

"Beginning in 1992, for reasons that tie into diversity and related trends, we determined that the trouble with the [CIA's] Directorate of Operations was its culture. And we undertook, unfortunately, a program that I call 'Kill That Culture.' And we did. We also damn near killed our ability to spy in the process. The evils in the system could have been addressed without ripping the guts out of the Directorate of Operations. The truth is, not everyone can spy. Live with it, and reward that small number of officers who can can actually successfully recruit people to spy."

--- Excerpt from A Spy's Journey by Floyd L. Paseman.

### Table of Contents

- Page 2 / Common Channel Interoffice Signaling / #1A ESS Description & Maintenance (Part 1)
   Overview of the old out-of-band signaling system under a 2-wire #1/#1A ESS.
- Page 28 / Remote Trunk Test Unit / #1A ESS
   Description of the remote trunk testing system under a #1/#1A ESS.
- Page 43 / Nortel DMS-100 Test Desk Trunk Group Type
   Overview of a DMS-100's TRKGRP type TD.
- Page 48 / Nortel DMS-100 No Double Connect Option
   DMS-100 switch option to prevent your phone line from being monitored via a remote test system.
- ♦ Page 51 / Device for Detecting GPS Receivers
  - Use an old AM radio to locate hidden GPS receivers.
- + Page 66 / Bonus
  - ♦ Bellcore is Hardcore
- ♦ Page 67 / The End
  - Editorial and rants.

### **Description & Maintenance – Part 1**

BELL SYSTEM PRACTICES AT&TCo Standard SECTION 231-038-010 Issue 2, February 1983

### 2400 DATA LINK - COMMON CHANNEL INTEROFFICE SIGNALING DESCRIPTION AND MAINTENANCE CONSIDERATION (1E7/1AE7 AND LATER GENERICS)

### 2-WIRE NO. 1 AND NO. 1A ELECTRONIC SWITCHING SYSTEMS

|    | CONTENTS                            | PAGE | CONTENTS PAGE                         | :     |
|----|-------------------------------------|------|---------------------------------------|-------|
| 1. | GENERAL                             | 4    |                                       | ł     |
|    |                                     | 4    | 4. TERMINAL ACCESS CONTROLLER UNIT 14 | ł     |
|    | PURPOSE OF CCIS SYSTEM              | 4    | CONT PHYSICAL DESCRIPTION 14          | ł     |
|    | SIGNALING LINK DATA                 | 4    | CONT FUNCTIONAL DESCRIPTION 14        | ļ     |
|    | TERMINAL OPERATION OVERVIEW         | 5    | CONT SEQUENCES                        |       |
|    |                                     | 5    | UNIT ALERT SEQUENCES                  | J     |
|    | REFERENCES                          | 10   | A. CONT READ Sequence 19              | ,     |
| 2. | VOICE FREQUENCY LINK ACCESS (VFLA)  |      | B. CONT WRITE Sequence 19             | ,     |
|    | UNIT                                | 10   | TERMINAL SEQUENCES                    | J     |
|    | VOICE FREQUENCY LINK ACCESS CIRCUIT | 10   | A. Terminal PUT Sequence 20           | ,     |
| 3. | MODEM-VFL INTERFACE                 | 11   | B. Terminal WRITE Sequence 23         | ;     |
|    | GENERAL                             | 11   | C. Terminal GET Sequence : 24         |       |
|    | MODEM CHARACTERISTICS AND CONFIGU-  |      | D. Terminal READ Sequence             | ;     |
|    | RATION                              | 11   | E. Maintenance WRITE Sequence         | , · · |
|    | MODEM-VFL CONFIGURATION             | 12   | F. Maintenance READ ONES Sequence 26  |       |
|    | MODEM TESTS                         | 12   | 5 DATA TERMINAL UNIT 26               |       |
|    | A. Digital Loopback                 | 12   | TERMINAL UNIT PHYSICAL DESCRIPTION 26 |       |
|    | B. Analog Loopback                  | 13   |                                       | -     |
|    | C. Line Transfer                    | 13   |                                       | )     |
|    | D. Facility Test                    | 14   | MESSAGE FORMAT AND CODING 32          | !     |

NOTICE Not for use or disclosure outside the Bell System except under written agreement

Printed in U.S.A.

### Description & Maintenance – Part 1

10.

11.

### SECTION 231-038-010

|            |              |                         | co          | NT   | EN          | TS      |     |      |      |       |      | P   | AGE |
|------------|--------------|-------------------------|-------------|------|-------------|---------|-----|------|------|-------|------|-----|-----|
| 6.         | TER/         | AINAL INPU              | T/O         | UT   | PU          | тс      | CIR | cu   | т    | •     | •    |     | 32  |
| 7.         | SUP          | PORT EQUIP              | ME          | ТΝ   |             |         |     | •    |      | •     |      |     | 33  |
|            | POW          | ER CONTRO               | DL          |      |             | •       |     |      |      |       |      |     | 33  |
|            | <b>A</b> .   | Purpose                 |             |      |             |         |     |      | •    |       |      |     | 33  |
|            | B.           | General D               | escri       | pti  | on          |         | •   | •    | •    |       | •    |     | 34  |
|            | С.           | Power App<br>Controller | olica       | tio  | n           | -Dc     | ita | Tei  | rmi  | na    | l ar | ıd  | 34  |
|            | D.           | Power Re<br>Controller  | mov         | al-  | D           | ata     | ı 1 | Feri | min  | al    | ar   | ıd  | 39  |
|            | E.           | Timers                  |             | •    | •           | •       | •   | •    |      | •     |      |     | 39  |
|            | F.           | Data Set P              | owe         | er C | Con         | tro     | I   | •    |      |       |      | •   | 39  |
|            | G.           | Scan Point              | s           | •    | •           | • .     | •   |      |      | •     |      |     | 39  |
|            | Н.           | Signal Dist             | ribu        | tor  | Po          | int     | 5   | •    |      | •     |      | • ' | 40  |
|            | I.           | Converter               | Alar        | ms   |             | •       | •   |      | •    | •     | •    | •   | 40  |
|            | J.           | Fuse Alarn              | 15          |      |             |         |     | •    | •    |       | •    |     | 40  |
|            | К.           | Major Alar              | ms          |      |             |         |     |      |      |       | •    | •   | 41  |
|            | L.           | Minor Alar              | ms          | ane  | d P         | ow      | er  | Alc  | ırm  | Τe    | st   |     | 41  |
|            |              |                         | •           | •    | •           | •       | •   | •    | •    | •     | ·    | •   | 41  |
|            | FUSE         | PANEL                   | •           | •    | •           | ·       | ·   | •    | •    | •     | ·    | •   | 41  |
|            | FILTE        | R UNIT .                | ·           | •    | ·           | ·       | ·   | •    | ·    | •     | •    | •   | 41  |
|            | AC C         | OUTLET .                | •           | •    | •           | •       | •   | •    | •    | •     | ·    | •   | 41  |
|            | POW          | ER SUPPLIE              | 5           | •    | •           |         | •   |      | •    | •     |      |     | 41  |
| <b>B</b> . | MAI          | TENANCE                 | CON         | ISI  | DEF         | RAT     | 10  | NS   |      |       |      | •   | 42  |
|            | <b>A</b> .   | Link Securi             | ty          |      | •           | •       | •   | •    | •    | •     |      |     | 42  |
|            | В.           | Signaling L             | ink         | Мс   | aint        | ten     | an: | ce I | Faci | iliti | es   |     | 45  |
| <b>?</b> . | DAT#<br>LINK | TERMINA                 | L A<br>Crip | NE   | )<br>)<br>) | vo<br>s | ICE | -FR  | EQ   | UE    | NC   | Y   | 45  |

| CONTENTS   | PAGE |
|--|------|
| DATA TERMINAL STATES                                 | . 45 |
| A. Automatic (AUTO) States                           | . 45 |
| B. Manual (MAN) States                               | . 46 |
| VOICE FREQUENCY LINK STATES                          | 47   |
| A. Automatic States                                  | 47   |
| B. Manual States                                     | 48   |
| DATA LINK FAILURE REPORTING AND ANALY-<br>SIS        | 49   |
| LSO1 OUTPUT MESSAGE                                  | 49   |
| LSO2 OUTPUT MESSAGE                                  | 51   |
| LSO3 OUTPUT MESSAGE                                  | 52   |
| LSO4 OUTPUT MESSAGE                                  | 52   |
| DTRM STATE CONTROL                                   | 52   |
| AUTOMATIC DTRM STATE TRANSITIONS                     | 54   |
| A. Normal Link Recovery                              | 54   |
| B. Emergency Link Recovery                           | 54   |
| MANUAL DTRM STATE TRANSITIONS                        | 54   |
| A. Removing a DTRM from Service                      | 54   |
| B. Restoring a DTRM to Service                       | 54   |
| C. Taking a DTRM Out of Service                      | 57   |
| D. Marking a DTRM Unavailable for Service            | 57   |
| E. Reinitializing a DTRM                             | 57   |
| MANUAL DTRM DIAGNOSTICS, STATUS<br>CHECKS AND AUDITS | 58   |
| A. Diagnosing a DTRM (Normal Printout)               | 58   |
| B. Diagnosing a DTRM (Raw Data Print-<br>out)        | 58   |

### Description & Maintenance – Part 1

### ISS 2, SECTION 231-038-010

|      |            | CONTENTS F  | AGE |
|------|------------|---|-----|
|      | С.         | Requesting DTRM Status                                  | 58  |
|      | D.         | Requesting an Audit of a DTRM                           | 58  |
| 12.  | VFL        |   | 58  |
|      | MAI        | NUAL VFL STATE TRANSITIONS                              | 58  |
|      | <b>A</b> . | Removing a VFL from Service                             | 58  |
|      | В.         | Marking a VFL Unavailable for Service                   | 59  |
|      | С.         | Operating a VFL Access Circuit                          | 59  |
|      | D.         | Releasing a VFL Access Circuit                          | 59  |
|      | E.         | Placing a VFL in the Manual Out-of-<br>Service State    | 59  |
|      | F.         | Restoring a VFL to Service                              | 59  |
|      | MAI<br>AUC | NUAL VFL STATUS CHECKS, TESTS, AND<br>DITS              | 60  |
|      | <b>A</b> . | Requesting VFL Status                                   | 60  |
|      | В.         | Initiating the Automatic Standby VFL<br>Test            | 60  |
| 13.  | ABB        | REVIATIONS AND ACRONYMS                                 | 60  |
| Figu | res        |   |     |
| 1    | . Ca<br>Sy | ommon Channel Interoffice Signal<br>ystem—Block Diagram | 6   |
| 2    | . Ci<br>gi | CIS Quad Network Structure—Block Dia-<br>ram            | 7   |
| 3    | . N        | o. 1/1A ESS Toll CCIS Configuration .                   | 8   |
| 4    | . Do<br>Ji | ata Terminal Supplementary Frame<br>1A094B              | 9   |
| 5    | . De<br>Fe | ata Set DS 201D Showing Simplified Test<br>eatures      | 13  |
| 6    | . Te<br>Po | erminal Access Controller Unit—Circuit<br>ack Layout    | 15  |

|             | CONTENTS F   | AGE |
|-------------|--|-----|
| 7.          | Interconnection of a Terminal and the Ter-<br>minal Access Controllers       | 17  |
| 8.          | CONT Word Format   | 18  |
| 9.          | CONT Write Work Format   | 18  |
| 10.         | Terminal Unit Circuit Pack Layout  | 28  |
| 11.         | Terminal Unit Controlled Hierarchy   | 31  |
| 12.         | Input/Output Circuit Enable Transformer<br>No. 2645A                         | 33  |
| 13.         | Unit Layouts for CCIS Basic and Supplemen-<br>tary Frames                    | 35  |
| 14.         | Data Terminal Power Control for Basic<br>Frame Bay 0                         | 36  |
| 15.         | Data Terminal Power Control for Basic<br>Frame Bay 1                         | 37  |
| 16.         | Data Terminal Power Control for Supple-<br>mentary Frames                    | 38  |
| 17.         | Redundant CCIS Network Structure   | 43  |
| 18.         | CCIS Data Link (A Links)   | 44  |
| 19.         | DTRM States <sup>v</sup>   | 46  |
| 20.         | Automatic DTRM State Transitions, Normal<br>Link Recovery                    | 48  |
| 21.         | Automatic DTRM State Transitions, Double<br>Link Failure (Emergency Restart) | 49  |
| 22.         | Manual DTRM State Transitions  | 50  |
| 23.         | Manually Requested DTRM Diagnostics .  | 51  |
| 24.         | Automatic VFL State Transitions  | 52  |
| 25.         | Manual VFL State Transitions   | 53  |
| <b>26</b> . | Data Terminal Base Frame J1A094A   | 63  |
| <b>27</b> . | Data Set DS 201D—Simplified Functional<br>Schematic                          | 64  |

**Description & Maintenance – Part 1** 

### SECTION 231-038-010

|            | CONTENTS  | PA     | GE |
|------------|---|--------|----|
| 28.        | Basic CCIS Configuration                                      | •      | 65 |
| 29.        | Voice Frequency Link Access Unit—Block<br>Diagram             | κ<br>• | 66 |
| 30.        | CONT Functional Block Diagram                                 | •      | 67 |
| 31.        | CCIS Terminal—Block Diagram                                   | •      | 68 |
| 32.        | Linked List Operation in Data Memory                          | •      | 69 |
| Tables     |   |        |    |
| <b>A</b> . | Supporting Documentation                                      |        | 10 |
| В.         | Control Inputs Determining State of Data<br>Set (DS)          |        | 13 |
| С.         | CONT Sequence Opcode Assignments                              |        | 16 |
| D.         | Terminal Opcode Assignment                                    |        | 21 |
| E.         | Controller and Terminal Register, Bus, and<br>Word Sizes      |        | 27 |
| F.         | Terminal and Controller Power States                          |        | 39 |
| G.         | Data Terminal (DTRM) States                                   |        | 47 |
| Н.         | Voice Frequency Link (VFL) States                             |        | 53 |
| I.         | DTRM State Transitions Allowable From<br>One State to Another |        | 55 |

### 1. GENERAL

#### INTRODUCTION

1.01 This section describes the common channel interoffice signaling (CCIS) feature of the 2wire No. 1 and No. 1A Electronic Switching Systems (ESS).

1.02 Revision arrows are used to emphasize significant changes. The Equipment Test List is not affected. The reason for reissuing this section is to incorporate information in Section 231-138-305, Toll-CCIS Data Link Configuration and Recovery, 2-Wire No. 1 ESS. This reissue will now provide a complete single section on the description and maintenance

consideration of the 2400 data link equipment with a No. 1/1A ESS.

### 1.03 Abbreviations used in this section are listed in Part 13.

### PURPOSE OF CCIS SYSTEM

1.04 The CCIS system (Fig. 1) is a signaling system in which all telephone signals associated with a designated trunk group are passed over a common data channel instead of the individual voice paths of the No. 1 or No. 1A ESS intertoll switching network. The CCIS network is designated for the exchange of telephone signaling information between processorequipped switching systems only. Interoffice signaling data is exchanged over a signaling link, consisting of a terminal unit and its associated modulatordemodulator (modem) located at each office, and the wire facility or voice-frequency channel over which the signaling data is transmitted and received.

1.05 The CCIS signaling link from each office is independently connected to a signal transfer point (STP). The STP processes signaling data directly between connecting CCIS offices, within the same signaling region (Fig. 2) (eg, A-C or D-E), and forwards signaling data to a distant STP for interregional trunk groups (eg, A-D, B-E). In the latter case, incoming CCIS connecting office signaling traffic at the STP is concentrated for transmission to the next STP to achieve efficient use of signaling link capacity.

1.06 The STP function is fully duplicated and redundant in each region as shown in Fig. 2. There are two STPs located in each of the ten continental toll regions. Each CCIS office is connected to both STPs of the pair, and the STPs of all regions are interconnected by four signaling links forming quads. The STPs in each region are also connected by signaling links. This permits an STP to transfer signaling data to the mate STP if its signaling links have failed. Under normal conditions, each STP is designed to process one-half of the regional signaling traffic, which can constitute no more than one-half of its processing capacity. In the event of signaling link or STP equipment failure, all regional CCIS signaling traffic is processed by the other STP.

### SIGNALING LINK DATA

**<sup>1.07</sup>** The data contained within the CCIS network exists in the form of binary serial data words

# Common Channel Interoffice Signaling / #1A ESS Description & Maintenance – Part 1

called signal units (SU). These 28-bit SUs are used singly [designated lone signal units (LSU)] or in groups [designated multiple unit messages (MUM)] to transfer supervisory and control signals between switching offices handling a call. Since signaling can take place before, during, or after a call, and can take place simultaneously in both directions, much more information regarding call status can be efficiently transferred between offices.

### TERMINAL OPERATION OVERVIEW

Incoming calls to a CCIS switching office may 1 08 be assigned to CCIS facilities by the processor. If so, then the necessary SUs required to control the progress of these calls are reformatted by the terminal access controller (CONT) and passed to the terminal equipment. These outgoing SUs, along with outgoing link and relative priority level information, are conveyed in parallel bit form over the peripheral unit address bus (PUAB) to the terminal access controller. The terminal access controller is also known as a TAC, but in this section, CONT is used as this term reflects the schematic diagrams and circuit description terminology (Fig. 3). The SUs are then relayed in the same form from the CONT to the indicated data terminal and stored in a transmit buffer according to priority level. Each SU remains in this buffer until it has been transmitted. It is then stored in the data terminal transmit record table until the data terminal receives an acknowledgment control unit from the distant office CCIS data terminal indicating error-free reception. If any SUs are received in error by the distant office, they are retransmitted. Thus, error control consists of error detection by the decoding of check bits included in each SU and by monitoring the modem carrier failure detector. Error correction is then accomplished by retransmission of SUs.

1.09 When ready to be transmitted, each SU, in priority order, is placed in a logic register where eight check bits are added. The 28-bit SU is then passed serially to the modem for encoding and transmission over the voice-frequency link (VFL) to the distant office. The VFL is a 4-wire voice bandwidth circuit similar to a 3002-basic private line channel for data transmission. The VFL is operated full duplex; that is, both directions of transmission are used for signaling simultaneously.

1.10 Incoming 28-bit SUs are received by a modem where the encoded data is converted back into

### ISS 2, SECTION 231-038-010

digital format and relayed serially to the receive section of the associated data terminal. There errorchecking is performed on the SUs, utilizing the eight check bits. Independent of the check code, the carrier detector circuit in the modem is also used to detect erroneous SUs. An SU is considered to be in error if the carrier detector circuit indicates a loss of received carrier. Each block of 12 SUs is processed by the data terminal, and an acknowledgment control unit is generated and returned to the distant office. Error-free SUs (minus the eight check bits) are stored by relative priority level in the data terminal receive buffer. Through wired logic, the data terminal receive buffer indicates a nonpriority or a priority-signal-present condition to the processor via the CONT. When the processor is ready to receive the SUs from the data terminal, each SU is relayed in parallel-bit form through the CONT to the processor over the scanner answer bus (SCAB).

1.11 The signaling information interface with the CONT is through the PUAB and the SCAB. Power status indications of the terminal equipment are also via the scanner. The CONT operates only under direction of processor instructions; however, the terminal unit autonomously conducts selfchecking routines interleaved with the data handling routines of the signaling link. Figure 3 shows the configuration of the CONTs and central control processors in the No. 1/1A ESS toll CCIS system.

### EQUIPMENT CHARACTERISTICS

1.12 The data terminal, including its associated modem, is a CCIS common systems design. As a stored program-controlled processor operating autonomously, its basic functions include all operations related to the 2-way synchronous signaling link. The data and control interface between the No. 1/1A ESS central control processor and CCIS terminal units is provided by the No. 1/1A ESS CCIS CONT unit.

1.13 The modem contained in each data terminal is a plug-in 2400 bit-per-second transmission rate 201D-L1A data set designed with 5V transistortransistor logic integrated circuits of the dual in-line package variety. All other functional units in the CCIS terminal group are designed with 1A-type 3V transistor-transistor logic circuits. Some of these are mounted on a ceramic substrate which is mounted on a plug-in card. The data terminal program memory and data memory consist of bipolar memory modules mounted on the same type plug-in cards.

1.14 Figures 4 and 26 show unit location and sizes.

**Description & Maintenance – Part 1** 

SECTION 231-038-010



Page 6

7

Description & Maintenance – Part 1



### **Description & Maintenance – Part 1**



Page 8

9



**Description & Maintenance – Part 1** 

### SECTION 231-038-010

### REFERENCES

**1.15** Refer to Table A for supporting documentation.

### 2. VOICE FREQUENCY LINK ACCESS (VFLA) UNIT

2.01 The VFLA unit allows test of a VFL from a centrally located test position such as the trunk and line test panel, supplementary trunk test panel, or the manual trunk test position in HILO 4-wire applications. The results of the tests are the same as if the test equipment used were located at the data terminal associated with the VFL under

test. For this to be accomplished, the transmission levels between the test position and the VFLA, including cable loss, must match the levels present between the data terminal and the VFLA. The VFLA maintenance circuit provides adjustable gain and loss to insure that the levels at the test position and VFLA are correct and to compensate for varying amounts of cable loss.

### VOICE FREQUENCY LINK ACCESS CIRCUIT

2.02 The VFLA circuit provides the required attenuation between the DS 201D modem and the

### ♦TABLE A

### SUPPORTING DOCUMENTATION

| CIRCUIT   | SD/CD NUMBER | OTHER REFERENCES    |
|---|--------------|---------------------|
| Data Terminal Basic Frame Circuit               | 1A441-01     | Section 820-069-151 |
| Data Terminal Supplementary Frame Circuit       | 1A442-01     | Section 820-069-151 |
| Terminal Access Controller Circuit              | 1A443-01     | -                   |
| Data Set 201D                                   | _            | Section 312-811-100 |
| Data Terminal Circuit                           | 1A444-01     | -                   |
| Data Terminal Power Control Circuit             | 1A445-01     | Section 231-115-501 |
| Voice Frequency Link Access Circuit             | 1A446-01     | -                   |
| 3-Volt, 8-Amp Power Converter                   | 82246-01     | Section 231-115-501 |
| 201D Data Set                                   | 73090-01     | Section 312-811-100 |
| Central Pulse Distributor                       | 1A109-01     |                     |
| Communications Bus Circuit for Peripheral Units | 1A119-01     | -                   |
| Master Scanner Applique Circuit                 | 1A133-01     | _                   |
| Signal Distributor Applique Circuit             | 1A146-01     | -                   |
| Office Alarm Circuit                            | 1A158-01     | Section 231-115-501 |
| Power Distributing Frame Circuit                | 1A126-03     |                     |
| Miscellaneous Circuit for All Frames            | 1A129-01     |                     |

### **Description & Maintenance – Part 1**



- (e) Receives from the voice-frequency channel the phase-shifted carrier pulses.
- (f) Determines the phase shift between the previous signaling element and the present signaling element to determine the dibit represented.

### ISS 2, SECTION 231-038-010

- (g) Generates the dibit.
- (h) Presents the received data to the signaling terminal in binary form one at a time.
- (i) Detects loss of carrier.
- (j) Maintains synchronization for a period of 1 second during loss of carrier.
- **3.02** Refer to CD-1A444-01 for a complete description of the operation of the modem-VFL interface.

#### MODEM CHARACTERISTICS AND CONFIGURATION

- **3.03** The 201D modem consists of seven circuit packs (six AR-type packs, plus a 102A power unit) in a self-contained housing. The modem mounts as a single unit via four screws.
- 3.04 Functionally, the six AR-type packs comprise a transmitter, receiver, and a terminal and telephone line interface section. The interface unit (AR668) is the only unit that is discussed in detail by this section. The modem operates under control of the terminal.
- 3.05 The DS 201D uses a 4-level differential phase-shift-keying modulation scheme to transmit and receive serial binary data synchronously at the rate of 2400 bps on a facility similar to 3002-type 4-wire private line channel with basic conditioning. Synchronization is achieved by a 2400-Hz clock provided by either the data set (transmit and receive clocks) or the terminal equipment (transmit clock external only).
- 3.06 The data set transmitter accepts serial binary data at 2400 bps in synchronization with a 2400-Hz clock. The transmitter encodes the digital data into symbols of two bits each (dibits). These are used to modulate the phase of the 1800-Hz carrier frequency at a 1200-baud rate. The resultant differential 4-phase modulated signal is converted to an analog signal for transmission over the voice-frequency telephone line.

**3.07** The receiver accepts the far-end transmitted analog signal from the telephone lines, demodulates the signal to recover the serial data and bit timing, and delivers the data and timing to the terminal through the interface connector.

**Description & Maintenance – Part 1** 

### SECTION 231-038-010

cuit pack.

### MODEM-VFL CONFIGURATION

3.08 There are many possible combinations for configuring the modem-to-modem interface.These are dependent on the type of facilities linked by the CCIS system. The basic CCIS configuration between offices is shown in Fig. 28.

3.09 In the VFLA maintenance access state, ground is provided on leads 11E and ALT (refer to Fig. 29). The 11E and ALT relays are operated in the JW422 VFLA circuit pack associated with the line B output of the data set. In this state, the 4-wire circuit of the associated VFL and the attenuators, switches, and jacks in the VFLA circuit are connected to the 4-wire circuit of the maintenance bus. The maintenance bus is a 4-wire multiple common to all VFLAs of a basic frame bay or supplementary frame bay. Each bus requires one trunk link network appearance. It provides a transmission path to the test position via the JW430 VFLA maintenance circuit.

3.10 Several data terminals may be controlling VFLA circuits which have access to the test position via a common maintenance bus. Since proper termination dictates that only one VFL at a time be switched to the maintenance bus, the ALT bit of only the terminal selected should be set to logic 1 in the terminal control register.

3.11 The VFLA circuit allows test of a VFL from a test position. The results of the tests are the same as if the test equipment used were located at the data terminal unit associated with the VFL under test. To effect this situation, the transmission levels between the test position and the VFLA (including cable loss) must match those levels present between the data terminal unit and the VFLA. To ensure that the levels at the test position and VFLA are correct, and to compensate for varying amounts of cable loss, the JW430 VFLA maintenance circuit provides adjustable gain and loss.

3.12 In the transmit path of the maintenance bus (ie, direction of transmission towards the transmission facility), the VFLA maintenance circuit provides nominally 13 dB of gain. This amplifies the 0 transmission level point test signal present at the test position to the +13 transmission level point required at the 310-type jack labeled TRMT on the VFLA circuit pack. In this path of the circuit, the JW430 VFLA maintenance circuit provides gain and loss in the continously variable range of -20 to +24 dB.

3.13 In the receive path of the maintenance bus cir-

cuit (ie, direction of transmission away from the transmission facility), the JW430 circuit pack contains a 49A-type variable attenuator that provides 0 to 1.5 dB of attenuation adjustable in 0.1 dB increments. The transmission level point present at the 310-type jack of the VFLA circuit pack labeled RCV is the -3 db transmission level point. The variable attenuation provided by the JW430 and cable loss between the VFLA and test position allows adjustment of the expected receive signal at the test position to the -4 db transmission level point.

3.14 With the VFLA circuit configured to provide

VFL-to-maintenance bus continuity, the output of the data set is removed from the circuits. In this state a loopback path from the data set transmitter circuit to the receive circuit is provided through a 25-dB, 600-ohm balanced attenuator (AT1). This external loopback path is used during data terminal unit diagnostic routines to test the transmitter output amplifier, output transformer, receiver input transformer, and the carrier detector circuits.

### MODEM TESTS

**3.15** The DS 201D provides several test features such as digital loop-back, analog loopback,

line transfer, and facility test. Figure 27 shows how these test features apply to the circuitry. Also refer to Fig. 5 and Table B.

### A. Digital Loopback

3.16 The control inputs establish digital loopback

(Table B, state 3) by operating the receive data loop relay. This loops RD to SD and serial clock receive to serial clock transmit, external secondary clock time. Also, it opens the SD and SCTE leads at the terminal interface. An initialization pulse called GIP is allowed to pass to the transmitter to align the transmitter countdown circuitry to the same condition as the receiver countdown circuitry, thus maintaining synchronization.

3.17 The data set is processing data all the time on the SD lead except when in digital loopback.While in digital loopback, the signals on IE, SD, and SCTE leads are ignored, and serial clock transmit is phase-locked to serial clock receive.

3.18 In state 3, the line signal is 0 or -15 dBm if carrier on is high (received signal present) and is

### **Description & Maintenance – Part 1**

### ISS 2, SECTION 231-038-010



#### Fig. 5—Data Set DS 201D Showing Simplified Test Features

#### ♦TABLE B4

### CONTROL INPUTS DETERMINING STATE OF DATA SET (DS)

| CONTROL INPUTS (NOTE)           |                                      |                                 |  |  |  |
|---------------------------------|--------------------------------------|---------------------------------|--|--|--|
| ιc                              | DL                                   | AL                              | STATE OF DS  |  |  |
| 0<br>1<br>0<br>0<br>1<br>1<br>1 | 0<br>1<br>0<br>1<br>1<br>1<br>1<br>0 | 0<br>0<br>1<br>1<br>0<br>1<br>1 | <ol> <li>Normal on-line</li> <li>Line signal power off (on-line)</li> <li>DL (DS regenerator)</li> <li>AL -15 dBm nominal receive level</li> <li>AL -26 dBm low receive level</li> <li>AL -5.5 dBm high receive level</li> <li>AL -30 dBm receive level COR test</li> <li>AL line signal power off, less than -40 dBm receive level</li> </ol> |  |  |

Note:

1 = High level, 0 = Low level

LC = Line Control

DL = Digital Loop-Back

AL = Analog Loop-Back

off if carrier on is low (no received signal present). This permits the near-end data set to control the transmitted line signal from the far-end data set if the latter is in digital loopback.

### B. Analog Loopback

3.19 There are five analog loopback states (states 4 through 8 of Table B) with each state at a different simulated, received-signal power level. The receiver is not connected to either line A or line B when in any of the analog loopback states (RAL relay is operated). Once the RAL relay is operated, switching between the five analog loopback states is accomplished through the transistor-controlled attenuator. Transition from state 4 (-15 dBm) to state 8 (PWR-OFF) within 15 microseconds is effected and the

CCIS diagnostic tests the response of carrier off reliable.

**3.20** In states 4, 5, 6, and 7 (Table B), the transmitter applies the nominal 0 or -15 dBm signal (as optioned) to line A or B (as selected by line transfer) at all times. The near-end testing does disrupt transmission to the far-end data set.

### C. Line Transfer

**3.21** Refer to Fig. 27. Line A (AT1, AR1, AT, and AR) and line B (BT1, BR1, BT, and BR) represent two separate 4-wire private lines. The transmitter output and receiver input are normally connected to line B (line transfer is low). Switching to line A is accomplished by making line transfer high which

### **Description & Maintenance – Part 1**

### SECTION 231-038-010

activates the line transfer relay K3. The data set presents a balanced 600-ohm termination to both lines except when in the facility test mode. A short circuit between any pairs or a ground fault on any lead will cause no damage to the data set.

### D. Facility Test

Refer to Fig. 27. A low level on the facility test 3.22 lead causes the telephone lines to be connected to the data set and terminated in 600 ohms. A high level on facility test causes the transmitter and receiver to be disconnected from the telephone lines and causes BT1-BR1 to be connected to AT-AR relay K2 and AT1-AR1 to be connected to BT-BR relay K1. A high level on facility test with line transfer low causes the transmitter and receiver to be connected to line B and the line A receive pair to be connected through a 16-dB amplifier to the line A transmit pair. A high level on facility test with line transfer high causes the transmitter and receiver to be connected to line A and the line B receivespair to be connected through the 16-dB amplifier to the line B transmit pair. The amplifier is set for 0 dB gain in CCIS. This provides a loopback (transmit-receive) on the VFL not currently connected through to the data terminal (DTRM).

**3.23** A summary of modem internal analog and digital loopback tests and other modem tests that are directed by the processor include tests as follows:

- Tests at power levels near the upper, lower, and nominal operating range of the receiver. These tests verify adequate transmitting power levels and receiver sensitivity.
- (2) Tests are at the levels designed to check the operate and nonoperate states of the carrier failure detector circuit.
- (3) Tests the frequency of the transmit and receive clocks and the ability of the modem to maintain synchronization properly.
- (4) Tests the capability of the various modem control signals to properly control the modem.
- (5) Tests response of carrier off reliable by means of an external analog loop through the VFLA.

### MODEM MAINTENANCE

**3.24** The entire DS 201D modem is replaced as a single unit if a fault is detected. It mounts

simply with four self-contained screws from the front of the terminal unit. This concept simplifies the resolution requirements of the modem diagnostics. Modem diagnostics are coded as separate phases of the terminal diagnostics program.

### 4. TERMINAL ACCESS CONTROLLER UNIT

#### CONT PHYSICAL DESCRIPTION

4.01 The CONT unit J1A094AB is located within the basic terminal frame as shown in Fig. 4. Circuit packs are arranged in the CONT as shown in Fig. 6.

**4.02** A description of the circuit packs (CPs) is given in CD 1A443-01. Their locations and numbers were previously listed.

### CONT FUNCTIONAL DESCRIPTION

- 4.03 The CONT controls all communication between the central controls and up to 16 associated terminals. The CONT must perform the following functions on information going from the processor to the terminal unit and then to the signaling link:
  - (a) Receive instructions and data from the processor.
  - (b) Check, decode, and analyze the information.
  - (c) Select the sequence to be used.
  - (d) Communicate the information to the proper terminal.

The following functions must be performed by the CONT on information going from the terminal unit to the CONT:

- (e) Check the terminal information.
- (f) Transmit the requested terminal data to the processor.

Thus, the CONT appears as the peripheral unit to the processor.

**4.04** All communication between the processor and terminals is performed through the CONT. Therefore, duplicated CONTs are provided. Although

### **Description & Maintenance – Part 1**

|    | UNIT MTG PLA  | TE POSITION  |
|----|---|--------------|
|    | 02  | 06           |
| 14 |   |              |
| 15 |   |              |
| 16 | 3-1   | OLT          |
| 17 | CONVE   | RTERS        |
| 18 | J87   | 3892         |
| 19 |   |              |
| 20 |   |              |
| 21 | FC21  | FC21         |
| 22 | FB152   | GRPING FIELD |
| 23 | VACANT  | VACANT       |
| 24 |   |              |
| 25 |   | BLE          |
| 26 | FTF   | LDS          |
| 27 |   |              |
| 28 | $>\!$ | >            |
| 29 | FA802   | FA800        |
| 30 | FA802   | FA800        |
| 31 | FA800   | FA800        |
| 32 | FA803   | FB304        |
| 33 | FB306   | FA807        |
| 34 | VACANT  | FA808        |
| 35 | FB300   | FA819        |
| 36 | SPARE   | FA834        |
| 37 | FA835   | FB304        |
| 38 | FA842   | FB304        |
| 39 | FA841   | FB304        |
| 40 | FA836   | FB304        |
| 41 | FA836   | FB304        |
| 42 | FA836   | FB304        |
| 43 |   |              |
| 44 | FA836   | FA800        |
| 45 | FA804   | FA800        |
| 46 | GRPING FIELD  | FA800        |
| 47 | FA803   | FA800        |
| 48 | 04  |              |
| 49 | TFRMT   | NATION       |
| 50 | FIE   | LDS          |
| 51 |   |              |
| 52 | VACANT  | VACANT       |
| 53 | VACANT  | VACANT       |
| 54 | VACANT  | VACANT       |
| 55 | VACANT  | VACANT       |
| 56 | VACANT  | VACANT       |
| 57 | VACANT  | VACÁNT       |

Fig. 6—Terminal Access Controller Unit—Circuit Pack Layout

### ISS 2, SECTION 231-038-010

the CONTs are duplicated, they are operated in the simplex mode; ie, only one CONT is active at one time. No matching is performed, but two paths are provided between the peripheral unit bus system and the terminals.

4.05 Processor-CONT communications are accomplished via the central pulse distributor (CPD), the PUAB and the SCAB (Fig. 30). The processor alerts the CONT by CPD enable pulses that data is arriving over the PUAB. Enable verification signals are returned to the CPD from the CONT. The PUAB data contains the information used by the CONT to determine the job to be done. The CONT returns data to the processor over the SCAB. Each CONT contains circuits for receiving from both peripheral unit bus 0 and 1 and for driving both SCABs 0 and 1.

4.06 The CONT performs no autonomous operations. It performs a task only in response to instructions received from the No. 1 or 1A ESS processor. These instructions are coded in 7-bit operation codes that are transmitted to the CONT over the PUAB. See Table C. The opcode is transmitted to the CONT in a 20-bit instruction that contains a 9-bit address field and a 4-bit terminal number field. The opcode indicates the particular operation to be performed; the address field indicates a particular location in the terminal to be used for some terminal operations; and the terminal number dictates the terminal to be used.

4.07 The amount of information required by the CONT to perform a job varies with the different instructions. Since the PUAB handles only 24 bits, some operations require that multiple words be transmitted to the CONT. Because of this, the CPD enable must indicate to the CONT whether an instruction word contains opcode information or data. The first word is referred to as an instruction word and the second as a data word. The enable also identifies which PUAB is being used.

(a) A we-really-mean-it (WRMI) bit is also generated by the processor and passed to the CONT via the WRMI bus associated with the PUB being used. This bit is used to direct the quarantine operations of a CONT unit. A quarantined CONT is prevented from contacting any of the terminal units by inhibiting the terminal active-standby signal. The intent is to prevent a failed CONT from blocking communications with the operating

**Description & Maintenance – Part 1** 

SECTION 231-038-010

### **♦TABLE C**

### CONT SEQUENCE OPCODE ASSIGNMENTS

|    | PUAB  | BITS        |  |
|----|-------|-------------|--|
| 21 | 20 19 | 18 17 16 15 | DEFINITION                                   |
|    |       |             |  |
| 1  | 00    | 0000        | Spare  |
| 1  | 00    | 0001        | Read Data Register Bits 1-16                 |
| 1  | 00    | 0010        | Read Reply Register Bits 17-24               |
| 1  | 00    | 0011        | Spare  |
| 1  | 00    | 0100        | Read Instruction Storage Register Bits 1-16  |
| 1  | 00    | 0101        | Spare  |
| 1  | 00    | 0110        | Spare  |
| 1  | 00    | 0111        | Read Reply Register Bits 1-16                |
| 1  | 00    | 1000        | Read Error Source Register                   |
| 1  | 00    | 1001        | Read Control Register                        |
| 1  | 00    | 1010        | Read Instruction Storage Register Bits 1-16  |
| 1  | 00    | 1011        | Read False All-Seems-Well Register           |
| 1  | 00    | · 1100      | Read High Priority Signal Present Indicators |
| 1  | 00    | 1101        | Read Trouble Indicators                      |
| 1  | 00    | 1110        | Read Telephone Signal Present Indicators     |
| 1  | 00    | 1111        | Read Data Register Bits 17-24                |
| 1  | 11    | 0001        | Write Control Register                       |

CONT. Without a quarantine signal, this mode of failure can occur.

(b) The enable verify signal is returned to the CPD over the same pair of leads that carried the enable to the CPD. The enable verify is applied to these leads by a cable driver circuit. Each cable driver board has a buffer protection circuit. This protection network is used to prevent the CONT from returning multiple enable verify pulses due to a failure of the CONT. A time-out feature is also used to prevent the circuit from babbling onto the enable leads.

(c) A failure of the CONT could also cause the CONT to continuously apply data to the SCAB and interfere with other processor-peripheral communications. The protection buffer provided in the cable driver is used to prevent the CONT from babbling on the SCAB.

**4.08** Instructions are divided into terminal operations and CONT operations. A zero in the most significant bit of the 7-bit opcode specifies that the opcode is a terminal opcode. Thus, the 64 available opcodes received from the processor are allotted equally between CONT operations and terminal operations. Examples of CONT operations and CONT terminal interaction are described later in the section.

The CONT communicates with a terminal over 4.09 two terminal dedicated buses (see Fig. 7). One of these buses is the 2-way terminal data (TD) bus. The second is the 7-bit 1-way terminal opcode bus. Twenty-three bits of data plus an odd parity bit are passed from the CONT to the terminal or from the terminal to the CONT through the TD bus. A 6-bit opcode is passed from the CONT to the terminal via the terminal opcode bus. The seventh bit passed with the opcode is an even parity bit generated over the 6bit opcode. After the CONT has applied the data to the TD bus and terminal op code bus and the data has settled, the active CONT transmits a terminal enable signal over a dedicated lead to that terminal. (The active CONT is identified to the terminal through the active-standby lead.) The terminal returns a termi-

### **Description & Maintenance – Part 1**

### ISS 2, SECTION 231-038-010

nal all-seems-well (TASW) signal as a verification signal to the CONT. This verification signal informs the CONT that the terminal has completed the requested operation without error and, if required, data has been placed on the TD bus. Three other leads are part of the CONT-terminal interface and are used to represent: (1) The status of the nonpriority telephone buffer in the terminal. (2) The status of the priority buffer in the terminal. (3) Trouble status; ie, that a problem has been encountered in the terminal. CONT SEQUENCES 4.10 Processor-controller communications are accomplished via the CPD, the PUAB, and the TERMINAL DATA BUS (24 BITS) TERMINAL OPCODE BUS (7 BITS) TERMINAL ENABLE LEAD TERMINAL ACCESS ACTIVE/STANDBY LEAD CONTROLLER 0 TERMINAL ALL-SEEMS-WELL LEAD SIGNAL PRESENT LEADS TERMINAL DATA BUS (24 BITS) TERMINAL OPCODE BUS (7 BITS) TERMINAL ENABLE LEAD TERMINAL ACCESS ACTIVE/STANDBY LEAD CONTROLLER

SCAB (see Fig. 3). The CONT is alerted by a CPD-ENABLE pulse that the data is arriving over the PUAB. From this data the CONT determines the job to be done. After accomplishing the requested task, the CONT returns data to the processor over the SCAB. Each CONT contains circuits for receiving from both PUAB 0 and PUAB 1 and for driving both SCAB 0 and SCAB 1. When the CONT replies to the processor, data is returned over both answer buses simultaneously.

4.11 The CONT is slaved to the processor; ie, the CONT does not perform any operation that has not been initiated by the processor. Coded instructions are used by the processor to direct the CONT operations. These instructions are passed to the CONT over the PUAB as 24-bit words. The format of a terminal instruction (one that directs the CONT to communicate a request to a terminal) contains a 7-bit opcode that defines the task to be per-

SIGNALING TERMINAL



TERMINAL ALL-SEEMS-WELL LEAD SIGNAL PRESENT LEADS

# Common Channel Interoffice Signaling / #1A ESS Description & Maintenance – Part 1

### SECTION 231-038-010

formed, the address that specifies a particular register or memory location in the terminal to be used in the operation, and the terminal number that indicates the terminal to be used. The format of a CONT instruction (one that directs the CONT to perform an operation not involving a terminal) contains the 7-bit opcode that defines the task to be performed, and the data that contains information to be used during the task.

4.12 The CONT sequences can be classified as those executed strictly within the CONT and those involved in CONT-terminal interaction. The CONT opcodes of the first type contain a one in the most-significant-bit position and are used to read the various CONT registers (nine opcodes), CONT indicators (three opcodes), and to write the CONT control register (one opcode). The word format for all CONT read sequences is indicated in Fig. 8. The opcodes identifying CONT sequences are given in Table C.



#### Fig. 8-+CONT Word Format

The CONT write sequence (opcode 1110001) is 4.13 used to write information into the CONT control register. A single opcode transfers the contents of bits 11 through 22 of the data register into the control register. The format of the CONT write word is indicated in Fig. 9. The second type of CONT sequence uses a CONT write in conjunction with the contents of the control register. The contents of the control register (loaded by the CONT write) modifies the normal CONT sequence initiated by the terminal opcode instruction paired with the CONT write. Numerous modifications of terminal sequences are possible to test the fault recognition circuitry within the CONT. These sequences are discussed in detail in CD-1A443-01 (CONT unit circuit description).

### UNIT ALERT SEQUENCES

**4.14** The unit alert sequence is not generally listed as one of the terminal sequences but is per-



Fig. 9-CONT Write Work Format

formed each and every time the central control needs to communicate with the CONT. Central control alerts the CONT by transmitting one enable pulse from the CPD to the CONT. A common sequence of events occurs each time the CONT receives an opcode enable or a DATA enable signal. When either the opcode or data enable arrives at the CONT, the enable verify clock is started to generate the signals to generate the enable verify signal. A translation of the received enable is started to determine the bus being used and the type of information arriving on that bus. The type of enable received is recorded in either the opcode enable or the DATA enable flipflop. The indication as to the bus being used for transmission of the data is recorded in either the enable bus 0 or the enable bus 1 flip-flop. When the enable bus 0 flip-flop is set, the enable bus zero signal, which allows information to be gated into the data register from PUAB 0, is generated. Setting of the enable bus 1 flip-flop generates the enable bus one signal which allows information to be gated into the data register from PUAB 1. When data is stored in the data register, the master control clock is started to generate the timing pulses for the control sequences.

4.15 An opcode enable, which specifies that the data register will receive an instruction word, sets the opcode enable flip-flop. This flip-flop then generates the opcode enable signal. The outputs of the flip-flops that store the 7-bit opcode in the data register are wired directly to the inputs of the opcode decoder. When opcode enable is generated, the opcode is decoded.

**4.16** Each time an opcode enable is received, the opcode register is cleared and, if the opcode is a terminal instruction, the storage register gate-in signal is generated to transfer the contents of the

data register into the instruction storage register.4.17 The initialize and clear signal used to initialize all control flip-flops of the CONT is gener-

### **Description & Maintenance – Part 1**

ated when both the enable verify clock and the master control clock are idle. Thus, while the CONT is in the idle state, initialize and clear signals are continuously generated. When the received enable starts the enable verify clock, the initialize and clear signal is stopped. The termination of initialize and clear initiates the generation of a group of signals that open a path between the data register and the parity circuit so that the validity of the data received over the PUAB can be checked. The signals generated are the data-register-gate-out (NADRGO and NBDRGO), the select data A, and the parity check select . The NADRGO signal gates bits 1 through 12 of the data register, and NBDRGO gates bits 13 through 24 out of the data register. The select data A signal gates the bus data through the information select network. The parity check select-one signal is a logic one to gate the data only to the parity circuit and not to the SCAB. The output of the parity circuit is monitored to determine whether the data is valid.

4.18 After the enable has been received and the WRMI bit has been received in the data register, the enable verify protection and the babble protection signals go high to unlock the buffer protection networks on the cable drivers. This allows the enable verify signal to be returned to the CPD at the proper time, and the data can be returned to the processor over the SCAB at the end of the operation.

4.19 The parity check indicates that the data is valid, and the sequence continues according to the operation required; but, if the check indicates that the data was received in error, the sequence is terminated and the circuit returns to the initial state after the enable verify clock completes its cycle.

### A. CONT READ Sequence

**4.20** The CONT operations are either READ operations or a WRITE of the control register. Twelve opcodes are assigned to read data from the following areas:

- Bits 1 through 16 of the data register
- Bits 17 through 24 of the data register
- Bits 1 through 16 of the reply register
- Bits 17 through 24 of the reply register
- Bits 1 through 16 of the instruction storage register

#### ISS 2, SECTION 231-038-010

- Bits 17 through 24 of the instruction storage register
- Error source register
- Control register
- False all-seems-well register
- Trouble indicators
- Telephone signal present indicators
- Priority signal present indicators.

The CONT generates the same sequence for the READ of each of the 12 areas except for the particular gating signals for the terminal information network.

4.21 The opcode enable received in the CONT initiates the unit alert sequence. The unit alert sequence is independent of the opcode received; ie, the sequence is generated for both terminal and CONT opcodes. At the end of the unit alert sequence, the signals data-register-gate-out bits 1 through 12 (NADRGO) and data-register-gate-out bits 1 through 24 (NBDRGO) are terminated unless the instruction is a READ of the data register. However, before the end of the unit alert sequences, select data A (Read bit 1 through 16 of instruction storage register or data register) is terminated for all instructions.

**4.22** The signal is initiated to select the data gated through the terminal information network. Then, the all-seems-well signal is returned over the SCAB to the processor. The circuit is initialized at master clock time (MCT) 50.

### B. CONT WRITE Sequence

- 4.23 The CONT WRITE sequence is used to write information into the control register. Information to be written into the control register is received in bits 11 through 22 of the processor data register. When the enable signal is received, the unit alert sequence is executed. During master clock time 11, the contents of bits 11 through 22 of the data register are transferred to the control register.
- **4.24** During this operation, the contents of the control register are returned to the processor so

### **Description & Maintenance – Part 1**

### SECTION 231-038-010

that the operation can be verified. The gating select signal for control or error source registers is a logic one gating the contents of the control register to the information select network. The read maintenance registers signal is initiated to gate the contents of the control registers through the information select network . After the information from the data register has been written into the control register, the gateto-bus signal is generated to allow information to be gated out of the information storage register and applied to the SCAB. The all-seems-well signal is returned to the processor at clock time MCT13. Clock time MCT50 generates the initialize and clear signal to initialize the circuit.

### **TERMINAL SEQUENCES**

4.25 Terminal opcodes and any associated data are decoded by the CONT and, if necessary, buffered for latter transmission to the proper terminal when all data has been received. The CONT enables the terminal addressed in the instruction. This terminal, in turn, decodes the opcode, checks any associated data, returns a terminal all-seems-well (TASW) signal to the CONT as an acknowledgment, and performs the indicated operation. The terminal communications unit within the CONT verifies that (1) a TASW was received from the terminal that was addressed and, (2) that a TASW was not returned from any other terminal. The false all-seems-well register within the CONT records all TASW signals from unaddressed terminals. The specific actions required by the CONT for each of the six types of terminal sequences are defined in CD-1A443-01. The six types of terminal sequences are as follows:

**PUT Sequence:** Each PUT instruction directs the terminal to store data on one of the 16 linked lists which are assigned to a portion of data memory.

(2) WRITE Sequence: Three WRITE instructions are used to store information in the terminal data memory in areas other than the linked list area. Two others are used to clear or set the control register, and an additional two are used to perform no operation for verifying opcode parity check circuit operation.

- (3) GET Sequence: Each GET instruction is a request by the processor for information from one of the linked lists which are assigned to a portion of data memory.
- (4) **READ Sequence:** Two READ instructions are used to read information from the termi-

nal that is in data memory areas other than the linked lists. Another READ instruction reads the terminal control register. Two other READ instructions are no operations used to verify opcode parity check circuit operation.

(5) Maintenance WRITE: Maintenance WRITE instructions are used for the following purposes:

- (a) Clear or set the terminal unit mode register.
- (b) Clear error indicators in the terminal unit.
- (c) Initialize the terminal unit instruction address register.
- (d) Load program memory starting at the instruction address register initial address.
- (e) No operations for verifying parity checks.
- (f) Perform daily parity check as on the terminal data (TD) bus and the input/output (I/O) data parity check circuit.

(6) Maintenance READ: Maintenance READ instructions are used to determine the status of the following circuit within the terminal.

- (a) Mode register, error source register, and instruction address register.
- (b) Data memory address bus, read/write A bus, and read/write B bus.
- (c) Maintenance read instructions can also force all zeros or all ones (maintenance read ones) to be returned over the terminal data bus to the CONT.

As can be seen in Table D, all terminal opcodes have a zero in the most significant bit position of the opcode. The position of each bit on the PUAB is also given in the table.

4.26 In the following circuit operation, refer to Fig. 30 for the CONT block diagram. For a more detailed description of the circuitry, refer to CD- and SD-1A443-01.

### A. Terminal PUT Sequence

**4.27** After the processor has transmitted an opcode enable and distributed the instruction word

### **Description & Maintenance – Part 1**

ISS 2, SECTION 231-038-010

### ♦TABLE D4

#### PUAB BITS 18 17 16 15 20 19 DEFINITION Maintenance Read - Zeros Maintenance Read - Mode Register Maintenance Read - Error Source Register Maintenance Read - Data Bus Maintenance Read — Data Address Bus Maintenance Read — Spare Maintenance Read - Instruction Address Register Maintenance Read - Ones Reserved (No. 4 ESS) Read - Control Register NOP Read - Data Bits 1-24 **°** Reserved (No. 4 ESS) NOP Read - Data Bits 25-34 Spare Get List 0000 Get List 0001 Get List 0010 Get List 0011 Get List 0100 Get List 0101 Ŏ Get List 0110 Get List 0111 Get List 1000 Get List 1001 Get List 1010 Get List 1011 Get List 1100 Get List 1101 Get List 1110 Get List 1111 Put List 0000 Put List 0001 Put List 0010 Put List 0011 Put List 0100 Put List 0101 Put List 0110 Put List 0111 Put List 1000 Put List 1001 Put List 1010 Put List 1011

### TERMINAL OPCODE ASSIGNMENTS

### **Description & Maintenance – Part 1**

### SECTION 231-038-010

### ♦TABLE D♥ (Contd)

### TERMINAL OPCODE ASSIGNMENTS

|    | PUAB I | BITS        |  |  |  |
|----|--------|-------------|--|--|--|
| 21 | 20 19  | 18 17 16 15 | DEFINITION                                   |  |  |
|    |        |             |  |  |  |
| 0  | 10     | 1100        | Put List 1100                                |  |  |
| 0  | 10     | 1101        | Put List 1101                                |  |  |
| 0  | 10     | 1110        | Put List 1110                                |  |  |
| 0  | 10     | 1111        | Put List 1111                                |  |  |
| 0  | 11     | 0000        | Write — Data Bits 13-24                      |  |  |
| 0  | 11     | 0001        | Write — Set Control Register                 |  |  |
| 0  | 11     | 0010        | NOP  |  |  |
| 0  | 11     | 0011        | Write — Data Bits 1-12                       |  |  |
| 0  | 11     | 0100        | Write — Clear Control Register               |  |  |
| 0  | 11     | 0101        | NOP  |  |  |
| 0  | 11     | 0110        | Write — Data Bits 26-34                      |  |  |
| 0  | 11     | 0111        | Spare  |  |  |
| 0  | 11     | 1000        | Maintenance Write - NOP                      |  |  |
| 0  | 11     | 1001        | Maintenance Write - Set Mode Register        |  |  |
| 0  | 11     | 1010        | Maintenance Write — Clear Error Source       |  |  |
| 0  | 11     | 1011        | Maintenance Write — Load Program Memory      |  |  |
| 0  | 11     | 1100        | Maintenance Write - Clear Mode Register      |  |  |
| 0  | 11     | 1101        | Maintenance Write – Data Parity Check        |  |  |
| 0  | 11     | 1110        | Maintenance Write — Load Instruction Address |  |  |
|    |        |             | Register                                     |  |  |
| 0  | 11     | 1111        | Maintenance Write - NOP                      |  |  |

containing a terminal PUT opcode over the PUAB, the CONT completes the unit alert sequence for an opcode enable. During the unit alert sequence, the terminal PUT signal is generated by the opcode decoder. This signal, in turn, sets the terminal PUT flip-flop of the opcode register. By the end of the unit alert sequence, as much of the sequence that can be accomplished without the data has been completed. The CONT returns an all-seems-well signal to the processor over the SCAB. The all-seems-well is approximately a one-half microsecond pulse.

4.28 Upon receipt of the data enable, the CONT executes the unit alert sequence for the data enable. During the unit alert sequence, the terminal number select signal is generated when the data enable flip-flop is set. The terminal number, which is stored in bits 17 through 20 of the instruction storage register, is translated from a binary coded decimal number to a 1 out of 16 signal. The translated terminal number is combined with the terminal number

select signal to gate the contents of bits 1 through 7 (opcode) of the instruction storage register onto the terminal opcode bus for the selected terminal and to select for the specified terminal the TD bus over which data is to be transmitted and received. The parity bit generated over the opcode is an even parity bit.

4.29 Since the TD bus is a 2-way bus, a means must be provided for the CONT to gate data destined for the terminal onto the bus and to remove that data in order to receive data from that terminal. The required gating function is achieved with the release terminal data signal. This signal is initiated to place data onto the TD bus during the unit alert sequence when the data enable flip-flop is set. The generation of terminal number select, release terminal data, NADRGO, and NBDRGO, gates the contents of the data register onto the selected TD bus.

**4.30** After parity over the PUAB has been checked, the data can be removed from the parity cir-

### **Description & Maintenance – Part 1**

cuit input and the select data (read bits 1 through 16 of instruction register or data register) signal terminated.

4.31 The terminal enable is generated to alert the terminal that the opcode and data have been placed on the buses and should be in a stable state. The terminal can now decode the opcode. The terminal nal enable is transmitted to the selected terminal over the terminal enable 0 lead. The data placed on the TD bus for a PUT instruction is bits 1 through 24 of the data register. Bit 23 of the TD bus must be in the logic one state to allow the terminal to return a buffer overflow indication if the link list is full when the terminal received the PUT instruction. Since bit 23 of the data register contains the WRMI (for an operation to be performed, WRMI must equal one) this condition is fulfilled.

**4.32** The terminal decodes the opcode and places the signal unit onto the selected list. If the buffer can accept the SU, the terminal returns a TASW signal. If the buffer is full, the terminal returns a TASW over the TTASWO lead and a buffer overflow (low-going signal) on bit 23 of the TD bus.

4.33 The terminal communications network of the CONT receives the TASW from the terminal, checks to ascertain that the TASW was received from the terminal addressed and sets the valid all-seemswell flip-flop. The terminal communications network also checks that a TASW was not received from a terminal not addressed. The false all-seems-well register records all TASW from terminals not addressed and sets a bit of the error source register if a bit is set in this register.

4.34 Information arriving in the CONT over the TD bus from a terminal is deposited in the 24-bit reply register. For all terminal operations, the window to this register is opened. During the PUT sequence, the only information returned from the terminal over the TD bus is the buffer overflow when it occurs. Therefore, the information of the TD bus which is gated into the reply register is the data the CONT has transmitted to the terminal, except in bit 23.

**4.35** Data and the all-seems-well signal are presented to the processor via the SCAB. The format of this data is:

• Bits 00 through 07 of the SCAB receive Bits 24 through 17 of the reply register

### ISS 2, SECTION 231-038-010

• Bits 08 through 15 of the SCAB receive Bits 08 through 01 of the reply register.

Bits 24 through 17 of the reply register are returned so that bit 23 can be examined. The terminal enable is ended, and initialize and clear is generated to clear the control flip-flops and the data register. Clearing the data register causes the removal of data from the TD bus and termination of the active standby signal.

### B. Terminal WRITE Sequence

- 4.36 The WRITE instruction, which appears to the CONT very much like the PUT instruction, is a 2-distribute operation. The instruction word, which contains the 7-bit opcode and terminal number is distributed first. It contains the 9-bit address required by the terminal. The data consisting of 12 bits is distributed last.
- **4.37** Upon receipt of the opcode enable and the instruction word for the WRITE instruction, the CONT performs essentially the same functions performed when the opcode enable and instruction word for a PUT instruction were received. The unit alert sequence is completed. However, for this instruction, the terminal write flip-flop is set in the opcode register. The CONT returns an all-seems-well to the processor.

4.38 When the data enable is received, the CONT executes the unit alert sequence for the data enable. For the WRITE operation, the CONT must perform essentially the same tasks as for the PUT sequence. During the unit alert sequence, the terminal number select and release terminal data signals are generated. The terminal number select is combined with the translated terminal number to select and enable the proper terminal opcode code and TD buses. The opcode stored in bits 1 through 7 of the instruction storage register are transmitted to the terminal. The release terminal data opens the TD bus for data to be sent to the terminal. However, for the WRITE sequence, the CONT must construct the 24bit word to be transmitted. This word consists of the following:

- Bits 1 through 12 from Bits 1 through 12 of the data register
- Bits 13 through 21 from Bits 8 through 16 of the instruction storage register
- Bits 22 and from Bits 19 and 20 of the data register

### **Description & Maintenance – Part 1**

### SECTION 231-038-010

• Bit 24 - Generated parity

4.39 The NBDRGO signal is ended, inhibiting the gating out of bits 13 through 24 from the data register. However, bits 1 through 12 continue to be gated out of the data register by NADRGO. The stored location gate out signal is generated to gate out bits 8 through 16 of the instruction storage register (the 9-bit address) to bit locations 13 through 21 of the TD bus. Bits 19 and 20 of the data register are gated to bits 22 and 23 of the TD for a WRITE operation. The odd parity bit over 23 bits of information is gated to bit 24 of the TD bus.

4.40 The terminal enable is generated to alert the terminal that the opcode and data are on the buses and should be in a stable state. The CONT opens the circuit to the reply register. The terminal decodes the opcode, checks and stores the data in the proper location specified by the 9-bit address, and returns a TASW to the CONT. The CONT checks the TASW and sets the valid all-seems-well flip-flop which starts the secondary clock. The contents of the reply register are applied to the parity check circuitry. This action places bits 1 through 16 of the reply register on the SCAB. The CONT checks to ascertain that the terminal returned a TASW and that no erroneous TASWs were returned and that no error was incurred in the transfer of information between the terminal and CONT. During the WRITE sequence, the data loaded into the reply register is the data transmitted to the terminal by the CONT. The CONT returns an all-seems-well to the processor over the SCAB. The terminal enable is removed. The initialize and clear signal is generated to clear the control flipflops and the data register. This action removes the active standby signal.

### C. Terminal GET Sequence

**4.41** In order to perform the GET operation, the CONT requires only the opcode and the terminal number. Therefore, only the instruction word is required to be distributed to the CONT.

4.42 The CONT receives the opcode enable and initiates the unit alert sequence. During the unit alert sequence for the GET instruction, the terminal GET signal is generated. The signal selects the required control signals for the GET sequence.

**4.43** As soon as the opcode is decoded, the NRTN signal is generated to be combined with the

translated terminal number to select the particular terminal opcode and TD buses. The opcode is gated to the terminal. For the GET operation, no data need be transmitted to the terminal over the TD bus. Therefore, release terminal data is not generated during the GET sequence. The terminal enable signal is generated to inform the terminal that the opcode is on the bus.

4.44 The CONT generates the gate reply register

signal to open the reply register to receive the information from the terminal. The terminal decodes the opcode, obtains the required data from the link list, places the information on the TD bus and returns a TASW over the TTASW0 lead to the CONT. When the TASW is received in the CONT, the CONT checks the validity of the TASW and sets the valid all-seems-well flip-flop starting the secondary clock. The data placed on the TD bus by the terminal is stored in the reply register.

4.45 Upon receipt of the TASW, the contents of the reply register are gated through the information storage register to the parity check circuit. This action places bits 1 through 16 of the reply register onto the SCAB. (The data is placed on the SCAB because NGPS0 is a logic 0.) This check, which determines whether an error has been incurred during a transfer of the data from the terminal to the CONT, is made at secondary clock time 03. If the data has been transferred without error, the terminal enable is removed immediately.

4.46 The terminal monitors the enable to determine whether the transfer was valid. If the enable is removed within 400 nanoseconds of the time the terminal returned the TASW to the CONT, the transfer is assumed valid. The terminal then updates the link list information. If an error is detected, the terminal enable is generated until master clock time (MCT) 49. The terminal determines that an error was detected and does not update the list information so that the processor can again request the data. If no error has occurred, the CONT returns an all seems well to the processor at MCT43.

4.47 The receipt of the all-seems-well by the pro-

cessor is a verification that the data placed on the bus earlier is valid. The initialize and clear signal is generated to initialize the circuit. In order that the remaining half of the word be obtained from the CONT, the processor uses the CONT opcode called read reply register bits 17 through 24. Thus, a GET

# Common Channel Interoffice Signaling / #1A ESS Description & Maintenance – Part 1

opcode must be followed by the CONT opcode for reading bits 17 through 24 of the reply register.

### D. Terminal READ Sequence

4.48 As with the GET operation, the CONT requires only the information word for the READ operation. When the CONT receives the opcode enable, the unit alert sequence is initiated. As soon as the opcode is decoded, the release terminal select and release terminal data signals are generated. The release terminal data signal is generated for this sequence because the 9-bit address must be transmitted to the terminal over the TD bus. The release terminal select signal is combined with the translated terminal number to select and gate data onto the terminal opcode and TD bus for the selected terminal. The opcode plus generated parity are transmitted to the terminal over the terminal opcode bus. For this sequence, the NADRGO and NBDRGO are terminated during the unit alert sequence. The stored location gate-out signal is generated to gate the 9-bit address from the instruction storage register onto the selected TD bus. A summary of the data transmitted to the terminal over the TD bus during the READ sequence is:

- Bits 1 through 12 All zeros
- Bits 13 through 21 Bits 8 through 16 of the instruction storage register
- Bits 22 through 23 1,1
- Bit 24 Generated odd parity

**4.49** The parity bit transmitted over the TD bus is , odd parity calculated over the 9-bit address. The terminal enable is then transmitted to the terminal and the gating circuit is opened for data from the TD bus to be received in the reply register.

4.50 The terminal returns 23 bits of data plus an odd parity bit when the data memory is read. The terminal places the data on the TD bus and returns the terminal all-seems-well simultaneously. Receiving this signal, the CONT checks the validity of the signal and sets the valid all-seems-well flip-flop. This action starts the secondary clock and terminates the release terminal data signal. Removing this signal terminates the gating of data onto the TD bus by the CONT, and the data placed on the TD bus by the terminal is forced into the reply register. The

#### ISS 2, SECTION 231-038-010

contents of the reply register are gated through the information select network to the parity circuit. Bits 1 through 16 of the reply register are gated to the SCAB. Then the parity is checked to determine whether or not a failure occurred in the transfer of data from the terminal to the CONT. If no error occurred, the CONT returns an all-seems-well to the processor. The terminal enable is removed and an initialize and clear is generated to clear the control flipflops and the data register. The CONT is again initialized. As with the GET instruction, this instruction must be followed by a READ reply register bits 17 through 24 in order for the processor to obtain the full word.

#### E. Maintenance WRITE Sequence

4.51 The mode register can be set or cleared with the maintenance write set mode register and maintenance write clear mode register operation, respectively. The TD bus data is used as a mask to select individual mode register bits. Only those register bits corresponding to ones on the bus are modified on a given operation. The maintenance write clear error source register operation clears all the error indicators in the error source register, including I/O buffer overflow. The TD bus data is ignored on this operation.

4.52 The maintenance write load instruction address register operation is used to initialize the instruction address register for the program loading or execution. This operation will be executed only if terminal stop mode register bit 4 is set. If not, an all-seems-well failure occurs and no change is made to the instruction address register. This register can be loaded directly or indirectly depending on the state of MR bit 13 (load instruction address register direct). If this bit is a one, maintenance write load instruction address register will cause the TD bus bits 1 through 11 to be loaded into the instruction address register. If the bit is zero, the contents of the program memory at the current address in the instruction address register is loaded into the register.

4.53 The terminal program memory is loaded using the maintenance write load program memory instruction. When executed, TD bus bits 1 through 12 are loaded into program memory at the current address in the instruction address register; then, the register is incremented to the next sequential address. An address is not supplied with the maintenance write load program memory operation.

### **Description & Maintenance – Part 1**

### SECTION 231-038-010

Program memory is loaded sequentially, one location at a time from any starting address by first using a maintenance write load instruction address register operation followed by a series of maintenance write load program memory operations. As with maintenance write load instruction address register, this operation is executed only when terminal stop is set.

4.54 The maintenance write N0 and N7 operations are no operation instructions and are used to verify the opcode leads and the opcode parity check circuit. The TD bus data is ignored. The maintenance write data parity check instruction is similar to a no operation but requires a valid parity on the TD bus. It is used to exercise the TD bus and I/O data parity check circuit.

### F. Maintenance READ ONES Sequence

4.55 The CONT performs the same sequence for all READ instructions except one. This operation is called the maintenance READ ONES. The CONT must decode the four least significant bits of the opcode to determine when this instruction is received.

4.56 The sequence for this READ operation is iden-

tical to the sequence for other READ operations except that the release terminal data signal is not generated. For the maintenance READ ONES operation, the terminal requires that the contents of the TD bus be all ones. If release terminal data is not generated, the CONT cannot gate information onto the TD bus. Thus, the leads of the TD bus are all high. The terminal should return all ones on the TD bus to the CONT. The CONT, in turn, returns all ones to the processor. This instruction must also be followed by read reply register bits 17 through 24. Refer to Table E for a listing of controller and terminal register, bus and word sizes.

### 5. DATA TERMINAL UNIT

### TERMINAL UNIT PHYSICAL DESCRIPTION

5.01 The data terminal units J1A094AC are located within the basic and supplementary terminal frames as shown in Fig. 4 and 26. The arrangement of the circuit packs which comprise the terminal unit are shown in Fig. 10. The number, quantity, and name of the circuit packs required along with the functional schematic section of SD-1A444-01 which pertains to the CPs are given in this figure.

#### TERMINAL UNIT FUNCTIONAL DESCRIPTION

5.02 The terminal unit is a small, high-speed, stored program processor that has simple but specialized order structure. The basic features of the terminal unit are:

- Independent program and data memories.
- An 11-bit instruction word.
- A 560-nanosecond instruction cycle time.
- A 2032-word (maximum) program memory.
- A 23-bit data word.
- A 400-nanosecond data access time.
- A 512-word (maximum) data memory.
- Dynamically allocated, wired logic SU buffers.
- Masked insertion, rotation, and increment logic function.
- High self-checking capabilities (utilizing an internal exercise program).
- Program memory controls the internal operations of the terminal unit. Data memory provides buffering for signaling unit traffic.

A block diagram of the CCIS terminal is given in Fig. 31.

5.03 The functions performed by the terminal unit are controlled by an internal stored program and include all operations related to the 2-way synchronous signaling link. Excess real-time capacity is used by a self-test exercise program which serves as the primary fault detection mechanism in the terminal unit. Processing of the transmitted and received SUs in the primary function performed by the terminal unit; therefore, these tasks are given priority over the self-test exercise routines.

5.04 Although the processing of SUs is the prime function of the terminal unit, it normally occupies the terminal for approximately 10 percent of the time. The terminal unit autonomously conducts the self-check exercises for the remainder of the real-

Page 26

ŝ

AT&T PRACTICE Standard

.

Ť

AT&T 231-032-025 Issue 2, July 1984

### **REMOTE TRUNK TEST UNIT**

### DESCRIPTION

### 1 AND 1A "ESS" SWITCHES

|    | CONTENTS                                  | PAGE           | CONTENTS                     | PAGE |
|----|---|----------------|------------------------------|------|
| 1. | GENERAL                                   | . 2            | A. 101-Type Calls            | . 10 |
| 2. | EQUIPMENT DESCRIPTION                     | . 4            | B. 105-Type Test Line Ports  | . 11 |
|    | CONTROL, ACCESS, AND MEASUREMEN           | т <sub>5</sub> | 4. RTTU COMMAND FUNCTIONS    | . 11 |
|    |   | . 5            | ADMINISTRATIVE COMMANDS      | . 11 |
|    |   | . 5            | RESOURCE COLLECTING COMMANDS | . 11 |
|    |   |                | CIRCUIT ACCESSING COMMANDS   | . 11 |
|    |   | . 5            | OFFICE TESTS                 | . 12 |
| 3  |   | . 5            | A. Administrative Commands   | . 12 |
| 0. |   | . 5            | B. Trunk State               | . 12 |
|    |   | . 9            | C. E&M Leads Test            | . 12 |
|    | A. RTTU Port                              | . 9            | D. Circuit Release Command   | . 12 |
|    | B. Local Terminal Port                    | . 9            | 5. TEST CAPABILITIES         | . 12 |
|    | C. CAROT/ROTL Port                        | . 9            | TRANSMISSION TESTS           | . 12 |
|    | D. Control Port Security Classes          | . 9            | E&M LEADS MONITOR TESTS      | . 12 |
|    | OUTGOING ACCESS PORT CIRCUITS             | . 9            | SUPERVISORY AND WINK TESTS   | . 12 |
|    | A. Trunk                                  | . 9            | DIAL PULSE TESTS             | . 13 |
|    | B. Line                                   | . 9            | MULTIMETER TESTS             | . 13 |
|    | C. Connection Appraisal (CA) and Security | y              | LINE TESTS                   | . 13 |
|    | Callback                                  | . 10           | DIAGNOSTIC SELF TESTS        | . 14 |
|    | INCOMING ACCESS PORT CIRCUITS             | . 10           |                              | . 14 |
| *т | rademark of AT&T Technologies             |                | 6. REFERENCES                | . 15 |

AT&T TECHNOLOGIES, INC. - PROPRIETARY

Printed in U.S.A.

### AT&T 231-032-025

|            | CONTENTS   | PAGE      |
|------------|--|-----------|
| Figures    | i .  |           |
| 1.         | RTTU and CTTU System Block Diagram               | . 4       |
| <b>2</b> . | RTTU Frame                                       | . 6       |
| 3.         | RTTU Functional Block Diagram                    | . 8       |
| 4.         | RTTU ESS Switch Interface                        | . 10      |
| Tables     |  |           |
| <b>A</b> . | 1 And 1A ESS Switches Remote Trunk Tes<br>Units  | st<br>. 3 |
| В.         | Control, Access, and Measurement Circui<br>Packs | it<br>. 7 |
| <b>C</b> . | Transmission Tests                               | . 13      |
| D.         | Multimeter Measurement Characteristics           | . 14      |
|            |  |           |

### 1. GENERAL

1.01 This practice describes the remote trunk test unit (RTTU) (SD-1P173-01) as used with 1 and 1A ESS switches. The RTTU is an integral part of a remote trunk testing system which provides trunk and line and limited switch testing capabilities under control of the Switching Control Center (SCC).

1.02 This practice is reissued to provide information which was not available for issue 1.

1.03 The RTTU provides a facility to both remove and return trunks to service and to test trunks and service circuits. The test repertory includes multimeter tests (voltage, resistance, and capacitance), signaling tests, and transmission tests (loss, noise, gainslope, and balance or return loss). It also provides 105 test lines and remote office test line (ROTL) equivalent testing capabilities. In addition, for 1E7/ 1AE7 and later generic programs it provides the same line testing capabilities as provided by the trunk and line test panel (TLTP). The RTTU is controlled by a central trunk test unit (CTTU) located at an SCC and is compatible with centralized automatic

Page 2

reporting on trunks (CAROT). The CTTU provides the normal craftsperson interface to the system.

1.04 The RTTU may be located up to 400 cable feet from the 2-wire network junctor grouping

frame. There is no change in function when the HILO 4-wire option is used. To determine this option and other options available to the RTTU, refer to Table A.

1.05 The CTTU is an intelligent terminal. It contains a processor for overall control, a cathode ray tube (CRT) display, a keyboard, a mass storage device, a local printer, and the input/output capabilities necessary to communicate with RTTUs and operations support systems (OS). An optional switch permits use of the keyboard and CRT as a terminal of the Switching Control Center System (SCCS) computer.

1.06 Figure 1 displays a block diagram of the RTTU and CTTU. The CTTU normally resides in an SCC where it forms the basis of a trunk work station. The CTTU accesses and controls the RTTU over a dialed-up data link. In addition to the data link, there is a talk and monitor path between a CALL DIRECTOR® telephone at the trunk work station (TWS) and the RTTU over which the craftsperson can listen to the trunk under test (TUT) and talk to other craft personnel. The CTTU is capable of dialing up other OSs such as Trunks Integrated Record Keeping System (TIRKS) and CAROT, using a 202-type data set.

- **1.07** The following abbreviations are used in this practice:
- ASCII American Standard Code for Information Interchange
- B&B Build-out and Blocking
- CA Connection Appraisal
- CAM Control, Access, and Measurement Unit
- CAROT Centralized Automatic Reporting On Trunks
- CPD Central Pulse Distributor

ISS 2, AT&T 231-032-025

### ♦TABLE A4

| OPERATION   | REQUIRED<br>FEATURE<br>GROUPS | GENERIC<br>ISSUE<br>AVAILABILITY        | FUNCTIONALLY<br>EQUIVALENT<br>TEST<br>PANEL | SUPERVISORY<br>MASTER SCAN<br>POINTS | BIPOLAR<br>CPD<br>POINTS | SIGNAL<br>DISTRIBUTOR<br>POINTS |
|---|-------------------------------|---|---|--------------------------------------|--------------------------|---------------------------------|
| Equipped for<br>2-wire trunks<br>testing  | 9SMTTP                        | 1E(B5) 6<br>and<br>later                | 2-Wire<br>MTTP                              | 29                                   | 10                       | 42                              |
| Equipped for<br>2-wire and/or<br>HILO 4-wire<br>operation                               |                               | or<br>1AE (C5B5) 5<br>and<br>later      | 4-Wire<br>MTTP                              | 42                                   |                          |                                 |
| Equipped for<br>2-wire operation<br>including line<br>testing*                          | 9SMTTP<br>and<br>9SR2C2       | 1E(B7) 7<br>and<br>later<br>1AE(C7B7) 7 | 2-Wire<br>MTTP with<br>line testing         | 46                                   | 10                       | 49*                             |
| Equipped for<br>2-wire and/or<br>HILO 4-wire<br>operation<br>including<br>line testing* |                               | and<br>later                            | 4-Wire<br>MTTP with<br>line testing         |                                      |                          |                                 |

1 AND 1A ESS SWITCHES REMOTE TRUNK TEST UNITS

\* Line testing is an option and requires 7 additional SD points making a total of 49.

| CPU    | Central Processor Unit                       | LAT  | Line Access Trunk          |
|--------|--|------|----------------------------|
| CRT    | Cathode Ray Tube                             | MF   | Multifrequency             |
| CTTU   | Central Trunk Test Unit                      | MTT  | Master Test Trunk          |
| DC/0GT | Direct Current/Outgoing Trunk<br>Test Module | MTTP | Manual Trunk Test Position |
|        |  | OIM  | Office Interface Module    |
| DTL    | Dual Test Line                               | OS   | Operations Support System  |
| EIA    | Electronic Industries Association            | PPS  | Pulses Per Second          |
| EMI    | Electromagnetic Interference                 | RAM  | Random Access Memory       |
| FSK    | Frequency Shift Keying                       | ROM  | Read Only Memory           |
| HILO   | High-Low                                     | ROTL | Remote Office Test Line    |

٧

### AT&T 231-032-025



### Fig. 1—RTTU and CTTU System Block Diagram

| RTTU  | Remote Trunk Test Unit                        | TNN  | Trunk Network Number |  |
|-------|---|--|----------------------|--|
| SCC   | Switching Control Center                      | TST  | Test Panel           |  |
| SCCS  | Switching Control Center System               | TUT  | Trunk Under Test     |  |
| T&M   | Talk and Monitor Module                       | TWS  | Trunk Work Station.  |  |
| TAT   | Test Access Trunk                             | 2. EQUIPMENT   | DESCRIPTION          |  |
| TGN   | Trunk Group Number                            | <b>2.01</b> The RTTU (Fig. 2) occupies a standard one- |                      |  |
| TIRKS | Trunks Integrated Record Keep-<br>ing Systems | blies:   |                      |  |
| TL    | Test Line                                     | • Control, access, and measurement (CAM) unit          |                      |  |
| TLP   | Transmission Level Point                      | • Line Test  | Panel                |  |
| TLTP  | Trunk and Line Test Panel                     | • Data Set   | Mounting Shelf       |  |

- Terminal Strip Unit
- Control Unit
- Power Circuit
- Fuse Panel.

### CONTROL, ACCESS, AND MEASUREMENT CIRCUIT

2.02 The CAM unit contains all of the frame electronics for measurements, access, and communications. It consists of 24 cards for the 2-wire application, and 31 cards for the HILO application. Two cards may be added for the 2-wire dual test line (DTL) module and up to four may be added for the high-low (HILO) application DTL. These cards are mounted on three shelves. Table B provides a complete list of CAM circuit packs. Each card measures 8 inches by 10 inches and terminates in a 200-pin connector.

2.03 In order to add new modules to the frame, the RTTU data bus must be wired to the module, and a transmission pair must be wired to the B switch card. The master central processor unit (CPU) control program must also be upgraded. Power is provided at all card slots—filled or empty. No wiring changes are needed to add the optional DTLs.

2.04 Space and power exist within the frame for up to four shelves of circuit packs in the CAM unit. The backplane of each shelf is designed to provide power and a ground plane to prevent electromagnetic interference (EMI) radiation from the unit.

### LINE TEST CIRCUIT

2.05 The line test unit contains the logic necessary to provide coin collect, ringing, cutoff release, and access for performing voltmeter tests. It is located beneath the data set shelves.

#### DATA SET SHELF

2.06 The data set houses the 212AR data set for the primary control port. If other data sets are to be used, they will be mounted on this shelf. The ac power is furnished for the data sets on this shelf. The CAM circuit connectors P1, P2, and P3 terminate at this shelf for connection to data sets or to the local frame maintenance terminal.

### ISS 2, AT&T 231-032-025

### TERMINAL STRIP UNIT

**2.07** Most frame or ESS switch connections and strap options appear on this connector located at the top of the RTTU.

### POWER CIRCUIT

2.08 Power is supplied to the RTTU from a power distributing frame via connectors located in the upper rear of the frame. Power is cabled from the connectors through hollow frame uprights down to the filters located in the base of the frame. The frame has one -48 volt and one +24 volt feeder cable. Filter inputs are connected to the fuse blocks located on the lowest mounting plate. The ac power leads are fused at the miscellaneous power frame.

#### 3. FUNCTIONAL DESCRIPTION

### **MODULE FUNCTIONS**

3.01 Overall frame control of the RTTU is provided by the master CPU module (Fig. 3). Communication and control are provided over a 21-lead digital bus that links all other modules to the master module. The master provides a 212 data set access for CTTU. A maintenance terminal port is provided for local access and control at the frame. The connector, CAM circuit connector P3, for this access appears at the data set shelf.

3.02 Switch access control is provided by the office interface module (OIM). This module interfaces to the switch via scan, distribute, and central pulse distributor (CPD) points. Three transmission access connections are provided on the test access trunks (TATs)—TAT1, TAT2, and TAT3—associated with the RTTU. The module also controls the line test circuit which terminates a line access trunk (LAT). The HILO frame options add two 4-wire TATs and one 2-wire TAT. The connection appraisal and security callback line control and a terminal monitor connection are also provided.

3.03 The terminal monitor connection sends ESS switch messages from the ESS switch to the

RTTU. The RTTU will receive and forward the messages to the CTTU. The CTTU will display these messages on the CTTU screen. The information contained in these ESS switch messages include:

• Trunk-in/out-of-service state

### AT&T 231-032-025



Fig. 2—RTTU Frame

#### ISS 2, AT&T 231-032-025

| TABLE B<br>CONTROL, ACCESS, AND MEASUREMENT<br>CIRCUIT PACKS |                          |     |  |  |
|--|--------------------------|-----|--|--|
|  |                          |     |  |  |
| UPPER  | Talk and Monitor         | 1   |  |  |
|  | Memory A, B, C           | 3   |  |  |
|  | Master CPU               | 1   |  |  |
|  | Office Interface         | 6-7 |  |  |
| MIDDLE   | DC/OGT                   | 2   |  |  |
|  | Switches                 | 4   |  |  |
|  | Test Line Interface 5-6* | 2   |  |  |
|  | Test Line Interface 7-8* | 2   |  |  |
|  | Build-out & Blocking     | 3   |  |  |
| LOWER  | Responder                | 4   |  |  |
|  | Switches                 | 0-4 |  |  |
|  | Test Line Interface 3-4  | 2   |  |  |
|  | Test Line Interface 1-2  | 2   |  |  |
|  | Build-out & Blocking*    | 0-3 |  |  |

\* Optional

• Task order output

• Trunk troubles.

**3.04** The talk and monitor (T&M) module provides callback and voice communications for incoming and outgoing testing purposes.

3.05 Two terminating 105 test line (TL) interfaces

are furnished by the first standard DTL module. Additional DTL modules are optional.  $\Phi$ Existing 105 test lines cannot be used with RTTU 105-type test lines as they use the same route index. When these 105 test lines are added to an ESS switch which already has conventional 105 test lines, the conventional test line must be removed. The new 105-type test lines are then put in the same trunk group as the original test lines. The second port of the standard DTL module can be switch optioned to provide a multifrequency (MF) ROTL control port. A frame connector option strap is also required. The ROTL control port will normally be desired in ESS switches not equipped with a stand-alone ROTL to permit CAROT control of the frame.  $\blacklozenge$  When the ROTL feature is desired, then testline 2 must have its own seven-digit access number in a one member trunk group ad must not be part of any 105-type testline trunk group.

**3.06** There are two measurement modules in the RTTU frame. The responder provides both manual (camp-on) and automatic transmission test

#### AT&T 231-032-025



### Fig. 3—RTTU Functional Block Diagram

capabilities. The direct current/outgoing trunk test (DC/OGT) circuit provides multimeter, signaling, and pulsing test functions.

3.07 The build-out and blocking (B&B) modules provide resistive build-out, drop build-out, and dc blocking for transmission access from the interface modules. Additional A and B switches are furnished with the HILO feature.

**3.08** The A and B switches provide the internal transmission connection from the interface modules to the measurement modules.

### CONTROL PORTS

### A. RTTU Port

**3.09** The primary port into the RTTU is known as the CTTU port. It uses a 1200 baud, 212AR type data set. The protocol used is BX.25 level 2.

3.10 The RTTU/CTTU command language consists of strings of American Standard Code for Information Interchange (ASCII) commands. These strings may be transmitted as a single buffer or a block of data. The RTTU is capable of simultaneously conducting several tests. The communication between RTTU and CTTU is organized by the use of a job number that the RTTU assigns to each test. Initial commands use the new job symbol (\*\*) in the initial transmission. All responses from the RTTU will contain the assigned number. After the job is initiated, a new job may be started by using the \*\* job number in a new transmission.

### B. Local Terminal Port

3.11 A local terminal port is provided for frame maintenance purposes at the RTTU (Fig. 4). This port electrically provides an Electronic Industries Association (EIA) RS232C connector wired as a data communication equipment appearance. The local terminal port accepts 300 or 1200 baud asynchronous ASCII characters generated by a terminal. A special editor provided by this port allows up to ten command strings to be entered and executed. The local terminal port also provides basic control of the RTTU, and it will accept the RTTU/CTTU command language for frame maintenance purposes. The local terminal port is not intended to be an efficient manmachine interface, and it should not be used for routine or demand tests.

### C. CAROT/ROTL Port

**3.12** An optional MF ROTL-like port can be installed at the RTTU. Operations via this port will take approximately 6 seconds longer per test code than the RTTU input with its high speed ASCII data interface. One of the standard 105 test line accesses must be converted to provide this function.

#### D. Control Port Security Classes

**3.13** The RTTU access to the ESS switch provides all of the capabilities that the test panel in the

#### ISS 2, AT&T 231-032-025

ESS switch provides. Four levels of security are used by the RTTU to provide security and restricted test access to remote users like the CTTU and CAROT. The four security classes are class A (Primary CTTU), class B (Secondary CTTU), class C (CAROT), and class D (Login). Upon login, the lowest level of security (class D) is assigned. No maintenance busy or service busy restoral functions may be performed until a higher security level has been granted. Security qualification is satisfied when a user requests a security callback to control. Upon request, the RTTU will speed dial the security callback number. After the RTTU detects ringing, it will request control to arm the callback port. Control must then answer and transmit the unlock tone. The RTTU will grant the desired security level when the unlock tone is received.

**3.14** The talk and monitor functions have implicit security because a separate speed dial code is assigned to the talk and monitor line. Only the primary CTTU (and in some instances the secondary CTTU) should have speed dial codes assigned.

3.15 The CAROT system is qualified to make trunks busy up to the automatic maintenance limit for the ESS switch. The secondary CTTU is able to busy out up to ten trunks per session for maintenance test purposes only. The primary CTTU is able to busy out or restore trunks to service without explicit limit. Messages are returned when the automatic maintenance limit for the trunk group has been exceeded.

### OUTGOING ACCESS PORT CIRCUITS

### A. Trunk

- 3.16 Three 2-wire transmission interfaces are provided as test access trunks (TAT1, TAT2, and TAT3) associated with the RTTU. Three 4-wire HILO TATs are provided for HILO testing (Fig. 4). The master test trunk (MTT) (SD-1A192 for 2-wire or SD-1A367 for HILO 4-wire) is used to obtain access to the trunk to be tested. Incoming calls directed to the RTTU are initially connected to the MTT before being transferred to a TAT.
- B. Line
- 3.17 In a 1/1A ESS switch with 1E7/1AE7 generic, line tests can be made using the line access trunk (LAT)(SD-1A176).
### AT&T 231-032-025



Fig. 4—RTTU ESS Switch Interface

### C. Connection Appraisal (CA) and Security Callback

3.18 An outgoing line appearance is provided for CA testing. Transmission tests to 100, 102, 105 test lines may be made for network evaluation of transmission. The RTTU uses this line to dial a TL and make tests.

3.19 The CA port doubles as the security callback port for the RTTU and, for this reason, the CA port is required for all RTTUs regardless of the class of switch they serve. Security-line access must be provided when maintenance busy or restoral functions are performed. The proper security unlock tone must be received from control before the maintenance state of a trunk or trunk group may be altered.

### INCOMING ACCESS PORT CIRCUITS

### A. 101-Type Calls

3.20 Incoming calls, after being initially answered at the MTT, can be transferred to TAT1, TAT2, or TAT3. Upon receipt of a 101-type call, the RTTU answers by returning off-hook supervision on the MTT. At the same time, the unit will originate a call to the SCC CTTU CALL DIRECTOR telephone and allow the caller to speak with the SCC craftsperson. If the CTTU is already connected to the RTTU and the T&M path is in use, a message is sent to the CTTU informing the craftsperson that a call has arrived. The CTTU craftsperson then has 2 minutes to connect the T&M path to the incoming call before the port is returned to idle (on-hook). Prior to returning idle, five bursts of test progress tone are sent to the caller to indicate that no craftsperson assistance is available at the SCC.

### B. 105-Type Test Line Ports

**3.21** The RTTU provides up to six 105-type test ports in 2-wire only 1 and 1A switches, up to four in HILO only offices and eight in combined 2-wire HILO switches. **4** One incoming, 2-wire TL port can be arranged to provide the ROTL-like MF control access to RTTU. The 105 TL supports all normal 52A responder test capabilities. See paragraph 3.22 for possible test port configurations.

**3.22** The following TL arrangements are possible:

- (a) 2-Wire Only Installations
  - (1) Test lines (1,2) arranged as 105-type test lines
  - (2) Test lines (1,2,5,6) arranged as 105-type test lines
  - (3) Test lines (1,2,5,6,7,8) arranged as 105-type test lines

(4) Test lines (1,5,6,7,8) arranged as 105-type test lines when test line (2) is arranged to provide the ROTL port

(5) Test line (1) arranged as 105-type test lines when test line (2) is arranged to provide the ROTL port

- (6) Test lines (1,5,6) arranged as 105-type test lines when test line (2) is arranged to provide the ROTL port
- (b) For HILO Only Installations
  - (1) Test lines (1,2) arranged as 105-type test lines
  - (2) Test lines (1,2,3,4) arranged as 105-type test lines
  - (3) Test lines (1,3,4) arranged as 105-type test lines when test line (2) is arranged to provide 2-wire ROTL port
  - (4) Test line (1) arranged as 105-type test line when test line (2) is arranged to provide 2wire ROTL port

(c) For 2-Wire/HILO Combined Installations

#### ISS 2, AT&T 231-032-025

- (1) Test lnes (1,2) arranged as 105-type test lines
- (2) Test lines (1,2,3,4) arranged as 105-type test lines
- (3) Test lines (1,3,4) arranged as 105-type test lines when test line (2) is arranged to provide 2-wire ROTL port
- (4) Test line (1) arranged as 105-type test line when test line (2) is arranged to provide 2wire ROTL port
- (5) Test lines (5,6) arranged as 105-type test lines
- (6) Test lines (5,6,7,8) arranged as 105-type test lines.

### 4. RTTU COMMAND FUNCTIONS

### ADMINISTRATIVE COMMANDS

**4.01** The administrative commands provide login/ logoff capability, invoke the security callback process, and display the status of the interface ports as well as the measurement modules. The administrative commands are also used to take terminating transmission ports out of service for maintenance or return them to service.

### **RESOURCE COLLECTING COMMANDS**

**4.02** These commands cause the RTTU to collect all of the resources needed to perform a test. The measurement module, talk and monitor, test mode, impedance, and transmission level point (TLP) are specified at this time. The test mode specifies the nature of the test which may be transmission, multimeter, signaling, balance, order wire, or monitor mode. Order wire is a basic talk mode without intent to make tests. The resources associated with a seized trunk may be changed using special commands.

### CIRCUIT ACCESSING COMMANDS

4.03 The circuit accessing command causes the switching machine to access either a trunk, line, junctor, or connection appraisal line. Trunk group tests may also be specified at this time. The circuit identification code [trunk network number (TNN), group number, or directory number] specifies

### AT&T 231-032-025

the specific trunk, group, or line to be accessed. The far-end test line is also specified so that the proper call disposition analysis may be made. Allowable TL types are 100, 102, 105, and manual test board (101).

4.04 The initial state of the trunk is specified upon

seizure. It may be changed later by issuing a trunk state command. Allowable states include tandem, local talk, bypass, pulsing (with or without E&M leads loop), and signaling tests (with or without E&M leads loop). The call may be monitored if successful far-end call disposition occurred. If desired, unsuccessful far-end call dispositions may be monitored by the CTTU operator. Calls to manual test positions always involve a talk path. A traffic busy trunk may be monitored for purposes of busy state verification if it appears to be permanently busy.

### OFFICE TESTS

### A. Administrative Commands

4.05 The administrative commands allow for trunk maintenance state changes, scan point control and display, the ability to cause the position to appear busy to potential incoming manual (Code 101) test calls, and the ability to disable defective 105 TL ports. Distribute points and register display characters may be monitored for a specified length of time or number of changes.

### B. Trunk State

4.06 All trunk states that are recognized by the switch may be selected. These include tandem I and II, local talk, bypass, signaling, and pulsing states.

### C. E&M Leads Test

4.07 The TATs may be used to set up E&M lead trunks for supervision testing. The DC/OGT then may be used to operate and monitor E&M leads toward the facility. The trunk may be returned to service for an in-service monitor of E&M leads.

### D. Circuit Release Command

4.08 The circuit release command causes a circuit to be released in a specified maintenance state or in its original state (idle, locked out, or disabled).All RTTU frame resources assigned to the test are normally released at this time.

### 5. TEST CAPABILITIES

### TRANSMISSION TESTS

5.01 Transmission tests are made by the responder module within the RTTU. Two categories of

tests that can be made are manual or automatic TL type tests. Self checks can be made for each measurement. These tests are listed in Table C. Manual (camp on) test commands may be either transmit or measure (or both as in the case of the Return Loss Tests). Manual tests may be made on either outgoing or incoming trunks. Automatic outgoing tests (CAROT responder type) may be made to 100, 102, or 105 TLs. Automatic incoming tests are done as a 105 TL would make them. Commands are received as MF digits when either ROTL-like outgoing tests using the portto-CAROT or when 105 TL incoming tests are to be made. In those cases, results are reported as timed frequency shift keying (FSK) signals. When accessed by the RTTU control port, the commands and results are ASCII character strings.

### **E&M LEADS MONITOR TESTS**

5.02 An E&M leads monitor of in-service trunks may be performed using the RTTU. The E&M leads are sampled every 200 ms and time-stamped on- or off-hook changes are reported to the CTTU.

### SUPERVISORY AND WINK TESTS

5.03 Supervisory tests are permitted only under the control of the CTTU. Manual control of outgoing supervision allows for forced on- or off-hook supervision as either the originating or terminating end of the trunk. The types of trunk supervision that may be used are: high-low, reverse battery (normal polarization), reverse battery (reverse polarization), and reverse high-low or E&M leads.

5.04 Incoming supervision may also be monitored. The RTTU returns a time-stamped message

indicating the change of state of the trunk. Time accuracy is  $\pm 5$  ms. The range is from 0 to 99.990 ms. Wink tests indicate the timing of wink response. Accuracy is  $\pm 1$  ms of the reported time. Measurements are collected for 15 seconds prior to displaying the results.

ISS 2, AT&T 231-032-025

### TABLE C

### TRANSMISSION TESTS

| TEST                     | FREQ   | TRANSMIT<br>LEVEL | RECEIVE<br>RANGE | ACCURACY             |
|--------------------------|--------|-------------------|------------------|----------------------|
| Signal Power (Level)     | 1004   | 0 dBm0            | +2 to -15.8 dBm  | ±0.1 dB              |
| Gainslope Low            | 404    | -16 dBm0          | –14 to –36.8 dBm | ±0.2 dB              |
| Gainslope Medium         | 1004   | -16 dBm0          | –14 to –36.8 dBm | $\pm 0.2 \ dB$       |
| Gainslope High           | 2804   | -16 dBm0          | –14 to –36.8 dBm | $\pm 0.2 \text{ dB}$ |
| C Message Noise          | 0.3kHz | Quiet             | 15 to 55 dBRNC   | $\pm 1.0 \ dB$       |
| C Notch Noise            | 1004   | -16 dBm0          | 34 to 74 dBRNC   | $\pm 1.0 \text{ dB}$ |
| Singing Return Loss      | _      | *                 | 0 to 40 dB       | $\pm 1.0 \ dB$       |
| Echo Return Loss         | -      | *                 | 0 to 40 dB       | $\pm 1.0 \ dB$       |
| Singing Return Loss High | _      | *                 | 0 to 40 dB       | ±1.0 dB              |

\* -15 to -16.5 dBm0 for 2-wire and -16.5 dBm0 for 4-wire

### **DIAL PULSE TESTS**

5.05 The RTTU is capable of either sending or measuring dial pulse test signals. The transmitted signal may be a specified number or a continuous stream of pulses. The percent break (30 percent o 90 percent) and speed of pulsing (8 to 12 pulses per second) may be specified. Accuracy is 0.1 pulses per second (PPS), and 2.5 units or 1/2 percent on percent break, whichever is greater. Four types of signaling may be specified: start dial, delay dial, wink, and immediate start. Four test conditions can be used: leak-D1, leak-0, short loop, and long loop battery and ground. The response to the measurement request includes percent break only. Speed is not reported.

### **MULTIMETER TESTS**

5.06 Multimeter tests are done by the DC/OGT module. These tests are all for metallic access loop trunks or lines. The measurements include ac, dc, resistance, and capacitance. All readings may be taken R-T, R-G, T-G (where T indicates tip, R indicates ring, and G indicates ground). In the multimeter mode, a quasi-continuous display of readings will be generated until the RTTU is commanded to stop. A voltage analysis test can be requested that will generate T-R, T-G, and R-G voltage readings for ac and dc. If the voltage readings are low enough, then three resistance readings will also be made. Table D lists multimeter measurement characteristics.

### LINE TESTS

5.07 Line tests can be made in ESS switches with the 1E7/1AE7 and later generics. All transmission and multimeter tests can be performed on lines. Special line tests can be made to coin stations and station line circuits. Coin tests include coin collect and release (±130 Vdc). Ringing capabilities include loop, ring party, and tip party. Cutoff release

### AT&T 231-032-025

### TABLE D

### MULTIMETER MEASUREMENT CHARACTERISTICS

| TEST        | FORMAT                        | RANGE       | ACCURACY*        | RESTRICTIONS                               |
|-------------|-------------------------------|-------------|------------------|--|
| DC          | Signed Volts                  | 0-200V      | 1V or 2%         | 120 Vac MAX                                |
| AC          | Volts                         | 0-150V      | 2V or 5%         | 100 Vdc MAX                                |
| Resistance  | Three Digits<br>Plus Exponent | 0-999 Kohms | 25 ohms<br>or 5% | 5 Vac or<br>5 Vdc MAX                      |
| Capacitance | x.yz Microfarads              | 0-5 µF†     | 0.01 μF<br>or 2% | 10 Vac, 2 Vdc MAX<br>and 50 kohms Minimum‡ |

\* Accuracy is determined by whichever number is the larger.

† The measurement accuracy depends on the nature of shunt resistance and voltage present.

Shunt Resistance 4% at 500 Kohms, 2% at 52 Kohms

DC Voltage 2 volts dc: 31% at 110 Kohms shunt, 60% at 51 Kohms shunt.

AC Voltage 1% at 2 volts peak-to-peak, 5% at 10 volts peak-to-peak

‡ The capacitance test will not be made if either the shunt resistance is less than 50 Kohms, or the dc voltage exceeds 2 volts, or the ac voltage exceeds 10 volts.

tests and ground-start signaling tests may also be made.

### DIAGNOSTIC SELF TESTS

5.08 The RTTU consists of a number of access and measurement modules. Diagnostic tests are provided for each module in the form of operational and analog measurement tests. Operational tests include CPU, read only memory, (ROM) and random access memory (RAM) tests, as well as per module circuit tests. Analog tests involve continuity and tone tests done within modules and between modules on the transmission and dc bus within the RTTU. Interface diagnostics provide for exercising all scan and distribute points, as well as transmission interfaces to the ESS switch.

### TALK AND MONITOR

5.09 For outgoing trunk tests, the talk and monitor function can be started when the test resources have been collected. The RTTU frame will call the CTTU CALL DIRECTOR telephone using a 1- or 2-digit speed dial code to either the primary or secondary CTTU. Security is provided by use of the speed dial code on callback.

5.10 On incoming calls, the talk and monitor func-

tion is needed for communication with the CTTU operator. When the incoming call arrives, the RTTU initiates a call to the trunk work station (TWS). If the T&M circuit is already in use, a message indicating that a call is waiting is sent to the CTTU. The CTTU operator may then connect the talk and monitor path to converse with the caller. If a transfer command is not received within 2 minutes, the call is terminated.

5.11 Special commands are provided to switch between several jobs or buses within the unit.
For local, on-site work at the frame, a speaker and volume control are provided. Special commands must be entered to enable the speaker. Access to the internal RTTU buses is provided by jacks on the front plate of the module.

### ISS 2, AT&T 231-032-025

| 6. REFERENC             | ES  | 6.02 AT&T p | practices to be used for reference are:  |
|-------------------------|---|-------------|--|
| 6.01 Operati<br>be used | on System Deliverable Documents to for reference are:   | 190-130-200 | SCC/SCCS Centralized Trunk<br>Operations, Switching Control<br>Centers, Operations Systems   |
| OPG-1P032               | Operations Support Systems—<br>Central Trunk Test Unit (CTTU)<br>and Remote Trunk Test Unit<br>(RTTU)—System Index                      | 190-130-203 | 1 and 1A ESS Switches Remote<br>Trunk and Line Test Procedures<br>using Remote Trunk Test Inter-<br>face (DS-1A485-01) Switching                 |
| OPD-1P033-01            | Operations Support Systems—<br>Central Trunk Test Unit (CTTU)<br>and Remote Trunk Test Unit<br>(RTTU—Overall System Descrip-<br>tion)   | 231-090-219 | Center Operations Systems<br>Remote Office Test Line (ROTL)<br>and Processor Controlled Interro-<br>gator (PCI) Feature-1 and 1A<br>ESS Switches |
| OPD-1P034-01            | Operations Support Systems—<br>Remote Trunk Test Unit (RTTU)<br>Feature—System Description—1  | 231-032-025 | Remote Trunk Test Unit Description $-1$ and 1A ESS Switches  |
|                         | and 1A ESS Switch, 1 and 1A ESS<br>Switch HILO, and 2 and 2B ESS  | 231-090-366 | HILO 4-Wire Switching Feature  |
| ODD 1 0005 01           | Switch  | 231-090-099 | Code 105-Type Test Line Feature<br>— 1 and 1A ESS Switches   |
| OPP-1P035-01            | operation Support System—Cen-<br>tral Trunk Test Unit (CTTU) and<br>Remote Trunk Test Unit<br>(RTTU)—Performance Test Re-<br>quirements | 231-032-000 | Remote Office Test Line (ROTL)<br>Description — 1 and 1A ESS<br>Switches   |
| OPO-1P036-01            | Operation Support Systems—Cen-<br>tral Trunk Test Unit (CTTU) and   | 231-055-008 | Remote Office Test Line $-1$ and 1A ESS Switches   |
|                         | Remote Trunk Test Unit<br>(RTTU)—System Operations<br>Guide   | 231-049-305 | Remote Trunk Test Unit—<br>Growth—1 and 1A ESS Switches  |
| OPM-1P037-01            | Operation Support Systems—Cen-<br>tral Trunk Test Unit (CTTU) and<br>Remote Trunk Test Unit (RTTU—                                      | 231-049-306 | Remote Trunk Test Unit—<br>Build-Out—1 and 1A ESS<br>Switches  |
|                         | RTTU/CTTU Overall System<br>Maintenance and Tests   | 231-190-405 | Interface with Switching Control<br>Center System—ESS Switches   |
| OPM-1P039-01            | Operation Support System—Re-<br>mote Trunk Test Unit (RTTU) for   | 231-390-405 | Interface with Switching Control<br>Center System-1A ESS Switch  |
|                         | 1A ESS Switches HILO—Trouble<br>Locating Procedures   | 824-101-118 | RTTU Equipment Design Re-<br>quirements  |
| 824-101-124             | CTTU Equipment Design Require-<br>ments   | 865-205-100 | RTTU/CTTU Engineering Imple-<br>mentation Methods System.  |
|                         |   |             |  |

.

 $\overline{\phantom{a}}$ 

Page 15 15 Pages

42

ł

## Nortel DMS-100 Test Desk Trunk Group Type

## Test Desk Trunk Group Type

In a DMS-100 end office, incoming and outgoing trunk group type TD connects with a test desk (for example, #14 Local Test Desk [LTD], #3 Local Test Cabinet [LTC]). Members of these trunk groups have Product Engineering Codes (PEC) of NT2X90AB or NT2X90AD.

If the dialed number is busy, the trunk is connected automatically to the line through Metallic Test Access (MTA).

Line Equipment Numbers (LEN) that do not have associated directory numbers (for example, multi-line hunt group members) can be addressed by 11 + LEN for testing purposes.

For example, if a trunk group with field VERSION equal to "MLT" or "TSTDK" is connected to a line that has option Plug–Up (PLP), Random Make Busy (RMB), Requested Suspension (RSUS), or Suspended Service (SUS) activated, and a test desk is connected in idle bridge mode to that line. the line will go to treatment Test Desk Bridged (TDBR) in treatment subtable LNT (Line Treatment), if one of the following conditions occur:

- The test desk closes its tip-and-ring loop.
- The line goes off-hook.

Trunk group type TD can, under certain circumstances, be used for verification. Refer to table TRKGRP, type VR for more information.

## Datafill

The following table lists the datafill for table TRKGRP, type TD.

| Field Descriptions - Test Desk |          |   |   |  |
|--------------------------------|----------|---|---|--|
| Field                          | Subfield | Entry                                   | Explanation and Action  |  |
| GRPKEY                         |          | See Subfield                            | <i>Group Key</i><br>This field consists of subfield CLLI.   |  |
|                                | CLLI     | Alphanumeric<br>(1 to 16<br>characters) | <i>Common Language Location Identifier</i><br>Enter the Common Language Location Identifier<br>(CLLI) name assigned to the trunk group in<br>table CLLI.                                  |  |
| GRPINFC                        | )        | See Subfields                           | Variable Group Information<br>This field consists of subfields GRPTYP, TRAFSNO,<br>PADGRP, NCCLS, TRAFCLS, SELSEQ, TRKDIR, PRTNM,<br>SCRNCL, SNPA, ORIGSCRE, VDEVAR, TDTYPE, and<br>BARGE |  |
|                                | GRPTYP   | TD                                      | <i>Group Type</i><br>Enter "TD" to specify the incoming and outgoing<br>test desk trunk group type.   |  |
|                                | TRAFSNO  | Numeric<br>(0 to 127)                   | Traffic Separation Number<br>Enter the incoming and outgoing traffic separation<br>number assigned to the trunk group. If it is not<br>required, enter "0" (zero).                        |  |

\_\_\_\_\_

43

|         |  | If switching unit has feature package NTX085AA<br>(Traffic Separation Peg Count), enter a number<br>between 1 and the value of office parameter<br>TFAN_IN_MAX_NUMBER in table OFCENG.  |
|---------|--|---|
|         |  | For switching units without feature package NTX085AA, enter 1 to 15.  |
|         |  | Incoming and outgoing traffic separation<br>numbers 1 to 9 should be reserved for<br>generic traffic separation numbers.<br>Refer to the description of table TFANINT<br>(Traffic Separation Intersection) for<br>additional information. |
| PADGRP  | Alphanumeric<br>(1 to 5<br>characters)   | <i>Pad Group</i><br>Enter the name of the pad group assigned to<br>the trunk group in table PADDATA.  |
|         |  | Refer to the description of table PADDATA (Pad Data) for additional information.  |
| NCCLS   | NCBN, NCID,<br>NCIM, NCIT,<br>NCLT, NCOF,<br>NCON, NCOT,<br>NCRT, NCTC,<br>or NOSC | Operational Measurements No-Circuit Class<br>Enter the Operational Measurements (OM)<br>No-Circuit Class (NCCLS) to indicate which<br>OM register is incremented if treatment<br>Generalized No-Circuit (GNCT) occurs.                    |
|         |  | If the trunk group direction is incoming,<br>this field is not required. Enter "NCRT"<br>(No-Circuit).  |
|         |  | The initial value for this trunk group type is "NCRT".  |
|         |  | For more information, refer to table TRKGRP<br>and the <i>Operational Measurements Reference</i><br><i>Manual</i> .   |
| TRAFCLS | Alphabetic<br>(2 characters)   | <i>Traffic Usage Class</i><br>Enter the traffic usage class assigned to the trunk<br>group.   |
| SELSEQ  | MIDL, CWCTH,<br>CCWCTH, ASEQ,<br>or DSEQ   | Select Sequence<br>If the trunk group direction is incoming,<br>sequential selection does not apply. Enter "MIDL".  |
|         |  | If the trunk group is outgoing and feature package<br>NTX244AB (Enhanced Sequential Trunk Hunting) is<br>present, base the selection order on the order of<br>the trunks in table TRKMEM, and enter:                                      |
|         |  | * CWCTH or CCWCTH for clockwise or<br>counter-clockwise circular trunk hunting<br>from the most recently released trunk in<br>the trunk group, if the far-end is CCWCTH<br>or CWCTH respectively, or:                                     |
|         |  | * ASEQ or DSEQ for ascending or descending<br>sequential selection, if far-end is DSEQ or<br>ASEQ respectively.   |

|          |  | Note: A trunk group trunk selection method cannot<br>be changed. If a change in the selection<br>method is required, a new trunk group must<br>be created with the required trunk selection<br>method. The individual trunks with the old<br>selection sequence must be deleted from the<br>old trunk group and then added to the new<br>trunk group. For an existing trunk group,<br>the selection sequence may be changed to ASEQ<br>from DSEQ or from DSEQ to ASEQ if all the<br>trunk members are Installation Busy (INB) or<br>Unequipped (UNEQ). |
|----------|--|--|
| TRKDIR   | IC or OG   | Trunk Direction<br>Enter "IC" to specify that the direction of traffic<br>flow is incoming or "OG" to specify that the<br>direction of traffic flow is outgoing.   |
|          |  | is set to "Y", all trunks in the group must be busy<br>before the value of this field can be changed by<br>Data Modification Order (DMO).  |
| PRTNM    | Alphanumeric<br>(1 to 4<br>characters) or<br>NPRT  | Standard Pre-Translator Name<br>If the trunk group is incoming, enter the name<br>of the standard pre-translator defined in table<br>STDPRTCT to which translation is to route on<br>receipt of the first incoming digit. If the trunk<br>group is outgoing, enter "NPRT".   |
|          |  | If office parameter TRK_OOS_CHK_ON in table OFCVAR<br>is set to "Y", all trunks in the group must be busy<br>before the value of this field can be changed by<br>DMO.  |
| SCRNCL   | Alphanumeric<br>(1 to 32<br>characters)<br>or NSCR | Class-of-Service Screening Table Name<br>If class-of-service screening is required, enter<br>the name of the class-of-service screening<br>table (datafilled in table SCRNCLAS) to which<br>digit translation routes.  |
|          |  | If class-of-service screening is not required,<br>enter "NSCR" (no screening).   |
|          |  | If the trunk group is outgoing, enter "NSCR".  |
| SNPA     | Numeric<br>(3 digits)                              | Serving Numbering Plan Area<br>Enter the code in table HNPACODE to which<br>translation routes for digit translation.  |
|          |  | If the trunk group is outgoing, enter "000".   |
| ORIGSRCE | LCL or NLCL  | Originating Source<br>If the trunk group is incoming, enter the<br>originating source of the call, Local (LCL)<br>or Non-Local (NLCL). This field is used to<br>screen calls in subtable HNPACONT.HNPACODE.  |
|          |  | If the trunk group is outgoing, enter "LCL".   |
| VDEVAR   | See Subfield                                       | <i>Variable Digit Data</i><br>This field consists of subfield VDESEL.  |

| VDESEL   | Y or N                   | Variable Digit Selector<br>If the number of incoming digits is variable,<br>enter "Y" and datafill refinements DIGSIN1<br>and DIGSIN2. If the number of incoming digits<br>is a fixed quantity, enter "N".   |
|----------|--------------------------|--|
| DIGSIN1  | Numeric<br>(1 to 18)     | Minimum Number of Incoming Digits<br>If the entry in subfield VDESEL is "Y", enter<br>the minimum number of incoming digits received<br>on the trunk group.  |
|          |                          | Entries outside the range indicated for this field are not valid.  |
|          |                          | If office parameter TRK_OOS_CHK_ON in table OFCVAR<br>is set to "Y", all trunks in the group must be busy<br>before the value of this field can be changed by<br>DMO.  |
| DIGSIN2  | Numeric<br>(1 to 18)     | Maximum Number of Incoming Digits<br>If the entry in subfield VDESEL is "Y", enter the<br>maximum number of incoming digits received on the<br>trunk group.  |
|          |                          | Entries outside the range indicated for this field are not valid.  |
|          |                          | If office parameter TRK_OOS_CHK_ON in table OFCVAR<br>is set to "Y", all trunks in the group must be busy<br>before the value of this field can be changed by<br>DMO.  |
| DIGREGEN | Numeric<br>(1 to 4) or N | Digits to be Regenerate<br>If the entry in subfield VDESEL is "N", enter the<br>digit string to be prefixed to the incoming digits<br>to regenerate a seven-digit number. The length of<br>the digit string entered is subtracted from seven<br>by the switch to determine the number of incoming<br>digits to expect. |
|          |                          | The regenerated number is then translated in table STDPRTCT.STDPRT or HNPACONT.HNPACODE, or both.  |
|          |                          | For example, if the entry is "73", the switch expects five incoming digits "XXXXX" and regenerates the number "73XXXXX".   |
|          |                          | If no digits are to be prefixed, enter "N".<br>The switch then expects seven incoming digits.  |
|          |                          | If office parameter TRK_OOS_CHK_ON in table OFCVAR<br>is set to "Y", all trunks in the group must be busy<br>before the value of this field can be changed by<br>DMO.  |
| TDTYP    | See Subfields            | <i>Test Desk Type</i><br>This field consists of subfield VERSION and<br>refinements.   |
| VERSION  | MLT or TSTDK             | <i>Version</i><br>If the incoming trunk group and switch has an<br>interface for a mechanized loop tester, enter<br>"MLT" and datafill refinement DGTTST.  |

|           |        |                                 | If the incoming trunk group and switch has an interface for signaling #14 LTD, enter "TSTDK" and datafill refinements DGTTST and TKTYP.   |
|-----------|--------|---------------------------------|---|
|           |        |                                 | The default value for TD trunks is "TSTDSK".  |
| D         | OGTTST | EXTRCVR or<br>INTRCVR           | Digit Test<br>If the value in field VERSION is "MLT" or "TSTDK",<br>datafill this field to specify whether an internal<br>or an external receiver is used in the NT2X90AB or<br>NT2X90AD test trunk for the digit test. For an<br>internal receiver, enter "INTRCVR". For an<br>external receiver, enter "EXTRCVR". |
|           |        |                                 | The default value is "INTRCVR".   |
| Τ         | TKTYP  | REGULAR,<br>NOTEST, or<br>blank | <i>Trunk Type</i><br>If the value in field VERSION is "TSTDK", datafill<br>this field.  |
|           |        |                                 | Enter "REGULAR" for regular trunks or "NOTEST" for no-test trunks.  |
| В         | BARGE  | Y or N                          | <i>Barge</i><br>Datafill this field to specify whether barging<br>into an existing call is allowed.   |
|           |        |                                 | If barging is allowed, enter "Y". Otherwise, enter "N".   |
|           |        |                                 | The default value for this subfield is "N".   |
| <br>-End- |        |                                 |   |

## Datafill Example

The following example MAP display shows sample datafill for table TRKGRP, type TD. This example shows datafill for an incoming trunk group with an AT&T Mechanized Loop Tester, an incoming trunk group with a signaling #14 LTD, and an outgoing trunk group.

| GRPKEY       | GRPINFO   |
|--------------|---|
| OTWAON23T051 | TD 15 ELO NCOT TK MIDL IC INC3 NSCR 613 NLCL N 72 MLT EXTRCVR N \$            |
| OTWAON23T052 | TD 17 ELO NCOT TK MIDL IC INC3 NSCR 613 NLCL N 72 TSTDK INTRCVR NOTEST N $\$$ |
| OTWAON23T050 | TD 16 ELO NCOT TK MIDL OG NPRT NSCR 000 LCL N N N \$                          |

# Nortel DMS-100 No Double Connect Option

## **Description**

The No Double Connect (NDC) option prevents a line from being connected to a verification or test circuit when the line is off-hook.

## Example

The following is an example of the NDC option. This example adds the option to existing individual line 666–1337.

```
Example of the NDC Option in the SERVORD Prompt Mode
                                     _____
_____
CI:
>SERVORD
SO:
>ADO
SONUMBER: NOW 98 2 7 PM
>
DN OR LEN:
>6661337
OPTION:
>NDC
OPTION:
>$
COMMAND AS ENTERED:
ADO NOW 98 2 7 PM 6661337 NDC $
ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT
>Y
```

Example of the NDC Option in the SERVORD No-Prompt Mode

\_\_\_\_\_

CI: >SERVORD SO: >ADO \$ 6661337 NDC \$ COMMAND AS ENTERED: ADO NOW 98 2 7 PM 6661337 NDC \$ ENTER Y TO CONFIRM, N TO REJECT, OR E TO EDIT >Y

\_\_\_\_\_

\_\_\_\_\_

## Prompts

The system prompts for the NDC option appear in the following table:

| Input Prompts | for the NDC Option   |  |
|---------------|--|--|
| Prompt        | Valid Input  | Explanation  |
| SONUMBER      | An entry in the format:                                      | Service Order Identifier<br>The unique number of the service order to  |
|               | abnnnnnc yy mm dd {AM} {PM}                                  | be entered. Date the service order is to be processed.   |
|               | Where:   |  |
|               | <pre>* a = Obligatory Alphabetical<br/>Character (A-Z)</pre> |  |
|               | <pre>* b = Optional Alphabetical<br/>Character (A-Z)</pre>   |  |
|               | <pre>* nnnnn = 5 Obligatory Numerical<br/>Characters</pre>   |  |
|               | <pre>* c = Optional Alphabetical<br/>Character (A-Z)</pre>   |  |
|               | * yy = Year (00-99)  |  |
|               | * mm = Month (1-12)  |  |
|               | * dd = Day (1-31)  |  |
| DN_OR_LEN     | Seven or ten digits.   | Directory Number or LEN of the Line<br>For MLH/DLH hunt members, if the user<br>specifies a DN, the system prompts for the<br>LEN. If the user enters the LEN, the syster<br>does not prompt for the DN. |
| OPTION        | NDC  | No Double Connect<br>Service options the user establishes,<br>modifies, or deletes. The user can specify<br>a maximum of 20 options in each ADD, ADO,<br>EST, or NEW command.                            |

-End-

## NDC to Line Class Code Compatibility

The following table shows NDC to Line Class Code (LCC) compatibility.

| Compatible? |
|-------------|
| Yes         |
| Yes         |
| Yes         |
| No          |
| Yes         |
| Yes         |
| Yes         |
| Yes         |
|             |

## Assigning NDC

The following functionalities apply to the NDC option:

- Set functionality applies.
- Subset functionality does not apply.
- DN functionality does not apply.
- Key functionality does not apply.

### <u>Notes</u>

When a data unit line is created, the system adds the NDC option to the line. The NDC option suppresses tests that can disrupt a data call. The NDC option also prevents the communication of important information to users that are not authorized. The system ignores the flashes and blocks Three–Way Calling (3WC) attempts when option 3WC is assigned to a 500/2500–type set.

# **Device for Detecting GPS Receivers**

## <u>Overview</u>

It is possible to detect some GPS receivers by the electromagnetic radiation they emit. GPS L1 receivers all generate a pseudo-random digital "noise" source at a chiprate of 1.023 MHz. These pseudo-random digital signals are then used to correlate against the data received from a GPS satellite's transmitted Coarse Acquisition (CA) data stream at 1575.42 MHz. By searching for any unintentional radiation of the receiver's 1.023 MHz digital noise signal (or its harmonics) you can pin-point the general location of an operating GPS receiver. By verifing that you "hear" a data stream at 1.023 MHz, 2.046 MHz, 3.069 MHz, etc. you can be sure that you've found a GPS receiver.

All you need to do this is a cheap AM radio receiver. One with the fancy PLL tuning will be useful, though. Tune the AM radio to approximately 1.023 MHz and pass it over an operating GPS receiver. You should hear a distinct, high–pitched digital "whine." That is, if you are not receiving any nearby AM radio broadcasts, which can be a problem. This receiving method will work best indoors or inside a shielded metal or concrete enclosure, which reduces the chance of external RF interference.

If you wish to get fancy, you can replace the Intermediate Frequency (IF) filter on the AM radio with one which has a much narrower bandwidth. This will help to eliminate any interference and reduce false signals. The *ARRL Handbook for Radio Amateurs* will cover the designing and building of suitable crystal IF filters. You could also try using a high–end shortwave receiver fed with a tuned ferrite stick or loop antenna.

## <u>Uses</u>

This tool should be handy during a TSCM sweep to determine if a hidden GPS receiver is being used to track someone or their vehicle. Here are a few other uses for this particular device:

1.) Islamic terrorists wishing to blend in with the general population will usually dress as women, complete with the burqa. If you happen to be patrolling an area, and a "woman" passes you who is radiating a strong digital noise signal at 1.023 MHz, you can be sure they are using a GPS receiver to monitor their progress back to their safe house in France.

2.) When child molesters are released from prison, they are often monitored via a GPS tracking bracelet. Thanks to brain-dead liberals, these sickos will only spend a few months in jail and, when finally released, they'll promptly rape and murder little kids all over again. You can fight back! If some weird looking 46 year old man who still hangs around teenaged boys shows up at your New York \$2600 meeting, and he is radiating a strong digital noise signal at 1.023 MHz, shoot the fucker!

## Signal Strength Meter Option

A visual signal strength meter can be a quite handy addition. It is made by directly tapping the speaker output from the AM radio and rectifying it with a common 1N4001 diode. The resulting DC voltage "pulses" are then used to drive a small analog meter movement, which can be salvaged from an old stereo receiver or CB radio system.

# Device for Detecting GPS Receivers S-Meter Option



## Pictures & Construction



AM radio used for this project.

It is a General Electric Model No. 7–2650A, FCC ID: AEX9YD7–2650. Get ahold of a bunch of different AM radios and try to choose one whose internal PC board will fit snuggly inside a piece of PVC pipe. Be sure the ferrite rod antenna is in a *horizontal* position (with respect to your body) when holding it.



Internal view of the AM radio. It can be powered from either a 9 volt battery or 120 VAC. Be sure to note any speaker, volume, tuning, or antenna wiring when you take it apart.



Picture of the AM radio's main PC board. You'll need to note the incoming +9 VDC line (the red & black wires) and the speaker wires (orange & yellow). The volume control potentiometer will also need to be unsoldered (or replaced, in this case) and mounted to the GPS Receiver Detector's handle assembly.

The ferrite antenna's main pick–up lobe will be *horizontal* to its axis. There will be sharp nulls on both ends. This can be useful for "nulling" any external RF interference.



Solder side view of the AM radio's main PC board. Be sure to tune the AM radio to approximately 1.023 MHz before construction. Remove the plastic tuning wheel and add a dab of hot–melt glue to the capacitor's tuning post (red circle) to prevent the received frequency from drifting.



Some of the PVC parts used to make the GPS Receiver Detector. From the top left-side, a 3-inch diameter PVC cap, a 4-inch long piece of 3-inch diameter PVC pipe, next to that is a 6-inch long piece of 2-inch diameter PVC pipe, which will be the handle. Below that is a 3-inch to 2-inch PVC reducer/coupler. On the right-side, from the top, is some weatherstrip caulking cord, a 2-inch diameter PVC threaded male adapter and a "clean-out" thingy. Below that is a 2-inch PVC cap. Finally, the AM radio receiver board and speaker.



Put it all together so it looks something like this. The AM radio will be mounted in the left-hand section, with the ferrite antenna just behind the PVC cap.



The AM radio's speaker should be mounted inside the 3-inch to 2-inch PVC reducer. You'll need to file the reducer so there is space for the control wires to pass through. You may also need to trim some metal from around the speaker. A "nibbler" tool will do this easily and without damaging the speaker's cone.



Mount the speaker inside the 3-inch to 2-inch PVC reducer like so, using the weatherstrip caulking cord to hold it in place.



Fit the 3-inch and 2-inch diameter pieces of PVC like so. Line the 3-inch diameter piece with art foam. This will be used to "hold" the AM radio. It is probably a good idea to spray in the inside of the PVC pipe with some sort of metallic or ferrite EMI spray.



Fit the AM radio's receiver board like so. Make sure the ferrite antenna goes into the space created by the 3–inch PVC cap.



Add a 9 volt battery holder clip inside the PVC handle.



Internal view. It should look something like this. Note the large wire bundle on the left. This will go underneath the speaker and into the PVC handle.

The wire bundle consists of the wires for the volume potentiometer, +9 VDC (via an on/off switch), ground, and an additional speaker output which will be used to drive a signal strength meter.



Rear view of the handle assembly showing the threaded adapter and cap. The new 10 kohm volume potentiometer has an attached on/off switch to control the radio's +9 VDC. The additional speaker tap is brought out to a 1/8-inch mono jack.



Pretty it all up. Note: Also makes a good tool to beat Emmanuel Goldstein over the head with.



Parts for making a visual signal strength meter. Shown are two 1.5–inch diameter PVC caps, an analog strength meter from an old stereo system, and a 1/8–inch mono jack.

You'll need to make or buy a small 1/8–inch to 1/8–inch patch cord to connect to the signal strength meter.



Completed signal strength meter. Mount it behind one of the PVC caps. Secure the meter into position with some epoxy. A small ferrite bead was added to the rectifier board's input.

The signal strength meter reading will be relative.

To adjust it, first turn on the GPS Receiver Detector and adjust the volume control until it reads around "2" on the signal strength meter. Bring it near an operating GPS receiver. The speaker should emit a high-pitched "whine." Adjust the 50 kohm potentiometer on the rectifier board so the meter reads full scale. Move the GPS Receiver Detector away from the operating GPS receiver and verify the signal drops back down to around "2". Once the meter is set, you can leave it. You'll have to tune the volume knob back to the same position if you wish to utilize the meter, though.





Overviews of the completed signal strength meter. The analog meter is shown on the left, the input to the rectifier board is on the right.



/FOR

## WFADI SECURITY SIGNON/SIGNOFF SCREEN

TO SIGNON: ENTER THE SIGNON NAME AND PASSWORD, THEN PRESS THE "ENTER" KEY. TO SIGNOFF: ENTER A "Y" IN THE SIGNOFF FIELD, THEN PRESS THE "ENTER" KEY.

SIGNON: piedb

PASSWORD: PIEDB

SIGNOFF:

EFFECTIVE ZONE NAME:

NOTICE - EXCEPT AS MAY OTHERWISE BE PERMITTED, IN WRITING, BY BELL COMMUNICATIONS RESEARCH INC. (BELLCORE) ACCESS TO THIS SOFTWARE IS LIMITED TO ONLY BELLCORE AUTHORIZED LICENSEES AND SUBLICENSEES. COPYRIGHT 1990 BELLCORE- ALL RIGHTS RESERVED. SEC000I SIGNON SUCCESSFUL.

# End of Issue #30



Any Questions?

## **Editorial and Rants**

Proof all Mexicans are savages and need to be killed.

## **Crossers Burying Border in Garbage**

July 30, 2006 - From: www.azstarnet.com

By Tony Davis

After three years of cleanups, the federal government has achieved no better than a 1 percent solution for the problem of trash left in Southern Arizona by illegal border–crossers.

Cleanup crews from various agencies, volunteer groups and the Tohono O'odham Nation hauled about 250,000 pounds of trash from thousands of acres of federal, state and private land across Southern Arizona in 2002 to 2005, says the U.S. Bureau of Land Management.

But that's only a fraction of the nearly 25 million pounds of trash thought to be out there.

Authorities estimate the 3.2 million–plus entrants caught by the Border Patrol dropped that much garbage in the Southern Arizona desert from July 1999 through June 2005. The figure assumes that each illegal entrant discards 8 pounds of trash, the weight of some abandoned backpacks found in the desert.

The trash is piling up faster than it can be cleaned up. Considering that the Border Patrol apprehended more than 577,000 entrants in 2004–05 alone, the BLM figures that those people left almost 4 million pounds of trash in that same year.

That's 16 times what was picked up in three years. And that doesn't include the unknown amounts of garbage left by border–crossers who don't get caught.

## **Diverse Trash Found All Over**

"We're keeping up with the trash only in certain locations, in areas that we've hit as many as three times," said Shela McFarlin, BLM's special assistant for international programs.

The trash includes water bottles, sweaters, jeans, razors, soap, medications, food, ropes, batteries, cell phones, radios, homemade weapons and human waste.

It has been found in large quantities as high as Miller Peak, towering more than 9,400 feet in the Huachuca Mountains, as well as in low desert such as Organ Pipe National Monument and Cabeza Prieta National Wildlife Refuge.

It's even started turning up in smaller amounts in hiking areas closer to Tucson, such as Josephine Saddle in the Santa Rita Mountains on the route to Mount Wrightson, says the Southern Arizona Hiking Club.

"In the Huachucas, you are almost wading through empty gallon water jugs," said Steve Singkofer, the Hiking Club's president. "There's literally thousands of water jugs, clothes, shoes. You could send 1,000 people out there and they could each pick up a dozen water jugs, and they couldn't get it all."

## **Cleanup Not Cheap, Easy**

While nobody has an exact cost estimate for removing all the garbage, it's clearly not cheap. But McFarlin agrees with several advocacy groups that without a tightening of controls on illegal immigration, a guest–worker program or other reform of federal border policy, the trash will just keep coming regardless of what's spent.

The financial details:

- In 2002, the U.S. estimated that removing all litter from lands just in Southeast Arizona -- east of the Tohono Reservation -- would cost about \$4.5 million over five years. This count didn't include such trash hotbeds as Ironwood Forest National Monument, the Altar Valley, Organ Pipe and Cabeza Prieta.
- Since then, Congress appropriated about \$3.4 million for a wide range of environmental remediation measures in all of Southern Arizona. This includes repairing roads, building fences and removing abandoned cars.
- The five-year tab is \$62.9 million for all forms of environmental remediation for immigration-related damage across Southeast Arizona, including \$23 million for the first year.

## Waste Unhealthy, Unsightly

Most of the garbage is left at areas where entrants wait to be picked up by smugglers. The accumulation of disintegrating toilet paper, human feces and rotting food is a health and safety issue for residents of these areas and visitors to public lands, a new BLM report says.

"It's particularly serious in areas where there are livestock," said Robin Hoover, pastor of the First Christian Church in Tucson and president of Humane Borders, a group that puts water tanks in the desert for the entrants and coordinates monthly cleanups of Ironwood Monument and other sites. "I've even found injectable drugs in the desert," he said. "It's rare when we find that kind of stuff, but there's tons of over-the-counter medication out there. If some cow comes along and eats a bunch of pills, that would be a real sick cow."

The trash also isn't good for wildlife, said Arizona Game and Fish spokesman Dana Yost. Birds and mammals can get tangled up in it or eat it, causing digestive problems, Yost said. It's not at all uncommon to find the trash in bears' stomachs, he said. Plastic bags, foil wrappers and certain foods are all problems.

## **Remote Areas Need More Help**

But clear inroads are being made into the trash problem, said BLM's McFarlin. Using the U.S. money, various local and federal agencies, the Tohono O'odham Tribe, the conservationist Malpais Borderlands Group and student youth corps remove trash from the most obvious and accessible areas, she said.

What needs tackling now are more remote areas such as wilderness, mountains and deserts far from major roads, she said. A couple of times, authorities have had to use helicopters or mules to haul stuff out of such areas.

This summer, with Border Patrol apprehensions of entrants down, the Tohono O'odham Tribe is seeing less trash on the ground than usual, said Gary Olson, the tribe's solid–waste administrator.

"I don't know whether they're hiding their trash or whether they are just not coming," Olson said.

But only six weeks ago, No More Deaths, an advocacy group that looks for injured, sick and lost entrants, came across a 10,000–square–foot area five miles west of Arivaca littered with hundreds and hundreds of backpacks.

"I've never seen anything that size. It's unbelievable," said Steve Johnston, who coordinates the group's camp near Arivaca.

Other activists from Derechos Humanos, Defenders of Wildlife and No More Deaths say the trash piles show what happens when the feds deliberately drive the entrants into the desert, by sealing the borders in cities.

"If you were going to cities, you wouldn't need to carry three days' worth of food," said Kat Rodriguez, a coordinator–organizer for Derechos.

But a Cochise County activist who has been photographing garbage and other signs of damage from illegal immigration for five years said she is appalled the federal government is spending tax dollars to pick this garbage up.

Illegal entrants should pick up the trash themselves, said Cindy Kolb, who helped found the group Civil Homeland Defense.

"Our mothers did not pay someone to pick up our trash," Kolb said. "We were taught to pick it up ourselves and to practice civic pride as law-abiding citizens."

LOL!

## Thailand Warns Against Travel to France Over Crime Fears

July 26, 2006 – From: www.ttc.org

BANGKOK, July 26, 2006 (AFP) – Thailand on Wednesday warned its citizens against non–essential travel to France, after its diplomats suffered a number of violent robberies around Paris.

"The ministry has received reports of four robberies in the last month. In the most recent incident, a Thai commercial officer attached to the embassy was attacked while travelling in an embassy car," the foreign ministry said in a statement.

"The ministry urges all Thais, both those who reside in Paris and those who want to travel to France, to exercise increased vigilance over their property. Any unnecessary travel should be postponed or canceled this summer," it said.

Ministry spokesman Songphol Sunkchan said the robberies had all been smash-and-grabs, in which thieves break through car windows to steal passengers' belongings.

"Thieves appear to be targeting Asians for robbery," Songphol told AFP.

The ministry also issued guidelines for Thais who need to travel to France, advising them to keep their personal possessions with them at all times, to avoid wearing expensive–looking clothing or jewelry, and not to travel alone.

Where is the outrage from Boyfucker and his Gay Pedo Posse on this one??????

## Gitmo Guards Often Attacked by Detainees

July 31, 2006 - From: www.breitbart.com

By John Solomon

The prisoners held at Guantanamo Bay during the war on terror have attacked their military guards hundreds of times, turning broken toilet parts, utensils, radios and even a bloody lizard tail into makeshift weapons, Pentagon reports say.

Incident reports reviewed by The Associated Press indicate Military Police guards are routinely head-butted, spat upon and doused by "cocktails" of feces, urine, vomit and sperm collected in meal cups by the prisoners.

They've been repeatedly grabbed, punched or assaulted by prisoners who reach through the small "bean holes" used to deliver food and blankets through cell doors, the reports say. Serious assaults requiring medical attention, however, are rare, the reports indicate.

The detainee "reached under the face mask of an IRF (Initial Reaction Force) team member's helmet and scratched his face, attempting to gouge his eyes," states a May 27, 2005, report on an effort to remove a recalcitrant prisoner from his cell.

"The IRF team member received scratches to his face and eye socket area," the report said.

Since its creation in early 2002, the U.S. detention camp on Cuba's coast has been a controversial symbol of the Bush administration's war on terror, bringing allegations of prisoner mistreatment, debates over civil rights and a landmark legal battle to win rights for the detainees.

At one point, more than 600 foreign men captured in the war on terror were kept there. Many have been released to their home countries, reducing the current population to about 450. Ten detainees have been accused of war crimes, but no one has been tried.

The Supreme Court has ruled that the men are entitled to lawyers and access to the courts and that the administration's original plan to give them justice through military tribunals was illegal.

Guards currently stationed at Guantanamo describe a tense atmosphere in which prisoners often orchestrate violence in hopes of unnerving their captors, especially with attacks using bodily fluids.

"I mean, seeing a human being act that way, it's terrifying. ... You are constantly watching before you take your next step to see if something is about to happen," Navy Senior Chief Petty Officer Mack D. Keen told AP in an interview from Guantanamo.

"You see little signs. They kind of show their hand every once in a while. They'll take their Quran and they'll cover it up," he said. "When you see a group of detainees taking their Quran and putting it away, you know something is about to happen."

Moazamm Begg, 38, a prisoner for more than two years at Guantanamo before being released to Great Britain, said he was suspicious of the Pentagon's description of incidents, especially allegations that Muslim men tore their Qurans or used sperm in attacks. The Pentagon continues to publicly question Begg's claim of innocence.

"This just doesn't make sense \_ especially since for Muslims this would be something that was disgusting, something that just wouldn't be done," he said. He added that some detainees told him they had mixed toothpaste and spit in the cocktails to make it look like semen.

Begg, who has written a book and spoken frequently about his experience, said most incidents he witnessed were spontaneous reactions "when word spread" among prisoners that a guard had done something wrong.

"I rarely saw lone prisoners acting out on their own for no reason except if they had some sort of mental illness or if they were on medication," he said.

Nonetheless, the incident reports released under the Freedom of Information Act and reviewed by AP, provide a rare chronicle of events inside the prison from the guards' perspective.

Entire wings of prisoners were reported to become riotous after complaints emerged that guards mishandled a Quran or mistreated prisoners. On two occasions, however, prisoners themselves were reported to have destroyed their Muslim holy books, the reports state.

"Detainee residing in cell (redacted) block tore his Quran into small pieces," a guard reported in May 2003. A month later, a prisoner "did intentionally destroy his Quran and throw (it) out of his cell," another report stated.

The reports detail more than 440 incidents between guards and prisoners from December 2002 through summer 2005 that resulted in recommendations of discipline, an average of about three per week. The names of guards and prisoners as well as the final discipline were blacked out by the Pentagon.

Often, guards went weeks without reporting problems; other times incidents were bunched together during times of frustration and tension.

For instance, nearly a quarter of the incidents occurred in July 2005, the month dozens of detainees started an extended hunger strike. Tensions likewise flared during Christmas week 2004, with inmates frequently spitting on guards. On Christmas Eve, a prisoner who was angry that he couldn't finish his meal was said to have used a plastic fork–spoon utensil – called a spork – to attack a guard collecting his tray.

"Detainee stabbed the MP guard ... in the hand with his spork from chow meal," the report said, adding the prisoner later "made a slicing motion across his neck" and vowed to kill the guard.

With many nearing five years in U.S. captivity, the prisoners "have a Ph.D. in being a detainee" and "know our procedures and they try to turn them against us and try to make us question what we are doing," said Army Lt. Col. Michael J. Nicolucci, the prison's executive officer.

"They'll take the smallest things, be it a piece of rust," he said. "They told us they are going to take that piece of rust and they are going for the jugular, they are going for the eye. They know what our vulnerabilities are, anatomically speaking."

Meal plates, shower flip–flops, cleaning brushes and other items deemed harmless in civilian life also are commonly turned into weapons, the reports said. For instance:

- "Detainee in cell (redacted) grabbed the radio from an MP and then threw the radio at the MP. The detainee then threw rocks at the MP," a Dec. 23, 2003, incident report stated.
- A detainee "reached out of his bean hole and attacked MP (name redacted) with a piece of metal foot pad from toilet striking him on the left hip area," a July 15, 2005, report said.
- "Detainee broke off the top of his sink, subsequently broke out the window then began throwing the sink and pieces of pipes at the Block Guard," a March 25, 2005, report said.

One of the most unusual incidents detailed in the four–inch stack of incident reports occurred when a detainee in the prison recreation yard assaulted a guard with a bloody tail torn from a lizard.

The detainee "caught the iguana by the tail at which time the tail detached," the May 2005 report described. When the guard turned to talk to a commanding officer, "he felt something strike him in the lower right back" and then "saw the tail on the ground at his feet and blood was in the same area of his uniform." The detainee said he was "just playing."

Nicolucci said one of the most serious incidents occurred this May, too recent to be recorded in the Pentagon's released reports. A prisoner staged an apparent suicide attempt while his inmates slicked the floors with human waste, seeking to overpower guards when they slipped, he said.

"We provide fans in order to keep them cool," Nicolucci recalled. "And they were using the basket, or the grate of the fan as a shield, the blades as machetes, the pole as a battering ram."

That disturbance was turned back in a few minutes with some guards and prisoners sustaining minor injuries, he said.
The Landmark Legal Foundation, a conservative legal group that fought to force the Pentagon to release the reports under the Freedom of Information Act, said it hopes the information brings balance to the Guantanamo debate.

"Lawyers for the detainees have done a great job painting their clients as innocent victims of U.S. abuse when the fact is that these detainees, as a group, are barbaric and extremely dangerous," Landmark President Mark Levin said. "They are using their terrorist training on the battlefield to abuse our guards and manipulate our Congress and our court system."

Though all detainees are foreigners, many are clearly Americanized when it comes to their insults and gestures. Male guards are frequently derided as "donkeys" while female guards are routinely called "bitches" or harassed by references to their breasts or genitalia, the reports said.

In all, nearly a quarter of incidents involved female guards, the reports show.

"They absolutely target female guards," Nicolucci said. "They have a lot of cultural biases about females, and we let them know in our culture that females do everything males do in a professional job environment, and we just hold firm."

James A. Gondles Jr., executive director of the American Correctional Association that sets standards for U.S. prisons, said much behavior inside Guantanamo mirrors that of civilian prisons though the attacks with bodily fluids seem more numerous.

"It happens from time to time at facilities here, but it seems the majority of ... assaults at Gitmo were either spitting, or bodily fluids being thrown on the guards," said Gondles, who has visited Guantanamo twice at the Pentagon's invitation and reviewed the reports at AP's request.

The bodily fluid attacks are so numerous that guards now frequently wear specialized shields to protect their faces.

The incident reports show waves of orchestrated behavior.

For instance, prisoners repeatedly grabbed their guards' whistles over a five-day period in June 2004. In July 2005, guards reported several instances of rock throwing, spitting and flip-flop hitting. Rocks were hidden under shower mats, the reports said.

The incident reports also are noteworthy for information that is missing. With redacted names, it is impossible to tell whether bad behavior is widespread or the work of a few repeat offenders. Likewise, the documents don't tell whether certain guards are prone to confrontation.

Prisoners' hunger strikes, suicide attempts and threats to injure themselves aren't considered disciplinary matters and thus aren't recorded in the incident reports. Yet the Pentagon acknowledges there have been scores of such incidents.

Sen. John McCain, R–Ariz., a prisoner of war during Vietnam, said the treatment of the guards has been overshadowed by the legal and political debates surrounding the detainees, but he has been impressed with the guards' professionalism.

"Our personnel there have perhaps the most difficult task you can have in the military outside of being in a combat zone. ... These are bad guys and some of the most hardened of hardened criminals. And some I think will need to be kept permanently," he said.

McCain said the detainees' behavior and the likelihood of permanent confinement only hastens the need for the administration and Congress to finalize detention and trial policies consistent with the Supreme Court's direction.

While Washington addresses those questions, the guards look to stay one step ahead of the detainees.

"Yes, you do get upset but you get somebody to take your place," Keen said in explaining how he survives the tensions of the cell block. "You go outside. You walk it off and you come back and (say) I want to be back in the fight."

## These are the Pictures That Damn Hezbollah

From: http://www.news.com.au/adelaidenow/story/0,22606,19960056–5006301,00.html



Direct from the United Nations, July 28: http://www.un.org/Depts/dpko/missions/unifil/pr012.pdf

"It was decided to relocate temporarily all unarmed military observers of the Observer Group Lebanon (OGL) from the patrol bases in the area of Marwahin and Markaba to UNIFIL positions. An OGL patrol base in Marun AI Ras remained unoccupied following the incident of 23 July, in which one military observer was seriously wounded by Hezbollah small arms fire, and the OGL patrol base in Khiyam was completely destroyed by Israeli aerial bombardment on 25 July."

Direct from the United Nations, July 27: http://www.un.org/Depts/dpko/missions/unifil/pr011.pdf

"It was also reported that Hezbollah fired from the vicinity of four UN positions at Marwahin, Alma Ash Shab, Brashit, and At Tiri."

Direct from the United Nations, July 25: http://www.un.org/Depts/dpko/missions/unifil/pr09.pdf

"This morning, Hezbollah opened small arms fire at a UNIFIL convoy consisting of two armored personnel carriers (APC) on the road between Kunin and Bint Jubayl. There was some damage to the APCs, but no casualties, and the convoy was obliged to return to Kunin.

What a bunch of useless bastards.