

When energized, Heatizon Systems Control Units turn the primary power on and off to a step-down, low-voltage Transformer that provides power to the Heatizon Tuff Cable or ZMesh. The Control Unit can be activated by many different types of activation devices. Examples of activation devices include simple timers and thermostats, temperature and moisture sensors and telephone computer activators (see your Heatizon Systems supplier for details).

All of Heatizon System's CBX series Control Units employ "soft turn" circuits that turn the Transformer on without a high in-rush current from the power source. If there is a problem, the primary power to the Control Unit must shut OFF.

The following safety circuits monitor the CBX6, CBX6T, CBX23 and CBX23T Control Units to contribute to safe operation:

- A. Shorting and Arcing: Monitors for loose connections between the Cold Leads and both the Transformer and the Tuff Cable or ZMesh heating element. In addition, this circuit monitors shorts and arcing on the Tuff Cable or ZMesh heating element.
- B. Overtemp Sensors: Monitors the temperature of the Transformer; in the event of the Transformer overheating, it will shut off the Transformer until it cools down, then turn it back on.
- C. Over current: If the secondary current is increased by more than 5% on ZMesh interior application systems and more than 10% on Tuff Cable systems and ZMesh snow melt and roof deicing applications, the Control Unit should shut off.
- D. Under current: If the current decreases by more than 10% on ZMesh interior application systems, and 20% on Tuff Cable systems or ZMesh snowmelt and roof deicing applications, the Control Unit should shut off.
- E. Automatic Check. The Heatizon Systems CBX6 and CBX23 Control Units automatically shut off every 30 minutes to check the power circuit for problems. If the Control Unit detects a power problems, it should shut off and keep it off.
- F. SCR Failure. The CBX6 and CBX23 has an SCR fault that opens a relay and turns the system off if the SCR fails, or if the activation device is off and the system attempts to stay on.

The following safety circuits monitor the CBX7 Control Unit to contribute to safe operation:

- A. SCR Failure. The CBX7 has an SCR fault that opens a relay and turns the system off if the SCR fails, or if the activation device is off and the system attempts to stay on.



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CBX23 SERIES SYSTEM
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**STARTING UP A CBX7
SERIES SYSTEM
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CBX6/23 START UP PROCEDURES

STARTING UP A CBX6 or CBX23 SERIES SYSTEM

After all equipment is installed and electrical connections have been made the system is ready to energize and test.

The adjustment potentiometer on the Control Board for the high and low current fault circuits must be set for the exact length of Tuff Cable or Z Mesh heating element and Transformer voltage. Before this can be done, the secondary current on the Transformer must be set.

Before proceeding, make certain that all shorts have been corrected and cleared, all damaged or cut heating element and/or Cold Lead has been appropriately repaired, and any and all joints have been crimped, soldered, and tightened where appropriate,

Step 1: Attach a Clamp on Amp Meter around one of the Cold Leads and set the amp meter for AC Amps with a range of at least 200 Amps. Turn on the circuit breaker and switch on the activation device. System will turn on and transformer will hum upon activation, this is normal.

Step 2: Check Amp Meter to see that system is running at less than 96 Amps. System will shut down in approximately 5 seconds, this will be long enough to get an Amperage reading from the system. The LEDs will indicate either under or over current prior to system shut down—this is normal. If the system is not running at the expected amperage, turn the circuit breaker and activation device off, and select a different transformer tap to achieve the proper operating amperage, and connect the Cold Lead to the newly selected tap.

Step 3: After readjusting the Transformer tap, switch the breaker and activation device on. System will run for another 5 seconds allowing you to recheck the Amperage measurement. Repeat this procedure until the proper operating Amperage is achieved. After the proper operating Amperage has been achieved, refer to the System Operating Tables in this Design and Installation Manual to see if Amperage compares to the calculated Amperage in in the System Operating Tables.



WARNING: If the proper operating amps cannot be achieved, this could indicate a fault in the installation of the heating element or other problem with the system. Consult your Heatizon dealer or Heatizon Systems for further assistance.

NOTE: If using an S202 or S203 dual tapped transformer repeat the start up procedures for both the top and bottom pairs of cold leads.

CBX6/23 START UP PROCEDURES

Step 4: Once the proper amperage readings have been verified you may adjust the Control Board adjustment potentiometer.

Set the activation device to the **OFF** position (no call for heat).

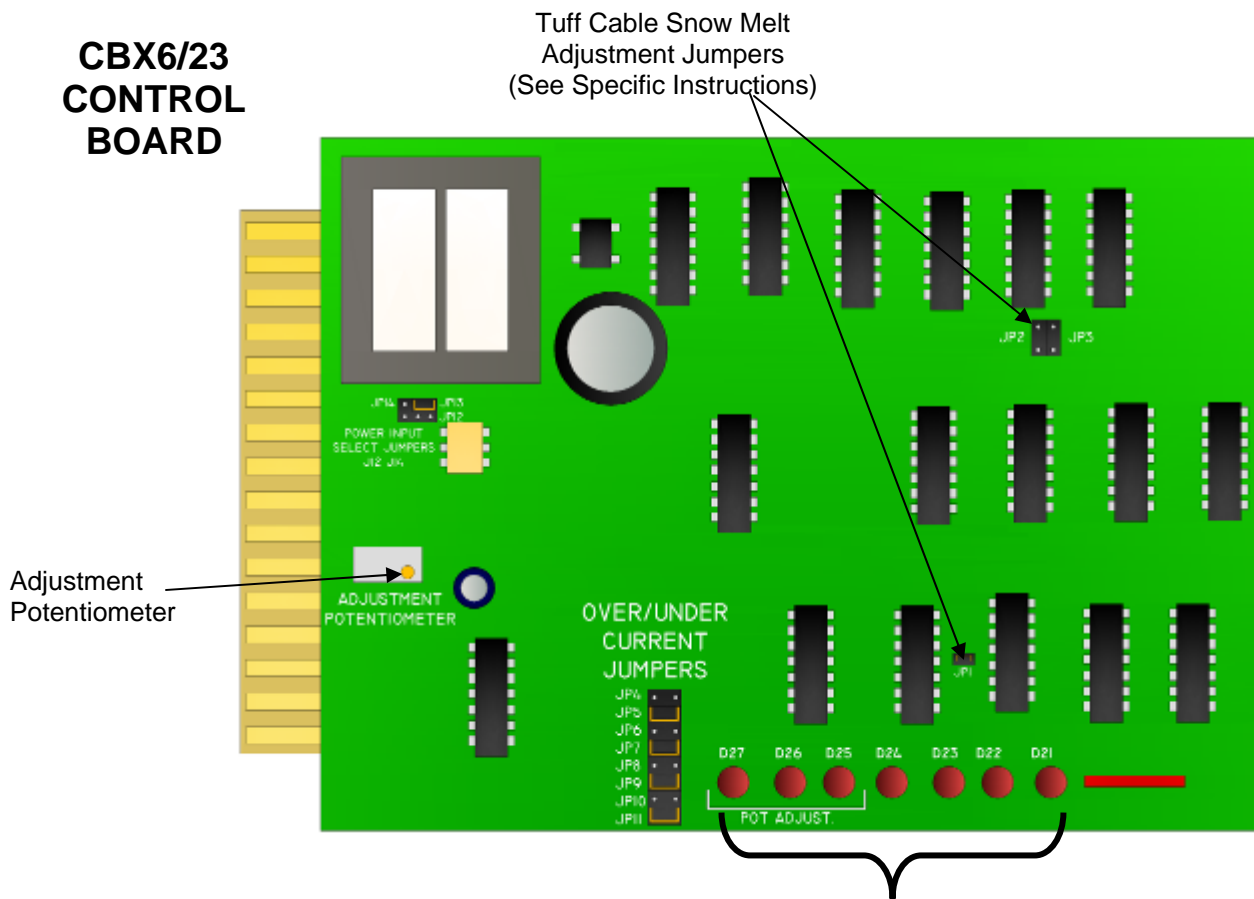
Switch the panel circuit breaker that feeds Control Unit to the **ON** position.

Switch the breaker in the front of the Control Unit to the **ON** position.

LED's D24 and D25 should be illuminated; this indicates line power is on with no call for heat.

NOTE: The Control Unit will not stay running until the Control Board is properly adjusted. Adjustment of the potentiometer must be done with the system turned on and calling for heat. The Control Unit will operate for approximately 5 seconds if not properly adjusted. When the Control Unit shuts down, it may be reset by switching the activation device and the Control Unit switch circuit breaker off and then on, then the adjustment procedure can resume.

Step 5: Follow the correct procedure for each specific application as described in the next few pages. There are a few additional adjustments and instructions that are unique to each application. Please locate the appropriate section for the type of system which has been installed. Refer to the Control Board diagram below to locate the adjustment potentiometer, jumpers, and LED indicators.



NOTE: LED's are designated as D21 through D27 (under current indication is D21 and over current indication is D22). LED functions are indicated on the side of the Control Unit cover. Also a status indicator is located near the other LED's on the right-hand side of the Control unit. This indicator mimics the function of the status indicator LED on the activation device.

CBX6/23 START UP PROCEDURES

CBX6/23 POTENTIOMETER AND JUMPER ADJUSTMENTS FOR SPECIFIC APPLICATIONS:

- 5A TUFF CABLE RETROFITS IN ASPHALT OR CONCRETE
- 5B INTERIOR ZMESH SYSTEMS AND INTERIOR TUFF CABLE SYSTEMS
- 5C Z MESH SNOW MELT AND ROOF DEICING SYSTEMS
- 5D TUFF CABLE SNOW MELT AND ROOF DEICING SYSTEMS

5A. TUFF CABLE RETROFITS IN ASPHALT OR CONCRETE:

When doing a start-up for Tuff Cable Retrofit Systems in existing asphalt or concrete, move Jumper JP1 to JP3 on the Control Board. Movement of Jumper JP1 to JP3 will cause the Control Unit to operate for approximately 120 seconds when not properly adjusted, rather than 5 seconds, to allow a longer delay before the system shuts down.

If D24 and/or D25 are on when the system is activated, turn adjustment potentiometer counter-clockwise until only D26 is lit. If LED D27 and/or D26 come on when system is activated, turn adjustment potentiometer clockwise until only D26 is lit. Let Control Unit run approximately 30 minutes for a Tuff Cable Retrofit System. After 30 minutes, the cable has warmed up and the current lowers, LED 27 should go off if the system is properly adjusted. If LED's D25 and/or D26 are lit, the Control Unit is adjusted correctly, otherwise, perform a FINAL adjustment to the potentiometer while the Tuff Cable heating element is warm. If the Control Board cannot be adjusted correctly after several attempts, turn the power off and refer to the troubleshooting section of the install manual.

5B. INTERIOR ZMESH SYSTEMS AND INTERIOR TUFF CABLE SYSTEMS

If LED's D27 and/or D26 come on when system is activated, turn adjustment potentiometer clockwise until D25 and D26 are equally lit. If D24 and D25 are lit turn the potentiometer counter clockwise until D25 and D26 are equally lit.

With the initial adjustment made let the Control Unit run for approximately 10 minutes then perform a final adjustment to the potentiometer while the heating element is warm. If the Control board cannot be adjusted correctly after several attempts, turn the power off and refer to the troubleshooting sections of the Heatizon installation manual.

NOTE: On cold startup of all systems, the system will be slightly out of adjustment and will drift into its proper adjustment as it reaches operating temperature. Amperage will lower slightly during this warm up period; this is a normal function of the system.

5C. ZMESH SNOW MELT AND ROOF DEICING SYSTEMS

The temperature rise of ZMesh is less than that of Tuff Cable, primarily because of the area of the ZMesh verses the area of the Tuff Cable. As a result, while the concept is the same as with Tuff Cable, the solution is different. When installing ZMesh on a roof deicing or snow melting project the final adjustment of the potentiometer many need to be performed when the ambient temperature closely approximates the ambient temperature that will exist when the system will be energized and operating (at a temperature lower than the freezing point of 32° F and preferably when snow is on the roof, deck or other surface to be deiced or snow melted).

It is possible to compensate for the difference between the ambient temperature at the time of installation and the ambient temperature expected at the time of operation be setting the secondary amperage down by one (1) amp for each ten (10) degrees F of expected ambient temperature decrease. For example: If the ambient temperature at the time of installation is 90° F and 30° F is the ambient temperature expected at the time of operation then the amps would be set 6 amps lower than the amps desired at the expected ambient operating temperature.

CBX6/23 START UP PROCEDURES

5D. TUFF CABLE SNOW MELT AND ROOF DEICING SYSTEMS INSTALLED DURING THE SUMMER MONTHS.

Once all shorts have been corrected and cleared, all damaged or cut Tuff Cable and/or Cold Lead has been appropriately repaired, and any and all joints have been crimped, soldered, and tightened where appropriate, the following steps must be taken:

- a) Move the black jumper currently on the pins marked JP1 to the pins marked JP3 in order to change the time out period from approximately 5 seconds to approximately 120 seconds.
- b) Use the following formula to calculate the appropriate amperage setting needed to compensate for the difference between the temperature of the surface into which the Tuff Cable is embedded at the time of installation and the anticipated temperature at the time of operation.

Note: In all of our examples, we use 30° F as the anticipated temperature at the time of operation for snow melting and roof deicing projects. You may choose to use a different anticipated temperature degree number in the formulas below.

OPA= Desired Operating Amps at 30°F

TA= Target Amps to set for at the surface temperature

ST= Surface Temperature of the project at the time of installation

30°F= Desired or anticipated operating temperature

NT= Number of Turns on the potentiometer to compensate for the change in amps due to temperature

STA= Surface Temperature Amps or the secondary recorded at the time of installation

$$\text{OPA} - (\text{ST} - 30) / 3.5 = \text{TA}$$

- c) Energize the Control Unit by turning the input power on.
- d) Set the Activator so that it is calling for the Control Unit to power the Tuff Cable heating element.
- e) Check the output amps on the secondary side of the Transformer.
- f) Set the secondary amps by changing the power tap to which the Cold Lead is connected until the amps equal the value of STA calculated in the above formula.
- g) Next use the following formula to determine the number of clockwise turns that must be made to the potentiometer in order to tune the Control Unit in for operation at the desired or anticipated operating temperature.

$$(\text{OPA} - \text{STA}) / 6 = \text{NT}$$

- h) Adjust the potentiometer of the Control unit for the desired or anticipated operating temperature by turning the potentiometer clockwise the number of times calculated in the above formula.

Note: After the potentiometer of the Control Unit has been adjusted for the desired or anticipated operating temperature the system will probably turn off with an undercurrent indication (LED's Number 24 and Number 25 lit). Once this happens the system is tuned in and should operate at the desired or anticipated operating temperature.

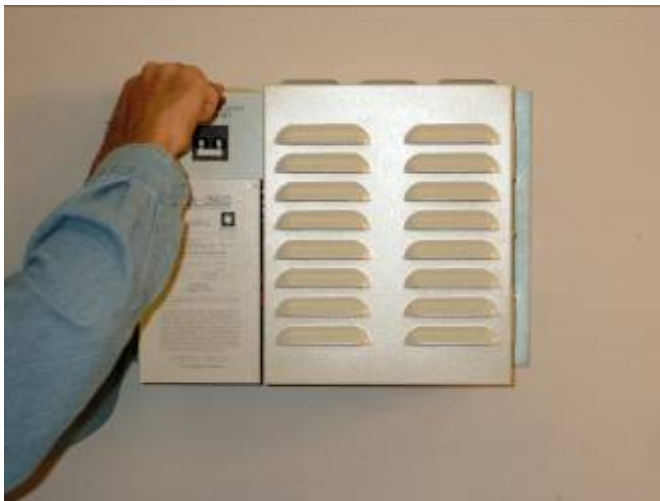
CBX6/23 START UP PROCEDURES

WARNING: ONCE THE CORRECT FINAL ADJUSTMENT OF THE POTENTIOMETER HAS BEEN MADE, THE POTENTIOMETER SHOULD NEVER NEED RE-ADJUSTMENT.

WARNING: NEVER READJUST THE POTENTIOMETER FOR ANY HEATIZON SYSTEM PRODUCT WITHOUT FIRST CHECKING THE OUTPUT SECONDARY CURRENT AND VERIFY THAT IT IS THE SAME AS IT WAS WHEN THE SYSTEM WAS INITIALLY SET UP AND ENERGIZED. IN THE EVENT THE OUTPUT SECONDARY CURRENT IS EVER DIFFERENT THAN IT WAS WHEN THE POTENTIOMETER WAS SET AND THAT DIFFERENCE CANNOT BE EXPLAINED BY EITHER A CORRESPONDING CHANGE IN THE PRIMARY INPUT POWER OR A CHANGE IN THE AMBIENT TEMPERATURE, A PROBLEM EXISTS AND ALL POWER TO THE SYSTEM SHOULD BE TURNED OFF UNTIL THE PROBLEM IS IDENTIFIED AND CORRECTED.

WARNING: Danger of shock, extreme care should be used to position Transformer taps so that they are clear of the cover or other taps on the transformer. Carefully bend copper taps as needed to ensure proper clearance on both used and unused taps.

Step 6: Before installing the Control Unit cover, visually inspect the Heating Element and Cold Leads for cuts, shorts, and other damage; repair as necessary. Check for continuity to any conductive material, including but not limited to metal; eliminate as necessary. Record system information in the spaces provided on the Control Unit front cover. Also fill out the form Heatizon Systems "After Installation Element Test" found in the Heatizon Systems After Installation element test section of the manual. Test system in presence of Architect, Contractor and Owner's Representative, to be certain system functions in accordance with design intent.



Step 7: After system has been properly adjusted and is running normally, the covers should be installed. Make sure to turn the system power off first, to reduce the risk of electrical shock while installing the covers.

Install Transformer cover plate first using provided #6 screws,
Next, install Control Unit cover also using provided #6 screws.

Step 8: With the covers installed, energize and activate the system using the thermostat. System should operate normally. If not refer to trouble shooting section of the Heatizon Design and Installation manual. Check status indicator on side of Control Unit or activation device for solid red condition. If status LED indicates other than solid red, refer to the trouble shooting section of the install manual.

Step 9: Air flow around the Control Unit and transformer is critical and must be maintained. If the transformer overheats the Control Unit will shut the system down until the transformer cools.

Step 10: The owner of the system should be given a copy of the Owner's Manual and the warranty card to be completed and returned to Heatizon Systems upon completion of the installation.

CBX7 START UP PROCEDURES

STARTING UP A CBX7 SERIES SYSTEM

(Tuff Cable Heating Element only for applications other than roofs)

The CBX7 Control Unit utilizes phase control to set the current on any given Heatizon Systems Transformer. The CBX7 incorporates a soft start that will ramp the current on and off from zero to full current in about two seconds. The soft start eliminates high in-rush current or power surge. The output current is set by adjusting a potentiometer on the Power Board, and not by using Transformer Taps.

The CBX7 has an SCR fault that opens a relay and turns the system off if the SCR fails, or if the activation device is off and the system attempts to stay on. Multiple CBX7 Control Units can be connected to a single activation device with a Selector Box (Heatizon Part # M329). Heatizon Systems offers a large number of different sized Transformers that may be used with the CBX7 Control Unit.

There is no power switch on the CBX7 assembly; the panel circuit breaker is used as the power on/off switch. A disconnect at the Transformer assembly may be desired, or required by the National Electric Code, local codes or regulations.

Before proceeding, make certain that all shorts have been corrected and cleared, all damaged or cut heating element and/or Cold Lead has been appropriately repaired, and any and all joints have been crimped, soldered, and tightened where appropriate,

Step 1: On the Power Board, turn R29 Adjustment Potentiometer (see diagram on page 6-8) counterclockwise five turns.

Step 2. Turn the circuit breaker ON, and/or turn the external power disconnect to the ON position.

Step 3. Attach a clamp-on True RMS Amp Meter to one of the Cold Leads.

Step 4. Turn the Activation device to the ON position

Step 5. Turn R29 Adjustment Potentiometer clockwise until the desired current (95 Amps or less) is achieved. Verify that the Green LED (D-7 on the Power Board) is lit when the Activation device is calling for heat.

Step 6. Measure the current output and voltage of the Transformer, and compare it to the System Operating Tables in this Design and Installation Manual.

Step 7. Measure the input current to make sure it is less than 80% of the rating of the breaker in the distribution panel. If the primary current is greater than 80% of the breaker rating, move to the next lower tap on the Transformer and readjust the potentiometer. If 80% of the circuit breaker capacity is still exceeded, call Heatizon Systems.

WARNING: If the proper operating amps cannot be achieved, this could indicate a problem in the installation of the heating element or other problem with the system. Consult your Heatizon dealer or Heatizon Systems for further assistance.

WARNING: Danger of shock. Extreme care should be used to position transformer taps so that they are clear of the cover or other taps on the transformer. Carefully bend copper taps as needed to ensure proper clearance on both used and unused taps.

CBX7 START UP PROCEDURES

Step 8: Visually inspect the Heating Element and Cold Leads for cuts, shorts, and other damage; repair as necessary. Check for continuity to any conductive material, including but not limited to metal; eliminate as necessary. Record system information in the spaces provided on the on the Control Unit front cover. Also fill out the form Heatizon Systems “*After Installation Element Test*” found in the Heatizon Systems After Installation element test section of the manual. Test system in presence of Architect, Contractor and Owner’s Representative, to be certain system functions in accordance with design intent.

Step 9: Let the system run for a 10 minute period of time.

Step 10: Recheck the Amps and readjust the potentiometer if needed.

Step 11: Turn the activation device to the OFF position, then turn the system power OFF.

Step 12: Check all connections; tighten as necessary.

Step 13: Connect the LED Indicator Cable (pre-attached to Control Unit Cover) to the J5 terminal on the Power Board. Install the Transformer cover using provided #8 screws.

Step 14: With the cover installed, energize by turning the power source on, and activate the system using the activation device. Check status indicator on the front of the Control Unit. When the system is in normal operation, the Green LED is lit. If not, refer to the Trouble Shooting Section of this Heatizon Design and Installation Manual. If the Red LED is on, refer to the Trouble Shooting Section of the Heatizon Design and Installation Manual or call Heatizon Systems Technical Support Department.

Note: Air flow around the Control Unit and Transformer is critical and must be maintained.

Note: The owner of the system should be given a copy of the Owner’s Manual and the Warranty Card to be completed and returned to Heatizon Systems upon completion of the installation.

