
Global Wulfsberg *Service Bulletin*

BULLETIN NO: C-5000-3
C-5000 Communications Management
Controller

EFFECTIVITY

C-5000, P/N 31300-0X01-1200 through -1222, serial numbers 1506 and below. Units with serial numbers above those stated have Mod 25 incorporated during original manufacturing.

C-5000, P/N 31300-0X01-2200 through -2223, serial numbers 1506 and below. Units with serial numbers above those stated have Mod 21 incorporated during original manufacturing.

REASON

To increase the range of the RT-5000 when using a dual C-5000, and KY-58 or OTAR encryption.

DESCRIPTION

This modification consists of replacing two resistors and an IC on each Serial RT Board in the unit, and aligning it according to the enclosed procedures.

COMPLIANCE

Recommended at operator's convenience.

WARRANTY INFORMATION

Warranty credit or payment will be issued for any C-5000, serial number 1506 and below, requiring this modification if the modification is completed by an appropriately rated AlliedSignal Service Center. A properly completed warranty claim for three (3.0) hours labor plus parts may be submitted. In order to insure warranty payment, the claim must be marked to show that Mod 25 for a C-5000, P/N 31300-0X01-12XX, or Mod 21 for C-5000, P/N 31300-0X01-22XX, was performed.

APPROVAL

This modification does not affect the original approval.

MANPOWER

Three (3.0) hours labor including testing.

REFERENCES

See attached drawings and procedures.

MODIFICATION PROCEDURE

1. Remove the cover from the unit.

CAUTION

Any disassembly / assembly of the C-5000 must be done at a static-safe work station. Removed modules should be placed in anti-static bags when not installed in the unit.

2. Remove all Serial RT Cards P/N 300-016290-01, and perform steps A-D for each.
 - A. See Figure 1. Replace R2 with a new R2, 1Kohm variable resistor, P/N 133-00100-0066.
 - B. Replace R22 with a new R22, 3.24 Kohm resistor P/N 139-93241-0000.
 - C. Replace U5 with a new U5, IC DG441DY P/N 120-03393-0002.
 - D. Mark ECO 124518 on the board to indicate the modification.
3. Reinstall all Serial RT Cards, and reassemble the unit.
4. Align the C-5000.
 - A. If using the C-5000 with the KY-58 or equivalent, align it according to the enclosed alignment procedure for the C-5000 with Military Encryption Units KY-58 or equivalent, P/N 001-01149-0000.
 - B. If using the C-5000 with an OTAR Encryption Unit, align it according to the enclosed alignment procedure for the C-5000 with OTAR Encryption Units, P/N 001-01150-0000.

TESTING PROCEDURE

Perform a final test procedure on the C-5000 according to C-5000 Communication Management Controller Installation Manual, P/N 150-1355-000.

IDENTIFICATION PROCEDURE

For a -1XXX flavor C-5000, stamp an X on the modification section of the Unit Serial Tag to indicate that Mod 25 is complete.

For a -2XXX flavor C-5000, stamp an X on the modification section of the Unit Serial Tag to indicate that Mod 21 is complete.

MATERIAL INFORMATION

All parts necessary to modify one Serial RT Card in a C-5000 per this Service Bulletin are listed below:

Part Number	Qty	Description
133-00100-0066	1	1Kohm Variable Resistor
139-03241-0000	1	3.24Kohm Resistor
120-03393-0002	1	IC DG441DY

**ALIGNMENT PROCEDURE,
C-5000 COMMUNICATIONS MANAGEMENT CONTROLLER
AND MILITARY ENCRYPTION UNITS
KY-58 or EQUIV
USING TSH-5000**

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TEST PROCEDURE
C5000 MILITARY ENCRYPTION ALIGNMENT
P/N 001-01149-0000 Rev. 2

1.0 DESCRIPTION OF DOCUMENT

This document is used to align the C5000 CONTROL HEAD for use with KY-58, or equivalent using the TSH-5000(Test System Harness).

2.0 TEST DESCRIPTION

2.1 C5000 FUNCTION

2.1.1 The C5000 CONTROL HEAD is installed in an aircraft as a part of a communications radio installation. The purpose of the control head is to tune up to 3 radios allowing for monitoring of main, guard or both receivers simultaneously.

2.1.2 Two types of interface cards are used to control Flexcom radios, a parallel card (P/N 300-031325) and a serial card (P/N 300-016290). The KY-58 will not function with the parallel card and parallel tuned radios unless the KY-58 is modified per KY-58 documentation.

2.2 KY-58 FUNCTION

2.1.1 The KY-58 is a Controlled Cryptographic Item. Observe all applicable regulations regarding its use and alignment.

3.0 REQUIRED TEST EQUIPMENT

Oscilloscope-Tektronix 2445 or Equivalent

DMM-Fluke 8050 or Equivalent

TSH-5000 Test Set 402-015348-1117

C-5000 System Interface Extender Card P/N 300-016545-02

Audio Analyzer HP-8903B, or Audio Function generator.

Headset, 600 Ohm.

Resistors, 100 ohm, 330 ohm, 1200 ohm, and 600 ohm if headset not available.

Personal Computer with COM port (optional)

C-5000 remote programming software (320-017758) Rev 4 and later (optional)

4.0 REFERENCE DRAWINGS

<u>Drawing</u>	<u>P/N</u>
31300-0X01-32XX C5000 Unit	400-031300
C5000 Audio Block Diagram	651-014936
C5000 Installation Manual	150-001355
C5000 Operators Manual	150-001352
C5000 Installation Wiring Diagram	147-014995 Rev 5
TSH-5000 for SYSTEM INTERFACE GWS SCHEMATIC	311-014791-01 152-014791
TSH-5000 for SERIAL R/T CARD GWS SCHEMATIC	311-017802-01 152-017802

5.0 EQUIPMENT SETUP

- 5.1 With the C5000 test system power OFF, remove the cover from the C-5000, and place the 300-031320-02 System Interface Board on the 300-016545-02 extender board. Connect P-500 to the TSH-5000 SYSTEM INTERFACE BOX, and P-501 to the TSH-5000 SERIAL INTERFACE BOX.
- 5.2 Turn the C5000 circuit breaker ON.
- 5.3 Use C-5000 remote programming software, P /N 320-017758 Rev 4 and later, to configure unit prior to test. Refer to the C-5000 Installation Manual P/N 150-1355-000 for configuration information.
- 5.4 Set the TSH-5000 System Test Set Cipher Select Switch to 0(zero).
- 5.5 C-5000 System Configuration Settings.

Verify the following configuration settings.

5.5.1 SYSTEM CONFIGURATION MENU

5.5.1.1 DISCRETES MENU

Set TX AUDIO DELAY	OFF
Set Re-XMIT For Encrypt	ON

5.5.1.2 ENCRYPT MENU

Set SYSTEM ENCRYPT	YES
Set SIDETONE	YES
Set DE_EMPH	NO

5.5.1.3 Guards - Enable and program Guards if applicable for the RT5000.

6.0 ALIGNMENT PROCEDURE

6.1 CIPHER TX

This section sets or verifies the adjustment of the KY-58 coded microphone gain. In the coded transmit mode audio is routed via R170 through the encryption unit and then encrypted. The cipher text is then routed for transmission via R141. In the clear transmit mode, the audio passes through R170 and the encryption unit, and returns via R160. This interruption of the microphone path allows the cipher unit to interrupt the microphone path preventing inadvertent transmission of plain text data when cipher text data is commanded from the encryption unit.

6.1.1 ALERT TONE ADJUST

6.1.1.1 Purpose:

Verify or adjust R102 on C-5000 for comfortable alert tone level. (5.5VRMS of headset audio at C-5000 Headset Audio Outputs with full volume selected.) This level should be approximately 3 and 1/2 turns clockwise from the bottom (fully CCW) of this 10-turn linear-taper potentiometer.

6.1.1.2 Set C-5000 Volume to Maximum.

6.1.1.3 Using the HP-8903B audio analyzer inject a 6Vp-p (2.12Vrms) 1kHz audio signal through a 1200 ohm resistor into the TSH-5000 SYSTEM J27 (AUX AUDIO IN). The audio analyzer signal generator common should be connected to J62 Aux Ground.

(Note: input voltage for this test is measured at the signal generator side of the resistor.)

6.1.1.4 Using the HP-8903B, monitor the C-5000 Primary Microphone Headset Audio at J40 (hi) and J39 (common) of the TSH-5000 SYSTEM.

6.1.1.5 Adjust R-102 for 5.5Vrms of headset audio with a 600ohm headset loading the C-5000.

6.1.1.6 This test is complete. Remove connections associated with this test.

6.1.2 CIPHER MIC GAIN

6.1.2.1 Purpose:

Verify or adjust R-170 for .45Vrms of microphone audio at pins J2-M and N of the KY-58, given a .25Vrms audio input into the C-5000.

- 6.1.2.2 Using the HP-8903B, inject a .25Vrms signal into the TSH-5000 SYSTEM J9 (Primary Carbon Mic HI). The audio analyzer signal generator common should be connected to J29 (Primary Carbon Mic Lo).
- 6.1.2.3 Connect J3 (XMIT AUD IN) to J49 (MIC OUT HI) and J4 (XMIT AUD COM) to J48 (MIC OUT LOW) of the TSH-5000 SYSTEM.
- 6.1.2.4 Place the C-5000 in PVT Mode and transmit.
- 6.1.2.5 Connect the audio analyzer inputs to J3 and J4 of the TSH-5000 System.
- 6.1.2. Adjust R-170 for .45Vrms of microphone audio.
- 6.1.2.7 This test is complete.

6.1.3 SIDETONE ADJUST

- 6.1.3.1 Purpose:

Verify R-118 is set for 5.5Vrms of sidetone at the C-5000 Headset Output with full audio volume level set, given a .25Vrms audio input into the C-5000. This level should be approximately 7 turns clockwise from the bottom (fully CCW) of this 10-turn linear-taper potentiometer.
- 6.1.3.2 Using the HP-8903B, inject a .25Vrms signal into the TSH-5000 SYSTEM J9 (Primary Carbon Mic HI). The audio analyzer signal generator common should be connected to J29 (Primary Carbon Mic Lo).
- 6.1.1.3 Using the HP-8903B, monitor the C-5000 Primary Microphone Headset Audio at TSH-5000 J40 (hi) and J39 (common).
- 6.1.1.4 Adjust R-118 for 5.5Vrms of headset audio with the C-5000 set for full volume.
- 6.1.1.5 This test is complete. Remove all connections associated with this test.

6.1.4 R141 ADJUST

- 6.1.4.1 Purpose:

Verify R-141 is set to such a level that the cipher text (wide band audio) to the radio does not clip. This level should be approximately 1 turn clockwise from the bottom (fully CCW) of this 10-turn linear-taper potentiometer.
- 6.1.4.2 Using the HP-8903B, inject a 12Vp-p signal (4.24Vrms) into the TSH-5000 SYSTEM J61 (EXT RTX WB XMT OUT) through a 100 ohm resistor. The audio analyzer signal generator common should be connected to J62 (Aux Ground).
- 6.1.4.3 Adjust R141 for 8.4Vp-p at TP-11 on the System Interface Board.

6.1.4.4 This set up will be used for the next step.

6.1.5 R2 ADJUST (each R/T system)

6.1.5.1 Purpose:

Verify R-2 is set to such a level that the cipher text does not clip, and produces the proper amount of FM deviation for the baseband signal. Refer to applicable KY-58 documentation for this level. The C-5000 should be properly set for this signal with the factory adjustments (4.3 - 4.1Khz emergency setting level). Switch each applicable R/T-5000 to AM mode and the KY-58 to Di-Phase, and verify TBD (70-90%) coded modulation per KY-58 Documentation.

6.1.5.2 Place the C-5000 in Transmit PVT and measure the output at the TSH-5000 SERIAL J68 (EXT XMIT AUD). The audio analyzer signal input common should be connected to J62 (Aux Ground).

6.1.5.3 Adjust R2 for 0.84Vrms (2.2Vp-p).

6.1.5.4 This test is complete. Remove the connections associated with this test.

6.2 PLAIN TX

In the plain transmit mode, audio is routed via R170 through the encryption unit and then returned to the C-5000 for transmission via R160.

6.2.1 PLAIN MIC GAIN

6.2.1.1 Purpose:

Verify (or adjust R-160 for) 3Khz of FM deviation out of each R/T given a .25Vrms audio input into the C-5000. This level should be approximately 1/2 turn clockwise from the bottom (fully CCW) of this 10-turn linear-taper potentiometer.

Verify R-170 is set for .45Vrms of microphone audio at pins J2-M and J2-N of the KY-58, given a .25Vrms audio input into the C-5000.

6.2.1.2 Using the HP-8903B, inject a .25Vrms signal into the TSH-5000 SYSTEM J9 (Primary Carbon Mic HI). The audio analyzer signal generator common should be connected to J29 (Primary Carbon Mic Lo).

6.2.1.3 Connect TSH-5000 SYSTEM J3 (XMIT AUD IN) to J49 (MIC OUT HI) and J4 (XMIT AUD COM) to J48 (MIC OUT LOW). Connect the audio analyzer inputs to J3 and J4, and verify R-170 is set for .45V rms of microphone audio per 6.1.2.

- 6.2.1.4 Provide simulated microphone bias by connecting TSH-5000 serial J-72 +15V to one end of a 330 ohm resistor. Connect the other end of the 330 ohm resistor to TSH-5000 serial pin J22(RT-5000 Mic Hi).
- 6.2.1.5 Connect the audio analyzer inputs to TSH-5000 SERIAL J22 (hi) and J23 (lo).
- 6.2.1.6 Take unit out of PVT mode and place TSH-5000 System PTT off, then back on.
- 6.2.1.7 Verify (or adjust R-160 for) .25Vrms of microphone audio. TSH-5000 Serial PTT (SW-2) should be set to the off position.
- 6.2.1.8 Take the C-5000 out of TRANSMIT and PVT modes.
- 6.2.1.9 This test is complete. Disconnect connections associated with this test.

6.3 PLAIN RX

This section sets a preliminary gain for the plain mode audio.

6.3.1 PLAIN RX GAIN

6.3.1.1 Purpose:

Verify (or adjust R108 for) no headset audio clipping, given a 4.5Khz deviation FM signal from each R/T given. This setting is typically 3 turns counter clockwise from the factory setting.

6.3.1.2 Connect the audio analyzer outputs to TSH-5000 SERIAL J33 (hi) and J34 (lo), VOICE AUDIO HI, VOICE AUDIO LOW.

6.3.1.3 Connect the audio analyzer inputs to TSH-5000 SYSTEM J1 (hi) and J62 (lo), EXT VOICE REXMIT AUDIO.

6.3.1.4 Inject a 2.75Vrms signal and verify (or adjust R-108 for) 2Vrms of audio output.

6.3.1.5 This test is complete. Disconnect connections associated with this test.

6.4 CIPHER RX

This section sets or verifies the wideband and decoded audio gains.

6.4.1 WIDEBAND AUDIO ADJUST

6.4.1.1 Purpose:

Verify (or adjust R135 for) maximum signal-to-noise ratio, given a coded baseband FM signal from each R/T. This level is 6-12Vp-p at J1-b of the encryption unit. This setting is typically 3 turns clockwise from the factory setting.

- 6.4.1.2 Connect the audio analyzer outputs to TSH-5000 SERIAL J81 (hi) and J86 (lo) UNSQUELCHED MAIN AUDIO (input scale factor .6Vrms = 3Khz dev.
- 6.4.1.3 Connect the audio analyzer inputs to TSH-5000 SYSTEM J37 (hi) and J62 (lo) EXT RTX DECODED AUDIO.
- 6.4.1.4 Inject a .82Vrms (1.2Vpk) signal, and verify (or adjust R-135 for) 7Vp-p (2.48Vrms) of audio output.
- 6.4.1.5 This test is complete. Remove connections associated with this test.

6.4.2 DECODED AUDIO ADJUST

- 6.4.2.1 Purpose:
Verify or adjust R131 for comfortable listening level given a coded baseband FM signal from each R/T. 3.5-7.75Vrms of C-5000 headset audio output for voice with C-5000 at full volume setting.
- 6.4.2.2 Connect the audio analyzer outputs to TSH-5000 SYSTEM J42 (hi) and J62 (lo) EXT RTX DECODED AUD.
- 6.4.2.3 Connect the audio analyzer inputs to TSH-5000 SYSTEM J40 (hi) and J39 (lo) PRI HEADSET AUDIO.
- 6.4.2.4 Inject a 2Vrms (2.82Vpk) signal using the audio analyzer, and verify (or adjust R-131 for) 7.75Vrms of audio output from the C-5000 Headset outputs.
- 6.4.2.5 This test is complete. Remove connections associated with this test.

6.4.3 GUARD AUDIO ADJUST

- 6.4.3.1 Purpose:
Verify (or adjust R114 for) comfortable listening level given a plain FM signal from each R/T. 0Vrms of C-5000 RTX V GD audio output for voice with C-5000 at full volume setting.
- 6.4.3.2 Turn R114 counter clock wise 11 turns.
- 6.4.3.3 End of tests. Turn all equipment off and disconnect the setup.

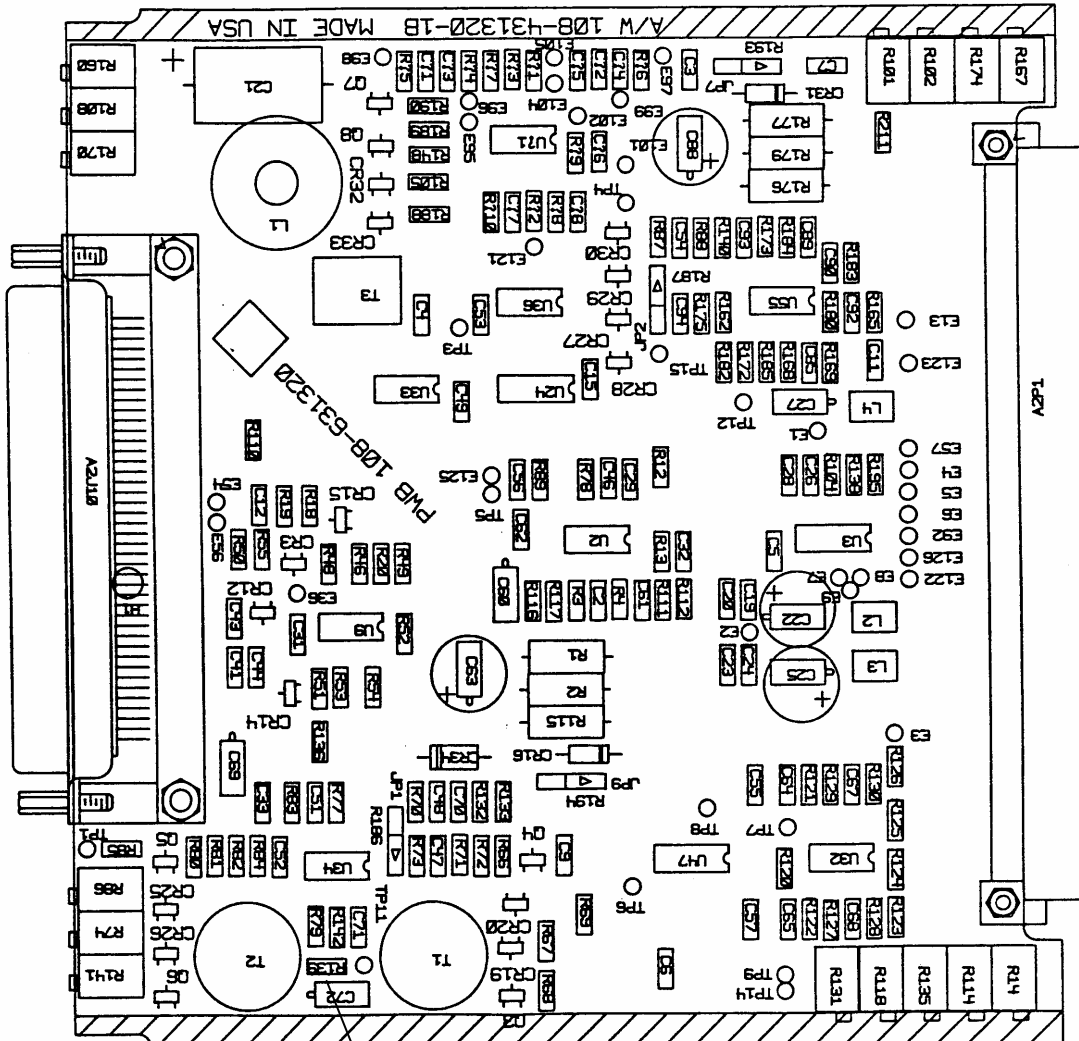
7.0 Summary of Adjustments

Reference Only:

Adjustment	Purpose	Factory Setting	Change Required
R135 RTX WB MN RX AUDIO	Controls the amplitude of the eye pattern(rx cipher text) going into the encryption unit.	4 Vp-p	Set for 7Vp-p when measured at pin b of encryption unit P1. Approximately 6-7 turns from the fully CCW position
R131 EXT RTX DCD RX AUDIO	Controls the amplitude of the decoded audio.	2 VRMS at TP 6	Adjust such that the coded receive audio produces the same amplitude as clear audio for a given mic. input. At full volume on the C-5000 this corresponds to 7.75Vrms out of the headset output for a 3 khz deviation clear signal. (Note for a typical DES/ASN installation this adjustment is fully clockwise)(Set to 2V rms for KY-58 [less than 3 turns CW])
R170 MIC OUT	Controls the amplitude of the voice band signal going to the cipher.	.45 VRMS	Set the C-5000 to transmit in private mode. With a .25V rms 1 Khz sine wave into the primary carbon mic input at the C-5000 adjust R170 so that there is an 185 mV rms sine wave at P202-1 of the ASN unit. Verify this signal with a microphone. A normal voice signal must produce more than .185Vrms at this point.(Set to .45Vrms for KY-58)
R160 XMIT AUDIO IN	Controls the amplitude of the clear transmission path. Set to at factory.	2 VRMS at JP2	Adjust this for 3.0 Khz of clear transmit deviation with no clipping using a .25V rms 1 Khz sine wave into the primary carbon mic input at the C-5000.(Set to 2V RMS for KY-58)

Adjustment	Purpose	Factory Setting	Change Required
R141 -- EXT RTX WB XMIT AUDIO	Controls the amount of deviation for the encrypted signal.	6 Vp-p at TP 11	For proper operation of relay and repeater mode this signal should be set for 8.2 V p-p with a 4.1 KHz deviation coded eye pattern. If it is not possible to adjust this at TP-11 adjust this so that there is no clipping in the coded output. Adjust R2 for specified (4.1 +/-0.1 KHz) deviation at each radio in coded mode. (Note: Set to 3vp-p for 3KHz deviation at factory.)(Set to 8.4Vp-p for KY-58)
R118 CIPHER SIDETONE	Controls the amount of sidetone heard during transmit for a Motorola, or other Land Mobile encryption product.	1.4 VRMS sidetone at TP6	Corresponds to a headset sidetone amplitude of 5.5Vrms of sidetone out of the primary headset at full C-5000 volume. Adjust for comfortable sidetone level during encrypted TX.
R108 RTX REXMT AUDIO	Controls the Clear Audio Amplitude.	2 VRMS on output pin	Adjust to Eliminate Clipping in the KY-58 Plain Text Voice Audio. (3 KHz Deviation Rx Audio should not clip) 3 Turns CCW from factory setting
R102 AUX AUDIO IN	Sets the volume level of the alert tones from the encryption unit during transmit.		Adjust this for a comfortable alert tone level. 5.5Vrms at full C-5000 volume is recommended.

8.0 COMPONENT/ADJUSTMENT LOCATOR



TP-11

**ALIGNMENT PROCEDURE,
C-5000 COMMUNICATIONS MANAGEMENT CONTROLLER
AND OTAR ENCRYPTION UNITS
USING TSH-5000**

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TEST PROCEDURE
C5000 OTAR ENCRYPTION ALIGNMENT
P/N: 31300-0x01-2XXX

1.0 DESCRIPTION OF DOCUMENT

This document is used to align the C5000 CONTROL HEAD for use with Motorola Advanced Secure Net (OTAR), or equivalent using the TSH-5000(Test System Harness).

2.0 TEST DESCRIPTION

2.1 C5000 FUNCTION

2.1.1 The C5000 CONTROL HEAD is installed in an aircraft as a part of a communications radio installation. The purpose of the control head is to tune up to 3 radios allowing for monitoring of main, guard or both receivers simultaneously.

2.1.2 Two types of interface cards are used to control Flexcom radios, a parallel card (300-031325) and a serial card (300-016290).

2.2 OTAR FUNCTION

2.2.1 The ASN is a Controlled Cryptographic Item. Observe all applicable regulations regarding its use and alignment.

3.0 REQUIRED TEST EQUIPMENT

Oscilloscope-Tektronix 2445 or Equivalent

DMM-Fluke 8050 or Equivalent

TSH-5000 Test Set 402-015348-1117

C-5000 System Interface Extender Card P/N 300-016545-02

Audio Analyzer HP-8903B, or Audio Function generator.

Headset, 600 Ohm.

Resistors, 100 ohm, 330 ohm, 1000 ohm, and 600 ohm if headset not available.

Personal Computer with COM port (optional)

C-5000 remote programming software (320-017758) Rev 4 and later (optional)

4.0 REFERENCE DRAWINGS

<u>Drawing</u>	<u>P/N</u>
31300-0X01-22XX C5000 Unit	400-031300
C5000 Audio Block Diagram	651-014936
C5000 Installation Manual	150-001355
C5000 Operators Manual	150-001352
OTAR Installation Supplement	150-1426-0000
C5000 Installation Wiring Diagram	147-014995 Rev 5
TSH-5000 for SYSTEM INTERFACE GWS SCHEMATIC	311-014791-01 152-014791
TSH-5000 for SERIAL R/T CARD GWS SCHEMATIC	311-017802-01 152-017802

5.0 EQUIPMENT SETUP

- 5.1 With the C5000 test system power OFF remove the cover from the C-5000 and place the 300-031320-02 system interface board on the 300-016545-02 extender board. Connect P-500 to the TSH-5000 SYSTEM INTERFACE BOX and P-501 to the TSH-5000 SERIAL INTERFACE BOX.
- 5.2 Turn the C5000 circuit breaker ON.
- 5.3 Use C-5000 remote programming software (320-017758) Rev 4 and later to configure unit prior to test. Refer to the C-5000 Installation Manual 150-1355-000 for configuration information.
- 5.4 Set the TSH-5000 System Test Set Cipher Select Switch to 0(zero).
- 5.5 C-5000 System Configuration Settings
Verify the following configuration settings
 - 5.5.1 SYSTEM CONFIGURATION MENU
 - 5.5.1.1 DISCRETES MENU
 - Set TX AUDIO DELAY - OFF
 - Set Re-XMIT For Encrypt - ON

5.5.1.2 ENCRYPT MENU

Set SYSTEM ENCRYPT - YES

Set SIDETONE - YES

Set DE_EMPH - NO

5.5.1.3 Guards - Enable and program Guards if applicable for the RT5000.

6.0 ALIGNMENT PROCEDURE

6.1 CIPHER TX

This section sets or verifies the adjustment of the OTAR coded microphone gain. In the coded transmit mode, audio is routed via R170 through the encryption unit, and then encrypted. The cipher text is then routed for transmission via R141. In the clear transmit mode, the audio passes through R170 and the encryption unit, and returns via R160. This interruption of the microphone path allows the cipher unit to interrupt the microphone path, preventing inadvertent transmission of plain text data when cipher text data is commanded from the encryption unit.

6.1.1 ALERT TONE ADJUST

6.1.1.1 Purpose:

Verify (or adjust R102) on C-5000 for comfortable alert tone level. (5.5VRMS of headset audio at C-5000 Headset Audio Outputs with full volume selected.) This level should be approximately 4 turns clockwise from the bottom (fully CCW) of this 10-turn linear-taper potentiometer.

6.1.1.2 Set C-5000 volume to maximum.

6.1.1.3 Using the HP-8903B audio analyzer, inject a 5voltp-p (1.76Vrms) 1khz audio signal through a 1000ohm resistor into the TSH-5000 SYSTEM J27 (AUX AUDIO IN). The audio analyzer signal generator common should be connected to J62 Aux Ground.

(Note: Input voltage for this test is measured at the signal generator side of the resistor.)

6.1.1.4 Using the HP-8903B, monitor the C-5000 Primary Microphone Headset Audio at J40 (hi) and J39 (common) of the TSH-5000 SYSTEM.

6.1.1.5 Adjust R-102 for 5.5Vrms of headset audio with a 600ohm headset loading the C-5000.

6.1.1.6 This test is complete. Remove connections associated with this test.

6.1.2 CIPHER MIC GAIN

6.1.2.1 Purpose:

Verify (or adjust R-170 for) .185Vrms of microphone audio at pins P202, and P203 of the OTAR, given a .25Vrms audio input into the C-5000.

6.1.2.2 Using the HP-8903B, inject a .25Vrms signal into the TSH-5000 SYSTEM J9 (Primary Carbon Mic HI). The audio analyzer signal generator common should be connected to J29 (Primary Carbon Mic Lo).

6.1.2.3 Connect J3 (XMIT AUD IN) to J49 (MIC OUT HI), and J4 (XMIT AUD COM) to J48 (MIC OUT LOW) of the TSH-5000 SYSTEM.

6.1.2.4 Place the C-5000 in PVT Mode, and transmit.

6.1.2.5 Connect the audio analyzer inputs to J3 and J4 of the TSH-5000 System.

6.1.2.6 Adjust R-170 for .185Vrms of microphone audio.

6.1.2.7 This test is complete.

6.1.3 SIDETONE ADJUST

6.1.3.1 Purpose:

Verify R-118 is set for 5.5Vrms of sidetone at the C-5000 Headset output with full audio volume level set, given a .25Vrms audio input into the C-5000. This level should be approximately 7 turns clockwise from the bottom (fully CCW) of this 10-turn linear-taper potentiometer.

6.1.3.2 Using the HP-8903B, inject a .25Vrms signal into the TSH-5000 SYSTEM J9 (Primary Carbon Mic HI). The audio analyzer signal generator common should be connected to J29 (Primary Carbon Mic Lo).

6.1.1.3 Using the HP-8903B, monitor the C-5000 Primary Microphone Headset Audio at TSH-5000 J40 (hi) and J39 (common).

6.1.1.4 Adjust R-118 for 5.5Vrms of headset audio with the C-5000 set for full volume.

6.1.1.5 This test is complete. Remove all connections associated with this test.

6.1.4 R141 ADJUST

6.1.4.1 Purpose:

Verify R-141 is set to such a level that the cipher text (wide band audio) to the radio does not clip. This level should be approximately 4 turns clockwise from the bottom (fully CCW) of this 10-turn linear-taper potentiometer.

6.1.4.2 Using the HP-8903B, inject a 9.6Vp-p signal (3.39Vrms) into the TSH-5000 SYSTEM J61 (EXT RTX WB XMT OUT) through a 100ohm resistor. The audio analyzer signal generator common should be connected to J62 (Aux Ground).

6.1.4.3 Adjust R141 for 8.2Vp-p at TP-11 on the System Interface Board.

6.1.4.4 This set up will be used for the next step.

6.1.5 R2 ADJUST (each R/T system)

6.1.5.1 Purpose:

Verify R-2 is set to such a level that the cipher text does not clip, and produces the proper amount of FM deviation for the baseband signal. Refer to applicable OTAR documentation for this level. The C-5000 should be properly set for this signal with the factory adjustments (4.3 - 4.1Khz emergency setting level).

6.1.5.2 Place the C-5000 in Transmit PVT, and measure the output at the TSH-5000 SERIAL J68 (EXT XMIT AUD). The audio analyzer signal input common should be connected to J62 (Aux Ground).

6.1.5.3 Adjust R2 for 0.82Vrms (2.2Vp-p).

6.1.5.4 This test is complete. Remove the connections associated with this test.

6.2 PLAIN TX

In the plain transmit mode, audio is routed via R170 through the encryption unit, and then returned to the C-5000 for transmission via R160.

6.2.1 PLAIN MIC GAIN

6.2.1.1 Purpose:

Verify (or adjust R-160 for) 3 Khz of FM deviation out of each R/T, given a .25Vrms audio input into the C-5000. This level should be approximately 1/2 turn clockwise from the bottom (fully CCW) of this 10-turn linear-taper potentiometer.

Verify (or R-170 is set for) .185Vrms of microphone audio at pins P201-1 of the ASN, given a .25Vrms audio input into the C-5000.

- 6.2.1.2 Using the HP-8903B, inject a .25Vrms signal into the TSH-5000 SYSTEM J9 (Primary Carbon Mic HI). The audio analyzer signal generator common should be connected to J29 (Primary Carbon Mic Lo).
- 6.2.1.3 Connect TSH-5000 SYSTEM J3 (XMIT AUD IN) to J49 (MIC OUT HI), and J4 (XMIT AUD COM) to J48 (MIC OUT LOW). Connect the audio analyzer inputs to J3 and J4, and verify R-170 is set for .185Vrms of microphone audio per 6.1.2.
- 6.2.1.4 Provide simulated microphone bias by connecting TSH-5000 serial J-72 +15V to one end of a 330 ohm resistor. Connect the other end of the 330 ohm resistor to TSH-5000 serial pin J22(RT-5000 Mic Hi).
- 6.2.1.5 Connect the audio analyzer inputs to TSH-5000 SERIAL J22 (hi) and J23 (lo).
- 6.2.1.6 Take unit out of PVT mode, and place TSH-5000 System PTT off, then back on.
- 6.2.1.7 Verify (or adjust R-160 for) .25Vrms of microphone audio. TSH-5000 Serial PTT (SW-2) should be set to the off position.
- 6.2.1.8 Take the C-5000 out of TRANSMIT and PVT modes.
- 6.2.1.9 This test is complete. Disconnect connections associated with this test.

6.3 PLAIN RX

This section sets a preliminary gain for the plain mode audio.

6.3.1 PLAIN RX GAIN

6.3.1.1 Purpose:

Verify (or adjust R108 for) no headset audio clipping, given a 4.5 KHz deviation FM signal from each R/T given. This setting is typically 0 turns counter clockwise from the factory setting.

6.3.1.2 Connect the audio analyzer outputs to TSH-5000 SERIAL J33 (hi) and J34 (lo) VOICE AUDIO HI, VOICE AUDIO LOW.

6.3.1.3 Connect the audio analyzer inputs to TSH-5000 SYSTEM J1 (hi) and J62 (lo) EXT VOICE REXMIT AUDIO.

6.3.1.4 Inject a 2.75Vrms signal. and verify (or adjust R-108 for) 2Vrms of audio output.

6.3.1.5 This test is complete. Disconnect connections associated with this test.

6.4 CIPHER RX

This section sets or verifies the wideband and decoded audio gains.

6.4.1 WIDEBAND AUDIO ADJUST

6.4.1.1 Purpose:

Verify (or adjust R135 for) maximum signal to noise ratio, given a coded baseband FM signal from each R/T. This level is 4 Vp-p at J203-pin 2 of the encryption unit. This setting is typically 3 turns clockwise from the factory setting.

6.3.1.2 Connect the audio analyzer outputs to TSH-5000 SERIAL J81 (hi) and J86 (lo) UNSQUELCHED MAIN AUDIO (input scale factor .6Vrms = 3KHz dev).

6.3.1.3 Connect the audio analyzer inputs to TSH-5000 SYSTEM J37 (hi) and J62 (lo) EXT RTX DECODED AUDIO.

6.3.1.4 Inject a .82Vrms (1.2Vpk) signal, and verify (or adjust R-135 for) 4Vp-p (1.41Vrms) of audio output.

6.3.1.5 This test is complete. Remove connections associated with this test.

6.4.2 DECODED AUDIO ADJUST

6.4.2.1 Purpose:

Verify (or adjust R131 for) a comfortable listening level, given a coded baseband FM signal from each R/T. 3.5 to 7.75Vrms of C-5000 headset audio output for voice with C-5000 at full volume setting.

6.4.2.2 Connect the audio analyzer outputs to TSH-5000 SYSTEM J42 (hi) and J62 (lo), an 8 Kohm resistor, EXT RTX DECODED AUD.

6.4.2.3 Connect the audio analyzer inputs to TSH-5000 SYSTEM J40 (hi) and J39 (lo).

PRI HEADSET AUDIO.

6.4.2.4 Inject a 3.2Vp-p (1.13Vrms) signal using the audio analyzer, and verify (or adjust R-131 for) 7.75Vrms of audio output from the C-5000 Headset outputs.

6.4.2.5 This test is complete. Remove connections associated with this test.

6.4.3 GUARD AUDIO ADJUST

6.4.3.1 Purpose:

Verify (or adjust R114 for) a comfortable listening level given a plain FM signal from each R/T. 0 Vrms of C-5000 RTX V GD audio output for voice with C-5000 at full volume setting.

6.4.3.1 Turn R114 counterclockwise 11 turns.

6.4.3.2 End of tests. Turn all equipment off and disconnect the setup.

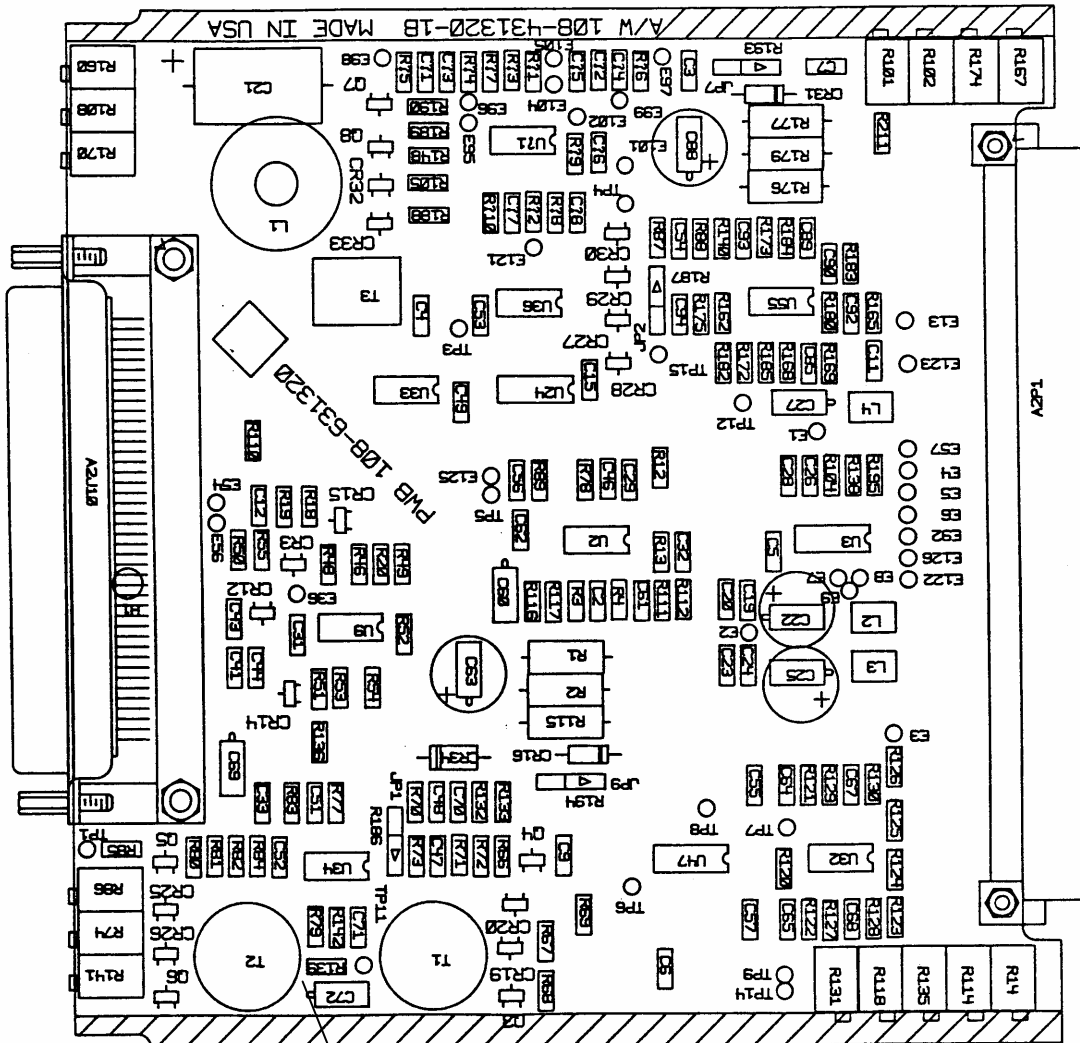
7.0 Summary of Adjustments

Reference Only:

Adjustment	Purpose	Factory Setting	Change Required
R135 RTX WB MN RX AUDIO	Controls the amplitude of the eye pattern(rx cipher text) going into the encryption unit.	4 Vp-p	Set for 7Vp-p when measured at pin b of encryption unit P1. Approximately 6-7 turns from the fully CCW position
R131 EXT RTX DCD RX AUDIO	Controls the amplitude of the decoded audio.	2 VRMS at TP 6	Adjust such that the coded receive audio produces the same amplitude as clear audio for a given mic. input. At full volume on the C-5000 this corresponds to 7.75Vrms out of the headset output for a 3 khz deviation clear signal. (Note for a typical DES/ASN installation this adjustment is fully clockwise)(Set to 2V rms for KY-58 [less than 3 turns CW])
R170 MIC OUT	Controls the amplitude of the voice band signal going to the cipher.	.45 VRMS	Set the C-5000 to transmit in private mode. With a .25V rms 1 Khz sine wave into the primary carbon mic input at the C-5000 adjust R170 so that there is an 185 mV rms sine wave at P202-1 of the ASN unit. Verify this signal with a microphone. A normal voice signal must produce more than .185Vrms at this point.(Set to .45Vrms for KY-58)
R160 XMIT AUDIO IN	Controls the amplitude of the clear transmission path. Set to at factory.	2 VRMS at JP2	Adjust this for 3.0 Khz of clear transmit deviation with no clipping using a .25V rms 1 Khz sine wave into the primary carbon mic input at the C-5000.(Set to 2V RMS for KY-58)

Adjustment	Purpose	Factory Setting	Change Required
R141 -- EXT RTX WB XMIT AUDIO	Controls the amount of deviation for the encrypted signal.	6 Vp-p at TP 11	For proper operation of relay and repeater mode this signal should be set for 8.2 V p-p with a 4.1 Khz deviation coded eye pattern. If it is not possible to adjust this at TP-11 adjust this so that there is no clipping in the coded output. Adjust R2 for specified (4.1 +/-0.1 Khz) deviation at each radio in coded mode. (Note: Set to 3vp-p for 3Khz deviation at factory.)(Set to 8.4Vp-p for KY-58)
R118 CIPHER SIDETONE	Controls the amount of sidetone heard during transmit for a Motorola, or other Land Mobile encryption product.	1.4 VRMS sidetone at TP6	Corresponds to a headset sidetone amplitude of 5.5Vrms of sidetone out of the primary headset at full C-5000 volume. Adjust for comfortable sidetone level during encrypted TX.
R108 RTX REXMT AUDIO	Controls the Clear Audio Amplitude.	2 VRMS on output pin	Adjust to Eliminate Clipping in the KY-58 Plain Text Voice Audio. (3 Khz Deviation Rx Audio should not clip) 3 Turns CCW from factory setting
R102 AUX AUDIO IN	Sets the volume level of the alert tones from the encryption unit during transmit.		Adjust this for a comfortable alert tone level. 5.5Vrms at full C-5000 volume is recommended.

8.0 COMPONENT/ADJUSTMENT LOCATOR



TP-11

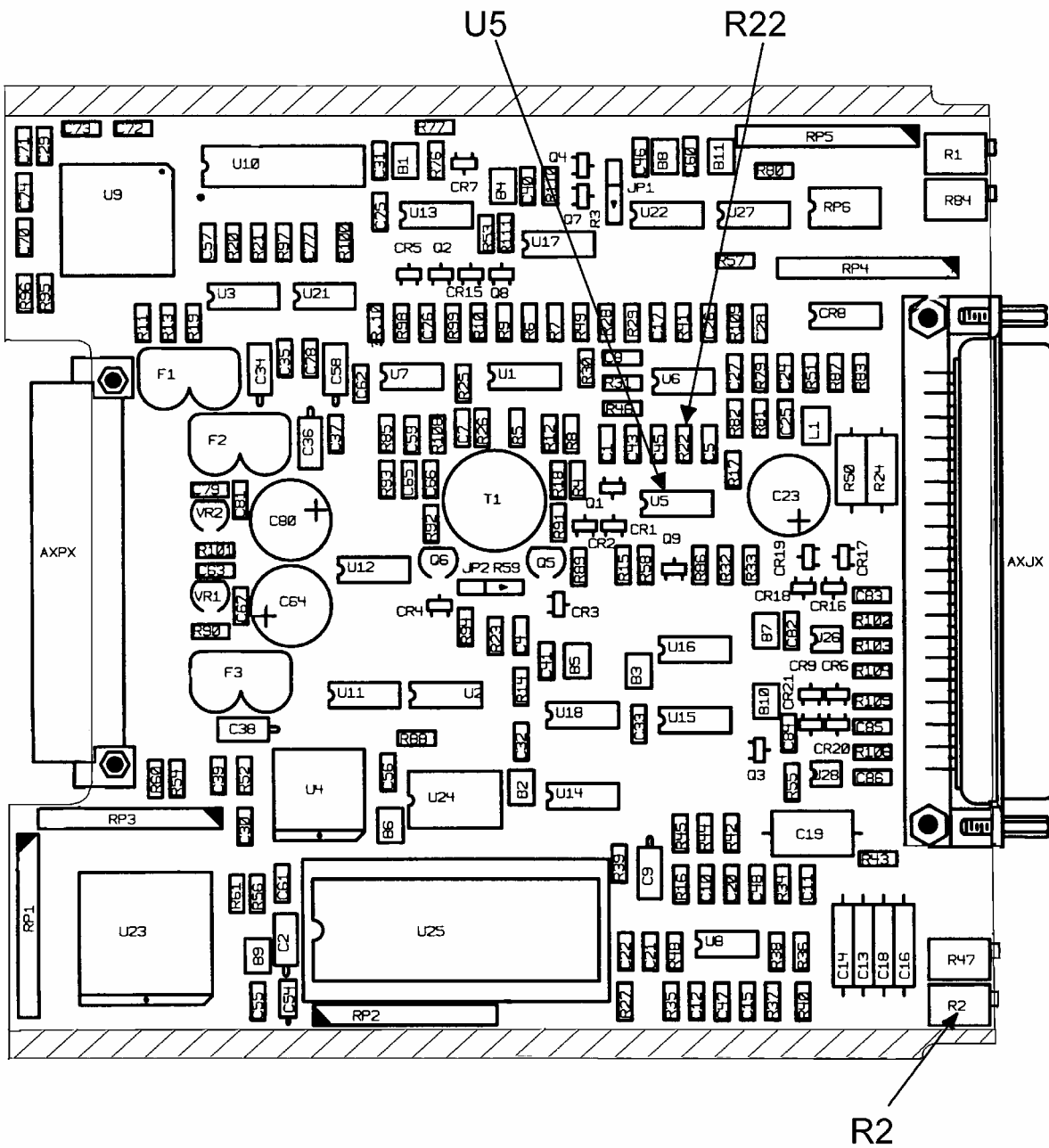


Figure 1
 C-5000 Serial RT Card
 310-016290 Rev-5

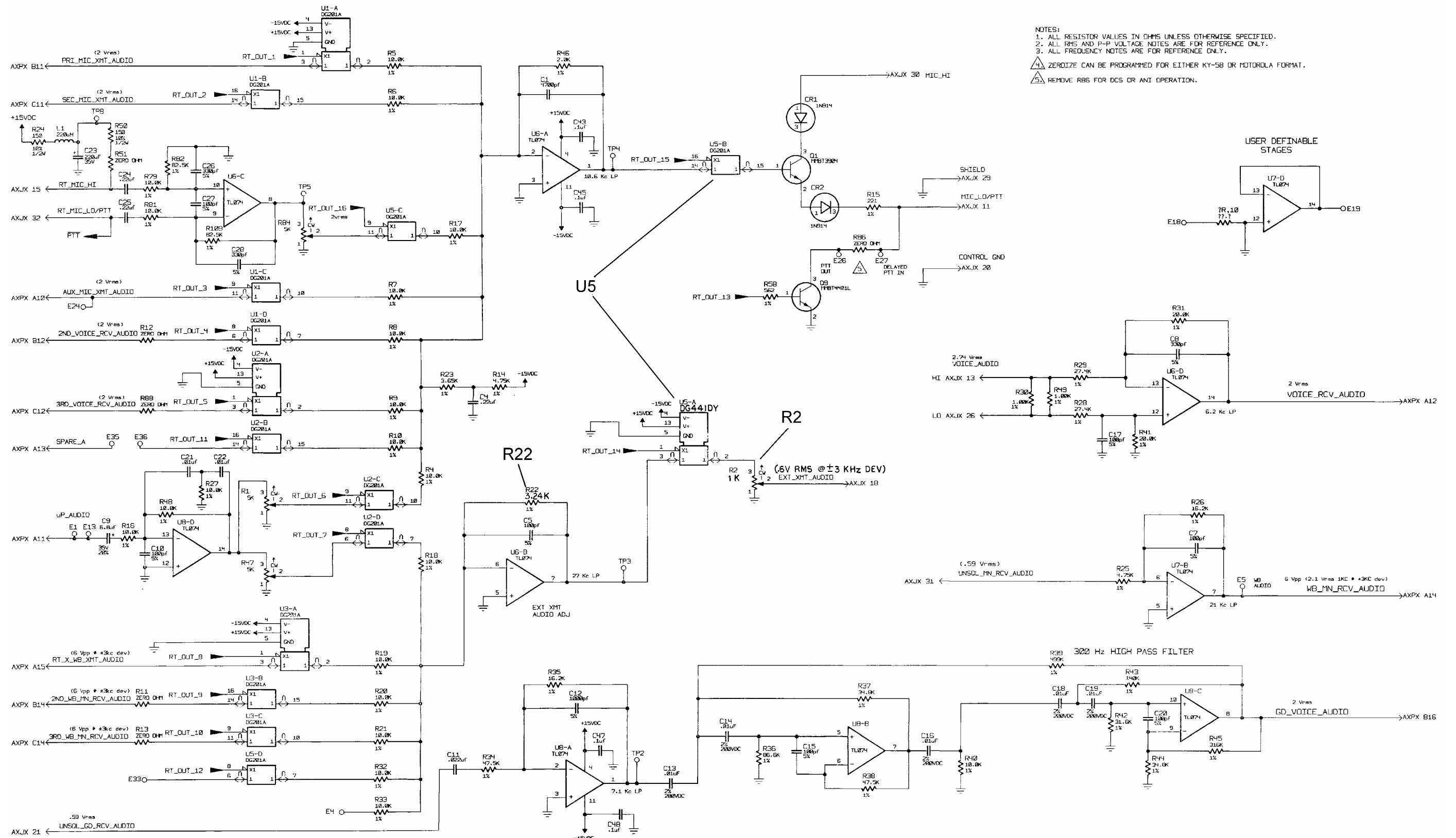


Figure 2
C-5000 Serial RT Card
152-016290 Rev-7