OPERATION AND MAINTENANCE
HOT STANDBY
DR 6/11-135A AND 135EC
RADIO RECEIVER PROCEDURES

CONTENTS PAGE

This practice provides the test and adjustment procedures for the radio receiver. These procedures should be performed when referred to from the alarm-clearing procedures, repair verification flowchart, or annual FCC tests.

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Each procedure lists the recommended test equipment and accessories. Each piece of equipment is keyed with an item number (e.g., Item A1) that corresponds to an item number in Table A, B, or C under the " Test Equipment and Accessories" tab. These tables provide the minimum specifications for each piece of test equipment. These specifications allow the technician to select alternate test equipment.

Deviation from the recommended test equipment may require a slightly different test setup to perform the following procedures. Manufacturer's setup and/or operation procedures for test equipment, accessories, and tools should always be followed.

This practice is reissued to revise the Radio Receiver Procedures. The practice is used in binders 421-105-001, 421-105-080, 421-105-090, 421-105-100, 421-106-001, 421-106-020, 421-106-030, and 421-106-060.

ADMONISHMENTS

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

SERVICE PROTECTION

Service protection is necessary before performing most tests and adjustments. The preface information for each procedure in this section contains one of the following:

> ***Note:*** THIS IS AN IN-SERVICE PROCEDURE.
>
> ***Caution: THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL PROTECTION SWITCHING OPERATION HAS BEEN PERFORMED.***

The ***Note*** indicates that the procedure can be performed on a working radio receiver without performing any service protection operations.

The ***Caution*** indicates that manual service protection operations ***must*** be performed to avoid interrupting service.

Generally, service on the regular channel under repair ***must*** be manually switched to standby to prevent service interruptions. If the standby channel is under repair, it ***must*** be locked out to prevent the regular channel from switching to it during the procedure.

If necessary, refer to the " Service Protection" tab and/or the " Operations" tab to perform or verify proper service protection.

TASR 1—MICROWAVE GENERATOR POWER CHECK

This procedure is used to check the power level of the microwave generator located in the RECEIVER DOWN CONV & MWV GEN (RCVR CONV) unit. The power is measured using an RF power meter at the GEN MON jack on the unit.

Note: THIS IS AN IN-SERVICE PROCEDURE.

The following test equipment is required to perform this procedure.

1 - Power meter (Item A4)

1 - RF power sensor (Item A5)

1 - Adapter, N (f) to SMA (m) (Item B17)

1 - Torque wrench, SMA-type (Item C4).

If other test equipment is used, ensure the specifications match those that are recommended. See the " Test Equipment and Accessories" tab.

Warning: The RF power sensor should be supported at the GEN MON jack, or the connector may be damaged.

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

STEP	PROCEDURE
1.	If necessary, remove the termination at the GEN MON jack on the RCVR CONV unit.
2.	Connect the RF power meter to the GEN MON jack, and tighten the connector with the torque wrench (see ***Warning***). ***Requirement for 6-GHz Unit:*** -6.0 to 0.0 dBm or within the requirement of the instruction that referenced this procedure, if different. ***Requirement for 11-GHz Unit:*** -9.0 to -1.0 dBm. or within the requirement of the instruction that referenced this procedure, if different.
3.	If the requirement is met, update the DATA CARD plug-in, if different, and go to Step 4. If the requirement is ***not*** met, replace the RCVR CONV unit. Go to the RCVR CONV Unit Initial Check (SR 8).
4.	Disconnect the test equipment. If the generator frequency is to be checked, go to the Microwave Generator Frequency Check and Adjustment (TASR 2). Otherwise, reinstall the termination on the GEN MON jack and tighten it with a torque wrench.

STEP	PROCEDURE
5.	This test is complete. If this procedure was entered from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.

TASR 2—MICROWAVE GENERATOR FREQUENCY CHECK AND ADJUSTMENT

This procedure is used to check and adjust, if necessary, the frequency of the microwave generator located in the RECEIVER DOWN CONV & MWV GEN (RCVR CONV) unit. The frequency is measured using a microwave frequency counter at the GEN MON jack on the unit. The proper frequency for each microwave generator code is provided in Table A (6-GHz regular channel), Table B (6-GHz staggered channel), Table C (11-GHz regular channel), or Table D (11-GHz alternate channel).

The generator drift frequency tolerances allowed before replacement is required are given in Step 3. These tolerances are well within the FCC requirements and frequency offsets that would cause an alarm condition on the system. For this reason, it is not necessary to immediately replace a unit that is slightly outside the indicated replacement limits. Other unrelated alarm-trouble isolation and alarm-clearing procedures may first be completed. Following the alarm-clearing, an out-of-spec RCVR CONV should then be replaced and adjusted using this procedure.

Caution: THE FREQUENCY ADJUSTMENT IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL SWITCHING OPERATION HAS BEEN PERFORMED.

Note: The frequency check is an in-service procedure.

The following test equipment is required to perform this procedure.

1 - Microwave frequency counter (Item A3)

1 - 5-foot " minicoaxial" cable with SMA (m) connectors (Item B6)

1 - Adapter, N (m) to SMA (m) (Item B16)

1 - Torque wrench, SMA-type (Item C4)

1 - Adjustment tool (Item C9).

If other test equipment is used, ensure the specifications match those that are recommended. See " Test Equipment and Accessories" tab.

Note: The microwave generator should operate for at least 1 hour after the RCVR GEN oven indicator has been extinguished before final measurements or final adjustments are made.

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

STEP	PROCEDURE

Frequency Check

1. Determine the correct fc (center frequency) for this microwave generator by matching the plug-in code and the letters in parentheses printed on the latch label with the code and letters listed in Table A, B, C, or D (also found on DATA CARD plug-in).

STEP	PROCEDURE

2. If necessary, remove the termination at the GEN MON jack.

3. Measure the frequency at the GEN MON jack. Tighten the connector with the torque wrench.

   Note: If this procedure was referenced for the final frequency adjustment of a recently replaced unit, go to Step 4.

   Requirement for 6-GHz Unit: ± 120 kHz of the fc (FCC requirement) or within the requirements of the instruction that referenced this procedure, if different.

   Requirement for 11-GHz Unit: ± 240 kHz of the fc (FCC requirement) or within the requirements of the instruction that referenced this procedure, if different.

   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 4 and adjust the frequency to the correct value.

   If the requirement is NOT met and the frequency measured in Step 3 has drifted more the ± 120 kHz (6 GHz) or ± 240 kHz (11 GHz) within the past 12 months, replace the RCVR CONV unit. Then perform RCVR CONV Unit Initial Check, SR 8.

Final Frequency Adjustment

4. Verify that service is protected.

   Note: The microwave generator should operate for at least 1 hour after the RCVR GEN OVEN indicator has been extinguished before the final adjustment is made.

5. At the RCVR CONV unit, adjust the GEN FREQ ADJ control for the following requirement.

   Requirement for 6-GHz Unit: ±3 kHz of fc.

   Requirement for 11-GHz Unit: ±5 kHz of fc.

   If the requirement is met, go to Step 6.

   If the requirement is ***not*** met, suspect test set, faulty unit, or bad test set connection. If the RCVR CONV unit was recently replaced, read the instructions contained in SR 8. If not, replace the unit and perform the RCVR CONV Unit Initial Check, SR 8.

6. Disconnect the test equipment. If the microwave generator power is to be checked, go to TASR 1. Otherwise, reinstall the termination on the GEN MON jack, and tighten with a torque wrench.

STEP	PROCEDURE
7.	This test is complete. If this procedure was entered from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.

TABLE A

6-GHZ REGULAR FREQUENCY PLAN

RADIO CHANNEL			TRANSMITTER UP CONV AND MVW GEN OR RECEIVER DOWN CONV AND MWV GEN	
NUMBER	CENTER FREQUENCY (KHz)	SIDEBAND	CODE	GEN MON CENTER FREQUENCY (KHz)
11T	5,945,198	Lower	B	6,015,198
12T	5,974,850	Lower	D	6,044,850
13T	6,004,502	Lower	F	6,074,502
14T	6,034,154	Lower	H	6,104,154
15T	6,063,805	Upper	K	5,993,805
16T	6,093,457	Upper	M	6,023,457
17T	6,123,109	Upper	P	6,053,109
18T	6,152,761	Upper	S	6,082,761
21T	6,197,239	Lower	AB	6,267,239
22T	6,226,891	Lower	AD	6,296,891
23T	6,256,542	Lower	AF	6,326,542
24T	6,286,194	Lower	AH	6,356,194
25T	6,315,846	Upper	AK	6,245,846
26T	6,345,498	Upper	AM	6,275,498
27T	6,375,150	Upper	AP	6,305,150
28T	6,404,802	Upper	AS	6,334,802

TABLE B

6-GHZ STAGGERED FREQUENCY PLAN

CHANNEL			TRANSMITTER UP CONV AND MVW GEN OR RECEIVER DOWN CONV AND MWV GEN	
NUMBER	CENTER FREQUENCY (KHz)	SIDEBAND	CODE	CENTER FREQUENCY (KHz)
11S	5,960,024	Lower	C	6,030,024
12S	5,989,676	Lower	E	6,059,676
13S	6,019,328	Lower	G	6,089,328
14S	6,048,979	Upper	J	5,978,979
15S	6,078,631	Upper	L	6,008,631
16S	6,108,283	Upper	N	6,038,283
17S	6,137,935	Upper	R	6,067,935
18S	6,167,587	Upper	T	6,097,587
20S	6,182,413	Lower	AA	6,252,413
21S	6,212,065	Lower	AC	6,282,065
22S	6,241,717	Lower	AE	6,311,717
23S	6,271,368	Lower	AG	6,341,368
24S	6,301,020	Upper	AJ	6,231,020
25S	6,330,672	Upper	AL	6,260,672
26S	6,360,324	Upper	AN	6,290,324
27S	6,389,976	Upper	AR	6,319,976

TABLE C

11-GHZ REGULAR FREQUENCY PLAN

RADIO CHANNEL			TRANSMITTER UP CONV AND MWV GEN OR RECEIVER DOWN CONV AND MWV GEN	
NUMBER	CENTER FREQUENCY (KHz)	SIDEBAND	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

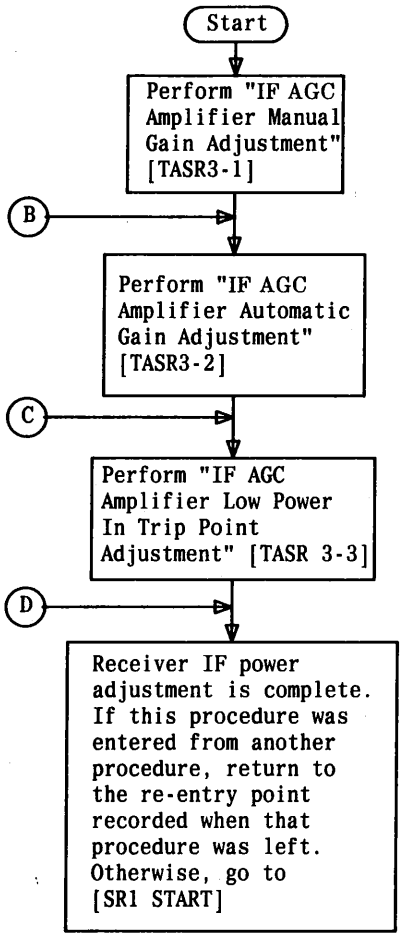
TABLE D

11-GHZ ALTERNATE FREQUENCY PLAN

RADIO CHANNEL			TRANSMITTER UP CONV AND MWV GEN OR RECEIVER DOWN CONV AND MWV GEN	
NUMBER	CENTER FREQUENCY (KHz)	SIDEBAND	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

TASR 3—RECEIVER IF ADJUSTMENT

This flowchart is used as an outline to perform complete IF adjustments on the IF AGC AMPL unit.



TASR 3—Receiver IF Adjustment

TASR 3-1—IF AGC AMPLIFIER MANUAL GAIN ADJUSTMENT

This procedure is used to adjust the IF output level of the radio receiver (using over-the-air signal) with both the IF AGC AMPL and ADAPTIVE SLOPE EQL in the manual mode. The output level is measured using an IF power meter at the IF OUT jack on the interface block located on top of the T/R (transmitter/receiver) pair.

Prerequisite: The IF IN to IF AGC AMPL unit is within ±3 dB of the most recently recorded DATA CARD value (see ***Note*** in Step 3). If not, go to TASR 6.

Caution: THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL PROTECTION SWITCHING OPERATION HAS BEEN PERFORMED.

The following test equipment is required to perform this procedure.

1 - Power meter (Item A4)

1 - IF power sensor (Item A6)

1 - Cable assembly, 5-foot cable with BNC (m) and 440A (m) (Item B1)

1 - Adapter BNC (f) to SMB (m) (Item B13)

1 - Adapter, N (f) to SMB (f) (Item B21)

1 - Adjustment tool (Item C9).

If other test equipment is used, ensure the specifications match those that are recommended. See " Test Equipment and Accessories" tab.

STEP	PROCEDURE
1.	Verify that the service is protected.
2.	Remove the normal IF cable from the IF OUT jack on the interface block at the top of the T/R pair, and connect the power meter in its place.
3.	Set the AUTO/MAN pushbuttons on the IF AGC AMPL and ADAPTIVE SLOPE EQL to the MAN position. ***Note:*** If the input signal to the IF AGC AMPL is undergoing an abnormal fading condition (>4.0 dB fluctuations), defer measurement to a more stable time. Otherwise, it will be necessary to visually average and evaluate results relative to requirement.
4.	If necessary, adjust the MAN GAIN control on the IF AGC AMPL unit to meet the following requirement:

STEP	PROCEDURE

Requirement: Standard IF interconnect cable (less than or equal to 50 feet)

Acceptable: -6.0 to -8.0 dBm
Optimal: -7.1 ±0.2 dBm.

Long IF interconnect cable (greater than 50 feet)

Acceptable: -2.5 to -4.5 dBm
Optimal: -3.5 ±0.2 dBm

If the requirement is met, this procedure is complete. If performing a complete receiver IF adjustment, go to TASR 3-2. If this procedure was referenced from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.

If the requirement is ***not*** met and if not previously done, replace the IF AGC AMPL unit and perform the IF AGC AMPL Unit Initial Check, SR 9.

Comment: If the unit was recently replaced, suspect a faulty replacement unit or a dc voltage, wiring, or connector problem. Refer to the applicable SD or Maintenance Support O&M manual and/or request assistance from the technical support group to isolate and clear the problem.

TASR 3-2—IF AGC AMPLIFIER AUTOMATIC GAIN ADJUSTMENT

This procedure is used to adjust the IF output level of the radio receiver (using over-the-air signal) with both the IF AGC AMPL and ADAPTIVE SLOPE EQL in the automatic mode.

Prerequisite: The IF AGC amplifier manual gain adjustments (TASR 3-1) met requirements.

Caution: THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL PROTECTION SWITCHING OPERATION HAS BEEN PERFORMED.

Test equipment is not required except for that specified for in the Radio Receiver IF AGC Manual Gain Adjustment procedure.

STEP	PROCEDURE
1.	Verify that service is protected.
2.	Set the AUTO/MAN pushbuttons on the IF AGC AMPL and ADAPTIVE SLOPE EQL to the AUTO position. ***Note:*** If the input signal to the IF AGC AMPL is undergoing an abnormal fading condition (>4.0 dB fluctuations), defer measurement to a more stable time. Otherwise, it will be necessary to visually average and evaluate results relative to requirement.
3.	If necessary, remove the normal IF cable from the IF OUT jack on the interface block at the top of the T/R pair and connect the power meter in its place.
4.	If necessary, adjust the AUTO GAIN control on the IF AGC AMPL unit to meet the following requirement: ***Requirement:*** Standard IF interconnect cable (less than or equal to 50 feet) -7.1 ±0.2 dBm. Long IF interconnect cable (greater than 50 feet) -3.5 ±0.2 dBm.

STEP	PROCEDURE
	If the requirement is met, go to Step 5. If the requirement is ***not*** met, suspect a faulty unit or bad connection. If not previously done, replace the IF AGC AMPL unit and perform the IF AGC AMPL Unit Initial Check, SR 9. ***Comment:*** If the unit was recently replaced, suspect a faulty replacement unit or a dc voltage, wiring, or connector problem. Refer to the applicable SD or Maintenance Support O&M manual and/or request assistance from the technical support group to isolate and clear problem.
5.	Using either the ALARM AND METER unit or a digital multimeter at the AGC V test point on the IF AGC AMPL, measure the AGC voltage and, if different, update the AGC V normal on the DATA CARD plug-in.
6.	Disconnect test equipment and install normal bay cables.
7.	This procedure is complete. If performing a complete receiver IF adjustment, go to TASR 3-3. If this procedure was entered from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.

TASR 3-3—IF AGC AMPLIFIER LOW POWER IN TRIP POINT ADJUSTMENT

This procedure is used to adjust the LPW IN TRIP (low power input trip) of the radio receiver IF AGC AMPL unit.

Prerequisite: The IF AGC amplifier automatic gain adjustment met requirements (TASR 3-2).

Caution: THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL PROTECTION SWITCHING OPERATION HAS BEEN PERFORMED.

The following test equipment is required to perform this procedure.

1 - Digital multimeter (if ALARM AND METER unit is not equipped) (Item A1)

1 - 30-dB IF pad with SMB (m) connectors (Item A16)

1 - Cable assembly with SMB (f) connectors (Item B20)

1 - Adjustment tool (Item C9).

If other test equipment is used, ensure the specifications match those that are recommended. See the " Test Equipment and Accessories" tab.

STEP	PROCEDURE
1.	Verify that service is protected and both the IF AGC AMPL and ADAPTIVE SLOPE EQL are in the AUTO mode.
2.	On the IF AGC AMPL unit, remove the cable from the IF IN jack and connect a 30-dB IF pad to the cable.
3.	Connect a short coaxial cable between the IF IN jack and the 30-dB IF pad.
4.	On the IF AGC amplifier, adjust the LPW IN TRIP control until the LPW IN indicator just lights. If the LPW IN indicator does not light, see ***Comment***. ***Comment:*** If not previously done, replace the IF AGC AMPL unit and perform the IF AGC AMPL Unit Initial Check procedure, SR 9. Otherwise, suspect a faulty replacement unit or a dc voltage, wiring, or connector problem. Refer to the applicable SD or Maintenance Support O&M manual and/or request assistance from the technical support group to isolate and clear problem.
5.	Measure the AGC voltage (AGC V jack) at the LPW trip point level and, if different, update the LPW IN voltage on the DATA CARD plug-in.
6.	Disconnect the test equipment and reconnect the normal bay cables.
7.	This test is complete. If this procedure was referenced from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.

TASR 4—DOWN-CONVERTER RF INPUT POWER CHECK AND RSL VERIFICATION

This procedure is used to check the RF input power level to the RECEIVER DOWN CONV & MWV GEN (RCVR CONV) unit. For the receiver under test, the power is measured using an RF power meter at the respective directional coupler output or at the isolator/transducer output. The power level requirement is the previously measured power level that was recorded for this point on the DATA CARD plug-in. Also provided is information for checking the RSL for the receiver.

Caution: THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL PROTECTION SWITCHING OPERATION HAS BEEN PERFORMED.

The following test equipment is required to perform this procedure.

1 - Power meter (Item A4)

1 - RF power sensor (Item A5)

1 - Adapter, N (f) to SMA (m) (Item B17)

1 - Torque wrench, SMA-type (Item C4).

If other test equipment is used, ensure the specifications match those that are recommended. See " Test Equipment and Accessories" tab.

Warning: The RF power sensor should be supported at the test point, or the connector may be damaged.

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

STEP	PROCEDURE

1. Verify that service is protected.

RF Input Power Check

2. Remove the semirigid cable between the directional coupler or the isolator/transducer and the RF IN jack on the RCVR CONV unit associated with the receiver to be tested (REG or STBY).

3. Connect the power meter to the SMA connector on the directional coupler or the isolator/transducer, and tighten the connector using the torque wrench.

   Note 1: If the RF input signal to the RCVR CONV is undergoing an abnormal fading condition (>4.0 dB fluctuations), defer measurement to a more stable time. Otherwise, it will be necessary to visually average and evaluate results relative to requirement.

STEP	PROCEDURE

Requirement: Within ±3 dB of the power level recorded on the DATA CARD plug-in (see ***Note 2***) or within the requirements of the instruction that referenced this procedure, if different.

Note 2: If a non-space diversity receiver is being tested, the power level for the standby receiver will be approximately 10.5 dB lower than the regular side out of the coupler.

If the requirement is met and the measured power is within ± 1 dB of the recorded value, update the DATA CARD (CONV RF IN), if different, and go to Step 4.

If the difference is more than ± 1 dB, investigate reason for change (i.e., RF component changed, channels added or removed, transmitter power reduced, fading, etc.) and, if valid, update DATA CARD to new value (this may also affect the RSL value). If the change cannot be accounted for, continue trouble clearing to clear alarmed condition and return and investigate reason for level change (see ***Comment***).

If the requirement is ***not*** met, suspect RF preamplifier, filter networks, waveguide, or antenna problem at the receive end or TRMT SWITCH filter networks, waveguide, or antenna problem at the transmit end (see ***Comment***).

Comment: Before replacing any RF components, ensure that the problem is not the result of abnormal fading activity. Also determine if the problem is present on other receivers sharing the waveguide. If so, suspect a problem in the equipment common to all receivers. If not, suspect a problem in the equipment (RCVG or TRMTG) that is channel sensitive (i.e., TRMT SWITCH RF filters, isolators/transducers, cables, connectors, drop or insert portions of the circulators, etc.). Systematically replace and remeasure to clear problem. If necessary, refer to the Maintenance Support O&M manual and/or request assistance from the technical support group to isolate and clear problem.

4. If an RSL check is desired, go to Step 5. Otherwise, go to Step 7.

STEP	PROCEDURE

RSL Check

5. Using the measured down-converter input (CONV RF IN) as a reference, calculate the RSL via the following equation:

   RSL = RF IN - (gain-loss)

   where RF IN = measured down-converter input level

   gain = gain of RF preamplifier unit

   loss = nominal loss of waveguide networks between RF preamplifier output and down-converter input (see (Table E)

   Example:

   RSL = -15.5 - (18-25)

   RSL = -15.5 - 15.5

   RSL = -32 dBm.

6. Compare this value with the previously measured RSL recorded on the DATA CARD.

   Requirement: Within ±1 dB of DATA CARD value.

   If requirement is met, go to Step 7.

   If requirement is ***not*** met, investigate and, if necessary, clear problem using information provided in Step 3.

7. If further tests are necessary and require access to the RF input on the RCVR CONV unit, go to Step 10. Otherwise, go to Step 8.

8. Disconnect the test equipment, and reconnect the semirigid cable between the directional coupler or the isolator/transducer and the RCVR CONV RF IN jack.

9. Tighten the connectors with the torque wrench.

10. This test is complete. If this procedure was entered from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.

TABLE E

RECEIVER WAVEGUIDE ASSEMBLY LOSSES

APPLICATION		NOMINAL WAVEGUIDE NETWORK LOSSES	
		6 GHz	11 GHz
SPACE DIVERSITY (without Directional Coupler)	REG	2.5	3.0
	STBY	2.5	3.0
NON-SPACE DIVERSITY (with Directional Coupler)	REG	3.2	3.7
	STBY	13.2	13.7

TASR 5—DOWN-CONVERTER GAIN CHECK

This procedure is used to check the gain of the RECEIVER DOWN CONV & MWV GEN (RCVR CONV) unit.

Prerequisite: The down-converter RF input power is good. If in doubt, perform TASR 4.

Caution: THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL PROTECTION SWITCHING OPERATION HAS BEEN PERFORMED.

The following test equipment is required to perform this procedure:

1 - Power meter (Item A4)

1 - IF power sensor (Item A6)

1 - Adapter, N (f) to SMB (f) (Item B21)

1 - Adapter, SMB (m) to SMB (m) (Item B22)

1 - Adapter, N female to SMA male (Item B14)

1 - 1-foot RF flexible coaxial test cable with SMA male connectors (Item B7)

1 - 20-dB RF pad (Item A18)

1 - Torque wrench (Item C4).

If other test equipment is used, ensure the specifications match those that are recommended. See " Test Equipment and Accessories" tab.

Warning: The IF power sensor should be supported at the test point, or the connector may be damaged.

STEP	PROCEDURE
1.	Verify that service is protected.
2.	Remove the semirigid cable between RCVR CONV RF IN jack and the isolator/transducer or the directional coupler. Measure RF power level and note level as P in.
3.	Connect a 1-foot flexible RF coaxial cable in series with a 20-dB pad between the isolator/transducer or the directional coupler and RCVR CONV RF IN jack.
4.	Disconnect cable at IF OUT on RCVR CONV and measure IF output level. Note as P out.

STEP	PROCEDURE
5.	Calculate the gain of the down-converter (see ***Note***). ***Requirement:*** The gain of the down-converter = 21 ±2 dB. ***Note:*** The gain equals IF power out (Step 4) minus RF power in (Step 2) minus 20 (pad value). g = Pout - (Pin - 20). If the requirement is met, remove pad and reconnect bay cables. Go to Step 6. If the requirement is ***not*** met, replace RCVR CONV unit and perform the RCVR CONV Unit Initial Check, SR 8.
6.	This test is complete. If this procedure was entered from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.

TASR 6—RECEIVER IF POWER LEVEL VERIFICATION

This procedure is used (1) to check receiver IF power levels against the recorded DATA CARD values and (2) to update the downstream DATA CARD values when a component in the receiver path is replaced with a component that has a different gain or loss characteristic.

Prerequisite: The RCVR CONV unit is functioning properly and the RF input level to the unit is within requirements. If in doubt, perform TASR 4 and TASR 5.

Caution: THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL PROTECTION SWITCHING OPERATION HAS BEEN PERFORMED.

The following test equipment is required to perform this procedure:

1 - Power meter (Item A4)

1 - IF power sensor (Item A6)

1 - Adapter, N (f) to SMB (f) (Item B21)

1 - Adapter, SMB (m) to SMB (m) (Item B22).

If other test equipment is used, ensure the specifications match those that are recommended. See " Test Equipment and Accessories" tab.

Warning: The test equipment must be properly supported, or connector damage may occur.

Note: If a test cable is necessary, it should be no longer than 5 feet.

STEP	PROCEDURE
1.	Verify that service is protected.
	Note: If the input signal to the IF AGC AMPL is undergoing an abnormal fading condition (>4.0 dB fluctuations), defer measurement to a more stable time. Otherwise, it will be necessary to visually average and evaluate results relative to the requirement.

STEP	PROCEDURE

Down-Converter IF Output Check (CONV IF OUT)

2. Remove the coaxial cable at the CONV IF OUT (Fig. 1), and measure the output level.

   Requirement: Within ± 3 dB of value recorded on DATA CARD plug-in or within the requirement of the instruction that referenced this procedure, if different.

   If the requirement is met and if the value is different than that on the DATA CARD, note the difference in measured and recorded values (see ***Note***) and update the DATA CARD for CONV IF OUT. Reconnect the normal bay cables and go to Step 3.

   Note: The difference in measured and previously recorded DATA CARD value(s) will need to be added to or subtracted from the tolerances for subsequent receiver measurements when the requirement is based on the previous recorded DATA CARD value.

   If the requirement is ***not*** met, suspect faulty RCVR CONV unit or problem in RF path ahead of RCVR CONV unit. Go to Resolving RF-to-IF Loss Problem, SR 3, to isolate and clear problem. Then, repeat this step.

Linear Delay Equalizer IF Output Check (LIN DEL EQL IF OUT)

3. Remove the coaxial cable at the LIN DEL EQL IF OUT jack (Fig. 1), and measure output level(s).

   Requirement: Within ±3 dB of value recorded on DATA CARD plug-in or within the requirement of the instruction that referenced this procedure, if different (see ***Note*** in Step 2).

   If the requirement is met and the value is different than that on the DATA CARD, note the difference in the measured and recorded values and update the DATA CARD value for the LINEAR DELAY EQUALIZER. Reconnect normal bay cable and go to Step 4.

   If the requirement is ***not*** met, suspect faulty LINEAR DELAY EQUALIZER cabling or connector problem. Go to Resolving Receiver IF Loss Problem, SR 2, to isolate and clear problem. Then, repeat this step.

IF Filter and Basic Equalizer IF Output Check (IF FLT BASIC EQL IF OUT)

4. Remove the coaxial cable at the IF FLT BASIC EQL IF OUT jack (Fig. 1), and measure output level.

   Requirement: ± 3 dB of previous DATA CARD value (see ***Note*** in Step 2).

STEP	PROCEDURE

If the requirement is met and the value is different than that on the DATA CARD, note the difference in measured and recorded values and update the DATA CARD value for IF FILTER AND BASIC EQUALIZER unit. Reconnect normal bay cables and go to Step 5.

If the requirement is ***not*** met, suspect faulty unit. Go to Resolving Receiver IF Loss Problem, SR 2, to isolate and clear problem. Then, repeat this step.

IF AGC Amplifier Output Check (IF AGC AMPL IF OUT)

5. Remove the coaxial cable at the IF AGC AMPL IF OUT jack (Fig. 1), and measure the output level.

Requirement: -2 dBm ±0.5 dBm

If the requirement is met, reconnect the normal cable, update the DATA CARD plug-in (if different), and go to Step 6.

If the requirement is ***not*** met, try adjusting the AUTO GAIN control to meet the requirement. If the requirement is still not met, replace the unit and perform the IF AGC AMPL Unit Initial Check, SR 9.

Adaptive Slope Equalizer Output Check (ADPT SL EQL IF OUT)

6. Remove the coaxial cable at the ADPT SL EQL IF OUT jack (Fig. 1), and measure the output level.

Requirement: -2 dBm ±0.5 dBm

If the requirement is met, reconnect the normal cable, update the DATA CARD plug-in (if different), and go to Step 9.

If the requirement is ***not*** met, replace the unit and perform the Adaptive Slope Equalizer Unit Initial Check, SR 10. Then, repeat this step.

Receiver Output Check (Interface Block—Top of Bay)

7. Remove the coaxial cable at the IF OUT jack (or connect the power meter to RF MON jack if equipped) at the top of the bay (Fig. 1), and measure the output level.

STEP	PROCEDURE

IF MON Requirement: -10 dBm ±0.5 dBm

IF OUT Requirement: Standard interface cable (less then or equal to 50 feet)

-7.1 ±0.5 dBm

Long interface cable (greater than 50 feet)

-3.5 ±0.5 dBm

If the requirement is met, reconnect the normal cable or termination, update the DATA CARD plug-in (if different), and go to Step 9.

If the requirement is ***not*** met and the ASE output is good, suspect the cables, connectors, pad, or hybrid network (if equipped) between the IF OUT jack of the adaptive slope equalizer unit and the point of measurement.

8. This check is complete. If this procedure was entered from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.

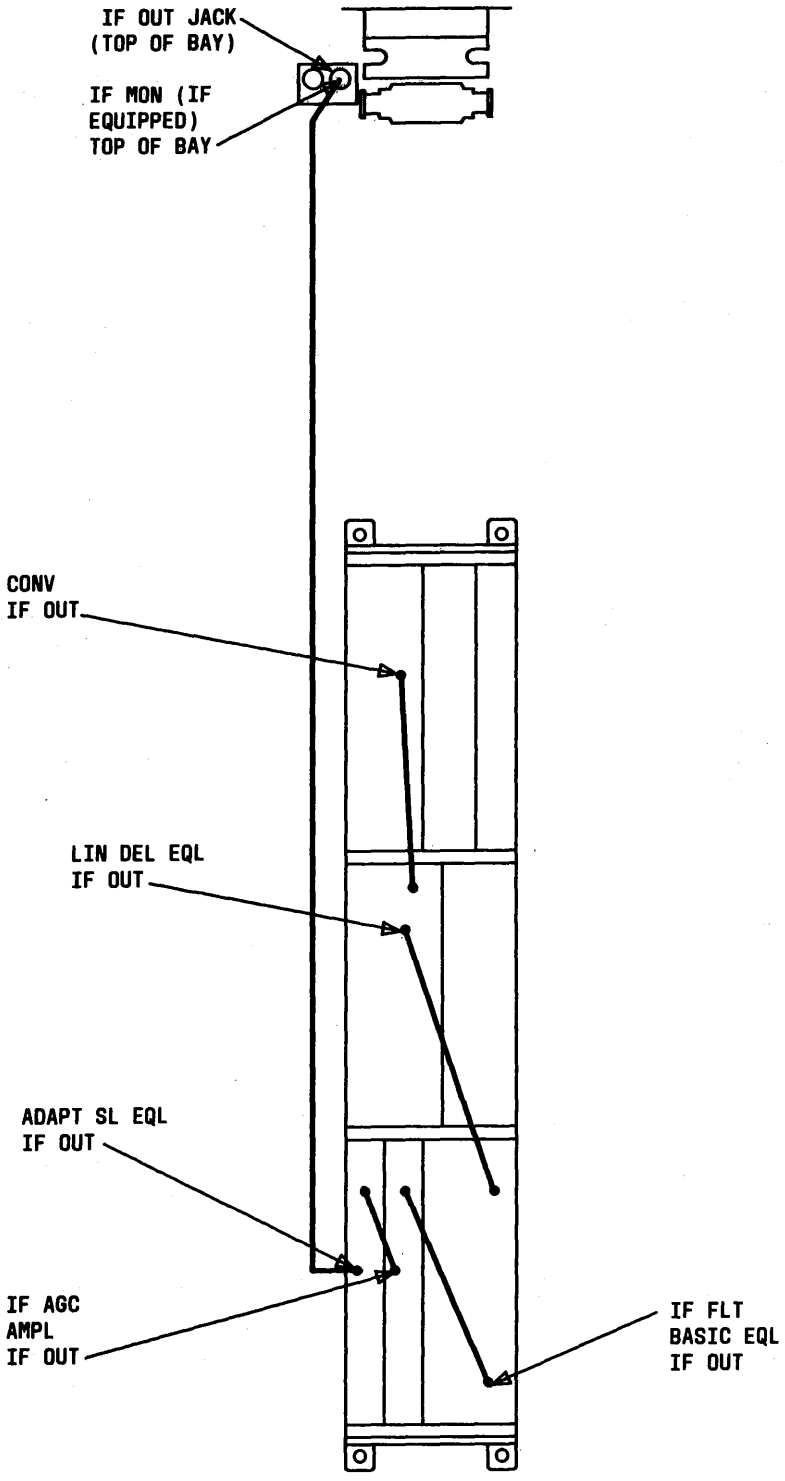


Fig. 1—Radio Receiver

TASR 7—RADIO RECEIVER IF-TO-IF AMPLITUDE RESPONSE CHECK

This procedure is used to check the amplitude response of the receiver IF section. A calibrated flat IF sweep signal is applied at the linear delay equalizer input. The output is measured at the adaptive slope equalizer unit output.

Caution: THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL PROTECTION SWITCHING OPERATION HAS BEEN PERFORMED.

The following test equipment is required to perform this procedure:

1 - Digital multimeter (Item A1)

1 - Link analyzer (Item A7)

* - Necessary cables and/or adapters to connect test equipment to radio unit.

If other test equipment is used, ensure the specifications match those that are recommended. See " Test Equipment and Accessories" tab.

STEP	PROCEDURE
1.	Verify that service is protected.
2.	Condition the analyzer to generate a 70-MHz output approximately equal to the level previously recorded on the DATA CARD plug-in for the RCVR CONV IF OUT signal level.
3.	Condition the analyzer to generate a flat sweep that is ±12 MHz wide centered at 70 MHz.
4.	Remove the cable from the IF IN jack on the linear delay equalizer unit, and connect the cable from the IF output of the analyzer transmitter in its place.
5.	Remove the cable from the IF OUT jack on the adaptive slope equalizer unit, and connect the cable from the IF input of the analyzer receiver in its place.
6.	Set the AUTO/MAN pushbuttons on the IF AGC AMPL and adaptive slope equalizer to the MAN position.
7.	Using the digital multimeter, measure the voltage at the CONT V jack on the ADAPTIVE SLOPE EQL, and verify that the voltage is at the proper flat voltage as recorded on the DATA CARD plug-in. Adjust the MAN FLAT control if necessary.

STEP	PROCEDURE

8. Measure the amplitude response of the test trace on the analyzer display (Fig. 2 and ***Note***).

   Requirement 1: < ±1.0 dB slope over the 24 MHz band.

   Requirement 2: An amplitude smile with parabolic components equal to 0.6 dB ± 0.2 dB (6 GHz) or 0.3 dB ± .2 dB (11 GHz).

   Requirement 3: Smooth response with no discontinuities. If present, the ripple component shall not exceed 0.2 dB.

   Note: Figure 3 shows the major amplitude distortion components. Figure 4 shows an example of how to evaluate the slope, parabolic, and ripple components for a typical amplitude response.

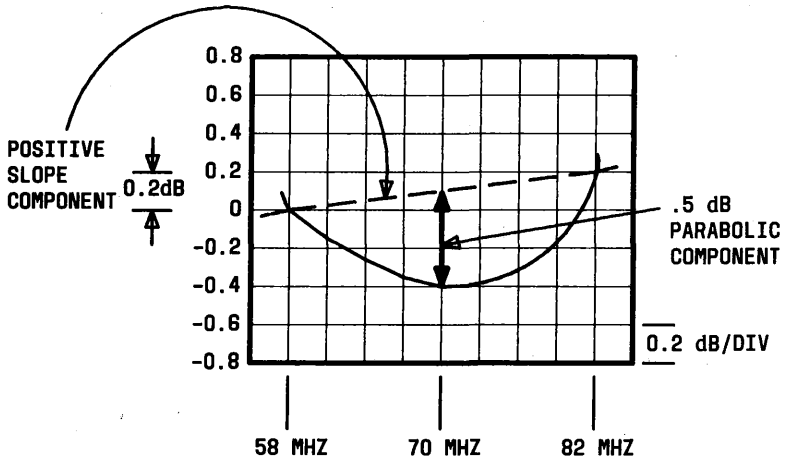
   If all requirements are met, go to Step 9.

   If all requirements are ***not*** met, maintain test setup and go to Resolving Receiver IF Slope Problem procedure, SR 4.

9. Set the AUTO/MAN pushbuttons on the IF AGC AMPL and ADAPTIVE SLOPE EQL to the AUTO position.

10. Disconnect the test equipment and reconnect the normal bay cables.

11. This test is complete. If this procedure was entered from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.



Note: There are no ripple components present.

Fig. 2—Example of Typical Receiver IF-to-IF Amplitude Response

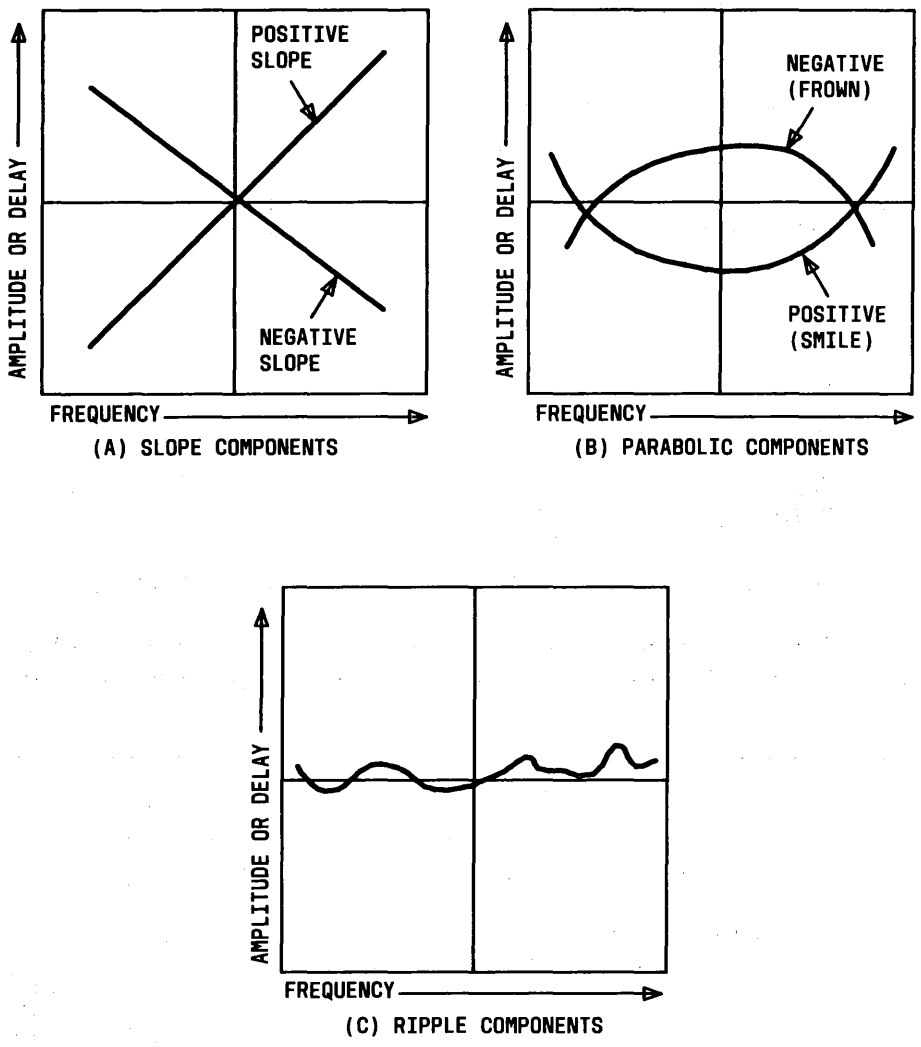
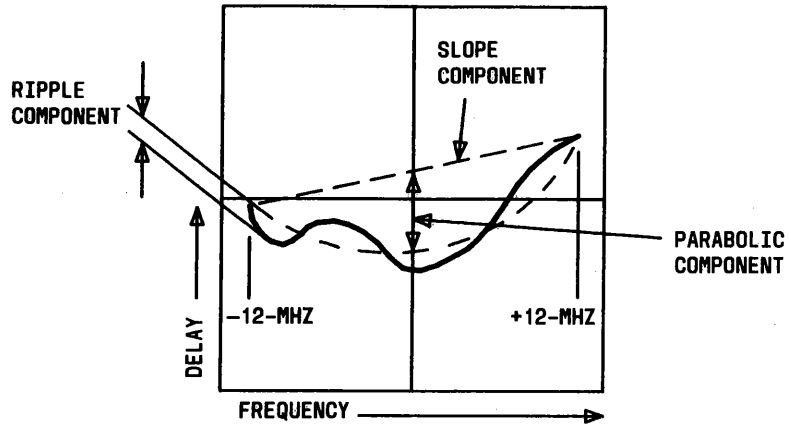


Fig. 3—Major Amplitude Distortion Components



Response Consisting of:
- **Positive Slope**
- **Positive Parabolic**
- **Ripple**

a. The slope component of a response is determined by drawing an imaginary line between the points of the display at the + and - 12 MHz end points of the swept response. If a ripple or other component happens to peak or dip at the end points, mentally average this in determining the slope component. The slope component is the vertical difference between the + and - 12 MHz end points of the imaginary slope line.

b. The parabolic component is determined by fitting the most likely simple parabolic shape (smile or frown) between the end points of the slope line. When ripple or other distortion components are present, as is in this example, the parabolic curve must be mentally averaged through these components. The parabolic content is the vertical distance between the 70-MHz center point on the slope line and the mentally fitted parabolic curve.

c. Once the slope and parabolic components are separated out, the ripple components are determined by the peak-to-peak deviations from the imaginary line.

Fig. 4—Example of Amplitude Response Defining Slope, Parabolic, and Ripple Components

TASR 8—ADAPTIVE SLOPE EQUALIZER MANUAL MODE CHECK AND ADJUSTMENT

This procedure is used to verify that the adaptive slope equalizer has a flat amplitude response when the unit is in the manual mode (AUTO/MAN pushbutton set to MAN position).

Caution: THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL PROTECTION SWITCHING OPERATION HAS BEEN PERFORMED.

The following test equipment is required to perform this procedure:

1 - Digital multimeter (Item A1)

1 - Power meter (Item A4)

1 - IF power sensor (Item A6)

1 - Link analyzer (Item A9)

* - Necessary cables and/or adapters to connect test equipment to radio unit.

If other test equipment is used, ensure the specifications match those that are recommended. See " Test Equipment and Accessories" tab.

STEP	PROCEDURE
1.	Verify that service is protected.
2.	Using the proper test cables, calibrate the link analyzer at a signal level of -2 dBm, centered at 70 MHz and with a total sweep width of 24 MHz (i.e., ±12 MHz). Observe the amplitude display and, if adjustable, adjust the trace to be flat at the + and - 12 MHz end points.
3.	Set the AUTO/MAN pushbutton on the ADAPTIVE SLOPE EQL to the MAN position.
4.	Connect the output of the microwave link analyzer to the IF IN jack on the adaptive slope equalizer unit.
5.	Connect the input of the microwave link analyzer to the IF OUT jack on the ADAPTIVE SLOPE EQL.
6.	Observe the amplitude response on the link analyzer, and if necessary, adjust the MAN FLAT control on the ADAPTIVE SLOPE EQL to meet the following requirement: ***Requirement:*** The observed response should be flat to within ± 0.02 dB between the + and - 12 MHz end points.

STEP	PROCEDURE
	If the requirement is met, measure the voltage at the CONT V jack on the ADAPTIVE SLOPE EQL and, if different, update the CONT V MAN on the DATA CARD plug-in. If performing automatic adjustments, go to the Adaptive Slope Equalizer Automatic Slope Check and Adjustment, TASR 9. Otherwise, go to Step 7. If the requirement is ***not*** met, replace the ADAPTIVE SLOPE EQL unit (if not previously done) and go to Adaptive Slope Equalizer Unit Initial Check, SR 10.
7.	Recondition the receiver to normal operation. Verify that the AUTO/MAN pushbutton on the adaptive slope equalizer is in the AUTO position.
8.	This test is complete. If this procedure was entered from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.

TASR 9—ADAPTIVE SLOPE EQUALIZER AUTOMATIC MODE CHECK AND ADJUSTMENT

This procedure is used to verify that the adaptive slope equalizer has the proper residual amplitude slope when the unit is operating in the automatic mode.

Caution: THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER MANUAL PROTECTION SWITCHING OPERATION HAS BEEN PERFORMED.

The following test equipment is required to perform this procedure:

1 - Digital multimeter (Item A1)

1 - Power meter (Item A4)

1 - IF power sensor (Item A6)

1 - Link analyzer (Item A7)

* - Necessary cables and/or adapters to connect test equipment to radio unit.

If other test equipment is used, ensure the specifications match those that are recommended. See " Test Equipment and Accessories" tab.

STEP	PROCEDURE
1.	Verify that service is protected.
2.	Using the proper test cables, calibrate the link analyzer at a signal level of -8 dBm, centered at 70 MHz and with a total sweep width of 24 MHz (i.e., ±12 MHz). Observe the amplitude display and, if adjustable, adjust the trace to be flat at the + and - 12 MHz end points.
3.	Set the AUTO/MAN pushbuttons on the IF AGC AMPL and ADAPTIVE SLOPE EQL to the MAN position.
4.	Connect the output of the microwave link analyzer to the IF IN jack on the IF FILTER AND BASIC EQUALIZER unit.
5.	Check and, if necessary, adjust the MAN GAIN control on the IF AGC AMPL for -2 dBm at the IF OUT jack of the ADAPTIVE SLOPE EQL.
6.	Observe the amplitude response on the analyzer, and if necessary, adjust the MAN FLAT control on the ADAPTIVE SLOPE EQL for a 0.5 dB positive slope measured between the + and - 12 MHz end points. ***Note:*** If necessary, refer to TASR 7 for a definition of the slope component.
7.	Measure (to 3 decimal places) the voltage at the CONT V jack on the ADAPTIVE SLOPE EQL and record for later use.
8.	Readjust the MAN FLAT control to obtain the most recently recorded CONT V MAN value on the DATA CARD plug-in.
9.	Remove the analyzer input from the IF OUT jack, and reconnect the normal bay cable.

STEP	PROCEDURE

10. On the transmitter not in use, connect the QAM signal from the cable connected to the IF predistorter input, or the up-converter input if the IF PDSTR is not equipped, to the IF FILTER AND BASIC EQL unit of the receiver under test. Keep the cable as short as possible. Never exceed 20 feet.

11. Operate the AUTO/MAN pushbutton on both the ADAPTIVE SLOPE EQL and IF AGC AMPL to the AUTO position.

12. Measure the voltage at the CONT V jack on the ADAPTIVE SLOPE EQL, and compare it to the manual 0.5 dB positive slope CONT V measured and recorded in Step 7.

    Requirement: Within ±0.002 V of CONT V recorded in Step 7.

    If the requirement is met, the slope is properly adjusted. Go to Step 18.

    If the requirement is ***not*** met, adjustment is necessary. Go to Step 13.

Manual Upslope Adjustment

13. Disconnect all cables from the ADAPTIVE SLOPE EQL and remove the unit. Refer to Radio Receiver Replacement procedures, if necessary.

14. Carefully align and insert the extender card into the plug-in slot for the ADAPTIVE SLOPE EQL.

15. Insert the ADAPTIVE SLOPE EQL into the extender card, and secure the latch lock.

16. Reconnect IF IN and IF OUT connections using test cables to extend the existing receiver cables to the new ASE position in the extender.

17. Adjust the control through the hole on the right side of the ADAPTIVE SLOPE EQL unit to obtain a CONT V equal to the value recorded in Step 7.

    Requirement 1: Within ±0.002 V of the value recorded in Step 7.

    Requirement 2: The EXCS SLP indicator shall be off.

    If the requirements are met, go to Step 18.

    If the requirements are ***not*** met, replace the ADAPTIVE SLOPE EQL unit and perform the Adaptive Slope Equalizer Initial Check, SR 10.

18. Recondition the receiver and transmitter to normal operation. Verify that the AUTO/MAN pushbuttons on the ADAPTIVE SLOPE EQL and IF AGC AMPL are in the AUTO position.

STEP	PROCEDURE
19.	This test is complete. If this procedure was entered from another procedure, return to the reentry point recorded when that procedure was left. Otherwise, go to SR 1, START.

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