



***Element***<sup>®</sup>

eco-friendly • efficient • energy



**ELEMENT<sup>®</sup> SERIES  
INDUSTRIAL BATTERY CHARGERS  
INSTALLATION & OPERATING  
INSTRUCTIONS**



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# SAFETY PRECAUTIONS

**BEFORE ATTEMPTING TO OPERATE THE CHARGER, PLEASE READ THIS GUIDE CAREFULLY.**

**SAVE THESE INSTRUCTIONS** – This guide contains important instructions for Element® High Frequency series product line that shall be followed during installation and maintenance of the charger. Only qualified personnel should install, operate, or service this equipment.

## WARNINGS:

- **WARNING Risk of High Voltages** – Lethal voltages are present within the charger enclosure whenever the ac line is energized and/or the battery/load is connected. The heatsinks and other internal components present the risk of electric shock.
- **WARNING Risk of Improper Grounding** – The charger must be connected to an ac power supply incorporating an earth/ground. The grounding conductor must be of a size equal to or larger than the line (phase) conductors.
- **WARNING Risk of Explosive Gases** – Working in the vicinity of a lead-acid battery is dangerous. Batteries generate explosive gases during charging and discharging. To reduce the risk of battery explosion, follow these safety instructions as well as those published by the battery manufacturer.
- **WARNING Protect Eye and Skin** – Wear safety goggles and skin protection while installing your battery charger or working in the vicinity of lead-acid batteries.
- To reduce the risk of injury, only charge rechargeable lead-acid batteries. Charging other battery types may cause damage and result in personal injury.

## CAUTIONS:

- **Risk of electric shock from stored energy.** Wait at least two minutes after de-energizing the ac line and disconnecting the battery/load before removing the cover.
- **Risk of electric shock and/or electric energy** - high current levels. Do not touch un-insulated battery, connectors or terminals. All tools should be adequately insulated to avoid the possibility of shorting connections. Inspect cables often for damage to the insulation. Replace cracked or worn cables immediately.
- **Risk of fire or explosion from gases vented by batteries.** Be sure to discharge static electricity from tools and technician by touching a grounded surface in the vicinity of the batteries. To prevent damage to the connectors and reduce the risk of explosion due to arcing, connect or disconnect the battery plug only when the charger output is off. ALWAYS press the STOP pushbutton before unplugging the battery to prevent arcing.
- **Risk of electrical component failure due to improper connection.** If the charger is incorrectly wired to input or output devices, or wiring is not in accordance with local safety codes and standards, the unit is at risk of being destroyed.

- **Risk of electrical component failure due to improper installation.** To prevent damage from overheating, proper airflow must be ensured. Do not restrict fan inlets or exhaust outlets. Do not mount the charger in a confined space or where the exhaust air will recirculate.
- There are no user serviceable parts within the charger enclosure. If service is required, contact the local GNB Industrial Power service representative.
- The charger is NOT for outdoor use. Do **not expose the charger to rain or snow.**
- Do not disconnect the battery while under charge.

**IMPORTANT:**

- Follow the battery manufacturer's published instructions when installing, charging and servicing batteries.
- These instructions assume a certain level of competence by the installer and/or user. The following practices and codes contain relevant information, and should be consulted for safe handling, installation, testing, and maintaining deep cycle batteries. Applicable state and local codes must be followed.
  - **NESC**, National Electric Safety Code, ANSI C2-1993 (or latest revision). Copies may be obtained by writing:  
 The Institute of Electrical and Electronics Engineers, Inc.  
 345 East 47<sup>th</sup> Street, New York, NY 10017, USA
  - **NEC** National Electrical Code NFPA-70 (or latest version) available from: National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
  - **Federal Codes:**  
 29CFR1926.441 "Safety Requirements for Special Equipment"  
 29CFR1910.151(c) "Medical Services and First Aid"  
 29CFR1910.305(j) "Wiring Methods, Components and Equipment"  
 STD 1-8.2(e) "OSHA Standing Directive"
  - **EMC** Compliance:  
 This device complies with Part 15 section 103 of FCC Rules as a digital device used exclusively as a power system in public utilities or industrial plants.  
 Operation is subject to the following two conditions:
    - (1) This device may not cause harmful interference, and
    - (2) This device must accept any interference received, including interference that may cause undesired operation.

## CHARGER SPECIFICATIONS

The *Element*® system specifications are listed below.

	LMT-06kW-48-xxxS	LMT-10kW-48-xxxT	LMT-10kW-80-xxxT
Nominal VA Ratings	48V / 150A	48V / 250A	80V / 120A
<b>Input Specs.</b>			
Voltage	480VAC, 3-phase +10% Delta Connection with Earth Ground		
Current (nominal)	8.3A rms / phase	13.8A rms / phase	13.8A rms / phase
AC Circuit Size	15A	20A	20A
Power Factor	0.96 (Active Power Factor Correction)		
<b>Output Specs.</b>			
Voltage	48V Nom. / 62.5V Max.	48V Nom. / 62.5V Max.	80V Nom. / 110V Max.
Current	150A Max.	250A Max.	120A Max.
Power	6 kW Max.	10 kW Max.	10 kW Max.
Pk-Pk Voltage Ripple	< 1%		
Efficiency (typical)	92% at Full Load		
<b>Protection</b>			
Input	<ul style="list-style-type: none"> <li>➤ Under voltage</li> <li>➤ Over Voltage</li> </ul>		
Output	<ul style="list-style-type: none"> <li>➤ Over Current</li> <li>➤ Over Voltage</li> <li>➤ Over temperature</li> <li>➤ Battery reverse polarity protection</li> </ul>		
<b>Operating Conditions</b>			
Ambient Temperature	0 – 40°C		
Humidity	10-90% RH non-condensing		
<b>Interface</b>			
Communication	Isolated RS-232 (Ethernet optional)		
User Interface	LCD/Keypad, RS-232, IR with a PDA (Palm Pilot)		
Cooling	Forced air (fans)		
<b>Mechanical</b>			
Dim. WxDxH	29"x8.5"x28"		
Weight	~ 98 lb		
Output Cabling	2/0 cables		
Output Connectors	SBX w/aux. contacts or Euro Connector		
Auxiliary Contacts	Interface with 5kΩ battery thermistor (optional)		
Certifications	UL and cUL Listed		
Note: Design and/or specifications are subject to change without notice. If questions arise, contact your local sales representative for clarification.			

## INSTALLATION PROCEDURE

### I. Charger Inspection

1. Upon receipt of the Element charger, verify that the shipping information (packing list) matches the charger rating (label on the side of the charger).
2. Upon receipt of the Element charger, ensure that there is no physical damage to the chassis, the LCD/keypad, the E-Stop/Disconnect switches, or the AC/DC cables. If you notice any damage, inform the shipping carrier and/or GNB Industrial Power.

**Do not install or operate the unit if it has received a sharp blow, been dropped or otherwise damaged.**

### II. Charger Physical Installation

1. Ensure that the charging area is well ventilated, dry, and adequately clean.
2. **Do not restrict airflow to the bottom air filter or top cover. Leave at least 1 ft spacing between the sides of the charger and any adjacent walls or barriers and 2 ft spacing between the bottom of the charger (air filter) and the floor / any mounting brackets.**
3. Use a cardboard sheet as a template to mark the locations for the hardware on the wall.
4. Drill and install the hardware needed to mount the charger on the wall.
5. Lift the charger and mount it on the wall using the installed hardware (Figure 1). Use ¼-20 hardware with lock washers to secure the charger to wall.



Figure 1: Charger installation

**CAUTION:** When installing, do not lift the unit from the middle of the lower cover as this may damage the filter. To reduce potential for filter damage, lift the charger using the lifting handles mounted on either side of the charger chassis (see Figure 2).

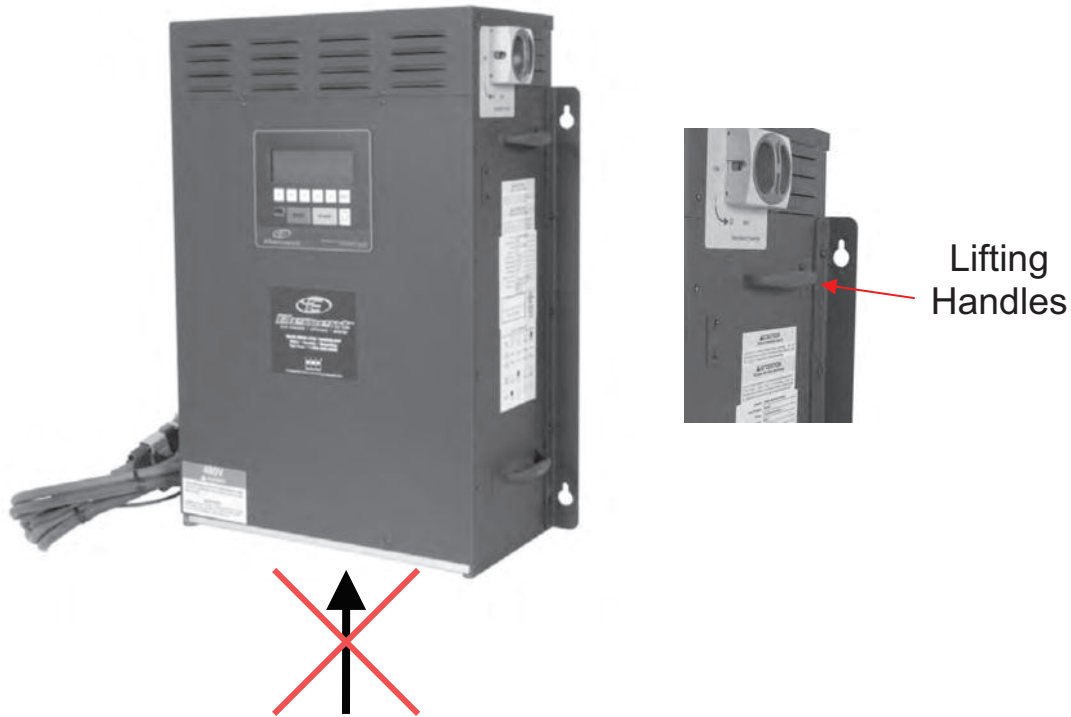


Figure 2: Charger lifting instructions

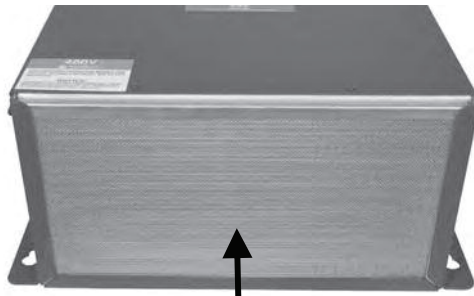
### III. Installing / Removing Air Filter

The charger is equipped with an air filter located in the lower cover of the unit. The air filter needs to be checked on a regular basis and cleaned if needed.

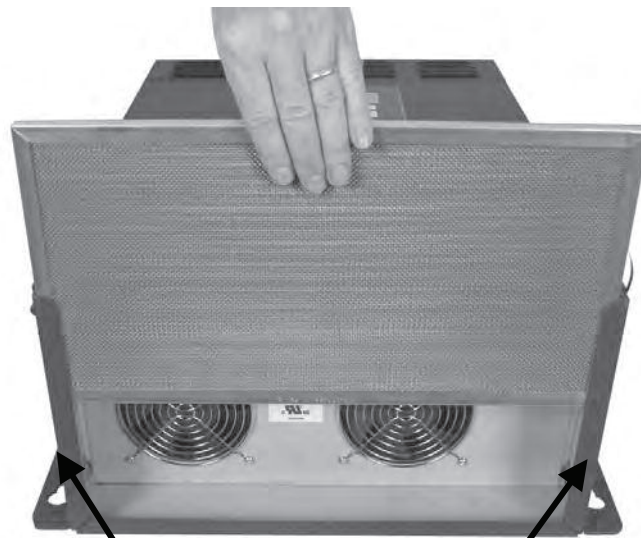
**ATTENTION: To clean the filter, use soap and water; dry thoroughly before installing.**

To remove the filter, hold the open end of the filter and slide out. To re-install, slide the filter into the lower cover guide and push in until fully inserted (Figure 3).





↑  
Air filter



Filter Guides

Figure 3: Installing / Replacing Air Filter

## Charger Electrical Installation

1. Verify proper AC line voltage and current ratings per the charger specifications as listed on the label on the side of the unit (see table below for proper AC line ratings).

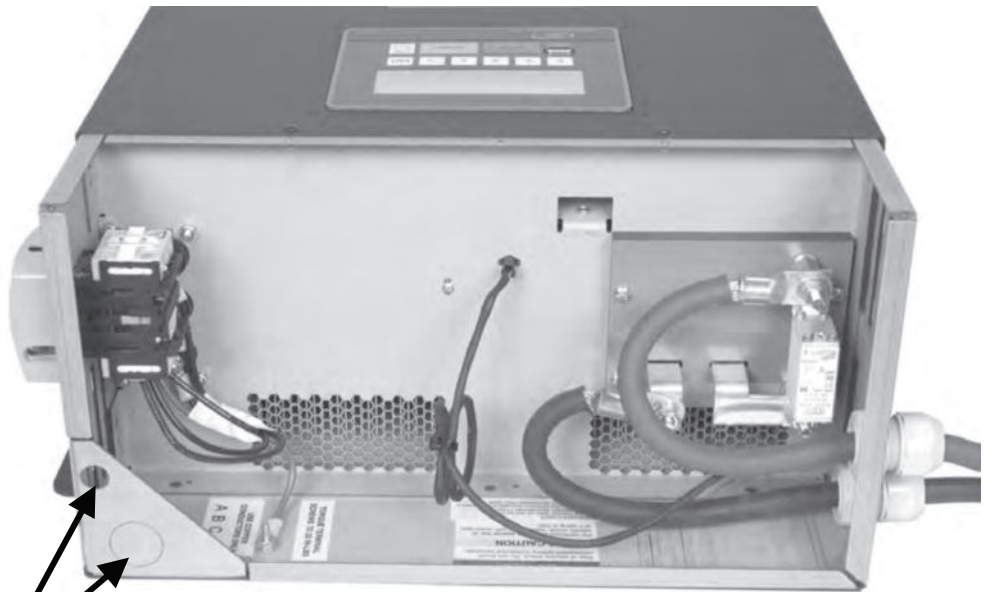
AC Line Ratings for Element Chargers

Charger Model	AC Voltage	AC Current	Disconnect Circuit (@125%)
LMT-06kW-48V	480VAC 3Ø (±10%) & GND	8.3 A nominal	15 A
LMT-10kW-48V-250A LMT-10kW-80V-120A	480VAC 3Ø (±10%) & GND	13.8 A nominal	20 A

2. Verify that the main power and emergency stop switches on the unit are in the off (stop) positions.
3. Figure 4) then push out one of the knockouts on the top cover to pass the AC conduit through. The AC & GND wire connections are shown in
4. Figure 5.
5. Connect the input 480VAC power cable to the three pole AC block terminals marked ABC (Figure 6). Connect the GND wire to the terminal marked GND as shown in Figure 7.
6. Note that the unit is not phase rotation sensitive, but noted here to avoid confusion.
7. Verify the line and ground connections of the outlet or junction box (4-Wire Delta – No Neutral).

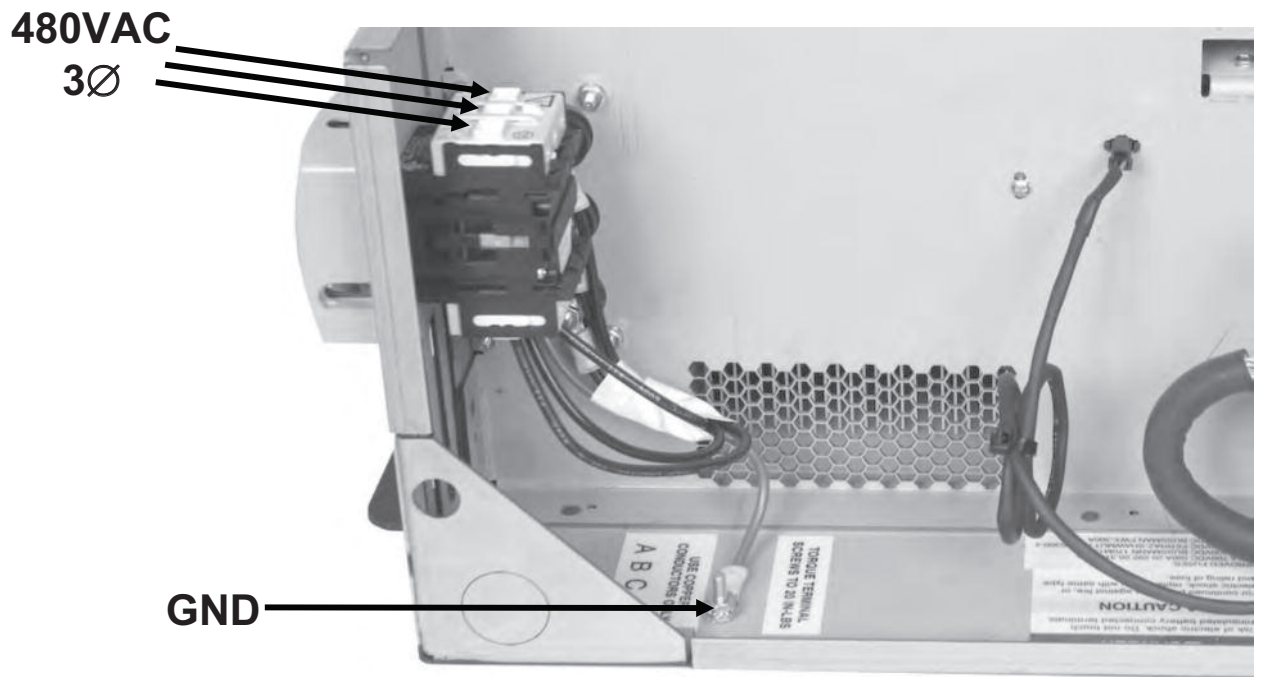
CAUTION: Verify that input and output wiring adheres to all local safety codes and standards.

THE UNIT IS NOW READY FOR OPERATION.



AC Knockouts

Figure 4: Removing top cover



480VAC  
3Ø

GND

Figure 5: AC wire connections

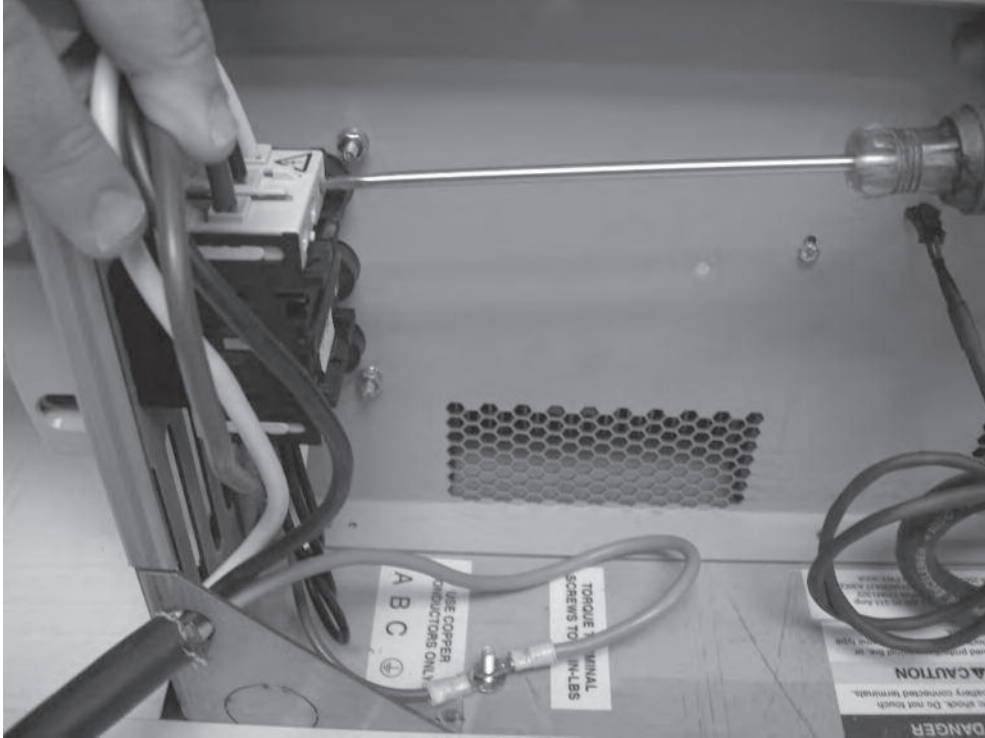


Figure 6 : Making AC wire connections

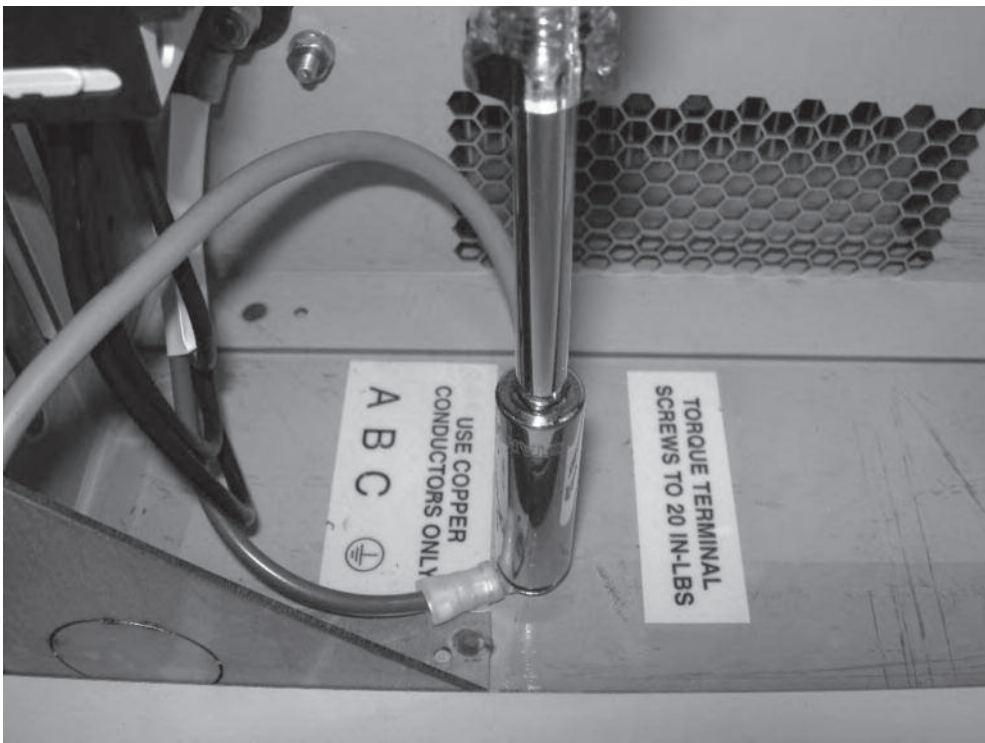


Figure 7: Connecting GND wire

## Charger Controls and User Interface

The charger main disconnect is located on the upper right side of charger. The user interface panel is located on the front of the charger (see Fig. 8).

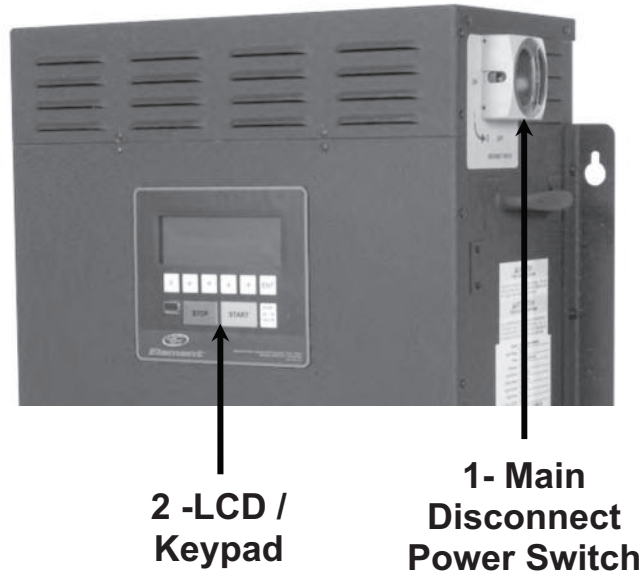


Fig. 8: Charger Controls

The following is a brief description of the charger controls:

- 1. Main Disconnect Switch:** This is a padlock type disconnect switch that should be in the OFF position and padlocked before any panels or drawers are removed. It disconnects AC power from all parts of the system.
  - 2. LCD/Keypad Assembly:** The main user interface for viewing and displaying operation and fault messages as well as programming the charger.
- The disconnect switch action is rotational where turning the switch clockwise will move the switch to the ON position (arrow pointing up) while turning the switch counter clockwise will move the switch to the OFF position (arrow pointing to the left) as shown in Fig. 9.



Fig. 9: Disconnect and Stop Switch Actions

- The LCD/Keypad assembly shown in Figure 10 encompasses:
  - A 4x20 character LCD for operation and fault message display
  - A 1x6 push button keypad with separate START and STOP push button
  - Two status LEDs for run (OK) and Fault indication
  - A serial RS-232 connector and an IR window



Fig. 10: LCD/Keypad and User Interfaces

- The status LEDs indicate the charger status, namely OK (**Green** LED lit) for normal operation, Fault (**Red** LED lit) when a fault trips (Fig. 11). For faults and troubleshooting, refer to the troubleshooting section of this manual.



Fig. 11: Charger status LEDs





## II. Starting a Charge Cycle

1. Connect the truck's battery to the charger. Once the battery is detected, the LCD message will change to "**Push Start to Begin Cycle**".

4	B	V																2	0	0	A				
0	?	/	1	9	/	0	?											1	2	:	0	0	:	0	0
				P	U	S	H			S	T	A	R	T						T	0				
					B	E	G	I	N			C	Y	C	L	E									

If the above message is not displayed, the battery may not have been detected. Make sure that the battery cables are connected properly and verify that the auxiliary contacts are proper and making good contact. Once a battery is connected, the above message will be displayed.

2. To start the charger, press the **START** button. A **STARTING CHARGE** screen will appear for few seconds as shown below.

				S	T	A	R	T	I	N	G			C	H	A	R	G	E					
E	X	I	T																					

3. The charge cycle will start and the following screen showing the charging operation will be displayed.

M	M		C	H	A	R	G	E						H	H	:	M	M	:	S	S		
			V	:	X	X	X	.	X					A	:	X	X	X	X				
			T	:	X	X	X	F						A	H	:	X	X	X	X			
E																F		5	2	%			

"MM" indicates the active charging mode, which can be Trickle, CC, CV, Finish, or Equalize. The Charge Timer, Battery Voltage, Current, Temperature, and returned Amp-Hours will all be displayed. Also, the battery state of charge is shown at the bottom of the screen.

4. To stop the charge cycle, press the **STOP** button. A **CHARGE CYCLE STOPPED** screen will appear as shown below.



C	H	A	R	G	E		C	Y	C	L	E		S	T	Ø	P	P	E	D
B	Y		U	S	E	R													

Pressing the **STOP** button for the second time will stop the charger completely and the unit will default to the Charger Idle screen. If necessary, it is now safe to disconnect the charger from the battery. Pressing the **START** button from the **CHARGE CYCLE STOPPED** screen will resume the charge cycle and the screen will again display the Charger Operation screen.

- Once the charge cycle has completed, the following screen will be displayed.

C	Y	C	L	E									H	H	:	M	M	:	S	S	
C	Ø	M	P	L	E	T	E														
T	E	M	P	:	X	X	X	F					A	H	R	S	:	X	X	X	X
E	X	I	T																		

The elapsed charging time, the battery temperature in degrees F, and the total returned amp-hours will be displayed.

**It is now safe to disconnect the battery from the charger.**

## CHARGER MENUS

Users can access various menus of the charger to view charge history, charger lifetime operational history, charger settings, charger model and serial number as well as activate a recovery cycle for a sulfated battery.

The charger menus can be accessed when the charger is idle, i.e. when the “**Connect Battery**” or the “**Push Start to Begin Cycle**” screens are displayed. Pushing the function key “**F**” will display the charger “**Main Menu**” while pushing the up/down (↑/↓) keys allows scrolling between the various menus of the charger.

### I. Charge Cycle History

1. With the “**Connect Battery**” or the “**Push Start to Begin Cycle**” screens are displayed, push the function key “**F**”. The “**Charge History**” menu will first appear.

M	A	I	N		M	E	N	U	:												
					C	H	A	R	G	E		H	I	S	T	Ø	R	Y			
E	X	I	T														E	N	T	E	R

Pressing the “**EXIT**” key will exit the charger menus while pressing the “**ENTER**” key will access the selected menu.

2. Push the ENTER key to access the charge cycle history. The charger can hold up to 100 charge cycles which can be displayed (Note that the first cycle will be cycle 0 and the last will be cycle 99). The last charge cycle is displayed first. Note that the charger will only save the last 100 charge cycles.

C	H	#	9	9		0	7	/	1	9	/	0	7		0	4	:	2	0			
V	Ø	L	T	:	5	8	.	6			H	R	S	:	0	3	:	2	1			
T	E	M	P	:	9	8	F				A	H	R	S	:	5	6	2				

The above screen will display the following:

- CH#XX: Charge cycle number
- 01/01/05: Start date of the charge cycle
- 04:20: Start time of charge cycle
- VOLT: Battery end of charge voltage
- HRS: Duration of charge cycle
- TEMP: Maximum battery temperature recorded
- AHRS: Amp-hours returned

3. Pressing the left/right (←/→) keys will display the second screen of the charger history.

C	H	#	9	9		0	7	/	1	9	/	0	7		0	4	:	2	0
A	C	T	I	V	A	T	E	D		P	R	0	F	I	L	E	S	:	
T	R		C	C		C	V		F	I		E	Q						
S	T	A	T	E	:	X	X	X	X	X	X	X	X	X	X	X	X	X	X

The second screen lists additional relevant information about the charge cycle including:

**ACTIVATED**

**PROFILES:** Lists the profiles that were activated during that cycle.

**STATE:** Shows whether the cycle completed successfully or interrupted by the user or due to a fault.

The **ACTIVATED PROFILES** allows users to check whether certain profiles were activated during certain times (e.g. equalize cycles on the preset days). The **STATE** field lists the state of the charge when the cycle was terminated. The following messages may appear:

**COMPLETED:** Cycle completed successfully

**STOPPED:** Cycle stopped by user

**XX FAULT # Y:** Charger fault with drawer # Y

If a fault took place, the reference to the drawer number allows quick identification of a problem or faulty drawer.

4. Pressing the up/down (↑/↓) keys allows scrolling between the various charge cycles saved.

## II. ACTIVE PROFILES

While in the **Main Menu**, press the up/down (↑/↓) keys until the **Charge Profiles** screen appears.

A	C	T	I	V	E		P	R	0	F	I	L	E	:	P	0			
P	0	:	T	R		C	C		C	V							Z	P	
P	1	:	T	R		C	C		C	V		F	I		E	Q		Z	P

The **Active Profile** screen shows the charger’s active profile as well as the profiles 0 and 1 settings. For each profile, the programmed charge modes are listed. Refer to the charger programming section for further details.

### III. Charger Lifetime History

While in the **Main Menu**, press the up/down (↑/↓) keys until the **Lifetime Summary** screen appears.

M	A	I	N	M	E	N	U	:												
		L	I	F	E	T	I	M	E	S	U	M	M	A	R	Y				
E	X	I	T													E	N	T	E	R

Pressing the “**ENTER**” key will access the selected menu. The charger lifetime operational summary screen will then appear.

F	I	R	S	T	C	H	A	R	G	:	0	7	/	1	9	/	0	7		
C	H	R	G		H	0	U	R	S	:	1	2	3	4						
A	M	P			H	0	U	R	S	:	1	2	3	4	5					
K	W				H	0	U	R	S	:	1	2	3	4						

The above variables allow users to verify charger usage since installation and compare usage of a specific charger versus others in the vicinity or in the plant.

### IV. CHARGER MODEL AND SERIAL NUMBER

While in the **Main Menu**, press the up/down (↑/↓) keys until the **Charger Model** screen appears.

M	0	D	E	L	:	P	C	H	G	-	L	V	-	6	0	0	4	8		
M	F	G			I	D	:	2	0	0	5	0	1	0	0	0	1			
M	F	G			D	A	T	E	:	0	7	/	1	9	/	2	0	0	7	
R	E	V	I	S	I	0	N	:		1	.	1	0							

The charger model number, ID, manufacturing date and firmware revision are shown for reference.

### V. RECOVERY CYCLE FOR SULFATED BATTERIES

One of the unique features of this charger is the ability to activate a long safe recovery cycle for sulfated batteries. This can be easily done by accessing the recovery cycle screen and starting a recovery cycle for a given battery.

1. While in the **Main Menu**, press the up/down (↑/↓) keys until the **Recovery Cycle for Sulfated Battery** screen appears.

M	A	I	N	M	E	N	U	:												
	R	E	C	O	V	E	R	Y		C	Y	C	L	E		F	O	R		
		S	U	L	F	A	T	E	D		B	A	T	T	E	R	Y			
E	X	I	T													E	N	T	E	R

Pressing the "ENTER" key will access the selected menu. The user will then be prompted to enter the battery voltage, charge current, and required cycle time.

		N	O	M	I	N	A	L		B	A	T	T	E	R	Y				
						V	O	L	T	A	G	E								
								4	B	V										
E	X	I	T													E	N	T	E	R

Pressing the up/down (↑/↓) keys will change the battery voltage setting (24V/36V/48V). Select the correct voltage then press the "ENTER" key. The recovery charge current setting screen will then appear.

		R	E	C	O	V	E	R	Y		C	H	A	R	G	E				
						C	U	R	R	E	N	T								
								1	D	A										
E	X	I	T													E	N	T	E	R

Pressing the up/down (↑/↓) keys will change the recovery charge current setting in 5 A increments. Recommended recovery charge current rates are 3A-5A / 100 Ahrs.

Select the correct value then press the "ENTER" key. The recovery charge timer screen will then appear.

		R	E	C	O	V	E	R	Y		C	H	A	R	G	E				
								T	I	M	E	R								
								1	2	:	0	0								
E	X	I	T													E	N	T	E	R

Pressing the up/down (↑/↓) keys will change the charge timer setting. The recommended charge timer setting is 12-24 hours. Longer recovery cycles may be needed as necessary.



## TROUBLESHOOTING

Under normal operation, the **Status OK LED** (green) is lit. In case of a fault, the **Status FAULT LED** (red) is lit. If that occurs, perform the following:

1. Note the fault message that appears on the screen. **Make sure to note the second line of the fault message as it indicates the type of fault.** It is important to note the fault message precisely as that will help identify the cause of the fault so that a fix can be quickly found.
2. Open the charger louvered front door and note if any of the charging drawers has a **RED LED** light (upper left corner of the front panel of the charging drawer). The charging drawer(s) with a **RED LED** is (are) the one(s) that initiated the fault.

### I. Charger Not Operational

When the charger is first turned on, with the main disconnect power switch in the **ON** (CW) position, the LCD should be ON with the **CHARGER IDLE** message displayed.

If the problem persists, perform the following:

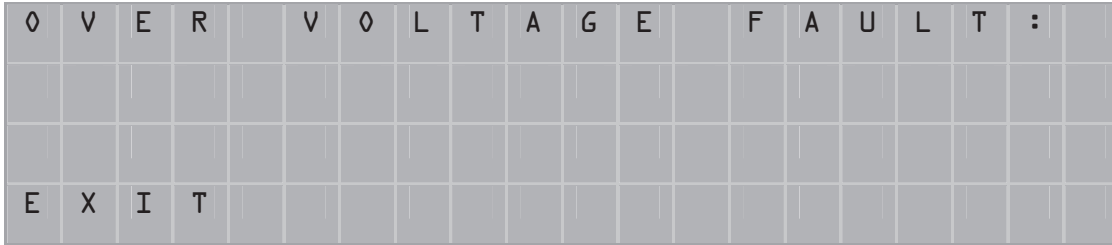
- A. Turn off the unit. Main disconnect power switch should be in the OFF (CCW) position
- B. Ensure proper AC wiring
- C. Ensure the main AC disconnect (wall) is energized
- D. Verify fuses in main AC junction box (wall)
- E. Using an AC voltmeter, verify that the supply voltage for all three phases (AC mains line to line) matches the specification for the charger and are within the charger tolerances.

After going through the checklist above, restart the unit once more. If the problem persists, contact the local GNB Industrial Power service representative.

**DO NOT ATTEMPT TO SERVICE THE UNIT.**







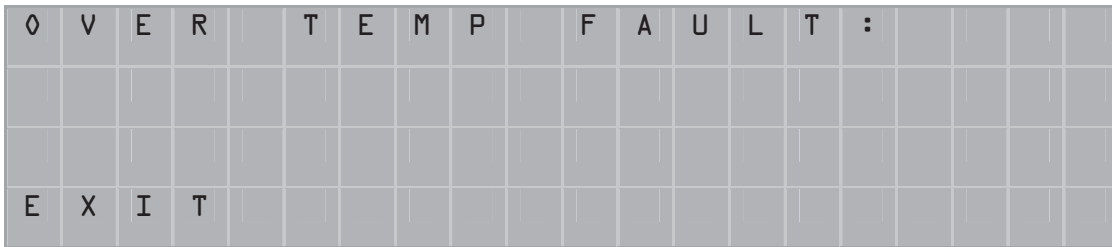
**Possible Causes:**

- Worn DC cables (open or short)
- Improper DC cable connections

**Troubleshooting:**

1. Press the **STOP** key to revert to the IDLE screen.
2. Verify that the output cables are in good working condition and are properly connected to the battery.
3. Restart the charge cycle by pressing the **START** key.
4. If the fault persists, turn off the charger and contact the local GNB Industrial Power service representative.

**3. Over Temperature**



**Possible Causes:**

- Blocked air flow to the charger
- Failed fan

**Troubleshooting:**

1. Press the **STOP** key to revert to the IDLE screen.
2. Allow the charger to cool down
3. Make sure there that there are no airflow restrictions on the sides or bottom of the charger.

4. Restart the charge cycle by pressing the **START** key.
5. If the charger starts with no faults, the fault was likely caused by the build up of heat in the charger.
6. If the fault persists, verify that all fans are operational. If one or more fans are not operational, switch off the disconnect switch and contact GNB Industrial Power.

#### 4. Battery Disconnected Fault

C	H	A	R	G	E		C	Y	C	L	E		S	T	Ø	P	P	E	D
B	A	T	T	E	R	Y		D	I	C	Ø	N	N	E	C	T	E	D	
E	X	I	T																

##### Possible Causes:

- Battery cable was disconnected while the charger cycle is active
- The charger or battery cables are worn out
- The charger or battery connectors' contacts are worn out

##### Troubleshooting:

1. If the battery was intentionally disconnected, press the **STOP** key to clear the fault message.
2. If the battery was not intentionally disconnected, check the charger and battery cables as well as the charger and battery connectors' contacts. Fix or replace worn out contacts / cables.
3. Press the **STOP** key to clear the fault message.
4. Restart the charge cycle by pressing the **START** key.
5. If the fault persists, turn off the charger and contact GNB Industrial Power.

#### 5. Battery Fault: Over Temperature

B	A	T	T	E	R	Y		F	A	U	L	T	:		Ø	V	E	R	
B	A	T	T	E	R	Y		T	E	M	P	E	R	A	T	U	R	E	
E	X	I	T																

**Possible Causes:**

- Battery temperature exceeded preset limit
- Faulty (worn) thermistor

**Troubleshooting:**

1. Press the **STOP** key to revert to the IDLE screen.
2. Measure the battery tray temperature. **If an elevated battery temperature is detected, do not re-start the charge cycle.**
3. If no elevated battery temperature is detected, verify battery cable connections including the auxiliary thermistor connections.
4. Restart the charge cycle by pressing the **START** key.
5. If the fault persists, turn off the charger and contact GNB Industrial Power.

**6. Battery Fault: Battery Not Detected (When Battery is Connected)**

4	B	V															2	0	0	A
0	1	/	0	1	/	0	5						1	2	:	0	0	:	0	0
			C	O	N	N	E	C	T				B	A	T	T	E	R	Y	
D	I	S	P	L	A	Y														

**Possible Causes:**

- Battery auxiliary wiring is damaged
- Charger auxiliary wiring is damaged

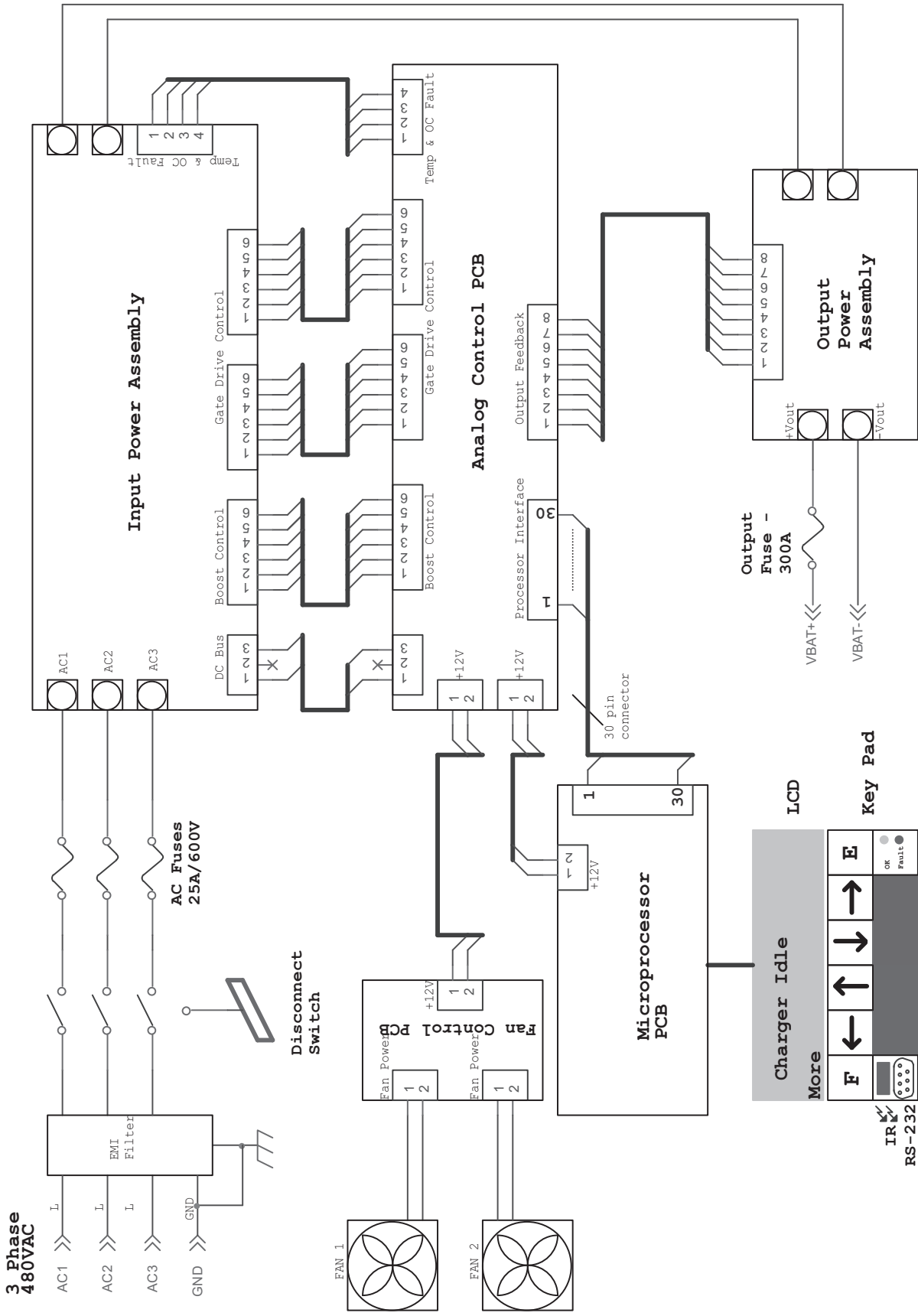
**Troubleshooting:**

1. Verify there is 2k-5k  $\Omega$  on the thermistor auxiliary contacts (Reading depends on battery temperature)
2. Verify there is zero  $\Omega$  on the opposite auxiliary contacts
3. Verify there are no open connections on the charger auxiliary contacts



## **Appendix**

### **Charging System Block Diagrams**



**Battery Charger System Block Diagram**





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