Production Test Requirements for the DME-4000 (822-1466-001)

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Notices and Signatures

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Revision History

Ver/Rev	Doc Chg #	Release Date	Originator	Reason(s) for Change
-001/ -			M. N. Sarpoolaki	First Draft
-001/ A			D. A. Moon	Added Module Level Sections
-001/ B			D. A. Moon	Added Alignment Information

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1 Scope

This production test procedure applies to the Collins type DME-4000 Distance Measuring Equipment receiver/transmitter, CPN 822-1466-001.

2 Sub-assembly Descriptions

2.1 Modulator/IF/Synthesizer

The modulator is driven by the P1/P2 signal which originates in the DSP board. When the conditions appropriate for interrogation are established, the DSP board sends the P1/P2 pulse-pair to the modulator. The P1/P2 pulse-pair is spaced either 12 or 36 μS, depending on whether the DME channel is X or Y, with each pulse being about 7.5- to 8-μS wide. The $\cos^2$ circuit reshapes the P1/P2 pulses into a $\cos^2$ pulse-pair with a nominal width of 3.5 μS and an amplitude of about +65V peak. This signal is used to develop four power amplifier drive signals, each with a peak amplitude of about +50 volts.

The Synthesizer portion of the board receives serial tuning data from the DSP board to generate the required CW RF frequencies for the Power Amplifier and the Receiver Mixer.

The Preselector/AGC DAC receives serial data from the DSP board to generate the varactor tuning voltages for the preselector, and the AGC voltage used to control the gain for the IF amplifier.

The function of the IF amplifier is to reduce the noise present in the received signal, isolate the desired reply signal, and raise its level as required by the video detector. The IF amplifier consists of six amplifier transistors for the needed gain and a special 63-MHz SAW (surface acoustic wave) filter for the required selectivity. AGC (automatic gain control) is used to maintain a nearly constant detected video amplitude over the complete range of received signal amplitudes. The detected video pulses are applied to the range processor on the DSP board.

2.2 RF Receiver/PA Transmitter

The A4 RECEIVER /TRANSMITTER RF board is a microwave substrate PC board which includes the driver stages for both the Transmitter and the Receiver LO injection, the Receiver, and the Transmitter PA stages. It also includes a TR/Switch, Power Detector and a harmonic low pass filter.

This board takes a 1025 MHz –1150 MHz CW signal that is generated on the Modulator/Synthesizer Bd. and amplifies this +2 dBm signal up to a level of +20 dBm, which is then applied to either the 1st Transmitter PA stages for transmit or to the Mixer as an L.O. in receive mode.

All required supply voltages and signals for all circuits on the Receiver/Transmitter board are supplied by the Modulator/IF/Synthesizer board.

TRANSMIT MODE:

The PA portion is a wide band amplifier which operates between 1025 MHz and 1150 MHz. All stages in the PA portion are only biased on for a short transmit cycle. During transmit, a +20 dBm CW signal from the predriver amps is switched to the 1st PA stage. This stage amplifies the signal to >1 watt peak pulsed power. Supply voltages for this stage are +18v square wave modulation. This stage is class A biased during the short transmit cycle. The signal is then amplified to > 4 watts peak power by the 2nd PA Class C stage. Supply voltages for this stage are +28v square wave modulation. The 3rd PA stage is Class C and amplifies to >35 watts peak power. Supply voltages for this stage are +50v Cos^2 (Gausian) shaped modulation. The 4th PA stage is Class C amplifies and amplifies to >200 watts peak power. Supply voltages for this stage are +50v Cos^2 (Gausian) shaped modulation. The 5th PA stage is Class C and amplifies to > 500 watts peak power. Supply voltages for this stage are +50v Cos^2 (Gausian) shaped modulation. The output of the 5th or final PA stage then goes through the Transmit/Receive Switch to a Low Pass Harmonic filter and then out to the rear antenna connector. A microstrip 30 dB coupler is used to monitor transmitter operation.

RECEIVE MODE:

In receive mode, a signal from the antenna goes through the low pass filter and Transmit/Receive Switch to the 1st set of preselector stages which are tuned to receive a narrow frequency band. This signal is then amplified by the Low Noise Amplifier stage and is filtered further by the 2nd set of tuned preselector stages. The signal then goes to the mixer and when mixed with the L.O. signal from the LO Switch, produces an IF signal. This IF signal is then fed to the Modulator/IF/Synthesizer board for further processing. A Diode Limiter circuit is incorporated before the 1st Preselector to protect the LNA from high level RF transmissions. A noise diode circuit is used to check receiver function during self test.

2.3 DSP / Power Supply

The main assembly of DSP/PS. Module contains two modules: a power supply module and a signal processing module.

2.3.1 Power Supply Module (PSM)

The PSM is a switching type regulator that supplies the rest of the unit with the required DC voltages. The PSM also functions as an energy storage device to maintain the unit in an operational state during momentary drops in the aircraft's electrical system output. The PSM monitors its incoming voltage and informs the DSP of low input voltage and/or imminent power failure conditions.

2.3.2 Signal Processing Module (SPM)

The SPM includes a Digital Signal Processor for running application code (U26).
The SPM includes non-volatile FLASH (U25) memory for storing application code.
The SPM includes non-volatile EEPROM memory for use by the software module.
The SPM provides a multi-function ASIC for ARINC and CSDB communications (U14); external discrete input ports, and synthesizer tuning.
The SPM provides a multi-function PLD for system timing (U24), address decoding, internal discrete ports, and range processor functions.
The SPM provides an ADC for BITE voltages and AGC monitoring.

3 Reference Information

3.1 Documentation

Description	Schematic	Assembly
Rear Interconnect Assembly	828-8871-00X	828-3371-00X
DSP/Power Supply Assembly	828-8872-00X	828-3372-00X
Modulator/IF/Synthesizer Assembly	828-8873-00X	828-3373-00X
RF Receiver/Power Amp Assembly	828-8874-00X	828-3374-00X

3.2 Glossary of Terms

F/T	Functional Test
KTS.	Knots
LNA	Low Noise Amplifier
µS	Microseconds
NCD	No Computed Data
NGT	Not greater than
NLT	Not less than
NM.	Nautical Miles
NML	Normal
NVM	Non-Volatile memory
PPS	Pulse Pairs per Second
SDI	Source/Destination Identifier
SSM	Sign/Status Matrix
TBD	To Be Determined
UUT	Unit Under Test

4 DME-4000 Block Diagrams

4.1 IF/Synthesizer/Modulator

4.1.1 Modulator

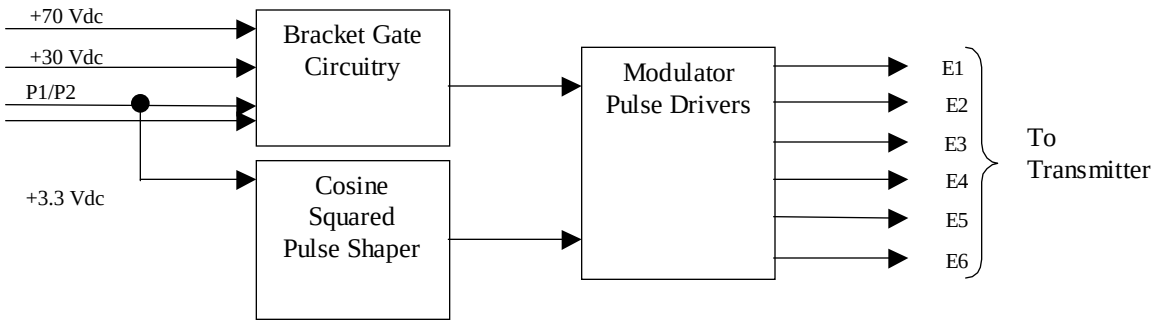


Figure 1

4.1.2 Preselector / AGC DAC and IF Functional Block Diagram

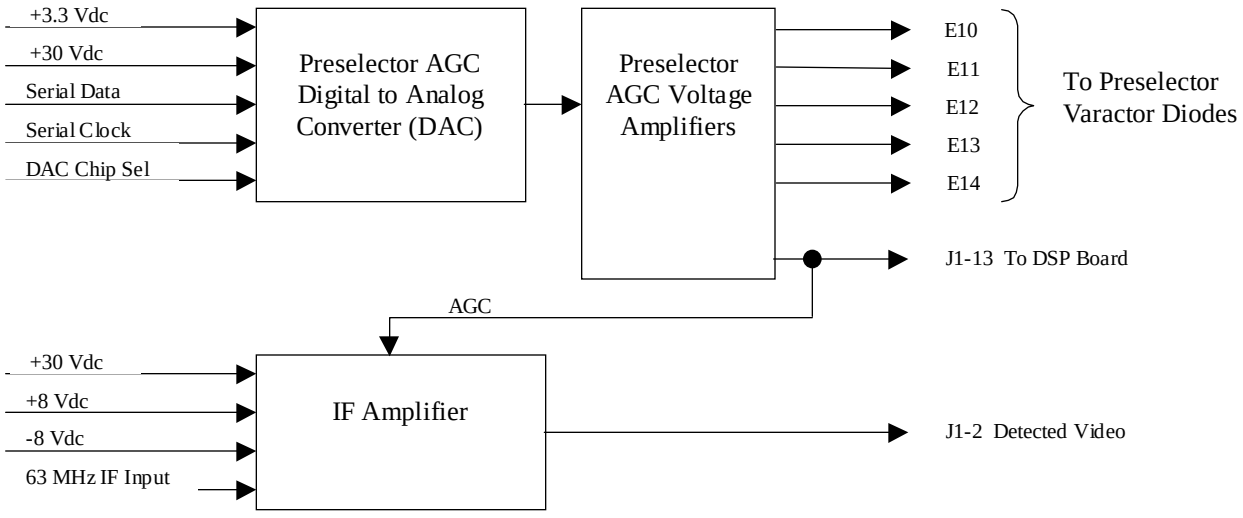


Figure 2

4.1.3 TX / Suppress / Test Switch Functional Block Diagram

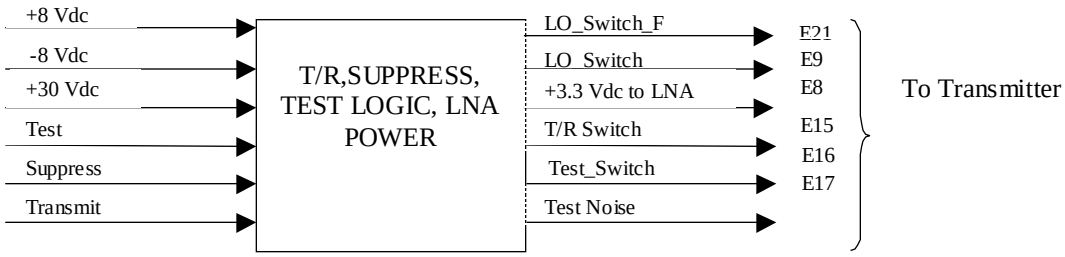


Figure 3

4.1.4 Synthesizer Functional Block Diagram

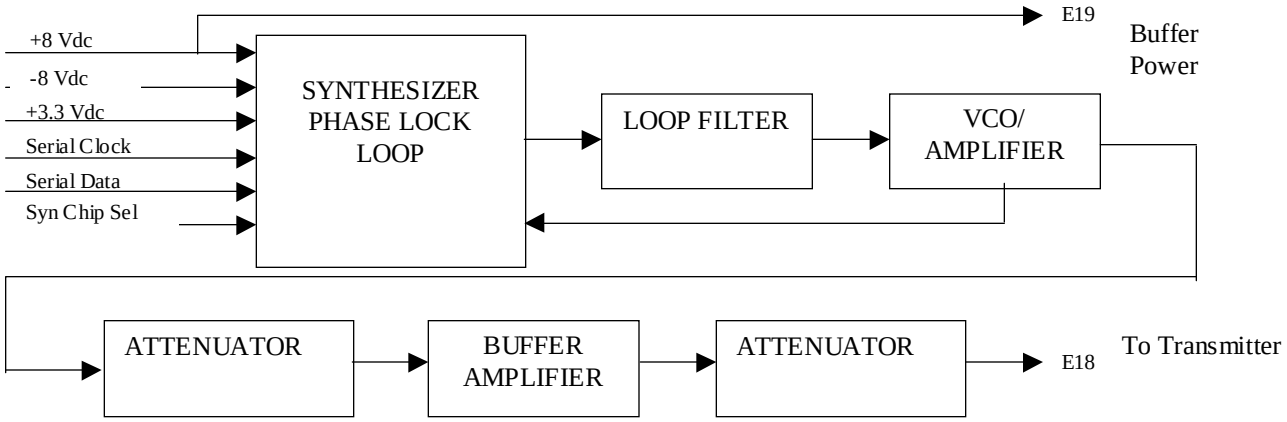


Figure 4

4.1.5 RF Receiver / Transmitter

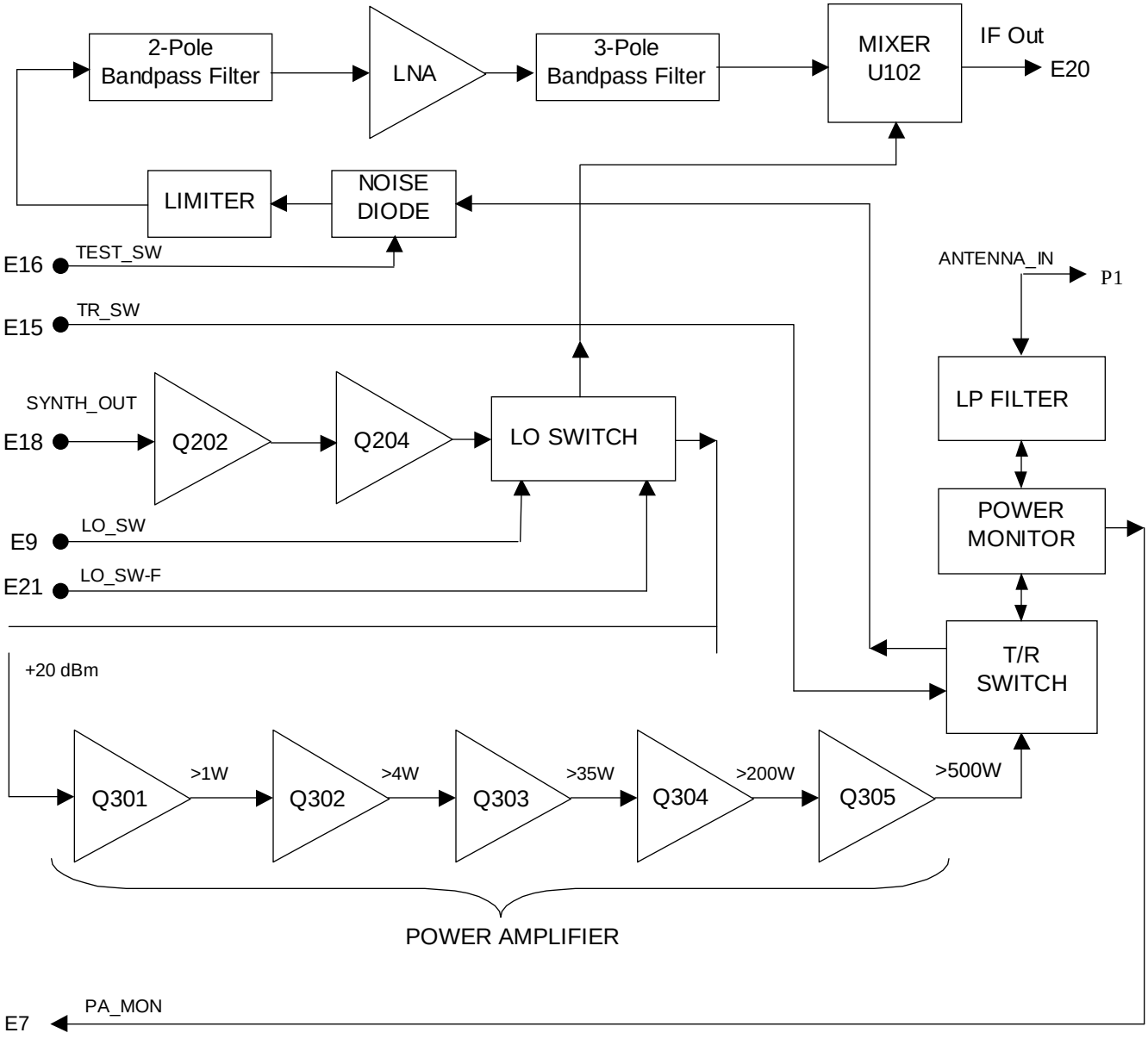


Figure 5

4.1.6 Top Level

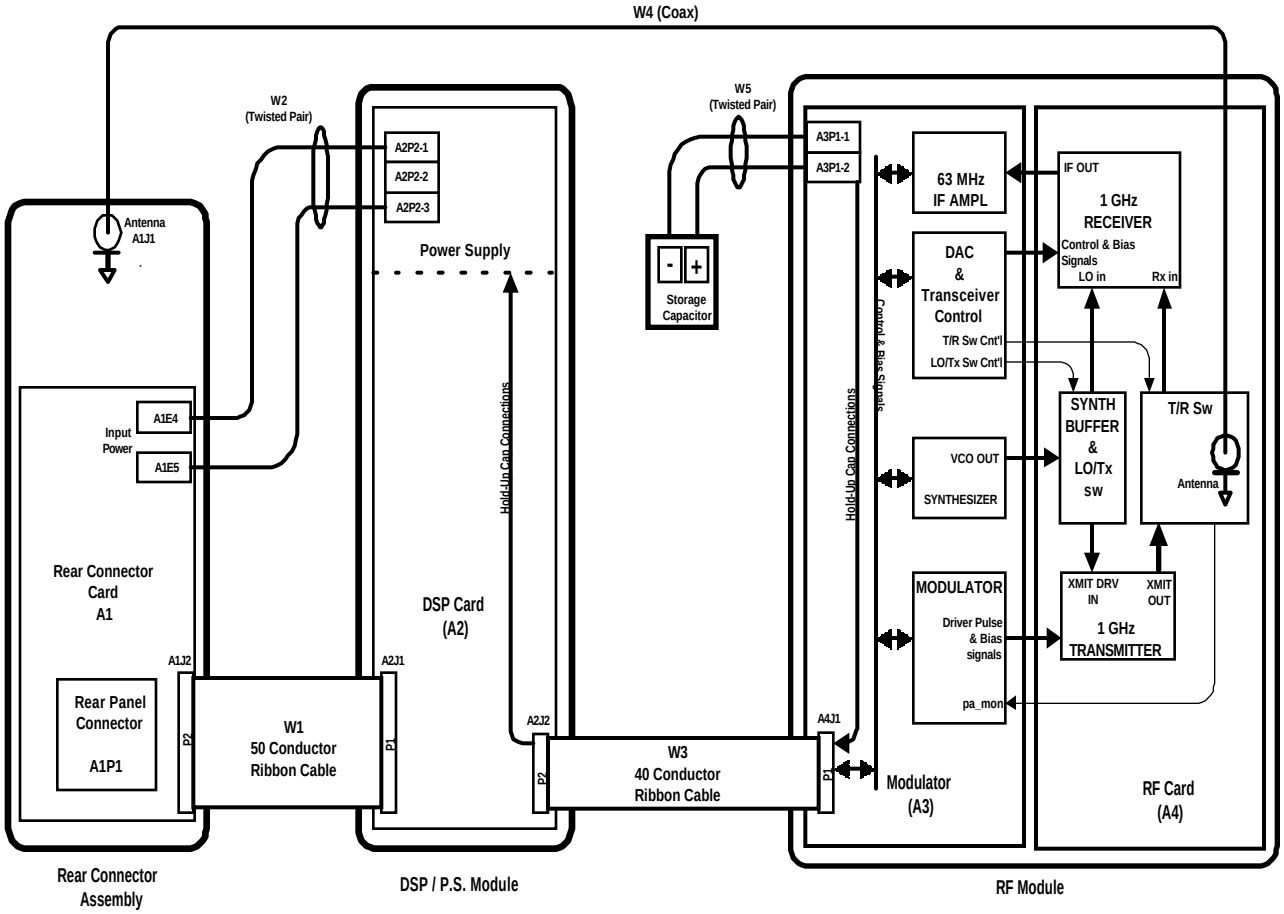


Figure 6

5 Test Equipment

5.1 Required Test Equipment Lists

5.1.1 IF/Synthesizer/Modulator

The following equipment or equivalents are required to perform the tests specified in paragraph 8.1, IF/Synthesizer/Modulator Assembly Test Requirements:

Quantity	Description	Model or equivalent
2	Triple output, DC Power Supply, 6V @ 5A, ±25V@1A	HP E3631A
1	DC Power Supply, +70V @ 500mA	HP 6299A
1	12 MHz Ref / 63 MHz Signal Source	HP 8664A
1	P1 / P2 Pulse Generator	HP 8005B
1	Spectrum Analyzer	HP 8591E
1	Digital Multimeter	HP 34401A
1	Oscilloscope	Tektronix 724D
1	IBM compatible PC	Gateway E-4200
1	5V to 3.3V Logic Converter	Local fabrication See Appendix C

5.1.2 RF Module

The following equipment or equivalents are required to perform the tests specified in paragraph 8.2, RF Module Assembly Test Requirements:

Quantity	Description	Model or equivalent
2	Triple output, DC Power Supply, 6V @ 5A, ±25V@1A	HP E3631A
1	DC Power Supply, +70V @ 500mA	HP 6299A
1	12 MHz Ref / 63 MHz Signal Source	HP 8664A
1	P1 / P2 Pulse Generator	HP 8005B
1	Spectrum Analyzer	HP 8591E
1	Digital Multimeter	HP 34401A
1	Oscilloscope	Tektronix 724D
1	IBM compatible PC	Gateway E-4200
1	5V to 3.3V Logic Converter	Local fabrication See Appendix C
1	RF Peak Power Meter	Giga-tronics 8502A
1	Peak Power Detector	Giga-tronics 16936
1	20 dB High Power Attenuator	Weinschel 35-20
1	20 dB Directional Coupler	Narda 3042B-20
1	20 dB Attenuator	Weinschel 1-20
1	10 dB Attenuator	Weinschel 1-10
1	DME-4000 Modulator Board	828-3373-00X

5.1.3 Receiver Auto Alignment

The following equipment or equivalents are required to perform the auto-alignment specified in paragraph 9.7, Receiver Alignment.

Quantity	Description	Model or equivalent
1	D.C. Power Supply, 0-34V, 2A	HP6543A
1	DME-4000 Test Interface Panel	CPN TBD
1	Arinc 429/CSDB Bus Test Console	See paragraph 7.3
1	HP-IB GPIB Controller	National Instruments PCI-GPIB
1	HP-IB GPIB Cable	National Instruments 763061-02
1	DME Signal Generator	IFR ATC-1400
1	Oscilloscope	Tektronix 724D
AR	Miscellaneous coax adapters and fittings	

5.1.4 Top Level

The following equipment or equivalents are required to perform the tests specified in paragraph 11, Top Level Test Requirements:

Quantity	Description	Model or equivalent
1	D.C. Power Supply, 0-34V, 2A	HP6543A
1	DME-4000 Test Interface Panel	CPN TBD
1	Arinc 429/CSDB Bus Test Console	See paragraph 7.3
2	DME Signal Generator	IFR ATC-1400
3	Directional Coupler 10dB	Narda 3042B-10
2	Attenuator 10dB	Narda 768-10
1	RF Peak Power Meter and Detector	HP8900, HP420A
1	Oscilloscope	Tektronix 724D
1	Digital Multimeter	HP 34401A
1	RF Pulse Frequency Counter	EIP 585C
1	Pulse Generator	HP 8005B
2	600 ohm resistive loads	705-3605-700
1	Suppression load	See paragraph 7.4
1	Headphones or Speaker for 600 ohm Z	
1	Stopwatch	
AR	Miscellaneous coax adapters and fittings	

5.2 Test Equipment Interconnection Diagrams

5.2.1 Modulator/IF/Synthesizer

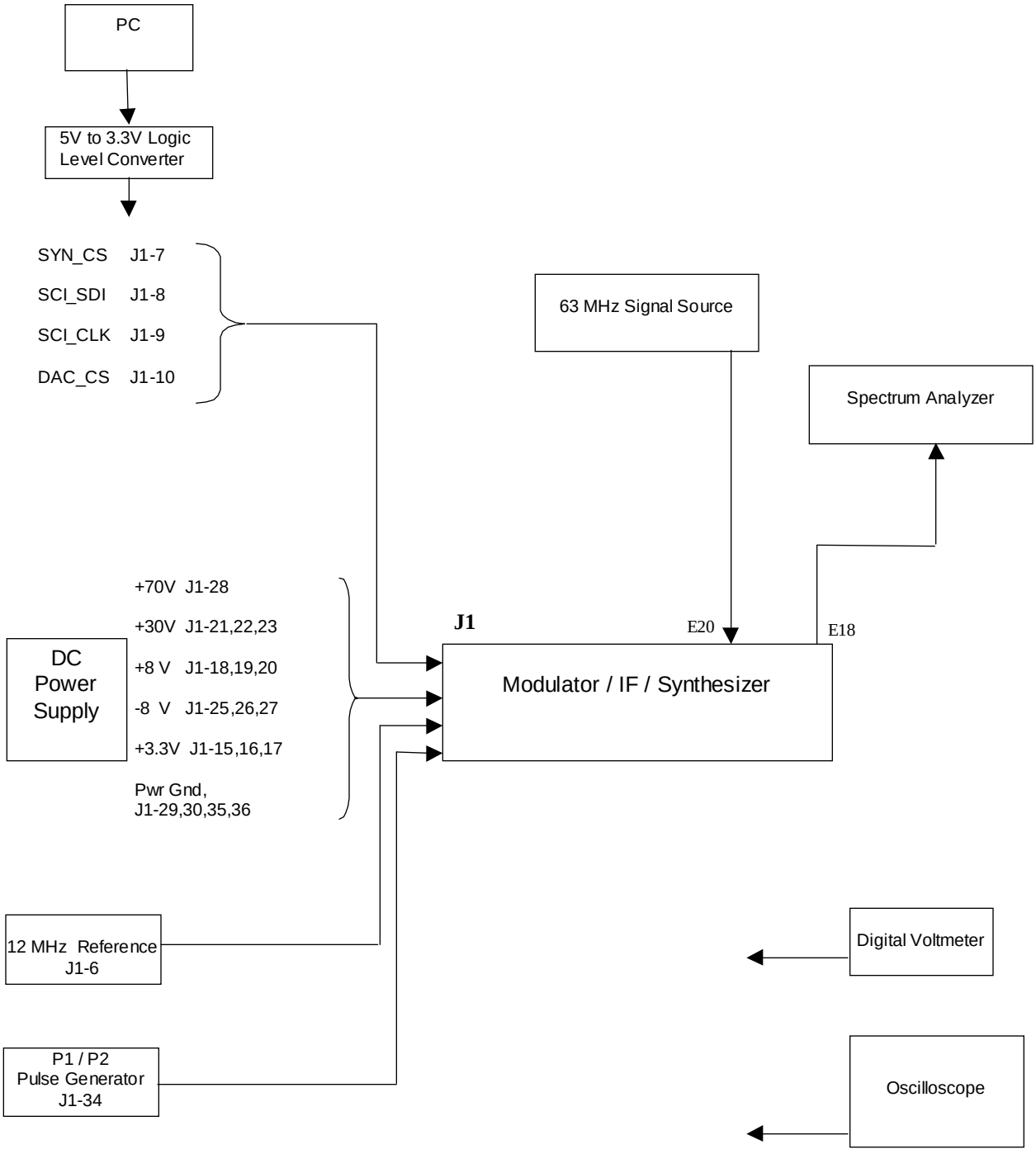


Figure 7

5.2.2 RF Module

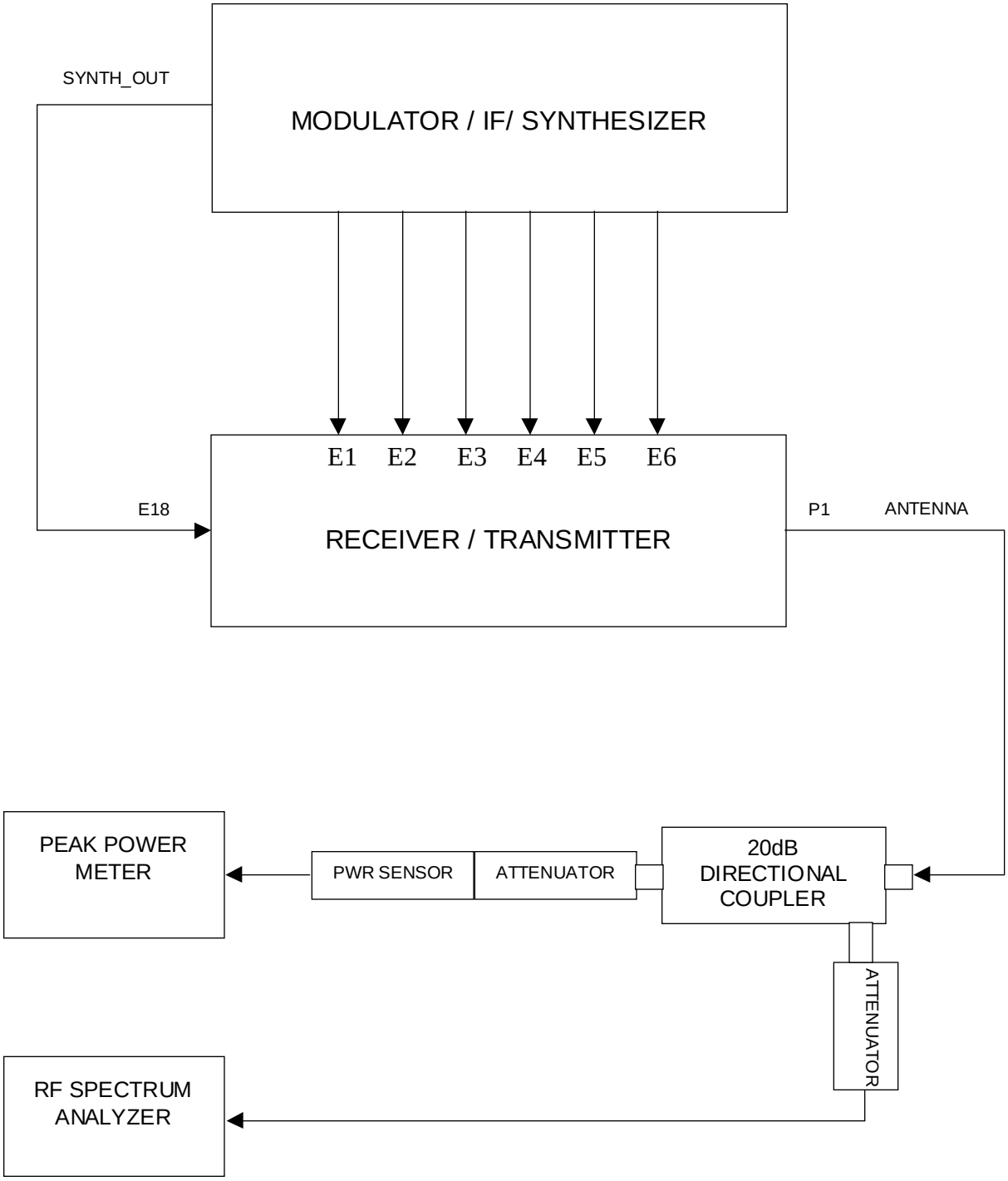


Figure 8

5.2.3 Receiver Auto-Alignment

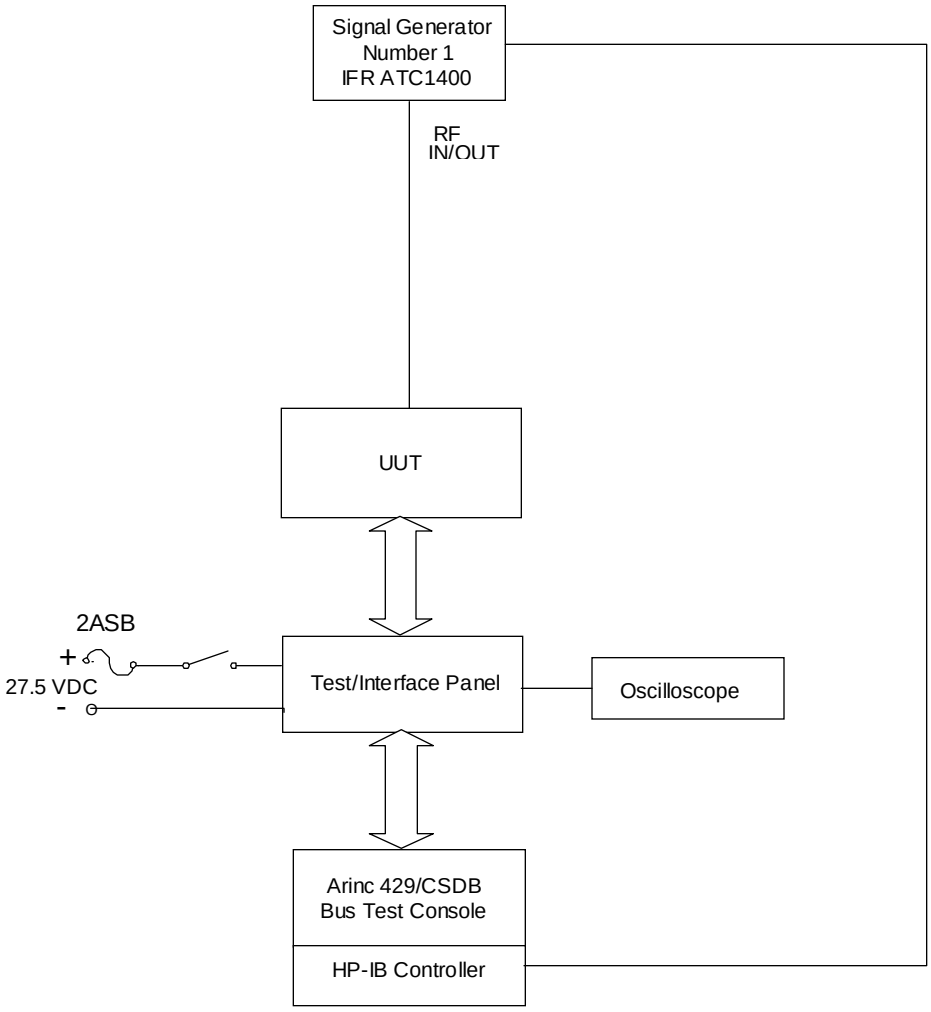


Figure 9

5.2.4 Top Level

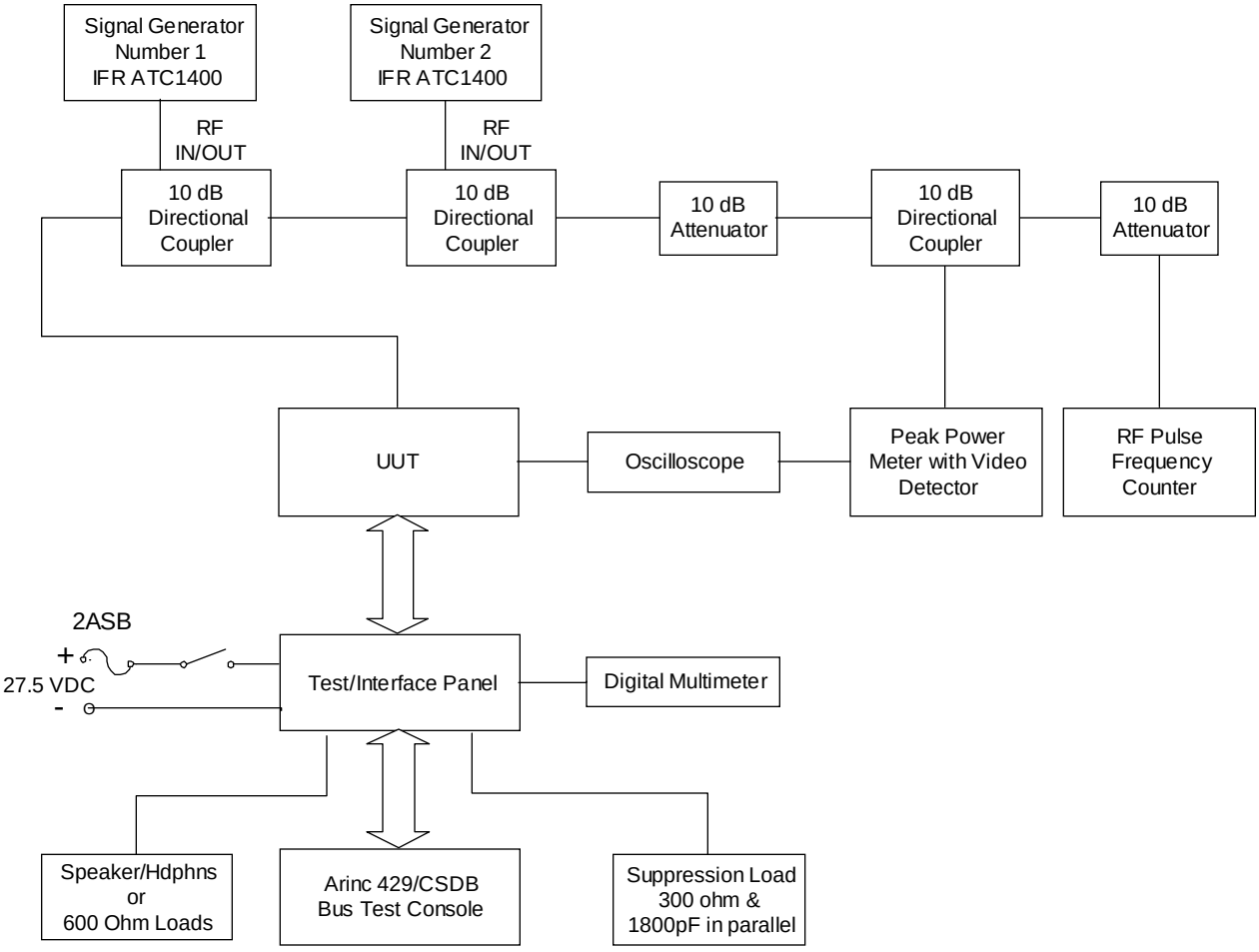


Figure 10

6 Test Conditions

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

6.1 Ambient Environment

1. Temperature – normal factory ambient
2. Humidity – normal factory ambient
3. Atmospheric pressure – normal factory ambient
4. Shielding and isolation – Electromagnetic fields in the frequency range of 950-1215 MHz below –110dBm.

6.2 Operational Duty Cycle

Continuous.

6.3 Warm-up Period

The unit under test (UUT) shall undergo a 15-minute warm-up period before performing adjustments or making any measurements specified by this document.

6.4 Electrostatic Precautions

All assemblies contain devices that are sensitive to electrostatic discharge. Appropriate precautions shall be taken in handling the UUT.

6.5 Received Signal Strength and RF Cable Connections

Received signal strength and Transmitter power output at the UUT will differ from the displayed signal output of the DME signal generators and peak power meters due to the attenuation introduced by directional couplers and other coaxial components. Correction factors (which may be somewhat dependent on frequency) shall be employed to convert the displayed output to the actual UUT received signal strength or transmitter output power. These correction factors are derived by special calibration of the DME-4000 test set-up. (see paragraph 6.7).

6.6 RF Load

While the DME-4000 transmitter is designed to withstand infinite VSWR, the transmitter must be terminated at all times with a 50-ohm load rated for at least 1 kW peak power at 1500 MHz.

6.7 Test Setup

For all testing described herein, the subassembly or top level UUT shall be connected to the applicable test setup as shown in paragraph 5.2.

7 Definitions/Setup for Top Level Testing

7.1 DME Signal Generator

The DME signal generators shall be adjusted as follows unless otherwise specified.

Pulse characteristics: Normal spacing
(X-mode or Y-mode, according to channel selected)
Reply efficiency: 70 percent
TACAN modulation: ON
Ident tone: code
Simulated distance: as specified
Simulated ground speed: 0 knots
Simulated acceleration: 0 knots/second
Equalizing pulses: ON
Echo pulses: OFF
Frequency: as specified
RF output level: as specified
Squitter rate: 2700-pulse pairs/second

7.2 I/O Data Bus Information

Unless otherwise specified, UUT tuning will be performed using continuos tuning with a transmit interval of 100 ms. The UUT output data will be retrieved from DME ARINC 429 Low Speed Output. Receiver auto-alignment will be performed by sending the appropriate alignment commands to the Maintenance input bus and receiving responses from the UUT via the Maintenance output bus.

7.3 ARINC 429/CSDB (Pro Line II) Bus Test Console

The CSDB (Pro Line II)/ARINC 429 Bus Test Console is a PC-based Condor interface card which has the capability to transmit and receive data formatted per the modified ARINC 429 format and the Collins serial digital bus specification. Selection of the format to be used is accomplished by installation and enablement of the proper interface card and the corresponding software. Unless otherwise directed, the ARINC 429 mode shall be used for frequency input. Serial output shall be read from the output bus(es) as specified in the particular test. As a minimum, the equipment must be capable of transmitting the CSDB message blocks associated with addresses 24 and 34 and with modified ARINC 429 label 035, and receiving the message blocks associated with CSDB labels 25, 26, 27, and F3 and with modified ARINC 429 labels 002, 012, 035, 044, 201, 202, 300, 350, and 371. To perform the receiver auto-alignment the equipment must be capable of transmitting modified ARINC 429 label 277 and receiving the message blocks associated with multiple modified ARINC 429 label 351s.

7.4 Suppression load and input level

For certain testing as herein specified, a special suppression load must be connected between suppression (P1-48 and ground (P1-54). This load shall consist of a parallel combination of a 300 Ohm , 6.5W wirewound resistor (CPN 747-5450-000 or equivalent) and an 1800 pf capacitor (912-4124-640 or equivalent).

7.5 Discrete definition and setup

The definition of each discrete with each logic level is listed below.

Definition	Logic 0 (GND)	Logic 1 (OPEN)
Burst Tune Select	Enable	*Disable
CSDB/ARINC Select	CSDB	*ARINC
Port B/A Select[Note 1]	Port A	*Port B
Port C Select	Port C Enable	*Port A or B
Weight On Wheels[Note 2]	On the Ground	*In the Air
Side 1/Side 2 Select[Note 3]	DME 2	*DME 1
RT ON/STBY	STBY	*ON
Self Test	Enable	*Disable
Data Load Enable[1]	Enable	*Disable

Table 1

* -- Configure the discrete for this level unless otherwise stated.

Note 1: This definition is valid when the Burst Tune discrete is set to normal or continuous tuning mode, the ARINC/CSDB select discrete is set in the ARINC mode, and the Port C Select input discrete indicates Port C is not selected.

Note 2: This definition is valid when the WOW input discrete indicates the aircraft is on the ground.

Note 3: When this discrete pin is open(1) DME1 is selected. When this discrete pin is grounded(0) DME 2 is selected.

7.6 Source/Destination Identifier

For all testing unless otherwise indicated, the ARINC 429 input DME frequency source/destination identifier bits (label 035, bits 9 and 10) shall be set at logic level zero (all-call). Except as otherwise stated, all ARINC 429 Serial output data words shall be expected to have bit 9 at logic level one and bit 10 at logic level zero (side 1).

7.7 Input Frequency Control

Input frequency control to the UUT shall be continuous ARINC 429 data to port B (P1-21(A) and P1-28(B)), except as otherwise stated.

8 Test Requirements

Some of the following tests contain required results for Factory, Return to Service (RTS), and Field UUTs. For those tests that do not contain separate results, the required value pertains to all three catagories of UUTs.

8.1 IF/Synthesizer/Modulator Assembly

8.1.1 Synthesizer

1. Synthesizer output (E18) shall produce an output frequency equal to the frequency requested via the serial tune data.
2. Synthesizer output level shall be per the following table across the frequency range of 1025 Mhz through 1150MHz.

Factory	RTS	Field
NLT +2dBm	NLT +2dBm	NLT +2dBm

8.1.2 Preselector 1st Pole – 5th Pole DAC Levels

The output voltages measured at E10 – E14 shall be as defined in the following table.

1st Pole output = E10
2nd Pole output = E11
3rd Pole output = E12
4th Pole output = E13
5th Pole output = E14

DAC Setting	Factory	RTS	Field
0	NMT 50mV	NMT 50mV	NMT 50mV
128	15 ± 1 Vdc	15 ± 1 Vdc	15 ± 1 Vdc
255	30 ± 1 Vdc	30 ± 1 Vdc	30 ± 1 Vdc

8.1.3 1st Pole and 2nd Pole Suppression

1. Set 1st and 2nd Pole DAC level to 255.
2. Enable Suppression by applying a logic 1 (+3.3 Vdc) to J1-31.
3. The voltage levels at the 1st Pole (E10) and the 2nd Pole (E11) shall be per the following table.

Factory	RTS	Field
NMT 1Vdc	NMT 1Vdc	NMT 1Vdc

8.1.4 Modulator Pulse Levels

With the following pulse parameters applied to P1_P2 input (J1-34), the Modulator output levels shall be as defined in the succeeding table.

Pulse Parameters: Pulse Width = 8 μs
Pulse Spacing = 36 μs
Amplitude = 3.3V
Pulse Repetition Rate = 90 PPS

Output / E#	Factory	RTS	Field	Waveform
0.7V Sq Wv / E1	0.7V ± 0.07V	0.7V ± 0.07V	0.7V ± 0.07V	Rectangular Pulse
28V Sq Wv 1 / E2	28V ± 2.8V	28V ± 2.8V	28V ± 2.8V	Rectangular Pulse
28V Sq Wv 2 / E3	28V ± 2.8V	28V ± 2.8V	28V ± 2.8V	Rectangular Pulse
1st Cos^2 Driver / E4	50V ± 1.0V *	50V ± 1.0V *	50V ± 1.0V *	Cos^2 pulse
2nd Cos^2 Driver / E5	50V ± 1.0V *	50V ± 1.0V *	50V ± 1.0V *	Cos^2 pulse
Final Driver / E6	50V ± 1.0V *	50V ± 1.0V *	50V ± 1.0V *	Cos^2 pulse

* Peak output voltage set by RV101.

8.1.5 Modulator Pulse Adjustment Range

By adjusting RV101, the Cos^2_Driver Pulse levels shall vary in a range specified by the following table

Factory	RTS	Field
<15V to >55V	<15V to >55V	<15V to >55V

8.1.6 LNA Drive

LNA Drive voltage measured at E8 shall be per the following table.

Factory	RTS	Field
+3.3 +/-0.08VDC	+3.3 +/-0.08VDC	+3.3 +/-0.08VDC

8.1.7 Mode Control Logic

Mode Control Logic shall be as defined in the following table.

OUTPUT	TX ENABLED TEST = DISABLED SUPPRESSION = DISABLED	TX DISABLED TEST = DISABLED SUPPRESSION = DISABLED	TEST ENABLED SUPPRESSION = DISABLED TX = DISABLED	SUPPRESSION ENABLED TEST = DISABLED TX = DISABLED
LO_SW (E21)	0V	-6V	-6V	-6V
LO_SW (E9)	-6V	0V	0V	0V
TEST_SW (E16)	+8V	-8V	+8V	+8V
TEST_NOISE (E17)	-8V	-8V	+30V	-8V
TR_SW (E15)	+8V	-8V	+8V	+8V

NOTE: Levels are approximate Voltages.

8.1.8 AGC Voltage

Apply 1.0 Vdc to the DAC_AGC input of the AGC amplifier.
Apply 2.0 Vdc to the OFFSET input of the AGC amplifier.
The voltage levels measured at J1-13 and CR401-A shall be per the following table.

Test Point	Factory	RTS	Field
J1-13	-0.55 +/-0.1VDC	-0.55 +/-0.1VDC	-0.55 +/-0.1VDC
CR401-A	-0.33 +/-0.1VDC	-0.33 +/-0.1VDC	-0.33 +/-0.1VDC

8.1.9 +12 Volt Regulator

The output of the +12 V regulator (U403-1) shall be per the following table.

Factory	RTS	Field
+12.0V +/-0.12VDC	+12.0V +/-0.12VDC	+12.0V +/-0.12VDC

8.1.10 –5 Volt Regulator

The output of the –5 V regulator (U402-3) shall be per the following table.

Factory	RTS	Field
-5.0VDC +/-0.5VDC	-5.0VDC +/-0.5VDC	-5.0VDC +/-0.5VDC

8.1.11 IF Amplifiers and Detected Video

DETECTED_VIDEO (TP401) shall be linear (undistorted) over the RF input signal range of –93 dBm to –10 dBm.

8.1.12 XMIT Monitor

XMIT_MON (TP104) shall produce an output NLT 3.0 Vdc when the pulse amplitude of PA_MON (E7) is greater than 0.75 V. (See Note 1)
XMIT_MON (TP104) shall produce an output NMT 0.1 Vdc when the pulse amplitude of PA_MON (E7) is 0.35 V or less.

Note 1: Output will stay at this level for 45 to 50 milliseconds after the last pulse is received.

8.2 RF Module

8.2.1 Transmitter Output

For each of the test frequencies, the Transmitter output shall comply with the following specifications:

Test Frequencies: 134.40 MHz (1X), 108.90 MHz (26X), 111.40 MHz (51X), 112.90 MHz (76X), 115.40 MHz (101X), and 117.90 MHz (126X).

Peak Modulation voltage measured at E6 shall be NMT +51 Vp.
Peak Transmit Power of the 1st pulse shall be NLT 350 watts peak.
Peak Transmit Power of the 2nd pulse shall be NLT 350 watts peak.
Peak Power difference between the 1st and 2nd pulse shall be NMT 10% of the 2nd pulse.
Pulse Shape shall have rounded tops with no concave sections at the peaks.
Pulse Width (Half-Amplitude Points) shall be 3.5 ±0.4 microseconds.
Pulse Rise time between the 10% and 90% points shall be 1.5 ± 0.4 microseconds.
Pulse Fall time between the 90% and 10% points shall be 1.5 ± 0.4 microseconds.
Maximum Spurious Spectrum level shall be NMT –70 dBc of the peak power from 960 MHz to 1215 MHz.
Maximum Harmonic Distortion output level shall be NMT –70 dBc of peak power.
Maximum Spurious CW RF energy emission from the antenna port when not transmitting shall be NMT –80 dBm.

Note: These test frequency settings result in transmitter outputs at 1025, 1050, 1075, 1100, 1125 and 1150 MHz, respectively.

8.2.2 Receiver Sensitivity

The minimum receiver sensitivity at which the unit acquires the correct range and maintains track shall be NMT –88 dBm. In addition, the aural identification shall be clear and unambiguous at an input RF level of NMT –85 dBm.

9 Preliminary Top Level Tests

9.1 Continuity and Shorts

With an ohmmeter, verify less than one ohm to chassis ground from the following Pins: P1-54,59,61 and 65.
Verify an open condition for each pin (negative probe to ground, positive to pin indicated): P1-58

9.2 Preset Adjustments

All preset adjustments should have been accomplished during previous module-level testing. Do not alter these settings until directed to do so.

9.3 Initial Adjustments

Perform the following alignment and adjustment procedures, observing warm-up requirements of paragraph 6.3. Remove dust cover from UUT. Connect UUT to test setup as shown in paragraph 5.2.3. Verify that the discrete select inputs have been provided according to paragraph 7.5. All DME signal generators shall be turned off until otherwise directed. (It is sufficient to place the "CW/NORM/OFF" switch of the IFR test set to the "OFF" position. Removal of power to the DME signal generator is not required.)

9.4 Abnormal Loading

Apply 27.5 VDC power to P1-58 (+) and P1-59 (-). Verify current supplied to be within 0.3 ± 0.1 ampere.

9.5 Power Supply

The Power Supply output voltages shall be within the limits specified in the following table.

Measurement Point	Voltage	Limits
TP14	+3.3 VDC	+3.3 Vdc ± 0.17 Vdc
TP15	+8 VDC	+8 Vdc ± 0.8 Vdc
TP16	-8 VDC	-8 Vdc ± 0.8 Vdc
TP12	+30 VDC	+30 Vdc ± 3 Vdc
TP11	+70 VDC	+73 Vdc ± 7.3 Vdc

9.6 DSP – 12 MHz Clock

The 12 MHz clock reference frequency measured at J2-6 shall be 12.0 MHz ± 60 Hz.

9.7 Receiver Alignment

Description: When commanded via the Maintenance input port, the DME-4000 performs an automatic alignment procedure that determines the optimum control voltages for the five varactor diodes in the RF preselector. The voltages are obtained at 64 frequency intervals within the 252 channel DME receiver band. The accumulated alignment data is then stored in FLASH memory on the DSP/PS board. This automatic alignment procedure is done under the control of external test equipment connected as per Figure 9.

1. The ARINC 429 Bus Test console initiates the alignment operation by sending a 277 label that contains a CMD277_SETUP_ALIGN command.
2. The UUT responds with a 351 label containing a COMMAND_COMPLETE response.
3. The GPIB controller commands the IFR to a specific DME channel.
4. The ARINC 429 Bus Test console then sends a 035-label with the appropriate tuning data, followed by a 277 label containing a CMD277_AUTO_ALIGN command.
5. The UUT performs the alignment procedure for the desired channel and then generates a series of 351 labels. The 351 labels contain information about the diode voltages, the AGC value, and finally, a COMMAND_COMPLETE response.
6. This process repeats for 64 frequency intervals. Each interval typically represents 4 channels with similar characteristics.
7. At the end of the alignment loop, the ARINC 429 Bus Test console sends a 277 label containing a CMD277_SAVE_EXIT command. This instructs the UUT to copy the accumulated alignment data into FLASH memory.
8. Upon completion, the UUT responds with a 351 label containing a COMMAND_COMPLETE response.
9. Alignment is compete and the UUT must be power-cycled to resume normal operation.

Note: A 351 label that contains a COMMAND_COMPLETE normally reports a PAD 1 value of zero. The UUT reports a non-zero value in this field to indicate an error. Upon receiving an error, the ARINC 429 Bus Test console issues a 277 label containing a CMD277_NOSAVE_EXIT command. This halts the alignment operation in both the ARINC 429 Bus Test console and the UUT.

9.7.1 Receiver Auto Alignment Label Definitions

Label 277 - Alignment Commands from the ATE to the LRU

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	SSM		UNDEFINED																MODE			SDI		LABEL								
X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	X	0	0	1	1	1	1	1	1	0	1

Command	Mode
CMD277_SETUP_ALIGN	1
CMD277_AUTO_ALIGN	2
CMD277_SAVE_EXIT	3
CMD277_NOSAVE_EXIT	4

Label 035 - Tuning Commands from the ATE to the LRU

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	SSM		TENS			ONES				TENTHS				H	R	UNDEF.			MODE			SDI		LABEL							
X	0	0	X	X	X	X	X	X	X	X	X	X	X	X	0	0	0	0	0	0	1	0	1	1	0	1	1	0	0	0	

Frequency tuning sequence
134.50, 134.90, 135.30, 135.70, 108.10, 108.50, 108.90, 109.30, 109.70, 110.10, 110.50, 110.90, 111.30, 111.70, 112.10, 133.40, 133.85, 134.25, 112.65, 113.05, 113.45, 113.85, 114.25, 114.65, 115.05, 115.45, 115.85, 116.25, 116.65, 117.05, 117.45, 117.85, 134.55, 134.95, 135.35, 135.75, 108.15, 108.55, 108.95, 109.35, 109.75, 110.15, 110.55, 110.95, 111.35, 111.75, 112.15, 133.45, 133.80, 134.20, 112.60, 113.00, 113.40, 113.80, 114.20, 114.60, 115.00, 115.40, 115.80, 116.20, 116.60, 117.00, 117.40, 117.80

Notes:

- The 'hundreds' digit is assumed and is not transmitted in the ARINC label.
- An increment of 0.05 MHz is coded in the 'hundredths' field as a binary '1'.

Label 351 - Alignment Reponses from the LRU to the ATE

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	SSM		PAD 1													PAD 2						SDI		LABEL							
X	0	0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0	1	1	0	0	1	0	1	1	1

Identifier	PAD 2
Diode 1	1
Diode 2	2
Diode 3	3
Diode 4	4
Diode 5	5
AGC	6
Command complete	7

9.8 Transmitter Alignment and Measurements

1. Set Signal Generator #1 and all three channels of the UUT to 133.70 MHz (64X).
2. Set Signal Generator #1 reply efficiency to "0" to force the unit into search mode.
3. Using an oscilloscope, measure the peak Modulator voltages at E4, E5, and E6. The peak voltage level shall be 50 V ± 1 V. Adjust RV101 on the Modulator board, CPN 828-3373-00X, if necessary.
4. Transmitter output power shall be NLT 350 watts. If necessary, adjust capacitors C322, C323, C324, C309, C310, C313, C316 for maximum peak power.
5. Set Signal Generator #1 and all three channels of the UUT to 117.90 MHz (126X).
6. Re-adjust capacitors C324, C323, C322, C309, C310, C313, C316, C318 for maximum peak power.
7. Set Signal Generator #1 and all three channels of the UUT to 134.40 MHz (1X).
8. Verify output power meets the minimum output power requirement (350 watts). Re-adjust capacitors C324, C323, C322, C309, C310, C313, if necessary.
9. Re-check transmitter output power at 117.90 MHz (126X) and 133.70 MHz (64X)
10. Re-check peak Modulator voltages at E4, E5, and E6 for 50 volt ± 1 volts level. Re-adjust RV101 as necessary.
11. Re-check transmitter output power at all three frequencies.
12. Verify the transmitter detected video pulse shape at all three frequencies have a round top (no flat topping or distortions). If necessary, readjust RV101 for 50 ±volt peak.
13. Verify the pulse width (half amplitude points) is 3.5 ± 0.3 microseconds at all three frequencies.

9.8.1 Interrogator Pulse Characteristics

Set Signal Generator #1 and all three UUT equipment channels to each of the test frequencies listed below.
The 1st and 2nd transmitter pulses shall meet the parameters per the following table.

1. Peak output power at the transmit frequency shall be NLT 350 watts.
2. Difference in peak output power between pulses shall be NMT 1 dB.
3. Pulse rise time measured from the 10% to 90% points shall be NMT 3.0 μS.
4. Pulse fall time measured from the 90% to 10% points shall be NMT 3.5 μS.
5. Pulse duration measured at the 50 percent points shall be 3.5 ± 0.5 μS.
6. The pulse shape between the 95% points of the rising and falling edges shall be greater than 95% of the peak voltage.
7. Spacing between the pulses measured between the 50% points of the leading edges shall be 12.0 ± 0.25 μS for 'X' channels and 36.0 ± 0.25 μS for 'Y' channels.

Test Frequencies: 134.40 MHz (1X), 108.90 MHz (26X), 111.40 MHz (51X), 112.90 MHz (76X), 115.40 MHz (101X), and 117.90 MHz (126X). These Nav frequency settings result in transmitter output frequencies of 1025, 1050, 1075, 1100, 1125, and 1150 MHz respectively.

Peak Modulation voltage measured at E6 shall be NMT +51 Vp.

9.9 Receiver Sensitivity

Set up the Signal Generators and tune the all 3 UUT channels for each test condition listed below.

Test Condition	Signal Generator #1		Signal Generator #2		UUT channel 1	UUT channel 2	UUT channel 3
	Freq.	RF Level	Freq.	RF Level			
1	134.40 (1X)	X	108.95 (26Y)	-70 dBm	134.40 (1X)	108.95 (26Y)	117.90 (126X)
2	134.40 (1X)	-70 dBm	108.95 (26Y)	X	134.40 (1X)	108.95 (26Y)	117.90 (126X)
3	111.40 (51X)	X	112.90 (76X)	-70 dBm	111.40 (51X)	112.90 (76X)	117.90 (126X)
4	111.40 (51X)	-70 dBm	112.90 (76X)	X	111.40 (51X)	112.90 (76X)	117.90 (126X)
5	115.45 (101Y)	X	117.90 (126X)	-70 dBm	115.45 (101Y)	117.90 (126X)	134.40 (1X)
6	115.45 (101Y)	-70 dBm	117.90 (126X)	X	115.45 (101Y)	117.90 (126X)	134.40 (1X)

For each test condition, the lock-on sensitivity (received signal level at which lock-on is achieved), indicated by “X” in the table above, shall be NMT –88 dBm.

Note: The six Nav frequencies correspond to DME received frequencies as follows: 134.40 – 962 MHz, 111.40 – 1012 MHz, 115.45 – 1062 MHz, 108.95 – 1113 MHz, 112.90 – 1163 MHz, and 117.90 – 1213 MHz.

9.10 Audio Output Level

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency
1	117.90 MHz (126X)	-70	10.0	70 %
2	OFF	OFF	n.a.	n.a.

UUT Equipment Channel	Frequency (CH #)
1	117.90 MHz (126X)
2	117.90 MHz (126X)
3	n.a.

1. Connect 600 ohm loads across Audio output #1 (P1-25 to P1-26) and Audio output #2 (P1-43 to P1-44).
2. Set Signal Generator #1 Ident to “TONE”.
3. Measure with an oscilloscope the voltage present on Audio output #1 and #2.
4. The voltage shall be 16.0 ± 1.0 V peak-peak.
5. Set Signal Generator #1 Ident to “OFF”.

9.11 Distance Accuracy Calibration

The DME-4000 does not require distance accuracy calibration.

9.12 Co-Channel Signal Rejection

With power supplies off, connect UUT into the setup of figure 10.
Adjust the station simulators settings to the following:

Signal Generator #1	**Signal Generator #2**
Freq. = 134.40 MHz	Freq. = 134.40 MHz
PRF = 2700	PRF = 3600
*RF = -79 dBm	*RF = -87 dBm
Ident = CODE	Ident = CODE
P_2 Dev = 0 uS	P_2 Dev = 0 uS
Reply = 70%	Reply = 0%
Dist = 150 NM	Dist = 50 NM
Equalizer = ON	Equalizer = ON

*Including directional coupler + cable loss

1. Tune all three UUT channels to 134.40 MHz.
2. Apply power to the UUT.
3. Verify distance on all three channels to be 150 NM ±0.1%.
4. Wait for Ident to be displayed in the Arinc 429 output (approximately 3 minutes).
5. Listen to audio Ident and verify it is not chop by the weaker interfering station.

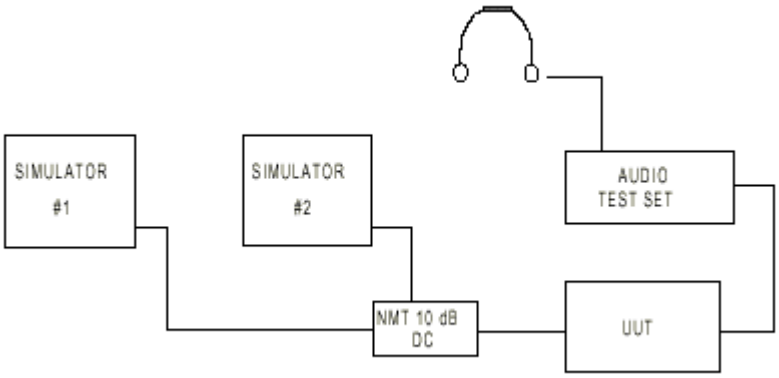


Figure 11

10 Burn-In

Replace dust cover on UUT. Subject UUT to burn-in test environment and record data of the nature and for the period prescribed by test engineering.

11 Top Level Test Requirements

Perform the following tests and procedures in the order specified. Record all test data in the corresponding paragraphs of the data sheets or equivalent. Ensure that all tests of preceding paragraphs have been performed and warm-up period has been observed. Remove dust cover from UUT. Connect UUT to test setup as shown in paragraph 5.2.3. Verify that the discrete select inputs have been provided according to paragraph 7.5. All DME signal generators shall be turned off until otherwise directed. (It is sufficient to place the "CW/NORM/OFF" switch of the IFR test set to the "OFF" position. Removal of power to the DME signal generator is not required.)

11.1 Transmitter Measurements

11.1.1 Interrogator Pulse Characteristics – Channel 1X

Tune all three UUT equipment channels to 134.40 MHz (1X).
Set Signal Generator #1 to 134.40 MHz (1X) and DME reply efficiency to 0.
The 1st and 2nd transmitter pulses shall meet the parameters per the following table.

1. Peak output power at the transmit frequency.
2. Difference in peak output power between pulses.
3. Pulse rise time measured from the 10% to 90% points.
4. Pulse fall time measured from the 90% to 10% points.
5. Pulse duration measured at the 50 percent points.
6. The pulse shape between the 95% points of the rising and falling edges.
7. Spacing between the pulses measured between the 50% points of the leading edges.

Parameter	Factory	RTS	Field
Peak Power Out	NLT 350 watts	NLT 300 watts	NLT 300 watts
Diff. Between pulses	NMT 1 dB	NMT 1dB	NMT 1dB
Pulse Rise time	NMT 3.0 µS	NMT 3.0 µS	NMT 3.0 µS
Pulse Fall time	NMT 3.5 µS	NMT 3.5 µS	NMT 3.5 µS
Pulse Duration	3.5 ± 0.5 µS	3.5 ± 0.5 µS	3.5 ± 0.5 µS
Pulse Shape	>95% btwn 95% pts.	>95% btwn 95% pts.	>95% btwn 95% pts.
Pulse Spacing	12.0 or 36.0 ± 0.25 uS	12.0 or 36.0 ± 0.25 uS	12.0 or 36.0 ± 0.25 uS

11.1.2 Interrogator Pulse Characteristics – Channel 64Y

Tune all three UUT equipment channels to 133.75 MHz (64Y).
Set Signal Generator #1 to 133.75 MHz (64Y).
Repeat the measurements listed in paragraph 11.1.1 steps 1-7.

11.1.3 Interrogator Pulse Characteristics – Channel 126X

Tune all three UUT equipment channels to 117.90 MHz (126X).
Set Signal Generator #1 to 117.90 MHz (126X).
Measure and record the parameters listed in paragraph 11.1.1 steps 1-7.

11.1.4 Interrogator Frequency Stability

Tune all three UUT equipment channels to the frequencies listed below and measure the center frequency of the pulse spectrum. The measured frequencies shall conform to the following table. Refer to– Frequency Measurement Method

Nav. Frequency	DME Channel	Factory	RTS	Field
134.40 MHz	1X	1025 MHz ± 15 KHz	1025 MHz ± 15 KHz	1025 MHz ± 15 KHz
133.70 MHz	64X	1088 MHz ± 15 KHz	1088 MHz ± 15 KHz	1088 MHz ± 15 KHz
117.90 MHz	126X	1150 MHz ± 15 KHz	1150 MHz ± 15 KHz	1150 MHz ± 15 KHz

11.1.5 Interrogator Pulse Repetition Frequency (PRF)

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency
1	133.70 MHz (64X)	< -120	10.0	70 %
2	OFF	OFF	n.a.	n.a.

UUT Equipment Channel	Frequency (CH #)
1	133.70 MHz (64X)
2	108.95 MHz (26Y)
3	117.95 MHz (126Y)

1. Re-cycle power on the UUT, then wait 15 seconds for the unit to exit the initial search mode.
2. Measure the pulse repetition frequency (PRF) of the UUT transmitter output. PRF shall be zero.
3. Increase Signal Generator #1 RF output level for a received signal strength of –85 dBm.
4. PRF shall be 6 ± 1 PPS.
5. Set Signal Generator #1 reply efficiency to zero, then wait 15 seconds for the unit to enter search mode.
6. PRF shall be 24 ± 1 PPS.
7. The spacing between successive transmitter pulse pairs shall not be constant.
8. Tune all three UUT equipment channels to 133.70 MHz (64X).
9. The PRF shall be NLT 64 PPS and NMT 75 PPS.

11.1.6 Interrogator Spurious Transmissions

Tune all three UUT Equipment channels to 134.40 MHz (1X), 133.70 MHz (64X), and 117.90 MHz (126X). The spur level shall not exceed -45 dBc between 800 MHz and 1400 MHz. This test shall be performed at factory ambient temperature as well as the temperature requirement limits.

NOTE: Perform spur test on a sample basis of one out of every twenty units.

11.2 Receiver Characteristics

11.2.1 Receiver Sensitivity

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency
1	134.45 MHz (1Y)	<-120	0.0	70 %
2	117.90 MHz (126X)	<-120	10.0	70 %

UUT Equipment Channel	Frequency (CH #)
1	134.45 MHz (1Y)
2	117.90 MHz (126X)
3	134.45 MHz (1Y)

Monitor Arinc 429 low-speed output Port A (P1-1, P1-2) for the following steps:

1. Monitor the distance and SSM of the Arinc 429 Label “202” output.
2. Set Signal Generator #1 Ident to “CODE”.
3. Gradually increase the RF level of Signal Generator #1 until a valid distance and “Normal” SSM are indicated and the audio ident is clear and unambiguous for UUT equipment channel 1.
4. Record the Signal Generator #1 RF level at which at which lock-on occurred. The RF level shall be per the following table. NMT –88 dBm.

Factory	RTS	Field
NMT –88 dBm	NMT –85dBm	NMT –85 dBm

5. Return Signal Generator #1 RF level to <-120 dBm.
6. Set Signal Generator #2 Ident to “CODE”.
7. Gradually increase the RF level of Signal Generator #2 until a valid distance and “Normal” SSM are indicated and the audio ident is clear and unambiguous for UUT equipment channel 2.
8. Record the Signal Generator #2 RF level at which at which lock-on occurred. The RF level shall be per the following table.

Factory	RTS	Field
NMT –88 dBm	NMT –85dBm	NMT –85 dBm

9. Return Signal Generator #2 RF level to <-120 dBm.
10. Set Signal Generator #1 to 133.70 MHz (64X) and a distance of 10.0 nm.
11. Set the UUT equipment channel 1 frequency to 133.70 MHz (64X).
12. Gradually increase the RF level of Signal Generator #1 until a valid distance and “Normal” SSM are indicated and the audio ident is clear and unambiguous for UUT equipment channel 1.
13. Record the Signal Generator #1 RF level at which at which lock-on occurred. The RF level shall be per the following table.

Factory	RTS	Field
NMT –88 dBm	NMT –85dBm	NMT –85 dBm

14. Return Signal Generator #1 RF level to <-120 dBm.
15. Set Signal Generator #1 to 134.40 MHz (1X).
16. Set the UUT equipment channel 1 frequency to 134.40 MHz (1X).

17. Gradually increase the RF level of Signal Generator #1 until a valid distance and "Normal" SSM are indicated and the audio ident is clear and unambiguous for UUT equipment channel 1.
18. Record the Signal Generator #1 RF level at which at which lock-on occurred. The RF level shall be per the following table.

Factory	RTS	Field
NMT –88 dBm	NMT –85dBm	NMT –85 dBm

19. Set Signal Generator #1 and #2 Ident to "OFF".

11.2.2 Receiver Lock-on Time

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency
1	134.40 MHz (1X)	< -120	10.0	70 %
2	117.90 MHz (126X)	-85	10.0	70 %

UUT Equipment Channel	Frequency (CH #)
1	134.40 MHz (1X)
2	116.90 MHz (116X)
3	134.45 MHz (1Y)

1. Retune UUT equipment channel 2 to 117.90 MHz (126X) while recording with a stopwatch the time elapsed between when the UUT equipment channel 2 receives the new tuning frequency till a valid distance and "Normal" SSM are indicated for UUT equipment channel 2. Lock-on time shall be NMT 2 seconds.
2. Increase Signal Generator #2 RF level to –10 dBm.
3. Tune UUT equipment channel 2 to 134.40 MHz (1X).
4. Retune UUT equipment channel 2 to 117.90 MHz (126X) while recording with a stopwatch the time elapsed between when the UUT equipment channel 2 receives the new tuning frequency till a valid distance and "Normal" SSM are indicated for UUT equipment channel 2. Lock-on time shall be NMT 2 seconds.

11.2.3 Receiver Decoder Selectivity – X Channel

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency
1	133.70 MHz (64X)	-85	100.0	70 %

UUT Equipment Channel	Frequency (CH #)
1	133.70 MHz (64X)

1. Set the Signal Generator #1 pulse spacing to 11.5 microseconds.
2. UUT equipment channel 1 shall lock on and the Arinc 429 Distance output shall be 100.0 ± 0.1 nm.
3. Set the Signal Generator #1 pulse spacing to 12.5 microseconds and the simulated distance to 50.0 nm.

4. UUT equipment channel 1 shall lock on and the Arinc 429 Distance output shall be 50.0 ± 0.1 nm.

11.2.4 Receiver Decoder Selectivity – Y Channel

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency
1	133.75 MHz (64Y)	-85	100.0	70 %

UUT Equipment Channel	Frequency (CH #)
1	133.75 MHz (64Y)

1. Set the Signal Generator #1 pulse spacing to 29.5 microseconds.
2. UUT equipment channel 1 shall lock on and the Arinc 429 Distance output shall be 100.0 ± 0.1 nm.
3. Set the Signal Generator #1 pulse spacing to 30.5 microseconds and the simulated distance to 50.0 nm.
4. UUT equipment channel 1 shall lock on and the Arinc 429 Distance output shall be 50.0 ± 0.1 nm.

11.2.5 Receiver Decoder Rejection – X Channel

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency
1	133.70 MHz (64X)	-48	100.0	70 %

UUT Equipment Channel	Frequency (CH #)
1	133.70 MHz (64X)

1. Set the Signal Generator #1 pulse spacing to 8.0 microseconds.
2. UUT equipment channel 1 **shall not** lock on.
3. Set the Signal Generator #1 pulse spacing to 16.0 microseconds.
4. UUT equipment channel 1 **shall not** lock on.
5. Return Signal Generator #1 pulse spacing to normal.

11.2.6 Receiver Decoder Rejection – Y Channel

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency
1	133.75 MHz (64Y)	-48	100.0	70 %

UUT Equipment Channel	Frequency (CH #)
1	133.75 MHz (64Y)

1. Set the Signal Generator #1 pulse spacing to 26.0 microseconds.
2. UUT equipment channel 1 **shall not** lock on.
3. Set the Signal Generator #1 pulse spacing to 34.0 microseconds.
4. UUT equipment channel 1 **shall not** lock on.
5. Return Signal Generator #1 pulse spacing to normal.

11.2.7 Echo Susceptibility

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Mod
1	133.70 MHz (64X)	-60	50.0	100 %	1350 pps	Off
2	133.70 MHz (64X)	-60	60.0	100 %	1350 pps	Off

UUT Equipment Channel	Frequency (CH #)
1	133.80 MHz (65X)
2	116.90 MHz (116X)
3	134.45 MHz (1Y)

1. Retune UUT equipment channel 1 to 133.70 MHz (64X).
2. UUT equipment channel 1 shall lock on and obtain an Arinc 429 Distance output of 50.0 ± 0.1 nm within 10 seconds.
3. Change Signal Generator #2 distance to 30.0 nm.
4. UUT equipment channel 1 Arinc 429 Distance output shall become 30.0 ± 0.1 nm within 10 seconds.

11.2.8 Co-channel Signal Rejection – X Channel

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Mod
1	133.70 MHz (64X)	-70	50.0	70 %	2700 pps	On
2	133.70 MHz (64X)	-78	60.0	70 %	2700 pps	On

UUT Equipment Channel	Frequency (CH #)
1	133.60 MHz (63X)
2	116.90 MHz (116X)
3	134.45 MHz (1Y)

1. Retune UUT equipment channel 1 to 133.70 MHz (64X).
2. UUT equipment channel 1 shall lock on and obtain an Arinc 429 Distance output of 50.0 ± 0.1 nm.
3. Set Signal Generator #1 Ident to “CODE”.
4. UUT equipment channel 1 audio output shall be clear and unambiguous.
5. Set Signal Generator #2 RF level to –73 dBm.
6. UUT equipment channel 1 audio output shall be garbled or the ident of both Signal Generators shall be heard.

11.2.9 Co-channel Signal Rejection – Y Channel

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate
1	133.75 MHz (64Y)	-70	50.0	70 %	2700 pps
2	133.75 MHz (64Y)	-78	60.0	70 %	2700 pps

UUT Equipment Channel	Frequency (CH #)
1	133.65 MHz (63Y)
2	116.90 MHz (116X)
3	134.45 MHz (1Y)

1. Retune UUT equipment channel 1 to 133.75 MHz (64Y).
2. UUT equipment channel 1 shall lock on and obtain an Arinc 429 Distance output of 50.0 ± 0.1 nm.
3. UUT equipment channel 1 audio output shall be clear and unambiguous.
4. Set Signal Generator #2 RF level to –73 dBm.
5. UUT equipment channel 1 audio output shall be absent, garbled, or the ident of both Signal Generators shall be heard.

11.2.10 Co-channel Signal Rejection – Random Interference

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Mod
1	133.70 MHz (64X)	-70	50.0	70 %	2700 pps	ON
2	133.70 MHz (64X)	-78	60.0	0 %	3600 pps	OFF

UUT Equipment Channel	Frequency (CH #)
1	133.80 MHz (65X)
2	116.90 MHz (116X)
3	134.45 MHz (1Y)

1. Retune UUT equipment channel 1 to 133.70 MHz (64X).
2. UUT equipment channel 1 shall lock on and obtain an Arinc 429 Distance output of 50.0 ± 0.1 nm.
3. UUT equipment channel 1 audio output shall be clear and unambiguous.

11.2.11 Signal Rejection – On-Code, Off-Frequency

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Mod
1	133.70 MHz (64X)	-70	50.0	70 %	2700 pps	ON
2	133.80 MHz (65X)	-28	60.0	0 %	3600 pps	OFF

UUT Equipment Channel	Frequency (CH #)
1	133.60 MHz (62X)
2	116.90 MHz (116X)
3	134.45 MHz (1Y)

1. Retune UUT equipment channel 1 to 133.70 MHz (64X).
2. UUT equipment channel 1 shall lock on and obtain an Arinc 429 Distance output of 50.0 ± 0.1 nm.

11.3 Memory Time

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Mod
1	134.40 MHz (1X)	-70	100.0	70 %	2700 pps	ON
2	117.90 MHz (126X)	OFF	300.0	70 %	2700 pps	ON

UUT Equipment Channel	Frequency (CH #)
1	134.40 MHz (1X)
2	117.90 MHz (126X)
3	134.40 MHz (1X)

1. Verify UUT equipment channel 1 is locked on and is displaying an Arinc 429 Distance output of 100.0 ± 0.1 nm.
2. Reduce Signal Generator #1 RF level abrupt to minimum signal level (< -120dBm)
3. Measure the time between when the Signal Generator #1 RF level was reduced until when the SSM of the Arinc 429 Distance output changes to 'NCD'.
4. The time measured shall be NLT 10 seconds and NMT 14 seconds.
5. Note the distance displayed in the Arinc 429 distance output when the UUT transitioned to 'NCD'
6. Increase Signal Generator #1 RF level to –70 dBm.
7. The distance indicated in the Arinc 429 distance output upon reacquisition shall be within ± 1.0 nm. of the distance noted in step 5.
8. Turn on Signal Generator #2, set the RF level to –70 dBm, and the ground speed to 200 kts.
9. Wait until UUT equipment channel 2 Arinc 429 ground speed output becomes 200 ± 2 kts.
10. Reduce Signal Generator #2 RF level abruptly to minimum signal level (< -120dBm)
11. Measure the time between when the Signal Generator #2 RF level was reduced until when the SSM of the Arinc 429 Distance output changes to 'NCD'.
12. The time measured shall be NLT 10 seconds and NMT 14 seconds.
13. The ground speed displayed for UUT channel 2 shall be 200 ± 2 kts. until the SSM of the Arinc 429 Distance output transitions to 'NCD'.
14. Set Signal Generator ground speed to 0 kts.

11.4 Identification

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Mod
1	134.40 MHz (1X)	-60	100.0	70 %	2700 pps	ON
2	133.70 MHz (64X)	-60	100.0	70 %	2700 pps	ON

UUT Equipment Channel	Frequency (CH #)
1	134.40 MHz (1X)
2	133.70 MHz (64X)
3	134.40 MHz (1X)

1. Connect 600 ohm loads across Audio output #1 (P1-25 to P1-26) and Audio output #2 (P1-43 to P1-44).
2. Set Signal Generator #1 Ident to “TONE”.
3. Measure with an oscilloscope the voltage present on Audio output #1.
4. The voltage shall be 16.0 ± 1.0 V peak-peak.
5. Set Signal Generator #1 Ident to “OFF”.
6. Set Signal Generator #2 Ident to “TONE”.
7. Measure with an oscilloscope the voltage present on Audio output #2.
8. The voltage shall be 16.0 ± 1.0 V peak-peak.
9. Set Signal Generator #2 Ident to “OFF”.
10. Replace 600 ohm loads with headphones or high-impedance speaker.
11. Set Signal Generator #1 and #2 Ident to “CODE”.
12. Set Signal Generator #1 and #2 RF level to –85 dBm.
13. Audio output #1 and #2 shall be clear and unambiguous.
14. UUT equipment channels 1 and 2 Arinc 429 distance outputs shall remain 100.0 ± 0.1 nm. during the ident periods.
15. UUT equipment channels 1 and 2 Arinc 429 identifier outputs shall display the correct ASCII character identifier.

11.5 Distance Requirements

Monitor Arinc 429 output ports A, B, C, and D and CSDB output ports A and B for the following tests.

11.5.1 Distance Accuracy

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency
1	134.45 MHz (1Y)	See below	See below	70 %
2	117.90 MHz (126X)	See below	See below	70 %

UUT Equipment Channel	Frequency (CH #)
1	134.45 MHz (1Y)
2	117.90 MHz (126X)
3	134.40 MHz (1X)

Select the tuning source and set the test distances and RF levels for Signal Generators #1 and #2 per the following table. Verify the correct distances are displayed and record the results for each test.

Test #	Input Tuning Bus CSDB or Arinc	Sig. Gen #1		Output Dist. CSDB/Arinc Ch. 1 (nm)	Sig. Gen #2		Output Dist. CSDB/Arinc Ch. 2 (nm)
		Distance (nm)	RF Level (dBm)		Distance (nm)	RF Level (dBm)	
1	CSDB	0.0	-60	NMT 0.1	5.5	-60	5.5 ± 0.1
2	CSDB	16.6	-10	16.6 ± 0.1	47.7	-85	47.7 ± 0.1
3	CSDB	78.8	-85	78.8 ± 0.1	99.9	-10	99.9 ± 0.1
4	CSDB	121.1	-85	121.1 ± 0.1	152.2	-85	152.2 ± 0.1
5	Arinc	183.3	-20	183.3 ± 0.1	234.4	-70	234.4 ± 0.1
6	Arinc	255.9	-50	255.9 ± 0.1	300.0	-30	300.0 ± 0.1
7	Arinc	301.0	-80	Invalid/NCD	300.0	-40	300.0 ± 0.1
8	Arinc	0.0	-10	NMT 0.1	100.0	-60	100.0 ± 0.1
9	Arinc	301.0	-85	Invalid/NCD	301.0	-85	Invalid/NCD

11.5.2 Distance Accuracy – Minimum Supply Voltage

1. Decrease the supply voltage to the UUT to +16.0 Vdc.
2. Repeat the tests of Paragraph 13.3.1
3. Return the supply voltage to the UUT to +27.5 Vdc.

11.5.3 Distance Accuracy – Reduced Squitter Rate, X Channel

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Modulation
1	134.40 MHz (1X)	-85	0.0	70 %	700	OFF
2	117.90 MHz (126X)	OFF	n.a.	n.a.	n.a.	n.a.

UUT Equipment Channel	Frequency (CH #)
1	134.40 MHz (1X)
2	117.90 MHz (126X)
3	133.70 MHz (64X)

1. Verify UUT equipment channel 1 Arinc 429 Distance output is NMT 0.1 nm.
2. Increase Signal Generator #1 RF level to –10 dBm.
3. Momentarily retune UUT equipment channel 1 to 134.45 MHz (1Y), then return it to 134.40 MHz (1X).
4. UUT equipment channel 1 shall lock on and the Arinc 429 Distance output shall be NMT 0.1 nm.

11.5.4 Distance Accuracy – Reduced Squitter Rate, Y Channel

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Modulation
1	134.45 MHz (1Y)	-85	0.0	70 %	700	OFF
2	117.90 MHz (126X)	OFF	n.a.	n.a.	n.a.	n.a.

UUT Equipment Channel	Frequency (CH #)
1	134.45 MHz (1Y)
2	117.90 MHz (126X)
3	133.70 MHz (64X)

1. Verify UUT equipment channel 1 Arinc 429 Distance output is NMT 0.1 nm.
2. Increase Signal Generator #1 RF level to –10 dBm.
3. Momentarily retune UUT equipment channel 1 to 134.40 MHz (1X), then return it to 134.45 MHz (1Y).
4. UUT equipment channel 1 shall lock on and the Arinc 429 Distance output shall be NMT 0.1 nm.

11.6 Ground Speed and Time-To-Station Accuracy

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Modulation
1	133.70 MHz (64X)	-78	50.0	70 %	2700	ON
2	108.00 MHz (17X)	OFF	80.0	70 %	2700	ON

UUT Equipment Channel	Frequency (CH #)
1	133.70 MHz (64X)
2	117.90 MHz (126X)
3	133.65 MHz (63Y)

1. Set Signal Generator #1 simulated ground speed for 200 kts. outbound.
2. Record UUT equipment channel 1 Arinc 429 ground speed output after 30 seconds.
3. The ground speed shall be 200 ± 20 kts.
4. Repeat steps 1-3 with Signal Generator #1 simulated ground speed set for 200 kts. inbound.
15. Turn on Signal Generator #2, set the RF level to –60 dBm, and the ground speed to 600 kts inbound.
5. Retune UUT equipment channel 2 to 108.00 MHz (17X).
6. Measure the time required for UUT equipment channel 2 Arinc 429 ground speed output to reach or exceed 540 knots.
7. The time measured shall be NMT 30 seconds.
8. Wait for UUT equipment channel 2 Arinc 429 ground speed output to become 600 ± 6 knots.
9. Read UUT equipment channel 2 Arinc 429 time-to-station output at the moment that the distance passes through 60 nm.
10. The time-to-station output shall be 6 ± 1 minutes.

11.7 Port A/B and Port C Select Straps with Arinc 429 Input Tuning

Set the Arinc 429 Input tuning data per the following table:

UUT Equipment Channel	Frequency (CH #)
1	117.90 MHz (126X)
2	117.90 MHz (126X)
3	117.90 MHz (126X)

1. Select Input tuning port A by connecting the Port A/B select strap to ground (P1-55 to P1-65).
2. Provide Arinc 429 Input tuning data to Arinc 429 Port B of the UUT.
3. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “10” respectively, indicating a ‘NCD status.
4. Change the Arinc 429 Input tuning data to Arinc 429 Port A of the UUT.
5. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating a ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 117.90 MHz.

6. Select Input tuning port B by removing the Port A/B select strap from ground (P1-55 from P1-65).
7. Set all three Arinc 429 Input tuning labels to 134.40 MHz (1X).
8. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “10” respectively, indicating a ‘NCD status.
9. Change the Arinc 429 Input tuning data to Arinc 429 Port B of the UUT.
10. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating a ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 134.40 MHz.
11. Select Input tuning port C by connecting the Port C select strap to ground (P1-51 to P1-65).
12. Set all three Arinc 429 Input tuning labels to 117.90 MHz (126X).
13. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “10” respectively, indicating a ‘NCD status.
14. Change the Arinc 429 Input tuning data to Arinc 429 Port C of the UUT.
15. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating a ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 117.90 MHz.
16. Select Input tuning port B by removing the Port C select strap from ground (P1-51 from P1-65).
17. Change the Arinc 429 Input tuning data to Arinc 429 Port B of the UUT.

11.8 Side 1/Side 2 Select Strap

Set the Arinc 429 Input tuning data per the following table:

UUT Equipment Channel	Frequency (CH #)	SDI, (bits 9,10)
1	133.70 MHz (64X)	Side 1, “10”
2	133.70 MHz (64X)	Side 1, “10”
3	133.70 MHz (64X)	Side 1, “10”

1. Select DME Side 2 by connecting the Side 1/Side 2 select strap to ground (P1-56 to P1-65).
2. The SDI (bits 9 and 10) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “01” respectively, indicating “Side 2”.
3. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “10” respectively, indicating a ‘NCD status.
4. Change the SDI for Arinc 429 Input tuning data for all three UUT equipment channels to ‘Side 2’.
5. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating a ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 133.70 MHz.
6. Select DME Side 1 by removing the Side 1/Side 2 select strap from ground (P1-56 from P1-65).
7. Set all three Arinc 429 Input tuning labels to 117.90 MHz (126X).
8. The SDI (bits 9 and 10) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “10” respectively, indicating “Side 1”.
9. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “10” respectively, indicating a ‘NCD status.
10. Change the SDI for Arinc 429 Input tuning data for all three UUT equipment channels to ‘Side 1’.

11. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating a ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 117.90 MHz.
12. Return the SDI of the Arinc 429 Input tuning data to ‘All Call’ for all three channels.

11.9 Burst Tune Enable Strap

Set the Arinc 429 Input tuning data per the following table:

UUT Equipment Channel	Frequency (CH #)
1	117.90 MHz (126X)
2	117.90 MHz (126X)
3	117.90 MHz (126X)

1. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating a ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 117.90 MHz.
2. Select “Burst” mode of operation for the Arinc 429 Input tuning data.
3. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “10” respectively, indicating a ‘NCD’ status.
4. Select DME Burst mode by connecting the Burst mode strap to ground (P1-49 to P1-65).
5. Set all three Arinc 429 Input tuning labels to 133.65 MHz (63Y), then burst the data to the UUT.
6. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating a ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 133.65 MHz.
7. Select DME Continuous mode by removing the Burst mode strap from ground (P1-49 from P1-65).
8. Reselect “Continuous” mode of operation for the Arinc 429 Input tuning data.

11.10 Arinc 429 Output Ports

Measure the differential pulse characteristics of all of the Arinc 429 Output ports and verify that they meet requirements per the following table. All measurements are taken with NO load on the port.

Parameter	Port A P1-1(A) P1-2(B)	Port B P1-23(A) P1-24(B)	Port C P1-5(A) P1-6(B)	Port D P1-7(A) P1-8(B)	Maint. P1-13(A) P1-14(B)
Bit rate	12.5 KHz	12.5 KHz	100 KHz	100 KHz	100 Kbps
High level	+10 ± 1.0 v	+10 ± 1.0 v	+10 ± 1.0 v	+10 ± 1.0 v	+10 ± 1.0 v
Null level	0 ± 0.5 v	0 ± 0.5 v	0 ± 0.5 v	0 ± 0.5 v	0 ± 0.5 v
Low level	-10 ± 1.0 v	-10 ± 1.0 v	-10 ± 1.0 v	-10 ± 1.0 v	-10 ± 1.0 v
Rise time	10 ± 5 uS	10 ± 5 uS	1.5 ± 0.5 uS	1.5 ± 0.5 uS	1.5 ± 0.5 uS
Fall time	10 ± 5 uS	10 ± 5 uS	1.5 ± 0.5 uS	1.5 ± 0.5 uS	1.5 ± 0.5 uS

11.11 CSDB Output Ports

Measure the differential pulse characteristics of all of the CSDB Output ports and verify that they meet requirements per the following table. All measurements are taken with NO load on the port.

Parameter	Port A P1-1(A) P1-2(B)	Port B P1-23(A) P1-24(B)
Bit rate	12.5 KHz ± 0.1 %	12.5 KHz ± 0.1 %
High level	NLT 3.5 Vdc	NLT 3.5 Vdc
Low level	NLT 0 Vdc, NMT 0.5 Vdc	NLT 0 Vdc, NMT 0.5 Vdc
Rise time	NMT 8.0 µS	NMT 8.0 µS
Fall time	NMT 8.0 µS	NMT 8.0 µS

11.12 Arinc 429/CSDB Select Strap

Set the Arinc 429 Input tuning data per the following table:

UUT Equipment Channel	Frequency (CH #)
1	117.90 MHz (126X)
2	117.90 MHz (126X)
3	117.90 MHz (126X)

Set the CSDB Input tuning data per the following table:

UUT Equipment Channel	Frequency (CH #)
1	134.40 MHz (1X)
2	134.40 MHz (1X)
3	134.40 MHz (1X)

1. Provide the Arinc 429 Input tuning data to Arinc 429 Port B of the UUT.
2. Provide the CSDB Input tuning data to CSDB Port B of the UUT.
3. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating a ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 117.90 MHz.
4. Select CSDB tuning by connecting the Arinc429/CSDB select strap to ground (P1-50 to P1-65).
5. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 134.40 MHz.

11.13 Port A/B Select Strap with CSDB Input Tuning

Set the CSDB Input tuning data per the following table:

UUT Equipment Channel	Frequency (CH #)
1	134.40 MHz (1X)
2	134.40 MHz (1X)
3	134.40 MHz (1X)

1. Verify that CSDB tuning is still selected.
2. Verify that Port B is still selected.
3. Provide the CSDB Input tuning data to the CSDB Port A of the UUT.
4. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “10” respectively, indicating a ‘NCD’ status.
5. Set all three Arinc 429 Input tuning labels to 133.70 MHz (64X)
6. Select Input tuning Port A by connecting the Port A/B select strap to ground (P1-55 to P1-65).
7. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating a ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 133.70 MHz.
8. Select Input tuning Port B by removing the Port A/B select strap from ground (P1-55 from P1-65).
9. Set all three Arinc 429 Input tuning labels to 117.90 MHz (126X).
10. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “10” respectively, indicating a ‘NCD’ status.
11. Change the CSDB tuning data to CSDB Port B of the UUT.
12. The SSM (bits 30 and 31) of the UUT Arinc 429 output frequency (Label 035) for all three equipment channels shall be “00”, indicating a ‘Normal’ status. The Arinc 429 output frequency for all three equipment channels shall be 117.90 MHz.

11.14 Self-Test and Diagnostics

11.14.1 Serial and Discrete Self-Test

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Modulation
1	134.40 MHz (1X)	-88	50.0	70 %	2700	ON
2	133.70 MHz (64X)	-88	50.0	70 %	2700	ON

UUT Equipment Channel	Frequency (CH #)
1	134.40 MHz (1X)
2	133.70 MHz (64X)
3	133.65 MHz (63Y)

1. Set Signal Generator #1 and #2 Ident to “CODE”.
2. While monitoring UUT equipment channel 1 Arinc 429 output labels, activate the self-test for equipment channel 1 by setting the SSM (bits 30 and 31) of the Input tuning label to “01” respectively, indicating “Self-test”.
3. The Arinc 429 output labels for equipment channel 1 shall be as follows:
   Distance (both Binary and BCD) = 100 ± 0.1 nm.
   Velocity = 100 ± 1 knots
   Time-to-Station = 60 ± 1 minutes
   Station Identifier = “AOK”
   Audio Identifier output = “AOK” (.- --- -.-)
4. Repeat steps 2 and 3 for UUT equipment channel 2.

5. Repeat steps 2 and 3 for UUT equipment channel 3. Exclude the Ident Audio output check.
6. Turn off Signal Generators #1 and #2.
7. Activate self-test by connecting the discrete self-test to ground (P1-46 to P1-65).
8. The Arinc 429 output labels for all three UUT equipment channels shall be as follows:
   Distance (both Binary and BCD) = 100 ± 0.1 nm.
   Velocity = 100 ± 1 knots
   Time-to-Station = 60 ± 1 minutes
   Station Identifier = "AOK"
9. The audio identifier "AOK" shall be present on Audio Identifier outputs #1 and #2.

11.14.2 Fault Detection

Using the following table, simulate diagnostic faults and verify proper codes are displayed in the Arinc 429 diagnostics (Label 350).

CODE	SIMULATED FAILURE	TEST POINT
01	POWER SUPPLY	TBD
02	SYNTHESIZER	TBD
03	TRANSMITTER	TBD

1. The Input Port B monitor fault shall be stimulated by removing the ARINC 429 tuning data from Arinc 429 Input Port B. The diagnostic word (label 350) bit 28 shall be set to a "1" and the diagnostic code shall be set to '09'.
2. The Input Port A monitor fault shall be stimulated by removing the ARINC 429 tuning data from Arinc 429 Input Port A. The diagnostic word (label 350) bit 29 shall be set to a "1" and the diagnostic code shall be set to '10'.

11.15 Suppression

Setup the signal generators and the Arinc 429 Input tuning data per the following tables:

Sig. Gen.	Frequency (CH #)	RF Level (dBm)	Distance (nm)	Reply Efficiency	Squitter Rate	Tacan Modulation
1	134.40 MHz (1X)	-88	10.0	70 %	2700	ON
2	133.70 MHz (64X)	OFF	50.0	70 %	2700	ON

UUT Equipment Channel	Frequency (CH #)
1	134.40 MHz (1X)
2	133.70 MHz (64X)
3	133.65 MHz (63Y)

1. Connect the suppression load described in paragraph 5.6 between the Suppression I/O output (P1-48) and Suppression shield (P1-54).
2. Connect an oscilloscope in parallel with the suppression load.
3. The amplitude of the suppression pulses shall be NLT 25 Vp-p and NMT 31 Vp-p.
4. With the oscilloscope synchronized to the suppression pulses, display the detected transmitter output pulses (detector output of the DME test set).

5. The suppression pulse shall reach 18 volts amplitude, 3 to 8 microseconds before the rising edge of the first transmitted pulse reaches its 10% point.
6. The suppression pulse shall remain above 18 volts amplitude between the 10% point of the rising edge of the first transmitted pulse, until the 10% point of the falling edge of the second transmitter pulse.
7. Disconnect the suppression load from the Suppression I/O output.
8. Verify that UUT equipment channel 1 Arinc 429 distance output is 10.0 ± 0.1 nm.
9. Connect the Suppressor output of Signal Generator #1 to the Suppression I/O output (P1-48) and Suppression shield (P1-54).
10. Set the Signal Generator #1 Suppressor switch to “ON”, then wait 15 seconds.
11. UUT equipment channel 1 shall lose lock and the SSM (bits 30 and 31) of the Arinc 429 distance output (Label 202) shall be “10” respectively, indicating a ‘NCD’ condition.
12. Set the Signal Generator #1 Suppressor switch to “OFF”.
13. UUT equipment channel 1 shall lock on and the Arinc 429 distance output (Label 202) shall be 10.0 ± .01 nm.

11.16 R/T On/Standby

1. Place the UUT into standby by connecting the RT On/Standby discrete to ground (P1-47 to P1-65).
2. The UUT current draw shall be NMT 0.03 amps.
3. Turn the UUT back on by removing the RT On/Standby discrete from ground (P1-47 from P1-65).

11.17 Equipment Identifier

1. Bits 25-29 of ARINC 429 “equipment identifier” label 371 shall be all zeroes.

11.18 Final Checks

Remove powers from UUT and disconnect UUT from test apparatus. Replace dust cover on UUT. Perform any final auto-test procedures applicable.

12 Production Test Data for DME-4000 Distance Measuring Equipment

Technician: _____ Date: _____
Part #: _____ Serial #: _____

Record all data in the blanks provided.

Test	Test Limits	Result
Alignment, burn-in, And warm-up complete	Yes	_____

12.1 Interrogator Pulse Characteristics

12.1.1 134.40 MHz (1X)

Peak Power Out, 1ST Pulse	NLT 350W	_____
Peak Power Out, 2ND Pulse	NLT 350W	_____
Peak Power Difference	1st Pulse NMT 1 dB Diff from 2nd pulse	_____
Pulse Rise Time	NMT 3 µsec	_____
Pulse Fall Time	NMT 3.5 µsec	_____
Pulse Duration	3.5 ±0.5 µsec	_____
Pulse Shape	Round and Smooth	_____

12.1.2 133.75 MHz (64Y)

Peak Power Out, 1ST Pulse	NLT 350W	_____
Peak Power Out, 2ND Pulse	NLT 350W	_____
Peak Power Difference	1st Pulse NMT 1 dB Diff from 2nd pulse	_____
Pulse Rise Time	NMT 3 µsec	_____
Pulse Fall Time	NMT 3.5 µsec	_____
Pulse Duration	3.5 ±0.5 µsec	_____
Pulse Shape	Round and Smooth	_____

12.1.3 117.90 MHz (126X)

Peak Power Out, 1ST Pulse	NLT 350W	_____
Peak Power Out, 2ND Pulse	NLT 350W	_____
Peak Power Difference	1st Pulse NMT 1 dB Diff from 2nd pulse	_____
Pulse Rise Time	NMT 3 µsec	_____
Pulse Fall Time	NMT 3.5 µsec	_____
Pulse Duration	3.5 ±0.5 µsec	_____
Pulse Shape	Round and Smooth	_____

Technician: _____ Date: _____
Part #: _____ Serial #: _____

12.1.4 Interrogator Frequency Stability

134.40 MHz	1025 MHz ±15 kHz	_____
133.70 MHz	1088 MHz ±15 kHz	_____
117.90 MHz	1150 MHz ±15 kHz	_____

12.1.5 Interrogator PRF

Initial	0 PPS	_____
Track	6 ±1 PPS	_____
Search	24 ±1 PPS	_____
Successive Pulse Pair Spacing	Not Constant	_____
Search (3 Channels)	NLT 64, NMT 75 PPS	_____

12.1.6 Interrogator Spurious Transmissions

134.40 MHz	Spur Level NMT –45 dBc	_____
133.70 MHz	Spur Level NMT –45 dBc	_____
117.90 MHz	Spur Level NMT –45 dBc	_____

12.2 Receiver Characteristics

12.2.1 Receiver Sensitivity

UUT Ch. 1 (64Y)	NMT –88 dBm	_____
UUT Ch. 2 (126X)	NMT –88 dBm	_____
UUT Ch. 1 (64X)	NMT –88 dBm	_____
UUT Ch. 1 (1X)	NMT –88 dBm	_____

12.2.2 Receiver Lock-On Time

RF Level –83 dBm	NMT 2 seconds	_____
RF Level –10 dBm	NMT 2 seconds	_____

12.2.3 Receiver Decoder Selectivity – X channel

Pulse spacing 11.5 µS	100 ± 0.1 nm.	_____
Pulse spacing 12.5 µS	50 ± 0.1 nm.	_____

12.2.4 Receiver Decoder Selectivity – Y Channel

Pulse spacing 29.5 µS	100 ± 0.1 nm.	_____
Pulse spacing 30.5 µS	50 ± 0.1 nm.	_____

Technician: _____ Date: _____
Part #: _____ Serial #: _____

12.2.5 Receiver Decoder Rejection – X Channel

Pulse spacing 8.0 µS	No Lock-on	_____
Pulse spacing 16.0 µS	No Lock-on	_____

12.2.6 Receiver Decoder Rejection – Y Channel

Pulse spacing 26.0 µS	No Lock-on	_____
Pulse spacing 34.0 µS	No Lock-on	_____

12.2.7 Echo Susceptibility

Arinc 429 Dist, Ch. 1	50.0 ± 0.1 nm.	_____
Lock-on Time	NMT 10 seconds	_____
Arinc 429 Dist, Ch. 1	30.0 ± 0.1 nm.	_____
Lock-on Time	NMT 10 seconds	_____

12.2.8 Co-channel Signal Rejection – X Channel

Arinc 429 Dist, Ch. 1	50.0 ± 0.1 nm.	_____
Audio output, Ch. 1	Clear and unambiguous	_____
-73 dBm, Audio output, Ch. 1	Absent, garbled, or both idents	_____

12.2.9 Co-channel Signal Rejection – Y Channel

Arinc 429 Dist, Ch. 1	50.0 ± 0.1 nm.	_____
Audio output, Ch. 1	Clear and unambiguous	_____
-73 dBm, Audio output, Ch. 1	Absent, garbled, or both idents	_____

12.2.10 Co-channel Signal Rejection – Random Interference

Arinc 429 Dist, Ch. 1	50.0 ± 0.1 nm.	_____
Audio output, Ch. 1	Clear and unambiguous	_____

12.2.11 Signal Rejection – On-Code, Off-Frequency

Arinc 429 Dist, Ch. 1	50.0 ± 0.1 nm.	_____

12.3 Memory Time

Memory time, 100 nm.	NLT 10 sec., NMT 14 sec.	_____
Re-acquisition distance	NMT ± 1.0 nm difference	_____
Memory time, 200 kts.	NLT 10 sec., NMT 14 sec.	_____
Memory speed	200 ± 2 knots, during memory time	_____

Technician: _____ Date: _____
Part #: _____ Serial #: _____

12.4 Identification

Audio output #1, tone	16.0 ± 1.0 Vpp	_____
Audio output #2, tone	16.0 ± 1.0 Vpp	_____
Audio output #1, code	Clear and unambiguous	_____
Audio output #2, code	Clear and unambiguous	_____
Arinc 429 Dist, Ch. 1	100.0 ± 0.1 nm.	_____
Arinc 429 Dist, Ch. 2	100.0 ± 0.1 nm.	_____
Arinc 429 Identifier, Ch. 1	Correct ASCII identifier	_____
Arinc 429 Identifier, Ch. 2	Correct ASCII identifier	_____

12.5 Distance Requirements

12.5.1 Distance Accuracy

Test #	Ch. 1	Ch. 2	Arinc 429	CSDB
1	NMT 0.1 nm.	5.5 ± 0.1 nm.	_____	_____
2	16.6 ± 0.1 nm.	47.7 ± 0.1 nm.	_____	_____
3	78.8 ± 0.1 nm.	99.9 ± 0.1 nm.	_____	_____
4	121.1 ± 0.1 nm.	152.2 ± 0.1 nm.	_____	_____
5	183.3 ± 0.1 nm.	234.4 ± 0.1 nm.	_____	_____
6	255.9 ± 0.1 nm.	300.0 ± 0.1 nm.	_____	_____
7	Invalid	300.0 ± 0.1 nm.	_____	_____
8	NMT 0.1 nm.	100.0 ± 0.1 nm.	_____	_____
9	Invalid	Invalid	_____	_____

12.5.2 Distance Accuracy – Minimum Supply Voltage

Test #	Ch. 1	Ch. 2	Arinc 429	CSDB
1	NMT 0.1 nm.	5.5 ± 0.1 nm.	_____	_____
2	16.6 ± 0.1 nm.	47.7 ± 0.1 nm.	_____	_____
3	78.8 ± 0.1 nm.	99.9 ± 0.1 nm.	_____	_____
4	121.1 ± 0.1 nm.	152.2 ± 0.1 nm.	_____	_____
5	183.3 ± 0.1 nm.	234.4 ± 0.1 nm.	_____	_____
6	255.9 ± 0.1 nm.	300.0 ± 0.1 nm.	_____	_____
7	Invalid	300.0 ± 0.1 nm.	_____	_____
8	NMT 0.1 nm.	100.0 ± 0.1 nm.	_____	_____
9	Invalid	Invalid	_____	_____

Technician: _____ Date: _____
Part #: _____ Serial #: _____

12.5.3 Distance Accuracy – Reduced Squitter Rate, X Channel

Arinc 429 Dist, Ch. 1	NMT 0.1 nm.	_____

12.5.4 Distance Accuracy – Reduced Squitter Rate, Y Channel

Arinc 429 Dist, Ch. 1	NMT 0.1 nm.	_____

12.6 Ground Speed and Time-To-Station Accuracy

200 knots outbound		
Arinc 429 Gndspd, Ch. 1	200 ± 20 knots	_____
200 knots inbound		
Arinc 429 Gndspd, Ch. 1	200 ± 20 knots	_____
Time to > 540 knots Gndspd	NMT 30 seconds	_____
Time-to-station @ 60 nm.	6 ± 1 minutes	_____

12.7 Port A/B and Port C Select Straps with Arinc 429 Input Tuning

Port B in, Port A selected	SSM = NCD, bit 30 = 1, bit 31 = 0	_____
Port A in, Port A selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____
Arinc 429, Freq., Ch. 1-3	117.90 MHz	_____
Port A in, Port B selected	SSM = NCD, bit 30 = 1, bit 31 = 0	_____
Port B in, Port B selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____
Arinc 429, Freq., Ch. 1-3	134.40 MHz	_____
Port B in, Port C selected	SSM = NCD, bit 30 = 1, bit 31 = 0	_____
Port C in, Port C selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____
Arinc 429, Freq., Ch. 1-3	117.90 MHz	_____

12.8 Side 1/Side 2 Select Strap

Side 1 in, Side 2 selected	SDI = Side 2, bit 9= 0, bit 10 = 1	_____
	SSM = NCD, bit 30 = 1, bit 31 = 0	_____
Side 2 in, Side 2 selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____
Arinc 429, Freq., Ch. 1-3	133.70 MHz	_____
Side 2 in, Side 1 selected	SDI = Side 1, bit 9= 1, bit 10 = 0	_____
	SSM = NCD, bit 30 = 1, bit 31 = 0	_____
Side 1 in, Side 1 selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____
Arinc 429, Freq., Ch. 1-3	117.90 MHz	_____

12.9 Burst Tune Enable Strap

Cont. in, Cont. selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____
Arinc 429, Freq., Ch. 1-3	117.90 MHz	_____
Burst in, Cont. selected	SSM = NCD, bit 30 = 1, bit 31 = 0	_____
Burst in, Burst selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____

Technician: _____ Date: _____
Part #: _____ Serial #: _____

12.10 Arinc 429 Output Ports

Parameter	Test Limits	Port A	Port B	Port C	Port D	Maint.
Bit Rate	12.5 KHz	_____	_____	N/A	N/A	N/A
Bit Rate	100 KHz	N/A	N/A	_____	_____	_____
High Level	+10 ± 1.0 V	_____	_____	_____	_____	_____
Null Level	0 ± 0.5 V	_____	_____	_____	_____	_____
Low Level	-10 ± 1.0 V	_____	_____	_____	_____	_____
Rise Time	10 ± 5 µS	_____	_____	N/A	N/A	N/A
Rise Time	1.5 ± 0.5 µS	N/A	N/A	_____	_____	_____
Fall Time	10 ± 5 µS	_____	_____	N/A	N/A	N/A
Fall Time	1.5 ±0.5 µS	N/A	N/A	_____	_____	_____

12.11 CSDB Output Ports

Parameter	Test Limits	Port A	Port B
Bit Rate	12.5 KHz ± 0.1%	_____	_____
High Level	NLT 3.5 Vdc	_____	_____
Low Level	NLT 0 Vdc, NMT 0.5 Vdc	_____	_____
Rise Time	NMT 8 µS	_____	_____
Fall Time	NMT 8 µS	_____	_____

12.12 Arinc 429/CSDB Select Strap

429 & CSDB in, 429 selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____
Arinc 429, Freq., Ch. 1-3	117.90 MHz	_____
429 & CSDB in, CSDB selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____
Arinc 429, Freq., Ch. 1-3	134.40 MHz	_____

12.13 Port A/B Select Strap with CSDB Input Tuning

Port A in, Port B selected	SSM = NCD, bit 30 = 1, bit 31 = 0	_____
Port A in, Port A selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____
Arinc 429, Freq., Ch. 1-3	133.70 MHz	_____
Port A in, Port B selected	SSM = NCD, bit 30 = 1, bit 31 = 0	_____
Port B in, Port B selected	SSM = NML, bit 30 = 0, bit 31 = 0	_____
Arinc 429, Freq., Ch. 1-3	117.90 MHz	_____

Technician: _____ Date: _____
Part #: _____ Serial #: _____

12.14 Self-Test and Diagnostics

12.14.1 Serial and Discrete Self-Test

Self test initiated via 429.

ARINC 429 outputs:		CH 1 (√)	CH 2 (√)	CH 3 (√)
Distance	100 ±.01 NM	____	____	____
Velocity	100 ±1 KTS	____	____	____
TTS	60 ±1 MIN	____	____	____
Identifier	"AOK"	____	____	____
Audio Identifier	#1 and #2	____	____	

Self test initiated via discrete (P1-46)

ARINC 429 outputs:		CH 1 (√)	CH 2 (√)	CH 3 (√)
Distance	100 ±.01 NM	____	____	____
Velocity	100 ±1 KTS	____	____	____
TTS	60 ±1 MIN	____	____	____
Identifier	"AOK"	____	____	____
Audio Identifier	#1 and #2	____	____	

12.14.2 Fault Detection

ARINC 429:		CODE (√)
Power Supply	Fault Code '01'	_____
Synthesizer	Fault Code '02'	_____
Transmitter	Fault Code '03'	_____

Input Port B Monitor

	(√)
ARINC 429 Label 350 BIT 28 = "1"	_____
Port B Fault Code '09'	_____

Input Port A Monitor

	(√)
ARINC 429 Label 350 BIT 29 = "1"	_____
Port B Fault Code '10'	_____

Technician: _____ Date: _____
Part #: _____ Serial #: _____

12.15 Suppression

Amplitude	NLT 25 Vp-p, NMT 31 Vp-p	_____
Timing – Rising edge P1	3-8 μS before P1	_____
Pulse Duration	NLT 18 V, 10% P1 to 10% P2	_____
External Suppression – ON		
Arinc 429 Dist, Ch. 1	SSM (bits 30 & 31) “10”, NCD	_____
External Suppression - OFF		
Arinc 429 Dist, Ch. 1	10.0 ± 0.1 nm.	_____

12.16 R/T ON/OFF

UUT Current	NMT 0.03 Amps	_____

12.17 Equipment Identifier

ARINC 429 Label 371	BITS 25-29 all zeroes	_____

12.18 Final checks

UUT removed from test setup, dust covers in place	_____
Final auto-test procedures completed as applicable	_____

Appendix A – DME Frequencies Table

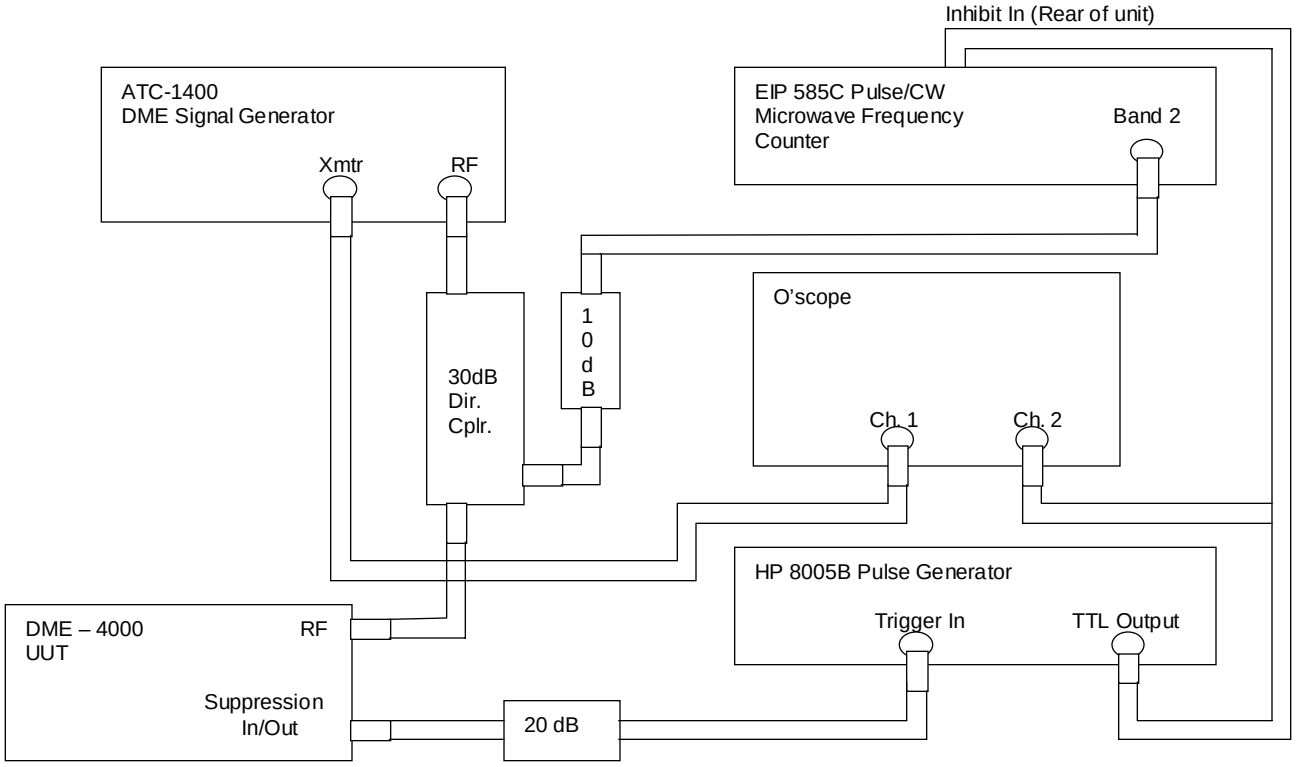
DME Channel Number	DME Gnd to Air (MHz)	DME Air to Gnd (MHz)	VHF		DME Channel Number	DME Gnd to Air (MHz)	DME Air to Gnd (MHz)	VHF
1X	962	1025	134.40		24X	985	1048	108.70
1Y	1088	1025	134.45		24Y	1111	1048	108.75
2X	963	1026	134.50		25X	986	1049	108.80
2Y	1089	1026	134.55		25Y	1112	1049	108.85
3X	964	1027	134.60		26X	987	1050	108.90
3Y	1090	1027	134.65		26Y	1113	1050	108.95
4X	965	1028	134.70		27X	988	1051	109.00
4Y	1091	1028	134.75		27Y	1114	1051	109.05
5X	966	1029	134.80		28X	989	1052	109.10
5Y	1092	1029	134.85		28Y	1115	1052	109.15
6X	967	1030	134.90		29X	990	1053	109.20
6Y	1093	1030	134.95		29Y	1116	1053	109.25
7X	968	1031	135.00		30X	991	1054	109.30
7Y	1094	1031	135.05		30Y	1117	1054	109.35
8X	969	1032	135.10		31X	992	1055	109.40
8Y	1095	1032	135.15		31Y	1118	1055	109.45
9X	970	1033	135.20		32X	993	1056	109.50
9Y	1096	1033	135.25		32Y	1119	1056	109.55
10X	971	1034	135.30		33X	994	1057	109.60
10Y	1097	1034	135.35		33Y	1120	1057	109.65
11X	972	1035	135.40		34X	995	1058	109.70
11Y	1098	1035	135.45		34Y	1121	1058	109.75
12X	973	1036	135.50		35X	996	1059	109.80
12Y	1099	1036	135.55		35Y	1122	1059	109.85
13X	974	1037	135.60		36X	997	1060	109.90
13Y	1100	1037	135.65		36Y	1123	1060	109.95
14X	975	1038	135.70		37X	998	1061	110.00
14Y	1101	1038	135.75		37Y	1124	1061	110.05
15X	976	1039	135.80		38X	999	1062	110.10
15Y	1102	1039	135.85		38Y	1125	1062	110.15
16X	977	1040	135.90		39X	1000	1063	110.20
16Y	1103	1040	135.95		39Y	1126	1063	110.25
17X	978	1041	108.00		40X	1001	1064	110.30
17Y	1104	1041	108.05		40Y	1127	1064	110.35
18X	979	1042	108.10		41X	1002	1065	110.40
18Y	1105	1042	108.15		41Y	1128	1065	110.45
19X	980	1043	108.20		42X	1003	1066	110.50
19Y	1106	1043	108.25		42Y	1129	1066	110.55
20X	981	1044	108.30		43X	1004	1067	110.60
20Y	1107	1044	108.35		43Y	1130	1067	110.65
21X	982	1045	108.40		44X	1005	1068	110.70
21Y	1108	1045	108.45		44Y	1131	1068	110.75
22X	983	1046	108.50		45X	1006	1069	110.80
22Y	1109	1046	108.55		45Y	1132	1069	110.85
23X	984	1047	108.60		46X	1007	1070	110.90
23Y	1110	1047	108.65		46Y	1133	1070	110.95

DME Channel Number	DME Gnd to Air (MHz)	DME Air to Gnd (MHz)	VHF		DME Channel Number	DME Gnd to Air (MHz)	DME Air to Gnd (MHz)	VHF
47X	1008	1071	111.00		72X	1159	1096	112.50
47Y	1134	1071	111.05		72Y	1033	1096	112.55
48X	1009	1072	111.10		73X	1160	1097	112.60
48Y	1135	1072	111.15		73Y	1034	1097	112.65
49X	1010	1073	111.20		74X	1161	1098	112.70
49Y	1136	1073	111.25		74Y	1035	1098	112.75
50X	1011	1074	111.30		75X	1162	1099	112.80
50Y	1137	1074	111.35		75Y	1036	1099	112.85
51X	1012	1075	111.40		76X	1163	1100	112.90
51Y	1138	1075	111.45		76Y	1037	1100	112.95
52X	1013	1076	111.50		77X	1164	1101	113.00
52Y	1139	1076	111.55		77Y	1038	1101	113.05
53X	1014	1077	111.60		78X	1165	1102	113.10
53Y	1140	1077	111.65		78Y	1039	1102	113.15
54X	1015	1078	111.70		79X	1166	1103	113.20
54Y	1141	1078	111.75		79Y	1040	1103	113.25
55X	1016	1079	111.80		80X	1167	1104	113.30
55Y	1142	1079	111.85		80Y	1041	1104	113.35
56X	1017	1080	111.90		81X	1168	1105	113.40
56Y	1143	1080	111.95		81Y	1042	1105	113.45
57X	1018	1081	112.00		82X	1169	1106	113.50
57Y	1144	1081	112.03		82Y	1043	1106	113.55
58X	1019	1082	112.10		83X	1170	1107	113.60
58Y	1145	1082	112.15		83Y	1044	1107	113.65
59X	1020	1083	112.20		84X	1171	1108	113.70
59Y	1146	1083	112.25		84Y	1045	1108	113.75
60X	1021	1084	133.30		85X	1172	1109	113.80
60Y	1147	1084	133.35		85Y	1046	1109	113.85
61X	1022	1085	133.40		86X	1173	1110	113.90
61Y	1148	1085	133.45		86Y	1047	1110	113.95
62X	1023	1086	133.50		87X	1174	1111	114.00
62Y	1149	1086	133.55		87Y	1048	1111	114.05
63X	1024	1087	133.60		88X	1175	1112	114.10
63Y	1150	1087	133.65		88Y	1049	1112	114.15
64X	1151	1088	133.70		89X	1176	1113	114.20
64Y	1025	1088	133.75		89Y	1050	1113	114.25
65X	1152	1089	133.80		90X	1177	1114	114.30
65Y	1026	1089	133.85		90Y	1051	1114	114.35
66X	1153	1090	133.90		91X	1178	1115	114.40
66Y	1027	1090	133.95		91Y	1052	1115	114.45
67X	1154	1091	134.00		92X	1179	1116	114.50
67Y	1028	1091	134.05		92Y	1053	1116	114.55
68X	1155	1092	134.10		93X	1180	1117	114.60
68Y	1029	1092	134.15		93Y	1054	1117	114.65
69X	1156	1093	134.20		94X	1181	1118	114.70
69Y	1030	1093	134.25		94Y	1055	1118	114.75
70X	1157	1094	112.30		95X	1182	1119	114.80
70Y	1031	1094	112.35		95Y	1056	1119	114.85
71X	1158	1095	112.40		96X	1183	1120	114.90
71Y	1032	1095	112.45		96Y	1057	1120	114.95

DME Channel Number	DME Gnd to Air (MHz)	DME Air to Gnd (MHz)	VHF		DME Channel Number	DME Gnd to Air (MHz)	DME Air to Gnd (MHz)	VHF
97X	1184	1121	115.00		112X	1199	1136	116.50
97Y	1058	1121	115.05		112Y	1073	1136	116.55
98X	1185	1122	115.10		113X	1200	1137	116.60
98Y	1059	1122	115.15		113Y	1074	1137	116.65
99X	1186	1123	115.20		114X	1201	1138	116.70
99Y	1060	1123	115.25		114Y	1075	1138	116.75
100X	1187	1124	115.30		115X	1202	1139	116.80
100Y	1061	1124	115.35		115Y	1076	1139	116.85
101X	1188	1125	115.40		116X	1203	1140	116.90
101Y	1062	1125	115.45		116Y	1077	1140	116.95
102X	1189	1126	115.50		117X	1204	1141	117.00
102Y	1063	1126	115.55		117Y	1078	1141	117.05
103X	1190	1127	115.60		118X	1205	1142	117.10
103Y	1064	1127	115.65		118Y	1079	1142	117.15
104X	1191	1128	115.70		119X	1206	1143	117.20
104Y	1065	1128	115.75		119Y	1080	1143	117.25
105X	1192	1129	115.80		120X	1207	1144	117.30
105Y	1066	1129	115.85		120Y	1081	1144	117.35
106X	1193	1130	115.90		121X	1208	1145	117.40
106Y	1067	1130	115.95		121Y	1082	1145	117.45
107X	1194	1131	116.00		122X	1209	1146	117.50
107Y	1068	1131	116.05		122Y	1083	1146	117.55
108X	1195	1132	116.10		123X	1210	1147	117.60
108Y	1069	1132	116.15		123Y	1084	1147	117.65
109X	1196	1133	116.20		124X	1211	1148	117.70
109Y	1070	1133	116.25		124Y	1085	1148	117.75
110X	1197	1134	116.30		125X	1212	1149	117.80
110Y	1071	1134	116.35		125Y	1086	1149	117.85
111X	1198	1135	116.40		126X	1213	1150	117.90
111Y	1072	1135	116.45		126Y	1087	1150	117.95

Appendix B – Frequency Measurement Method

Test Equipment:
IFR ATC-1400 DME Signal Generator
EIP 585C Pulse/CW Microwave Frequency Counter
HP 8005B Pulse Generator or equivalent
30 dB Directional Coupler
20 dB Attenuator
10 dB Attenuator



Measurement Procedure:

1. Set the Signal Generator reply efficiency to zero.
2. Tune all 3 UUT Channels and the Signal Generator to the desired frequency.
3. Verify on the Signal Generator that the UUT is in search mode.
4. Adjust the Pulse Generator width control for a 2 μS wide single pulse at the TTL output.
5. Adjust the Pulse Generator delay control to center the 2 μS pulse within the P1 or P2 transmitter pulse.
6. Set the center frequency of the EIP Frequency counter for the transmit frequency (ie: 1025, 1088, or 1150 MHz).
7. Set the minimum PRF of the EIP Frequency counter to 50 Hz.
8. After approximately 7-10 seconds, the Frequency counter will display the transmitter frequency.
9. Repeat steps 2-8 for the other transmit frequencies.

Appendix C– 5V to 3.3V Logic Converter