Production Test Requirements

(Including list of Semiconductor Devices)

VHF-920

CPN 822-1250-001

Document CPN 815-1098-001

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DRAFT - UNRELEASED

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History of Changes

Page Number	Rev Ltr	Description of Changes
All	-	Original Release based on VHF-900B PTR, 827-2504-001, Rev K. Modified to add alignment and Tests for VDL Mode 2 Operation. Blue font represents changes from VHF-900B

Table of Contents

1. Scope

These production test requirements apply to the VHF-920 Transceiver, CPN 822-1250-001.

2. Associated Information

Reference Information:

- Equipment Specification 832-7117-001

3. Test Equipment Required

The following test equipment or equivalent is required to perform the specified test:

- RFT-1000 Test Station with CTRD TBD

4. Test Conditions

Unless otherwise specified, all tests shall be performed under the following conditions:

4.1 Power Supply Voltages

27.5 ± 0.5 VDC

4.2 Temperature

Normal factory ambient.

4.3 Humidity

Normal factory ambient.

4.4 Warmup

None required

4.5 Atmospheric Pressure

Normal factory ambient.

4.6 Transmit Duty Cycle

Three minutes receive, thirty seconds transmit, if no cooling air is provided.

4.7 Standard Conditions and Test Information

- AM voice or analog data receive mode: 2 uv (hard) modulated 30% at 1000 Hz at same frequency as transceiver tuning with the squelch disabled (ground MPC13).
- In transmit mode, unit shall be terminated in 50 ohm load. In receive mode, receiver and data audio outputs are terminated in 600 ohm load, low side grounded.

Unit will automatically momentarily transmit in a self test mode when first powered on if the air/ground discrete (MPB14) indicates an "on the ground" (pin open)

- Bit numbers refer to bits 0 -7 in single byte registers
- RAM TFM variables refer to the RAM locations for the currently used value of a EEROM TFM variable. RAM calibration variables refer to the RAM locations for the value of an EEROM calibration variable. RAM monitor refers to RAM location of various bytes. See Appendix A for memory locations.

NOTE: All receiver rf levels are in "hard" microvolts.

NOTE: Whenever instructions are given to modify a RAM value, the unit must also be instructed to suspend normal EEROM-TFM-to-RAM update operations. Room temperature values to be used for all temperature ranges for all TFM variables.

NOTE: The high speed data loader/alignment bus shall be used for all alignment tests and those in the final test that require monitoring internal memory locations. Normal/maintenance discrete (TP6A) must be grounded for this alignment bus to function in the UUT. Wait a minimum of 1 sec between updates for changes to take effect or be reported on data bus.

NOTE: Port A of the low speed frequency control input shall be used unless otherwise specified. rear connector port select discrete must be in appropriate state (ground MPD11 for port A).

4.8 Operating Frequencies VS ICAO Channel Designators

For all test frequencies listed in test setups in this report, the ICAO Channel Identification developed for the new 8.33 kHz channels is used. The channel identification will not necessarily reflect the actual operating frequency. Table 4.8-1 shows the relationship between ICAO Channel Identification, actual operating frequency, receiver bandwidth, and ARINC 429 frequency control word. NOTE: NB is selectivity for 8.33 kHz channels and WB is selectivity for 25 kHz channels.

Table 4.8-1

Frequency (MHz)	ICAO Channel Name	ARINC 429 Control Word Content	ARINC 429 Control Word Label	Receiver IF Bandwidth automatically selected by unit
118.0000	118.000	118.000	030	WB
118.0000	118.005	118.000	047	NB
118.0083	118.010	118.008	047	NB
118.0167	118.015	118.017	047	NB
118.0250	118.025	118.025	030	WB
118.0250	118.030	118.025	047	NB
118.0333	118.035	118.033	047	NB
118.0417	118.040	118.042	047	NB
118.0500	118.050	118.050	030	WB
118.0500	118.055	118.050	047	NB
118.0583	118.060	118.058	047	NB
118.0667	118.065	118.067	047	NB
118.0750	118.075	118.075	030	WB
118.0750	118.080	118.075	047	NB
118.0833	118.085	118.083	047	NB
118.0917	118.090	118.092	047	NB
118.1000	118.100	118.100	030	WB

118.1000	118.105	118.100	047	NB
.	.	.	.	.
.	.	.	.	.
136.9750	136.975	136.975	030	WB
136.9750	136.980	136.975	047	NB

5. Preliminary Test and Adjustments

5.1 Mechanical Construction

Inspect the unit for positive connector contacts, proper and tight hardware, nameplate, etc.

5.2 Presets

Nominal program variables are loaded into EEROM when the software is loaded. These variables may be adjusted from their nominal values to insure the unit meets top level requirements.

5.3 Test Equipment Interconnections

Connect main connector plug from test station to UUT.

5.4 Test Fixture Initial Settings

Determined by test fixture. Note: current limit for +27.5 VDC power supply shall be set to 9 amps.

5.4.1 Test Sequence

All alignment tests (except checksum) to be performed in sequence. During alignment it is necessary that the checksum (see section 5.9) be updated at the end of any alignment procedure that has changed an NVM value. If the unit has never been aligned then all alignment steps must be performed. For realigment of units as a result of a repair action or modification, perform only alignment steps of circuits that have been effected by repair action or modification.

5.4.2 Software Load Procedure

Load the desired top-level software using the data loader capability of the VHF-900B.

5.4.3 Initial Power Up Tests

Ground the normal/shop mode discrete (TPA6). Apply 27.5 ± 0.5 VDC to the power input pins (BP2 and BP4).

NOTE: Any time power is cycled wait 25 seconds before continuing alignment.

5.5 Calibration Variables

NOTE: The calibration values shown are nominal values, and may be changed as needed to insure that the unit meets top-level requirements.

Store the following values for calibration variables in NVM. Values are shown for all statuses of VHF–900B. The default values for –001 are shown in the “Default“ column. For units with Service Bulletin L, the values for variables #25 and #26 are changed as shown in column “SB-L”.

Variable #	Name	Value	
		Default	**SB-L**
1	LOWER_THRESHOLD_XMITR_FORWARD_POWER	$10	$10
2	UPPER_THRESHOLD_XMITR_FORWARD_POWER	$6E	$6E
3	UPPER_THRESHOLD_VSWR	$05	$05
4	UPPER_THRESHOLD_XMITR_OVER_VOLTAGE	$C1	$C1
5	FAN_ENABLE_TEMP_THRESHOLD	$C0	$C0
6	FAN_DISABLE_TEMP_THRESHOLD	$B0	$B0
7	UPPER_THRESHOLD_XMITR_TEMP	$D2	$D2
8	LOWER_THRESHOLD_5_VDC	$66	$66
9	UPPER_THRESHOLD_5_VDC	$99	$99
10	LOWER_THRESHOLD_12_VDC	$7F	$7F
11	UPPER_THRESHOLD_12_VDC	$B2	$B2
12	LOWER_THRESHOLD_NEGATIVE_12_VDC	$70	$70
13	UPPER_THRESHOLD_NEGATIVE_12_VDC	$91	$91
14	LOWER_THRESHOLD_33_VDC	$7F	$7F
15	UPPER_THRESHOLD_33_VDC	$BA	$BA
16	LOWER_THRESHOLD_MOD_PERCENTAGE	$30	$30
17	UPPER_THRESHOLD_AUDIO_LEVEL	$FF	$FF
18	LOWER_THRESHOLD_AUDIO_LEVEL	$06	$06
19	UPPER_THRESHOLD_DISTORTION_LEVEL	$FF	$FF
20	LOWER_THRESHOLD_NOISE_SQUELCH	$00	$00
21	UPPER_THRESHOLD_NOISE_SQUELCH	$FF	$FF
22	LOWER_THRESHOLD_AGC_SQUELCH	$00	$00
23	UPPER_THRESHOLD_AGC_SQUELCH	$FF	$FF
24	POWER_OFF_TIMER_THRESHOLD	$50	$50
25	XMITR_TIMER_WARNING_THRESHOLD	$1D	**$FF**
26	XMITR_TIMER_FAULT_THRESHOLD	$20	**$FF**
27	MODE_2_SIGP LOW_VOLTAGE THRESHOLD	$6A	$6A
28	SPARE	$01	$01
29	SPARE	$00	$00
30	TEMPERATURE_ZONE 1-2	$01	$01
31	TEMPERATURE_ZONE 2-3	$02	$02
32	TEMPERATURE_ZONE 3-4	$FF	$FF

33	TEMPERATURE HYSTERESIS	$CD	$CD
34	XMITR TIMER AUDIBLE WARNING LEVEL	$21	$21
35	SIGP LOW VOLTAGE THRESHOLD	$91	$91
36	MAC_OFFSET	$00	$00

5.5.1 System Processor VCXO Calibration

Store the value $FF into TFM variable #9 for the corresponding EEROM TFM memory locations for all frequencies.

Store the value $00 into TFM variable #9 for the corresponding EEROM TFM memory location for frequency 128 MHz.

5.6 Receiver Alignment

5.6.1 Simulcom Initial Value

Store the value $FF into TFM variable #5 for the corresponding EEROM TFM memory locations.

5.6.2 Receiver Compressor

Store the value $46 into TFM variable #28 for the corresponding EEROM TFM memory locations.

5.6.3 Receiver Voice Audio Output

Tune the transceiver to 118.425 MHz and disable the squelch. Apply a standard test signal with the RF level set to 1000 uv. If the unit has never been aligned, then set RAM TFM variables #1, #2, #3, and #4 to $60. Monitor the receiver audio output and adjust RAM TFM variable #17 for 2.45 VAC $\pm$ 0.05 VAC.

Store the value used for RAM TFM variable #17 in the corresponding EEROM TFM memory locations.

5.6.4 Preselector Alignment

Set the receiver frequency to voice mode at 118.425 MHz. Disable the squelch and monitor the voice audio output. Apply a standard test signal with an RF level sufficient to give a 12 dB S+N/N ratio. If the unit has never been aligned then use the initial values of $60 for preselectors #1 - #4. Alternately adjust RAM TFM variables #1 - #4 for the best S+N/N while reducing the RF level to 2 uv. The final S+N/N after adjustment must be at least 8 dB.

Store the values used for RAM TFM variables #1 - #4 in the corresponding eerom tfm memory locations.

Repeat the above procedure every 1 MHz from 119.425 to 136.425 MHz.

5.6.5 Simulcom Adjustment

Tune the transceiver to 126.425 MHz. Apply a standard test signal at -15 dBm (40 mv). Set RAM TFM variable #5 for $FF and monitor the SIMULCOM AGC voltmeter. Decrease variable # 5 until the SIMULCOM AGC voltmeter reading is approximately 50% of the initial reading (± $02).

Remove modulation and increase the RF level to 1000 mv. Verify that SIMULCOM AGC voltmeter decreases to less than $3D.

Store the values used for RAM TFM variable #5 in the corresponding EEROM TFM memory locations.

5.6.6 Squelch Adjustment

5.6.6.1 25 kHz Noise Squelch

Tune the transceiver to 126.425 MHz. Apply 30%, 1 kHz signal at standard 3 uv. Monitor the receiver audio output. Set RAM TFM variables #13, #14, #15, and #16 to $00. Wait a minimum of 10 msec, then set RAM TFM variables #14 and #16 to $FF. Increase RAM TFM variable #13 from $00 until receiver audio is present (0.05 to 2.6 VAC).

Reduce the RF generator output by 3 dB. Decrease RAM TFM variable #14 from $FF until the receiver audio is squelched (0.0 to 0.0245 VAC).

Store the values used for RAM TFM variables #13 and #14 in the corresponding EEROM TFM memory locations.

5.6.6.2 Carrier Squelch

Tune the transceiver to 126.425 MHz. Apply a 20 uv signal modulated 50% at 6 kHz. While monitoring the receiver's audio output, increment RAM TFM variable #15 from $00 until receiver audio is present in the receiver's audio output. While incrementing RAM TFM variable #15, pause between each increment for a minimum of 40 msec (plus normal update delay).

Reduce the RF generator output by 4 dB. Decrease RAM TFM variable #16 from $FF until the receiver's audio is squelched.

Store the values used for RAM TFM variables #15 and #16 in the corresponding EEROM TFM memory locations.

5.6.6.3 8.33 kHz Noise Squelch

Tune the transceiver to Channel 126.430 (126.425 MHz with ARINC 429 047 label). Apply 30%, 1 kHz signal at standard 3 uv. Monitor the receiver audio output. Set RAM TFM variables #22 and 23 to $00. Wait a minimum of 10 msec, then set RAM TFM variable #23 to $FF. Increase RAM TFM variable #22 from $00 until receiver audio is present (0.05 to 2.6 VAC).

Reduce the RF generator output by 3 dB. Decrease RAM TFM variable #23 from $FF until the receiver audio is squelched (0.0 to 0.0245 VAC).

Store the values used for RAM TFM variables #22 and #23 in the corresponding EEROM TFM memory locations.

5.7 Transmitter Alignment

NOTE: For all transmitter alignment procedures, disable the transmit timer or limit individual transmission times to less than 25 seconds to avoid transmitter timeout.

NOTE: All transmitter tests must be run in order listed.

5.7.1 Transmit Reflection Coefficient

NOTE: The transmit reflection coefficient TFM sets the VSWR at which the signal processor software reduces the transmitted power. It should be sufficient to cause the power reduction to occur when the transmitter is presented with a 3:1 VSWR at all phase rotation angles and DC input voltages.

Store the value $14 into TFM variable #24 for the corresponding EEROM TFM memory locations.

5.7.2 Transmit Q Channel Gain and Offset

Store the value $00 into TFM variable #20 for the corresponding EEROM TFM memory locations.

Store the value $00 into TFM variable #21 for the corresponding EEROM TFM memory locations.

5.7.3 Transmitter Phasing Preset

Store the following values for transmitter phase adjust, TFM #6

Frequency Band	**Variable**	**Value**
118 MHz	TRANSMITTER PHASE	$4D
119 MHz	TRANSMITTER PHASE	$4A
120 MHz	TRANSMITTER PHASE	$47
121 MHz	TRANSMITTER PHASE	$46
122 MHz	TRANSMITTER PHASE	$46
123 MHz	TRANSMITTER PHASE	$44
124 MHz	TRANSMITTER PHASE	$42
125 MHz	TRANSMITTER PHASE	$41
126 MHz	TRANSMITTER PHASE	$3F
127 MHz	TRANSMITTER PHASE	$3C
128 MHz	TRANSMITTER PHASE	$3B
129 MHz	TRANSMITTER PHASE	$38
130 MHz	TRANSMITTER PHASE	$E2

131 MHz	TRANSMITTER PHASE	$E0
132 MHz	TRANSMITTER PHASE	$DC
133 MHz	TRANSMITTER PHASE	$D9
134 MHz	TRANSMITTER PHASE	$D7
135 MHz	TRANSMITTER PHASE	$D5
136 MHz	TRANSMITTER PHASE	$D3

5.7.4 Bias Adjustment

Set the TX drive inhibit bit in the serial word (bit 31 of label 131) on the alignment bus.

Tune the transceiver to 118.425 MHz. Set RAM TFM variables #7, #8, #18, and #19 to $00. Key the PTT (ground MPC1), and monitor the input current to the transceiver. Adjust RAM TFM variable #7 until the current increases by 50 ma ±10 ma over the original value. Adjust RAM TFM variable #8 until the current increases by an additional 60 ma ± 10 ma over the final value given by the adjustment of RAM TFM variable #7.

Clear the TX inhibit bit in the serial word (bit #31 of label 131) on the alignment bus.

Store the values used for RAM TFM variables #7 and #8 in the corresponding EEROM TFM memory locations.

5.7.5 Analog Voice and Analog Data Microphone Compressor

Store the value $15 into TFM variable #27 for the corresponding EEROM TFM memory locations.

Store the value $15 into TFM variable #29 for the corresponding EEROM TFM memory locations.

5.7.6 Transmitter Phasing Adjustment

NOTE: The power supply voltage is set nominally to +27.5VDC but may be changed as needed during this procedure to insure stable phase adjustment over all operating voltages.

Tune the transceiver to 118.425 MHz. Set bit #28 to a “1” in the label 131 serial word, present on the data loader/alignment. While this bit is set the transmitter phasing alignment SW will be loaded into the SIGP. Wait at least 2 seconds for this to load.

Disable the TX timer. Remove any audio input signal. Set RAM TFM #19 to $AA (TFM#19 adjusts I channel offset to set transmitter power to about 30 watts).

Monitor the SIMULCOM AGC voltmeter (This reads transmitter Q detector when in transmit mode). Key the transmitter and vary RAM TFM #6 up or down from initial value as necessary to null the SIMULCOM AGC reading. Final null should be less than $05 and the value for RAM TFM #6 should be within the range of either $30 to $70 or $B0 to $FF. Unkey the unit.

NOTE: When adjusting for a null, if the final value for RAM TFM #6 falls outside the range of either $30 to $70 or $B0 to $FF, unkey the unit and repeat the search for a null of less than $05 by starting at the low end of the other range.

Store the value used for RAM TFM variable #6 in the corresponding EEROM TFM memory location.

Using the same value for RAM TFM variable # 6 at the starting value, repeat the above procedure at the next 1 MHz increment up to 136.425 MHz.

Reset bit #28 to “0” in the label 131 serial word, present on the data loader/alignment bus. This will unload the SIGP alignment SW and reload normal voice/data SIGP SW.

5.7.7 Analog Voice Transmitter Power and Modulation

Tune the transceiver to 118.425 MHz. Set RAM TFM 18 & 19 to $00. Disable the TX timer. Key the transmitter and increment RAM TFM #19 until the wattmeter indicates 30 watts ± 1 watt. Transmitter current must not exceed 7.5 amps. Store the value used for RAM TFM variable #19 in the corresponding EEROM TFM memory location.

Repeat the above procedure every 1 MHz from 119.425 to 136.425 MHz.

Tune transceiver to 118.425 MHz. Apply a 0.125 VRMS audio signal to the microphone input. Adjust RAM TFM #18 to obtain negative modulation of 93-95%. Unkey the transmitter. Store the value used for RAM TFM variable #18 in the corresponding EEROM TFM memory location.

Repeat the above procedure every 1 MHz from 119.425 to 136.425 MHz.

5.7.8 Reserved

5.7.9 Analog Voice Sidetone

Tune the transceiver to 126.425 MHz. Apply a 0.125 VRMS audio signal to the microphone input. Key the transmitter and monitor the receiver audio output. Adjust RAM TFM variable #26 for 2.45 ± 0.1 VRMS.

Store the value used for RAM TFM variable #26 in the corresponding EEROM TFM memory locations.

5.8 D8PSK Data Mode Alignment

5.8.1 TFM presets

For all frequency ranges, store the value $00 into TFM variables:

10 (Mode 2_Driver_Bias)

11 (Mode_2_Final_Bias)

12 (Quad_mismatch)

25 (Mode_2_I_Gain)

30 (Mode_2_I_Offset)

31(Mode_2_Q_Gain)

32 (Mode_2_Q_Offset).

Update Checksum by storing the value $5A in NVM location $123. Store the value $A5 in NVM location $321. Allow the unit 10 seconds to recognize the command and to perform the checksum calculation.

5.8.2 Mode 2 Bias Adjustment

Set the TX drive inhibit bit in the serial word (bit 31 of label 131) on the alignment bus.

Ground Voice /Data discrete input.

Tune transceiver to 118.425 MHz, set RAM TFM variable 10 (Mode 2_Driver_Bias), variable 11 (Mode_2_Final_Bias), variable 12 (Quad_mismatch), variable 25 (Mode-2_I_Gain), variable 30 (Mode_2_I_Offset), variable 31 (Mode-2_Q_Gain), and variable 32 (Mode_2_Q_Offset) to $00.

Ground data key line (keys radio) and adjust RAM TFM variable 10 until the current increases 1000 ma +/- 50 ma over original unkeyed current reading.

Adjust RAM TFM variable 11 until the current increases by an additional 200 ma over the final value given by adjustment of RAM TFM variable 10.

Unground data key line.

Store the values used for RAM variables 10 and 11 in corresponding EEROM TFM memory locations for all frequency locations.

Clear the TX drive inhibit bit in the serial word (bit 31 of label 131) on the alignment bus

Update Checksum by storing the value $5A in NVM location $123. Store the value $A5 in NVM location $321. Allow the unit 10 seconds to recognize the command and to perform the checksum calculation

5.8.3 Mode 2 Power, Carrier Null, and I_Q Offset Adjustment:

Tune the transceiver to 118.425 MHz.

Set bit #28 to a “1” in the label 131 serial word on the data loader/alignment input. While this bit is set, the transmitter alignment SW will be loaded into the SIGP. Wait at least 2 seconds for this to load.

Disable the TX timer.

Ground Voice/data discrete.

Set RAM TFM variable 12 (Quad_mismatch), variable 25 (Mode-2_I_Gain), variable 30 (Mode_2_I_Offset), variable 31, (Mode-2_Q_Gain), and variable 32 (Mode_2_Q_Offset) to $00.

Ground data key line (keys radio)

Increment variable 25 (Mode-2_I_Gain) until RF power output is 10 Watts, +/- 0.5 watts.

Increment variable 31 (Mode-2_Q_Gain) until RF power output is 20 Watts +/- 0.5 watts.

With spectrum analyzer tuned to 118.425 and span of 1 kHz, measure power on lower sideband at approximately 1 kHz below 118.425 MHz. This power is reference for future measurements.

Set span to 1 kHz and tune analyzer to 118.426 MHz.

Adjust variable 31 (Mode-2_Q_Gain) up or down from original value so as to null out upper sideband.

Adjust variable 12 (Quad_mismatch) reading up or down from $00 to null upper sideband power.

Repeat adjustments on variables 31 and 12 as necessary to achieve final value of at least 50 dB below reference marker value of lower sideband

Tune analyzer to carrier at 118.425 MHz.

Adjust variable 30 (Mode_2_I_Offset), and variable 32 (Mode_2_Q_Offset) to null this carrier.

Repeat adjustments on variables 30 and 32 as necessary to achieve final value of at least 50 dB below reference marker value of lower sideband.

Unground data key line.

Store the values use for RAM variable 12 (Quad_mismatch), variable 25 (Mode-2_I_Gain), variable 30 (Mode_2_I_Offset), variable 31, (Mode-2_Q_Gain), and variable 32 (Mode_2_Q_Offset) in the corresponding EEROM TFM memory location.

Repeat above procedure every 1 MHz from 119.425 to 136.425 MHz

Update Checksum by storing the value $5A in NVM location $123. Store the value $A5 in NVM location $321. Allow the unit 10 seconds to recognize the command and to perform the checksum calculation

5.9 Checksum

Store the value $5A in NVM location $123. Store the value $A5 in NVM location $321. Allow the unit 10 seconds to recognize the command and to perform the checksum calculation.

5.10 Frequency Standard Verification

Tune UUT to 127.400 MHz. With no audio applied, key PTT and measure frequency. If the measured frequency is not within ± 250 Hz of 127.400 MHz, adjust the trimmer on U45 on the A2 Signal Processor/Frequency Synthesizer Assembly until the frequency is within 127.400 MHz + 6.5 x offset (stamped on U45 TCXO). This is a room temperature adjustment.

5.11 Selftest

Open the Normal/Alignment discrete and apply a valid ARINC 429 tuning word on Port B of the low-speed frequency control input.

Connect the transceiver's antenna port to a dummy load.

Place the Air/Ground discrete in the *ground* position. Remove the DC input power for longer than 10 seconds. Reapply the power and verify the tranceiver's status by monitoring bits 11, 12, and 15 in the label 350 word on the OMS bus for "O" condition. *Caution - The unit will transmit automatically during this test.*

6. OMS Test

6.1 OMS Test (Airbus Units)

Select Airbus OMS mode (MP11C gnd and MP14A gnd)

Disconnect the VHF-920 OMS input port A from the CFDS Monitor Channel A TX port. Connect the VHF-920 OMS output port to the OMS Monitor Channel A RX port. Set Normal/Maint switch to Normal. Select (USER CONFIGURATION MODE) on the CFDS monitor. Select (BINARY MODE). Select (RX A MODE). Select RX label 350.

6.1.1 Label 350

Turn the power off to the UUT for 15 seconds. Reapply power using the standard hook up. Select Port B and tune the UUT to 126.425 MHz via Port B frequency. Stop sending data on Port A frequency.

Verify that the following bits are cleared:

BIT No.	Function
11	TRANSCEIVER FAULT
12	ANTENNA FAULT
13	OMS INPUT BUS INACTIVE
15	CONTROL SOURCE FAULT

6.1.2 Strut Switch

Stop sending the label 227 word to OMS Port 1 input. Ground the “AIR/GROUND” discrete. Delay 10 seconds and verify that bit 28 is set. Remove the ground from the “AIR/GROUND” discrete, delay 10 seconds and verify that bit 28 is cleared.

6.1.3 SDI Strapping

With SDI1 (MPA9) and SDI0 (MPB9) discretes open, verify that bits 9 and 10 are clear.

Open SDI1, ground SDI0, delay 2 seconds and verify bit 9 is set and bit 10 is clear.

Ground SDI1, open SDI0, delay 2 seconds and verify bit 9 is clear and bit 10 is set.

Ground SDI1, ground SDI0, delay 2 seconds and verify bit 9 is set and bit 10 is set.

6.1.4 Label 356 Test

Verify Label 356 is present.

6.2 OMS Test (Boeing Units)

Select Boeing OMS mode (MP11C gnd and MP14A open)

Connect the VHF-920 OMS input port A to the CFDS Monitor Channel A TX port. Connect the VHF-920 OMS output port to the OMS Monitor Channel A RX port. Set Normal/Maint switch to Normal. Select (USER CONFIGURATION MODE) on the CFDS monitor. Select (BINARY MODE). Select (RX A MODE). Select RX label 350.

6.2.1 Label 350

Turn the power off to the UUT for 15 seconds. Reapply power using the standard hook up. Select Port B and tune the UUT to 126.425 MHz via Port B frequency. Stop sending data on Port A frequency.

Verify that bits 11-16 are cleared. A bit set to 1 indicates:

BIT No.	Function
11	TRANSCEIVER FAULT
12	ANTENNA FAULT
13	CFDIU INPUT BUS 1 INACTIVE
14	PORT A CONTROL SOURCE
15	CONTROL SOURCE FAULT
16	CFDIU INPUT BUS 2 INACTIVE
17	CMU/MU INPUT BUS 1 INACTIVE
18	CMU/MU INPUT BUS 2 INACTIVE
27	8.33 KHz CAPABLE

6.2.2 Strut Switch

Ground the "AIR/GROUND" discrete. Delay 10 seconds and verify that bit 28 is set. remove the ground from the "air/ground" discrete, delay 10 seconds and verify that bit 28 is set.

6.2.3 SDI Strapping

With SDI1 (MPA9) and SDI0 (MPB9) discretes open, verify that bits 9 and 10 are clear.

Open SDI1, ground SDI0, delay 2 seconds and verify bit 9 is set and bit 10 is clear.

Ground SdI1, open SDI0, delay 2 seconds and verify bit 9 is clear and bit 10 is set.

Ground SDI1, ground SDI0, delay 2 seconds and verify bit 9 is set and bit 10 is set.

6.2.4 OMS Label 356 Test

Verify Label 356 is not present.

7. Burn-In

Verify proper performance of the UUT before burn-in by performing tests of paragraph 8.1 or 8.2. Place the UUT in the burn-in chamber. Burn-in requirements shall be outlined per existing reliability test plan.

Upon completion of burn-in route to final inspection.

After satisfactory completion of inspection, perform final and talkout tests and record results. Talkout tests are to be performed while units are vibrating on the shake table.

7.1 Burn-In Tests

Unit performance during burn-in shall be verified once each working day at the high temperature extreme. Cold temperature data shall be taken during the first and last cycle. Any failure found shall be repaired before burn-in is continued.

7.1.1 Frequency Accuracy

Key the UUT with the MIC Keyline without MIC audio applied. Using a 40 dB attenuator, measure the transmitted frequency at 118.975 MHz and 136.975 MHz.

Production Limit: ± 590 Hz at 118.975 MHz and ± 680 Hz at 136.975 MHz.

CMM Limit: N/A

7.1.2 Transmitter Power Output

At the following frequencies, 118.975 MHz, 126.975 MHz, and 136.975 MHz, perform the following:

Record the transmitted unmodulated output power.

Key the unit with the mic keyline while applying a 1 kHz, 1 volt modulating signal to the mic audio input. Monitor RF envelope for at least 70% positive modulation and no oscillations.

At only 126.975 MHz perform the following:

Record the sidetone audio output.

Production Limit: Output power: 25-35 Watts,
Sidetone level: 2.45 ± 0.5 VAC.

CMM Limit: N/A

7.1.3 Receiver Sensitivity/Squelch

Measure the SINAD for 5 uv RF input (30%, 1 kHz modulation) at 118.975, 118.980, 126.975, and 136.975 MHz. Refer to Section 16.1.4 for the test method.

Verify that the receiver audio is squelched when no RF input signal is present.

Production Limit: NLT 6 dB SINAD,
Receiver audio squelched when no RF input signal is present.

CMM Limit: N/A

7.1.4 Receiver Audio Output

Record the audio output level while the unit is receiving a 126.975 MHz, 1000 uV input signal modulated 30% at 1 kHz.

Production Limit: 2.45 ± 0.6 V.

CMM Limit: N/A

Slot _____________ Tech: _____________

VHF–920 BURN–IN TEST DATA SHEET

Date: **Temperature:**						**Limits**
ETM						
Frequency Accuracy						
118.975 MHz						+/- 590 Hz
136.975 MHz						+/- 680 Hz
Transmitter Power						
118.975 MHz						25–40 Watts
126.975 MHz						25–40 Watts
136.975 MHz						25–40 Watts
Transmitter Modulation						NLT 70% positive and No Oscillations
Sidetone Audio Output						
126.975 MHz						2.45 +/- 0.5V
RCVR Sensitivity (S+N/N)						
118.975 MHz						NLT 6 dB
118.980 MHz						NLT 6 dB
126.975 MHz						NLT 6 dB
136.975 MHz						NLT 6 dB
RCVR Audio Output						
126.975 MHz						2.45 +/- 0.6V
Fault History (check if no faults) **Fault Code Summary**						

8. Final Test Requirements

NOTE: If necessary due to interference experienced during testing (and as a result of the testing environment), a frequency on an adjacent channel not more than 1 MHz away from the specified frequency may be for testing receive mode parameters.

Unless otherwise instructed:

Power the unit up with all the discretes open and with the antenna output port connected to a 50 ohm load. Wait about 25 seconds for the unit to complete power on testing.

Select Port A frequency (ground MPD11) and tune the UUT to 126.425 MHz via frequency control Port A (MPA11-B11). Disable the transmitting of any ARINC 429 data to frequency control Port B (MPA7-B7). Input a null command with equipment code 016 (label 227) to the OMS/CMC input port A (MPA6- B6).

Pull the following outputs to 27.5 VDC through the specified load:

SIGNAL NAME	PIN NUMBER	LOAD
KEY EVENT	MPD1	4 to 6 KOhm
MUTING	MPC15	40 to 60 Ohm, 20 Watt
FAN SWITCH	MPB10	No Connection

8.1 Receiver Tests

Unless otherwise specified, disable the squelch (ground MPC13), connect a VHF signal generator to the antenna input (BP1), and connect the distortion analyzer to the audio output (MPA15/MPB15).

8.1.1 Input Power

Apply 27.5 ± 0.5 VDC to the power input pins (BP2 & BP4). Record the input current. Decrease the input voltage to 18.0 ± 0.5 VDC. Record the input current.

Production Limit:	0.3 - 1.2 AMP AT +27.5 VDC INPUT 0.3 - 1.9 AMP AT +18.0 VDC INPUT
CMM Limit:	NMT 1.3 AMP AT +27.5 VDC INPUT NMT 2.0 AMP AT +18 VDC INPUT

8.1.2 25 KHz Channel Selectivity

Ground the Normal/Maintenance discrete (TP6A).

Apply an unmodulated 2 uV signal at 126.000 MHz to the antenna input (BP1).

Connect the high–speed alignment bus to the bus reader (MP4C, MP4D).

Command a read of the IF AGC voltage RAM TFM location (680C5) using the alignment bus and record the reading, V_{ref}.

Apply an unmodulated 4 uV signal at 126.000 MHz to the antenna input (BP1).

Step the RF input frequency, in 200 Hz steps, both above and below 126.000 MHz, starting 8.4 kHz away from 126.000 MHz. At each frequency, read the IF AGC voltage RAM TFM location (680C5) using the alignment bus. Notice the two frequencies, one above and one below 126.000 MHz, where the IF AGC voltage is equal to or greater than V_{ref}. The difference between the two frequencies is the 6 dB bandwidth. Band Centering is the frequency deviation from the center frequency (126.000 MHz) where the IF AGC voltage is equal to or greater than V_{ref}. Band Centering test is only made using the 6 dB response points.

Apply an unmodulated 2 uV signal at 126.000 MHz to the antenna input (BP1).

Step the RF input frequency, in 200 Hz steps, both above and below 126.000 MHz, starting 14.0 kHz away from 126.000 MHz. At each frequency, read the IF AGC voltage RAM TFM location (680C5) using the alignment bus. Notice the two frequencies, one above and one below 126.000 MHz, where the IF AGC voltage is equal to or greater than V_{ref}. The difference between the two frequencies is the 60 dB bandwidth.

Remove the ground from the Normal/Maintenance discrete (TP6A).

Disconnect the high–speed alignment bus from the bus reader (MP4C, MP4D).

Production Limit:	6 dB bandwidth:	NLT 17 kHz
	Band Centering	NLT 8.0 kHz
	60 dB bandwidth:	NGT 33.5 kHz
CMM Limit:	6 dB bandwidth:	NLT 17 kHz
	Band Centering	NLT 8.0 kHz
	60 dB bandwidth:	NGT 34 kHz

8.1.3 8.33 kHz Channel Selectivity

Ground the Normal/Maintenance discrete (TP6A).

Apply an unmodulated 2 uV signal at 126.000 MHz to the antenna input (BP1).

Tune the UUT to Channel 126.005 (Actual tuned frequency is 126.000 MHz on Label 047).

Connect the high–speed alignment bus to the bus reader (MP4C, MP4D).

Command a read of the IF AGC voltage RAM TFM location (680C5) using the alignment bus and record the reading, V_{ref}.

Apply an unmodulated 4 uV signal at 126.000 MHz to the antenna input (BP1).

Step the RF input frequency, in 100 Hz steps, both above and below 126.000 MHz, starting 2.2 kHz away from 126.000 MHz. At each frequency, read the IF AGC voltage RAM TFM location (680C5) using the alignment bus. Notice the two frequencies, one above and one below 126.000 MHz, where the IF AGC voltage is equal to or greater than V_{ref}. The difference between the two frequencies is the 6 dB bandwidth. Band Centering is the frequency deviation from the center frequency (126.000 MHz) where the IF AGC voltage is equal to or greater than V_{ref}. Band Centering test is only made using the 6 dB response points.

Apply an unmodulated 2 uV signal at 126.000 MHz to the antenna input (BP1).

Step the RF input frequency, in 100 Hz steps, both above and below 126.000 MHz, starting 5.0 kHz away from 126.000 MHz. At each frequency, read the IF AGC voltage RAM TFM location (680C5) using the alignment bus. Notice the two frequencies, one above and one below 126.000 MHz, where the IF AGC voltage is equal to or greater than V_{ref}. The difference between the two frequencies is the 60 dB bandwidth.

Remove the ground from the Normal/Maintenance discrete (TP6A).

Disconnect the high–speed alignment bus from the bus reader (MP4C, MP4D).

Production Limit:	6 dB bandwidth:	NLT 6 kHz
	Band Centering	NLT 3 kHz
	60 dB bandwidth:	NGT 13.5 kHz
CMM Limit:	6 dB bandwidth:	NLT 5.8 kHz
	Band Centering	NLT 3 kHz
	60 dB bandwidth:	NGT 14 kHz

8.1.4 Sensitivity

Tune unit to Channel 118.425 (118.425 MHz on Label 030).

Apply a 2 uV signal at 118.425 MHz, modulated 30% at 1000 Hz to the antenna input. Record the S+N/N ratio by taking the average of a minimum of three readings. Repeat the measurement every 1 MHz from 118.425 MHz to 136.425 MHz. Additional frequencies may be tested at the discretion of Test Engineering.

To verify operation on an 8.33 kHz channels, repeat the above test for the 8.33 kHz channels associated with a 25 kHz channel by using Label 047. Note: Additional frequencies may be tested at the discretion of Test Engineering.

Production Limit: 2 uV S+N/N: 7.5 to 20 dB

CMM Limit: 2 uV S+N/N: NLT 6 dB AT 118.000, 126.000, & 136.975 MHz

8.1.4.1 Sensitivity During Low Line Voltage

Set the transceiver power input for +18 ± 0.2 VDC. Input a 4uV signal at 118.425 MHz, modulated 30% at 1000 Hz. Record the S+N/N ratio by taking the average of a minimum of three readings. Repeat the measurement every 1 MHz from 118.425 MHz to 136.425 MHz.

Production Limit: 4 uV S+N/N: 7.0 to 20 dB

CMM Limit: N/A

Set the transceiver power input to +27.5 ± 0.1 VDC.

NOTE: The sensitivity at low voltage is measured at 25 kHz bandwidth.

8.1.5 Receiver Quieting

Apply a 1000 uV signal at 126.425 MHz, modulated 30% at 1000 Hz to the antenna input. Adjust the audio level meter input sensitivity to establish a 0 dB reference and remove the modulation from the signal at the generator. Record the change in the S+N/N ratio of the audio output signal.

Production Limit: S+N/N 42 TO 80 dB

CMM Limit: S+N/N NLT 40 dB

8.1.6 Squelch Operation

8.1.6.1 25 kHz Noise Squelch Operation

Enable the squelch (open MPC13), turn the RF generator output off, and confirm that audio output is squelched (voice audio 0 to 0.0245 VAC) with no signal applied. Disable the squelch (ground MPC13) and verify that audio out is unsquelched (0.05 to 2.6VAC).

Enable the squelch and apply a 126.425 MHz and 128.000 MHz signal whose level is less than 1 uV, modulated 30% at 1 kHz. Slowly increase the level until the audio out is unsquelched. Verify that squelch opened at 2.5 to 3.5 uV and record the signal level at the squelch opening point.

Slowly decrease the signal level until the audio output is squelched. Record the signal level at the squelch point. Calculate the difference between the signal levels for the squelched and the unsquelched cases.

Select Analog Data Mode (ground MPC7). Wait 1 second and then verify that the receiver audio output is squelched for any setting of the RF generator's level.

Production Limit:

1. Satisfactory operation of rear connector squelch disable function with no input signal.
2. Noise squelch open between 2.5 and 3.5 uv.
3. Difference in signal level - squelched vs unsquelched: 2 to 4 dB.
4. Audio squelched in data mode.

CMM Limit:

1. Same as Production Limit
2. Same as Production Limit
3. 1 to 5 dB
4. Same as Production Limit

8.1.6.2 Carrier Squelch Operation

Select voice mode (open MPC7). Enable the squelch, turn the RF generator output off, and confirm that audio output is squelched.

Apply a 126.425 MHz signal, modulated 50% at 6 kHz whose level is less than 5 uV. Slowly increase the RF level until the audio out is unsquelched. Verify that the squelch opened at 15 to 24 uV and record the level. Slowly decrease the RF input level until the audio out is squelched and record the level. The difference in the RF generator levels between the squelched and the unsquelched points should be 2 to 6 dB.

Production Limit:

1. Carrier squelch open: 15 uv to 24 uv
2. Carrier squelch closes: -2.0 dB to -6 dB

CMM Limit:

1. Carrier squelch open: 10 uv to 30 uv
2. Carrier squelch closes: NMT 7 dB hysteresis

8.1.6.3 8.33 kHz Noise Squelch Operation

Enable the squelch (open MPC13), turn the RF generator output off, and confirm that audio output is squelched (voice audio 0 to 0.0245 VAC) with no signal applied. Disable the squelch (ground MPC13) and verify that audio out is unsquelched (0.05 to 2.6VAC).

Tune the UUT to Channel 126.430 (126.425 MHz on Label 047). Enable the squelch and apply a 126.425 MHz signal whose level is less than 1 uV, modulated 30% at 1 kHz. Slowly increase the level until the audio out is unsquelched. Verify that squelch opened at 2.5 to 3.5 uV and record the signal level at the squelch opening point.

Slowly decrease the signal level until the audio output is squelched. Record the signal level at the squelch point. Calculate the difference between the signal levels for the squelched and the unsquelched cases.

Production Limit:
1. Satisfactory operation of rear connector squelch disable function with no input signal.
2. Noise squelch open between 2.5 and 3.5 uv.
3. Difference in signal level - squelched vs unsquelched: 2 to 4 dB.

CMM Limit:
1. Same as Production Limit
2. Same as Production Limit
3. 1 to 6.5 dB.

8.1.7 AGC Characteristics

Apply a 5 uV signal at 126.425 MHz, modulated 30% at 1 kHz. Adjust the distortion analyzer connected to the audio output to establish a 0 dB reference. Increase the RF signal generator output level to +11 dBm and record the change in audio output level in dB.

Production Limit:	Audio variation:	NMT 3 dB
CMM Limit:	Audio variation:	NMT 6 dB

8.1.8 Audio Output Levels

Apply a 1000 uV signal at 126.425 MHz, modulated 30% at 1 kHz to the antenna port. Set the audio output distortion analyzer function switch to *voltmeter* and record the audio output level.

Connect the distortion analyzer to the analog data audio out (MPA13-MPB13). Adjust the modulation to 80% at 1800 Hz and record the data audio output level.

Production Limit:	Audio output level:	2.3 - 2.6 VRMS
	Data output level:	0.9 - 1.2 VRMS
CMM Limit:	Audio output level:	2.0 - 3.0 vrms
	Data output level:	0.8 - 1.2 vrms

8.1.9 Receiver Main Audio Output Phasing

Apply a 1000 uV signal at 126.425 MHz, modulated 30% at 1 kHz. Verify that the phase of the audio output signal with respect to the envelope of the RF input signal is within ± 60 degrees.

Production Limit: Audio output to envelope phase shift: < ± 60 degrees at 1000 Hz.

CMM Limit: N/A

8.1.10 Audio Frequency Response

Apply a 1000 uV signal at 126.425 MHz, modulated 30% at 1 khz. Adjust the distortion analyzer connected to the audio output to establish a 0 dB reference. Change the modulating frequency (maintaining 30% modulation) from 300 to 4000 Hz in 200 Hz increments and record the change in level in dB of the audio output.

Apply a 1000 uV signal at 126.425 MHz, modulated 30% at 1 kHz. Adjust the distortion analyzer connected to the data audio output (MPA13, MPB13) to establish a 0 dB reference. Change the modulating frequency (maintaining 30% modulation) from 300 to 6600 Hz in 525 Hz increments and record the change in level in dB of the data audio output.

Production Limit:	Audio response:	NMT 6 dB variation 300 to 2500 Hz and NLT 42 dB down at 4 kHz.
	Data audio:	NMT ± 4 dB 300 to 6600 Hz.
CMM Limit:	Audio response:	NMT 6 dB variation 300 to 2500 Hz and NLT 40 dB down at 4 kHz
	Data response:	NMT ± 6 dB 300 to 6600 Hz

8.1.11 Audio Distortion

Apply a 1000 uV signal at 126.425 MHz, modulated 30% at 1 kHz. Adjust the distortion analyzer connected to the data audio output (MPA13, MPB13) and measure audio distortion.

Production Limit:	Audio distortion:	NMT 7%
	Data audio :	NMT 5%
CMM Limit:	Audio distortion:	NMT 7%
	Data audio	NMT 5%

8.1.12 Audio AGC

Apply a 1000 uV signal at 126.425 MHz, modulated 50% at 1 kHz. Record the audio output level. Increase the modulation depth to 90% and note that audio output level does not change more than ± 2 dB.

Production Limit:	Audio variation:	NMT ± 2 dB.
CMM Limit:	Audio variation:	NMT ± 3 dB.

8.1.13 Signal Breakup Test

Reserved

8.2 Transmitter Test

Unless otherwise specified, the tests are to be performed at 126.425 MHz. Always keep the antenna port connected to a 50 ohm load.

8.2.1 Power Output/Current

With no modulation applied, tune the UUT to Channel 118.425. Key the PTT line (ground MPC1), measure and record the output power and input current, and unkey the PTT line (open MPC1). Repeat for every 1 MHz step through 136.425 MHz.

Production Limit: 26-33 Watts and NMT 7.5 Amps

CMM Limit: NLT 25 Watts and 7.6 Amps at 118.000, 126.000, and 136.975 MHz.

8.2.1.1 Power Output During Low Line Voltage

With an input line voltage of +18 ± 0.2 VDC and 1 VAC audio input applied, record the output power at 126.425 MHz.

Production Limit: 10 - 20 Watts.

CMM Limit: N/A.

8.2.2 Transmit Modulation

8.2.2.1 Compressor Threshold

Connect the RF output to an AM modulation meter through a 40 dB pad. Connect an audio oscillator to the mic audio input (MPA1, MPB1). Set the oscillator frequency to 1 kHz with an amplitude of zero Volts. Key the PTT line and increase the mic audio (1 kHz) from 0 Volts until the negative modulation stops increasing. Unkey the PTT line. Record the audio input voltage.

Key the PTT line while tuning from 118.000 to 136.975 MHz in no more than 1 MHz steps. Measure the distortion of the envelope of the modulated signal. Unkey the PTT line.

Production Limit: 0.1 to 0.15 VAC at NMT 7% distortion.

CMM Limit: 0.08 to 0.175 VAC

8.2.2.2 Compressor Range

Key the PTT line and increase the mic audio voltage to 1.25 VAC. Record the percentage of negative modulation. Unkey the ptt line.

Production Limit: NLT 90% but LT 100%.

CMM Limit: NLT 70% but LT 100%.

8.2.2.3 Modulation at Nominal Input

Key the PTT line and measure the percentage of negative modulation with a modulation meter when the audio input level is 0.25 VAC. Unkey the PTT line.

Production Limit: NLT 90% but LT 100%.

CMM Limit: NLT 70% but LT 100%.

8.2.2.4 Voice Audio Frequency Response

Apply a 0.25 VAC audio signal to the mic audio input (MPA1, MPB1). Connect a distortion analyzer to the modulation output of the modulation meter. While the PTT line is keyed, measure the variation in dB of the audio out of the modulation meter as the audio input frequency is varied from 300 to 2500 Hz in 275 Hz steps. Unkey the PTT line.

Production Limit: NMT 4 dB variation.

CMM Limit: NMT 6 dB variation.

8.2.2.5 Microphone Bias

With no audio applied, key the PTT line and measure voltage at mic audio input hi (MPA1). Unkey the PTT line.

Production Limit: 11.5 ± 1 VDC.

CMM Limit: N/A.

8.2.3 Sidetone

8.2.3.1 Sidetone Frequency Response

Connect the antenna port through a 40 dB pad to the modulation meter. Connect the audio out to the distortion analyzer. Apply 0.25 VRMS 1 kHz signal to the mic audio input and key the PTT line. Change the modulating frequency from 300 to 2500 Hz by 200 Hz steps and record the change in the audio out level measured on the distortion analyzer. Unkey the PTT line.

Production Limit: NMT 6 dB.

CMM Limit: N/A.

8.2.3.2 Sidetone Distortion

Measure and record the audio output distortion at 300, 1000, and 2500 Hz.

Production Limit: NMT 10%.
CMM Limit: N/A.

8.2.3.3 Sidetone Level

Set the mic audio frequency to 1 kHz and measure the audio output level.

Production Limit: 2.2 - 2.8 VAC.
CMM Limit: 2.0 - 3.0 VAC.

8.2.3.4 Sidetone Compressor

Increase the mic audio level to 1.24 VAC and measure the audio output level.

Production Limit: 2.2 - 2.8 VAC.
CMM Limit: 2.0 - 3.0 VAC.

8.2.4 Transmit Noise Level

Apply a 1 kHz, 0.25 VAC audio signal to the mic audio input. Connect the distortion analyzer to the modulation meter's modulation output. Key the PTT line and establish a 0 dB reference on the distortion analyzer. Remove the modulation and record the change in level of the modulation meter's modulation output. (Use 300 Hz - 3 kHz filtering on the modulation meter and disable any auto ranging function).

Production Limit: NLT 35 dB.
CMM Limit: N/A.

8.2.5 Data Input

Place the UUT in analog data mode (ground MPC7) for all tests in this section.

8.2.5.1 Frequency Response

Configure the distortion analyzer and modulation meter configured as in 16.2.4 except turn off all modulation audio filtering. Apply a 600 Hz, 0.4 VAC signal to the data input (MPA5, MPB5). Key the data keyline (ground MPD7) and establish a 0 dB reference on the distortion analyzer. Increase the frequency of the modulating frequency to 6600 Hz in 500 Hz steps and monitor the change in modulation level with distortion analyzer as in 16.2.4. Unkey the data keyline (open MPD7).

Production Limit: NMT 4 dB variation over 600-6600 Hz.
CMM Limit: N/A.

8.2.5.2 Data Modulation Percentage at Nominal Input

Verify that a 1.0 VAC, 1800 Hz data audio input produces proper negative modulation.

Production Limit: 90 - 100%

CMM Limit: 70 - 100%

8.2.6 Frequency Accuracy

Place the UUT in voice mode (open MPC7). Connect the UUT's antenna output port to a frequency counter through a 40 dB pad. Tune the UUT to 125.000 MHz. With no modulation applied, key the PTT line (ground MPC1) and record the frequency error between tuned and measured frequencies. Unkey the PTT line (open MPC1). Repeat for 118.000, 120.125, 122.200, 124.300, 126.500, 127.850, 129.400, 131.600, 133.700, and 136.975 MHz.

Production Limit: Verify proper channel selection and frequency error for the frequencies listed. The limit is ″ 3 ppM.
118.0 MHz
120.125 MHz
122.2 MHz
124.3 MHz
125.0 MHz
126.5 MHz
127.850 MHz
129.4 MHz
133.7 MHz
136.975 MHz

CMM Limit: Measured at 131.600 MHz, ±600 Hz.

8.2.7 Transmitter FM

8.2.7.1 Transmitter Incidental FM

Connect the UUT's antenna output port through a 40 db pad to the modulation meter. Set the modulation meter to measure FM deviation and enable the 15 kHz low pass and 30 Hz high pass filters. Connect the audio oscillator to the UUT's mic audio input. Set the audio oscillator to 1 kHz at 1.25 VAC. Key the PTT line and observe the transmitted incidental FM. Unkey the PTT line.

Production Limit: NMT 4 kHz at 118.000, 127.000, and 136.975 MHz.

CMM Limit: N/A.

8.2.7.2 Transmitter FM Durning Low Line Voltage

Set the input line voltage to +18 ± 0.2 VDC and repeat paragraph 16.2.7.1. Return the input line voltage to 27.5 ± 0.5 VDC.

Production Limit: NMT 5 kHz at 118.000, 127.000, and 136.975 MHz.

CMM Limit: N/A.

8.2.8 VDL Mode 2 Tests

8.2.8.1 VDL Mode 2 Sensitivity

Tune UUT to Channel 118.425 (118.425 MHz on Label 030). Place unit in receiver BER test mode.

Apply a –100 dBm (at receiver antenna input) VDL Mode 2 BER test signal at 118.425 MHz. Measure the BER by taking an average of a minimum of three readings. Repeat the measurement at 126.425 MHz and 136.975 MHz.

Production Limit: -100 dBm: NMT .001BER

CMM Limit: -98 dBm: NMT .001 BER.

8.2.8.2 VDL Mode 2 Receiver Dynamic Range

Tune UUT to Channel 118.425 (118.425 MHz on Label 030). Place unit in receiver BER test mode.

Apply a –87 dBm (at receiver antenna input) VDL Mode 2 BER test signal at 118.425 MHz. Measure the BER by taking an average of a minimum of three readings. Repeat the measurement at –67, -47, -27 and –7 dBm.

Production Limit: NMT .0005 BER

CMM Limit: NMT .001 BER

8.2.8.3 VDL Mode 2 Transmitter Power Output/Current

Tune the UUT to Channel 118.425. Place unit in transmitter BER test mode. Transmit a maximum length test message and measure and record the output power and input current. Repeat for every 1 MHz step through 136.425 MHz.

Production Limit: 18-22 Watts and NMT 7.5 Amps

CMM Limit: NLT 15 Watts and 7.6 Amps at 118.000, 126.000, and 136.975 MHz.

8.2.8.4 VDL Mode 2 Transmitter Error Vector Magnitude (EVM)

Tune the UUT to Channel 118.425. Place unit in transmitter BER test mode. Transmit a maximum length test message and measure and record the EVM over at least 250 symbols. Repeat at 126.000 and 136.975 MHz.

Note: This test may be conducted on a sample test basis as determined by production engineering.

Production Limit:	NMT 6%
CMM Limit:	N/A

8.2.8.5 VDL Mode 2 Transmitter Adjacent Channel Power (ACI)

Tune the UUT to Channel 118.425. Place unit in transmitter BER test mode. Transmit a maximum length test message. Using a spectrum analyzer set to measure channel power in 16 kHz BW and 25 kHz channel spacing, measure and record the power in upper and lower 25 kHz channels. Repeat at 126.000 and 136.975 MHz.

Note: This test may be conducted on a sample test basis as determined by production engineering.

Production Limit:	NMT –20 dBm in upper and lower channels
CMM Limit:	NMT –18 dBm in upper and lower channels

8.3 Combined Transmit/Receive Tests

8.3.1 Discrete Outputs During Transmit/Receive

8.3.1.1 Muting

Key the PTT line and verify that the voltage at the muting discrete output is 0.0 to 3.0 VDC. Unkey the PTT line. and verify that the voltage at the muting discrete output (MPC15) is 25.0 to 30.0 VDC.

Production Limit:	Keyed:	0 - 3.0 VDC
	Unkeyed:	25 - 30 VDC
CMM Limit:	N/A.	

8.3.1.2 Key Event Line

Key the PTT line and verify that the voltage at the key event discrete output (MPD1) is 0.0 to 3.0 VDC. Unkey the PTT line and verify that the voltage at the key event discrete output is 25.0 to 30.0 VDC.

Production Limit:	Keyed:	0 - 3.0 VDC.
	Unkeyed:	25 - 30 VDC.
CMM Limit:	N/A.	

8.3.2 T/R and R/T Switching

This section is reserved for future use.

8.3.3 Data Keyline

Apply a 1.0 VRMS, 1800 Hz audio signal to the data input (MPA5, MPB5). Key the data keyline (ground MPD7). Verify that the muting line is at 25.0 - 30.0 VDC. Verify that the key event line is at 25.0 - 30.0 VDC. Unkey the data keyline.

Set the UUT into "data mode" (ground MPC7). Key the data keyline and verify that the muting line is 0.0 - 3.0 VDC. Verify that no sidetone is present. Unkey the data keyline. Key the PTT line and verify that the muting line is at 25.0 - 30.0 VDC. Unkey the PTT line.

Production Limit: As described above.

CMM Limit: As described above.

8.3.4 8.33 kHz Program Pin

Measure the resistance between rear connector plug MP-5D and chassis ground. Verify resistance is less than 1 ohm.

Production Limit: As described above.

CMM Limit: N/A

8.3.5 Front Panel Operation

8.3.5.1 Front Panel Jack Operation

Set up for a standard receiver test. Set the RF level to 1000 uV. Connect the audio analyzer to the front panel phone jack and verify that the level of the audio at the phone jack is 2.0 - 3.0 VRMS.

Set up for a standard transmitter test. Apply a 1000 Hz, 1.25 VRMS signal to the UUT's front panel mic jack. Key the UUT's front panel keyline. Verify that the modulation is 70 - 100 %. Verify that the audio sidetone at the UUT's front panel phone jack is 2.0 - 3.0 VRMS.

Production Limit:	Audio out:	2.0 - 3.0 vrms
	Modulation depth:	70 - 100 %
	Sidetone level:	2.0 - 3.0 vrms
CMM Limit:	Audio out:	2.0 - 3.0 vrms
	Modulation depth:	70 - 100 %
	Sidetone level:	2.0 - 3.0 vrms

8.3.5.2 Front Panel Self-Test Button

The purpose of this test is to check the operation of the LEDs.

Press the UUT's front panel test button and verify the that the SSM bits of the ARINC 350 word transmitted by the UUT on the OMS bus correspond to the setting for FUNCTIONAL TEST. Verify that the front panel LEDs light in the proper sequence for the first three phases.

NOTE: The first three phases test the LEDs. The color of the lights in the fourth phase indicate the result of the self test. The duration of the lights is for reference only.

Phase	LRU	Control	Antenna	Duration
1	red	red	red	1-3 sec
2	green	red	red	1-3 sec
3	off	off	off	1-3 sec
4	green	off	off	20-40 sec

8.3.6 Transmitter Timer

Key the PTT line and verify that the transmission duration meets the limits shown below. Unkey the transmitter.

Ground MPA2 (disables the transmitter time), key the PTT line and verify that the transmitter duration meets the limits shown below. Unkey the transmitter. Cycle the power to the UUT to clear out the transmitter duration fault.

Production Limit: MPA2 open w/o SB-L : 30 ± 5 seconds
MPA2 open w/SB-L NLT 40 seconds
MPA2 grounded: NLT 40 seconds.

CMM Limit: MPA2 open w/o SB-L: 30 ± 5 seconds
MPA2 open w/SB-L NLT 40 seconds
MPA2 grounded: NLT 40 seconds.

8.3.7 Vibration

Mount the UUT on the shake table and perform tests 16.1.5 Receiver Quieting, and 16.2.4 Transmit Noise Level.

Production Limit: Receiver quieting: NLT 35 dB.
Transmitter noise level: NLT 35 dB.

CMM Limit: N/A.

NOTE: This test to be performed on a sample basis, as determined by test engineering.

8.3.8 Talkout

Connect a headset & microphone to the UUT's front panel. Communicate with another VHF-900B station using approximately 100 dB of RF attenuation between antennas of the units. Operate at 118.205, 123.250, and 136.975 MHz.
Verify clear reception from each unit.

Set RF attenuation between units to approximately 40 dB. Set one unit to receive on 123.25 MHz. Key the other unit on 121.800, 125.10, and 130.5 MHz and verify that the squelch does not open on the unit tuned to 123.25 MHz.

NOTE: This test may be performed on a sample basis, as determined by test engineering.

8.4 OMS Test

The following section checks the bits of the OMS 350 output word to verify the integrity of the hardware. When a test needs to verify a bit, it refers to a specific bit in the 350 output word on the OMS bus.

NOTE: The tests in steps 16.4.1, 16.4.2, and 16.4.3 may be run at the same time by combining steps.

8.4.1 Label 350 Word

Select Boeing OMS mode (MP11C gnd and MP14A open)

Turn power off to the UUT for 15 seconds. Reapply power with the standard transmitter set up. Select port B and tune the UUT to 126.425 MHz via port B frequency. Stop sending data on port A frequency.

8.4.1.1 350 Word Bits (BOEING FORMAT)

Verify that bits 11-16 are cleared.

BIT No.	Function
11	TRANSCEIVER FAULT
12	ANTENNA FAULT
13	OMS INPUT BUS INACTIVE
14	CONTROL SOURCE 1=A
15	CONTROL SOURCE FAULT
16	CFDIU INPUT BUS 2 INACTIVE
17	RESERVED FOR CMU/MU
18	RESERVED FOR CMU/MU
27	8.33 KHz CAPABLE (-003/-010 ONLY)
28	IN FLIGHT

8.4.1.2 350 Word Bits

Verify that the following bits are cleared:

BIT No.	Function
11	TRANSCEIVER FAULT
12	ANTENNA FAULT
13	OMS INPUT BUS INACTIVE
15	CONTROL SOURCE FAULT

8.4.2 OMS Bus Activity Test

8.4.2.1 OMS Bus Select

Send only a label 377 word with the equipment code set to 154 to the UUT on OMS port 1 input. Wait 25 sec for the OMS to recognize a dual bus system and to determine that there is no active data on either port. Verify that bits 13 and 16 in the 350 output word are set.

Send a null command with equipment code 016 on label 227 to OMS port 2. Wait 10 seconds and verify bit 16 in the 350 word is clear.

8.4.2.2 OMS Bus Active Test

Send a NULL command with equipment code 016 on label 227 to OMS port 1. Wait 10 seconds and verify that bit 13 is clear in the 350 word.

Stop sending the label 227 word to the OMS port 1 input. Allow the UUT 25 seconds to recognize the loss of data on the active port. Verify that bit 13 is set in the 350 word output.

8.4.3 Control Bus Select

Stop sending data on port A frequency. Select port B and tune the UUT to 126.425 MHz via port B frequency. Verify that bits 14 and 15 are clear. Stop sending data on port B frequency and select port A. Wait 10 seconds and verify that bits 14 and 15 are set. Send data on port A frequency and verify bit 15 is clear.

8.4.4 Strut Switch

Ground the ”Air/Ground” discrete, delay 20 seconds and verify that bit 28 is set. Remove the ground from the ”Air/Ground” discrete, delay 20 seconds and verify bit 28 is clear.

8.4.5 SDI Select

With SDI1 (MPA) and SD10 (MPB9) discretes open, verify that bits 9 and 10 are clear.

Open SDI1, ground SD10, delay 2 seconds and verify bit 9 is set and bit 10 is clear.

Ground SDI1, open SD10, delay 2 seconds and verify bit 9 is clear and bit 10 is set.

Ground SDI1, ground SD10, delay 2 seconds and verify bit 9 is set and bit 10 is set.

8.5 Data Initialization

The following section is used to verify the CFDS menu response and to load the serial number into the NVM. A print out of the menus is at the end of this section. Commands are sent to the OMS in a label 227 word.

8.5.1 Set Normal Align Discrete

Set Normal/Align discrete to ALIGN and the Air/Ground discrete to GROUND.

8.5.2 Connect TX Port.

Connect the VHF-900B OMS input port A to CFDS monitor Channel A TX port.

8.5.3 Connect RX Port.

Connect the VHF-900B OMS output port to a CFDS monitor Channel A RX port.

8.5.4 Select CFDS Mode.

Select CFDS mode on the CFDS monitor.

8.5.5 Select LRU.

Select the LRU to be tested on the monitor.

8.5.6 Select Main Menu

Select CFDS MENU MODE on the monitor and verify that MENU # 1 is displayed.

8.5.6.1 OMS Type Select Verification

Select Airbus OMS Mode (MP11C gnd and MP14A gnd)

Cycle Power to unit and wait 30 seconds for unit to re-initialize

Select CFDS Menu Mode on the monitor and verify that MENU # 1.1 is displayed

Select McDonnell OMS Mode (MP11C open and MP14A gnd)

Cycle Power to unit and wait 30 seconds for unit to re-initialize

Select CFDS Menu Mode on the monitor and verify that MENU # 1.2 is displayed

8.5.7 Select Shop Menu

Select SHOP and verify that MENU # 2 is displayed.

8.5.8 Select Clear Fault Memory Menu

Select CLEAR MEMORY and verify that MENU # 3 is displayed.

8.5.9 Select Clear All Memory Menu

Select CLEAR ALL MEMORY and verify that MENU # 4 is displayed.

8.5.10 Memory Cleared Message

Select CLEAR MEMORY, wait 30 seconds and confirm that MENU #5 is displayed.

8.5.11 Enter Serial Number

Send the desired serial number of the UUT on the OMS bus.

8.5.12 Return to Clear Memory Menu

Press RETURN until MENU # 3 is displayed, then select "LOAD SERIAL NUMBER".

8.5.13 Load Serial Number Menu

Verify that MENU # 6 is displayed and that the correct serial number is displayed. Select "LOAD DISPLAYED S/N". Press RETURN three times, then exit CFDS mode. Set Normal/Align discrete to normal.

```
                  MENU # 1
                    111111111122222
           123456789012345678901234
          ************************
1         *        VHF-SDI        *
2         *LAST LEG               *
3    1L   *<REPORT                *   1R
4         *PREVIOUS LEGS          *
5    2L   *<REPORT           TEST>*   2R
6         *                       *
7    3L   *<LRU IDENT        SHOP>*   3R
8         *                       *
9    4L   *<GROUND SCAN           *   4R
10        *TROUBLESHOOTING   GROUND*
11   5L   *<DATA           REPORT>*   5R
12        *               SPECIFIC*
13   6L   *<RETURN           DATA>*   6R
14        ************************
```

```
                  MENU # 1.1
                    111111111122222
           123456789012345678901234
          ************************
1         *        VHF-SDI        *
2         *LAST LEG        CLASS 3*
3    1L   *<REPORT        FAULTS>*   1R
4         *PREVIOUS LEGS          *
5    2L   *<REPORT           TEST>*   2R
6         *                       *
7    3L   *<LRU IDENT        SHOP>*   3R
8         *                    LRU*
9    4L   *<GROUND SCAN     STATUS*   4R
10        *TROUBLESHOOTING   GROUND*
11   5L   *<DATA           REPORT>*   5R
12        *                       *
13   6L   *<RETURN                *   6R
14        ************************
```

```
                   MENU # 1.2
                     111111111122222
            123456789012345678901234
           **************************
1          *        VHF-SDI         *
2          *LAST LEG         CLASS 3*
3    1L    *<REPORT          FAULTS>*   1R
4          *PREVIOUS LEGS           *
5    2L    *<REPORT            TEST>*   2R
6          *                        *
7    3L    *<LRU IDENT         SHOP>*   3R
8          *                     LRU*
9    4L    *<CURRENT FAULTS   STATUS*   4R
10         *TROUBLESHOOTING   GROUND*
11   5L    *<DATA            REPORT>*   5R
12         *                        *
13   6L    *<RETURN                 *   6R
14         **************************
```

```
                   MENU # 2
                     111111111122222
            123456789012345678901234
           **************************
1          *        VHF-SDI         *
2          *       SHOP MENU        *
3    1L    *<CLEAR MEMORY           *   1R
4          *                        *
5    2L    *<SYSTEM STATISTICS      *   2R
6          *                        *
7    3L    *<VIEW SHOP VISITS       *   3R
8          *                        *
9    4L    *<RECORD SHOP VISIT      *   4R
10         *                        *
11   5L    *                        *   5R
12         *                        *
13   6L    *<RETURN                 *   6R
14         **************************
```

```
                MENU # 3
                  111111111122222
         1234567890123456789012345
        *************************
1       *        VHF-SDI        *
2       *   CLEAR FAULT MEMORY   *
3   1L  *<CLEAR ALL MEMORY       *   1R
4       *                       *
5   2L  *<CLEAR FLIGHT MEMORY    *   2R
6       *                       *
7   3L  *<CLEAR GROUND MEMORY    *   3R
8       *                       *
9   4L  *<LOAD SERIAL NUMBER     *   4R
10      *                       *
11  5L  *<CLEAR SHOP VISIT MEMORY*   5R
12      *                       *
13  6L  *<RETURN           PRINT**   6R
14      *************************
```

```
                MENU # 4
                  111111111122222
         1234567890123456789012345
        *************************
1       *        VHF-SDI        *
2       *   CLEAR FAULT MEMORY   *
3   1L  *                       *   1R
4       *                       *
5   2L  *                       *   2R
6       * TO CLEAR ALL MEMORY    *
7   3L  *<PRESS LEFT FUNCTION 3  *   3R
8       *                       *
9   4L  *                       *   4R
10      *                       *
11  5L  *                       *   5R
12      *                       *
13  6L  *<RETURN           PRINT**   6R
14      *************************
```

```
                   MENU # 5
                     111111111122222
            123456789012345678901234
           **************************
1          *        VHF-SDI         *
2          *   CLEAR FAULT MEMORY   *
3    1L    *                        *   1R
4          *                        *
5    2L    *                        *   2R
6          * TO CLEAR ALL MEMORY    *
7    3L    *<PRESS LEFT FUNCTION 3  *   3R
8          *                        *
9    4L    *     MEMORY CLEARED     *   4R
10         *                        *
11   5L    *                        *   5R
12         *                        *
13   6L    *<RETURN           PRINT**   6R
14         **************************
```

```
                   MENU # 6
                     111111111122222
            123456789012345678901234
           **************************
1          *        VHF-SDI         *
2          * RECORD SERIAL NUMBER   *
3    1L    *                        *   1R
4          *DDDDD TTTT              *
5    2L    *SERVICE ORDER #:        *   2R
6          *SHOP CODE 1:            *
7    3L    *SERIAL NUMBER: XXXXXX   *   3R
8          *                        *
9    4L    *                        *   4R
10         *TO LOAD DISPLAYED S/N   *
11   5L    *<PRESS SELECT LEFT 5    *   5R
12         *                        *
13   6L    *<RETURN           PRINT**   6R
14         **************************
           NOTE: DDDDDTTTT IS DATE/TIME
```

8.6 High-Speed CMU Port Activity

The following test verifies the hardware functionality of the high-speed CMU interface ports. The rear connector pins for these ports are:

Port A Input:	MPA12(hi), MPB12(lo)
Port B Input:	MPC12(hi), MPD12(lo)
Output	MPC10(hi), MPD10(lo).

With no high-speed input data to either Port A or Port B, wait at least five seconds and verify that an ARINC label 270 word is broadcast on the output port at a rate of at least once per second whose bits 15 and 16 are both “1”. These bit settings will indicate the absence of an active CMU on either Port A or Port B.

With a 270 word being input only to Port A at a rate of at least once per second and whose bit 9=“1” and bit 10=“0”, wait at least five seconds and verify that an ARINC label 270 word is broadcast on the output port at a rate of at least once per second whose bit 15=“1” and bit 16=“0”.

With a 270 word being input only to Port B at a rate of at least once per second and whose bit 9=“0” and bit 10=“1”, wait at least five seconds and verify that an ARINC label 270 word is broadcast on the output port at a rate of at least once per second whose bit 15=“0” and bit 16=“1”.

8.7 Serial Number Identification

The following section is used to identify and verify the LRU serial number of the VHF 900 series radio.

8.7.1 Set Normal Align Discrete

Set Normal/Align discrete to ALIGN and the Air/Ground discrete to GROUND.

8.7.2 Connect TX Port.

Connect the VHF-900B OMS input port A to CFDS monitor Channel A TX port.

8.7.3 Connect RX Port.

Connect the VHF-900B OMS output port to a CFDS monitor Channel A RX port.

8.7.4 Select CFDS Mode.

Select CFDS mode on the CFDS monitor.

8.7.5 Select LRU.

Select the LRU to be tested on the monitor.

8.7.6 Select Main Menu

Select CFDS MENU MODE on the monitor and verify that MENU #1 is displayed.

8.7.7 Select LRU Ident. Menu

Verify that the serial number and part number of the LRU are correct.

.

Appendix A - Memory Maps

When the unit is in the alignment mode (TPA6 grounded), the System Processor will communicate over the high-speed data loader bus (MPC2, MPCD2 and MPC4, MPD4). The processor accepts ARINC label 130 and 131 for calibration words and label 030 and 047 for frequency word. When the processor receives ARINC 429 label 130 it checks for a valid address. The SSM bits of ARINC label 131 are checked for read or write data. The following are the valid addresses (in hex) for the alignment and troubleshooting of the VHF-900B.

RAM TFM Variables		
Var #	**Address**	**RAM Function Name**
1	$1000	RECEIVER_PRESELECTOR_1
2	$1001	RECEIVER_PRESELECTOR_2
3	$1002	RECEIVER_PRESELECTOR_3
4	$1003	RECEIVER_PRESELECTOR_4
5	$1004	SIMULCOM_THRESHOLD
6	$1005	XMITR_PHASE_ADJ
7	$1006	PA_DRIVER_BIAS
8	$1007	PA_FINAL_BIAS
9	$1008	OSCILLATOR_SHIFT
10	$1009	Mode 2_DRIVER_BIAS
11	$100A	MODE_2_FINAL _BIAS
12	$100B	QUAD_MISMATCH
13	$100C	25 KHZ CHANNEL NOISE_SQUELCH_LOWER_THRESHOLD
14	$100D	25 KHZ CHANNEL NOISE_SQUELCH_UPPER_THRESHOLD
15	$100E	AGC_SQUELCH_LOWER_THRESHOLD
16	$100F	AGC_SQUELCH_UPPER_THRESHOLD
17	$1010	RECEIVER_AUDIO_OUTPUT_LEVEL
18	$1011	I CHANNEL GAIN (AM MODULATION)
19	$1012	I CHANNEL OFFSET (AM CARRIER POWER)
20	$1013	Q CHANNEL GAIN
21	$1014	Q CHANNEL OFFSET

22	$1015	8.33 KHZ CHANNEL NOISE SQUELCH LOWER THRESHOLD
23	$1016	8.33 KHZ CHANNEL NOISE SQUELCH UPPER THRESHOLD
24	$1017	TRANSMIT REFLECTION COEFFICIENT THRESHOLD
25	$1018	MODE_2_I_GAIN
26	$1019	VOICE_XMTR_SIDETONE_AUDIO_LEVEL
27	$101A	XMIT_COMPRESSOR_THRESHOLD
28	$101B	RCV_COMPRESSOR_THRESHOLD
29	$101C	DATA_TX_COMPRESSOR_THRESHOLD
30	$101D	MODE_2_I_OFFSET
31	$101E	MODE_2_Q_GAIN
32	$101F	MODE_2_Q_OFFSET

D/A Converter		
Address	**Type**	**Function Name**
$68050	WRITE ONLY	PRESELECTOR 1
$68051	WRITE ONLY	PRESELECTOR 2
$68052	WRITE ONLY	PRESELECTOR 3
$68053	WRITE ONLY	PRESELECTOR 4
$68060	WRITE ONLY	NORMAL_SHOP_SELECT
$68061	WRITE ONLY	OSCILLATOR_SHIFTER
$68062	WRITE ONLY	SPARE D/A #2
$68063	WRITE ONLY	SPARE D/A #3
$68070	WRITE ONLY	PA FINAL BIAS
$68071	WRITE ONLY	PA DRIVER BIAS
$68072	WRITE ONLY	SIMULCOM ADJUST
$68073	WRITE ONLY	TRANSMITTER PHASE ADJUST

A/D Converter		
Address	**Type**	**Function Name**
$680B0	READ ONLY	+28 VDC
$680B1	READ ONLY	+12 VDC

$680B2	READ ONLY	+ 5 VDC
$680B3	READ ONLY	+33 VDC
$680B4	READ ONLY	INTERNAL TEMPERATURE
$680B5	READ ONLY	FORWARD POWER
$680B6	READ ONLY	REFLECTED POWER
$680B7	READ ONLY	PEAK POWER
$680C0	READ ONLY	POWER OFF TIMER
$680C1	READ ONLY	-12 VDC
$680C2	READ ONLY	REFERENCE SMO TUNING VOLTAGE
$680C3	READ ONLY	OUTPUT SMO TUNING VOLTAGE
$680C4	READ ONLY	SIMULCOM AGC VOLTAGE
$680C5	READ ONLY	IF AGC VOLTAGE
$680C6	READ ONLY	NOISE SQUELCH VOLTAGE
$680C7	READ ONLY	TRANSMITTER TEMPERATURE

NVM Calibration Variables		
Var #	**Address**	**Calibration Variable Name**
1	$78400	LOWER_THRESHOLD_XMITR_FORWARD_POWER
2	$78401	UPPER_THRESHOLD_XMITR_FORWARD_POWER
3	$78402	UPPER_THRESHOLD_VSWR
4	$78403	UPPER_THRESHOLD_XMITR_OVER_VOLTAGE
5	$78404	FAN_ENABLE_TEMP_THRESHOLD
6	$78405	FAN_DISABLE_TEMP_THRESHOLD
7	$78406	UPPER_THRESHOLD_XMITR_TEMP
8	$78407	LOWER_THRESHOLD_5_VDC
9	$78408	UPPER_THRESHOLD_5_VDC
10	$78409	LOWER_THRESHOLD_12_VDC
11	$7840A	UPPER_THRESHOLD_12_VDC
12	$7840B	LOWER_THRESHOLD_NEGATIVE_12_VDC
13	$7840C	UPPER_THRESHOLD_NEGATIVE_12_VDC
14	$7840D	LOWER_THRESHOLD_33_VDC
15	$7840E	UPPER_THRESHOLD_33_VDC
16	$7840F	LOWER_THRESHOLD_MOD_PERCENTAGE
17	$78410	UPPER_THRESHOLD_AUDIO_LEVEL

18	$78411	LOWER_THRESHOLD_AUDIO_LEVEL
19	$78412	UPPER_THRESHOLD_DISTORTION_LEVEL
20	$78413	LOWER_THRESHOLD_NOISE_SQUELCH
21	$78414	UPPER_THRESHOLD_NOISE_SQULECH
22	$78415	LOWER_THRESHOLD_AGC_SQUELCH
23	$78416	UPPER_THRESHOLD_AGC_SQULECH
24	$78417	POWER_OFF_TIMER_THRESHOLD
25	$78418	XMITR_TIMER_WARNING_THRESHOLD
26	$78419	XMITR_TIMER_FAULT_THRESHOLD
27	$7841A	SPARE
28	$7841B	SPARE
29	$7841C	SPARE
30	$7841D	TEMPERATURE_ZONE 1-2
31	$7841E	TEMPERATURE_ZONE 2-3
32	$7841F	TEMPERATURE_ZONE 3-4
33	$78420	TEMPERATURE HYSTERESIS
34	$78421	XMITR TIMER AUDIBLE WARNING LEVEL
35	$78422	SIGP_LOW_VOLTAGE_THRESHOLD
36	$78423	MAC_OFFSET

TFM Variables for 118 MHz Band at Room Temperature		
Var #	**Address**	**Variable Name**
1	$78D00	RECEIVER_PRESELECTOR_1
2	$78D01	RECEIVER_PRESELECTOR_2
3	$78D02	RECEIVER_PRESELECTOR_3
4	$78D03	RECEIVER_PRESELECTOR_4
5	$78D04	SIMULCOM_THRESHOLD
6	$78D05	XMTR_PHASE_ADJ
7	$78D06	PA_DRIVER_BIAS
8	$78D07	PA_FINAL_BIAS
9	$78D08	OSCILLATOR SHIFT
10	$78D09	MODE_2_DRIVER_BIAS
11	$78D0A	MODE_2_FINAL_BIAS
12	NOT	QUAD MISMATCH

	USED	
13	$78D0C	25 KHZ CHANNEL NOISE_SQUELCH_LOWER_THRESHOLD
14	$78D0D	25 KHZ CHANNEL NOISE_SQUELCH_UPPER_THRESHOLD
15	$78D0E	AGC_SQUELCH_LOWER_THRESHOLD
16	$78D0F	AGC_SQUELCH_UPPER_THRESHOLD
17	$78D10	RECEIVER_AUDIO_OUTPUT_LEVEL
18	$78D11	I CHANNEL GAIN (AM MODULATION)
19	$78D12	I CHANNEL OFFSET (AM CARRIER POWER)
20	$78D13	Q CHANNEL GAIN
21	$78D14	Q CHANNEL OFFSET
22	$78D15	8.33 KHZ CHANNEL NOISE SQUELCH LOWER THRESHOLD
23	$78D16	8.33 KHZ CHANNEL NOISE SQUELCH UPPER THRESHOLD
24	$78D17	TRANSMIT REFLECTION COEFFICIENT THRESHOLD
25	$78D18	MODE_2_I_GAIN
26	$78D19	VOICE_XMTR_SIDETONE_AUDIO_LEVEL
27	$78D1A	XMIT_COMPRESSOR_THRESHOLD
28	$78D1B	RCV_COMPRESSOR_THRESHOLD
29	$78D1C	DATA_TX_COMPRESSOR_THRESHOLD
30	$78D1D	MODE_2_I_OFFSET
31	$78D1E	MODE_2_Q_GAIN
32	$78D1E	MODE_2_Q_OFFSET

NOTE: The above addresses are for the 118.000 - 118.975 MHz band at room temperature. To find the address locations for the other frequencies, add $20 (hex) to the address for each MHz step above 118 MHz. For example, the address for preselector #3 at 126.425 MHz would be $78D02 plus $20 times the difference in MHz (8). Thus the address would be $78E02.

Appendix B - Rear Connector Discretes

8.8 Discrete Definitions

Discrete Definitions		
Shop mode Normal mode	GND OPEN	TPA6 TPA6
Disable transmit timer Enable transmit timer	GND OPEN	MPA2 MPA2
Enable self test Normal mode	GND OPEN	MPA4 MPA4
Key the PTT line Unkey the PTT line	GND OPEN	MPC1 MPC1
Select data mode Select voice mode	GND OPEN	MPC7 MPC7
Key data keyline Unkey data keyline	GND OPEN	MPD7 MPD7
Data load mode Normal mode	GND OPEN	MPB8 MPB8
Frequency offset	GND OPEN	MPC8 MPC8
SDI 0	OPEN OPEN	MPA9 MPB9
SDI 1	GND OPEN	MPA9 MPB9
SDI 2	OPEN GND	MPA9 MPB9
SDI 3	GND GND	MPA9 MPB9
Port A frequency Port B frequency	GND OPEN	MPD11 MPD11
Disable squelch Enable squelch	GND OPEN	MPC13 MPC13
Air Ground	GND OPEN	MPB14 MPB14

8.9 Rear Connector Pins by Function

Discrete Inputs	
TPA6	NORMAL/SHOP MODE
TPB6	SPARE 1
TPC6	SPARE 2
TPD6	SPARE 3
MPC1	PTT
MPA2	TRANSMIT TIMER DISABLE
MPA4	SELF TEST ENABLE
MPC5	SPARE
MPC7	VOICE DATA
MPD7	DATA KEYLINE
MPD8	DATA KEYLINE RETURN
MPB8	DATA LOAD ENABLE
MPC8	FREQ OFFSET ENABLE
MPA9	SDI CODING 1
MPB9	SDI CODING 0
MPD11	PORT A/B SELECT
MPC13	SQUELCH DISABLE
MPD13	SQUELCH RETURN
MPB14	AIR-GROUND DISCRETE

Discrete Outputs	
MPB10	FAN CONTROL (FUTURE USE)
MPD1	KEY EVENT
MPD5	8.33 KHZ CAPABLE
MPC15	MUTING
MPD15	MUTING RETURN

Audio Inputs	
MPA1	MIC AUDIO HI
MPB1	MIC AUDIO LO
MPB2	MIC GROUND
MPB4	AUDIO GROUND
MPA5	ANALOG DATA AUDIO INPUT HI
MPB5	ANALOG DATA AUDIO INPUT LO

Audio Outputs	
MPA13	ANALOG DATA AUDIO OUT HI
MPB13	ANALOG DATA AUDIO OUT LO
MPA15	AUDIO - SIDETONE OUT HI
MPB15	AUDIO - SIDETONE OUT LO
ARINC 429 Inputs	
MPC2	DATA LOADER INPUT A

MPD2	DATA LOADER INPUT B
MPA6	OMS/CMC INPUT PORT 1 HI
MPB6	OMS/CMC INPUT PORT 1 LO
MPC6	OMS/CMC INPUT PORT 2 HI
MPD6	OMS/CMC INPUT PORT 2 LO
MPA11	FREQUENCY CONTROL PORT A HI
MPB11	FREQUENCY CONTROL PORT A LO
MPA7	FREQUENCY CONTROL PORT B HI
MPB7	FREQUENCY CONTROL PORT B LO
MPA12	CMU DATA INPUT PORT A HI
MPB12	CMU DATA INPUT PORT A LO
MPC12	CMU DATA INPUT PORT B HI
MPD12	CMU DATA INPUT PORT B LO

ARINC 429 Outputs	
MPC4	DATA LOADER OUTPUT A
MPD4	DATA LOADER OUTPUT B
MPC14	OMS/CMC DATA OUTPUT HI
MPD14	OMS/CMC DATA OUTPUT LO
MPC10	CMU DATA OUT HI
MPD10	CMU DATA OUT LO

Miscellaneous	
BP1	ANTENNA RF INPUT
BP2	POWER INPUT + 28 VDC
BP4	POWER INPUT GROUND
MPD3	DC GROUND
MPC9	GROUND
MPA3	NOT USED
MPB3	NOT USED
MPC3	NOT USED
MPA8	NOT USED
MPD9	NOT USED
MPA10	NOT USED
BP5	NOT USED
MPC11	CFDS_SEL_1
MPA14	CFDS_SEL_2
BP3	SPARE

APPENDIX A – LIST OF SEMICONDUCTOR DEVICES

SEMICONDUCTOR DEVICES AND FUNCTIONS
Assembly A1 – RF Assembly 676-7351-104

Ref Desig	Description
CR1	T/R switch shunt diode
CR2	Receiver AM detector
CR3	Transmitter Phasing Control
CR4	Receiver noise squelch detector
CR5	Receiver AM detector
CR6	Simulcomm attenuator temp compensation
CR7	Transmitter directional coupler detector
CR8	Simulcomm attenuator temp compensation
CR9	Transmitter directional coupler detector
CR10	Simulcomm attenuator temp compensation
CR11	Receiver IF AGC fast/slow “or”
CR12	Transmitter phase adjust varactor tuning
CR13	Transmitter phase adjust varactor tuning
CR14	Transmitter Q channel detector
CR15	Transmitter VSWR gate
CR16	Transmitter VSWR protection gate
CR17	Transmitter VSWR protection gate
CR18	Transmitter driver bias temperature compensation
CR19	Transmitter phase adjust varactor tuning
CR20	Transmitter final bias temperature compensation
CR21	Transmitter phase adjust varactor tuning
CR22	Simulcomm attenuator clamp
CR23	Simulcomm attenuator loop control clamp
CR24	Simulcomm attenuator detector
CR25	Simulcomm attenuator detector
CR26	Simulcomm attenuator detector bias
CR27	Simulcomm attenuator detector bias

Ref Desig	Description
CR28	Receiver IF AGC clamp
CR29	Receiver AGC fast attack clamp
CR30	Receiver IF AGC fast attack/dump “or”
CR51	Preselector varactor tuning
CR52	Preselector varactor tuning
CR53	Preselector varactor tuning
CR54	RF amplifier temperature bias adjust
CR55	Preselector varactor tuning
CR56	Preselector varactor tuning
CR58	Simulcomm attenuator
CR59	Simulcomm attenuator
CR60	Simulcomm attenuator
CR64	Preselector varactor tuning
CR64A	Preselector varactor tuning
CR65	Preselector varactor tuning
CR66	Preselector varactor tuning
CR69	Preselector varactor tuning
CR73	Preselector varactor tuning
CR74	Preselector varactor tuning
CR75	Preselector varactor tuning
CR76	Preselector varactor tuning
CR77	Preselector varactor tuning
CR78	Preselector varactor tuning
CR87	Preselector varactor tuning
CR88	Preselector varactor tuning
CR89	Preselector varactor tuning
CR90	Preselector varactor tuning
CR91	Preselector varactor tuning
CR92	Preselector varactor tuning
CR102	Receiver noise squelch detector
CR171	T/R switch shunt diode

Ref Desig	Description
CR172	T/R switch series diode
Q1	Transmitter PA pre-driver
Q2	Transmitter PA driver
Q3	Transmitter PA final amplifier
Q4	Transmitter PA final amplifier
Q5	VSWR/monitor switch
Q6	Transmitter final bias amplifier
Q7	VSWR/monitor switch
Q8	Receiver HW/SW AGC control switch
Q9	T/R +12 V switch
Q10	Simulcomm attenuator fast attack fet switch
Q11	Transmitter RF amplifier
Q12	Transmitter RF amplifier
Q13	Receiver HW/SW AGC control switch
Q14	T/R bias switch
Q15	+12 V switch
Q16	Transmitter Driver Bias amplifier
Q50	Receiver RF amplifier bias
Q51	Receiver RF amplifier
Q53	Q53 fast attack switch
U1	Receiver 2nd IF amplifier
U2	Transmitter Driver/Final bias
U3	Transmitter Driver/Final bias
U4	Transmitter directional coupler detector buffer
U5	Transmitter demodulator phase adjust
U6	Receiver IF filter switch
U7	Receiver IF filter switch
U8	VSWR/monitor switch
U9	Transmitter I/Q error amplifier clamp

Ref Desig	Description
U10	Transmitter Q channel AC detector
U11	Transmitter I-Q error amplifiers
U12	Transmitter demodulator RF splitter
U13	Receiver 1st IF amplifier
U14	Receiver HW/SW AGC control switch
U17	Transmitter heatsink temperature monitor
U26	Receiver noise squelch active filter/buffer
U27	Simulcomm attenuator detector RF amp
U28	Simulcomm attenuator detector RF amp
U29	Receiver 1st mixer
U31	Receiver IF AGC monitor buffer
U33	Receiver AM detector
U34	Receiver 1st IF amplifier
U35	Receiver 2nd mixer
U36	-5 V regulator
U77	Simulcomm attenuator fast attack comparator
U78	Receive IF AGC integrator
U100	Transmitter Vector (I-Q) modulator
U102	Transmitter Phasing control
U103	Transmitter Vector (I-Q) demodulator
U181	Transmitter demodulator phase adjust
U260	Simulcomm Attenuator active detector/audio buffer
U400	Receiver 20.125 MHz IF amplifier
U1000	Transmitter I/Q error amplifier
VR4	Low voltage shutdown switch bias
VR10	Simulcomm attenuator bias
VR11	Simulcomm attenuator bias
VR12	Receiver IF AGC monitor clamp
VR131	AGC clamp
VR151	Receiver AGC clamp

Assembly A2 – Signal Processor/Frequency Synthesizer Assembly 676-7353-105

Ref Desig	Description
CR1	Transmit synthesizer RF amplifier bias temperature compensation
CR2	Receiver synthesizer RF amplifier bias temperature compensation
Q1	Transmit key switch
Q2	+12 V switch
Q3	+12 V switch
Q4	+5 V switch
Q5	Transmit synth RF amp bias
Q6	+12 V switch
Q7	+12 V switch
Q8	+5 V switch
Q9	Receive synth RF amp bias
Q10	Transmit synth RF amplifier
Q11	Receive synth RF amplifier
Q12	+12 V switch
Q13	+12 V switch
S1	Quad multiplexer
U1	D/A converter
U2	A/D converter
U3	!6.6320 DSP clock
U4	Logic inverters
U5	Logic inverters
U6	Transmit synthesizer prescaler
U7	Receiver synthesizer prescaler
U8	D/A converter
U9	525 KHz receiver IF sample and hold
U10	Transmit synthesizer loop integrator

Ref Desig	Description
U11	256K Flash Memory
U12	Transmit synthesizer reference frequency filter
U13	Receiver synthesizer PLL integrator
U14	Receiver synthesizer reference frequency filter
U15	+2.5 v reference
U16	Transmit synthesizer Voltage Controlled Oscillator
U17	Receiver synthesizer Voltage Controlled Oscillator
U18	DSP watchdog timer
U19	Divide by 10 logic
U21	10K ohm resistive pull-up array
U22	10 dB gain block for 2^{nd} lo drive
U23	A/D converter
U24	Transmit synthesizer RF amplifier buffer
U25	Receiver synthesizer RF amplifier buffer
U26	+ 5 V regulator
U27	Transmit synthesizer PLL controller
U28	Receiver synthesizer PLL controller
U29	+ 5 V regulator
U30	+ 5 V regulator
U32	+ 16 V regulator
U35	Transmit synthesizer reference RF amplifier
U36	Receiver synthesizer reference RF amplifier
U37	Transmit synthesizer phase detector
U38	A/D converter latch
U39	A/D converter latch
U40	Receiver synthesizer phase detector
U41	FPGA (Field programmable gate array)
U42	+ 5 V regulator
U43	VSWR amplifier/buffer
U44	FPGA (Field programmable gate array)
U45	19.600 MHz reference oscillator

Ref Desig	Description
U46	Digital Signal Processor
U47	D/A converter buffer
U48	D/A converter low pass filter
U49	D/A converter low pass filter
U50	A/D converter
U54	Baseband audio amplifier/buffer
U55	RX_AGC amplifier/buffer
U59	A/D amplifier
U60	525 KHz receiver IF sample amplifier
U61	525 KHz receiver IF sample amplifier

Assembly A3 – System Processor Assembly (Used on versions of VHF-920 converted from VHF-900B by service bulletin)

There are no semiconductor devices on this assembly related to the operation of the receiver or transmitter.

Assembly A4 – Power Supply and I/O Assembly (Used on versions of VHF-920 converted from VHF-900B by service bulletin)

There are no semiconductor devices on this assembly related to the operation of the receiver or transmitter.

Assembly A5 – Rear Interconnect Assembly (Used on versions of VHF-920 converted from VHF-900B by service bulletin and new production versions of VHF-920)

There are no semiconductor devices on this assembly.

Assembly A6 – LED Display Board (Used on versions of VHF-920 converted from VHF-900B by service bulletin and new production versions of VHF-920)

There are no semiconductor devices on this assembly related to the operation of the receiver or transmitter.

Assembly A3 – Combination System Processor and Power Supply I/O Assembly (Used on Production versions of VHF-920)

There are no semiconductor devices on this assembly related to the operation of the receiver or transmitter.