

# MICROWAVE ANTENNAS

## KS-15676 HORN-REFLECTOR AND WAVEGUIDE SYSTEM

### INSTALLATION

### ANTENNA INSTALLATION

#### 1. GENERAL

1.01 This section pertains to the installation of the horn-reflector antennas used for 4, 6, and 11 GHz radio relay systems. A copy of this section is shipped with every fourth antenna, unless order specifies otherwise, for use during installation.

1.02 This section is reissued to add torque requirements for the adjustment locking screws, to illustrate the L17 azimuth adjusting tool since the L12 tool has been rated MD, and to make miscellaneous corrections.

1.03 ♦ Before starting the antenna installation, inspect the interior of the antenna for the presence of water or, in cold weather, ice or frost. If moisture in any form is present, it must be removed before the antenna is installed. A standard ventilating heater, as covered in Division 649 of the Bell System Practices, may be used to melt ice and speed drying.♦

#### 2. METHOD OF INSTALLATION

2.01 The following is a list of the equipment and tools needed for the installation of the antenna:

##### EQUIPMENT:

(a) Derrick capable of hoisting the antenna which weighs approximately 2000 pounds with the mounting frame in place. The derrick should have a boom length of at least 26 feet to hoist the antennas from a central setup on the tower platform. A satisfactory derrick control consists of rigging a 5/16-inch winch line from the small drum of the truck winch to the topping lift, and a 5/16-inch winch line from the large drum of the truck winch to the pulley at the end of the derrick boom. The derrick should be equipped

with guys from the top of the mast to the outermost points of the tower.

(b) Hoisting sling as shown in Fig. 1, or equivalent.

(c) Hoisting sling as shown in Fig. 2, or equivalent (required for L9 and L14 antennas).

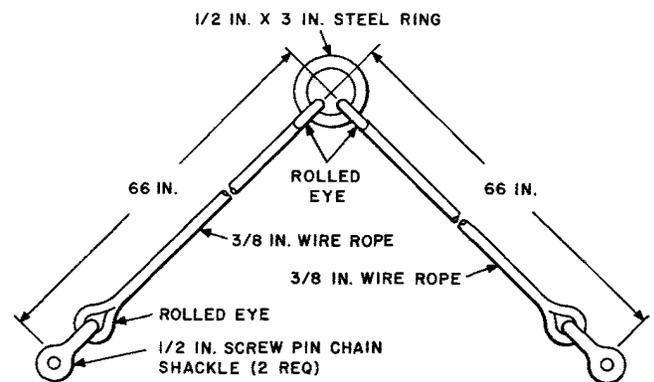


Fig. 1—Hoisting Sling (Short)

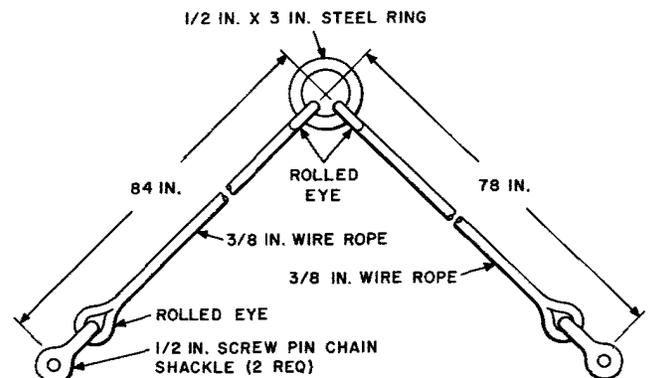


Fig. 2—Hoisting Sling (Long)

(d) Telephone communications between top of tower and truck are desirable to coordinate installation operations.

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- (e) Beacon P-290 Grease (Standard Oil Co. of N.J.).
- (f) Anti-seize compound, KS-19094.

**TOOLS**

QUANTITY	ITEM
1	KS-15676 L17 Azimuth Adjusting Tool
	<i>Note:</i> If the L17 adjusting tool is not available, the KS-15676 L12 Azimuth Adjusting Tool, which is rated MD, may be used.
1	KS-15676 L13 Tilt Adjusting Tool
1	Ratchet Wrench with 1/2-inch square drive
1	1/2-inch Square Socket with 1/2-inch square drive
1	9/16-inch Socket with 1/2-inch square drive
1	3/4-inch Socket with 1/2-inch square drive
1	7/8-inch Socket with 1/2-inch square drive
1	9/16-inch Open-End Wrench
1	3/4-inch Open-End Wrench
1	7/8-inch Open-End Wrench
2	1-7/16 inch Open-End Wrenches
1	Adjustable Open-End Wrench with 3-inch capacity
1	Block Support
1	Torque Wrench, 0 to 150 foot-pound capacity, 1/2-inch square drive

**2.02** Erect the derrick on top of the tower, and hoist the L4 mounting base into position. Attach the mounting base to the tower as shown

in Fig. 3. Apply KS-19094 Anti-Seize Compound to threads of bolts. If this installation replaces an existing KS-5759 delay lens antenna, note that the horn-reflector antenna can be mounted on the KS-5759 L3 mounting base. The L4 mounting base may be placed by either the tower-erecting crew or by the telephone company personnel.

**2.03** Fasten four two-by-fours to the antenna assembly along the sides of the feed horn, using lashing wire. These boards should extend beyond the ends of the feed horn to protect it from damage during antenna installation.

**Caution:** *Installation of an antenna should not be attempted unless wind velocities are gentle and weather conditions are expected to remain stable. Wind loading on the antenna can make control while hoisting the antenna difficult, especially when winds are gusting. When considering the suitability of weather conditions, remember that wind velocities will probably be greater at the top of the tower than at ground level.*

**2.04 Raising the L8 Antenna:** The L8 antenna is assembled front down and is raised from this position as follows: Attach the hoisting sling (Fig. 1) to the load line from the derrick atop the tower. Connect the ends of the sling to the two eyebolts located near the center of the sides of the antenna reflector. Attach guide lines to the ends of the sling to control the load during hoisting. Raise the antenna to a vertical position, and hoist to the top of the tower.

**Caution 1:** *Although the two-by-fours partially protect the feed horn from dents and nicks, be sure not to drop the small end of the antenna or drag it over rough terrain, as this may result in serious damage.*

**Caution 2:** *Deploy men on the ground to handle the guide lines in the manner best suited to minimize erratic motion and prevent collision with the tower or other obstacles.*

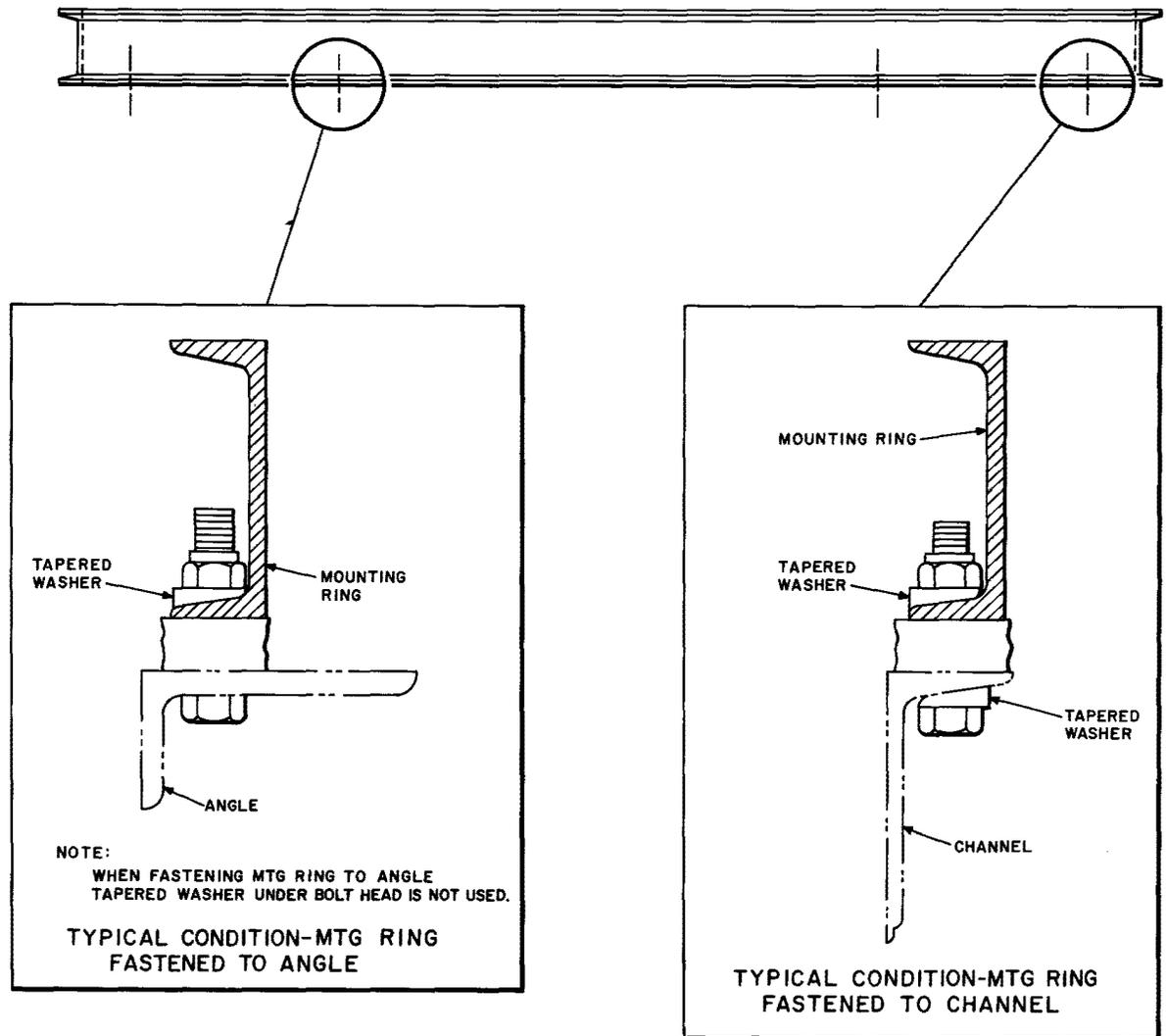


Fig. 3—KS-15676 L4 Mounting Base

**Caution 3:** Exercise extreme care to avoid contact with the guy wires when installing antennas on guyed towers.

**Caution 4:** On guyed towers, the antenna platforms are close to each other. Exercise care to avoid contact between rigging equipment on the antenna being hoisted and previously installed antennas.

#### 2.05 Raising the L9 and L14 Antennas:

The L9 and L14 antennas are shipped on the side with one of the four wheels removed from the mounting frame. This wheel is shipped with miscellaneous hardware and should be placed temporarily in the mounting frame before the antenna is raised. Attach two L11 mounting clamp beam jaws, using two 1/2-inch cap screws with lockwashers per jaw, to the web of the mounting frame side beam which is uppermost as the antenna

lies on the shipping base (see Fig. 4). Place a 3/4-inch bolt in each beam jaw and fasten with the hex nuts provided. Raise the antenna using the following procedure:

- (1) Attach the short hoisting sling (Fig. 1) to the load line from the derrick atop the tower, and connect the ends to the eyebolts located near the center of the sides of the antenna reflector. Attach guide lines to the ends of the sling for control of the load during hoisting and to allow the antenna to be pulled to one side if necessary to clear intermediate guy wires on guyed towers. Attach the block support, per Fig. 4, to the load line by engaging the load line in the open ring on the upper end. Attach a 3-sheave block and fall to the eyebolt opposite the open ring. Push the support, with tackle attached, upward on the load line until the safety hook on the lower end can be engaged in the sling ring. The safety hook shall be equipped with a spring-loaded keeper to ensure positive engagement.
- (2) Attach the long hoisting sling (Fig. 2) to the 3/4-inch bolts which were installed previously in the L11 mounting clamp beam jaws.
- (3) Attach the lower block of the 3-sheave block and fall to the ring in the sling. With the block and fall pulled up tightly, slowly raise the load line, lifting the antenna clear of the shipping base. Slack off the block and fall as the load line is raised. The antenna will rotate into a vertical position supported completely by the hoisting sling which is directly attached to the load line.
- (4) Remove the 3/4-inch bolts and hence the ends of the sling, from the two L11 mounting clamp beam jaws. Unhook the lower end of the block support from the ring in the sling and slide the support down the load line until the upper block can be reached conveniently. Remove the block and fall from the support. Remove the block support from the load line. During the above operation, observe extreme care to avoid dropping any part of the gear on the antenna.
- (5) Install the two remaining L11 mounting clamp beam jaws on the mounting frame. Insert the heads of the four L11 mounting clamp

eyebolts in the beam jaws, and fasten in place by passing the 3/4-inch bolts through the beam jaws and the eyebolt heads. Run the nuts on the bolts. Do not overtighten.

- (6) The antenna may be hoisted to the top of the tower.

**Caution 1:** *Deploy men on the ground to handle the guide lines in the manner best suited to minimize erratic motion and prevent collision with the tower or other obstacles.*

**Caution 2:** *Exercise extreme care to avoid contact with the guy wires when installing antennas on guyed towers.*

**Caution 3:** *On guyed towers, the antenna platforms are close to each other. Exercise care to avoid contact between rigging equipment on the antenna being hoisted and previously installed antennas.*

**2.06** If the derrick is mounted on the same level on which the antenna is to be mounted, the derrick can be adjusted so that the antenna is centered directly above the mounting base. If an antenna is being installed on a dual platform tower, and the derrick is mounted on the upper platform and the antenna is to be mounted on the lower platform, it will be necessary to tilt the antenna to lower it into the mounting base. To do this, face the antenna away from the tower and, using a manila rope block and fall secured to the opposite edge of the platform apply a horizontal force to the square mounting frame. Remove two of the four adjacent wheels in the mounting frame and lower the antenna into position on the mounting base after applying a liberal amount of grease to the upper surface of the mounting base. ♦Replace the two wheels in the mounting frame. All four wheels should be positioned in the slotted mounting hole away from the mounting frame.♦

**2.07** The derrick may be used to support the weight of the assembly until it is given a preliminary orientation. Obtain dimensions for orienting the antenna from the antenna deck plan for the particular installation. Turn the antenna so it is aimed as closely as possible in the direction indicated on the mounting plan. ♦Position the antenna on the mounting base assembly so it is located in accordance with dimensions shown in

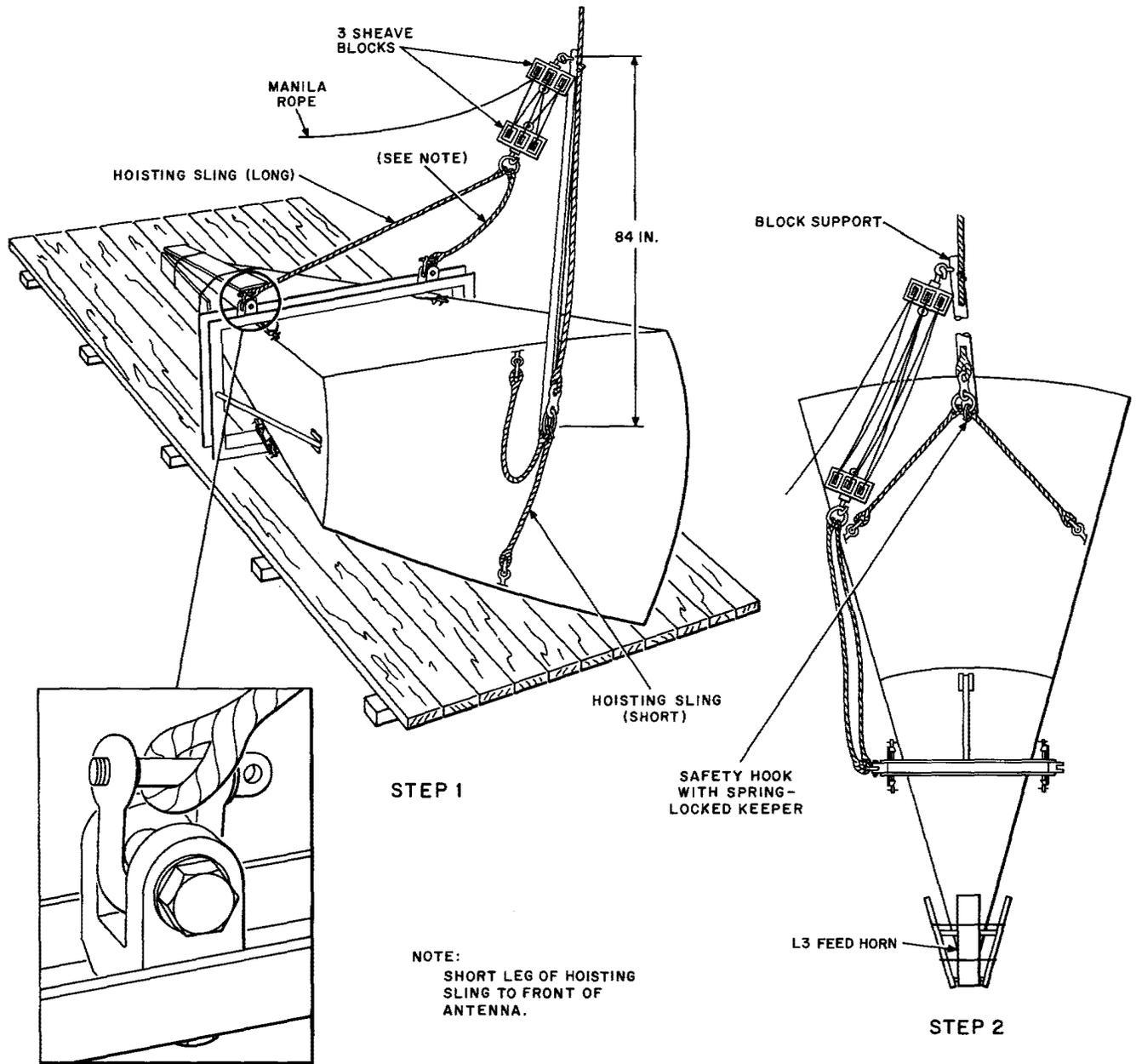


Fig. 4—Raising the L9 or L14 Antenna

Fig. 5. Place the L11 mounting clamp beam clamps in position by passing the beam clamp over the shank of the eyebolt which was fastened previously in the beam jaw, at the same time engaging the mounting base flange in the beam clamp jaw. Push the beam clamp toward the antenna until the face of the beam clamp is in contact with the eyebolt head. Run the large stopnut on the eyebolt shank, and tighten until no

play can be felt in the bolt. Turn down the four square-head setscrews to hold the beam clamp in position on the mounting-base flange. With a torque wrench, tighten the setscrews to a torque of 60 foot/pounds. Lock the setscrews with the hex jam nuts provided. The completed installation of one L11 mounting clamp assembly is shown in Fig. 6. Repeat the above procedure for each of the three remaining mounting clamps. After the

antenna has been positioned and all four mounting clamps have been installed, adjust the four wheels in the mounting frame so the shoulder of each wheel is in contact with the flange of the mounting base. When properly installed all four wheels should be in approximately the same position in the slotted holes. ♦

**Caution:** ♦Do not leave the antenna elevation held solely by either the tubular shipping support or the tilt adjustment tool. Neither of these is designed to withstand the force created by even moderate winds blowing against the antenna. The antenna elevation must be locked as described in 2.10 (8) for overnight or longer periods. ♦

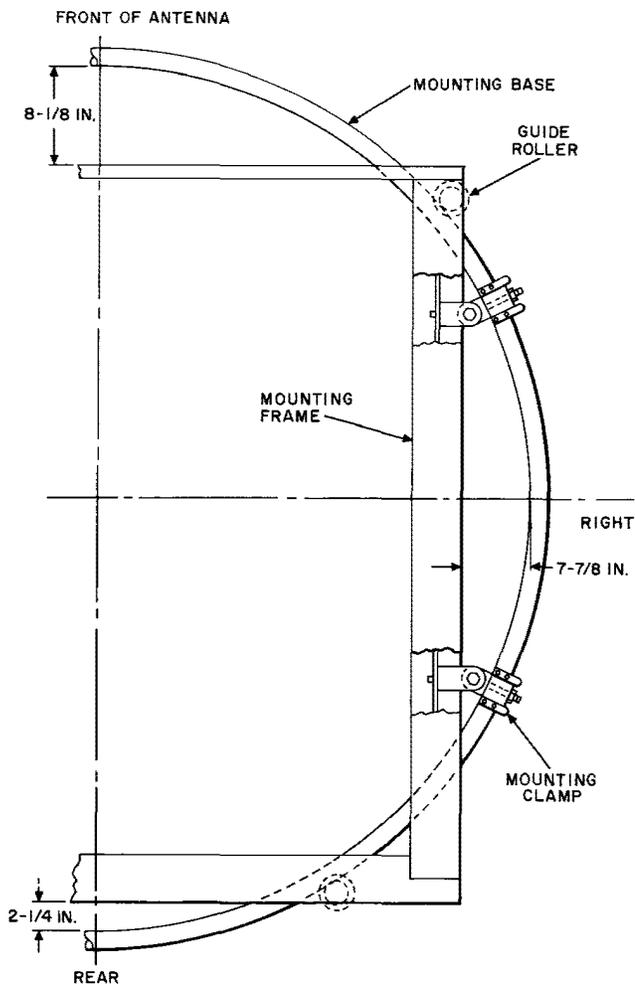


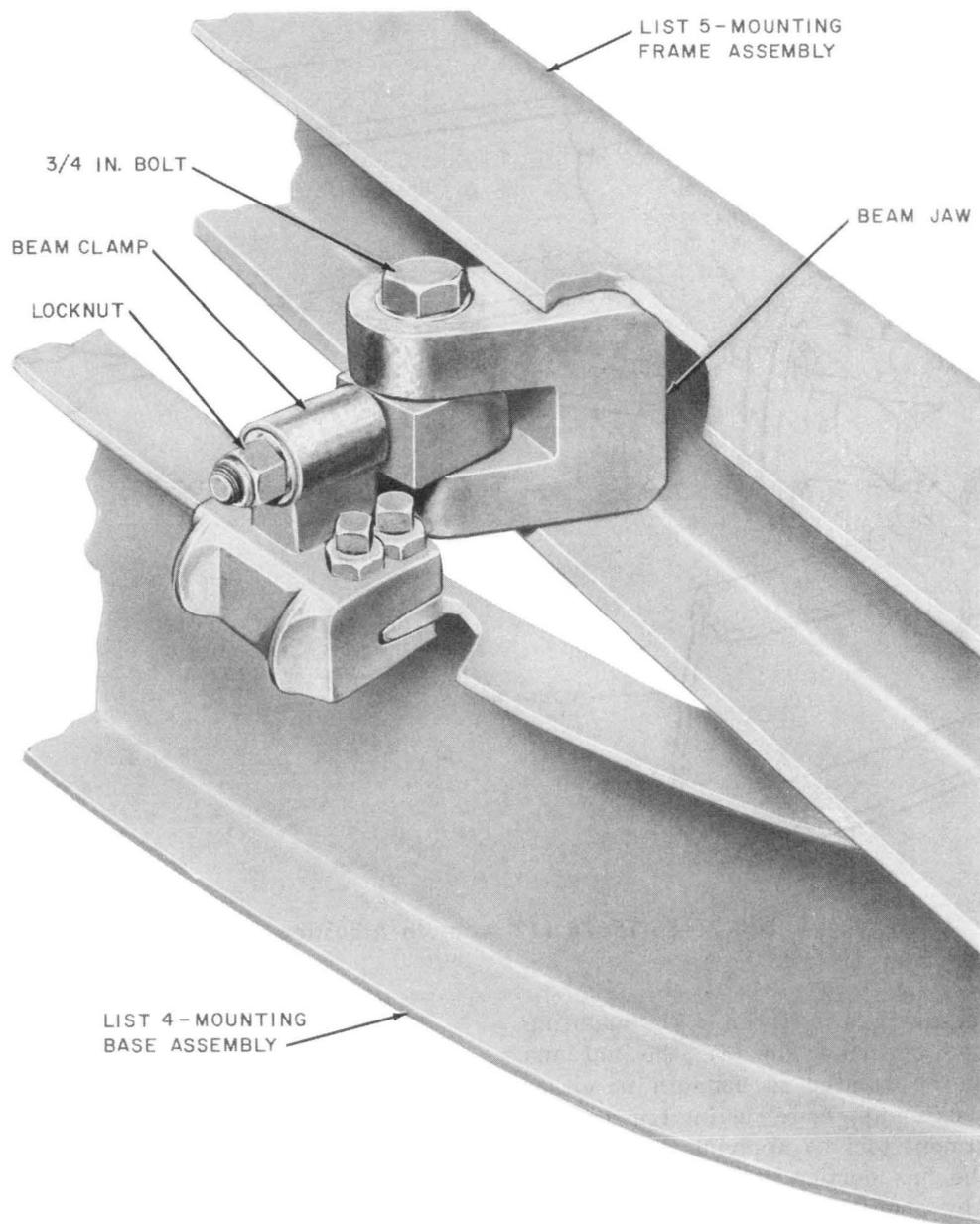
Fig. 5—Antenna Locating Dimensions

**2.08** The antenna will be left in this position until the final electrical orientation is to be accomplished. Remove the wood boards which were placed to protect the feed horn. Make sure the protecting cover with which the feed horn was shipped is in place on the bottom of the feed horn. This cover is vented to prevent any buildup of pressure in the antenna due to temperature change.

**2.09** A method of locking the antenna in elevation has been provided. This consists of providing four tie angles bolted to the antenna assembly, four brackets welded to the L5 mounting frame, and four pairs of locking screws, one pair to each bracket. The locking screws are positioned above and below a channel section which is welded to the antenna tie angle. When these screws are run down into contact with the two channel flanges, the antenna is locked in elevation. The details of the elevation adjustment lock are shown in Fig. 16 of Section 402-421-201.

**2.10** When preparing for final orientation and elevation of the antenna in accordance with Sections 402-421-206, 402-421-207, and 402-421-208, the following procedure shall be followed:

- (1) ♦Either the L12 or the L17 azimuth adjusting tool (Fig. 7 and 8) may be used to make the fine adjustment of the antenna in azimuth during electrical orientation. The adjusting tools are mounted and operated in the same manner except that the L12 tool is operated with an open-end wrench instead of a ratchet assembly, which is a part of the L17 tool. The tools are intended for use only during orientation and are not to be left in position on the antenna. ♦
- (2) On the antenna deck, select the L11 mounting clamp which is the most convenient for use with the azimuth adjusting tool. In general, this will be the clamp nearest the center of the tower. Slightly loosen the eyebolt stopnut and remove the 3/4-inch bolt from the beam jaw. Lay the bolt, with nut, carefully aside. Unlock and turn the four setscrews in the beam clamp until the clamp can be moved sideways on the mounting base flange. Move the clamp on the flange, withdrawing the eyebolt head from the beam clamp. Insert the end of the azimuth adjusting tool in the beam jaw, and fasten it by dropping the captive pin through the bolt hole in the beam jaw. ♦Extend the screw(s) of the azimuth adjustment tool enough to expose



**Fig. 6—KS-15676 L11 Mounting Clamp Assembly**

about 3 1/2 inches of screw threads. Pass the two ears of the clevis on the end of the azimuth adjusting tool over the head of the eyebolt projecting from the beam clamp, and pass the captive pin through the clevis and eyebolt. Move the beam clamp as required to accommodate the tool. Set the beam clamp in position on the mounting base flange, making sure the flange is fully engaged in the beam clamp jaw. Turn down the four setscrews to fasten the beam

clamp to the mounting base flange. Lock the setscrews with the hex jam nuts.

(3) Unlock and loosen the four setscrews in each of the three remaining beam clamps. Make sure the setscrews are fully withdrawn into the body of the clamp so that the clamps can slide freely on the mounting base flange when the antenna is rotated.

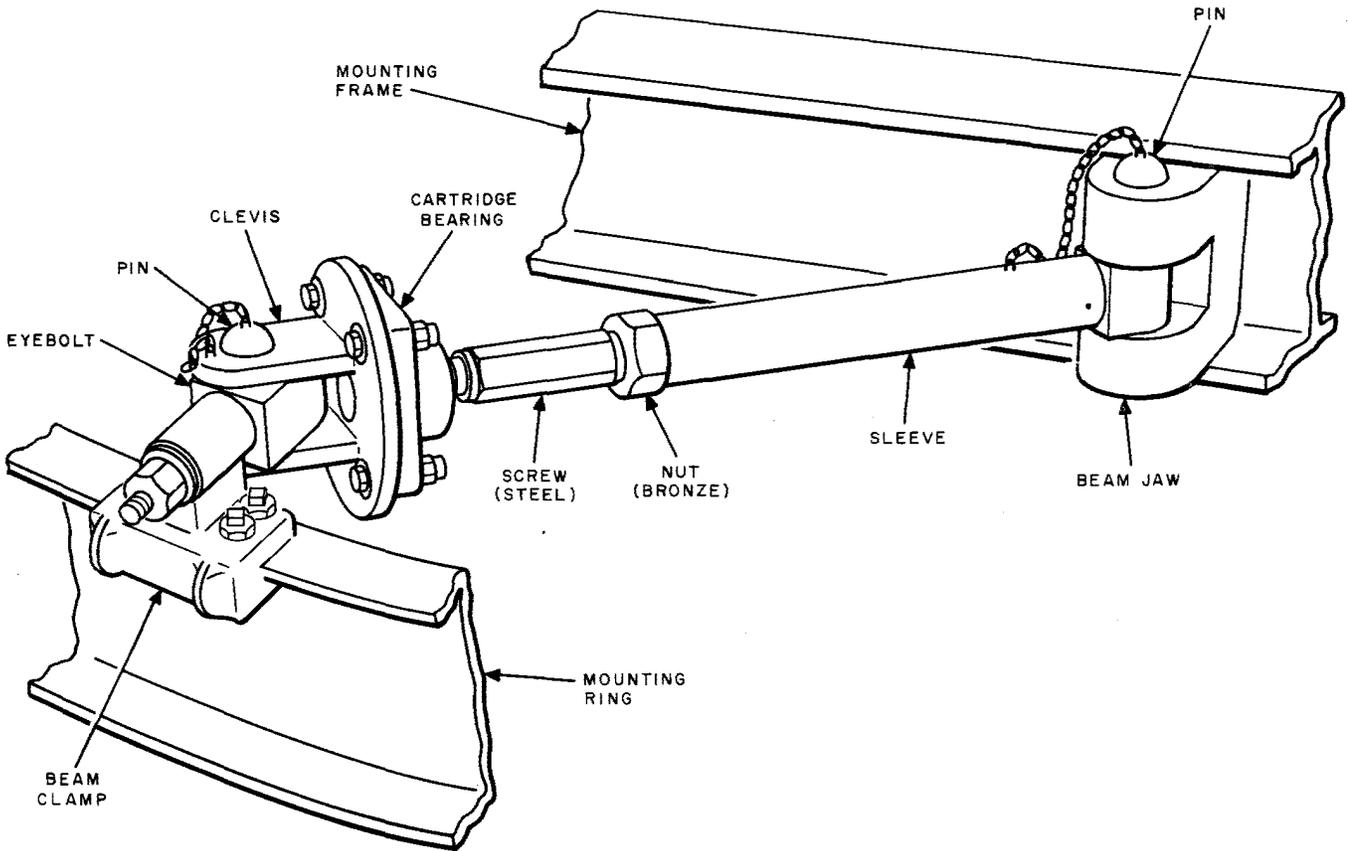


Fig. 7—KS-15676 L12 Azimuth Adjusting Tool

(4) After loosening the three L11 mounting clamps as described in (3), the antenna assembly can be rotated in azimuth in either direction by extending or retracting the screw(s) of the adjustment tool by applying an open-end wrench to the hex portion of the screw on the L12 tool or by operating the ratchet handle on the L17 tool.⚡

(5) When orientation in azimuth has been completed, reset the L11 mounting clamp beam clamps, and set and lock the four setscrews. Remove the azimuth adjusting tool by pulling the captive pins out of the beam jaw and beam clamp. Replace the pins in their respective holes in the tool, and secure in position with one or two turns of friction tape on the shanks.

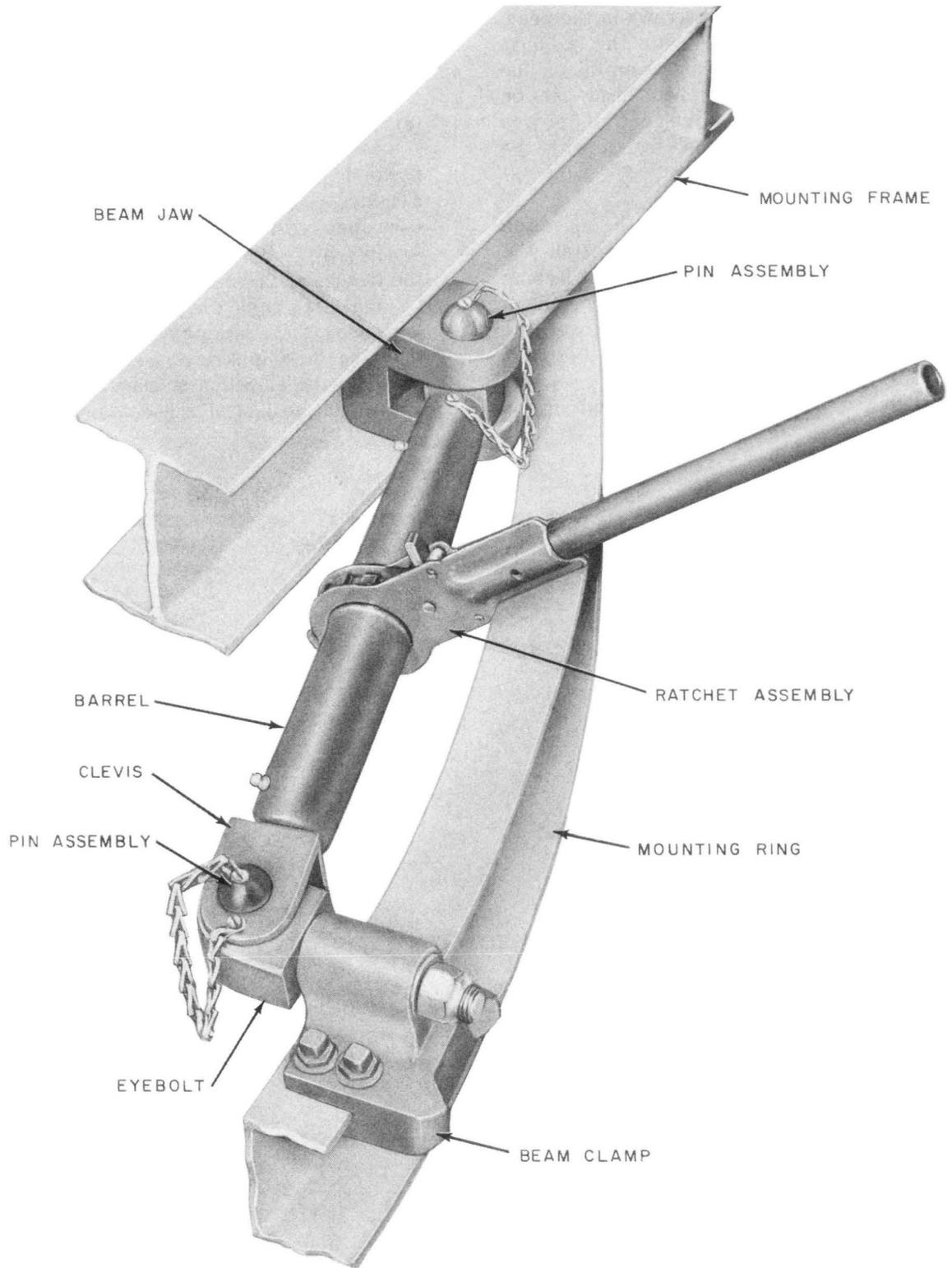


Fig. 8—KS-15676 L17 Azimuth Adjusting Tool

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(6) Unlock and loosen the setscrews in the beam clamp which was used with the azimuth adjusting tool. Move the beam clamp along the mounting base until the eyebolt head can be engaged in the beam jaw. Replace the 3/4-inch bolt, previously set aside, and fasten with the nut provided.

(7) Loosen the locknuts on all of the elevation adjustment locking screws and install the L13 tilt adjustment tool. The adjustment locking arrangement is designed to provide for a minimum vertical adjustment of  $\pm 3$  degrees. Loosen the locking collars on the elevation adjustment assembly. Turning the tubing body on the assembly in the appropriate direction will adjust

the antenna vertically to move the signal path above or below the horizontal.

(8) After adjusting the antenna in elevation, lock the elevation adjustment assembly by tightening the locking collars previously loosened. Tighten the eight adjustment locking screws (two per corner) to a torque of 50 to 55 foot/pounds. Be sure they are in contact with the flanges of the channels welded to the antenna tie angles. Lock the screws by means of the jam nuts on the locking screws. It is important that the locking screws be locked properly to maintain the elevation setting. Remove the tilt adjustment tool after the antenna is locked.