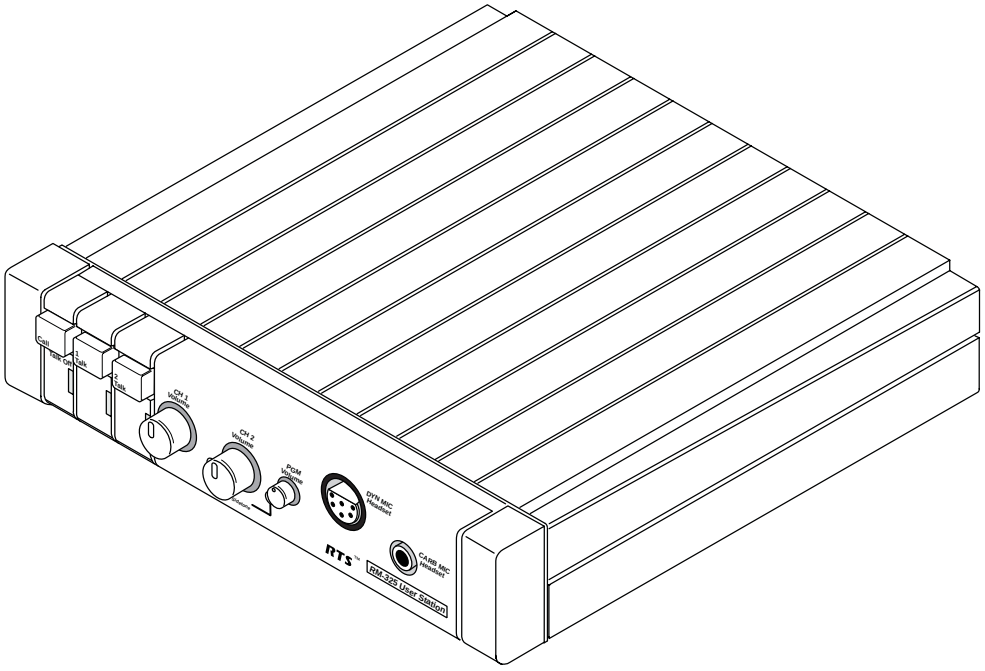
USER MANUAL

RM-325

Rack Mount Intercom Station



RTS™

9350-7491-000 Rev B 3/98

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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.

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1 DESCRIPTION AND SPECIFICATIONS

1.1 DESCRIPTION

1.1.1 GENERAL

The RM-325 is a two-channel intercom user station for the RTS TW Intercom System. It is designed for use with a headset, and it can be placed on a desktop, or rack mounted with optional rack mount hardware.

1.1.2 FEATURES

- Talk Features: There is a separate talk button with talk-on indicator for each channel. Talk buttons feature dual-action, momentary/latching talk operation: a button may be pressed and held to talk, then released when finished, or the button may be tapped once to turn talk on and then tapped again to turn talk off. Latching operation may be independently deactivated for each channel via an internal DIP switch. The channel 1 and 2 talk buttons may also be independently disabled via internal DIP switches. Additionally, there is a an external talk switch input (for footswitch etc.) for each channel via the Aux connector.

- Listen Features and Headsets: There is a separate listen volume control for each channel, and a listen volume control for the program input. The RM-325 accepts a stereo, dynamic-mic headset or a monaural, carbon-mic headset. Default operation is set for stereo listen, with channel 1 assigned to left headphone, channel 2 to right headphone, and program input to both headphones. Internal jumpers permit all signals to be combined for monaural listening. Internal jumpers also permit the program audio to be assigned left or right when using a stereo headset.

- Microphone and Microphone Switch Features: The Dynamic-mic headset connector features a balanced, dynamic mic input, and a mic on/off switch input. A remote mic on/off switch may also be connected via the Aux connector. There is an internal mic-sensing circuit for the carbon-mic headset jack, which activates the mic circuit when the carbon mic is on. An internal jumper can configure the carbon mic input exclusively for use as a mic on/off switch input (monaural headphone output is supported in either case). The microphone audio is available as an unswitched (hot, or always on) unbalanced output at the Aux connector.

- Talk-off (Mic Kill) Signaling: the RM-325 can send and receive Talk Off signals. Talk-off send and receive can be independently enabled/disabled via internal DIP switches.

- Call Signaling: There is a call button and indicator, and the RM-325 can send and receive call signals. There is also an internal setup switch to disable call send.

- Program Input: Balanced program audio may be input via the 1/4-inch stereo phone jack (PGM) or via the AUX connector.

- Line/Local Power Options: By default, the RM-325 receives operating power from intercom channel 1. Alternatively it may be configured to receive power from channel 2 or from a local, 24 VDC power source connected to the AUX connector.

- Sidetone: There is a separate sidetone control for each intercom channel. These adjust the level of the station operator's own voice in the headphones when talking.

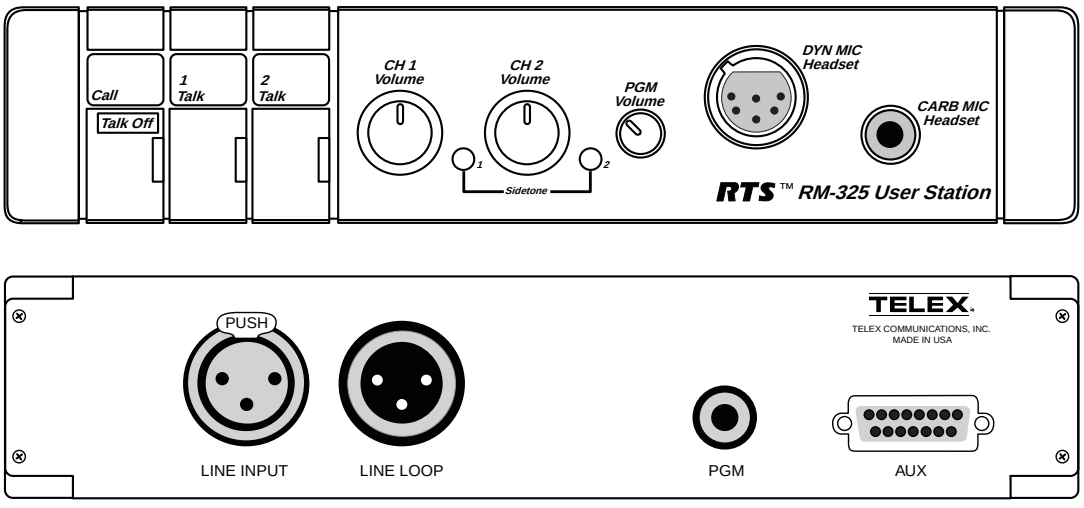


Figure 1. RM-325 Front and Rear Panel Reference View

1.2 SPECIFICATIONS

1.2.1 TW System Specifications

DC Operating Limits (station to power supply):
About 5,000 ft. (1.5 km) with #22 AWG wire

Audio Operating Limits (locally powered stations):
About 10,000 ft. (3 km) with low-capacitance cabling

System Capacitance:
0.3 µF, maximum (10,000 ft. [3 km] cable at 30 pF/ft.)

Intercom Channels:
Station Output Level: 0.7 Vrms (0 dBu) nominal
Channel Terminating Impedance: 200Ω ±5%
Station Bridging Impedance: greater than 10,000Ω

Current Source:
Transfer Ratio: 3.3 mA/V = 3.3 millisiemans
Output: ±5 mA into 200Ω, ±1 Vpeak (limiter threshold)

Call Signalling:
Send: 20 kHz ±100 Hz, 0.3 Vrms nominal
Receive: 20 kHz ±200 Hz, 100 mVrms

Talk- Off Signalling:
Send: 24 kHz ±100 Hz, 0.3 Vrms nominal
Receive: 24 kHz ±200 Hz, 100 mVrms

1.2.2 RM-325 General Specifications

Power Requirements, Channel Powered RM-325:
30 VDC nominal (standard TW line), 60 to 100 mA

Power Requirements, Locally Powered RM-325:
24 VDC nominal, 60 to 100 mA

Environmental Requirements:
Storage: -40°C to 125°C; 0% to 95% humidity, non-condensing
Operating: 0°C to 50°C; 0% to 95% humidity, non-condensing

Dimensions:
1.72" (44 mm) high x 8.2" (208 mm) wide x 8" (203 mm) deep

Weight:
2 lbs 12 oz (1.23 kg)

Noise Contribution:
less than -75 db on the line

Common Mode Rejection Ratio:
greater than 40 dB from the line

Program Input:
Maximum Input Level: 20 dBu
Nominal Input Level: -10 to +8 dBu
Frequency Response: 100 Hz to 12 kHz ±3 dB

Headphone Amplifier
Voltage Gain: 30 ±3 dB from the line
Maximum Output: 150 mW into 50Ω
Frequency Response: 100 Hz to 8 kHz ±3 dB nominal
Output Voltage Level: 8 volts peak-to-peak
Headphone Impedance: 50 to 600Ω

Sidetone:
20 dB minimum range, adjustable

Microphone Preamplifier:
Maximum Voltage Gain: 54 dB
Frequency Response: 100 Hz to 8 kHz, nominal
Input Impedance: 1,000Ω, balanced
Limiter Range: 30 dB

Total Harmonic Distortion:
Less than 0.2% nominal at Channel output

1.2.3 RM-325 Connectors

Auxiliary Connector
Type: DB-15F
Pin 1: Program input low
Pin 2: Program input high
Pin 3: Unswitched mic output high
Pin 4: Foot switch in, channel 1
Pin 5: Foot switch in, channel 2
Pin 6: Local power (+24 VDC)
Pin 7: Remote mic switch in
Pin 8: Not Used
Pin 9: Common
Pin 10: Common
Pin 11: Common
Pin 12: Foot switch channel 1 common
Pin 13: Foot switch channel 2 common
Pin 14: Local power common
Pin 15: Remote mic switch common

CARB MIC Headset Connector
Type: ¼", 3-Conductor Phone Jack
Tip: Microphone input high (or mic switch contact
Ring: Headphone high
Sleeve: Common

DYN-MIC Headset Connector
Type: XLR-6F 6-Pin Female Audio Connector
Pin 1: Headset dynamic microphone low
Pin 2: Headset dynamic microphone high
Pin 3: Headphone and mic switch common
Pin 4: Headphone left high
Pin 5: Headphone right high
Pin 6: Remote microphone switch contact

Intercom Line Input Connector
Type: XLR-3F 3-Pin Female Audio Connector
Pin 1: Common
Pin 2: Intercom channel 1 audio and power
Pin 3: Intercom channel 2 audio

Intercom Line Loop Connector
Type: XLR-3M 3-Pin Male Audio Connector
Pin 1: Common
Pin 2: Intercom channel 1 audio and power
Pin 3: Intercom channel 2 audio

Program Input Connector
Type: 1/4", 3-Conductor Phone Jack
Tip: Program input high
Ring: Program input low
Sleeve: Common

2 INSTALLATION

2.1 Configuration Jumper and DIP Switch Precheck

Before making connections, check that the internal jumpers and DIP switches are properly configured for your intended use. The descriptions and default settings are summarized below and in Tables 1 and 2. For internal access, remove the four long screws (Figure 7, item 11) and remove the top cover. Locations of jumpers and DIP switches are shown in Figure 2.

2.1.1 Channel 1 and 2 Listen Disables (W1 & W2)

Normally, listen is enabled for both channels 1 and 2. Listen may be disabled for either channel by changing the setting of W1 or W2.

This option could be used, for example, when you want to use the left side of a stereo headphone exclusively for program audio input and the right side for one channel of intercom audio. In this case you would:

1. Set W5 for stereo operation (default).
2. Set W1 to “off” to disable channel 1 intercom listen.
3. Set DIP switch S4-4 to “on” to disable channel 1 talk.
4. Set W3 for left headphone program and set W4 to disable right headphone program.

2.1.2 Program Assignment (W3 & W4)

Normally, the RM-325 is set for stereo headphone operation (W5 jumper pins 1&2 shorted) and the program input is assigned to both right and left headphones via jumpers W3 and W4. You can disable program listen in either headphone (or both) by changing the W3 and W4 settings. For monaural operation (W5 jumper pins 2&3 shorted) set W3 to “pins 1&2 shorted”, and set W4 to “pins 2&3 shorted”.

2.1.3 Stereo/Monaural Headset Select (W5)

In stereo mode, with a stereo dynamic-mic headset attached, intercom channel 1 will be heard in the left headphone, and channel 2 will be heard in the right. The program will be heard in the left and/or right headphone depending on the settings of W3 and W4 (it is heard in both the left and right headphones by default).

To use a monaural or single-sided headset with the DYN MIC jack, set jumper W5 so that pins 2&3 are shorted. Also, set the W4 jumper to “Pins 2&3 shorted”: this will prevent possible loss of the program signal in the headphones due to cancellation effects of the internal headphone amplifiers.

If you use a carbon-mic headset, keep the default stereo settings for W3, W4 and W5. There is an internal mixing amplifier which automatically mixes the right and left stereo headphone signals for the monaural CARB Mic Headset jack.

Table 1. Internal Jumpers and Default Settings

Jumper Number	Jumper Function	Default Setting
W1	CH1 Listen: Pins 1&2 shorted: listen enabled Pins 2&3 shorted: listen disabled	1 & 2 shorted
W2	CH2 Listen: Pins 1&2 shorted: listen enabled Pins 2&3 shorted: listen disabled	1 & 2 shorted
W3	Program Assign to Left Headphone or Mono Mix Pins 1&2 shorted: enabled Pins 2&3 shorted: disabled	1 & 2 shorted
W4	Program Assign to Right Headphone Pins 1&2 shorted: enabled Pins 2&3 shorted: disabled	1 & 2 shorted
W5	Stereo/Mono Operation: Pins 1&2 shorted: stereo Pins 2&3 shorted: mono	1 & 2 shorted
X1	Audible Alert Option	1 & 2 open
X2	Channel Power Source Select: Pins 1&2 shorted: channel 2 power Pins 2&3 shorted: channel 1 power	2 & 3 shorted
X3	*CARB MIC* Jack Setting: Pins 1&2 shorted: carbon mic Pins 2&3 shorted: mic switch only	1 & 2 shorted

Table 2. Internal DIP Switches and Default Settings

Dip Switch Number	Switch Function	Default Setting
S4-1	Call Send Disable Off (Open): call send enabled On (Closed): call send disabled	Off
S4-2	Channel 2 Talk Latching Disable Off (Open):Ch 2 talk latching enabled On (Closed): Ch 2 talk latching disabled	Off
S4-3	Channel 2 Talk Disable: Off (Open): Ch 2 talk enabled On (Closed): Ch 2 talk disabled	Off
S4-4	Channel 1 Talk Disable: Off (Open): Ch 1 talk enabled On (Closed): Ch 1 talk disabled	Off
S4-5	Channel 1 Talk Latching Disable Off (Open):Ch 1 talk latching enabled On (Closed): Ch 1 talk latching disabled	Off
S4-6	Talk-Off Transmit Enable Off (Open): disabled On (Closed): enabled	On
S4-7	Not used	Off
S4-8	Talk-Off Receive Enable: Off (Open): disabled On (Closed): enabled	On

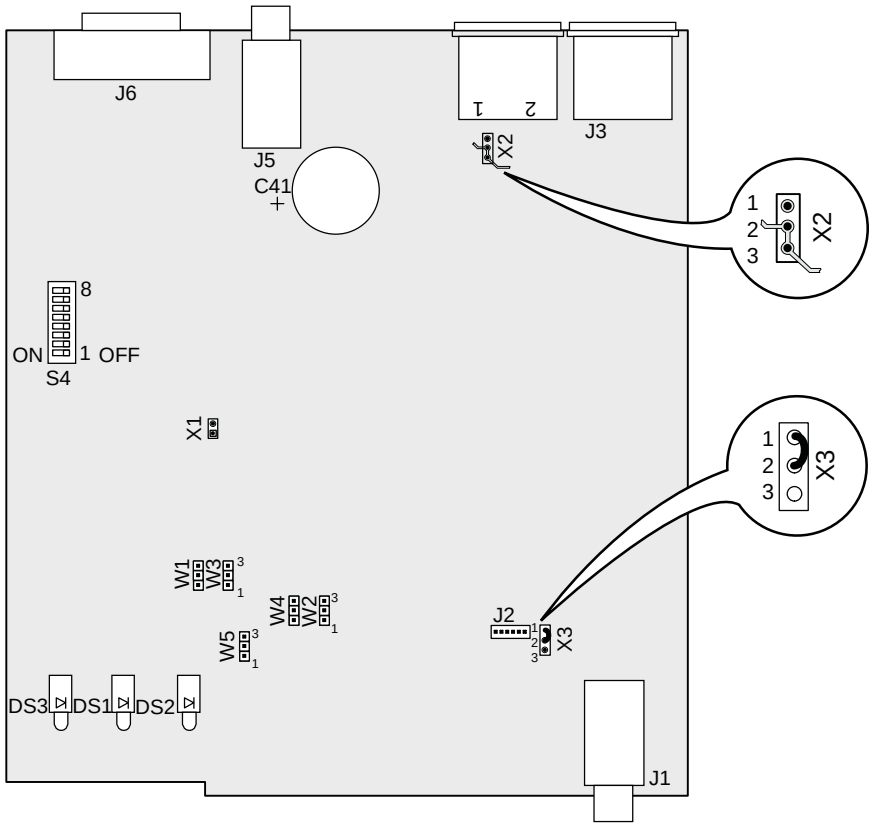


Figure 2. Internal Jumpers and Switches

2.1.4 Audible Alert Option (X1)

A high-impedance, piezoelectric buzzer may be connected between the X1 terminals for audible alert on incoming call.

2.1.5 Channel Power Source Select (X2)

The X2 jumper determines which (if any) intercom channel the RM-325 will be powered from. Normally, this is channel 1 and no change should be required. There are some situations, however, where you may need to power the RM-325 from channel 2, or from a local power source. See “Intercom Channel and Power Connections”, page 9, for details.

2.1.6 CARB MIC Headset Jack Setting (X3)

The CARB MIC Headset jack on the front panel is normally used for a monaural, carbon-mic headset. If the headset is equipped with a mic on/off switch, this can be used with the remote mic switch feature of the RM-325. See “Mic On/Off Switch” in the operation instructions, page 15. If the CARB MIC Headset jack is not used for a headset, it can be converted to a remote mic on/off switch jack for use with the remote mic switch feature. By default, jumper X3 is set for carbon mic input. When X3 is set for mic on/off switch input, a switch contact closure between the tip and sleeve contacts on the CARB MIC jack will activate the mic circuit.

2.1.7 Call Send Disable (S4-1)

Normally, the RM-325 can send call signals. This feature may be disabled by setting S4-1 to the “On” position.

2.1.8 Latch Disable (S4-2 & S4-5)

The talk buttons feature dual-action, momentary/latching operation. For momentary operation, a talk button may be pressed and held to talk, and will turn off when released. For latching operation, a talk button may be tapped to turn it on and then tapped again to turn it off. In some applications it may be desirable to disable the latching feature. This can be done independently for the channel 1 and 2 talk buttons via the S4-2 and S4-5 DIP switches

2.1.9 Channel 1 and 2 Talk Disable (S4-3 & S4-4)

Normally, the talk buttons for channels 1 and 2 are enabled. They may be disabled via DIP switches S4-3 and S4-4.

2.1.10Talk-off Transmit Enable (S4-6)

The RM-325 can send a special, inaudible signal to turn off the microphones on all stations on a channel that are equipped to receive this signal. This feature is useful when an unattended intercom station has been left with a mic or talk button in the on position and is picking up

background noise. In some applications, it may be desirable to disable the talk-off transmit feature.

2.1.11Talk-off Receive Enable (S4-8)

The RM-325 can also receive the special talk-off signals discussed above. In some cases, it may be desirable to disable this receive capability. This will prevent accidental deactivation of the RM-325 station operator's talk buttons during critical communications.

2.2 Mounting

The RM-325 can be used on a desktop, or console-mounted, or rack-mounted. Some possible mounting configurations and the required optional mounting hardware are shown in Figure 6, page 14. When mounting the RM-325, always allow adequate room behind the unit for cable access.

2.3 Intercom Channel and Power Connections

There are several methods to connect the RM-325 to intercom channels and power. Whichever method is used, you must assure that the RM-325 receives operating power, and also that the intercom channels are properly terminated.

2.3.1 Standard TW Connection

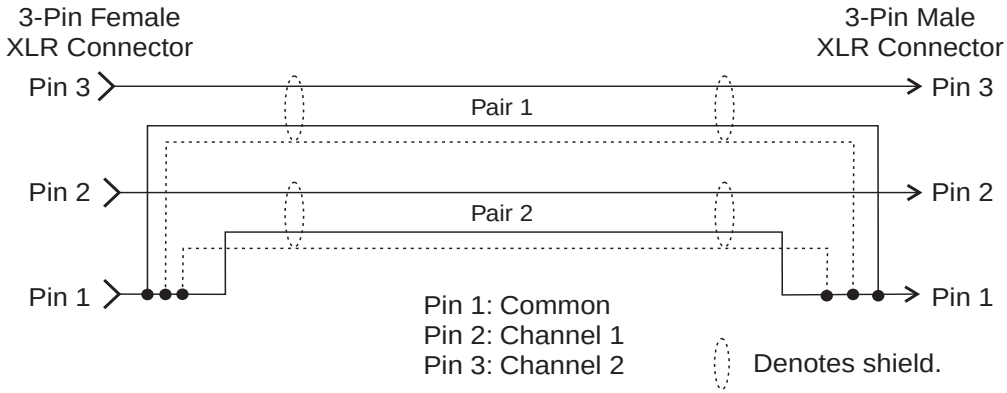
You can connect the RM-325 directly to a PS-15 or PS-31 power supply using a standard 2-channel TW intercom cable (Figure 3). Connect from the power supply's OUTPUT to the RM-325's LINE INPUT. You can then connect another 3-pin cable to the LINE LOOP connector on the RM-325 and continue on to another RM-325 or other intercom station. When you connect stations in this manner, all stations receive operating power on channel 1. And, both intercom channels will be properly terminated by the TW power supply.

The RM-325 can also be connected to a TW5W or TW7W splitter, which is itself connected directly to a TW power supply. Again, you use a standard 2-channel TW intercom cable. The RM-325 will receive operating power on channel 1, and both intercom channels will be properly terminated.

2.3.2 Connection to a Source Assign Panel

If TW power supplies are used, but an SAP Source Assign Panel is used to assign channels to the RM-325, there can be occasions when the RM-325 will not receive operating power on channel 1 as required, but will still be properly terminated on both channels.

Example: Suppose the RM-325 is connected to a SAP612 Source Assign Panel, and there are three PS15 Power Supplies connected to the SAP612. The SAP612 has twelve connectors on the back, for connecting RM-325's and other intercom stations. On the SAP612 front panel, there are two selector switches for each of the twelve connectors, and you can select any two PS15 channels to route to each connector. Since the PS15 power supplies only provide power on their #1 channels, the SAP612 selector switches could let you select combinations where



Cable Type: 22 AWG stranded copper, 2-pair twisted-wire, with shield and drain wire (Belden #8723 or equivalent)

Standard cables are generally constructed using a female connector at one end and a male connector at the other end. This allows several cables to be interconnected to create longer cable runs if neede. Also, TW intercom stations typically provide both a male and female XLR connector for conference lines. This permits loop-through connection of several intercom stations using the standard cables.

Figure 3. Standard 2-channel TW Intercom Cable Wiring Diagram

power would be supplied on channel 2 of a connector, or not at all. In this case, you have 3 alternatives:

1) Assign different channels to the RM-325 so that it will receive power on channel 1

2) Reconfigure the RM-325 to receive power on channel 2. See “Channel 2 Power when using TW Power Supplies”, below.

3) Reconfigure the RM-325 for local power. See “Supplying Local Power when Using TW Power Supplies”, below.

2.3.2.1 Channel 2 Power when using TW Power Supplies

To power the RM-325 from channel 2, carefully and completely cut the circuit trace between X2 pins 2&3. Then solder a jumper between X2 pins 1&2. The RM-325 will now receive power from channel 2, and both channels will be terminated by the TW power supply.

2.3.2.2 Supplying Local Power when Using TW Power Supplies

To use a local power source, carefully and completely cut the circuit trace between X2 pins 2&3, and leave all X2 pins unconnected.

Connect your own local 24 VDC power supply to the AUX connector. (Use a well filtered power source, 60 to 100 mA.) Pin 6 is +DC. Pin 14 is Common.

The RM-325 will now receive power from the local power supply, while both channels will be terminated by the TW power supply. Note that since the RM-325 is not drawing any power from the channels, you should not include this station if you are computing total power consumption for the TW power supply.

2.3.3 Channel Connections when using all Locally Powered Intercom Stations

There may be a few occasions where it makes sense to locally power all of your intercom stations. For example, your intercom stations may be widely dispersed about a large building complex, where stations are separated by anywhere from 1000 ft to 10,000 ft. Due to wire resistances, it is not practical to supply power over the intercom channels for these distances. However, the audio and signals can operate over this range. The solution is to supply power separately to each station.

When all stations are locally powered, and there is no TW power supply in the system, a line termination will have to be inserted at one (and only one) location in in each intercom channel. It doesn’t matter where, but it is important that there is only only one termination per channel. Figure 4 shows

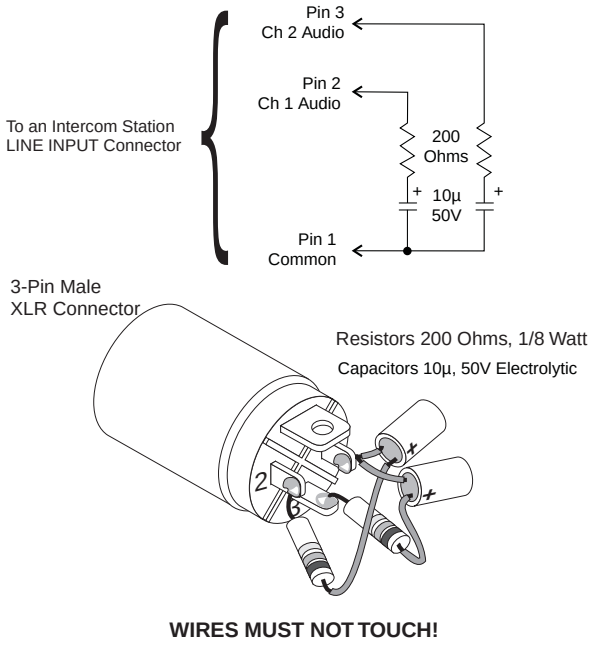


Figure 4. Termination plug for 2 intercom channels when all stations are locally powered

how to construct a termination plug for this purpose. Plug the termination plug into the intercom LINE INPUT connector of only 1 intercom station. Then plug a standard 2-channel TW cable into the LINE LOOP connector to connect to another intercom station.

2.3.4 Distributed Power from a Non-TW Power Source

It is possible to power several TW intercom stations from a single, non-TW power source, such as a battery. This might be an ideal setup for a small, portable system where AC power is not available. This method uses channel 1 only to connect the non-TW power supply. Audio on channel 1 will be unusable. Channel 2, however, will still be operational. Also, channel 2 will require a terminating impedance, since this is not supplied by the non-RTS power supply.

Figure 5 shows how to construct a termination plug and also connect power. Plug the power/termination plug into the intercom LINE INPUT connector of only 1 intercom station. Then plug a standard 2-channel TW cable into the LINE LOOP connector to connect to another intercom station.

2.4 Program Input Connections

You can connect a balanced or unbalanced audio source to either the PGM input connector or to the AUX connector. Refer to the specifications (page 6) for pin-outs of these connectors.

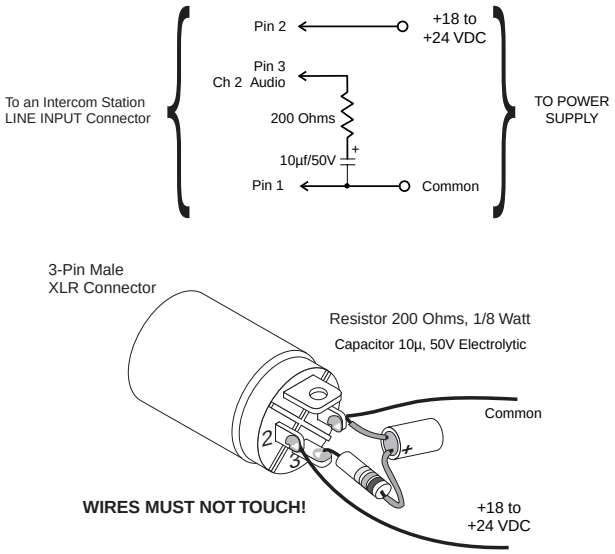


Figure 5. Termination / power plug for 1 intercom channel , with distributed power from a non-TW power source

2.5 Headset Connections

Connect a stereo (default) or monaural headset to the DYN MIC Headset connector. Or, connect a monaural, carbon-mic headset to the CARB MIC headset connector. Refer to the specifications (page 6) for pin-outs of these connectors.

2.6 Remote Mic Switch Connection

If your headset is equipped with a mic on/off switch, you can probably use it with the remote mic switch feature of the RM-325. See “Mic On/Off Switch” in the operation instructions, page 15.

If your headset does not have a mic switch, but you want to use this feature, you can connect a remote mic switch to the AUX connector. Or, you can change the setting of the X3 jumper (page 8) and then use the CARB MIC Headset jack for a remote mic switch. Refer to the specifications (page 6) for pin-outs of these connectors.

2.7 Unswitched, Unbalanced Mic Audio Output

The mic audio is available at the AUX connector for connection to an external device, such as a PA amplifier. The mic audio at this output is always on and will not be switched off my the talk buttons. Refer to the specifications (page 6) for unswitched mic pin numbers.

2.8 Remote Footswitches for Talk On/Off

There are separate footswitch inputs for channel 1 and 2 at the AUX connector. A switch contact closure at either of these inputs will have the same effect as turning on the talk button for that channel. Refer to the AUX connector specifications (page 6) for footswitch pin numbers.

2.9 Sidetone Adjustment

The sidetone trimmers control the level of the station operator’s own voice in the headphones while talking. Normally, when using headphones that do not fully cover the ears, no sidetone level is required, and the sidetone trimmers should be adjusted to minimize the operator’s voice level. This also lessens the risk of feedback between the headphones and microphone. When using headphones that completely cover the ears, the sidetone level may be increased to overcome the muffled sensation when talking. Use a small flat-blade screwdriver through the sidetone trimmer access holes in the front panel to increase or decrease the voice level while talking on the intercom channels. Note that there is a separate trimmer for each channel.

2.10 Installation Notes

2.10.1Choosing Headsets or Handsets

The RM-325 accepts a wide variety of headsets and handsets. Headset or handset choice depends on operating environment, operating requirements, and personal taste.

Table 3 shows typical operating environments and the level of background noise present. The background noise is measured using a Sound Pressure Level (SPL) meter, which measures the sound pressure level in decibels. SPL is useful for measuring environmental background noise, comparing headphone efficiency, and predicting whether speech communication is possible.

- A very noisy/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 canceling microphones.

- 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.

- In general, the loudness of a headphone depends upon its ability to absorb power at a given voltage (power=voltage squared divided by the impedance) and the efficiency of its design. Practically, the

impedance has a larger effect with present day headsets.

- Low impedance headphones are louder, causing the RM-325 to draw more current from the power supply. High impedance headphones are not as loud, drawing less current from the power supply. The RM-325 design range of impedances for the headphone part of the headset is 25Ω to 600Ω.

- Efficiency is the amount of SPL (Sound Pressure Level) produced for a given electrical input power.

2.10.1.1Headphone 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 have almost no (0 dB) isolation. The trade off is that lightweight headsets are very comfortable and can be worn for long periods (8 to 12 hours) without physical discomfort from the earmuffs or headband. Because there is no isolation, care must be taken that the sound signals from lightweight headsets are not unintentionally leaked into microphones. In general, the comfort of headsets depends upon their weight, padding and design.

2.10.1.2Isolation, Headset Microphones

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

2.10.2Cabling Requirements

2.10.2.1Wire Size

It may be necessary to overcome power losses by increasing conductor size over long runs (more than one kilometer). Normal conductor size is #22 AWG. The maximum allowable loop resistance is determined by the power supply voltage, the loop current and the user station minimum operating voltage. The maximum loop resistance equals the difference of the power supply voltage and the minimum operating voltage divided by the maximum loop current (power required by the user station(s)).

Example: A headset station (with 25Ω headphones) uses up to 70 mA. The power supply voltage is 26 VDC and the user station minimum operating voltage is 18 VDC. Then the maximum allowable loop resistance is:

(26 - 18) V/0.07 A = 114Ω

Table 3. Environmental Noise, Sound Pressure Level At 10 Meters

SOURCE	SPL
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
Vane axial 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

This corresponds to an operating distance of 1.1 kilometers (3,562 feet) for a #22 AWG wire pair using a single user station with 25 ohm headphones. Data for these calculations can be found in standard electrical wire tables.

2.10.2.2Grounding

System circuit ground should not be directly connected to “earth” or “chassis” ground (where directly means a connection an ohmmeter would show).

In order to prevent a buildup of voltage across the system capacitance, the power supply has a bleeder resistor to chassis ground (22 kΩ). If the system has no RTS Systems power supply, such a bleeder resistor should be supplied at a central point in the system.

The basic benefit of not "earth" grounding the RTS System circuit return is that it permits continued operation during an accidental system ground fault. This accidental grounding can happen as the result of a pinched wire or a scraped cable that has been pulled across a sharp edge. A single 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. 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™ circuit ground conducts these currents, it is likely that they will be heard as interfering noise on the communication line.

2.10.2.3Signal

Two conductors are required for a one channel system, and three conductors are required for a two channel system. Shielded cable is recommended.

Two channel 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 it is recommended that each channel should have individually shielded twisted pair of at least #22 gauge wire; such as Belden #8723 or 9402 for 2 channels. This will reduce interference and help maintain a low crosstalk figure between channels. Connections are as follows:

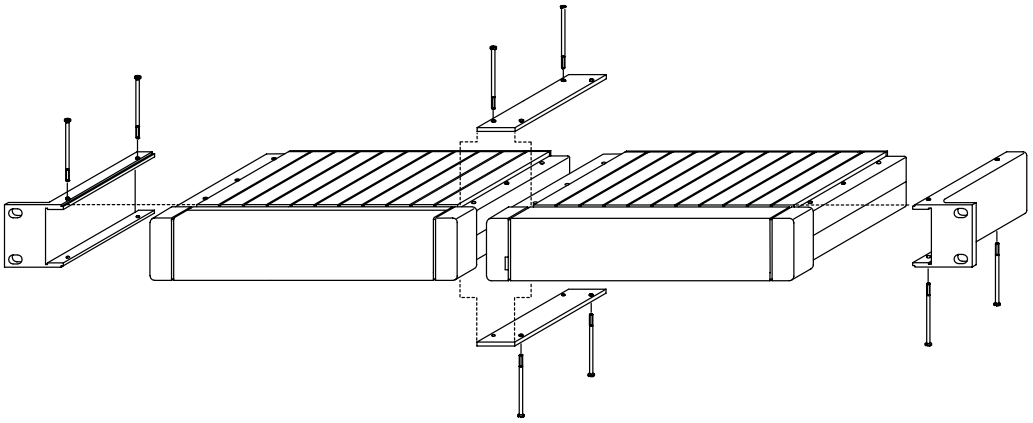
First shielded pair: connect shield and black to common (pin 1 in two channel system), connect color to channel 1 (pin 2 in two channel system);

Second shielded pair: connect shield and black to common (pin 1 in two channel system), connect color to channel 2 (pin 3 in two channel system).

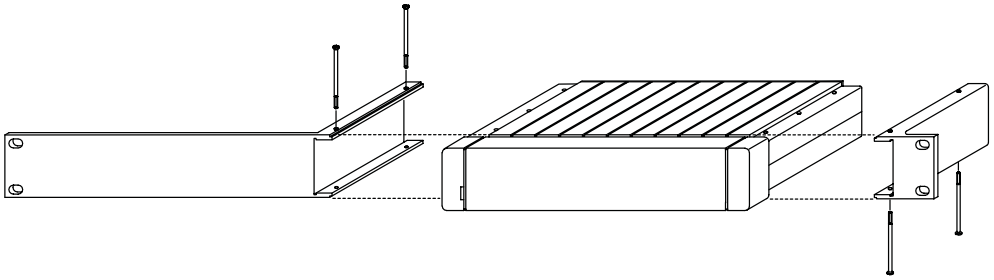
The audio signal line level is maintained between -10 dBu and 0 dBu (between 0.24 and 0.77 Vrms). These levels are low enough to prevent crosstalk into other equipment (such as TV cameras) yet high enough to reduce external interference to the TW System.

The 200Ω 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 200Ω impedance gives a high fidelity bandwidth with low losses.

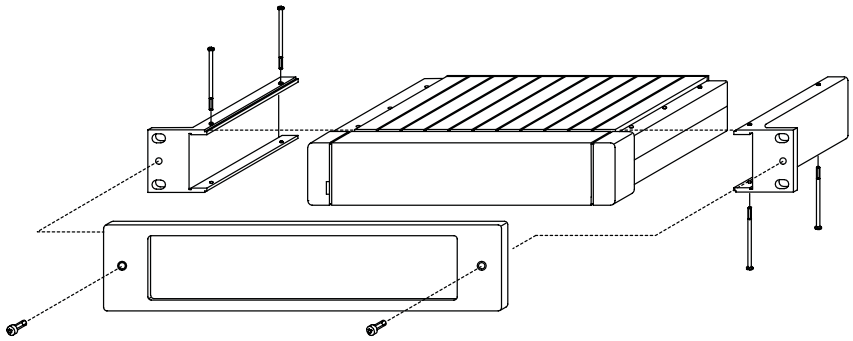
When using equipment in rain or conditions of excessive moisture, always protect the equipment with plastic covers and make sure all cable connectors are lifted out of mud, snow or moisture and protected with plastic or tape. Water mud and snow in connectors can cause considerable hum.



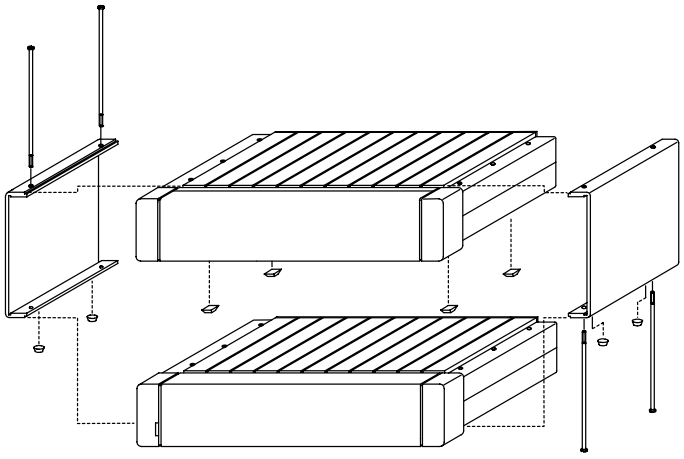
Side-By-Side Rack Mount Configuration Using an MCP1 Rack Mount Kit



Single-unit Rack Mount Configuration Using an MCP2 Rack Mount Kit



Console Mount Configuration Using an MCP3 Console Mount Kit



Tandem Configuration Using an MCP4 Tandem Mount Kit

Figure 6. Optional Mounting Configurations

3 RM-325 OPERATION

☞ There are several operating features that are configured with internal jumpers and switches. If the default settings for these are changed, your RM-325 may not operate exactly as described below. The operating procedures describe the factory default operation first, and then explain how the operation could be affected by the internal settings.

3.1 Listen Volumes

If you are using a stereo dynamic-mic headset, adjust the channel 1 level in the left headphone with the CH 1 Volume control; adjust the channel 2 volume in the right headphone using the CH 2 Volume control. If you are using a monaural, carbon-mic headset, the volume controls adjust the channel 1 and 2 levels in the mono mix.

If there is an external program source connected, adjust its volume in the headphones with the PGM Volume control.

☞ If the RM-325 is reconfigured for a monaural, dynamic-mic headset (page 7) the CH 1 and CH 2 controls adjust the level for each channel in the mono mix.

☞ If either channel's listen has been deactivated (page 7) you will not be able to hear or adjust volume for that channel.

☞ Depending on how the program is assigned (page 7) the PGM Volume control may adjust the program level in the right headphone, the left headphone, or in the mono mix.

3.2 Talking to an Intercom Channel

For momentary talk, press and hold the "1 Talk" or "2 Talk" button while talking. Then, release the button when finished talking. While the button is held, the talk indicator will be on.

For latching talk, tap a talk button to turn it on. Then, tap it again to turn it off when you are finished talking. The talk indicator will remain lit while the button is latched on.

☞ If latching operation does not work for one or both channels, it may have been disabled (page 8).

☞ If talk has been disabled for one or both channels (page 8) you will not be able to talk to the affected channel(s).

3.3 Mic On/Off Switch

If your headset includes a mic on/off switch, or if a remote mic on/off switch has been connected to the CARB MIC or AUX connector, you can use it to remotely activate either or both talk buttons. Set up the mic switch as follows:

1. Turn the mic switch on.
2. Tap one or both talk buttons to latch them on. The talk light(s) should be on.
3. Turn the mic switch off. Now when you turn the mic switch on, the talk buttons that you selected in step 2 will turn on.
4. To change which talk button(s) are activated by the mic switch, repeat steps 1 and 2.

☞ You can manually activate either talk button when the mic switch is off. As long as you turn that talk button off before you activate the mic switch again, your current mic switch settings will not be affected.

3.4 Sending Call Signals

Although you can activate a talk button and simply begin talking on a channel, it is sometimes preferable to send an inaudible, visual call signal first as follows:

1. Turn on the talk button for the channel that you want to call.
2. Press and hold the Call button until a verbal response is received, then release the Call button and begin talking.
3. Turn off the talk button when you are finished.

☞ You cannot send call signals if call send has been disabled (page 8).

3.5 Receiving Calls

When someone else sends a call signal on a channel, the RM-325 Call indicator will flash red.

- If a talk button is also flashing, this means you must activate that button to talk back.
- If no talk button is flashing, this means the talk button is already on: simply begin talking.

Turn the talk key off when finished talking.

3.6 Sending a Talk-off Signal

The RM-325 can generate an inaudible signal which can be used to deactivate the microphones on other intercom stations connected to the intercom channel (works with models BP-318, BP-325, BP-350, RM-325, MCE-325 and MRT-327). This feature is useful when there is a microphone activated on an unattended intercom station, and it is causing noise on the intercom channel. To send a Talk-Off signal:

1. Turn off both talk buttons.

2. Tap the CALL button three quick taps. The red CALL indicator will turn on for a few seconds.

3. While the red CALL indicator is on, momentarily press the talk button for the desired channel. This will send the talk-off signal and turn off all remote microphones on that channel.

☞ You cannot send talk-off signals if this feature has been deactivated (page 8).

3.7 Receiving Talk-off Signals

If a talk button is on, and a talk-off signal is received on that channel, the talk button will turn off.

☞ Talk-off signals will not be received if this feature has been disabled (page 9).

4 REPLACEMENT PARTS

4.1 Where To Obtain Parts

Parts may be obtained directly from Telex at:

Telex/RTS Systems
9600 Aldrich Ave. So.
Minneapolis, MN 55420
800-828-6107
Fax: 800-323-0498

4.2 Mechanical Parts

FINAL ASSEMBLY
(Refer to Figure 4-1 for Item No. locations)

Item No.	Description	Part No.
1	Bezel, RM-325	9070-7491-000
2	Insert, 6 Pin Connector	2018-0077-00
3	Lightpipe, Call Button	4501-0062-00
4	Knob, Volume	2703-0037-00
5	Key Cap, Call	9150-6643-05
6	Key Cap, Talk 1	9150-6643-01
7	Key Cap, Talk 2	9150-6643-03
8	Stem, Switch	2705-0021-00
9	P.C. Board Assy.	9030-7491-00 see Fig. 4-2
10	Case, Extruded	9060-6260-00
11	Screw, Case	9160-6305-00
12	Screw, #4-40 x 3/8"	51845-039
13	Screw, Lock, #4-40	58421-000
14	Screw, M3 x 7.0 mm	16030D8
15	Panel, Rear RM-325	9080-7491-000
16	Valox Film, 0.010 Thk., 7.0" X 6.75"	1303-0009-00
17	Knob, Volume	2703-0034-00
18	Not Used	
19	Not Used	
20	Not Used	
21	Not Used	
22	Not Used	
23	Not Used	
24	Housing, Connector, 6 Pin	59958-006
25	Terminal	59958-200

4.3 Electrical Parts

CIRCUIT BOARD ASSEMBLY
(Refer to Figures 4-3 and 4-4)

Ref. No.	Description	Part No.
	Heatsink	45020018-00
C1	Capacitor, EL, SM, 47 µF, 10V	102884-215
C2	Capacitor, CM, SM, 100 pF, 50V	102879-204
C3	Capacitor, EL, SM, 47 µF, 10V	102884-215
C4	Capacitor, CM, SM, 1000 pF, 50V	102881-327
C5	Capacitor, CM, SM, 1000 pF, 50V	102881-327
C6	Capacitor, CM, SM, 0.1 µF, 50V	102881-351
C7	Capacitor, CM, SM, 0.1 µF, 50V	102881-351
C8	Capacitor, CM, SM, 0.1 µF, 50V	102881-351
C9	Capacitor, EL, SM, 47 µF, 10V	102884-215
C10	Capacitor, CM, SM, 470 pF, 50V	102879-212
C11	Capacitor, CM, SM, 0.1 µF, 50V	102881-351
C12	Capacitor, EL, SM, 22 µF, 35V	1099R226-3G
C13	Capacitor, CM, SM, 0.01 µF, 50V	102881-339
C14	Capacitor, CM, SM, 1000 pF, 50V	102881-327
C15	Capacitor, CM, SM, 10 pF, 50V	102879-271
C16	Capacitor, EL, SM, 1 µF, 50V	102884-606
C17	Capacitor, CM, SM, 0.1 µF, 50V	102881-351
C18	Capacitor, CM, SM, 100 pF, 50V	102879-204
C19	Capacitor, CM, SM, 100 pF, 50V	102879-204
C20	Capacitor, CM, SM, 100 pF, 50V	102879-204
C21	Capacitor, CM, SM, 10 pF, 50V	102879-271
C22	Capacitor, EL, SM, 22 µF, 35V	1099R226-3G
C23	Capacitor, EL, SM, 22 µF, 35V	1099R226-3G
C24	Capacitor, EL, SM, 22 µF, 35V	1099R226-3G
C25	Capacitor, CM, SM, 100 pF, 50V	102879-204
C26	Capacitor, EL, SM, 22 µF, 35V	1099R226-3G
C27	Capacitor, CM, SM, 100 pF, 50V	102879-204
C28	Capacitor, CM, SM, 100 pF, 50V	102879-204
C29	Capacitor, CM, SM, 10 pF, 50V	102879-271
C30	Capacitor, EL, SM, 22 µF, 35V	1099R226-3G
C31	Capacitor, EL, SM, 22 µF, 35V	1099R226-3G
C32	Capacitor, EL, SM, 22 µF, 35V	1099R226-3G
C33	Capacitor, CM, SM, 100 pF, 50V	102879-204
C34	Capacitor, EL, SM, 1 µF, 50V	102884-606
C35	Capacitor, EL, SM, 1 µF, 50V	102884-606
C36	Capacitor, CM, SM, 1000 pF, 50V	102881-327
C37	Capacitor, CM, SM, 1000 pF, 50V	102881-327
C38	Capacitor, EL, SM, 1 µF, 50V	102884-606
C39	Capacitor, CM, SM, 100 pF, 50V	102879-204
C40	Capacitor, EL, SM, 47 µF, 10V	102884-215
C41	Capacitor, EL, RA, 4700 µF, 35V	1513R478-4G
C42	Capacitor, EL, SM, 47 µF, 10V	102884-215
C43	Capacitor, EL, SM, 47 µF, 10V	102884-215
C44	Capacitor, CM, SM, 0.1 µF, 50V	102881-351
C45	Capacitor, CM, SM, 0.1 µF, 50V	102881-351
C46	Capacitor, EL, SM, 22 µF, 35V	1099R226-3G
C47	Capacitor, CD, RA, 0.1 µF, 500V	1510R104-2Q
C48	Capacitor, EL, 1000 µF, 16V	51821-072
C49	Capacitor, EL, 1000 µF, 16V	51821-072
C50 - C99	Not Used	
C100	Capacitor, EL, SM, 1 µF, 50V	102884-606

CIRCUIT BOARD ASSEMBLY (Refer to Figures 4-3 and 4-4)		
Ref. No.	**Description**	**Part No.**
C101	Capacitor, EL, SM, 1 μF, 50V	102884-606
C102	Capacitor, CM, SM, 10 pF, 50V	102879-271
C103	Capacitor, CM, SM, 10 pF, 50V	102879-271
C104	Capacitor, CM, SM, 100 pF, 50V	102879-204
C105	Capacitor, CM, SM, 10 pF, 50V	102879-271
C106	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
C107	Capacitor, CM, SM, 1000 pF, 50V	102881-327
C108	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
C109	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
C110	Capacitor, EL, SM, 47 μF, 10V	102884-215
C111	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
C112	Capacitor, CM, SM, 1000 pF, 50V	102881-327
C113	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
C114	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
C115	Capacitor, EL, SM, 47 μF, 10V	102884-215
C116	Capacitor, EL, SM, 1 μF, 50V	102884-606
C117	Capacitor, EL, SM, 1 μF, 50V	102884-606
CC1	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC2	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC3	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC4	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC5	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC6	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC7	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC8, CC9	Not Used	
CC10	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC11	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC12	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC13	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
CC14	Capacitor, CM, SM, 0.1 μF, 50V	102881-351
D1	Diode, SM, Switching, 914/4148	58711-100
D2	Diode, SM, Switching, 914/4140	58711-100
D3	Diode, SM, Switching, 914/4148	58711-100
D4	Diode, 1A, 40OV, lN4004	16016481-SM
D5	Diode, 1A, 40OV, 1N4004	16016481-SM
D6	Diode, SM, Zener TVS, 1500W, 1SMC33A	16010004-SM
D7	Diode, SM, Switching, 914/4148	58711-100
D8	Diode, SM, Switching, 914/4148	58711-100
D9	Diode, SM, Switching, 914/4148	58711-100
D10	Diode, SM, Switching, 914/4148	58711-100
D11	Diode, SM, Switching, 914/4148	58711-100
D12	Diode, SM, Switching, 914/4148	58711-100
D13	Diode, SM, Switching, 914/4148	58711-100
D14-D100	Not Used	
D101	Diode, SM, Switching, 914/4148	58711-100
D102	Diode, SM, Switching, 914/4148	58711-100
D103	Diode, SM, Switching, 914/4148	58711-100
DS1	LED, T-1 3/4, Green	18014740-00
DS2	LED, T-1 3/4, Green	18014740-00
DS3	LED, T-1 3/4, Red	18010027-00
	LED, T-1 3/4, Mount	18010028-00
FB1	Inductor, Ferrite Bead	24040001-00
FB2	Inductor, Ferrite Bead	24040001-00

CIRCUIT BOARD ASSEMBLY (Refer to Figures 4-3 and 4-4)		
Ref. No.	**Description**	**Part No.**
FB3	Inductor, Ferrite Bead	24040001-00
FB4	Inductor, Ferrite Bead	24040001-00
J1	Connector, PC Mount Jack	20130049-00
J2	Connector, ST Locking, 0.059, M-6	59958-106
J3	Connector, RA XLR, M-3	59892-003
J4	Connector, RA XLR, 3-F	20180081-00
J5	Connector, PC Mount Jack	20130049-00
J6	Connector, RA HD 2-Row D-Sub, F-15	59926-015
Q1	Transistor, SM, SI NPN, MMBT5088	102210-000
Q1	Transistor, N-JFET, SST-108	54750-000
Q2	Transistor, SM, SI NPN, MMBT5088	102210-000
Q3	Transistor, SM, SI NPN, MMBT5088	102210-000
Q4 - Q9	Not Used	
Q10	Transistor, SM, SI, PNP, MBT5087	16025087-SM
Q11	Not Used	
Q12	Transistor, SM, SI, PNP, MBT5O87	16025087-SM
Q13	Transistor, SM, SI, PNP, MST5087	16025087-SM
Q14	Transistor, SM, SI, PNP, MBT5087	16025087-SM
Q15	Transistor, SM, SI NPN, MMBT5088	102210-000
R1	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R2	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R3	Resistor, SM, 1 kΩ, 5%, 1/8W	102513-102
R4	Resistor, SM, 301 Ω, 1%, 1/8W	102404-146
R5	Resistor, SM, 3.01 kΩ, 1%, 1/8W	102404-246
R6	Resistor, SM, 301 Ω, 1%, 1/8W	102404-146
R7	Resistor, SM, 3.01 kΩ, 1%, 1/8W	102404-246
R8	Resistor, SM, 1 kΩ, 5%, 1/8W	102513-102
R9	Resistor, SM, 620 Ω, 5%, 1/8W	102513-621
R10	Resistor, SM, 620 Ω, 5%, 1/8W	102513-621
R11	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R12, R13	Not Used	
R14	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R15	Resistor, SM, 5.1 MΩ, 5%, 1/8W	102513-515
R16	Resistor, SM, 5.1 MΩ, 5%, 1/8W	102513-515
R17	Resistor, SM, 5.1 MΩ, 5%, 1/8W	102513-515
R18	Resistor, SM, 200 Ω, 5%, 1/8W	102513-201
R19	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R20	Resistor, SM, 10 kΩ, 1%, 1/8W	102404-300
R21	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R22	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R23	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R24	Resistor, SM, 15 kΩ, 5%, 1/8W	102513-153
R25	Resistor, SM, 10 kΩ, 1%, 1/8W	102404-300
R26	Resistor, SM, 200 Ω, 5%, 1/8W	102513-201
R27	Resistor, SM, 100 Ω, 5%, 1/8W	102513-101
R28	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R29	Resistor, SM, 1 kΩ, 5%, 1/8W	102513-102
R30	Resistor, SM, 10 kΩ, 1%, 1/8W	102404-300
R31	Resistor, SM, 1 kΩ, 5%, 1/8W	102513-102
R32	Resistor, SM, 220 kΩ, 5%, 1/8W	102513-224

CIRCUIT BOARD ASSEMBLY (Refer to Figures 4-3 and 4-4)		
Ref. No.	**Description**	**Part No.**
R33	Resistor, SM, 1 kΩ, 5%, 1/8W	102513-102
R34	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R35	Resistor, SM, 68 kΩ, 5%, 1/8W	102513-683
R36	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R37	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R38	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R39	Potentiometer, 10 kΩ, 20%, 0.1W	14090060-00
R40	Resistor, SM, 60.4 kΩ, 1%, 1/8W	102404-375
R41	Resistor, SM, 60.4 kΩ, 1%, 1/8W	102404-375
R42	Resistor, SM, 20 kΩ, 1%, 1/8W	102404-329
R43	Resistor, SM, 20 kΩ, 1%, 1/8W	102404-329
R44	Resistor, SM, 100 Ω, 5%, 1/8W	102513-101
R45	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R46	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R47	Resistor, SM, 68 kΩ, 5%, 1/8W	102513-683
R48	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R49	Resistor, SM, 1 kΩ, 5%, 1/8W	102513-102
R50	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R51	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R52	Potentiometer, 10 kΩ, 20%, 0.1W	14090060-00
R53	Resistor, SM, 60.4 kΩ, 1%, 1/8W	102404-375
R54	Resistor, SM, 60.4 kΩ, 1%, 1/8W	102404-375
R55	Resistor, SM, 20 kΩ, 1%, 1/8W	102404-329
R56	Resistor, SM, 20 kΩ, 1%, 1/8W	102404-329
R57	Resistor, SM, 100 Ω, 5%, 1/8W	102513-101
R58	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R59	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R60	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R61	Resistor, SM, 60.4 kΩ, 1%, 1/8W	102404-375
R62	Resistor, SM, 10 kΩ, 1%, 1/8W	102404-300
R63	Resistor, SM, 60.4 kΩ, 1%, 1/8W	102404-375
R64	Resistor, SM, 10 kΩ, 1%, 1/8W	102404-300
R65	Potentiometer, 10 kΩ, 30%, 0.OSW	14060044-00
R66	Resistor, SM, 10 kΩ, 1%, 1/8W	102404-300
R67	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R68	Resistor, SM, 10 kΩ, 1%, 1/8W	102404-300
R69	Resistor, SM, 2.7 Ω, 5%, 1/8W	102513-2R7
R70	Resistor, SM, 10 kΩ, 1%, 1/8W	102404-300
R71	Resistor, SM, 1.1 kΩ, 5%, 1/8W	102513-112
R72	Resistor, SM, 30 Ω, 5%, 1/8W	102513-300
R73	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R74	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R75	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R76	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R77	Resistor, SM, 200 Ω, 5%, 1/8W	102513-201
R78	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R79	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R80	Resistor, SM, 22 Ω, 5%, 1/8W	102513-220
R81	Resistor, SM, 30 Ω, 5%, 1/8W	102513-300
R82	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R83	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R84	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R85	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104

CIRCUIT BOARD ASSEMBLY (Refer to Figures 4-3 and 4-4)		
Ref. No.	**Description**	**Part No.**
R86 - R96	Not Used	
R97	Potentiometer, 10 kΩ, 30%, 0.08W	14060044-00
R98	Resistor, SM, 100 Ω, 5%, 1/8W	102513-101
R99	Potentiometer, 10 kΩ, 30%, 0.08W	14060044-00
R100	Resistor, SM, 100 Ω, 5%, 1/8W	102513-101
R101	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R102	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R103	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R104	Resistor, SM, 100 kΩ, 5%, 1/8W	102513-104
R105	Resistor, SM, 270 kΩ, 5%, 1/8W	102513-274
R106	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R107	Resistor, SM, 270 kΩ, 5%, 1/8W	102513-274
R108	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R109	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R110	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R111	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R112	Resistor, SM, 2.2 MΩ, 5%, 1/8W	102513-225
R113	Resistor, SM, 270 kΩ, 5%, 1/8W	102513-274
R114	Resistor, SM, 270 kΩ, 5%, 1/8W	102513-274
R115	Resistor, SM, 270 kΩ, 5%, 1/8W	102513-274
R116	Resistor, SM, 470 kΩ, 5%, 1/8W	102513-474
R117	Resistor, SM, 470 kΩ, 5%, 1/8W	102513-474
R118	Resistor, SM, 470 kΩ, 5%, 1/8W	102513-474
R119	Resistor, SM, 47 kΩ, 5%, 1/8W	102513-473
R120	Resistor, SM, 47 kΩ, 5%, 1/8W	102513-473
R121	Resistor, SM, 47 kΩ, 5%, 1/8W	102513-473
R122	Resistor, SM, 3.01 kΩ, 1%, 1/8W	102404-246
R123	Resistor, SM, 39 Ω, 5%, 1/8W	102513-390
R124	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R125	Resistor, SM, 47 kΩ, 5%, 1/8W	102513-473
R126	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R127	Resistor, SM, 47 kΩ, 5%, 1/8W	102513-473
R128	Resistor, SM, 2.7 Ω, 5%, 1/8W	102513-2R7
R129	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
R130	Resistor, SM, 2.7 Ω, 5%, 1/8W	102513-2R7
R131	Resistor, SM, 22 kΩ, 5%, 1/8W	102513-223
RR1	Resistor, SM, 22 Ω, 5%, 1/8W	102513-220
RR2	Resistor, SM, 22 Ω, 5%, 1/8W	102513-220
RR3	Resistor, SM, 22 Ω, 5%, 1/8W	102513-220
RR4	Resistor, SM, 22 Ω, 5%, 1/8W	102513-220
RR5	Resistor, SM, 22 Ω, 5%, 1/8W	102513-220
RR6	Resistor, SM, 22 Ω, 5%, 1/8W	102513-220
RR7	Resistor, SM, 22 Ω, 5%, 1/8W	102513-220
RP1	Resistor, Network 8-Bus, 22 kΩ	14112202-00
RP2	Resistor, Network 8-Bus, 22 kΩ	14112202-00
S1	Switch, Momentary Pushbutton, DPDT	19110047-00
S2	Switch, Momentary Pushbutton, DPDT	19110047-00
S3	Switch, Momentary Pushbutton, DPDT	19110047-00
S4	Switch, SM, DIP, SPST, 8 Pos	19090002-SM
TP1	Connector, Test Point Terminal	20170014-00
TP2	Connector, Test Point Terminal	20170014-00

CIRCUIT BOARD ASSEMBLY (Refer to Figures 4-3 and 4-4)		
Ref. No.	**Description**	**Part No.**
TP3	Connector, Test Point Terminal	20170014-00
TP4	Connector, Test Point Terminal	20170014-00
U1	IC, SM, Dual Op Amp, LMS33	16030833-SM
U2	IC, SM, Triple 2 Channel Mux, 4053	53266-123
U3	IC, SM, LP JFET Input Op Amp, TL062	16030131-SM
U4	IC, SM, LP JFET Input Op Amp, TL062	16030131-SM
U5	IC, SM, Dual Op Amp, MC34072	16030140-SM
U6	IC, SM, LP JFET Input Op Amp, TL062	16030131-SM
U7	IC, SM, LP JFET Input Op Amp, TL062	16030131-SM
U8	IC, Voltage Regulator, LM317	53290-000
U9	Not Used	
U10	IC, SM, Adj Micropower Vreg	59631-000
U11	IC, SM, Quad Schmidt 2 Input NAND, 4093B	53266-117
U12	IC, SM, Microcontroller, HD63OlVlL	16030144-00
U13	IC, SM, Audio Amp, LM386	53281-100
U14	IC, SM, Audio Amp, LM386	53281-100
U15	IC, SM, Darl Trans Array, ULN2004A	16030008-SM
W1	Connector, ST Header, 0.100, M-3	590089-003
W2	Connector, ST Header, 0.100, M-3	590089-003
W3	Connector, ST Header, 0.100, M-3	590089-003
W4	Connector, ST Header, 0.100, M-3	590089-003
W5	Connector, ST Header, 0.100, M-3	590089-003
Y100	Crystal, SM, 4 MHz	33010009-SM

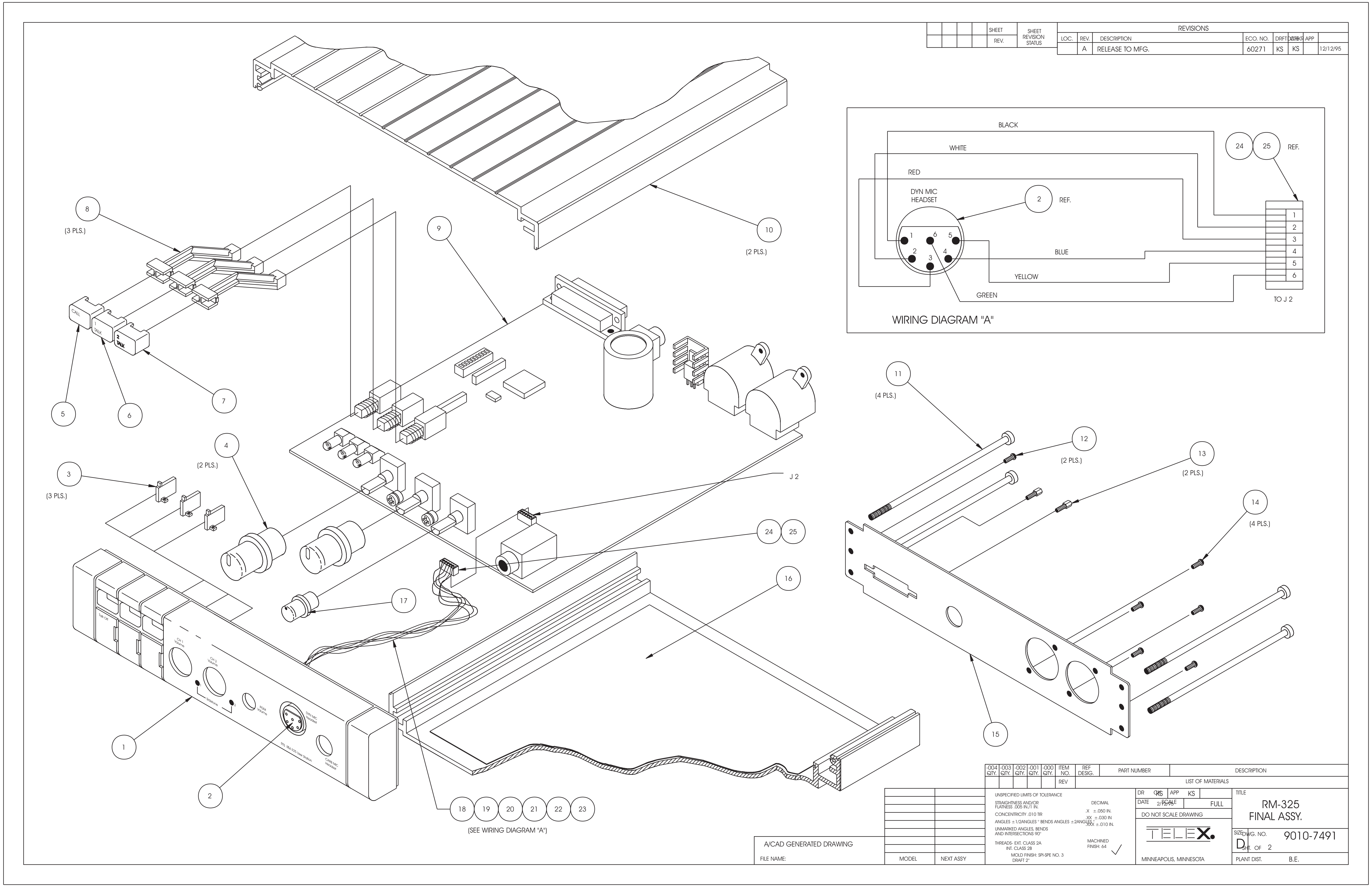


Figure 7. Final Assembly, RM-325

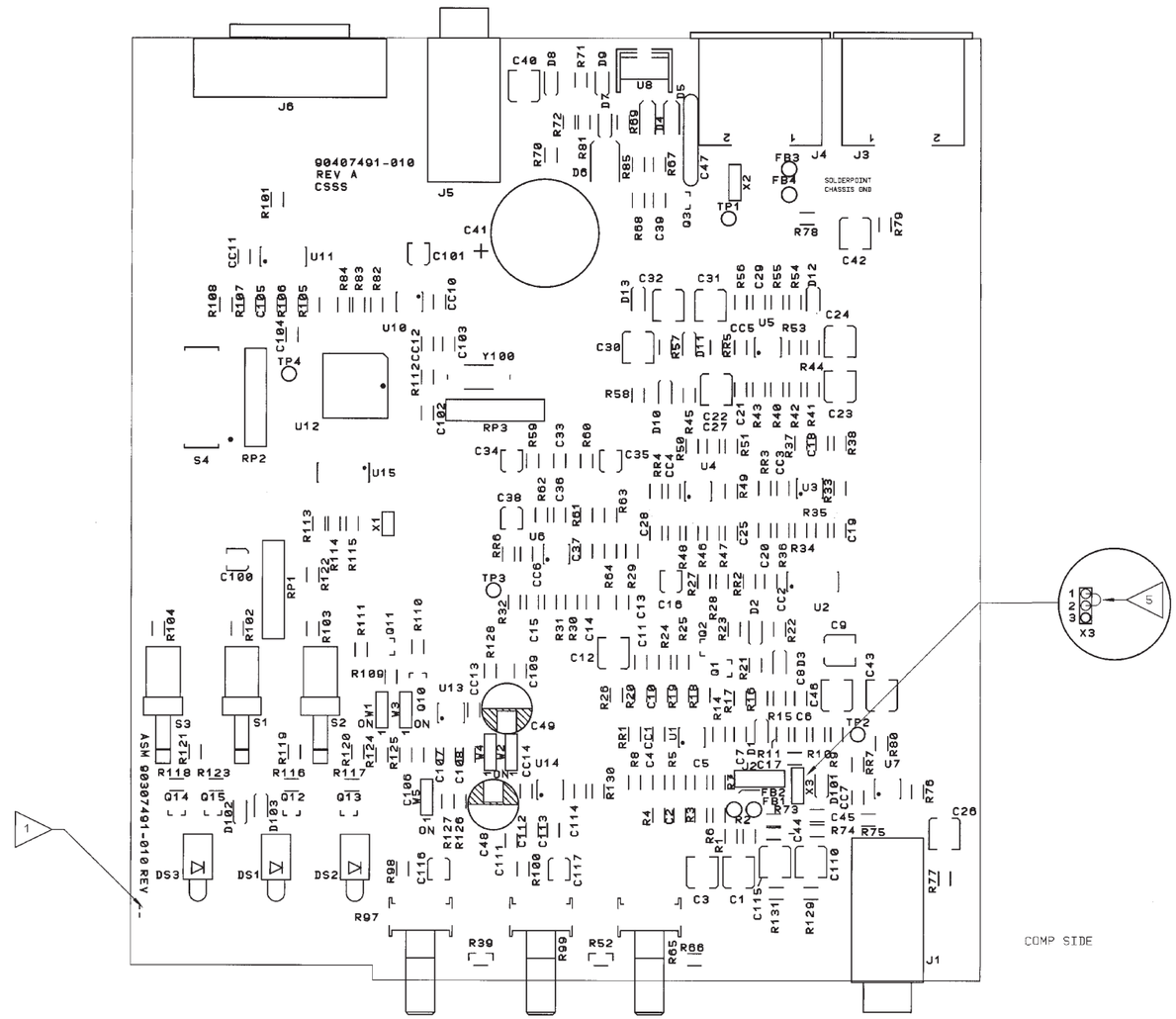
NOTES

1. MANUFACTURING TO STAMP SAME REV. ON BOARD THAT APPEARS ON DRAWING.
2. REFERENCE SCHEMATIC DIAGRAM 90277491-010
3. PARTS LIST FILED SEPARATELY 90309471-010 REV C
4. SURFACE MOUNT PLACEMENT FILE, COMPONENT SIDE - REV A
5. SOLDER JUMPER , ITEM 74 TO PRINTED CIRCUIT BOARD

SHEET REV	SHEET REVISION STATUS

REVISIONS

LOC.	REV	DESCRIPTION	ECO #	DR	CHK	APP	DATE
	A	RELEASED	60715	DP			6-16-95
	B	NOTE 3 WAS REV A.	60870	MK			10-2-95
	C	NOTE 3 WAS REV B	61228	MK			2-16-96



CAD GENERATED DRAWING
FILE NAME: boards/90407491-010/C

RM325 PHASE2 | MODEL | NEXT ASS'Y

004-003-002-001 ITEM QTY QTY QTY QTY QTY | REF. NO. | DESIG. | PART NUMBER | DESCRIPTION
-010 REV

LIST OF MATERIALS

UNSPECIFIED LIMITS OF TOLERANCE
STRAIGHTNESS AND/OR FLATNESS .005 IN./1 IN.
CONCENTRICITY .010 TIR
ANGLES ±1/2° BENDS ±2°
UNMARKED ANGLES, BENDS AND INTERSECTIONS 90°
DECIMAL .X ±.050 IN. .XX ±.030 IN. .XXX ±.010 IN.

DR DP | CK | APP
DATE 12-6-94 | SCALE
DO NOT SCALE DRAWING

TITLE RACK MOUNT 325 PHASE 2 PC ASSEMBLY

TELEX ®
MINNEAPOLIS, MINNESOTA

P/N
SIZE D | DWG. NO. 90307491-010 | SH. 1 OF 1
PLANT DIST. BE

Figure 8. PC Board Assembly, RM-325

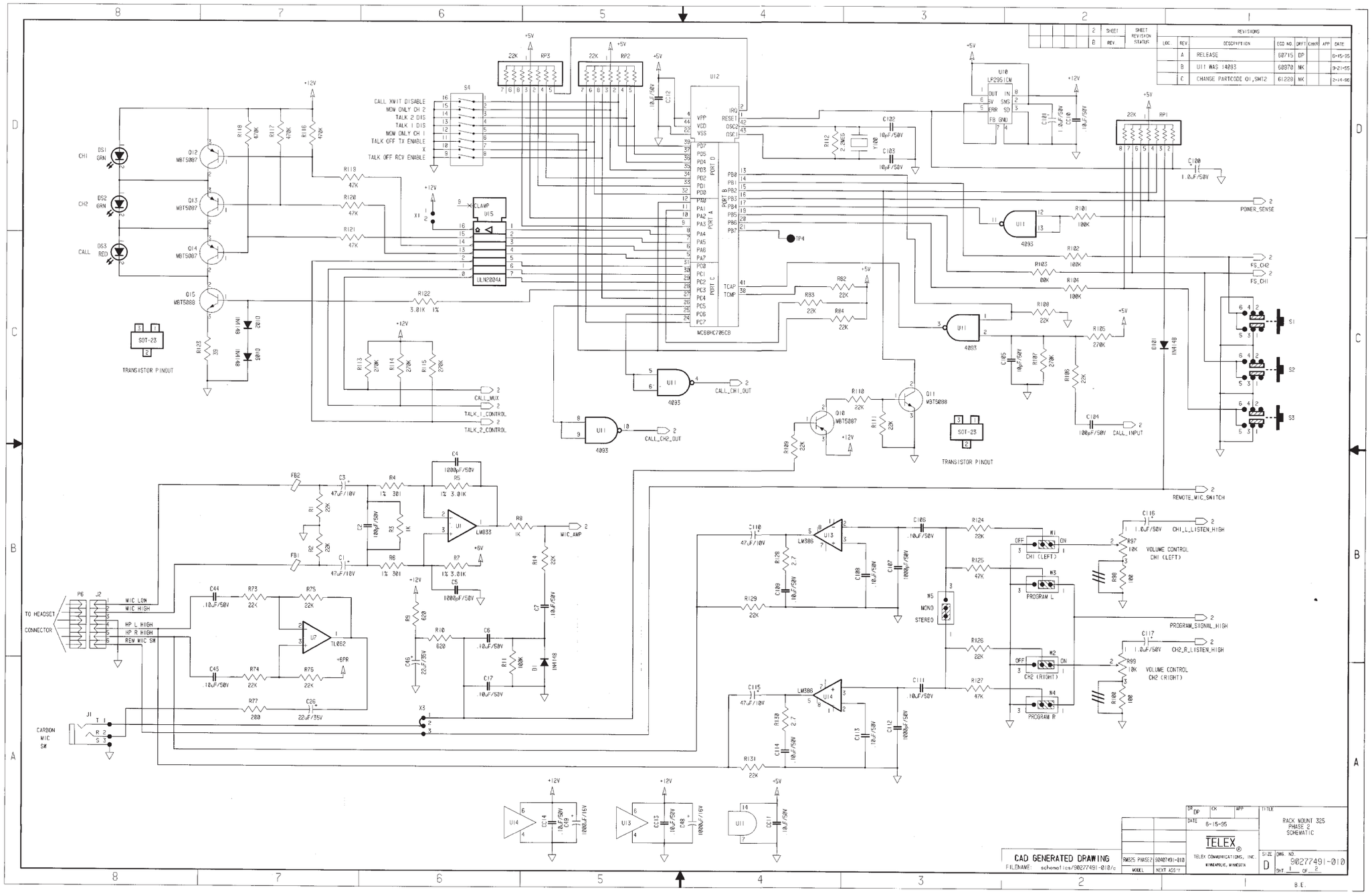


Figure 9. Schematic, RM-325, Sheet 1 of 2

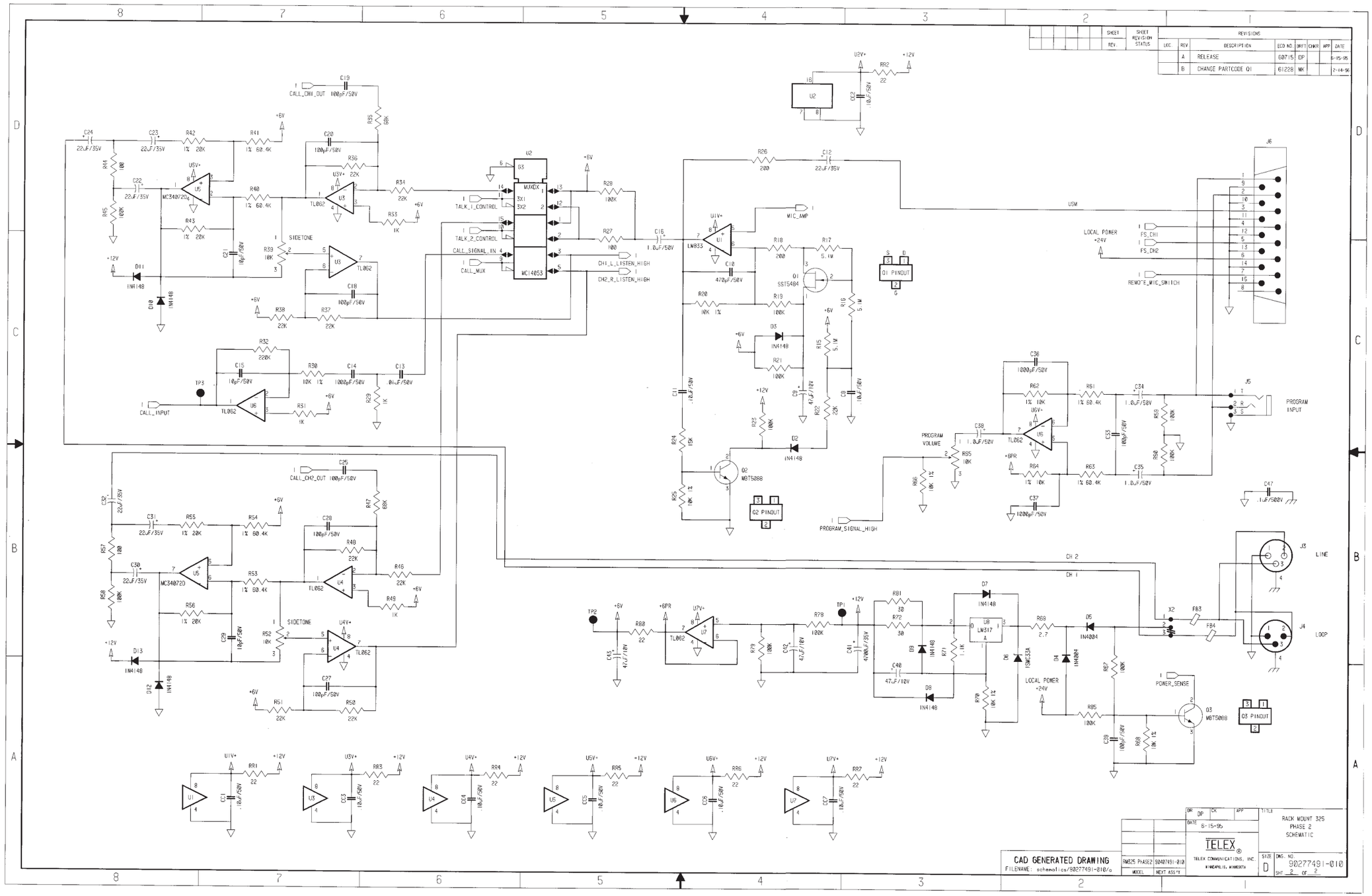


Figure 10. Schematic, RM-325, Sheet 2 of 2