



24 VOLT FULLY AUTOMATIC DUAL MODE BATTERY CHARGER MODEL 18360 TYPE 24EL12

Specifications

AC Supply:	120 volts AC, 60 Hertz, single-phase, 5 amps maximum
DC Output:	24 volts DC, 12 amps, tapering to 3 amps (WET) 24 volts DC, 12 amps, tapering to 0 amps (AGM)
Battery Type:	24-volt, 12-cell, series-connected, deep-cycle motive power battery systems. Conventional wet lead-acid or sealed absorbed glass mat (AGM).
Battery Capacity:	50 to 150 amp hours
Normal Recharge Time:	8 hours

PLEASE SAVE THESE IMPORTANT SAFETY AND OPERATING INSTRUCTIONS

For correct operation of the equipment, it is important to read and be familiar with this entire manual before installing and operating the charger.
DO NOT DISCARD THIS MANUAL AFTER READING.



LOOK FOR THIS SYMBOL TO POINT OUT SAFETY PRECAUTIONS. IT MEANS: *BECOME ALERT—YOUR SAFETY IS INVOLVED.* IF YOU DO NOT FOLLOW THESE SAFETY INSTRUCTIONS, INJURY OR PROPERTY DAMAGE CAN OCCUR.

Features

- Charger output characteristics are adjustable to charge wet lead-acid or sealed absorbed glass mat (AGM) deep-cycle lead-acid batteries. Different charge characteristics are selected by a switch on the front of the charger.
- Electronic circuit monitors battery state of charge and automatically turns charger off when the batteries reach full charge.
- Line voltage compensation produces consistent charger output for AC supply voltage variations of $\pm 3\%$ from nominal.
- Convection cooled design for maximum reliability and minimum maintenance.

INTRODUCTION

The Dual Mode battery charger is designed to recharge deep-cycle batteries of wet lead-acid or sealed absorbed glass mat (AGM) design. The different charge characteristics required by these different types of battery design are selected by sliding the BATTERY TYPE selector switch to the correct setting. An electronic circuit turns the charger on and off automatically.

Batteries used on industrial equipment are subjected to severe deep-cycle duty on a daily basis. For this reason, it is important that only deep-cycle batteries be used.

⚠ CAUTION: THIS CHARGER IS FOR USE ONLY ON 24-VOLT, 12-CELL, SERIES CONNECTED, 50-150 AMP-HOUR (20 HR. RATE), 2.45-2.50 VOLTS PER CELL MAXIMUM VOLTAGE RECHARGEABLE, DEEP-CYCLE BATTERY SYSTEMS. THIS CHARGER IS FOR USE ON WET LEAD-ACID OR ABSORBED GLASS MAT (AGM) DEEP-CYCLE BATTERIES. "BATTERY TYPE" SWITCH MUST BE SET TO THE PROPER TYPE OF BATTERY. BATTERIES IMPROPERLY MATCHED WITH CHARGER MAY BURST, CAUSING PERSONAL INJURY AND DAMAGE TO BATTERIES OR CHARGER.

INITIAL INSTALLATION

Circuit breaker or fuse protection in the 120 volt AC outlet to which the charger is to be plugged should allow 7 amps per charger. Do not overload electrical outlet. Use of an extension cord with the charger should be avoided unless absolutely necessary. Use of an improper extension cord could result in a risk of a fire and electric shock. If an extension cord is needed, use a three-conductor, No. 14 AWG (or larger) cord with ground, properly wired, in good electrical condition and keep as short as possible. Make sure that the pins on the plug of the extension cord are the same number, size, and shape as that of the plug on the battery charger. Locate all cords so that they will not be stepped on, tripped over, or otherwise subjected to damage or stress. Do not operate the battery charger with a damaged cord or plug. Do not operate the battery charger if it received a sharp blow, was dropped or otherwise damaged in any manner. Refer to a qualified service agent.

Provide adequate ventilation for both batteries and charger. The convection cooled design requires an unobstructed flow of cooling air for proper operation. Keep all charger ventilation openings at least two inches (2") (5.08cm) away from walls and other objects. Do not allow clothing, blankets, or other material to cover charger.

⚠ WARNING: CHARGERS CAN IGNITE FLAMMABLE MATERIALS AND VAPORS. DO NOT USE NEAR FUELS, GRAIN DUST, SOLVENTS, THINNERS, OR OTHER FLAMMABLES.

⚠ WARNING: KEEP DRY; DO NOT EXPOSE TO RAIN OR SPRAY. FOR STORAGE, KEEP CHARGER IN A BUILDING. REPLACE WORN, CUT, OR DAMAGED ELECTRICAL CORDS AND PLUGS IMMEDIATELY.

AC INPUT

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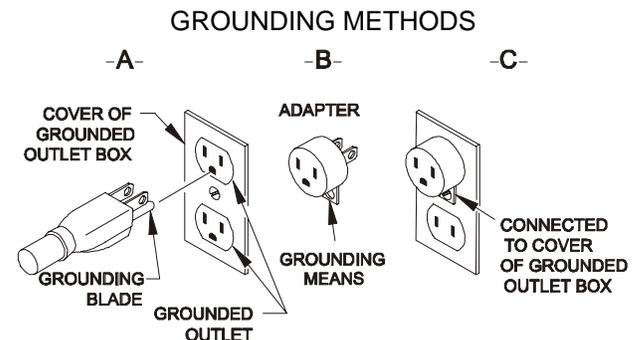
The charger must be grounded to reduce the risk of electric shock. It is equipped with an electric cord having an equipment-grounding conductor and a grounding-type plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with the National Electrical Code and all local codes and ordinances.

⚠ DANGER: IMPROPER CONNECTION OF THE EQUIPMENT-GROUNDING CONDUCTOR CAN RESULT IN A RISK OF ELECTRIC SHOCK. DO NOT REMOVE GROUNDING PRONG FROM PLUG.

GROUNDING INSTRUCTIONS

This battery charger is equipped with a grounding plug as illustrated in Figure A, for use on a nominal 120 volt, 60 Hertz circuit. A temporary adapter, as illustrated in Figures B and C, may be used to connect this plug to a two-pole receptacle as shown in Figure B if a properly grounded outlet is not available. The temporary adapter should be used only until a properly grounded outlet can be installed by a qualified electrician. The green-colored rigid ear extending from the adapter must be connected to a permanent ground such as a properly grounded outlet box.

⚠ DANGER: BEFORE USING THE ADAPTER AS ILLUSTRATED, BE CERTAIN THAT THE CENTER SCREW OF THE OUTLET PLATE IS GROUNDED.



NOTE: Use of adapter shown in Figures B and C is NOT permitted in Canada.

BATTERY TYPE

Battery manufacturers frequently use the same battery cases for different battery types. Wet lead-acid replaceable liquid electrolyte deep-cycle batteries have removable cell caps. Water electrolyzed by discharging and charging the battery is replaced through these openings.

Absorbed glass mat (AGM) deep-cycle batteries have non-removable cell caps. The physical

appearance of the battery case is frequently the same as that of a wet lead-acid battery though the cell caps are not removable.

Refer to the battery manufacturer's information panel on the battery case to determine the type battery you have. If the information panel is missing or not legible, do not use the battery. Refer to your dealer if you do not understand what type battery you are using and have them set the BATTERY TYPE switch accordingly.

The BATTERY TYPE switch is a two-position slide switch visible in the rectangular opening on the front of the charger. Using a small screwdriver, slide the switch from one setting to the other through the opening. Take care not to damage the switch when moving it to the desired setting.

NORMAL OPERATION

Instructions printed on cover of charger are for daily reference.

1. Set "BATTERY TYPE" switch to the proper style of battery to be charged.

CAUTION: MAKE SURE THE BATTERY PACK IS A 24-VOLT, 12-CELL, SERIES-CONNECTED, 50-150 AMP-HOUR (20 HR. RATE), RECHARGEABLE DEEP-CYCLE BATTERY SYSTEM. THE "SEALED ABSORBED GLASS MAT (AGM)" SETTING CHARGES TO A MAXIMUM ON-CHARGE VOLTAGE OF 2.45 VOLTS PER CELL. THE "CONVENTIONAL WET LEAD-ACID" SETTING HAS AN ON-CHARGE VOLTAGE OF AT LEAST 2.50 VOLTS PER CELL. VISUALLY CHECK THAT THE BATTERY TYPE SWITCH IS SET CORRECTLY FOR THE TYPE OF BATTERY YOU ARE USING.

DANGER: TO PREVENT ELECTRIC SHOCK, DO NOT TOUCH UNINSULATED PARTS OF THE CHARGER DC OUTPUT CONNECTOR, BATTERY CONNECTOR, OR BATTERY TERMINALS. MAKE SURE ALL ELECTRICAL CONNECTORS ARE IN GOOD WORKING CONDITION. DO NOT USE CONNECTORS THAT ARE CRACKED, CORRODED OR DO NOT MAKE ADEQUATE ELECTRICAL CONTACT. USE OF A DAMAGED OR DEFECTIVE CONNECTOR MAY RESULT IN A RISK OF OVERHEATING OR ELECTRIC SHOCK.

2. Move the POWER switch to "OFF" position.
3. Connect the power supply cord to a properly grounded 120 volt, 60 Hertz, single phase outlet.
4. Connect charger's DC output plug to the equipment charging receptacle. Do not connect the DC plug unless the "POWER" switch is in the "OFF" position.

5. Move the POWER switch to "ON" and the RED and GREEN lights will come on steady for a few seconds to test the lights. If the lights do not come on, either the AC cord is not plugged in or the AC outlet is not live. Test for a live AC outlet by connecting a suitable appliance into the specific outlet.

WARNING: CHARGER IS NOT TO BE USED WHILE THE EQUIPMENT IS OPERATING.

ATTENTION: *Ne pas utiliser le charger pendant que l'equipment est en marche.*

WARNING: LEAD-ACID BATTERIES GENERATE GASES WHICH CAN BE EXPLOSIVE. TO PREVENT ARCING OR BURNING NEAR BATTERIES, DO NOT DISCONNECT DC CHARGING CORD FROM BATTERIES WHEN THE CHARGER IS OPERATING. IF THE CHARGE CYCLE MUST BE INTERRUPTED, MOVE THE "POWER" SWITCH TO "OFF", AND DISCONNECT THE CHARGER POWER SUPPLY CORD BEFORE DISCONNECTING THE DC OUTPUT CORD FROM THE BATTERIES. KEEP SPARKS, FLAME, AND SMOKING MATERIALS AWAY FROM BATTERIES.

WARNING: ALWAYS SHIELD EYES WHEN WORKING NEAR BATTERIES. DO NOT PUT WRENCHES OR OTHER METAL OBJECTS ACROSS BATTERY TERMINAL OR BATTERY TOP. ARCING OR EXPLOSION OF THE BATTERY CAN RESULT!

Charger will output power three to five (3-5) seconds after turning switch "ON" as indicated by the RED light turning off, the slow blinking GREEN light (once per second), and a slight transformer hum.

If both lights go off about five seconds after AC is applied, check to see if the DC plug is correctly connected to the battery. If the DC plug is connected properly, either an open circuit exists in the equipment's internal circuitry, or the battery voltage is below 7 volts (see Troubleshooting).

The charger has an under-voltage protection mode which will terminate the charge if battery voltage does not increase above 18 volts after 10 minutes of charging. This prevents destroying 12 volt battery systems with this 24 volt charger. When this occurs, the RED light will come on steady.

6. Correct initial charge rate should be between 11 to 13 amps. As the batteries become more charged the charge rate decreases. When the batteries reach approximately 80% of full charge, the GREEN light will fast blink (eight times per second), the charge rate will have decreased as determined by the "BATTERY TYPE" switch setting and the condition of the batteries.

Wet Lead-Acid Deep-Cycle Batteries

With healthy batteries, the charging current will decrease to between 2 to 4 amps and remain there until the charger turns off. As wet lead-acid deep cycle batteries lose capacity, the charge rate may no longer decrease to this reading. The charger will still determine when the batteries are as charged as they are capable of being and will turn off. When battery capacity has decreased to where the charger is no longer able to taper down to less than 4 amps, or the batteries will no longer perform as desired, they should be replaced.

Absorbed Glass Mat (AGM) Deep-Cycle Batteries

The charging current will decrease to near zero and remain there until the charger turns off. As absorbed glass mat (AGM) deep-cycle batteries lose capacity and range, the charge current may no longer decrease to this low of a reading. The charger will still determine when the batteries are as charged as they are capable of being and turn off. When the batteries will no longer perform as desired, they should be replaced.

7. Charger is equipped with a thermal breaker which automatically turns the charger off if it overheats. Should charger turn off before the batteries are fully charged, check to be sure all ventilation openings are free from obstructions. After charger cools down to a safe temperature, it will automatically restart. If charger repeatedly overheats, refer to a qualified service agent.
8. Charger turns off automatically when batteries are fully charged as indicated by steady on GREEN light. Charge time varies with battery capacity and depth of discharge. Allow 8 hours for normal charging. Larger batteries (greater than 150 ampere-hours) or severely discharged batteries may require up to 16 hours to be properly charged and equalized. If the charger

operates for 16 hours and is unable to fully charge the batteries, an internal timer turns the charger off and begins to fast blink the RED light.

A maximum voltage shutoff for wet lead-acid batteries is an additional safety feature of the charger. When the battery potential increases above 2.83 volts per cell, the charger cycle is terminated and the RED light begins to slow blink.

9. After the charger has turned off, move the Power switch to "OFF", disconnect AC cord first, then the DC output cord from the equipment charging receptacle.

⚠ CAUTION: TO AVOID DAMAGE TO THE CHARGER CORD AND BATTERY CONNECTOR, DISCONNECT BY GRASPING THE PLUG HANDLE OR BODY AND PULLING IT STRAIGHT OUT OF THE BATTERY CONNECTOR. DO NOT PULL ON THE CHARGER CORD. DO NOT TWIST, ROCK OR PULL THE PLUG SIDEWAYS.

⚠ WARNING: TO PREVENT ARCING OR BURNING NEAR THE BATTERIES, DO NOT DISCONNECT THE OUTPUT CORD FROM THE BATTERIES WHILE THE CHARGER IS OPERATING. IF THE CHARGE CYCLE MUST BE INTERRUPTED, FIRST SLIDE THE POWER SWITCH TO OFF, THEN DISCONNECT AC CORD, AND FINALLY THE OUTPUT CORD FROM THE BATTERIES. KEEP SPARKS, FLAME, AND SMOKING MATERIALS AWAY FROM BATTERIES.

⚠ WARNING: DO NOT LEAVE THE DC OUTPUT CONNECTOR PLUGGED IN WHILE UNATTENDED FOR MORE THAN TWO (2) DAYS. SEVERE OVERCHARGING AND DAMAGE TO THE BATTERIES MAY RESULT IF THE CHARGER DOES NOT TURN OFF.

PROPER CARE OF DEEP-CYCLE MOTIVE POWER BATTERIES

Batteries used on industrial equipment are subjected to severe deep-cycle duty on a daily basis. For this reason, it is important that only deep-cycle batteries be used. Although these batteries are designed to withstand such duty, the following precautions must be observed to obtain good performance and maximum cycle life.

⚠ CAUTION: ALWAYS WEAR PROTECTIVE CLOTHING AND EYE SHIELDS WHEN WORKING WITH BATTERIES. BATTERIES CONTAIN ACID WHICH CAN CAUSE BODILY HARM. DO NOT

PLACE WRENCHES OR OTHER METAL OBJECTS ACROSS THE BATTERY TERMINALS OR BATTERY TOP. ARCING OR EXPLOSION OF THE BATTERY MAY RESULT. SOMEONE SHOULD BE WITHIN RANGE OF YOUR VOICE OR CLOSE ENOUGH TO COME TO YOUR AID WHEN YOU WORK NEAR A LEAD-ACID BATTERY. HAVE PLENTY OF FRESH WATER AND SOAP NEARBY IN CASE BATTERY ACID CONTACTS SKIN, CLOTHING OR EYES.

 WARNING: RISK OF EXPLOSIVE GASES. WORKING IN VICINITY OF A LEAD-ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT EACH TIME BEFORE USING YOUR CHARGER, YOU READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.

1. New batteries should be given a full charge before their first use because it is difficult to know how long batteries have been stored.
2. New batteries are not capable of their rated output until they have been discharged a number of times.
3. Do not excessively discharge batteries. Excessive discharge can cause polarity reversal of individual cells resulting in complete failure shortly thereafter.
4. CHECK THE LEVEL OF THE ELECTROLYTE IN WET LEAD-ACID LIQUID ELECTROLYTE BATTERIES MONTHLY. MAINTAIN THE PROPER ELECTROLYTE LEVEL BY ADDING WATER WHEN NECESSARY. Electrolyte levels lower during discharge and rise during charge. Therefore, it is mandatory that water be added to cells ONLY when they are fully charged; do not overfill. Old batteries require more frequent additions of water compared to new batteries.
5. Keep tops of batteries clean and dry to prevent excessive self-discharge. Keep battery terminals reasonably tight.

PERSONAL PRECAUTIONS

1. Someone should be within range of your voice or close enough to come to your aid when you work near a lead-acid battery.
2. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
3. Wear complete eye and clothing protection. Avoid touching eyes while working near battery.

4. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 10 minutes and get medical attention immediately.
5. NEVER smoke or allow a spark or flame in vicinity of battery.
6. Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short-circuit battery or other electrical part that may cause explosion.
7. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.
8. NEVER charge a frozen battery.

TROUBLESHOOTING GUIDE

 CAUTION: DO NOT DISASSEMBLE THE CHARGER. TAKE IT TO A QUALIFIED SERVICE AGENT WHEN SERVICE OR REPAIR IS REQUIRED. INCORRECT REASSEMBLY MAY RESULT IN A RISK OF ELECTRIC SHOCK OR FIRE.

The following procedures are intended only to determine if a malfunction may exist in the charger, or in the equipment and batteries.

 DANGER: TO REDUCE RISK OF ELECTRIC SHOCK, ALWAYS DISCONNECT BOTH THE POWER SUPPLY CORD AND THE OUTPUT CORD BEFORE ATTEMPTING MAINTENANCE OR CLEANING.

 CAUTION: DO NOT OPERATE THE CHARGER IF IT IS DAMAGED OR APPEARS TO BE MALFUNCTIONING. PERSONAL INJURY OR DAMAGE TO THE CHARGER AND/OR BATTERIES MAY RESULT.

Use the following chart to help you troubleshoot problems with the battery and charger system. There are four different modes that each light can have: OFF (light is off), SLOW BLINK (light blinks on and off once per second), FAST BLINK, (light blinks on and off eight times per second), and STEADY (light is full on).

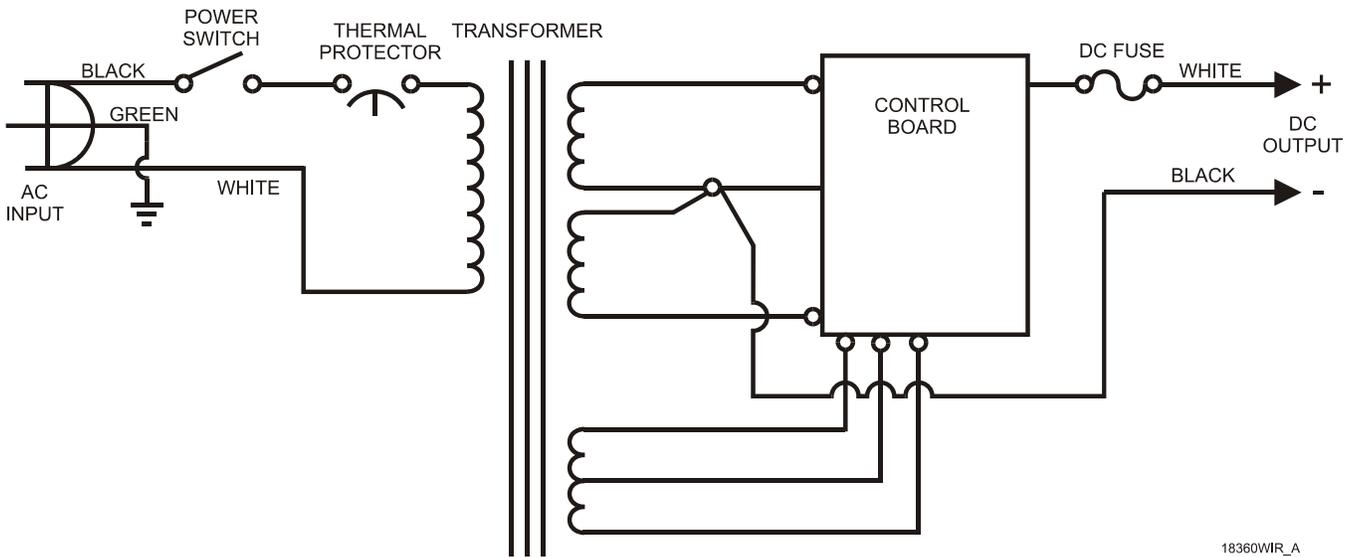
RED LIGHT	GREEN LIGHT	FUNCTION
Off	Off	No AC Power or No Battery Connected
Steady	Steady	Light test when AC connected
Off	Slow Blink	Charging (less than 80% Charged)
Off	Fast Blink	Charging (over 80% Charged)
Off	Steady	Normal charge completed
Steady	Off	Undervoltage shutoff, <18.0 Volts
Slow Blink	Off	Overvoltage shutoff, >33.96 Volts
Fast Blink	OFF	Max. timer shutoff, >18 hours

1. If the RED and GREEN lights do not illuminate within three (3) seconds after the AC power is applied to the charger, it indicates one of the following:
 - a. Charger "POWER" switch is not in "ON" position.
 - b. Charger is not plugged into a live AC outlet.
2. If both lights go off and stay off three to five (3-5) seconds after the charger connections are completed, it indicates one of the following and the charger is prevented from turning on:
 - a. DC plug not connected to the equipment receptacle.
 - b. Fault in equipment wiring. Poor or open connections in the wiring that connects to the batteries; corroded terminals, loose or worn plugs and receptacles, loose or worn fuseholders. (Have your dealer repair the equipment.)
 - c. Battery connections in equipment wrong (reverse polarity).
 - d. One or more batteries no longer serviceable (voltage below 7 volts for a 24-volt system).
3. If the charger turns off before the batteries are fully charged, it indicates one of the following:
 - a. Charger internal thermal breaker turned the charger off due to overheating because charger ventilation openings are blocked. After the charger has cooled down to a safe temperature, it will automatically restart. If

- the charger repeatedly overheats, it may be malfunctioning.
 - b. The AC power was interrupted during charge.
 - c. The DC cord charging plug accidentally disconnected during charge.
 - d. Fault in equipment wiring. The equipment charging circuit has high resistance, corroded or loose connections, loose or worn charging receptacle, loose or worn fuseholders.
4. A decrease in equipment range where it loses power earlier and earlier in the day indicates one of the following:
 - a. Use of the equipment before the batteries have been fully charged and the charger turns off, shortens battery life and hastens the onset of this reduced daily range.
 - b. Wet lead-acid batteries are being under charged on the absorbed glass mat (AGM) "BATTERY TYPE" switch setting.
 - c. Overcharging occurs when absorbed glass mat (AGM) batteries are charged on the wet lead-acid "BATTERY TYPE" switch setting.
 - d. The battery has been allowed to sulfate. Charge the battery no less frequently than once every three days when the equipment is lightly utilized. Once sulfation is allowed to take place, it may be partially reduced by returning, temporarily, to daily charging.
 - e. The electrolyte level in wet lead-acid batteries was allowed to drop below the top of the battery plates. Add distilled water to just cover the tops of the plates immediately upon discovery and fill to the proper level with distilled water at the completion of the very next charge cycle.
 - f. This is the normal wearout process for all types of deep-cycle motive power batteries.
5. If battery voltage does not exceed 18 volts after 10 minutes of charging, the charger turns off and the RED light will turn on steady, indicating one of the following:
 - a. Improper batteries used with charger. Must be a 24-volt, 12-cell, series-connected 2.45-2.50 volts per cell battery system.
 - b. Failed cells in the battery do not allow the battery voltage to rise above 18 volts.
6. The charger operates through 16 hours before turning off. The RED light will begin to blink very rapidly, indicating one of the following:
 - a. Batteries of higher than 150 amp-hour capacity (20 hr. rate) can require more than 16 hours to charge.

- b. New batteries can require more than 16 hours to charge.
 - c. Very deeply discharged batteries (100% discharged) can require more than 16 hours to charge.
 - d. Failed cells in the batteries that do not allow the charge rate to taper below 4 amps.
7. If battery voltage exceeds 2.83 volts per cell, the charger turns off and the RED light begins to slow blink, indicating one of the following:
- a. Improper batteries used with charger. Must be a 24-volt, 12-cell, series-connected 2.45-2.50 volts per cell battery system.
 - b. Battery design may be inappropriate for this use. Check with your dealer for deep-cycle batteries only.
 - c. Sulfation of batteries may have occurred.

WIRING DIAGRAM



18360WIR_A

PARTS LIST FOR MODEL 18360 TYPE 24EL12 120 VAC / 60 HZ

PART NO.	QTY.	DESCRIPTION
38433S	1	CASE ASSEMBLY
22458S	1	POWER SWITCH
04275S	2	BUSHING, STRAIN RELIEF, FOR CORDS
23083S	1	CORDSET, AC, 18/3, 102", W/ MOLDED PLUG
24286S	1	CORDSET, DC, 14/2, 108", W/ SB50 GRAY PLUG
26054S	1	CORDSET, DC, 14/2, 108", W/ SB50 RED PLUG

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