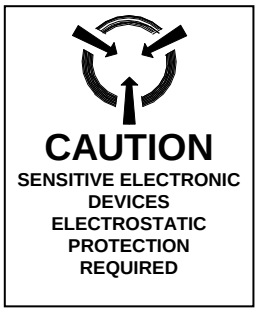
APPLICATION		
DASH NO.	**NEXT**	**USED ON**
0002	PL120588-0002	ILS 420

REVISIONS			
REV	**DESCRIPTION**	**DATE**	**APPROVED**
A	FINAL RELEASE PER ECN 02575	2/14/06	M.McNally
B	Updated PWR setting to 30 W Per ECN 02815	8/29/06	M.McNally
C	Add test to verify TP1 and TP2 Per ECN 03687	10/15/08	M.McNally



REVISION	**C**
SHEET NO.	**1-25**
CONT. NO.	THALES AIR TRAFFIC MANAGEMENT — **THALES ATM, INC.** SHAWNEE, KANSAS

First release signatures below. Subsequent versions signatures per ECN	
DRAWING/CHECKED Y M.MCNALLY	2/14/06
E.E. APPROVAL N/A	
M.E. APPROVAL N/A	
T.E. APPROVAL M. MCNALLY	2/14/06
Q.A. APPROVAL L.STROH	2/14/06
CONF. MGMT. M.GRAY	2/14/06

TEST PROCEDURE:

ILS 420 LOC MOD PA

SIZE	**FSCM NO.**	**DWG NO.**	**REV**
A	**65597**	**TP120588-0002**	**C**

SCALE		**SHEET**
NONE	**FSC**	**1 OF 25**

1. Scope

This Test Procedure verifies the electrical performance of the ILS 420 Localizer Modulator Power Amplifier assembly, Thales P/N 120588-0002.

2. Notes

***** CAUTION *****

The UUT and its components are ESD sensitive. ESD precautions should be taken when handling the UUT and its components.

***** CAUTION *****

Except as required during testing, the RF outputs of the UUT, J 2 and J 3, must always be terminated with 50 Ohm loads capable of handling the full power output of the UUT. Extended Operation of the UUT into an open circuit can result in instability, this may potentially damage the RF output transistors.

3. Applicable Documents

PL120588-0002a
EL120588-0002a
AD120588-0002a
EL1291-60148-1a

4. Required Equipment

Equivalent equipment may be substituted for the items listed below. Substitute equipment is acceptable provided it meets either the accuracy, and resolution specifications of the original item, or minimally meets the tolerances and accuracy where defined in the body of the test procedure.

FIG 1 Item	FIG 2 Item	Description
A,E		+24V PWR Supply >9Amps with current display HP6038A
B,C		±15V PWR Supply HPE3631A
D		Audio Oscillator HP209A
F	F	LOC/GS PA Test Fixture
I		Digital Multimeter HP34401A
J	S	Oscilloscope 400MHz TEKTRONIX 2465B
	A,L,F	>20dB Coupler
	B,G	30dB 100W Attn.
	C,H	10 dB 1W Attn.
	D,I	20dB 1W Attn.
	E,J	Thermal PWR Meter HP437B
	K	RF Freq. Synthesizer HP8656B
	N	Vector Volt meter HP8405A
	P,Q	Power Divider
	R	Spectrum Analyzer HP8568B
	X	50Ω load 25W
	Y	Fan

5. Test Procedure

5.1 Test Equipment Setup.

Configure the test equipment as indicated in figures 1 and 2. Figure 1 shows the connections between the test fixture, the UUT, and the RF test equipment group. Figure 2 shows the connections within the RF test equipment group for Test of the CSB section of the UUT.

Figure 3 shows the connections within the RF test equipment group for Test of the SBO section of the UUT.

All Figures are located in Section 7.

5.1.1 RF Test Group Calibration.

This procedure shall be performed or verified as required to ensure the offset entered into the thermal power meters is correct. It must be performed after removal, re-connection, or substitution of the associated attenuators, power meters, or couplers in the RF Test Group, other than as required for testing in this procedure.

Use a network analyzer to determine the total RF attenuation via the RF path from the cable at J2 to the connection point of the power sensor for the CSB Power Meter, Box 1 in Figure 2. Measure this attenuation to an accuracy of ± 0.1 dB at the test frequency of 110 MHz.

Use a network analyzer to determine the VSWR that the amplifier will see. Connect Port 1 of the network analyzer to the cable that will hook to J2 on the amplifier going to the coupler Item F in Figure 2. Verify that the VSWR is less than 1.15.

Perform a power meter calibration for the CSB power meter. Ensure that the offset is turned off.

Enter the attenuation “offset” into the power meter offset memory. Enable “offset” on the power meter.

Use a network analyzer to determine the total RF attenuation via the RF path from the cable at J3 to the connection point of the power sensor for the SBO Power Meter, Box 2 in Figure 2. Measure this attenuation to an accuracy of ± 0.1 dB at the test frequency of 110 MHz.

Use a network analyzer to determine the VSWR that the amplifier will see. Connect Port 1 of the network analyzer to the cable that will hook to J3 on the amplifier going to the coupler Item A in Figure 2. Verify that the VSWR is less than 1.15.

Perform a power meter calibration for the SBO power meter. Ensure that the offset is turned off.

Enter the attenuation “offset” into the power meter offset memory. Enable “offset” on the power meter.

5.2 Initial Adjustments.

Set the Test Fixture controls as follows:

SW1	CSB Audio	Off
SW2	SBO Audio	Off
SW4	I Phase	Off
SW5	Q Phase	Off
SW6	I-Q AC/DC Coupling	AC
R2	CSB % Modulation	CCW
R3	CSB Power	CCW
R4	SBO Audio Modulation Level	CCW
R5	SBO Power	CCW

Prior to application of power, locate R66, R67, and R140. Set each of the variable resistors fully counter clockwise to remove the bias from the RF power transistors.

Additionally, locate and set R111, R122, and R42 fully CCW.

Next, locate R170, and R172. Apply only +15 and -15 volts to the UUT. Do not apply +24 volts.

Connect one probe of the multi-meter to the side of R171 that connects to the wiper of R170 and the other to ground. Adjust R170 for 0 ±0.01 Volts DC.

Check the verification box on the data sheet.

Connect one probe of the multi-meter to the side of R173 that connects to the wiper of R172 and the other to ground. Adjust R170 for 0 ±0.01 Volts DC. This ensures that no initial DC offset is applied to the SBO Input amplifiers.

Check the verification box on the data sheet.

5.2.1 Initial Adjustments:

Specification: R170 Verified R170 verified _____

Specification: R172 Verified R172 verified _____

5.3 Set RF Stage DC Bias.

The DC Bias for the RF stages is set by sequential adjustment of the bias for each stage while observing the total +24 Volt current using the DC ammeter, item E, in figure 1.

Set the Test Fixture controls as follows:

SW1	CSB Audio	Off
SW2	SBO Audio	Off
SW4	I Phase	Off
SW5	Q Phase	Off
SW6	I-Q AC/DC Coupling	AC
R2	CSB % Modulation	CCW
R3	CSB Power	CCW
R4	SBO Audio Modulation Level	CCW
R5	SBO Power	CCW

Apply power to the UUT.

5.3.1 BIAS Q6.

Set the bias current for Q6 to 0.4 Amperes. Adjust R140 clockwise while observing the total DC Current. Set the total current drawn by the UUT to 0.4 Amperes.

Record the total current on the data sheet for this step.

5.3.2 BIAS Q4.

Set the bias current for Q4 to 0.4 Amperes. Adjust R66 clockwise while observing the total DC Current. Set the total current drawn by the UUT to 0.8 Amperes.

Record the total current on the data sheet for this step.

5.3.3 BIAS Q3

Set the bias current for Q3 to 1.0 Amperes. Adjust R67 clockwise while observing the total DC Current. Set the total current drawn by the UUT to 1.8 Amperes.

Record the total current on the data sheet for this step.

5.3.4 RF Stage DC Bias results:

Specification: Step 1: 0.4 Amps ±0.01Amps Total Current: _____Amps

Specification: Step 2: 0.8 Amps ±0.01Amps Total Current: _____Amps

Specification: Step 3: 1.8 Amps ±0.01Amps Total Current: _____Amps

5.4 Set the CSB Modulation Sensitivity.

Locate the CSB modulation Sensitivity control, R42, on the UUT. Set this control fully counter clockwise.

Set the Test Fixture controls as follows:

SW1	CSB Audio	Off
SW2	SBO Audio	Off
SW4	I Phase	Off
SW5	Q Phase	Off
SW6	I-Q AC/DC Coupling	AC
R2	CSB % Modulation	CCW
R3	CSB Power	CCW
R4	SBO Audio Modulation Level	CCW
R5	SBO Power	CCW

Turn on the Signal generator and set the generator to 110MHz and amplitude of 14dBm.

Connect the multimeter to the CSB IN, TP6, on the test fixture. Adjust the CSB Power control, R3, on the test fixture to obtain 5.0 ± 0.02 Volts DC at TP6, CSB IN.

Adjust R42 on the UUT clockwise until the CSB power meter, F, in Figure 2 indicates a power output of 30 ±0.25 Watts.

Record the voltage at TP6, CSB IN, and the RF power output on the data sheet.

5.4.1 CSB Modulation Sensitivity

Specification: TP6, CSB IN, 5 ±0.02V. TP6 Voltage: _____

Specification: Total PWR Out: 30 ±0.25Watts. Total PWR: _____

5.5 Adjust the CSB directional coupler output-matching network.

This adjustment matches the output impedance of the CSB directional coupler to 50 Ohms. The reflected power output voltage; measured at TP4, CSB REV indicates when the correct adjustment is achieved.

Set channel 1 of the oscilloscope for DC coupling, 1 Volt per division, and set the ground reference at the bottom of the screen. Set the triggering of the oscilloscope to automatic. Connect the oscilloscope probe to TP4, CSB REV, on the test fixture. Also connect the multimeter to TP4, CSB REV. Set the multimeter to indicate DC voltage.

With the UUT operating as in section 5.4, alternately adjust C12 and C17 to reduce the amplitude indicated on the oscilloscope to as low as possible.

After the adjustment is complete, record the DC voltage as indicated by the multimeter on the data sheet. The voltage shall be less than 0.5 Volts.

Record this voltage on the data sheet.

5.5.1 CSB directional coupler output matching network:

Specification: TP4, CSB REV < 0.5 VDC. TP4 Voltage: _____

5.6 Calibration of CSB Reflected Power Detector Output Voltage.

With the UUT operating as above, temporarily remove the 24-Volt power. Connect a 2:1 load on the output of the CSB channel, J2. Nothing else should be connected, not even the coupler.

Connect the multimeter to TP4, CSB REV.

Locate R17 on the UUT. Adjust R17 while observing the multimeter to obtain a DC voltage reading of 5.0 +/- 0.05 Volts DC.

5.6.1 CSB VSWR Calibration:

Specification: TP4, CSB REV 5.0 +/- 0.05 Volts DC. TP4 Voltage: _____

Remove the 24-Volt power. Restore the test setup connections..

5.7 Calibration of the CSB Forward Power Detector Output Voltage.

Connect the multimeter to TP5, CSB FWD, to the CSB Forward Power Detector Output test point.

Restore the 24-Volt power, and verify that the power output indicated on the CSB power meter, J, of Figure 2 is still 30 Watts +/- 0.25 Watts. If not, verify that the CSB modulation input voltage at TP 6, CSB IN, is 5.0 +/- 0.05 Volts and then adjust R42 slightly, if required, to obtain specified power output.

Locate R34. With the multimeter connected to TP5, CSB FWD, adjust R34 to obtain a DC voltage indication of 5.0 ±0.05 Volts.

Record the following data on the data sheet.

5.7.1 CSB Forward Power Detector Calibration:

Power Specification: 30 ±0.25 Watts Power Output: _____

Detector Output Specification: 5.0 ±0.05 Volts Detector Output: _____

5.8 Adjustment of the CSB Phase Lock Loop.

The CSB amplifier contains a Phase Lock Loop to maintain the output carrier phase in a constant relationship with a phase reference derived from the Frequency Synthesizer input at J1. The objective of this adjustment is to optimize the control range of this PLL.

Connect the oscilloscope probe, and the DC multimeter, to the CSB phase control voltage test point, TP3, PHASE CNTL. Set the vector voltmeter, item N in Figure 2, to indicate phase A to B.

Locate the PLL phase reference adjustment capacitor, C30.

With the UUT operating as above, adjust C30 to determine the minimum and maximum phase control voltage obtainable throughout the range of adjustment.

Set C30 to the minimum control voltage. Record this voltage on the data sheet.

Observe the vector voltmeter indication, item N in Figure 2, and set the phase reference to 0.

Set C30 to the maximum control voltage. Record this voltage and the phase reading indicated by the vector voltmeter on the data sheet.

Determine the midpoint of the available range of phase adjustment. Adjust C30 to set the phase indicated by the vector voltmeter to the midpoint of the range. On the data sheet record the midpoint phase, and control voltage indicated when C30 is adjusted to the midpoint.

5.8.1 Adjustment of the CSB Phase Lock Loop.

Acceptance Criteria (nominal values):

Minimum Control Voltage: 5 to 8 Volts Measured: _____

Maximum Control Voltage: 13 to 15 Volts Measured: _____

Phase Control Range: 40 to 50 Degrees Measured: _____

Setup Data:

Calculated Midpoint of Phase Control Range: _____Degrees

Phase Control Voltage at Midpoint of Control Range: _____Volts

5.9 CSB Static Peak Envelope Power

The objective of this test is to verify the DC to RF conversion efficiency of the CSB RF amplifier.

Set the Test Fixture controls as follows:

SW1	CSB Audio	Off
SW2	SBO Audio	Off

SW4	I Phase	Off
SW5	Q Phase	Off
SW6	I-Q AC/DC Coupling	AC
R2	CSB % Modulation	CCW
R3	CSB Power	For 25 +/- 0.25 Watts CW
R4	SBO Audio Modulation Level	CCW
R5	SBO Power	CCW

Observe the CSB RF power meter, Item J, in Figure 2. Adjust the CSB Power control, R3, on the test fixture to obtain an indicated power output of 70 Watts.

*****CAUTION*****

To avoid over heating, do not operate the amplifier under these test conditions for an extended period of time. Do not leave the amplifier un-attended when operating under these test conditions. Use a cooling fan when operating the amplifier.

Record the 24-Volt Current indicated by the ammeter, Item E, in Figure 1. The current shall be less than 8 Amperes. Record the current and power on the data sheet.

5.9.1 CSB Static Peak Envelope Power.

Acceptance Criteria:

Power Output: 70 +/- 1.0 Watts

24 Volt Current < 8.0 Amperes. Measured Current: _____

5.10 CSB AM Modulation Performance.

Set the Test Fixture controls as follows:

SW1	CSB Audio	Off initially
SW2	SBO Audio	Off
SW4	I Phase	Off
SW5	Q Phase	Off
SW6	I-Q AC/DC Coupling	AC
R2	CSB % Modulation	CCW initially
R3	CSB Power	For 25 +/- 0.25 Watts CW
R4	SBO Audio Modulation Level	CCW
R5	SBO Power	CCW

Adjust the oscilloscope, item S, in Figure 2, to display the RF envelope on channel 2. Set the gain of the oscilloscope such that the RF envelope produces a vertical deflection of approximately four divisions. Adjust the CSB Power Control, R3, on the Test Fixture until the CSB power output of 70 Watts is indicated.

Set the cursor on the oscilloscope at the tips of the RF envelope to calibrate the oscilloscope cursors to indicate 70 Watts Peak Envelope Power, PEP.

Reset the CSB Power control to obtain 25 ±0.25 Watts CSB output.

Connect the scope probe on channel one of the oscilloscope to the Audio oscillator Input to the Test Fixture at TP20, AUDIO GEN INP. Adjust the output of the Audio oscillator to supply a 150 Hz sine wave at an amplitude of 6 ±0.2 Volts peak to peak.

Set the CSB Audio switch, SW1, on the Test Fixture to On.

Next, adjust the CSB percent modulation control on the test fixture clockwise until the peak RF amplitude indicated on the oscilloscope is set to the cursor lines corresponding to 70 Watts Peak Envelope Power.

Adjust the spectrum analyzer to a Center Frequency of 110 MHz and a Span of 2 kHz. Observe the modulated RF spectrum.

Using the Marker facility of the spectrum analyzer record amplitude of the of the highest modulation harmonic sideband (i.e. 300 Hz, 450 Hz, etc) relative to the 150 Hz sidebands.

The amplitude of the highest harmonic sideband shall be less than 26 dB below 150 Hz sidebands. Record the offset Frequency and the amplitude of the highest harmonic sideband on the data sheet.

Connect the oscilloscope probe on channel one of the oscilloscope to the PHASE CNTL, TP3, on the Test Fixture. Set the gain to the oscilloscope to 2 volts per division and ground reference at the bottom line of the oscilloscope screen.

Verify that the AC modulation present on the phase control voltage is not clipped and that the amplitude does not exceed 2-Volt peak to peak. Set the oscilloscope input coupling to AC and increase the gain if required to measure the peak to peak voltage.

Record these items on the data sheet.

5.10.1 CSB AM Modulation Performance.

CSB Modulation Harmonic Amplitude:

Requirement: < -26 dB relative to 150 Hz sideband.

Measured: ___dB relative to 150 Hz sideband. Offset Frequency: ____ Hz

Phase Control Voltage:

Control Voltage is not Clipped. Verified: _____

AC on Control Voltage < 2 Volt Peak to Peak. AC Voltage: _____ Vpp

Connect the Scope to TP1. Verify a 150Hz sine wave is present. TP1 Verified _____

When this test is completed set the CSB Modulation to OFF, and Set the CSB Power Control Fully CCW to minimum power output.

5.11 SBO Modulator Initial Setup and I-Q Feedback Phase Adjustment.

Reconnect the RF Test Equipment Group as indicated in Figure 3.

Set the Test Fixture controls as follows:

SW1	CSB Audio	Off
SW2	SBO Audio	Off
SW4	I Phase	0 Deg
SW5	Q Phase	Off
SW6	I-Q AC/DC Coupling	DC
R2	CSB % Modulation	CCW
R3	CSB Power	CCW
R4	SBO Audio Modulation Level	CCW
R5	SBO Power	CCW

Connect the DC multimeter to test point, TP22, I INPUT. Adjust the SBO RF Power control on the Test Fixture to obtain 4 volts DC ±0.02 Volts at TP22, I INPUT.

Locate R111, the SBO I modulation adjustment on the UUT. Adjust this control clockwise until the SBO RF power meter indicates 1 Watts ±0.05 Watts.

Locate C91 and C93, the SBO directional coupler matching capacitors. Connect the oscilloscope probe to TP1, SBO REV PWR, and set for DC coupling with the ground reference at the bottom of the scope display.

Adjust C91 and C93 to minimize the DC voltage indicated.

Readjust R111, if required, to obtain an output of 1 Watt ±0.05 Watts.

Observe the RF envelope on the oscilloscope and set the voltage cursors to mark the peak points of the RF envelope. This establishes a calibration point on the oscilloscope at 1 W Peak Envelope Power.

Set the I- Q AC DC coupling switch, SW6, to AC. Verify that the input from the Audio oscillator at TP20, AUDIO GEN INP, is set to 6 volts peak to peak and 150 Hz.

Turn SBO AUDIO On, SW2.

Rotate the SBO audio level control on the Test Fixture, R4, clockwise until the RF envelope peaks on the oscilloscope are at the preset voltage cursor lines. This sets the SBO power output to 1 W peak envelope

power.

Next the IQ Feedback phase will be adjusted to minimize the output from the Q modulator.

Connect the oscilloscope probe to Q MODULATOR, TP14, on the Test Fixture. Set the oscilloscope for AC coupling and adjust the vertical gain as required (~ 0.5 V/division) to display Q modulator output.

Locate the IQ modulator phase reference adjustment, C99, in the SBO section of the UUT.

Adjust, C99, to minimize the amplitude of the Q modulator waveform displayed on the oscilloscope.

This amplitude must be less than 0.06 Volts peak to peak.

Record this amplitude on the data sheet.

5.11.1 SBO Modulator Initial Setup and I-Q Feedback Phase Adjustment.

Requirement: Q modulator AC voltage <0.06 Vpp. Measured: _____ Vpp

Connect the Scope to TP2. Verify a 150Hz sine wave is present. TP2 Verified _____

5.12 I-Q Modulator Power Calibration

Set the Test Fixture controls as follows:

SW1	CSB Audio	Off
SW2	SBO Audio	Off
SW4	I Phase	0 Deg
SW5	Q Phase	Off
SW6	I-Q AC/DC Coupling	DC
R2	CSB % Modulation	CCW
R3	CSB Power	CCW
R4	SBO Audio Modulation Level	CCW
R5	SBO Power	Unchanged from 5.11

Verify that the DC voltage on the I INPUT test point, TP22, is 4.0 ±0.02 Volts DC.

Adjust the SBO Power Control on the Test Fixture if required.

Adjust R111, the I modulator gain control to obtain a power output of 1.0 ±0.05 Watts as indicated on the thermal power meter, Item E, in figure 3.

Record these values on the data sheet.

Set the I Phase Switch, SW4, to OFF, and set the Q Phase Switch to 180 degrees.

Verify that the DC voltage on the Q INPUT test point, TP 19, is -4.0 ±0.02 Volts DC.

Adjust R122, the Q modulator gain control to obtain a power output of 1.0 ±0.05 Watts.

Record these values on the data sheet.

5.12.1 I-Q Modulator Power Calibration

Requirement: I input:	4.0 ±0.02 VDC	I Output: 1.0 ±0.05 Watts	
Measured: I input:	_____ VDC	I Output: _____	Watts
Requirement: Q input:	-4.0 ±0.02VDC	Q Output: 1.0 ±0.05Watts	
Measured: Q input:	_____VDC	Q Output: _____	Watts

5.13 I-Q Modulator Carrier Suppression

Set the Test Fixture controls as follows:

SW1	CSB Audio	Off
SW2	SBO Audio	On
SW4	I Phase	0 Deg
SW5	Q Phase	Off
SW6	I-Q AC/DC Coupling	AC
R2	CSB % Modulation	CCW
R3	CSB Power	CCW
R4	SBO Audio Modulation Level	CCW
R5	SBO Power	As Set in 5.12

Set the spectrum analyzer, Item R, in figure 3 for a span of 10 KHz, and adjust the controls to display the SBO suppressed carrier.

Change the Frequency of the Audio oscillator to 1500 Hz, and verify that the output voltage is 6 volts peak to peak.

Increase the SBO Audio modulation level control, R4, on the Test Fixture until the peaks of the RF envelope displayed on the oscilloscope matched the preset cursor lines corresponding to a peak envelope power of 1 Watt.

In the center section of the UUT, locate the I-Q modulator DC offset controls, R170, and R172.

Adjust R170, I channel offset, to obtain the maximum carrier suppression on the spectrum analyzer display.

On the Test Fixture, Set the I phase switch to OFF, and set the Q phase switch to 0 degrees.

Verify that the peak envelope power displayed on the oscilloscope corresponds to the 1 W cursor lines.

Adjust, R172, the Q channel offset, to obtain the maximum carrier suppression on the spectrum analyzer display.

On the Test Fixture Set the I phase switch to 0 degrees and do not change the setting of the Q phase switch.

The power output indicated on the oscilloscope will increase. Readjust the SBO Audio Modulation Level on the Test Fixture to reset the power output to 1 W peak envelope power as indicated by the cursor lines on the oscilloscope.

Observe the carrier suppression indicated on spectrum analyzer. The Carrier shall be suppressed by >30 dB relative to either modulation sideband.

Record the measured carrier suppression on the data sheet.

On the Test Fixture, Set the Q modulation phase switch to 180 degrees. Observe the carrier suppression indicated on spectrum analyzer. The Carrier shall be suppressed by >30 dB relative to either modulation sideband.

Record the measured carrier suppression on the data sheet.

5.13.1 I-Q Modulator Carrier Suppression

Requirement: I-Q phase: 0 degrees Carrier suppression >30 dB at 1 Watt.
I-Q phase 180 degrees Carrier suppression >30dB at 1 Watt.

Measured: I-Q phase: 0 degrees Carrier suppression: _____dB at 1 Watt.
I-Q phase: 180 degrees Carrier suppression: _____dB at 1 Watt.

5.14 I-Q Modulator Amplitude and Phase Performance.

This test verifies the operation of the SBO IQ modulator at eight different phase settings.

Set the Test Fixture controls as follows:

SW1	CSB Audio	Off
SW2	SBO Audio	Off
SW4	I Phase	0 Deg
SW5	Q Phase	Off
SW6	I-Q AC/DC Coupling	DC

R2	CSB % Modulation	CCW
R3	CSB Power	CCW
R4	SBO Audio Modulation Level	CCW
R5	SBO Power	CCW

Adjust the CSB Power Control, R3, on the test fixture to obtain a CSB power output of 30 ±1.0 Watts.

Adjust the SBO Power control, R5, on the test fixture to obtain a SBO power output of 1 Watt ±0.05 Watts. Set as close to 1 Watt as possible.

Refer to Figure 3 and set the vector voltmeter, Item N, to measure the CSB to SBO phase.

Set the vector voltmeter phase reference to zero.

Sequentially set the test fixture controls as indicated below and record the SBO power and phase (relative to the CSB phase).

5.14.1 I-Q Modulator Amplitude and Phase Performance.

SW4 I Phase	SW5 Q Phase	SBO Power	SBO/CSB Phase	Phase Requirement
0 Deg	Off	_____	_____	0 +/- 5 Degrees
180 Deg	Off	_____	_____	180 +/- 5 Degrees
Off	0 Deg	_____	_____	-90 +/- 5 Degrees
Off	180 Deg	_____	_____	90 +/- 5 Degrees

Next set SBO I PHASE, SW4 and SBO Q PHASE, SW5 on the test fixture to 0 Degrees. The SBO power output will increase. Adjust the SBO Power Control on the test fixture to reset the power output to 1.0 ±0.05 Watts.

Sequentially set the test fixture controls as indicated below and record the SBO power and phase (relative to the CSB phase).

SW4 I Phase	SW5 Q Phase	SBO Power	SBO/CSB Phase	Phase Requirement
0 Deg.	180 Deg.	_____	_____	+45 ±5 Degrees
0 Deg.	0 Deg.	_____	_____	-45 ±5 Degrees
180 Deg.	0 Deg.	_____	_____	-135 ±5 Degrees

180 Deg.	180 Deg.	_____	_____	+135 ±5 Degrees

5.15 SBO Forward and Reverse Power Detector Calibration.

Set the Test Fixture controls as follows:

SW1	CSB Audio	Off
SW2	SBO Audio	Off
SW4	I Phase	0 Deg
SW5	Q Phase	Off
SW6	I-Q AC/DC Coupling	DC
R2	CSB % Modulation	CCW
R3	CSB Power	CCW
R4	SBO Audio Modulation Level	CCW
R5	SBO Power	CCW

On the Test Fixture adjust the SBO Power control to obtain a power output of 1.0 ±0.05 Watts.

Connect a DC multimeter to the SBO FWD PWR test point to TP2, on the Test Fixture.

Adjust R108 on the UUT to obtain a DC voltage of 2.23 ±0.05 Volts at the test point.

Record the power output in the DC voltage at the test point on the test data sheet.

Remove the 24-Volt power from the UUT. Connect a 2:1 load on the output of the SBO channel, J3. Nothing else should be connected, not even the coupler.

Restore the 24-Volt power to the UUT.
Connect the DC multimeter to the SBO reverse Power test point, TP1, on the test fixture.

Adjust R92 on the UUT to obtain a reading of 2.23 ±0.05 Volts at the test point. Record the UUT voltage at TP1 on the data sheet.

Remove the 24-Volt power. Restore the test setup connections.

Restore the 24-Volt Power.

5.15.1 SBO Forward and Reverse Power Detector Calibration.

Forward Power Detector Ouput:

Requirement: 2.23 ±0.05 Volts at 1 ±0.05 Watts

Measured: _____ Volts at _____ Watts

Reverse Power Detector:

Requirement: 2.23 ±0.05 Volts at

Measured: _____ Volts at

6. Post Test Procedures

Install the covers onto the CSB and SBO amplifier sections.

7. Test Setups

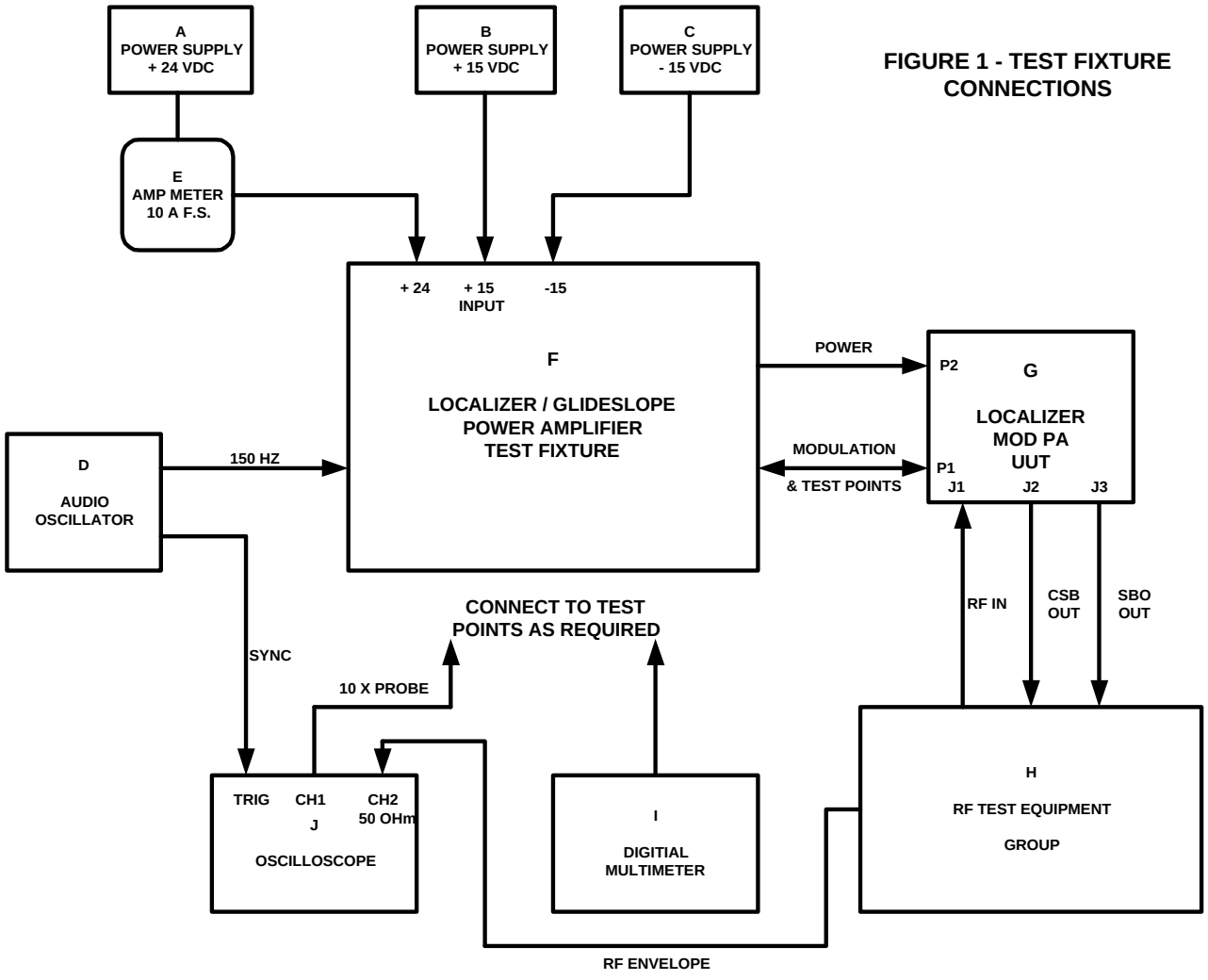


FIGURE 1 - TEST FIXTURE CONNECTIONS

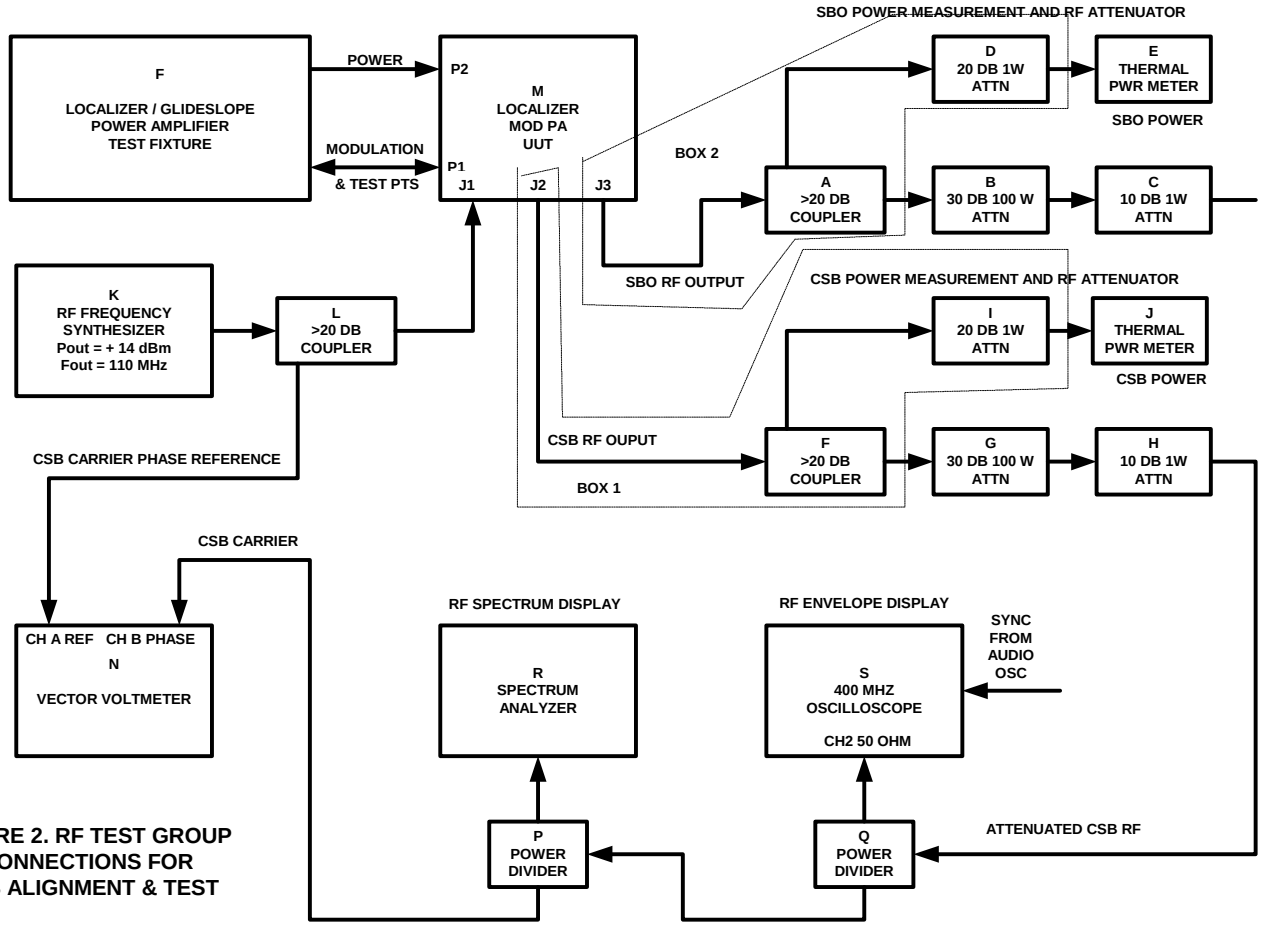


FIGURE 2. RF TEST GROUP CONNECTIONS FOR CSB ALIGNMENT & TEST

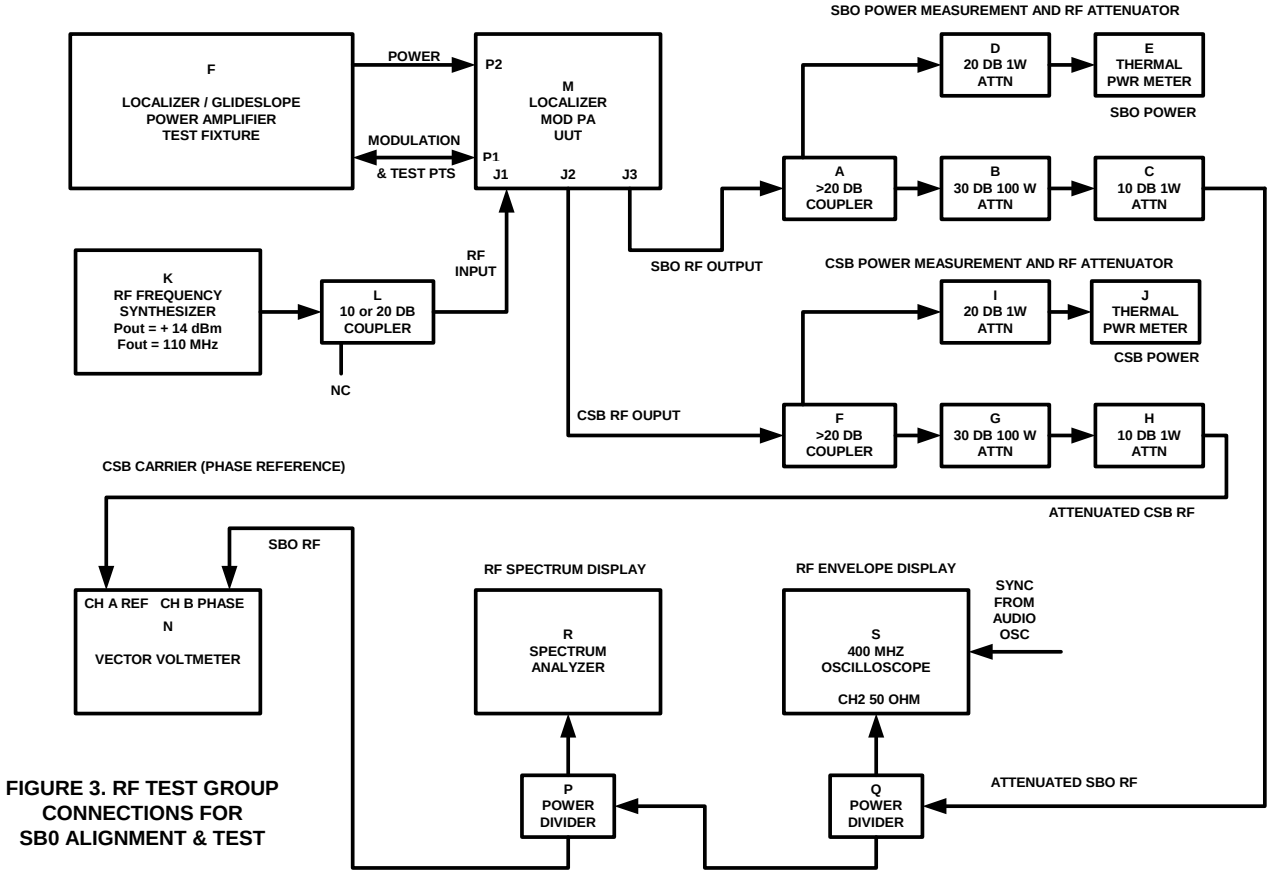


FIGURE 3. RF TEST GROUP CONNECTIONS FOR SB0 ALIGNMENT & TEST

8. Data Sheet

Name: _____ Date: _____

Part Number: 120588-0002 REV:_____

Serial Number: _____

Test Data is referenced to the applicable sections of the Test Procedure.

5.2.1 Initial Adjustments:
Specification: R170 Verified — R170 verified _____
Specification: R172 Verified — R172 verified _____

5.3.4 RF Stage DC Bias results:
Specification: Step 1: 0.4 Amps ±0.01Amps — Total Current: _____ Amps
Specification: Step 2: 0.8 Amps ±0.01Amps — Total Current: _____ Amps
Specification: Step 3: 1.8 Amps ±0.01Amps — Total Current: _____Amps

5.4.1 CSB Modulation Sensitivity
Specification: TP6, CSB IN 5 ±0.02V. — TP6 Voltage: _____ VDC
Specification: Total PWR Out: 30 ±0.25Watts. — Total PWR: _____ Watts

5.5.1 CSB directional coupler output matching network:
Specification: TP4, CSB REV < 0.5 VDC. — TP4 Voltage: _____ VDC

5.6.1 CSB VSWR Calibration:
Specification: TP4, CSB REV 5.0 +/- 0.05 Volts DC. — TP4 Voltage: _____ VDC

5.7.1 CSB Forward Power Detector Calibration:
Power Specification: 30 ±0.25 Watts — Power Output: _____ Watts
Detector Output Specification: 5.0 ±0.05 Volts — Detector Output: _____ VDC

5.8.1 Adjustment of the CSB Phase Lock Loop.
Acceptance Criteria (nominal values):
Minimum Control Voltage: 5 to 8 Volts — Measured: _____ VDC
Maximum Control Voltage: 13 to 15 Volts — Measured: _____ VDC
Phase Control Range: 40 to 50 Degrees — Measured: _____ Degrees

Setup Data:
Calculated Midpoint of Phase Control Range: _____Degrees
Phase Control Voltage at Midpoint of Control Range: _____Volts

5.9.1 CSB Static Peak Envelope Power.
Acceptance Criteria:
Power Output: 70 +/- 1.0 Watts
24 Volt Current < 8.0 Amperes. — Measures Current: _____ Amps

5.10.1 CSB AM Modulation Performance.

CSB Modulation Harmonic Amplitude:
Requirement: < -26 dB relative to 150 Hz sideband.
Measured: _____ dB relative to 150 Hz sideband. Offset Frequency: _____ Hz

Phase Control Voltage:
Control Voltage is not Clipped. Verified: _____
AC on Control Voltage < 2 Volt Peak to Peak. AC Voltage: _____ Vpp
Connect the Scope to TP1. Verify a 150Hz sine wave is present. TP1 Verified _____

5.11.1 SBO Modulator Initial Setup and I-Q Feedback Phase Adjustment.
Requirement: Q modulator AC voltage <0.06 Vpp. Measured: _____ Vpp
Connect the Scope to TP2. Verify a 150Hz sine wave is present. TP2 Verified _____

5.12.1 I-Q Modulator Power Calibration

Requirement:	I input: 4.0 ±0.02 VDC	I Output:	1.0 ±0.05 Watts
Measured:	I input: _____ VDC	I Output:	_____ Watts
Requirement:	Q input: -4.0 ±0.02 VDC	Q Output:	1.0 ±0.05 Watts
Measured:	Q input: _____ VDC	Q Output:	_____ Watts

5.13.1 I-Q Modulator Carrier Suppression

Requirement:	I-Q phase: 0 degrees Carrier suppression > 30	dB at 1 Watt.
	I-Q phase: 180 degrees Carrier suppression > 30	dB at 1 Watt.
Measured:	I-Q phase: 0 degrees	Carrier suppression: _____ dB at 1 Watt.
	I-Q phase: 180 degrees	Carrier suppression: _____ dB at 1 Watt.

5.14.1 I-Q Modulator Amplitude and Phase Performance.

SW4 I Phase	SW5 Q Phase	SBO Power	SBO/CSB Phase	Phase Requirement
0 Deg	Off	_____	_____	0 +/- 5 Degrees
180 Deg	Off	_____	_____	180 +/- 5 Degrees
Off	0 Deg	_____	_____	-90 +/- 5 Degrees
Off	180 Deg	_____	_____	90 +/- 5 Degrees

SW4 I Phase	SW5 Q Phase	SBO Power	SBO/CSB Phase	Phase Requirement
0 Deg.	180 Deg.	_____	_____	+45 ±5 Degrees
0 Deg.	0 Deg.	_____	_____	-45 ±5 Degrees
180 Deg.	0 Deg.	_____	_____	-135 ±5 Degrees
180 Deg.	180 Deg.	_____	_____	+135 ±5 Degrees

5.15.1 SBO Forward and Reverse Power Detector Calibration.

Forward Power Detector Ouput:
Requirement: 2.23 ±0.05 Volts at 1 ±0.05 Watts
Measured: _____ Volts at _____ Watts

Reverse Power Detector:
Requirement: 2.23 ±0.05 Volts at
Measured: _____ Volts at