

OWNER'S MANUAL 193111-048

Revised November 7, 2005

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

SCR1000 CHARGE CONTROL

DO NOT DESTROY

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

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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. Replace any precautionary or instruction label that cannot be easily read.

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

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

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

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

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

Equipment Identification

The unit's identification number (specification, 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.

INITIAL SET-UP

See Location Diagram of Selector Switches (see page 4-1) included in this manual.

For proper operation, the SCR1000 Control must be set to match the charger in which it is installed.

Cell Size Selection

From the data plate on the charger, note the number of cells. Place the corresponding DIP switch (S4) on the SCR1000 Control in the "closed" position.

S4-1	6 Cells
S4-2	9 Cells
S4-3	12 Cells
S4-4	18 Cells
S4-5	24 Cells
S4-6	Unique Part Number

Only one of the above DIP switches should be in the "closed" position at any one time.

For chargers that are rated above 24 cells, a 194479-002 Control is required. Proper Dip Switch settings are listed below:

S4-1	12 Cells
S4-2	18 Cells
S4-3	24 Cells
S4-4	36 Cells
S4-5	40 Cells
S4-6	Unique Part Number

Full Scale Digital Ammeter Selection

From the data plate on the charger, note the DC output per circuit – Max. Amps. Set S4-7 and S4-8 as follows:

DC Output per Circuit Max. Amps	S4-7	S4-8	Full Scale Current
0 – 80	ON	OFF	100
81 – 163	OFF	OFF	200
164 – 340	OFF	ON	400

Amp Hour Jumper

If shipped from the factory with a charger, the correct amp hour jumper will be installed in the control board. This jumper resistor tells the control the amp hour size of charger. If the control is a replacement, be sure that the amp hour jumper from the replaced control is installed into the new control. If the jumper is missing or there is any question, consult the factory.

Single or Three Phase Control Settings

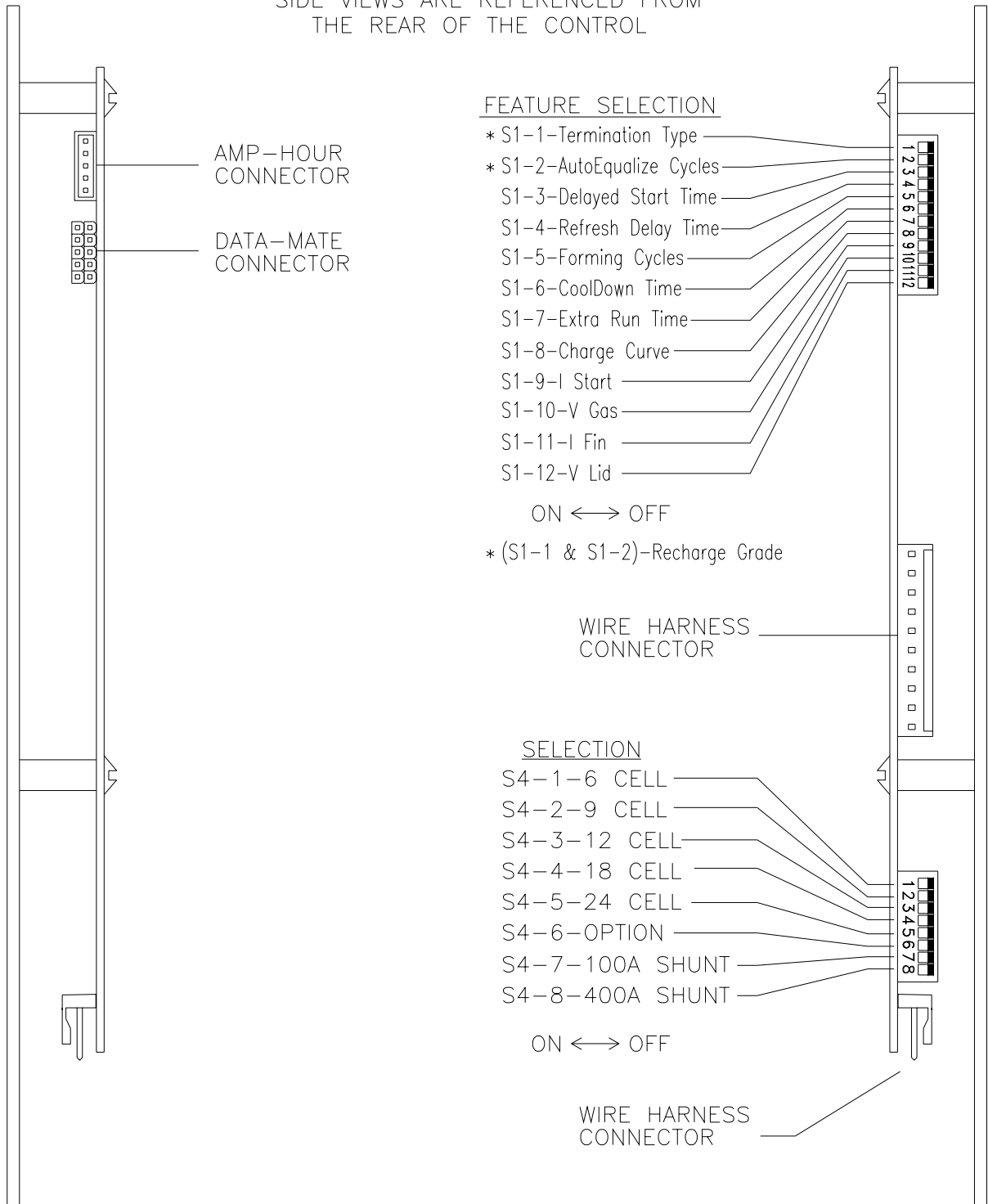
Replacement controls are shipped from the factory set for use with a three phase charger. If the control is to be used with a single phase charger, press and hold the "EQUALIZE" key down while applying power to the charger and control. When the key is released, the display should read "1 PH". When a battery is connected, the control display should read "1 PH". To reset the control for use with a three phase charger, repeat the process described above, holding the "STOP/REVIEW" key down upon power up instead of the "EQUALIZE" key. When the "STOP/REVIEW" key is released, the display should read "3 PH".

LOCATION DIAGRAM – SCR1000 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 Battery Charger equipped with the SCR1000 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. "bld" will be displayed for several seconds followed by the charger phase setting, AH for the charge cycle and the curve type number for the charge cycle. Then, after a five second down count, the charger will turn on and the "Charge in Progress" LED will light. The digital display will alternately 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 SCR1000 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 page 7-1 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 SCR1000 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.

SCR1000 CONTROL FEATURES

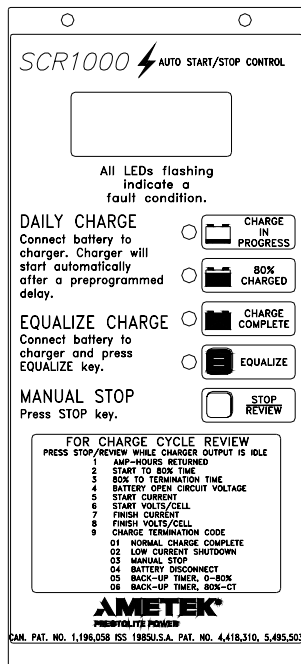


Figure 6-1

Main Features

1. DV/DT Charge Termination
2. 4 Character Digital 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 after charge complete

Press "Stop/Review" key while charger output is idle

- 1 Amp hours returned
- 2 Start to 80% Time
- 3 80% to Termination Time
- 4 Battery Open Circuit Voltage
- 5 Start Current
- 6 Start Volts/Cell
- 7 Finish Current
- 8 Finish Volts/Cell
- 9 Charge Termination Code
 - 01 Normal Charge Complete
 - 02 Low Current Shutdown
 - 03 Manual Stop
 - 04 Battery Disconnect
 - 05 Back-Up Timer, 0-80%
 - 05 DI/DT
 - 09 Curve Error
 - 11 Unbalanced Line

6. Down loading of Archived Charge Cycle Data for the last 30 Charge Cycles. This data can 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
 - Truck I.D.
 - Battery I.D.
 - Battery I.D. start temperature
 - Battery I.D. end temperature
 - Battery I.D. max. temperature (CDAC only)
 - Cycle amp hours
 - Battery open circuit voltage (Data Link, CDAC)
 - Battery type
7. Manual or Automatic Equalize Operation
8. Back-up Timer Shutdowns
9. Failure Mode Diagnostics
 - High Battery Reject (Hb)
 - Low Battery Reject (Lb)
 - Charge Complete (OFF)
 - Low Current S.D. (LCSd)
 - 0 – 80% - Backup Timer (0-80)
 - Manual Stop (OFF)
 - High Current S.D. (0-80)
 - Charge Curve Error (CUrE)
 - Unbalance Input Amps (UbL1)

10. 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.
11. Adjustable 8-99 Hour Refresh Charge Delay
12. Voltage Time Feature (Termination Type)
13. "Forming Cycles" Feature (Programmable from 0-30 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.

14. Programmed Features and Archive Data maintained for a minimum of 10 Years
15. Charge Cycle Data maintained for a minimum of 10 Years
16. Programmable Delayed Start Mode
17. Manual Override of Delayed Start Mode
18. Automatic Equalize by Number of Cycles
19. Programmable Cool Down Time (0-8 Hours)
20. Extra Run Time past the normal charger termination point (00-60 minutes)
21. Programmable Curve types for maintenance free batteries

Description of Features

Charge Termination — The SCR1000 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 SCR1000 Control is 30 minutes. The SCR1000 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.

Digital Display — A 7-segment character display is standard on the SCR1000 Control. The characters are a minimum of .56 inches tall, making the information on the digital display legible at distances exceeding ten feet. Easy to understand abbreviations are used to indicate charge status, output current, voltage and other functions including; 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.

Automatic Start Operation— In the automatic start mode, the charger will start ten seconds after the battery is connected. The alphanumeric display will display "bld" and then count down for a five second period (i.e., 5-4-3-2-1).

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. SCR1000 controls are shipped from the factory with the automatic equalize feature enabled. 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 SCR1000 Control during any start mode, count-down, 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.

Back-Up Timer Shutdown — The standard SCR1000 Control has a back-up timer. The charger will shutdown and a 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 period is 14 hours if the 80D6C10 ("E") grade is selected.

Battery Voltage Discrimination — A standard SCR1000 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. A low battery reject may be overridden by pressing the “Stop” key on the front panel.

One Part Number Control — The standard SCR1000 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 SCR1000 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 delayed start operation.

Charge cycle data 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 SCR1000 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 SCR1000 Control uses EEPROM memory for all data retention. Factory default information is in EEPROM and has a minimum data retention time of 10 years.

Delayed Start — The SCR1000 Control can be programmed to delay the start of a charge cycle for a specific period of time. Any time period from 15 minutes to 23 hours and 45 minutes, in 15 minute increments, can be used for the delayed start period.

When an SCR1000 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.

Manual Override of Delayed Start Mode — An SCR1000 Control, when programmed for delayed start can be manually overridden by pressing the “Stop” key while the start of the charge cycle is being automatically delayed by the control. 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 SCR1000 Control can be programmed for automatic equalize. SCR1000 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 SCR1000 is programmed to automatically provide an equalize cycle every zero cycles, the automatic equalize mode is disabled. The automatic equalize feature allows 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 digital display reads “COOL”. 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 Curve Type – Allows typical flooded and maintenance free batteries of several types to be properly charged.

BID Module Compatibility – With a Battery Identification (BID) module connected to the battery, the SCR1000 can automatically adjust its output to match the electrolyte temperature of the battery, compensating for temperatures ranging from 32 degrees F to 132 degrees F. Once the battery is connected to the charger, the SCR1000 reads the BID information which identifies the battery along with its ampere-hour rating, voltage, construction, and electrolyte temperature. The SCR1000 then regulates the charger output curve based on this information. During the charge cycle, the SCR1000 continuously monitors the battery's temperature, via the BID module, and adjusts its output throughout the charge cycle to match the charging battery's temperature.

SCR1000 Charge Archive Function – The archive function allows 17 items of charge cycle information to be downloaded from the control to either a Print Kit (P/N 192749) and compatible dot-matrix printer (contact factory for a list of compatible printers), or a PC (contact factory for hardware requirements) with installed Data Link software through a Data Link module (P/N 193206). The last 30 cycles of information will be printed or listed in the file, with the most recent cycle labeled #1 and either cycles labeled in ascending order.

To print or download information, connect the Print Kit or Data Link module to the control Data-Mate connector (see page 4-1), and press the “Equalize” key with no battery connected to the charger. The display will read “SEnd” until all information has been transferred.

Programming Your SCR1000 Control

The SCR1000 programming function allows 13 functions to be programmed to customize your SCR1000 Control to your particular charging application. Programming is not available during an active charge cycle, and can only be accessed when no battery is connected to the charger. With no battery connected, the display will read "SCR1" and DIP switches S1-1 thru S1-12 can be independently closed to program a particular charge parameter. The display will indicate the initial value of the parameter that is selected. The user can then press the "Equalize" or "Manual Stop" keys to increment or decrement the parameter to the desired value. The DIP switch is then returned to its original position and the new parameter value is stored in the control.

Table 7-1 contains the programming steps required to change the number of automatic equalize cycles from the factory setting of 05 to 00 (automatic equalize Disabled). Descriptions of the programmable functions are listed after Table 7-1. If a programmable feature is modified by the user to a value other than the factory setting, then the **right-most decimal point on the display will blink on and off** indicating the change. The factory settings for all of the features are also included below.

STEP	CONTROL DISPLAY READING
1.) Make sure that the battery is disconnected from charger.	"SCR1"
2.) Close DIP switch S1-2	"05"
3.) Press the "Stop/Review" button until the display reading is "00".	"00"
4.) Open DIP switch S1-2	"SCR1" - Right-most decimal point flashing
5.) Operation complete	"SCR1" - Right-most decimal point flashing

Table 7-1
SCR1000 Control Programming Example

Termination Type — To disable the factory DV/DT charge termination setting, close DIP switch S1-1 to the "on" position with no battery connected to the charger, and using the "Equalize" and "Stop" keys to select DV/DT or VT (Voltage time Termination). The current setting will be displayed as listed below.

$$dV/dT = \text{dV/dt}$$

$$VT = \text{VT}$$

Closing the DIP switch to the original "off" position will store the setting in the control memory. The control is factory set to DV/DT Termination.

Auto-Equalize Cycles — The number of complete charge cycles between equalize charges. This setting is programmed by closing DIP switch S1-2 with no battery connected to the charger. Setting this parameter to 0 disables the auto-equalize feature and equalize charge requests are performed by pressing the "Equalize" push-button on the control front panel. When the auto-equalize function is enabled (programmed to a value other than 0), then the "Equalize" push-button cannot be used to request an equalize charge. The SCR1000 Control is shipped from the factory with the auto-equalize feature set for every five cycles.

Delayed Start — The time from battery connection to the start of a charge sequence is programmable from 0 minutes to 23 hours and 45 minutes in fifteen minute increments. The delay time is programmed by closing DIP switch S1-3 with no battery connected to the charger. The control is shipped from the factory with the delayed start time set to 0.

Refresh Delay — The time from a normal charge Termination to the start of a refresh charge is adjustable from 8 to 99 hours in 1 hour increments. The refresh delay time is programmed by closing DIP switch S1-4 with no battery connected to the charger. The control is shipped from the factory with the refresh delay time set to 72 hours.

Forming Cycles — To select any number of forming cycles from 0 to 30, close DIP switch S1-5 to the "on" position, and using the "Equalize" and "Stop" keys to select the number of forming cycles desired. Closing the DIP switch to the original "off" position will store the setting in the control memory.

Cool Down Delay — The battery cool down delay time is adjustable from 0 to 8 hours in 1 hour increments. The parameter is adjusted by closing DIP switch S1-6 with no battery connected to the charger. The factory setting is 0 hours.

Extra Run Time — 0 to 60 minutes of extra charger run time after normal charge complete can be selected by closing DIP switch S1-7 to the “on” position, and using the “Equalize” and “Stop” keys to select the desired number of minutes. Closing the DIP switch to the original “off” position will store the setting in the control memory. The control is factory set to 0 minutes of extra runtime after charge complete.

Battery Type – The battery type the charger uses to select the proper output voltage and current characteristic. The battery type is selected by closing DIP switch S1-8 with no battery connected to the charger. The available battery types are listed below:

- 0 = Standard flooded lead acid industrial type battery. Factory setting.
- 1 = Custom Curve – uses the programmed voltage and current values set by the user via DIP switches S1-9 thru S1-12.
- 2 = Charge Curve for a sealed Gel type flat plate battery.
- 3 = Charge Curve for a sealed AGM type battery.
- 4 = Charge curve that meets the requirements of a “DEKA Dominator” battery.
- 5 = Charge Curve for a sealed Gel type tubular plate battery.

Start Current (A/100 AH) - The custom output curve (battery type #1 above) start current is adjustable from 10.0 to 16.3 A/100 AH. The parameter is adjusted by closing DIP switch S1-9 with no battery connected to the charger. The factory setting is 16.3 A/100 AH.

Gassing Voltage (volts/cell) - The custom output curve (battery type #1 above) gassing voltage is adjustable from 2.00 to 2.99 volts/cell. The parameter is adjusted by closing DIP switch S1-10 with no battery connected to the charger. The factory setting is 2.40 volts/cell.

Finish Current (A/100AH) - The custom output curve (battery type #1 above) finish current is adjustable from 0.0 to 7.9 A/100 AH. The parameter is adjusted by closing DIP switch S1-11 with no battery connected to the charger. The factory setting is 4.5 A/100 AH.

Lid Voltage (volts/cell) - The custom output curve (battery type #1 above) lid voltage is adjustable from 2.00 to 2.99 volts/cell. The parameter is adjusted by closing DIP switch S1-12 with no battery connected to the charger. The factory setting is 2.55 volts/cell.

Charge Grade – Allows the same charger and control to charge batteries at 100D6C8, 80D6C8, and 80D6C10 BCI Charge ratings. Program by closing DIP switch S1-1 and S1-2 to the “on” position simultaneously, and select the desired charge grade using the “Equalize” and “Stop” keys.

00 = 100D6C8
 0b = 80D6C8
 0E = 80D6C10

Closing the DIP Switches to the original “off” position, will store the setting in the control memory. The control is factory set to the 100D6C8 setting.

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) Misaligned Switch Plunger	8.08	8-5
	(2) Bad Control Board	8.07	8-5
Bad Lamp Test	(1) Bad Control Board	8.07	8-5
Display Illegible	(1) Noisy Environment	8.09	8-5
	(2) Low Input Voltage	8.10	8-6
	(3) Bad Control Board	8.07	8-5
Charger Doesn't Respond To Battery Being Connected	(1) Output Fuse Bad	8.11	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	8.12	8-6
	(5) Bad Output Connector	8.13	8-6
	(6) Fault Lockout is on	8.34	8-7
Control Not Responding (Locked Up)	(1) Noisy Environment	8.09	8-5
	(2) Low Input Voltage	8.10	8-6
	(3) Power Interruption	8.09	8-5
Battery has Low S.G.'s	(1) Reading Not Temperature Corrected	8.15	8-6
	(2) Bad Battery	8.16	8-6
	(3) Too Cold	8.19	8-6
	(4) Improper Curve	8.35	8-7

SYMPTOM	PROBABLE CAUSES	ACTION	
		PARAGRAPH	PAGE
Battery Doesn't Last Full Shift	(1) Faulty Lift Interrupt	8.20	8-6
	(2) Manual Disconnect	8.21	8-6
	(3) A.H. Required > Battery Nameplate	8.22	8-6
	(4) Battery Not Providing Nameplate Rating	8.16	8-6
	(5) Equalize Schedule	8.17	8-6
	(6) Rates Set Incorrectly	8.18	8-6
	(7) Charger too Small for Battery	8.29	8-7
	(8) Improper Curve	8.35	8-7
Battery Water Usage Is Too High	(1) Rates Set Incorrectly	8.18	8-6
	(2) Equalize Schedule	8.17	8-6
	(3) Control on Forming Cycles	8.23	8-6
	(4) Control on Voltage/Time	8.24	8-7
Low Number Of A.H.'s Returned To Battery	(1) Faulty Lift Interrupt	8.20	8-6
	(2) Battery Not Fully Discharged	8.25	8-7
	(3) Manual Disconnect	8.21	8-6
	(4) Rates Set Incorrectly	8.18	8-6
	(5) Battery Not Providing Nameplate Rating	8.16	8-6
	(6) Bad Control Board	8.07	8-5
Battery Temperature Too High	(1) Insufficient Cool Down before and/or after Charging	8.26	8-7
	(2) Battery Power Demand Too Great	8.22	8-6
	(3) Rates Set Incorrectly	8.18	8-6
	(4) Equalize Schedule	8.17	8-6
	(5) Control Set for Voltage/Time	8.24	8-7
	(6) Control Set for Cell Forming	8.23	8-6
Incorrect Charge Rate	(1) Rates Set Incorrectly	8.18	8-6
	(2) Battery A.H. Not Equal To Charger A.H.	8.29	8-7
	(3) Blown Input Fuse (3 phase)	8.30	8-7

SYMPTOM	PROBABLE CAUSES	ACTION	
		PARAGRAPH	PAGE
Charger Doesn't Shutdown when Battery is Disconnected	(1) Control Set for Forming Cycles	8.23	8-6
	(2) Bad Control Board	8.07	8-5
Meter Reading Wrong (V/C)	(1) Bad Output Connector	8.13	8-6
	(2) Bad Harness/Connections – Loose Or Incorrect	8.06	8-5
	(3) Bad Internal Power Connection	8.14	8-6
	(4) Bad Control Board	8.07	8-5
Meter Reading Wrong (Amps)	(1) Bad Output Connector	8.13	8-6
	(2) Bad Harness/Connections – Loose or Incorrect	8.06	8-5
	(3) Bad Internal Power Connection	8.14	8-6
	(4) Bad Control Board	8.07	8-5
	(5) Bad/Incorrect Shunt	8.27	8-7
	(6) DIP Switch Settings Incorrect	8.32	8-7
Display Reads (0-80)	(1) Hot Battery	8.26	8-7
	(2) Battery A.H. > Charger A.H.	8.29	8-7
	(3) Bad Output Cable/Connector	8.13	8-6
	(4) Bad Battery	8.02	8-5
	(5) Improper Curve	8.35	8-7
Display Reads (OFF) with Flashing LEDs	(1) Someone Pressed Manual Stop Key	8.21	8-6
	(2) Misaligned Switch Plunger	8.08	8-5
	(3) Bad Control Board	8.07	8-5
Display Reads (LCSd)	(1) Bad Harness/Connections – Loose or Incorrect	8.06	8-5
	(2) Battery Not Fully Formed	8.28	8-7
	(3) Bad Battery	8.16	8-6
	(4) Battery A.H.> Charger A.H.	8.29	8-7
	(5) Bad Internal Power Connection	8.14	8-6
	(6) AC Supply	8.01	8-5
	(7) Bad AC Fuse	8.02	8-5
	(8) Bad Contactor	8.33	8-7
	(9) Output Fuse Bad	8.11	8-6
	(10) Bad Control Board	8.07	8-5
	(11) Bad Transformer	8.07	8-5
	(12) Cold Battery	8.19	8-6

SYMPTOM	PROBABLE CAUSES	ACTION	
		PARAGRAPH	PAGE
Display Reads (Lb)	(1) Bad Harness/Connections – Loose or Incorrect	8.06	8-5
	(2) Bad Battery	8.16	8-6
	(3) Wrong Cell Size Battery	8.31	8-7
	(4) Incorrect DIP Switch Setting	8.32	8-7
	(5) Bad Control Board	8.07	8-5
	(6) Bad Output Cable/Connector	8.13	8-6
Display Reads (Hb)	(1) Bad Battery	8.17	8-6
	(2) Bad Control Board	8.07	8-5
	(3) Incorrect DIP Switch Setting	8.32	8-7
	(4) Wrong Cell Size Battery	8.31	8-7
Display Reads (COP, OPC, ADDR, or Inu)	(1) Noise (Supply)	8.09	8-5
	(2) Bad Control Board	8.07	8-5
Display Reads (CURE)	(1) Bad Control Board	8.07	8-5
	(2) Bad Harness/Connections – Loose or Incorrect	8.06	8-5
	(3) Bad Internal Power Connection	8.14	8-6
	(4) Bad Transformer	8.07	8-5
	(5) Input Fuse Blown	8.30	8-7
	(6) Wrong A.H. Jumper/A.H. Jumper does not match Charger	8.36	8-7
Display Reads (Ubl1)	(1) Bad Control Board	8.07	8-5
	(2) Bad Harness/Connections – Loose or Incorrect	8.06	8-5
	(3) Bad Internal Power Connection	8.14	8-6
	(4) Bad Transformer	8.07	8-5
	(5) Input Fuse Blown	8.30	8-7

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 24 VAC is on the output side of the control transformer. If there is, the control has failed. If there isn't 24 VAC, 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 24 VAC 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 24 VAC. 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 (208 VAC), 240 (240 VAC), and 480 (480 VAC). Some chargers are equipped with higher input voltage control transformers labeled as follows: COM (common), 240 (240 VAC), 480 (480 VAC), and 575 (575 VAC). 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 24 VAC.
- 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 Manual Stop switch plunger is captive between the front panel overlay and the plastic control panel. If it is misaligned, it may improperly actuate the stop switch. Remove the PC board from the control panel and re-align the plunger.
- 8.09** 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.

- 8.10** Measure the AC supply voltage coming into the charger to confirm that it matches the charge input tap settings.
- 8.11** 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.
- 8.12** 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.
- 8.13** 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.
- 8.14** 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.
- 8.15** 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.
- 8.16** 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.
- 8.17** The proper equalize schedule is one that is tailored to the specific battery and charger operation. The SCR1000 auto equalize feature can be used to automate the equalize schedule (see the "SCR1000 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 SCR1000 Control" chapter of this manual).
- 8.18** 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.
- 8.19** If battery electrolyte temperatures are well below 32 degrees F, the charger will not be able to adequately charge the the battery. Battery insulation or heaters would be required to keep the battery electrolyte temperatures close to 32 degrees F.
- 8.20** 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).
- 8.21** 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.*
- 8.22** 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.
- 8.23** 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 SCR1000 Control" chapter of this manual).

- 8.24 Program the control to DV/DT charge termination (see the “Programming Your SCR1000 Control” chapter of this manual).
- 8.25 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.
- 8.26 A cool down can be programmed into the SCR1000 Control to add a specified cool down time between charge termination and the signaling of charge complete (see the “Programming Your SCR1000 Control” chapter of this manual). A delayed start can be programmed into the SCR1000 Control to add a specified delay time between battery connection and the start on the charge (see the “Programming Your SCR1000 Control” chapter of this manual).
- 8.27 Battery is being discharged at too high (fast) of a rate. Consult the battery manufacturer or distributor for applications assistance.
- 8.28 Program the forming cycles feature of the SCR1000 Control to the number of cycles required to properly form the battery (see the “Programming Your SCR1000 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.

- 8.29 Try charging the battery on a larger amp-hour rated charger or downsize the battery to match the available chargers size.
- 8.30 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.
- 8.31 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.
- 8.32 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.
- 8.33 Check the voltage across the contactor coil. If the voltage is 24VAC +/-10%, replace contactor with a properly functioning part.
- 8.34 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.
- 8.35 Check Function 39 to see if the charger is set to charge with the proper curve type. See Function 39 of Programming Your SCR1000 Control.
- 8.36 Consult the factory to find the proper A.H. Jumper size for the charger.

PARTS LIST

<u>ITEM</u>	<u>PART NUMBER</u>
SCR1000 CONTROL	SEE BACK OF CONTROL PANEL
MAIN PC BOARD	PRINTED ON PC BOARD
PRINT KIT	192749
DATA LINK	193026

ELECTRONIC PRINTED CIRCUIT BOARD EXCHANGE SERVICE POLICY

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

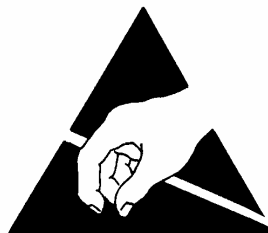
In recognition of the fact that most users of this equipment lack the facilities and specially trained personnel necessary to service and repair electronic equipment, the company has established an electronic printed circuit board exchange service plan.

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

A standard exchange price has been established for

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

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



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



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 EXTREME	ULTRA MAXX	ULTRA CHARGE	POWER STAR
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)	2-years additional	9-years additional	9-years additional	9-years additional
TOTAL WARRANTY TERM (YEARS)	3-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

Data Sheet: 1148
 Index: 030105
 Replaces: 110100