

**OPERATION AND MAINTENANCE
1×N FREQUENCY DIVERSITY
DR6/11-135A AND 135EC
TWT AMPLIFIER
RADIO TRANSMITTER PROCEDURES**

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1. INTRODUCTION

This practice is used for testing and adjusting a DR6/11-135 radio transmitter. These procedures are referenced from the RADIO TRMTR TROUBLE ISOLATION, REPAIR VERIFICATION, and ANNUAL FCC TESTS tabs in this manual.

1.1 UPDATE INFORMATION

This practice is reissued to combine all test procedures into one practice. The practice is used in binders 421-102-090 and 421-103-090.

1.2 ADMONISHMENTS

Admonishments are strategically-placed reminders to assure safety of personnel (**DANGER**), to minimize or prevent service interruptions (**Caution**), and to prevent equipment damage (**Warning**). The technician should read and become familiar with the admonishments in the MAINTENANCE tab.

Personal Injury

Whenever a condition exists that may result in personal injury, a **DANGER** statement is provided. Two potential dangers involved with maintaining the radio system are:

- **DANGER 1:** *Looking directly into an open radio transmitter RF port may result in eye injury from RF radiation.*
- **DANGER 2:** *Working with or near the -24 V DC battery supply voltage may result in electrical shock and/or burns.*

Do not mistake the -24 V battery supply as being harmless. Under the right conditions, -24 V can cause a severe shock. Also, since the battery supply provides a high current, there is potential for arcing. Always be careful with instruments such as screwdrivers and test equipment probes.

Service Protection

Manual service protection is necessary before performing most of the procedures. Any procedure containing the **Caution** statement below requires that a manual protection switching operation be performed before doing that procedure or step; otherwise, the system performance could be degraded or interrupted. Procedures or steps that are not service-affecting will be identified with the **Note** below.

- **Caution:** *This procedure is service-affecting unless the proper manual protection switching operation has been performed.*
- **Note:** This is an In-Service Procedure.

Generally, if testing a regular channel, manually switch service to the protection channel for the direction under test (even if an automatic switch exists). If testing the protection channel, manually lock out the protection channel for the direction(s) under test. Refer to the OPERATION tab for information on service protection.

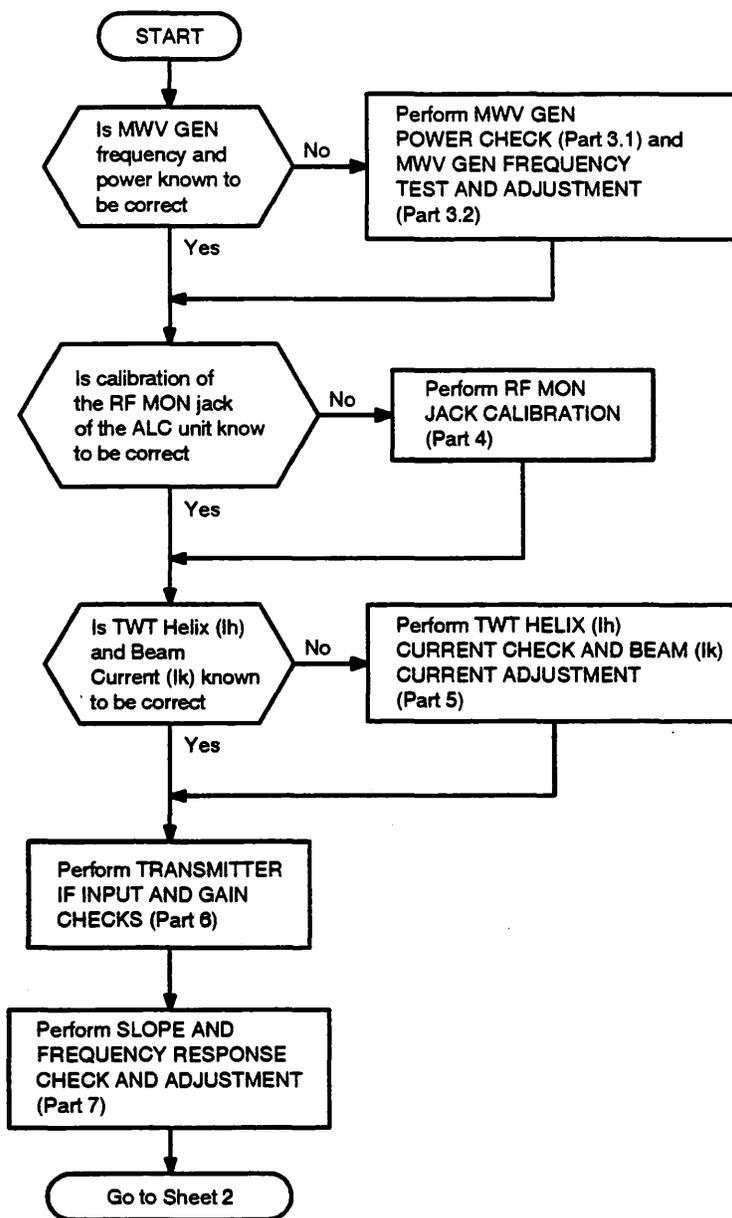
Equipment Damage

If there is a possibility of equipment damage when performing a test, replacement, etc., a **Warning** statement will be provided.

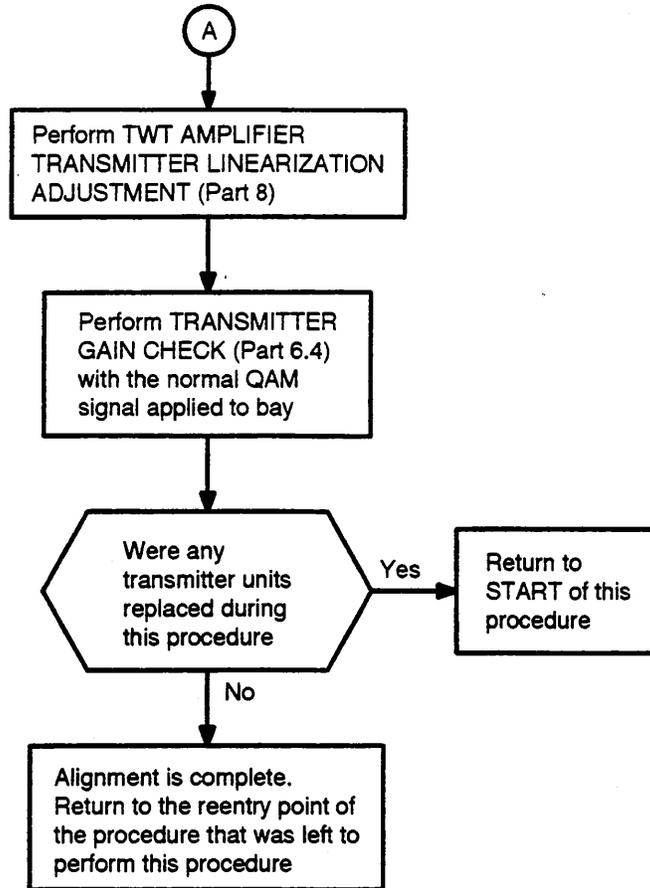
2. TRANSMITTER ALIGNMENT PROCEDURES

Flowchart 1 is used as an outline to perform a complete IF to RF alignment of the radio transmitter. This procedure is necessary when a unit that affects the linearity of the radio transmitter has been replaced. The units involved are the IF predistorter, Transmitter Up-Converter and Microwave Generator, TWT power supply, TWT amplifier, and ALC NETWORK.

Note: You may leave the termination off and the adapter connected to RF MON jack until all test have been completed.



Flowchart 1 - Transmitter Alignment Procedures Sequence (Sheet 1 of 2)



Flowchart 1-Transmitter Alignment Procedures Sequence (Sheet 2 of 2)

3. MICROWAVE GENERATOR CHECKS

These procedures are used to check the TRANSMITTER UP CONVR & MWV GEN (TRMTR CONVR) units.

3.1 MWV GEN POWER CHECK

This procedure is used to check the power level of the microwave generator located in the TRMTR CONVR unit. The GEN MON jack on the unit is used to check the power.

Note: This is an in-service procedure.

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage to the connectors.*

TEST EQUIPMENT

- Refer to Figure 1.

PROCEDURE

1. On the TRMTR CONVR unit, remove the termination on the GEN MON jack.
2. Condition the test equipment to measure the expected power level (normally -3 through +3 dBm), and connect it at the GEN MON jack (Figure 1).

Requirement: 0 ± 3 dBm and no GEN OVEN lamp lighted.

If the requirement is *not* met, replace the TRMTR CONVR unit. Refer to the REPLACEMENT PROCEDURES tab.

Note: If the TRMTR CONVR is replaced, go to Flowchart 1, Transmitter Alignment Procedures Sequence, for additional tests that must be performed.

3. Disconnect the power meter and, if necessary, update the RADIO DATA CARD.
4. If the frequency is to be measured, proceed to Part 3.2. Otherwise, replace the termination on the GEN MON jack and tighten with a torque wrench.
5. This test is complete. Return to the reentry point of the procedure that was left to perform this procedure.

END OF PROCEDURE

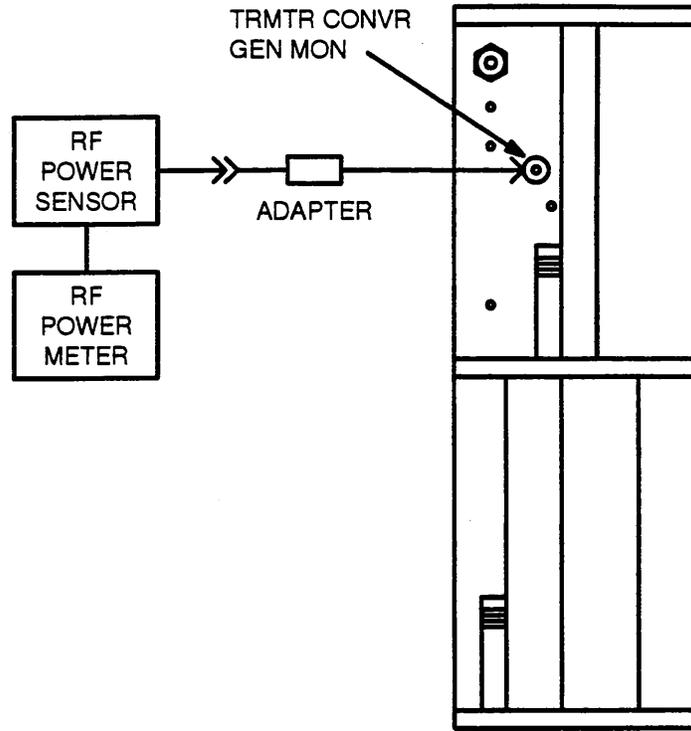


Figure 1-MWV GEN Power Output Check

3.2 MWV GEN FREQUENCY CHECK AND ADJUSTMENT

This procedure is used to check the frequency of the microwave generator in the TRMTR CONVR unit. The GEN MON jack on the unit is used to check for the frequency. Refer to Table A, B, C, or D for the appropriate frequency.

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage to the connectors.*

TEST EQUIPMENT

- Refer to Figure 2.

PROCEDURE

1. Verify that service is protected.
2. On the TRMTR CONVR unit, remove the termination from the GEN MON jack.
3. Using Tables A, B, C, and D (also found on the RADIO DATA CARD), determine the correct center frequency (f_c) for the microwave generator to be tested by matching the letter designation of the TRMTR CONVR unit code (printed on the latch label) with the letter designation in the CODE column of the table.
4. Condition the test equipment to measure the appropriate center frequency, and connect it to the GEN MON jack. Refer to Figure 2.

Note: The microwave generator unit must be warmed up for at least 1 hour before proceeding.

6-GHz Requirement: Microwave generator frequency should be within ± 120 kHz and no GEN OVEN lamp lighted.

11-GHz Requirement: Microwave generator frequency should be within ± 240 kHz and no GEN OVEN lamp lighted.

If the requirement is met and the frequency is within ± 15 kHz (6 GHz) or ± 30 kHz (11 GHz), no adjustment is required; go to Step 6. Otherwise, go to Step 5 and adjust the frequency to the correct value.

If the requirement is NOT met and the frequency measured in Step 4 has drifted more than ± 120 kHz (6 GHz) or ± 240 kHz (11 GHz) within the past 12 months, replace the TRMTR CONVR. Refer to the REPLACEMENT PROCEDURES tab.

5. On the TRMTR CONVR unit, adjust the GEN FREQ ADJ control for the following requirements:

6-GHz Requirement: ± 3 kHz of f_c

11-GHz Requirement: ± 5 kHz of f_c .

If the requirement is not met, suspect test set, bad unit, or bad test cable. Replace the faulty unit and repeat this procedure. Refer to the REPLACEMENT PROCEDURES tab.

6. Disconnect the test equipment, and if necessary, update the RADIO DATA CARD.

7. If the microwave generator power is to be measured, proceed to Part 3.1. Otherwise, replace the termination on the GEN MON jack and tighten with a torque wrench.
8. This test is complete. Return to the reentry point of the procedure that was left to perform this procedure.

END OF PROCEDURE

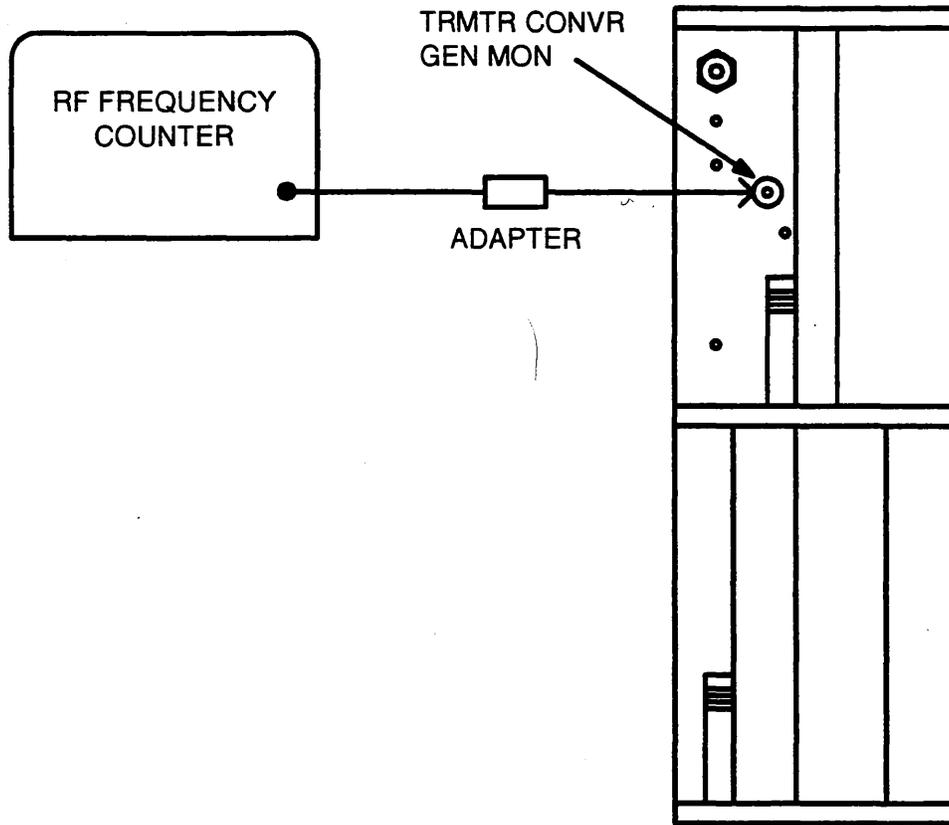


Figure 2-MWV GEN Frequency Measurement

TABLE A 6-GHz REGULAR FREQUENCY PLAN					
CHANNEL			TRANSMITTER UP/RECEIVER DOWN CONVERTER AND MICROWAVE GENERATOR		
NUMBER	CENTER FREQUENCY (kHz)	SIDEBAND	1502() RF FILTER CODE	1503() RF FILTER CODE	GEN MON CENTER FREQUENCY (kHz)
11T	5,945,198	Lower	B	CB	6,015,198
12T	5,974,850	Lower	D	CD	6,044,850
13T	6,004,502	Lower	F	CF	6,074,502
14T	6,034,154	Lower	H	CH	6,104,154
15T	6,063,805	Upper	K	CK	5,993,805
16T	6,093,457	Upper	M	CM	6,023,457
17T	6,123,109	Upper	P	CP	6,053,109
18T	6,152,761	Upper	S	CS	6,082,761
21T	6,197,239	Lower	AB	DB	6,267,239
22T	6,226,891	Lower	AD	DD	6,296,891
23T	6,256,542	Lower	AF	DF	6,326,542
24T	6,286,194	Lower	AH	DH	6,356,194
25T	6,315,846	Upper	AK	DK	6,245,846
26T	6,345,498	Upper	AM	DM	6,275,498
27T	6,375,150	Upper	AP	DP	6,305,150
28T	6,404,802	Upper	AS	DS	6,334,802

TABLE B 6-GHz STAGGERED FREQUENCY PLAN					
CHANNEL			TRANSMITTER UP/RECEIVER DOWN CONVERTER AND MICROWAVE GENERATOR		
NUMBER	CENTER FREQUENCY (kHz)	SIDEBAND	1502() RF FILTER CODE	1503() RF FILTER CODE	GEN MON CENTER FREQUENCY (kHz)
11S	5,960,024	Lower	C	CC	6,030,024
12S	5,989,676	Lower	E	CE	6,059,676
13S	6,019,328	Lower	G	CG	6,089,328
14S	6,048,979	Upper	J	CJ	5,978,979
15S	6,078,631	Upper	L	CL	6,008,631
16S	6,108,283	Upper	N	CN	6,038,283
17S	6,137,935	Upper	R	CR	6,067,935
18S	6,167,587	Upper	T	CT	6,097,587
20S	6,182,413	Lower	AA	DA	6,252,413
21S	6,212,065	Lower	AC	DC	6,282,065
22S	6,241,717	Lower	AE	DE	6,311,717
23S	6,271,368	Lower	AG	DG	6,341,368
24S	6,301,020	Upper	AJ	DJ	6,231,020
25S	6,330,672	Upper	AL	DL	6,260,672
26S	6,360,324	Upper	AN	DN	6,290,324
27S	6,389,976	Upper	AR	DR	6,319,976

TABLE C				
11-GHz REGULAR FREQUENCY PLAN				
RADIO CHANNEL			TRANSMITTER UP/RECEIVER DOWN CONVERTER AND MICROWAVE GENERATOR	
NUMBER	CENTER FREQUENCY (kHz)	SIDEBAND	FILTER CODE	GEN MON JACK CENTER FREQUENCY (kHz)
1P	10,755,000	UPPER	PB	10,685,000
10P	10,795,000	UPPER	PC	10,725,000
11P	10,835,000	UPPER	PD	10,765,000
6P	10,875,000	UPPER	PE	10,805,000
7P	10,915,000	UPPER	PF	10,845,000
2P	10,955,000	UPPER	PG	10,885,000
3P	10,995,000	UPPER	PH	10,925,000
12P	11,035,000	UPPER	PJ	10,965,000
9P	11,075,000	UPPER	PK	11,005,000
8P	11,115,000	UPPER	PL	11,045,000
5P	11,155,000	UPPER	PM	11,085,000
9J	11,245,000	LOWER	JA	11,315,000
12J	11,285,000	LOWER	JB	11,355,000
5J	11,325,000	LOWER	JC	11,395,000
8J	11,365,000	UPPER	JD	11,295,000
1J	11,405,000	UPPER	JE	11,335,000
4J	11,445,000	UPPER	JF	11,375,000
11J	11,485,000	UPPER	JG	11,415,000
10J	11,525,000	UPPER	JH	11,455,000
7J	11,565,000	UPPER	JJ	11,495,000
6J	11,605,000	UPPER	JK	11,535,000
3J	11,645,000	UPPER	JL	11,575,000

TABLE D 11-GHz ALTERNATE FREQUENCY PLAN				
RADIO CHANNEL			TRANSMITTER UP/RECEIVER DOWN CONVERTER AND MICROWAVE GENERATOR	
NUMBER	CENTER FREQUENCY (kHz)	SIDEBAND	FILTER CODE	GEN MON JACK CENTER FREQUENCY (kHz)
4E	10,735,000	UPPER	EA	10,665,000
1E	10,775,000	UPPER	EB	10,705,000
10E	10,815,000	UPPER	EC	10,745,000
11E	10,855,000	UPPER	ED	10,785,000
6E	10,895,000	UPPER	EE	10,825,000
7E	10,935,000	UPPER	EF	10,865,000
2E	10,975,000	UPPER	EG	10,905,000
3E	11,015,000	UPPER	EH	10,945,000
12E	11,055,000	UPPER	EJ	10,985,000
9E	11,095,000	UPPER	EK	11,025,000
8E	11,135,000	UPPER	EL	11,065,000
12D	11,265,000	LOWER	DB	11,335,000
5D	11,305,000	LOWER	DC	11,375,000
8D	11,345,000	LOWER	DD	11,415,000
1D	11,385,000	UPPER	DE	11,315,000
4D	11,425,000	UPPER	DF	11,355,000
11D	11,465,000	UPPER	DG	11,395,000
10D	11,505,000	UPPER	DH	11,435,000
7D	11,545,000	UPPER	DJ	11,475,000
6D	11,585,000	UPPER	DK	11,515,000
3D	11,625,000	UPPER	DL	11,555,000
2D	11,665,000	UPPER	DM	11,595,000

4. RF MON JACK CALIBRATION

This procedure is used to calibrate the RF MON jack on the ALC NETWORK unit. First, measure the normal operating power at the RF OUT jack on the ALC NETWORK unit. Then measure at the RF MON jack on the same unit with the normal connections terminating the RF OUT jack. Subtract these two measurements for the calibration difference.

Example: 36.9 dBm – 8.9 dBm = 38 dB

The IF input for this test is supplied by either the normal quadrature amplitude modulation (QAM) signal from a digital terminal or regenerator or a properly conditioned 3-tone signal source (the preferred input is the QAM signal). The IF input signal (the nominal level is –8.2 dBm when using the QAM signal) should be inserted directly into the IF IN jack on the TRMTR CONVR unit, bypassing the IF predistorter.

Prerequisite: The TWT amplifier RF output power must be within limits. If in doubt, go to Part 10.

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

TEST EQUIPMENT

- Refer to Figure 3.

PROCEDURE

RF Output Adjustment

1. Verify that service is protected.
 2. On the ALC NETWORK unit, operate the ALC ON/OFF switch to OFF.
 3. On the TWT power supply, operate the TRANS/STBY switch to STBY.
 4. Remove the input from the IF IN jack on the TRMTR CONVR unit.
 5. Remove the semirigid cable between the RF OUT jack on the ALC NETWORK unit and the isolator/transducer INPUT jack on the transmitter waveguide assembly.
 6. Establish test connections to the RF OUT jack per Figure 3, Option A. (See Warnings.)
 7. Connect the IF signal (–8.2 dBm) to the IF IN jack on the TRMTR CONVR unit.
 8. Operate the TRANS/STBY switch to TRANS.
- Note:** Before you “power-up” the transmitter, the RF OUT jack must be terminated with the normal bay cables or a high power attenuator.
9. On the TRMTR CONVR unit, adjust the IF LEV ADJ control to meet the following requirement, and record the value measured on the RADIO DATA CARD for the RF OUT jack.

Note 1: Allow 1 minute for thermal stabilization before the final reading.

Note 2: These requirements are normal maximum operating power levels. Consult the station license for proper operating power.

Requirement:

- +36.9 dBm \pm 0.1 dB for 6-GHz Transmitter
- +36.5 dBm \pm 0.1 dB for 11-GHz Transmitter.

10. Operate the TRANS/STBY switch to STBY.
11. Disconnect the power meter from the RF OUT jack on the ALC NETWORK.
12. Reconnect the semirigid cable between the ALC RF OUT jack and the isolator/transducer INPUT jack.

RF MON Calibration

13. Remove the termination from the RF MON jack on the ALC NETWORK unit.
14. Establish test connections per Figure 3, Option B.
15. Operate the TRANS/STBY switch to TRANS.
16. Allow the power meter 2 minutes to stabilize. Observe the power meter indication and record this value.
17. Subtract the power measurement made in Step 16 from the value recorded in Step 9.

Requirement:

- 28 \pm 4 dB for 6-GHz Transmitter
- 30 \pm 4 dB for 11-GHz Transmitter.

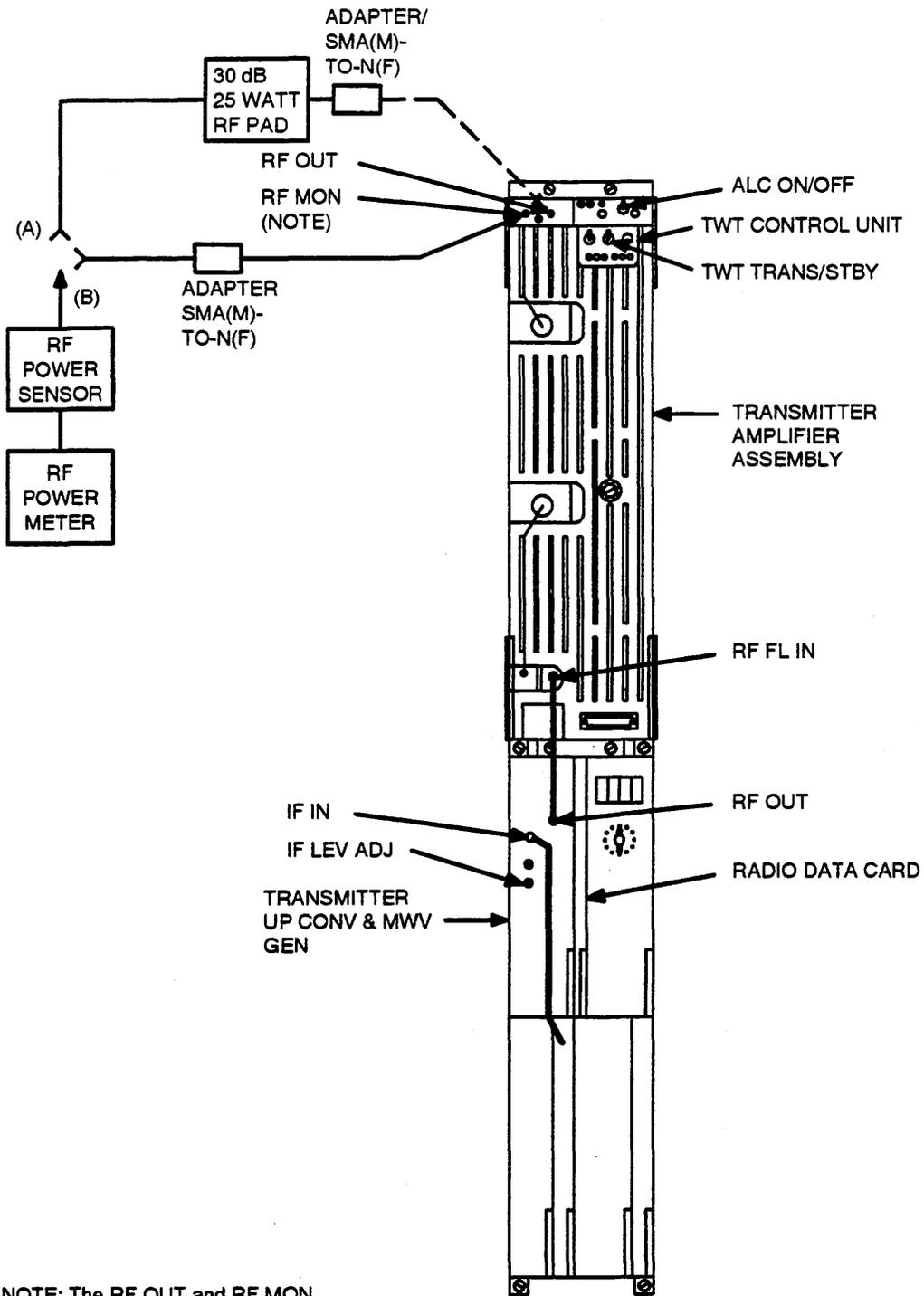
If the requirement is met, record the power level measured on the RADIO DATA CARD for the RF MON OUT jack.

If the requirement is NOT met, recheck connections and if necessary replace the ALC NETWORK unit; then repeat this procedure.

Note: If the ALC NETWORK was replaced, go to Flowchart 1, Transmitter Alignment Procedures Sequence, for additional tests that must be performed.

18. Disconnect all test equipment and return all connections to normal.
19. Operate the ALC switch to ON.
20. This test is complete. Return to the reentry point of the procedure that was left to perform this procedure.

END OF PROCEDURE



NOTE: The RF OUT and RF MON jacks may be reversed on some applications.

Figure 3-RF MON Jack Calibration Test Connections

5. TWT HELIX CURRENT CHECK AND BEAM CURRENT ADJUSTMENT

This procedure is used to measure the beam (Ik) and helix (Ih) current of the TWT amplifier. Also included is a step for adjusting the beam (Ik) current.

Caution: *The beam current adjustment is service-affecting unless the proper manual switching operation has been performed.*

Warning: *To prevent damage when performing these measurements, do not use probes with metal tips that are longer than 1/2-inch.*

Note: Before proceeding, if the TWT POWER SUPPLY CONTROL unit has been turned off or power has been removed, allow a 5-minute warm-up period after power supply cycles ON.

PROCEDURE

1. Verify that service is protected.
2. Ensure the TWT ON/OFF switch is set to ON and the TRANS/STBY switch is set to TRANS.
3. On the DC scale, condition a digital multimeter for a 20-volt measurement on the DC scale.

Note: The SIEMENS* TWT power supply has an external meter resistance of approximately 100K ohms.

4. Connect the meter between the Ik and GND jacks on the TWT POWER SUPPLY CONTROL unit.
5. Observe the multimeter indication, and multiply the voltage value by a factor of 10 to obtain the beam current (Ik) milliamperes.

Requirement: ± 2 mA of the value recorded on the RADIO DATA CARD and/or the TWT amplifier faceplate.

Note: The beam current in milliamperes is equal to the indicated voltage multiplied by 10.

If the beam current is within limits, but different than the original recorded value for this TWT, record the new value along with the existing value; then go to Step 6.

If the beam current is not within limits, adjust the BEAM ADJ control to within ± 2 mA of the original recorded value.

If the requirement cannot be met, perform Part 11. Then with the TWT amplifier and power supply connected normally, repeat this procedure.

6. Connect the multimeter between the helix current (Ih) and GND jacks.

Requirement: The helix current (Ih) shall be less than or equal to 2.2 mA and no PREAL indication present.

If the requirement cannot be met, perform Part 11. Then with the TWT amplifier and power supply connected normally, repeat this procedure.

* Registered trademark of Siemens Aktiengesellschaft.

7. Record the helix current (Ih) value with the original value on the RADIO DATA CARD.
8. Disconnect the meter.

Note: If the TWT amplifier and/or TWT power supply is replaced, go to Flowchart 1, Transmitter Alignment Procedures Sequence, for additional tests that must be performed.

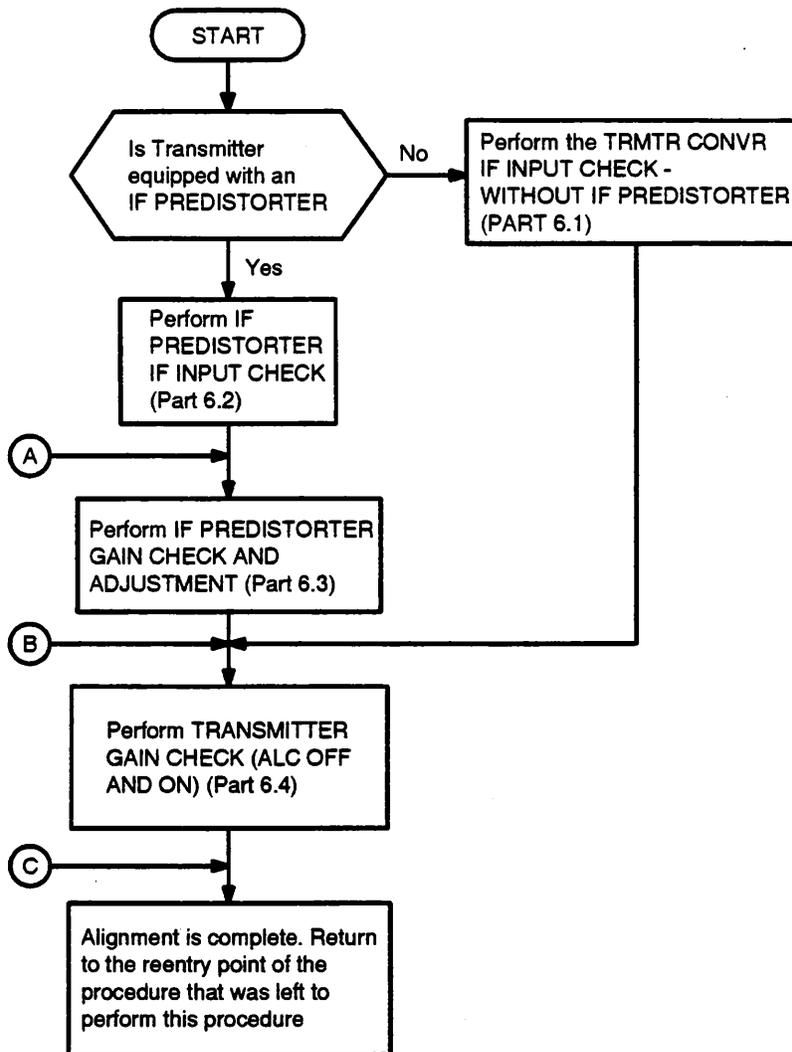
9. This test is complete. Return to the reentry point of the procedure that was left to perform this procedure.

END OF PROCEDURE

6. TRANSMITTER IF INPUT AND GAIN CHECKS

Flowchart 2 is used as an outline for checking the IF input power and the RF output power (ACL OFF and ON). In addition the RF output power is adjusted.

These procedures are necessary when a unit that affects the gain of radio transmitter has been replaced or when certain alarms exist and the defective unit needs to be isolated. The units involved are the IF predistorter, TRMTR CONVR, TWT power supply, TWT amplifier, and the ALC NETWORK.



Flowchart 2- Transmitter IF Input and Gain Checks Sequence

6.1 TRANSMITTER UP-CONVERTER IF INPUT CHECK—WITHOUT IF PREDISTORTER

This procedure is used to measure the normal QAM IF input to the TRMTR CONVR without an IF predistorter unit.

This procedure should be entered because of an RF power alarm and is intended only to help locate the defective unit. Final adjustments will be made after the unit has been replaced.

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

TEST EQUIPMENT

- Refer to Figure 4.

PROCEDURE

1. Verify that service is protected.
2. On the ALC NETWORK, operate the ALC switch to OFF.
3. Disconnect the IF cable from the TRMTR CONVR unit IF IN jack.
4. Condition the power meter to measure the expected power level (normally -8.2 dBm), and connect it to the free end of the cable (Figure 4).

Requirement:

For IF interconnect cables 50 feet or less, -8.2 ± 1.2 dBm

For IF interconnect cables greater than 50 feet, -8.2 ± 1.7 dBm.

If the requirement is not met, suspect a problem in the IF terminal equipment or the IF interconnect cabling.

5. Disconnect all test equipment and return all connections to normal.
6. On the ALC NETWORK, operate the ALC switch to ON.
7. This test is complete. Return to Flowchart 2, Transmitter IF Input and Gain Checks Sequence, at reentry Point B.

END OF PROCEDURE

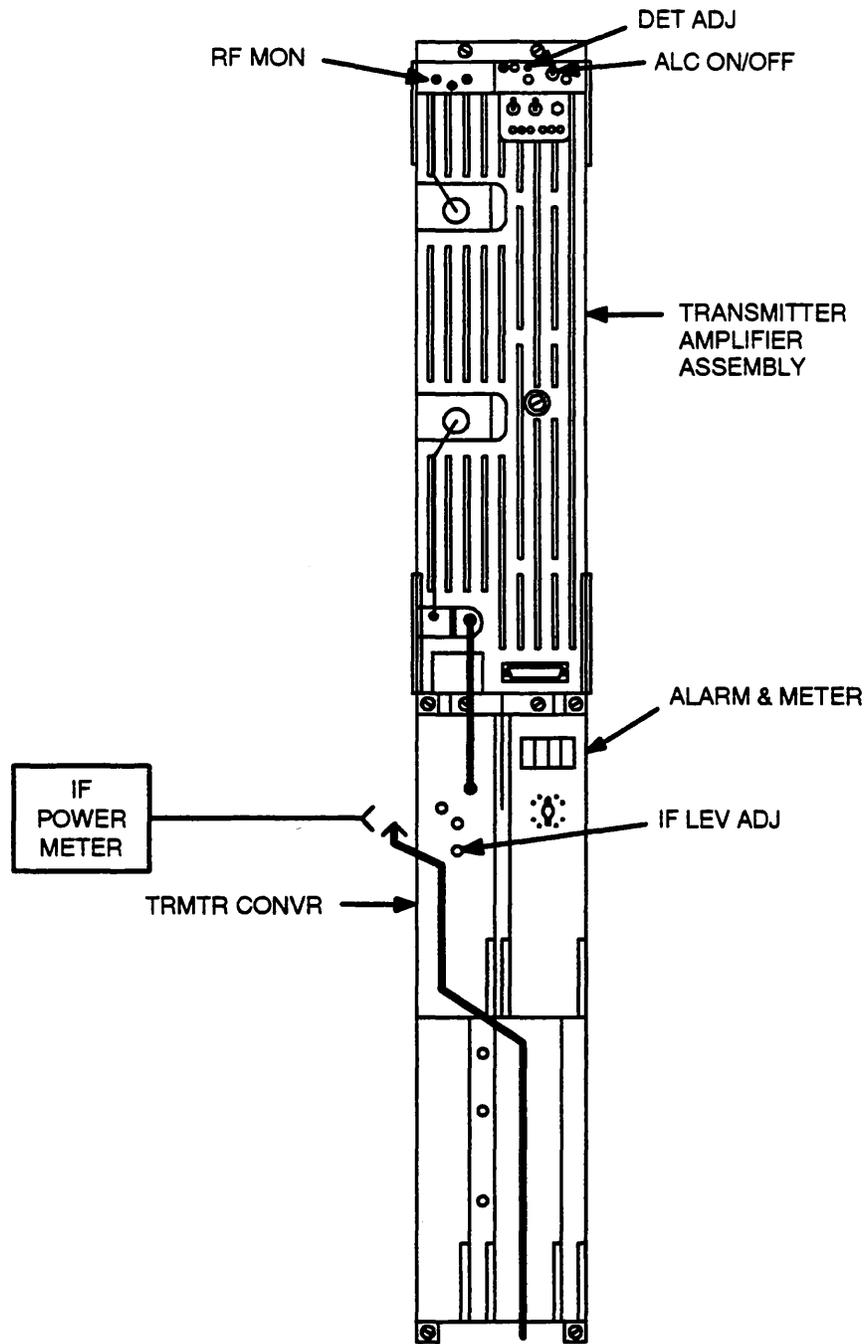


Figure 4- Transmitter Converter IF Input Test Connections Without IF Predistorer

6.2 IF PREDISTORTER IF INPUT CHECK

This procedure is used to measure the normal QAM IF input signal applied to the IF predistorter unit.

This procedure should be entered because of an RF power alarm and is intended only to help locate the defective unit. Final adjustments will be made after the unit is replaced.

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

TEST EQUIPMENT

- Refer to Figure 5.

PROCEDURE

1. Verify that service is protected.
2. Operate the ALC ON/OFF switch to OFF.
3. Disconnect the IF cable from the IF predistorter unit IF IN jack.
4. Condition the power meter to measure the expected power level (normally -8.2 dBm), and connect it to the free end of the cable (Figure 5).

Requirement:

For IF interconnect cables 50 feet or less, -8.2 ± 1.2 dBm

For IF interconnect cables greater than 50 feet, -8.2 ± 1.7 dBm.

If the requirement is not met, suspect a problem in the terminal equipment or the interconnect cabling.

5. Disconnect all test equipment and return all connections to normal.
6. Operate the ALC switch to ON.
7. This test is complete. Return to Flowchart 2, Transmitter IF Input and Gain Checks Sequence, at reentry Point A.

END OF PROCEDURE

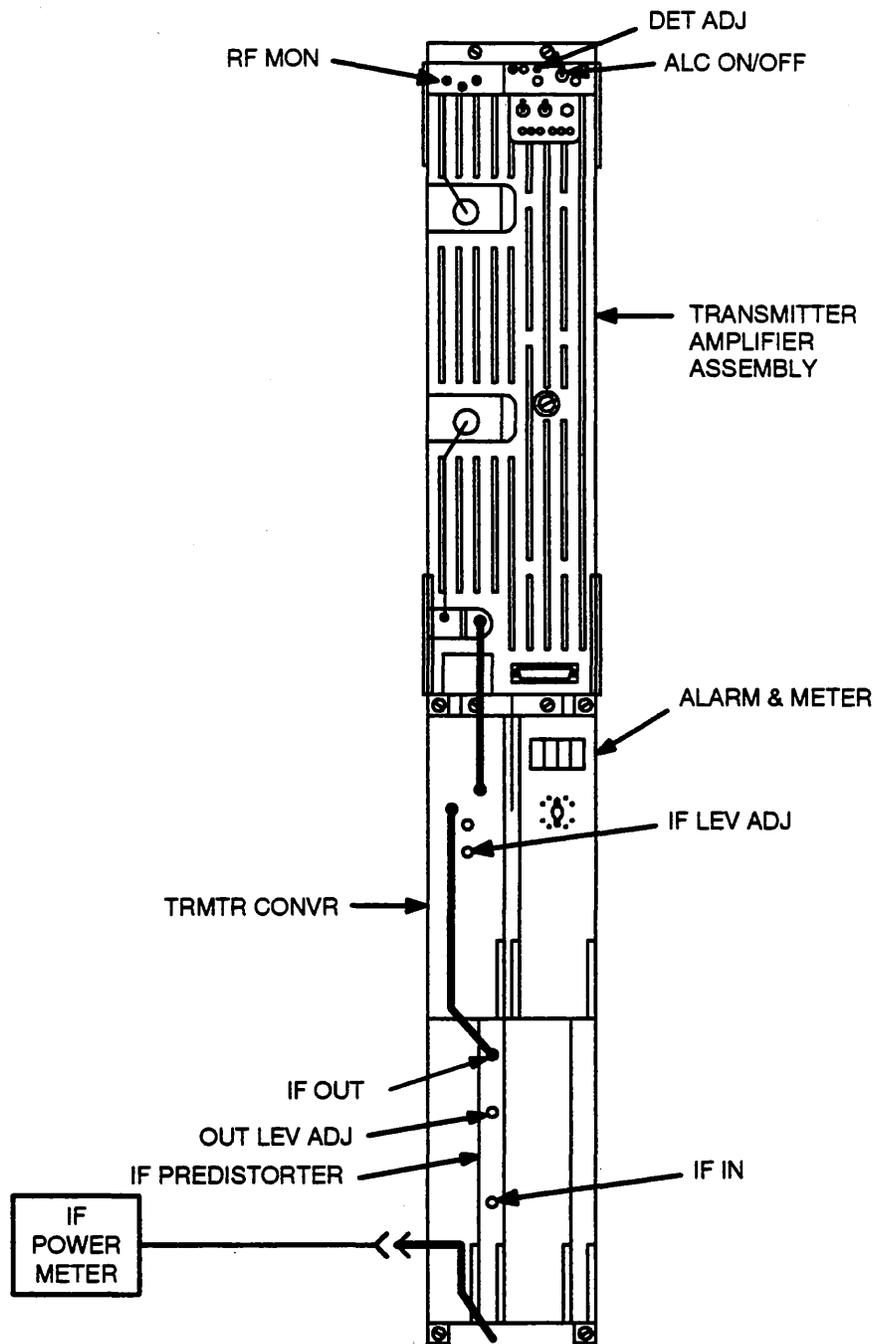


Figure 5-IF Predistorter Input Test Connections

6.3 IF PREDISTORTER GAIN CHECK AND ADJUSTMENT

This procedure is used to measure and adjust the IF predistorter output signal when the normal QAM input signal or a properly adjusted 3-tone signal is applied to the IF predistorter unit.

This procedure should be entered because of an RF power alarm and is intended only to help locate the defective unit. Final adjustments will be made after the unit has been replaced.

Prerequisite: The IF input to the IF predistorter unit is within requirements (Part 6.2).

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

TEST EQUIPMENT

- Refer to Figure 6.

PROCEDURE

1. Verify that service is protected.
2. Operate the ALC switch to OFF.
3. Disconnect the cable from the IF PREDISTORTER unit IF OUT jack.
4. Condition the power meter to measure the expected power level (normally -8.2 dBm), and connect it to the IF OUT jack (Figure 6).

Requirement: For acceptable transmitter gain operation, -8.2 ± 1.2 dBm

Note: The IF predistorter should have unity gain.

If the requirement is not met, adjust the OUT LEV ADJ control on the IF predistorter unit. If the requirement is not met, replace the IF predistorter unit and repeat this procedure.

If the requirement is still not met, suspect a DC voltage, wiring, or connector problem. Refer to the SD drawing and/or request assistance from the radio technical support group to locate and clear the problem.

Note: If the IF predistorter is replaced, go to Part 2 for additional tests that must be performed.

5. Disconnect all test equipment and return all connections to normal.
6. Operate the ALC switch to ON.
7. This test is complete. Return to Flowchart 2, Transmitter IF Input and Gain Checks Sequence, at reentry Point B.

END OF PROCEDURE

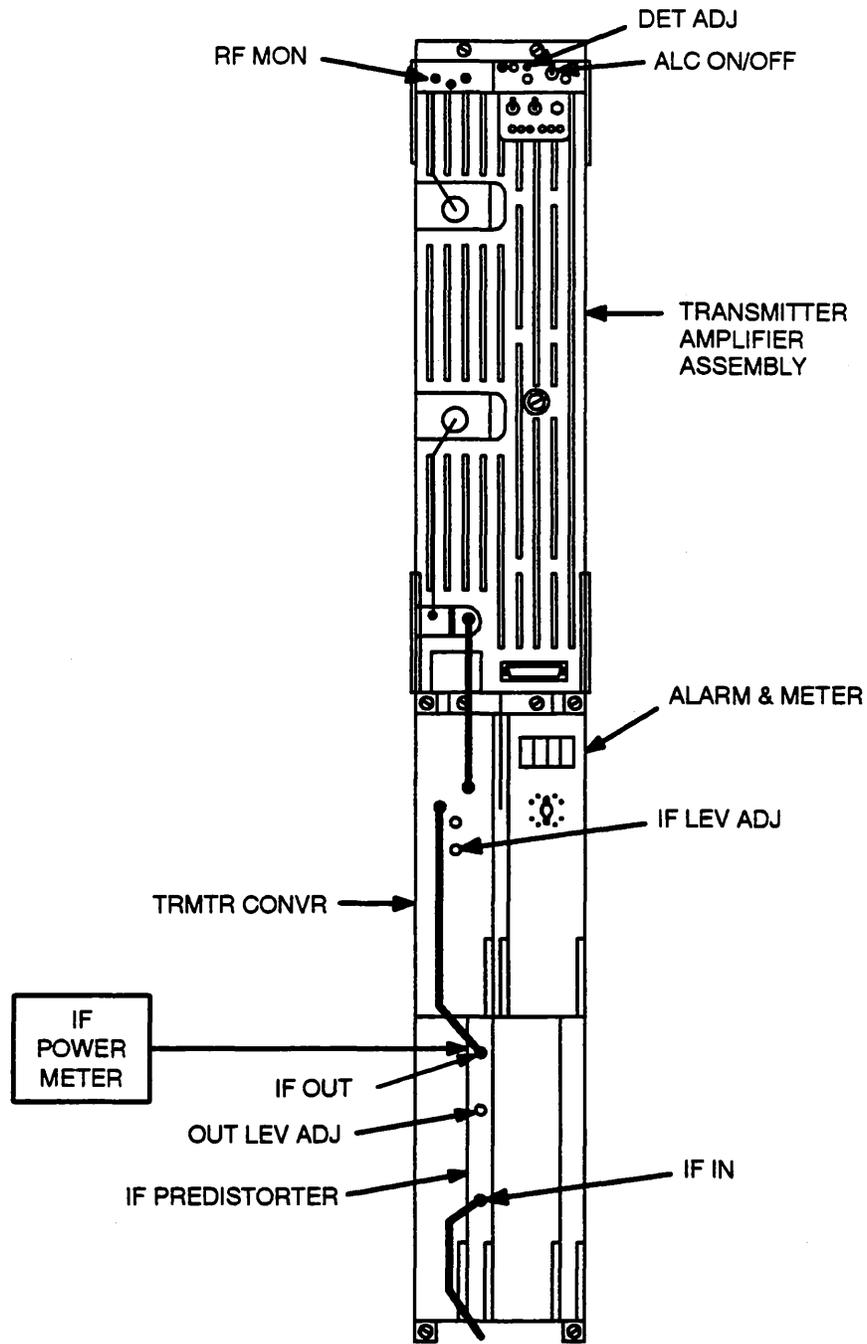


Figure 6- IF Predistorter Gain Check and Adjustment Test Connections

6.4 TRANSMITTER GAIN CHECK (ALC OFF AND ON)

This procedure is used to check the gain of the transmitter in the manual mode (ALC OFF) and then in the automatic mode (ALC ON).

This procedure should be entered because of an RF power alarm or an out-of-limit level condition.

The IF input for this test can be supplied by either the normal QAM signal from a digital terminal or regenerator or a properly conditioned 3-tone test set signal. A nominal IF signal (-8.2 dBm) is required at the IF IN jack on the TRMTR CONVR.

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

TEST EQUIPMENT

- Refer to Figure 7.

PROCEDURE

1. Verify that service is protected.
2. On the ALC NETWORK unit, operate the ALC switch to OFF.
3. Remove the input from the IF IN jack on the TRMTR CONVR.
4. Remove the termination from the RF MON jack on the ALC NETWORK.
5. Condition an RF power meter to measure the expected power level (see the RADIO DATA CARD), and connect the meter to the RF MON jack (Figure 7).
6. Reconnect the input to the IF IN jack on the TRMTR CONVR.
7. Observe the power meter and adjust the IF LEV ADJ control on the TRMTR CONVR unit.

Requirement: ± 0.1 dB of the RF MON OUT level recorded on the RADIO DATA CARD.

Note: Allow 1 minute for thermal stabilization before the final reading.

If the requirement is met, note the exact value for later use (call RF MON MAN); then go to step 8.

If the requirement is NOT met, suspect a faulty TWT amplifier or TRMTR CONVR unit. Replace faulty unit and then repeat this procedure.

Note: The RF output level measured at the TRMTR CONVR unit RF OUT jack is -2.0 dBm or greater (Part 6.5). The RF output level of the TWT amplifier is +38.0 dBm (Part 10).

8. If the ALARM AND METER unit is equipped, set the selector switch to the TRMTR ALC V position, or connect a digital multimeter to the ALC V jacks on the ALC NETWORK unit.

Requirement: 0.00 ± 0.05 volts.

9. Adjust the DET ADJ on the ALC NETWORK unit to give an ALC V indication 0.0 ± 0.05 volts.

Note: This adjustment is made to prevent unnecessary power excursion transients when the ALC switch is turned on. Deviation from this setting whenever the ALC is turned off during the steps that follow or after the completion of this procedure does not indicate a transmitter problem.

If the requirement is NOT met, suspect a faulty ALC NETWORK. Replace the unit and go to the ALC NETWORK unit RF MON jack calibration (Part 4); then repeat this procedure.

10. Operate the ALC switch to ON.
11. While observing the power meter, adjust the DET ADJ control.

Requirement: A power meter indication within ± 0.1 dB of the value recorded in Step 7 (RF MON MAN).

If the requirement is NOT met, suspect a faulty ALC NETWORK or a faulty TRMTR CONVR (internal gain circuit) unit. Replace unit and repeat this procedure.

12. While observing the power meter, operate the ALC switch OFF and then ON.

Requirement: The two indications must be within 0.03 dB of each other and each within ± 0.1 dB of the RF MON OUT value recorded on the RADIO DATA CARD.

If the requirement is met, leave the ALC ON and go to Step 13.

If the requirement is NOT met, cycle the ALC switch ON and then OFF at least six times and repeat from Step 8 with ALC OFF.

Note 1: Normally, the above process need not be performed more than three times. When the requirements have been met, switch the ALC to the ON position and go to Step 13. If the conditions cannot be met, suspect a defective TRMTR CONVR or ALC NETWORK unit.

Note 2: If the ALC NETWORK unit is replaced, perform the RF MON jack calibration (Part 4) and repeat this entire procedure.

13. Observe the ALC V voltage on the ALARM AND METER unit or at the ALC V jacks on the ALC NETWORK unit.

Requirement: 0.00 ± 0.05 volts and the PWR OUT OF RANGE indicator is off.

If the requirement is met, go to Step 14.

If the requirement is NOT met, suspect ALC NETWORK problem. If not previously done, replace the ALC NETWORK unit. Perform the ALC NETWORK unit RF MON jack calibration (Part 4); then repeat this procedure.

Note: If any units are replaced, go to the Part 2 for additional tests that must be performed.

14. Disconnect all test equipment and return all connections to normal.
15. This test is complete. Return to Flowchart 2, Transmitter IF Input and Gain Checks Sequence, at reentry Point C.

END OF PROCEDURE

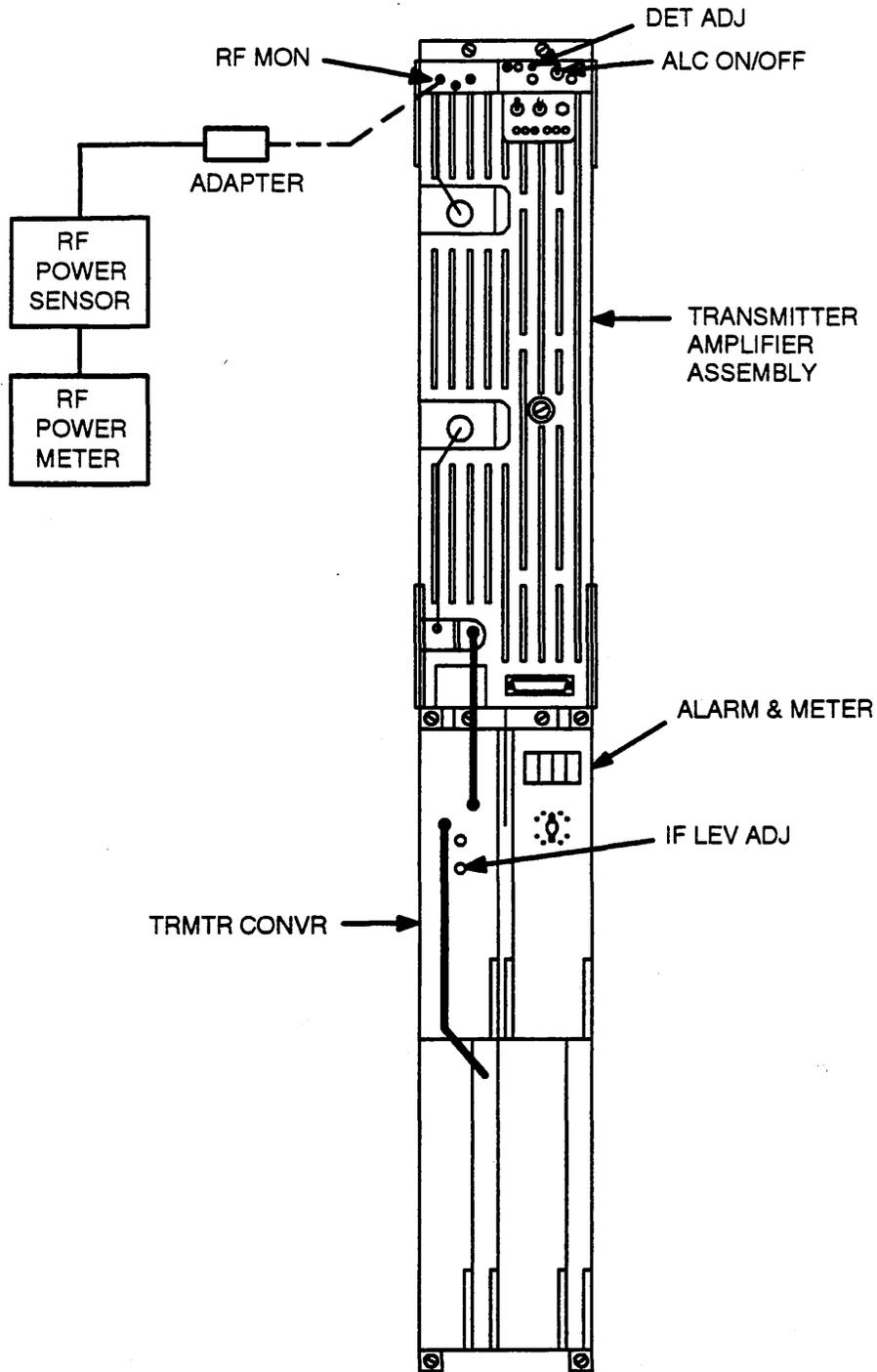


Figure 7-TWT Transmitter Gain Test Connections

6.5 TRANSMITTER UP-CONVERTER GAIN CHECK

This procedure is used to check the gain of the TRMTR CONVR.

This procedure should be entered because of an RF power alarm or an out-of-limit level condition.

The IF input for this test can be supplied by either the normal QAM signal from a digital terminal or regenerator or a properly conditioned 3-tone test set signal. The IF signal (-8.2 dBm) should be inserted directly into the IF IN jack on the TRMTR CONVR.

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

TEST EQUIPMENT

- Refer to Figure 8.

PROCEDURE

1. Verify that service is protected.
2. On the ALC NETWORK unit, operate the ALC switch to OFF.
3. Remove the input from the IF IN jack on the TRMTR CONVR.
4. Remove the semirigid cable connected between the RF OUT jack on the TRMTR CONVR and the RF FL IN jack.
5. Condition the RF power meter to measure the expected power level (normally -2 to +5 dBm), and connect the meter to the RF OUT jack on the TRMTR CONVR (Figure 8).
6. Reconnect the input to the IF IN jack on the TRMTR CONVR.
7. Observe the power meter and record the meter indication.
8. Adjust the IF LEV ADJ control for the maximum power meter indication.

Requirement: -2.0 dBm or greater.

If the requirement is NOT met, suspect a faulty TRMTR CONVR unit. Replace the faulty unit and then repeat this procedure.

Note: If any units are replaced, go to Part 2 for additional tests that must be performed.

9. Adjust the IF LEV ADJ control to the indication recorded in Step 7.
10. Disconnect all test equipment and return all connections to normal.
11. Operate the ALC switch to ON.
12. This test is complete. Return to the reentry point of the procedure that was left to perform this procedure.

END OF PROCEDURE

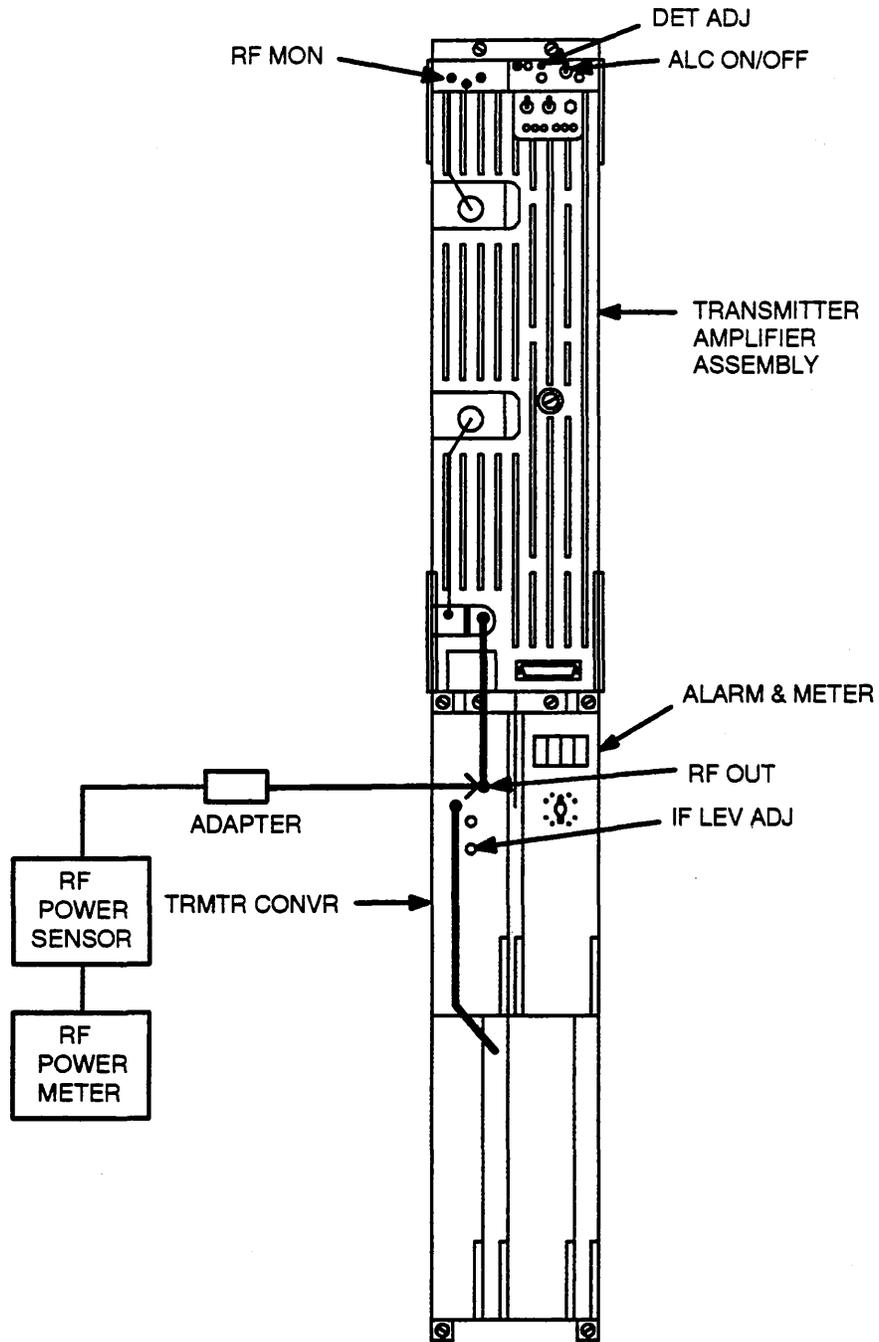


Figure 8-TRMTR CONVR RF OUT Test Connections

7. SLOPE AND FREQUENCY RESPONSE CHECK AND ADJUSTMENT

This procedure checks the amplitude vs frequency response of the TRMTR CONVR/TWT amplifier combination. Also included are steps to adjust the slope component of the amplitude response.

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

TEST EQUIPMENT

- Refer to Figure 9 or 10.

PROCEDURE

1. Verify that service is protected.
2. On the ALC NETWORK unit, operate the ALC switch to OFF.
Note: For test equipment capable of swept IF transmissions and RF displays, continue with Step 3; otherwise proceed to Step 8.
3. Condition the test set sending unit to transmit a swept IF signal at a level of -8.2 dBm at a center frequency of 70 MHz and a sweep width of ± 12 MHz. The test signal should be flat between the ± 12 -MHz points.
4. Condition the RF display unit for a scope presentation at the channel transmit frequency of ± 12 -MHz and 0.2 dB/DIV.
5. Connect the test equipment per Figure 9.
6. Observe the RF scope display.
Requirement: The +12 and -12 MHz points shall be equal (flat) ± 0.1 dB.
If the requirement is not met, adjust the SLOPE ADJ control on the TRMTR CONVR unit.
If the requirement is still not met, check components in the RF path (Flowchart 3), replace defective unit, and repeat this procedure.
7. Observe the swept trace between the ± 12 MHz points (58 and 82 MHz).
Requirement: The peak-to-peak variation between the end points shall fall within a 1 dB response window, and there shall be no abrupt discontinuities.
If the requirement is met and adjustment was necessary, go to Step 14; otherwise, go to Step 15.
If the requirement is still not met, check components in the RF path (Flowchart 3), replace defective unit, and repeat this procedure.
8. Condition the IF link analyzer transmitter to provide a continuous wave IF signal of -8.2 dBm at a frequency of 58 MHz.
Note: The link analyzer must be variable from 58 to 82 MHz.
9. Connect the test equipment per Figure 10.

10. Observe the power meter indication; temporarily record this reading.
11. Condition the IF link analyzer transmitter to provide a continuous wave IF signal of -8.2 dBm at a frequency of 82 MHz.
12. Observe the power meter indication.

Requirement: The 58- and 82-MHz points shall be equal (flat) ± 0.1 dB.

If this requirement is not met, adjust the SLOPE ADJ control on the TRMTR CONVR unit.

If the requirement is still not met, check components in the RF path (Flowchart 3), replace defective unit, and repeat this procedure.

13. While observing the power meter indication, adjust the IF link analyzer frequency in discreet steps of 78, 74, 70, 66, and 62 MHz at -8.2 dBm.

Requirement: The points shall be equal (flat) within a 1-dB window of the values observed at the end points (58 and 82 MHz) without any abrupt discontinuities.

If the requirement is met and adjustment was necessary, go to Step 14; otherwise, go to Step 15.

If the requirement is still not met, check components in the RF path (Flowchart 3), replace defective unit, and repeat this procedure.

14. If adjustment was made, perform Part 6.4 and then proceed to Step 16.
15. If NO adjustments were made, disconnect test equipment and restore all connections to normal.
16. If units were replaced during this procedure, perform Part 2.
17. Disconnect all test equipment and return all connections to normal.
18. Operate the ALC switch to ON.
19. This test is complete. Return to the reentry point of the procedure that was left to perform this procedure.

END OF PROCEDURE

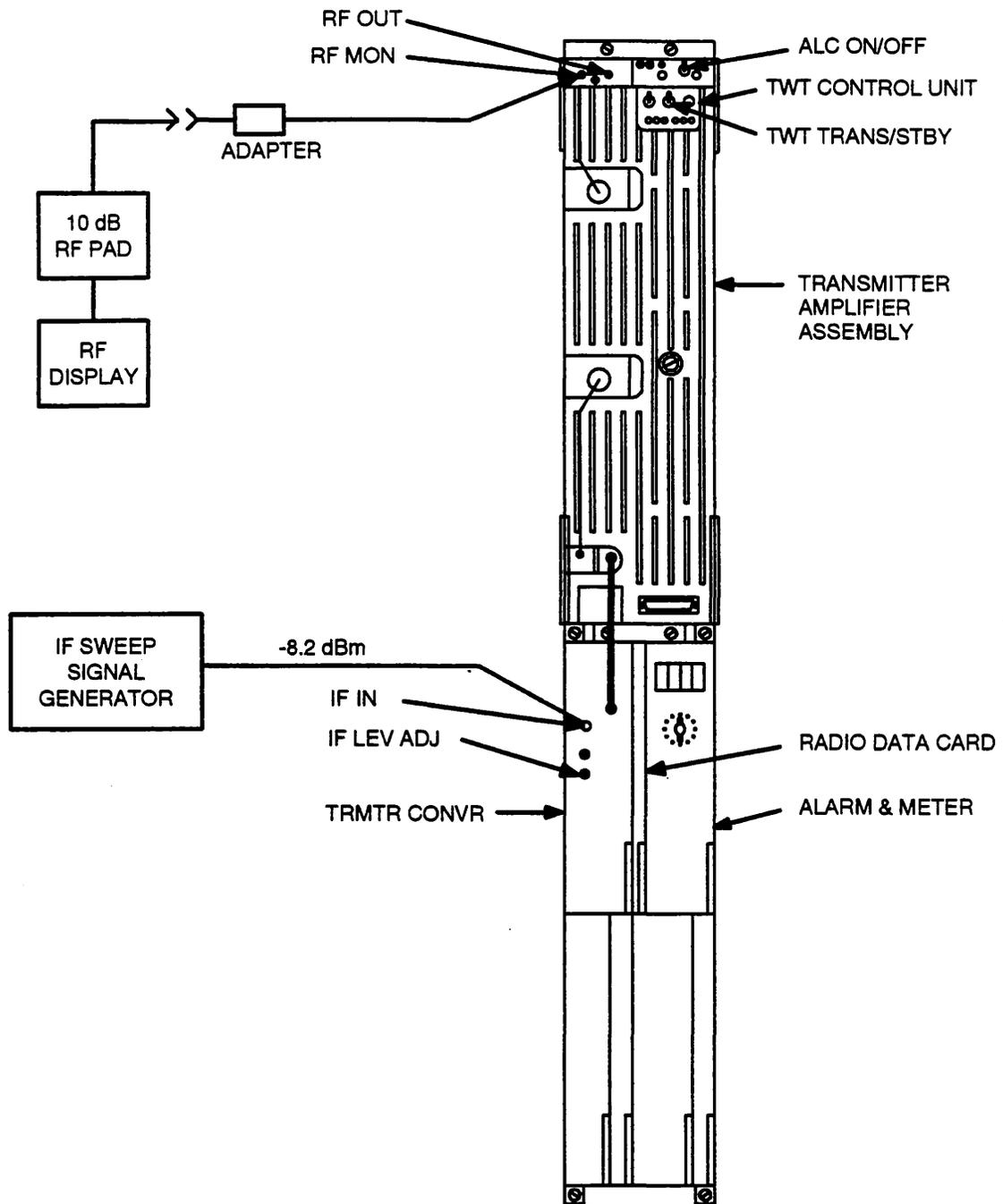


Figure 9-Slope and Frequency Response Test Connections With IF Sweep Signal Generator

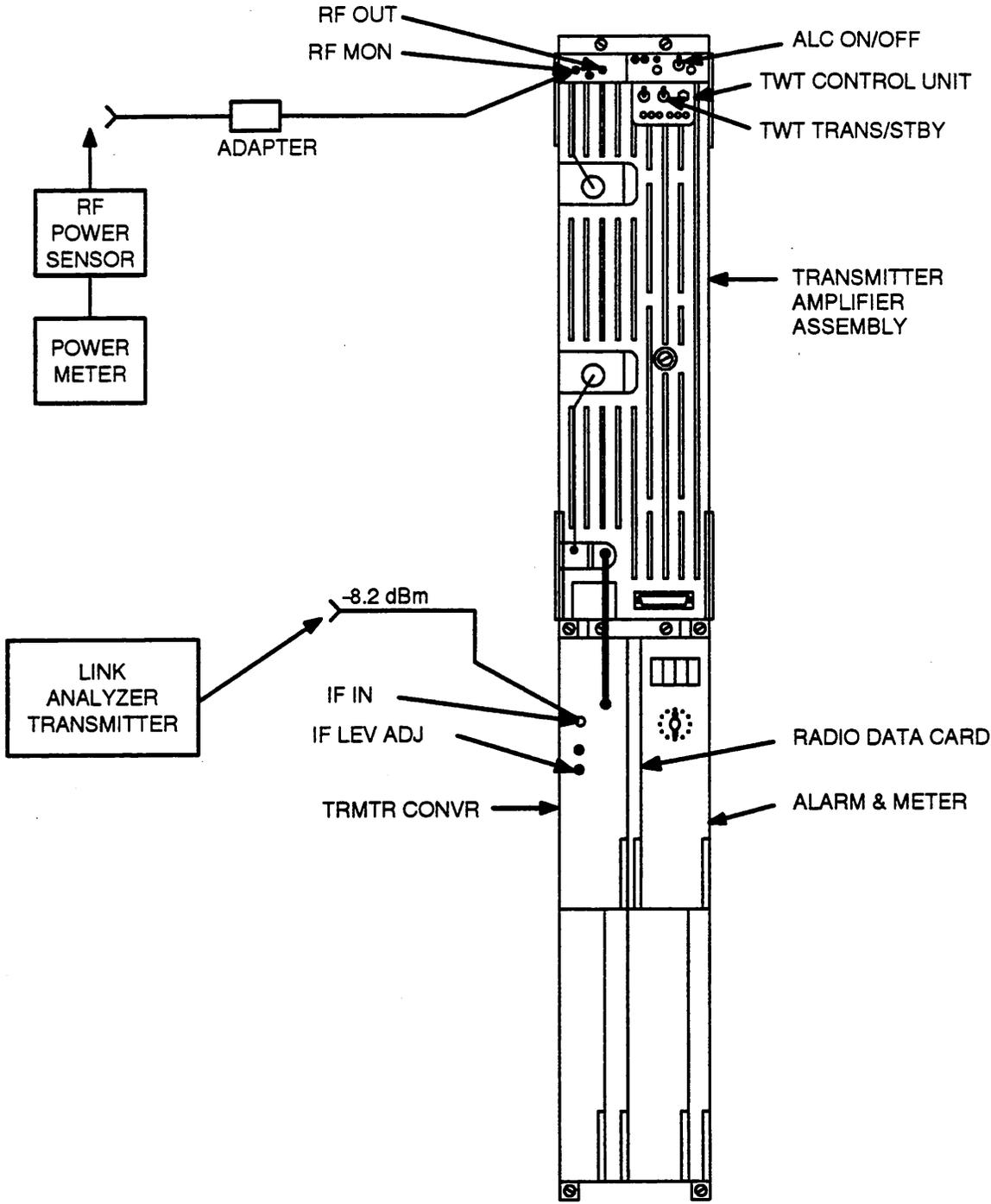
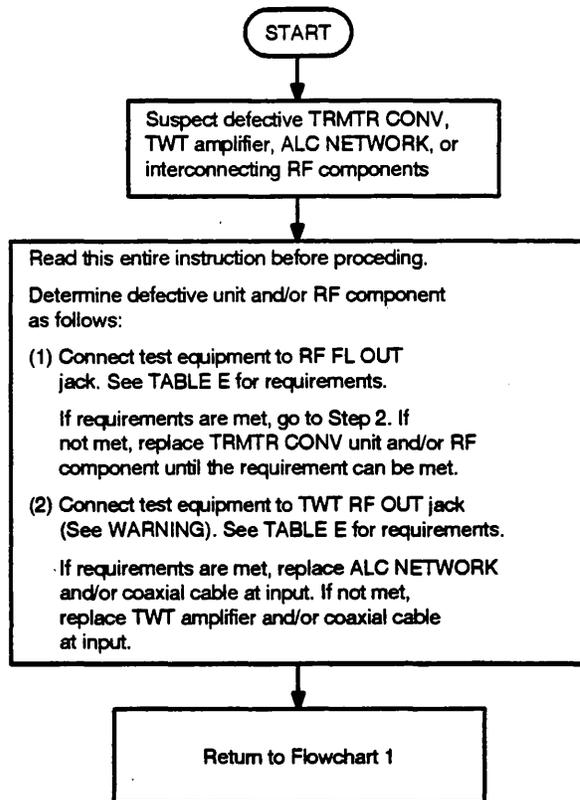


Figure 10-Slope and Frequency Response Test Connections With Link Analyzer



WARNING: To avoid power meter damage, use power attenuator when measuring RF OUT.

TABLE E SLOPE AND RESIDUAL SHAPE REQUIREMENTS		
TEST POINT	SLOPE* AT 58 AND 82 MHZ	SHAPE FROM 58 TO 82 MHZ
RF FL OUT	± 0.6 dB	± 0.4 dB
TWT RF OUT	± 0.2 dB	± 0.8 dB

* Maximum residual slope allowed with SLOPE ADJ control on TRMTR CONV unit adjusted to maximum

Flowchart 3-Transmitter Slope and Frequency Response Trouble Isolation

8. TWT AMPLIFIER TRANSMITTER LINEARIZATION ADJUSTMENTS

8.1 TWT AMPLIFIER TRANSMITTER LINEARIZATION ADJUSTMENT WITH RF SPECTRUM ANALYZER

This procedure is used to measure and then adjust to minimize the third-order products of the transmitter. A -8.2 dBm 3-tone source is used for inputs and the outputs are measured by RF and IF spectrum analyzers.

Prerequisite: Part 6.4 must be completed before proceeding with this procedure.

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

TEST EQUIPMENT

- Refer to Figure 11.

PROCEDURE

1. Verify that service is protected.
2. On the ALC NETWORK unit, operate the ALC switch to OFF.
3. Condition the 3-tone signal generator for a -8.2 dBm output with equal amplitude tones.
4. Remove the cable normally connected to the IF IN jack on the TRMTR CONVR.
5. Condition the RF spectrum analyzer to measure a 30-MHz bandwidth centered at the RF channel transmit frequency.
6. Connect the test equipment per Figure 11.
7. Operate the ALC switch to ON.
8. Observe the displayed spectrum and note the difference in power between any one of the three tones and the highest level (third-order) tone within the 30-MHz bandwidth. See Figure 12 for an example.
9. Insert a 3-dB attenuator at the input to the spectrum analyzer (See Note).

Note: If a 3-dB attenuator is not available, a 10-dB attenuator can be used.

Requirement: The difference between the fundamental and third-order products shall remain the same when the pad is inserted.

If this requirement is not met, remove the 3-dB attenuator, add 10 dB more RF attenuation to the spectrum analyzer input, and repeat from Step 8.

10. Remove the 3-dB attenuator from the analyzer input.

11. Observe the displayed spectrum and note the difference in power between any one of the three tones and the highest level (third-order) tone within the 30-MHz bandwidth. See Figures 12 and 13 for an example and definition of this difference.

Requirement: The difference between any one of the three tones and the highest level (third-order product) shall meet the requirement given in Figure 13 for the operating power level.

If this requirement is NOT met, refer to Flowchart 4 for linearity trouble isolation procedures.

12. For transmitters equipped with IF predistorters, proceed with Step 13; otherwise, go to Step 30.
13. For use in the following steps, observe the displayed spectrum and temporarily record the exact difference in level; call this difference TWT(dif).
14. Operate the ALC switch to OFF.
15. Remove the cable normally connected to the IF OUT jack on the IF predistorter.
16. Condition the IF power meter for an IF power measurement.
17. Connect the IF power sensor to the IF OUT jack on the IF predistorter.
18. Connect the 3-tone -8.2 dBm signal to the IF IN jack on the IF predistorter.
19. Adjust the OUT LEV ADJ control of the IF predistorter for a power level of -8.2 dBm.
20. Condition the spectrum analyzer for a center frequency of 70 MHz and a bandwidth of 30 MHz.
21. Connect the test equipment per Figure 14, Option A.
22. Adjust the DIST LEV ADJ control of the IF predistorter for the same difference in level recorded in Step 14.
23. Remove the IF spectrum analyzer and restore normal connection between the IF OUT jack of the IF predistorter and the IF IN jack on the TRMTR CONVR.
24. Condition the RF spectrum analyzer to measure a 30-MHz bandwidth centered at the RF channel transmit frequency.
25. Connect the test equipment per Figure 14, Option B.
26. Operate the ALC switch to ON.
27. Adjust the DIST ANGLE ADJ control on the IF predistorter for minimum intermodulation tone levels (maximum difference between any one of the three signal tones and the highest third-order product).
28. Alternately adjust the DIST LEV ADJ and DIST ANGLE ADJ controls on the IF predistorter to maximize the difference between the signal tones and intermodulation tones across the 30-MHz bandwidth. Continue until no further minimization is possible (Figure 15).

Requirement: The difference shall be equal to or greater than 47 dB.

If this requirement cannot be met, remove the IF predistorter unit and verify that the slide switch on the side of the unit is in the proper position. See the REPLACEMENT PROCEDURES tab for the correct position.

If this requirement still cannot be met, replace the IF predistorter unit and repeat this procedure.

29. Operate the ALC switch to OFF and measure the IF predistorer IF OUT power level.

Requirement: $-8.2 \text{ dBm} \pm 0.5 \text{ dB}$.

If this requirement is NOT met, adjust the OUT LEV ADJ control on the IF predistorer to $-8.2 \text{ dBm} \pm 0.1 \text{ dB}$ and repeat from Step 25.

Note: If any units were replaced during this procedure, go to Flowchart 1, Transmitter Alignment Procedures Sequence, for any additional tests that must be performed.

30. If necessary, operate the ALC switch to OFF.
31. Disconnect all test equipment and return all connections to normal.
32. Operate the ALC switch to ON.
33. This test is complete. Return to the reentry point of the procedure that was left to perform this procedure.

END OF PROCEDURE

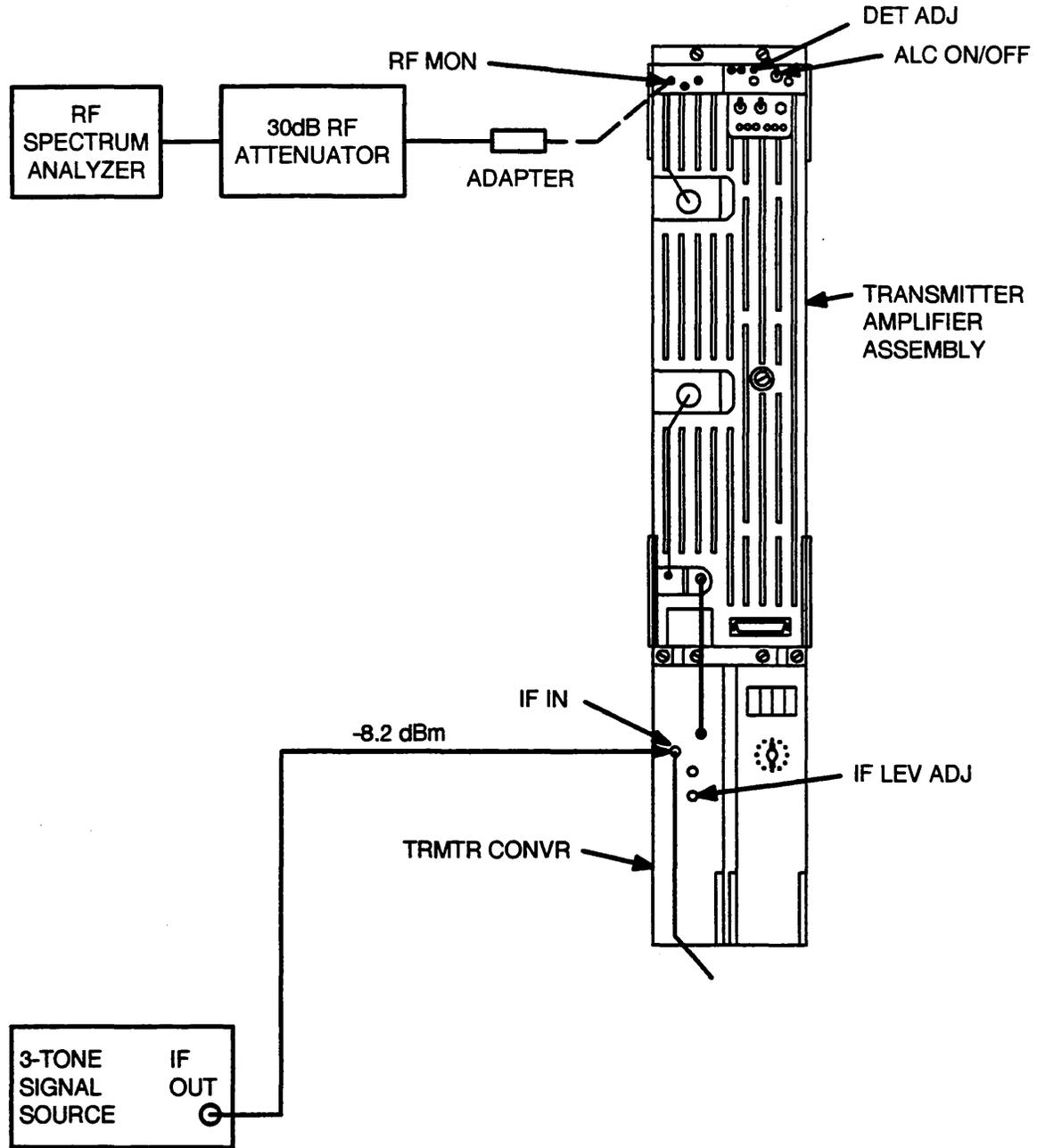


Figure 11-TWT Amplifier Linearity Test Connections With RF Spectrum Analyzer

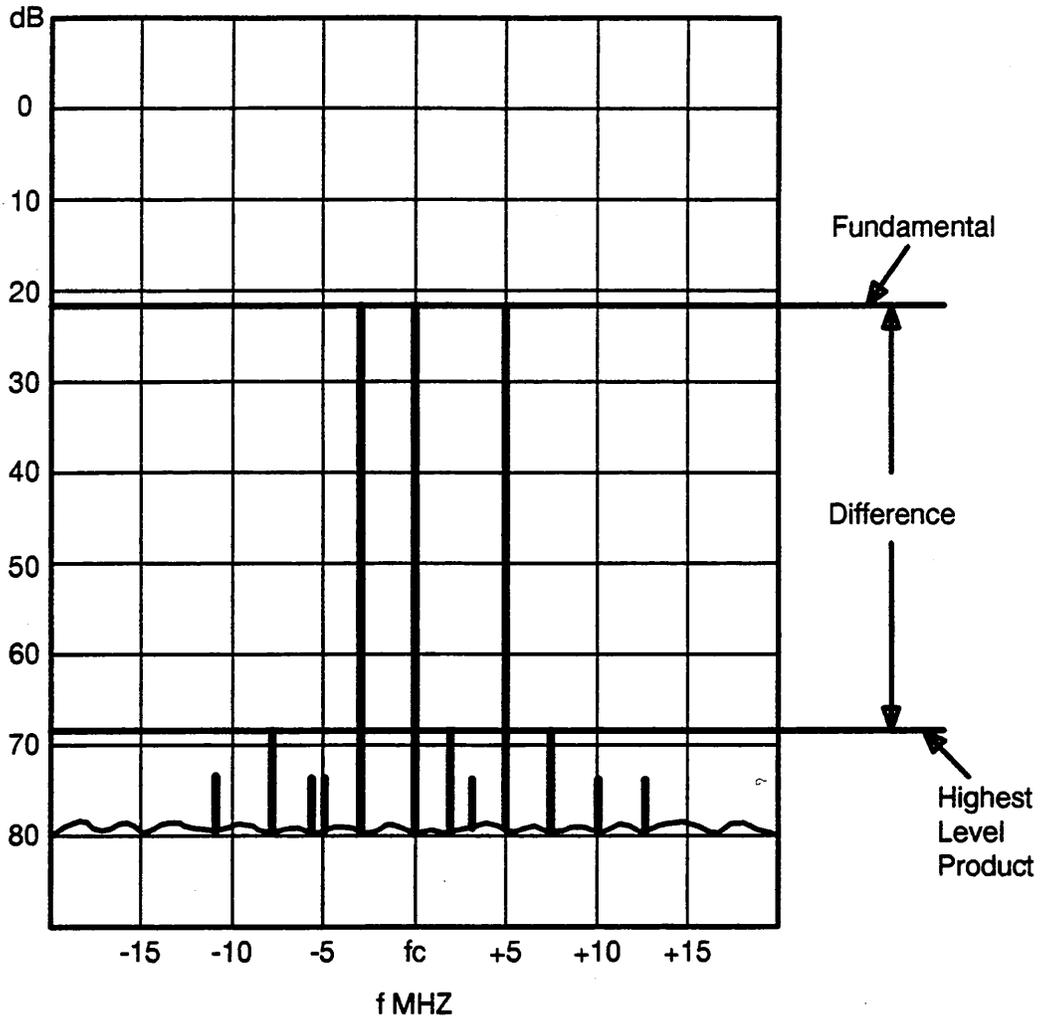
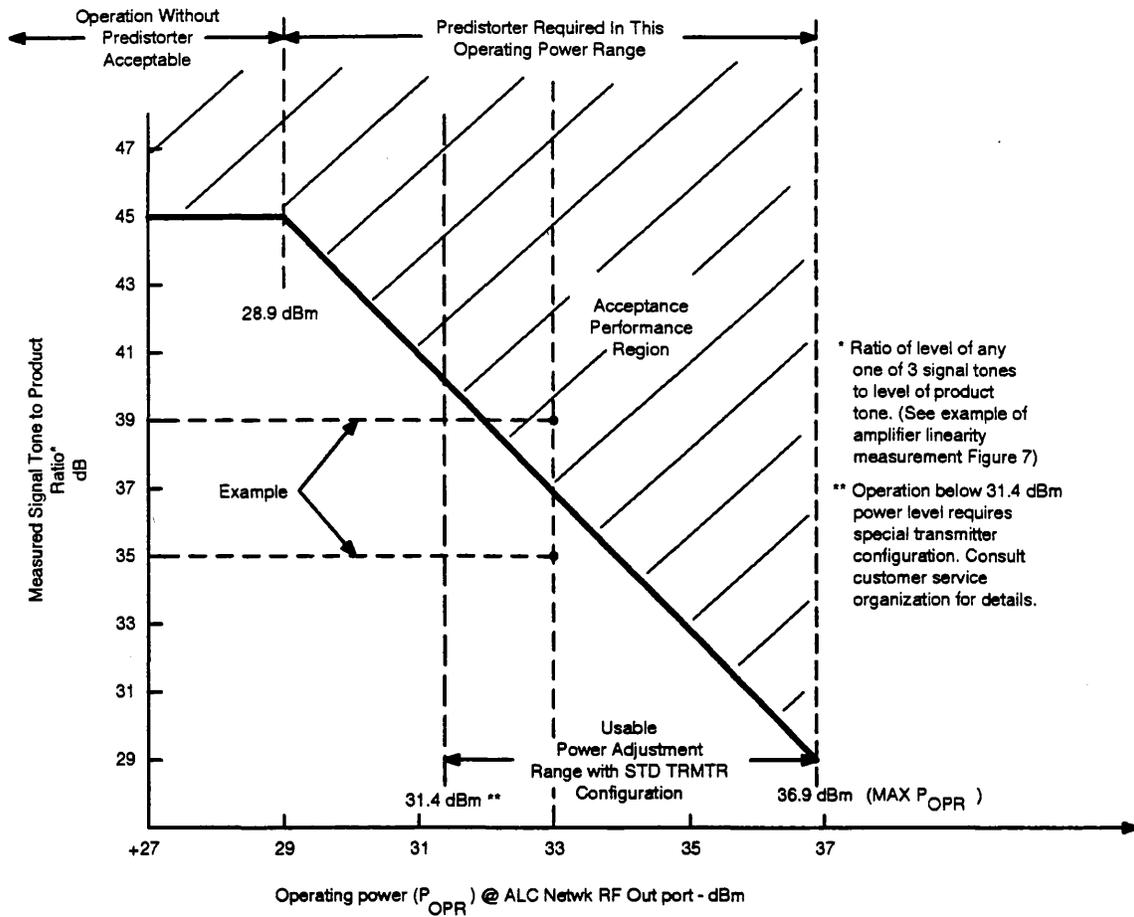


Figure 12- Transmitter Alignment Check Example



Example with operating power of +33 dBm

- Measured product ratio of 35 dB is not acceptable
- Measured product ratio of 39 dB is acceptable

Figure 13-TRMTR CONVR/TWT Amplifier 3-Tone Linearity Requirements

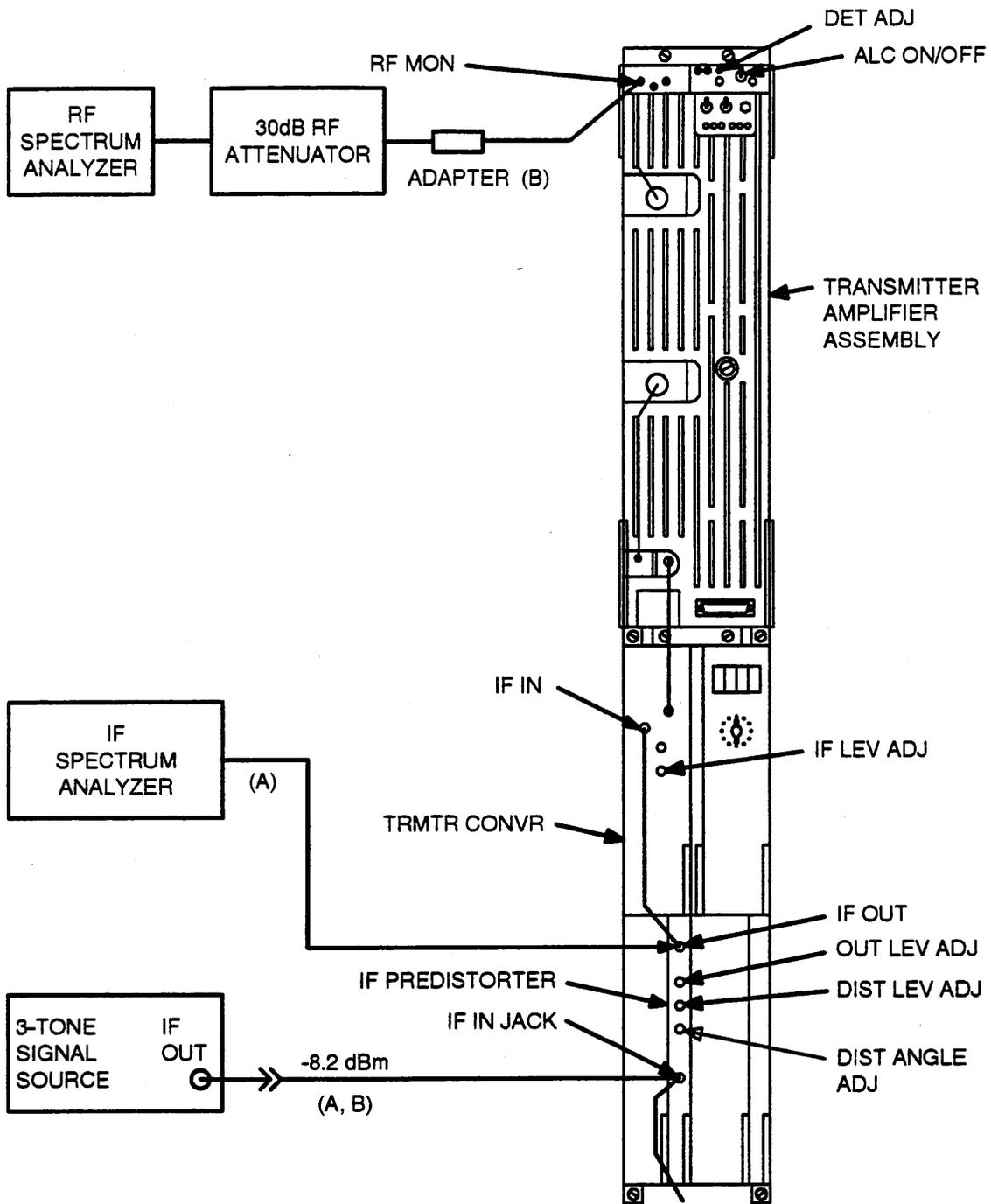


Figure 14-Transmitter Linearization Adjustment Test Connections With RF Spectrum Analyzer

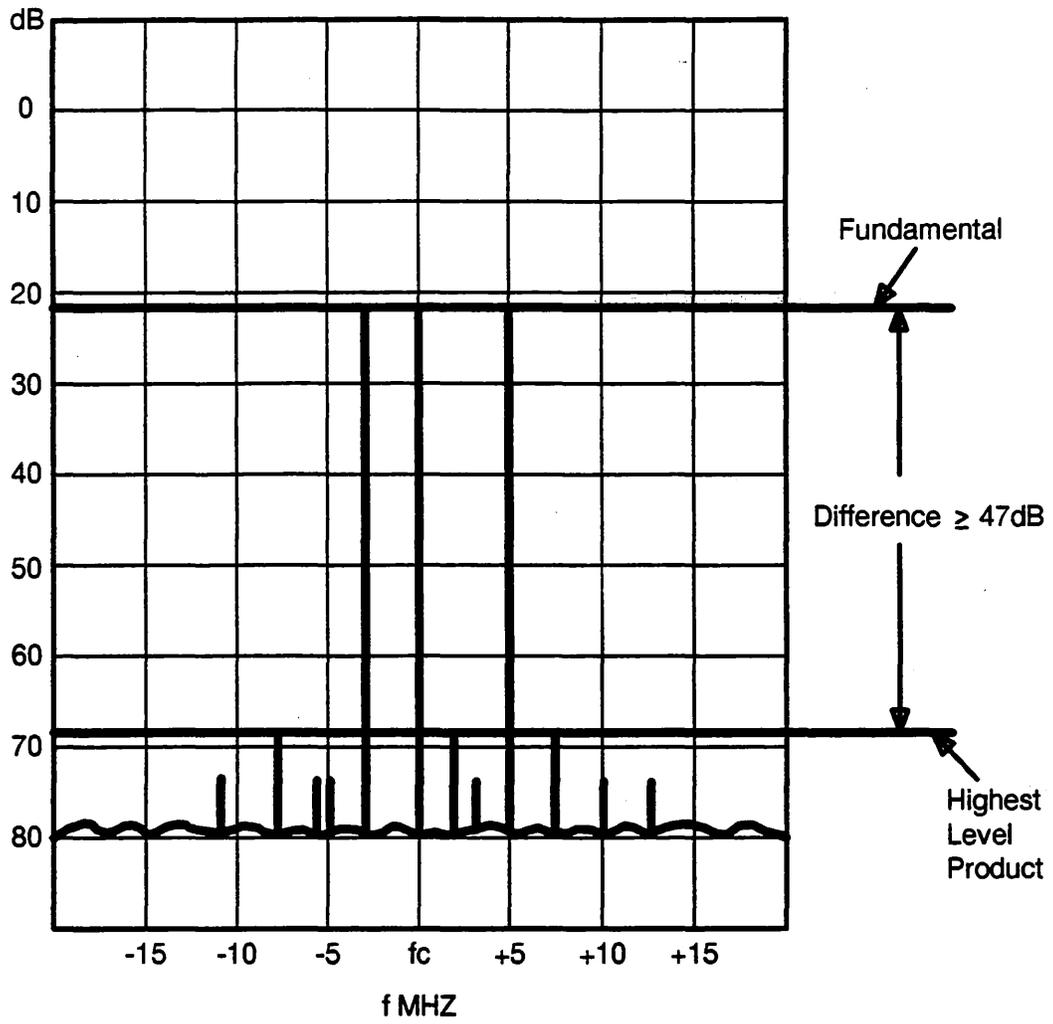
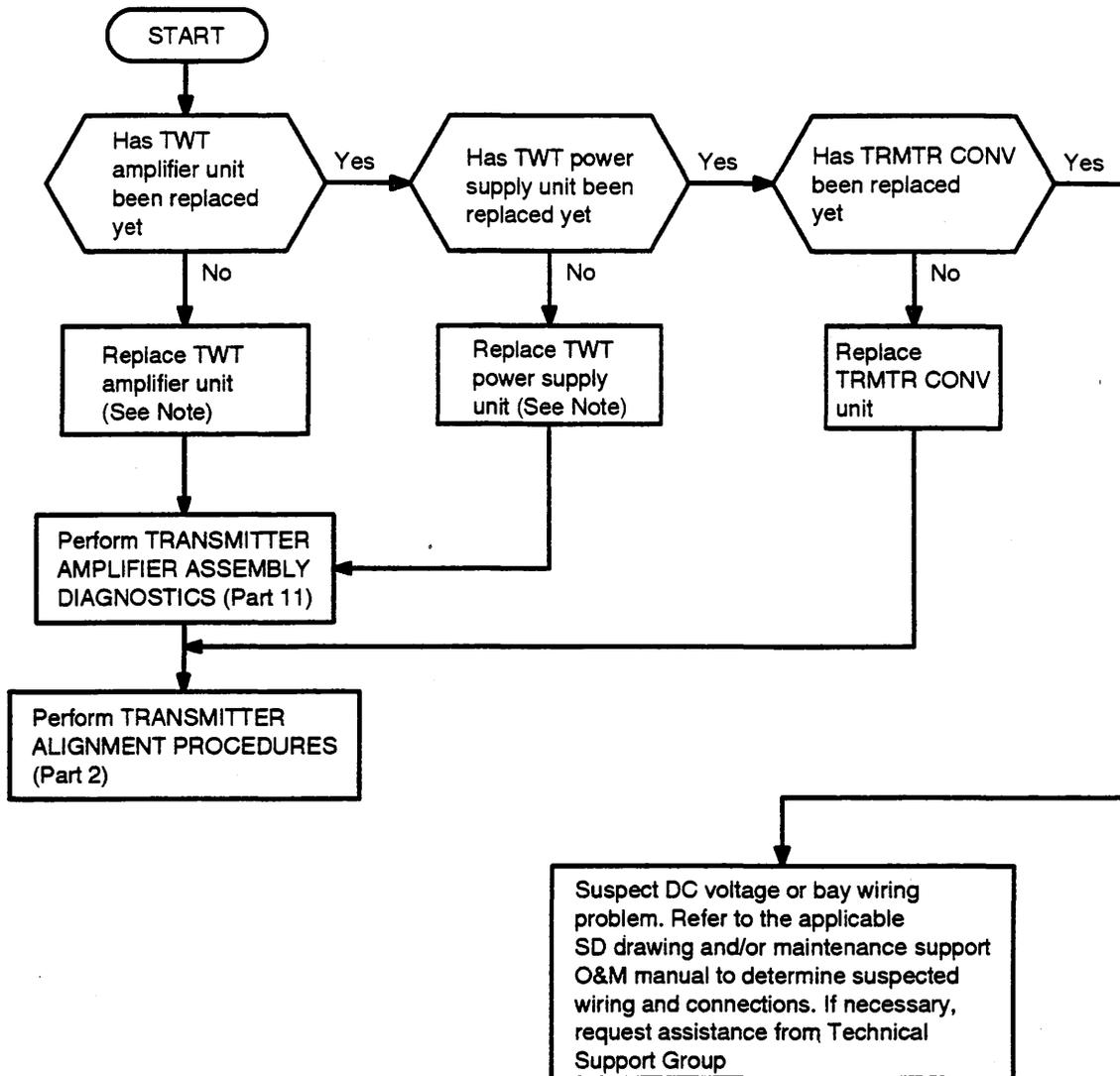


Figure 15- Overall Transmitter 3-Tone Linearity Requirement



Note:

If the source of the problem is found to be something other than a TWT amplifier or TWT power supply that has been replaced, retain the original unit(s) as a spare if it is relatively new. If there is any doubt about the quality of the original unit(s), either reinstall original and retest OR return to the factory for evaluation once an additional spare is available. In the latter case, the unit returned to the factory should be identified as being returned for this purpose. If the original unit is relatively old, especially the TWT amplifier, a new spare should be ordered.

Flowchart 4-Transmitter Linearity Trouble Isolation

8.2 TWT AMPLIFIER TRANSMITTER LINEARIZATION ADJUSTMENT WITH IF SPECTRUM ANALYZER

This procedure is used to measure and then adjust to minimize the third-order products of the transmitter. A -8.2 dBm 3-tone source is used for inputs and the output is measured by IF spectrum analyzer.

Prerequisite: The transmitter gain check (Part 6.4) must be completed before proceeding with this procedure.

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

TEST EQUIPMENT

- Refer to Figure 16.

PROCEDURE

1. Verify that service is protected.
2. On the ALC NETWORK unit, operate the ALC switch to OFF.
3. Condition the 3-tone signal generator for a -8.2 dBm output with equal amplitude tones.
4. Remove the cable normally connected to the IF IN jack on the TRMTR CONVR.
5. Condition the IF spectrum analyzer to measure a 70 MHz and a bandwidth of 30 MHz.
6. Connect the test equipment per Figure 16, Option A.
7. Operate the ALC switch to ON.
8. Observe the displayed spectrum and note the difference in power between any one of the three tones and the highest level (third-order) tone within the 30-MHz bandwidth. See Figures 12 and 13 for an example and definition of this difference.

Requirement: The difference between any one of the three tones and the highest level (third-order product) shall meet the requirement given in Figure 13 for the operating power level.

If this requirement is not met, refer to Flowchart 4 for linearity trouble isolation assistance.

9. For transmitters equipped with IF predistorters, proceed with Step 10; otherwise, go to Step 25.
10. For use in the following steps, observe the displayed spectrum and temporarily record the exact difference in level; call this difference TWT(dif).
11. Operate the ALC switch to OFF.
12. Remove the cable normally connected to the IF OUT jack on the IF predistorter.
13. Condition the IF power meter for an IF power measurement.

14. Connect the IF power sensor to the IF OUT jack on the IF predistorter.
15. Connect the 3-tone -8.2 dBm signal to the IF IN jack on the IF predistorter.
16. Adjust the OUT LEV ADJ control of the IF predistorter for a power level of -8.2 dBm.
17. Connect the test equipment per Figure 16, Option B.
18. Adjust the DIST LEV ADJ control of the IF predistorter for the same difference in level recorded in Step 11.
19. Remove the IF spectrum analyzer and restore normal connection between the IF OUT jack of the IF predistorter and the IF IN jack on the TRMTR CONVR.
20. Connect the test equipment as shown in Figure 16, Option C.
21. Operate the ALC switch to ON.
22. Adjust the DIST ANGLE ADJ control on the IF predistorter for minimum intermodulation tone levels (maximum difference between any one of the three signal tones and the highest third-order product).
23. Alternately adjust the DIST LEV ADJ and DIST ANGLE ADJ controls on the IF predistorter to maximize the difference between the signal tones and intermodulation tones across the 30-MHz bandwidth. Continue until no further minimization is possible (Figure 15).

Requirement: The difference shall be equal to or greater than 47 dB.

If this requirement cannot be met, remove the IF predistorter unit and verify that the slide switch on the side of the unit is in the proper position. See the REPLACEMENT PROCEDURES tab for the correct position.

If this requirement still cannot be met, replace the IF predistorter unit and repeat this procedure.

24. Operate the ALC switch to OFF and measure the IF predistorter IF OUT power level.

Requirement: -8.2 dBm \pm 0.5 dB.

If this requirement is NOT met, adjust the LEV OUT control on the IF predistorter to -8.2 dBm \pm 0.1 dB and repeat from Step 20.

25. If necessary, operate the ALC switch to OFF.
26. Disconnect all test equipment and return all connections to normal.
27. Operate the ALC switch to ON.
28. This test is complete. Return to the reentry point of the procedure that was left to perform this procedure.

END OF PROCEDURE

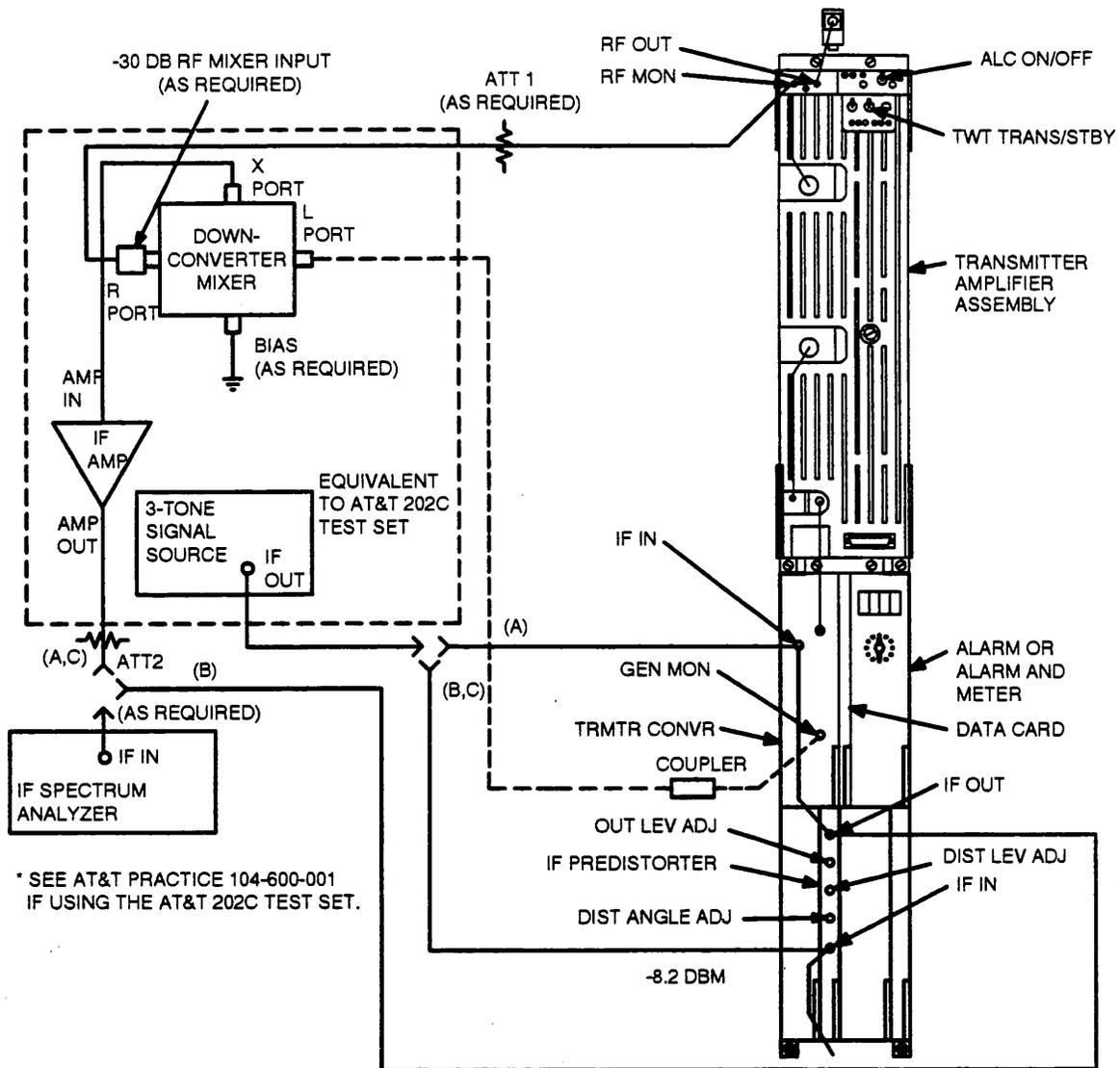


Figure 16-TWT Transmitter Linearity Test Connections With IF Spectrum Analyzer

9. TRANSMITTER RF OUTPUT POWER CHECK

This procedure is used to check the RF output power at the calibrated RF MON jack and the ALC voltage of the transmitter with the 64-QAM signal applied. The RF MON jack is used for the power measurement.

Note: This is an in-service procedure.

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

TEST EQUIPMENT

- Refer to Figure 17.

PROCEDURE

1. Remove the termination on the ALC NETWORK unit RF MON jack.
2. Condition the power meter to measure the expected power level (normally +6 to +12 dBm), and connect it to the RF MON jack. Refer to Figure 17. See the RADIO DATA CARD.

Requirement: Within ± 0.3 dB of the RF MON OUT value recorded on the RADIO DATA CARD.

3. Set the selector switch on the ALARM AND METER unit to the ALC V position, or use a digital multimeter and measure at the ALC V test points on the ALC NETWORK unit.

Requirement: 0.00 ± 0.12 volts.

If the requirement is NOT met, perform Part 6.

4. Disconnect all test equipment and return all connections to normal.
5. This test is complete. Return to the reentry point of the procedure that was left to perform this procedure.

END OF PROCEDURE

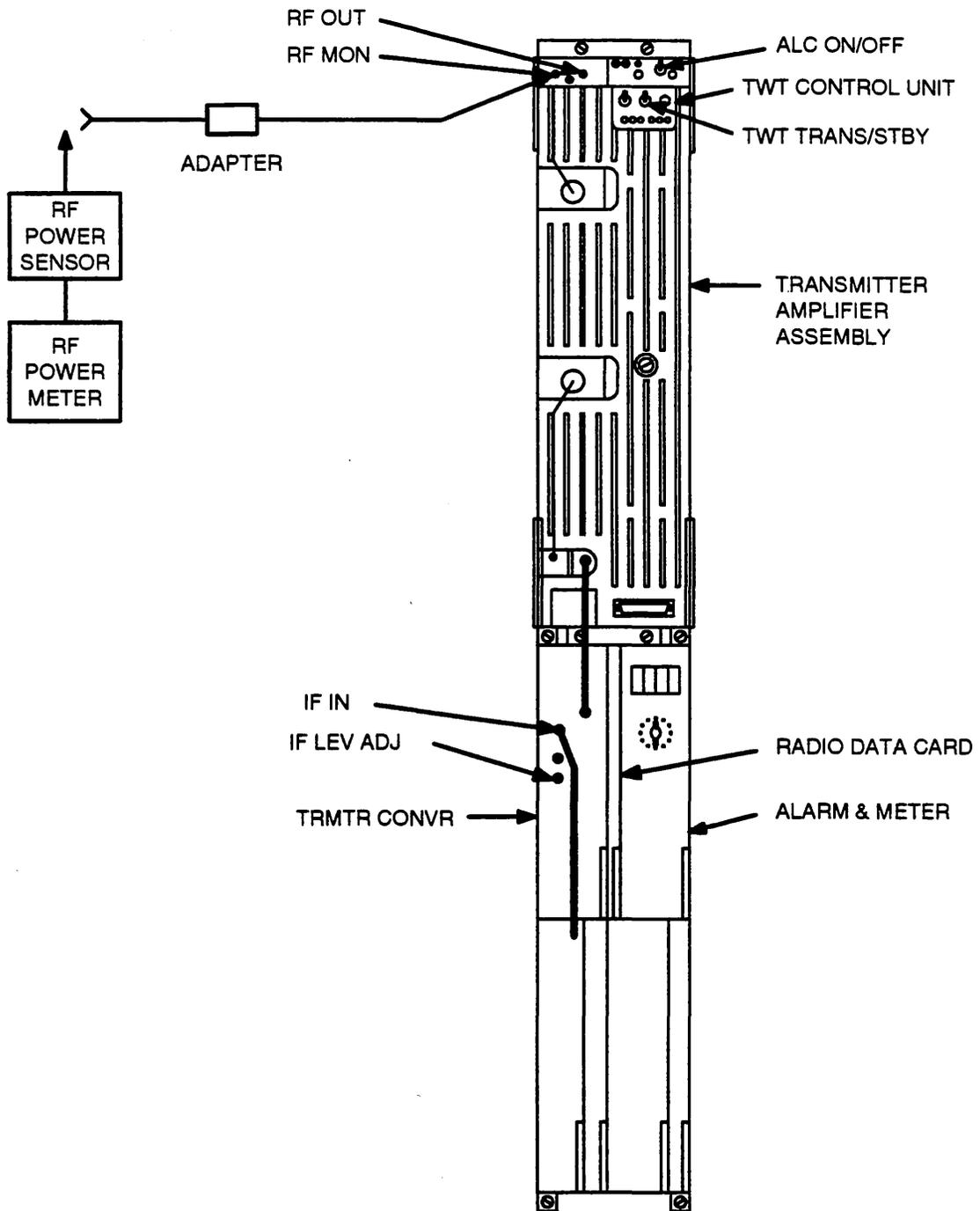


Figure 17-TWT Transmitter Output Power Test Connections

10. TWT AMPLIFIER RF OUTPUT POWER CHECK

This test is used to check the RF output level of the TWT amplifier unit. The IF input for this test can be supplied by either the normal QAM signal from a digital terminal or regenerator or a properly conditioned 3-toned test signal (the preferred input is the QAM signal).

Prerequisite: The RF input to the TWT amplifier is within requirements.

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The RF power sensor and high power attenuator must be supported, or the connector may be damaged.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

TEST EQUIPMENT

- Refer to Figure 18.

PROCEDURE

1. Verify that service is protected.
2. On the ALC NETWORK unit, operate the ALC switch to OFF.
3. On the TWT power supply, operate the TRANS/STBY to STBY.

Note: Do not leave the TWT power supply in STBY for periods exceeding 24 hours. Leave the TWT amplifier powered (on TRANS and ON) when the input is removed. This mode of "keep-warm" operation can improve the return-to-operation time. There is no difference in aging with either operation.

4. Remove the semirigid cable at the RF OUT jack of the ALC NETWORK.
5. Remove the semirigid cable from the RF OUT jack on the TWT amplifier.

Note: Move ALC NETWORK forward to facilitate the removal of the semirigid cable.

6. Connect the test equipment to the RF OUT jack of the TWT amplifier per Figure 18.

Note: Before "power-up" of the TWT amplifier, the RF OUT jack must be terminated with the normal bay cable or high-power attenuator.

7. Operate the TRANS/STBY switch to TRANS.
8. Observe the RF power meter.

Note: Allow 1 minute for thermal stabilization before the final reading.

Requirement: +38.0 dBm \pm 0.2 dB.

If the requirement is NOT met, try adjusting the IF LEV ADJ control on the TRMTR CONVR for +38.0 dBm.

If the requirement still is NOT met, suspect a faulty TWT amplifier or TWT power supply. Replace the unit and repeat this procedure. See REPLACEMENT PROCEDURES tab.

9. Operate the TRANS/STBY switch to STBY.

10. Disconnect all test equipment and return all connections to normal.

Note: If any units were replaced, go to Part 2 for additional tests that must be performed.

11. Operate the TRANS/STBY switch to TRANS.

Note: Before "power-up" of the TWT amplifier, the RF OUT jack must be terminated with the normal bay cable or high-power attenuator.

12. Operate the ALC switch to ON.

13. This test is complete. Return to the reentry point of the procedure that was left to perform this procedure.

END OF PROCEDURE

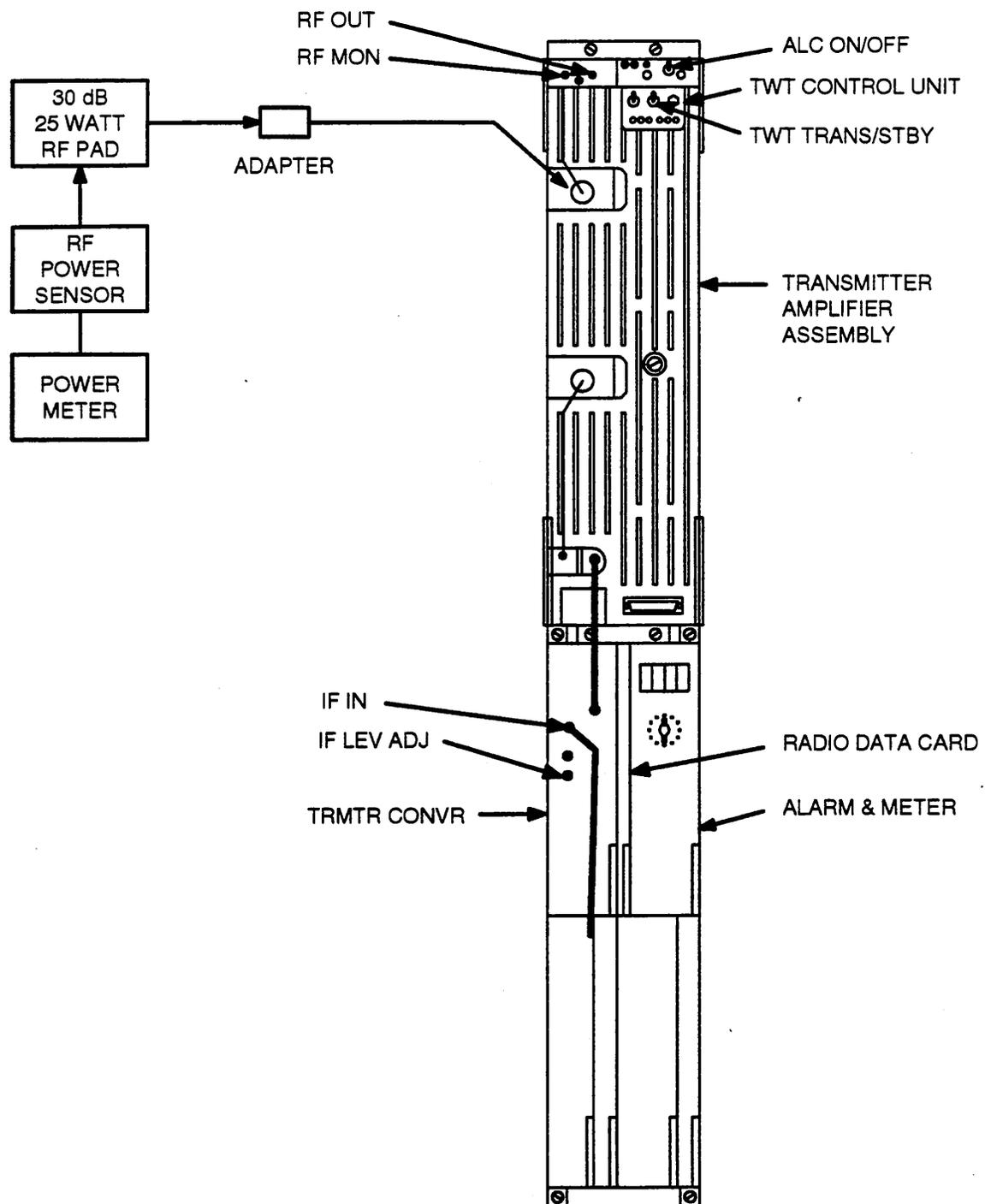
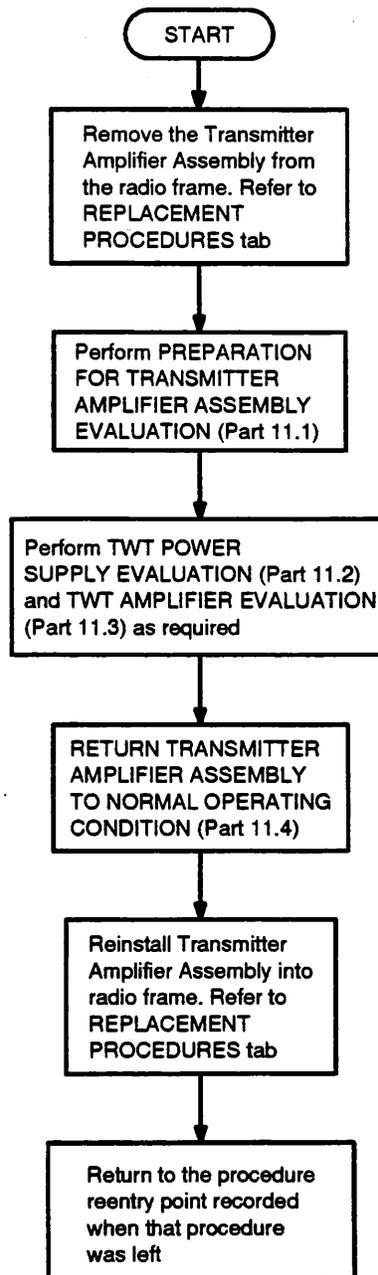


Figure 18-TWT Amplifier RF Output Test Connections

11. TRANSMITTER AMPLIFIER ASSEMBLY DIAGNOSTICS

Flowchart 5 is used as an outline for evaluating a suspected TWT power supply and/or TWT amplifier problem.



Flowchart 5- Transmitter Amplifier Assembly Diagnostics Sequence

11.1 PREPARATION FOR TRANSMITTER AMPLIFIER ASSEMBLY EVALUATION

This procedure is used to prepare the transmitter amplifier assembly for diagnostic evaluation.

Prerequisite: The transmitter amplifier assembly must be removed from the radio bay (see the REPLACEMENT PROCEDURES tab).

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

TEST EQUIPMENT

- 1 - SIEMENS Dummy Load
- 1 - Screwdriver.

PROCEDURE

1. Verify that service is protected.
2. Place the transmitter amplifier assembly on its back so that the controls are facing upward.
3. At the bottom of the transmitter amplifier assembly, remove the multipin power connector at the output of the TWT power supply control unit.
4. Connect the dummy load test cable to the output connector of the TWT power supply control unit.
5. Route the free ends of both cables to the lower front, clear of the transmitter amplifier assembly.

Caution: *Before placing the assembly on the support bracket, carefully inspect the assembly to ensure there are no wires that could be caught or pinched by the bracket. Observe the assembly as it is being slid into the support bracket to ensure that no wires catch or get pinched.*

6. Install the transmitter amplifier assembly into the radio frame while carefully routing the free end of the two cables under the front heat sink of the assembly. Lock the four holding screws into place.
7. On the TWT power supply control unit, operate the TRANS/STBY switch to STBY and the ON/OFF switch to OFF.
8. Reconnect the power connector located on the lower right corner of the transmitter amplifier assembly.
9. Reconnect the semirigid cable between the RF OUT jack on the TRMTR CONVR unit and the RF FL IN jack on the transmitter amplifier assembly. Tighten with a torque wrench.
10. The TWT power supply and/or TWT amplifier is ready for evaluation. Go to Part 11.2 or 11.3 as required.

END OF PROCEDURE

11.2 TWT POWER SUPPLY EVALUATION

This procedure provides the test setup for evaluating the TWT power supply control unit using the dummy-load test set.

Prerequisite: The dummy load must be connected (see Part 11.1).

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

PROCEDURE

1. Verify that service is protected.
2. Connect the dummy-load test set to the end of the test cable that is attached to the TWT power supply control unit.
3. Verify that the ALC switch on the ALC NETWORK unit is OFF.
4. On the TWT power supply control unit, operate the ON/OFF switch to ON and the TRANS/STBY switch to TRANS.

Requirement: The green ON indicator should light immediately.

5. Perform the TWT power supply control unit dummy-load evaluation using the instructions provided with the test set.
6. This test is complete. Return to Flowchart 5.

END OF PROCEDURE

11.3 TWT AMPLIFIER EVALUATION

This procedure provides the test setup for evaluating the TWT amplifier and TWT power supply using the dummy-load test set.

Prerequisite: The dummy load must be connected (see Part 11.1).

Caution: *This procedure is service-affecting unless the proper manual switching operation has been performed.*

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

PROCEDURE

1. Verify that service is protected.
2. Connect the dummy-load test cable from the TWT power supply control unit to the normal cable of the TWT amplifier unit.
3. Verify that the ALC switch on the ALC NETWORK unit is OFF.

Note: Before power-up of the TWT amplifier, the TWT RF OUT jack and/or the ALC RF OUT must be terminated with normal bay cables or high-power attenuator.

4. On the TWT power supply control unit, operate the ON/OFF switch to ON and the TRANS/STBY switch to TRANS.
5. Observe the AL and PREAL indicators.

Requirement: The AL and PREAL lights should extinguish.

If the requirement is NOT met, replace the TWT amplifier and repeat this procedure.

6. Condition a digital multimeter for a 20-volt measurement on the DC scale.

Note: The SIEMENS TWT power supply has an external meter resistance of approximately 100K ohms.

7. Connect the meter between the 1k and GND jacks on the TWT power supply control unit.
8. Observe the meter and multiply the voltage value observed by 10 to obtain the beam current (Ik) in milliamperes.

Requirement: ± 4 mA of the original value recorded for this TWT amplifier on the RADIO DATA CARD and/or the TWT amplifier faceplate.

Note: The beam current in milliamperes is equal to the indicated voltage multiplied by 10.

If the beam current is not within limits, adjust the BEAM ADJ control to within ± 2 mA of the original recorded value.

If the beam current is within limits, but different than the original recorded value for this TWT amplifier, record the new value beside the existing value; then go to Step 5.

If the requirement cannot be met, replace the TWT amplifier and, if necessary, the TWT power supply unit and repeat this procedure.

9. Connect the multimeter between the helix current (I_h) and GND jacks.

Requirement: The helix current (I_h) shall be less than or equal to 2.2 mA and no PREAL indication shall exist on the TWT amplifier.

If the requirement is not met, replace the TWT amplifier and, if necessary, the TWT power supply and repeat this procedure.

10. Record the helix current (I_h) value on the RADIO DATA CARD.
11. Disconnect the meter.

Note: If the TWT amplifier and/or TWT power supply is replaced, go to Part 2 for additional tests that must be performed.

12. This test is complete. Return to the reentry point recorded when that procedure was left.

END OF PROCEDURE

11.4 RETURN TRANSMITTER AMPLIFIER ASSEMBLY TO NORMAL OPERATING CONDITION

This procedure is used to return the transmitter amplifier assembly to normal operating condition following evaluation using the dummy load.

Warning: *The SMA connectors should be tightened ONLY with a torque wrench to prevent damage.*

PROCEDURE

1. Remove the transmitter amplifier assembly from the radio frame. Ensure that no wires catch or get pinched.
2. Place the transmitter amplifier assembly on its back so that the controls are facing upward.
3. Remove the multipin test cable and any other test cables and/or test equipment from the amplifier assembly.
4. Reconnect the multipin power connector between the TWT amplifier and TWT power supply control unit. Tighten the screws finger tight, then another 1/4 to 1/2 turn with a screwdriver.
5. This test is complete. Return to Flowchart 5.

END OF PROCEDURE