

Shively Labs[®]

Circularly Polarized FM Broadcast Antenna

Model 6842



Instruction Manual
Installation, Operation, &
Maintenance

Congratulations!

Thank you for purchasing one of the finest FM broadcast antennas on the market today. The Shively Labs 6842 is the top-of-the-line in its class for its simplicity, superior performance and durability.

Your purchase is backed by the best technical support in the industry. Shively is a leading manufacturer in the broadcast industry, providing an extensive range of antennas, transmission line and components. Our technical staff has a wealth of experience in the broadcast industry and is standing by to serve you in any way.

This manual is intended to give you a good basic understanding of your antenna: its proper and safe installation, startup, and operation, and troubleshooting and maintenance information to keep it working satisfactorily for years to come. *Please have everyone involved with the antenna read this manual carefully, and keep it handy for future reference.*

Meanwhile, please feel free to contact your sales representative at Shively Labs at any time if you need information or help. Call or write:

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IMPORTANT

Please read this manual in its entirety before beginning installation of your antenna!

Failure to follow the installation and operation instructions in this manual could lead to failure of your equipment and might even void your warranty!

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Check the shipment.

As soon as you receive your antenna, BEFORE signing for the shipment:

- a. Check to be sure all the material has arrived.
- b. Check for evident damage to any of the boxes.
- c. If any boxes are missing, or if any are obviously damaged, describe the problem in a WRITTEN note on the shipping papers BEFORE signing them. Then call Shively right away, and we'll do everything we can to correct the situation.

Important!

Never store the antenna system outdoors, boxed or otherwise. Take pains to keep the antenna components dry. You will need to purge moisture from the interior of the antenna components if they get wet.

Torque specifications.**NOTE**

Use an anti-seize compound to minimize galling on stainless steel threads.

Table 1. Torque specifications

Hardware size	Torque (dry)	Torque (lubricated)
1/4-20 (radome flanges, 7/8" EIA flanges)	75.2 in-lbf (8.5 N-m)	63.9 in-lbf (7.2 N-m)
M6 stainless	n/a	8.2 in-lb
5/16-18 (1-5/8" EIA flanges)	132 in-lbf (14.9 N-m)	112 in-lbf (12.7 N-m)
3/8-16 (2-1/8", 3-1/8" EIA flanges)	236 in-lbf (26.7 N-m)	201 in-lbf (22.7 N-m)
1/2-13 galvanized steel threaded rod (Grade 5)	94 ft-lb	n/a
1/2-13 galvanized steel bolt (Grade 2)	61 ft-lb	n/a

Check the parts.

Check to be sure all the parts shown in [Table 4](#) on page 41, [Table 6](#) on page 42, [Table 8](#) on page 44, and [Table 9](#) on page 44, as applicable, have arrived in good condition.

NOTE

Item callouts are consistent across all the illustrations in this technical sheet.

Set up the mounting pole.**Remember!**

It is YOUR responsibility to ensure that your installation meets all applicable codes and the centerline-of-radiation requirements of your FCC construction permit.

Preparation

CAUTION

Before attaching the pole mounts to the tower, scrape away tower paint to ensure good electrical contact. If you don't, the antenna may generate unwanted electrical signals, and performance may be degraded.

- a. Set up a outrigged round pole or pipe, 3" to 5-1/4" in diameter, 15" from the tower face or leg. See [Figure 1](#) through [Figure 8](#), as applicable, for mounting pole length requirements.

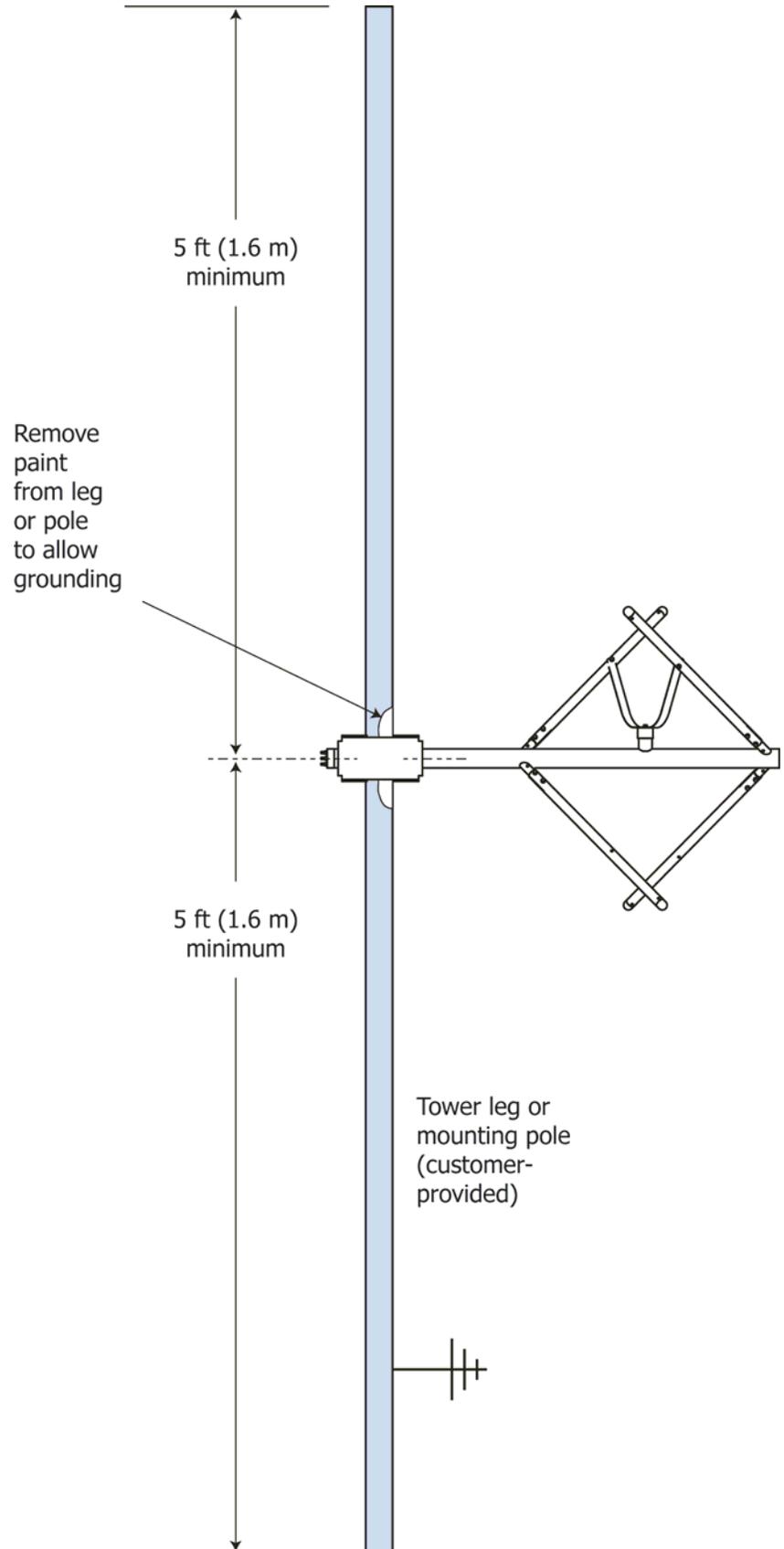
CAUTION

Watch for tower components that might interfere with your installation.

- b. Mark the mounting pole at the locations where the antenna bays will be mounted, in accordance with the installation drawing. The bay spacing is critical.

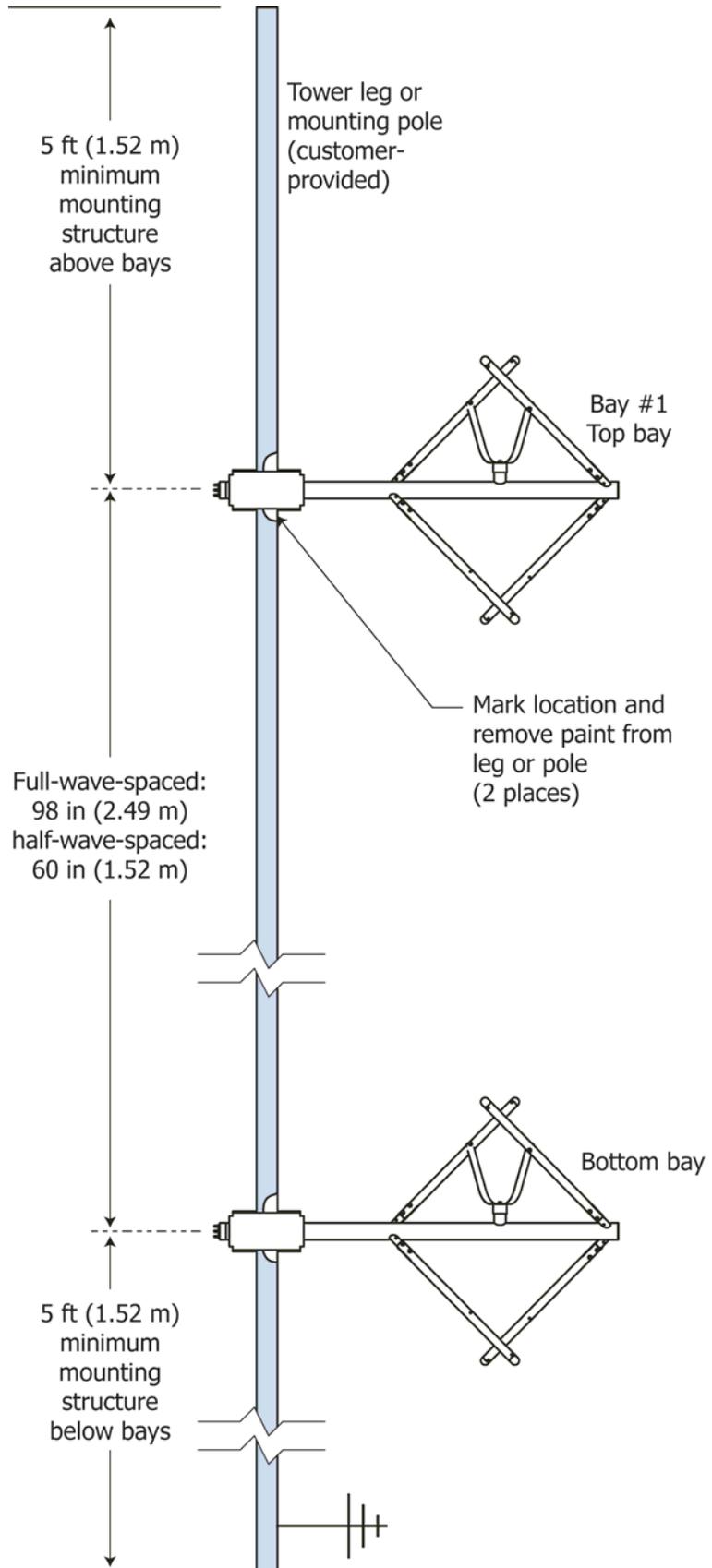
Preparation

Figure 1. Tower layout, single-bay antenna



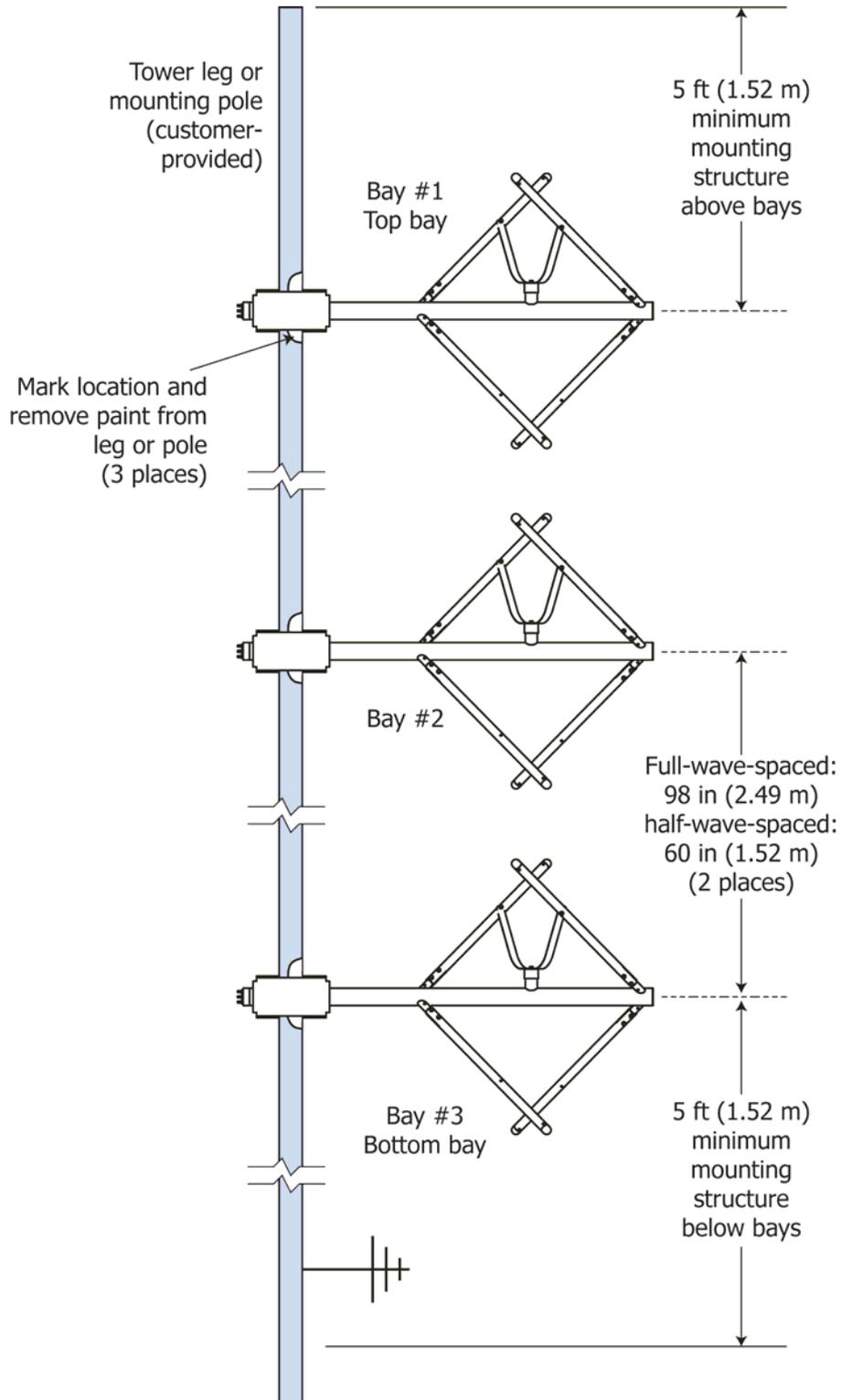
Preparation

Figure 2. Tower layout, two-bay antenna



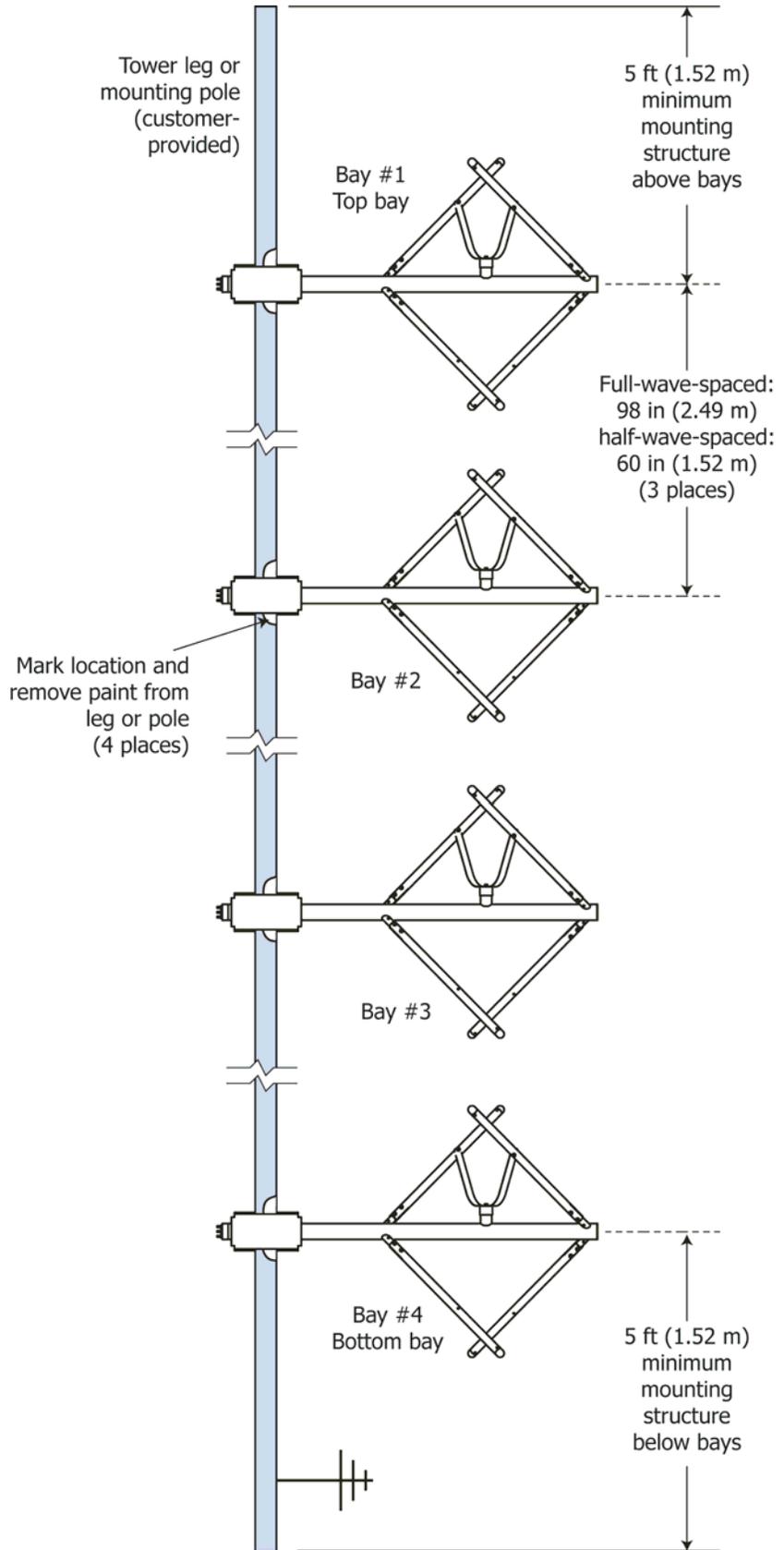
Preparation

Figure 3. Tower layout, three-bay antenna



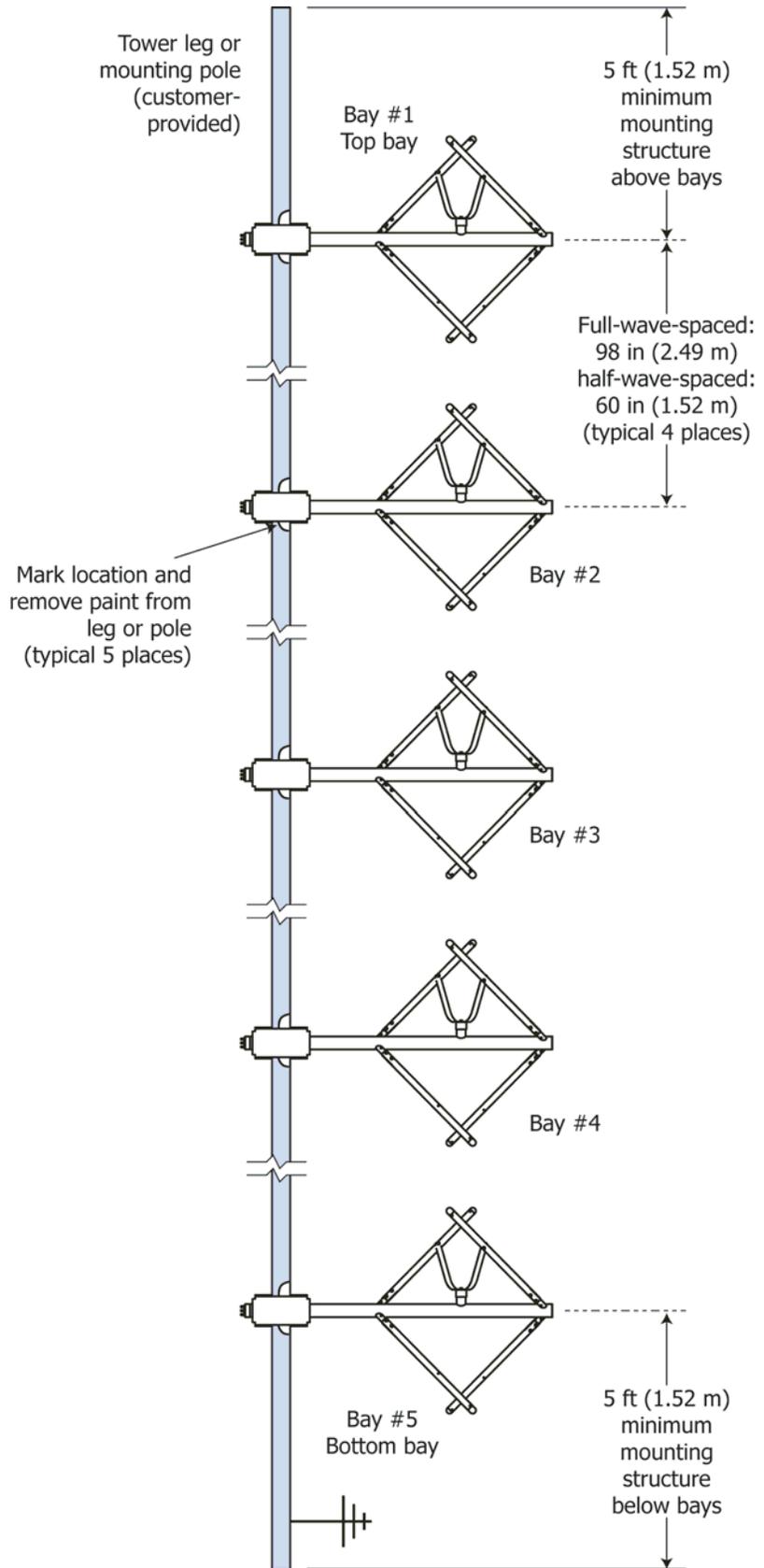
Preparation

Figure 4. Tower layout, four-bay antenna



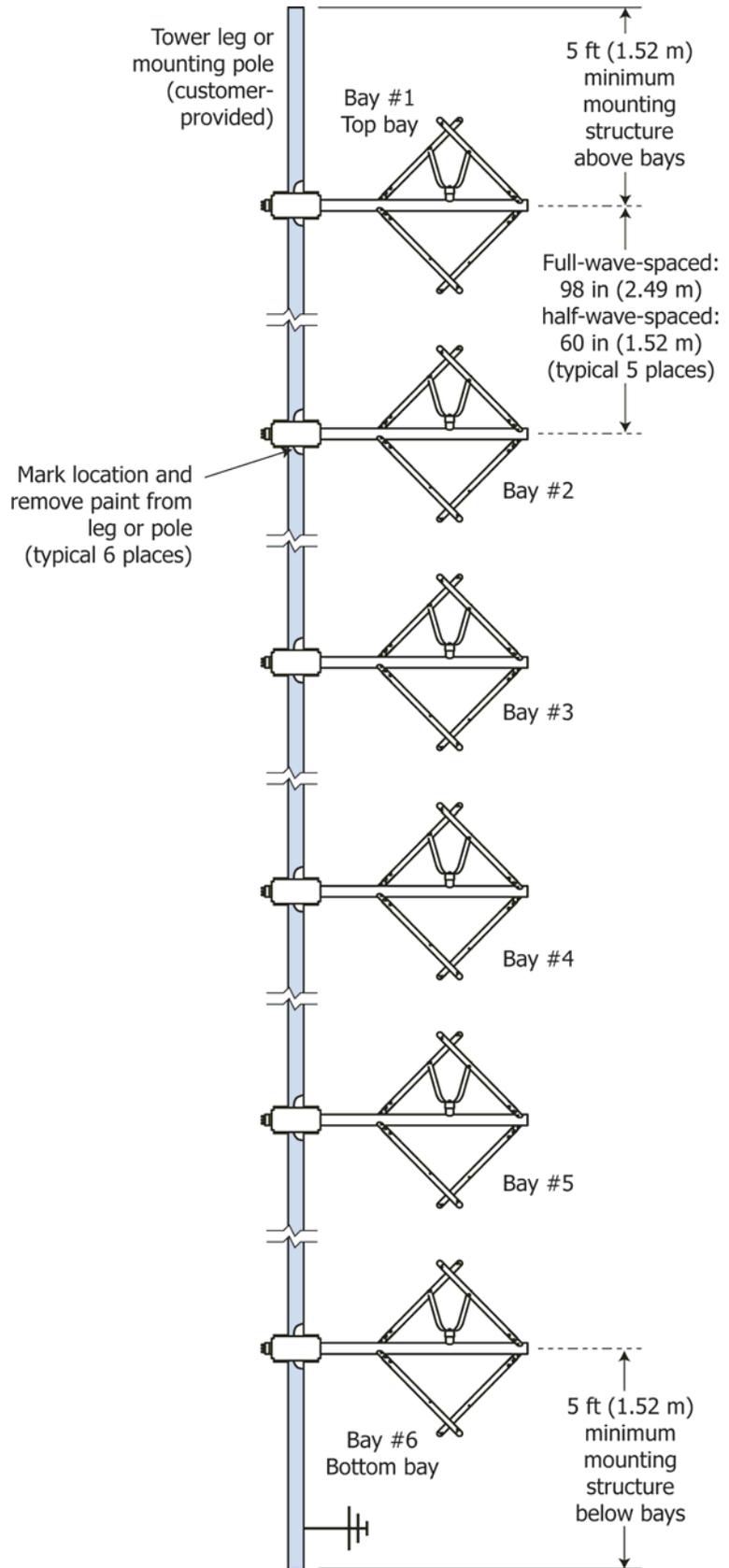
Preparation

Figure 5. Tower layout, five-bay antenna



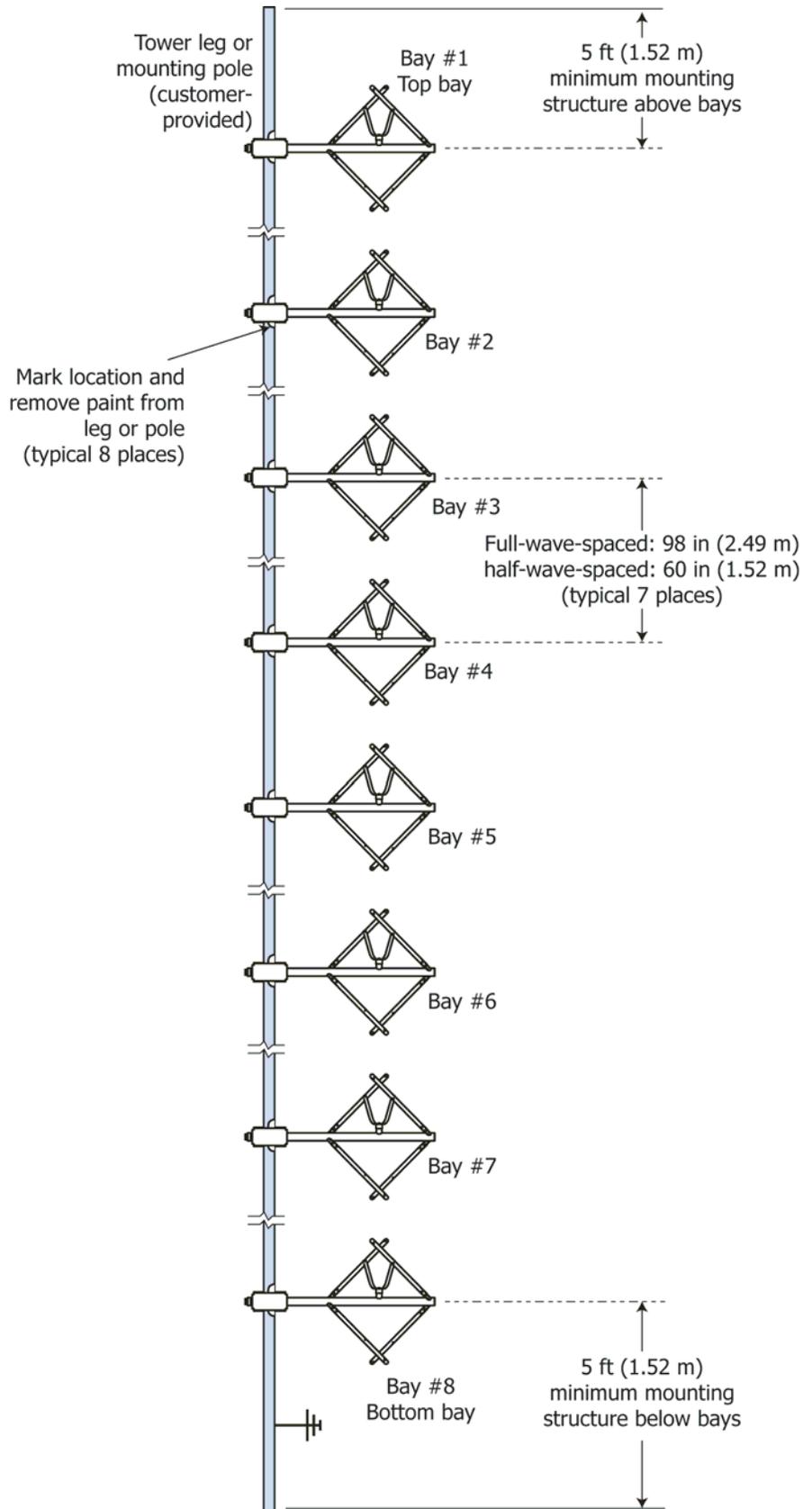
Preparation

Figure 6. Tower layout, six-bay antenna



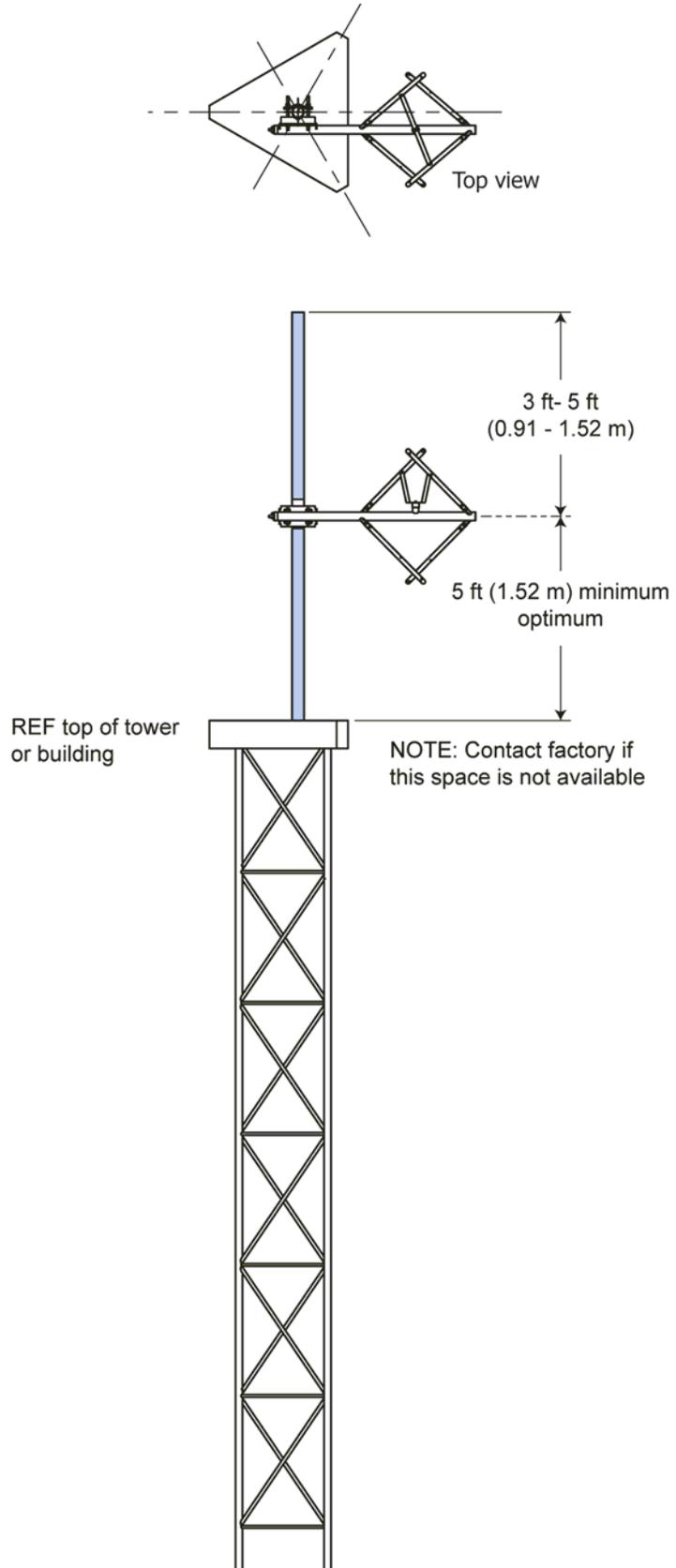
Preparation

Figure 7. Tower layout, eight-bay antenna



Preparation

Figure 8. Top mounted installation



Attach the bay arms (antennas without de-icers).

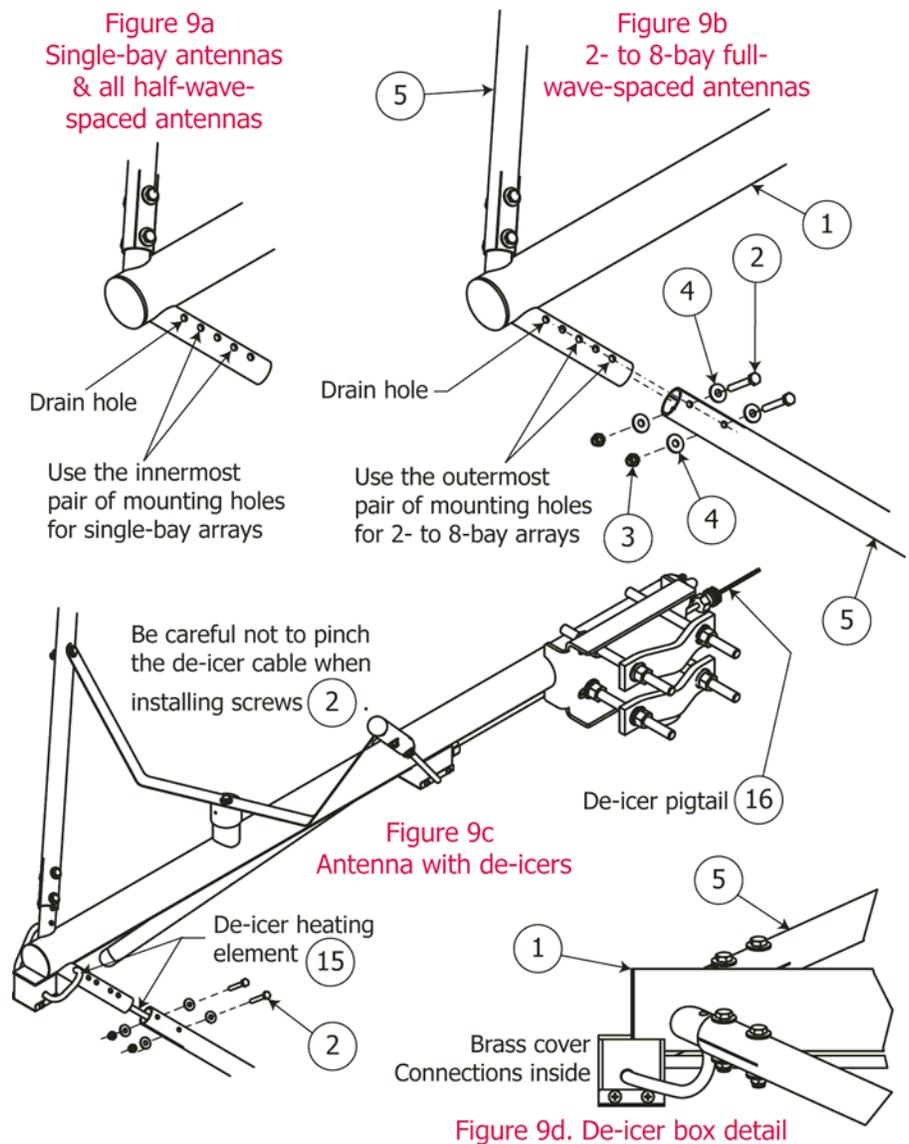
[for single bay antennas and 1/2-wave-spaced antennas only]

- a. Using 1/4-20 x 1-3/4" hardware (Figure 9a, 2, 3, and 4), attach the four antenna arms (5) to the innermost pair of holes on the boom (1) mounting stubs.

[for 2- to 8-bay full-wave-spaced antennas only]

- b. Using 1/4-20 x 1-3/4" hardware (Figure 9b, 2, 3, and 4), attach the four antenna arms (5) to the outermost pair of holes on the boom (1) mounting stubs.
- c. Tighten the hardware before continuing.

Figure 9. Attaching the arms



Attach the bay arms (antennas with de-icers).

The bay de-icer pigtail is shipped pre-assembled. Handle the de-icer components carefully to prevent damaging them when assembling the bay.

CAUTION

When installing the screws securing the arms to the stubs (Figure 9c), be very careful not to damage the bay de-icer heater (15) and pigtail (16) within.

[for single bay antennas and 1/2-wave-spaced antennas only]

- a. Using 1/4-20 x 1-3/4" hardware (Figure 9a, 2, 3, and 4), attach the four antenna arms (5) to the *innermost* pair of holes on the boom (1) mounting stubs.

[for 2- to 8-bay full-wave-spaced antennas only]

- b. Using 1/4-20 x 1-3/4" hardware (Figure 9b, 2, 3, and 4), attach the four antenna arms (5) to the *outermost* pair of holes on the boom (1) mounting stubs.
- c. Tighten the hardware before continuing.

Attach the feedstrap.

- a. If necessary, remove the bolt and washers (Figure 10, 6, 4, and 7) from the center of the endseal (the white plastic dome on the antenna mast).
- b. Using the endseal hardware you removed above, attach the center hole of the feedstrap (8) to the endseal, but do not tighten it fully yet.
- c. Using the 1/4-20 x 1-3/4" hardware (2, 3, and 4), attach the feedstrap ends to the inside of the antenna arms as shown. Tighten to 7 ft-lb.

NOTE

The feedstrap should cross the antenna mast at an angle of approximately 22° from perpendicular, as shown.

Important!

Do NOT twist the feedstrap with the endseal nut tightened. You may damage internal components.

- d. For antennas without radomes, grasp the flat sections near the center of the feedstrap, and twist it in a flat plane until the center section rests (the ends of the feedstrap will twist, as shown in Figure 10 - and it will spring back somewhat) crossing the antenna mast at a 84° - 90° angle.

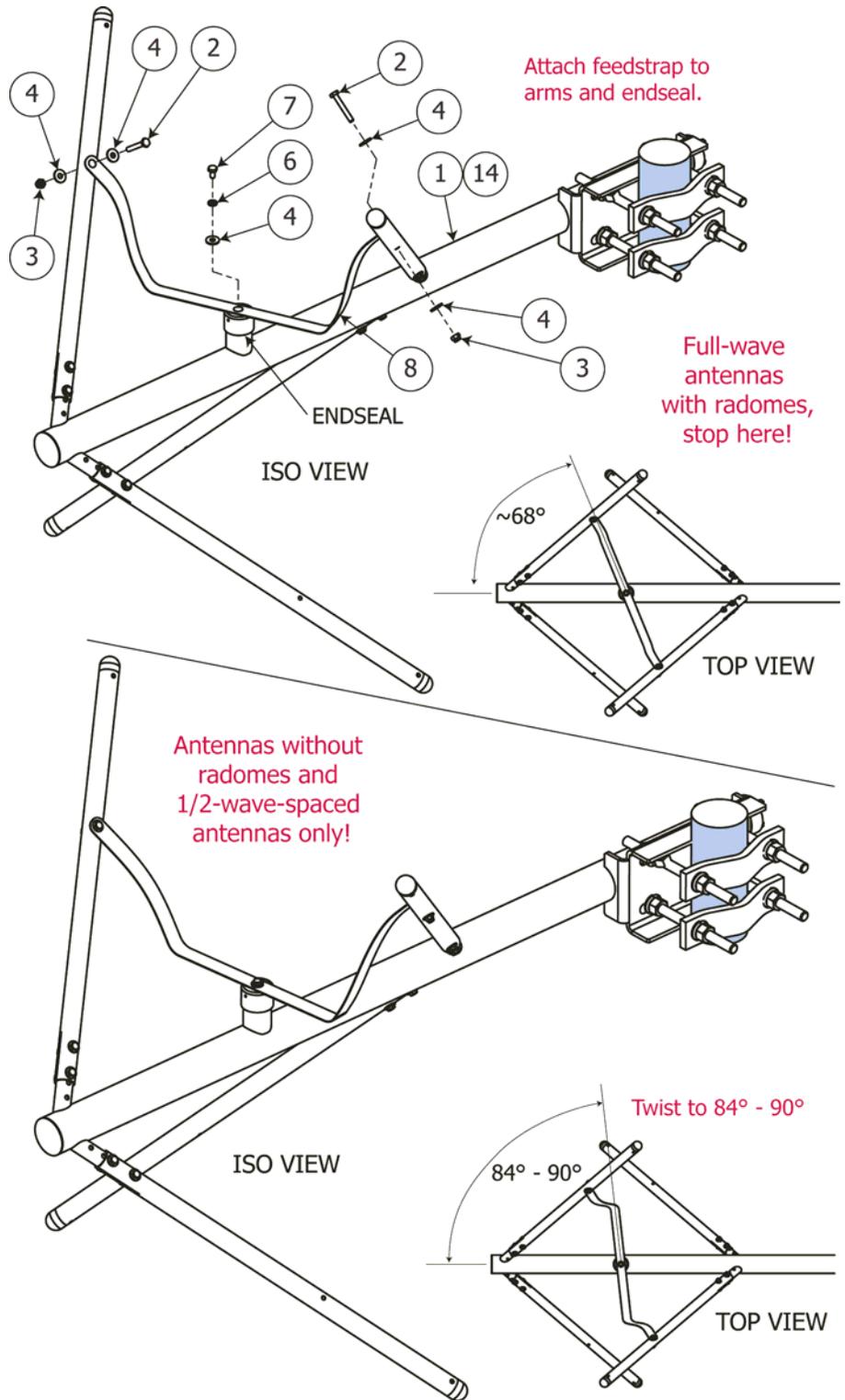
CAUTION

Tighten the endseal hardware only until the lock washer flattens. Do not overtighten.

- e. Tighten the endseal hardware.

Bay Assembly

Figure 10. Attaching the feedstrap



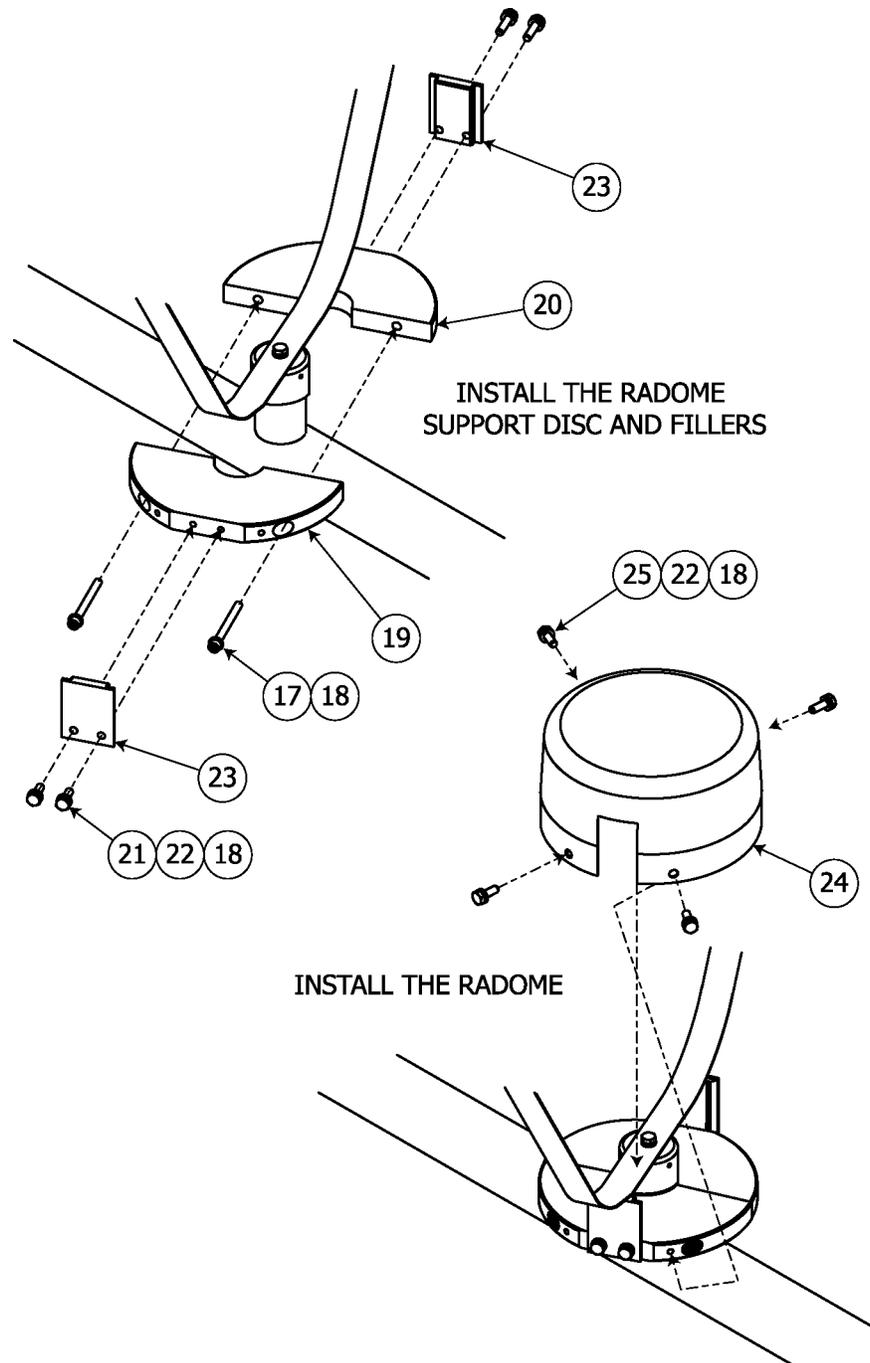
3

Endseal Radome Installation

Install the radome.

- a. Using 1/4-20 x 2-1/4" hardware (Figure 11, 17 & 18), assemble the radome support disc halves (19 & 20) around the base and up against the shoulder of the endseal.
- b. Using 1/4-20 x 1" hardware (21, 22 & 18), secure the radome fillers (23) to the edges of the support disc halves, aligning them with the antenna feedstrap.

Figure 11. Installing the endseal radome



Endseal Radome Installation

- c. Aligning its side slots with the notches in the fillers, slip the radome ([24](#)) over the fillers and onto the support disc. Secure it in place using the 1/4-20 x 3/4" hardware ([25](#), [22](#) & [18](#)).
- d. Seal the gaps around the fillers, using a room-temperature-vulcanizing (RTV) compound.

4

Mounting the Antenna Bay(s)

Mount the antenna bays.

WARNING

Whenever a rigger is on the tower in the area of the antenna, shut off the signal and lock it off so that it cannot be turned on accidentally. RF emissions at close range are hazardous.

CAUTION

Do not attach the bays together with the RF cable before mounting them. NEVER try to support the bays from the cable.

- a. Using the galvanized 5/8" hardware ([Figure 12](#), [9](#), [10](#), and [11](#)), attach the threaded rods ([12](#)) to the boom ([1](#)) brackets.

NOTE

Mount antenna bays with feed straps up, clear of all guylines and other obstructions.

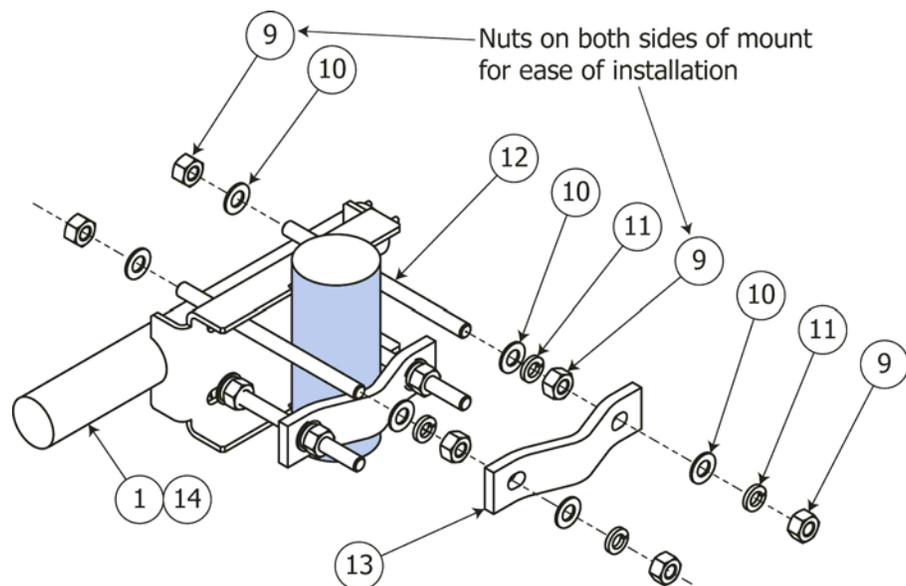
- b. Using the galvanized 5/8" hardware, attach the clamp halves ([13](#)) to the threaded rods ([12](#)), encircling the mounting pole as shown. Do not tighten the hardware fully yet.
- c. Repeat for the other antenna bay(s) as applicable.
- d. Ensure the bays are located on the mounting pole at the locations you marked.
- e. Align the bays to the correct azimuth and vertically with each other, then tighten the mounting hardware to 37 ft-lb.

NOTE

The Model 6842 does not require pressurization or purging. The feed system up to the bays may be pressurized.

Please proceed to [Connecting the Antenna \(single-bay\)](#) on page 25, [Connecting the Antenna \(2-bay\)](#) on page 27, or [Connecting the Antenna \(3-bay to 8-bay\)](#) on page 31 as applicable.

Figure 12. Bay mounting on pole



5 Installing the De-icer System (if applicable)

Precautions

WARNING
Installation should be performed only by personnel experienced in RF systems, qualified in electrical work, and familiar with this equipment.

WARNING

Don't expose personnel to the medical hazards of intense radio frequency (RF) radiation. Whenever working on the tower in the area of the antenna, turn off all transmitters and lock them out so that they cannot be turned on accidentally.

CAUTION

All parts of the de-icer system within approximately 20 feet (6 meters) of any radiator must be shielded from RF energy.

CAUTION

An improperly installed de-icer can overheat and damage your antenna.

De-icer system description

The de-icer system consists of the bay de-icer pigtails in the bays, their branch cables, and the main harness. The main harness consists of a bay junction box for each antenna bay, interbay cables, and a "pigtail" of wires about 10 feet (3 meters) long which you will connect to the tower junction box you are to provide. The following will help in installation:

- System electrical schematic: [Figure 13](#) on page 20.
- Electrical specifications: [Table 2](#) on page 21.
- Bay junction box: [Figure 14](#) on page 22.
- Thermostat readings: [Table 3](#) on page 23.

Your system may also include specially-ordered items, such as a ground-mounted main control box, a power cable extending up the tower, or a tower-mounted dual-setting thermostat.

Electric power

The de-icer system requires 220 VAC, 50 - 60 Hz., single-phase. [Table 2](#) shows approximate heater leg resistances and current draw, respectively.

Dual-setting thermostat

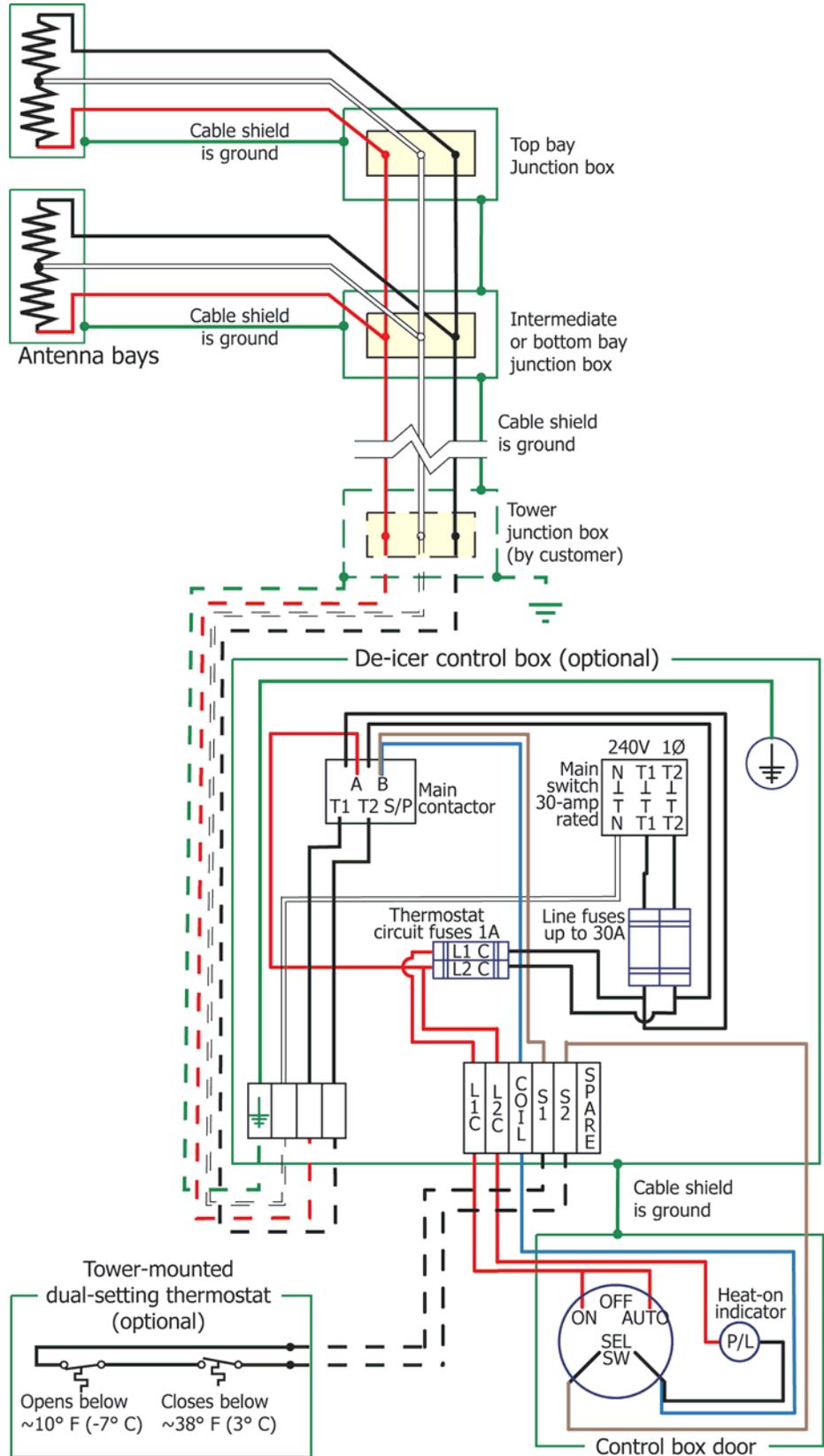
CAUTION

Remember that conditions may be favorable for icing on the tower, even if they are not on the ground.

Shively Labs deicers are designed to prevent ice from forming on antenna elements and are not designed to melt ice that has already formed. For this reason, Shively Labs recommends that the system be installed with a tower-mounted dual-setting thermostat assembly (Shively Labs Model 55522-G502) and de-icer control box (Shively Labs Model 94068) that ensure the deicers are operated in the temperature range ice is most likely to form.

Installing the De-icer System (if applicable)

Figure 13. De-icer electrical schematic diagram



NOTE

Customer-supplied items are shown in broken lines.

NOTE

A liquid-tight conduit connector (3/8" conduit size by 1/2" hub size) for the harness entry to the tower junction box, is packed loose with the de-icer harness.

NOTE

Shively recommends the use of shielded braided polyethylene-covered wire or rubber-sheathed flexible metal conduit and weather-tight fittings at all junctions.

Table 2. De-icer specifications

	Heater leg resistance, Ω	Heater leg (T1 or T2) current draw, amps
1-Bay	72	1.7
2-Bay	36	3.4
3-Bay	24	5
4-Bay	18	6.7
5-Bay	14.4	8.3
6-Bay	12	10
8-Bay, single circuit	9	13.3

De-icer installation

Installing the de-icer harness

- a. Install the main de-icer harness with its bay junction boxes as shown in [Figure 13](#) on page 20 and [Figure 14](#) on page 22. Connect the leads from each bay's de-icer pigtail to the main harness in that bay's junction box as shown.

CAUTION

It is important to ground both the tower junction box and the control box, as shown in the schematic diagrams.

- b. Furnish a tower junction box as shown schematically in [Figure 13](#) to connect the antenna's de-icer harness to the main power.
- c. Using tie-wraps, secure the entire length of the de-icer harness to the RF feedline at about 24" (60 cm) intervals. Run the ten-foot de-icer pigtail along a feedline mount to the tower junction box and secure it to the mount and the tower.

Installing the thermostat (if applicable)

If you are using a thermostat, you may locate and mount it at your discretion. We recommend mounting it as close as practical to the antenna.

CAUTION

Shively Labs's de-icer control box, Model 94068, is designed for interior installation only.

CAUTION

When testing the thermostat, be sure to have one or both thermostat leads disconnected before taking resistance readings. Otherwise, readings may be affected by other components.

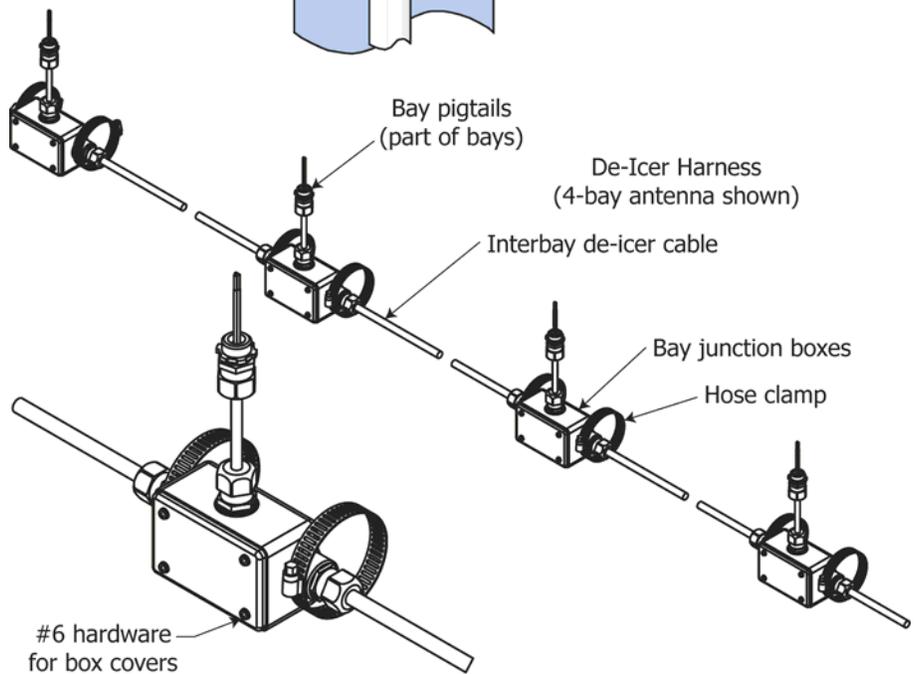
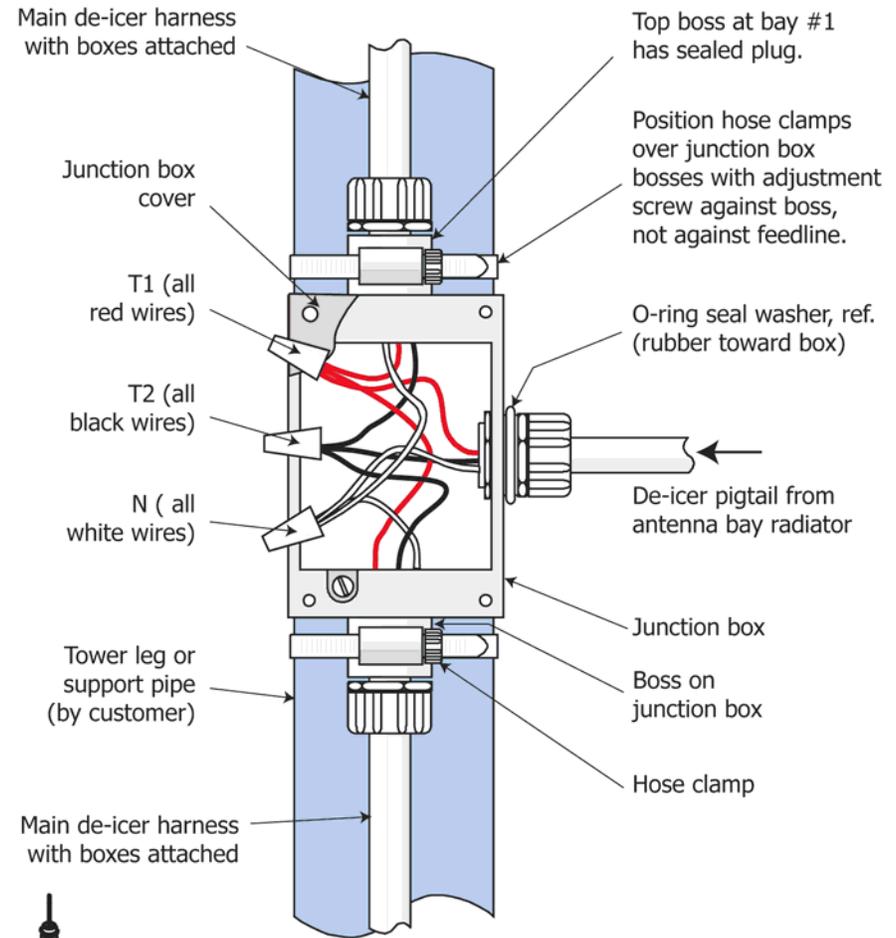
- a. Before you connect the thermostat, measure the resistance across the thermostat circuit and from it to ground to ensure that there are no short-circuits. Thermostat readings should be as shown in [Table 3](#) on page 23.
- b. Mount the thermostat near the antenna and connect the thermostat leads to points S1 and S2 in the control box as shown in the schematic diagram, [Figure 13](#) on page 20.

Installing the De-icer System (if applicable)

Figure 14. Bay junction box installation

NOTE

Wire nuts, cover with screws, and gaskets, and tie-wraps are provided with the de-icer cable harness.



Installing the De-icer System (if applicable)

Table 3. Thermostat readings

Reading Location	Ambient Temperature	Resistance = 0 ohms (short circuit)	Resistance = infinite ohms (open circuit)
Leg-to-Ground	Any	Defective thermostat or shorted leads	OK
Leg-to-Leg	Above about 38° F (3.3° C)	Defective thermostat or shorted leads	OK
	Between about 10° and about 38° F (-6.7° to 3.3° C)	OK	Defective thermostat or broken leads
	Below about 10° F (-6.7° C)	Defective thermostat or shorted leads	OK

6

Connecting the Antenna (single-bay)

Connect the antenna bay.

- a. Provide a gas stop between the tower transmission line and the antenna input if necessary. The antenna bay is not pressurized. The feed system up to the bay may be pressurized.

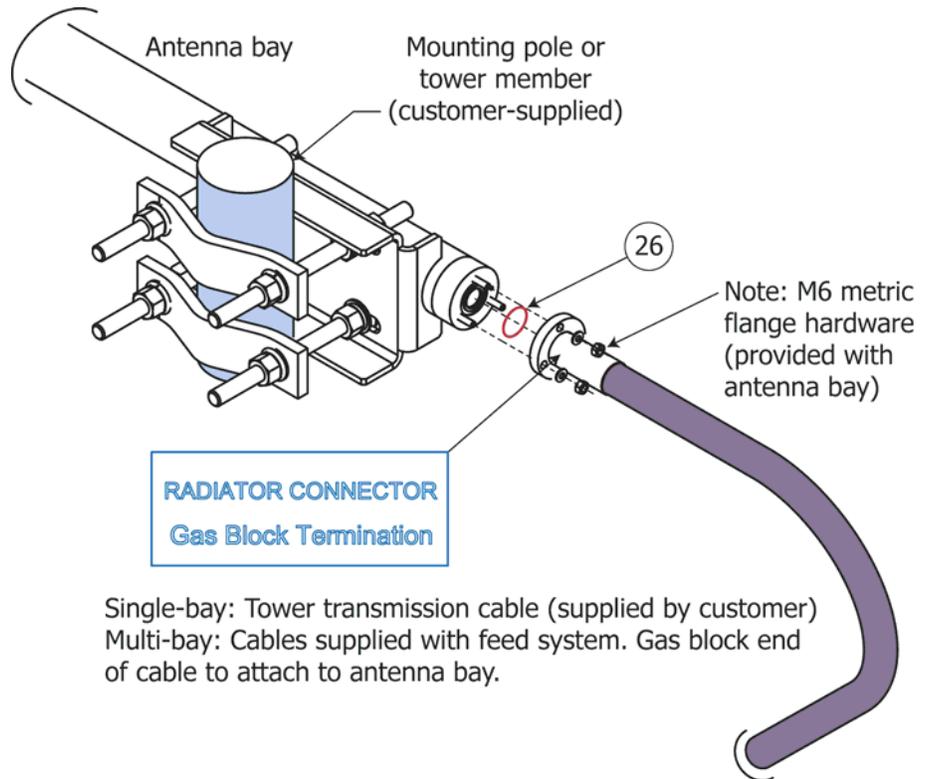
CAUTION

All O-rings are made of silicone. Do not lubricate them with silicone grease, as this will soften the O-ring. Use only a light lubricating coat of O-Lube (provided) or petroleum jelly; too much may hamper electrical contact and contaminate the interior of the system.

Be sure the O-ring is properly seated in its groove and not pinched between the flange contact surfaces.

- b. Coat the flange O-ring (Figure 15, 26) lightly with O-Lube, then install it in the O-ring groove in the flange.
- c. Before connecting the cable to the radiator, make sure an inner conductor connector is in place in the inner conductor of the input flange.

Figure 15. Single bay antenna connection



Connecting the Antenna (single-bay)

- d. Using the M6 metric nuts (provided with the bay), connect the tower transmission cable to the antenna bay input ([Figure 15](#)). Be sure the connection is tight.
- e. Loop or drape any excess cable and secure it to the pole, using tie-wraps () or customer-supplied clamps, to prevent wind damage to the cables and to ensure the weight of the cable is not carried by the antenna input.

NOTE

The Model 6842 bay does not require pressurization or purging.

Installation of your Model 6842 single-bay is now complete. Please proceed to [Startup](#) on page 35.

7

Connecting the Antenna (2-bay)

Mount the power divider.

- a. Using two power divider mount kits ([Figure 17, 30](#)), mount the two-way power divider ([29](#)) to the mounting structure, with its outlet ports roughly halfway along the antenna array. Locate the mounts as close to the ends of the power divider as you can.
-

Connect the antenna cables.

CAUTION

All O-rings are made of silicone. Do not lubricate them with silicone grease, as this will soften the O-ring. Use only a light lubricating coat of O-Lube (provided) or petroleum jelly; too much may hamper electrical contact and contaminate the interior of the system.

Be sure the O-ring is properly seated in its groove and not pinched between the flange contact surfaces.

- a. Coat each O-ring ([Figure 16, 26](#)) lightly with O-Lube (supplied with the antenna), then install it in the O-ring groove in the flange.
- b. Before connecting each flange, make sure an inner conductor connector is in place in the inner conductor of the flange.

CAUTION

Do not overtighten the flange nuts. Overtightening may damage them.

- c. Using the 7/8" EIA flange hardware kits ([Figure 17, 27](#)), connect the unlabeled input ends of the antenna bay cables ([31](#)) to the power divider outputs. Tighten flange nuts evenly in accordance with [Table 1](#) on page 1.

CAUTION

Stressing a coax connection after assembly can detune the system. Therefore, never make a connection and then bend or twist the cable, or use the flange to force the coax into shape. Form the cable first, then attach it to the flange.

CAUTION

The minimum bending radius for 1/2" coax is 10" (0.25 m). Do not bend it too tightly; you may damage it.

- d. Using the M6 metric nuts (provided with the bay), connect the output ends (labeled "Gas Block Termination") of the antenna bay cables to the antenna bay input flanges.
 - e. Secure the cables to the mounting pole or tower leg, using tie-wraps ([28](#)) or customer-supplied cable clamps.
-

Install the optional fine-matching transformer (if applicable)

One of the unique features of Shively Labs antenna systems is the adjustable impedance-matching transformer ([Figure 20, 57](#)) available with the antenna. It allows the installer to compensate for changes in the input impedance caused by the installation (tower, conduit, ladder, etc.).

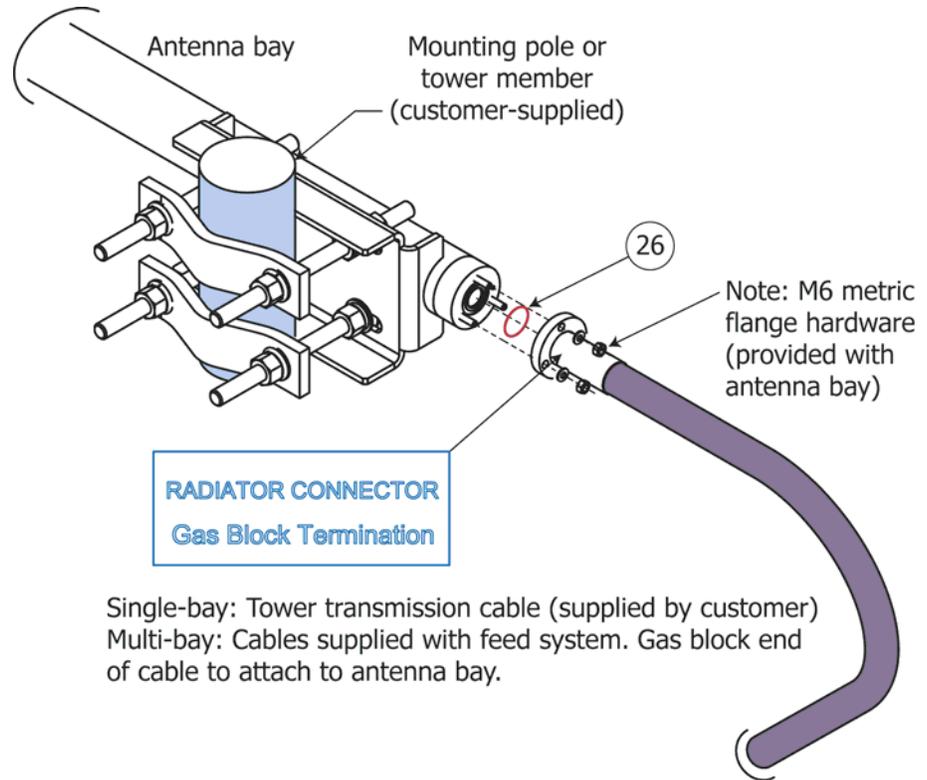
NOTE

The transformer may be oriented in whichever direction you wish. Make it easy for yourself to reach for adjustment at startup.

Install the transformer at your antenna array input. This will be at the input flange of the power divider ([29](#)). Transformer mounts are generally similar to feedline mounts and should be installed in the same manner.

Connecting the Antenna (2-bay)

Figure 16. Bay cable connection



Connect the tower transmission line.

- Provide a gas stop between the tower transmission line and the power divider (or transformer) if necessary. The antennas bays are not pressurized. The feed system up to the power divider may be pressurized.
- Using an lightly lubricated O-ring (32) and the 1-5/8" EIA flange hardware kit (33), attach the tower transmission cable to the power divider (or transformer) input. Tighten in accordance with [Table 1](#) on page 1.
- Secure all the cables to the mounting pole or tower leg, using tie-wraps () or customer-supplied cable clamps.
- Loop or drape any excess cable and tie-wrap it to the pole, to prevent wind damage to the cables and to ensure the weight of the cable is not carried by the antenna input.

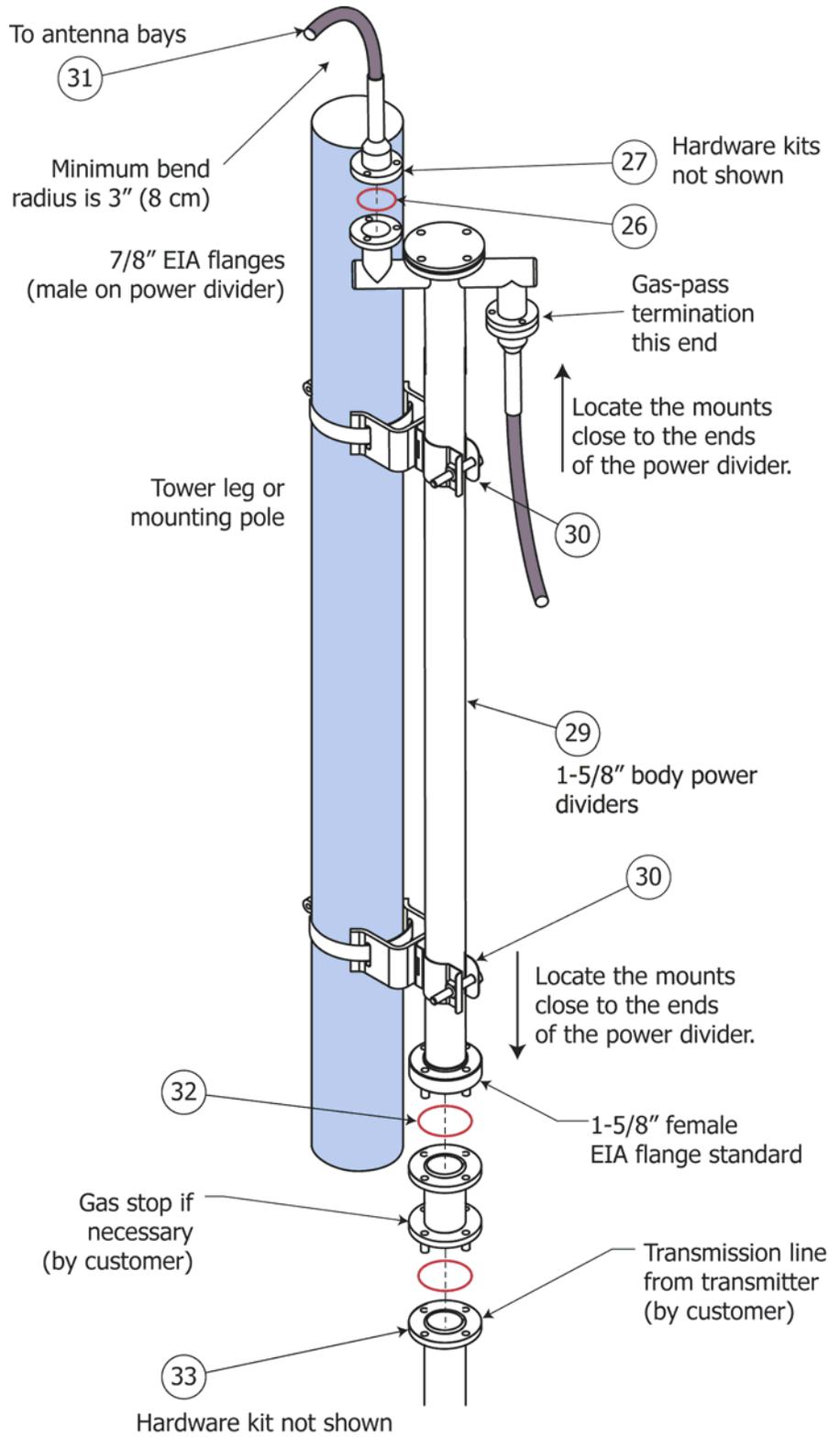
NOTE

The Model 6842 antenna does not require pressurization or purging. The feed system up to the power divider may be pressurized.

Installation of your Model 6842 2-bay is now complete. Please proceed to [Startup](#) on page 35.

Connecting the Antenna (2-bay)

Figure 17. Two-way power divider, mounted and connected



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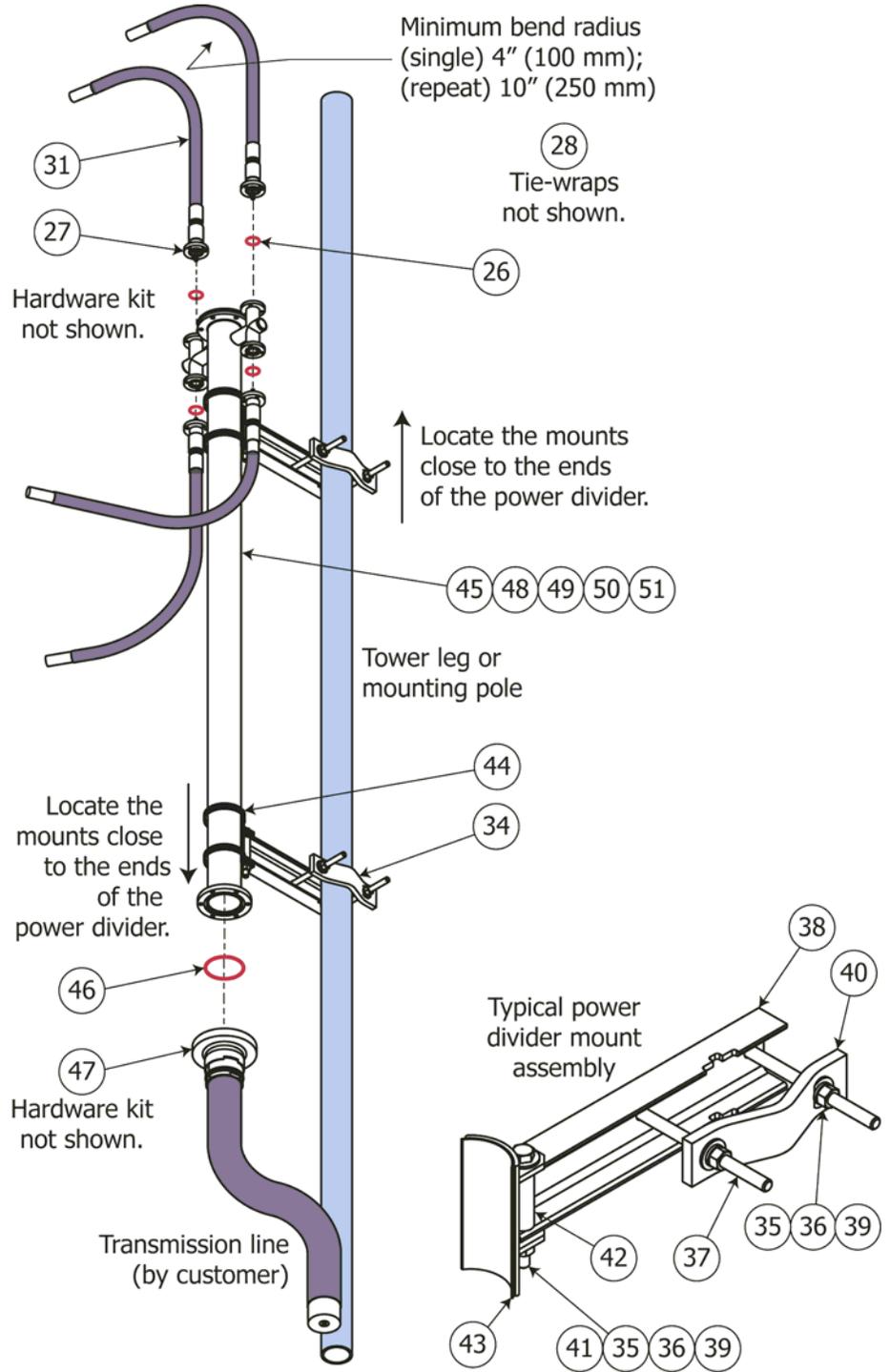
Connecting the Antenna (3-bay to 8-bay)

Mount the power divider.

Figure 18. Power divider, mounted and connected

- a. Assemble the power divider mounts (Figure 18, 34):
 - (1) Using 1/2" stainless hardware (35 and 36), attach the threaded rods (37) to the mount channel (38).

3-1/8" four-way power divider shown. 5-way, 6-way, 7-way, and 8-way power dividers are similar.



Connecting the Antenna (3-bay to 8-bay)

- (2) Using 1/2" stainless hardware ([35](#), [36](#), and [39](#)), attach the clamp half ([40](#)) loosely to the threaded rods.
 - (3) Using 1/2" stainless hardware ([41](#), [35](#), [36](#), and [39](#)) and the spacer ([42](#)), attach the saddle assembly ([43](#)) to the mount base.
 - (4) Repeat for the other mount assembly.
- b. Using the hose clamps ([44](#)), attach the mounts to the three-way ([45](#)), four-way ([48](#)), five-way ([49](#)), six-way ([50](#)), or eight-way ([51](#)) power divider. Locate the mounts as close to the ends of the power divider as you can.
 - c. Mount the power divider to the mounting pole, with its outlet ports roughly halfway along the antenna array. Secure it using the clamp halves ([40](#)) to encircle the mounting pole as shown.

Install the optional fine-matching transformer (if applicable)

One of the unique features of Shively Labs antenna systems is the adjustable impedance-matching transformer (see [Figure 20](#)) optionally available with the antenna. It allows the installer to compensate for changes in the input impedance caused by the installation (tower, conduit, ladder, etc.).

NOTE

The transformer may be oriented in whichever direction you wish. Make it easy for yourself to reach for adjustment at startup.

Install the transformer at your antenna array input. This will be at the input flange of the power divider ([29](#), [45](#), [48](#), [49](#), [50](#), or [51](#)). Transformer mounts are generally similar to feedline mounts and should be installed in the same manner.

Connect the antenna cables.

CAUTION

All O-rings are made of silicone. Do not lubricate them with silicone grease, as this will soften the O-ring. Use only a light lubricating coat of O-Lube (provided) or petroleum jelly; too much may hamper electrical contact and contaminate the interior of the system.

Be sure the O-ring is properly seated in its groove and not pinched between the flange contact surfaces.

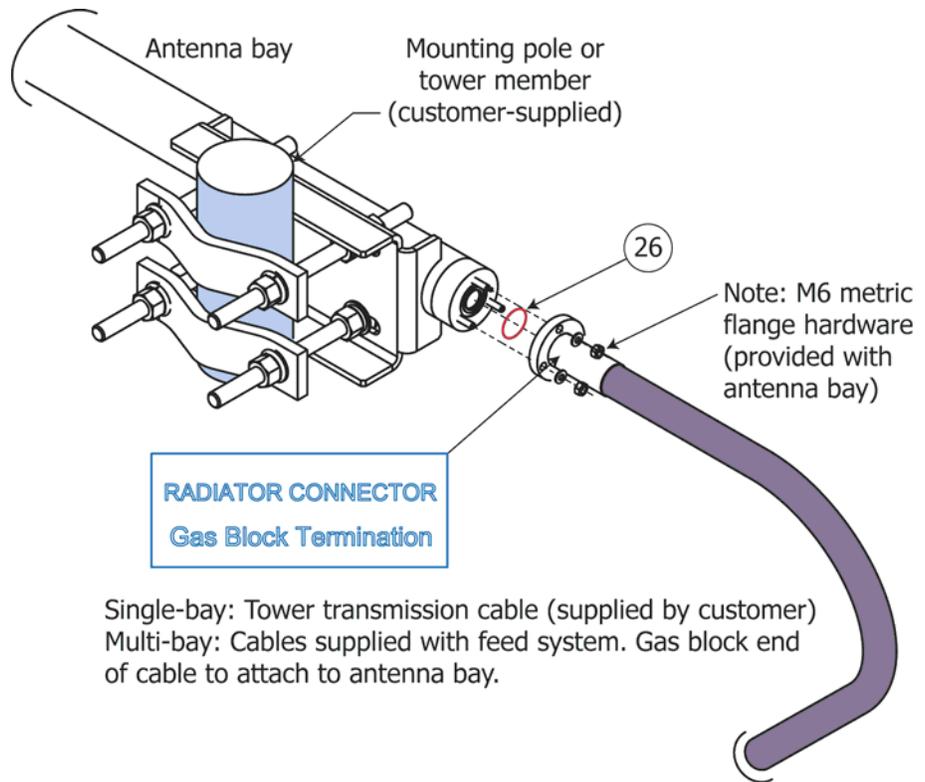
- a. Coat each O-ring ([Figure 20](#) on page 36, [26](#)) lightly with O-Lube (supplied with the antenna), then install it in the O-ring groove in the flange.
- b. Before connecting each flange, make sure an inner conductor connector is in place in the inner conductor of the flange.

CAUTION

Do not overtighten the flange nuts. Overtightening may damage them.

- c. Using the 7/8" EIA flange hardware kits ([27](#)), connect the unlabeled input ends of the antenna bay cables ([31](#)) to the power divider outputs. Tighten flange nuts in accordance with [Table 1](#) on page 1.

Figure 19. Bay cable connection



CAUTION

Stressing a coax connection after assembly can detune the system. Therefore, never make a connection and then bend or twist the cable, or use the connector to force the coax into shape. Form the cable first, then attach it to the connector.

CAUTION

The minimum single bending radius for HCA78-50J coax is 4" (100 mm). The repeated bending radius is 10" (250 mm). Do not bend it too tightly; you may damage it.

- d. Using the M6 metric nuts (provided with the bay), connect the output ends (labeled "Gas Block Termination") of the antenna bay cables to the antenna bay input flanges.
- e. Secure the cables to the mounting pole or tower leg, using tie-wraps (29) or customer-supplied cable clamps.

Connect the tower transmission line.

- a. Provide a gas stop between the tower transmission line and the power divider (or transformer) if necessary. The antenna bays are not pressurized. The feed system up to the power divider may be pressurized.
- b. Coat the O-ring (46) lightly with O-Lube (supplied with the antenna), then install it in the O-ring groove in the flange.
- c. Using the 3-1/8" EIA flange hardware kit (47), attach the tower transmission cable to the power divider (or transformer) input. Tighten in accordance with Table 1 on page 1.
- d. Secure the cables to the mounting pole or tower leg, using tie-wraps or customer-supplied cable clamps.

Connecting the Antenna (3-bay to 8-bay)

- e. Loop or drape any excess cable and tie-wrap it to the pole, to prevent wind damage to the cables and to ensure the weight of the cable is not carried by the antenna input.

NOTE

The Model 6842 antenna does not require pressurization or purging. The feed system up to the power divider may be pressurized.

Installation of your Model 6842 3- to 8-bay is now complete. Please proceed to [Startup](#) on page 35.

Before beginning initial characterization:



We strongly recommend initial characterization as the best way to identify both initial problems and possible future system damage.

Important

In the days before the hazards of intense RF power were realized, it was common practice to have a technician climb the tower and adjust the impedance match using the transmitter as a signal source and reading the VSWR or return power on the transmitter. This practice **MUST NOT** be used, as few transmitters can be operated at a low enough power level to avoid exposing the rigger to an unsafe RF level. For reference, see 29 CFR, Section 1910.97, the OSHA standard for exposure to non-ionizing radiation.

To test and adjust VSWR safely, use low-power test equipment, such as a network analyzer. If you don't have access to low-power test equipment, please call Shively Labs before proceeding.

WARNING

Whenever a rigger is on the tower in the area of the antenna, shut off the transmitter signal and lock and tag it out so that it cannot be turned on accidentally.

Low-power test equipment should be used to prevent excessive radiation exposure to the person doing the adjusting.

A high transmission line VSWR may indicate damaged transmission line and is likely to cause problems in the future, including serious damage to your equipment.

Read transmission line VSWR.

The first step is to characterize the transmission line by itself

- a. Briefly disconnect the transmission line from the antenna system input. Seal the antenna system input to prevent the entry of moisture.
- b. Terminate the coax transmission line in an instrument-quality 50-ohm load.
- c. Measure and record the voltage standing wave ratio (VSWR) across the operating band. File this information with this manual for future reference.
- d. The VSWR of the transmission line should be within the manufacturer's specifications. If it is, proceed. If not, you should call the manufacturer before connecting the antenna. Problems must be worked out with the design engineer on a case-by-case basis.

Read transmission line TDR.

With the transmission line still terminated in 50 ohms, make a time domain reflectometer (TDR) plot. Label and file the plot with this manual.

Read system VSWR.

You tested the VSWR of the transmission line alone. Now test the VSWR of the system as a whole.

- a. Remove the load and connect the transmission line to the antenna system input.
- b. Measure VSWR. VSWR at this point should be around 1.3 : 1 or better. If it is not, check to be sure all the radiators are functioning (below).

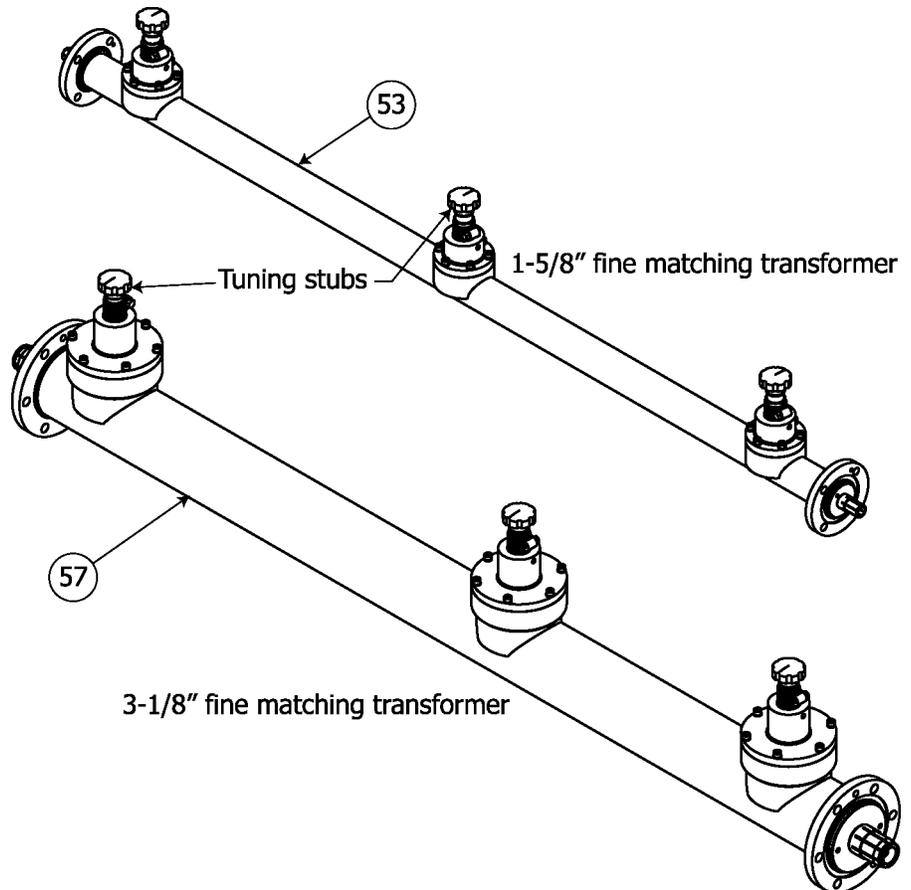
- c. Record the reading and file it with this manual.

Trim impedance.

If your antenna is equipped with the optional Shively fine-matching transformer, adjust the transformer (Figure 20, 53 or 57) as follows:

- a. Loosen the hose clamps on the tuning stubs enough to allow the stubs to move.
- b. Grasp one of the tuning stubs and slide it in or out about 1/4 inch or 6 millimeters. It will move stiffly because of O-ring friction.

Figure 20. Impedance-matching transformer



- c. Read the VSWR. If the reading went down, move the control rod again in the same direction. If the VSWR went up, move the same rod in the opposite direction. Repeat until no further improvement is seen.
- d. Adjust the second and third tuning stubs in the same manner.

NOTE

If you get "lost," return all three tuning stubs to the factory setting (all the way out) and start over.

- e. Return to the first tuning stub, and so forth, until you have the lowest possible VSWR or return power reading. This is the optimal transformer setting at this frequency.
- f. VSWR for each frequency at this point should be below 1.2 : 1. If it is not, call Shively Labs to help identify the problem.

Startup

- g. When you have set the transformer, use a sharp point to scribe the shaft of each control rod where it leaves the flange collar. Record the settings of the control rods and file this information with this manual for future reference.
- h. Tighten the hose clamps. If the clamps are left loose, vibration may change the adjustments.

Before beginning checkout:

Before beginning checkout of the antenna system, be sure the following items have been done:

- The antenna system has been installed in accordance with this manual and the installation drawing.
- All radiators are operating and VSWR is within specification.
- The initial characterization data have been recorded.
- The system is gas-tight, purged, and pressurized.

Check out.

Check the system out as follows:

- a. Bring up RF power slowly and observe transmitter readings, stability, and general operation.
- b. Run at about half power for at least an hour, reading forward and reflected power, stability, etc.
- c. If the system is stable and seems to be operating properly, bring it up to full power. Take initial readings, and repeat the readings periodically.

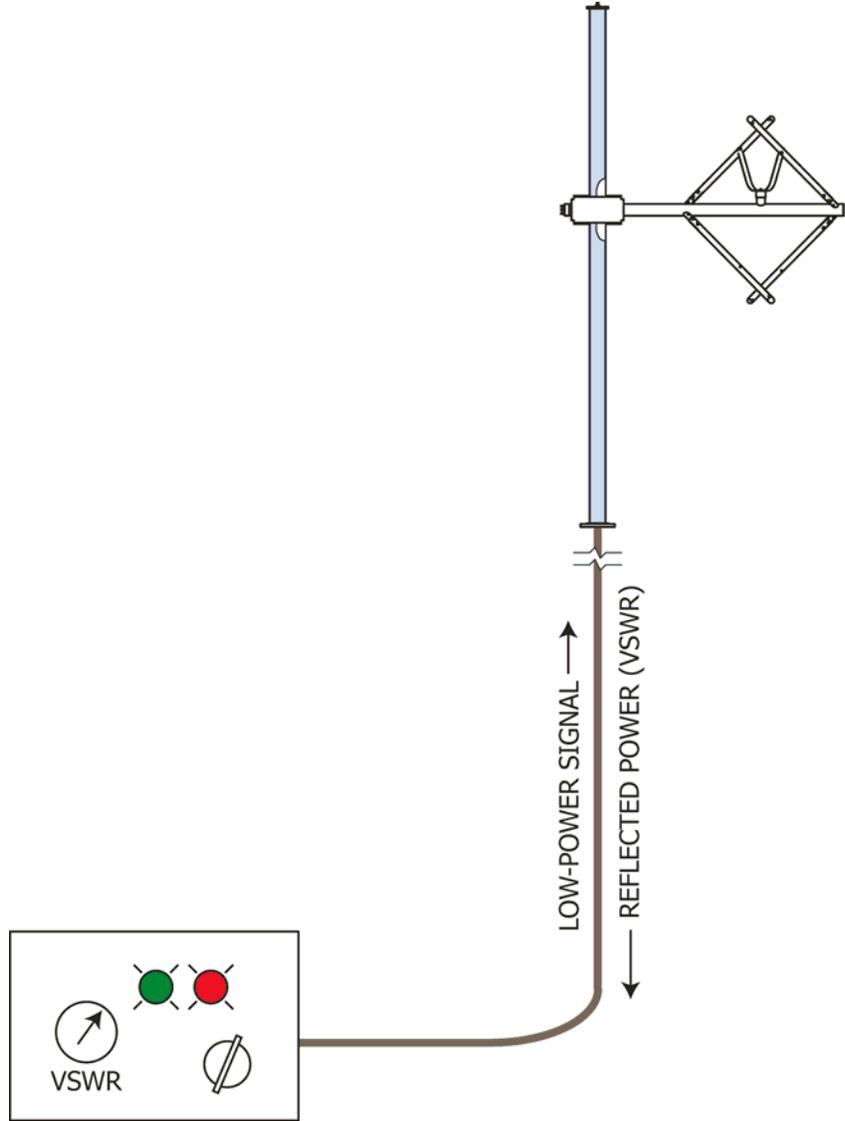
Performance readings should not change, and there should be no evidence of abnormal heating in the antenna system.

If any problem is found, fix it now. Call Shively Labs if you need help or advice.

Operate.

Once the antenna has been installed and VSWR has been optimized, simply apply the transmitter signal. Don't exceed the rated power of the antenna.

Figure 21. Apply the signal.



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Maintenance

**WARNING**

Whenever a rigger is on the tower in the area of the antenna, shut off the signal and lock it off so that it cannot be turned on accidentally. RF emissions at close range are hazardous.

Log

We recommend that you keep a log of VSWR readings and any other performance notes and maintenance history for your antenna. Such a record can be invaluable for troubleshooting.

Inspection

Whenever a rigger is on the tower for any reason, it is a good idea to have him check your antenna for general condition, looseness of connectors and mounts, and electrical damage.

Paint

The radiator should never be painted; this will affect the VSWR.

Return policy

When returning any material to the factory, be sure to call your salesperson and obtain an returned materials authorization (RMA) number first. Material may be refused and sent back to you at your expense if you don't do this.

Troubleshooting**Broad spectrum RF noise.**

This indicates that some component is not in good electrical contact with the tower. Make sure mounts are tight, that tower paint has been removed from under the mounts, and that components of other systems are likewise in good contact with the tower.

High VSWR

This is caused by any factor that changes the impedance match between the antenna and the transmitter. Look for:

- Defective RF connector. Make sure connectors are in good shape, and that center pins are not bent over.
- Damage to any antenna components.
- Paint on radiators.
- Ice buildup on radiators.
- Interference from other tower components, especially components broken by wind or ice.

Change in coverage

This may be caused by the same factors that can cause high VSWR. Look for VSWR changes as well.

Do recognize, however, that apparent changes in coverage may be due to subjective factors or faults of the receiving equipment. Before doing more than checking the VSWR, be sure that an actual coverage change has occurred.

Bay components

Table 4. Components, 6842 bay without de-icers (per antenna bay)

Part Number	Description	Qty.
1. 99718-G504	Bay assembly with arms & mounting bracket	1
2. 01/4-20SS028HM	• Screw, hex head 1/4-20 x 1-3/4" SS	10
3. 01/4-20SSN	• Nut, 1/4-20 locking SS	10
4. 01/4SSF	• Washer, flat 1/4" regular SS	21
5. 99744-G501	• Arm weldment	4
6. 1/4SSS	Washer, split lock 1/4" SS	1
7. 01/4-20SS008HM	Screw, hex head 1/4-20 x 1/2" SS	1
8. 99745-01 formed	Feedstrap, formed	1
9. G58NUT	Nut, hex 5/8-11 heavy galvanized	12
10. GR58FW	Washer, flat 5/8 heavy galvanized	12
11. G58LW	Washer, split lock 5/8" galvanized	8
12. G58R-10	Rod, full threaded 5/8-11 galvanized	4
13. DCP	Clamp half, 5.75" bolt spacing	2

Table 5. Components, 6842 bay with de-icers (per antenna bay)

Part Number	Description	Qty.
14. 99718-G504	Bay assembly with arms, mounting bracket, and de-icers	1
2. 01/4-20SS028HM	• Screw, hex head 1/4-20 x 1-3/4" SS	10
3. 01/4-20MSN	• Nut, 1/4-20 locking SS	10
4. 01/4SSF	• Washer, flat 1/4" regular SS	21
5. 99744-G501	• Arm weldment	4
15. 97353-11	• Element, de-icer heater	
16. 51299-G506	• Pigtail, bay deicer	1
6. 1/4SSS	Washer, split lock 1/4" SS	1
7. 01/4-20SS016HM	Screw, hex head 1/4-20 x 1" SS	1
8. 99745-01 formed	Feedstrap, formed	1
9. G58NUT	Nut, hex 5/8-11 heavy galvanized	12
10. GR58FW	Washer, flat 5/8 heavy galvanized	12
11. G58LW	Washer, split lock 5/8" galvanized	8
12. G58R-10	Rod, full threaded 5/8-11 galvanized	4
13. DCP	Clamp half, 5.75" bolt spacing	2

Parts

Figure 22. Components, 6842 bay without endseal radome

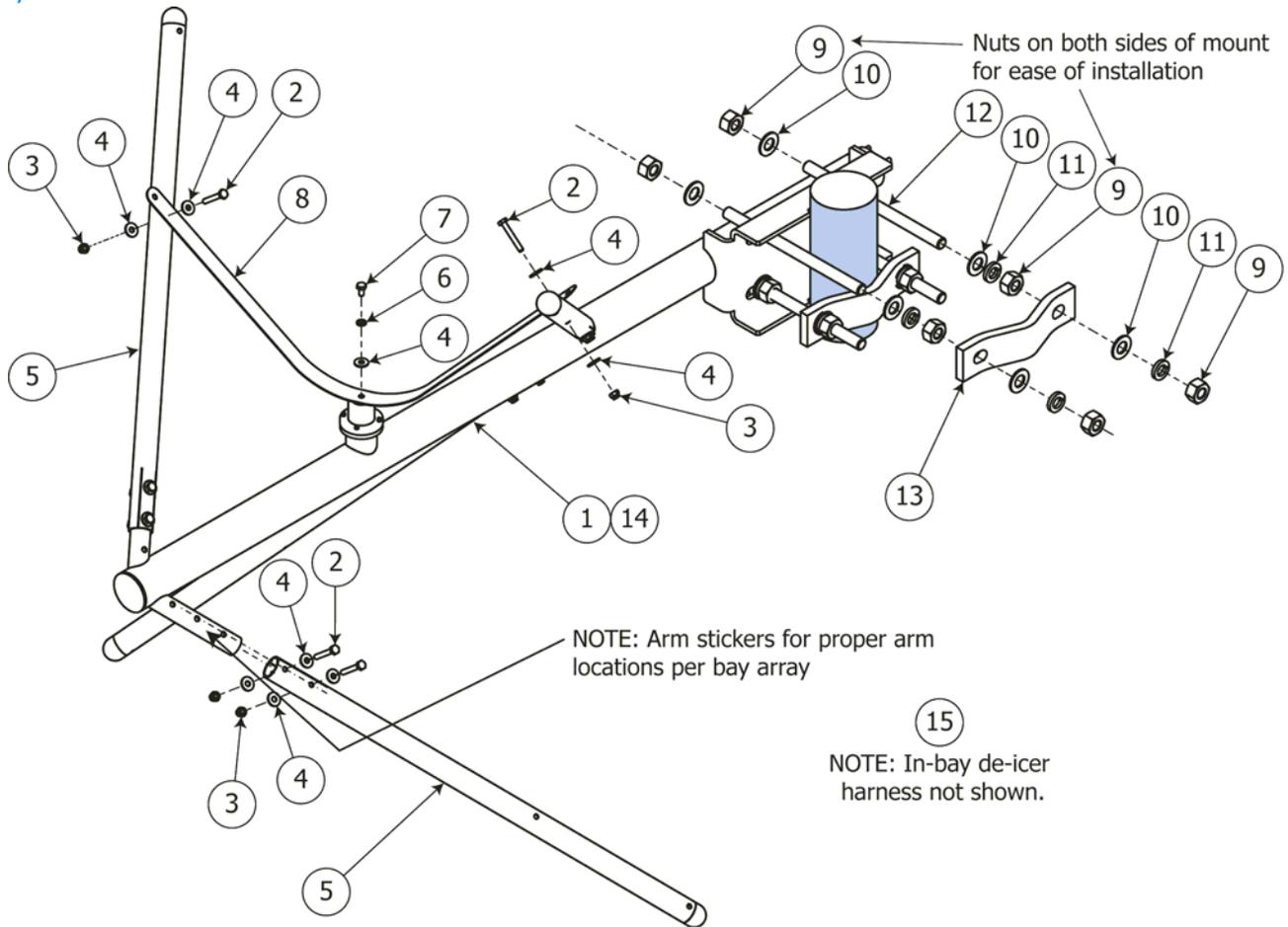
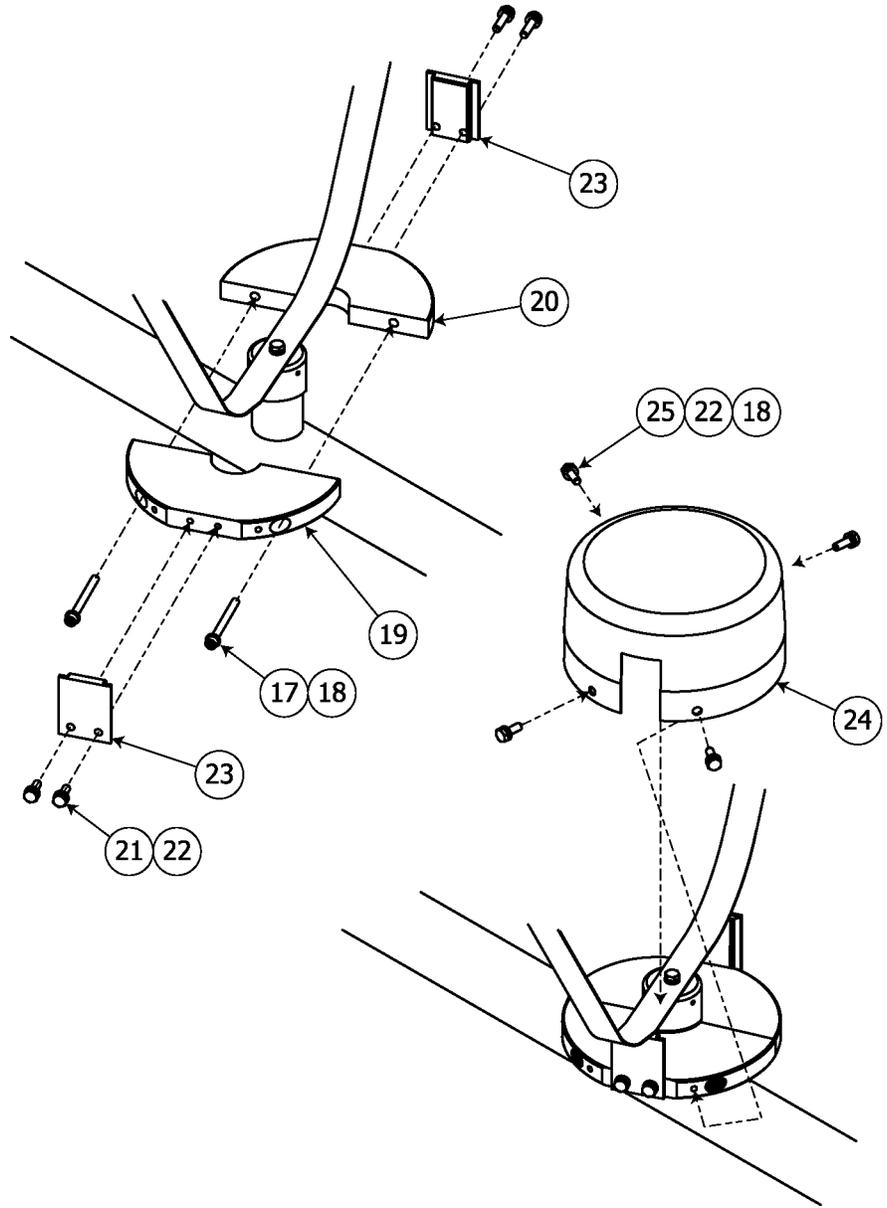


Table 6. Kit, endseal radome (per antenna bay)

Part Number	Description	Qty.
17. 01/4-20SS040SC	Screw, socket head 1/4-20 x 2-1/4", SS	2
18. 01/4SSS	Washer, lock 1/4", SS	10
19. 99718-03-01	Disc, radome support half	1
20. 99718-03-02	Disc, radome support half	1
21. 01/4-20SS016HM	Screw, hex head 1/4-20 x 1", SS	4
22. 01/4SSFN	Washer, flat 1/4" narrow, SS	8
23. 99718-04	Filler, radome	2
24. 86708-02	Radome	1
25. 01/4-20SS012HM	Screw, hex head 1/4-20 x 3/4", SS	4

Parts

Figure 23. Endseal radome components



Feed system components

Table 7. Components, feed system for single-bay antenna

Part Number	Description	2-bay Qty.
26. 9068-215	O-ring for 7/8" EIA flange	4
27. 82912-G507M	Kit, hardware for 7/8" EIA flange	2
28. TY529MX	Tie-wrap	a/r

Table 8. Components, feed system for 2-bay antenna

Part Number	Description	2-bay Qty.
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NOTE

Feed system for a two-bay array is shown in [Figure 17](#) on page 29.

29. 158F-078F x 2	Power divider, 2-way, 1-5/8" EIA to 7/8" EIA	1
30. 98162-G501	Kit, 1-5/8" power divider mount (2 clamps each per kit)	1
31. 99715-G5xx	Coax cable section, HCA78-50J, 7/8" gas-block EIA to 7/8" gas-pass EIA	2
26. 9068-215	O-ring for 7/8" EIA flange	4
27. 82912-G507M	Kit, hardware for 7/8" EIA flange	2
28. TY529MX	Tie-wrap	a/r
32. 9068-328	O-ring for 1-5/8" EIA flange	1
33. 82912-G501	Kit, hardware for 1-5/8" EIA flange	1

Table 9. Components, feed system for 3-bay antenna

Part Number	Description	3-bay Qty.
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NOTE

Feed system for 3- to 8-bay arrays is shown in [Figure 18](#) on page 31.

34. 98141-G504	Mount, 3-1/8" power divider	2
35. 01/2-13SS	• Nut, hex 1/2-13 SS	5
36. G12SSF	• Washer, flat 1/2" SS	6
37. G12R-8	• Rod, threaded, 1/2-13 x 8" galvanized	2
38. 98141-03	• Channel, power divider	1
39. 01/2SSS	• Washer, lock, 1/2" galvanized	5
40. DCP	• Clamp half, 5.75" bolt spacing	1
41. G1205	• Bolt, hex head 1/2-13 x 5" galvanized	1
42. 98359-05	• Spacer, universal mount, transformer & transmission line	1
43. 98359-G503	• Saddle assembly, power divider mount	2
44. 6114-400	Clamp, hose	4
45. 318F-078F x 3	Power divider, 3-way, 3-1/8" EIA to 7/8" EIA	1
26. 9068-215	O-ring for 7/8" EIA flange	6

Parts

Table 9. Components, feed system for 3-bay antenna (continued)

Part Number	Description	3-bay Qty.
27. 82912-G507M	Kit, hardware for 7/8" EIA flange	6
31. 99715-G5xx	Coax cable section, HCA78-50J, 7/8" EIA to 7/8" EIA	3
28. TY529MX	Tie-wrap	a/r
46. 9068-340	O-ring for 3-1/8" EIA flange	1
47. 82912-G503	Kit, hardware for 3-1/8" EIA flange	1

Table 10. Components, feed system for 4-bay antenna

Part Number	Description	4-bay Qty.
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NOTE

Feed system for 3- to 8-bay arrays is shown in [Figure 18](#) on page 31.

34. 98141-G504	Mount, 3-1/8" power divider	2
35. 01/2-13SS	• Nut, hex 1/2-13 SS	5
36. G12SSF	• Washer, flat 1/2" SS	6
37. G12R-8	• Rod, threaded, 1/2-13 x 8" galvanized	2
38. 98141-03	• Channel, power divider	1
39. 01/2SSS	• Washer, lock, 1/2" galvanized	5
40. DCP	• Clamp half, 5.75" bolt spacing	1
41. G1205	• Bolt, hex head 1/2-13 x 5" galvanized	1
42. 98359-05	• Spacer, universal mount, transformer & transmission line	1
43. 98359-G503	• Saddle assembly, power divider mount	2
44. 6114-400	Clamp, hose	4
48. 318F-078F x 4	Power divider, 4-way, 3-1/8" EIA to 7/8" EIA	1
26. 9068-215	O-ring for 7/8" EIA flange	8
27. 82912-G507M	Kit, hardware for 7/8" EIA flange	8
31. 99715-G5xx	Coax cable section, HCA78-50J, 7/8" EIA to 7/8" EIA	4
28. TY529MX	Tie-wrap	a/r
46. 9068-340	O-ring for 3-1/8" EIA flange	1
47. 82912-G503	Kit, hardware for 3-1/8" EIA flange	1

Parts

Table 11. Components, feed system for 5-bay antenna

Part Number	Description	5-bay Qty.
NOTE		
Feed system for 3- to 8-bay arrays is shown in Figure 18 on page 31.		
34. 98141-G504	Mount, 3-1/8" power divider	2
35. 01/2-13SS	• Nut, hex 1/2-13 SS	5
36. G12SSF	• Washer, flat 1/2" SS	6
37. G12R-8	• Rod, threaded, 1/2-13 x 8" galvanized	2
38. 98141-03	• Channel, power divider	1
39. 01/2SSS	• Washer, lock, 1/2" galvanized	5
40. DCP	• Clamp half, 5.75" bolt spacing	1
41. G1205	• Bolt, hex head 1/2-13 x 5" galvanized	1
42. 98359-05	• Spacer, universal mount, transformer & transmission line	1
43. 98359-G503	• Saddle assembly, power divider mount	2
44. 6114-400	Clamp, hose	4
49. 318F-078F x 5	Power divider, 5-way, 3-1/8" EIA to 7/8" EIA	1
26. 9068-215	O-ring for 7/8" EIA flange	10
27. 82912-G507M	Kit, hardware for 7/8" EIA flange	10
31. 99715-G5xx	Coax cable section, HCA78-50J, 7/8" EIA to 7/8" EIA	5
28. TY529MX	Tie-wrap	a/r
46. 9068-340	O-ring for 3-1/8" EIA flange	1
47. 82912-G503	Kit, hardware for 3-1/8" EIA flange	1

Table 12. Components, feed system for 6-bay antenna

Part Number	Description	6-bay Qty.
NOTE		
Feed system for 3- to 8-bay arrays is shown in Figure 18 on page 31.		
34. 98141-G504	Mount, 3-1/8" power divider	2
35. 01/2-13SS	• Nut, hex 1/2-13 SS	5
36. G12SSF	• Washer, flat 1/2" SS	6
37. G12R-8	• Rod, threaded, 1/2-13 x 8" galvanized	2
38. 98141-03	• Channel, power divider	1
39. 01/2SSS	• Washer, lock, 1/2" galvanized	5
40. DCP	• Clamp half, 5.75" bolt spacing	1
41. G1205	• Bolt, hex head 1/2-13 x 5" galvanized	1
42. 98359-05	• Spacer, universal mount, transformer & transmission line	1
43. 98359-G503	• Saddle assembly, power divider mount	2

Parts

Table 12. Components, feed system for 6-bay antenna (continued)

Part Number	Description	6-bay Qty.
44. 6114-400	Clamp, hose	4
50. 318F-078F x 6	Power divider, 6-way, 3-1/8" EIA to 7/8" EIA	1
26. 9068-215	O-ring for 7/8" EIA flange	12
27. 82912-G507M	Kit, hardware for 7/8" EIA flange	12
31. 99715-G5xx	Coax cable section, HCA78-50J, 7/8" EIA to 7/8" EIA	6
28. TY529MX	Tie-wrap	a/r
46. 9068-340	O-ring for 3-1/8" EIA flange	1
47. 82912-G503	Kit, hardware for 3-1/8" EIA flange	1

Table 13. Components, feed system for 8-bay antenna

Part Number	Description	8-bay Qty.
NOTE		
Feed system for 3- to 8-bay arrays is shown in Figure 18 on page 31.		
34. 98141-G504	Mount, 3-1/8" power divider	2
35. 01/2-13SS	• Nut, hex 1/2-13 SS	5
36. G12SSF	• Washer, flat 1/2" SS	6
37. G12R-8	• Rod, threaded, 1/2-13 x 8" galvanized	2
38. 98141-03	• Channel, power divider	1
39. 01/2SSS	• Washer, lock, 1/2" galvanized	5
40. DCP	• Clamp half, 5.75" bolt spacing	1
41. G1205	• Bolt, hex head 1/2-13 x 5" galvanized	1
42. 98359-05	• Spacer, universal mount, transformer & transmission line	1
43. 98359-G503	• Saddle assembly, power divider mount	2
44. 6114-400	Clamp, hose	4
51. 318F-078F x 8	Power divider, 8-way, 3-1/8" EIA to 7/8" EIA	1
26. 9068-215	O-ring for 7/8" EIA flange	16
27. 82912-G507M	Kit, hardware for 7/8" EIA flange	16
31. 99715-G5xx	Coax cable section, HCA78-50J, 7/8" EIA to 7/8" EIA	8
28. TY529MX	Tie-wrap	a/r
46. 9068-340	O-ring for 3-1/8" EIA flange	1
47. 82912-G503	Kit, hardware for 3-1/8" EIA flange	1

Accessories and optional items

Table 14. Accessories and optional items for single-bay antenna

Part Number	Description	Qty.
52. 56009-G501	Harness, de-icer main	1
53. 99952-G502	Fine matcher, 1-5/8"	1
31. 9068-328	• O-ring, silicone, 1-5/8" EIA flange	1
54. Various	Mount assembly, fine matcher	2
55.	Adapter, 1-5/8" to 7/8"	1

Table 15. Accessories and optional items for 2-bay antenna

Part Number	Description	Qty.
56. 56009-G502	Harness, de-icer main, 2 bays	1
57. 99952-G502	Fine matcher, 1-5/8"	1
31. 9068-328	• O-ring, silicone, 1-5/8" EIA flange	1
58. Various	Mount assembly, 1-5/8" fine matcher	2

Table 16. Accessories and optional items for 3-bay antenna

Part Number	Description	Qty
59. 56009-G503	Harness, de-icer main, 3 bays	1
57. 99952-G501	Fine matcher, 3-1/8"	1
45. 9068-340	• O-ring, silicone, 3-1/8" EIA flange	1
60. Various	Mount assembly, 3-1/8" fine matcher	2

Table 17. Accessories and optional items for 4-bay antenna

Part Number	Description	Qty
61. 56009-G504	Harness, de-icer main, 4 bays	1
57. 99952-G501	Fine matcher, 3-1/8"	1
45. 9068-340	• O-ring, silicone, 3-1/8" EIA flange	1
60. Various	Mount assembly, 3-1/8" fine matcher	2

Table 18. Accessories and optional items for 5-bay antenna

Part Number	Description	Qty
62. 56009-G505	Harness, de-icer main, 5 bays	1
57. 99952-G501	Fine matcher, 3-1/8"	1
45. 9068-340	• O-ring, silicone, 3-1/8" EIA flange	1
60. Various	Mount assembly, 3-1/8" fine matcher	2

Parts

Table 19. Accessories and optional items for 6-bay antenna

Part Number	Description	Qty
63. 56009-G506	Harness, de-icer main, 6 bays	1
57. 99952-G501	Fine matcher, 3-1/8"	1
45. 9068-340	<ul style="list-style-type: none"> • O-ring, silicone, 3-1/8" EIA flange 	1
60. Various	Mount assembly, 3-1/8" fine matcher	2

Table 20. Accessories and optional items for 8-bay antenna

Part Number	Description	Qty
64. 56009-G508	Harness, de-icer main, 8 bays	1
57. 99952-G501	Fine matcher, 3-1/8"	1
45. 9068-340	<ul style="list-style-type: none"> • O-ring, silicone, 3-1/8" EIA flange 	1
60. Various	Mount assembly, 3-1/8" fine matcher	2

Appendix A

Selected Assembly Drawings

The following are excerpts from selected assembly drawings.

Figure A-1. 22° Feed Strap with Endseal Radome & Deicer

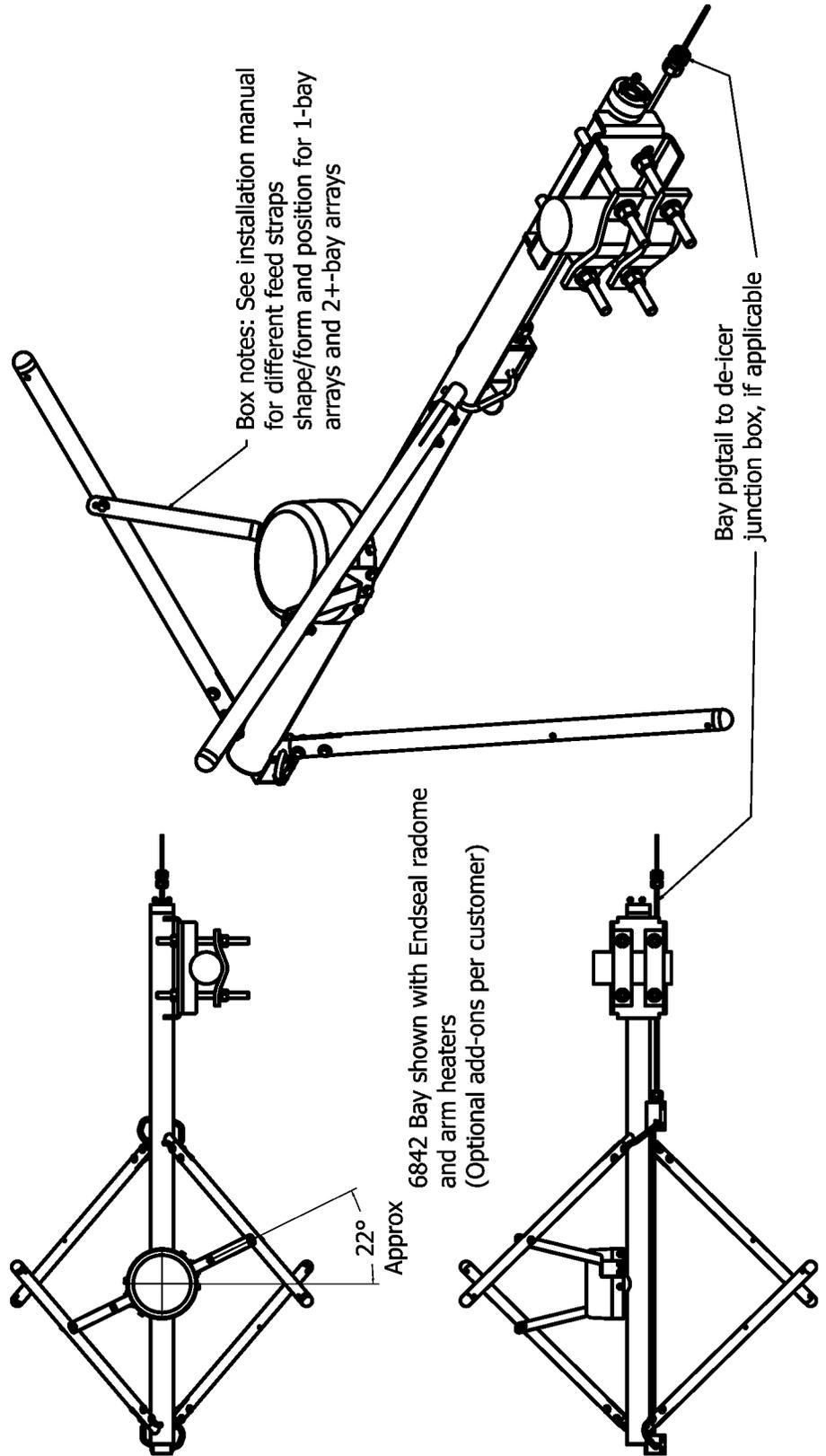
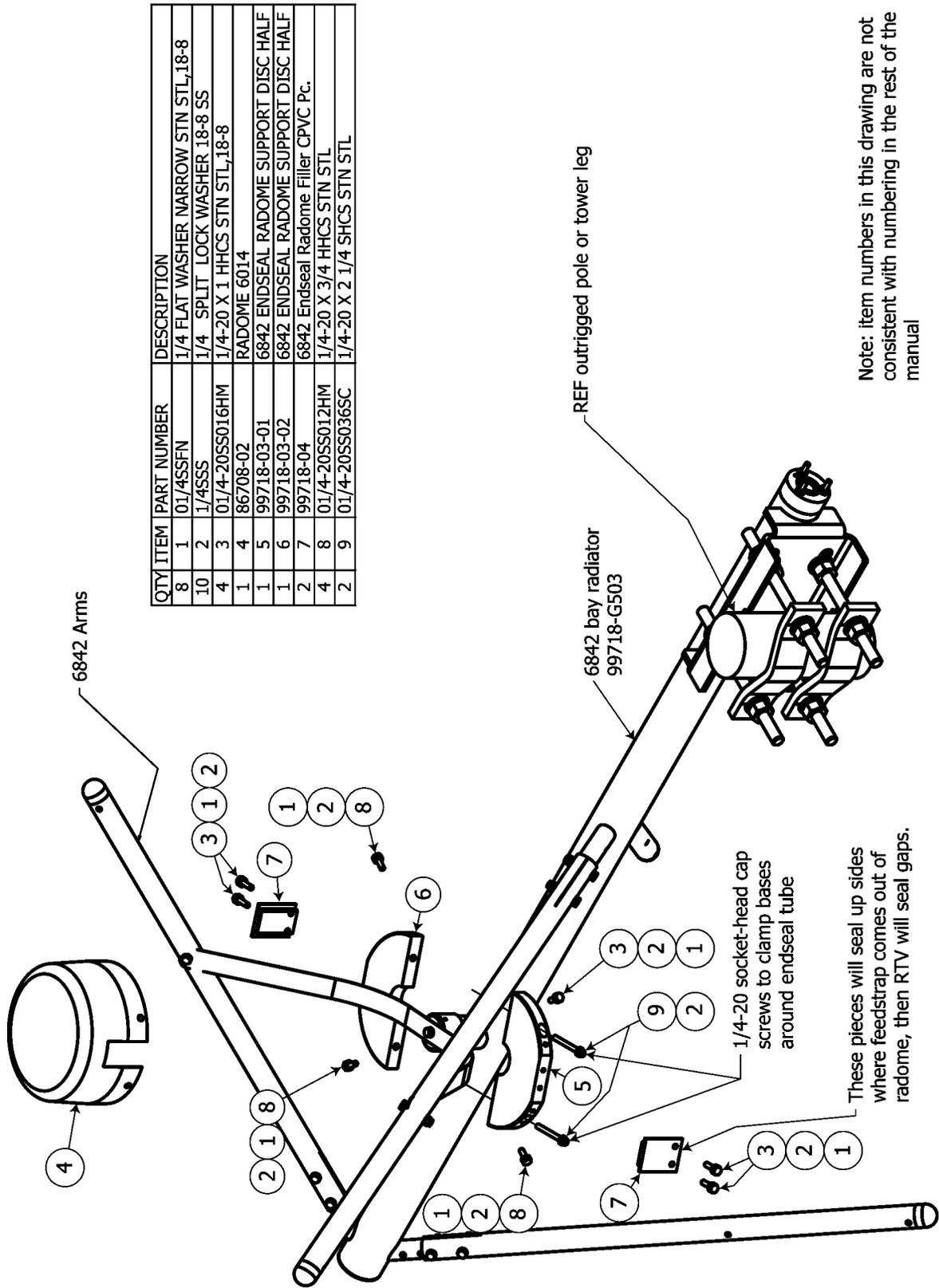


Figure A-2. 6842 Exploded View with Endseal Radome



QTY	ITEM	PART NUMBER	DESCRIPTION
8	1	01/4SSFN	1/4 FLAT WASHER NARROW STN STL,18-8
10	2	1/4SS	1/4 SPLIT LOCK WASHER 18-8 SS
4	3	01/4-20SS016HM	1/4-20 X 1 HHCS STN STL,18-8
1	4	86708-02	RADOME 6014
1	5	99718-03-01	6842 ENDSEAL RADOME SUPPORT DISC HALF
1	6	99718-03-02	6842 ENDSEAL RADOME SUPPORT DISC HALF
2	7	99718-04	6842 Endseal Radome Filler CPVC Pc.
4	8	01/4-20SS012HM	1/4-20 X 3/4 HHCS STN STL
2	9	01/4-20SS036SC	1/4-20 X 2 1/4 SHCS STN STL

Note: item numbers in this drawing are not consistent with numbering in the rest of the manual

Figure A-3. Bay Arm Stickers

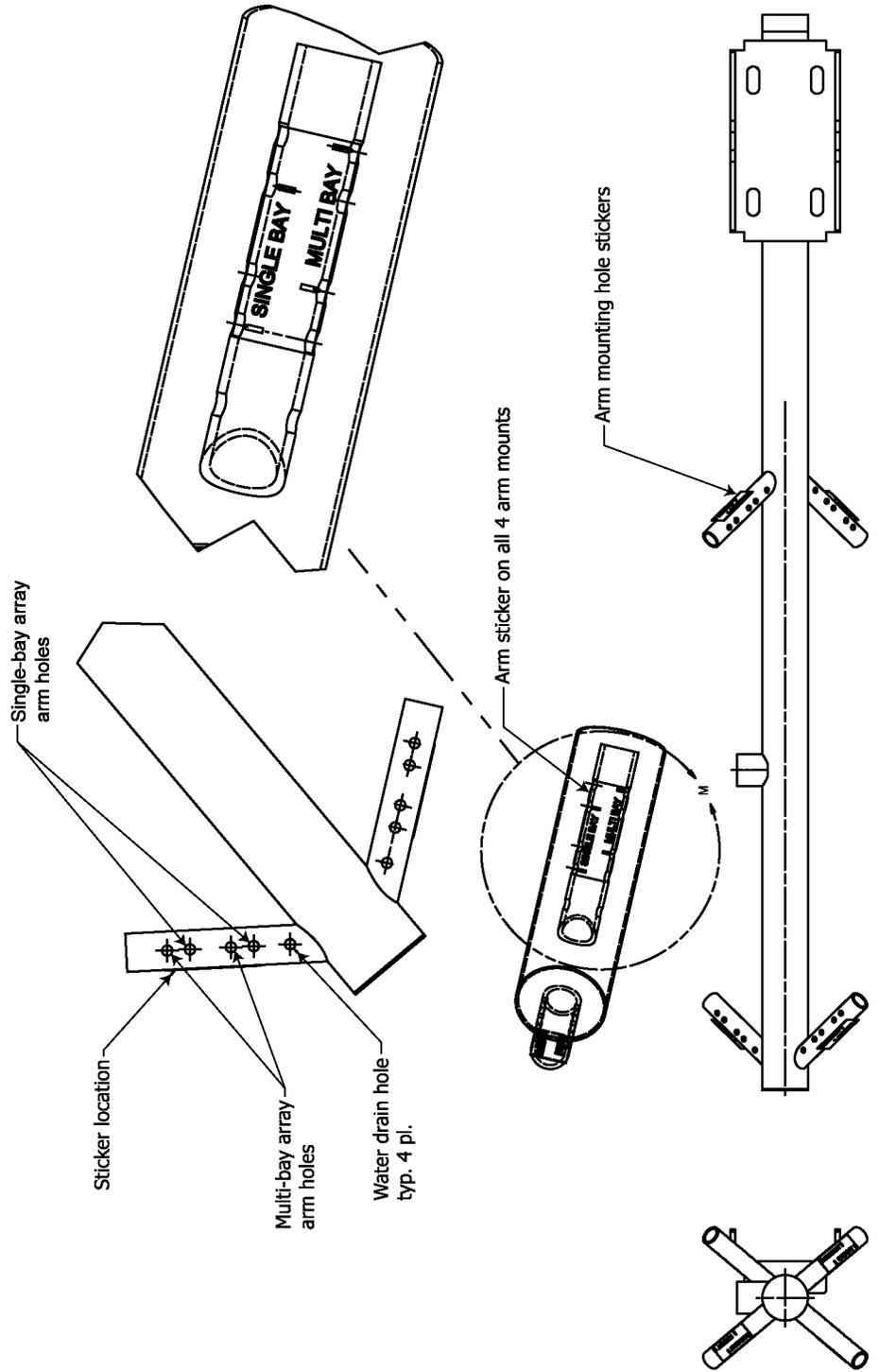


Figure A-4. Power Divider Mount Detail

