OWNER'S MANUAL 193111-063

Revised October 7, 2010

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

AC2000 CHARGE CONTROL

DO NOT DESTROY

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

INTRODUCTION **1**
How To Use This Manual 1-1
Equipment Identification 1-1
Receipt Of Equipment 1-1

SAFETY INSTRUCTIONS AND WARNINGS **2**

INITIAL SET-UP **3**
Cell Size Selection 3-1
Full Scale Digital Ammeter Selection 3-1

LOCATION DIAGRAM **4**

OPERATION **5**
Preliminary 5-1
Normal or Daily Charge 5-1
Equalize or Weekend Charge 5-1
Manual Stop 5-1
AC Power Fail 5-1

AC2000 CONTROL FEATURES **6**
Main Features 6-1
Description of Features 6-2
AC2000 Charge Archive Function 6-5
AC2000 Charge Cycle Review Function 6-7

PROGRAMMING YOUR AC2000 CONTROL **7**
BID Programming 7-4

TROUBLESHOOTING **8**
Troubleshooting Table 8-1
Action 8-5

PARTS LIST **9**

DIAGRAMS

WARRANTY

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 included in this manual.

For proper operation, the AC2000 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 (S1) on the AC2000 Control in the "closed" position.

S1-1	6 Cells
S1-2	12 Cells
S1-3	18 Cells
S1-4	24 Cells
S1-5	36 Cells
S1-6	Unique Part Number

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

Full Scale Digital Ammeter Selection

From the data plate on the charger, note the DC output per circuit – Max. Amps. Set S1-7 and S1-8 as follows:

DC Output per Circuit Max. Amps	S1-7	S1-8	Full Scale Current
0 – 80	ON	OFF	100
81 – 176	OFF	OFF	200
177 – 340	OFF	ON	400

LOCATION DIAGRAM – AC2000 CONTROL

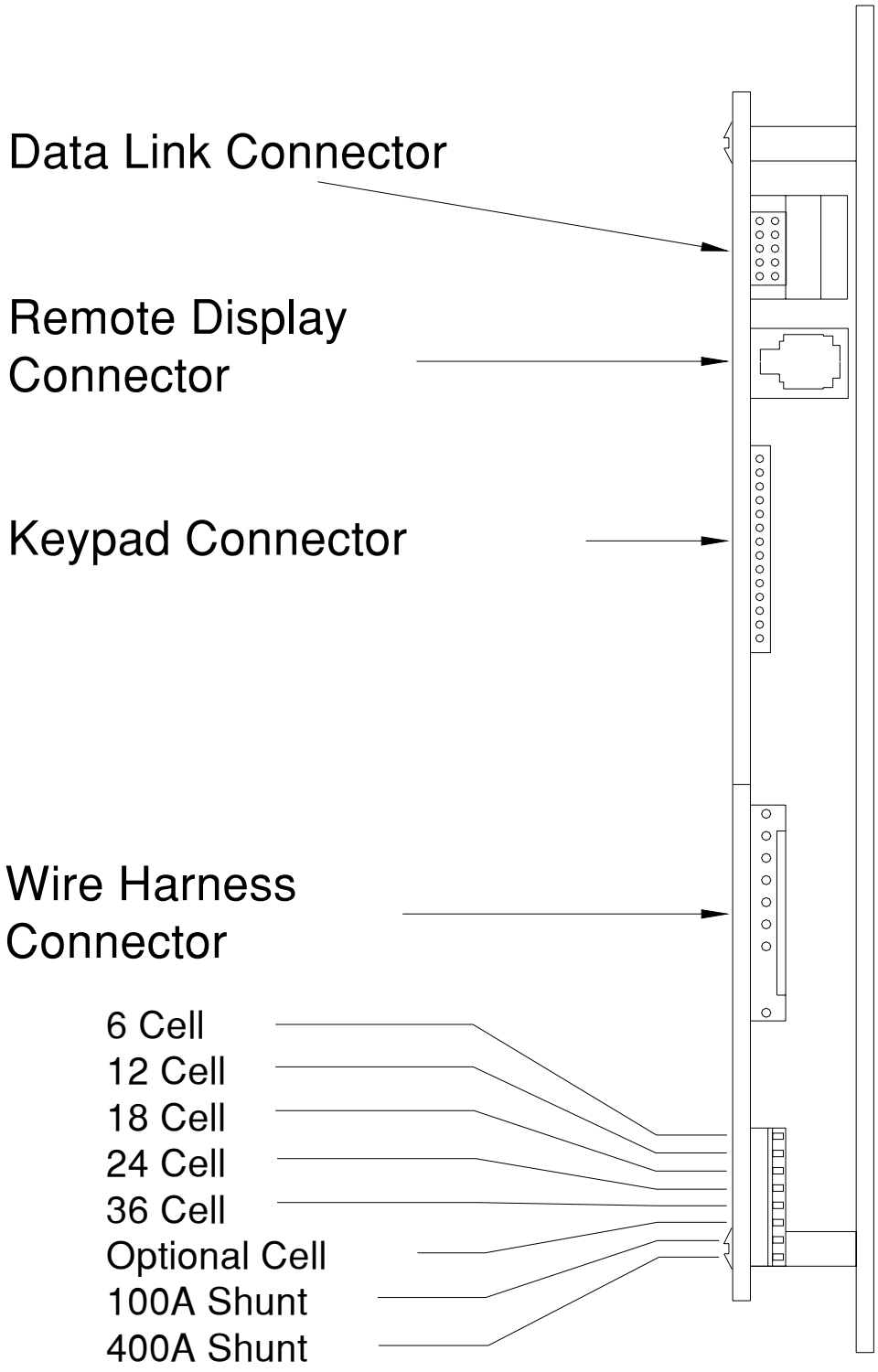


Figure 4-1

OPERATION

The operating procedure given here explains the operation of an Accu-Charger equipped with the AC2000 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 (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 gassing point (Standard = 2.37 volts/cell).
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 AC2000 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 in the Programming chapter in this manual to enable the manual equalize key.

Manual Stop

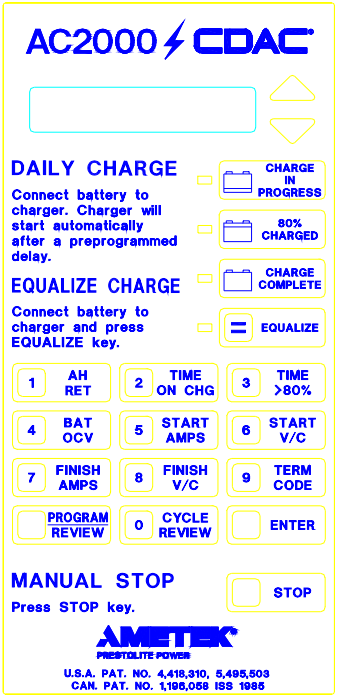
To stop any charge cycle before charge complete, press the red "STOP" key. For maximum shift run times and longest battery life, the charger should be allowed to always reach charge complete.

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 AC2000 Control will resume the charge where it left off when the AC power failure occurred, virtually unaffecting charge time. A random turn on delay time of up to 4 minutes will happen when AC power returns to prevent multiple chargers from re-starting at the same time. The display will show "RESTART" during this delay 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.

AC2000 CONTROL FEATURES



Main Features

1. Proportional 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 cycle
   - 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. — 6 Digit
   - Battery I.D. start temperature
   - Battery I.D. end temperature
   - Battery I.D. max. temperature
   - Charger I.D.
   - Month
   - Date
8. Automatic or Push-to-Start Operation
9. Manual, Automatic, or BID Equalize Operation
10. Fault Lock-out or No Fault Lock-out Operation
11. Back-up Timer Shutdowns

12. Failure Mode Diagnostics
    - High Battery Reject
    - Low Battery Reject
    - Battery Reject
    - 80% - CC Backup Timer
    - Low Current S.D.
    - 0 – 80% - Backup Timer
    - Manual Stop
    - Fault Lockout
    - High Current S.D. (Thermal Runaway)
13. One Part Number Control is User/Factory programmable for 6-12-18-24-36 Cells and 100-200-400 Amp Digital Ammeter.
14. Adjustable 8-99 Hour Refresh Charge Delay
15. Voltage Time Feature (DV/DT Disable)
16. "Cell Forming" 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.

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
19. 5 Programmable Start Modes
    - Automatic Start (5 Second Delay)
    - Push-To-Start
    - Delayed Start
    - Time-of-Day Start
    - Time-of-Day Blockout
    - 80% Charge Blockout
20. Programmable Manual Override of Start Modes
21. Automatic Equalize by Number of Charge Cycles, BID Cycles, or Day of Week
22. Programmable Cool Down Time
23. User selectable on charge displays
    - Output Amps/Output Volts per Cell
    - Accumulated Amp Hours
    - Total Charge Time
24. Extra Run Time past the normal charger termination point (00-60 minutes)
25. User Selectable Full Battery Reject of charged batteries if they reach the 80% charged point in the first 4 minutes of charge
26. Program password feature to deter unwanted programming changes
27. Approval delay defeat feature to allow identifying of archived charge cycles with a charger I.D. number
28. Battery I.D. programming capability directly from the control
29. Adjustable 80% voltage
30. UC2000 Remote Compliant
31. Random Restart Delay on AC Fail Recovery

Description of Features

Charge Termination — The AC2000 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 AC2000 Control is ten minutes. The AC2000 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 three hours after the battery reaches the "80% Charged" point.

Alphanumeric Display — A dot-matrix, 8 character display is standard on the AC2000 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 AC2000 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 one, thus providing a lamp test feature. Nine functions are displayed during a standard review. The information in all 48 review functions can be displayed. See the AC2000 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— In the automatic start mode, the charger will start approximately 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. AC2000 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 three 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 AC2000 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 AC2000 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 the fault, 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 AC2000 Control has two back-up timers. 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), or if 5 hours has passed since the battery has reached gassing voltage and a DV/DT charge termination has not occurred. If the DV/DT feature has been disabled (see Voltage Time section), only the nine-hour back-up timer is active.

Battery Voltage Discrimination — A standard AC2000 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 overriden by pressing the "Enter" key on the front panel.

One Part Number Control — The standard AC2000 Control is user/factory programmable for 6, 12, 18, 24,and 36 cell Accu-Chargers 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 AC2000 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 AC2000 will not start the charge cycle during a time-of-day blockout period. It will automatically request an equalize cycle if it 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 four hours and fifteen 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 AC2000 Control can be programmed to provide voltage-time charge termination and disable the low current shutdown feature for a limited number of charge cycles. The number of cycles programmed into the Forming Cycles function 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.

80% Charged Point – A standard AC2000 Control will light the "80% Charged" LED and enable the charge Termination routine. The gassing voltage is set at 2.37 V/C at the factory and is user adjustable from 2.30-2.59 V/C. Voltage drop across the charge cables is accounted for by adding a "Drop" factor for each cell size. The control's displayed output voltage at the gassing point will indicate the effects of this factor. See chart below.

Cells	"Drop Factor"
6	.05V/C
12	.04V/C
18	.03V/C
24	.02V/C
36	.01V/C

NOTE: The drop factor used is based on standard 10 foot cables. Longer charging cables will increase the cable drop and should be taken into consideration.

Data Retention — The AC2000 Control uses two types of electronic memory for data retention. The charge cycle data is kept in EEPROM memory. 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 and time for a minimum of 10 years. Factory default information is also in EEPROM. This will have a minimum data retention time of 10 years.

Time-of-Day Start – The AC2000 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 AC2000 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 AC2000 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 AC2000 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 Blockout – The AC2000 Control can be programmed to disable the charger during a specific time of day. The charger will turn off at the beginning of the blockout period, and resume the charge cycle at the end of the blockout period. Any time of day, in 1 minute increments, can be used for the time-of-day blockout period. When a AC2000 is programmed for time-of-day blockout, and a battery is being charged when the blockout period occurs, the programmed end of blockout 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.

80% Charge Blockout—The AC2000 Control can be programmed to disable the charger from charging batteries that are greater then 80% charged during a specific time of day. The charger will turn off at the beginning of the block period and display "80% CHGD" with the Charge Complete LED. If the same battery is still connected at the end of the block period, the charging process will resume and finish the cycle. Any time of day, in 1 minute increments, can be used for the 80% blockout period. This feature can be used to provide a battery cool down period or to prevent over charge in some situations.

BID Programming – The AC2000 can program BID modules provided that one is correctly installed on a battery and that battery is connected to the charger. The AC2000 Control must be in a Manual Stop status before programming may take place. Battery cell size, number, amp hour size and curve type may be programmed. This feature is useful when a new BID is installed on a battery. By having the BID data programmed, it greatly enhances the value of archived charger data by identifying the battery from which it came from.

Remote Display – The AC2000 Control may be used with the the UC2000 Remote Display. The Remote Display, a small easily mountable assembly, will give the user access to the current charge status and the stop/equalize switches if the charger control is located in a hard to reach space.

Manual Override of Programmed Start Modes – An AC2000 Control, when programmed for time-of-day start, delayed start, or time-of-day blockout, 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 AC2000 Control can be programmed for three different types of automatic equalize. AC2000 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 AC2000 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 AC2000 will provide an equalize to any battery which is connected to the charger on the programmed equalize day.

Auto-Equalize by BID Cycle. It works just like auto-equalize by charger cycle except that the count (function 22) is compared to charge complete cycles read from the BID. 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.

Selectable Display Readout During Charging Cycle – The default display is an alternation between present output volts per cell and present output amps. Present amp hours or total charge time can be selected.

The display can be changed during the charging process by pressing the #1 (for amp hours) key or #2 (for charge time) key for approximately 5 seconds. Pressing either key again will cause a return to the original display.

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.

Full Battery Reject – The AC2000 Control can be programmed to immediately terminate the charge cycle if the battery reaches the 80% charged point in less than 4 minutes. This may prevent opportunity charging especially in the Voltage Time termination mode.

For further information on programming and reviewing the AC2000 features refer to the Programming Your AC2000 chapter and the Reviewing AC2000 Charge Data section of this chapter.

Programming Password – The password protection Feature may be turned on or off by holding down the #1 key for 10 seconds at AC power up. When programming, the user will be prompted for a password (2176) before programming can take place. This may deter any unwanted program changes to the control by non-authorized personnel if the feature is enabled. The Default setting for the programming password is off. A second non-published password is available. Contact Ametek Prestolite Power service for details.

Approval Delay Defeat – If a charger I.D. is programmed into function #37, a CDAC approval delay will take place on every battery connect. This gives a chance for a CDAC system to properly approve a charge cycle to occur. However, if a CDAC system is not present, a 15 minute delay will occur before every charge cycle. Therefore, if a Charger I.D. number is desired to identify chargers with cycle data in a non-CDAC site, the delay defeat feature can be used. If turned on, it will eliminate the approval delay. Only use this feature if CDAC is not being used. To toggle the Approval feature, hold the #2 key down for 10 seconds at AC power up.

AC2000 Charge Archive Function

The archive function allows 19 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

At this point, key in the cycle number and press enter. The charge cycle data will automatically scroll through the display along with the charge cycle number.

For quick downloads, use the Data Link Module. All available cycles can be dumped to a PC, eliminating the need to scroll through data cycles by hand. With the Data Link connected, go to the “Archive?” prompt. Press the #1 and #3 keys simultaneously and data will begin flowing to the PC.

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 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.

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:

- CHG COMP - Normal DV/DT or VT shutdown.
- LOW CURR - Low current shutdown.
- MAN STOP - Manual stop.
- BAT DISC - Battery disconnect
- 0-80% BU - 0-80% Back-up timer shutdown.
- >80% BT - 0-80% Charge Complete backup Timer shutdown.
- COOL INT - CDAC function
- BAT TEMP - CDAC reject on Battery temperature
- BAT VOLT - CDAC reject on battery voltage
- BID NUM - CDAC reject on BID number
- CTRL VER - CDAC reject on charger control version number
- BAT TYPE - CDAC reject on battery type
- AH CAP - CDAC reject on amp hour capacity
- DIDT - High current Shutdown (Thermal Runaway)
- NONE - Charger running, no termination yet

EQUALIZE TIME	The time of the equalize portion of the charge cycle. Equalize can be automatically or manually selected.
START TIME	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 Prestolite Battery Identification Module (BID).
BID START TEMP	The temperature of the battery sensed by the Prestolite Battery Identification Module at the start of the charge cycle.
BID END TEMP	The temperature of the battery sensed by the Prestolite 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.
CHARGER I.D.	The identification number of the charger that the charge cycle occurred on
MONTH	The month that the charge cycle occurred
DATE	The day of the month that the charge cycle occurred.

AC2000 Charge Cycle Review Function

The review function allows up to 48 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.
(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) CHG COMP — Normal DV/DT or VT shutdown
- (02) LOW CURR — Low current shutdown
- (03) MAN STOP — Manual stop
- (04) BAT DISC — Battery disconnect.
- (05) 0-80% BU — 0-80% back-up timer shutdown
- (06) >80%BT — 80% Charge Complete backup timer shutdown
- (07) COOL INT — CDAC function
- (11) BAT TEMP — CDAC reject on battery temperature
- (12) BAT VOLT — CDAC reject on battery voltage
- (13) BID NUM — CDAC reject on bid number
- (14) CTRL VER — CDAC reject on charger control version number
- (15) BAT TYPE — CDAC reject on battery type
- (16) AH CAP — CDAC reject on amp-hour capacity
- (17) HIGH CUR — 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 (AM/PM format).

12. END TIME — The time at the end of the charge cycle. Includes the equalize time if it was automatically or manually selected (AM/PM format).

13. NOT USED

14. BATTERY I.D. — The Battery I.D. number of the battery that was charged in the charge cycle. Requires Prestolite 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 Prestolite Battery Identification Module at the start of the charge cycle (degrees C).

17. BID END TEMP — The temperature of the battery sensed by the Prestolite 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 (AM/PM 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 charger cycle count (see AUTO EQ. COUNT).

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

B.I.D. = By BID cycle count (see AUTO EQ. COUNT).

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 "CYCLE" or "B.I.D."

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 "D.O.W."

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. (AM/PM). 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 (AM/PM). See START MODE.

28. BLOCK END — The ending time of the time of day blockout function. (AM/PM). 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

XGAS = 80% charging 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 of 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 OPT. — 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. EXTRA RUN TIME — Current setting for amount extra running time past the normal charge termination point (0-60 minutes)

34. LOW BATTERY — Current setting for the rejection of a connected battery if the open circuit voltage is too low (1.75 – 1.99 V/C). May be overridden by pressing the enter key.

35. HIGH BATTERY — Current setting for the rejection of a connected battery if the open circuit voltage is too high (2.00-2.59 V/C).

36. FULL BATT. REJECT — If turned on will cause an immediate charge complete to occur if the gassing voltage is reached within 4 minutes of the start of charge.

OFF = no full battery reject
ON = full battery reject

37. CHARGER I.D. — The battery charger identiification number. (0000 to 9999)

38. 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).

39. TERM TYPE — Disables the automatic DV/DT charge termination feature and enables Voltage Time charge termination.

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

40. MONTH — The current month (1 to 12).

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

42. YEAR — The current year (00 to 99).

43. 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).

44. PROG. BID CELLS* — If a connected battery is equipped with a Battery I.D. module, the battery cell size (6,9,12,18,24,36) may be reprogrammed into the BID. The control must be in “Manual Stop” status.

45. PROG. BID NO. — If a connected battery is equipped with a Battery I.D. module, the I.D. number (000001-999999) may be reprogrammed into the BID. The control must be in “Manual Stop” status.

46. PROG. BID AH* — If a connected battery is equipped with a Battery I.D. module, the battery amp hour size (0000-9999) may be reprogrammed into the BID. The control must be in “Manual Stop” status.

47. PROG BATT. TYPE* — If a connected battery is equiped with a Battery I.D. module, the battery type may be programmed into the BID. The control must be in “Manual Stop” status.

0 = Standard Curve
1 = Custom Curve
2 = Sealed Lead Acid Curve
3 = Sealed Lead Recombinant Curve Absorbed Glass Mat (AGM) Types

48. 80% V/C — The 80% or gassing point for each charge cycle may be changed from 2.30 to 2.59 V/C.

49. 80% Block Start — The beginning time of the 80% Charged Block period. See Start Mode

50. 80% Block End — The ending time of the 80% Charged Block period. See Start Mode

* These BID parameters are `only for use with the Ultra Charge and Power Star units.

AC2000 ARCHIVE, REVIEW & PROGRAMMING MENU STRUCTURE

SCROLL FOR MENUS

ENT. FOR ARCHIVE	
ENT. CYCLE NO.	01
A.H. RETURNED	XXXX
CHG. TIME	XXH XXM
80-END	XXH XXM
BAT. D.C.V.	X.XXV/C
START AMPS	XXXA
START V.	X.XXV/C
FINISH AMPS	XXXA
FIN. VOLTS	X.XXV/C
TERM. CODE	XXXXXXX
EQ. TIME	XXH XXM
START TM.	XXXXAM
END TIME	XXXXAM
NOT USED	XXXX
BATTERY I.D.	XXXXXX
B.I.D. STRT. TMP.	XXC
B.I.D. END TEMP.	XXC
CYC. A.H.	XXXX
CYC. CELLS	XX
BAT. TYPE	XXX
IN USE MAX TEMP	XX
IN USE MIN	X.XX V/C
MONTH	XX
DATE	XX

ENTER FOR REVIEW		
	ENT. FUNCT. NO.	01
01	A.H. RETURNED	XXXX
02	CHG. TIME	XXH XXM
03	80-END	XXH XXM
04	BAT. D.C.V.	X.XXV/C
05	START AMPS	XXXA
06	START V.	X.XXV/C
07	FINISH AMPS	XXXA
08	FIN. VOLTS	X.XXV/C
09	TERM. CODE	XXXXXXX
10	EQ. TIME	XXH XXM
11	START TM.	XXXXAM
12	END TIME	XXXXAM
13	NOT USED	XXXX
14	BATTERY I.D.	XXXXXX
15	BAT. VLTS.	XX.XXVDC
16	SINK TEMP.	XXXC
17	B.I.D. STRT. TMP.	XXC
18	B.I.D. END TEMP.	XXC
19	TIME	0100PM
20	DAY OF WEEK	SAT.
21	AUTO EQ. TYPE	CYC.
22	AUTO EQ. COUNT	05
23	AUTO EQ. DAY	SAT.
24	AUTO EQ.	ON
25	T.O.D. START	0100
26	DEL. START	0100
27	BLOCK ON	0100
28	BLOCK END	0100
29	START OVERIDE	ON
30	START MODE	AUTO
31	FORM CYCLES	00
32	SPECIAL OPT.	OFF
33	EXT. RUNTIME MIN.	00
34	LOW BATTERY	1.75 V/C
35	HIGH BATTERY	2.30 V/C
36	FULL BATTERY REJECT	OFF
37	CHARGER I.D.	0000
38	REFRESH DEL.	72HR
39	TERM. TYPE	DVDT
40	MONTH	XX
41	DATE	XX
42	YEAR	XX
43	COOL DOWN HOURS	0
44	PROG. BID CELLS	
45	PROG. BID NO.	
46	PROG. BID A.H.	
47	PROG. BATT. TYPE	
48	80% V/C	2.37 V/C
49	80% BLOCK START	0100
50	80% BLOCK END	0100

ENTER TO PROGRAM

ENTER PASSWORD]IF THE FEATURE IS ENABLED,
XXXX 2176 **

ENT. FUNCT. NO. 19

19	TIME	0100PM	0000 TO 2399 (MILITARY TIME)
20	DAY OF WEEK	SAT.	01 TO 07 (01 = SUN.)
21	AUTO EQ. TYPE	CYC.	0 = BY CYCLE, 1 = BY DAY OF WEEK, 2 = BID
22	AUTO EQ. COUNT	05	00 TO 30
23	AUTO EQ. DAY	SAT.	01 TO 07 (01 = SUN.)
24	AUTO EQ.	ON	0 = OFF, 1 = ON
25	T.O.D. START	0100	0000 TO 2399 (MILITARY TIME)
26	DEL. START	0100	0000 TO 2399 (MILITARY TIME)
27	BLOCK ON	0100	0000 TO 2399 (MILITARY TIME)
28	BLOCK END	0100	0000 TO 2399 (MILITARY TIME)
29	START OVERIDE	ON	0 = OFF, 1 = ON
30	START MODE	AUTO	0 = AUTO, 1 = T.O.D.S., 2 = DEL. STRT., 3 = T.O.D.B., 4 = XGAS
31	FORM CYCLES	00	x 00 TO 30
32	SPECIAL OPT.	OFF	0 = OFF, 1 = ON
33	EXT. RUNTIME MIN.	00	0 TO 60
34	LOW BATTERY	1.75 V/C	1.75 TO 1.99 (1. IS NOT ENTERED)
35	HIGH BATTERY	2.30 V/C	2.00 TO 2.59 (2. IS NOT ENTERED)
36	FULL BATTERY REJECT	OFF	0 = OFF, 1 = ON
37	CHARGER I.D.	0000	0000 TO 9999 (USED ONLY FOR CDAC)
38	REFRESH DEL.	72HR	08 TO 99
39	TERM. TYPE	DVDT	0 = DVDT ON, 1 = DVDT OFF
40	MONTH	XX	01 TO 12
41	DATE	XX	01 TO 31
42	YEAR	XX	00 TO 99
43	COOL DOWN HOURS	0	0 TO 8
44	PROG. BID CELLS		x 06, 09, 12, 18, 24 & 36
45	PROG. BID NO.		x 000000 TO 999999
46	PROG. BID A.H.		x 0000 TO 9999
47	PROG. BATT. TYPE		x 0 = STD., 1 = CUSTOM, 2 = S.L.A., 3 = S.L.R., 4 = D.S.G.
48	80% V/C	2.37 V/C	2.30 TO 2.59 (2. IS NOT ENTERED)
49	80% BLOCK START	0100	
50	80% BLOCK END	0100	

NOTES:

x DEFAULT VALUES SHOWN IN BOX
A BID EQUIPPED BATTERY MUST BE CONNECTED & CHARGER MUST BE DISPLAYING "MANUAL STOP" BEFORE THESE FUNCTIONS CAN BE PROGRAMMED.

WARNING: PROGRAMMING 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.

FIG. 6-2

Programming Your AC2000 Control

The program feature allows up to 30 functions to be programmed to customize your AC2000 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 normally not password protected. If a password is needed to prevent unauthorized programming, one (2176) may be turned on. See Programming Password in the AC2000 Control Features chapter.

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.

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

*If Enabled

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

19. 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 charger cycle count (see AUTO EQ. COUNT). Factory setting.

1 = By the day of week (see AUTO EQ. DAY).

2 = B.I.D. (see Auto EQ. COUNT)

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". If Auto Equalize by BID is turned on, then only completed cycles stored by a BID Module are counted.

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 (00H 01m 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 blockout 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 blockout 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 blockout).

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 “DEL.STRT.”
3 = Time of day blockout “T.O.D.B.”
4 = 80% Charging Block “XGAS”

Key in data and press enter.

31. FORM CYCLES — Sets the number of forming cycles for a new battery by disabling the low current shut-down 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 — Sets special option modes, see below:

0 = OFF, factory setting
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 mode

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

Key in data and press enter.

33. EXTRA RUN TIME — Sets additional run time after normal charge termination point. Addition time will not be added on a equalize charge.

(0-60 minutes)

Factory = 00

Key in data and press enter.

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 right of the decimal.

(1.75-1.99)

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 right of the decimal.

(2.00-2.59)

Factory = 2.30

Key in data and press enter.

36. FULL BATTERY REJECT — The charge will immediately be terminated if the 80% point is reached within 4 minutes of the start of the charge cycle.

0 = OFF (Factory Setting)
1 = ON

Key in data and press enter.

37. CHARGER I.D. — The battery charger identification number. This must be set to 0000 unless the battery charger is part of a Prestolite CDAC system (0000 to 9999) or approval defeat DIP switch is set, see AC2000 features.

Factory setting = 0000

Key in data and press enter.

38. 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).

Factory setting = 72 hours

Key in data and press enter.

39. 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.

40. MONTH — The current month (1 to 12).

Key in data and press enter.

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

Key in data and press enter.

42. YEAR — The current year (00 to 99).

Key in data and press enter.

43. 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 Prestolite BID can be programmed with this control:

a. A battery with the 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 44 and 47 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.

44. 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

45. PROG. BID NO. — Programs the battery identification number into the BID.

(000000 to 999999)

46. PROG. BID A.H.* — Programs the battery ampere hour rating into the BID.

(0000 to 9999)

47. PROG BATT. TYPE* — Programs the battery type into the BID.

0 = Standard Curve
1 = Custom Curve
2 = Sealed Lead Acid Curve
3 = Sealed Lead Recombinant Curve Absorbed Glass Mat (AGM) Types
8 = ULTRA MAXX
9 = ULTRA EXTREME

48. 80% V/C — Sets the gassing point. Only enter the data to the right of the decimal.

(2.37 Factory Setting, 2.00 to 2.59)

Key in data and press enter.

49. 80% CHARGING BLOCK START — Sets the beginning time of the 80% charged blockout function (0000 to 2359, 24 hour format). See START MODE.

Key in data and press enter.

50. 80% CHARGING BLOCK END — Sets the ending time of the 80% charged blockout function (0000 to 2359, 24 hour format). See START MODE.

Key in data and press enter.

* These BID parameters are only for use with the Ultra Charge and Power Star units.

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
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
	(4) Control Assembled Improperly	8.43	8-8
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
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) 80% Point Set Improperly	8.37	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) 80% Point Set Improperly	8.37	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
	(7) Discharge Rate Too Fast	8.29	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 (2) Bad Control Board	8.25 8.07	8-7 8-5
Meter Reading Wrong (V/C)	(1) Bad Output Connector (2) Bad Harness/Connections – Loose Or Incorrect (3) Internal Power Connection (4) Bad Control Board	8.14 8.06 8.15 8.07	8-6 8-5 8-6 8-5
Meter Reading Wrong (Amps)	(1) Bad Output Connector (2) Bad Harness/Connections – Loose or Incorrect (3) Internal Power Connection (4) Bad Control Board (5) Bad/Incorrect Shunt (6) DIP Switch Settings Incorrect	8.14 8.06 8.15 8.07 8.34 8.40	8-6 8-5 8-6 8-5 8-7 8-8
Display Reads 5 or 10 Hr B.U.	(1) Hot Battery (2) Battery A.H. > Charger A.H. (3) Bad Output Cable Connector (4) Bad Battery (5) 80% Point Set Incorrectly	8.28 8.36 8.14 8.18 8.37	8-7 8-8 8-6 8-5 8-8
Display Reads (MANUAL STOP)	(1) Someone Pressed Manual Stop Key (2) Bad Connection (Keypad-Control) (3) Bad Keypad (4) Bad Control Board	8.23 8.08 8.09 8.07	8-7 8-5 8-6 8-5
Display Reads (LOW CURRENT SHUTDOWN)	(1) Bad Harness/Connections – Loose or Incorrect (2) Battery Not Fully Formed (3) Bad Battery (4) Battery A.H.> Charger A.H. (5) Bad Internal Power Connection (6) AC Supply (7) Bad AC Fuse (8) Bad Contactor (9) Output Fuse Bad (10) Bad Control Board (11) Bad Transformer (12) Cold Battery	8.06 8.35 8.18 8.36 8.15 8.01 8.02 8.41 8.12 8.07 8.42 8.21	8-5 8-7 8-6 8-8 8-6 8-5 8-5 8-8 8-6 8-5 8-5 8-7

SYMPTOM	PROBABLE CAUSES	ACTION	
		PARAGRAPH	PAGE
Display Reads (LOW BATT REJECT)	(1) Bad Harness/Connections – Loose or Incorrect (2) Bad Battery (3) Wrong Cell Size Battery (4) Incorrect DIP Switch Setting (5) Bad Control Board (6) Bad Output Cables/Connector	8.06 8.18 8.39 8.40 8.07 8.14	8-5 8-6 8-8 8-8 8-5 8-6
Display Reads (HI BATT REJECT)	(1) Bad Battery (2) Bad Control Board (3) Incorrect DIP Switch Setting (4) Wrong Cell Size Battery	8.18 8.07 8.40 8.39	8-6 8-5 8-8 8-8
Display Reads (COP FAIL)	(1) Noise (Supply) (2) Bad Control Board	8.10 8.07	8-6 8-5
Display Reads (CLK MON)	(1) Noise (Supply) (2) Bad Control Board	8.10 8.07	8-6 8-5
Display Reads (OPCODE)	(1) Noise (Supply) (2) Bad Control Board	8.10 8.07	8-6 8-5
Display Reads (HIGH CUR SHUTDOWN)	(1) Bad Battery (2) Hot Battery (3) Bad Control Board	8.18 8.28 8.07	8-6 8-7 8-5

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: If present, 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). Replace the Control Board if the voltages are not in spec.

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 taken 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 AC2000 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.

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. 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 AC2000 board. Remove the control and inspect, the connector is located in the lower right of the PC boards. With the boards powered up, check the voltages at the following points marked on the solder side of the expansion PC board. DGND to +5V (4.9 to 5.1), DGND to +12V (11.9 to 12.1) and PSGND to +5V (4.9 to 5.1). Observe polarity when making these measurements. Check for the proper I.D. number in function #37 (See "Programming Your AC2000 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 AC2000 auto equalize feature can be used to automate the equalize schedule (see the "AC2000 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 AC2000 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 AC2000 Control (see the "Programming Your AC2000 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 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 AC2000 Control" chapter of this manual).

8.26 Program the control to DV/DT charge termination (see the "Programming Your AC2000 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 AC2000 control to add a specified cool down time between charge termination and the signaling of charge complete (see the "Programming Your AC2000 Control" chapter of this manual). A delayed start can be programmed into the AC2000 control to add a specified delay time between battery connection and the start on the charge (see the "Programming Your AC2000 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 AC2000 Control should be set to 0000 for proper normal (non-CDAC) operation (see the "Programming Your AC2000 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 AC2000 Control to the number of cycles required to properly form the battery (see the "Programming Your AC2000 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 AC2000 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.

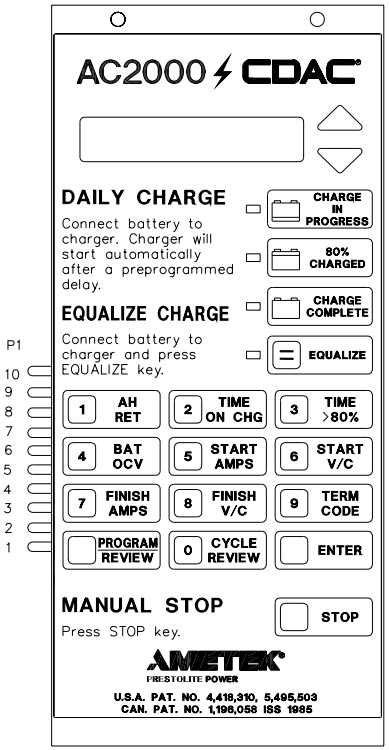
8.42 AC fuses are most likely to have failed. Visually inspect the transformer. If a winding has failed, the winding will appear to be burnt or look black. The varnish might be flaking off. Refer to the Diagram chapter in the manual and locate the diagram for your charger. On the diagram, there will be a winding configuration of the transformer. Disconnect the diodes from the transformer and reapply AC to the charger. Measure the transformer secondary voltage. If less than 25VAC is present, replace the transformer.

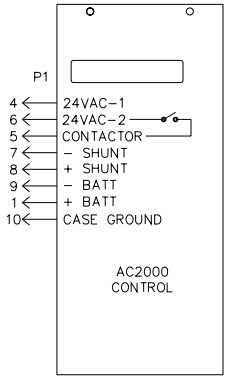
8.43 Remove AC power to the control, then take the control out of the charger. Carefully take the front panel apart from the PC board assembly and check that the display is seated correctly. Reassemble the control. Reinstall it into the charger.

PARTS LIST

ITEM	PART NUMBER
AC2000 CONTROL	SEE BACK OF CONTROL PANEL
MAIN PC BOARD	PRINTED ON PC BOARD
WIRING HARNESS	191303
PRINT KIT	192749
DATA LINK	193026
EXPANSION PC BOARD (CDAC INTERFACE)	192901-XXX
PLASTIC PRESS RIVET	193101-001
UC2000 REMOTE	192356-001
REMOTE BOX CONTROL	195884

CONNECTION DIAGRAM	
STANDARD AC2000	192819A SHEET 2





SCHEMATIC

J2 CONNECTOR, HARNESS (MALE) J1 CONNECTOR, HARNESS (FEMALE) P1 CONNECTOR, PCB

LEGEND

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

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

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

SEQUENCE OF OPERATION

DISTRIBUTION TABLE	
OUTSIDE DISTR.	

CHANGE RECORD					
E.C. No.	DATE	FILE NAME	PLOT DATE	FINISH CODE PER 193814: NONE	
		192819A2	10-20-03	ACTIVITY / REPLACED BY / REPLACES 192819	
		UNLESS OTHERWISE SPECIFIED		MATERIAL NO. / QUANTITY-U.M. / COMM. CLS.	
		DIMENSIONS ARE IN INCHES/MILLIMETERS		MATERIAL SPEC.	
		TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS. PRODUCED TO RECOGNIZED STANDARDS.		ASSY.	
		FRACT. ±	ANGLES ± 3°	TITLE: CONTROL, AC2000	
		DECIMAL-INCH		DESCRIPTIVE DATA	
		.00 ± .03 / .000 ± .010	0. ± 1.0mm / 0.0 ± 0.4mm / 0.00 ± 0.1mm	DESIGNED TMB / DRAWN DWF / DATE 10-20-03 / SCALE FULL	
		DO NOT SCALE DRAWING		CHECKED / APPROVED / RECORDS 10-23-03 / ITEM TYPE	

CONFIDENTIAL: This drawing, including all information contained thereon, is the exclusive and confidential property of Ametek/ Prestolite Power of Troy, Ohio 45373. This drawing is not to be copied, reproduced, delivered or disclosed to others, in whole or in part, except with express written permission.

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

SIZE C | DWG. NO. 192819A | SHEET 2

WARRANTY

AMETEK/PRESTOLITE POWER "FERRORESONANT" 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:

FERRORESONANT PRODUCTS	ACCU CHARGER	BATTERY MATE 100	BATTERY MATE 80	BATTERY MATE 60
FULL COVERAGE - LABOR, TRAVEL, MILEAGE & PART REPLACEMENT	10-year "full"	10-year "full"	1-year	1-year
PRINTED CIRCUIT BOARD (REPLACEMENT ONLY)				
TRANSFORMER, INDUCTOR, SCR & DIODE (REPLACEMENT ONLY)			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. The ACCU CHARGER and BATTERY MATE 100, 10-year full warranty only applies to chargers manufactured after the 4th quarter of 2004. Units manufactured previous to the 4th quarter will have 1-year full, plus 9-years parts limited coverage.

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 MERCHANTABLILITY 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: 1153
Index: 030105
Replaces: Original