



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

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1 Introduction

Use the procedures in this section to replace units in the radio transmitter.

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 or on the entire transmitter.

To replace a transmitter shelf, a transmitter 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 TWT Units

2.1 Amplifier Assembly Removal and Installation (TWT)

In this procedure, you will remove and install the complete Amplifier Assembly from and to the radio bay. To replace or test any of the units within the assembly, refer to the procedure for that specific unit.



CAUTION:

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



CAUTION:

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



CAUTION:

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

- Prerequisites:**
1. The **ALC ON/OFF** switch is set to **OFF**.
 2. The IF input signal is removed from the up-converter.

Required tools:

- 1 - torque wrench, SMA-type
- 1 - screwdriver, 4 inch
- 1 - screwdriver, 10 inch

Step	Procedure
1	Review the Safety Labels and verify that the prerequisites have been met.
Removal of the Amplifier Assembly	
2	On the POWER SUPPLY CONTROL unit: <ol style="list-style-type: none"> a. Operate the TRANS/STBY switch to STBY. b. Operate the ON/OFF switch to OFF.
3	On the AMPLIFIER ASSEMBLY: <ol style="list-style-type: none"> a. Remove the semirigid cable from between the RF FL IN jack and the RF OUT jack on the TRANSMITTER UP CONV & MWV GEN. b. Remove the power cable from the P12 connector by disengaging the sliding-lock mechanism.

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- c. Remove the semirigid cable connected between the RF OUT jack on the Automatic Level Control (ALC) Network and the INPUT jack on the Isolator/Transducer.
- d. Loosen the four captive screws holding the assembly to the bay framework (two at the top rear and two at the lower front).

**CAUTION:**

Service on adjacent channels may be interrupted as you perform Step 4 unless you visually verify that the power cables on the transmitters on either side are locked to their connectors so you will not cause them to loosen. Watch closely for any wires or cables that might be snagged or pinched as you remove the assembly from the bay.

- 4 Remove the Amplifier Assembly as follows:
 - a. Use the handles to slide the assembly forward (about six inches) on the support bracket of the framework.
 - b. Place one hand under the assembly and the other hand on the upper handle to lift and remove the assembly from the support bracket. (The assembly weighs about 27 pounds.)
 - c. Set the assembly on a solid work surface.
- 5 Return to the replacement procedure or test procedure that referred you to this procedure.

Installation of the Amplifier Assembly

- 6 On the AMPLIFIER ASSEMBLY:
 - a. Verify that the bandpass filter is the correct code (frequency).
 - b. Verify that all test equipment is removed and that units within the Amplifier Assembly are properly installed and connected.

**CAUTION:**

Service on adjacent channels may be interrupted as you perform Step 7 unless you visually verify that the power cables on the transmitters on either side are locked to their connectors so you will not cause them to loosen. Watch closely for any wires or cables that might be snagged or pinched as you slide the assembly into the bay.

- 7 Place the Amplifier Assembly on the framework support bracket.
- 8 Slide the assembly into the bay.
- 9 On the AMPLIFIER ASSEMBLY,
lock the four captive screws into place
(two at the top rear and two at the lower front).

- 10 On the POWER SUPPLY CONTROL unit:
- Verify that the ON/OFF switch is in the OFF position.
 - Verify that the TRANS/STBY switch is in the STBY position.
- 11 On the ALC NETWORK,
- verify that the **ALC ON/OFF** switch is in the **OFF** position.
- 12 On the AMPLIFIER ASSEMBLY:
- Reconnect the bay power cable to the P12 connector (located in the lower section of the Amplifier Assembly).
 - Engage the sliding-lock mechanism on P12.
 - Reconnect the semirigid cable between the RF FL IN jack and the RF OUT jack on the TRANSMITTER UP CONV & MWV GEN.
- 13 On the ALC NETWORK,
- reconnect the semirigid cable between the RF OUT jack and the INPUT jack on the Isolator/Transducer.
- 14 On the POWER SUPPLY CONTROL unit:
- Operate the ON/OFF switch to ON.

⇒ NOTE:

Gas that produces noise can form in TWT's during storage. This gas can delay the operating performance of the TWT from an indication of degraded performance to no radio frequency (RF) output. The gas will burn off during operating conditions, but as Table A indicates, it can take hours to completely burn the gas out of the tube. Most gas is burnt off in the first 30 minutes after DC power is applied to the TWT. It may be necessary to operate the channel at a degraded level until the remaining gas burns off and then redo linearity tests and adjustments.

Table A. TWT Gas Burn Off Time

Storage Period	Operating Period
Up to 1 year	24 hours
1 to 2 years	48 hours
2 to 5 years	72 hours

- Wait a minimum of 30 minutes for TWT gas to burn off.
 - Operate the TRANS/STBY switch to TRANS.
- 15 Return to the replacement procedure or test procedure that referred you to this procedure.

End of Procedure

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2.2 Amplifier (TWT)

Use this procedure to replace only the TWT Amplifier.



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.



CAUTION:

The SMA connectors damage easily. Finger-start SMA and N-type connections for several turns, then use only a torque wrench to tighten them.

- Prerequisites:**
1. The **ALC ON/OFF** switch is set to **OFF**.
 2. The IF input signal is removed from the up-converter.

Required tools:

- 1 - torque wrench, SMA-type
- 1 - torque wrench, N-type (for 6 GHz only)
- 1 - screwdriver, 3 inch
- 1 - screwdriver, 4 inch
- 1 - open-end wrench, 7 mm.

Step	Procedure
1	Review the Safety Labels and verify that the prerequisites have been met.
2	Verify that a replacement TWT Amplifier and a new thermal shim are available.
3	Remove the AMPLIFIER ASSEMBLY from the radio bay.

Reference: Procedure 2.1, Amplifier Assembly Removal and Installation (Removal), in this tab.

Comment: There are two types of ALC Networks. On the type most often used, the RF IN jack is mounted on the side and it is accessible only after the side plate is removed. On the other, the RF IN jack is mounted on the front of the ALC Network and the side plate does not have to be removed.

- 4 Place the Amplifier Assembly on its right side (right side as seen in the radio bay) with the blue TWT Amplifier facing up.
- 5 Remove the side plate (five screws) that is beside the ALC Network.
- 6 On the front of the AMPLIFIER ASSEMBLY:
 - a. Remove the semirigid cable connected between the RF IN jack (N-type for 6 GHz and SMA-type for 11 GHz) and the RF FL OUT jack (SMA-type).
 - b. Remove the semirigid cable connected between the TWT Amplifier RF OUT jack (N-type for 6 GHz and SMA-type for 11 GHz) and the RF IN jack (SMA-type) on the ALC Network.
- 7 On the side of the AMPLIFIER ASSEMBLY:
 - a. Remove only the five outside screws on the lower side plate.
 - b. Carefully lift out the plate with attached RF Filter and set it aside.
 - c. Remove the TWT Amplifier power cable from the output connector of the TWT Power Supply.
- 8 On the backplate of the AMPLIFIER ASSEMBLY:
 - a. Remove the four screws that attach the large heat sink and TWT Amplifier to the backplate.
 - b. Carefully lift the heat sink and TWT Amplifier out of the Amplifier Assembly.
 - c. Move them to a work area.
- 9 On the HEAT SINK:
 - a. Remove six 7-mm slotted hex-head screws that hold the TWT Amplifier to the heat sink.

**CAUTION:**

The next sub-step may be difficult due to adhesion of the thermal shim. Use extreme care.

- b. Separate the TWT Amplifier from the heat sink.
- c. Remove all of the old shim material from the heat sink.

Comment: In Steps 10 through 19, you will install a replacement TWT Amplifier into the Amplifier Assembly.

- 10 On the RADIO DATA CARD,
 - a. Record the beam current (IK) value that is printed on a label located on the side or front of the replacement TWT Amplifier.
 - b. Record the TWT Amplifier serial number (TWT-SN).
- 11 Support the TWT Amplifier with the input/output jacks facing down.

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**CAUTION:**

To prevent damage to the delicate thermal shim, handle it carefully.

- 12 Carefully lay the new thermal shim on the top of the TWT Amplifier with the shim aligned with the top of the TWT Amplifier.
- 13 Place the heat sink on top of the shim and use the two uncovered screw holes on the lower part of the amplifier for alignment.
- 14 Insert and tighten screws into these two holes.
- 15 Punch through the shim to insert and tighten the remaining screws.
- 16 On the side of the AMPLIFIER ASSEMBLY:
 - a. Place the heat sink and TWT Amplifier onto the Amplifier Assembly.
 - b. Attach the heat sink and TWT Amplifier to the backplate with the screws that were removed in Step 8.
 - c. Connect the TWT Amplifier power cable to the TWT Power Supply output connector.
 - d. Tighten the TWT Amplifier power-cable screws fingertight, then tighten with a screwdriver (not more than 1/4 turn).
 - e. Install the lower side-plate and attached RF Filter with five screws.
- 17 On the front of the AMPLIFIER ASSEMBLY:
 - a. Connect the semirigid cable between the RF OUT jack on the TWT Amplifier and the RF IN jack on the ALC Network.
 - b. Connect the semirigid cable between the RF FL OUT jack and the RF IN jack on the TWT Amplifier.
 - c. Torque all SMA and/or N-type connections.
- 18 On the side of the AMPLIFIER ASSEMBLY,
install the upper side plate.

(Before you tighten the screws, be sure the ALC Network is aligned within the side-plate slots.)

**NOTE:**

See Table A, *TWT Gas Burn Off Time*, and associated Note.

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

End of Procedure

2.3 Power Supply and Control Unit (TWT)

Use this procedure to replace the TWT Power Supply and Control unit. This unit consists of two parts: a power supply and a power supply control unit, but they are replaced as a single, assembled unit.



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.



CAUTION:

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

- Prerequisites:**
1. The **ALC ON/OFF** switch is set to **OFF**.
 2. The IF input signal is removed from the up-converter.

Required tools:

- 1 - torque wrench, SMA-type
- 1 - torque wrench, N-type (for 6 GHz only)
- 1 - screwdriver, 3 inch
- 1 - screwdriver, 4 inch
- Compound, heat-conductive (Stock No. KS-21343, L1)

Step	Procedure
1	Review the Safety Labels and verify that the prerequisites are met.
2	Verify that a replacement Power Supply and Control unit is available.
3	Remove the AMPLIFIER ASSEMBLY from the radio bay.

Reference: Procedure 2.1, Amplifier Assembly Removal and Installation (Removal), in this tab.

Removing the Power Supply and Control Unit

- 4 Place the AMPLIFIER ASSEMBLY on its side, with the power supply facing up.

- 5 On the side of the AMPLIFIER ASSEMBLY,
remove the side plate adjacent to the ALC Network.
- 6 On the front of the AMPLIFIER ASSEMBLY:
 - a. Loosen the screw and release the holding tab on the lower front of the ALC Network.
 - b. Disconnect the semirigid cable from the RF OUT jack of the TWT Amplifier.
 - c. Carefully move the ALC Network forward, away from the Amplifier Assembly.
- 7 On the power-supply side of the AMPLIFIER ASSEMBLY:
 - a. Remove the lower side plate of the Amplifier Assembly.
 - b. Remove the power connectors on the top and bottom of the Power Supply and Control unit.
- 8 On the front of the AMPLIFIER ASSEMBLY:
 - a. Remove the six slotted hex-head screws holding the Power Supply and Control unit to the heat sink.

**CAUTION:**

The next sub-step may be difficult due to the adhesion of the heat-conductive compound. Use extreme care.

- b. Carefully separate the Power Supply and Control unit from the heat sink.

Strapping Options on the Replacement Power Supply and Control Unit

Comment: Strapping refers to switch-position combinations of two dual in-line package (DIP) switches and two DIP-FIX switches. (DIP-FIX switches are small, blue blocks with an open-or-closed safety pin-type connection.)

Strapping options permit this power supply to be used for several combinations of TWT's, frequencies, and power levels. A table on the left-side cover shows the options and identifies each with a number in the Strapping Position column (third column from the right). A mark or note in either the "strapped by factory" or "strapped by user" column indicates the present option.

- 9 On the replacement POWER SUPPLY and CONTROL unit,
refer to the table on the left-side cover to verify that proper strap options are selected:
- 6 GHz: Strapping Position 9
 - 11 GHz: Strapping Position 7.
- 10 Are you certain that the power supply is correctly strapped?
- YES - Go to Step 12.
NO - Go to Step 11.
- 11 On the replacement POWER SUPPLY and CONTROL unit:
- a. Remove the left-side cover.
 1. Remove two screws on the back of the power supply.
 2. Unlatch the two spring clips (only the end that blocks the removal of the left-side cover).
 - b. Position the switches as required.

Reference: Table and switch-location chart on the left-side cover.
 - c. Reinstall the cover and the two screws.
 - d. Latch the two spring clips.
 - e. Mark the label on the cover to show the present strapping option in the "strapped by user" column.

Installing the Power Supply and Control Unit

- 12 On the RADIO DATA CARD,
Record the serial numbers of the Power Supply (PS-SN) and Control unit (CU-SN).
- 13 On the replacement POWER SUPPLY and CONTROL unit,
apply heat-conductive compound to the front, bare-metal surface with a thin coat that covers the entire surface.
- 14 On the front of the AMPLIFIER ASSEMBLY:
- a. Align the Power Supply and Control unit to the heat sink.
 - b. Secure the unit with the six hex-head screws.
 - c. Wipe off any excess heat-conductive compound.

- 15 On the POWER SUPPLY and CONTROL unit:
 - a. Connect the power connectors on the top and bottom.
 - b. Finger-tighten the locking screws.
 - c. Use a screwdriver to tighten the screws another 1/8 to 1/4 turn.
- 16 On the front of the AMPLIFIER ASSEMBLY,
connect the semirigid cable (from the ALC Network) to the RF OUT jack of the TWT Amplifier.
- 17 On the side of the AMPLIFIER ASSEMBLY:
 - a. Install the lower side plate.
 - b. Install the upper side plate.

(Before you tighten the screws, be sure the ALC Network is aligned within the side-plate slots.)
- 18 On the front of the AMPLIFIER ASSEMBLY,
slide the holding tab for the ALC Network into position and tighten the screw.
- 19 Return to **TEST PROCEDURES** tab, Flowchart 3, Unit Replacement and Alignment.

End of Procedure

2.4 ALC Network, 4300-Series (TWT)

Use this procedure to replace or install a 4388A (11 GHz) or 4389A (6 GHz) ALC Network (4300 series).

Comment: There are two types of ALC Networks (4300 and 4400 series). The 4300 series has an RF IN jack that is not on the faceplate but is accessible only after you remove the Amplifier Assembly from the bay. There is a separate replacement procedure for each type.



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.



CAUTION:

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

Prerequisites: 1. The **ALC ON/OFF** switch is set to **OFF**.
2. The IF input signal is removed from the up-converter.

Required tools:

- 1 - torque wrench, SMA-type
- 1 - torque wrench, N-type (for 6 GHz only)
- 1 - screwdriver, 3 inch

Step	Procedure
1	Review the Safety Labels and verify the prerequisites.
2	Verify that a replacement ALC Network is available.
3	Remove the AMPLIFIER ASSEMBLY from the radio bay.

Reference: Procedure 2.1, Amplifier Assembly Removal and Installation (Removal), in this tab.

Removing the 4300-Series ALC Network

- | | |
|---|---|
| 4 | Place the Amplifier Assembly on its side with the TWT Amplifier up. |
|---|---|

- 5 On the side of the AMPLIFIER ASSEMBLY:
- Remove the side plate covering the ALC Network.
 - Release the sliding lock mechanism and disconnect the cable connectors.
- 6 On the front of the AMPLIFIER ASSEMBLY:
- Loosen the screw and release the holding tab on the lower edge of the ALC Network.
 - Remove the N-type connector (6 GHz) or SMA connector (11 GHz) from the RF OUT jack.
 - Carefully remove the ALC Network and the attached semirigid cable from the Amplifier Assembly.
- 7 On the removed ALC NETWORK,
remove the semirigid cable from the RF IN jack.

Comment: If you are replacing the removed 4300-series with a 4400-series ALC Network, you will be referred to another procedure to make the installation. Two different semirigid cables are required for the 4400-series ALC Network.

- 8 Are you replacing the removed 4300-series ALC Network with another 4300-series ALC Network?
- YES - Go to Step 10.
- NO - Verify that you have the different semirigid cables.
- Go to Procedure 2.5, ALC Network, 4400-Series (Installation), in this tab.

Installing the 4300-Series ALC Network

- 9 Are you replacing a 4400-series ALC Network with a 4300-series?
- YES - Remove the AMPLIFIER ASSEMBLY from the radio bay.

Reference: Procedure 2.1, Amplifier Assembly Removal and Installation (Removal), in this tab.

- Go to Step 10.
- NO - Go to Step 10.

- 10 On the replacement ALC NETWORK:
- Operate the **ALC ON/OFF** switch to **OFF**.
 - If necessary, transfer alignment screws from the replaced ALC Network to corresponding holes on the replacement ALC Network.
- Comment: These screws vertically align the ALC Network with slots in the side plates.*
- Loosely connect the semirigid cable to the RF IN jack.
- 11 On the front of the AMPLIFIER ASSEMBLY:
- Install the ALC Network into the Amplifier Assembly.
 - Align and connect the N-type connector (6 GHz) or SMA connector (11 GHz) to the RF OUT jack.
 - Torque connectors on both ends of the semirigid cable between the RF IN jack on the ALC Network and the RF OUT jack on the Amplifier Assembly.
 - Slide the holding tab over the lower edge of the ALC Network.
 - Tighten the screw.
- 12 On the side of the AMPLIFIER ASSEMBLY:
- Reconnect the cable connector and engage the sliding lock.
 - Install the side plate.
- (Before you tighten the screws, be sure the ALC Network is aligned within the side-plate slots.)
- 13 Install the AMPLIFIER ASSEMBLY into the radio bay.
- Reference: Procedure 2.1, Amplifier Assembly Removal and Installation (Installation), in this tab.
- 14 Return to **TEST PROCEDURES** tab, Flowchart 3, Unit Replacement and Alignment.

End of Procedure

2.5 ALC Network, 4400-Series (TWT)

Use this procedure to replace or install a 4411B (6 GHz) or 4411C (11 GHz) ALC Network (4400 series).

Comment: There are two types of ALC Networks (4300 and 4400 series). The 4300 series has an RF IN jack that is not on the faceplate but is accessible only after you remove the Amplifier Assembly from the bay. There is a separate replacement procedure for each type.



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.



CAUTION:

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

- Prerequisites:**
1. The **ALC ON/OFF** switch is set to **OFF**.
 2. The IF input signal is removed from the up-converter.

Required tools:

- 1- torque wrench, SMA-type
- 1 - torque wrench, N-type (for 6 GHz only)
- 1 - screwdriver, 3 inch

Step	Procedure
1	Review the Safety Labels and verify that the prerequisites are met.
2	Verify that a replacement ALC Network is available.
3	On the POWER SUPPLY CONTROL unit, operate the TRANS / STBY switch to STBY.

Removing the 4400-Series ALC Network

- 4 On the ALC NETWORK:
 - a. Remove the semirigid cable from between the RF OUT jack and the RF IN jack on the Isolator/Transducer.
 - b. Remove the semirigid cable from between the RF IN jack and the RF OUT jack on the TWT Amplifier.
 - c. Loosen the screw and release the holding tab from the lower edge of the ALC Network.

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- 5 As you slide the ALC Network forward,
disconnect the connecting cable by releasing the sliding-lock.
- Comment: If you are replacing the removed 4400-series ALC Network with a 4300-series ALC Network, you will be referred to another procedure to make the installation. Two different semirigid cables are required for the 4300-series ALC Network.*
- 6 Is the replacement ALC Network a 4400-series?
- YES - Go to Step 7.
 - NO - Verify that you have the different semirigid cables.
 - Go to Procedure 2.4, ALC Network, 4300-Series (Installation), in this tab.

Installing the 4400-Series ALC Network

- 7 On the replacement ALC NETWORK:
- a. Operate the **ALC ON/OFF** switch to **OFF**.
 - b. Attach the connecting cable to the bay cable.
 - c. Engage the sliding-lock mechanism on the connectors.
- 8 Install the ALC Network into the Amplifier Assembly.
- 9 On the ALC NETWORK:
- a. Slide the holding tab up (over the lower edge of the ALC Network) and tighten the screw.
 - b. Connect the semirigid cable between the RF IN jack and the RF OUT jack on the TWT Amplifier.
- 10 Is the Amplifier Assembly mounted in the radio bay?
(It is if you replaced a 4400-series ALC Network with another 4400-series.)
- YES - Connect the semirigid cable between the RF OUT jack and the RF IN jack on the Isolator/Transducer.
 - Go to Step 12.
 - NO - Go to Step 11.
- 11 Install the AMPLIFIER ASSEMBLY into the radio bay.
- Reference: Procedure 2.1, Amplifier Assembly Removal and Installation (Installation), in this tab.
- 12 Return to **TEST PROCEDURES** tab, Flowchart 3, Unit Replacement and Alignment.

End of Procedure

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2.6 Isolator/Transducer and/or RF Filter (TWT)

Use this procedure to replace an Isolator/Transducer, the RF Filter, or both. They are located within the Amplifier Assembly.



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.



CAUTION:

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

- Prerequisites:**
1. The **ALC ON/OFF** switch is set to **OFF**.
 2. The IF input signal is removed from the up-converter.

Required tools:

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

Step	Procedure
1	Review the Safety Labels and verify that the prerequisites are met.
2	Verify that a replacement Isolator/Transducer and/or RF Filter with the correct code is available.
3	Remove the AMPLIFIER ASSEMBLY from the radio bay. Reference: Procedure 2.1, Amplifier Assembly Removal and Installation (Removal), in this tab.
4	On the front of the AMPLIFIER ASSEMBLY, remove the semirigid cable from between the RF FL OUT jack and the RF IN jack of the TWT Amplifier.
5	Place the Amplifier Assembly on its side with the TWT Amplifier up.

- 6 On the side of the AMPLIFIER ASSEMBLY:
 - a. Remove only the five outside screws on the lower side plate.
 - b. Remove the side plate with the RF Filter Assembly attached.
- 7 Replace the RF Filter or Isolator/Transducer.
- 8 Reinstall the RF Filter Assembly onto the side plate.
- 9 On the side of the AMPLIFIER ASSEMBLY:
 - a. Attach the side plate.
 - b. Tighten the screws.
- 10 On the front of the AMPLIFIER ASSEMBLY,
 connect the semirigid cable between the RF FL OUT jack and the
 RF IN jack of the TWT Amplifier.
- 11 Install the AMPLIFIER ASSEMBLY into the radio bay.

 Reference: Procedure 2.1, Amplifier Assembly Removal
 and Installation (Installation), in this tab.
- 12 Return to the flowchart or procedure that sent you here.

End of Procedure

3 Solid-State Units

3.1 328A Amplifier (Solid State)

Use this procedure to remove the Amplifier Assembly, replace the 328A Amplifier, and reinstall the Amplifier Assembly.

⚠ 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.

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

Prerequisites: 1. The **ALC ON/OFF** switch is set to **OFF**.
 2. The IF input signal is removed from the up-converter.

Required tools:

- 1 - torque wrench, SMA-type
- 1 - screwdriver, 3 inch
- 1 - screwdriver, 10 inch

Step	Procedure
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Comment: In this procedure, the term "Amplifier Assembly" includes the 328A Amplifier, an RF Filter, and two Isolator/Transducers.

- | | |
|---|---|
| 1 | Review the Safety Labels and verify that the prerequisites are met. |
| 2 | Verify that the correct replacement unit is available. |

Removing the Amplifier Assembly

- | | |
|---|---|
| 3 | On the TRMTR PWR unit,
operate the STBY/ TRMTR ON push button to STBY (out). |
|---|---|

- 4 On the 328A AMPL:
 - a. Slide the power-connector locking mechanism up.
 - b. Remove the connector.
 - c. Remove the semirigid cable between the RF OUT jack and the INPUT jack on the Isolator/Transducer.
- 5 On the AMPLIFIER ASSEMBLY:
 - a. Remove the semirigid cable between the RF FL IN jack and the RF OUT jack on the TRANSMITTER UP CONV & MWV GEN.
 - b. Loosen the four screws (two at the top, two at the bottom) that hold the assembly to the framework.
 - c. Lift the assembly upward and free of the framework.
- 6 Place the Amplifier Assembly on a suitable work surface.
- 7 Which unit are you going to replace?
 - a. To replace the 328A AMPL, go to Step 8.
 - b. To replace the RF Filter or an Isolator/Transducer, go to Procedure 3.2, Isolator/Transducer and/or RF Filter.

Replacing the 328A Amplifier

- 8 On the 328A AMPL:
 - a. Remove the semirigid cable between the RF IN jack and the OUTPUT jack on the RF Filter assembly.
 - b. Remove the screws that attach the RF Filter assembly to the 328A AMPL.
- 9 On the replacement 328A AMPL:
 - a. Attach the RF Filter assembly to the replacement 328A AMPL.
 - b. Reconnect the semirigid cable between the RF IN jack and the OUTPUT jack on the RF Filter assembly.

Installing the Amplifier Assembly

**CAUTION:**

As you install the assembly, make sure no wires or cables are caught or pinched between the assembly mounting plate and the mounting supports.

- 10 Position the Amplifier Assembly in the bay.

-
- 11 On the AMPLIFIER ASSEMBLY:
- a. Tighten the four screws.
 - b. Connect the semirigid cable between the RF FL IN jack and the RF OUT jack on the TRANSMITTER UP CONV & MWV GEN.
- 12 On the TRMTR PWR unit,
- verify that the STBY/TRMTR ON push button is set to STBY (out).
- 13 On the 328A AMPL:
- a. Connect the power cable to the power plug and engage the sliding-lock mechanism.
 - b. Connect the semirigid cable between the RF OUT jack and the INPUT jack on the Isolator/Transducer.
 - c. Operate the **ALC ON/OFF** switch to **OFF**.
- 14 On the TRMTR PWR unit,
- operate the STBY/TRMTR ON push button to TRMTR ON (in).
- 15 Did you replace the 328A Amplifier?
- YES - Return to **TEST PROCEDURES** tab,
Flowchart 3, Unit Replacement and Alignment.
- NO - Return to the flowchart or procedure that sent you here.

End of Procedure

3.2 Isolator/Transducer and/or RF Filter (Solid State)

Use this procedure to replace an Isolator/Transducer, the RF Filter, or both. They are part of the Amplifier Assembly.



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.

- Prerequisites:**
1. The **ALC ON/OFF** switch is set to **OFF**.
 2. The IF input signal is removed from the up-converter.

Required tools:

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

Step	Procedure
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Comment: In this procedure, the term "Amplifier Assembly" includes the 328A Amplifier, an RF Filter, and two Isolator/Transducers. The Filter Assembly consists of the RF Filter and both Isolator/Transducers.

- 1 Review the Safety Labels and verify that the prerequisites are met.
- 2 Verify that a replacement RF Filter (with the correct code) or replacement Isolator/Transducer is available.
- 3 Remove the AMPLIFIER ASSEMBLY from the radio bay.

Reference: Procedure 3.1, 328A Amplifier
(Amplifier Assembly Removal), in this tab.

Removing the Filter Assembly

- 4 With the AMPLIFIER ASSEMBLY on its back:
 - a. Remove the semirigid cable between the RF IN jack on the 328A AMPL and the OUTPUT jack on the front Isolator/Transducer.
 - b. Remove the two screws that hold the RF Filter assembly bracket to the bottom of the 328A Amplifier.
 - c. Remove the two screws that hold the RF Filter assembly to the bracket.
 - d. As you hold the filter assembly, remove the SMA connector from the INPUT jack on the rear Isolator/Transducer.
 - e. Remove the filter assembly.

Comment: The two Isolator/Transducers are different codes and are not interchangeable.

- 5 Replace the defective component or the entire filter assembly.

Installing the Filter Assembly

- 6 With the AMPLIFIER ASSEMBLY on its back:
 - a. Connect the semirigid cable (attached to the bracket) to the INPUT jack on the rear Isolator/Transducer.
 - b. Install the screws that attach the filter assembly to the bracket.
 - c. Install the filter assembly, and bracket, to the bottom of the 328A Amplifier.
- 7 Install the Amplifier Assembly in the radio bay.

Reference: Procedure 3.1, 328A Amplifier
(Amplifier Assembly Installation), in this tab.

- 8 Return to flowchart or procedure that sent you here.

End of Procedure

3.3 Power Unit, 471GA or 474GA (Solid State)

Use this procedure to replace the 471GA or 474GA Power Unit plug-in located in the transmitter shelf.



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.

Prerequisite: The **ALC ON/OFF** switch is set to **OFF**.

Step	Procedure
1	Review the Safety Labels and verify that the prerequisite is met.
2	Verify that a replacement unit with the correct code is available. Power Unit plug-in codes are: <ul style="list-style-type: none"> ■ 471GA (for -24 volt supply) ■ 474GA (for -48 volt supply). <i>Comment: Input power will be removed from the Power Unit when you open the latch lever in the next step.</i>
3	On the POWER UNIT: <ol style="list-style-type: none"> a. Simultaneously: <ul style="list-style-type: none"> — Release the latch catch. — Pull the latch lever forward. <i>Comment: The ALM/OFF indicator will light momentarily.</i> b. Pull the latch lever down until the unit is released from the backplane connector. c. Hold the Power Unit at the top and bottom: <ul style="list-style-type: none"> — Slide it out of the shelf. — Place it in an ESD-protective container.

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- 4 On the replacement Power Unit:
 - a. Release the latch catch.
 - b. Pull the latch lever forward.

**CAUTION:**

Backplane connectors will be damaged if the Power Unit is misaligned in the shelf guides as it is inserted into the shelf.

- 5 Carefully align the Power Unit in the top and bottom shelf guides.
- 6 Slide the Power Unit into the shelf until the bottom of the latch lever clears the front of the shelf.
- 7 To seat the Power Unit plug-in, simultaneously:
 - a. Apply light pressure to the top of the plug-in.
 - b. Push up on the latch lever.
- 8 On the Power Unit plug-in:
 - a. Ensure that the catch has engaged the latch lever.
 - b. Verify the ALM/OFF indicator is extinguished.
- 9 Return to the flowchart or procedure that sent you here.

End of Procedure

4 Common Units

4.1 IF Predistorter

Follow this procedure to replace the IF Predistorter.



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.

Prerequisite: The **ALC ON/OFF** switch is set to **OFF**.

Step	Procedure
1	Review the Safety Labels and verify that the prerequisite is met.
2	Obtain a replacement IF Predistorter with the same unit code.
3	On the IF PREDISTORTER: <ol style="list-style-type: none"> a. Remove the cables from the IF IN and the IF OUT jacks. b. Simultaneously: <ul style="list-style-type: none"> — 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 IF Predistorter at the top and bottom: <ul style="list-style-type: none"> — Slide it out of the shelf. — Place it in an ESD-protective container.
4	On the replacement IF Predistorter: <ol style="list-style-type: none"> a. Set the slide-switch on the left side to the same position (A or B) as the original IF Predistorter. <p style="margin-left: 40px;">Verify the correct position per Table B, IF Predistorter Switch Position.</p> b. Simultaneously: <ul style="list-style-type: none"> — Release the latch catch. — Pull the latch lever forward.

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CAUTION:

Backplane connectors will be damaged if the IF Predistorter is misaligned in the shelf guides.

- c. Carefully align the IF Predistorter in the top and bottom shelf guides.
- d. Slide the IF Predistorter 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 IF Predistorter.
- f. Ensure that the latch catch has hooked the latch lever.
- g. Reconnect the cables to the IF IN and the IF OUT jacks.

Table B. IF Predistorter Switch Position

Switch Position	Frequency Code (Note)									
	6 GHz			11 GHz						
A	J	R	AM	DE	DL	EE	EL	JJ	PE	PL
	K	S	AN	DF	DM	EF	JD	JK	PF	PM
	L	T	AP	DG	EA	EG	JE	JL	PG	
	M	AJ	AR	DH	EB	EH	JF	PB	PH	
	N	AK	AS	DJ	EC	EJ	JG	PC	PJ	
	P	AL		DK	ED	EK	JH	PD	PK	
B	B	G	AD							
	C	H	AE							
	D	AA	AF	DB	DC	DD	JA	JB	JC	
	E	AB	AG							
	F	AC	AH							

Note:

The frequency code is on the latch label of the TRANSMITTER UP CONV & MWG GEN, and it is also stamped on the shelf designation strip below the unit.

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

End of Procedure

4.2 MWV Generator or Up-Converter

It is unlikely that you will replace both the up-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 TRANSMITTER UP CONV & MWV GEN unit from the transmitter 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 ESD may damage plug-in units. Use proper methods to prevent ESD damage.



CAUTION:

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

Prerequisite: The **ALC ON/OFF** switch is set to **OFF**.

Required tools:

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

Step	Procedure
1	Review the Safety Labels and verify that the prerequisite is met.
2	Verify that you have a replacement unit available and, for a microwave oscillator, that it is the correct code.
	<i>Comment: The MWV generator code is the letter(s) that follows the Model (141 for 6 GHz, 142 for 11 GHz) of the Microwave Oscillator.</i>

Removing the TRANSMITTER UP CONV & MWV GEN

- 3 On the TRANSMITTER UP CONV & MWV GEN:
- a. Disconnect the cable from the IF IN jack.
 - b. Remove the semirigid cable from between the RF OUT jack and the RF FL IN jack of the Amplifier Assembly.

- c. Simultaneously:
 - Release the latch catch.
 - Pull the latch lever forward.
- d. Pull the latch lever down until the unit is released from the backplane connector.
- e. Slide the unit out of the shelf.
- f. Place the unit on an ESD-protected (grounded) surface with the Microwave Oscillator facing up.

Removing the Microwave Oscillator

- 4 On the TRANSMITTER UP 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 up-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 on the Microwave Oscillator.
 - g. Remove the Microwave Oscillator module.
- 5 Which item are you going to replace?
 - a. To replace the Up-Converter, go to Step 6.
 - b. To replace the Microwave Oscillator, go to Step 8.
 - 6 Place the replacement TRANSMITTER UP CONV & MWV GEN on the ESD-protected work surface.
 - 7 Is the replacement equipped with a Microwave Oscillator module?

YES - Perform Step 4 to remove it; then go to Step 8.

NO - Go to Step 8.
 - 8 Verify that the Microwave Oscillator you are going to install is the same code as the original.

Installing the Microwave Oscillator

- 9 On the TRANSMITTER UP CONV & MWV GEN:
- Place the Microwave Oscillator module in position.
 - Plug the power connector into plug P1.
 - Finger-start the SMA connector on the RF OUT jack to the semirigid cable.
 - Hold the cable with a 1/4-inch wrench as you torque the SMA connector at the RF OUT jack on the Microwave Oscillator.
 - Torque the SMA connector at the up-converter end of the cable.
 - Turn the unit over and reinstall the two mounting screws.

Installing the TRANSMITTER UP CONV & MWV GEN

- 10 On the TRANSMITTER UP CONV & MWV GEN unit:
- Release the latch catch.
 - Pull the latch lever forward.



CAUTION:

Backplane connectors will be damaged if the TRANSMITTER UP CONV & MWV GEN is misaligned in the shelf guides.

- Align the TRANSMITTER UP CONV & MWV GEN in the top and bottom shelf guides.
 - Slide the unit into the shelf until the bottom of the latch lever clears the front of the shelf.
 - Simultaneously:
 - Push up on the latch lever.
 - Apply light pressure to the top of the TRANSMITTER UP CONV & MWV GEN.
 - Ensure that the latch catch has hooked the latch lever.
 - Verify that the correct label is applied to the latch lever.
 - Install the semirigid cable between the RF OUT jack and the RF FL IN jack on the Amplifier Assembly.
 - Connect the cable to the IF IN jack.
- 11 Return to **TEST PROCEDURES** tab, Flowchart 3, Unit Replacement and Alignment.

End of Procedure

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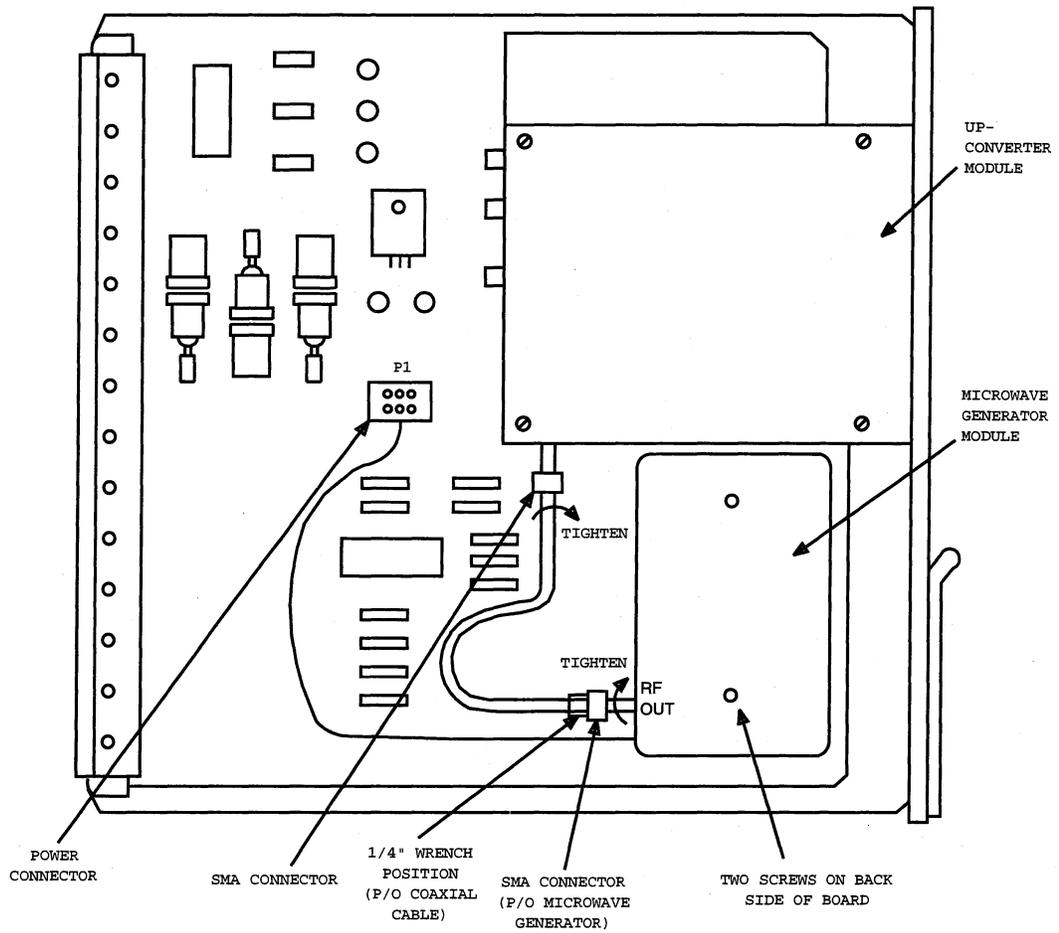


Figure 1. Microwave Oscillator Module Replacement (6 GHz)

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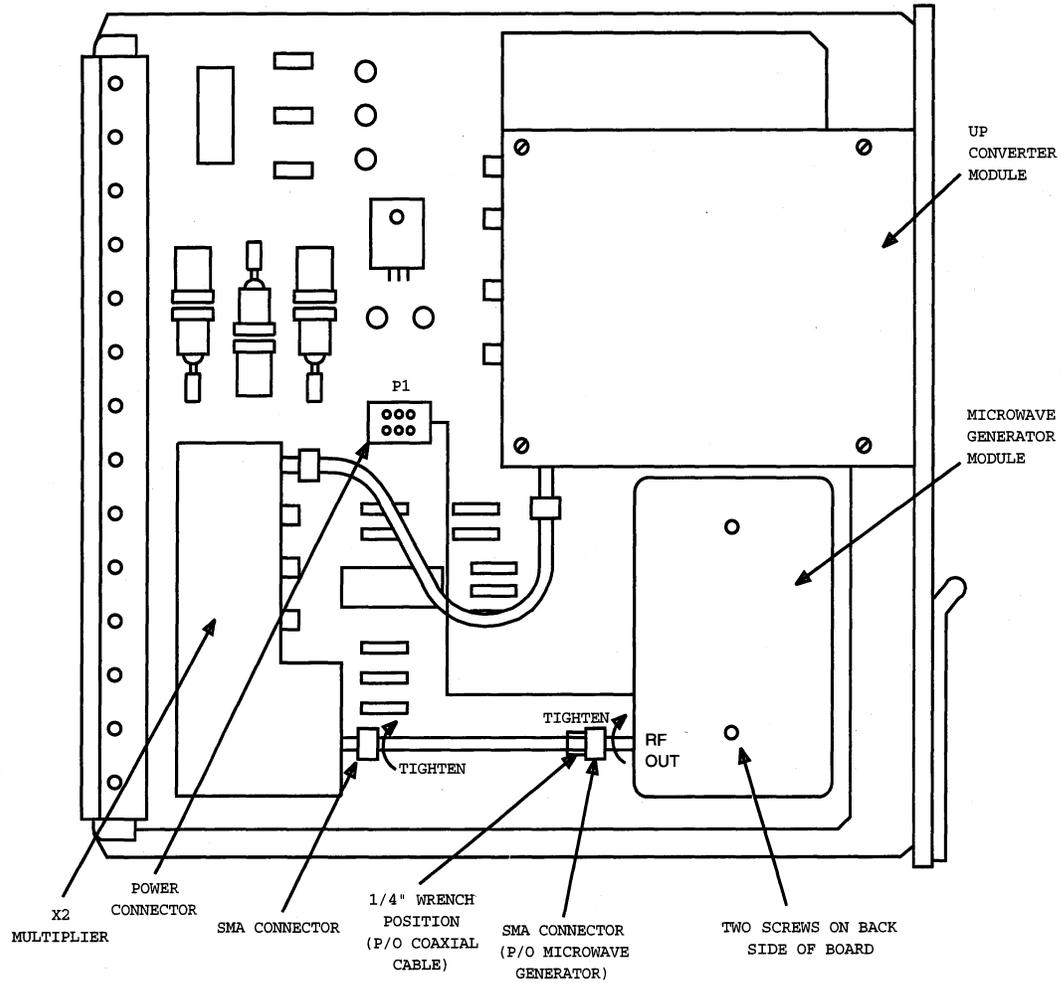


Figure 2. Microwave Oscillator Module Replacement (11 GHz)

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4.3 Transmitter Power Unit, 1474AE or AF

Use this procedure to replace the TRMTR PWR plug-in unit that is located in the transmitter shelf. This TRMTR PWR unit is used in both types of transmitters, TWT and Solid State.



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.

Prerequisite: The **ALC ON/OFF** switch is set to **OFF**.

Step	Procedure
1	Review the Safety Labels and verify that the prerequisite is met.
2	Verify that a replacement unit with the correct code is available. TRMTR PWR units are: <ul style="list-style-type: none"> ■ 1474AF (for -24 volt supply) ■ 1474AE (for -48 volt supply).

Removing the Power Unit

- 3 On the TRMTR PWR unit:
 - a. Operate the STBY / TRMTR 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 TRMTR PWR unit at the top and bottom:
 - Slide it out of the shelf.
 - Place it in an ESD-protective container.

- 4 On the replacement TRMTR PWR unit:
 - a. Verify that the STBY / TRMTR ON switch is set to STBY (out).
 - b. Release the latch catch.
 - c. Pull the latch lever forward.

Installing the Power Unit



CAUTION:

Backplane connectors will be damaged if the TRMTR PWR unit is misaligned in the shelf guides as it is inserted into the shelf.

- 5 Carefully align the TRMTR PWR unit in the top and bottom shelf guides.
- 6 Slide the TRMTR PWR unit into the shelf until the bottom of the latch lever clears the front of the shelf.
- 7 To seat the TRMTR 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 TRMTR PWR plug-in,

operate the STBY / TRMTR ON push button to the TRMTR ON position (in).
- 9 Return to the flowchart or procedure that sent you here.

End of Procedure

4.4 Alarm and Meter Unit

Use this procedure to replace the Alarm and Meter unit.



CAUTION:

This is an Out-of-Service procedure. Service can 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.

Step	Procedure
1	Review the Safety Labels.
2	Verify that a replacement ALARM AND METER unit is available.

Removing the Alarm and Meter Unit

- 3 On the ALARM AND METER unit:
 - a. Set the selector switch to TRMTR OFF.
 - b. Simultaneously:
 - Release the latch catch.
 - Pull the latch lever forward.
 - c. Pull the latch lever down until the unit releases from the backplane connector.
 - d. As you hold the ALARM AND METER unit at the top and bottom:
 - Slide it out of the shelf.
 - Place it in an ESD-protective container.
- 4 On the replacement ALARM AND METER unit:
 - a. Locate the two miniplugs in the upper-left area on the left (component) side of the plug-in.
 - b. Position the two miniplugs in the positions indicated in Figure 3.
 - c. Set the selector switch to TRMTR OFF.
 - d. Release the latch catch.
 - e. Pull the latch lever forward.

Installing the Alarm and Meter Unit

**CAUTION:**

Backplane connectors will be damaged if the ALARM AND METER unit is misaligned in the shelf guides as it is inserted into the shelf.

- 5 Align the ALARM AND METER unit in the top and bottom shelf guides.
- 6 Slide the ALARM AND METER unit into the shelf until the bottom of the latch lever clears the front of the shelf.
- 7 To seat the ALARM AND METER unit, 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 ALARM AND METER unit:
 - a. Turn the selector switch through all positions.
 - b. Check meter readings against the values recorded on the RADIO DATA CARD.
- 9 Return to the flowchart or procedure that sent you here.

End of Procedure

Table C. Alarm and Meter Unit Miniplug Options

Application	Miniplug (P1) Position	Miniplug (P2) Position
Antenna Diversity	J 2 to J 3	J 6 to J 7
Non-Diversity	J 3 to J 4	J 5 to J 6

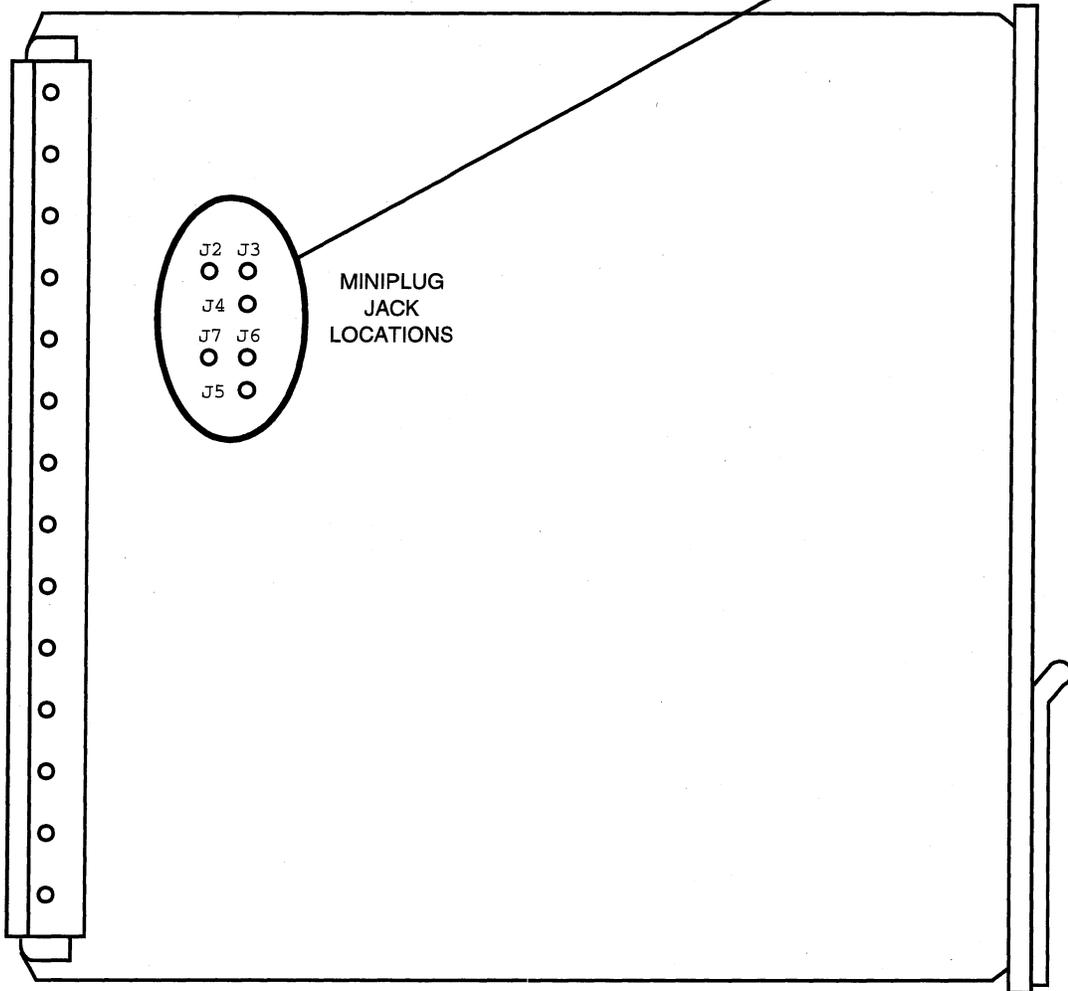
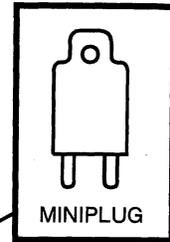


Figure 3. Alarm and Meter Unit Miniplug Options

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