

ST Charger

Industrial Battery Charger

Installation and Operation Manual

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1. Installation

1.1. Receiving

Immediately upon receipt of the charger, check it against the shipping invoice to ensure the shipment is complete and undamaged. Examine the outside of the packing for signs of rough handling before accepting the charger from the carrier. If there is evidence of damage, the receipt should be signed, and both copies (carrier's and receiving copies) marked "Shipment Received Damaged". The carrier's representative should be called immediately and asked to make a "Carrier's Damage Report". If concealed damage is later detected, the carrier should be called and requested to make a "Carrier's Inspection for Concealed Damage Report". After inspection by the carrier, arrangements should be made with the charger representative to have the charger repaired before placing it in service.

When contacting your charger representative for assistance on a damage claim or shipment error, provide the Model, and Serial Number of the charger, and a full description of the damage or error. It is good practice to move the charger to the installation site before uncrating. When using bars, hammers, etc. for uncrating, use care to avoid damage to the charger.

1.2. Location

For the best operating conditions and longest life, take care in selecting an installation site. Avoid locations exposed to high humidity, temperature extremes or dust. Moisture condensing on machine parts and electrical components can cause corrosion, which seriously affects operation, efficiency and life. Dust and dirt will also decrease heat radiation from heat-generating components, such as transformers and diodes. This will result in higher operating temperatures and shorter life. Adequate air circulation is needed at all times in order to ensure proper operation. Provide a minimum of 6 inches of free air space at the sides and rear of the charger. The front of the charger must remain unobstructed for serviceability.

1.3. Line Voltage

ST chargers are set voltage chargers with appropriately sized AC cordage and plugs. Proper grounding of the charger is provided via the cordage and plug connector. The AC service should be verified as correct (voltage, amperage and grounding) for the charger prior to connecting the charger.

Warning! Changing the charger's AC connection cord and/or connector may create a hazardous condition. Refer to national and local electrical codes prior to making any changes.

1.4. AC Service Requirements

Follow local code requirements if they are different than the instructions in this manual. Refer to Table 1-1, to determine the correct ratings for the AC cable, AC fuses, and AC service disconnect switch for the line amperes as listed on the nameplate of the charger for the available AC voltage.

Line Amperes	Fuse Size Amps	Power Cable Size
0.1 - 4.0	05	#14
4.1 - 8.0	10	#14
8.1 -12.0	15	#14
12.1 - 16.0	20	#12
16.1 - 20.0	25	#10
20.1 - 24.0	30	#10
24.1 - 28.0	35	#10
28.1 - 32.0	40	#8
32.1 - 40.0	50	#8
40.1 - 48.0	60	#6
48.1 - 64.0	80	#4

1.5. Battery Connector Charging Cable

Verify that the connector on both the battery and the charger are attached so that the positive output terminal of the charger is connected to the positive battery terminal.

CAUTION! IF THE POLARITY IS REVERSED, THE DC FUSE WILL BLOW. IF IN DOUBT, CHECK THE POLARITY WITH A DC VOLTMETER.

2. Operation

The charger utilizes a ferro-resonant transformer to provide isolation from the AC service line and to regulate the charging current. The transformer output is connected to a full-wave bridge of silicon diodes, which provides DC charging current to the battery. The starting charge amps and length of time required for a charge vary depending on the charger model. See the data plate on the charger for information.

2.1 046-0266 CONTROL

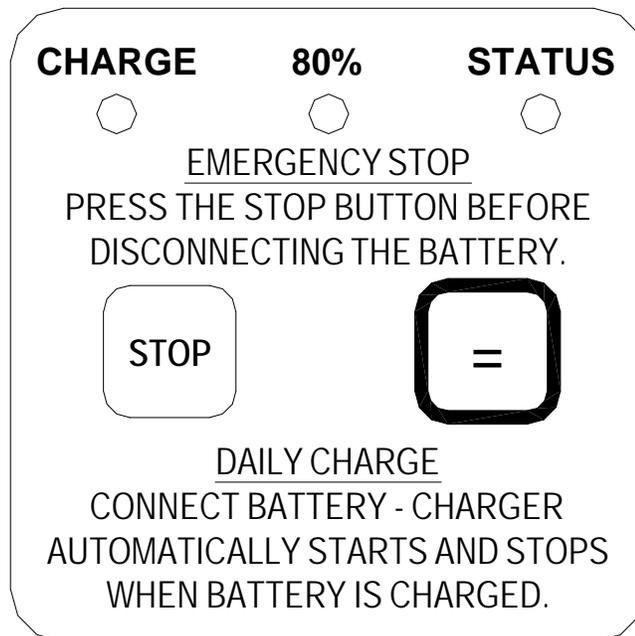
2.1.1 Feature Summary

- Charges flooded lead-acid batteries.
- Automatic start when battery is connected.
- Automatic stop when charge is finished.
- Fully charges partially discharged batteries without overcharging.
- Dead battery 'jump start' for overly-discharged batteries.
- Equalize charge by user request.
- Automatic shut-down if battery starts to overheat.
- Displays charge status and indications with LED's.

2.1.2 Control Description

The front panel has 3 LED's (light emitting diodes). A yellow 'CHARGE' LED indicates when the charger is charging. A yellow '80%' LED indicates when the battery has reached 80% state of charge. A multi-color 'STATUS' LED indicates charger status.

The front panel has a 2 button keypad that is used to manually stop the charge cycle, and to manually select an equalize cycle. A charge can be stopped by pressing the 'STOP' button. An equalize charge can be requested by pressing the '=' button and turned off by pressing it again.



046-0266 Control

2.1.3 Operation

The control provides fully automatic battery charging.

The standard charging profile for flooded lead-acid batteries has 2 phases. During phase 1 the battery is charged at high current until the battery is 80% charged. Then phase 1 terminates and phase 2 begins. As the battery voltage rises during phase 2, charging current tapers down toward the finish current and the battery voltage starts to flatten out. Phase 2 ends and the charge is terminated when the battery voltage no longer changes. This termination method is called 'dvdt-didt'.

The control offers several safeguards to protect the battery. If a wrong voltage battery is connected, the charger does not start. A 'Wrong-Battery-Voltage' condition is indicated. While charging, if the battery voltage exceeds a profile-specific cut-off value, the charge terminates. If the battery starts to overheat, the charge terminates.

2.1.4 Normal Daily Charge

When no battery is connected, the 'STATUS' multi-color LED is flashing green. Connecting a battery to the charger will cause the charger to perform a self-diagnostic test to verify the control is working properly. During this time a lamp test is performed causing all LED's to light. This allows the operator to observe any defective LED's.

When the self-diagnostic is complete, the charge starts and the yellow 'CHARGE' LED lights.

When the battery is 80% charged, the yellow '80%' LED lights and the charger starts phase 2 of the charge cycle. When the charge is finished, the 'STATUS' multi-color indicator lights green indicating the battery is ready to be taken.

Warning: Risk of explosion. Do not disconnect the battery while the charger is running. Hydrogen gas produced by the battery during charging can be ignited by arcing that occurs when the battery cable is disconnected.

If the battery must be disconnected before the end of the charge cycle, the charger should be turned off first. Press the 'STOP' button, and verify the 'CHARGE' LED goes out and the multi-color 'STATUS' LED is flashing amber. The battery can then be safely disconnected.

2.1.5 Equalize Charge

Over time batteries can develop inequalities in cell charge. This can lower the effective capacity of the battery and shorten life. An equalizing charge re-balances the charge in the battery cells. Perform an equalize charge if any of the following conditions exist:

1. On flooded batteries the specific gravity of any cell at the end of charge is 20 points less than the average of all the cells.
2. The on-charge voltage of any cell at the end of charge is 20 millivolts less than the average of all the cells.
3. The battery has been stored for 30 days.

The control performs an equalize charge when requested manually. First connect the battery and allow the charge to start normally. Then press the '=' button. The yellow 'CHARGE' LED will flash. The charge time will be extended to allow the cells to equalize their charge. The equalize cycle can be cleared by again pressing the '=' button. The yellow 'CHARGE' LED will remain solid.

2.1.6 Charge Indications

The following table shows the various charge indications displayed by the LED's. If an abnormal charge condition occurs, the charge is terminated.

State	CHARGE	80%	STATUS	Description
No Battery	o	o	"●"	Waiting for battery to be connected.
Lamp Test	●	●	●	A battery has been connected and the charger is performing a self-test prior to starting a charge cycle.
Charging Phase 1 (no =)	●	o	o	Normal charging. The battery has not reached the 80% point. An equalize will not be performed for this cycle.
Charging Phase 1 (=)	"●"	o	o	Normal charging. The battery has not reached the 80% point. An equalize will be performed for this cycle.
Charging Phase 2 (no =)	●	●	o	Normal charging. The battery has reached the 80% point. An equalize will not be performed for this cycle.
Charging Phase 2 (=)	"●"	●	o	Normal charging. The battery has reached the 80% point. An equalize will be performed for this cycle.
Equalizing	"●"	"●"	o	Charger is equalizing the battery.
Charge Complete	o	o	●	The charge cycle is complete and the battery may be taken.
Charge Terminated	o	o	"●"	The charge cycle was terminated by pressing the 'STOP' button.
F1	o	o	●	Possible shorted cell or low charging amps. Battery did not reach 80% (2.40 V/C) in allowed time.
F3/F4	o	o	"●"	Low battery voltage, less than 1.60 V/C (F3) or High battery voltage, more than 2.40 V/C (F4) at start up.
F5	o	o	●	No charging current to the battery.
F7	o	●	●	Long charge, the charger ran longer than allowed time.
F8	"●"	o	●	Charger stayed on when control requested it to shut off.

o = LED Off

● = LED On

"●" = LED Flashing

2.1.7 F3 (Low Battery) Override

If the battery voltage is below 1.6 volts per cell the charger will not start automatically. If this is due to an overly discharged battery of the correct voltage, the F3 indication can be manually overridden by pressing the 'STOP' button while the F3 indication (Low Battery) shows on the LED's.

3. Troubleshooting

Caution-There are lethal voltages exposed when the charger is energized with the enclosure open. Always disconnect the AC service voltage to the charger and disconnect the battery before opening the enclosure. The following chart lists the most probable cause of a malfunction.

3.1. No charging current, the control has no display, contactor does not operate.

POSSIBLE CAUSE

- A. No AC service voltage.
- B. Incorrect AC voltage.
- C. Defective control transformer.
- D. Defective control board.

3.2. No charging current, control has a display.

POSSIBLE CAUSE

- A. Blown DC fuse.
- B. Defective ammeter.
- C. Open battery cell.
- D. Defective diode.
- E. Defective capacitor.
- F. Shorted power transformer secondary.

3.3. AC fuse blows/Circuit breaker trips.

POSSIBLE CAUSE

- A. Incorrect fuse rating.
- B. Incorrect AC voltage.
- C. Shorted transformer winding.

3.4. DC fuse blows.

POSSIBLE CAUSE

- A. Reversed battery connector.
- B. Incorrect fuse rating.
- C. Shorted diode in rectifier assembly.

3.5. Excessive water loss in battery.

POSSIBLE CAUSE

- A. Charger amp-hour rating exceeds the battery amp-hour rating.
- B. Battery has defective cells.

3.6. Low specific gravity at the end of the charge cycle.

POSSIBLE CAUSE

- A. Battery was over-discharged.
- B. Charger amp-hour rating is less than the battery AH rating.
- C. Defective open diode.
- D. Battery has defective cells.
- E. Battery has been over-watered.

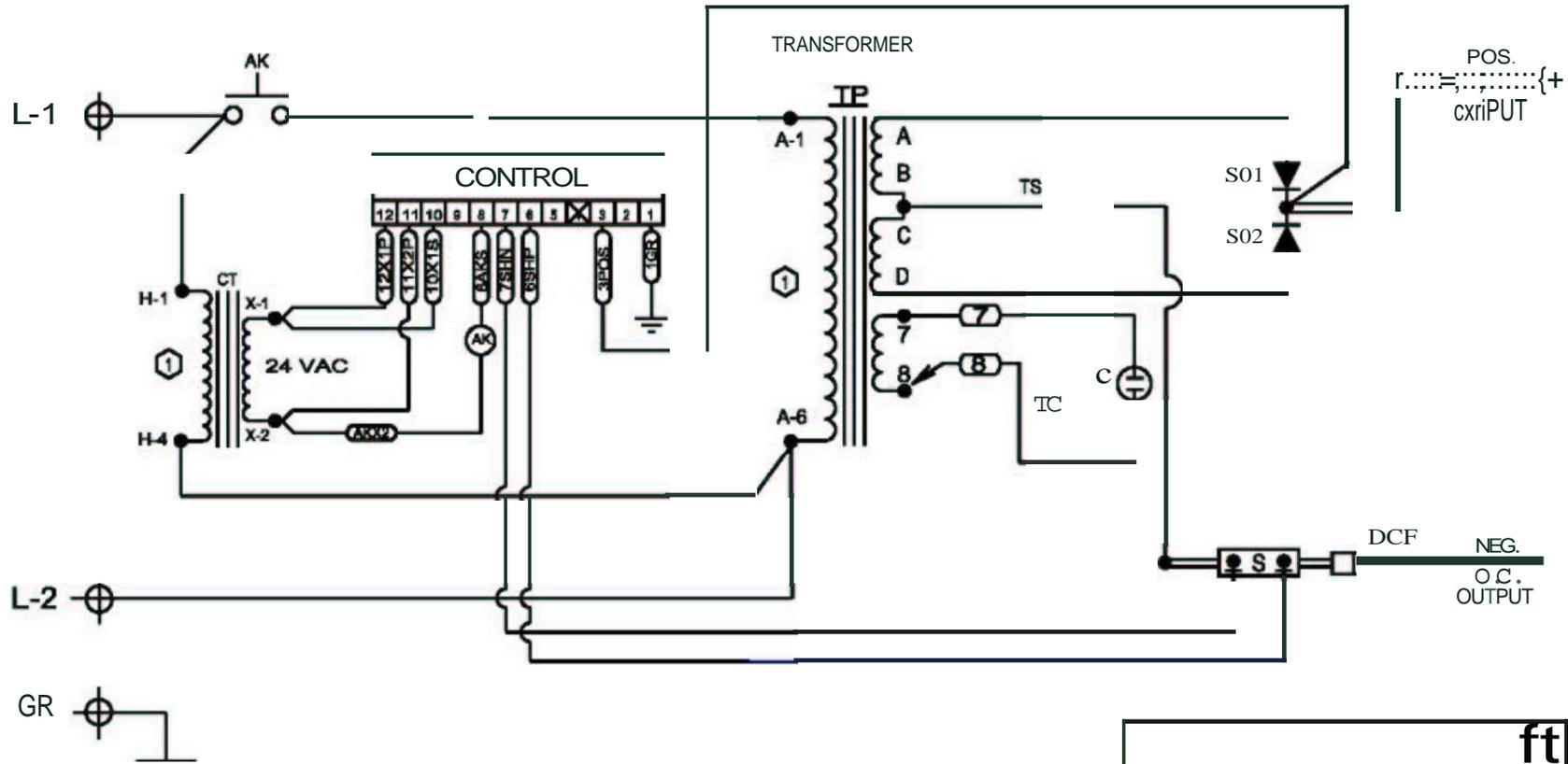
3.7. Charger does not turn off when the control terminates the charge cycle.

POSSIBLE CAUSE

- A. Defective control.
- B. AC contactor has welded contacts.

3.8. General Maintenance

The charger requires a minimum of maintenance. Connections and terminals should be kept clean and tight. The charger should be periodically cleaned with an air hose to prevent any excessive dirt build up on components. Care should be taken not to bump or move any adjustments during cleaning. Make sure that both the AC lines and the battery are disconnected before cleaning. The frequency of this type of maintenance depends on the environment in which this unit is installed. If any cabinet sheet metal panels are removed for cleaning, be certain they are properly reinstalled upon completion.



NOTES:
(Dshown in set voltage)

REV 1810N - - STANDARD CONFIGURATION, CORD CONNECTED

NO.	DATE
A	REMOVED RESISTOR
B	ADDED THERMAL OVERLOAD
C	REMOVED 5 NEG
E	REMOVED THERMAL OVERLOAD

DATE	DRW. BY:	APP. BY:	SCALE:	DATE:	SHEET:
02/06/98	CMP		NONE	04/03/93	
10/19/00					
02/06/01					

ft

ferro magnetics corporation
Power Systems

WIRING DIAGRAM : 1PHof<SE, TRANS

WIRING DIAGRAM # 02-524