INSTALLATION INSTRUCTIONS

KP95, KP96 and KP97

Intercom Keypanels

EKP95, EKP96 and EKP97

Expansion Keypanels

NOTE: For additional information describing the installation of the KP95R-00 Keypanel, refer to the KP95R-00 Installation Instructions, part number 9330-7122-000.

RTS™

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SECTION 1

KEYPANEL INSTALLATION

1.1 GENERAL

The keypanel installation procedure consists of:

1. Unpacking and inspecting the equipment.

2. Setting the keypanel DIP switches.

3. Mounting the keypanel and expansion panels in an equipment rack or bay.

4. Connecting the keypanel to the expansion panels and to the intercom system.

5. Connecting any other optional equipment.

6. Powering up the keypanel and expansion panels, and checking operation.

Note: There are several internal jumpers and level adjustments which can be reset to modify the keypanel operation and audio input/output levels. For further information, refer to Section 2 of this manual before proceeding with the installation.

1.2 UNPACKING AND INSPECTION

There should be one power cord for each keypanel and expansion panel and a 3-ft ribbon cable for each expansion panel. There should also be a gooseneck microphone for each keypanel (unless keypanels were ordered without microphones). Other optional accessories may also be packed in the container.

As soon as possible after receipt, inspect the container and its contents for physical damage that may have occurred in shipping. If damage has occurred, immediately (within 24 hours of receipt of equipment) contact the carrier involved and file a claim. Save all packing materials, and request an immediate inspection by the carrier's insurance claims agent.

Notify the RTS Systems shipping department if a shipment has been damaged in transit. Notify the RTS Systems sales department if equipment is to be returned for repair, or if a warranty claim is to be made. A return authorization number, issued by the sales department, is required for all items returned to RTS.

1.3 SETTING THE DIP SWITCHES

The DIP switches are located on the back of the keypanel. They control the following functions:

1.3.1 DISPLAY TYPE SELECTION

SW1-1 selects the keypanel display type:
    Open: Alpha-numeric displays
    Closed: LED displays

SW1-2 selects the expansion panel display type:
    Open: Alpha-numeric displays
    Closed: LED displays

Note: If no expansion panels are connected, the position of SW1-2 does not matter.

1.3.2 LISTEN KEY WINK

SW1-3 turns winking on or off:
    Open: Wink off
    Closed: Wink on

When winking is on, the *Listen* key LED will wink while the associated *Talk* key is on. This helps provide a visual indication of any active talk paths in low-light conditions.

1.3.3 LOGICAL KEYPANEL NUMBER

SW1-4 to SW1-7 select the logical keypanel number.

To set the logical keypanel number on a keypanel:

1. Determine the intercom audio channel number that the keypanel will be connected to.

2. For channel numbers ending in 1 through 9, the logical keypanel number is the last digit of the channel number. If the last digit is zero, use 10 as the logical keypanel number.

3. After determining the logical keypanel number, set DIP switches SW1-4 to SW1-7 using Table 1-1.

1.3.4 BAUD RATE

SW1-8 selects the baud rate for communication with the intercom matrix.
  Open: 9600 baud (CS9500 Intercom Systems only)
  Closed: 76,800 baud (CS9600 and CS9700 Intercom Systems only)

Table 1-1
DIP Switch Settings for Logical Keypanel Numbers

Logical Keypanel Number	DIP Switch Settings			
	SW1-4	SW1-5	SW1-6	SW1-7
1	Closed	Open	Open	Open
2	Open	Closed	Open	Open
3	Closed	Closed	Open	Open
4	Open	Open	Closed	Open
5	Closed	Open	Closed	Open
6	Open	Closed	Closed	Open
7	Closed	Closed	Closed	Open
8	Open	Open	Open	Closed
9	Closed	Open	Open	Closed
10	Open	Closed	Open	Closed

1.4 MOUNTING THE KEYPANEL AND EXPANSION PANELS

Keypanels may be mounted in any industry standard 483 mm (19") wide equipment rack. For all panels, allow an additional 2 to 3 inches in back for cables and connectors. No special tools other than those found in a typical tool kit are required for mounting. The keypanels have no special ventilation requirements.

1.5 CONNECTIONS

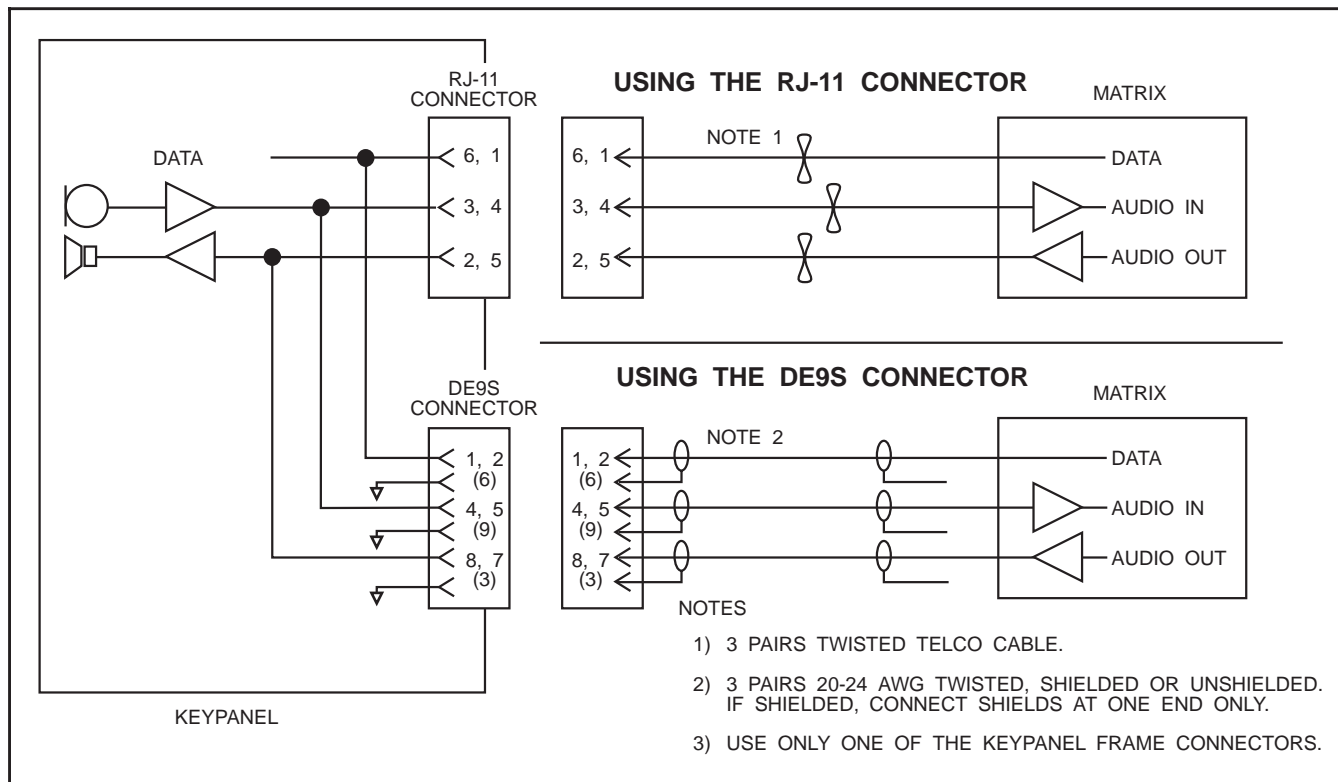### 1.5.1 CONNECTION TO INTERCOM MATRIX

Use either FRAME connector to connect the keypanel to the intercom system. The two connectors are wired in parallel, and only one should be used. Connector pin-outs are shown in Tables 1-2 and 1-3. Figure 1-1 shows the cable wiring diagrams.

Table 1-2
DE9S FRAME Connector Pin-out

Pin	Function
1	RS422 Data "+"
2	RS422 Data "-"
3	Ground, Shield Input
4	Audio Output "+"
5	Audio Output "-"
6	Ground, Shield Data
7	Audio Input "-"
8	Audio Input "+"
9	Ground

Table 1-3
RJ-11 FRAME Connector Pin-out

Pin	Function
1	RS422 Data "-"
2	Audio Input "+"
3	Audio Output "+"
4	Audio Output "-"
5	Audio Input "-"
6	RS422 Data "+"

Figure 1-1. Keypanel to Matrix Interconnect Cables

NOTES

1) 3 PAIRS TWISTED TELCO CABLE.

2) 3 PAIRS 20-24 AWG TWISTED, SHIELDED OR UNSHIELDED. IF SHIELDED, CONNECT SHIELDS AT ONE END ONLY.

3) USE ONLY ONE OF THE KEYPANEL FRAME CONNECTORS.

1.5.2 OPTIONAL CONNECTIONS

1.5.2.1 HEADSET Connector (KP95-0 Keypanel and KP-96-RC Option Only)

Table 1-4 lists the HEADSET connector pin functions.

Table 1-4
HEADSET Connector Pin-out

Pin	Function
1	Dynamic mic "+" input
2	Dynamic mic common (shield)
3	Carbon mic "+" input
4	Carbon mic common (shield)
5	Headphone "+"
6	Dynamic mic "-" input
7	HDST switch control
8	HDST switch common
9	Headphone common

1.5.2.2 EXPANSION Connector (KP95-0 Keypanel and KP-96-RC Option Only)

To connect an expansion panel, use the ribbon cable supplied with the expansion panel. Connect from the EXPANSION connector on the keypanel to the CONTROL connector on the expansion panel. If EKPD series expansion panels are used, the second CONTROL connector on the expansion panel may be used to connect to an additional expansion panel. Up to three EKPD series expansion panels may be connected, providing up to 48 additional *Talk* and *Listen* keys.

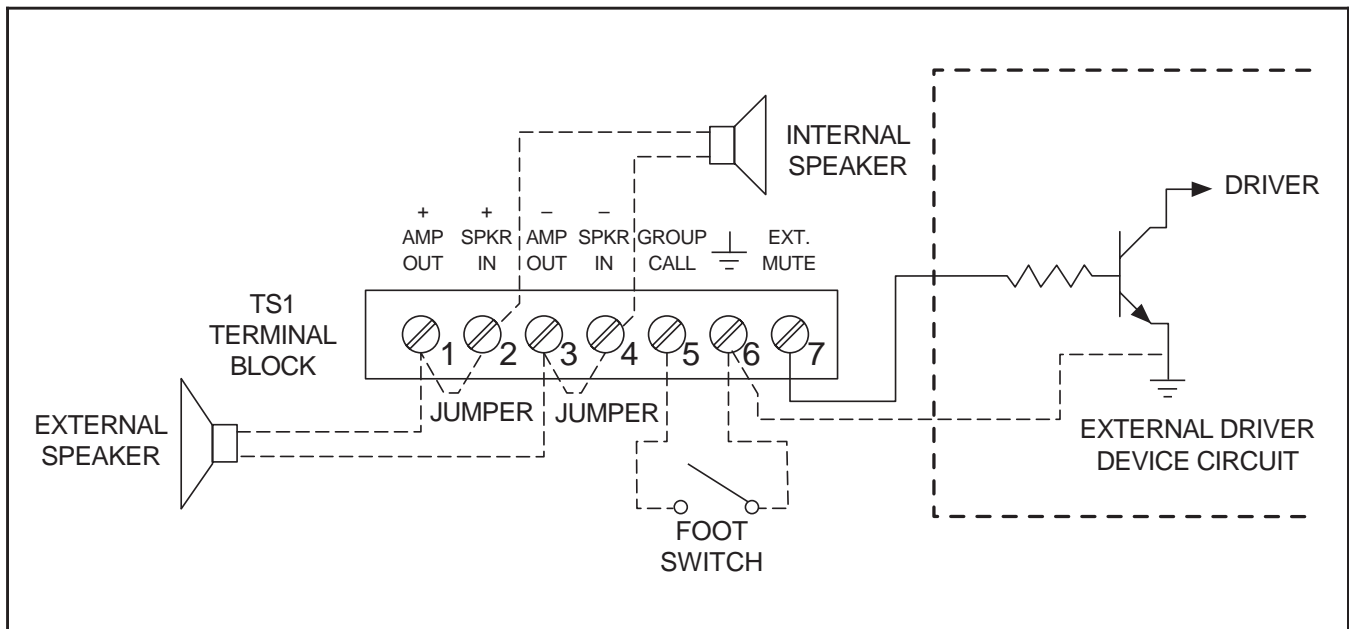#### 1.5.2.3 Terminal Block Connections

(Reference Figure 21-2)

AMP OUT "+" and "-" : These terminals provide the keypanel audio amplifier output signal to drive an 8-ohm, 3-watt speaker. As supplied from the factory, jumpers connect these terminals to the SPKR IN "+" and "-" terminals. Remove these jumpers only if the keypanel audio output is to be redirected to an external speaker.

SPKR IN "+" and "-" : These terminals connect to the internal speaker.

GRP CALL (Group Call): As supplied from the factory, a jumper connects this terminal to the ground terminal for normal *Talk* key operation. For external group call, remove the jumper, and connect a normally open footswitch between this terminal and the ground terminal. When the footswitch is pressed, all *Talk* keys that are latched in the "up" position will be activated. When the footswitch is released, they will be deactivated.

EXT MUTE (KP-96-RC Option Only) : This terminal may be used to drive external devices (such as open-collector circuits) at no greater than 2 mA sinking current. Its normal logic state is low (0 Vdc). It shifts to logic high (+5 Vdc) when a *Talk* key is pressed. This signal may be used, for example, to mute a monitor speaker when the keypanel operator is talking on the intercom system.

Figure 1-2. Optional Terminal Block Connections

1.5.2.4 EXT MIC IN (KP-96-RC Option Only)

An external microphone can be connected. The external microphone may be used with or without a front panel gooseneck microphone of the same type. (Internal keypanel jumpers J404-J406 must be set for the type of microphone (see *Setting the Internal Jumpers*, Section 2).

Table 1-5
EXT MIC IN Connector Pin-out

Pin	Function
1	Shield
2	Mic in "+"
3	Mic in "-"

1.5.2.5 EXT LINE IN (KP-96-RC Option Only)

An external balanced audio source, such as program sound, can be connected. The source input must be at a nominal line level of +8dBu.

Table 1-6
EXT LINE IN Connector Pin-out

Pin	Function
1	Shield
2	Line in "+"
3	Line in "-"

1.5.2.6 MIC PRE OUT (KP-96-RC Option Only)

This connector provides a balanced mic output signal of +8 dBu at 60 ohms. As supplied, the MIC PRE OUT signal is activated only when a *Talk* key is pressed. If you want this output to be on continuously, you must reset internal jumper J403 (see *Setting the Internal Jumpers*, Section 2).

Table 1-7
MIC PRE OUT Connector Pin-out

Pin	Function
1	Shield
2	Mic out "+"
3	Mic out "-"

1.6 POWER-UP AND OPERATIONAL CHECK

1.6.1 POWER-UP SEQUENCE

Plug in the ac power cords on the keypanel and any connected expansion panels.

Turn on the power switches on the keypanel and any connected expansion panels. Observe the power-up sequence:

1.6.1.1 Keypanels with Alpha-Numeric Displays

When power is turned on, all alpha-numeric displays will first display asterisks (∗∗∗∗) then dashes (----). After a few moments, the *Talk* key assignments will display. If no *Talk* key assignments have yet been programmed, the displays will continue to show dashes (----).

If the keypanel cannot establish data communications with the intercom system, the alpha-numeric displays will continue to show asterisks (∗∗∗∗). Check the data line connections.

If the keypanel displays random characters in the alpha-numeric displays, DIP switch SW1-1 on the rear panel may be incorrectly set. If the alpha-numeric displays of any connected expansion panels display random characters, DIP switch SW1-2 on the rear panel of the main keypanel may be incorrectly set.

If the keypanel does not display the expected key assignments, or there is no audio to the keypanel from other keypanels, this indicates that the rear panel DIP switch settings for logical keypanel number may be incorrectly set. Recheck the settings.

1.6.1.2 Keypanels with LED Displays

The LED's will remain off. The *Incoming Messages* display will first display asterisks (∗∗∗∗) then dashes (----).

If the keypanel cannot establish data communications with the intercom system, the *Incoming Messages* display will continue to show asterisks (∗∗∗∗). Check the data line connections.

If the *Talk* key LEDs on the main keypanel blink randomly, or some LEDs remain on even when there are no calls to the keypanel, DIP switch SW1-1 on the rear panel may be incorrectly set. If the *Talk* key LEDs on any connected expansion panels blink randomly, or some LEDs remain on even when there are no calls, DIP switch SW1-2 on the rear panel of the main keypanel may be incorrectly set.

If the keypanel *Talk* key LED's periodically turn on briefly (this may occur at intervals of one or two minutes), or there is no audio to the keypanel from other keypanels, this indicates that the rear panel DIP switch settings for logical keypanel number may be incorrectly set. Recheck the settings.

SECTION 2

ELECTRICAL ADJUSTMENTS

2.1 SETTING THE INTERNAL JUMPERS

2.1.1 DEFAULT SETTINGS

There are several internal jumpers which modify keypanel operation. The jumpers are set for the following default operations:

J201   The EXT LINE IN signal (KP-96-RC option only) is muted when any *Talk* key is pressed.

J202   The speaker (or headphones) are muted by 15 dB when any *Talk* key is pressed.

J203   Continuous sidetone (When using a headset, the keypanel operator's own voice will be heard at all times in their headphones.)

J401   The microphone is automatically activated when any *Talk* key is pressed.

J402   Normal/test switch set for normal operation.

J403   The MIC PRE OUT signal (KP-96-RC option only) is activated only when any *Talk* key is pressed.

J404-J406   The keypanel is configured for operation with the standard dynamic, -70dB, 150-ohm gooseneck microphone.

To reset any of the jumpers, remove the top cover from the keypanel. Locations of the jumpers are shown in Figure 2-1. The following paragraphs describe the alternative settings for the jumpers.

2.1.2 J201 (EXTERNAL INPUT MUTING)

This jumper is only significant in KP96 and KP97 Series Keypanels that have the KP-96-RC Rear Connector Plate option installed. When pins 2 and 3 are shorted, a signal input at the EXT LINE IN connector is muted when any *Talk* key is pressed. When pins 1 and 2 are shorted, the signal is not muted during *Talk* key activation.

2.1.3 J202 (SPEAKER/HDST MUTE)

When pins 1 and 2 are shorted, the speaker/headset signal is fully muted when any *Talk* keys are pressed. When pins 2 and 3 are shorted, the signal is muted by 15 dB when any *Talk* keys are pressed.

2.1.4 J203 (SIDETONE MUTING)

When pins 1 and 2 are shorted, the sidetone signal is always on. When pins 2 and 3 are shorted, the sidetone signal is on only when a *Talk* key is pressed.

2.1.5 J401 (OUTPUT ENABLE)

When the jumper is installed, the microphone is on only when any *Talk* key is pressed. When the jumper is removed, the microphone will always be on.

2.1.6 J402 (BALANCE TEST)

For normal operation, there should be no jumper installed. This jumper is used when adjusting the keypanel audio levels. See *Balance Adjustment*, page 2-3.

2.1.7 J403 (PREAMP OUT)

This jumper is only significant in KP96 and KP97 Series Keypanels that have the KP-96-RC Rear Connector Plate option installed. When pins 1 and 2 are shorted, the mic signal at the MIC PRE OUT connector is switched on and off by the *Talk* keys. When pins 2 and 3 are shorted, the mic signal at the MIC PRE OUT connector is always on.

2.1.8 J404-J406 (PANEL MIC SELECTION)

These jumpers work together to configure the panel microphone preamp for various types of microphones as follows:

2-Wire Electret:
     J404   Pins 1 and 2 shorted
     J405   No jumper
     J406   No jumper

3-Wire Electret:
     J404   No jumper
     J405   No jumper
     J406   No jumper

Balanced Dynamic (-70 dB, 150 ohms):
     J404   Pins 2 and 3 shorted
     J405   Pins 1 and 2 shorted
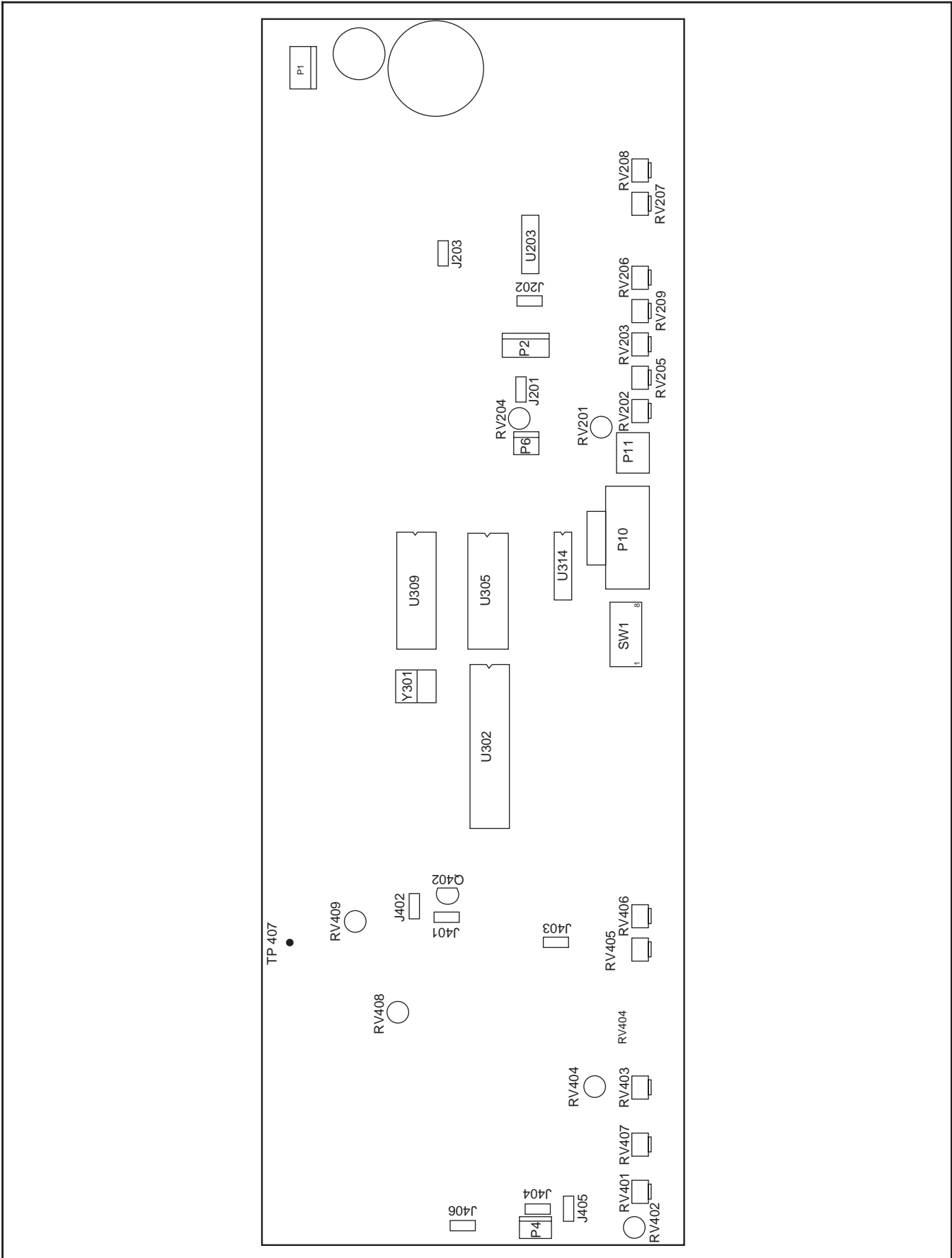   J406   Pins 1 and 2 shorted

Figure 2-1. Locations of Jumpers and Trimpots

2.2 AUDIO LEVEL ADJUSTMENTS

2.2.1 GENERAL

The following paragraphs describe the procedures to calibrate the output level to the factory standard of +8 dBu. If a different level is required, substitute that level for +8 dBu.

Most audio level trimpots are accessible through access holes on the back of the keypanel. Each trimpot access hole is labelled with its function. Some trimpots are internal, and can only be accessed with the top cover removed. Locations of trimpots are shown in Figure 2-1.

Audio levels may be adjusted with the panel disconnected from the intercom system. However, proper operation should be confirmed when the panel is re-connected. If levels change after re-connection, check the intercom system wiring for one-sided shorts to ground, wiring errors, or unintended terminations.

The following procedures make use of the additional connectors available on the KP95-0 Keypanel or the KP-96-RC Rear Connector Plate option. Connector pin-outs for these connectors were presented earlier in this section. If the keypanel under adjustment does not have these connectors, refer to drawing number IKP-950/2-5 (in the KP95, KP96 and KP97 Keypanel Drawings Manual). This drawing shows equivalent locations where test equipment may be connected.

Required test equipment:

      Audio Signal Generator with balanced output
      Audio Signal Analyzer with balanced input
      DC Millivoltmeter
      Oscilloscope - any commercially available type

2.2.2 MICROPHONE PRE-AMPLIFIER

1. Set the HDST switch to off.

2. Remove the gooseneck microphone, and insert a -70 dBm signal (1KHz at 150 ohms) into the microphone connector. Or use the EXT MIC IN connector with the front panel microphone removed (ref Table 1-5 for pin-out).

3. Activate the microphone by setting a *Talk* key to the latched-up position.

4. Check the level at the MIC PRE OUT connector (ref Table 1-7 for pin-out). It should measure +8 dBu.

5. If the reading is not +8 dBu, but within a 3 dB range, adjust the LEVEL TO MATRIX trimpot (RV406) for +8 dBu.

6. If the reading is more than 3 dB from +8 dBu, or another output level is used by your facility, proceed to paragraph 2.2.2.1 to begin the mic preamp calibration procedures.

7. Check the frequency response from 200 Hz to 15 KHz. It should be within 1 dB.

8. Check the input noise. It should be at least -70 dB below +8 dBu.

9. Check the Total Harmonic Distortion (THD) from 200 Hz to 15 KHz at +18 dBu output. It should be less than or equal to 0.15 percent.

2.2.2.1 Balance Adjustment

1. Turn the COMPR trimpot (RV405) fully counter-clockwise. This sets the compressor circuit to minimum (compressor ratio of 1:1).

2. Measure and record the dc voltage at test point TP407.

3. Install a shorting plug across J402.

4. Measure the dc voltage at TP407, and adjust RV408 (internal) to match (within 5 mV) the previously recorded voltage.

5. Remove the shorting plug at J402.

2.2.2.2 Tone Generator Level Adjustment

1. Activate the 400 Hz tone generator in the keypanel (enter 0-8-7 on the keypad, or use CSedit).

2. Adjust the LEVEL TO MATRIX trimpot (RV406) for a +8 dBu tone output level at the MIC PRE OUT connector.

3. Turn off the tone generator (press CLR on the keypad, or use CSedit). (If you turned the tone generator on using CSedit, you must turn it off using CSedit.)

2.2.2.3 Panel Mic Level Adjustment

1. Configure the J404-J406 jumper blocks for a balanced dynamic panel microphone: J404 short pins 2-3; J405 short pins 1-2; J406 short pins 1-2. (This is the default microphone configuration.)

2. Insert a -70 dBm signal (1 KHz at 150 ohms) into the gooseneck microphone connector. Or use the EXT MIC IN connector (with the front panel microphone removed).

3. Adjust the PNL trimpot (RV401) for +8 dBu at the MIC PRE OUT connector.

4. Insert a common mode signal (120 Hz, -70 dBm) into the gooseneck microphone connector, or into the EXT MIC IN connector.

5. Adjust RV402 (internal) for a minimum common mode signal at the MIC PRE OUT connector.

6. Re-insert a -70 dBm signal.

7. Remove the shorting plug across J401 (causes continuous mic activation).

8. Monitor the level at the audio output pins of the FRAME connector, P10 (reference Table 1-2 for pin-out). The output level should be +8 dBu.

9. Remove the signal from the mic input, and re-install the shorting plug across J401.

2.2.2.4 Headset Dynamic-Mic Level

1. Insert a -60 dBm signal (1 KHz at 150 ohms) into the dynamic mic input of the HEADSET connector (reference Table 1-4 for pin-out).

2. Activate the HDST key on the front of the keypanel.

3. Monitor the signal level at the MIC PRE OUT connector. It should be +8 dBu. If not, adjust the DYN HDST trimpot (RV403) to achieve an output reading of +8 dBu.

4. Insert a common mode signal into the dynamic mic input of the HEADSET connector.

5. Adjust RV404 (internal) for a minimum common mode signal at the MIC PRE OUT connector.

6. Remove the signal at the dynamic mic input.

2.2.2.5 Headset Carbon-Mic Level

1. Insert a -25 dBm signal (1 KHz at 50 ohms) into the carbon mic input of the HEADSET connector (reference Table 1-4 for pin-out).

Note: A +12 vdc bias voltage is supplied at pin 3 (carbon mic + input) of the HEADSET connector. The signal generator should be isolated from this dc bias voltage.

2. Activate the HDST key on the front of the keypanel.

3. Monitor the signal level at the MIC PRE OUT connector. It should be +8 dBu. If not, adjust the CARBON HDST trimpot (RV407) to achieve an output reading of +8 dBu.

4. Remove the signal from the carbon mic input.

2.2.2.6 Compressor/AGC Set-up

1. Insert a -60 dBm signal (1 KHz at 150 ohms) into the front panel microphone connector. Or use the EXT MIC IN connector (with the front panel microphone removed).

2. Adjust the COMPR trimpot (RV405) to measure +13 dBu at the audio output of the FRAME connector, P10.

3. Reduce the input signal level to -80 dBm.

4. Adjust RV409 (internal) for a +4 dBu audio output level at the FRAME connector.

5. Perform this procedure several times to optimize the compression ratio accuracy. This will test compression at a 2:1 ratio (0.5 dBu). Confirm correct

operation of the compression circuit by increasing and reducing input levels and measuring output ratio accordingly.

2.2.3 SPEAKER/HEADSET AMPLIFIER ADJUSTMENTS

2.2.3.1 Matrix-to-Speaker Gain

1. Disconnect the loudspeaker (either internal or external) from the + AMP OUT and - AMP OUT terminals on the back of the keypanel.

2. Terminate the + AMP OUT and - AMP OUT terminals with an 8-ohm, 10-watt resistive load. Connect an audio analyzer across the load.

3. Remove the keypanel audio connection from the intercom matrix.

4. Insert a +8 dBu (1 KHz) signal into the audio input "+" and "-" pins of the FRAME connector, P10 (Table 1-2).

5. Turn the front panel HDST switch off.

6. Turn the front panel intercom audio level control (outer knob) fully clockwise (maximum volume).

7. Adjust the SPKR trimpot (RV207) to measure 4.9V RMS (3 watts) at the audio analyzer. There should be no clipping of the output signal.

8. Turn the front panel intercom audio level control fully counter-clockwise (minimum volume). Adjust the MIN I/C trimpot (RV202) to measure -30 dB below the 4.9V AC reference level.

9. Readjust the front panel intercom audio level control to again measure 4.9V AC at the audio analyzer.

10. Insert a 1 KHz common mode signal into the audio input "+" and "-" pins of the FRAME connector.

11. Adjust RV201 (internal) for a minimum common mode signal.

12. Remove the signal from the FRAME connector.

2.2.3.2 Line Input-to-Speaker Gain Adjustment

1. Install a shorting plug across J201, pins 2 and 3.

2. Insert a +8 dBu (1 KHz) signal into the EXT LINE IN connector (reference Table 1-6 for pin-out).

3. The HDST switch should be off.

4. Turn the line input level control (inner knob on the front panel) fully counter-clockwise.

5. Adjust the MIN EXT trimpot (RV205) to measure -30 dB below a reference level of 4.9V AC level at the audio analyzer connected to the amplifier output.

6. Readjust the line input level control to measure 4.9V AC output at the audio analyzer.

7. Insert a 1KHz common mode signal into the EXT LINE IN connector.

8. Adjust RV204 (internal) for a minimum common mode signal.

9. Insert a +8 dBu (1 KHz) signal into the EXT LINE IN connector and record the output reading.

10 Remove the signal from the EXT LINE IN connector, and insert it into the audio input "+" and "-" pins of the FRAME connector, P10.

11. Remove the shorting plug from jumper block J201. The output reading should be the same as in step 9.

2.2.3.3 Speaker Muting Set-up

1. Short pins 2 and 3 of jumper block J202.

2. Insert a +8 dBu signal (1 KHz) into the audio input pins of the FRAME connector, P10.

3. Alternately activate and deactivate a front panel *Talk* key while adjusting the SPKR MUTE trimpot (RV203) to provide 15 dB muting at the + AMP OUT and - AMP OUT terminals during *Talk* switch activation.

4. Short pins 1 and 2 of J202. Insert a +8 dBu signal (1 KHz) into the audio input of the FRAME connector.

5. Activate a front panel *Talk* key, and check that the amplifier output is fully muted. Restore the J202 shorting plug to pins 2-3.

6. Remove the 8-ohm load from the amplifier output, and reconnect the speaker.

2.2.3.4 Headphone Level Adjust

1. Terminate the headphone output of the HEADSET connector (pins 5 and 9) with an 8-ohm, 10-watt resistive load. Connect an audio analyzer across the load.

2. Set the front panel HDST switch to on.

3. Insert a +8 dBu signal (1 KHz) into the audio input of the FRAME connector.

4. Adjust the HDST trimpot (RV208) for 2V RMS (500 milliwatts) at the headphone output.

5. Set the front panel HDST switch to off.

6. Adjust the HDST MUTE trimpot (RV206) for 6 dB muting below the 2V AC reference level.

2.2.3.5 Sidetone Level Adjust

1. Install a shorting plug across pins 1-2 of J203.

2. Insert a -70 dBm signal (1KHz at 150 ohms) into the dynamic mic input of the HEADSET connector .

3. Turn on the HDST switch, and monitor the signal level across the 8-ohm load at the headphone output of the HEADSET connector.

4. Adjust the SIDETONE trimpot (RV209) to 35 dB below a 2V AC reference level. (The level may be varied according to user preference.)

5. Remove the test equipment.