LIBERTY ELECTRIC PRODUCTS

New England Electrical Sales
A Liberty Group Company

# Smart Heat Trace Design and Installation

*Getting It Right with Chromalox, Liberty, and New England Electrical*

**11.13.25**

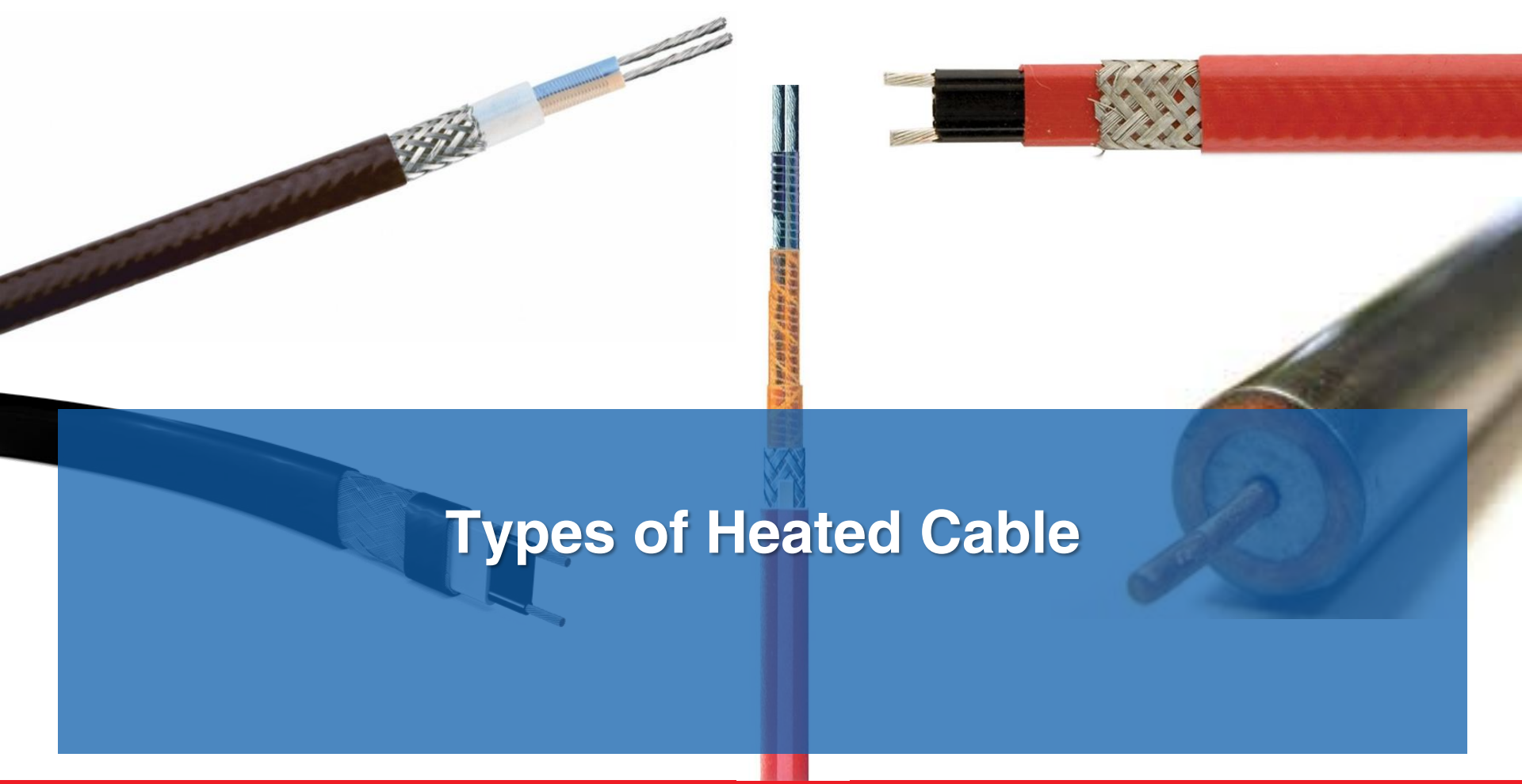
# Presentation Outline

- **Types of Heating Cable**
  - Self-Regulating
  - Constant Watt

- **Freeze Protection vs. Process Temp. Maintenance**
  - Design tips for both applications
  - Sizing SR circuits
  - Voltage impact
  - Positioning cable on the pipe
  - Splicing

**Common Cable Controls**
- Single Circuit
- Multi-Circuit
- What to use and why?

**Installation Tips**
- Pre-job meeting
- C.Y.A.



# Types of Heated Cable

# Types of Heat Cable

1. **Self-Regulating**
   Variable heat/wattage output, resilient, and versatile, can be cut and connected in the field. We find self-regulating is the most commonly used heat cable for roof & gutter and pipe trace applications. SR cable also doesn't create high temperatures that will typically melt or ignite materials, and is the only heating cable that can safely touch against itself without burning through.

2. **Constant Watt**
   Constant watt cable is also resilient and versatile; some types can also be field cut and terminated. Constant wattage cable gives out consistent heat and does not vary in output, making it predictable. Mostly seen in floor heating, snow melting, and frost heave applications, but can be easily installed on piping, especially smaller diameter metal pipes. NOT for use on PVC, CPVC, or non-metallic piping.

# Self-Regulating Cable

- Industry Standard: Output is rated at 50°F. 5, 8, 12 watts/ft. is what the rated output is at 50°F. **All manufacturers comply with this standard.*
- Output wattage/heat *(and price)* is determined by irradiated carbon content mixture during production and the surface temp. of what's being heated or de-iced after installation.
- SR cables can cross over/touch themselves without burning through.
- Low temp SR cable max. temp. output is 150°F, and it will destroy itself at 180°F max exposure temp. Medium temp SR cables can go up to 540°F max. exposure temp.

Self-reg cables are the most popular choice for pipe tracing because:

- *Field serviceable*
- *Energy efficiency*
- *Won't burn through itself or materials*

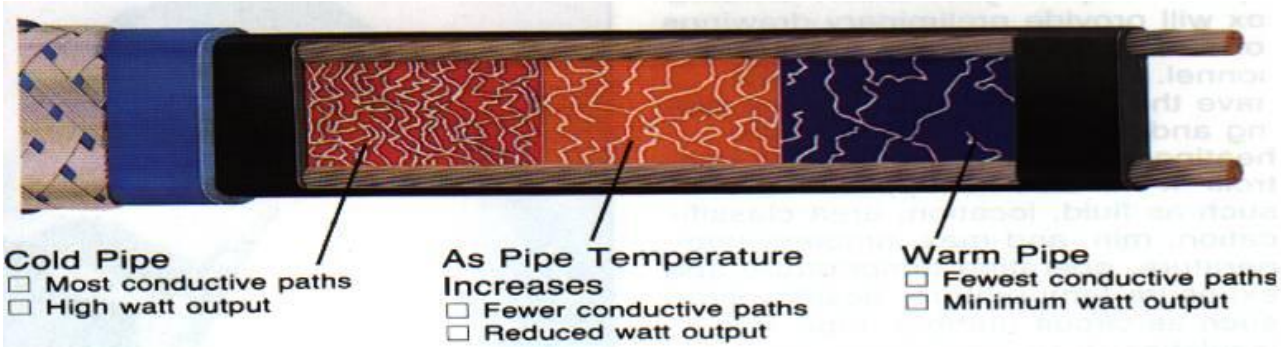
# SR Cable Construction

- Buss wire
- Irradiated Carbon matrix (carbon black)
- Primary over-jacket
- Tinned copper over-braid
- UV or chemical-resistant over-jacket

# How SR Cables Work

- Carbon black suspended in a polymer matrix is used to conduct current between parallel buss wires.

- Expansion and contraction of the polymer matrix versus temperature causes output variation. The colder a surface is, the more ‘contraction’ at a molecular level you get, and the cable creates more resistance and heats up. Conversely, when you put the cable against a warmer surface, the molecules expand/repel each other, reducing the wattage output across the length of the cable.



# SR Circuit Length Max.

- Typically, this cable has a limited life expectancy; wattage output diminishes over time and conditions *(10-25 years depending on controls and brand/quality of manufacture). Voltages over 100 start the degradation process over time.*

- There are 2 cable voltages for low-temp SR cables: 120V and 208-277V cables. The 208-277V version is designed around 240V. If you use 208V, you de-rate the cable slightly; 277V makes it run a little on the hot side.

*Recommended Circuit Lengths NOT TO EXCEED per V for 5w/ft cable (12 w/ft. max draw)*

30A Breaker:

120V – 275ft.

208V – 400ft.

240V – 450ft.

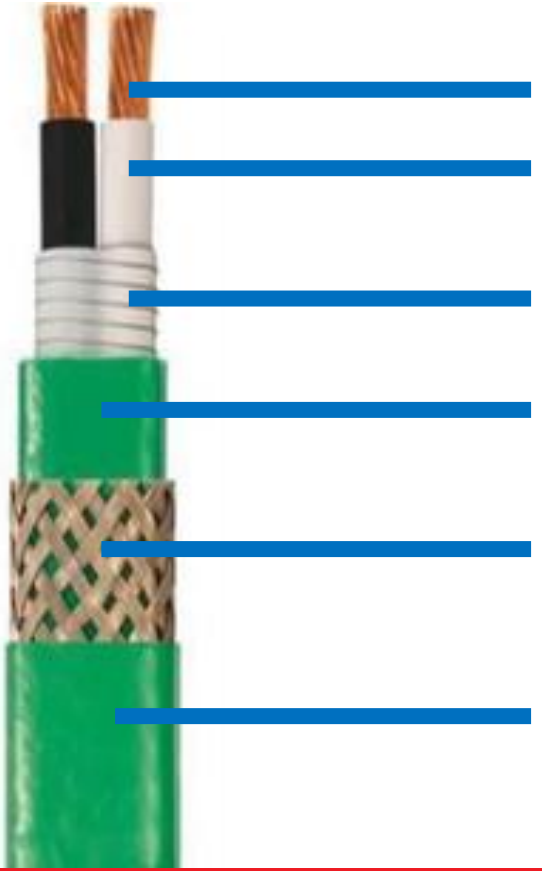
277V – 525ft.

# Constant Watt Cable

- 12 AWG buss wires.
- 4, 8, and 12-watt outputs most common.
- 37 Ga. Ni-Chrome resistance wire.
- 120 – 480V range.
- Can perform up to 320F/390F max. exposure.
- Class 1, Div. 2, groups A, B, C, D.

- Constant watt cable is versatile, and shines in many applications, including floor heating, pipe tracing, frost-heave prevention, and, in low watt outputs, residential roof & gutter melting.
- Constant watt cable delivers a predictable, consistent wattage output. Sizing circuits is easy.
- *Pipe trace CW cables can be cut and terminated in the field*, but flooring cables can only be repaired due to the nature of how they are manufactured.

# Constant Watt Cable



- Buss Wire(s)
- Primary Buss Over-Jacket
- Resistance Wire
- Primary Over-Jacket
- Tinned Copper Over-Braid
- UV or Chemical Resistant Over-Jacket

# Constant Watt Cable

## Advantages:

- Standard Voltages - 120V to 480V (120V, 208-277V, and 480V)
- Lower start up in-rush current & predictable wattage draw and can fit more cable per circuit
- Pipe trace - cut-to-length and flexible; easy to install
- CID2, Zone 1 & 2 Certifications
- Good for smaller diameter metallic pipes/tubing

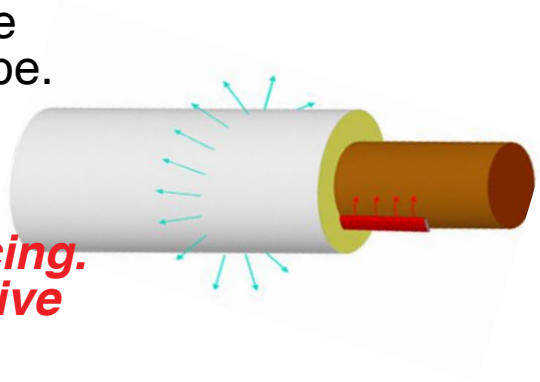
## Disadvantages:

- CANNOT TOUCH AGAINST ITSELF
- CANNOT be used on PVC or CPVC pipes
- Applications are more limited vs. self-reg cables

# Freeze Protection vs. Process Temp. Maintenance

# Pipe Tracing Applications

- Pipe tracing applications are split into 2 different application categories:
  - Freeze Protection
  - Process Temp Maintenance
- Freeze protection is exactly what it is: preventing fluid in the pipe from freezing and bursting the pipe.
- Process temp. maintenance is offsetting the losses on the pipe to maintain a consistent temperature, INSIDE the pipe.



***Pipe insulation MUST be used with heat cables/pipe tracing. One without the other doesn't offer a consistently effective solution!***

# Freeze Protection

- Freeze protection applications are very common and pretty easy to design/engineer. The temp. range we typically figure is based on keeping water melted from -20F to 40F inside the pipe.

- Here are some things we need to know:
  - What is the pipe diameter?
  - What is it made of: PVC, metal, copper, etc.?
  - How much insulation thickness will be added to the pipe?
  - What voltage(s) are available?

- Once we have that information, we can do a “wattage loss calculation” and recommend the right heating cable (5w/ft, 8w/ft, SR or CW, etc.) to offset the heat losses for that particular diameter pipe, its material, and insulation thickness.

# Process Pipe Temperature Maintenance

- Process temp maintenance is basically offsetting the heat losses that are coming off the pipe to maintain a consistent temperature. For example, a 1” syrup line at a food processing plant, the syrup is applied to the food best at 95F, and the temp must be kept at/around that temp.

- Same as freeze protection, a few questions need to be answered first;
  - What is the pipe diameter?
  - What is it made of: PVC, metal, copper, etc.?
  - How much insulation thickness will be added to the pipe?
  - What voltage(s) are available?
  - What’s the ambient plant temperature or base temp. the pipe will be exposed to?
  - What temp. do you need to maintain?

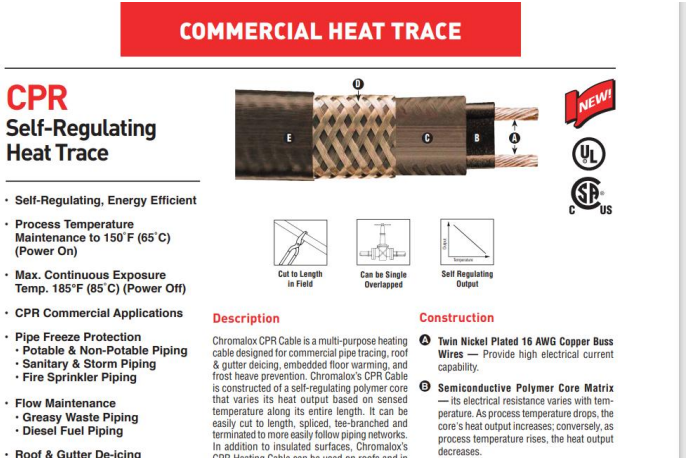
# Design & Layout

- The questions & answers lead to the design, and there are a few differences between freeze protection and process temp. when it comes to design & location/installation. Or, CALL LIBERTY ELECTRIC!
  - Electrically, 30A breakers can support most heat cable circuit lengths. Power runs don't count against total footage, only heat cable does.
  - Voltage can de-rate or help a cable run hotter; always consider this.
  - Linear pipe runs use less cable footage than spiral wrapping.
  - Metal pipes can take the heat. Plastics can't be grossly oversized on watt density, or it can misshape a radius, or create some malleability in the pipe.
  - Rule of 4: You can use 1 linear trace run down a pipe PER 4" of diameter for freeze protection. A ½" wide heat cable vs. the surface area of an 8" pipe would require 2 passes, whereas process temp. could use 1 run because you're offsetting heat, not preventing ice formation.
  - Freeze protection controls are typically outdoor ambient sensing temp, 38F or below. Process temp uses an RTD or thermocouple against the pipe to sense the actual pipe temperature.

# Sizing Circuits – SR Cables

- Sizing circuits is one of the more confusing aspects of designing a pipe tracing system with SR cables. You CANNOT use the wattage rating of the cable but should use the max. in-rush current limitation on the spec sheet.
- When power is applied to the heating cable, it will incur an “in-rush current” that can spike the cable’s highest output.

- **Here’s what we mean**
  - 5w/ft cable – has a 12w/ft max in-rush current and max. output.
  - 8w/ft cable – has a 22w/ft max in-rush current and max. output.
  - This is where to reference your Chromalox spec sheet to see what he maximum circuit length is for your application.
  - For pipe freeze protection, use the “40F Start Up”.



COMMERCIAL HEAT TRACE

**CPR**
**Self-Regulating Heat Trace**

- Self-Regulating, Energy Efficient
- Process Temperature Maintenance to 150˚F (65˚C) (Power On)
- Max. Continuous Exposure Temp. 185°F (85˚C) (Power Off)
- CPR Commercial Applications
- Pipe Freeze Protection
  - Potable & Non-Potable Piping
  - Sanitary & Storm Piping
  - Fire Sprinkler Piping
- Flow Maintenance
  - Greasy Waste Piping
  - Diesel Fuel Piping
- Roof & Gutter De-icing

NEW!

Cut to Length in Field | Can be Single Overlapped | Self Regulating Output

**Description**

Chromalox CPR Cable is a multi-purpose heating cable designed for commercial pipe tracing, roof & gutter deicing, embedded floor warming, and frost heave prevention. Chromalox’s CPR Cable is constructed of a self-regulating polymer core that varies its heat output based on sensed temperature along its entire length. It can be easily cut to length, spliced, tee-branched and terminated to more easily follow piping networks. In addition to insulated surfaces, Chromalox’s

**Construction**

Ⓐ **Twin Nickel Plated 16 AWG Copper Buss Wires** — Provide high electrical current capability.

Ⓑ **Semiconductive Polymer Core Matrix** — its electrical resistance varies with temperature. As process temperature drops, the core’s heat output increases; conversely, as process temperature rises, the heat output decreases.

| Cable Rating | 40˚F Start-up (Ft.) | | | | 20˚F Start-up (Ft.) | | | | 0˚F Start-up (Ft.) | | | | -20˚F Start-up (Ft.) | | | | -40˚F Start-up (Ft.) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 Amp | 20 Amp | 30 Amp | 40 Amp | 15 Amp | 20 Amp | 30 Amp | 40 Amp | 15 Amp | 20 Amp | 30 Amp | 40 Amp | 15 Amp | 20 Amp | 30 Amp | 40 Amp | 15 Amp | 20 Amp | 30 Amp | 40 Amp |
| CPR3-1 | 265 | 350 | 360 | 360 | 220 | 290 | 360 | 360 | 200 | 266 | 360 | 360 | 180 | 238 | 340 | 350 | 160 | 210 | 320 | 340 |
| CPR3-2 | 525 | 660 | 660 | 660 | 440 | 585 | 660 | 660 | 415 | 553 | 660 | 660 | 368 | 489 | 628 | 643 | 320 | 425 | 595 | 625 |
| CPR5-1 | 170 | 226 | 270 | 270 | 150 | 200 | 270 | 270 | 135 | 180 | 270 | 270 | 120 | 160 | 240 | 248 | 105 | 140 | 210 | 225 |
| CPR5-2 | 340 | 450 | 540 | 540 | 300 | 400 | 540 | 540 | 270 | 360 | 540 | 540 | 243 | 323 | 485 | 525 | 215 | 286 | 430 | 510 |
| CPR8-1 | 135 | 180 | 215 | 215 | 115 | 153 | 215 | 215 | 110 | 145 | 215 | 215 | 98 | 129 | 193 | 205 | 85 | 113 | 170 | 195 |
| CPR8-2 | 270 | 330 | 420 | 420 | 235 | 310 | 420 | 420 | 200 | 265 | 395 | 420 | 188 | 238 | 355 | 410 | 175 | 210 | 315 | 400 |
| CPR10-1 | 90 | 120 | 180 | 180 | 85 | 113 | 170 | 180 | 80 | 90 | 135 | 180 | 73 | 88 | 130 | 175 | 65 | 85 | 125 | 170 |
| CPR10-2 | 150 | 200 | 300 | 360 | 140 | 185 | 280 | 360 | 125 | 166 | 250 | 333 | 118 | 156 | 233 | 313 | 110 | 145 | 215 | 293 |
| CPR15-1 | 60 | 80 | 120 | 160 | 55 | 73 | 110 | 146 | 53 | 70 | 105 | 140 | 49 | 65 | 98 | 130 | 45 | 60 | 90 | 120 |
| CPR15-2 | 95 | 125 | 190 | 250 | 90 | 110 | 180 | 230 | 75 | 100 | 150 | 200 | 70 | 93 | 140 | 187 | 65 | 86 | 130 | 173 |

PIPE FREEZE PROTECTION

# Sizing Circuits – Breaker Sizing

- Staying with the example of 750’ of 8w/ft heat cable/240V feeding with 30A breakers for freeze protection, we want to use the “40F Start-up”, as your pipe with be frozen otherwise!
- Referencing the chart on your Chromalox CPR cut sheet. If we follow the 40F Start-up, 30A breaker size, and CPR8-2, you’ll see the maximum circuit length for this cable, at this voltage, with this breaker, is **420’ max.**
- For reference, Chromalox uses a “1” at the end of the part number to denote 120V. A “2” means it’s rated for 208-277V.
- Now you know exactly how much cable you can put on each circuit (420’) and plan your design accordingly. Since we need 750’ total to do the job, it’s a safe assumption you’re going to need a minimum of 2 circuits.
- The next step is figuring out where you’re bringing power from. Long runs of pipe & wire to bring power to heat trace J-boxes can get expensive quick. Look for convenience and practicality when bringing power out to your heat trace location.

| Cable Rating | 40˚F Start-up (Ft.) | | | | 20˚F Start-up (Ft.) | | | | 0˚F Start-up (Ft.) | | | | -20˚F Start-up (Ft.) | | | | -40˚F Start-up (Ft.) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 Amp | 20 Amp | 30 Amp | 40 Amp | 15 Amp | 20 Amp | 30 Amp | 40 Amp | 15 Amp | 20 Amp | 30 Amp | 40 Amp | 15 Amp | 20 Amp | 30 Amp | 40 Amp | 15 Amp | 20 Amp | 30 Amp | 40 Amp |
| CPR3-1 | 265 | 350 | 360 | 360 | 220 | 290 | 360 | 360 | 200 | 266 | 360 | 360 | 180 | 238 | 340 | 350 | 160 | 210 | 320 | 340 |
| CPR3-2 | 525 | 660 | 660 | 660 | 440 | 585 | 660 | 660 | 415 | 553 | 660 | 660 | 368 | 489 | 628 | 643 | 320 | 425 | 595 | 625 |
| CPR5-1 | 170 | 226 | 270 | 270 | 150 | 200 | 270 | 270 | 135 | 180 | 270 | 270 | 120 | 160 | 240 | 248 | 105 | 140 | 210 | 225 |
| CPR5-2 | 340 | 450 | 540 | 540 | 300 | 400 | 540 | 540 | 270 | 360 | 540 | 540 | 243 | 323 | 485 | 525 | 215 | 286 | 430 | 510 |
| CPR8-1 | 135 | 180 | 215 | 215 | 115 | 153 | 215 | 215 | 110 | 145 | 215 | 215 | 98 | 129 | 193 | 205 | 85 | 113 | 170 | 195 |
| CPR8-2 | 270 | 330 | 420 | 420 | 235 | 310 | 420 | 420 | 200 | 265 | 395 | 420 | 188 | 238 | 355 | 410 | 175 | 210 | 315 | 400 |
| CPR10-1 | 90 | 120 | 180 | 180 | 85 | 113 | 170 | 180 | 80 | 90 | 135 | 180 | 73 | 88 | 130 | 175 | 65 | 85 | 125 | 170 |
| CPR10-2 | 150 | 200 | 300 | 360 | 140 | 185 | 280 | 360 | 125 | 166 | 250 | 333 | 118 | 156 | 233 | 313 | 110 | 145 | 215 | 293 |
| CPR15-1 | 60 | 80 | 120 | 160 | 55 | 73 | 110 | 146 | 53 | 70 | 105 | 140 | 49 | 65 | 98 | 130 | 45 | 60 | 90 | 120 |
| CPR15-2 | 95 | 125 | 190 | 250 | 90 | 110 | 180 | 230 | 75 | 100 | 150 | 200 | 70 | 93 | 140 | 187 | 65 | 86 | 130 | 173 |

PIPE FREEZE PROTECTION

# Design – Voltages

- Voltages have a profound effect on heating cables, and typically range from 120V-277V, sometimes 480V for most industrial/commercial pipe tracing applications.
- Chromalox's SR cables are 120V and 208-277V. Contant wattage is 120V, 208-277V, and 480V.
- Voltages over 100 begin a molecular degradation on the irradiated carbon core of the heating cable, and it begins to lose its output over the years. Typical premium-grade cables are 20-25-year products, but life expectancy can depend on voltage and usage.
- 208-277V cables are designed around 240V, so when you apply 208V, they run a slightly lower watt density per foot, and conversely, 277V runs hotter/higher watt density.
- The higher the voltage, the faster the cable's life expectancy will fade; however, you also get longer circuit lengths that save money on controls/# of circuits.

**Output Wattage at Alternate Voltages (W/Ft.)**

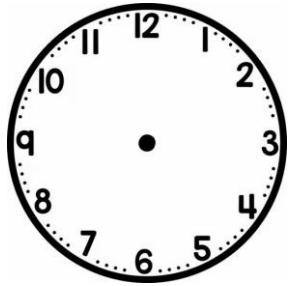
| Model | 208V | % Change In Output | 220V | % Change In Output | 277V | % Change In Output |
|---|---|---|---|---|---|---|
| CPR 3 | 2.4 | -20 | 2.6 | -13 | 3.4 | +15 |
| CPR 5 | 4.1 | -18 | 4.5 | -10 | 5.6 | +13 |
| CPR 8 | 6.88 | -14 | 7.28 | -9 | 8.96 | +12 |
| CPR 10 | 8.7 | -13 | 9.2 | -8 | 11.1 | +10 |
| CPR 15 | 13.2 | -12 | 13.95 | -7 | 16.2 | +8 |

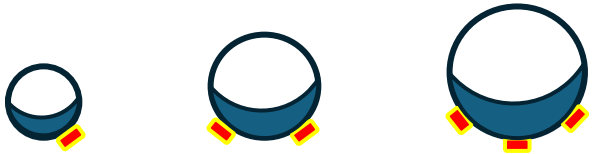
*Voltage plays a huge role in getting proper/expected heat output; 208-277V heat cables are usually designed around 240V, so 208 runs 'cooler' and 277 runs 'hotter'.*

*Another voltage affecting mistake commonly made is stripping too many copper threads off the buss wires! SR heat cables are 16-GA braided, so when you strip them, care is needed to ensure you're not losing copper on your buss. Less copper = less voltage.*

# Cable Positioning Freeze Protection

- Freeze protection applications use a “rule of 4 inches”, which means for every 4” of pipe diameter, you should be using an extra linear run of cable.
- Therefore, 1” – 4” diameter pipes = 1 run. 5” – 8” = 2 runs, etc. Obviously, this affects how much cable footage is in the design.
- Freeze protection is usually a “non-pressurized” system, so any fluid in the pipe will be on the lower half (horizontally), and where we install the cable.
- Looking at the “clock face”, 5 and 7 are great choices.



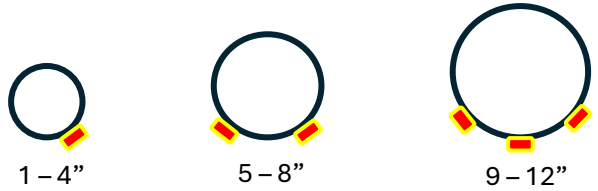



1 – 4” 5 – 8” 9 – 12”

*Another voltage-affecting mistake commonly made is stripping too many copper threads off the buss wires! SR Heat cables are 16-GA braided, so when you strip them, care is needed to ensure you’re not losing copper on your buss. Less copper = less voltage.*

# Cable Positioning Process Temp. Maintenance

- Process temp. maintenance applications are primarily to offset the temp loss itself, without as much worry about spreading across the lower surface area of the pipe.
- That being said, it's often logical and appropriate to use multiple linear runs depending on diameter, what's in the pipe, or if it's metal or plastic.
- Process pipes are usually pressurized, which means the entire pipe is filled with fluid.
- Process piping systems are typically maintained and worked on more frequently than freeze protection, so a little extra length when wrapping valves, couplings, etc., is needed.




*The same spacing and location for runs applies to Constant wattage cables as well. Constant wattage cables are typically smaller in diameter and may want to consider using foil tape to spread heat across the surface.*

# Splicing

- Splicing is common. As much as we try to avoid it by just going “down & up” the pipe *(as metal pipes can take the extra heat),* but in cases where it makes sense to splice, we recommend using ABOVE INSULATION J-boxes. Under-Insulation splices are less money, but impossible to find if there’s an issue. Good splices and power connections take time (figure 30 minutes). Accuracy is key, not speed.

It’s IMPERATIVE to do a VOLTAGE check at the end of the cable run after installing a splice!

Splices are opportunities to lose voltage, and losing voltage means losing heat output.

# Cable Positioning Process Temp Maintenance

- When putting cable on the pipe, fiberglass tape is your best product. It's heat-resistant, thin, and just a wind and a half around is enough to hold the cable onto the pipe during the insulating process.
- Foil tape also works because it's wider and tackier; it can fold up, but the BEST product for helping spread heat across the pipe surface.
- Stay to the outside of radius bends. It's a greater surface area vs. the inner radius bend.
- It's a judgment call, but typically a wind around every 2-3' will keep the heat cable taut enough for the insulating process.

## NO NEED TO SPIRAL WRAP

*(99.9% of the time)*

*Spiral wrapping uses A LOT more cable length, and unless it's a process temp. job, there's no reason to consider it. To determine how much more cable it uses, the calculation is: Pipe Dia. X 3.14.*

*A 12" pipe would require 3.14' of cable to perform 1 wrap.*

# Positioning Power/J-Boxes

- Bringing power out to the location can have a big impact on costs. In the design process, look for locations where you can maximize heat cable coverage. Also, circuit length maximums for heat cable aren't affected by power runs, so you can "link together" J-boxes on the same circuit even if they are separated by a few hundred feet.

*Heat Trace Circuit – 20A breaker max. length 330'*
*J1 = 120' 8w/ft heat trace*
*J2 = 150' 8w/ft heat trace*
*(light blue dashes) Power/Pipe & Wire #10 = 180'*
*The 'blue' power doesn't count towards the max circuit length*

# Heat Cable Controls

# Single Circuit Controls

- Single Circuit controllers refer to having a point of control that turns power on/off to (1) circuit breaker.
- There are 2 kinds of sensors for pipe tracing applications:
- Ambient – measures temperature of the surrounding environment. Can be used indoors or outdoors.
- Line Sensing – a temperature sensor or probe is affixed and reads actual temperature of the pipe surface.

Ambient


Line Sensing

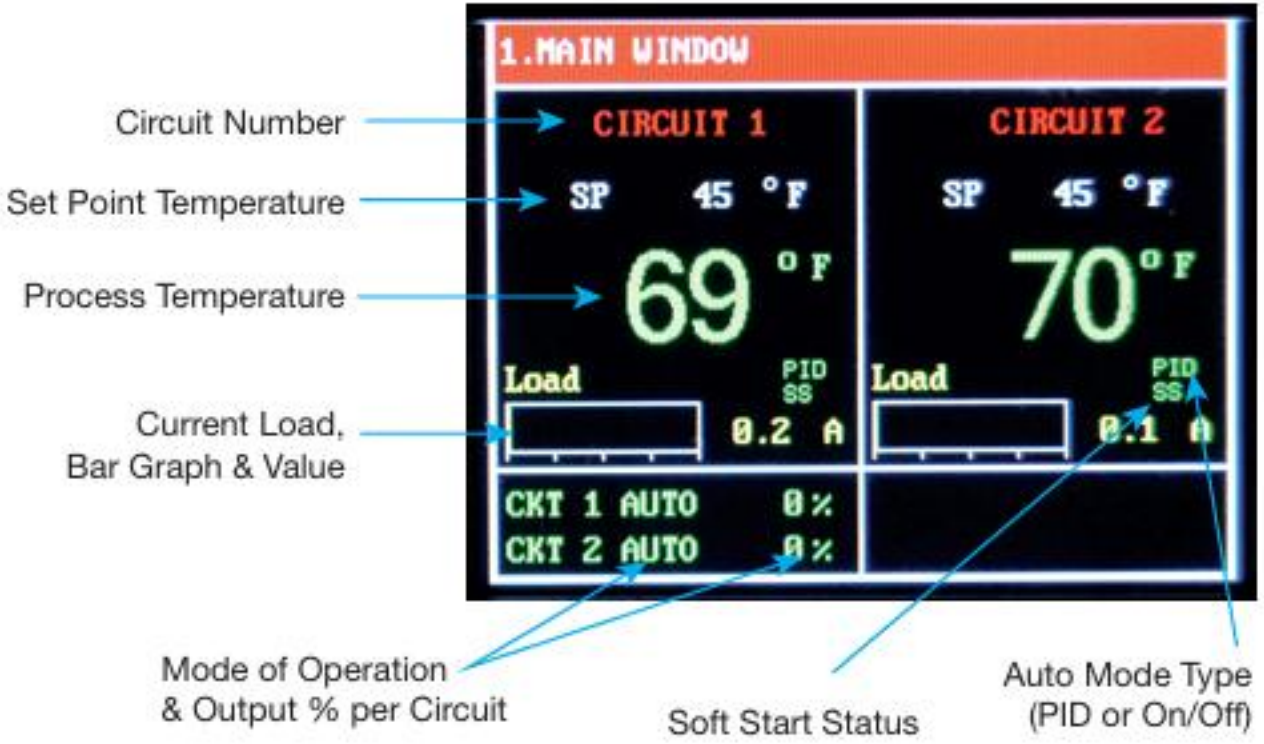

Advanced

- You can wire power directly to a dedicated thermostat/ single circuit controller and come out of the thermostat with heat cable along a run of pipe- perfectly acceptable.
- Single-circuit controllers can come with GFI code requirement circuit cut, or not- and can generally handle up to 40A @ 120V, 208-277V, some 480V.
- Advanced single & dual circuit controllers can connect with BMS, give accurate fault codes, real time info, ground fault protection, BMS integration, alarm histories, etc. and come at a higher price tag.

# Chromalox ITC – 1 & 2 Circuit

- Chromalox's ITC heat trace controller is a 1 or 2 circuit ADVANCED
- Unit that allows the user to set multiple parameters and obtain a higher level of information in real time and can connect to a BMS system.
- Each circuit can handle 40A and offers a 'soft start' feature that limits inrush current trips.
- Temperatures set point is fully adjustable along with high current limit, GFI trip alarm & latch, and can send information via RS485 to building management systems.
- *One of the best features of this controller is being able to identify fault codes. Having the controller tell you WHICH circuit and WHAT the problem is can save a lot of time trying to diagnose in the field!*

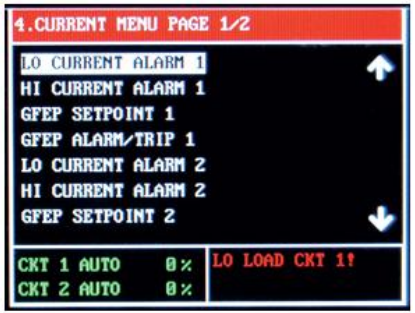
# Chromalox ITC – 1 & 2 Circuit



# Chromalox ITC – Programming

- Chromalox's ITC heat trace controller is very intuitive in the setup process.
- The Master Code is 0063. When you go to access the menus, you'll need to input this code to gain access to all functions for this controller.
- Once you enter the code, you'll land immediately on the "Page 3" temperature setup menu. You can simply arrow down to the field you want to change, then hit "Enter" to access that field and change it with the up/down arrows.
- When you want to save your choice, hit "Enter" again, and it's saved. Page 4 is "Current/Power menu", and this is where you can set a high current alarm and disable the low current alarm as it generally just incurs nuisance trips. This is also the menu you'd find "GFI  Alarm & Latch," which is highly recommended/required if you want to use the controller to watchdog GFI events. If detected, it'll both alarm the controller and cut power to the circuit.


| 3. Temperature Menu | |
|---|---|
| Temperature Setpoint | Process Temperature Variable |
| Low Temperature Alarm | Lower limit of the Process Temperature Variable at which the system goes into alarm state. This alarm may be turned OFF by going one increment beyond the Lowest setting. |
| High Temperature Alarm | Upper limit of the Process Temperature Variable at which the system goes into alarm state. This alarm may be turned OFF by going one increment beyond the Highest setting. |

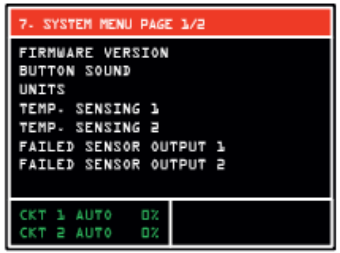


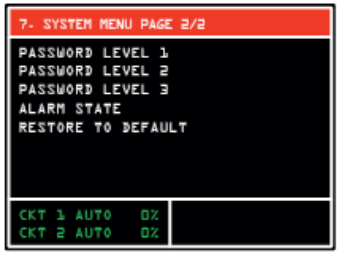

*Descriptions like the box above stating what each field does are in your Chromalox ITC INSTALL MANUAL.*

# Chromalox ITC – Programming

- Menu pages 5 and 6: I'd avoid unless you're a communications tech and you want to set up specific IP addresses and communicate with the ITC.
- Menu page 7 is the systems menu and gives the user the ability to change passwords, audible sound levels, and most importantly, the ability to assign circuit 1 or 2 on the controller with what kind of sensor mode you're using temp. sensing 1 & 2.
- The ITC uses a 3-wire RTD for temp sensing on the pipe. You can also use an ambient sensor. Typically, you'd assign RTD 1 to Circuit 1, and use can also use 1 RTD to turn on BOTH circuits.
- Circuit 1/board 1 is the lower board inside the unit, and everything hinges off of this board. If you opt for a 2-circuit ITC, the upper board is a slave unit.
- Overall, the Chromalox ITC is a highly capable 1- or 2-circuit controller that offers a lot of information for not that much more in price.





# Multi-Circuit Controls

- Multi-circuit panels can handle from 2 to 100+ circuits and are going to come in the form of either contactor-relay (CR) panel or a fully breaker-integrated distribution panel with HMI. Multi-circuit panels are very common and are turned on/off by sensors and controllers wired back to them. Just like single-circuit controls, they can be either ambient or line sensing temperatures.

Line Sensing

OR

Ambient


# Contactor Relay Panels

- Contactor relay panels are the most affordable of the multi-circuit control options. They are built in 2-circuit configurations: 2, 4, 6, 8, 10, 12 circuits, etc.
- CRs accept either a line or low voltage signal and allow power to pass to 30A, 40A, or 50A contactors, typically 120V-480V common line voltages.
- CRs can also come with GFPE code-compliance for heat trace circuits, a very popular and low-cost way to handle it.
- Lower price also comes with more installation. Each circuit of the CR panel needs to be fed with a 30A breaker from an electrical distribution panel.

# HMI/Breaker-Loaded Advanced Panels

- The advanced/breaker integrated panels come with 20 or 30A GFI-rated breakers integrated; all it needs is a 200A or 400A feed.
- Advanced panels are driven with HMI touch-screens, with full information displays including pipe temp, current draw, alarm status, etc. They are BMS-capable and typically operate from low-voltage RTD input temperature sensors.
- The alarming system gives you the reason for the alarm and which circuit it is. It can also keep alarm histories, and the user has full range control over temp. set points, current min/max, and linking circuits together on the same RTD/sensor.
- Despite the higher cost of these panels, they do save quite a bit in labor costs, as you only need to bring a single, large feed. They can, however, be more sensitive to site power quality issues.

# Power Quality

- Power quality is almost always overlooked and is very important for heat trace system controls.
- Over 70% of surge events and power quality issues happen inside the walls of the building, NOT from the utility side at the pole.
- The utility only needs to bring you the correct voltage to meet their obligation, and they don't have to guarantee the quality of that electrical power – that's up to the building owner.
- Any controls that utilize circuit boards, microprocessors, and low-voltage signals are subject to voltage issues, and the electrician must have a good understanding of what else is being powered by the panel feeding your heat trace controls. Many times, inconsistent performance and fault codes aren't a defect in the controller, but power quality issues wreaking havoc. SURGE PROTECTION devices installed on the feeding panel to your heat trace system help to resolve these issues, and a professional power quality assessment for the right power conditioning equipment may be needed to get the best from your sensitive controls.


# Installation Tips

# Installation

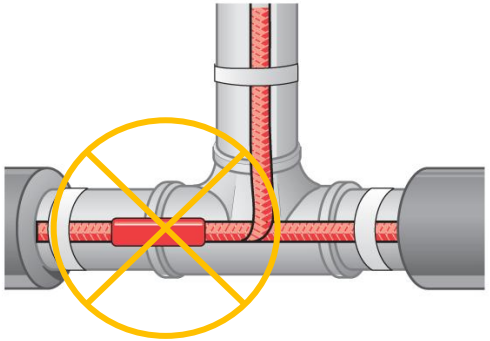
***BEFORE THE ACTUAL CABLE ON PIPE***

- Installers should be reviewing the plans for installation, and installation manuals at least a week before the start date (at least), and ensure all materials are ready to go, and any proactive questions can be answered. This is Step 1 of your CYA journey.
- Trace out your circuits on the physical drawing to match what the layout/design or bill of materials included for your job. Now, anyone working on the crew knows what materials go where.
- Have a spreadsheet ready or a notes page where you can record your voltages, resistances, ohm readings, and dates you performed them. This is your install record, and you should save a copy for your records, and one for your PM, GC, or end user. CYA #2.
- Perform a voltage check on the electrical panel(s) feeding your heat trace circuits and record them. Also, check for what else is connected to that panel, or any other potential power quality issues. Voltage can have a profound effect on heat cables, and it can be for the good, but usually the bad. Step #3 of your CYA policy.
- When your heat cable shows up on site, do a megger reading on the spool to ensure it wasn't damaged during transit and record on your spreadsheet with date and time.

# Installation

***CABLE ON PIPE***

- Heat cables should be installed on the lower portion of the pipe. If you're referencing the face of a clock, 5 or 7 are ideal locations for your run; stick to the outsides of radius bends.
- If you're tracing larger diameter pipes, or PVC/CPVC, you might try running a line of aluminum foil tape down the 5 or 7 o'clock linear runs so the cable sits on top of it, and it helps disperse heat along the surface area.
- Run your heat cable in a linear pass, affixing it to the pipe using fiberglass tape. You can also use foil tape to cover it or even hold it on the pipe as well. Take pictures of your work (CYA policy #4); your phone is a tool!
- If there are any valves, couplings, pump housings, etc., that have to be covered, make sure you have enough "slack" built in to remove the cable and re-install it if the valve or pump ever needs to be replaced.
- After you've taped the cable to the pipe, perform a megger test and record. CYA #5.
- If you have to install a splice box, it's recommended to go "above insulation" so you can access the J-box anytime. Any time you splice, make sure to check the voltage again on the other side of the splice.



# Installation

***AFTER CABLE ON PIPE***

- MEGGER, MEGGER, MEGGER. Make sure your heat trace cables have been tested (one buss wire at a time) and recorded BEFORE the insulators get there.
  - You can also label the inside of J-boxes with
  - Circuit number back at the panel
  - How many feet of cable are on the circuit/box
  - Voltage
  - This helps anyone following your work in the future

- Talk with the insulator or GC's PM. If an insulator feels like they nicked the heating cable with a razor knife, or damaged it in any way, offer to re-megger the line.
- Download your pics, take your paper record of megger readings, voltage, dates/time, and submit your job record to PM or GC. Keep a record for yourself, too.
- Your quality of work speaks to who you are.

# “CYA” Policy

- ***When heating cable systems have issues, the first person the finger is pointed at is the installing electrician.***

- The whole point of “Cover Your Ass” is having a file of proof your job was done correctly, recorded, and submitted SO YOU CAN GET PAID! The whole point of what you do is to do it once and get paid.

- Pics of terminations and cable install prior to insulation, megger & voltage readings are key elements of proof the job was done correctly, and startup should go smoothly with no GFI-popping circuits! This also pays big dividends if there’s an issue when speaking with the manufacturer and casting the doubt more on the product vs. the installer.

# Technical Help

**When you get stuck on site, you have options:**

1. Go back and re-read that section of the install manual, and re-trace your steps/re-check your work & use logic/process of elimination.

2. Call who you bought materials from/or the rep and get some tech help from them. If they cannot …

3. Try YouTube or go online to research the issue with your phone. The manufacturer's site can often have resources.

4. Call the manufacturer of the product and ask for jobsite technical assistance.

# Our Agency

- Established in 1987, Liberty Electric Sales is celebrating its 38th year of serving Upstate NY and the Northeast with industry-leading products, designs, and technical expertise in the electrical, HVAC, and industrial industries. Our agency does most of its own engineering designs, and we seldom rely on the factory, which means we can react quickly to your needs.

- Our agency started with a focus on electric heat applications and has grown through both sales volume and strategic timing. In the past 10 years, we've bought and integrated 4 other representative agencies; we total around 50 lines throughout the Northeast.

- Our main offices are located in Syracuse, N.Y. and New Bedford, Mass. We're staffed with 10 outside salespeople and 8 inside sales & support staff.

- We call on a diverse audience, including architects/engineers, electrical/mechanical wholesalers, contractors, commercial/industrial, and institutional accounts.

# Thank You

Check out our website at www.libertyelectricproducts.com.
For more information email sales@libertyelectricproducts.com.