Shively Labs®

FM Broadcast Antenna De-Icer System Model 94068

Instruction Manual Installation, Operation, & Maintenance

Congratulations!

Thank you for purchasing one of the finest FM broadcast antenna products on the market today. The Shively Labs Model 94068 de-icer control is widely recognized as the top-of-the-line in its class for its 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 trouble-shooting 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 de-icer box!

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

Table of Contents

1 Preparing for Installation

Receiving

You will probably have ordered your de-icer system as part of an antenna. As soon as you receive your equipment, *BEFORE* signing for the shipment:

a. Check to be sure all the material has arrived.

NOTE

The box number and the total number of boxes are marked on each box; for example, “Box 2 of 5” means “box number 2 of a total of five boxes.”

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 de-icer system outdoors, boxed or otherwise.

Unpacking

a. Find Box 1; it is marked “Open This Box First.” It contains two copies of the installation drawing. The parts list on one sheet of the installation drawing shows what box each item is in.

b. Then open the boxes and examine for shipping damages. File any necessary claims with the carrier immediately.

c. If all the boxes are present and in good condition but material seems to be missing, please contact Shively Labs immediately, using the telephone or Fax number on the inside cover of this manual. For the best service, have our shop order number (S/O) handy; it's in the block at the bottom right corner of the installation drawing.

Check the System

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.

Shively's factory designer has planned the installation of the de-icer system based upon information provided by you. If this information contained errors, the parts and mounting hardware will have been designed incorrectly and will cause expensive delays in installation. *Therefore, we recommend that you recheck the installation parameters during this planning stage.*

Have a reliable tower person, familiar with antennas and coaxial line, inspect the tower and review the installation drawings before the full rigging crew arrives.

If design problems are found, contact Shively Labs immediately. Pay particular attention to:

- Availability of proper electrical service for the de-icers.
- Fit of the mounts to the tower members.
- Current capacity of the control box, as compared to the current draw of your antenna. Current capacities are shown in Table 1. See Table 4 on page 10 for a direct correlation of antenna current draw versus control box current capacity.

Table 1. Control Box Models' Current Capacities

Control Box Model	Current Capacity
94068-G501	10 Amperes
94068-G502	20 Amperes
94068-G503	30 Amperes

You gave Shively this information at the time of purchase, but a last check at this time can catch an error, which will be easier to correct before installation begins.

2 Installing the De-Icer System

Before Beginning De-Icer Installation:

Remember!

It is YOUR responsibility to ensure that your installation meets all applicable electrical codes.

We recommend that the installation be reviewed by a qualified electrician before you apply power.

CAUTION

All parts of the de-icer system within about 20 feet (6 meters) of any antenna radiator must be shielded from RF energy, and the entire outdoor portion of the system must be made waterproof.

Note that unless an exterior box has been ordered specially, a de-icer control box purchased from Shively Labs is designed for interior installation only.

CAUTION

To prevent electrical short-circuiting, secure all cables to minimize wind-induced motion and chafing against edges of system or tower components.

CAUTION

It is important that you ground *both* the tower junction box, as shown in Figure 4 on page 7, and the control box, as shown in Figure 6 on page 8.

CAUTION

When testing the thermostat in step k, be sure to disconnect one or both thermostat leads before taking resistance readings. Otherwise, readings may be affected by other components.

CAUTION

The resistance readings in tables 3 through 6 are for the Shively-supplied portion of the systems only, and do not take into account any long run of cable to the tower and up to the antenna.

CAUTION

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

Description and Electrical Schematic Diagrams

The de-icer system consists of the heating elements 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 extending about 10 feet (3 meters) which you will connect to the tower junction box you are to provide. Figure 1 on page 4 is a schematic diagram of the overall de-icer system.

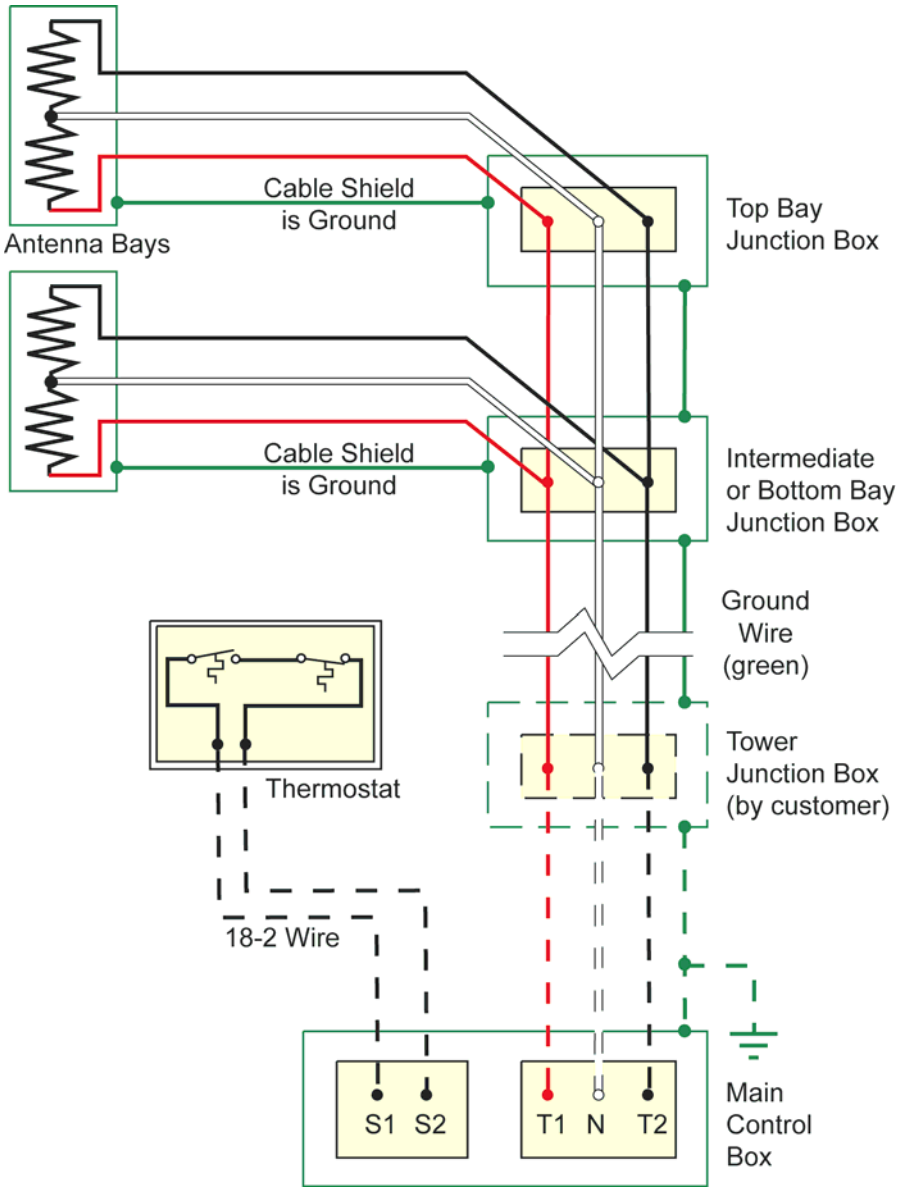


Figure 1. De-Icer System Electrical Schematic

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 thermostat. Figure 2 on page 5 is a schematic of Shively's main control box, and Figure 3 on page 5 is a schematic of our optional thermostat. Use these diagrams as a guide when wiring your de-icer system.

Figure 2. Main Control Box Electrical Schematic

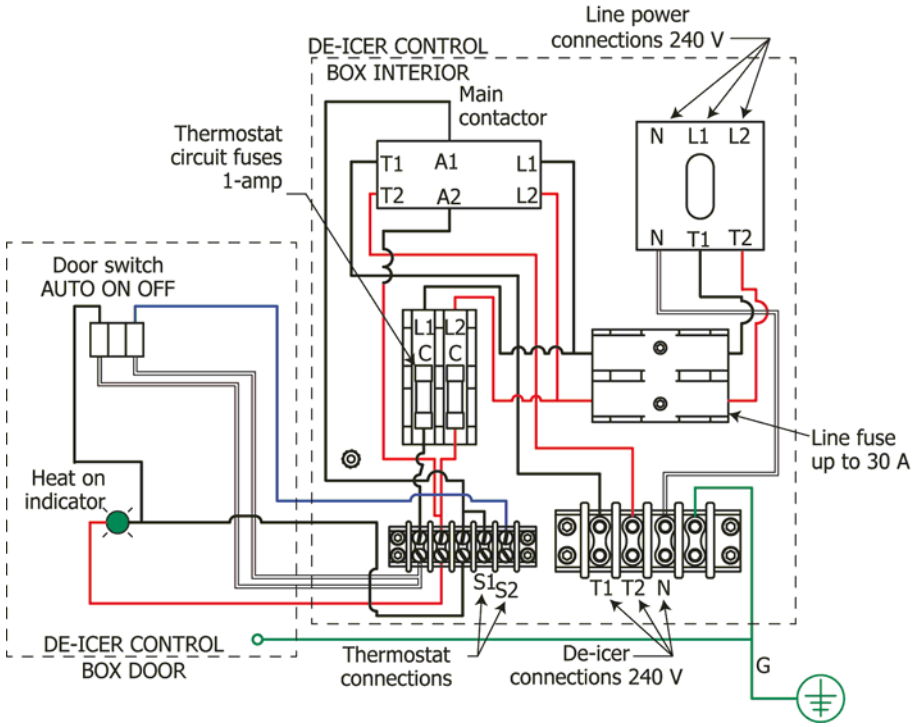
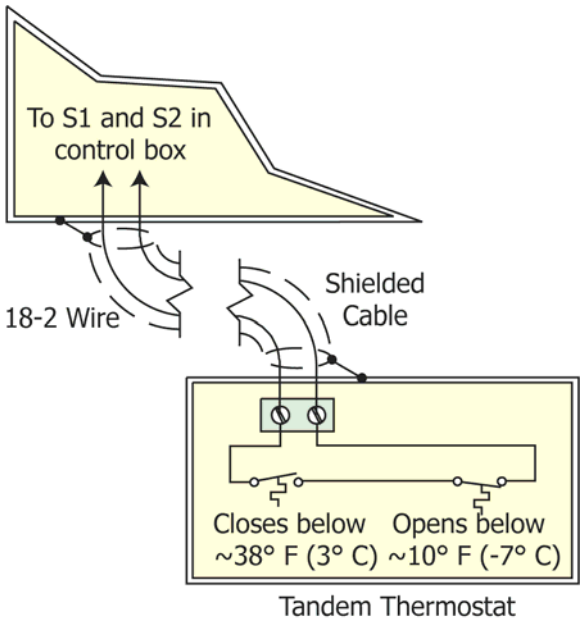


Figure 3. Thermostat Electrical Schematic



Installation Procedure

The de-icer system requires 220 VAC, 50 - 60 Hz., single-phase. Table 3 on page 9 and Table 4 on page 10 show approximate heater leg resistances and current draws for various models and configurations.

Install the de-icer system as follows:

a. Install the main de-icer harness with its bay junction boxes as shown in the installation drawing, Figure 1 on page 4, and Figure 4 on page 7.

b. (Center-fed antenna only) You may find that the feedline mounts are in the way when mounting the bottommost bay junction box. If necessary, using band clamps, secure the bay junction box to the mounting bar provided, then secure the mounting bar to the feedline section. See Figure 5 on page 7.

c. Connect the leads from each bay de-icer to the main harness in that bay's junction box as shown in Figure 4 on page 7. Secure any slack in these cables to the feedline with tie-wraps to avoid wind damage.

d. Furnish a tower junction box as shown schematically in Figure 1 on page 4.

NOTE

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

e. 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 pigtail along a feedline mount to the tower junction box and secure it to the mount and the tower.

f. Furnish a main control box as shown schematically in Figure 2 on page 5. Shively's box is shown in Figure 6, but you may provide your own box if desired.

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

NOTE

The thermostat is shown schematically in Figure 3 on page 5.

h. 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 2 on page 9.

Figure 4. Bay Junction Box Installation

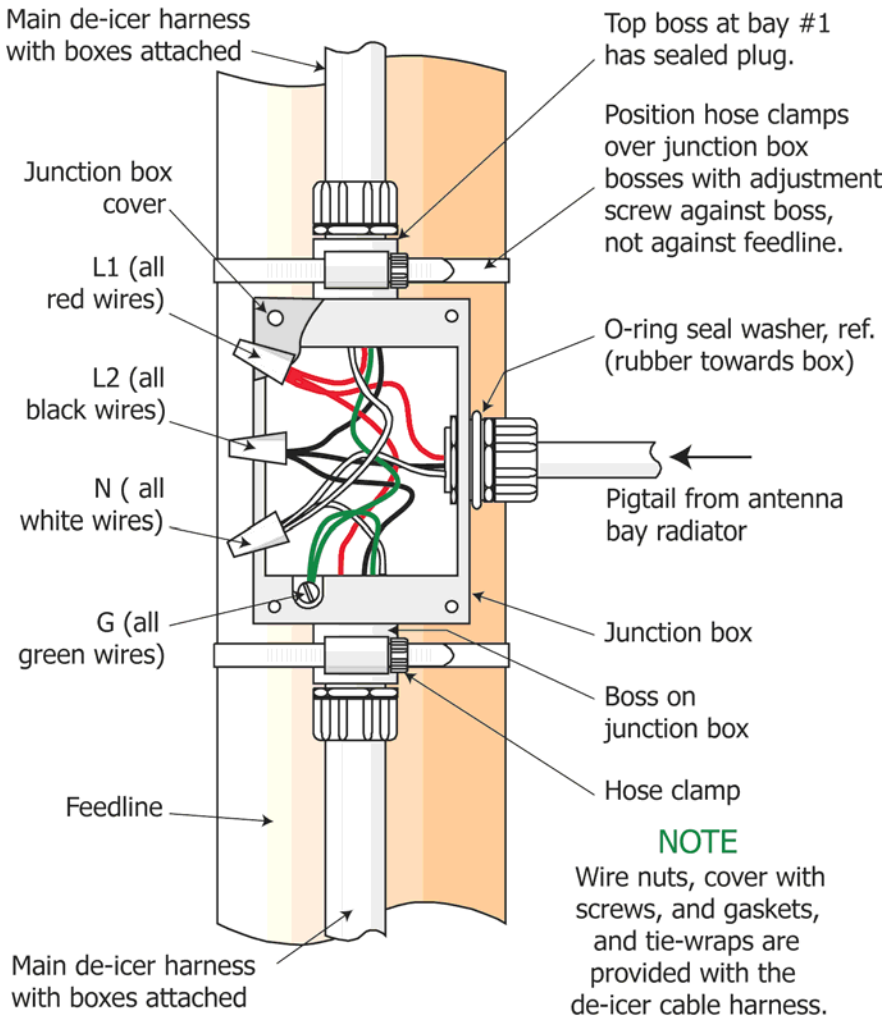
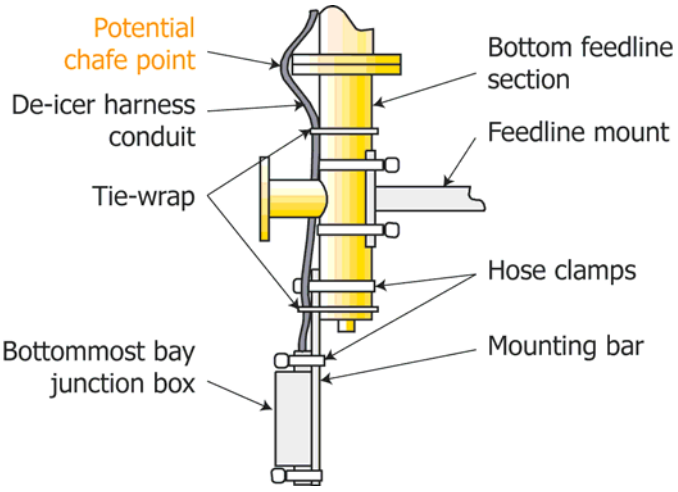
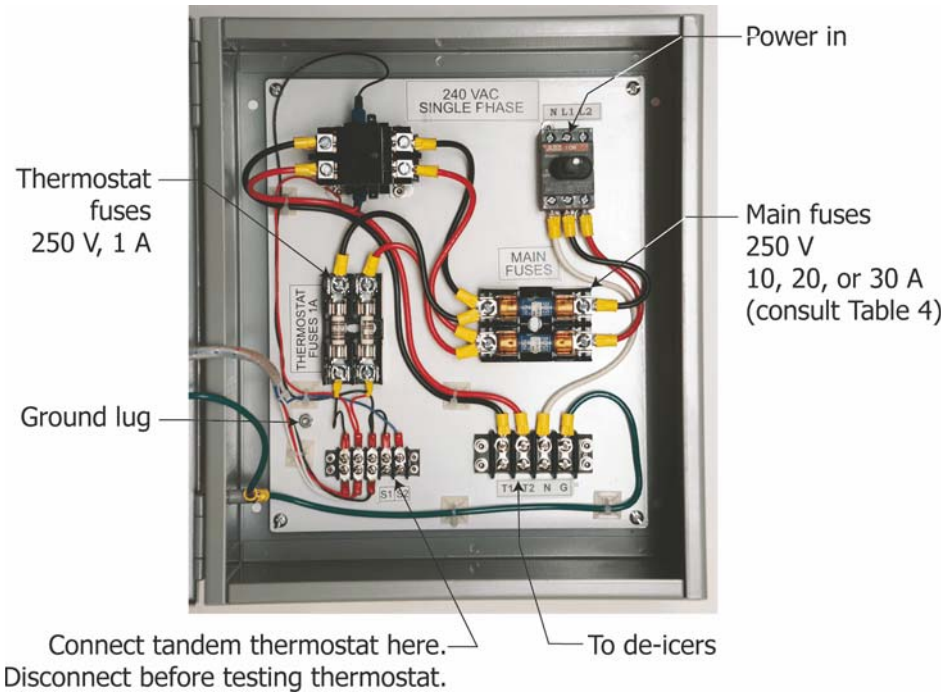


Figure 5. Mounting of Bottommost Bay Junction Box (as needed)



(for center-fed antennas only)

Figure 6. Model 94068 De-Icer Control Box



Cover open, not shown.
Box dimensions are 305 mm (12 in) wide x 356 mm (14 in) high x 152 mm (6 in) deep.

i. Wire the thermostat to terminals S1 and S2 in the main control box.

NOTE

Wire sizes must account for the total current draw of the cable run to the antenna and the de-icer system itself.

j. Before connecting power to the system, measure the resistance across each heater leg. Be sure to account for the resistance of any long cable runs from the control box to the antenna. Compare readings against Table 3 on page 9.

k. Run a power cable from the main control box (normally indoors) to the tower junction box and connect it to the de-icer harness pigtail(s) in the tower junction box.

l. After installation is complete, measure the resistance from each heater leg to ground to ensure that there are no short-circuits. Resistance should be infinite.

m. Turn the de-icer on by switching it to Manual, and measure its current draw with an ammeter. Compare this reading with Table 4 on page 10.

n. Record the resistance and current readings in your maintenance log for future reference in troubleshooting the de-icer system. See Sample Maintenance Log on page 16 for a suggested log format.

Table 2. Tandem 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

Table 3. Approximate Heater Leg Resistance, Ω

Antenna Model	6602 or 6602B	6812 or 6812B	6813	6600	6814	6810
1-Bay	182	182	100	60	60	56
2-Bay	91	91	50	30	30	28
3-Bay	61	61	33	20	20	19
4-Bay	46	46	25	15	15	14
5-Bay	36	36	20	12	12	11
6-Bay	30	30	17	10	10	9
7-Bay	26	26	14	9	9	8
8-Bay	23	23	13	8	8	7
10-Bay	18	18	10	6	6	6
12-Bay	15	15	8	5	5	5

Table 4. Approximate Heater Leg Current Draw (amperes) and Control Box Applications

Antenna Size	Control Box Model	6602 or 6602B	6812 or 6812B	6813	6600	6814	6810
1-Bay	94068 -G501	0.7	0.7	1.2	2.0	2.0	2.1
2-Bay		1.3	1.3	2.4	4.0	4.0	4.3
3-Bay		2.0	2.0	3.6	6.0	6.0	6.4
4-Bay		2.6	2.6	4.8	8.0	8.0	8.6
5-Bay		3.3	3.3	6.0	10.0	10.0	10.7
6-Bay		4.0	4.0	7.2	12.0	12.0	12.9
7-Bay		4.6	4.6	8.4	14.0	14.0	15.0
8-Bay		5.3	5.3	9.6	16.0	16.0	17.1
10-Bay		6.6	6.6	12.0	20.0	20.0	21.4
12-Bay		7.9	7.9	14.4	24.0	24.0	25.7
	-G502						
	-G503						

NOTE

De-icers for some antenna arrays over 12 bays will require two separate circuits, each with its own control box serving half the bays.

3 Operation

Precautions

The broadcast industry has recently recognized the potential medical hazards of intense radio frequency radiation. Don't expose personnel to personal harm. For reference, see CFR 29, Section 1910.97, the OSHA standard for exposure to non-ionizing radiation.

WARNING

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

CAUTION

Never operate the antenna system without proper purging and constant positive dry gas pressure. Shively Labs will not accept responsibility for antenna failure after operation without proper purging or positive pressure of dry air or dry nitrogen.

Operating the De-Icer System

There is a generous margin of safety built into the Model 94068 de-icer system, and operation for prolonged periods below 60° F (16° C) will do no harm. If icing conditions are expected, the heaters should be turned on ahead of time as a preventive measure. It is much easier to prevent ice formation than to remove a heavy coating. Thermostatic control systems which sense temperature conducive to ice formation are highly desirable and are available from Shively Labs upon request.

The Shively de-icer control box has two switches: the master switch and the mode selector switch.

Master Switch

WARNING

The master switch is not to be used for lockout-tagout purposes. The power-in circuit is still "hot" even when the master switch is turned off.

The master switch turns the entire de-icer system on and off.

Mode Selector Switch

The mode selector switch gives you the choice of manual or automatic operation. There are three switch settings: AUTOMATIC, OFF, and ON. When the switch is set to AUTOMATIC, the thermostat turns the heaters on and off according to the temperature.

When the switch is set to OFF, the thermostat is overridden and the heaters will stay off no matter what the temperature.

When the switch is set to ON, the thermostat is overridden and the heaters will stay on no matter what the temperature.

Ice Removal

The rate of ice removal will vary greatly with temperature, wind speed, and type of ice. As a guide, the de-icers will remove 1/4 inch (6 mm) of clear ice at 32° F (0° C) in still air in about 15 minutes.

4 Troubleshooting

Precautions

WARNING

Troubleshooting should be performed only by personnel experienced in RF systems and familiar with this equipment.

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5 Maintenance

Precautions

WARNING

Maintenance should be performed only by personnel experienced in RF systems and familiar with this equipment.

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The broadcast industry has recently recognized the potential medical hazards of intense radio frequency radiation. Don't expose personnel to personal harm. For reference, see CFR 29, Section 1910.97, the OSHA standard for exposure to non-ionizing radiation. Whenever a rigger is on the tower in the area of the antenna, shut off the transmitter and lock it off so that it cannot be turned on accidentally.

Maintenance Log

Shively recommends that you keep a maintenance log; in it record performance parameters such as readings of VSWR.

Such a log can be invaluable in spotting and identifying problems. Sample Maintenance Log on page 16 shows a suggested log form you may use if you like.

Physical Inspection

The de-icer system should operate for years with no problem. However, any time you have a rigger up on the tower, it's a good idea to have him check for general condition, looseness of components, and electrical damage. During this inspection, all mounting and electrical hardware should be tightened.

Troubleshooting

Troubleshoot the de-icer control system as described in Chapter 4.

Return Policy

When returning any material to the factory, be sure to call your salesman and obtain an authorized return (AR) number first. Use this number in all correspondence. This number helps us to track your returned item. It will expedite repair or replacement and prevent loss of your material.

Sample Maintenance Log

DATE	Heater Leg Resistance to Ground, Ω		Heater Leg Current Draw, amps		OBSERVATIONS Visual Inspection; Hardware Checked; Tower Repairs Accomplished; etc.
	T1	T2	N - T1	N - T2	