

5.3.25 KLYSTRON TUBE UD3V1/FOCUS COIL UD3L1.

The following procedures describe how to remove the Klystron Tube V1 and Focus Coil L1 and install replacement units. It is not necessary to remove the focus coil to remove the klystron. However, the klystron tube must be removed before replacing the focus coil.

Two technicians are required for this procedure.

5.3.25.1 Equipment and Tools Required.

1. Torque wrench, 3/8" drive, 30-200 in. lbs.
2. Drive extension bar, 3/8" x 6"
3. Drive adapter, 3/8" to 1/4"
4. Hex head driver, 1/4" drive, 3/16"
5. [Allen wrench, 3/16", modified](#)
6. Torque wrench, SMA connector
7. 4 x 4 x 15" wood block (for temporary focus coil pallet) (Qty=2)
8. Chain fall, 1/2 ton, special lift (10 ft.) R400-SE5
9. [Klystron sling R400-SE6](#)
10. Klystron tube container (empty)
11. Locking/sealing compound (as required)
12. Lubricant, silicon grease (as required)
13. [Oil tank dolly R400-SE7](#)
14. Waveguide gasket
15. Screwdriver set, Phillips
16. Screwdriver set, flat-tip
17. Waveguide dust cover
18. Wrench set, open-end

19. Oil, light weight
20. Cloth, lint free
21. Cleaning solvent

5.3.25.2 Initial Conditions/Preliminary Setup.

WARNING

Hazardous voltages are present within the transmitter cabinet. Take all standard precautions against electric shock. Failure to comply may cause serious injury or **DEATH**.

CAUTION

During handling, be extremely careful the high-voltage ceramic seal is not struck or scratched, and no side pressure is exerted on the metal terminals of the klystron. Never lift the klystron tube by the output waveguide. Never allow the tube to rest on the cathode terminal. Failure to follow these precautions will result in damage to the klystron tube.

1. Perform paragraph 3.4.1.2, steps 1 through 4 to power down the transmitter, lock HIGH VOLTAGE POWER CB1 circuit breaker, and remove the interlock key.
2. On [Waveguide Pressurization Unit UD6](#), set the ON/OFF switch to **OFF**. **Redundant sites**, on Waveguide Pressurization Unit UD6 or UD106 corresponding to the channel with klystron/focus coil to be removed, set the ON/OFF switch to **OFF**.
3. Remove transmitter center bay door and right bay outer door.
4. Perform the following steps to inspect the chain fall hoist:
 - a. Inspect load and hand chain for worn, broken, cracked links, twists, or kinks. Also inspect chains for grit, dirt, or any other foreign matter which may be carried into the hoist mechanism.
 - b. Inspect hooks for cracks, twisting, throat extension and corrosion.
 - c. Inspect braking mechanism for slippage.
 - d. Repair and/or replace any parts showing excessive wear or damage.
 - e. Use a non-caustic solvent to clean hand and load chain from grit, dirt, or any other foreign matter.

- f. Use oil and rags to apply a light film of oil on hand chain and all chain fall surfaces to protect them against rust and corrosion.

NOTE

Never lubricate the hoist mechanism, since this can adversely effect the braking operations.

CAUTION

After hoist is repaired, test with a light load for proper function.

5.3.25.3 Removal Procedure. The following paragraphs describe how to remove Klystron Tube V1 and Focus Coil L1. See Figure FO11-21, Sheet 1 and proceed as follows:

5.3.25.3.1 Removing Cables and Waveguide.

1. Use interlock key to unlock and open the right bay inner door.
2. Unscrew the two captive screws on the front bottom of MPA A12. See Figure FO11-28, Sheet 1.
3. Press the two release knobs at the bottom of MPA A12 and slowly slide it out of the cabinet until braided ground wire on the top left of the assembly is exposed. Disconnect the braided ground wire.
4. Disconnect W05P2 from A12J3 on top of MPA A12.
5. Slide the MPA slowly out of cabinet until the stops are engaged.

WARNING

Use the grounding stick provided to ground the terminals to be disconnected before touching them. High voltage could be present even after primary power is shut off due to capacitors in the circuit. Failure to comply could cause serious injury or **DEATH**.

6. Use grounding stick to ground terminals [E7A](#), [E7B](#), [E8A](#), and [E8B](#) on top of the modulator. See Figure FO11-29, Sheet 1.
7. Lower the front support at the bottom of the MPA and lock into position using the quick release. See Figure FO11-28, Sheet 1, detail A.
8. Press the two release knobs at the bottom of MPA A12 and slowly slide it out to gain access to the hardware securing the high voltage cover to the Oil Tank Assembly A7.

9. Remove [screws](#) and associated hardware securing cover over oil tank leads A7E18 through A7E21, and lift [cover](#) away. Screws are accessible from the right bay. See Figure FO11-21, Sheet 1, view A, and Figure FO11-22.
10. Use grounding stick to ground terminals [A7E18](#), [A7E19](#), [A7E20](#), and [A7E21](#) on oil tank.
11. Disconnect leads from terminals A7E18, A7E19, A7E20, and A7E21 on oil tank.

WARNING

After removing the right bay rear cover, use a grounding stick to ensure all high-voltage points are at ground potential before performing any task in the high-voltage area. Even though power is off, a charge can accumulate and hazardous voltages may be present. Failure to comply could cause serious injury or **DEATH**.

12. Remove the right bay rear panel.
13. Use the ground stick to ground all high voltage terminals on the rear of both the right bay backplane and the MPA.

CAUTION

When moving MPA A12, make sure the rear exhaust duct in the cabinet does not pinch cable 3W144 connected to the rear interface plate. In addition, ensure cables 3W900 and 3W901 do not get pinched when sliding MPA A12 into the cabinet.

14. Press the two release knobs at the bottom of the MPA and slowly slide it back preventing HV cables from being pinched behind the MPA.

[Supplemental Video from NWSTC
Oil Tank Interface Removal](#)

15. Close and lock the right bay inner door.
16. Use interlock key to unlock and open left bay inner door.
17. Disconnect connector [A7P1](#) from Oil Tank Interface Assembly A7A1A1J1 and coax cable A7J7 (labeled A7/TP2) from A7A1TP2. See Figure FO11-21, Sheet 2, view B, and Figure FO11-24.
18. Loosen screws securing Oil Tank Interface Assembly A7A1 to [oil tank terminal block](#), and lift assembly enough to expose terminals on oil tank terminal block. Three screws are accessible from the left bay.

CAUTION

To prevent wire damage, do not allow connecting wires to support the weight of Oil Tank Assembly A7A1 after it is removed from the terminal block.

19. Ground all terminals on oil tank terminal block, and disconnect leads from terminals A7E1, A7E4, A7E5, and A7E16. See Figure FO11-21, Sheet 2, view C.
20. On exterior of Oil Tank Interface Assembly A7A1, remove [safety cover on terminal board A1TB3](#).
21. Disconnect terminal leads TB3-1A and TB3-2A from Terminal Board A1TB3.
22. Disconnect [connector L1P1 from focus coil jack L1J1](#).
23. Tie disconnected terminal leads and cables clear of Oil Tank Interface Assembly A7A1 to gain access to work area.
24. Disconnect [exhaust air manifold from focus coil](#) by loosening four captive screws on right side of manifold.
25. Place Oil Tank Interface Assembly A7A1 in place on oil tank assembly terminal block. Do not tighten hardware.
26. Disconnect [exhaust air stove pipe duct from klystron](#) tube cooling shroud by loosening hose clamp closest to klystron (lower of two hose clamps).
27. Disconnect connector [W1P1](#) from ion pump high-voltage jack V1J1 on Klystron Tube V1.

CAUTION

Waveguide pressure will discharge when waveguide is loosened.

28. Remove [rigid coax W104](#) connected between RF INPUT jack on Klystron Tube V1 and Variable RF Drive Attenuator AT1J2.
29. Remove the center bay rear cover.
30. Disconnect [RF output waveguide flange on Klystron Tube V1 from Arc Detector A6](#), and place dust cover on klystron waveguide opening.
31. Disconnect three grounding straps on top of Oil Tank Assembly A7 (one strap on each rear corner and one on right front corner). [Supplemental Video from NWSTC A7 Ground Straps Locations](#)

32. Remove [tuner adjusting tools](#) from Focus Coil L1.

5.3.25.3.2 Transferring Oil Tank to Oil Tank Dolly. See Figure FO11-21, Sheet 3 and proceed as follows:

1. Attach chain fall to eye bolt provided in shelter overhead in front of transmitter cabinet. See Figure FO11-21, Sheet 4. Then attach klystron sling to chain fall hook.
2. Set [oil tank dolly in place at threshold of transmitter cabinet center bay](#). See Figure FO11-21, Sheet 3, view E.
3. Adjust dolly height and horizontal position, as necessary, to engage [dolly alignment tabs in cabinet rails](#).
4. Connect [dolly cabinet hooks to transmitter cabinet](#) and tighten wing nuts.
5. Remove [wheel chock](#) from left front oil tank carriage wheel. See Figure FO11-21, Sheet 3, view D.

CAUTION

The oil hoses and oil pump wires are still connected to the rear of the oil tank. Take care not to damage the oil hoses or wires during the removal of the oil tank assembly from the cabinet.

6. Lift [safety stop](#) and use oil tank handle to pull klystron tube and oil tank assembly out of [cabinet and onto dolly](#). See Figure FO11-21, Sheet 3, views D and F.
7. Insert [dolly wheel stop pin](#). See Figure FO11-21, Sheet 3, view E.

5.3.25.3.3 Klystron Tube UD3V1 Removal Procedure.

1. Remove [hardware securing x-ray shield to focus coil](#) and remove x-ray shield from Focus Coil L1. See Figure FO11-21, Sheet 4, view G.

Supplemental Video from NWSTC
Remove X-ray Shield

CAUTIONS

Never lift Klystron Tube V1 and Focus Coil L1 together. To prevent damage to klystron tuning gears, make sure tuner adjustment tools have been removed from klystron before lifting klystron.

To prevent klystron sling from separating from klystron, make sure three nuts holding sling hooks are tight. (Recommended torque is 25 foot-pounds.)

The hook hardware should be lubricated and checked for free play before use. Take care not to bump or damage the waveguide components or vacuum pump connection.

2. Attach two [lifting sling](#) hooks to two eye bolts on Klystron Tube V1. See Figure FO11-21, Sheet 4, view H.
3. Align chain fall directly over Klystron Tube V1 by adjusting the eye bolt in the shelter ceiling. Turn the eye bolt CCW to loosen and then slide left or right as needed. Re-tighten after the adjustment is complete.

CAUTIONS

Clean top of focus coil assembly before extracting klystron so contaminants do not fall into oil tank.

During tube extraction, proceed slowly making sure sling hooks do not damage klystron shroud and klystron is entirely supported by sling hooks and eye bolts.

4. One person should steady klystron while a second person operates chain fall to carefully extract Klystron Tube V1 from Focus Coil L1.

WARNINGS

Dielectric oil is a skin irritant. Avoid prolonged skin contact. Breathing oil vapors for a prolonged time is hazardous. Make sure the area is adequately ventilated. Oil on floor is slippery and hazardous to maintenance personnel.

On ingestion of dielectric oil, get medical attention. On eye contact, flush with water for at least 15 minutes, and get medical attention. Frequent or prolonged skin contact should be avoided. Inhalation of vapors or oil mist may irritate lungs.

WARNING-CONT

Good industrial hygiene practice requires the use of effective ventilation to remove any dielectric oil vapors and mist. Skin contact is minimized by use of rubber gloves and oil resistant, nonabsorbent clothing. After working with lubricants, wash thoroughly with soap and water before eating or smoking. Change clothing soaked with oil, and reuse only after laundering.

5. Once Klystron Tube V1 is clear of Focus Coil L1, transfer Oil Tank Assembly A7 from dolly to cabinet per paragraph 5.3.25.4.3.

CAUTION

Two people are required to handle the klystron. One person should grasp the lower end of the tube and avoid touching the ceramic portions. The other person should grasp the upper portion of the tube, exercising care not to lift on the RF output waveguide flange. Take care not to bump or damage the waveguide components or vacuum pump connection.

NOTE

Place the removed Klystron in a clean dry area paying particular attention to protect the waveguide and socket areas from damage and contamination. The top half of the shipping container is an excellent location to place the removed Klystron.

6. Using two people, remove klystron from the lifting sling and carry to a safe clean area, away from the immediate work area.
7. Make sure O-ring was extracted with klystron. If O-ring slipped off, recover it from oil tank.
8. Mop up oil that may have dripped from klystron during transfer.
9. If it is not necessary to remove Focus Coil L1, proceed to paragraph 5.3.25.4.2 for klystron installation procedures.
10. If tube will be out of oil tank for extended period, cover the lower section of the removed klystron and the oil tank opening to prevent contaminating the dielectric oil.

5.3.25.3.4 Focus Coil UD3L1 Removal Procedure. After removing Klystron Tube V1, see Figure FO11-22 and proceed as follows:

Supplemental Video from NWSTC
Remove Focus Coil

CAUTION

The oil hoses and oil pump wires are still connected to the rear of the oil tank. Take care not to damage the oil hoses or wires during the removal of the oil tank assembly from the cabinet.

1. Lift safety stop and use oil tank handle to pull klystron tube and oil tank assembly out of cabinet and onto dolly. See Figure FO11-21, Sheet 3, views D and F.
2. Remove [filter and filter bracket](#) from air intake side of focus coil, (see Figure FO11-22).
([Filter bracket removed picture from NWSTC](#))
3. Remove [manifold clip assembly](#), clip gasket, and two spacers from exhaust side of focus coil.
([Manifold Clip Assembly removed picture from NWSTC](#))
4. Remove [mounting flange hardware](#) from focus coil base.
5. Attach lifting sling to chain fall hoist lifting hook and three eye bolts on focus coil.

WARNING

To avoid personal injury and equipment damage, use a lifting mechanism rated for at least 500 pounds. Make sure shelter eye bolt will withstand the anticipated load.

CAUTION

Support the removed focus coil with wooden blocks, when it is placed on a dolly to protect the tube that extends below the coil mounting base.

6. Lift Focus Coil L1 clear of oil tank and transfer oil tank from oil tank dolly to cabinet per paragraph 5.3.25.4.3.
7. Lower focus coil onto wood blocks to protect tube extension. Push focus coil away from transmitter cabinet.

CAUTION

Keep dust and other foreign matter out of oil tank opening to prevent dielectric oil pollution.

8. Cover the oil tank opening to prevent contaminating the dielectric oil.

5.3.25.4 Installation Procedures. The following paragraphs describe how to install Focus Coil L1 and Klystron Tube V1. If only Klystron Tube V1 has been removed, proceed to paragraph 5.3.25.4.2.

5.3.25.4.1 Focus Coil UD3L1 Installation Procedure. See Figure FO11-22 and proceed as follows:

[Supplemental Video from NWSTC
Replace the Focus Coil](#)

WARNING

To avoid personal injury and equipment damage, use a lifting mechanism rated for at least 500 pounds. Make sure shelter eye bolt will withstand the anticipated load.

1. Slide the replacement focus coil (in container) into position in front of the transmitter.
2. Remove top from container. Remove hardware securing focus coil in container.
3. Attach lifting sling to replacement Focus Coil L1.
4. Lift the focus coil out of the container high enough to allow the oil tank to be rolled out onto the dolly. Move containers from the immediate area.

CAUTION

Take care not to damage the stud bolts on top of oil tank.

5. Transfer oil tank to oil tank dolly per paragraph 5.3.25.3.2.

NOTE

Orient the focus coil so the waveguide connections are to the rear at the 11 o'clock position and the Klystron tuning holes are pointed towards the front at the 5 o'clock position.

6. Lower the focus coil onto the stud bolts of Oil Tank Assembly A7. Ensure proper orientation of the focus coil, attach hardware, and remove sling.
7. Tighten focus coil hold-down bolts sufficiently to compress lockwashers.
8. Transfer oil tank from oil tank dolly to cabinet per paragraph 5.3.25.4.3.
9. Remove the oil tank dolly per paragraph 5.3.25.3.2.
10. Slide the old focus coil in front of the transmitter and attach the sling.
11. Lift the old focus coil and slide the container underneath it. Lower it into the container.

12. Secure the focus coil in the container. Remove the old focus coil from the immediate area.
13. Replace the oil tank dolly per paragraph 5.3.25.4.3.
14. Transfer the oil tank from the cabinet to the dolly.
15. Attach air intake bracket using locking/sealing compound on studs, flatwashers, and nuts.
16. Torque air intake bracket nuts to 40-inch-pounds maximum.
17. Install a clean air filter in the bracket.
18. Attach manifold clip assembly, clip gasket, and two spacers using locking/sealing compound on studs, flatwashers, and nuts. Torque nuts to 40-inch-pounds maximum.

5.3.25.4.2 Klystron Tube UD3V1 Installation Procedure.

CAUTION

Avoid touching the ceramic portion of the tube. All ceramic portions of the tube should be examined to make sure they are clean and dry. Ensure there are no foreign particles of any kind between the flange and ceramic window. Ensure there is no foreign debris or defects in the klystron socket.

NOTE

Examine klystron tube, and if necessary, install O-ring while the klystron tube is still in the transport cart.

1. [Lubricate O-ring on replacement Klystron Tube V1](#) with small amount of silicon grease.
2. Push the oil tank and focus coil back into the transmitter cabinet until the safety lock clicks into place.
3. Attach lifting sling between chain fall and eye bolts on Klystron Tube V1 as shown. See Figure FO11-21, Sheet 4, view H.

[Supplemental Video from NWSTC
Install the Klystron](#)

CAUTIONS

Two people are required to remove the klystron from the shipping container. One person should grasp the lower end of the tube. The other person should grasp the upper portion of the tube, exercising care not to lift on the RF output waveguide flange.

During klystron insertion, proceed slowly, making sure the sling hooks do not damage the klystron shroud, and the klystron is entirely supported by sling hooks and eye bolts. Take care not to bump or damage the waveguide components or vacuum pump connection.

4. Raise Klystron Tube V1 above Focus Coil L1 and transfer Oil Tank Assembly A7 to oil tank dolly per paragraph 5.3.25.3.2. Line up tuning ports on Klystron Tube V1 with holes in Focus Coil L1.
5. Lower klystron, slowly guiding it carefully in place in focus coil.
6. When klystron is seated in focus coil, remove lifting sling.

WARNING

The klystron produces dangerous X-radiation during operation. Never modify or alter klystron or other transmitter components that might decrease radiation shielding. Never operate transmitter unless all shielding is in place. X-ray exposure can occur without personnel being aware, and serious personal injury or **DEATH** may occur as a consequence at some later date.

7. Install x-ray shield on Focus Coil L1. See Figure FO11-21, Sheet 4, view G.

[Supplemental Video from NWSTC](#)

5.3.25.4.3 Transferring Oil Tank from Dolly to Transmitter Cabinet. [Install X-ray Shield on Klystron](#)

CAUTION

Ensure all hoses, cables, and wires are free and will not be damaged during placement of the oil tank assembly into the cabinet.

1. Remove wheel stop pin on dolly and push Klystron Tube V1, Focus Coil L1, and Oil Tank Assembly A7 into transmitter cabinet until oil tank is seated against rear wheel stop. See Figure FO11-21, Sheet 3, view E.

[Supplemental Video from NWSTC](#)

2. Install [wheel chocks](#) on left front oil tank carriage wheel. [Install the Oil Tank](#)

- Loosen wing nuts on dolly cabinet hooks, unhook dolly from cabinet, and roll dolly away from transmitter cabinet. See Figure FO11-21, Sheet 3, view E.

5.3.25.4.4 Cable and Waveguide Reconnection.

CAUTION

Careful alignment between the output flanges of the klystron and connecting waveguide components is essential to prevent arcs. Errors in alignment can result in window failure and damage to Klystron Tube V1.

- Remove klystron waveguide dust cover.
- Connect Arc Detector A6 to klystron tube waveguide flange using a new RF gasket. Leave flange screws loose at this time so waveguide can be purged. See Figure FO11-21, Sheet 2, view B.
- Set [Waveguide Pressurization Unit UD6](#) ON/OFF switch to **ON**. **Redundant sites**, set the ON/OFF switch on Waveguide Pressurization Unit UD6 or UD106 corresponding to the channel with the replaced klystron to **ON**. Wait 10 minutes after Waveguide Pressurization Unit UD6 is turned on to allow waveguide to purge properly.

NOTE

Waveguide flange hardware should be torqued to 50 inch-pounds maximum.

- Torque waveguide flange screws to 50 inch-pounds in sequence shown in Figure 5-1. Check for pressure integrity and correct any leaks before proceeding with installation.
- Connect three grounding straps to top of oil tank. One strap is connected on right front; the remaining two are connected to rear corners.

[Supplemental Video from NWSTC
A7 Ground Straps Locations](#)

CAUTIONS

To avoid arcing and corona damage, make sure no other wires are within 1 inch of high-voltage connection A7E1 when wires are installed and the interface box is replaced.

To prevent wire damage, do not allow connecting wires to support the weight of Oil Tank Assembly A7A1 after it is removed from the terminal block.

- Lift Oil Tank Interface Assembly A7A1 high enough to gain access to terminals on oil tank terminal block. Connect leads to terminals [A7E1](#), [A7E4](#), [A7E5](#), and [A7E16](#). See Figure FO11-21, Sheet 2, view C.

7. On exterior of Oil Tank Interface Assembly A7A1, connect leads to terminal board terminals [TB3-1A](#) and [TB3-2A](#). Install [terminal board cover](#). See Figure FO11-21, Sheet 2, view B.
8. Replace [exhaust air manifold](#) to focus coil exhaust air manifold bracket and tighten four captive screws.
9. Connect [L1P1 to L1J1](#) on Focus Coil L1. Route this lead through interface assembly box when setting box in place over oil tank terminal block.

NOTE

To avoid a cabinet door interlock alarm when the transmitter is powered up, make sure the Oil Tank Interface Assembly A7A1 is firmly seated.

10. Set Oil Tank Interface Assembly A7A1 in place over oil tank terminal block, and secure it with [eight screws and associated hardware](#). See Figure FO11-21, Sheet 2, view B.
11. Connect connector [A7P1 to Oil Tank Interface Assembly Jack A7A1A1J1](#). See Figure FO11-24.
12. Reconnect coaxial cable A7J7 (labeled A7/TP2) to [Oil Tank Interface A7A1TP2](#).
13. Connect exhaust [air stove pipe duct to klystron tube cooling shroud](#) and tighten stovepipe duct clamp.
14. Connect [Ion Pump High-Voltage W1P1 to the klystron tube J1](#).
15. Install [rigid coaxial W104](#) between RF INPUT jack on klystron tube and Variable RF Drive Attenuator AT1J2.
16. Connect high-voltage leads to [terminals A7E18, A7E19, A7E20, and A7E21](#) to the top right corner of Oil Tank Assembly A7. See Figure FO11-21, Sheet 1, view A.
17. Close and lock the left bay inner door.
18. User the interlock key to open the right bay inner door.
19. Press the two release knobs at the bottom of the MPA and slowly slide it out of the cabinet until the stops are engaged.
20. Lower the front support at the bottom of the MPA and lock it into position using the quick release. See Figure FO11-28, Sheet 1, detail A.
21. Press the two release knobs at the bottom of the MPA and slowly slide it out to gain access to reinstall the hardware securing the high voltage cover to Oil Tank Assembly A7.

22. Install the cover over the high-voltage terminals.

CAUTION

When moving Modulator Pulse Assembly A12, make sure the rear exhaust duct in the cabinet does not pinch cable 3W144 connected to the rear interface plate. In addition, ensure cables 3W900 and 3W901 do not get pinched when sliding the MPA into the cabinet.

23. Reinstall MPA A12 per paragraph 5.4.3.17.
24. Replace the klystron tuning tool.
25. Check oil level at [oil tank sight glass](#), and refer to paragraph 5.4.2.4.2 to replace oil, if necessary.
26. Close and lock right bay inner door.
27. Replace and close right bay outer door.
28. Return interlock key to HIGH VOLTAGE POWER CB1 lock and rotate the key CCW.
29. Replace and close center bay door.

5.3.25.5 Related Alignment Procedures. After replacing the klystron or focus coil:

1. If the klystron was replaced, perform paragraph 4.5.5.1 to calibrate the filament current and voltage. [Supplemental Job Aids are available for this procedure at http://www.nwstc.noaa.gov/NEXRAD/](http://www.nwstc.noaa.gov/NEXRAD/)
2. Refer to PMI Work Cards NWS EHB 6-503-2 and perform oil dielectric strength test.
3. Check for radiation leakage per paragraph 4.5.8, paying particular attention to the side of the flange connecting the klystron to the arc detector. Any measurements above 0.5 mW/cm^2 indicates a loose joint or defective component.
4. Perform klystron transmitter tune per paragraph 5.5.10.

5.3.26 HEAT EXCHANGER UD3HP1.

The following procedures describe how to remove and install Heat Exchanger HP1. See Figure FO11-13, Sheet 2 and locate the heat exchanger.

Two technicians are required for this procedure.