

OWNER'S MANUAL 193111-086

Revised June 15, 2011

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

POWER STAR PLUS

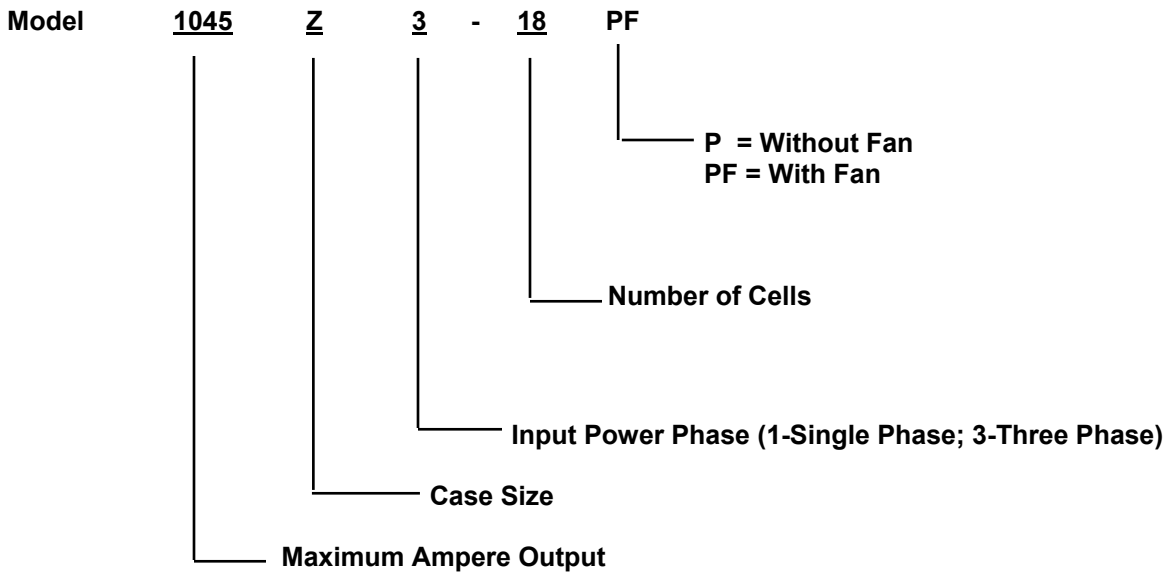
**SCR – Controlled Output Type
Battery Charger**

DO NOT DESTROY

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

NOTE: Information regarding obtaining additional copies of this manual is located in the Introduction chapter of this manual.

A battery charger is identified by model number. Incorporated into the model number is the ampere-hour capacity, case size, input power phase, and number of cells in battery for which charger is intended. The following example explains the basic model numbering arrangement.



NOTE: This information is required for ordering certain replacement/service parts.

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INTRODUCTION

How To Use This Manual

IMPORTANT: It is especially important that all charger internal components be kept clean and dry, and all electrical connections tightened as instructed in the Maintenance chapter of this manual. Replace any precautionary or instruction label that cannot be easily read.

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, model, serial number) usually appears on a nameplate attached to the front 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 and group part numbers (if any) as described above along with a full description of the parts in error.

Move the equipment to the site of installation before uncrating. 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.

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.

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.

DESCRIPTION OF EQUIPMENT

Charger

The basic charging circuit is the silicon controlled rectifier (SCR)-type with isolating transformer (s). This design regulates charging current by allowing the battery to determine its own charge cycle rate in accordance with its state of discharge. It provides an I-E-I charge curve that eliminates the possibility of overcharging, even with line voltage variations of $\pm 10\%$. The charger is internally protected from overload and short circuits.

The charger is designed to properly charge batteries of 3 different ampere-hour ratings, which are listed on the charger nameplate. One of the three ratings can be chosen through the "charge grade" control setting. Charge times are dependent on the charge grade setting as shown below.

Charge Grade	BCI Code	Discharge Level	Charge Time
0	100D6C8	100%	8 Hrs.
B (1)	80D6C8	80%	8 Hrs.
E (2)	80D6C10	80%	10 Hrs.

Batteries of smaller or larger ampere-hour capacities can also be charged, but will require shorter or longer charging, respectively.

Charge Control

The SCR2000 Control is provided as the standard charger control. It utilizes a patented dV/dT charge termination technique which eliminates excessive gassing returning approximately 107% of the amp-hours removed from the battery. Features of the SCR2000 Control include auto start/stop, manual equalize, manual stop, back-up timer protection, two charge termination methods, manual or automatic (with optional BID module) battery temperature compensation, high and low battery voltage discrimination, AC power fail recovery, selectable output profiles, and charge cycle data archiving.

The SCR2000 is "matched" to the output voltage of the charger by means of a printed circuit board mounted DIP switch. It will operate on a 6, 9, 12, 18, 24 and "optional" cell batteries. The optional setting is provided to accommodate batteries between 6 and 24 cells that are not listed above. A second SCR2000 Control version is available that accommodates 12, 18, 24, 36, 40 and "optional" cell batteries.

A dot-matrix, 8 character display is standard on the SCR2000 Control. The characters are used to indicate charge status, output current, voltage and other functions including; archive information, review information, programming information, and operating status.

The four LEDs on the front panel indicate the status of a normal charge cycle. The "80% Charged" LED will light when the battery current is reduced to approximately 8.2 amps per 100 AH of battery rating. The battery voltage at the 80% charged point will vary with charge profile setting and/or manual or automatic temperature settings. The "Charge Complete" LED will light only if the battery has completed the charge cycle and is ready for use. All four LEDs will flash if the charger terminates a charge prematurely. See the Troubleshooting chapter of this manual to determine the cause of the fault. The "Equalized" LED will light solid when an equalize charge is requested by pressing the equalize push button. The "Equalize" LED will flash when the charger is equalizing the battery.

WARNING: Do not connect a battery to this charger if any LED is lit. Do not disconnect a battery from this charger while a charge is in progress. 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.

INSTALLATION

Location

For best operating characteristics and longest unit life, take care in selecting an installation site. Avoid locations exposed to high humidity, dust, high ambient temperature, or corrosive fumes. Moisture can condense on electrical components, causing corrosion or shorting of circuits (especially when dirt is also present).

Adequate air circulation is needed at all times in order to assure proper operation. Provide a minimum of 6 inches of free air space at rear and sides of the unit. Make sure that ventilation openings are not obstructed.

Always remove the charger shipping skid from the unit before installation. The charger must be installed over a noncombustible surface such as concrete or metal. Keep the charging area clear of all combustible material such as wood, paper, and cloth. When moving the charger after the packing skid and box have been removed, make sure that lifting forks do not damage the charger panels or cables.

WARNING: SPARKS OR MOLTEN METAL falling through open bottom can cause fire or explosion.

- Install over noncombustible material such as concrete or metal.
- Keep charging area clear of combustible material.

Environmental Characteristics

Operating Characteristics	0°C to 40°C (32°F to 104°F)
Operating Altitude	To 2000 Meters (6562 Feet)
Operating Humidity	80% up to 31°C, decreasing to 50% at 40°C, non-condensing 80% up to 88°F decreasing to 50% at 104°F, non-condensing

Grounding

The frame of the power source must be grounded for personnel safety. Where grounding is mandatory under state or local codes, it is the responsibility of the user to comply with all applicable rules and regulations. Where no state or local codes exist, it is recommended that the National Electrical Code be followed.

In addition to the usual function of protecting personnel against the hazard of electrical shock due to fault in the equipment, grounding serves to discharge the static electrical charges which tend to build up on the surfaces of equipment. These static charges can cause painful shock to personnel, and can lead to the erroneous conclusion that an electrical fault exists in the equipment.

If a charger is to be connected to the AC power supply with a flexible jacketed cable, one having a separate grounding conductor should be used. When included in cable assembly, grounding conductor will be green, green with a yellow stripe, or bare. When connecting input power to charger (as instructed in Line Connection to Battery Charger section of this manual), connect grounding conductor to equipment grounding terminal (stud with a green nut and a cup washer and identified by symbol $\frac{\perp}{\perp}$), taking care to make a good electrical connection. Connect other end of grounding conductor to the system ground.

If, for any reason, an input cable which does not include a grounding conductor is used, the equipment must be grounded with separate conductor. Minimum size and color coding requirements must be in accordance with any applicable state or local code, or the National Electrical Code.

If metallic armored cable or conduit is used, the metal sheathing or conduit must be effectively grounded as required by state or local code, or the National Electrical Code.

If a system ground is not available, the charger frame must be connected to a driven ground rod (at least 8 ft [2438 mm] long), or to a water pipe that enters the ground not more than 10 ft (3048 mm) from the charger. A grounding conductor must be connected to the rod or pipe in a manner that will assure a permanent and effective ground. The conductor must be sized in accordance with any applicable state or local code, or by the National Electrical Code. If in doubt, use the same size conductor as is used for the conductors supplying power to the charger.

WARNING: ELECTRIC SHOCK HAZARD – Under no circumstance should you use a grounding conductor with a current carrying capacity less than the ampere rating shown in Table 4-1.

LINE AMPS	DISCONNECT SWITCH *	BRANCH FUSE SIZE (AMPERES)	COPPER CABLE SIZE AWG **	
			POWER	GROUND
0-2.5	30A	5	No. 14	No. 14
2.6-4.5	30A	7	No. 14	No. 14
4.6-7.5	30A	10	No. 14	No. 14
7.6-12	30A	15	No. 14	No. 14
12.1-16	30A	20	No. 12	No. 12
16.1-18	30A	25	No. 10	No. 10
18.1-22	30A	30	No. 10	No. 10
22.1-24.5	60A	35	No. 8	No. 10
24.6-32.5	60A	40	No. 8	No. 10
32.6-40	60A	50	No. 8	No. 10
40.1-45	60A	60	No. 6	No. 10
45.1-57.5	100A	80	No. 4	No. 8
57.6-78	100A	100	No. 2	No. 8
78.1-102.5	200A	125	No. 2	No. 6
102.6-135	200A	150	No. 1/0	No. 6

Table 4-1 Recommended AC Input and Branch Fusing

The above table (Table 4-1) is based on 75°C (167°F) rated conductors and 40°C (104°F) ambient temperatures. Refer to National Electrical Code (2008) Tables 310-16 corrected to 40°C (104°F).

* For 115, 208, and 230-volt lines, use 250-volt disconnect switch.
 For 440-480, 575-volt lines, use 600-volt disconnect switch.

** Two conductors and ground conductor required for single phase.
 Three conductors and ground conductor required for three phase.

Recommended minimum size of grounding conductors (based on National Electrical Code 2008– Table 250-95).

Line Voltage Changeover Instructions

1. Determine if the charger is connected for available line voltage. A label located near AC input terminals is marked with the AC voltage for which the charger is factory connected.
2. If charger is not connected correctly, check serial nameplate to determine that charger is equipped to be connected for available line voltage. If charger is suitably equipped, make voltage changeover connections by following instructions on AC INPUT label inside charger.
3. If charger is reconnected, check input fuse (s) ratings with ratings specified on label and replace if necessary.

CAUTION: INCORRECT CONNECTIONS AND INCORRECT FUSE SIZE can damage this equipment. Follow voltage changeover instructions carefully.

Line Connections to Battery Charger

Follow local code requirements if different than instructions in this manual.

1. Turn charger OFF.
2. Be sure charger is connected correctly for available line voltage as instructed above.
3. On charger nameplate, note the AC input amperes corresponding to the line voltage to which charger is to be connected. Use that ampere value to select the proper disconnect switch, fuse, and power cable sizes from Table 4-1. A “WARNING” label inside charger also lists fuse sizes for each line voltage (circled fuse rating is required for internal line voltage connections made at factory).

4. Route AC power input cable in through knock-out provided in side panel of charger cabinet. Securely fasten cable wires to a power input terminal inside charger. Refer to Grounding section of this manual for proper connection of grounding conductor. (Charger cabinet top or side panel, or both, may have to be removed to provide access to terminal block.)
5. With disconnect switch (on AC input power line) in "OPEN" or "OFF" position, connect power cable coming from charger, to the switch. Install fuses in switch.

Charging Cable Connectors

If connectors are already attached to charging cables, make sure that they're attached so that positive charger polarity will connect to positive battery terminal.

If connectors must be attached to charging cables, follow instructions supplied with connectors.

CAUTION: Make sure connectors are securely attached to cables (good solder joint or well tightened set screws, whichever is applicable). Be certain that positive charger cable will connect to positive battery terminal. If necessary, trace cables into charger and use supplied connection diagram to determine polarity. The use of a DC voltmeter may show polarity. Improper connections will "blow" output fuse and may cause other damage.

Note: If this charger is equipped with certain optional features, the connector attaching procedure may be modified. Refer to OPTIONS chapter of this manual for details.

Pre-operation Checks

1. Inspect charger thoroughly for damage; loose screws, nuts, or electrical connections.

WARNING: ELECTRICAL SHOCK HAZARD – Before inspecting or cleaning inside cabinet, turn OFF and remove fuses of disconnect switch (supplying AC power to charger) and disconnect battery.

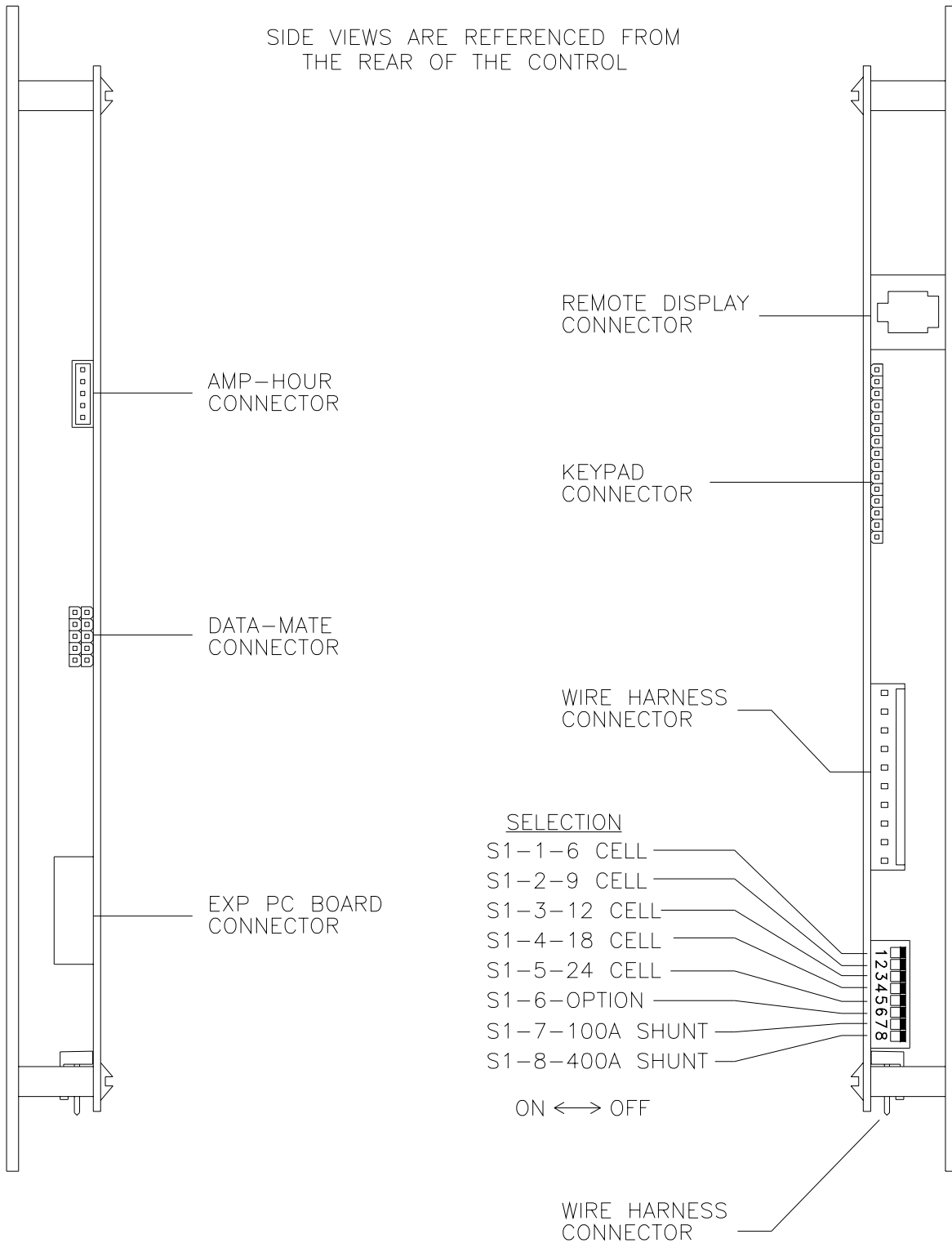
2. Remove all special tags that are tied to charger. Keep tags with this manual for future reference. Leave all precautionary and instruction labels in place on charger. Carefully read and follow instructions on all tags and labels. Make sure all labels remain visible to anyone operating charger.
3. Make sure all charger cabinet panels are fastened in place, to assure proper flow of ventilating air through cabinet.

LOCATION DIAGRAM – SCR2000 CONTROL

LEFT SIDE

RIGHT SIDE

SIDE VIEWS ARE REFERENCED FROM
THE REAR OF THE CONTROL



OPERATION

The operating procedure given here explains the operation of a Power Star Plus Battery Charger equipped with the SCR2000 Control.

Preliminary

1. Make sure that charger is installed and grounded as instructed in this manual.
2. Turn on main fused disconnect switch that supplies AC power to charger.
3. Maintain electrolyte level in batteries to be charged, as instructed by battery manufacturer. The volume of electrolyte will expand during the charge. Therefore, to avoid overfilling, do not add water until the battery has received at least an 80% charge. This will usually be reached at the time gassing starts.

Normal or Daily Charge

1. Insure that battery size and type matches the charger and charger settings, (Number of cells and ampere hour capacity are within nameplate information).
2. Connect AC power to charger.
3. Connect the battery to the charger.
4. "BID READ" will be displayed for several seconds; then, after a five second downcount, the charger will turn on and the "Charge in Progress" LED will light. The digital display will indicate output current and output volts per cell.
5. The "80% Charged" LED will light when the battery voltage has reached the 80% charged level.
6. When the charge termination point is reached, the charger will turn off. The "Charge Complete" LED will be on and the "Equalize" LED will be on if this was an equalize charge.

Equalize or Weekend Charge

Batteries may need periodic equalizing to correct for inequalities between cells that result from daily or frequent cycling. An equalizing charge should be given if any of the following conditions exist:

1. The specific gravity of any cell at the end of charge is 20 points less than the average.
2. The on-charge voltage of any cell at the end of charge is 20mV less than the average.
3. The battery has been stored for 30 days.
4. A large volume of water has been added.

When the equalize mode is desired, follow the operation outlined for a normal charge and press the "Equalize" key to set the charge control for an additional 3 hours more than required for a normal charge. The charge is complete when charge control automatically lights the "Charge Complete" LED.

NOTE: The SCR2000 is shipped from the factory set to the Auto Equalize by Cycle mode, and will automatically provide an equalize charge every 5 cycles. The manual equalize key is disabled in this mode. See function #24 (see page 6-8) in the Programming chapter in this manual to enable the manual equalize key.

Manual Stop

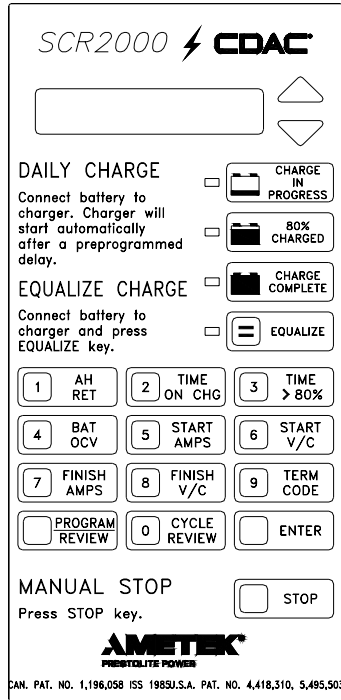
To stop any charge cycle before charge complete, press the red "STOP" key. For maximum shift run times and longest battery life, the charger should be allowed to always reach charge complete.

WARNING: Do not connect a battery to this charger if any lamp is lit. Do not disconnect a battery from this charger while a charge is in progress; otherwise, damage to charger, 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.

AC Power Fail

The SCR2000 Control will resume the charge where it left off when the AC power failure occurred, virtually unaffected charge time. If the battery is disconnected from the charger during an AC power failure and it or any other battery is reconnected, the control will recognize this when AC power returns and restart the charge cycle from the beginning. In the case of a battery with a BID module, the control will only restart from the beginning if the reconnected battery's BID number is different from the one at the time of power fail.

SCR2000 CONTROL FEATURES



Main Features

1. DV/DT Charge Termination
2. 8 Character Alphanumeric Display
3. Four LEDs for Status Display; automatic LED lamp test provided on start up
4. Manual Stop Capability
5. One touch Review of Charge Cycle Information during charge cycle or after charge complete
 - (Key #1) Amp hours returned during charge cycle
 - (Key #2) Total time on charge
 - (Key #3) 80% point to end of charge timer
 - (Key #4) Battery open circuit voltage
 - (Key #5) Start current
 - (Key #6) Start voltage (volts/cell)
 - (Key #7) Finish current
 - (Key #8) Finish voltage (volts/cell)
 - (Key #9) Charge termination code
 - (Key #0) Will display all nine items
6. Review of Charge Cycle Data and Programmed Features
7. Review of Archived Charge Cycle Data for the last 99 Charge Cycles. This data may also be downloaded to a printer using a Prestolite Print Kit or to a P.C. using a Data Link Kit.
 - Amp hours returned during charge
 - Total Time on charge
 - 80% point to end of charge time
 - Start current
 - Start voltage (volts/cell)
 - Finish current
 - Finish voltage (volts/cell)
 - Charge termination code
 - Equalize time
 - Start time
 - End time
 - Battery I.D.
 - Battery I.D. start temperature
 - Battery I.D. end temperature
 - Cycle amp hours
 - Month
 - Date
 - Battery open circuit voltage (Data Link)
 - Battery type
8. Automatic or Push-to-Start Operation
9. Manual or Automatic Equalize Operation
10. Fault Lock-out or No Fault Lock-out Operation
11. Back-up Timer Shutdowns

12. Failure Mode Diagnostics
 - High Battery Reject (HI BATT)
 - Low Battery Reject (LOW BATT)
 - Battery Reject (REJECT)
 - Charge Complete (COMPLETE)
 - Low Current S.D. (LOW CURR)
 - 0 – 80% - Backup Timer (BACKUP 10)
 - Manual Stop (MAN STOP)
 - Fault Lockout
 - High Current S.D. (BACKUP 10)
 - Charge Curve Error (CURVE)
 - Unbalance Input Amps (UNBAL LN)
 - Maximum Battery Temp (BAT TEMP)
13. One Part Number Control is User/Factory programmable for 6-9-12-18-24 Cells and 100-200-400 Amp Digital Ammeter. A Second Part Number is used for 12-18-24-36-40 Cells.
14. Adjustable 8-99 Hour Refresh Charge Delay
15. Voltage Time Feature (DV/DT Disable)
16. "Cell Forming" Feature (Programmable from 0-30 Cycles)
17. Programmed Features and Archive Data maintained for a minimum of 10 Years
18. Charge Cycle Data and Time-of-Day/Date maintained for a minimum of 10 Years

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 key. 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.

19. 5 Programmable Start Modes
 - Automatic Start (5 Second Delay)
 - Push-To-Start
 - Delayed Start
 - Time-of-Day Start
 - Time-of-Day Blockout
20. Programmable Manual Override of Start Modes
21. Automatic Equalize by Number of Cycles or Day of Week
22. Programmable Cool Down Time
23. Extra Run Time past the normal charger termination point (00-60 minutes)
24. Battery I.D. programming capability directly from the control
25. Programmable Curve types for maintenance free Batteries
26. Charge "Gassing" delay feature (No Gassing Hours)
27. 20A/100 to 50A/100 Opportunity Charging mode Available with or without the use of a BID

Description of Features

Charge Termination — The SCR2000 utilizes a patented DV/DT technique in order to determine the charge termination point. This technique returns approximately 107% of the amp hours removed from a battery (regardless of the state of discharge) and prevents variations in the incoming AC line voltage from affecting the amount of energy returned to the battery. The minimum time required for a DV/DT charge termination on the SCR2000 Control is 30 minutes. The SCR2000 Control can be programmed to utilize a voltage-time charge termination technique. If the DV/DT charge termination is disabled, the control will terminate the charge cycle four hours after the battery reaches the "80% Charged" point.

Alphanumeric Display — A dot-matrix, 8 character display is standard on the SCR2000 control. The characters are a minimum of .27 inches tall, making the information on the digital display legible at distances exceeding ten feet. Plain English and easy to understand abbreviations are used to indicate charge status, output current, voltage and other functions including; archive information, review information, programming information, fault information, and operating status.

Status Display LEDs — The “Charge In Progress” LED (Amber) is illuminated whenever the charger is flowing current to the battery. There are four status LEDs provided to indicate the present operating status of the charger and battery (see Figure 6-1). A lamp test feature is provided. See [Review of Charge Cycle](#) feature.

Review of Charge Cycle — When the charge cycle is in progress or has been terminated, either by the SCR2000 Control or the operator, the charge cycle history can be automatically read out by pressing the “Cycle Review” key. After displaying the information from memory, the unit will return to the normal display. All status LEDs will be illuminated during the review of function number 1, thus providing a lamp test feature. Nine functions are displayed during a standard review. The information in all 59 review functions can be displayed. See the [SCR2000 Charge Cycle Review Feature](#) section in this chapter. A single item can be selected by pressing the appropriate labeled key. This feature can greatly aid in the analysis of charge data and in situations where troubleshooting is required. See the [Troubleshooting](#) chapter in this manual.

Automatic , Push-to-Start Operation, or Fault Lockout — In the automatic start mode, the charger will start ten seconds after the battery is connected. The alphanumeric display will display “BID READ” and then count down during for a five second period (i.e., 5-4-3-2-1). In the push-to-start mode, the charger will not start the charge cycle until the “Enter” key is pressed. “ENTER TO START” will be scrolled across the display on battery connect when this feature has been selected.

Manual or Automatic Equalize — An equalize charge is a prolonged charge cycle (by 3 hours) used to correct any inequalities of voltage and specific gravity which may have developed between the cells during service. SCR2000 controls are shipped from the factory with the automatic equalize feature enabled. This mode of operation is indicated in the full Review “AUTO EQ. ON” function. There are two modes of automatic equalize. See the Automatic Equalize section in this chapter for further details. When the automatic equalize feature is active, the “Equalize” key on the front panel is disabled. When automatic equalize is disabled, an equalize charge is requested by pressing the “Equalize” key on the front panel of the SCR2000 control during any start mode, countdown, or after the charge cycle has started. If this key is pressed again during the charge cycle, the equalize request will be canceled if the equalize period has not begun.

Fault Lockout Operation — In the normal operating mode (No fault lock-out), if an abnormal shutdown occurs, disconnecting and reconnecting the battery will clear the fault and the SCR2000 will restart the charge cycle as programmed. If an abnormal shutdown occurs with the fault lock-out feature enabled, disconnecting and reconnecting a battery will not clear the fault condition.

The alphanumeric display will display “Fault Lockout”, and the status LEDs will continue to flash even with no battery connected to the charger until the fault condition is cleared. The “Enter” key will clear the fault if it is pressed while a battery is not connected to the charger.

Back-Up Timer Shutdown — The standard SCR2000 control has a back-up timer. The charger will shutdown and backup timer message will be displayed if 10 hours has passed since the start of a charge cycle and the battery has not reached gassing voltage(80% charged), and a DV/DT charge termination has not occurred. The backup timer is 14 hours if the 80D6C10 (“E”) grade is selected.

Battery Voltage Discrimination — A standard SCR2000 Control will not initiate a charge cycle if the open circuit voltage of the connected battery is less than 1.75 V/C or greater than 2.30 V/C. Both high and low battery reject levels can be adjusted through the front panel keypad. Low battery may be adjusted from 1.75 V/C to 1.99 V/C and high battery may be adjusted from 2.00 V/C to 2.59 V/C. See the Programming chapter of this manual. A low battery reject may be overridden by pressing the “Enter” key on the front panel.

One Part Number Control — The standard SCR2000 control is user/factory programmable for 6, 9, 12, 18, and 24 cell Power Stars with 100, 200, and 400 amp shunts. Any combination of the above cell sizes and current shunt sizes can be selected by DIP switches on the P.C. board. This feature reduces the quantity of spare parts inventory. See Figure 4-1 for further information.

Refresh Charge Feature — A refresh charge of a storage battery is a charge given to charged and wet batteries which are in storage or inactive periods to replace losses due to local action and to insure that every cell is brought periodically to a full state of charge. The SCR2000 Control has an 8 to 99 hour refresh charge timer (programmed through the “Refresh Delay” function) which starts with a normal charge complete, either DV/DT or voltage time. If a battery is left connected to the charger for the programmed number of hours after a charge complete, the control will automatically begin a refresh charge cycle.

The control will start automatically even if programmed for time-of-day start, delayed start, or push-to-start operation. The SCR2000 will not start the charge cycle during a time-of-day blackout period. It will automatically request an equalize cycle if it is programmed to equalize on that day. Charge cycle data (Functions #1-48) is not affected by a refresh charge.

The charge termination technique for a refresh charge will be DV/DT regardless of how the control is user programmed, and the 0-80% back-up timer will be 4 hours and 15 minutes during a refresh charge. This feature will insure that any battery left connected to the charger for extended periods of time will not be damaged due to self-discharge, and will be kept in a fully charged state.

Finish Cell Forming Feature — The SCR2000 Control can be programmed to provide voltage-time charge termination and disable the low current shut-down feature for a limited number of charge cycles. The number of cycles programmed in the control will be decremented each time a charge complete condition is reached. The number of forming cycles selected can be from 0 to 30 charge cycles.

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 key. 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.

Data Retention — The SCR2000 Control uses EEPROM memory for all data retention. A lithium battery supports the time-of-day and day-of-week circuitry. The lithium battery is only utilized during AC power failures and will maintain date, time, and data for a minimum of 10 years. Factory default information is in EEPROM and has a minimum data retention time of 10 years.

Time-of-Day Start — The SCR2000 Control can be programmed to delay the start of a charge cycle until a specific time of day. Any time of day, in 1 minute increments, can be used for the time-of-day start time. When a SCR2000 is programmed for time-of-day start, and a battery is connected to the charger, the programmed start time will be displayed. This feature can be used to save on energy costs, provide a battery cool down period, or to prevent opportunity charging.

Delayed Start — The SCR2000 Control can be programmed to delay the start of a charge cycle for a specific period of time. Any time period from 1 minute to 23 hours and 59 minutes, in 1 minute increments, can be used for the delayed start period.

When a SCR2000 is programmed for delayed start, and a battery is connected to the charger, the programmed delay time will be displayed. The time displayed will be decremented once per minute so that the time displayed is always the amount of time remaining before the start of charge. This feature can be used to save on energy costs, provide a battery cool down period, or to prevent opportunity charging.

Time-of-Day Blackout — The SCR2000 Control can be programmed to disable the charger during a specific time of day. The charger will turn off at the beginning of the blackout period, and resume the charge cycle at the end of the blackout period. Any time of day, in 1 minute increments, can be used for the time-of-day blackout period. When a SCR2000 is programmed for time-of-day blackout, and a battery is being charged when the blackout period occurs, the programmed end of blackout time will be displayed. This feature can be used to save on energy costs, provide a battery cool down period, or to prevent opportunity charging.

Manual Override of Programmed Start Modes — A SCR2000 Control, when programmed for time-of-day start, delayed start, or time-of-day blackout, can be manually overridden by pressing the “Enter” key while the start of the charge cycle is being automatically delayed by the control. This manual override feature can be disabled through the “Start Override” programming function. The manual override feature allows the operator to start a charge cycle immediately if a battery is needed sooner than the programmed start time would allow.

Automatic Equalize — The SCR2000 Control can be programmed for two different types of automatic equalize. SCR2000 controls are shipped from the factory programmed to automatically provide an equalize charge to every fifth complete charge cycle. The number of cycles between equalize requests can be varied from 0 to 30. If the SCR2000 is programmed to automatically provide an equalize cycle every zero cycles, then an equalize charge cannot be requested manually and will never be provided automatically. The second type of automatic equalize mode is when an equalize charge is desired on a particular day of the week. When programmed for automatic equalize by day of week, the SCR2000 will provide an equalize charge to any battery which is connected to the charger on the programmed equalize day.

The automatic equalize features allow for the consistent application of equalize charges without constant attention by the operators.

Programmable Cool Down Time — A programmable cool down feature allows the battery to cool down for 0 to 8 hours before the charger signals charge complete. During the cool down period the alphanumeric display reads “COOL DOWN”. This feature allows the battery to cool down before being returned to use and can be used to minimize the battery maximum temperature during operation.

Extra Run Time — The charge time can be extended past the normal charge termination point (DV/DT or VT) from 0 to 60 minutes. If equalize has been selected, any extra run time programmed will not be added. This feature may be useful in some abnormal charging situations such as cold storage.

Programmable Recharge Grade – This feature allows the same charger and control to charge batteries at different BCI ratings. Settings for 100D6C8, 80D6C8, and 80D6C10 are available.

Programmable Amp Hour Settings – Allow the charger to charge batteries smaller than nameplate ratings at exactly the correct rate.

Programmable Battery Temperature – Allows the charger to charge batteries at correct rates for the estimated battery temperature.

Programmable Battery Type – Allows typical flooded and maintenance free batteries of several types to be properly charged.

Maximum Charge Temperature – Pauses the charge cycle whenever the battery temperature exceeds the programmed value (BID Module required).

BID Module Compatibility – Allows the charger to automatically read battery size, type, and temperature before and during the charge cycle and optimize charging the battery type and conditions.

No Gassing – A programmable time that effects how long from the start of a charge cycle before the gassing portion can begin. If the battery on charge reaches the finish portion of the curve and the gassing time has not elapsed, the control will interrupt charging. This minimizes any battery gassing that may occur during an opportunity charge cycle. Once the “No Gassing” time has elapsed, the charger will resume charging at the standard finish rate.

Programmable Start Rate Charging (Extended AH) - Batteries of AH rating less than the charger nameplate AH rating that are equipped with or without a BID module, can be configured for fast charging at rates from 20 to 50 amps/100AH. This mode enables fast/opportunity charging for a wide range of battery ratings. To operate in this charging mode with a BID installed, program the BID battery type to 8 (function 55) and the BID start amps (function 58) to the desired charger start rate in amp/100AH. If operating without a BID, program the charger curve type to 8 (function 39) and the Battery start amps (function 57) to the desired charger start rate in amp/100AH. For example, to charge an 800AH battery at 320 amps, the “BID Start Amps” would be programmed to 40A/100AH. Please note that if the programmed rate exceeds the maximum rated charger amps, the charger output will be limited to the maximum current rating.

SCR2000 Charge Archive Function

The archive function allows all 21 items of charge cycle information to be retrieved and displayed. The last 99 charge cycles are stored, with the most recent cycle labeled #1 and earlier cycles labeled in ascending order.

The most recent charger cycle data is moved to the #1 archive location when the next battery to be charged is connected to the charger. At this time the all previous archive cycle data is shifted to the next highest archive location (1 to 2, 2 to 3, etc.).

The following key sequence is used to access charge cycle archive data:

Keys	Display
PROGRAM/REVIEW	SCROLL FOR MENUS
▽	ARCHIVE?
ENTER	CYCLE 01 – 99

The 19 archive data items are described in detail below (see Figure 6-2):

AH RETURNED

The total ampere-hours returned during the charge cycle. This number includes ampere-hours delivered to the battery during the 0-80%, 80% to End, and Equalize portions of the charge cycle.

CHARGE TIME The total charging time of the The total charging time of the charge cycle. This number includes the time of the 0-80%, 80% to End, and Equalize portions of the charge cycle.

80%-END TIME

The time the battery was charged from the 80% charged point until DV/DT or VT (depending on the control setting) charge termination. This time does not include any equalize charging time that may have been automatically or manually selected.

BATTERY OCV

The Battery Open Circuit voltage prior to the start of charge.

START AMPS

The value of the current delivered to the battery at the start of the charge cycle.

START VOLTS

The value of the battery voltage (in volts/cell) of the battery at the start of the charge cycle.

FINISH AMPS

The value of the charge current delivered to the battery at the end of the charge cycle.

FINISH VOLTS

The value of the battery voltage at the end of the charge cycle.

TERM CODE

The reason for charge cycle termination. All possible codes are listed below:

COMPLETE	Normal DV/DT or VT shutdown
LOW CUR.	Low current shutdown
MAN. STP.	Manual stop.
BAT. DIS.	Battery disconnect
BACKUP 10	0-80% Back-up timer shutdown
BACKUP 10	High current shutdown (Thermal Runaway)
UNBAL LN	Unbalanced input AC amps
CURVE	Charger output curve error
NONE	Charger running, no termination yet

EQ. TIME

The time of the equalize portion of charge cycle. Equalize can be automatically or manually selected.

START TM.

The time at the start of the charge cycle (24 hour format).

END TIME

The time at the end of the charge cycle. Includes the equalize time if it was automatically or manually selected (24 hour format).

BATTERY I.D.

The Battery I.D. number of the battery that was charged in the charge cycle. Requires Battery Identification Module (BID).

BID STRT. TEMP

The temperature of the battery sensed by the Battery Identification Module at the start of the charge cycle.

BID END TEMP

The temperature of the battery sensed by the Battery Identification Module at the end of the charge cycle (degrees C).

BID MAX TEMP

The maximum temperature of the battery from the beginning of the last charge cycle to the beginning of this charge cycle. This would be the maximum temperature recorded while the battery was in use or being charged.

CYCLE AH SIZE

Charger AH setting for that cycle

BATTERY TYPE

Charger battery type setting for that cycle

MONTH

The month that the charge cycle occurred.

DATE

The day of the month that the charge cycle occurred

SCR2000 Charge Cycle Review Function

The review function allows up to 59 items of charge cycle information to be retrieved and displayed. Only the last charge cycle is stored, with the data being moved into archive cycle #1 location when the next battery is connected to the charger. The review data functions described in detail below in ascending order.

A single review item can be accessed by entering its item number at the "ENTER FUNC NUM" prompt.

The following key sequence is used to access charge cycle review data functions:

Keys	Display
Program/Review	SCROLL FOR MENUS
▽	ARCHIVE
▽	REVIEW
Enter	ENTER FUNC NUM

Key in function number and press enter; then use the arrow keys to move through the functions or press enter and an automatic review will begin. Auto reviewing can be stopped by use of the arrow keys (see Figure 6-2).

01. AH RETURNED

The total ampere-hours returned during the charge cycle. This number includes ampere-hours delivered to the battery during the 0-80%, 80% to End, and Equalize portions of the charge cycle.

02. CHARGE TIME

The total charging time of the charge cycle. This number includes the time of the 0-80%, 80% to End, and Equalize portions of the charge cycle.

03. 80%-END TIME

The time the battery was charged from the 80% charged point until DV/DT or VT (depending on the control setting) charge termination. This time does not include any equalize charging time that may have been automatically or manually selected.

04. BATTERY OCV

The open circuit voltage of the battery immediately before the beginning of the charge cycle.

05. START AMPS

The value of the current delivered to the battery at the start of the charge cycle.

06. START VOLTS

The value of the battery voltage (in volts/cell) of the battery at the start of the charge cycle.

07. FINISH AMPS

The value of the charge current delivered to the battery at the end of the charge cycle.

08. FINISH VOLTS

The value of the battery voltage at the end of the charge cycle.

09. TERM CODE

The reason for charge cycle termination. All possible codes are listed below:

(01) COMPLETE	Normal DV/DT or VT shutdown
(02) LOW CURR	Low current shutdown
(03) MAN STOP	Manual stop
(04) BAT DISC	Battery disconnect.
(05) BACKUP 10	0-80% back-up timer shutdown
(17) BACKUP 10	High current shutdown (Thermal Runaway)
(00) NONE	Charger running, no termination yet

10. EQUALIZE TIME

The time of the equalize portion of the charge cycle. Equalize can be automatically or manually selected.

11. START TIME

The time at the start of the charge cycle (24 hour format).

12. END TIME

The time at the end of the charge cycle. Includes the equalize time if it was automatically or manually selected (24 hour format).

13. NOT USED

14. BATTERY I.D.

The Battery I.D. number of the battery that was charged in the charge cycle. Requires Battery Identification Module (BID).

15. BATTERY VOLTS

The present voltage of the battery connected to the battery charger (volts DC).

16. BID START TEMP

The temperature of the battery sensed by the Battery Identification Module at the start of the charge cycle (degrees C).

17. BID END TEMP

The temperature of the battery sensed by the Battery Identification Module at the end of the charge cycle (degrees C).

18. BID MAX TEMP

The maximum temperature of the battery from the beginning of the last charge cycle to the beginning of this charge cycle. This would be the maximum temperature recorded while the battery was in use or being charged.

19. PRESENT TIME

The present time (24 hour format)

20. DAY OF WEEK

The present day of week (SUN through SAT).

21. AUTO EQ. TYPE

The type of auto equalize selected. The types that can be selected are listed below:

CYC. = By cycle count (see AUTO EQ. COUNT).

D.O.W. = By the day of week (see AUTO EQ. DAY).

22. AUTO EQ. COUNT

The number of charge cycles between equalize charges when the auto equalize function is programmed "ON" and the auto equalize type is set to "COUNT".

23. AUTO EQ. DAY

The day of the week that an equalize charge cycle is performed when the auto equalize function is "ON" and the auto equalize type is set to "DAY".

24. AUTO EQ.

Shows the auto equalize function on or off.

Auto equalize "OFF"
Auto equalize "ON"

25. T.O.D. START

Time of day start time. (24 hour format). See START MODE.

26. DELAYED START

Delayed start time interval. (00H 00M to 23H 59M). See START MODE.

27. BLOCK START

The beginning time of the time of day blockout function (24 hour format). See START MODE.

28. BLOCK END

The ending time of the time of day blockout function (24 hour format). See START MODE.

29. START OVERRIDE

The start override function that allows the operator to override any of charger start modes (i.e. delayed start, time of day start, or time of day blockout) by pressing the ENTER key.

30. START MODE

Shows the selected start mode for the start of the charge cycle.

AUTO = Automatic mode

T.O.D.S. = Time of day start mode

DLY.ST. = Delay start mode

T.O.D.B. = Time of day blockout

31. FORM CYCLES

The number of forming cycles for a new battery by disabling the low current shutdown, and setting VT Termination mode for the programmed number cycles (00 to 30).

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 key. 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.

32. SPECIAL OPTION

Special option modes see below.

OFF

"P.T.S." = Push to start mode.

The charger will not start until the "ENTER" key is pressed.

F.L.O. = Fault lockout mode.

The charger will not restart until any faults are reset by pressing the "ENTER" key with no battery connected.

33. CYCLE AH SIZE

The ampere-hour setting of the charger during the charge cycle. This value cannot exceed the maximum charger output rating.

34. LOW BATTERY

Present setting for the rejection of a connected battery if the open circuit voltage is too low (1.75-1.99 V/C). May be over-ridden by pressing the enter key.

35. HIGH BATTERY

Present setting for the rejection of a connected battery if the open circuit voltage is too high (2.00-2.49 V/C). May be over-ridden by pressing the enter key.

36. RECHARGE GRADE

Allows charger to be configured as 100D6C8, 80D6C8, or 80D6C10 rated charger.

37. FIX AH SIZE

The ampere-hour size the charger will operate at if the charger does not detect a BID module.

38. FIX BAT TEMP

The battery temperature used for charger output voltage compensation, if the charger does not detect a BID module (032 to 132 degrees F).
Factory default = 77 degrees F

39. BATTERY TYPE

The battery type the charger uses to select the proper output voltage and current characteristic, if the charger does not detect a BID module.

- 00 FLD Flooded Lead Acid
- 01 CTM Custom curve (programmable)
- 02 YGR Sealed battery curve
- 03 SLR Sealed battery curve
- 04 DSG Sealed battery curve
- 05 SLE Sealed battery curve
- 08 MAX Opportunity Charge curve

40. STRT. A/100A.H.

The selected output curve start current setting.

41. FIN. A/100A.H.

The selected output curve finish current setting.

42. GAS V/C

The selected output curve gassing voltage level setting.

43. LID. V/C

The selected output curve lid voltage setting.

44. CHARGER I.D.

The battery charger identification number.
(0000 to 9999)

45. REFRESH DELAY

The number of hours before the charger automatically starts and refresh charges a battery that has not been disconnected (8 to 99 hours).

46. TERM TYPE

Disables the automatic DV/DT charge termination feature and enables Voltage Time charge termination.

- 0 = (DV/DT Mode)
- 1 = (VT mode)

47. MONTH

The current month (1 to 12).

48. DATE

The current day of the month (1 to 31).

49. YEAR

The current year (00 to 99).

50. COOL DOWN HRS.

The number of hours cool down from the end of charge until charge complete is indicated by the charger (0 to 8).

51. EXTRA RUN TIME

The programmed run time after normal charge complete.

52. PROG. BID CELLS*

If a connected battery is equipped with a Battery I.D. module, the battery cells size (6,9,12,18,24,36) may be re-programmed into the BID. The control must be in "Manual Stop" status.

53. PROG. BID NO.

If a connected battery is equipped with a Battery I.D. module, the I.D. number (000000-999999) may be re-programmed into the BID. The control must be in "Manual Stop" status.

54. PROG. BID AH

If a connected battery is equipped with a Battery I.D. module, the battery amp-hour size (0000-9999) may be re-programmed into the BID. The control must be in "Manual Stop" status.

55. PROG. BATT. TYPE*

If a connected battery is equipped with a Battery I.D. module, the battery type may be programmed type may be programmed into BID. The control must be in "Manual Stop" status.

- 00 FLD Flooded Lead Acid
- 01 CTM Custom curve (programmable)
- 02 YGR Sealed battery curve
- 03 SLR Sealed battery curve
- 04 DSG Sealed battery curve
- 05 SLE Sealed battery curve
- 08 MAX Opportunity Charge curve

56. NO GASSING HOURS

The number of hours before the charger can begin the gassing portion of the charging cycle. (0-8 hours)

**57. BATTERY START AMPS
(Opportunity/Fast charging without a BID)**

Programs the charger start rate at the programmed charger AH setting to the selected amps/100AH. For example, to charge an 800AH battery at 320 amps, the "battery start amps" would be programmed to 40A/100AH.

Please note that if the programmed rate exceeds the maximum rated charger amps, the charger output will be limited to the maximum current rating.

**58. BID START AMPS
(Opportunity/Fast charging with a BID)**

Programs the charger start rate at the programmed BID AH setting to the selected amps/100AH. For example, to charge an 800AH battery at 320 amps, the "bid start amps" would be programmed to 40A/100AH.

Please note that if the programmed rate exceeds the maximum rated charger amps, the charger output will be limited to the maximum current rating.

59. MAX CHARGE TEMP

The maximum battery temperature for charging to start or continue. Once interrupted, the charge will restart after the temperature drops 5 degrees F.

SCR2000 ARCHIVE, REVIEW & PROGRAMMING MENU STRUCTURE

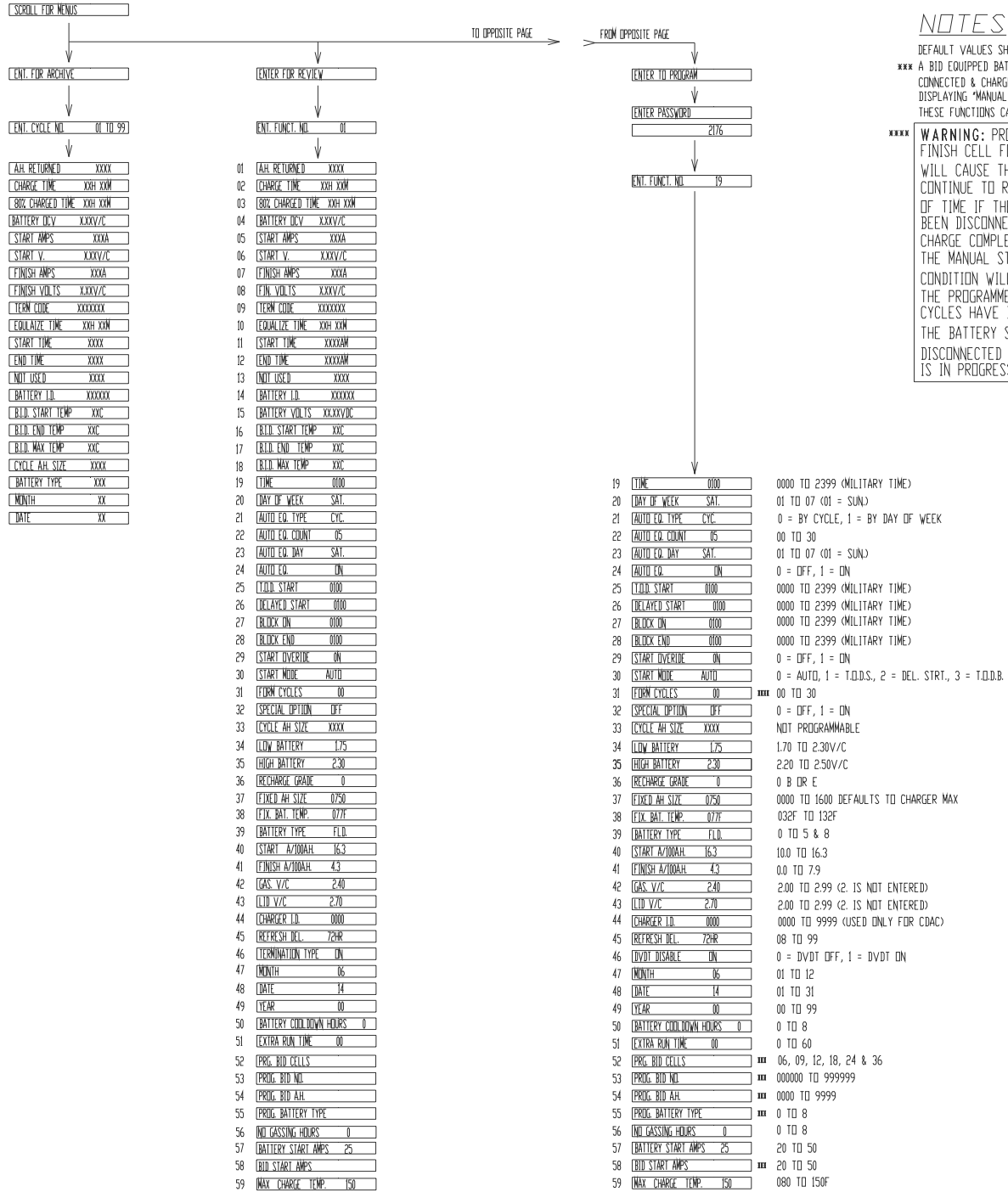


Figure 6-2

Programming Your SCR2000 Control


The program feature allows up to 40 functions to be programmed to customize your SCR2000 Control to your battery charging application. Programming is not available during the active charge cycle, and can only be accessed before charging or after charge termination.

Programmable functions are password protected. The password needed for programming is (2176).

NOTE: If an incorrect password is entered, it will be rejected by the control and "PW FAIL" will be displayed. To return to the menu, use either arrow.

Any item can be accessed by entering its function number at the "ENTER FUNC NUM" prompt or by pressing the up/down arrows until the desired function is reached. After changing the function, press the "ENTER" key to indicate you are completed and "XXXXXXXX" will briefly be displayed.

NOTE: If the function number or arrows were used at the "ENTER FUNC NUM" prompt, once the data is changed, you may press the up or down arrow key to indicate you finished programming a function. The next/previous function will be displayed.

Keys	Display
Program/Review	SCROLL FOR MENU
	ENTER PROGRAM
Enter	ENTER PASSWORD
2176	ENTER FUNC NUM

Key in the function number and press enter or scroll using arrow keys to reach the desired programming function (see Figure 6-2).

19. PRESENT TIME

The current time. Program in 24 hour format (0000 to 2359). Key in data and press enter.

20. DAY OF WEEK

The present day of week (SUN through SAT)

- 1 = Sun.
- 2 = Mon.
- 3 = Tue.
- 4 = Wed.
- 5 = Thu.
- 6 = Fri.
- 7 = Sat.

Key in data and press enter.

21. AUTO EQ. TYPE

The type of auto equalize selected. The types that can be selected are listed below.

- 0 = By cycle count (see AUTO EQ. COUNT).
Factory setting.
- 1 = By the day of week (see AUTO EQ. DAY).

Key in data and press enter.

22. AUTO EQ. COUNT

The number of complete charge cycles between equalize charges when the auto equalize function is programmed "ON" and the auto equalize type is set to "COUNT".

- 05 = factory setting

Key in data (0-30) and press enter.

23. AUTO EQ. DAY

The day of the week that an equalize charge cycle is performed when the auto equalize function is "ON" and the auto equalize type is set to "DAY".

- 1 = Sun.
- 2 = Mon.
- 3 = Tue.
- 4 = Wed.
- 5 = Thu.
- 6 = Fri.
- 7 = Sat., factory setting

Key in data and press enter.

24. AUTO EQ.

Sets the auto equalize function on or off.

- 0 = Auto equalize "OFF"
- 1 = Auto equalize "ON", factory setting

Key in data and press enter.

25. T.O.D. START

Sets the time of day start time (0000 to 2359, 24 hour format). See START MODE

Key in data and press enter.

26. DELAYED START

Sets the delayed start time interval (01H 00m to 23H 59M). Factory = 01H 00M See START MODE.

Key in data and press enter.

27. BLOCK START

Sets the beginning time of the time of day blackout function (0000 to 2359, 24 hour format). See START MODE.

Key in data and press enter.

28. BLOCK END

Sets the ending time of the time of day blackout function (0000 to 2359, 24 hour format). See START MODE.

Key in data and press enter.

29. START OVERRIDE

Sets the start override function that allows the operator to override any of the charger start modes (i.e.; delayed start, time of day start, or time of day blackout).

- 0 = Off
- 1 = On, factory setting

Key in data and press enter.

30. START MODE

Selects the desired start mode for the start of the charge cycle.

- 0 = Automatic mode "AUTO", factory setting
- 1 = Time of day start mode "T.O.D.S."
- 2 = Delay start mode "DLY.ST."
- 3 = Time of day blackout "T.O.D.B."

Key in data and press enter.

31. FORMING CYCLES

Sets the number of forming cycles for a new battery by disabling the low current shutdown and setting VT Termination mode for the programmed number of cycles (00 to 30).

00 = factory setting

Key in data and press enter.

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 key. 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.

32. SPECIAL OPTION

Special option modes see below:

- 0 = OFF
- 1 = "P.T.S." Push to start mode.

The charger will not start until the "ENTER" key is pressed.

- 2 = "F.L.O." Fault lockout

The charger will not restart until any faults are reset by pressing the "ENTER" key with no battery connected.

Key in data and press enter.

33. CYCLE AH SIZE

The ampere-hour setting of the charger during the charge cycle. This value cannot exceed the maximum charger output rating. **(NOT PROGRAMMABLE)**

34. LOW BATTERY REJECT

Sets the point in V/C at which a battery will be rejected if it is lower. Only enter the data to the right of the decimal point. (1.75 to 1.99)

Factory = 1.75

Key in data and press enter.

35. HIGH BATTERY REJECT

Sets the point in V/C at which a battery will be rejected if it is higher. Only enter the data to the right of the decimal point. (2.00 to 2.59)

Factory = 2.30

Key in data and press enter.

36. RECHARGE

Allows charger to be configured as 100D6C8, 80D6C8, or 80D6C10 rated charger.

Enter 0 = 100D6C8,
1 (B Grade) = 80D6C8,
2 (E Grade) = 80D6C10

37. FIX AH SIZE

The ampere-hour size the charger will operate at if the charger does not detect a BID module (0001 to nameplate AH rating).

Factory setting = nameplate rating

38. FIX BAT TEMP

The battery temperature used for charger output voltage compensation, if the charger does not detect a BID module (32 to 132 degrees F)

Factory Setting = 77F

39. BATTERY TYPE

The battery type the charger uses to select the proper output voltage and current characteristic, if the charger does not detect a BID module.

00	FLD	Flooded Lead Acid
01	CTM	Custom curve (programmable)
02	YGR	Sealed battery curve
03	SLR	Sealed battery curve
04	DSG	Sealed battery curve
05	SLE	Sealed battery curve
08	MAX	Opportunity Charge curve

40. START A/100AH

The custom output curve start current setting. (10.0 to 16.3A/100AH)

Factory setting = 16.3

41. FINISH A/100AH

The custom output curve finish current setting. (0.0 to 7.9A/100AH)

Factory setting = 4.5

42. GAS V/C

The custom output curve gassing voltage level setting. (2.00 to 2.99V/Cell)

Factory setting = 2.40

43. LID. V/C

The custom output curve lid voltage level setting. (2.00 to 2.99V/Cell)

Factory setting = 2.70

44. CHARGER I.D.

The battery charger identification number. This must be set to 0000 unless the battery charger is part of a CDAC system (0000 to 9999) or approval defeat DIP switch is set, see SCR2000 features.

Factory setting = 0000

Key in data and press enter.

45. REFRESH DELAY

The number of hours before the charger automatically starts and refresh charges a battery that has not been disconnected (8 to 99 hrs).

Factory setting = 72 hours

Key in data and press enter.

46. TERM TYPE

Disables the automatic DV/DT charge termination feature and enables Voltage Time charge termination

0 = (DV/DT mode) factory setting
1 = ON (VT mode)

Key in data and press enter.

47. MONTH

The current month (1 to 12).

Key in data and press enter.

48. DATE

The current day of the month (1 to 31).

Key in data and press enter.

49. YEAR

The current year (00 to 99).

Key in data and press enter.

50. COOL DOWN HRS

The number of hours cool down from the end of charge until charge complete is indicated by the charger (0 to 8).

0 = factory setting

Key in data and press enter.

BID Programming

The following conditions must be met before a BID can be programmed with this control:

- a. A battery with the correct cell size BID must be connected to the charger.
- b. The control must be in the Manual Stop condition.
- c. The control must be set to the programming menu and functions 52 thru 55 and 58 must be selected.

After the above conditions are met, the BID can be properly programmed. After a number entry is keyed in, the control will immediately attempt to program it in the BID while displaying READ BID. If the entered number is out of range or is not accepted by the BID, the control will return to the original prompt with all 0's displayed for the entered data. If the BID properly accepts the data, the programmed number will be returned to the display.

51. EXTRA RUN TIME

The programmed run time after normal charge complete. (0 to 60 minutes)

Factory setting = 00

52. PRG.BID CELLS

Programs the Cell Size into the BID.

- 06 = 6 Cells
- 09 = 9 Cells
- 12 = 12 Cells
- 18 = 18 Cells
- 24 = 24 Cells
- 36 = 36 Cells
- 40 = 40 Cells

53. PROG. BID NO.

Programs the battery identification number into the BID. (000000 to 999999)

54. PROG. BID A.H.

Programs the battery ampere hour rating into the BID. (0000 to 9999)

55. PROG BATT. TYPE

Programs the battery type into the BID.

- 00 FLD Flooded Lead Acid
- 01 CTM Custom Curve (programmable)
- 02 YGR Sealed battery curve
- 03 SLR Sealed battery curve
- 04 DSG Sealed battery curve
(Deka Dominator)
- 05 SLE Sealed battery curve
- 08 MAX Opportunity Charge Curve

56. NO GASSING HOURS

The number of hours before the charger can begin the gassing portion of the charging cycle. (0-8 hours)

Factory setting = 00 hours

Use the up or down arrow to select the proper set

57. BATTERY START AMPS

(Opportunity/Fast charging without a BID)

Programs the charger start rate at the programmed charger AH setting to the selected amps/100AH.

For example, to charge an 800AH battery at 320 amps, the "battery start amps" would be programmed to 40A/100AH.

Please note that if the programmed rate exceeds the maximum rated charger amps, the charger output will be limited to the maximum current rating.

58. BID START AMPS

(Opportunity/Fast charging with a BID)

Programs the charger start rate at the programmed BID AH setting to the selected amps/100AH.

For example, to charge an 800AH battery at 320 amps, the "bid start amps" would be programmed to 40A/100AH.

Please note that the programmed rate exceeds the maximum rated charger amps, the charger output will be limited to the maximum current rating.

59. MAX CHARGE TEMP

The maximum battery temperature for charging to proceed. (080 to 150 degrees F)

Factory setting = 150

Using extended AH for Opportunity/ Fast charging on the Power Star Plus.

The Extended AH feature of the Power Star Plus allows the user to Opportunity/Fast Charge batteries at charge rates from 20-50A/100AH, as long as the actual charge current is within the name-plate rating of the charger. Batteries that are rated below the maximum AH rating of the charger can be Opportunity/Fast charged at rates higher than the normal 25A/100AH.

Using a BID

When a BID is installed on the battery, it must have the "Battery Start Amps" set to a value between 20 and 50. The charger will then supply a start current equal to the battery that is programmed into the bid divided by 100. See the example below:

Battery 24 cell, 600AH (24-100-13)
Charger 1045Z3-24PF

BID settings:
BID cells 24 (Function 52)
BID AH 0600 (Function 54)
BID Battery Type 08 (Function 55)
BID Start Amps 40 (Function 58)

Resulting Charge Rate:

Start Amps — $6 \times 40 = 240$ Amps
Finish Amps — $4.5 \times 6 = 27$ Amps
Charger rated start amp = 261

Not using a BID

The example below describes how to accomplish extended amp-hour charging without the use of BID

Module on the battery.

Battery 24 cell, 600AH (24-100-13)
Charger 1045Z3-24PF

Charger settings:
Charger Fixed AH 0600 (Function 37)
Charger Curve Type 08 (Function 39)
Battery Start Amps 40 (Function 57)

Resulting Charge Rate:

Start Amps — $6 \times 40 = 240$ Amps
Finish Amps — $4.5 \times 6 = 27$ Amps
Charger rated start amp = 261

****Note: In order to use any of the opportunity/fast charge modes of this control, it must be in "plus" mode. "SCR2000+" should appear on the display. To put the control into "plus" mode, hold the 2 and 5 keys down while applying AC power. The control is put into standard mode by holding the 1 and 6 keys while applying AC power.***

TROUBLESHOOTING

Troubleshooting Table

SYMPTOM	PROBABLE CAUSES	ACTION	
		PARAGRAPH	PAGE
No Display And No LED's	(1) No AC Voltage To Charger	8.01	8-5
	(2) Input Fuse(s) Blown	8.02	8-5
	(3) Control Trans. Breaker Tripped	8.03	8-5
	(4) Bad Control Transformer	8.04	8-5
	(5) Wrong Control Trans. Connection	8.05	8-5
	(6) Bad Harness/Connection – Loose or Incorrect	8.06	8-5
	(7) Bad Control Board	8.07	8-5
No Keypad Response	(1) Keypad Not Connected	8.08	8-5
	(2) Keypad Connected Improperly	8.08	8-5
	(3) Bad Control Board	8.07	8-5
	(4) Bad Keypad	8.09	8-6
Bad Lamp Test	(1) Keypad Not Connected	8.08	8-5
	(2) Keypad Connected Improperly	8.08	8-5
	(3) Bad Control Board	8.07	8-5
	(4) Bad Keypad	8.09	8-6
Display Illegible	(1) Noisy Environment	8.10	8-6
	(2) Low Input Voltage	8.11	8-6
	(3) Bad Control Board	8.07	8-5
Charger Doesn't Respond To Battery Being Connected	(1) Output Fuse Bad	8.12	8-6
	(2) Bad Harness/Connections – Loose Or Incorrect	8.06	8-5
	(3) Bad Control Board	8.07	8-5
	(4) Output Cables Reversed	8.13	8-6
	(5) Bad Output Connector	8.14	8-6
	(6) Fault Lockout is on	8.42	8-8
Control Not Responding (Locked Up)	(1) Noisy Environment	8.10	8-6
	(2) Low Input Voltage	8.11	8-6
	(3) Power Interruption	8.10	8-6
Battery has Low S.G.'s	(1) Reading Not Temperature Corrected	8.17	8-6
	(2) Bad Battery	8.18	8-6
	(3) Too Cold	8.21	8-7
	(4) Improper Curve	8.43	8-8

SYMPTOM	PROBABLE CAUSES	ACTION	
		PARAGRAPH	PAGE
Battery Doesn't Last Full Shift	(1) Faulty Lift Interrupt	8.22	8-7
	(2) Manual Disconnect	8.23	8-7
	(3) A.H. Required > Battery Nameplate	8.24	8-7
	(4) Battery Not Providing Nameplate Rating	8.18	8-6
	(5) Equalize Schedule	8.19	8-6
	(6) Rates Set Incorrectly	8.20	8-7
	(7) Charger too Small for Battery	8.36	8-8
	(8) Improper Curve	8.43	8-8
Battery Water Usage Is Too High	(1) Rates Set Incorrectly	8.20	8-7
	(2) Equalize Schedule	8.19	8-6
	(3) Control on Forming Cycles	8.25	8-7
	(4) Control on Voltage/Time	8.26	8-7
Low Number Of A.H.'s Returned To Battery	(1) Faulty Lift Interrupt	8.22	8-7
	(2) Battery Not Fully Discharged	8.27	8-7
	(3) Manual Disconnect	8.23	8-7
	(4) Rates Set Incorrectly	8.20	8-7
	(5) Battery Not Providing Nameplate Rating	8.18	8-6
	(6) Bad Control Board	8.07	8-5
Battery Temperature Too High	(1) Insufficient Cool Down before and/or after Charging	8.28	8-7
	(2) Battery Power Demand Too Great	8.24	8-7
	(3) Rates Set Incorrectly	8.20	8-7
	(4) Equalize Schedule	8.19	8-6
	(5) Control Set for Voltage/Time	8.26	8-7
	(6) Control Set for Cell Forming	8.25	8-7
Incorrect Charge Rate	(1) Rates Set Incorrectly	8.20	8-7
	(2) Battery A.H. Not Equal To Charger A.H.	8.36	8-8
	(3) Blown Input Fuse (3 phase)	8.38	8-8
Long CDAC Approval Delay	(1) Bad CDAC Cabling	8.30	8-7
	(2) CDAC System Down (Computer)	8.31	8-7
	(3) No AC to Control of 1 or More Chargers	8.32	8-7
	(4) No CDAC System and Charger I.D. in Control isn't set to "0000"	8.33	8-7
	(5) Bad Expansion Board	8.16	8-6
	(6) Bad Control Board	8.07	8-5

SYMPTOM	PROBABLE CAUSES	ACTION	
		PARAGRAPH	PAGE
Charger Doesn't Shutdown when Battery is Disconnected	(1) Control Set for Forming Cycles	8.25	8-7
	(2) Bad Control Board	8.07	8-5
Meter Reading Wrong (V/C)	(1) Bad Output Connector	8.14	8-6
	(2) Bad Harness/Connections – Loose Or Incorrect	8.06	8-5
	(3) Bad Internal Power Connection	8.15	8-6
	(4) Bad Control Board	8.07	8-5
Meter Reading Wrong (Amps)	(1) Bad Output Connector	8.14	8-6
	(2) Bad Harness/Connections – Loose or Incorrect	8.06	8-5
	(3) Bad Internal Power Connection	8.15	8-6
	(4) Bad Control Board	8.07	8-5
	(5) Bad/Incorrect Shunt	8.34	8-7
	(6) DIP Switch Settings Incorrect	8.40	8-8
Display Reads 10 Hr B.U.	(1) Hot Battery	8.28	8-7
	(2) Battery A.H. > Charger A.H.	8.36	8-8
	(3) Bad Output Cable/Connector	8.14	8-6
	(4) Bad Battery	8.02	8-5
	(5) Improper Curve	8.43	8-8
Display Reads (MANUAL STOP)	(1) Someone Pressed Manual Stop Key	8.23	8-7
	(2) Bad Connection (Keypad-Control)	8.08	8-5
	(3) Bad Keypad	8.09	8-6
	(4) Bad Control Board	8.07	8-5
Display Reads (LOW CURRENT SHUTDOWN)	(1) Bad Harness/Connections – Loose or Incorrect	8.06	8-5
	(2) Battery Not Fully Formed	8.35	8-7
	(3) Bad Battery	8.18	8-6
	(4) Battery A.H.> Charger A.H.	8.36	8-8
	(5) Bad Internal Power Connection	8.15	8-6
	(6) AC Supply	8.01	8-5
	(7) Bad AC Fuse	8.02	8-5
	(8) Bad Contactor	8.41	8-8
	(9) Output Fuse Bad	8.12	8-6
	(10) Bad Control Board	8.07	8-5
	(11) Bad Transformer	8.07	8-5
	(12) Cold Battery	8.21	8-7

SYMPTOM	PROBABLE CAUSES	ACTION	
		PARAGRAPH	PAGE
Display Reads (LOW BATT REJECT)	(1) Bad Harness/Connections – Loose or Incorrect	8.06	8-5
	(2) Bad Battery	8.18	8-6
	(3) Wrong Cell Size Battery	8.39	8-8
	(4) Incorrect DIP Switch Setting	8.40	8-8
	(5) Bad Control Board	8.07	8-5
	(6) Bad Output Cable/Connector	8.14	8-6
Display Reads (HI BATT REJECT)	(1) Bad Battery	8.18	8-6
	(2) Bad Control Board	8.07	8-5
	(3) Incorrect DIP Switch Setting	8.40	8-8
	(4) Wrong Cell Size Battery	8.39	8-8
Display Reads (COP FAIL)	(1) Noise (Supply)	8.10	8-6
	(2) Bad Control Board	8.07	8-5
Display Reads (CLK MON)	(1) Noise (Supply)	8.10	8-6
	(2) Bad Control Board	8.07	8-5
Display Reads (OPCODE)	(1) Noise (Supply)	8.10	8-6
	(2) Bad Control Board	8.07	8-5
CURVE	(1) Bad Control Board	8.07	8-5
	(2) Bad Harness/Connections – Loose or Incorrect	8.06	8-5
	(3) Bad Internal Power Connection	8.15	8-6
	(4) Bad Transformer	8.07	8-5
	(5) Input Fuse Blown	8.38	8-8
	(6) Wrong A.H. Jumper/A.H. Jumper does not match Charger	8.44	8-8
UNBAL LN	(1) Bad Control Board	8.07	8-5
	(2) Bad Harness/Connections – Loose or Incorrect	8.06	8-5
	(3) Bad Internal Power Connection	8.15	8-6
	(4) Bad Transformer	8.07	8-5
	(5) Input Fuse Blown	8.38	8-8
BAT TEMP	(1) Hot Battery	8.28	8-7
	(2) Bad Control Board	8.07	8-5
	(3) Bad Output Cable/Connector	8.14	8-6
	(4) Bad BID Module	8.45	8-8

Action

- 8.01** Refer to the INSTALLATION chapter in the charger manual.
- 8.02** Disconnect AC power and replace the bad AC fuse. Reapply AC power to the charger. If the fuse (s) blows instantly, check the connections on the input side of the contactor to make sure there are no shorts between any of the input wires. If that's okay, then check or change the control transformer. If the fuse (s) blow after the contactor closes, then check the input wiring from the contactor to the main transformer (s). Refer to the charger manual and locate the diagram for your charger to confirm that the charger is wired correctly. Also check the wires going up to the terminal block on the transformer, the wires will have numbers that correspond to the number on the terminal block. If they are incorrect, change them and start over. If it still blows fuse (s), the transformer will have to be replaced.
- 8.03** Disconnect AC power and reset the breaker. Disconnect the control and reapply AC power to the charger. Measure to see if 24VAC is on the output side of the control transformer. If there is, the control has failed. If there isn't 24VAC, then replace the control transformer. It is still possible that the control has failed; so once the control transformer is replaced, measure to see if the 24VAC drops once the control is connected.
- 8.04** Check and see if any input fuses are blown. Visually inspect the control transformer for discoloration on the casing of the input side of the control transformer. Disconnect the control before applying AC power. Once AC power is reapplied, measure the input voltage to the control transformer, it should be the AC supply voltage (208/240/480) (240/480/575). If not, check the control transformer input wiring. If you did read the supply voltage, then measure the output side and you should read 24VAC. If not, replace the control transformer.
- 8.05** Look at the casing of the control transformer on the input side. Reference the charger manual to determine the input. There will be four pins and each one will be labeled as follows: COM (common), 208 (208VAC), 240 (240VAC), and 480 (480VAC). Some chargers are equipped with higher input voltage control transformers labeled as follows: COM (common), 240 (240VAC), 480 (480VAC), and 575 (575VAC). There should always be a wire on the common terminal no matter what voltage is applied to the charger, and the second wire will go to the pin labeled as the voltage that is applied to operate the charger. Measure the voltage on the output side of the control transformer, it should read approximately 24VAC.
- 8.06** A bad harness/connection can cause many different problems. The best way to confirm a bad harness/connection problem is to take measurements where the harness is connected to the charger and then follow the wire (s) up the harness to the PC boards and measure there also. The measurement should match what was measured at the charger connection. If it doesn't, check the following: Check the connectors at the square plugs where the control harness connects to the charger harness, the connectors could be pressed out of the plugs. Make sure the connectors look okay inside the edge mount connector at the PC board (s). Make sure the harness connections are tight where they connect to the charger. Make sure the wires are crimped to the terminals tightly and also check to make sure that they are crimped to the bare wire and not to the insulation only.
- 8.07** To check the Control Board for proper operation, first check the DIP Switch settings of S1. Make sure the proper cell size is set to match the charger. Also make sure the shunt size setting matches the shunt in the charger (100A on =100A shunt, 400A on = 400A, 100A and 400A off = 200A).
- If the control operates normally except there is no display, then check the connection between the display and the Control Board. Replace the Control Board if the connection is correct.
- If the control still does not operate properly even though the above settings are correct, the Control Board still may need to be replaced. However, this is unlikely and all other possibilities should be investigated before this step.
- 8.08** Disconnect the AC power to the charger and open the front door of the charger. The front panel keypad connects at the side of the control just above the wiring harness connection. If the ribbon connector is off or looks questionable, correct it.

- 8.09** With no battery connected to the charger, press all of the keys on the keypad and the display should indicate that the button did function. The only exception will be the Equalize and Stop keys. To test them, connect a battery and allow the charger to start, then press the button. The SCR2000 is shipped set for automatic equalize which means unless this is changed, the equalize button will not respond. To find out if the Status LED's on the keypad are okay, press key number "0" and a complete review will occur that starts out by performing a lamp test which lights all the Status LED's.
- 8.10** Temporarily shut down any equipment on the same voltage supply line and see if the control starts to respond normally. If the control does, then check all grounds going to the equipment that is shut down. If the problems still exist, then return power to all the other equipment and call your local Prestolite Power Representative.
- 8.11** Measure the AC supply voltage coming into the charger to confirm that it matches the charge input tap settings.
- 8.12** Use an Ohmmeter and measure directly across the DC Fuse. A good fuse will measure almost (0) Ohms and a bad one will measure a very high resistance, in the megohm range or greater. If for some reason a DC fuse measures somewhere in between, replace the DC fuse and send it in to your local Prestolite Power Representative.
- 8.13** Refer to the DIAGRAM chapter in the owners manual and locate the diagram for your charger to determine where the output cables connect to the charger. The black (Negative) output cable goes into the charger and connects to a bus bar on the end of the DC fuse which is located on the left portion of the interior panel. The red (Positive) output cable goes into the charger and connects to the heat sink in the back of the charger. The output connector will have a (+) and (-) symbol on it. The (+) terminal should have the red output cable connected to it, and the (-) should have the black output cable connected to it.
- 8.14** Make sure the output connector does not have any cracks on its casing that could result in a short. Make sure the output cable lugs are making a good connection with the battery connector. You will see traces of pitting on the lug surface from arcing if there isn't a good connection. This could be the result of a weak retainer clip in the connector or lugs that were soldered on incorrectly. If the lugs had too much heat applied to them when the cables were soldered on, the solder will wick up the cable and make it very stiff. When they are inserted into the connector, the stiff cable forces the retainer clip down and creates poor connection between the battery connector and the charger connector.
- 8.15** Do a continuity or resistance test. Check for connection points that visually appear to have been exposed to extreme heat. Any connections that appear loose or overheated must be re-lugged and rechecked.
- 8.16** To check expansion board for proper operation, first make sure there is a good connection to the main SCR2000 board. Remove the control and inspect, the connector is located in the lower right of the PC boards. Check for the proper I.D. number in function #37 (See "Programming Your SCR2000 Control" chapter in this manual). Also check the CDAC cables for proper insertion or damage.
- If the interface to CDAC still does not work after these checks and if any of the voltage measurements are incorrect, replace the expansion PC board.
- 8.17** Specific Gravity readings vary with the temperature of the electrolyte. To temperature correct the readings to match the nameplate ratings of the battery, use the following rule of thumb: +1 S.G. point per 3 degrees F. increase of the electrolyte temperature from 77 degrees F.
- 8.18** Take "Specific Gravity" readings and measure "Cell Voltages". If acid has been spilled or the battery has been extremely heated, it is possible that a battery's capacity could be greatly reduced, and the acid is not capable of increasing to the battery nameplate rating.
- 8.19** The proper equalize schedule is one that is tailored to the specific battery and charger operation. The SCR2000 auto equalize feature can be used to automate the equalize schedule (see the "SCR2000 Control Features" chapter of this manual).

Excess equalizing causes increased water usage. Too little or no equalizing can lead to battery sulfation and/or decrease battery shift run times. Adjusting the auto equalize number of cycles to can improve the equalize performance (see the "Programming Your SCR2000 Control" chapter of this manual). Some operations may also benefit from day of week equalizing. This can be programmed by the AUTO EQ type function to the SCR2000 Control (see the "Programming Your scr2000 Control" chapter of this manual).

- 8.20 Turn off the power to the charger and check the tap settings of the charger transformers (See the Charger owner's manual). Following the guidelines in the manual, adjust the taps if necessary.
- 8.21 If battery electrolyte temperatures are well below 32 degrees F, the charger will not be able to adequately charge the battery. Battery insulation or heaters would be required to keep the battery electrolyte temperatures close to 32 degrees F.
- 8.22 A faulty lift interrupt on a lift truck can cause the battery to be over or under discharged. Check the interrupt voltage of the interrupt following the procedures found in your truck and/or lift interrupt operators' manual (s).
- 8.23 Repeated manual disconnecting of the battery from the charger before complete can cause long term battery damage and lead to inefficient truck/battery operations. When it is necessary to stop the charge cycle before charge complete, *always terminate the charge cycle by pressing the STOP key before disconnecting the battery from the charger.*
- 8.24 If the application requires a larger AH battery than is presently in use, the only long term solution is to replace the battery with one of the proper AH rating.
- 8.25 If the control is set to perform forming cycles, DV/DT termination is disabled, and the low current shutdown is disabled. To return to normal operation, program the control to "00" Forming Cycles (see the "Programming Your SCR2000 Control" chapter of this manual).
- 8.26 Program the control to DV/DT charge termination (see the "Programming Your SCR2000 Control" chapter of this manual).
- 8.27 If fully discharged batteries are desired for efficient operations, lift interrupts can be installed on the trucks to allow the operators to recognize a fully discharged battery.
- 8.28 A cool down can be programmed into the SCR2000 control to add a specified cool down time between charge termination and the signaling of charge complete (see the "Programming Your SCR2000 Control" chapter of this manual). A delayed start can be programmed into the SCR2000 control to add a specified delay time between battery connection and the start on the charge (see the "Programming Your SCR2000 Control" chapter of this manual).
- 8.29 Battery is being discharged at too high (fast) of a rate. Consult the battery manufacturer or distributor for applications assistance.
- 8.30 Check and repair/reconnect connections between the last charger that is polling properly and the next charger connected (see your CDAC Owners Manual).
- 8.31 Reboot computer and select "Restart CDAC after abnormal termination" menu item (see your CDAC Owners Manual).
- 8.32 Check for control operation on all CDAC connected chargers down stream of the last connected charger that is polling properly (or all CDAC connected chargers). Loss of AC power connections or proper control transformer voltage will prevent proper CDAC operation (see CDAC Owners Manual).
- 8.33 The Charger I.D. function in the SCR2000 Control should be set to 0000 for proper normal (non-CDAC) operation (see the "Programming Your SCR2000 Control" chapter in this manual).
- 8.34 Replace damaged and/or incorrect shunt with one of correct size.
- 8.35 Program the forming cycles feature of the SCR2000 Control to the number of cycles required to properly form the battery (see the "Programming Your SCR2000 Control" chapter of this manual).

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 key. 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.

- 8.36 Try charging the battery on a larger amp-hour rated charger or downsize the battery to match the available chargers size.
- 8.37 The gassing or 80% charged point may be set too low or high. Try re-adjusting, in small increments. (See the "Programming Your SCR2000 Control" chapter in this manual.)
- 8.38 If the charger is 3 phase, it is possible that only 1 fuse may be blown. This would cause the charger and control to look as if they function as normal, but at a reduced charging rate. Turn off the power to the charger and replace fuse if necessary.
- 8.39 The battery connected to the charger may be the wrong cell size for the charger, check the nameplate on the battery and verify that it matches the cell size of the charger.
- 8.40 The cell selection DIP switch on the control may be set incorrectly. See the Set-Up chapter of this manual and verify that the switches are set correctly.
- 8.41 Check the voltage across the contactor coil. If the voltage is 24VAC +/-10%, replace contactor with a properly functioning part.
- 8.42 Check Function 32 to see if any special options are set. If Fault Lockout is on (FLO), turn it off or clear the fault by pressing the enter key with no battery connected.
- 8.43 Check Function 39 to see if the charger is set to charge with the proper curve type. See Function 39 of Programming Your SCR2000 Control.
- 8.44 Consult the factory to find the proper A.H. Jumper size for the charger.
- 8.45 Check the BID Module on the battery. Be sure it is attached securely and connections are tight. Check the small internal LED on the BID, make sure it is flashing. If it is not, replace the BID.

MAINTENANCE

WARNING: ELECTRICAL SHOCK HAZARD — Before inspecting or cleaning inside cabinet, turn OFF and remove fuses of disconnect switch (supplying AC power to charger) and disconnect battery.

Inspection And Cleaning

For uninterrupted, satisfactory service from this charger, it's necessary to keep unit clean, dry, and well ventilated. At least every three months, or more often as necessary, wipe and blow out all dirt from unit's interior components, with clean, dry air of not over 25 psi (172 kPa) pressure. Use a hand bellows if compressed air isn't available.

Check and tighten all electrical connections as necessary to eliminate unnecessary losses and to avoid subsequent trouble from overheating or open circuits. Check for broken wiring or damaged insulation on wiring.

WARNING: ELECTRICAL SHOCK HAZARD — Failure to keep internal parts clean and dry may allow transformer (s) to short out, causing secondary circuits to carry dangerously high voltage.

Be sure to replace all charger cabinet panels after any servicing, to assure proper flow of cooling air through unit and to protect internal components.

WARNING: ELECTRICAL SHOCK HAZARD — All cabinet panels must be replaced to protect personnel from contact with hazardous voltages.

Lubrication

None required.

Fuse Replacement

The SCRs and silicon diodes in this charger are protected by a "fast-clearing" type fuse.

CAUTION: The use of any other type fuse besides the "fast-clearing" type may cause damage to silicon diodes.

OPTIONS

The options listed in the following table of contents are those most commonly available. Special options not listed here will be covered by enclosed “addendum” sheets.

OPTION NUMBER	OPTION DESCRIPTION	PAGE
002	Parallel Charging.....	8-1
003	Series Charging.....	8-1
500	Fused Disconnect Switch and 24V Control Circuit.....	8-2

Parallel Charging – Option 002

This option provides cables allowing two batteries to be charged at the same time (batteries connected in parallel to charger).

To prevent premature charger turn on, this option requires the use of a battery connector with auxiliary contacts (Anderson “SBX” or equivalent). The same type connector must be specified on the battery and vehicle. The connector on the battery must have the auxiliary contacts jumpered together.

NOTE: The safety interlock circuit is protected by an in-line 1 Amp AGC Fuse inside the battery charger.

When charging two batteries, each must be of the same voltage (or number of cells). The total rated ampere-hour capacity of both batteries plus the voltage (number of cells of only one of the batteries) must be within the range of the charger. Refer to charger nameplate for ratings. For example: two 12-volt (6 cell), 225 ampere-hour batteries would make a 12-volt (6 cell), 450 ampere-hour load.

Operate this charger as instructed in the Operation chapter of this manual except that batteries are to be connected as shown in Figure 10-1, plus the total ampere-hour capacity must be used to calculate charging time.

CAUTION: Make sure all connections are made positive to positive and negative to negative as shown.

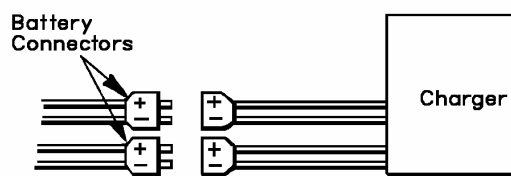


Figure 10-1 Parallel Charging Connections

Series Charging – Option 003

This option provides a cable allowing two batteries to be charged at the same time (batteries connected in series to charger).

CAUTION: With the batteries required to be connected in series, this charger cannot be used to charge one battery only.

Both batteries must be of the same ampere-hour rating. The total rated voltage (or number of cells) of both batteries (add the two), plus the ampere-hour capacity of only one battery, must be within the charger nameplate range ratings. For example: two 12-volt (6-cell), 450 ampere-hour batteries would make a 24-volt (12-cell), 450 ampere-hour load.

For series charging, both batteries must be at identical depths of discharge (DOD); ie, they are used in series in the vehicle. A mismatch in DOD of the two batteries will result in severe overcharge of the lightly discharged battery and severe undercharge of a deeply discharged battery.

Operate this charger as instructed in the Operation chapter of this manual, except that charger must be connected to both batteries instead of just one. Refer to Figure 10-2.

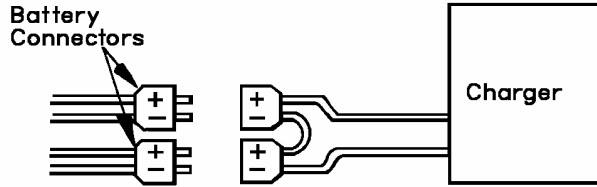


Figure 10-2 Series Charging Connections

CAUTION: Make sure all connections are made positive to positive and negative to negative as shown.

Fused Disconnect Switch – Option 500 (Refer to Figure 10-3)

This option is provided to meet certain “JIC” requirements. The switch must be in the open (OFF) position to disconnect all AC power into charger and to allow front door to be opened. With switch in open position, door can be opened by turning slotted latch screw to the left.

Disconnect switch is for *emergency* or *service use* only.

Charge cycle should continue until automatically shut off. If cycle must be interrupted, turn timer to “OFF” or push “STOP” button.

A control circuit operating on 24 volts is also provided to help assure operator safety.

Fused Disconnect Switch
(Shown in ON Position)

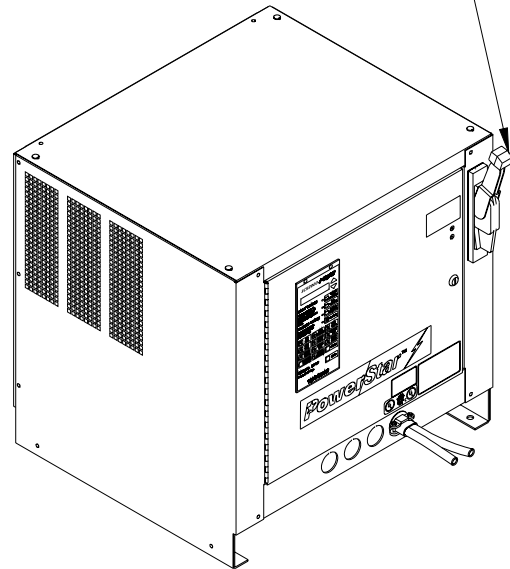


Figure 10-3 Fused Disconnect Switch

CDAC Expansion Kit

Power Star CDAC Expansion Kit.....193360-001

This option is required for communications with the Host Computer of a Prestolite CDAC (Charger Data Acquisition and Control) System.

Remote Display Kit

Power Star Remote Display Kit.....192356-001

A remote display kit is available for applications where the charger display is inaccessible or not visible. It allows remote control of Manual Stop and Equalize functions, as well as LED Status indicators.

This remote control box must be connected to charger as instructed on label provided with remote charge control. Operate the charger as instructed in the Operation chapter of this manual and as instructed under any applicable option descriptions.

Archive Downloading Kit

Prestolite Data Link Kit.....193026

This kit is available to allow the user to download Power Star archive data to a laptop PC via the PC's Serial Port. Data is stored in a "text" file format that can be imported into most popular spreadsheet programs.

Wall Mounting Bracket

Wall Mounting Bracket.....390850-2

Facilitates wall mounting of Z Case Chargers
Chargers.

PARTS LIST

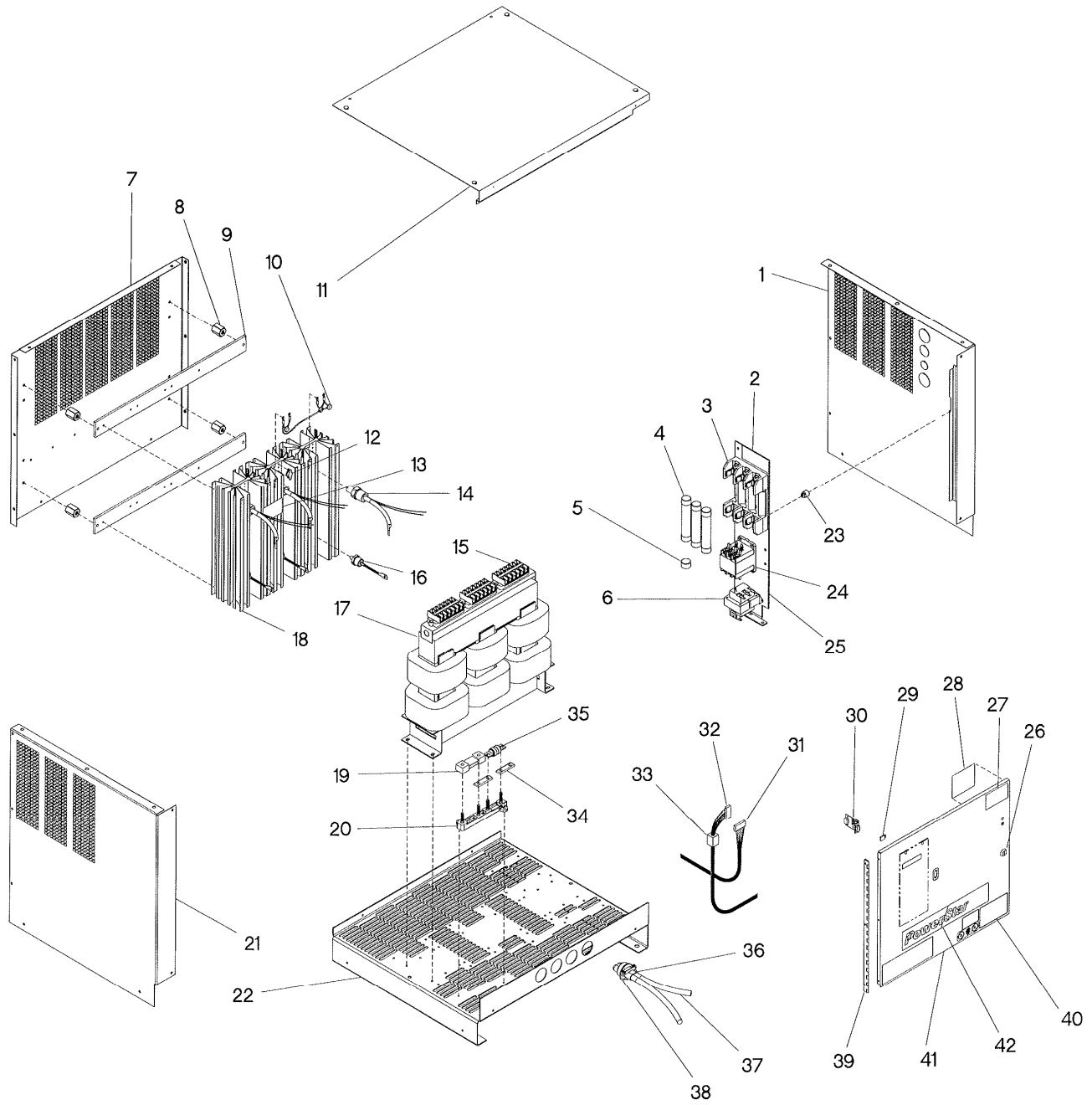


Figure 11-1

Parts List For Figure 11-1

		590Z3-12P 208/240/480	590Z3-12P 240/480/575	680Y3-12P 208/240/480	680Y3-12P 240/480/575	785Z3-12P 208/240/480	785Z3-12P 240/480/575
Item No.	Item Description	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
1	Panel, Side, Right	194521	194521	194521	194521	194521	194521
2	Panel, Interior	194447	194447	194447	194447	194447	194447
3	Block, Fuse	404605-4	404605-4	404605-4	404605-4	404605-4	404605-4
4	Fuse, AC Input (208 V.)	196030-25	N/A	196030-30	N/A	196030-30	N/A
	Fuse, AC Input (240 V.)	196030-20	196030-20	196030-25	196030-25	196030-30	196030-30
	Fuse, AC Input (480 V.)	196030-15	196030-15	196030-12	196030-12	196030-15	196030-15
	Fuse, AC Input (575 V.)	N/A	196030-10	N/A	196030-10	N/A	196030-12
5	Reducer, Fuse	N/A	N/A	N/A	N/A	N/A	N/A
6	Transformer, Control	406247-2	406247-4	406247-2	406247-4	406247-2	406247-4
7	Panel, Rear	194373	194373	194373	194373	194373	194373
8	Insulator, Heatsink	404033	404033	404033	404033	404033	404033
9	Insulator, Heatsink	194727	194727	194727	194727	194727	194727
10	Capacitor, Ay.	194708	194708	194708	194708	194708	194708
11	Panel, Top	194376	194376	194376	194376	194376	194376
12	Thermostat	196060	196060	196060	196060	196060	196060
13	Label, Warning	406518	406518	406518	406518	406518	406518
14	Rectifier, Silicon Controlled	192113-1	192113-1	192113-1	192113-1	192113-1	192113-1
15	Block, Terminal	192273	192273	192273	192273	192273	192273
16	Diode, Silicon, 150 A.	402832-3	402832-3	402832-3	402832-3	402832-3	402832-3
17	Transformer Assy.	194765	194910	194774	194911	194777	194912
18	Heatsink, Extruded	194391	194391	194391	194391	194391	194391
19	Shunt, Current	193125-2	193125-2	193125-2	193125-2	193125-3	193125-3
20	Insulator, Shunt	193114	193114	193114	193114	193114	193114
21	Panel, Side, Left	194374	194374	194374	194374	194374	194374
22	Base, Mounting	194372	194372	194372	194372	194372	194372
23	Grommet, Mounting	194827-1	194827-1	194827-1	194827-1	194827-1	194827-1
24	Contact, 3 Pole	406243-1	406243-1	406243-1	406243-1	406243-1	406243-1

Parts List For Figure 11-1 (Continued)

		590Z3-12P 208/240/480	590Z3-12P 240/480/575	680Y3-12P 208/240/480	680Y3-12P 240/480/575	785Z3-12P 208/240/480	785Z3-12P 240/480/575
Item No.	Item Description	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
25	Panel, Interior	194447	194447	194447	194447	194447	194447
26	Latch, Door	194530	194530	194530	194530	194530	194530
27	Label, Danger	404099	404099	404099	404099	404099	404099
28	Label, AC Input (208/240/480 V.)	406461	N/A	406461	N/A	406461	N/A
	Label, AC Input (240/480/575 V.)	N/A	194140	N/A	194140	N/A	194140
	Label, AC Input (480/575 V.)	N/A	N/A	N/A	N/A	N/A	N/A
29	Connector, Amp Hour	194840-5	194840-5	194840-1	194840-1	194840-2	194840-2
30	Board, PC Communicatios	196626	196626	196626	196626	196626	196626
31	Harness, Wire, Interior Panel	194810	194810	194810	194810	194810	194810
32	Harness, Wire, Rectifier Assy	194808	194808	194808	194808	194808	194808
33	Suppressor, Harness	192266-1	192266-1	192266-1	192266-1	192266-1	192266-1
34	Bus Bar	392458	392458	392458	392458	392458	392458
35	Fuse, DC	Y1890-5	Y1890-5	Y1890-6	Y1890-6	Y1890-7	Y1890-7
36	Cover, Neoprene	378234-13	378234-13	378234-13	378234-13	378234-13	378234-13
37	Cable, Output	396263-81	396263-81	396263-81	396263-81	396263-82	396263-82
38	Bushing, Strain Relief	W10080-5	W10080-5	W10080-5	W10080-5	W10080-5	W10080-5
39	Hinge, Door	194377	194377	194377	194377	194377	194377
40	Label, PIP	407217-1	407217-1	407217-1	407217-1	407217-1	407217-1
41	Door, Hinged	194378	194378	194378	194378	194378	194378
42	Label, Power Star plus	197973	197973	197973	197973	197973	197973
43	Label, Warning & Information (Not Shown)	196183	196183	196183	196183	196183	196183

Parts List For Figure 11-1 (Continued)

		910Z3-12P 208/240/480	910Z3-12P 240/480/575	680Z3-18P 208/240/480	680Z3-18P 240/480/575	785Z3-18P 208/240/480	785Z3-18P 240/480/575
Item No.	Item Description	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
1	Panel, Side, Right	194521	194521	194521	194521	194521	194521
2	Panel, Interior	194447	194447	194447	194447	194447	194447
3	Block, Fuse	404605-5	404605-5	404605-5	404605-5	404605-5	404605-5
4	Fuse, AC Input (208 V.)	196030-45	N/A	196030-45	N/A	196030-50	N/A
5	Fuse, AC Input (240 V.)	196030-40	196030-40	196030-40	196030-40	196030-45	196030-45
6	Fuse, AC Input (480 V.)	196030-20	196030-20	196030-20	196030-20	196030-20	196030-20
7	Fuse, AC Input (575 V.)	N/A	196030-15	N/A	196030-15	N/A	196030-20
8	Reducer, Fuse	196017	196017	196017	196017	196017	196017
9	Transformer, Control	406247-2	406247-4	406247-2	406247-4	406247-2	406247-4
10	Panel, Rear	194373	194373	194373	194373	194373	194373
11	Insulator, Heatsink	404033	404033	404033	404033	404033	404033
12	Insulator, Heatsink	194727	194727	194727	194727	194727	194727
13	Capacitor, Ay.	194708	194708	194708	194708	194708	194708
14	Panel, Top	194376	194376	194376	194376	194376	194376
15	Block, Terminal	192273	192273	192273	192273	192273	192273
16	Diode, Silicon, 150 A.	402832-3	402832-3	402832-3	402832-3	402832-3	402832-3
17	Transformer Assy.	194888	194913	194780	194918	194783	194919
18	Heatsink, Extruded	194392	194392	194392	194392	194392	194392
19	Shunt, Current	193125-3	193125-3	193125-2	193125-2	193125-3	193125-3
20	Insulator, Shunt	193114	193114	193114	193114	193114	193114
21	Panel, Side, Left	194374	194374	194374	194374	194374	194374
22	Base, Mounting	194453	194453	194453	194453	194372	194372
23	Grommet, Mounting	194827-1	194827-1	194827-1	194827-1	194827-1	194827-1
24	Contact, 3 Pole	406243-1	406243-1	406243-1	406243-1	406243-1	406243-1

Parts List For Figure 11-1 (Continued)

		910Z3-12P 208/240/480	910Z3-12P 240/480/575	680Z3-18P 208/240/480	680Z3-18P 240/480/575	785Z3-18P 208/240/480	785Z3-18P 240/480/575
Item No.	Item Description	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
25	Panel, Interior	194447	194447	194447	194447	194447	194447
26	Latch, Door	194530	194530	194530	194530	194530	194530
27	Label, Danger	404099	404099	404099	404099	404099	404099
28	Label, AC Input (208/240/480 V.)	406461	N/A	406461	N/A	406461	N/A
	Label, AC Input (240/480/575 V.)	N/A	194140	N/A	194140	N/A	194140
	Label, AC Input (480/575 V.)	N/A	N/A	N/A	N/A	N/A	N/A
29	Connector, Amp Hour	194840-3	194840-3	194840-1	194840-1	194840-2	194840-2
30	Board, PC Communicatios	196626	196626	196626	196626	196626	196626
31	Harness, Wire, Interior Panel	194810	194810	194810	194810	194810	194810
32	Harness, Wire, Rectifier Assy	194808	194808	194808	194808	194808	194808
33	Suppressor, Harness	192266-1	192266-1	192266-1	192266-1	192266-1	192266-1
34	Bus Bar	392458	392458	392458	392458	392458	392458
35	Fuse, DC	Y1890-8	Y1890-8	Y1890-6	Y1890-6	Y1890-7	Y1890-7
36	Cover, Neoprene	378234-13	378234-13	378234-13	378234-13	378234-13	378234-13
37	Cable, Output	396263-82	396263-82	396263-81	396263-81	396263-82	396263-82
38	Bushing, Strain Relief	W10080-5	W10080-5	W10080-5	W10080-5	W10080-5	W10080-5
39	Hinge, Door	194377	194377	194377	194377	194377	194377
40	Label, PIP	407217-1	407217-1	407217-1	407217-1	407217-1	407217-1
41	Door, Hinged	194378	194378	194378	194378	194378	194378
42	Label, Power Star plus	197973	197973	197973	197973	197973	197973
43	Label, Warning & Information (Not Shown)	196183	196183	196183	196183	196183	196183

Parts List For Figure 11-1 (Continued)

		910Z3-18P 208/240/480	910Z3-18P 240/480/575	680Z3-24P 208/240/480	680Z3-24P 240/480/575	785Z3-24P 208/240/480	785Z3-24P 240/480/575
Item No.	Item Description	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
1	Panel, Side, Right	194521	194521	194521	194521	194521	194521
2	Panel, Interior	194447	194447	194447	194447	194447	194447
3	Block, Fuse	404605-5	404605-5	404605-5	404605-5	404605-5	404605-5
4	Fuse, AC Input (208 V.)	196030-60	N/A	196030-50	N/A	196030-60	N/A
	Fuse, AC Input (240 V.)	196030-50	196030-50	196030-50	196030-50	196030-60	196030-60
	Fuse, AC Input (480 V.)	196030-25	196030-25	196030-25	196030-25	196030-30	196030-30
	Fuse, AC Input (575 V.)	N/A	196030-20	N/A	196030-20	N/A	196030-25
5	Reducer, Fuse	196017	196017	196017	196017	196017	196017
6	Transformer, Control	406247-2	406247-4	406247-2	406247-4	406247-2	406247-4
7	Panel, Rear	194373	194373	194373	194373	194373	194373
8	Insulator, Heatsink	404033	404033	404033	404033	404033	404033
9	Insulator, Heatsink	194727	194727	194727	194727	194727	194727
10	Capacitor, Ay.	194708	194708	194708	194708	194708	194708
11	Panel, Top	194376	194376	194376	194376	194376	194376
12	Thermostat	196060	196060	196060	196060	196060	196060
13	Label, Warning	406518	406518	406518	406518	406518	406518
14	Rectifier, Silicon Controlled	192113-1	192113-1	192113-1	192113-1	192113-1	192113-1
15	Block, Terminal	192273	192273	192273	192273	192273	192273
16	Diode, Silicon, 150 A.	402832-3	402832-3	402832-3	402832-3	402832-3	402832-3
17	Transformer Assy.	194865	194920	194788	194842	194791	194925
18	Heatsink, Extruded	194392	194392	194392	194392	194392	194392
19	Shunt, Current	193125-3	193125-3	193125-2	193125-2	193125-3	193125-3
20	Insulator, Shunt	193114	193114	193114	193114	193114	193114
21	Panel, Side, Left	194374	194374	194374	194374	194374	194374
22	Base, Mounting	194372	194372	194372	194372	194372	194372
23	Grommet, Mounting	194827-1	194827-1	194827-1	194827-1	194827-1	194827-1
24	Contact, 3 Pole	406244-1	406243-1	406243-1	406243-1	406244-1	406243-1

Parts List For Figure 11-1 (Continued)							
		910Z3-18P 208/240/480	910Z3-18P 240/480/575	680Z3-24P 208/240/480	680Z3-24P 240/480/575	785Z3-24P 208/240/480	785Z3-24P 240/480/575
Item No.	Item Description	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
25	Panel, Interior	194447	194447	194447	194447	194447	194447
26	Latch, Door	194530	194530	194530	194530	194530	194530
27	Label, Danger	404099	404099	404099	404099	404099	404099
28	Label, AC Input (208/240/480 V.)	406461	N/A	406461	N/A	406461	N/A
	Label, AC Input (240/480/575 V.)	N/A	194140	N/A	194140	N/A	194140
	Label, AC Input (480/575 V.)	N/A	N/A	N/A	N/A	N/A	N/A
29	Connector, Amp Hour	194840-3	194840-3	194840-1	194840-1	194840-2	194840-2
30	Board, PC Communicatios	196626	196626	196626	196626	196626	196626
31	Harness, Wire, Interior Panel	194810	194810	194810	194810	194810	194810
32	Harness, Wire, Rectifier Assy	194808	194808	194808	194808	194808	194808
33	Suppressor, Harness	192266-1	192266-1	192266-1	192266-1	192266-1	192266-1
34	Bus Bar	392458	392458	392458	392458	392458	392458
35	Fuse, DC	Y1890-8	Y1890-8	Y1890-6	Y1890-6	Y1890-7	Y1890-7
36	Cover, Neoprene	378234-13	378234-13	378234-13	378234-13	378234-13	378234-13
37	Cable, Output	396263-82	396263-82	396263-81	396263-81	396263-82	396263-82
38	Bushing, Strain Relief	W10080-5	W10080-5	W10080-5	W10080-5	W10080-5	W10080-5
39	Hinge, Door	194377	194377	194377	194377	194377	194377
40	Label, PIP	407217-1	407217-1	407217-1	407217-1	407217-1	407217-1
41	Door, Hinged	194378	194378	194378	194378	194378	194378
42	Label, Power Star plus	197973	197973	197973	197973	197973	197973
43	Label, Warning & Information (Not Shown)	196183	196183	196183	196183	196183	196183

Parts List For Figure 11-1 (Continued)

		520Z3-36P 240/480/575	520Z3-40P 240/480/575
Item No.	Item Description	Part No.	Part No.
1	Panel, Side, Right	194521	194521
2	Panel, Interior	194447	194447
3	Block, Fuse	404605-5	404605-5
4	Fuse, AC Input (208 V.)	N/A	N/A
	Fuse, AC Input (240 V.)	196030-60	196030-60
	Fuse, AC Input (480 V.)	196030-30	196030-30
	Fuse, AC Input (575 V.)	196030-25	196030-25
5	Reducer, Fuse	196017	196017
6	Transformer, Control	406247-4	406247-4
7	Panel, Rear	194373	194373
8	Insulator, Heatsink	404033	404033
9	Insulator, Heatsink	194727	194727
10	Capacitor, Ay.	194708	194708
11	Panel, Top	194376	194376
12	Thermostat	196060	196060
13	Label, Warning	406518	406518
14	Rectifier, Silicon Controlled	192113-1	192113-1
15	Block, Terminal	192273	192273
16	Diode, Silicon, 150 A.	402832-3	402832-3
17	Transformer Assy.	194927	198026
18	Heatsink, Extruded	194392	194392
19	Shunt, Current	193125-2	193125-2
20	Insulator, Shunt	193114	193114
21	Panel, Side, Left	194374	194374
22	Base, Mounting	194372	194372
23	Grommet, Mounting	194827-1	194827-1
24	Contact, 3 Pole	406243-1	406243-1

Parts List For Figure 11-1 (Continued)

		520Z3-36P 208/240/480	520Z3-40P 240/480/575
Item No.	Item Description	Part No.	Part No.
25	Panel, Interior	194447	194447
26	Latch, Door	194530	194530
27	Label, Danger	404099	404099
28	Label, AC Input (208/240/480 V.)	N/A	N/A
	Label, AC Input (240/480/575 V.)	194140	194140
	Label, AC Input (480/575 V.)	N/A	N/A
29	Connector, Amp Hour	194840-6	194840-6
30	Board, PC Communicatios	196626	196626
31	Harness, Wire, Interior Panel	194810	194810
32	Harness, Wire, Rectifier Assy	194808	194808
33	Suppressor, Harness	192266-1	192266-1
34	Bus Bar	392458	392458
35	Fuse, DC	Y1890-5	Y1890-5
36	Cover, Neoprene	378234-13	378234-13
37	Cable, Output	396263-81	396263-81
38	Bushing, Strain Relief	W10080-5	W10080-5
39	Hinge, Door	194377	194377
40	Label, PIP	407217-1	407217-1
41	Door, Hinged	194378	194378
42	Label, Power Star plus	197973	197973
43	Label, Warning & Information (Not Shown)	196183	196183

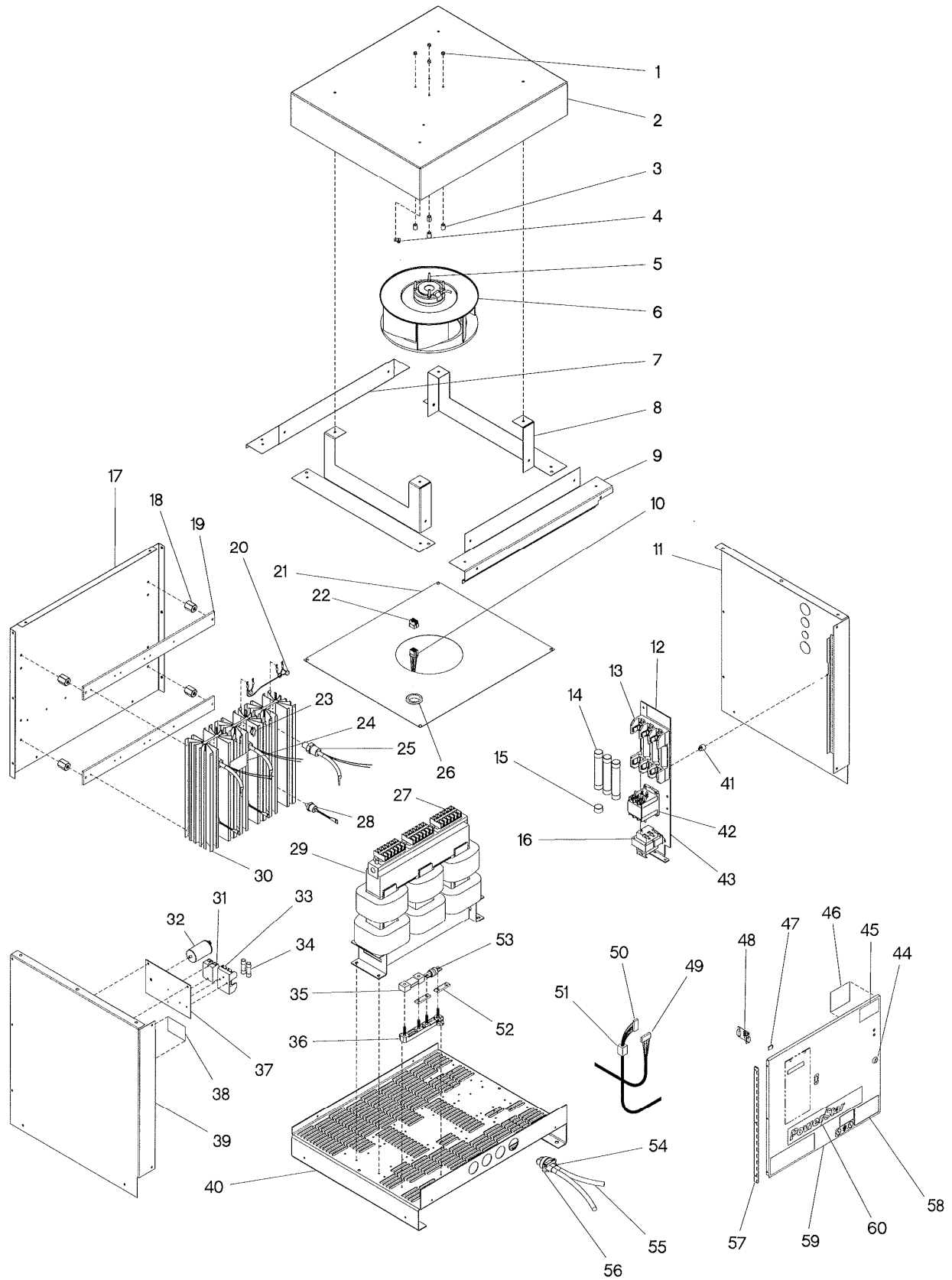


Figure 11-2

Parts List For Figure 11-2

		1045Z3-18PF 480/575	1270Z3-18PF 480/575	1400Z3-18PF 480/575	910Z3-24PF 480/575	1045Z3-24PF 480/575
Item No.	Item Description	Part No.	Part No.	Part No.	Part No.	Part No.
1	Nut, Keps, M6	50MS732-8	50MS732-8	50MS732-8	50MS732-8	50MS732-8
2	Canopy	195040	195040	195040	195040	195040
3	Spacer, Impeller	196352	196352	196352	196352	196352
4	Clamp, Wire	196390-1	196390-1	196390-1	196390-1	196390-1
5	Stud, Threaded, M6 x 40mm	196064-2	196064-2	196064-2	196064-2	196064-2
6	Impeller	196078	196078	196078	196078	196078
7	Support, Rear, Canopy	195064	195064	195064	195064	195064
8	Support, Side, Canopy	195065	195065	195065	195065	195065
9	Support, Front, Canopy	195063	195063	195063	195063	195063
10	Harness, Wire	196636	196636	196636	196636	196636
11	Panel, Side, Right	196562	196562	196562	196562	196562
12	Panel, Interior	194447	194447	194447	194447	194447
13	Block, Fuse	404605-4	404605-5	404605-5	404605-4	404605-5
	Fuse, AC Input (480 V.)	196030-25	196030-35	196030-35	196030-30	196030-40
	Fuse, AC Input (575 V.)	196030-20	196030-30	196030-30	196030-20	196030-35
15	Reducer, Fuse	N/A	196017	196017	N/A	N/A
16	Transformer, Control	406247-4	406247-4	406247-4	406247-4	406247-4
17	Panel, Rear	196546	196546	196546	196546	196546
18	Insulator, Heatsink	404033	404033	404033	404033	404033
19	Insulator, Heatsink	196222	196222	196222	196222	196222
20	Capacitor, Ay.	194708	194708	194708	194708	194708
21	Panel, Top	196563	196563	196563	196563	196563
22	Housing, Pin	401563-2	401563-2	401563-2	401563-2	401563-2
23	Thermostat	196060	196060	196060	196060	196060
24	Label, Warning	406518	406518	406518	406518	406518
25	Rectifier, Silicon Controlled	192113-1	192113-1	192113-1	192113-1	192113-1
26	Grommet, Rubber	402037-27	402037-27	402037-27	402037-27	402037-27
27	Block, Terminal	192273	192273	192273	192273	192273
28	Diode, Silicon, 150 A.	402832-3	402832-3	402832-3	402832-3	402832-3
29	Transformer Assy.	197989	197826	197897	197998	197929
30	Heatsink, Extruded	194392	194392	194392	194392	194392

Parts List For Figure 11-2 (Continued)

		1045Z3-18PF 480/575	1270Z3-18PF 480/575	1400Z3-18PF 480/575	910Z3-24PF 480/575	1045Z3-24PF 480/575
Item No.	Item Description	Part No.	Part No.	Part No.	Part No.	Part No.
31	Relay, Solid State	196570-1	196570-1	196570-1	196570-1	196570-1
32	Capacitor, Impeller	196055	196055	196055	196055	196055
33	Block, Fuse	405357-1	405357-1	405357-1	405357-1	405357-1
34	Fuse, 3 A., 250 V.	W10085-2	W10085-2	W10085-2	W10085-2	W10085-2
35	Shunt, Current	193125-3	193125-4	193125-4	193125-3	193125-3
36	Insulator, Shunt	193114	193114	193114	193114	193114
37	Panel, Mounting, Relay	196569	196569	196569	196569	196569
38	Label, Fan Fuse	196095	196095	196095	196095	196095
39	Panel, Side, Left	196561	196561	196561	196561	196561
40	Base, Mounting	194372	194372	194372	194372	194372
41	Grommet, Mounting	194827-1	194827-1	194827-1	194827-1	194827-1
42	Contactora, 3 Pole	406243-1	406243-1	406243-1	406243-1	406243-1
43	Panel, Interior	194447	194447	194447	194447	194447
44	Latch, Door	194530	194530	194530	194530	194530
45	Label, Danger	404099	404099	404099	404099	404099
46	Label, AC Input (480/575 V.)	192667	192667	192667	192667	192667
47	Connector, Amp Hour	194840-6	194840-8	194840-3	194840-3	194840-6
48	Board, PC Communicatios	196626	196626	196626	196626	196626
49	Harness, Wire, Interior Panel	194810	194810	194810	194810	194810
50	Harness, Wire, Rectifier Assy	194808	194808	194808	194808	194808
51	Suppressor, Harness	192266-1	192266-1	192266-1	192266-1	192266-1
52	Bus Bar	392458	392458	392458	392458	392458
53	Fuse, DC	Y1890-8	Y1890-9	Y1890-9	Y1890-8	Y1890-8
54	Cover, Neoprene	378234-13	378234-13	378234-13	378234-13	378234-13
55	Cable, Output	396263-95	396263-93	396263-93	396263-82	396263-95
56	Bushing, Strain Relief	W10080-5	W10080-5	W10080-5	W10080-5	W10080-5
57	Hinge, Door	194377	194377	194377	194377	194377
58	Label, PIP	407217-1	407217-1	407217-1	407217-1	407217-1
59	Door, Hinged	194378	194378	194378	194378	194378
60	Label, Power Star plus	197973	197973	197973	197973	197973
61	Label, Warning & Information(Not Shown)	196183	196183	196183	196183	196183

Parts List For Figure 11-2 (Continued)

		1270Z3-24PF 480/575	1400Z3-24PF 480/575	680Z3-36PF 480/575	680Z3-40PF 480/575
Item No.	Item Description	Part No.	Part No.	Part No.	Part No.
1	Nut, Keps, M6	50MS732-8	50MS732-8	50MS732-8	50MS732-8
2	Canopy	195040	195040	195040	195040
3	Spacer, Impeller	196352	196352	196352	196352
4	Clamp, Wire	196390-1	196390-1	196390-1	196390-1
5	Stud, Threaded, M6 x 40mm	196064-2	196064-2	196064-2	196064-2
6	Impeller	196078	196078	196078	196078
7	Support, Rear, Canopy	195064	195064	195064	195064
8	Support, Side, Canopy	195065	195065	195065	195065
9	Support, Front, Canopy	195063	195063	195063	195063
10	Harness, Wire	196636	196636	196636	196636
11	Panel, Side, Right	196562	196562	196562	196562
12	Panel, Interior	194447	194447	194447	194447
13	Block, Fuse	404605-5	404605-5	404605-5	404605-5
14	Fuse, AC Input (208 V.)	N/A	N/A	N/A	N/A
	Fuse, AC Input (240 V.)	N/A	N/A	N/A	N/A
	Fuse, AC Input (480 V.)	196030-40	196030-50	196030-35	196030-40
	Fuse, AC Input (575 V.)	196030-35	196030-45	196030-30	196030-30
15	Reducer, Fuse	196017	196017	196017	196017
16	Transformer, Control	406247-4	406247-4	406247-4	406247-4
17	Panel, Rear	196546	196546	196546	196546
18	Insulator, Heatsink	404033	404033	404033	404033
19	Insulator, Heatsink	196222	196222	196222	196222
20	Capacitor, Ay.	194708	194708	194708	194708
21	Panel, Top	196563	196563	196563	196563
22	Housing, Pin	401563-2	401563-2	401563-2	401563-2
23	Thermostat	196060	196060	196060	196060
24	Label, Warning	406518	406518	406518	406518
25	Rectifier, Silicon Controlled	192113-1	192113-1	192113-1	192113-1
26	Grommet, Rubber	402037-27	402037-27	402037-27	402037-27
27	Block, Terminal	192273	192273	192273	192273
28	Diode, Silicon, 150 A.	402832-3	402832-3	402832-3	402832-3
29	Transformer Assy.	197943	197947	197951	197987
30	Heatsink, Extruded	194392	194392	194392	194392

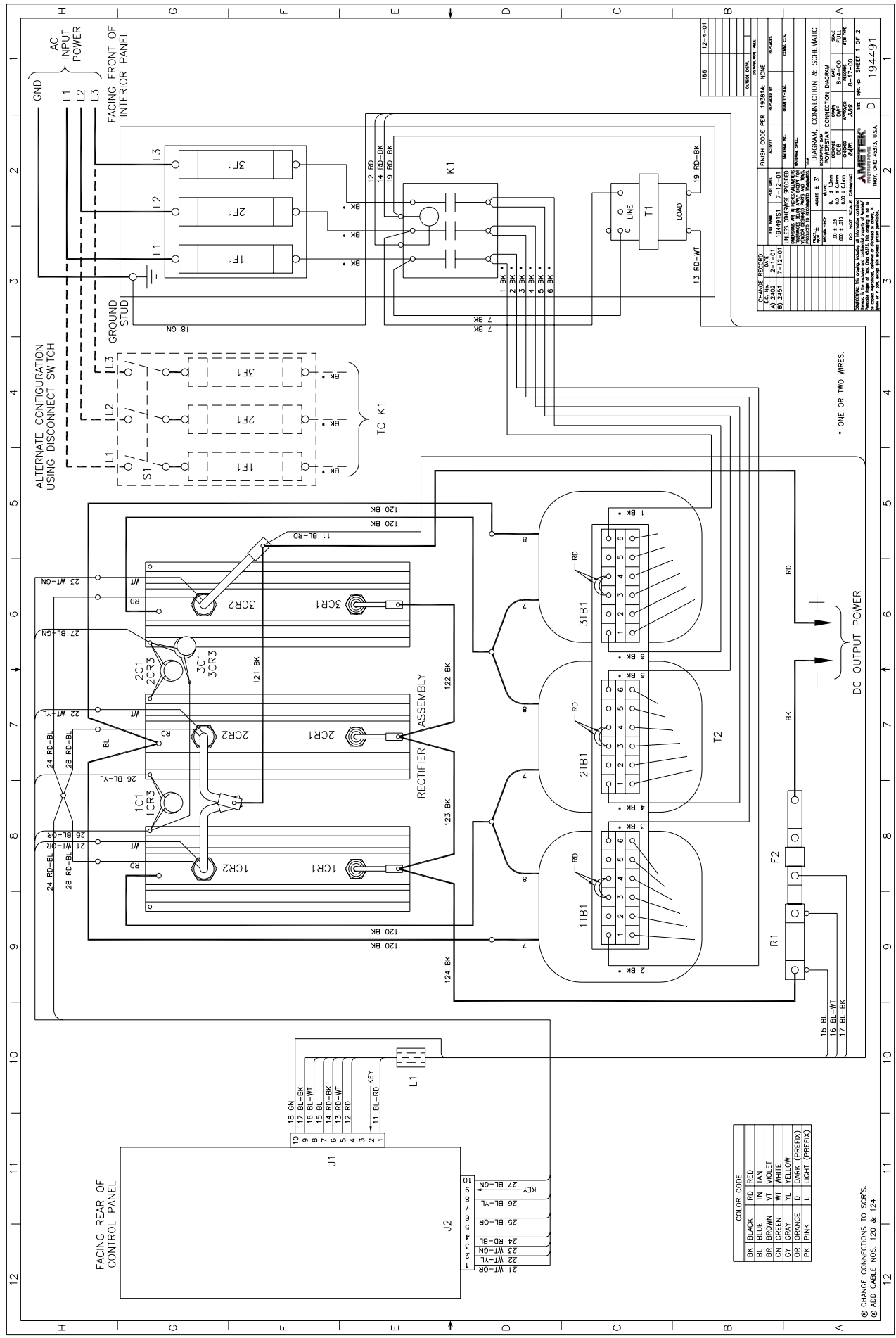
Parts List For Figure 11-2 (Continued)

		1270Z3-24PF 480/575	1400Z3-24PF 480/575	680Z3-36PF 480/575	680Z3-40PF 480/575
Item No.	Item Description	Part No.	Part No.	Part No.	Part No.
31	Relay, Solid State	196570-1	196570-1	196570-1	196570-1
32	Capacitor, Impeller	196055	196055	196055	196055
33	Block, Fuse	405357-1	405357-1	405357-1	405357-1
34	Fuse, 3 A., 250 V.	W10085-2	W10085-2	W10085-2	W10085-2
35	Shunt, Current	193125-4	193125-4	193125-2	193125-2
36	Insulator, Shunt	193114	193114	193114	193114
37	Panel, Mounting, Relay	196569	196569	196569	196569
38	Label, Fan Fuse	196095	196095	196095	196095
39	Panel, Side, Left	196561	196561	196561	196561
40	Base, Mounting	194372	194372	194372	194372
41	Grommet, Mounting	194827-1	194827-1	194827-1	194827-1
42	Contact, 3 Pole	406243-1	406243-1	406243-1	406243-1
43	Panel, Interior	194447	194447	194447	194447
44	Latch, Door	194530	194530	194530	194530
45	Label, Danger	404099	404099	404099	404099
	Label, AC Input (208/240/480 V.)	N/A	N/A	N/A	N/A
46	Label, AC Input (240/480/575 V.)	N/A	N/A	N/A	N/A
	Label, AC Input (480/575 V.)	192667	192667	192667	192667
47	Connector, Amp Hour	194840-8	194840-3	194840-1	194840-1
48	Board, PC Communicatios	196626	196626	196626	196626
49	Harness, Wire, Interior Panel	194810	194810	194810	194810
50	Harness, Wire, Rectifier Assy	194808	194808	194808	194808
51	Suppressor, Harness	192266-1	192266-1	192266-1	192266-1
52	Bus Bar	392458	392458	392458	392458
53	Fuse, DC	Y1890-9	Y1890-9	Y1890-6	Y1890-6
54	Cover, Neoprene	378234-13	378234-13	378234-13	378234-13
55	Cable, Output	396263-93	396263-93	396263-81	396263-81
56	Bushing, Strain Relief	W10080-5	W10080-5	W10080-5	W10080-5
57	Hinge, Door	194377	194377	194377	194377
58	Label, PIP	407217-1	407217-1	407217-1	407217-1
59	Door, Hinged	194378	194378	194378	194378
60	Label, Power Star plus	197973	197973	197973	197973
61	Label, Warning & Information (Not Shown)	196183	196183	196183	196183

DIAGRAMS

Model no. Information			DIAGRAM OUTPUT SCHEMATIC	OUTLINE DIMENSION
CASE SIZE	PHASE	MODEL SUFFIX		
Z	3	P	194491	194449
Z	3	PF	197887	194449

See model number description inside front cover.



ALTERNATE CONFIGURATION USING DISCONNECT SWITCH

FACING REAR OF CONTROL PANEL

FACING FRONT OF INTERIOR PANEL

RECTIFIER ASSEMBLY

CHANGE RECORD	REV. NO.	DATE	DESCRIPTION
A	1	7-12-01	INITIAL ISSUE
B	2	7-12-01	REVISED BY
B	3	7-12-01	REVISED BY

FINISH CODE PER 193841	WIRE	WIRE	WIRE
1344915	7-12-01	1344915	7-12-01
1344915	7-12-01	1344915	7-12-01

DIAGRAM CONNECTION & SCHEMATIC	WIRE	WIRE	WIRE
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1344915	7-12-01	1344915	7-12-01

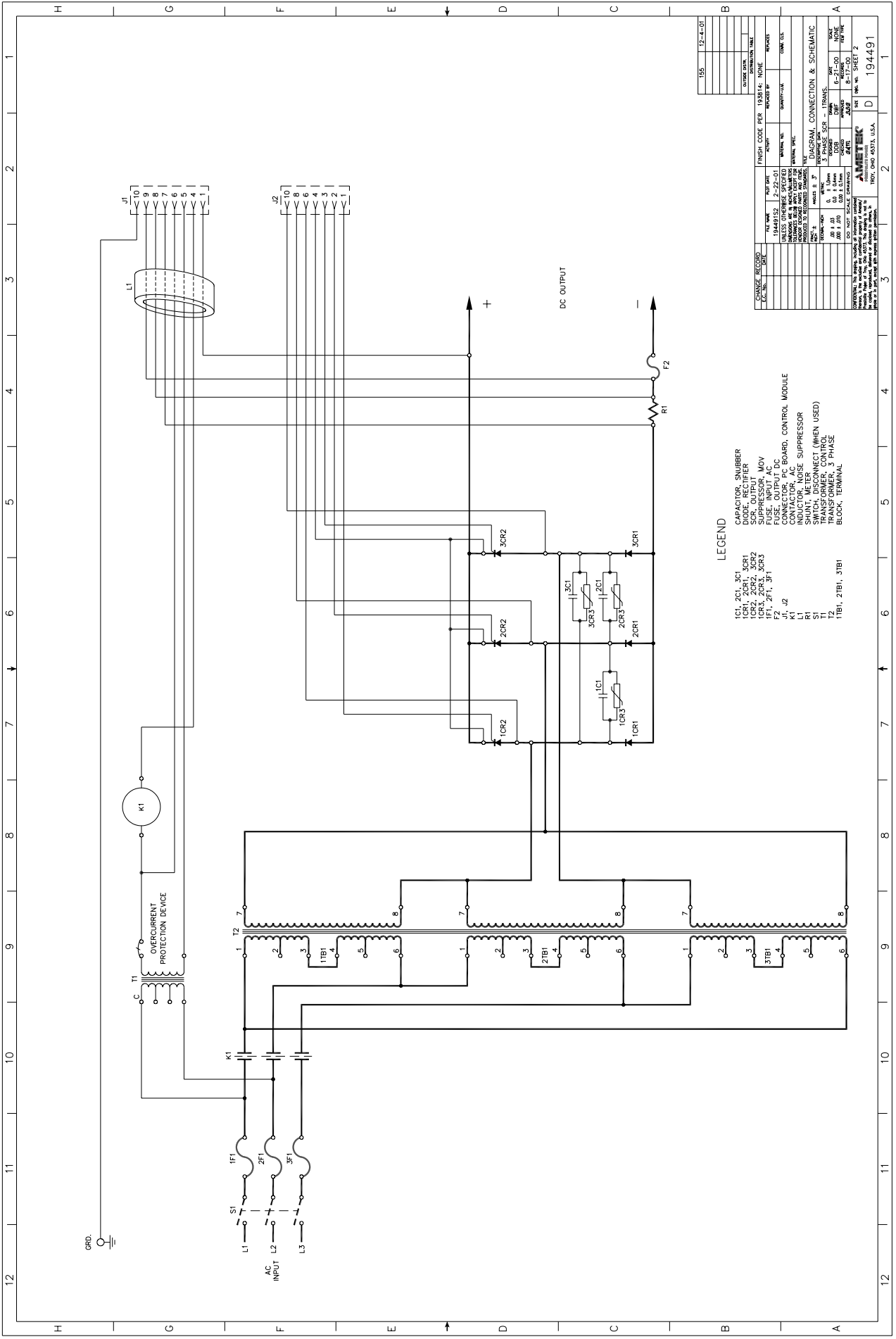
AMETEK	REV. NO.	DATE	DESCRIPTION
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AMETEK	2	7-12-01	REVISED BY
AMETEK	3	7-12-01	REVISED BY

155	17-4-01
155	17-4-01
155	17-4-01

COLOR CODE	WIRE
BK	BLACK
RD	RED
BL	BLUE
TN	TAN
BR	BROWN
VT	VIOLET
GN	GREEN
WT	WHITE
OR	ORANGE
PK	PINK
LT	LIGHT (PREFIX)
DK	DARK (PREFIX)

* ONE OR TWO WIRES.

© CHANGE CONNECTIONS TO SCR'S.
 © ADD CABLE NOS. 120 & 124



- LEGEND**
- 1C1, 2C1, 3C1 CAPACITOR, SNUBBER
 - 1CR1, 2CR1, 3CR1 SCR, OUTPUT
 - 1CR2, 2CR2, 3CR2 SUPPRESSOR, MOV
 - 1CR3, 2CR3, 3CR3 SUPPRESSOR, MOV
 - F1, 2F1, 3F1 FUSE, OUTPUT DC
 - J1, J2 CONNECTOR, PC BOARD, CONTROL MODULE
 - L1, 2L1, 3L1 INDUCTOR, NOISE SUPPRESSOR
 - R1 SHUNT, METER
 - S1 SWITCH, CONTROL
 - T1 TRANSFORMER, 3 PHASE
 - 1T1, 2T1, 3T1 BLOCK, TERMINAL

DESIGN NO.	19449152	REV.	2-22-01
UNLESS OTHERWISE SPECIFIED			
ALL DIMENSIONS ARE IN INCHES			
FRONT VIEW UNLESS OTHERWISE SPECIFIED			
PROVIDE TO RESPONSIBLE ENGINEER			
DATE	1944	BY	1944
DESIGNED BY		CHECKED BY	
APPROVED BY		DATE	
FINISH CODE PER 193814	NONE	QUANTITY	10000 ULS
DRAWING DATE			
OUTSIDE DATE			
ISS.	12-4-01		

19449152 2-22-01
 UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN INCHES
 FRONT VIEW UNLESS OTHERWISE SPECIFIED
 PROVIDE TO RESPONSIBLE ENGINEER
 DATE 1944 BY 1944
 DESIGNED BY CHECKED BY
 APPROVED BY DATE
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 DRAWING DATE OUTSIDE DATE
 ISS. 12-4-01

DIAGRAM CONNECTION & SCHEMATIC
 19449152 2-22-01
 UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN INCHES
 FRONT VIEW UNLESS OTHERWISE SPECIFIED
 PROVIDE TO RESPONSIBLE ENGINEER
 DATE 1944 BY 1944
 DESIGNED BY CHECKED BY
 APPROVED BY DATE
 FINISH CODE PER 193814 NONE QUANTITY 10000 ULS
 DRAWING DATE OUTSIDE DATE
 ISS. 12-4-01

19449152 2-22-01
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 ALL DIMENSIONS ARE IN INCHES
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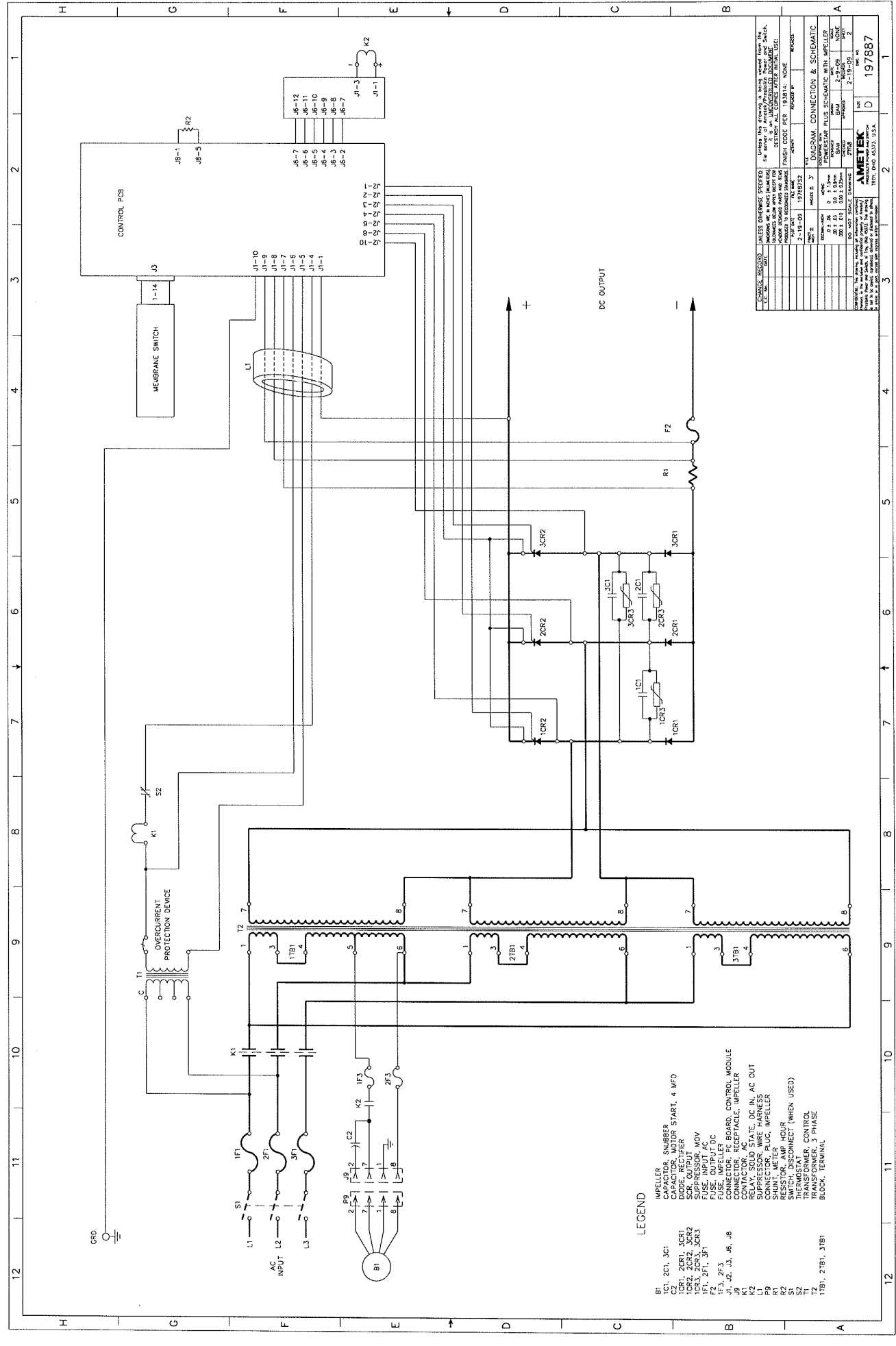
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19449152 2-22-01
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19449152 2-22-01
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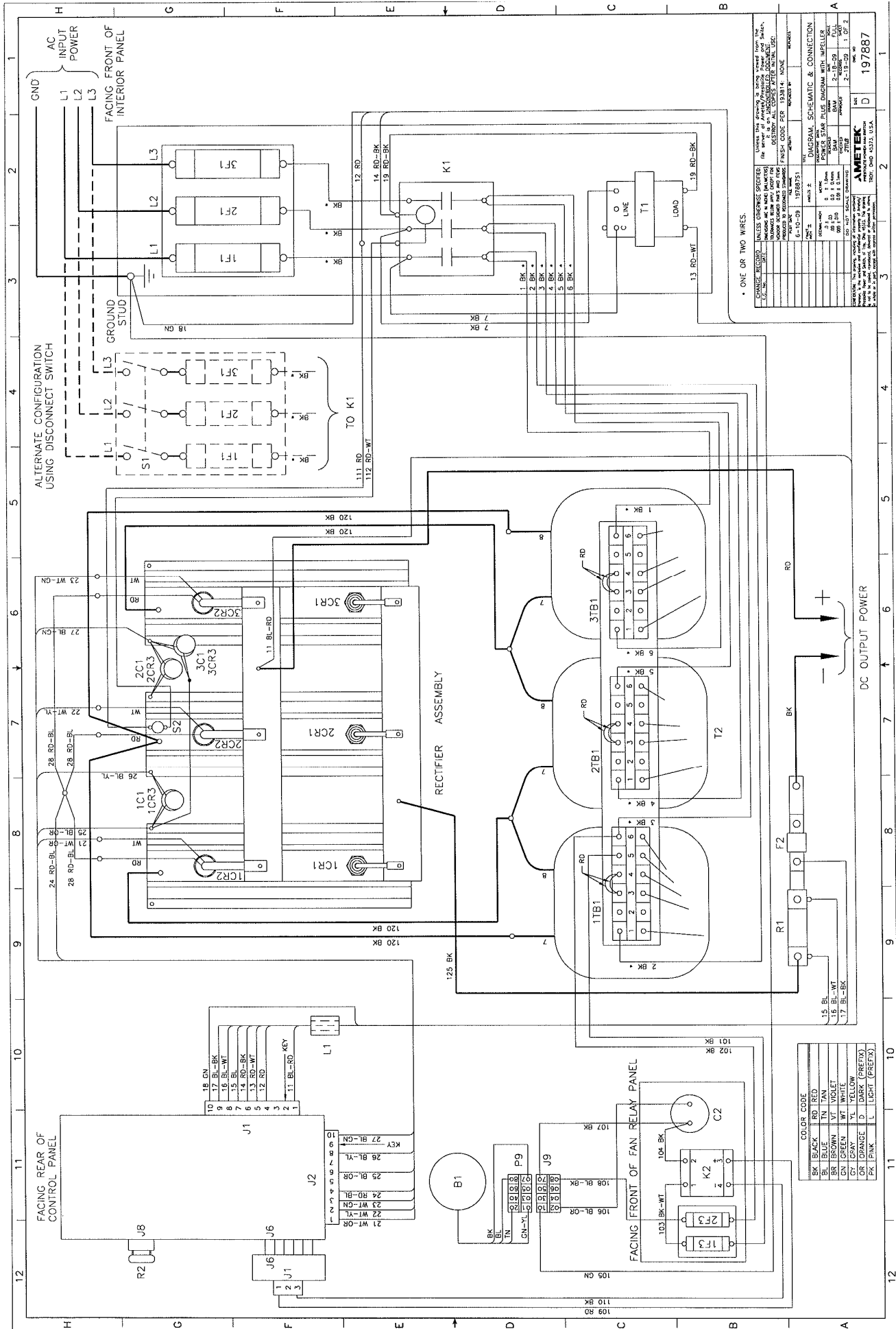


LEGEND

- B1 IMPELLER
- IC1, 2C1, 3C1 CAPACITOR, SNUBBER
- 1CR1, 2CR1, 3CR1 DIODE, RECTIFIER
- 1CR2, 2CR2, 3CR2 SCR, OUTPUT
- 1CR3, 2CR3, 3CR3 FUSE, INPUT AC
- 1F1, 2F1, 3F1 FUSE, OUTPUT DC
- 1F3, 2F3 FUSE, IMPELLER BOARD CONTROL MODULE
- J1, J2, J3, J4, J5, J6 CONNECTOR, RECEPTACLE, IMPELLER
- K1 CONTACTOR, AC
- L1, L2 SUPPRESSOR WAVE WARRNESS
- P1 CONNECTOR, PLUG, IMPELLER
- P2 SHUNT, METER HOOP
- S1 SWITCH, DISCONNECT (WHEN USED)
- S2 THERMOSTAT, CONTROL
- T1 TRANSFORMER, 3 PHASE
- 1T1, 2T1, 3T1 BLOCK, TERMINAL

CHANGE NO.	DATE	UNLESS OTHERWISE SPECIFIED THE SYMBOLS AND NOTATION SHALL BE AS SHOWN IN THIS SCHEMATIC. FOR ALL OTHERS REFER TO THE APPROPRIATE STANDARD DRAWING SPECIFICATIONS.	FINISH CODE PER 1978/72	WORKS
1	2-19-09	1978/72	1978/72	WORKS
DIAGRAM, CONNECTION & SCHEMATIC				
NO.	DATE	BY	CHKD.	WORKS
1	2-19-09	J. J. J.	J. J. J.	WORKS
2	2-19-09	J. J. J.	J. J. J.	WORKS
3	2-19-09	J. J. J.	J. J. J.	WORKS
4	2-19-09	J. J. J.	J. J. J.	WORKS
5	2-19-09	J. J. J.	J. J. J.	WORKS
6	2-19-09	J. J. J.	J. J. J.	WORKS
7	2-19-09	J. J. J.	J. J. J.	WORKS
8	2-19-09	J. J. J.	J. J. J.	WORKS
9	2-19-09	J. J. J.	J. J. J.	WORKS
10	2-19-09	J. J. J.	J. J. J.	WORKS
11	2-19-09	J. J. J.	J. J. J.	WORKS
12	2-19-09	J. J. J.	J. J. J.	WORKS

197887



• ONE OR TWO WIRES.

CHANGE RECORD (VALUES CHANGED SPECIFIED IN THIS COLUMN) (INCLUDE IN MAKE PARTS LIST) (REVISIONS AND DISCONTINUED DOCUMENTS) (REVISIONS AND DISCONTINUED DOCUMENTS) (REVISIONS AND DISCONTINUED DOCUMENTS)

NO.	DATE	DESCRIPTION	BY
1	6-10-59	1978751	WICK
2	10-19-59	1978751	WICK

DIAGRAM, SCHEMATIC & CONNECTION

NO.	DATE	DESCRIPTION	BY
1	6-10-59	1978751	WICK
2	10-19-59	1978751	WICK

POWER STAR PULSE DIAGRAM WITH IMPELLER

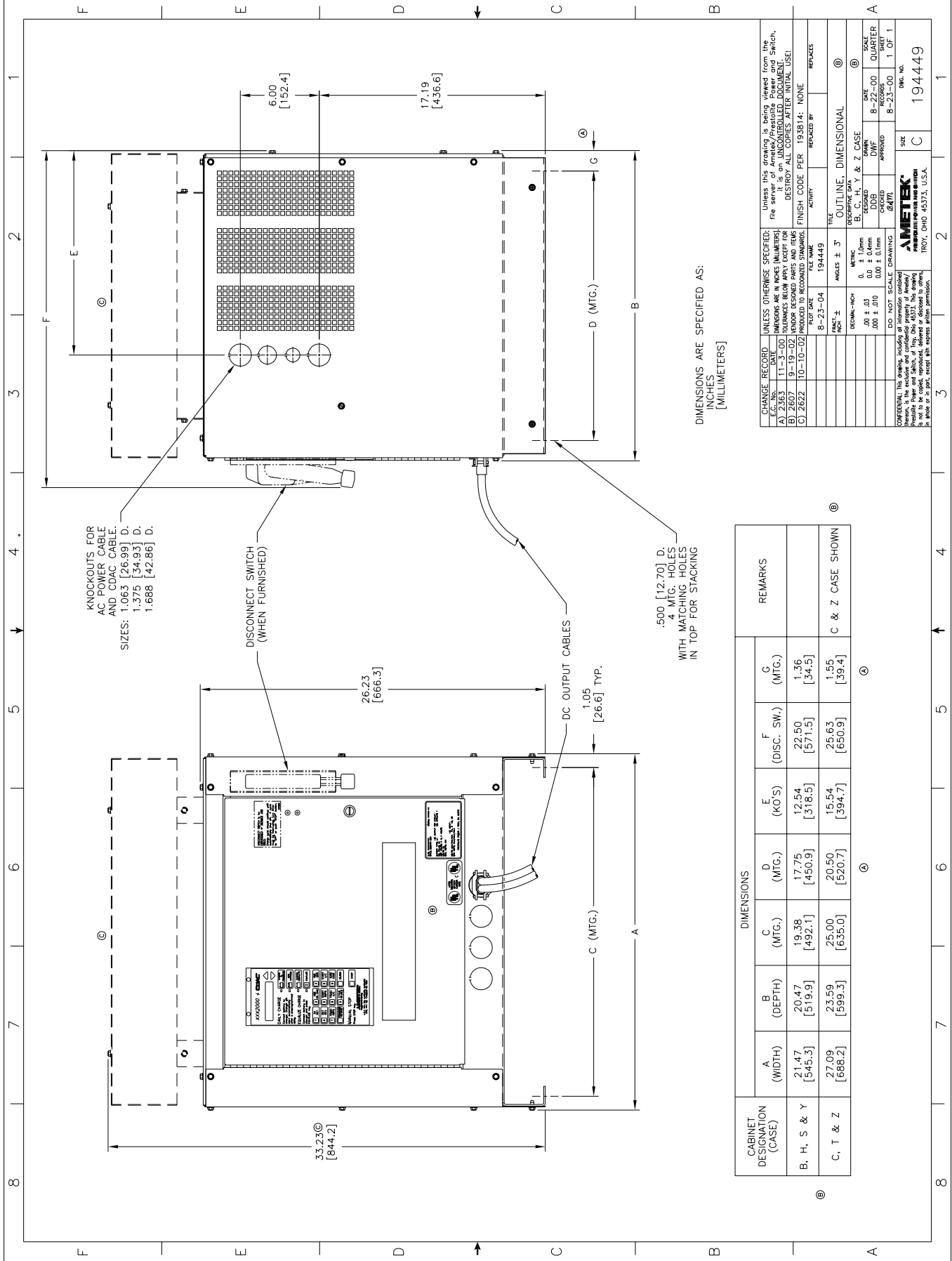
NO.	DATE	DESCRIPTION	BY
1	6-10-59	1978751	WICK
2	10-19-59	1978751	WICK

AMETEK

1978751 D 197887

COLOR CODE

BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET
CN	GREEN	WT	WHITE
CY	GRAY	YL	YELLOW
OR	ORANGE	DBK	DARK GREY
PX	PINK	LT	LIGHT GREY



DIMENSIONS ARE SPECIFIED AS:
INCHES
(MILLIMETERS)

CABINET DESIGNATION (CASE)	DIMENSIONS						REMARKS
	A (WIDTH)	B (DEPTH)	C (MTG.)	D (MTG.)	E (KO'S)	F (DISC. SW.)	
B, H, S & Y	21.47 [545.3]	20.47 [519.9]	19.38 [492.1]	17.75 [450.9]	12.54 [318.5]	22.50 [571.5]	1.36 [34.5]
C, T & Z	27.09 [688.2]	23.59 [599.3]	25.00 [635.0]	20.50 [520.7]	15.54 [394.7]	25.63 [650.9]	1.55 [39.4]

CHANGE RECORD	UNLESS OTHERWISE SPECIFIED:	UNLESS THE DRAWING IS BEING ISSUED FROM THE FILE SERVER OF Ametek/Prestolite Power and Switch, IT IS AN UNCONTROLLED DOCUMENT. DESTROY ALL COPIES AFTER INITIAL USE!
E.C. No.	DATE	DESCRIPTION
A) 2363	11-3-00	RELEASES BELOW COPY EXCEPT FOR REWORK
B) 2607	9-19-02	REWORK REVISION PARTS AND ITEMS
C) 2622	10-10-02	INDICATED TO RECOMMEND STANDARDS. FINISH CODE PER 193814: NONE

DC NOT SCALE DRAWING	TITLE	REWORKED BY
B-23-04	194449	
REVISION	DATE	BY
1	8-22-00	DAVE
2	8-22-00	DAVE
3	8-23-00	DAVE
4	8-23-00	DAVE

DESCRIPTION	QUANTITY	UNIT
DC NOT SCALE DRAWING		
DC NOT SCALE DRAWING		
DC NOT SCALE DRAWING		
DC NOT SCALE DRAWING		
DC NOT SCALE DRAWING		

DC NOT SCALE DRAWING	DATE	BY	APPROVED	SIZE
DC NOT SCALE DRAWING	8-22-00	DAVE		C
DC NOT SCALE DRAWING	8-23-00	DAVE		1 OF 1

AMETEK PRESTOLITE POWER AND SWITCH
PROY. OHIO 45373, U.S.A.

SIZE: 194449



WARRANTY

AMETEK/PRESTOLITE POWER “SCR” 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. **PRODUCT AND PARTS WARRANTED.** Subject to the exceptions listed below each Industrial Battery Charger is warranted for a specific period of time commencing 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) Terms and conditions for warranty coverage:

<u>SCR PRODUCTS</u>	ULTRA MAXX	ULTRA CHARGE	POWER STAR	POWERSTAR PLUS
FULL COVERAGE - LABOR, TRAVEL, MILEAGE & PART REPLACEMENT	1-year	1-year	1-year	1-year
PRINTED CIRCUIT BOARD (REPLACEMENT ONLY)	2-years additional	2-years additional	2-years additional	2-years additional
TRANSFORMER, INDUCTOR, SCR & DIODE (REPLACEMENT ONLY)	9-years additional	9-years additional	9-years additional	9-years additional
TOTAL WARRANTY TERM (YEARS)	10-years	10-years	10-years	10-years

b) Warranty Expense Limitation: The maximum warranty expense Prestolite will incur for any Battery Charger will be limited to the original purchase price of the Battery Charger.

c) 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.** Prestolite extends this warranty 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.
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.

THIS WARRANTY IS GIVEN AND ACCEPTED IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OTHER THAN AS EXPRESSLY SET FORTH HEREIN. IN NO EVENT SHALL PRESTOLITE BE LIABLE FOR ANY ANTICIPATED OR LOST PROFITS, SPECIAL, DIRECT, INDIRECT OR INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, TIME CHARGES OR OTHER COMMERCIAL EXPENSES OR LOSSES, AND BUYER ASSUMES ALL RISK AND LIABILITY RESULTING FROM USE OF THE GOODS. PRESTOLITE DOES NOT AUTHORIZE ANY REPRESENTATIVE OR OTHER PERSON TO ASSUME ON BEHALF OF PRESTOLITE 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

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