

MICROWAVE ANTENNAS  
KS-16320 PASSIVE REFLECTORS  
INSTALLATION

INSTALLATION OF LISTS 1 AND 2 ON THE AT-7728 B GUYED TOWER, AND LIST 1  
ON THE AT-8009 C GUYED TOWER AND AT-8013 C SELF-SUPPORTING TOWER

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Option A permits all connections between the reflector and the mount to be made on the ground, leaving only the connections between the pipe mount and the supporting structure to be made aloft, and in general should require less time. Option B affords the advantages of reduced individual lift weight and less bulky assemblies, thereby facilitating handling and minimizing the possibilities of damage to the reflector or to the supporting structure. The choice of method to be employed is left to the discretion of local supervision.

1. GENERAL

1.01 This section describes the manner in which KS-16320, Lists 1 and 2 passive reflectors are to be installed on the AT-7728 B guyed tower, and List 1 passive reflectors on the AT-8009 C guyed tower and AT-8013 C self-supporting tower.

1.02 This section is reissued to reflect:

- (a) Changes in the passive reflectors, lists 1 and 2, and associated adjustment screw assemblies.
- (b) Standardization of C towers.

1.03 Each passive reflector and associated mount will have been separately assembled in advance. Either of two options may be used for installation.

*Option A:* The reflector may be connected to the mount on the ground and the entire assembly hoisted and installed as a unit.

*Option B:* The mount may be hoisted and fastened to the tower, after which the reflector may be brought up and installed.

1.04 Suitable hoisting tackle must be provided including power winch, winch line, slings, and hardware. Rig the tackle properly to the tower to permit hauling all parts directly to the elevation at which the installation is to be made and to facilitate positioning of the parts so that they can be connected permanently to the structure. At least two handling lines are required, of sufficient length to permit men to restrain the reflector and/or mount from the ground as it is being lifted.

2. DESCRIPTION

2.01 Passive reflector assemblies are mounted on the tower by connection to one of the three tower legs. Two sets of brackets furnished with the tower are bolted to prepared holes in the appropriate tower leg; upper and lower points of attachment for the reflector mount are thus formed as indicated in Fig. 1 of this section.

2.02 The 4-inch od pipe of the reflector mount (Section 402-423-400, Fig. 1 or 2, Item 26) is bolted to the upper and lower points of attachment by using the four 5/8 by 7-3/4 inch U bolts (Fig. 1 or 2 above, Items 36D) which are sup-

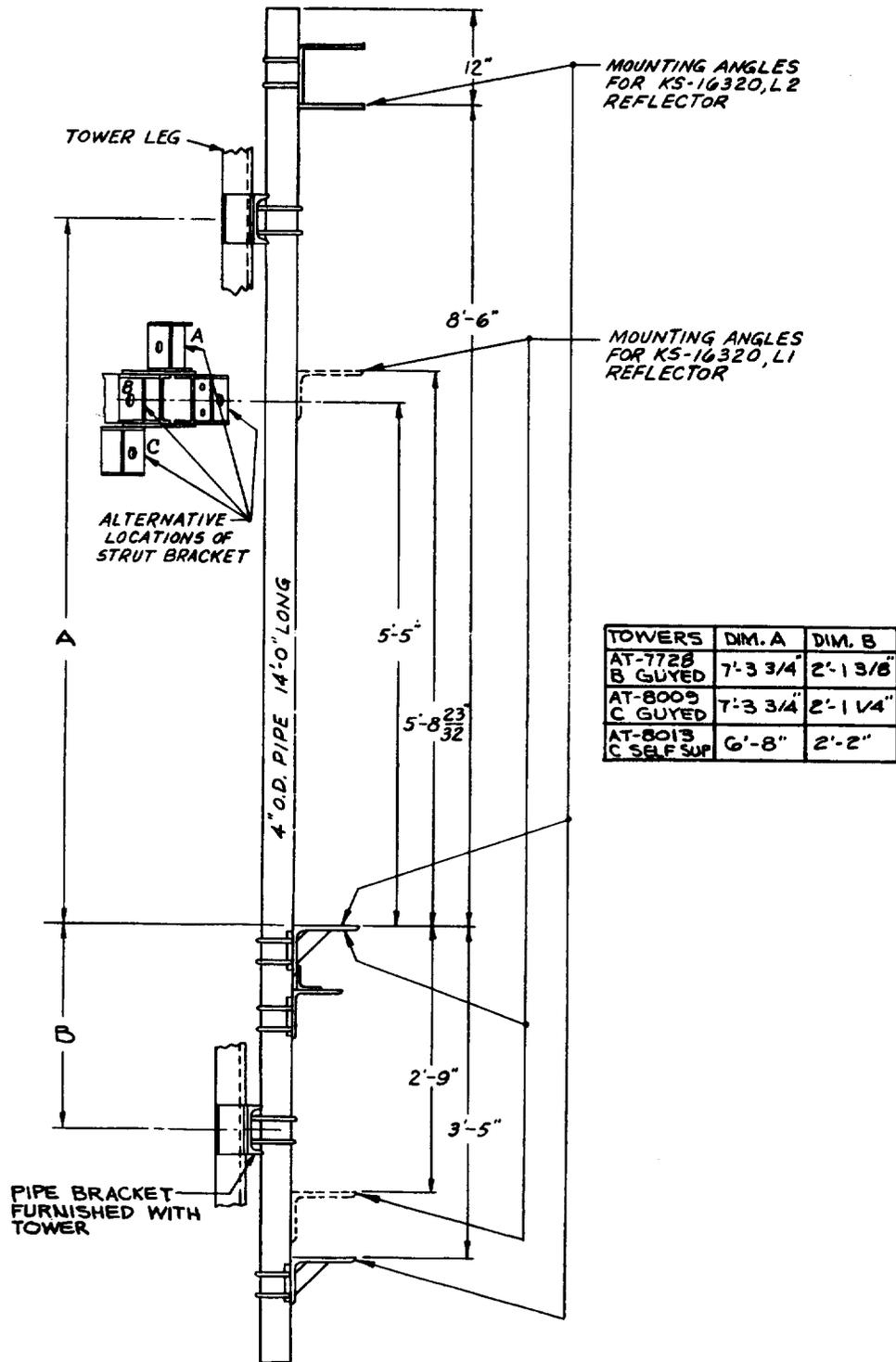


Fig. 1 - KS-16320 Pipe Mount on AT-7728 B Guyed Tower, AT-8009 C Guyed Tower, and AT-8013 C Self-Supporting Tower

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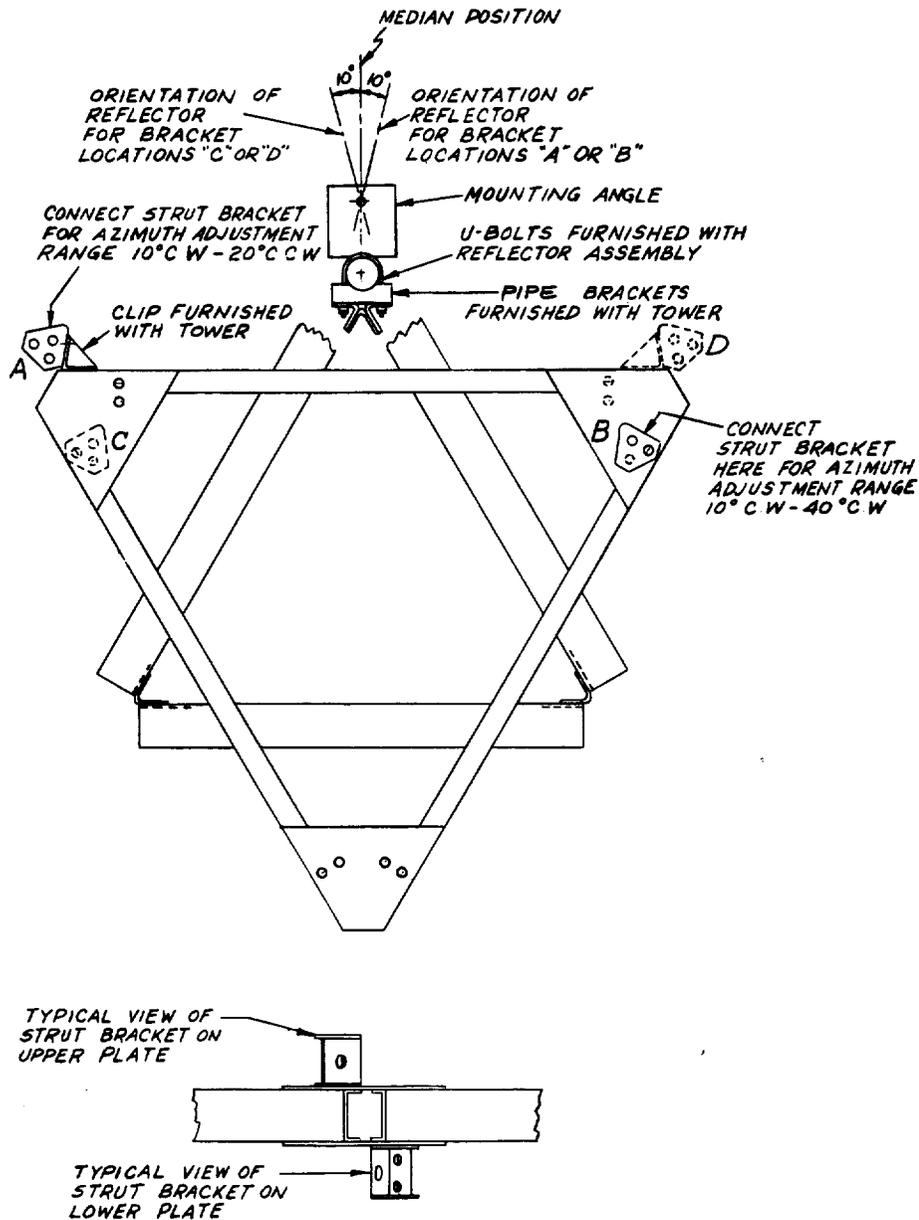
plied with the reflector. Two pipe brackets are furnished with the tower, to be installed between the pipe and the tower connections as shown in Fig. 2 of this section.

**2.03** A triangular backstay, shown in Fig. 2, is built into the tower to provide a point of attachment for the strut assembly.

**3. PREPARATION**

**3.01** Local supervision is to determine the tower leg on which the reflector will be mounted.

**3.02** Bolt the attachment brackets for the reflector mount to the prepared holes in the designated tower leg. The bolt holes for the



**Fig. 2 - Mount for KS-16320 Passive Reflector on AT-7728 B Guyed Tower, AT-8009 C Guyed Tower, and AT-8013 C Self-Supporting Tower**

clips will be identified as two sets, each consisting of three holes in each face of the leg angle. The upper set of holes is approximately 3 feet 2 inches from the top of the tower, and spacing between sets is approximately 9 feet 5 inches.

**3.03** The next step in the preparation procedure is to ensure that the backstay is ready for attachment of the strut assembly. It is necessary, therefore, that local supervision select the side of the reflector frame to which the strut will be connected. The choice depends on the anticipated azimuth adjustment and on the orientation of the reflector mount with respect to the tower. The following discussion will assist in establishing the most favorable strut location.

**3.04** The KS-16320, Lists 1 and 2 passive reflector assemblies, when mounted on the AT-7728 B guyed tower, the AT-8009 C guyed tower, and the AT-8013 C self-supporting tower, have a total range of azimuth adjustment of approximately 40 degrees to either side of a median position. This range of adjustment is obtainable in four overlapping segments of 30 degrees each. The limit of adjustability of each of these segments is imposed by the maximum and minimum lengths to which the telescoping strut can be adjusted. Choice of the particular segment, based on the reflector orientation desired, dictates the strut bracket that should be used. Fig. 2 illustrates the four positions (A, B, C, or D) of this strut bracket, and the following table gives the limits of adjustability of the reflector relative to the median position for each position.

STRUT BRACKET LOCATION	STRUT POSITION	LIMITS OF ADJUSTABILITY
C	Left Hand	40° ccw - 10° ccw
A	Left Hand	20° ccw - 10° cw
D	Right Hand	10° ccw - 20° cw
B	Right Hand	10° cw - 40° cw

**3.05** The approximate azimuth setting required for the reflector must be known before a final decision on the strut location can be made. After the reflector has been installed on the tower and the strut connection to the backstay completed, it must be possible to adjust to correct azimuth. To accomplish this the reflector base orientation must be chosen so that when the

reflector is at the required azimuth setting, its angle with respect to the base orientation is between 0 and 30 degrees in the direction toward the strut connection. Preferably, some margin should exist on both sides of the estimated position for final adjustment.

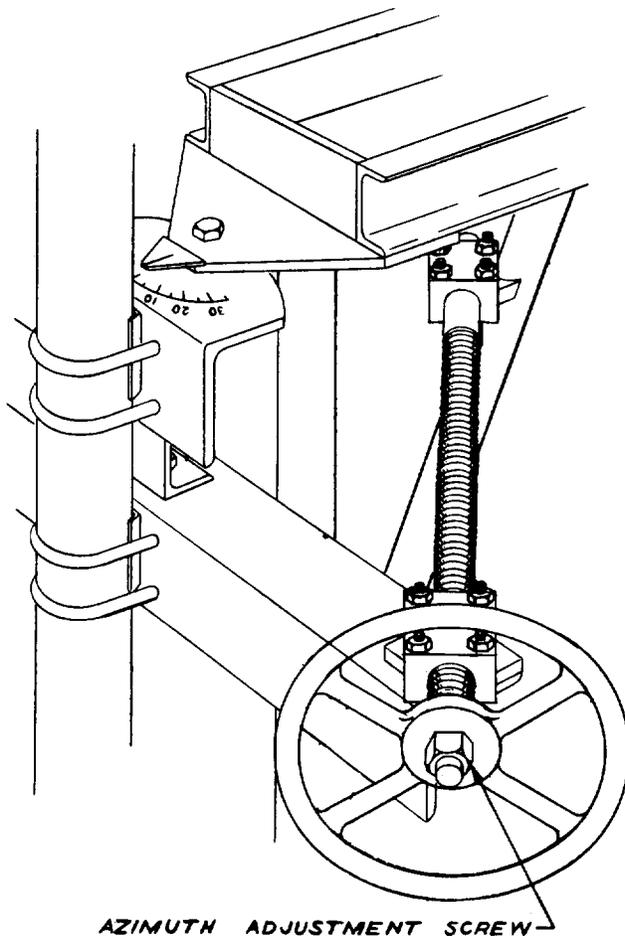
**3.06** When the strut location has been determined as described in 3.04, connect the strut bracket at the corresponding location on the backstay. Fig. 2 of this section shows that a particular point of attachment is associated with each azimuth range. If orientation A or D has been selected, a special clip furnished with the tower (shown at one corner of the backstay in Fig. 2) is to be bolted to the face of the backstay in the proper position. If orientation B or C has been selected, be sure that the two 5/8-inch bolts with nuts and lockwashers are available at the correct corner for attachment of the strut bracket. Note that for orientation B the bracket will be connected to the upper surface of the corner plate, and for orientation C the bracket will be connected to the lower surface of the corner plate, as determined by the arrangement of the bolt holes at the particular location involved.

## 4. INSTALLATION

### OPTION A

**4.01** If Option A is followed for the installation, the reflector will be connected to the mount on the ground and the complete assembly then hoisted into position. Check the reflector carefully for correct assembly and install the top mount as described in 4.12 and 4.13 of this section. Examine the reflector mount for correct assembly as outlined in applicable Section 402-423-204 or -205; spacing of the mounting angles on the pipe shall be as indicated in Fig. 1 of this section.

**4.02** Support the reflector mount horizontally or vertically, as preferred, allowing ample space for the safe and convenient handling of the reflector. The lower mount should extend vertically upward if the 4-inch od pipe is horizontal. If the pipe is vertical, the assembly should be in its normally upright position as shown in Section 402-423-400, Fig. 1 or 2 as applicable; in that case the lower mount will be horizontal. Install the azimuth adjusting tool as shown in Fig. 3 of this section, lash it in place



**Fig. 3 – KS-16320, List 8 Azimuth Adjustment Screw Assembly in Operating Position**

using marline or heavy twine, and leave it in place until the assembly has been installed on the tower.

**Note:** The reflector must be carefully supported, either manually or by suitable lifting tackle, while it is being connected to the mount.

**4.03** Refer to Section 402-423-400, Fig. 1 or 2 as applicable, and place the reflector on the mount as shown. Connect the clamp assembly loosely (Fig. 1, Items 11B, 12B, and 13B; or Fig. 2, Items 9B, 10B, and 11B) and bolt the top mount loosely (Fig. 1, 10B; or Fig. 2, 12B) to the swivel (Fig. 1, 9B; or Fig. 2, 8B). **Remove the 3/8 by 1-1/2 inch cap screw from the top mount.** Position the pointer on clamp (Fig. 1, 12B; or Fig. 2, 10B) to the approximate eleva-

tion setting; if no estimate can be made, set the pointer at midscale. Clamp the reflector to the lower mount. Tighten the bolts connecting the top mount to the reflector and to the swivel.

**4.04** Install the strut as described in 4.14 to 4.17 of this section.

**4.05** The two pipe brackets and the four 5/8 by 7-1/4 inch U bolts with nuts and lock-washers must be available at the top of the tower when the reflector is hoisted.

**Caution:** *Hoisting of the reflector should not be attempted if strong winds or heavy gusts are prevalent. In general, wind velocity is considerably greater near the top of a structure than at ground level.*

**4.06** Attach the winch line to the 4-inch od pipe. Rig the assembly for hoisting so that it assumes the normal upright position (see 402-423-400, Fig. 1 or 2) during the ascent; the approximate weight is 785 pounds for list 1 reflectors or 960 pounds for list 2 reflectors. Connect at least two handling lines near the bottom of the assembly, and deploy men on the ground to handle the lines in the best manner to minimize erratic motion and prevent collision with the tower or other adjacent obstacles. **Exercise extreme care to avoid contact with the guy wires which support the tower.** Guide the assembly into the predetermined location on the designated tower leg; use the handling lines to control the assembly without restricting placement. Position and clamp it as described in 4.10 of this section. Follow the procedure in 4.24 of this section for connecting the strut to the backstay, then remove all lifting and handling tackle and support slings.

**Note:** As the assembly rises, it may be necessary for the men on the handling lines to move farther from the structure in order to exert satisfactory control.

#### OPTION B

**4.07** When following Option B in 1.03, be certain that the reflector mount has been fully assembled as described in applicable Section 402-423-204 or -205; set the spacing of the mounting angles as shown in Fig. 1 of this section. **The two pipe brackets furnished with the tower and the four 5/8 by 7-3/4 inch U bolts with**

*nuts and lockwashers furnished with the reflector must be available at the top of the tower when the reflector mount is hoisted.*

**4.08** Referring to Section 402-423-400, Fig. 1 or 2 as applicable, fit the clamp assembly (Fig. 1, Item 11B; or Fig. 2, Item 9B) to the lower mount (Fig. 1, 7B; or Fig. 2, 13B), place the clamps (Fig. 1, 12B and 13B; or Fig. 2, 10B and 11B) over the studs, and fasten them temporarily. The clamps must be removed when the reflector is brought into place in the final assembly; therefore, attach them now only to prevent loss while the mount is being hoisted. Make them reasonably easy to detach for placement of the reflectors, but screw the nuts on at least to their full thickness. Position the clamp assembly as closely as possible to the 45-degree reading on the elevation scale of the lower mount, and lash securely as shown in Fig. 4 of this section.

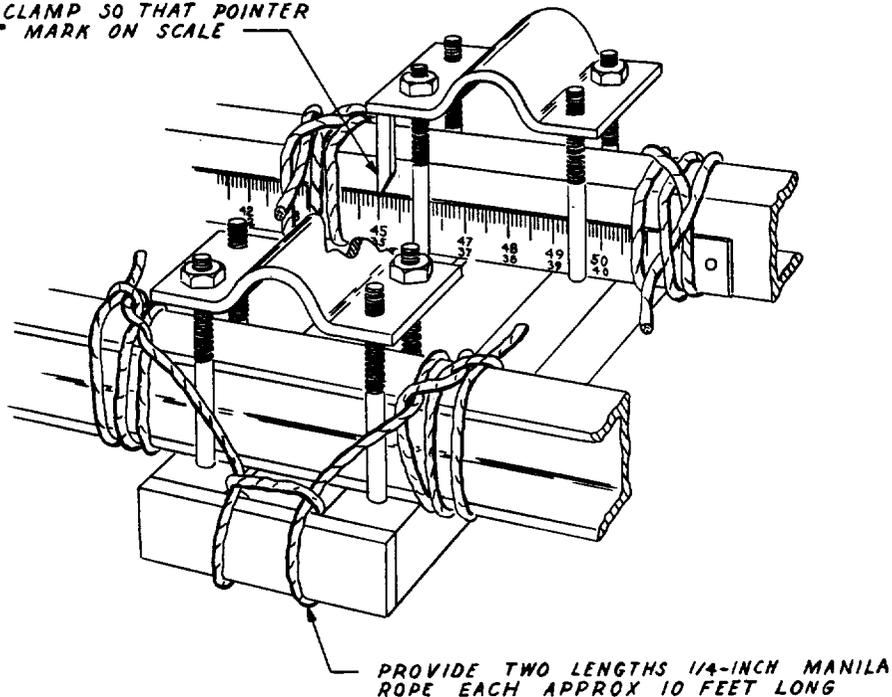
**4.09** Rig the mount for hoisting so that it assumes the normal upright position during the ascent (see Section 402-423-400, Fig. 1 or 2); the approximate weight is 260 pounds. Connect at least two handling lines near the bottom

of the mount and deploy men on the ground to handle the ropes in the best manner to minimize erratic motion and prevent collision with the supporting structure or other obstacles as the assembly is being hoisted. *Exercise extreme care to avoid contact with the guy wires which support the tower.*

*Note:* As the assembly rises, it may be necessary for the men on the handling lines to move farther from the structure in order to exert satisfactory control.

**4.10** When the reflector mount reaches the installation level, guide it into position at the predetermined tower leg; use the handling lines to control the mount without restricting placement. Place the saddles between the 4-inch od pipe and the upper and lower attachment points, and install the U bolts as shown in Fig. 2 of this section. Adjust the distance between the intermediate mounting angle and the center line of the backstay to 5 feet 5 inches as shown in Fig. 1 of this section. Turn the pipe so that the attached mounting angles are pointing as indicated in Fig. 2 of this section. When the adjustments have been made, fully tighten the

POSITION CLAMP SO THAT POINTER IS AT 45° MARK ON SCALE



**Fig. 4 – Temporary Attachment of Clamp Assembly to Lower Mount —  
KS-16320 Passive Reflector**

U-bolt connections to the upper and lower attachment points before releasing tension on the winch line and removing all lines from the reflector mount.

4.11 Check the reflector carefully for correct assembly in accordance with Section 402-423-202 or -203 as applicable. Place the reflector face-downward on wooden skids at a point from which it can be rigged conveniently for lifting; arrange the skids to protect the metal face and also to provide a rest for the bottom of the frame as the reflector is drawn upward into its normal position in the first stage of hoisting.

4.12 Connect the top mount (Section 402-423-400, Fig. 1, Item 10B; or Fig. 2, Item 12B) to the 1-1/32 inch hole in the casting at the back of the reflector. There are two positions on the top mount at which it might be connected to the reflector as shown in Fig. 5 of this section. *The choice depends on the desired range of elevation adjustability and is to be determined by local supervision.*

4.13 Join the top mount to the reflector at the correct bolting position, using a 1- by 5-inch bolt with lockwasher and nut. Run the nut up as far as possible without immobilizing the mount. Install the 3/8 by 1-1/2 inch cap screw (Section 402-423-400, Fig. 1 and 2, Item 16) through the small hole in the top mount, adjacent to the bolting position, and into the tapped hole in the reflector casting, as shown in enlarged view D-D of the above figures. The top mount is now positioned at the proper angle, with respect to the back of the reflector, to receive the top swivel when the reflector is placed on the tower.

4.14 Remove all shipping protection from the strut assembly (Section 402-423-400, Fig. 1 or 2, Item 32B). See that the insertion tube and sleeve of the strut move freely with respect to each other. The ball joints at the ends of the strut have been factory set; *do not disassemble them*, but examine the recess between the nut and the ball for dirt or foreign material. Remove any deposit carefully using a clean, dry, lint-free cloth; if a probe is required, use a suitably

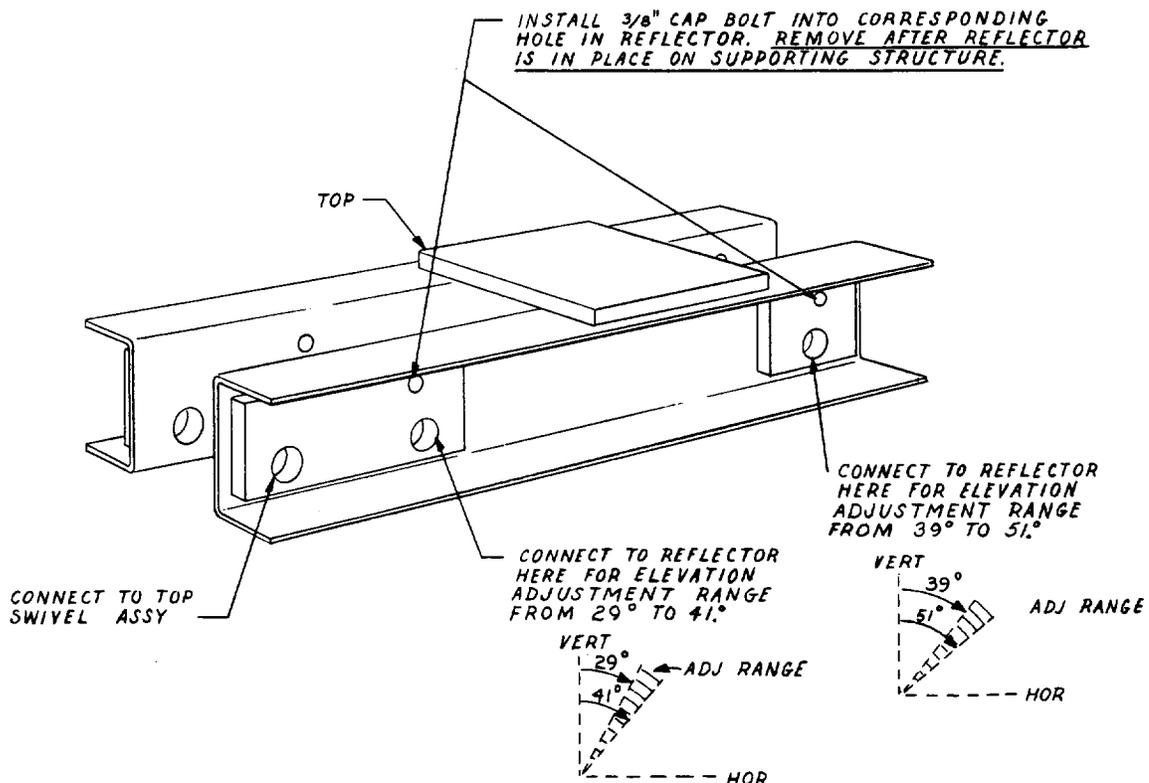


Fig. 5 - Top Mount Assembly — KS-16320 Passive Reflector

shaped stick and be careful to avoid entrapment of splinters in the joint. Take precautions to keep the joints clean during assembly. The joints have been preloaded to require 20 to 30 pound-feet of applied torque for movement; therefore, they will not move freely by hand. However, a check is to be made of the freedom of the joint by carefully restraining the end (the octagonal flats on the body provide a convenient clamping point); the ball should move in its seat under moderate force applied by hand along the strut. Work each ball around through its full cone of movement.

4.15 When the joints have been carefully checked for cleanliness and freedom of movement, apply grease equally to each joint from the metal container supplied with the strut. Pack the grease into the recess between the nut and the ball, as indicated in Section 402-423-400, Fig. 1 and 2. Using a flat blade, work the grease in evenly around the circular cavity and pack it down firmly. Keep the joints off the ground and away from gritty dust, etc, after the grease has been applied.

4.16 Connect the ball joint at the end of the sleeve to the bracket (Section 402-423-400, Fig. 3, Item 29 or 30; or Fig. 4, Item 27 or 28) on the side of the reflector frame which has been selected in accordance with the discussion in 3.03 of this section. Connection is made by placing the open end of the joint against the raised face on the front of the bracket. Place the lock-washer under the head of the 1- by 2-inch bolt, install it from the back of the bracket, and tighten the bolt firmly in place. Arrange the split clamps so that the bolts are upright when the split ends are facing toward the reflector.

4.17 Connect the attachment bracket furnished with the strut to the ball joint on the insertion tube. Assemble the strut and lash the two pieces together to prevent them from separating. Apply another lashing to hold the strut approximately in the installed position (see Section 402-423-400, Fig. 1 or 2) and to prevent it from swinging uncontrollably while the reflector is being hoisted. Tighten the bolts in the split clamps to the point where they still permit the tubes to telescope but require a minimum of tightening for full clamping.

**Note:** In applying rope lashings keep the knots toward the back of the reflector assembly where they will be accessible for untying when the reflector is in place on the tower. Where lashings are passed around sections of the reflector assembly which will later be inaccessible, be sure that they can be pulled away without jamming the rope or stressing the reflector.

**Caution:** *Damage to the reflecting surface shall be avoided. If it is necessary to step on the reflector for any reason, this shall be done only by permission of supervision and with the exercise of extreme care. Use a scaling ladder or platform which:*

- (1) *Provides for the complete safety of the user in that it is capable of being firmly attached to the reflector, affords the user adequate support, and when installed can be safely and readily mounted and dismantled by the user.*
- (2) *Ensures complete protection of the reflector from damage. Do not in any case apply concentrated loads directly to the sheet metal reflecting surface.*

4.18 The clamp assembly which will hold the bottom of the reflector has been temporarily lashed to the lower mount which is now in place, as shown in Fig. 4 of this section. Before the reflector is hoisted into position, be certain that the clamps, which have been bolted loosely to the studs, are removed and kept readily available. The necessary 1/2-inch nuts and lockwashers must be available to complete the assembly.

4.19 Install an azimuth adjusting tool on the reflector mount, as shown in Fig. 3 of this section, before the reflector is hoisted.

4.20 Sling the reflector so that the lifting load will be taken by the tubular member at the back of the frame (Section 402-423-400, Fig. 3, Item 13; or Fig. 4, Item 18). The approximate weight is 525 pounds for list 1 reflectors or 700 pounds for list 2 reflectors. **Do not transmit any of the lifting load to the casting at the top of the frame, and avoid bending any welded connection.** Attach at least two handling lines near the bottom of the reflector, of sufficient length to permit men to be deployed on the

ground to suitable positions from which the motion of the reflector can be effectively controlled throughout the ascent. Keep the reinforcing pads clear at the center of the base (Fig. 3, Items 8; or Fig. 4, Items 35) so that the reflector can be rested on the lower mount when it has been hoisted into position.

**Caution:** *Hoisting of the reflector should not be attempted if strong winds or heavy gusts are prevalent. In general, wind velocity is considerably greater near the top of a structure than at ground level.*

**4.21** Lift the reflector into place, being careful to avoid collision with the supporting structure or other obstacles. ***Exercise extreme care to avoid contact with the guy wires which support the tower.***

**Note:** As the assembly rises, it may be necessary for the men on the handling lines to move farther from the tower in order to exert satisfactory control.

**4.22** As the reflector reaches the installation position, guide it carefully in over the lower mount; use the handling lines to control the reflector without restricting placement. Set the reinforced sections of the base on the rails between the projecting studs of the clamp assembly. ***While this operation is in progress, avoid any impact on the top mount which is projecting from the back of the reflector frame.*** Immediately put the clamps in place and install the lockwashers and nuts. Leave the clamps just loose enough to permit the base to rotate.

**4.23** Remove the bolt which has been placed temporarily in the hole of the top swivel. Bring the top of the reflector back carefully so

that the swivel passes into the space between the two sides of the top mount, and install the 1- by 5-inch bolt through the top mount and the swivel. Leave the nut loose enough to permit the top mount to rotate with respect to the swivel but not so loose that there is excessive side movement between the parts. ***Immediately remove the 3/8-inch cap screw which locks the top mount to the reflector.***

**Note:** The winch line and handling lines are still in place and have not been slacked.

**4.24** Remove the lashing which has held the strut contracted, taking care to avoid separation of the tube and sleeve. If possible, leave a portion of the support sling in place to take the weight of the strut until it is connected to the tower; if this is impossible or inconvenient, before the lashing is removed rig an auxiliary sling to take the weight of the strut. Carefully extend the strut and bolt it to the strut bracket on the backstay.

**4.25** Remove all lifting and handling tackle and support slings.

## **5. PRECAUTIONS**

**5.01** If elevation, azimuth, and curvature adjustments are to proceed immediately, perform the work in accordance with the practice described in Sections 402-423-209, -210, and -211, respectively. Then immobilize the reflector in accordance with Section 402-423-212.

**5.02** If the reflector is to be left overnight or longer before adjustment, immobilize the assembly as described in Section 402-423-212.