

USER MANUAL

MODEL CM300

Console Mount User Station

MODEL RM300

Rack Mount User Station

RTSTM

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PATENT NOTICE

This equipment contains and uses a design embodied in United States Patent No. 4,358,644: "A Bilateral Current Source for a Multi-terminal Intercom". This design employs a two-wire to four-wire converter.

UNPACKING AND INSPECTION

Immediately upon receipt of the equipment, inspect the shipping container and the contents carefully for any discrepancies or damage. Should there be any, notify the freight company and the dealer at once.

WARRANTY INFORMATION

RTS products are warranted by Telex Communications, Inc. to be free from defects in materials and workmanship for a period of three years from the date of sale.

The sole obligation of Telex during the warranty period is to provide, without charge, parts and labor necessary to remedy covered defects appearing in products returned prepaid to Telex. This warranty does not cover any defect, malfunction or failure caused beyond the control of Telex, including unreasonable or negligent operation, abuse, accident, failure to follow instructions in the Service Manual or the User Manual, defective or improper associated equipment, attempts at modification and repair not authorized by Telex, and shipping damage. Products with their serial numbers removed or effaced are not covered by this warranty.

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CUSTOMER SUPPORT

Technical questions should be directed to:

Customer Service Department
RTS/Telex
12000 Portland Avenue South
Burnsville, MN 55337 U.S.A.
Telephone: (952) 884-4051
Fax: (800) 323-0498

RETURN SHIPPING INSTRUCTIONS

PROCEDURE FOR RETURNS

If a repair is necessary, contact the dealer where this unit was purchased.

If repair through the dealer is not possible, obtain a RETURN AUTHORIZATION from:

Customer Service Department
Telex Communications, Inc.
Telephone: (877) 863-4169
Fax: (800) 323-0498

DO NOT RETURN ANY EQUIPMENT DIRECTLY TO THE FACTORY WITHOUT FIRST OBTAINING A RETURN AUTHORIZATION.

Be prepared to provide the company name, address, phone number, a person to contact regarding the repair, the type and quantity of equipment, a description of the problem and the serial number(s).

SHIPPING TO MANUFACTURER FOR REPAIR OR ADJUSTMENT

All shipments of RTS products should be made via United Parcel Service or the best available shipper, prepaid. The equipment should be shipped in the original packing carton; if that is not available, use any suitable container that is rigid and of adequate size. If a substitute container is used, the equipment should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material. All shipments must be sent to the following address and must include the Return Authorization.

Factory Service Department
Telex Communications, Incorporated
West 1st Street
Blue Earth, MN 56013 U.S.A.

Upon completion of any repair the equipment will be returned via United Parcel Service or specified shipper collect.

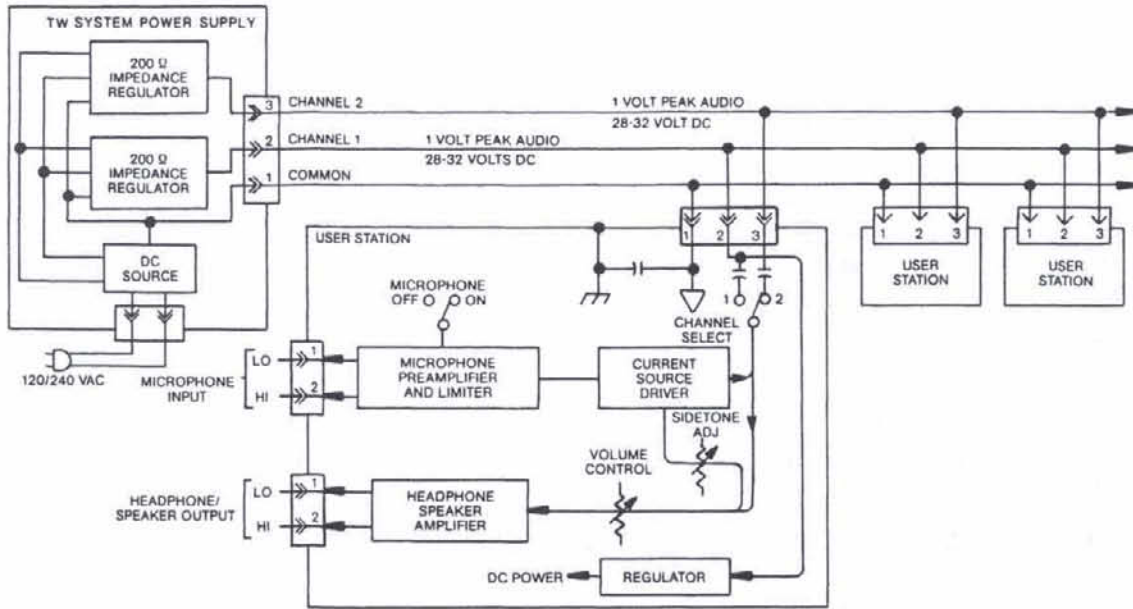


Figure 1-1
TW System Concept Block Diagram

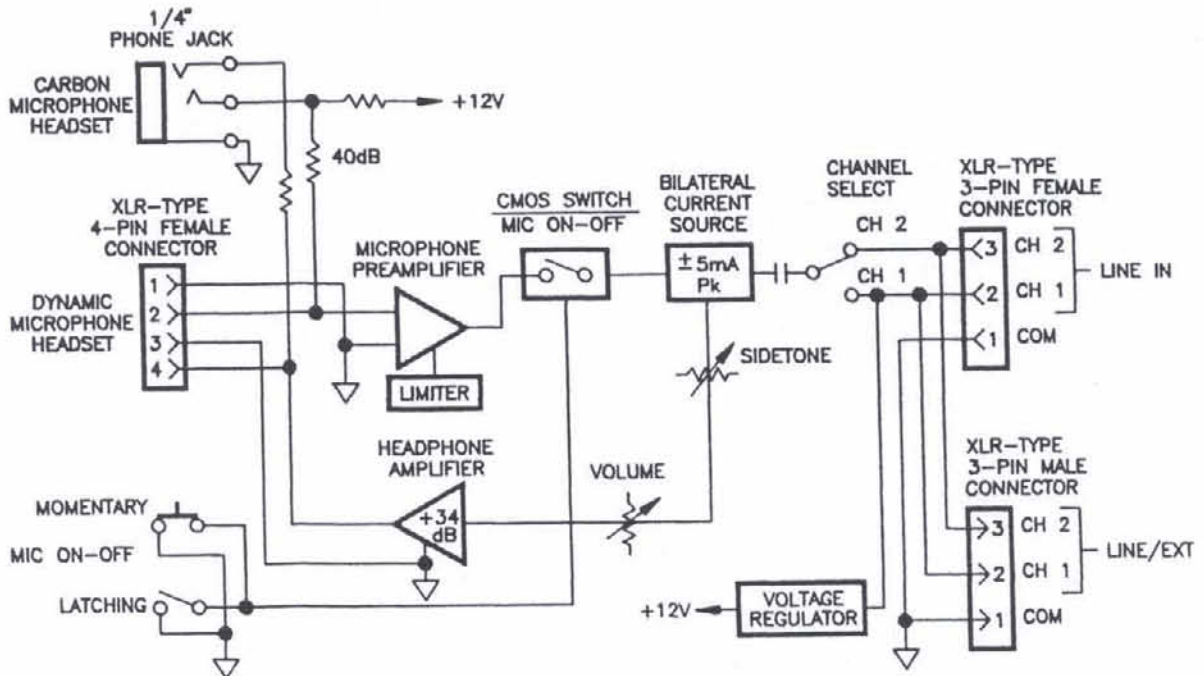


Figure 1-2
CM300/RM300 Block Diagram

SECTION 1: DESCRIPTION & SPECIFICATIONS

1.1 DESCRIPTION

The Model CM300 is a console mount, two-channel intercom user station. The Model RM300 is a rack mount, two-channel intercom user station. The user station is designed to be used in a full duplex, conference line intercom system.

Conference Line Intercom System (Figure 1-1)

A conference line intercom system allows a group of people to talk and listen on a single channel. On this channel, all users can listen when one or more other users are talking (conferencing). Up to 75 users can share the same conference line (or conference bus).

Full Duplex Operation

Full duplex operation allows two way conversation at the same time, that is, one user can interrupt a second user while the second user is still talking.

The CM300/RM300, with a headset, interfaces a human user to the intercom system. The user talks and listens using the headset (or a handset). The headset connects to the CM300/RM300 via a four conductor cable and connector (optionally five or six pin). The CM300/RM300 connects to the system using a three conductor "microphone" type cable. The CM300/RM300 contains four controls: the volume control, the latching microphone switch, the momentary microphone switch, and the channel select switch. On the Model CM300/RM300L, the momentary microphone switch is replaced with the call light button.

Volume Control

The volume control on the CM300/RM300 has a wide range to compensate for: user hearing differences, ambient noise variation, variations in headset / handset sensitivity, and variations in voices. The volume control in the CM300/RM300 reduces distortion by driving the headphone amplifier only as much as needed.

Microphone Switch(es)

In normal system operation, one or more users talk and the others listen. A microphone switch on each station allows the talker's microphone to be enabled and allows the listeners to keep their microphones disabled. In this condition, speech intelligibility is enhanced since background noise from other microphones is not present.

On the Model CM300/RM300, a latching switch or momentary push button turns the microphone on.

The momentary push button allows quick bursts of communication, especially useful in a high noise environment. The latched position allows "hands free" operation, when the user needs to have two way conversation while performing another activity.

The Channel Select Switch

A channel selector switch allows a choice of two (optionally three) channels. When the switch is on the "1" position the station talks and listens on channel 1, on the "2" position, channel 2, and so on. On larger systems the "1" position may be any system channel (1 through 12 for example). Similarly, for position "2". See Section 2.1 for DC powering requirements under these conditions.

Call Light Push Button (CM300L/RM300L, only)

Pushing this button transmits a call signal to all other units on the channel selected by the channel selector switch. A call signal on this channel will cause the call light push button to flash. The flash rate is 2 to 5 times a second. The call signal itself is a 20 kilohertz signal.

Options (-DL, -E, -3CH, -USMB, -LP)

The CM300/RM300 and CM300L/RM300L use the CC33 card *except* as indicated below. Codes at the end of each paragraph indicate the card used. Codes are: *CC33 card, **CC40 card, ***CC45 card. (CC33 schematic is SD1464; CC40/CC45 schematic is SD1427).

-DL: Dual Listen on two channels. The volume control is changed to a dual concentric potentiometer with two knobs. The channel select switch routes the talk signal. The outside knob follows the channel selector. The inside knob is the non-talk, listen only channel.

-E: Program Input, balanced. Deletes line loop-through, the balanced program is fed in instead. Pins 2 and 3 are the input connections. A dual concentric potentiometer with two knobs provides separate level controls for intercom and program.

-3CH: Three Channel operation. Line and loop-through connectors are changed to 4-pin from 3-pin. A 3-position channel select switch replaces the 2-position switch.

-USMB: UnSwitched Microphone output, Balanced. Deletes line loop-through. Level: -7dBm to +3dBm. The USMB provides a line level microphone signal to other systems such as an Interrupted Feedback System (IFB), telephone, radiotelephone, or Stage Announce.

-LP: Local Power source. A small module converts AC line power to low voltage to power the user station, a separate connector is provided. The unit does not use power from the intercom line.

1.3 CM300/RM300 SPECIFICATIONS

Input DC Voltage

TW Mode	18 to 35 volts DC
LP Option	15 to 35 volts DC
Battery	12 to 35 volts DC (reduced performance)

DC Current Drawn from TW Line (Note: LP Option draws no current from TW line)

Quiescent	
CM300/RM300	23 milliamperes \pm 10%
CM300/RM300L	33 milliamperes \pm 10%
Operating, 25 ohm headphones	
CM300/RM300	37 milliamperes \pm 10%
CM300/RM300L	45 milliamperes \pm 10%
Operating, 25 ohm headphones + Call Light	
CM300/RM300L	60 milliamperes \pm 10%

Impedance Across Line 10,000 ohms, minimum

Environmental

Temperature	
Operating	0°C to 60°C
Storage	- 40°C to 85°C
Humidity	
Operating & Storage	5% to 95% non-condensing

Noise Contribution

One unit	- 75 dBu
Ten units:	- 67 dBu

Microphone Preamplifier

Input Impedance	470 ohms/dynamic mic
Source Impedance	200 ohms, nominal
Maximum Input Level	150 millivolts
Frequency Response (-54 dBu input)	100 hertz to 10 kilohertz \pm 3 dB
Limiter Range	30 dB
Carbon Mic Excitation Current	10 milliamperes, nominal

Current Source

Transfer Ratio	3.3 milliamperes / volt = 3.3 millisiemens
Output	\pm 5 milliamperes into 200 ohms = \pm 1 volt peak, nominal

Headphone Amplifier

Voltage Gain	34 dB
Output Voltage	8 volts peak-to-peak into 25 Ω
Output Power	1/2 watt peak into 25 ohms
Frequency Response	150 hertz to 8 kilohertz \pm 3 dB
Headphone Impedance Range	25 to 600 ohms (600 to 2000 with reduced levels)

NOTE: DO NOT USE HEADPHONES WITH IMPEDANCES LESS THAN 25 OHMS.

Sidetone Adjustment Range	- 20 dB to full on
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Call-Light

Signaling Frequency	20,000 hertz \pm 100 hertz
Flashing Rate	5 hertz \pm 2 hertz

Auxiliary Connections

Headset Connector

Dynamic Microphone	XLR type 4-pin female
Carbon Microphone	1/4" standard phone jack, 3 circuit

Line Connections

Input	XLR type 3-pin female
Loop/External	XLR type 3-pin male

Mechanical CM300/CM300L

Dimensions	2.75 H x 6.00 W x 6.40 D inches 69.9 H x 152.4 W x 162.6 D, millimeters
Weight	1.3 pounds, 0.59 kilograms
Finish	Front Panel: Light Gray Enamel Paint, Federal Standard 595A Color #26492 Chassis: Gold Iridite over Aluminum

Mechanical RM300/RM300L

Dimensions	1.72 H x 19.00 W x 7.00 D inches 43.7 H x 482.6 W x 177.8 D, millimeters
Weight	1.4 pounds, 0.64 kilograms
Finish	Front Panel: Light Gray Enamel Paint, Federal Standard 595A Color #26492 Chassis: Gold Iridite over Aluminum

SPECIFICATION NOTES:

0 dBu = 0.775 volts rms.

0 dBm = 1 milliwatt = 0.775 volts rms. into 600 ohm load (0 dBu, open circuit)

Note: All products and specifications subject to change without notice.

SECTION 2: INSTALLATION

2.1 Power Requirements, Type Of System, Powering Method And Power Supply(ies)

Power Requirements

To maintain a bridging 10,000 ohms impedance to the intercom line, the CM300/RM300 requires +18 to +35 volts DC. To operate in local power or battery modes, the CM300/RM300 requires from +15 to +35 volts DC, but is operable at reduced performance from +12 to +17.9 volts.

Type of System

The CM300/RM300 can be installed in a (1) three wire system, (2) two wire system, or (3) special two wire system.

Powering Method

Power is carried to the unit from a system power supply using three different methods:

- (1) In a 3-wire system ("Series 17" type), the power is separate from the audio and supplied centrally.
- (2) In a two wire system ("TW" type), the power and audio may share the same wire. The power is supplied centrally by a special "TW" type supply.
- (3) In a special two wire system (Local Power), each CM300/RM300 is locally powered and operates on switch channel two. The CM300/RM300s are interconnected using two wire cable. Power is supplied by a battery or a local power supply. The local power supply should be isolated from earth ground.

In (1) above, the power supply is a regulated supply, 24 volts DC to 32 volts DC, 1.5 amperes. This supply can operate up to 50 CM300/RM300 and 30 CM300L/RM300L user stations.

For case (2) above, assuming currents shown, the supplies versus maximum number of stations powered are:

<u>Power Supply</u>	<u>CM300 RM300 (37mA)</u>	<u>CM300L RM300L (60mA)</u>
Model PS8 (0.43A)	11	7
Model PS15 (1.0A)	27	16
Model PS31 (1.5A)	41	25

Note: Operation of a system at maximum load does not allow for other variations such as temperature, line voltage, cable resistance, and surges. A more prudent approach is to operate the system at no more than 80% of capacity.

In (3) above, a local power supply provides 12 to 24 volts DC at 120 milliamperes peak for each station, or, for remote single station operation, two 9-volt batteries in series may be used.

In (1) & (3) above, the two wires carrying audio require one system termination consisting of a 200 ohm resistor and a 100 microfarad capacitor in series. This combination is connected across the two wires. Connect polarized capacitors negative to system circuit common.

To Install the CM300/RM300:

1. Determine the type of system in which the CM300/RM300 is to be installed. Determine the powering method and power supply(ies).
2. Determine the mounting of the CM300/RM300.
3. Read "Choosing Headsets or Handsets".
4. Determine the cabling requirements.
5. Create a system block diagram & equipment list (if not already available), then install the system.
6. Verify correct system operation by using the checkout procedure in this chapter (2.6).
7. Update the system block diagram, equipment list and any other documentation to reflect the "as installed" configuration. If the system block diagram was originally created by RTS Systems, send a copy of the "as installed" system block diagram to RTS Systems. This diagram will be used to update the original documentation, and for future service support.

2.2 Mounting

The CM300 mounts in a console, use the installation diagram at the back of this manual for cutout dimensions and mounting hole locations. The RM300 mounts in an EIA 19 inch rack.

2.3 Choosing Headsets

Introduction Headset or handset choice depends on operating environment, operating requirements, and personal taste.

Operating Environment Table 2-1 shows typical operating environments and the amount of background noise present.

A very quiet operating environment, such as a television studio, may require that sound does not leak from the headphones, meaning the headphones should have good "acoustic isolation".

A very noisy or loud environment usually requires headphones that prevent outside sound from leaking in (again, good acoustic isolation), headphones that can produce a loud, clear sound, and noise cancelling microphones, as well.

Understanding speech in a noisy environment requires that the sound from the headphones is as loud or louder than the sound leaking into the headphones from the noisy environment.

Loudness In general, the loudness of a headphone depends upon its ability to absorb power at a given voltage (impedance) and the efficiency of its design. Practically, the impedance has a larger effect with present day headsets.

Impedance Low impedance headphones are louder, causing the user station to draw more current from the power supply. High impedance headphones are not as loud, drawing less current from the power supply. The user station design range of impedances for the headphone part of the headset is 25 ohms to 600 ohms. Headphone impedances 600 to 2000 ohms will operate at reduced levels. In a double muff headset such as the Beyer DT109 sold by RTS Systems, there are 50 ohm headphones connected in parallel resulting in an impedance of 25 ohms.

Efficiency The user station produces the loudest sound in low impedance headphones such as the DT109. In this headphone, one milliwatt of electrical power produces 94 dB SPL (Sound Pressure Level).

Practical Loudness The user station can produce an SPL of 111 dB in each ear of a DT109 or DT108 headset. Low impedance headsets such as the DT108 and DT109 headsets, cause the user station to require more power from the power supply. With DT109 headsets, CM300/RM300 peak current is 75 milliamperes. The CM300L/RM300L peak current is 80 milliamperes. With 600 ohm headphones, peak current is 30 milliamperes for the CM300/RM300 user station, 40 milliamperes for the CM300L/RM300L user station. (Quiescent current is

23 milliamperes for the CM300/RM300, 33 milliamperes for the CM300L/RM300L).

Headphone Sound Isolation

The ability of headphones to shut out unwanted environmental noise varies from none (0 dB isolation) to about 1/8th as loud (30 dB isolation). The degree of isolation depends both on the design of the headset and the frequency content of the environmental noise. Lightweight, "open" headsets such as the RTS Systems LH267 (single muff) and LH268 (double muff), have almost no (0 dB) isolation. The trade-off is that the LH267/LH268 are very comfortable and can be worn for long periods (8 to 12 hours) without physical discomfort from the earmuffs or headband. The LH267/LH268 are low impedance and can be turned up loud.

Because there is less acoustic isolation, care must be taken that the sound signals from the LH267/LH268 are not unintentionally leaked into microphones.

The DT108/DT109 headsets have an isolation ranging from 10 dB to 20 dB.

At least four companies, Telex, Setcom, David Clark, and Carter Engineering sell headsets intended for heavy industrial, aerospace, and military markets. These headsets can provide acoustic isolation figures of 20dB to 40dB. Generally speaking, these headsets are heavier and less comfortable to wear.

Isolation. Headset Microphones

In high noise environments, the headset microphone should be a noise cancelling type.

Comfort In general, the comfort of headsets depends upon their weight, padding and design.

In the headset connecting cable, prevent coupling between the microphone and headphone leads by using at least a shielded wire for the microphone, and a separate pair of wires for the headphone(s). Better isolation may be possible with a twisted, shielded pair for the microphone leads. Do not allow headphone ground to contact microphone ground or shield. Tie the shield to microphone ground or microphone low. Do not tie the shield to the case of the connector or the case of the user station. In general the maximum length for the headset cable is ten feet (3.1 meters). Lengths over ten feet require a special extension cable. Check with RTS Systems for help with longer cables.

2.4. Cabling Requirements

2.4.1 Wire Size and Maximum Operating Distance

Wire size determines the maximum operating distance (where the DC voltage drop is the limiting factor). The following equations apply for a conductor size of #22 AWG, a minimum user station voltage of 18.0 volts, and a minimum power supply voltage as stated below.

For Models PS10, PS30, PS31, PS50, PS60, use $V_{min} = 28.4$ VDC:

$$\text{Distance}_{max} \text{ (feet)} = 322,181 / I_{tot} \text{ (milliamperes)}$$
$$\text{Distance}_{max} \text{ (meters)} = 99,133 / I_{tot} \text{ (milliamperes)}$$

For Models PS8, PS15 ($V_{min} = 24.0$ VDC):

$$\text{Distance}_{max} \text{ (feet)} = 185,874 / I_{tot} \text{ (milliamperes)}$$
$$\text{Distance}_{max} \text{ (meter)} = 56,654 / I_{tot} \text{ (milliamperes)}$$

Example: The CM300L/RM300L with 25 ohm headphones uses up to 60 milliamperes. With a PS8 supply the maximum operating distance for this station is $185,874/60$ milliamperes = 3098 feet (944 meters). And with a PS31 power supply the maximum operating distance is $322,181/60$ milliamperes = 5370 feet (1652 meters). The maximum operating distance using a PS8 power supply and a user station with 25 ohm phones (37 mA) is $185,874/37 = 5024$ feet (1531 meters).

2.4.2 Grounding

System circuit ground should not be directly connected to "earth" or "chassis" ground (directly means a connection an ohmmeter would show). Each user station is bypassed to its own chassis via a 0.1 microfarad capacitor, establishing a radio frequency (RF) ground to reduce radio frequency interference from radio transmitters.

To prevent a buildup of voltage across the system capacitance, the power supply has a bleeder resistor to chassis ground (22 kilohms). If the system has *no* RTS Systems power supply, add a bleeder resistor at a central point in the system.

The benefit of not "earth" grounding the RTS System circuit return is that continued operation is possible during an accidental system ground fault. This accidental grounding can happen when a wire is pinched or a cable scraped across a sharp edge. One accidental ground can be tolerated by the system until the fault can be cleared and (with luck) before a second ground fault can cause noise or overload or bring the system down.

Another benefit of not "earth" grounding the circuit return is that it prevents the introduction of noise through "earth" currents from other equipment. If the RTS System circuit ground conducts these currents, it is likely that they will be heard as interfering noise on the communication line.

2.4.3 Signal

The number of conductors required to interconnect user stations is:

<u>No. of Conductors</u>	<u>No. of Channels</u>
2	1
3	2
4	3

Wiring/Cabling (See Cable Wiring Diagrams in Section 7, Application Information)

Two channel "TW" applications, or single channel, three wire applications may use either standard microphone cable (for convenience) or two-twisted-pair cable (less expensive than microphone cable). Standard wire size for the system is #22 gauge wire for interconnection. For permanent installations each channel should have an individually shielded twisted pair of at least #22 gauge wire; such as Belden 8723 for 2 channels, and 8777 for 3 channels. For plenum and / or 200° C wiring, use Belden 88723 and 88777. The plenum cable has a slightly smaller diameter, is Teflon insulated, and about three times the price of 8723 / 8777.

Wire using Cable Wiring Diagrams, Section 7, to reduce interference and help maintain a low crosstalk figure between channels.

The audio signal line level is between 10 dBu and 0 dBu (between 0.24 and 0.77 volts rms). These levels are low enough to prevent crosstalk into other equipment (such as TV cameras) yet high enough to minimize external interference to the TW System.

The 200 ohm line impedance is high enough to allow communication over line lengths of 1.6 kilometers (one mile) and low enough to permit an adequate speech bandwidth with 3.2 kilometers of accumulated cable. In most systems the 200 ohm impedance gives a high fidelity bandwidth with low losses.

When using equipment in rain or conditions of excessive moisture, always protect the equipment with plastic covers and make sure all cable connectors are lifted out of mud, snow or moisture and protected with plastic. Water mud and snow in connectors can cause noise.

2.4.4 Channel to Channel Crosstalk Control

In the TW Intercom System all channels share a common circuit ground return. Crosstalk due to common ground resistance can be reduced by using 22 gage shielded cable, and paralleling shield drain wires with circuit return wires. Capacitive crosstalk can be reduced by using two shielded pair. One wire of one pair connects to channel one (pin 2), one wire of the other pair connects to channel two (pin 3), the remaining wires are circuit return (pin 1). (See Cable Wiring Diagram at back of manual).

Crosstalk reduction may also be achieved in some cases using Model CCD214 Crosstalk Cancellation Device.

2.5 Mechanical

The CM300 is designed for mounting in a console (See installation data at back of this manual. The RM300 is designed for rack mounting in an EIA 19 inch rack.

Leave space for control access, cabling and servicing, such as cabling service loops, reaching for XLR type connector locks, local power option power supplies and headset connectors and cables.

If the headset connector is remoted, do not run this cable close to interfering sources such as video/TV monitors, power supplies and equipment with internal power supplies.

2.6 System Check

Using three user stations with three headsets and three persons, verify that all persons can intercommunicate throughout the system. Verify that with all microphone switches off and volume controls midway, only a barely audible hiss is heard. The other two persons should sound equally loud and clear to the third person.

2.7 Standard User Station Connections

Dynamic Microphone headset connectors:

XLR-4-31 receptacle

Input level: -55 dBu, nominal
Output level to headphone: 10 volts peak-to-peak, open circuit.

Pin 1 - Microphone low
Pin 2 - Microphone high
Pin 3 - Headphone low
Pin 4 - Headphone high

XLR-5-31 receptacle

Pin 1 - Microphone low
Pin 2 - Microphone high
Pin 3 - Headphone low
Pin 4 - Headphone high, left
Pin 5 - Headphone high, right

XLR-6-31 receptacle

Pin 1 - Microphone low
Pin 2 - Microphone high
Pin 3 - Headphone low
Pin 4 - Headphone high, left
Pin 5 - Headphone high, right
Pin 6 - Microphone switch

Carbon Microphone Headset Connector: 1/4 in. phone jack (J2):

Carbon Microphone: Tip (-15 dBV input, nominal)
Headphone: Ring (10 V peak to peak open circuit)
Common: Sleeve

LINE input and LOOP/EXTension connectors: (J3/J4)

XLR-3-31 receptacle (for single-channel)

Pin 1 - Common (low side of line)
Pin 2 - Power
Pin 3 - Channel

XLR-3-31 receptacle (for two-channel line)

Pin 1 - Common (low side of line)
Pin 2 - Channel 1 (+DC)
Pin 3 - Channel 2

XLR-4-31 receptacle (for three-channel line)

Pin 1 - Channel 1
Pin 2 - Channel 2
Pin 3 - Channel 3
Pin 4 - Common

Table 2-1

Typical Operating Environments,
Environmental Noise, Sound Pressure Level,
at 10 meters distance

<u>Source</u>	<u>SPL</u>
Aircraft	120 dB to 160 dB
Orchestra, 75 piece, (Peaks) or Pipe Organ, (Peaks)	140 dB
Rock Concert	110 dB to 140 dB
Piano, Peaks	120 dB
Blaring Radio	110 dB
Centrifugal Ventilating Fan	110 dB
Auto on Highway	100 dB
Vaneaxial Ventilating Fan	90 dB
Voice, Shouting	90 dB
Factory	75 dB
Voice, Conversational	70 dB
Residence	45 dB
Television Studio	25 dB to 35 dB
Voice, Whisper	30 dB

Table 2-2

Typical Operating Environments,
Sound Pressure Level,
at Ear

<u>Source</u>	<u>SPL</u>
Maximum Allowable Impulse Exposure	140 dB
LH267 + CM300/RM300, 10 dB below Clipping	114 dB
DT109 + CM300/RM300, 10 dB below Clipping	111 dB
LH268 + CM300/RM300, 10 dB below Clipping	110 dB
Setcom Series 5 + CM300/RM300, 10 dB below Clipping	99 dB
Headphones with 20 dB Acoustic Isolation at 130 dB Rock Concert (Mouth Closed)	110 dB
Headphones with 40 dB Acoustic Isolation at 140 dB Rock Concert (Mouth Closed)	100 dB

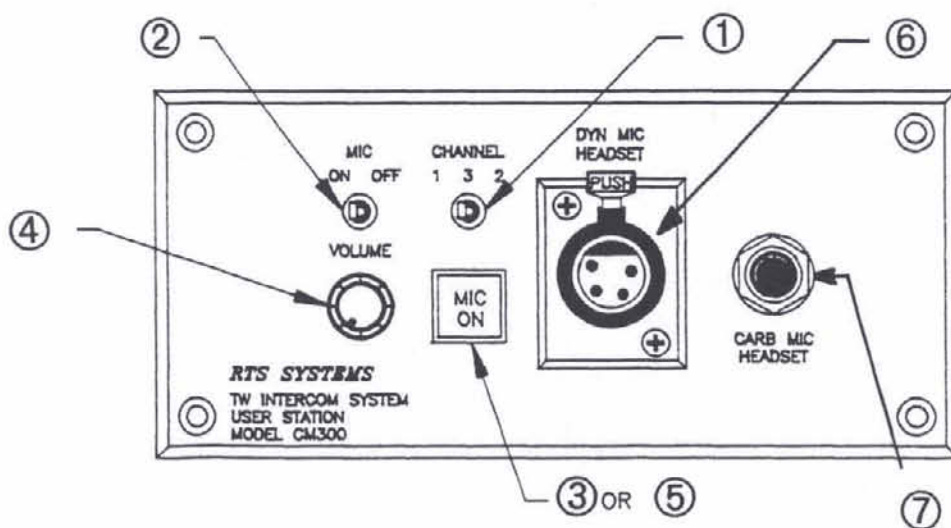


Figure 3
Front Panel, Model CM300/RM300 User Station

SECTION 3: OPERATION

3.1 Operating Controls And Connectors

The reference numbers in below correspond to the circled numbers in Figure 3.

<u>Ref No.</u>	<u>Name</u>	<u>Description</u>
1)	CHannel Select Switch	1 2 Selects 1 of 2 channels (standard) or 1 of 3 channels (optional). The optional Call Light operates on the channel selected by this switch. The CHannel select switch is omitted in the Single Channel (SC) option.
2)	MIC ON-OFF toggle	A latching-action switch.
3)	MIC ON-off push button	A momentary-action microphone enable switch on the Model CM300/RM300 (Standard - - without the Call Light option).
4)	VOLUME	A headphone VOLUME control. (May be a dual control for the Dual Listen (DL) or Program (E) option).
5)	CALL push button	(Optional) The CALL push button in Model CM300L/RM300L (No momentary mic).
6)	DYNAmic MICRophone HeaDSeT Connector.	A dynamic microphone type headset plugs in here.
7)	CARBon MICRophone Connector	A carbon microphone type headset plugs in here. The headset may also HeaDSeT be a carbon microphone emulate type headset.

(On Rear Panel)

INPUT	Plug in the Line connector here. Connects the console mount user station to the TW intercom system.
LOOP/EXTension	A convenience connector - - allows another console mount user station to be connected to the TW intercom system.

CAUTION!

Always turn the volume control all the way counterclockwise (to the left) before plugging in the headset

3.2 Operation (After connecting station to the intercom line and plugging in headset).

To communicate directly with another station or stations:

- 1) Turn the VOLUME control all the way counterclockwise (to the left) before plugging in the headset.
- 2) Select the channel using the CHannel select switch.
- 3) Set the listening level in the headset using the VOLUME control.
- 4) To talk, set the MIC ON/OFF toggle switch to the "ON" position (or push the MIC push button) and speak into the microphone. Return the switch to the OFF position to eliminate unnecessary noise on the intercom line.

Section 7: DIAGRAMS / DRAWINGS

<u>Document Number</u>	<u>Size</u>	<u>Title</u>	<u>Page</u>
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These drawings applies to CM300 Units with CC33 or CC40 cards.

OD2993	A	Outline Drawing, CM30015
ID2993	A	Installation Drawing, CM30016

These drawings applies to CM300/RM300 Units with CC33 or CC40 cards.

----	A	Cable Wiring Diagrams, 2-Channel System/3-Channel System17
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Application Information

	A	Systems Interconnect / System-to-System Interfacing18
TM1786	B	12-volt Battery Operation / Teleproduction System Example Multi-channel Operation / Dry Line Operation (For extended distances).19

Model CM300/RM300 User Stations with CC33 card (Standard units and units with Call Light Option).

SD1464	B	Schematic Diagram, Series B Phase 3 User Station20
AS1821	B	Assembly Diagram, P.C.B., CC3321

Model CM300/RM300 User Stations with CC40 card (Units with various options or combinations of options.9 Also applies to standard units built between 1979 and 1981, approximately.)

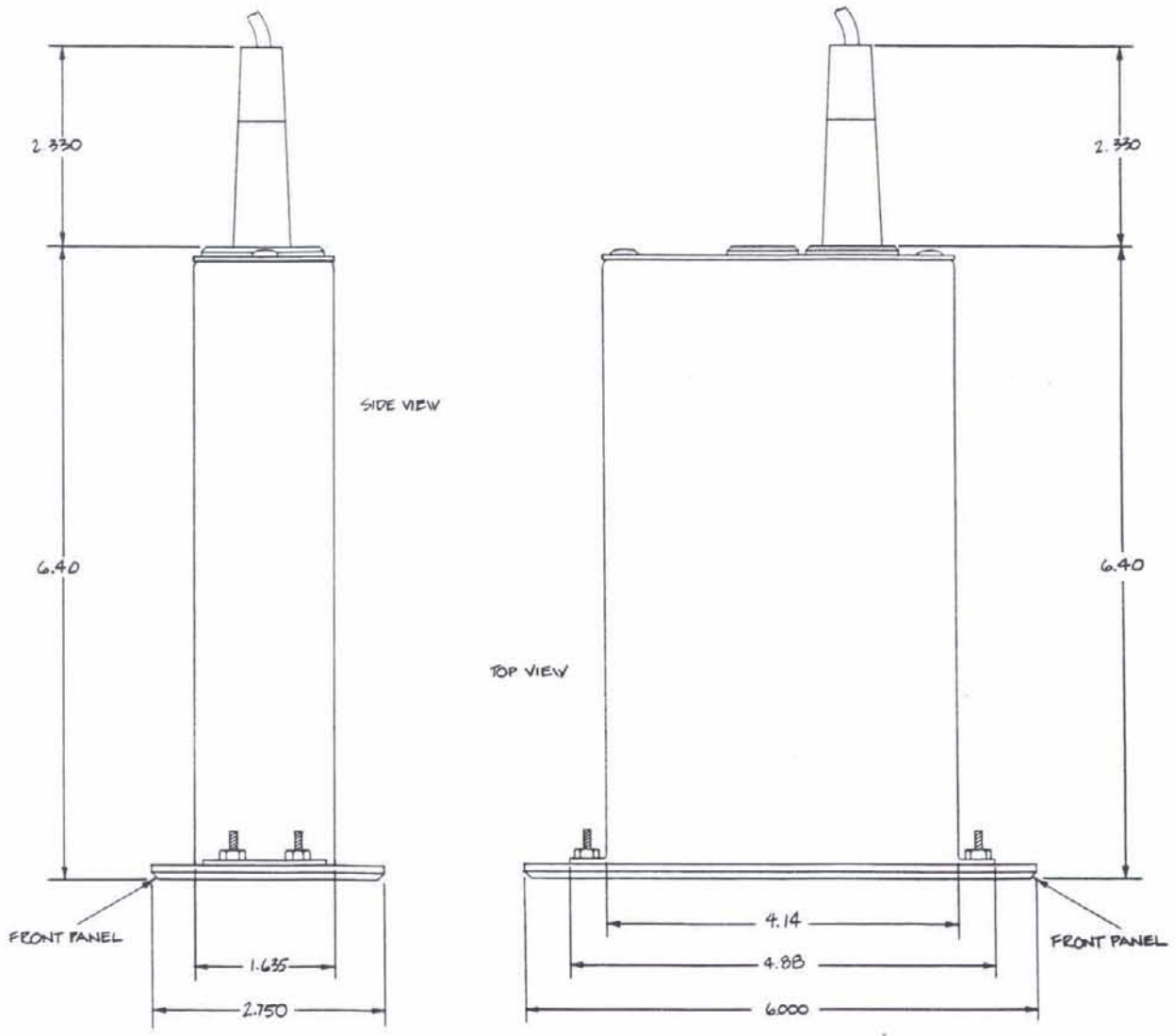
SD1427-01	B	(Simplified) Schematic Diagram, Phase III User Stations (CC-40) sheet 122
AS1409	B	Assembly Diagram, P.C.B. CC40/45 Layout23

CC40 card detailed diagrams

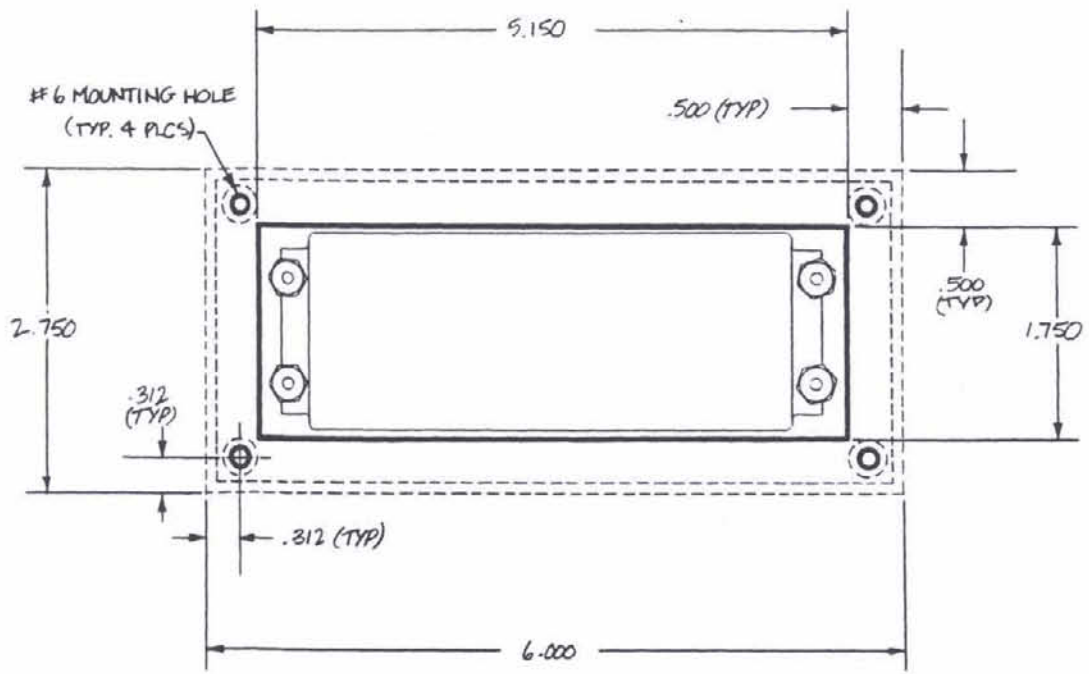
SD1427-00	B	Schematic Diagram, Phase 3 User Stations, sheet 1 of 224
SD1427-00	B	Schematic Diagram, Phase 3 User Stations, sheet 2 of 225

Call Light Option used by both Model CM300/RM300 User Stations with CC33 card (Standard units and units with Call Light Option).

SD1470	B	Servicing Diagram, Light Signaling Circuit, CC-18SL, Phase 3 Configuration26
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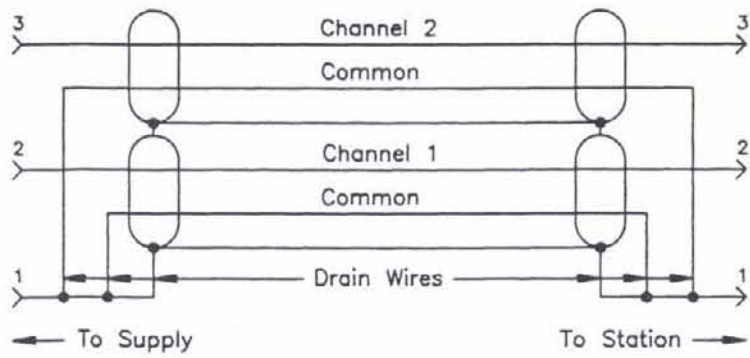
OD2993, Outline Drawing, CM300



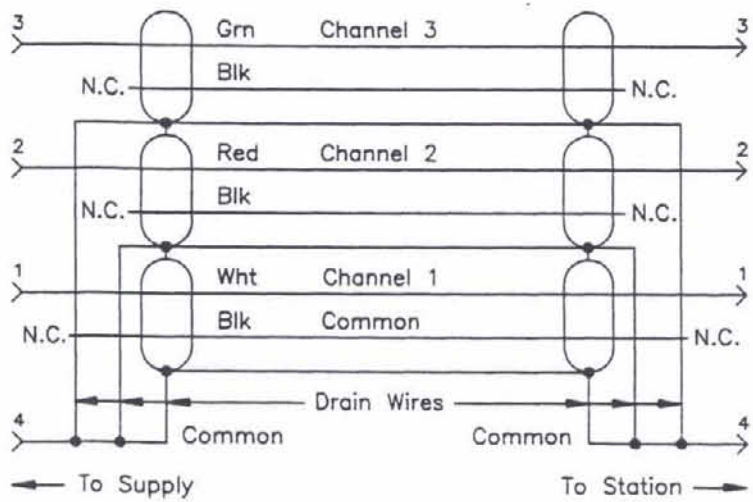
REAR VIEW

CUT-OUT : 5.150" x 1.750"

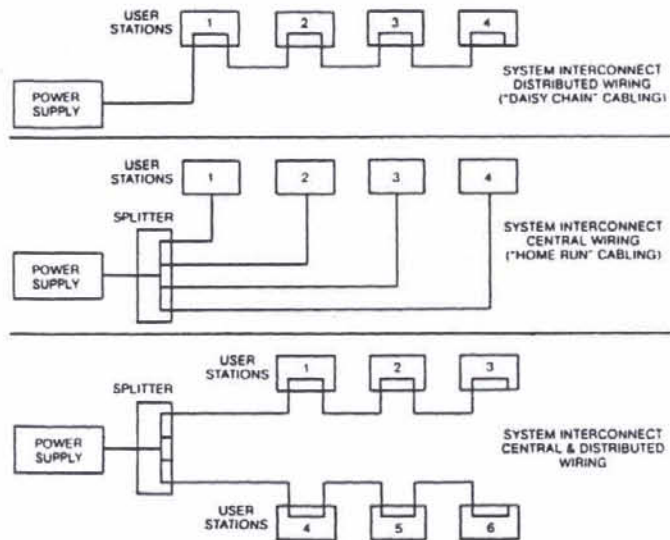
ID2993, Installation Drawing, CM300



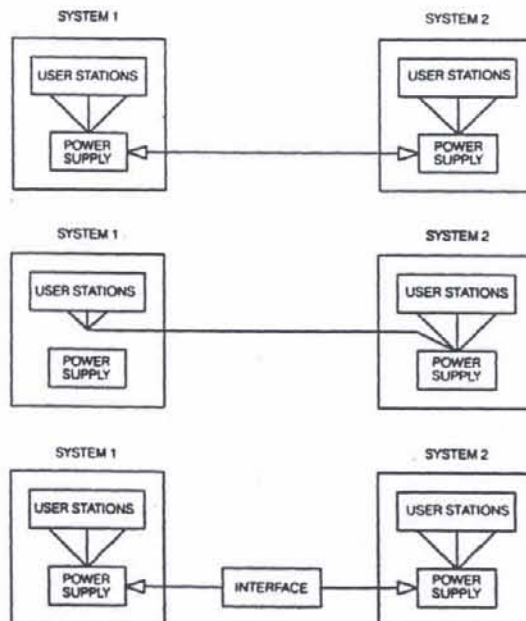
Cable Wiring Diagram, Two Channel System



Cable Wiring Diagram, Three Channel System



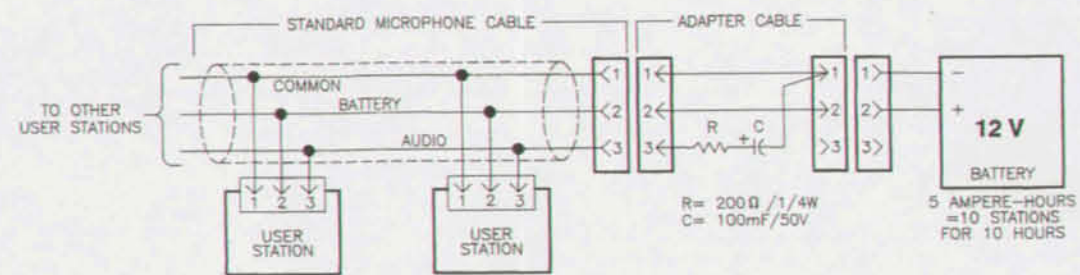
Systems Interconnect



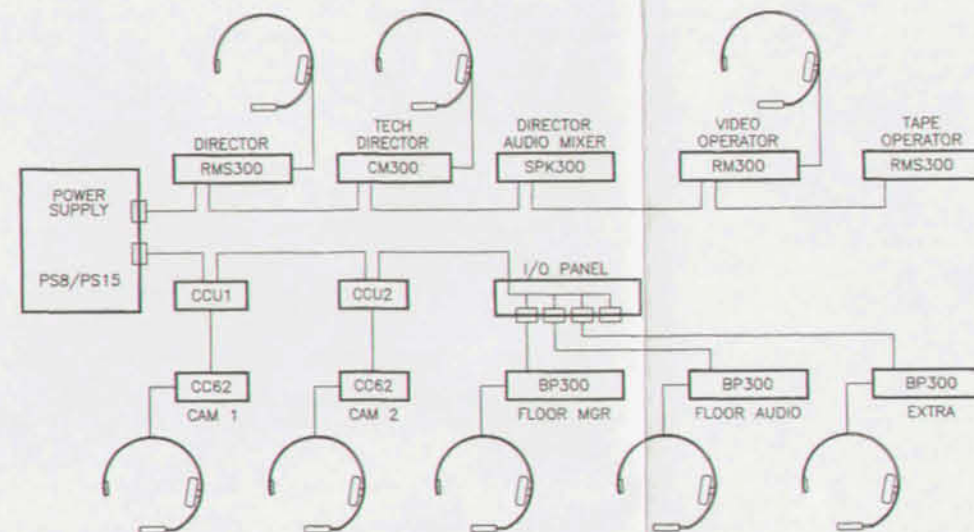
System to System Interfacing

To connect two separate TW Intercom systems together, there are three recommended methods; each one has its merits. The first approach simply connects the audio signals from each power supply via the audio only connection (with line impedance selector switches in the 400 ohm/dual position). The second approach disconnects one power supply from service and uses the other to power both systems. A third approach employs a 2-wire to 2-wire interface to couple the intercom audio signals together.

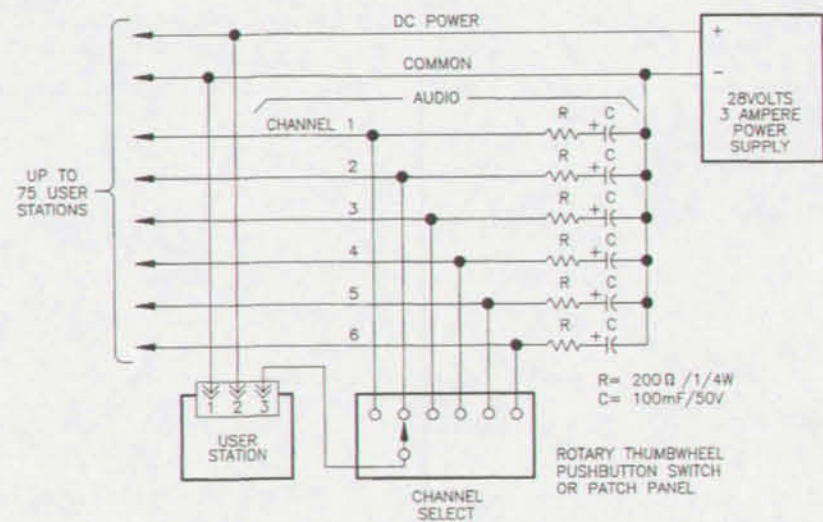
System to System Interfacing



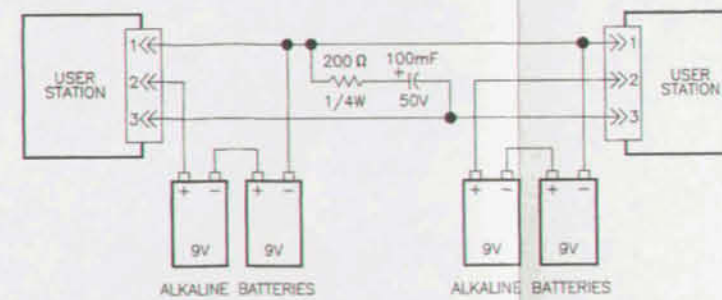
12-volt Battery Operation



Telproduction System Example



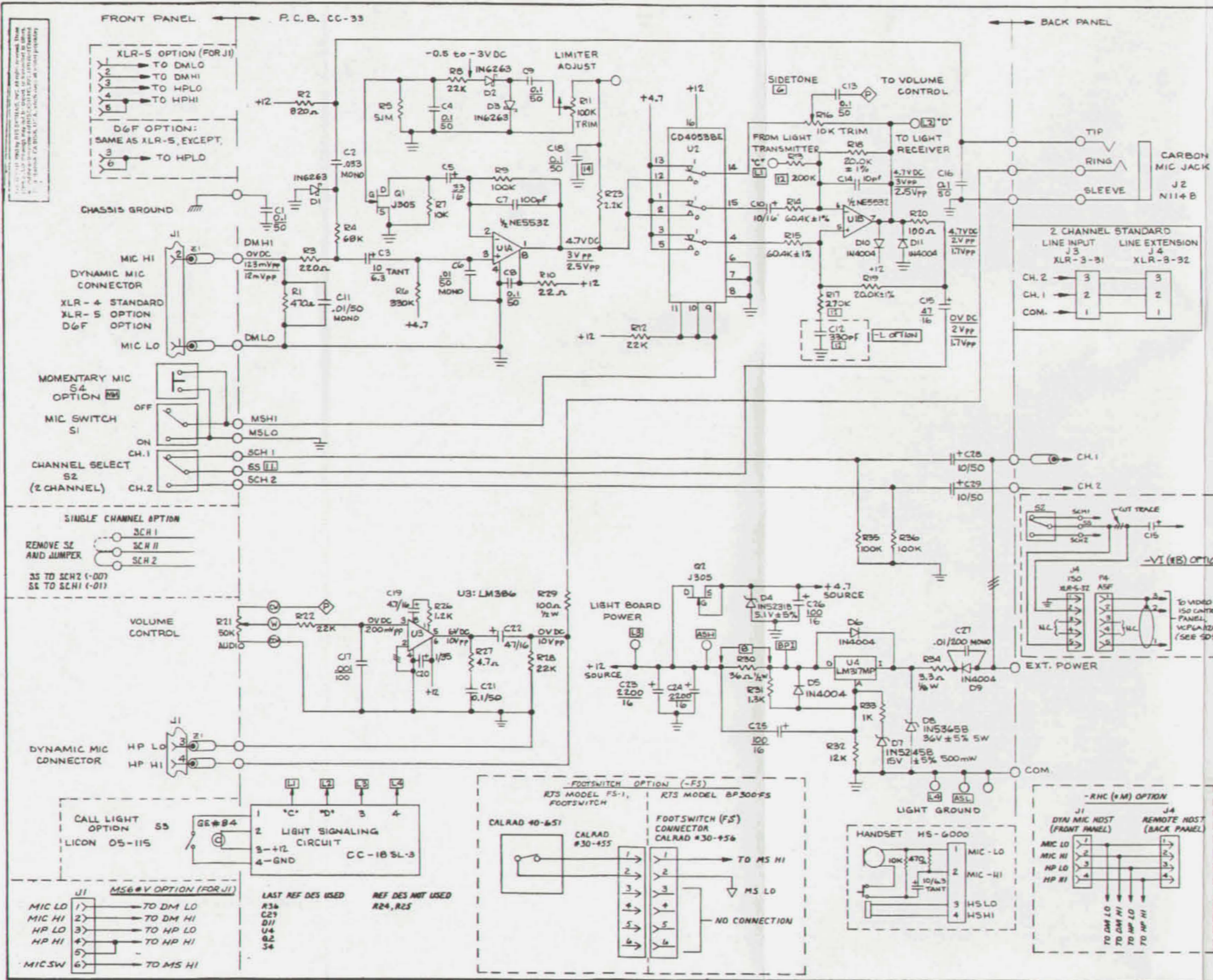
Multi-channel Operation



Dry Line Operation (For extended distances)

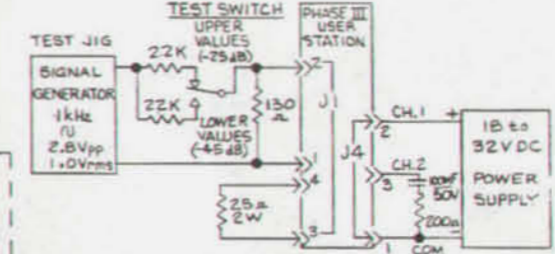
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

UNLESS OTHERWISE SPECIFIED REMOVE ALL SURFS & BREAK SWAMP EDGES HOLE TOLERANCES PER ANSI B91.11-1982, B19.12 DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 1/16 .005 .005 1/8 .010 .010 3/16 .015 .015 1/4 .020 .020 3/8 .030 .030 1/2 .040 .040 3/4 .050 .050 1 .060 .060		CONTRACT NO.	APPROVALS	DATE	TECHNICAL MANUAL ILLUSTRATION- APPLICATION INFORMATION
NEXT ASSY	USED ON	ISSUED	BY	DATE	
APPLICATION	FINISH	ISSUED	BY	DATE	SIZE FSCM NO. DWG NO. REV
					D 60572 TMI1786
					SCALE — T1786-02.DWG SHEET 2 OF 2



REV	DESCRIPTION	DATE	BY
A	CONN. R15 TO U2-4, REMOVED C11, ADD 10uF TO NOTE 10.	2-12-80	
B	SEE ELD # 023	9-7-80	
C	SEE ELD # 055	3-21-80	
D	SEE ELD # 056	4-3-80	
E	SEE ELD # 098	5-5-80	
F	ADDITIONAL REVISIONS TO THE SCHEMATIC DIAGRAM AND PARTS LIST TO BE MADE BY THE USER. SEE THE USER STATION MANUAL FOR DETAILS.	6-22-83	
H	REV PER ECO # 1500	7-27-85	
J	REVISED PER ECO 1555	11-27-85	
K	REVISED PER ECO # 1577	4-2-86	
L	REVISED PER ECO 1863	87-3-26	
M	REVISED PER ECO 2612	8-21-87	
N	REVISED NOTE 10 PER ECO 3866	9-14-90	
P	REVISION PER ELD # 3346	4-15-91	
R	ADD SINGLE CHANNEL OPTION ELD 55275	3-12-92	JL 2"

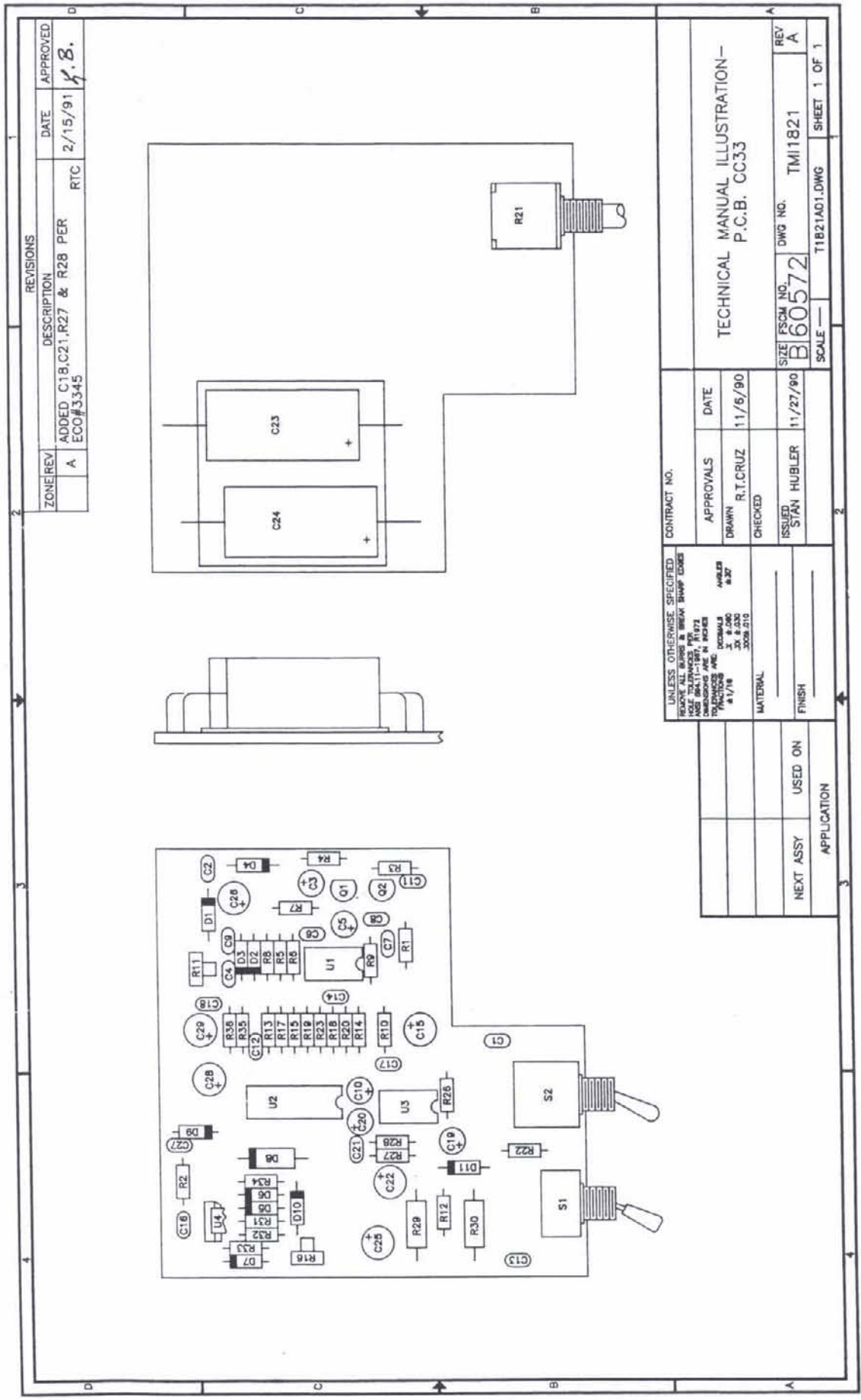
- 14. OPTIONAL PART FOR LIMITER TRANSIENT SENSITIVITY REDUCTION.
- 13. ∇ = SCHOTTKY DIODE, VF \approx 0.1 TO 0.3V
- 12. ADD FOR CALL LIGHT (L) OPTION.
- 11. CALL LIGHT OPTION TEST DATA: 20,000 \pm 0.1000kHz AT 1.0Vpp MEASURED AT THIS POINT
- 10. TEST JIG AND TEST SETUP FOR VOLTAGE READINGS SET CHANNEL SELECT FOR CHANNEL 2.



- 9. ALL TEST VOLTAGES AND CURRENTS: $\pm 10\%$
- 8. QUIESCENT CURRENT: 17mA (NO 'L' OPTION) QUIESCENT CURRENT: 27mA (WITH 'L' OPTION) DYNAMIC CURRENT: 20 TO 40mA ADDITIONAL
- 7. OPTIONS AND MNEMONICS ARE EXPLAINED ON THE OPTION LIST AND ON THE OPTION DETAIL SHEET.
- 6. SIDETONE POT TYPE AND LOCATION: TRIMPC MOUNTED ON P.C. BOARD. P.C. MOUNTED POTS ARE SCREWDRIVER ADJUSTABLE THROUGH OPTIONAL HOLE IN SIDE OF CASE.
- 5. CUTTABLE TRACES (USED FOR OPTIONS) ARE SHOWN: ---
- 4. THIS DRAWING APPLIES TO THE FOLLOWING USER STATION OPTIONS: A5, BPI, XLS, DGF, L, LP, MM, MTI, MTZ.

- 3. THIS DRAWING APPLIES TO THE FOLLOWING USER STATION MODEL NUMBERS: CC-33, BP300, CM300, RM300
- 2. CAP. VALUES ARE SHOWN: MICROFARADS/VOLTS. ALL RESISTORS ARE CARBON FILM, 1/4 WATT, $\pm 5\%$. NOTES: (UNLESS OTHERWISE SPECIFIED)

PRODUCT LINE	RTS SYSTEMS NO. HOLLYWOOD, CA.		
DATE	REV	BY	CHKD
FC/JB	3/24/79		
SCALE	D 60572	SD 1464	



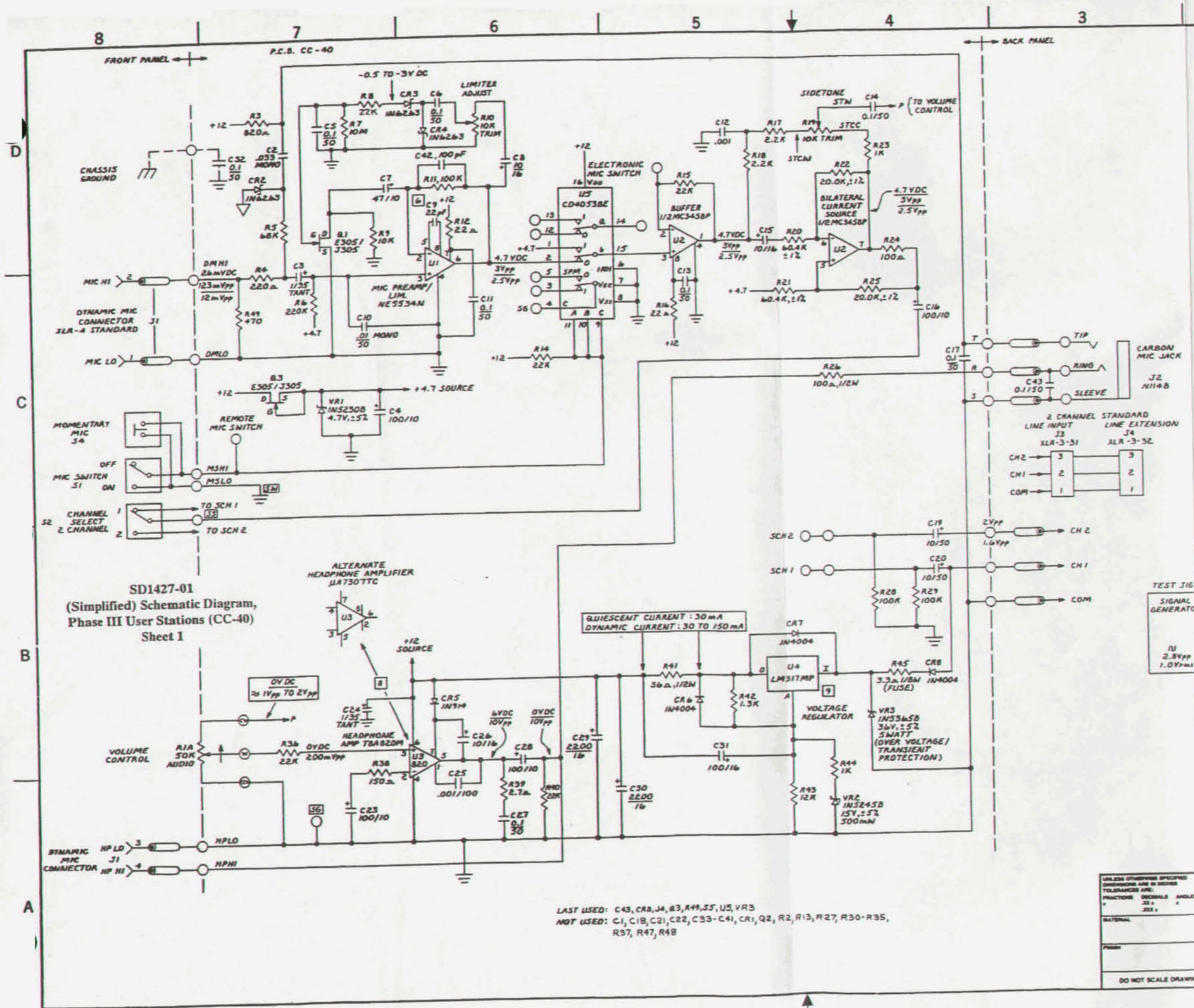
REVISIONS		DATE	APPROVED
ZONE/REV	DESCRIPTION		
A	ADDED C18, C21, R27 & R28 PER ECO#3345	2/15/91	K.B.
		RTC	

CONTRACT NO.		APPROVALS		DATE
		DRAWN	R.T. CRUZ	11/6/90
		CHECKED		
		ISSUED	STAN HUBLER	11/27/90
		NEXT ASSY	USED ON	
		APPLICATION		

UNLESS OTHERWISE SPECIFIED	REMOVE ALL BURRS & BREAK SHARP EDGES
USE 20 GA. 11-11.500, 11.173	
ALL DIMENSIONS ARE IN INCHES	
DECIMALS	
1/16	0.0625
1/8	0.125
3/16	0.1875
1/4	0.25
5/16	0.3125
3/8	0.375
1/2	0.5
5/8	0.625
3/4	0.75
7/8	0.875
1	1.0

SIZE	FSCM NO.	DWG NO.	REV
B	60572	TMI1821	A
SCALE	T1821AQ1.DWG		SHEET 1 OF 1

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
D	REDRAWN		12-9-85	
E	REVISED PER ECO # 2523		6-28-87	
F	CHANGED NOTE B PER ELO # 3106		7-14-90	



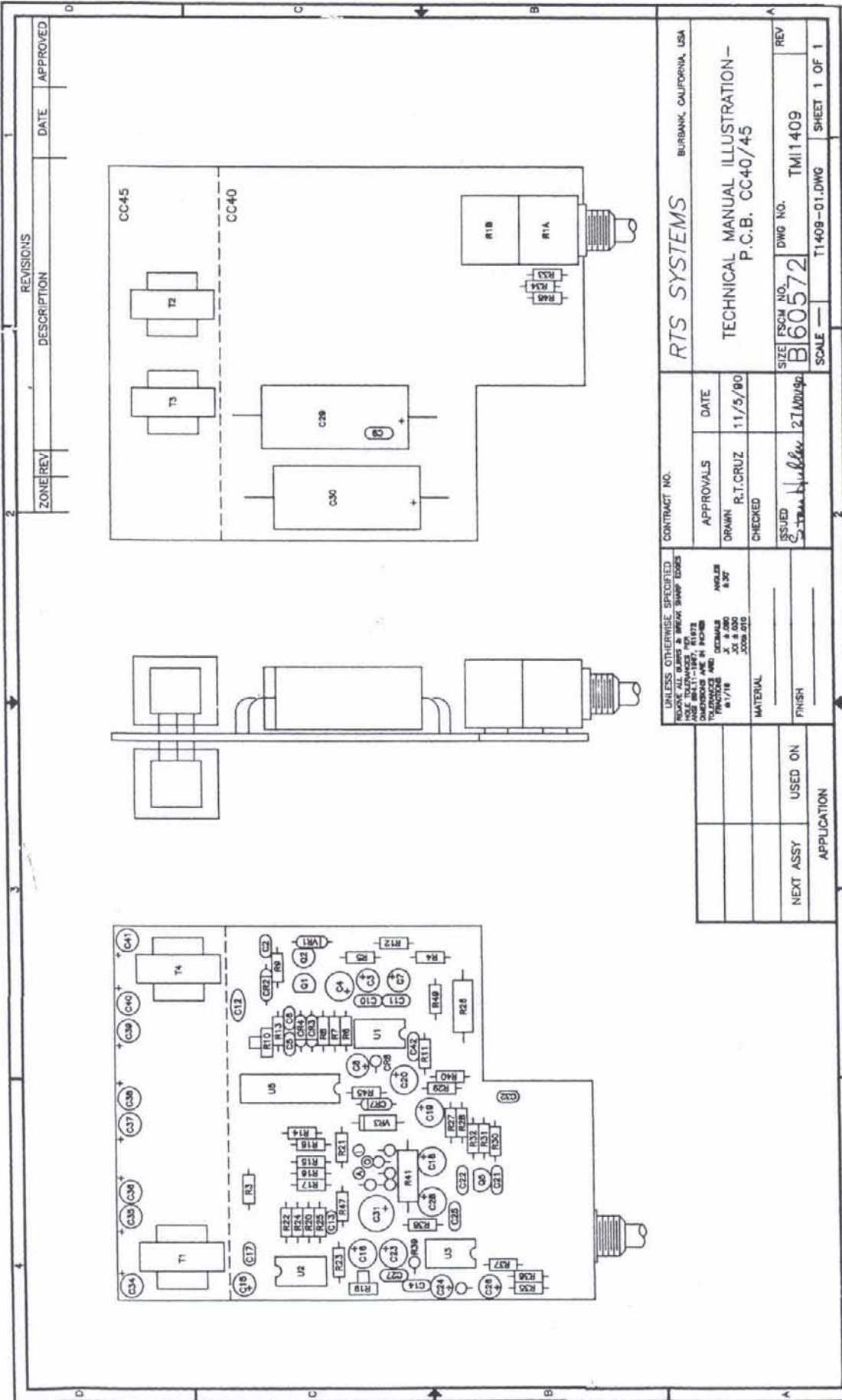
SD1427-01
(Simplified) Schematic Diagram,
Phase III User Stations (CC-40)
Sheet 1

LAST USED: C43, C48, J4, R3, R44, J5, U5, VR3
NOT USED: C1, C18, C21, C22, C33-C41, CR1, Q2, R2, R13, R27, R30-R35, R37, R47, R48

10. THIS DRAWING DOES NOT SHOW OPTIONAL PARTS. FOR OPTION INFORMATION, REFER TO SD 1427-00.
 9. FOR SPEAKER STATIONS, CHANGE U4 TO AN LM317T. THE LM317T MUST BE ATTACHED TO A HEATSINK, SUCH AS AHAM #362.
 8. SEE SD3362 FOR ALTERNATE HEADPHONE/SPEAKER AMP TBA 820M ALT. PINOUT NOTED.
 7. σ = SCHOTTKY DIODE, $V_f \approx 0.1$ TO $0.3V$.
 6. NOMINAL VALUE MAY VARY.
 5. TEST JIG AND SET UP FOR CALIBRATION & VOLTAGE READINGS. SET CHANNEL SELECT FOR CH 2. DISCONNECT SPEAKER.
- TEST SWITCH**
- UPPER VALUES (-25dB)
LOWER VALUES (-45dB)
- SET FREQUENCY TO 1KHZ, TEST SWITCH TO -25dB, AND VOLUME POT AT MIN. ADJUST LIMITER POT FOR 2Vpp AT J4 PIN 3. TEST FREQUENCIES: 100HZ, 1KHZ, 10KHZ ($\pm 3dB$).
 4. ALL TEST VOLTAGES AND CURRENTS: $\pm 10\%$
 3. OPTIONS AND MNEMONICS ARE EXPLAINED ON THE OPTION LIST, AND ON THE OPTION DETAIL SHEET.
 2. CAP. VALUES ARE SHOWN: MICROFARADS/VOLTS.
 1. ALL RESISTORS ARE CARBON FILM, 1/4 WATT, $\pm 5\%$.

NOTES: (UNLESS OTHERWISE SPECIFIED)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES		CONTRACT NO.		DATE	
		APPROVALS		DATE	
DRAWN		R. NEILSON		12-9-85	
CHECKED					
MATERIAL					
FINISH					
DO NOT SCALE DRAWING		SCALE		SHEET	
		D 60572		SD 1427-01	
				F	



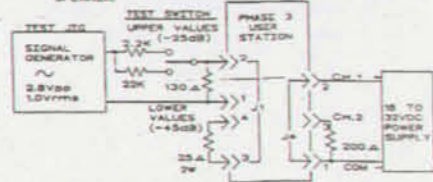
ZONE/REV	DESCRIPTION	DATE	APPROVED

REVISIONS

RTS SYSTEMS BURBANK, CALIFORNIA, USA	
TECHNICAL MANUAL ILLUSTRATION - P.C.B. CC40/45	
CONTRACT NO.	DATE 11/5/80
APPROVALS DRAWN: R.T. CRUZ CHECKED:	ISSUED: <i>[Signature]</i> 2/1/80/92
SIZE: FSCM NO. B60572 DWG NO. TM11409 SCALE: 1:1 SHEET 1 OF 1	MATERIAL: FINISH:
UNLESS OTHERWISE SPECIFIED INCLUDE 1% TOLERANCE & BREAK SHARP EDGES HOLE TOLERANCES ARE: DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS .0005 DECIMALS .0005 ANGLES .0005 DIMENSIONS .0005 DIMENSIONS .010	APPLICATION USED ON NEXT ASSY

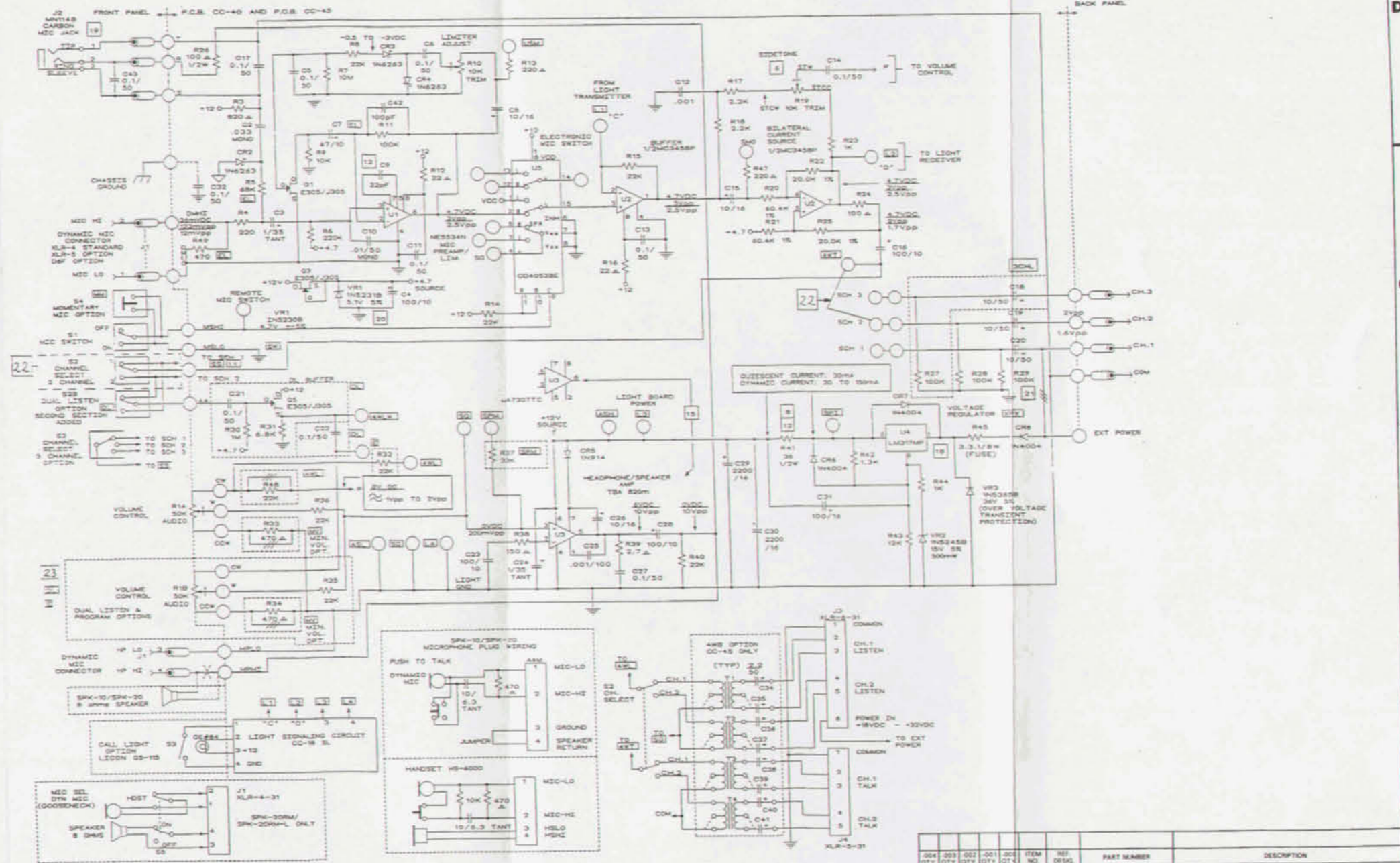
NOTES:

1. ALL RESISTORS ARE CARBON FILM 1/4W. 5%. 2. CAP. VALUES ARE SHOWN MICROFARADS/VOLTS.
3. THIS DRAWING APPLIES TO THE FOLLOWING USER STATION OPTIONS: ASBPK20, 33, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
4. THIS DRAWING APPLIES TO THE FOLLOWING USER STATION MODEL NUMBERS: SP-10, SP-20, SP-30, SP-30A, SP-30B, SP-30C, SP-30D, SP-30E, SP-30F, SP-30G, SP-30H, SP-30I, SP-30J, SP-30K, SP-30L, SP-30M, SP-30N, SP-30O, SP-30P, SP-30Q, SP-30R, SP-30S, SP-30T, SP-30U, SP-30V, SP-30W, SP-30X, SP-30Y, SP-30Z.
5. OUTLINE TRACES (USED FOR OPTIONS) ARE SHOWN.
6. SIDETONE POT. TYPE AND LOCATION DESK SPEAKER STATIONS SP-10, SP-20, PANEL MOUNT ON REAR PANEL. BACK MOUNT SPEAKER STATION SP-30, 30A, 30B, 30C, 30D, 30E, 30F, 30G, 30H, 30I, 30J, 30K, 30L, 30M, 30N, 30O, 30P, 30Q, 30R, 30S, 30T, 30U, 30V, 30W, 30X, 30Y, 30Z. PANEL MOUNT ON FRONT PANEL. ALL OTHERS, TRIMPOT MOUNTED ON P.C. BOARD. P.C. MOUNTED POT'S ARE SCREWDRIVER ADJUSTABLE THROUGH HOLE IN SIDE OF CASE.
7. OPTIONS AND WAVEFORMS ARE EXPLAINED ON THE OPTION LIST, AND ON THE OPTION DETAIL SHEET.
8. ON SP-30, 30A, 30B, 30C, 30D, 30E, 30F, 30G, 30H, 30I, 30J, 30K, 30L, 30M, 30N, 30O, 30P, 30Q, 30R, 30S, 30T, 30U, 30V, 30W, 30X, 30Y, 30Z. JUMPER FROM J2 TO J3. ADD EXT. CHANGE R41 TO 10 K, 1/2 W.
9. ALL TEST VOLTAGES AND CURRENTS = DC.
10. TEST J22 AND SET UP FOR CALIBRATION AND VOLTAGE READINGS. SET CHANNEL SELECT FOR CH2 DISCONNECT SPEAKER.



SET FREQUENCY TO 1000 TEST SWITCH IN -25dB AND VOLUME POT AT MIN. ADJUST LIMITER POT FOR 20dB AT 10 PPM 3. TEST FREQUENCIES: 100HZ, 1KHZ, 10KHZ (-3dB).

11. CALL LIGHT OPTION TEST DATA: 20000 Hz - 0.00002 Hz AT 10VDC MEASURED AT THIS POINT. USE TEST JIC BELOW.
12. FOR SP-10 AND SP-20, CHANGE R41 TO A 10 K, 1/2 W, RESISTOR.
13. NOMINAL VALUE MAY VARY.
14. SCOTTKY DIODE V_f = 0.1 TO 0.3V.
15. WAT737C IS AN OBSOLETE PART. USED ON EARLY VERSION USER STATIONS.
16. OUT TRACE AT J22 FOR 4WS OPTION.
17. P2 OR US482 OPTIONS DELETE CARBON MIC ON SP-300 & SP-300L UNITS.
18. FOR SPEAKER STATIONS, CHANGE U4 TO AN LIGHT. THE LIGHT MUST BE ATTACHED TO A HEATSHNK. SUCH AS AMM #362.
19. MOUNT ON FRONT PANEL FOR 5W & 5W UNITS. SP UNITS MOUNT ON BACK PANEL.
20. UNITS BUILT BEFORE FEB. 51 HAVE 1N2338B (4.7V) DIODES.
21. FOR LOCAL POWER (F) OPTION, OUT TRACE, CONNECT POWER SUPPLY (18-22 VDC) BETWEEN 'EXT. POWER' AND COMMON.
22. -Z OPTION (EX#2) REMOVE S2 AND CONNECT CH#2 INPUT TO EXT CONNECTION.
23. WILL NOT BE USED ON 300-120.



LAST USED: C43,C48,J4,D5,R49,S5,T4,U5,V8
NOT USED: Q2,Q4,R46,C33

QTY	REV	ITEM NO	REF DESIG	PART NUMBER	DESCRIPTION
1004	1	Q01	Q01	1N2338	DIODE
1005	1	Q02	Q02	1N2338	DIODE
1006	1	Q03	Q03	1N2338	DIODE
1007	1	Q04	Q04	1N2338	DIODE
1008	1	Q05	Q05	1N2338	DIODE
1009	1	Q06	Q06	1N2338	DIODE
1010	1	Q07	Q07	1N2338	DIODE
1011	1	Q08	Q08	1N2338	DIODE
1012	1	Q09	Q09	1N2338	DIODE
1013	1	Q10	Q10	1N2338	DIODE
1014	1	Q11	Q11	1N2338	DIODE
1015	1	Q12	Q12	1N2338	DIODE
1016	1	Q13	Q13	1N2338	DIODE
1017	1	Q14	Q14	1N2338	DIODE
1018	1	Q15	Q15	1N2338	DIODE
1019	1	Q16	Q16	1N2338	DIODE
1020	1	Q17	Q17	1N2338	DIODE
1021	1	Q18	Q18	1N2338	DIODE
1022	1	Q19	Q19	1N2338	DIODE
1023	1	Q20	Q20	1N2338	DIODE

UNSPECIFIED LIMITS OF TOLERANCE

STRAIGHTNESS OR FLATNESS	DECIMAL	DR / S	OK	APP
CENTRICITY	XX	SCALE	DATE: 10-15	
ANGLES	XX	DO NOT SCALE DRAWING		
UNMARKED ANGLES	XXX			
AND INTERSECTIONS	XXX			
THREADS	XXX			
EXT. CLASS 2B				
INT. CLASS 2B				
MOLD FROM DR. PLATE NO 3				
DRMT. 2"				

TELEX MINNEAPOLIS, MINNESOTA

CHEMATIC DIAGRAM PHASE THREE USER STATION

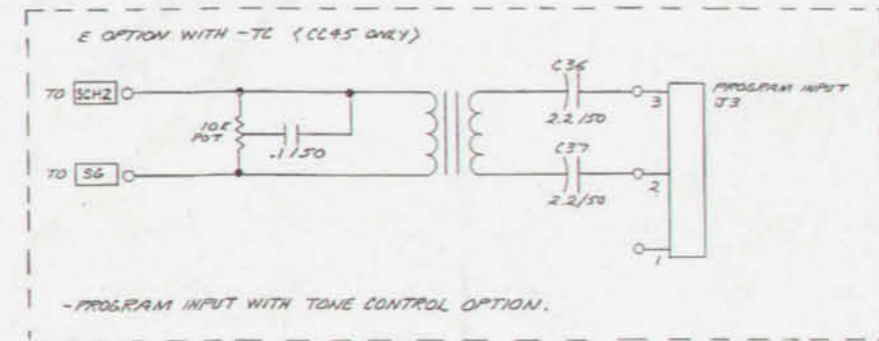
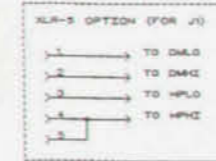
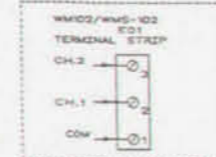
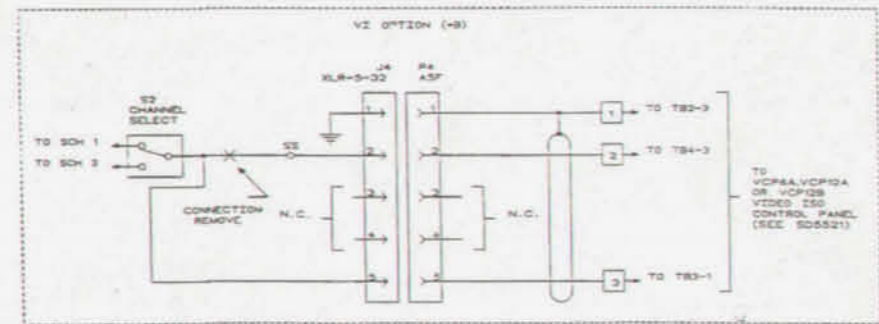
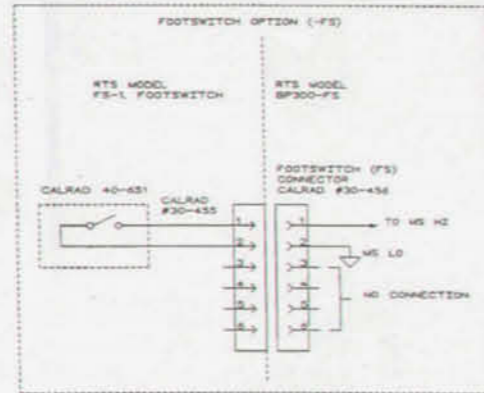
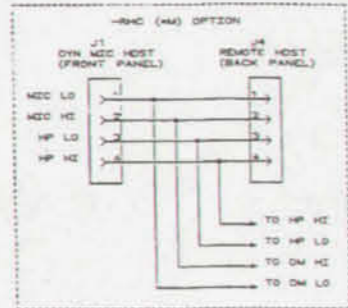
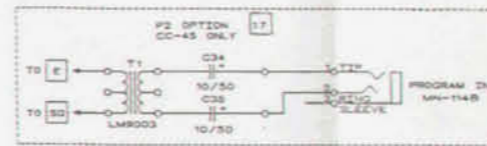
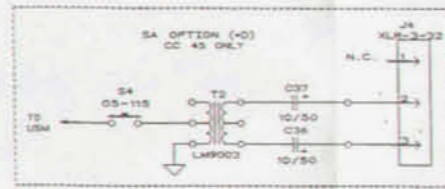
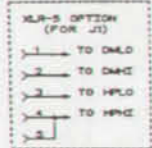
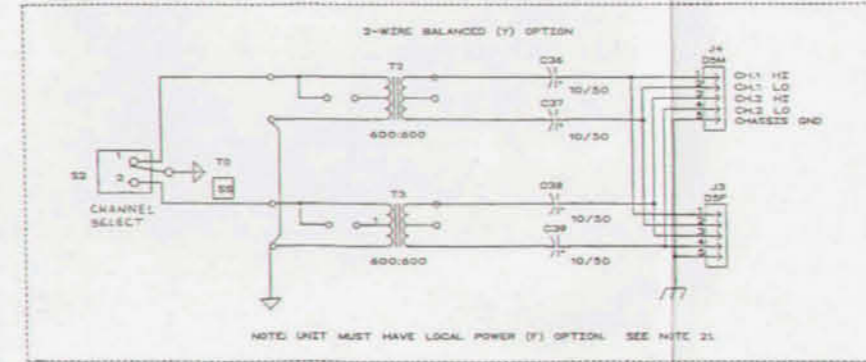
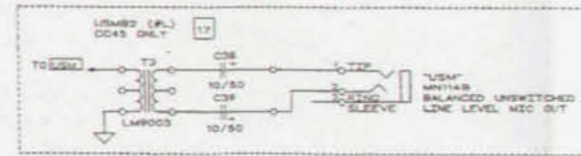
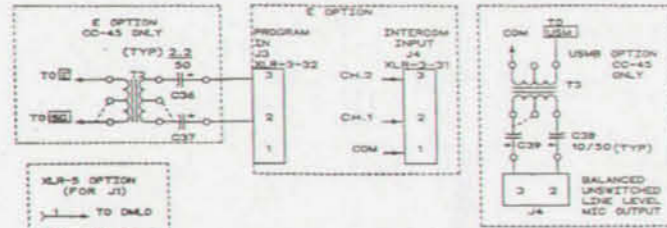
9027-1427-00

1 OF 2

B.E.

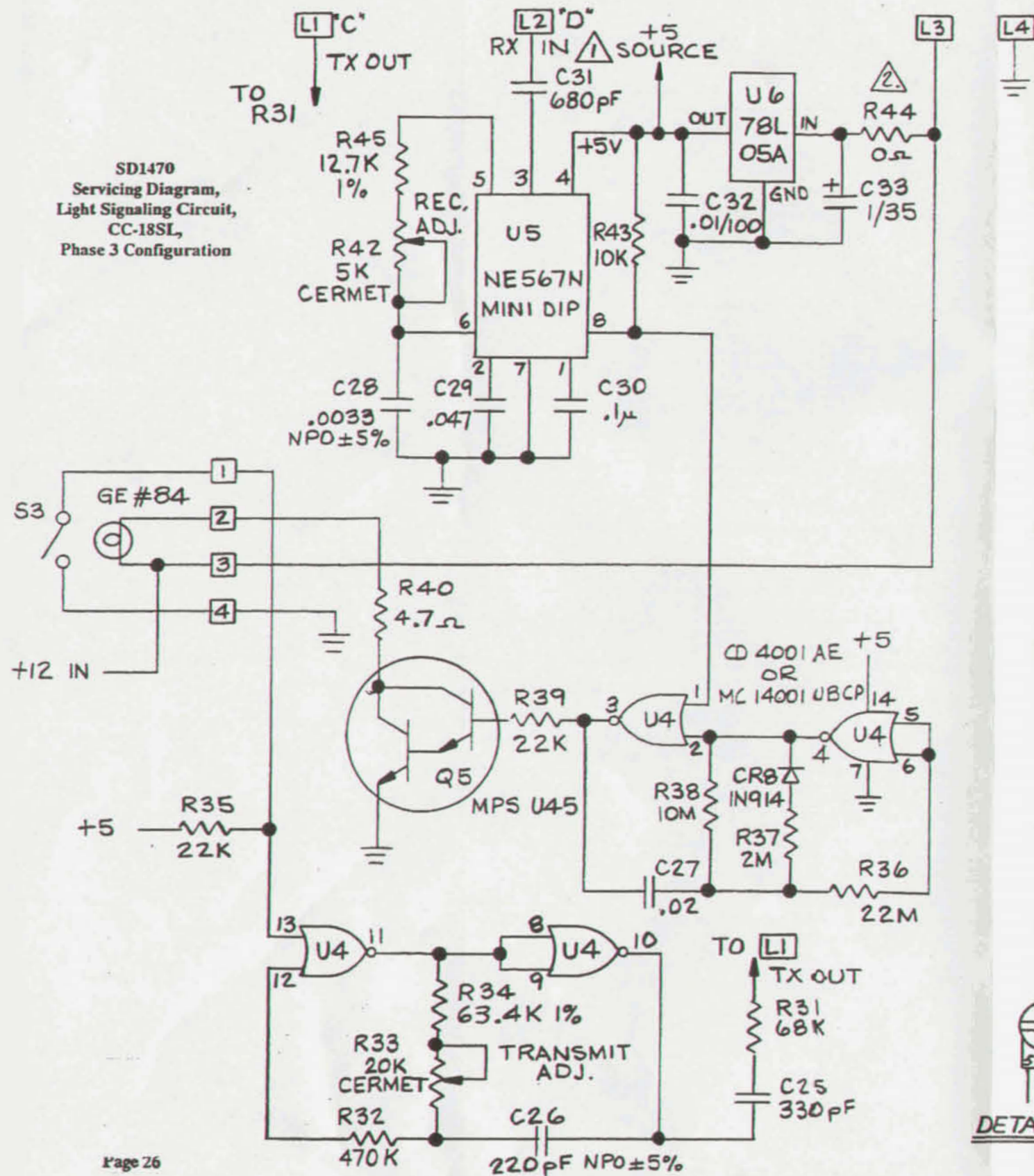
NOTES:

2		SHEET		SHEET		REVISIONS					
REV.	REV.	REV.	STATUS	LOC.	REV.	DESCRIPTION	ECO. NO.	DRY	CHKD	APP.	DATE
		AS	REVISED / REDRAWN								10-18-53



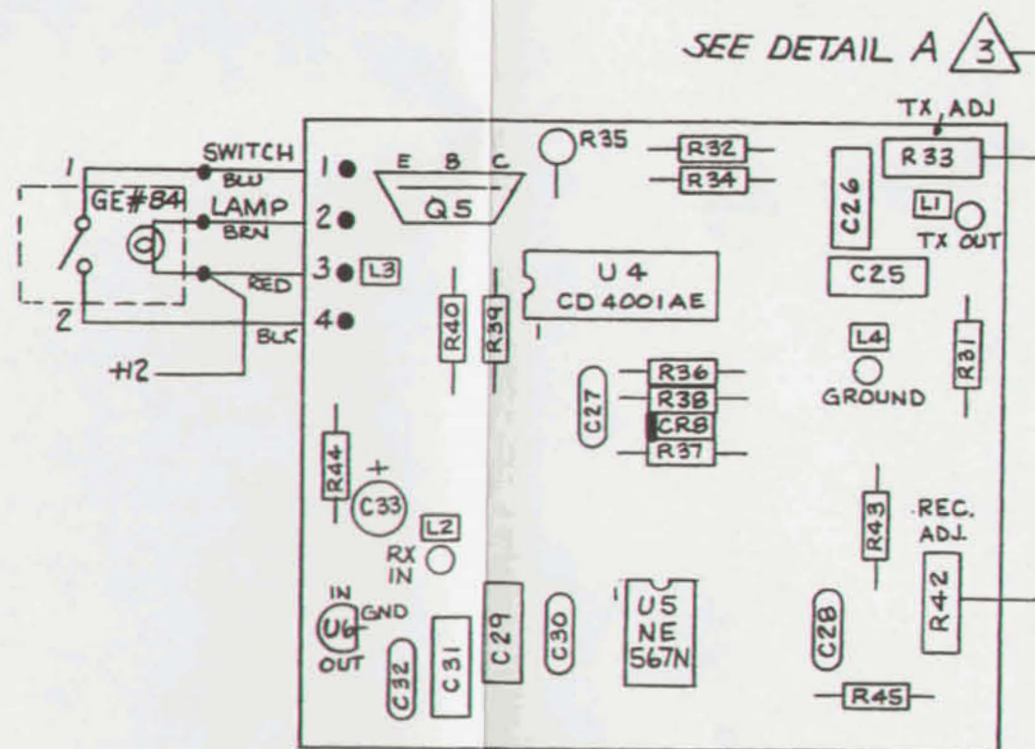
UNSPECIFIED LIMITS OF TOLERANCE		LIST OF MATERIALS	
STRAIGHTNESS AND OR FLATNESS	DECIMAL	DR	CK
CONCENTRICITY	X ±.05 IN	DATE	SCALE
ANGLES	±1/2° BEND ±.02°	DO NOT SCALE DRAWING	
UNMARKED ANGLES, BENDS AND INTERSECTIONS	±.01 IN	SIZE	DATE
THREADS - EXT. CLASS 2	MACHINED FINISH 14	DWG NO.	DATE
MOLD PARTS - DR. SPE NO 3	DR. DATE	D	9027-1427-00
		SHT	2 OF
		PLANT	BE
		DIST.	

SD1470
Servicing Diagram,
Light Signaling Circuit,
CC-18SL,
Phase 3 Configuration



Page 26

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	RELEASED	4/10/79	J.F.H.
	B	ADDED NOTES $\Delta 1$ & $\Delta 2$ - RKB	2/4/80	SLH
	C	REV PER ECO # 729 B.M.	2-14-83	SLH
	D	REVISED PER ECO # 1537	11-5-85	RN
	E	CORRECTED VALUE $\Delta 6$ R34 WAS 60.4K PER ECO 1605 MW	4-30-86	
	F	REVISED PER ECO 2466 DL	7-24-89	
	G	ADDED NOTE 3 PER ECO # 2781	1-8-90	



- $\Delta 3$ GLUE SHOULD BE APPLIED TO LOWER RIGHT CORNER OF POT.
- $\Delta 2$ FOR PHASE II USER STATIONS USE 620 Ω FOR R44.
- $\Delta 1$ 320/501 SERIES: USE 680pF FOR C31.

NOTES: UNLESS OTHERWISE SPECIFIED.



CONTRACT NO.		PRODUCT LINE		
APPROVALS	DATE	SERVICING DIAGRAM, LIGHT SIGNALING CIRCUIT, CC-18SL, PHASE THREE CONFIGURATION		
DRAWN F.C.	4/9/79	SIZE B	FSCM NO. 60572	DWG. NO. SD1470
CHECKED		SCALE NONE		SHEET
ISSUED Stan Duke	2/14/83			REV. F