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DR 6/11-135A and 135EC 1×N Frequency Diversity Operation and Maintenance Radio Receiver Replacement Procedures

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1 Introduction

Use the procedures in this section to replace the Radio Frequency (RF) Preamplifier or units in the radio receiver.

After you have completed the replacement procedure, return to the flowchart or procedure that sent you to this section. In most cases, additional tests will have to be performed on the replaced unit.

To replace a receiver shelf, a receiver waveguide assembly, or backplane pin connectors, refer to the Maintenance Support manual.

1.1 Safety Labels

Safety labels are strategically placed symbols and messages that will alert you to potential risks. There are three types of safety labels.

DANGER:
DANGER *indicates the presence of a hazard that* ***will*** *cause death or severe personal injury if the hazard is not avoided.*

WARNING:
WARNING *indicates the presence of a hazard that* ***can*** *cause death or severe personal injury if the hazard is not avoided.*

CAUTION:
CAUTION *indicates the presence of a hazard that* ***will*** *or* ***can*** *cause minor personal injury or property damage if the hazard is not avoided.*

Within the **CAUTION** safety label, the term "property damage" refers also to possible service interruption or impairment.

Please refer to the Safety Labels heading in the **START HERE** tab for additional information about, and examples of, safety labels.

1.2 Service Protection

With no exceptions, service must be protected before any out-of-service tests are performed.

Service protection generally consists of:

a. Regular Channel—Manually line-switch service to Protection.

b. Protection Channel—Manually lock out the Protection channel.

Please refer to the **SERVICE PROTECTION** tab for details on service protection.

2 Unit Replacement

2.1 RF Preamplifier

Follow this procedure to replace an RF Preamplifier.

Because as many as four channels (DR 6) or six channels (DR 11) may go through each RF Preamplifier, there is potential for serious service interruption unless proper precautions are taken.

CAUTION:
Replacement of this unit can cause system interruption. Discuss the procedure with technical support and use an approved Method of Procedure (MOP) to perform this procedure.

CAUTION:
Electrostatic Discharge (ESD) may damage plug-in units. Use proper methods to prevent ESD damage.

Required tools:

1 - torque wrench, SMA-type
1 - socket wrench, waveguide, U-joint
1 - open-end wrench, 1/4 inch
1 - screwdriver

Step	Procedure

Comment: In an antenna-diversity system, there are dual paths to the IF IN jacks of the IF Combiners. In the following steps, you will protect service by moving it off the path of the amplifier being replaced.

Comment: On non-diversity systems, there is no practical way to protect service except to be very careful when you move the amplifier in or out of the waveguide. Done properly, there will be little service impairment.

1 Review the Safety Labels.

2 Obtain a replacement RF Preamplifier with the same unit code.

Note the gain value(s) stamped on the replacement for later use.

3 Is this an antenna-diversity system?

YES - Go to Step 4.

NO - Go to Step 11.

4 The RF Preamplifier to be replaced is in which path?

Regular - Go to Step 5.

Diversity - Go to Step 8.

5 For all Regular-channel receivers in the affected bay:

a. On a selected Regular channel,

obtain a channel release and have service line-switched to Protection.

b. On the IF COMBINER of the released channel:

1. Remove the cable from the REG IF IN jack.
2. Verify that the DIV ACTIVE indication is lighted.

c. Return this channel to service (release the line switch).

d. Repeat sub-steps a. through c. for next Regular channel.

6 Is there a Protection channel in this bay?

YES - Go to Step 7.

NO - Go to Step 12.

7 For the Protection-channel receiver in the affected bay:

a. Obtain a channel release and have it locked out.

b. On the IF COMBINER of the released channel:

1. Remove the cable from the REG IF IN jack.
2. Verify that the DIV ACTIVE indication is lighted.

c. Return this channel to service (release the lockout).

Comment: You have protected service and now you are ready to replace the RF Preamplifier.

d. Go to Step 12.

8 For all Regular-channel receivers in the affected bay:

a. On a selected Regular channel,

obtain a channel release and have service line-switched to Protection.

b. On the IF COMBINER of the released channel:

1. Remove the cable from the DIV IF IN jack.
2. Verify that the REG ACTIVE indication is lighted.

c. Return this channel to service (release the line switch).

d. Repeat sub-steps a. through c. for next Regular channel.

e. Go to Step 9.

9 Is there a Protection channel in this bay?

YES - Go to Step 10.

NO - Go to Step 12.

10 For the Protection-channel receiver in the affected bay:

a. Obtain a channel release and have it locked out.

b. On the IF COMBINER of the released channel:

1. Remove the cable from the DIV IF IN jack.
2. Verify that the REG ACTIVE indication is lighted.

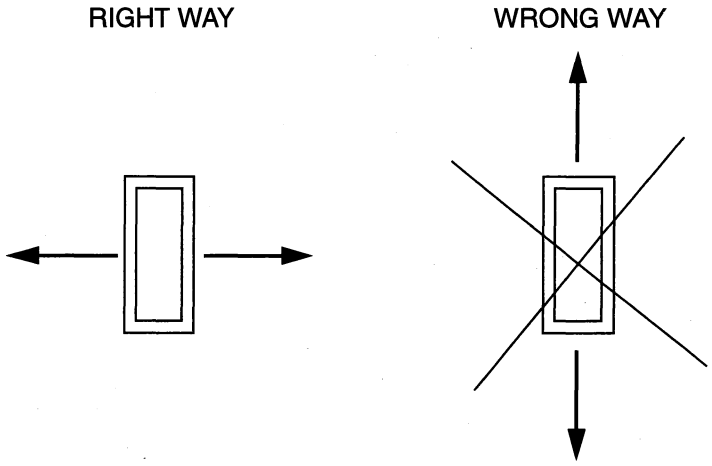
c. Return this channel to service (release the lockout).

Comment: You have protected service and now you are ready to replace the RF Preamplifier.

d. Go to Step 12.

11 Read the following CAUTION statement before performing Step 12.

CAUTION:
To reduce service impairment on non-diversity systems, move the RF Preamplifier into, or out of, the opening in a direction perpendicular to the wide dimension of the waveguide, as illustrated below.



12 On the failed RF PREAMPLIFIER:

a. Remove the eight waveguide screws at each end of the amplifier.

b. Smoothly slide the failed amplifier out of the waveguide run.

Comment: On non-diversity systems, the air gap will provide a transmission path. Keep objects, especially metal, away from the open gap.

c. Disconnect the power connector.

13 On the associated ALARM AND METER unit,

check for the following requirement.

Requirement: The RCVR—RF PRE AMP alarm indication is not lighted.

Was the requirement met?

YES - Go to Step 14.

NO - You have either selected the wrong amplifier to replace or there is a problem in the alarm wiring.

- Resolve the problem.

- Go to Step 14.

14 On the replacement RF PREAMPLIFIER:

a. Connect the power connector.

b. Verify that the green indicator lights.

c. Smoothly slide the replacement into place.

d. Replace the waveguide screws and tighten with the open-end wrench.

15 On the associated ALARM AND METER unit,

check for the following requirement.

Requirement: The RCVR—RF PRE AMP alarm indication is not lighted.

Was the requirement met?

YES - Go to Step 16.

NO - Suspect a defective replacement amplifier.

- Resolve the problem.

- Go to Step 16.

16 Is this an antenna-diversity system?

YES - Go to Step 17.

NO - Go to Step 20.

Comment: On antenna-diversity systems, the cables must be reconnected to the IF IN jacks of the IF Combiners. To prevent service impairments, service will be removed from each Regular channel before the cable is reconnected in the next step.

17 For all Regular-channel receivers in the affected bay:

a. On a selected Regular channel,

obtain a channel release and have service line-switched to Protection.

b. On the IF COMBINER of the released channel, reconnect the cable to the IF IN jack (DIV or REG, as appropriate).

c. Return the channel to service (release the line switch).

d. Repeat sub-steps a. through c. for next Regular channel.

18 Is there a Protection channel in the bay?

YES - Go to Step 19.

NO - Go to Step 20.

19 For the Protection-channel receiver in the affected bay:

a. Obtain a channel release and have it locked out.

b. On the IF COMBINER, reconnect the cable to the IF IN jack (REG or DIV, as appropriate).

c. Return the protection channel to service (release the lockout).

Comment: All service should now be fully restored.

20 Was the gain of the replacement amplifier, as noted in Step 2, a single value or three values?

Single - Go to Step 21.

Three - Go to Step 23.

21 On the RADIO DATA CARD of each receiver in the bay,

record the gain value noted in Step 2 on the RF PREAMPL GAIN line, REG or DIV column, as appropriate.

22 Go to Step 25.

23 Starting with the gain values noted in Step 2, determine (interpolate) the approximate gain at the center frequency of each receiver in the bay.

Comment: Three-gain RF Preamplifiers are stamped with the gain measured at each of three frequencies across the bandwidth:
HI - 6,420 MHz
MID - 6,175 MHz
LO - 5,930 MHz.
The gain value recorded on the Radio Data Card may be different for each channel in the bay.

24 On the RADIO DATA CARD of each receiver in the bay,

record the gain determined in Step 23 as RF PREAMPL GAIN, REG or DIV, as appropriate.

25 Return to **TEST PROCEDURES** tab, Flowchart 3, Unit Replacement and Alignment.

End of Procedure

2.2 Microwave Generator or Down-Converter

It is unlikely that you will replace both the down-converter and the MWV generator (labeled internally as "Microwave Oscillator") at the same time. You will usually replace one or the other. Either way, you must remove the RECEIVER DOWN CONV & MWV GEN unit from the receiver shelf, then remove the microwave oscillator from the unit.

CAUTION:
This is an Out-of-Service procedure. Service will be interrupted or impaired unless you apply Service Protection measures.

CAUTION:
The SMA connectors damage easily. Finger-start SMA connections for several turns, then use only a torque wrench to tighten.

CAUTION:
The ESD may damage plug-in units. Use proper methods to prevent ESD damage.

Required tools:

1 - combination wrench, 1/4 inch
1 - torque wrench, SMA-type
1 - screwdriver, 3 inch

Step	Procedure
1	Review the Safety Labels.
2	Verify that you have a replacement unit available and, for a Microwave Oscillator, that it is the correct code.

Comment: The MWV Gen code is the letter(s) that follows the Model Number (141 for 6 GHz, 142 for 11 GHz) of the Microwave Oscillator.

Removing the RECEIVER DOWN CONV & MWV GEN

3 On the RECEIVER DOWN CONV & MWV GEN:

a. Disconnect the cable(s) from the IF OUT jack(s), REG and DIV.

b. Remove the semirigid cable(s) from between the RF IN jack(s) and the OUTPUT jack(s) of the Isolator/Transducer.

c. Simultaneously:

— Release the latch catch.

— Pull the latch lever forward.

d. Pull the lever down until the unit is released from the backplane connector.

e. Hold the unit at the top and bottom.

f. Slide the unit out of the shelf.

g. Place the unit on an ESD-protected (grounded) surface with the Microwave Oscillator facing up.

Removing the Microwave Oscillator

4 On the RECEIVER DOWN CONV & MWV GEN:

Reference: For 6 GHz, refer to Figure 1.
For 11 GHz, refer to Figure 2.

a. Remove the Microwave Oscillator power connector from plug P1.

b. Turn the unit over and remove the two screws holding the Microwave Oscillator.

c. Carefully turn the unit over again.

d. Hold the semirigid cable with a 1/4-inch wrench as you use the torque wrench to loosen the SMA connector at the RF OUT jack.

e. Loosen the SMA connector at the down-converter (6 GHz) or multiplier (11 GHz) end of the semirigid cable.

f. Remove the semirigid cable from the SMA connector on the RF OUT jack.

g. Remove the Microwave Oscillator module.

5 Which item are you going to replace?

a. To replace the Down-Converter, go to Step 6.

b. To replace the Microwave Oscillator, go to Step 10.

6 Place the replacement RECEIVER DOWN CONV & MWV GEN on the ESD-protected work surface.

7 Is the replacement a 4400-series?

YES - Go to Step 8.

NO - Go to Step 9.

8 On the replacement down-converter,

verify that the Upper/Lower sideband selection jumper is in the correct position.

Reference: Table A and Figure 1 or 2.
To determine the correct sideband, refer to:
TEST PROCEDURES tab,
Table B, C, D, or E,
SIDEBAND column.

Table A. Sideband Selector Position (4400-Series Down-Converter)

Sideband	Miniplug Position
Upper	J4 to J5
Lower	J4 to J6

9 Is the replacement equipped with a Microwave Oscillator?

YES - Perform Step 4 to remove it; then go to Step 10.

NO - Go to Step 10.

Installing a Microwave Oscillator into the Unit

10 On the RECEIVER DOWN CONV & MWV GEN:

a. Place the Microwave Oscillator in position.

b. Plug the power connector into plug P1.

c. Finger-start the SMA connector of the RF OUT jack to the semirigid cable.

d. Hold the semirigid cable with the 1/4-inch wrench as you torque the SMA connector at the RF OUT jack on the Microwave Oscillator.

e. Torque the SMA connector at the down-converter (or multiplier) end of the semirigid cable.

f. Carefully turn the unit over and reinstall the two mounting screws.

Installing the RECEIVER DOWN CONV & MWV GEN

11 On the RECEIVER DOWN CONV & MWV GEN:

a. Release the latch catch.

b. Pull the latch lever forward.

CAUTION:
Backplane connectors will be damaged if the RECEIVER DOWN CONV & MWV GEN is misaligned in the shelf guides.

c. Carefully align the RECEIVER DOWN CONV & MWV GEN in the top and bottom shelf guides.

d. Slide the unit into the shelf until the bottom of the latch lever clears the front of the shelf.

e. Simultaneously:

— Push up on the latch lever.

— Apply light pressure to the top of the RECEIVER DOWN CONV & MWV GEN.

f. Ensure that the latch catch has hooked the latch lever.

g. Install the semirigid cable(s) between the RF IN jack(s) and the OUTPUT jack(s) of the Isolator/Transducers.

h. Connect the cable(s) to the IF OUT jack(s).

i. Verify that the correct label has been applied to the latch lever.

j. Verify that the GEN MON jack has a termination.

12 Return to **TEST PROCEDURES** tab, Flowchart 3, Unit Replacement and Alignment.

End of Procedure

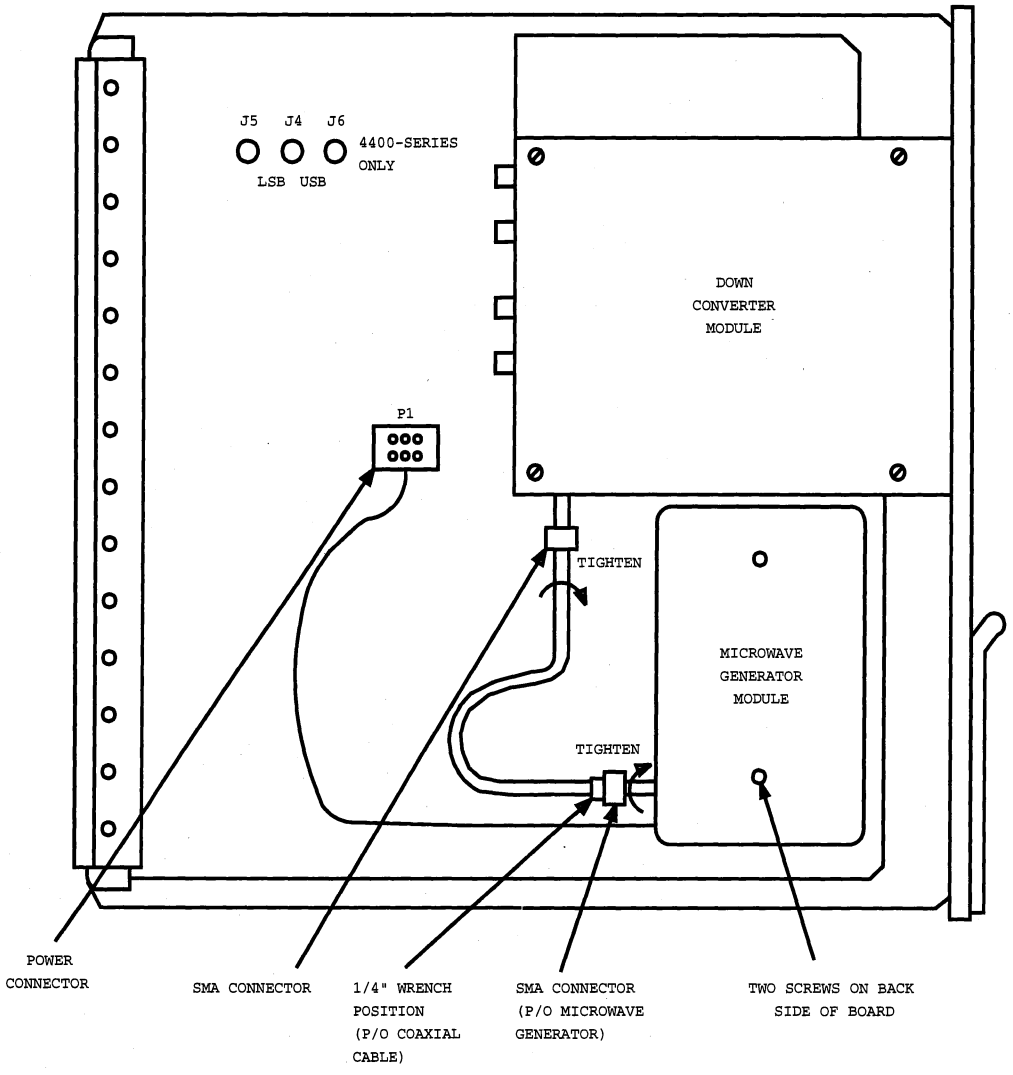


Figure 1. 6-GHz Receiver Down-Converter

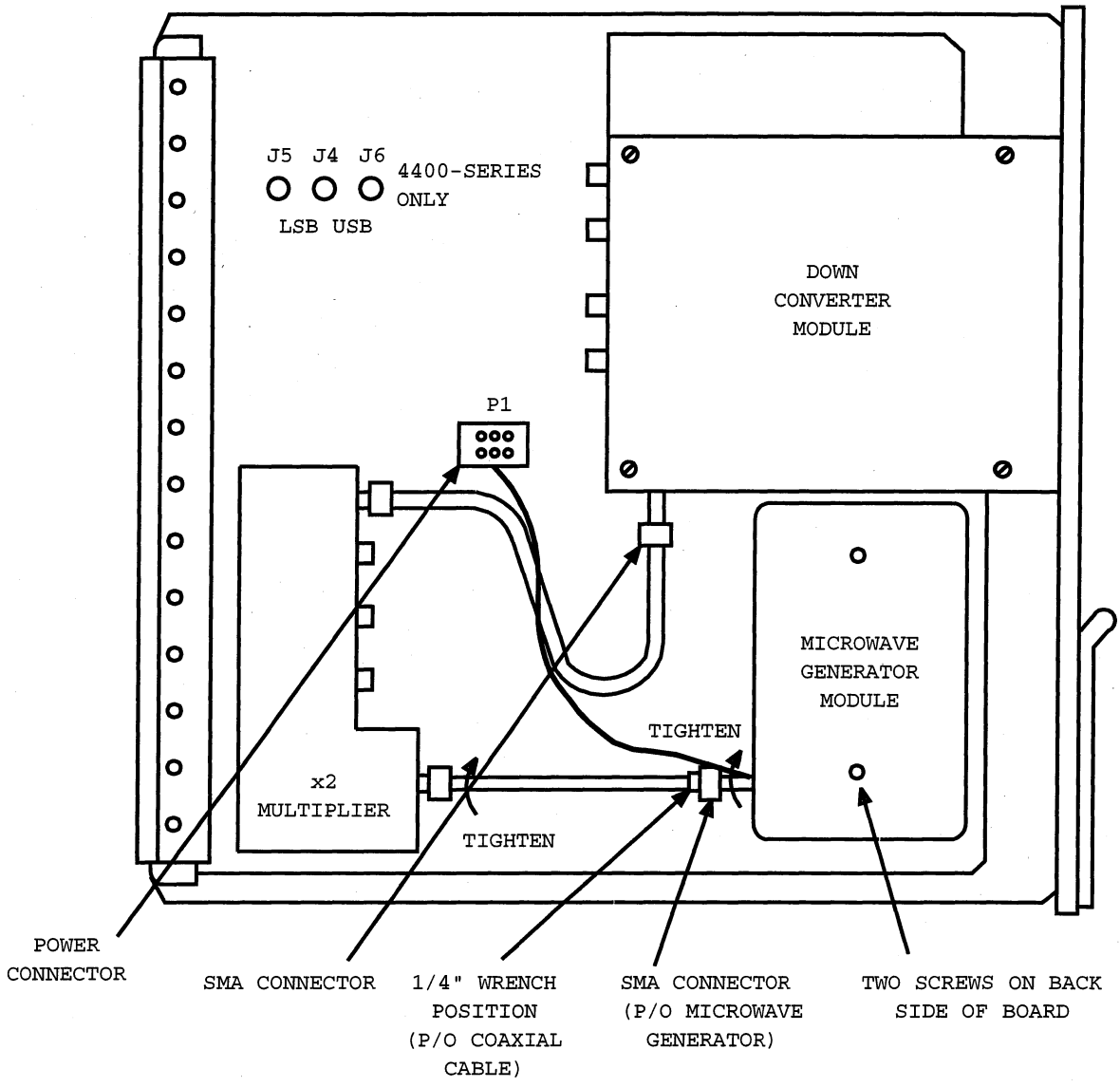


Figure 2. 11-GHz Receiver Down-Converter

2.3 Linear Delay Equalizer

Use this procedure to add, remove, or replace individual 2001( ) equalizer modules within the Linear Delay Equalizer plug-in.

CAUTION:
This is an Out-of-Service procedure. Service will be interrupted or impaired unless you apply Service Protection measures.

CAUTION:
On antenna-diversity systems, unequal signal delay between regular and diversity paths may cause service interruptions. If a delay equalizer is added, removed, or replaced by one with a different code, a Differential Absolute Delay Equalization (DADE) test must be performed.

Required tools:

1 - extractor
1 - screwdriver

Step	Procedure

Comment: You add, remove, or replace Linear Delay Equalizers to either replace a defective equalizer or to meet the requirements of an Envelope Delay Distortion (EDD) test.

1 Review the Safety Labels.

2 On the LINEAR DELAY EQUALIZER plug-in:

a. Remove the cables from all the jacks on the faceplate.
   — IF IN (REG and DIV, if it is antenna-diversity system)
   — IF OUT (REG and DIV)
   — DADE IF OUT (if equipped).

b. With the screwdriver, push in and turn the locking screw counterclockwise.

c. With the extractor tool, remove the unit from the shelf.

3 Are you replacing a defective equalizer?

YES - Obtain a replacement equalizer with the same type and code as the defective equalizer.

NO - Obtain the equalizer(s) to meet the requirements of the EDD tests.

4 Inside the LINEAR DELAY EQUALIZER:

Reference: Figures 3, 4, and 5

a. Remove screws as necessary to remove the equalizer(s).

You may also have to remove the bracket with the equalizer.

If a coil of minicoaxial DADE cable is in the plug-in, you may have to temporarily remove cable ties and stick-downs to replace an equalizer.

b. Install the equalizer(s) by using the screws removed earlier.

5 On the front of the LINEAR DELAY EQUALIZER,

update the label to show codes of all installed equalizers.

6 Install the LINEAR DELAY EQUALIZER plug-in into the shelf.

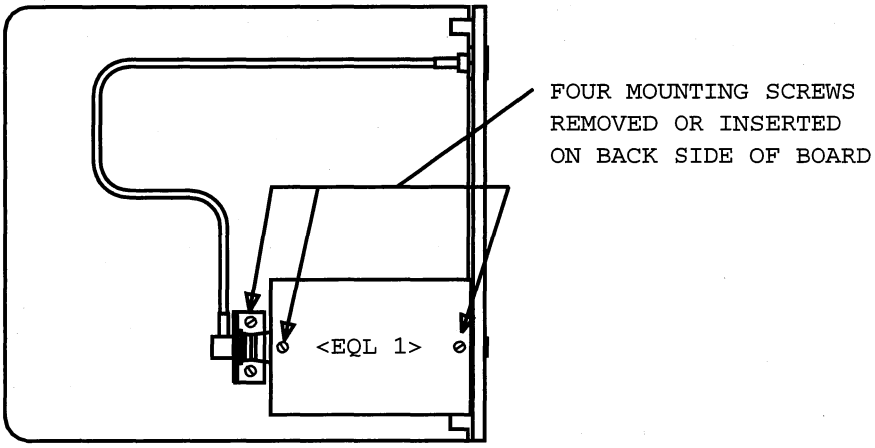
7 On the LINEAR DELAY EQUALIZER:

a. Lock the plug-in into the shelf by pushing in and turning the locking screw clockwise.

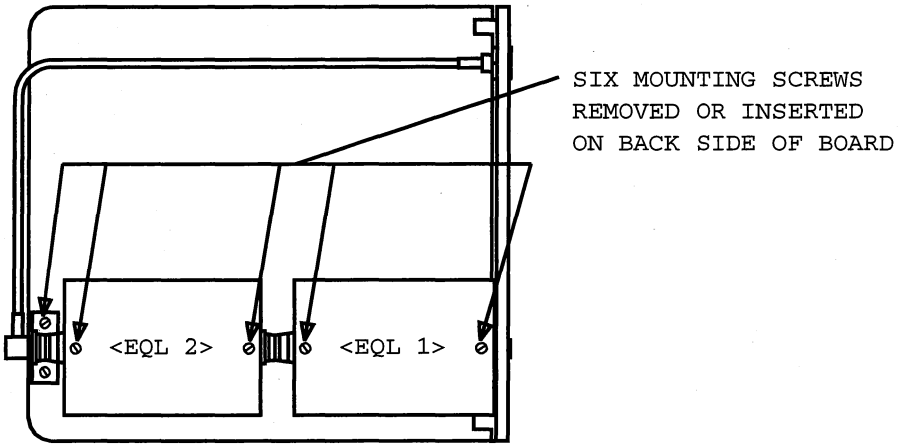
b. Reconnect the cables removed in Step 2.

8 Return to **TEST PROCEDURES** tab, Flowchart 3, Unit Replacement and Alignment.

End of Procedure



A. ONE EQUALIZER EQUIPPED



B. TWO EQUALIZERS EQUIPPED

Figure 3. Linear Delay Equalizer—Non-Diversity

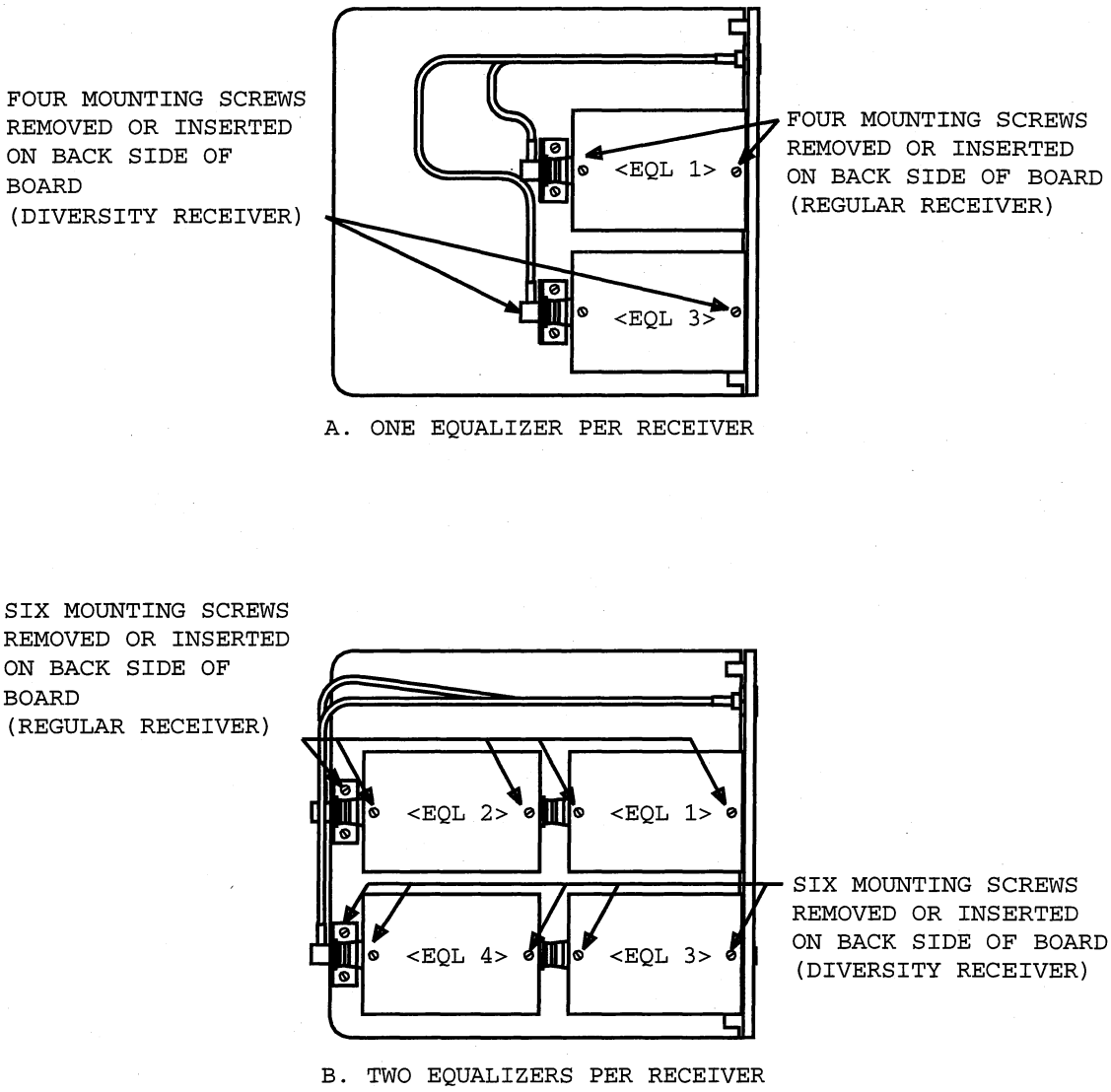


Figure 4. Linear Delay Equalizer—Antenna-Diversity

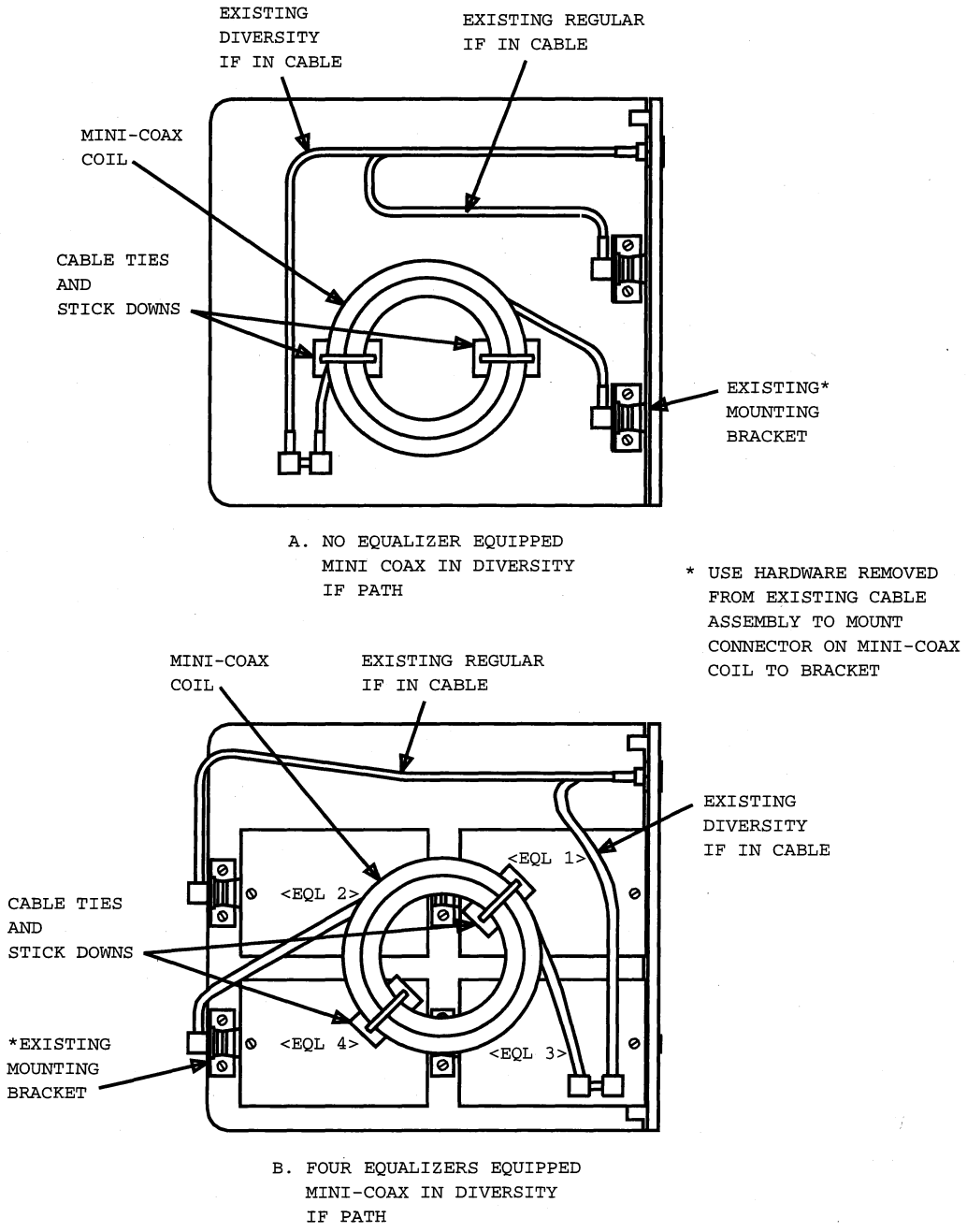


Figure 5. Linear Delay Equalizer—with Minicoax DADE Cable

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2.4 IF Filter or Basic Equalizer

Use this procedure to replace either the 1603B IF Filter or the 2002( ) Basic Equalizer. Both are located inside the IF Filter and Basic Equalizer plug-in.

CAUTION:
This is an Out-of-Service procedure. Service will be interrupted or impaired unless you apply Service Protection measures.

Required tools:

1 - extractor
1 - screwdriver

Step	Procedure
1	Review the Safety Label.
2	On the IF FILTER AND BASIC EQUALIZER: a. Remove the cables from the IF IN and IF OUT jacks. b. With the screwdriver, push in and turn the locking screw counterclockwise. c. With the extractor tool, remove the unit from the shelf.
3	Obtain a replacement Filter or Equalizer with the same unit code.
4	Inside the IF FILTER AND BASIC EQUALIZER: Reference: Figure 6. a. Remove the cable between the IF FILTER output jack (P2) and the BASIC EQUALIZER input jack (P1). b. Remove the screws holding the filter or equalizer to be replaced. c. Remove the filter or equalizer. d. Install the replacement with the screws removed earlier. e. Reconnect the cable removed earlier.
5	Install the IF FILTER AND BASIC EQUALIZER plug-in into the shelf: a. Lock the plug-in into the shelf by pushing in and turning the locking screw clockwise. b. Reconnect the bay cables to the IF IN and the IF OUT jacks.
6	Return to **TEST PROCEDURES** tab, Flowchart 3, Unit Replacement and Alignment.

End of Procedure

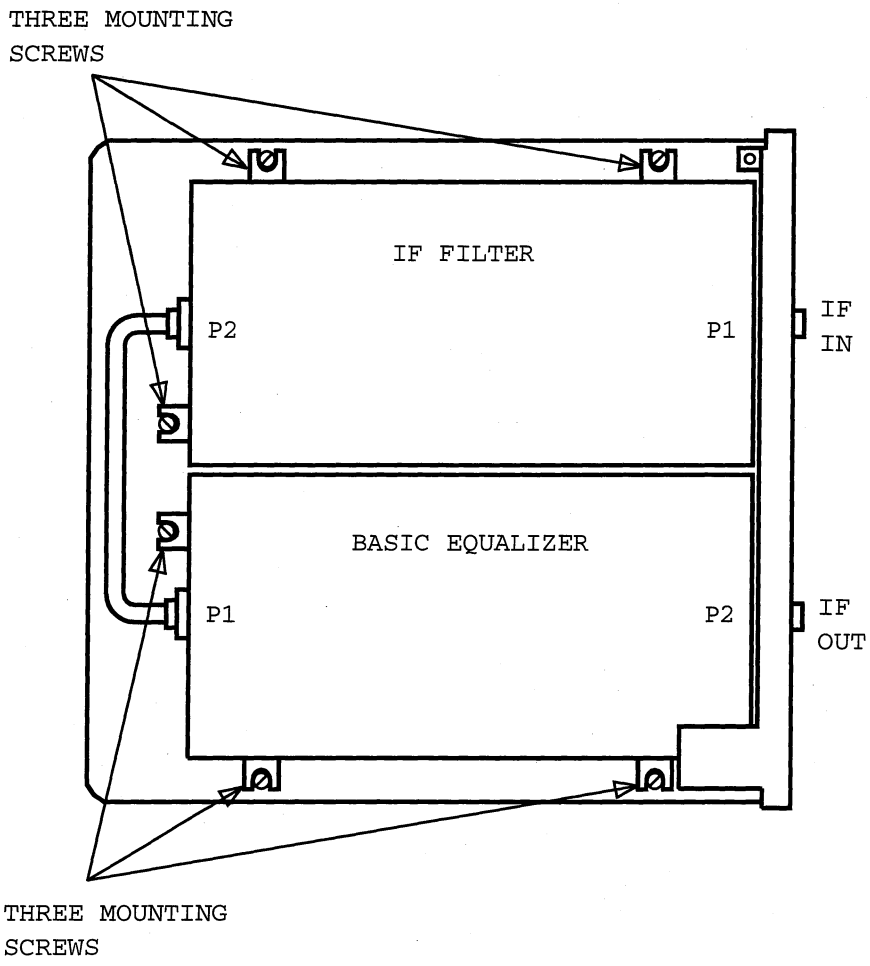

Figure 6. IF Filter and Basic Equalizer

2.5 IF AGC Amplifier, Adaptive Slope Equalizer, or IF Combiner

Use this procedure to replace the IF Automatic Gain Control (AGC) Amplifier, the Adaptive Slope Equalizer, or the IF Combiner.

CAUTION:
This is an Out-of-Service procedure. Service will be interrupted or impaired unless you apply Service Protection measures.

CAUTION:
The ESD may damage plug-in units. Use proper methods to prevent ESD damage.

Required tools:

1 - extractor
1 - screwdriver

Step	Procedure
1	Review the Safety Labels.
2	Obtain a replacement with the same type and code.
Removal	
3	On the unit to be replaced: a. Remove the cables from all jacks on the faceplate. b. With the screwdriver, push in and turn the locking screw counterclockwise. c. With the extractor tool, remove the unit from the shelf. d. Place the removed unit on an ESD-protective surface or in an ESD-protective container.

Installation

CAUTION:
Backplane connectors may be damaged if the replacement unit is misaligned in the shelf guides.

4 Carefully align the replacement in the top and bottom shelf guides:

a. Slide the plug-in into the shelf.

b. Seat the plug-in by applying pressure to the top and bottom of the unit.

c. Lock the plug-in by pushing in the locking screw and turning it clockwise.

5 On the faceplate of the plug-in:

a. Reconnect the cables to the appropriate jacks.

b. Set the MAN / AUTO push button to the AUTO (in) position.

6 Return to **TEST PROCEDURES** tab, Flowchart 3, Unit Replacement and Alignment.

End of Procedure

2.6 Receiver Power Unit

Use this procedure to replace an RCVR PWR unit.

CAUTION:
This is an Out-of-Service procedure. Service will be interrupted or impaired unless you apply Service Protection measures.

NOTE:
The RCVR PWR unit may be supplying ±15 V to an RF Preamplifier. Removing or turning off the power unit will impair service on any channels going through the preamplifier.

CAUTION:
The ESD may damage plug-in units. Use proper methods to prevent ESD damage.

Step	Procedure
1	Review the Safety Labels.
2	Verify that a replacement unit with the correct code is available. The two codes for RCVR PWR units are: ■ 1474AD for –24 volt supply ■ 1474AB for –48 volt supply.
Removal	
3	On the RCVR PWR unit: a. Operate the STBY/RCVR ON push button to STBY (out). b. Simultaneously: — Release the latch catch. — Pull the latch lever forward. c. Pull the latch lever down until the unit is released from the backplane connector. d. Hold the RCVR PWR unit at the top and bottom as you slide it out of the shelf. e. Place the removed unit on an ESD-protective surface or in an ESD-protective container.

Installation

4 On the replacement RCVR PWR unit:

a. Verify that the STBY/RCVR ON switch is set to STBY (out).

b. Release the latch catch.

c. Pull the latch lever forward.

CAUTION:
Backplane connectors may be damaged if the replacement unit is misaligned in the shelf guides.

5 Carefully align the RCVR PWR unit in the top and bottom shelf guides.

6 Slide the RCVR PWR unit into the shelf until the bottom of the latch lever clears the front of the shelf.

7 To seat the RCVR PWR plug-in, simultaneously:

a. Apply light pressure to the top of the plug-in.

b. Push up on the latch lever.

Ensure that the catch has engaged the latch lever.

8 On the RCVR PWR plug-in,

operate the STBY / RCVR ON push button to the RCVR ON position (in).

9 Return to **TEST PROCEDURES** tab, Flowchart 3, Unit Replacement and Alignment.

End of Procedure

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