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PO748297
Book 1 of 2

telemanuals.com

SL-1

Meridian 1

System installation procedures

Publication number: 553-3001-210
Document release: 7.0
Document status: Standard
Date: April 1, 1994

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Revision history

January 29, 1990

Standard, release 1.0.

February 28, 1990

Standard, release 2.0.

December 1, 1991

Standard, release 3.0. This document is reissued to include technical content updates. Due to the extent of the changes, revision bars are not used.

December 31, 1992

Standard, release 4.0. New information and changes to technical content are noted by revision bars in the margins.

April 1, 1993

Standard, release 5.0. Due to the extent of the changes, revision bars are not used.

August 1, 1993

Standard, release 6.0. New information and changes to technical content are noted by revision bars in the margins.

April 1, 1994

Standard, release 7.0. New information and changes to technical content are noted by revision bars in the margins.

Contents

Introduction	1-1
About this document	1-1
References	1-1
Meridian 1 equipment	1-3
Equipment handling precautions	1-5
Unloading equipment	1-5
Power equipment	1-5
Circuit cards	1-6
Datadisks	1-7
Cable routing guidelines	1-8
Initial Meridian 1 installation	2-1
System installation procedures	2-2
Preparing equipment for installation	3-1
Placing the fourth module on a column	4-1
Positioning and leveling equipment	5-1
Installing overhead cable tray kits	6-1
Installing AC power	7-1
Safety ground/protective earth and logic return wiring	7-2
Installation procedures	7-6

Installing DC power	8-1
External DC power equipment	8-2
Safety ground/protective earth and logic return wiring	8-4
PDU connections	8-7
Installation procedures	8-11
Planning and designating the Modular Distribution Frame (MDF)	9-1
BIX installation and designation	9-3
Backplane cable expansion	9-8
Installing PFTUs	10-1
Installation procedure	10-3
Connecting trunks and telephones	10-5
Configuring the system monitor	11-1
Configuring the NT8D22 System Monitor	11-1
Cabling the NT8D22 System Monitor	11-5
Installing the NT7D15 System Monitor	11-11
Connecting a system terminal (or modem)	12-1
Option 61C and 81 terminal and modem connections	12-9
Cabling common equipment	13-1
System option	13-2
System option 61C	13-5
System option 71	13-13
System option 81	13-24
Cabling network loops	14-1
NT8D04 Superloop Network Card	14-2
QPC414 Network Card	14-12
Cabling lines and trunks	15-1
I/O panel connections	15-5
Connecting lines and trunks	15-9



Powering up the system and initial loading	16-1
Preparing for power-up	16-1
Connecting power for AC-powered systems	16-3
Connecting power for DC-powered systems	16-4
Power-up option 21A, 21, 21E, 51, 61, and 71	16-6
Power-up option 61C and 81	16-8
Performing acceptance tests	17-1
Module power supply test	17-1
Blower unit and thermal sensor test	17-3
Sysloadtest	17-5
System terminal and system monitor test	17-7
PFTU test	17-8
Disk drive unit test	17-9
Installing earthquake bracing	18-1
Selecting the kit	18-1
Drilling the floor	18-4
Installing anchor plates	18-6
Procedure for installing Kit A	18-6
Procedure for installing Kit B:	18-6
Installing rods	18-8
Positioning and leveling the system	18-15
Installing anchors and angle brackets	18-16
Configuring remote peripheral equipment	19-1
Installing RPE	19-6
RPE option switch settings	19-17
Performing acceptance tests	19-23
Testing equipment	19-23
Testing transmission quality	19-24
Locating span line faults	19-24

Adding a module to a column	20-1
Adding a module to the base of a column	20-2
Adding a module between two other modules	20-7
Adding a module to the top of a column	20-13
Installing a PO71 5058 Universal I/O Panel	21-1
Appendix A: NTOR72, NT6D82, QBL12, QBL15, QCA13	A-1
Installing an NT6D82 Power System	A-1
Installing a QBL12 distribution box	A-2
Installing a QBL15 power system	A-7
Installing a QCA13 power plant	A-22
Installing safety ground/protective earth and logic return wiring	A-23
Connecting the PDU	A-30
Connecting the NT8D22 system monitor	A-40
Appendix B: NT7D10 PDU connections	B-1
Appendix C: Backplane cabling in NT8D11 (AC and DC) and NT8D37 (AA and DC) modules	C-1
I/O panel connections	C-6
Connecting lines and trunks	c-7
Backplane cable expansion	C-28
NT8D11 CE/PE Modules	C-28
NT8D37 IPE Modules	c-31
Appendix D: List of terms	D-1

List of figures

Figure 1-1	
Static discharge points	1-6
Figure 1-2	
Disk position	1-7
Figure 1-3	
Cable routing troughs-front view of module	1-9
Figure 3-1	
Locking latches on the module cover	3-2
Figure 3-2	
Removing the pedestal grill	3-2
Figure 3-3	
Location of the backplane jumper in the NT9D 11 Core/Network Module	3-5
Figure 3-4	
Location of the backplane jumpers in the NT6D60 Core Modules	3-5
Figure 4- 1	
Module positioning guides	4-2
Figure 4-2	
Module mounting bolts	4-3
Figure 4-3	
Power and system monitor connections	4-4
Figure 5-1	
Positioning spacer gaskets	5-2

Figure 5-2		
Spacer positioning	5-3	
Figure 5-3		
Column positioning with spacers	5-4	
Figure 6- 1		
Removing top cap grills	6-2	
Figure 6-2		
Overhead cable tray kit	6-2	
Figure 7- 1		
Single column-ground and logic return distribution	7-3	
Figure 7-2		
Multiple column-ground and logic return distribution	7-4	
Figure 7-3		
Multiple-column, multiple-row -ground and logic return distribution	7-5	
Figure 7-4		
Logic return connection for each column	7-7	
Figure 7-5		
AC reserve power configuration	7-8	
Figure 7-6		
UPS grounding diagram	7-9	
Figure 8-1		
Ground and logic return distribution —MFA150 Modular Power System	8-5	
Figure 8-2		
Ground and logic return distribution —MPP600 Modular Power Plant	8-6	
Figure 8-3		
Circuit protection for the PDU	8-7	
Figure 8-4		
DC-power equipment in the rear of the pedestal —NT7D67CB PDU	8-9	



Figure 8-5 Cable routing in the rear of the pedestal—NT7D67CB PDU	8-10
Figure 8-6 PDU to MFA150 connections	8-15
Figure 8-7 PDU to MPP600 connections	8-16
Figure 9-1 BIX Module	9-4
Figure 9-2 Recommended BIX layout for NT8D11 CE/PE, NT8D13 PE, and NT8D37 IPE Modules	9-5
Figure 9-3 Sample basic BIX labels—NT8D11 CE/PE and NT8D37 IPE Modules	9-6
Figure 9-4 Sample overlay BIX labels—NT8D14 Universal Trunk Card	9-6
Figure 9-5 Sample overlay BIX labels—NT8D15 E&M Trunk Card	9-7
Figure 9-6 Sample BIX labels—PFTU	9-7
Figure 10-1 MDF terminations for PFTU operation	10-2
Figure 11-1 Options 21, 21E, 51, 61 and 61C-cable master system monitor to SDI port	11-5
Figure 11-2 Options 71 and 81-cabling for master system monitor toslaveunit 1 and SDI port	11-6
Figure 11-3 Multiple-column system monitor connections	11-7
Figure 11-4 UPS alarm cabling	11-10

Figure 12-1	
Terminal connection diagram	12-2
Figure 12-2	
Ports and switches on the NT8D41 SDI Paddle Board	12-5
Figure 12-3	
Switch locations on the NTND02 MSPS Card	12-6
Figure 12-4	
Cabling diagram for the NT8D41 SDI Paddle Board	12-7
Figure 12-5	
Cabling diagram for the NTND02 MSPS Card	12-8
Figure 12-6	
Cabling diagram for the QPC84 1 Four-Port SDI Card	12-8
Figure 12-7	
One terminal for the CPIO ports	12-11
Figure 12-8	
One terminal and a switch box to two CPIO ports	12-13
Figure 12-9	
One terminal and a switch box to the SDI and CPIO ports	12-15
Figure 12-10	
Modem to SDI port	12-20
Figure 12-11	
Modem to a switch box and SDI and CPIO ports	12-23
Figure 13-1	
Option 61 dual CPU, full network group configuration	13-2
Figure 13-2	
NT6D39 CPU/Network Module (front view)	
-CMA and 3PE cables	13-4
Figure 13-3	
NT6D39 CPU/Network Module (rear view)	
-location of D and E connectors	13-4
Figure 13-4	
Option 61C dual CPU, full network group	13-5



Figure 13-5 NT9D11 Core/Network Module (rear view) -location of D and E connectors	13-8
Figure 13-6 NT9D 11 Core/Network Module (rear) -pre-installed backplane connections	13-9
Figure 13-7 NT9D11 Core/Network Module (rear)-connections for IOP to IOP and CP to CP cables	13-11
Figure 13-8 NT9D 11 Core/Network Module (front) -clock controller card connections	13-12
Figure 13-9 Option 71 dual CPU, multiple network group configuration	13-14
Figure 13-10 NT8D34 CPU Module (front view)-CMA, clock controller, and SBE cards	13-19
Figure 13- 11 NT8D36 InterGroup Module connectors	13-19
Figure 13-12 NT8D35 Network Module (front view)-3PE and IGS cables	13-20
Figure 13-13 Cable routing from clock controller cards to InterGroup Module	13-20
Figure 13-14 Network Group O-cable routing to CPU and InterGroup Modules . . ,	13-21
Figure 13-15 Network Group 1 -cable routing to CPU and InterGroup Modules . .	13-21
Figure 13-16 Network Group 2-cable routing to CPU and InterGroup Modules . .	13-22
Figure 13-17 Network Group 3-cable routing to CPU and InterGroup Modules . .	13-22
Figure 13-18 Network Group 4-cable routing to CPU and InterGroup Modules . .	13-23

Figure 13-19	
Option 81 dual CPU, multiple network group configuration	13-25
Figure 13-20	
NT6D60 Core Module (rear)-preinstalled backplane connections . .	13-30
Figure 13-21	
NT6D60 Core Module (rear)-connections for IOP to IOP and CP to CP cables	13-31
Figure 13-22	
NT6D60 Core Module (front)-clock controller card connections . .	13-33
Figure 13-23	
Cable routing from clock controller cards to InterGroup Module	13-34
Figure 13-24	
NT8D36 InterGroup Module-connectors for IGS cards	13-37
Figure 13-25	
Network Group O-cable routing to Core and InterGroup Modules . .	13-37
Figure 13-26	
Group 1 -cable routing to Core and InterGroup Modules	13-38
Figure 13-27	
Network Group 2-cable routing to Core and InterGroup Modules . .	13-38
Figure 13-28	
Network Group 3-cable routing to Core and InterGroup Modules . .	13-39
Figure 13-29	
Network Group 4-cable routing to Core and InterGroup Modules . .	13-39
Figure 14- 1	
Multiple rows of columns	14-2
Figure 14-2	
NT8D04 Superloop Network Card network loops -connectors for single-row connections	14-4
Figure 14-3	
Installing a superloop adapter plate	14-6
Figure 14-4	
NT8D04 Superloop Network Card network loops -network card to I/O panel connections	14-8



Figure 14-5	
NT8D04 Superloop Network Card network loops	
-controller card to I/O panel connections	14-9
Figure 14-6	
QPC414 Network Card network loops	
-connectors and cables for single-row connections	14-13
Figure 14-7	
QPC414 Network Card network loops	
-network card to I/O panel connections	14-15
Figure 14-8	
QPC414 Network Card network loops	
-DLB card to I/O panel connections	14-17
Figure 14-9	
QPC414 network loop configurations	14-18
Figure 15-1	
NT8D 11 backplane cable designations	15-2
Figure 15-2	
NT8D37 backplane cable designations	15-4
Figure 15-3	
NT8D11 CE/PE Module I/O panels	15-6
Figure 15-4	
NT8D13 PE Module I/O panels	15-7
Figure 15-5	
NT8D37 IPE Module I/O panels	15-8
Figure 17- 1	
Blower unit removal	17-4
Figure 18- 1	
Mounting plate installation	18-7
Figure 18-2	
Top cap assembly	18-10
Figure 18-3	
Installing bracing rods for column support	18- 11

Figure 18-4	
Positioning spacer gaskets	18- 12
Figure 18-5	
Spacer positioning	18- 13
Figure 18-6	
Adding spacers to columns	18- 14
Figure 18-7	
Floor layout template	18-18
Figure 18-8	
Anchor bolt installation	18- 19
Figure 18-9	
Attaching spacers	18-2 1
Figure 18- 10	
Angle bracket placement	18-22
Figure 19- 1	
Card slots in the NT8D47 RPE Module	19-2
Figure 19-2	
Possible ORB locations in the RPE system	19-3
Figure 19-3	
RPE Module backplane	19-4
Figure 19-4	
Input/output panel	19-5
Figure 19-5	
Remote peripheral equipment cabling	19-7
Figure 19-6	
Local-to-remote RPE cross-connections	19- 13
Figure 19-7	
MDF cross-connections	19- 14
Figure 19-8	
Maintenance lead cross-connections	19-15
Figure 19-9	
QPC62 option switch and header pin locations	19-17

Figure 19-10	
QPC66 header pin strapping	19-18
Figure 19-11	
QPC99 option switch locations	19-19
Figure 19-12	
QPC99 maintenance jacks and looping switches	19-26
Figure 19-13	
Typical span line fault locating arrangement	19-27
Figure 20-1	
NT7D09CA Pedestal-module power and system monitor connections	20-3
Figure 20-2	
Module mounting bolts	20-4
Figure 20-3	
Module-to-module power and system monitor connections	20-6
Figure 20-4	
Module-to-module power and system monitor connections	20-9
Figure 20-5	
Module mounting bolts	20-10
Figure 20-6	
Module positioning guides	20-11
Figure 20-7	
Top cap assembly	20-15
Figure 20-8	
Module positioning guides	20-16
Figure 20-9	
Module mounting bolts	20-17
Figure 20-10	
Module-to-module power and system monitor connections ..	20-19
Figure A-1	
QBL12 distribution box	A-2

Figure A-2	
QBL12 -48 V and ground connections	A-5
Figure A-3	
QBL12 SENSE and DCON connections	A-6
Figure A-4	
NTOR72 rectifier-front view	A-8
Figure A-5	
NTOR72 rectifier-rear view	A-8
Figure A-6	
NTOR72 rectifiers and NT7D12 rectifier rack	A-10
Figure A-7	
NT7D1201 baffle assembly mounted in rack	A-11
Figure A-8	
NTOR72 rectifier mounted in rack	A-12
Figure A-9	
QBL15 battery connections	A-16
Figure A-10	
Rectifier to QBL15 connections	A-20
Figure A-11	
NT6D54 field wiring kit connections	A-21
Figure A-12	
NT8D62 Ground and logic return distribution —NT6D82 Power System	A-24
Figure A-13	
QBL12 ground and logic return distribution	A-25
Figure A-14	
QBL15 ground and logic return distribution	A-26
Figure A-15	
QCA13 ground and logic return distribution	A-27
Figure A-16	
Circuit protection for the PDU	A-30

Figure A- 17	
DC power equipment in the rear of the pedestal—NT7D67CB PDU .	A-32
Figure A- 18	
Cable routing in the rear of the pedestal—NT7D67CB PDU	A-33
Figure A- 19	
PDU to NT6D82 connections	A-37
Figure A-20	
PDU to QBL12 or QCA13 connections	A-38
Figure A-21	
PDU to QBL15 connections	A-39
Figure B-1	
Power equipment in the rear of the pedestal—NT7D10 PDU	B-1
Figure B-2	
PDU to MFA150 connections	B-5
Figure B-3	
PDU to NT6D82 connections	B-6
Figure B-4	
PDU to QBL12 or QCA13 connections	B-7
Figure B-5	
PDU to QBL15 connections	B-8
Figure C- 1	
NT8D11 backplane cable designations for 7-cable configuration . . .	c-2
Figure C-2	
NT8D11 CE/PE Module I/O panels for 7-cable configuration	c-3
Figure C-3	
NT8D37 backplane cable designations for 12-cable configuration . .	c-4
Figure C-4	
NT8D37 IPE Module I/O panels for 12-cable configuration	c-5
Figure C-5	
NT8D11 backplane cable designations: expanded configuration	C-30
Figure C-6	
NT8D37 backplane cable designations: expanded configuration	C-33



List of tables

Table 2-1	
Initial system installation-list of tasks in subsections	2-4
Table 8- 1	
Wire gauge requirements with two 30-amp feeds (five wires)	8-8
Table 9- 1	
Order codes for BIX designation strips	9-2
Table 10- 1	
MDF cross-connections for PFTU operations	10-3
Table 11-1	
NT8D22 switch settings for a single-column system	11-1
Table 1 1-2	
Switch settings for master in multiple-column system	11-2
Table 1 1-3	
Switch settings for slaves in multiple-column system	11-2
Table 1 1-4	
SW2 on master-total number of slaves in the system	11-3
Table 1 1-5	
SW2 on each slave-unit number for the slave	11-4
Table 11-6	
NT8D22 System Monitor-system monitor to MDF cable pin assignments at the MDF	11-8
Table 11-7	
Pin assignments for the NT8D46 (AJ, AQ, AU) UPS alarm cable . . .	11-9

Table 11-8	Alarm and trip lead connections — NT8D46AV cable	11-11
Table 11-9	NT7D 15 System Monitor-system monitor to MDF cable pin assignments at the MDF	11-12
Table 13-1	SBE to 3PE cable assignment-use NT8D80 cables	13-16
Table 13-2	IGS to InterGroup cable assignment-use NT8D76 cables	13-18
Table 13-3	Typical CNI configuration (option 81)	13-26
Table 13-4	CNI backplane connector positions - NTND 14 cables	13-29
Table 13-5	CNI to 3PE connections- NTND14 cables	13-35
Table 13-6	IGS to InterGroup cable assignment-use NT8D76 cables	13-36
Table 14-1	NT8D04 network loop configurations	14-11
Table 15-1	NT8D11 cable connections	15-2
Table 15-2	NT8D37 cable connections	15-3
Table 15-3	Line and trunk pair-termination tables	15-9
Table 15-4	NT8D 11 CE/PE Module: line card pair-terminations	15- 10
Table 15-5	NT8D 11 CE/PE Module: NT8D 14 Universal Trunk Card pair-terminations	15- 11
Table 15-6	NT8D 11 CE/PE Module: NT8D 15 E&M Trunk Card 2-wire paging mode pair-terminations	15- 12

Table 15-7	
NT8D 11 CE/PE Module: NT8D 15 E&M Trunk Card	
2-wire type 1 mode pair-terminations	15-12
Table 15-8	
NT8D 11 CE/PE Module: NT8D 15 E&M Trunk Card	
4-wire type 1 and type 2 mode pair-terminations	15-13
Table 15-9	
NT8D13 PE Module: line card pair-terminations	
for connectors A, C, E, and G (single loop mode)	15-14
Table 15-10	
NT8D 13 PE Module: line card pair-terminations	
for connectors B, D, and F (single loop mode)	15-15
Table 15-11	
NT8D 13 PE Module: line card pair-terminations	
for connectors A, C, E, and G (dual loop mode)	15-16
Table 15-12	
NT8D 13 PE Module: line card pair-terminations	
for connectors B, D, and F (dual loop mode)	15-17
Table 15-13	
NT8D 13 PE Module: QPC7 1 E&M//DX Trunk pair-terminations ...	15- 18
Table 15-14	
NT8D 13 PE Module: QPC74 Recorded Announcement Trunk	
pair-terminations	15-19
Table 15-15	
NT8D13 PE Module: QPC237 4-wire	
E&M//DX Trunk pair-terminations	15-20
Table 15-16	
NT8D 13 PE Module: QPC239 Recorded Telephone Dictation Trunk	
pair-terminations	15-21
Table 15-17	
NT8D13 PE Module: QPC250 Release Line Trunk pair-terminations	15-21
Table 15-18	
NT8D 13 PE Module: QPC449 Loop Signaling Trunk and QPC450	
CO/FX/WATS Trunk pair-terminations	15-22

Table 15-19	
NT8D 13 PE Module: Announcement and Music Trunk pair-terminations	15-23
Table 15-20	
NT8D37 IPE Module: line card pan-terminations	15-24
Table 15-21	
NT8D37 IPE Module: NT8D 14 Universal Trunk Card pair-terminations	15-25
Table 15-22	
NT8D37 IPE Module: NT8D 15 E&M Trunk Card 2-wire paging mode pair-terminations	15-26
Table 15-23	
NT8D37 IPE Module: NT8D15 E&M Trunk Card 2-wire type 1 mode pair-terminations	15-26
Table 15-24	
NT8D37 IPE Module: NT8D15 E&M Trunk Card 4-wire type 1 and type 2 mode pair-terminations	15-27
Table 18-1	
Seismic Bracing Kits	18-2
Table 18-2	
Seismic Anchor Kit	18-3
Table 18-3	
Anchor hole sizes	18-5
Table 19-1	
Connector C pin assignments (receive signal cable)	19-9
Table 19-2	
Connector D pin assignments (transmit signal cable)	19-10
Table 19-3	
Connector E pin assignments	19-11
Table 19-4	
Connector F pin assignments	19-12
Table 19-5	
QPC62 switch settings	19-18

Table 19-6	
QPC99 A20 switch and F25 pad switch	19-20
Table 19-7	
QPC99 S2 switch	19-20
Table 19-8	
NT8D22 System Monitor switch settings for slaves	19-21
Table 19-9	
SW2 on each slave-unit number for the slave	19-22
Table A- 1	
QBL 12 cabling	A-4
Table A-2	
Equipment dimensions	A-7
Table A-3	
Rectifier settings	A- 14
Table A-4	
Cabling to connect a QBL15 to batteries	A-15
Table A-5	
Cabling to add a second QBL15	A-17
Table A-6	
Cabling to connect NTOR72 rectifiers to the QBL15 distribution box	A-20
Table A-7	
Wire gauge requirements with two 30-amp feeds (five wires)	A-31
Table A-8	
NT6D82 alarm and trip lead connections—NT8D46AV cable ,	A-41
Table A-9	
QBL12 alarm and trip lead connections—NT8D46AW cable	A-42
Table A- 10	
QBL15 alarm and trip lead connections—NT8D46AT cable	A-43
Table A- 11	
QCA13 alarm and trip lead connections—NT8D46AV cable	A-44

Table C- 1	
NT8D 11 cable connections for 7-cable configuration	c-2
Table C-2	
NT8D37 cable connections for 12-cable configuration	c-4
Table C-3	
Line and trunk pair-termination tables	c-7
Table C-4	
NT8D11 CE/PE Module: line card pair-terminations for connectors A, B, E, and H (7-cable)	C-8
Table C-5	
NT8D11 CE/PE Module: line card pair-terminations for connectors C, F, and K (7-cable)	C-9
Table C-6	
NT8D 11 CE/PE Module: NT8D 14 pair-terminations for connectors A, B, E, and H (7-cable)	C-10
Table C-7	
NT8D11 CE/PE Module: NT8D14 pair-terminations for connectors C, F, and K (7-cable)	C-11
Table C-8	
NT8D11 CE/PE Module: NT8D 15 2-wire paging mode pair-terminations for connectors A, B, E, and H (7-cable)	C-12
Table C-9	
NT8D 11 CE/PE Module: NT8D 15 2-wire paging mode pair-terminations for connectors C,F,and K (7-cable)	C-12
Table C-10	
NT8D11 CE/PE Module: NT8D15 2-wire type 1 mode pair-terminations for connectors A, B, E, and H (7-cable)	C- 13
Table C-1 1	
NT8D11 CE/PE Module: NT8D 15 %-wire type 1 mode pair-terminations for connectors C, F, and K (7-cable)	C- 13

Table C-12	
NT8D11 CE/PE Module: NT8D15 4-wire type 1 and type 2 mode pair-terminations for connectors A, B, E, and H (7-cable)	C-14
Table C- 13	
NT8D11 CE/PE Module: NT8D15 4-wire type 1 and type 2 mode pair-terminations for connectors C, F, and K (7-cable)	C- 15
Table C-14	
NT8D37 IPE Module: line card pair-terminations for connectors A, E, K, and R (12-cable)	C-16
Table C- 15	
NT8D37 IPE Module: line card pair-terminations for connectors B, F, L, and S (12-cable)	C-17
Table C- 16	
NT8D37 IPE Module: line card pair-terminations for connectors C, G, M, and T (12-cable)	C-18
Table C-17	
NT8D37 IPE Module: NT8D14 pair-terminations for connectors A, E, K, and R (12-cable)	c-19
Table C- 18	
NT8D37 IPE Module: NT8D 14 pair-terminations for connectors B, F, L, and S (12-cable)	c-20
Table C-19	
NT8D37 IPE Module: NT8D14 pair-terminations for connectors C, G, M, and T (12-cable)	c-21
Table C-20	
NT8D37 LPE Module: NT8D15 2-wire paging mode pair-terminations for connectors A, E, K, and R (12-cable)	c-22
Table C-21	
NT8D37 IPE Module: NT8D 1.5 2-wire paging mode pair-terminations for connectors B, F, L, and S (12-cable)	C-22
Table C-22	
NT8D37 IPE Module: NT8D15 2-wire paging mode pair-terminations for connectors C, G, M, and T (12-cable)	C-23

Table C-23
NT8D37 IPE Module: NT8D15 2-wire type 1 mode
pair-terminations for connectors A, E, **K**, and R (12-cable) C-23

Table C-24
NT8D37 IPE Module: NT8D15 2-wire type 1 mode
pair-terminations for connectors B, F, L, and S (12-cable) C-24

Table C-25
NT8D37 IPE Module: NT8D15 2-wire type 1 mode
pair-terminations for connectors C, G, M, and T (12-cable) C-24

Table C-26
NT8D37 IPE Module: NT8D15 4-wire type 1 and type 2 mode
pair-terminations for connectors A, E, **K**, and R (12-cable) C-25

Table C-27
NT8D37 IPE Module: NT8D15 4-wire type 1 and type 2 mode
pair-terminations for connectors B, F, L, and S (12-cable) C-26

Table C-28
NT8D37 IPE Module: NT8D15 4-wire type 1 and type 2 mode
pair-terminations for connectors C, G, M, and T (12-cable) C-27

Table C-29
NT8D1 1 cable connections: expanded configuration c-30

Table C-30
NT8D37 cable connections: expanded configuration C-32

introduction

About this document

This document provides installation and acceptance testing procedures for Meridian 1 system options 21A, 21, 21E, 51,61, 61C, 71, and 81.

System installation is to be performed by qualified personnel only. To use this document, you should have a basic knowledge of Meridian 1 equipment and operation. (Contact Northern Telecom Training Centers for information on installation courses.) You should also read and fully understand the Meridian 1 *System overview* (553-3001-100) before you install a system.

References

See the *Meridian 1 planning and engineering guide* for:

- *System overview* (553-3001-100)
- *Installation planning* (553-3001-120)
- *System engineering* (553-3001-151)
- *Power engineering* (553-3001-152)
- *Spares planning* (553-3001-153)
- *Equipment identification* (553-3001-154)

See the *Meridian 1 installation and maintenance guide* for:

- *Library Navigator* (553-3001-000)
- *Circuit card installation and testing* (553-3001-211)
- *Telephone and attendant console installation* (553-3001-215)
- *General maintenance information* (553-3001-500)
- *Fault clearing* (553-3001-510)
- *Hardware replacement* (553-3001-520)

For information on the **MFA150** Modular Front Access Power System, see the following documents:

- *MFA150 Modular Front Access Power System: Description, installation, operation, and maintenance manual* (167-9021-104)
- *MFA150 Modular Front Access Power System User Guide* (P0730 121)

For information on the **MPP600** Modular Power Plant, see the following documents:

- *MPP600 Modular Power Plant: Description, installation, operation, and maintenance manual* (167-9021-105) (P0741670)
- *50-amp Rectifier Expansion Assembly Installation* (P0743512)

For information on the **NT6D82** Power System, see the following documents:

- *NT6D82 Power System description, installation, and maintenance* (553-3001-110)
- *Reference manual for NT6D82 Power System* (P07 14863)
- *Reference manual for 100A Rectifier* (P0714864)

For information on the **QCA13** DC power system, see the following documents:

- *Power Distribution Plant J2412A* (167-2191-200)
- *NT5C03 Switched Mode Rectifier -48V/50A: Description, Maintenance, and Ordering Information* (169-2031-200)

See the *Meridian I XI1* software guide for:

- *XI1 software management* (553-3001-300)
- *XI1 features and services* (553-3001-305)

See the *XI1 input/output guide* (553-3001-400) for a description of all administration programs, maintenance programs, and system messages.

Meridian 1 equipment

In Meridian 1 systems, modules are stacked one on top of another to form a column. Each column contains a pedestal, a top cap, and up to four modules that can include the:

- **NT6D39 CPU/Network Module**
required for options 5 1 and 6 1
- **NT6D60 Core Module**
required for option 81
- **NT8D1 1 Common/Peripheral Equipment (CE/PE) Module**
required for options 21A, 21, and 21E
- **NT8D13 Peripheral Equipment (PE) Module**
optional for options 21, 21E, 51, 61, 61C, 71, and 81
- **NT8D34 CPU Module**
required for option 71
- **NT8D35 Network Module**
required for options 7 1 and 8 1, optional for digital trunk interface (DTI)/primary rate interface (PRI) expansion in options 21, 21E, 51, and 61
- **NT8D36 InterGroup Module**
required for options 7 1 and 8 1
- **NT8D37 Intelligent Peripheral Equipment (IPE) Module**
required for options 5 1, 6 1, 6 1 C, 7 1, and 8 1; optional for options 2 1 and 21E
- **NT8D47 Remote Peripheral Equipment (RPE) Module**
optional for options 21, 21E, 51, 61, 61C, 71, and 81
- **NT9D11 Core/Network Module**
required for option 6 1 C

In addition, modules that house application specific equipment, such as Meridian Mail and Meridian Link modules, can be included in a column.

Each pedestal (except in option 21A) houses a blower unit, air filter, power distribution unit (PDU), and system monitor.

The top cap provides airflow exits, input/output (I/O) cable access, and overhead cable-rack mounting. Thermal sensor assemblies for the column are attached to a perforated panel, which is placed on top of the highest module in the column, under the top cap.

A system can have one column or multiple columns. For compliance with **EMI/RFI** standards, spacer kits are provided to interconnect the columns in a multiple-column system.

The procedures in this document apply to the following system options:

- option 2 1 A: single CPU, single module
- options 2 1 and 2 1E single CPU
(2 1 Enhanced):
- option 5 1: single CPU, half network group
- option 6 1: dual CPU, full network group
- option 6 1 C: enhanced common control complex with dual CPU, full network group
- option 7 1: dual CPU, multiple network groups
- option 8 1: enhanced common control complex with dual CPU, multiple network groups

All system options are available in both AC- and DC-powered versions (except option **2 1A**, which is available with AC power only).

Meridian 1 system architecture and each type of module are described in *System overview* (553-3001-100). The components of AC-powered systems, DC-powered systems, and reserve power options for both are described in *Power engineering* (553-3001-152).

Equipment handling precautions

To avoid personal injury and equipment damage, review the following guidelines before handling Meridian 1 equipment.

Unloading equipment

Special ramps, packed inside the pallet holding Column 0, must be used to move the equipment off the pallet. Follow the instructions provided with the ramps.

CAUTION

Never pry up the pedestal to lift the column. This could cause major damage to the pedestal. Manually slide the column down the ramps provided.

Power equipment

There are no user-repairable components in the power system. If a power supply fails, the complete unit must be replaced. Do *not* disassemble a power supply under any circumstances.

WARNING

To avoid the danger of electric shock, **be careful** when you work with power equipment and connections. **Warning** notices are displayed and *must* be heeded.

External power equipment, such as a UPS, power plant, or batteries, may be very heavy and may require special handling procedures and additional personnel for unloading and installation. Also, be aware of weight distribution and keep the equipment room floor from being overly stressed.

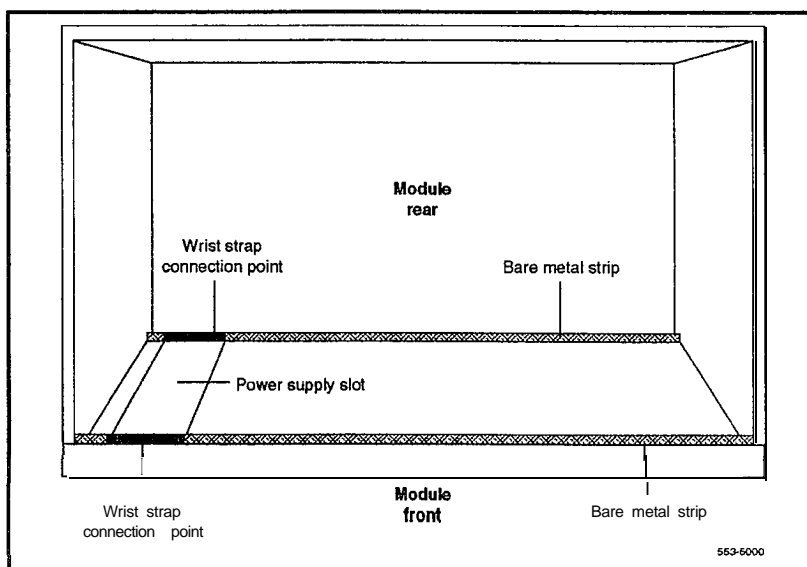
Circuit cards

Handle cards as follows:

- Unpack or handle cards away from electric motors, transformers, or similar machinery.
- Handle cards by the edges only. Do not touch the contacts or components.
- Set cards on a protective antistatic bag. If an antistatic bag is not available, hand-hold the card, or set it in a card cage unseated from the connectors.
- Store cards in protective packing. Do not stack cards on top of each other unless they are packaged.

To avoid card damage from static discharge, wear a properly connected antistatic wrist strap when you work on Meridian 1 equipment. If a wrist strap is not available, regularly touch one of the bare metal strips in the module to discharge static. Figure 1-1 shows connection points for the wrist strap and the bare metal strips you should touch.

Figure 1-1
Static discharge points



Data disks

Check the disk identification to make sure it is the correct disk. Compare software options with the data cartridge. Follow these precautions to avoid damaging disks:

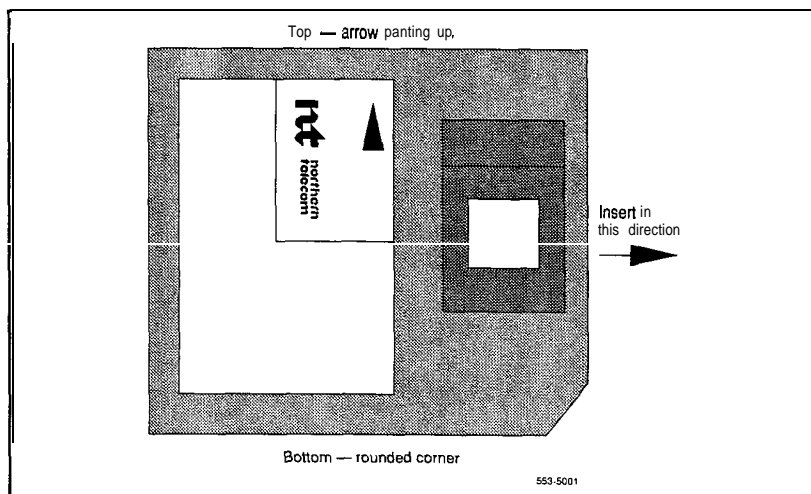
- Handle only the hard surface; never touch the recording surface.
- Keep disks away from strong magnetic fields.
- Avoid exposing disks to extreme heat, rapid changes in temperature, or high humidity.
- Store disks in a suitable container.

To install a disk, make sure the arrow on the label is pointing up and the rounded corner is on the bottom on the right-hand side (see Figure 1-2).

CAUTION

The disk drive can be damaged if an upside-down disk is forced into the slot. If there is significant resistance when you try to insert a disk, remove the disk and check the position.

Figure 1-2
Disk position



Cable routing guidelines

A system layout, **preconfigured** at the factory, is included in the software box with each system shipment. Before you route cables, refer to the “to-from” cable connections in the system layout. Note that there are a variety of cable lengths. Make sure you install the designated cable for each connection.

Because the cable troughs (see Figure 1-3) and spaces on the sides of each module are within the **EMI** shielding of the system, unshielded cables can be routed in those areas. The corner vertical channels in the rear of the module are outside of the **EMI** shield. Cables routed in the vertical channels must be shielded, and must enter and exit the **EMI-shielded** area through I/O panels and adapters.

As space permits, cables can be routed

- horizontally in the cable troughs at the front, rear, and sides of the module

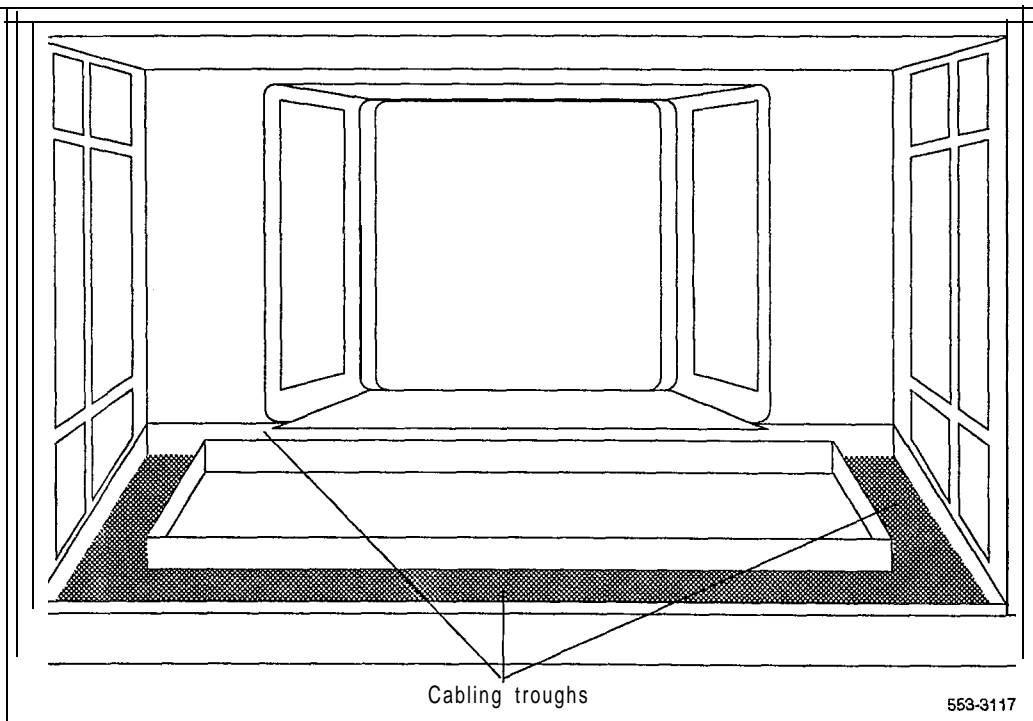
Note: In a DC-powered module, because there is no MPDU, there is room to route cables horizontally from front to rear on the left side (front view) of the module.

- vertically on the sides of the module
- vertically in the corner channels in the rear of the module (shielded cables only)

CAUTION

Cables must be routed as perpendicular as possible to any nearby power cables. Avoid routing cables near power cables if alternate routing is available. (At the rear of the module, cables routed between the I/O panel and the rear cover can be parallel to the power cables because the panel provides EMI shielding.)

Figure 1-3
Cable routing troughs-front view of module





Initial Meridian 1 installation

Before Meridian 1 equipment is delivered to the installation site, you must consider

- fire protection and safety requirements
- equipment room requirements
- grounding and power requirements
- cable requirements

Specifications for these requirements and for developing the equipment room floor plan are provided in *Installation planning (553-3001-120)*.

For proper installation, perform the steps in this procedure in the order given. If you go to a subsection to perform a step, return to the next step in this procedure when the tasks in the subsection are completed. For example, when you complete Step 3 “position and level equipment,” return to Step 4 in this procedure. See Table 2-1 for a list of tasks in subsections.

Whenever possible, install external power equipment before the system installation. If reserve power equipment is used, install it according to the manufacturer’s instructions.

To install telephones and attendant consoles, see *Telephone and attendant console installation (X3-3001-215)*.

System installation is to be performed by qualified personnel only.

System installation procedures

- 1 Prepare equipment for installation; go to “Preparing equipment for installation” on page 3- 1.
- 2 Place the fourth module on a column (if required); go to “Placing the fourth module on a column” on page 4- 1.
- 3 Position and level equipment; go to “Positioning and leveling equipment” on page 5- 1.

Note: If earthquake bracing is required, go to “Installing earthquake bracing” on page 18-1 to install column and floor bracing and to position and level equipment. When those procedures are complete, return to Step 4 or Step 5 (as applicable) in this procedure.

- 4 Install overhead cable tray kits (if required); go to “Installing overhead cable tray kits” on page 6- 1.
- 5 Install power supplies in all modules:
 - Make sure the system is disconnected from any power source.
 - Set switches and breakers on all module power supplies or module power distribution units (**MPDUs**) to OFF.
 - Insert each power supply into the appropriate card cage and hook the locking devices.

Note: In option 21E, a battery pack on the NTND02 **Misc/SDI/Peripheral** Signaling (MSPS) Card can provide up to 60 minutes of backup for CPU memory during power failures. To enable this function, pull the MSPS Card out, plug the connector from the battery pack assembly into the connector on the card (make sure the connector key is centered on **J2**), and reseal the card.

- 6 Install the disk drive unit in a CPU Module.

Note: In options 61C and 81, there are two disk drive units. Install a disk drive unit in each Core/Network or Core Module.

- 7 Install power equipment and ground wiring:
 - For AC-powered systems, go to “Installing AC power” on page 7- 1
 - For DC-powered systems, go to “Installing DC power” on page 8- 1

- 8 Plan and designate the main distribution frame (MDF); go to “Planning and designating the Modular Distribution Frame (MDF)” on page 9- 1.
- 9 Install power fail transfer units (PFTUs) (if required); go to “Installing PFTUs” on page 10- 1.
- 10 Configure the system monitor; go to “Configuring the system monitor” on page 11-1.
- 11 Connect a system terminal (or modem); go to “Connecting a system terminal (or modem)” on page 12- 1.

Note: The NT7D15 System Monitor used in option 21A does not connect to an SDI port or to the system terminal.

12 Install cabling:

- To cable common equipment, go to “Cabling common equipment” on page 13-1.

Note: This procedure does not apply to single CPU systems (options 21A, 21, 21E, and 51).

- To cable network loops, go to “Cabling network loops” on page 14-1.

Note: In options 21A, 21, and 21E, IPE slots 0-9 in the NT8D11 CE/PE Module are served by the NT8D18 Network/Digitone Receiver (DTR) Card. There is no cabling between the Network/DTR card and the IPE Cards.

- To cable PE/IPE Modules to the MDF and to connect lines and trunks, go to “Cabling lines and trunks” on page 15-1.

- 13 Power up the system and load the system software; go to “Powering up the system and initial loading” on page 16-1.
- 14 Perform acceptance tests; go to “Performing acceptance tests” on page 17-1.

Note: To test circuit cards, see “Acceptance tests” in *Circuit card installation and testing* (553-3001-2 11). To test telephones and attendant consoles, see *Telephone and attendant console installation* (553-3001-215).

- 15 Replace all covers and grills on the front and rear of the system.

Table 2-1
Initial system installation-list of tasks in subsections

Task	Go to
Prepare equipment for installation	page 3-1
Place the fourth module on a column	page 4-1
Position and level equipment	page 5-1
Install overhead cable tray kits	page 6-1
Install power supplies in all modules*	—
Install the disk drive unit(s)	—
Install power equipment and ground wiring AC power DC power	page 7-1 page 8-1
Plan and designate the MDF	page 9-1
Install PFTUs	page 10-1
Configure the system monitor	page 11-1
Connect a system terminal (or modem)	page 12-1
Cable common equipment	page 13-1
Cable network loops	page 14-1
Cable lines and trunks	page 15-1
Power up the system and load system software	page 16-1
Perform acceptance tests	page 17-1
* See "System installation procedures" on page 2-2 and 2-3 for details on tasks that are not described in subsections.	

Preparing equipment for installation

Use the equipment room floor plan to position equipment. See *Installation planning* (553-3001-120) to prepare the equipment room and floor plan.

WARNING

A fully loaded column weighs 274.4 kg (605 lbs). More than one person is required to remove equipment from shipping pallets.

WARNING

Module covers are *not* hinged; do not let go of the cover. **Lift** the cover away from the module and set it out of the work area.

- 1 Remove equipment from the shipping pallets; follow the unpacking instructions that come with the packaging material.
- 2 Remove the front and rear covers from each module:
 - With a flat blade screwdriver, turn the lock clockwise on the two locking latches (see Figure 3-1).
 - Simultaneously push the latches toward the center of the cover and pull the cover toward you while lifting it away from the module.
 - Set the covers aside until the installation is complete.
- 3 Remove the front and rear grills from each pedestal:
 - Loosen the two captive screws that secure the grill.
 - Pull the grill forward and lift it out of the base of the pedestal (see Figure 3-2).
 - Set the grills aside until the installation is complete.

Figure 3-1
Locking latches on the module cover

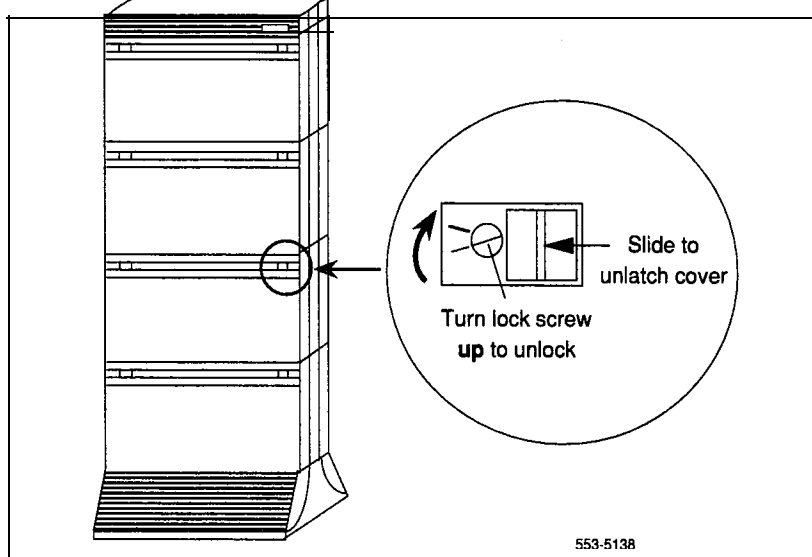
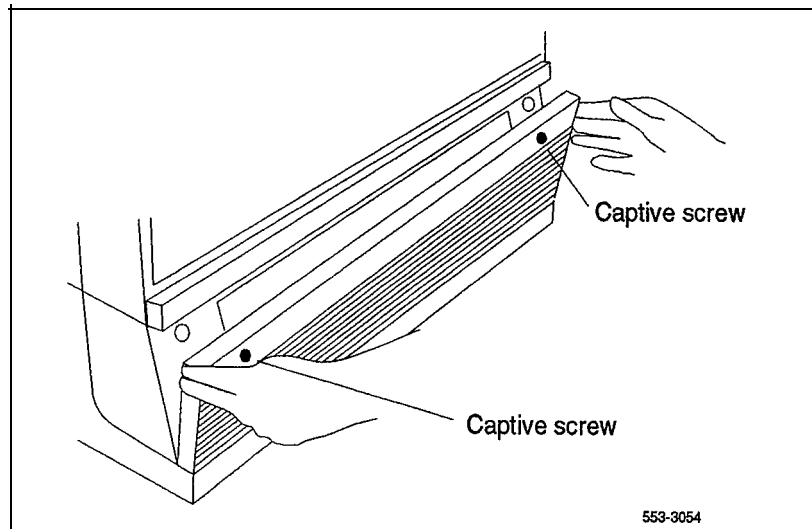


Figure 3-2
Removing the pedestal grill



-
- 4 Make sure all of the items on the system order form are on the packing slip that comes with the equipment.
 - 5 Inspect all equipment for physical damage. Report any damage to your supplier.
 - 6 Remove the foam pieces that secure bus terminating units (BTUs) in the following modules and verify that the BTUs are installed in the correct positions:
 - In options 51 and 61, check the NT6D39 CPU/Network Module:
 - between slots 1 and 2—QPC477A10 or B10
 - between slots 2 and 3 —QPC477A9
 - between slots 12 and 13— QPC477A22
 - In option 61C, check the NT9D11 Core/Network Module:
 - between slots 0 and 1 —QPC477A9
 - between slots 1 and 2—QPC477B10
 - In option 71, check the NT8D34 CPU Module:
 - for CPU 0 between slots 13 and 14—QPC477A20
 - for CPU 1 between slots 13 and 14—QPC477A21

Check the NT8D35 Network Module:

 - between slots 11 and 12—QPC477A9
 - between slots 12 and 13—QPC477A10 or B10
 - In option 81, check the NT6D60 Core Module:
 - between slots 4 and 5 —QPC477A9
 - between slots 5 and 6—QPC477B10

Check the NT8D35 Network Module:

 - between slots 11 and 12—QPC477A9
 - between slots 12 and 13—QPC477A10 or B10

- 7 Check the option settings on all cards that have a switch symbol on the faceplate. Also check the jumper settings for NTCD6003 CBT card. To check the option switch and jumper settings, refer to Circuit card *and testing* (553-3001-211) for all switch and jumper settings.

In **Option 61C**, a single jumper in each of the **NT9D11** Core/Network Modules determines whether the module is designated as Core/Network 0 or Core/Network 1. The jumper is located on the rear of the backplane behind card slot 14 (see Figure 3-3).

- In Core/Network Module 0, verify that the jumper is closed (there is a plug over both pins).
- In Core/Network Module 1, verify that the jumper is open (there is not a plug over the pins).

In option 81, four jumpers in the **NT6D60** Core Modules determine whether the module is designated as Core 0 or Core 1. The jumpers are located on the backplane, along the bottom of the front side (behind the circuit cards) (see Figure 3-4).

- In Core 0, verify that all four jumpers are closed (there is a plug over both pins).
- In Core 1, verify that jumper JB4, between slots 9 and 10, is open (**jumper plug not installed**). Verify that the other three backplane jumpers are closed.

CAUTION

If the Core Module jumpers are set incorrectly, the system will not load and operate correctly.

Figure 3-3
Location of the backplane jumper in the **NT9D11** Core/Network Module

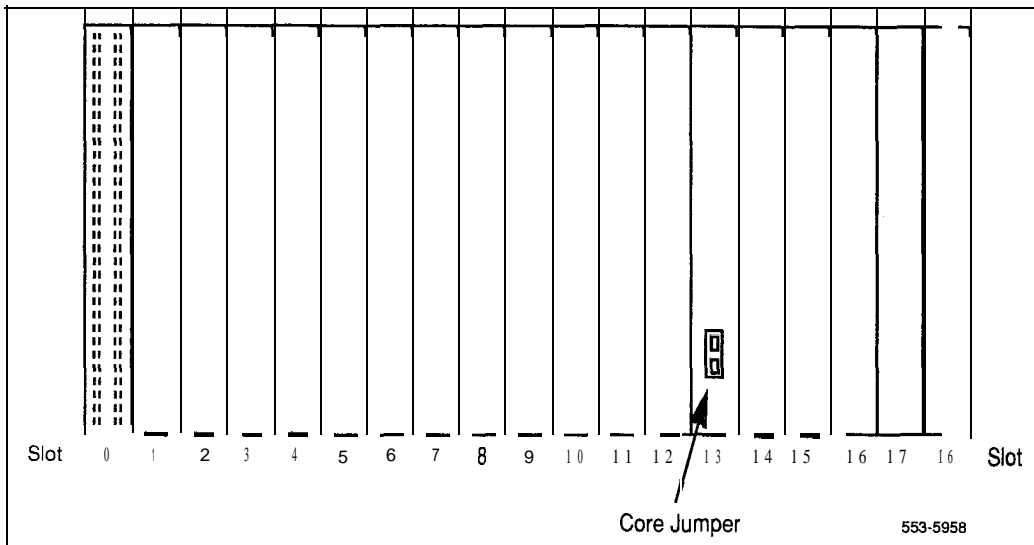
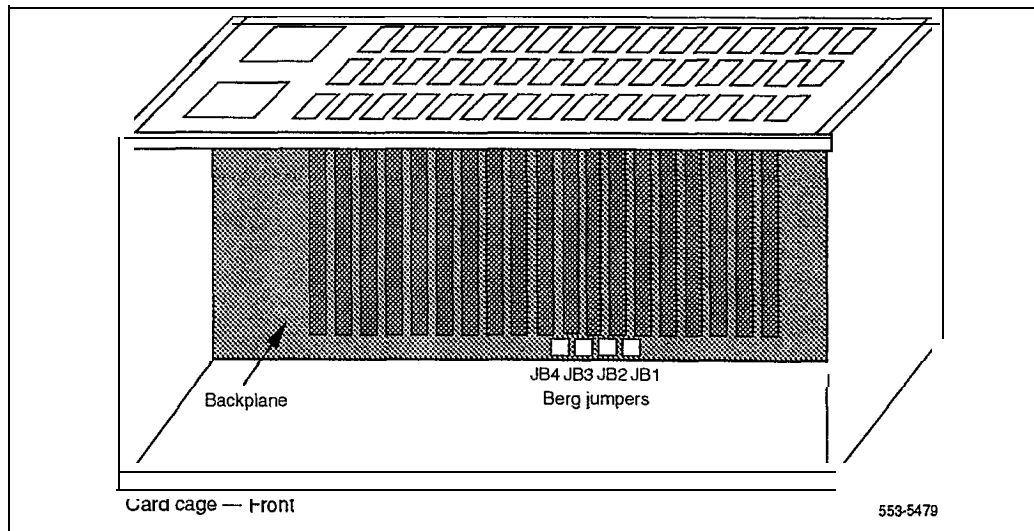


Figure 3-4
Location of the backplane jumpers in the **NT6D60** Core Modules



2025

Placing the fourth module on a column

A four-module column is shipped in two segments. One shipping pallet carries the pedestal and three modules. Another shipping pallet carries the fourth module and top cap. Starting at the bottom of the column, modules are numbered from zero to three in each column. Use this procedure to place the fourth module (and top cap) on the column.

To add a module to a column that is already powered, see the procedures in “Adding a module to a column” on page 20- 1.

WARNING

A fully loaded module weighs approximately 58.9 kg (130 lbs). More than one person is required to place a module on a column.

- 1 Position and secure the fourth module:
 - Locate the positioning guides on the third module (see Figure 4-1).
 - Position the fourth module so it faces the same direction as the column.
 - Place the fourth module on top of the column and adjust it until it is seated securely on the positioning guides.
 - Use a 9/16-in. socket wrench to secure the fourth module with five mounting bolts (see Figure 4-2).

Figure 4-1
Module positioning guides

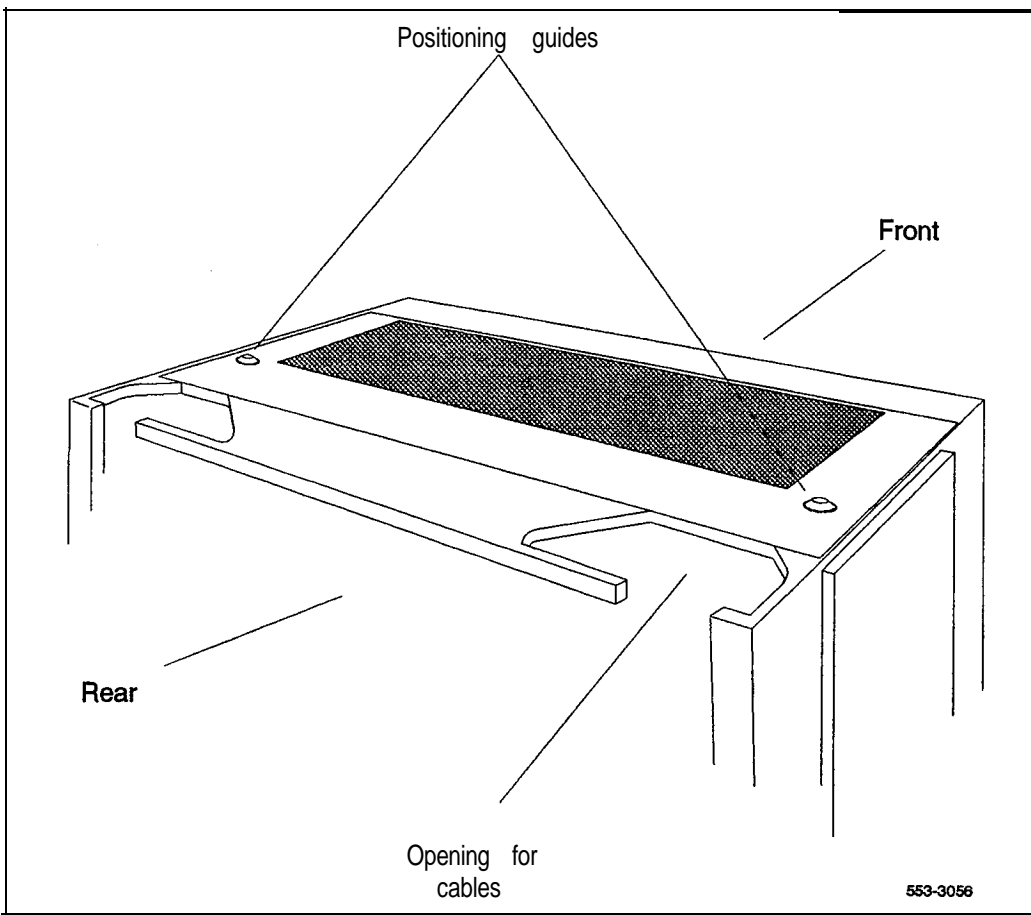
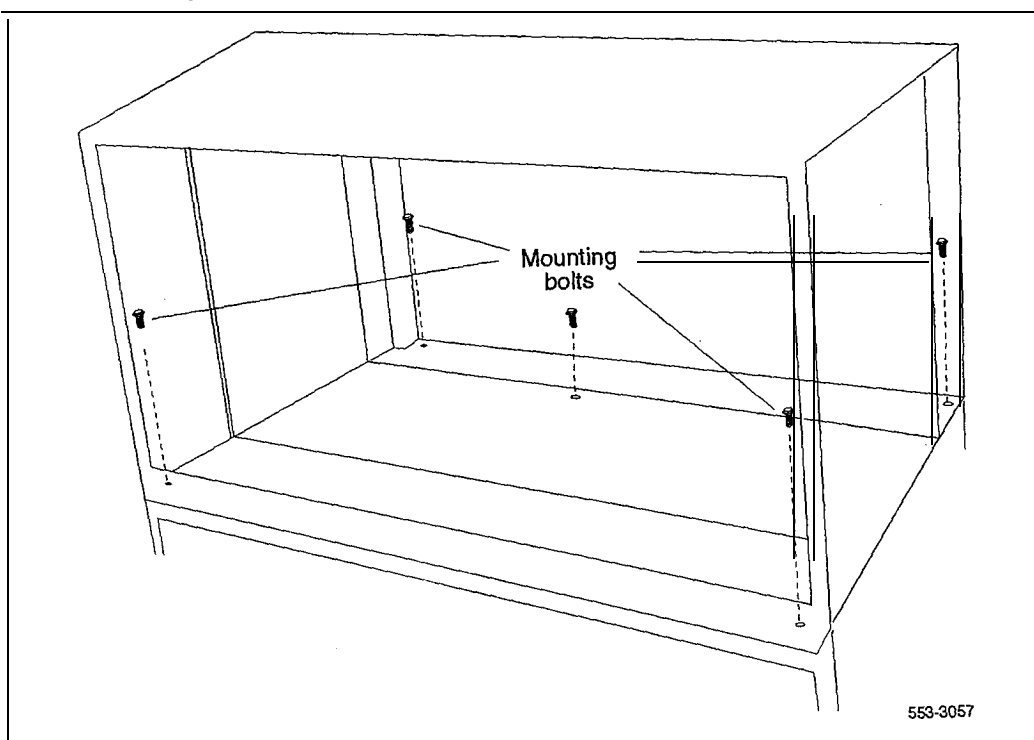


Figure 4-2
Module mounting bolts



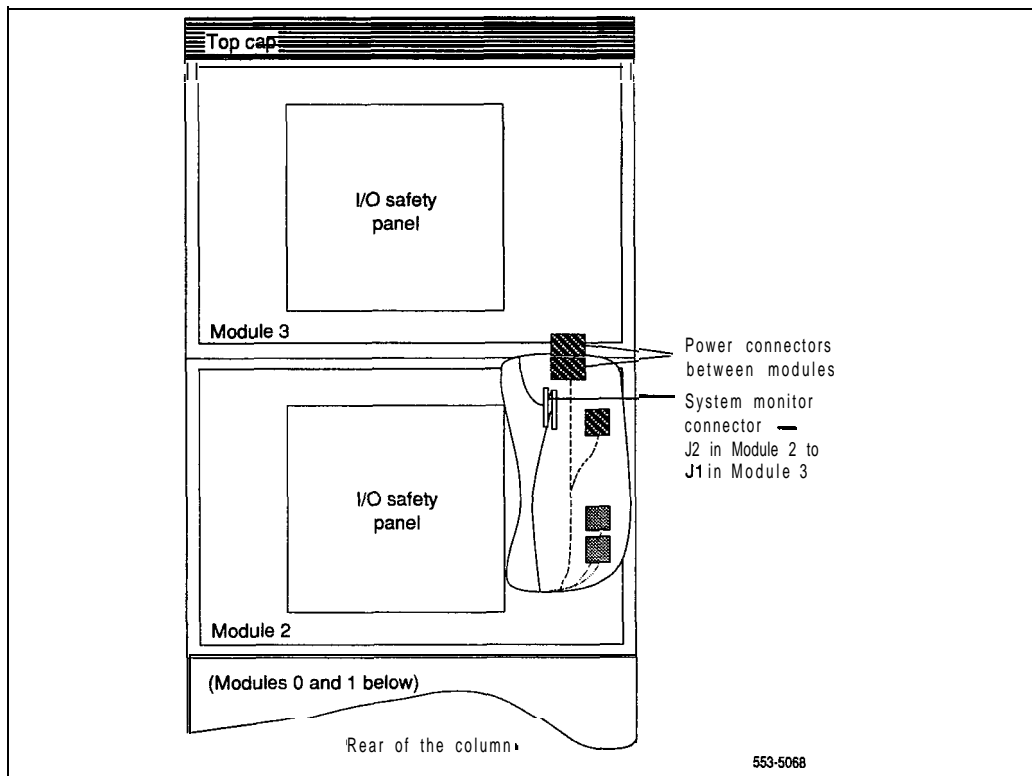
4-4 Placing the fourth module on a column

- 2 Connect the module-to-module power and system monitor cables:
 - Remove the I/O safety panel over the backplane at the rear of the third and fourth modules.
 - Connect the power connectors between the modules (see Figure 4-3).
 - Connect the system monitor cable from connector J2 on the third module to J1 on the fourth module.

Note: There are no power or system monitor connectors in the **NT8D36 InterGroup** Module; connect the top cap cables (extra length is provided) to the module below the **InterGroup** Module.

- 3 Reinstall the I/O safety panel in each module.

Figure 4-3
Power and system monitor connections



Positioning and leveling equipment

Columns normally stand on adjustable feet that provide leveling capability and ground isolation. However, casters are available and can be used for two-tier columns. If a third module is added to a column with casters, the casters must be replaced with leveling feet.

Note: If earthquake bracing is required, go to “Installing earthquake bracing” (page 18- 1) to install column and floor bracing and to position and level equipment. When those procedures are complete, return to Step 4 or Step 5 (as applicable) in the initial installation procedure.

- 1 Check the equipment room floor plan to position columns.
- 2 Adjust the feet on each pedestal to level all columns (turn the leveling foot clockwise to raise it).

Note: Leave at least 1.27 cm (1/2 in.) between the floor and the bottom of the pedestal for air flow required by the blower unit.

- 3 For a multiple-column system, install **NT8D49** Spacer Kits between columns:
 - Attach gaskets to both sides in the front section of each spacer (see Figure 5-1).
 - Attach a spacer to one side of each module that will be next to another module, except on the end column (see Figures 5-2 and 5-3). Insert the screws through holes in the trim panels.

CAUTION

Do not try to adjust the horizontal position of a column by tightening the spacer screws. Tightening the screws with the columns too far apart will warp the spacer.

- One at a time, push the columns together and attach the other side of the spacers.

Figure 5-1
Positioning spacer gaskets

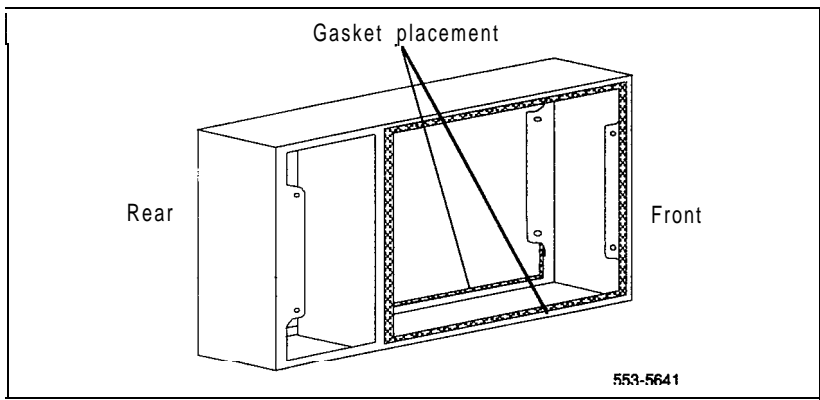


Figure 5-2
Spacer positioning

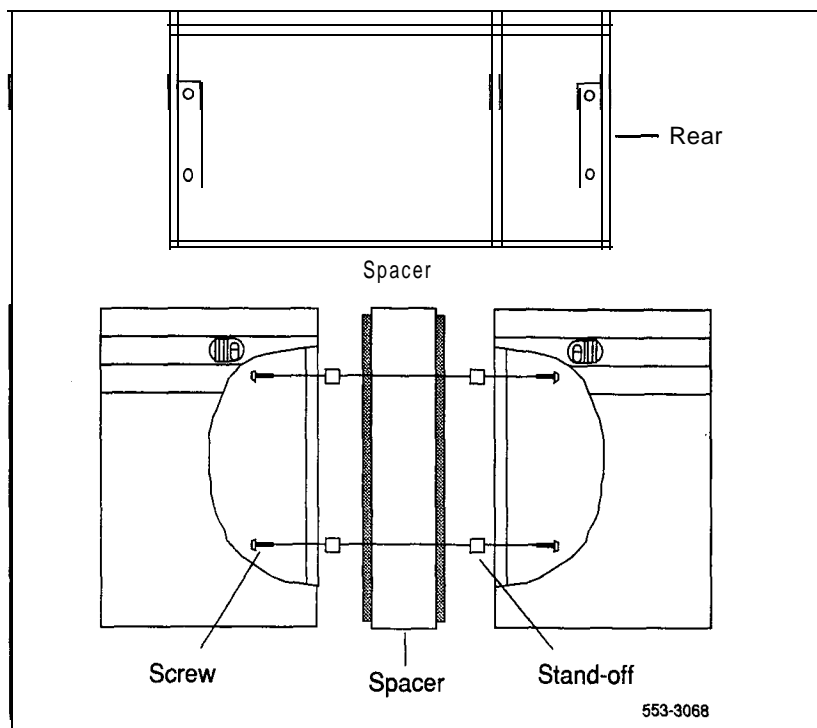
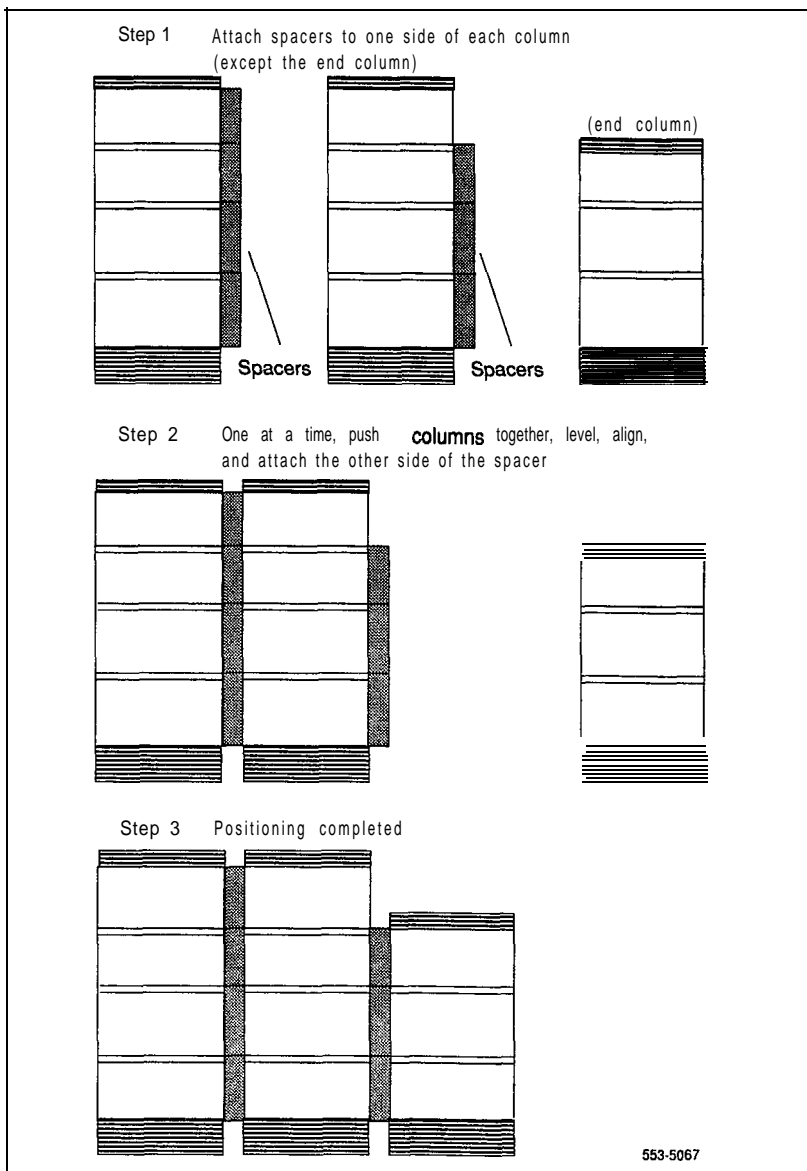


Figure 5-3
Column positioning with spacers



Installing overhead cable tray kits

Cable trays (also called ladder racks) can hang from a ceiling, or they can be mounted across the tops of the Meridian 1 columns.

If ceiling-hung racks are used, the rear top cap grill on each column must be replaced with a PO69985 1 Top Cap Cable Egress Panel, which provides cutouts for cable routing. The cable trays and the equipment required to hang them must be provided by the customer and installed according to the manufacturer's instructions.

Northern Telecom offers an **NT8D63** Overhead Cable Tray Kit that provides equipment for mounting cable trays on the Meridian 1 columns. The kit includes two support brackets and front and rear exhaust grills with cutouts for cable routing. The cable tray itself must be provided by the customer; it is not included in the kit. Use this procedure to install the **NT8D63** kit.

CAUTION

Column frames must be insulated from contact with building structures such as concrete walls, floors, and ceilings. Whether the cable racks are column-mounted or ceiling-hung, the installation must maintain the integrity of the Meridian 1 grounding architecture.

- 1 Remove air exhaust grills at the front and rear of the top cap. Pull forward on the two clips underneath the front edge of each grill and lift up to remove the grill (see Figure 6-1).
- 2 Mount a support bracket at the front and rear of the module (see Figure 6-2). Using two bolts, secure each support to the threaded holes in the top of the module.

- 3 Install the front and rear air exhaust grills that come with the kit.
- 4 Place the cable rack on top of the support brackets and fasten it to the supports with the J-bolts as shown in Figure 6-2.

Figure 6-1
Removing top cap grills

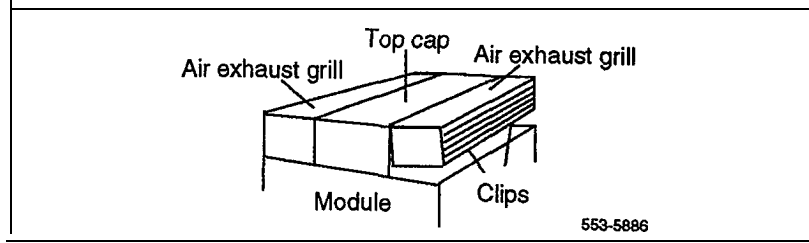
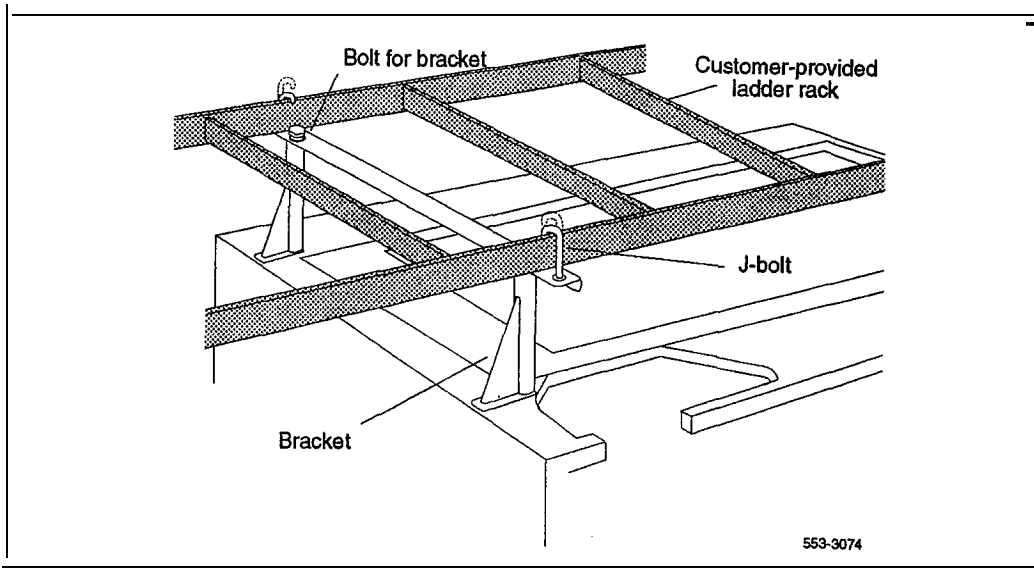


Figure 6-2
Overhead cable tray kit



Installing AC power

For AC-powered systems, use this procedure to install safety ground/protective earth and logic return wiring and to install ground and alarm cabling for a UPS.

For AC-powered systems without reserve power, one input receptacle is required per column, within 2.4 m (8 ft) of each pedestal. One IG-L6-30 or L6-30 receptacle is required for each column (option 21A requires one L6-20 receptacle).

Instead of using the power plug provided, the PDU can be hard-wired to the power source. In this case, #10 AWG conductors routed through 3/4-in. conduit are generally used. The leads connect to the L1, L2, and GND terminations on the field wiring terminal block on the PDU.

Note: Do not use ground fault circuit interrupt (GFCI) devices on Meridian 1 AC power feeds.

Systems that use reserve power plug into the UPS, which in turn plugs into the power source (associated batteries can be located within the UPS or installed externally). Consult the UPS documentation for receptacle requirements.

Safety ground/protective earth and **logic** return wiring

A separate safety ground/protective earth connection is required. The safety ground/protective earth wire must be **#6** AWG or larger and must connect the pedestal to the single-point ground (SPG) in the service panel. The single-point ground can be an isolated ground (**IG**) bus or AC equipment ground (ACEG) bus in the service panel or transformer. Figures 7-1, 7-2, and 7-3 show an ACEG as the single-point ground.

Depending on the distances between columns, the location of the service panel, and the availability of panel SPG connection points, safety ground/protective earth wiring can be daisy-chained or run independently from each column to the service panel. Figures 7-2 and 7-3 show safety ground/protective earth wiring in daisy-chain configurations.

Note: Refer to *Installation* planning (553-3001-120) for a complete description of approved ground sources and methods. Insulated ground wire must be used for system grounding.

Multiple-column systems use a logic return equalizer (LRE) as the point where the logic return wires from different columns are consolidated before connecting to the single-point ground. The **NT6D5304** small LRE (usually used with AC power systems) is available from Northern Telecom.

Figure 7-1
Single column-ground and logic return distribution

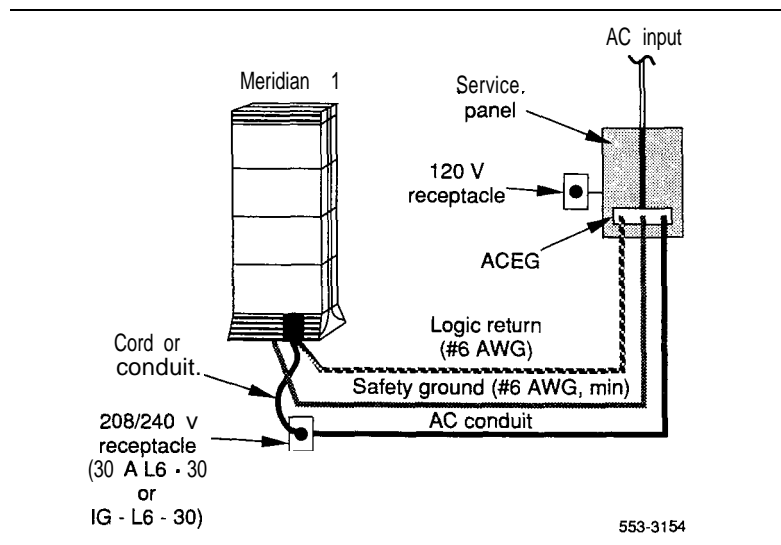


Figure 7-2
Multiple column-ground and logic return distribution

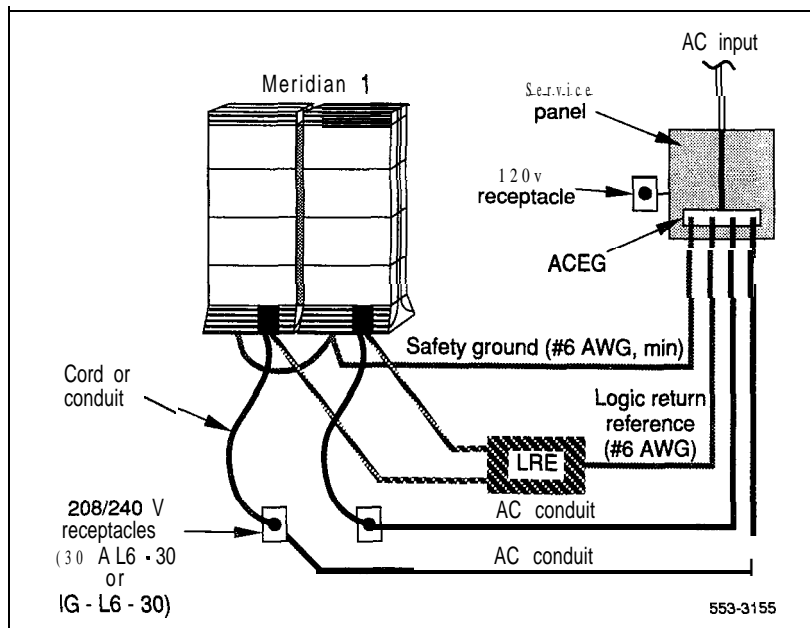
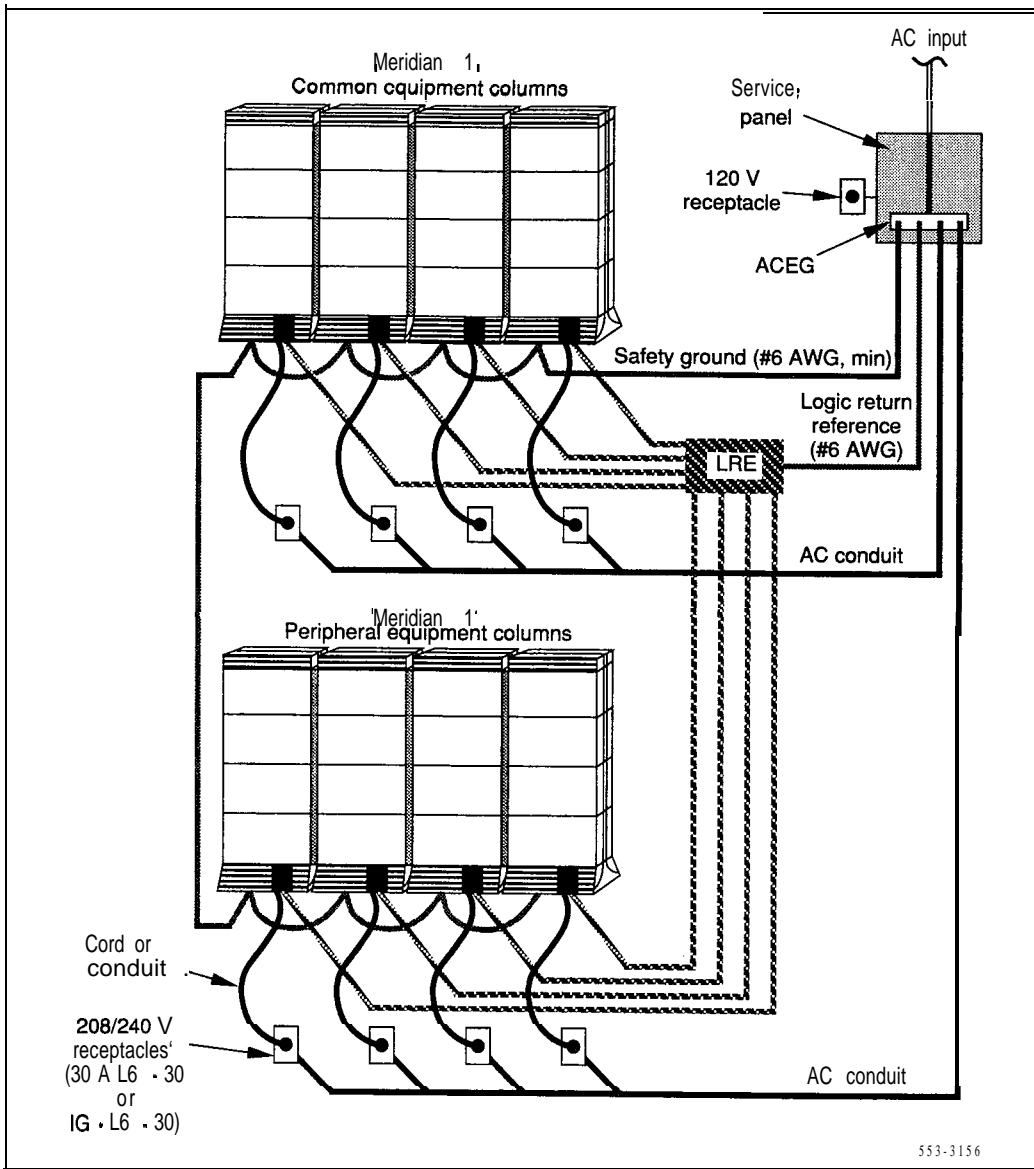


Figure 7-3
Multiple-column, multiple-row-ground and logic return distribution



Installation procedures

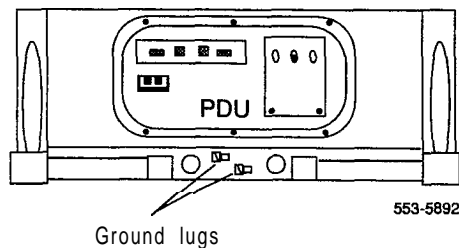
Installing safety ground/protective earth and logic return wiring

WARNING

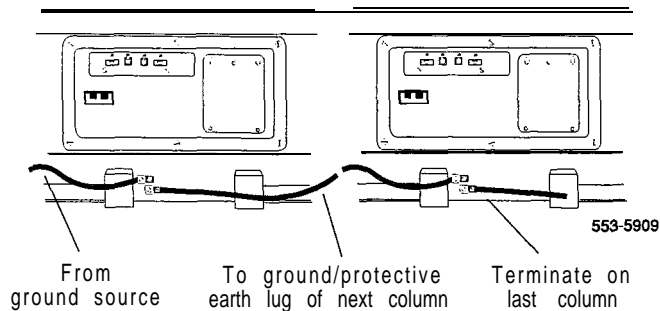
Failure to follow grounding procedures can result in unsafe or faulty equipment. See *Installation planning (553-3001-120)* for a complete description of approved ground sources and methods.

- 1 Make sure the power cord is disconnected from the power source.
- 2 Using a volt/ohm meter, measure the resistance between the ground pin on the power plug and a ground lug on the rear of the pedestal.

The resistance should be 0 ohms; if it is greater, check the power cord connections.

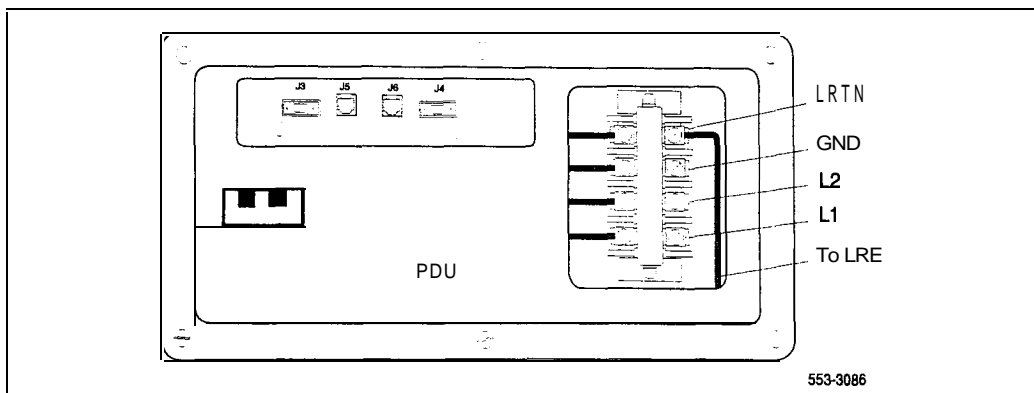


- 3 Connect the safety ground/protective earth wire (insulated ground wire *must* be used for system grounding):
For a single-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the pedestal.
For a multiple-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the closest column. Daisy-chain #6 AWG ground wires from one pedestal to the next, connecting all of the columns (or run a #6 AWG wire from the ground source to each column individually).
- 4 Place a warning tag (WARNING-TELEPHONE SYSTEM GROUND CONNECTION-DO NOT DISCONNECT) on the connection at the ground source.



- 5 Using a volt/ohm meter, measure the resistance between the ground pin on the power plug and the ground terminal on the power outlet.
The resistance should be 0 ohms. If the resistance is greater than **5** ohms, check the power outlet ground and safety ground/protective earth connections.
- 6 Remove the field wiring access plate on the PDU.
- 7 Connect the logic return wire.
Starting at the **LRE**, connect a **#8** AWG wire and route it to the column and up or down the I/O channel area, as appropriate, then through the conduit hole in the pedestal to LRTN on the field wiring block (see Figure 7-4).
- 8 Replace the field wiring access plate on the PDU.

Figure 7-4
Logic return connection for each column



UPS ground cabling

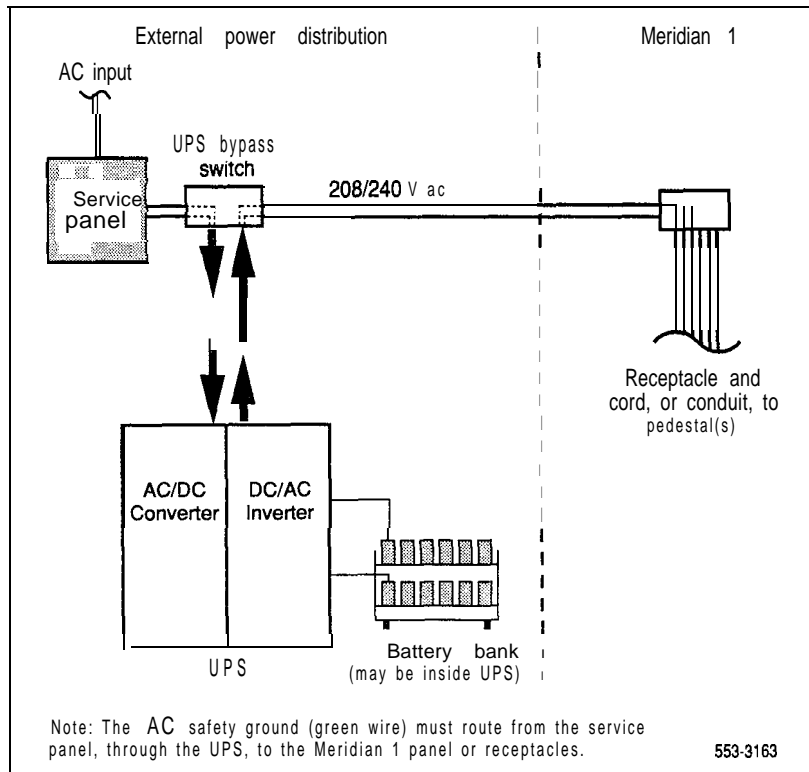
Use the manufacturer's documents to install and cable a UPS. If the UPS does not contain an integral bypass switch, one should be added externally during initial UPS wiring. Figure 7-5 is a block diagram of a UPS installation and associated wiring.

Note: Because UPS installation can be complex, we recommend that installers attend vendor training programs.

CAUTION

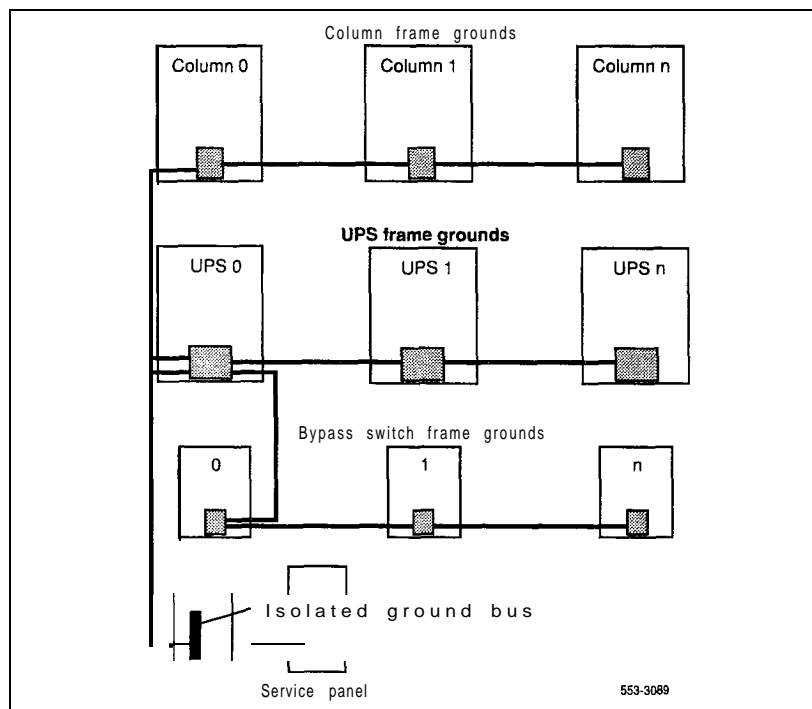
Take care when connecting battery leads to the UPS. A battery reversal can result in severe damage to the UPS.

Figure 7-5
AC reserve power configuration



- 1 Make sure the safety ground/protective earth wire is connected on all Meridian 1 columns.
- 2 Daisy-chain ground cables to each UPS (see Figure 7-6) using #6 AWG wire.
- 3 Daisy-chain ground cables to each bypass switch (if equipped) using #6 AWG wire.
- 4 Run a #6 AWG wire between the ground lug on the rear of the pedestal, the bypass switch, and the UPS to a common frame ground point.
- 5 Run a #6 AWG wire between the common ground point and the ground bus in the service panel.

Figure 7-6
UPS grounding diagram





Installing DC power

Use this chapter to install safety ground/protective earth and logic return wiring, configure system monitors, and connect PFTUs for DC-powered systems using an MFA150 or MPP600 power system.

Note: The procedures in this chapter apply to the global power distribution unit (PDU). The global PDU replaces the one-piece NT7D 10AA (North American) and NT7D 10DA (European) PDUs. The global PDU comprises an upper NT7D10CA System Monitor/Power Supply Assembly and a lower NT7D67CB Filter/Power Distribution Unit Assembly. Throughout this document, the global PDU is referred to as the “NT7D67CB PDU.” To connect power to a vintage AA or DA NT7D 10 PDU, see “Appendix B: NT7D 10 PDU connections.” Both NT7D 10 (vintage AA or DA) and NT7D67 PDUs can be used in a system.

To install reserve power equipment (batteries), follow the instructions provided with the equipment. To comply with safety requirements, consult the following articles before working with any battery systems:

- Read the “Material Safety Data Sheet” that must be posted to meet OSHA requirements. This article outlines appropriate reserve battery handling procedures.
- Refer to National Electric Code 645-10. This article outlines requirements that call for the installation of AC- and DC-power kill switches to battery systems in certain environments.

See Appendix A in this document to perform one of the following tasks:

- connect an NT6D82 Power System
- install and connect a QBL12 Power Distribution Box

- install and connect a power plant consisting of a
 - QBL15 Power Distribution Box
 - NT6D52 or NTOR72 Switched Mode Rectifier (NTOR72 replaces NT6D52)
- connect a QCA13 Power System

External DC power equipment

The **MFA150** Modular Power System and **MPP600** Modular Power Plant are considered “external” power equipment because they are not housed in Meridian 1 columns.

DC-powered systems generally require one input receptacle per rectifier, within 1.8 m (6 ft) of each rectifier. The commercial power receptacles required are determined by the number and type of rectifiers used.

MFA150 Modular Power System

The **MFA150** is a DC power system for options 21, 21E, 51, 61, 61C, 71, and 81. It replaces the rectifier/rack assembly consisting of the **NT6D52** or **NTOR71** Rectifier and **QBL15** Power Distribution Unit.

The **MFA150** is a modular, front access power system with a positive ground and -48 V dc output capacity of 150 amps, provided in **25-amp** increments using plug-in rectifier modules. The **MFA150** is suitable for any system with power requirements of less than 150 amps. One **MFA150** is required per DC system (configured with one to six **NT5C06** rectifiers, as required by system power consumption), installed in one or two **MPS75** shelves.

The ordering codes for the complete power plant are **NT5C90EF** and **NT5C90EG**. Each of these configurations is a complete power bay with an **NT6C** 14GB Control and Distribution Panel mounted on an **NT6C40DC** Seismic Rack:

- **NT5C90EF** is a single **MPS75** shelf, with a capacity of 75 amps.
- **NT5C90EG** is a dual-shelf configuration, with a capacity of 150 amps.

The **MFA150** power system requires one **50-amp** power feed per shelf.

MPP600 Modular Power Plant

The MPP600 Modular Power Plant can be used with all system options, but it is optimized for options 71 and 81 (and larger option 61 and **61C** configurations).

The **MPP600** is a modular power supply providing front- and rear-access power distribution and a control system that supports from one to twelve 50-amp rectifiers. These rectifiers are housed in one or two cabinets providing up to 300 amps per cabinet, for a total of 600 amps.

The MPP600 consists of either one main cabinet (for loads requiring up to 300 amps) or one main and one supplemental cabinet (for loads up to 600 amps), a common equipment panel, distribution and control panels, and rectifier shelves.

The MPP600 utilizes up to twelve **NT5C07** 50-amp switch mode rectifiers as building blocks connected in parallel to reach the maximum capacity of 600 amps. The rectifiers operate on single-phase, 60 Hz ac service at either 208 V or 240 V nominal input. Each rectifier requires one 20-amp power feed.

NT6D53 Junction Box

If a rectifier is positioned at a distance from the Meridian 1, the **NT6D53** Junction Box can provide an interim connection between the rectifier and the field wiring terminal block in the pedestal. One junction box supports one column. The junction box can be used with the **NT7D67CB** PDU, but it is not required.

The junction box is equipped with a 3-m (10-ft) flexible conduit that contains all the wiring needed to connect the rectifier to the pedestal. (Make sure the junction box is installed close enough to the pedestal for the conduit to reach the terminal block in the pedestal.)

On the input side, the junction box has allowance for up to four **#4** AWG pairs and one logic return, and up to two 1-1/4 in. conduit fittings (one fitting is supplied). On the output side, the junction box is prewired with four **#10** AWG pairs (one pair per module) and a logic return. This wiring is routed in a 3-m (10-ft) length of 3/4-in. conduit that connects to the pedestal.

The junction box connects to the pedestal as follows:

- For distances of up to 30 m (100 ft), there are
 - four split feeds per column with nine #10 AWG conductors in a single 3/4-in. conduit
 - two 30-amp feeds from the distribution point to the junction box with five #4 AWG conductors in a single 1 - 1 /4 in. conduit
- For distances of up to 60 m (200 ft), there are
 - four split feeds per column with nine #10 AWG conductors in a single 3/4-in. conduit
 - two 30-amp feeds from the distribution point to the junction box, with nine #4 AWG conductors in two 1 - 1 /4 in. conduits

Safety ground/protective earth and logic return wiring

The single-point ground (SPG) required by the system can be an isolated ground (IG) bus or AC equipment ground (ACEG) bus in the service panel or transformer. The system must be connected to safety ground/protective earth in accordance with NEC requirements. For international use, the system must be connected to safety ground/protective earth in accordance with Paragraph 2.5 of EN60950/IEC950.

Note: Refer to *Installation planning* (553-3001-120) and *Power engineering* (553-3001-152) for a complete description of approved ground sources and methods. Insulated ground wire must be used for system grounding.

Depending on the distances between columns, the location of the service panel, and the availability of panel SPG connection points, safety ground/protective earth wiring can be daisy-chained or run independently from each Meridian 1 column to the SPG or alternately to a logic return equalizer (LRE). Figures 8-2 and 8-2 show safety ground/protective earth wiring in daisy-chain configurations. For the MFA150, safety ground is daisy-chained between columns and then run directly to the ACEG in the service panel. For the MPP600, safety ground is daisy-chained between columns and then run to the ACEG. The MPP600 safety ground is connected to the AC panel through the AC input conduit.

Multiple-column systems use an LRE as the point where the logic return wires from different columns are consolidated before connecting to the single-point ground. The LRE used with the MFA 150 and MPP600 is a copper bus bar mounted in the control/distribution panel of the power system.

Figure 8-1
Ground and logic return distribution-MFA150 Modular Power System

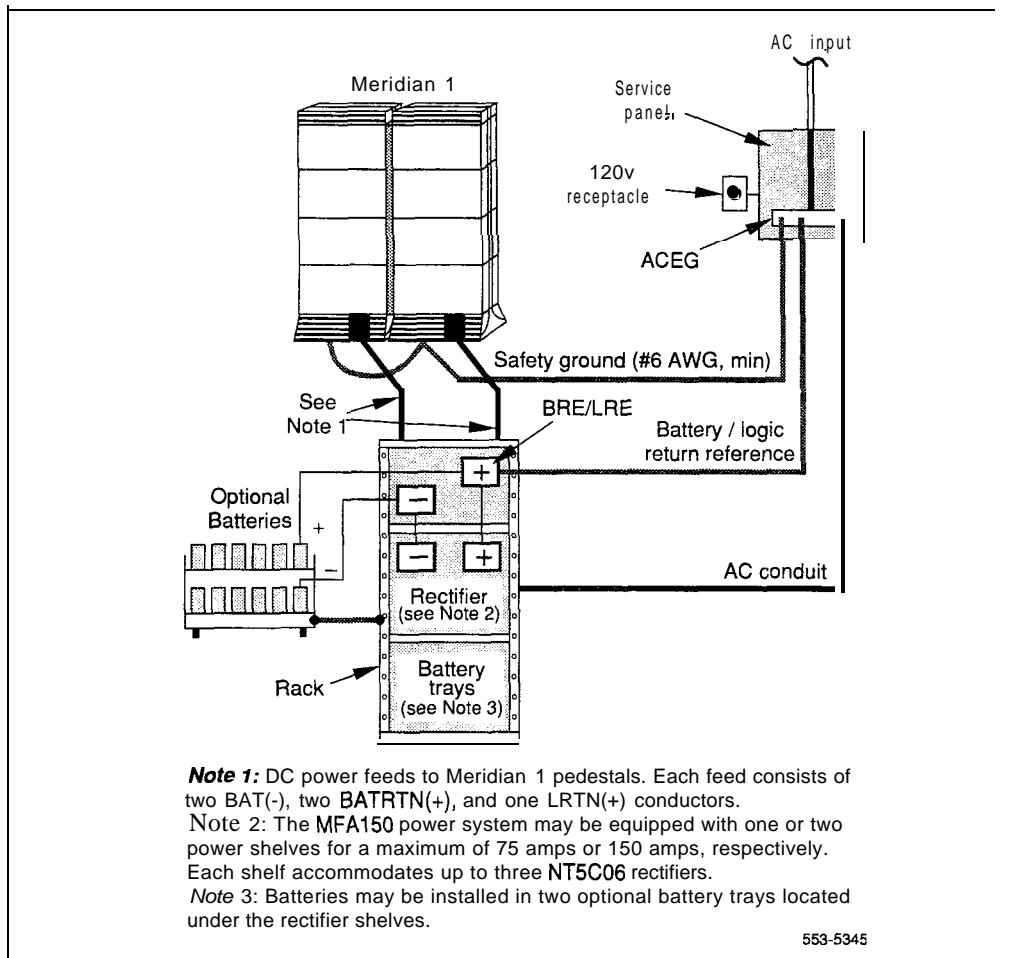
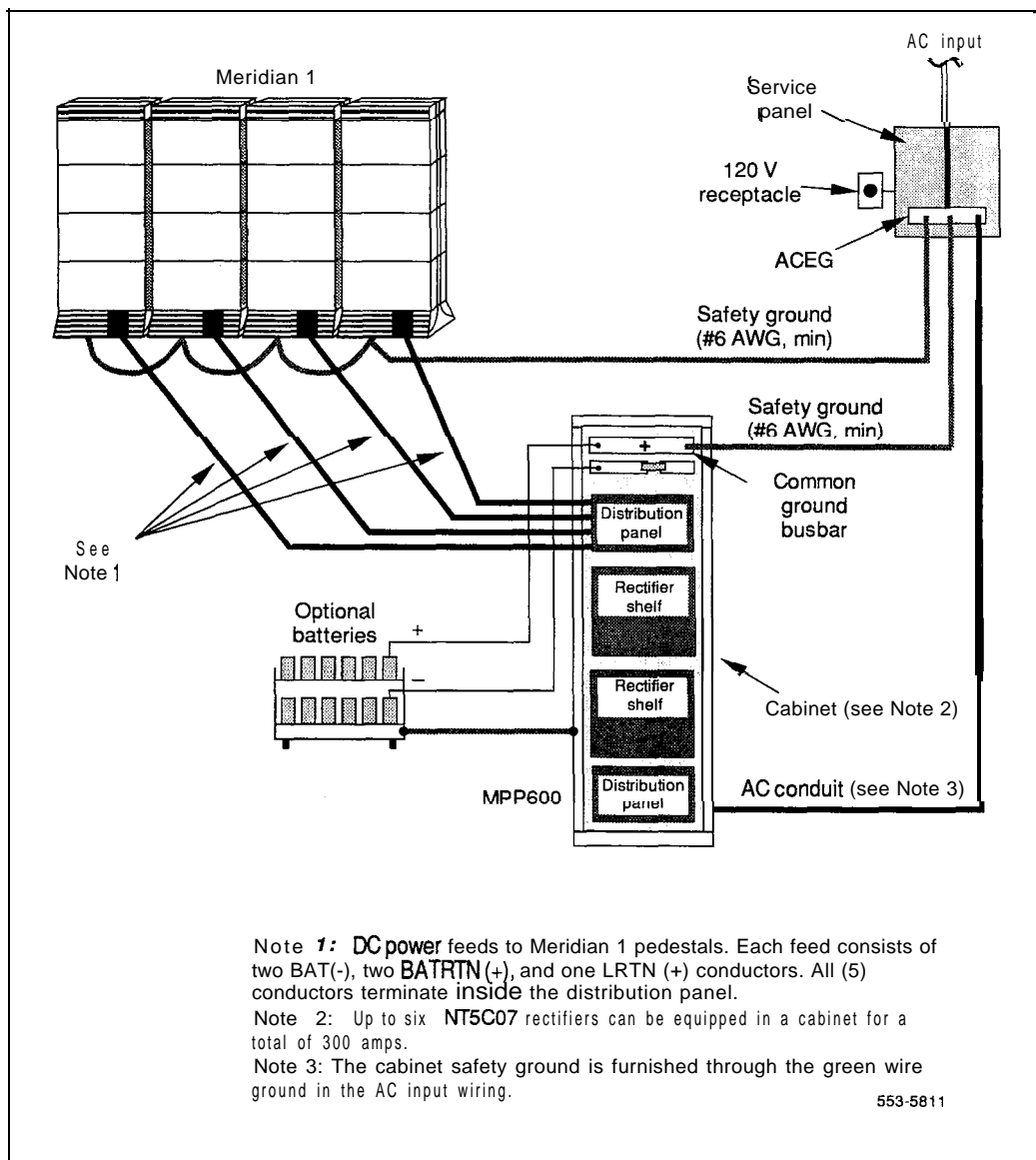


Figure 8-2
Ground and logic return **distribution—MPP600** Modular Power Plant



PDU connections

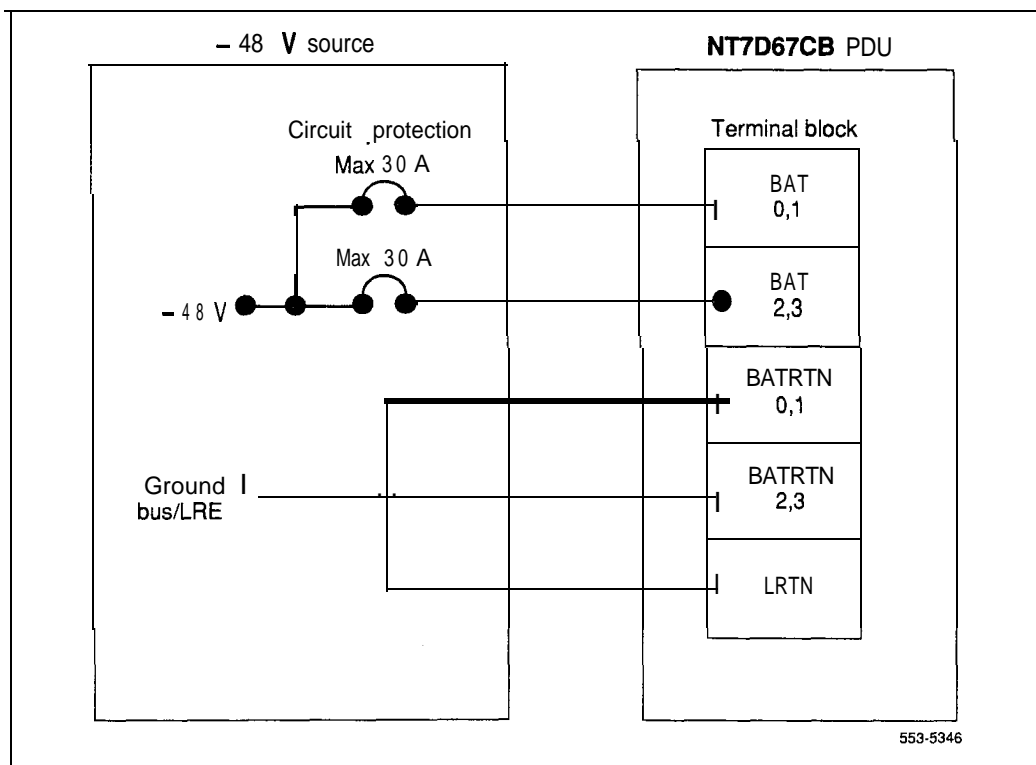
A readily accessible disconnect device for input power is required.

CAUTION

DC power for the NT7D09 pedestal must be provided with circuit protection of 30 amps for the BAT 0,1 and BAT 2,3 feeds (see Figure 8-2).

Circuit breakers must be located next to each other and labeled to show that both must be shut off to remove all power to the system.

Figure 8-3
Circuit protection for the PDU



8-8 Installing DC power

A maximum loop drop of two volts is allowed between the pedestal, or junction box, and the external power equipment. See Table 8-1 for allowable wire sizes. See *Power engineering* (553-300 1- 152) for detailed information on calculating wire size.

Table 8-1
Wire gauge requirements with two **30-amp** feeds (five wires)

Length	#8 AWG	#6 AWG	Single #4 AWG	Double #4 AWG
0-3 m (10 ft)	Yes	Yes	Yes	Yes
3-6 m (20 ft)	Yes	Yes	Yes	Yes
6-9 m (30 ft)	Yes	Yes	Yes	Yes
9-12 m (40 ft)	Yes	Yes	Yes	Yes
12-15 m (50 ft)	Yes	Yes	Yes	Yes
15-18 m (60ft)	No	Yes	Yes	Yes
18-21 m (70 ft)	No	Yes	Yes	Yes
21-24 m (80 ft)	No	Yes	Yes	Yes
24-27 m (90 ft)	No	No	Yes	Yes
27-30 m (100 ft)	No	No	Yes	Yes
30-60 m (200 ft)	No	No	No	Yes
over 60 m (200 ft)	No	No	No	No

Note 1: Two **30-amp** feeds are typically adequate for a column with four modules (five wires total-two 30-amp feed pairs plus logic return).

Note 2: If dual conduit is used, the wires must be run in battery/battery return pairs, with one pair in one conduit and the other pair, plus logic return, in the other conduit.

Legend: Yes = Wire size is adequate for the distance.
No = Wire size has too high a voltage drop and is inadequate for the distance.

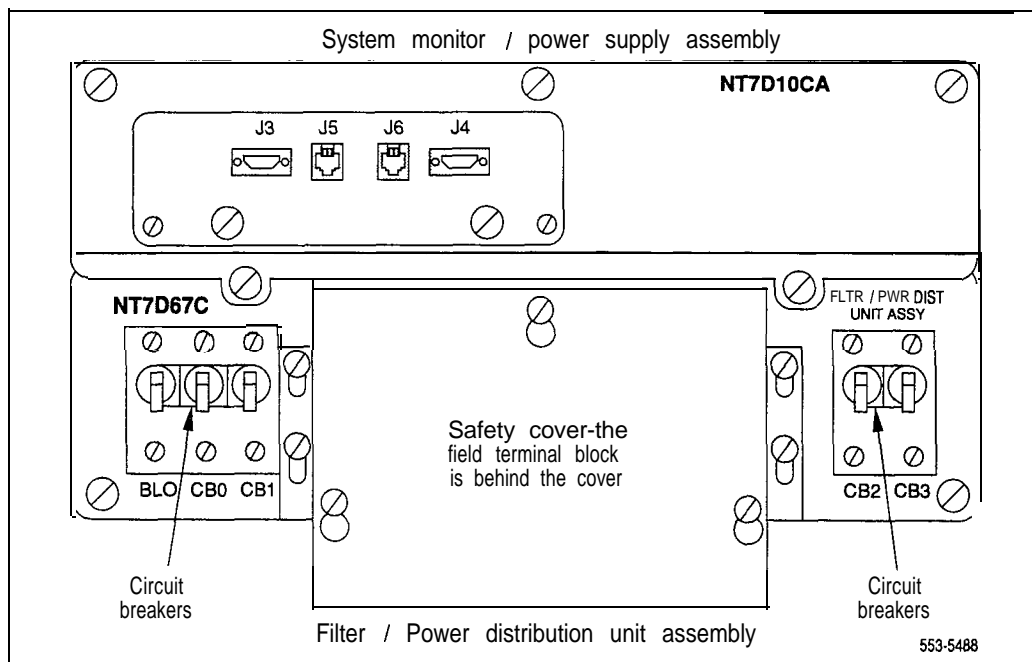
The following equipment is located in the rear of each pedestal (see Figure 8-4) in Meridian 1 columns:

- The PDU distributes power to the entire column.
- The field wiring terminal provides the connection point for wiring brought into the pedestal.
- A circuit breaker is provided for each module in the column and for the blower unit

Note: All column circuit breakers will trip if a column thermal overload is detected or a DC-power low-voltage condition is sensed.

- The system monitor checks the column temperature, cooling system status, and system voltage status, and controls alarms and line transfer states accordingly.

Figure 8-4
DC-power equipment in the rear of the **pedestal—NT7D67CB** PDU

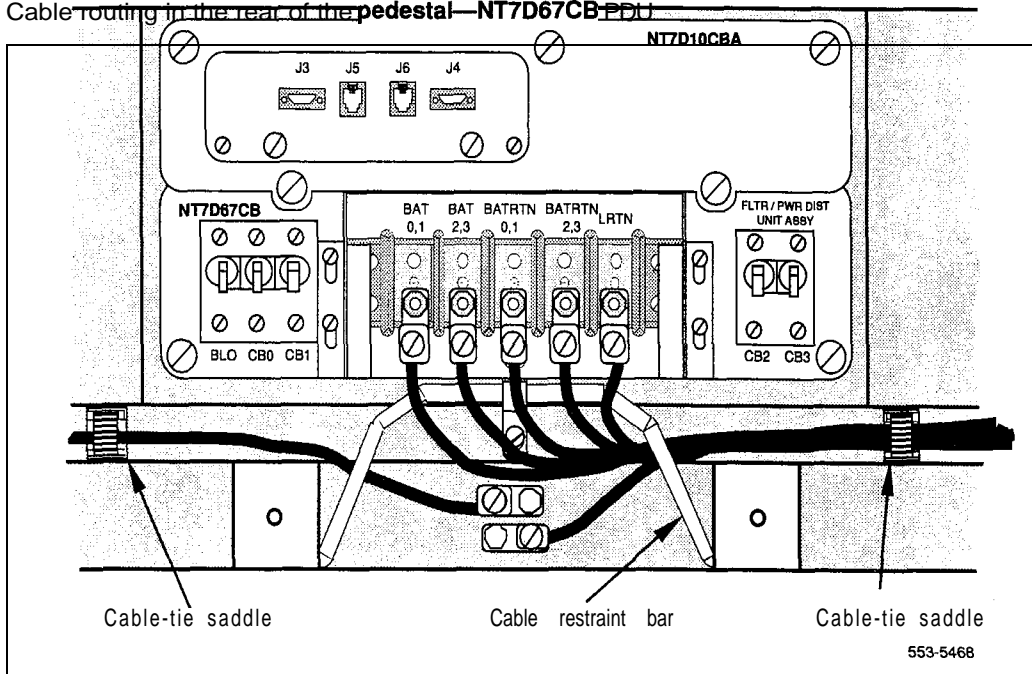


8-10 Installing DC power

With the NT7D67CB PDU, the safety ground/protective earth wires and all wiring to the terminal block in the PDU must be neatly routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal (see Figure 8-5). This ensures that there is room to install the PDU cover, safety cover, and rear grill.

Conduit is not required with the NT7D67CB PDU. However, 1-1/4 or 3/4 in. conduit can be used if local codes or individual installations require it. Conduit can be routed down through the column from overhead racks or up through the floor. Conduit clamps and the hardware to fasten the conduit are provided in the pedestal. If the NT7D0902 Rear Mount Conduit Kit is used, conduit can enter from the rear of the column (above the floor).

Figure 8-5
Cable routing in the rear of the pedestal—NT7D67CB PDU



Installation procedures

Installing safety ground/protective earth wiring

WARNING

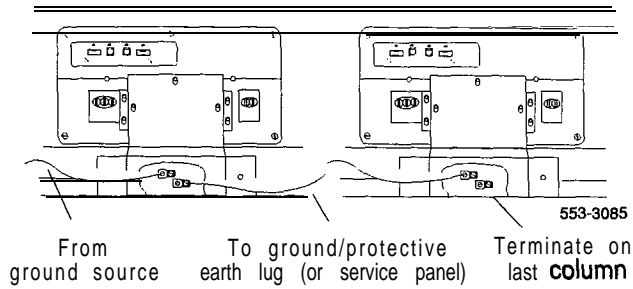
Failure to follow grounding procedures can result in unsafe or faulty equipment. See *Installation planning* (553-3001-120) for a complete description of approved ground sources and methods.

- 1 Remove the associated 30-amp fuse in the power plant to disconnect each pedestal from the power source.
- 2 At the rear of the pedestal, remove the plastic safety cover over the terminal block to access the safety ground/protective earth lugs (leave the cover off until all pedestal connections are made):
 - Loosen the three screws holding the cover.
 - Lift the cover up, then over the three mounting screws on the front panel of the cover.
- 3 Connect the safety ground/protective earth wire:

Note: Insulated ground wire must be used for system grounding.

For a single-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the pedestal.

For a multiple-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the closest column. Daisy-chain #6 AWG ground wires from one pedestal to the next, **connecting** all of the columns (or run a #6 AWG wire from the ground source to each column individually).



Note: The safety ground/protective earth wire must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

- 4 Place a warning tag (WARNING-TELEPHONE SYSTEM GROUND CONNECTION-DO NOT DISCONNECT) on the connection at the ground source.

Note: The following procedures apply to columns equipped with the NT7D67CB PDU. To connect power to an NT7D10 (vintage AA or DA) PDU, go to "Appendix B: NT7D10 PDU connections."

Preparing the **NT7D67CB** PDU

When a system is shipped, a set of screws secures the leveling bracket at the rear of the **NT7D67CB** PDU to protect it from vibration damage during transit. The shipping screws should be removed during initial installation.

- 1 For access to the rear of the PDU, temporarily remove the blower unit in the front of the pedestal:
 - Turn the screws on the front of the blower unit counterclockwise.
 - Grasp the lip at the top edge of the blower unit. Slide the unit out of the glides and onto the bottom ledge of the pedestal. Lift the unit out of the pedestal. (Keep the blower unit in an upright position.)
- 2 Remove the two shipping screws holding the PDU to the vertical shield in the pedestal.
- 3 Reinstall the blower unit:
 - Set the blower unit on the bottom ledge of the pedestal.
 - Tilt the back of the blower unit up slightly so it will slide into the pedestal glides (you may need to lift the unit). Gently push the unit into position.
 - Tighten the screws on the front of the blower unit.

Connecting power to the **NT7D67CB** PDU

To connect the external power system to the pedestal, use the following procedure for each column (this procedure gives the connections for a four-module column).

Note: All wiring to the PDU must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

- 1 If a junction box is used, insert the conduit from the junction box into one of the conduit access holes in the pedestal.

Connect the wires from the junction box to the matching connections on the terminal block on the PDU:

- Connect the red wires to **BAT 0,1** and **BAT 2,3**.
- Connect the black wires **BATRTN 0,1** and **BATRTN 2,3**.
- Connect the remaining wire (orange or white) to **LRTN**.

Note: If a junction box is used, the connections described in Steps 2 through 4 apply to the junction box rather than the pedestal.

- 2 Connect the red BAT (-48 V) wires:

- At the power plant, connect the wires to the **first** two circuit breakers in the main control/distribution panel (see Figure 8-6 for **MFA150**, Figure 8-6 for **MPP600**).
- At the PDU, connect the wires to the terminal block (one wire feeds two modules):

For modules 0 and 1, connect to **BAT 0,1**.

For modules 2 and 3, connect to **BAT 2,3**.

- 3 Connect the black BATRTN (48 V return) wires:

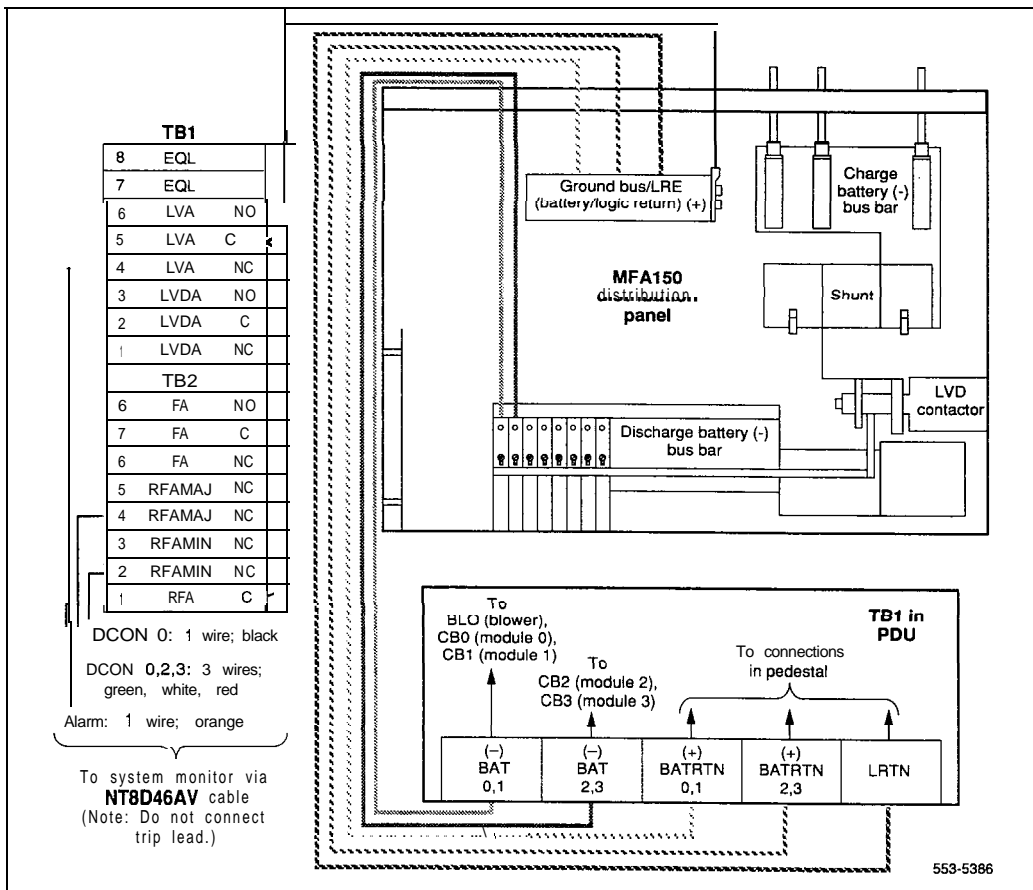
- At the power plant, connect the wires to the ground **bus/LRE**.
- At the PDU, connect the wires to the terminal block (one wire feeds two modules):

For modules 0 and 1, connect to **BATRTN 0,1**.

For modules 2 and 3, connect to **BATRTN 2,3**.

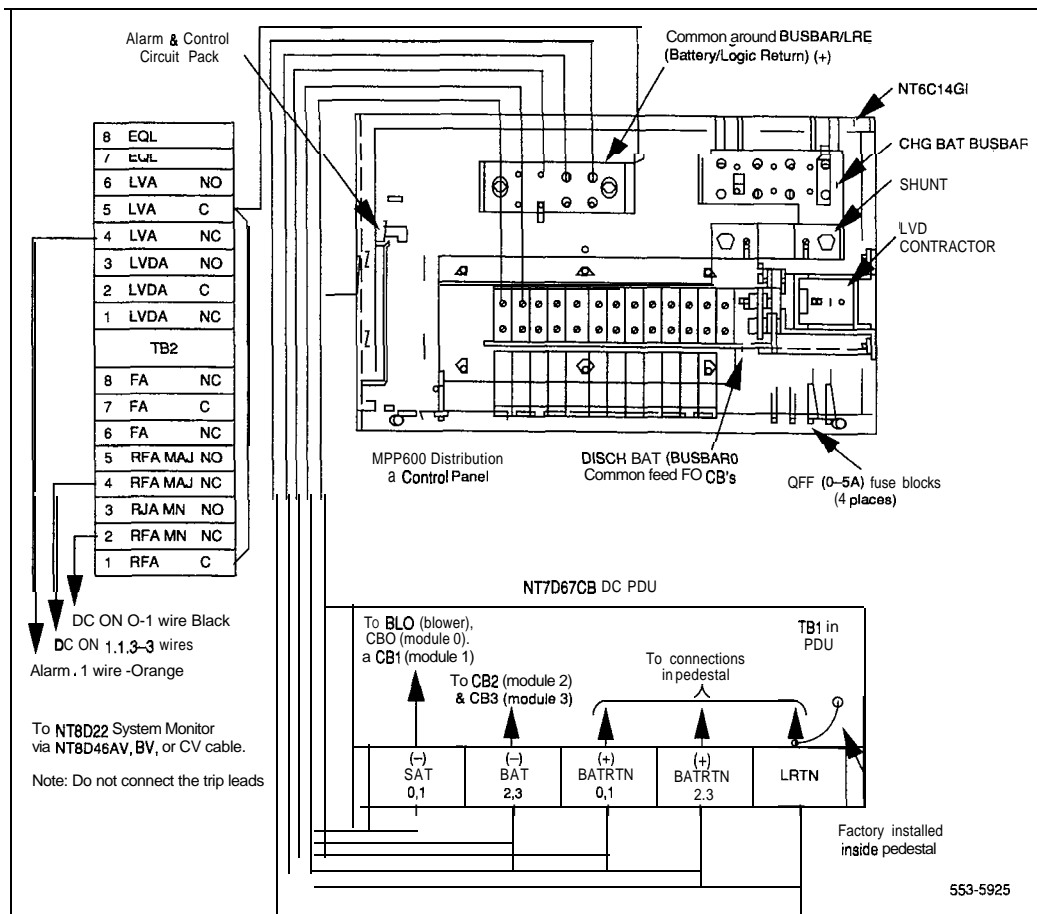
- 4 Connect the LRTN wire (orange or white) from the ground bus/LRE in the power plant to LRTN on the terminal block on the PDU.
- 5 Reinstall the plastic safety cover over the terminal block:
 - Lower the front panel over the mounting screws on the PDU
 - Tighten the three screws holding the cover.
- 6 Close the covers on the power plant.

Figure 8-6
PDU to **MFA150** connections



8-16 Installing DC power

Figure 6-7
PDU to MPP600 connections



Planning and designating the Modular Distribution Frame (MDF)

WARNING**Electrical shock hazard**

Tip, ring, A, B, E, M, ESC, and ESCG connections may be considered to be Telecommunications Network Voltages (TNV).

All Meridian 1 terminations are cross-connected on frame-mounted or wall-mounted **BIX** Modules and connecting blocks. The layout of the blocks can vary to meet the requirements of the site. See the following documents for a complete description of the **BIX** cross-connect system:

- *BIX In-Building Cross-Connect System Material Description*
(631-4511-100)
BIX In-Building Cross-Connect System Planning (631-4511-150)
BIX In-Building Cross-Connect System Material Installation and Servicing (631-4511-200)
Customer premises distribution frame description and installation
(631-4511-201)
- *Protection entrance terminal description and installation*
(631-4511-202)

Table 9-1 lists part numbers for BIX designation labels.

Table 9-1
Order codes for BIX designation strips

Label	Part number
NT8D11 CE/PE Module (basic label)	PO71 1373
NT8D37 IPE Module (basic label)	PO71 1372
NT8D37 IPE Module (fully expanded label)	PO71 1371
NT8D1 4 Universal Trunk Card (RAN)	PO71 1376
NT8D1 4 Universal Trunk Card (paging)	PO71 1378
NT8D14 Universal Trunk Card (CO/FX/WATS and all other modes)	PO71 1380
NT8D1 5 E&M Trunk Card (e-wire, type 1)	PO71 1379
NT8D15 E&M Trunk Card (e-wire, paging)	PO71 1377
NT8D1 5 E&M Trunk Card (4-wire, type 1)	PO71 1374
NT8D15 E&M Trunk Card (4-wire, type 2)	PO71 1375
A0355200 PFTU: Dees Model 154A Gordon-Kapes Model BP-2-48	PO71 1382 PO71 1383

BIX installation and designation

- 1 Install BIX cross-connect blocks according to the installation procedure described in *BIX Installation and Servicing* (63 1-45 1 1-200).
 - The BIX Module includes one **QMBIX10A** mount, ten **QCBIX1A** connectors, and five **QSBIX20A** designation strips. A **QMBIX12E** mount, which holds 12 **QCBIX1A** connectors, is also available.
 - Figure 9-1 shows a wall-mounted BIX Module.
 - Figure 9-2 shows the recommended BIX Module layout for **NT8D11 CE/PE**, **NT8D13 PE**, and **NT8D37 IPE** Modules.
- 2 Attach the adhesive designation labels for lines to the BIX designation strips. Figure 9-3 shows samples of the basic BIX designation labels for **NT8D 11 CE/PE** and **NT8D37 IPE** Modules.
- 3 Attach the labels for trunks on top of the basic labels according to the assignments shown on the work order. The transparent window on the trunk labels allows the card number on the basic labels to be seen.
 - Figure 9-4 shows samples of the overlay BIX designation labels for all **NT8D 14 Universal Trunk** modes.
 - Figure 9-5 shows samples of the overlay BIX designation labels for all **NT8D15 E&M Trunk** modes.
- 4 Attach the labels for the **P1**, **P2** (from the **PFTU**), and **P3** (alarm) cable connections. Figure 9-6 shows samples of the BIX designation labels for the **PFTU**.
- 5 Attach the labels for incoming trunks, telephones, and riser cables according to the work order.

Figure Q-1
BIX Module

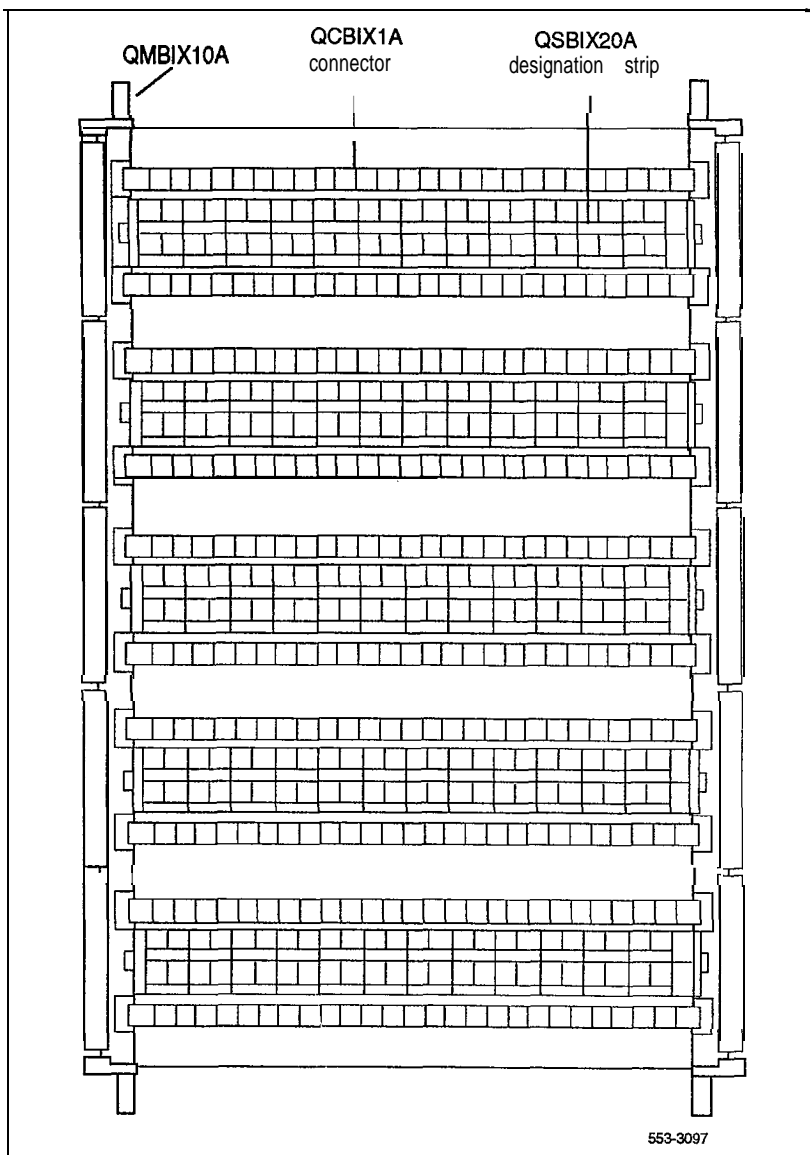


Figure 9-2
Recommended **BIX** layout for **NT8D11 CE/PE**, **NT8D13 PE**, and **NT8D37 IPE** Modules

Cable terminations for NT8D11 CE/PE Module	Cable terminations for one NT8D37 IPE Module	Cable terminations for multiple NT8D13 PE Modules
PFTU Cable 1	From I/O panel Cable A	From I/O panels Cable A
PFTU Cable 2	Cable B	Cable B
	Cable C	Cable C
Monitor/Alarm connections	Cable D (Note)	Cable D
Monitor/Alarm connections	Cable E	Cable E
	Cable F	Cable F
	Cable G	Cable G
	Cable H (Note)	Cable A
	Cable K	Cable B
	Cable L	Cable C
From I/O panel Cable A	Cable M	Cable D
From I/O panel Cable B	Cable N (Note)	Cable E
Cable C	Cable R	Cable F
Cable D (Note)	Cable S	Cable G
Cable E	Cable T	Cable A
Cable F	Cable U (Note)	Cable B
Cable G (Note)	Spare	Cable C
Cable H	Spare	Cable D
Cable K	Spare	Cable E
Cable L (Note)	Spare	Cable F

Note: In **NT8D11AC** or **NT8D11DC CE/PE** and **NT8D37AC** or **NT8D37DC IPE** Modules, these slots are not used. They are used in **NT8D11BC** or **NT8D11EC CE/PE** and **NT8D37BA** or **NT8D37EC IPE** Modules.

553-3099

Backplane cable expansion

In the backplane configuration in **NT8D11AC** or **NT8D11DC CE/PE** and **NT8D37AC** or **NT8D37DC** IPE Modules, only some of the slots on the backplane are fully cabled to accommodate 24 tip and ring pairs (three cable connectors). Most of the backplane slots accommodate 16 pairs (two cable connectors). By adding and reconfiguring cable ends in the backplane slots, 24 pairs can be connected to each backplane slot.

With the 7-cable backplane configuration in the **NT8D11AC** and **NT8D 11DC CE/PE** Modules, cable designations D, G, and L on the I/O panel are reserved for expansion (as shown in Figure 9-2). Those cable designations are utilized in the lo-cable expanded configuration in **NT8D11BC** and **NT8D 11EC** Modules.

With the 12-cable backplane configuration in the **NT8D37AC** and **NT8D37DC** IPE Modules, cable designations D, H, N, and U on the I/O panel are reserved for expansion (as shown in Figure 9-2). Those cable designations are utilized in the 16-cable expanded configuration in **NT8D37BA** and **NT8D37EC** Modules.

When backplane slots are reconfigured for expanded cabling, the labeling for **NT8D11 CE/PE** and **NT8D37** IPE Modules must be changed at the MDF to reflect the change in the backplane slots. Figure 9-3 gives a sample of the basic BIX labels for **NT8D11 CE/PE** and **NT8D37** IPE Modules with the standard backplane cabling configuration and with the expanded backplane cabling configuration.

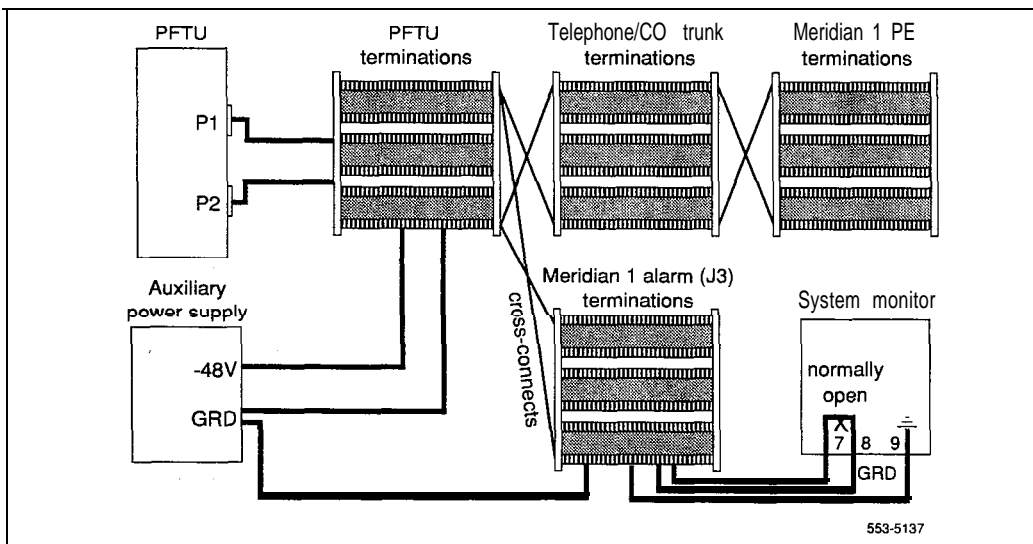
Installing PFTUs

Use the PFTU manufacturer's instructions and this procedure to install and connect A0355200 Power Fail Transfer Units. In AC-powered systems, PFTUs are powered by the A0367916 Auxiliary -48V Power Supply (up to six PFTUs can be supported by one power supply). In DC-powered systems, PFTUs are powered from an auxiliary -48 V dc fused output from the external power equipment.

Figure 10-1 shows a high-level view of PFTU alarm connections. For PFTU operation, wiring from the following equipment cross-connects through termination areas at the MDF:

- PFTU
- auxiliary power supply
- system monitor
- attendant console (optional)
- designated telephones (DTMF or rotary dial types)
- central office trunks

Figure 1 0-1
MDF terminations for PFTU operation



Installation procedure

- 1 Install PFTUs according to the manufacturer's instructions.
- 2 Attach the yellow PFTU label to the BIX designation strip, indicating the top BIX connector as P1 and the bottom connector as P2.
- 3 Install two NE-A25B type 25-pair cables from connectors P1 and P2 on the front of the PFTU to the PFTU termination area at the MDF.
- 4 Cross-connect wiring for PFTU operation as shown in Table 10-1.

Table 10-1
MDF cross-connections for PFTU operations

Description	Connection
-48 V dc return (GND)	PFTU connector P1, pin 49 PFTU connector P2, pin 49 and MDF GND
All grounds on system monitor cable	MDF GND
Console cable pin 11 Console cable pin 36	PFTU connector P1, pin 25 MDF GND
LFBN (line forced bypass enable) LFBENR (line forced bypass enable return)	PFTU connector P1, pin 50 MDF GND
MDF GND	PFTU connector P2, pin 24
Note: At connector P1 on the PFTU, pins 25 and 50 are labeled SWE for "switch enable." When pin 25 is grounded by the attendant console or pin 50 is grounded by the system monitor, line transfer is activated.	

5 For AC-powered systems, install the A0367916 auxiliary power supply:

- Attach the unit to the wall using screws in the four mounting holes.
- Connect a #24 (or larger) AWG wire from the -48 V connection on the auxiliary power supply to the PFTU termination area on the MDF.
- Connect a #24 (or larger) AWG wire from the ground (GND) connection on the auxiliary power supply to the PFTU termination area on the MDF.
- Connect a second #24 (or larger) AWG wire from the GND connection on the auxiliary power supply to the Meridian 1 alarm termination area on the MDF.
- Plug in the A036791 6 auxiliary power supply:

If a UPS is used, you must plug the power supply into an auxiliary output on the UPS.

Without a UPS, plug the power supply into an outlet in the equipment room.

6 For DC-powered systems, power the PFTU from the fused low-current auxiliary power outputs on the DC power system. One 1.33-amp fuse supports up to six PFTUs.

Connecting trunks and telephones

The “ground start” feature on **500/2500-type** telephones connected to CO trunks requiring a ground start condition is not required. Automatic ground start is performed by the PFTU. However, rotary dials (dial pulse) are required on telephones assigned to trunks that are not equipped to recognize tone pulses (touch tone).

See the **PFTU** documentation for MDF cable terminations for telephones and trunks associated with the **PFTU**. If the connections are not designated on the connecting blocks, mark the blocks as shown in the documentation or install the appropriate designation strips.

- 1 For each telephone assigned to the **PFTU**:
 - Connect the tip and ring of the line card to the first pair of the assigned **PFTU**.
 - Connect the tip and ring of the telephone to the second pair of the assigned **PFTU**.
- 2 For each trunk assigned to the **PFTU**:
 - Connect the tip and ring of the CO card to the third pair of the assigned **PFTU**.
 - Connect the tip and ring of the trunk to the fourth pair of the assigned **PFTU**.

10-6 Installing PFTUs

Configuring the system monitor

The NT8D22 System Monitor is used in options 21, 21E, 51, 61, 61C, 71, and 81. The NT7D15 System Monitor is used in only option 21A.

Configuring the NT8D22 System Monitor

The master NT8D22 System Monitor interfaces with a Serial Data Interface (SDI) port in the column with CPU 0.

- 1 Set the baud rate for the SDI port associated with the system monitor to 1200 baud in DTE mode.
- 2 In the rear of the pedestal, loosen the **two** retaining screws on the system monitor and remove it from the PDU .
- 3 Set the option switches for each system monitor. (See *Circuit card installation and testing* (553-3001-211) for a detailed description of switch setting options.)

For a single-column system, set the switches as shown in Table 11-1.

Note: Connect and cable the system monitor in a single-column system like a master system monitor for the rest of this procedure.

Table 11-1
NT8D22 switch settings for a single-column system

Switch	1	2	3	4	5	6	7	8
SW1	off	off	*	on**	off	off	off	off
SW2	on	off	on	on	on	on	on	on
SW3	on	on	on	on				

* Set to on for a DC-powered system; set to off for an AC-powered system.
** Set to off if the system is not equipped with a PFTU.

For a multiple-column system, set the system monitor in the column with CPU 0 as the master, using the settings shown in Tables 11-2 and 11-4.

Set option switches on slave system monitors as shown in Tables 11-3 and 11-5. If CPU 0 and CPU 1 are in different columns, set the system monitor in the column with CPU 1 as slave unit 1. Number the slaves sequentially wherever possible.

Table 11-2
Switch settings for master in multiple-column system

Switch	1	2	3	4	5	6	7	8
SW1	off	off	*	on**	off	off	off	off
SW2	on	off	To set positions 3–8, see Table 11-4					
SW3	on	on	on	on				
* Set to on for a DC-powered system; set to off for an AC-powered system. ** Set to off if the system is not equipped with a PFTU.								

Table 11-3
Switch settings for slaves in multiple-column system

Switch	1	2	3	4	5	6	7	8
SW1	off	off	off	**	off	off	off	off
SW2	off	off	To set positions 3–8, see Table 11-5					
SW3	off	off	off	off				
* Set to on for a DC-powered system; set to off for an AC-powered system. ** Set to on to enable PFTU (if equipped) during over-temperature condition. Set to off to disable PFTU during over-temperature condition.								

Table 11-4
SW2 on master--total number of slaves in the system

How many slave units	Switch position						How many slave units	Switch position					
	3	4	5	6	7	8		3	4	5	6	7	8
0	on	on	on	on	on	on	32	off	on	on	on	on	on
1	on	on	on	on	on	off	33	off	on	on	on	on	off
2	on	on	on	on	off	on	34	off	on	on	on	off	on
3	on	on	on	on	off	off	35	off	on	on	on	off	off
4	on	on	on	off	on	on	36	off	on	on	off	on	on
5	on	on	on	off	on	off	37	off	on	on	off	on	off
6	on	on	on	off	off	on	38	off	on	on	off	off	on
7	on	on	on	off	off	off	39	off	on	on	off	off	off
8	on	on	off	on	on	on	40	off	on	off	on	on	on
9	on	on	off	on	on	off	41	off	on	off	on	on	off
10	on	on	off	on	off	on	42	off	on	off	on	off	on
11	on	on	off	on	off	off	43	off	on	off	on	off	off
12	on	on	off	off	on	on	44	off	on	off	off	on	on
13	on	on	off	off	on	off	45	off	on	off	off	on	off
14	on	on	off	off	off	on	46	off	on	off	off	off	on
15	on	on	off	off	off	off	47	off	on	off	off	off	off
16	on	off	on	on	on	on	48	off	off	on	on	on	on
17	on	off	on	on	on	off	49	off	off	on	on	on	off
18	on	off	on	on	off	on	50	off	off	on	on	off	on
19	on	off	on	on	off	off	51	off	off	on	on	off	off
20	on	off	on	off	on	on	52	off	off	on	off	on	on
21	on	off	on	off	on	off	53	off	off	on	off	on	off
22	on	off	on	off	off	on	54	off	off	on	off	off	on
23	on	off	on	off	off	off	55	off	off	on	off	off	off
24	on	off	off	on	on	on	56	off	off	off	on	on	on
25	on	off	off	on	on	off	57	off	off	off	on	on	off
26	on	off	off	on	off	on	58	off	off	off	on	off	on
27	on	off	off	on	off	off	59	off	off	off	on	off	off
28	on	off	off	off	on	on	60	off	off	off	off	on	on
29	on	off	off	off	on	off	61	off	off	off	off	on	off
30	on	off	off	off	off	on	62	off	off	off	off	off	on
31	on	off	off	off	off	off	63	off	off	off	off	off	off

Table 11-5
SW2 on each slave-unit number for the slave

Slave unit address	Switch position						Slave unit address	Switch position					
	3	4	5	6	7	8		3	4	5	6	7	8
1	on	on	on	on	on	off	33	off	on	on	on	on	off
2	on	on	on	on	off	on	34	off	on	on	on	off	on
3	on	on	on	on	off	off	35	off	on	on	on	off	off
4	on	on	on	off	on	on	36	off	on	on	off	on	on
5	on	on	on	off	on	off	37	off	on	on	off	on	off
6	on	on	on	off	off	on	38	off	on	on	off	off	on
7	on	on	on	off	off	off	39	off	on	on	off	off	off
8	on	on	off	on	on	on	40	off	on	off	on	on	on
9	on	on	off	on	on	off	41	off	on	off	on	on	off
10	on	on	off	on	off	on	42	off	on	off	on	off	on
11	on	on	off	on	off	off	43	off	on	off	on	off	off
12	on	on	off	off	on	on	44	off	on	off	off	on	on
13	on	on	off	off	on	off	45	off	on	off	off	on	off
14	on	on	off	off	off	on	46	off	on	off	off	off	on
15	on	on	off	off	off	off	47	off	on	off	off	off	off
16	on	off	on	on	on	on	48	off	off	on	on	on	on
17	on	off	on	on	on	off	49	off	off	on	on	on	off
18	on	off	on	on	off	on	50	off	off	on	on	off	on
19	on	off	on	on	off	off	51	off	off	on	on	off	off
20	on	off	on	off	on	on	52	off	off	on	off	on	on
21	on	off	on	off	on	off	53	off	off	on	off	on	off
22	on	off	on	off	off	on	54	off	off	on	off	off	on
23	on	off	on	off	off	off	55	off	off	on	off	off	off
24	on	off	off	on	on	on	56	off	off	off	on	on	on
25	on	off	off	on	on	off	57	off	off	off	on	on	off
26	on	off	off	on	off	on	58	off	off	off	on	off	on
27	on	off	off	on	off	off	59	off	off	off	on	off	off
28	on	off	off	off	on	on	60	off	off	off	off	on	on
29	on	off	off	off	on	off	61	off	off	off	off	on	off
30	on	off	off	off	off	on	62	off	off	off	off	off	on
31	on	off	off	off	off	off	63	off	off	off	off	off	off
32	OR	on	on	on	on	on	58	off	off	off	on	off	on

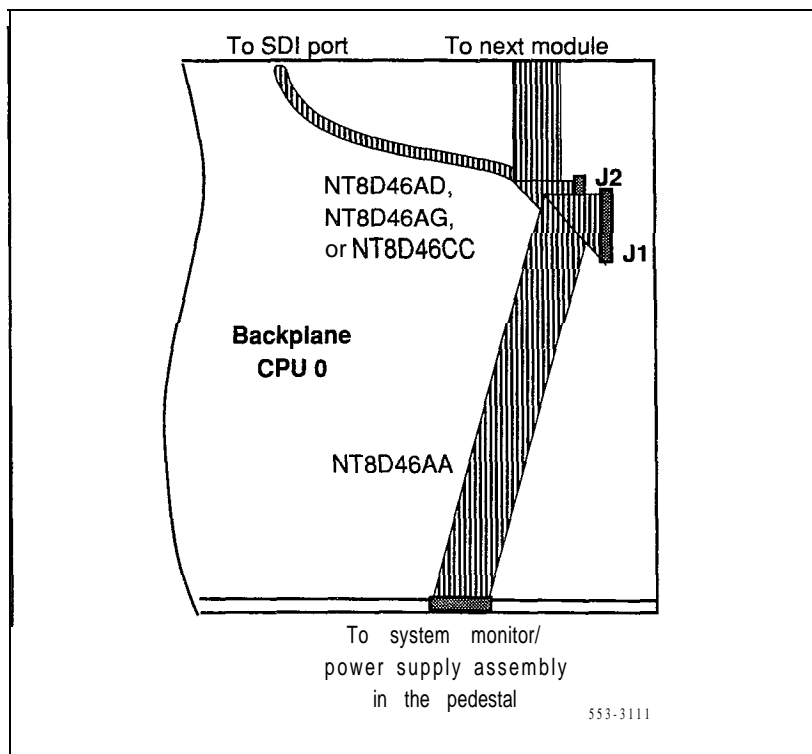
Cabling the NT8D22 System Monitor

- 1 Remove the I/O safety panel in the rear of the module with CPU 0.
- 2 Connect the master system monitor to the SDI port.

For options **21, 21E, 51, 61,** and **61C**, connect the narrow ribbon on one of the cables listed below from connector J2 on the backplane to the assigned port on the SDI card (see Figure 11-1).

- To connect an NT8D41 SDI Paddle Board, use an NT8D46AG cable, or, if an NT7D67CB PDU is equipped, an NT8D46CC cable.
- To any other type of SDI card, use an NT8D46AD cable.

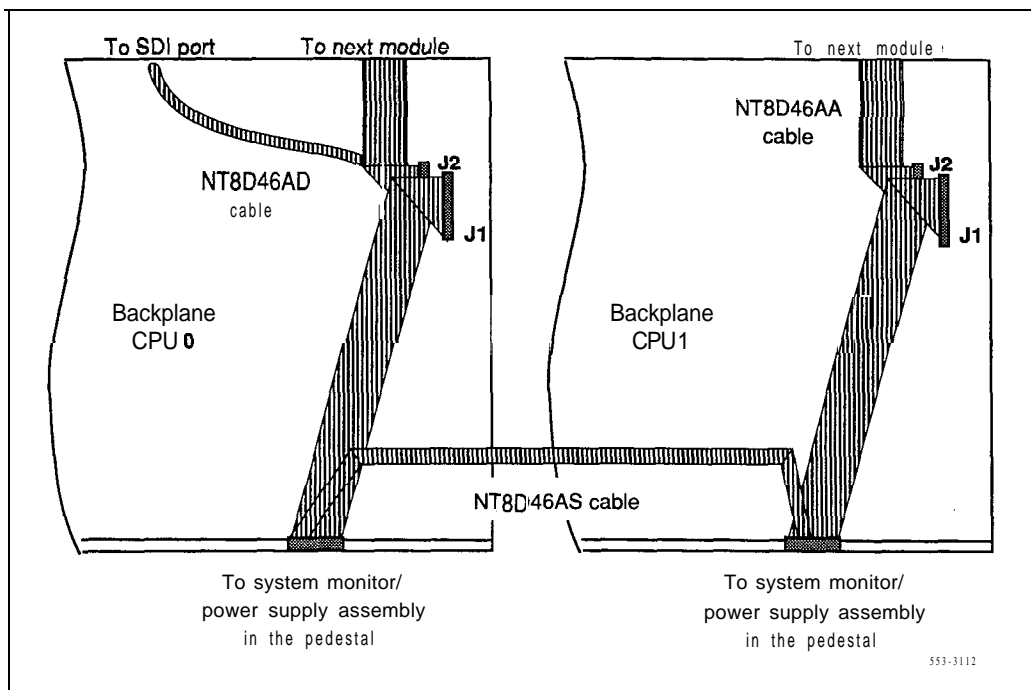
Figure 11-1
Options **21, 21E, 51, 61** and **61C**—cable master system monitor to SDI port



For options 71 and 81,

- Connect the master system monitor to slave unit 1 with an **NT8D46AS** cable.
- Connect the narrow ribbon on an **NT8D46AD** cable from connector **J2** in the module with CPU 0 to the assigned port on the **SDI** card (see Figure 1 I-2).

Figure 1 I-2
Options 71 and 81—cabling for master system monitor to slave unit 1 and **SDI** port



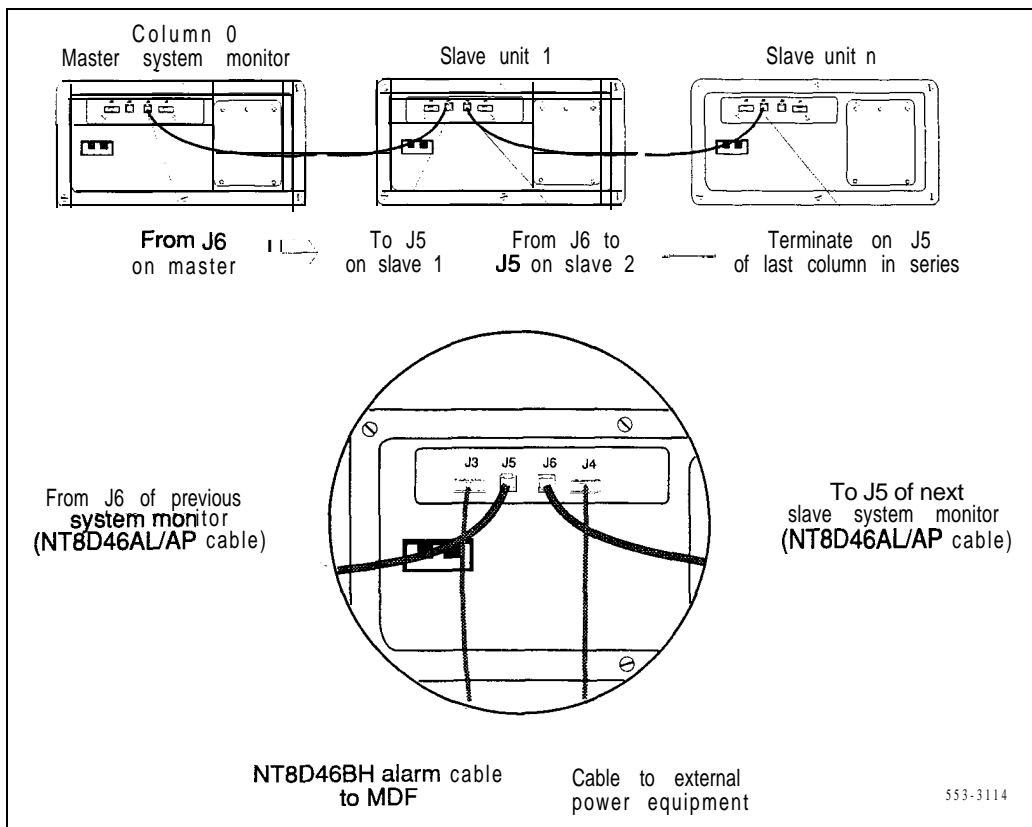
3 Daisy-chain slave system monitors to the master.

For a single-column system, skip this step.

For a multiple-column system, beginning with the master system monitor, cable in series (slave 1 to slave 2, slave 2 to slave 3, and so on) from connector J6 to connector J5 on each system monitor (see Figure 11-3). Terminate at connector J5 on the last column.

- If columns are adjacent, use an NT8D46AL cable.
- If columns are not adjacent, use an NT8D46AP cable.

Figure 11-3
Multiple-column system monitor connections



4 For **PFTU** or external alarm cabling, connect a system monitor to MDF cable:

- Connect a system monitor to MDF cable to connector J3 on the master system monitor.
- Connect the cable at the Meridian 1 alarm termination area at the MDF. See Table 11-6 for the terminating sequence.

Note 1: The system monitor to MDF cable is available in three lengths: **NT8D46BH** (32 ft), **NT8D46EH** (100 ft), and **NT8D46DH** (150 ft).

Note 2: If additional contact closures are required through the **J3 REMALMA** or **REMAMB** leads (for a hard alarm in case a column loses power, for example), additional system monitor to MDF cables can be ordered.

Table 11-6
NT8D22 System Monitor-system monitor to MDF cable pin assignments at the MDF

Pin	Direction	Color	Signal name	Description
1	out	BL/W	REMALMA	Remote major alarm (connect for external alarm)
2	out	OR/W	REMAMB	Remote major alarm return (connect for external alarm)
3	out	GR/W	CE-SYSLT	CE system line transfer (upgraded systems only)
4	in	BR/W	M D F 0/-48	MDF return (ground)
5	in	SL/W	CEALMIN	CE alarm (upgraded systems only)
6	—	BL/R	SYSLTIN	System line transfer in (upgraded systems only)
7	out	W/BL	LFBEN	Line forced bypass enable (connect for PFTU operation)
8	out	W/OR	LFBENR	Line forced bypass enable return (connect for PFTU operation)
9	—	W/GR	G N D	Ground

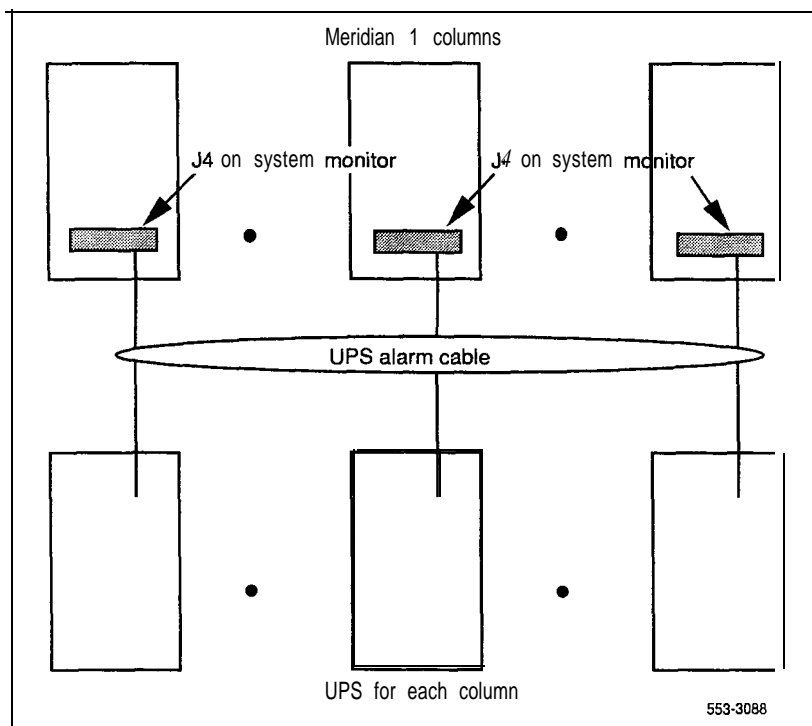
Note: Pins 6, 8, and 9 should be connected and grounded at the MDF.

- 5 For AC-powered systems with a UPS:
- Connect the appropriate cable (see the following list) from connector **J4** on the system monitor in the column with **CPU 0** (the master system monitor) to the associated UPS. Table 11-7 gives the pin assignments and signal descriptions for the alarm cables.
 - For a Best Inc. UPS, use an **NT8D46AJ** alarm cable.
 - For an Exide UPS, use an **NT8D46AQ** alarm cable.
 - For an Alpha UPS, use an **NT8D46AU** alarm cable.
 - Connect the cable to the UPS as specified by the manufacturer.
 - Repeat this step for each system monitor with an associated UPS (see Figure 11-4).

Table 11-7
Pin assignments for the **NT8D46** (AJ, AQ, AU) UPS alarm cable

Pin	Signal description
1	Not used
2	Not used
3	Not used
4	Not used
5	Alarm 1
6	Alarm 1 return
7	Alarm 2
8	Alarm 2 return
9	Not used

Figure 1 I-4
UPS alarm cabling



- 6 For DC-powered systems, extend the alarm and trip leads from connector J4 on the system monitor in the column with CPU 0 (the master system monitor) to the external power equipment using an NT8D46AV cable (Table I 1-8).

Note 1: Conduit is not required.

Note 2: An NT8D46BV cable, 20 m (64 ft), or NT8D46CV cable, 33 m (100 ft), can be used instead of the NT8D46AV cable. Connections are the same as the NT8D46AV cable.

Table 11-8
Alarm and trip lead **connections—NT8D46AV** cable

Color	Description	Connection at control and distribution panel	
		Terminal block 1	Terminal block 2
OR	Alarm	LVA, position 4	
BL	DCON 0		RFA MIN, position 2
R	DCON 1'		RFA MAJ, position 4
W	DCON 2*		RFA MAJ, position 4
GR	DCON 3*		RFA MAJ, position 4

* Connect the red, white, and green wires together at MJA.

installing the NT7141 5 System Monitor

In option 21 A, the NT7D15 System Monitor can be installed in any of the four slots on the rear of the backplane in the NT8D11 CE/PE Module. Note that there are no system terminal or SDI port connections to the NT7D15.

CAUTION

Cables must be disconnected when the system monitor is installed. When you connect the cables, follow the order given in this procedure or the system will shut down.

- 1 Remove the I/O safety panel in the rear of the CE/PE Module. Insert the system monitor into one of the slots on the rear of the backplane before you connect any cables to the system monitor.
- 2 Connect an NT8D40BJ cable from P1 on the system monitor to connector J1 on the backplane.
- 3 Connect an NT8D84BA cable from P2 on the system monitor to an available connector on the interior of the I/O panel; connect a system monitor to MDF cable from the external side of the I/O connector to the MDF (see Table 11-9).

11-12 Configuring the system monitor

Note: The system monitor to MDF cable is available in three lengths: NT8D46BH (32 ft), NT8D46EH (100 ft), and NT8D46DH (150 ft).

- 4 Connect an NT8D40BK cable from P3 on the system monitor to connectors C 1 and C2 on the circuit breaker assembly in the pedestal.

Table 11-9
NT7D15 System Monitor-system monitor to MDF cable pin assignments at the MDF

Pin	Direction	Signal name	Description
1	out	REMALMA	Remote major alarm (connect for external alarm)
2	—	NC	Do not connect
3	—	NC	Do not connect
4	out	LFBEN	Line forced bypass enable (connect for PFTU operation)
5	—	GND	Ground
6	out	REMALMB	Remote major alarm return (connect for external alarm)
7	—	NC	Do not connect
8	—	GND	Ground
9	out	LFBENR	Line forced bypass enable return (connect for PFTU)

Note: Pins 5, 8, and 9 should be connected and grounded at the MDF.

Connecting a system terminal (or modem)

This procedure does not apply to the **NT7D15** System Monitor used in option **21A**.

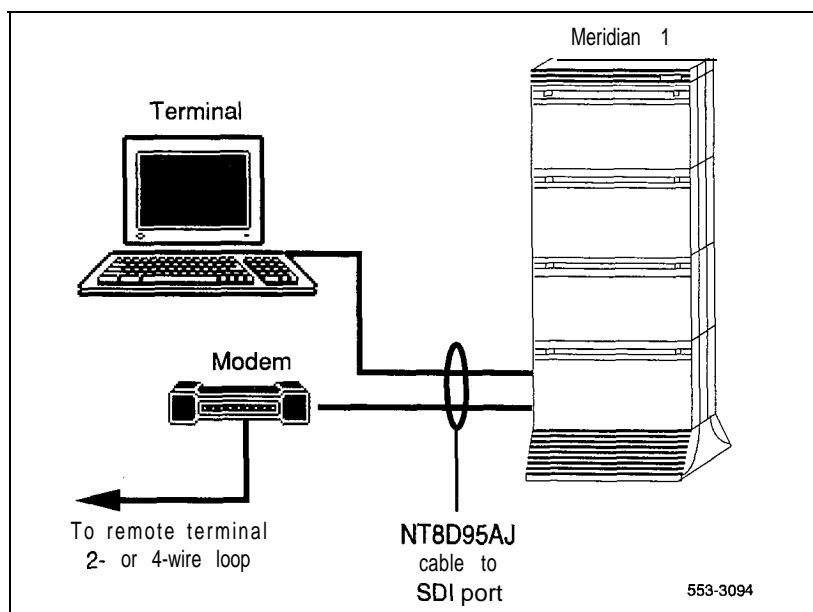
At this point in the installation, a terminal must be connected to a serial data interface (SDI) port to provide an I/O interface to the system. When the installation is complete, a terminal (for local access) or a modem (for remote access) must remain permanently connected to an SDI port to provide a constant I/O interface to the system (see Figure 12-1).

During the initial installation of a dual CPU system, you may want to temporarily install additional terminals for split mode monitoring, or programming, or both.

Note: In options 6 1 and 7 1, SDI cards can be temporarily installed in CPU slots during a software conversion. In options 61 C and 8 1, I/O ports on the **NT6D66** Call Processing (CP) Cards can be used to monitor Core operations. These configurations should not be used as the permanent I/O connection for the system because the port is only active when the associated CPU, or Core, is active.

12-2 Connecting a system terminal (or modem)

Figure 12-1
Terminal connection diagram



For a modem connection to the Meridian 1, Bell 1031212 compatible dumb modems are recommended for all systems, except options 61C and 8 1.

CAUTION

If a Hayes command-set compatible (smart) modem is used at the Meridian 1 end, you *must* select the dumb mode of operation, Command Recognition OFF and Command Echo OFF, before connecting the modem to the SDI port. Refer to the modem instructions to set the mode of operation.

If a printer is connected to an SDI port (locally or remotely), you must disable XON/XOFF flow control, so no characters or signals are sent to the port, to avoid a "ping-pong" effect.

For information specific to options 61C and 8 1, see “Option 61C and 81 terminal and modem connections” on page 12-9.

1 Install and cable a system terminal or a modem:

- Unpack the terminal/modem and place it in its assigned location.
- Install the terminal/modem according to the manufacturer’s instructions.
- Connect an **NT8D95AJ** cable to a matching **connector** on the terminal/modem.

Note: At a remote location, install and connect a compatible modem and terminal. Connect the **NT8D95AJ** cable to the modem.

2 Install and cable the SDI card:

- Set the **Enb/Dis** switch to **Dis** (down).
- See *Circuit card installation and testing* (553-3001-211) to set the option switches for each port.

See Figure 12-2 for switch locations on an **NT8D41 SDI** Paddle Board. (The paddle board cannot be used in options 7 1 and 8 1.)

See Figure 12-3 for switch locations on an **NTND02 MSPS** Card. (The MSPS card is used in option 21E only.)

- Insert the **SDI** card into its assigned slot.
- Cable the **SDI** card:

See Figure 12-4 to cable the **NT8D41 SDI** Paddle Board. (There is no faceplate on the paddle board; Figure 12-4 identifies the ports.)

See Figure 12-5 to cable an **NTND02 MSPS** Card.

See Figure 12-6 to cable a **QPC841 Four-Port SDI** Card.

- Set the **Enb/Dis** switch to **Enb** (up).

3 Software enable the **SDI** card:

- Define each **SDI** port in the Configuration Record (**LD17**).
- Enable each **SDI** port using the appropriate software program for the port application. Typical **SDI** applications and associated programs include:

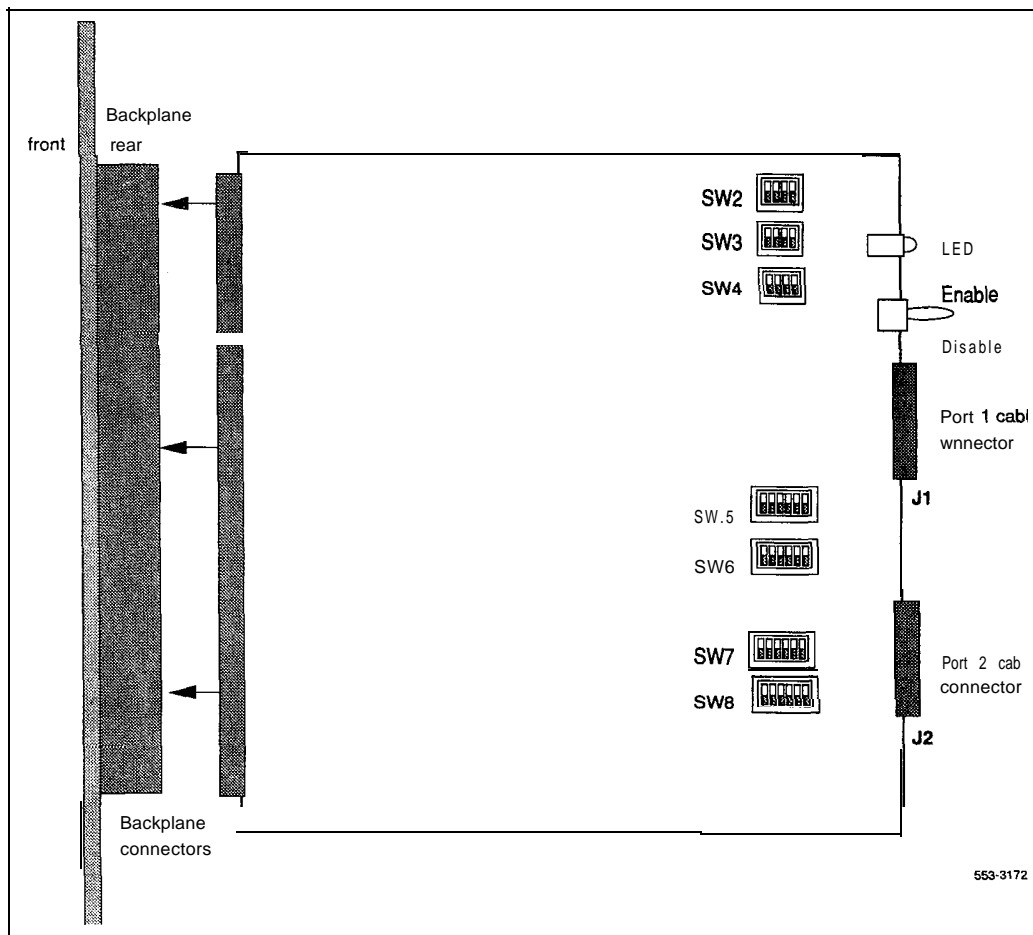
Terminal and printer ports LD 37

Call Detail Recording (**CDR**) ports LD 42

Automatic Call Distribution (**ACD**) ports LD 48

- 4 Connect an **NT8D95AJ** cable from the terminal, or modem, to the assigned **SDI** port.

Figure 12-2
Ports and switches on the **NT8D41SDI** Paddle Board



12-6 Connecting a system terminal (or modem)

Figure 12-3
Switch locations on the **NTND02** MSPS Card

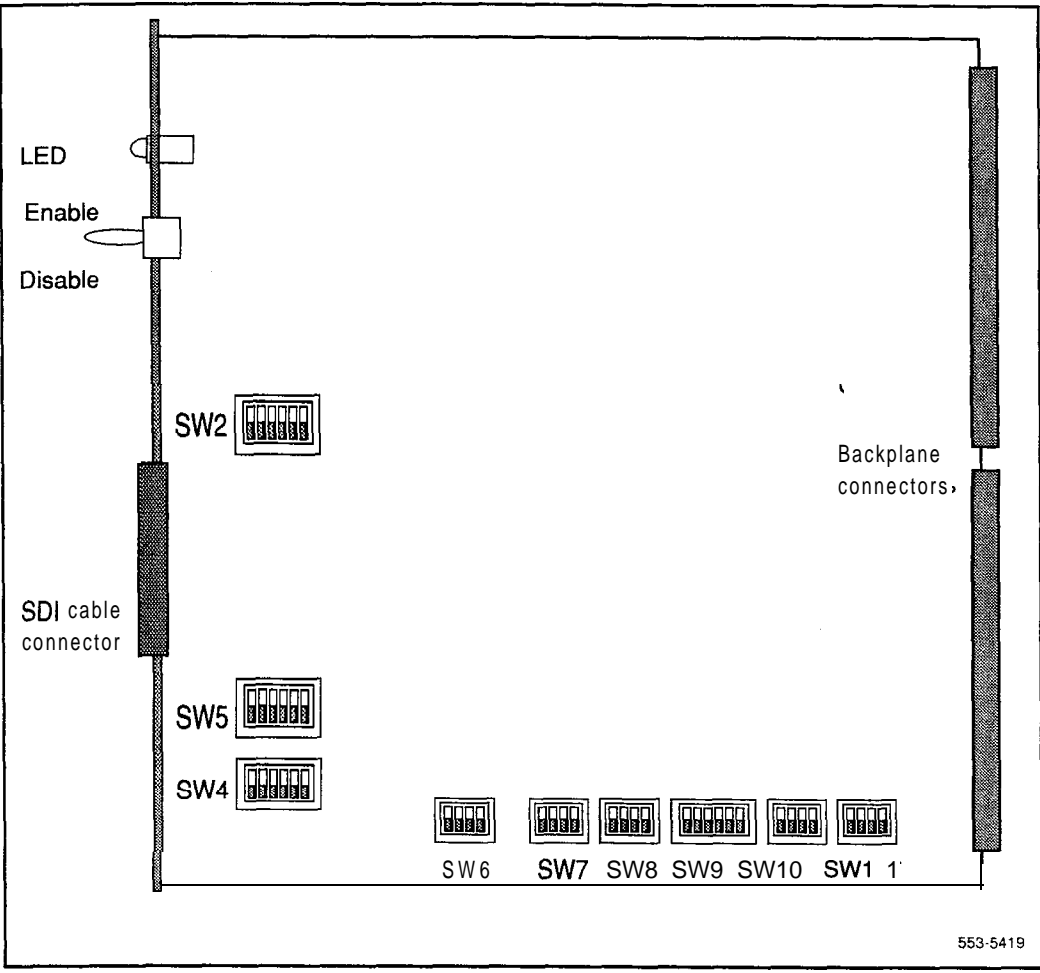
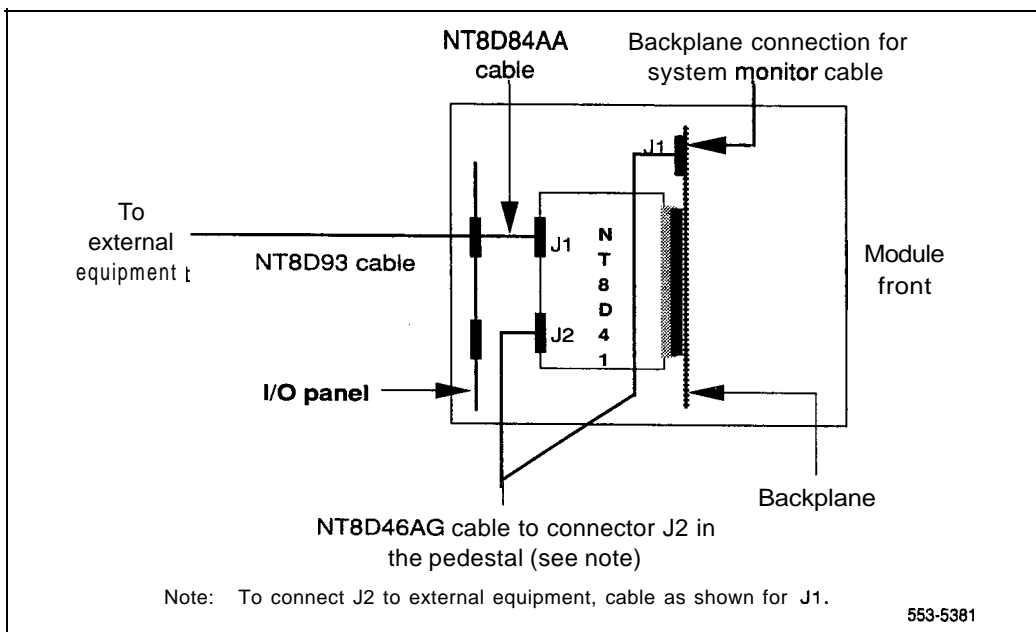
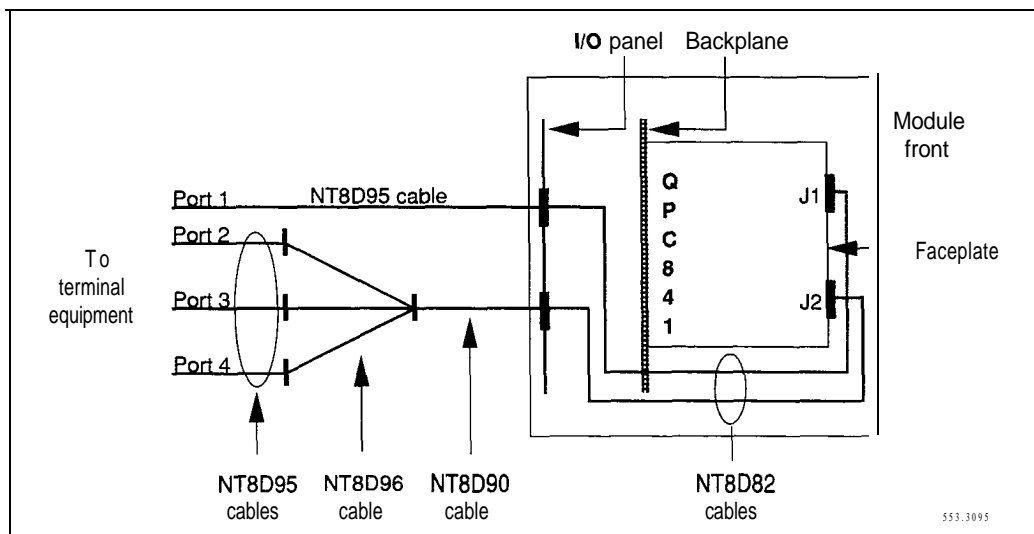
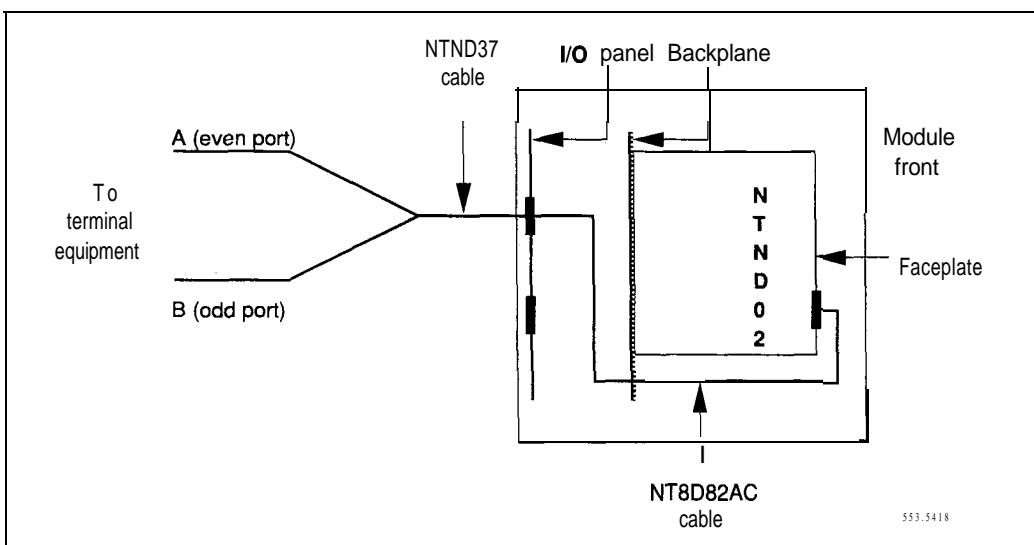


Figure 12-4
Cabling diagram for the **NT8D41 SDI** Paddle Board



12-8 Connecting a system terminal (or modem)

Figure 12-5
Cabling diagram for the **NTND02** MSPS Card



Option 61C and 81 terminal and modem connections

During the system installation and for continuing system operation, a terminal must be connected to an **SDI** port in a network slot to provide an I/O interface to the active Core in the system. In addition, a data terminal equipment (DTE) and a data communication equipment (DCE) port on each **NT6D66** CP Card can be used for **direct** access to the Core or Core/Network Module that houses the card. Typically, the CPIO ports are **preconfigured** on I/O addresses four and five.

The ports on the CP card (CPIO ports) are active only when the Core associated with the CP card is active. Therefore, the CPIO ports should not be used as the only I/O connection for the system.

When the initial installation is complete, you must leave a terminal or a modem connected to the system. One **SDI** port in a network slot must be permanently connected to a terminal or modem. On the CPIO ports you can

disconnect the ports

- leave terminals connected for local monitoring
- connect modems for remote monitoring

The Black Box ABCDE-Switch, which provides up to four-to-one switching, is available from Northern Telecom as part number A0377992. The switch box can be used to connect the **SDI** and CPIO ports to a terminal or a modem. If used, one switch box must be used for terminals and one for modems.

12-10 Connecting a system terminal (or modem)

Option 61C and 81 terminal guidelines

During an installation, you can connect terminals to the CPIO ports for split mode monitoring, or programming, or both. (Due to the speed of the operating system, personal computers are useful for file capture and manipulation.) Terminals connected to the CPIO ports can be installed as follows:

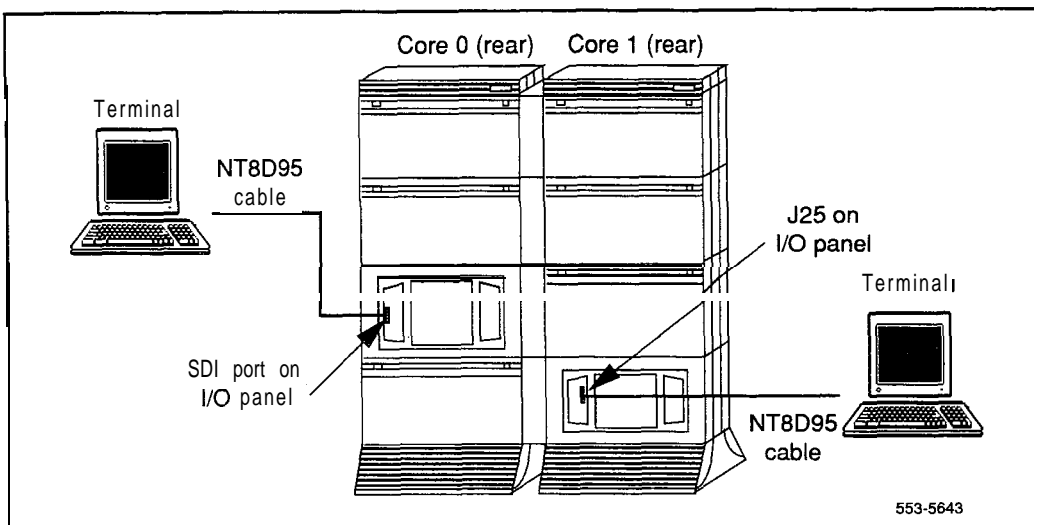
- one terminal connects to a CPIO port in one Core (the cable is switched from module to module as needed): one terminal is required in addition to the terminal for the **SDI** port connection (see Figure 12-7)
- one terminal connects to a switch box that connects to a CPIO port in each Core: one terminal and a switch box are required in addition to the terminal for the **SDI** port connection (see Figure 12-8)
- one terminal connects to a switch box that connects to an **SDI** port and to a CPIO port in each Core: one terminal and a switch box are required (see Figure 12-9)

Connecting a terminal to a **CPIO** port

Use the following procedure to connect a CPIO port directly (no switch box) to a terminal (see Figure 12-7):

- Set the terminal to 9600 baud, 7 data, space parity, one stop bit, full duplex, XON .
- Connect an **NT8D95** cable to a matching connector on the terminal.
- Connect the **NT8D95** cable to **J25** on the I/O panel in the rear of the Core or Core/Network Module.
- If you are using only one terminal for both CPIO ports, switch the cable as needed. The terminal connected to the **SDI** port will always communicate with whichever Core is active.

Figure 12-7
One terminal for the **CPIO** ports



Connecting a switch box and terminal to **CPIO** ports

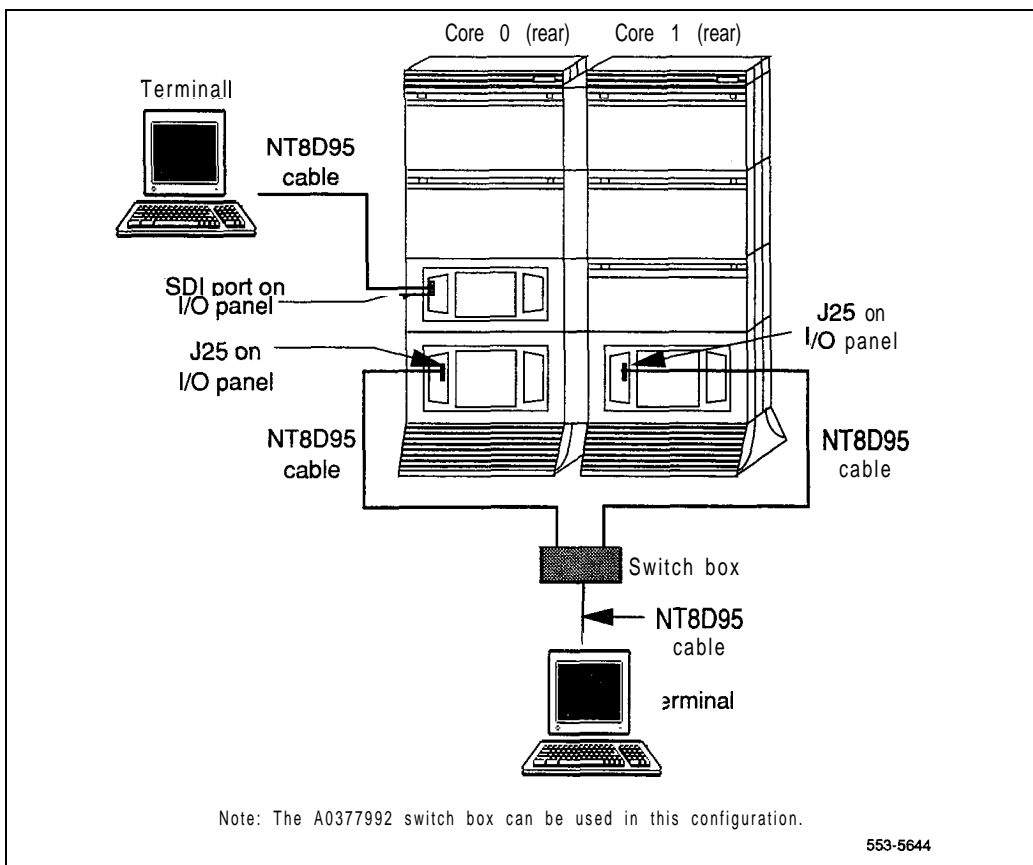
Use the following procedure to connect CPIO ports to a switch box and a terminal (see Figure 12-8):

- Set the terminal to 9600 baud, 7 data, space parity, one stop bit, full duplex, XON.
- Connect an **NT8D95** cable to the terminal and to the switch box.
- Connect **NT8D95** cables to a matching connector on the switch box.

If you are using an A0377992 ABCDE box, connect cables as follows:

- Connect Core 0 to connector A.
 - Connect Core 1 to connector B . .
- Connect the **NT8D95** cables from the switch box to **J25** on the **I/O** panel in the rear of the Core or **Core/Network** Modules.
 - To communicate directly with a CPIO port, switch the cable as needed. The terminal connected to the **SDI** port will always communicate with whichever Core is active.

Figure 12-8
One terminal and a switch box to two **CPIO** ports



Connecting a switch box and terminal to the SDI and CPIO ports

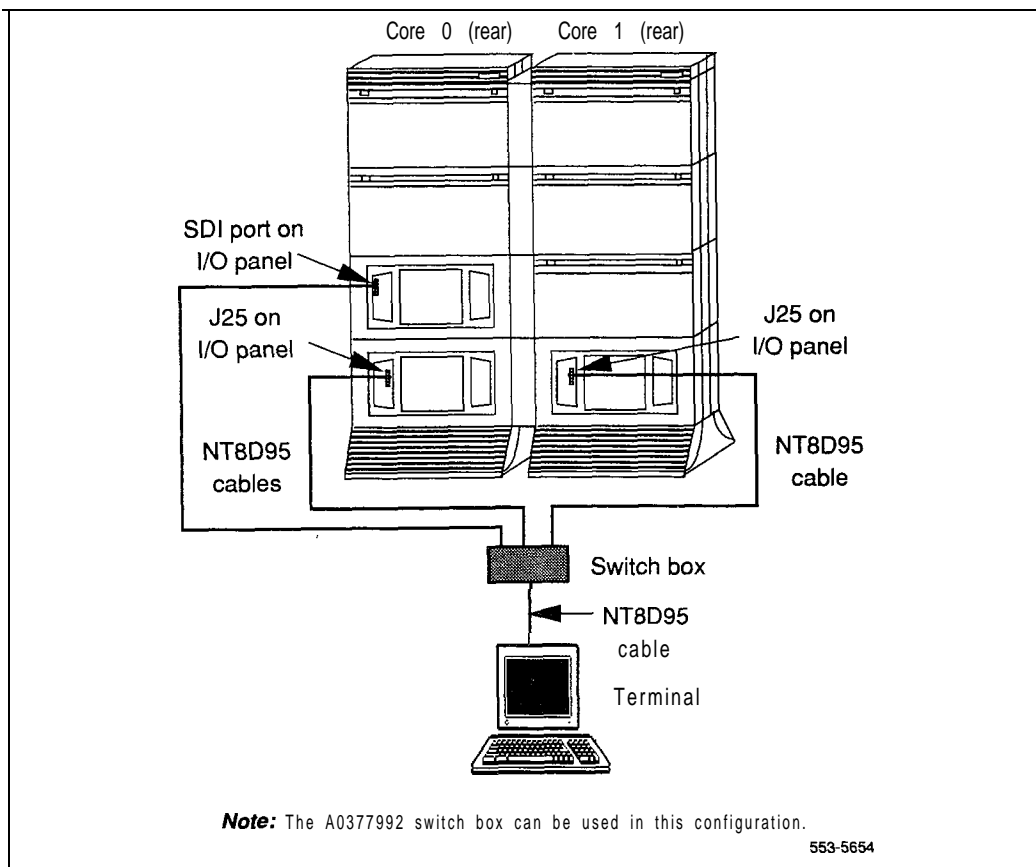
Use the following procedure to connect CPIO ports to a switch box and a terminal (see Figures 12-8 and 12-9):

- Set the terminal to 9600 baud, 7 data, space parity, one stop bit, full duplex, XON.
- Connect an **NT8D95** cable to the terminal and to the switch box.
- Connect **NT8D95** cables to a matching connector on the switch box.

If you are using an A0377992 ABCDE box, connect cables as follows:

- Connect Core 0 to connector A.
- Connect Core 1 to connector B ,
- Connect the **SDI** port to connector D (connector C is common).
- Connect **NT8D95** cables from the switch box to J25 on the I/O panel in the rear of each Core or Core/Network Module.
- Connect an **NT8D95** cable from the switch box to the I/O panel slot for the **SDI** card.
- To communicate with the system in general, set the switch box to the **SDI** port. To communicate directly with a CPIO port, switch the cable as needed.

Figure 12-9
One terminal and a switch box to the SDI and **CPIO** ports



Option 61C and 81 modem guidelines

You can connect a modem to an **SDI** port to remotely monitor general system operation. Or you can connect a modem to the CPIO ports for debugging and patch downloading (through your Northern Telecom representative). Or you may want a remote connection to both the **SDI** and CPIO ports.

At the Meridian 1 end (the local end), modems must be set to dumb mode (command recognition OFF, command echo OFF). Modems at the local end can be connected as follows:

- one modem connects to the **SDI** port and the cable is switched to each CPIO port as needed (see Figure 12-10)
- one modem connects to a switch box that connects to the **SDI** and CPIO ports (see Figure 12-11)

Note: The second method listed here is preferred. Other configurations, such as a separate modem for each port, are possible.

At the remote end, at least one modem (which can be set to smart mode), one terminal, and one RS-232 cable are required in all modem configurations.

Modems at the local end must meet the following required specifications to be compatible with options 61C and 81. Modems that meet the following recommended specifications must also meet the required specifications.

- true, not buffered, 9600 baud support (required for remote Northern Telecom technical support)
- *Required:* CCITT V.32 or V.32bis compliance
- *Recommended:* the ability to adjust to lower and higher speeds, depending on line quality, while maintaining 9600 baud at local DTE
- *Recommended:* V.42 error correction
- *Recommended:* V.42bis data compression

A dispatch or call back modem, normally connected to the **SDI** port, can be used if it meets the requirements. If you want to use a modem of this type that does not meet the requirements, the modem can only be used in addition to a modem that does meet specifications.

Any modem that meets the required specifications should be compatible with options 61C and 81. The following models have been tested and verified as compatible:

- Hayes V-series ULTRA Smartmodem 9600
- UDS **FastTalk** V.32/42b
- US Robotics Courier HST Dual Standard **V.32bis**

The UDS **FastTalk** modem is available through Northern Telecom as part number A038 139 1. The modem is equipped with a 6-ft power cord for a standard 110 V ac wall socket and a cable that connects to an **RJ11C** jack. (The A0377992 Black Box ABCDE-Switch can be used with the UDS **FastTalk** modem.)

Configuring an A0381391 UDS **FastTalk** modem

Use the following procedure to configure a UDS **FastTalk** modem for operation with options 61C and 8 1.

Note: With the exception of the smart/dumb mode, configuration changes to the modem are made through software. The modem must remain in smart mode (as shipped) until the software configuration is complete.

- Connect an RS-232 cable to the modem and to a terminal.
- Enter the following commands to set compatible parameters (the modem is preset for 9600 baud):
 - ATE turn off local character echo
 - ATSO=2 enable autoanswer on second ring
 - ATDT set for tone dialing (default is pulse dialing)
 - AT & W store changes in profile 0
 - AT & Y use profile 0 at power up
- Disconnect the power cord, RS-232 cable, and any other cables to the modem.
- Remove the top cover on the modem:
 - Stand the unit on its side.
 - Using a medium-size flat screwdriver, lightly pry each lock tab off the latch lock, pulling the cover away from the modem as the lock releases.
- Set the modem to dumb mode:
 - Locate the option strap.
 - Position the shunt connector over the center post and the post closest to the center of the board.

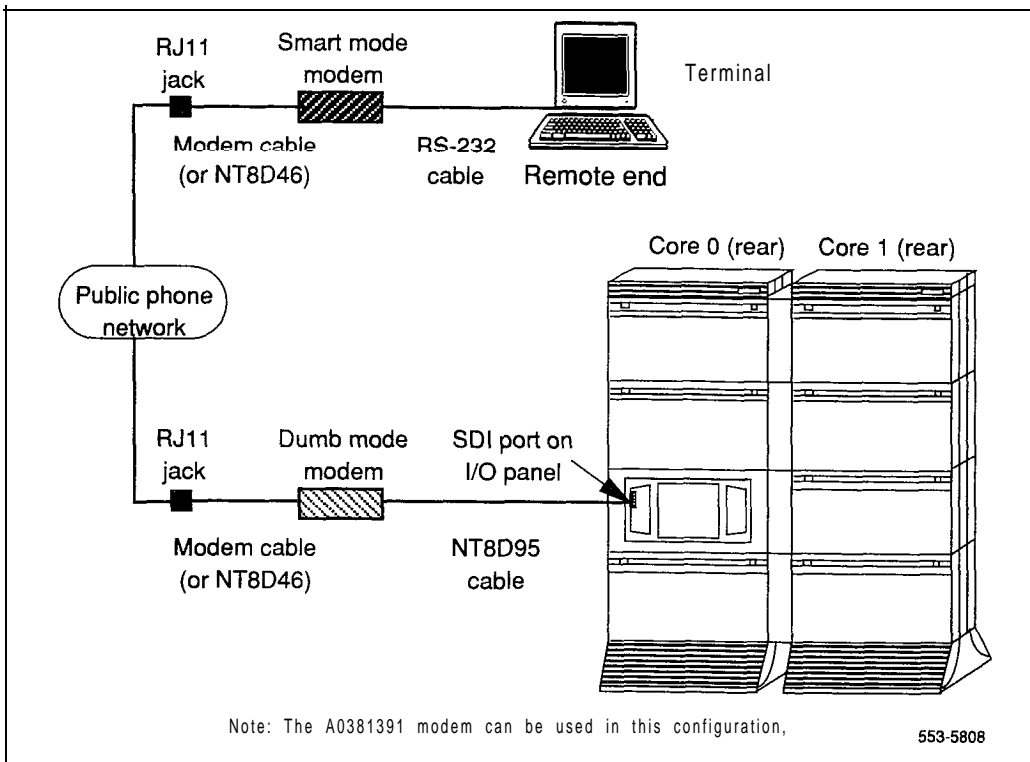
- Replace the cover on the modem:
 - Align the latch locks, the lock tabs, and the rear guide grooves.
 - Press the cover into place until the latch locks engage the lock tabs.
- Reconnect the power cord and any other cables that will be reused.

Connecting a modem to an **SDI** port

Use the following procedure to connect an **SDI** port directly (no switch box) to a modem (see Figure 12-10):

- At the remote end, connect an RS-232 cable to the terminal and to the modem.
- At the remote end, connect the cable from the modem to an **RJ11** telephone jack. (If a cable is required, connect an **NT8D46** cable to the modem and to the **RJ11** jack.)
- At the local end, configure the modem:
 - If you are using an A0381391 UDS **FastTalk** modem, follow the instructions in this document.
 - If you are using a different type of modem, follow the manufacturer's instructions to set the modem for 9600 baud, autoanswer, dumb mode, command recognition OFF, command echo OFF.
- At the local end, connect an **NT8D95** cable to the **SDI** port on the I/O panel in the rear of the module and to the modem.
- At the local end, connect the cable from the modem to an **RJ11** telephone jack. (If a cable is required, connect an **NT8D46** cable to the modem and to the **RJ11** jack.)
- To communicate with a **CPIO** port, switch the cable from the modem to the port as needed:
 - For debugging or monitoring, connect the cable to the *active Core* at **J21** on the I/O panel in the rear of the **Core** or **Core/Network Module**.
 - For patch downloading, connect the cable to the *inactive Core* at **J21** on the I/O panel in the rear of the **Core** or **Core/Network Module**.

Figure 12-10
Modem to SDI port



Connecting a modem to a switch box and CPIO and SDI ports

Use the following procedure to connect SDI and CPIO ports to a switch box and a modem (see Figure 12-11):

- At the remote end, connect an RS-232 cable to the terminal and to the modem.
- At the remote end, connect the cable from the modem to an RJ11 telephone jack. (If a cable is required, connect an NT8D46 cable to the modem and to the RJ11 jack.)
- At the local end, configure the modem:
 - If you are using an A0381391 UDS **FastTalk** modem, follow the instructions in this document.
 - If you are using a different modem, follow the manufacturer's instructions to set the modem for 9600 baud, autoanswer, dumb mode, command recognition OFF, command echo OFF.
- At the local end, connect NT8D95 cables to
 - J21 on the I/O panel in the rear of the Core or Core/Network Modules
 - the SDI port on the I/O panel in the rear of the Core module
- At the local end, connect NT8D84 cables to
 - the SDI Paddle Board at the Core/Network backplane to the I/O panel in the rear of the Core/Network Module (not shown in Figure 12-11).
- At the local end, connect NT8D95 cables from the I/O panels to a matching connector on the switch box.

If you are using an A0377992 ABCDE box, connect cables as follows:

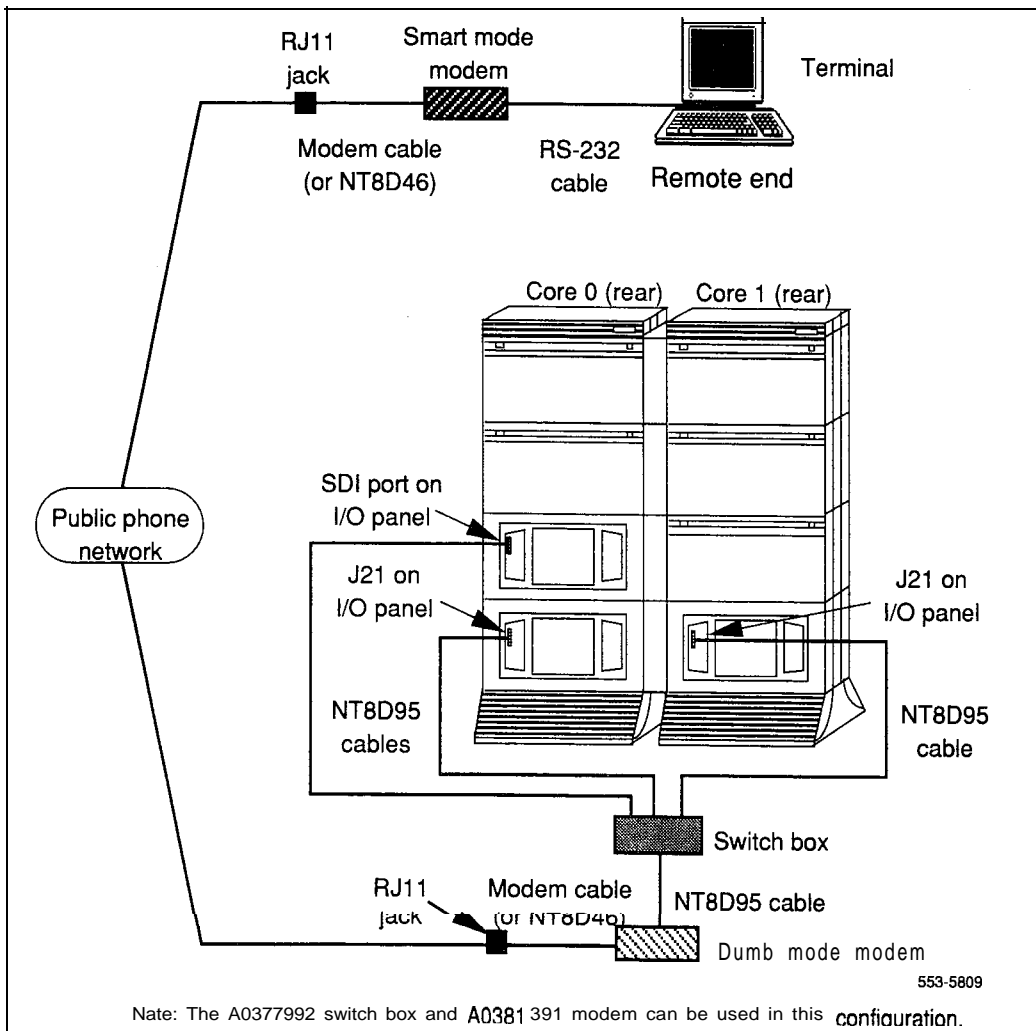
- Connect Core 0 to connector A.
- Connect Core 1 to connector B.
- Connect the SDI port to connector D (connector C is common).

12-22 Connecting a system terminal (or modem)

- At the local end, **connect** an **NT8D95** cable from the switch box to the modem.
- At the local end, connect the cable from the modem to an **RJ11** telephone jack. (If a cable is required, connect an **NT8D46** cable to the modem and to the **RJ11** jack.)
- At the local end, set the switch box as needed to communicate with the **CPIO** ports:
 - During normal operation, set the switch to the **SDI** port.
 - ⌋ For debugging, set the switch to the *active* Core.
 - ⌋ For patch downloading, set the switch to the *inactive* Core.



Figure 12-I 1
Modem to a switch box and SDI and CPIO ports



System installation procedures 553-3001-210

12-24 Connecting a system terminal (or modem)



Cabling common equipment

This procedure does not apply to single CPU systems (options **21A, 21, 21E, and 51**).

Use the following guidelines for routing common equipment cables:

- When routing SBE or CNI to 3PE cables, store any excess cable length near the associated Network Module. Do not store excess cable in a CPU or Core Module.
- When routing IGS to intergroup cables, store excess length near the **InterGroup Module**.

Because the cable troughs and spaces on the sides of a module are within the EMI shielding of the system, unshielded cables can be routed in those areas. As space permits, common equipment cables can be routed:

- horizontally in the cable troughs at the front, rear, and sides of the module

Note: In a DC-powered module, because there is no MPDU, there is room to route cables horizontally from front to rear on the left side (front view) of the module.

- vertically on the sides of the module

CAUTION

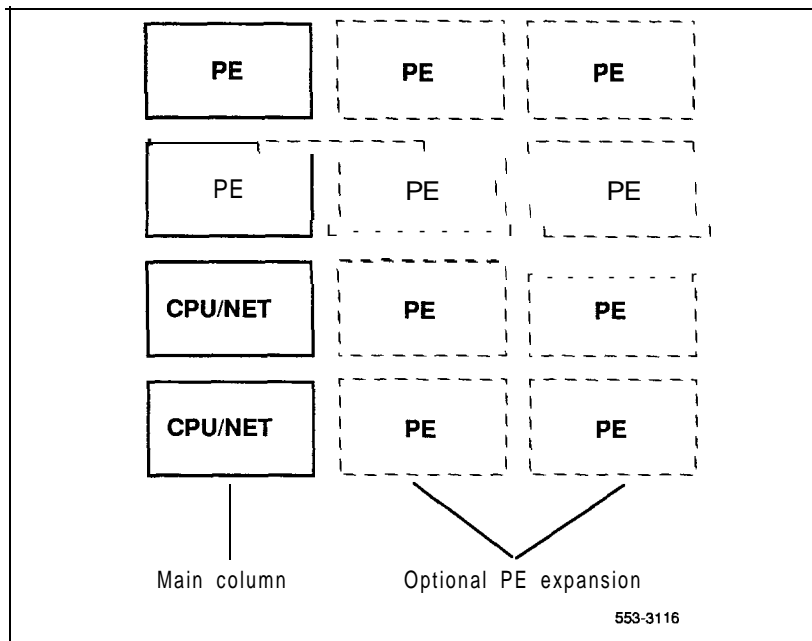
Cables must be routed as perpendicular as possible to any nearby power cables. Avoid routing cables near power cables if alternate routing is available. (At the rear of the module, cables routed between the I/O panel and the rear cover can be parallel to the power cables because the panel provides **EMI** shielding.)

System option 61

Option 61 is a dual CPU system with standby processing capability, fully redundant memory, and a full network group. Two CPU/Network Modules and one IPE Module are required. Additional IPE Modules, PE Modules, WE Modules, and application modules can be used.

Figure 13-1 shows a basic configuration.

Figure 13-1
Option 61 dual CPU, full network group configuration



Cable installation

- 1 Connect the NTND 10 Changeover and Memory Arbitrator (CMA) Card (QPC58 1 before XI 1 release 18) in CPU/Network 0 to the CMA card in CPU/Network 1:
 - Connect J2 to J2 with an **NT8D85AZ** cable.
 - Connect J1 to J1 with an **NT8D80AD** cable.
 - Figure 13-2 shows the CMA card position in the **NT6D39** CPU/Network Module and the cables required.
- 2 Connect the QPC441 3-Port Extender (3PE) Card in CPU/Network 0 to the 3PE card in CPU/Network 1:
 - Connect J3 to J3 with an **NT8D80AD** cable.
 - Connect J4 to J4 with another **NT8D80AD** cable.
 - Figure 13-2 shows the 3PE card position in the **NT6D39** CPU/Network Module and the cables required.
- 3 Connect network half-group 0 in CPU/Network 0 to half-group 1 in CPU/Network 1:
 - Cable the D connectors (on the rear of the backplane) together with an **NT8D99AB** cable.
 - Cable the E connectors (on the rear of the backplane) together with another **NT8D99AB** cable.
 - Figure 13-3 shows the D and E connectors on the backplane of the **NT6D39** CPU/Network Module and the cables required.
- 4 If clock controller cards are equipped, cable the faceplate connectors together with an **NT8D75AD** cable.
- 5 Seat and secure all connectors.

13-4 Cabling common equipment

Figure 13-2
NT6D39 CPU/Network Module (front view)—CMA and 3PE cables

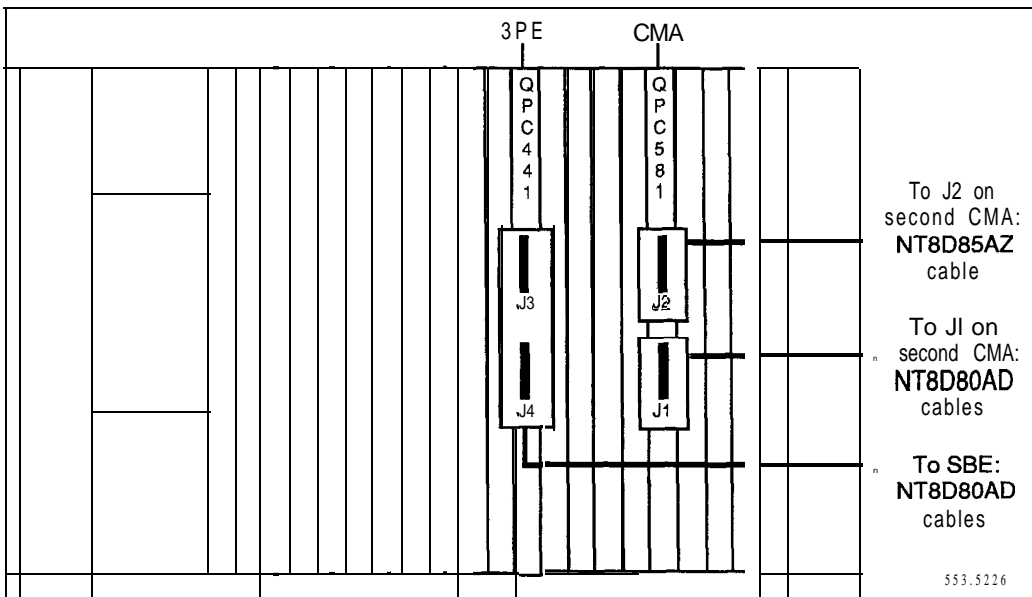
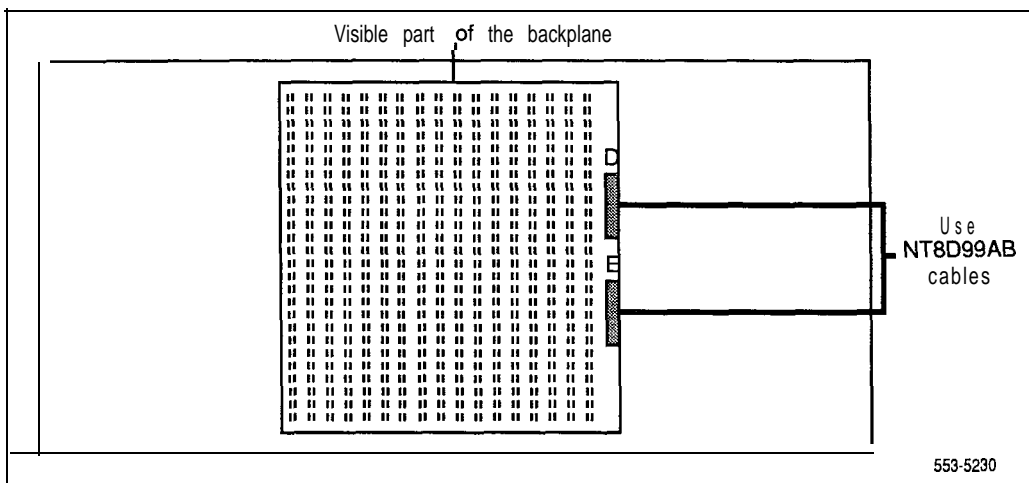


Figure 13-3
NT6D39 CPU/Network Module (rear view)-location of D and E connectors

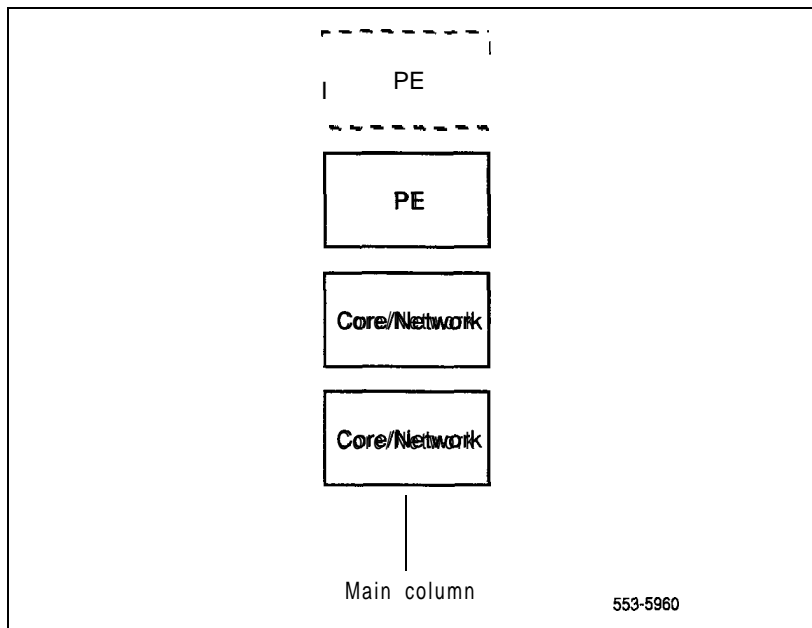


System option 61C

Option 61C is a dual CPU system with standby processing capability, fully redundant memory, and a full network group. Two Core/Network Modules and one IPE Module are required. Additional IPE Modules, PE Modules, RPE Modules, and application modules can be used.

Figure 13-4 shows a basic configuration.

Figure 13-4
Option 61 C dual CPU, full network group



CNI configuration

In the **NT9D** 11 Core/Network Module, port 0 on the **NT6D65** Core to Network Interface (CNI) Card in slot 12 must be configured as “group 0.” This extension is through the CNI card in slot 12, backplane bussing, and a **QPC441** 3-Port Extender (3PE) Card in slot 11. No cable is used.

Since only one network group is supported in option 6 1 C, only one CNI card is required. The CNI card must be installed in slot 12 in the Core/Network Module, and Port 0 is dedicated to “group 0.”

Cable installation guidelines

Core/Network module backplanes, like all circuit boards, have a primary side and a secondary side. The primary side, which faces the front of the module, contains the primary shrouds, which provide mechanical guidance for the pins of the card edge connectors. The secondary side of the backplane, which faces the rear of the module, contains the secondary shrouds, which provide mechanical guidance for cable connectors.

The columns of secondary backplane shrouds are designated 18 through 12 from left to right (facing the rear of the backplane). This numbering matches the card slots in the front of the module. The connector rows of secondary backplane shrouds are designated A through F from top to bottom.

Before you connect cables to the backplane, visually inspect the backplane shroud connectors to make sure there are no bent pins. To connect cables:

- 1 Orient the cable connector so the strain relief paddle is to the right.
- 2 Partially insert the cable connector so its guides mate to the corresponding backplane connector.
- 3 Apply a small amount of pressure to push the cable connector straight into the backplane connector. You will feel a detent click when the connector seats.

CAUTION

Pins may be bent or broken if you try to insert the cable connector at an angle. Do not push the connector in any further after you hear the detent click.

Using the extraction tool

To disconnect a cable from the Core/Network Module backplane, use the PO741489 Extraction Tool provided in the rear of the module (behind the I/O safety panel).

CAUTION

You must use the PO741489 Extraction Tool to disconnect cables from the backplane shrouds in **NT9D11** Core/Network Modules. Follow the procedure below to avoid bending or breaking pins when removing cable connectors from the backplane shrouds. Do not insert the extraction tool unless the cable connector is locked into the shroud. Do not force the extraction tool deeper than the detent on the cable connector.

- 1 Grasp the cable connector by the strain relief tab.
- 2 Center the longer flat edge on the angled end of the tool between the cable connector and the wall of the shroud on the right side of the cable connector.

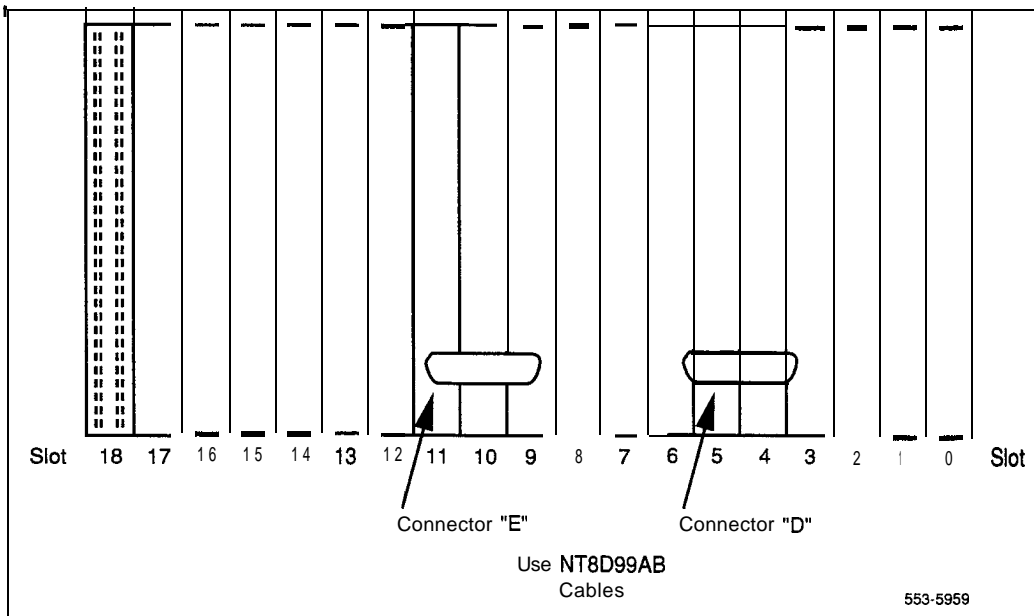
Note: If the straight end of the tool is notched, use that end if the connector can be accessed straight-on. If you must angle the tool at all, use the angled end.
- 3 *Gently* insert the extraction tool and gradually apply pressure while gently rocking the cable connector up and down.
- 4 Stop applying pressure as soon as the detent of the cable connector comes loose from the shroud.
- 5 Slowly remove the extraction tool and the cable connector.

Cable installation procedures

A PO738866 Label Kit is included in all option 61C packages. The kit is included in all packages because the preprinted labels may be useful. Use of the labels is optional.

- 1 Connect network half-group 0 in Core/Network 0 to half-group 1 in Core/Network 1:
 - Cable the D connectors (on the rear of the backplane) together with an **NT8D99AB** cable.
 - Cable the E connectors (on the rear of the backplane) together with another **NT8D99AB** cable.
 - Figure 13-5 shows the D and E connectors on the backplane of the **NT9D11** Core/Network Module and the cables required.

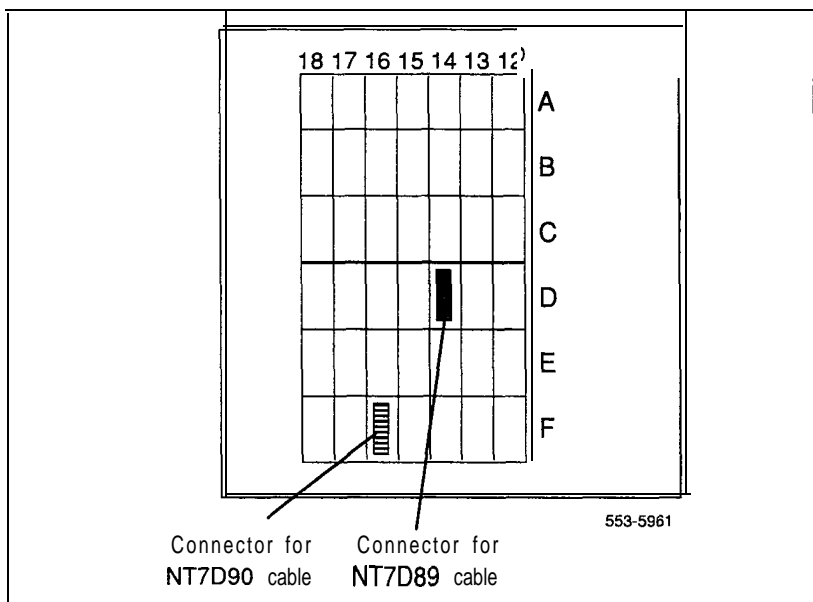
Figure 13-5
NT9D11 Core/Network Module (rear view)-location of D and E connectors



- 2 At the rear of the module, remove the left I/O panels. Verify that the following cables are installed in both Core/Network Modules (see Figure 13-6):
 - An **NT7D89** RS-232 cable (CP to I/O panel) should be connected to backplane connector position 14D and to ports **J21** and **J25** on the I/O panel. Check the labeling on the cables to identify the J21 and J25 connectors.
 - An **NT7D90** Ethernet cable should be connected to backplane connector position 16F and to port J28 on the I/O panel.

Note: The Ethernet port is equipped for future use; it cannot currently be used. Attaching an external device to this port may cause service interruptions.

Figure 13-6
NT9D11 Core/Network Module (rear)—pre-installed backplane connections



- 3 On the faceplates of the 3PE cards in the Core/Network Modules:
 - connect an **NT8D80AZ** cable from **J4** in Core/Network 0 to **J4** in Core/Network 1
 - connect another **NT8D80AZ** cable from **J3** in Core/Network 0 to **J3** in Core/Network 1.

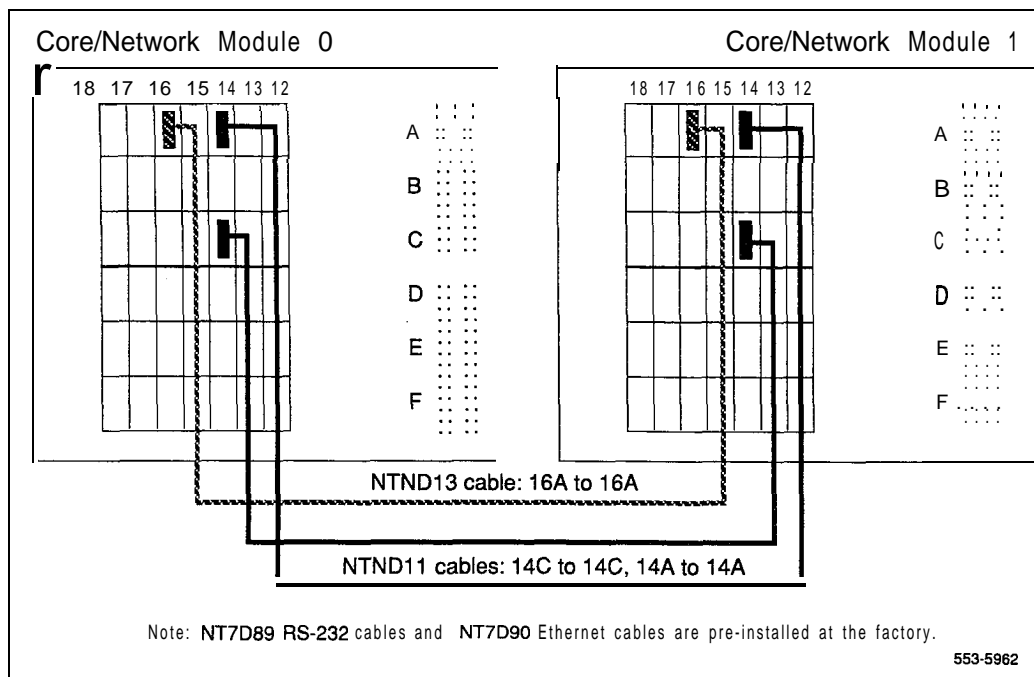
- 4 In the rear of the Core/Network Modules, connect the cables between Core/Network 0 and Core/Network, 1 (see Figure 13-7):

Note 1: The following cables may already be connected in one of the modules. If so, leave them connected and attach the loose end.

Note 2: The cables must be routed as perpendicular as possible to nearby power cables.

- Connect the NTND 13 IOP to IOP SCSI Cable from backplane connector position 16A in Core/Network 0 to backplane connector position 16A in Core/Network 1.
 - Connect one NTND 11 CP to CP Cable from backplane connector position 14C in Core/Network 0 to backplane connector position 14C in Core/Network 1.
 - Connect another NTND 11 cable from backplane connector position 14A in Core/Network 0 to backplane connector position 14A in Core/Network 1.
 - Reinstall the left I/O panels in both Core Modules. Use and tighten all eight screws.
- 5 Interconnect the clock controller cards in both Core /Network Modules (see Figure 13-8).
 - Connect an **NT8D75** (AC or AD length as needed) from the faceplate connector on the clock controller card in Core/Network 0 to the faceplate connector on the clock controller card in Core/Network 1.

Figure 13-7
NT9D11 Core/Network Module (rear)—connections for IOP to IOP and CP to CP cables

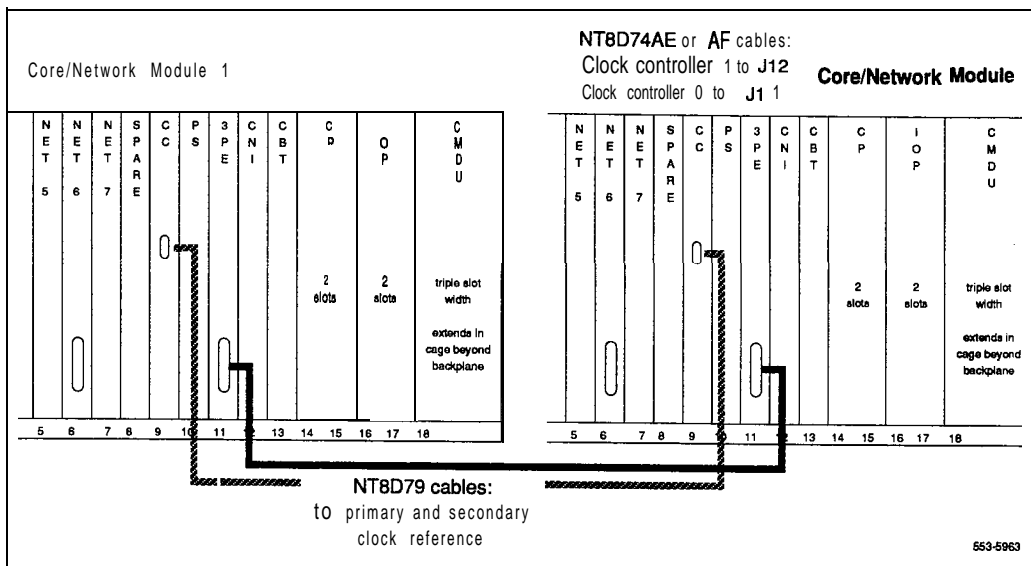


- 6 If **PRI/DTI** cards are equipped in the Core/Network Modules, connect the faceplate cables.

Note: For detailed instructions on **PRI/DTI** connections, see *ISDN Primary Rate Interface installation* (553-2901-200).

- Connect a **QCAD133** cable from connector **J4** on the card to the I/O panel.
- Connect an **NT8D85** cable from connector **J3** on the card to the selected **QPC414** Network Card.
- If needed, connect two **NT8D79** cables from connectors **J1** and **J2** on the card to the respective clock controller cards in each Core/Network Module.

Figure 13-8
NT9D11 Core/Network Module (front)—clock controller card connections



System option 71

Option 71 is a dual CPU system with standby processing capabilities, fully redundant memory, and up to five full network groups. The following modules are required:

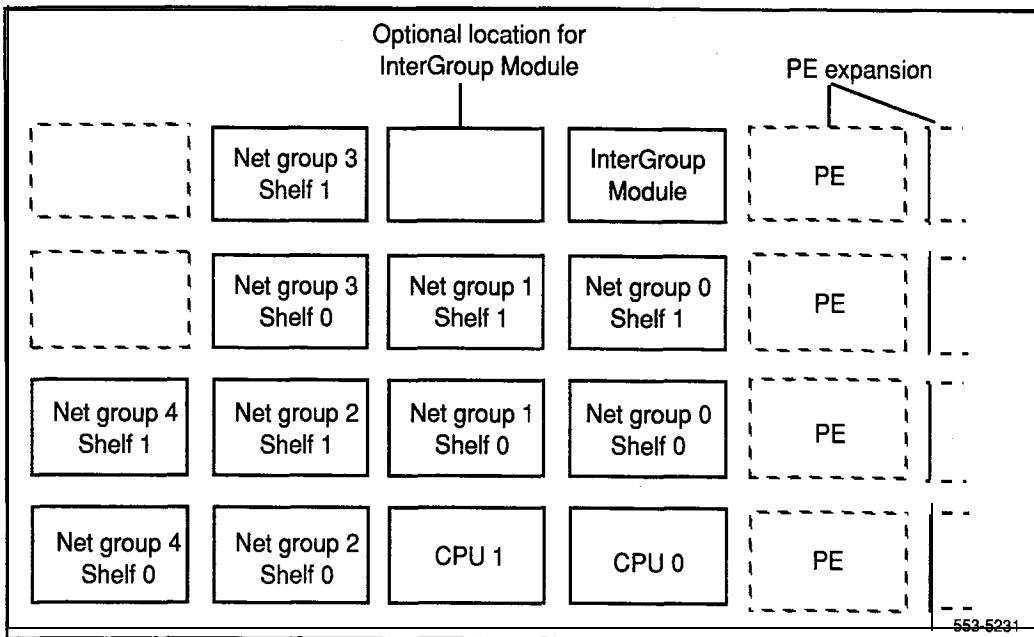
- two CPU Modules
- one **InterGroup** Module
- a minimum of two Network Modules (provides one network group)
- a minimum of one IPE Module

Additional Network and IPE Modules are required for additional network groups. PE Modules, RPE Modules, and application modules can also be used.

Note: The terminating plugs in the **InterGroup** Module for unused connectors are pre-installed in the factory. These should be removed only when additional groups are installed. Remove a plug just before the connector is installed for a new group and installed a plug immediately after a cable is disconnected when a group is removed.

Figure 13-9 shows a typical configuration. Additional columns can be added, and there can be more than one row of columns.

Figure 13-9
Option 71 dual CPU, multiple network group configuration



Cable installation

- 1 Connect the **NTND10** Changeover and Memory Arbitrator (CMA) Card (**QPC58** 1 before X 11 release 18) in CPU/Network 0 to the CMA card in CPU/Network 1:
 - Connect **J2** to **J2** with an **NT8D85AZ** cable.
 - Connect **J1** to **J1** with an **NT8D80AD** cable.
 - Figure 13-10 shows the CMA card position in the **NT8D34** CPU Module and the cables required.
- 2 Connect the **QPC471** or **QPC775** Clock Controller (CC) Cards in CPU Modules 0 and 1 to the **InterGroup** Module (IGM):
 - Connect the clock controller card in CPU Module 0 to connector **SCG 0** in the **InterGroup** Module with an **NT8D74** cable.
 - Connect the clock controller card in CPU Module 1 to connector **SCG 1** in the **InterGroup** Module with an **NT8D74** cable.
 - Figure 13- 10 shows the clock controller card position in the **NT8D34** CPU Module and the cable required.
 - Figure 13-11 shows the clock controller connection points in the **NT8D36** Inter-Group Module.
 - Figure 13-13 shows the recommended cable routing.
- 3 Connect the **QPC215** Segmented Bus Extender (SBE) Cards in CPU Modules 0 and 1 to the **QPC441** 3-Port Extender (3PE) Cards in network shelves 0 and 1 for every network group:
 - Connect SBE cards to 3PE cards with **NT8D80** cables. Table 13-1 lists the SBE to 3PE connections.
 - Figure 13-10 shows the positions of the SBE cards in the **NT8D34** CPU Module and the cable required.
 - Figure 13-12 shows the 3PE card position in the **NT8D35** Network Module.
 - Figures 13- 14 through 13- 18 show the recommended cable routing.

13-16 Cabling common equipment

Table 13-1
SBE to 3PE cable assignment-use **NT8D80** cables

From			To		
CPU module	SBE card	SBE connector	Network group	Network shelf	3PE connector
0	0	J3	0	0	J3
0	0	J4	0	0	J4
0	1	J3	1	0	J3
0	1	J4	1	0	J4
0	2	J3	2	0	J3
0	2	J4	2	0	J4
0	3	J3	3	0	J3
0	3	J4	3	0	J4
0	4	J3	4	0	J3
0	4	J4	4	0	J4
1	0	J3	0	1	J3
1	0	J4	0	1	J4
1	1	J3	1	1	J3
1	1	J4	1	1	J4
1	2	J3	2	1	J3
1	2	J4	2	1	J4
1	3	J3	3	1	J3
1	3	J4	3	1	J4
1	4	J3	4	1	J3
1	4	J4	4	1	J4

- 4 Connect QPC412 **InterGroup** Switch (IGS) Cards 0 and 1 for each network group to the **InterGroup** Module:
 - Connect IGS cards to the **InterGroup** Module with **NT8D76** cables. Table 13-2 lists the IGS to **InterGroup** connections.
 - Figure 13-12 shows the positions of the IGS cards in the **NT8D35** Network Module and the cable required.
 - Figure 13-11 shows the IGS connection points in the **NT8D36 InterGroup** Module.
 - Figures 13-14 through 13-18 show recommended cable routing.
- 5 Seat and secure all connectors. |

13-18 Cabling common equipment

Table 13-2
IGS to **InterGroup** cable assignment-use **NT8D76** cables

From			To
Network group	Network shelf	IGS	InterGroup connector
0	0	0	J1
0	0	1	J6
0	1	1	J17
0	1	0	J22
1	0	0	J2
1	0	1	J7
1	1	1	J16
1	1	0	J21
2	0	0	J3
2	0	1	J8
2	1	1	J15
2	1	0	J20
3	0	0	J4
3	0	1	J9
3	1	1	J14
3	1	0	J19
4	0	0	J5
4	0	1	J10
4	1	1	J13
4	1	0	J18

Figure 13-I 0
NT8D34 CPU Module (front view)—CMA, clock controller, and SBE cards

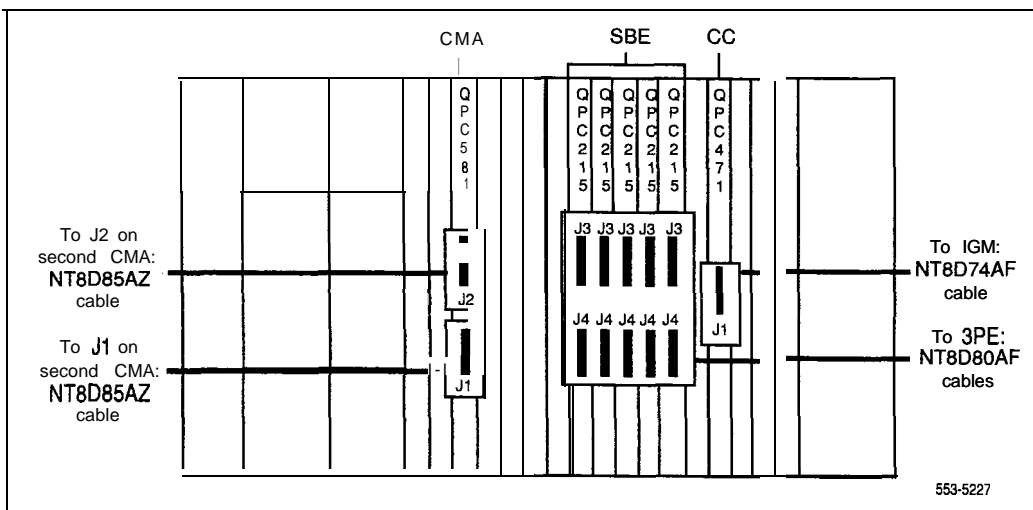


Figure 13-I 1
NT8D36 InterGroup Module connectors

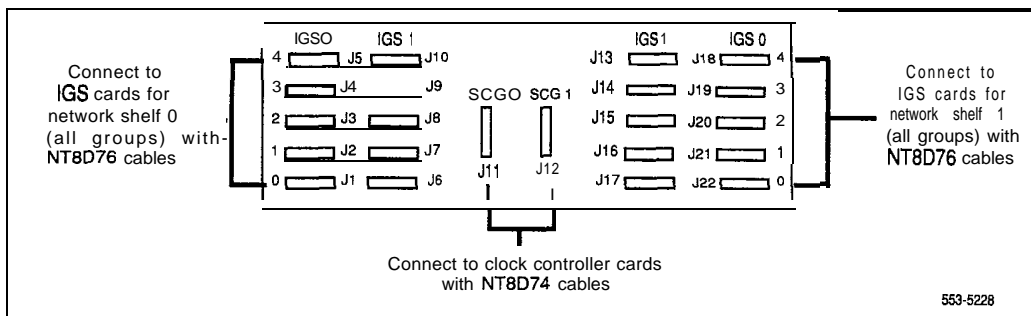


Figure 13-12
NT8D35 Network Module (front view)—**3PE** and **IGS** cables

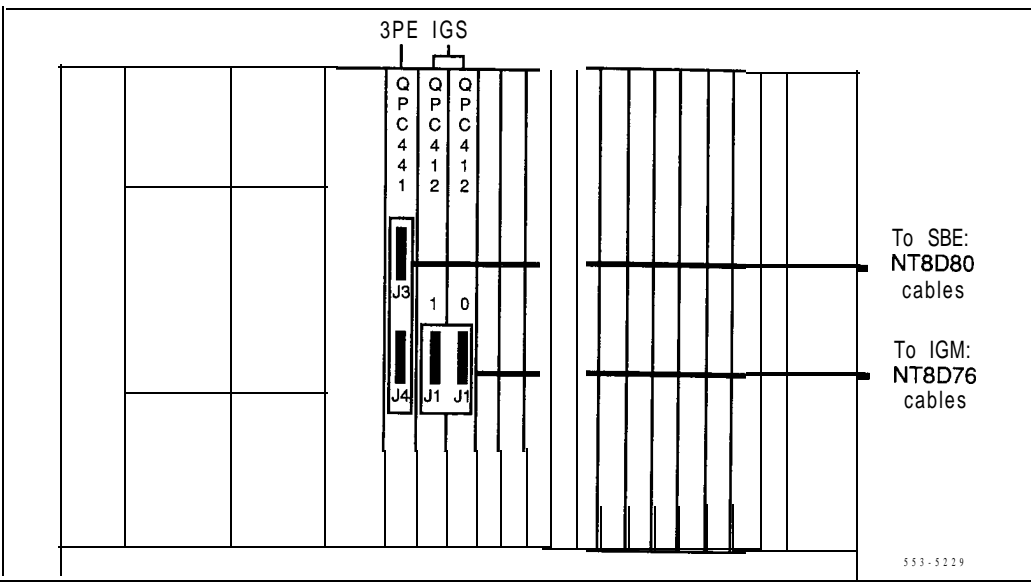


Figure 13-13
 Cable routing from clock controller cards to **InterGroup** Module

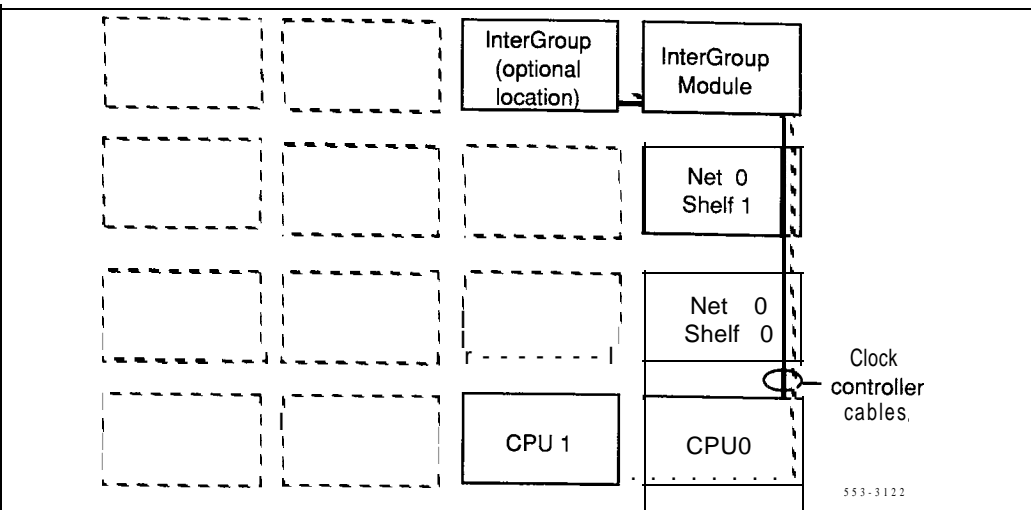
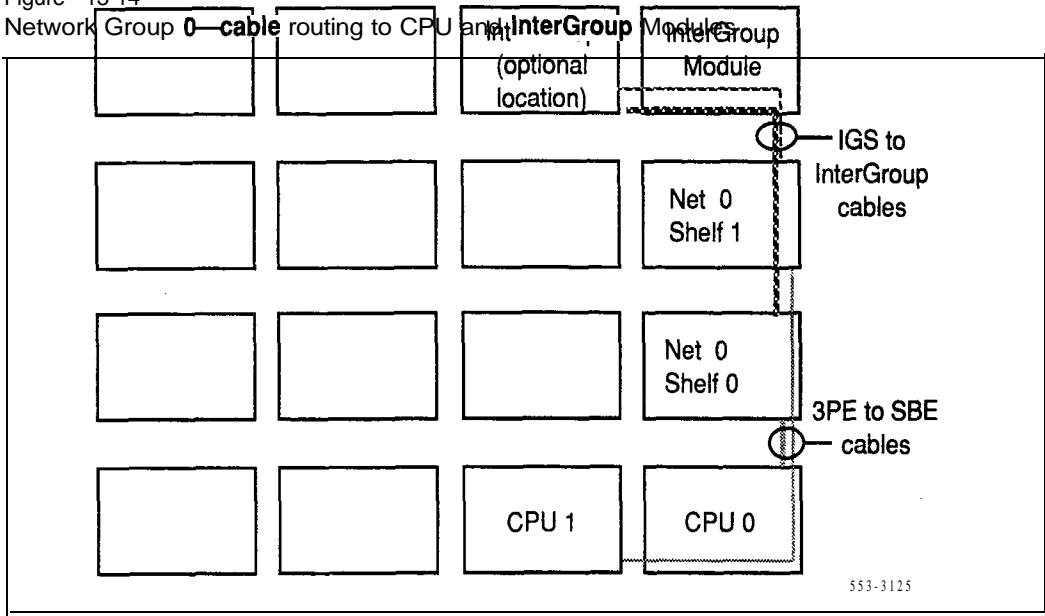
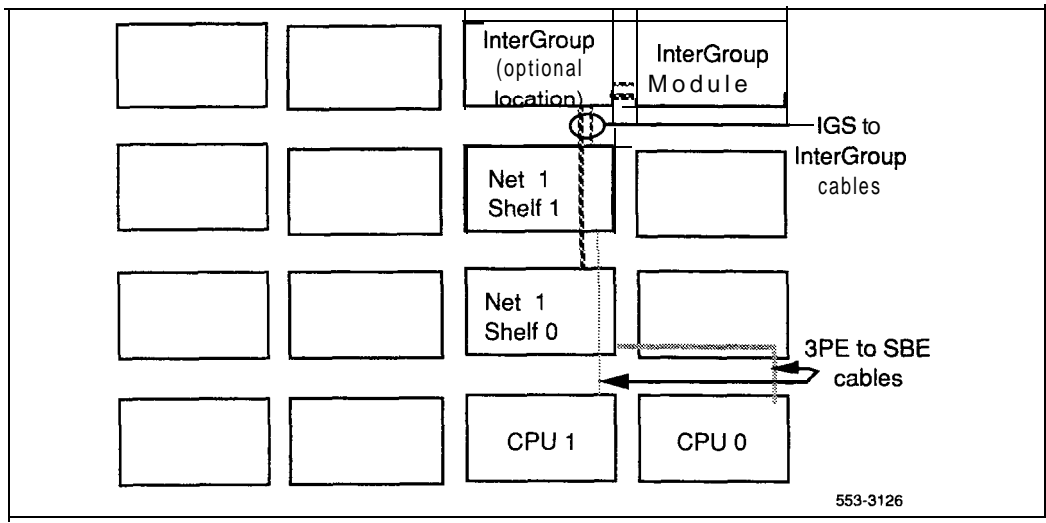


Figure 13-14
Network Group I-cable routing to CPU and **InterGroup** Modules



553-3125

Figure 13-15
Network Group I-cable routing to CPU and **InterGroup** Modules



553-3126

Figure 13-16
Network Group 2—cable routing to CPU and InterGroup Modules

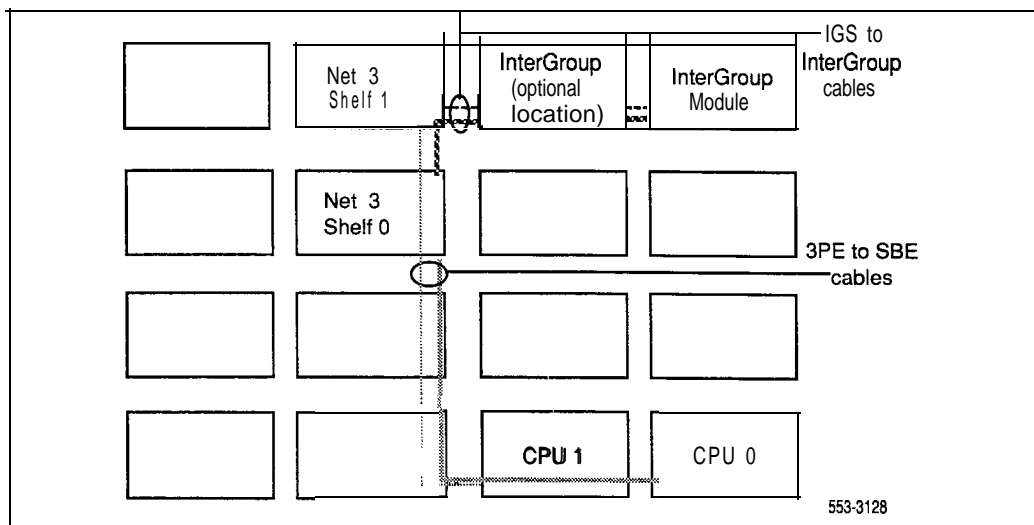
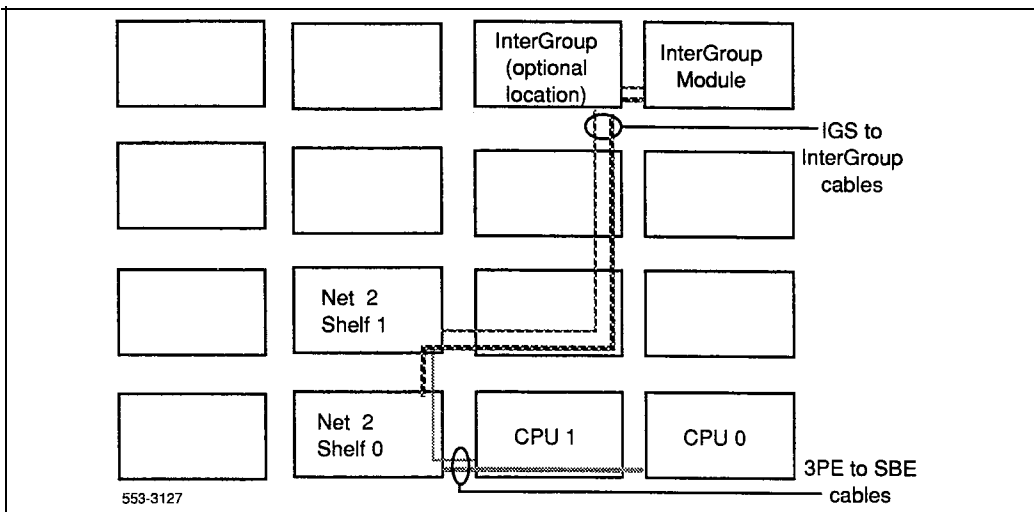
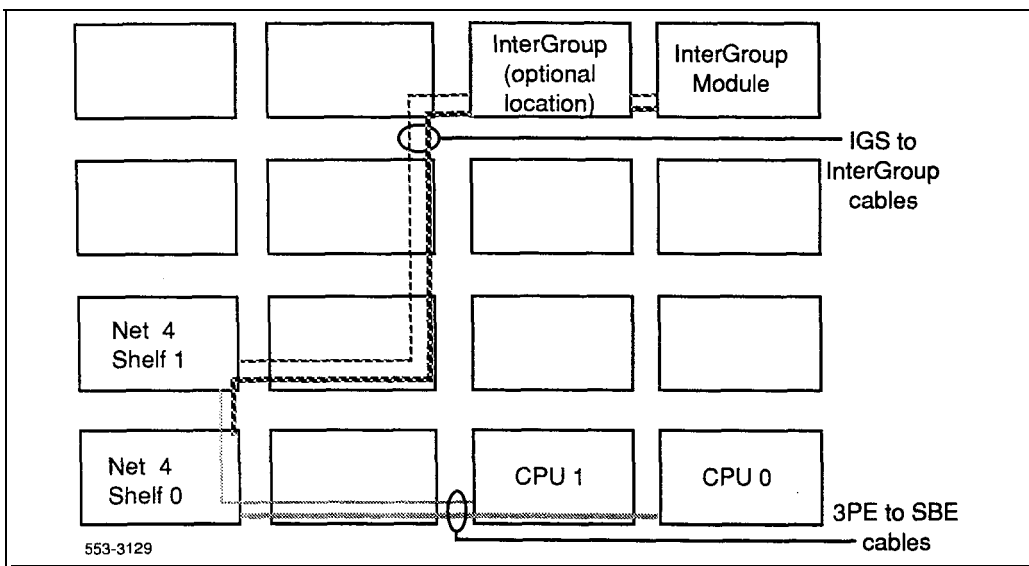


Figure 13-I 8
Network Group 4—cable routing to CPU and InterGroup Modules



System option 81

Option 81 is a dual CPU system with standby processing capabilities, fully redundant memory, and up to five full network groups. Option 81 is equipped with two redundant disk drive units.

The following modules are required:

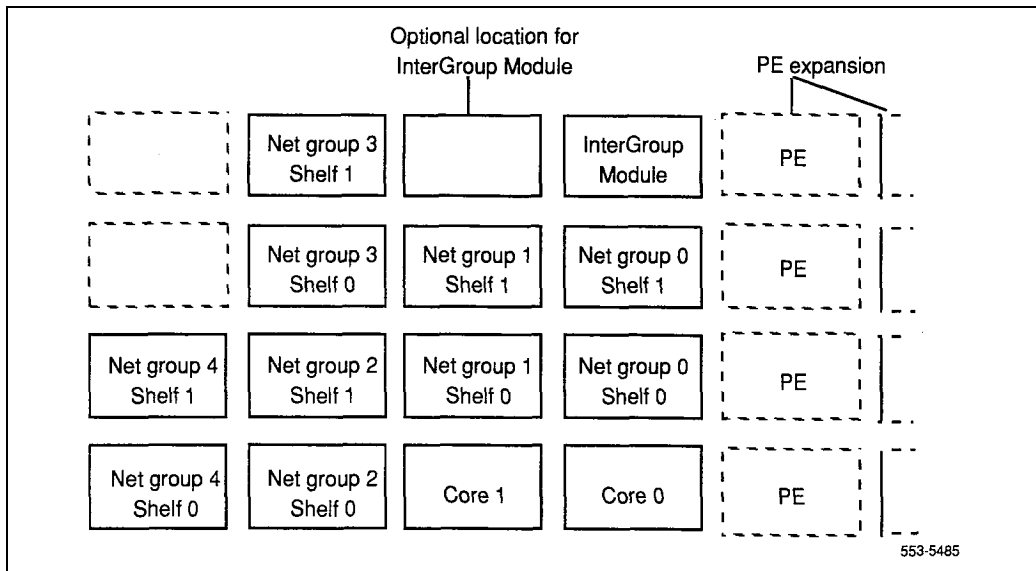
- two Core Modules
- one **InterGroup** Module
- a minimum of two Network Modules (provides one network group)
- a minimum of one IPE Module

Additional Network and IPE Modules are required for additional network groups. PE Modules, RPE Modules, and application modules can also be used.

Note: The terminating plugs in the **InterGroup** Module for unused connectors are pre-installed in the factory. These should be removed only when additional groups are installed. Remove a plug just before the connector is installed for a new group and installed a plug immediately after a cable is disconnected when a group is removed.

Figure 13- 19 shows a typical configuration for five full network groups. Additional columns can be added, and there can be more than one row of columns.

Figure 13-I9
Option 81 dual CPU, multiple network group configuration



CNI configuration

In the **NT6D60** Core Module, port 0 on the **NT6D65** Core to Network Interface (CNI) Card in slot 8 must be configured as “group 5.” This is not equivalent to a network switching group (groups 0-4). “Group 5” extends the CE bus to the interface section in the Core Module. This extension is through the CNI card in slot 8, backplane bussing, and a **QPC441** 3-Port Extender (3PE) Card in slot 7. No cable is used.

There are two ports on each CNI card. However, if only one CNI card is equipped, only one network group is supported. This is because the CNI card must be installed in slot 8 in the Core Module, and Port 0 is dedicated to “group 5.” Only Port 1 is available to support a network switching group. Therefore, to support two network groups, two CNI cards are required. To support three network groups, still only two CNI cards are required, because one port is available in slot 8 and two ports are available on the second CNI card.

In a typical configuration, there are three CNI cards for live network groups (see Table 13-3) in each Core Module.

Table 13-3
Typical CNI configuration (option 81)

CNI card slot / port	Network group supported
CNI 8 / Port 0	Core bus extender (preconfigured as “group 5”)
CNI 8 / Port 1	Group 0
CNI 9 / Port 0	Group 1
CNI 9 / Port 1	Group 2
CNI 10 / Port 0	Group 3
CNI 10 / Port 1	Group 4

Note: Each port on the CNI card provides functions similar to one QPC215 SBE Card in option 71. You do not have to configure both ports on the CNI card.

Cable installation guidelines

Core Module backplanes, like all circuit boards, have a primary side and a secondary side. The primary side, which faces the front of the module, contains the primary shrouds, which provide mechanical guidance for the pins of the card edge connectors. The secondary side of the backplane, which faces the rear of the module, contains the secondary shrouds, which provide mechanical guidance for cable connectors.

The columns of secondary backplane shrouds are designated 18 through 8 from left to right (facing the rear of the backplane). This numbering matches the card slots in the front of the module. The connector rows of secondary backplane shrouds are designated A through F from top to bottom.

Before you connect cables to the backplane, visually inspect the backplane shroud connectors to make sure there are no bent pins. To connect cables:

- 1 Orient the cable connector so that the cable runs downwards.
- 2 Partially insert the cable connector so its guides mate to the corresponding backplane connector.
- 3 Apply a small amount of pressure to push the cable connector straight into the backplane connector. You will feel a detent click when the connector seats.

CAUTION

Pins may be bent or broken if you try to insert the cable connector at an angle. Do not push the connector in any further after you hear the detent click.

Using the extraction tool

To disconnect a cable from the Core Module backplane, use the PO741489 Extraction Tool provided in the rear of the module (behind the I/O safety panel).

CAUTION

You must use the PO741489 Extraction Tool to disconnect cables from the backplane shrouds in **NT6D60** Core Modules. Follow the procedure below to avoid bending or breaking pins when removing cable connectors from the backplane shrouds. Do not insert the extraction tool unless the cable connector is locked into the shroud. Do not force the extraction tool deeper than the detent on the cable connector.

cable connector and the wall of the shroud on the right side of the cable connector.

If the straight end of the tool is notched, use that end if the connector can be accessed straight-on. If you must angle the tool at all, use the angled end.

- 3 *Gently* insert the extraction tool and gradually apply pressure while gently rocking the cable connector up and down.
- 4 Stop applying pressure as soon as the detent of the cable connector comes loose from the shroud.
- 5 Slowly remove the extraction tool and the cable connector.

Cable installation procedures

A PO738866 Label Kit is included in all option 81 packages. The kit is included in all packages because the preprinted labels may be useful (such as for labeling CNI to 3PE cables). Use of the labels is optional.

- 1 At the rear of the module, remove the left I/O panels. Verify that the following cables are installed in both Core Modules (see Figure 13-20):
 - An **NT7D89** RS-232 cable (CP to I/O panel) should be connected to backplane connector position 14D and to ports **J21** and **J25** on the I/O panel. Check the labeling on the cables to identify the **J21** and **J2.5** connectors.
 - An **NT7D90** Ethernet cable should be connected to backplane connector position 16F and to port **J28** on the I/O panel.

Note: The Ethernet port is equipped for future use; it cannot currently be used. Attaching an external device to this port may cause service interruptions.

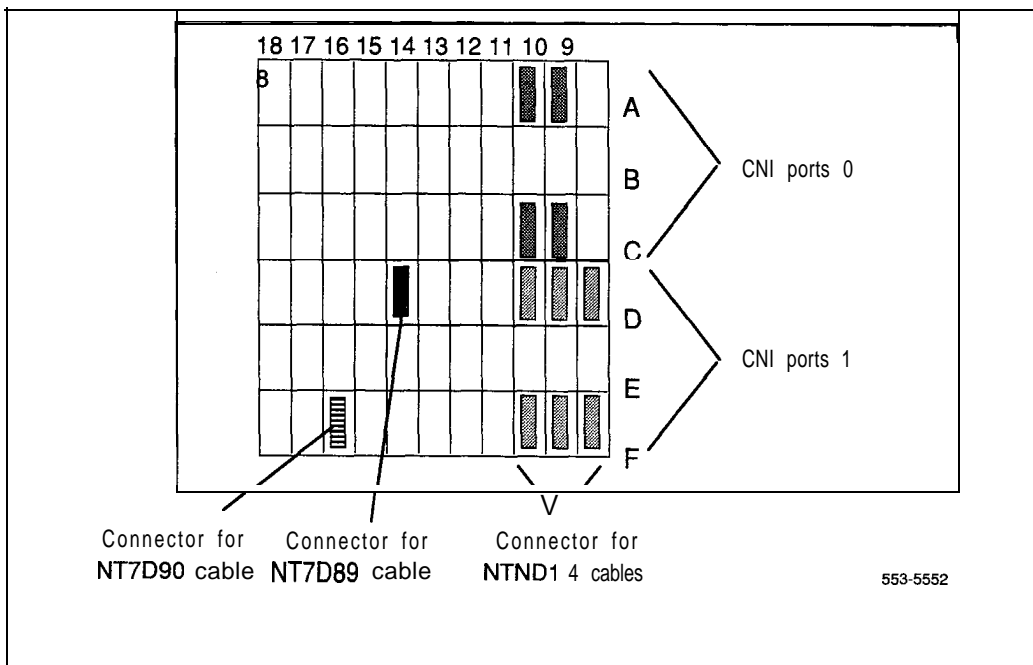
- **NTND 14** CNI to 3PE Cables should be connected to the appropriate backplane connector positions for all network groups (Table 13-4). The cables should be secured to the cable restraint bracket behind the right (facing the rear) I/O panel.

Table 13-4
CNI backplane connector **positions—NTND14** cables

Backplane connection	Group
8D	0
8F	0
9A	1
9C	1
9D	2
9F	2
10A	3
10C	3
10D	4
10F	4

Note: Backplane shroud designations are 8 through 18 from left to right and A through F from top to bottom.

Figure 13-20
NT6D60 Core Module (rear)—preinstalled backplane connections



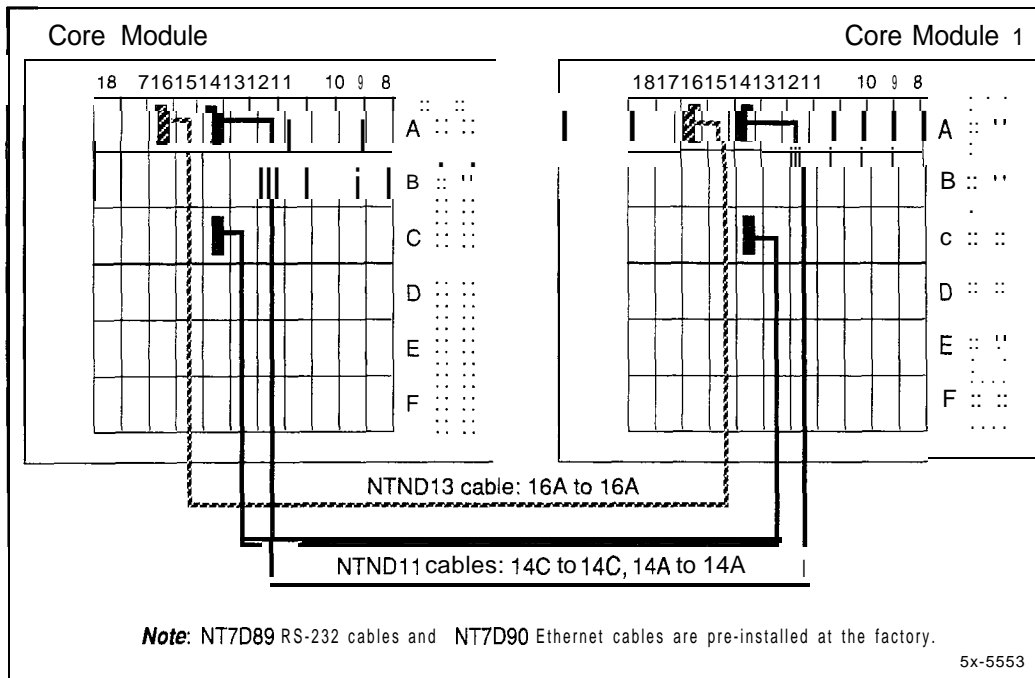
- 2 On the faceplates of the 3PE cards in the Core Modules
 - connect an **NT8D80AZ** cable from **J4** in Core 0 to **J4** in Core 1
 - connect another **NT8D80AZ** cable from **J3** in Core 0 to **J3** in Core .
- 3 In the rear of the Core Modules, connect the cables between Core 0 and Core 1 (see Figure 13-20):

Note 1: The following cables may already be connected in one of the modules. If so, leave them connected and attach the loose end.

Note 2: The cables must be routed as perpendicular as possible to nearby power cables.

- Connect the NTND13 IOP to IOP SCSI Cable from backplane connector position 16A in Core 0 to backplane connector position 16A in Core 1.
- Connect one NTND 11 CP to CP Cable from backplane connector position 14C in Core 0 to backplane connector position 14C in Core 1.
- Connect another NTND 11 cable from backplane connector position 14A in Core 0 to backplane connector position 14A in Core 1.
- Reinstall the left I/O panels in both Core Modules. Use and tighten all eight screws.

Figure 13-21
NT6D60 Core Module (rear)—connections for IOP to IOP and CP to CP cables

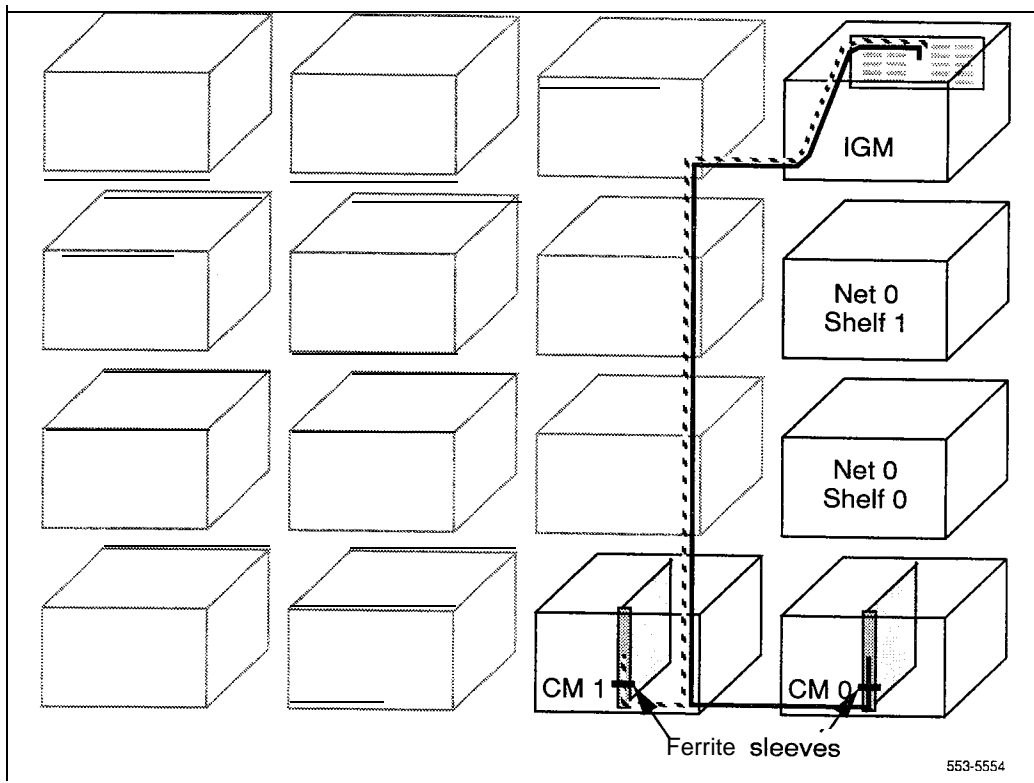


- 4 Connect the clock controller cards in both Core Modules to the junctor board in the **InterGroup** Module (see Figure 13-22). Route the cables as shown in Figure 13-23.
 - Connect an **NT8D74** (AE or AF length as needed) from the faceplate connector on the clock controller card in Core 0 to connector SCG 0 (**J1 1**) in the **InterGroup** Module.
 - Connect an **NT8D74** (AE or AF length as needed) from the faceplate connector on the clock controller card in Core 1 to connector SCG 1 (**J 12**) in the **InterGroup** Module.
- 5 If **PRI/DTI** cards are equipped in the Core Modules, connect the faceplate cables.

Note: For detailed instructions on **PRI/DTI** connections, see *ISDN Primary Rate Interface installation* (553-2901-200).

- Connect a QCAD133 cable from connector **J4** on the card to the I/O panel.
- Connect an **NT8D85** cable from connector **J3** on the card to the selected QPC414 Network Card.
- If needed, connect two **NT8D79** cables from connectors **J1** and **J2** on the card to the respective clock controller cards in each Core Module.

Figure 13-23
Cable routing from clock controller cards to **InterGroup** Module



- 6 Connect the NTND14 cable pairs to the QPC441 3PE Cards in the Network Modules. Table 13-5 lists the CNI to 3PE connections. Figures 13-25 through 13-29 show the recommended cable routing.

Note: This step does not apply to the QPC441 3PE card in the Core Module.

Table 13-5
CNI to 3PE connections-NTND14 cables

Backplane connector	Group	Shelf		3PE connection
		Core 1	Core 0	
8D	0	1	0	J3
8F	0	1	0	J4
9A	1	1	0	J3
9C	1	1	0	J4
9D	2	1	0	J3
9F	2	1	0	J4
10A	3	1	0	J3
10C	3	1	0	J4
10D	4	1	0	J3
10F	4	1	0	J4

Note: Backplane shroud designations are 18 through 8 from left to right and A through F from top to bottom.

- 7 Connect QPC412 InterGroup Switch (IGS) Cards 0 and 1 for each network group to the junctor board in the InterGroup Module.
- With NT8D76 cables, connect the faceplate connectors on the IGS cards to the InterGroup Module. Table 13-6 lists the IGS to InterGroup connections.
 - Figure 13-24 shows the IGS connection points in the NT8D36 InterGroup Module.
 - Figures 13-25 through 13-29 show the recommended cable routing.

Table 13-6
IGS to InterGroup cable assignment-use **NT8D76** cables

From			To
Network group	Network shelf	IGS connector J1	InterGroup connector
0	0	0	J1
0	0	1	J6
0	1	1	J17
0	1	0	J22
1	0	0	J2
1	0	1	J7
1	1	1	J16
1	1	0	J21
2	0	0	J3
2	0	1	J8
2	1	1	J15
2	1	0	J20
3	0	0	J4
3	0	1	J9
3	1	1	J14
3	1	0	J19
4	0	0	J5
4	0	1	J10
4	1	1	J13
4	1	0	J18

To secure network group cables with tie-wraps, follow these instructions:

- 1 Tie-wrap to the Core 0 strain relief bracket, all Core 0 CNI to 3PE cables and Core 1 CNI to 3PE cables for groups 0 and 1. The strain relief bracket is located at the bottom of the right-hand-side I/O panel of the Core 0 Module, as viewed from the rear of the module.
- 2 Tie-wrap to the Core 1 strain relief bracket, Core 1 CNI to 3PE cables for network groups 2, 3, and 4. The strain relief bracket is located at the bottom of the right-hand-side I/O panel of the Core 1 Module, as viewed from the rear of the module.

Figure 13-24
NT8D36 InterGroup Module-connectors for IGS cards

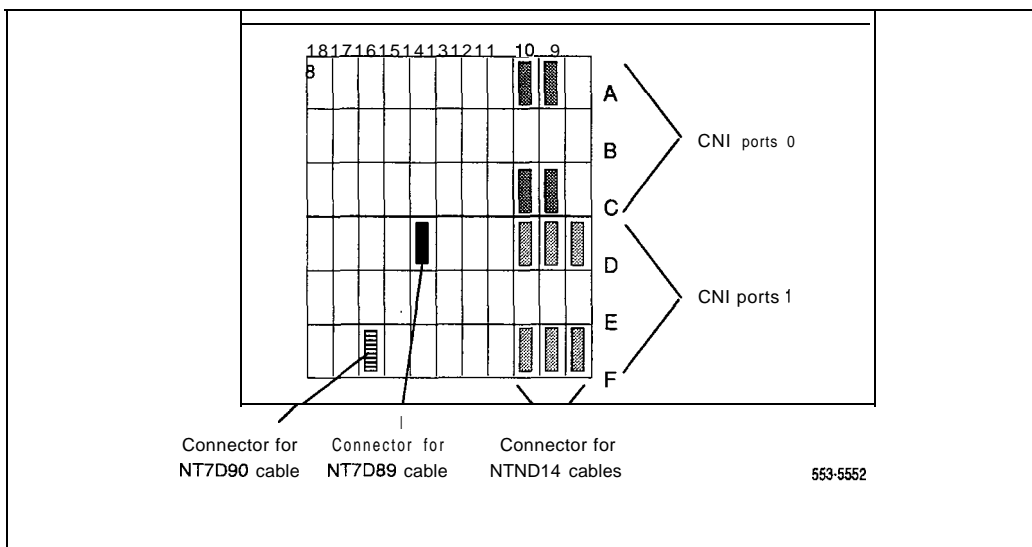
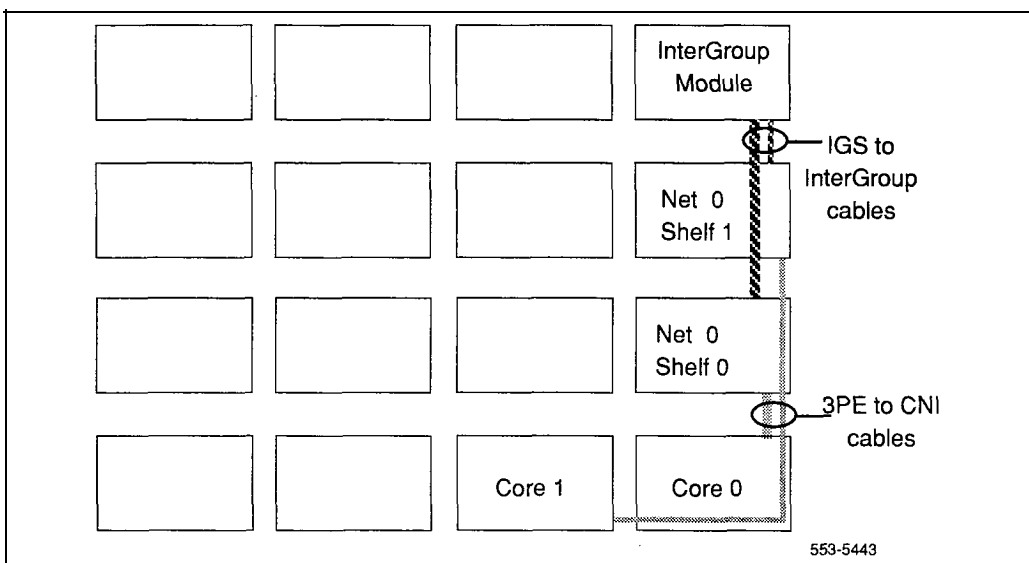


Figure 13-25
 Network Group O-cable routing to Core and **InterGroup** Modules



13-38 Cabling common equipment

Figure 13-26
Group I-cable routing to Core and InterGroup Modules

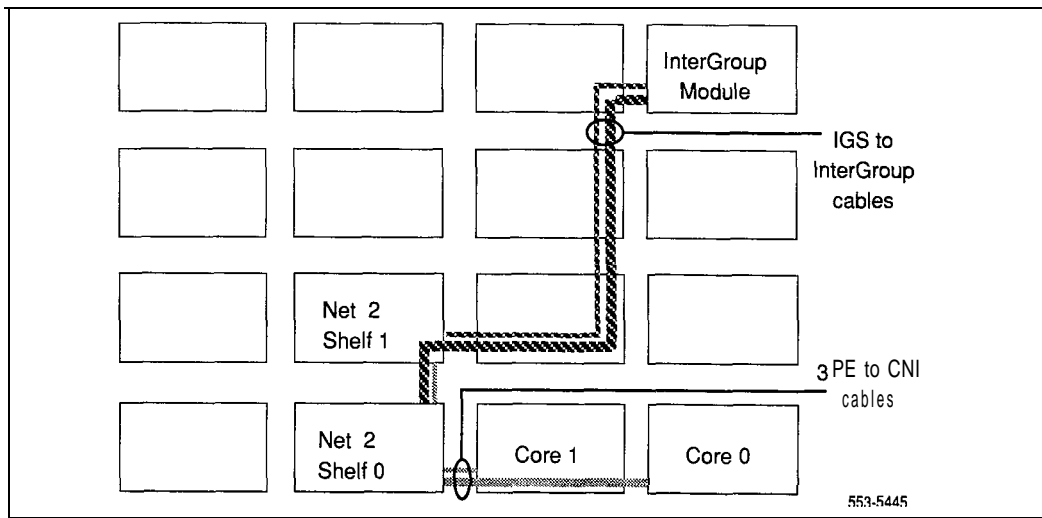
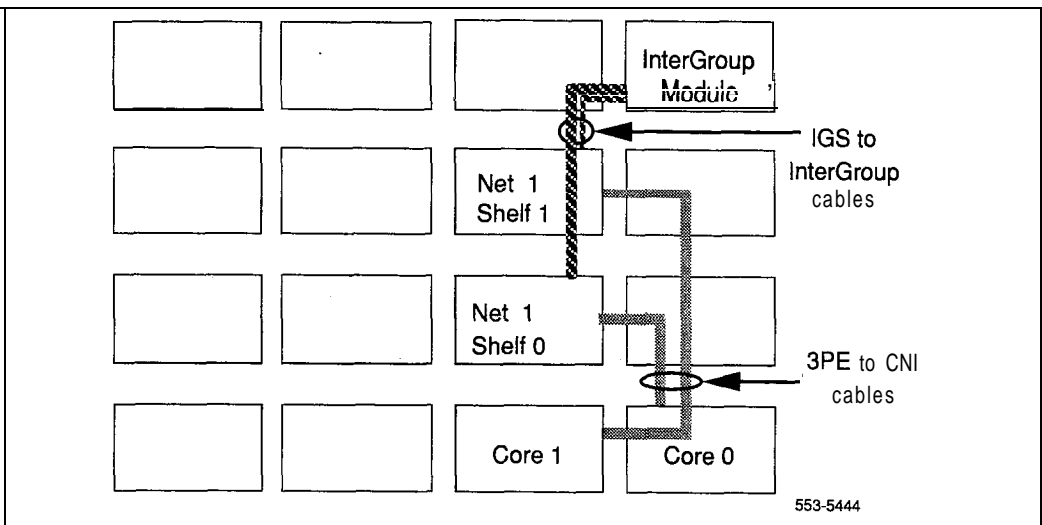


Figure 13-28
Network Group 3—cable routing to Core and InterGroup Modules

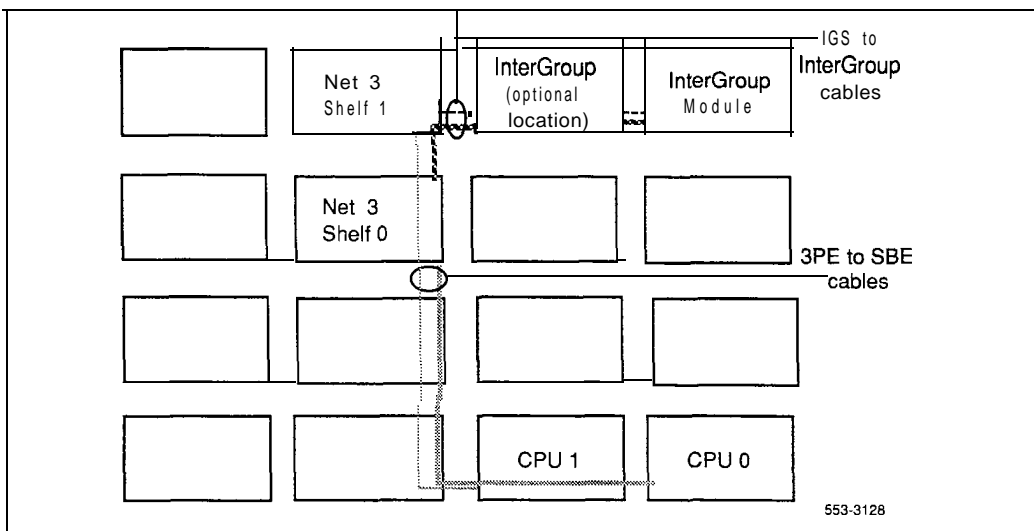
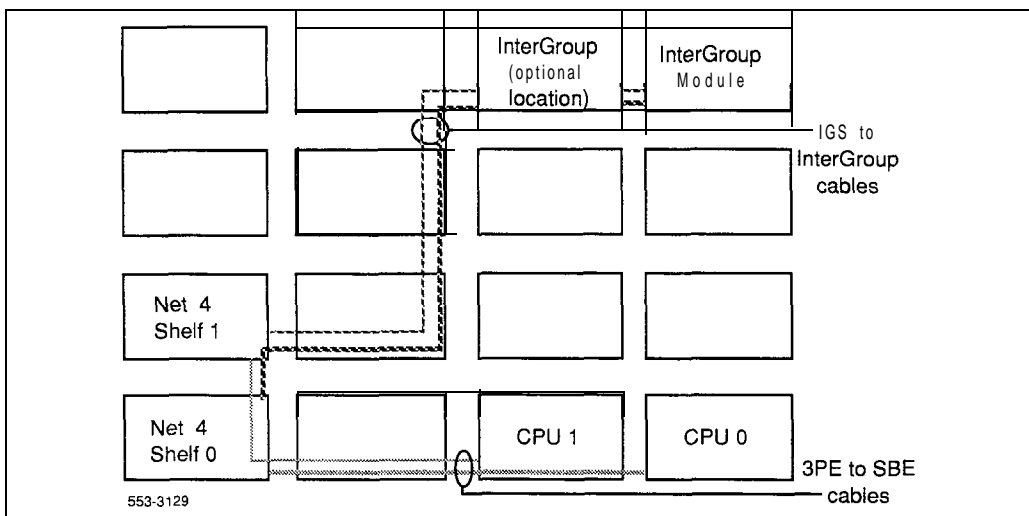


Figure 13-29
Network Group 4—cable routing to Core and InterGroup Modules



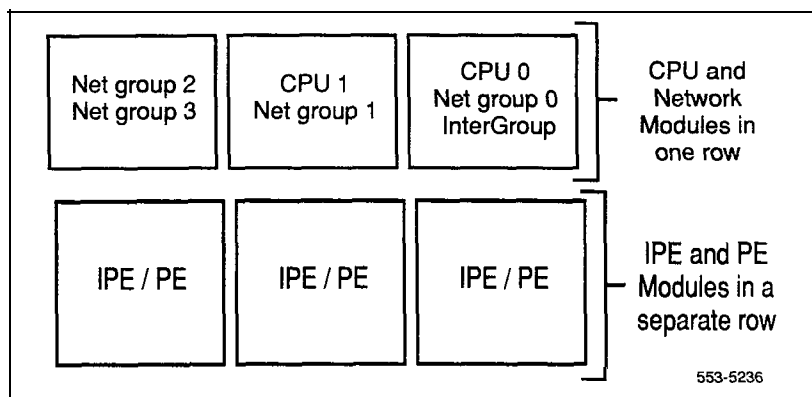


Cabling network loops

In a system with multiple network groups, there can be a single row or multiple rows of columns (see Figure 14-1):

- For superloops: **NT8D04** Superloop Network Cards and associated **NT8D01** Controller Cards
 - If the columns containing the network and controller cards are in the same row, the network loop is cabled from the faceplate of the network card to the backplane for the controller card.
 - If the columns containing the network and controller cards are in different rows, the cards require I/O panel connections, and a shielded cable connects the network card I/O panel to the controller card I/O panel.
- For regular loops: **QPC414** Network Cards and associated **QPC659** Dual Loop Peripheral Buffer (DLB) Cards
 - If the columns containing the network and DLB cards are in the same row, the network loop is cabled from the faceplate of the network card to the faceplate of the DLB card.
 - If the columns containing the network and DLB cards are in different rows, the cards require I/O panel connections, and a shielded cable connects the network card I/O panel to the DLB card I/O panel.

Figure 14-1
Multiple rows of columns



NT8D04 Superloop Network Card

CAUTION

Due to the possibility of **EMI/RFI** noise, do not route cables from front to rear next to the power supply unit.

Basic cabling for single-row network connections

- 1 Refer to the work order and the cabling layout shipped with the system to determine
 - each loop number assigned
 - the module and slot assignments for the **NT8D04** Superloop Network Card associated with each loop
 - the location of **NT8D37** IPE Modules that contain **NT8D01** Controller Cards associated with each loop
- 2 Set the **Enb/Dis** switch on each superloop network card to **Dis**.

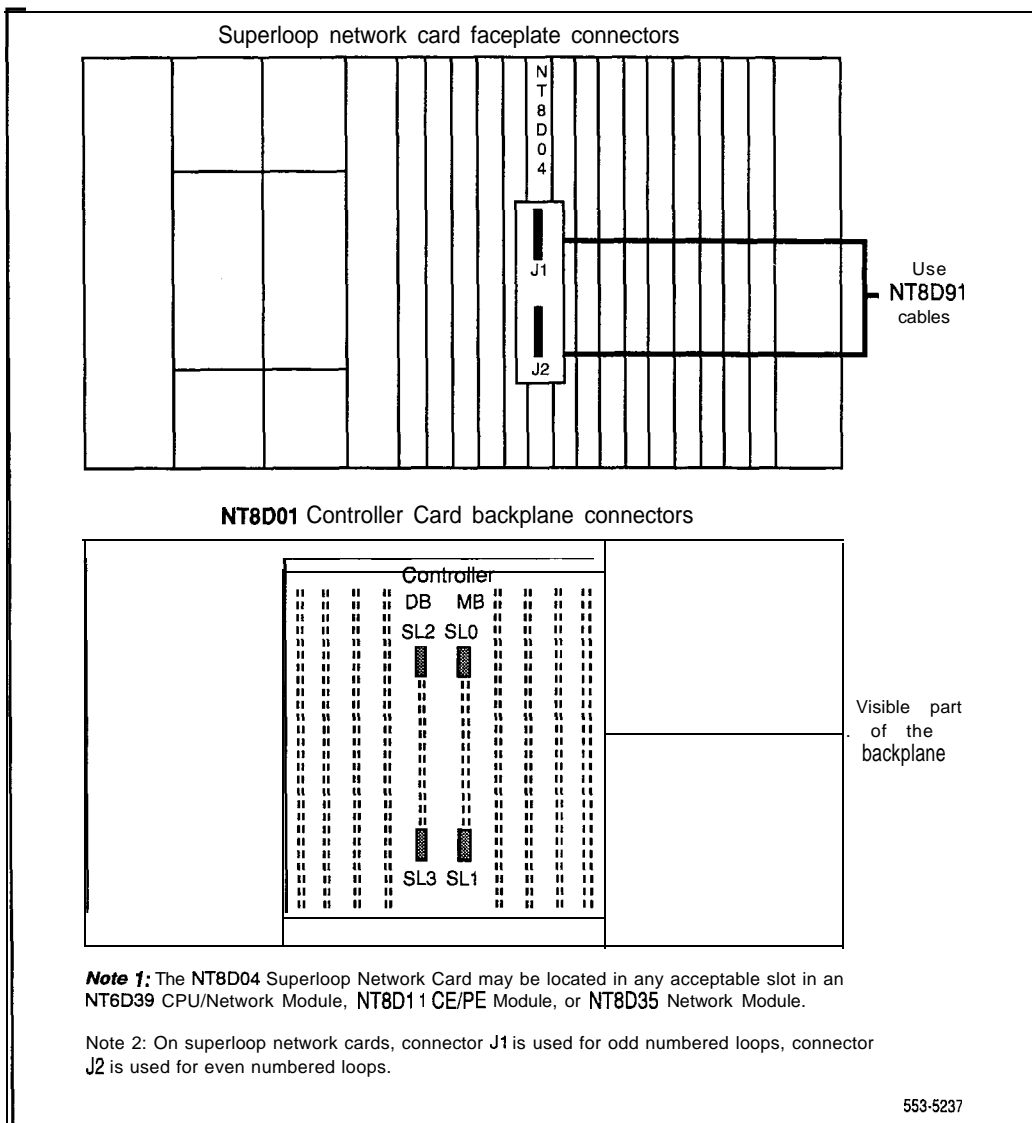
- 3 Cable network loops from the faceplate connector on the superloop network card to the backplane for associated controller cards (see Table 14-1).
 - Label both ends of an **NT8D91** cable with the loop number, then connect one end of the cable to the superloop network card faceplate connector:
 - J1 for shelf 1
 - J2 for shelf 0
 - On the backplane for the controller card, connect the cable to the SLO, **SL1**, SL2, or SL3 connector assigned to the loop.

Note: The key (polarizing tab) on the side of the cable connector must be inserted into the **keyway** on the left side, facing the backplane, of the backplane connector. Blue and white wires should show through the top of the cable connector and, if there is a directional label, the arrow on the cable connector should be located at the top right.

 - Figure 14-2 shows the superloop network card faceplate connectors, the backplane connectors for the controller card, and the cables required.
- 4 Seat and secure all connectors.
- 5 Set the **Enb/Dis** switch on each network card to Enb.
- 6 During system software configuration, use *the XII input/output guide (553-3001-400)* to enter loop assignments.

Figure 14-2

NT8D04 Superloop Network Card network loops-connectors for single-row connections



Basic cabling for multiple-row network connections

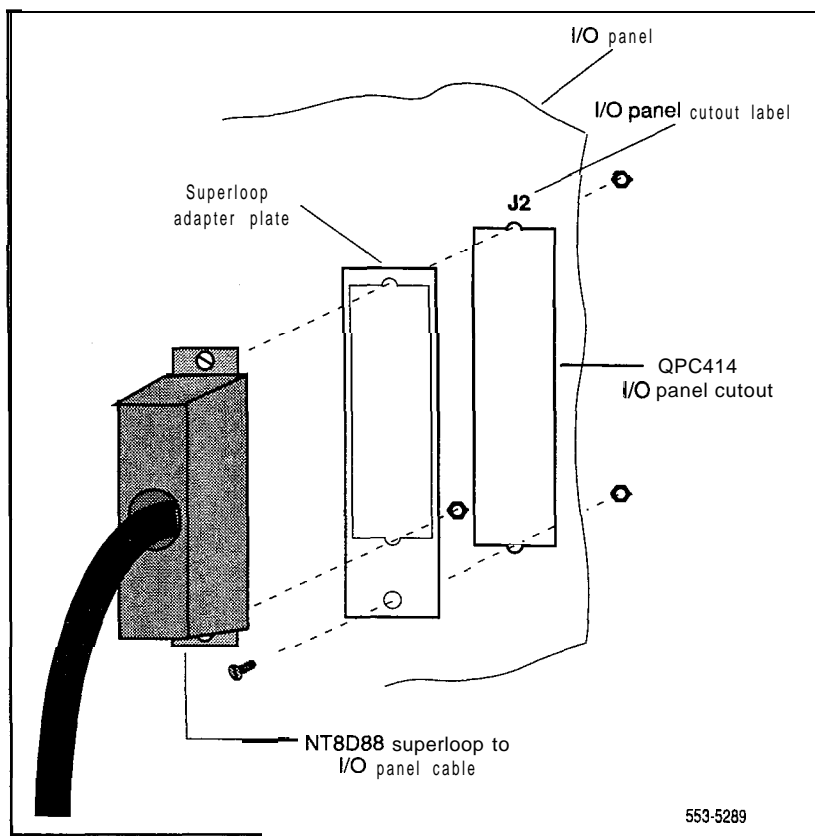
- 1 Refer to the work order and the cabling layout shipped with the system to determine
 - each loop number assigned
 - the location (**NT8D35** Network Module and slot assignments) of the **NT8D04** Superloop Network Card associated with each loop
 - the location of **NT8D37** IPE Modules that contain **NT8D01** Controller Cards associated with each loop
- 2 Set the **Enb/Dis** switch on the faceplate of each network card to Dis.
- 3 Install **NT8D1107** Superloop Adapter Plates on universal I/O panels (**P07 15058**), if required.

Note 1: The superloop adapter plate reduces a QPC4 14 network loop cutout to the size for a superloop connection.

Note 2: The recommended order for installing superloop adapter plates is over cutouts J2, J6, J10, J22, J26, J31.

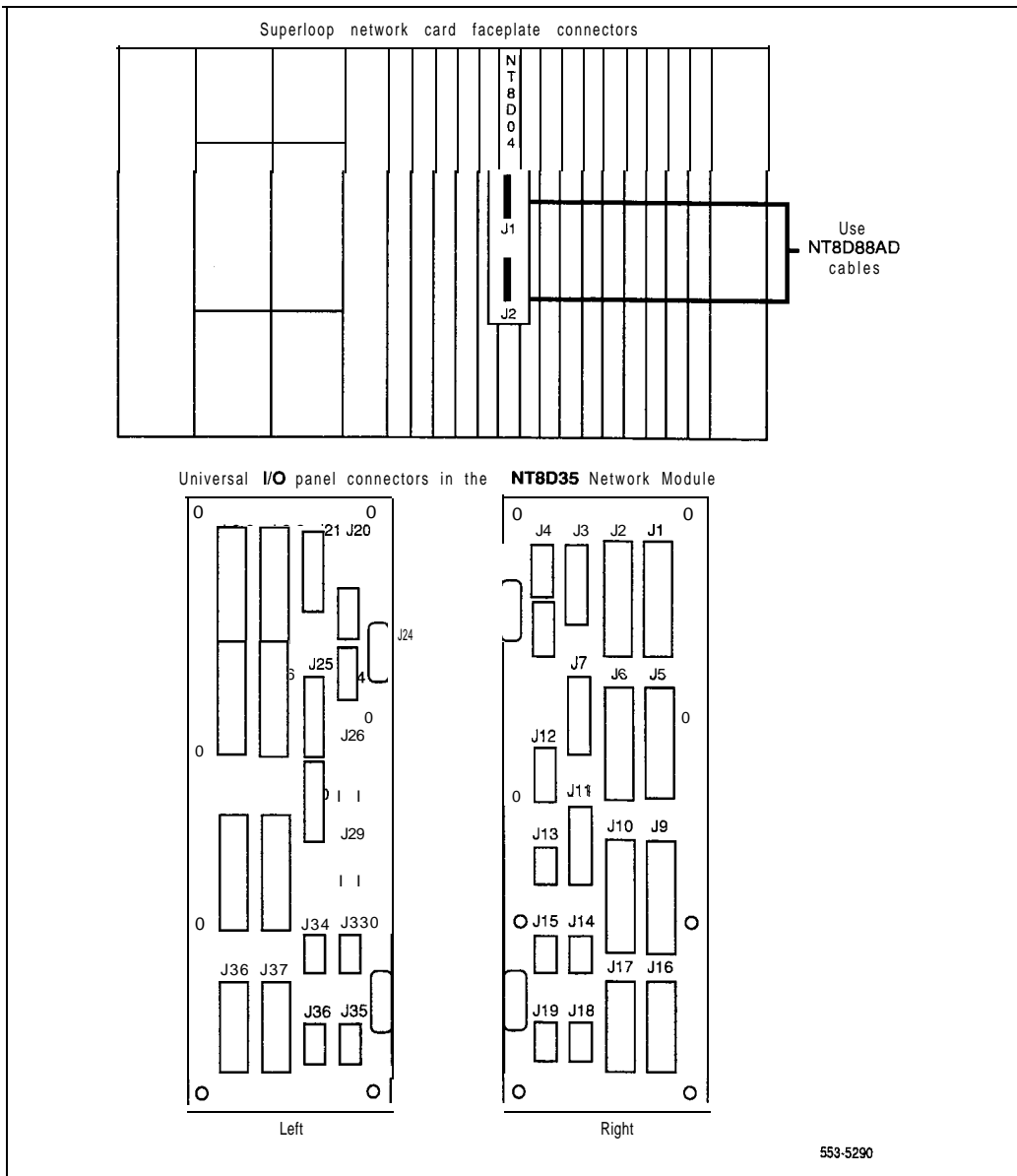
- Position the adapter plate over the QPC414 cutout and install the screw and washer at the bottom of the plate.
- Position the cable connector on the adapter plate and install one screw and washer at the top and one screw and washer at the bottom of the connector.
- Figure 14-3 shows mounting details for the superloop adapter plate.

Figure 14-3
Installing a superloop adapter plate



- 4 Cable network loops from the faceplate connector on the network card to the I/O panels on the rear of the Network Module.
 - Label both ends of an **NT8D88AD** cable with the loop number, then connect one end of the cable to the network card faceplate connector:
 - J1** for shelf 1
 - J2** for shelf 0
 - Route the cable around the card cage to the I/O panel and mount the cable connector in one of the cutouts in the panel.
 - with the universal I/O panel, the recommended order for connections is 516,517, **J37, J38**, then, with superloop adapter plates, **J2, J6, J10, J22, J26, J31**
 - with any other I/O panel, the recommended order for connections is **J28, J25, J9, J12**
 - Figure 14-4 shows the network card faceplate connectors, the universal I/O panel connectors, and the cables required.
- 5 Cable the backplane connectors (**SLO, SL1, SL2, SL3**) for the controller card to the I/O panels on the rear of the IPE Module.
 - Label both ends of an **NT8D92** cable with the loop number, then connect one end of the cable to the backplane connector.
 - Mount the connector on the other end of the cable in one of the cutouts in the I/O panels. The recommended order for connections is:
 - SLO** to **J2**
 - SL1** to **J3**
 - SL2** to **J4**
 - SL3** to **J5**
 - Figure 14-5 shows the controller card backplane connectors and the I/O panels for the IPE Module.

Figure 14-4
NT8D04 Superloop Network Card network loops-network card to I/O panel connections



14-10 Cabling network loops

- 6 Complete the network loop connection (see Table 14-1).
 - Connect one end of an **NT8D98** cable to the I/O panel connector for the network card.
 - Connect the other end of the cable to the **I/O** panel connector for the associated controller card.
- 7 Seat and secure all connectors.
- 8 Set the **Enb/Dis** switch on each network card to Enb.
- 9 During system software configuration, use *the XII input/output guide* (553-3001-400) to enter loop assignments.

Table 14-1
NT8D04 network loop configurations

	FROM		TO	
	Superloop network card	Faceplate connector	Controller card	Backplane connector
One segment per superloop	NT8D04 #1	J2	NT8D01 AC #1	SL0 1
	NT8D04 #2	J2	NT8D01 AC #1	SL1
	NT8D04 #3	J2	NT8D01 AC #1	SL2
	NT8D04 #4	J2	NT8D01 AC #1	SL3
Two segments per superloop	NT8D04 #1	J2	NT8D01 AD #1	SL0
	NT8D04 #2	J2	NT8D01 AD #1	SL1
Four segments per superloop	NT8D04 #1	J2	NT8D01 AD #1	SL0
Eight segments per superloop	NT8D04 #1	J2	NT8D01 AD #1	SL0
	NT8D04 #1	J1	NT8D01 AD #2	SL0
One segment per superloop/three segments per another superloop	NT8D04 #1	J2	NT8D01 AD #1	SL0
	NT8D04 #2	J2	NT8D01 AD #1	SL1
Two segments per superloop/six segments per another superloop	NT8D04 #1	J2	NT8D01 AC #1	SL0
	NT8D04 #2	J2	NT8D01 AC #2	SL0
	NT8D04 #2	J1	NT8D01 AC #2	SL1
<i>Note:</i> NT8D01 AC is a controller-4 NT8D01 AD is a controller-2				

QPC414 Network Card

CAUTION

Due to the possibility of **EMI/RFI** noise, do not route cables from front to rear next to the power supply unit.



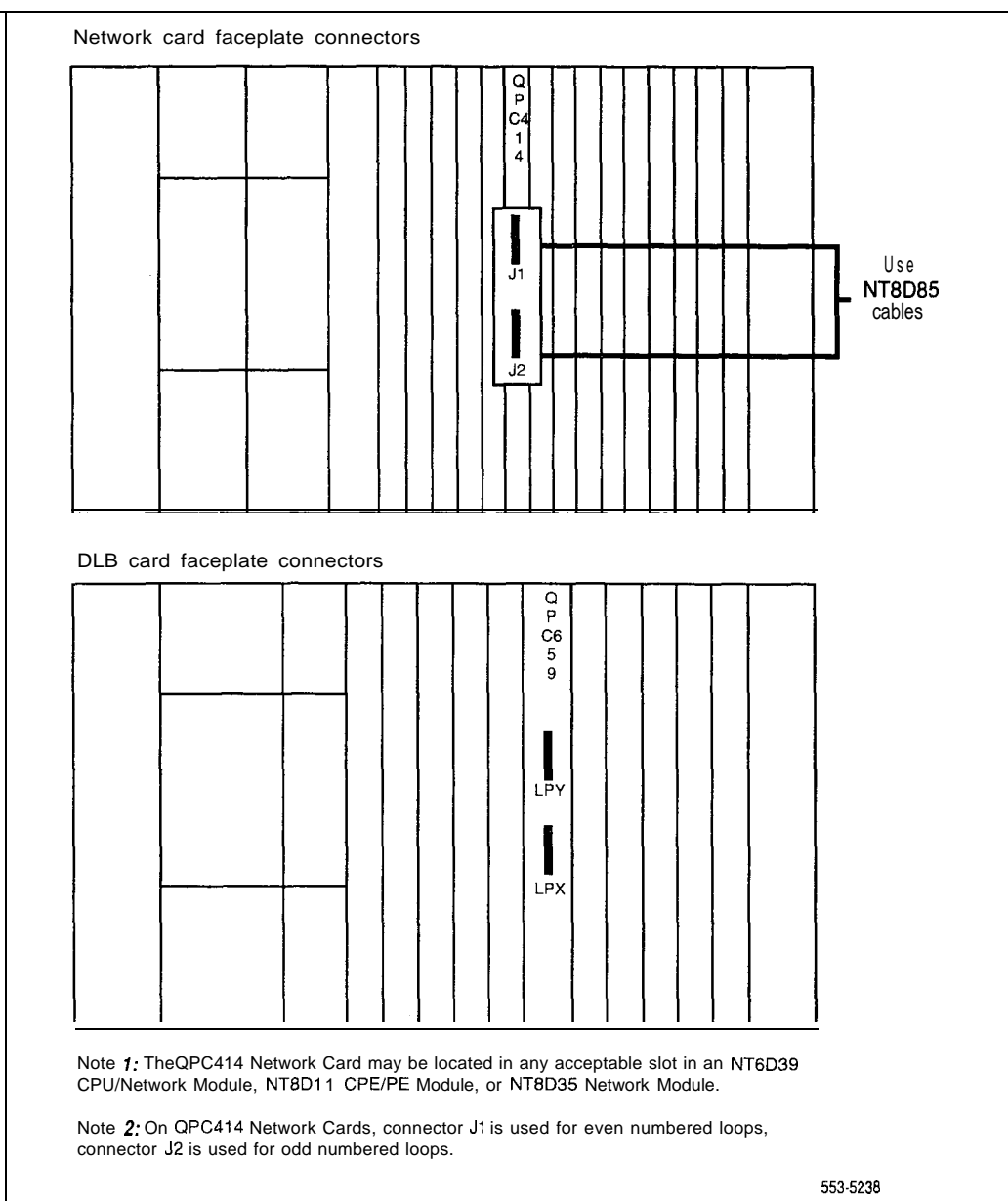
Basic cabling for single-row network connections

- 1 Refer to the work order and the cabling layout shipped with the system to determine
 - each loop number assigned
 - the module and slot assignments for the QPC414 Network Card associated with each loop
 - the location of **NT8D** 13 PE Modules that contain QPC659 DLB Cards associated with each loop
- 2 Set the **Enb/Dis** switch on the faceplate of each network card to Dis.
- 3 Cable network loops from the faceplate connector on the network card to the faceplate connector on the associated DLB card.
 - Label both ends of an **NT8D85** cable with the loop number, then connect one end of the cable to the network card faceplate connector:
 - J1 for shelf 0
 - J2 for shelf 1
 - On the DLB card, connect the cable to the LPX or LPY connector assigned to the loop.
 - Figure 14-6 shows the network card and DLB card connectors and the cables required.
- 4 Seat and secure all connectors.
- 5 Set the **Enb/Dis** switch on each network card to Enb.
- 6 During system software configuration, use the *XII input/output guide* (553-3001-400) to enter loop assignments.



Figure 14-6

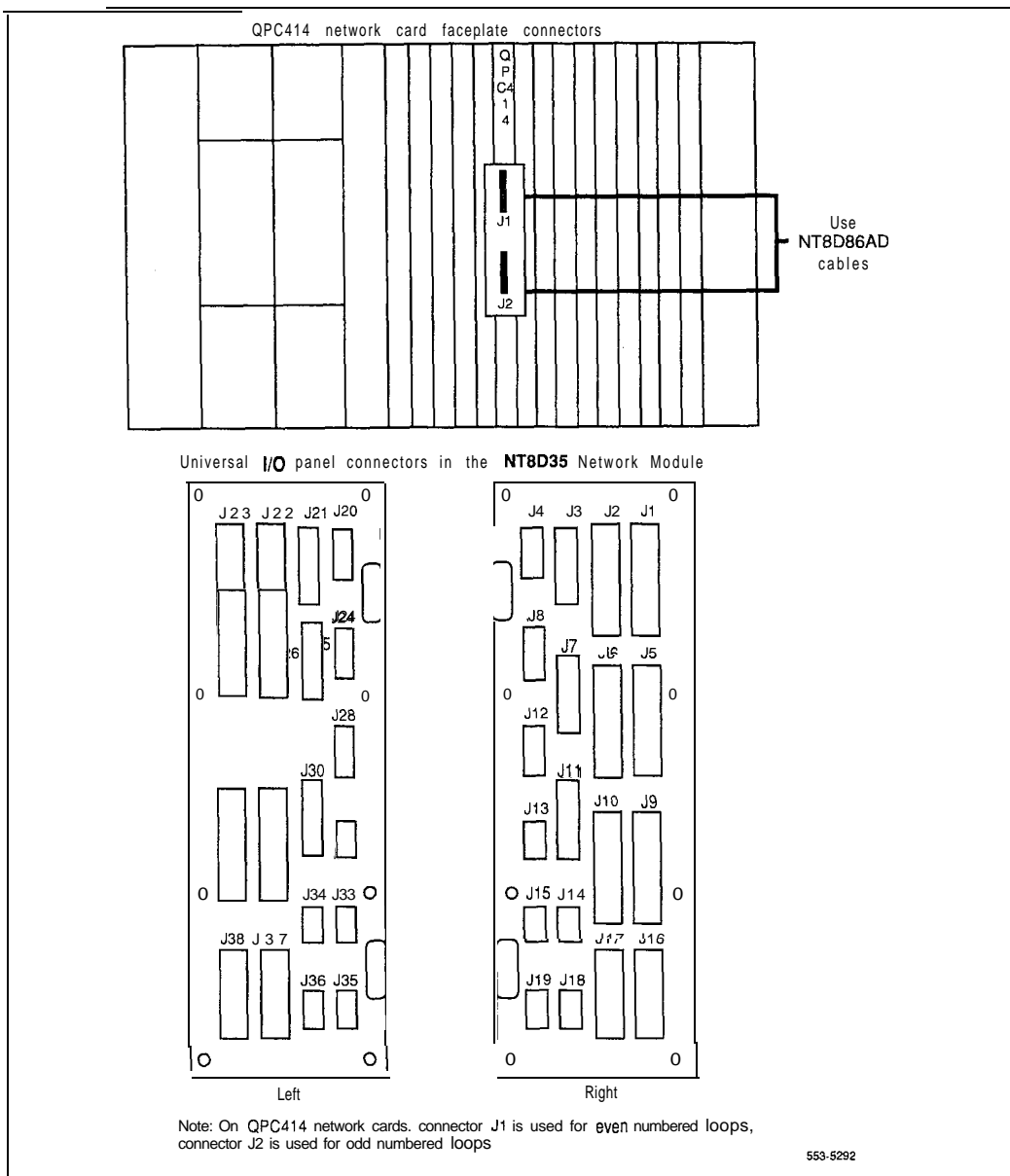
QPC414 Network Card network loops-connectors and cables for single-row connections



Basic cabling for multiple-row network connections

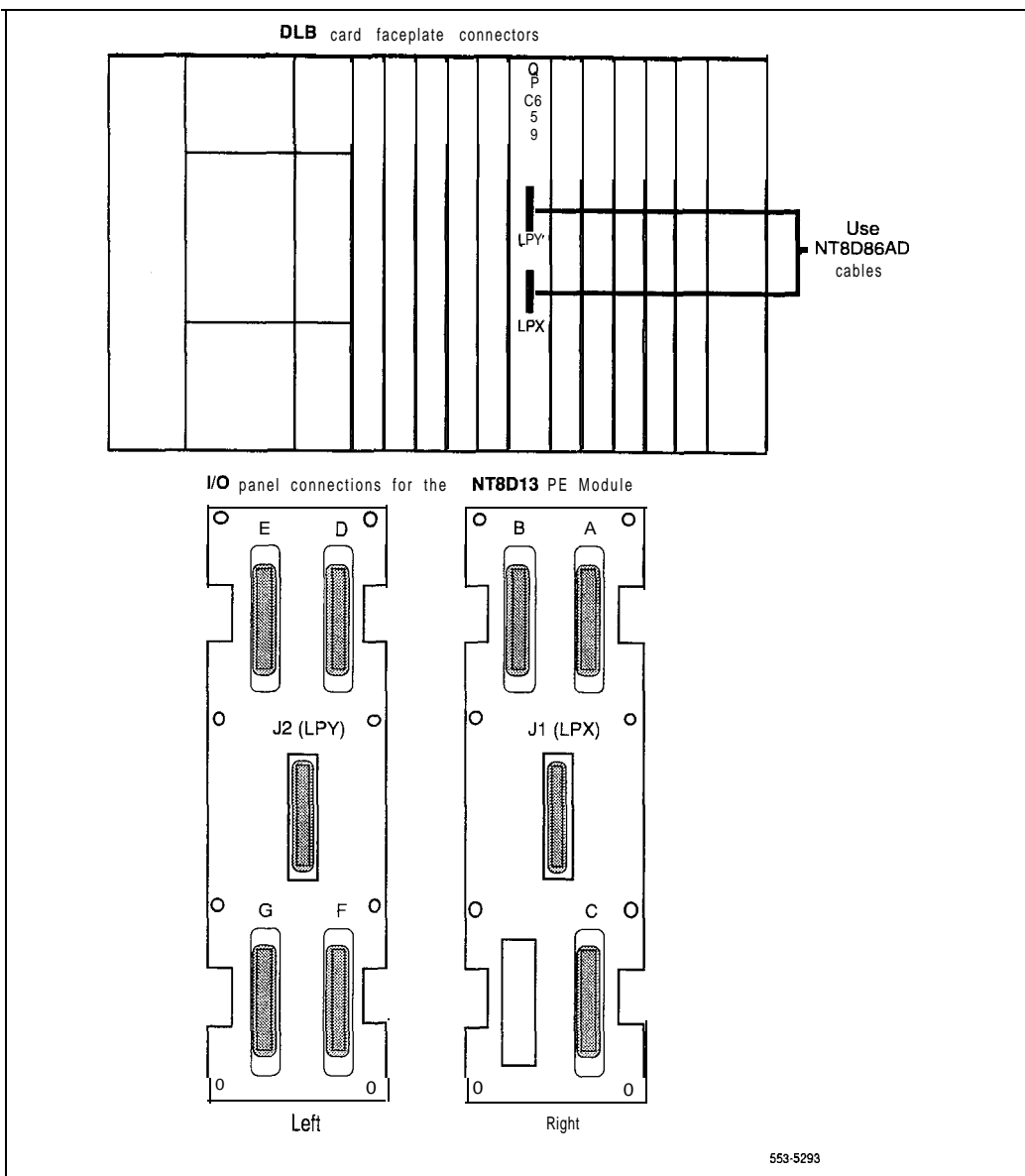
- 1 Refer to the work order and the cabling layout shipped with the system to determine
 - each loop number assigned
 - the location (**NT8D35** Network Module and slot assignments) of the **QPC414** Network Card associated with each loop
 - the location of **NT8D13** PE Modules that contain **QPC659** DLB Cards associated with each loop
- 2 Set the **Enb/Dis** switch on the faceplate of each network card to **Dis**.
- 3 Cable network loops from the faceplate connector on the network card to the I/O panels on the rear of the Network Module.
 - Label both ends of an **NT8D86AD** cable with the loop number, then connect one end of the cable to the network card faceplate connector:
 - J1** for shelf 0
 - J2** for shelf 1
 - Route the cable around the card cage to the **I/O** panel and mount the cable connector in one of the cutouts in the panel.
 - with the universal **I/O** panel (**PO7 15058**), the recommended order for connections is **J1, J2, J5, J6, J9, J10, 522,523, J26, J27, J31, J32**
 - with any other **I/O** panel, the recommended order for connections is **J20, J17, J16, J2, J1, J4**
 - Figure 14-7 shows the network card faceplate connectors, the universal **I/O** panel connectors, and the cables required.

Figure 14-7
QPC414 Network Card network loops--network card to I/O panel connections



- 4 Cable the DLB card to the I/O panels on the rear of the PE Module.
 - Label both ends of an **NT8D86AD** cable with the loop number, then connect one end of the cable to the assigned LPX or LPY faceplate connector on the DLB card.
 - Mount the connector on the other end of the cable in one of the cutouts in the I/O panels:
 - LPX to J1**
 - LPY to J2**
 - Figure 14-8 shows the DLB card connectors, the I/O panels for the PE Module, and the cables required.
- 5 Complete the network loop connection.
 - Connect one end of an **NT8D73** cable to the I/O panel connector for the network card.
 - Connect the other end of the cable to the I/O panel connector for the associated DLB card.
- 6 Seat and secure all connectors.
- 7 Set the **Enb/Dis** switch on each network card to Enb.
- 8 During system software configuration, use the *XI I input/output guide* (553-3001-400) to enter loop assignments.

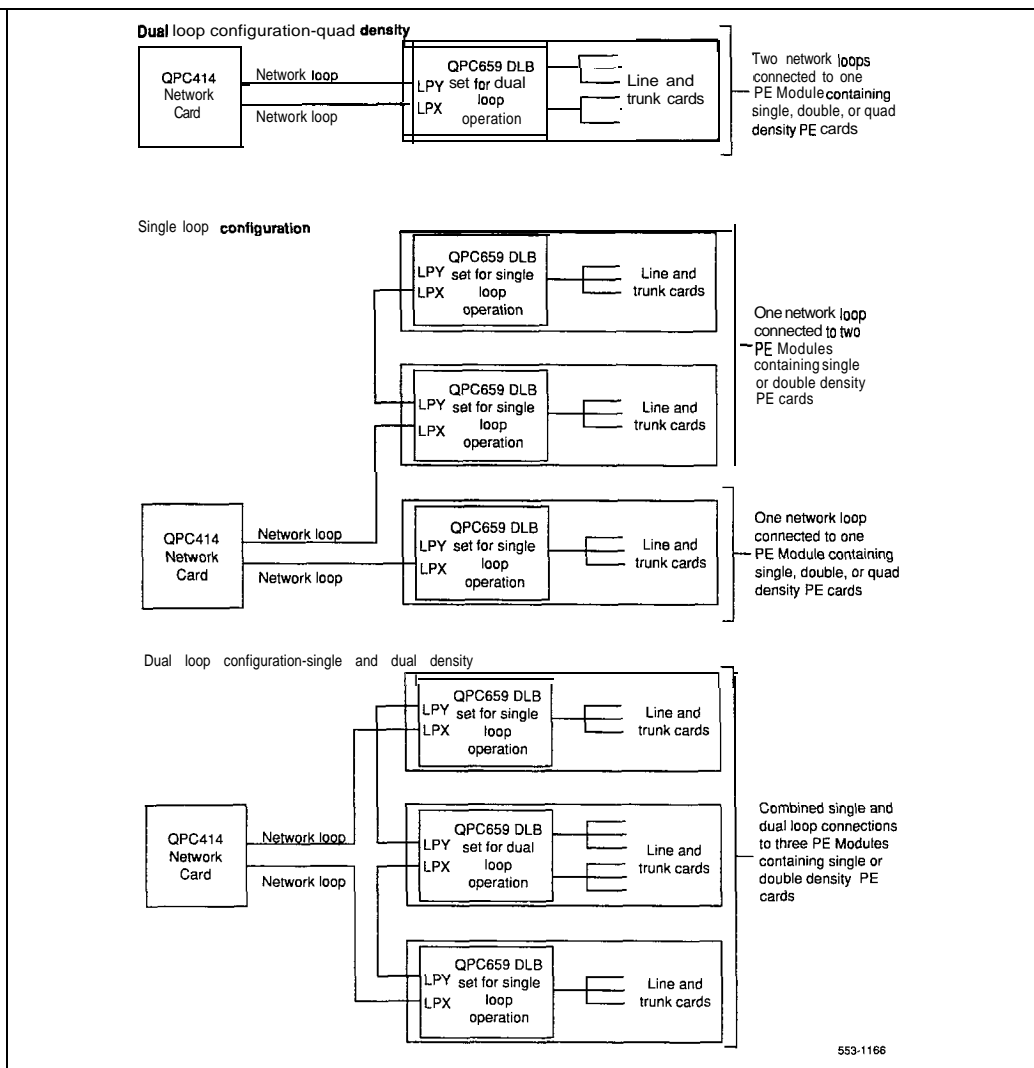
Figure 14-8
QPC414 Network Card network loops-DLB card to I/O panel connections



Network loop configurations

Figure 14-9 shows shelf configurations for single, dual, and quad density loops using the QPC414 Network Card.

Figure 14-9
QPC414 network loop configurations



Cabling lines and trunks

Cables are designated by the letter of the I/O panel cutout (A, B, C, and so on) where the 50-pin cable connector is attached. Each cable has three 20-pin connectors (16 positions are used), designated 1, 2, and 3, that attach to the backplane. Using the designations described, the backplane ends of the first cable are referred to as A-1, A-2, and A-3.

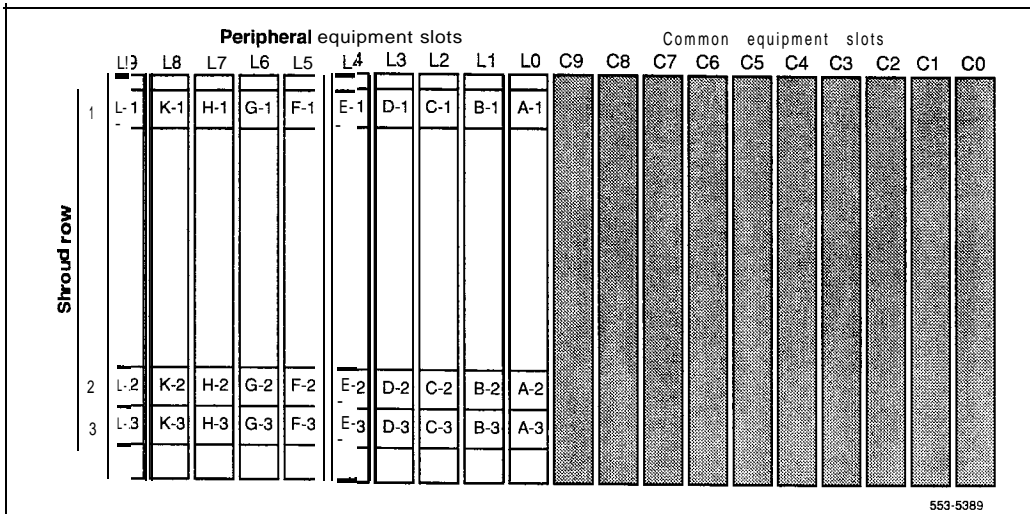
The locations of the cable connectors on the backplane are designated by the slot number (LO through L9 for **NT8D11**, LO through L1.5 for **NT8D37**) and the shroud row (1, 2, and 3). Using these designations, the slot positions in the first slot are referred to as LO-1, LO-2, and LO-3.

In **NT8D11BC** and **NT8D11EC** (and later vintage) **CE/PE** Modules, all 10 IPE card slots support 24-pair cable connections. Table 15-1 shows the cable connections from the backplane to the inside of the I/O panel. Figure 15-1 shows the designations (such as A-1) for the backplane end of the cables, and the backplane slot designations (such as LO) for the cable connections.

Table 15-1
NT8D11 cable connections

Backplane slots-shroud rows	I/O panel/cable designation
L0-1,2,3	A
L1-1,2,3	B
L2-1,2,3	C
L3-1,2,3	D
L4-1,2,3	E
L5-1,2,3	F
L6-1,2,3	G
L7-1,2,3	H
L8-1,2,3	K
L9-1,2,3	L

Figure 15-1
NT8D11 backplane cable designations



553-5389

In **NT8D37BA** and **NT8D37EC** (and later vintage) IPE Modules, all 16 IPE card slots support 24-pair cable connections. Table 15-2 shows the cable connections from the backplane to the inside of the I/O panel. Figure 15-2 shows the designations for the backplane end of the cables, the backplane slot designations for the cable connections, and the associated network segments for the backplane slots.

Table 15-2
NT8D37 cable connections

Backplane slots-shroud rows	I/O panel/cable designation
LO-1, 2, 3	A
L1-1, 2, 3	B
L2-1, 2, 3	C
L3-1, 2, 3	D
L4-1, 2, 3	E
L5-1, 2, 3	F
L6-1, 2, 3	G
L7-1, 2, 3	H
L8-1, 2, 3	K
L9-1, 2, 3	L
L10-1, 2, 3	M
L11-1, 2, 3	N
L12-1, 2, 3	R
L13-1, 2, 3	S
L14-1, 2, 3	T
L15-1, 2, 3	U

Note: To cable lines and trunks in **NT8D11AC** or DC modules (7-cable configuration), and in **NT8D37AA** or DC modules (12-cable configuration), go to Appendix C.

15-4 Cabling lines and trunks

Figure 15-2
NT8D37 backplane cable designations

Stroud row	Segment 3								Segment 2				Segment 1				Segment 0			
	L16	L15	L14	L13	L12	L11	L10	L9	L8	L7	L6	L5	L4	L3	L2	L1	L0			
1		U-1	T-1	S-1	R-1	N-1	M-1	L-1	K-1	SL2	SL0	H-1	G-1	F-1	E-1	D-1	C-1	B-1	A-1	
2		U-2	T-2	S-2	R-1	N-2	M-2	L-2	K-2			H-2	G-2	F-2	E-2	D-2	C-2	B-2	A-2	
3		U-3	T-3	S-3	R-1	N-3	M-3	L-3	K-3	SL3	SL1	H-3	G-3	F-3	E-3	D-3	C-3	B-3	A-3	

553-5391

I/O panel connections

Use this procedure to cable **NT8D 11 CE/PE**, **NT8D 13 PE**, and **NT8D37 IPE** Modules.

Note: The corner vertical channels in the rear of the module are outside of the **EMI** shield. Cables in those vertical channels must be shielded, and must enter and exit the **EMI-shielded** area through I/O panels and adapters.

CAUTION

Electrical shock hazard

Tip, ring, A, B, E, M, ESC, and ESCG connections may be considered to be Telecommunications Network Voltages (TNV).

- 1 Select an appropriate number of **NE-A25B** (or equivalent) cables long enough to run from the I/O panels on the rear of the module to the MDF.
 - Figure 15-3 shows the I/O panels on the **NT8D11 CE/PE** Module.
 - Figure 15-4 shows the I/O panels on the **NT8D13 PE** Module.
 - Figure 15-5 shows the I/O panels on the **NT8D37 IPE** Module.
- 2 Attach a tag that shows the module number and the I/O connector designation to both ends of each cable.
- 3 Connect each cable to the appropriate connector on the I/O panel and run the cables to the MDF.
- 4 Terminate each cable on the cross-connect block designated with the appropriate module number.

Note: For information on the MDF layout see "Planning and designating the Modular Distribution Frame (MDF)" on page 9-1.

- 5 Make sure all cables are neatly run, properly seated, and secured with cable ties.

15-6 Cabling lines and trunks

Figure 15-3
NT8D11 CE/PE Module I/O panels

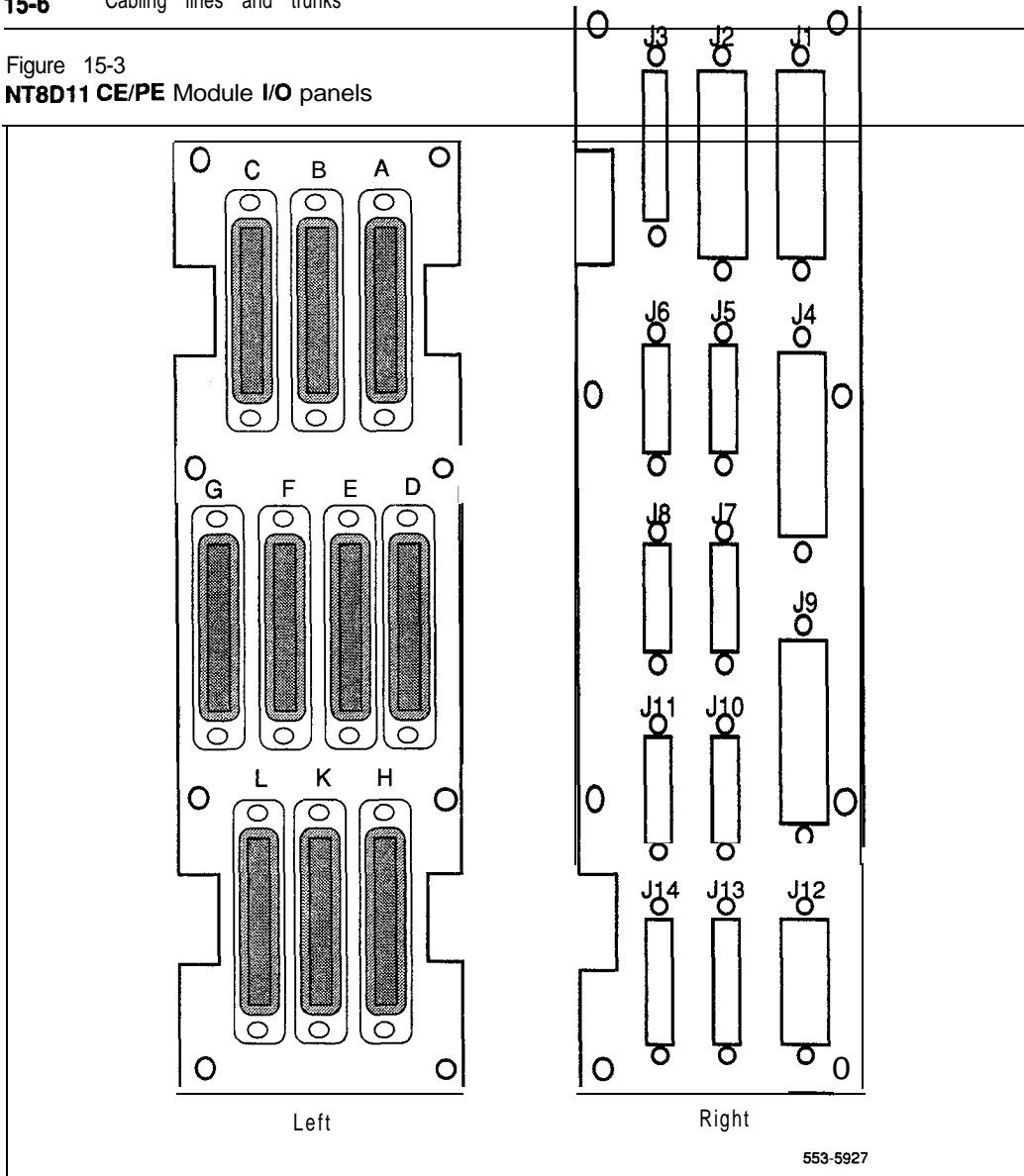


Figure 15-4
NT8D13 PE Module I/O panels

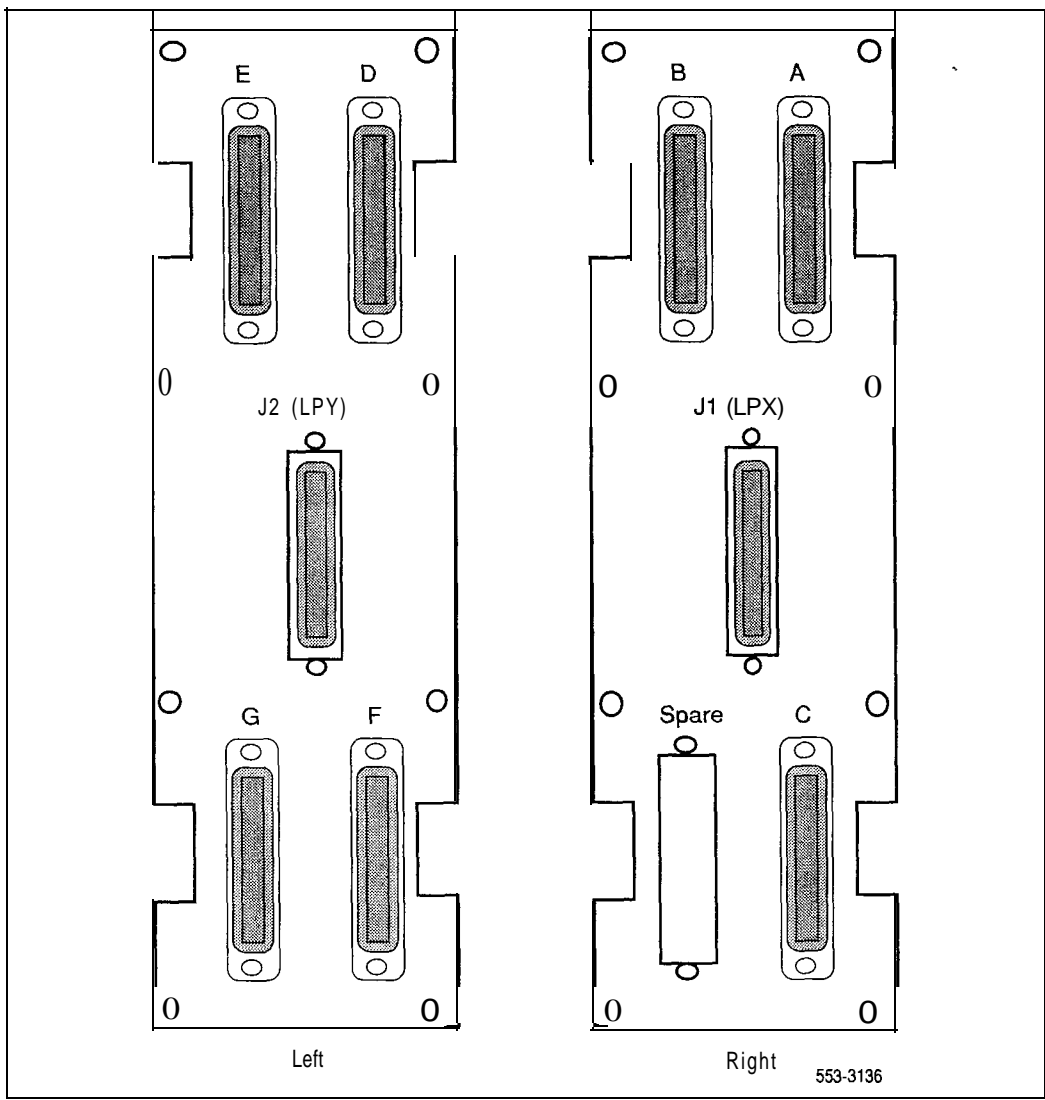
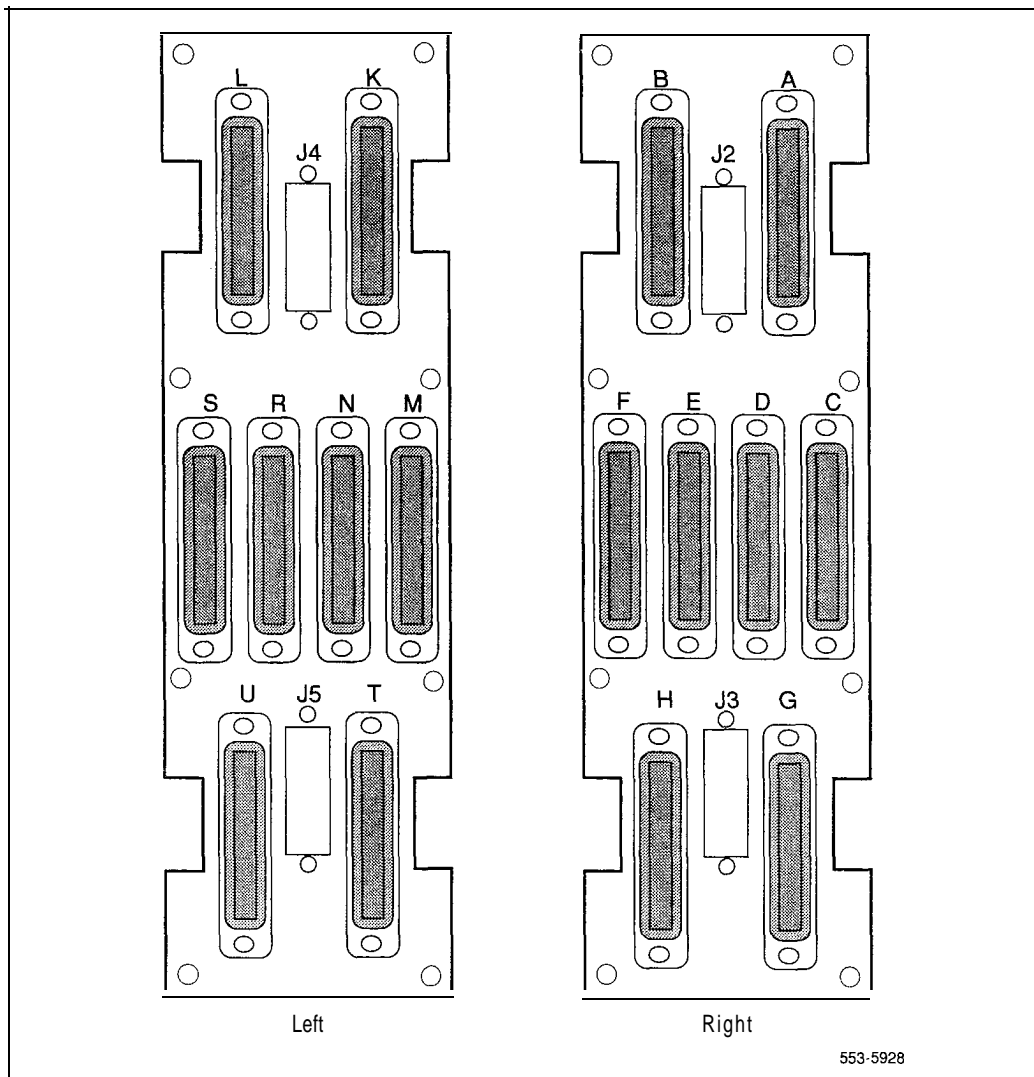


Figure 15-5
NT8D37 IPE Module I/O panels



Connecting lines and trunks

Throughout this procedure, make sure wiring is not reversed and is on the proper terminals. Allow enough slack in the wiring to allow tracing and to reconnect wires if they break at the terminal.

- 1 Extend incoming wiring (such as cables from the central office or wiring from a recorded announcement machine) to the MDF and terminate them on separate connecting blocks.
- 2 Assign and record terminal numbers (TNs) for each line or trunk. Determine the location of the line or trunk connection and its assigned TN from the work order or assignment records.
- 3 Connect each line and trunk to the TN using cross-connecting wire (typically 24 AWG type-2 wire). Table 15-3 lists pair-termination tables for line and trunk cards in NT8D11 CE/PE, NT8D13 PE, and NT8D37 IPE Modules.
- 4 Cross-connect incoming wiring and lines and trunks at the MDF.

Table 15-3
Line and trunk pair-termination tables

	NT8D11 CE/PE Module	NT8D13 PE Module	NT8D37 IPE Module
Line cards	Table 15-4	Single loop mode: Tables 15-9, 15-10; Dual loop mode: Tables 15-11, 15-12	Table 15-20
Trunk cards	NT8D14 Universal Trunk Card: Table 15-5 NT8D15 E&M Trunk Card: Tables 15-6 through 15-8	QPC71, QPC74, QPC237, QPC239, QPC250, QPC449, QPC450, and announcement and music trunk cards: Tables 15-13 through 15-19	NT8D14 Universal Trunk Card: Table 15-21 NT8D15 E&M Trunk Card: Tables 15-22 through 15-24

Table 15-4
NT8D11 CE/PE Module: line card pair-terminations

Pair	Pin numbers	Pair color	Unit 24/card
1T/1R	26/1	W-BL/BL-W	0
2T/2R	27/2	W-O/O-W	1
3T/3R	28/3	W-G/G-W	2
4T/4R	29/4	W-BR/BR-W	3
5T/5R	30/5	W-S/S-W	4
6T/6R	31/6	R-BL/BL-R	5
7T/7R	32/7	R-O/O-R	6
8T/8R	33/8	R-G/G-R	7
9T/9R	34/9	R-BR/BR-R	8
10T/10R	35/10	R-S/S-R	9
11T/11R	36/11	BK-BL/BL-BK	10
12T/12R	37/12	BK-O/O-BK	11
13T/13R	38/13	BK-G/G-BK	12
14T/14R	39/14	BK-BR / BK-BR	13
15T/15R	40/15	BK-S/S-BK	14
16T/16R	41/16	Y-BL/BL-Y	15
17T/17R	42/17	Y-O/O-Y	16
18T/18R	43/18	Y-G/G-Y	17
19T/19R	44/19	Y-BR/BR-Y	18
20T/20R	45/20	Y-S/S-Y	19
21T/21R	46/21	V-BL/BL-V	20
22T/22R	47/22	V-O/V-O	21
23T/23R	48/23	V-G/G-V	22
24T/24R	49/24	V-BR/BR-V	23
25T/25R	50/25	v-s/s-v	Spare

Note: Each of the following I/O panel connectors is cabled as shown above:
 connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with
 backplane slots 0 through 9, sequentially.

Table 15-5
NT8D11 CE/PE Module: NT8D14 Universal Trunk Card pair-terminations

Lead designations			Pin numbers	Pair color	Unit
RAN mode	Page mode	Other modes			
OTIOR CPIMB	OTIOR A/PG	OTIOR	26/1 27/2	W-BUBL-W w-o/o-w	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BWBR-W	1
2T/2R CPIMB	2T/2R A/PG	2T/2R	30/5 31/6	w-s/s-w R-BUBL-R	2
3T/3R CPIMB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R	3
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R	4
5T/5R CPIMB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BUBL-BK BK-O/O-BK	5
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR	6
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BUBL-Y	7

Note 1: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with backplane slots 0 through 9, sequentially.

Note 2: Use LD14 to select trunk termination impedance (600 ohm or 900 ohm). See the XI 1 input/output guide (553-3001-400) for information on LD14.

Table 15-6
NT8D11 CE/PE Module: **NT8D15** E&M Trunk Card
2-wire paging mode pair-terminations

Pair	Pin numbers	Pair color	Unit
0T/0R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	0
1T/1R A/PG	30/5 33/8	W-S/S-W R-G/G-R	1
2T/2R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK	2
3T/3R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y	3

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with backplane slots 0 through 9, sequentially.

Table 15-7
NT8D11 CE/PE Module: **NT8D15** E&M Trunk Card
2-wire type 1 mode pair-terminations

Pair	Pin numbers	Pair color	Unit
0T/0R E/M	26/1 28/3	W-BL/BL-W W-G/G-W	0
1T/1R E/M	30/5 32/7	w - s / s - w R-O/O-R	1
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BUBL-BK	2
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK	3

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with backplane slots 0 through 9, sequentially.

Table 15-8
NT8D11 CE/PE Module: NT8D15 E&M Trunk Card 4-wire type 1 and type 2 mode pair-terminations

Lead designations		Pin numbers	Pair color	Unit
Type 1	Type 2			
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	26/1 27/2 28/3 29/4	W-BUBL-W w-o/o-w W-G/G-W W-BR/BR-W	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	30/5 31/6 32/7 33/8	w-s/s-w R-BUBL-R R-O/O-R R-G/G-R	1
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BWBR-R R-S/S-R BK-BUBL-BK BK-O/O-BK	2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BR/BR-BK BK-S/S-BK Y-BLIBL-Y	3
<p>Note 1: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with backplane slots 0 through 9, sequentially.</p> <p>Note 2: TA/TB is the transmit pair; RA/RB is the receive pair.</p>				

Table 15-9

NT8D13 PE Module: line card pair-terminations for connectors A, C, E, and G (single loop mode)

Pair	Pins	Pair color	I/O panel connectors				Units per card							
			A	C	E	G	16 (see note)	8	4	2				
1T/1R	26/1	W-BL/BL-W	slot X-1	slot X-4	slot X-7	slot X-10	0	0	0	0				
2T/2R	27/2	W-O/O-W					8							
3T/3R	28/3	W-G/G-W					1				1			
4T/4R	29/4	W-BR/BR-W	card 1	card 4	card 7	card 10	9	2	2	1	i -			
5T/5R	30/5	W-S/S-W					2							
6T/6R	31/6	R-BL/BL-R					10							
7T/7R	32/7	R-O/O-R					3					3		
8T/8R	33/8	R-G/G-R					11							
9T/9R	34/9	R-BR/BR-R					4					4	2	
10T/10R	35/10	R-S/S-R					12							
11T/11R	36/11	BK-BL/BL-BK					5					5		
12T/12R	37/12	BK-O/O-BK					13							
13T/13R	38/1 3	BK-G/G-BK					6					6	3	
14T/14R	39/1 4	BK-BR/BK-BR					14							
15T/15R	40/1 5	BK-S/S-BK	7	7										
16T/16R	41/16	Y-BUBL-Y	15											
17T/17R	42/17	Y-O/O-Y	slot X-2	slot X-5	slot X-8	spare	0	0	0	0				
18T/18R	43/18	Y-G/G-Y					8							
19T/19R	44/19	Y-BR/BR-Y					1				1			
20T/20R	45/20	Y-S/S-Y	card 2	card 5	card 8	spare	9	2	2	1	1			
21T/21R	46/21	V-BUBL-V					2							
22T/22R	47/22	V-O/V-O					10							
23T/23R	48/23	V-G/G-V					3					3		
24T/24R	49/24	V-BR/BR-V					11							
25T/25R	50/25	V-S/S-V					spare							
Note: Applies to QPC594 16 Port 500/2500 Line rd.														

Table 15-10
NT8D13 PE Module: line card pair-terminations for connectors B, D, and F
 (single loop mode)

Pair	Pins	Pair color	I/O panel connector			Units per card			2
			B	D	F	16 (see note)	8	4	
1T/1R	26/1	W-BL/BL-W	slot X-2	slot x-5	slot X-8	4	4	2	—
2T/2R	27/2	W-O/O-W				12			
3T/3R	28/3	W-G/G-W				5	5		
4T/4R	29/4	W-BR/BR-W	card 2	card 5	card 8	13			3
5T/5R	30/5	W-S/S-W				6	6		
6T/6R	31/6	R-BL/BL-R				14			
7T/7R	32/7	R-O/O-R				7	7		
8T/8R	33/8	R-G/G-R				15			
9T/9R	34/9	R-BR/BR-R	slot X-3	slot X-6	slot X-9	0	0	0	0
10T/10R	35/10	R-S/S-R				8			
11T/11R	36/11	BK-BL/BL-BK				1	1		
12T/12R	37/12	BK-O/O-BK	card 3	card 6	card 9	9			1
13T/13R	38/13	BK-G/G-BK				2	2		
14T/14R	39/14	BK-BR/BK-BR				10			
15T/15R	40/15	BK-S/S-BK				3	3		
16T/16R	41/16	Y-BL/BL-Y				11			
17T/17R	42/17	Y-O/O-Y				4	4	2	
18T/18R	43/18	Y-G/G-Y				12			
19T/19R	44/19	Y-BR/BR-Y				5	5		
20T/20R	45/20	Y-S/S-Y				13			
21T/21R	46/21	V-BL/BL-V				6	6	3	
22T/22R	47/22	V-O/O-V	14						
23T/23R	48/23	V-G/G-V	7	7					
24T/24R	49/24	V-BR/BR-V	15						
25T/25R	50/25	V-S/S-V	spare						—

Note: Applies to QPC594 16 Port 500/2500 Line Card.

Table 15-11
NT8D13 PE Module: line card pair-terminations for connectors A, C, E, and G
 (dual loop mode)

Pair	Pins	Pair color	I/O panel connectors				Units per card								
			A	C	E	G	16 (see note)	8	4	2					
1T/1R	26/1	W-BL/BL-W	slot X-1	slot x-4	slot Y-2	slot Y-5	0	0	0	0					
2T/2R	27/2	W-O/O-W					8								
3T/3R	28/3	W-G/G-W					1	1							
4T/4R	29/4	W-BR/BR-W	card 1	card 4	card 2	card 5	9			1					
5T/5R	30/5	W-S/S-W					2	2	1						
6T/6R	31/6	R-BL/BL-R					10								
7T/7R	32/7	R-O/O-R					3	3							
8T/8R	33/8	R-G/G-R					11								
9T/9R	34/9	R-BR/BR-R					4	4	2						
10T/10R	35/10	R-S/S-R					12								
11T/11R	36/11	BK-BL/BL-BK					5	5							
12T/12R	37/12	BK-O/O-BK					13								
13T/13R	38/13	BK-G/G-BK					6	6	3						
14T/14R	39/14	BK-BR/BR-BK					14								
15T/15R	40/15	BK-S/S-BK					7	7							
16T/16R	41/16	Y-BL/BL-Y					15								
17T/17R	42/17	Y-O/O-Y					slot X-2	slot x-5	slot Y-3		spare	0	0	0	0
18T/18R	43/18	Y-G/G-Y										8			
19T/19R	44/19	Y-BR/BR-Y	1	1											
20T/20R	45/20	Y-S/S-Y	card 2	card 5	card 3		9			1					
21T/21R	46/21	V-BL/BL-V					2	2	1						
22T/22R	47/22	V-O/O-V					10								
23T/23R	48/23	V-G/G-V					3	3							
24T/24R	49/24	V-BR/BR-V					11								
25T/25R	50/25	V-S/S-V					spare								

Note: Applies to QPC.594 16 Port 500/2500 Line rd.

Table 15-12
NT8D13 PE Module: line card pair-terminations for connectors B, D, and F (dual loop mode)

Pair	Pins	Pair color	I/O panel connector			Units per card					
			B	D	F	16 (see note)	8	4	2		
1T/1R	26/1	W-BL/BL-W	slot X-2	slot X-5	slot Y-3	4	4	2	2		
2T/2R	27/2	W-O/O-W				12					
3T/3R	28/3	W-G/G-W				5	5				
4T/4R	29/4	W-BR/BR-W	card 2	card 5	card 3	13	6	3			
5T/5R	30/5	W-S/S-W				6					
6T/6R	31/6	R-BL/BL-R				14					
7T/7R	32/7	R-O/O-R				7					
8T/8R	33/8	R-G/G-R				15					
9T/9R	34/9	R-BR/BR-R	slot X-3	slot Y-1	slot Y-4	0	0	0	0		
10T/10R	35/10	R-S/S-R				8					
11T/11R	36/11	BK-BL/BL-BK				1	1				
12T/12R	37/12	BK-O / O-BK	card 3	card 1	card 4	9	2	1	1		
13T/13R	38/13	BK-G/G-BK				2					
14T/14R	39/14	BK-BR/BK-BR				10					
15T/15R	40/15	BK-S/S-BK				3					
16T/16R	41/16	Y-BL/BL-Y				11					
17T/17R	42/17	Y-O/O-Y				4				4	2
18T/18R	43/18	Y-G/G-Y				12					
19T/19R	44/19	Y-BR/BR-Y				5				5	
20T/20R	45/20	Y-S/S-Y				13					
21T/21R	46/21	V-BL/BL-V				6				6	3
22T/22R	47/22	V-O/V-O	14								
23T/23R	48/23	V-G/G-V	7	7							
24T/24R	49/24	V-BR/BR-V	15								
25T/25R	50/25	V-S/S-V	spare								

Note: Applies to QPC594 16 Port 500/2500 Line Card.

Table 15-13
NT8D13 PE Module: QPC71 **E&M/DX** Trunk pair-terminations

Unit	Pair color			Connection	Termination
	Slot 1, 4, 7, 10, 13, 16	Slot 2, 5, 8, 11, 14	Slot 3, 6, 9, 12, 15		
0	W-BUBL-W	Y-O/O-Y	R-BWBR-R	T0/R0 900 Ω	First E&M signaling trunk 900 Ω trunk
	w-o/o-w	Y-GIG-Y	R-S/S-R	T0/R0 600 Ω	600 Ω trunk
	W-G/G-W	Y-BR/BR-Y	BK-BUBL-BK	A1.0/B1E.0	E&M or DX (4W) signaling
0	W-BUBL-W	Y-O/O-Y	R-BR/BR-R	T0.9/R0.9 900 Ω	First paging trunk 900 Ω amplifier
	W-O/O-W	Y-G/G-Y	R-S/S-R	T0.6/R0.6 600 Ω	600 Ω amplifier
1	W-S/S-W	V-BL/BL-V	BK-G/G-BK	T1/R1 900 Ω	Second E&M signaling trunk 900 Ω trunk
	R-BL/BL-R	V-O/O-V	BK-BR/BR-BK	T1/R1 600 Ω	600 Ω trunk
	R-O/O-R	V-G/G-V	BK-S/S-BK	A1.1/B1E.1	E&M or DX (4W) signaling
1	W-S/S-W	V-BL/BL-V	BK-G/G-BK	T1/R1 900 Ω	Second paging trunk 900 Ω amplifier
	R-BL/BL-R	V-O/O-V	BK-BR/BR-BK	T1/R1 600 Ω	600 Ω amplifier

Table 15-16
NT8D13 PE Module: QPC239 Recorded Telephone Dictation Trunk pair-terminations

Unit	Pair color			Connection	Termination
	Slot 1, 4, 7, 10, 13, 16	Slot 2, 5, 8, 11, 14	Slot 3, 6, 9, 12, 15		
0	W-O/O-W	Y-G/G-Y	R-S/S-R	T0/R0	First trunk Voice
	W-G/G-W	Y-BR/BR-Y	BK-BL/BL-BK	DTA0/DTB0	Dial tone
	W-BR/BR-W	Y-S/S-Y	BK-O/O-BK	ARA0/ARB0	Audible ringback tone
1	R-BL/BL-R	V-O/O-V	BK-BR/BR-BK	T1/R1	Second trunk Voice
	R-O/O-R	V-G/G-V	BK-S/S-BK	DTA1/DTB1	Dial tone
	R-G/G-R	V-BR/BR-V	Y-BUBL-Y	ARA1/ARB1	Audible ringback tone

Table 15-17
NT8D13 PE Module: QPC250 Release Line Trunk pair-terminations

Unit	Pair color			Connection	Termination
	Slot 1, 4, 7, 10, 13, 16	Slot 2, 5, 8, 11, 14	Slot 3, 6, 9, 12, 15		
0	W-BL/BL-W	Y-O/O-Y	R-BR/BR-R	T0/R0 900 Ω	First trunk to 900 Ω termination
	W-G/G-W	Y-BR/BR-Y	BK-BUBL-BK	T0/R0 600 Ω	or 600 Ω termination at far end
1	w-s/s-w	V-BVBL-V	BK-G/G-BK	T1/R1 900 Ω	Second trunk to 900 Ω termination
	R-O/O-R	V-G/G-V	BK-S/S-BK	T1/R1 600 Ω	or 600 Ω termination at far end

Table 15-18

NT8D13 PE Module: QPC449 Loop Signaling Trunk and **QPC450 CO/FX/WATS** Trunk pair-terminations

Unit	Pair color			Connection	Termination
	Slot 1, 4, 7, 10, 13, 16	Slot 2, 5, 8, 11, 14	Slot 3, 6, 9, 12, 15		
0	W-BUBL-W	Y-010-Y	R-BR/BR-R	T0/R0 900 Ω	First trunk 900 Ω trunk
	w-o/o-w	Y-G/G-Y	R-S/S-R	T0/R0 600 Ω	600 Ω trunk
	W-G/G-W W-BR/BR-W	Y-BR/BR-Y Y-S/S-Y	BK-BUBL-BK BK-O/O-BK	MMM	(see note)
1	w-s/s-w	V-BUBL-V	BK-G/G-BK	T1/R1 900 Ω	Second trunk 900 Ω amplifier
	R-BUBL-R	v-o/o-v	BK-BR/BR-BK	T1/R1 600 Ω	600 Ω amplifier
	R-O/O-R R-G/G-R	V-G/G-V V-BR/BR-V	BK-S/S-BK Y-BUBL-Y	MMM	(see note)
2	R-BR/BR-R	W-BUBL-W	v-o/o-v	T2/R2 900 Ω	Third trunk 900 Ω trunk
	R-S/S-R	w-o/o-w	V-G/G-V	T2/R2 600 Ω	600 Ω trunk
	BK-BUBL-BK BK-O/O-BK	W-G/G-W W-BR/BR-W	V-BR/BR-V Y-S/S-Y	MMM	(see note)
3	BK-G/G-BK	w-s/s-w	V-BUBL-V	T3/R3 900 Ω	Fourth trunk 900 Ω amplifier
	BK-BR/BR-BK	R-BUBL-R	v-o/o-v	T3/R3 600 Ω	600 Ω amplifier
	BK-S/S-BK Y-BUBL-Y	R-O/O-R R-G/G-R	V-G/G-V V-BR/BR-V	MMM	(see note)

Note: The M and MM leads are found on QPC295, QPC330, and QPC331 cards,

Table 15-19
NT8D13 PE Module: Announcement and Music Trunk pair-terminations

Unit	Pair color			Connection	Termination
	Slot 1, 4, 7, 10, 13, 16	Slot 2, 5, 8, 11, 14	Slot 3, 6, 9, 12, 15		
0	W-BL/BL-W W-O/O-W	Y-O/O-Y Y-G/G-Y	R-BR/BR-R R-S/S-R	T/R	Music or announcement source (see note)
1	W-G/G-W W-BR/BR-W	Y-BR/BR-Y Y-S/S-Y	BK-BL/BL-BK BK-O/O-BK	T/R	Music or announcement source (see note)
2	W-S/S-W R-BL/BL-R	V-BL/BL-V V-O/O-V	BK-G/G-BK BK-BR/BR-BK	T/R	Music or announcement source (see note)
3	R-O/O-R R-G/G-R	V-G/G-V V-BR/BR-V	BK-S/S-BK Y-BL/BL-Y	T/R	Music or announcement source (see note)
4	R-BR/BR-R R-S/S-R	W-BL/BL-W w-o/o-w	Y-010-Y Y-G/G-Y	T/R	Music or announcement source (see note)
5	BK-BUBL-BK BK-O/O-BK	W-G/G-W W-BWBR-W	Y-BR/BR-Y Y-S/S-Y	T/R	Music or announcement source (see note)
6	BK-G/G-BK BK-BR/BR-BK	w-s/s-w R-BL/BL-R	V-BUBL-V v-o/o-v	T/R	Music or announcement source (see note)
7	BK-S/S-BK Y-BL/BL-Y	R-O/O-R R-G/G-R	V-GIG-V V-BR/BR-V	T/R	Music or announcement source (see note)

Note: When a high impedance (higher than 2 ohm) music or announcement source is used, the volume level of the source may have to be adjusted when altering the source. Low impedance sources (less than 2 ohm) are not usually affected by changes in the source.

Table 15-20
NT8D37 IPE Module: line card pair-terminations

Pair	Pin numbers	Pair color	Unit 24/card
1T/1R	26/1	W-BUBL-W	0
2T/2R	27/2	w-o/o-w	1
3T/3R	28/3	W-G/G-W	2
4T/4R	29/4	W-BR/BR-W	3
5T/5R	30/5	w-s/s-w	4
6T/6R	31/6	R-BUBL-R	5
7T/7R	32/7	R-O/O-R	6
8T/8R	33/8	R-G/G-R	7
9T/9R	34/9	R-BWBR-R	8
10T/10R	35/10	R-S/S-R	9
11T/11R	36/11	BK-BUBL-BK	10
12T/12R	37/12	BK-O/O-BK	11
13T/13R	38/13	BK-G/G-BK	12
14T/14R	39/14	BK-BR/BK-BR	13
15T/15R	40/15	BK-S/S-BK	14
16T/16R	41/16	Y-BL/BL-Y	15
17T/17R	42/17	Y-010-Y	16
18T/18R	43/18	Y-G/G-Y	17
19T/19R	44/19	Y-BR/BR-Y	18
20T/20R	45/20	Y-S/S-Y	19
21 T/21 R	46/21	V-BUBL-V	20
22T/22R	47/22	V-ON-O	21
23T/23R	48/23	V-GIG-V	22
24T/24R	49/24	V-BR/BR-V	23
25T/25R	50/25	V-S/S-V	Spare

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15., sequentially.

Table 15-21
NT8D37 IPE Module: **NT8D14** Universal Trunk Card pair-terminations

Lead designations			Pin numbers	Pair color	Unit
RAN mode	Paging mode	Other modes			
0T/0R CPIMB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W w-o/o-w	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W	1
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	w-s/s-w R-BUBL-R	2
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R	3
4T/4R CPIMB	4T/4R A/PG	4T/4R	34/9 35/10	R-BWBR-R R-S/S-R	4
5T/5R CPIMB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BUBL-BK BK-O/O-BK	5
6T/6R CPIMB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR	6
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BUBL-Y	7

Note 1: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15, sequentially.

Note 2: Use LD14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* (553-3001-400) for information on LD14.

Table 15-22

NT8D37 IPE Module: **NT8D15** E&M Trunk Card **2-wire** paging mode pair-terminations

Pair	Pin numbers	Pair color	Unit
0T/0R A/PG	26/1 2914	W-BUBL-W W-BFVBR-W	0
1T/1R A/PG	30/5 33/8	w-s/s-w R-G/G-R	1
2T/2R A/PG	3419 37/12	R-BWBR-R BK-O/O-BK	2
3T/3R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y	3

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15, sequentially.

Table 15-23

NT8D37 IPE Module: **NT8D15** E&M Trunk Card **2-wire** type 1 mode pair-terminations

Pair	Pin numbers	Pair color	Unit
0T/0R E/M	26/1 2813	W-BUBL-W W-G/G-W	0
1T/1R E/M	3015 32/7	w-s/s-w R-O/O-R	1
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BUBL-BK	2
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK	3

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15, sequentially.

Table 15-24

NT8D37 IPE Module: **NT8D15** E&M Trunk Card **4-wire** type 1 and type 2 mode pair-terminations

Lead designations		Pin numbers	Pair color	Unit
Type 1	Type 2			
TA/TB	TA/TB	26/1	W-BUBL-W	0
RA/RB	RA/RB	27/2	w-o/o-w	
E/M	EA/EB	28/3	W-G/G-W	
ESC/ESCG	MA/MB	29/4	W-BR/BR-W	
TA/TB	TA/TB	30/5	w-s/s-w	1
RA/RB	RA/RB	31/6	R-BL/BL-R	
E/M	EA/EB	32/7	R-O/O-R	
ESC/ESCG	MA/MB	33/8	R-G/G-R	
TA/TB	TA/TB	34/9	R-BR/BR-R	2
RA/RB	RA/RB	35/10	R-S/S-R	
E/M	EA/EB	36/11	BK-BL'BL-BK	
ESC/ESCG	MA/MB	37/12	BK-O/O-BK	
TA/TB	TA/TB	38/13	BK-G/G-BK	3
RA/RB	RA/RB	39/14	BK-BR/BR-BK	
E/M	EA/EB	40/15	BK-S/S-BK	
ESC/ESCG	MA/MB	41/16	Y-BUBL-Y	

Note 1: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15, sequentially.

Note 2: TA/TB is the transmit pair; RA/RB is the receive pair.

553-3001-210

15-28 Cabling lines and trunks



Powering up the system and initial loading

Preparing for power-up

- 1 Check the disks supplied with the system. Verify the software version and issue and the options equipped.
- 2 Install the QMM42 Security Data Cartridge on the host card (QPC584 MSI, QPC742 FDI, or NT6D63 IOP). In a dual CPU system, install a data cartridge for both CPUs:

- Make sure the ID number, software version, and options on the data cartridge match the disks supplied with the system. These numbers must match.
- If the host card is an **MSI** or **FDI**, disconnect the cables to the faceplate of the card. (There is no faceplate connector on the IOP card.)
- Remove the host card from the card cage.

Note: If the host card is an **MSI** or **FDI**, verify that the option switches on the card are correct for the system. See *Circuit card installation and testing (553-3001-211)* for the correct switch settings. (There are no option switches on the IOP card.)

- Plug the cartridge into the connectors on the component side of the card and install the screw that secures the cartridge.
- On **MSI** or **FDI** cards, reconnect the cables to the faceplate connectors.
- Reinstall the host card.
- Set the **Enb/Dis** switch on the host card to **Enb**.

- 3 Verify that all cards are locked into their assigned slots.
- 4 Verify that all cable connectors are secured.
- 5 Set all circuit breakers to OFF.
- 6 Reinstall all trim panels.
- 7 Set all faceplate switches to Enb.
- 8 Set **CPUs** for normal operation.

Note: This step does not apply to options **21A**, **21**, or **21E**.

- For option **51**, set the **Norm/Maint** switch on the CPU interface card to **Maint** .
- For options **61**, **61C**, **71**, and **81**, set the **Norm/Maint** switch for both **CPUs** to **Maint**.

Connecting power for AC-powered systems

- 1** Test the commercial power source for proper voltage (*see Installation planning* (553-3001-120) for voltage requirements).
- 2** Set the main circuit breaker in the rear of each pedestal to OFF.
- 3** Set the circuit breakers on each MPDU, or the switch on each module power supply, to OFF in each module.
- 4** Set the circuit breaker on the blower unit in the front of each pedestal to OFF.
- 5** Connect the AC power cord for each pedestal to its associated commercial power outlet.

Note: If a problem is found in any of the following steps, resolve that problem before continuing.

- 6** If not already done, in the power panel set the circuit breaker that provides service for Column 0 to ON.
- 7** Set the main circuit breaker in Column 0 to ON.
- 8** Set the circuit breaker on the blower unit in Column 0 to ON. You should hear the blower running.

Note: On initial power-up, the blower may rotate slower than expected. As the sensor detects heat, the blower will rotate faster.

- 9** Set the circuit breaker on the MPDU, or the switch on the module power supply, to ON in Module 0. After a few seconds, the green LED on the power supply should light.

Repeat this step for each module in the column, one module at a time. (If the module is equipped with a ringing generator, set the breakers or switches for both the power supply and the ringing generator to ON.)

Note: It may take up to 90 seconds for the green LED to light on a ringing generator. This is normal operation.

- 10** Repeat steps 5 through 9 for each column.

- 11 Once the green LED is lit on all module power supplies and ringing generators, set the main circuit breaker for each column to OFF *except on the CPU columns*, wait at least 30 seconds, then set the breaker back to ON (leave CPU columns off).
 - The breaker should not trip. The blower unit in each column should be running and the green LED on all module power supplies and ringing generators should be lit. All red column LEDs should also be lit.
 - Set the main circuit breakers for the CPU columns to ON (in dual CPU systems, set the breakers simultaneously).

At this point, all blower units should be running and the green LED on all module power supplies and ringing generators should be lit. The red column LEDs will remain lit until the system reloads

Connecting power for DC-powered systems

- 1 Set the main AC circuit breaker to each rectifier to OFF.
- 2 For each rectifier, test the commercial power source for proper voltage (*see Installation planning (553-3001-120)* for voltage requirements).
- 3 Remove all distribution fuses, or set all distribution breakers to OFF, on the DC power source for each column.
- 4 Set all circuit breakers in the rear of each pedestal to OFF.
- 5 Set the switch on each module power supply and ringing generator to OFF.
- 6 Set the switch on the blower unit in the front of each pedestal to OFF.

Note 1: If a problem is found in any of the following steps, resolve that problem before continuing.

Note 2: If reserve batteries are equipped, the volt meter on the DC power source should show approximately -48 V.
- 7 If not already done, connect each rectifier to its associated AC outlet and set the breakers in the power panel to ON.

- 8 Turn on the rectifiers, one at a time, waiting about 10 seconds between one rectifier and the next. Voltage at the distribution meter should go to about 54 V (equalize voltage) or 52 V (if equalize voltage has not been set up).

Note: Perform steps 9 through 12 for each column *with the CPU columns last.*

- 9 Replace the distribution fuses, or set the distribution breakers to ON, on the DC power source for the column.
- 10 Set the circuit breaker for the blower unit (the far left breaker in the rear of the pedestal) to ON in the column.
- 11 Set the switch on the blower unit (in the front of the pedestal) in the column to ON. You should hear the blower running.

Note: On initial power-up, the blower may rotate slower than expected. As the sensor detects heat, the blower will rotate faster.

- 12 Set the switch on the module power supply to ON in the column. After a few seconds, the green LED on the power supply should light.

Repeat this step for each module in the column, one module at a time. (If the module is equipped with a ringing generator, set the switch on both the power supply and the ringing generator to ON.)

Note: It may take up to 90 seconds for the green LED to light on a ringing generator. This is normal operation.

At this point, all blower units should be running and the green LEDs on all module power supplies and ringing generators should be lit. The red column LEDs will remain lit until the system reloads

Power-up option 21 A, **21**, **21 E**, **51**, **61**, and 71

- 1 Insert disks into their respective drives (A and B) and start a sysload:
 - For options 21A and 21, set the baud rate for the **SDI** port on the QPC687 CPU Card to match the baud rate of the system terminal, and press the QPC687 reload (Rld) button.
 - For option **21E**, on the NTND02 MSPS Card set the baud rate for the **SDI** port associated with the system terminal to match the system terminal. Press the Rld button on the NTND01 ICM Card.
 - For option 51, press the Rld button (the bottom button) on the single NTND10 CMA Card (QPC581 before X11 release 18).
 - For options 61 and 71, simultaneously press the Rld button (the bottom button) on both NTND10 CMA Cards (QPC581 before X11 release 18).

The following functions occur during a sysload:

- The LED on the disk drive unit should light, indicating data is being copied from the disk into the system memory.
- The LED on the memory card should flash.
- The maintenance display on the **MSI** or FDI card should indicate the status of the disk drive unit.

When the sysload is complete, the system terminal displays **DONE** and the system automatically invokes the initialization program. The red column **LEDs** should go off.

Wait until software download has completed before logging in. For disk systems where A1 disk has been removed, it has to be reinserted into the disk drive so that **loadware** can be identified.

When the initialization and download is complete, the system automatically runs the programs in the midnight routine. You can allow the midnight routines to complete or you can log onto the system and begin the acceptance tests.

Refer to the *XI 1 input/output guide* (553-3001-400) if

- the system terminal displays any IN1 codes other than IN1000.
- any red column LED is lit
- the LED on any common equipment card lights and remains lit (see the note below for an exception)
- the maintenance display shows any code

Note: In a dual CPU system, the LED associated with the inactive CPU will be lit. This is normal operation.

2 If the disk drive unit has a hard disk:

- Change the Configuration Record to indicate a hard disk is equipped:

LD 17

at the prompt IOTB enter YES

at the prompt **ADAN** enter CHG HDK 0

key through the entire program, then exit LD17:

- Enter the Equipment Data Dump program from the floppy disks:

LD 43

- Transfer data from the floppy disks to the hard disk:

RES

- When the data dump is complete, exit LD43:

Power-up option **61C** and **81**

- 1 At power-up, a sysload starts and completes very quickly (typically in less than five minutes). If you were not able to observe the sysload outputs at power-up, you can manually reload the system by simultaneously pressing the Man Rst button (the bottom button) on both **NT6D66** CP Cards.

- As the **NT6D63** IOP Cards perform card level power-up tests, watch the faceplate HEX displays for flashing error codes. When the test completes, the displays will show a steady "A" with flashing decimal points (if a HEX code keeps flashing, the test failed).
- As the **NT6D66** CP Cards perform card level power-up tests, watch the LCD displays:

Following the "Selftest Complete" message on the CP card, watch the LCD for the message "IOP in Slot 16."

Watch the LCD for the message "Loading Disk OS." (The CMDU hard disk is shipped preloaded with the necessary software.) As the system attempts to access the hard disk, watch the LCD for error messages.

- At this point the terminal connected to the CPIO port becomes active. Watch for system reload (SYS) and initialization (INI) messages.

When the sysload is complete, the system automatically invokes the initialization program. The red column LEDs should go off. When the initialization is complete, the system automatically runs the programs in the midnight routine. You can allow the midnight routines to complete or you can log onto the system to synchronize the **CMDUs** and begin acceptance tests.

Note: On the CNI cards in the inactive Core, the LEDs remain lit. This is normal operation. In addition, if the network loop for a CNI port is not configured and enabled, the LED for that port may stay lit.

- 2 Load overlay 137 to synchronize the disk drives (synchronization may take up to 30 minutes):

```
LD 137
STAT CMDU      get the status of both CMDUs
SYNC           synchronize the disk drives
****          exit LD 137
```

- 3 Test the IOP to IOP SCSI connection, then enable and test the CMDUs:

```
LD 137
TEST SCSI      check the IOP to IOP connection and access to the
                CMDUs
ENL CMDU       enable the CMDUs
TEST CMDU      test the hard and floppy disk drives (note: a floppy
                disk must be installed)
****          exit LD137
```

- 4 Test Core functions:

```
LD 135
TEST CPU       test the inactive CP card and CP to CP cable
TEST IPB       test the backplane protocol on the inactive side
TEST CNI c s   test each configured CNI on the inactive side
                (specify Core and slot)
```

If all the tests pass, switch Cores and test the side that is now inactive:

```
SCPU         switch to Core 1
TEST CPU       test the inactive CP card and CP to CP cable
TEST IPB       test the backplane protocol on the inactive side
TEST CNI c s   test each configured CNI on the inactive side
                (specify Core and slot)
```

5 Clear displays, major alarms, and minor alarms:

CDSP	clear the display on Core 1
CMAJ	clear all major alarms
CMINALL	clear all minor alarms
SCPU	switch to Core 0
CDSP	clear the display on Core 0
****	exit LD35

Note: If you need to add or remove network groups for the system, see “LD135” in the *X11 input/output* guide (553-3001-400).

Performing acceptance tests

Perform the following acceptance tests after the system loading is completed:

- Module power supply test
- Blower unit and thermal sensor test

Sysload test

System terminal and system monitor test

PFTU test (if PFTUs are equipped)

Disk drive unit test

the *X11 input/output guide* (553-3001-400) for a detailed explanation of software prompts and for the meaning of system messages and display codes generated during acceptance tests.

Module power supply test

Use this procedure to test module power supplies and ringing generators and their interface to the system monitor. This procedure should be performed for each power supply at system installation, or whenever a module is installed.

Performing these tests on a single CPU system may cause a sysload.

Performing these tests on a dual CPU system may cause an initialization; disregard INI messages during the tests.

- 1 Verify that the green LED on each power supply is lit and that each red column LED is OFF.
- 2 Set the power supply to OFF. If there is an MPDU in the module, use the associated circuit breaker on the MPDU. If there is a switch on the power supply, use the switch.
 - The green LED on the power supply should go out.
 - The red column LED should light.
 - The system terminal should display PWROO02 and BSD090.

Note: If the power supply is in an IPE Module, XMI messages may be generated.

 - The system terminal should then display BSD000.
- 3 Set the power supply to ON.
 - The green LED on the power supply should light.
 - The red column LED should go out.
 - The system terminal should display PWRO000.
- 4 Set the power supply to **OFF**. Wait until the red column LED lights, then unseat the power supply. While the power supply is unseated, set it to **ON**.
 - The green LED on the power supply should go off.
 - The red column LED should remain lit.
 - The system terminal should display PWRO002, BSD090, BSD000, and PWRO003.
- 5 Set the power supply to OFF and push it back into the slot. Set the power supply to ON.
 - The green LED on the power supply should light.
 - The red column LED should go out.
 - The system terminal should display PWRO000.

Blower unit and thermal sensor test

Use this procedure to test the **NT8D52** Blower Unit and its interface to the system monitor. This test should be performed on the blower unit when a column is initially installed.

- 1 In the front of the pedestal, set the blower unit circuit breaker, or power switch, to OFF.
 - The red LED at the top front of the column should light.
 - The system terminal should display PWRO06, BSD090, and BSD000.
- 2 Set the blower unit circuit breaker, or power switch, to ON.
 - The column LED should go out.
 - The system terminal should display PWRO46.
- 3 Use a screwdriver to loosen the retaining screws at the front of the blower unit (see Figure 17- 1) and pull the unit out until it is disconnected from the pedestal.

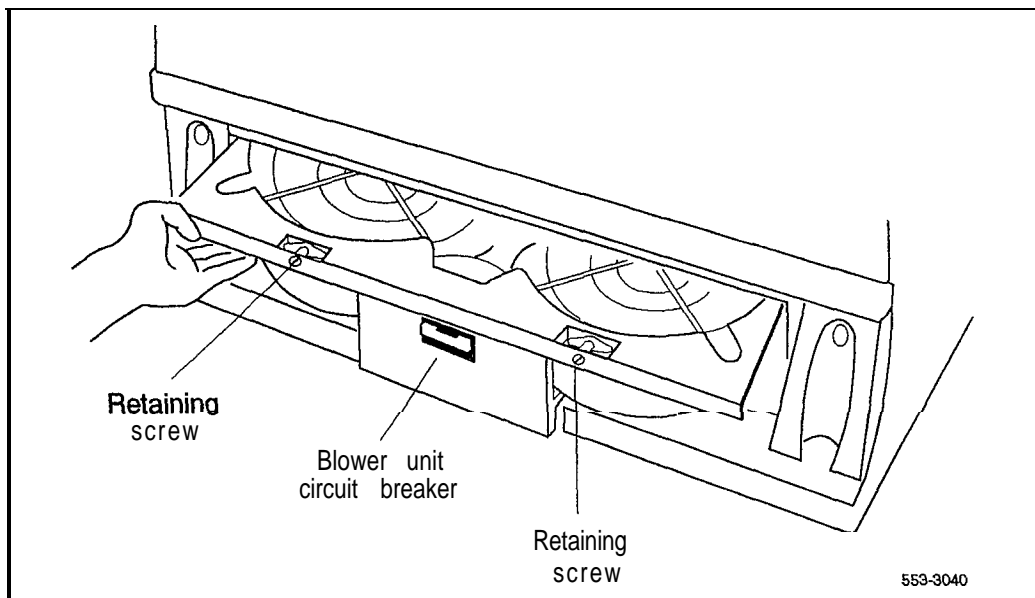
Note: Do not pull the unit all the way out of the pedestal.

 - The column LED should light.
 - The system terminal should display PWRO06 and BSD090.
- 4 Reinstall the blower unit and tighten the retaining screws.
 - The column LED should go out.
 - The system terminal should display PWRO46.
- 5 Heat one of the two thermal sensors under the top cap of the column with a hand-held hair dryer or similar heat source.
 - The column LED should light.
 - Thirty seconds after the thermal sensor detects 70 degrees C (158 degrees F), the main circuit breaker, or the blower unit circuit breaker, at the rear of the pedestal should trip. The system terminal should display PWRO04, PWRO06, and PWR007.

17-4 Performing acceptance tests

- 6 Allow the sensor to cool, then reset the circuit breaker in the pedestal. If a sysload occurs, allow it to complete.
 - The column LED should go out.
 - The system terminal should display PWRO044, PWR0046, and PwRoo47.
- 7 Repeat steps 5 and 6 for the other thermal sensor.

Figure 17-1
Blower unit removal



Sysload test

Use this procedure to test the sysload (manual reload) function.

1 Start the sysload:

- On options 21A and 21, press the reload (Rld) button on the QPC687 CPU Card.
- On option **21E**, press the Rld button on the NTND01 ICM Card.
- On option 51, press the Rld button (the bottom button) on the single NTND 10 CMA Card (QPC58 1 before X 1 I release 18).
- On options 61 and 71, simultaneously press the Rld buttons (the bottom buttons) on both NTND10 CMA Cards (QPC58 1 before X11 release 18). I
- On options 61C **and** 81, simultaneously press the Man Rst buttons (the bottom buttons) on both NT6D66 Call Processor Cards. I

The following functions occur during a sysload:

- On all system options:
 - The red LED at the top of the CPU column should light.
 - The major alarm indication should be displayed on all attendant consoles.
 - The LED on the front of the disk drive unit should light. (In options 61C and 8 1, the LED on only one of the disk drive units will light.) I
- On options 21A and 21:
 - The display on the faceplate of the QPC742 FDI Card should indicate the status of the disk drive unit.
 - A series of codes should be displayed on the faceplate of the NT8D19 Memory/Peripheral Signaling Card.
- On option 21E:
 - The display on the faceplate of the QPC742 FDI Card should indicate the status of the disk drive unit.
 - A series of codes should be displayed on the NTND01 ICM and NTND02 MSPS Cards.

- On options **51, 61,** and 71:

The display on the faceplate of the **QPC584 MSI** or **QPC742 FDI** Cards should indicate the status of the disk drive unit.

The **LEDs** on the **QPC583** or **NTND09** Memory Cards should flash as memory checks take place.

A series of codes should be displayed on the **QPC580** CPU Interface Card.

- On options 61C and 81:

The faceplate **HEX** displays on the **NT6D63** IOP Card(s) should show a steady "A" with flashing decimal points when the card(s) complete a self-test.

On the LCD displays on the **NT6D66** CP Card(s):

Following the "Selftest Complete" message, watch the LCD for the message "IOP in Slot 16."

Watch the LCD for the message "Loading Disk OS."

When the sysload is complete, the system terminal displays DONE and the system automatically invokes the initialization program.

The following functions occur when the initialization is complete:

- The column LED should go out.
- The major alarm indication should disappear from all attendant consoles.
- The system automatically runs the programs in the midnight routine.

- 2 Press the return key on the system terminal to monitor the progress of the midnight routines until the **OVL1 11 BKGD** response is received.

System terminal and system monitor test

Use this procedure to test system terminals connected to the Meridian 1.

- 1 Log into the system:

LOG1 (password)

- 2 Enter the program and check the status of the system monitor:

LD 37
STAT XSM

- 3 Test the terminal:

TTY x "x" is the device number assigned to the system terminal

The system terminal should display

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
%*!&()<=>.,:?
READY FOR INPUT

- 4 Step through the keys on the keyboard one at a time. All keyboard input should be echoed until END is entered.
- 5 Exit LD 37:

PFTU test

Use this procedure to test a PFTU and its interface with the system monitor.

- 1 Set the line transfer switch on the PFTU to BYPASS.
 - The red LED of the column associated with the PFTU should light.
 - Associated attendant consoles should display a major alarm.
 - The system terminal should display BSD090 and PWRO016.
 - Set the line transfer switch on the PFTU to NORMAL.
- 2 Set the line transfer switch on the attendant console associated with the PFTU to ON.
 - The red LED of the column associated with the PFTU should light.
 - Associated attendant consoles should display a major alarm.
 - The system terminal should display BSD090 and PWROO 16.
- 3 Set the line transfer switch on the attendant console associated with the PFTU to OFF.
 - The red LED of the column associated with the PFTU should go out.
 - The "major" alarm condition displayed on attendant consoles associated with the PFTU should disappear.
 - The system terminal should display PWRO056.
- 4 Repeat Steps 2 and 3 for each attendant console associated with the PFTU.
- 5 Set the line transfer switch on the PFTU to BYPASS and test the telephones and trunks connected to the PFTU.
 - Place an outgoing call from each telephone associated with the PFTU. Each telephone should be connected directly to a trunk.
 - Place an incoming call on each trunk associated with the PFTU. Each trunk should be connected directly to a telephone.
- 6 Set the line transfer switch on the PFTU to NORMAL and test the telephones and trunks connected to the PFTU. The telephones and trunks associated with the PFTU should return to normal operation.

Disk drive unit test

Use this procedure to test the FDU or MDU (for other than options 61C and 81).

- 1 Log into the system:
LOG1 (password)
- 2 Enter the program:
LD 37
- 3 Make sure the disk drive unit is not disabled:
STAT MSI
- 4 If the disk drive unit is disabled, enable it:
ENL MSI 0
- 5 Test the disk drive unit:
MSI 0
If the system response is not "OK," see the XI I *input/output guide* (553-3001-400) for the meaning of the message received.
- 6 Exit LD37:

Use this procedure to test the CMDUs in options 61C and 81.

- 1 Log into the system:
LOG1 (password)
- 2 Enter the program:
LD 137
- 3 Make sure the CMDU to be tested is not disabled:
STAT CMDU checks the status of both CMDUs
- 4 If the CMDU to be tested is disabled, enable it:
ENL CMDU x x represents the number for the specific CMDU

- 5 Test the CMDU:

TEST CMDU

If the system response is not "OK," see the
(553-3001-400) for the meaning of the message received.

- 6 Exit LD137:

- 7 To test the second CMDU, enter

LD 135

Switch CPUs:

SCPU

Repeat steps 1 through 6.

Installing earthquake bracing

The Meridian 1 system of universal equipment modules (UEM's) is designed to withstand most earthquakes. However, to ensure this earthquake security, the installation of two kits is required for each column—a bracing kit provides vertical support to each column of modules and an anchor kit secures each pedestal to the floor.

The Meridian 1 system has been certified to two of the most stringent seismic specifications for concrete floor mounting: **BELLCORE** and **CALIFORNIA OSHPD**:

- **BELLCORE** is intended for central-office equipment installations. The requirements are defined in the Network Equipment Building System (NEBS), General Equipment Requirements, TR-EOP-000063 issued by Bell Communications Research (BELLCORE). The Meridian 1 system has been certified to meet the maximum severity (Zone 4).
- **CALIFORNIA OSHPD** as part of the California building code, this specification requires the anchorage of all fixed hospital equipment to be approved by the California Office of Statewide Health Planning and Development (OSHPD), Division of Facilities Development and Financing. Meridian 1 has been certified for such installations under anchorage pre-approval number R-0233.

Selecting the kit

To select the applicable bracing and anchorage kits for your particular installation, you must first determine the following site requirements:

- Identify system configuration (number of columns and modules per column).
- Identify specification requirements (i.e. **BELLCORE** or **CALIFORNIA OSHPD**).

- Determine site mounting floor parameters (this information can usually be found in the engineering building drawings):
 - concrete type (hardrock vs lightweight aggregate),
 - minimum concrete compressive strength (megapascals or psi),
 - minimum concrete thickness

First, choose the appropriate module bracing kit using Table 18-1. Select a separate kit for each column of modules. For column expansion (when an additional module is added to a column which already contains seismic bracing) the expansion bracing kit should be used

Table 18-1
Seismic Bracing Kits

Seismic Bracing Kit	System configuration
NT8D64CD	1 -module
NT8D64CA	2-modules
NT8D64CB	3-modules
NT8D64CC	4-modules
NT8D64BD	expansion

Note: The **NT8D64CD** kit contains neither bracing rods nor tie bars because these are not needed for single module installations. The **NT8D64BD** kit does not contain mounting plates as these are not needed for column expansion.

Next, each column must also be secured to the floor. This is accomplished by installing one of two available anchor kits. Select the anchor kit by comparing the site requirements to Table 18-2. This table shows that either anchor kit can be used to meet the CALIFORNIA OSHPD specification, but only Kit B meets the BELLCORE specification. For those installations where neither specification is required, Kit A is recommended due to its shallower concrete requirement.

Both anchor kits can be used in **hardrock** concrete as long as the compressive strength exceeds 20.7 megapascals (3000 psi). Only Kit A can be used in lightweight aggregate concrete with a compressive strength greater than 27.6 megapascals (4000 psi). The floor parameters for your installation can usually be found in the engineering building drawings.

Table 18-2
Seismic Anchor Kit

Kit	Seismic Anchor Kit	BELLCORE	CAL OSHPD	Concrete thk (min)	Light-weight
A	NT8D64BE	No	Yes	90 mm (3.54")	Yes
B	NT8D64CE	Yes	Yes	180 mm (7.09")	No

The kits listed in Table 18-2 contain commercially available mounting hardware. You have the option of purchasing the contents directly from the manufacturer (using the listing below) or ordering the kits directly from Northern Telecom .

- Kit A (NT8D64BE) contains four of each of the following items:
 - Hilti HDI 3/4" (box of 25, manufacturer part# 457564), Hilti Corporation (918) 252-6000 or, Multi-Set II (manufacturer part# RM-34), ITW Ramset/Redhead, Incorporated (219) 874-4217
 - Hex head bolt, Ø.3/4"- 10 x 1.50" long, steel material, zinc plate finish
 - Flat washer, internal diameter = 0.812", outside diameter=1.469", thickness = 0.120", steel material, zinc plate finish

-Kit B (NT8D64CE) contains four of the following item:

- Hilti HSL M16/25 (box of 10, manufacturers part# 665934),?Hilti Corporation (918) 252-6000

Finally, to aid installation, two kits have been developed. The first is a seismic anchor hole template kit, NT8D64BH—it provides a mylar template to aid floor marking. The second is a drill fixture kit, NT8D64BG—it provides a large mechanical fixture which aligns and supports the bit when hammer-drilling the concrete holes. Only one kit is needed for an installation and both kits are reusable.

Drilling the floor

The following tools are required to drill the holes for the anchor bolts:

- anchor hole template kit, NT8D64BH
- dark marking pencil
- center-punch
- drill fixture kit, NT8D64BG
- rotary hammer drill
 - carbide-tip drill bit:?
 - 1.00 inch diameter(for Kit A, NT8D64BE)?
 - 24 mm diameter(for Kit B, NT8D64CE)
- blowout bulb or compressed air source
- hammer or mallet
- vacuum

WARNING

Wear safety goggles when drilling anchor holes. For all drilling, use the appropriate tools and follow local codes. Make sure to obey all safety and warning precautions provided by the hammer drill and anchor bolt manufacturers.

Note: The following description applies only to installations into concrete floors.

- 1 Using the equipment room floor plan mark the position of all of the columns.
- 2 Using the anchor hole template (**NT8D64BH**) and a dark marking pencil, mark the location of the four primary anchor holes for each column.
- 3 Center-punch each of the hole centers.
- 4 Using a carbide-tipped drill bit, hammer drill the holes to the size and depth shown in Table 18-3. Northern Telecom offers drill fixture kit **NT8D64BG** to aid this process.

Table 18-3
Anchor hole sizes

Kit	Kit part number	Hole diameter	Hole depth
A	NT8D64BE	1.00 inch	3.18 inch
B	NT8D64CE	24 mm	125 mm

Note: Special care should be taken in drilling the holes. The holes have to be drilled straight and perpendicular to the floor surface in order for the anchors to be installed correctly. The drill fixture kit can aid this process.

- 5 Should you hit reinforcing bar or the hole breaks through, abandon that hole and use the secondary hole location indicated in the anchor hole template.
- 6 Remove any debris from the holes with a blowout bulb or compressed air. Use a vacuum to dispose of the debris.
- 7 If the mounting plates are not to be installed immediately, cover the anchor holes to prevent debris from falling into them.

Installing anchor plates

The following tools are required to install the anchors and the anchor plates:

- Kit A
 - setting tool (**Hilti HST 3/4"**, manufacturer **part#329821**)
 - 1 1/8 inch open-end wrench
- Kit B
 - 24 mm open-end wrench

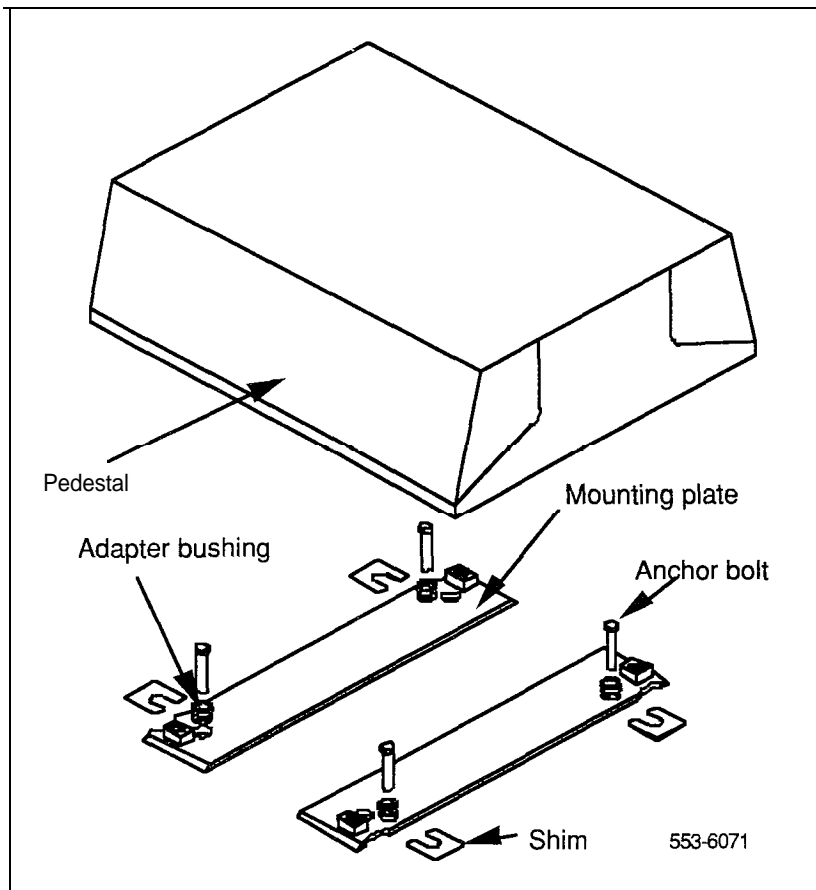
Procedure for installing Kit A

- 1 Insert the anchors into the holes. Use the manufacturer's setting tool to install each anchor flush with the surface of the concrete. The setting tool is required for the **Hilti** anchor.
- 2 Locate the two mounting plates for each column over the anchors. Place an adapter bushing into each of the plate holes and insert a 3/4 -inch diameter bolt and flat washer as shown in Figure 18-1
- 3 Level the plates with shims. Leave the stack of shims exposed until all leveling has been completed (this will allow the addition or removal of shims if necessary).
- 4 If the installation must meet CALIFORNIA OSHPD, tension proof load testing is required on 50 percent of the anchor bolts. These anchors must be tested to 24,020 newtons (5400 pounds) tension and 122 newton-meters (90 foot-pounds) torque. Any failure requires testing of all remaining anchors.
- 5 Go to "Installing rods".

Procedure for installing Kit B:

- 1 Locate the two mounting plates for each column over the anchor holes. Insert the anchors into the holes and tap the anchors into place with a mallet.
- 2 Level the plates with shims. Leave the stack of shims exposed until all leveling has been completed (this will allow the addition or removal of shims if necessary).

Figure 18-1
Mounting plate installation



- 3 If the installation must meet CALIFORNIA OSHPD, tension proof load testing is required on 50 percent of the anchor bolts. These anchors must be tested to 6230 newtons (1400 pounds) tension and 122 newton-meters (90 foot-pounds) torque. Any failure requires testing of all remaining anchors.
- 4 Go to "Installing rods".

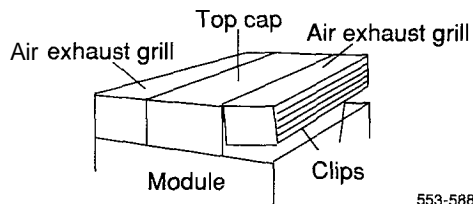
Installing rods

The following tools are required to install the rods:

- 5/16 inch socket wrench
- 1/2 inch open-end wrench (for rods)
- 9/16 inch open-end wrench (for nuts)

Note: The rods should be installed before you position the columns.

- 1 Remove the top cap on each column:
 - Pull forward on the clips underneath the front edge of each air exhaust grill on the top cap. Lift up and remove the grill.



- Use a 5/16 in. socket wrench to remove the six screws that secure the top cap (see Figure 18-2). Lift the top cap from the column.
- 2 Remove the side panels on the exterior of each module by removing the four bolts that secure the panel.

Note: In a two-tier or three-tier column, with adequate ceiling clearance, you may be able to thread the rods down the sides of the column without removing the side panels. Insert each rod into its hole at the top of the column.

3 Install bracing rods:

- Position each rod in one of the vertical slots along the sides of the modules and insert the rods into the threaded holes in the pedestal (see Figure 18-3). Tighten the rods in by hand or snug tight with a 1/2" open-end wrench.
- Place a tie bar over each pair of rods, from side to side across the top of the module, as shown in Figure 18-3.
- Secure the tie bars with flat washers and hexagon nuts. Torque with 9/16" wrench to 17.6 joules (13.0 ft-lbs).

Note: When installing expansion rods as part of the **NT8D64BD** bracing kit, the rods are screwed into the previously-installed rods by means of a coupling nut. The resulting two-piece rod should be secured in the same **manner** as the single rod described above.

4 Reinstall the top cap and grills:

- Position each top cap and install the bolts that secure it.
- Replace the air exhaust grills at the front and rear of each top cap.

5 For a single-column system, reinstall the side panels on each module.

For a multiple-column system, install **NT8D49AA** Spacer Kits between adjacent columns:

- Attach gaskets to both sides in the front section of each spacer (see Figure 18-4).
- Attach a spacer to one side of each module that will be next to another module, except on the end column (see Figures 18-5 and 18-6). Insert the screws through holes in the trim panels.

6 Go to "Positioning and leveling the system" on page 18-15.

Figure 18-2
Top cap assembly

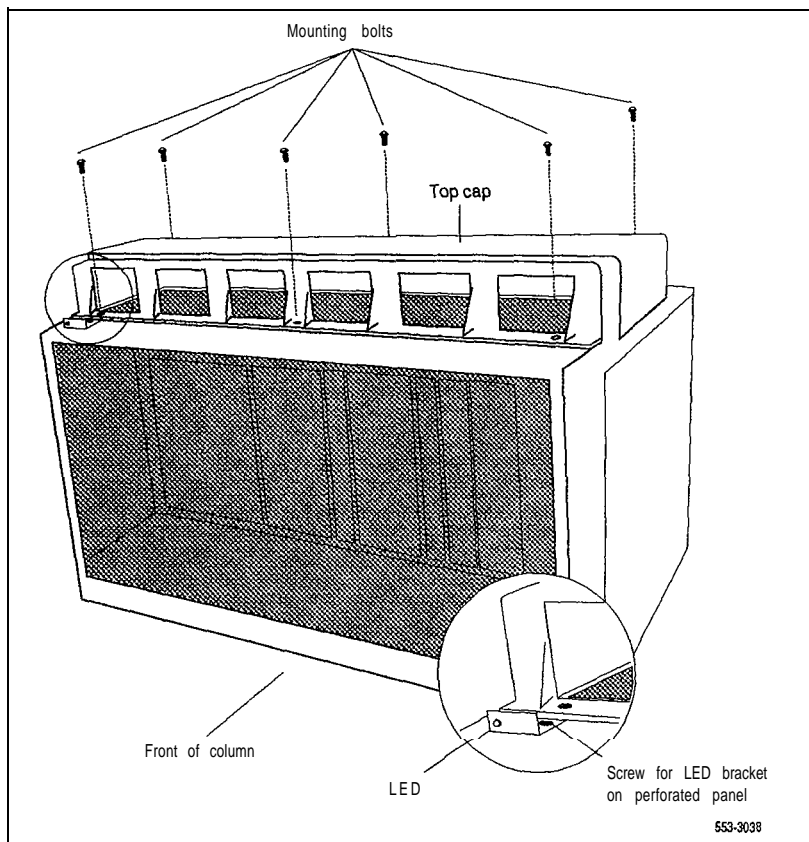
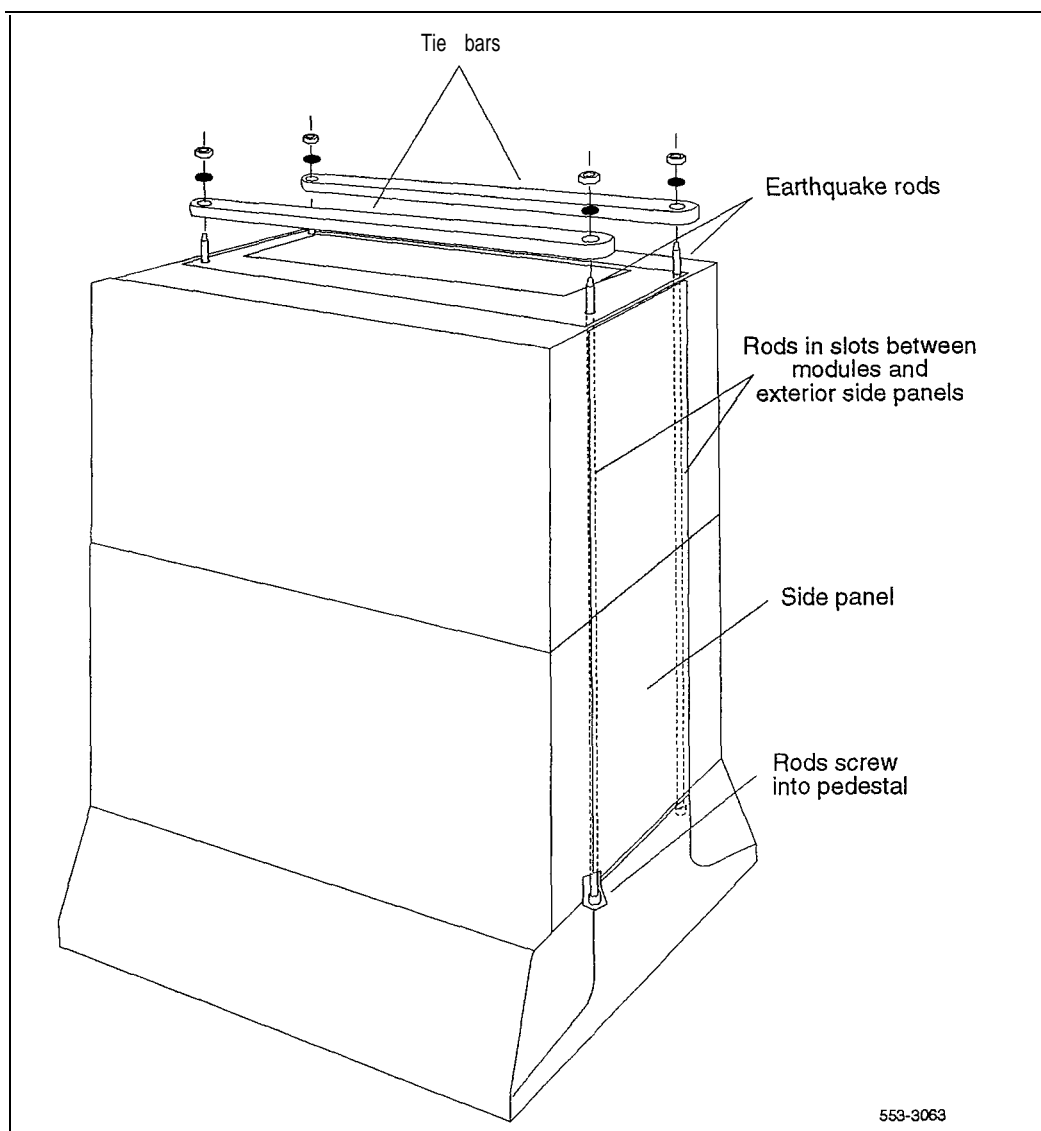


Figure 18-3
Installing bracing rods for column support



18-12 Installing earthquake bracing

Figure 18-4
Positioning spacer gaskets

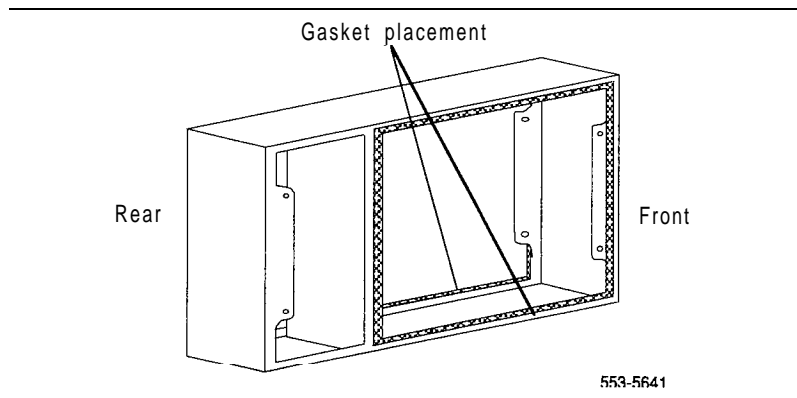


Figure 18-5
Spacer positioning

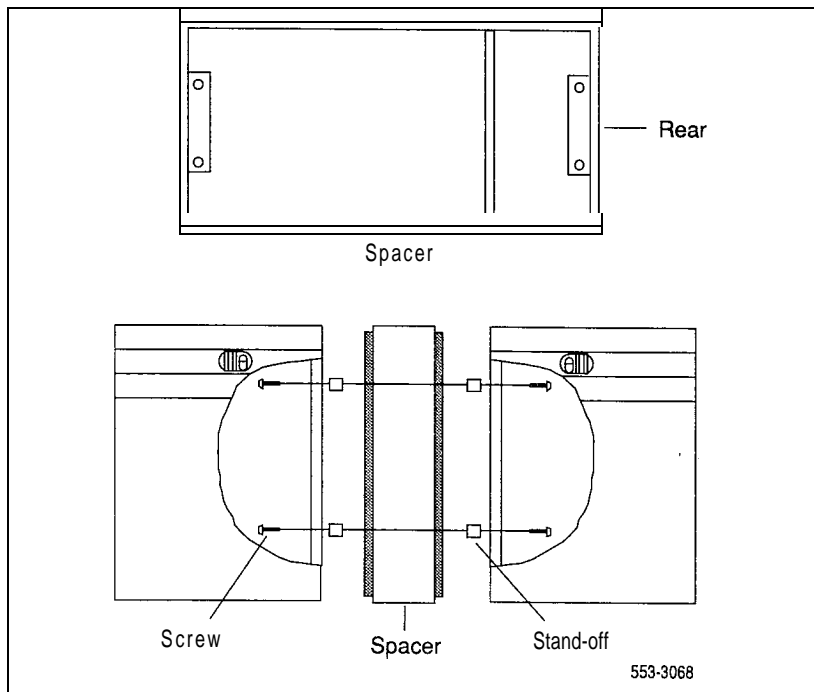
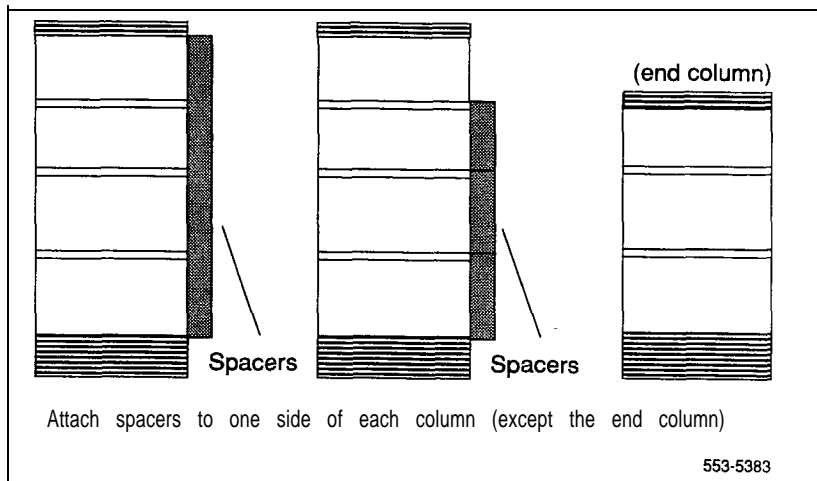


Figure 18-6
Adding spacers to columns



Positioning and leveling the system

The following tools are required to position and level the system:

- socket wrench (anchor bolts):
 - 1 1/8 inch for Kit A
 - 24mm for Kit B
- 5/8" socket wrench (pedestal bolts)

Follow the steps below to level the system:

- 1 Loosen the anchor bolts until the mounting plates are free to move.
- 2 Starting from one end of the line-up, move a column into position.
- 3 Loosely install the pedestal mounting hardware (1/2" bolts, lockwasher, plain washer, and insulating washer), using the plastic insulating washers.
- 4 Re-level the column, adding or removing shims as needed. Go back and re-level any other columns.
- 5 Repeat the above steps until all columns have been positioned.
- 6 Slide shims completely under seismic plates. First tighten the pedestal mounting bolts, torque to 122 Newton-meters (90 ft-lbs). Then, tighten the concrete anchors, torque to 48 Newton-meters (35 ft-lbs).

Installing anchors and angle brackets

Do not position columns until the anchor holes are drilled in the floor and the anchors are installed.

Note: The anchors provided in the earthquake bracing kits can be used in concrete floors only.

The following tools are required to install the anchors:

- 1/2-in. diameter carbide-tip drill bit
- 3/4-in. wrench
- 5/8-in. diameter high-speed steel drill bit
- blowout bulb or compressed air source
- dark marking pencil
- hammer or mallet
- rotary hammer drill

In addition, a drill jig (PO7 12690) is available to aid in locating and drilling anchor holes. To order this tool, contact your Northern Telecom representative.

WARNING

Wear safety goggles when drilling anchor holes. For all drilling, use the appropriate tools and follow local codes. Follow all safety and warning precautions provided with drilling equipment.

- 1 Using the equipment room floor plan, mark the position of all the columns.
- 2 Using the floor layout template shown in Figure 18-7, mark the location of the anchor holes for the foot anchors and the angle brackets for all of the pedestals.

CAUTION

Contact the building facilities supervisor. Find out if the floor concrete meets the minimum compressive standard, FC = 2500 PSI. Also determine if the floor is thick enough to drill holes a minimum of 14.8 cm (5.85 in.) deep.

- 3 Drill the anchor holes 1.3 cm (0.5 in.) in diameter and at least 14.8 cm (5.85 in.) deep. Remove any debris from the holes.
- 4 Install the anchors in the holes and remove the bolts (they will be used later) from the anchors. (If the columns will not be positioned immediately, cover the anchor holes to prevent debris from falling into them.)
- 5 Remove the four leveling feet on each pedestal and drill the mounting holes to 1.6 cm (5/8 in.) in diameter. (If the mounting holes cannot be drilled at this time, drill them before the columns are positioned.)
- 6 Position the columns and secure the foot anchors:
For a single-column system, position the column over the anchor holes in the floor.
 - Install two 1 -cm (3/8-in.) spacer washers between the pedestal and the floor at each of the anchor holes. If the column is not level, insert slotted shims between the spacer washers and the floor as required to level the column.
 - Insert the anchor bolts (with washers) through the foot mounting holes and into the anchors (see Figure 18-8). Torque to 78.6 to 81.3 joules (58 to 60 ft-lbs).

Figure 18-7
Floor layout template

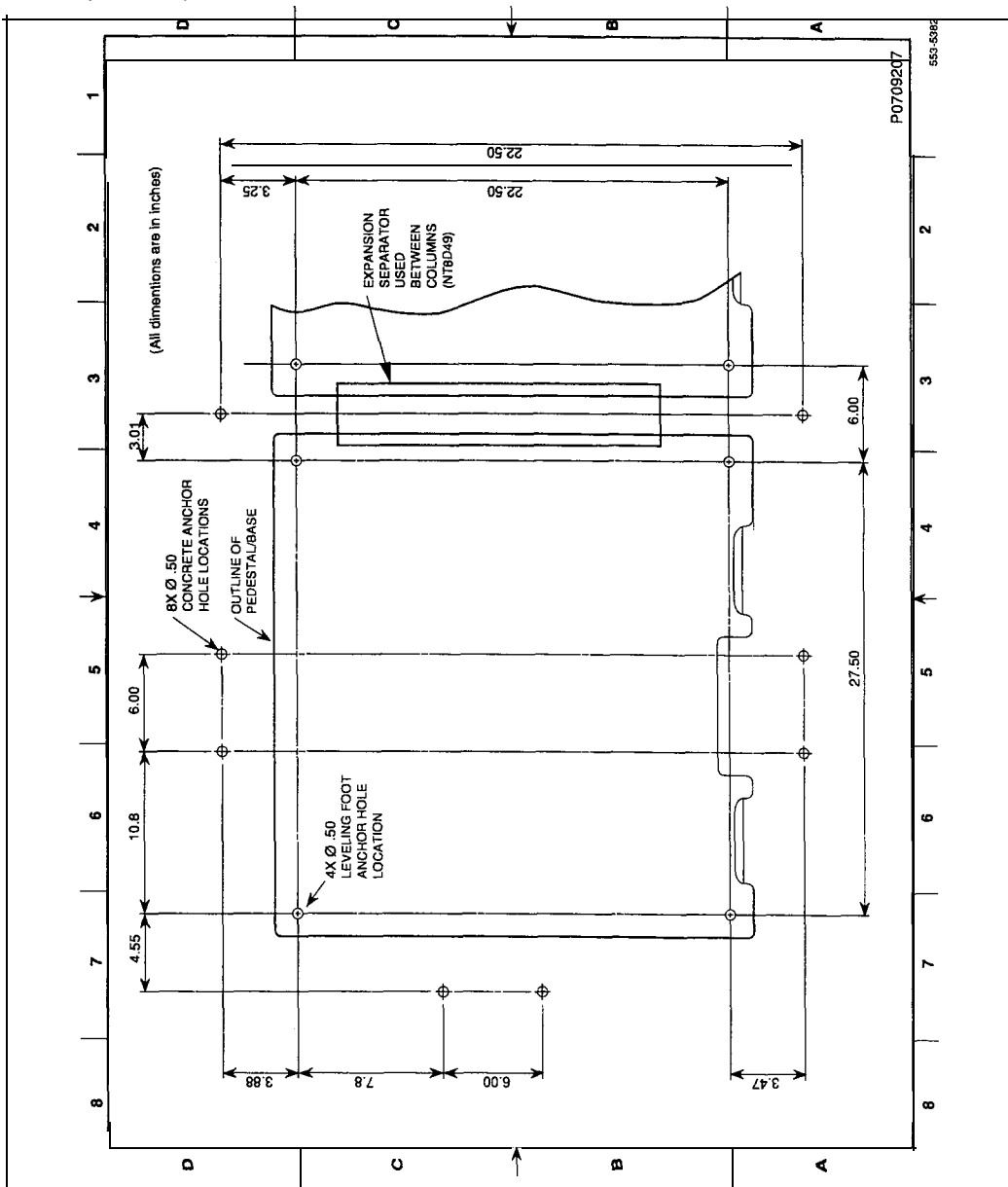
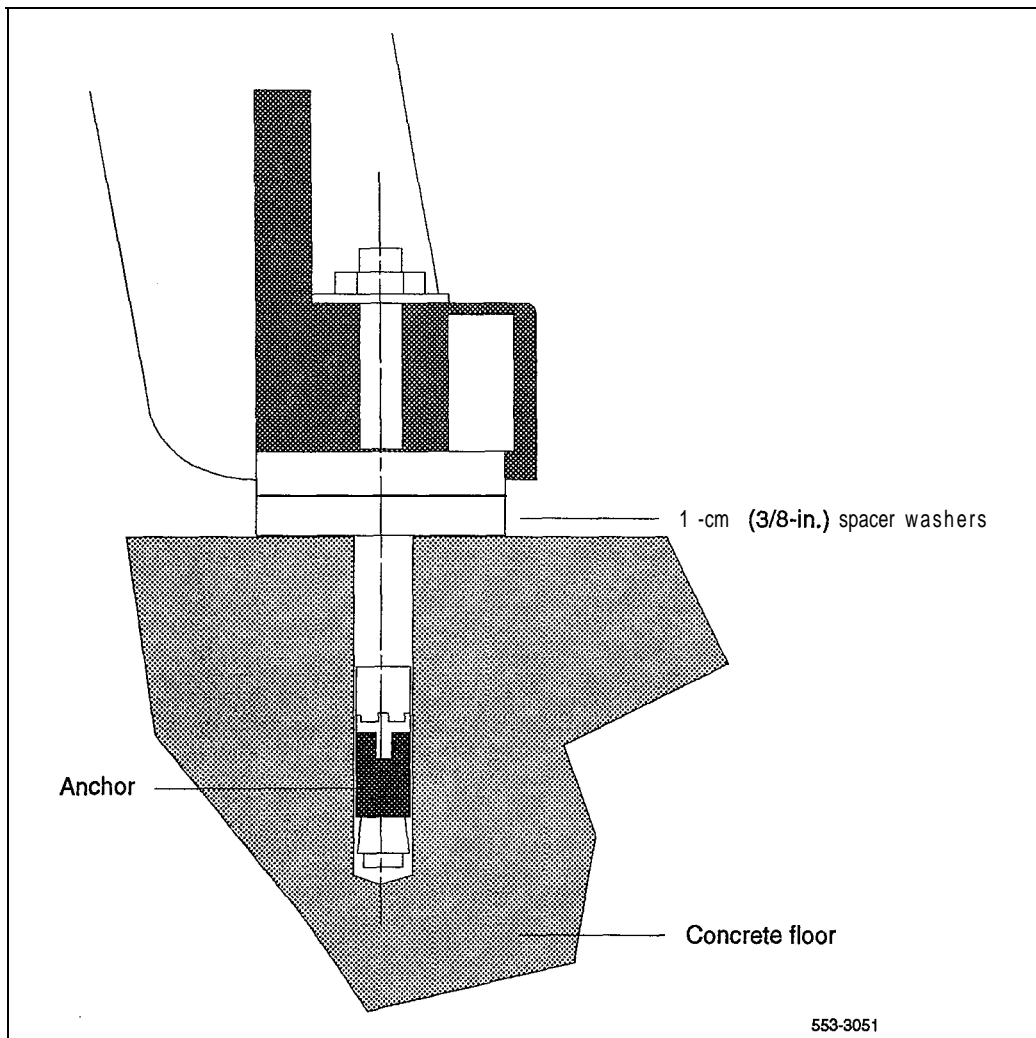


Figure 18-8
Anchor bolt installation



For a multiple-column system, position one column in its designated position, over the anchor holes in the floor.

- Install two 1-cm (3/8-in.) spacer washers between the pedestal and the floor at each of the anchor holes. If the column is not level, insert slotted shims between the spacer washers and the floor as required to level the column.
- One at a time, position the columns and install the spacer washers between the pedestal and the floor. Level each column, using shims as required, and align each column with the adjacent column.
- Insert the anchor bolts (with washers) through the foot mounting holes and into the anchors (see Figure 18-8). Torque to 78.6 to 81.3 joules (58 to 60 ft-lbs).
- Attach the spacers to the adjacent column (see Figure 18-9).

7 Install the angle brackets:

- At the base of the pedestal, place the angle brackets flush against each side of the pedestal (see Figure 18-10) with the mounting holes over the anchor holes.

Note: For a multiple-column system, use a spacer bracket, instead of an angle bracket, between adjacent columns.

- Insert the anchor bolts (with washers) through the mounting holes in the angle brackets into the anchors. Torque to 78.6 to 81.3 joules (58 to 60 ft-lbs). Place a cap screw over the top of the bolt.

8 Test the tension proof load at 1338 kg (2948 lb) on 50 percent of the anchors. If any anchor fails, test the remaining anchors.

Note: Use any method that effectively measures the tension in the anchor, such as a direct pull with a hydraulic jack, a torque wrench calibrated for use with the anchor, or a calibrated spring loading device.

If the tension proof load requirement is not met, redrill the holes at another location or install an alternate anchor, such as the **Hilti** HVA Adhesive Anchor (**Hilti** part number 000459578) that is approved for this application at a proof load value of 1686 kg (3716 lbs).

Figure 18-9
Attaching spacers

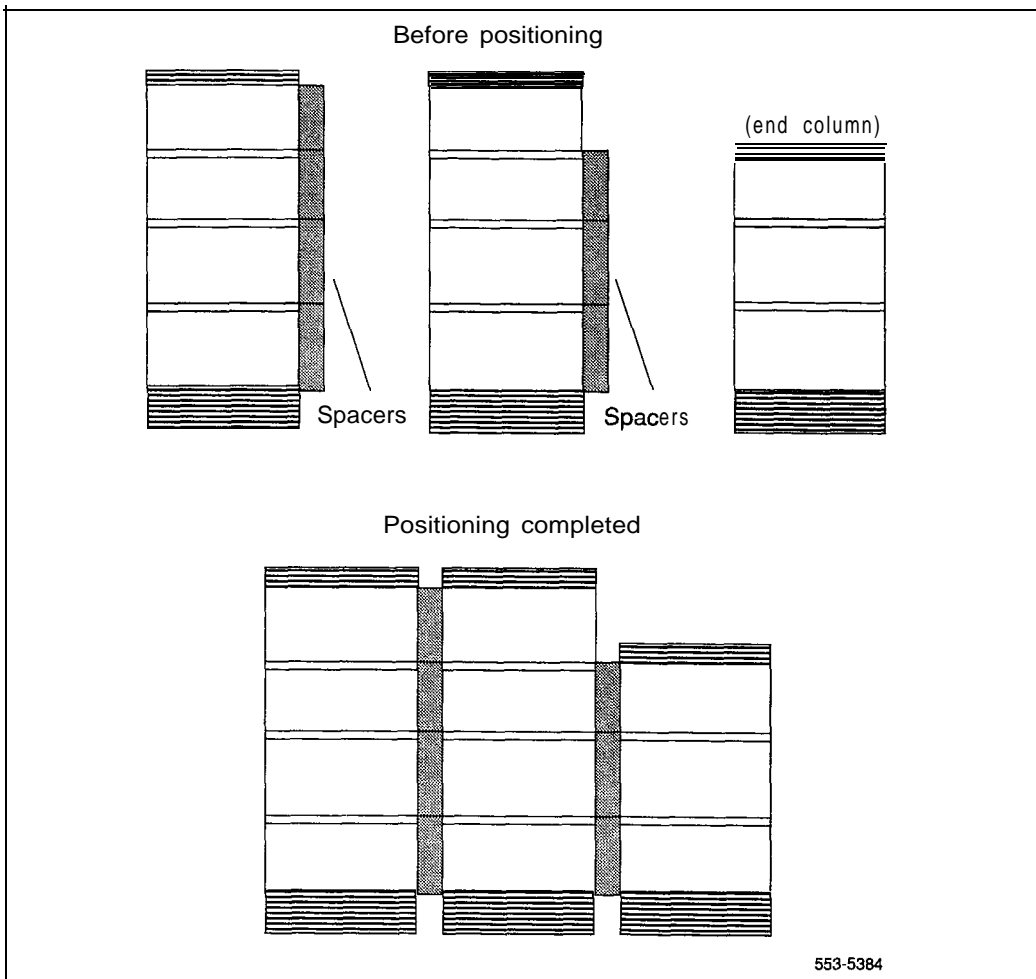
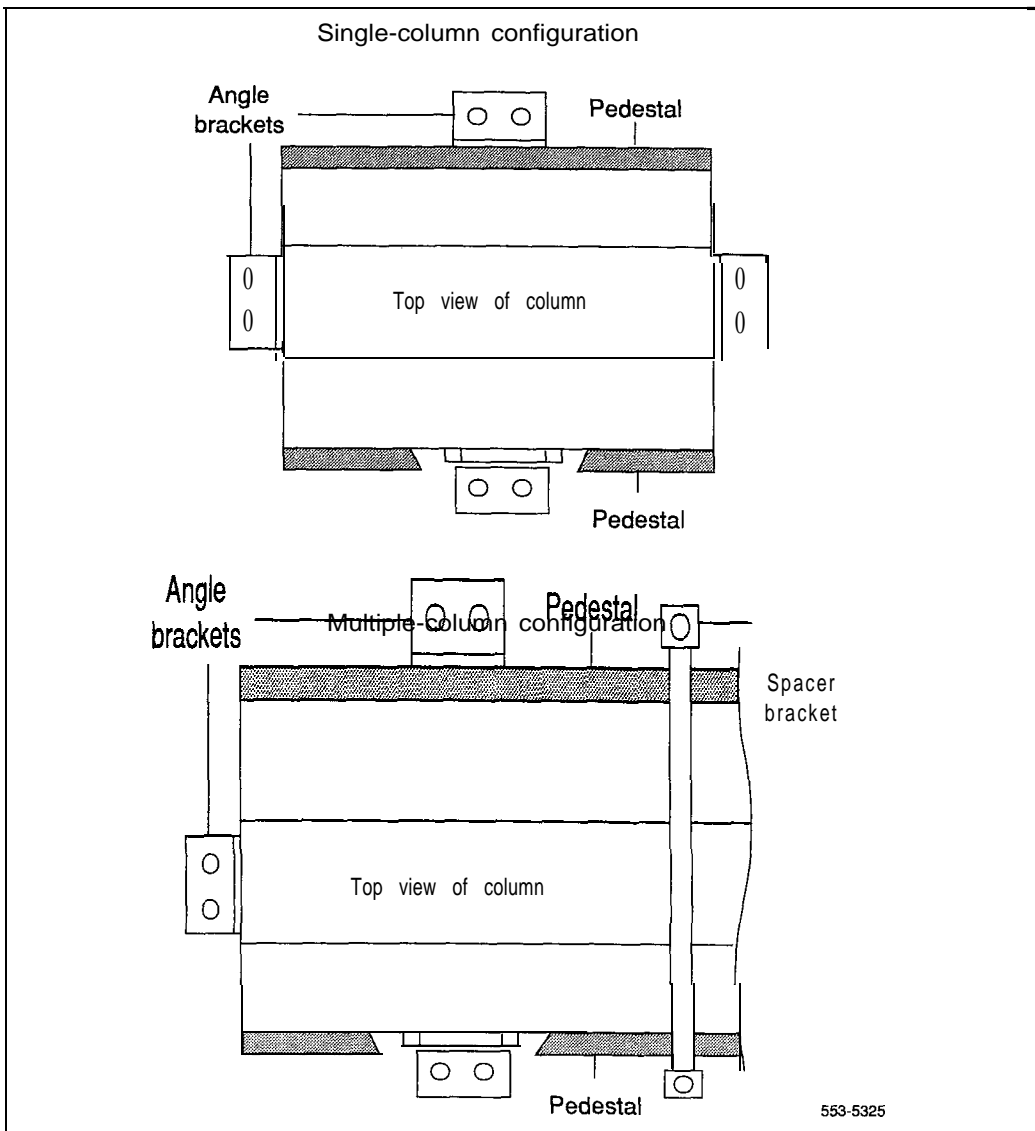


Figure 18-10
Angle bracket placement



Configuring remote peripheral equipment

Remote peripheral equipment (RPE) allows you to locate peripheral equipment (PE) at a site up to 112.7 km (70 miles) from common equipment (CE) by converting multiplexed loop signals to a form compatible with T-1 type digital transmission. Any medium that conforms to the DS-1 format (1.544 Mbps), including digital microwave radio and fiber optic transmission, may be used to link local and remote sites.

NT8D47 RPE Modules can be configured in:

-an existing column

RPE Modules can be installed at any level in a column.

-a stand-alone RPE column

The column consists of the RPE Module, a peripheral equipment module, the top cap, and the pedestal.

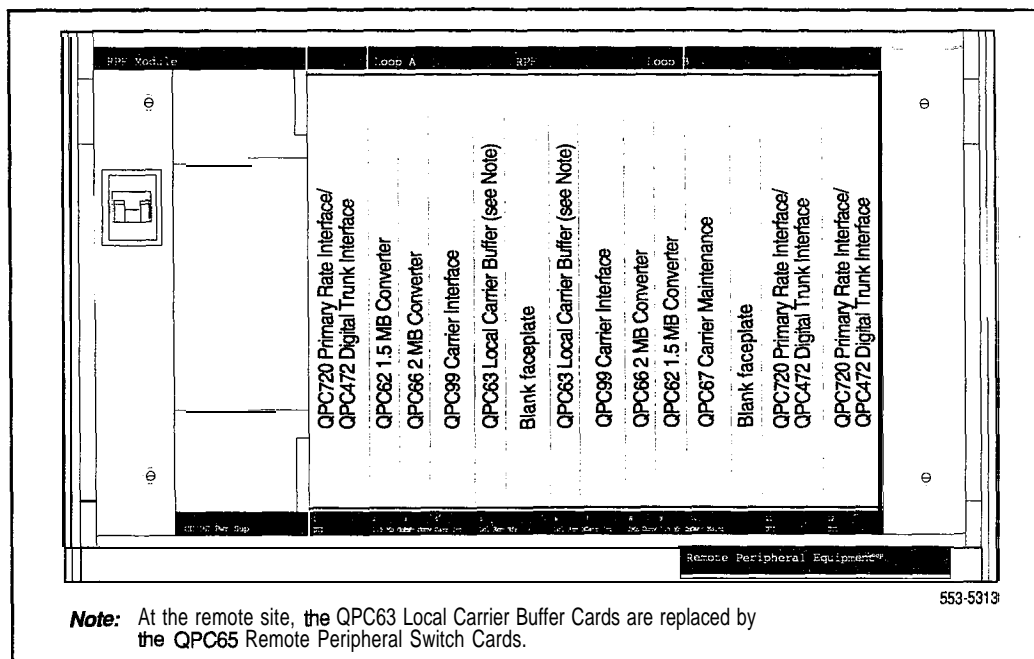
RPE Modules house the following cards (see Figure 19-1):

- slots 2 and 9: QPC62F (or later vintage) 1.5 Mbyte Converter Card
- slots 3 and 8: QPC66E (or later vintage) 2 Mbyte Converter Card
- slots 4 and 7: QPC99F (or later vintage) Carrier Interface Card
- slots 5 and 6: local end-QPC63F (or later vintage) Local Carrier Buffer Card; remote end-QPC65D (or later vintage) Remote Peripheral Switch Card
- slot 10: QPC67E (or later vintage) Carrier Maintenance Card

Note: QPC720 Primary Rate Interface (PRI) and QPC472 Digital Trunk Interface (DTI) Cards can be used in slots 1, 11, and 12, but these cards are not related to the RPE function.

19-2 Configuring remote peripheral equipment

Figure 19-1
Card slots in the **NT8D47 RPE** Module

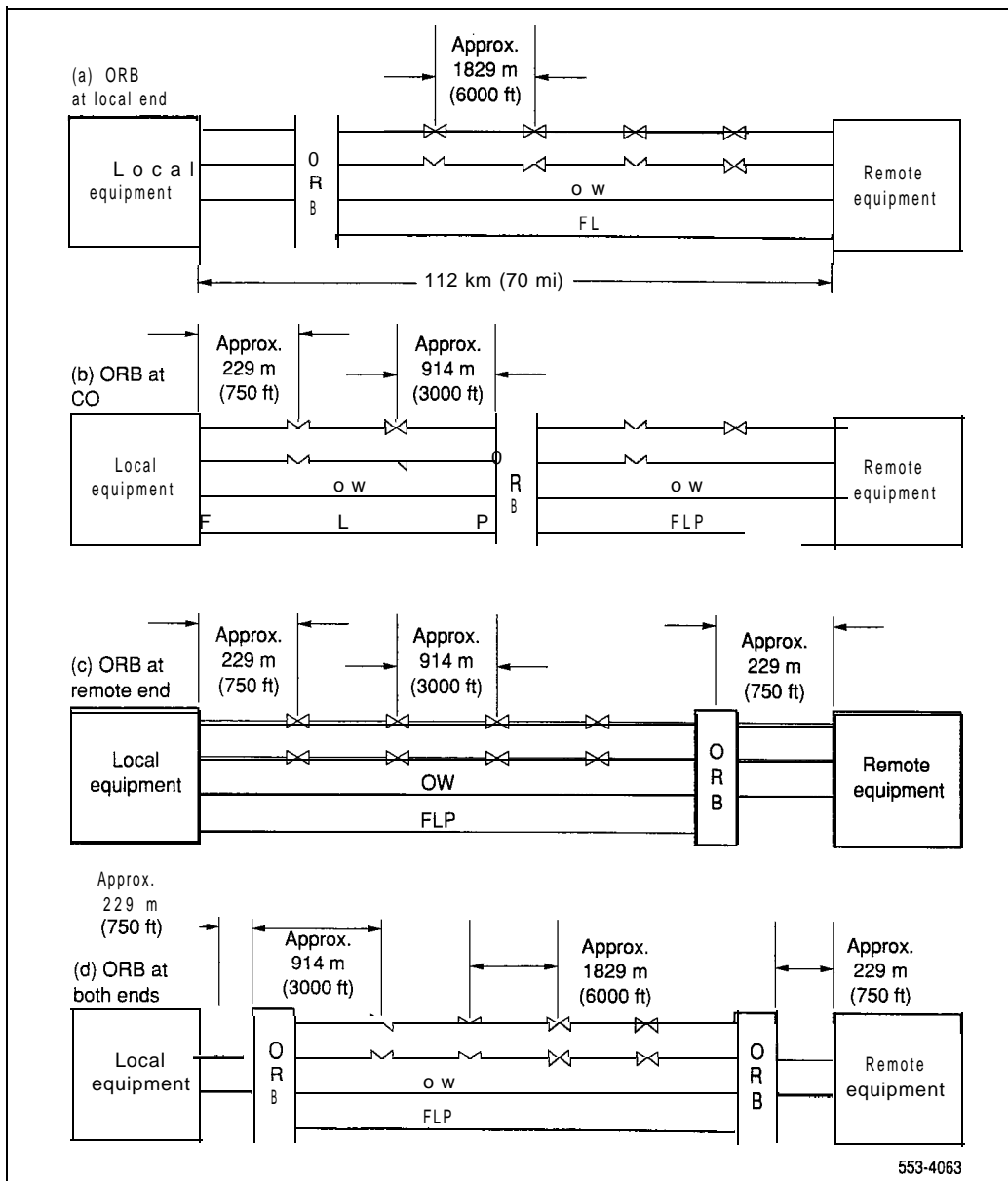


In an RPE configuration, the common equipment site is the “local” site; the site without common equipment is the “remote” site.

If the distance between local and remote sites is more than 726 m (2500 ft), an office repeater bay (ORB) is required to effectively isolate the carrier span from the Meridian 1 equipment (see Figure 19-2). An ORB provides:

- span line powering
- error monitoring
- fault-locate system access
- order-wire termination with DID access
- line looping

Figure 19-2
Possible ORB locations in the RPE system



19-4 Configuring remote peripheral equipment

The local and remote sites are connected through two 50-pin connectors, C and D, on the rear of the backplane in RPE Modules (see Figure 19-3). Two 25-pair cables connect the C and D connectors to the input/output (I/O) panel of the RPE Module (see Figure 19-4).

At the local site, the RPE Module and the Network Module are connected through 36-pin connectors, E and F, on the rear of the RPE backplane (see Figure 19-3). Two 1 8-pair cables connect the E and F connectors to the faceplate connectors on a QPC414 Network Card in the Network Module.

At the remote site, the RPE Module and PE Modules are connected through backplane connectors E and F (see Figure 19-3). Eighteen-pair cables connect the E and F connectors to the faceplate connectors on QPC659 Dual Loop Peripheral Buffer (DLB) Cards in two PE Modules (the PE Modules support only single loop mode).

The RPE Module accommodates two network loops. The number of RPE Modules required per system depends on the number of connections required at the remote site. If only one network loop is required, only half of the card slots in the module are used. However, the QPC67 Carrier Maintenance Card is always required.

Note: The connector used (E or F) determines which card slots are used. Connector F supports slots 1 through 5. Connector E supports slots 6 through 10.

Figure 19-3
RPE Module backplane

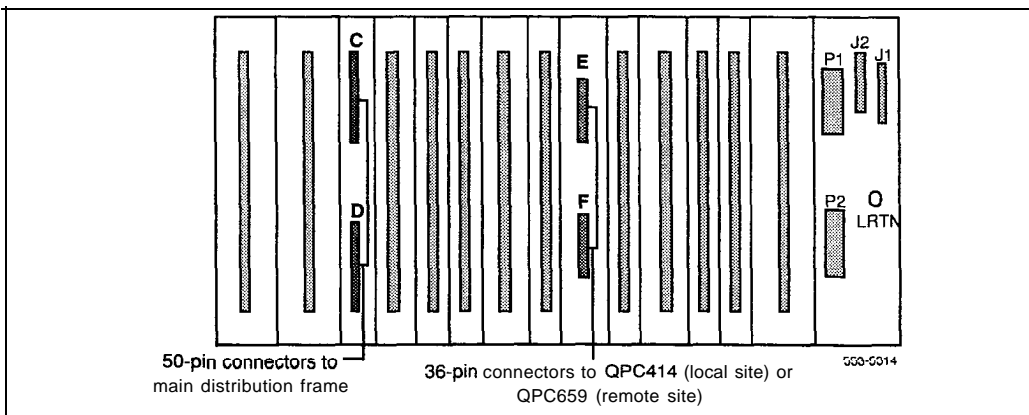
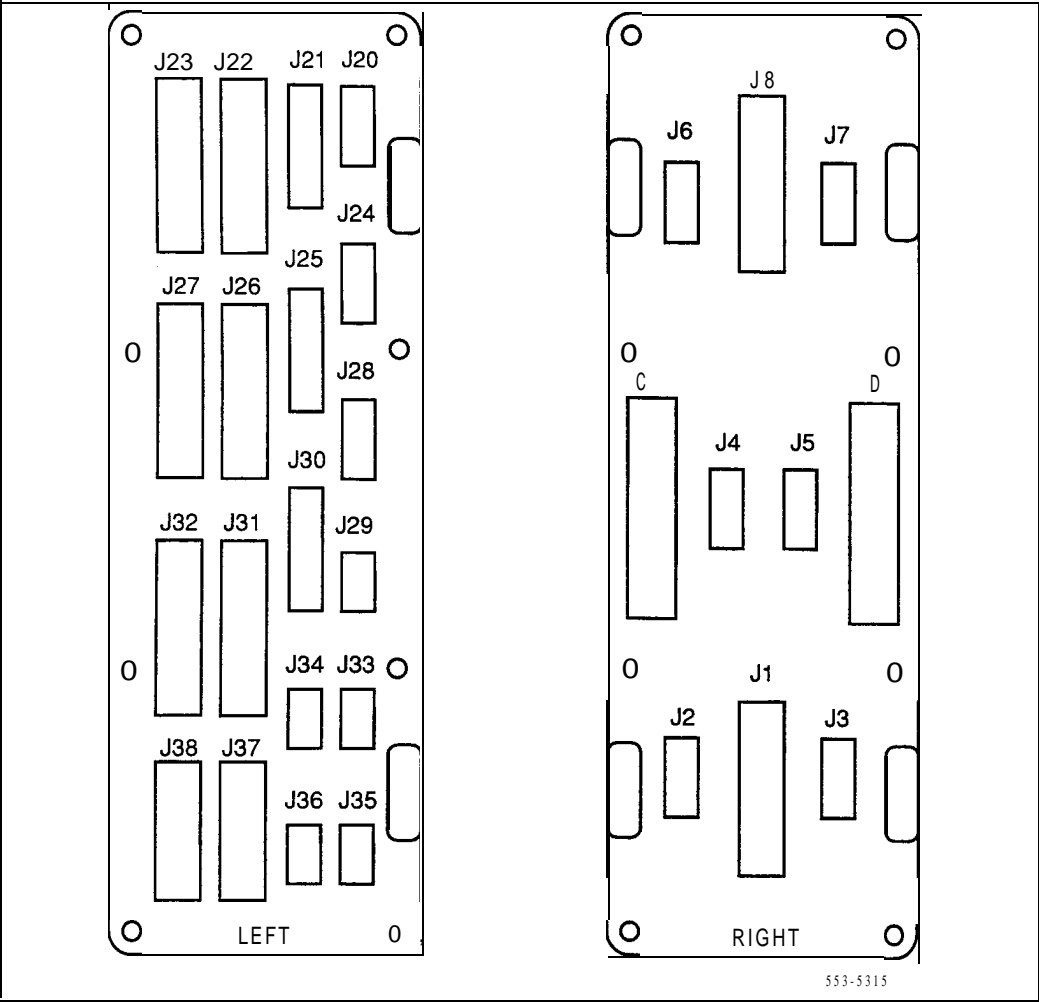


Figure 19-4
input/output panel



Installing RPE

Refer to Figure 19-5 throughout this procedure.

1 Install RPE Modules:

- To install an RPE Module in an existing column, follow the appropriate procedure in “Adding a module to a column” on page 20-1.
- To install a stand-alone RPE column, follow the procedures in “Initial Meridian 1 installation” on page 2- 1.

2 For local RPE installation, connect an **NT8D85** cable from connector E or F on the backplane of the RPE Module to a faceplate connector on the QPC414 Network Card in the network module.

Note: If two network loops are required, attach both E and F to the two faceplate connectors on the QPC414 Network Card.

3 For remote RPE installation, connect an **NT8D85** cable from connector E or F on the backplane of the RPE Module to faceplate connector LPX on the QPC659 DLB Card in a PE Module.

Note: Each DLB card can serve only one RPE loop.

4 Connect two **NT9J94AB** cables from connectors C and D on the backplane of the RPE Module to cut-outs C and D on the I/O panel.

5 Connect two standard **25-pair A25B** connector cables (tip and ring **Amphenol** cables) from cut-outs C and D on the I/O panel to the main distribution frame (**MDF**).

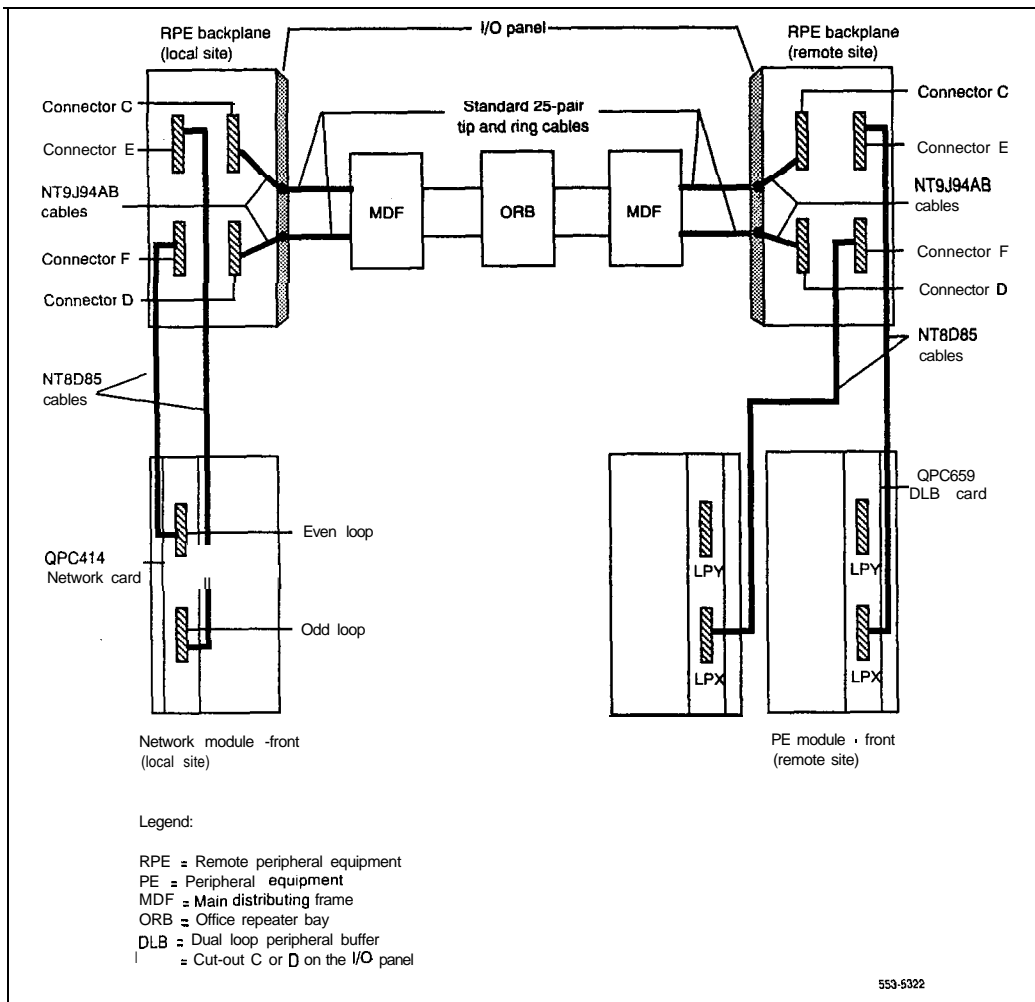
6 Check the option switch settings on the QPC62, QPC66, and QPC99 cards. Check the switch settings on the **PRI/DTI** cards, if equipped. See “RPE option switch settings” on page 19- 17.

7 Inspect the equipment:

- Set all circuit breakers to OFF.
- Lock all cards into their assigned slots.
- Secure all cable connectors.

- 8 For remote RPE installation, set all system monitors as slaves. See "RPE option switch settings" on page 19-17.
- 9 Perform the acceptance tests at the end of this chapter.

Figure 19-5
Remote peripheral equipment cabling



Connections

All cables, except connector C, D, E, and F cables, are terminated and designated as described in *Telephone and attendant console installation* (553-3001-215). Connector C, D, E, and F cable designations are shown in Tables 19-1, 19-2, 19-3, and 19-4.

Telephones and consoles are cross-connected to PE modules as described in *Telephone and attendant console installation* (553-3001-215).

The local and remote RPE Modules are cross-connected to the digital carrier cable pairs, as shown in Figure 19-6 and Figure 19-7.

The RPE maintenance leads are cross-connected, as shown in Figure 19-g.

Table 19-1
Connector C pin assignments (receive signal cable)

Pin number	Lead color	Signal name
c-1	BL-W	C1A
c-2	o-w	C3A
c-3	G-W	C9A
c-4	BR-W	C11A
C-5	s-w	OWT
C-6	BL-R	FLT
c-7	O-R	FLWAA
C-6	G-R	WFIT
c-9	DR-R	OWAT
c-10	S-R	FIAT
C-11 through C-24		GND
C-26	W-BL	C2A
C-27	w-o	C4A
C-28	W-G	C10A
c-29	W-BR	C12A
c-30	w-s	OWR
c-31	R-BL	FLR
C-32	R-O	FLWBA
c-33	R-G	WFIR
c-34	R-DR	OWAR
c-35	R-S	FLAR
C-36 through C-49		GND

19-10 Configuring remote peripheral equipment

Table 19-2
Connector D pin assignments (transmit signal cable)

Pin number	Lead color	Signal name
D-1	BL-W	C5A
D-2	o-w	C7A
D-3	G-W	CI 3A
D-4	BR-W	CI 5A
D-5	s-w	GND
D-6	BL-R	PFT1
D-7	O-R	PFT3
D-8	G-R	DCST
D-9	BR-R	DETT
D-10 through D-24		GND
D-26	W-BL	C6A
D-27	w-o	C8A
D-28	W-G	C14A
D-29	W-BR	C16A
D-30	w-s	GND
D-31	R-BL	PFT5
D-32	R-O	PFT6
D-33	R-G	DCSR
D-34	B-BR	DETR
D-35 through D-49		GND

Table 19-3
Connector E pin assignments

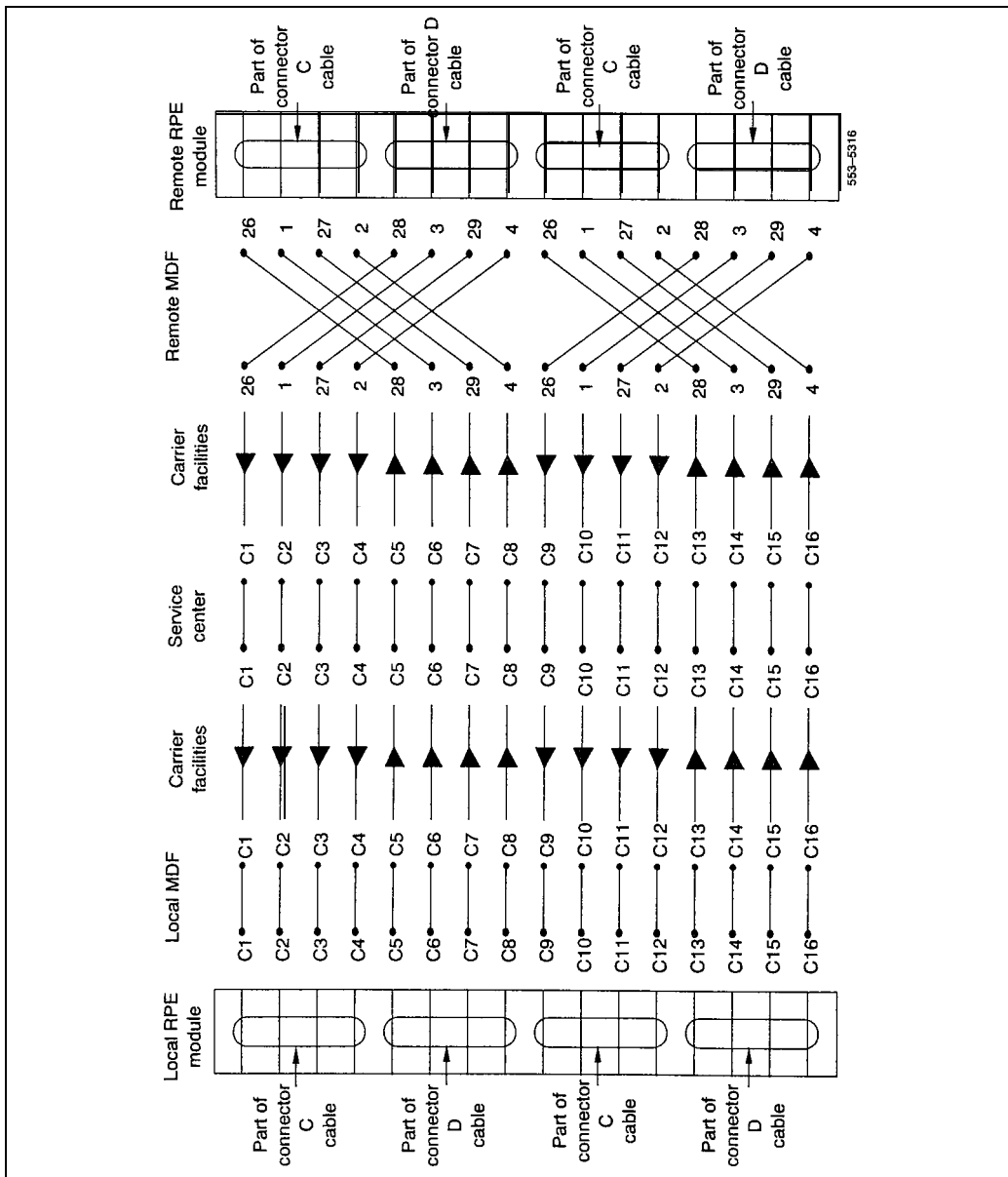
Pin number	Signal name	Pin number	Signal name
E-1	-SEN02	E-19	SEN02
E-2	-SEN12	E-20	SEN12
E-3	-SEN22	E-21	SEN22
E-4	-SEN32	E-22	SEN32
E-5	LPIN02	E-23	-LPIN02
E-6	LPIN12	E-24	-LPIN12
E-7	LPIN22	E-25	-LPIN22
E-8	LPIN32	E-28	-LPIN32
E-9	LN02	E-27	-LN02
E-10	LN12	E-28	-LN12
E-i 1	CN22	E-29	-CN22
E-12	CN32	E-30	-CN32
E-13	CN42	E-31	-CN42
E-14	CN52	E-32	-CN52
E-1 5	MFSS2	E-33	-MFSS2
E-1 6	-BYP2	E-34	BYP2
E-1 7	M42	E-35	-M42
E-1 8	LP02	E-36	-LP02

19-12 Configuring remote peripheral equipment

Table 19-4
Connector F pin assignments

Pin number	Signal name	Pin number	Signal name
F-1	-SEN01	F-19	SEN01
F-2	-SEN11	F-20	SEN11
F-3	-SEN21	F-21	SEN21
F-4	-SEN31	F-22	SEN31
F-5	LPIN01	F-23	-LPIN01
F-6	LPIN11	F-24	-LPIN11
F-7	LPIN21	F-25	-LPIN21
F-6	LPIN31	F-26	-LPIN31
F-9	LN01	F-27	-LN01
F-10	LN11	F-28	-LN11
F-11	CN21	F-29	-CN21
F-12	CN31	F-30	-CN31
F-13	CN41	F-31	-CN41
F-14	CN51	F-32	-CN51
F-15	MFSSI	F-33	-MFSSI
F-16	-BYP1	F-34	BYP1
F-17	M41	F-35	-M41
F-18	LP01	F-36	-LP01

Figure 19-6
Local-to-remote RPE cross-connections



19-14 Configuring remote peripheral equipment

Figure 19-7
MDF cross-connections

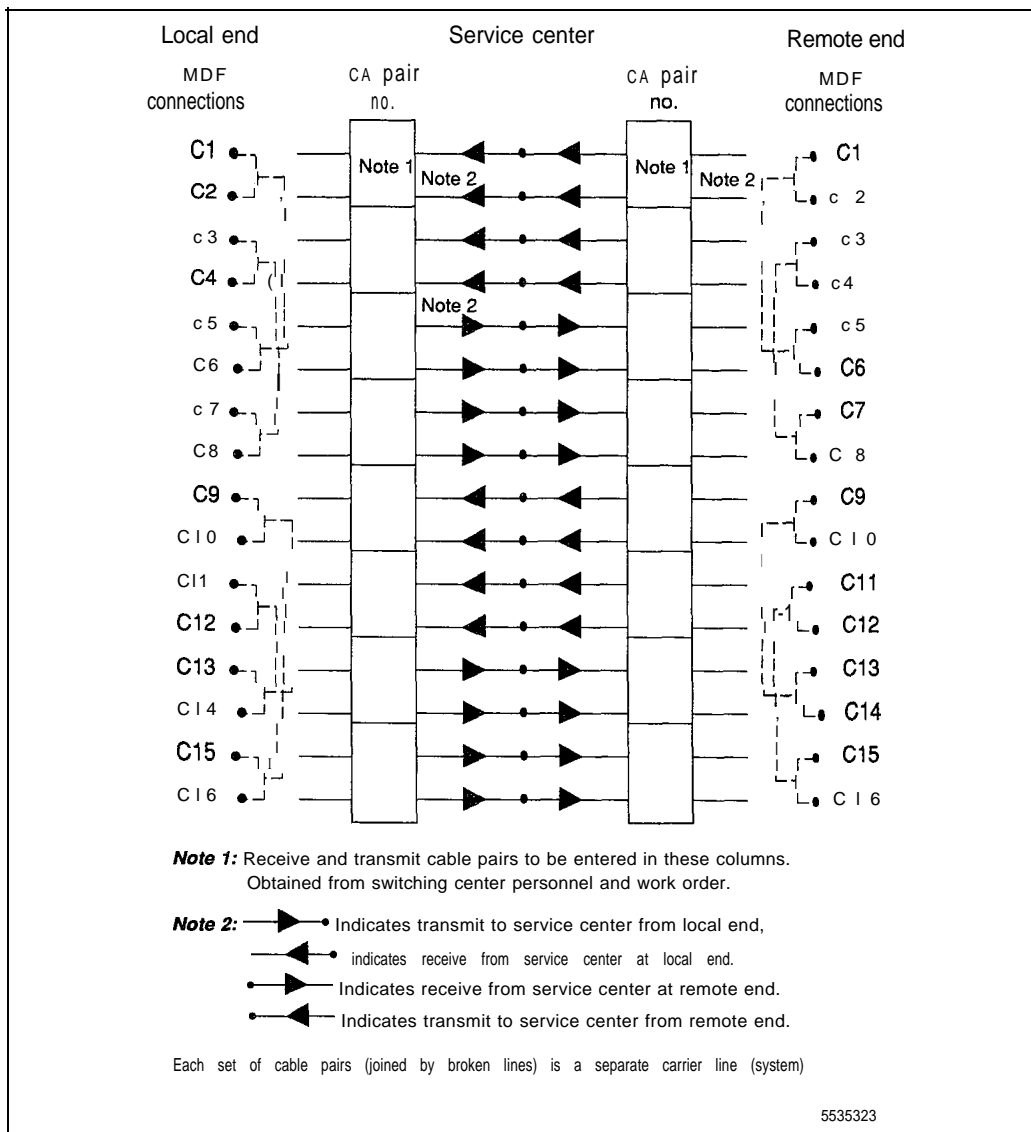


Figure 19-8
Maintenance lead cross-connections (Part 1 of 2)

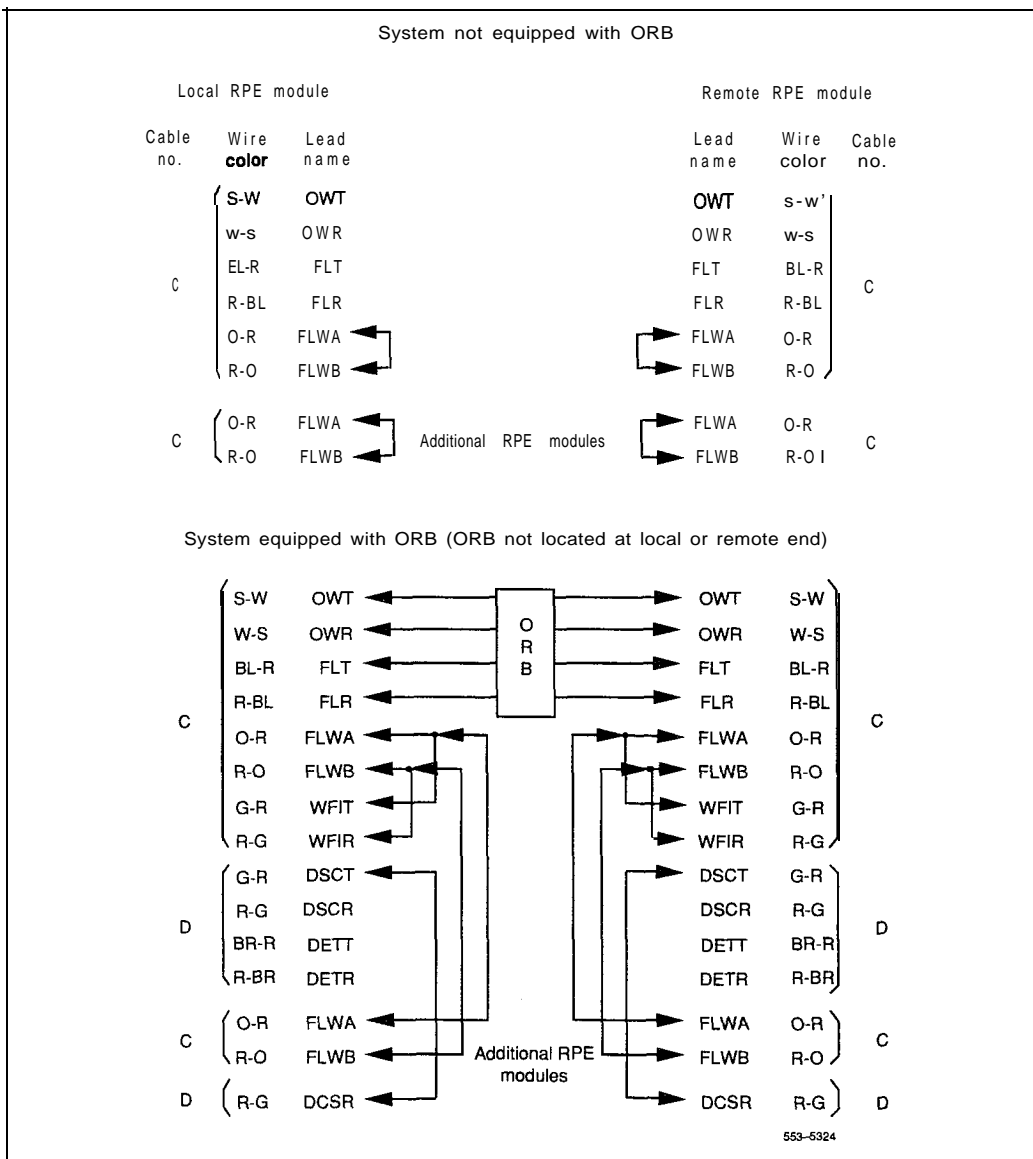
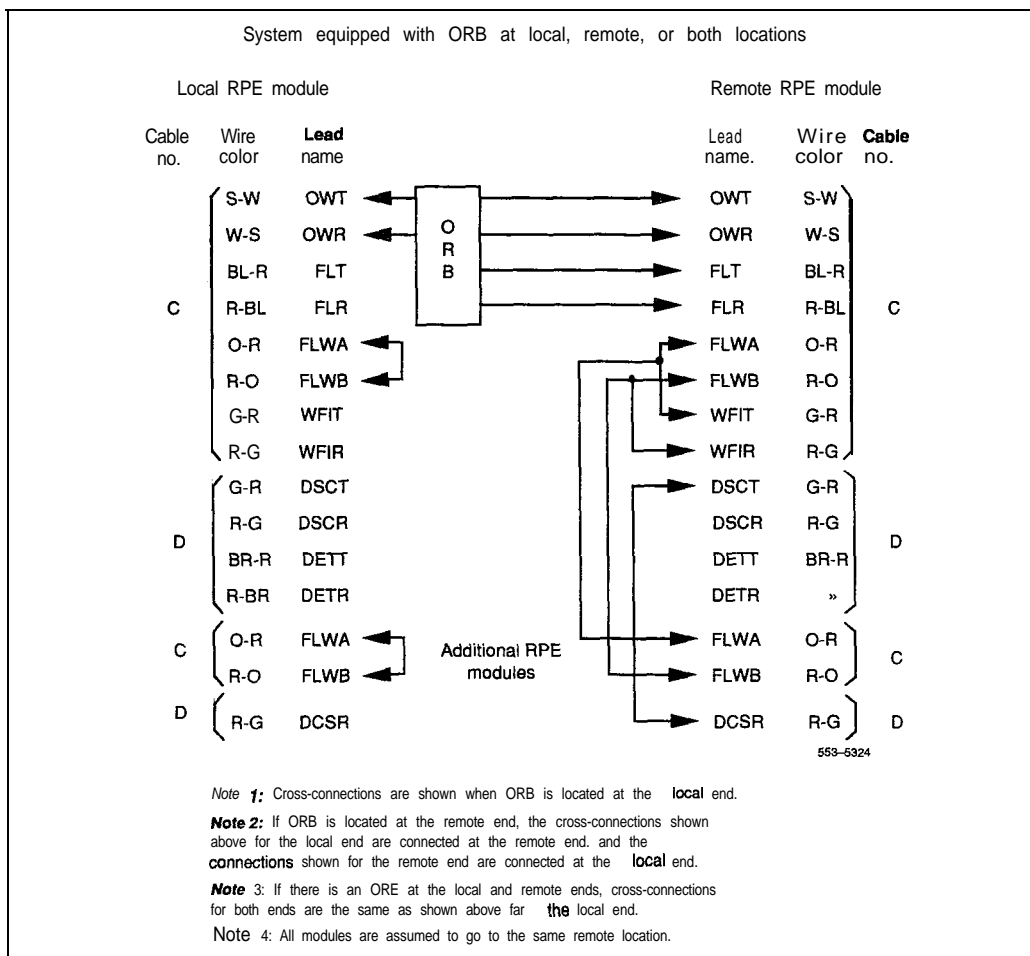


Figure 19-8
Maintenance lead cross-connections (Part 2 of 2)



RPE option switch settings

Verify the switch settings on all of the cards listed in this chapter.

QPC62 1 .5M Baud Converter Card

Use QPC62F or later vintage. Set the switches on the card (see Figure 19-9) according to Table 19-5.

Figure 19-9
QPC62 option switch and header pin locations

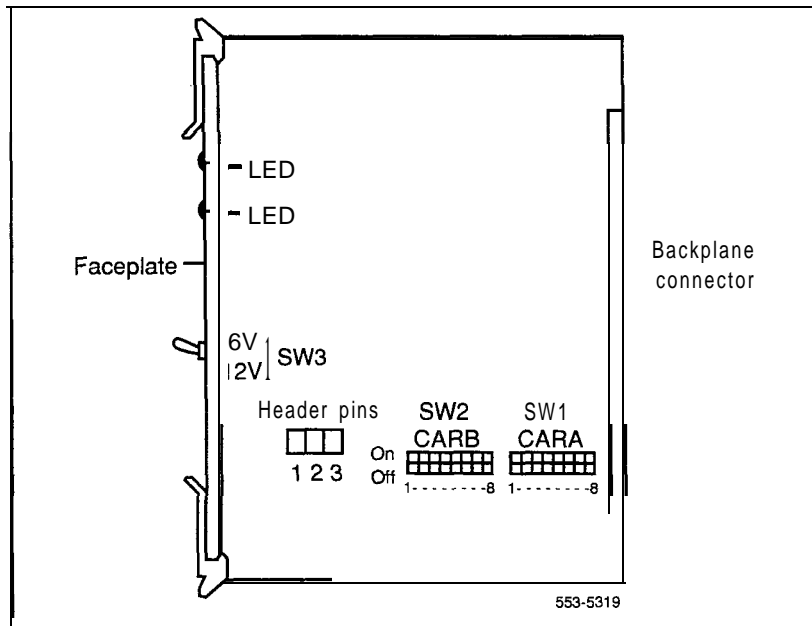


Table 19-5
QPC62 switch settings

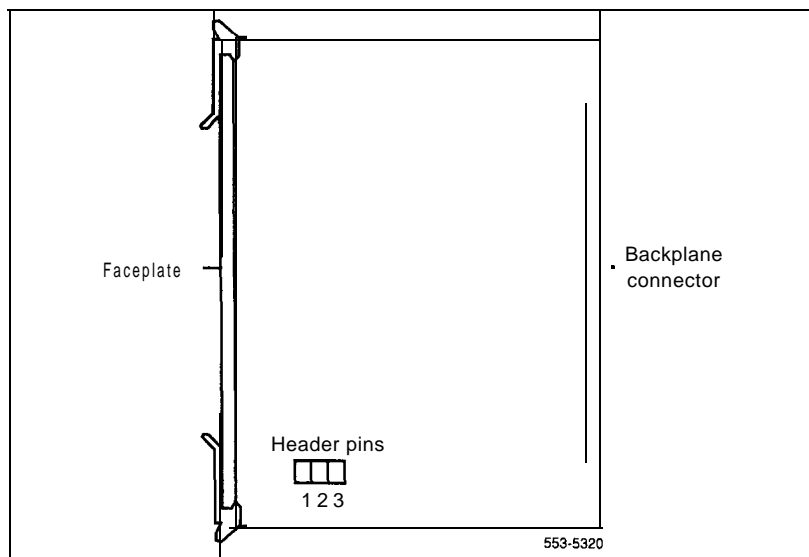
Carrier A & B options* distance to ORB		Switch settings** SW1 and SW2								SW3
Feet	Meters	1	2	3	4	5	6	7	8	
0 - 150***	0 - 45	off	off	on	on	off	on	on	off	6 V
151 - 450	146 - 147	off	on	on	off	on	on	off	on	12 V
451 - 750	446 - 229	on	off	off	on	on	off	on	on	12 V

1 Inset-t the plug-in jumper (U-link) between header pins 1 and 2 (located at **B25**).
 1 * Switch 1 (**SW1**) is for carrier A; Switch 2 (**SW2**) is for Carrier B. SW3 is the faceplate toggle switch.
 1 ** Set the card for 0-45 m (0-1 50 ft) when interfacing directly with the carrier (not through an ORB).

QPC66 2M Baud Converter Card

Use **QPC66E** or later vintage. Insert the plug-in jumper (U-link) between header pins 1 and 2 located at **B35** (see Figure 19-10).

Figure 19-10
QPC66 header pin strapping



QPC99 Carrier Interface Card

Use **QPC99F** or later vintage. Set the switches on the card (see Figure 19-1 1) according to Tables 19-6 and 19-7.

Figure 19-1 1
QPC99 option switch locations

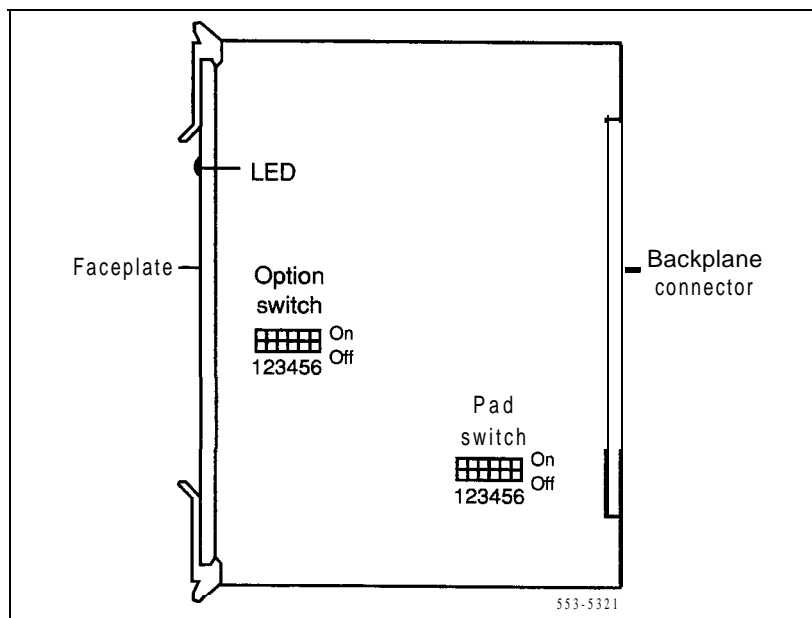


Table 19-6

QPC99 A20 switch and F25 pad switch

Carrier location	Interface equipment	A20 switch						F25 pad switch					
		1	2	3	4	5	6	7	6	9	10	11	12
Local	ORB at local end (pads in)	Off	Off	Off	on	off	on	on	on	on	on	off	off
	Direct to LD-1 or GTE carrier (no ORB at local end) (pads out)	Off	Off	Off	on	on	on	Off	Off	Off	Off	on	on
Remote	ORB at remote end (pads in)	on	Off	on	Off	Off	on	on	on	on	on	Off	Off
	Direct to LD-1 or GTE carrier (no ORB at remote end) (pads out)	on	Off	on	Off	on	on	Off	Off	Off	Off	on	on

Note: Consult manufacturer for switch settings if card interfaces with other type of carrier equipment,

Table 19-7

QPC99 S2 switch

Carrier location	Interface equipment	SW2					
		1	2	3	4	5	6
Local	ORB at local end (pads in)	Off	Off	Off	Off	on	on
	Direct to LD-1 or GTE carrier (no ORB at local end) (pads out)	on	on	on	on	Off	Off
Remote	ORB at remote end (pads in)	Off	Off	Off	Off	on	on
	Direct to LD-1 or GTE carrier (no ORB at remote end) (pads out)	on	on	on	on	off	off

NT8D22 System Monitor

At the remote location, set all system monitors as slaves, as shown in the following Tables 19-8 and 19-9.

Table 19-8

NT8D22 System Monitor switch settings for slaves

Switch	1	2	3	4	5	6	7	8
SW1	off	off	|	**	off	off	off	off
SW2	off	off	To set positions 3-8, see Table 19-9					
SW3	off	off	off	off				

* Set to on for DC systems; set to off for AC systems.
 | * Set to on to enable PFTU (if equipped) during over-temperature condition.
 Set to off to disable PFTU during over-temperature condition.

Table 19-9
SW2 on each slave-unit number for the slave

Slave unit address	Switch position						Slave unit address	Switch position					
	3	4	5	6	7	8		3	4	5	6	7	8
1	on	on	on	on	on	off	33	off	on	on	on	on	off
2	on	on	on	on	off	on	34	off	on	on	on	off	on
3	on	on	on	on	off	off	35	off	on	on	on	off	off
4	on	on	on	off	on	on	36	off	on	on	off	on	on
5	on	on	on	off	on	off	37	off	on	on	off	on	off
6	on	on	on	off	off	on	38	off	on	on	off	off	on
7	on	on	on	off	off	off	39	off	on	on	off	off	off
8	on	on	off	on	on	on	40	off	on	off	on	on	on
9	on	on	off	on	on	off	41	off	on	off	on	on	off
10	on	on	off	on	off	on	42	off	on	off	on	off	on
11	on	on	off	on	off	off	43	off	on	off	on	off	off
12	on	on	off	off	on	on	44	off	on	off	off	on	on
13	on	on	off	off	on	off	45	off	on	off	off	on	off
14	on	on	off	off	off	on	46	off	on	off	off	off	on
15	on	on	off	off	off	off	47	off	on	off	off	on	off
16	on	off	on	on	on	on	48	off	off	on	on	on	on
17	on	off	on	on	on	off	49	off	off	on	on	on	off
18	on	off	on	on	off	on	50	off	off	on	on	off	on
19	on	off	on	on	off	of-i	51	off	off	on	on	off	off
20	on	off	on	off	on	on	52	off	off	on	off	on	on
21	on	off	on	off	on	off	53	off	off	on	off	on	off
22	on	off	on	off	off	on	54	off	off	on	off	off	on
23	on	off	on	off	off	off	55	off	off	on	off	off	off
24	on	off	off	on	on	on	56	off	off	off	on	on	on
25	on	off	off	on	on	off	57	off	off	off	on	on	off
26	on	off	off	on	off	on	58	off	off	off	on	off	on
27	on	off	off	on	off	off	59	off	off	off	on	off	off
28	on	off	off	off	on	on	60	off	on	off	off	on	on
29	on	off	off	off	on	off	61	off	off	off	off	on	off
30	on	off	off	off	off	on	62	off	off	off	off	off	on
31	on	off	off	off	off	off	63	off	off	off	off	off	off
32	off	on	on	on	on	on							

Performing acceptance tests

After RPE installation, several tests are performed to verify that the equipment functions properly.

Testing equipment

Test the following:

- To test LD- 1 carrier equipment, see *Initial linap and installation t&s* (368-2101-200).

- To test network loops:

- Load the RPE Diagnostic Program:

LD 33

LOOP L "L" is the loop number

If the response is OK, no faults are detected.

Note: With RPE, include LD33 in the midnight routines.

- Switch primary carriers on loop L:

SCAR L

Enter loop number again

LOOP L

Note: If any connection memory or channel faults are detected, the affected channel is disabled. See LD30 to interpret system messages.

- To test telephones, attendant consoles, and add-on modules, see *Telephone and a t - console installation(553-3001-215)*.

Note: If outgoing trunks are ground start, lift the receiver and momentarily press the ground start button on the 500 telephone.

Testing transmission quality

Test RPE transmission quality through the monitoring facilities built into the QPC99 Carrier Interface Card (see Figure 19-12). There are four jacks on the front of the QPC99 card:

- ROUT A and ROUT B are input jacks for channels A and B, respectively.
- MON A and MON B are output jacks that monitor the regenerated signal. Connect a test set to a MON jack at any time to test transmission quality.

Check transmission by closing the MLP switch at the rear end, injecting a test signal at the ROUT jack, and monitoring the output at a remote end MON jack. Use this procedure to check the transmission path in both directions.

Locating span line faults

The typical repeatered line maintenance arrangement (see Figure 19-13) includes a series of fault locating filters and a fault locating cable pair installed in each span line:

- One fault locating filter is used for all repeaters installed in a single housing (maximum 25 two-way repeaters in a single housing).
- A filter with a different audio center frequency is installed in each repeater housing in the span line.

The fault locating filter is a narrow band selective filter centered at one of 12 audio frequencies. The output of each repeater in the housing is bridged across the input of the respective fault locating filter. The outputs of all filters in a span are connected to the common fault locating cable pair. This arrangement permits checking each repeater in a span from either span terminal, using a test signal with an audio frequency component corresponding to the center frequency of the respective fault locating filter.

When a span line produces excessive errors or a failure occurs, perform a fault locating test to locate the defective repeater. The fault locating test uses a Pulse Code Modulation (PCM) line and repeater test set (Lear Seigler Sierra 41 5A or equivalent). To perform the fault locating test, remove the line from service and connect the test set to the line at the span terminal. Connect the output of the test set transmit section to the span line; connect the receive section input to the corresponding fault locating jack.

A series of test pulses with an audio-frequency component is transmitted down the line. The audio-frequency component is selected to correspond to each of the fault-locating filters in the span. This audio-frequency component appears in the output of each repeater in the span. However, a portion of this signal filters through the appropriate associated fault locating filter and returns to the test set over the fault locating pair.

The amplitude of the test signal is measured on the decibel meter and is a function of the performance of the repeater under the various test signal conditions. If a repeater has failed completely, no test signal is returned to the test set. By changing the audio-frequency component, each repeater in a span can be tested until the faulty or marginal repeater is located.

Figure 19-1 2
QPC99 maintenance jacks and looping switches

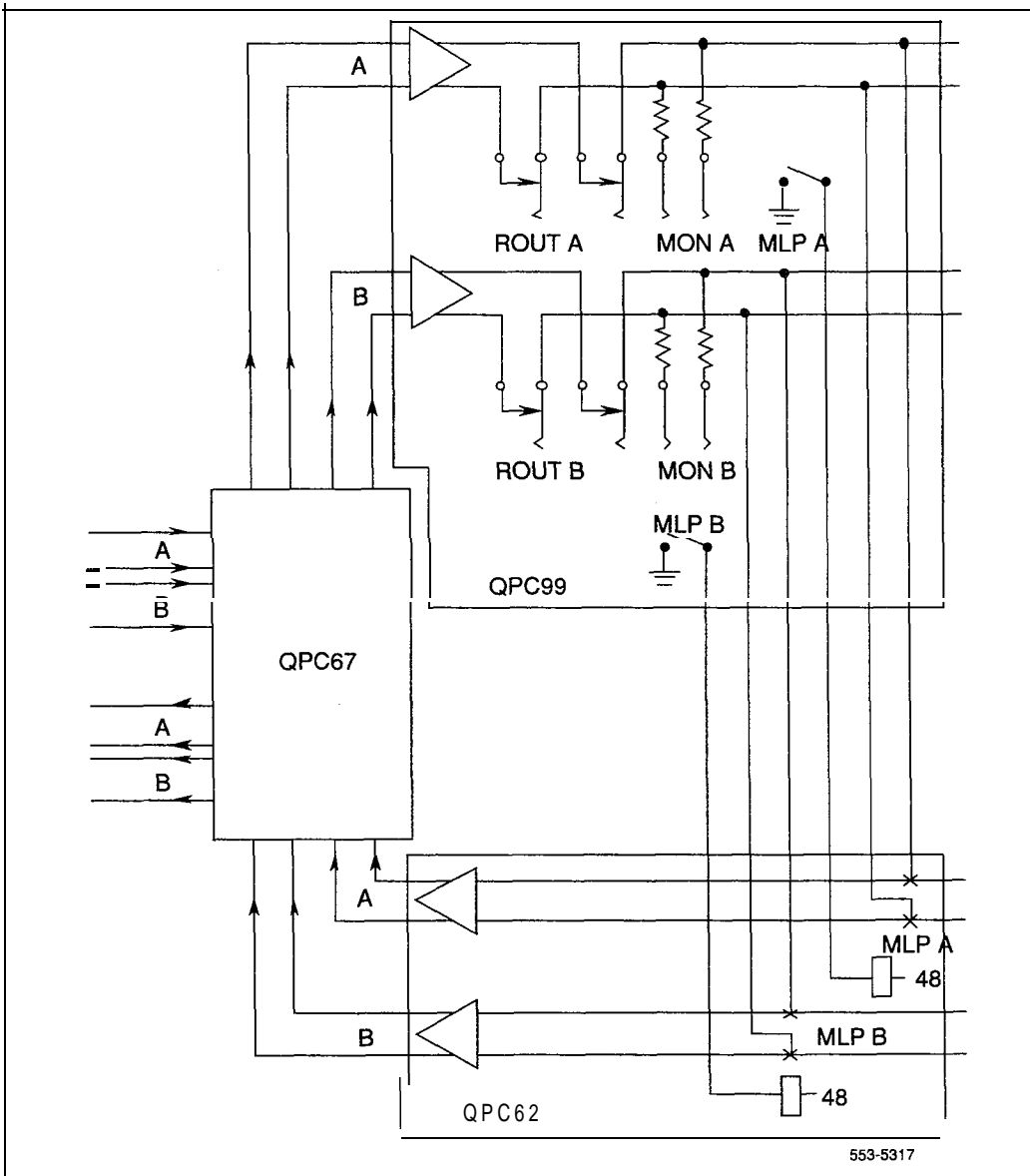
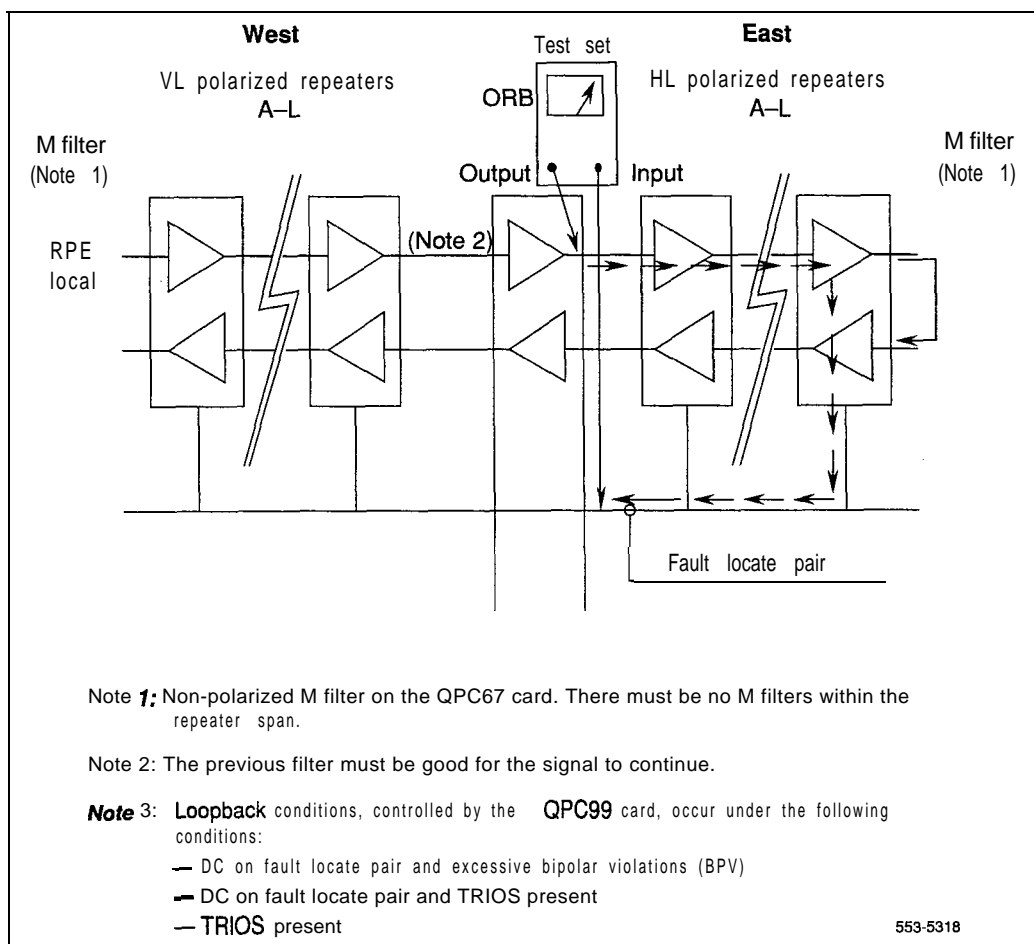


Figure 19-1 3
Typical span line fault locating arrangement





Adding a module to a column

The procedures in this chapter apply to adding a module to a column that is fully equipped and powered up. To add a fourth module to a column during initial system installation, see the procedure for placing the fourth module on a column in “Meridian | Initial installation” on page 2-1.

A module can be added to a column in one of three positions; a procedure is given for each:

- “Adding a module to the base of a column” on page 20-2
- “Adding a module between two other modules” on page 20-7
- “Adding a module to the top of a column” on page 20-13

If the column is equipped with earthquake bracing, the column support rods must be removed and longer rods must be installed after the module is added. To change the rods, see “Installing earthquake bracing” on page 18-1.

WARNING

A fully loaded module weighs approximately 58.9 kg (130 lbs). More than one person is required to move a module.

WARNING

In a DC-powered system, power to the column can remain on during the following procedures. In an AC-powered system, however, power to the entire column *must* be shut down throughout the procedures.

Adding a module to the base of a column

If conduit or other cabling runs through modules that are being moved, you must tag and disconnect the cables, pull them out of the modules, and reroute them after all of the modules are repositioned. The top cap can remain on the module it is attached to.

- 1 Disconnect and remove the **NT8D22** System Monitor for the column in the rear of the pedestal (do not turn off the blower unit in the front of the pedestals):

- If the column houses the master system monitor, load overlay 37 and software disable the associated **SDI** port:

LD 37

DIS TTY x disable the device associated with the port

- Disconnect the RJ 11 cable to **J3**, then the cable to **J6**, then pull the system monitor out of the slot.
- 2 Set all circuit breakers in the rear of the pedestal to **OFF** (down).
 - 3 Remove the module above the pedestal:

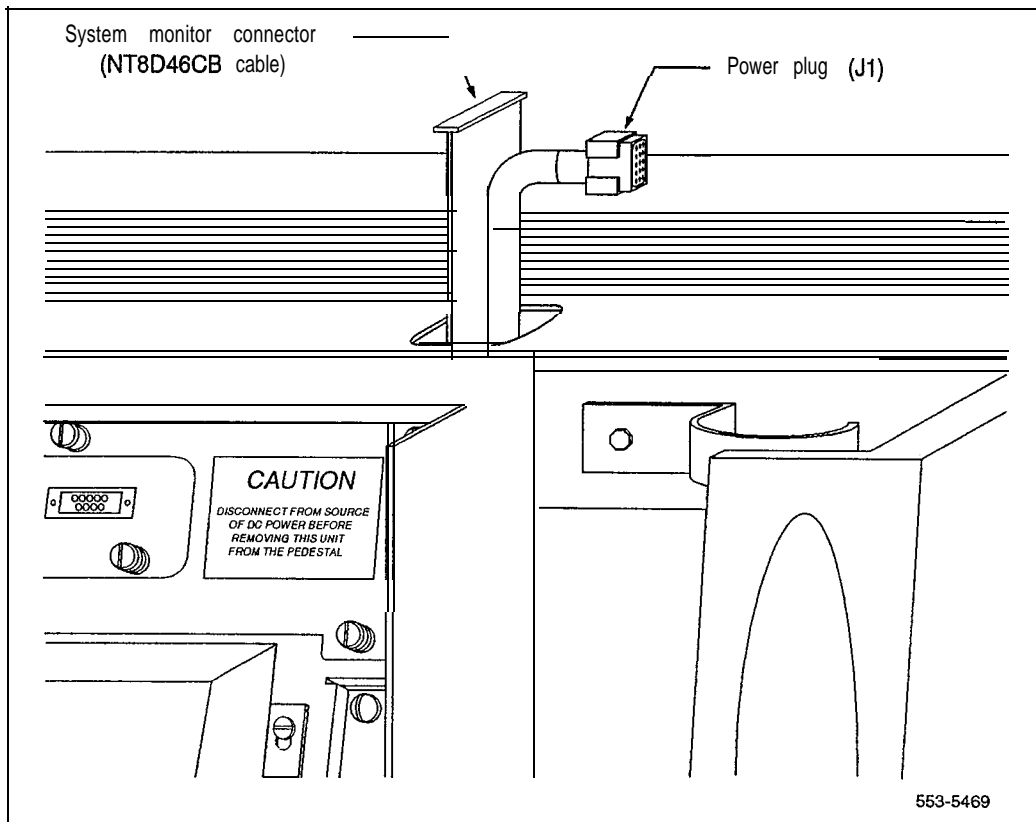
- Disconnect the power connector to the pedestal (see Figure 20-1).

Note: You must press a latch trip on the front and rear of the plug. You may need to use a screwdriver blade against the latch tip on the front of the plug.

- Disconnect the system monitor connector to the pedestal (see Figure 20-1).
- Use a **9/16** in. socket wrench to remove the five mounting bolts that secure the module (see Figure 20-2) and lift it off the column.

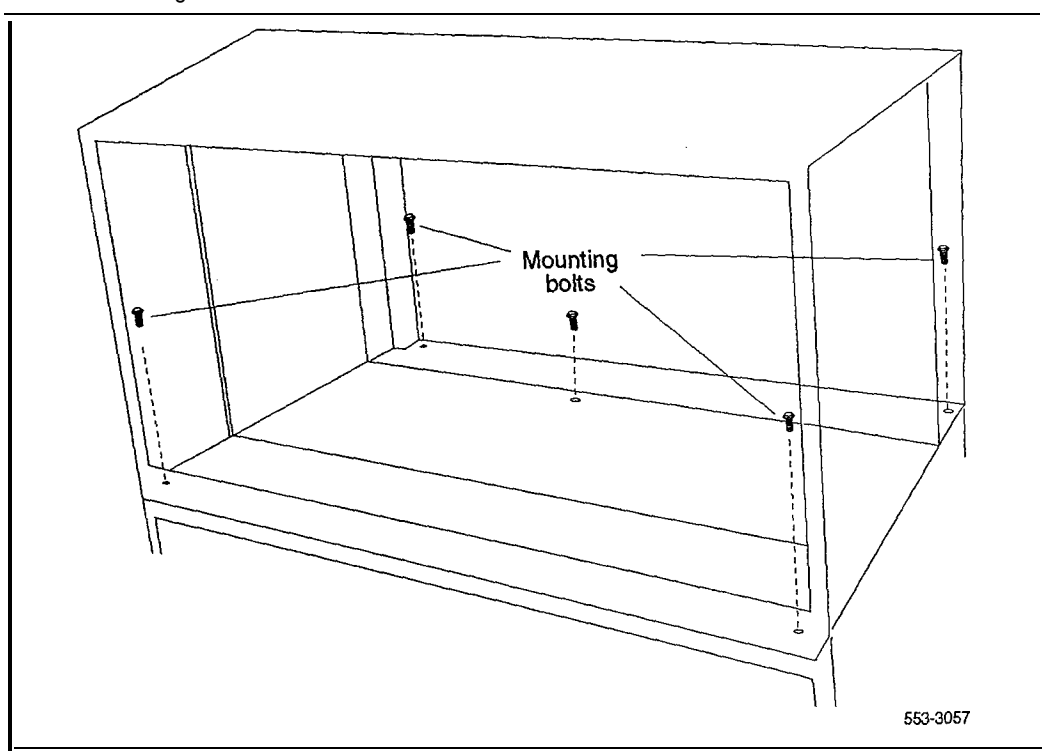
Note: There is an EM1 shield (it looks like a brass grill) on the top of each pedestal. Leave this shield on the pedestal. Use a few pieces of tape to hold the shield in position, so the holes for the mounting bolts are aligned with the screw holes on the pedestal. After the module is secured, remove as much of the tape as possible.

Figure 20-1
NT7D09CA Pedestal-module power and system monitor connections



20-4 Adding a module to a column

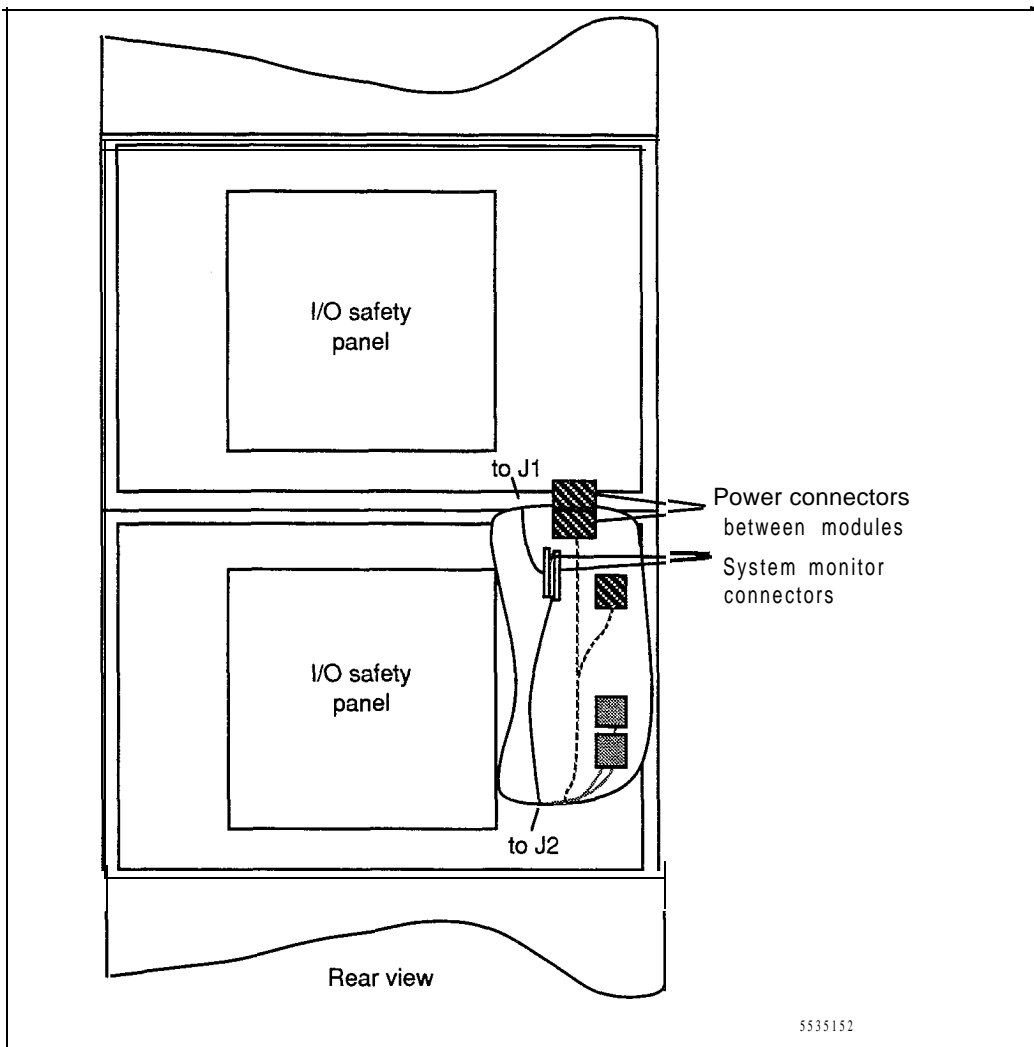
Figure **20-2**
Module mounting bolts



- 4 Position and secure modules:
 - Locate the positioning guides on the pedestal. Make sure the module being added is facing the same direction as the column.
 - Place the module being added on the pedestal and adjust it until it is seated securely on the positioning guides.
 - Secure the mounting bolts for the module.
 - Place the module that was removed onto the top of the module that was added and secure it with the mounting bolts.
- 5 Connect the power and system monitor cables in the module:
 - Connect the power connectors to the pedestal and to the module above (see Figures 20-1 and 20-3).
 - Attach the frame ground wires to the frame ground post at the base of the module.
 - Connect the system monitor cable from the pedestal to connector J1 on the module being added.
 - Connect the system monitor cable from connector J2 in the module being added to J1 in the module above.
- 6 Set all circuit breakers in the pedestal to ON.
- 7 Reinstall the system monitor in the pedestal:
 - Reconnect the RJ 11 cable to J6, then the cable to J3. Reinstall the system monitor.
 - If the column houses the master system monitor, load overlay 37 and software reenables the associated SDI port:


```
LD 37
          ENL TTY x      enable the device associated with the port
          ****          exit LD37
```
- 8 Replace all module covers and the pedestal grill.

Figure 20-3
Module-to-module power and system monitor connections



Adding a module between two other modules

If conduit or other cabling runs through modules that are being moved, you must tag and disconnect the cables, pull them out of the modules, and reroute them after all of the modules are repositioned.

The top cap can remain on the module it is attached to.

- 1 Disconnect and remove the **NT8D22** System Monitor for the column in the rear of the pedestal (do *not* turn off the blower unit in the front of the pedestals):
 - If the column houses the master system monitor, load overlay 37 and software disable the associated **SDI** port:

```
LD 37
DIS TTY x
```

disable the device associated with the port
 - Disconnect the RJ 11 cable to J3, then the cable to **J6**, then pull the system monitor out of the slot.
- 2 Turn off power as necessary:
 - With AC power, set the main circuit breaker for the column to **OFF** (down) in the rear of the pedestal.

WARNING

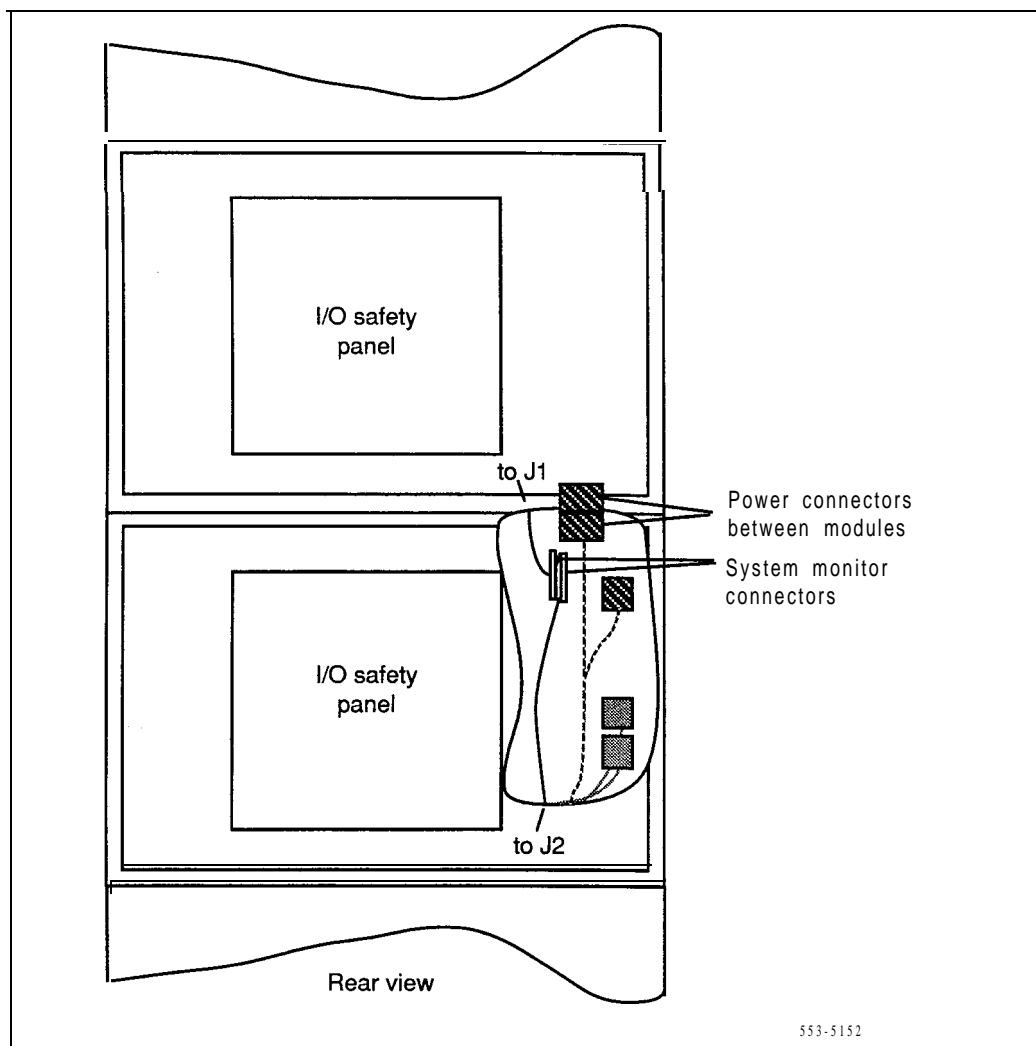
Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column.

- With DC power, set the switch on the module power supply and the circuit breaker in the rear of the pedestal to **OFF** (down) for any module that will be moved and for the module being added. (All other modules in the column can safely retain power.)

- 3 Remove the module that will be above the module being added:
 - Disconnect the power connectors between the modules (see Figure 20-4).
 - Disconnect the system monitor cable from connector J 1 in the module that will be above the module being added.
 - Use a **9/16** in. socket wrench to remove the five mounting bolts that secure the module and lift it off the column (see Figure 20-5).
- 4 Position and secure modules:
 - Locate the positioning guides on what is now the top module in the column (see Figure 20-6). **Make sure the module being added is facing the same direction as the column.**
 - Place the module being added on top of the column and adjust it until it is seated securely on the positioning guides.
 - **Secure the mounting bolts for the module.**
 - Place the module that was removed on top of the module that was added and secure it with the mounting bolts.
- 5 Connect the power and system monitor cables between modules:
 - Connect the power connectors between the module being added and the modules above and below it.
 - Connect the system monitor cable from connector J2 in the module below to J 1 in the module being added (see Figure 20-4).

Connect the system monitor cable from J2 in the module being added to J1 in the module above.
- 6 Restore power to the module:
 - With AC power, set the main circuit breaker to ON (up) in the rear of the pedestal.
 - With DC power, set the circuit breaker in the rear of the pedestal then the module power supply to ON (up) for the module that was added and for any module that was moved.

Figure 20-4
Module-to-module power and system monitor connections



20-10 Adding a module to a column

Figure 20-5
Module mounting bolts

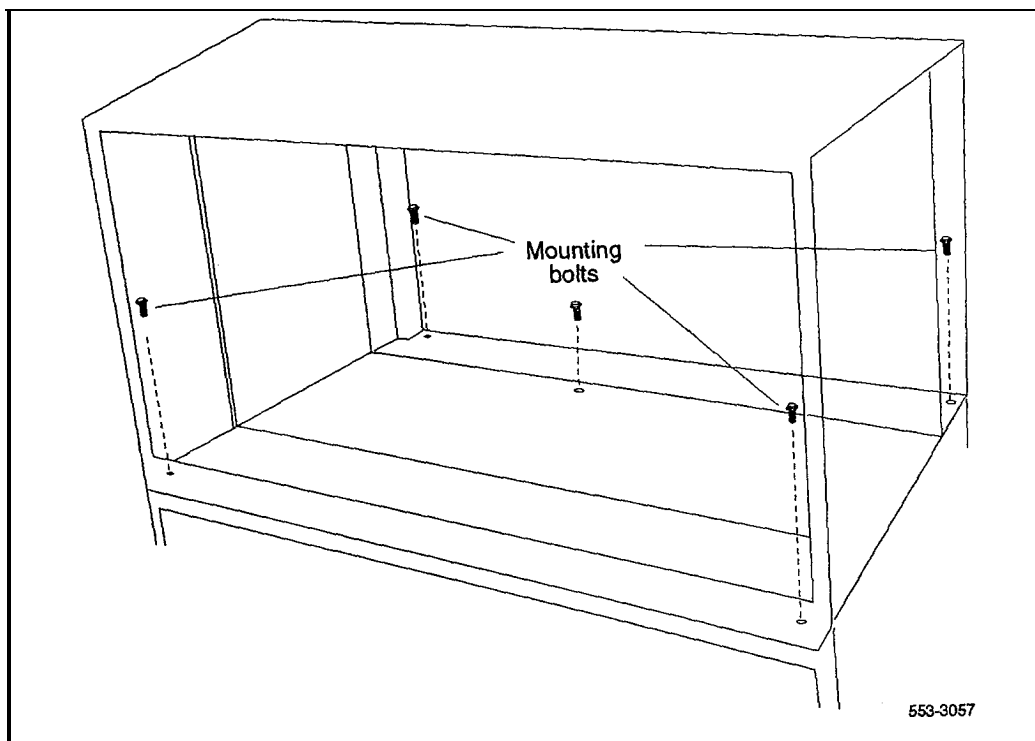
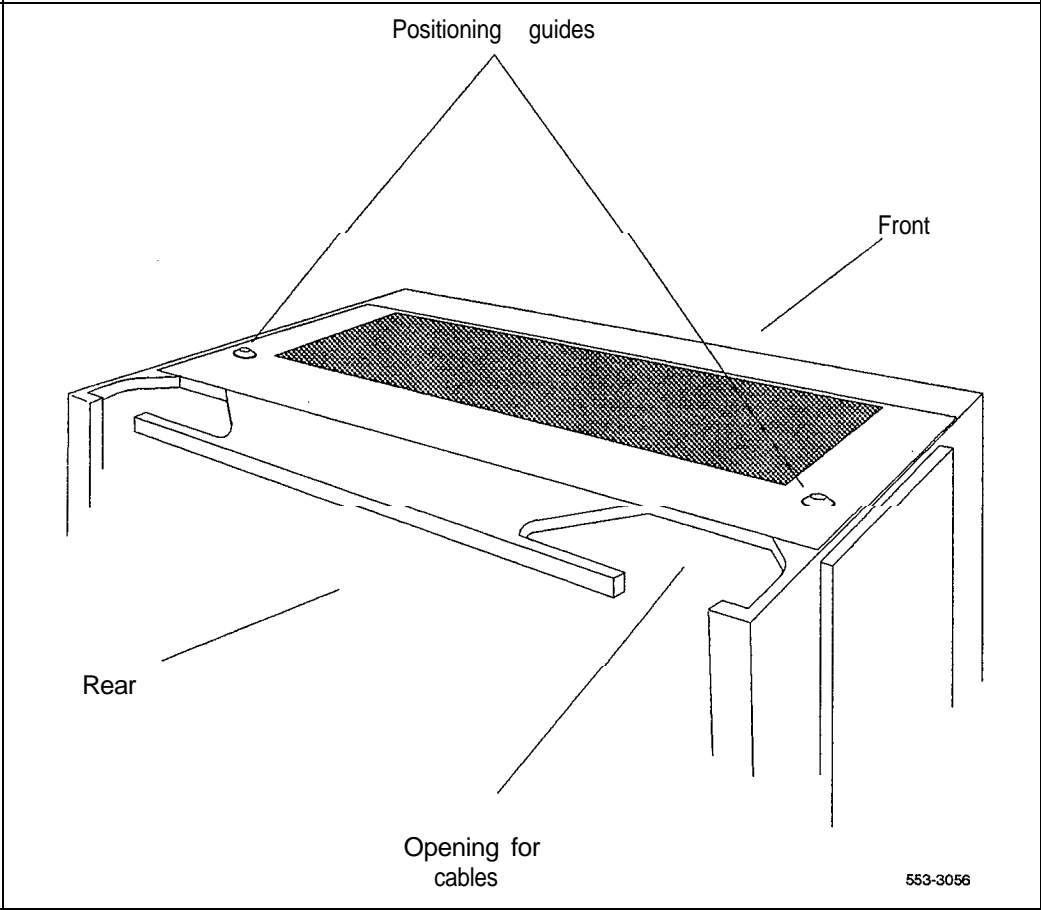


Figure 20-6
Module positioning guides



7 Reinstall the system monitor in the pedestal:

- Reconnect the RJ 11 cable to **J6**, then the cable to **J3**. Reinstall the system monitor.
- If the column houses the master system monitor, load overlay 37 and software reenables the associated **SDI** port:

LD 37

ENL TTY x enable the device associated with the port
**** exit LD37

8 Replace all module covers and the pedestal grill.

Adding a module to the top of a column

In a DC-powered system, power to the column can remain on during this procedure.

If conduit or other cabling **runs** through the top cap, you must tag and disconnect the cables, pull them out of the way, and reroute them after the new module and the top cap are positioned.

- 1 Disconnect and remove the **NT8D22** System Monitor for the column in the rear of the pedestal (do **not** turn off the blower unit in the front of the pedestals):

- If the column houses the master system monitor, load overlay 37 and software disable the associated **SDI** port:

LD 37

DIS TTY x disable the device associated with the port

- Disconnect the RJ 11 cable to J3, then the cable to **J6**, then pull the system monitor out of the slot.
- 2 Turn off power as necessary:
 - With AC power, set the main circuit breaker for the column to **OFF** (down) in the rear of the pedestal.

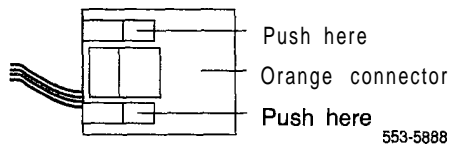
WARNING

Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column.

- With DC power, set the switch on the module power supply and the circuit breaker in the rear of the pedestal to **OFF** (down) for the module being added.

3 Disconnect power connections to the top cap:

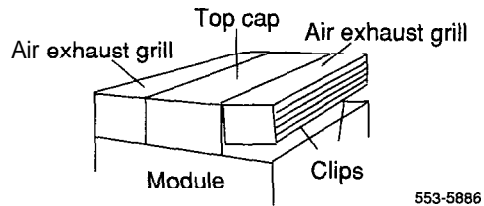
- At the top of the rear of the module, disconnect the orange power connector from the module power harness. Press the four tabs (two on each side) and let the connector fall loose into the module below.



- Disconnect the system monitor cable at connector **J2** on the backplane.

4 Remove the top cap and perforated panel:

- Pull forward on the clips underneath the front edge of each air exhaust grill on the top cap. Lift up and remove the grill.

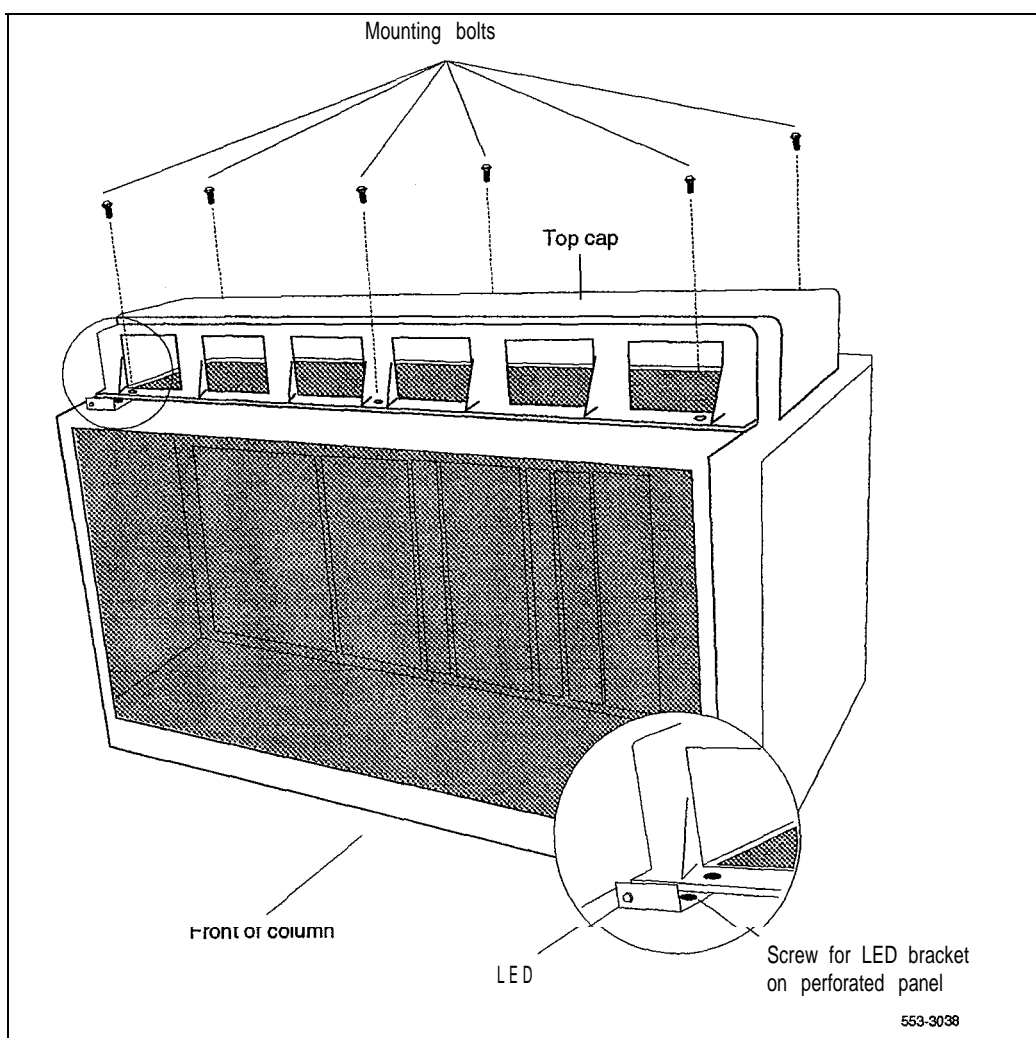


- Use a **5/16** in. socket wrench to remove the six bolts that secure the top cap (see Figure 20-7). Remove the top cap from the column.
- Remove the screw that secures the perforated panel and LED bracket. Slide the panel slightly to the left (looking at it from the rear of the column) and **remove** it.

5 Position and secure the module being added:

- Locate the positioning guides on the module in the column (see Figure 20-8). Make sure the module being added is facing the same direction as the column.
- Place the module being added on top of the column and adjust it until it is seated securely on the positioning guides.
- Use a **9/16** in. socket wrench to secure the module with five mounting bolts (see Figure 20-9).

Figure 20-7
Top cap assembly



20-16 Adding a module to a column

Figure 20-8
Module positioning guides

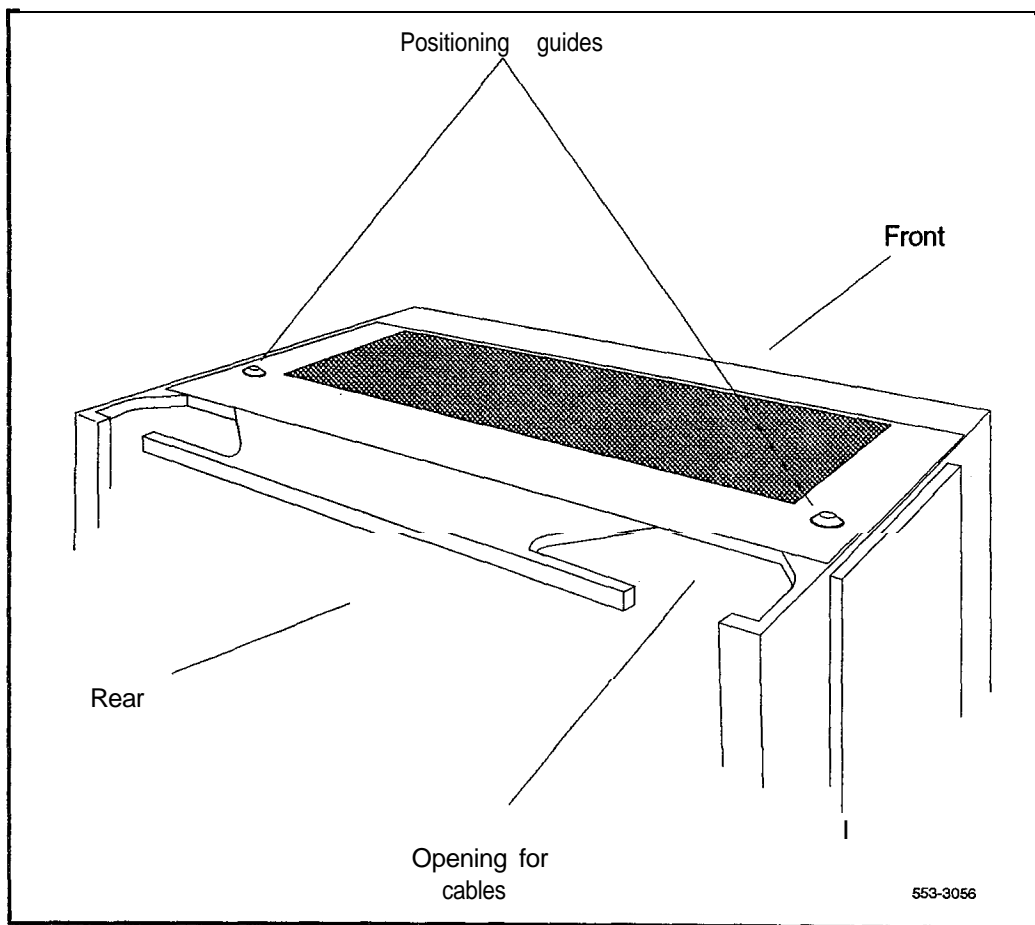
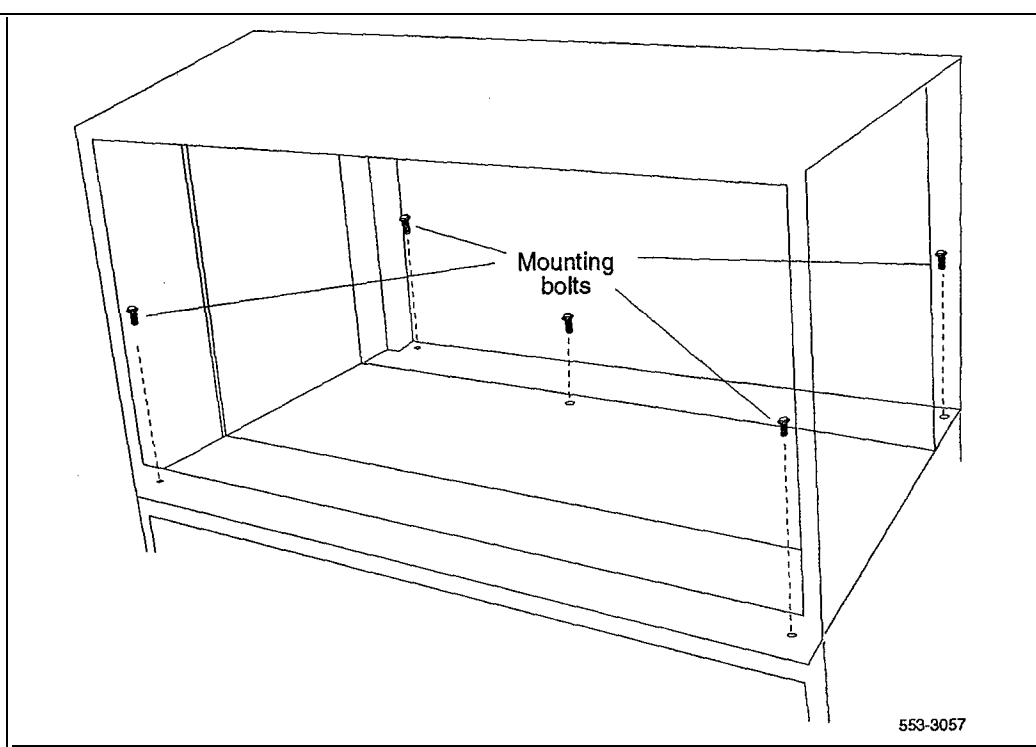
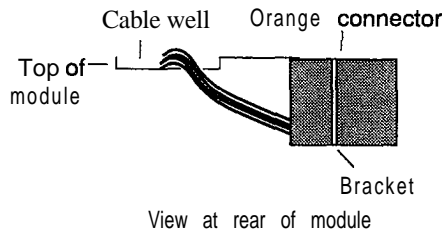


Figure 20-9
Module mounting bolts

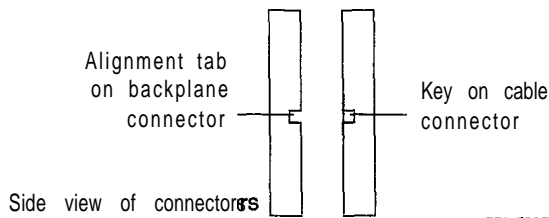


- 6 Connect the power and system monitor cables between modules:
 - Connect the power connectors between the module being added and the module below it (see Figure 20-10).
 - Connect the system monitor cable from connector **J2** in the lower module to **J1** in the module being added (see Figure 20-10).
- 7 Install the perforated panel and top cap on the module being added:
 - Position the perforated panel and slide it slightly to the right (at the rear). Install the screw that secures the panel and LED bracket.
 - Position wiring from the perforated panel so it rests in the cable well (next to the orange power connector at the rear of the module).



553-5889

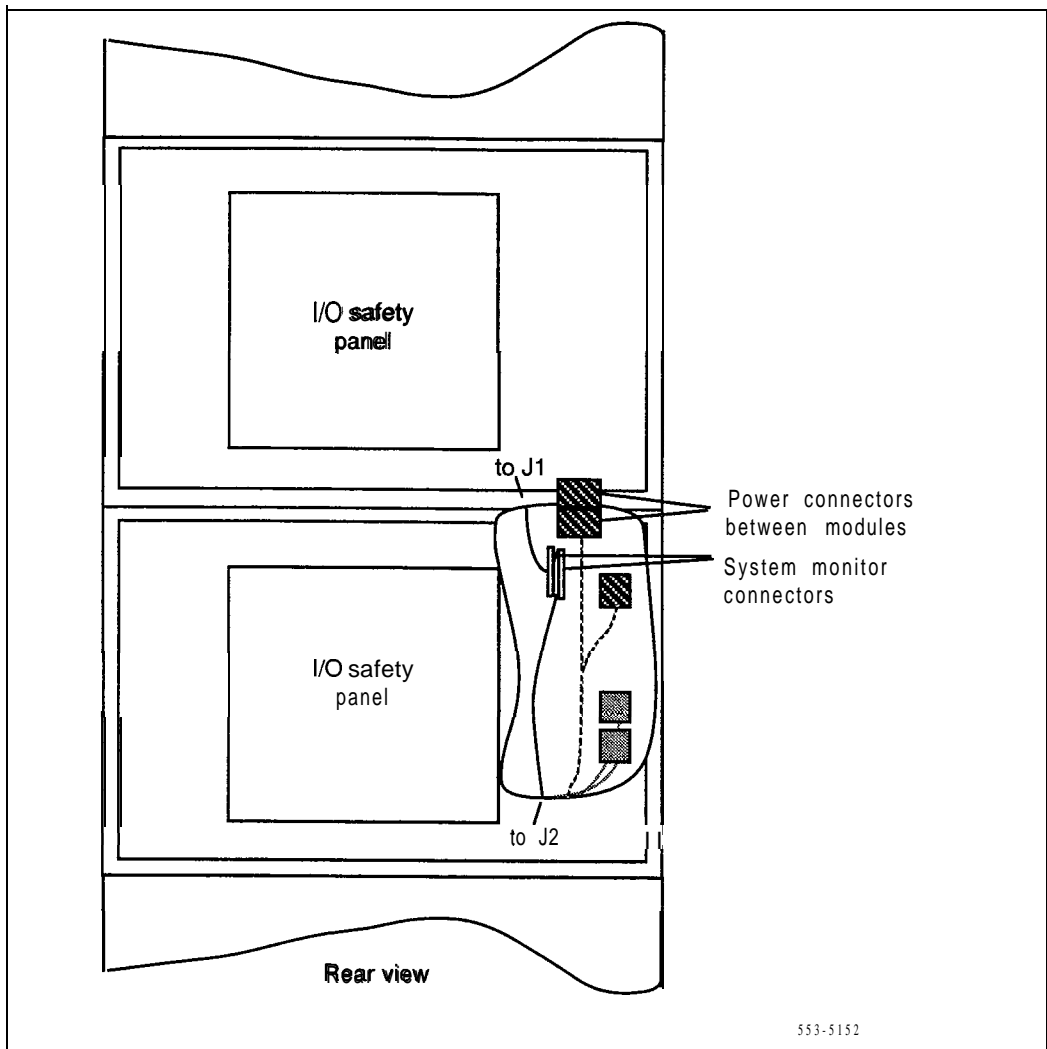
- Position the top cap and install the bolts that secure it.
 - Replace the air exhaust grills at the front and rear of the top cap.
- 8 Reconnect power to the top cap:
 - Connect the system monitor cable to **J2** on the backplane. Line up the alignment tab on the connector and snap on the pin headers to position the connector correctly.



553-5885

- Connect the orange power connector to the module power harness.

Figure 20-1 0
Module-to-module power and system monitor connections



553-5152

9 Restore power to the module:

- With AC power, set the main circuit breaker to ON (up) in the rear of the pedestal.
- With DC power, set the circuit breaker in the rear of the pedestal and then set the module power supply to ON (up) for the module that was added.

10 Reinstall the system monitor in the pedestal:

- Reconnect the **RJ1** 1 cable to **J6**, then the cable to **J3**. Reinstall the system monitor.
- If the column houses the master system monitor, load overlay 37 and software reenables the associated **SDI** port:

LD 37

ENL TTY x enable the device associated with the port
**** exit LD37

11 Replace all module covers and the pedestal grill.

Installing a PO71 5058 Universal I/O Panel

Use this procedure to replace a PO699732 I/O Panel with a PO715058 Universal I/O Panel.

CAUTION

Depending on the module or modules affected, this procedure may disable the system.

- 1** Remove all connectors from the existing I/O panel.
- 2** Remove the eight screws that hold the I/O panel in place.
- 3** Remove the I/O panel.
- 4** Position the Universal I/O Panel so the side with the two indents fits into the module.
- 5** Mount the Universal I/O Panel in place with the eight screws previously removed.
- 6** Attach connectors to the appropriate openings in the Universal I/O Panel.

21-2 Installing a PO71 5058 Universal I/O Panel

Appendix A: NTOR72, **NT6D82**, **QBL12**, **QBL15**, **QCA13**

DC-powered systems generally require one AC-input receptacle per rectifier within 1.8 m (6 ft) of each rectifier. The input receptacles required are determined by the number and type of rectifiers used.

Note: Depending on the distance between the input receptacle and the pedestal, a junction box may be required if the column is equipped with a vintage AA or DA **NT7D10** PDU. A junction box may be used with the **NT7D67CB** PDU, but it is not required.

Installing an **NT6D82** Power System

The **NT6D82** Power System can be used with all system options, but it is optimized for options 71 and 81 (and larger option 61 and 61C configurations).

The **NT6D82** Power System is an enclosed, front-access power distribution and control panel that supports from one to three **100-amp** rectifiers per rack. One to three racks can be paralleled in a single configuration. The maximum capacity of three fully equipped racks is 900 amps.

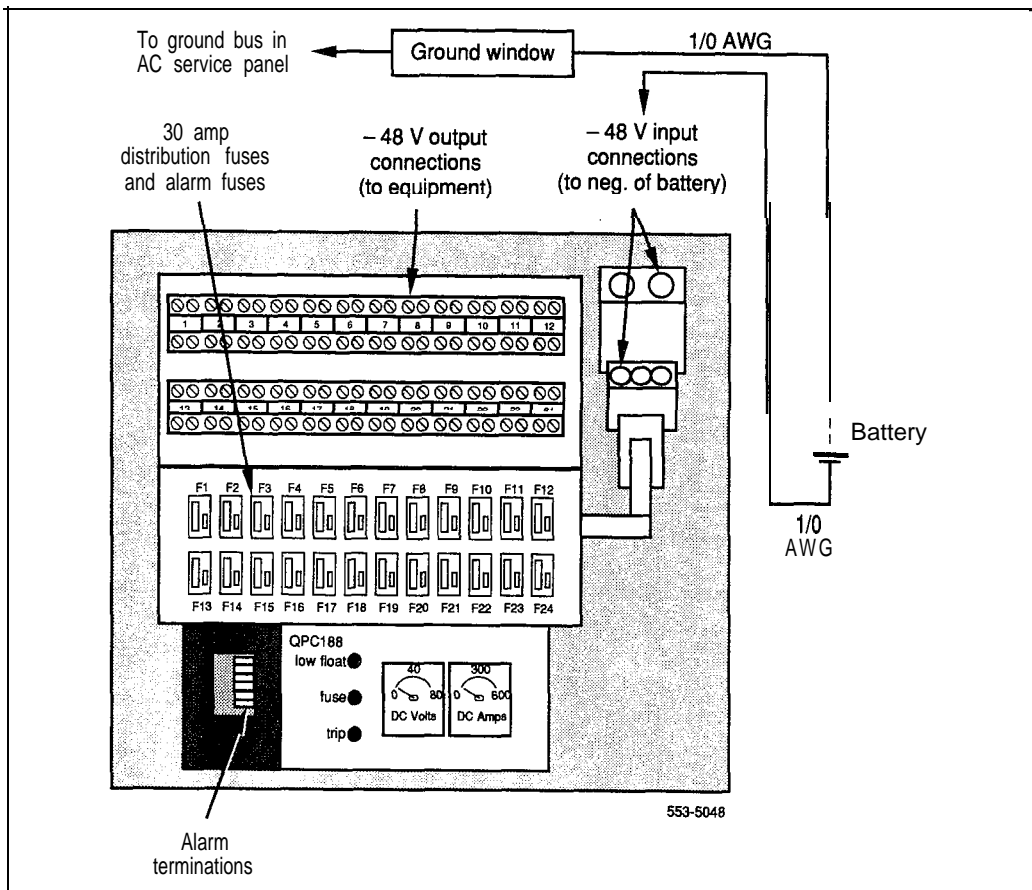
The rectifiers in an **NT6D82** operate on single-phase, 60 Hz, AC service and can be strapped for either 120, 208, or 240 V nominal input. The **NT6D82** Power System requires one **50-amp** power feed per rectifier.

To install an **NT6D82** Power System, follow the instructions provided with the **NT6D82** equipment.

Installing a QBL12 distribution box

The QBL12 Power Distribution Box is a wall-mounted unit that connects a customer-provided power plant to options 7 1 and 8 1 (and larger option 6 1 and 6 1 C configurations) (see Figure A- 1).

Figure A-1
QBL12 distribution box



The QBL12 distribution box connects up to 12 Meridian 1 columns (48 modules), with a maximum allowable load current of 600 amps. The distribution box contains 24 distribution fuses. Each distribution fuse supports two modules. Generally, one QBL12 is required per system.

For the receptacle requirements for the customer-provided power plant, refer to the manufacturer's specifications.

installing a **QBL12** and connecting to the power plant or batteries
If batteries are used, follow directions from the power plant manufacturer to connect the batteries to the power plant.

Table A- 1 summarizes the connections in this procedure.

- 1 Unpack the distribution box. Check for damage to the unit or the meters. Report any damage to your supplier.
- 2 Mount the distribution box securely on a wall or other suitable surface:
 - Mount the unit with its bottom edge approximately 1.2 m (4 ft) from the floor within 1.8 m (6 ft) of the power plant.
 - If batteries are used, mount the unit close enough to the batteries to allow a voltage drop of not more than .25 V (SO V on the loop) on the wire between the QBL12 and the batteries. See *Power engineering* (553-3001-152) to calculate wire size.
- 3 Connect a black wire between the positive terminal of the power plant or battery string and the system ground source (ground window/LRE) (see Figure A-2).

Typically, this connection is to a ground window that is connected to the ground bus in the service panel.
- 4 Connect a red wire between the negative output terminal of the power plant or battery string and the -48 V input terminal in the QBL12.
- 5 Connect a #16 AWG wire between the positive terminal of the power plant or battery string and connector TB3-2 (+ SENSE) of the QBL12 (see Figure A-3).
- 6 Connect a #16 AWG wire between the negative terminal of the power plant or battery string and connector TB3-1 (- SENSE) of the QBL12.

- 7 Connect a #16 AWG wire between the DCON connection in the rectifier and connector TB3-6 (DCON) in the QBL12.

Note: A wire gauge smaller than #16 can be used if it does not provide more than 2.5 ohms of resistance across its entire length.

Table A-I
QBL12 cabling

AWG (typical)	Color	From power plant or battery string	To
#1/0	Black	Positive terminal	System ground source
#1/0	Red	Negative terminal	-48 V input terminal in QBL1 2
#16	—	Positive terminal	TB3-2 (+ SENSE) in QBL12
#16	—	Negative terminal	TB3-1 (- SENSE) in QBL12
#16	—	DCON connection (in rectifier)	TB3-6 (DCON) in QBL1 2

Figure A-2
QBL12 -48 V and ground connections

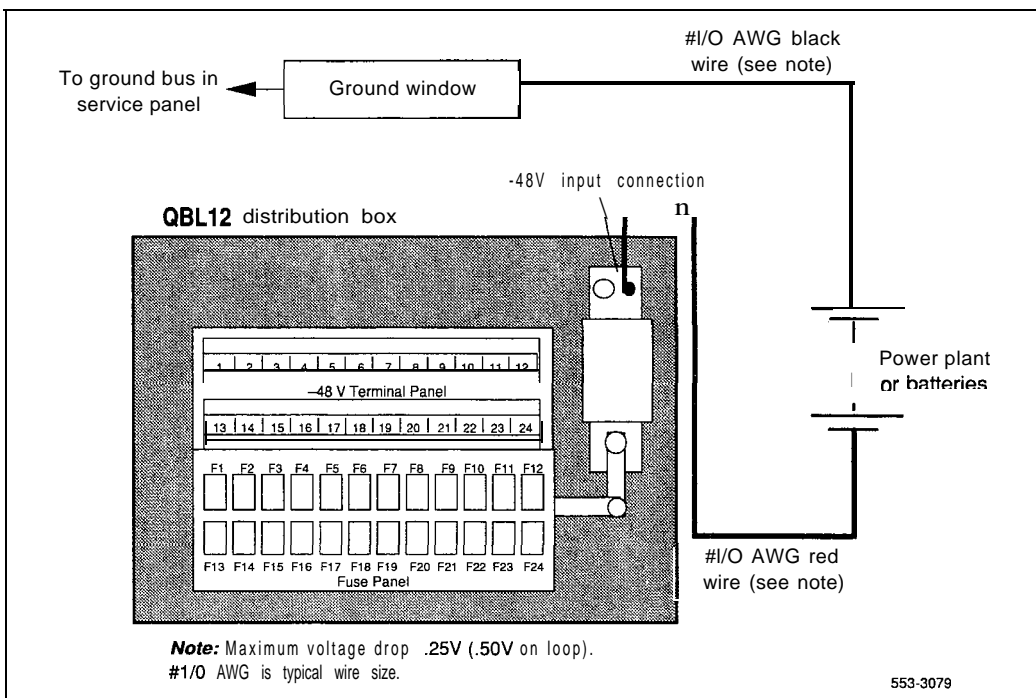
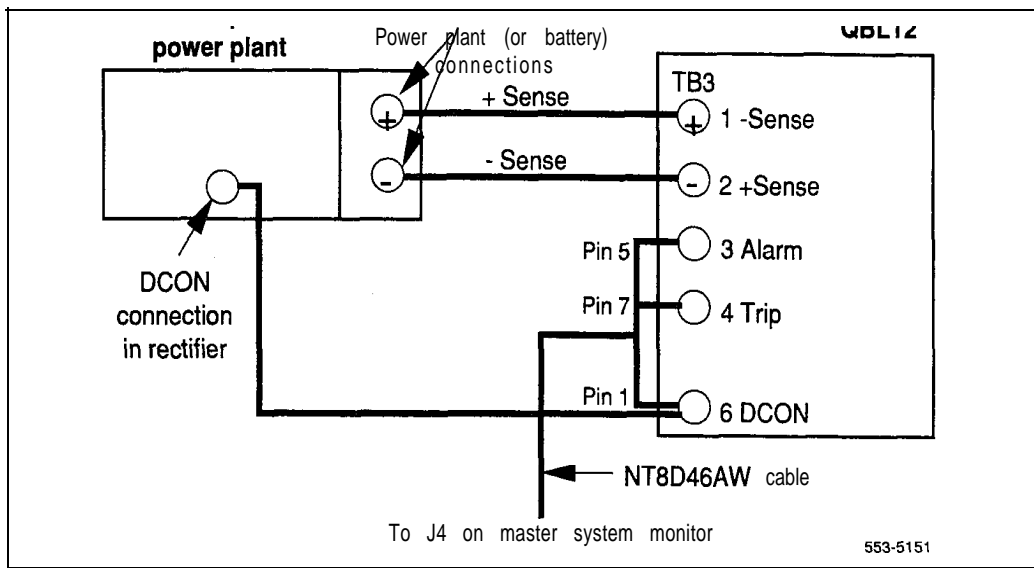


Figure A-3
QBL12 SENSE and DCON connections



Installing a QBL15 power system

A power plant consisting of the QBL15 Power Distribution Box and NT6D52 or NTOR72 Switched Mode Rectifier can be used with options 21, 21E, 51, 6 I, and 6 I C. The NT6D52 are discontinued and are replaced by NTOR72 rectifiers.

One QBL15 distribution box is needed for every three NT6D52 or NTOR72 rectifiers; up to two QBL15 units can be used per system. This means a QBL15 power system can support a total of six rectifiers that support a maximum of twelve modules.

NTOR72 rectifiers operate on 240 V ac at 20 amps input current

NT6D52 rectifiers operate on 240 V ac at 20 amps or 120 V ac at 30 amps:

Each rectifier comes equipped with a 20-amp cord and plug for use at 2051240 V ac. One IG-L6-20 or L6-20 receptacle is required for each rectifier.

Note: Do not exceed minimum and maximum input voltage limits of 180 to 250 V ac for NT6D52 rectifiers and 176 to 280 V ac for NTOR72 rectifiers. If only 240 V ac service is available, use a voltage regulation device so the 250 V ac limit cannot be exceeded.

Refer to Figures A-4 and A-5 throughout the procedures for installing QBL15 distribution boxes and NTOR72 rectifiers.

The dimensions of the QBL15 components are given in Table A-2.

Table A-2
Equipment dimensions

Equipment	Width		Depth		Height	
	cm	in.	cm	in.	cm	in.
NT6R52 Rectifier	48.3	19.0	35.6	14.0	25.4	10.0
NTOR72 Rectifier	48.3	19.0	35.6	14.0	25.4	10.0
NT7D12 Rectifier Rack	52.7	20.5	38.1	15.0	132.0	52.0
QBL15 Power Distribution Box	55.9	22.0	24.1	9.5	63.5	25.0

Figure A-4
NTOR72 rectifier-front view

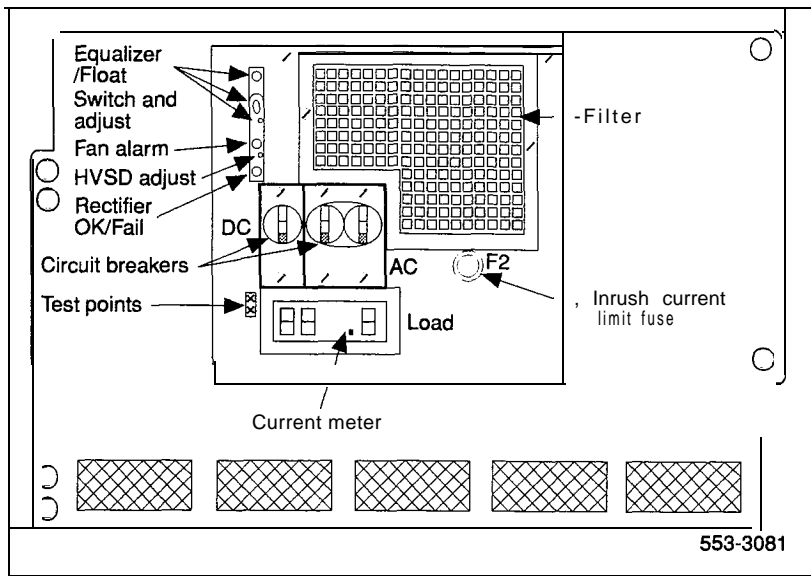
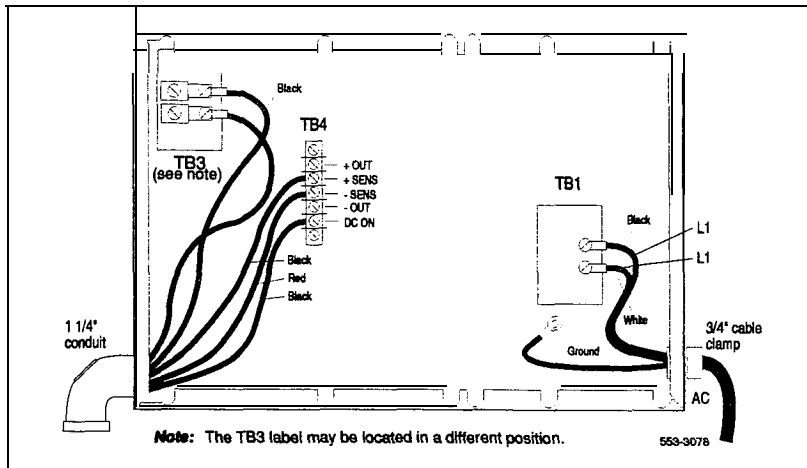


Figure A-5
NTOR72 rectifier-rear view



Mounting NTOR72 rectifiers

Use this procedure to install NTOR72 rectifiers in an NT7D12 rectifier rack. The NT7D12 Rectifier Rack Assembly supports up to three rectifiers. Up to two racks can be used per system.

Each rectifier requires one NT7D1204 Mounting hardware kit and a NT7D 120 1 Rectifier Baffle assembly that consists of a set of support brackets and a heat baffle plate.

- 1** Position the rectifier rack. Install a bolt in each of the four holes at the base of the rack to secure the rack to the floor.
- 2** If not already installed, mount an NT7D 120 1 baffle assembly on the rack directly below the space for the rectifier (see Figure A-6).

Secure the baffle assembly to the rack with the eight mounting screws provided (see Figure A-7).
- 3** Attach NT7D1204 Mounting brackets to NTOR72 rectifiers (see Figure A-8)
- 4** Mount the rectifier directly above the baffle assembly. Secure the rectifier to the rack with eight mounting screws and to the baffle assembly with two self-tapping screws (see Figure A-8).

Note: For proper weight distribution, install rectifiers starting at the *bottom* of the rectifier rack.

- 5** Remove the rear cover from the rectifier (leave the cover off until the rectifier and the QBL15 distribution box are connected).
- 6** If the AC power cord is not installed, connect it to the rear of the rectifier as shown in Figure A-5. Do *not* connect it to the commercial power outlet at this point.
- 7** Perform continuity test from the ground prong on the power cord to the rectifier chassis.
- 8** Install a 1-1/4 in. conduit fitting as shown in Figure A-5.
- 9** Neatly secure the AC power cord and other external wiring to the rectifier rack with plastic cable ties.

Figure A-6
NTOR72 rectifiers and NT7D12 rectifier rack

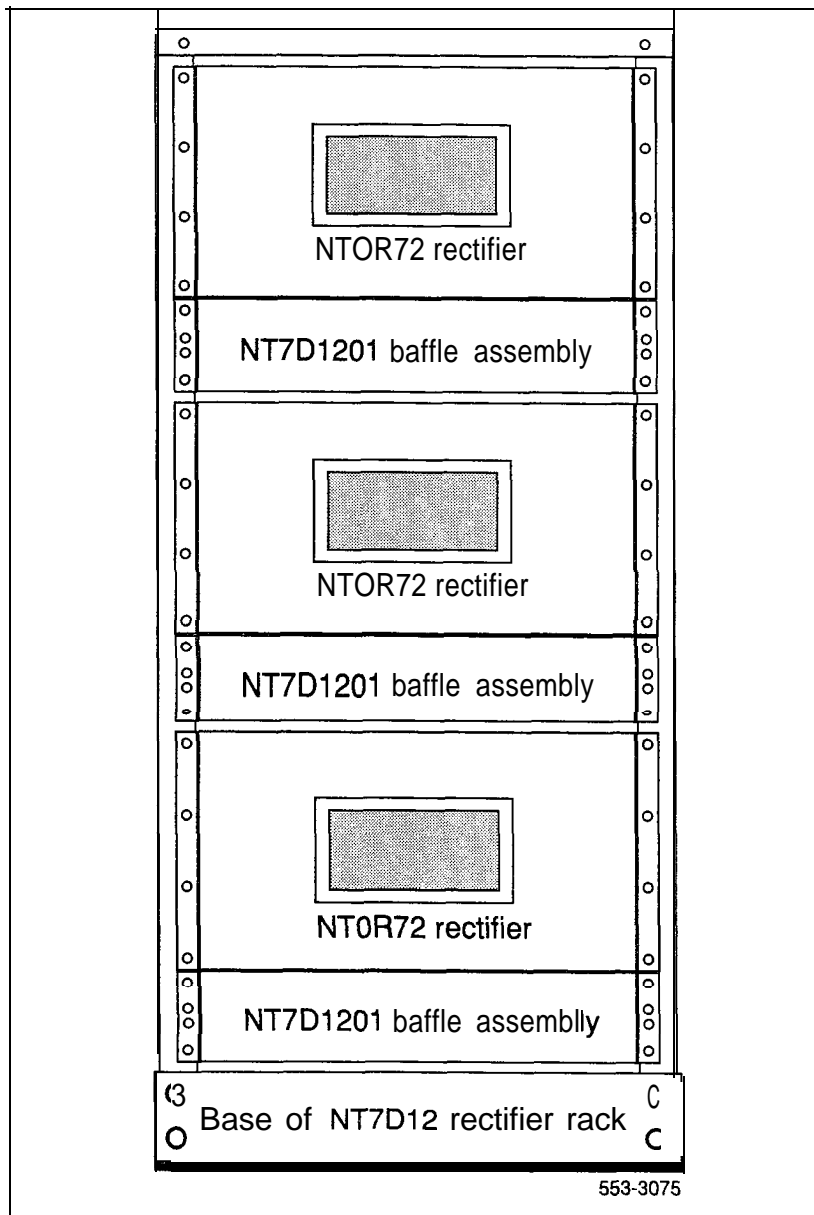


Figure A-7
NT7D1201 baffle assembly mounted in rack

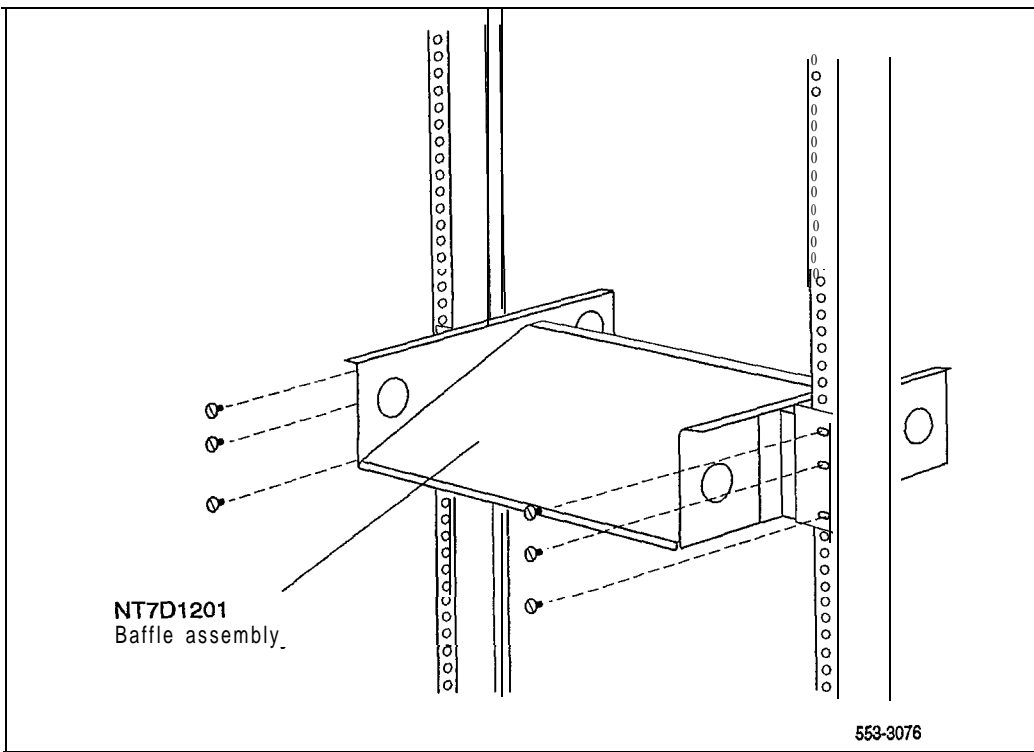
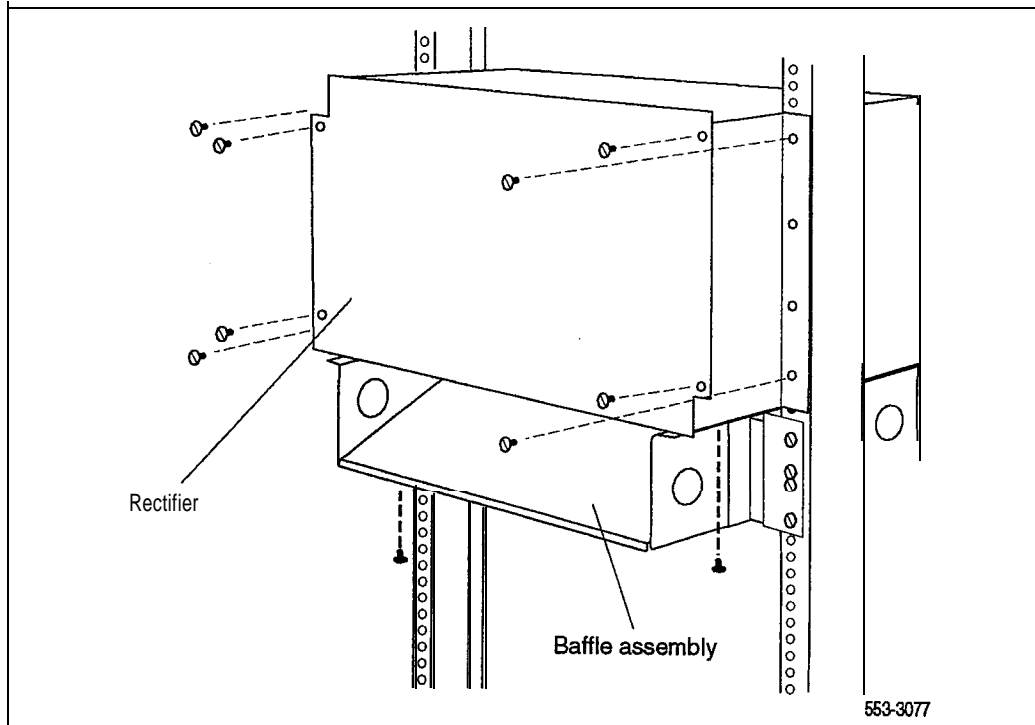


Figure A-8
NTOR72 rectifier mounted in rack



Measuring and adjusting NTOR72 rectifiers

Use this procedure to measure and adjust the high voltage shutdown and float voltage for each NTOR72 rectifier.

Note: Although rectifiers are adjusted during manufacture, they should be measured and, if necessary, readjusted on site.

- 1** Set the AC BRKR switch on the front of the rectifier to OFF. If connected, disconnect the power cord.
- 2** If connected, disconnect the wires from the +SENS and -SENS terminals on TB4. Install one jumper from the +OUT terminal to the +SENS terminal and another jumper from the -OUT terminal to the -SENS terminal on TB4 (see Figure A-5).
- 3** Connect a voltmeter to the +OUT and -OUT terminals on TB4.
- 4** Plug the power cord into the commercial power outlet. Set the DC circuit breaker to ON and set the AC BRKR switch to ON, wait for the **ON/RFA** LED to turn GREEN.
- 5** Check the voltmeter. Slowly turn the **FLT** (float voltage adjustment, see Figure A-4) potentiometer clockwise and note the output voltage level where high voltage shutdown occurs. Record this voltage.
- 6** Slowly turn the FLT potentiometer slightly counterclockwise to lower the rectifier output voltage to a point just below the shutdown voltage. Reset the rectifier by setting the AC BRKR switch to OFF, then back to ON.

If the shutdown voltage you recorded does not fall within the range of acceptable values (see Table A-3), adjust the rectifier as follows:

- Turn the HVSD (high voltage shutdown adjustment, (see Figure A-4) potentiometer fully clockwise.
- Check the voltmeter. Turn the FLT potentiometer until the voltmeter indicates the desired high voltage shutdown value.
- Slowly turn the HVSD potentiometer counterclockwise and stop when the **ON/RFA** LED turns RED and the voltmeter reading drops to approximately 0 volts, indicating that the rectifier has shut down.

- Turn the **FLT** potentiometer 1/4 turn counterclockwise.
 - Set the AC BRKR switch to **OFF**, then back to ON.
 - Check the voltmeter. Slowly turn the **FLT** potentiometer clockwise. The voltmeter reading should increase until the desired high voltage shutdown value is reached and then drop to 0 volts.
 - If necessary, repeat these adjustments until the desired level for high voltage shutdown is set.
- 7 Turn the FLT potentiometer to obtain the desired float voltage reading (see Table A-3). Set the AC circuit breaker to OFF and then back ON.
 - 8 If wires were removed from the SENS terminals on TB4, remove the jumper straps and reconnect the black wire to **+SENS** and the red wire to **-SENS**. Store the jumper straps under the two screws provided adjacent to TB4.
 - 9 Perform this procedure on each rectifier.

Table A-3
Rectifier settings

Specification	Range
High voltage shutdown	-56.5 to -57.5 V
Float voltage	-51.5 to -54.0 v

Installing a QBL15 distribution box

Use this procedure to install and connect a QBL15 distribution box. When two QBL15 units are installed, connect the battery only to the distribution box with the functional circuit breaker.

Table A-4 summarizes the connections in this procedure.

- 1 Unpack the QBL15. Inspect the unit and the meters for damage.

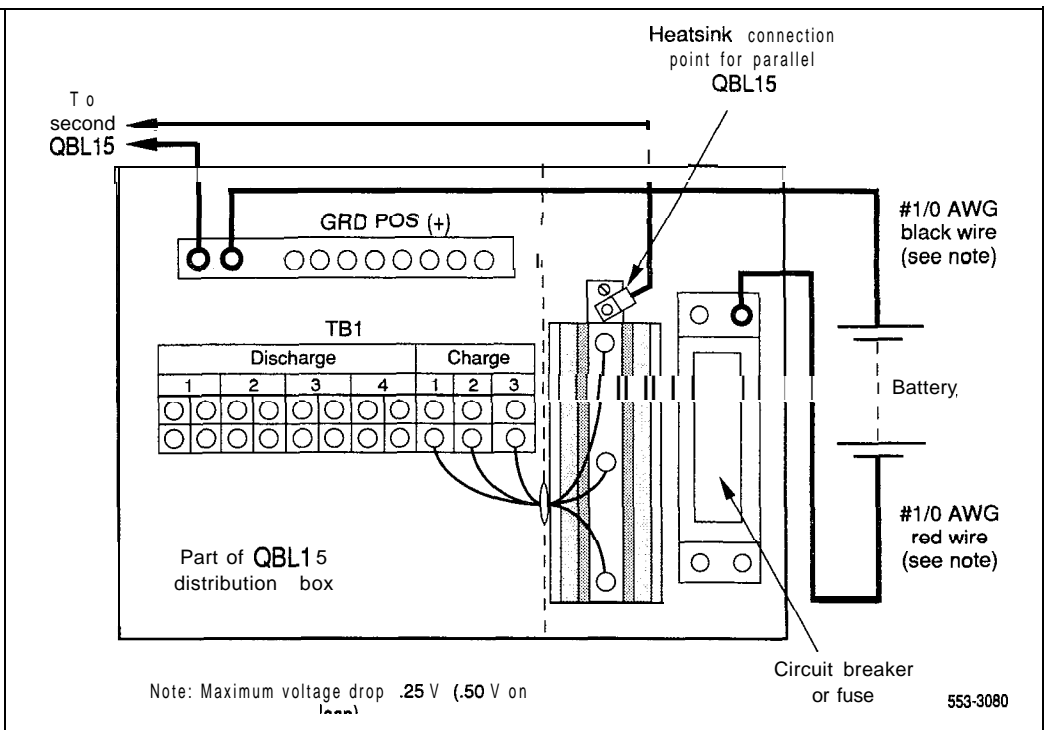
CAUTION
The QBL15 distribution box weighs approximately 25 kg (50 lb).

- 2 Mount the distribution box securely on a wall or other suitable surface:
 - Mount the unit approximately 1.2 m (4 ft) from the floor.
 - If batteries are used, mount the unit close enough to the batteries to allow a voltage drop of not more than .25 V (.50 V on the loop) on the #1/0 AWG wire between it and the batteries.
- 3 Open the front cover of the QBL15 and remove the plate that covers the main circuit breaker (or main fuse-CRS200). Set the circuit breaker to OFF (or remove the fuse).
- 4 Install and connect a red #1/0 AWG wire between the negative terminal of the battery string and the negative input at the top of the circuit breaker (or fuse) in the QBL15 (see Figure A-9).
- 5 Install and connect a black #1/0 AWG wire between the positive terminal of the battery string and the positive bus in the QBL15.
- 6 Replace the plate that covers the main circuit breaker (or fuse). Leave the front cover open to connect the QBL15 to the rectifiers.

Table A-4
Cabling to connect a QBL15 to batteries

AWG	Color	From battery string	To QBL15
#1/0	Red	Negative terminal	Negative input at the top of the circuit breaker (or fuse)
#1/0	Black	Positive terminal	Positive bus

Figure A-9
QBL15 battery connections



Adding a second QBL15

Table A-5 summarizes the connections in this procedure.

- 1 Unpack and mount the QBL15.
- 2 Open the front cover of the unit and remove the plate that covers the main circuit breaker (or main fuse-CRS200).
- 3 Install and connect a red #4 AWG wire between the initially installed QBL15 and the second QBL15.
 - Before you install the wire, crimp a ring lug on each end, or use a compression fitting like the type on the positive bus.
 - The connection point on each unit is a 1/4-20 stud located at the top of the large heatsink (see Figure A-9). Note that there are already four wires connected to the stud.
- 4 Install and connect a black #4 AWG wire between the initially installed QBL15 and the second QBL15. The connection point on each unit is a compression fitting, labeled GND POS (+), on the positive bus.
- 5 Do not set the main circuit breaker of the second QBL15 to ON (or do not reinsert the main fuse in the box).
- 6 Replace the plate that covers the main circuit breaker (or main fuse). Place a tag labeled "CIRCUIT BREAKER IS NON-FUNCTIONAL" on the circuit breaker in the second QBL15.

Table A-5
Cabling to add a second QBL15

AWG	Color	From first QBL15	To second QBL15
#4	Red	Stud on the heatsink	Stud on the heatsink
#4	Black	GND POS (+)	GND POS (+)

Connecting NTQR72 rectifiers to the QBL15 distribution box

All wiring between the QBL15 and the rectifier must be contained in the same conduit. A 1-1/4 in., or equivalent, flexible-type conduit is required. Install the conduit in one of the conduit openings on the top of the QBL15 (choose one of the openings near the rear so the door can be closed).

One NT6D54 field wiring kit is required for every three rectifiers connected to a QBL15. The kit contains one male connector (A0290885), two mounts for cable ties (P0594300), four connector contacts (A0290890), and two cable ties (P0567232).

Table A-6 summarizes the connections for this procedure.

- 1 In each rectifier, install #4 AWG wires for -48 V and 48 V return connections (see Figure A-10):
 - The wires must not be longer than 30 m (100 ft).
 - For 48 V return, connect a black wire from terminal 2 on TB3 in the rectifier to the positive bus in the QBL15.
 - For -48 V, connect a red wire from terminal 1 on TB3 in the rectifier to charge terminal 1, 2, or 3 on TB 1 in the QBL15.
- 2 In each rectifier, install #22 AWG wires for + SENS, - SENS, and DCON connections (see Figure A-10). (A full pair of #24 AWG station wire can be used instead of one, #22 AWG wire. Wrap appropriately colored tape near the ends of each station-wire pair .)

Note: The (+) and (-) sense lead pairs from a rectifier must connect to TB3 in the QBL15, with the first rectifier connected to TB3-1 and TB3-2 (+ and - sense, respectively). A second rectifier connects to TB3-3 and TB3-4, etc.

- Connect a black wire between the + SENS terminal on TB4 in the rectifier and terminal 1, 3, or 5 on TB3 in the QBL15.
- Connect a red wire between the - SENS terminal on TB4 in the rectifier and terminal 2, 4, or 6 on TB3 in the QBL15.
- Connect a blue wire to the DCON terminal on TB4 in the rectifier. This wire will connect to the field wiring kit (installed in the next step) in the QBL15.

- 3 Install an **NT6D54** field wiring kit in the **QBL15** (see Figure A-1 1).
 - Remove approximately 6 mm (1/4 in.) of insulation from the end of the blue DCON wires from terminal 5 on TB4 in the rectifiers.
 - With an AMP 90296-type crimping tool, install one connector contact (A0290890) on the skinned wires.
 - Label the wires DCON 0, DCON 1, or DCON 2 as appropriate.
 - Insert the connector contact in the male connector (A0290885).
 - Connect the male connector to the female connector (A0290886) on the end of the NT8D46AT cable to the system monitor.
 - Secure the DCON connectors to the left inside panel of the **QBL15** with the cable tie mounts and cable ties supplied with the kit.
- 4 Make sure all rectifiers in the system are properly connected.
- 5 Set the AC circuit breakers on all rectifiers to OFF and all circuit breakers on all Meridian 1 columns to OFF.
- 6 Set the CBO circuit breaker on just one Meridian 1 column to ON to establish a minimum load.
- 7 Adjust rectifier float voltage as follows:
 - Set the AC and DC circuit breaker on a single rectifier to ON.
 - At the **QBL15**, connect a voltmeter to the (+) and (-) test points (located with the QPC188 Battery Monitor). Adjust the FLT potentiometer on the energized rectifier to obtain the desired float voltage reading, ± 5 mV dc.
 - Set the AC circuit breaker to OFF.
- 8 Repeat step 7 for all remaining rectifiers in the system.
- 9 Disconnect all rectifier power cords until the system is placed in service.

Table A-6
Cabling to connect NTOR72 rectifiers to the **QBL15** distribution box

AWG	Color	Connection	From rectifier	To QBL15
#4	Black	48 V return	Terminal 2 on TB3	GRD POS (+)
#4	Red	-48 V	Terminal 1 on TB3	Terminal 9, 10, or 11 on TB1
#22	Black	+ sense	+ SENS terminal on TB4	Terminal 1, 3, or 5 on TB3
#22	Red	- sense	- SENS terminal on TB4	Terminal 2, 4, or 6 on TB3
#22	Blue	DCON	DCON terminal on TB4	Field wiring kit; see Fig. A-1 1

Figure A-1 0
Rectifier to **QBL15** connections

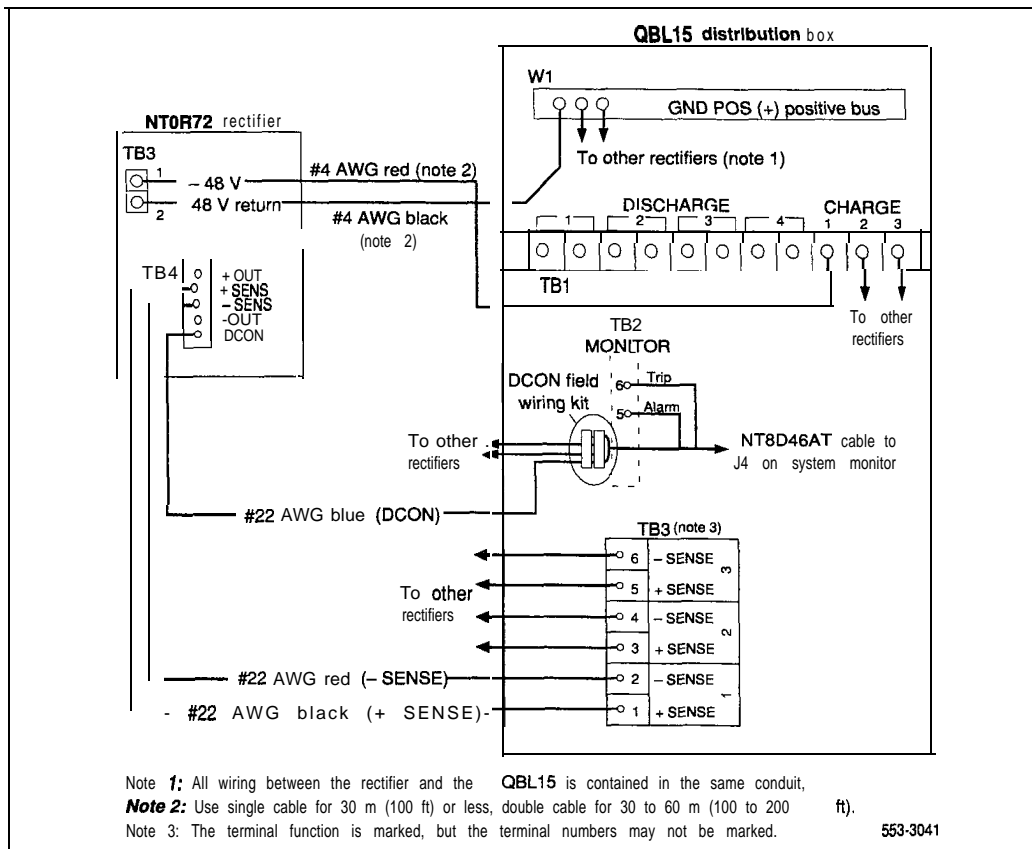
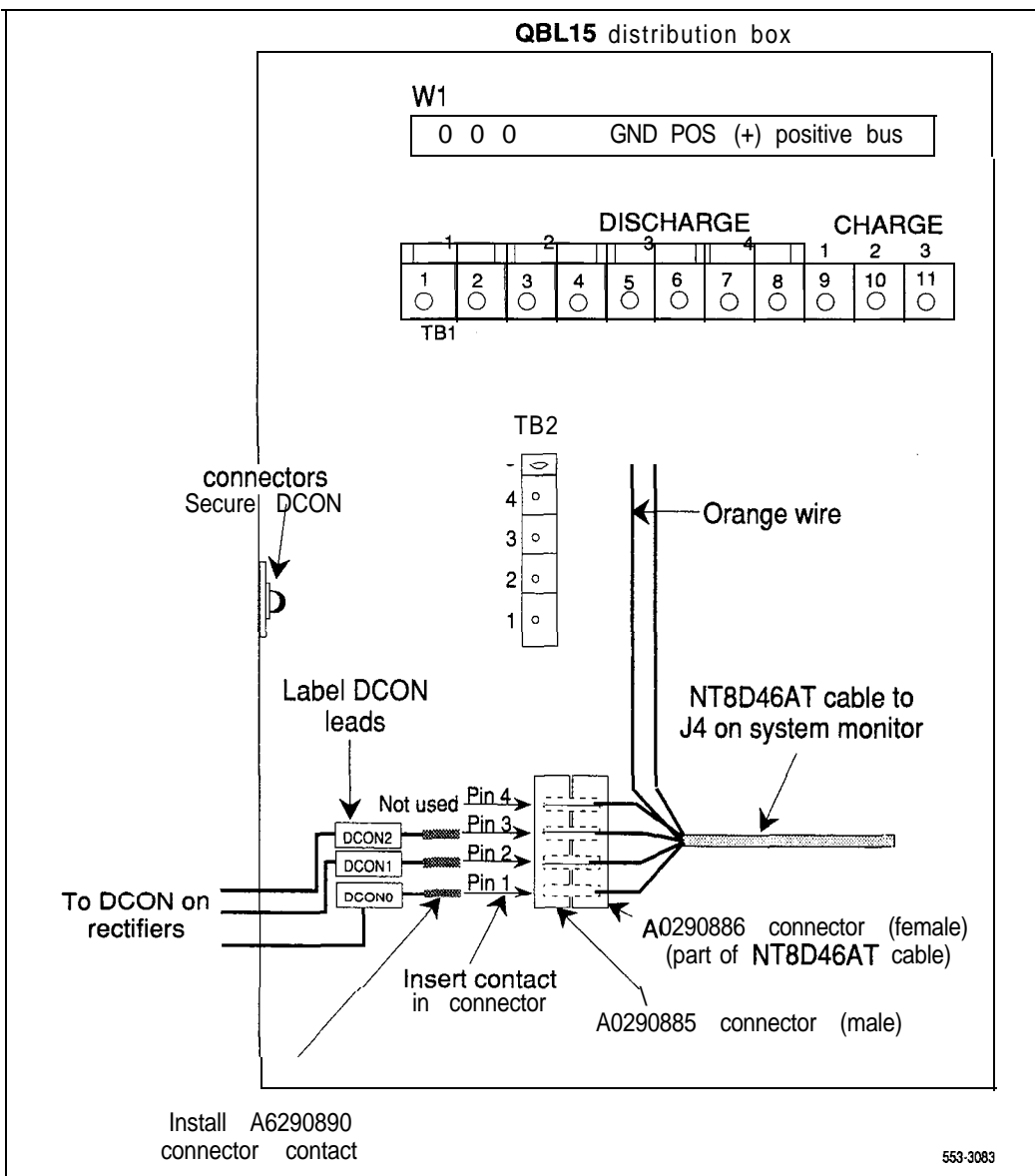


Figure A-1 1
NT6D54 field wiring kit connections



Installing a QCA13 power plant

The QCA13 DC Power Plant can be used with options 7 1 and 8 1 (and larger option 6 1 and 61C configurations).

The QCA13 consists of fusing and distribution hardware, monitoring and control equipment, and up to four **NT5C03** rectifiers. Up to two supplemental cabinets can be added, with up to four rectifiers in the first supplemental cabinet and up to two rectifiers in the second cabinet, for a total of ten rectifiers and a total system capacity of 500 amps.

Each of these rectifiers operates from a nominal 208/240 V ac at 23/21 amps. Each rectifier is generally hard-wired to the commercial power source. One 30-amp circuit is required for each rectifier.

To install a QCA13, follow the instructions provided with the QCA13 equipment.

Installing safety ground/protective earth and logic return wiring

The single point ground required by the system can be an isolated ground (IG) bus or AC equipment ground (ACEG) bus in the service panel or transformer. The system is to be connected to safety ground/protective earth in accordance with national requirements. For international use, the system is to be connected to safety ground/protective earth in accordance with Paragraph 2.5 of EN60950/IEC950.

Note: Refer to *Installation planning (553-3001-120)* for a complete description of approved ground sources and methods. Insulated ground wire must be used for system grounding.

Depending on the distances between columns and the service panel, safety ground/protective earth wiring can be daisy-chained or run independently from each column to the service panel.

Figures A-12, A-13, A-14, and A-15 show the ACEG as the single point ground and safety ground/protective earth wiring in daisy-chain configurations.

Multiple-column systems often use a logic return equalizer (**LRE**) as the point where the logic return wires from different columns are consolidated before connecting to the single point ground. The **NT6D5303** large LRE (usually used with DC power systems) is available from Northern Telecom.

The LRE used with the QBL12 is a copper bus bar that is mounted on a wall next to the QBL12. The positive bus in the QBL15 is used as the LRE. The LRE used with the QCA13 is located on top of the QCA13 cabinet. The LRE used with the **NT6D82** is a copper bus bar mounted in the control/distribution panel or the power plant.

Figures A-12, A-13, A-14, and A-15 show the logic return points and wiring configurations.

Figure A-1 2
NT8D62 Ground and logic return distribution—NT6D82 Power System

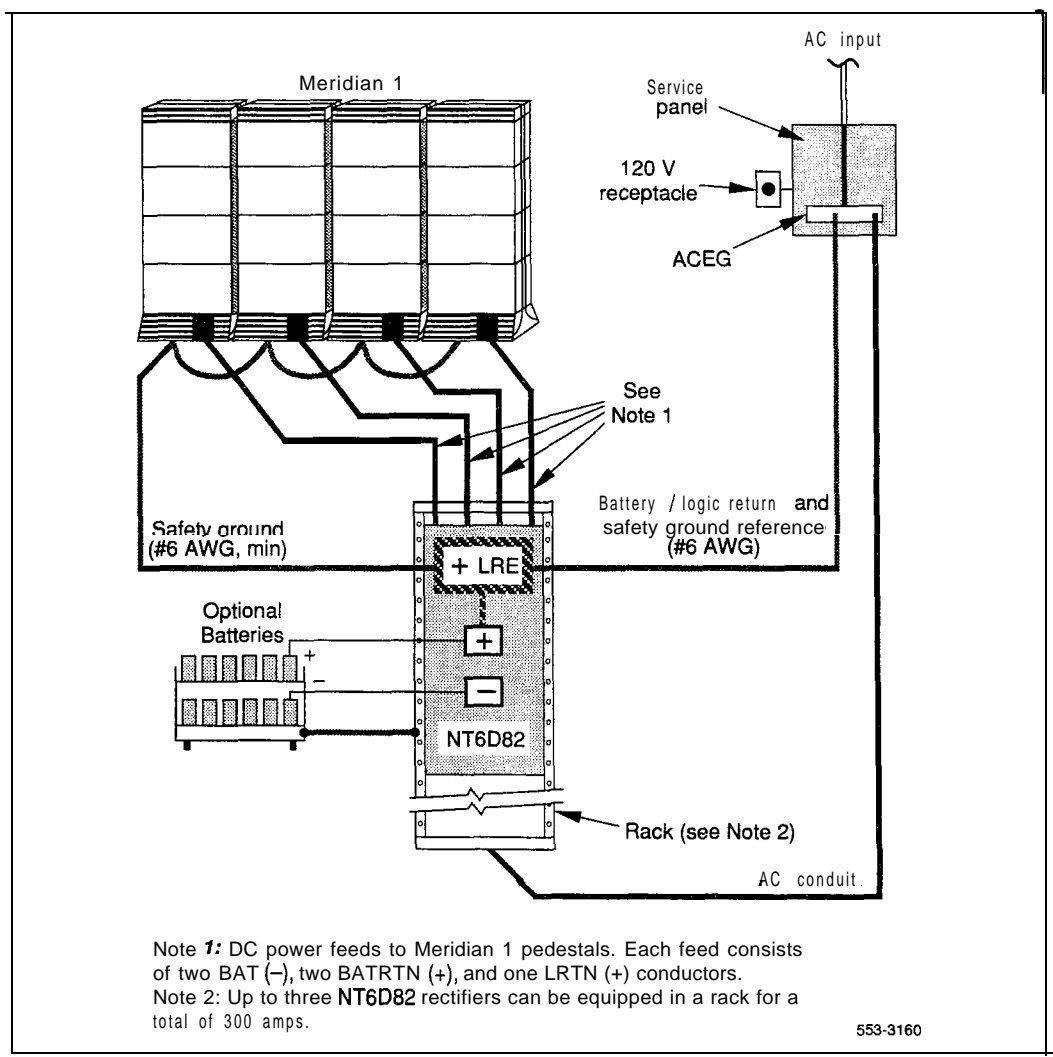


Figure A-1 3
QBL12 ground and logic return distribution

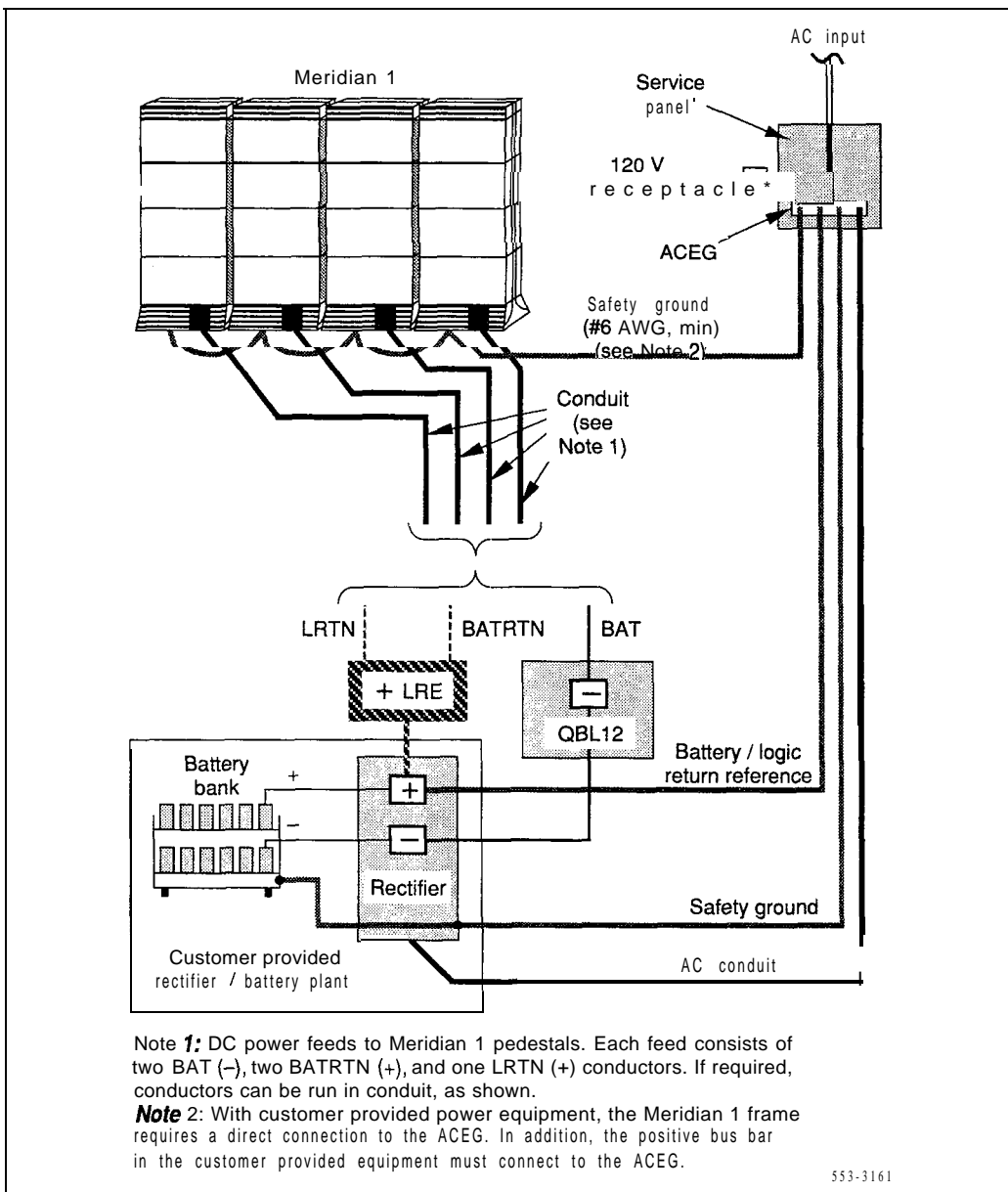


Figure A-14
QBL15 ground and logic return distribution

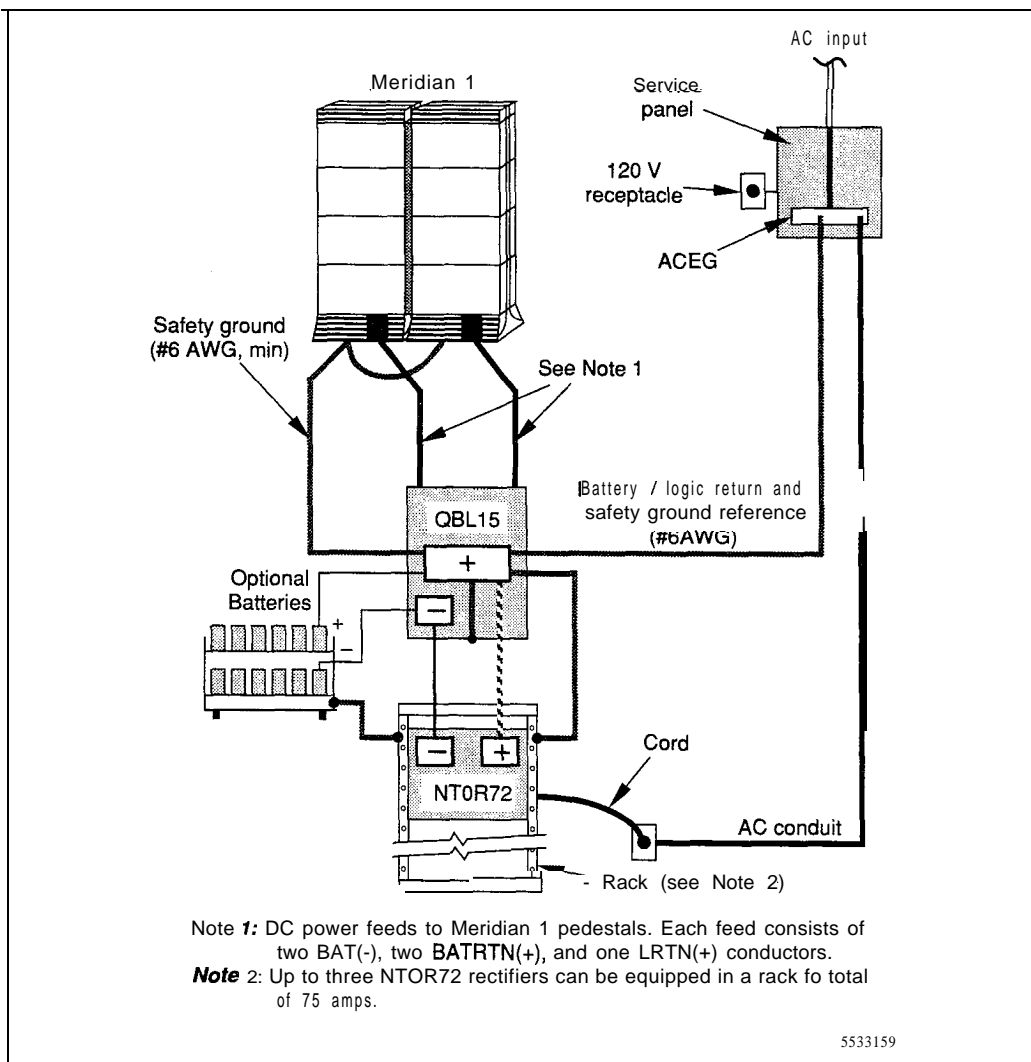
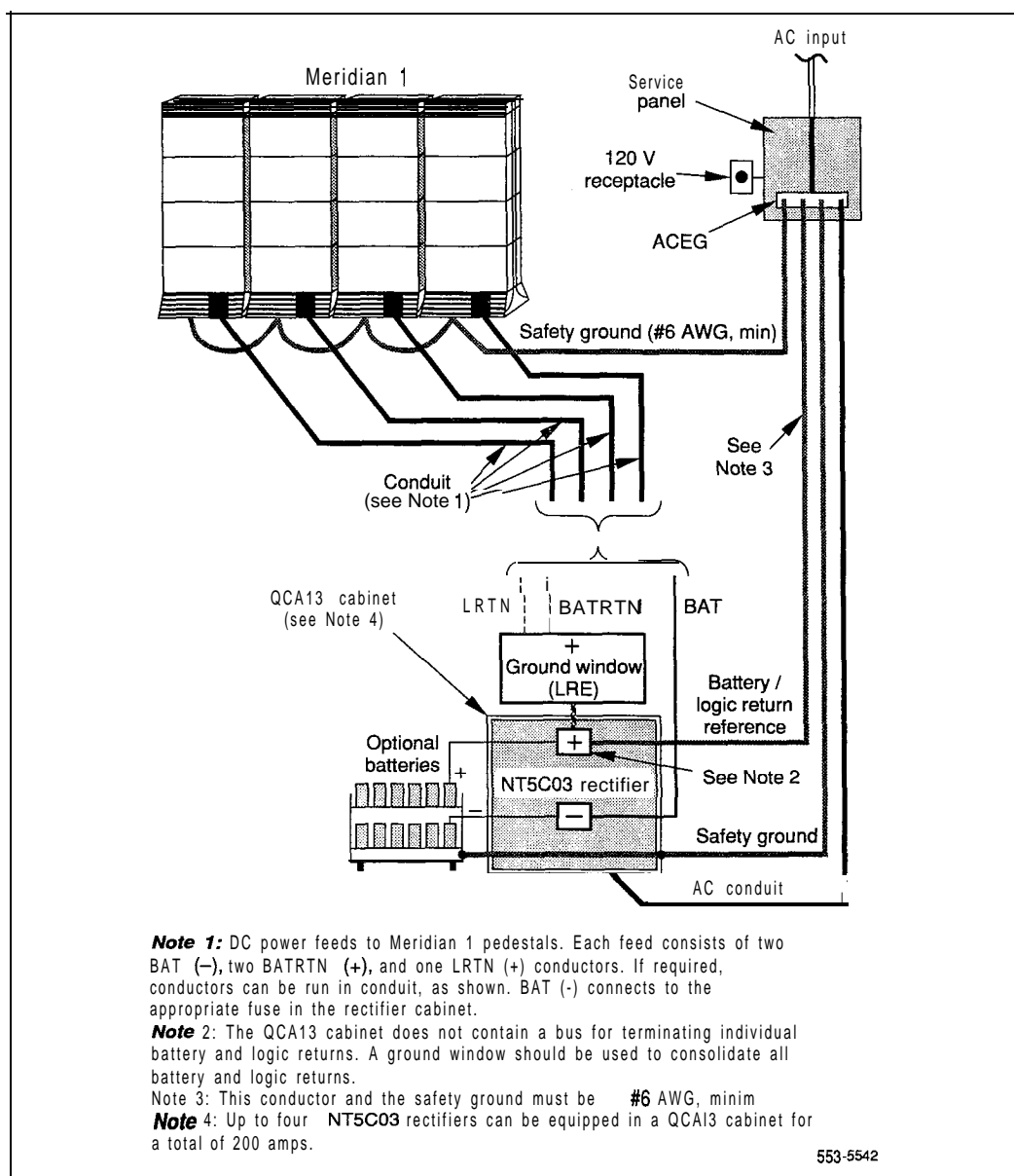


Figure A-15
QCA13 ground and logic return distribution



Installing safety ground/protective earth wiring

WARNING

Failure to follow grounding procedures can result in unsafe or faulty equipment. See *Installation planning (553-3001-120)* for a complete description of approved ground sources and methods.

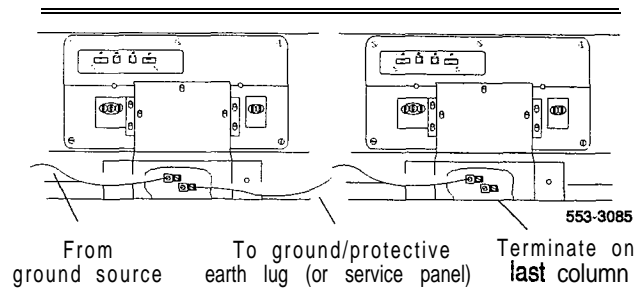
- 1 Make sure all pedestals are disconnected from the power source.
 - With an NT682, **QBL12**, or **QCA13**, remove the associated 30-amp fuse.
 - With a **QBL15**, set the circuit breaker to OFF (or remove the main fuse).
- 2 At the rear of the pedestal, remove the plastic safety cover over the terminal block to access the safety ground/protective earth lugs (leave the cover off until all pedestal connections are made):
 - Loosen the three screws holding the cover.
 - Lift the cover up, then over the three mounting screws on the front panel of the cover.
- 3 Connect the safety ground/protective earth wire:

Note: Insulated ground wire must be used for system grounding.

For a single-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the pedestal.

 NTOR72, NT6D82, QBLI2, QBL15, QCA13 A-29

For a multiple-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the closest column. Daisy-chain #6 AWG ground wires from one pedestal to the next, connecting all of the columns (or run a #6 AWG wire from the ground source to each column individually).



Note: With the NT7D67CB PDU, the safety ground/protective earth wire must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

- 4 Place a warning tag (WARNING-TELEPHONE SYSTEM GROUND CONNECTION-DO NOT DISCONNECT) on the **connection** at the ground source.

Connecting the PDU

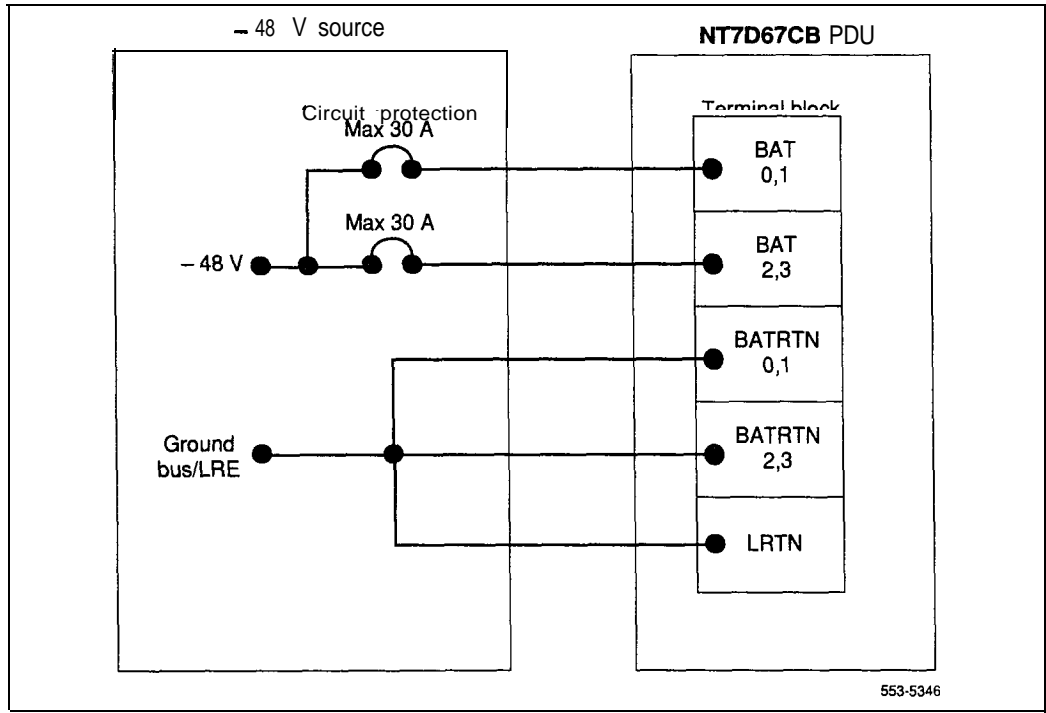
A readily accessible disconnect device for input power is required.

CAUTION

DC power for the **NT7D09** Pedestal must be provided with circuit protection of 30 amps for the **BAT 0,1** and **BAT 2,3** feeds (see Figure A-16).

Circuit breakers must be located next to each other and labeled to show that both must be shut off to remove all power to the system.

Figure A-16
Circuit protection for the PDU



123 1
1 0242 2
55 1 7

NTOR72, NT6D82, QBL12, QBL15, QCA13 A-31

A maximum loop drop of two volts is allowed between the PDU, or junction box, and the external power equipment. See Table A-7 for allowable wire sizes. See *Power engineering* (553-3001-152) for detailed information on calculating wire size.

Note: Conduit is required with the NT7D10 PDU.

Table A-7
Wire gauge requirements with two **30-amp** feeds (five wires)

Length	#8 AWG	#6 AWG	Single #4 AWG	Double #4 AWG
0-3 m (10 ft)	Yes	Yes	Yes	Yes
3-6 m (20 ft)	Yes	Yes	Yes	Yes
6-9 m (30 ft)	Yes	Yes	Yes	Yes
9-12 m (40 ft)	Yes	Yes	Yes	Yes
12-15 m (50ft)	Yes	Yes	Yes	Yes
15-18 m (60 ft)	No	Yes	Yes	Yes
18-21 m (70 ft)	No	Yes	Yes	Yes
21-24 m (80 ft)	No	Yes	Yes	Yes
24-27 m (90 ft)	No	No	Yes	Yes
27-30 m (100 ft)	No	No	Yes	Yes
30-60 m (200 ft)	No	No	No	Yes
over 60 m (200 ft)	No	No	No	No

Note 1: Two **30-amp** feeds are typically adequate for a column with four modules (five wires total-two **30-amp** feed pairs plus logic return).

Note 2: If dual conduit is used, the wires must be run in battery/battery return pairs, with one pair in one conduit and the other pair, plus logic return, in the other conduit.

Legend: Yes = Wire size is adequate for the distance.
No = Wire size has too high a voltage drop and is inadequate for the distance.

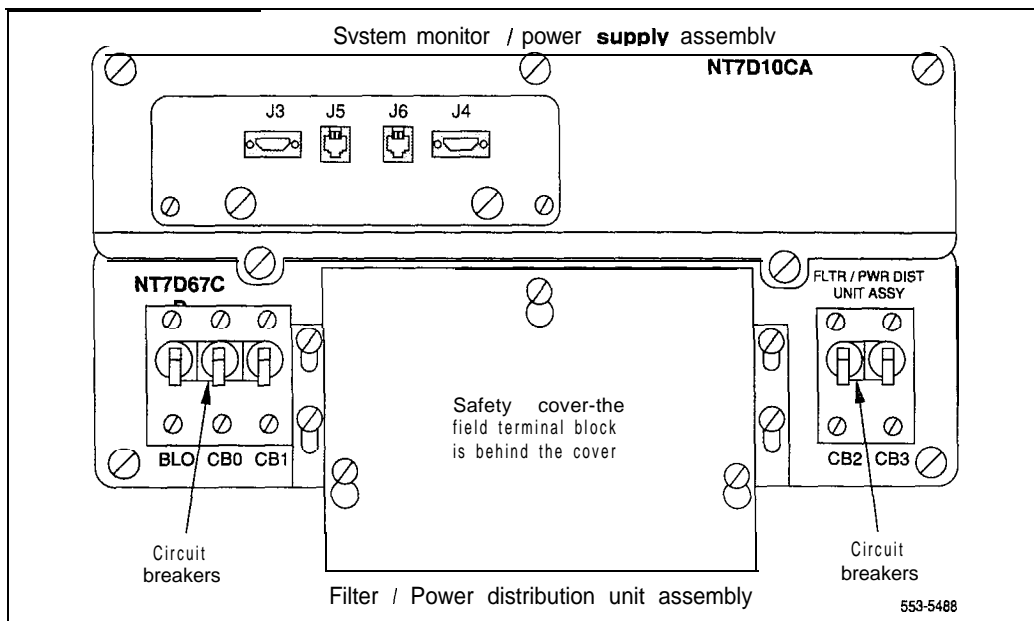
The following equipment is located in the rear of each pedestal (see Figure A-17) in Meridian 1 columns:

- The PDU distributes power to the entire column.
- The field wiring terminal provides the connection point for wiring brought into the pedestal.
- A circuit breaker is provided for each module in the column and for the blower unit.

Note: All column circuit breakers will trip if a column thermal overload is detected or a DC-power low-voltage condition is sensed.

- The system monitor checks the column temperature, cooling system status, and system voltage status, and controls alarms and line transfer states accordingly.

Figure A-17
DC power equipment in the rear of the pedestal—NT7D67CB PDU

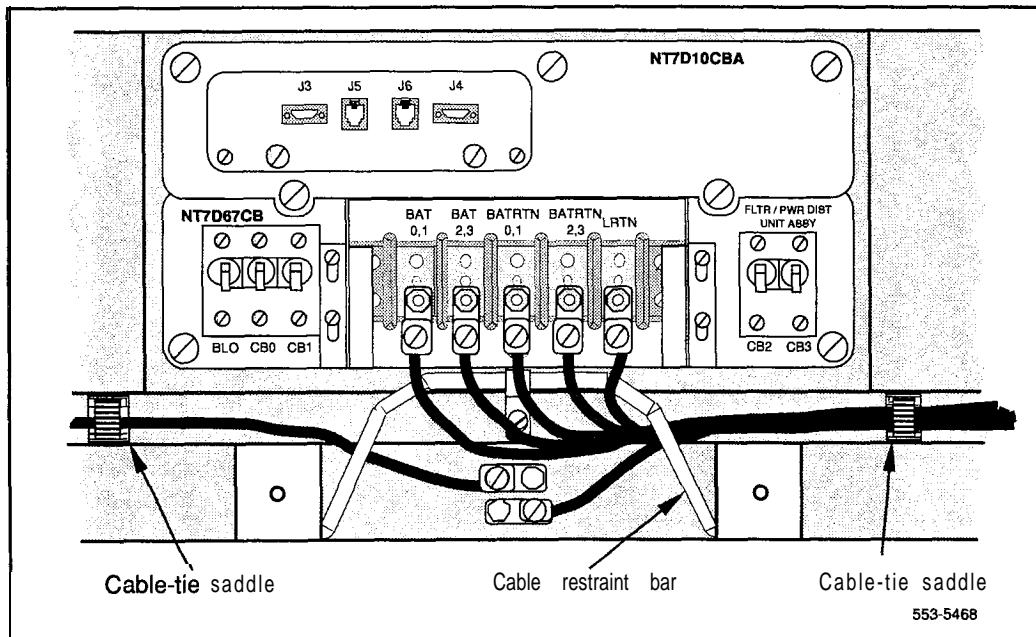


With the NT7D67CB PDU, the safety ground/protective earth wires and all wiring to the terminal block in the PDU must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal (see Figure A-18).

Conduit is not required with the NT7D67CB PDU. However, 1-1/4 or 3/4 in. conduit can be used if local codes or individual installations require it. Conduit can be routed down through the column from overhead racks or up through the floor. Conduit clamps and the hardware to fasten the conduit are provided in the pedestal. If the NT7D0902 Rear Mount Conduit Kit is used, conduit can enter from the rear of the column (above the floor).

Note: If you are connecting the power system to a vintage AA or DA NT7D10 PDU, go to “Appendix B: NT7D10 PDU connections.”

Figure A-18
Cable routing in the rear of the pedestal—NT7D67CB PDU



Preparing the NT7D67CB PDU

When a system is shipped, a set of screws secures the leveling bracket at the rear of the **NT7D67CB** PDU to protect the PDU from vibration damage during transit. The shipping screws should be removed during initial installation.

- 1 For access to the rear of the PDU, temporarily remove the blower unit in the front of the pedestal:
 - Turn the screws on the front of the blower unit counter-clockwise.
 - Grasp the lip at the top edge of the blower unit. Slide the unit out of the glides and onto the bottom ledge of the pedestal. Lift the unit out of the pedestal. (Keep the blower unit in an upright position.)
- 2 Remove the two shipping screws holding the PDU to the vertical shield in the pedestal.
- 3 Reinstall the blower unit:
 - Set the blower unit on the bottom ledge of the pedestal.
 - Tilt the back of the blower unit up slightly so it will slide into the pedestal glides (you may need to lift the unit). Gently push the unit into position.
 - Tighten the screws on the front of the blower unit.

Connecting power to the **NT7D67CB** PDU

To connect the external power system to the PDU, use the following procedure for each column (this procedure gives the connections for a four-module column).

Note: All wiring to the PDU must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

- 1 If a junction box is used, insert the conduit from the junction box into one of the conduit access holes in the pedestal.

Connect the wires from the junction box to the matching connections on the terminal block on the PDU:

- Connect the red wires to BAT 0,1 and BAT 2,3.
- Connect the black wires to BATRTN 0,1 and BATRTN 2,3.
- Connect the remaining wire (orange or white) to LRTN.

Note: If a junction box is used, the connections described in steps 2 through 4 apply to the junction box rather than the PDU.

- 2 Connect the red BAT (-48 V) wires:

- At the power plant:

For an **NT6D82**, connect the wires to the first two circuit breakers in the main control/distribution panel (see Figure A- 19).

For a **QBL12** or **QCA13**, connect the wires to the first two available 30-amp fuse output connections on the -48 V terminal panel (see Figure A-20).

Note: Each 30-amp fuse output has two connection points on the distribution panel. Only one 30-amp connection point is required for every two modules; typically, #6 AWG is adequate (#4 AWG can be used).

For a **QBL15**, connect the wires to terminals **1, 2, or 3** (DISCHARGE) on **TB1** (see Figure A-21).

- At the PDU, connect the wires to the terminal block (one wire feeds two modules):

For modules 0 and 1, connect to **BAT 0,1**.

For modules 2 and 3, connect to **BAT 2,3**.

3 Connect the black BATRTN (48 V return) wires:

- At the power plant:

For an **NT6D82**, connect two wires to the ground **bus/LRE**.

For a **QBL12** or **QCA13**, connect two wires to the LRE.

For a **QBL15**, connect two wires to the positive bus.

- At the PDU, connect the wires to the terminal block (one wire feeds two modules):

For modules 0 and 1, connect to **BATRTN 0,1**.

For modules 2 and 3, connect to **BATRTN 2,3**.

4 Connect the LRTN wire (orange or white):

- At the power plant:

For an **NT6D82**, connect the wire to the ground **bus/LRE**.

For a **QBL12** or **QCA13**, connect the wire to the LRE.

For a **QBL15**, connect the wire to the positive bus.

- At the PDU, connect the wire to LRTN on the terminal block.

5 Reinstall the plastic safety cover over the terminal block:

- Lower the front panel over the mounting screws on the PDU.
- Tighten the three screws holding the cover.

6 Close the covers on the power plant.

Figure A-19
PDU to **NT6D82** connections

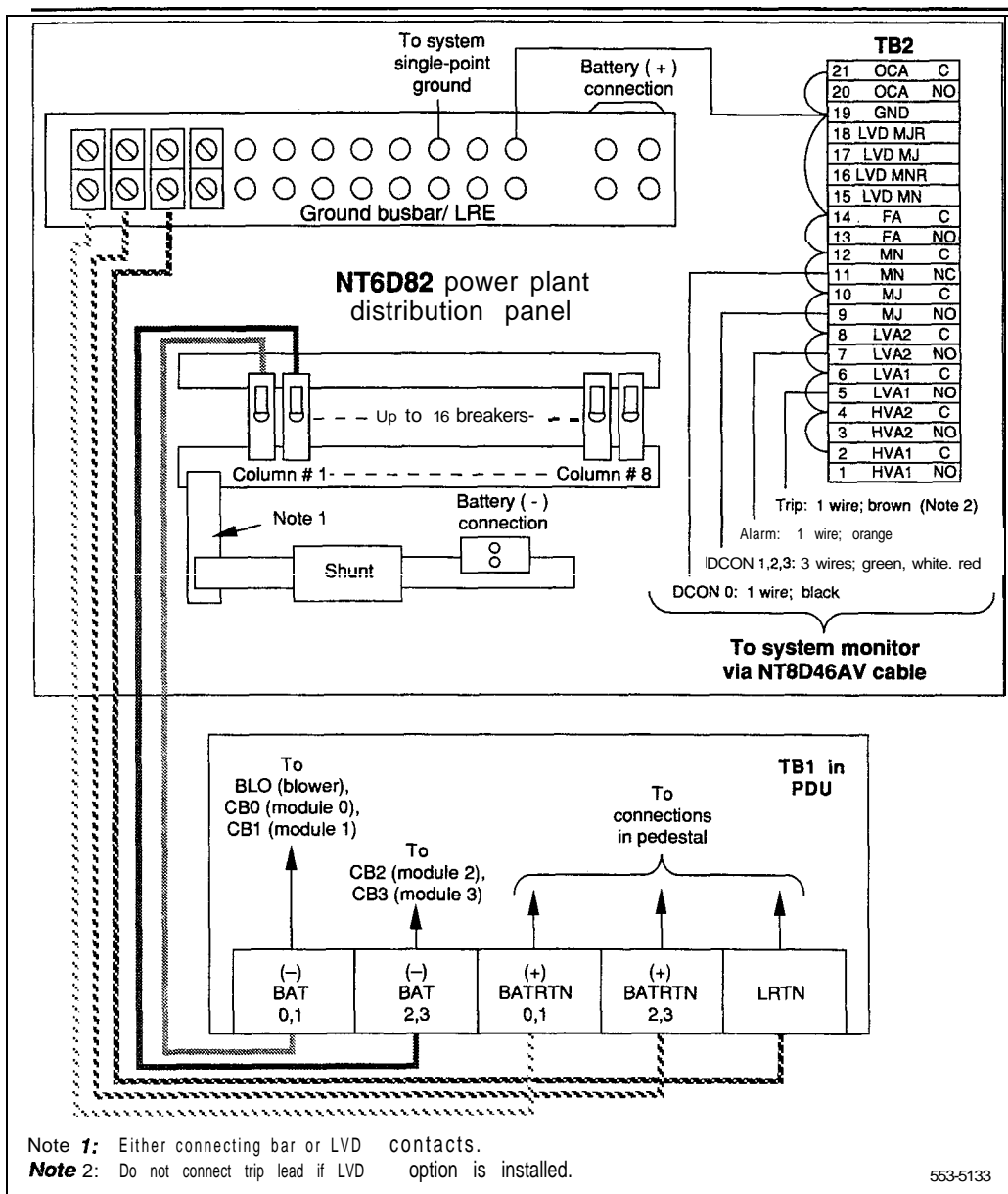


Figure A-20
PDU to **QBL12** or **QCA13** connections

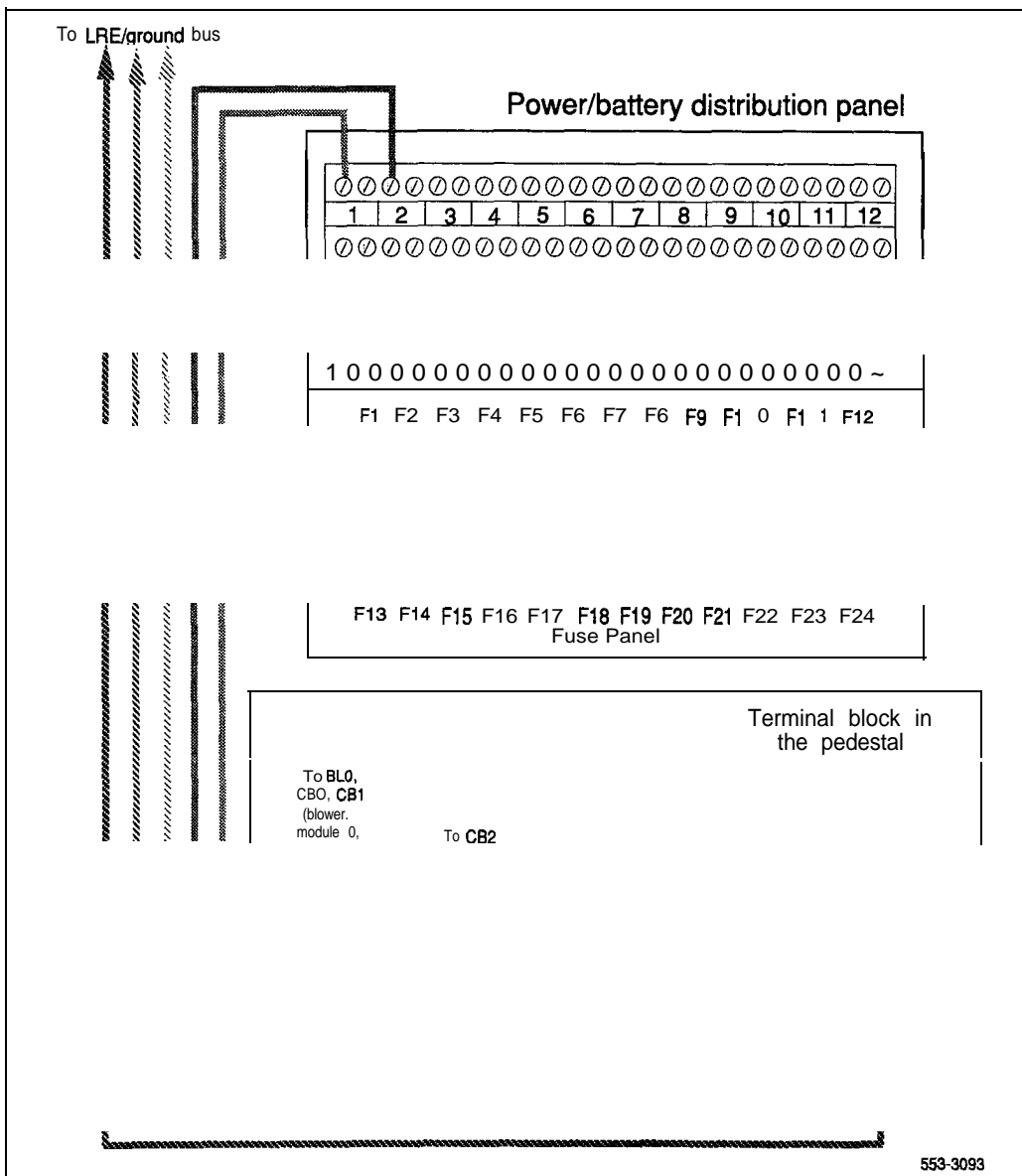
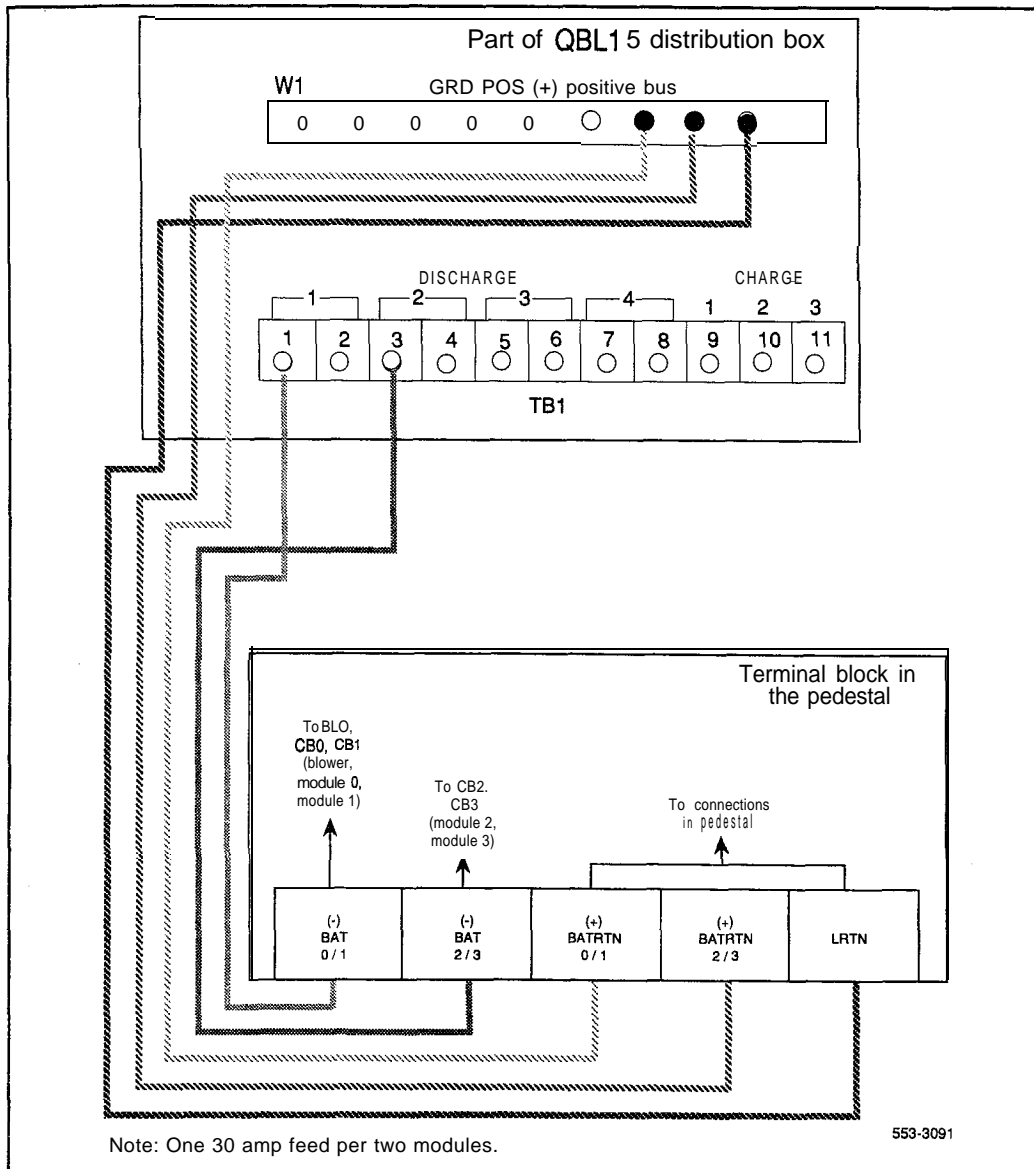


Figure A-21
PDU to QBL15 connections



Connecting the **NT8D22** system monitor

See “Configuring the system monitor” on page 1 I-1 to

- configure system monitor switch settings
- cable the system monitor to the **SDI** port
- cable system monitors in a multiple-column Meridian 1
- cable the system monitor to **PFTUs** or external alarms

Use the following cables to extend the alarm and trip leads from connector **J4** on the master system monitor to the external power equipment (conduit is not required):

- For an **NT6D82**, use an **NT8D46AV** cable (see Table A-8).
- For a **QBL12**, use an **NT8D46AW** cable (see Table A-9).
- For a **QBL15**, use an **NT8D46AT** cable (see Table A-10).
- For a **QCA13**, use an **NT8D46AV** cable (see Table A-11).

An **NT8D46BV** cable, 20 m (64 ft), or **NT8D46CV** cable, 33 m (100 ft), can be used instead of the **NT8D46AV** cable. Connections are the same as the **NT8D46AV** cable.

Table A-8
NT6D82 alarm and trip lead **connections—NT8D46AV** cable

Color	Description	Connection at TB2 in the NT6D82
B L	DCON 0	MNA (NO), position 11
R	DCON 1"	MJA(NO) , position 9
W	DCON 2*	MJA(NO) , position 9
GR	DCON 3"	MJA(NO) , position 9
OR	Alarm	LVA2 (NO), position 7
B L	not used	—
BR	not used	—
Y	not used	—
V	not used	—
Connect the red, white, and green wires together at MJA.		

Table A-9
 QBL12 alarm and trip lead **connections—NT8D46AW** cable

Color	Description	Connection at TB3 in the QBL12
B L	DCON 0'	Terminal 6
R	not used	---
W	not used	---
GR	not used	---
OR	Alarm	Terminal 3
B L	not used	---
BR	Trip	Terminal 4
Y	not used	---
V	not used	---

*Also terminate the DCON connection from the rectifier on terminal 6.

Table A-I 0
 QBL15 alarm and trip lead **connections—NT8D46AT** cable

Color	Description	Connection at TB2 in the QBL15
B L	DCON 0	*
R	DCON 1	*
W	DCON 2	·
GR	not used	—
OR	Alarm	Terminal 5
B L	not used	—
BR	Trip	Terminal 6
Y	not used	—
V	not used	—

The A0290885 male connector in the QBL15 connects the DCON wires from the rectifiers to the A0290888 female connector on the end of the **NT8D46AT** cable. See "Connecting NTO72 rectifiers to the QBL15 distribution box" on page A-I 8 to install the A0290885 connector.

Table A-11
QCA13 alarm and trip lead **connections—NT8D46AV** cable

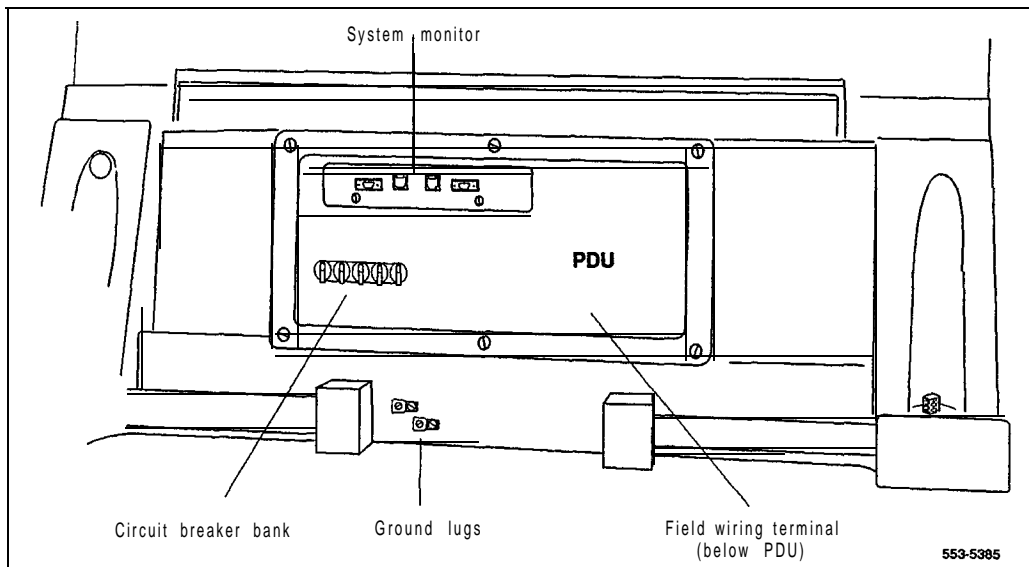
Color	Description	Connection at TSA in the QCA13
BL	not used	—
R	not used	—
W	not used	—
GR	not used	—
OR	Alarm	Terminal 50
BL	not used	—
BR	Trip	Terminal 49
Y	not used	—
V	not used	—

Appendix B: NT7D10 PDU connections

Figure B-1 shows the location of the vintage AA or DA NT7D10 PDU in the rear of the pedestal. To connect the external power system to the PDU, use the following procedure for each column (this procedure gives the connections for a four-module column).

The -48 V (BAT), 48 V return (RTN), and logic return (LRTN) wires must be installed in conduit, and must be installed in the same conduit.

Figure B-1
Power equipment in the rear of the pedestal—NT7D10 PDU



Connecting power to the **NT7D10** PDU

- 1 To access the field wiring terminal block (TB 1) in the bottom of the pedestal, you must remove the PDU:
 - Remove the **I/O** safety panel in module 0 (bottom module).
 - Disconnect the power plug (**J1**) and the system monitor ribbon cable between module 0 and the PDU .

Note: To disconnect the power plug, you must press a latch trip on the front and rear of the plug. You may need to use a screwdriver blade against the latch trip on the front of the plug.

 - If the module has an **SDI** paddle board installed on the backplane, temporarily remove the paddle board to avoid damage.
 - Disconnect cables from the faceplate of the system monitor.
 - Loosen the retaining screws that secure the PDU and pull the unit out of the pedestal.
- 2 If a junction box is used, insert the conduit from the junction box into one of the conduit access holes in the pedestal.

Connect the wires from the junction box to the matching connections on the terminal block in the pedestal:

- Connect the red wires to BAT 0 through BAT 3.
- Connect the black wires to RTN 0 through RTN 3.
- Connect the remaining wire (orange or white) to LRTN

Note: If a junction box is used, the connections described in steps 3 through 5 apply to the junction box rather than to the PDU.

3 Connect the red BAT (-48 V) wires:

- At the power plant:

For an **MFA150** or **NT6D82**, connect two wires to the first two circuit breakers in the main control/distribution panel (see Figure B-2 for **MFA150**, Figure B-3 for **NT6D82**).

For a **QBL12** or **QCA13**, connect two wires to the first two available 30-amp fuse output connections on the -48 V terminal panel (see Figure B-4).

Note: Each 30-amp fuse output has two connection points on the distribution panel. Only one 30-amp connection point is required for every two modules; typically, #6 AWG is adequate (#4 AWG can be used).

For a **QBL15**, connect the wires to terminals 1, 2, or 3 (DISCHARGE) on **TB1** (see Figure B-5).

- At the pedestal, connect the wires to the terminal block:

For modules 0 and 1, connect to BAT 0 and add a strap (if not already installed) between BAT 0 and BAT 1.

For modules 2 and 3, connect to BAT 2 and add a strap (if not already installed) between BAT 2 and BAT 3.

4 Connect the black BATRTN (48 V return) wires:

- At the power plant:

For an **MFA150** or **NT6D82**, connect two wires to the ground bus/LRE.

For a **QBL12** or **QCA13**, connect two wires to the LRE.

For a **QBL15**, connect two wires to the positive bus.

- At the pedestal, connect the wires to the terminal block:

For modules 0 and 1, connect to RTN 0 and add a strap (if not already installed) between RTN 0 and RTN 1.

For modules 2 and 3, connect to RTN 2 and add a strap (if not already installed) between RTN 2 and RTN 3.

5 Connect the LRTN wire (orange or white):

- At the power plant:
 - For an **MFA150** or **NT6D82**, connect the wire to the ground bus/LRE.
 - For a **QBL12** or **QCA13**, connect the wire to the LRE.
 - For a **QBL15**, connect the wire to the positive bus.
- At the PDU, connect the wire to LRTN on the terminal block.

6 Reinstall the PDU:

- In the front of the pedestal, set the switch on the front of the blower unit to OFF (down). Unseat the blower unit. Slide the unit forward approximately 7.5 cm (3 in.).
- Insert the PDU and secure it with its retaining screws.
- Insert the blower unit until it is properly plugged into the PDU. Set the switch to ON.
- Reconnect the system monitor and power cables from module 0 to the pedestal.
- Reinstall the SDI paddle board on the backplane if one was removed.
- Reinstall the I/O safety panel.
- Reconnect cables to the faceplate of the system monitor.

7 Close the covers on the power plant.

To connect the **NT8D22** system monitor, go to the appropriate chapter:

- For an **MFA150** or **NT6D82**, see “Configuring the system monitor” on page 11-1.
- For a **QBL12**, **QBL15**, or **QCA13**, see Appendix A.

Figure B-2
PDU to **MFA150** connections

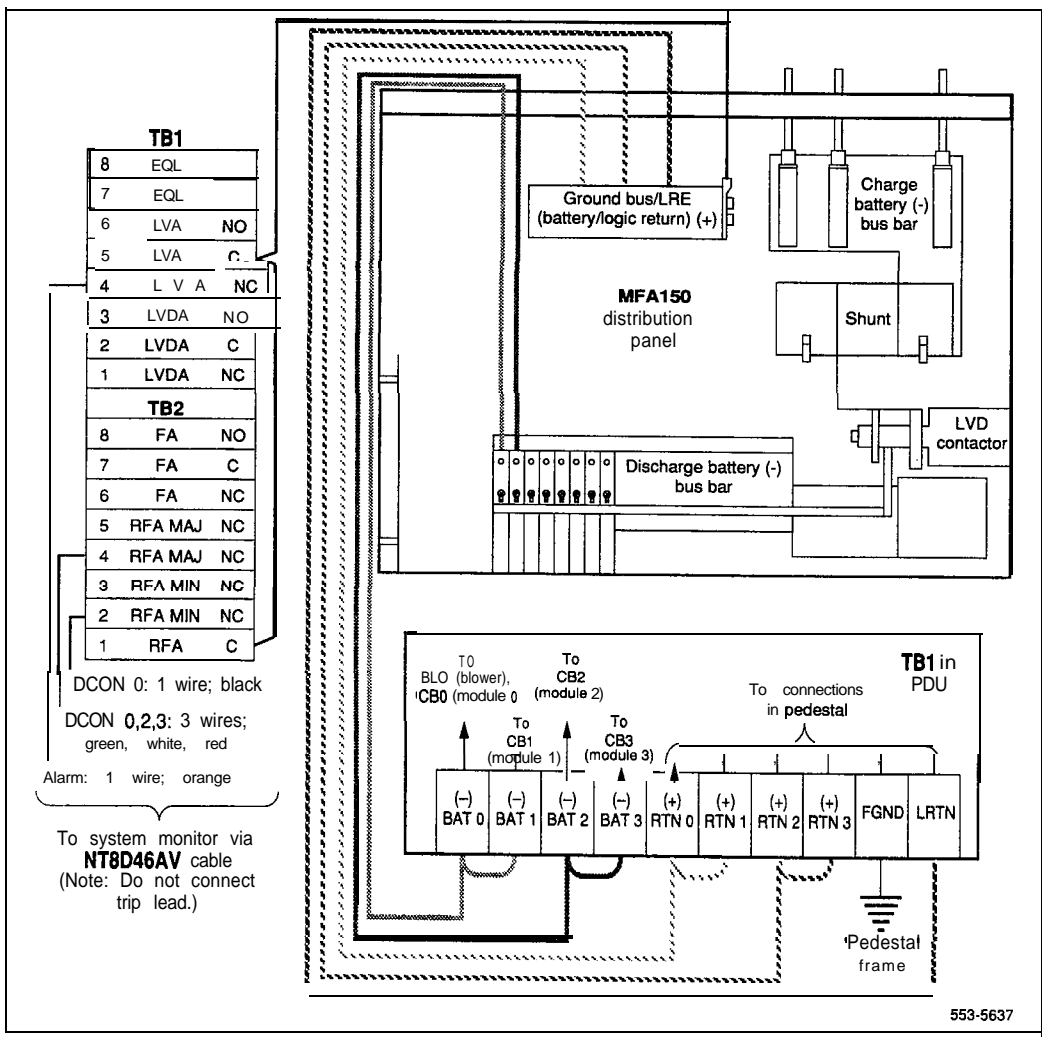


Figure B-3
PDU to **NT6D82** connections

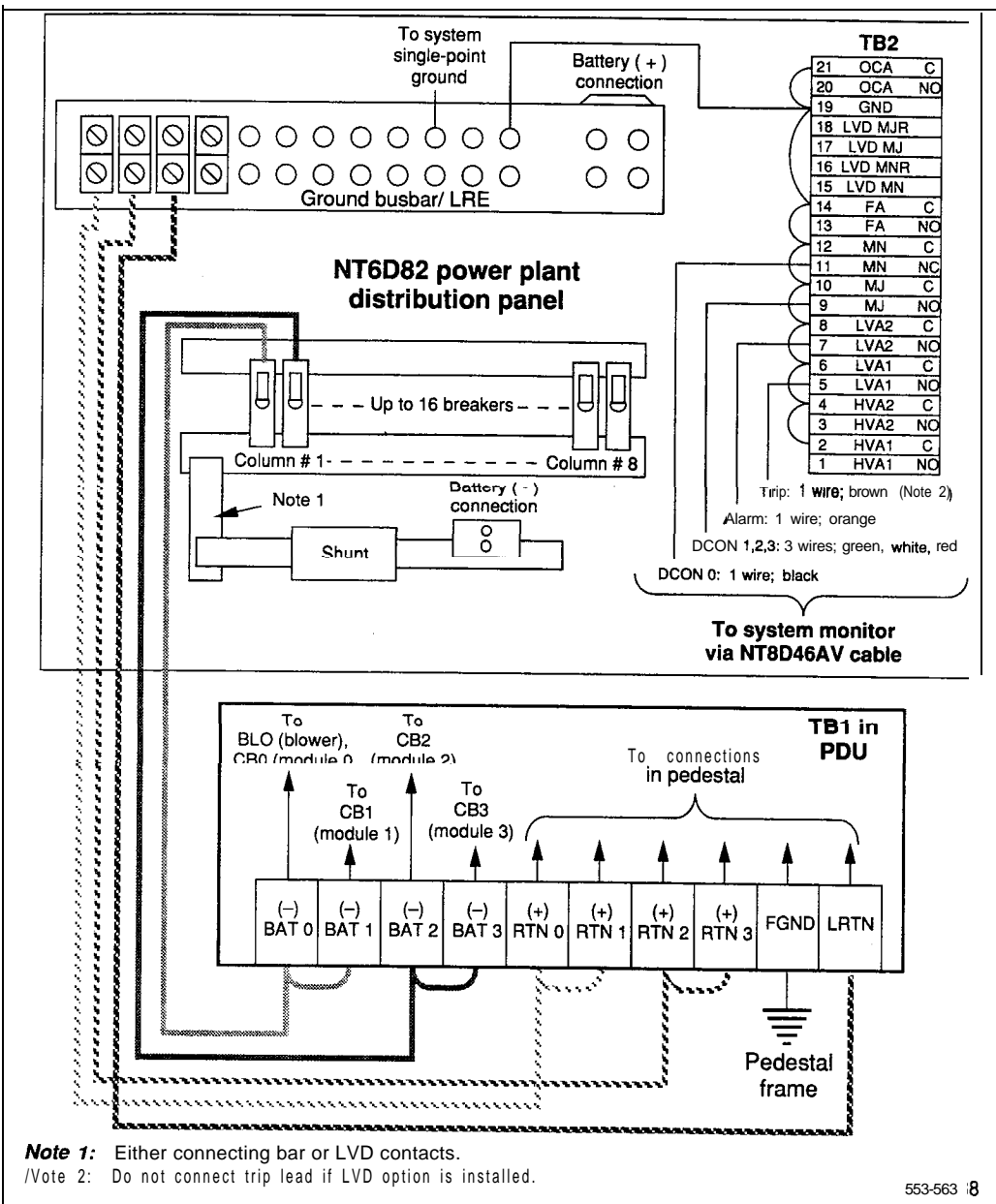


Figure B-4
PDU to **QBL12** or **QCA13** connections

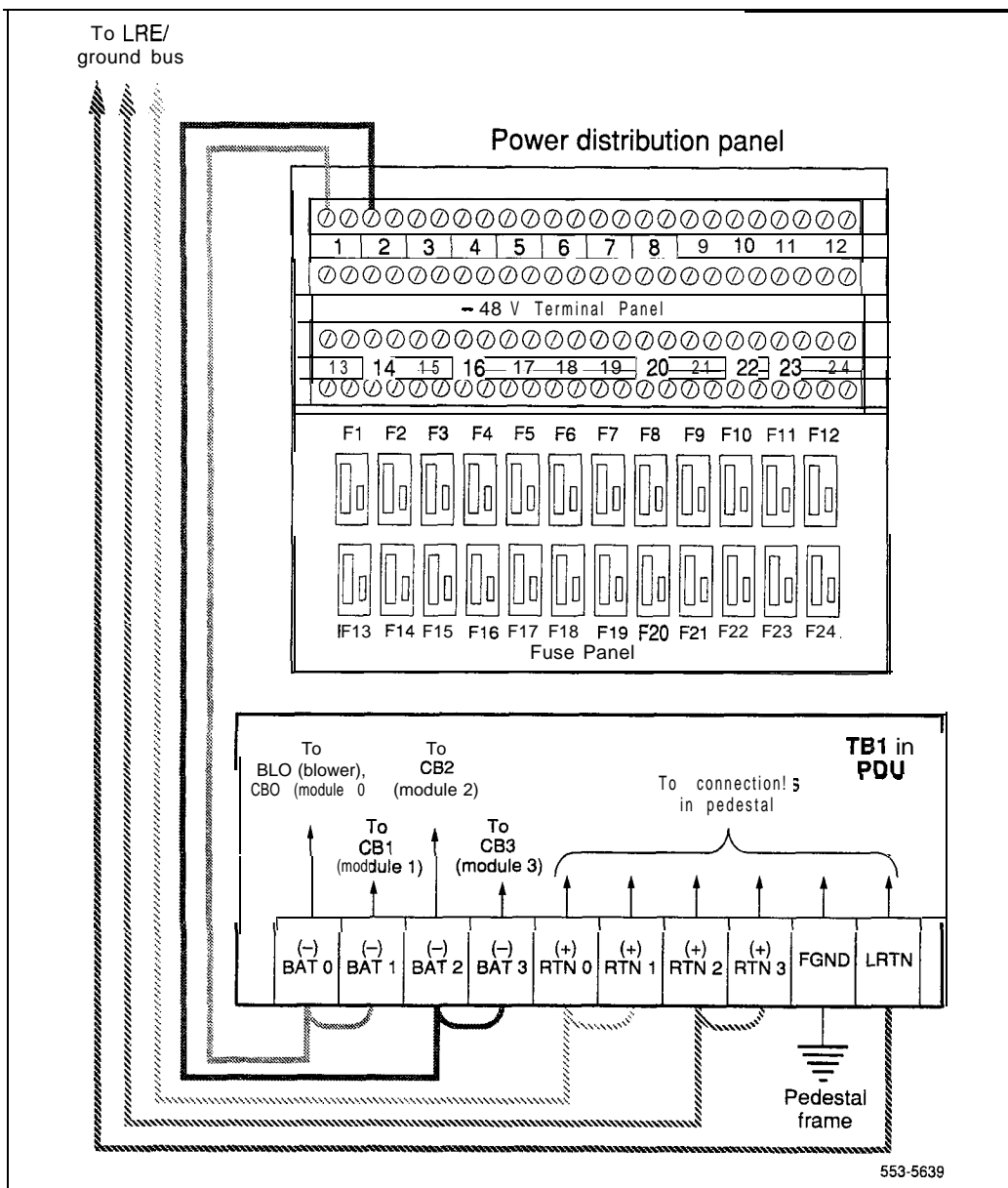
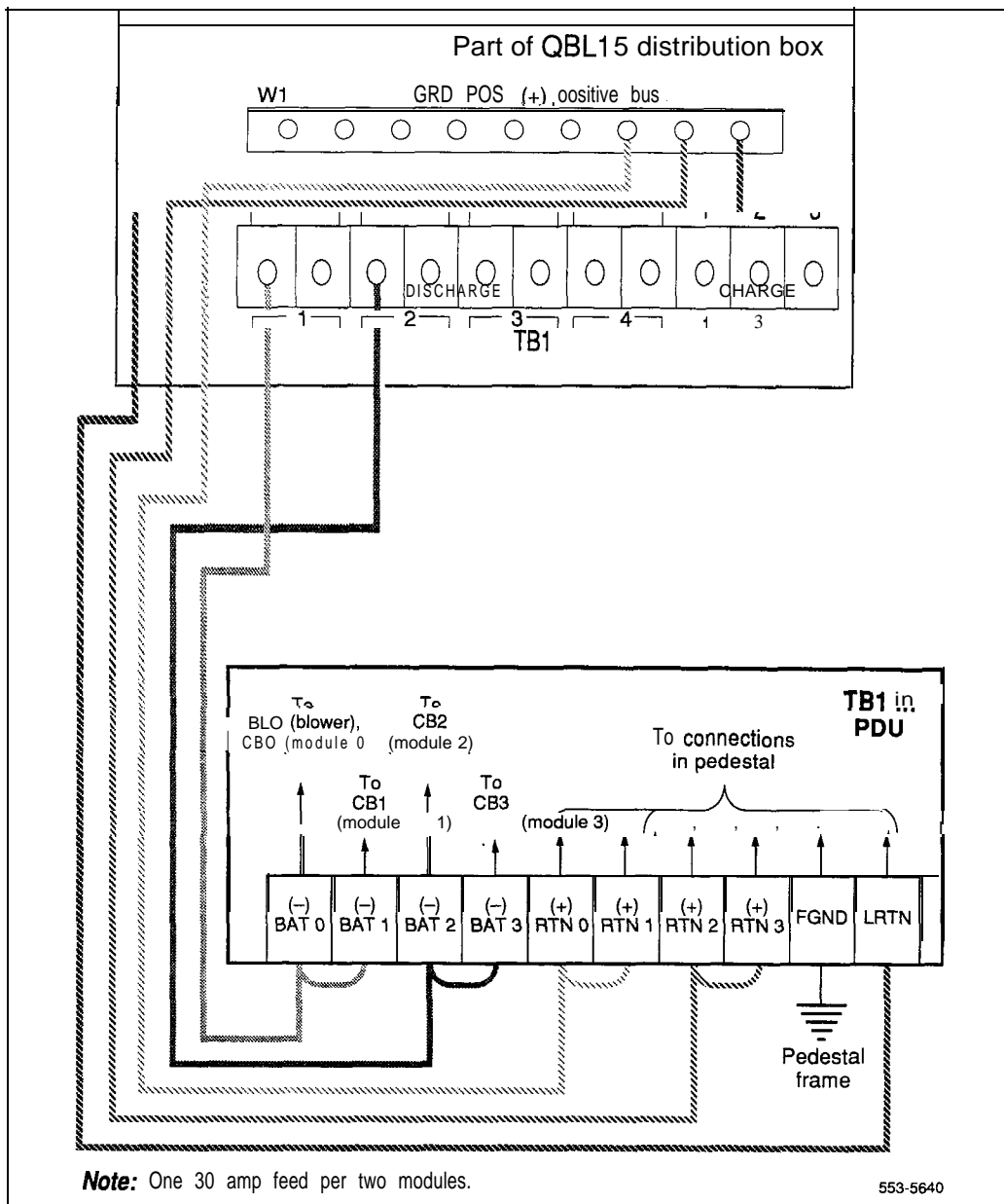


Figure B-5
PDU to QBL15 connections



Appendix C: Backplane cabling in **NT8D11** (AC and DC) and **NT8D37** (AA and DC) modules

In the backplane configurations in **NT8D11** (AC and DC vintage) **CE/PE** Modules and **NT8D37** (AA and DC vintage) **IPE** Modules, some slots on the backplane are fully cabled to accommodate 24 tip and ring pairs (three cable connectors). Most of the backplane slots, however, accommodate 16 pairs (two cable connectors).

In the 7-cable configuration for the backplane in the **NT8D11 CE/PE** Module, cables D, G, and L are not used. Those cables are used in the **10-cable** expanded configuration (**NT8D11BC**, **NT8D11ED**, and later vintage modules).

Table C-1 lists cable connections for the 7-cable configuration. Figure C-1 shows the backplane slots, and Figure C-2 shows the external I/O panel designations.

In the **12-cable** configuration for the backplane in the **NT8D37 IPE** Module, cables D, H, N, and U are not used. Those cables are used in the **16-cable** expanded configuration (**NT8D37BA**, **EC**, and later vintage modules).

Table C-2 lists cable connections in the 12-cable configuration. Figure C-3 shows the backplane slots, and Figure C-2 shows the external I/O panel designations.

Table C-1
NT8D11 cable connections for **7-cable** configuration

Backplane slots-shroud	rows	I/O panel/cable designation	
L0-1	L0-2	L0-3	A
L1-1	L1-2	L2-1	B
L2-2	L3-1	L3-2	C
L4-1	L4-2	L5-1	E
L5-2	L6-1	L6-2	F
L7-1	L7-2	L8-1	H
L8-2	L9-1	L9-2	K

Note: Cables D, G, and L are not used in this configuration.

Figure C-1
NT8D11 backplane cable designations for **7-cable** configuration

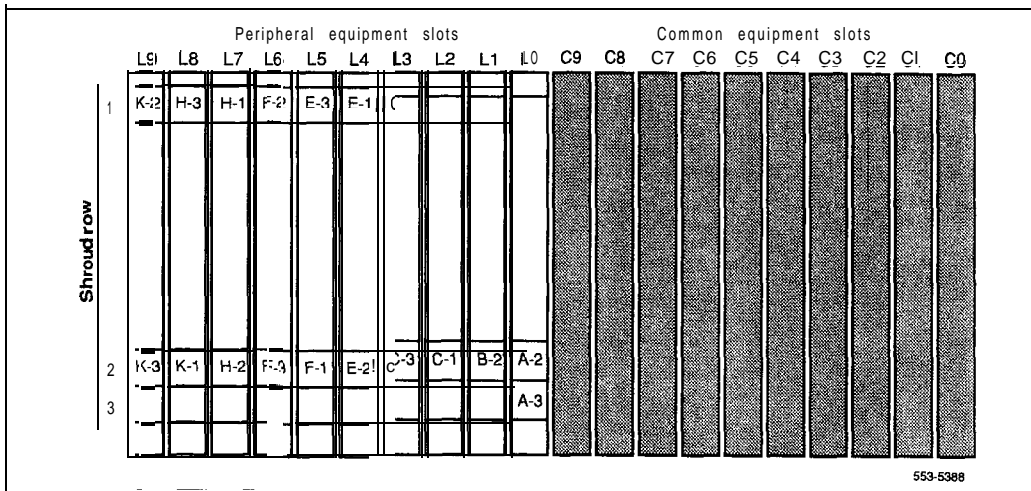


Figure C-2
NT8D11 CE/PE Module I/O panels for 7-cable configuration

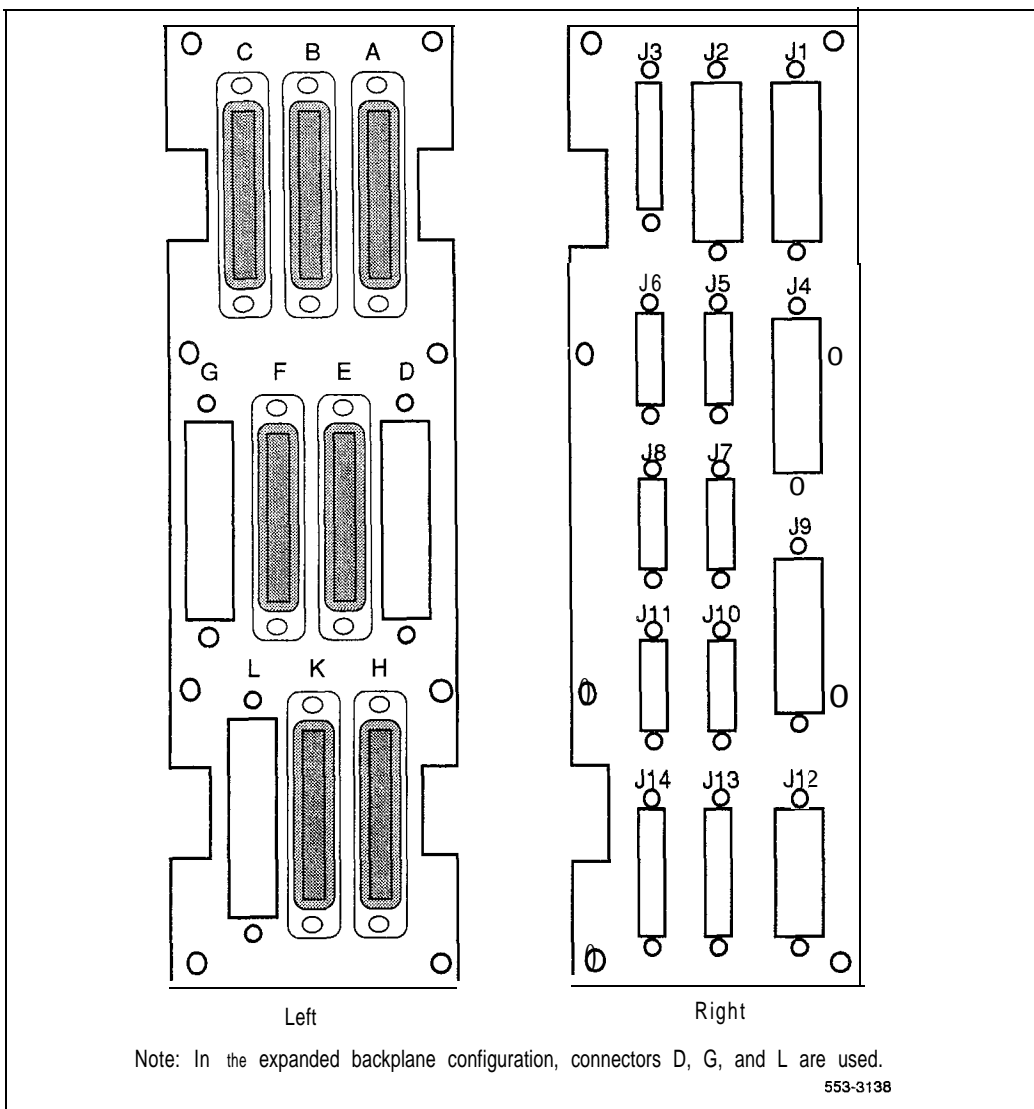


Table C-2
NT8D37 cable connections for **12-cable** configuration

Backplane slots-shroud	rows	I/O panel/cable designation	
L0-1	L0-2	L0-3	A
L1-1	L1-2	L2-1	B
L2-2	L3-1	L3-2	C
L4-1	L4-2	L4-3	E
L5-1	L5-2	L6-1	F
L6-2	L7-1	L7-2	G
L8-1	L8-2	L8-3	K
L9-1	L9-2	L10-1	L
L10-1	L11-2	L11-2	M
L12-1	L12-2	L12-3	R
L13-1	L13-2	L14-1	S
L14-2	L15-1	L15-2	T

Note: Cable D, H, N, and are not used in this configuration.

Figure C-3
NT8D37 backplane cable designations for **12-cable** configuration

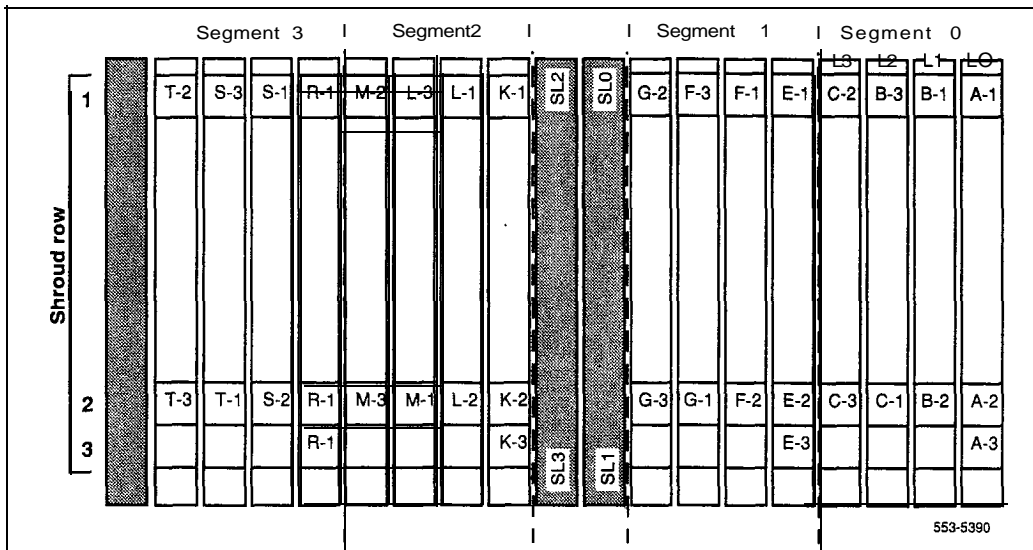
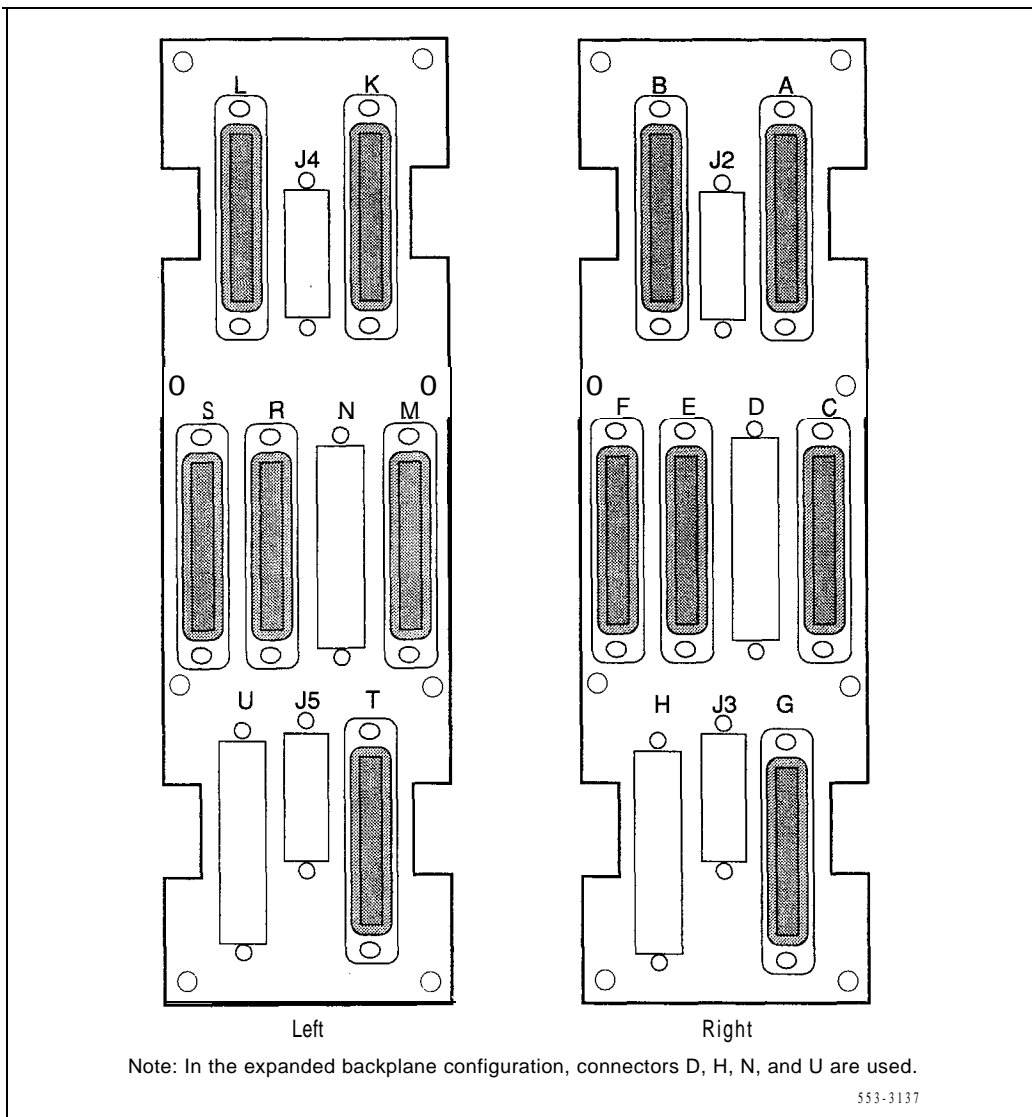


Figure C-4
NT8D37 IPE Module I/O panels for 12-cable configuration



I/O panel connections

Note: The corner vertical channels in the rear of the module are outside of the EMI shield. Cables in those vertical channels must be shielded, and must enter and exit the **EMI-shielded** area through I/O panels and adapters.

WARNING
Electrical shock hazard
Tip, ring, A, B, E, M, ESC, and ESCG connections may be considered to be Telecommunications Network Voltages (TNV).

- 1 Select an appropriate number of NE-A25B (or equivalent) cables long enough to run from the I/O panels on the rear of the module to the MDF.
- 2 Attach a tag that shows the module number and the I/O connector designation to both ends of each cable.
- 3 Connect each cable to the appropriate connector on the I/O panel and run the cables to the MDF.
- 4 Terminate each cable on the cross-connect block designated with the appropriate module number.

Note: Refer to “Planning and designating the Modular Distribution Frame (MDF)” on page 9- 1 for information on the MDF layout.

- 5 Make sure all cables are neatly run, properly seated, and secured with cable ties.

Connecting lines and trunks

Throughout this procedure, make sure wiring is not reversed and is on the proper terminals. Allow enough slack in the wiring to allow tracing and to reconnect wires if they break at the terminal.

- 1 Extend incoming wiring (such as cables from the central office or wiring from a recorded announcement machine) to the MDF and terminate them on separate connecting blocks.
- 2 Assign and record terminal numbers (**TNs**) for each line or trunk. Determine the location of the line or trunk connection and its assigned TN from the work order or assignment records.
- 3 Connect each line and trunk to the TN using cross-connecting wire (typically 24 AWG type-Z wire). Table C-3 lists pair-termination tables for line and trunk cards in **NT8D 11** (AC and DC vintage) **CE/PE** modules and **NT8D37** (AA and DC vintage) **IPE** Modules.
- 4 Cross-connect incoming wiring and lines and trunks at the MDF.

Table C-3
Line and trunk pair-termination tables

	NT8D11 CE/PE Module	NT8D37 IPE Module
Line cards	Tables C-4 through C-6	Tables C-14 through C-16
Trunk cards	NT8D14 Universal Trunk Card: Tables C-6, C-7 NT8D15 E&M Trunk Card: Tables C-8 through C-1 3	NT8D14 Universal Trunk Card: Tables C-17 through c-19 NT8D15 E&M Trunk Card: Tables C-20 through C-28

Table C-4

NT8D11 CE/PE Module: line card pair-terminations for connectors A, B, E, and H (7-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit 16 per card
			A	B	E	H	
1T/1R	26/1	W-BL/BL-W	slot 0	slot 1	slot 4	slot 7	0
2T/2R	27/2	W-O/O-W					1
3T/3R	28/3	W-G/G-W					2
4T/4R	29/4	W-BR/BR-W					3
5T/5R	30/5	W-S/S-W					4
6T/6R	31/6	R-BL/BL-R					5
7T/7R	32/7	R-O/O-R					6
8T/8R	33/8	R-G/G-R					7
9T/9R	34/9	R-BR/BR-R					8
10T/10R	35/10	R-S/S-R					9
11T/11R	36/11	BK-BL/BL-BK					10
12T/12R	37/12	BK-O/O-BK					11
13T/13R	38/13	BK-G/G-BK					12
14T/14R	39/14	BK-BWBK-BR					13
15T/15R	40/15	BK-S/S-BK					14
16T/16R	41/16	Y-BL/BL-Y					15
17T/17R	42/17	Y-O/O-Y	slot 2	slot 5	slot 8	0	
18T/18R	43/18	Y-GIG-Y				1	
19T/19R	44/19	Y-BR/BR-Y				2	
20T/20R	45/20	Y-S/S-Y				3	
21T/21R	46/21	V-BU/BL-V				4	
22T/22R	47/22	V-O/O-V				5	
23T/23R	48/23	V-G/G-V				6	
24T/24R	49/24	V-BR/BR-V				7	
25T/25R	50/25	V-S/S-V				Spare	

Table C-5

NT8D11 CE/PE Module: line card pair-terminations for connectors C, F, and K **(7-cable)**

Pair	Pins	Pair color	I/O panel connector			Unit 16 per card
			C	F	K	
1T/1R	26/1	W-BUBL-W	slot 2	slot 5	slot 8	8
2T/2R	27/2	w-o/o-w				9
3T/3R	28/3	W-G/G-W				10
4T/4R	29/4	W-BR/BR-W				11
5T/5R	30/5	W-S/S-W				12
6T/6R	31/6	R-BUBL-R				13
7T/7R	32/7	R-O/O-R				14
8T/8R	33/8	R-G/G-R				15
9T/9R	34/9	R-BWBR-R	slot 3	slot 6	slot 9	0
10T/10R	35/10	R-S/S-R				1
11T/11R	36/11	BK-BL/BL-BK				2
12T/12R	37/12	BK-O/O-BK				3
13T/13R	38/13	BK-G/G-BK				4
14T/14R	39/14	BK-BR/BK-BR				5
15T/15R	40/15	BK-S/S-BK				6
16T/16R	41/16	Y-BUBL-Y				7
17T/17R	42/17	Y-O/O-Y				8
18T/18R	43/18	Y-G/G-Y				9
19T/19R	44/19	Y-BR/BR-Y				10
20T/20R	45/20	Y-S/S-Y				11
21T/21R	46/21	V-BL/BL-V				12
22T/22R	47/22	V-O/V-O				13
23T/23R	48/23	V-G/G-V				14
24T/24R	49/24	V-BR/BR-V				15
25T/25R	50/25	v-s/s-v				Spare

Table C-6
NT8D11 CE/PE Module: **NT8D14** pair-terminations for connectors A, B, E, and H (7-cable)

Lead designations			Pins	Pair color	I/O panel connectors				Unit
RAN mode	Paging mode	Other modes			A	B	E	H	
0T/0R CPIMB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W w-o/o-w	slot 0	slot 1	slot 4	slot 7	0
1T/1R CPIMB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W					1
2T/2R CPIMB	2T/2R A/PG	2T/2R	30/5 31/6	w-s/s-w R-BUBL-R					2
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R					3
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BWBR-R R-S/S-R					4
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BUBL-BK BK-O/O-BK					5
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BWBK-BR					6
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BUBL-Y	7				
0T/0R CP/MB	0T/0R A/PG	0T/0R	42/17 43/18	Y-010-Y Y-G/G-Y	spare	slot 2	slot 5	slot 8	0
1T/1R CPIMB	1T/1R A/PG	1T/1R	44/19 45/20	Y-BR/BR-Y Y-S/S-Y					1
2T/2R CPIMB	2T/2R A/PG	2T/2R	46/21 47/22	V-BUBL-V V-ON-O					2
3T/3R CPIMB	3T/3R A/PG	3T/3R	48/23 49/24	V-G/G-V V-BR/BR-V					3

Note: Use LD14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* (553-3001-400) for information on LD14.

Table C-7
NT8D11 CE/PE Module: NT8D14 pair-terminations for connectors C, F, and K (7-cable)

Lead designations			Pins	Pair color	I/O panel connectors			Unit
RAN mode	Paging mode	Other modes			C	F	K	
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	slot 2	slot 5	slot 8	4
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W				5
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	W-S/S-W R-BL/BL-R				6
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R				7
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R	slot 3	slot 6	slot 9	0
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BL/BL-BK BK-O/O-BK				1
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR				2
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BL/BL-Y				3
0T/0R CP/MB	0T/0R A/PG	0T/0R	42/17 43/18	Y-O/O-Y Y-G/G-Y				4
1T/1R CP/MB	1T/1R A/PG	1T/1R	44/19 45/20	Y-BR/BR-Y Y-S/S-Y				5
2T/2R CP/MB	2T/2R A/PG	2T/2R	46/21 47/22	V-BL/BL-V V-O/V-O				6
3T/3R CP/MB	3T/3R A/PG	3T/3R	48/23 49/24	V-G/G-V V-BR/BR-V	7			

Note: Use LD14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X17 Input/output guide (553-3001-400)* for information on LD14.

C-12 Backplane cabling in NT8D1 1 (AC and DC) and NT8D37 (AA and DC) modules

Table C-8

NT8D11 CE/PE Module: NT8D15 P-wire paging mode pair-terminations for connectors A, B, E, and H (7-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit
			A	B	E	H	
0T/0R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	slot 0	slot 1	slot 4	slot 7	0
1T/1R A/PG	30/5 33/8	W-S/S-W R-G/G-R					1
2T/2R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK					2
3T/3R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y					3
0T/0R A/PG	42/17 45/20	Y-O/O-Y Y-S/S-Y	spare	slot 2	slot 5	slot 8	0
1T/1R A/PG	46/21 49/24	V-BL/BL-V V-BR/BR-V					1

Table C-9

NT8D11 CE/PE Module: NT8D15 P-wire paging mode pair-terminations for connectors C, F, and K (7-cable)

Pair	Pins	Pair color	I/O panel connectors			Unit
			C	F	K	
2T/2R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	slot 2	slot 5	slot 8	2
3T/3R A/PG	30/5 33/8	w-s/s-w R-G/G-R				3
0T/0R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK	slot 3	slot 6	slot 9	0
1T/1R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y				1
2T/2R A/PG	42/17 45/20	Y-O/O-Y Y-S/S-Y				2
3T/3R A/PG	46/21 49/24	V-BL/BL-V V-BR/BR-V				3

Table C-10

NT8D11 CE/PE Module: **NT8D15 2-wire** type 1 mode pair-terminations for connectors A, B, E, and H (**7-cable**)

Pair	Pins	Pair color	I/O panel connectors				Unit
			A	B	E	H	
0T/0R E/M	26/1 28/3	W-BL/BL-W W-G/G-W	slot 0	slot 1	slot 4	slot 7	0
1T/1R E/M	30/5 32/7	W-S/S-W R-O/O-R					1
2T/2R E/M	34/9 36/11	R-BWBR-R BK-BUBL-BK					2
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK					3
0T/0R E/M	42/17 44/19	Y-010-Y Y-BRIBR-Y	spare	slot 2	slot 5	slot 8	0
1T/1R E/M	46/21 48/23	V-BUBL-V V-G/BR-G					1

Table C-11

NT8D11 CE/PE Module: **NT8D15 2-wire** type 1 mode pair-terminations for connectors C, F, and K (**7-cable**)

Pair	Pins	Pair color	I/O panel connectors			Unit
			C	F	K	
2T/2R E/M	26/1 28/3	W-BUBL-W W-G/G-W	slot 2	slot 5	slot 8	2
3T/3R E/M	30/5 32/7	W-S/S-W R-O/O-R				3
0T/0R E/M	34/9 36/11	R-BR/BR-R BK-BL/BL-BK	slot 3	slot 6	slot 9	0
1T/1R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK				1
2T/2R E/M	42/17 44/19	Y-O/O-Y Y-BRIBR-Y				2
3T/3R E/M	46/21 48/23	V-BUBL-V V-G/BR-G				3

Table C-I 2

NT8D11 CE/PE Module: **NT8D15 4-wire** type 1 and type 2 mode pair-terminations for connectors A, B, E, and H **(7-cable)**

Lead designations		Pins	Pair color	I/O panel connectors				Unit
Type 1	Type 2			A	B	E	H	
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	26/1 27/2 28/3 29/4	W-BUBL-W w-o/o-w W-G/G-W W-BR/BR-W	slot 0	slot 1	slot 4	slot 7	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	30/5 31/6 32/7 33/8	w-s/s-w R-BL/BL-R R-010-R R-G/G-R					1
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BR/BR-R R-S/S-R BK-BUBL-BK BK-O/O-BK					2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BWBR-BK BK-S/S-BK Y-BUBL-Y					3
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	42/17 43/18 44/19 45/20	Y-O/O-Y Y-G/G-Y Y-BR/BR-Y Y-S/S-Y	spare	slot 2	slot 5	slot 8	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	46/21 47/22 48/23 49/24	V-BUBL-V v-o/o-v V-G/G-V V-BR/BR-V					1

Note: TA/TB is the transmit pair; RA/RB is the receive pair.

Table C-13

NT8D11 CE/PE Module: **NT8D15 4-wire** type 1 and type 2 mode pair-terminations for connectors C, F, and K (7-cable)

Lead designations		Pins	Pair color	I/O panel connectors			Unit
Type 1	Type 2			C	F	K	
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	26/1 27/2 28/3 29/4	W-BL/BL-W W-O/O-W W-G/G-W W-BR/BR-W	slot 2	slot 5	slot 8	2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	30/5 31/6 32/7 33/8	W-S/S-W R-BL/BL-R R-O/O-R R-G/G-R				3
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BR/BR-R R-S/S-R BK-BUBL-BK BK-O/O-BK	slot 3	slot 6	slot 9	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BR/BR-BK BK-S/S-BK Y-BUBL-Y				1
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	42/17 43/18 44/19 45/20	Y-O/O-Y Y-G/G-Y Y-BR/BR-Y Y-S/S-Y	slot 3	slot 6	slot 9	2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	46/21 47/22 48/23 49/24	V-BUBL-V v-o/o-v V-GIG-V V-BR/BR-V				3

Note: TA/TB is the transmit pair; RA/RB is the receive pair.

Table C-14 NT8D37 IPE Module: line card pair-terminations for connectors A, E, K, and R (12-cable)			A			Unit 16/card
T/R	Pins	Color	I/O panel connectors			
			E	K	R	
1T/1R	26/1	W-BL/BL-W	slot 0			
2T/2R	27/2	W-O/O-W				
3T/3R	28/3	W-G/G-W				
4T/4R	29/4	W-BR/BR-W				
5T/5R	30/5	W-S/S-W				
6T/6R	31/6	R-BL/BL-R				
7T/7R	32/7	R-O/O-R				
8T/8R	33/8	R-G/G-R				
9T/9R	34/9	R-BR/BR-R				
10T/10R	35/10	R-S/S-R				
11T/11R	36/11	BK-BL/BL-BK				
12T/12R	37/12	BK-O/O-BK				
13T/13R	38/13	BK-G/G-BK				
14T/14R	39/14	BK-BR/BK-BR				
15T/15R	40/15	BK-S/S-BK				
16T/16R	41/16	Y-BL/BL-Y				
			slot 4	slot 8	slot 12	0
						1
						2
						3
						4
						5
						6
						7
						8
						9
						10
						11
						12
						13
						14
						15

Table C-15
NT8D37 IPE Module: line card pair-terminations for connectors B, F, L, and S (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit 16/card
			B	F	L	S	
1T/1R	26/1	W-BUBL-W	slot 1	slot 5	slot 9	slot 13	0
2T/2R	27/2	W-O/O-W					1
3T/3R	28/3	W-G/G-W					2
4T/4R	29/4	W-BR/BR-W					3
5T/5R	30/5	W-S/S-W					4
6T/6R	31/6	R-BUBL-R					5
7T/7R	32/7	R-O/O-R					6
8T/8R	33/8	R-G/G-R					7
9T/9R	34/9	R-BR/BR-R					8
10T/10R	35/10	R-S/S-R					9
11T/11R	36/11	BK-BL/BL-BK					10
12T/12R	37/12	BK-O/O-BK					11
13T/13R	38/13	BK-G/G-BK					12
14T/14R	39/14	BK-BR/BK-BR					13
15T/15R	40/15	BK-S/S-BK					14
16T/16R	41/16	Y-BL/BL-Y					15
17T / 17R	42 / 17	Y-O / O-Y	slot 2	slot 6	slot 10	slot 14	0
18T / 18R	43 / 18	Y-G / G-Y					1
19T / 19R	44 / 19	Y-BR / BR-Y					2
20T / 20R	45 / 20	Y-S / S-Y					3
21T / 21R	46 / 21	V-BL / BL-V					4
22T / 22R	47 / 22	V-O / V-O					5
23T / 23R	48 / 23	V-G / G-V					6
24T / 24R	49 / 24	V-BR / BR-V					7
25T / 25R	50 / 25	V-S / S-V					Spare

C-18 Backplane cabling in **NT8D1 1** (AC and DC) and **NT8D37** (AA and DC) modules

Table C-16
NT8D37 IPE Module: line card pair-terminations for connectors C, G, M, and T **(12-cable)**

Pair	Pins	Pair color	I/O panel connectors				Unit 16/card
			C	G	M	T	
1T/1R	26/1	W-BL/BL-W	slot 2	slot 6	slot 10	slot 14	8
2T/2R	27/2	W-O/O-W					9
3T/3R	28/3	W-G/G-W					10
4T/4R	29/4	W-BR/BR-W					11
5T/5R	30/5	W-S/S-W					12
6T/6R	31/6	R-BL/BL-R					13
7T/7R	32/7	R-O/O-R					14
8T/8R	33/8	R-G/G-R					15
9T/9R	34/9	R-BR/BR-R	slot 3	slot 7	slot 11	slot 15	0
10T/10R	35/10	R-S/S-R					1
11T/11R	36/11	BK-BL/BL-BK					2
12T/12R	37/12	BK-O/O-BK					3
13T/13R	38/13	BK-G/G-BK					4
14T/14R	39/14	BK-BR/BR-BK					5
15T/15R	40/15	BK-S/S-BK					6
16T/16R	41/16	Y-BL/BL-Y					7
17T/17R	42/17	Y-O/O-Y					8
18T/18R	43/18	Y-G/G-Y					9
19T/19R	44/19	Y-BR/BR-Y					10
20T/20R	45/20	Y-S/S-Y					11
21T/21R	46/21	V-BL/BL-V					12
22T/22R	47/22	V-O/O-V					13
23T/23R	48/23	V-G/G-V					14
24T/24R	49/24	V-BR/BR-V					15
25T/25R	50/25	V-S/S-V					Spare

Table C-1 7

NT8D37 IPE Module: NT8D14 pair-terminations for connectors A, E, K, and R (12-cable)

Lead designations			Pins	Pair color	I/O panel connectors				Unit
RAN mode	Paging mode	Other modes			A	E	K	R	
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	slot 0	slot 4	slot 8	slot 12	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W					1
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	w-s/s-w R-BL/BL-R					2
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R					3
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R					4
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BUBL-BK BK-O/O-BK					5
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR					6
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BUBL-Y					7

Note: Use LD14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* (553-3001-400) for information on LD14.

Table C-18

NT8D37 IPE Module: NT8D14 pair-terminations for connectors B, F, L, and S (12-cable)

Lead designations			Pins	Pair color	I/O panel connectors				Unit
RAN mode	Paging mode	Other modes			B	F	L	S	
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	slot 1	slot 5	slot 9	slot 13	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W					1
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	W-S/S-W R-BL/BL-R					2
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R					3
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R					4
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BL/BL-BK BK-O/O-BK					5
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BW/BK-BR					6
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BL/BL-Y	7				
0T/0R CP/MB	0T/0R A/PG	0T/0R	42/17 43/18	Y-O/O-Y Y-G/G-Y	slot 2	slot 6	slot 10	slot 14	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	44/19 45/20	Y-BR/BR-Y Y-S/S-Y					1
2T/2R CP/MB	2T/2R A/PG	2T/2R	46/21 47/22	V-BL/BL-V V-O/V-O					2
3T/3R CP/MB	3T/3R A/PG	3T/3R	48/23 49/24	V-G/G-V V-BR/BR-V					3

Note: Use LD14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* (553-3001-400) for information on LD14.

Table C-19
NT8D37 IPE Module: NT8D14 pair-terminations for connectors C, G, M, and T (12-cable)

Lead designations			Pins	Pair color	I/O panel connectors				Unit
RAN mode	Paging mode	Other modes			C	G	M	T	
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	slot 2	slot 6	slot 10	slot 14	4
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W					5
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	w-s/s-w R-BL/BL-R					6
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R					7
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BWBR-R R-S/S-R	slot 3	slot 7	slot 11	slot 15	0
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BUBL-BK BK-O/O-BK					1
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-GIG-BK BK-BR/BK-BR					2
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BL/BL-Y					3
0T/0R CP/MB	0T/0R A/PG	0T/0R	42/17 43/18	Y-O10-Y Y-G/G-Y					4
1T/1R CP/MB	1T/1R A/PG	1T/1R	44/19 45/20	Y-BR/BR-Y Y-S/S-Y					5
2T/2R CP/MB	2T/2R A/PG	2T/2R	46/21 47/22	V-BIJBL-V V-ON-O					6
3T/3R CP/MB	3T/3R A/PG	3T/3R	48/23 49/24	V-GIG-V V-BR/BR-V	7				

Note: Use LD14 to select trunk termination impedance (600 ohm or 900 ohm). See the X11 input/output guide (553-3001-400) for information on LD14.

Table C-20

NT8D37 IPE Module: **NT8D15** P-wire paging mode pair-terminations for connectors A, E, K, and **R (12-cable)**

Pair	Pins	Pair color	I/O panel connectors				Unit
			A	E	K	R	
0T/0R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	slot 0	slot 4	slot 8	slot 12	0
1T/1R A/PG	30/5 33/8	W-S/S-W R-G/G-R					1
2T/2R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK					2
3T/3R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y					3

Table C-21

NT8D37 IPE Module: **NT8D15 2-wire** paging mode pair-terminations for connectors B, F, L, and **S (12-cable)**

Pair	Pins	Pair color	I/O panel connectors				Unit
			B	F	L	S	
0T/0R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	slot 1	slot 5	slot 9	slot 13	0
1T/1R A/PG	30/5 33/8	W-S/S-W R-G/G-R					1
2T/2R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK					2
3T/3R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y					3
0T/0R A/PG	42/17 45/20	Y-O/O-Y Y-S/S-Y	slot 2	slot 6	slot 10	slot 14	0
1T/1R A/PG	46/21 49/24	V-BL/BL-V V-BR/BR-V					1

Table C-22

NT8D37 IPE Module: NT8D15 P-wire paging mode pair-terminations for connectors C, G, M, and T (12-cable)

Pair	Pins	Pair color	I/O panel connectors	Unit
2T/2R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	slot 2	2
3T/3R A/PG	30/5 33/8	W-S/S-W R-G/G-R		
0T/0R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK	slot 3	0
1T/1R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y		1
2T/2R A/PG	42/17 45/20	Y-O/O-Y Y-S/S-Y		2
3T/3R A/PG	46/21 49/24	V-BL/BL-V V-BR/BR-V		3

Table C-23

NT8D37 IPE Module: NT8D15 P-wire type 1 mode pair-terminations for connectors A, E, K, and R (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit
			A	E	K	R	
0T/0R E/M	26/1 28/3	W-BL/BL-W W-G/G-W	slot 0	slot 4	slot 8	slot 12	0
1T/1R E/M	30/5 32/7	W-S/S-W R-O/O-R					1
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BL/BL-BK					2
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK					3

Table C-24

NT8D37 IPE Module: **NT8D15 2-wire** type 1 mode pair-terminations for connectors B, F, L, and S (**12-cable**)

Pair	Pins	Pair color	I/O panel connectors				Unit
			B	F	L	S	
0T/0R E/M	26/1 28/3	W-BUBL-W W-G/G-W	slot 1	slot 5	slot 9	slot 13	0
1T/1R E/M	30/5 32/7	w-s/s-w R-O/O-R					1
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BUBL-BK					2
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK					3
0T/0R E/M	42/17 44/19	Y-O/O-Y Y-BR/BR-Y	slot 2	slot 6	slot 10	slot 14	0
1T/1R E/M	46/21 48/23	V-BUBL-V V-G/G-V					1

Table C-25

NT8D37 IPE Module: **NT8D15 P-wire** type 1 mode pair-terminations for connectors C, G, M, and T (**12-cable**)

Pair	Pins	Pair color	I/O panel connectors				Unit
			C	G	M	T	
0T/0R E/M	26/1 28/3	W-BUBL-W W-G/G-W	slot 2	slot 6	slot 10	slot 14	2
1T/1R E/M	30/5 32/7	w-s/s-w R-O/O-R					3
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BUBL-BK	slot 3	slot 7	slot 11	slot 15	0
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK					1
0T/0R E/M	42/17 44/19	Y-O/O-Y Y-BR/BR-Y					2
1T/1R E/M	46/21 48/23	V-BUBL-V V-G/BR-G					3

Table C-26
NT8D37 IPE Module: NT8D15 4-wire type 1 and type 2 mode pair-terminations for connectors A, E, K, and R (1 P-cable)

Lead designations		Pins	Pair color	I/O panel connectors				Unit
Type 1	Type 2			A	E	K	R	
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	26/1 27/2 28/3 29/4	W-BL/BL-W W-O/O-W W-G/G-W W-BR/BR-W	slot 0	slot 4	slot 8	slot 12	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	30/5 31/6 32/7 33/8	W-S/S-W R-BL/BL-R R-O/O-R R-G/G-R					1
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BR/BR-R R-S/S-R BK-BL/BL-BK BK-O/O-BK					2
TA/TR RA/RB E/M ESC/ESCG	TA/TR RA/RB EA/EB MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BR/BR-BK BK-S/S-BK Y-BL/BL-Y					3

Note: TA/TB is the transmit pair; RA/RB is the receive pair.

Table C-27

NT8D37 IPE Module: **NT8D15 4-wire** type 1 and type 2 mode pair-terminations for connectors B, F, L, and S (12-cable)

Lead designations		Pins	Pair color	I/O panel connectors				Unit
Type 1	Type 2			B	F	L	S	
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	26/1 27/2 28/3 29/4	W-BUBL-W w-o/o-w W-G/G-W W-BR/BR-W	slot 1	slot 5	slot 9	slot 13	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	30/5 31/6 32/7 33/8	w-s/s-w R-BL/BL-R R-O/O-R R-G/G-R					1
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BR/BR-R R-S/S-R BK-BUBL-BK BK-O/O-BK					2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BWBR-BK BK-S/S-BK Y-BUBL-Y					3
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	42/17 43/18 44/19 45/20	Y-O/O-Y Y-G/G-Y Y-BR/BR-Y Y-S/S-Y	slot 2	slot 6	slot 10	slot 14	0
TA/TB RWRB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	46/21 47/22 48/23 49/24	V-BUBL-V v-o/o-v V-G/G-V V-BR/BR-V					1

Note: TA/TB is the transmit pair; RA/RB is the receive pair.

Table C-28

NT8D37 IPE Module: NT8D15 4-wire type 1 and type 2 mode pair-terminations for connectors C, G, M, and T (1 P-cable)

Lead designations		Pins	Pair color	I/O panel connectors				Unit
Type 1	Type 2			C	G	M	T	
TA/TB RA/RB E/M ESC I ESCG	TA/TB RA/RB EA/EB G MA/MB	26/1 27/2 28/3 29/4	W-BL/BL-W w-o/o-w W-G/G-W W-BR/BR-W	slot 2	slot 6	slot 10	slot 14	2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB M A / M B	30/5 31/6 32/7 33/8	w-s/s-w R-BUBL-R R-O/O-R R-G/G-R					3
TAA-B RA/RB E/M ESC I ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BR/BR-R R-S/S-R BK-BUBL-BK BK-O/O-BK	slot 3	slot 7	slot 11	slot 15	0
TA/TB RA/RB E/M ESC I ESCG	TA/TB RA/RB EA/EB G MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BR/BR-BK BK-S/S-BK Y-BUBL-Y					1
TA/TB RA/RB E/M ESC I ESCG	TA/TB RA/RB EA/EB G MA/MB	42/17 43/18 44/19 45/20	Y-O/O-Y Y-G/G-Y Y-BR/BR-Y Y-S/S-Y	slot 3	slot 7	slot 11	slot 15	2
TA/TB RA/RB E/M ESC I ESCG	TA/TB RA/RB EA/EB MA/MB	46/21 47/22 48/23 49/24	V-BUBL-V v-o/o-v V-GIG-V V-BR/BR-V					3

Note: TA/TB is the transmit pair; RA/RB is the receive pair.

Backplane cable expansion

You can reconfigure NT8D11 (AC and DC vintage) CE/PE and NT8D37 (AA and DC vintage) IPE Modules for expanded cabling. By adding and reconfiguring cable ends in the backplane slots, 24 pairs can be connected to each backplane slot.

Note: When backplane slots are reconfigured for expanded cabling, the labeling for NT8D 11 CE/PE and NT8D37 IPE Modules must be changed at the MDF to reflect the change in the backplane slots.

To cable lines and trunks with expanded backplane configurations, go to “Cabling lines and trunks” on page 15- 1.

NT8D11 CE/PE Modules

In the NT8D 11 Modules, cabling for the first four IPE slots can be expanded using one NT8D8 1 AA Cable/Filter Assembly. Cabling for all of the IPE slots can be expanded using three NT8D8 1AA Cable/Filter Assemblies.

Note: The first IPE slot is already fully cabled for 24 pairs, so no change is required for that slot.

NT8D11 backplane cable expansion: first four IPE slots only

- 1 Leave cable A as is in slot position L0.
- 2 Move cable end B-3 to slot position L1-3.
- 3 Remove cable C from the backplane and connect cable ends C-1, C-2, and C-3 to slot positions L2-1, L2-2, and L2-3.
- 4 Add cable D to the I/O panel by connecting cable ends D- 1, D-2, and D-3 to slot positions L3-1, L3-2, and L3-3.

Note: Cables E, F, H, and K remain the same. Cable positions G and L are open for further expansion.

- 5 Label the MDF for one cable for each of the first four IPE slots.

NT8D11 backplane cable expansion: all IPE slots

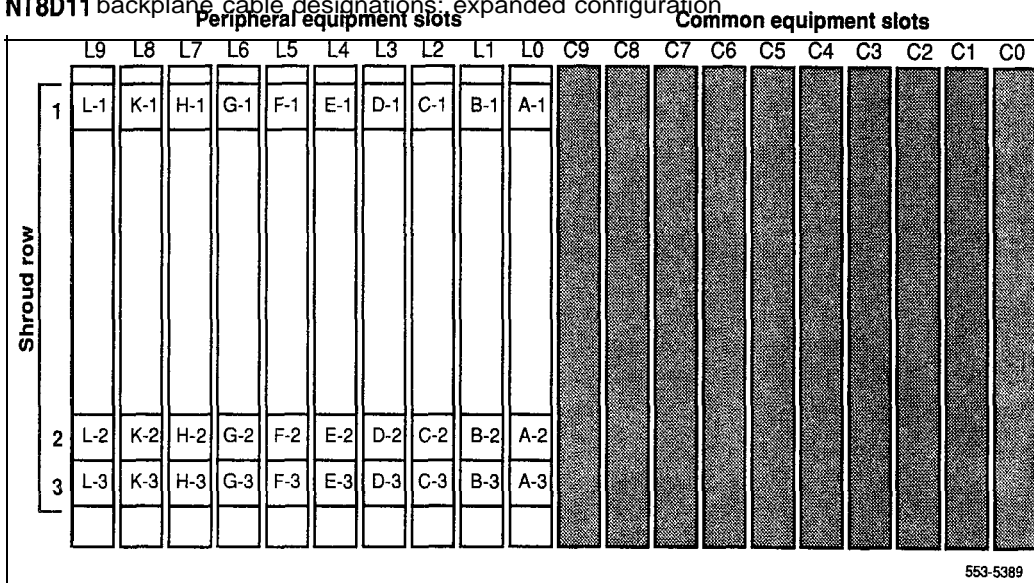
- 1 Leave cable A as is in slot position L0.
- 2 Move cable end B-3 to slot position L1-3.
- 3 Remove cable C from the backplane and connect cable ends C-1, C-2, and C-3 to slot positions L2-1, L2-2, and L2-3.
- 4 Add cable D to the I/O panel by connecting cable ends D-1, D-2, and D-3 to slot positions L3-1, L3-2, and L3-3.
- 5 Move cable end E-3 to slot position L4-3.
- 6 Remove cable F from the backplane and connect cable ends F- 1, F-2, and F-3 to slot positions L5-1, L5-2, and L5-3.
- 7 Add cable G to the I/O panel by connecting cable ends G-1, G-2, and G-3 to slot positions L6-1, L6-2, and L6-3.
- 8 Move cable end H-3 to slot position L7-3.
- 9 Remove cable K from the backplane and connect cable ends K- 1, K-2, and K-3 to slot positions L9-1, L9-2, and L9-3.
- 10 Add cable L to the I/O panel by connecting cable ends L-1, L-2, and L-3 to slot positions L9-1, L9-2, and L9-3.
- 11 Label the MDF to show one cable for each PE slot.

Table C-29 lists cable connections for an expanded configuration.
 Figure C-5 shows the backplane slots in an expanded configuration.

Table C-29
NT8D11 cable connections: expanded configuration

Backplane slots-shroud rows	I/O panel/cable designation
LO-1, 2, 3	A
L1-1, 2, 3	B
L2-1, 2, 3	C
L3-1, 2, 3	D (new cable)
L4-1, 2, 3	E
L5-1, 2, 3	F
L6-1, 2, 3	G (new cable)
L7-1, 2, 3	H
L8-1, 2, 3	K
L9-1, 2, 3	L (new cable)

Figure C-5
NT8D11 backplane cable designations: expanded configuration



553-5389

NT8D37 IPE Modules

In the **NT8D37** Modules, cabling for each segment can be expanded using one **NT8D8 1AA** Cable/Filter Assembly. Cabling for the whole backplane can be expanded using four **NT8D8 1AA** Cable/Filter Assemblies.

Note: Backplane slots 0, 4, 8, and 12 (for cables A, E, K, and R) are already fully cabled for 24 pairs, so no change is required to those slots.

NT8D37 backplane cable expansion: Segment 0

- 1 Leave cable A as is in slot position L0.
- 2 Move cable end B-3 to slot position L1-3.
- 3 Remove cable C from the backplane and connect cable ends C-1, C-2, and C-3 to slot positions L2-1, L2-2, and L2-3.
- 4 Add cable D to the I/O panel by connecting cable ends D-1, D-2, and D-3 to slot positions L3-1, L3-2, and L3-3.

NT8D37 backplane cable expansion: Segment 1

- 1 Leave cable E as is in slot position L4.
- 2 Move cable end F-3 to slot position L5-3.
- 3 Remove cable G from the backplane and connect cable ends G-1, G-2, and G-3 to slot positions L6-1, L6-2, and L6-3.
- 4 Add cable H to the I/O panel by connecting cable ends H-1, H-2, and H-3 to slot positions L7-1, L7-2, and L7-3.

NT8D37 backplane cable expansion: Segment 2

- 1 Leave cable K as is in slot position L8.
- 2 Move cable end L-3 to slot position L9-3.
- 3 Remove cable M from the backplane and connect cable ends M-1, M-2, and M-3 to slot positions L10-1, L10-2, and L10-3.
- 4 Add cable N to the I/O panel by connecting cable ends N-1, N-2, and N-3 to slot positions L11-1, L11-2, and L11-3.

NT8D37 backplane cable expansion: Segment 3

- 1 Leave cable R as is in slot position L12.
- 2 Move cable end S-3 to slot position L13-3.
- 3 Remove cable T from the backplane and connect cable ends T-1, T-2, and T-3 to slot positions L14-1, L14-2, and L14-3.
- 4 Add cable U to the I/O panel by connecting cable ends U- 1, U-2, and U-3 to slot positions L15-1, L15-2, and L15-3.

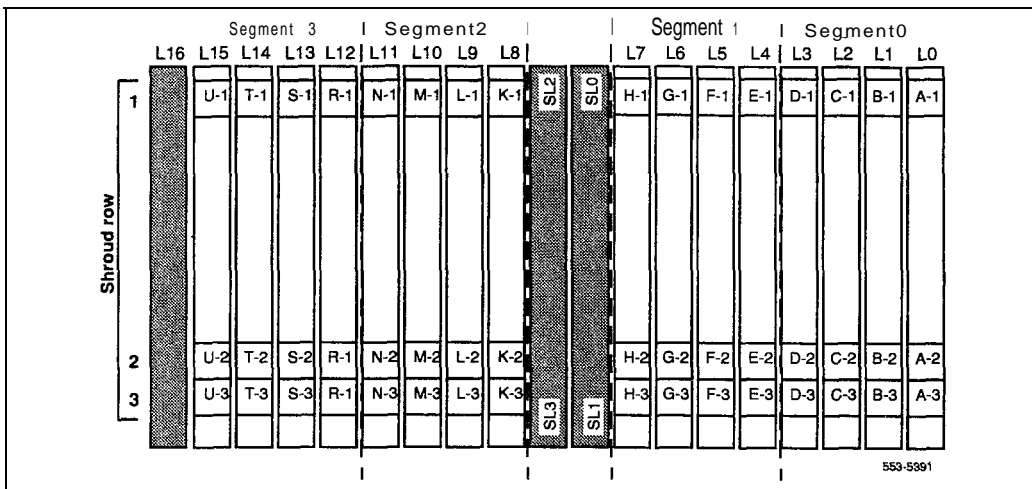
Table C-30 lists cable connections for a fully expanded configuration. Figure C-6 shows the backplane slots in a fully expanded configuration,

Table C-30

NT8D37 cable connections: expanded configuration

Backplane slots-shroud rows	I/O panel/cable designation
LO-1, 2, 3	A
L1-1, 2, 3	B
L2-1, 2, 3	C
L3-1, 2, 3	D (new cable)
L4-1, 2, 3	E
L5-1, 2, 3	F
L6-1, 2, 3	G
L7-1, 2, 3	H (new cable)
L8-1, 2, 3	K
L9-1, 2, 3	L
L10-1, 2, 3	M
L11-1, 2, 3	N (new cable)
L12-1, 2, 3	R
L13-1, 2, 3	S
L14-1, 2, 3	T
L15-1, 2, 3	U (new cable)

Figure C-6
NT8D37 backplane cable designations: expanded configuration



C-34 Backplane cabling in **NT8D1 1** (AC and DC) and **NT8D37** (AA and DC) modules



Appendix D: List of terms

AC

Alternating current

AC equipment ground (ACEG)

An insulated conductor, used to protect personnel from injury, that does not normally carry current. The ACEG is permanently bonded to the service panel ground and to metal parts of electrical equipment that do not normally carry current.

AWG

American wire gauge

Backplane

A printed circuit board that extends across the width of the card cage and connects to the circuit card connectors

Battery backup

System power furnished by stand-by batteries that are charged by a charger. If commercial power fails, the batteries will maintain service for a limited period of time, determined by the size of the batteries and the traffic on the system. (Also called battery reserves.)

Battery return (BR, BATRTN, or RTN)

A conductor that carries -48 V dc return current. Although battery return conductors are not grounding conductors, they must be referenced to ground by a single connection.

BTU

Bus terminating unit

Bus

A copper bar, plate, or conductor

Card cage

A frame for holding circuit cards in a module; also called a card chassis

CBT

Core bus terminator

CE/PE

Common equipment/peripheral equipment

CEC

Canadian Electrical Code

Central office (CO)

The site where a telephone company terminates customer lines and houses the switching equipment that interconnects those lines

Central processing unit (CPU)

The main portion of a computer that contains the primary storage, arithmetic and logic units, and the control unit (may also mean a mainframe computer)

Circuit cards

Circuit cards carry the electronics for particular functions (such as memory and switching functions). Most cards are housed in the card cage in a module and connect to the backplane. Some cards must be installed in dedicated slots in a card cage. (Also called circuit packs or boards.)

CMA

Changeover and memory arbitrator

CMDU

Core multi-drive unit

CNI

Core to network interface

Common equipment (CE)

A hardware subsystem that houses one or more central processing units (CPUs), memory cards, disk drive units, and service cards

CSA

Canadian Standards Association

DC

Direct current

DCE

Data communications equipment

DTE

Data terminal equipment

DTR

Digitone receiver

FDI

Floppy disk interface

FDU

Floppy disk unit

FG (or FGND)

Frame ground (safety ground)

Ground

A metallic connection, whether intentional or accidental, between an electric circuit or equipment and the earth, or some conducting body that serves in place of the earth. Typically, a connection to earth obtained by a grounding electrode.

HZ

Hertz (cycles per second)

IG

Isolated ground

Input/output (I/O)

Exchange between a machine and end user equipment

IOP

Input/output processor

IPB

Inter-processor bus

IPE

Intelligent peripheral equipment

LED

Light emitting diode

Line

A communications channel or circuit; an electrical path

Logic return (LR or LRTN)

Sometimes referred to as logic ground, logic return is the voltage reference and current return path that is eventually connected to the single point ground for analog and digital circuits.

Logic return equalizer (LRE)

The point at which all logic return wires are consolidated before connecting to the single point ground. Physically, the LRE function can be provided by a separate grounding bus bar, by the common battery return bus in a DC power distribution panel, or by the AC equipment ground in an isolated ground service panel.

Loop

A bidirectional path between network equipment and peripheral equipment

MDF

Main distribution frame (cross-connect terminal)

MDU

Multi-disk unit

MFA150

150-amp modular, front access DC power system, rack style

Module power supplies

Individual power units that generate the different DC voltages required by the cards installed in each module

MPDU

Module power distribution unit

MPP600

600-amp modular DC power plant, cabinet style

MSI

Mass storage interface

NEC

National Electrical Code (U.S.A.)

Network equipment

A hardware subsystem that provides digital multiplexed switching for voice, data, and signaling paths

NT6D82

900-amp DC power system, rack style

Pedestal

The bottom element in a column. Each pedestal houses a blower or fan unit, an air filter, the PDU (which contains the column circuit breakers), and the system monitor. (The pedestal in system option 21A houses only the PDU.)

Peripheral equipment (PE)

A hardware subsystem that provides analog and digital line and trunk interfaces and houses a combination of line, trunk, and **Digitone** receiver circuit cards

PFTU

Power fail transfer unit

Power distribution unit (PDU)

Input power for Meridian I is brought into the pedestal to the PDU. The PDU distributes input power to the column.

QBL12

75-amp external DC power distribution unit

QBL15

150-amp external DC power distribution unit

QCA13

50-200-amp rectifier/distribution unit cabinet

RPE

Remote peripheral equipment

SDI

Serial data interface

Single point ground (SPG)

A single connection used to reference electronic equipment to ground; no DC current flows through the connection unless a fault condition exists.

System monitor

A microprocessor-based circuit card that controls and monitors the status of cooling equipment and power-related hardware and functions

System SPG

The point where frame ground, logic return, AC equipment ground, and battery return are connected to ground

TDS

Tone and digit switch

TN

Terminal number

Top cap

The top cap is mounted on the top module of each column. It provides airflow exits, **EMI/RFI** shielding, I/O cable entry and exit, and overhead cable rack mounting. The top cap covers thermal sensor assemblies for the column.

Trunk

A single circuit between two points, both of which are switching centers or individual distribution points

Universal equipment module (UEM)

A modular, self-contained hardware cabinet that houses a card cage, power supply, backplane, circuit cards, and other basic equipment. When equipped, the UEM becomes a specific type of module, such as a CPU Module or Network Module.

UPS

Uninterruptible power supply

V ac

Voltage alternating current

Vdc

Voltage direct current

SL-1

Meridian 1

System installation procedures

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Information subject to change without notice.

Release 7.0

Standard

April 1, 1994

Printed in the U.S.A.



553-3001-211

SL-1

Circuit card installation and testing

Publication number: 553-3001-211

Document release: 8.0

Document status: Standard

Date: April 1, 1994

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Revision history

January 29, 1990

Standard. release 1.0.

July 31, 1990

Standard. release 2.0

December 20, 1990

Standard, release 3.0. Updated to include the NT6D42 Ringing Generator, QPC442 Tone Detector option settings and a correction to the QPC441 3-Port Extender.

December 1, 1991

Standard, release 4.0. This document is reissued to include technical content updates. Due to the extent of the changes, revision bars are omitted.

December 31, 1992

Standard. release 5.0. New information and changes to technical content are noted by revision bars in the margins.

April 1, 1993

Standard. release 6.0. Changes to technical content are noted by revision bars in the margins.

August 1, 1993

Standard. release 7.0. Changes to technical content are noted by revision bars in the margins.

April 1, 1994

Standard, release 8.0. This document is reissued to include technical information on Meridian | option 61C and corrections specified in the Product Bulletin 93062 Rev. 1. Changes to technical content are noted by revision bars in the margins.

Contents

About this document	1
Circuit card installation	3
Card slots—System options 21A, 21, 21E, 51, 61, 61C, 71, 81	3
Precautions	12
Installing a circuit card	15
Installation procedure	15
Acceptance tests	21
Conference cards	21
Digitone receiver cards	23
Line cards	24
Multifrequency sender cards	25
Multifrequency signaling cards	26
Networkcards	26
Trunkcards	27
Test procedure using a maintenance telephone	27
Test procedure using a system terminal	27
Tone and digit switch cards	28
Option settings	31
Circuit card grid	31
NT6D 11 D-Channel Interface Card	33
NT6D42 Ringing Generator DC	35
NT6D43 CE/PE Power Supply DC	37

NT9D1102 Core/Network Module Backplane	38
NT6D68 Core Module Backplane.	39
NT6D6003 Core Bus Terminator Card	39
NT6D80 Multi-purpose Serial Data Link Card.	40
NT7D03 Ringing Generator DC	41
NT7D04 CE/PE Power Supply DC.	41
NT8D14 Universal Trunk Card.	42
NT8D15 E&M Trunk Card	45
NT8D17 Conference/TDS Card.	46
NT8D21 Ringing Generator AC	47
NT8D22 System Monitor.	48
NT8D41 Dual Port Serial Data Interface Paddle Board	52
NTND02 Misc/SDI/Peripheral Signaling Card.	53
NTND10 Changeover and Memory Arbitrator Card.	55
QMT8 Add-on Data Module	56
QMT1 1 Asynchronous/Synchronous Interface Module	59
QPA62 Call Detail Recording 32 K RAM Card	59
QPC30 4 K RAM Card	60
QPC31 8 K RAM Card	61
QPC33 Tape Interface Card.	62
QPC41 Miscellaneous Card.	62
QPC43 Peripheral Signaling Card.	62
QPC45 Serial Data Interface Card.	63
QPC46, QPC1.55 Common Equipment Bus Extender Cards. ...	63
QPC62 1.5 Mbyte Baud Converter Card.	64
QPC66 2 Mbyte Baud Converter Card	65
QPC70, QPC217, QPC293 CO/FX/WATS Trunk Cards	65
QPC71 E&M Trunk Cards.	66
QPC72, QPC288, QPC449, QPC559, QPC560 Loop Signaling Trunk Cards.	67
QPC73, QPC289 Recorded Telephone Dictation Cards	68
QPC74, QPC290 Recorded Announcement Trunk Cards.	69
QPC84 Power Monitor	70
QPC99 Carrier Interface Card	76
QPC139 Serial Data Interface Card	77
QPC173 Power Monitor.	78
QPC197 Tone Detector Switch Card	79

QPC2 14 Memory Controller Card	80
QPC2 15 Segmented Bus Extender Card	80
QPC216 3-Port Extender Card	81
QPC218, QPC272 CO/FX/WATS Trunk Cards	81
QPC219, QPC295 CO/FX/WATS Trunk Cards	83
QPC237A, QPC237B, QPC296A, QPC296B 4-Wire E&M/DX Signaling Trunk Cards	84
QPC239 Recorded Telephone Dictation Trunk Card	87
QPC327 Multifrequency Sender/Receiver Card	87
QPC330, QPC331 Buffered Message Register Trunk Cards	88
QPC377, QPC379 Conference Cards	89
QPC387 Peripheral Buffer Card	89
QPC390, QPC391 Pulsed E&M Trunk Cards	90
QPC414 Network Card	92
QPC417 Junctor Board	92
QPC422 Tone Detector Card	93
QPC423 192 K RAM Card	93
QPC425 CPU Card	94
QPC426 192 K RAM Card	95
QPC432 4-Port Data Line Card	95
QPC441 3-Port Extender Card	96
QPC446, QPC447 Conference Cards	97
QPC450, QPC528 CO/FX/WATS Trunk Cards	98
QPC464 Peripheral Buffer Card	99
QPC471 Clock Controller Card	100
QPC472 Digital Trunk Interface Card	101
QPC478 128 K RAM Card	101
QPC479 128 K RAM Card	102
QPC503 Common Equipment Backplane	103
QPC513 Enhanced Serial Data Interface Card	104
QPC52.5, QPC526, QPC527 CO Trunk Card	105
QPC550 Direct Inward Dial Trunk Card	105
QPC551 Radio Paging Trunk Card	108
QPC574, QPC595 Digitone Receiver Cards	109
QPC577, QPC596 Digitone Receiver Daughterboards	109
QPC584 Mass Storage Interface Card	110
QPC650, QPC651 Music Trunk Cards	111

QPC659 Dual Loop Peripheral Buffer Card . .	112
QPC672 512 K Memory Card	113
QPC673 512 K Memory Card.	113
QPC674 256 K Memory Card	114
QPC687 CPU Card	115
QPC699 Common Equipment Backplane	116
QPC720 Primary Rate Interface Card	117
QPC742 Floppy Disk Interface Card.	118
QPC757 D-Channel Interface Card.	119
QPC775 Clock Controller Card	120
QPC841 4-Port Serial Data Interface Card . . .	120
Sample settings for NT8D22 System Monitors . .	123
Meridian 1 systems	123
ST, STE, and RT systems with Meridian 1 upgrades	124
ST,STE,orRTwithPEupgrade	125
ST, STE, RT with CE upgrade	126
NT and XT systems with Meridian 1 upgrades	127
NT or XT with PE upgrade	127
NT or XT with CE upgrade	128

List of figures

Figure 1				
Static	discharge	points	.	13
Figure 2				
Connector	for the battery pack assembly	. . . . .		16
Figure 3				
Installing	the circuit card in the card cage	.		18
Figure 4				
C i r c u i t c a r d				gri32

CONTENTS

viii

About this document

This document provides:

- a list of compatible slots for circuit cards used in options 2 I A, 2 I B, 2 I E, 51, 61, 61C, 71, and 81
- a general procedure for initially installing a circuit card
- acceptance tests for circuit cards that provide service functions, network control, and line and trunk connections
- option settings for the PBX circuit cards currently supported by Northern Telecom

Note: For information on equipment used with system option I I, see the appropriate documentation for that product.

- sample option settings for system configurations with NT8D22 System Monitors

For detailed procedures for removing a specific circuit card and installing a replacement, see *Hardware replacement* (553-3001-520).

For option settings on telephones, attendant consoles, or add-on modules, see the appropriate document for that equipment.

For a description of all administration programs, maintenance programs, and system messages see the *XI I input/output guide* (553-3001-400).

553-3001-211

2 About this document



Circuit card installation

Card slots-System options 21 A, 21, 21E, 51, 61, 61C, 71, 81

This chapter identifies card slot compatibility in the following modules:

- NT6D39 CPU/Network Module
required for options 5 I and 6 I
- NT6D60 Core Module
required for option 8 I
- NT9D I I Core/Network Module
required for option 61C
- NT8D I I Common/Peripheral Equipment (CE/PE) Module
required for options 2 I A, 2 I I, and 2 I E
- NT8D I3 Peripheral Equipment (PE) Module
optional for options 21, 21E, 51, 61, 61C, 71, and 81
- NT8D34 CPU Module
required for option 7 I
- NT8D35 Network Module
required for options 7 I and 8 I, optional for options 2 I, 21E, 51, 61, and 61C
- NT8D36 InterGroup Module
required for options 7 I and 8 I
- NT8D37 Intelligent Peripheral Equipment (IPE) Module
required for options 5 I, 6 I, 61C, 7 I, and 8 I, optional for options 2 I and 21E
- NT8D47 Remote Peripheral Equipment (RPE) Module
optional for options 21, 21E, 51, 61, 61C, 71, and 81

Table 1
System option 21 A, 21, 21E, 51, 61, 61C, 71, 81 card slots (Part 1 of 8)

	21A	21	21E	51	61	61C	71	81
NT6D003 Core Bus Terminator Card	—	—	—	—	—	Core/Net: 13	—	Core: 13
NT6D63 I/O Processor Card	—	—	—	—	—	Core/Net: 16 & 17*	—	Core: 16 & 17*
NT6D64 Core Multi Drive Unit	—	—	—	—	—	Core/Net: 18	—	Core: 18
NT6D65 Core to Network Interface Card	—	—	—	—	—	Core/Net: 12*	—	Core: 8-10**
NT6D66 Call Processor Card	—	—	—	—	—	Core/Net: 14 & 15	—	Core: 14 & 15*
NT6D70 S/T Interface Line Card	—	—	CE/PE: 0-9 (PE) IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"
NT6D71 U Interface Line Card	—	—	CE/PE: 0-9 (PE) IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"
NT6D72 Basic Rate Signal Concentrator Card	—	—	CE/PE: 0-9 (PE) IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"
NT6D73 Multi-purpose ISDN Signaling Processor Card	—	—	CE/PE: 4-9 (Net)	CPU/Net: 1-8	CPU/Net: 1-8	Core/Net: 0-7	Net: 5-12	Net: 5-12
NT6D80 Multi-purpose Serial Data Link	—	—	CE/PE: 4-9 (Net)	CPU/Net: 1-8, 13	CPU/Net: 1-8, 13	Core/Net: 0-7	Net: 5-12	Net: 5-12
* The card occupies two slots.								
** A CNI card must be installed in slot 8-10 in option 81 and slot 12 in option 61 C.								

Table 1
System option 21 A, 21, 21E, 51, 61, 61C, 71, 81 card slots (Part 2 of 8)

	21A	21	21E	51	61	61C	71	81
NT7D16 Data Access Card	CE/PE: O-9 (PE)*	CE/PE: O-9 (PE)*	CE/PE: O-9 (PE)*	IPE: any slot but "Cont"***	IPE: any slot but "Cont"***	IPE: any slot but "Cont"	IPE: any slot but "Cont"***	IPE: any slot but "Cont"***
NT8D01 Controller Card	—	IPE: "Cont"	IPE: "Cont"	IPE: "Cont"	IPE: "Cont"	IPE: "Cont"	IPE: "Cont"	IPE: "Cont"
NT8D02 Digital Line Card	CEIPE: O-9 (PE)	CEIPE: O-9 (PE) IPE: any slot but "Cont"	CEIPE: O-9 (PE) IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"
NT8D03 Analog Line Card	CEIPE: O-9 (PE)	CEIPE: O-9 (PE) IPE: any slot but "Cont"	CEIPE: O-9 (PE) IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"
NT8D04 Superloop Network Card	CEIPE: 4-9 (Net)	CEIPE: 4-9 (Net)	CEIPE: 4-9 (Net)	CPU/Net: 1-8	CPU/Net: 1-8	Core/Net: 0-7	Net: 5-12	Net: 5-12
NT8D09 Analog Message Waiting Line Card	CE/PE: O-9 (PE)	CE/PE: O-9 (PE) IPE: any slot but "Cont"	CEIPE: O-9 (PE) IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"
NT8D14 Universal Trunk Card	CE/PE: O-9 (PE)	CEIPE: O-9 (PE) IPE: any slot but "Cont"	CEIPE: O-9 (PE) IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"
<p>* This applies to NT8D11 BC or NT8D11 EC CE/PE Modules. In NT8D11 AC or NT8D11 DC modules, use only slot 0.</p> <p>** This applies to NT8D37BA or NT8D37EC IPE Modules, In NT8D37AA or NT8D37DC modules, us only slots 0, 4, 8, and 12</p>								

Table 1
System option 21A, 21, 21E, 51, 61, 61C, 71, 81 card slots (Part 3 of 8)

	21A	21	21E	51	61	61C	71	81
NT8D15 E&M Trunk Card	CE/PE: 0-9 (PE)	CE/PE: 0-9 (PE) IPE: any slot but "Cont"	CE/PE: 0-9 (PE) IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"
NT8D16 Digitone Receiver Card	—	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"	IPE: any slot but "Cont"
NT8D17 Conference/TDS Card	CE/PE: 4 (Net)	CE/PE: 4 (Net)	CE/PE: 4 (Net)	CPU/Net: 1-8	CPU/Net: 1-8	Core/Net: 0-7	Net: 5-12	Net: 5-12
NT8D18 Network/DTR Card	CE/PE: 10 (Net)	CE/PE: 10 (Net)	CE/PE: 10 (Net)	—	—	—	—	—
NT8D19 Memory/Peripheral Signaling Card	CE/PE: 3 (CPU/Mem)	CE/PE: 3 (CPU/Mem)	—	—	CPU/Net: —	—	—	—
NT8D41 Dual Port SDI Paddle Board	CE/PE: any rear bkplane slot	CE/PE: any rear bkplane slot	CE/PE: any rear bkplane slot	CPU/Net: rear bkplane 7, 8, 12	rear bkplane 7, 8, 12	—	—	—
NT8D68 Floppy Disk Unit	CE/PE: any 2 slots	CE/PE: any 2 slots	—	CPU/Net: 18*	CPU/Net: 18*	—	—	—
NT8D69 Multi Disk Unit	—	—	—	CPU/Net: 18**	CPU/Net: 18**	—	CPU: 15-17**	—
NTND01 Integrated CPU/Memory Card	—	—	CE/PE: 2 (CPU/Mem)	—	—	—	—	—
NTND02 Misc/SDI/Peripheral Signaling Card	—	—	CE/PE: 3 (CPU/Mem)	—	—	—	—	—
* Requires two slots. ** Requires three slots								

Table 1
System option 21 A, 21, 21 E, 51, 61, 61C, 71, 81 card slots (Part 4 of 8)

	21A	21	21E	51	61	61C	71	81
NTND09Bx 6 Mbyte Memory Card		—		CPU/Net: 17	CPU/Net: 17		CPU: 1-2*	—
NTND09 Cx 12 Mbyte Memory Card			—	CPU/Net: 17	CPU/Net: 17		CPU: 2	
NTND10 Changeover Memory Arbitrator Card				CPU/Net: 16	CPU/Net: 16		CPU: 3	—
NTND15 Floppy Disk Unit		—	CE/PE: any 2 slots	—			—	
NTND16 Multi Disk Unit	—	—		CPU/Net: 18**	CPU/Net: 18**		CPU: 15-17**	
QPC43 Peripheral Signaling Card		—	—	CPU/Net: 10	CPU/Net: 10	Core/Net: 10	Net: 4	Net: 4
QPC62 1.5 Mbyte Converter Card	--	RPE: 2 and 9	RPE: 2 and 9	RPE: 2 and 9	RPE: 2 and 9	RPE: 2 and 9	RPE: 2 and 9	RPE: 2 and 9
QPC63 Local Carrier Buffer Card		RPE: 5-6	RPE: 5-6	RPE: 5-6	RPE: 5-6	RPE: 5-6	RPE: 5-6	RPE: 5-E,
QPC65 Remote Peripheral Switch Card		RPE: 5-6	RPE: 5-6	RPE: 5-6	RPE: 5-6	RPE: 5-6	RPE: 5-6	RPE: 5-6;
QPC66 2 Mbyte Converter Card	—	RPE: 3 and 8	RPE: 3 and 8	RPE: 3 and 8	RPE: 3 and a	RPE: 3 and 8	RPE: 3 and 8	RPE: 3 and 8
QPC67 Carrier Maintenance Card	—	RPE: 10	RPE: 10	RPE: 10	RPE: 10	RPE: 10	RPE: 10	RPE: 10
* If only one NTND09 card is used, install it in slot 2 (next to the CMA card). ** Requires three slots.								

Table 1
System option 21A, 21, 21 E, 51, 61, 61 C, 71, 81 card slots (Part 5 of 8)

	21A	21	21E	51	61	61C	71	81
QPC71 E&M/DX Trunk Card	---	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC99 Carrier Interface Card	---	RPE: 4 and 7	RPE: 4 and 7	RPE: 4 and 7	RPE: 4 and 7	RPE: 4 and 7	RPE: 4 and 7	RPE: 4 and 7
QPC192 Off-Premises Extension Card	---	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC215 Segmented Bus; Extender Card	---	---	---	---	---	---	CPU: 8-12	---
QPC237 4-Wire E&M/DX Trunk Card	---	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC250 Release Link Trunk Card	---	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC297 Attendant Console Monitor Card	---	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC412 InterGroup Switch Card							Net: 2-3	Net: 2-3
QPC414 Network Card	CE/PE 4-9 (Net)	CE/PE: 4-9 (Net)	CE/PE: 4-9 (Net)	CPU/Net: 1-8	CPU/Net: 1-8	Core/Net: 0-7	Net: 5-12	Net: 5-12
QPC422 Tone Detector Card	---	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC430 Asynchronous Interface Line Card		PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC432 4-Port Data Line Card		PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"

Table 1
System option 21 A, 21, 21 E, 51, 61, 61C, 71, 81 card slots (Part 6 of 8)

	21A	21	21E	51	61	61C	71	81
QPC441 3-Port Extender Card	--	-		CPU/Net: 11	CPU/Net: 11	Core: 7 Net: 1	Net: 1	Core: 7 Net: 1
QPC449 Loop Signaling Trunk Card	-	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC450 CO/W/WATS Trunk Card		PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC471 Clock Controller Card	CE/PE: 4-7 (Net)	CE/PE: 4-7 (Net)	CE/PE: 4-7 (Net)	CPU/Net: 9	CPU/Net: 9	CPU: 14	CPU: 14	Core: 6
QPC477 Bus Terminating Units: QPC477A9	--	-	-	CPU/Net: 2/3	CPU/Net: 2/3	CPU/Net: 0/1	Net: 11/12	Core: 4/5 Net: 11/12
QPC477B10 (replaces AI 0)		-	-	CPU/Net: 1/2	CPU/Net: 1/2	CPU/Net: 1/2	Net: 12/13	Core: 5/6 Net: 12/13
QPC477A20 (CPU 0)		--	-				CPU: 13/14	--
QPC477A21 (CPU 1)		-	-				CPU: 13/14	-
QPC477A22			-	CPU/Net: 12/13	CPU/Net: 12/13			--
QPC513 Enhanced Serial Data Interface Card	CE/PE: 4-9 (Net)	CE/PE: 4-9 (Net)	CE/PE: 4-9 (Net)	CPU/Net: 1-9	CPU/Net: 1-9, 13	Core/Net: 9, 13	CPU: 6, 13 Net: 5-13	Core: 6, 13 Net: 5-13
QPC578 Integrated Services Digital Line Card	-	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"

10 Circuit card installation

Table 1
System option 21A, 21, 21E, 51, 61, 61 C, 71, 81 card slots (Part 7 of 8)

	21A	21	21E	51	61	61C	71	81
QPC579 CPU Function Card	—		—	CPU/Net: 14	CPU/Net: 14		CPU: 5	
QPC580 CPU Interface Card	—		—	CPU/Net: 15	CPU/Net: 15		C P U : 4	
QPC581 Changeover Memory Arbitrator Card				CPU/Net: 16	CPU/Net: 16	—	C P U : 3	—
QPC583 Memory Card			—	CPU/Net: 17	CPU/Net: 17	—	CPU: 1-2 —	
QPC584 Mass Storage Interface Card	—		—	CPU/Net: 12	CPU/Net: 12	—	CPU: 7	—
QPC594 16-Port 50012500 Line Card		PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC659 Dual Loop Peripheral Buffer Card		PE: "DLB"	PE: "DLB"	PE: "DLB"	PE: "DLB"	PE: "DLB"	PE: "DLB"	PE: "DLB"
QPC687 CPU Card	CE/PE: 2 (CPU/Mem)	CE/PE: 2 (CPU/Mem)	—	—	—	—		
QPC720 Primary Rate Interface Card	CE/PE: 4-8 (Net)	CE/PE: 4-8 (Net) Net: 5-11, 13-14 RPE: 1, 11-12	CE/PE: 4-8 (Net) Net: 5-11, 13-14 RPE: 1, 11-12	CPU/Net: 3-7 Net: 5-11, 13-14 RPE: 1, 11-12	CPU/Net: 3-7 Net: 5-11, 13-14 RPE: 1, 11-12	Core/Net: 0-7 Net: 5-11, 13-14 RPE: 1, 11-12	CPU: 8-12, 15-16 Net: 5-11, 13-14 RPE: 1, 11-12	Core: 0-3 Net: 5-11, 13-14 RPE: 1, 11-12
QPC723 RS-232 4-Port Interface Line Card	—	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC742 Floppy Disk Interface Card	CE/PE: 1 (CPU/Mem)	CE/PE: 1 (CPU/Mem)	CE/PE: 1 (CPU/Mem)	CPU/Net: 12	CPU/Net: 12	—	—	—

Table 1
System option 21A, 21, 21 E, 51, 61, 61 C, 71, 81 card slots (Part 8 of 8)

	21A	21	21E	51	61	61C	71	81
QPC757 D-Channel Handler Interface Card	—	CE/PE: 4-9 (Net)	CE/PE: 4-9 (Net)	CPU/Net: 1-9, 13	CPU/Net: 1-9, 13	PE: any slot but "DLB"	Net: 5-13	Net: 5-13
QPC789 16-Port 500/2500 (Message Waiting) Line Card	—	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"
QPC841 4-Port Serial Data Interface Card	CE/PE: 4-9 (Net)	CE/PE: 4-9 (Net)	CE/PE: 4-9 (Net)	CPU/Net: 1-9	CPU/Net: 1-9, 13	Core/Net: 9, 13	CPU: 6, 13 Net: 5-13	CPU: 6, 13 Net: 5-13
QPC918 High-Speed Data Card	—	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"	PE: any slot but "DLB"

Precautions

To avoid personal injury and equipment damage, review the following guidelines before handling Meridian 1 equipment.

WARNING

Module covers are not hinged; do not let go of the covers. Lift covers away from the module and set them out of your work area.

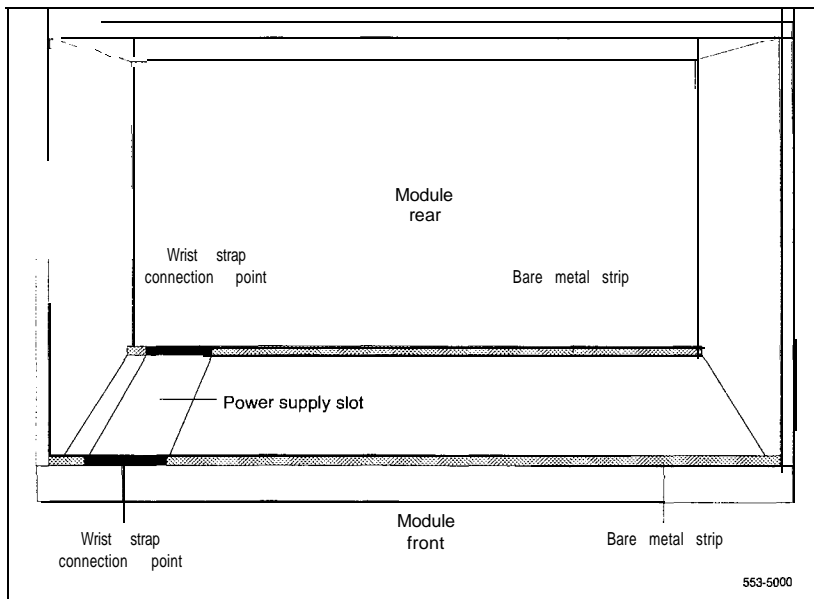
WARNING

Circuit cards may contain a lithium battery. There is a danger of explosion if the battery is incorrectly replaced. Do not replace components on any circuit card; you must replace the entire card.

Dispose of circuit cards according to the manufacturer's instructions.

connected antistatic wrist strap when you work on Meridian 1 equipment. If a wrist strap is not available, regularly touch one of the bare metal strips in a module to discharge static. Figure 1 shows the recommended connection points for the wrist strap and the bare metal strips you should touch.

Figure 1
Static discharge points



Handle circuit cards as follows:

- Unpack or handle cards away from electric motors, transformers, or similar machinery.
- Handle cards by the edges only. Do not touch the contacts or components.
- Set cards on a protective antistatic bag. If an antistatic bag is not available, hand-hold the card, or set it in a card cage unseated from the connectors.
- Store cards in protective packing. Do not stack cards on top of each other unless they are packaged.
- Keep cards installed in the system as much as possible to avoid dirty contacts and unnecessary wear.
- Store cards in a cool, dry, dust-free area.

During repair and maintenance procedures:

- Turn off the circuit breaker or switch for a module power supply before the power supply is removed or inserted.
Note: In AC-powered systems, capacitors in the power supply must discharge. Wait five full minutes between turning off the circuit breaker and removing the power supply from the module.
- Software disable cards, if applicable, before they are removed or inserted.
- Hardware disable cards, whenever there is an enable/disable switch, before they are removed or inserted.
- Return defective or heavily contaminated cards to a repair center. Do not try to repair or clean them.

Installing a circuit card

This procedure provides detailed installation instructions for Meridian 1 circuit cards.

WARNING

To avoid personal injury and equipment damage, read all of the guidelines in "Precautions" on page 12 before you begin installation and follow all guidelines throughout the procedure.

Installation procedure

- 1 Open the protective carton and remove the circuit card from the antistatic bag. Return the antistatic bag to the carton and store it for future use.
- 2 Inspect the card components, faceplate, locking devices, and connectors for damage. If damaged, tag the card with a description of the problem and package it for return to a repair center.
- 3 Refer to the work order to determine the module and slot location for the card.
- 4 If there is an enable/disable (Enb/Dis) switch on the faceplate, set it to Dis.
- 5 If there are option switches or jumpers on the card, set them according to the work order (see "Option settings" on page 31).

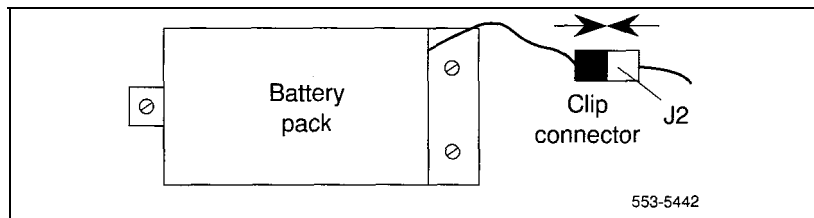
CAUTION

Incorrectly set switches on common equipment circuit cards may cause a system failure.

- 6 If you are installing an NTND02 Misc/SDI/Peripheral Signaling (MSPS) Card, the A0378252 Battery Pack Assembly must be attached:
 - Position the battery pack on the component side of the MSPS card. From the back of the card, install the screws that secure the battery pack.
 - On the component side of the MSPS card, plug in the clip connector wired to the battery pack. Make sure the connector key is centered on J2 (see Figure 2).

Note: The battery will not be fully charged until 24 hours after installation in a powered system.

Figure 2
Connector for the battery pack assembly



- 7 If you are installing one of the following cards, the QMM42 Security Data Cartridge must be attached:

NT6D63 I/O Processor (IOP) Card
QPC584 Mass Storage Interface (MSI) Card
QPC742 Floppy Disk Interface (FDI) Card

To install a data cartridge, plug it into the connectors on the component side of the host card and install the screw that secures the data cartridge.

CAUTION

To avoid system failure, the ID number on the data cartridge must match the ID number of the system.

- 8 If you are installing one of the following cards, the associated ROM card must be attached:

NTND01 Integrated CPU/Memory (ICM) Card – NTND31 ROM
QPC579 CPU Function (FN) Card – NTND08 or QPC939 ROM
QPC687 CPU Card – QPC940 ROM

To install a ROM card, plug it into the connectors on the component side of the host card.

Note: For the NTND31 ROM Card, you must also install a screw and washer at each corner of the ROM card.

CAUTION

When you install a ROM card, do not touch other components on the host card.

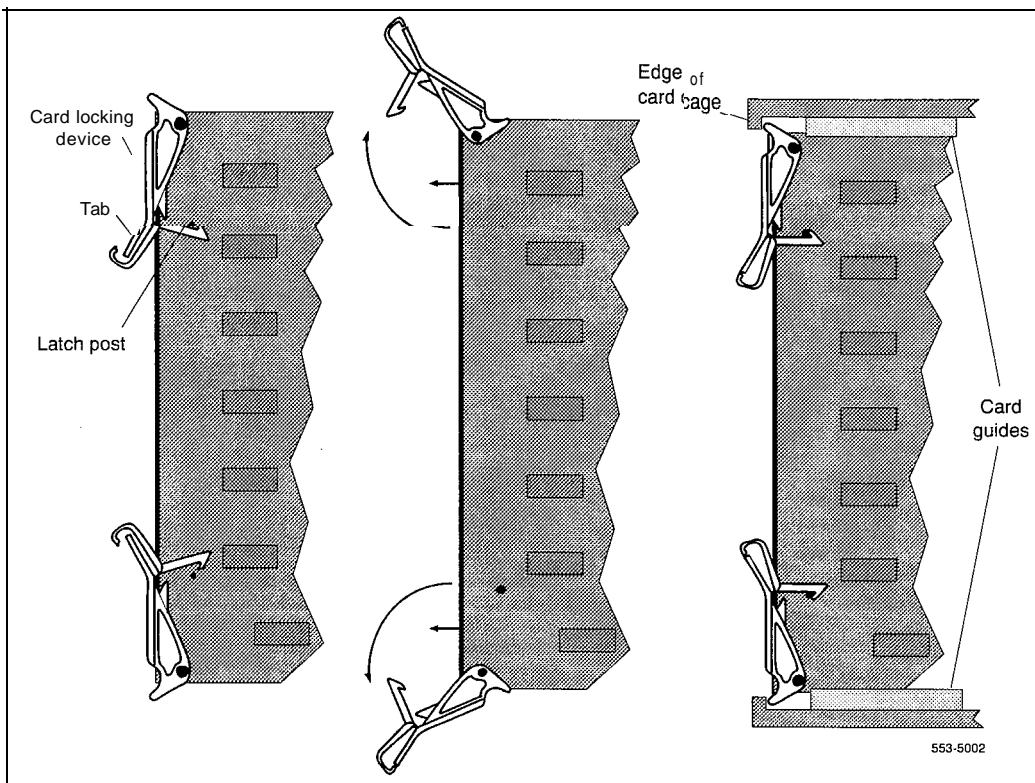
- 9 Squeeze the ends of the locking devices on the card and pull the tabs away from the latch posts and faceplate (see Figure 3).
- 10 Insert the card into the card aligning guides in the card cage. Gently push the card into the slot until you feel resistance. The tip of the locking device must be behind the edge of the card cage (see Figure 3).
- 11 Lock the card into position by simultaneously pushing the ends of the locking devices against the faceplate.

Note: When IPE cards are installed, the red LED on the faceplate remains lit for two to five seconds as a self-test runs. If the self-test completes successfully, the LED flashes three times and remains lit until the card is configured and enabled in software, then the LED goes out. If the LED does not follow the pattern described or operates in any other manner (such as continually flashing or remaining weakly lit), replace the card.

- 12 If there is an enable/disable switch, set it to Enb.

Note: Do not enable the switch on an NT8D04 Superloop Network Card or QPC414 Network Card until network loop cables are installed.

Figure 3
Installing the circuit card in the card cage



13 If you are adding a voice, conference, or tone and digit loop, press the manual initialize (Man Int) button if the card is associated with the active CPU:

- In options 21A and 21, the manual initialize button is on the NT8D19 Memory/Peripheral Signaling Card.
- In option 21E, the manual initialize button is on the NTND01 Integrated CPU/Memory (ICM) Card.
- In options 51, 61, and 71, the manual initialize button is on the QPC580 CPU Interface Card.
- In options 61C and 81, the manual initialize button is on the NT6D66 Call Processor (CP) Card.

Note: An initialization causes a momentary interruption in call processing.

14 If you are installing the card in a working system, refer to the work order and the *X11 input/output guide* (553-3001-400) to add the required office data to the system memory.

15 Go to the appropriate test procedure in “Acceptance tests” on page 21.

W 2001-1

20 Circuit card installation

20

Acceptance tests

Test procedures for most circuit cards require that internal and external cabling be installed. See the appropriate installation document for your system and *Telephone and attendant console installation (553-300 1-215)* for cabling procedures.

Conference cards

Use this procedure to test a conference card or to test the conference function of an NT8D 17 Conference/TDS Card.

- 1 Log into the system:
LOG1 (password)
- 2 Request the status of a loop on the conference card:
LD 38
STAT loop

Conference status is formatted as follows:

CNFC n DSBL n BUSY

“n” represents the number of conference groups disabled and busy

CHAN n DSBL n BUSY

“n” represents the number of channels disabled and busy

UNEQ

card is not equipped in the system

DSBL

card is disabled in software

22 Acceptance tests

- 3 If the conference card loop is disabled, enable it.

For an **NT8D17 Conference/TDS Card**, enter:

ENLX loop

(the conference loop is the odd loop of the **conference/TDS** loop pair)

Note: The **conference/TDS** card is not enabled automatically when it is inserted. You must enable the card with the command **ENLX** (this command is used in LD 34 and LD 46 to address even loops, LD 38 to address odd loops). Enabling the loops with the command **ENLL** does not enable the hardware for the card.

For other than an **NT8D17 Conference/TDS Card**, enter:

ENLL loop

(the conference loop must be an even loop for cards other than the **NT8D17**)

If the system response is other than **OK**, see the *X11 input/output guide* (553-3001-400) to analyze the messages.

- 4 Test the conference loop for channel, group, and switching faults:
CNFC loop

If the conference loop passes the tests, the output is **OK**.

If the system response is other than **OK**, see the *X11 input/output guide* to analyze the messages.

- 5 Prepare the system for a manual conference call on a specified loop:
CNFC MAN loop c "c" is the manual conference group (1-15)

A manual conference test is performed by stepping through conference channels and groups, listening for noise that indicates a faulty card.

The manual conference test can be performed through a system terminal or **BCS** maintenance telephone. If commands are entered from a maintenance telephone, this telephone automatically becomes part of the manual conference call.

Only one manual conference call is allowed at one time. A manual conference consists of only two telephones, where one telephone acts as a signal source while the other acts as a listening monitor.

After you enter the CNFC command, any two telephones (one may already be the maintenance telephone) dialing the special service prefix code (SPRE) and the digits 93 will enter the manual conference call. The prime directory number (PDN) indicator, if equipped, will light on each telephone.

Going on-hook takes the telephone out of the manual conference call, and the test must be restarted.

See "LD38" in the *X11 input/output guide* for more detailed information on using this command.

- 6 Test various channels and conference groups audibly:
CNFC STEP

When stepping through channels and groups, a clicking followed by silence is normal. Any distortion or other noises indicates a faulty card.

Once the CNFC STEP command has been entered, entering C on the system terminal or maintenance telephone steps through the conference channels. Entering G steps through the conference groups. There are 15 channels per group and 15 groups per conference card.

Entering an asterisk (*) and END stops the test.

Again, see "LD 38" in the *X11 input/output guide* for detailed information on using this command.

- 7 End the session in LD 38:

Digitone receiver cards

Use this procedure to test a Digitone receiver (DTR) card, a DTR daughterboard, or the DTR function on the NT8D18 Network/DTR Card.

Note: The DTR daughterboard connected to a QPC659 Dual Loop Peripheral Buffer Card cannot be assigned when the peripheral equipment (PE) shelf is used in single loop mode.

- 1 Log into the system:
LOGI (password)

- 2 See if the **Digitone** receiver to be tested is disabled:
LD 34
STAT

The system responds with the terminal number (TN), or numbers, of any disabled **Digitone** receivers.
- 3 If the **Digitone** receiver is disabled, enable it:
ENLR l s c u loop, shelf, card, and unit numbers
- 4 Test the **Digitone** receiver:
DTR l s c u loop, shelf, card, and unit numbers

If the system response is other than **OK**, see the *XI 1 input/output guide* (553-3001-400) to analyze the messages.
- 5 End the session in LD 34:

Line cards

Use this procedure to test a line card.

- 1 Log into the system:
LOG1 (password)
- 2 Perform a network memory test, continuity test, and signaling test on a specific loop and shelf:
LD 30
SHLF l s loop and shelf numbers

If the system response is other than **OK**, see the *X11 input/output guide* (553-3001-400) to analyze the messages.
- 3 For a line card on a superloop, perform a signaling test on a specific card or unit:
UNTT l s c loop, shelf, and card numbers

For the **NT8D02** Digital Line Card, enter:
UNTT l s c u loop, shelf, card, and unit numbers

If the system response is other than **OK**, see the *X11 input/output guide* (553-3001-400) to analyze the messages.
- 4 End the session in LD 30:

Multifrequency sender cards

Use this procedure to test a multifrequency sender (MFS) card or the MFS function of an NT8D17 Conference/TDS Card.

- 1 Log into the system:
LOG1 (password)
- 2 Test and enable an MFS loop:
LD 46
MFS loop
(on the NT8D17 Conference/TDS Card, the TDS/MFS loop is the even loop of the conference/TDS loop pair)

Note: The conference/TDS card is not enabled automatically when it is inserted. You must enable the card with the command ENLX (this command is used in LD 34 and LD 46 to address even loops, LD 38 to address odd loops). Enabling the loops with the command ENLL does not enable the hardware for the card.

If the system response is other than OK, see the *X11 input/output guide* (553-3001-400) to analyze the messages.

- 3 Access the system from a maintenance telephone; then enter:
LD 46

Note: Give the system approximately 20 seconds to load the program.

See "Communicating with the Meridian 1" in the *X11 input/output guide* (553-3001-400) for details on accessing the system from a maintenance telephone.

- 4 Obtain 10-second bursts of digits 1 to 9, 0, and 11 to 15 (in that order) for all digits on the specified loop:
TONE loop ALL

Each burst should sound different. If the bursts do not sound different, replace the card.

- 5 End the session in LD 46:

Multifrequency signaling cards

Use this procedure to test a multifrequency signaling card.

- 1 Log into the system:
LOGI (password)
- 2 Test and enable the specified unit:
LD 54
ATST l s c u loop, shelf, card, and unit numbers

If the system response is other than **OK**, see the *X11 input/output guide* (553-3001-400) to analyze the messages.
- 3 End the session in LD 54:

Network cards

Use this procedure to test a network card.

- 1 Log into the system:
LOG1 (password)
- 2 Perform a network memory test, continuity test, and signaling test:
LD 30
LOOP loop can be a specific loop number or **ALL**

If **ALL** is specified, all enabled loops (except attendant console loops) and all shelves on each loop are tested.

If only one loop is being tested and it is disabled, enter **ENLL** loop to enable and test a network card associated with the specified loop. (This command cannot enable network cards disabled by LD 32.)

If the system response is other than **OK**, see the *X11 input/output guide* (553-3001-400) to analyze the messages.
- 3 End the session in LD 30:

Trunk cards

Use the following procedures to test a trunk card.

Test procedure using a maintenance telephone

- 1 Access the system from a maintenance telephone.
See "Communicating with the Meridian 1" in the *XII input/output guide* (553-3001-400) for details on accessing the system from a maintenance telephone.
- 2 Test the trunk unit:
LD 36
TRK l s c u loop, shelf, card, and unit numbers
- 3 If the maintenance telephone is hooked up to a monitor and the system response is other than **OK**, see the *XI 1 input/output guide* (553-3001-400) to analyze the messages.

Test procedure using a system terminal

- 1 Log into the system:
LOG1 (password)
- 2 Enter:
LD 36
- 3 To test a trunk from a remote test center, seize a central office (CO) monitor trunk:
CALL
or
CALL l s c u
Seize the automatic number identification (ANI) trunk:
TRK l s c u loop, shelf, card, and unit numbers
Note: When you see the **DN?** prompt, enter the directory number (DN) you want the system to dial.
If the system response is other than **OK**, see the *XII input/output guide* to analyze the messages.
- 4 End the session in LD 36:

- 5 Test an automatically identified outward dialing (AIOD) trunk card:

LD 41

AIOD Is c loop, shelf, and card numbers

If the system response is other than OK, see the *X11 input/output guide* to analyze the messages.

- 6 End the session in LD 41:

Tone and digit switch cards

Use this procedure to test a tone and digit switch (TDS) card or to test the TDS function of an **NT8D17 Conference/TDS Card**.

- 1 Log into the system:
LOG1 (password)
- 2 Obtain a list of terminal numbers (TNs) for disabled TDS cards:
LD 34
STAD
- 3 If the TDS loop to be tested is disabled, enable it.

For an **NT8D17 Conference/TDS Card**, enter:

ENLX loop

(the TDS/MFS loop is the even loop of the **conference/TDS** loop pair)

Note: The **conference/TDS** card is not enabled automatically when it is inserted. You must enable the card with the command ENLX (this command is used in LD 34 and LD 46 to address even loops, LD 38 to address odd loops). Enabling the loops with the command ENLL does not enable the hardware for the card.

For other than an **NT8D17 Conference/TDS Card**, enter:

ENLL loop

- 4 Test the TDS loop:
TDS loop

If the system response is other than OK, see the *X11 input/output guide* (553-3001-400) to analyze the messages.

- 5 End the session in LD 34:

- 6 Using a maintenance telephone, log into the system.
See "Communicating with the Meridian 1" in the *XI 1 input/output guide* (553-3001-400) for details on accessing the system using a maintenance telephone.
- 7 From the maintenance telephone, enter:
LD#34##
To test outpulsers and channels for the TDS loop, see Table 2 for a sample of the input commands used with the maintenance telephone. See the *X11 input/output guide* for all tones that can be tested.
- 8 Exit LD 34 from the maintenance telephone:

Table 2
TDS tone tests

Input command	Dial pad equivalent	Description
BSY#loop##	279#loop##	Provides busy tone from TDS loop specified.
C##	2##	Removes any active tone.
DIA#loop##	342#loop##	Provides dial tone from TDS loop specified.
OVF#loop##	683#loop##	Provides overflow tone from TDS loop specified.
RBK#loop##	725#loop##	Provides ringback tone from TDS loop specified.
RNG#loop##	764#loop##	Provides ring tone from TDS loop specified.
****		Exits TDS test program.



Option settings

Circuit card grid

Some circuit cards contain option switches or jumpers, or both, that define specific functions. A switch or jumper may be identified by an alphanumeric coordinate (such as D29) that indicates a location on the card, or by a switch number (such as SW2) printed on the circuit board (see Figure 4). Positions on a switch (for example, positions 1, 2, 3, and 4 on SW2) are labeled on the switch block.

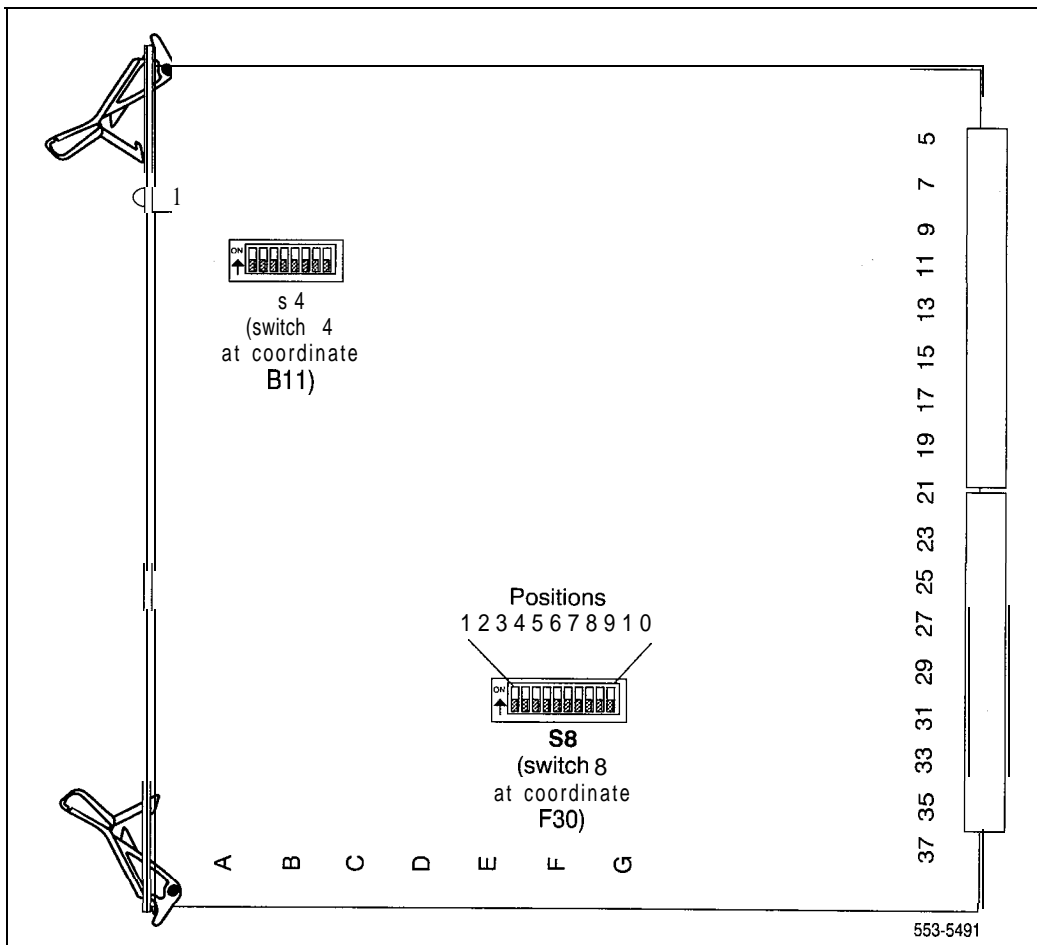
On a circuit card:

- ON may be indicated by the word “on,” the word “up,” the word “closed,” the number “1,” an arrow pointing up, or a solid dot (•).
- OFF may be indicated by the word “down,” the word “open,” the number “0,” or an arrow pointing down.

Throughout this document, if neither ON nor OFF is given (there is a blank space) for a position on a switch, that position may be set to either ON or OFF because it has no function for the option described.

32 Option settings

Figure 4
Circuit card grid



NT6D1 1 D-Channel Interface Card

The next three tables list option settings for the NT6D11 DCHI Card.

NT6D11 jumper settings and group selection

Jumper settings				Address selection			
Option	Port	Socket number		Group number	Switch		
					1	2	3
DTE (terminal)	0 1	U11 u5	U9 u3	0 1	off off	off on	off on
DCE (modem)	0 1	u12 U6	U10 u4	2 3	off off	on on	off on
RS-232-C interface	0 1	u31 U25	u29 U23	4 5	on on	off off	off on
High-speed interface	0 1	U30 U24	U28 u22	6 7	on on	on on	off on

Note: Group and port numbers combine to define a complete port address (the following two tables define port numbers). There are 8 groups and 16 port numbers, for a total of 128 possible ports. Group 0 is the only group supported by Generic X11 Supplementary Features Group F (Phase 6). Therefore, when using Group F software set switches 1, 2, and 3 to OFF.

34 Option settings

NT6D11 port address settings for single port operation

Port number SDI/DCHI (J1/J2)	Switch						
	4	5	6	7	8	9	0
0	off	off	off	off	on	*	off
1	off	off	off	on	on	*	off
2	off	off	on	off	on	*	off
3	off	off	on	on	on	*	off
4	off	on	off	off	on	*	off
5	off	on	off	on	on	*	off
6	off	on	on	off	on	*	off
7	off	on	on	on	on	*	off
8	on	off	off	off	on	*	off
9	on	off	off	on	on	*	off
10	on	off	on	off	on	*	off
11	on	off	on	on	on	*	off
12	on	on	off	off	on	*	off
13	on	on	off	on	on	*	off
14	on	on	on	off	on	*	off
15	on	on	on	on	on	*	off

* Set switch 9 to ON (1) to enable the SDI port and disable the DCHI port, Set switch 9 to OFF (0) to disable the SDI port and enable the DCHI port.

NT6D11 port settings for dual port operation

Port number		Switch						
SDI (J1)	DCHI (J2)	4	5	6	7	8	9	0
0	1	off	off	off	*	off	*	off
2	3	off	off	on	*	off	*	off
4	5	off	on	off	*	off	*	off
6	7	off	on	on	*	off	*	off
8	9	on	off	off	*	off	*	off
10	11	on	off	on	*	off	*	off
12	13	on	on	off	*	off	*	off
14	15	on	on	on	*	off	*	off

* Switches 7 and 9 do not affect dual port operation; they may be set to ON or OFF.

NT6D42 Ringing Generator DC

The next six tables list option settings for the NT6D42 Ringing Generator.

NT6042 recommended options for North American and British Telecom

Application	Ring frequency	Ring	Jumper locations	Ring
	ing	ing		ing
	frequency	voltage		output
North America	20 Hz	86 V ac	P5 High voltage message waiting	Low impedance
British Telecom	20 Hz	80 V ac	P4 No high voltage message waiting	Low impedance

NT6D42 jumper locations P4 and P5

High voltage message waiting	Pin location
Disable	Jumper in P4
Enable	Jumper in P5
Note: There must be one jumper installed.	

NT6D42 jumper location J7

Ring	Jumper location J7
ing	
output	
Low impedance (normal)	Connect pins 1 and 2
High impedance (Australia)	Connect pins 2 and 3

NT6D42 SW1

Ring	Position SW1
ing	
frequency (Hz)	
20	1
25	2
50	3

36 Option settings

NT6D42CB SW2

Ringing voltage	Message waiting voltage	SW2			
		1	2	3	4
86 V ac	-120 V dc	off	off	off	off
86 V ac	-150Vdc	off	off	off	on
80 V ac	-120 V dc	on	off	off	off
80 V ac	-150Vdc	on	off	off	on
75 V ac	-120Vdc	off	on	off	off
75 V ac	-150 V dc	off	on	off	on
70 V ac	-120 V dc	off	off	on	off
70 V ac	-150 V dc	off	off	on	on

NT6D42CC SW2

Ringing voltage	Message waiting voltage	SW2			
		1	2	3	4
86 V ac	-100 V dc	off	off	off	off
86 V ac	-150Vdc	off	off	off	on
80 V ac	-100 V dc	on	off	off	off
80 V ac	-150Vdc	on	off	off	on
75 V ac	-100 V dc	off	on	off	off
75 V ac	-150 V dc	off	on	off	on
70 V ac	-100 V dc	off	off	on	off
70 V ac	-150Vdc	off	off	on	on

NT6D43 CE/PE Power Supply DC

The next five tables list options settings for the NT6D43 Power Supply.

Note: For installations outside of North America, a jumper on the motherboard (at J5) and switches on the daughterboard must be set to select the ringing frequency or voltage, and to enable or disable Message Waiting lamps. The daughterboard must be removed to access the switches. To remove the daughterboard, remove the screws on either side of the motherboard and carefully slide out the daughterboard.

NT6D43 recommended options for North America and British Telecom

Application	Ringing frequency	Ringing voltage	Message Waiting	Ringing output
North America	20 Hz	86 V ac	Enabled (-150 V dc)	Low impedance
British Telecom	20 Hz	80 V ac	Disabled	Low impedance

NT6D43 jumper locations P4 and P5

Message Waiting lamp	Pin location
Enabled	Jumper in E1
Disabled	Jumper in E2

Note: There must be one jumper installed.

NT6D43 jumper location J5

Ringing output	Jumper location J5 (motherboard)
Low impedance (normal)	Connect pins 1 and 2
High impedance (Australia)	Connect pins 2 and 3

38 Option settings

NT6D43 SW1

Ringing frequency (Hz)	SW1		
	1	2	3
20	on	off	off
25	off	on	off
50	off	off	on

NT6D43 SW2

Ringing voltage	Message waiting voltage	SW2			
		1	2	3	4
86 V ac	-120 V dc	off	off	off	off
86 V ac	-150 V dc	on	off	off	off
80 V ac	-120 V dc	off	off	off	on
80 V ac	-150 V dc	on	off	off	on
75 V ac	-120 V dc	off	off	on	off
75 V ac	-150 V dc	on	off	on	off
70 V ac	-120 V dc	off	on	off	off
70 V ac	-150 V dc	on	on	off	off

NT9D1 102 Core/Network Module Backplane

Jumper	Location (between slots)	Core/Network 1	Core/Network 0
JB1	14/15	Jumper plug not installed	Plug installed

Note: Berg jumper is located at the bottom of the primary side of the backplane (this is inside the card cage assembly).

NT6D68 Core Module Backplane

Jumper	Location (between slots)	Core 1	Core 0
JB4	9 / 10	Jumper plug not installed	Plug installed
JB3	10 / 11	Plug installed	Plug installed
JB2	11 / 12	Plug installed	Plug installed
JB1	12 / 13	Plug installed	Plug installed

Note: Berg jumpers are located along the bottom of the primary side of the backplane (this is inside the card cage assembly).

NT6D6003 Core Bus Terminator Card

Jumper	Location	Core 1	Core 0
J5	A21	Jumper plug not installed	Jumper plug not installed
J4	A25	Jumper plug not installed	Jumper plug not installed
J3	A28	Jumper plug not installed	Jumper plug not installed
J2	A30	Jumper plug not installed	Jumper plug not installed
J1	A35	Jumper plug not installed	Jumper plug not installed

Note 1: All jumpers are preset to open (the two pins are not connected together by a jumper plug) and must be left open. There may, however, be a jumper plug over one pin. The plugs are provided as extras that may be required on some other card or for future requirements.

Note 2: Jumper J5 may not be present.

Note 3: There are four LEDs on the component side (not on the faceplate) of the card. In Core 0, all of the LEDs should be off. In Core 1, the top LED should be lit and the other three should be off. The pattern of the LEDs matches the jumper settings on the Core Module backplane.

NT6D80 Multi-purpose Serial Data Link Card

RS-232-D DTE or DCE* RS-422-A DTE (terminal) RS-422-A DCE (modem)	Port O-SW4 all off all off all on	Port O-SW8 all off all on all off
RS-232-D DTE or DCE* RS-422-A DTE RS-422-A DCE	Port I-SW3 all off all off all on	Port I-SW7 all off all on all off
RS-232-D DTE or DCE* RS-422-A DTE RS-422-A DCE	Port 2—SW2 all off all off all on	Port 2-SW6 all off all on all off
RS-232-D DTE or DCE* RS-422-A DTE RS-422-A DCE	Port 3—SW1 all off all off all on	Port 3—SW5 all off all on all off
<p>* W-232-D DTE and DCE modes are software configured. RS-422-A DTE and DEC modes are switch configured.</p> <p>Note: The device number for the MSDL card is configured in LD17 at the prompt DNUM. You must also set the device number, using switches S9 and S10, on the MSDL card. S9 designates ones and S10 designates tens. To set the device number as 14, for example, set S9 to 1 and S10 to 4.</p>		

NT7D03 Ringing Generator DC

Frequency HZ	Volts RMS	Switch S300			
		1	2	3	4
20	86	off	off	off	off
20	80	off	off	off	on
25	86	on	off	off	off
25	80	on	off	off	on
25	70	off	on	off	off
50	86	off	on	off	on
50	80	off	off	on	off
50	70	off	off	on	on

NT7D04 CE/PE Power Supply DC

Frequency Hz	Volts RMS	Switch S300			
		1	2	3	4
20	86	off	off	off	*
20	80	on	off	off	*
25	86	off	on	off	*
25	80	on	on	off	*
25	70	off	off	on	*
50	86	on	off	on	*
50	80	off	on	on	*
50	70	on	on	on	*

* Not applicable, can be ON or OFF.

42 Option settings

NT8D14 Universal Trunk Card

The next five tables list option settings for the NT8D14 Universal Trunk Card.

NT8D14 vintage AA jumper strap settings

Modes	Location	Jumper strap
Central Office (CO)	J1, J2	Off
2-way tie trunk (loop dial repeat)	J1, J2	Off
2-way tie trunk (outgoing/incoming dial)	J1, J2	Off
Recorded announcement (RAN)	J1, J2	Off
Paging trunk	J1, J2	off
Japan CO/DID operation	J1, J2	Off
DID operation: loop length $\geq 2000 \Omega$	J1, J2	On
DID operation: loop length $< 2000 \Omega$	J1, J2	Off

Note 1: off = no strap present.
Note 2: Locations (J1, J2) apply to all eight units.

NT8D14 vintage BA jumper strap settings-factory standard

Trunk types	Loop length	Jumper strap settings			
		J1.X	J2.X	J3.X	J4.X
CO/FX/WATS	Zero-1524 m (5000 ft)	Off	Off	1-2	1-2
2-way tie (LDR)					
2-way tie (OAID)					
DID	Zero-600 ohms				
RAN: continuous operation mode					
Paging					

Note: Jumper strap settings J1.X, J2.X, J3.X, and J4.X apply to all eight units; "X" indicates the unit number, 0-7. "Off" indicates that no jumper strap is installed on a jumper block. Store unused straps on the universal trunk card by installing them on a single jumper pin as shown below,

553-5924

NT8D14 vintage BA jumper strap settings-extended range

Trunk types	Loop length	Jumper strap settings			
		J1.X	J2.X	J3.X	J4.X
CO/FX/WATS	> 1524 m (5000 ft)	Off	Off	1-2	2-3
2-way tie (LDR)					
2-way tie (OAID)					
DID	> 600 ohms				
RAN: pulse start or level start modes					

Note: Jumper strap settings J1.X, J2.X, J3.X, and J4.X apply to all eight units; "X" indicates the unit number, 0-7. "Off" indicates that no jumper strap is installed on a jumper block.

NT8D14 vintage BA trunk types-termination impedance and balance network

Trunk types	Terminating impedance (Note 1)	Balance network for loop lengths (Note 2)		
		Zero–915 m (zero–3000 ft)	915–1524 m (3000–5000 ft)	> 1524 m (> 5000 ft)
CO/FX/WATS	600 ohms	600 ohms	3COM1	3COM2
2-way tie (LDR)	600 ohms	600 ohms	3COM1	3COM2
2-way tie (OAID)	600 ohms	600 ohms	3COM1	3COM2
DID (loop < 600 ohms)	600 ohms	600 ohms	3COM1	3COM2
DID (loop ≥ 600 ohms)	600 ohms	600 ohms	N/A	3COM2
RAN: continuous operation mode	600 or 900 ohms	600 or 900 ohms	N/A	N/A
Paging	600 ohms	600 ohms	N/A	N/A

Note 1: The terminating impedance of each trunk unit is software selectable in LD14 and should match the nominal impedance of the connecting equipment.

Note 2: The balance network of each trunk unit is software selectable between resistive 600 or 900 ohms or 3COM and jumper selectable between 3COM1 and 3COM2.

NT8D14 vintage BA cable loop resistance and loss

Cable length	Cable loop resistance (ohms)			Cable loop loss (dB) (non-loaded at 1kHz)		
	22 AWG	24 AWG	26 AWG	22 AWG	24 AWG	26 AWG
915 m (3000 ft)	97	155	251	0.9	1.2	1.5
1524 m (5000 ft)	162	260	417	1.6	2.0	2.5
2225 m (7300 ft)	236	378	609	2.3	3.0	3.7
3566 m (11700 ft)	379	607	977	3.7	4.8	6.0
5639 m (18500 ft)	600	960	1544	5.9	7.6	9.4

NT8D15 E&M Trunk Card

Jumper (Note 1)	Mode of operation (Note 2)					
	P-wire trunk		4-wire trunk			
	Type I	Paging	Type I	Type II	DX tip & ring pair	
					M - rcv M-xmt	E - rcv M-xmt
J1.X	off	off	off	off	Pins 1-2	Pins 2-3
J2.X	on	on (Note 3)	on	on	off	off
J3.X	off	off	off	off	(Note 4)	(Note 4)
J4.X	off	off	off	off	Pins 2-3	Pins 1-2
J5.X	off	off	off	off	(Note 4)	(Note 4)
J6.X	off	off	off	off	on	on
J7.X	off	off	off	off	on	on
J8.X	off	off	off	off	on	on
J9.X	Pins 2-3	Pins 2-3	Pins 2-3	Pins 2-3	Pins 1-2	Pins 1-2

Note 1: Jumper strap settings J1.X through J9.X apply to all 4 units; "X" indicates the unit number, 0-3.
Note 2: Off indicates that no jumper strap is installed on a jumper block.
Note 3: Paging trunk mode is not zone selectable.
Note 4: Jumper strap installed in this location only if external loop resistance exceeds 2500 ohms
Note 5: Dot next to the jumper block indicates pin 1.

46 Option settings

NT8D17 Conference/TDS Card

Switch and jumper settings are used to select the **companding** law and change the conference attenuation PAD levels. These PAD levels are used if prompt CPAD = 1 in LD97. The **J1** connector on the faceplate is reserved for future use.

You can enable or disable a warning tone for conference calls. When the option is enabled, the tone lets callers know they are entering a conference call. The switch for this option is preset to disable the warning tone.

Companding law	Jumper at J3								
μ -law (North America)	connect pins 2 and 3								
A-law	connect pins 1 and 2								
Attenuation levels	SW2 (see Note)								
	1	2	3						
12.2 db	on	on	on						
10.4 db	on	on	Off						
8.2 db	off	on	on						
7.2 db	off	on	off						
5.4 db	on	Off	on						
4.0 db	on	Off	Off						
1.2 db	Off	Off	on						
0 db	Off	off	Off						
<p>Note: Set position 4 to ON to disable the warning tone option. When the warning tone is enabled, select the warning tone level as shown below.</p> <table border="0"> <thead> <tr> <th>Level</th> <th>Jumper at J2</th> </tr> </thead> <tbody> <tr> <td>24 db</td> <td>connect pins 1 and 2</td> </tr> <tr> <td>30 db</td> <td>connect pins 2 and 3</td> </tr> </tbody> </table>				Level	Jumper at J2	24 db	connect pins 1 and 2	30 db	connect pins 2 and 3
Level	Jumper at J2								
24 db	connect pins 1 and 2								
30 db	connect pins 2 and 3								

NT8D21 Ringing Generator AC

Frequency	Amplitude	Settings		
		P1	P2	P3
20 Hz	86 V ac	open	open	2-5 8-11
25 Hz	70 V ac	open	1-4 7-10	open
25 Hz	80 V ac	open	3-6 9-12	open
25 Hz	86 V ac	open	2-5 8-11	open
50 Hz	70 V ac	1-4 7-10	open	open
50 Hz	80 V ac	3-6 9-12	open	open

NT8D22 SW2

SW2 indication	Position							
	1	2	3	4	5	6	7	8
Master system monitor Slave system monitor	on off							
Operation with ST, STE, or RT All other operation		on off						
For master, indicates total number of slaves			Set 3-8 according to the table titled "NT8D22 settings for total number of slaves-SW2 on master."					
For each slave, indicates the slave address			Set 3-8 according to the table titled "NT8D22 slave address-SW2 on slave."					

NT8D22 SW3

SW3 indication		Position			
		1	2	3	4
CTA	master slave	on off			
CTR	master slave		on off		
FAIL	master slave			on off	
MAJOR	master slave				on off

50 Option settings

NT8D22 settings for total number of slaves-SW2 on master

How many slave units	Switch position						How many slave units	Switch position					
	3	4	5	6	7	8		3	4	5	6	7	8
0	on	on	on	on	on	on	32	off	on	on	on	on	on
1	on	on	on	on	on	off	33	off	on	on	on	on	off
2	on	on	on	on	off	on	34	off	on	on	on	off	on
3	on	on	on	on	off	off	35	off	on	on	on	off	off
4	on	on	on	off	on	on	36	off	on	on	off	on	on
5	on	on	on	off	on	off	37	off	on	on	off	on	off
6	on	on	on	off	off	on	38	off	on	on	off	off	on
7	on	on	on	off	off	off	39	off	on	on	off	off	off
8	on	on	off	on	on	on	40	off	on	off	on	on	on
9	on	on	off	on	on	off	41	off	on	off	on	on	off
10	on	on	off	on	off	on	42	off	on	off	on	off	on
11	on	on	off	on	off	off	43	off	on	off	on	off	off
12	on	on	off	off	on	on	44	off	on	off	off	on	on
13	on	on	off	off	on	off	45	off	on	off	off	on	off
14	on	on	off	off	off	on	46	off	on	off	off	off	on
15	on	on	off	off	off	off	47	off	on	off	off	off	off
16	on	off	on	on	on	on	48	off	off	on	on	on	on
17	on	off	on	on	on	off	49	off	off	on	on	on	off
18	on	off	on	on	off	on	50	off	off	on	on	off	on
19	on	off	on	on	off	off	51	off	off	on	on	off	off
20	on	off	on	off	on	on	52	off	off	on	off	on	on
21	on	off	on	off	on	off	53	off	off	on	off	on	off
22	on	off	on	off	off	on	54	off	off	on	off	off	on
23	on	off	on	off	off	off	55	off	off	on	off	off	off
24	on	off	off	on	on	on	56	off	off	off	on	on	on
25	on	off	off	on	on	off	57	off	off	off	on	on	off
26	on	off	off	on	off	on	58	off	off	off	on	off	on
27	on	off	off	on	off	off	59	off	off	off	on	off	off
28	on	off	off	off	on	on	60	off	off	off	off	on	on
29	on	off	off	off	on	off	61	off	off	off	off	on	off
30	on	off	off	off	off	on	62	off	off	off	off	off	on
31	on	off	off	off	off	off	63	off	off	off	off	off	off

Option settings 51

NT8D22 slave address-SW2 on slave

Slave unit address	Position						Slave unit address	Position					
	3	4	5	6	7	8		3	4	5	6	7	8
1	on	on	on	on	on	off	33	off	on	on	on	on	off
2	on	on	on	on	off	on	34	off	on	on	on	off	on
3	on	on	on	on	on	off	35	off	on	on	on	off	off
4	on	on	on	off	on	on	36	off	on	on	off	on	on
5	on	on	on	off	on	off	37	off	on	on	off	on	off
6	on	on	on	off	off	on	38	off	on	on	off	off	on
7	on	on	on	off	off	off	39	off	on	on	off	on	off
8	on	on	off	on	on	on	40	off	on	off	on	on	on
9	on	on	off	on	on	off	41	off	on	off	on	on	off
10	on	on	off	on	off	on	42	off	on	off	on	off	on
11	on	on	off	on	off	off	43	off	on	off	on	off	off
12	on	on	off	off	on	on	44	off	on	off	off	on	on
13	on	on	off	off	on	off	45	off	on	off	off	on	off
14	on	on	off	off	off	on	46	off	on	off	off	off	on
15	on	on	off	off	off	off	47	off	on	off	off	off	off
16	on	off	on	on	on	on	48	off	off	on	on	on	on
17	on	off	on	on	on	off	49	off	off	on	on	on	off
18	on	off	on	on	off	on	50	off	off	on	on	off	on
19	on	off	on	on	off	off	51	off	off	on	on	off	off
20	on	off	on	off	on	on	52	off	off	on	off	on	on
21	on	off	on	off	on	off	53	off	off	on	off	on	off
22	on	off	on	off	off	on	54	off	off	on	off	off	on
23	on	off	on	off	off	off	55	off	off	on	off	off	off
24	on	off	off	on	on	on	56	off	off	off	on	on	on
25	on	off	on	on	on	off	57	off	off	off	on	on	off
26	on	off	off	on	off	on	58	off	off	off	on	off	on
27	on	off	off	on	off	off	59	off	off	off	on	off	off
28	on	off	off	off	on	on	60	off	off	off	off	on	on
29	on	off	off	off	on	off	61	off	off	off	off	on	off
30	on	off	off	off	off	on	62	off	off	off	off	off	on
31	on	off	off	off	off	off	63	off	off	off	off	off	off
32	off	on	on	on	on	on							

52 Option settings

NT8D41 Dual Port Serial Data Interface Paddle Board

The next three tables list option settings for the NT8D41 SDI Paddle Board.

NT8D41 port addresses

Device number		SW4			
Port 1	Port 2	1	2	3	4
0	1	On	On	On	On
2	3	Off	On	On	Off
4	5	Off	On	Off	On
6	7	Off	On	Off	Off
8	9	Off	Off	On	On
10	11	Off	Off	On	Off
12	13	Off	Off	Off	On
14	15	Off	Off	Off	Off

NT8D41 baud rate

Baud rate	Port 1-SW2				Port 2-SW3			
	1	2	3	4	1	2	3	4
150	Off	Off	On	On	Off	Off	On	On
300	Off	On	Off	On	Off	On	Off	On
600	Off	Off	Off	On	Off	Off	Off	On
1200	Off	On	On	Off	Off	On	On	Off
2400	Off	Off	On	Off	Off	On	On	Off
4800	Off	On	Off	Off	Off	On	Off	Off
9600	Off	On	Off	Off	Off	Off	Off	Off

NT8D41 DTE or DCE selection

Mode	Port 1—SW5						Port 1—SW6					
	1	2	3	4	5	6	1	2	3	4	5	6
DTE (terminal)	on	on	on	on	(on	(on	(off	(off	off	off	off	off
DCE (modem)	off	off	off	off	off	off	on	off	on	on	on	on
	Port 2—SW7						Port 2—SW8					
DTE	on	on	on	on	on	on	off	off	off	off	off	off
DCE	off	off	off	off	off	off	on	Off	on	on	on	on

NTND02 Misc/SDI/Peripheral Signaling Card

The next four tables list option settings for the NTND02 MSPS Card.

NTND02 port addresses

Device Number		Even port SW8				Odd port SW9					
		1	2	3	4	1	2	3	4	5	8
0	1	*	off	off	off	off	off	off	on	on	on
2	3	*	off	off	off	off	off	off	on	on	off
4	5	*	off	off	off	off	off	off	on	off	on
6	7	*	off	off	off	off	off	off	on	off	off
8	9	*	off	off	off	off	off	off	off	on	on
10	11	*	off	off	off	off	off	off	off	on	off
12	13	*	off	off	off	off	off	off	off	off	on
14	15	*	off	off	off	off	off	off	off	off	off

* Switch does not affect operation; it may be set to ON or OFF.

54 Option settings

NTND02 baud rates-switch settings

Baud rate	Even port-SW10				Odd port-SW11			
	1	2	3	4	1	2	3	4
150	*	off	on	on	*	off	on	on
300	*	on	off	on	*	on	off	on
600	*	off	off	on	*	off	off	on
1200	*	on	on	off	*	on	on	off
2400	*	off	on	off	*	off	on	off
4800	*	on	off	off	*	on	off	off
9600	*	off	off	off	*	off	off	off

* Switch does not affect operation; it may be set to ON or OFF.

NTND02 DTE or DCE selection

Mode	Even port-SW4						Even port-SW5					
	1	2	3	4	5	6	1	2	3	4	5	6
DTE (terminal)	off	off	off	off	off	off	on	on	on	on	on	on
DCE (modem)	on	on	on	on	on	on	off	off	off	off	off	off

	Odd port-SW2						Odd port-SW3					
	1	2	3	4	5	6	1	2	3	4	5	6
DTE	off	off	off	off	off	off	on	on	on	on	on	on
DCE	on	on	on	on	on	on	off	off	off	off	off	off



NTND02 data format selection

Format	Even port-SW6				Odd port-SW7			
	1	2	3	4	1	2	3	4
7 bits/character		off	on			off	on	
8 bits/character		off	off			off	off	
Odd parity	on			on	on			on
Even parity	on			off	on			off
No parity	off			*	off			*

1 Switch does not affect operation; it may be set to ON or OFF.

NTND1 0 Changeover and Memory Arbitrator Card

Options	Jumper at J3
1 Mbyte to 4 Mbyte memory	connect pins 1 and 2
768 K memory	connect pins 2 and 3

QMT8 Add-on Data Module

The next five tables list options settings for the QMT8 ADM.

QMT8 jumper plugs

Mode	Pin location
ADM connected to DTE (terminal)	Jumpers in U6 and U7
ADM connected to DCE (modem)	Jumpers in U4 and U5

QMT8 SW1 (slide switch)

SW1 function	SW1 settings
Set the voice frequency DN (VFDN) for modem pooling only*	Set the required 3- or 4-digit VFDN (example: 2406)

ADM is not connected to any modem | Set the switch to 0000

* The VFDN cannot be set unless jumpers U4 and U6 are plugged. The VFDN must be left-justified on the switch (example: if you select 234 as the VFDN, the switch must be set to 2340).

QMT8 SW2 (rotary dial)

Transmission mode	Transmission speed
Asynchronous	50 to 19200
Synchronous	1.2 K to 56 K

QMT8 SW3 (DIP switch)

Transmission mode	Switch settings
Asynchronous	1-inhibit or enable parity 2-even or odd parity 3-HDX or FDX 4—7- or 8-bit code (Note 1) 5-1 or 2 stop bits (Note 2) 6—echo or no echo 7-manual or auto-answer 8-OFF for normal operation, or LOOPBACK test mode (Note 3)
Synchronous	1-not used 2—not used 3—HDX or FDX 4-modem or network (clock) 5—external or internal clock (Note 4) 6—echo or no echo 7-manual or auto-answer 8-OFF for normal operation, or LOOPBACK test mode (Note 3)
<p>Note 1: This setting is overridden when switch SW4 positions 5 and 6 are ON. Use 8 bits/character and no parity for all ASCII terminals.</p> <p>Note 2: This setting is overridden when switch SW4 position 1 is ON.</p> <p>Note 3: See Meridian Data Services operation and tests (553-2731-300) for information on the use of the LOOPBACK setting.</p> <p>Note 4: If the synchronous ADM (SADM) is connected to a synchronous terminal (DTE):</p> <ul style="list-style-type: none"> — internal clock indicates that the SADM transmits clock to the DTE — external clock indicates that the SADM receives clock from the DTE <p>If the synchronous ADM (SADM) is connected to a synchronous modem (DCE):</p> <ul style="list-style-type: none"> — internal clock indicates that the SADM receives clock from the DCE — external clock indicates that the SADM transmits clock to the DCE 	

58 Option settings

QMT8 SW4 (DIP switch)

Configuration option	Switch settings			
	1	2	3	4
Normal 7- or 8-bit operation or keyboard dialing	Off	Off		
Five-bit code (Note 1)	Off	on		
Six-bit code (Note 1)	on	Off		
Data hotline	on	on		
Digitone receiver required (Note 2)			off (Note 3)	
Digitone receiver not required (Note 2)			on (Note 3)	
Synchronous (Note 4)				on
Asynchronous (Note 4)				off

Note 1: 1.5 stop bits are not supported. These switch positions are not used for synchronous operation.

Note 2: — If positions 1-3 and the terminal are ON, a carriage return invokes the auto dial operation.
 — If positions 1 and 2 are ON with position 3 and the terminal OFF, turning the terminal on invokes hotline.
 — If positions 1 and 2 are OFF and position 3 is ON or OFF, a carriage return invokes keyboard dialing. There is no auto-dialing with this mode.
 — If position 3 is OFF, a call is terminated if DTR is dropped.

Note 3: Position 3 permits compatibility with a wide range of modems. Position 3 is OFF if the modem is controlled by level type M/MIC leads. Position 3 is ON if the modem is controlled by pulse type leads.

Note 4: Both ASCII and EBCDIC codes are supported in the asynchronous mode. The synchronous mode operation is code independent. Use the reset button when an installed ADM is switched from asynchronous to synchronous mode.

QMT1 1 Asynchronous/Synchronous Interface Module

Hot line	on*
Forced DTR (data terminal ready)	on*
FDX (full duplex)	on
SYNC	on
INTernal CLK	on
Modem/Network	modem
Auto Answer	on
Loopback	Off

* Only one side of the interface should be set to originate the hot line.
 ** Forced DTR automatically reinitiates a dropped hot line call.

QPA62 Call Detail Recording 32 K RAM Card

Card vintage	Switch location	Switch settings							
		1	2	3	4	5	6	7	8
C, E, and G	E1	off	off	on	off	off	off	off	off
	G5	off	off	on	off	off	off	off	off
	F18	off	off	on	off	on	off	on	off
D	F5	off	off	on	off	off	off	off	off
	G5	off	off	off	off	off	off	off	off
F and H	F5	off	off	off	off	off	off	off	off
	G5	off	off	off	on	off	off	off	off

QPC30 4 K RAM Card

Device number	E5 switch						Device number	E5 switch					
	2	3	4	5	6	7		2	3	4	5	6	7
0	off	off	off	off	off	off	24	off	off	off	on	on	off
1	on	off	off	off	off	off	25	on	off	off	on	on	off
2	off	on	off	off	off	off	26	off	on	off	on	on	off
3	on	on	off	off	off	off	27	on	on	off	on	on	off
4	off	off	on	off	off	off	28	off	off	on	on	on	off
5	on	off	on	off	off	off	29	on	off	on	on	on	off
6	off	on	on	off	off	off	30	off	on	on	on	on	off
7	on	on	on	off	off	off	31	on	on	on	on	on	off
8	off	off	off	on	off	off	32	off	off	off	off	off	on
9	on	off	off	on	off	off	33	on	off	off	off	off	on
10	off	on	off	on	off	off	34	off	on	off	off	off	on
11	on	on	off	on	off	off	35	on	on	off	off	off	on
12	off	off	on	on	off	off	36	off	off	on	off	off	on
13	on	off	on	on	off	off	37	on	off	on	off	off	on
14	off	on	on	on	off	off	38	off	on	on	off	off	on
15	on	on	on	on	off	off	39	on	on	on	off	off	on
16	off	off	off	off	on	off	40	off	off	off	on	off	on
17	on	off	off	off	on	of-i	41	on	off	off	on	off	on
18	off	on	off	off	on	off	42	off	on	off	on	off	on
19	on	on	off	off	on	off	43	on	on	off	on	off	on
20	off	off	on	off	on	off	44	off	off	on	on	off	on
21	on	off	on	off	on	off	45	on	off	on	on	off	on
22	off	on	on	off	on	off	46	off	on	on	on	off	on
23	on	on	on	off	on	off	47	on	on	on	on	off	on

Note: Switch 1 is set to OFF for normal operation and set to ON for card debugging. Switch 8 is set to ON only when the card is used as the spare.

QPC31 8 K RAM Card

Device number	E5 switch						Device number	E5 switch					
	2	3	4	5	6	7		2	3	4	5	6	7
0	off	off	off	off	off	off	12	off	off	off	on	on	off
1	off	on	off	off	off	off	13	off	on	off	on	on	off
2	off	off	on	off	off	off	14	off	off	on	on	on	off
3	off	on	on	off	off	off	15	off	on	on	on	on	off
4	off	oil	off	on	off	off	16	off	off	off	off	off	on
5	off	on	off	on	off	off	17	off	on	off	off	off	on
6	off	off	on	on	off	off	18	off	off	on	off	off	on
7	off	on	on	on	off	off	19	off	on	on	off	off	on
8	off	off	oil	off	on	off	20	off	off	off	on	off	on
9	off	on	off	off	on	off	21	off	on	off	on	off	on
10	off	off	on	off	on	off	22	off	off	on	on	off	on
11	off	on	on	off	on	off	23	off	on	on	on	off	on

Note: Switch 1 is set to OFF for normal operation and set to ON for card debugging. Switch 8 is set to ON only when the card is used as the spare.

QPC33 Tape interface Card

Tape unit	E8 switch (address selection)		
0	Off	on	on
1	on	Off	on
2	on	on	Off
3	Off	Off	Off

Note 1: Main system tape units are assigned as tape unit 0. In dual CPU systems, both QPC33 cards are assigned as tape unit 0.

Note 2: Use tape unit 1 for Mini-Call Detail Recording (CDR) feature.

QPC41 Miscellaneous Card

System type	B5 switch (memory configuration)			
	1	2	3	4
S, MS	on	off	Off	on
A with split mode	Off	Off	on	Off
All other systems	off	Off	Off	on

QPC43 Peripheral Signaling Card

Options (minimum vintage N)	Plug location
QSD39, QSD40, QSP31, QSP32 network shelves NT6D39 CPU/Network Module NT8D35 Network Module	F13
Other network shelves	F9

QPC45 Serial Data Interface Card

Address selection			Speed selection			Output device plug location			
Device number	C15 switch			Baud rate	B15 switch				
	4	5	6		1			2	3
0	on	on	on	110	on	off	off	TTY	A15
1	off	on	on	300	off	off	off	Modem	B5
2	on	off	on	1200	off	off	on		
3	off	off	on	2400	off	on	off	RS-232 data terminal	B10
4	on	on	off	4800	off	on	on		
5	off	on	off						
6	on	off	off						
7	off	off	off						

QPC46, QPC155 Common Equipment Bus Extender Cards

Application	QPC46 A35 switch						QPC155 A35 switch					
	1	2	3	4	5	6	1	2	3	4	5	6
CPU located at extension end of bus	off	off	off	off	off	off	off		off	off	off	off
CPU not located at extension end of bus	off	off	off	off	off	on	on		off	off	off	off
Basic system (QPC155)		on										
Expanded system (QPC155)		off										

QPC62 1.5 Mbyte Baud Converter Card

Carrier A & B options* distance to office repeater bay (ORB)		Switch settings* SW1 and SW2								SW3
(Feet)	(Meters)	1	2	3	4	5	6	7	8	
0-1 50***	0-45	off	off	on	on	off	on	on	off	6 V
151-450	46-1 47	off	on	on	off	on	on	off	on	1 2 v
451-750	148-229	on	off	off	on	on	off	on	on	1 2 v

* If both cards provided are minimum vintage E, insert the plug-in jumper (U-link) between header pins 1 and 2 (located at B25). If any card provided is vintage D, or an earlier vintage, insert the plug-in jumper (U-link) between header pins 2 and 3. On systems equipped with dual network cards, minimum vintage E must be used.

** Switch 1 (SW1) is set for carrier A, switch 2 (SW2) is set for carrier B. SW3 refers to the faceplate toggle switch.

*** Set to the 0-150 ft range when interfacing directly with the carrier (without going through an ORB).

QPC66 2 Mbyte Baud Converter Card

With vintage C, insert the plug-in jumper (U-link) between header pins 2 and 3. On systems with dual network cards, you must use minimum vintage D; insert the plug-in jumper (U-link) between header pins 1 and 2 (located at B35).

QPC70, QPC217, QPC293 CO/FX/WATS Trunk Cards

Application	Unit 0 E35 switch						Unit 1 E5 switch					
	1	2	3	4	5	6	12	3	4	5	6	
Loop start, 24 V CO battery	off	on	on	on	off	on	off	on	on	on	on	off
Loop start, 48 V CO battery	off	off	on	off	off	on	off	on	off	off	on	off
Ground start, 24 V CO battery	on	on	off	on	off	off	on	off	on	on	off	off
Ground start, 48 V CO battery	on	off	off	off	off	off	on	off	off	off	off	off

QPC71 E&M Trunk Cards

Application	Unit 0 E35 switch								Unit 1 E5 switch							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
E&M	off	off	off	on	off	off	on	off	off	off	off	on	off	off	on	off
Paging	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off
DX 2-wire (conductor loop < 2.5 K Ω)	on	on	off	off	off	on	off	on	on	on	off	off	off	on	off	on
DX 2-wire (conductor loop > 2.5 K Ω)	on	on	on	on	off	on	off	on	on	on	on	on	off	on	off	on
DX 4-wire (conductor loop < 2.5 K Ω)	off	off	off	off	on	on	off	on	off	off	off	off	on	on	off	on
DX 4-wire (conductor loop > 2.5 K Ω)	off	off	on	on	on	on	off	on	off	off	on	on	on	on	off	on

Note: DX trunks must be balanced correctly. If the loop is <2.5 K Ω, far-end balancing is standard. If the loop is >2.5 K Ω, far end balancing requires standard plus 2.5 K Ω. To connect PBX to PBX, switches should be arranged for loops to be >2.5 K Ω at one end and <2.5 K Ω at the other. Apply similar treatment when connecting to Pulse QPJ69 trunks.

QPC72, QPC288, QPC449, QPC559, QPC560 Loop Signaling Trunk Cards

The next two tables list option settings for loop signaling trunk cards,

QPC72, QPC288, QPC449, QPC559, QPC560 single density

Application	Single density-Unit O/I F30/F8* switch					
	1	2	3	4	5	6
Outgoing ANI only:						
loop pulsing	Off	Off	Off	Off	Off	Off
battery and ground pulsing	Off	Off	Off	Off	On	Off
Other than outgoing ANI	On	Off	On	Off	On	off
	Jumpers (QPC560) Units 0/1/2/3					
600 Ω resistive impedance	connect pins 1 and 2					
3-component complex impedance	connect pins 2 and 3					
* On QPC7 vintage 2M (CSA SDT C22.2), the switch location is E27/E11.						

68 Option settings

QPC72, QPC288, QPC449, **QPC559**, QPC560 double density

Application	Double density-Unit 0/1/2/3 H17/H3/A17/A3 switch					
	1	2	3	4	5	6
Outgoing ANI only:						
loop pulsing	off	off	off	off	off	off
battery and ground pulsing	off	off	off	off	on	off
Other than outgoing ANI	on	off	on	off	on	off
	Jumpers (QPC560) Units 0/1/2/3					
600 Ω resistive impedance	connect pins 1 and 2					
3-component complex impedance	connect pins 2 and 3					

QPC73, QPC289 Recorded Telephone Dictation Cards

Application	Unit 0 D35 switch				Unit 1 D5 switch			
	1	2	3	4	1	2	3	4
External resistance < 430 Ω	off	off	off	off	on	off	off	off
External resistance > 430 Ω	off	off	off	off	on	off	off	off

QPC74, QPC290 Recorded Announcement Trunk Cards

Application	Unit O-C35 switch				Unit I-F35 switch			
	1	2	3	4	1	2	3	4
Audichron	off	off	on	off	off	off	on	off
Code-A-Phone	off	on	off	off	off	on	off	off
Cook Digital Announcer (continuous run)	off	off	off	on	off	off	off	on
Cook Digital Announcer (start/stop)	off	off	on	off	off	off	on	off
Test or music (600 Ω source Z)	on	off	off	on	on	off	off	on
	Unit 2—C5 switch				Unit 3—F5 switch			
Audichron	off	off	on	off	off	off	on	off
Code-A-Phone	off	on	off	off	off	on	off	off
Cook Digital Announcer (continuous run)	off	off	off	on	off	off	on	off
Cook Digital Announcer (start/stop)	off	off	on	off	off	off	on	off
Test or music (600 Ω source Z)	on	off	off	on	on	off	off	on

QPC84 Power Monitor

The next four tables list option settings for the QPC84 Power Monitor.

QPC84 vintage R and S-switch A4

Options	A4 switch							
	1	2	3	4	5	6	7	8
Option A*	on	off	on					
Option B*	off	on	off					
Monitor FAIL and CTR signal**								
— Defeat monitoring (XN/QCA108 cabinet)								on
— Allow monitoring (all other systems)								Off
<p>* Options A and Ei apply to vintage R only. Switch A4 is set based on the cabinet type and vintage suffix. See the following table for option selection.</p> <p>** For vintage S, A4 switch 8 must be ON when CTR signal monitoring is required.</p>								

QPC84 vintage R-options A and B

Cabinet type	Vintage	Option A	Option B
QCA6	all vintages		X
QCA7	all vintages		X
QCA8	all vintages		X
QCA23	all vintages		X
QCA28	all vintages		X
QCA37	all vintages		X
QCA58	vintages A thru E		X
QCA58*	vintage E1 only	X	
QCA58	vintage F1 and later		X
QCA60	all vintages		X
QCA74	vintages A thru E		X
QCA74*	vintage E1 only	X	
QCA74	vintage F1 and later		X
QCA96	all vintages		X
QCA108**	vintages A thru E		X
QCA108*/**	vintage E1 only	X	
QCA108**	vintage F1 and later		X
QCA109	vintage A and later		X

* If a vintage A QSP43 or QSP44 converter shelf is equipped, the switch must be set in Option B mode.
 ** CI1 switch 1 must be ON for QCA108 cabinets.

72 Option settings

QPC84 vintage A to L-switch A5 or D18 (Part 1 of 2)

Options	A5 or D18* switch							
	1	2	3	4	5	6	7	8
86 V ringing generator fails								
Allow alarm and line transfer	on	off						
Allow alarm but defeat transfer	off	off						
Defeat alarm and transfer	off	on						
48 V regulator fails								
Allow alarm and line transfer			Off				on	
Allow alarm but defeat transfer			Off				Off	
Defeat alarm and line transfer			on				Off	
With reserve battery								
Allow trip input				on				
<p>Switch locations depend on card vintages: for vintages A to K the switch is located at A5 for vintage L the switch is located at D18</p> <p>Note 1: Alarm refers to QPC84 LEDs, cabinet LEDs, remote alarm, and CE alarm (initiate internal diagnostics).</p> <p>Note 2: Power, fan, and temperature LEDs are not functional when QPC84 is located in a PE cabinet.</p>								

QPC84 vintage A to L-switch A5 or D18 (Part 2 of 2)

Options	A5 or D18* switch							
	1	2	3	4	5	6	7	8
Defeat trip input				off				
±10 V fails (CONV 1)								
Allow line transfer					on			
Defeat line transfer					Off			
±10 V fails (CONV 2)								
Allow line transfer						on		
Defeat line transfer						Off		
Reset button								
Allow reset function								on
Defeat reset function								Off
<p>* Switch locations depend on card vintages: for vintages A to K the switch is located at A5 for vintage L the switch is located at D18</p> <p>Note 1: Alarm refers to QPC84 LEDs, cabinet LEDs, remote alarm, and CE alarm (initiate internal diagnostics).</p> <p>Note 2: Power, fan, and temperature LEDs are not functional when QPC84 is located in a PE cabinet.</p>								

74 Option settings

QPC84 vintage P to S-switches D29 and C11 (Part 1 of 2)

Options	D29 switch								C11 switch						
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7
86 V ringing generator fails															
Allow alarm/line transfer	on	off													
Allow alarm, defeat transfer	off	off													
Defeat alarm/line transfer	off	on													
48 V regulator fails															
Allow alarm/line transfer			on					on							
Allow alarm, defeat transfer			on					off							
Defeat alarm/line transfer			off					off							
With reserve battery															
Allow trip input			on												
Defeat trip input			off												
±10 V fails (QSP43/44 shelf)															
Allow line transfer				on	on					on	on	off	off		
Defeat line transfer				off	off					off	off	off	off		
±10 V fails (CONV 1)															
Allow line transfer				on						off	off	on			
Defeat line transfer				off						off	off	off			
±10 V fails (CONV 2)															
Allow line transfer						on				off	off		on		
Defeat line transfer						off				off	off		off		
Reset button															
Allow reset								on							
Defeat reset								off							
<p>Note 1: Alarm refers to QPC84 LEDs, cabinet LEDs, remote alarm, and CE alarm (initiate internal diagnostics).</p> <p>Note 2: Power, fan, and temperature LEDs are not functional when QPC84 is located in a PE cabinet.</p> <p>Note 3: C11 switch 1 must be ON for QCA108 cabinets.</p>															

QPC84 vintage P to S-switches **D29** and **C11** (Part 2 of 2)

Options	D29 switch							C11 switch								
	1	2	3	4	5	6	7	6	1	2	3	4	5	6	7	
CE power failure (Note 3) Allow remote alarm and SYSLTOUT signal Defeat remote alarm and SYSLTOUT signal									on							
Monitor FAIL/CTR signal Defeat monitoring (QCA58, QCA108, QCA109 cabinets) Allow monitoring (all other cabinets)										on						
Monitor cooling unit failure Defeat monitoring (QCA58 or QCA108 cabinets or QCA109 cabinet with half-group configuration) Allow monitoring (all other configurations)															on	
Note 1: Alarm refers to QPC84 LEDs, cabinet LEDs, remote alarm, and CE alarm (initiate internal diagnostics). Note 2: Power, fan, and temperature LEDs are not functional when QPC84 is located in a PE cabinet. Note 3: C11 switch 1 must be ON for QCA108 cabinets.																

QPC99 Carrier Interface Card

The next two tables list option settings for the QPC99 Carrier Interface Card.

QPC99 A20 switch and F25 pad switch

Carrier location	Interface equipment	A20 switch						F25 pad switch					
		1	2	3	4	5	6	7	8	9	10	11	12
Local	ORB at local end (pads in)	off	off	off	on	off	on	on	on	on	on	off	off
	Direct to LD-1 or carrier (no ORB at local end) (pads out)	GTE	off	off	off	on	on	on	off	off	off	on	on
Remote	ORB at remote end (pads in)	on	off	on	off	off	on	on	on	on	on	off	off
	Direct to LD-1 or carrier (no ORB at remote end) (pads out)	GTE	on	off	on	off	on	on	off	off	off	on	on

Note: Consult manufacturer for switch settings if card interfaces with other type of carrier equipment.

QPC99 S2 switch

Carrier location	Interface equipment	SW2					
		1	2	3	4	5	6
Local	ORB at local end (pads in)	off	off	off	off	on	on
	Direct to LD-1 or GTE carrier (no ORB at local end) (pads out)	on	on	on	on	off	off
Remote	ORB at remote end (pads in)	off	off	off	off	on	on
	Direct to LD-1 or GTE carrier (no ORB at remote end) (pads out)	on	on	on	on	off	off

QPC139 Serial Data Interface Card

The next two tables list option settings for the QPC139 SDI Card.

QPC139 address and output device selection

Address selection					Output device		
Device number	F7 switch					Port 1 plug location	Port 2 plug location
	1	2	3	4			
0-1	Off	On	On	On	Modem	A13	A25
2-3	off	On	On	off	RS-232 data terminal	A16	A22
4-5	Off	On	off	On			
6-7	Off	On	Off	off			
8-9	Off	Off	On	On			
10-11	Off	Off	On	off			
12-13	Off	off	Off	On			
14-15	Off	off	Off	off			

Note: Switches at D22 and D31 are not used and set to OFF.

QPC139 baud rate selection

Baud rate	Port 1 C34 switch				Port 2 C22 switch			
	1	2	3	4	1	2	3	4
110	Off	On	On	On	Off	On	On	On
150	Off	Off	On	On	Off	Off	On	On
300	off	On	Off	On	off	On	Off	On
600	Off	off	Off	On	off	Off	Off	On
1200	Off	On	On	Off	off	On	On	off
2400	Off	off	On	off	off	Off	On	off
4800	Off	On	Off	Off	Off	On	Off	Off
9600	Off	Off	off	Off	Off	off	Off	off

Note: Switches at D22 and D31 are not used and set to OFF.

QPC1 73 Power Monitor

The next two tables list option settings for the QPC173 Power Monitor.

QPC173 vintages A to D

Options Vintages A to D	A31 switch							
	1	2	3	4	5	6	7	8
Option A*	on	off	on					
Option B*	off	on	off					
Allow reset button function (VL only)					on			
Defeat reset button function (VLE/XL/XN)					off			
Allow trip input**						on		
Defeat trip input						off		
Systems with one QCA25 (QCA14) cabinet or QCA55 cabinet equipped with one group							on	on
Systems with two QCA25 (QCA14) cabinets or QCA55 cabinet equipped with two or three groups							on	off

* Options A and B apply to vintage D only. Switch A31 is set based on the cabinet type and vintage suffix. See the following table for option selection.

** Switch 5—Applies to C and later vintages only.
 Switch 6—If trip input is required, must be ON to allow the -48 V cabinet input switches of QCA24 (QCA10), QCA25 (QCA14), QCA8, and QCA55 cabinets to trip when battery voltage is < 43.5 V. If trip input is not required, switch 6 should be OFF.
 Switch 7—Must be ON for temperature monitoring even in a system with two or three groups.
 Switch 8—Must be OFF for fan alarm monitoring in a system with more than one group.

QPC173 vintage D-options A and B

Cabinet type	Vintage	Option A	Option B
QCA10	all vintages		X
QCA24	all vintages		X
QCA55	vintages A thru E		X
QCA55*	vintage EI only		
QCA55	vintages F1 and later		X

* If a vintage A QBL21 distribution shelf is equipped, the switch must be set in the Option B mode.

QPC197 Tone Detector Switch Card

Options (minimum vintage C)	Jumper plug locations
SL-I telephone ringing: Audible ringing of 533/666 Hz modulated at: 10 Hz-connect pins 1 and 2 20 Hz-connect pins 2 and 3	B5 B5
Dial tone level: Low dial tone level, 23 dB below overflow level: connect pins 1 and 2 High dial tone level, 19 dB below overflow level: connect pins 2 and 3	B10 B10

80 Option settings

QPC214 Memory Controller Card

Memory option	QPC214A, B, or C A35 switch								QPC214D A35 switch			
	1	2	3	4	5	6	7	8	1	2	3	4
A standard	off	on	off	off	off	on	off	off	off	off	on	off
A split store	on	off	off	off	off	on	off	off	on	off	on	off
LE standard	off	off	off	off	off	off	off	off	off	off	off	off
LE split store	on	off	off	off	off	off	off	off	on	off	off	off
VLE, XL standard	off	off	off	off	off	off	off	off	off	off	off	off
M standard									on	on	off	off

Network group	D3 switch					
	1	2	3	4	5	6
0	on	off	on	on	on	on
1	on	off	on	on	on	off
2	on	off	on	on	off	on
3	on	off	on	on	off	off
4	on	off	on	off	on	on
To MGC	on	off	off	off	off	off

QPC216 3-Port Extender Card

Application	A20 switch			
	1	2	3	4
Half network group	on	off		
Full network group	off	off		
Page 3 address			on	
Page 7 address			off	
Multi-group systems				on
Single-group systems				off

QPC218, QPC272 CO/FX/WATS Trunk Cards

The next two tables option settings for the QPC128 and QPC272 trunk cards.

QPC218 (other than vintage F) and QPC272 switch settings

Application	Unit 0 E35 switch						Unit 1 E5 switch					
	1	2	3	4	5	6	1	2	3	4	5	6
Loop start	off	off	off	off	off	off	off	off	off	off	off	off
Loop start with automatic guard detection	off	off	on	off	off	off	off	off	on	off	off	off
Ground start	on	off	on	off	off	off	on	off	on	off	off	off

82 Option settings

QPC218 vintage F

Application	Unit 0 F27 switch								Unit 1 F9 switch							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Loop start	Off	on	Off	Off	Off	Off	Off	on	Off	on	off	off	off	Off	off	on
Loop start with automatic guard detection	Off	on	on	Off	Off	Off	Off	on	Off	on	off	off	off	Off	off	on
Ground start	Off	on	on	Off	Off	on	Off	on	Off	on	off	off	off	on	off	on

QPC219, QPC295 CO/FX/WATS Trunk Cards

Application	Unit 0 E35 switch								Unit 1 E5 switch																							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8																
Loop start:																																
Third wire battery on M lead	off	off	off	off	on	off			off	off	off	off	on	off																		
Third wire ground on M lead	off	off	off	off	off	on			off	off	off	off	off	on																		
Second pair (M & MM)	off	off	off	off	off	off			off	off	off	off	off	off																		
Automatic guard detection	off	off	on						off	off	on																					
Ground Start:																																
Third wire battery on lead	M on	off	on	off	on	off			on	off	on	off	on	off																		
Third wire ground on lead	M on	off	on	off	off	on			on	off	on	off	off	on																		
Second pair (M & MM)	on	off	on	off	off	off			on	off	on	off	off	off																		
900 Ω termination*							on	on							on	on																
600 Ω termination*							off	off							off	off																
<p>* Minimum vintage E. Vintage J has a third switch that must be set as follows:</p> <table style="margin-left: 40px;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td> </tr> <tr> <td>on</td><td>off</td><td>off</td><td>off</td><td>on</td><td>off</td><td>on</td><td>off</td> </tr> </table>																	1	2	3	4	5	6	7	8	on	off	off	off	on	off	on	off
1	2	3	4	5	6	7	8																									
on	off	off	off	on	off	on	off																									

QPC237A, QPC237B, QPC296A, QPC296B 4-Wire E&M/DX Signaling Trunk Cards

The next three tables show option settings for the trunk cards listed above.

QPC237 vintage A, QPC237 vintage B, QPC296 vintage A, QPC296 vintage B

Application	S1 (E34) S3 (E4)						S2 (F20) S4 (F7)					
	1	2	3	4	5	6	1	2	3	4	5	6
E&M Type I	off	off	on	on	off	off	on	off	on	on	off	on
E&M Type II	off	off	on	off	off	off	on	on	off	off	on	off
DX 4-wire lead A1 to T1, T1 to T2:												
conductor loop < 2.5 K Ω	off	on	off	on	on	off	off	off	off	on	off	off
conductor loop > 2.5 K Ω	on	on	off	on	on	off	on	off	off	on	off	off
DX 4-wire lead A1 to T2, B1 to T1:												
conductor loop < 2.5 K Ω	off	on	off	on	on	off	off	off	off	on	off	off
conductor loop > 2.5 K Ω	on	on	off	on	on	off	on	off	off	on	off	off
Unit 0: Unit 1:	S6 (D31) S5 (D3)											
Application	1	2	3	4	5	6						
E&M Type I	Off	Off	Off	Off								
E&M Type II	Off	Off	off	Off								
DX 4-wire lead A1 to T1, T1 to T2:												
conductor loop < 2.5 K Ω	Off	on	Off	on								
conductor loop > 2.5 K Ω	Off	on	Off	on								
DX 4-wire lead A1 to T2, B1 to T1:												
conductor loop < 2.5 K Ω	on	Off	on	Off								
conductor loop > 2.5 K Ω	on	Off	on	Off								
Interface:												
carrier interface							on					on
public network							Off					Off

QPC237 vintage C

Application	SI (D28) S3 (D10)						S2 (D31) S4 (D7)					
	1	2	3	4	5	6	1	2	3	4	5	6
E&M Type I	off	off	off	on	off	on	off	off	on	on	off	off
E&M Type II	off	off	off	off	off	on	off	on	off	off	on	off
British Telecom	off	off	off	off	on	on	off	off	on	off	off	off
DX 4-wire lead A1 to T1, B1 to T2		on	on	on	off	off	on	off	on	on	off	off
DX 4-wire lead A1 to T2, B1 to T1		on	on	on	off	off	on	off	on	on	off	off
conductor loop > 2.5 K Ω	on											
conductor loop < 2.5 K Ω	off											
Unit 0: Unit 1:	S6 (E26) S5 (E12)				S8 (F33) s7 (S4)							
Application	1	2	3	4	1	2	3	4				
E&M Type I	off	off	off	off								
E&M Type II	off	off	off	off								
British Telecom	off	off	off	off								
DX 4-wire lead A1 to T1, B1 to T2	off	on	off	on	on	on						
DX 4-wire lead A1 to T2, B1 to T1	on	off	on	off	on	on						
Interface:												
carrier interface					on		on					
public network						off		off				

86 Option settings

QPC237 vintage D, QPC237 vintage E, QPC296 vintage C

Unit 0: Unit 1:	S1 (D33) S2 (D5)											
Application	1	2	3	4	5	6	7	8	9	10		
E&M Type I	off	off	off	off	off	off	off	off	on	off		
E&M Type II	off	off	off	off	off	off	off	off	on	off		
British Telecom	off	off	off	off	off	off	off	off	on	off		
DX 4-wire lead M to T1, E to T2	off	on	off	on			on	on	off	on		
DX 4-wire lead M to T2, E to T1	on	off	on	off			on	on	off	on		
conductor loop > 2.5 K Ω					on	on						
conductor loop < 2.5 K Ω					off	off						
Unit 0: Unit 1:	S3 (E25) S5 (E13)						S4 (B33) S6 (B5)					
Application	1	2	3	4	5	6	1	2	3	4	5	6
E&M Type I		on		on	on	on	off	off	on	on	off	off
E&M Type II		on		on	on	off	off	on	off	off	on	off
British Telecom		on		on	on	off	on	off	off	on	off	off
DX 4-Wire lead M to T1, E to T2		on		on	off	on	off	off	on	on	off	off
DX 4-wire lead M to T2, E to T1		on		on	off	on	off	off	on	on	off	off
Interface:												
carrier interface	on		on									
public network		off		off								

QPC239 Recorded Telephone Dictation Trunk Card

Transmission during dialing	Unit 0 D33 switch				Unit 1 D8 switch			
	1	2	3	4	1	2	3	4
Yes	off	off	off	off	off	off	off	off
No	on	off	off	off	on	off	off	off

QPC327 Multifrequency Sender/Receiver Card

Options	Jumper plug location
A-Law operation-connect pins 2 and 3	A35
μ -Law operation-connect pins 1 and 2	A35

88 Option settings

QPC330, QPC331 Buffered Message Register Trunk Cards

Application	Unit 0 E35 switch						Unit 1 E5 switch					
	1	2	3	4	5	6	1	2	3	4	5	6
Loop start (accumulated pulsing):												
Third wire battery on M lead	off	off	off	off	on	off	off	off	off	off	on	off
Third wire ground on M lead	off	off	off	off	off	on	off	off	off	off	off	on
Second pair (M & MM)	off	off	off	off	off	off	off	off	off	off	off	off
Ground start (accumulating):												
Third wire battery on M lead	on	off	on	off	on	off	on	off	on	off	on	off
Third wire ground on M lead	on	off	on	off	off	on	on	off	on	off	off	on
Second pair (M & MM)	on	off	on	off	off	off	on	off	on	off	off	off
Regular CO trunk (same as QPC219)	off	on	off	on	off	off	off	on	off	on	off	off

QPC377, QPC379 Conference Cards

Options	Strap location
Enable warning tone-insert strap from E20 to ENB	D1
Disable warning tone-insert strap from EI 9 to DIS	D1

QPC387 Peripheral Buffer Card

Ringing voltage	A35 switch			
	5	6	7	8
16 Hz, 86 Vrms superimposed on -48 V	on	off	off	off
20 Hz, 86 Vrms superimposed on -48 V	off	on	off	off
25 Hz, 75 Vrms superimposed on -48 V	off	off	on	off
50 Hz, 70 Vrms superimposed on -48 V	off	off	off	on

90 Option settings

QPC390, QPC391 Pulsed E&M Trunk Cards (Part 1 of 2)

Application	Unit 0:	S1 (D30)					S2 (D25)					
	Unit 1:	S3 (D30)					S4 (D15)					
	1	2	3	4	5	612	3	4	5	6		
Pulsed E&M Type I:												
North America	Off	off	off	on	off	off	off	on	on	off	off	
Norway	off	off	on	off	on	off	off	on	off	off	off	
British Post Office	off	off	off	on	off	on	off	on	off	off	off	
Pulsed E&M Type II:												
North America	off	off	off	off	off	off	off	on	off	off	on	
Norway	off	off	on	off	off	off	off	on	off	off	on	
British Post Office	off	off	off	off	off	off	off	on	off	off	on	
DX 4-wire lead M to T1, lead E to T2:												
Norway		on	on	off	on	off		off	off	off	off	
British Post Office		on	off	off	on	on		off	off	off	off	
DX 4-wire lead M to T2, lead E to T1:												
Norway		on	on	off	on	off		off	off	off	off	
British Post Office		on	off	off	on	on		off	off	off	off	
DX 4-wire:												
conductor loop < 2.5 KΩ	off						off					
conductor loop > 2.5 KΩ	on						on					
Carrier failure alarm:												
enabled											on	
disabled											off	

Note: Set all positions on S7 (at 837) to OFF.

QPC390, QPC391 Pulsed E&M Trunk Cards (Part 2 of 2)

Application	Unit 0:	S6 (F35) S5 (F5)					
	Unit 1:	1	2	3	4	5	6
Pulsed E&M Type I:							
North America	off	off	off	off	off	off	off
Norway	off	off	off	off	off	off	off
British Post Office	off	off	off	off	off	off	off
Pulsed E&M Type II:							
North America	off	off	off	off	off	off	off
Norway	off	off	off	off	off	off	off
British Post Office	off	off	off	off	off	off	off
DX 4-wire lead M to T1, lead E to T2:							
Norway	off	on	off	on	on	on	on
British Post Office	off	on	off	on	on	on	on
DX 4-wire lead M to T2, lead E to T1:							
Norway	on	off	on	off	on	on	on
British Post Office	on	off	on	off	on	on	on
Note: Set all positions on S7 (at B37) to OFF.							

92 Option settings

QPC414 Network Card

Application	Pin connection. J3/S2 and J4/S1
Option A: In-house remote peripheral equipment (RPE), microwave, fiber optics	connect pins 2 and 3 (pin 1 is next to the white dot)
Option B: T-i facilities (including PRI/DTI)*, channel service unit	connect pins 1 and 2 (pin 1 is next to the white dot)
<p>* To connect 1.5M RPE to T-I through Channel Service Unit, select option B. For 2M RPE, jumper plugs are not used.</p> <p>Note 1: Possible jumper locations for vintage B (for different styles/series): J3—E11 or H11 J4—H17 or E7 S1 and S2—E33</p> <p>Note 2: Possible jumper locations for vintage A (for different styles/series). These cards do not have the option selection and can only be used in the option A setting: J3—H5 or E11 J4—H17 or E7 S1 and S2—E33</p> <p>Note 3: Connectors and loop relations: Even loop: J1 faceplate connector, jumper at J4 or S1 Odd loop: J2 faceplate connector, jumper at J3 or S2</p>	

All unused connectors must be terminated with **QPF36A** Junctor Terminating Plugs. Any group not used requires four of these plugs.

QPC422 Tone Detector Card

Options	Jumper plug connection
A-Law operation	connect center pin to top pin
μ -Law operation	connect center pin to lower pin

QPC423 192 K RAM Card

Application	Memory page	Range	F11 switch (memory configuration)								
			1	2	3	4	5	6	7	8	
Single memory card	0	0-32K	off	on	off	on	off	off	off	on	
	1	0-64 K									
	2	32-64 K									
	5	0-64 K									
Dual memory card: Module 0	0	0-32 K	on	on	off	off	off	off	off	on	
	1	0-64 K									
	2	32-64 K									
	Module 1*	5	0-64 K	on	on	off	on	off	off	off	on
		6	0-64 K								

* Module 1 can be either a QPC423 or QPC478 RAM Card.

QPC425 CPU Card

The next two tables list option settings for the QPC425 CPU Card.

QPC425 address and output device selection

SDI address selection										Output device Plug location	
Device number	AI switch				Device number	AI switch					
	1	2	3	4		1	2	3	4		
0	on	on	on	on	8	on	on	on	off	Modem	A7
1	off	on	on	on	9	off	on	on	off		
2	on	off	on	on	10	on	off	on	off	Data terminal	A5
3	off	off	on	on	11	off	off	on	off		
4	off	on	off	on	12	off	on	off	off		
5	on	on	off	on	13	on	on	off	off		
6	on	off	off	on	14	on	off	off	off		
7	off	off	off	on	15	off	off	off	off		

Note: Switches 9 and 10 are available on vintage D.

QPC425 baud rate selection

Baud rate	AI switch					
	5	6	7	8	9	10
300	off	off	on	off	on	off
600	off	on	off	on	on	off
1200	on	off	on	on	on	off
1800	off	on	on	on	on	off
2400	off	off	on	off	off	on
4800	off	on	off	on	off	on
9600	on	off	on	on	off	on

Note: Baud rates 2400 and up are available on vintage D.

QPC426 192 K RAM Card

Application	Memory page	Range	F11 switch (memory configuration)								
			1	2	3	4	5	6	7	8	
N, XN	0	0-64 K	off	off	off	off	off	off	off	off	on
	1	0-64 K									
	2	0-64 K									
N, XN	4	0-64 K	off	off	off	on	off	off	off	off	on
	5	0-64 K									
	6	0-64 K									
XN	8	0-64 K	off	off	on	off	off	off	off	off	on
	9	0-64 K									
	10	0-64 K									
XN	12	0-64 K	off	off	on	on	off	off	off	off	on
	13	0-64 K									
	14	0-64 K									

QPC432 4-Port Data Line Card

	Jumper plugs			
	B6	B10	B24	B27
Inside PVC (24 AWG) Outside PIC (22 AWG)	E1-E2	E4-E5	E7-E8	E10-E11
Inside PVC (26 AWG) Outside PIC (24 and 26 AWG)	E2-E3	E5-E6	E8-E9	E11-E12

QPC441 3-Port Extender Card

System type	D20 switch				Shelf and group		D20 switch			
	1	2	3	4	Shelf	Group	5	6	7	8
LE half group, RT (see Note 1)	on	off	on	off	0	0	on	on	on	on
LE full group	off	off	on	off		1	on	on	off	on
N, NT, 51, 61 (see Note 1)	off	off	on	off		2	on	off	on	on
VLE, XL, XN (QCA97)	off	off	on	on		3	on	off	off	on
KN, XT, 61C, 71, 81 (see Note 2)	off	on	on	on		4	off	on	on	on
					1	0	on	on	on	off
						1	on	on	off	off
						2	on	off	on	off
						3	on	off	off	off
	4	off	on	on	off					

Note 1: If clock controllers are installed in an N, NT, or RT, position 2 must also be set to ON.

Note 2: Options 61 C and 81 require minimum vintage F for the Core Module.

QPC441 F-D20 switch in NT6D60 Core Module (options 61C and 81):

Core 1								Core 0							
1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
off	on	on	off	off	on	off	off	off	on	on	off	off	on	off	on

QPC441 F-RN27 jumper at E35 (address range checking):

NT6D60 Core Module set to A
 All other modules set to B

QPC446, QPC447 Conference Cards

Options	Strap location
Enable warning tone-insert strap from E8 to ENB	A37
Disable warning tone-insert strap from E8 to DIS	A37
Low-tone level (30 dB below digital overload)-insert strap from E7 to LOW	A37
High-tone level (24 dB below digital overload)-insert strap from E7 to HIGH	A37

QPC450, QPC528 CO/FX/WATS Trunk Cards (Part 1 of 2)

QPC450A, B, QPC528		Switch (location) S1 (A23)	1 on	2 off	3 on	4 Off	5 on	6 off	7 on	8 off	
Unit switch (location)		0 s2 (E29)		1 s3 (E9)		2 S4 (A28)		3 S5 (A10)			
		1	2	3	4	5	6	7	8	9 10	
Loop start		off	on	off	off	on	off			off off	
Ground start		off	on	on	on	on	off			off off	
Metering:											
Second pair (M, MM)								off	off		
Third wire, battery on M								off	on		
Third wire, ground on M								on	off		
Jumpers (for above)	Unit (location)	0 (E27)		1 (E11)		2 (D29)		3 (D9)			
600 Ω resistive impedance		Pin 1 to 2									
3-component complex Impedance		Pin 2 to 3									
QPC450C		Units switch (location) s2 (E29)	0	1 S3 (E9)	2 S4 (A28)	3 S5 (A10)	4	5	6	7	8
		1	2	3	4	5	6	7	8		
Loop start		off	on	off	off	on					off
Ground start		off	on	on	on	on					off
Metering:											
Second pair (M, MM)								off	off		
Third wire, battery on M								off	on		
Third wire, ground on M								on	off		
QPC450C1, D		Unit switch (location) S4 (F28)	0	1 s3 (F10)	2 S1 (C27)	3 s2 (B10)	4	5	6	7	8
		1	2	3	4	5	6	7	8		
Loop start		off	on	off			off	off	on		
Ground start		off	on	on			on	off	on		
Metering:											
Second pair (M, MM)					off	off					
Third wire, battery on M					off	on					
Third wire, ground on M					on	off					

QPC450, QPC528 CO/FX/WATS Trunk Cards (Part 2 of 2)

QPC450E, F	Unit switch (location)	0 s4 (F25)	1 s3 (F11)	2 S1 (B25)	3 s2 (B13)
		1	2	3	4
Loop start		off	off		
Ground start		on	on		
Metering:					
Second pair (M, MM)				off	off
Third wire, battery on M				off	on
Third wire, ground on M				on	on
Illustrated DIP switch settings:	on	(closed)	on		
	off	(open)	off		

QPC450G	Unit switch (location)	0 s4 (F25)	1 s3 (F11)	2 S1 (B25)	3 s2 (B13)
		1	2	3	4
				5	6
Loop start		off	off		
Ground start		on	on		
Short loops (600 Ω compromise impedance network)				on	off
Long loop (EIA recommended Impedance network)				off	on

QPC464 Peripheral Buffer Card

Ringing voltage	D13 or B12 switch					
	1	2	3	4	5	6
16 Hz, 86 Vrms superimposed on -48 V	on	off	off	off		off
20 Hz, 86 Vrms superimposed on -48 V	off	on	off	off		off
25 Hz, 75 Vrms superimposed on -48 V	off	off	on	off		off
50 Hz, 70 Vrms superimposed on -48 V	off	off	off	on		off
Dual density loops					off	
Quad density loops					on	

QPC471 Clock Controller Card

The next two tables list option settings for the QPC471 Clock Controller Card.

QPC471 vintages A through G

Vintage	Switch	MS	ST, STE 21A, 21	N, NT, RT, 51, 61	XN, XT, 61 C, 71, 81
QPC471 A	SW2	not applicable	not applicable	on	off
QPC471 B through G	SW1 SW2 Jumper F38 Jumper G38	on on TP9-TP10 TP12-TP13	on off TP8-TP9 TP11-TP12	on off TP8-TP9 TP11-TP12	off off TP8-TP9 TP11-TP12

QPC471 vintage li

System	SW1				SW2				SW4			
	1	2	3	4	1	2	3	4	1	2	3	4
ST, STE, 21A, 21, 21 E	on	on	on	on	off	off	off	off	off	off	off	off
MS, SN	on	on	on	on	on	on	on	on	off	off	off	off
RT, N, NT, 51, 61	on	on	on	on	off	off	off	off	off	on	*	*
XN, XT, 61 C, 71, 81	off	off	off	off	off	off	off	off	off	on	*	*
Cable length between the J3 faceplate connectors:												
O-4.3 m (0-14 ft)											off	off
4.6-6.1 m (15-20 ft)											off	on
6.4-10.1 m (21-33 ft)											on	off
10.4-15.2 m (34-50 ft)											on	on
* If there is only one clock controller card in the system, set to OFF. If there are two clock controller cards, set to match the cable length between the J3 faceplate connectors. Determine the total cable length (no single cable can exceed 25 ft) between the J3 connectors. Both cards must have the same setting.												

QPC472 Digital Trunk Interface Card

Switch setting (transmission equalization)	To repeatered facility	To cross-connect point
5 on	0-45 m (0-150 ft)	0-15 m (0-55 ft)
2, 4, 6 on	45-135 m (150-450 ft)	15-100 m (56-355 ft)
1, 3, 7 on	135-225 m (450-750 ft)	100-200 m (355-655 ft)

Note: All switch positions should be OFF except those shown under the "switch setting" column.

QPC478 128 K RAM Card

System type	Memory page	Range	F11 switch (memory configuration)							
			1	2	3	4	5	6	7	8
M, MS, S Module 0	0	0-32 K	on	on	off	off	off	off	off	on
	1	0-64 K								
	2	32-64 K								
M, MS, S Module 1	5	0-64 K	on	on	off	on	off	off	off	on
	6	0-64 K								

Note: Module 1 can be either a QPC478 RAM or a QPC423 RAM.

QPC479 128 K RAM Card

System type	Memory page	Range	F11 switch (memory configuration)								
			1	2	3	4	5	6	7	8	
LE, N	0	0-64	K	on	off	off	off	off	off	off	on
	1	0-64 K									
LE, N	5	0-64	K	on	off	on	off	off	off	off	on
	6	0-64 K									
LE, N	2	0-64	K	on	off	on	on	off	off	off	on
	6	0-64 K									
LE, N	0	0-32	K	on	off	off	on	off	off	off	on
	1	0-32 K									
	2	0-64 K									

QPC503 Common Equipment Backplane

Application	Pin connections		
	P1	P5	P6
Main CE shelf without remote CE shelf	1-8 3-6	1-8 3-6	1-8 4-5
Main CE shelf with remote CE shelf	1-8 4-5	2-7 4-5	1-8 4-5
Remote CE shelf	1-8 3-6	2-7 4-5	1-8 4-5

Note 1: The option plugs P1, P5, and P6 are 8-pin sockets. To set the required option, connect the pins indicated with the metal straps provided.

Note 2: Option plugs P2, P3, and P4 are set during manufacture and should not be changed.

QPC513 Enhanced Serial Data Interface Card

Program socket selection				Switch S2 —Address selection								
Option	Port	Socket number		Device number	Style A				Style B			
					1	2	3	4	1	2	3	4
DTE (terminal)	1	UA10	UA12	0-1	off	off	off	*	off	off	off	*
	2	UA17	UA19	2-3	on	off	off	*	off	off	on	*
DCE (modem)	1	UA9	UA11	4-5	off	on	off	*	off	on	off	*
	2	UA16	UA18	6-7	on	on	off	*	off	on	on	*
RS-232-C interface	1	UB9	UB11	8-9	off	off	on	*	on	off	off	*
	2	UB16	UB18	10-11	on	off	on	*	on	off	on	*
High-speed interface	1	UB10	UB12	12-13	off	on	on	*	on	on	off	*
	2	UB17	UB19	14-15	on	on	on	*	on	on	on	*

* ON defaults to synchronous mode. OFF defaults to asynchronous mode. (Support for asynchronous mode is not design intent. However, before X11 release 18 asynchronous mode may work in some applications. With Release 18 and later, asynchronous mode will not function.)

QPC525, QPC526, QPC527 CO Trunk Card

Application	Switches at E29/E9/A29/A11 Units 0/1/2/3							
	1	2	3	4	5	6	7	a
0 Ω outpulsing	on	off						off
Standard outpulsing	off	on						off
Ground start			on	on				off
Loop start			off	off				off
Loop start, automatic guard detection			off	on				off
QPC524 not installed					on			off
QPC524 installed					off			off
Battery on M operation						off	on	off
Ground on M operation						on	off	off
Second pair M&MM						off	off	off

QPC550 Direct Inward Dial Trunk Card

The next five tables give the option settings for the **QPC550** DID Trunk Card.

QPC550 vintages A and B-real/complex balance impedance selection

Device location	Device designation	Switch number	Unit number	Impedance type	
				Real	Complex
F31	S4.0	1	0	on	off
F24	s4.1	1	1	on	off
F16	S4.2	1	2	on	off
F11	s4.3	1	3	on	off

106 Option settings

QPC550 vintage A-600/900 Ohm impedance selection

Device location	Device designation	Unit number	Switch number								Impedance (ohms)
			1	2	3	4	5	6	7	8	
G29(a)	S3.0	0	off	on	on	off	off	on	on	off	600
			on	off	off	on	on	off	off	on	900
G29(b)	s3.1	1	off	on	on	off	off	on	on	off	600
			on	off	off	on	on	off	off	on	900
G8(a)	S3.2	2	off	on	on	off	off	on	on	off	600
			on	off	off	on	on	off	off	on	900
G8(b)	53.3	3	off	on	on	off	off	on	on	off	600
			on	off	off	on	on	off	off	on	900

QPC550 vintage A-software/hardware control for 2dB pad

Device location	Device designation	Unit number	Switch number	S/W	2 dB pad control H/W	
					(pad in)	(pad out)
F38	S1	0	1	off	off	on
			2	on	off	off
			3	on	off	off
			4	off	off	on
F1	s2	0	1	off	off	on
			2	on	off	off
			3	on	off	off
			4	off	off	on

QPC550 vintage B-attenuation level control

Device location	Device designation	Unit number	Switch number								2 dB option
			1	2	3	4	5	6	7	8	
D39	S2.0/1	0	on		on		on		on		on
		1		off		off		off		off	off
D1	S2.2/3	2	on		on		on		on		on
		3		off		off		off		off	off

QPC550 vintage B-hardware control for 2dB pad

Device location	Device designation	Unit number	Switch number	2 dB pad control H/W	
				(pad in)	(pad out)
F38	S1.0/1	1	1	on	off
			2	off	off
		0	3	off	off
			4	on	off
F1	S1.2/3	3	1	on	off
			2	off	off
		2	3	off	off
			4	on	off

QPC551 Radio Paging Trunk Card

Signal duration on the 18-pair faceplate				S1 (F33)								
				1	2	3	4	5	6			
Binary value (.1 second)				1	2	4	8	16	32			
<p>Note: This switch determines the length of time a signal stays on the 18-pair data bus. The time is set in binary to the nearest tenth second. For example, to keep data on the bus for 5 seconds, the switch settings total 50 by closing S1.2, S1.5, and S1.6.</p>												
Signal duration and pause time				S2 (G33)								
				1	2	3	4	5	6	7		
Binary value (.1 second)				1	2	4	8	16	32	64		
<p>Note: This switch determines the time data must stay on the 18-pair data bus plus the pause time between the removal of data and the reappearance of subsequent data. The time is set in binary to the nearest tenth second. For example, to keep data on the bus for 5 seconds and have a pause time of 3.2 seconds, the switch settings should total 82 by closing S2.2, S2.5, and S2.7.</p>												
Application			S3 (E2)		S4 (F2)							
			Unit 0, Unit 1		Unit 0, Unit 1							
	1	2	Address	3	4	5	6	Address	3	4	5	6
Paging			0	off	off	off	off	8	off	off	off	on
single	on		1	on	off	off	off	9	on	off	off	on
multiple	off		2	off	on	off	off	10	off	on	off	on
			3	on	on	off	off	11	on	on	off	on
Timer*			4	on	off	on	off	12	on	off	on	on
enabled	on		5	on	on	on	off	13	on	off	on	on
disabled	off		6	off	on	on	off	14	off	on	on	on
			7	on	on	on	off	15	on	on	on	on
<p>* When enabled, this switch prevents a signal from being sent from a paging unit until 5 seconds have elapsed since the beginning of the previous signal on that same unit.</p>												
			S5 (E38)		S6 (D1)							
			Unit 0		Unit 1							
Impedance termination					1							
Real					on							
Complex					off							

QPC574, QPC595 Digitone Receiver Cards

	Location	Connection
12 DTMF tones	E9	Center to E3
16 DTMF tones	E9	Center to E2

QPC577, QPC596 Digitone Receiver Daughterboards

16/12 tone options jumper	Jumper at P1
16tone (4x4)	connect pins 1 and 2
12 tone (3 x 4)	connect pins 2 and 3

Note: When a DTR daughterboard is installed, check YES on the faceplate of the QPC659 Dual Loop Peripheral Buffer.

QPC584 Mass Storage Interface Card

Options	Switch S3							
	1	2	3	4	5	6	7	8
5.25-inch disk drives only	on	off	off	off	off	off	off	off
5.25-inch disk drives and 5.25-inch hard drive	on	off	off	on	off	off*	off	off
3.5-inch disk drives only	on	off	off	off	on	off	**	***
3.5inch disk drives and 3.5-inch hard drive	on	off	off	on	on	off	**	***

Note: Minimum vintage E is required for 3.5 inch drives. Minimum vintage L is required for X11 release 18.

* When a QMM38 MSU is replaced, set switch 6 to ON before the faulty QMM38 is powered down so the disk head will retract (shipping mode). After the replacement MSU is installed, set switch 6 to OFF.

** For 4 Mbyte set to ON.
For 2 Mbyte set to OFF.

***For STE and 21 E, set to on when the NTND01 Integrated CPU/Memory (ICM) Card is installed, For all other systems set to off.



QPC650, QPC651 Music Trunk Cards

Channel	Switch location	Switch settings*			
		1	2	3	4
0	F31	x		x	
1	F31		x		x
2	F9	x		x	
3	F9		x		x
4	c31	x		x	
5	C31		x		x
6	C9	x		x	
7	C9		x		x

* Set x to OFF if the impedance of announcement source is 2or 4 Ω.
Set x to ON if the impedance of the announcement source is ∞Ω.

112 Option settings

QPC659 Dual Loop Peripheral Buffer Card

Options	Switch settings								
	U25				u3	U9	U10	U14	u22
	1	2	3	4	(all)	(all)	(all)	(all)	(all)
± 10 V monitor disables circuit enables circuit	off on								
Ringing select 20 Hz and 25 Hz 50 Hz		off on							
Quad double density quad density			off on						
Loop dual single				on off	off on	off on	off on	on off	off on

QPC659
112

QPC659
112

QPC672 512 K Memory Card

System type	Memory page	Range	F11 switch (memory configuration)							
			1	2	3	4	5	6	7	8
N, XN, LE, VLE, XL, N(QCA96) and XN(QCA97)	0	O-64 K	off	off	on	off	off	off	off	on
	1	O-64 K								
	2	8-64 K								
	4	O-64 K								
	5	O-64 K								
	6	O-64 K								
	8	O-64 K								
	9	O-64 K								

Note: Switch 8 must be OFF for non-CE shelf.

QPC673 512 K Memory Card

System type	Memory page	Range	F11 switch (memory configuration)							
			1	2	3	4	5	6	7	8
MS, S, ST	0	O-64 K	off	off	on	off	off	off	off	on
	1	O-64 K								
	2	8-64 K								
	4	O-64 K								
	5	O-64 K								
	6	O-64 K								
	8	O-64 K								
	9	O-64 K								

Note: Switch 8 must be OFF for non-CE shelf.

QPC674 256 K Memory Card

System type	Memory page	Range	F11 switch (memory configuration)							
			1	2	3	4	5	6	7	8
MS, S	0	0-32 K	off	off	off	off	off	off	off	on
	1	0-64 K								
	2	32-64 K								
	5	0-64 K								
	6	0-64 K								
<p>Note 1: This card responds to both module 0 and module 1 in existing software.</p> <p>Note 2: No software change is required if configuration for two 128 K modules was used.</p>										

QPC687 CPU Card

Address selection B1 switch					Speed selection B1 switch*							Output device		
Device number	1	2	3	4	Baud rate	5	6	7	8	9	10			
0	on	on	on	on	300	off	off	on	off	on	off	QPC687A Port	Plug location	
1	off	on	on	on	600	off	on	off	on	on	off			
2	on	off	on	on	1200	on	off	on	on	on	off	Modem	A 7	
3	off	off	on	on	1800	off	on	on	on	on	off	EIA data terminal	A 5	
4	on	on	off	on	2400	off	off	on	off	off	on	QPC687B Port	Switch location	
5	off	on	off	on	4800	off	on	off	on	off	on			
6	on	off	off	on	9600	on	off	on	on	off	on		A 23 B23	
7	off	off	off	on									S1 s2	
8	on	on	on	off								Modem	All on All off	
9	off	on	on	off								EIA data terminal	All off All on	
10	on	off	on	off										
11	off	off	on	off										
12	on	on	off	off										
13	off	on	off	off										
14	on	off	off	off										
15	off	off	off	off										

* On vintage B, the option plug has been replaced with two switches (S1 and S2) in locations A23 and B23.

QPC699 Common Equipment Backplane

Application	Pin connections		
	P1	P5	P6
Network slot	1-8 3-6	1-8 3-6	1-8 4-5
Segmented bus extender-main shelf	1-8 4-5	2-7 4-5	1-8 4-5
Segmented bus extender-remote shelf	1-8 3-6 4-5	2-7 4-5	1-8

Note 1: The option plugs P1, P5, and P6 are 8-pin sockets. To set the required option, connect the pins indicated with the metal straps provided.

Note 2: Option plugs P2, P3, and P4 are set during manufacture and should not be changed.

QPC720 Primary Rate interface Card

Switch S2 settings	To repeatered facility	To cross-connect point
5 on	0-45 m (0-150 ft)	0-30 m (0-100 ft)
2, 4, 6 on	46-135 m (151-450 ft)	31-100 m (101-355 ft)
1, 3, 7 on	136-225 m (451-750 ft)	101-200 m (356-655 ft)
Switch 3 option for DTI with ESF		
SW3-1 on = extended superframe format (ESF) off = superframe format (SF)		
<p>Note 1: All positions on S2 (location B22) are OFF except as shown under the column labeled "Switch S2 settings."</p> <p>Note 2: The switch 3 option for DTI with ESF applies to only X11 releases 16, 17, and 18. All other positions on the 8-pole SW3 (location E37) should be OFF.</p> <p>Note 3: Prior to X11 release 19 (releases 16, 17, and 18), you must set the framing format as ESF with the DLOP prompt in LD17 before you set SW3-1 on the card for the DTI with ESF option.</p> <p>Note 4: Beginning with X11 release 19, framing format, line encoding, and method of yellow alarm are selectable for both DTI and PRI in LD17 with the DLOP, LCMT, and YALM prompts. All SW3 switch positions should be OFF.</p>		

QPC742 Floppy Disk Interface Card

Options	SW3							
	1	2	3	4	5	6	7	8
5.25inch disk drives	on	off	off	off	off	off	off	off
3.5-inch disk drives	on	off	off	off	on	off	*	**

Note: Minimum vintage C1 is required for 3.5 inch drives. Minimum vintage F is required for X11 release 18.

* For 4 Mbyte set to ON.
For 2 Mbyte set to OFF

** For STE or 21 E, set to ON when the NTND01 Integrated CPU/Memory (ICM) Card is installed.
For all other systems, set to OFF.

QPC757 D-Channel Interface Card

Vintage A socket selection				Address selection				
Option	Port	Socket number		Device number	S2 switch			
					1	2	3	4
Data terminal equipment (DTE)	0	UA10	UA12	0-1	off	off	off	off
	1	UA17	UA19	2-3	off	off	on	off
Data communication equipment (DCE)	0	UA9	UA11	4-5	off	on	off	off
	1	UA16	UA18	6-7	off	on	on	off
RS-232-C interface	0	UB9	UB11	8-9	on	off	off	off
	1	UB16	UB18	10-11	on	off	on	off
High-speed interface	0	UB10	UB12	12-13	on	on	off	off
	1	UB17	UB19	14-15	on	on	on	off
Vintage C socket selection				Address selection				
DTE	0	U11	U9	0-1	off	off	off	off
	1	U5	u3	2-3	off	off	on	off
DCE	0	u12	U10	4-5	off	on	off	off
	1	U6	u4	6-7	off	on	on	off
RS-232-C interface	0	U31	u29	8-9	on	off	off	off
	1	U25	U23	10-11	on	off	on	off
High-speed interface	0	U30	U28	12-13	on	on	off	off
	1	U24	u22	14-15	on	on	on	on

QPC775 Clock Controller Card

	SW2				SW3				SW4			
	1	2	3	4	1	2	3	4	1	2	3	4
XN, XT, 61 C, 71, 81	Off	Off	off	Off	off	off	off	off	on	on	on	on
N, NT, RT, ST*, 21*, 51, 61	on	on	on	on	off	off	off	off	on	on	on	on
MS, SN	on	on	on	on	on	on	on	on	off	off	off	off

* Also applies to STE, 21A, and 21 E.

QPC841 4-Port Serial Data Interface Card

The next four tables list option settings for the QPC841 4-Port SDI Card.

QPC841 port 1 and 2 address selection

Device number		SW14							
Port 1	Port 2	1	2	3	4	5	6	7	8
0	1	off	off	off	Off	Off	on	on	on
2	3	Off	Off	Off	Off	Off	on	on	Off
4	5	Off	Off	Off	Off	off	on	off	on
6	7	Off	Off	Off	Off	off	on	off	Off
8	9	Off	Off	Off	Off	Off	off	on	on
10	11	Off	Off	Off	off	Off	off	on	Off
12	13	Off	Off	Off	Off	Off	Off	Off	on
14	15	off	Off	Off	Off	Off	off	Off	Off

Note 1: On SW1 6, positions 1, 2, 3, and 4 must be OFF.

Note 2: To avoid address conflicts, SW14 and SW15 can never have identical setting.

Note 3: To disable ports 1 and 2, set SW14 position 1 to 0N.

QPC841 port 3 and 4 address selection

Device number		SW15							
Port 3	Port 4	1	2	3	4	5	6	7	8
0	1	Off	Off	Off	Off	off	0 n	0 n	0 n
2	3	Off	Off	Off	Off	Off	0 n	0 n	Off
4	5	Off	off	Off	Off	off	0 n	off	0 n
6	7	Off	Off	Off	Off	Off	0 n	Off	Off
8	9	Off	Off	Off	Off	off	Off	0 n	0 n
10	11	Off	Off	Off	Off	Off	Off	0 n	Off
12	13	Off	off	Off	off	Off	Off	Off	0 n
14	15	Off	Off	Off	Off	Off	Off	Off	Off

Note 1: On SW16, positions 1, 2, 3, and 4 must be OFF

Note 2: To avoid address conflicts, SW14 and SW15 can never have identical setting

Note 3: To disable ports 3 and 4, set SW15 position 1 to ON.

QPC841 baud rate

Baud rate	Port 1 SW10				Port 2 SW11				Port 3 SW12				Port 4 SW13			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
150	Off	Off	0 n	0 n	Off	Off	0 n	0 n	Off	Off	0 n	0 n	Off	Off	0 n	0 n
300	off	0 n	Off	0 n	Off	0 n	Off	0 n	Off	0 n	Off	0 n	Off	0 n	off	0 n
600	Off	Off	Off	0 n	Off	off	Off	0 n	Off	Off	off	0 n	off	off	Off	0 n
1200	Off	0 n	0 n	Off	Off	0 n	0 n	Off	off	0 n	0 n	off	Off	0 n	0 n	off
2400	Off	Off	0 n	Off	Off	off	0 n	off	Off	Off	0 n	Off	Off	Off	0 n	Off
4800	Off	0 n	off	Off	off	0 n	Off	Off	Off	0 n	off	Off	Off	0 n	Off	Off
9600	Off	Off	Off	Off	Off	off	Off	Off	off	Off	off	off	off	Off	Off	Off

122 Option settings

QPC841 DTE or DCE selection

Mode	Port 1-SW8						Port 1-SW9					
	1	2	3	4	5	6	1	2	3	4	5	6
DTE (terminal)	on	on	on	on	on	on	off	off	off	off	off	off
DCE (modem)	off	off	off	off	off	off	on	on	on	on	on	on
DTE	Port 2-SW6						Port 2-SW7					
	on	on	on	on	on	on	off	off	off	off	off	off
DCE	off	off	off	off	off	off	on	on	on	on	on	on
DTE	Port 3-SW4						Port 3-SW5					
	on	on	on	on	on	on	off	off	off	off	off	off
DCE	off	off	off	off	off	off	on	on	on	on	on	on
DTE	Port 4-SW2						Port 4-SW3					
	on	on	on	on	on	on	off	off	off	off	off	off
DCE	off	off	off	off	off	off	on	on	on	on	on	on

Sample settings for NT8D22 System Monitors

This chapter gives examples of system monitor option settings for basic system configurations. These configurations are only samples; you may have a variety of complex configurations. See “NT8D22 System Monitor” on page 48 for detailed information.

Meridian 1 systems

The master system monitor must be configured in the CPU column. In options 7 | and 8 |, the master must be configured in the column containing CPU 0 and slave unit | must be configured in the column containing CPU 1. Any other system monitors are slaves.

Table 3
Master system monitor switch settings

Switch	1	2	3	4	5	6	7	8
SW1	off	off	1	on**	off	off	off	off
SW2	on	off	(For 3-8, see “NT8D22 settings for total number of slaves-SW2 on master” in option settings)					
SW3	on	on	on	on				
* Set to ON for DC-powered systems, OFF for AC-powered systems.								
† PFTU enabled due to over-temperature in column with master system monitor.								

Table 4
Slave system monitor switch settings

Switch	1	2	3	4	5	6	7	8
SW1	off	off	*	**	off	off	off	off
SW2	off	off	(For 3-8, see "NT8D22 slave address— SW2 on slave" in option settings)					
SW3	off	off	off	off				
<p>* Set to ON for DC-powered systems, OFF for AC-powered systems.</p> <p>** Set to ON to enable PFTU during over-temperature condition. Set to OFF to disable PFTU during over-temperature condition.</p>								

ST, STE, and RT systems with Meridian 1 upgrades

The following tables give examples of option settings for:

- ST, STE, or RT with peripheral equipment (PE) upgrade
- ST, STE, or RT with common equipment (CE) upgrade

ST, STE, or RT with PE upgrade

Configure the system monitor in one PE column as the master. Configure any other system monitors as slaves. If there are CE *and* PE modules, use the option settings for CE upgrades.

Table 5
Master system monitor switch settings

Switch	1	2	3	4	5	6	7	8
SW1	on	off	*	**	on	on	on	on
SW2	on	on	(For 3-8, see "NT8D22 settings for total number of slaves-SW2 on master" in option settings)					
SW3	on	on	on	on				
* Set to ON for DC-powered systems, OFF for AC-powered systems. ** Set to ON to enable PFTU during over-temperature condition. Set to OFF to disable PFTU during over-temperature condition								

Table 6
Slave system monitor switch settings

Switch	1	2	3	4	5	6	7	8
SW1	on	off	*	**	on	on	on	on
SW2	off	on	(For 3-8, see "NT8D22 slave address—SW2 on slave" in option settings)					
SW3	Off	Off	Off	Off				
* Set to ON for DC-powered systems, OFF for AC-powered systems. ** Set to ON to enable PFTU during over-temperature condition. Set to OFF to disable PFTU during over-temperature condition.								

ST, STE, RT with CE upgrade

Configure the system monitor in the CPU column as the master. Configure any other system monitors as slaves.

Table 7
Master system monitor switch settings

Switch	1	2	3	4	5	6	7	8
SW1	on	on	*	on**	on	on	off	on
SW2	on	on	(For 3-8, see "NT8D22 settings for total number of slaves-SW2 on master" in option settings)					
SW3	on	on	on	on				
* Set to ON for DC-powered systems, OFF for AC-powered systems, ** PFTU enabled due to over-temperature in column with master system monitor.								

Table 8
Slave system monitor switch settings

Switch	1	2	3	4	5	6	7	8
SW1	on	off	*	**	on	on	off	on
SW2	off	on	(For 3-8, see "NT8D22 slave address—SW2 on slave" in option settings)					
SW3	off	off	off	off				
* Set to ON for DC-powered systems, OFF for AC-powered systems ** Set to ON to enable PFTU during over-temperature condition. Set to OFF to disable PFTU during over-temperature condition.								

NT and XT systems with Meridian 1 upgrades

The following tables give examples of option settings for

- NT or XT with PE upgrade
- NT or XT with CE upgrade

NT or XT with PE upgrade

Configure the system monitor in one PE column as the master. Configure any other system monitors as slaves. If there are CE PE modules, use the option settings for CE upgrades.

Table 9
Master system monitor switch settings

Switch	1	2	3	4	5	6	7	8
SW1	on	off	*	**	Off	Off	on	Off
SW2	on	off	(For 3-8, see "NT8D22 settings for total number of slaves-SW2 on master" in option settings)					
SW3	on	on	on	on				
<p>* Set to ON for DC-powered systems, OFF for AC-powered systems.</p> <p>** Set to ON to enable PFTU during over-temperature condition. Set to OFF to disable PFTU during over-temperature condition.</p>								

Table 10
Slave system monitor switch settings

Switch	1	2	3	4	5	6	7	8
SW1	on	off	*	**	Off	Off	on	Off
SW2	off	off	(For 3-8, see "NT8D22 slave address—SW2 on slave" in option settings)					
SW3	off	off	off	off				
* Set to ON for DC-powered systems, OFF for AC-powered systems. ** Set to ON to enable PFTU during over-temperature condition Set to OFF to disable PFTU during over-temperature condition.								

NT or XT with CE upgrade

Configure the master system monitor in the column containing CPU 0.
 Configure the system monitor in the column containing CPU 1 as slave unit 1.
 Configure any other system monitors as slaves.

Table 11
Master system monitor switch settings

Switch	1	2	3	4	5	6	7	a
SW1	on	on	*	on**	off	off	off	on
SW2	on	off	(For 3-8, see "NT8D22 settings for total number of slaves-SW2 on master" in option settings)					
SW3	on	on	on	on				
* Set to ON for DC-powered systems, off for AC-powered systems. ** PFTU enabled due to over-temperature in column with master system monitor.								

Table 12
Slave system monitor switch settings

Switch	1	2	3	4	5	6	7	8
SW1	on	off	*	**	off	off	off	on
SW2	off	off	(For 3-8, see "NT8D22 slave address— SW2 on slave" in option settings)					
SW3	off	off	off	off				
<p>* Set to ON for DC-powered systems, off for AC-powered systems.</p> <p>** Set to ON to enable PFTU during over-temperature condition. Set to OFF to disable PFTU during over-temperature condition.</p>								

SL-1

Circuit card installation and testing

Description

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Release 8.0

Standard

April 1, 1994

Printed in the U.S.A.





SL-1

Meridian 1


General maintenance information

Publication number: 553-3001-500

Document release: 8.0

Document status: Standard

Date: April 1, 1994



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Revision history

January 29, 1990

Standard, release 1.0.

February 28, 1990

Standard, release 2.0.

July 31, 1990

Standard, release 3.0.

December 1, 1991

Standard, release 4.0. This document is reissued to include technical content updates. Due to the extent of the changes, revision bars are not used.

December 31, 1992

Standard, release 5.0. This document is reissued to include information on system option 8 I and equipment required for compatibility with X 11 release 18. Only new information and changes to technical content are noted by revision bars in the margins.

April 1, 1993

Standard, release 6.0. Changes to technical content are noted by revision bars in the margins.

August 1, 1993

Standard, release 7.0. Changes to technical content are noted by revision bars in the margins.

April 1, 1994

Standard, release 8.0. This document is reissued to include the information on Meridian | option 6 I C. Changes to technical content are noted by revision bars in the margins.



207

Contents

About this document	1
References	1
Precautions	3
General precautions	3
Circuit cards	4
Datadisks	6
Communicating with the system	9
System terminal	9
Message format	10
Local and remote access	11
Options 6 | C and 8 | 1 terminal and modem guidelines	12
Maintenance telephone..	15
Routine maintenance	17
Pedestal air filter	17
Option 2 | 1 E battery pack assembly	17
DC-power battery systems	18
Hardware maintenance took	19
Circuit card features	19
Battery backup for CPU memory	19
Card test	19
Enable/disable switch	20
LED	20
Maintenance display code	22

CPU controls	26
Initialize button	26
Normal/maintenance switch	26
Reload button	28
Systemalarms	28
Major alarms	30
Remote alarms	31
System monitor indicators	32
NT7D15 System Monitor	32
NT8D22 System Monitor	33
Line transfer	35
Main power loss	37
Module power supply failure	37
Temperature alarms	38
Software maintenance tools	41
Diagnostic programs	41
Error Monitor	42
Initialize Program	4
Midnight and Background Routines	43
Overlay Loader	45
Overload Monitor	45
Resident Trunk Diagnostic	45
System Loader	45
Options 61 C and 81 features	47
The History File feature	48
Interactive diagnostics	49
The Enhanced Maintenance feature	49
Manual continuity tests	50
User reports	53
Technical assistance service	55




2



List of figures

Figure 1 Static discharge points	4
Figure 2 Diskposition	7
Figure 3 Local and remote access to a system terminal .	12
Figure 4 Modem to a switch box and SDI and CPIO ports	13
Figure 5 Sample enable/disable switch	21
Figure 6 Sample LED indicator	23
Figure 7 Sample maintenance display	25
Figure 8 Manual initialize button and normal/maintenance switch on the CPU interface card	27
Figure 9 Reload button on the changeover and memory arbitrator card	29
Figure 10 NT8D22 System Monitor message flow	34
Figure 11 PFTU configurations	36

vi List of figures

Figure 12		
Power equipment designations from the master NT8D22 System Monitor	39	
Figure 13		
Manual continuity tests: point-to-point configurations	51	
Figure 14		
Manual continuity tests: loopback configurations	52	

List of tables

Table 1	
System message format	10
Table 2	
Translation from keyboard to dial pad	16
Table 3	
Sample LED indications	22
Table 4	
Circuit cards with maintenance displays	24
Table 5	
Faults monitored by the NT8D22 System Monitor	33
Table 6	
Programs used in Midnight and Background Routines	44
Table 7	
User report indications	54
Table 8	
Technical service emergency classifications	56
Table 9	
Technical service non-emergency classifications	57
Table 10	
Checklist for service requests	58

viii List of tables



About this document

This document describes maintenance features for Meridian 1 system options 21A, 21, 21E, 51, 61, 61C, 71, and 81. The chapters in this document describe the following:

- Precautions: guidelines to avoid personal injury and equipment damage
- Communicating with the system: methods for exchanging information with the system
- Routine maintenance: requirements for servicing batteries and air filters
- Hardware maintenance tools: descriptions of circuit card hardware, CPU controls, system alarms, and system monitor indicators
- Software maintenance tools: descriptions of diagnostic programs, the History File, and interactive diagnostics
- User reports: problems typically reported by users
- Customer technical assistance service: information on Northern Telecom Technical Assistance Centers and services

This document does not provide procedures for locating faults, clearing faults, or replacing equipment. See *Fault clearing* (553-3001-510) to locate and clear faults. See *Hardware replacement* (553-3001-520) to replace faulty equipment.

References

See the *Meridian 1 planning and engineering guide* for

- *Master index of publications* (553-3001-000)
- *System overview* (553-3001-1 00)
- *Equipment identification* (553-3001-154)

2 About this document

the *Meridian 1 installation and maintenance guide* for

- *System installation procedures* (553-3001-210)
- *Circuit card installation and testing* (553-3001-211)
- *Telephone and attendant console installation* (553-3001-215)
- *Fault clearing* (553-3001-510)
- *Hardware replacement* (553-3001-520)

See the *X1 I software guide* for an overview of software architecture, procedures for software installation and management, and a detailed description of all X1 I features and services. This information is contained in two documents:

- *X1 I software management* (553-3001-300)
- *X1 I features and services* (553-3001-305)

See the *X1 I input/output guide* (553-3001-400) for a description of all administration programs, maintenance programs, and system messages.

Precautions

General precautions

Meridian 1 equipment is sensitive to static electricity and environmental conditions. Follow the precautions in this chapter to avoid personal injury or equipment damage.

WARNING

Module covers are not hinged; do not let go of the covers. Lift covers away from the module and set them out of your work area.

WARNING

To avoid the danger of electric shock, be very careful when you work with power equipment and connections. Warning notices are displayed and must be heeded.

There are no user repairable components or assemblies in the power system. If a power unit fails, the complete unit must be replaced. Do not disassemble a power unit under any circumstances because of the risk of electric shock.

Circuit cards

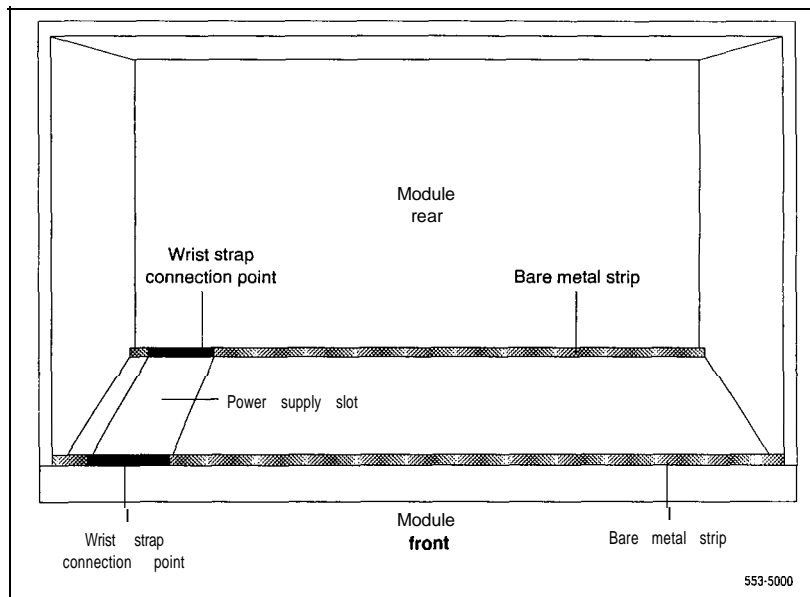
WARNING

Circuit cards may contain a lithium battery. There is a danger of explosion if the battery is incorrectly replaced. Do not replace components on any circuit card; you must replace the entire card.

Dispose of circuit cards according to the manufacturer's instructions.

To avoid damage to circuit cards from static discharge, wear a properly connected antistatic wrist strap when you work on Meridian 1 equipment. If a wrist strap is not available, regularly touch one of the bare metal strips in a module to discharge static. Figure 1 shows the recommended connection points for the wrist strap and the bare metal strips you should touch.

Figure 1
Static discharge points



Handle cards as follows:

- Handle cards by the edges only. Do not touch the contacts or components.
- Set cards on a protective antistatic bag. If an antistatic bag is not available, hand-hold the cards, or set them in card cages unseated from the connectors.
- Unpack or handle cards away from electric motors, transformers, or similar machinery.
- Store cards in protective packing. Do not stack cards on top of each other unless they are packaged.
- Store cards in a dry, dust-free area.

During repair and maintenance procedures do the following:

- Insert cards into compatible slots only.
- Turn off the circuit breaker or switch for a module power supply before the power supply is removed or inserted.

Note: In AC-powered systems, capacitors in the power supply must discharge. Wait five full minutes between turning off the circuit breaker and removing the power supply from the module.

Software disable cards, if applicable, before they are removed or inserted.

Hardware disable cards, whenever there is an enable/disable switch, before they are removed or inserted.

- Return defective or heavily contaminated cards to a repair center; do not try to repair or clean them.

Data disks

Make sure disks are labeled with the software generic and issue number if you remove them from the system.

Follow the precautions below to avoid damaging disks:

- Handle only the hard surface of the disk; never touch the recording surface.
- Keep disks away from strong magnetic fields.
- Avoid exposing disks to extreme heat, rapid changes in temperature, or high humidity.
- Store disks in a suitable container.

Before installing a new disk do the following:

- Check the disk identification to make sure it is the correct disk. Compare software options with the data cartridge.
- Look for any damage to the disk.
- Make sure the arrow on the label is pointing up and the rounded corner on the disk is on the bottom (see Figure 2).

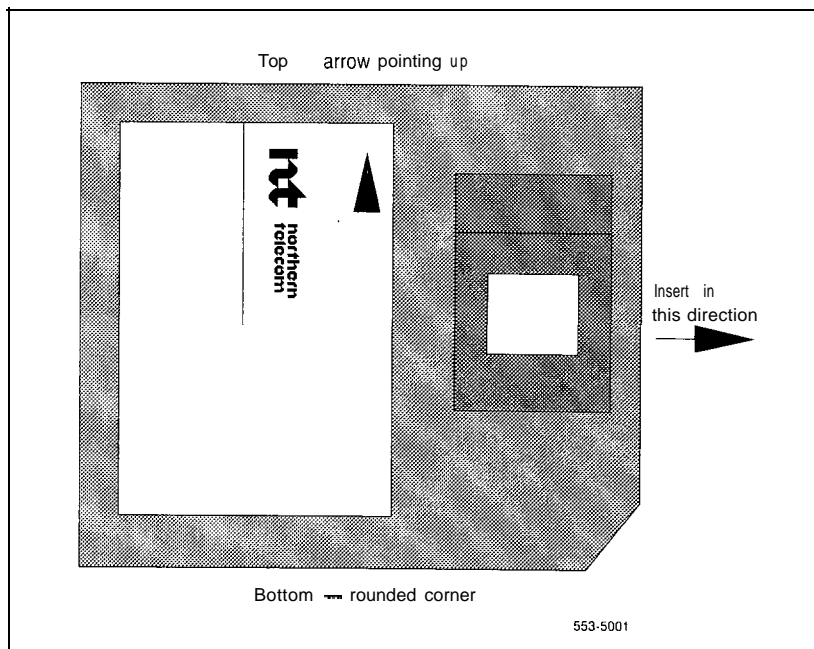
CAUTION

The disk drive can be damaged if an upside-down disk is forced into the slot. If there is significant resistance when you try to insert a disk, remove the disk and check the position.

For more detailed information on data disks, see *XI I software management* (553-3001-300).

Note: No maintenance or cleaning is required on the disk drives.

Figure 2
Disk position





Communicating with the system

You can exchange information with the system through system terminals and maintenance telephones. This chapter discusses these tools for communicating with the system.

Note: Before XI | release 19, only one device at a time can communicate with the system. Accessing a device while another is logged in will log out the device that was already connected. The Multi User Login feature, available with XI | release 19 and later, allows more than one device to interact with the Meridian 1. Refer to *XI | system management application (553-3001-301)* for details on using this feature.

System terminal

You can send maintenance commands and receive system messages (status and error messages) by accessing the central processing unit (CPU) through an RS-232 device, such as a video display terminal (VDT) or teletypewriter (TTY).

For most system options, only the code is displayed or printed when the CPU sends system messages. For the interpretation of the code and any required action, refer to the *XI | input/output guide (553-3001-400)*. Option 61 C and option 81 provide the code, a plain text explanation, and required actions.

Before XI | release 18, if the same data is printed on more than one port, the throughput of each port is equal to the speed of the slowest device. If, for example, a traffic report is printed on two ports, one configured for 9600 baud and the other for 300 baud, the effective throughput of both ports is 300 baud.

X11 release 18 and later provide enhanced I/O buffering (independent throughout). With this capability, devices with higher baud rates run faster than devices that are limited to slower speeds.

Message format

Through the system terminal, you can enter commands that tell the system to perform specific tasks; the system performs the tasks and sends messages back to the system terminal, indicating status or errors. System messages, along with indicators such as maintenance display codes and light emitting diode (LED) indicators, identify faults in the system.

System messages are codes with a mnemonic and number, such as PWRO014. The mnemonic identifies an overlay program or a type of message. The number identifies the specific message. Table 1 gives an example of the format for a system message.

Table 1
System message format

System message: PWRO014	Interpretation
PWR	This message (generated by the system monitor) indicates power and temperature status or failures.
0014	This message means the system monitor failed a self-test.

With option 61C and option 81, system messages generated from the Core Common Equipment Diagnostic (LD 135) and the Core Input/Output Diagnostic (LD 137) include the interpretation and any action required. For example, if a CPU test from LD 135 fails, the message displayed is "CCED200 CPU test failed Check the CP card."

See the *XII input/output guide* (553-3001-400) for a description of all maintenance commands and the interpretation of all system messages.

Local and remote access

A terminal or a modem must remain permanently connected to an SDI port in a network slot to provide a constant I/O interface to the system. Although only one device can communicate with the system at a time, many devices can be installed at local and remote locations.

When a system terminal is installed locally, it is connected directly to a serial data interface (SDI) card, located within a module. When a system terminal is installed at a remote location, modems (or data sets) and a telephone line are required between the terminal and the SDI card.

For a modem connection to the Meridian 1, Bell 103/212 compatible dumb modems are recommended for all systems, except options 61C and 81.

CAUTION

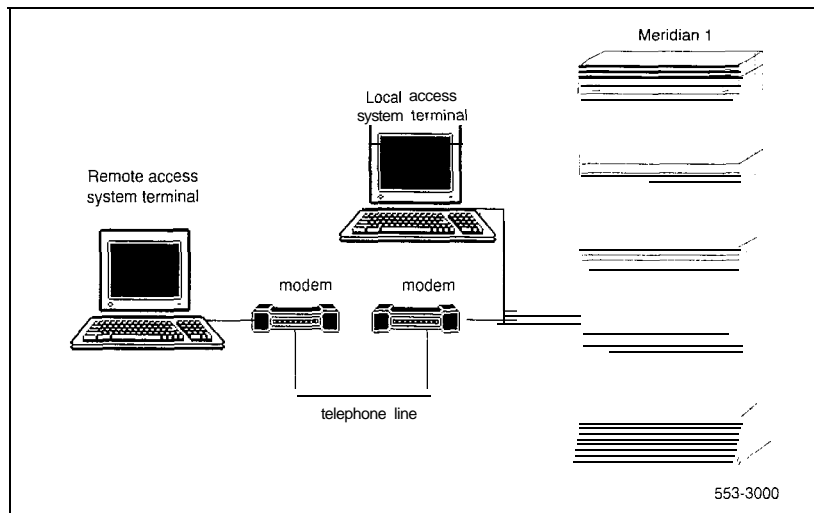
If a Hayes command-set compatible (smart) modem is used at the Meridian 1 end, you select the dumb mode of operation, Command Recognition OFF and Command Echo OFF, before connecting the modem to the SDI port. Refer to the modem instructions to set the mode of operation.

If a printer is connected to an SDI port (locally or remotely), you must disable XON/XOFF flow control so that no characters or signals are sent to the port, to avoid a “ping-pong” effect.

Figure 3 shows typical system terminal configurations. See “Access through the system terminal” in *Fault clearing* (553-3001-510) or *Hardware replacement* (553-3001-520) for the access procedure.

For information specific to option 61C and option 81, see “Options 61C and 81 terminal and modem guidelines” on page 12.

Figure 3
Local and remote access to a system terminal



Options 61C and 81 terminal and modem guidelines

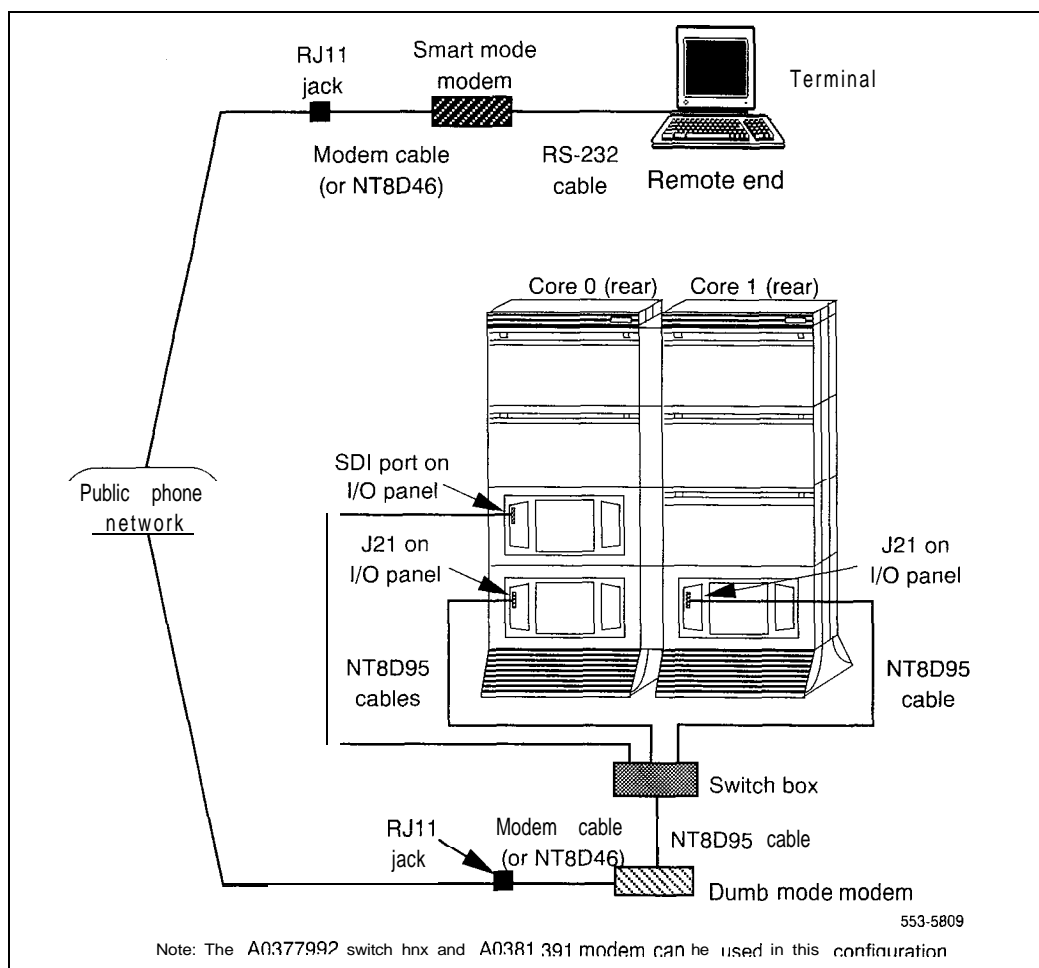
Each NT6D66 Call Processor (CP) Card provides a data terminal equipment (DTE) port at J21 and a data communication equipment (DCE) port at J25 on the Core and Core/Network Module I/O panel. The designations DTE and DCE refer to the function of the port, not the type of device that connects to the port. Therefore, a modem (which is DCE) connects to the DTE port at J21, and a terminal (which is DTE) connects to the DCE port at J25.

The input/output ports on the CP card (CPIO ports) are used for access to the Core or Core/Network Module, which houses the card. The CPIO ports are active only when the Core associated with the CP card is active. Therefore, the CPIO ports should not be used as the only I/O connection for the system.

Note: For correct operation, terminals used with options 61C and 81 must be set to 9600 baud, 7 data, space parity, one stop bit, full duplex, XON.

Figure 4 shows the recommended configuration for remote maintenance monitoring on option 81, which also applies to option 61 C. In this configuration, a switch box is normally set to the SDI port to remotely monitor general system operation. The CPIO ports can be accessed for debugging and patch downloading (through your Northern Telecom representative).

Figure 4
Modem to a switch box and SDI and CPIO ports



See “Options 61C and 81 terminal and modem connections” in *System installation procedures (553-3001-210)* for detailed information on configuring and connecting terminals and modems with options 61C and 81.

Note: The A0377992 Black Box ABCDE-Switch, A0381391 UDS FastTalk modem, and cables required for the configuration are available through Northern Telecom.

Modems must meet the following required specifications to be compatible with option 61C and option 81. Modems that meet the following recommended specifications must also meet the required specifications.

Required: true, not buffered, 9600 baud support (required for remote Northern Telecom technical support)

- *Required:* CCITT V.32 or V.32bis compliance
- *Recommended:* the ability to adjust to lower and higher speeds, depending on line quality, while maintaining 9600 baud at local DTE
- *Recommended:* V.42 error correction
- *Recommended:* V.42bis data compression

The following models have been tested and verified as compatible with option 61C and option 81:

- Hayes V-series ULTRA Smartmodem 9600
UDS FastTalk V.32/42b (available through Northern Telecom)
- US Robotics Courier HST Dual Standard V.32bis

A dispatch or call back modem, normally connected to the SDI port, can be used if it meets the requirements listed above. If you want to use a modem of this type that does not meet the requirements, the modem can only be used in addition to a modem that does meet specifications.

Maintenance telephone

A telephone functions as a maintenance telephone when you define the class of service as maintenance set allowed (MTA) in the Multi-line Telephone Administration program (LD1 1). A maintenance telephone allows you to send commands to the system through the following maintenance overlays: LD 30, LD 32, LD 33, LD 34, LD 35, LD 36, LD 37, LD 38, LD 41, LD 42, LD 43, LD 45, LD 46, LD 60, LD 61, and LD 62.

Note: The Core Common Equipment Diagnostic (LD 13.5) and Core I/O Diagnostic (LD 137) are among the overlays that cannot be accessed through a maintenance telephone.

You can test tones and outpulsing through the maintenance telephone. Specific commands for tone testing are given in the Tone and Digit Switch and Digitone Receiver Diagnostic (LD 34).

To enter commands on a maintenance telephone, you press the keys that correspond to the letters and numbers of the command (for example, to enter *LD 42 return*, key in *53#42##*). Table 2 shows the translation from a terminal keyboard to a telephone dial pad.

See "Access through the maintenance telephone" in *Fault clearing* (553-3001-510) or *Hardware replacement* (553-3001-520) for the access procedure.

Table 2
Translation from keyboard to dial pad

Keyboard				Dial pad
			1	1
A	B	C	2	2
D	E	F	3	3
G	H	I	4	4
J	K	L	5	5
M	N	O	6	6
P	R	S	7	7
T	U	V	8	8
W	X	Y	9	9
			0	0
			Space or #	#
			Return	##
			*	*

Note: There is no equivalent for Q or Z on a dial pad.

Routine maintenance

You must service batteries and air filters regularly. Follow the guidelines in this chapter to maintain batteries and air filters.

Pedestal air filter

There is an air filter in the pedestal of each column (in all options except 21A). Service the air filters once a month. For instructions on replacing the air filter. *see Hardware replacement (553-300 I-520).*

If an air filter is damaged in any way, discard it and install a new one. If a dirty air filter is not damaged, you can clean it with warm water and mild detergent. (Do not use compressed air because it may damage the filter.) When the filter is completely dry, you can reinsert it in the pedestal or store it as a spare.

Option 21 E battery pack assembly

An A0378252 Battery Pack Assembly on the NTND02 Misc/SDI/Peripheral Signaling (MSPS) Card is used in option 21 E. The battery is constantly recharged through a trickle charging circuit on the NTNDOI Integrated CPU/Memory (ICM) Card.

You can run a battery checking routine manually using the command BATT in the Common Equipment Diagnostic (LD35), or as part of the midnight routines. A battery failure generates system message CED503.

Replace the battery pack every three years, even if no battery failures have occurred. For instructions on replacing the battery pack assembly, *see Hardware replacement (553-300 I-520).*

18 Routine maintenance

DC-power battery systems

External batteries, often used with DC-powered systems, generally require regular visual inspections. They may also require charger or rectifier tests and pilot cell tests. Perform all inspections and tests according to the supplier's instructions.

To comply with safety requirements, consult the following articles before working with any battery systems:

- Read the “Material Safety Data Sheet” that must be posted to meet Occupational Safety and Health Administration (OSHA) requirements. This article outlines appropriate reserve battery handling procedures.
- Refer to National Electric Code 645-10. This article outlines requirements that call for the installation of AC- and DC-power kill switches to battery systems in certain environments.



Hardware maintenance tools

There are fault indicators and hardware features that help you perform maintenance tasks (particularly identifying and clearing faults). These maintenance tools include the following:

- circuit card features that include card level tests and status indicators
- CPU controls that allow you to control common equipment functions
- system alarms that categorize the severity of a system failure
- system monitor indicators that identify power and temperature faults

Circuit card features

Battery backup for CPU memory

The NTND02 MSPS Card, used in option 2 | E, is equipped with the A0378252 Battery Pack Assembly. If power to the system is lost, the battery retains CPU memory for up to 60 minutes.

Card test

A card test checks to see that a card is working correctly. Many cards perform a self-test on power-up. You can also force card-level tests through software commands.

Enable/disable switch

Some cards have a switch on the faceplate that enables or disables the hardware for that card.

When you remove a card, whenever possible disable the software, then disable the hardware by setting the switch to Dis.

Hardware disable a card (set the switch to Dis) before you install it. After the card is locked into position, set the switch to Enb then enable the software. Software disable and enable cards as described in the XI *I input/output guide (553-3001-400)*.

Figure 5 shows the typical location of an enable/disable (Enb/Dis) switch.

LED

Many cards have one or more light emitting diodes (LEDs) on the faceplate. The LED gives a visual indication of the status of the card or of a unit on a card.

When a *green* LED is steadily lit, it indicates the card is operating normally. When a green LED is off, it indicates the card is disabled or faulty.

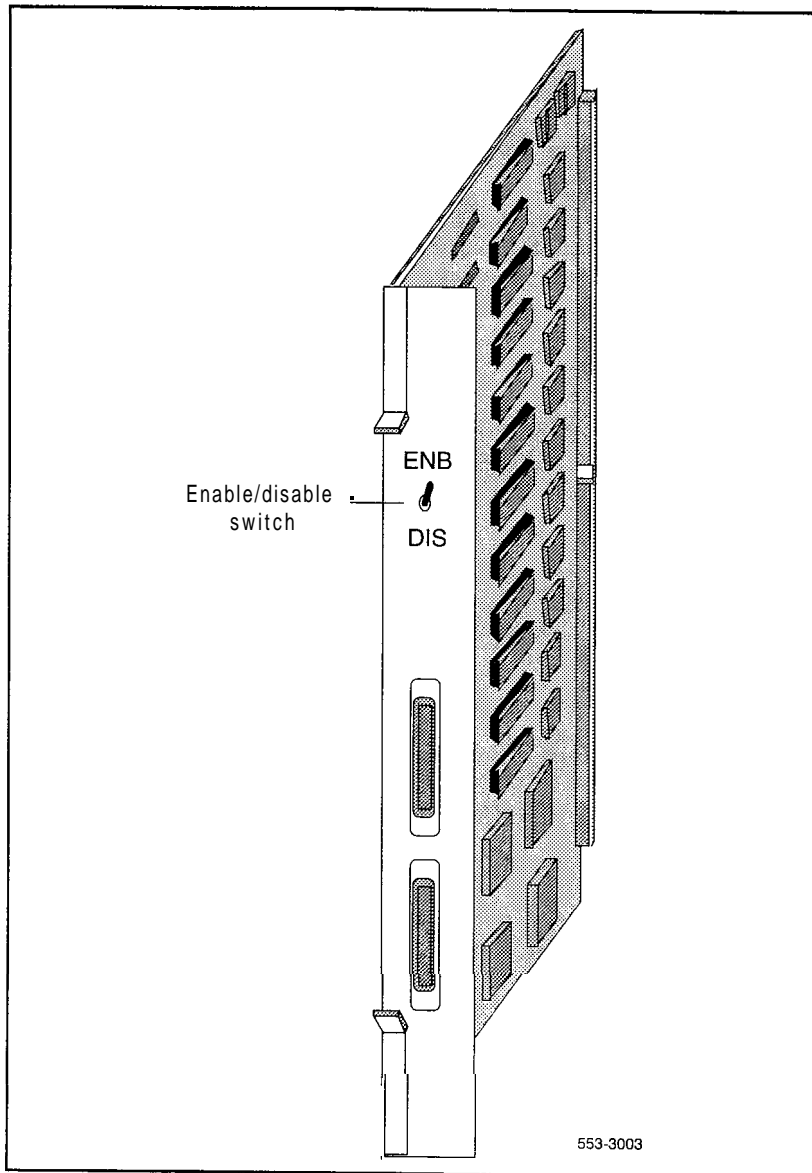
When a red LED is steadily lit, it indicates the card, or a unit on it, is disabled or faulty. When a red LED is off and power is available to the card, it indicates the card is operating normally.

Note 1: The shape of the LED (some are round and some are rectangular) does not indicate a different function.

Note 2: In option 61C and option 81, the red LEDs on the NT6D65 Core to Network Interface (CNI) Cards are lit when the associated Core is inactive. This is normal operation.

When intelligent peripheral cards are installed, the red LED on the faceplate remains lit for two to five seconds while a self-test runs. (The time required for the self-test depends on the type of card.) If the test is successful, the LED flashes three times and remains lit until the card's software is configured and enabled, and then the LED goes out. If the LED does not follow the pattern described or operates in any other manner (such as continually flashing or remaining weakly lit), the card should be replaced.

Figure 5
Sample enable/disable switch



22 Hardware maintenance tools

In option 61C and option 81, when Core common control cards are installed, a self-test runs. If the self-test is successful, the LED flashes three times, then goes out.

Table 3 gives two examples of LED indications.

Table 3
Sample LED indications

Type of card	LED color	Status
Common equipment power supply	green	LED lit = operation normal
Digital line card	red	LED lit = disabled

Figure 6 shows the location of the LED on the faceplate of an intelligent peripheral line card.

Maintenance display code

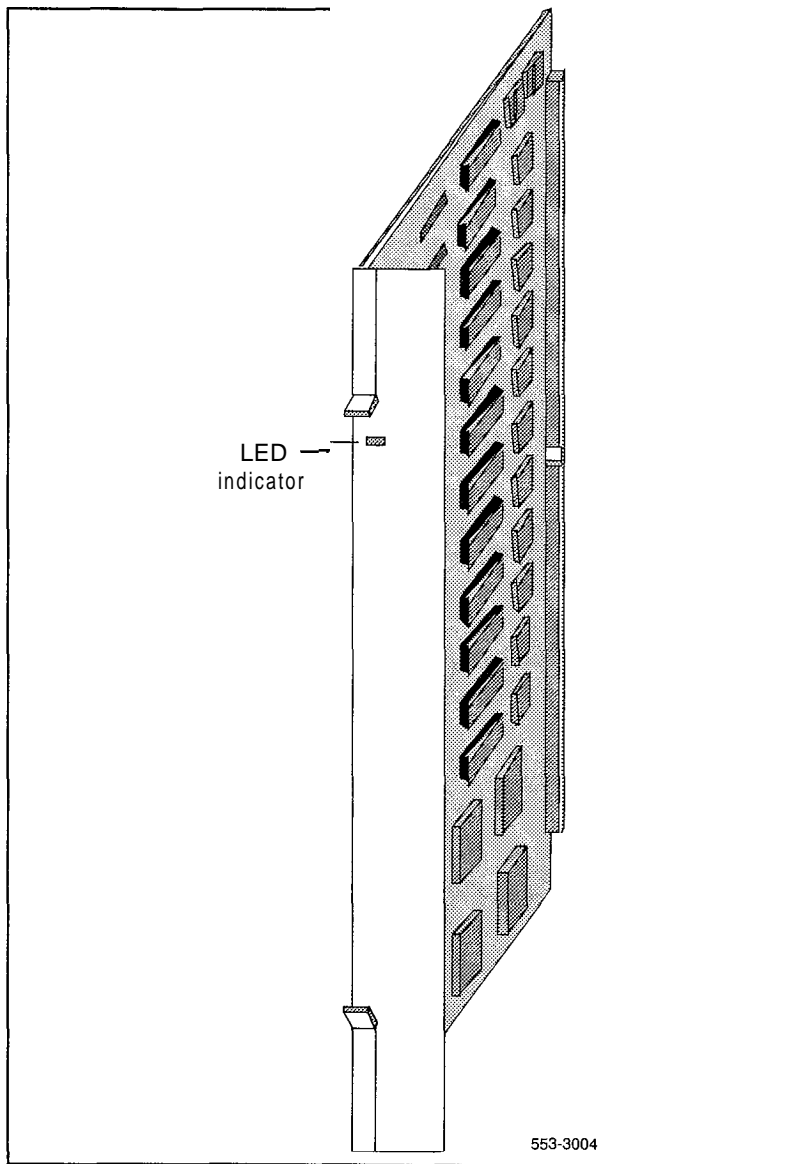
Maintenance displays are located on the faceplate of some circuit cards. A hexadecimal code is displayed. Interpretations of the maintenance display codes are listed under "HEX" in the *XI* (553-3001-400). You should examine previous codes, system messages, and visual indicators with any current maintenance display codes to properly analyze faults.

In option 61C and option 81, the maintenance display on the NT6D66 Call Processor (CP) Card shows two lines of information with up to 16 characters per line. The hexadecimal code and its definition are shown on the display.

Each new code shown on a maintenance display overwrites the one before it. However, note the following:

- All codes received on common equipment displays are recorded. You can review them by printing the History File.

Figure 6
Sample LED indicator



24 Hardware maintenance tools

The most recent 16 codes displayed on a controller card stay in memory. You can review them and reset the counter through the Network and Signaling Diagnostic (LD30).

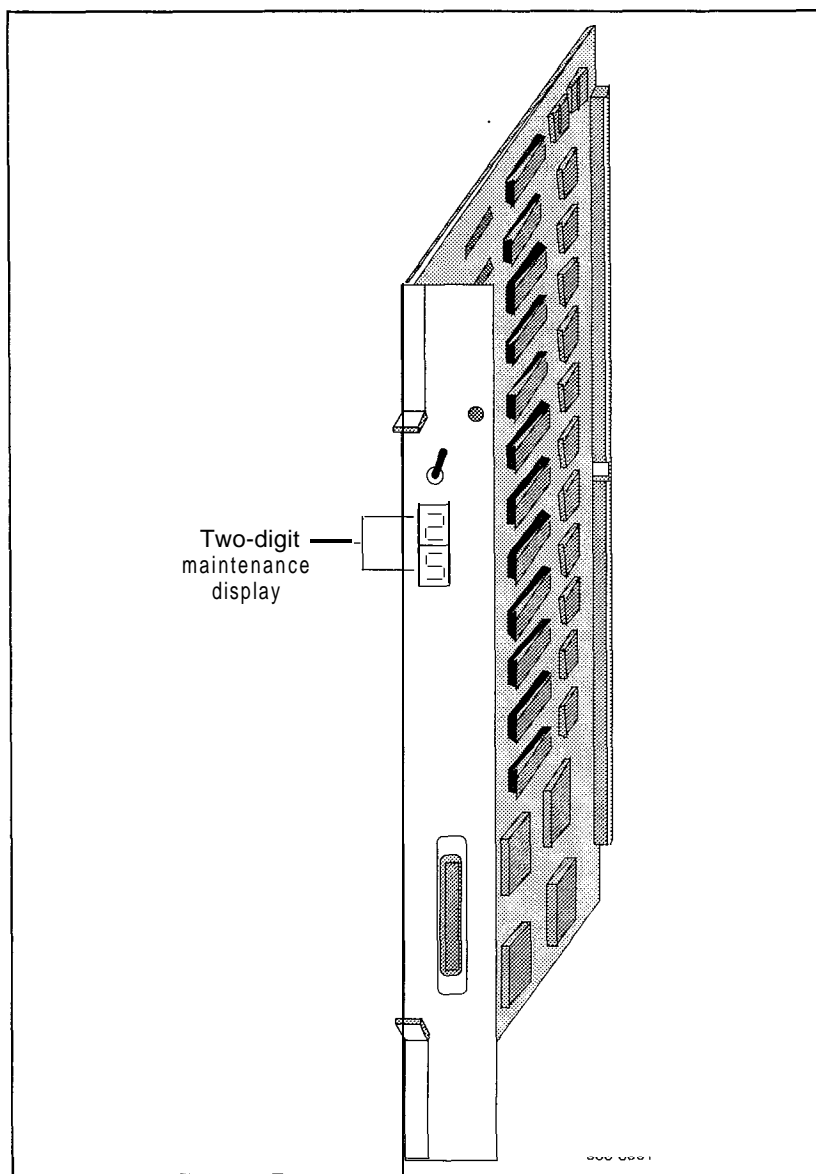
- In option 61C and option 81, the most recent 64 displays on a CP card stay in memory. You can review the displays on the active CP card through the Core Common Equipment Diagnostic (LD135).

Table 4 lists the cards with maintenance displays and the type of information the codes indicate on each card. Figure 7 shows the location of the maintenance display on the faceplate of a floppy disk interface card.

Table 4
Circuit cards with maintenance displays

System options	Circuit card	Display indication (for all related cards)
21A, 21	— NT8D19 Memory/Peripheral Signaling Card	Sysload (system reload) status Interrupt faults Memory faults
— 21E	— NTND01 ICM Card	Common equipment hardware faults
— 51, 61, 71	QPC580 CPU Interface Card	
61C, 81	— NT6D66 Call Processor Card	
— 21A, 21, 21E, 51, 61	— QPC742 Floppy Disk Interface Card	Faults on the disk drive unit Faults on the disk drive interface card
— 51, 61, 71	QPC584 Mass Storage Inter-face Card	
— 61C, 81	— NT6D63 I/O Processor Card	
21, 21E, 51, 61, 61C, 71, 81	— NT8D01 Controller Card	During normal operation, display shows self-test codes and port number on which controller clock is tracking

Figure 7
Sample maintenance display



CPU controls

Switches and buttons on common equipment cards allow you to control CPU activity and clear common equipment faults.

Initialize button

Pressing the manual initialize (Man Int) button associated with the active CPU starts the Initialize Program. The Initialize Program clears common equipment faults and then rebuilds call-dependent data and generates system messages indicating the status of the system. This process is called an initialization. Call processing is briefly interrupted during an initialization.

Manual initialize buttons are located on the following cards:

- In options 21A and 21, the initialize button is on the NT8D19 Memory/Peripheral Signaling Card.
- In option 21E, the initialize button is on the NTND01 ICM Card.
- In options 51, 61, and 71, the initialize button is on the QPC580 CPU Interface Card.
- In option 61 C and option 81, the initialize button is on the NT6D66 Call Processor (CP) Card.

Normal/maintenance switch

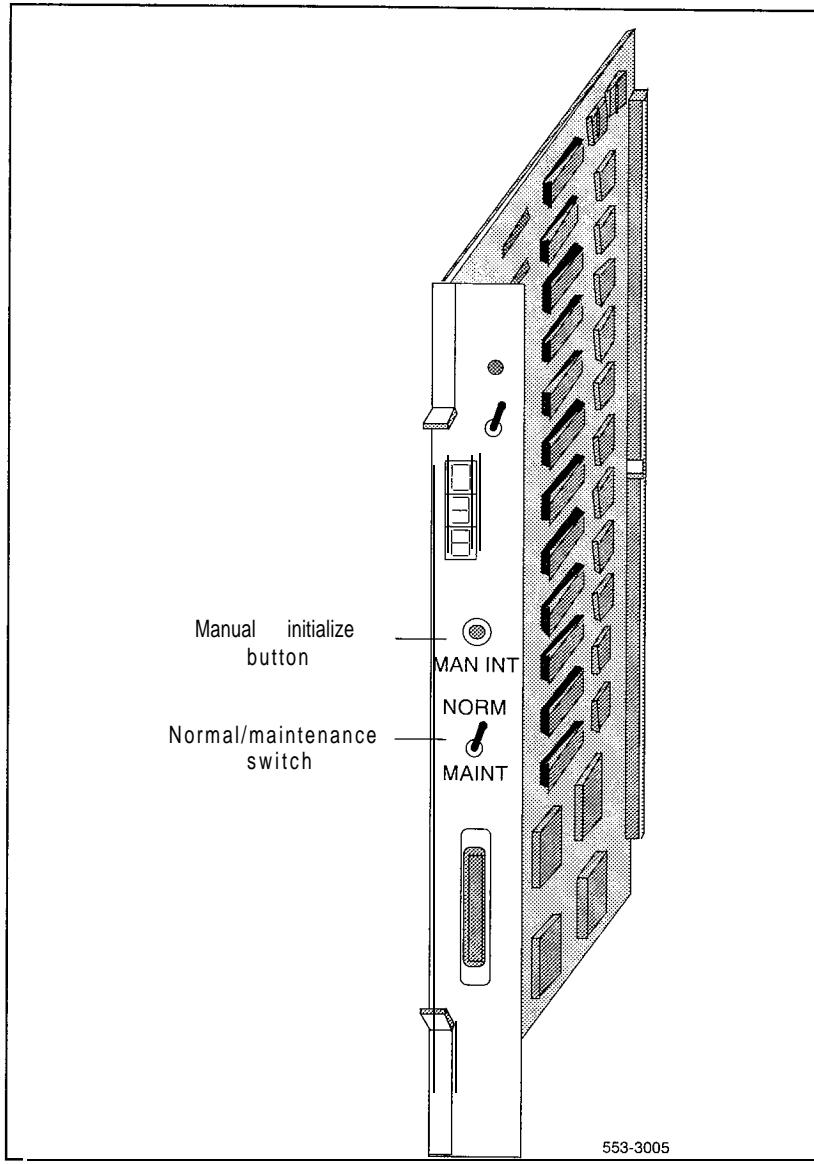
There is a normal/maintenance (Norm/Maint) switch on the QPC580 CPU Interface Card and the NT6D66 CP Card. In dual CPU systems (options 61, 61C, 71, and 81), you use this switch as follows to keep the dual CPUs from switching, or trying to switch, when you are testing or replacing common equipment hardware on the inactive CPU:

- On the CPU you are not testing or replacing, set the switch to Maint. This CPU will be *active*.
- On the CPU you are testing or replacing, set the switch to Norm. This CPU will remain *inactive* as long as the other CPU is set to Maint.

For regular operation in dual CPU systems, set both normal/maintenance switches to Norm. For option 51 (a single CPU system), set the switch to Maint.

Figure 8 shows the location of both the manual initialize button and the normal/maintenance switch on the QPC580 CPU Interface Card.

Figure 8
Manual initialize button and normal/maintenance switch on the CPU
interface card



Reload button

Reload (Rld or Man Rst) buttons allow you to manually activate the System Loader program. The System Loader initiates call processing and starts memory-checking diagnostics. This process is called a *sysload* or *system reload*. Here are the locations of the reload button for the various options:

- In options 21A and 21, the reload button is on the QPC687 CPU Card.
- In option 21 E, the reload button is on the NTND01 ICM Card.
- In option 51, the reload button is on the NTNDIO Changeover and Memory Arbitrator (CMA) Card (or QPC581 before X11 release 18).
- In options 61 and 71, the reload button is on the NTND10 (or QPC581) CMA Card. To start a sysload, you must simultaneously press the reload button on both CMA cards.
- In option 61 C and option 81, the reload button (Man Rst) is on the NT6D66 CP Cards. To start a sysload, you must simultaneously press the reload buttons on both CP cards.

Figure 9 shows the location of the reload button on a QPC581 CMA Card.

CAUTION

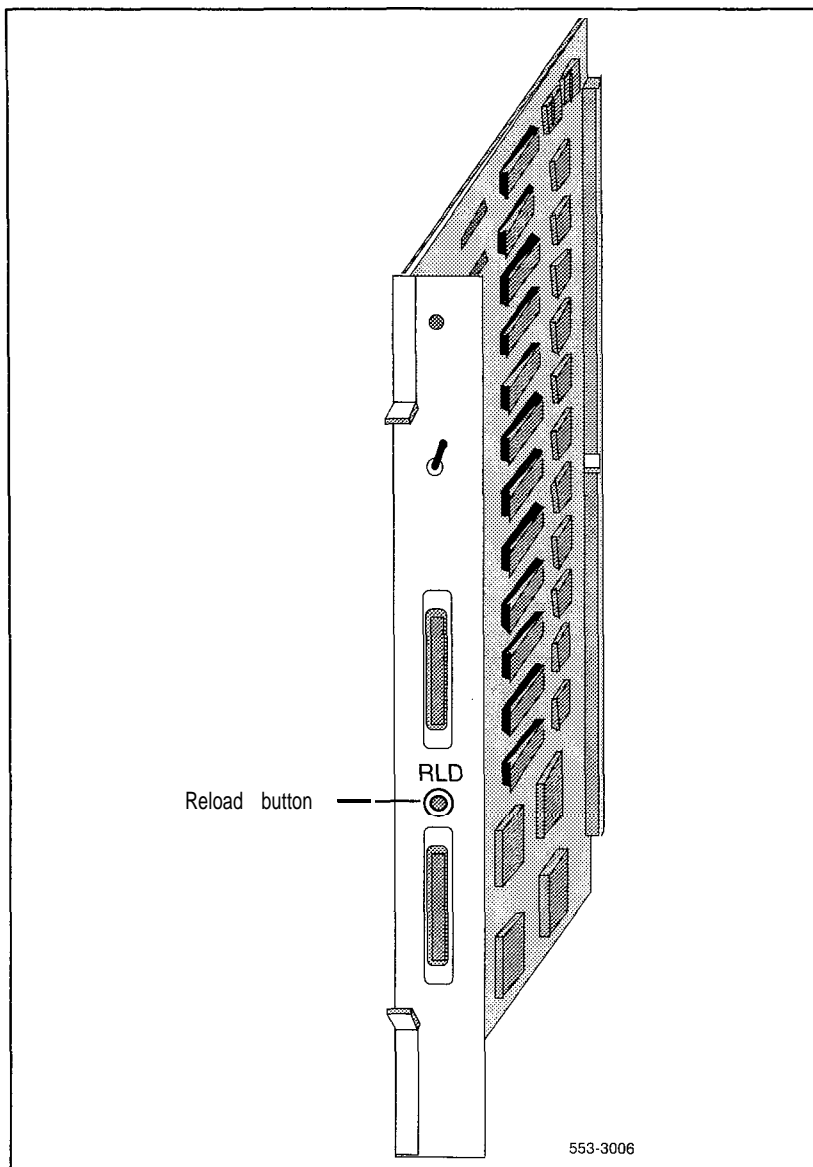
Active calls are disconnected and the system goes into an emergency line transfer state during a sysload. Use the reload button only if you are specifically instructed to do so in Northern Telecom Publications.

System alarms

System alarms are based on various fault monitors and indicators. The category of the alarm — major, minor, or remote — indicates the severity of the system failure:

- A major alarm requires immediate action by the technician.
- A minor alarm requires attention, but not necessarily immediate attention, by the technician.
- A remote alarm may require attention by the technician.

Figure 9
Reload button on the changeover and memory arbitrator card



Major alarms

A major alarm indicates a fault that seriously interferes with call processing. The following faults cause a major alarm:

- CPU or control bus failure
- disk system failure when attempting to load the system
- system power failure (without reserve power)
- temperature fault (excessive heat)

When there is a major alarm, the red LED at the top of the affected column lights. A major alarm also activates a display on all attendant consoles.

When a Meridian 1 is equipped with a power failure transfer unit, a major alarm causes designated 500/2500 telephones to connect directly to Central Office trunks; this is called a line transfer. Minor alarms

A minor alarm indicates the system hardware or software has detected a fault requiring attention. The following faults cause a minor alarm: Automatic identification of outward dial (AIOD) trunk failure

- conference failure
- digitone receiver failure
- memory failure
- more than one fault on different line and trunk cards in one shelf (indicated on affected customer's console only)
- network failure (indicated on affected customer's console only)
- peripheral signaling failure
- serial data interface failure
- tone and digit switch failure

A minor alarm displays an alarm on attendant consoles in customer groups affected by the fault. (A minor alarm indication on the console is an optional feature, enabled and disabled on a customer basis through data administration procedures.)

Remote alarms

A remote alarm is an optional extension of a major alarm to another location, such as a monitoring or test center, or to an indicator, such as a light or bell. When a major alarm occurs, the Meridian 1 provides relay contact closure across two remote alarm lines, **REMALMA** and **REMALMB**. These lines are extended to the main distribution frame (MDF) through the system monitor to MDF cable for customer use. The relay contacts are rated at 30 V dc and 2 amps. The **REMALMB** line is the return or ground for the **REMALMA** line. Northern Telecom does not extend remote alarm lines beyond the MDF.

System monitor indicators

The system monitor checks the column temperature, cooling system status, and system voltage status and controls line transfer states accordingly.

NT7D15 System Monitor

System option 21A is equipped with the NT7D15 System Monitor, which is a paddle board installed on the rear of the backplane. This system monitor performs the following:

- If the main circuit breaker in the system trips (for example, if there is a power surge or short circuit), the system monitor starts a line transfer and sends a remote alarm signal.
- If the temperature of the column reaches 70 degrees C (158 degrees F), the system monitor trips the main circuit breaker, starts a line transfer, and sends a remote alarm signal.
- If the power supply loses +5 volts, the system monitor starts a line transfer and sends a remote alarm signal.

If the power supply loses any voltage other than +5 volts, the system monitor lights the column LED, sends a major alarm indication to the CPU, and sends a remote alarm signal.

- If call processing stops, the system monitor lights the column LED and starts a line transfer.

Note: The NT7D15 System Monitor does not generate system messages.

When major system failures occur, the system monitor sends a remote alarm signal. As an option, an indicator, such as a bell or light, can be connected to the system monitor to receive the remote alarm signal.

NT8D22 System Monitor

System options 21, 21E, 51, 61, 61C, 71, and 81 are equipped with the NT8D22 System Monitor, which is installed in the rear of the pedestal in each column. Table 5 lists faults monitored by this system monitor.

Note: The NT8D15 System Monitor must be used in option 21A. In multiple-column systems, there is one master system monitor, located in the column with CPU 0, and multiple slave system monitors. A switch setting on each system monitor defines the master or the address of each slave.

Table 5
Faults monitored by the NT8D22 System Monitor

Power faults	Source
CPU condition	CPU failure Sysload (system reload)
Main power loss	System input power, AC or DC
Power supply failure	Common equipment power supply Common/peripheral equipment power supply Peripheral equipment power supply Ringing generator
Temperature alarm	Blower unit Column temperature sensors

The master system monitor checks the CPU column and periodically polls the slaves to check their status. When polled, the slaves report their status to the master. If a slave does not respond when it is polled, the master reports the address as a faulty slave.

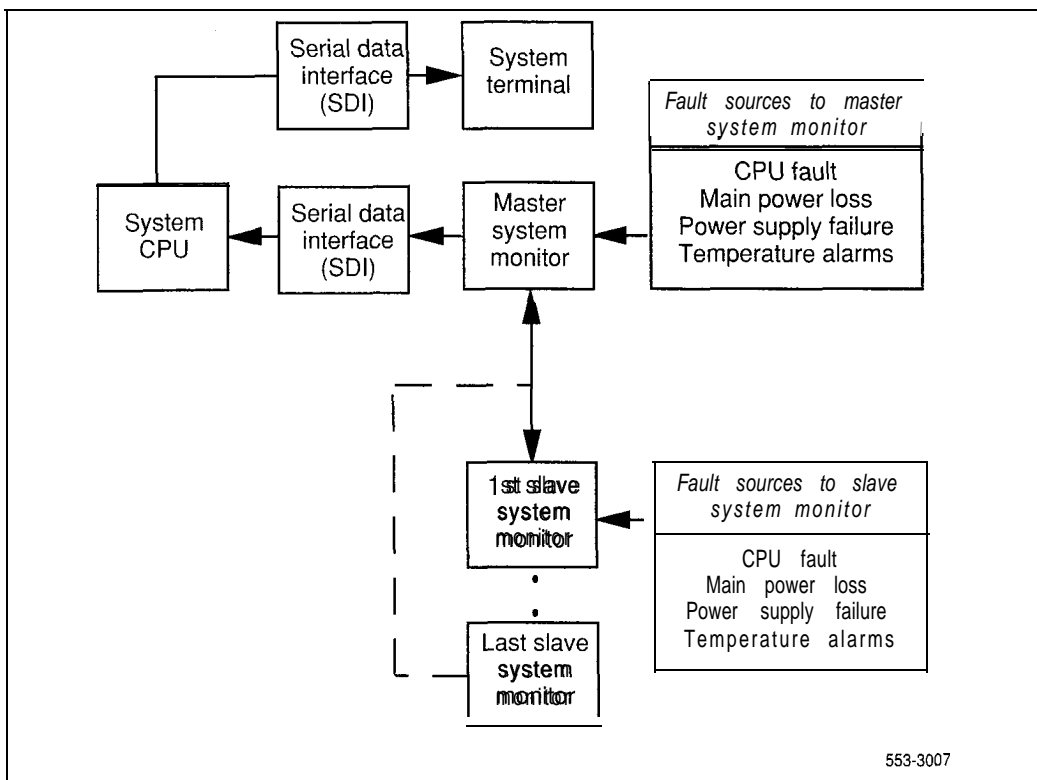
If a slave is removed, the master cannot communicate with higher addresses. Therefore, the master considers the removed slave and all slaves with a higher address as disabled. For example, if slave 2 is disabled, the master also reports slaves 3, 4, and up as disabled.

34 Hardware maintenance tools

The system monitor reports power equipment status and faults to the CPU. (Only the master system monitor communicates with the CPU.) System messages generated by the system monitor are identified by the mnemonic PWR. Figure 10 shows the flow of messages from NT8D22 System Monitors to the system terminal.

If there is a fault, the system monitor lights the LED on the affected column.

Figure 10
NT8D22 System Monitor message flow



Line transfer

As an option, you can connect one or more power failure transfer units (PFTUs) to the Meridian 1. Each PFTU connects up to eight designated 500/2500 telephones to Central Office trunks. If call processing stops, those 500/2500 telephones are transferred through the PFTU to the Central Office so that you still have outside connections. A line transfer occurs during the following situations:

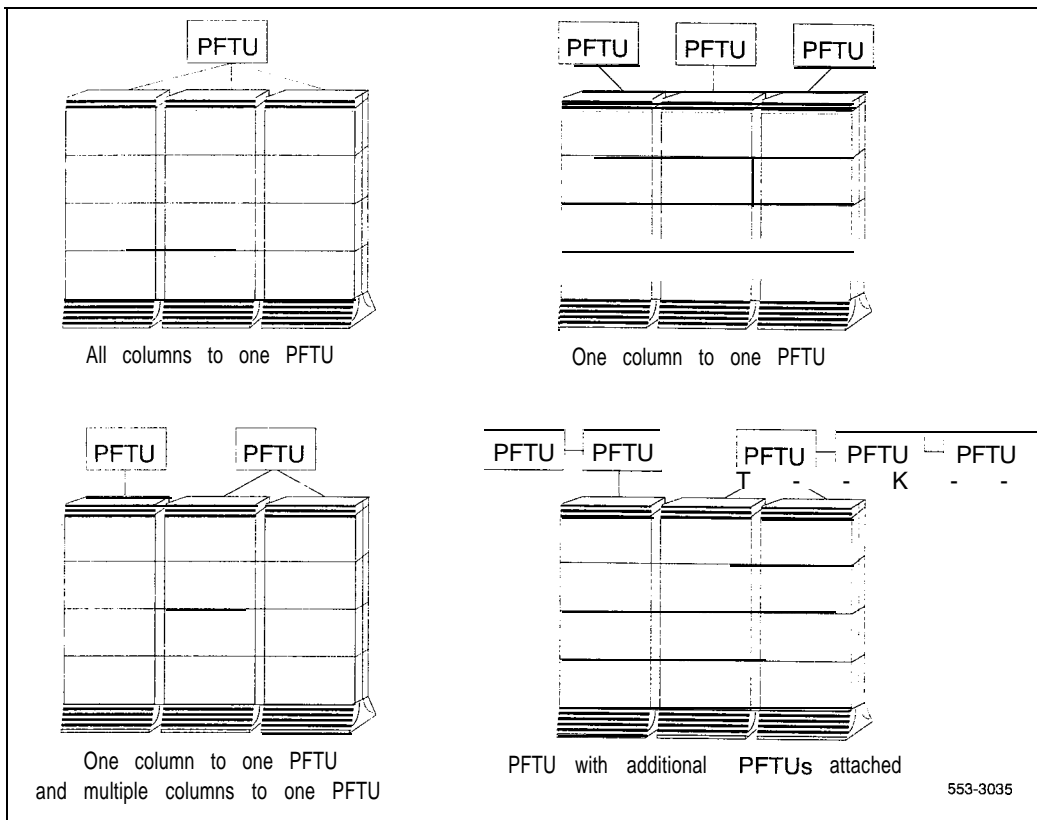
- during a sysload (system reload)
- if there is a major power failure in a DC-powered system (as detected by the TRIP signal)
- if call processing stops because of a CPU failure
- if there is a loss of power to the column
- if there is a loss of power to the PFTU
- if the temperature in a column is too high
- if a line transfer button on the attendant console is pressed (this applies on a customer basis)
- if a line transfer switch on the PFTU is turned on

Note: If position 4 on switch 1 (SW1) is set to OFF on a system monitor, that system monitor's column will not activate a line transfer if the temperature is too high.

Figure 11 shows four ways multiple-column systems and PFTUs can be configured. You can configure in the following ways:

- connect all the columns in a system to a single PFTU
- connect each column to an individual PFTU
- combine connecting individual columns to individual PFTUs and multiple columns to a single PFTU
- attach additional PFTUs to a PFTU that is connected to one or multiple columns

Figure 11
PFTU configurations



Main power loss

The system monitor receives status and control signals from the external power system. The system monitor then generates system messages that indicate the status of main and reserve power supplies.

You can connect a reserve (back-up) power supply to the Meridian 1: either an uninterruptible power supply (UPS) for AC-powered systems or reserve batteries for DC-powered systems. If the main source of external power is lost, power to the system is maintained by the UPS or reserve batteries.

If the main power supply is lost, the system monitor generates a major alarm. The NT8D22 System Monitor also generates system messages to indicate the system is running on reserve power.

Module power supply failure

There are four types of module power supplies:

- common equipment (CE) power supply
- common/peripheral equipment (CE/PE) power supply
- peripheral equipment (PE) power supply
- ringing generator

The NT8D22 System Monitor handles complete or partial failures in a module power supply as follows:

If the output voltage is higher than the threshold for +5 volts, the affected power supply shuts down, the column LED lights, and a system message is sent.

If the output voltage is higher than the threshold for other than +5 volts, power for only that voltage shuts down in the affected power supply, the column LED lights, and a system message is sent.

- If the output voltage is lower than the threshold for any voltage, power for only that voltage shuts down in the affected power supply, the column LED lights, and a system message is sent.
- If the input voltage is lower than the threshold, the affected power supply shuts down and then recovers when the input level recovers.

To help you pinpoint a power supply problem, the master NT8D22 System Monitor identifies the following:

- the column with the fault (system monitor O-63)
- the module (O-3) in that column
- the power supply unit (I-2) in the module

Figure 12 shows the power equipment designations in a column.

Temperature alarms

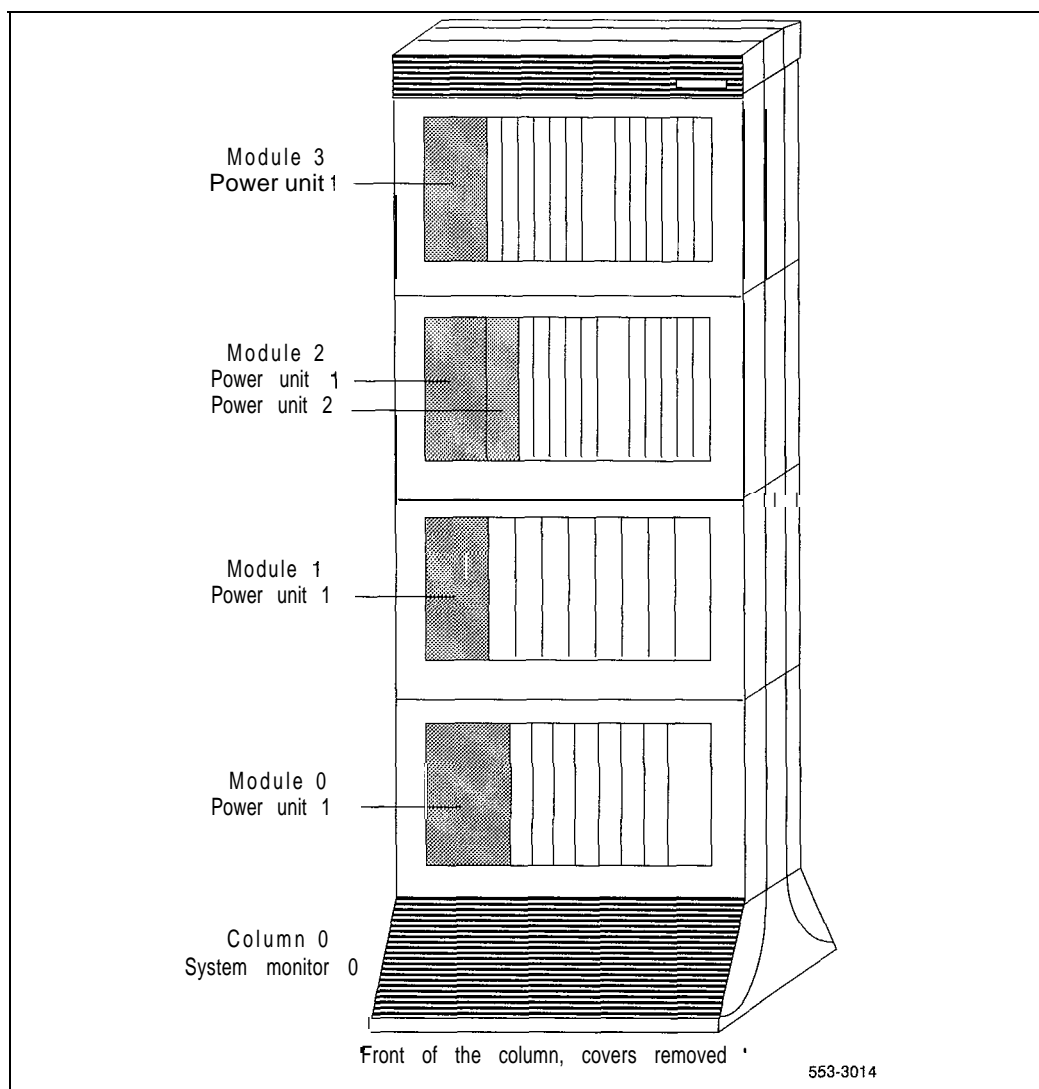
System option 21A has two fans in the top cap. If the temperature of the system exceeds 70 degrees C (158 degrees F), the NT7D15 System Monitor trips the main circuit breaker to prevent further overheating.

Each column in options 21, 21E, 51, 61, 61C, 71, and 81 is cooled by a blower unit (NT8D52AB with AC power or NT8D52DD with DC power) in the pedestal. All of these systems are equipped with the NT8D22 System Monitor, which performs the following functions:

- If there is a partial or complete failure in a blower unit, the system monitor lights the column LED and generates a system message.
- If the thermostats in a column report a temperature exceeding 70 degrees C (158 degrees F), the system monitor lights the column LED, generates a system message, then, providing this condition exists for 30 seconds, shuts down power to the column in 30 seconds.

The NT8D22 System Monitor generates a system message if the air leaving the column exceeds 55 degrees C (131 degrees F). This thermal alarm may indicate a loss of air-conditioning in the room, loss of ventilation in the column, a problem with the blower unit, or a blocked air filter.

Figure 12
Power equipment designations from the master NT8D22 System Monitor



40 Hardware maintenance tools

Software maintenance tools

Diagnostic programs

Note: See “Options 6 1 C and 8 1 features” on page 47 for information specific to option 6 1 C and option 8 1.

Diagnostic software programs monitor system operations, detect faults, and clear faults. Some programs run continuously; some are scheduled.

Diagnostic programs are *resident* or *non-resident*. Resident programs, such as the Error Monitor and Resident Trunk Diagnostic, are always present in system memory. Non-resident programs, such as the Input/Output Diagnostic and Common Equipment Diagnostic, are used as Midnight and Background Routines or for interactive diagnostics. Non-resident programs are loaded from the system disk and are run as scheduled or upon request.

Non-resident programs are called overlay programs or loads. They are identified by a title and a number preceded by the mnemonic for load (for example, Trunk Diagnostic-LD 36).

See the *XI 1 input/output guide* (553-300 I-400) for detailed information on all diagnostic programs.

Error Monitor

The Error Monitor is a resident program that continuously tracks call processing. The Error Monitor generates system messages if it detects invalid or incorrectly formatted call- processing information.

System messages generated by the Error Monitor are preceded by the mnemonic ERR, which usually indicates hardware faults, or the mnemonic BUG, which usually indicates software problems. With prompt ERRM in the Configuration Record (LD 17), you can instruct the system to print or not print ERR or BUG messages.

Initialize Program

The Initialize Program momentarily interrupts call processing as it clears common equipment faults. It then rebuilds call-dependent data and generates system messages, with the mnemonic INI, that indicate the status of the system. This process is called an *initialization*.

Through an initialization, you can download firmware from the CPU to superloop network cards and controller cards. Call processing is interrupted for an additional amount of time during this process.

You can activate an initialization by pressing the manual initialize (Man Int) button on the following:

- NT8D19 Memory/Peripheral Signaling Card in options 21A and 21
- NTND01 ICM Card in option 21E
- QPC580 CPU Interface Card in options 51, 61, and 71
- NT6D66 CP Card in option 61C and option 81

An initialization always occurs automatically after the System Loader program runs. An initialization often occurs when a software or firmware fault is detected and when a common equipment hardware fault is detected.

Midnight and Background Routines

In the Configuration Record (LD 17), you can select the overlay programs that will *run* in the *Midnight Routine* and *Background Routine*. These routines automatically perform maintenance checks. Programs included in the Midnight Routine are defined with the prompt DROL (derived from “daily routine overlay”). Programs included in the Background Routine are defined with the prompt BKGD.

Note: A memory test must be run once a day on options 21 and 21E. Therefore, the Common Equipment Diagnostic (LD 35) runs as part of the Midnight Routine even if it is not programmed.

The Midnight Routine runs once every 24 hours. This routine is preset to run at midnight when a system is shipped, but you may assign a different time in the Configuration Record. When it is time for the Midnight Routine to start, the system cancels any other program.

The Background Routine runs when no other program is loaded in the overlay area. The programs included in the Background Routine run in sequence repeatedly until the Midnight Routine runs or there is another request to use the overlay area (for example, if you log on to check the status of a circuit card).

You may include the programs listed in Table 6 in Midnight and Background Routines. Your maintenance requirements and the configuration of your system determine the programs you include in Midnight and Background Routines.

Note: Software Audit (LD 44) should always be used in the Background Routine.

Table 6
Programs used in Midnight and Background Routines

Program number	Program function
LD 30	Network and Signaling Diagnostic
LD 32 (Midnight only)	Network and Peripheral Equipment Replacement
LD 33	1.5 Mbyte Remote Peripheral Equipment Diagnostic
LD 34	Tone and Digit Switch and Digitone Receiver
LD 35 (see Note 1)	Common Equipment Diagnostic
LD 36	Trunk Diagnostic 1
LD 37 (see Note 1)	Input/Output Diagnostic
LD 38	Conference Circuit Diagnostic
LD 40	Call Detail Recording Diagnostic
LD 41	Trunk Diagnostic 2
LD 43 (Midnight only)	Data Dump (see Note 2)
LD 44	Software Audit
LD 45	Background Signal and Switching Diagnostic
LD 46	Multifrequency Sender Diagnostic for ANI
LD 60 (Midnight only)	Digital Trunk Interface Diagnostic
LD 61 (Midnight only)	Message Waiting Lamps Reset
<p>Note 1: For option 61 C and option 81, use LD 135 instead of LD 35. Use LD 137 and LD 37.</p> <p>Note 2: LD 43 will automatically be activated during midnight routines if changes have been made within the past 24 hour.</p>	

Overlay Loader

This resident program locates, loads, and checks all overlay programs. It automatically activates the Midnight and Background Routines. You can load programs manually by entering commands through the system terminal or maintenance telephone. Once the program is loaded, you see the program mnemonic (such as TRK for Trunk Diagnostic) on the system terminal.

You can also use the Overlay Loader to enable, disable, and display the status of the disk drive unit.

Overload Monitor

The system continuously monitors the volume of system messages. If it detects too many error messages are detected from a line or trunk card, the system activates the Overload Monitor program. The Overload Monitor disables the faulty card and generates system messages with the mnemonic OVD.

Resident Trunk Diagnostic

This program automatically monitors all trunk calls and records apparent faults on each trunk. If the number of faults on a trunk exceeds the threshold for that trunk, the program generates a system message identifying the trunk and the type of fault.

A failure on a trunk may keep the trunk from detecting incoming calls. The threshold mechanism cannot detect such a failure, so this program also records how many days it has been since each trunk received an incoming call. If you suspect some incoming calls are not being processed, you can use the command LMAX in Trunk Diagnostic 1 (LD 36) to identify the trunk with the maximum idle days.

System Loader

The System Loader program loads all call-processing programs and data, and starts memory-checking diagnostics. After all required programs and data have been loaded and all checks performed, the System Loader is erased from system memory, the Initialize Program runs, and normal call processing begins. This process is called a *system reload*.

The System Loader operates automatically on system power up or if a common equipment or power fault destroys information in the system memory. For maintenance purposes, you generally activate this program only if call processing has stopped.

You can start a sysload manually by pressing the reload (Rld) button on the following:

- QPC687 CPU Card in options 21A and 21
- NTND01 ICM Card in option 21E
- NTND10 (or QPC581) CMA Card in options 51, 61, and 71
(simultaneously press both buttons in options 61 and 71)
- NT6D66 CP Card in option 61C and option 81 (simultaneously press both buttons)

Note: The system loses the time and date during a sysload (except on option 61C and option 81). You should reset the time and date using LD02.

CAUTION

Active calls are disconnected and the system goes into an emergency line transfer state during a sysload. Activate the System Loader only if you are specifically instructed to do so in Northern Telecom Publications.

To minimize sysload time, you can enable the Short Memory Test capability in LD 17 (prompt SMEM). If you enable the test, only one pass of memory testing is performed on a normal reload. If any subsequent system failure causes an automatic reload, the full six-pass Memory Test is performed on all system memory.

Note: A sysload completes so quickly on option 61C and option 81 that the Short Memory Test is not useful. Therefore, the package was not designed to be compatible with options 61C and 81.



Options 61C and 81 features

When option 61C and option 81 receive a system reload signal, the sysload occurs in two to five minutes, depending on the size of the customer database. During the sysload, option 61 C and option 81 perform a core shelf test, which includes self-tests on the CP and IOP cards. The results of the self-tests are displayed on the liquid crystal display (LCD) on the CP card, the hex display on the IOP card, and the system terminal. On the other Core cards, the LED blinks three times after a successful test.

Options 61C and 81 typically performs an initialization in under 90 seconds. You can manually initialize only the active core side.

In option 61C and option 81, the overlays reside in dynamic random access memory (DRAM) after they are loaded from the hard disk during an initial software load (software is shipped on redundant hard disks). Since they are always in resident memory, the overlays can be loaded quickly.

Option 61C and option 81 can diagnose faults in field replaceable units for all Core hardware, including cables. In case of a failure, a message in a natural language (such as English) appears on the system terminal and on the liquid crystal display (LCD) on the CP card.

If there is a hardware fault, the system attempts a recovery. In the case of a redundant hardware failure, under certain conditions option 61C and option 81 will attempt a graceful switchover to the core side without the failure.

Option 61C and option 81 remote operation capabilities include remote access to both Core Modules, the ability to sysload, initialize, or put the system in a split mode, and the ability to upload and download the customer database. You can access the core complex in each Core Module through the I/O ports on the CP cards.

The History File feature

If you have a printer connected to the system, each system message is printed as it is received. If you do not have a printer connected, you can use the History File to store a limited number of system messages in protected memory. The contents of the file may then be printed on demand using Print Routine 3 (LD 22).

The messages stored are specified on a system basis and can be one or more of the following types:

- customer service changes (CSC)
- maintenance messages (MTC)
- service changes (SCH)
- software errors (BUG)
- initialization and sysload messages (INI and SYS)
- traffic messages (TRF)

For information on selecting the messages to be stored, *see XI 1 features and services* (553-3001-305).

The contents of the History File are erased during a sysload or if you change the History File's length. However, because the History File is located in protected data store, the contents survive an initialization.

You can change the length of the History File with the prompt HIST in the Configuration Record (LD 17). The maximum length of the file depends on the amount of protected data store available, which in turn depends on the number of system features that require protected data store.

If the History File is full, the first messages stored are replaced by incoming messages. If this happens, the system gives a "file overflow" message at the start of a printout so you know some information has been replaced by newer messages.

Interactive diagnostics

You can load overlay programs, including programs called *maintenance routines*, into memory through the system terminal or maintenance telephone. This function is performed by the Overload Loader program.

Note: The programs used in Midnight and Background Routines are also used manually as interactive diagnostic programs (see Table 6).

Maintenance routines are used interactively with a command/response format. In this format, you enter a command that tells the system to perform a specific task. The system performs the task and sends system messages indicating the status or errors back to you.

With interactive diagnostics you can do the following:

- disable, test, and enable specific equipment
- verify that a reported fault still needs to be cleared
- verify that a repair procedure has cleared a fault

All maintenance programs, commands, and system messages are described in detail in the *X11 input/output guide* (553-3001-400).

The Enhanced Maintenance feature

System software sometimes requires modifications, called *patches*, provided by Northern Telecom Technical Assistance Centers. The command ISS in Print Routine 3 (LD 22) prints the software generic and issue. A plus sign (+) by the issue number means a patch is in service.

The Enhanced Maintenance feature does the following:

- allows patches to automatically survive a sysload
- permits patches on non-resident programs
- records all patches in the system
- allows data disks to be shipped with pre-loaded patches

If there is a problem with a patch, the CPU sends system messages with the mnemonic EHM to the system terminal or the History File.

Manual continuity tests

You can perform manual continuity tests on superloop network cards, intelligent peripheral equipment, and Basic Rate Interface (BRI) equipment. A continuity test generates a signaling pattern at one point, monitors its progress, and checks for its detection at an end point. For example, when a superloop network card sends a signal to a controller card, the continuity test verifies the following:

- the superloop network card sent the signal
- the loop carried the signal to the controller card
- the controller card received the signal

In a point-to-point continuity test, a superloop network card or a controller card can generate or detect the test pattern. In **loopback** tests, one card, a superloop network card, a controller card, or a multi-purpose ISDN signaling processor (MISP) card, is both the generator and the detector. Only idle timeslots are tested in any of the continuity tests.

There are two types of **loopback** tests for BRI equipment. In one type of test, the pattern generated by the MISP card loops back through the digital subscriber loop (DSL) interface. In the other type of test, the pattern generated by the MISP card loops back through an S/T-interface line card (SILC) or a U-interface line card (UILC), depending on which is specified. Both types of test are accessed as Test 9, but responses to the series of prompts for Test 9 determine the **loopback** point.

Fifteen continuity tests can run simultaneously. When a test is completed, it stops, the **status** is reported, and the other tests continue running. You can check the **status** of any test at any time. When all the tests end, the number of tests run and any failed tests are reported to the CPU. You can display the results at any time during the procedure.

There are nine continuity test configurations. You can run each test by entering a set of prompts outlined in the Background Signaling and Switching Diagnostic (LD 45). Figure 13 shows point-to-point configurations. Figure 14 shows **loopback** configurations.

Figure 13
Manual continuity tests: point-to-point configurations

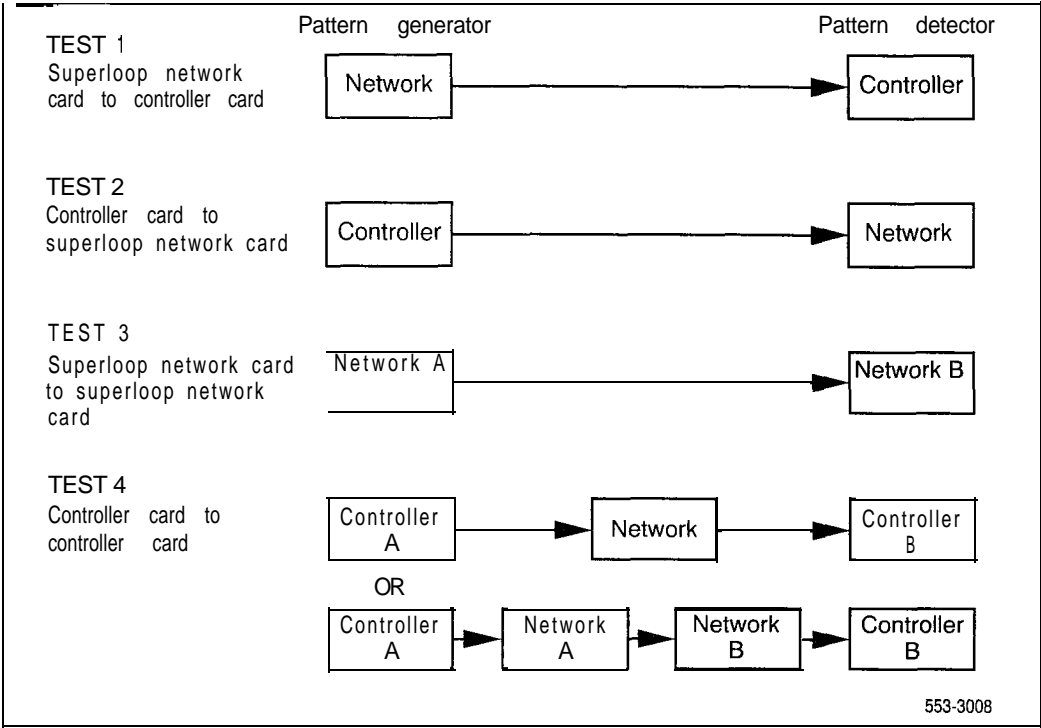
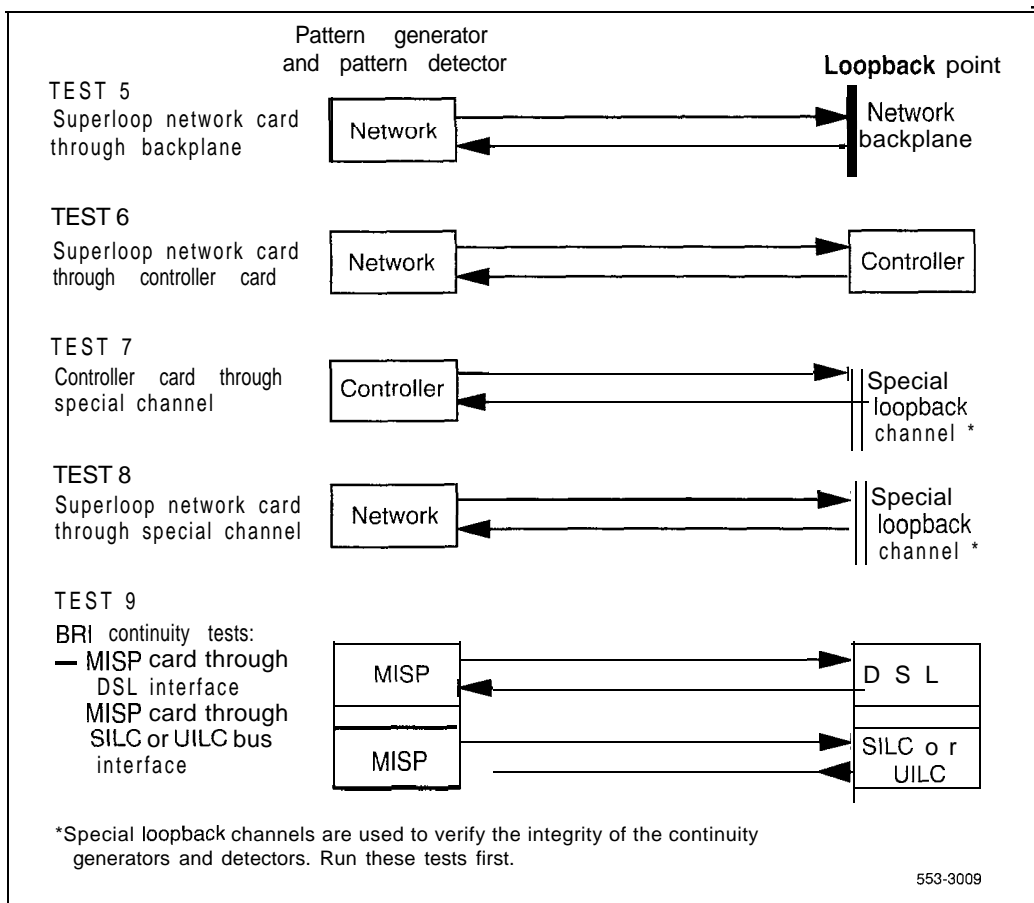


Figure 14
Manual continuity tests: **loopback** configurations



User reports

Reports from system users often tell you about problems that the system may not indicate. Many faults reported by users, such as a damaged telephone or data set, are obvious and can be fixed by replacing the damaged equipment.

Some faults are less obvious and may be caused by other equipment, such as a defective peripheral equipment line or trunk card. To classify the fault in these cases, check for system messages and visual fault indications. You may also need to have the user reproduce the problem so you can determine the sequence of events that led to the fault.

Table 7 lists problems users typically report.

54 User reports

Table 7
User report indications

User report	Type of fault
Major alarm reported by attendant No ring on 500/2500 telephones	Power
Major alarm reported by attendant	Common equipment
Minor alarm reported by attendant Users cannot transfer or conference Users cannot dial out on 500/2500 telephones	Network equipment
Trouble with calls on attendant console Trouble with calls on 500/2500 telephones Trouble with calls on SL-1, MI 000, or digital telephones	Peripheral equipment
Users have trouble with a specific trunk Callers report continuous ringing Trouble with calls on console or telephones, or both	Trunk
Trouble with calls Trouble with equipment (such as handset, headset, or display)	Attendant console
Trouble with calls Trouble with equipment (such as handset or add-on module)	Telephone

Technical assistance service

Northern Telecom provides technical assistance in resolving system problems. To access a Technical Assistance Center, contact your Northern Telecom representative. Services available include the following:

- diagnosing and resolving software problems not covered by support documentation
- diagnosing and resolving hardware problems not covered by support documentation
- assisting in diagnosing and resolving problems caused by local conditions

Several types of class-of-service are available. Emergency requests (Class E1 and E2) receive an immediate response. Service for emergency requests is continuous until normal system operation is restored. Non-emergency requests (Class S 1, S2, and NS) are serviced during normal working hours. Service classifications are described further in Tables 8 and 9.

Except as excluded by the provisions of warranty or other agreements with Northern Telecom, a fee for technical assistance may be charged, at rates established by Northern Telecom. Information on rates and conditions for services are available through Northern Telecom representatives.

Collect the information listed in Table 10 before you call for service.

56 Technical assistance service

Table 8
 Technical service emergency classifications

Class	Degree of failure	Symptoms
E1	Major failure causing system degradation or outage	System out of service with complete loss of call-processing capability Loss of total attendant console capability Loss of incoming or outgoing call capability Loss of auxiliary Call Detail Recording (CDR) in resale application Call processing degraded for reasons such as: <ul style="list-style-type: none"> — trunk group out of service — 10% or more lines out of service — frequent initializations (seven per day or more) — inability to recover from initialization or sysload — consistently slow dial tone (eight seconds or more delay)
E2	Major failure causing potential system degradation or outage	Standby CPU out of service Frequent initializations (one per day or more) Disk drive failure Two sets of disks inoperative

Table 9
 Technical service non-emergency **classifications**

Class	Degree of failure	Symptoms
S1	Failure that affects service	Software or hardware trouble directly and continuously affecting user's service or customer's ability to collect revenue Problem that will seriously affect service at in-service or cut-over date
s 2	Intermittent failure that affects service	Software or hardware faults that only intermittently affect service System-related documentation errors that directly result in or lead to impaired service
NS	Failure that does not affect service	Documentation errors Software inconsistencies that do not affect service Hardware diagnostic failures (not defined above) that cannot be corrected by resident skills Test equipment failures for which a back-up or manual alternative can be used Any questions concerning products

58 Technical assistance service

Table 10
Checklist for service requests

Name of person requesting service	_____
Company represented	_____
Telephone number	_____
System option number/identification	_____
System serial number	_____
Installed software generic and issue (located on data disk)	_____
Modem telephone number and password (if applicable)	_____
Request classification (see Tables 8 and 9)	_____
Description of assistance required	_____
_____	_____
_____	_____

11/11/11



SL-1

Meridian 1

General maintenance information

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Release 8.0

Standard

April 1, 1994

Printed in the U.S.A.



SL-1

Meridian 1

Fault clearing

Publication number: 553-3001-510
Document release: 5.0
Document status: Standard
Date: April 1, 1994

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Revision history

January 29, 1990

Standard. release 1.0.

February 28, 1990

Standard. release 2.0.

December 1, 1991

Standard, release 3.0. This document is reissued to include technical content updates. Due to the extent of the changes, revision bars are not used.

December 31, 1992

Standard. release 4.0. This document is reissued to include hardware required for XI release 18 (option 8 I is not included in this release). Changes are indicated by revision marks in the margins.

April 1, 1994

Standard, release 5.0. This document is reissued to include information on Meridian options 61 C and 8 I. Changes are indicated by revision marks in the margins.

Contents

About this document	1
References	1
How to clear faults	3
Fault clearing process	3
Using this document	4
Fault indicators	6
System messages	6
Visual fault indicators	8
Maintenance display codes	9
User reports	10
Accessing the system.	13
Access through the system terminal	13
Access through the maintenance telephone	15
Clearing power faults	19
Powerfaults	20
Fault clearing procedures	24
Main circuit breaker and all LEDs off (option 21 A)	27
Main circuit breaker on but all LEDs off (option 21 A)	28
Green LED off on module power supply (option 21 A)	29
Circuit breakers and all column LEDs off (DC power)	30
Circuit breakers on but all column LEDs off (DC power)	32

Green LED off on module power supply (DC power)	33
Defective blower unit indicated (DC power)	35
Main circuit breaker and all column LEDs off (AC power)	36
Main circuit breaker on but all column LEDs off (AC power)	38
Breaker off on MPDU (AC power)	39
Green LED off on module power supply (AC power)	41
Defective blower unit indicated (AC power)	43
Clearing common equipment faults	45
Common equipment faults	46
Fault clearing procedures	47
Call processing stopped (options 21A and 21)	49
Call processing stopped (option 21 E)	51
Fault indicated on memory/peripheral signaling card (options 21A and 21)	53
Fault indicated on MSPS card (option 21E)	54
Fault indicated on the CPU card (options 21A and 21)	55
Fault indicated on the ICM card (option 21E)	57
Call processing stopped (option 5 1)	59
Fault indicated on memory card (option 51)	62
Fault indicated on a common equipment card (option 51)	64
Call processing stopped (options 61 and 71)	67
Fault indicated on a memory card (options 61 and 71)	70
Fault indicated on a common equipment card (options 61 and 71)	73
Fault indicated on a common equipment card (options 61C and 81)	76
Floppy disk unit not operating	79
Multi Disk Unit not operating	80
Core Multi Disk Unit not operating	82

Clearing network equipment faults	85
Network equipment faults	86
Fault clearing procedures	87
Disabled loop indicated by OVD message (NT8D04 Superloop Network Card)	89
Loop disabled without OVD message (NT8D04 Superloop Network Card)	91
Disabled loop indicated by OVD message (QPC414 Network Card)	94
Loop disabled without OVD message (QPC414 Network Card)	97
Disabled peripheral signaling card indicated by OVD message	100
Peripheral signaling card disabled without OVD message	102
Problems with transferring, placing conference calls, or Music-on-Hold	104
Problems placing calls on 2500 telephones and some trunks	106
Clearing peripheral equipment faults	109
Peripheral equipment faults	110
Fault clearing procedures	110
Red LED lit on controller card	112
Red LED lit on dual loop peripheral buffer card	114
Disabled peripheral equipment card	116
More than one peripheral equipment card disabled	118
Clearing trunk faults	121
Trunk faults	122
Fault clearing procedures	123
Trunk cannot make or receive calls (OVD message received)	124
Trunk cannot make or receive calls (no OVD message)	127

Clearing attendant console faults	129
Attendant console faults	130
Fault clearing procedures	131
Console cannot make or receive calls (OVD message received)	132
Console cannot make or receive calls (no OVD message)	134
Indicator or digit display not functioning properly	136
Operator cannot hear or be heard properly	138
Clearing telephone faults.	141
Telephone faults	142
Fault clearing procedures	143
Telephone cannot make or receive calls (OVD message received) ...	144
Telephone cannot make or receive calls (no OVD message)	146
One end cannot hear or be heard	148
Noise or low volume on all calls	150
Defective indicator, digit display, or component	152
Defective feature	154
Defective add-on module	155
Cannot dial from 2500 telephone	156
No ring on 500 and 2500 telephones	158
Final maintenance procedure	161
Introduction	161
List of terms	163

List of figures

Figure 1		
Power equipment -- option 21A	.....	1
Figure 2		
Internal DC power equipment	C	power equipment
Figure 3		
Internal AC power equipment (except option 21A)	.....	23
Figure 4		
Power equipment designations		25
Figure 5		
Option 21A power cabling in rear of column	.....	29
Figure 6		
DC power cabling in rear of column	.....	34
Figure 7		
Dual circuit breaker and associated module power supplies		40
Figure 8		
AC power cabling in rear of column	.....	42



List of tables

Table 1	Using fault indicators to classify a fault . . .	5
Table 2	System message fault indicators and related fault types	6
Table 3	Visual fault indicators and related fault types	8
Table 4	Maintenance display locations and related fault types .	9
Table 5	User reported problems and related fault types	11
Table 6	Translation from keyboard to telephone dial pad . .	16
Table 7	P W R m e s s a g e f i e l d s	24
Table 8	Power fault indicators	26
Table 9	Common equipment fault indicators	4X
Table 10	Network equipment fault indicators	88
Table 11	Peripheral equipment fault indicators	111
Table 12	T r u n k fault indicators	123

Table 13	
Attendant console fault indicators	131
Table 14	
Telephone fault indicators	133



About this document

This document gives instructions for locating and clearing faults. The procedures in this document are based on the assumption that the Meridian 1 is properly installed (for example, all card locations, option switch settings, and cable connections are correct) and was fully operational before the fault.

To use this document, you should have a basic knowledge of Meridian 1 operation and maintenance. (Contact Northern Telecom Training Centers for information on courses.) You should also read and fully understand *General maintenance information* (553-3001-500) before attempting to clear faults.

This document does not provide procedures for replacing equipment. See *Hardware replacement* (553-3001-520) to replace faulty equipment.

References

See the *Meridian 1 planning and engineering guide* for:

- *System overview* (553-3001-100)
- *Spares planning* (553-3001-153)
- *Equipment identification* (553-3001-154)

See the *Meridian 1 installation and maintenance guide* for:

- *System installation procedures* (553-3001-210)
 - *Circuit card installation and testing* (553-3001-211)
- *Telephone and attendant console installation* (553-3001-215)
- *General maintenance information* (553-3001-500)
- *Hardware replacement* (553-3001-520)

See the *XI 1 input/output guide* (553-3001-400) for a description of all administration programs, maintenance programs, and system messages

2 About this document



How to clear faults

Fault clearing process

When a fault must be cleared in the Meridian I, follow these steps:

- Observe and record all fault indicators.

System messages, visual fault indicators, maintenance display codes, and user reports identify many problems. If the indicators are not current (or seem incomplete, you may need to print the History File for previous messages, you may need to initialize the system for information on the current status, or you may need to do both.

Look up all system messages and maintenance display codes in the *XI I input/output guide* (553-300 I-400).

The interpretation of the message or code may identify faulty equipment and tell you what action to take to clear the problem. If you cannot clear the fault through information in the *XI I input/output guide*, follow the process in this document to isolate and clear the fault (see "Using this document").

- Try to test and enable disabled equipment.

You may be able to hardware reenablen circuit cards by unseating then reinstalling them. You may be able to software reenablen cards by disabling then reenablen them. When the cause of a fault is not clearly evident, a software test may help you identify the problem.

- Replace equipment as necessary

When you identify faulty equipment, follow procedures in *Hardware replacement* (553-300 I-520). When you think the fault is corrected, follow the instructions in "Final maintenance procedure" on page 16 I to completely restore normal operation.

Using this document

To use the information in this document, follow the steps below:

- 1 Classify the fault by the indicators present (see “Fault indicators”). When there are indications of multiple faults, clear them in the following order:
 - Power faults
 - Common equipment faults
 - Network equipment faults
 - Peripheral equipment faults
 - Trunk faults
 - Attendant console faults
 - Telephone faults

Note: Always clear possible power faults then common equipment faults before any other type of fault.

- 2 Go to the chapter for clearing the type of fault identified. There is a chapter for each type of fault listed above (for example, “Clearing power faults”). As closely as possible, match the problem to a symptom listed at the beginning of the chapter.
- 3 Go through the procedure for clearing each possible cause of the problem until the fault is cleared.
- 4 When the fault is corrected, follow the instructions in “Final maintenance procedure” on page 161 to completely restore normal operation.

Procedure 1 is an example of the process described above.

Procedure 1
An example of using this document

- 1 Classify the fault-The indicators present are listed in Table 1. They identify a common equipment fault.

Table 1
Using fault indicators to classify a fault

Fault indicators	Type of fault
SYSTEM MESSAGE: CED013	Common equipment
VISUAL FAULT INDICATOR: Red LED lit on memory card	Common equipment
MAINTENANCE DISPLAY CODE: Code indicating a fault displayed on CPU interface card	Common equipment
USER REPORT: Major alarm reported by attendant	Common equipment

- 2 Go to the chapter for clearing the fault and match the symptom- Go to "Clearing common equipment faults" on page 45 and you will find "Fault indicated on memory card" in the table of contents.
- 3 Go through the procedures-Check for a defective memory card. If it is not defective, check for another defective common equipment card. If you find the CPU interface card is defective, you can disregard the remaining possible causes.
- 4 Go to "Final maintenance procedure" on page 161—Follow the instructions in each step.



Fault indicators

When there is a fault in the system, you may be notified by any combination of the following indicators:

- system messages
- visual fault indicators
- maintenance display codes
- user reports

Each type of indicator is described below.

System messages

System messages are codes with a mnemonic and number, such as PWR0014. The mnemonic identifies a software program or a type of message. The number identifies the specific message. Use system messages with other indicators, such as maintenance display codes and visual indicators, to identify and clear faults.

Table 2 lists the most common fault indicating messages and the type of fault they indicate. For a complete list and interpretation of system messages, see the *XI 1 input/output guide (553-3001-400)*.

Table 2
System message fault indicators and related fault types (Part 1 of 2)

System messages	Type of fault
BSD090 PWR messages	Power
BSD080, 085, 086, 103 CED messages CIOD, CMON, and CNI messages INI001, 002, 004, 005 IOD006, 007, 060, 061, 291-297 NWS030, 102, 103, 142 SYS messages	Common equipment

Table 2
System message fault indicators and related fault types (Part 2 of 2)

System messages	Type of fault
BSD081, 101, 110, 111, 121, 130, 201-203, 205-209, 600, 602 CNF messages DTA, DTC, DTI messages ERR020, 120, 4060 INI003, 007-012 NWS1 01, 141, 201-204, 301,401 OVD021, 022, 023, 031 TDS messages XMI messages	Network equipment
BSD301, 401, 402 ERR4062 NWS301, 401, 501 OVD001-010, 024 XMI messages	Peripheral equipment
ERR090, 220, 270 OVD003, 008, 009, 010 TRK messages	Trunk
BSD501	Attendant console
BSD501 ERR500 MWL500 NWS501 OVD001-002, 004, 005 XMI messages	Telephone

Visual fault indicators

There are visual indicators on the Meridian 1 that can help you identify faults. These indicators include:

- a major or minor alarm display on the attendant console: indicates a possible power, common equipment, or network equipment fault
- circuit card light emitting diodes (LEDs): indicates a card or a unit on a card is disabled
- column LED: indicates a fault in the column

Table 3 lists visual indicators you may see and the types of faults they indicate.

Table 3
Visual fault indicators and related fault types

Indicator	Type of fault
Major alarm on attendant consoles Red LED lit on column top cap Green LED off on module power supply Circuit breaker tripped (down) Remote alarm	Power
Major alarm on attendant consoles Red LED lit on CE card (other than the CPU interface card on the non-active CPU)	Common equipment
Minor alarm on an attendant console Red LEDs lit or flashing on associated cards	Network equipment
Red LED lit on associated card	Peripheral equipment
Red LED lit on trunk card	Trunk
Red LED lit on associated cards	Attendant console
Red LED lit on associated cards	Telephone

Maintenance display codes

Maintenance displays are located on the faceplate of some Meridian 1 circuit cards. A maintenance display shows an alphanumeric code which can indicate the status of the system and aid in fault identification. Interpretations of the maintenance display codes are listed under "HEX" in the *X11 input/output guide* (553-3001-400).

Each new code shown on a maintenance display overwrites the one before it. However, all codes received on common equipment displays are recorded; you can review them by printing the History File. The most recent 16 codes displayed on a NT8D01 Controller Card stay in memory. You can review them and reset the counter through the Network and Signaling Diagnostic (LD 30). You should examine previous codes, system messages, and visual indicators with the current maintenance display code to properly analyze faults.

Table 4 lists the cards with maintenance displays and the type of fault they might indicate.

Table 4
Maintenance display locations and related fault types

Maintenance display	Type of fault
QPC580 CPU Interface Card QPC584 Mass Storage Interface Card NT8D19 Memory/Peripheral Signaling Card QPC742 Floppy Disk Interface Card NTND01 Integrated CPU/Memory Card NT6D66 Call Processor NT6D63 Input/Output Processor	Common equipment
NT8D01 Controller Card	Peripheral equipment

User reports

Many faults reported by users, such as a damaged telephone or data set, are obvious and can be fixed by replacing the damaged equipment.

Some faults are less obvious and may be caused by other equipment, such as a defective peripheral equipment card. To classify the fault in these cases, check for system messages and visual fault indications. You may also have the user reproduce the problem so you can determine the sequence of events that led to the fault.

Table 5 lists typical problems reported by users and the type of fault they might indicate.

Table 5
User reported problems and related fault types

User report	Type of fault
Major alarm reported by attendant No ring on 500/2500-type telephones	Power
Major alarm reported by attendant	Common equipment
Minor alarm reported by attendant Cannot transfer or conference Cannot dial out on 500/2500 telephones	Network equipment
Trouble with calls on attendant console Trouble with calls on 500/2500 telephones Trouble with calls on SL-1, M1 000, or digital telephones	Peripheral equipment
Trouble with a specific trunk Continuous ringing Trouble with calls on console and/or telephones	Trunk
Trouble with calls Trouble with equipment (such as handset, headset, or display)	Attendant console
Trouble with calls Trouble with equipment (such as handset or add-on module)	Telephone

12 How to clear faults

End

Accessing the system

When you replace equipment, you often send commands to the system software in order to disable faulty equipment and to enable and test newly installed equipment.

You send maintenance commands to the system through the system terminal or the maintenance telephone. This chapter gives the procedures for accessing the system through these devices.

Note: With software prior to XI release 19, only one device at a time can communicate with the system. Accessing a device while another is logged in will log out the device that was already connected. The Multi User Login feature, available with XI release 19, allows more than one device to interact with the Meridian I. Refer to *XI I system management application* (553-300 I-30 1) for detailed information on using this feature.

Access through the system terminal

You can send maintenance commands and receive system messages by accessing the CPU through an RS-232 device, such as a video display terminal (VDT) or teletypewriter (TTY).

When you access the system through a system terminal, a log in procedure is required (see Procedure 2). All system passwords are initially set as 0000, but you can change passwords in the Configuration Record (LD 17).

Note: If a sysload occurs before you save a new password in a data dump, the last active password remains valid.

Each system has two levels of passwords: level 1 is for general use, level 2 is for administrative use. Either password is accepted in the log in procedure.

14 Accessing the system

Procedure 2

Access through the system terminal

- 1 Press the return key
 - If the response is a period (.), you are ready to log into the system.
 - If the response is **OVL111 nn TTY x** or **OVL111 nn SL1** someone else is logged into the system. When they have logged off, press return and go to Step 2.
 - If the response is **OVLIII nn IDLE** or **OVLIII nn BKGD** you are ready to log into the system. Go to Step 2
 - If the response is **OVL000 >** you are already logged into the system. Go to Step 4.

Note: Responses vary with different Background Terminal packages.
- 2 Log into the system by entering:
LOGI
then press the return key.

The normal response is
PASS?
If there is any other response, see the *XI 1 input/output guide* (553-3001-400).
- 3 Enter either the level 1 or level 2 password and press the return key. If the password is correct, the system responds with the prompt
>
- 4 Load a program by entering:
LD xx "xx" represents the number of the program
- 5 Perform tasks.
- 6 End the program by entering:
END or ****
- 7 Always end the log in session with
LOGO
Background routines are then loaded automatically.

Access through the maintenance telephone

A telephone functions as a maintenance telephone when you define the class-of-service as MTA (maintenance set allowed) in the Multi-line Telephone Administration program (LD 11). A maintenance telephone allows you to send commands to the system through the following maintenance overlays: LD 30, LD 32, LD 33, LD 34, LD 35, LD 36, LD 37, LD 38, LD 41, LD 42, LD 43, LD 45, LD 46, LD 60, LD 61, LD 62.

The Core Common Equipment Diagnostic Program (LD 135) and Core I/O Diagnostic Program (LD 137) are among the overlays that cannot be accessed through a maintenance telephone.

You can test tones and outpulsing through the maintenance telephone. Specific commands for those tests are given in the Tone and Digit Switch and Digitone Receiver Diagnostic (LD 34).

To access the system using the maintenance telephone, see Procedure 3. To enter commands, press the keys that correspond to the letters and numbers of the command (for example, to enter *LD 42 return*, key in *53#42##*). Table 6 shows the translation from a terminal keyboard to a telephone dial pad.

Note: To use the maintenance telephone, the peripheral equipment loop for that telephone must be operating.

Table 6
Translation from keyboard to telephone dial pad

Keyboard				Dial pad
			1	1
A	B	C	2	2
D	E	F	3	3
G	H	I	4	4
J	K	L	5	5
M	N	O	6	6
P	R	S	7	7
T	U	V	8	8
W	X	Y	9	9
			0	0
			Space or #	#
			Return	##
			.	.

Note: There is no equivalent for Q or Z on a dial pad.

553-3001-510

Accessing the system 17

Procedure 3

Access through the maintenance telephone

- 1 Press the prime DN key.
- 2 Place the set in maintenance mode by entering:
xxxx91 "xxxx" is the customer Special Prefix (SPRE) number. It is defined in the Customer Data Block and can be printed using LD 21. The SPRE number is typically "1" (which means you would enter 797).
- 3 Check for busy tone by entering "return"
##
If there is no busy tone, go to Step 4.
If there is a busy tone, a program is active. To end an active program and access the system enter

- 4 Load a program by entering:
53#xx## "xx" represents the number of the program
- 5 Perform tasks.
- 6 Enter ******* to exit the program and return the telephone to call processing mode. Background routines are then loaded automatically.

18 Accessing the system



Clearing power faults

Symptoms:

Main circuit breaker and all LEDs off (option 2 | A) . .	27
Main circuit breaker on but all LEDs off (option 2|A) . . .	28
Green LED off on module power supply (option 2 | A)	29
Circuit breakers and all column LEDs off (DC power) . . .	30
Circuit breakers on but all column LEDs off (DC power) .	32
Green LED off on module power supply (DC power) . .	33
Defective blower unit indicated (DC power)	35
Main circuit breaker and all column LEDs off (AC power)	36
Main circuit breaker on but all column LEDs off (AC power).	38
Breaker off on MPDU (AC power).	39
Green LED off on module power supply (AC power) .	41
Defective blower unit indicated (AC power) . .	43

20 Clearing power faults

Power faults

Various electrical voltages are required to power the Meridian 1. These electrical voltages are developed and delivered by the power equipment system. Cooling and monitoring devices are interconnected with the power system. Figures 1, 2, and 3 show power, cooling, and monitoring equipment that may be located in a column, including:

- air probe: increases the impeller speed as the temperature goes up (not equipped in option 21A)

blower unit: provides cooling for the column (not equipped in option 21A)

module power distribution unit (MPDU): houses circuit breakers for some module power supplies (AC power only and not equipped in option 21A)

Note: In DC-powered systems, there is a switch on each power supply, so MPDUs are not required.

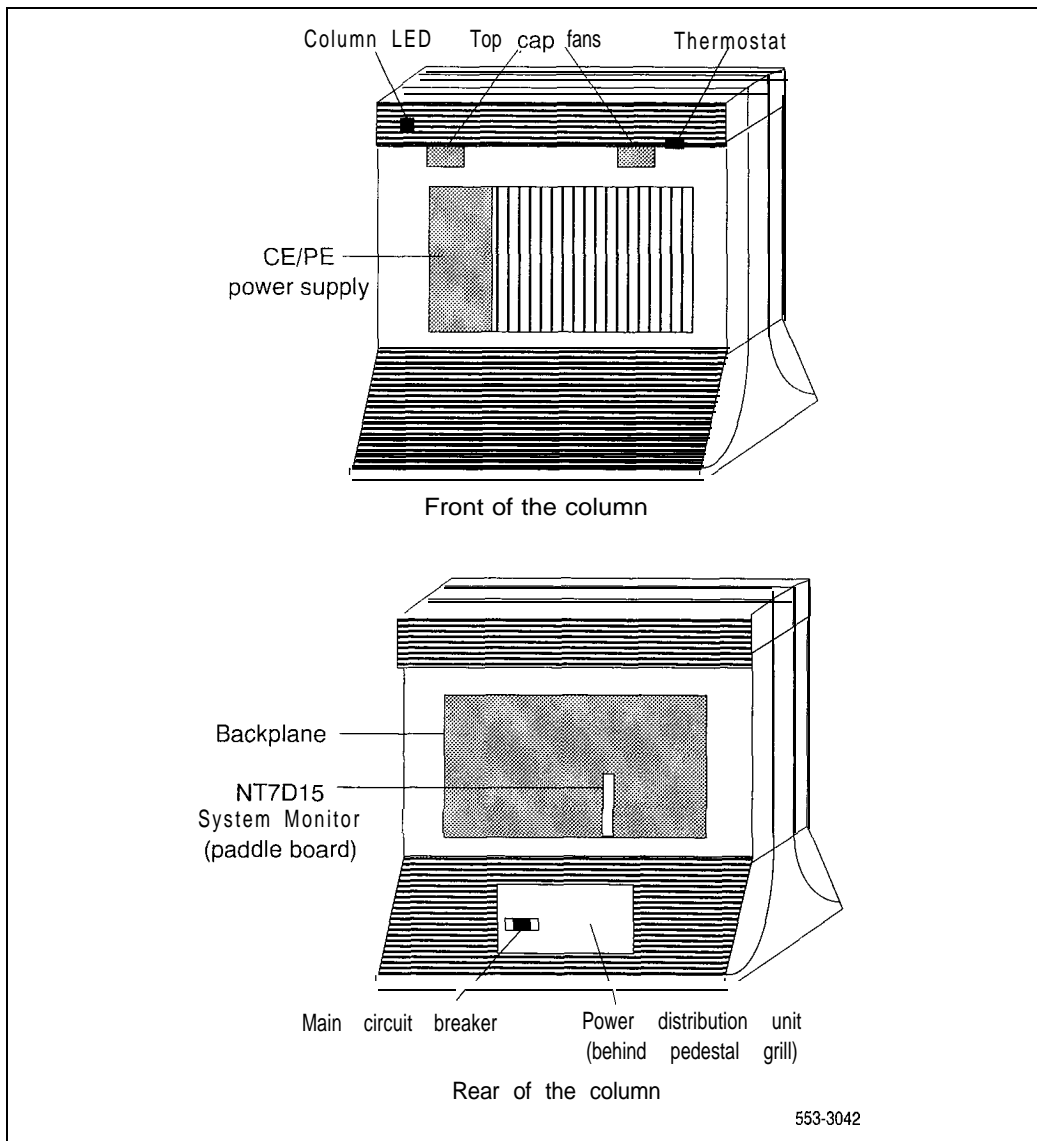
power distribution unit (PDU): distributes power from the external source to module power supplies and houses the column circuit breaker(s)

- module power supply: converts voltage from the PDU to the voltages needed in each type of module
- ringing generator: provides current to ring 500/2500 telephones and to light the message waiting light on the 2500 telephones
- system monitor: monitors power and temperature conditions
- thermostat: monitors column temperature
- top cap fan: cools the power supply (option 21A only)

Power faults can disable ringing for 500/2500 telephones, message waiting lights on 2500 telephones, all the cards in a module, all the modules in a column, or the entire system.

Clearing power faults 21

Figure 1
Power equipment-option 21A



22 Clearing power faults

Figure 2
Internal DC power equipment

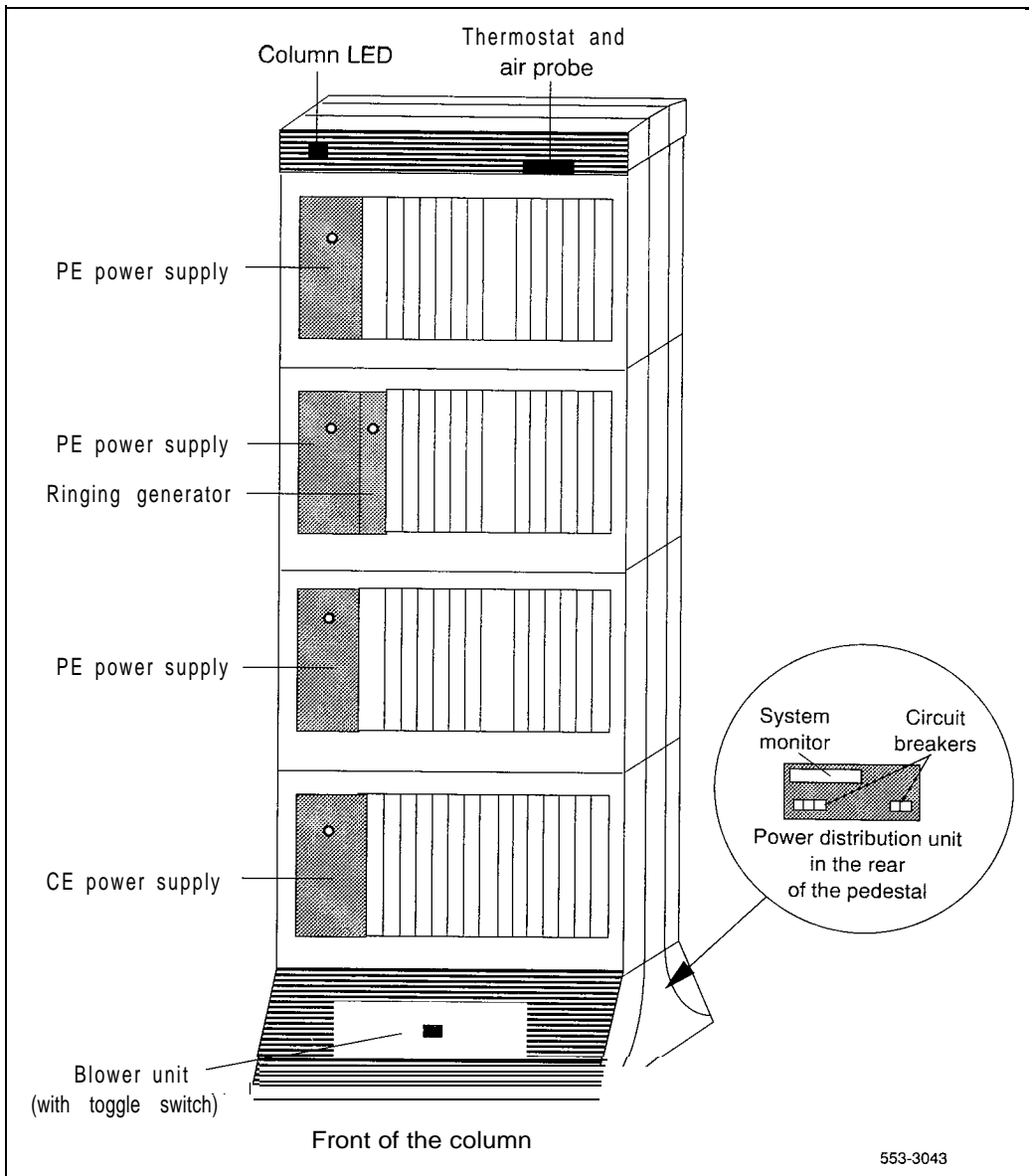
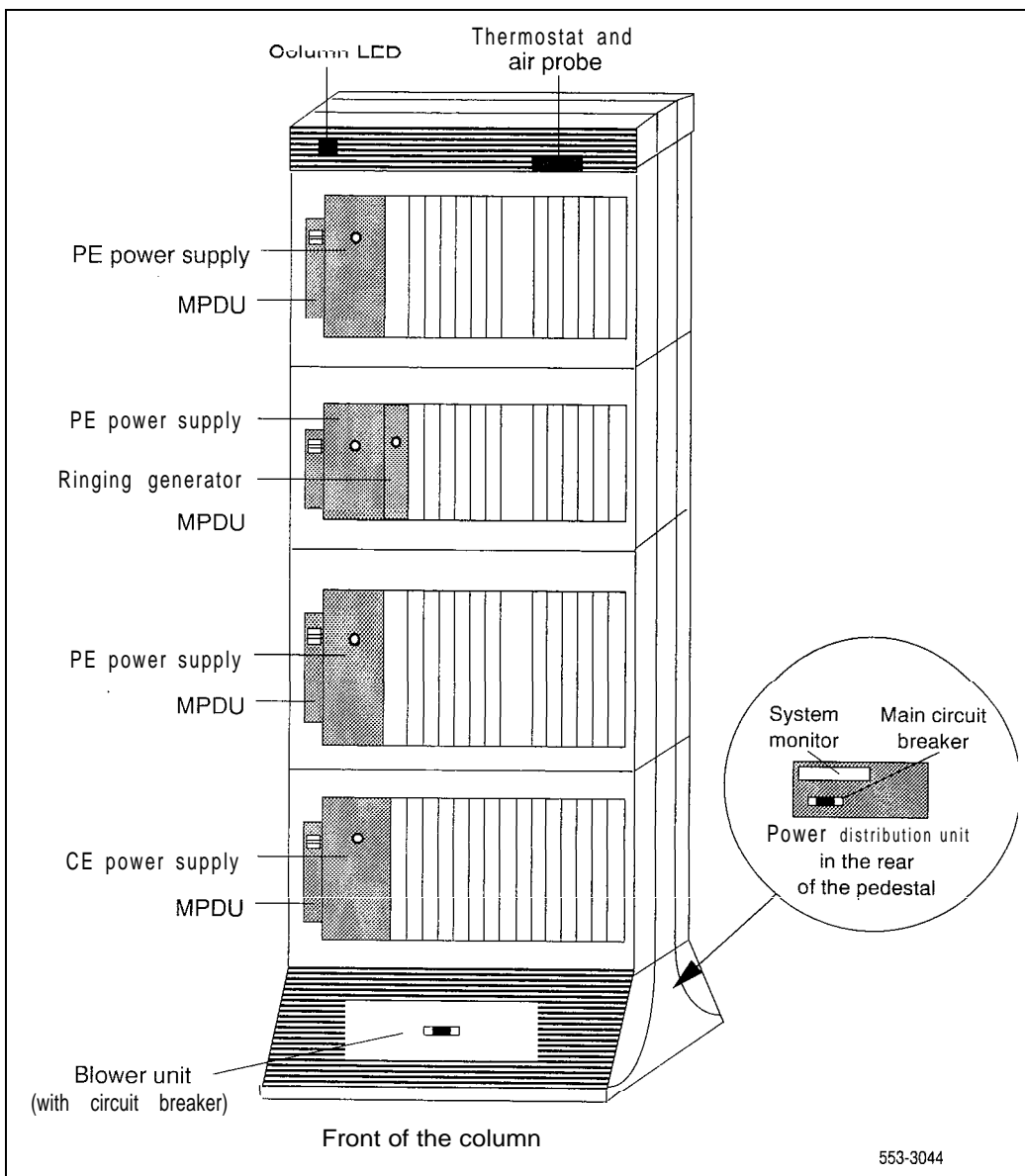


Figure 3
Internal AC power equipment (except option 21A)



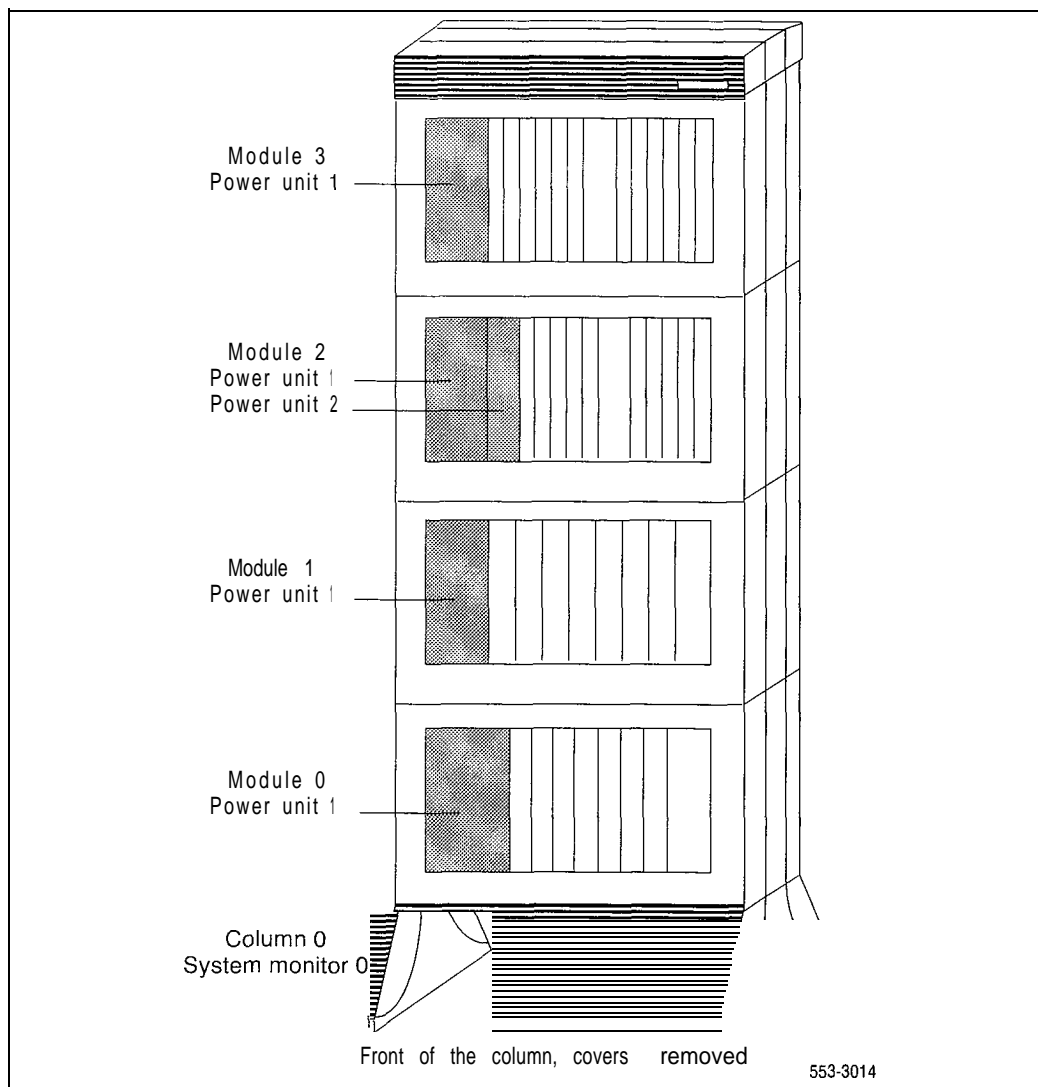
Fault clearing procedures

System messages with the mnemonic PWR (power) contain four fields of information about power equipment. These fields identify the type of equipment indicated (such as the blower unit) and the source of the message (system monitor, module, and module power supply). Table 7 defines the fields in PWR messages. Figure 4 shows the power equipment identified in PWR messages.

Table 7
PWR message fields

PWRxxxx (HW) (SM) (UEM) (U)	
HW	Hardware type, one of the following: CRBK Circuit breaker DCSP DC power supply FANU Blower unit PFTC Power fail transfer PWSP Module power supply, including ringing generator THSW Thermal switch UPSA Uninterruptible power supply (UPS) alarm XSMC System monitor card
SM	System monitor (O-63) generating the message (0 is the master system monitor)
UEM	Module (O-3) reporting the condition
U	Number of the power supply (i-2) in the module

Figure 4
Power equipment designations



26 Clearing power faults

Table 8 lists common power fault indications. To clear faults, select the symptom that most resembles the fault indications then go through the procedure for clearing each possible cause until the fault is fixed. Once the fault is corrected, disregard the remaining possible causes.

You must clear power faults before you try to clear other types of faults in the system.

If the fault is not cleared after you have gone through each possible cause, check the most recent fault indications. Also check "Clearing power faults" on page 19 to see if another type of fault is indicated.

After the fault is corrected, go to "Final maintenance procedure" on page 161 to completely restore normal operation.

Table 8
Power fault indicators

Indicator	Possible indications
System messages	BSD090 (Program has detected a power fault indication. Check PWR messages.) PWR messages
Visual indicators	Major alarm on attendant consoles Red LED lit on column top cap Green LED off on module power supply LED lit on PFTU Circuit breaker tripped (down) Remote alarm
User reports	Major alarm reported by attendant No ring on 500/2500 telephones
WARNING Modules covers are not hinged; do <i>not</i> let go of the cover. Lift the cover away from the module and set it out of your work area.	

Symptom:

Main circuit breaker and all LEDs off (option 21A)

All the LEDs in the system are off and the main circuit breaker on the PDU is tripped. Use this procedure to clear the problem.

Note: High room temperature or a power surge can shut down the system. Check the temperature of the room and voltages at the commercial power outlet.

Replace equipment as described in *Hardware replacement (553-3001-520)*. You may need to replace one of the following:

- Thermostat harness: NT8D46AC
- Top cap fan: A0321 130
- System monitor cables

Possible cause	Action
Short circuit or damage	Look for signs of damage (such as smoke, burnt contacts, or melted insulation) that may be caused by a short circuit or misplaced equipment. If you do not find a problem of this type, go to the next possible cause.
Thermal overload	Make sure nothing is blocking ventilation throughout the system. Allow the system to cool for a few minutes then reset the breaker. If the breaker trips immediately, check the thermostat harness: <ul style="list-style-type: none"> — make sure the harness is securely connected to the module — use an ohm meter to check the connector pins for the harness; if there is an open circuit between pins 3 and 4 or between pins 5 and 6, replace the harness If the breaker does not trip immediately, listen for the sound of the top cap fan. If you do not hear the fan, replace it. If there is no problem with this equipment, go to the next possible cause.
Defective connection to system monitor	Make sure the cable to connector J3 is securely connected to the system monitor. Also check the system monitor connection to the module. If the breaker trips with all cables connected, replace the cables one-at-a-time until the breaker stays on.

Symptom: Main circuit breaker on but all **LEDs** off (option 21A)

All the **LEDs** in the system are off but the main circuit breaker on the PDU is not tripped. Use this procedure to clear the problem.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- PDU: NT8D53AD
- Main power cord
- UPS

Possible cause	Action
Power cord not connected	<p>If the power cord for the column is unplugged, plug it in.</p> <p>If the power cord is already plugged in or if the column LEDs do not light and the breaker trips when reset, go to the next possible cause.</p>
WARNING The following tests are performed on a live power connection.	
No power at outlet	<p>With a meter or test lamp, test for AC power at the outlet.</p> <p>If there is no power at the outlet when AC power is supplied through a UPS unit, repair or replace the UPS following the manufacturer's instructions.</p> <p>If there is no power at the outlet when AC power is supplied through commercial service (not through a UPS), take the necessary steps to have the commercial power restored.</p> <p>If there is power at the outlet, go to the next possible cause.</p>
Defective power cord	<p>With a meter or test lamp, test the field wiring connections (behind the PDU) for AC power.</p> <p>If there is no power, replace the power cord.</p> <p>If there is power at the connections, go to the next possible cause.</p>
Defective PDU	Replace the PDU.

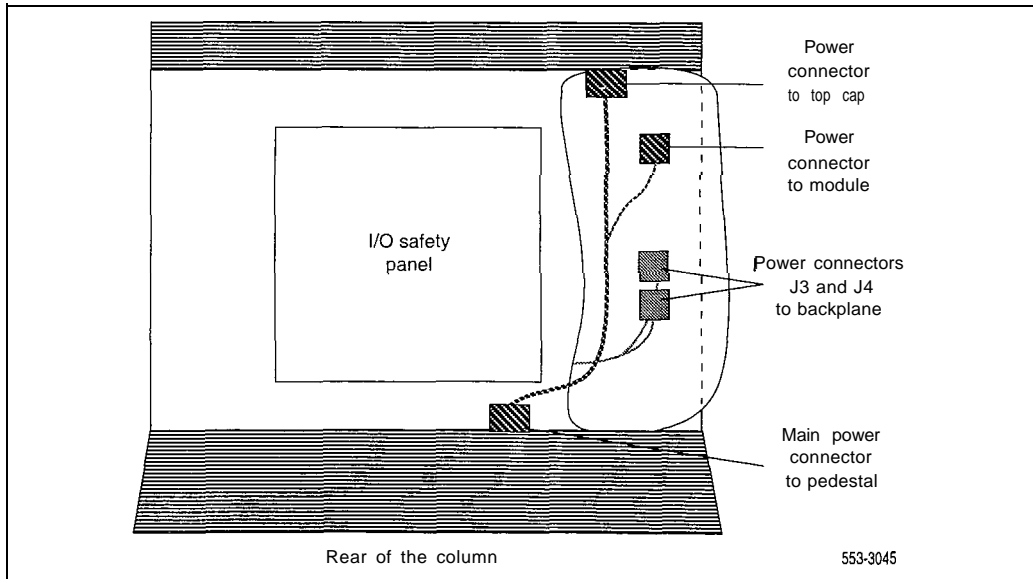
Symptom:
Green LED off on module power supply (option 21A)

The green LED is off on the CE/PE power supply, but the main circuit breaker on the PDU not tripped. Use this procedure to clear the problem.

You may need to replace the NT7D14 CE/PE Power Supply. Replace equipment as described in *Hardware replacement* (553-3001-520).

Possible cause	Action
Disconnected power cable	Check the power cable connection to the power supply (see Figure 5). If all power cables are connected, go to the next possible cause.
Defective power supply	Set the switch on the power supply to OFF (down), wait at least 60 seconds, then set the switch back to ON (up). If the LED on the power supply is still off, replace the power supply.

Figure 5
 Option 21A power cabling in rear of column



30 Clearing power faults

Symptom:
Circuit breakers and all column LEDs off (DC power)

All the LEDs in a column are off and all circuit breakers on the PDU are tripped. You may receive message PWROO04 which indicates the circuit breakers for the column have tripped. See “PWR” in the *Xl 1 input/output guide* (553-3001-400) and use this procedure to clear the problem.

Note: High room temperature can shut down the system. If all columns in a multi-column system are shut down, check for this external condition.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Air filter: PO699798
- Air probe harness: NT8D46AM
- System monitor cables
- Thermostat harness: NT8D46AC

Possible cause	Action
Low batteries	If a TRIP signal to the system has shut down power: <ul style="list-style-type: none">— check the cable from the external power system— check the batteries and service them as necessary
Short circuit or damage	Look for signs of damage (such as smoke, burnt contacts, or melted insulation) that may be caused by a short circuit or misplaced equipment. If you do not find a problem of this type, go to the next possible cause.

(continued)

Clearing power faults 31

Possible cause	Action
Thermal overload	<p>Make sure nothing is blocking ventilation throughout the system. Allow the system to cool for a few minutes then reset the breakers.</p> <p>If the breakers trip immediately, check the thermostat harness:</p> <ul style="list-style-type: none">— make sure the harness is securely connected to the module below, it— use an ohm meter to check the connector pins for the harness; if there is an open circuit between pins 3 and 4 or between pins 5 and 6, replace the harness <p>If the breakers do not trip immediately, check the air filter:</p> <ul style="list-style-type: none">— if the filter is dirty and undamaged, clean the filter as described in <i>General maintenance information (553-3001-500)</i>— if the filter is damaged in any way, replace the filter as described in <i>Hardware replacement (553-3001-520)</i> <p>If there is no problem with the air filter or if the breakers trip when reset, check the air probe harness:</p> <ul style="list-style-type: none">— make sure the harness is securely connected to the module below it— use an ohm meter to check the connector pins for the harness; if there is an open circuit between pins 1 and 2, replace the harness <p>If there is no problem with this equipment, go to the next possible cause.</p>
Defective connection to system monitor	<p>Make sure cables to connectors J5 and J6 are securely connected to the system monitor in the column.</p> <p>Check the system monitor connections to each module.</p> <p>If the breakers trip with all cables connected, replace the cables one-at-a-time until the breakers stay on.</p>

Symptom:
Circuit breakers on but all column LEDs off (DC power)

All the LEDs in a column are off but the circuit breakers on the PDU are not tripped. Use this procedure to clear the problem.

Replace equipment as described in (553-3001-520).
You may need to replace one of the following:

- External rectifier
- PDU

Possible cause	Action
DC wires not connected	If the DC wires are disconnected, connect them. If the wires are already connected or if the column LEDs do not light when they are connected, go to the next possible cause.
WARNING The following test is performed on a live power connection.	
No power at DC source	Make sure the rectifier is on and connected. Make sure the rectifier is receiving power. If there is no problem with the rectifier, go to the next possible cause.
Defective power cable	With a meter, test the field wiring connections in the PDU for DC power. If there is no power, replace the cable. If there is power at the connections, go to the next possible cause.
Defective PDU	Replace the PDU.

Symptom:
Green LED off on module power supply (DC power)

The green LED is off on one of the following power supplies:

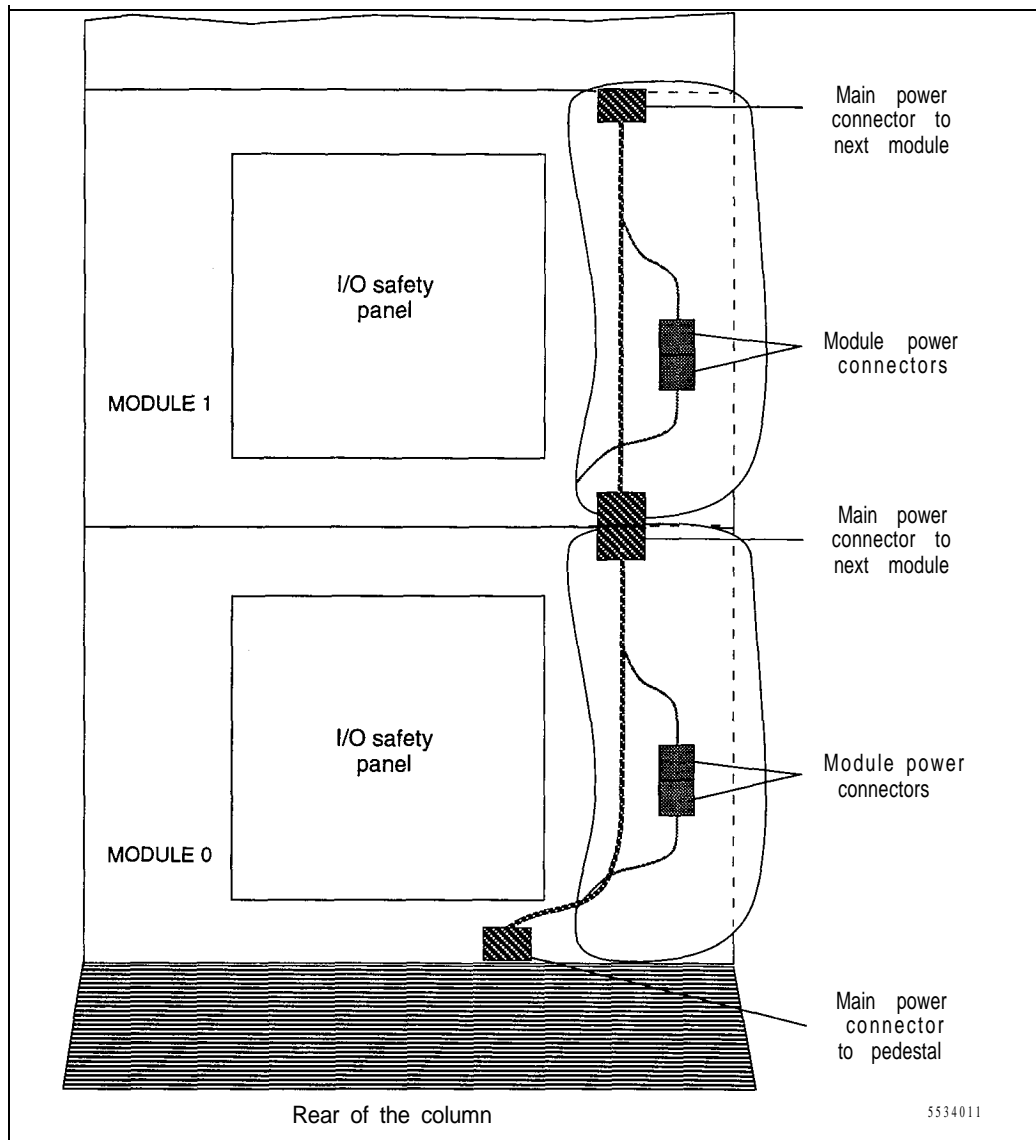
- PE power supply: NT6D40
- CE power supply: NT6D41
- Ringing generator: NT6D42
- CE/PE power supply: NT6D43

You may receive a system message indicating the status of the power supply. See “PWR” in the *X11 input/output guide* (553-3001-400) and use this procedure to clear the problem.

Replace equipment as described in *Hardware replacement* (553-3001-520).

Possible cause	Action
Disconnected power cable	<p>Check the power cable connection to the power supply.</p> <p>If the cable is connected, check power cable connections to each module below the affected one (see Figure 6).</p> <p>If all power cables are connected, go to the next possible cause.</p>
Defective power supply	<p>Set the switch on the power supply to OFF (down), wait at least 60 seconds, then set the switch back to ON (up).</p> <p>If the LED on the power supply is still off, replace the power supply.</p>

Figure 6
DC power cabling in rear of column



Symptom:
Defective blower unit indicated (DC power)

The blower unit circuit breaker (breaker number 5 on the PDU) is tripped and trips when reset. You may receive a system message indicating there is a failure in the blower. See “PWR” in the *X11 input/output guide* (553-3001-400) and use this procedure to clear the problem.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

Blower unit: NT8D52DD

P D U

Possible cause	Action
Blower unit switch turned off	Set the switch on the front of the blower unit to ON (right). Reset the circuit breaker. If the switch was already on or if the circuit breaker trips again, go to the next possible cause.
Defective blower unit	Replace the blower unit and set the circuit breaker to on If the breaker trips, go to the next possible cause.
Defective PDU	Replace the PDU.

Symptom:

Main circuit breaker and all column LEDs off (AC power)

All the LEDs in a column are off and the main circuit breaker on the PDU is tripped. You may receive message PWR0004 which indicates the main circuit breaker for the column has tripped. See "PWR" in the *X11 input/output guide* (553-3001-400) and use this procedure to clear the problem.

Note: High room temperature or a power surge can shut down the system. If all columns in a multi-column system are shut down, check for these external conditions.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Air filter: PO699798
- Air probe harness: NT8D46AM
- System monitor cables
- Thermostat harness: NT8D46AC

Possible cause	Action
Short circuit or damage	Look for signs of damage (such as smoke, burnt contacts, or melted insulation) that may be caused by a short circuit or misplaced equipment. If you do not find a problem of this type, go to the next possible cause.
Thermal overload	Make sure nothing is blocking ventilation throughout the system. Allow the system to cool for a few minutes then reset the breaker. If the breaker trips immediately, check the thermostat harness: <ul style="list-style-type: none">- make sure the harness is securely connected to the module below it- use an ohm meter to check the connector pins for the harness; if there is an open circuit between pins 3 and 4 or between pins 5 and 6, replace the harness

(continued)

Clearing power faults 37

Possible cause	Action
Defective connection to system monitor	<p>If the breakers do not trip immediately, check the air filter:</p> <ul style="list-style-type: none">if the filter is dirty and undamaged, clean the filter as described in <i>General maintenance information (553-3001-500)</i>if the filter is damaged in any way, replace the filter as described in <i>Hardware replacement (553-3001-520)</i> <p>If there is no problem with the air filter or if the breaker trips when reset, check the air probe harness:</p> <ul style="list-style-type: none">— make sure the harness is securely connected to the module below ituse an ohm meter to check the connector pins for the harness; if there is an open circuit between pins 1 and 2, replace the harness <p>If there is no problem with this equipment, go to the next possible cause.</p> <p>Make sure cables to connectors J5 and J6 are securely connected to the system monitor in the column.</p> <p>Check the system monitor connections to each module.</p> <p>If the breaker trips with the cables connected, replace the cables one-at-a-time until the breaker stays on.</p>

Symptom:

Main circuit breaker on but all column LEDs off (AC power)

All the LEDs in the column are off but the main circuit breaker on the PDU is not tripped. Use this procedure to clear the problem.

Replace equipment as described in *Hardware replacement (553-3001-520)*. You may need to replace one of the following:

- PDU: NT8D53AB
 - Main power cord
 - UPS

Possible cause	Action
Power cord not connected	<p>If the power cord for the column is unplugged, plug it in.</p> <p>If the power cord is already plugged in or if the column LEDs do not light when it is plugged in, go to the next possible cause.</p>
<div style="border: 1px solid black; padding: 5px;"><p>WARNING</p><p>The following tests are performed on a live power connection.</p></div>	
No power at outlet	<p>With a meter or test lamp, test for AC power at the outlet.</p> <p>If there is no power at the outlet when AC power is supplied through a UPS unit, repair or replace the UPS following the manufacturer's instructions.</p> <p>If there is no power at the outlet when AC power is supplied through commercial service (not through a UPS), take the necessary steps to have the commercial power restored.</p> <p>If there is power at the outlet, go to the next possible cause.</p>
Defective power cord	<p>With a meter or test lamp, test the field wiring connections in the PDU for AC power.</p> <p>If there is no power, replace the power cord.</p> <p>If there is power at the connections, go to the next possible cause.</p>
Defective PDU	Replace the PDU.

Symptom: Breaker off on MPDU (AC power)

A circuit breaker on a MPDU is tripped and trips when reset. The green LED will be off on the associated power supply:

- NT8D56AA single breaker MPDU: for NT8D29 CE Power Supply
- NT8D56AC single breaker MPDU: for NT7D14 CE/PE Power Supply
- NT8D57AA dual breaker MPDU: for NT8D06 PE Power Supply and NT8D21 Ringing Generator

You may receive a system message indicating the status of the breaker. See “PWR” in the XI *I input/output guide* (553-3001-400) and use this procedure to clear the problem.

Replace equipment as described in *Hardware replacement* (553-3001-520).

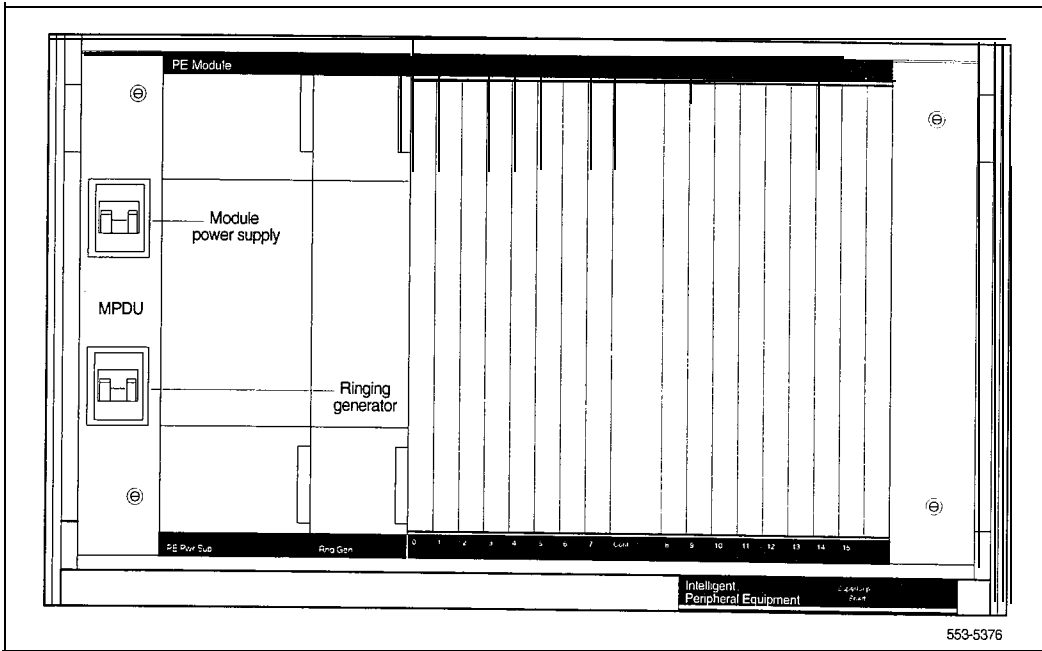
Possible cause	Action
Short circuit or damage	Look for signs of damage (such as smoke, burnt contacts, or melted insulation) that may be caused by a short circuit or misplaced equipment. If you do not find a problem of this type, go to the next possible cause.
Defective module power supply (single breaker)	Unseat the associated power supply and reset the breaker. If the breaker does not trip, replace the power supply. If the breaker trips, replace the MPDU.
Defective module power supply (dual breaker)	If one circuit breaker is tripped on a dual MPDU: <ul style="list-style-type: none"> — unseat the associated power supply (see Figure 7) then reset the breaker — if the breaker does not trip, replace the power supply — if the breaker trips, replace the MPDU

(continued)

40 Clearing power faults

Possible cause	Action
	<p>If both circuit breakers are tripped:</p> <ul style="list-style-type: none"> — unseat both power supplies then reset the breakers — if either breaker or both breakers trip, replace the MPDU <p>If the breakers do not trip, set them to OFF (down):</p> <ul style="list-style-type: none"> — reinsert one power supply then reset the associated breaker — if the breaker trips, replace that power supply — if the breaker does not trip, set the breaker to OFF and unseat that power supply — reinsert the other power supply then reset the associated breaker — if the breaker trips, replace that power supply

Figure 7
Dual circuit breaker and associated module power supplies



Symptom:
Green LED off on module power supply (AC power)

The circuit breaker on the associated MPDU is not tripped, but the green LED is off on one of the following power supplies:

- PE power supply: NT8D06
- CE/PE power supply: NT7D14
- Ringing generator: NT8D21
- CE power supply: NT8D29

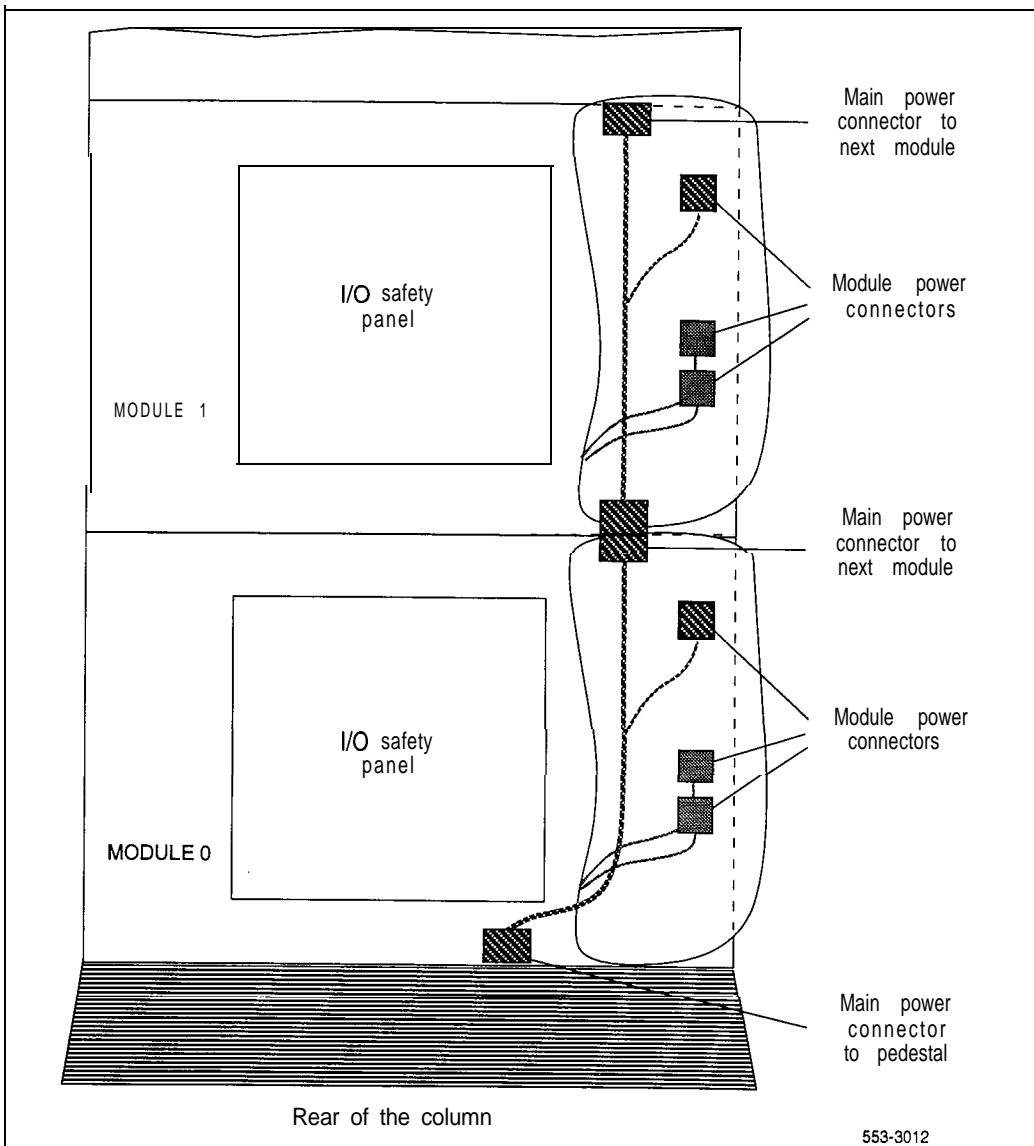
You may receive a system message indicating the status of the power supply. See “PWR” in the *input/output guide* (553-3001-400) and use this procedure to clear the problem.

Replace equipment as described in *Hardware replacement* (553-3001-520).

Possible cause	Action
Disconnected power cable	<p>Check the power cable connection between the power supply and the back of the MPDU.</p> <p>If the cable is connected, check power cable connections to each module below the affected one (see Figure 8).</p> <p>If all power cables are connected, go to the next possible cause.</p>
Defective power supply	<p>Set the circuit breaker on the associated MPDU off then back on (see Figure 7 if there are dual circuit breakers).</p> <p>If the LED on the power supply is still off, replace the power supply.</p> <p>If you replace the power supply, the LED on the replacement should light and stay lit. If it does not, go to the next possible cause.</p>
Defective MPDU	<p>Replace the MPDU.</p>

42 Clearing power faults

Figure 8
AC power cabling in rear of column



Symptom:
Defective blower unit indicated (AC power)

The blower unit circuit breaker (located on the front of the unit) is tripped and trips when reset. You may receive a system message indicating there is a failure in the blower. See “PWR” in the (553-3001-400) and use this procedure to clear the problem.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Blower unit: NT8D52AB
- PDU: NT8D53

Possible cause	Action
Defective blower unit	Replace the blower unit and set the circuit breaker to ON (up). If the breaker trips, go to the next possible cause.
Defective PDU	Replace the PDU.

44 Clearing power faults



Clearing common equipment faults

Symptoms:

Call processing stopped (options 2 I A and 2 I)	49
Call processing stopped (option 21E)	51
Fault indicated on memory/peripheral signaling card (options 21A and 21)	53
Fault indicated on MSPS card (option 21E)	54
Fault indicated on the CPU card (options 21A and 21)	55
Fault indicated on the ICM card (option 21E)	57
Call processing stopped (option 51)	59
Fault indicated on memory card (option 51)	62
Fault indicated on a common equipment card (option 51)	64
Call processing stopped (options 6 I and 7 1)	67
Fault indicated on a memory card (options 6 I and 7 1)	70
Fault indicated on a common equipment card (options 6 I and 7 I)	73
Fault indicated on a common equipment card (options 6 I and 7 I)	73
Floppy disk unit not operating	79
Multi Disk Unit not operating.	80
Multi Disk Unit not operating.	80

Common equipment faults

Common equipment (CE) functions perform system control and switching. Common equipment in the Meridian 1 can include:

- bus terminating unit (BTU): provides logical termination to CPU and network buses (options 51, 61, 61C, 71, and 81)
- changeover and memory arbitrator (CMA) card: provides CPU access to RAM memory; allows a CPU to access redundant memory in a dual CPU system (options 51, 61, and 71)
- central processing unit (CPU): performs system call processing functions
call processor (CP): performs system arithmetic and logic functions
data cartridge: allows access to software packages purchased
- mass storage interface card (floppy disk interface card or multi disk interface card): interface between the CPU and the mass storage unit
- mass storage unit (floppy disk unit, multi disk unit, or core multi disk unit): provides a backup for programs and data stored in system memory
read only memory (ROM) card: provides memory for the CPU; the daughterboard on the QPC687 CPU Card (options 21, 21 A), the NTND01 ICM Card (option 21E), the QPC579 CPU Function Card (options 51, 61, 71), or the NT6D66 Call Processor (options 61C and 81)
- serial data interface (SDI) card: provides ports between the CPU and external devices
segmented bus extender (SBE) card: extends the CE bus signals to the network module (option 71)
- core to network interface(CNI) card: links the CE bus with the 3PE card(s) in the network slots (option 61C and 81)
- three-port extender (3PE) card: extends CPU signals to the network (option 61), between the SBE and the network (option 71), and between Core Network Interface (CNI) and the network (options 61C and 81).

Common equipment faults can disable the CPU or the mass storage unit and stop call processing. In addition, other types of equipment (such as network equipment) may not operate properly while there is a CE fault in the system.

Fault clearing procedures

Table 9 lists common equipment fault indications. To clear faults, select the symptom that most resembles the fault indications and go through the procedure for clearing each possible cause until the fault is fixed. Once the fault is corrected, disregard the remaining possible causes.

Note: Clear any power faults before you try to clear common equipment faults.

If the fault is not cleared after you have gone through each possible cause, check the most recent fault indications. Also check “How to clear faults” on page 3 to see if another type of fault is indicated.

After the fault is corrected, go to “Final maintenance procedure” on page 161 to completely restore normal operation.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Table 9
Common equipment fault indicators

Indicator	Possible indications
System messages	BSD080, 085, 086, 103 CED messages INI001, 002, 004, 005 IOD006, 007, 060, 061, 291-297 NWS030, 102, 103, 142 SYS messages
Visual indicators	Major alarm on attendant consoles Red LED lit on column top cap Red LED lit on CE card of active CPU
Maintenance displays	QPC580 CPU Interface NT8D19 Memory/Peripheral Signaling QPC584 Mass Storage Interface QPC742 Floppy Disk Interface NTND01 ICM Card NTND10 CMA Card NT6D66 CP Card NT6D63 IOP Card
User reports	Major alarm reported by attendant

Symptom:

Call processing stopped (options 21A and 21)

Call processing has stopped on a single CPU system. Look up all system messages and maintenance display codes in the XI I *input/output* guide (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Take any action indicated by the maintenance display codes. Constantly observe and look up codes and system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-3001-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- CPU card: QPC687
- Data cartridge: QMM42
- FDI card: QPC742
- FDU: NT8D68
- Memory/peripheral signaling card: NT8D19
- ROM card: QPC940
- CE/PE card cage: NT8D 1103

Possible cause	Action
Defective module power supply	Make sure the green LED on the CE/PE power supply is lit. If it is not lit, go to "Clearing power faults" on page 19. If the power supply LED is lit, go to the next possible cause.
Initialization required	Press the manual initialize (Man Int) button on the memory/peripheral signaling card. If the system initializes, check all fault indicators and clear any faults indicated. If the system does not initialize, unseat network cards one-at-a-time. If the system initializes, replace the last card you removed (it is faulty). If the system will not initialize, go to the next possible cause.

(continued)

50 Clearing common equipment faults

Possible cause	Action
Defective FDI card or FDU	<p>Unseat the FDU and FDI card then reinstall them. Make sure the cable between the FDU and FDI card is securely connected. If the system does not recover, continue with this procedure.</p> <p>If a disabled FDI card is indicated make sure the data cartridge is securely attached:</p> <ul style="list-style-type: none">— check the switch settings; if necessary, correct the switch settings— try to enable the FDI card (try to software disable, hardware disable, then reenable)— if you cannot load a program or the FDI is still disabled, replace it— if necessary, replace the data cartridge <p>If a disabled FDU is indicated:</p> <ul style="list-style-type: none">— replace it— if the FDU is still disabled, replace the cable between the FDU and FDI card <p>If the system does not recover, go to the next possible cause.</p>
Sysload required	<p>Press the reload (reset) button on the CPU card.</p> <p>If a sysload (reload) occurs, check all fault indicators and clear any faults indicated.</p> <p>If the system will not sysload, go to the next possible cause.</p>
Defective CE card	<p>Unseat the cards then reinstall them. If the system does not recover, check the CPU card:</p> <ul style="list-style-type: none">— make sure the ROM card is properly installed on the CPU card— replace the ICPU card— if necessary, replace the ROM card <p>If the system will not sysload, replace the memory/peripheral signaling card.</p> <p>If the system does not recover, go to the next possible cause.</p>
Defective backplane	<p>Replace the card cage assembly in the module.</p>

Symptom:

Call processing stopped (option 21 E)

Call processing has stopped on a single CPU system. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Take any action indicated by the maintenance display codes. Constantly observe and look up codes and system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-3001-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- ICM card: NTND01
- Data cartridge: QMM42
- FDI card: QPC742
- FDU: NTND15
- MSPS card: NTND02
- ROM card: NTND31
- CE/PE card cage: NT8D 1103

Possible cause	Action
Defective module power supply	Make sure the green LED on the CE/PE power supply is lit. If it is not lit, go to "Clearing power faults" on page 19. If the power supply LED is lit, go to the next possible cause.
Initialization required	Press the manual initialize (Man Int) button on the ICM card. If the system initializes, check all fault indicators and clear any faults indicated. If the system does not initialize, unseat network cards one-at-a-time. If the system initializes, replace the last card you removed (it is faulty). If the system will not initialize, go to the next possible cause.

(continued)

52 Clearing common equipment faults

Possible cause	Action
Defective FDI card or FDU	<p>Unseat the FDU and FDI card then reinstall them. Make sure the cable between the FDU and FDI card is securely connected. If the system does not recover, continue with this procedure.</p> <p>If a disabled FDI card is indicated:</p> <ul style="list-style-type: none">— make sure the data cartridge is securely attached— check the switch settings; if necessary, correct the switch settings— try to enable the FDI card (try to software disable, hardware disable, then reenable)— if you cannot load a program or the FDI is still disabled, replace it— if necessary, replace the data cartridge <p>If a disabled FDU is indicated:</p> <ul style="list-style-type: none">— replace it— if the FDU is still disabled, replace the cable between the FDU and FDI card <p>If the system does not recover, go to the next possible cause.</p>
Sysload required	<p>Press the reload (reset) button on the ICM card.</p> <p>If a sysload (reload) occurs, check all fault indicators and clear any faults indicated.</p> <p>If the system will not sysload, go to the next possible cause.</p>
Defective CE card	<p>Unseat the cards then reinstall them. If the system does not recover, check the ICM card:</p> <ul style="list-style-type: none">— make sure the ROM card is properly installed on the ICM card— replace the ICM card— if necessary, replace the ROM card <p>If the system will not sysload, replace the MSPS card.</p> <p>If the system does not recover, go to the next possible cause,</p>
Defective backplane	<p>Replace the card cage assembly in the module.</p>

Symptom:

Fault indicated on memory/peripheral signaling card (options 21A and 21)

The red LED is lit on the memory/peripheral signaling card and call processing has stopped. Look up all system messages and maintenance display codes in the XI I *input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Take any action indicated by the maintenance display codes. Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- CPU card: QPC687
- Memory/peripheral signaling card: NT8D19
- ROM card: QPC940
- CE/PE card cage: NT8D1103

Possible cause	Action
Defective memory/peripheral signaling card	<p>Unseat the card then reinstall it.</p> <p>If the LED on the card is still lit, replace the card.</p> <p>If the LED turns off but the system does not recover, go to the next possible cause.</p>
Defective CPU card	<p>Unseat the CPU card then reinstall it. If the system does not recover:</p> <ul style="list-style-type: none"> - make sure the ROM card is properly installed - as necessary, replace the CPU card and the ROM card <p>If the system does not recover, go to the next possible cause.</p>
Defective backplane	<p>Replace the card cage assembly in the module.</p>

Symptom:

Fault indicated on MSPS card (option 21 E)

The red LED is lit on the MSPS card and call processing has stopped. Look up all system messages and maintenance display codes in the *XII input/output guide (553-3001-400)* and follow the instructions given. If the fault does not clear, use this procedure.

Note: Take any action indicated by the maintenance display codes. Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement (553-3001-520)*. You may need to replace one of the following:

- ICM card: NTND01
- MSPS card: NTND02
- ROM card: NTND31
- CE/PE card cage: NT8D1103

Possible cause	Action
Defective MSPS card	<p>Unseat the card then reinstall it.</p> <p>Set the Enb/Dis switch on the NT8D18 Network/DTR Card to Dis, then back to Enb.</p> <p>If the LED on the card is still lit, replace the card.</p> <p>If the LED turns off but the system does not recover, go to the next possible cause.</p>
Defective ICM card	<p>Unseat the ICM card then reinstall it. If the system does not recover:</p> <ul style="list-style-type: none"> - make sure the ROM card is properly installed as necessary, replace the ICM card and the ROM card <p>If the system does not recover, go to the next possible cause.</p>
Defective backplane	<p>Replace the card cage assembly in the module.</p>

Symptom:

Fault indicated on the CPU card (options 21A and 21)

The red LED is lit on the CPU card. Look up all system messages and maintenance display codes in *the X11 input/output guide (553-3001-400)* and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing (553-3001-211)*. Replace equipment as described in *Hardware replacement (553-3001-520)*. You may need to replace one of the following:

CPU card: QPC687

FDI card: QPC742

Memory/peripheral signaling card: NT8D19

ROM card: QPC940

SDI paddle board: NT8D41

CE/PE card cage: NT8D1103

Possible cause	Action
Defective FDI card (lit LED)	<p>Unseat the card then reinstall it. If the card does not recover:</p> <ul style="list-style-type: none"> — make sure the cable between the FDU and FDI card is securely connected — check the switch settings; if necessary, correct the switch settings and try to enable the card — if you cannot load a program or the card will not enable, replace the card <p>If the CPU is still faulty, go to the next possible cause.</p>

(continued)

56 Clearing common equipment faults

Possible cause	Action
Defective SDI	<p>Check each SDI port by entering:</p> <p>LD 37 TTY x "x" represents the number of the interface device attached to the port</p> <ul style="list-style-type: none">— if software is disabled, try to enable it (software disable, hardware disable, then reenable)— if the card will not enable, replace it <p>If the CPU is still faulty, go to the next possible cause.</p>
CPU card (lit LED)	<p>Check the CPU card:</p> <ul style="list-style-type: none">— make sure the ROM card is properly installed as necessary, replace the CPU card and the ROM card <p>If the CPU is still faulty, replace the memory/peripheral signaling card.</p> <p>If the CPU remains faulty, go to the next possible cause.</p>
Defective backplane	<p>Replace the card cage assembly in the module.</p>

Symptom:

Fault indicated on the ICM card (option 21 E)

The red LED is lit on the ICM card. Look up all system messages and maintenance display codes in the XLI *input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-3001-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- ICM card: NTND01
- FDI card: QPC742
- MSPS card: NTND02
- ROM card: NTND31
- SDI paddle board: NT8D41
- CE/PE card cage: NT8D1103

Possible cause	Action
Defective FDI card (lit LED)	<p>Unseat the card then reinstall it. If the card does not recover:</p> <ul style="list-style-type: none"> make sure the cable between the FDU and FDI card is securely connected check the switch settings: if necessary, correct the switch settings and try to enable the card -- if you cannot load a program or the card will not enable, replace the card <p>If the CPU is still faulty, go to the next possible cause.</p> <p>(continued)</p>

58 Clearing common equipment faults

Possible cause	Action
Defective SDI	Check each SDI port by entering: LD 37 TTY x "x" represents the number of the interface device attached to the port — if software is disabled, try to enable it (software disable, hardware disable, then reenable) if the card will not enable, replace it If the CPU is still faulty, go to the next possible cause.
ICM card (lit LED)	Check the ICM card: make sure the ROM card is properly installed — as necessary, replace the ICM card and the ROM card If the CPU is still faulty, replace the MSPS card. If the CPU remains faulty, go to the next possible cause.
Defective backplane	Replace the card cage assembly in the module.

12-00000



Symptom: Call processing stopped (option 51)

Call processing has stopped on a single CPU system. Look up all system messages and maintenance display codes in the *XII input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure. Before you begin:

- Make sure the normal/maintenance switch on the QPC580 CPU Interface Card is set to Maint.
- Take any action indicated by the maintenance display codes.

Note: Constantly observe and look up codes and system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-3001-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- BTU: QPC477
- CMA card: QPC581 or NTND10
- FN card: QPC579
- IF card: QPC580
- Data cartridge: QMM42
- FDI or MSI card: QPC742, QPC584
- FDU or MDU: NT8D68 or NTND15, NT8D69 or NTND16
- Memory card: QPC583 or NTND09
- ROM card: QPC939 or NTND08
- CPU/network card cage: NT6D3903

60 Clearing common equipment faults

Possible cause	Action
Defective module power supply	<p>Make sure the green LED on the CE power supply is lit. If it is not lit, go to "Clearing power faults" on page 19.</p> <p>If the power supply LED is lit, go to the next possible cause.</p>
Initialization required	<p>Press the manual initialize (Man Int) button on the IF card. If the system initializes, clear any faults indicated.</p> <p>If the system does not initialize, unseat network cards one-at-a-time. If the system initializes, replace the last card you removed (it is faulty).</p> <p>If the system will not initialize, go to the next possible cause.</p>
Defective mass storage unit or interface card	<p>Unseat the mass storage unit and interface card then reinstall them. Make sure the cable between the interface card and the unit is securely connected. If the system does not recover, continue with this procedure.</p> <p>If a disabled FDI or MSI card is indicated:</p> <ul style="list-style-type: none">— make sure the data cartridge is securely attached— check the switch settings; if necessary, correct the switch settings— try to enable the interface card (try to software disable, hardware disable, then reenable)— if you cannot load a program or the interface card is still disabled, replace it— if necessary, replace the data cartridge <p>If a disabled FDU or MDU is indicated:</p> <ul style="list-style-type: none">— replace it— if the unit is still disabled, replace the cable between the unit and the interface card <p>If the system does not recover, go to the next possible cause.</p>
Sysload required	<p>Press the reload (Rld) button on the CMA card.</p> <p>If a sysload (reload) occurs, clear any faults indicated.</p> <p>If the system will not sysload, go to the next possible cause.</p>

(continued)

Clearing common equipment faults 61

Possible cause	Action
Defective CE card	<p>Unseat the CE cards then reinstall them. If the system does not recover, continue with this procedure. Try to sysload after any card is replaced.</p> <p>Make sure the cable between the IF and FN cards is securely connected. Make sure the CMA cable is securely connected.</p> <p>Check the CPU cards:</p> <ul style="list-style-type: none">— make sure the ROM card is properly installed on the FN card— as necessary, replace the IF card, the FN card, the ROM card, and the cable <p>If the system does not sysload, replace the memory card.</p> <p>If the system does not sysload, replace the CMA card. If necessary, replace the CMA cable.</p> <p>If the system does not sysload, replace the BTU.</p> <p>If the system does not recover, go to the next possible cause.</p>
Defective backplane	<p>Replace the card cage assembly in the module.</p>

Symptom: Fault indicated on memory card (option 51)

The red LED is lit on the memory card and call processing has stopped. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Take any action indicated by the maintenance display codes. Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- CMA card: QPC581 or NTND10
- FN card: QPC579
- IF card: QPC580
- Memory card: QPC583 or NTND09
- ROM card: QPC939 or NTND08
- CPU/network card cage: NT6D3903

Possible cause	Action
Defective memory card	Unseat the card then reinstall it. If the LED on the card is still lit, replace the card. If the LED turns off but the system does not recover, go to the next possible cause.

(continued)

Clearing common equipment faults 63

Possible cause	Action
Defective CE card	<p>Unseat the CE cards then reinstall them. If the system does not recover, continue with this procedure.</p> <p>Make sure the cable between the IF and FN cards is securely connected. Make sure the CMA cable is securely connected.</p> <p>Check the CPU cards:</p> <ul style="list-style-type: none">make sure the ROM card is properly installed on the FN cardas necessary, replace the IF card, the FN card, the ROM card, and the QCAD240 cable between the IF and FN cards <p>If the system does not recover, replace the CMA card. If necessary, replace the CMA cable.</p> <p>If the system does not recover, go to the next possible cause.</p>
Defective backplane	<p>Replace the card cage assembly in the module</p>

Symptom:

Fault indicated on a common equipment card (option 51)

The red LED is lit on a common equipment card, other than the memory card. Look up all system messages and maintenance display codes in the *X11* input/output (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Make sure the normal/maintenance switch on the QPC580 CPU Interface Card is set to Maint. Constantly observe and look up system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-300 1-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- CMA card: QPC581 or NTND10
- FN card: QPC579
- IF card: QPC580
- FDI or MSI card: QPC742, QPC584
- Memory card: QPC583 or NTND09
ROM card: QPC939 or NTND08
- SDI cards: NT8D41, QPC513, QPC841
CPU/network card cage: NT6D3903

Possible cause	Action
Defective FDI or MSI card (lit LED)	<p>Unseat the card then reinstall it. If the card does not recover:</p> <ul style="list-style-type: none"> make sure the cable between the mass storage unit and the interface card is securely connected check the switch settings; if necessary, correct the switch settings and try to enable - if you cannot load a program or the card will not enable, replace the card <p>If the CPU is still faulty, go to the next possible cause.</p>

(continued)

Possible cause	Action
Defective SDI	<p>Check each SDI port by entering:</p> <p>LD 37 TTY x "x" represents the number of the interface device attached to the port</p> <ul style="list-style-type: none"> — if software is disabled, try to enable it (software disable, hardware disable, then try to reenable) — if the card will not enable, replace it <p>If the CPU is still faulty, go to the next possible cause.</p>
Defective CE card (lit LED)	<p>Unseat the CE cards then reinstall them. If all cards do not recover, continue with this procedure.</p> <p>If the LED is lit on the IF card:</p> <ul style="list-style-type: none"> — make sure the cable between the IF and FN cards is securely connected — make sure the ROM card is properly installed on the FN card <p>as necessary, replace the IF card, the FN card, the ROM card, and the QCAD240 cable between the IF and FN cards</p> <p>If the LED is lit on the CMA, make sure the CMA cable is securely connected. If the cable is connected, enter:</p> <p>LD 35 STAT CMA x "x" represents the CMA number</p> <ul style="list-style-type: none"> — if the CMA is disabled, try to enable it (software disable, hardware disable, then try to reenable) — if the card will not enable, replace it — if the replacement CMA does not enable, replace the cable

(continued)

66 Clearing common equipment faults

Possible cause	Action
Defective backplane	<p>If the LED is lit on the memory card, enter:</p> <p>LD 35</p> <p>STAT MEM x "x" represents a two-digit number-the first digit is the CPU number (0 or 1), the second is the memory card number</p> <p>if the card is disabled, try to enable it (software disable, then reenable):</p> <p>ENL x "x" represents the memory card number</p> <p>— if the card will not enable, enter:</p> <p>MEM x</p> <p>— if the card fails the memory test, replace it</p> <p>If the CPU is still faulty, go to the next possible cause.</p> <p>Replace the card cage assembly in the module.</p>

Symptom:

Call processing stopped (options 61 and 71)

Call processing has stopped on a dual CPU system. Look up all system messages and maintenance display codes in the *X1 I input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure. Before you begin:

- Make sure the normal/maintenance switch on both QPC580 CPU Interface Cards is set to Norm.
- Take any action indicated by the maintenance display codes.

Note: Constantly observe and look up codes and system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-3001-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- BTU: QPC477
- CMA card: QPC581 or NTND10
- FN card: QPC579
- IF card: QPC580
- Data cartridge: QMM42
- FDI or MSI card: QPC742, QPC584
- FDU or MDU: NT8D68 or NTND15, NT8D69 or NTND 16
- Memory card: QPC583 or NTND09
- ROM card: QPC939 or NTND08
- SBE card: QPC215 (option 71)
- 3PE card: QPC441
- CPU/network or CPU card cage: NT6D3903, NT8D3403

68 Clearing common equipment faults

Possible cause	Action
Defective module power supply	Make sure the green LED on the CE power supply is lit. If it is not lit, go to "Clearing power faults" on page 19. If the power supply LED is lit, go to the next possible cause.
initialization required	Press the manual initialize (Man Int) button on the IF card on the active CPU. If the system initializes, clear any faults indicated. If the system does not initialize, unseat network cards one-at-a-time. If the system initializes, replace the last card you removed (it is faulty). If the system will not initialize, go to the next possible cause.
Defective mass storage unit or interface card	Unseat the mass storage unit and the interface card on the inactive CPU then reinstall them. Make sure the cable between the interface card and the unit is securely connected. If the system does not recover, continue with this procedure. If a disabled interface card is indicated: <ul style="list-style-type: none">— make sure the data cartridge is securely attached— check the switch settings; if necessary, correct the switch settings— try to enable the interface card (try to software disable, hardware disable, then reenable)— if you cannot load a program or the interface card is still disabled, replace it— if necessary, replace the data cartridge If a disabled mass storage unit is indicated: <ul style="list-style-type: none">— replace it— if the unit is still disabled, replace the cable between the unit and the interface card If the system does not recover go to the next possible cause
Sysload required	Simultaneously press reload (Rid) button on both CMA cards If a sysload (reload) occurs, clear any faults indicated. If the system will not sysload, go to the next possible cause.

(continued)

Possible cause	Action
Defective CE card	<p>Unseat the CE cards then reinstall them:</p> <ul style="list-style-type: none"> — make sure all CE cables are securely connected, including the cable between the IF and FN cards. — make sure the ROM card is properly installed on the FN card <p>If the system does not recover, continue with this procedure. Try to sysload after any card is replaced.</p> <p>Check the inactive CPU by entering:</p> <pre>LD 35 TCPU</pre> <ul style="list-style-type: none"> — if a disabled card is indicated, check it with the appropriate test or stat command — try to software enable any disabled card (software disable, hardware disable, then reenable) <p>If the system does not recover:</p> <ul style="list-style-type: none"> — unseat all CE cards (including SBE and 3PE cards) on the inactive CPU; try to sysload by pressing the reload button on the active CMA — if a sysload occurs, reinsert the cards one-at-a-time; the system will fail when the defective card is inserted; replace that card <p>If the system does not sysload when all cards are reinstalled on the inactive CPU:</p> <ul style="list-style-type: none"> — remove the cards from the other CPU and try to sysload — again, if a sysload occurs, reinsert the cards one-at-a-time; replace the card that causes the failure <p>If the system still does not sysload, one-at-a-time, replace the CE cables until a sysload occurs.</p> <p>If the system does not recover, go to the next possible cause.</p>
Defective backplane	Replace the card cage assembly in the module.

Symptom:

Fault indicated on a memory card (options 61 and 71)

The red LED is lit on a memory card. The dual CPU system will be operating but may be limited to one CPU. Look up all system messages and maintenance display codes in the *X11* input/output (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- CMA card: QPC581 or NTND10
- FN card: QPC579
- IF card: QPC580
- Memory card: QPC583 or NTND09
- ROM card: QPC939 or NTND08
- CPU/Network or CPU card cage: NT6D3903, NT8D3403

Possible cause	Action
Defective Memory card	<p>Check disabled memory by entering: LD 35 LDIS</p> <p>If the disabled memory card is on the active CPU, test CPUs by entering: TCPU</p> <p>If the response is "OK" switch CPUs by entering: SCPU</p> <p>Test the disabled Memory by entering: MEM x "x" represents the memory card number</p> <p>If the memory card fails the test, replace it.</p> <p style="text-align: center;">(continued)</p>

Clearing common equipment faults 71

Possible cause	Action
	<p>If the memory card passes the test, software disable it, then try to reenable by entering:</p> <p>ENL x</p> <p>If the card will not enable, replace it.</p> <p>if all memory cards are enabled but the CPU is still faulty, go to the next possible cause.</p>
Defective CMA	<p>Make sure the cable between the CMA cards is securely connected.</p> <p>Check the status of the CMA on the inactive CPU by entering:</p> <p>STAT CMA x "x" represents the CMA number</p> <p>If the CMA is enabled test CPUs by entering:</p> <p>TCPU</p> <p>If the response is "OK" switch CPUs by entering:</p> <p>SCPU</p> <p>If the CPU cannot switch but additional system messages do not indicate a CMA problem, go to the next possible cause.</p> <p>If the CMA is disabled or additional system messages indicate a CMA problem, try to enable the CMA by entering:</p> <p>ENL CMA x</p> <p>If the card will not enable, replace it.</p> <p>If the CMA is enabled but the CPU still will not switch, go to the next possible cause.</p>
Defective CE card	<p>Unseat the CE cards on the inactive CPU then reinstall them:</p> <ul style="list-style-type: none">--- make sure all CE cables are securely connected, including the cable between the IF and FN cards--- make sure the ROM card is properly installed <p>If the CPU is still faulty, continue with this procedure.</p>

(continued)

72 Clearing common equipment faults

Possible cause	Action
	<p>Check the inactive CPU by entering: LD 35 TCPU</p> <ul style="list-style-type: none">— if a disabled card is indicated, check it with the appropriate test or stat command— try to software enable any disabled card (software disable, hardware disable, then reenable) <p>If the CPU is still faulty:</p> <ul style="list-style-type: none">— unseat all CE cards on the inactive CPU; try to sysload by pressing the reload button on the active CMA— if a sysload occurs, reinsert the cards one-at-a-time; the system will fail when the defective card is inserted; replace that card <p>If the CPU is still faulty, one-at-a-time, replace the CE cables until a sysload occurs.</p> <p>If the CPU is still faulty, go to the next possible cause</p>
Defective backplane	Replace the card cage assembly in the module.

Symptom:

**Fault indicated on a common equipment card
(options 61 and 71)**

The red LED is lit on a common equipment card, other than a memory card. The dual CPU system will still be operating but may be limited to one CPU. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Make sure the normal/maintenance switch on both QPC580 CPU Interface Cards is set to Norm. Constantly observe and look up system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-3001-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- BTU: QPC477
- CMA card: QPC581 or NTND10
- FN card: QPC579
- IF card: QPC580
- FDI or MSI card: QPC742, QPC584
- Memory card: QPC583 or NTND09
- ROM card: QPC939 or NTND08
- SBE card: QPC215 (option 71)
- SDI cards: NT8D41, QPC513, QPC841
- 3PE card: QPC441
- CPU/network or CPU card cage: NT6D3903, NT8D3403

The red LED is lit on a common equipment card, other than a memory card. The dual CPU system will still be operating but may be limited to one CPU. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

74 Clearing common equipment faults

Possible cause	Action
Defective FDI or MSI card (lit LED)	<p>Unseat the FDI or MSI card then reinstall it. If the card does not recover, continue with this procedure.</p> <p>Make sure the cable between the mass storage unit and the interface card is securely connected.</p> <p>Check the card by entering:</p> <p>LD 37 MSI 0</p> <ul style="list-style-type: none">— if the card is disabled, try to enable it (software disable, hardware disable, then try to reenable)— if the card will not enable, check switch settings; if necessary, correct the switch settings and try to enable— if the card will not enable, replace the card <p>If the CPU is still faulty, go to the next possible cause</p>
Defective SDI	<p>Check each SDI port by entering:</p> <p>LD 37 STAT TTY</p> <ul style="list-style-type: none">— if software is disabled, try to enable it (software disable, hardware disable, then try to reenable)— if the card will not enable, replace it <p>If the CPU is still faulty, go to the next possible cause</p>

(continued)

Clearing common equipment faults 75

Possible cause	Action
Defective CE card (lit LED)	<p>Unseat the cards then reinstall them. Make sure all cables are securely connected. If all cards do not recover, continue with this procedure.</p> <p>If the LED is lit on the IF card:</p> <ul style="list-style-type: none">make sure the cable between the IF and FN cards is securely connectedmake sure the ROM card is properly installed on the FN cardas necessary, replace the IF card, the FN card, the ROM card, and the QCAD240 cable between the IF and FN cards <p>If the LED is lit on some other CE card, enter:</p> <p>LD 35</p> <p>and the appropriate test or stat command to check the status of the card:</p> <ul style="list-style-type: none">— if a card is disabled, try to enable it (software disable, hardware disable, then try to reenable)— if the card will not enable, replace it— if the card enables and the LED turns off, test the CPU by entering: <p>LD 35 TCPU</p> <p>If the CPU is still faulty, one-at-a-time replace the CE cards until the fault clears.</p> <p>If the CPU is still faulty, one-at-a-time replace the CE cables.</p> <p>If the CPU remains faulty, go to the next possible cause.</p>
Defective backplane	<p>Replace the card cage assembly in the module.</p>

Symptom:
fault indicated on a common equipment card
(options 61C and 81)

The red LED is lit or the display is indicating a fault on a common equipment card. The dual Core system will still be operating but may be limited to one CP. Look up system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given by these codes. If the fault does not clear, use this procedure.

Note: Make sure the normal/maintenance switch on both NT6D66 CPs is set to Norm. Constantly observe and look up system messages as you perform this procedure.

For information on switch settings for the applicable Core cards, *see Circuit card installation and testing* (553-3001-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- CP card: NT6D66
- CP to CP cable: NTND11
- IOP card: NT6D63
- CNI card: NT6D65
- 3PE card: QPC441
- CPIO backplane: NTND68 (option 81)
- CPNET backplane: NT9D1102 (option 61 C)
- CBT card: NT6D6003
- Core or Core/Network card cage: NT6D6008, NT9D1101

Clearing common equipment faults 77

Possible cause	Action
Defective serial I/O ports	<p>Check each SDI port by entering:</p> <p>LD 37 STAT TTY</p> <ul style="list-style-type: none">— if software is disabled, try to enable it (software disable, hardware disable, then try to reenale)— if the card will not enable, replace it <p>If the CPU is still faulty. go to the next possible cause</p>
Defective IOP card	<p>Check the IOP card:</p> <ul style="list-style-type: none">— reinstall the IOP card, test it, and enable it: <p>LD 137 DIS IOP TEST IOP ENL IOP ****</p> <p>If the CPU is still faulty, go to the next possible cause.</p>

(continued)

78 Clearing common equipment faults

Possible cause	Action
Defective CE card (lit LED)	<p>Unseat the CP and CNI cards then reinstall them. Make sure all cables are securely connected. If all cards do not recover, continue with this procedure.</p> <p>If the display on the CP card shows a fault:</p> <p>LD 135 TEST CPU</p> <p>If there is a problem with the test, CCED system messages will be generated.</p> <p>If the LED is lit on some other CE card, check the CNI card, enter:</p> <p>LD 135 TEST CNI c s</p> <p>where c represents the CPU 0 or 1 and s represents the card slot</p> <p>If the CPU is still faulty, one-at-a-time replace the CE cables.</p> <p>If the CPU remains faulty, go to the next possible cause</p>
Defective backplane	<p>Replace the card cage assembly in the module</p> <p>To be able to replace the card cage, you must first switch the system to use the alternate CPU and then disable and remove all the cards in the card cage you wish to replace.</p>

Symptom:
Floppy disk unit not operating

There may be a lit LED on the FDU. There may be a maintenance display code on the FDI card indicating a problem with the FDU. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Take any action indicated by the maintenance display codes. Constantly observe and look up system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-3001-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Cable between FDU and FDI card
- Data cartridge: QMM42
- FDI card: QPC742
- FDU: NT8D68 or NTND15

Possible cause	Action
Defective FDI card or data cartridge	<p>Unseat the FDU and FDI card then reinstall them. Make sure the cable between the FDU and FDI is securely connected. (In a dual CPU system, check both FDI cards.) If the FDU does not recover, continue with this procedure.</p> <p>Check the FDI:</p> <ul style="list-style-type: none"> - make sure the data cartridge is securely attached check switch settings; if necessary, correct the switch settings - try to enable the FDI (try to software disable, hardware disable, then reenable) - if you cannot load a program or the FDI is still disabled, replace it if necessary, replace the data cartridge <p>If the FDU is still not operating, go to the next possible cause.</p>
Defective FDU or cable	<p>Replace the FDU. If it is still disabled, replace the cable between the FDU and FDI.</p>

Symptom: Multi Disk Unit not operating

There may or may not be a lit LED on the front of the MDU. There may be a maintenance display code on the MSI card indicating a problem with the MDU. Look up all system messages and maintenance display codes in the *X11 input/output guide (553-3001-400)* and follow the instructions given. If the fault does not clear, use this procedure.

Note: Take any action indicated by the maintenance display codes. Constantly observe and look up system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing (553-3001-211)*. Replace equipment as described in *Hardware replacement (553-3001-520)*. You may need to replace one of the following:

- Cable between MDU and MSI card
- Data cartridge: QMM42
- MSI card: QPC.584
 - MDU: NT8D69 or NTND16
 - CPU/network or CPU card cage: NT6D3903, NT8D3403

Possible cause	Action
Defective MDU (lit LED)	<p>Unseat the MDU and MSI card then reinstall them. Make sure the cable between the MDU and MSI is securely connected. (In a dual CPU system, check both MSI cards.) If the MDU does not recover, continue with this procedure.</p> <p>Try to restore the hard drive from disks:</p> <ul style="list-style-type: none"> — hardware disable the MSI (in a dual CPU system, disable both MSI cards), remove the card and set SW4 to OFF — reinstall the MSI card and hardware enable it — try to software enable the MSI card through the Overlay Loader (you will not be in an overlay) by entering: <p>**** ENLT</p>

(continued)

Clearing common equipment faults 81

Possible cause	Action
	<p>If you cannot load the program, try to enter LD 37 through the maintenance telephone:</p> <ul style="list-style-type: none"> — if you can load the program, test the port for the system terminal you were using — if the port is okay, test the cable to the system terminal — if the cable is okay, check the system terminal <p>If you cannot load a program through the system terminal or the maintenance telephone, replace the MDU.</p> <p>If the MDU is still faulty, go to the next possible cause</p>
Defective cable between MDU and MSI card	<p>Replace the cable to each MSI card.</p> <p>Try to test the MSI and MDU by entering:</p> <p>LD 37 MSI x "x" represents the MSI card number 0 or 1</p> <p>If the MDU is still faulty, go to the next possible cause</p>
Defective MSI card	<p>Check the MSI card:</p> <ul style="list-style-type: none"> -- make sure the data cartridge is securely attached — check switch settings; if necessary, correct the switch settings — try to enable the MSI card (try to software disable, hardware disable, then reenable) — if you cannot load a program or the MSI is still disabled, replace it — if the MSI card is still disabled, replace the data cartridge <p>If the MDU is still faulty, go to the next possible cause.</p>
Defective backplane connection to MDU (LED not lit)	<p>Move the MDU to another acceptable location</p> <p>Try to test the MDU by entering:</p> <p>MSI x</p> <p>If the MDU is still faulty, replace it.</p> <p>If the MDU enables after it is moved, replace the card cage assembly in the module you took it from.</p>

Symptom: Core Multi Disk Unit not operating

There may or may not be a lit LED on the front of the CMDU. Look up all system messages and maintenance display codes in the *X11 input/output* guide (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Take any action indicated by the maintenance display codes. Constantly observe and look up system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-3001-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- SCSI cable: NTND13
- IOP card: NT6D63
- CMDU:NT6D64
- Core or Core/Network card cage: NT6D6008, NT9D1101

Possible cause	Action
Defective CMDU (lit LED)	Unseat the CMDU and then reinstall it. Make sure the cable-between the CMDUs is securely connected. If the CMDU does not recover, continue with this procedure. Try to restore the hard drive from disks: <ul style="list-style-type: none">- stat CMDU, enable it, and test it: LD 137 STAT CMDU x TEST CMDU x DIS CMDU X SYNC ENL CMDU X If the problem continues, a CIOD system message appears and LED lights on the faceplate.

(continued)

Clearing common equipment faults 83

Possible cause	Action
	<p>If you cannot load the program, replace the CMDU:</p> <ul style="list-style-type: none"> — if you can load the program, test the port for the system terminal you were using — if the port is okay, test the cable to the system terminal — if the cable is okay, check the system terminal <p>If the CMDU is still faulty, go to the next possible cause.</p>
Defective SCSI cable between IOPs	<p>Replace the SCSI cable.</p> <p>Test IOP-to-IOP connection:</p> <p>LD 137 TEST SCSI</p> <p>If the CMDU is still faulty, go to the next possible cause.</p>
Defective IOP card	<p>Check the IOP card:</p> <ul style="list-style-type: none"> — reinstall the IOP card, test it, and enable it: <p>LD 137 DIS IOP TEST IOP ENL IOP</p> <p>If the CMDU is still faulty, go to the next possible cause.</p>
Defective backplane connection to CMDU (LED not lit)	<p>Move the CMDU to another acceptable location.</p> <p>Try to test the CMDU by entering:</p> <p>LD 137 TEST CMDU x"x" represents the CMDU card number 0 or 1</p> <p>If the CMDU is still faulty, replace it.</p> <p>If the CMDU enables after it is moved, replace the card cage assembly in the module you took it from.</p>



Clearing network equipment faults

Symptoms:

Disabled loop indicated by OVD message (NT8D04 Superloop Network Card)	89
Loop disabled without OVD message (NT8D04 Superloop Network Card)	91
Disabled loop indicated by OVD message (QPC414 Network Card)	94
Loop disabled without OVD message (QPC414 Network Card)	97
Disabled peripheral signaling card indicated by OVD message.	100
Peripheral signaling card disabled without OVD message.	102
Problems with transferring, placing conference calls. or Music-on-Hold	104
Problems placing calls on 2500 telephones and some trunks	106

Network equipment faults

Network equipment in the Meridian 1 provides speech path switching and transmits and receives signaling messages from the CPU. Network equipment can include:

- conference/tone and digit switch (**CONF/TDS**) card: provides conference capability, all tones for the system, and multifrequency sender (MFS) functionality

intergroup switch (IGS) card: provides speech path switching between network groups for option 71 and 81

- network card: provides digital switching for the system

Note 1: The NT8D04 Superloop Network Card provides the equivalent of four network loops.

Note 2: The NT8D18 Network/Digitone Receiver (DTR) Card provides the digital switching and MFS functionality, for options 21A, 21, and 21E.

- peripheral signaling (PS) card: provides the signaling interface to the CPU and clocking

Note: The NT8D19 Memory/Peripheral Signaling Card combines the functionality of memory and peripheral signaling cards, as well as miscellaneous CPU functions, for options 21A and 21. The NTND02 Misc/SDI/Peripheral Signaling Card combines the functionality of peripheral signaling and SDI cards, as well as miscellaneous CPU functions.

- serial data interface (SDI) card: provides the interface from the CPU to an input/output (I/O) device

Network equipment faults can cause system initializations and disable conference capability or all terminal connections (such as trunks and telephones) on a loop. Defective network equipment can make functional peripheral equipment seem faulty.

Fault clearing procedures

Manual continuity tests can be used to isolate superloop network card and IPE faults. For a description of manual continuity tests, see *General maintenance information* (553-3001-500). See “LD45” the *XII input/output guide* (553-3001-400) for details on performing the tests.

Table 10 lists common network equipment fault indications. To clear faults, select the symptom that most resembles the fault indications and go through the procedure for clearing each possible cause until the fault is fixed. Once the fault is corrected, disregard the remaining possible causes.

Note: Clear any power or common equipment faults before you try to clear network equipment faults.

If the fault is not cleared after you have gone through each possible cause, check the most recent fault indications. Also check “Clearing network equipment faults” on page 85 to see if another type of fault is indicated.

After the fault is corrected, go to “Final maintenance procedure” on page 161 to completely restore normal operation.

WARNING

Module covers are *not* hinged; do *not* let go of the cover. Lift the cover away from the module and set it out of your work area.

Table 10
Network equipment fault indicators

indicator	Possible indications
System messages	BSD081, 101, 110, 111, 121, 130, 201–203, 205–209, 600, 602 CNF messages DTA, DTC, DTI messages ERR020, 120, 4060 INI003, 007–012 NWS101, 141, 201–204, 301, 401 OVD021, 022, 023, 031 TDS messages XMI messages
Visual indicators	Minor alarm on an attendant console Red LEDs lit or flashing on cards
User reports	Minor alarm reported by attendant Users cannot transfer or conference Users cannot dial out on 500/2500 telephones No dial tone at all sets; no display on digital sets

Symptom:
Disabled loop indicated by OVD message
(NT8D04 Superloop Network Card)

An overload (OVD) system message indicates a loop on an NT8D04 Superloop Network Card is disabled. All terminal connections on the loop are disabled. A red LED on the card may be lit or flashing. Look up all system messages and maintenance display codes in the *XI I input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Manual continuity tests can be used to isolate superloop network card and IPE faults. See "LD45" the *XII input/output guide* (553-3001-400) for details on performing the tests.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Controller card: NT8D01
- Superloop network card: NT8D04
- IPE card
- Cable between superloop network card and controller card

Possible cause	Action
Defective superloop network card	<p>Hardware disable then reenable the superloop network card to initiate a self-test. If the test fails, replace the card. If the test passes, follow the procedure below.</p> <p>Disconnect the loop cable(s) to the superloop network card. Enable and test each loop on the card by entering:</p> <p>LD 32 ENLL loop "loop" represents the loop number</p> <p>Wait for an OVD message.</p> <p style="text-align: center;">(continued)</p>

90 Clearing network equipment faults

Possible cause	Action
	<p>If you receive an OVD message, replace the superloop network card.</p> <p>If there is no OVD message, go to the next possible cause.</p>
Defective controller card	<p>Unseat all cards on the PE shelf except the controller card. Reconnect the loop cable to the controller card and enable the card by entering:</p> <p>ENXP x "x" represents the controller number</p> <p>Note: If there are multiple shelves involved, follow this and subsequent procedures one-at-a-time for each controller card.</p> <p>Check the maintenance display codes on the controller card and wait for an OVD message.</p> <p>If you receive an OVD message, unseat and reinstall the controller card to initiate a self-test. If the test fails, replace the card and reinsert cards on the PE shelf.</p> <p>If there is no OVD message, go to the next possible cause.</p>
Defective PE card	<p>Reinsert the PE cards one-at-a-time. Wait for an OVD message after each card is inserted.</p> <p>If the red LED lights when a card is inserted, software disable the card, then try to reenable it. If it will not enable, replace the card.</p> <p>If you receive an OVD message when one of the PE cards is inserted, replace that card.</p> <p>If there is no OVD message as you insert the cards, go to the next possible cause.</p>
Defective cable	<p>Disconnect the loop cable at the controller card. (If there are multiple loop cables, disconnect them one-at-a-time and follow the procedure below for each cable.)</p> <p>Reconnect the cable(s) to the superloop network card and wait for an OVD message.</p> <p>If you receive an OVD message, replace the cable.</p> <p>If there is no OVD message, go to the next possible cause.</p>
Defective terminal equipment	<p>Check terminal equipment (such as attendant consoles and telephones) on the disabled loop.</p> <p>If you find defective terminal equipment, see the appropriate chapter (such as "Clearing attendant console faults" on page 129) to fix the fault.</p>

Symptom:
Loop disabled without OVD message
(NT8D04 Super-loop Network Card)

There is probably a system message indicating the loop or loops on this card are defective or disabled, but there is no overload (OVD) message indicating the card is disabled. The LED on the faceplate may be lit or flashing. Look up all system messages and maintenance display codes in the *X11 input/output guide (553-3001-400)* and follow the instructions given. If the fault does not clear, use this procedure.

Manual continuity tests can be used to isolate superloop network card and IPE faults. See "LD45" the *X11 input/output guide (X53-3001 -400)* for details on performing the tests.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement (553-3001-520)*. You may need to replace one of the following:

- Controller card: NT8D01
 Superloop network card: NT8D04
 IPE card
- Cable between superloop network card and controller card

Possible cause	Action
Defective superloop network card	<p>Hardware disable then reenable the superloop network card to initiate a self-test. If the test fails, replace the card. If the test passes, follow the procedure below.</p> <p>Disconnect the loop cable(s) to the superloop network card. Try to enable each loop on the card by entering:</p> <p>LD 30 ENLL loop "loop" represents the loop number</p> <p>Test each loop by entering:</p> <p>LOOP loop</p>

(continued)

92 Clearing network equipment faults

Possible cause	Action
Defective controller card	<p>If you receive an OVD message at this point, replace the superloop network card.</p> <p>If there is no OVD message and the loops will not enable, go to the next possible cause.</p> <p>Unseat all cards on the PE shelf except the controller card. Reconnect the loop cable to the controller card and enable the controller card by entering:</p> <p>LD 32 ENXP x "x" represents the controller number</p> <p>Note: If there are multiple shelves involved, follow this and subsequent procedures one-at-a-time for each controller card.</p> <p>Check the maintenance display codes on the controller card.</p> <p>If you receive an OVD message at this point, unseat and reinstall the controller card to initiate a self-test. If the test fails, replace the card. Reinsert cards on the PE shelf.</p> <p>If there is no OVD message and the loops will not enable, go to the next possible cause.</p>
Defective PE card	<p>Reinsert the PE cards one-at-a-time.</p> <p>If the red LED lights when a card is inserted, software disable the card, then try to reenale it. If it will not enable, replace the card.</p> <p>If you receive an OVD message when one of the PE cards is inserted, replace that card.</p> <p>If no LEDs light and there is no OVD message as you reinsert the cards, go to the next possible cause.</p>
Defective cable	<p>Disconnect the loop cable at the controller card. (If there are multiple loop cables, disconnect them one-at-a-time and follow the procedure below for each cable.)</p> <p>Reconnect the cable(s) to the superloop network card.</p> <p>If you receive an OVD message at this point replace the cable.</p> <p>If there is no OVD message and the loops will not enable, go to the next possible cause.</p>

(continued)

Clearing network equipment faults 93

Possible cause	Action
Defective terminal equipment	Check terminal equipment (such as attendant consoles and telephones) on the disabled loop. If you find defective terminal equipment, see the appropriate chapter (such as "Clearing attendant console faults" on page 129) to fix the fault.

Symptom:
Disabled loop indicated by OVD message
(QPC414 Network Card)

An overload (OVD) system message indicates a loop on a QPC414 Network Card is disabled. All terminal connections on the loop are disabled. A red LED on the card may be lit. Look up all system messages and maintenance display codes in the *XI 1 input/output guide (553-300) 1-400* and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing (553-3001-211)*. Replace equipment as described in *Hardware replacement (553-3001-520)*. You may need to replace one of the following:

Dual loop peripheral buffer (DLB) card: QPC659

Network card: QPC4 14

PE card

- Cable between network card and DLB card

Possible cause	Action
Defective network card	<p>Disconnect the loop cable(s) to the network card. Enable and test each loop on the network card by entering:</p> <p>LD 30 ENLL loop "loop" represents the loop number</p> <p>Test each loop by entering:</p> <p>LOOP loop</p> <p>Wait for an OVD message.</p> <p>If you receive an OVD message, replace the network card.</p> <p>If there is no OVD message, go to the next possible cause.</p> <p style="text-align: center;">(continued)</p>

Clearing network equipment faults 95

Possible cause	Action
Defective DLB card	<p>Unseat all cards on the PE shelf except the DLB card (if there are two shelves on the loop, disconnect the cable to connector LPY);</p> <p>reconnect the loop cable to the DLB card</p> <p>-- if you receive an OVD message, replace the DLB card and reinsert cards on the PE shelf</p> <p>If there is no OVD message:</p> <p>-- check switch settings on the DLB card; if necessary, correct the switch settings</p> <p>-- if there are two shelves on the loop, go to the next possible cause if there is one shelf on the loop, go to "Defective PE card"</p>
Defective DLB card on second shelf (if two shelves on the loop)	<p>Unseat all cards on the second shelf except the DLB card. Reconnect the inter-shelf cable to the DLB card and wait for an OVD message.</p> <p>If there is an OVD message, replace the DLB card and reinsert cards on the PE shelf.</p> <p>If there is no OVD message, go to the next possible cause.</p>
Defective PE card	<p>Reinsert the PE cards one-at-a-time. (If there are two shelves on the loop, follow this and subsequent procedures one-at-a-time for each shelf.) Wait for an OVD message after each card is inserted.</p> <p>If the LED lights when a card is inserted, software disable the card, then try to reenale it. If it will not enable, replace the card.</p> <p>If you receive an OVD message when one of the PE cards is inserted, replace that card.</p> <p>If there is no OVD message as you reinsert the cards, go to the next possible cause.</p>
Defective cable between network and DLB cards	<p>Disconnect the loop cable at the DLB card.</p> <p>Reconnect the cable(s) to the network card and wait for an OVD message.</p> <p>If you receive an OVD message, replace the cable</p> <p>If there is no OVD message, go to the next possible cause.</p>

(continued)

Possible cause	Action
Defective cable between shelves (if two shelves on the loop)	Disconnect the inter-shelf cable to connector LPX on the second shelf DLB card. Reconnect the cable to connector LPY on the first shelf DLB card and wait for an OVD message. If you receive an OVD message, replace the inter-shelf cable. Reinsert cards on the PE shelf. If there is no OVD message, go to the next possible cause,
Defective terminal equipment	Check terminal equipment (such as attendant consoles and telephones) on the disabled loop. If you find defective terminal equipment, see the appropriate chapter (such as "Clearing attendant console faults" on page 129) to fix the fault.

Symptom:
Loop disabled without OVD message
(QPC414 Network Card)

There is probably a system message indicating the loop or loops on this card are defective or disabled, but there is no overload (OVD) message indicating the card is disabled. The LED on the faceplate may be lit. Look up all system messages and maintenance display codes in the *XI | input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-3001-21 1). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Dual loop peripheral buffer (DLB) card: QPC659
- Network card: QPC414
- PE card

Cable between network card and DLB card

Possible cause	Action
Defective network card	<p>Test the loops on the card by entering:</p> <p>LD 30</p> <p>LOOP loop "loop" represents the loop number</p> <p>Try to enable the loops by entering:</p> <p>ENLL loop</p> <p>Wait for an OVD message.</p> <p>If you receive an OVD message at this point, replace the network card.</p> <p>If there is no OVD message and the loops will not enable, go to the next possible cause.</p>

(continued)

Possible cause	Action
Defective DLB card	<p>Unseat all cards on the PE shelf except the DLB card (if there are two shelves on the loop, disconnect the cable to connector LPY):</p> <ul style="list-style-type: none"> — reconnect the loop cable to the DLB card — if you receive an OVD message at this point, replace the peripheral buffer card and reinsert cards on the PE shelf <p>If there is no OVD message and the loops will not enable:</p> <ul style="list-style-type: none"> — check switch settings on the DLB card; if necessary, correct the switch settings — if there are two shelves on the loop, go to the next possible cause — if there is one shelf on the loop, go to "Disabled peripheral equipment card" on page 116
Defective DLB card on second shelf (if two shelves on the loop)	<p>Unseat all cards on the second shelf except the DLB card. Reconnect the inter-shelf cable to the DLB card.</p> <p>If you receive an OVD message at this point, replace the DLB card and reinsert cards on the PE shelf.</p> <p>If there is no OVD message and the loops will not enable, go to the next possible cause.</p>
Defective PE card	<p>Reinsert the PE cards one-at-a-time. (If there are two shelves on the loop, follow this and subsequent procedures one-at-a-time for each shelf.)</p> <p>If the LED lights when a card is inserted, software disable the card, then try to reenale it. If it will not enable, replace the card.</p> <p>If you receive an OVD message when one of the PE cards is inserted, replace that card.</p> <p>If no LEDs light and there is no OVD message as you reinsert the cards, go to the next possible cause.</p>
Defective cable between network and DLB cards	<p>Disconnect the loop cable at the DLB card.</p> <p>Reconnect the cable(s) to the network card.</p> <p>If you receive an OVD message at this point, replace the cable.</p> <p>If there is no OVD message and the loops will not enable, go to the next possible cause.</p>

(continued)

Possible cause	Action
Defective cable between shelves (if two shelves on the loop)	<p>Disconnect the inter-shelf cable to connector LPX on the second shelf DLB card.</p> <p>Reconnect the cable to connector LPY on the first shelf DLB card.</p> <p>If you receive an OVD message at this point, replace the inter-shelf cable. Reinsert cards on the PE shelf.</p> <p>If there is no OVD message and the loops will not enable, go to the next possible cause.</p>
Defective terminal equipment	<p>Check terminal equipment (such as attendant consoles and telephones) on the disabled loop.</p> <p>If you find defective terminal equipment, see the appropriate chapter (such as "Clearing attendant console faults" on page 129) to fix the fault.</p>

Symptom: Disabled peripheral signaling card indicated by OVD message

There is an overload (OVD) system message indicating a peripheral signaling card is disabled. The LED on the faceplate may be lit. Look up all system messages and maintenance display codes in the *XI I input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Superloop network card or network card: NT8D04, QPC414
- PS card: QPC43
- Clock controller: QPC471, QPC775
- D-channel handler interface card: QPC757

Possible cause	Action
Defective PS card	Unseat all network cards associated with the PS card. Enable the PS card by entering: LD 32 ENPS x "x" represents the PS card number Wait for an OVD message. If you receive an OVD message, replace the PS card. If there is no OVD message, go to the next possible cause.

(continued)

Clearing network equipment faults 101

Possible cause	Action
Defective network card	Reinsert network cards one-at-a-time. Wait for an OVD message after each card is inserted. If you receive an OVD message when one of the cards is inserted, replace that card. Reenable the PS card by entering: LD 32 ENPS x If you do not receive an OVD message, go to the next possible cause.
Defective clock controller	<i>See Digital Trunk Interface/Computer-to-PBX Interface maintenance (553-2811-500)</i>

Symptom: Peripheral signaling card disabled without OVD message

The peripheral signaling card is disabled on one shelf. The LED on its faceplate may be lit. There is no overload (OVD) message indicating a fault with this card. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Superloop network card or network card: NT8D04, QPC414
- PS card: QPC43
- Clock controller: QPC471, QPC77.5
- D-channel handler interface card: QPC757

Possible cause	Action
Defective PS card	Unseat all network cards associated with the PS card Try to enable the PS card by entering: LD 32 ENPS x "x" represents the PS card number If you receive an OVD message at this point or if you cannot enable the PS card, replace it. If the PS card is still disabled, go to the next possible cause. (continued)

Possible cause	Action
Defective network card	Reinsert network cards one-at-a-time. If you receive an OVD message when one of the cards is inserted or if the card is disabled, replace that card. Reenable the PS card by entering: LD 32 ENPS x If the PS card is still disabled, go to the next possible cause.
Defective clock controller	See <i>Digital Trunk Interface/Computer-to-PBX Interface maintenance (553-281 1-500)</i>

Symptom: Problems with transferring, placing conference calls, or Music-on-Hold

Several users cannot transfer or place conference calls, or calls do not receive Music-on-Hold. A card that provides conference capability may be disabled. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Conference/TDS card: NT8D17
- PS card: QPC43
- 3PE card: QPC441
- Telephone keys

Possible cause	Action
Defective conference/TDS card	<p>If there are no messages indicating a fault on any conference loop, test each conference loop in the system by entering:</p> <p>LD 38 CNFC loop "loop" represents the conference loop number</p> <p><i>Note:</i> See the <i>X77 input/output guide</i> for other tests.</p> <p>If the conference loop is disabled, try to enable it by entering:</p> <p>LD 38 ENLX loop "loop" represents the Conference loop which is the odd loop of the Conference/TDS loop pair</p> <p><i>Note:</i> You must enable the card with the command ENLX. Enabling the loops with the command ENLL does not enable the hardware.</p>

(continued)

Possible cause	Action
Defective card on Network shelf	<p>If a fault is indicated on a conference loop, replace the conference/TDS card identified.</p> <p>If no faults are detected on any conference loop, go to the next possible cause.</p> <p>One-at-a-time, replace the following cards until the fault clears:</p> <ul style="list-style-type: none"> — 3PE card — PS card <p>If there is still a Conference problem, go to the next possible cause.</p>
Defective telephone keys	<p>Check the keys on any telephone with this problem. See the following Northern Telecom Publications:</p> <ul style="list-style-type: none"> — X71 input/output guide (553-3001-400)—LD31 tests — <i>Telephone and attendant console installation (553-3001-215)</i> — <i>Meridian 1 telephones description and specifications (553-3001-1 08)</i>
Excessive traffic in the system	<p>Additional conference/TDS cards may be required to handle the traffic in the system. See <i>Traffic measurement formats and output (553-2001-450)</i>.</p>

Symptom:
Problems placing calls on 2500 telephones and some trunks

Several users of 2500 telephones report trouble placing calls. Other users may report trouble dialing on certain trunks. A **digitone** receiver or a card that provides tone and digit switch capability may be disabled. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Conference/TDS card: NT8D17
- DTR card: NT8D16
- Network/DTR card: NT8D18

Possible cause	Action
Defective digitone receiver	<p>Check for disabled digitone receiver TNs by entering LD 34 STAT</p> <p>If any are disabled, try to enable them by entering: ENLR I s c u "I s c u" represents loop, shelf, card, and unit numbers</p> <p>Test the digitone receiver by entering: DTR I s c u</p> <p>If the digitone receiver fails the test, replace it. If the digitone receiver passes the test, go to the next possible cause.</p>

(continued)

Possible cause	Action
Defective conference/TDS card	<p>Test Tone and Digit Switch loops by entering:</p> <p>LD 34 TDS loop "loop" represents the loop number</p> <p>If the conference loop is disabled, try to enable it by entering:</p> <p>ENLX loop "loop" represents the TDS/MFS loop which is the even loop of the Conference/TDS loop pair)</p> <p>Note: You must enable the card with the command ENLX. Enabling the loops with the command ENLL does not enable the hardware.</p> <p>If a fault is indicated on a conference loop, replace the conference/TDS card identified.</p> <p>If no faults are detected on any conference loop, go to the next possible cause.</p>
Excessive traffic in the system	<p>Additional digitone receivers or conference/TDS cards may be required to handle the traffic in the system. See <i>Traffic measurement formats and output</i> (553-2001-450).</p>

108 Clearing network equipment faults



Clearing peripheral equipment faults

Symptoms:

Red LED lit on controller card	112
Red LED lit on dual loop peripheral buffer card	114
Disabled peripheral equipment card	116
More than one peripheral equipment card disabled	118

Peripheral equipment faults

Peripheral equipment (PE) provides the interface between network equipment switching and terminal equipment (such as trunks, telephones, data sets, and attendant consoles). Peripheral equipment faults can disable network and terminal equipment.

Note: For fault clearing purposes, the general term “peripheral equipment” includes intelligent peripheral equipment (IPE). When there are differences, PE and IPE are specified.

Fault clearing procedures

Manual continuity tests can be used to isolate superloop network card and IPE faults. For a description of manual continuity tests, see *General maintenance information (553-3001-500)*. See “LD45” the *XI 1 input/output guide (553-3001-400)* for details on performing the tests.

Table 11 lists common peripheral equipment fault indications (many other system messages may be generated). To clear faults, select the symptom that most resembles the fault indications and go through the procedure for clearing each possible cause until the fault is fixed. Once the fault is corrected, disregard the remaining possible causes.

Note: Clear any power or common equipment faults before you try to clear telephone faults.

If the fault is not cleared after you have gone through each possible cause, check the most recent fault indications. Also check “How to clear faults” on page 3 to see if another type of fault is indicated.

After the fault is corrected, go to "Final maintenance procedure" on page 161 to completely restore normal operation.

Table 11
Peripheral equipment fault indicators

Indicator	Possible indications
Sample system messages	BSD301, 401, 402 ERR4062 NWS301, 401, 501 OVD001-010, 024 XMI messages
Visual indicators	Red LEDs lit on cards
Maintenance displays	NT8D01 AC or NT8D01 AD Controller Card
User reports	Trouble with calls on attendant console Trouble with calls on 500/2500 telephones Trouble with calls on SL-1, MI 000, or digital telephones

WARNING

Module covers are *not* hinged; do *not* let go of the cover. Lift the cover away from the module and set it out of your work area.

Symptom: Red LED lit on controller card

The red LED is lit on only one controller card. Red LEDs on Peripheral (PE) Equipment cards on the same shelf may be lit. Look up all system messages and maintenance display codes in the *XI I input/output guide (553-3001-400)* and follow the instructions given. If the fault does not clear, use this procedure.

Manual continuity tests can be used to isolate IPE faults. See "LD 45" the *XII input/output guide (553-3001-400)* for details on performing the tests.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement (553-3001-520)*. You may need to replace one of the following:

- Controller card: NT8D01AC, NT8D01AD
IPE card
- IPE card cage: NT8D3703

Possible cause	Action
Defective controller card	<p>Remove then reinstall the controller card to initiate a self-test:</p> <ul style="list-style-type: none">-- the maintenance display on the card shows the code for each test running (see "HEX" in the <i>XII input/output guide</i>)-- if the tests complete successfully, the display continually flashes-- if the card continuously fails a test, the code for that test is steadily displayed <p>If the test fails, replace the card.</p> <p>If the test passes but the card is still disabled, test the loop by entering: LD 30 LOOP loop "loop" represents the loop number</p> <p>If the test fails, go to the next possible cause.</p>

(continued)

Possible cause	Action
Defective PE card	<p>Unseat all the cards in the shelf associated with the controller card:</p> <ul style="list-style-type: none">— if the red LED on the controller card turns off, the fault is in one of the unseated cards— reinsert the cards one-at-a-time— when the controller card LED turns on again, replace the last card you inserted <p>If the red LED on the controller card does not turn off when the PE cards are unseated, reinstall the cards and go to the next possible cause.</p>
Defective cable	<p>Test all cables to the controller card</p> <p>If you find a defective cable, replace it.</p> <p>If there is no problem with the cables, go to the next possible cause.</p>
Defective backplane	<p>Replace the card cage assembly in the module.</p>

Symptom:

Red LED lit on dual loop peripheral buffer card

The red LED is lit on only one dual loop peripheral buffer card. Red LEDs on Peripheral (PE) Equipment cards on the same shelf may be lit. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

For information on switch settings, see *Circuit card installation and testing* (553-3001-211). Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Dual loop peripheral buffer (DLB) card: QPC659
- PE card
- PE card cage NT8D1303

Possible cause	Action
Defective DLB card	<p>Test the shelf by entering:</p> <p>LD 30 LOOP loop "l s" represents loop and shelf numbers</p> <p>Note: If two loops are assigned to the shelf, be sure to test both.</p> <p>If a defective DLB card is indicated, check the switch settings on the card. If the switch settings are correct, replace the card.</p> <p>If the test fails but the DLB card does not seem to be faulty, go to the next possible cause.</p>

(continued)

Clearing peripheral equipment faults 115

Possible cause	Action
Defective PE card	Unseat all the cards in the shelf associated with the DLB card: <ul style="list-style-type: none">— if the red LED on the DLB card turns off, the fault is in one of the unseated cards— reinsert the cards one-at-a-time— when the DLB LED turns on again, replace the last card you inserted If the red LED on the DLB does not turn off when the PE cards are unseated, reinstall the cards and go to the next possible cause.
Defective cable	Test all cables to the DLB card. If you find a defective cable, replace it. If there is no problem with the cables, go to the next possible cause.
Defective backplane	Replace the card cage assembly in the module.

Symptom: Disabled peripheral equipment card

One PE or IPE card is disabled, the red LED on a PE card is lit, or two or more units on a card are disabled. There is a system message indicating the card or units on the card are disabled. Only one card on the shelf is affected. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Manual continuity tests can be used to isolate IPE faults. See “LD 45” the *X11 input/output guide* (553-3001-400) for details on performing the tests.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Controller card: NT8D01AC, NT8D01AD
- Dual loop peripheral buffer (DLB) card: QPC659
- Superloop network card and network card: NT8D04, QPC414
- PE or IPE card
- PE or IPE card cage: NT8D1303, NT8D3703

Possible cause	Action
Defective PE card	Replace the affected card. Enable the card by entering: LD 32 ENLC I s c “I s c” represents loop, shelf, and card numbers Test the card by entering: LD 30 SHLF I s

(continued)

553-3001-510

Clearing peripheral equipment faults 117

Possible cause	Action
Defective controller card or DLB card	Replace the controller card or DLB card. Enable the PE card by entering: LD 32 ENLC I s c Test the card by entering: LD 30 SHLF I s
Defective network card	Replace the network card. Test the loop by entering: LOOP loop "loop" represents the loop number
Defective backplane	Replace the card cage assembly in the module.

Symptom:

More than one peripheral equipment card disabled

More than one PE or IPE card, or two or more units on different cards, are disabled on the same shelf. There is a system message indicating the cards or units on the cards are disabled. Look up all system messages and maintenance display codes in the *X11 input/output guide (553-3001-400)* and follow the instructions given. If the fault does not clear, use this procedure.

Manual continuity tests can be used to isolate IPE faults. See “LD 4.5” the *X11 input/output guide (553-3001-400)* for details on performing the tests.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement (553-3001-520)*. You may need to replace one of the following:

- Cable between network card and PE/IPE shelf
- Controller card: NT8D01AC, NT8D01AD
- Dual loop peripheral buffer (DLB) card: QPC659
- Superloop network card and network card: NT8D04, QPC414
- PE or IPE card
- PE or IPE card cage: NT8D1303, NT8D3703

Possible cause	Action
Defective controller card or DLB card	Replace the controller card or DLB card. Enable the PE card by entering: LD 32 ENLC l s c “l s c” represents loop, shelf, and card numbers Test the card by entering: LD 30 SHLF l s

(continued)

Clearing peripheral equipment faults 119

Possible cause	Action
Defective cable from network card	<p>Disable the loop for the affected shelf by entering: DISL loop "loop" represents the loop number Replace the cable from the network card to the PE shelf. Test the loop by entering: LOOP loop</p>
Defective network card	<p>Replace the network card. Test the loop by entering: LOOP loop</p>
Defective PE card	<p>Replace the affected card. Enable the card by entering: LD 32 ENLC I s c Test the card by entering: LD 30 SHLF I s</p>
Defective backplane	<p>Replace the card cage assembly in the module.</p>

CONTENTS

120 Clearing peripheral equipment faults

121

Clearing trunk faults

Symptoms:

Trunk cannot make or receive calls (OVD message received).	124
Trunk cannot make or receive calls (no OVD message).	127

Trunk faults

Trunk cards provide the interface between the peripheral equipment buffer and various trunk facilities. This chapter specifically considers two types of trunk cards:

- E&M trunk card: provides four analog trunks, each of which can be individually configured to operate as:
 - E&M signaling trunk
 - Two-wire tie trunk
 - Four-wire tie trunk
 - Paging trunk
- universal trunk card: provides eight trunks, each of which can be individually configured to operate as:
 - Central Office (CO) trunk
 - Direct Inward Dialing (DID) trunk
 - Two-way tie, Dial Repeating (2DR)
 - Two-way tie, Outgoing Automatic Incoming Dial (OAID) trunk
 - Outgoing Automatic Number Identification (OANI) trunk
 - Recorded Announcement (RAN) trunk
 - Music trunk
 - Paging trunk

Trunk faults can cause problems (such as noise) on outside calls and can keep calls from coming in or going out.

Fault clearing procedures

Manual continuity tests can be used to isolate superloop network card and IPE faults. For a description of manual continuity tests, *see General maintenance information (553-3001-500)*. See “LD 45” the *XI Input/output guide (553-3001-400)* for details on performing the tests.

Table 12 lists common trunk fault indications. To clear faults, select the symptom in that most resembles the fault indications and go through the procedure for clearing each possible cause until the fault is fixed. Once the fault is corrected, disregard the remaining possible causes.

Note: Clear any power or common equipment faults before you try to clear telephone faults.

If the fault is not cleared after you have gone through each possible cause, check the most recent fault indications. Also check “How to clear faults” on page 3 to see if another type of fault is indicated.

After the fault is corrected, go to “Final maintenance procedure” on page 161 to completely restore normal operation.

Table 12
Trunk fault indicators

Indicator	Possible indications
System messages	ERROSO, 220,270 OVD003, 008, 009, 010 TRK messages
Visual indicators	Red LED lit on trunk card
User reports	Users have trouble with a specific trunk Callers report continuous ringing Trouble with calls on console and/or telephones

WARNING

Module covers are not hinged; do *not* let go of the cover. Lift the cover away from the module and set it out of your work area.

Symptom: Trunk cannot make or receive calls (OVD message received)

You cannot make or receive calls over a trunk and an overload (OVD) system message is received. The message indicates only the TN for this trunk has been disabled. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Manual continuity **loopback** tests can be used to isolate faults to IPE, such as E&M and universal trunk cards. See "LD 45" the *X11 input/output guide* (553-3001-400) for details on performing the tests.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- E&M trunk card: NT8D15
- Universal trunk card: NT8D14
- Any other trunk card
- Conference/TDS card: NT8D17
- DTR card: NT8D16
- Network/DTR card: NT8D18
- Trunk equipment (such as music source or paging equipment)
- PE or IPE card cage: NT8D1303, NT8D3703

Possible cause	Action
Defective trunk card	If the indicated card is an E&M or universal trunk card, unseat then reinstall the card to initiate a self-test. If the test fails, replace the card. If the test passes, follow the procedure below. Disconnect the wiring between the card and the cross-connect terminal.

(continued)

Possible cause	Action
Defective wiring	<p>Enable the TN by entering: LD 32 ENLU I s c u "I s c u" represents loop, shelf, card, and unit numbers Wait for an OVD message. If you receive an OVD message, replace the card. If you do not receive an OVD message, reconnect the wiring and go to the next possible cause.</p> <p>At the main cross-connect terminal, disconnect the wiring to the CO or other trunk equipment (such as a music source or paging equipment). Enable the TN and wait for an OVD message. If you receive an OVD message, repair or replace the wiring to the PE shelf. If there is no OVD message, repair or replace the wiring from the cross-connect terminal to the telephone. If the trunk card still will not enable or there is still a trunk problem, reconnect the wiring and go to the next possible cause.</p>
Defective trunk equipment	<p>Make sure the CO equipment or other trunk equipment is not defective. If there is no problem with this equipment, go to the next possible cause.</p>
Defective DTR, TDS, or MFS	<p>Use the attendant console to seize trunks and audibly test for dial tone and outpulsing, or use a maintenance telephone and enter: LD 36 TRK I s c u</p> <p>Note: See the <i>X11 input/output</i> guide for information on using this test.</p> <p>If you do not hear outpulsing, the digitone receiver, tone and digit switch, or multifrequency sender may not be sending or receiving digits and the fault will affect more than one trunk. See the procedures for clearing faults on this equipment. If there is no problem with this equipment, go to the next possible cause.</p>

(continued)

126 Clearing trunk faults

Possible cause	Action
Defective PE shelf	Unseat the affected trunk card and enable the TN. If you do not receive an OVD message, test superloop TNs by entering: LD 30 UNTT l s c u Test TNs on other loops by entering: LD 45 TEST If you receive an OVD message, replace the card cage assembly in the module.

Symptom:**Trunk cannot make or receive calls (no OVD message)**

You cannot make or receive calls over a trunk, but there is no overload (OVD) or other system message showing the TN for this trunk is defective or has been disabled. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Manual continuity **loopback** tests can be used to isolate faults to IPE, such as E&M and universal trunk cards. See "LD 45" the *X11 input/output guide* (553-3001-400) for details on performing the tests.

Note: Constantly observe and look up system messages as you perform this procedure.

Replace equipment as described in *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- E&M trunk card: NT8D15
- Universal trunk card: NT8D14
- Any other trunk card
- Conference/TDS card: NT8D17
- DTR card: NT8D16
- Network/DTR card: NT8D18
- Trunk equipment (such as music source or paging equipment)

Possible cause	Action
Defective trunk equipment	Make sure the CO equipment or other trunk equipment is not defective. If there is no problem with this equipment, go to the next possible cause.

(continued)

128 Clearing trunk faults

Possible cause	Action
Disabled or defective TN	<p>Test TNs on superloops by entering: LD 30 UNTT l s c u "l s c u" represents loop, shelf, card, and unit numbers</p> <p>Test TNs on other loops by entering: LD 45 TEST</p> <p>If the test fails, replace the indicated item and test again.</p>
Defective trunk card	<p>If the card is an E&M or universal trunk card, unseat the reinstall the card to initiate a self-test.</p> <p>If the test fails, replace the card.</p> <p>If the test passes, go to the next possible cause.</p>
Defective wiring	<p>At the main cross-connect terminal, disconnect the wiring to the CO or other trunk equipment.</p> <p>Enable the TN and wait for an OVD message. If you receive an OVD message, repair or replace the wiring to the PE shelf.</p> <p>If there is no OVD message, repair or replace the wiring from the cross-connect terminal to the telephone.</p> <p>If the trunk card still will not enable or there is still a trunk problem, reconnect the wiring and go to the next possible cause.</p>
Defective DTR, TDS, or MFS	<p>Use the attendant console to seize trunks and audibly test for dial tone and outpulsing, or use a maintenance telephone and enter: LD 36 TRK l s c u</p> <p>Note: See the <i>X11 input/output guide</i> for information on using this test.</p> <p>If you do not hear outpulsing, the digitone receiver, tone and digit switch, or multifrequency sender may not be sending or receiving digits and the fault will affect more than one trunk. See the procedures for clearing faults on this equipment.</p> <p>If there is no problem with this equipment, go to the next possible cause.</p>
Excessive traffic in the system	<p>Additional trunk cards may be required to handle the traffic in the system. See <i>Traffic measurement formats and output (553-2001-450)</i>.</p>

Clearing attendant console faults

Symptoms:

Console cannot make or receive calls (OVD message received)	132
Console cannot make or receive calls (no OVD message)	134
Indicator or digit display not functioning properly.	136
Operator cannot hear or be heard properly	138

Attendant console faults

Attendant consoles are the operator's interface to the system and its features. Components that can cause an attendant console fault are:

- the console itself or add-on units
- the console power supply
- the building wiring
 - the cross-connect from the console to the line circuit
 - the unit on the peripheral line card
- the peripheral line card
- the ringing generator
- the peripheral controller card
- the peripheral module power
- the peripheral module backplane

Attendant console faults typically affect only a single attendant. However, if more than one attendant console is affected, look for connections such as:

- they are on the same line card
- they are on the same module
- they are on the same loop
- they are served by the same peripheral controller
- there is a problem with ringing or tones

Use the following software programs to isolate attendant console faults:

- LD 30 to test network loops
- LD 31 to test sets and consoles
- LD 32 to test peripheral controllers
- LD 45 to perform
 - signaling tests
 - manual continuity tests

Fault clearing procedures

Table 13 lists common attendant console fault indications. To clear faults, select the symptom that most resembles the fault indications then go through the procedure for clearing each possible cause until the fault is fixed. Once the fault is corrected, disregard the remaining possible causes.

Note: Clear any power or common equipment faults before you try to clear attendant console faults.

If the fault is not cleared after you have gone through each possible cause, check the most recent fault indications. Also check “How to clear faults” on page 3 to see if another type of fault is indicated.

After the fault is corrected, go to “Final maintenance procedure” on page 161 to completely restore normal operation.

Table 13
Attendant console fault indicators

Indicator	Possible indications
System messages	BSD501—The console (identified by loop, shelf, card, and unit) failed the signaling test. If the unit number is preceded by a minus sign, the console was disabled. There is a console fault or a fault on the peripheral equipment card indicated.
Visual indicators	Red LED lit on associated cards
User reports	Trouble with calls Trouble with equipment (such as handset, headset, or display)

WARNING

Module covers are *not* hinged; do *not* let go of the cover. Lift the cover away from the module and set it out of your work area.

Symptom:
Console cannot make or receive calls (OVD message received)

The attendant console cannot make or receive calls. There is an OVD message indicating a TN for the attendant console has been disabled. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See Telephone and attendant console installation (553-3001-215) for information on connecting attendant consoles. See *System installation procedures* (553-3001-210) for information on system cabling. To replace other equipment, see *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Attendant console
 - PE or IPE card associated with the console
- CE/PE, PE, or IPE card cage: NT8D1103, NT8D1303, NT8D3703

Possible cause	Action
Defective PE card	Software disable the TN indicated by the OVD message by entering: LD 32 DISU l s c u "l s c u" represents loop, shelf, card, and unit numbers Disconnect the wiring between the PE card and the cross-connect terminal. Reenable the TN by entering: ENLU l s c u and wait for an OVD message (continued)

Possible cause	Action
Defective console	<p>If you receive a message indicating a problem with the card or unit, replace the card.</p> <p>If you do not receive a message indicating a problem with the card or unit, reconnect the wiring and go to the next possible cause.</p> <p>Disable the TN. Disconnect the wiring from the console to the jack. Reenable the TN and wait for an OVD message.</p> <p>If you do not receive an OVD message, replace the console.</p> <p>If you receive an OVD message, reconnect the wiring and go to the next possible cause.</p>
Defective wiring	<p>Disable the TN. Disconnect the wiring between the console and the cross-connect terminal.</p> <p>Reenable the TN and wait for an OVD message.</p> <p>If you do not receive an OVD message, replace or repair the wiring between the console and the cross-connect terminal.</p> <p>If you receive an OVD message, replace or repair the wiring between the PE shelf and the cross-connect terminal.</p> <p>If there is still a console problem, reconnect all wiring and go to the next possible cause.</p>
Defective backplane	<p>Disable the TN. Unseat the affected PE card.</p> <p>Reenable the TN and wait for an OVD message.</p> <p>If you receive an OVD message, replace the card cage assembly in the module.</p>

Symptom:

Console cannot make or receive calls (no OVD message)

The attendant console cannot make or receive calls. There is no OVD message. There may be other system messages indicating the TN for this console is defective or has been disabled. Look up all system messages and maintenance display codes in the *X1 1 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See Telephone and attendant console installation (553-3001-215) for information on connecting attendant consoles. See *System installation procedures* (553-3001-210) for information on system cabling.

Possible cause	Action
No power to console	Check the power supply and wiring to see that the console is powered up. If there is a power supply problem, correct it. If there is no power problem, go to the next possible cause.
Defective console	Test the console by entering: LD 31 (See the <i>X1 1 input/output guide</i> for information on testing consoles with LD 31.) If the console fails the test, replace it. If the console passes the test, go to the next possible cause.
Console connected to wrong TNs	Check the cross-connect terminal to make sure the console is connected to the correct TNs. If the console is not connected correctly, fix the wiring. If the console is connected correctly, go to the next possible cause.

(continued)

Possible cause	Action
Disabled TN	<p>Software disable then reenable each TN by entering:</p> <p>LD 32 DISUlscu ENLUlscu "l s c u" represents loop, shelf, card, and unit numbers</p> <p>Test TNs on superloops by entering:</p> <p>LD 30 UNTTlscu</p> <p>Test TNs on other loops by entering:</p> <p>LD 45 TEST</p> <p>If there is still a console problem, go to the next possible cause.</p>
Defective wiring	<p>Make sure wiring is properly connected and wires are not interchanged, crossed, or grounded:</p> <ul style="list-style-type: none"> — check the wiring between the console and the cross-connect terminal — check the wiring between the PE/IPE shelf and the cross-connect terminal <p>If there is a wiring problem, correct it.</p>

Symptom:
Indicator or digit display not functioning properly

The attendant console operates, but some LCD indicators or digit displays are not functioning properly. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See Telephone and attendant console installation (553-3001-215) for information on connecting attendant consoles.

Possible cause	Action
Disconnected or defective power supply	Make sure the required power supplies to the attendant console are connected and are not defective. If there is still a console problem, go to the next possible cause.
Disabled TN	Software disable then reenable each TN by entering: LD 32 DISU I s c u ENLU I s c u "I s c u" represents loop, shelf, card, and unit numbers Test TNs on superloops by entering: LD 30 UNTT I s c u Test TNs on other loops by entering: LD 45 TEST If there is still a console problem, go to the next possible cause.

(continued)

Possible cause	Action
Feature not assigned	Make sure the feature or the indicator is assigned in software (see the X7 1 input/output guide). If there is still a console problem, go to the next possible cause.
Defective console	Test the console by entering: LD 31 (See the X77 <i>input/output guide</i> for information on testing consoles with LD 31.) If the console fails the test, replace it.

Symptom:

Operator cannot hear or be heard properly

The attendant console operates, but the user cannot hear or be heard properly. **Look** up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See *Telephone and attendant console installation* (553-3001-215) for information on connecting attendant consoles. See *System installation procedures* (553-3001-210) for information on system cabling. To replace other equipment, see *Hardware replacement* (553-3001-520).

Possible cause	Action
Defective headset or handset	<p>Make sure the handset or headset is plugged into the correct jack on the console.</p> <p>Try another handset or headset.</p> <p>If the test equipment works, replace the faulty handset or headset.</p> <p>If there is still a console problem, go to the next possible cause.</p>
Defective console	<p>Test the console by entering:</p> <p>LD 31</p> <p>(Follow the procedures in the X77 input/output guide to test consoles with LD 31.)</p> <p>If the console fails the test, replace it.</p> <p>If the console passes the test, go to the next possible cause.</p>

(continued)

Possible cause	Action
Defective PE/IPE card	<p>Software disable each TN by entering: LD 32 DISU I s c u "I s c u" represents loop, shelf, card, and unit numbers Disconnect the wiring between the PE card and the cross-connect terminal. Reenable and test each TN by entering: ENLU I s c u Wait for an OVD message. If you receive a message indicating a problem with the card or unit, replace the card. If you do not receive a message indicating a problem with the card or unit, reconnect the wiring and go to the next possible cause.</p>
Defective wiring to console	<p>Make sure wiring is properly connected and wires are not interchanged, crossed, or grounded:</p> <ul style="list-style-type: none">— check the wiring between the console and the cross-connect terminal— check the wiring between the PE shelf and the cross-connect terminal <p>If there is a wiring problem, correct it.</p>

553-3001-510

140 Clearing attendant console faults



Clearing telephone faults

Symptoms:

Telephone cannot make or receive calls (OVD message received) . .	144
Telephone cannot make or receive calls (no OVD message)	146
One end cannot hear or be heard.	148
Noise or low volume on all calls.	150
Defective indicator, digit display, or component	152
Defective feature.	154
Defective add-on module	155
Cannot dial from 2500 telephone	156
No ring on 500 and 2500 telephones.	158

Telephone faults

Telephones and terminals are the user's interface to the system and its features. Components that can cause a telephone fault are:

- the telephone itself or add-on units
- the telephone power supply
- the building wiring
- the cross-connect from the telephone to the line circuit
- the unit on the peripheral line card
 - the peripheral line card
- the ringing generator
- the peripheral controller card
- the peripheral module power
- the peripheral module backplane

Telephones and terminal faults typically affect only a single user. However, if more than one telephone is affected, look for connections such as:

- they are on the same line card
- they are on the same module
- they are on the same loop
- they are served by the same peripheral controller
- there is a problem with ringing or tones

Use the following software programs and tests to isolate telephone faults:

- LD 30 to test network loops
- LD 31 to test sets and consoles
- LD 32 to test peripheral controllers
- LD 45 to perform signaling tests
- Meridian Modular Telephone (M2006, M2008, M2016S, and M2616) self-test

Fault clearing procedures

Table 14 lists common telephone fault indications. To clear faults, select the symptom that most resembles the fault indications and go through the procedure for clearing each possible cause until the fault is fixed. Once the fault is corrected, disregard the remaining possible causes.

Note: Clear any power or common equipment faults before you try to clear telephone faults.

If the fault is not cleared after you have gone through each possible cause, check the most recent fault indications. Also check “How to clear faults” on page 3 to see if another type of fault is indicated.

After the fault is corrected, go to “Final maintenance procedure” on page 161 to completely restore normal operation.

Table 14
Telephone fault indicators

Indicator	Possible indications
System messages	BSD501 ERR500 MWL500 NWS501 OVD001–002, 004, 005 XMI messages
Visual indicators	Red LED lit on associated cards
User reports	Trouble with calls Trouble with equipment (such as handset or add-on module)
WARNING Module covers are not hinged; do <i>not</i> let go of the cover. Lift the cover away from the module and set it out of your work area.	

Symptom:
Telephone cannot make or receive calls (OVD message received)

The telephone cannot make or receive calls. There is an OVD message indicating the TN for only this telephone has been disabled. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See *Telephone and attendant console installation* (553-3001-215) for information on connecting telephones. See *System installation procedures* (553-3001-210) for information on system cabling. To replace other equipment, see *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- PE or IPE card
- Telephone
 - Wiring between the cross-connect terminal and the telephone
 - Wiring between the PE/IPE shelf and the telephone
- CE/PE, PE, or IPE card cage: NT8D1103, NT8D1303, NT8D3703

Possible cause	Action
Defective PE card	Software disable the TN indicated by the OVD message by entering: LD 32 DISU l s c u "l s c u" represents loop, shelf, card, and unit numbers Disconnect the wiring between the PE card and the cross-connect terminal. Reenable the TN by entering: ENLU l s c u and wait for an OVD message. (continued)

Clearing telephone faults 145

Possible cause	Action
Defective telephone	<p>If you receive a message indicating a problem with the card or unit, replace the card.</p> <p>If you do not receive a message indicating a problem with the card or unit, reconnect the wiring and go to the next possible cause.</p> <p>Note: If the telephone is a Meridian Modular Telephone, enter: LD 32 IDU l s c u</p> <p>If there is no response, replace the telephone. If there is an appropriate response, continue this procedure.</p> <p>Disable the telephone TN. Disconnect the wiring from the telephone to the jack.</p> <p>Reenable the TN and wait for an OVD message.</p> <p>If you do not receive an OVD message, replace the telephone.</p> <p>If you receive an OVD message, reconnect the wiring and go to the next possible cause.</p>
Defective wiring	<p>Disable the TN. Disconnect the wiring between the telephone and the cross-connect terminal.</p> <p>Reenable the TN and wait for an OVD message.</p> <p>If you do not receive an OVD message, replace or repair the wiring between the telephone and the cross-connect terminal.</p> <p>If you do not receive an OVD message, replace or repair the wiring between the telephone and the cross-connect terminal.</p> <p>If there is still a problem with the telephone, reconnect all wiring and go to the next possible cause.</p>
Defective backplane	<p>Disable the TN. Unseat the affected PE card.</p> <p>Reenable the TN and wait for an OVD message.</p> <p>If you receive an OVD message, replace the card cage assembly in the module.</p>

Symptom:

Telephone cannot make or receive calls (no OVD message)

The telephone cannot make or receive calls. There is no OVD message or other system message indicating the TN for this telephone is defective or disabled. There may or may not be dial tone when the handset is off-hook. Look up all system messages and maintenance display codes in the *XI 1 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See *Telephone and attendant console installation* (553-3001-215) for information on connecting telephones. See *System installation procedures* (553-3001-210) for information on system cabling. To replace other equipment, see *Hardware replacement* (553-3001-520).

Possible cause	Action
No power to digital telephone	Check the power supply (if one is required) and make sure it is not defective. If there is a power supply problem, correct it. If there is no problem with the power supply, go to the next possible cause.
Telephone connected to wrong TNs	Check the cross-connect terminal to make sure the telephone is connected to the correct TN. If the telephone is not connected correctly, fix the wiring. If the telephone is connected correctly, go to the next possible cause.

(continued)

Possible cause	Action
Disabled TN	<p>Software disable then reenable the telephone TN by entering:</p> <p>LD 32 DISU l s c u ENLU | s c u "l s c u" represents loop, shelf, card, and unit numbers</p> <p>Test TNs on superloops by entering:</p> <p>LD 30 UNTT l s c u</p> <p>Test TNs on other loops by entering:</p> <p>LD 45 TEST</p> <p>If there is still a problem with the telephone, go to the next possible cause.</p>
Defective telephone	<p>Disconnect the telephone from the jack. Plug in another telephone of the same type.</p> <p>If the replacement telephone works, replace the telephone you removed.</p> <p>If the replacement telephone does not work, reconnect the original telephone and go to the next possible cause.</p> <p>Note: If the telephone is a Meridian Modular Telephone, enter:</p> <p>LD 32 IDU l s c u</p> <p>If there is no response, replace the telephone.</p> <p>If there is an appropriate response, see "Add-on modules" in Telephone and attendant console <i>installation</i> for self-test instructions.</p>
Defective wiring	<p>Make sure wiring is properly connected and wires are not interchanged, crossed, or grounded:</p> <ul style="list-style-type: none"> — check the wiring between the telephone and the cross-connect terminal — check the wiring between the PE shelf and the cross-connect terminal <p>If there is a wiring problem, correct it.</p>

Symptom:
One end cannot hear or be heard

The person at the far end can hear you but you cannot hear them or the person at the far end cannot hear you but you can hear them. Look up all system messages and maintenance display codes in the *XII* input/output *guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See Telephone and attendant console installation (553-3001-215) for information on connecting telephones. *See System installation procedures* (553-3001-210) for information on system cabling. To replace other equipment, *see Hardware replacement* (553-3001-520). You may need to replace one of the following:

- PE or IPE card
- Telephone handset
- Telephone
- Wiring to the telephone

Possible cause	Action
Fault on other equipment	<p>Check with the user to determine if the fault is present only on:</p> <ul style="list-style-type: none"> — certain types of calls (such as on a paging trunk or a Tie trunk) — calls to a specific location — calls to a specific telephone or other piece of equipment (such as a modem or Fax machine) <p>If the fault occurs only with certain calls, take the appropriate action.</p> <p>If the fault occurs on all calls, go to the next possible cause.</p>
Defective handset	<p>Check the receiver or transmitter in the handset. If one is defective, replace the handset or, if necessary, the telephone.</p>

(continued)

Clearing telephone faults 149

Possible cause	Action
Defective telephone	<p>Disconnect the telephone from the jack. Plug in another telephone of the same type.</p> <p>If the replacement telephone works, replace the telephone you removed.</p> <p>If the replacement telephone does not work, reconnect the original telephone and go to the next possible cause.</p> <p>Note: If the telephone is a Meridian Modular Telephone, enter:</p> <p>LD 32 IDU I s c u</p> <p>If there is no response, replace the telephone.</p> <p>If there is an appropriate response, see "Add-on modules" in Telephone and attendant console installation for self-test instructions.</p>
Defective PE card	<p>Software disable the telephone TN by entering:</p> <p>LD 32 DISU I s c u "I s c u" represents loop, shelf, card, and unit numbers</p> <p>Disconnect the wiring between the PE card and the cross-connect terminal.</p> <p>Reenable and test the TN by entering:</p> <p>ENLU I s c u</p> <p>Wait for an OVD message. If you receive a message indicating a problem with the card or unit, replace the card.</p> <p>If you do not receive a message indicating a problem with the card or unit, reconnect the wiring and go to the next possible cause.</p>
Defective wiring to telephone	<p>Make sure wiring is properly connected and wires are not interchanged, crossed, or grounded:</p> <ul style="list-style-type: none">check the wiring between the telephone and the cross-connect terminalcheck the wiring between the PE shelf and the cross-connect terminal <p>If there is a wiring problem, correct it.</p>

Symptom:

Noise or low volume on all calls

There is noise on the line on all calls or the volume is lower than usual on all calls. Look up all system messages and maintenance display codes in the *XI 1 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See *Telephone and attendant console installation* (553-3001-215) for information on connecting telephones. See *System installation procedures* (553-3001-210) for information on system cabling. To replace other equipment, see *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- PE or IPE card
- Telephone
- Wiring to the telephone

Possible cause	Action
Defective wiring	Make sure wiring is properly connected and wires are not interchanged, crossed, or grounded: check the wiring between the telephone and the cross-connect terminal — check the wiring between the PE shelf and the cross-connect terminal If there is a wiring problem, correct it. If there is no problem with the wiring, go to the next possible cause.

(continued)

possible cause	Action
Defective telephone	<p>Disconnect the telephone from the jack. Plug in another telephone of the same type.</p> <p>If the replacement telephone works, replace the telephone you removed.</p> <p>If the replacement telephone does not work, reconnect the original telephone and go to the next possible cause.</p> <p>Note: If the telephone is a Meridian Modular Telephone, enter:</p> <p>LD 32 IDU I s c u</p> <p>If there is no response, replace the telephone.</p> <p>If there is an appropriate response, see "Add-on modules" in Telephone <i>and attendant console installation</i> for self-test instructions.</p>
Defective PE card	<p>Software disable the telephone TN by entering:</p> <p>LD 32 DISU I s c u "I s c u" represents loop, shelf, card, and unit numbers</p> <p>Disconnect the wiring between the PE card and the cross-connect terminal.</p> <p>Reenable and test the TN by entering:</p> <p>ENLU I s c u</p> <p>Wait for an OVD message. If you receive a message indicating a problem with the card or unit, replace the card.</p>

Symptom:
Defective indicator, digit display, or component

The telephone can place and receive calls, but one or more LED or LCD indicator, a digit display, or a component (such as a handsfree unit) is not working. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See *Telephone and attendant console installation* (553-3001-215) for information on connecting telephones. To replace other equipment, see *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Power supply to telephone
 - PE or IPE card
- Telephone

Possible cause	Action
Telephone has incorrect software parameters	Disconnect then reconnect power to the telephone to force a reset and parameter download. If the fault is not cleared, go to the next possible cause.
No power to digital telephone	Check the power supply (if one is required) and make sure it is not defective. If there is a power supply problem, correct it. If there is no problem with the power supply, go to the next possible cause.

(continued)

Clearing telephone faults 153

Possible cause	Action
Defective telephone	<p>Disconnect the telephone from the jack. Plug in another telephone of the same type.</p> <p>If the replacement telephone works, replace the telephone you removed.</p> <p>If the replacement telephone does not work, reconnect the original telephone and go to the next possible cause.</p> <p>Note: If the telephone is a Meridian Modular Telephone, enter:</p> <p>LO 32 IDU I s c u</p> <p>If there is no response, replace the telephone.</p> <p>If there is an appropriate response, see "Add-on modules" in <i>Telephone and attendant console installation</i> for self-test instructions.</p>
Feature not assigned	<p>Make sure the feature or the indicator is assigned in software (see the <i>X1 1 input/output guide</i>).</p>

Symptom:
Defective feature

The telephone can make and receive calls, but one or more of its features (such as call transfer or ring again) is not working. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See Telephone and attendant console installation (553-3001-215) for information on connecting telephones.

Possible cause	Action
Feature not assigned	Make sure the feature or the indicator is assigned in software (see the <i>X 11 input/output guide</i>). If there is still a console problem, go to the next possible cause.
Defective telephone	Disconnect the telephone from the jack. Plug in another telephone of the same type. If the replacement telephone works, replace the telephone you removed. If the replacement telephone does not work, reconnect the original telephone and go to the next possible cause. <i>Note:</i> If the telephone is a Meridian Modular Telephone, enter: LD 32 IDU I s c u If there is no response, replace the telephone. If there is an appropriate response, see "Add-on modules" in <i>Telephone and attendant console installation</i> for self-test instructions.

Symptom:
Defective add-on module

The telephone can make and receive calls, but an add-on module connected to it is not working. Look up all system messages and maintenance display codes in the *X11 input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See *Telephone and attendant console installation* (553-3001-215) for information on connecting telephones. You may need to replace one of the following:

- Add-on module
- Data option card
- Power supply for add-on module

Possible cause	Action
Defective power supply for add-on module	If the add-on module requires a separate power supply, make sure it is properly connected and in working order. If there is still a problem with the telephone, go to the next possible cause.
Defective add-on module	Replace the add-on module.
Defective data option card	If the fault is with a data add-on module, replace the data option card.

Symptom:
Cannot dial from 2500 telephone

A user cannot dial from a 2500 telephone. The condition may exist on more than one telephone and may be intermittent. The telephone may occasionally experience a “no dial tone” condition. Calls from other types of sets are not affected. Look up all system messages and maintenance display codes in the *X11 input/output guide (553-3001-400)* and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See *Telephone and attendant console installation (553-3001-215)* for information on connecting telephones. See *System installation procedures (553-3001-210)* for information on system cabling. To replace other equipment, see *Hardware replacement (553-3001-520)*. You may need to replace one of the following:

- DTR card: NT8D16
- Network/DTR card: NT8D18
- Telephone
- Wiring to the telephone

Possible cause	Action
Defective telephone	<p>If only one telephone is affected, replace it.</p> <p>If there is still a problem with the telephone, go to the next possible cause.</p>
Defective wiring	<p>If only one telephone is affected, make sure wiring is properly connected and wires are not interchanged, crossed, or grounded:</p> <ul style="list-style-type: none"> — check the wiring between the telephone and the cross-connect terminal — check the wiring between the PE shelf and the cross-connect terminal <p>If there is a wiring problem, correct it.</p> <p>If there is still a problem with the telephone, go to the next possible cause.</p>

(continued)

Possible cause	Action
Defective digitone receiver	<p>If the condition is intermittent or more than one telephone is affected, test the digitone receivers in the system by entering:</p> <p>LD 34 DTR l s c u "l s c u" represents loop, shelf, card, and unit numbers of the DTR</p> <p>Replace any units that fail the test.</p> <p>If there is still a problem with the telephone, go to the next possible cause.</p>
Excessive Digitone traffic	<p>Additional digitone receivers may be required to handle the traffic in the system. See <i>Traffic measurement formats and output (553-2001-450)</i>.</p>

Symptom:
No ring on 500 and 2500 telephones

Both 500 and 2500 telephones do not ring. One or several sets in the same module are experiencing the problem. Look up all system messages and maintenance display codes in *the XII input/output guide* (553-3001-400) and follow the instructions given. If the fault does not clear, use this procedure.

Note: Constantly observe and look up system messages as you perform this procedure.

See Telephone and attendant console installation (553-3001-215) for information on connecting telephones. See *System installation procedures* (553-3001-210) for information on system cabling. To replace other equipment, see *Hardware replacement* (553-3001-520). You may need to replace one of the following:

- Ringing generator: NT6D42, NT8D21
- PE or IPE card
- Telephone

Wiring to the telephone

CE/PE, PE, or IPE card cage: NT8D1103, NT8D1303, NT8D3703

Possible cause	Action
Defective telephone	If only one telephone is affected, replace it. If there is still a problem with the telephone, go to the next possible cause.
Defective wiring	If only one telephone is affected, make sure wiring is properly connected and wires are not interchanged, crossed, or grounded: <ul style="list-style-type: none"> — check the wiring between the telephone and the cross-connect terminal — check the wiring between the PE shelf and the cross-connect terminal If there is a wiring problem, correct it. If there is still a problem with the telephone, go to the next possible cause.

(continued)

Possible cause	Action
Defective PE card	Software disable the telephone TN by entering: LD 32 DISU I s c u "I s c u" represents loop, shelf, card, and unit numbers Disconnect wiring between the PE card and the cross-connect terminal. Reenable and test the TN by entering: ENLU I s c u Wait for an OVD message. If you receive a message indicating a problem with the card or unit, replace the card. If you do not receive a message indicating a problem with the card or unit, reconnect the wiring and go to the next possible cause.
Defective controller card	If several sets on different cards in the same loop are affected, replace the controller card. If there is still a problem with the telephone, reinstall the original controller card and go to the next possible cause.
Defective ringing generator	If several sets on different cards in the same module are affected, replace the ringing generator for the shelf (even if the green LED on the unit is lit). If there is still a problem with the telephone, reinstall the original ringing generator and go to the next possible cause.
Defective backplane	If the green LED is lit on the ringing generator and the fault persists, replace the card cage assembly in the module.

160 Clearing telephone faults



Fault clearing 553-3001-510



Final maintenance procedure

Introduction

Perform the final maintenance procedure (Procedure 4) to verify that the Meridian | is operating properly and there are no remaining faults.

Procedure 4

Final maintenance procedure

- 1** Make sure all cards that may have been removed are reinserted in their assigned location and enabled.
- 2** Make sure all wiring and connectors that may have been disconnected are reconnected.
- 3** Make sure all loops and shelves that should be enabled are enabled.

Note: Digital telephones on a network loop that was disabled may not be restored when the loop is enabled. Each telephone should be individually disabled and reenabled through LD 32. Service may also be restored by disconnecting and reconnecting the telephone line cord.

- 4** Make sure all circuit breakers are set to ON and any fuses (in power panels or auxiliary equipment) are inserted.
- 5** Clear fault indicators by entering:

LD 35 or (LD 135 for options 61C and 81)

To clear the maintenance display in a single CPU system, enter:

CDSP

To clear the maintenance display in a dual CPU system, clear the display on one CPU by entering:

CDSP

Test the CPU by entering:

TCPU (LD 35), or

TEST CPU (LD 135 for options 61 C and 81)

If the response is "OK" switch CPUs by entering:

SCPU

Clear the display on the other CPU by entering:

CDSP

To clear a major alarm indication and restore Power Fail Transfer Units (PFTUs) to normal operation, enter:

CMAJ

To clear a minor alarm indication from all attendant consoles, enter:

CMIN ALL

- 6 Set the midnight routine to run after you log out of the system with:

MIDN

End the session in LD35 or LD 135 and log out of the system:

LOGO (the midnight routine will now run)

- 7 Check system messages produced when the midnight routine runs. Clear any faults indicated.

- 8 If there was a sysload (reload) while you were clearing a fault, reset the correct time and date by entering:

LD2

STAD (day) (month) (year) (hour) (minute) (second)

Check the time and date you entered:

TTAD

End the session in LD2 and log out of the system:

LOGO

- 9 Replace any covers you removed from modules,
- 10 Tag defective equipment with a description of the fault and return it to a repair center.

List of terms

3PE card	QPC44 1 Three-Port Extender Card
BTU	QPC477 Bus Terminating Unit
CBT	Core Bus Terminator
CE	Common Equipment
CE/PE	Common/Peripheral Equipment
CMA card	Changeover and Memory Arbitrator Card
CMDU card	Core Multi Disk Unit
Conference/TDS card	NT8D17 Conference/Tone and Digit Switch Card
CNI	Core to Network Interface
CP	Call Processor

CPU	Central Processing Unit
DLB card	QPC659 Dual Loop Peripheral Buffer Card
DTR card	Digitone Receiver Card
Network/DTR card	NT8D18 Network/Digitone Receiver Card
FDI card	QPC742 Floppy Disk Interface Card
FDU	NT8D68 Floppy Disk Unit
FN card	QPC579 CPU Function Card
IF card	QPC580 CPU Interface Card
IOP	Input/Output Processor
IPE	Intelligent Peripheral Equipment
MDU	NT8D69 Multi Disk Unit
MSI card	QPC742 Mass Storage Interface Card
PE	Peripheral Equipment

PS card

QPC43 Peripheral Signaling Card

ROM cards

Read Only Memory Cards

SBE

QPC215 Segmented Bus Extender Card

SDI cards

Serial Data Interface Cards

UPS

Uninterruptible Power Supply

SL-1

Meridian 1

Fault clearing

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Information subject to change without notice.

Release 5.0

Standard

April 1, 1994

Printed in the U.S.A.




SL-1

Meridian 1

Hardware replacement

Publication number: 553-3001-520
Document release: 7.0
Document status: Standard
Date: April 1, 1994



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Revision history

January **29, 1990**

Standard, release 1.0

July 31, 1990

Standard, release 2.0

December **1, 1991**

Standard, release 3.0. This document is reissued to include technical content updates. Due to the extent of the changes, revision bars are omitted.

December **31, 1992**

Standard, release 4.0. New information and changes to technical content are noted by revision bars in the margins.

April **1, 1993**

Standard, release 5.0. New information and changes to technical content are noted by revision bars in the margins.

August **1, 1993**

Standard, release 6.0. Changes to technical content are noted by revision bars in the margins.

April **1, 1994**

Standard, release 7.0 Reissued to include the information for Meridian 1 option 61C. Changes to technical content are noted by revision bars in the margins.

Contents

About this document	1
References	2
Accessing the system	3
Access through the system terminal	3
Access through the maintenance telephone	5
Hardware replacement guidelines	9
Precautions	9
Power equipment	9
Circuit cards..	9
Datadisks	11
Option 61C and 81 cable guidelines	13
Replacing equipment	15
Removing module covers and pedestal grills	15
Modulecovers	15
Pedestal grills	17
A0321130 Fan Unit	18
A0378252 Battery Pack Assembly	21
NT6D3903 CPU/Network Module Card Cage	24
NT6D40, NT6D41, NT6D42, NT6D43 Power Supply DC	29
NT6D52 Rectifier -48 V/30 A	30
NT6D6008 Core and NT9D1102 Core/Network Card Cage	34
NT6D6003 Core Bus Terminator Card	47

iv Contents

NT6D63 I/O Processor Card	48
NT6D64 Core Multi Drive Unit	51
NT6D65 Core to Network Interface Card	53
NT6D66 Call Processor Card	56
NT7D10 Power Distribution Unit DC	61
NT7D14, NT8D06, NT8D21, NT8D29 Power Supply AC.	66
NT7D15 System Monitor	68
NT7D67CB Power Distribution Unit DC	70
NT8D01 Controller Card	77
NT8D02, NT8D03, NT8D09, NT8D14, NT8D15, NT8D16 Intelligent Peripheral Equipment Card	79
NT8D04 Superloop Network Card, QPC414 Network Card	81
NT8D17 Conference/TDS Card	83
NT8D18 Network/DTR Card	85
NT8D19 Memory/Peripheral Signaling Card	87
NT8D22 System Monitor	88
NT8D41 Dual Port Serial Data Interface Paddle Board	90
NT8D46AC Thermostat Harness	92
NT8D46AM, NT8D46DC Air Probe Harness	98
NT8D52AB, NT8D52DD Pedestal Blower Unit	102
NT8D53AB Power Distribution Unit AC	104
NT8D53AD Power Distribution Unit	107
NT8D56AA, NT8D56AC, NT8D57 Module Power Distribution Unit	110
NT8D1103 CE/PE Module Card Cage	112
NT8D1303 PE Module Card Cage	115
NT8D3403 CPU Module Card Cage	118
NT8D3503 Network Module Card Cage	122
NT8D3703 IPE Module Card Cage	127
NTND01 Integrated CPU/Memory Card	130
NTND02 Misc/SDI/Peripheral Signaling Card	132

NTND08, QPC939 ROM Card	134
NTND09, QPC583 Memory Card	136
NTND10, QPC581 Changeover and Memory Arbitrator Card	138
NTND15, NT8D68 Floppy Disk Unit	141
NTND16, NT8D69 Multi Disk Unit	143
NTND31 ROM Card	145
P0699798 Air Filter	147
QMM42 Security Data Cartridge	149
QPC43 Peripheral Signaling Card	151
QPC215 Segmented Bus Extender Card	153
QPC412 InterGroup Switch Card	155
QPC441 Three-Port Extender Card	157
QPC471, QPC775 Clock Controller Card	163
QPC477 Bus Terminating Unit	166
QPC513, QPC841 Serial Data Interface Card	167
QPC579 CPU Function Card	169
QPC580 CPU Interface card	171
QPC584 Mass Storage Interface Card	173
QPC659 Dual Loop Peripheral Buffer Card	176
QPC687 CPU Card	178
QPC742 Floppy Disk Interface Card	180
QPC940 ROM Card	183
Replacing an NT7D10 PDU with an NT7D67CB PDU	185

(5)

List of figures

Figure 1	
Static discharge points	10
Figure 2	
Disk position	12
Figure 3	
Locking latches on the module cover	16
Figure 4	
Removing the pedestal grill	17
Figure 5	
Air exhaust grills on the top cap	18
Figure 6	
Top cap assembly	19
Figure 7	
Connector for the battery pack assembly	22
Figure 8	
NT6D.52 Rectifier and QBL15 Power/Battery Distribution Box connections	33
Figure 9	
NT7D10 Power Distribution Unit DC	61
Figure 10	
Cabling between the PDU and the field wiring terminal block	63
Figure 11	
Dual circuit breaker and associated module power supplies	67

viii List of figures



Figure 12		
NT7D67CB Power Distribution Unit DC	71	
Figure 13		
Field wiring terminals in the NT7D67CB PDU	73	
Figure 14		
NT8D22 System Monitor in an AC-power pedestal	88	
Figure 15		
Air exhaust grills on the top cap	93	
Figure 16		
Topcap assembly	93	
Figure 17		
Mounting for the column LED	94	
Figure 18		
Thermostat harness	95	
Figure 19		
Routing the thermostat harness from the top cap	96	
Figure 20		
Installing the column LED	96	
Figure 21		
Aligning the thermostat harness connector	97	
Figure 22		
Air exhaust grills in the top cap	98	
Figure 23		
Topcap assembly	99	
Figure 24		
Air probe harness	100	
Figure 25		
Connector for the air probe harness	100	
Figure 26		
Routing the air probe harness from the top cap	101	
Figure 27		
NT8D52 Blower Unit	102	

Figure 28	
NT8D53AB Power Distribution Unit AC	104
Figure 29	
Connections at the field wiring terminal	105
Figure 30	
NT8D53AD Power Distribution Unit (option 21A)	107
Figure 31	
Mounting screws for the MPDU	111
Figure 32	
Connector for the battery pack assembly	133
Figure 33	
Blower unit and air filter in the front of the pedestal	147
Figure 34	
Pull-tab locations on the air filter	148
Figure 35	
NT7D10 Power Distribution Unit DC	187
Figure 36	
Cabling between the PDU and the field wiring terminal block	189
Figure 37	
Dimensions for drilling holes on the pedestal	190
Figure 38	
NT7D67CB Power Distribution Unit DC	191
Figure 39	
Field wiring terminals in the NT7D67CB PDU	193



List of tables

Table 1	
Translation from keyboard to telephone dial pad	6
Table 2	
Network loop codes	25
Table 3	
Extendercodes	123
Table 4	
Networkloopcodes	123
Table 5	
Peripheral signaling card numbers	152
Table 6	
Extendercodes	153
Table 7	
Extendercodes	158
Table 8	
Peripheral signaling card numbers	160



About this document

This document tells you how to replace hardware in Meridian I systems. In this manual, “replacing hardware” means removing a faulty piece of equipment and installing identical operating equipment. The procedures in this document are based on the assumption that the system is properly installed (for example, all card locations, option switch settings, and cable connections are correct) and was fully operational before the hardware fault.

To use this document, you should have a basic knowledge of Meridian I maintenance procedures. Generally, only common tools (such as socket wrenches, screwdrivers, and pliers) are required to perform these procedures.

This document does not provide procedures for locating and clearing faults. See *Fault clearing* (553-300 I -5 10) to locate and clear faults.

References

See the *Meridian 1 planning and engineering guide* for

- *System overview* (553-3001-100)
- *Sparesplanning* (553-3001-153)
- *Equipment identification* (553-3001-154)

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See the *Meridian 1 installation and maintenance guide* for

- *System installation procedures* (553-3001-210)
- *Circuit card installation and testing* (553-3001-211)
- *Telephone and attendant console installation* (553-3001-215)
- *General maintenance information* (553-3001-500)
- *Fault clearing* (553-3001-510)

See the *X11 software guide* for an overview of software architecture, procedures for software installation and management, and a detailed description of all X11 features and services. This information is contained in two documents:

- *X11 software management* (553-3001-300)
- *X11 features and services* (553-3001-305)

See the *X11 input/output guide* (553-3001-400) for a description of all administration programs, maintenance programs, and system messages.



Accessing the system

When you replace equipment, you often send commands to the system software in order to disable faulty equipment and to enable and test newly installed equipment.

You send maintenance commands to the system through the system terminal or the maintenance telephone. This chapter gives the procedures for accessing the system through these devices.

Note: Before X 1 1 release 19, only one device at a time can communicate with the system. Accessing a device while another is logged in will log out the device that was already connected. The Multi User Login feature, available with X1 1 release 19 and later, allows more than one device to interact with the Meridian 1. Refer to *X1 1 system management application (553-3001-301)* for details on using this feature.

Access through the system terminal

You can send maintenance commands and receive system messages by accessing the CPU through an RS-232 device, such as a video display terminal (VDT) or teletypewriter (TTY).

When you access the system through a system terminal, a log in procedure is required (see Procedure 1). All system passwords are initially set as 0000, but you can change passwords in the Configuration Record (LD 17).

Note: If a sysload occurs before you save a new password in a data dump, the last active password remains valid.

Each system has two levels of passwords: level 1 is for general use, level 2 is for administrative use. Either password is accepted in the log in procedure.

Procedure 1
Access through the system terminal

- 1 Press the return key.
 - If the response is a period (.), you are ready to log into the system.
 - If the response is
OVL111 nn TTY x or **OVL111 nn SLI**
someone else is logged into the system. When they have logged off, press return and go to Step 2.
 - If the response is
OVL111 nn IDLE or **OVL1 11 nn BKGD**
you are ready to log into the system. Go to Step 2.
 - If the response is
OVL000 >
you are already logged into the system. Go to Step 4.

Note: Responses vary with different Background Terminal packages.

- 2 Log into the system by entering
LOGI
then press the return key.

The normal response is
PASS?
If there is any other response, see the XI 1 *input/output* guide (553-3001-400).
- 3 Enter either the level 1 or level 2 password and press the return key.
If the password is correct, the system responds with the prompt
>
- 4 Load a program by entering
LD xx "xx" represents the number of the program
- 5 Perform tasks.
- 6 End the program by entering
END or ****
- 7 Always end the log in session with
LOGO
Background routines are then loaded automatically.

Access through the maintenance telephone

A telephone functions as a maintenance telephone when you define the class-of-service as MTA (maintenance set allowed) in the Multi-line Telephone Administration program (LD11). A maintenance telephone allows you to send commands to the system through the following maintenance overlays: LD30, LD32, LD33, LD34, LD35, LD36, LD37, LD38, LD41, LD42, LD43, LD45, LD46, LD60, LD61, and LD62.

Note: The Core Common Equipment Diagnostic (LD135) and Core I/O Diagnostic (LD137) are among the overlays that cannot be accessed through a maintenance telephone.

You can test tones and outpulsing through the maintenance telephone. Specific commands for those tests are given in the Tone and Digit Switch and Digitone Receiver Diagnostic (LD34).

To access the system using the maintenance telephone, see Procedure 2. To enter commands, press the keys that correspond to the letters and numbers of the command (for example, to enter *LD 42 return*, key in *53#42##*). Table 1 shows the translation from a terminal keyboard to a telephone dial pad.

Note: To use the maintenance telephone, the peripheral equipment loop for that telephone must be operating.

Table 1
Translation from keyboard to telephone dial pad

Keyboard				Dial pad
A	B	C	1	1
D	E	F	2	2
G	H	I	3	3
J	K	L	4	4
M	N	O	5	5
P	R	S	6	6
T	U	V	7	7
W	X	Y	8	8
			9	9
			0	0
			Space or #	#
			Return	##
			.	.

Note: There is no equivalent for Q or Z on a dial pad.

Procedure 2

Access through the maintenance telephone

- 1 Press the prime DN key.
- 2 Place the set in maintenance mode by entering
xxxx91 "xxxx" is the customer Special Prefix (SPRE) number. It is defined in the Customer Data Block and can be printed using LD21. The SPRE number is typically "1" (which means you would enter 197).
- 3 Check for busy tone by entering "return"
##
 - If there is no busy tone, go to Step 4.
 - If there is a busy tone, a program is active. To end an active program and access the system enter

- 4 Load a program by entering
53#xx## "xx" represents the number of the program
- 5 Perform tasks.
- 6 Enter ******** to exit the program and return the telephone to call processing mode. Background routines are then loaded automatically.

8 Accessing the system

Hardware replacement guidelines

Precautions

To avoid personal injury and equipment damage, review the following guidelines before handling Meridian I equipment.

Power equipment

There are no user-repairable components in the power system. If a power supply fails, the complete unit must be replaced. Do not disassemble a power supply under any circumstances.

WARNING

To avoid the danger of electric shock, be very careful when you work with power equipment and connections. Warning notices are displayed and *must* be heeded.

Circuit cards

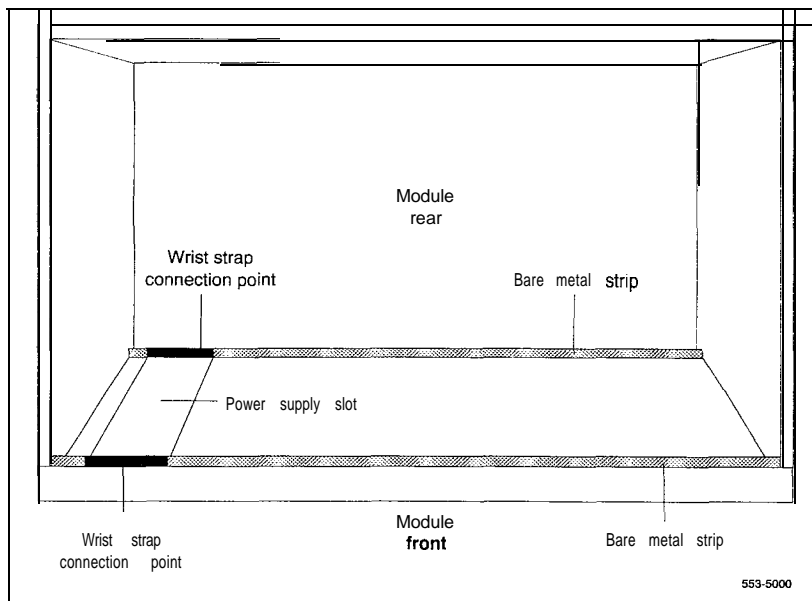
Handle cards as follows:

- Unpack or handle cards away from electric motors, transformers, or similar machinery.

Handle cards by the edges only. Do not touch the contacts or components.
- Set cards on a protective antistatic bag. If an antistatic bag is not available, hand-hold the card, or set it in a card cage unseated from the connectors.
- Store cards in protective packing. Do not stack cards on top of each other unless they are packaged.

To avoid card damage from static discharge, wear a properly connected antistatic wrist strap when you work on Meridian 1 equipment. If a wrist strap is not available, regularly touch one of the bare metal strips in a module to discharge static. Figure 1 shows the recommended connection points for the wrist strap and the bare metal strips you should touch.

Figure 1
Static discharge points



During repair procedures:

Turn off the circuit breaker or switch for a module power supply before the power supply is removed or inserted.

In AC-powered systems, capacitors in the power supply must discharge. Wait five full minutes between turning off the circuit breaker and removing the power supply from the module.

- Software disable cards, if applicable, before they are removed or inserted.
- Hardware disable cards, whenever there is an enable/disable switch, before they are removed or inserted.
- Return defective or heavily contaminated cards to a repair center. Do not try to repair or clean them.

Data disks

Follow the precautions below to avoid damaging disks:

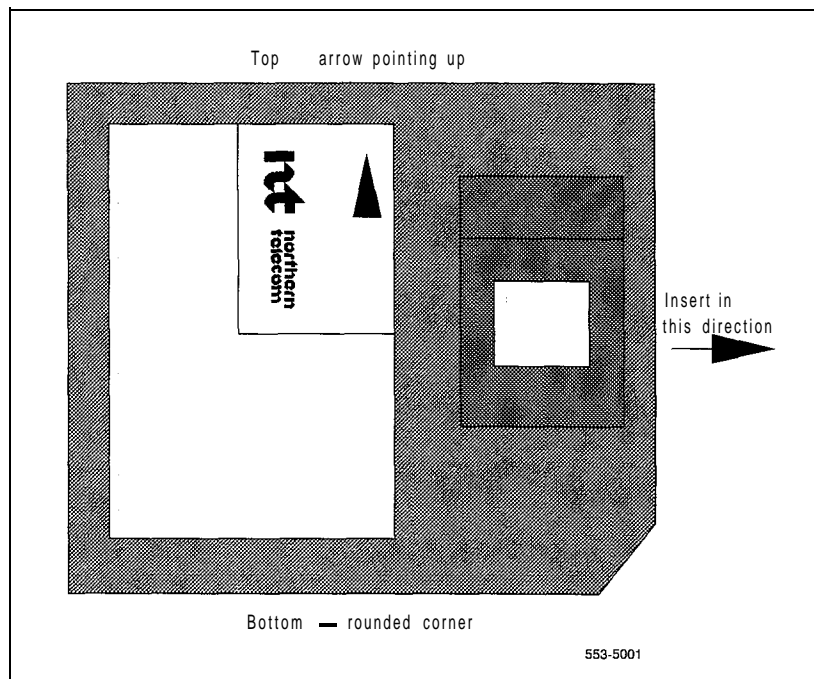
- Handle only the hard surface; never touch the recording surface.
- Keep disks away from strong magnetic fields.
- Avoid exposing disks to extreme heat, rapid changes in temperature, or high humidity.
- Store disks in a suitable container.

To install a disk, make sure the arrow on the label is pointing up and the rounded corner is on the bottom on the right-hand side (see Figure 2).

CAUTION

The disk drive can be damaged if an upside-down disk is forced into the slot. If there is significant resistance when you try to insert a disk, remove the disk and check the position.

Figure 2
Disk position



Option 61C and 81 cable guidelines

To disconnect a cable from the Core or Core/Network Module backplane, use the PO741489 Extraction Tool provided in the rear of the module (behind the I/O safety panel).

CAUTION

You must use the PO741489 Extraction Tool to disconnect cables from the backplane shrouds in **NT6D60** Core and **NT9D11** Core/Network Modules.

Follow the procedure below to avoid bending or breaking pins when removing cable connectors from the backplane shrouds. Do not insert the extraction tool unless the cable connector is locked into the shroud. Do not force the extraction tool deeper than the detent on the cable connector.

- 1 Grasp the cable connector by the strain relief tab.
- 2 Center the longer flat edge on the angled end of the tool between the cable connector and the wall of the shroud on the right side of the cable connector.
Note: If the straight end of the tool is notched, use that end if the connector can be accessed straight-on. If you must angle the tool at all, use the angled end.
- 3 *Gently* insert the extraction tool and gradually apply pressure while gently rocking the cable connector up and down.
- 4 Stop applying pressure as soon as the detent of the cable connector comes loose from the shroud.
- 5 Slowly remove the extraction tool and the cable connector.

14 Hardware replacement guidelines

Before you connect cables to the backplane, visually inspect the backplane shroud connectors to make sure there are no bent pins. To connect cables:

- 1 Orient the cable connector so the strain relief paddle is to the right.
- 2 Partially insert the cable connector so its guides mate to the corresponding backplane connector.
- 3 Apply a small amount of pressure to push the cable connector straight into the backplane connector. You will feel a detent click when the connector seats.

CAUTION

Pins may be bent or broken if you try to insert the cable connector at an angle. Do not push the connector in any further after you hear the detent click.

Replacing equipment

Removing module covers and pedestal grills

Module covers

To remove the front and rear covers from a module:

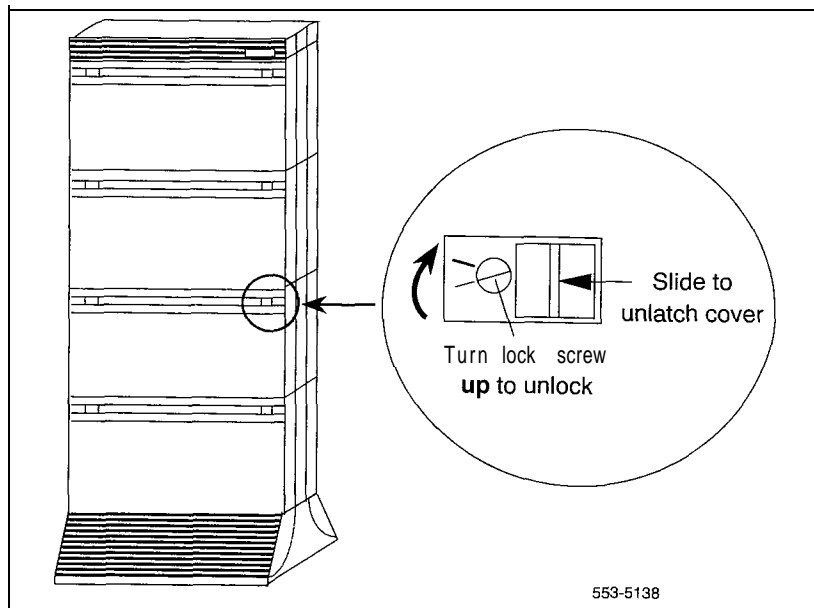
With a flat blade screwdriver, turn the lock clockwise on the two locking latches (see Figure 3).

- Simultaneously push the latches toward the center of the cover and pull the cover toward you while lifting it away from the module.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Figure 3
Locking latches on the module cover

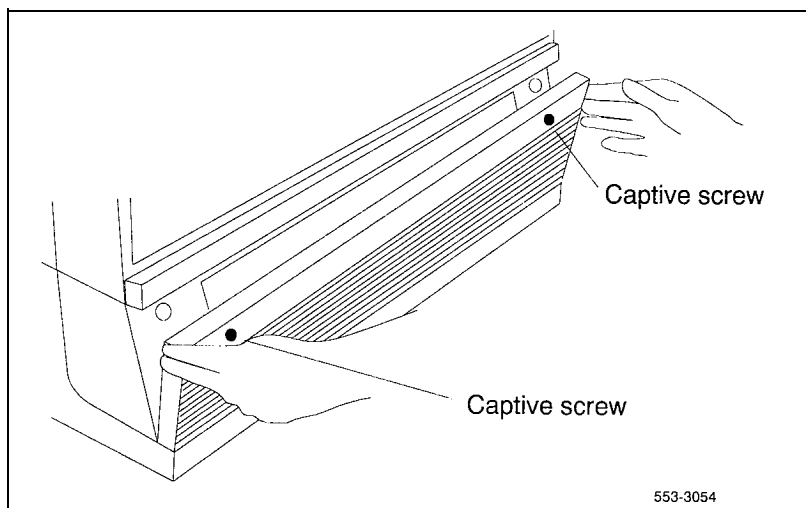


Pedestal grills

To remove the front and rear grills on the pedestal:

- Loosen the two captive screws that secure the grill.
- Pull the grill forward and lift it out of the base of the pedestal (see Figure 4).

Figure 4
Removing the pedestal grill



A0321130 Fan Unit

Use this procedure to replace the fan unit used in option 21A.

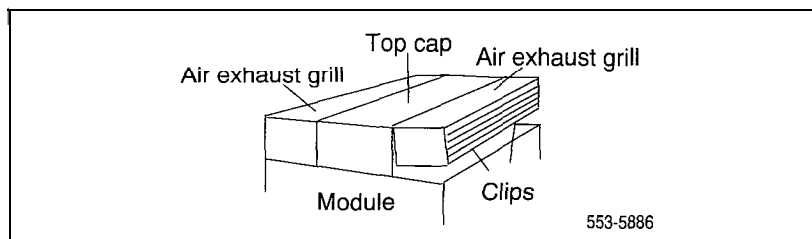
WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Disconnect power to the top cap fan:
 - Remove the rear cover on the module.
 - Remove the I/O safety panel over the backplane.
 - At the top of the rear of the module, disconnect the orange connector from the module power harness.
- 2 Remove the top cap:
 - Remove air exhaust grills at the front and rear of the top cap. Pull forward on the two clips underneath the front edge of each grill and lift up to remove the grill (see Figure 5).

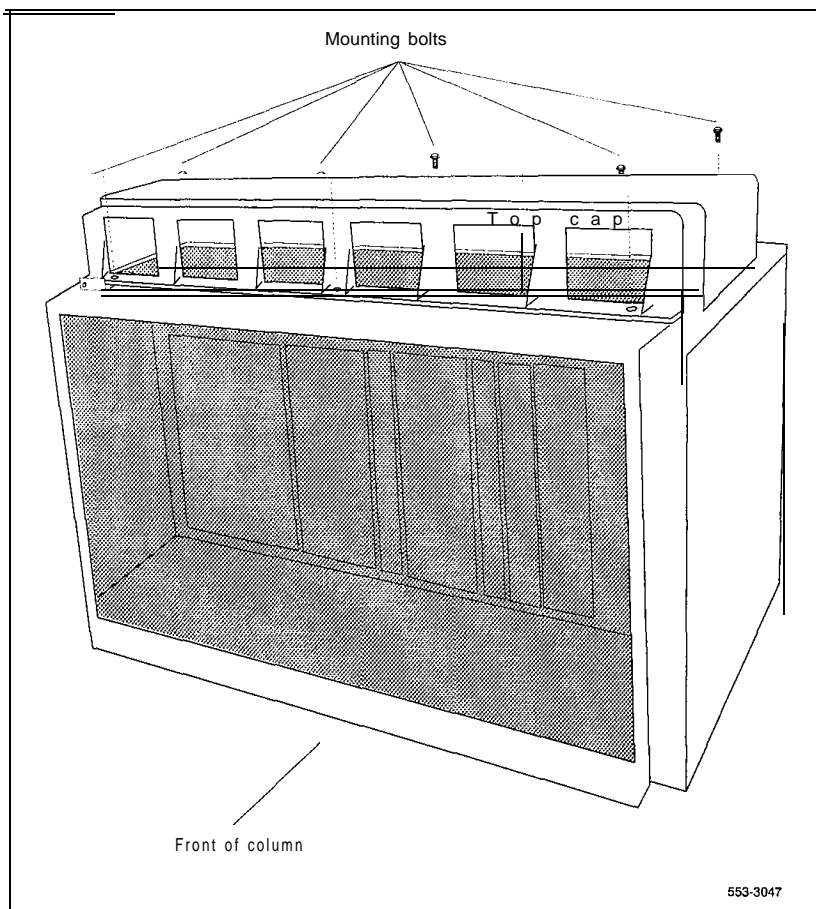
Figure 5
Air exhaust grills on the top cap



- Use a $5/16$ " socket wrench to remove the six bolts that secure the top cap (see Figure 6). Lift off the top cap only.

Note: You do not need to remove the perforated panel on the top of the module.

Figure 6
Top cap assembly



20 Replacing equipment

- 3 Remove the top cap fan:
 - Remove the four corner screws that secure the fan and the metal cover plate on top of the fan. Keep the cover plate handy; you will use it with the replacement fan.
 - Disconnect the black cord from the plug on the front of the fan.

Installing equipment

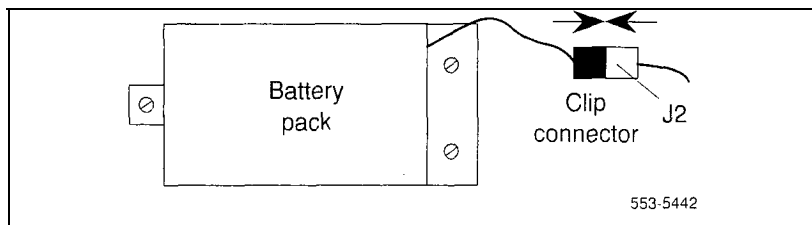
- 1 Install the replacement top cap fan:
 - Position the fan. The air flow arrow must point up, and the plug on the black cord must face the *front* of the module.
 - Connect the black cord to the plug on the front of the fan.
 - Place the cover plate on top of the fan. Install the four corner screws that secure the fan and cover plate.
- 2 Install the top cap:
 - Position the top cap and install the six bolts that secure it.
 - Install the air exhaust grills at the front and rear of the top cap.
- 3 Connect power to the top cap fan:
 - At the top of the rear of the module, connect the orange connector to the module power harness.
 - Replace the I/O safety panel.
 - Replace the rear cover on the module.
- 4 Tag defective equipment with a description of the problem and package it for return to a repair center.

Installing equipment

- 1 Install the battery pack on the MSPS card:
 - Position the battery pack on the component side of the MSPS card; install the screws for the battery pack from the back of the card.
 - On the component side of the MSPS card, plug in the clip connector wired to the battery pack. Make sure the connector key is centered on J2 (see Figure 7).

Note: The battery will not be fully charged until 24 hours after installation in a powered system.

Figure 7
Connector for the battery pack assembly



- 2 Reinsert the MSPS card and hook the locking devices:
 - Connect the SDI cable to the card.
 - Set the Enb/Dis switch to Enb.
 - Set the Enb/Dis switch on the NT8D18 Network/DTR Card to Dis, then back to Enb.
 - Press the initialize (Init) button on the NTND01ICM Card to activate a clean initialization.

- Software enable each SDI port configured:

```
LD37
ENL TTY x
TTY x
```

The response should be:

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789"#$%*!&()<>-.:;.? READY FOR INPUT
```

Anything entered on the keyboard will be echoed until END is input.

If there is a problem, an IOD system message is generated and the red LED lights on the faceplate of the card.

If there is no problem, exit LD37:

```
****
```

- 3 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT6D3903 CPU/Network Module Card Cage

To replace a defective backplane in an NT6D39 CPU/Network Module, you must replace the card cage. Use this procedure to replace the CPU/Network Module card cage.

See the XII input/output guide (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

1 Disable the CPU:

- In a single CPU system, set the Enb/Dis switch to Dis on the QPC580 CPU Interface (IF) Card. This will stop call processing.
- In a dual CPU system, the CPU on the backplane you are replacing must be inactive:

If you need to switch CPUs:

LD 35

TCPU test CPU

SCPU switch CPU

**** exit LD35

Set the Norm/Maint switch to Maint on the *active* CPU interface (IF) card. (This keeps the system from switching to the inactive CPU.)

Set the Enb/Dis switch to Dis on the *inactive* interface card.

2 Software disable network equipment cards:

- Disable all network loops on the shelf by disabling the peripheral signaling card:

LD32

DSPS x

Table 2 lists the loops represented by "x"
exit LD32

- Disable all other cards that might be in the module, such as serial data interface (SDI) cards or primary rate interface (PRI) cards.

CAUTION

If the system terminal is assigned to an SDI that will be disabled, assign it to another port before the SDI is disabled.

Table 2
Network loop codes

Group/ shelf	Peripheral signaling card	Loops disabled/enabled		
0 / 0	0	0	—	15
0 / 1	1	16	—	31

- 3 If the multi disk unit (MDU) or floppy disk unit (FDU) is located in the module, unseat disks from the disk drives. (In an option 6 I, move the MDU or FDU to the active CPU module.)

4 Turn off power to the column or the module power supply:

- With AC power, set the main circuit breaker for the column to OFF (down) in the rear of the pedestal.

WARNING

Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column.

- With DC power, set the switch on the NT6D41 CE Power Supply to OFF (down). Set the circuit breaker to OFF (down) in the rear of the pedestal. (All other modules in the column retain power.)
- 5 Remove the NT8D22 System Monitor in the rear of the pedestal. (Do not turn off the blower unit in the front of the pedestal.).

Note: If this is the master system monitor, disconnect the RJ11 cables before you pull the system monitor out of the pedestal.

CAUTION

If the system monitor is not removed, the system may shut down.

- 6 Remove all cards from the module:
- Tag and disconnect cables to all faceplate connectors.
 - Tag cards so they can be returned to the same slot. Remove cards.
- 7 Disconnect cables, plugs, and wires from the rear of the module to the backplane:
- Remove the I/O safety panel by turning the screws on each side. Set the cover aside.
 - Tag and disconnect all cables from the backplane to the interior of the I/O assembly.
 - Tag and disconnect all plugs, wires, and cables to the backplane.
- 8 Remove the two mounting screws that secure the rear of the card cage to the module.
- 9 Remove the front cover plates on both sides of the card cage.
- 10 Remove the three mounting screws that secure the front of the card cage to the bottom of the module. Pull the card cage out of the module.

Installing equipment

- 1** Slide the replacement card cage into position in the module. Install the mounting screws at the front of the card cage.
- 2** Replace the front cover plates on both sides of the card cage.
- 3** Install the mounting screws at the rear of the card cage.
- 4** Reconnect cables, plugs, and wires to the backplane:
 - Connect all cables from the interior of the I/O assembly to the backplane.
 - Connect all plugs, wires, and cables to the backplane.
 - Position the I/O safety panel. Tighten the screws.
- 5** Return cards to their slots. Reconnect all cables to connectors.
- 6** Reinstall the system monitor. If this is the master system monitor, reconnect the RJ 11 cables after it is installed.
- 7** Turn on power to the column or the module power supply:
 - With AC power, set the main circuit breaker in the pedestal to ON (up).
 - With DC power, set the breaker to ON (up) in the pedestal. Set the switch to ON (up) on the power supply in the module.
- 8** If the MDU or FDU is in the module, reinsert disks into the drive.
- 9** Enable the CPU:
 - Set the Enb/Dis switch to Enb on the inactive interface card.
 - In a dual CPU system, set the Norm/Maint switch to Norm on both interface cards.

28 Replacing equipment

10 Software enable network equipment cards:

- Enable the peripheral signaling card:

LD 32

ENPS x

**** exit LD32

- Enable any other disabled cards.

11 Test network loops:

LD 30

LOOP ALL

If there is a problem, an NWS system message is generated.

If there is no problem, exit LD30:

- ### 12 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT6D40, NT6D41, NT6D42, NT6D43 Power Supply DC

Use this procedure to replace the following DC power supplies:

NT6D40 PE Supply DC

- NT6D41 CE Power Supply DC
- NT6D42 Ringing Generator DC
- NT6D43 CE/PE Power Supply DC

CAUTION

Module covers are *not* hinged: do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Set the switch on the front of the power supply to OFF (down).
- 2 Unhook the locking devices on the power supply: pull it out of the card cage.

Installing equipment

- 1 Set the switch on the replacement power supply to OFF (down).
Note: On a replacement NT6D42 or NT6D43, set option switches the same as on the one you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.
- 2 Insert the replacement power supply into the vacated slot and hook the locking devices.
- 3 Set the switch on the replacement power supply to ON (up). The green LED on the power supply should light and stay lit.
- 4 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT6D52 Rectifier -48 V/30 A

Use this procedure to replace the NT6D52 Rectifier.

Removing equipment

- 1 Make sure power to the system is completely shut down by first placing all breakers on all Meridian 1 columns to OFF and then placing the AC BRKR switches on all rectifiers to OFF. This includes the AC BRKR switches on other rectifiers which may be connected to the system through another QBL15 Power Distribution Box.
- 2 Unplug the AC power plug of the rectifier being replaced from its AC receptacle and remove any plastic cable ties which might be securing this power cord to the rack.
- 3 Remove the rear cover from the rectifier.
- 4 Tag and disconnect all wiring from TB3 and TB4 on the rear panel of the rectifier.
- 5 Unscrew the nut from the conduit fitting (located below TB3) and carefully remove the fitting and wires from the rectifier.
- 6 Remove the two sheet metal screws which secure the baffle assembly to the bottom of the rectifier.
- 7 Remove the rack mounting screws that secure the rectifier in the rack and lift the rectifier out of the rack.
- 8 Tag the defective rectifier with a description of the failure symptoms and package it for return to a repair center.

Installing equipment

- 1 Position the replacement rectifier in the rack. Replace the rack mounting screws and the two sheet metal screws that secure the baffle assembly to the bottom of the rectifier.
- 2 Remove the rear cover from the replacement rectifier.
- 3 Remove the conduit fitting which is installed below TB3 in the replacement rectifier; it will not be used.

- 4 Remove the switch locking bracket from the 220 V /110 V switch (SW1 on the front of the rectifier) and set the switch to match the commercial power source. Make sure the bracket is properly reinstalled to prevent the switch from being operated.
- 5 Remove the safety shield from TB3.
- 6 Carefully insert the wires and conduit fitting from the QBL15 into the hole below TB3 and secure the fitting to the chassis with a nut.
- 7 Reconnect the wiring from the QBL15 to the rectifier as follows (see Figure 8):
 - Connect the #4 AWG black wire to terminal 2 on TB3 (48 V return).
 - Connect the #4 AWG red wire to terminal 1 on TB3 (- 48 V).
 - For systems without battery backup:
 - Make sure that the two factory installed jumpers are properly connected to TB4, one from + OUT to +SENS and the other from - OUT to - SENS.
 - For systems with battery backup:
 - Remove all jumpers from TB4; they will not be used.
 - Connect the #22 AWG black wire to the + SENS terminal on TB4.
 - Connect the #22 AWG red wire to the - SENS terminal on TB4.
 - Connect the #22 AWG blue wire to the DCON terminal on TB4.

CAUTION

Incorrect wiring connections between a rectifier and the QBL15 can cause serious system damage. Refer to Figure 8 and verify that all wiring is properly connected before proceeding.

- 8 Reinstall the safety shield on TB3 and then install the rear cover on the rectifier.
- 9 Make sure the AC BRKR switch on the rectifier is OFF.

- 10 **Plug** the AC power plug from the rectifier into the commercial power source and then dress the power cord to the rack using plastic cable ties.

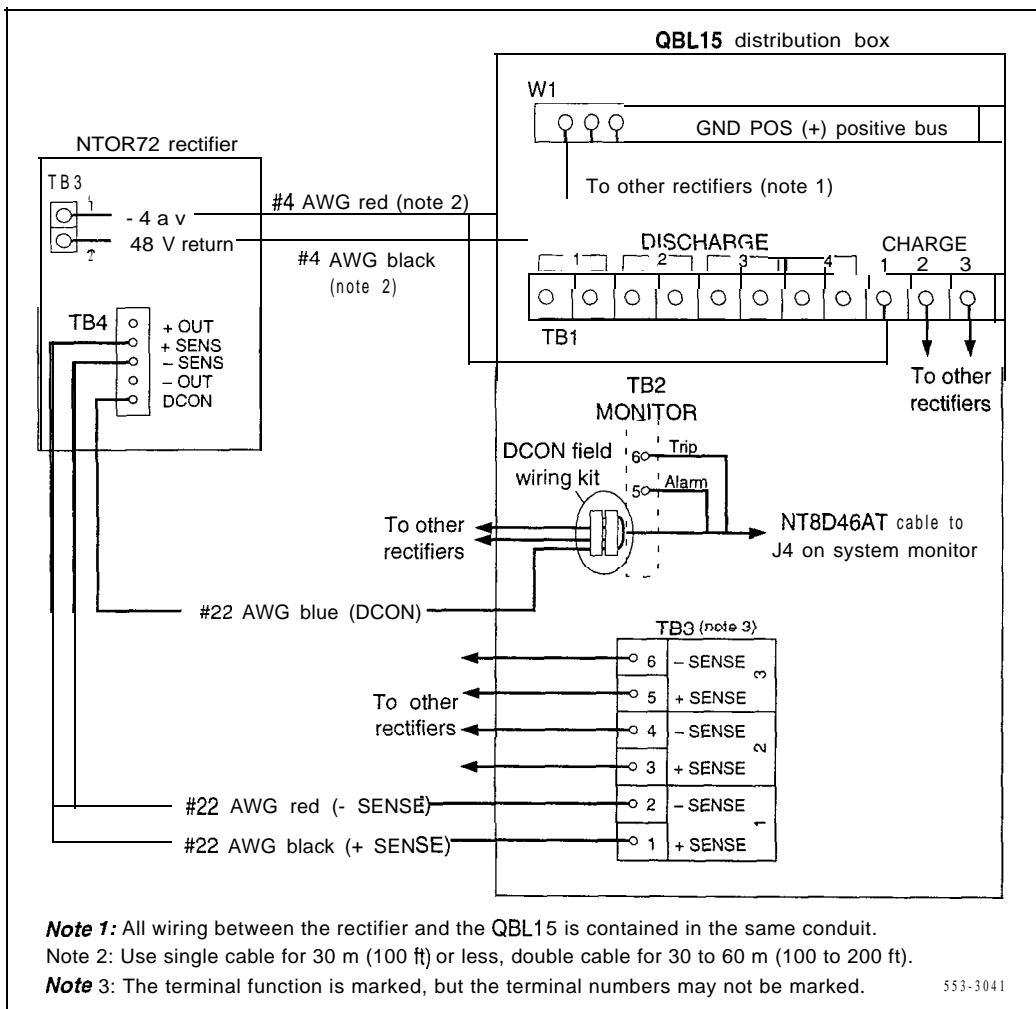
Adjusting equipment

Note: Do not adjust the over voltage shutdown (OV ADJ) potentiometer on the front panel of replacement rectifiers. This potentiometer is adjusted at the factory and does not require readjustment upon installation into an existing power system.

Note: The following steps adjust the float voltage of the replacement rectifier. This float voltage must be adjusted to match the float voltage settings of all other system rectifiers to ensure proper load sharing.

- 1 At the QBL15, connect a voltmeter to the (+) and (-) test points (located with the QPC188 Battery Monitor).
- 2 Set the AC BRKR switch on the replacement rectifier to ON.
- 3 Set the CBO circuit breaker on just one Meridian 1 column to ON to establish a minimum load.
- 4 Adjust the VOLT ADJ potentiometer on the front panel of the replacement rectifier to obtain the desired float voltage reading, ± 100 mV dc.
- 5 Set the CBO breaker on the Meridian 1 column to OFF and then set the AC BRKR switch on the rectifier to OFF.
- 6 Disconnect the multimeter and follow normal power up procedure to restore the system to service.

Figure 8
NT6D52 Rectifier and QBL15 Power/Battery Distribution Box connections



NT6D6008 Core and NT9D1 102 Core/Network Card Cage

To replace a defective backplane in an NT6D60 Core Module or in an NT9D11 Core/Network Module, you must replace the card cage. Use this procedure to replace the card cage. See the XII *input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 To access the Cores during the replacement procedure, connect a terminal to the J25 port on the I/O panel in the rear of each Core or Core/Network Module. You must use the following settings on the terminal:
9600 baud, 7 data, space parity, 1 stop bit, full duplex, XON

Note: If you are using only one terminal or a switch box, switch the connection from Core to Core as needed.
- 2 The NT6D66 Call Processor (CP) Card must be inactive in the card cage you are replacing.
 - Check the status of the CP cards:
LD 135
STAT CPU determine which CP card is active
If necessary, switch Cores:
SCPU switch Cores
**** exit LD135
 - Set the **Norm/Maint** switch to Maint on the now *active* CP card.
 - Connect the terminal to the port on the inactive Core.

- 3 Set the **Norm/Maint** switch to **Maint** on the CP card in the card cage you are replacing (the inactive Core). Wait two minutes for the system to initialize. (A series of IN1 messages will be seen on the terminal for the inactive Core.)
- 4 The NT6D64 Core Multi Disk Unit (CMDU) in the card cage you are replacing must be inactive:
 - Check the status of the CMDUs:
 LD 137
 STAT CMDU determine which CMDU is active
 If necessary, switch CMDUs:
 SWAP switch CMDUs
 **** exit LD137
 - Set the **Enb/Dis** switch to **Dis** on the CMDU in the card cage you are replacing.
- 5 Disable the clock controller card and any QPC720 Primary Rate Interface or QPC472 Digital Trunk Interface (**PRI/DTI**) Cards in the card cage you are replacing.
 - Check the status of the clock controller cards:
 LD 60
 SSCK x “x” is the Core (0 or 1)
 If the clock controller card is active, switch to make it inactive:
 SWCK
 Disable the clock controller card:
 DIS CC x “x” is the Core (0 or 1)
 - Set the **Enb/Dis** switch to **Dis** on the clock controller card in the card cage you are replacing.
 - Disable any **PRI/DTI** cards in the card cage you are replacing.
 DISL loop disable the network loop and the card
 **** exit LD60

Note: If the **PRI/DTI** cards service loops that cannot be out of service, move the cards to a different module and reenale them.

6 Set the **Enb/Dis** switch to **Dis** on all CNI cards and the IOP card in the card cage you are replacing.

7 Follow the steps below to disconnect and remove the **NT8D22** System Monitor (do not turn off the blower unit in the front of the pedestals):

- Load LD 37 and software disable the associated **SDI** port:

LD 37

DIS TTY x disable the device associated with the port

**** exit LD37

- If the card cage you are removing is in the column with the master system monitor (should be column 0):

On the master system monitor (column 0), disconnect the **RJ1 1** cable to **J3**, then the cable to **J6**, then pull the system monitor out of the slot.

- If the card cage you are removing is in the column with a slave system monitor (should be column 1):

On the master system monitor (column 0), disconnect the **RJ1 1** cable to **J3**, then the cable to **J6**, then pull the system monitor out of the slot.

On column 1, disconnect the cables, then pull the system monitor out of the slot.

CAUTION

If the system monitors are not removed, the system may shut down.

8 Follow the appropriate step below to turn off power to the module:

- With AC power, set the main circuit breaker for the column to OFF (down) in the rear of the pedestal.

WARNING

Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column **INCLUDING THE NETWORK GROUP TN THAT COLUMN**. Relocate essential services from this group before proceeding.

- With DC power, set the switch on the NT6D41 CE Power Supply to OFF (down). Set the circuit breaker *for just this module* to OFF (down) in the rear of the pedestal. (All other modules in the column retain power.)

9 Follow the steps below to remove all cards from the module:

- Tag and disconnect all cables to the front of the module. Tape over the contacts to avoid grounding. Tape or tie all cables to the sides so the working area in front of the card cage is totally clear.
- Set the Enb/Dis switch to Dis on any cards that are not already set to disable.
- Tag the cards so they can be returned to the same slot in the replacement card cage. Remove the cards, including the bus terminating units (BTUs) between slots 4 and 5, and slots 5 and 6 in option 81 and between slots 0 and 1 and 1 and 2 in option 61C.

10 Follow the steps below to disconnect cables to the I/O panels and backplane at the rear of the module:

- Tag and disconnect cables from the I/O panels.
- Remove the I/O panels and the I/O safety panel over the backplane to access the rear backplane connectors.
- Use the PO741489 Extraction Tool to disconnect cables to the backplane connectors. (See “Option 61C and 81 cable guidelines” on page 13.)

- 11 Follow the steps below to disengage the module:
 - Remove the two mounting screws that secure the rear of the card cage to the module.
 - Remove the front trim panels on each side of the card cage.
 - Remove the three mounting screws that secure the front of the card cage to the bottom of the module.
 - Pull the card cage half-way out of the module.
- 12 Follow the steps below to disconnect power and ground connections at the rear of the module:
 - Disconnect the system monitor ribbon cables to J1 and J2.
 - Disconnect the module power connectors. These are small orange connectors plugged into the module power distribution unit (MPDU) with AC power, or connected to each other with DC power.
 - Disconnect the logic ground (orange) wire from the backplane bolt.
 - Disconnect the frame ground (green) wire from the frame ground post.

WARNING

Do *not* disconnect the main power connectors (large orange connectors) at the top and bottom of the module.

- 13 Pull the card cage all the way out of the module.

Note: For AC-powered systems, after the card cage is out of the module you must remove the MPDU and reinstall it on the replacement card cage. The screw-heads for the MPDU are in the wall of the power supply slot.
- 14 Remove the floating power connector (the black connector) on the rear of the card cage. Using the same mounting screws and nuts, attach the connector to the new card cage.

Note: Check the orientation of the connector; Looking at it from the rear of the card cage, the upper left corner pin should be empty (no wire) and the lower right corner pin should have a wire installed. The green wire should be up.

Installing equipment

- 1 Set the backplane jumpers in the card cage for Core 0 and Core 1 in option 81 and Core/Network 0 and Core/Network 1 in option 61C. The jumpers are located on the backplane, along the bottom of the front side (the side facing into the card cage assembly):
 - For Core 0, verify that all four jumpers are closed (there is a plug over both pins). For Core/Network 0, verify that jumper between card slots 14 and 15 is closed.
 - For Core 1, verify that jumper JB4, between slots 9 and 10, is open (jumper plug not installed). Verify that the other three backplane jumpers are closed. For Core/Network 1, verify that the jumper between card slots 14 and 15 is open.

CAUTION

If the Core or Core/Network Module jumpers are set incorrectly, the system will not load and operate correctly.

- 2 Install the BTUs in the new card cage. The components must be on the right (looking at the front of the card cage):
 - Install QPC477A9 between slots 4 and 5 for option 81 and between slots 0 and 1 for option 61C.
 - Install QPC477B10 between slots 5 and 6 for option 81 and between slots 1 and 2 for option 61C.
- 3 Reposition the EM1 shield (it looks like a brass grill) in the base of the module. Tape over the front mounting tabs to hold the shield in position. The tape will be removed later.

4 Slide the new card cage about half-way into the module. Hold the card cage firmly while the ground and power connections are attached at the rear of the module:

- Attach the system monitor ribbon cables (J1 goes down to the pedestal, J2 goes up the column).
- Attach the frame ground (green) wire to the frame ground post on the module. (A 5/16" socket wrench is needed for this operation.) Remove the nut and the lockwasher at the top of the post. Put the frame ground connector over the post. Reinstall the top lockwasher and the nut, then tighten the nut down.
- Attach the logic ground (orange) wire. Remove one nut and the lo&washer. Put the connector over the post, reinstall the lo&washer and nut, then tighten the nut down. (A 3/8" socket wrench is needed for this operation.)
- Connect the module power connectors to the MPDU for AC power, or to each other for DC power.

5 Follow the steps below to install the new card cage in the module:

- Slide the card cage the remainder of the way into the module.
- Check the position of the EMI shield. If it has shifted, reposition it. Remove the tape holding the EMI shield.
- Secure the card cage to the module with the three screws in the front and the two screws in the rear.

6 Replace the trim panels on both sides of the card cage.

7 Install the NT6D6003 CBT Card in slot 13.

Note: All jumpers on the CBT card are preset to open (the two pins are not connected together by a jumper plug) and must be left open. The card may, however, have jumper plugs installed over one pin on the jumpers. The plugs are provided as extra plugs that may be required on some other card or for future requirements.

Replacing equipment 41

- 8 Install the module power supply in the slot labeled “CE pwr sup” in the Core or Core/Network card cage. Perform a hardware sanity check:
 - Turn on power to the module:

With AC power, set the main circuit breaker to ON (up) in the rear of the pedestal.

With DC power, set the breaker to ON (up) in the pedestal, then set the switch to ON (up) on the power supply in the module.
 - Check the LEDs on the NT6D003 CBT Card (the LEDs are on the component side of the card, not on the faceplate). The pattern of the LEDs must be OFF-OFF-OFF-OFF for Core 0, or ON-OFF-OFF-OFF, from the top down, for Core 1.

The LED pattern matches the jumper settings on the backplane. If the pattern is incorrect, check the jumpers on the backplane.
 - Shut down power to the module again.

With AC power, set the main breaker for the column to OFF (down).

With DC power set the switch on the power supply and the pedestal breaker for the module to OFF (down).
- 9 Follow the steps below to reconnect cables to the backplane:
 - Reconnect all cables to the backplane connectors.

CAUTION

If you try to insert the cable connector at an angle, pins may be bent or broken.

- Route the NTND14 CNI to 3PE cables to the right side (facing the rear) of the module and tie-wrap them to the cable restraint bracket behind the I/O panel.
 - Position and secure the I/O panels.
 - Position and secure the I/O safety panel.
- 10 Reinstall the NT6D64 CMDU. Set the Enb/Dis switch to Enb.
 - 11 Reinstall the 3PE card. Set the Enb/Dis switch to Enb.

- 12 Set the Enb/Dis switch on the clock controller card to Dis. Seat the clock controller card; leave the Enb/Dis switch set to Dis and do not connect the faceplate cables.
- 13 Follow the appropriate step below to turn on power to the column or the module power supply:
 - With AC power, set the main circuit breaker in the pedestal to ON (up).
 - With DC power, set the breaker to ON (up) in the pedestal. Set the switch to ON (up) on the power supply in the module.
- 14 Follow the appropriate steps below to connect the clock controller cables:
 - For a QPC471 Clock Controller card, connect the NT8D79 cables from the primary or secondary reference to the faceplate of the clock controller card. For option 81, connect the NT8D74 cable from the NT8D36 InterGroup Module to the clock controller card.
 - For QPC775 Clock Controller Cards in option 81, connect the NT8D74 cable from the junctor board to the faceplate of the clock controller card. Then connect the NT8D79 cables from the primary or secondary reference to the faceplate of the clock controller card.
 - Leave the Enb/Dis switch set to Dis on QPC471 or QPC775 cards.
- 15 Reinstall the NT6D63 IOP Card, then set the Enb/Dis switch to Enb.

As the card performs card level power-up tests, watch the faceplate HEX display for flashing error codes. See *XII input/output guide* (553-3001-400) for an explanation of the codes.
- 16 Set the Norm/Maint switch on the CP card to Maint. (This will keep the system in split mode when the card is reinstalled.)
- 17 Reinstall the CP card. As the card performs card level power-up tests, watch the LCD display and output from the CPIO port for error messages:
 - Following the “Selftest Complete” message, watch the LCD on the CP card for the message “IOP in Slot 16.”

- Watch the LCD for the message “Loading Disk OS.” (The CMDU hard disk is shipped pre-loaded with the necessary software.) As the system attempts to access the hard disk, watch the LCD for error messages.
- Watch for system reload (SYS) and initialization (INI) messages on the terminal.

Note: If you replaced the CMDU during the card cage replacement procedure, you must match the hard drive to the current software. If you replaced a CP card or an IOP card, you must match the ROM on the card to the current software. To match the software, follow the appropriate steps in “Option 81 installation tool” in *Software conversion procedures (553-2001-320)*.

18 Seat all CNI cards, but leave the Enb/Dis switches set to Dis.

19 Load LD 135 and check the status of all configured CNI cards:

```
LD 135
STAT CNI      get the status of all configured CNIs
TEST CNI c s  test each configured CNI on the inactive side
****         exit LD135
```

20 Set the Enb/Dis switch to Enb on the clock controller card.

21 Set the Enb/Dis switch to Enb on all CNI cards.

22 Press and release the Man Rst button on the CP card in the new card cage. When SYS700 messages appear on the LCD display, set the Norm/Maint switch to Norm. Within 60 seconds, the LCD will display the following messages, confirming the process:

```
RUNNING ROM OS
ENTERING CPU VOTE
```

An HW1533 message from the CPIO or SDI port indicates the memory is shadowed.

Note 1: At this point, the other Core is still active and in split mode. The Core in the new card cage is the standby (inactive) side. The memories are shadowed (synchronized), but the hard disks are not synchronized (redundancy is disabled).

Note 2: A CNI port LED may not go out if a network loop corresponding to that port is disabled.

- 23 Set the **Norm/Maint** switch to Norm on the CP card in the active Core and perform a redundancy sanity test:

LD 135

```
STAT CNI      get the status of all configured CNIs
STAT CPU      get the status of both Cores
TEST CPU      test the inactive CP card and CP to CP cable
TEST CNI c s  test each configured CNI on the inactive side
```

Note: Testing the CP and CNI cards can take up to 90 seconds for each test.

- 24 Switch Cores and test the other side:

```
SCPU          switch to Core 0
TEST CPU      test the inactive CP card and CP to CP cable
```

- 25 Get the status of the CP cards and memories, and of the CNIs:

```
STAT CPU      get the status of both Cores
STAT CNI      get the status of all configured CNIs
****         exit LD135
```

- 26 Load LD 137 and synchronize the hard disks. To be sure the contents of CMDU 1 are copied to CMDU 0, verify that CMDU 0 is disabled:

```
LD 137
STAT          get the status of CMDUs, IOPs, and redundancy
SWAP         switch CMDUs (if necessary)
SYNC         synchronize the hard disks
```

Note: Synchronization may take up to 30 minutes.

27 Get the status of the CMDUs and be sure CMDU 0 is active. Switch CMDUs if necessary:

```

STAT          get the status of CMDUs, IOPs, and redundancy
SWAP          switch CMDUs (if necessary)
****         exit LD137
    
```

28 Test the IOP to IOP SCSI connection and test the CMDUs:

```

LD 137
TEST SCSI     check the IOP to IOP connection and access to the
              CMDUs
TEST CMDU     test the hard and floppy disk drives
              (a floppy disk must be installed)
****         exit LD137
    
```

29 Test Core functions:

```

LD 135
TEST CPU     test the inactive CP card and CP to CP cable
TEST IPB     test the backplane protocol on the inactive side
TEST CNI c s test each configured CNI on the inactive side
    
```

If all the tests pass, switch Cores and test the side that is now inactive:

```

SCPU        switch to the other Core
TEST CPU     test the inactive CP card and CP to CP cable
TEST IPB     test the backplane protocol on the inactive side
TEST CNI c s test each configured CNI on the inactive side
    
```

30 Clear displays, major alarms, and minor alarms:

```

CDSP        clear the display
CMAJ        clear all major alarms
CMIN ALL    clear all minor alarms
SCPU        switch to the other Core
CDSP        clear the display
****         exit LD135
    
```

31 Software enable, from the active side, the clock controller and PRI/DTI cards:

- Enable the clock controller card:

```
LD 60
ENL CC x
TRCK aaa      if necessary, set tracking
```

- Enable the PRI/DTI cards:

```
ENLL loop
****          exit LD60
```

32 Follow the appropriate steps below to reinstall and check the system monitor:

- If you replaced the card cage in the column with the master system monitor:

Reconnect the RJ11 cable to J6, then the cable to J3. Reinstall the system monitor.

- If you replaced the card cage in the column with the slave system monitor:

Reinstall the system monitor in column 1 first.

On the master system monitor, reconnect the RJ11 cable to J6, then the cable to J3. Reinstall the system monitor.

- Enter:

```
LD 37
STAT XSM      check the status of the system monitors
****          exit LD37
```

33 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT6D6003 Core Bus Terminator Card

Use this procedure to replace a core bus terminator (CBT) card.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

- 1 The CBT card must be on the inactive Core. If you need to switch the active Core:
LD 135
SCPU
- 2 Unhook the locking devices on the CBT card; pull it out of the card cage.
- 3 Check the replacement CBT card. All jumpers on the card should be preset to open (the two pins are not connected together by a jumper plug) and must be left open.

Note: The card may, however, have jumper plugs installed over one pin on the jumpers. The plugs are provided as extra plugs that may be required on some other card or for future requirements.

- 4 Insert the replacement CBT card into the vacated slot.
- 5 Test the functions of the CBT card in LD13.5:
TEST CPU test the CP card and CP to CP cable
TEST IPB test the backplane protocol
TEST CNI c s “c” is the CPU (0 or 1), “s” is the slot (S-12);
 perform this test for each CNI in the module

If all the tests pass, switch the active Core:

SCPU

- If there is a problem with any of the tests, CCED system messages are generated.
 - If there is no problem, exit LD135:

- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

- 2 Set the Enh/Dis switch to Dis on the faceplate of the IOP card.
- 3 Unhook the locking devices on the card; pull it out of the card cage.
- 4 Remove the screw that secures the QMM42 Data Cartridge. Gently unplug the cartridge from the connectors on the component side of the card.

Installing equipment

- 1 Plug the data cartridge into the connectors on the component side of the replacement card. Install the screw that secures the cartridge.
- 2 Set the Enh/Dis switch to Dis on the replacement card
- 3 Insert the replacement card into the vacated slot and hook the locking devices.
- 4 Set the Enh/Dis switch to Enh on the replacement card. Watch the card until the self-test completes. If the self-test is successful, the faceplate LED will flash three times then stay lit until the card is enabled.
- 5 Match the ROM on the replacement card to the software currently on the CMDU hard disk:

Note: Refer to "Option 81 installation tool reference" in *Software conversion procedures* (553-2001-320).

- To activate the options 61C and 81 installation tool, insert disk A1 from the software package into the CMDU on the Core side with the replacement card.
 - Press the Man Rst button on the CP card in the Core with the replacement card.
 - Select the following options in sequence:
 - <f> to install CP ROM only
 - <yes> to start installation
- specify software installation from the hard disk

- Follow all screen directions until the main menu returns.
- Remove the disk from the CMDU.
- Select the following options to quit and reload the system:

<q>	to quit
<yes>	to confirm quit
<a>	to reboot the system

6 Test and enable the IOP card:

- If the faulty IOP card is associated with the *inactive* Core, switch Cores:
LD 135
SCPU
**** exit LD135

- Test and enable the card:
LD 137
DIS IOP required for the next command
TEST IOP
ENL IOP this also enables the CMDU(s)
**** exit LD137

If there is a problem, a CIOD system message is generated and the red LED lights on the faceplate of the card.

7 Tag defective equipment with a description of the problem and package it for return to a repair center.



NT6D64 Core Multi Drive Unit

Use this procedure to replace the core multi drive unit (CMDU).

See the *XI 1 input/output* guide (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Software disable the CMDU you are replacing:
LD 137
STAT CMDU x x is the CMDU number (0 or 1)
If the CMDU is not disabled enter:
DIS CMDU x
**** exit LD 137
- 2 If needed, save (datadump) the current data configuration to the known good CMDU:
LD 43
EDD execute data dump
**** exit LD43
- 3 If there is a floppy disk in the CMDU you are replacing, remove the floppy disk.
- 4 Set the power switch on the front of the CMDU to OFF (down).
- 5 Wait at least ten seconds, then unhook the locking devices on the CMDU and gently pull the unit out of the card cage.

CAUTION

You must wait *at least 10* before you remove the CMDU from the card cage. This allows the hard disk to stop.

Installing equipment

- 1 Insert the replacement CMDU into the vacated slot and hook the locking devices.
- 2 Set the power switch on the front of the CMDU to ON (up).
- 3 Match the software on the replacement CMDU to the system software.

Note: Refer to "Option 81 installation tool" in *Software conversion procedures* (553-2001-320).

- 4 If there was a floppy disk in the CMDU you replaced, install the floppy disk in the replacement CMDU.
- 5 Software enable and test the CMDU:

LD 137

ENL CMDU x

The system will respond with:

DISK RDUN WILL BE ENABLED, ENTER Y(ES) TO CONFIRM.

Enter:

YES

If this operation fails, enter:

SYNC synchronizes the hard disks

TEST SCSI check access to the CMDU

TEST CMDU x check the hard and floppy disk drives

**** exit LD137

If there is a problem, a CIOD system message is generated.

- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT6D65 Core to Network Interface Card

See the *XI I input/output guide (553-3001-400)* for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Before replacing a core to network interface (CNI) card, you can test it in an unused CNI slot (in case, for example, there is a bent pin on the backplane). If the card works correctly in the new slot, you can leave it there. To switch slots:

- The Core associated with the CNI card must be inactive:
 - If you need to switch Cores:
 - LD 135
 - SCPU**
 - Set the Norm/Maint switch to Maint on the active CP card.
- Software disable the CNI card:


```
DIS CNI c s    "c" is the CPU (0 or 1), "s" is the card slot (8-12)
****          exit LD135
```
- Software configure the new slot:


```
LD 17
EXT x 3PE     "x" is the number (0-4) of the associated 3PE card(s)
CNI X s p   delete the group(s) associated slot
CNI s p g   add group(s) to new slot
****          exit LD17
LD 43
EDD           datadump the new configuration
****          exit LD43
```
- Insert the CNI card in the new slot. Move the cables to the shrouds on the backplane to the connectors for the new slot.

- Enable the CNI card and switch the CP cards:
 - Set the Norm/Maint switch to Norm on the active CP card.
 - LD 135
ENL CNI c s
SCPU

Use the following procedure to replace a CNI card.

Removing equipment

- 1 The Core associated with the CNI card must be inactive:
 - If you need to switch Cores:
LD 135
SCPU
 - Set the Norm/Maint switch to Maint on the active CP card.
- 2 Set the Enb/Dis switch to Dis on the CNI card you are replacing.
- 3 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.
- 2 Insert the replacement card into the vacated slot and hook the locking devices.
- 3 Set the Enb/Dis switch to Enb on the replacement card.
- 4 Set the Norm/Maint switch to Norm on the *active* CP card.
- 5 Software enable and test the CNI card and configured ports on the card:
ENL CNI c s "c" is the CPU (0 or 1), "s" is the card slot (8-12)
TEST CNI c s
SCPU
**** exit LD135

Replacing equipment 55

Note: Due to the need to reestablish memory shadowing and contents, the test command may take a minute or more depending on memory size. The LED on the CNI card flashes as the test runs.

If there is a problem, a CCED system message is generated (LEDs on the CNI cards stay lit on the inactive Core).

Note: If the network loop corresponding to a CNI port is not enabled, the LED for that port may not go out.

- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT6066 Call Processor Card

Use this procedure to replace an NT6D66 Call Processor (CP) card.

See the XII *input/output* guide (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

At some point in this procedure the system may initialize, causing a momentary interruption in call processing.

Removing equipment

- 1 To access the Core during the replacement procedure, connect a terminal to the J25 port on the I/O panel in the Core Module in option 81 or Core/Network Module in option 61C, for the card you are replacing. You must use the following settings on the terminal:

9600 baud, 7 data, space parity, 1 stop bit, full duplex, XOFF

Note: If you are using only one terminal or a switch box, switch the connection from Core to Core as needed.

- 2 The CP card you are replacing must be on the inactive Core. Check the status of the CP cards:

LD 135

STAT CPU determine which CP card is active

If necessary, switch Cores:

SCPU switch Cores

**** exit LD 135

- 3 Put both Cores into maintenance mode and remove replaced CP card using the following sequence:

- First, set the Norm/Maint switch to Maint on the *active* CP card (the one you are *not* replacing).

WARNING

Setting the Norm/Maint to Maint on the inactive CP card at this point will cause an init.

- Then, set the Norm/Maint switch to Maint and press the Man Rst button on the CP card you are replacing. Unhook the locking devices in the CP card you are replacing and pull it out of the card cage.

Installing equipment

- 1 Set the Norm/Maim switch to **Maint** on the replacement card.
- 2 Match the ROM on the replacement card to the software currently on the CMDU hard disk by using the following procedure:
 - To activate the installation tool, insert disk A1 into the CMDU in the Core Module for option 81 or the Core/Network Module for option 61C, where the replacement CP card is to be installed.
 - Insert the CP replacement card into its vacated slot and hook the locking devices.
 - Press the Man Rst button on the replacement CP card.
 - Select the following options in sequence from the install menu:
 - <e> to install CP ROM only
 - <yes> to start installation
 - specify software installation from the hard disk
 - Follow all screen directions until the main menu returns.
 - Select the following options to quit:
 - <q> to quit
 - <yes> to confirm quit.
 - Remove disk A1 from the CMDU and then reload the system:
 - <a> to reboot the system.
 - Press the Man Rst button and then set the **Norm/Maint** switch to **Norm** on the replacement CP card.(It may take 2 to 4 minutes for memory synchronization to take place).
 - Refer to Option 81 Installation Tool Reference in X11Software conversion (553-2001-320).
 - Check the status of the replacement CP card from the active side:
 - LD 135
 - STAT CPU

If there are CCED messages generated by the STAT CPU command on

the replacement CP card: set the **Norm/Maint** switch to **Maint**, and press the reload (**Man Rst**) button and set the **Norm/Maint** switch back to **Norm**. (It may take 2 to 4 minutes for memory synchronization to take place).

If there are no **CCED** messages generated by the **STAT CPU** command, continue with step 4.

- 3 After the **HWI0533** message is displayed, test the replacement CP card from the active CPU:

TEST CPU the test causes a cold start on the inactive CPU

If the test results in:

CCED014 “Test failed because unable to enter **SPLIT** mode”

On the active CP card set the **Norm/Maint** switch to **Norm** and from the active side enter:

TEST CPU to test the CP card

- 4 After a successful test that takes 2 or 4 minutes, proceed with the following:
 - Set the **Norm/Maint** switch to **Norm** on the active CP card (if not already set).
 - Check the status of the **CPUs**:
STAT CPU
 - Check the status of the **CNIs**:
STAT CNI
 - Switch Cores and exit the program:
SCPU
**** exit LD135

If there is a problem, **CCED** system messages are generated.

- 5 Tag defective equipment with a description of the problem and package it for return to a repair center.

Note: Repeat the process for the replacement of the second CP card (if applicable) by moving the terminal cable to the J25 port on the I/O panel of the other Core or Core/Network Module and continuing the procedure starting at step 2 of the Removing Equipment section.

- 6 Synchronize the hard disks on both CMDUs:
LD 137
SYNC synchronizes the CPUs

Synchronization may take as long as 40 minutes. Progress reports appear on the TTY periodically.

NT7D10 Power Distribution Unit DC

Use this procedure to replace the power distribution unit (PDU) for DC-powered systems.

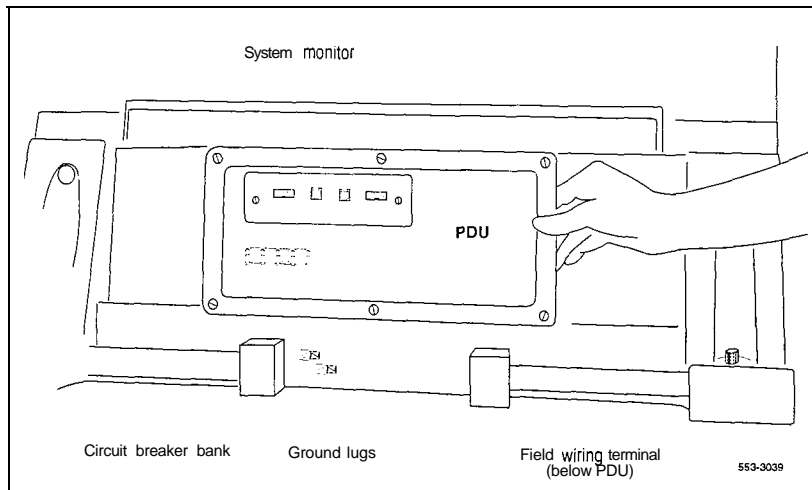
WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Disconnect the DC power at the source (not at the PDU).
- 2 Remove the grill on the rear of the pedestal.
- 3 Set all five circuit breakers on the PDU to OFF (down). Figure 9 shows the location of the PDU in the rear of the pedestal.

Figure 9
NT7D10 Power Distribution Unit DC



- 4 Unseat the blower unit in the front of the pedestal:
 - Remove the grill on the front of the pedestal. Set the toggle switch on the front of the unit to OFF (left).
 - Turn the screws on the front of the unit counter-clockwise and pull the unit forward several inches so the connector on the rear disengages.



WARNING

Do not pull the blower unit out of the pedestal. The unit is heavy and the blades on the blower may still be rotating up to 2 minutes after the power is turned off.

- 5 Disconnect cables that run between the module above the pedestal (module 0) and the top of the PDU:
 - Remove the rear cover on the module.
 - Remove the I/O safety panel over the backplane in the module.
 - Disconnect the system monitor ribbon cable from the PDU.
 - Disconnect the large orange power connector (J1) from the PDU.

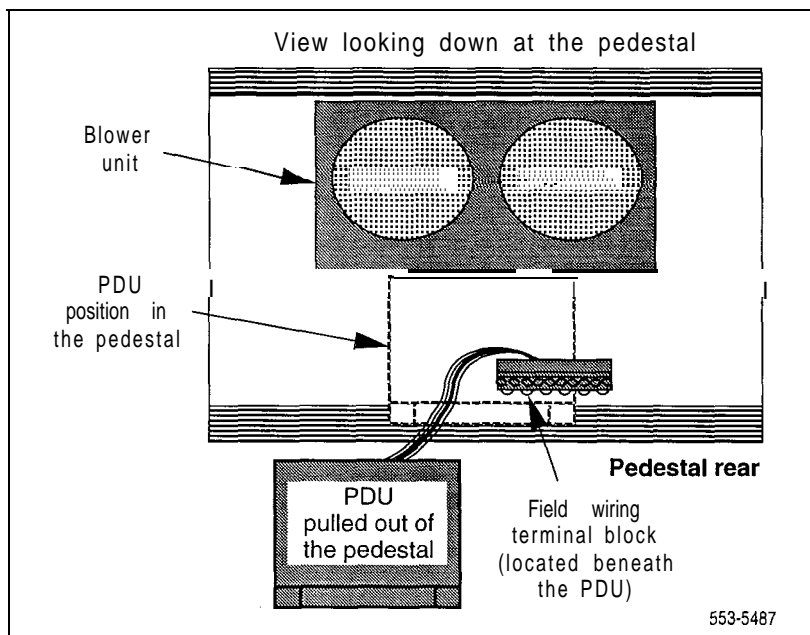
Note: To disconnect the power plug, you must press a latch trip on the front and rear of the plug. You may need to use a screwdriver blade against the latch trip on the front of the plug.
- 6 Tag and disconnect cables to the NT8D22 System Monitor. Loosen the two screws on the system monitor card and remove it from the PDU.
- 7 Remove the six screws that position the PDU. Carefully pull the unit straight forward and set it on the floor next to the pedestal (see Figure 10).

CAUTION

The PDU cannot be completely removed from the pedestal until cables to the field wiring terminal block are disconnected. Label wires carefully. Improper wiring can cause system damage.



Figure 10
Cabling between the PDU and the field wiring terminal block



- 8 Remove the field wiring terminal block:
 - Remove the cover over the field wiring terminal block.
 - Locate the frame ground wire that runs from the field wiring terminal block to the frame ground bolt inside the pedestal. Disconnect this wire at the terminal block.
 - Carefully tag and then disconnect all input wiring to the field wiring terminal block. Take special note of any jumper wires which might be installed. It is not necessary to disconnect wiring that runs from the terminal block to the PDU.
 - Remove the four screws that secure the terminal block in place and lift it out of the pedestal.

Installing equipment

- 1 Install the replacement field wiring terminal block:
 - Position the replacement PDU next to the rear of the pedestal.
 - Position the replacement field wiring terminal block and replace its mounting screws.
 - Reconnect all wiring to the field wiring terminal block, including any jumpers which might have been present on the terminal block that was removed.
 - Reconnect the frame ground wire from the frame ground bolt inside the pedestal to the field wiring terminal block.
 - Replace the cover over the field wiring terminal block.
- 2 Gently push the PDU into the pedestal. Replace the screws on the PDU.

Note: Be sure you push the unit straight back so the connector on the rear will seat properly with the connector for the blower unit.
- 3 Reconnect cables from module 0 to the PDU:
 - Attach power plug J1 and the system monitor cable.
 - Replace the I/O safety panel on the module.
 - Replace the rear cover on the module.
- 4 Reseat the blower unit:
 - Lift the unit slightly and slide it into the pedestal glides. Set the toggle switch to ON (right).
 - Tighten the screws on the front of the unit.
- 5 Insert the system monitor card into the PDU. Tighten the screws on the card. Reconnect cables to the system monitor faceplate.
- 6 Set all five circuit breakers on the PDU to **OFF** (down). Reconnect the source of DC power.

Replacing equipment 65

- 7 One at a time starting with the breaker for the blower unit, set the circuit breakers on the PDU to ON (up). Make sure the green LED lights on the power supply unit(s) in each module.

Note: On initial power up, the blower may rotate slower than expected. As the sensor detects heat, the blower will rotate more rapidly.

- 8 Replace the pedestal grills in the front and rear.
- 9 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT7D14, NT8D06, NT8D21, NT8D29 Power Supply AC

Use this procedure to replace AC power supplies:

- NT7D14 CE/PE Power Supply AC
- NT8D06 PE Power Supply AC
- NT8D21 Ringing Generator AC
- NT8D29 CE Power Supply AC

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

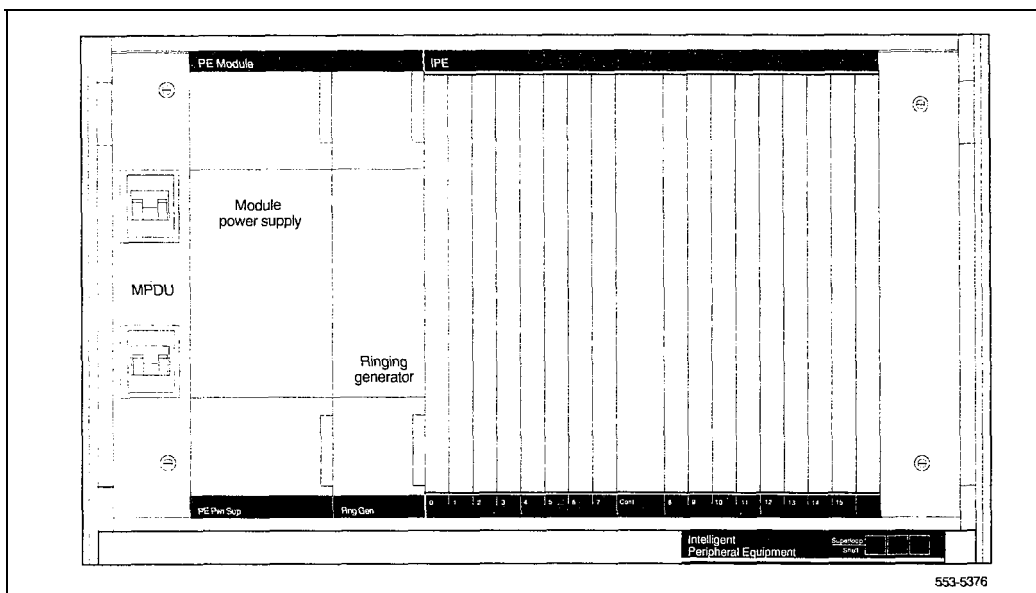
- 1 Turn off power to the module power supply:
 - If there is a Module Power Distribution Unit (MPDU), set the circuit breaker(s) on the associated MPDU to OFF (down).

Note: If there are two circuit breakers on the MPDU, the top one is associated with the module power supply, the bottom one with the ringing generator (see Figure 11).
 - If there is no MPDU, set the switch on the power supply faceplate to OFF (down).
- 2 Unhook the locking devices on the power supply. Wait at least five minutes, then pull the power supply out of the card cage.

CAUTION

Power must discharge. Wait *five full minutes* before you remove the power supply from the module.

Figure 11
Dual circuit breaker and associated module power supplies



Installing equipment

- 1 Insert the replacement power supply into the vacated slot and hook the locking devices.

Note 1: If there is a switch on the power supply, set the switch to OFF (down) before you insert the power supply

Note 2: On a replacement NT8D21, set option strapping the same as on the one you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.

- 2 Turn on power to the module power supply. The green LED on the power supply should light and stay lit:
 - If there is an MPDU, set the circuit breaker(s) to ON (up).
 - If there is no MPDU, set the power supply switch to ON (up).
- 3 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT7D15 System Monitor

The NT7D15 System Monitor, used only in option 21A, attaches to the rear of the backplane in the NT8D11CE/PE Module. Use this procedure to replace the system monitor.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Remove the rear cover on the module.
- 2 Remove the I/O safety panel by turning the screws on each side. Set the cover aside.
- 3 Tag and disconnect cables to the system monitor in the following order: disconnect the cable to connector P3, then P2, then P1.

CAUTION

If you do not disconnect cables in the order given, the system will shut down.

- 4 Pull the card out of the connector on the backplane.

installing equipment

- 1 Plug the replacement card into the vacated connector (the connector closest to the right) on the backplane before the cables are connected.

CAUTION

Cables must be *disconnected* when the card is installed. When you connect the cables, you must follow the order given or the system will shut down.

- 2 Connect cables to the system monitor in the following order: connect the cable to connector P1, then P2, then P3.
- 3 Replace the I/O safety panel.
- 4 Replace the rear cover on the module.
- 5 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT7D67CB Power Distribution Unit DC

Use this procedure to replace the power distribution unit (PDU) for DC-powered systems.

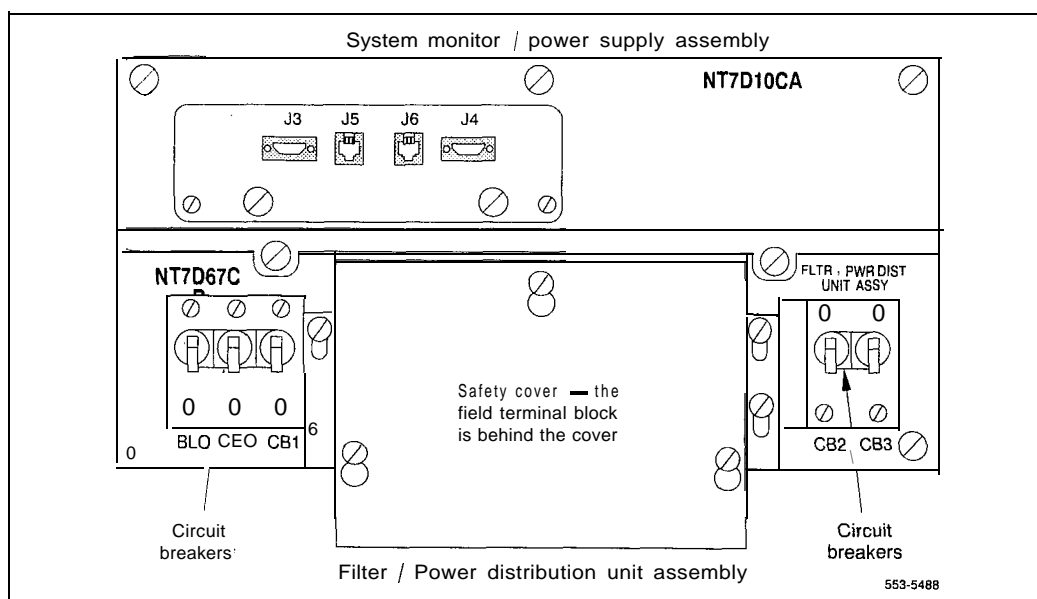
WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Disconnect the DC power at the source (not at the PDU).
- 2 Remove the grill on the rear of the pedestal.
- 3 In the rear of the pedestal, set all five circuit breakers on the PDU to OFF (down). Figure 12 shows the PDU (labeled FLTR/PWR DIST UNIT ASSY on the equipment) and the NT7D10CA System Monitor/Power Supply Assembly (labeled XSM/PWR SUPPLY ASSY on the equipment).
- 4 Unseat the blower unit in the front of the pedestal:
 - Remove the grill on the front of the pedestal. Set the toggle switch on the front of the unit to OFF (left).
 - Turn the screws on the front of the unit counter-clockwise and pull it forward several inches (you will see the L-bracket on the rear of the unit) until the connector disengages from the rear of the PDU.

Figure 12
NT7D67CB Power Distribution Unit DC



WARNING

Do not pull the blower unit out of the pedestal. The unit is heavy and the blades on the blower may still be rotating up to 2 minutes after the power is turned off.

- 5 Disconnect cables that run between the module above the pedestal (module 0) and the PDU:
 - Remove the rear cover on the module.
 - Remove the I/O safety panel over the backplane in the module.
 - Disconnect the system monitor ribbon cable from module 0.
 - Disconnect the large orange power connector (J1) from the PDU.

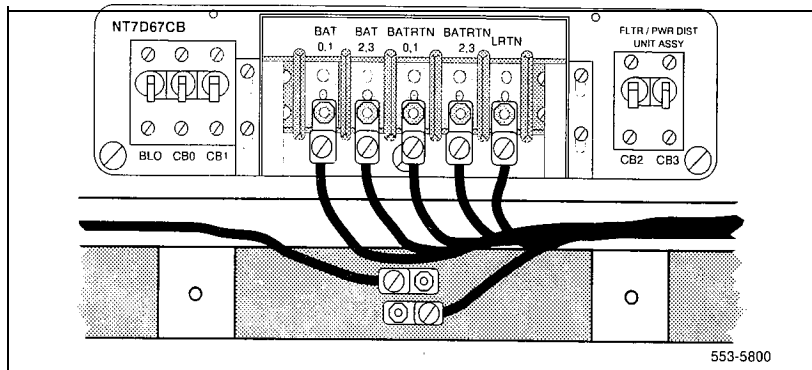
Note: To disconnect the power plug, you must press a latch trip on the front and rear of the plug. You may need to use a screwdriver blade against the latch trip on the front of the plug.

- 6 Tag and disconnect cables to the NT8D22 System Monitor faceplate.
- 7 Loosen the five screws that secure the NT7D10CA system monitor assembly. Pull the assembly out of the pedestal far enough to disconnect the cables to the PDU:
 - Disconnect the small orange connectors (J2 on the PDU, P2 on the system monitor assembly) on the left side of the PDU.
 - Disconnect the flat white connector to the small circuit board (P1 on the PDU, J1 on the system monitor assembly) on the right side of the PDU.
- 8 Pull the system monitor assembly out of the pedestal along with the attached ribbon cable and set it aside until the replacement PDU is installed.
- 9 Remove the plastic safety cover over the terminal block on the PDU:
 - Loosen the three screws holding the cover.
 - Lift the cover up, then over the three mounting screws on the front panel of the cover.
- 10 Tag and disconnect all wiring to the field wiring terminal block on the PDU (see Figure 13).

CAUTION

Label wires carefully. Improper wiring can cause system damage.

Figure 13
Field wiring terminals in the NT7D67CB PDU



bracket at the rear of the PDU to protect against vibration during transit. If the shipping screws were not removed during initial installation, you must remove them now to pull the PDU out of the pedestal. Pull the blower unit all the way out of the pedestal so you can access the shipping screws on the leveling bracket.

- Loosen the three screws that secure the PDU.
- Remove the two vertical screws located in the rear of the PDU that hold the L-bracket to the lower pedestal.
- Pull the PDU out of the pedestal, being careful to not chafe the cables against the pedestal.
- Disconnect the frame ground wire from the PDU at the frame ground bolt inside the pedestal.

Installing equipment

- 1 Install the replacement PDU:
 - Connect the frame ground wire from the PDU to the frame ground bolt inside the pedestal.
 - Guide the connector for the power cable through the hole in the top of the pedestal (do not allow the PDU to drop).
 - Gently push the PDU into the pedestal. Position the leveling bracket (attached to the rear of the PDU) in the small opening toward the front of the pedestal. The leveling bracket will support the back of the PDU.
- 2 Install the NT7D10CA system monitor assembly:
 - Connect the small orange connectors (J2 on the PDU, P2 on the system monitor assembly) on the left side of the PDU.
 - Connect the flat white connector to the small circuit board (P1 on the PDU, J1 on the system monitor assembly) on the right side of the PDU.
 - Guide the connector on the free end of the system monitor ribbon cable (from J2) up through the hole in the top of the pedestal and connect it to module 0.
 - Install and tighten the two vertical screws that attach the L-bracket to the PDU.
 - Gently push the system monitor assembly into the pedestal.
- 3 Tighten the screws that secure the PDU and the system monitor assembly.
- 4 Reconnect the remaining cables from module 0:
 - Reconnect the large orange power connector (J1).
 - Replace the I/O safety panel.
 - Replace the rear cover to the module.

- 5 Reconnect all external wiring to the field wiring terminal block on the PDU:

Note: All wiring to the PDU must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

- Remove the plastic safety cover over the terminal block.
- Connect the red BAT (-48 V) wires to the terminal block:
 - for modules 0 and 1 connect to the BAT 0,1 terminal
 - for modules 2 and 3 connect to the BAT 2,3 terminal

The safety ground/protective earth wires and all wiring to the block in the PDU must be neatly routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal. This insures that there is room to install the PDU cover, safety cover, and rear grill.

- Connect the black BATRTN (48 V return) wires to the terminal block:
 - for modules 0 and 1 connect to the BATRTN 0,1 terminal
 - for modules 2 and 3 connect to the BATRTN 2,3 terminal
 - Connect the orange (or white) wire to the LRTN terminal.
- 6 Reinstall the plastic safety cover over the terminal block.
- 7 Reseat the blower unit:
- Lift the unit slightly and slide it into the pedestal glides. Set the toggle switch to ON (right).
 - Tighten the screws on the front of the unit.
- 8 Reconnect cables to the system monitor faceplate.
- 9 Set all five circuit breakers on the PDU to OFF (down). Reconnect the source of DC power.

- 10 One at a time starting with the breaker for the blower unit, set the circuit breakers on the PDU to ON (up). Make sure the green LED lights on the power supply unit(s) in each module.

Note: On initial power up the blower may rotate slower than expected. As the sensor detects heat, the blower will rotate more rapidly.

- 11 Replace the pedestal grills in the front and rear.
- 12 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D01 Controller Card

Use this procedure to replace a controller card.

See the XI I *input/output* guide (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Turn off power to the module:
 - With AC power, set the associated circuit breaker on the module power supply (MPDU) to OFF (down).
Note: If there are two circuit breakers on the MPDU, the top one is associated with the module power supply, the bottom one with the ringing generator.
 - With DC power, set the switch on the module power supply to OFF (down).
- 2 Software disable the controller card (and all cards connected to the controller):
LD 32
DSXP x “x” is the controller card number
- 3 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Insert the replacement card into the vacated slot and hook the locking devices.
- 2 Turn on power to the module:
 - With AC power, set the associated circuit breaker on the MPDU to ON (up).
 - With DC power, set the switch on the module power supply to ON (up).
- 3 Watch the controller card as it runs a series of self-tests:
 - During the tests, the maintenance display on the card shows the code for each test running (*see* "HEX" in the *XI I input/output guide*). If the tests complete successfully, the display begins normal operation. If the card continuously fails a test, the code for that test is displayed.
 - When IPE cards are installed, the red LED on the faceplate remains lit for two to five seconds as a self-test runs. If the self-test completes successfully, the LED flashes three times and remains lit until the card is configured and enabled in software, then the LED goes out. If the LED does not follow the pattern described or operates in any other manner (such as continually flashing or remaining weakly lit), replace the card.
- 4 Software enable and test the controller card (and all cards connected to the controller):
ENXP x
 - If there is a problem, an NPR, NWS, or SDL system message may be produced and the red LED lights on the controller card.
 - If there is no problem, exit LD32:

- 5 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D02, NT8D03, NT8D09, NT8D14, NT8D15, NT8D16 Intelligent Peripheral Equipment Card

Use this procedure to replace the following intelligent peripheral equipment (IPE) cards:

- NT8D02 Digital Line Card
- NT8D03 Analog Line Card
- NT8D09 Analog Message Waiting Line Card
- NT8D14 Universal Trunk Card
- NT8D15 E&M Trunk Card

NT8D16 Digitone Receiver (DTR) Card

See the *XI I input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Software disable the card:

LD 32

DISI s c “[s c” are loop, shelf, and card numbers

You will see “NPR011” on the system terminal when the card is disabled. Busy channels will not be disabled until the call is disconnected.

- 2 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set jumpers on the following replacement cards the same as on the card you removed:

NT8D14 Universal Trunk Card
NT8D15 E&M Trunk Card

To check settings, see *Circuit card installation and testing* (553-3001-211).

- 2 Insert the replacement card into the vacated slot and hook the locking devices.

Note: When IPE cards are installed, the red LED on the faceplate remains lit for two to five seconds as a self-test runs. If the self-test completes successfully, the LED flashes three times and remains lit until the card is configured and enabled in software, then the LED goes out. If the LED does not follow the pattern described or operates in any other manner (such as continually flashing or remaining weakly lit), replace the card.

- 3 Software enable the card:

ENLC I s c

- When the process is complete, you will receive a system response.
- Exit LD32:

- 4 Test the card:

LD30
SHLF I s

Note: This command tests every card on the designated shelf.

- If there is a problem, an NPR system message is generated and the red LED(s) on the faceplate of the card will remain lit.
- If there is no problem, exit LD30:

- 5 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D04 Superloop Network Card, QPC414 Network Card

Use this procedure to replace a superloop network card or network card.

See the *XI 1 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

All services on a loop are interrupted while the loop is disabled.

Removing equipment

- 1 Check the status of each loop on the network or superloop network card:
LD 32
STAT loop “loop” is a loop number
 - If the response is DSBL for the loop(s), go to Step 2.
 - If there are responses other than DSBL, see “LD32” in the *XII input/output guide* for an interpretation.
- 2 Set the Enb/Dis switch to Dis.
- 3 Tag and disconnect cables to the card you are removing.
- 4 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.

Note: On a replacement QPC414, set jumpers the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.

- 2 Insert the replacement card into the vacated slot and hook the locking devices.
- 3 Connect cables to the replacement card.
- 4 Set the **Enb/Dis** switch to **Enb** on the replacement card.
- 5 Software enable each loop on the card:
ENLL loop
 - When the process is complete, you will receive a system response.
 - The card is tested automatically when all loops are enabled.
 - If there is a problem, an NWS system message is generated and the red LED on the faceplate of the card will flash (on the NT8D04) or be steadily lit (on the QPC414).
 - If there is no problem, exit LD32:

- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D17 Conference/TDS Card

The **conference/TDS** card provides conference functions on one loop and both tone and digit switch (TDS) and multifrequency sender (MFS) functions on a second loop. Use this procedure to replace a **conference/TDS** card.

See the *X11 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Software disable the conference/TDS card:

LD 34 or LD 38 or LD 46

DISX loop In LD38 “loop” is the conference loop which is the odd loop of the conference/TDS loop pair. In LD34 and LD46 “loop” is the TDS/MFS loop which is the even loop of the conference/TDS loop pair.

Note: You must use the command DISX to disable both loops and all hardware functions. Disabling loops with the command DISL prevents software from using the loops but does not disable the card.

- 2 Set the Enb/Dis switch to Dis.
- 3 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.
- 2 Set option switches and jumpers on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.

3 Insert the replacement card into the vacated slot and hook the locking devices. Both red **LEDs** should flash three times and remain lit if the card is good.

4 Set the **Enb/Dis** switch to Enb on the replacement card.

5 Software enable the card:

ENLX loop This prompt is available in LD34, LD38, and LD46. Use the appropriate loop number (see Step 1 in “Removing equipment” on page 83).

Note: You must enable the card with the command ENLX. Enabling the loops with the command ENLL does not enable the card.

6 Test each loop on the card (when each test completes, enter ********):

• Test TDS capability:

LD 34

TDS loop “loop” is an even loop number

• Test Conference capability:

LD 38

CNFC loop “loop” is an odd loop number

• Test MFS capability:

LD 46

MFS loop “loop” is an even loop number

• If there is a problem, a TDS, CNF, or MFS system message is generated and the appropriate red LED lights on the card faceplate.

7 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D18 Network/DTR Card

The network/DTR card provides network and peripheral controller functions along with Digitone receiver capability. Use this procedure to replace a network/DTR card.

See the XI I input/output guide (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

All services on a loop are interrupted while the loop is disabled.

Removing equipment

- 1 Check the status of the superloop:
LD 32
STAT 28 the superloop must be loops 28-31
 - If the response is DSBL for all loops, go to Step 1 on page 85.
 - If there are responses other than DSBL, see “LD32” in the *XI I input/output guide* (553-3001-400) for an interpretation.
- 2 Set the Enb/Dis switch to Dis.
- 3 Unhook the locking devices on the card; pull it out of the card cage.

installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.
- 2 Insert the replacement card into the vacated slot and hook the locking devices.
- 3 Set the Enb/Dis switch to Enb on the replacement card.

- 4 Software enable the superloop:
ENLL 28
 - When the process is complete, you will receive a system response.
 - If there is a problem, an NPR system message is generated and the red LED on the faceplate of the card lights.
 - If there is no problem, exit LD32:

- 5 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D19 Memory/Peripheral Signaling Card

Use this procedure to replace a memory/peripheral signaling card.

See the *XII input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

Call processing will stop when the NT8D19 card is removed.

- 1 Unhook the locking devices on the memory/peripheral signaling card; pull it out of the card cage.
- 2 Insert the replacement card into the vacated slot and hook the locking devices.
- 3 The system will sysload when the NT8D19 card is inserted.
Press the reload button on the QPC687 CPU Card to activate a clean sysload.
- 4 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D22 System Monitor

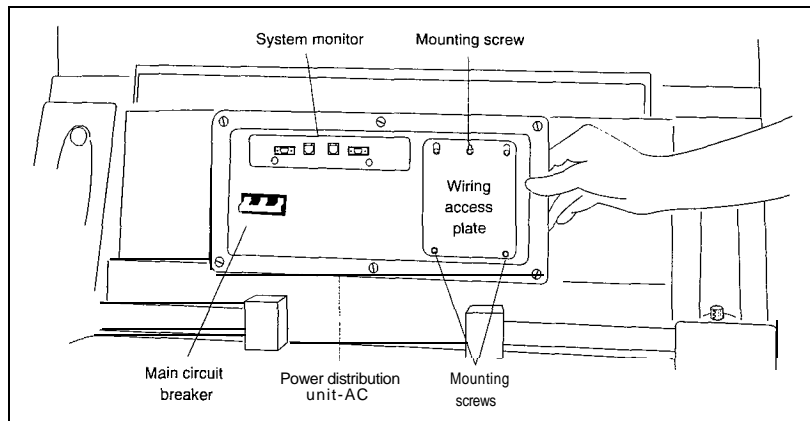
Use this procedure to replace the system monitor.

See the *X11 input/output guide (553-3001-400)* for a description of all maintenance commands and system messages.

Removing equipment

- 1 Remove the grill on the rear of the pedestal.
- 2 Tag and disconnect cables to the system monitor. Figure 14 shows the location of the system monitor in the rear of an AC-power pedestal.

Figure 14
NT8022 System Monitor in an AC-power pedestal



- 3 Loosen the two screws on the card and pull it out of the slot.

Note: If a slave is removed, the master considers that slave and all slaves with a higher address as disabled. For example, if the slave designated "XSM 2" is disabled, the master also reports slaves 3, 4, and up are disabled.

Installing equipment

- 1 Set option switches on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.
- 2 Insert the replacement card into the vacated slot and tighten the two screws on the front of the card.
- 3 Connect cables to the replacement card.
- 4 Replace the grill on the rear of the pedestal.
- 5 Test the system monitor:
LD 37
STAT XSM
 - If a single or master system monitor was replaced successfully, you will receive system message "PWROOO XSMC 00 0 0."
 - If a slave was replaced successfully, you will receive "PWR053 XSMC xx 0 0" ("x" is the system monitor address).
 - If there is a problem with a slave, you will receive system message "PWR013 XSMC xx 0 0."
 - If there is no problem, exit LD37:

- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D41 Dual Port Serial Data Interface Paddle Board

The serial data interface (SDI) paddle board attaches to the rear of the backplane in an NT8D11 CE/PE or NT6D39 CPU/Network Module backplane. Use this procedure to replace an SDI paddle board.

See the *X1 I input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

If the system terminal is assigned to the SDI being replaced, assign it to another port before this SDI is disabled.

Removing equipment

- 1 Software disable each port on the SDI paddle board:
LD 37
DIS TTY x “x” is the number of the interface device attached to the port
- 2 Remove the rear cover on the module.
- 3 Remove the I/O safety panel by turning the screws on each side. Set the cover aside.
- 4 Set the **Enb/Dis** switch to the disable position (down) on the paddle board.

CAUTION

To avoid interrupting service, set **Enb/Dis** switches to Dis before disconnecting or connecting cables.

- 5 Tag and disconnect cables to the paddle board you are removing (connector J1 for port 1, connector J2 for port 2).
- 6 Pull the paddle board out of the connector on the backplane.

Installing equipment

- 1 Set the **Enb/Dis** switch to the disable position (down) on the replacement paddle board.
- 2 Set option switches on the replacement paddle board the same as on the board you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.
- 3 Plug the replacement paddle board into the vacated connector on the backplane.
- 4 Connect cables to the replacement paddle board.
- 5 Set the **Enb/Dis** switch to the enable position (up) on the replacement paddle board.
- 6 Replace the I/O safety panel. Replace the rear cover on the module.
- 7 Software-enable and test each port on the paddle board:
ENL TTY x
TTY x
 - . If there is a problem, an IOD system message is generated and the red LED lights on the faceplate of the card.
 - . If there is no problem, exit LD37:

- 8 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D46AC Thermostat Harness

Use this procedure to replace the thermostat harness located in the top cap of each column.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Disconnect the system monitor from the circuit breaker system:

Note: For system option 21A, go to the note in Step 2.

- Remove the grill on the rear of the column pedestal.
- Loosen the two screws on the system monitor and pull it out a few inches.

CAUTION

If the system monitor is not unseated, column operation will shut down when the thermostat harness is disconnected.

- 2 Disconnect power to the top cap:

- Remove the rear cover on the module below the top cap.
- Remove the I/O safety panel over the backplane.

Note: For system option 21A, disconnect the cable to connector J3 on the NT7D15 System Monitor at this point.

- At the top of the rear of the module, disconnect the connector from the module power harness.
- Disconnect the pin headers on connector J2 on the backplane; disconnect the ribbon cable connector.

- 3 Remove the top cap:
 - Remove air exhaust grills at the front and rear of the top cap (see Figure 15). Pull forward on the two clips underneath the front edge of each grill and lift up to remove the grill.
 - Use a 5/16" socket wrench to remove the six bolts that secure the top cap and perforated panel (see Figure 16). Lift off the top cap only.

Figure 15
Air exhaust grills on the top cap

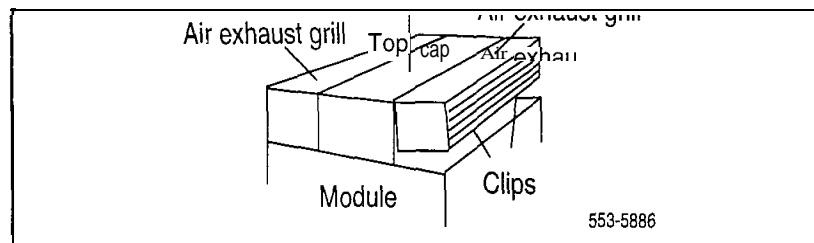
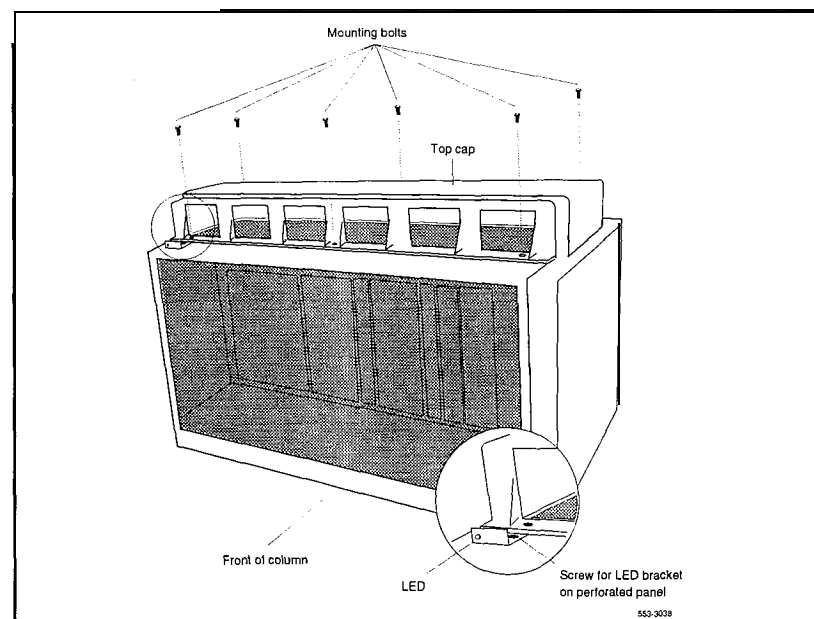


Figure 16
Top cap assembly

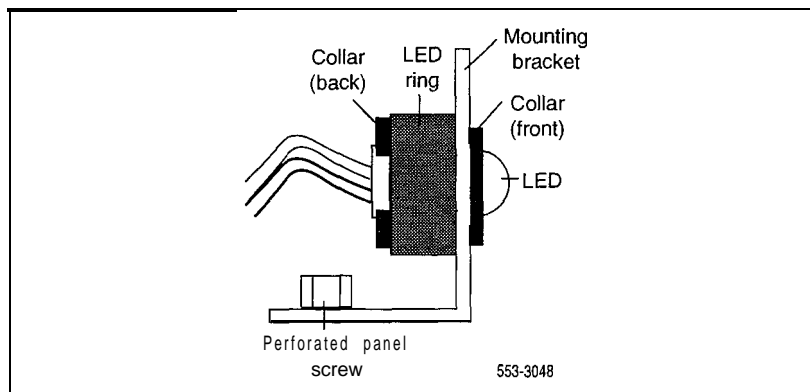


- 4 Remove the thermostat harness:

Note: The column LED and LED wiring are part of the thermostat harness.

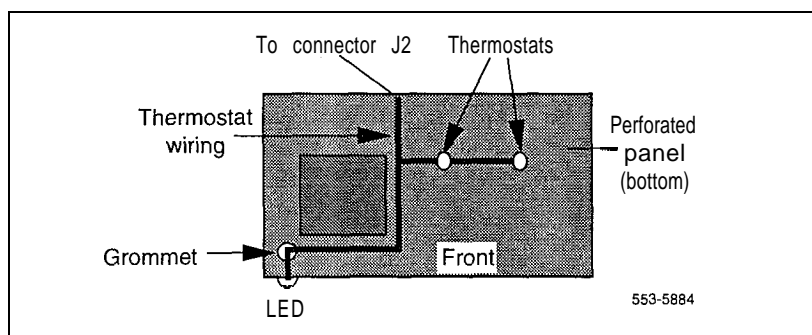
- Pull the LED ring away from the LED mounting bracket (see Figure 17). You may need to loosen it with a standard screwdriver.

Figure 17
Mounting for the column LED



- Push the LED back completely out of the collar on the LED mounting bracket.
- Remove the LED ring by pulling it forward over the LED. Keep the ring handy; you will use it with the replacement equipment.
- Remove the screw that secures the perforated panel at the LED mounting bracket.
- Slide the perforated panel slightly to the left (looking at it from the rear of the column). Lift the panel and turn it over.
- Clip all cable ties that secure the thermostat harness. Be careful not to damage other wiring (such as the air probe harness).
- Pull the LED through the rubber grommet at the front of the perforated panel.
- Remove the screws (two each) that secure the thermostats. Remove the thermostats and wiring (see Figure 18).

Figure 18
Thermostat harness



- Route the thermostat wiring on the perforated panel. At the rear edge of the panel, route the wires with wiring for the air probe harness (or top cap fan in system option 21A). Secure loose wiring to the perforated panel with cable ties.
- 2 Turn the perforated panel over. Slide it slightly to the right (at the rear of the column) so it is in a secure position. Position wiring from the perforated panel so it rests in the cable well next to the orange connector at the rear of the module (see Figure 19). Position the perforated panel and install the screw that secures it at the LED mounting bracket.
- Slide the LED ring over the LED (see Figure 20). The ring will hang loosely at this point.
 - Gently push the LED forward completely through the collar on the LED mounting bracket.
 - Push the LED ring into position over the back of the collar and tight against the LED mounting bracket.

Figure 19
Routing the thermostat harness from the top cap

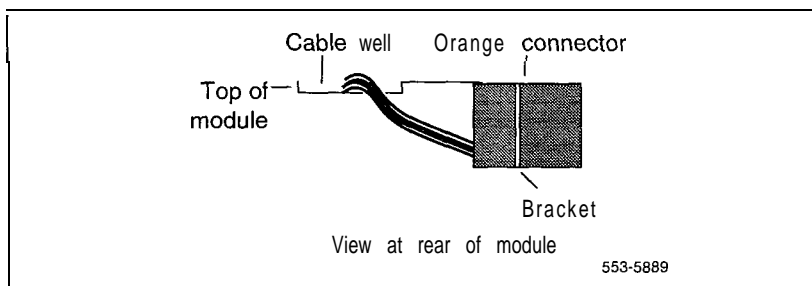
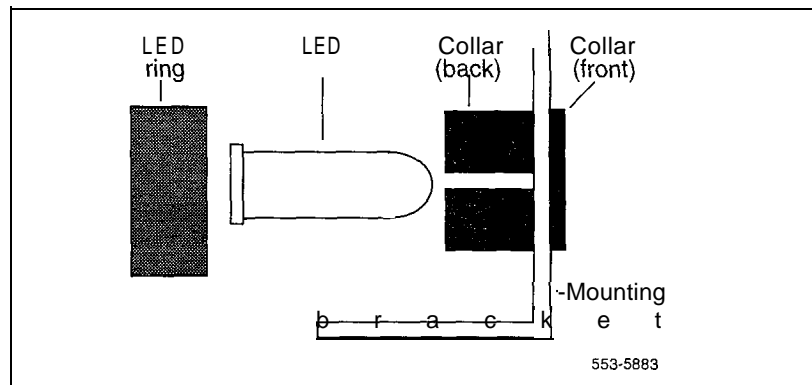
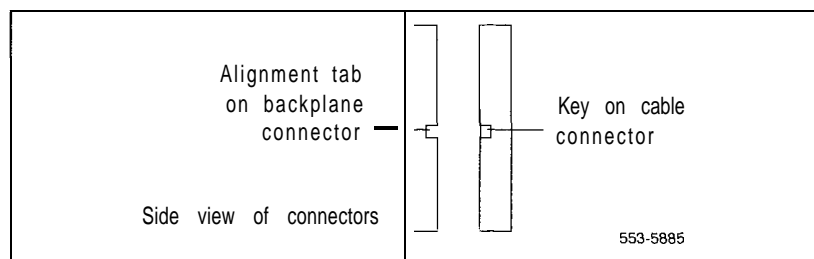


Figure 20
Installing the column LED



- 3 Install the top cap:
 - Position the top cap and install the six bolts that secure the top cap and perforated panel.
 - Install the air exhaust grills at the front and rear of the top cap.
- 4 Reconnect power to the top cap:
 - Connect the ribbon cable connector to connector J2 on the backplane. Line up the alignment tab on the connector and snap on the pin headers to position the connector correctly (see Figure 21).
 - Connect the orange connector to the module power harness.

Figure 21
Aligning the thermostat harness connector



Note: For system option 21A, reconnect the cable to connector J3 on the system monitor at this point.

- Replace the rear cover on the module.
- 5 Reconnect the system monitor to the circuit breaker system:
- Note:* For system option 21A, skip this step (the system monitor is already connected).
- Push the system monitor into position and tighten the screws.
 - Replace the grill on the pedestal.
- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D46AM, NT8D46DC Air Probe Harness

Use this procedure to replace the air probe harness located in the top cap of each column (except option 21 A).

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Disconnect the air probe harness plug:
 - Remove the rear cover on the module below the top cap.
 - Remove the I/O safety panel over the backplane.
 - At the top of the rear of the module, disconnect the orange connector from the module power harness.
- 2 Remove the top cap:
 - Remove air exhaust grills at the front and rear of the top cap (see Figure 22). Pull forward on the two clips underneath the front edge of each grill and lift up to remove the grill.
 - Use a 5/16" socket wrench to remove the six bolts that secure the top cap and perforated panel (see Figure 23). Lift off the top cap.

Figure 22
Air exhaust grills in the top cap

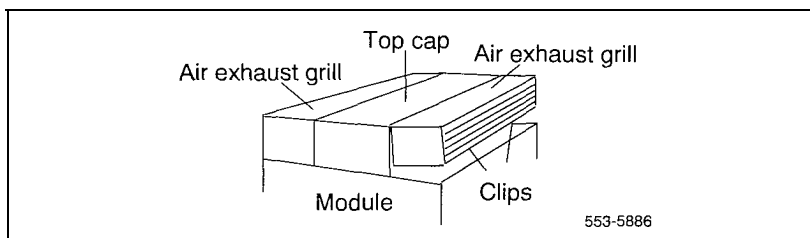
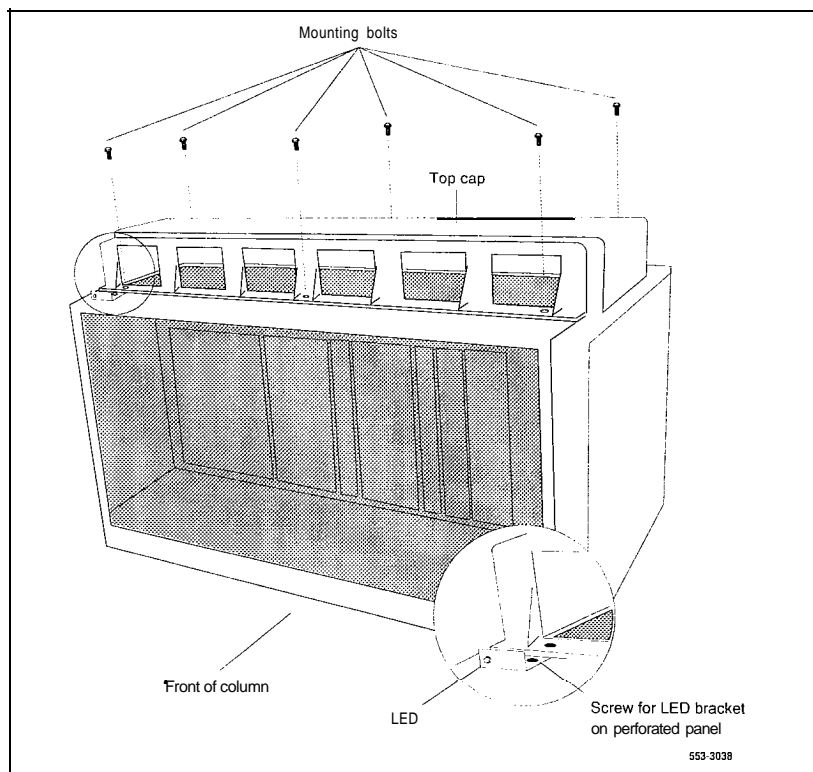
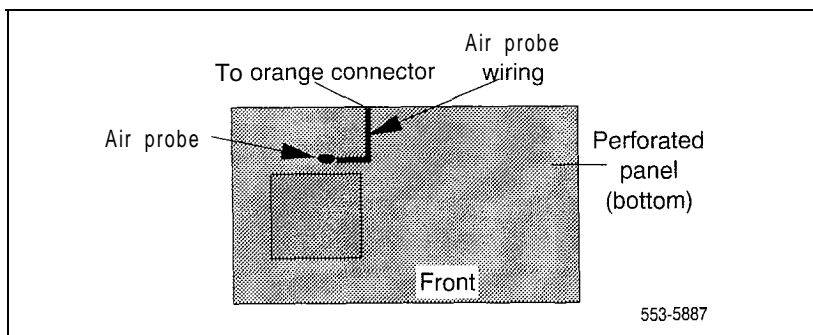


Figure 23
Top cap assembly



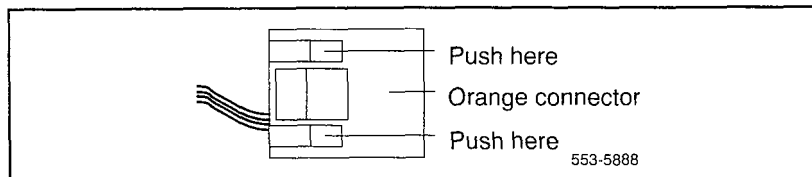
- 3 Remove the air probe harness:
 - Remove the screw that secures the perforated panel at the LED mounting bracket.
 - Slide the perforated panel slightly to the left (looking at it from the rear of the column). Lift the panel and turn it over.
 - Pull the air probe out of the clip holder (see Figure 24).
 - Clip cable ties that secure the air probe wiring. Be careful not to damage other wiring (such as the thermostat harness).

Figure 24
Air probe harness



- Remove the orange connector from the right-angle bracket at the top of the module. Simultaneously push the four small snaps (two on each side) on the connector to release it from the bracket (see Figure 25).

Figure 25
Connector for the air probe harness



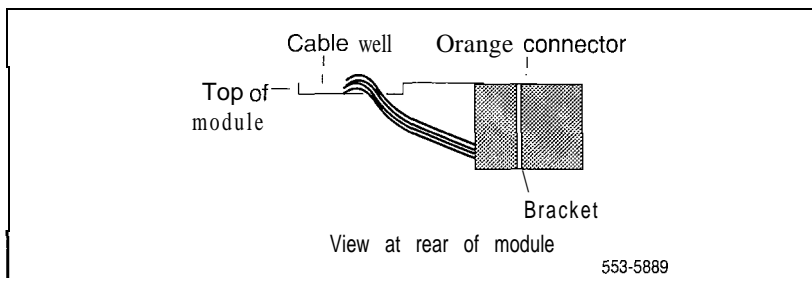
Installing equipment

- 1 Install the replacement air probe harness:
 - Gently push the air probe into the clip holder.
 - Route the air probe wiring on the perforated panel. At the rear edge of the panel, route the wires with wiring for the thermostat harness. Secure loose cabling to the perforated panel with cable ties.



- Turn the perforated panel over. Slide it slightly to the right (at the rear of the column) so it is in a secure position. Position wiring from the perforated panel so it rests in the cable well next to the orange connector at the rear of the module (see Figure 26).

Figure 26
Routing the air probe harness from the top cap



- Insert the orange connector into the right-angle bracket at the top of the module. Simultaneously push the four small snaps on the connector to insert it.
- 2 Install the top cap and perforated panel:
 - Position the perforated panel and install the screw that secures it at the LED bracket.
 - Position the top cap and install the six bolts that secure the top cap and perforated panel.
 - Install the air exhaust grills at the front and rear of the top cap.
 - 3 Reconnect the air probe harness plug:
 - Connect the orange connector to the module power harness.
 - Replace the I/O safety panel.
 - Replace the rear cover on the module.
 - 4 Tag defective equipment with a description of the problem and package it for return to a repair center.

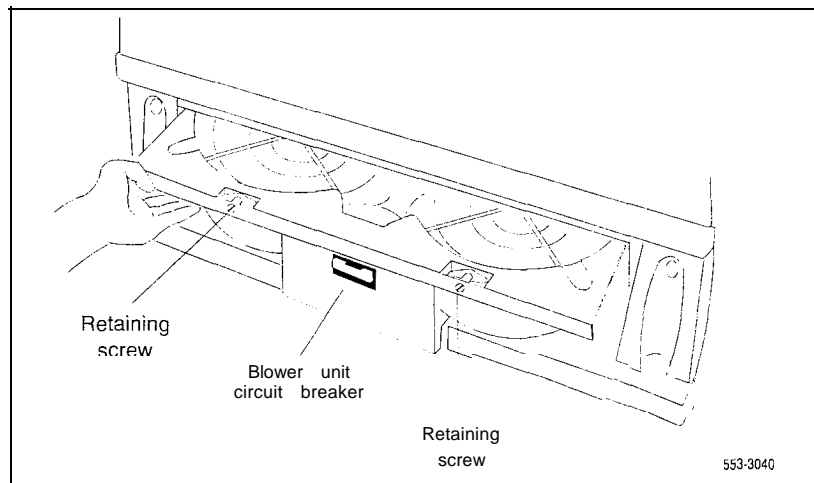
NT8D52AB, NT8D52DD Pedestal Blower Unit

Use this procedure to replace a blower unit.

Removing equipment

- 1 Remove the front pedestal grill and set it aside. Figure 27 shows the blower unit and its location in the front of the pedestal.

Figure 27
NT8D52 Blower Unit



- 2 Turn off power to the blower unit:
 - With AC power, set the circuit breaker on the front of the unit to OFF (down).
 - With DC power, set the toggle switch on the front of the unit to OFF (left).

WARNING

Impellers in the blower unit do not stop instantly when the power is turned off. Wait *two full* minutes before you remove the unit.

- 3 Loosen the two screws on the front of the blower unit by turning them counter-clockwise.
- 4 Grasp the lip at the top edge of the blower unit. Slide the unit out of the glides and onto the bottom ledge of the pedestal. Lift the unit out of the pedestal.

Note: Store the blower unit in an upright position.

Installing equipment

- 1 Set the replacement blower unit on the bottom ledge of the pedestal.
- 2 Tilt the back of the blower unit up slightly so it will slide into the pedestal glides (you may need to lift the unit). Gently push the unit into position.
- 3 Tighten the screws on the front of the unit.
- 4 Turn on power to the blower unit:
 - With AC power, set the circuit breaker to ON (up).
 - With DC power, set the toggle switch to ON (right).

Note: On initial power up the blower may rotate slower than expected. As the sensor detects heat, the blower will rotate more rapidly.

- 5 Fit the grill into the holes in the bottom ledge of the pedestal. Push the grill back into a locked position.
- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D53AB Power Distribution Unit AC

Use this procedure to replace the power distribution unit (PDU) for AC-powered systems.

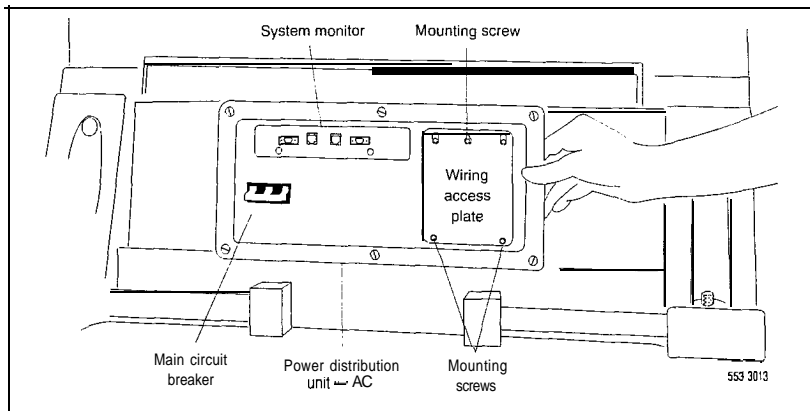
WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Turn off power at the distribution box. If the column is not hardwired, unplug the power cable.
- 2 Remove the grill on the rear of the pedestal. Figure 28 shows the location of the unit in the rear of the pedestal.

Figure 28
NT8D53AB Power Distribution Unit AC



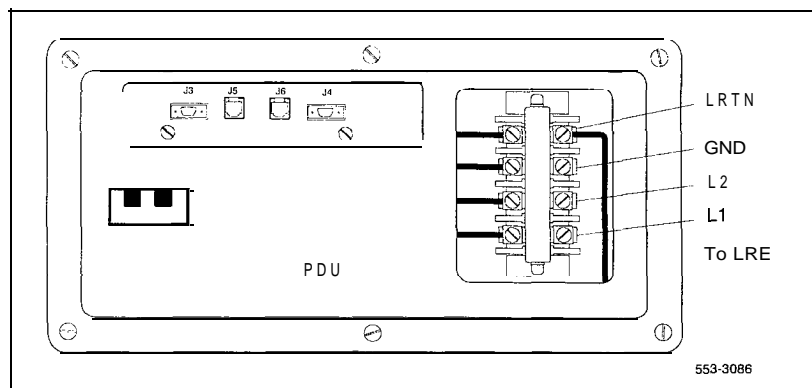
- 3 Loosen the three mounting screws that secure the field wiring access plate). Lift the plate over the screws and set it aside.

- 4 Tag and disconnect wiring to the LRTN, GND, L2, and L1 connections on the right side of the field wiring terminal (see Figure 29). Push all the wires down into the empty area under the pedestal.

CAUTION

Label wires carefully. They must be reconnected correctly or the system may be damaged.

Figure 29
Connections at the field wiring terminal



- 5 Tag and disconnect cables to the NT8D22 System Monitor. Loosen the two retaining screws on the system monitor. Remove the card.
- 6 Disconnect cables to the module above the pedestal (module 0):
 - Remove the rear cover on the module.
 - Remove the I/O safety panel over the backplane in the module.
 - Disconnect the power plug (J1) and system monitor ribbon cable to the module.

Note: To disconnect the power plug, you must press a latch trip on the front and rear of the plug. You may need to use a screwdriver blade against the latch trip on the front of the plug.

106 Replacing equipment

- 7 Remove the six screws that position the PDU. Carefully pull the unit straight forward out of the pedestal.

Installing equipment

- 1 Set the main circuit breaker on the replacement PDU to OFF (down).
- 2 Position the replacement PDU and gently push it into the pedestal.

Note: Be sure you push the unit straight back, so the connector on the rear will seat properly with the blower unit connector. It may be easier to position the PDU if you temporarily pull the blower unit out several inches.

- 3 Reconnect cables to module 0:
 - Attach power plug J1 and the system monitor cable.
 - Replace the I/O safety panel.
 - Replace the rear cover.
- 4 Insert the system monitor. Tighten the screws on the card. Reconnect cables to the system monitor faceplate.
- 5 Connect wiring to the right side of the field wiring terminal.
- 6 Position the field wiring access plate over the three mounting screws. Tighten the screws.
- 7 Turn on power at the distribution box or plug in the power cable.
- 8 Set the main circuit breaker to ON (up).
- 9 Replace the pedestal grill.
- 10 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D53AD Power Distribution Unit

Use this procedure to replace the power distribution unit (PDU); used in option 21A.

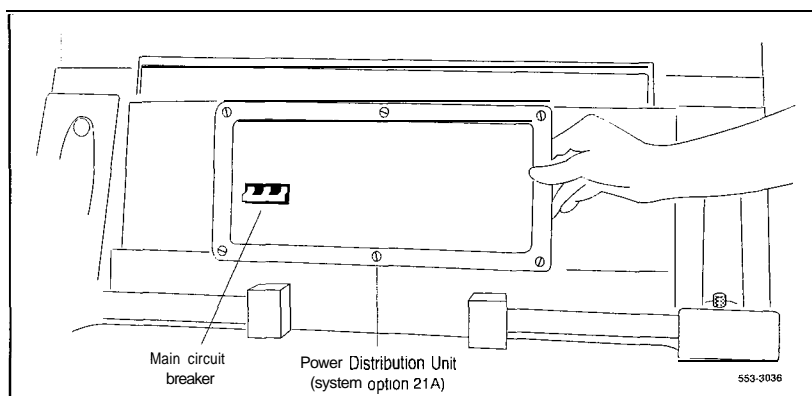
WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Set the circuit breaker on the PDU to OFF (down). Figure 30 shows the location of the unit in the rear of the pedestal.

Figure 30
NT8D53AD Power Distribution Unit (option 21A)



- 2 Unplug the power cable from the external outlet.
- 3 Disconnect the power cable from the pedestal to the module:
 - Remove the rear cover on the module.
 - Remove the I/O safety panel over the backplane.
 - Disconnect the power plug at connector J1.

108 Replacing equipment

Note: To disconnect the power plug, you must press a latch trip on the front and rear of the plug. You may need to use a screwdriver blade against the latch trip on the front of the plug.

- 4 Remove the six screws that position the PDU and lift the unit out of the pedestal.
- 5 Remove the grill on the rear of the pedestal.
- 6 Tag and disconnect wiring to the rear of the panel:
 - Disconnect cables from the system monitor to connectors C1 and C2.
 - Remove the cover over the terminal block (TB1). Disconnect wiring from the power cord to connectors L1 and L2 on the terminal block.
 - Disconnect the ground wiring from the ground bolt from inside the pedestal.

CAUTION

Label wires carefully. They must be reconnected correctly or the system may be damaged.

Installing equipment

- 1 Set the circuit breaker on the replacement panel to OFF (down).
- 2 Connect wiring to the replacement panel:
 - Install the ground bolt and wiring inside the pedestal.
 - Connect wiring from the power cord to connectors L1 and L2 on the terminal block. Replace the cover over the terminal block.
 - Connect cables from system monitor to connectors C1 and C2.

- 3 Reconnect the power cable from the pedestal to the module:
 - Attach the power plug at connector J1.
 - Replace the I/O safety panel.
 - Replace the rear cover on the module.
- 4 Position the replacement panel and replace the screws.
- 5 Plug the power cable into the external outlet.
- 6 Set the circuit breaker on the panel to ON (up).
- 7 Replace the pedestal grill.
- 8 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D56AA, NT8D56AC, NT8D57 Module Power Distribution Unit

Use this procedure to replace the following module power distribution units (MPDUs):

- NT8D56AA single breaker MPDU for the NT8D29 CE Power Supply AC
- NT8D56AC single breaker MPDU for the NT7D14 CE/PE Power Supply AC
- NT8D57 dual breaker MPDU for the NT8D06 PE Power Supply AC and NT8D21 Ringing Generator AC

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Remove the rear grill on the column pedestal. Set the main circuit breaker to OFF (down).

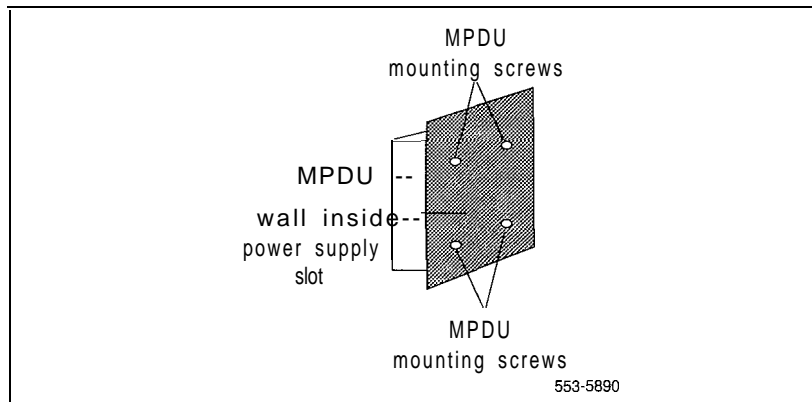
CAUTION

Shutting off the main circuit breaker disables the entire column.

- 2 Remove the I/O safety panel over the backplane.
- 3 Tag and disconnect the power plugs to the MPDU.
- 4 Remove the metal plate covering the MPDU in the front of the module by removing the mounting screw in each corner.
- 5 Unhook the locking devices on the power supply next to the MPDU. Pull the power supply out of the card cage.

- 6 Remove the mounting screws for the MPDU; the screw-heads are in the wall of the power supply slot (see Figure 31). (Be careful-do not let the screws fall into the module below.) Lift the unit out of the module.

Figure 31
Mounting screws for the MPDU



Installing equipment

- 1 Set the circuit breaker(s) on the replacement MPDU to OFF (down).
- 2 Position the replacement MPDU in the module. Install the mounting screws through the wall of the power supply slot.
- 3 Reinsert the power supply and hook the locking devices.
- 4 Position the metal plate in front of the MPDU and install the mounting screw in each corner.
- 5 Connect the power plugs to the rear of the MPDU.
- 6 Position the I/O safety panel. Tighten the screws.
- 7 Set the circuit breaker(s) on the replacement MPDU to ON (up).
- 8 Reset the main circuit breaker in the column pedestal to ON (up) and replace the pedestal grill.
- 9 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D1103 CE/PE Module Card Cage

To replace a defective backplane in an NT8D11CE/PE Module, you must replace the card cage. Use this procedure to replace the CE/PE Module card cage.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Unseat disks in the floppy disk unit (FDU) from the disk drives.
- 2 Turn off power to the column or the module power supply:
 - With AC power, set the main circuit breaker for the column to OFF (down) in the rear of the pedestal.

WARNING

Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column.

- With DC power, set the switch on the NT6D43 CE/PE Power Supply to OFF (down). Set the circuit breaker for just to OFF (down) in the rear of the pedestal. (All other modules in the column retain power.)

CAUTION

If the system monitor is not removed, the system may shut down.

- 4 Remove all cards from the module:
 - Tag and disconnect cables to all faceplate connectors.
 - Tag cards so they can be returned to the same slot. Remove cards.
- 5 Disconnect cables, plugs, and wires from the rear of the module to the backplane:
 - Remove the I/O safety panel by turning the screws on each side. Set the cover aside.
 - Tag and disconnect all cables from the backplane to the interior of the I/O assembly.
 - Tag and disconnect all plugs, wires, and cables to the backplane.
- 6 Remove the two mounting screws that secure the rear of the card cage to the module.
- 7 Remove the front cover plates on both sides of the card cage.
- 8 Remove the three mounting screws that secure the front of the card cage to the bottom of the module. Pull the card cage out of the module.

Installing equipment

- 1 Slide the replacement card cage into position in the module. Install the mounting screws at the front of the card cage.
- 2 Replace the front cover plates on both sides of the card cage.
- 3 Install the mounting screws at the rear of the card cage.
- 4 Reconnect cables, plugs, and wires from the rear of the module to the backplane:
 - Connect all cables from the interior of the I/O assembly to the backplane.
 - Connect all plugs, wires, and cables to the backplane.
 - Position the I/O safety panel. Tighten the screws.

114 Replacing equipment

- 5 Return cards to their slots. Reconnect all cables to faceplate connectors.
- 6 Reinstall the system monitor. Reconnect the RJ11 cables after it is installed.
- 7 Turn on power to the column or the module power supply:
 - With AC power, set the main circuit breaker in the pedestal to ON (up).
 - With DC power, set the breaker to ON (up) in the pedestal. Set the switch to ON (up) on the power supply in the module.
- 8 Reinsert disks into the disk drive unit.
- 9 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D1303 PE Module Card Cage

To replace a defective backplane in an NT8D13 Peripheral Equipment Module, you must replace the card cage. Use this procedure to replace the PE Module card cage.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Disable the peripheral equipment (PE) shelf:
LD 32
DISS I s “1 s” are the loop and shelf numbers

If a second shelf is assigned to a loop, disable that shelf also:
DISS I s
- 2 Turn off power to the column or the module power supply and ringing generator (if equipped):
 - With AC power, set the main circuit breaker for the column to OFF (down) in the rear of the pedestal.

WARNING

Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column.

- With DC power, set the switch on the NT6D40 PE Power Supply and NT6D42 Ringing Generator to OFF (down). Set the circuit breaker for just this to OFF (down) in the rear of the pedestal. (All other modules in the column retain power.)

116 Replacing equipment

- 3 Remove the NT8D22 System Monitor in the rear of the pedestal. (Do not turn off the blower unit in the front of the pedestal.)

Note: If this is the master system monitor, disconnect the RJ11 cables before you pull the system monitor out of the pedestal.

CAUTION

If the system monitor is not removed, the system may shut down.

- 4 Remove all cards from the module:
 - Tag and disconnect cables to all faceplate connectors.
 - Tag cards so they can be returned to the same slot. Remove cards.
- 5 Disconnect cables, plugs, and wires from the rear of the module to the backplane:
 - Remove the I/O safety panel by turning the screws on each side. Set the cover aside.
 - Tag and disconnect all cables from the backplane to the interior of the I/O assembly.
 - Tag and disconnect all plugs, wires, and cables to the backplane.
- 6 Remove the two mounting screws that secure the rear of the card cage to the module.
- 7 Remove the front cover plates on both sides of the card cage.
- 8 Remove the three mounting screws that secure the front of the card cage to the bottom of the module. Pull the card cage out of the module.

Installing equipment

- 1 Slide the replacement card cage into position in the module. Install the mounting screws at the front of the card cage.
- 2 Replace the front cover plates on both sides of the card cage.
- 3 Install the mounting screws at the rear of the card cage.

- 4 Reconnect cables, plugs, and wires from the module to the backplane:
 - Connect all cables from the interior of the I/O assembly to the backplane.
 - Connect all plugs, wires, and cables to the backplane.
 - Position the I/O safety panel. Tighten the screws.
- 5 Return cards to their slots. Reconnect all cables to connectors.
- 6 Reinstall the system monitor. If this is the master system monitor, reconnect the RJ11 cables after it is installed.
- 7 Turn on power to the column or the module power supply and ringing generator:
 - With AC power, set the main circuit breaker in the pedestal to ON (up).
 - With DC power, set the breaker to ON (up) in the pedestal. Set the switch to ON (up) on the power supply and the ringing generator in the module.
- 8 Enable the shelf:
ENLS I s

If a second shelf is assigned to a loop, enable that shelf also:
ENLS I s

Exit LD32:

- 9 Test the shelf by testing each loop with:
LD 30
SHLF I s

If there is a problem, an NWS system message is generated.

If there is no problem, exit LD30:

- 10 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D3403 CPU Module Card Cage

To replace a defective backplane in an NT8D34 CPU Module, you must replace the card cage. Use this procedure to replace the CPU Module card cage.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 The CPU on the backplane you are replacing must be inactive:
 - If you need to switch CPUs:
 - LD 35
 - SCPU
 - Set the Norm/Maint switch to Maint on the *active* CPU interface (IF) card. (This keeps the system from switching to the inactive CPU.)
 - Set the Enb/Dis switch to Dis on the *inactive* interface card.
- 2 If the multi disk unit (MDU) or floppy disk unit (FDU) is located in the module, move the unit to the other CPU module:
 - Remove floppy disks from the disk drives.
 - Tag and disconnect cables to the unit.
 - Unhook the locking devices on the unit; pull it out of the card cage.

CAUTION

If you are moving an MDU, pull it forward two or three inches, then wait at *least 10 seconds* before you remove the MDU from the card cage.

- Insert the unit in an acceptable slot in the other CPU module. See *Circuit card installation and testing* (553-3001-21 1) for slot assignments.
 - Return floppy disks to the disk drives.
 - Reconnect cables to the unit.
- 3 Turn off power to the column or the module power supply:
- With AC power, set the main circuit breaker for the column to OFF (down) in the rear of the pedestal.

WARNING

Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column.

- With DC power, set the switch on the NT6D41 CE Power Supply to OFF (down). Set the circuit breaker *for just this module* to OFF (down) in the rear of the pedestal. (All other modules in the column retain power.)
- 4 Remove the NT8D22 System Monitor in the rear of the pedestal. (Do not turn off the blower unit in the front of the pedestal.)
- Note: If this is the master system monitor, disconnect the RJ11 cables before you pull the system monitor out of the pedestal.

CAUTION

If the system monitor is not removed, the system may shut down.

- 5 Remove all cards from the module:
- Tag and disconnect cables to all faceplate connectors.
 - Tag cards so they can be returned to the same slot. Remove cards.

120 Replacing equipment

- 6 Disconnect cables, plugs, and wires from the rear of the module to the backplane:
 - Remove the I/O safety panel by turning the screws on each side. Set the cover aside.
 - Tag and disconnect all cables from the backplane to the interior of the I/O assembly.
 - Tag and disconnect all plugs, wires, and cables to the backplane.
- 7 Remove the two mounting screws that secure the rear of the card cage to the module.
- 8 Remove the front cover plates on both sides of the card cage.
- 9 Remove the three mounting screws that secure the front of the card cage to the bottom of the module. Pull the card cage out of the module.

Installing equipment

- 1 Slide the replacement card cage into position in the module. Install the mounting screws at the front of the card cage.
- 2 Replace the front cover plates on both sides of the card cage.
- 3 Install the mounting screws at the rear of the card cage.
- 4 Reconnect cables, plugs, and wires from the rear of the module to the backplane:
 - Connect all cables from the interior of the I/O assembly to the backplane.
 - Position the I/O safety panel. Tighten the screws.
- 5 Return cards to their slots. Reconnect all cables to faceplate connectors.
- 6 Reinstall the system monitor. If this is the master system monitor, reconnect the RJ11 cables after it is installed.
- 7 Turn on power to the column or the module power supply:
 - With AC power, set the main circuit breaker in the pedestal to ON (up).
 - With DC power, set the breaker to ON (up) in the pedestal. Set the switch to ON (up) on the power supply in the module.

- 8 If the MDU or PDU is located in the module, reinsert disks into the disk drive unit.
- 9 Enable the CPU1:
 - Set the Enb/Dis switch to **Enb** on the inactive interface card.
 - Set the **Norm/Maint** switch to **Norm** on the active interface card.
- 10 Test and switch CPUs:

TCPU
SCPU

If you are unable to test and switch CPUs, check the extenders:

STAT **E**XT

Enable any that are disabled:

ENL EXT x "x" is the number of the extender pair
**** exit LD35

- 11 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D3503 Network Module Card Cage

To replace a defective backplane in an NT8D35 Network Module, you must replace the card cage. Use this procedure to replace the Network Module card cage.

WARNING

Module covers are *not* hinged: do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

1 Software disable the following:

- Disable the QPC4413-Port Extender (3PE) Card by disabling the associated OPC215 Segmented Bus Extender (SBE) Card (the CPU associated with the SBE must be inactive):

LD 35

DIS EXT xxx Table 3 lists extender codes specified by "xxx"
**** exit LD35

- Disable all network loops on the shelf by disabling the peripheral signaling card:

LD 32

DSPS x Table 4 lists the loops represented by "x"
**** exit LD32

- Disable all other cards that might be in the module, such as serial data interface (SDI) cards or primary rate interface (PRI) cards.

CAUTION

If the system terminal is assigned to an SDI that will be disabled, assign it to another port before the SDI is disabled.

Table 3
Extender codes

Extender number	From	To
OG0	CPU 0	Network Group 0
OG1	CPU 0	Network Group 1
OG2	CPU 0	Network Group 2
OG3	CPU 0	Network Group 3
OG4	CPU 0	Network Group 4
1G0	CPU 1	Network Group 0
1G1	CPU 1	Network Group 1
1G2	CPU 1	Network Group 2
1G3	CPU 1	Network Group 3
1G4	CPU 1	Network Group 4

Table 4
Network loop codes

Group/ shelf	Peripheral signaling card	Loops disabled/enabled
0/0	0	0 - 15
0/1	1	16 - 31
1/0	2	32 - 47
1/1	3	48 - 63
2/0	4	64 - 79
2/1	5	80 - 95
3/0	6	96 - 111
3/1	7	112 - 127
4/0	8	128 - 143
4/1	9	144 - 159

- 2 If the multi disk unit (MDU) or floppy disk unit (FDU) is located in the module, unseat disks from the disk drives and move the MDU or FDU to another location.
- 3 Turn off power to the column or the module power supply:
 - With AC power, set the main circuit breaker for the column to OFF (down) in the rear of the pedestal.

WARNING

Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column.

- With DC power, set the switch on the NT6D41 CE Power Supply to OFF (down). Set the circuit breaker *for just this module* to OFF (down) in the rear of the pedestal. (All other modules in the column retain power.)
- 4 Remove the NT8D22 System Monitor in the rear of the pedestal. (Do not turn off the blower unit in the front of the pedestal.)

Note: If this is the master system monitor, disconnect the RJ11 cables before you pull the system monitor out of the pedestal.

CAUTION

If the system monitor is not removed, the system may shut down.

- 5 Remove all cards from the module:
- Tag and disconnect cables to all faceplate connectors.
 - Tag cards so they can be returned to the same slot. Remove cards.
- 6 Disconnect cables, plugs, and wires from the rear of the module to the backplane:
- Remove the I/O safety panel by turning the screws on each side. Set the cover aside.
 - Tag and disconnect all cables from the backplane to the interior of the I/O assembly.
 - Tag and disconnect all plugs, wires, and cables to the backplane.
- 7 Remove the two mounting screws that secure the rear of the card cage to the bottom of the module.

installing equipment

- 1 Remove the front cover plates on both sides of the card cage.
- 2 Remove the three mounting screws that secure the front of the card cage to the bottom of the module. Pull the card cage out of the module.
- 3 Slide the replacement card cage into position in the module. Install the mounting screws at the front of the card cage.
- 4 Replace the front cover plates on both sides of the card cage.
- 5 Install the mounting screws at the rear of the card cage.
- 6 Reconnect cables, plugs, and wires to the backplane:
 - Connect all cables from the interior of the I/O assembly to the backplane.
 - Connect all plugs, wires, and cables to the backplane.
 - Position the I/O safety panel. Tighten the screws.
- 7 Return cards to their slots. Reconnect all cables to connectors.
- 8 Reinstall the system monitor. If this is the master system monitor, reconnect the RJ45 cables after it is installed.
- 9 Turn on power to the column or the module power supply:
 - With AC power, set the main circuit breaker in the pedestal to ON (up).
 - With DC power, set the breaker to ON (up) in the pedestal. Set the switch to ON (up) on the power supply in the module.
- 10 If the MDU or FDU is in the module, reinsert disks into the drive.

11 Software enable the following:

- Enable the 3PE by enabling the associated SBE:
LD 35
ENL EXT xxx

- Enable the peripheral signaling card:
LD 32
ENPS x

- Enable any other disabled cards.

12 Test network loops:

LD 30
LOOP ALL

- If there is a problem, an NWS system message is generated.
- If there is no problem, exit LD30:

13 Tag defective equipment with a description of the problem and package it for return to a repair center.

NT8D3703 IPE Module Card Cage

To replace a defective backplane in an NT8D37 IPE Module, you must replace the card cage. Use this procedure to replace the IPE Module card cage.

See the *XLI input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Software disable the controller card (and all cards connected to the controller):
LD 32
DSXP x “x” is the controller card number
- 2 Turn off power to the column or the module power supply and ringing generator (if equipped):
 - With AC power, set the main circuit breaker for the column to OFF (down) in the rear of the pedestal.

WARNING

Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column.

- With DC power, set the switch on the NT6D40 PE Power Supply and NT6D42 Ringing Generator to OFF (down). Set the circuit breaker *for just this module* to OFF (down) in the rear of the pedestal. (All other modules in the column retain power.)

128 Replacing equipment

- 3 Remove the NT8D22 System Monitor in the rear of the pedestal. (Do not turn off the blower unit in the front of the pedestal.)

Note: If this is the master system monitor, disconnect the RJ11 cables before you pull the system monitor out of the pedestal.

CAUTION

If the system monitor is not removed, the system may shut down.

- 4 Remove all cards from the module:
 - Tag and disconnect cables to all faceplate connectors.
 - Tag cards so they can be returned to the same slot. Remove cards.
- 5 Disconnect cables, plugs, and wires from the rear of the module to the backplane:
 - Remove the I/O safety panel by turning the screws on each side. Set the cover aside.
 - Tag and disconnect all cables from the backplane to the interior of the I/O assembly.
 - Tag and disconnect all plugs, wires, and cables to the backplane.
- 6 Remove the two mounting screws that secure the rear of the card cage to the module.
- 7 Remove the front cover plates on both sides of the card cage.
- 8 Remove the three mounting screws that secure the front of the card cage to the bottom of the module. Pull the card cage out of the module.

Installing equipment

- 1 Slide the replacement card cage into position in the module. Install the mounting screws at the front of the card cage.
- 2 Replace the front cover plates on both sides of the card cage.
- 3 Install the mounting screws at the rear of the card cage.

- 4 Reconnect cables, plugs, and wires from the rear of the module to the backplane:
 - Connect all cables from the interior of the I/O assembly to the backplane.
 - Connect all plugs, wires, and cables to the backplane.
 - Position the I/O safety panel. Tighten the screws.
- 5 Return cards to their slots. Reconnect all cables to faceplate connectors.
- 6 Reinstall the system monitor. If this is the master system monitor, reconnect the RJ11 cables after it is installed.
- 7 Turn on power to the column or the module power supply and ringing generator:
 - With AC power, set the main circuit breaker in the pedestal to ON (up).
 - With DC power, set the breaker to ON (up) in the pedestal. Set the switch to ON (up) on the power supply and the ringing generator in the module.
- 8 Software enable and test the controller card (and all cards connected to the controller):


```
ENXP x          "x" is the controller card number
****           exit LD32
```
- 9 Test the shelf by testing each loop with


```
LD 30
SHLF l s       "l s" are the loop and shelf numbers
```

 - If there is a problem, an NWS system message is generated.
 - If there is no problem, exit LD30:
 - ****
- 10 Tag defective equipment with a description of the problem and package it for return to a repair center.

NTND01 Integrated CPU/Memory Card

Use this procedure to replace the integrated CPU/memory (ICM) card.

See the *X11 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

Call processing will stop when the ICM card is removed.

Removing equipment

- 1 Unhook the locking devices on the card; pull it out of the card cage.
- 2 Remove the NTND31 ROM Card from the ICM card:
 - On the top (component side) of the card, remove the screw and washer at each corner of the ROM card.
 - Gently unplug the ROM card from the pin connector.

CAUTION

When you remove the ROM card, do not touch other components on the ICM card.

Installing equipment

1 Install the ROM card on the replacement ICM card:

- Plug the ROM card into the pin connector.
- Install the screw and washer at each corner of the ROM card.

2 Insert the replacement ICM card into the vacated slot and hook the locking devices.

The system will sysload. Check system messages in the XII *input/output guide* (553-3001-400).

3 Tag defective equipment with a description of the problem and package it for return to a repair center.

NTND02 Misc/SDI/Peripheral Signaling Card

Use this procedure to replace a misc/SDI/peripheral signaling (MSPS) card.

See the *X11 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

Call processing will stop when the MSPS card is removed. An initialization will occur when the new card is installed.

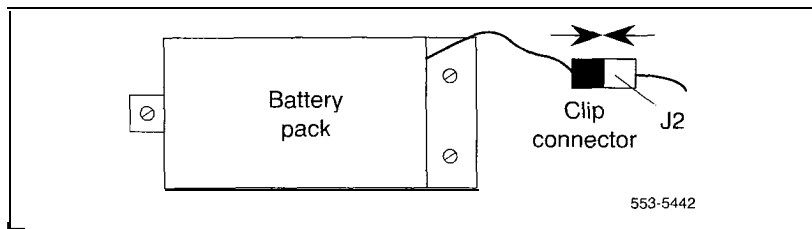
Removing equipment

- 1 Software disable each serial data interface (SDI) port configured on the MSPS card:
LD37
DIS TTY x "x" is the number of the interface device attached to the port
- 2 Set the Enb/Dis switch to Dis.
- 3 Disconnect the cable to the SDI connector from the faceplate of the card.
- 4 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.
- 2 Set option switches and plugs on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.
- 3 Connect the wire from the battery pack assembly to the connector on the MSPS card (see Figure 32).

Figure 32
Connector for the battery pack assembly



- 4 Insert the replacement card into the vacated slot and hook the locking devices.
- 5 Connect the SDI cable to the replacement card.
- 6 Set the Enb/Dis switch to Enb on the replacement card.
- 7 Set the Enb/Dis switch on the NT8D18 Network/DTR Card to Dis, then back to Enb.
- 8 Press the initialize (INIT) button on the NTND01 ICM Card to activate a clean initialization.
- 9 Software-enable and test each configured port on the MSPS card:
LD37
ENL TTY x
TTY x

The response should be:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789"#\$%*!&()<>-:.,? READY FOR INPUT

Anything entered on the keyboard will be echoed until END is input.
 - If there is a problem, an IOD system message is generated and the red LED lights on the faceplate of the card.
 - If there is no problem, exit LD37:

- 10 Tag defective equipment with a description of the problem and package it for return to a repair center.

NTND08, QPC939 ROM Card

These read-only memory (ROM) cards attach to the QPC579 CPU Function (FN) Card. Use this procedure to replace the ROM card.

See the XI I input/output guide (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

At some point in this procedure the system may initialize or sysload, causing an interruption in call processing.

Removing equipment

- 1 To replace the ROM card you must disable and remove the function card. Disable the function card by disabling the associated QPC580 CPU Interface (IF) Card.
 - This CPU must be inactive. If you need to switch CPUs:
LD 35
SCPU
 - Set the **Norm/Maint** switch to **Maint** on the *active* interface card. (This keeps the system from switching to the inactive CPU.)
 - Set the **Enb/Dis** switch to **Dis** on the *inactive* interface card.
- 2 Disconnect the cable between the function and interface cards.
- 3 Unhook the locking devices on the function card; pull it out of the card cage.

Replacing equipment 135

- 4 Gently unplug the ROM card from the connectors on the component side of the function card.

CAUTION

When you remove the ROM card, do not touch other components on the function card.

Installing equipment

- 1 Plug the replacement ROM card into the connectors on the component side of the function card.
- 2 Reinsert the function card and hook the locking devices.
- 3 Connect the cable between the function and interface cards.
- 4 Enable the function card by enabling the interface card.
 - Set the **Enb/Dis** switch to **Enb** on the inactive interface card.
 - Set the **Norm/Maint** switch to **Norm** on both interface cards.
- 5 Test the CPU:
TCPU
SCPU
 - If there is a problem, a CED system message is generated.
 - If there is no problem, exit LD3.5:

- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

NTND09, QPC583 Memory Card

Use this procedure to replace a memory card with a matching memory card.

Note: If you are replacing a 6 Mbyte memory card with a 12 Mbyte memory card, you must perform a system reload (syload). See “Replacing an NTND09Bx 6 Mbyte Memory Card with an NTND09Cx 12 Mbyte Memory Card” on page 193 for detailed procedures.

See the *XI I input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

At some point in this procedure the system may initialize, causing a momentary interruption in call processing.

Removing equipment

- 1 Software disable the memory card:
 - The associated CPU must be inactive. If you need to switch CPUs:
LD 35
SCPU
 - All memory cards on this CPU must be disabled before the defective memory card is removed. For each memory card:
DIS x “x” is a two-digit number—the first digit is the associated CPU interface card and the second is the memory card number

CAUTION

All memory cards on this CPU must be software disabled to avoid the possibility of a sysload.

- 2 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Insert the replacement card into the vacated slot and hook the locking devices.
- 2 Test and enable memory cards:
 - Test the replacement card:
MEM x
 - When the process is complete, you will receive a system response.
 - Enable each disabled memory card:
ENL x
- 3 Test the CPU:
TCPU
 - If there is a problem with one of the memory cards, a CED system message is generated and the red LED lights on the faceplate of the card.
 - If there is no problem, exit LD3.5:

- 4 Tag defective equipment with a description of the problem and package it for return to a repair center.

NTND10, QPC581 Changeover and Memory Arbitrator Card

Use this procedure to replace a changeover and memory arbitrator (CMA) card.

See the *X11 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

At some point in this procedure the system may initialize, causing a momentary interruption in call processing.

Removing equipment

- 1 Software disable the CMA:
 - The associated CPU must be inactive. If you need to switch CPUs:
LD 35
SCPU
 - All memory cards served by the CMA must be disabled before the CMA can be disabled. For each memory card:
DIS x "x" is a two-digit number- the first digit is the associated CPU card and the second is the memory card number
 - Disable the CMA:
DIS CMA x "x" is the CMA number 0 or 1
 - Set the Norm/Maint switch to Maint on the *active* QPC580 CPU Interface (IF) Card.

Replacing equipment 139

- 2 Set the Enb/Dis switch to Dis on the CMA.

CAUTION

To avoid interrupting service, set Enb/Dis switches to Dis before disconnecting or connecting cables.

- 3 Tag and disconnect cables to the card you are removing; disconnect the top cable first.
- 4 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.

Note: On an NTND10 card, for 768 K memory connect pins 2 and 3 on the jumper at J3. For 1 M to 4 M memory connect pins 1 and 2.

- 2 Insert the replacement card into the vacated slot and hook the locking devices.
- 3 Connect cables to the replacement card; connect the bottom cable first.
- 4 Set the Enb/Dis switch to Enb on the replacement card.
- 5 Software enable any cards that were disabled:
 - To enable the CMA:
ENL CMA x
 - To enable each memory card:
ENL x
 - Set the Norm/Maint switch to Norm on both interface cards.

140 Replacing equipment

- 6 Test the CMA:
TCPU
 - A CED065 message may be generated from this test. If this occurs, enter TCPU again to clear this condition.
 - If the replacement CMA is faulty, further system messages will be generated and the red LED will light on the faceplate of the card.
 - If there is no problem, exit LD35:

- 7 Tag defective equipment with a description of the problem and package it for return to a repair center.

NTND15, NT8D68 Floppy Disk Unit

Use this procedure to replace the floppy disk unit (FDU).

See the *X11 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 To software disable the FDU, log in on a system terminal. At the > prompt enter:
DIST

(This command is entered directly through the Overlay Loader program. No other program should be active.)
- 2 Set the **Enb/Dis** switch to **Dis** on the associated QPC742 Floppy Disk Interface (FDI) Card.
- 3 Remove the disks from the FDU.
- 4 Tag and disconnect the cable(s) to the faceplate of the FDU.
- 5 Unhook the locking devices on the FDU and pull the unit out of the card cage.

Installing equipment

- 1 Insert the replacement FDU into the vacated slot and hook the locking devices.
- 2 Connect the cable(s) to the replacement FDU.
- 3 Install the disks in the replacement FDU.
- 4 Set the **Enb/Dis** switch to **Enb** on the associated FDI.

142 Replacing equipment

- 5 To software enable the FDU, at the > prompt enter:
ENLT

(This command is entered directly through the Overlay Loader.)
- 6 Test the FDU:
LD 37
MSI 0
 - If there is a problem, an IOD system message is generated.
 - If there is no problem, exit LD37:

- 7 Tag defective equipment with a description of the problem and package it for return to a repair center.

NTND16, NT8D69 Multi Disk Unit

Use this procedure to replace the multi disk unit (MDU).

See the *X11 input/output guide (553-3001-400)* for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1** Enter the Equipment Data Dump program:
LD 43
- 2** Set the Enb/Dis switch to Dis on the faceplate of both QPC584 Mass Storage Interface (MSI) cards.
- 3** Remove the floppy disks from their disk drives.
- 4** Tag and disconnect the cable(s) to the faceplate of the MDU.
- 5** Unhook the locking devices on the MDU and gently pull the unit forward two or three inches. Wait at least ten seconds, then pull the unit out of the card cage.

CAUTION

You must wait *at least 10 seconds* before you remove the MDU from the card cage. This allows the hard disk to stop.

Installing equipment

- 1 Insert the replacement MDU into the vacated slot and hook the locking devices.
- 2 Connect the cable(s) to the faceplate of the MDU.
- 3 Install the floppy disks in the replacement MDU.
- 4 Set the **Enb/Dis** switch to **Enb** on both **QPC584 MSI** cards.
- 5 Restore data from the floppy disks to the hard disks. Enter:
RES
- 6 Test the MDU:
LD 37
MSI 0
 - If there is a problem, an **TOD** system message is generated.
 - If there is no problem, exit **LD37**:

- 7 Tag defective equipment with a description of the problem and package it for return to a repair center.

NTND31 ROM Card

This read-only memory (ROM) card is attached to the NTND01 Integrated CPU/Memory (ICM) Card. Use this procedure to replace an NTND31 ROM Card.

See the *XI1 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

Call processing will stop when the ICM card is removed.

Removing equipment

- 1 To replace the ROM card you must remove the ICM card. Unhook the locking devices on the ICM card; pull it out of the card cage.
- 2 Remove the ROM card from the ICM card:
 - On the top (component side) of the ICM card, remove the screw and washer at each corner of the ROM card.
 - Gently unplug the ROM card from the pin connector.

CAUTION

When you remove the ROM card, do not touch other components on the ICM card.

146 Replacing equipment

Installing equipment

- 1 Install the replacement ROM card on the ICM card:
 - Plug the replacement ROM card into the pin connector.
 - Install the screw and washer at each corner of the ROM card.
- 2 Reinsert the ICM card and hook the locking devices. The system will sysload at this point.
- 3 Tag defective equipment with a description of the problem and package it for return to a repair center.



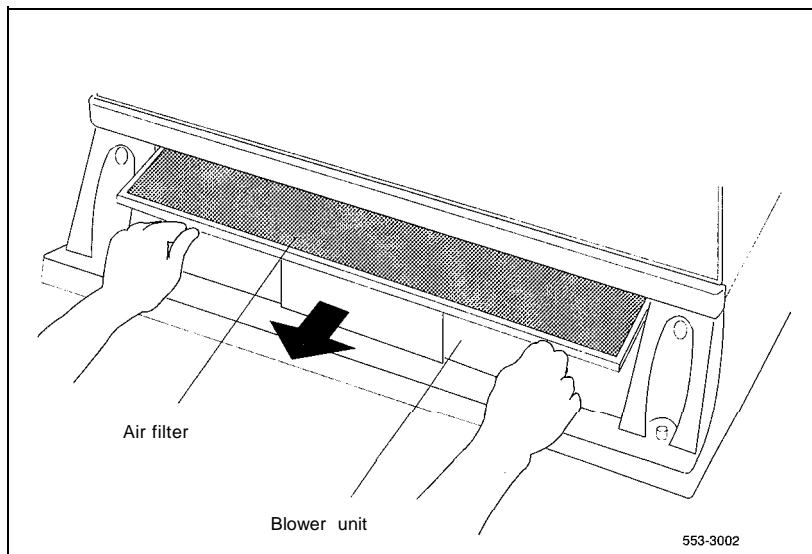
PO699798 Air Filter

Use this procedure to replace the air filter in the pedestal.

Note: You do not need to power down the system to perform this procedure.

- 1 Remove the pedestal front grill and set it aside. The air filter is directly above the blower unit in a slot in the pedestal (see Figure 33).

Figure 33
Blower unit and air filter in the front of the pedestal

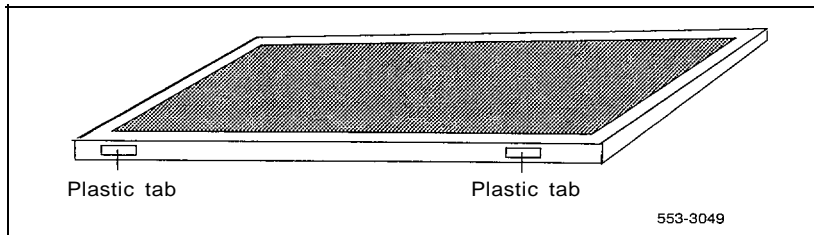


- 2 Grasp the plastic tabs on the front of the air filter. Pull the filter out of the pedestal.

148 Replacing equipment

- 3 To install a clean, dry air filter:
 - Make sure the plastic tabs will be on the front of the filter (see Figure 34).
 - Gently push the filter into the pedestal slot until it seats fully in the back.

Figure 34
Pull-tab locations on the air filter





150 Replacing equipment

- 4 Remove the screw that secures the data cartridge. Gently unplug the cartridge from the connectors on the component side of the host card.

Installing equipment

- 1 Plug the replacement data cartridge into the connectors on the component side of the host card. Install the screw that secures the cartridge.



CAUTION

To avoid system failure, the ID number on the data cartridge must match the ID number of the system.

- 2 Reinsert the card and hook the locking devices.

For an MSI or FDI card, reconnect the cable to the card.

- 3 Set the Enb/Dis switch to Enb.
- 4 Test the host card.

- For an MSI or FDI card:

```
LD 37
MSI 0
****          exit LD37
```

- For an IOP card, test and enable the card:

```
LD 137
DIS IOP          the card must be disabled for testing
TEST IOP
ENL IOP          this also enables the CMDU(s)
****          exit LD137
```

If there is a problem, an IOD or CIOD system message is generated and the red LED lights on the faceplate of the card.

- 5 Tag defective equipment with a description of the problem and package it for return to a repair center.

Note: For dual CPU systems, repeat this procedure for the second data cartridge.



QPC43 Peripheral Signaling Card

Use this procedure to replace a peripheral signaling card.

See the *X11 input/output guide (553-3001-400)* for a description of all maintenance commands and system messages.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

Disabling or removing a peripheral signaling card from a network shelf disables all loops on that shelf.

Removing equipment

- 1 Check the status of the peripheral signaling card:
LD 32
STAT PER x Table 5 lists peripheral signaling card numbers specified by "x"
 - If the response is DSBL, go to Step 2.
 - If the response is ENBL, enter DSPS x to disable the card, then go to Step 2.
- 2 Set the Enb/Dis switch to Dis.
- 3 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.
- 2 Set the jumper plug on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing (553-3001-211)* for any differences.
- 3 Insert the replacement card into the vacated slot and hook the locking devices.

152 Replacing equipment

- 4 Set the Enb/Dis switch to Enb on the replacement card.
- 5 Software enable the card and loops serviced by the card:
 ENPS x
 - When the process is complete, you will receive a system response.
 - If there is a problem, an NPR system message is generated and the red LED lights on the faceplate of the card.
 - If there is no problem, exit LD32:

- 6 Test each loop serviced by the peripheral signaling card:
 LD 30
 LOOP loop “loop” is a loop number
 **** exit LD30
- 7 Tag defective equipment with a description of the problem and package it for return to a repair center.

Table 5
Peripheral signaling card numbers

Group/ shelf	Peripheral signaling card	Loops disabled/enabled		
o/o	0	0	-	15
0/1	1	16	-	31
1/0	2	32	-	47
1/1	3	48	-	63
2/0	4	64	-	79
2/1	5	80	-	95
3/0	6	96	-	111
3/1	7	112	-	127
4/0	8	128	-	143
4/1	9	144	-	159

QPC215 Segmented Bus Extender Card

Use this procedure to replace a segmented bus extender (SBE) card.

See the *X11 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Software disable the SBE (the QPC441 3-Port Extender Card will also be disabled):
 - The CPU associated with the SBE must be inactive. To switch CPUs:


```
LD 3.5
SCPU
```
 - Disable the SBE:


```
DIS EXT xxx
```

 Table 6 lists extender codes specified by "xxx"

Table 6
Extender codes

Extender number	From	To
0G0	CPU 0	Network Group 0
0G1	CPU 0	Network Group 1
0G2	CPU 0	Network Group 2
0G3	CPU 0	Network Group 3
0G4	CPU 0	Network Group 4
1G0	CPU 1	Network Group 0
1G1	CPU 1	Network Group 1
1G2	CPU 1	Network Group 2
1G3	CPU 1	Network Group 3
1G4	CPU 1	Network Group 4

154 Replacing equipment

- 2 Set the Enb/Dis switch to Dis.
- 3 Tag and disconnect cables to the card.
- 4 Unhook the locking devices on the card; pull it out of the card cage.

installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.
- 2 Set option switches on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing (553-3001-211)* for any differences.

CAUTION

Incorrect switch settings on the SBE can cause a system failure.

- 3 Insert the replacement card into the vacated slot and hook the locking devices.
- 4 Connect cables to the replacement card.
- 5 Set the Enb/Dis switch to Enb on the replacement card.
- 6 Software enable and test the SBE card:
ENL EXT xxx
TCPU
SCPU
 - When the process is complete, you will receive a system response.
 - If there is a problem, a CED system message is generated and the red LED lights on the faceplate of the appropriate card.
 - If there is no problem, exit LD35:

- 7 Tag defective equipment with a description of the problem and package it for return to a repair center.

QPC412 InterGroup Switch Card

Use this procedure to replace an intergroup switch (IGS) card.

See the *XI I input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

1 Software disable the IGS:

- The associated CPU must be inactive. If you need to switch CPUs:

LD 35

SCPU switch CPU

**** exit LD35

- Disable the IGS:

LD 39

DISI IGS xx “xx” is the IGS card number – 0 to 19

You will see ISR043 on the system terminal when the card is disabled. Busy channels will not be disabled until the call is disconnected.

2 Set the Enb/Dis switch to Dis.

CAUTION

To avoid interrupting service, set Enb/Dis switches to Dis before disconnecting or connecting cables.

- 3 Tag and disconnect cables to the card you are removing.
- 4 Unhook the locking devices on the card; pull it out of the card cage.

156 Replacing equipment

Installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.
- 2 Insert the replacement card into the vacated slot and hook the locking devices.
- 3 Connect cables to the replacement card.
- 4 Set the Enb/Dis switch to Enb on the replacement card.
- 5 Software enable and test the IGS:
ENL IGS xx
STAT IGS
 - When the process is complete, you will receive a system response.
 - If there is a problem, an ISR system message is generated and the red LED lights on the faceplate of the card.
 - If there is no problem, exit LD39:

- 6 Test the IGS cards:
LD 45
NSIG
 - If there is a problem, a CED system message is generated.
 - If there is no problem, exit LD45:

- 7 Tag defective equipment with a description of the problem and package it for return to a repair center.

QPC441 Three-Port Extender Card

Use this procedure to replace a three-port extender (3PE) card. To software disable the 3PE card:

- In option 61, go directly to Step 2 on page 159.
- In option 71, you must disable the associated QPC215 Segmented Bus Extender (SBE) Card. Go to Step 1 on page 158.
- In options 61C and 81, you must disable the associated NT6D65 Core to Network Interface (CNI) Card. Go to Step 1 on page 158.

Note 1: In any Network Module, before you hardware disable the 3PE card you must software disable the QPC43 Peripheral Signaling Card, the QPC412 Intergroup Switch (IGS) Card, and any serial data interface (SDI) cards in the card cage.

Note 2: In options 61C and 81, if you are replacing the 3PE card in the Core/Network or Core Module, before you hardware disable the 3PE card you must software disable the QPC471 or QPC775 Clock Controller Card on the same CPU. Make sure the replacement card is QPC441 vintage F or later.

See the *X1 I input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

At some point in this procedure the system may initialize, causing a momentary interruption in call processing.

158 Replacing equipment

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Removing equipment

- 1 Software disable the 3PE. The CPU associated with the SBE or CNI card must be inactive:

- In option 71, if you need to switch CPUs:

LD 35
SCPU

Disable the SBE card:

DIS EXT xxx Table 7 lists extender codes specified by "xxx"
 ***** exit LD35

Table 7
 Extender codes

Extender number	From	To
OG0	CPU 0	Network Group 0
OG1	CPU 0	Network Group 1
OG2	CPU 0	Network Group 2
OG3	CPU 0	Network Group 3
OG4	CPU 0	Network Group 4
1G0	CPU 1	Network Group 0
1G1	CPU 1	Network Group 1
1G2	CPU 1	Network Group 2
1G3	CPU 1	Network Group 3
1G4	CPU 1	Network Group 4

- In options 61C and 81, check the status of all configured CNI cards and the network Group number of both ports on each CNI card:

STAT CNI

The CPU associated with the CNI card must become inactive. If you need to switch CPUs:

LD 135
SCPU

Disable the CNI port associated with the 3PE card:

```
DIS CNI c s p    "c" is the CPU (0 or 1), "s" is the card slot
                  (8-12), "p" is the port (0 or 1)
****
                  exit LD13.5
```

In options 61C and 81, if the 3PE card is in the Core or Core/Network Module, you must disable the clock controller card in that module. Check the status of the clock:

```
LD 60
SSCK x          "x" is the CPU (0 or
```

If the clock is active, switch the clock to make it inactive:

```
SWCK
```

Disable the clock:

```
DIS CC x
****
                  exit LD60
```

Go to Step 5 on page 160.

- 2 Software disable the associated peripheral signaling card:

```
LD 32
DSPA x          Table 8 lists peripheral signaling card numbers
                  specified by "x"
****
                  exit LD32
```

160 Replacing equipment

Table 8
Peripheral signaling card numbers

Group/ shelf	Peripheral signaling card	Loops disabled/enabled		
o/o	0	0	--	15
0/1	1	16	--	31
1/0	2	32	--	47
1/1	3	48	--	63
2/0	4	64	--	79
2/1	5	80	--	95
3/0	6	96	--	111
3/1	7	112	--	127
4/0	8	128	--	143
4/1	9	144	--	159

CAUTION

If the system terminal is assigned to an SDI port that will be disabled, assign it to another port before the SDI is disabled.

- Software disable the associated IGS cards:

LD 39

DISI IGS x "x" is the IGS card number- 0 to 19

**** exit LD39

You will see ISR043 on the system terminal when the card is disabled. Busy channels will not be disabled until the call is disconnected.

- Set the Enb/Dis switch on the 3PE to Dis.
- Tag and disconnect cables to the 3PE.
- Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement 3PE card
- 2 Set option switches on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.
- 3 Insert the replacement card into the vacated slot and hook the locking devices.
- 4 Connect cables to the replacement card.
- 5 Set the Enb/Dis switch to Enb on the replacement card.
- 6 Enable cards.

- In options 61 and 71:

LD 35

ENL EXT xxx Table 7 lists extender codes
 **** exit LD35

- Press the Man Int button to initialize the system.

- In options 61C and 81, enable and test the CNI and 3PE cards:

LD 135

ENL CNI c s p CPU (0 or 1). Slot (8-10), port (0 or 1) for
 option 81 and slot 12, port 0 for option 61C.
 **** exit LD35

If the LED on the 3PE card turns off, go to Step 7. If the LED stays lit, press the Man Int button to initialize the system.

In options 61 C and 81, if the 3PE card is in the Core/Network or the Core Module, enable the clock controller card:

LD 60

ENL CC x
 **** exit LD60

If there is a problem, a CED or CCED system message is generated and the red LED lights on the faceplate of the appropriate card.

162 Replacing equipment

- 7 Check to see that all cards were enabled.

Check the status of the IGS card:

LD 39

STAT IGS x "x" is the IGS card number – 0 to 19

If the card is still disabled, enable it:

ENL IGS xx

**** exit LD39

Check the status of SDI ports:

LD 37

STAT

If any port still disabled, enable it:

ENLTTY x

**** exit LD37

Check the status of the peripheral signaling card:

LD 32

STAT PER x Table 8 lists peripheral signaling card numbers

If the card is still disabled, enable it:

ENPS x

**** exit LD32

- 8 Tag defective equipment with a description of the problem and package it for return to a repair center.

Replacing equipment 163

QPC471, QPC775 Clock Controller Card

Use this procedure to replace a clock controller (CC) card.

Note: The QPC775 Clock Controller is used in Canadian and International applications. QPC775 and QPC471 cards may not be combined in one system.

the *XI 1 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 The clock controller card must be on the inactive CPU. If you need to switch the active CPU:

LD 35 (for other than option 81) or LD 135 (for options 61C and 81)

SCPU

- 2 Disable the clock controller card:

- The card you are removing must be inactive:

LD 60

- In a single CPU system:

Disable the clock controller card.

DIS CC x "x" is the card number-0 or 1

- In a dual CPU system:

Check the status of the clock controller card you are removing.

SSCK x "x" is the card number - 0 or 1

If the clock is active, switch clocks.

SWCK switch system clock from active to standby

164 Replacing equipment

Make sure the card you are removing is disabled and the other clock controller card is active and in free run mode.

SSCK x

TRCK FRUN

Disable the clock controller card you are removing.

DIS CC x "x" is the card number – 0 or 1

- 3 Set the **Enb/Dis** switch to **Dis** on the card you are removing.

CAUTION

To avoid interrupting service, set **Enb/Dis** switches to **Dis** before disconnecting or connecting cables.

- 4 Tag and disconnect cables to the card you are removing.
- 5 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set the **Enb/Dis** switch to **Dis** on the replacement card.
- 2 Set option switches on the replacement card. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.
- 3 Insert the replacement card into the vacated slot and hook the locking devices.
- 4 Connect cables to the replacement card.
- 5 Set the **Enb/Dis** switch to **Enb** on the replacement card.
- 6 Software enable the card:

ENL CC x

Note: With a vintage H clock controller card, do not issue the tracking (TRCK) or status (SSCK) commands at this time. If you do issue these commands, the system may respond with an inaccurate error condition.

QPC477 Bus Terminating Unit

Use this procedure to replace a bus terminating unit (BTU).

Note: Check the codes on all replacement BTUs.

- QPC477A10 and QPC477B10 BTUs are interchangeable in NT8D35 Network Modules.
- QPC744B10 BTUs must be used in NT6D60 Core Modules.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

- 1 Turn off power to the module:
 - With AC power, set the circuit breaker on the Module Power Distribution Unit (MPDU) to OFF (down).
 - With DC power, set the switch on the power supply to OFF (down).
- 2 Remove enough cards on both sides of the BTU to access the unit.

See Circuit installation *and testing* (553-3001-211) for BTU slot locations.
- 3 Gently pull the BTU out of the card cage.
- 4 Insert the replacement BTU into the vacated slot.
- 5 Reinstall the cards on both sides of the BTU.
- 6 Turn on power to the module:
 - With AC power, set the MPDU circuit breaker to ON (up).
 - With DC power, set the power supply switch to ON (up).

Note: As necessary, software reenable cards in the module. See the appropriate replacement procedures in this document.
- 7 Tag defective equipment with a description of the problem and package it for return to a repair center.

Replacing equipment 167

QPC513, QPC841 Serial Data Interface Card

Use this procedure to replace a serial data interface (SDI) card.

See the *X11 input/output guide (553-3001-400)* for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

If the system terminal is assigned to the SDI being replaced, assign it to another port before this SDI is disabled.

Removing equipment

- 1 Software disable each port on the SDI:
LD 37
DIS TTY x "x" is the number of the interface device attached to a port
- 2 Set the Enb/Dis switch to Dis.

CAUTION

To avoid interrupting service, set Enb/Dis switches to Dis before disconnecting or connecting cables.

- 3 Tag and disconnect cables to the card you are removing.
- 4 Unhook the locking devices on the card; pull it out of the card cage.

168 Replacing equipment

Installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.
- 2 Set option switches on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.
- 3 Insert the replacement card into the vacated slot and hook the locking devices.
- 4 Connect cables to the replacement card.
- 5 Set the Enb/Dis switch to Enb on the replacement card.
- 6 Software enable each port on the card:

ENL TTY x

- When the process is complete, you will receive a system response.
 - If there is a problem, an IOD system message is generated and the red LED lights on the faceplate of the card.
 - If there is no problem, exit LD37:

- 7 Tag defective equipment with a description of the problem and package it for return to a repair center.

QPC579 CPU Function Card

Use this procedure to replace a CPU function (FN) card.

See the *XII input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

At some point in this procedure the system may initialize, causing a momentary interruption in call processing.

Removing equipment

- 1 Disable the function card you are replacing by disabling the associated QPC580 CPU Interface (IF) Card. This CPU must be inactive.
 - If you need to switch CPUs:
 - LD 35
 - SCPU
 - Set the Norm/Maint switch to Maint *on* the *active* interface card. (This keeps the system from switching to the inactive CPU.)
 - Set the Enb/Dis switch to Dis on the *inactive* interface card.
- 2 Disconnect the cable between the function card and the interface card.
- 3 Unhook the locking devices on the card; pull it out of the card cage.

170 Replacing equipment

- 4 Gently unplug the ROM Card from the connectors on the component side of the function card.

CAUTION

When you remove the ROM card, do not touch other components on the function card.

installing equipment

- 1 Plug the ROM card into connectors on the component side on the replacement function card.
- 2 Insert the replacement function card into the vacated slot and hook the locking devices.
- 3 Connect the cable between the replacement function card and the interface card.
- 4 Enable the function card by enabling the interface card:
 - Set the Enb/Dis switch to Enb on the inactive interface card.
 - Set the Norm/Maint switch to Norm on both interface cards.
- 5 Test and switch CPUs:
TCPU
SCPU
 - If there is a problem, a CED system message is generated.
 - If there is no problem, exit LD35:

- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

QPC580 CPU Interface card

Use this procedure to replace a CPU interface (IF) card.

See the *X11 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

At some point in this procedure the system may initialize, causing a momentary interruption in call processing.

Removing equipment

- 1 Disable the interface card. This CPU must be inactive.
 - If you need to switch CPUs:
 - LD 35
 - SCPU**
 - Set the Norm/Maint switch to Maint on the *active* interface card. (This keeps the system from switching to the inactive CPU.)
 - Set the Enb/Dis switch to Dis on the *inactive* interface card (the one you are replacing).
- 2 Disconnect the cable between the interface card and the QPC579 CPU function card.
- 3 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set the **Enb/Dis** switch to **Dis** on the faceplate of the replacement card.
- 2 Insert the replacement card into the vacated slot and hook the locking devices.
- 3 Connect the cable between the interface card and the function card.
- 4 Enable the interface card:
 - Set the **Enb/Dis** switch to **Enb** on the replacement card.
 - Set the **Norm/Maint** switch to **Norm** on both interface cards.
- 5 Test and switch CPUs:
 - TCPU**
 - SCPU**
 - If there is a problem, a CED system message is generated and the red LED lights on the faceplate of the card.
 - If there is no problem, exit LD35:

- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

QPC584 Mass Storage Interface Card

Use this procedure to replace a mass storage interface (MSI) card. See the *XI 1 input/output* guide (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Save the current data configuration to the disk drive unit:

```
LD 43
EDD          execute data dump
****          exit LD43
```

- 2 Disable the MSI card:

- The associated CPU must be inactive. If you need to switch CPUs:

```
LD 35
SCPU
****
```

- Software disable the MSI card:

```
LD 37
DIS MSI 0
****
```

- Set the **Enb/Dis** switch to **Dis** on the faceplate of the MSI card.

CAUTION

To avoid interrupting service, set **Enb/Dis** switches to **Dis** before disconnecting or connecting cables.

174 Replacing equipment

- 3 Tag and disconnect the cable to the card you are removing.
- 4 Unhook the locking devices on the card; pull it out of the card cage.
- 5 Remove the screw that secures the QMM42 Data Cartridge. Gently unplug the cartridge from the connectors on the component side of the MSI card.

Installing equipment

- 1 Plug the data cartridge into the connectors on the component side of the replacement MSI card. Install the screw that secures the cartridge.
- 2 Set the Enb/Dis switch to Dis on the replacement card.
- 3 Set option switches on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.

CAUTION

Incorrect switch settings on an MSI card can cause a system failure.

- 4 Insert the replacement card into the vacated slot and hook the locking devices.
- 5 Connect the cable to the replacement card.
- 6 Set the Enb/Dis switch to Enb on the replacement card.
- 7 Switch to the active CPU:

LD 35
SCPU

- 8 Test the MSI card:

LD 37

MSI 0

- If there is a problem, an IOD system message is generated and the red LED lights on the faceplate of the card.
- If there is no problem, exit LD37:

- 9 Restore the current data configuration:

LD 43

RES

Note: If three system software disks are used, disks **A1** and **B1** must be installed in the disk drive units after the restore operation.

- 10 Tag defective equipment with a description of the problem and package it for return to a repair center.

QPC659 Dual Loop Peripheral Buffer Card

Use this procedure to replace a dual loop peripheral buffer (DLB) card.

See the *Xl 1 input/output guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

r

CAUTION

Service is interrupted when a loop is disabled.

Removing equipment

- 1 Software disable the dual loop peripheral buffer:
LD 32
DISS I s “I s” are the loop and shelf numbers
- 2 Set the Enb/Dis switch to Dis.
- 3 Tag and disconnect cables to the card you are removing.
- 4 Unhook the locking devices on the card; pull it out of the card cage.

Installing equipment

- 1 Set the Enb/Dis switch to Dis on the replacement card.
- 2 Set option switches on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.
- 3 Insert the replacement card into the vacated slot and hook the locking devices.
- 4 Connect cables to the replacement card.
- 5 Set the Enb/Dis switch to Enb on the replacement card.

Replacing equipment 177

- 6 Software enable the replacement card by enabling the shelf:
ENLS I s
 - When the process is complete, you will receive a system response.
 - If there is no problem, exit LD32:

- 7 Test each shelf:
LD 30
SHLF I s
 - If there is a problem, an NWS system message is generated and the appropriate red LED lights on the faceplate of the card.
 - If there is no problem, exit LD30:

- 8 Tag defective equipment with a description of the problem and package it for return to a repair center.

QPC687 CPU Card

Use this procedure to replace the CPU card.

See the XI I input/output guide (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

Call processing will stop when the CPU card is removed.

Removing equipment

- 1 If the serial data interface (SDI) port is used, software disable it:
LD 37
DIS TTY x “x” is the number of the interface device attached to the port
- 2 Disconnect the cable to the SDI port.
- 3 Unhook the locking devices on the card; pull it out of the card cage.
- 4 Gently unplug the QPC940 ROM Card from the connectors on the component side of the CPU card.

CAUTION

When you remove the ROM card, do not touch other components on the CPU card.

Installing equipment

- 1 Plug the ROM card into the connectors on the component side on the replacement CPU card.
- 2 Set option switches and plugs on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing* (553-3001-211) for any differences.
- 3 Connect the cable to the **SDI** port.
- 4 Insert the replacement card into the vacated slot and hook the locking devices.

The system will sysload, or initialize, or both. Check system messages in the *X11 input/output* guide (553-3001-400).

- 5 If the **SDI** port is used, software-enable it:

```
LD37
ENL TTY x
TTY x
```

The response should be:

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789"#$%*!&()<>-.:.,? READY FOR INPUT
```

Anything entered on the keyboard will be echoed until END is input.

- If there is a problem, an IOD system message is generated and the red LED lights on the faceplate of the card.
 - If there is no problem, exit LD37:

- 6 Tag defective equipment with a description of the problem and package it for return to a repair center.

QPC742 Floppy Disk Interface Card

Use this procedure to replace a floppy disk interface (FDI) card. See the *XI I* input/output *guide* (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Save the current data configuration to the disk drive unit:
LD 43
EDD execute data dump
**** exit LD43
- 2 Disable the FDI card:
 - The associated CPU must be inactive. If you need to switch CPUs:
LD 35
SCPU

 - Software disable the FDI card:
LD 37
DIS MSI 0

 - Set the Enb/Dis switch to Dis on the faceplate of the FDI card.

CAUTION

To avoid interrupting service, set Enb/Dis switches to Dis before disconnecting or connecting cables.

- 3 Tag and disconnect the cable to the card you are removing.
- 4 Unhook the locking devices on the card; pull it out of the card cage.
- 5 Remove the screw that secures the QMM42 Data Cartridge. Gently unplug the cartridge from the connectors on the component side of the FDI card.

Installing equipment

- 1 Plug the data cartridge into the connectors on the component side of the replacement FDI card. Install the screw that secures the cartridge.
- 2 Set the Enb/Dis switch to Dis on the replacement card.
- 3 Set option switches on the replacement card the same as on the card you removed. If there is a vintage change, be sure to check *Circuit card installation and testing (553-3001-211)* for any differences.

CAUTION

Incorrect switch settings on an FDI card can cause a system failure.
--

- 4 Insert the replacement card into the vacated slot and hook the locking devices.
- 5 Connect the cable to the replacement card.
- 6 Set the Enb/Dis switch to Enb on the replacement card.
- 7 Switch to the active CPU:

LD 35
SCPU

8 Test the FDI card:

LD 37

MSI0

- If there is a problem, an IOD system message is generated and the red LED lights on the faceplate of the card.
- If there is no problem, exit LD37:

9 Restore the current data configuration:

LD 43

RES

Note: If three system software disks are used, disks A1 and B1 must be installed in the disk drive units after the restore operation.

- 10 Tag defective equipment with a description of the problem and package it for return to a repair center.

QPC940 ROM Card

This read-only memory (ROM) card is attached to the QPC687 CPU Card. Use this procedure to replace a QPC940 ROM Card.

See the XI 7 input/output guide (553-3001-400) for a description of all maintenance commands and system messages.

WARNING

Module covers are not hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

CAUTION

Call processing will stop when the CPU card is removed.

Removing equipment

- 1 To replace the ROM card you must remove the CPU card. Unhook the locking devices on the CPU card; pull it out of the card cage.
- 2 Gently unplug the ROM card from the connectors on the component side of the CPU card.

CAUTION

When you remove the ROM card, do not touch other components on the CPU card.

184 Replacing equipment

Installing equipment

- 1 Plug the replacement ROM card into the connectors on the component side of the CPU card.
- 2 Reinsert the CPU card and hook the locking devices. The system will sysload at this point.
- 3 Tag defective equipment with a description of the problem and package it for return to a repair center.



Replacing an NT7D10 PDU with an NT7D67CB PDU

Use this procedure to replace an NT7D10 PDU with an NT7D67CB PDU in DC-powered systems.

Note 1: The NT7D67CB PDU replaces the NT7D10 PDU. However, both PDUs may be used in a system.

Note 2: Conduit is not required with the NT7D67CB PDU but may be used.

Before you begin this procedure, prepare for the installation:

- Additional wire may be required (see Step I).
- An electric drill, fitted with a .234-in. metal bit must be available.
- A Rear Mount Conduit Kit (NT7D0902) must be available.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of your work area.

Removing equipment

- 1 Check the length of existing wire to the PDU. Due to the location of the field wiring terminal block on the NT7D67CB PDU, 6 to 9 inches more length is required to reach its terminals than is required to reach those on the NT7D10 PDU.

Note 1: The existing service loop where wire enters the pedestal may have enough excess length or enough slack wire may exist in the conduit path from the power plant to allow pulling a sufficient amount through to the pedestal. Figure 39, located further on in this procedure, shows the location on the NT7D67CB PDU to which wiring must extend. If existing wiring will not reach, replace the entire wire run from the power plant. Do *not* splice short pieces of wire onto the end of existing wiring.

Note 2: If a QCAD321 or an NT6D53 junction box is installed on the power feed to the console, the wiring from the power plant may have to be altered as follows:

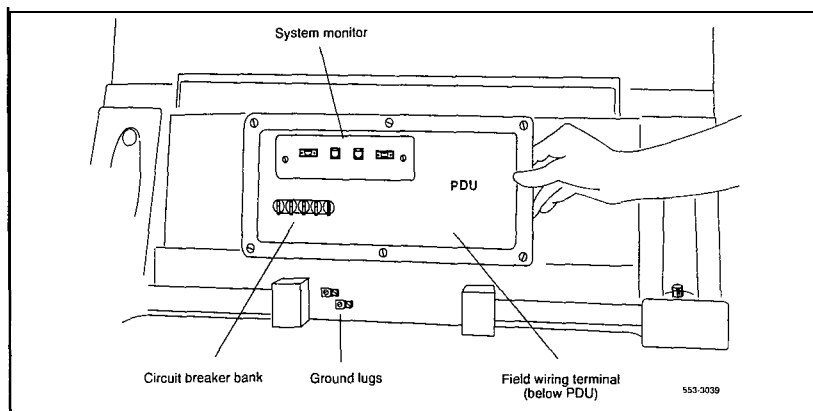
- If five #4 AWG wires are run from the power plant to the junction box (two BAT, two RTN, and one LRTN), then the junction box must *not* be used. The junction box must be removed and the entire wire run from the power plant to the pedestal must be replaced. Do not splice short pieces of wire onto the end of existing wiring.
 - If nine #4 AWG wires are run from the power plant to the junction box (four BAT, four RTN, and one LRTN) then the junction box may be used. However, the #10 AWG wires from the junction box to the pedestal may have to be replaced to provide sufficient length. Do *not* splice short pieces of wire onto the end of existing wiring.
- 2 Disconnect DC power at the source (not at the PDU).

CAUTION

Before performing these procedures, disconnect the power at the source; simply turning off the circuit breakers does not shut off power to the system monitor.

- 3 Remove the grill on the rear of the pedestal.
- 4 Set all five circuit breakers on the PDU to OFF (down). Figure 35 shows the NT7D10 PDU in the rear of the pedestal.

Figure 35
NT7D10 Power Distribution Unit DC



- 5 Unseat the blower unit in the front of the pedestal:
 - Remove the grill on the front of the pedestal. Set the toggle switch on the front of the unit to OFF (left).
 - Turn the screws on the front of the unit counter-clockwise and pull the unit out several inches so the connector on the rear disengages.

WARNING

The unit is heavy and the blades on the blower may still be rotating up to 2 minutes after the power is turned off.

- 6 Disconnect cables to the module above the pedestal (module 0):
 - Remove the rear cover on the module.
 - Remove the I/O safety panel over the backplane in the module.
 - Disconnect the system monitor ribbon cable from the PDU and from the module and set it aside for reconnection with the replacement NT7D67CB PDU.
 - Disconnect the large orange power connector (J1) from the PDU.

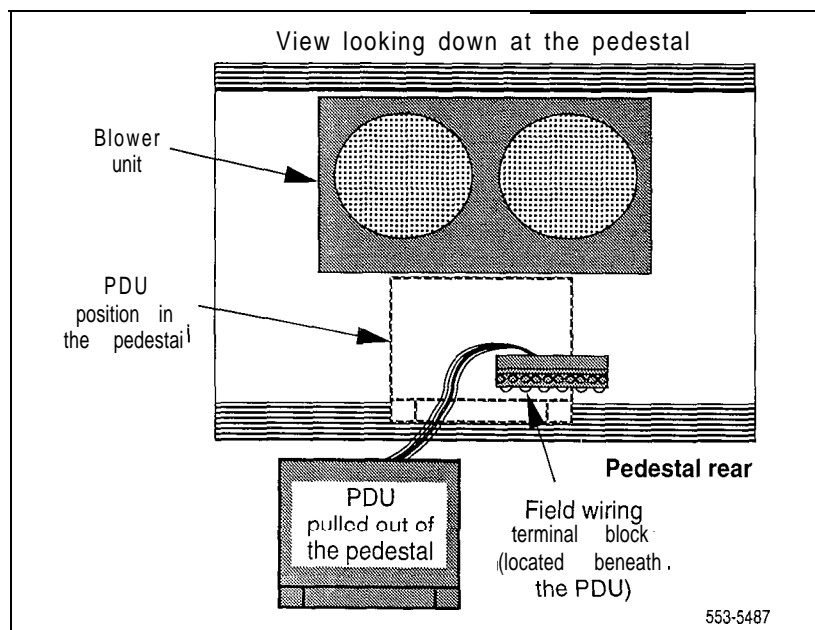
Note: To disconnect the power plug, you must press a latch trip on the front and rear of the plug. You may need to use a screwdriver blade against the latch trip on the front of the plug.

- 7 Tag and disconnect cables to the NT8D22 System Monitor card. Loosen the two screws on the card faceplate and remove it.
- 8 Remove the six screws that position the NT7D10 PDU. Carefully pull the unit straight out and set it on the floor next to the pedestal (see Figure 36).

CAUTION

The PDU cannot be completely removed from the pedestal until wires to the field wiring terminal block are disconnected. Label wires carefully. Improper wiring can cause system damage.

Figure 36
Cabling between the PDU and the field wiring terminal block



- 10 Locate the frame ground wire from the field wiring terminal block to the frame ground bolt inside the pedestal. Disconnect this wire at the ground bolt.
- 11 Remove the field wiring terminal block:
 - Remove the cover over the terminal block.
 - Remove the four screws that secure the terminal block and lift it out of the pedestal.
- 12 Move the NT7D10 PDU out of the work area,

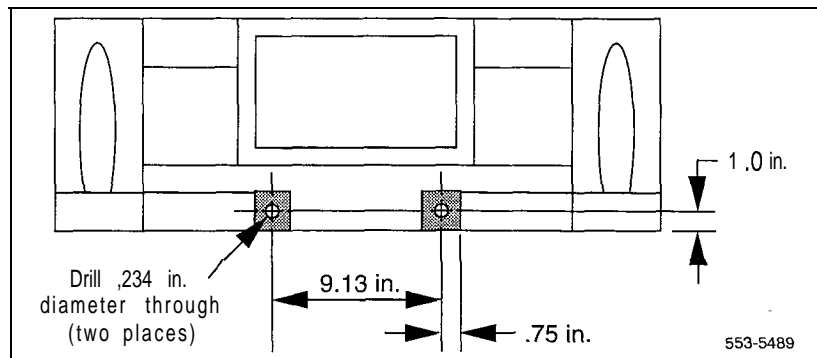
Installing equipment

WARNING
The NT7D67CB PDU is much heavier than the NT7D10 PDU.

Note: The conduit attachment plate provided in the NT7D0902 Rear Mount Conduit Kit must be installed as a safety cover and to restrain wiring to the terminal block.

- 13 Drill two .234-in. screw holes in the rear of the pedestal (see Figure 37). The holes will be used to install the conduit attachment plate.

Figure 37
Dimensions for drilling holes on the pedestal



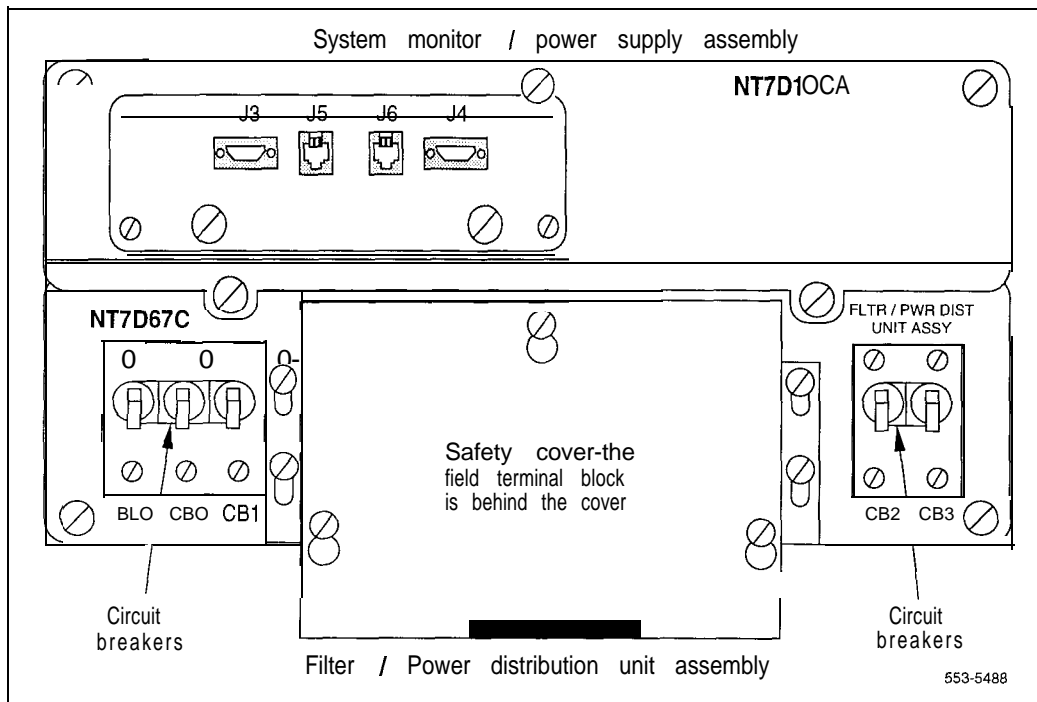
- 14 Place the NT7D67CB PDU next to the pedestal.

Figure 38 shows the PDU (labeled FLTR/PWR DIST UNIT ASSY on the equipment) and the NT7D10CA System Monitor/Power Supply Assembly (labeled XSM/PWR SUPPLY ASSY on the equipment).

Note: The NT7D09CA Pedestal has a brace that supports a leveling bracket on the rear of the PDU. There is no room for the leveling bracket in the NT7D09AA Pedestal, so the bracket must be removed before the PDU is installed.

- 15 Remove the two screws that secure the leveling bracket on the rear of the PDU. Reinstall the screws to hold the rear cover on the PDU in place.

Figure 38
NT7D67CB Power Distribution Unit DC



WARNING

You should support the PDU as far into the pedestal as you can without letting it drop to the bottom of the pedestal, but watch your hands! It becomes more difficult to support the PDU the further into the pedestal it is inserted. The PDU is held in its proper position only when the mounting screws on its faceplate are tightened.

16 Install the NT7D67CB PDU:

- Connect the green frame ground wire from the PDU to the frame ground bolt inside the pedestal.
- Guide the power cable connector through the hole in the top of the pedestal. Set the PDU in the pedestal and tighten the three screws that secure it to the pedestal.

17 Install the NT7D10CA system monitor assembly:

- Connect the small orange connectors (J2 on the PDU, P2 on the system monitor assembly) on the left side of the PDU.
- Connect the flat white connector to the small circuit board (P1 on the PDU, J1 on the system monitor assembly) on the right side of the PDU.
- Connect the ribbon cable (set aside when the NT7D10 PDU was removed) to the system monitor (J2). Guide the connector on the other end of the cable through the hole in the top of the pedestal and connect it to module 0.
- Gently push the system monitor assembly into the pedestal.

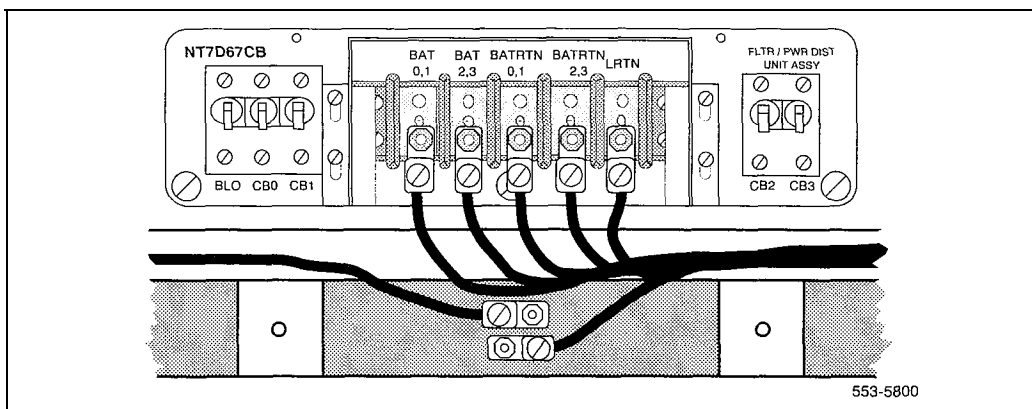
18 Tighten the screws that secure the system monitor assembly.

19 Reconnect the cables from module 0:

- Reconnect the large orange power connector (J1).
- Replace the I/O safety panel.
- Replace the rear cover on the module.

- 20 Reconnect all external wiring to the terminal block on the PDU (see Figure 39):
- Remove the plastic safety cover over the terminal block.
 - Connect the red BAT (–48 V) wires:
 - for modules 0 and 1 connect to the BAT 0,1 terminal
 - for modules 2 and 3 connect to the BAT 2,3 terminal
 - Connect the black BATRTN (48 V return) wires:
 - for modules 0 and 1 connect to the BATRTN 0,1 terminal
 - for modules 2 and 3 connect to the BATRTN 2,3 terminal
 - Connect the orange (or white) wire from the ground bus/LRE in the power plant to the LRTN terminal.

Figure 39
Field wiring terminals in the NT7D67CB PDU



- 21 Position the conduit attachment plate on the rear of the pedestal (over the newly drilled holes) and secure it with two screws, nuts, and washers.
- 22 Reinstall the plastic safety cover over the terminal block.

23 Reseat the blower unit:

- Lift the unit slightly and slide it into the pedestal glides. Set the toggle switch to ON (right).
- Tighten the screws on the front of the unit.
- Replace the front pedestal grill.

24 Insert the system monitor card. Tighten the screws on the card faceplate. Reconnect cables to the system monitor.

25 Set all five circuit breakers on the PDU to OFF (down). Reconnect the source of DC power.

26 One at a time, starting with the breaker for the blower unit, set the circuit breakers on the PDU to ON (up). Make sure the green LED lights on the power supply unit(s) in each module.

Note: On initial power up the blower may rotate slower than expected. As the sensor detects heat, the blower will rotate more rapidly.

27 Replace the rear pedestal grill.

28 Tag defective equipment with a description of the problem and package it for return to a repair center.

SL-1

Meridian 1

Hardware replacement

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Information subject to change without notice

Release 7.0

Standard

April 1, 1994

Printed in the U.S.A.

