OWNER'S MANUAL 430429-186

Revised February 14, 2001

IMPORTANT: Read these instructions before installing, operating, or servicing this system.

450C CONTROL

(ALSO INCLUDES 460C CONTROL)

DO NOT DESTROY

AMETEK/PRESTOLITE POWER , TROY, OHIO 45373-1099, U.S.A.

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INTRODUCTION

How To Use This Manual

To ensure safe operation, read the entire manual, including the chapter on Safety Instructions and Warnings.

Throughout this manual, the words **WARNING**, **CAUTION**, and **NOTE** may appear. Pay particular attention to the information provided under these headings. These special annotations are easily recognized as follows:

WARNING gives information regarding possible personal injury. Warnings will be enclosed in a box such as this.

CAUTION refers to possible equipment damage. Cautions will be shown in bold type.

NOTE offers helpful information concerning certain operating procedures. Notes will be shown in italics.

Equipment Identification

The unit's identification number (specification number), model, and serial numbers appear on a nameplate usually attached to the control panel.

Receipt Of Equipment

When you receive the equipment, check it against the invoice to make sure it is complete and inspect the equipment for possible damage due to shipping. If there is any damage, notify the carrier immediately to file a claim. Furnish complete information concerning damage claims or shipping errors to the company shown on the cover of this manual.

Include all equipment identification numbers as described above along with a Group Part Number (if any) and a full description of the parts in error.

Move the equipment to the installation site before Uncrating the unit. Use care to avoid damaging the equipment when using bars, hammers, etc., to uncrate the unit.

Additional copies of this manual may be purchased by contacting the company shown on the cover of this manual. Include the Owner's Manual number and equipment identification numbers.

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SAFETY INSTRUCTIONS AND WARNINGS

FOR OPERATION OF BATTERY CHARGING EQUIPMENT

IMPORTANT – READ AND UNDERSTAND THESE INSTRUCTIONS. DO NOT LOSE THEM. ALSO READ OPERATING/INSTRUCTION MANUAL BEFORE INSTALLING, OPERATING, OR SERVICING THIS EQUIPMENT.

A. General

Battery charging products can cause serious injury or death, or damage to other equipment or property, if the operator does not strictly observe all safety rules and take precautionary actions.

Safe practices have developed from past experience in the use of charging equipment. These practices must be learned through study and training before using this equipment. Anyone not having extensive training in battery charging practices should be taught by experienced operators.

Only qualified personnel should install, use, or service this equipment.

B. Shock Prevention

Bare conductors, or terminals in the output circuit, or ungrounded, electrically-live equipment can fatally shock a person. To protect against shock, have competent electrician verify that the equipment is adequately grounded and learn what terminals and parts are electrically HOT.

The body's electrical resistance is decreased when wet, permitting dangerous current to flow through the body. Do not work in damp area without being extremely careful. Stand on dry rubber mat or dry wood and use insulating gloves when dampness or sweat cannot be avoided. Keep clothing dry.

1. Installation and Grounding of Electrically Powered Equipment – Electrical equipment must be installed and maintained in accordance with the National Electrical Code, NFPA 70, and local codes. A power disconnect switch must be located at the equipment. Check nameplate for voltage and phase requirements. If only 3-phase power is available, connect *single-phase* equipment to only two wires of the 3-phase line. DO NOT CONNECT the equipment grounding conductor (lead) to the third live wire of the 3 phase line as this makes the equipment frame electrically HOT, which can cause a fatal shock.

   If a grounding lead (conductor) is part of the power supply cable, be sure to connect it to a properly grounded switch box or building ground. If not part of the supply cable, use a separate grounding lead (conductor). Do not remove a ground prong from any plug. Use correct mating receptacles. Check ground for electrical continuity before using equipment.

   The grounding conductor must be of a size equal to or larger than the size recommended by Code or in this manual.

2. Charging Leads – Inspect leads often for damage to the insulation. Replace or repair cracked or worn leads immediately. Use leads having sufficient capacity to carry the operating current without overheating.

3. Battery Terminals – Do not touch battery terminals while equipment is operating.

4. Service and Maintenance – Shut OFF all power at the disconnect switch or line breaker *before* inspecting, adjusting, or servicing the equipment. Lock switch OPEN (or remove line fuses) so that the power cannot be turned ON accidentally. Disconnect power to equipment if it is to be left unattended or out of service.

   Disconnect battery from charger. Measure voltage on capacitors and discharge through an insulated screwdriver if there is any voltage reading.

   Keep inside parts clean and dry. Dirt and/or moisture can cause insulation failure. This failure can result in high voltage at the charger output.

C. Burn and Bodily Injury Prevention

The battery produces very high currents when short circuited, and will burn the skin severely if in contact with any metal conductor that is carrying this current. Do not permit rings on fingers to come in contact with battery terminals or the cell connectors on top of the battery.

Battery acid is very corrosive. Always wear correct eye and body protection when near batteries.

D. Fire and Explosion Prevention

Batteries give off explosive flammable gases which easily ignite when coming in contact with an open flame or spark. Do not smoke, cause sparking, or use open flame near batteries. Charge batteries only in locations which are clean, dry, and well ventilated. Do not lay tools or anything that is metallic on top of any battery. All repairs to a battery must be made only by experienced and qualified personnel.

E. Arcing and Burning of Connector

To prevent arcing and burning of the connector contacts, be sure the charger is OFF before connecting or disconnecting the battery. (If the charger is equipped with an ammeter, the ammeter should not indicate current flow.) Always connect battery before turning charger ON.

F. Medical and First Aid Treatment

First aid facilities and a qualified first aid person should be available for each shift for immediate treatment of electrical shock victims.

EMERGENCY FIRST AID: Call physician and ambulance immediately. Use First Aid techniques recommended by the American Red Cross.

DANGER: ELECTRICAL SHOCK CAN BE FATAL. If person is unconscious and electric shock is suspected, do not touch person if he or she is in contact with charging leads, charging equipment, or other live electrical parts. Disconnect (open) power at wall switch and then use First Aid. Dry wood, wooden broom, and other insulating material can be used to move cables, if necessary, away from person. IF BREATHING IS DIFFICULT, give oxygen. IF NOT BREATHING, BEGIN ARTIFICIAL BREATHING, such as mouth-to-mouth. IF PULSE IS ABSENT, BEGIN ARTIFICIAL CIRCULATION, such as external heart massage.

IN CASE OF ACID IN THE EYES, flush very well with clean water and obtain professional medical attention immediately.

G. Equipment Warning Labels

Inspect all precautionary labels on the equipment. Order and replace all labels that cannot be easily read.

GENERAL INFORMATION

Description of Equipment

The 450C Control uses a single chip microcomputer to both monitor and control the battery charging process. The user is kept up-to-date on the progress of the charge cycle by the LEDs in the “Charge Cycle Status” section and the digital display on the front panel of the control (see Figure 6-1). The 450C Control utilizes a patented DV/DT charge termination technique which eliminates excessive gassing by returning 107% of the amp-hours removed from the battery. The 450C Control can also be programmed to utilize a voltage-time charge termination technique. If the (DV/DT)VT dip switch is turned on, the control will terminate the charge cycle three hours after the battery reaches the “80% Charged” point. All front panel information (including operating instructions) is back printed on a clear Lexan polycarbonate overlay which is resistant to damage from oils, gasoline, and frequent operator handling. The 450C Control is easily installed in any Prestolite Power Accu-Charger with a plug-in socket. The 450C is “matched” to the output voltage of the charger by means of a PCB mounted dip switch (see Figure 6-2). Manual-Equalize, Delayed Start, Automatic Equalize, Refresh Charge, and Battery Forming features are also incorporated into a standard 450C Control.

Installation

If a 450C Control is ordered with a Prestolite Power Accu-Charger, no installation is required. The control is preset at the factory to operate with the size charger it is installed into. If the 450C Control is a replacement, see the Initial Set-up chapter of this manual.

Charge Cycle Status Display

The status of a charge cycle is indicated by the LEDs in the “Charge Cycle Status” section. The “Charge in Progress” LED will be lit any time the charger is running. If the charger is not on, the “Charge in Progress” LED will not be lit. The “80% Charged” LED will light when battery voltage reaches the selected 80% trip voltage. The “Charge Complete” LED will light only if the battery has completed the charge cycle and is ready for use. The digital display will show the DC amperes that the charger is sending to the battery.

Digital Display

The digital display consists of a seven-segment, four-digit display. The characters are .56 inch tall, making the information on the digital display legible at distances exceeding ten feet. The center horizontal bars in each digit flash when the delayed start feature is enabled. A blank display is utilized for AC power fail indication. The standard range of the digital display is 0-200 amps. If a range of 0-100 amps is desired, dip switch S1-7 should be closed. If a range of 0-400 amps is desired, dip switch S1-8 should be closed (see Figure 6-2).

Charge Termination

The 450C Control can use either a patented DV/DT (rate of change of voltage with respect to time) charge termination technique or a VT (voltage-time) charge termination technique. Regardless of the charge termination technique used, if the battery reaches the 80% charged point in less than three minutes, the Charge in Progress will be terminated immediately. If the Charge in Progress takes longer than three minutes to reach the 80% charged point, the charge will terminate when the DV/DT shutdown point is reached. If the VT charge termination technique is used (by closing dip switch S1-6), the Charge in Progress will run for three hours after it reaches the 80% charged point and then shut down (see Figure 6-2). With battery unhooked, the operator can determine which mode he is in by holding the Equalize pushbutton in for two seconds. If the control is in the DV/DT mode, “450” will show up on the display but it will be left-hand justified. If the control is in VT mode, “400” will show up on the display and it will be left-hand justified also.

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OPERATION

Normal Charge

WARNING: DO NOT connect a battery to this charge if any LED (except the power indicator) is lit. Do not disconnect a battery from this charger while the charge in progress LED is lit; otherwise, arcing and burning of connector parts or a battery explosion may result. BATTERIES PRODUCE EXPLOSIVE GASES. Keep sparks, flame, and cigarettes away. Ventilate when charging in an enclosed area. Always shield eyes when working near batteries.

1. Insure that battery size matches charger (Number of cells and ampere hour capacity are within nameplate ratings).

2. If a start-up delay is not desired, make sure dip switch (S1) positions 1 through 4 are “Open” or “Off“.

3. Securely engage battery and charger connectors.

4. After a five second countdown, the charger will turn on and the “Charge in Progress” LED will light. The digital display will indicate output current.

5. The “80% Charged” LED will light when the battery on charge reaches the selected 80% trip voltage.

6. When the charge termination point is reached (see section on Charge Termination), the charger will turn OFF. The “Charge Complete” LED will light and the digital display will read “450”. All other LEDs will turn OFF.

7. If the battery remains connected to the charger for 72 hours, a short “Refresh” charge will be applied to the battery.

   NOTE: If it is desirable to remove a battery from the charger before the charge is complete, first press the “Manual Stop” pushbutton, then disconnect the battery from the charger.

Manual Equalize

If position #5 on the PCB dip switch (S1) is in the “Open” or “Off” position, the “Equalize” switch on the front panel (see Figure 6-2) is activated. Pressing the equalize pushbutton at any time during a charge cycle (including delayed start and digital display countdown) will illuminate the “Equalize” LED and extend the charge period for three hours. Pressing the Equalize pushbutton again during the normal charge cycle will “Cancel” the extra three hours of charging time and the “Equalize” LED will turn off. Pressing the Equalize pushbutton after it has started the Equalize period will not cancel the Equalize charge. An Equalize charge should progress as follows:

WARNING: DO NOT connect a battery to this charge if any LED (except the power indicator) is lit. Do not disconnect a battery from this charger while the charge in progress LED is lit; otherwise, arcing and burning of connector parts or a battery explosion may result. BATTERIES PRODUCE EXPLOSIVE GASES. Keep sparks, flame, and cigarettes away. Ventilate when charging in an enclosed area. Always shield eyes when working near batteries.

1. Insure that battery size matches charger (Number of cells and ampere hour capacity are within nameplate ratings).

2. If a start-up delay is not desired, make sure dip switch (S1) positions 1 through 4 are “Open” or “Off“.

3. Securely engage battery and charger connectors.

4. After a five second countdown, the charger will turn on and the “Charge in Progress” LED will light. The digital display will indicate output current.

5. Press the “Equalize” pushbutton. The “Equalize” LED will light.

6. The “80% Charged” LED will light when the battery on charge reaches the selected 80% trip voltage.

7. After the normal charge termination point is reached (see section on Charge Termination), the “Equalize” LED will flash at a 50% Duty Cycle for the three extra hours of charging time.

8. Upon completion of the three-hour equalize period, all LEDs will be turned off except “Charge Complete” and “Equalize”. The digital display will show “450”.

9. If the battery remains connected to the charger for a period of 72 hours, a short “Refresh” charge will be applied to the battery.

   NOTE: If it is desirable to remove a battery from the charger before the charge is complete, first press the “Manual Stop” pushbutton, then disconnect the battery from the charger.

Automatic Equalize

If S1-5 on the PCB dip switch (see Figure 6-2) is in the “Closed” or “On” position, the “Equalize” push-button is disabled and the control will automatically select an Equalize charge for every fifth complete charge cycle. AC power failures do not affect the Auto-Equalize Counter can be reset by placing S1-5 in the “Open” or “Off” position, connecting a battery, and letting a charge Start. When S1-5 is returned to the “Closed” or “On” Position, the Auto-Equalize Counter will be reset to Cycle #1. Cycle #5 will be an equalize charge.

Delayed Start

WARNING: DO NOT connect a battery to this charge if any LED (except the power indicator) is lit. Do not disconnect a battery from this charger while the charge in progress LED is lit; otherwise, arcing and burning of connector parts or a battery explosion may result. BATTERIES PRODUCE EXPLOSIVE GASES. Keep sparks, flame, and cigarettes away. Ventilate when charging in an enclosed area. Always shield eyes when working near batteries.

Starting a charge with the 450C Control can be delayed up to 7-1/2 hours (in 1/2 hour increments) by setting dip switch S1, positions 1 through 4, in their proper positions (see Figure 6-2). The normal charge procedure should be followed, except that before connecting a battery to the charger, set the dip switches to desired length of delay (see following chart). Once the switches are set and the battery is connected, the charge will not start until the delay time has expired. The delayed start mode will be indicated by four horizontal flashing bars in the digital display. All switches in the “Open” or “Off” position will give a delay of 00 hours.

Manual Stop

If it is necessary to remove a battery from a charger while the charger is running, first press the “Manual Stop” pushbutton. The charger will turn off and all front panel LEDs (except for “Abnormal Shutdown”) will turn off. The digital display will read “450”. The battery may now be disconnected.

WARNING: DO NOT connect a battery to this charge if any LED (except the power indicator) is lit. Do not disconnect a battery from this charger while the charge in progress LED is lit; otherwise, arcing and burning of connector parts or a battery explosion may result. BATTERIES PRODUCE EXPLOSIVE GASES. Keep sparks, flame, and cigarettes away. Ventilate when charging in an enclosed area. Always shield eyes when working near batteries.

S1-1	S1-2	S1-3	S1-4	START OF CHARGE WILL BE DELAYED
OFF	OFF	OFF	OFF	00 HOURS
OFF	OFF	OFF	ON	1/2 HOUR
OFF	OFF	ON	OFF	1 HOUR
OFF	OFF	ON	ON	1-1/2 HOURS
OFF	ON	OFF	OFF	2 HOURS
OFF	ON	OFF	ON	2-1/2 HOURS
OFF	ON	ON	OFF	3 HOURS
OFF	ON	ON	ON	3-1/2 HOURS
ON	OFF	OFF	OFF	4 HOURS
ON	OFF	OFF	ON	4-1/2 HOURS
ON	OFF	ON	OFF	5 HOURS
ON	OFF	ON	ON	5-1/2 HOURS
ON	ON	OFF	OFF	6 HOURS
ON	ON	OFF	ON	6-1/2 HOURS
ON	ON	ON	OFF	7 HOURS
ON	ON	ON	ON	7-1/2 HOURS

Battery Discrimination

The 450C Control has the ability to reject batteries which have a different number of cells than the control has been programmed for via the PCB dip switch. If the battery connected to the charger has an average terminal voltage of greater than 2.3 volts/cell, the charger will not start and the “Equalize”, “Abnormal Shutdown”, and “Charge Complete” LEDs will flash. If the battery voltage eventually falls below 2.3 volts/cell, the control will begin a normal charge sequence.

If the battery connected to the charger has an average terminal voltage of less than 1.75 volts/cell, the charger will not start and the “Equalize” and “Abnormal Shutdown” LEDs will flash. If the battery voltage eventually rises above 1.75 volts/cell, the control will start a normal charge sequence. If the battery connected to the charger has a terminal of less than 1.75 volts/cell and the operator wishes to start the charge regardless of the low battery voltage, the charge cycle will start if both the “Equalize” and “Manual Stop” pushbuttons are held pushed in for at least one second and then released.

Refresh Charge

In order to guarantee that a fully charged battery is always ready for use, a “Refresh” feature has been incorporated into the 450C Control. If a battery is left connected to the charger for 72 hours after a “Charge Complete” has been reached, the 450C will start a normal charge sequence. The running time of this “Refresh” charge will depend on the depth of self-discharge of the battery. (See Description of Charge Termination)

Battery Forming

The 450C Control has the ability to disable the normal charge termination technique (3 hours of charging after 80%), for up to ten charge cycles. When the forming process is turned on, the low current shutdown feature of the 450C Control is disabled. This is done through the use of the “Manual Stop” push-button and the “Equalize” push button (see Figure 6-1). If a battery is not connected and the operator wishes to set the number of battery forming cycles, hold both the “Equalize” and “Manual Stop” push-buttons for five seconds.

After five seconds have passed, the digital display will show horizontal bars and then display “0”. This indicates the 450C Control is in the forming mode. If the push-buttons are held for two more seconds, the digital display will show “1”, indicating one forming cycle. If the pushbuttons are held for two more seconds, the digital display will show “2”, indicating two forming cycles. Every two seconds thereafter, one forming cycle will be added until ten cycles are reached. If the pushbuttons are still held down, the forming cycles will return to “0”. This allows for the low finish currents of new batteries. To clear forming cycles, battery must be disconnected, and again hold front panel pushbuttons for five seconds until horizontal dashes show up on the digital display, then release.

WARNING: Enabling the Finish Cell Forming feature will cause the charger to continue to run for a period of time if the battery has been disconnected before Charge Complete or pressing the Manual Stop switch. This condition will continue until the programmed number of cycles have been completed. The battery should never be disconnected while a charge is in progress.

Abnormal Shutdown

If a battery is connected to the charger and the battery does not reach the 80% charged point in 10.5 hours, the 450C Control will terminate the charge cycle and begin flashing the “Abnormal Shutdown” LED at a 75% ON and 25% OFF rate. The digital display will read “450” during this time. If battery voltage has exceeded the 80% charged point, and does not reach the DV/DT shutdown point within five hours, the 450C Control will terminate the charge in progress and begin flashing the “Abnormal Shutdown” LED at a 25% ON and 75% OFF rate. The digital display will read “450” during this time. (See Troubleshooting chapter in this manual for a list of possible causes.)

The 450C Control also monitors output current and will terminate the charge cycle if it falls below a preset value. If the charge is terminated due to low output current, the “Charge Complete” LED will turn on and the “Abnormal Shutdown” LED will flash at a 50% Duty cycle. The digital display will read “450”.

AC Power Failure

During an AC power failure, key information concerning the charge cycle is stored in electrically erasable programmable read only memory (EEPROM). The microcomputer stores the following information into the EEPROM: delayed start time, time left on the charge, state of charge, back-up timers, equalize requests, auto-equalize counts, battery forming counts, and type of abnormal shutdown. This information is retrieved upon resumption of AC power and the charge continues from the same condition as it was in when the AC power failure occurred. This allows charge cycles to be virtually unaffected by AC power failures.

80% Trip Point Selection

The 450C Control may be set for either the 2.37 volts/cell or 2.45 volts/cell 80% trip voltage. The control will leave the factory set with the 2.37 volts/cell setting. In order to change the trip voltage to 2.45 volts/cell, close dip switch S1-10. Reference the chart in The INITIAL SET-UP PROCEDURE chapter of this manual. If the 2.45 volts/cell option is selected the full battery reject will be disabled, not terminating the charge if the battery reaches 80% in less than 3 minutes.

460C CONTROL

The 460C Control is functionally equivalent to the 450C Control with the two following exceptions:

1. Upon returning from an AC FAIL, the charge cycle will be restarted from it's beginning, provided a battery is connected. All normal or abnormal shutdowns (also equalizes) that happened before the AC FAIL will be ignored. The standard 450C picks up the charge cycle where it left off or will go back to the shutdown mode it was in, when the AC FAIL happened.

2. The model number when displayed will read 460. When using the EQUALIZE button to determine the termination mode, in the case of DV/DT, 460 will be displayed (left justified). All other features and functions of the 450C described in this manual remain the same for the 460C Control.

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INITIAL SET-UP PROCEDURE

(Not required if the charger is received with the control installed)

A single part number 450C Control will operate properly on all 6, 12, 18, 24, and 36 cell Accu-Chargers with a plug-in socket. Contact the factory for cell sizes other than those listed above.

The 450C Control is matched to the cell size of the charger by placing the proper position of the PCB dip switch in the “Closed” or “On” position (see Figure 6-2). All other cell selection positions (S4-1 through S4-6) should be in the “Open” or “Off” position.

POSITION (S4)	FUNCTION
1	6 Cell
2	12 Cell
3	18 Cell
4	24 Cell
5	36 Cell
6	Optional Cell Size

POSITION (S1)	FUNCTION
1	Delayed Start
2	Delayed Start
3	Delayed Start
4	Delayed Start
5	Auto-Equalize
6	DV/DT or VT
7	100 Amp Scale
8	400 Amp Scale
9	Not Used
10	80% Trip Voltage, Closed = 2.45 Volts/Cell

For a description of (S1) functions, see Operation chapter of manual.

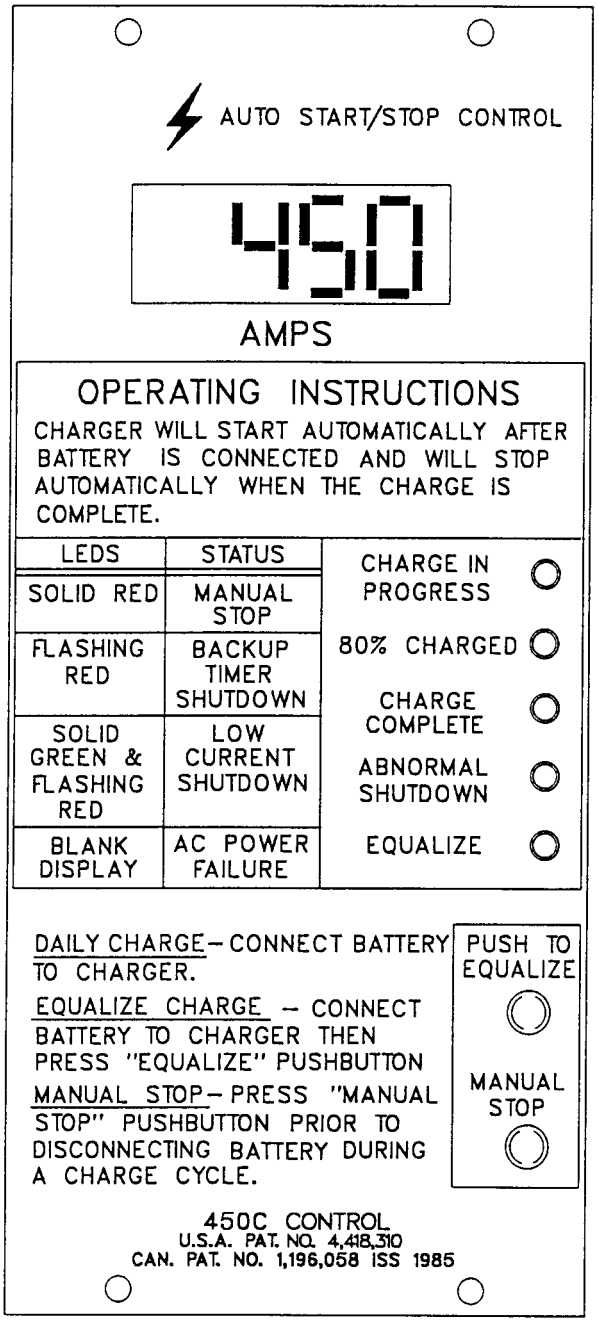

Figure 6-1 450C Front Panel

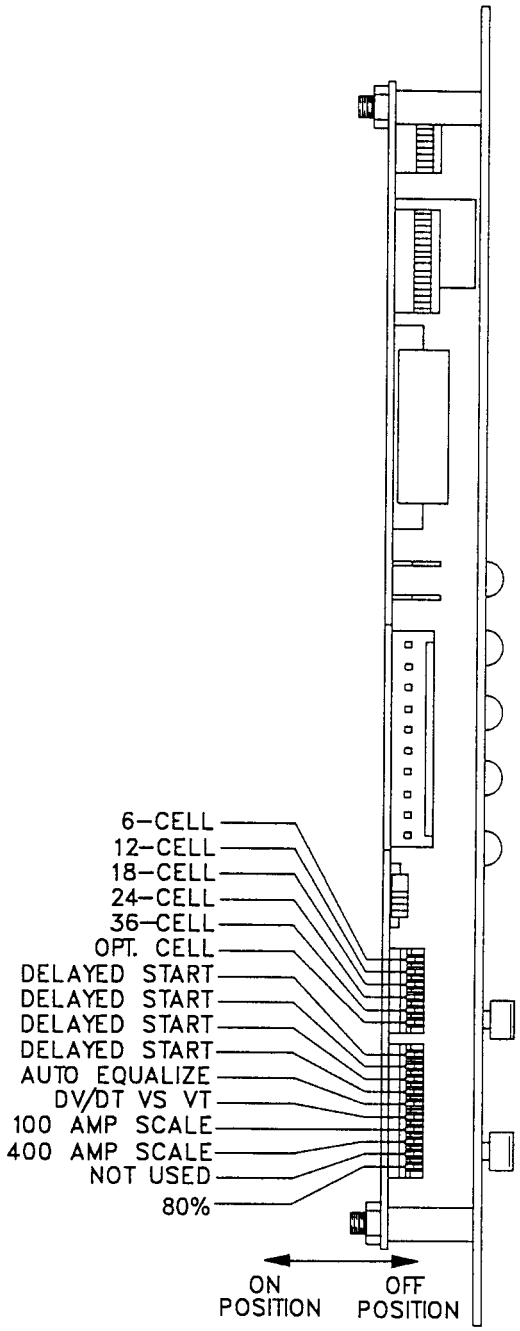

Figure 6-2 PCB Dip Switch

TROUBLESHOOTING

450C Auto Start/Stop Control System

Troubleshooting Procedures

"Abnormal Shutdown" LED is ON solid and display shows "450".

"Manual Stop" pushbutton was pressed.

Condition A: Charge cycle deliberately terminated prematurely.

CAUTION: BATTERY IS NOT FULLY RECHARGED.

Disconnect battery from charger. Reconnect battery to charger to begin new charge Cycle.

Condition B: Reason for "Manual Stop" pushbutton being pressed is unknown.

Check specific gravities to determine need for additional charge. Disconnect and reconnect battery to charger to begin new charge cycle.

"Abnormal Shutdown" LED is flashing at a 75% ON and 25% OFF rate (10.5-hour back-up timer shut-down) and digital display reads "450".

Battery on charge did not reach the selected 80% trip voltage in 10.5 hours.

Check for the following conditions:

1. *One or more low voltage cells*
2. *Low charger output*

   Incorrect line voltage/connection

   Blown input fuse

   Charge rate set too low

   Defective resonant capacitor

   Defective power transformer

   Battery has incorrect number of cells for Charger/Control

   High impedance in cable or connector

   Open rectifier diode

3. *Amp-hour capacity of battery exceeds that of charger by 50% or greater.*

"Abnormal Shutdown" LED is flashing at a 25% ON and 75% OFF rate (5-hour back-up timer shutdown) and digital display reads "450".

Battery on charge did not reach DV/DT termination point within 5 hours after reaching 60% charged voltage.

Check for the following conditions.,

Battery amp-hour capacity greater than **150%** *of charger amp-hour capacity*

Abnormally high battery counter EMF

Incorrect cell switch setting on 450C

Incorrect resonant tap settings

"Charge Complete" LED continuous with flashing "Abnormal Shutdown" LED and digital display reads "450".

Low output current shutdown

1. *Battery cell greater than charger cell rating (450C Cell Switch setting)*
2. *Battery amp-hour much greater than or much less than charger amp-hour rating (review data and test as required).*
3. *High resistance in charge circuit*
   - *A. Cable*
   - *B. Connector*
   - *C. Intercell connectors*
   - *D. Internal cell open*
4. *Sulfated battery*
5. *Low acid level*
6. *Rate incorrectly set*
7. *Blown input fuses*
8. *Incorrect line voltages/connections*
9. *Open rectifier diode*
10. *Open resonant capacitor*
11. *Defective power transformer*
12. *Blown output fuse*
13. *Charger rate set too low for battery*
14. *Wiring between 450C and charger*

Digital Display is blank.

AC power is not present at 450C control.

Determine cause of missing AC power and restore power to 450C control.

Possibilities:

1. *No AC power to charger*
2. *Blown AC input fuse*
3. *Blown control fuse*
4. *Faulty charger wiring*

450C Control is defective.

First, insure that AC power (24 VAC) is present at wire harness plug, then replace 450C Control.

PARTS LIST

ITEM NO.	ITEM DESCRIPTION	PART NUMBER
1	450C Control Panel	See Back of Control Panel
2	Control Panel, 450C Control	191286
3	Overlay, 450C Control	191983
4	460C Control Panel	See Back of Control Panel

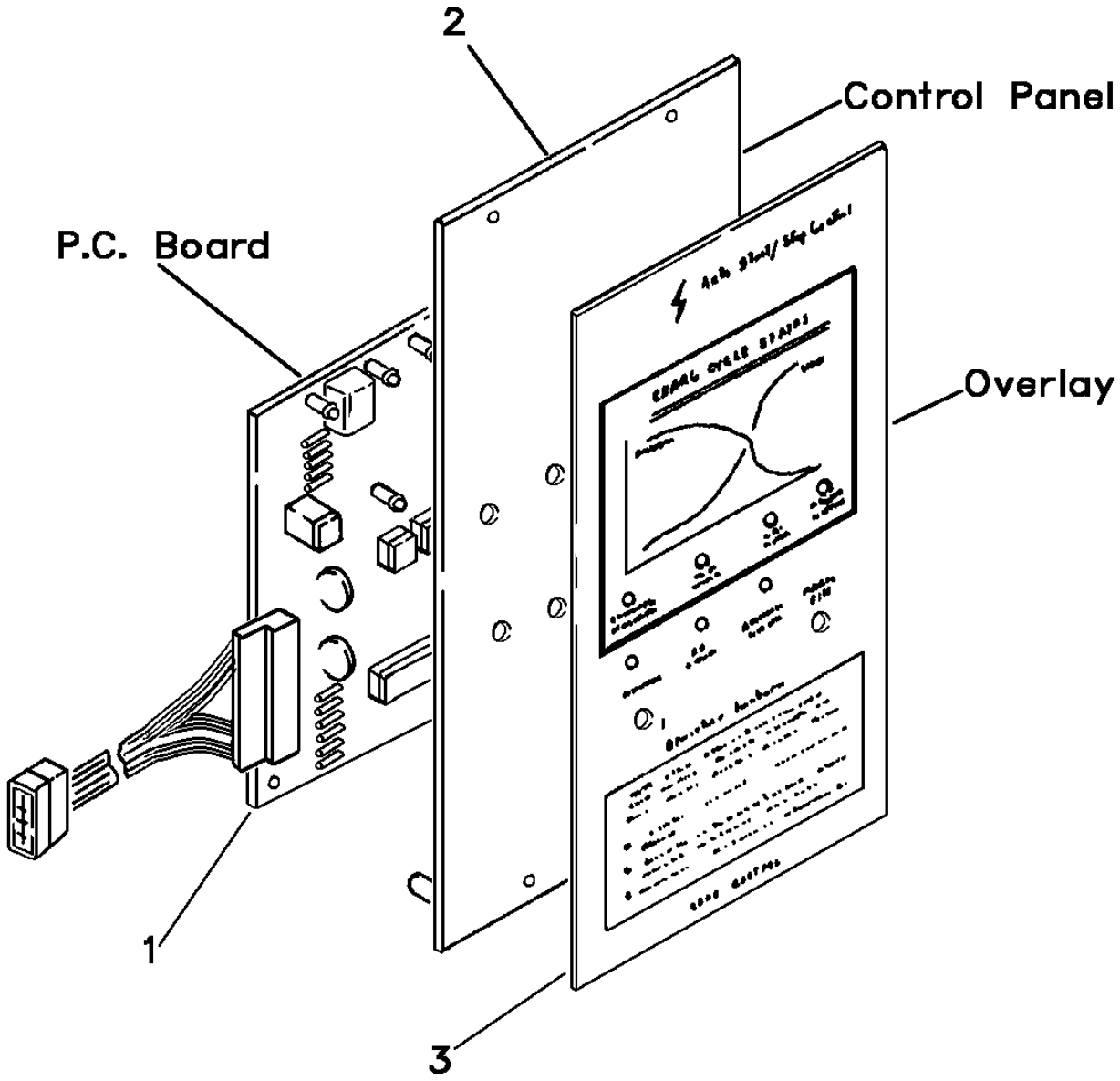

Figure 8-1 450C Control Assembly

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ELECTRONIC PRINTED CIRCUIT BOARD EXCHANGE SERVICE POLICY

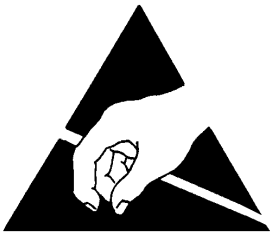
Because of the definite superiority of certain solid-state control components over conventional electro-mechanical relays and regulators, the company product lines now incorporate solid-state controls for applications in which they may be used to advantage. To facilitate testing and servicing, these control components and circuits have been assembled as modules on printed circuit boards, mounted in such a manner as to be quickly and easily removed. Electrical connections to other components of the unit are by means of plug-in, screw type, or “Faston” connectors.

In recognition of the fact that most users of this equipment lack the facilities and specially trained personnel necessary to service and repair electronic equipment, the company has established an electronic printed circuit board exchange service plan.

Under the Printed Circuit Board Exchange Plan, the owner of the equipment may exchange the printed circuit board (s) in which fault has developed for a replacement.

A standard exchange price has been established for each printed circuit board without regard to the amount of repair required to the original turned in, which is applied against the cost of the replacement. Exchange prices for a specific printed circuit board may be determined by contacting an authorized company distributor or by writing to the factory, giving the SPECIFICATION or ASSEMBLY, MODEL, and SERIAL numbers of the unit in which the printed circuit board is installed.

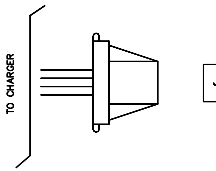
This Exchange Plan applies only to the specified solid-state control components circuitry which have failed due to electrical fault or normal deterioration resulting from use and age. The plan does not cover parts which have been physically damaged through accident or abuse, or to which unauthorized repairs have been made or attempted.

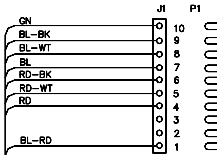


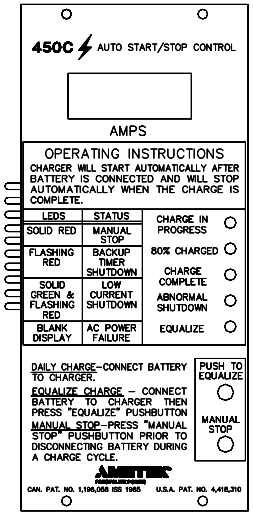
CAUTION: Printed circuits and other devices may be affected by static electricity. Handling precautions required.

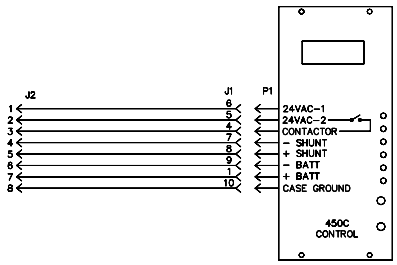
DIAGRAMS

DESCRIPTION	PART NUMBER
Standard Wiring Diagram	191981, Sheet 2
Remote Wiring Diagram	191143









SCHEMATIC

J1 CONNECTOR, HARNESS (FEMALE) J2 CONNECTOR, HARNESS (MALE)

P1 CONNECTOR, PCB

LEGEND

1. NORMAL CHARGE
   CONNECT DISCHARGED BATTERY TO CHARGER. AFTER A FIVE SECOND DOWNCOUNT THE CONTROL WILL ENERGIZE THE COIL OF THE INPUT CONTACTER (K1), LIGHT THE CHARGE IN PROGRESS LED, AND THE DISPLAY WILL INDICATE OUTPUT AMPS. WHEN THE COIL OF K1 IS ENERGIZED, LINE VOLTAGE IS APPLIED TO THE PRIMARY CIRCUITS OF THE FERRORESONANT TRANSFORMERS. WHEN BATTERY VOLTAGE REACHES APPROXIMATELY 2.37 VOLTS PER CELL, THE "80% CHARGED" LED WILL LIGHT. WHEN THE BATTERY REACHES THE CHARGE TERMINATION POINT, THE CONTROL WILL DE–ENERGIZE THE LINE CONTACTOR, LIGHT THE "CHARGE COMPLETE" LED, AND THE DISPLAY WILL READ "450".

2. EQUALIZE CHARGE
   OPERATION IS THE SAME AS ABOVE EXCEPT THAT WHEN THE "EQUALIZE" SWITCH IS PUSHED THE "EQUALIZE" L.E.D. WILL LIGHT. WHEN THE CHARGE TERMINATION POINT IS REACHED THE "EQUALIZE" LED WILL FLASH ON AND OFF DURING THE THREE HOUR EQUALIZE PERIOD. AFTER THE EQUALIZE PERIOD THE CONTROL WILL DE–ENERGIZE THE LINE CONTACTOR AND LIGHT BOTH THE "CHARGE COMPLETE" L.E.D. AND THE "EQUALIZE" L.E.D.. THE DISPLAY WILL READ "450".

3. ABNORMAL OPERATION
   THE CONTROL WILL NOT START A CHARGE CYCLE IF THE OPEN CIRCUIT VOLTAGE IS TOO HIGH OR TOO LOW. THE CONTROL WILL TERMINATE A CHARGE CYCLE IF THE BACK–UP TIMER EXPIRES, IF THE BATTERY CURRENT FALLS BELOW A PRE–DETERMINED VALUE, OR IF THE "MANUAL STOP" SWITCH IS PUSHED.

SEQUENCE OF OPERATION

CHANGE RECORD							
E.C. No.	DATE						
		FILE NAME	PLOT DATE				
		191981	1-30-01				
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES/MILLIMETERS TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS.					
		FRACT ± ---	ANGLES ± 3°				
		DECIMAL–INCH	METRIC				
		.00 ± .03	0. ± 1.0mm				
		.000 ± .010	0.0 ± 0.4mm				
			0.00 ± 0.1mm				
		DO NOT SCALE DRAWING					

FINISH CODE PER 193814: NONE

ACTIVITY	REPLACED BY	REPLACES
MATERIAL NO.	QUANTITY–U.M.	COMM. CLS.

MATERIAL SPEC.

TITLE: CONTROL, 450C

DESCRIPTIVE DATA: DIAGRAM, CONNECTION, CONTROL

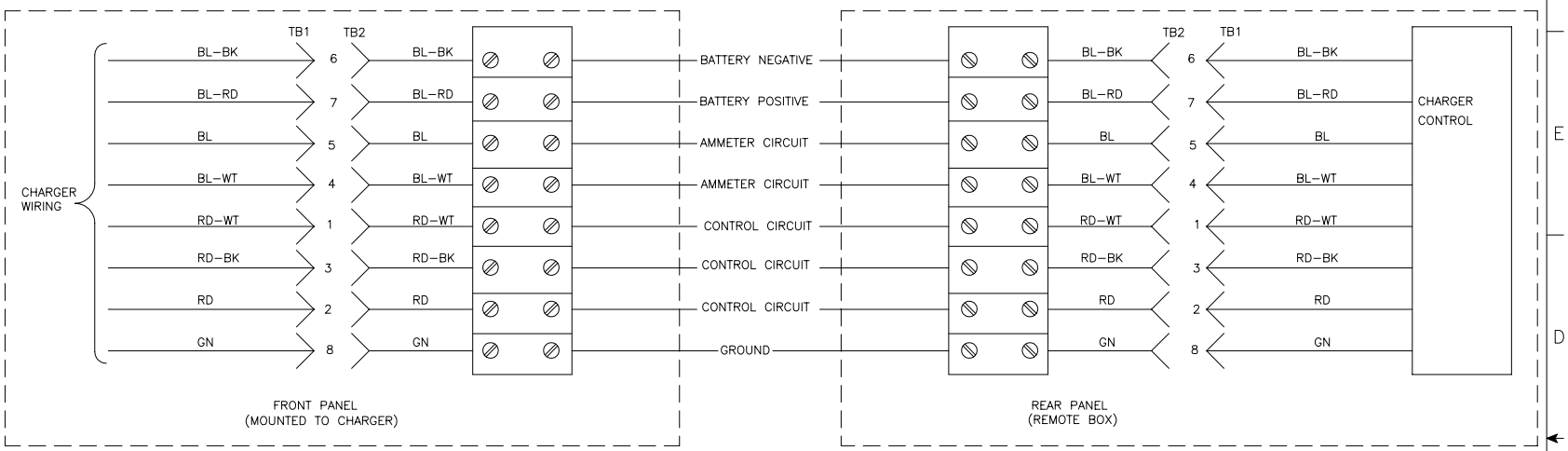
DESIGNED	DRAWN	DATE	SCALE
SRK	BAM	BAM	NONE
CHECKED	APPROVED	RECORDED	ITEM TYPE
		9-24-92	

OUTSIDE DISTR.

DISTRIBUTION TABLE

AMETEK
PRESTOLITE POWER
TROY, OHIO 45373, U.S.A.

SIZE D | DWG. NO. 191981 | SHEET 2



CUSTOMER TO PROVIDE INTERCONNECTING AWG. 14 WIRES BETWEEN TERMINAL STRIPS. LENGTH OF EACH WIRE NOT TO EXCEED 50 FEET.

CHANGE RECORD	
E.C. No.	DATE

FILE NAME	PLOT DATE
191143	1–18–01

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS. PRODUCED TO RECOGNIZED STANDARDS.

FRACT INCH	ANGLES
± ––	± 3°

DECIMAL–INCH	
.00 ± .03	0. ± 1.0mm
.000 ± .010	0.0 ± 0.4mm
	0.00 ± 0.1mm

DO NOT SCALE DRAWING

FINISH CODE PER 193814: NONE

ACTIVITY	REPLACED BY	REPLACES

MATERIAL NO.	QUANTITY–U.M.	COMM. CLS.

MATERIAL SPEC.

TITLE
DIAGRAM, CONNECTION, CONTROL

DESCRIPTIVE DATA
REMOTE

DESIGNED	DRAWN	DATE	SCALE
TMB	MRM	6–14–89	FULL
CHECKED	APPROVED	RECORDS	ITEM TYPE
GSC		6–19–89	

OUTSIDE DISTR.

DISTRIBUTION TABLE

AMETEK
PRESTOLITE POWER
TROY, OHIO 45373, U.S.A.

SIZE C

DWG. NO. 191143 SHEET

WARRANTY

AMETEK/PRESTOLITE POWER INDUSTRIAL BATTERY CHARGERS

Ametek/Prestolite Power (hereinafter called "Prestolite") warrants that each new and unused Industrial Battery Charger manufactured and supplied by it is of good workmanship and is free from any inherent mechanical defects, provided that (1) the product is installed and operated in accordance with generally accepted industrial standards and in accordance with the printed instructions of Prestolite, (2) the product is used under normal conditions for which designed, (3) the product is not subjected to misuse, negligence or accident, and (4) the product receives proper care, protection and maintenance under supervision of competent personnel. This warranty is subject to the following provisions:

1. **PRODUCTS AND PARTS WARRANTED.** Subject to the exceptions listed below each Industrial Battery Charger is warranted for a period of one (1) year from the date of it's shipment by Prestolite, provided the charger is used in accordance with Prestolite's published performance rating for the unit involved. The exceptions to this warranty are as follows:

   a) Power transformers and silicon diodes on unit (s) shipped after January 1, 1997 are warranted for ten (10) years after Prestolite's shipment of the unit(s) of which they are a part, provided however that during the last nine (9) years of this 10 year period the warranty covers parts replacement only – no labor or other services are provided by Prestolite, nor shall Prestolite be obligated to reimburse the owner or any other person for any work performed.

   b) Primary switch contacts, fuses, bulbs, and filters are not warranted unless found to be defective prior to use.

2. **COMMENCEMENT OF WARRANTY TIME PERIODS.** The warranty periods indicated in the Warranty Schedule shall commence on the date of shipment by Prestolite.

3. **PERSONS COVERED BY WARRANTY.** This warranty is extended by Prestolite only to the purchaser of new equipment from Prestolite or one of its authorized distributors. The products purchased under this agreement shall be used exclusively by the buyer and its employees and by no other persons; and therefore there shall be no third party beneficiary to this warranty.

4. **LIMITATION OF REMEDY.** The existence of claimed defects in any product covered by this warranty is subject to Prestolite's factory inspection and judgement. Prestolite's liability is limited to repair of any defects found by Prestolite to exist or, at Prestolite's option, the replacement of the defective product. F.O.B. factory after the defective product has been returned by the purchaser at its expense to Prestolite's shipping place. Replacement and exchange parts will be warranted for the remainder of the original Industrial Battery Charger Warranty or for a period of ninety (90) days, whichever is greater.
   Prestolite and its authorized distributors or dealers shall not be liable for direct or indirect, special or consequential damages in excess of such repair or replacement. In no event shall the purchaser be entitled to recover for contingent expenses resulting from, but not limited to, telephone calls, telegrams, travel expenses, lodging, duties and taxes, labor, rental or replacement equipment, loss of business or profits or other commercial losses.

5. **USE OF DEFECTIVE PRODUCT.** Continued use of an Industrial Battery Charger after discovery of a defect VOIDS ALL WARRANTIES.

6. **ALTERED EQUIPMENT.** Except as authorized in writing, the warranty specified does not cover any equipment that has been altered by any party other than Prestolite.

EXCEPT AS STATED ABOVE, ALL OTHER WARRANTIES AND CONDITIONS, EITHER EXPRESSED OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXCLUDED AND BUYER ASSUMES ALL RISK AND LIABILITY RESULTING FROM USE OF THE GOODS. AMETEK/PRESTOLITE POWER NEITHER ASSUMES NOR AUTHORIZES ANY PERSONS TO ASSUME FOR AMETEK/PRESTOLITE POWER ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OR USE OF THE GOODS SOLD, AND THERE ARE NO ORAL AGREEMENTS OR WARRANTIES COLLATERAL TO OR AFFECTING THIS WRITTEN WARRANTY.

WARNING

At all times, safety must be considered an important factor in the installation, servicing, and operation of the product, and skilled, qualified technical assistance should be utilized.

AMETEK/PRESTOLITE POWER
TROY, OHIO USA

Data Sheet: **1140**
Index: **110100**
Replaces: **082499**

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PRESTOLITE POWER