



## Installation Instructions

# SELF-REGULATING (SR) ROOF AND GUTTER DE-ICING CABLES

## INDUSTRIAL AND COMMERCIAL SERIES



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Warning: Self-Regulating Cable must be installed by a qualified electrician. All assembly, installation, and test instructions must be followed. Improper installation can result in property damage, serious injury, or death due to electric shock. Please call Delta-Therm Corporation at 1-800-526-7887 with any installation or operating questions.

## Section 1. Overview

### 1.1 PRECAUTIONS

**ROOF AND GUTTER:** The purpose and function of roof and gutter de-icing cable is to create an open drainage path for any water that would otherwise be stopped (by either ice or snow) from draining properly. It is not meant to melt all accumulated snow or ice.

Please read these installation instructions and all instructions included with kits prior to installation. Observe all warnings. Visually inspect the cable for damage. The cable, including braid, must not be cut, nicked or worn. Do not install damaged cable.

- Install in accordance with the prevailing electrical code.
- System must be grounded in accordance with the prevailing electrical code.
- Self-regulating cable has an inrush current. Please refer to the page 175 for proper breaker sizing.
- Do not bend cable tighter than 3" inside diameter.
- Do not twist, kink, or spiral the cable.
- Do not pull cable from coil. Roll coil to unreel cable.
- Test cable before installation with 500 VDC insulation resistance tester and multimeter.
- All related components and controls should be properly rated for the specified location classification.
- Do not splice the cable.

### 1.2 CABLE AND COMPONENTS

Each self-regulating cable circuit will require at least one power connection kit (sold separately) which includes one end termination. All cable ends must be properly terminated per the instructions. Directions to preform the power connection and end termination are included with the kit.

### 1.3 GENERAL ACCESSORIES

#### Accessories

Product Number	Description
<b>PCK-RG</b>	Power Connection Kit (IN Series)
<b>PCK-RGP</b>	Power Connection Kit (CO Series)
<b>IMP</b>	Ice Melt Panel
<b>DT-AS-50</b>	Roof Clips For Asphalt Shingles
<b>RM-25-AL</b>	Aluminum Clips For Metal Roofs
<b>Specialty Clips</b>	Specialty clips for slate, copper, etc. roof materials. Please refer to datasheet.
<b>SB-190</b>	Roof adhesive for DT-AS-50 clips.
<b>VHB Pads</b>	Double-sided adhesive pads for RM-25-AL clips
<b>DSH</b>	Downspout Hanger

#### Panels

Product Number	Description
<b>DT-XXPXXX</b>	Enclosed Contactor Panel
<b>GFPE-X-X-X</b>	Power Control Panel w/GFPE
<b>LNR-X</b>	Low Noise Relay Panel
Custom Control/Monitor/Alarm Panels	

#### Controls

Product Number	Description
<b>DTC120-G</b>	Roof De-Icing Control
<b>MPS W/RG</b>	Roof De-Icing Control

## Section 1. Overview

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### 1.4 TOOLS RECOMMENDED

- 500 VDC insulation resistance tester
- Digital multimeter
- Adjustable wrench
- Flat head screwdriver
- Fish tape
- Nylon cable ties
- Pre-punched stainless steel strap
- Metal ties
- Wire rope (stainless steel or copper)

### 1.5 SITE PLAN

Delta-Therm offers engineered drawing services as outlined in our Price List. If drawings were ordered, please compare the drawing bill of materials to materials supplied with your order and verify that you received all of the Delta-Therm components. Before starting the installation verify the proper location and layout of heating cable(s), control(s), and/or accessories.

### 1.6 CABLE STORAGE

All cables should be stored in a cool, dry location. Cables should be protected from damage. Following the cable testing instructions in section 4, test all cables removed from storage, and record the readings on the warranty card.

### 1.7 CABLE LABELING

Delta-Therm cable is UL Listed or CSA Certified for wet location installations. Refer to operational voltage chart for part numbers. Each cable has rating and listing data printed on the outside of the cable jacket (you may have to pull braid back to read the printing).

### 1.8 CABLE TESTING

Please refer Section 4 for all cable testing procedures.

### 1.9 SITE PREPARATION

Review installation, engineering, electrical, and or architectural drawings prior to installation. Verify that available voltage is the same as the cable operating voltage indicated on the UL or CSA label. Install conduit from the cable feed points to an indoor or dry junction box, continuing to the power panel per site plan. Install appropriate grounding system per prevailing electrical code.

1. To determine or confirm load or breaker size, find the circuit cable length and start-up temperature, 40°F (4.4°C) is recommended, and then refer to the Electrical Specifications Charts on page.
2. Be sure there is sufficient main panel-board capacity to accommodate this additional load. Capacity for summer air conditioner loads may handle this alternate winter load.
3. Measure the gutters to be traced. Refer to cable allowance chart for cable footages on the various items. Double or triple the length for areas to be double or triple traced.
4. Provide power to the start of the roof and gutter heating cable assembly. Verify voltage provided is consistent with the voltage indicated on the datasheet.

### 1.10 PROPER CABLE HANDLING

Always unroll the coil of cable. Do not pull the cable in a helix fashion.

### 1.11 NEC CODE

Please consult NEC Article 426 Fixed Outdoor Electric Deicing and Snow-Melting Equipment with attention to Section 426.21 Exposed Deicing and Snow-Melting Equipment.

### 1.12 CONDUIT AND CIRCUIT WIRE

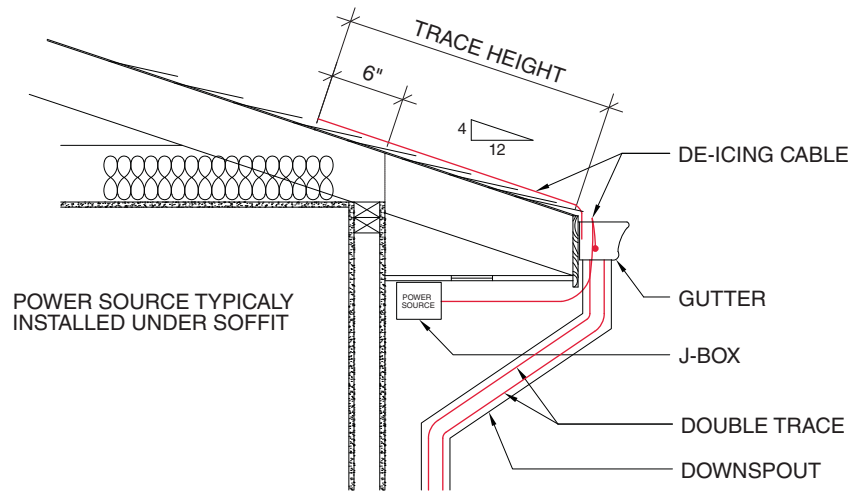
The cable assemblies require a permanently wired and grounded conduit system. Use only UL Listed (CSA Certified) weatherproof junction boxes.

## Section 1. Overview

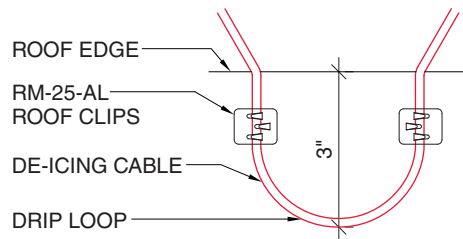
### 1.12 CONDUIT AND CIRCUIT WIRE

Delta-Therm's self-regulating cables require a permanently wired and grounded conduit system to feed the cable for proper, safe performance. Use only UL Listed or CSA Certified weatherproof junction boxes.

1. Install conduit and wire to a point within 1' of the start of the cable. Attach junction box to the end of the conduit.
2. Determine circuit length and load.
3. If you haven't already, verify that adequate breaker capacity is available. Please refer to the page 175 for breaker sizing.



**Detail 1.** Location of junction box and conduit.



**Detail 2.** 3" drip loop of de-icing cable to direct melt water gutter is typical on all sloped roof eaves.

## Section 2. Installation

### 2.1 GENERAL INFORMATION

Before starting the installation please refer to Section 1.5 Site Plan, Section 1.9 Site Preparation, and test cables following the directions in Section 3.1 Pre-Installation Testing.

1. Assemble the power termination per PCK-RGP (CO series cable) or PCK-RG (IN series cable) instruction sheet included with the kit.
2. Attach cable to roof as shown per drawings or per details included in these instructions. The junction box should be located as aesthetically as possible. Before starting installation determine if power is being supplied at roof level or at ground level.
3. On sloped roofs the cable loop should be 6" up the roof eave beyond the projected exterior wall line. The cable should also be installed inside of gutters and downspouts. Angle of roof eave installation is approximately 60 degrees.
4. On flat roofs the cable is installed around the perimeter, looped around the internal drain(s) or looped inside of the scuppers.
5. Terminate the end of the cable per power connection kit instructions. Please refer to page 175 for maximum circuit lengths per breaker size.

### 2.2 PERMANENT ATTACHMENT OF CABLES

Cables should be permanently attached to the roof to insure retaining position during severe weather. There are many ways to fasten cable. After determining the roof material, refer to the chart below. If the roofing material is not listed, please consult the roofing manufacturer for proper attachment.

Attach the cable at the top of roof eave triangles, at the drip loop into the gutter, every 3' - 5' for cable laying inside of gutters and around flat roof perimeters, and at the top/bottom of downspouts.

Roof Material	Clip	Recommended Fastening Method
Asphalt Shingle	DT-AS-50	SB-190*
Standing Seam Metal	RM-25-AL/SS series (no adhesive)	VHB pads*
Slate	Specialty	Clip with extended hook or slotted strap
Ceramic Tile	Specialty	Clip with extended hook or slotted strap
Rubber Membrane	Any	Per roofing manufacturer approved means
Copper	RM-25-CU	Solder
Downspouts	DSH	Not applicable

\* Follow the cleaning, primer, minimum adhesion time (curing time before installing cable) and minimum adhesion temperature directions of the Adhesive being used.

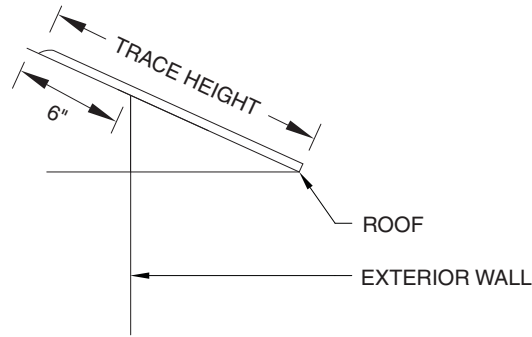
NOTE: If the clips are fastened to the sub-roof with screws, the screw entry points must be waterproofed.

### 2.3 MAINTAINING CABLE PATTERN ON EAVES

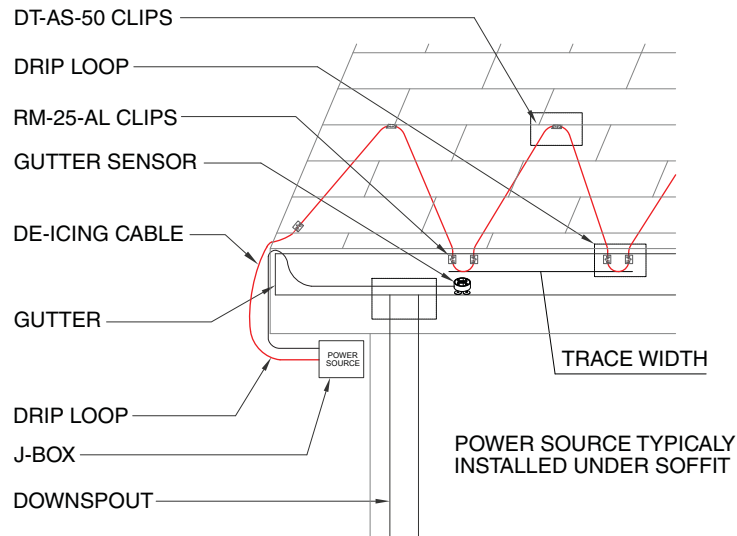
To minimize piercing or cementing the roofing, install stainless steel, copper or copper plated wire ropes. Firmly anchor ropes at end walls. Lace each heater loop at the apex of each triangle, top and bottom. Tie, clip or tape the heater and wire rope together to insure minimum or no movement of the heater cable. Anchor the wire rope every 4' to minimize movement of the cable.

## Section 2. Installation

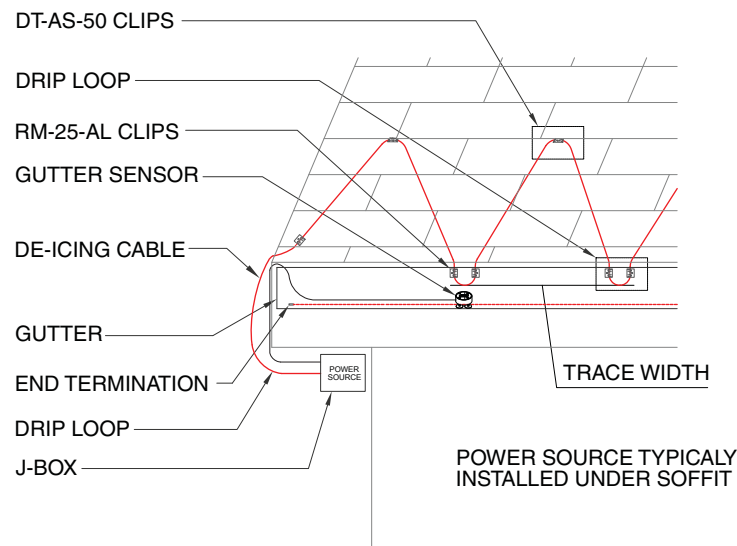
### 2.4 SLOPED ASPHALT ROOFS



**Detail 3.** De-icing cable should extend 6" above exterior wall on sloped roofs.



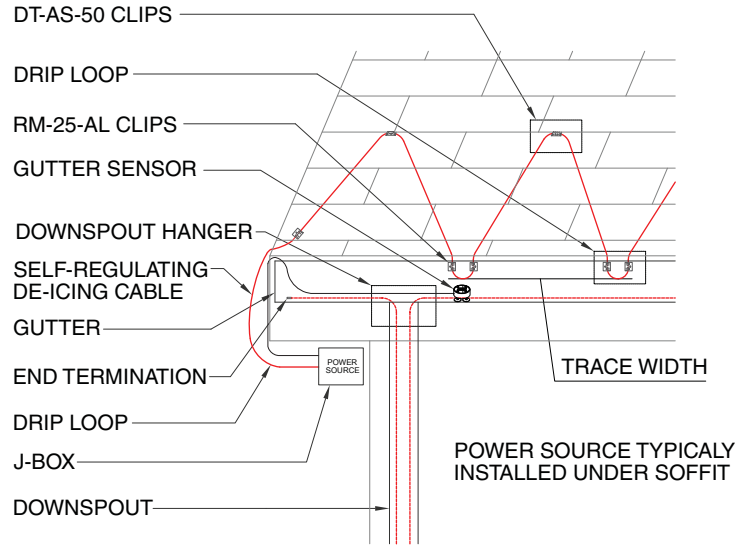
**Detail 4.** De-icing cable on sloped asphalt eave only. This layout typically uses DT-AS-50 clips with SB-190 adhesive on roof, and RM-25-AL clips with VHB adhesive pads for drip loop in gutter.



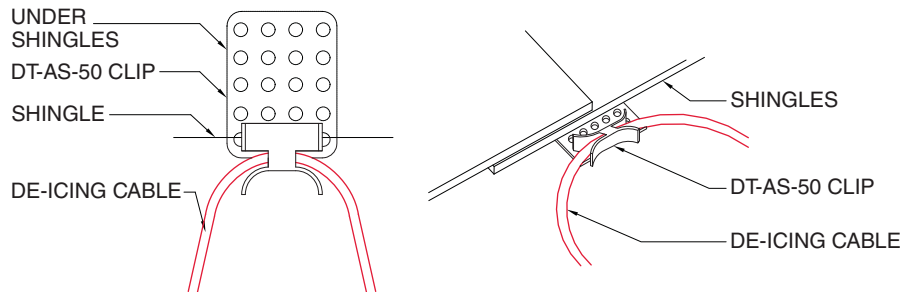
**Detail 5.** De-icing cable on sloped asphalt eave and inside of gutter. This layout typically uses DT-AS-50 clips with SB-190 adhesive on roof, and RM-25-AL clips with VHB adhesive pads for drip loop in gutter. Clip de-icing cable laying in gutter to the bottom of the gutter every 3'-5'. For copper gutters use RM-25-CU clips.

## Section 2. Installation

### 2.4 SLOPED ASPHALT ROOFS



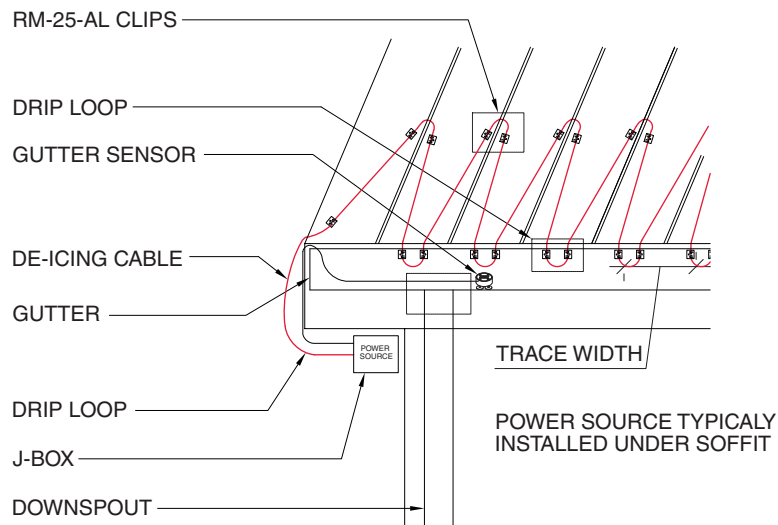
**Detail 6.** De-icing cable on sloped asphalt eave, inside of gutter, and in downspout. This layout typically uses DT-AS-50 clips with SB-190 adhesive on roof eave and RM-25-AL clips with VHB adhesive pads in gutter. Clip de-icing cable laying in gutter to bottom of gutter every 3'-5'. For copper gutters use RM-25-CU clips. Use DSH to hold de-icing cable at top of downspout.



**Detail 7.** DT-AS-50 clip is installed between two shingles using SB-190 adhesive.

### 2.5 SLOPED STANDING SEAM METAL ROOFS

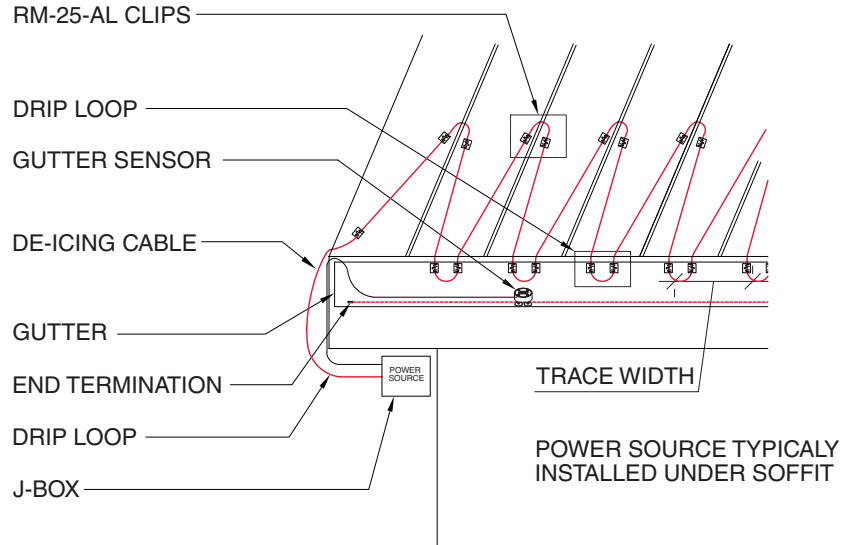
Please refer to Detail 2 to calculate the cable trace height on the roof eave.



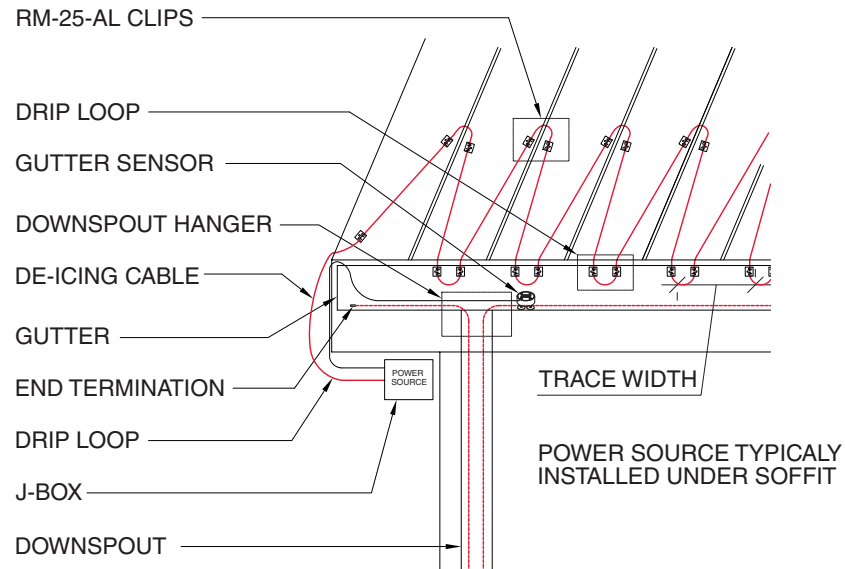
**Detail 8.** De-icing cable on sloped standing seam metal eave only. This layout typically uses RM-25-AL clips with VHB adhesive pads.

## Section 2. Installation

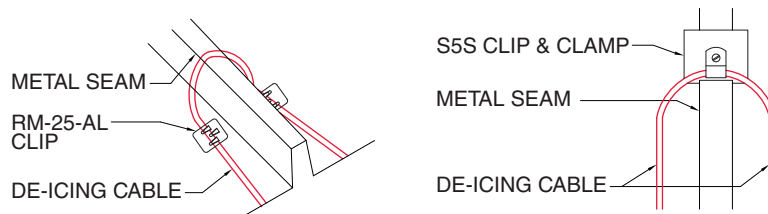
### 2.5 SLOPED STANDING SEAM METAL ROOFS



**Detail 9.** De-icing cable on sloped standing seam metal eave and inside of gutter. This layout typically uses RM-AL-25 clips with VHB adhesive pads. Clip de-icing cable laying in gutter to bottom of gutter every 3'-5'. For copper gutters use RM-25-CU clips.



**Detail 10.** De-icing cable on sloped standing seam metal eave, inside of gutter, and in downspout. This layout typically uses RM-AL-25 clips with VHB adhesive pads. Clip de-icing cable laying in gutter to bottom of gutter every 3-5'. For copper gutters use RM-25-CU clips. Use DSH to hold de-icing cable at top of downspout.

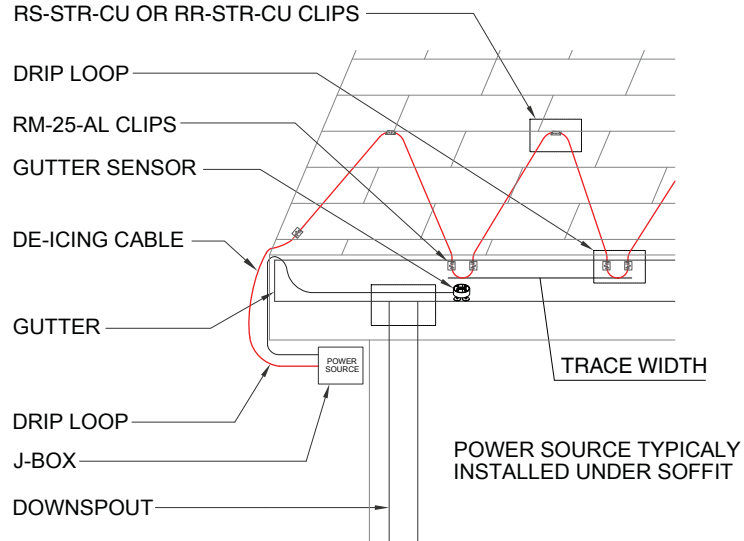


**Detail 11.** Install de-icing cable using either RM-25-AL clip with VHB adhesive pads or S5S clip and clamp combination.

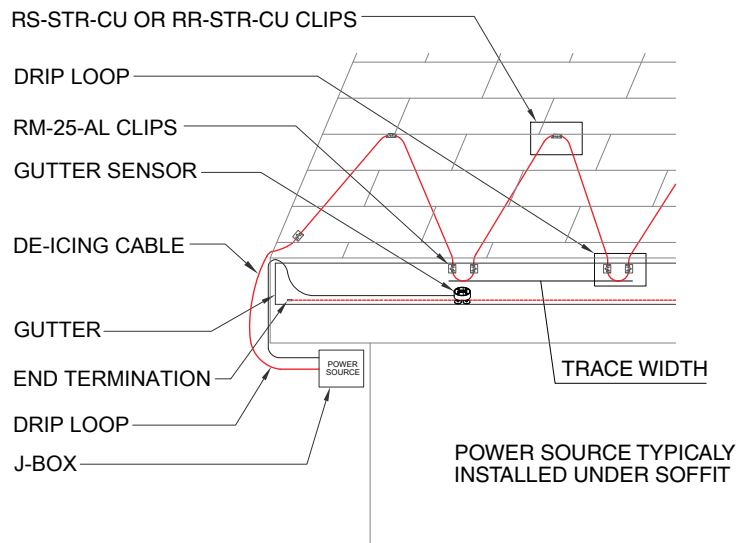


## Section 2. Installation

### 2.6 SLOPED SLATE ROOFS



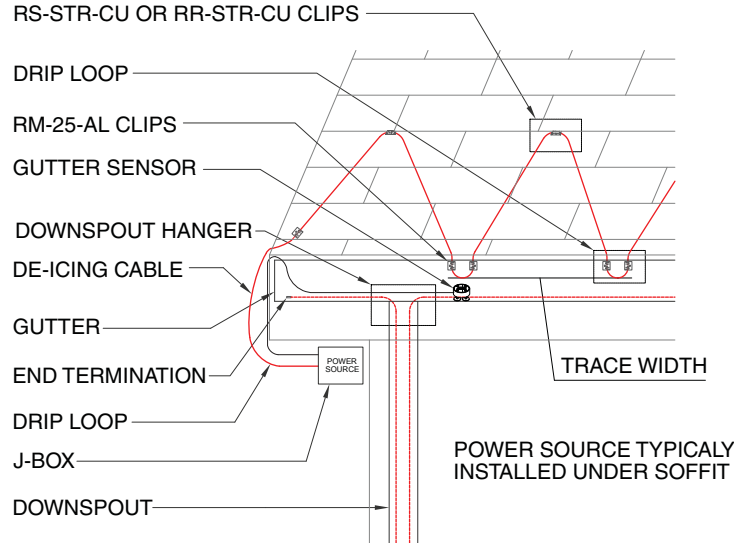
**Detail 12.** De-icing cable on sloped slate eave only. This layout typically uses RS-STR-CU or RR-STR-CU clips on roof eave and RM-25-AL clips with VHB adhesive pads in gutter. For copper gutters use RM-25-CU clips.



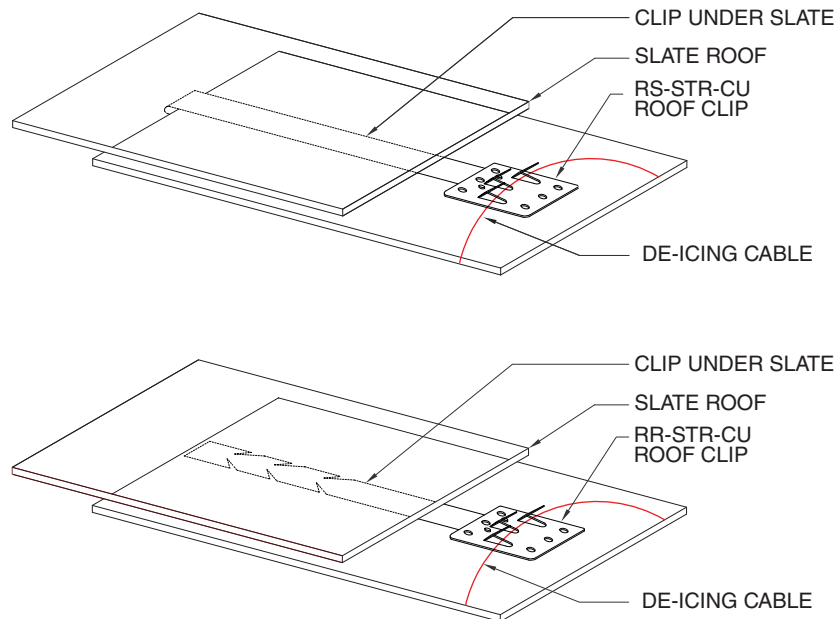
**Detail 13.** De-icing cable on sloped slate eave and inside of gutter. This layout typically uses RS-STR-CU or RR-STR-CU clips on roof, and RM-25-AL clips with VHB adhesive pads in gutter. Clip de-icing cable laying in gutter to bottom of gutter every 3'-5'. For copper gutters use RM-25-CU clips.

## Section 2. Installation

### 2.6 SLOPED SLATE ROOFS



**Detail 14.** De-icing cable on sloped slate eave, inside of gutter, and in downspout. This layout typically uses RS-STR-CU or RR-STR-CU clips on roof eave and RM-25-AL clips with VHB adhesive pads in gutter. Clip de-icing cable laying in gutter to bottom of gutter every 3'-5'. For copper gutters use RM-25-CU clips. Use DSH to hold de-icing cable at top of downspout.

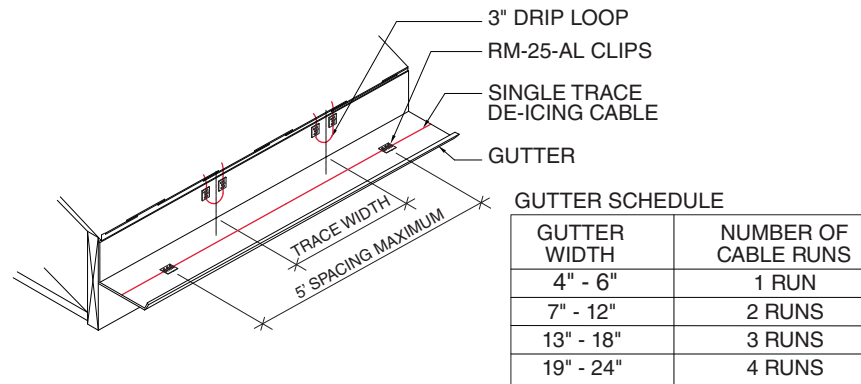


**Detail 15.** Install de-icing cable using either RS-STR-CU clip with 13.5" long hooked strap or RR-STR-CU clip with 13.5" long slotted strap.

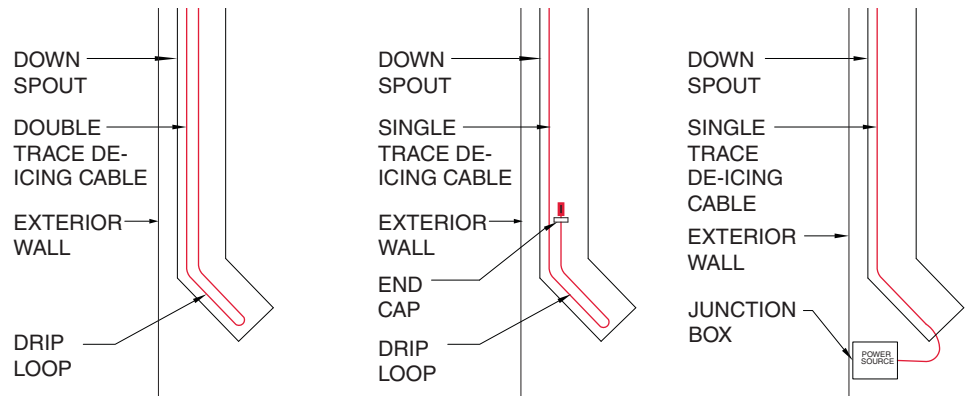
## Section 2. Installation

### 2.7 GUTTERS, DOWNSPOUTS AND VALLEYS

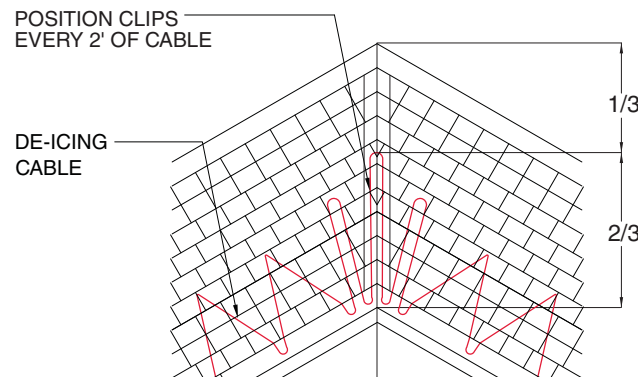
1. Cable passes in gutters are anchored to the bottom of the gutter using roof clips. A distance of 3' - 5' will prevent moving and flexing. When there are multiple cable passes in a gutter the passes should be spaced at least 2" apart.
2. Hold cable in place at the top of the downspout using DSH downspout hanger. Clip cable at bottom of downspout using roof clips. The bottom of cable should remain within downspout. If exposed, it must be protected.
3. Verify that any cable extending over a gutter or roof is anchored using DSH downspout hanger to insure that cable will not be cut or worn through by top edge of gutter, and to prevent chafing or abrading of cable.



**Detail 16.** Installing de-icing cable in the gutter.



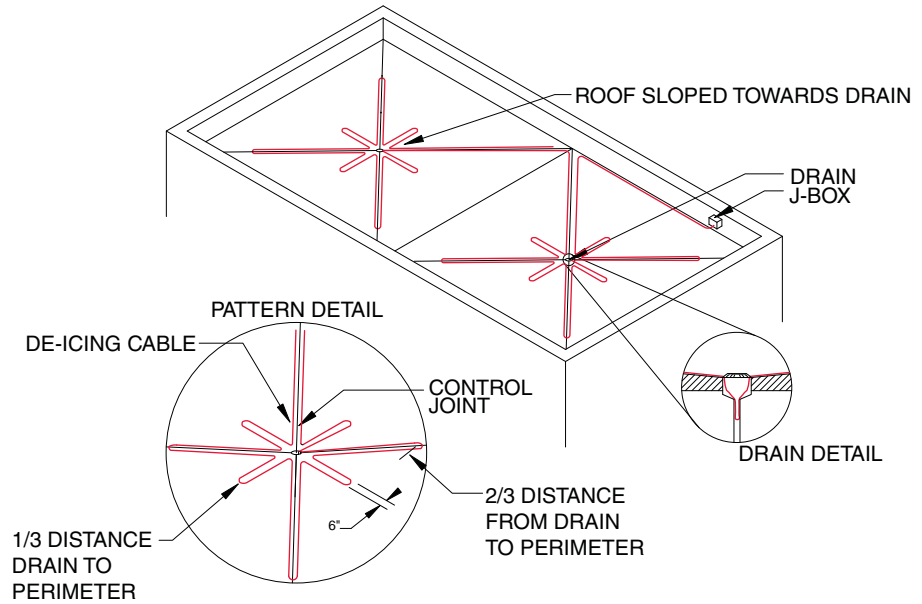
**Detail 17.** De-icing cable looped in downspout, terminated in downspout, and power connection made at the ground level outside of the downspout. Please refer to the DSH datasheet included with the downspout hanger for installation instructions.



**Detail 18.** De-icing cable is looped twice up the valley.

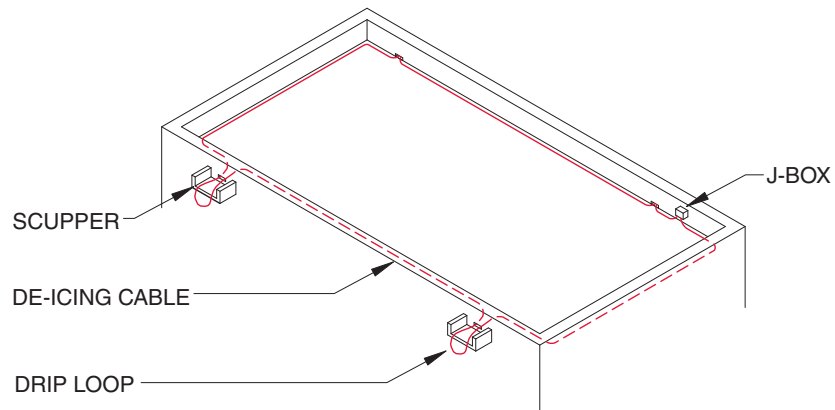
## Section 2. Installation

### 2.8 FLAT ROOF WITH INTERNAL DRAINS



Detail 19. De-icing cable on a flat roof with internal drains.

### 2.8 FLAT ROOF WITH EXTERNAL DRAINS



Detail 20. De-icing cable on a flat roof with external drains.

## Section 3. Cable Technical information

### 3.1 CABLE BREAKER SIZES, ALTERNATE VOLTAGES, AND ELECTRICAL SPECIFICATIONS

#### IN SERIES CABLE

##### Breaker Sizing And Maximum Circuit Length Ft. (m)

Volts	Catalog Number	Protective Device Rating		
		15A	20A	30A
120	IN 120-5-CBT	125' (38)	150' (46)	205' (62)
240	IN 240-5-CBT	250' (76)	300' (91)	335' (102)
277	IN 240-5-CBT	160' (49)	210' (64)	320' (98)
208	IN 240-8-CBT	190' (58)	225' (69)	260' (79)

#### Alternate Voltages

Delta-Therm 240V self-regulating heating cable is multi-voltage. It can be used in 208V, 240V, and 277V applications. (Please refer to the thermal rating row on the Electric Specifications Table)

#### IN Series Electrical Specifications

Catalog Number	IN120-5-CBT	IN240-5-CBT	IN240-5-CBT	IN240-8-CBT
<b>Voltage</b>	120	240	277	208
<b>Maximum Circuit Length Ft. (m)</b>	205' (62)	335' (102)	320' (98)	260' (79)
<b>Thermal Rating At 32°F (Watts/Ft.) Air 0°C (Watts/m) Air</b>	6 (20)	6 (20)	7 (23)	8 (26)
<b>Thermal Rating At 32°F (Watts/Ft.) H<sub>2</sub>O 0°C (Watts/m) H<sub>2</sub>O</b>	9 (30)	9 (30)	10 (33)	14 (46)
<b>Maximum Exposure Temperature °F (°C)</b>	185° (85°)	185° (85°)	185° (85°)	185° (85°)

#### CO SERIES CABLE

##### Breaker Sizing And Maximum Circuit Length Ft. (m)

Volts	Catalog Number	Protective Device Rating		
		15A	20A	30A
120	CO 120-6-CBT	100' (30)	130' (40)	190' (58)
208	CO 240-6-CBT	200' (61)	260' (80)	380' (116)
240	CO 240-6-CBT	175' (54)	230' (70)	340' (104)
277	CO 240-6-CBT	150' (46)	190' (58)	285' (87)

#### Alternate Voltages

Delta-Therm 240V self-regulating heating cable is multi-voltage. It can be used in 208V, 240V, and 277V applications. (Please refer to the thermal rating row in the Electrical Specifications Table.)

#### CO Series Electrical Specifications

Catalog Number	CO120-6-CBT	CO240-6-CBT	CO240-6-CBT	CO240-6-CBT
<b>Service Voltage</b>	120	240	277	208
<b>Maximum Circuit Length Ft. (m)</b>	190' (58)	340' (104)	285' (87)	380' (116)
<b>Thermal Rating at 32°F Watts/Ft. In Air (Watts/m)</b>	6 (20)	6 (20)	7 (23)	5 (16)
<b>Thermal Rating At 32°F Watts/Ft. In H<sub>2</sub>O (Watts/m)</b>	9 (30)	9 (30)	10 (33)	8 (26)
<b>Maximum Exposure Temperature °F (°C)</b>	185° (85°)	185° (85°)	185° (85°)	185° (85°)

## Section 4. Testing and Trouble Shooting

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### 4.1 PRE-INSTALLATION TESTING

Unpack the self-regulating cables and test each cable for insulation resistance (IR) and total resistance (TR). IR should be greater than 10 megohms and TR will fluctuate with ambient temperature. Please enter the following information on the warranty card: IR reading, TR reading, ambient temperature at time of reading, and length of cable on the circuit.

To test IR, connect one lead of a 500 VDC insulation resistance meter (megger) to one bus wire and the other lead to the cable braid. To test TR, connect one lead of the 500 VDC insulation resistance meter (megger) to each bus wire. Test in accordance with the meter manufacturer's instructions.

### 4.2 MONITORING CABLE DURING INSTALLATION

Repeat the tests as described in Section 4.1 and enter the information on the warranty card. If there is a change in the meter reading, please check the cable for damage, as well as the power connections and end terminations.

### 4.3 FINAL TESTING

Repeat the TR tests as described in Section 4.1. To test IR, connect one lead of the 500 VDC to the cable cold lead and the other to building ground/cable braid. Enter the information on the warranty card. If there is a change from the initial meter readings, please check the cable for damage, as well as the power connections and end terminations.

### 4.4 MAINTENANCE

Annually check system for loose or damaged cable. Repair or replace clips as necessary. Assure that the gutters and downspouts are free of leaves and other debris prior to the winter season.

### 4.5 TROUBLE-SHOOTING AND TECHNICAL SUPPORT

If during any test the meter readings vary by +/- 10% from the previous test, stop the installation and investigate. Please check for pinched or crushed cables, test splices, test power connections, test end terminations, and repair accordingly. Check for water in all junction boxes or conduit. Any faults should be repaired by a qualified electrician or factory technician.

For additional trouble-shooting and repair procedures, please contact Delta-Therm technical support at 1-800-526-7887. Please be prepared to provide:

- Part numbers for all installed equipment
- IR and TR readings on all installed cables
- Verification that incoming voltage matches design voltage of Delta-Therm equipment
- Verification that you have checked all wiring, junction boxes, etc.
- Digital photos of installed equipment

If you have any questions or comments about these instructions or your installation please call Delta-Therm at 1-800-526-7887.