

**MICROWAVE ANTENNAS**  
**KS-15676 HORN-REFLECTOR AND WAVEGUIDE SYSTEM**  
**INSTALLATION**  
**SYSTEMS COMBINING NETWORK**

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<b>E. 1407A Networks</b> . . . . .	7	<b>1.01</b> This section provides information required to install systems combining networks used in 4-, 6-, and 11-GHz radio systems utilizing the KS-15676 horn-reflector antenna.	
<b>F. 35A Transducer and 4A Clamp</b> . . . . .	8	<b>1.02</b> This section is reissued to update information in 2.06 and 2.09. The installation information in 2.19, 2.25, 2.30, and 2.38 has been changed to reference network installation to the antenna face instead of the previously installed networks. The appropriate figures have been changed to include the antenna face. This revision should help to ensure that the networks are installed with the correct polarization. Also, the transducer assembly for 11-GHz only radio systems has been added to the PARTIAL INSTALLATION information.	
<b>G. 1428A Network and P-30C079 Waveguide Assembly</b> . . . . .	8	<b>1.03</b> Systems combining networks are provided so that dual polarization of 4-, 6-, and 11-GHz radio relay systems or combinations of the three systems may be installed utilizing the same horn-reflector antenna.	
<b>H. 34A Transducer</b> . . . . .	12	<b>1.04</b> For the purposes of this practice, a systems combining network array includes all of the equipment between the lowermost flange of the rigid circular waveguide run on the tower and the	
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## SECTION 402-421-204

rectangular waveguide ports on the networks. Installation of the rectangular waveguide, both rigid and flexible, is covered in Section 402-421-205.

### 2. INSTALLATION

#### A. General

**2.01** The installation procedures assume the use of cross polarization at each frequency range. If single polarization is desired, it should be done by substituting the appropriate passive network for one combining network as described in the installation procedures. Figure 1 shows the full network array configuration.

**2.02** Prior to beginning installation, review all pertinent drawings and specifications covering the installation to be made. The following prerequisites must be met before installing the systems combining networks.

- (a) The WC281 rigid waveguide run must have been installed in accordance with Section 402-421-203.
- (b) The mounting facilities (slot angles) must be installed on the towers prior to the installation of the network restrainers.
- (c) The antenna must be orientated as closely as possible to its final position.

**2.03** The procedure for installation of multiple restrainers is included in this section because they must be installed at the time the combining networks are installed.

**2.04** The networks are shipped with protective covers attached to the ports. The protective covers should be left in place until the unit is to be installed and then, only the cover on the flanges to be joined should be removed. Care must be

taken to prevent dirt, debris, or foreign matter from entering the units. The networks, transducers, and other components are precise devices and care should be taken at all times to prevent mechanical deformation.

**2.05** Procedures for joining mating flanges are essentially the same for the combining networks and passive networks. The bolts and washers used to secure protective covers on the square ends of the networks should not be discarded as they are used in installation.

**2.06** The gaskets supplied with all units are made from ethylene propylene rubber (EPR). Dow Corning DC-4 compound is not required for ozone protection and should not be used with EPR gaskets. The gaskets are individually packaged and marked "EPR Rubber DO NOT USE DC-4 Compound". When needed, as an aid to installation, apply a small dab of KS-20421, L1 adhesive to each corner of the gasket as shown in Fig. 2 and place the gasket in place in the flange. Make a *small* opening and apply the adhesive directly from the tube.

**Note:** The only ~~two~~ exceptions to the use of DC-4 are at the junctor of the WC281 and the 29B transducer ~~and~~ the junction of the 34A transducer and the 1424A network. ~~Here~~ a thin coating may be used to help reduce the friction when the 29B transducer is oriented.

**2.07** The lowest network to be equipped should always have either a water trap or network drain attached to the bottom port. When a systems combining network array ends in a 1407A, 1406A, or 1428A network, connect an ED-82230 network water trap or a network drain to the bottom port. If the array ends in a 1424A network, connect either an ED-82230 network water trap or a 524A termination.

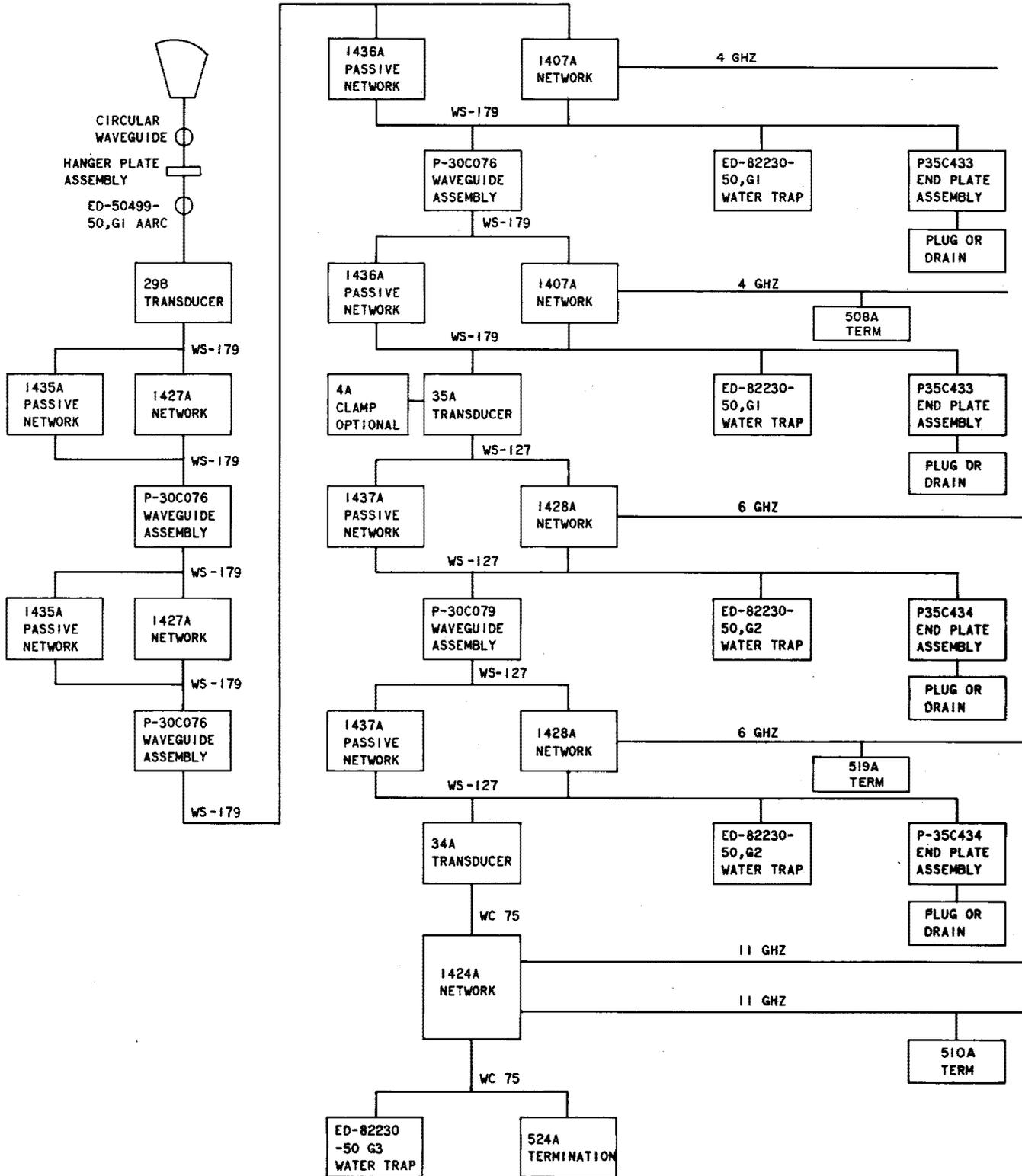


Fig. 1—Full Array—System Combining Network

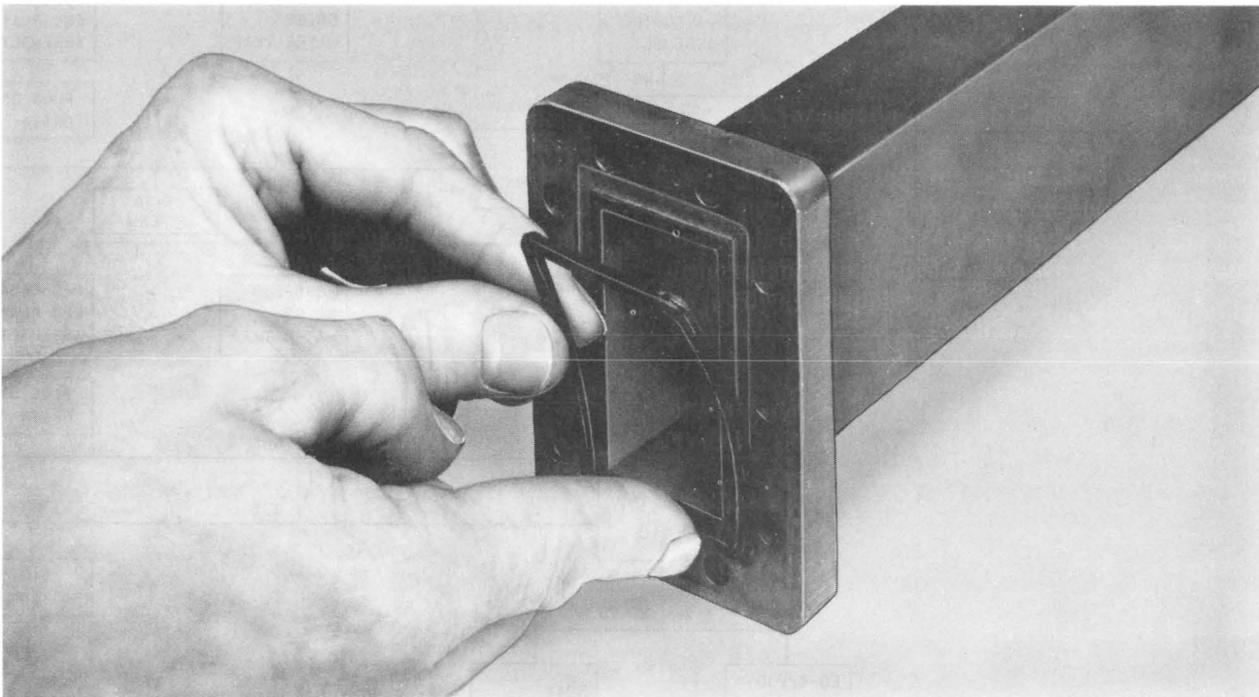
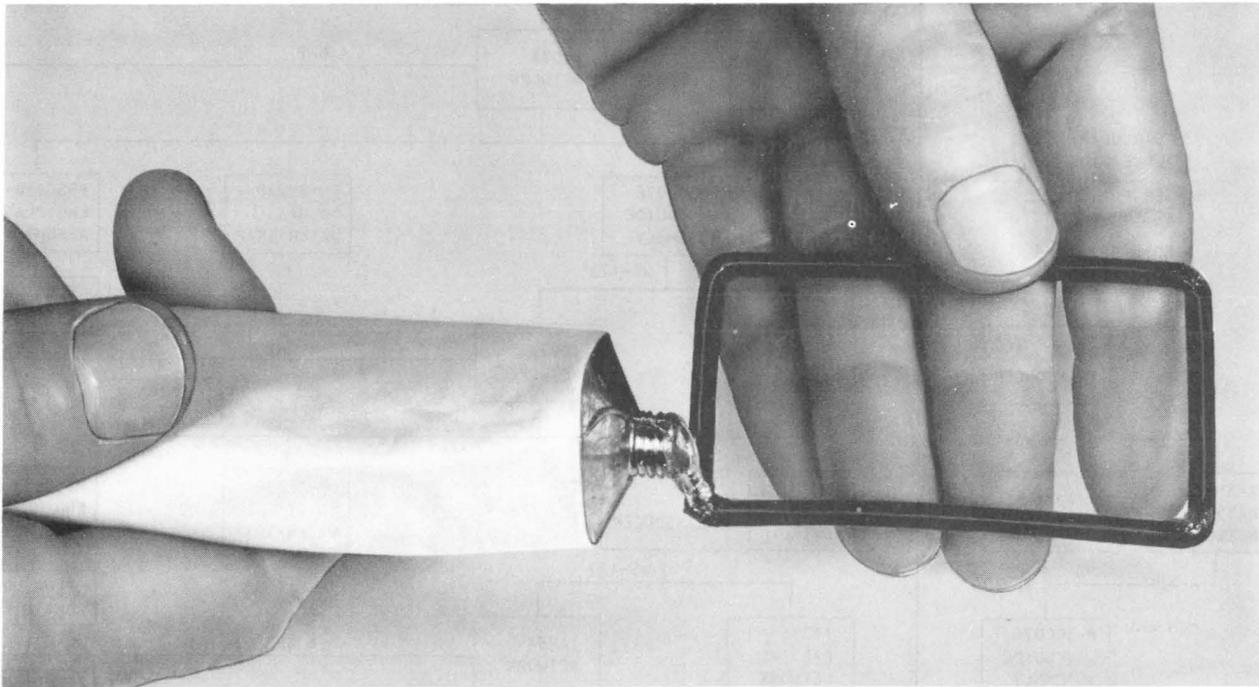


Fig. 2—Application of KS-20421,L1 Adhesive

**2.08** The following tools and equipment are required for installation.

QUANTITY	ITEM
3	7/16-inch Sockets with 3/8-inch square drive
3	7/16-inch Open-End Wrenches
1	3/4-inch Socket with 3/8-inch square drive
1	13/16-inch Open-End Wrench
3	Extension Bars, 6 inches long, 3/8-inch square drive to 3/8-inch square drive
3	Ratchet Wrenches with 3/8-inch square drive
3	1/2-inch Sockets with 3/8-inch square drive
3	Long 1/2-inch Sockets with 3/8-inch square drive
3	1/2-inch Open-End Wrenches
1	5/8-inch Open-End Wrench
1	Platform
1	Construction Trunk with winch
2	Extension Bars, extra short—3 inches long, 3/8-inch square drive to 3/8-inch square drive
1	12-point, 9/16-inch Socket with 3/8-inch square drive

#### B. Network Orientation

**2.09** The uppermost network to be installed shall be orientated for horizontal polarization. All networks except the 1427A, 1424A, and 1434A networks should be positioned so that the side arm (rectangular waveguide port) is parallel with the face of the antenna (Fig. 3). This orientation will position these three networks for horizontal polarization. To position the upper 1427A network

for horizontal polarization, install the network with the back plate parallel to the antenna face. To position the 1424A or 1434A network for horizontal polarization, the upper side arm (rectangular waveguide port) is perpendicular to the antenna face.

**2.10** Depending upon the routing of the rectangular waveguide, the second network to be installed (vertical polarization) may be rotated 90 degrees to the right or left (whichever provides the optimum path for the rectangular waveguide) from the first network. This arrangement of alternating the polarization of the networks must be maintained throughout the entire network array.

#### C. 29B Transducer and P-37B824 Circular Waveguide Restrainer

**2.11** Attach the 29B transducer to the bottom flange of the circular waveguide as shown in Fig. 4, using the bolts, lockwashers, and gasket provided. Pass the shoulder bolts, first through the flange of the circular waveguide and then into the rotatable flange of the 29B transducer. The shoulder compensates for the somewhat larger holes in the rigid circular waveguide flange and provides alignment in the event that an AT-8390 "B" waveguide alignment wrench is not available. Apply a small amount of KS-14616 antiseize compound to the bolts as shown in Fig. 5.

**Caution:** Do not allow any antiseize compound to enter network openings as it may affect transmission and require factory repair. Tighten the bolts finger-tight so that the transducer is free to rotate independent of the circular waveguide.

**2.12** Attach the P-37B824 circular restrainer to the tower mounting angles below the 29B transducer as shown in Fig. 6, using the washers, nuts, and palnuts supplied with the restrainer. Slide the restrainer up around the transducer and position the midpoint of the restrainer to the junction of the circular waveguide and the transducer. Tighten the nuts and palnuts of the restrainer.

#### D. 1427A Networks and P-30C076 Waveguide Assemblies

**2.13** Position the upper 1427A network with the bolted back plate parallel to the face of the antenna (horizontal polarization) as shown in Fig. 7.

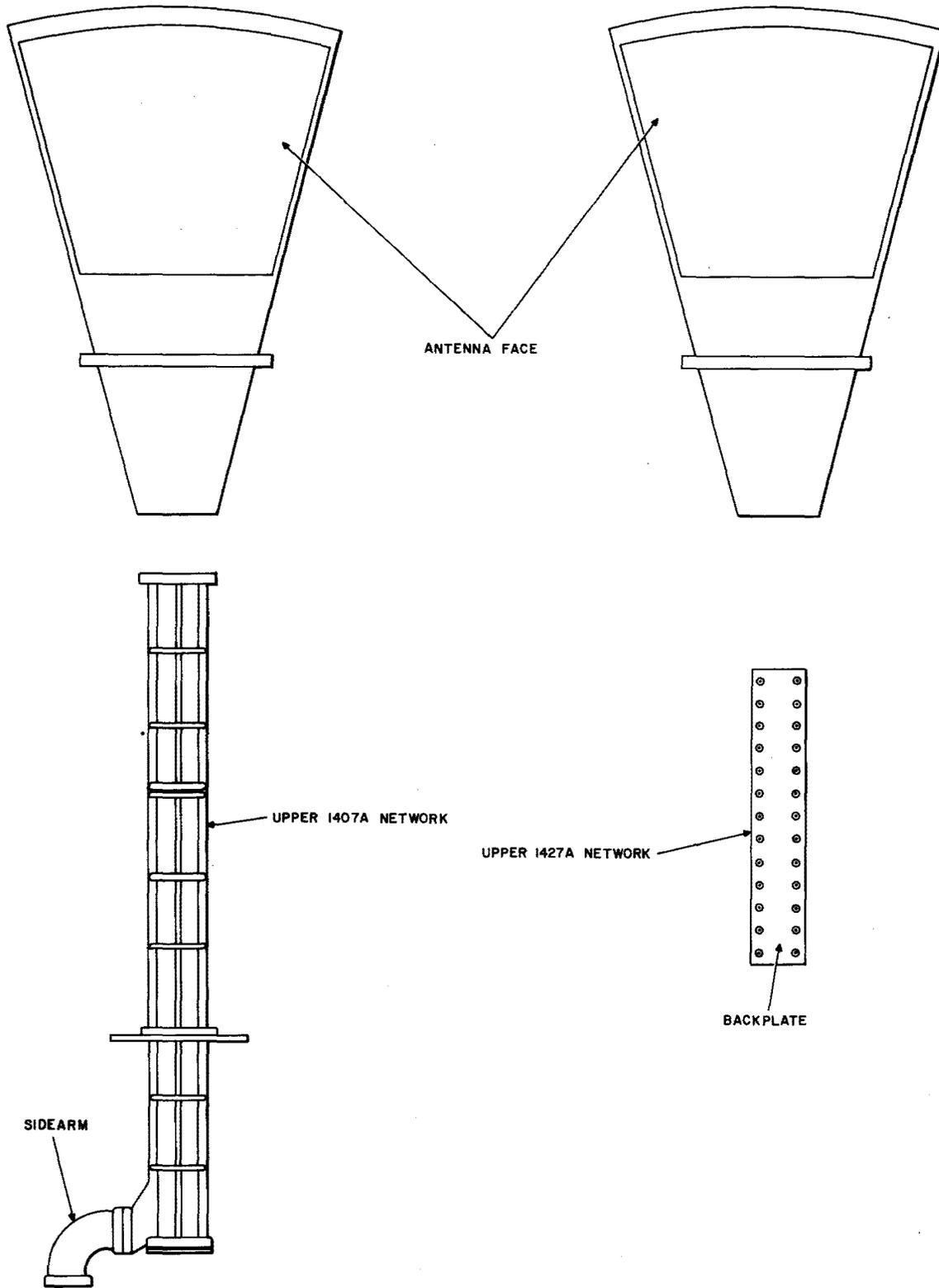


Fig. 3—Network Orientation for Horizontal Polarization

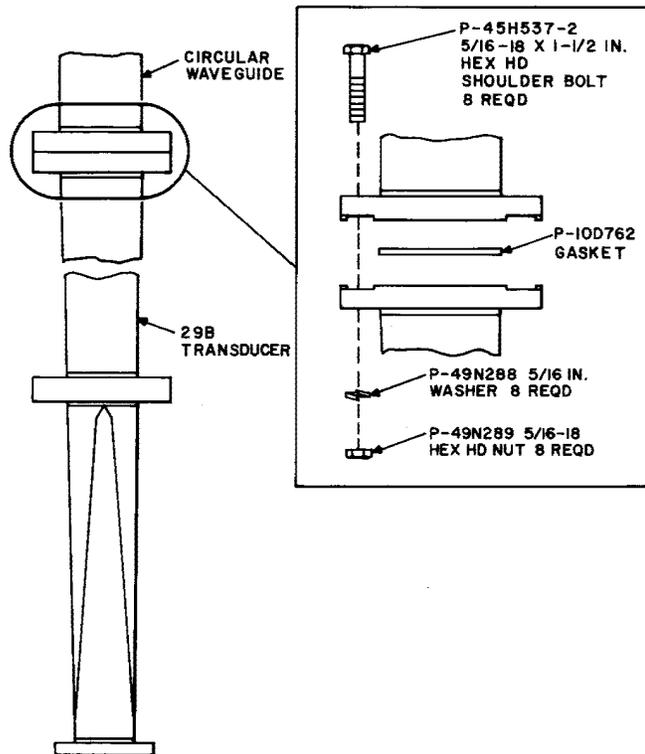


Fig. 4—Installation of 29B Transducer

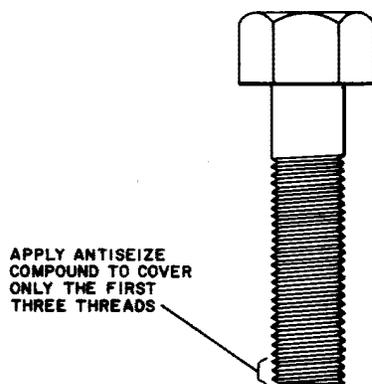


Fig. 5—Application of KS-14614 Antiseize Compound

This may be done by visually aligning the back plate of the network with the antenna face.

**2.14** Attach the 1427A network to the 29B transducer using the bolts, lockwashers, and gasket supplied with the network. Apply a small amount of antiseize compound to the bolts as shown in Fig. 5.

**2.15** After the 1427A network is positioned and attached, the bolts in the top flange of the 29B transducer should be tightened.

**2.16** Attach the P-30C076 waveguide assembly to the bottom flange of the 1427A network as shown in Fig. 7 using the gasket, bolts, and lockwashers supplied with the network and waveguide assembly. Use an antiseize compound on the bolts as shown in Fig. 5.

**2.17** Position the lower 1427A network with the back plate rotated 90 degrees from the back plate of the upper 1427A network and perpendicular to the antenna face. Attach the network to the P-30C076 waveguide assembly as shown in Fig. 7 using the bolts, lockwashers, and gasket supplied with the network and waveguide assembly. Use an antiseize compound on the bolts as shown in Fig. 5.

**2.18** Install the P-30C076 waveguide assembly to the bottom flange of the lower 1427A network as described in 2.16.

#### E. 1407A Networks

**2.19** Position the upper 1407A network for horizontal polarization. Position the side tap of the 1407A network so that the side tap is parallel with the antenna face. Refer to Fig. 8 for installation information. Attach the network to the P-30C076 waveguide assembly as shown in Fig. 8, using the bolts, lockwashers, and gasket supplied with the network and waveguide assembly. Use an antiseize compound on the bolts as shown in Fig. 5.

**2.20** Attach the P-30C076 waveguide assembly to the bottom flange of the 1407A network as shown in Fig. 8, using the bolts, lockwashers, and gasket supplied with the network and waveguide assembly. Use an antiseize compound on the bolts as shown in Fig. 5.

**2.21** Position the lower 1407A network with the side tap rotated 90 degrees from the side tap of the upper 1407A network (vertical polarization). Both side taps should be within the 180 degree sector as shown in Fig. 8, view A-A.

**2.22** Attach the network to the P-30C076 waveguide assembly as shown in Fig. 8, using the bolts, lockwashers, and gasket supplied with the network

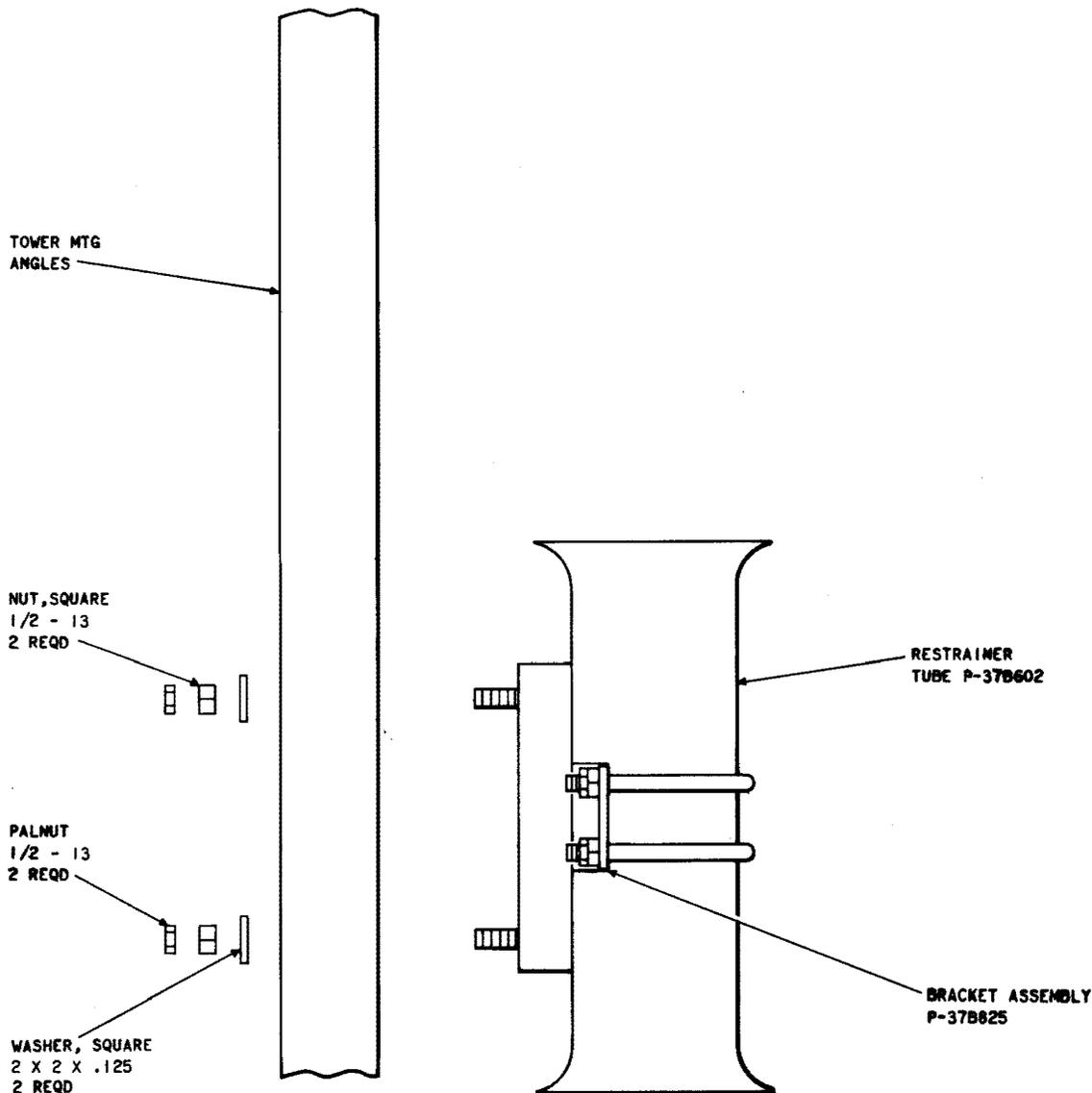


Fig. 6—Installation of Circular Restrainer Assembly, P-37B824

and waveguide assembly. Use an antiseize compound on the bolts as shown in Fig. 5. Install the multiple restrainer approximately 34 inches below the side tap of the upper 1407A network. The installation procedure for the multiple restrainer is given in 2.35.

**F. 35A Transducer and 4A Clamp**

**2.23** Attach the 35A transducer to the 1407A network as shown in Fig. 9 using the bolts, lockwashers, and gasket supplied with the transducer.

**2.24** When a 4A clamp is required, install it on the 35A transducer as shown in Fig. 9 using the cap screws supplied with the clamp. The 4A clamp may be installed either on the corners or the sides of the 35A transducer.

**G. 1428A Network and P-30C079 Waveguide Assembly**

**2.25** Position the upper 1428A or 1406A network for horizontal polarization. Position the side tap of the 1428A or 1406A network so that the side tap is parallel with the antenna face. Refer

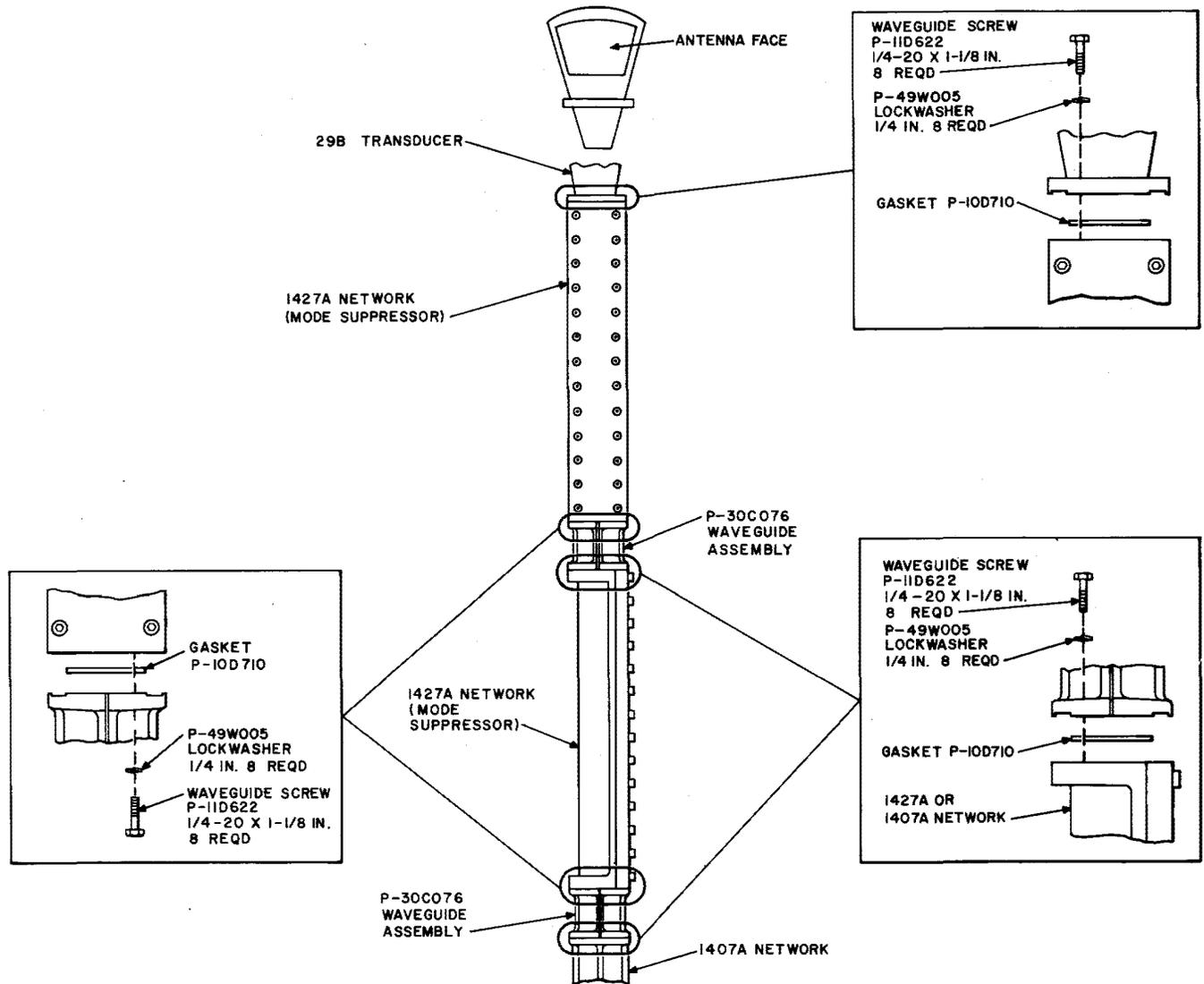


Fig. 7—Installation of Two 1427A Networks

to Fig. 9 for installation information. Attach the network to the 35A transducer using the gasket, bolts, and lockwashers supplied with the transducer and network. Install the multiple restrainers approximately 34 inches below the side port of the lower 1407A network. Installation procedures are given in 2.35.

**2.26** Attach the P-30C079 waveguide assembly to the bottom flange of the 1428A or 1406A network as shown in Fig. 9 using the gasket, bolts, and lockwashers supplied with the network and waveguide assembly. Use an antiseize compound on the bolts as shown in Fig. 5.

**2.27** Position the lower 1428A or 1406A network with the side tap rotated 90 degrees from the side tap of the upper 1428A or 1406A network. Both side taps should be within a 180 degree sector (Fig. 9).

**2.28** Attach the network to the P-30C079 waveguide assembly as shown in Fig. 9 using the gasket, bolts, and lockwashers supplied with the network and the waveguide assembly. Use an antiseize compound on the bolts as shown in Fig. 5. Install the multiple restrainer, located in accordance with job conditions as required. (See 2.35.)

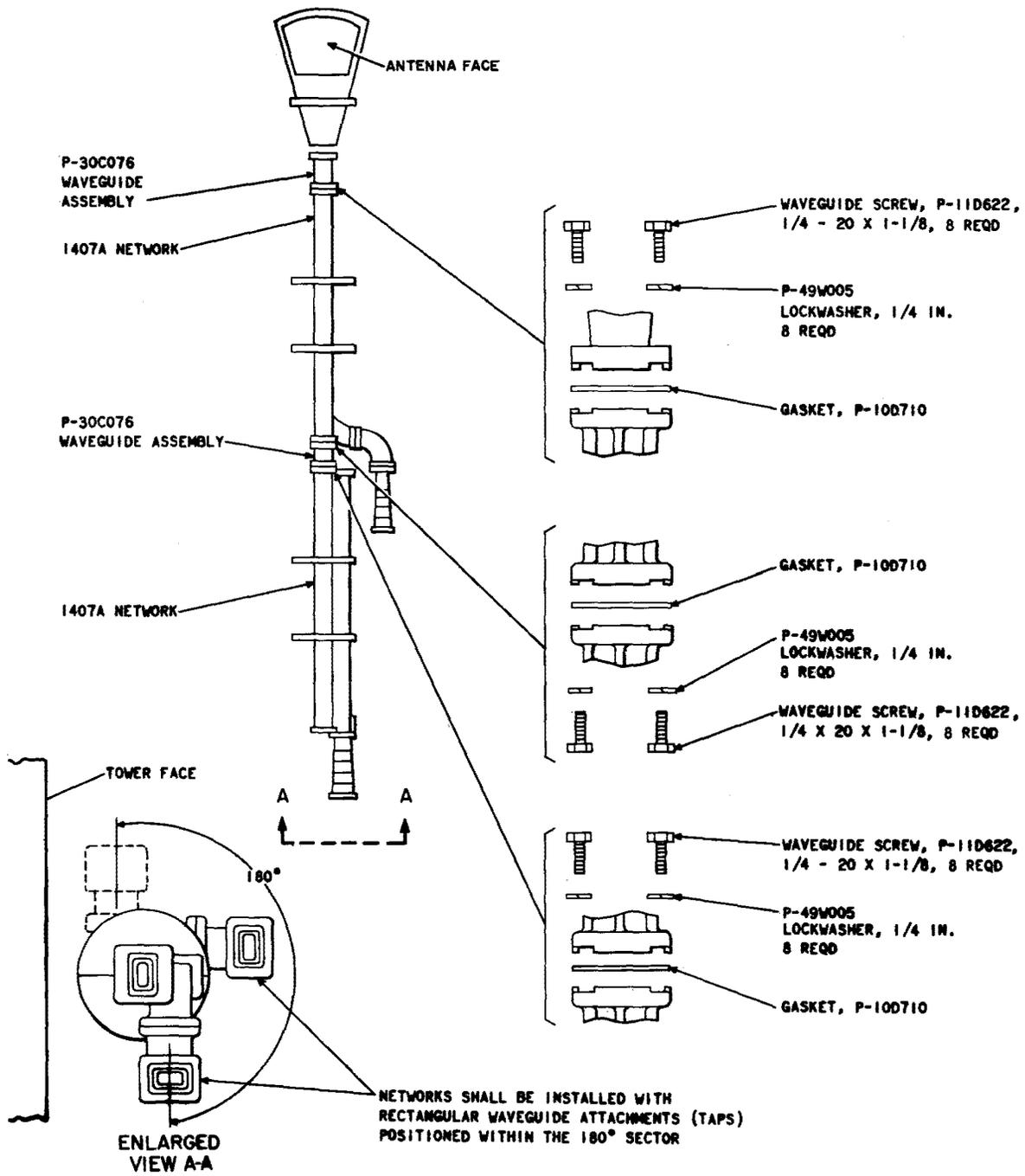


Fig. 8—Installation of Two 1407A Networks

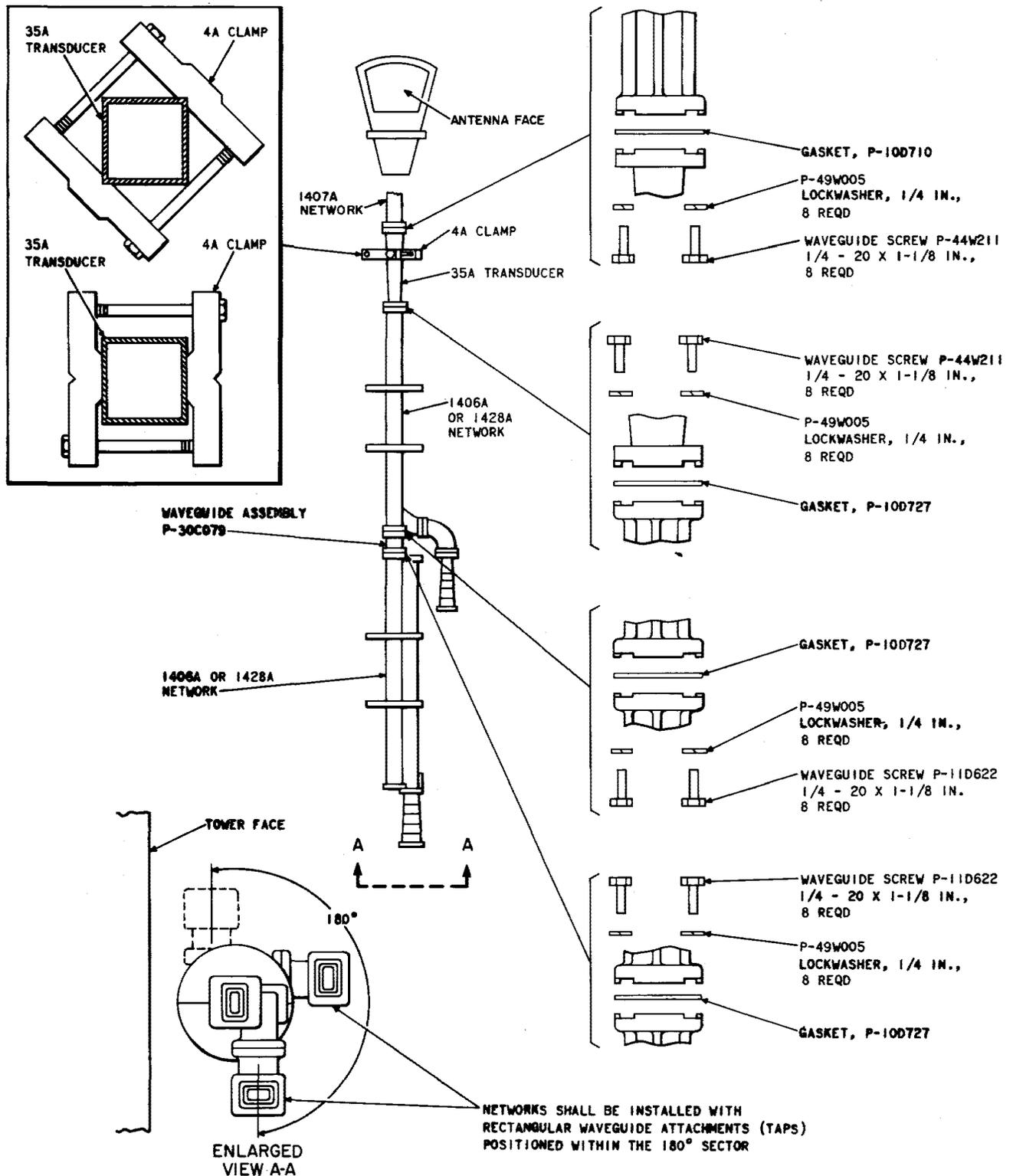


Fig. 9—Installation of 35A Transducer, and Two 1428A or 1406A Networks

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### H. 34A Transducer

**2.29** Install the 34A transducer to the bottom flange of the 1428A network, as shown in Fig. 10, using the bolts, lockwashers, and gasket supplied with the transducer. Use an antiseize compound on the bolts as shown in Fig. 5.

### I. 1424A Network

**2.30** Position the 1424A network so that the upper side tap is perpendicular to the antenna face. The orientation will give horizontal polarization for the upper side tap and vertical polarization for the lower side tap. Refer to Fig. 10 for installation information. Attach the network to the 34A transducer using the bolts, lockwashers, and gasket supplied with the network and transducer. Use an antiseize compound as shown in Fig. 5.

### J. Water Traps and Network Drains

**2.31** When an ED-82230-50 water trap is required, attach it to the appropriate network as shown in Fig. 11, using the bolts, lockwashers, and gasket supplied with the network and water trap. Use an antiseize compound as shown in Fig. 5 when required.

**2.32** When the use of a water trap is not desired, end-plate assemblies are available for draining condensation from the bottoms of networks (Fig. 12). Screw the 3/8-inch tubing male connector into the 1/4-inch NPT tapped hole in the center of the end plate, as shown in Fig. 12. Install the 3/8-inch OD black polyethylene plastic tubing, between the male connector and a point approximately 5 feet above the tower base. Attach another 3/8-inch tubing connector to the tubing, and then attach the draincock to the tubing by means of the 1/4-inch NPT female coupling. Secure the draincock to the tower. The draincock will be used, as required, to remove any water which has entered the system above this point.

### K. P-183904 and P-183905 Network Restrainers

**2.33** The P-183905 network restrainer is used for attaching the 1407A network or the 1436A passive network to the slot angles. The P-183904 network restrainer is used for attaching the 1406A and 1428A networks or their respective 1438A and 1437A passive networks to the slot

angles. Restrainers are usually attached to the flange of every second network.

**Note:** The 1407A, 1406A, and 1428A networks now have only one restrainer plate as do the 1436A, 1438A and 1437A passive networks.

**2.34** The network restrainers are shipped assembled. To install, proceed, as follows. (See Fig. 13.)

- (a) Remove the back plate and the two clamps from the assembly.
- (b) With the clamp bracket positioned against the tower slot angles, raise the restrainer until the bracket makes contact with the circular flange on the network.
- (c) Replace the two clamps, with the screws only fingertight.
- (d) Pass the 1/2-13x2 bolts through the holes in the clamp bracket and the gap between the slot angles. Attach the back plate to the protruding bolts and position the clamp bracket so that the slide bolts are centered in the slots. Tighten the nuts and install the palnuts.

**Note:** The clamp bracket must be centered at installation to allow for expansion and contraction of the waveguide.

### L. Multiple Restrainers

**2.35** Multiple restrainers are used to support the flexible waveguide coming from the combining network. The multiple restrainers are installed as shown in Fig. 14 using the hardware supplied with the restrainer. The hanger plate assembly is attached to the restrainer assembly in the appropriate position depending on the position selected for the optimum run.

### M. 524A Termination

**2.36** When a water trap is not used on the bottom port of a 1424A network, the port must be terminated with a 524A termination. The 524A termination is installed as shown in Fig. 15 using the hardware supplied.

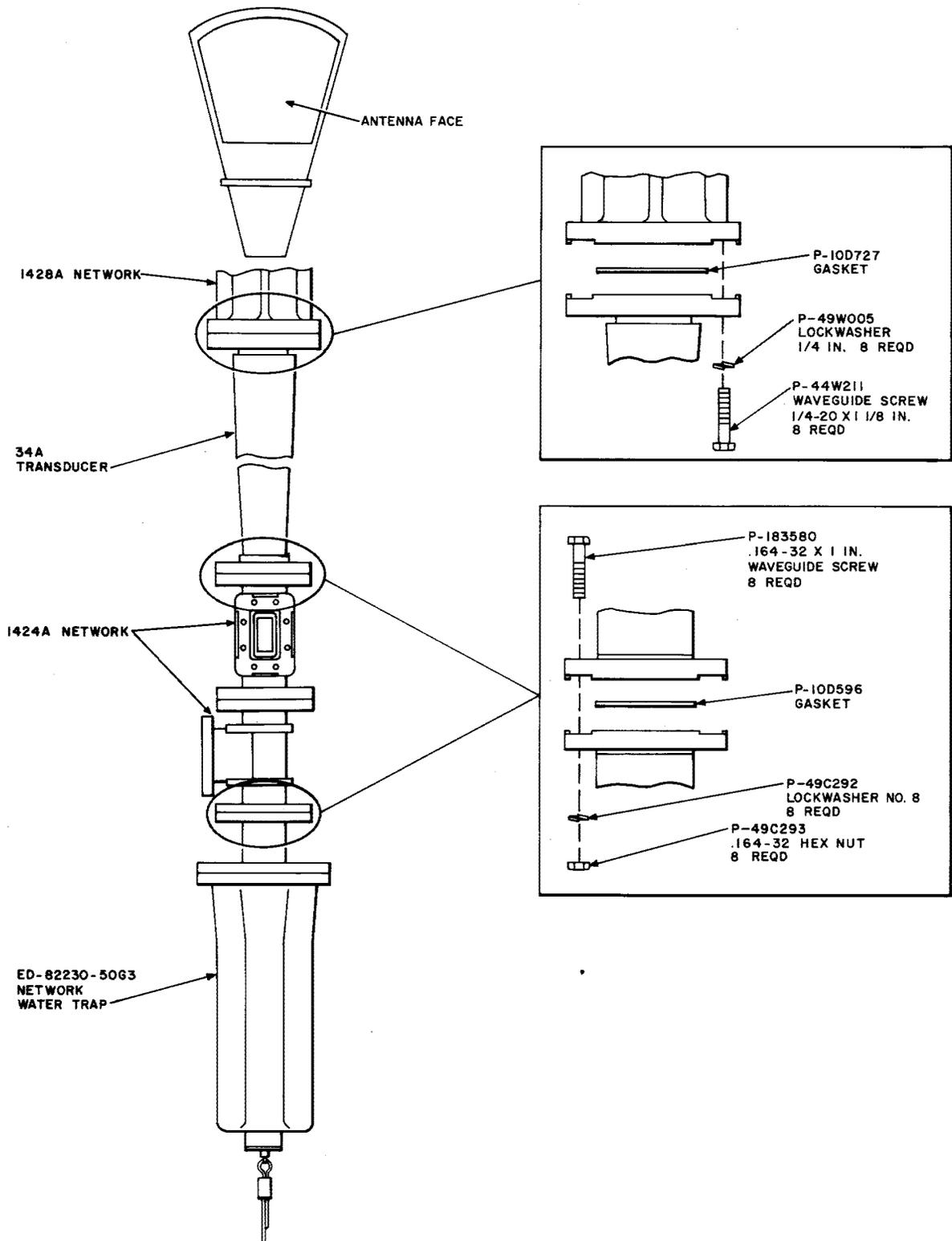


Fig. 10—Installation of 34A Transducer and 1424A Network

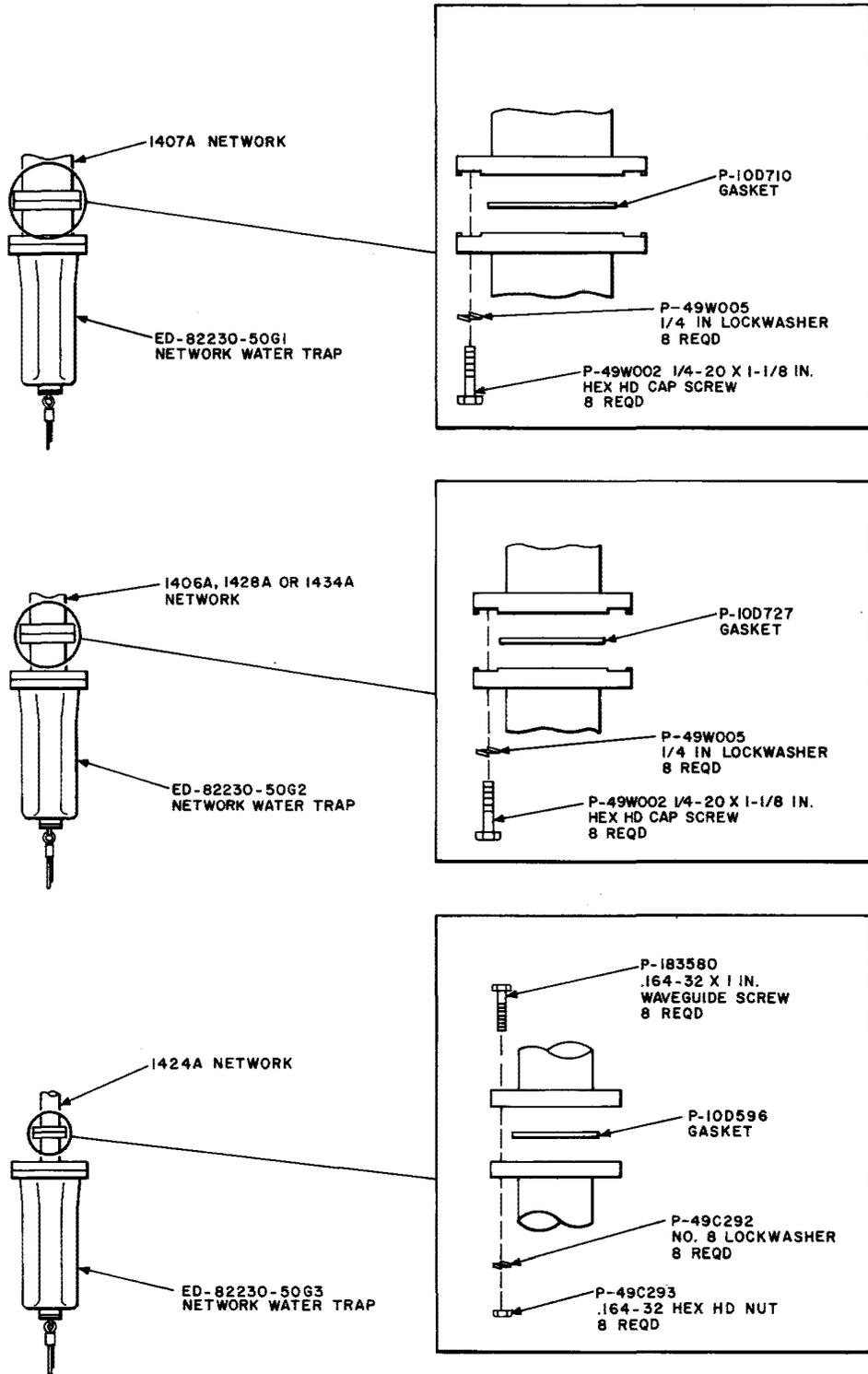


Fig. 11—Installation of ED-82230-30-50 Water Trap

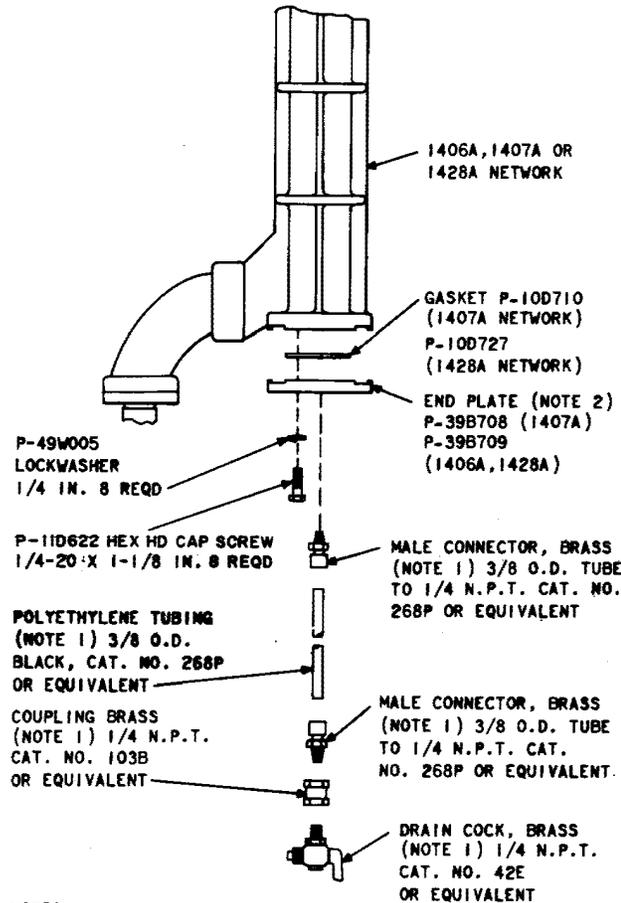


Fig. 12—Installation of Network Drain

**N. 1406A Network**

**2.37** The 1406A network is installed as described in 2.25 through 2.28 for the 1428A network. If a future 11-GHz radio system is planned or likely, the 1428A network is recommended.

**O. 1434A Network**

**2.38** When there is no requirement for an 11-GHz radio system, the 1434A network may be used in place of the 1406A or 1428A networks. An ED-82230-50G2 water trap must be used with the 1434A network. The 1434A network is installed as shown in Fig. 16, using the bolts, gaskets, and lockwashers provided with the network, transducer, and water trap. The upper 1434A network is positioned so that the side tap is perpendicular to the antenna face. This will result in horizontal polarization for the upper network. The lower 1434A network is positioned so that the side tap is rotated 90 degrees from the side tap of the upper 1434A network.

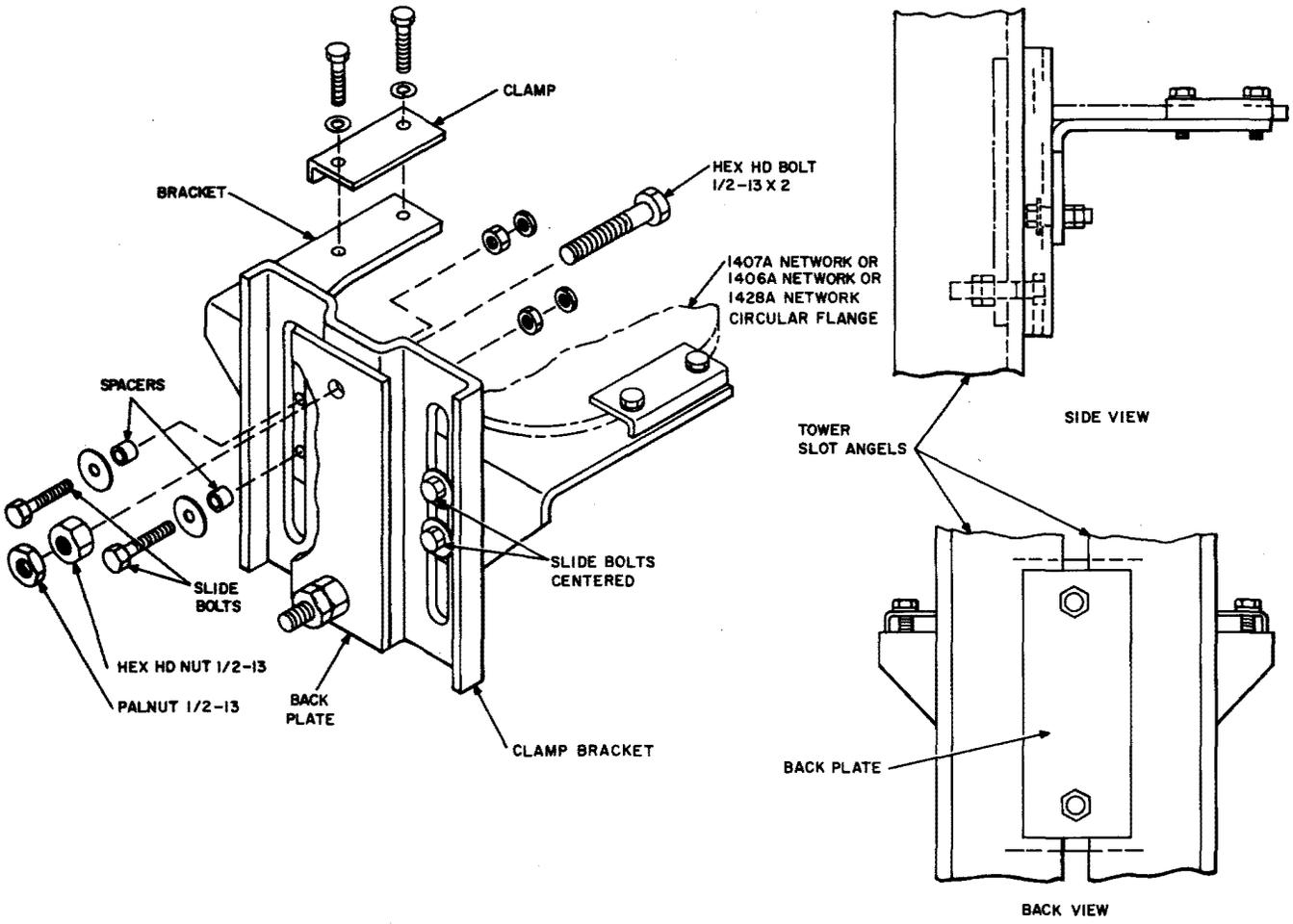


Fig. 13—Installation of Network Restrainer

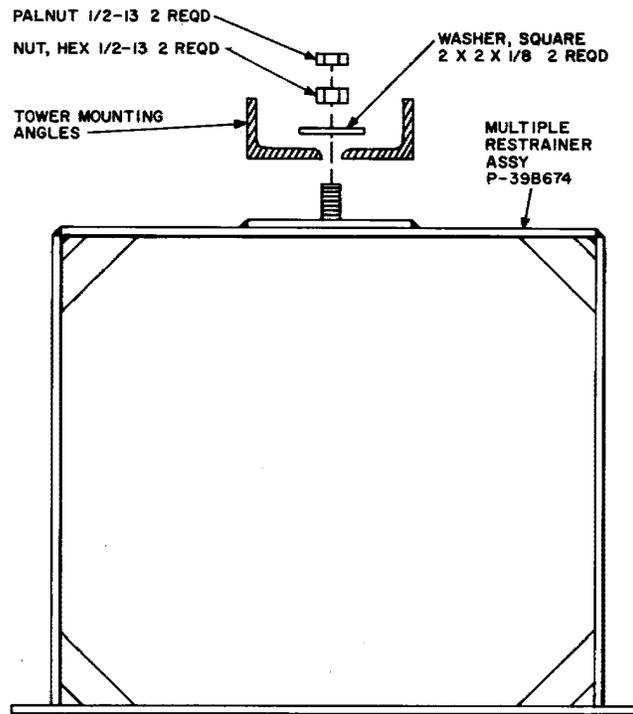


Fig. 14—Installation of Multiple Restrainer

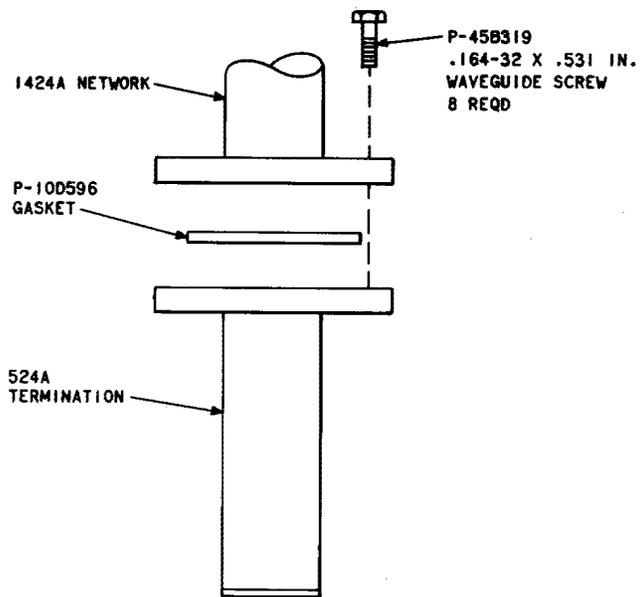


Fig. 15—Installation of 524A Termination

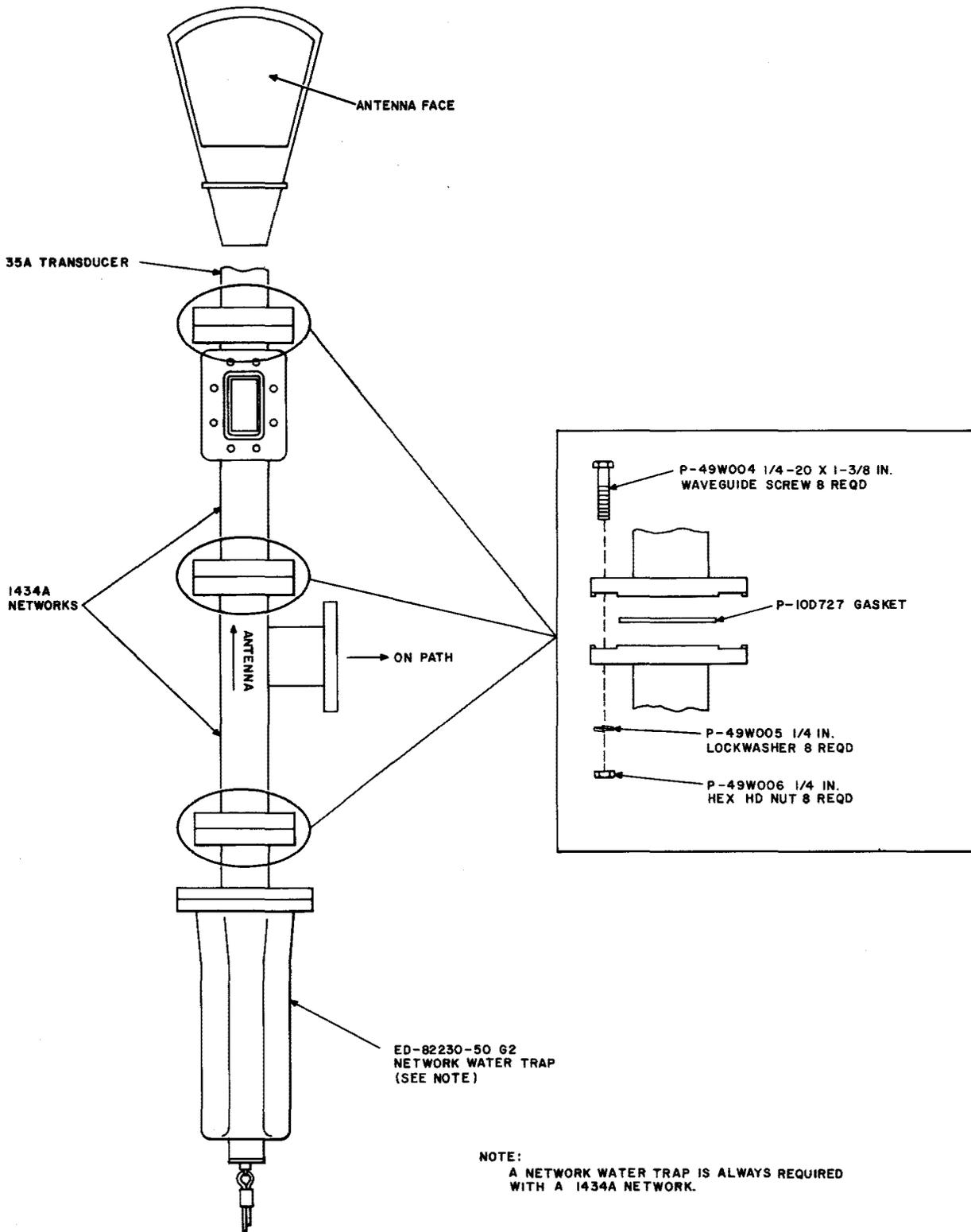


Fig. 16—Installation of 1434A Network

## P. Passive Networks

**2.39** A passive network is installed the same as the active network it replaces. Equivalent networks are listed below:

NETWORK	PASSIVE NETWORK
1427A	1435A
1407A	1436A
1428A	1437A
1406A	1438A

## 3. PARTIAL INSTALLATIONS

### A. 29B Transducer and 35A Transducer

**3.01** When there will be no 4-GHz radio system equipped, the 35A transducer is attached directly to the 29B transducer as shown in Fig. 17. All networks after the 35A transducer are installed as described in Part 2.

### B. 29B Transducer and 1407A Network

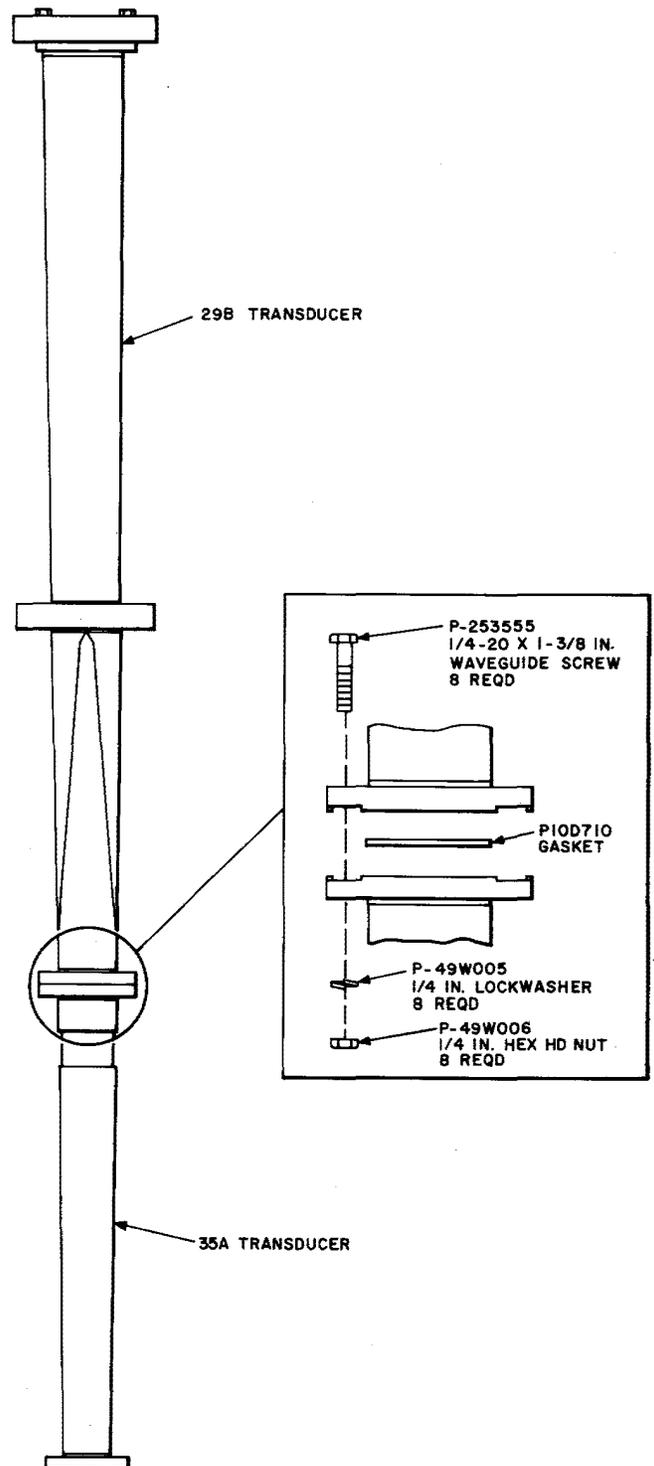
**3.02** When vertical space below an antenna is limited, the 1427A networks and passive networks may be omitted. The 1407A network is attached directly to the 29B transducer as shown in Fig. 18. All networks after the 1407A network are installed as described in Part 2.

### C. 29B Transducer, 35A Transducer, and 34A Transducer

**3.03** When there will be no 4-GHz and 6-GHz radio systems equipped, the 35A transducer is attached directly to the 29B transducer as shown in 3.01. In addition, the 34A transducer is attached directly to the 35A transducer as shown in Fig. 19. The network after the 34A transducer (1424A) is installed as described in Part 2.

### D. 510A 11-GHz Termination

**3.04** When only one polarization of 11 GHz is equipped, the unused port of the 1424A network must be terminated by a 510A termination. Install the 510A termination as shown in Fig. 20.



**Fig. 17—Installation of 35A to 29B Transducer**

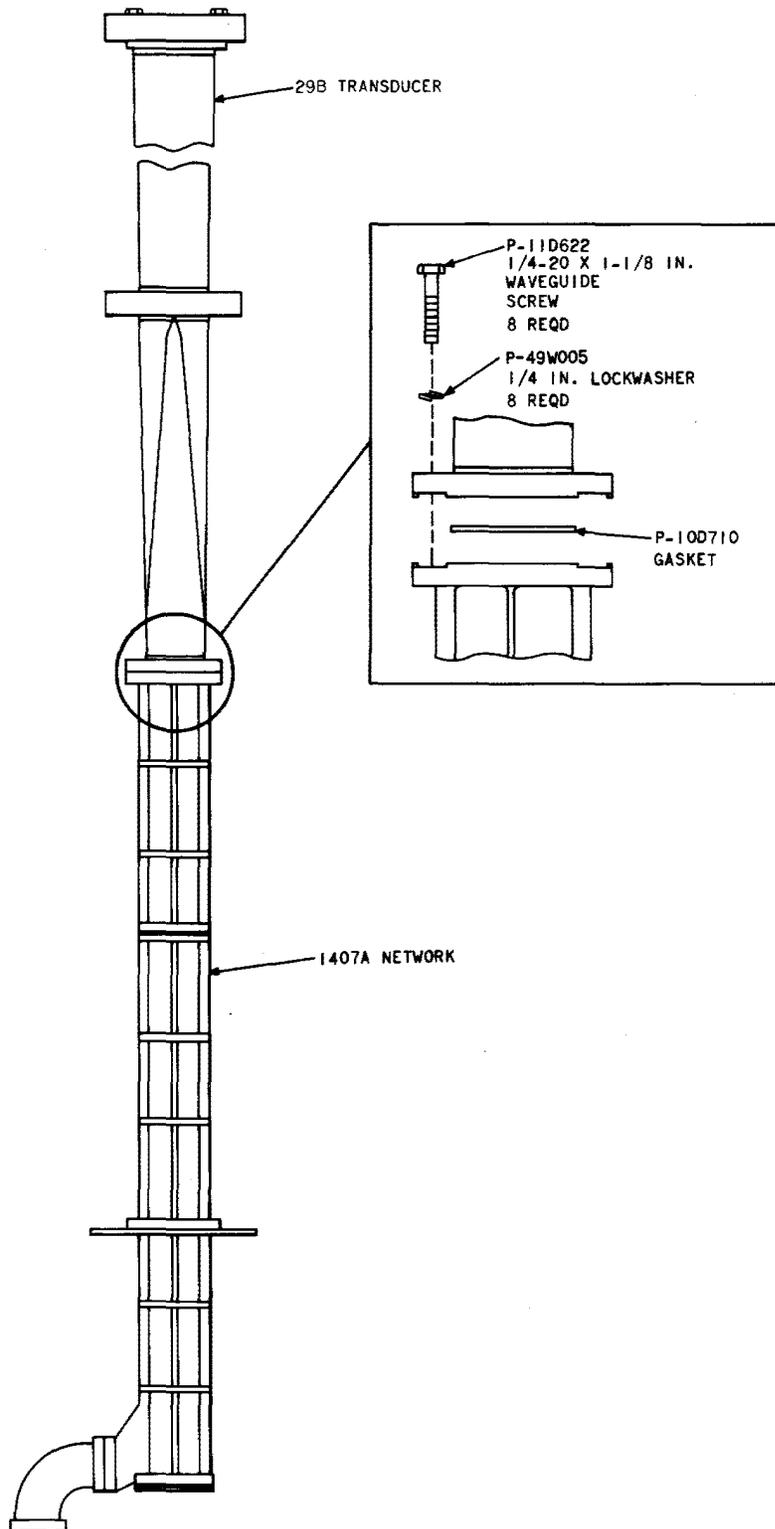


Fig. 18—Installation of 1407A Network to 29B Transducer

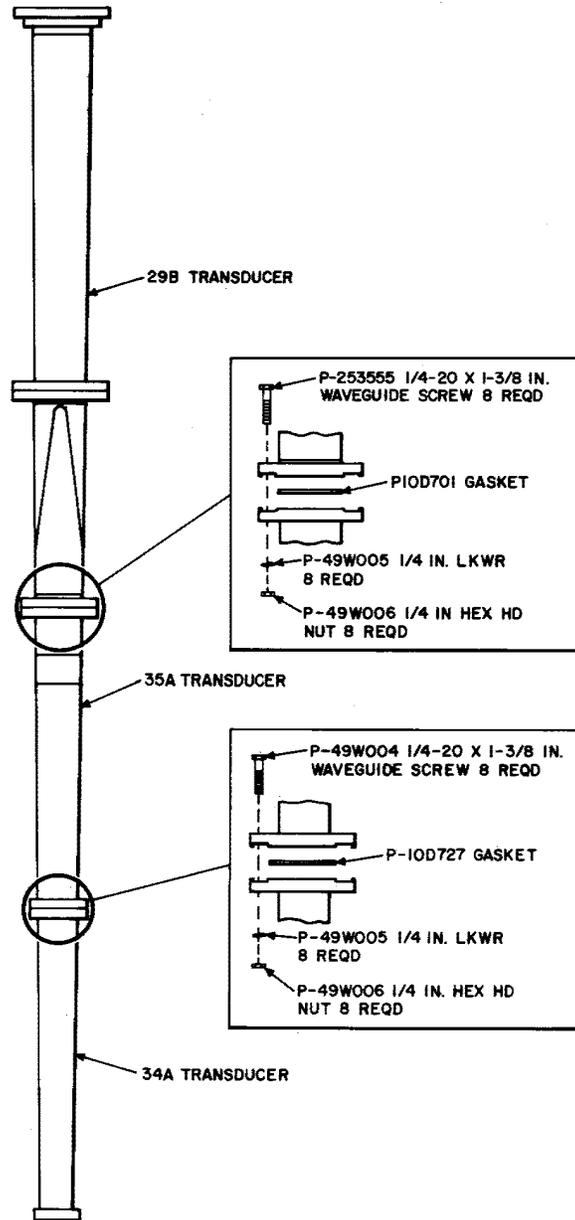


Fig. 19—Installation of 29B to 35A to 34A Transducer

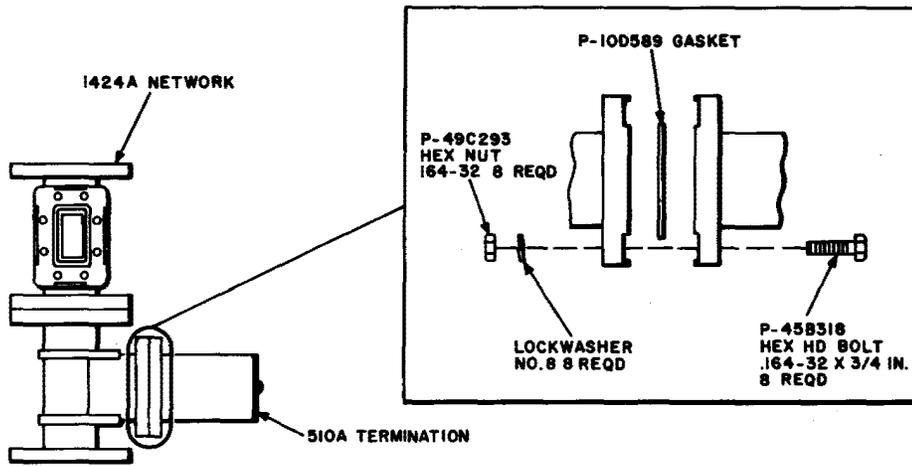


Fig. 20—Installation of 510A Termination