CHARGING SOLUTIONS

PTO™ MOD3

PTO™ MOD3 Battery Charger

OWNER'S MANUAL

Model: PTO3

Skip to page 25 For Model:
PTOM1, PTOM3, and PTOM3C (Standard and Flex)

HAWKER®

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CONTENTS

Features

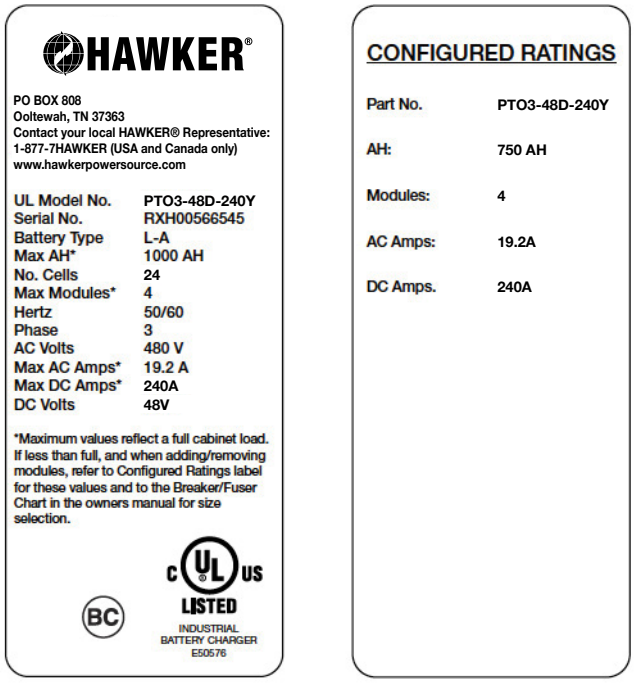
- Microprocessor-controlled
- Compatible with battery voltages of 12, 24, 36, 48, 60, 64, 72 and 80
- Unique profile for charging Thin Plate Pure Lead (TPPL)
- Unique profiles for HAWKER FLEX® battery charge applications.
- Flooded, Gel, VRLA, Opportunity, Cold storage, FLEX bloc batteries and FLEX 2V batteries.
- Fully programmable to unique fleet requirements
- Battery chemistry agnostic - TPPL, Flooded and Gel Lead Acid

Technical Information

Main nameplates (UL model number) vs. Configured Rating (Part number) labels

There are two nameplates located on the outside of the charger. The Main nameplate includes the UL model number and the ratings of the cabinet at its full capacity, while the Configured Ratings nameplate includes the part number and the ratings of the cabinet as configured. The Configured Ratings nameplate label must be replaced when adding or removing modules permanently in the field.

The part number is required in any discussion or correspondence regarding this unit.



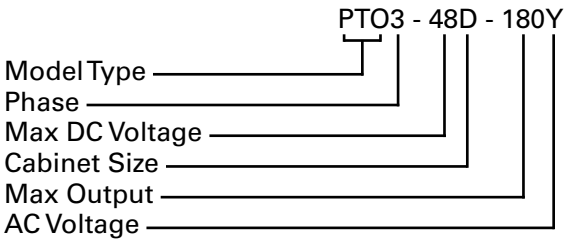
Nameplate Labels

Technical Information (cont.)

Nameplate Label Definitions

Item	Description
UL Model No	UL recognized number that indicates the ratings of the cabinet at its full capacity.
Serial Number	Provides date code.
Battery type	L-A: Lead Acid; Li-ion: Lithium-ion.
Max Ah	Maximum amp-hour capacity of this cabinet.
No. Cells	Number of battery cells this unit will charge. **Any battery connected to the charger output should have the same number of cells.**
Max Modules	Maximum number of modules the cabinet can hold.
Hertz	AC input voltage frequency. **Under no conditions operate the charger at a different frequency or from a generator with unstable frequency**
Phase	Number "3" indicates a three phase charger and number "1" indicates a single phase charger.
AC Volts	Nominal voltage for which this charger is rated to operate.
Max AC Amps	Maximum AC amps for which this cabinet is rated.
Max DC Amps	Maximum output DC amps for which this charger is rated.
DC Volts	Nominal DC output voltage of the charger.
Part Number	Indicates the complete information about the charger.
Ah	Largest ampere-hour (Ah) capacity of the battery this charger is designed to charge efficiently as configured.
Modules	Actual number of power modules installed in the charger cabinet.
AC Amps	AC current drawn by the charger with the number of power modules shown in Configured Ratings nameplate.
DC Amps	DC current that this charger will deliver to a discharged battery with the number of power modules installed.
CEC	Logo is applied to chargers that are certified with the California Energy Commission in compliance with appliance efficiency regulations.
cULus	Logo is applied to chargers that have been tested to applicable standards and requirements by Underwriter Laboratories (UL) and the Canadian Standards Association (CSA). c UL us LISTED

Single Display Cabinet:



Technical Information (cont.)

Cabinet Size (number of modules available) and DC Cable Size

Letter Code	Module Positions	Standard Cable Gauge	Comments
D	4	3/0	Four slot, 3.5 kW cabinet
F	6	3/0	Six slot, 3.5 kW cabinet
H	8	3/0	Eight slot, 3.5 kW cabinet

AC Line Voltage

Letter Code	Voltage(s) (volts rms)	Line Frequency (Hertz)	Comments
C	600	50/60	600 VAC only
G	208/220/240	50/60	208/220/240 VAC
Y	480	50/60	480 VAC only

Description
Remote control capable (order remote control separately)
Red/Green Next Battery Capable – USED in conjunction with BSI and BSS
PLC capable
LAN (ethernet compatible)

CABLES
Extra length charging leads (10' standard w/charger)

Cable Length
15 ft. charging lead
20 ft. charging lead
25 ft. charging lead
30 ft. charging lead

NOTES:
- AC input voltage + 10%
- Frequency Hz 50/60
- Battery cable length: 10 ft standard – optional 15, 20, 25, 30 ft.
- IP protection IP20
- Operating temperature 32 to 113°F
- Display –TFT LCD

(*) Opportunity Profile Options

Operation: In Opportunity charging mode, the user can charge the battery during breaks, lunch, or any available time during the work schedule. The Opportunity charge profile allows the battery to be safely charged while it is kept in a partial state of charge between 20% and 80% of C6 throughout the work week. Sufficient time should be scheduled after the weekly equalize charge to allow battery cooling and to perform periodical electrolyte level checks.
Daily Charge: This option can be set to add additional daily charging time, if the work schedule allows. It should be considered only when the daily work demand requires additional capacity.

Equalization Charging
Equalization charging for traditional flooded lead acid batteries, performed after normal charging, balances the electrolyte densities in the battery's cells.
NOTE: The factory default is Daily Charge ENABLE.

Block-Out Time
This function inhibits the charger from charging the battery during the block-out time window. If a charge cycle has started before the block-out window it is inhibited during the block-out window and will automatically restart the charge cycle at the end of the block-out window.

Refresh charging
Refresh or maintenance charging enables the charger to maintain the battery at maximum state of charge as long as it is attached to the charger.

Important Safety Instructions

⚠ WARNING THE SHIPPING PALLET MUST BE REMOVED FOR PROPER AND SAFE OPERATION.

1. This manual contains important safety and operating instructions. Before using the battery charger, read all instructions, **CAUTIONs**, and **WARNINGs** on the battery charger, the battery, and the product using the battery.
2. This charger has been designed to only charge lead-acid and lithium batteries. Read and understand all setup and operating instructions before using the battery charger to prevent damage to the battery and to the charger.
3. **Do not** touch non-insulated parts of the output connector or the battery terminals to prevent electrical shock.
4. While charging, batteries produce hydrogen gas, which can explode if ignited. Never smoke, use an open flame, or create sparks in the vicinity of the battery. Ventilate well when the battery is in an enclosed space.
5. Unless charger is equipped with LM2 (Late Break/Early Make) feature, **do not** connect or disconnect the battery plug while the charger is on. Doing so will cause arcing and burning of the connector, resulting in charger damage or battery explosion.
6. Lead-acid batteries contain sulfuric acid which causes burns. **Do not** get in eyes, on skin, or on clothing. In case of contact with eyes, flush immediately with clean water for 15 minutes. Seek medical attention immediately.
7. Only factory-qualified personnel can service this equipment. De-energize all AC and DC power connections before servicing the charger.
8. The charger is **not** for outdoor use.
9. **Do not** expose the charger to moisture. Operating **conditions** should be 32° to 113°F (0° to 45°C); 0 to 70% relative humidity.
10. Do not operate the charger if it has been dropped, received a sharp hit, or is otherwise damaged in any way.
11. For continued protection and to reduce the risk of fire, install chargers on a floor of non-combustible material such as stone, brick or grounded metal.
12. For HAWKER FLEX® batteries, use only HAWKER® battery packs that include the battery management system and all necessary protection for the battery pack integral to the pack.
13. The DC cables of the charger emit low-power magnetic fields in their surroundings (<5cm). People with medical implant devices should avoid being near charger while charging.

Installation

Location
For safe operation, choose a location which is free of excess moisture, dust, combustible material, and corrosive fumes. Also, **avoid high temperatures (above 113ºF [45ºC])** or potential liquid spills on the charger.
Do not obstruct the openings in the charger for air ventilation.
Follow charger warning label instructions when mounting on or over a combustible surface.
It is recommended to mount the charger **at least 28 inches radial distance** away from the closest top edge of the battery.

Cabinet Mounting
The charger must be mounted on a wall, stand, shelf or floor in a vertical position. The minimum distance between two chargers must be 12 inches. The charger must be installed with four 5/15-inch bolts or with the bracket supplied. Charger should be permanently fastened in place.
For shelf mounting, part number 159-6LA22723 is required – two per charger.

Electrical Connections
To prevent failure of the charger, make sure it is connected to the correct line voltage. Follow your local and National Electric Code (NEC) in making these connections.

⚠ WARNING Make sure the power source is OFF and the battery is disconnected before connecting the input power to the terminals of the charger.

Connecting Input Power
Connect the input power to the appropriate terminals and apply appropriate torque as follow:

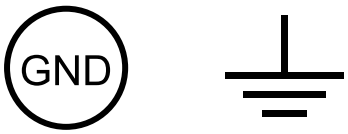
Phase	Power (kW)	Cabinet (Bay)	Terminals			Torque (in-lbs)
1	2.5/3.5	4	L2			15
3	2.5/3.5	4 and 6	L1	L2	L3	15
3	2.5/3.5	8	L1	L2	L3	25

Three phase chargers are not phase rotation sensitive and work with a grounded Delta or Wye electrical service configuration.

AC Circuit Protection
The user must provide suitable branch circuit protection and a disconnect method from the AC power supply to the charger to allow for safe servicing.

⚠ CAUTION **Risk of Fire.** Use only on circuits provided with branch circuit protection in accordance with the Breaker/Fuse Chart table in this manual, and the National Electrical Code, NFPA 70.

Grounding the Charger
Connect ground wire to terminal marked with either of the two symbols below and apply same torque value per table above:



⚠ DANGER FAILURE TO GROUND THE CHARGER COULD LEAD TO FATAL ELECTRIC SHOCK. Follow National Electric Code for ground wire sizing.

AC Circuit Protection
The user must provide suitable branch circuit protection and a disconnect method from the AC power supply to the charger to allow for safe servicing.

⚠ CAUTION **Risk of Fire.** Use only on circuits provided with branch circuit protection in accordance with the Breaker/Fuse Chart table in this manual, and the National Electrical Code, NFPA 70.

Installation (cont.)

AC Amps (A)	Description
1 - 12	15
12.1 - 16	20
16.1 - 20	25
20.1 - 24	30
24.1 -28	35
28.1 - 32	40
32.1 - 36	45
36.1 - 40	50
40.1 - 48	60
48.1 - 56	70
56.1 - 64	80
64.1 - 72	90
72.1 - 80	100
80.1 - 88	110
88.1 - 100	125

DC Plug Polarity
The charging cables are connected to the DC output of the charger with the red cable to the positive bussbar, and the black cable to the negative bussbar. The red cable is terminated into the "+" side of the battery connector, and the black cable is terminated into the "-" side of the connector. The output polarity of the charger must be observed when connecting to the battery (read warning above). Improper connection will open the DC fuses in the power modules.

Glossary

Charging Profile
The charging profile defines the rate of current charge over time. The charger adapts to the battery's age and level of discharge. Controlling the overcharge coefficient, whatever the battery's discharge level, reduces the amount of electricity consumed.

Cold Storage Profile
This is a charging profile that allows the configuration of the charger for use with batteries in cold storage application. The profile is an IEI (constant current, constant voltage, constant current) type with a number of user configurable parameters.

Equalization Charging
Equalization charging, performed after normal charging, balances the electrolyte densities in the battery's cells.

STD Flooded (IEI) Profile
The profile is an IEI (constant current, constant voltage, constant current) type with a number of user-configurable parameters.

Gel Profile
This charging profile allows for valve regulated lead-acid batteries to be charged. This charging profile is an IEIE (constant current, constant voltage, constant current, constant voltage) type.

Opportunity Profile
This charging profile is used when opportunity charging is desired. It includes a start rate of up to 25% of the battery's 6-hour rated amp hour capacity and requires an equalize charge performed once a week. The weekly equalize charge can be programmed to run automatically.

Operation
During opportunity charging the user can charge the battery during breaks, lunch or any available time during the work day. The Opportunity Profile allows the battery to be safely charged while it is in a kept in a partial state of charge between 20% and 80% of the 6-hour rated capacity during the work week. Sufficient time should be scheduled after the weekly equalize charge to check and maintain electrolyte levels and allow the battery to cool to ambient temperatures.

Glossary (cont.)

Opportunity Profile (cont.)

Daily Charge
When using the Opportunity Profile, the Daily Charge option can be set to add additional charging time every day if the work schedule allows. This option should be considered only when the daily work demand requires more than 80% of the 6-hour rated capacity.

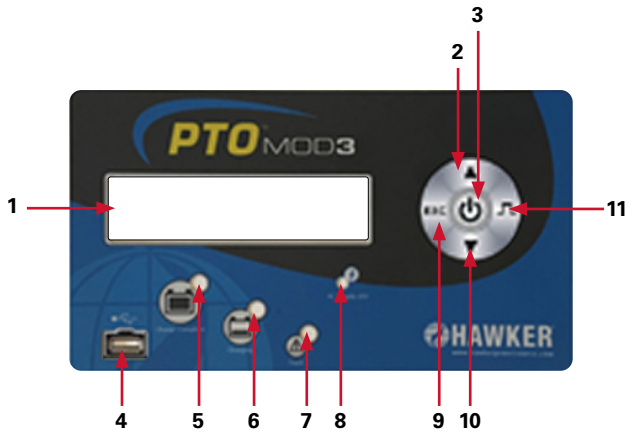
FXBLOC
This charging profile allows the charging of HAWKER FLEX® bloc batteries.

FXSTND
This charging profile allows the charging of HAWKER FLEX® 2V batteries at rates up to 0.25 of C6.

Refresh Charging
Refresh or maintenance charging enables the battery to be maintained at maximum charge all the time that it is connected to the charger.

Operating Instructions

Ref	Function	Description
1	LCD display	Display charger operation info/menus
2	Navigate UP button	Navigate menus/Change values
3	ENTER/STOP & START button	Select menu items/Enter values/Stop and restart battery charge
4	USB Port	Download memos/Upload software
5	GREEN charge complete indicator	OFF = charger off or battery not available Flashing = cooling phase ON = battery ready and available
6	YELLOW charging indicator	OFF = charger output is off ON = charging in progress
7	RED fault indicator	OFF = no fault FLASHING = ongoing fault detected ON = fault
8	BLUE AC supply indicator	OFF = AC missing ON = AC present
9	Navigate LEFT/ESC button	Enter Main Menu/Scroll left/ Exit menus
10	Navigate DOWN button	Navigate menus/Change values
11	Navigate RIGHT/ EQUALIZE button	Scroll right/Start equalize or desulfation



Control Panel Features

Menu Access

When the charger is idle, press and hold <ESC>, the Main Menu is then displayed. The main menu is automatically exited after 60 seconds of inactivity or can be exited voluntarily by pressing the <ESC> button.

Main Menu
All menus are accessed from Main Menu; a detailed description of each menu is included in the next sections of this manual. The menus that require a password are not displayed until the correct password has been entered.
The menus provide access to the following functions:

- View last 200 charging cycles (**Memo** menu).
- View of faults, alarms, etc. (**Status** menu).
- USB functions (**USB** menu).
- Setting of date, language and others (**Parameters** menu).
- Management of password (**Password** menu).

Memorizations Display Screen
The charger can display the details of the last 200 charge cycles.

Figure 1

The display in **Figure 1** shows one charge stored in memory. MEMO 1 is the latest charge memorized. After memorizing the two-hundredth charge, the oldest record is deleted and replaced by the next oldest.

Displaying a Charge Cycle
Proceed as follows:

1. Select a record (MEMO x) using the ▲ / ▼ buttons.
2. Display the first History screen by pressing Enter.
3. Display the second History screen by pressing ▼.
4. Return to the Main Menu by pressing Esc.

The charge history is displayed; use ▲ / ▼ to scroll through the parameters.

Memorization Data

Memo	Description
Profile	Selected profile
Capacity	Rated battery capacity (Ah)
U batt	Rated battery voltage (V)
Temp	Battery temperature at start of charge (F)
% init	State of charge at start of charge (%)
U start	Battery voltage at start of charge (Vpc)
U end	Battery voltage at end of charge (Vpc)
I end	Current at end of charge

Memo	Description
Chg Time	Time of the charge cycle (minutes)
Ah	Amp-hours returned during charge cycle
SoC	Start of charge date and time
DBa	Battery disconnect date and time
Status	Partial or complete
Fault	Fault Codes
CFC	Termination code (for ServiceTech)

Menu Access (cont.)

Status
This menu displays the status of the charger's internal counters (number of normal and partial charges, faults by type, etc.).

Status	Description
Charge	Total number of charges – corresponds to the total of normally terminated charges and charges terminated with or by faults
	Number of charges normally terminated
	Number of charges terminated abnormally
DF1 etc.	Number of faults recorded by the charger (see Fault Codes)
TH	Number of charger temperature faults

USB
This menu provides access to the USB function to update software.

Record Memo: Requires higher level password. Allows recording charger data. Default is yes.
Record Profile: Requires higher level password. Allows for recording voltage, current, and temperature for a charge cycle.
Sampling Profile: Requires higher level password. Allows setting the time interval for recording profile data.
Update Software: Updates charger's firmware.
Save Settings: Save configuration settings from a flash drive.
Restore Settings: Restore configuration settings from a flash drive.
Update MODULE: Update module firmware.

Date/Hour
Sets date and time of the charger. The clock has a battery backup which will preserve the time when power to the charger is off.

Language
Selects the language displayed in the menus.

Status Screen

Region
Selects the format for date, metric (EU) or imperial (US) units for temperature, length and cable gauge.

Display
Set screen saver function.

Contrast: Modifies the display contrast level (20 to 29).
Screen Saver: Enable or Disable the screen saver function.
Delay: Set the time the screen stays illuminated. The delay time is adjustable in minutes up to one hour and 59 minutes.

Daylight Savings
Enables or disables automatic clock adjustment for daylight savings time. When enabled, time will move ahead one hour at 02:00 on the second Sunday in March and will move back one hour at 02:00 on the first Sunday of November. The charger must be powered up at the time of the change for it to take effect.

Password
This is where the password is entered to gain access to service level menus by authorized HAWKER® service personnel.

Configuration
This menu allows for configuration of the charger. Password is required to view this menu.

Access: On the Main Menu select Password and then press Enter. Use the four ESC, EQ, ▲ and ▼ buttons to select the numbers corresponding to your password. Then select Configuration.

Charging the Battery

At this point, the charger should have been set up by a qualified service person. Charging can only begin with a battery of the proper type, capacity and voltage connected to the charger.

With the charger in wait mode (no battery connected) and without pressing the Stop/Start button, the display will show the information shown in **Figure 1** and **Figure 2**.

Ref.	Description
1	Charger Type
2	Firmware Version
3	System Time
4	Connect Battery
5	System Date
6	Selected Charge Profile

Starting a Charge Cycle
The charger will start automatically when a battery is connected, or push the ENTER/STOP & START button if the battery is already connected.

Delayed Start
If the charger was programmed for delayed start, charging will begin following that delay. When the battery is plugged in to the charger, the display shows the time remaining before the programmed charging starts.

Effective Charge
A few moments into the effective charge, the display will begin alternating between the charging information shown in **Figure 3**, **Figure 4**, and **Figure 5**.

Ref.	Description
1	Charge Profile
2	Charge Current
3	Pending Equalize Symbol (if selected)
4	Charge Ah
5	Charge Voltage (total V)
6	Charge Time
7	Charge Voltage (V/c)
8	Estimated Remaining Charge Time
9	Percent of Charge

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

End of Charge without Equalization
The GREEN charge complete indicator comes on after proper end of charge. The GREEN charge complete indicator is on and the display shows AVAIL. The display alternates between:

- total charging time
- amp-hours restored to the battery

Any other lit LED indicates a problem during charging. Please refer to Control Panel on page 9 for more information.

If the battery remains plugged in and refresh charge has been enabled, refreshes will occur to maintain an optimal charge.

The battery is now ready for use. Push the ENTER/STOP & START button before unplugging the battery.

End of Charge with Equalization
An equalization charge charge can be started manually or automatically.

Charging the Battery (cont.)

Manual Equalization Start

1. At the end of charge (GREEN charge complete indicator or flashing), press on the <EQUALIZE> button. The equalize button can also be pressed any time during the charge and an equalize charge will be started after charging is complete. **NOTE:** When an equalization charge is manually started, the output current will be set to the value saved in the charger configuration. The factory default value is 23 A.
2. The start of the equalization charge is indicated by the message EQUAL. During the equalization charge, the charger displays the output current, alternating with the following: battery voltage, voltage per cell, and remaining time.
3. The battery will be available when the GREEN charge complete indicator comes back on and the display shows AVAIL.
4. The battery is now ready for use. If the battery remains plugged in and refresh charge has been enabled, refreshes will occur to maintain an optimal charge. Push the ENTER/STOP & START button before unplugging the battery.

Automatic Equalization Start

If an equalization day has been programmed into the charger configurations, the equalization charge will start automatically on the programmed day of the week after charging is complete.

NOTE: The factory default setting is IEI Equalize, 6 hour equalization, Sunday at 00:00 hours.

The battery will be available when the GREEN charge complete indicator comes back on and the display shows AVAIL. The battery is now ready for use. If the battery remains plugged in and refresh charge has been enabled, refreshes will occur to maintain an optimal charge. Push the ENTER/STOP & START button before unplugging the battery.

Charge

Profile
For selecting the right charging profile for the application: OPP, COLD STORAGE, STDFLD, GEL, FXBLOC, or FXSTND.

Autostart
Enable or disable autostart.

Charge Displays
Type: sets OFF, DELAY, or TIME OF DAY.
Value hour delay: sets the amount or time of day for the delay (00:00 to 24:00).

Delay: Start of charge is delayed for the amount of time stored in VALUE (0 to 24 hours).

Time of Day: Charge will not start until the time of day stored in VALUE (24-hour format).

Daily Charge
On/Off: Sets daily charge ON or OFF.
Daily Chg Start: Sets daily charge start time.
Daily Chg End: Sets daily charge end time.

Block Out Charge
Enable or disable to allow for setting start time and end time.

Floating Load
On/Off: Sets float mode ON or OFF.
Current: Sets float current.
Voltage: Sets float voltage.

This feature can be turned ON or OFF depending on the application. A float charge at the end of a standard charge is intended to compensate for consumption by the truck electronics that are left on when the truck is not used (typically AGV). The parameter VOLTAGE is in mVpc (millivolts per cell) determines the maximum float voltage. The parameter CURRENT defines the current output during float, the current will automatically decrease to keep the battery voltage at the maximum defined by the VOLTAGE parameter.

Battery Rest
Set battery rest time in hours.

Conditional Charge %
Set conditional charge %. The charge will only commence the charge if the battery has reached the limit of Depth of Discharge (DoD) or more than x%. For example, if the user wants to charge the battery only if it is discharged more than 30%, the parameter 30 has to be entered in the conditional charge. The 0 value disables the function.

Refresh On/Off
Sets refresh mode to ON or OFF.

CF Flooded
Requires a higher level password. Allows for setting charge factor for flooded lead-acid batteries.

I Max
Allows for setting max output current limit of charger.

Equalization

Current
This defines the equalization or desulphation current for a manual start. Manual equalization is disabled during opportunity cycles.

Time
Sets the equalization time from one to 48 hours.

Delayed Start (delay)
Sets the delay between the normal charge and the equalization charge from zero hour to 23:59 hours.

Frequency
Selects one or several periods for carrying out the equalization charge. The user can select one or several days per week.

FAULT CODES

Options

Idle On/Off
Enable or disable the screen saver.

Power Supply
To select AC power supply.

Options Test
Turns on Battery Status (Red/Green) and Electrovalve output briefly to test operation.

Electrovalve Time
Sets time on in seconds.

RST Memo/Status

Resets the memorizations and charge status memory.

Factory Reset

Requires higher level password. Allows for resetting all configuration settings back to factory defaults.

Fault Codes

In case of a fault, one of the corresponding fault codes listed below will appear on the display. If it is a critical fault, charging will stop and the RED fault indicator will be illuminated.

Fault	Critical	Cause	Solution
DF1	Yes	Low output current	Check input voltage and fuses.
DF2	Yes	Output fault	Check for proper battery connection (reversed polarity). Check output fuse.
DF3	Yes	Improper battery	Battery voltage too high (>2.4 Vpc) or too low (<1.6 Vpc). Use proper charger for battery.
DF4	No	The battery has been discharged more than 80% of its capacity	Prevent future over-discharging of battery. Battery charge gauges and lift interrupts may need calibration.
DF5	No	Battery requires inspection	Non-critical fault. Check battery cables for condition and size, check for loose connections, check for defective cells.
DF7	No	Inspect battery	Non-critical fault. This will cause the charge to terminate early. Battery may require service. Check the battery (Temperature, Specific Gravity...).
DF-CUR	Yes	Failed power module, AC fuses or AC input	Check the battery condition of use. Check the configuration in the menu (charge cables parameters).
TH	Yes	Charger overheating	Check the AC input, AC fuses, if AC fuses are open, perform internal module tests.
MOD TH	No	Alternating with charge parameters – one or more module in thermal fault – the charge process continues – the fault module(s) is (are) displayed + RED fault indicator flashing.	Check that fans are working. Verify that ambient temperature is not too high. Inspect to see if charger ventilation is obstructed or impaired.

Fault Codes (cont.)

Fault	Critical	Cause	Solution
J	14.0/10.0	4	Check that the fan(s) is (are) working correctly and/or that the ambient temperature is not too high, or whether there is poor natural ventilation to the charger. If all modules are in thermal fault, a TH fault will follow.
MOD DEF	Yes	Module not detected – the fault module(s) is (are) displayed + RED fault indicator flashing.	Check faulty module.
MOD DFC	Yes	Alternating with charge parameters – one or more module in DF1 fault – the charge process continues – the fault module(s) is (are) displayed + RED fault indicator flashing.	Check power modules. If all modules in DF1 fault, a DF1 error will follow.
DEF ID	Yes	Blocking fault – one or more modules are not compatible with the charger configuration (for example, a 24 V charger with one 48 V module). This can happen if the user replaces one module with another one with a different voltage setting.	Use correct module(s).
MOD FUS	Yes	Module DC fuse	Check/replace fuse.
MOD Err	No	Module internal error	Check/replace module.
MOD VBAT	Yes	Battery voltage fault	Check battery voltage.
Power Module OFF	Yes	Low AC voltage, or at least one phase is lost. CAN communication problem or display board	Check all fuses and line voltage. Check ribbon cable from display board to backplane. Replace display board.
MOD x DEF-CTN	No	Module internal sensor faulty	Verify that battery voltage matches internal module voltage readings.
MOD x TH-LOCK	No	Module is locked because of repetitive thermal events	Check that fans are working. Verify that ambient temperature is not too high. Inspect to see if charger ventilation is obstructed or impaired.

Go to the menu Charger/Information gen for details (x is the module number)

		Module is unplugged or no CAN communication
MOD x	TH	Thermal Fault
MOD x	VLMFB	LMEB input fault
MOD x	VBATMAX	Module reached max voltage value
MOD x	FUSE-OUT	Output fuse open
MOD x	PWM-MAX	Module reached max current
MOD x	ERROR	Module internal error
MOD x	VBAT	VBAT input fault

3.5 kW Technical Specifications

Charger Model Number	AC Input 208/220/240V 3PH.				DC Output			8 Hour Capacity Range (Ah)	Opportunity/ Flex Standard Capacity Range (Ah)	Bloc Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Weight (lbs)	Cabinet Type
	Voltage	Nominal Amp Draw (A)	Max Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)							
PTO3-48D-40G	208-240	7.4	29.6	3	1/4	12	40	100 - 250	100 - 160	58	19 x 13.3 x 13.7	3/0	54	D
						18	40	100 - 250	100 - 160	58				
						24	40	100 - 250	100 - 160	58				
PTO3-48D-80G	208-240	14.8	29.6	3	2/4	12	80	100 - 500	100 - 320	100 - 115	19 x 13.3 x 13.7	3/0	62	D
						18	80	100 - 500	100 - 320	100 - 115				
						24	80	100 - 500	100 - 320	100 - 115				
PTO3-48D-120G	208-240	22.2	29.6	3	3/4	12	120	100 - 750	100 - 480	100 - 172	19 x 13.3 x 13.7	3/0	70	D
						18	120	100 - 750	100 - 480	100 - 172				
						24	120	100 - 750	100 - 480	100 - 172				
PTO3-48D-160G	208-240	29.6	29.6	3	4/4	12	160	100 - 1000	100 - 640	100 - 229	19 x 13.3 x 13.7	3/0	94	D
						18	160	100 - 1000	100 - 640	100 - 229				
						24	160	100 - 1000	100 - 640	100 - 229				
PTO3-48F-40G	208-240	7.4	44.4	3	1/6	12	40	100 - 250	100 - 160	58	20 x 19.2 x 13.8	3/0	70	F
						18	40	100 - 250	100 - 160	58				
						24	40	100 - 250	100 - 160	58				
PTO3-48F-80G	208-240	14.8	44.4	3	2/6	12	80	100 - 500	100 - 320	100 - 115	20 x 19.2 x 13.8	3/0	78	F
						18	80	100 - 500	100 - 320	100 - 115				
						24	80	100 - 500	100 - 320	100 - 115				
PTO3-48F-120G	208-240	22.2	44.4	3	3/6	12	120	100 - 750	100 - 480	100 - 172	20 x 19.2 x 13.8	3/0	86	F
						18	120	100 - 750	100 - 480	100 - 172				
						24	120	100 - 750	100 - 480	100 - 172				
PTO3-48F-160G	208-240	29.6	44.4	3	4/6	12	160	100 - 1000	100 - 640	100 - 229	20 x 19.2 x 13.8	3/0	94	F
						18	160	100 - 1000	100 - 640	100 - 229				
						24	160	100 - 1000	100 - 640	100 - 229				
PTO3-48F-200G	208-240	37	44.4	3	5/6	12	200	100 - 1250	100 - 800	100-286	20 x 19.2 x 13.8	3/0	102	F
						18	200	100 - 1250	100 - 800	100-286				
						24	200	100 - 1250	100 - 800	100-286				
PTO3-48F-240G	208-240	44.4	44.4	3	6/6	12	240	100 - 1500	100 - 960	100 - 343	20 x 19.2 x 13.8	3/0	110	F
						18	240	100 - 1500	100 - 960	100 - 343				
						24	240	100 - 1500	100 - 960	100 - 343				
PTO3-80D-25G	208-240	7.7	30.8	3	1/4	36	25	100 - 160	100 - 100	36	19 x 13.3 x 13.7	3/0	54	D
						40	25	100 -160	100 - 100	36				
PTO3-80D-50G	208-240	15.4	30.8	3	2/4	36	50	100 - 320	100 - 200	72	19 x 13.3 x 13.7	3/0	62	D
						40	50	100 - 320	100 - 200	72				
PTO3-80D-75G	208-240	23.1	30.8	3	3/4	36	75	100 - 470	100 - 300	100 - 108	19 x 13.3 x 13.7	3/0	70	D
						40	75	100 - 470	100 - 300	100 - 108				
PTO3-80D-100G	208-240	30.8	30.8	3	4/4	36	100	100 - 625	100 - 400	100 - 143	19 x 13.3 x 13.7	3/0	94	D
						40	100	100 - 625	100 - 400	100 - 143				
PTO3-80F-25G	208-240	7.7	46.2	3	1/6	36	25	100 - 160	100 - 100	36	20 x 19.2 x 13.8	3/0	70	F
						40	25	100 -160	100 - 100	36				
PTO3-80F-50G	208-240	15.4	46.2	3	2/6	36	50	100 - 315	100 - 200	72	20 x 19.2 x 13.8	3/0	78	F
						40	50	100 - 315	100 - 200	72				
PTO3-80F-75G	208-240	23.1	46.2	3	3/6	36	75	100 - 470	100 - 300	100 - 108	20 x 19.2 x 13.8	3/0	86	F
						40	75	100 - 470	100 - 300	100 - 108				

TECHNICAL SPECIFICATIONS

3.5 kW Technical Specifications (cont.)

Charger Model Number	AC Input 208/220/240V 3PH.				DC Output			8 Hour Capacity Range (Ah)	Opportunity/ Flex Standard Capacity Range (Ah)	Bloc Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Weight (lbs)	Cabinet Type
	Voltage	Nominal Amp Draw (A)	Max Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)							
PTO3-80F-100G	208-240	30.8	46.2	3	4/6	36	100	100 - 625	100 - 400	100 - 143	20 x 19.2 x 13.8	3/0	94	F
						40	100	100 - 625	100 - 400	100 - 143				
PTO3-80F-125G	208-240	38.5	46.2	3	5/6	36	125	100 - 780	100 - 500	100 - 179	20 x 19.2 x 13.8	3/0	102	F
						40	125	100 - 780	100 - 500	100 - 179				
PTO3-80F-150G	208-240	46.2	46.2	3	6/6	36	150	100 - 940	100 - 600	100 - 215	20 x 19.2 x 13.8	3/0	110	F
						40	150	100 - 940	100 - 600	100 - 215				

Charger Model Number	AC Input 480V 3PH.				DC Output			8 Hour Capacity Range (Ah)	Opportunity/ Flex Standard Capacity Range (Ah)	Bloc Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Weight (lbs)	Cabinet Type
	Voltage	Nominal Amp Draw (A)	Max Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)							
PTO3-48D-60H	440	4.8	19.2	3	1/4	12	70	100 - 438	100 - 280	100 - 100	19 x 13.3 x 13.7	3/0	54	D
						18	65	100 - 407	100 - 260	100 - 93				
						24	60	100 - 375	100 - 240	100 - 86				
PTO3-48D-120H	440	9.6	19.2	3	2/4	12	140	100 - 875	100 - 560	100 - 200	19 x 13.3 x 13.7	3/0	62	D
						18	130	100 - 813	100 - 520	100 - 186				
						24	120	100 - 750	100 - 480	100 - 172				
PTO3-48D-180H	440	14.4	19.2	3	3/4	12	210	100 - 1313	100 - 840	100 - 300	19 x 13.3 x 13.7	3/0	70	D
						18	195	100 - 1219	100 - 780	100 - 279				
						24	180	100 - 1125	100 - 720	100 - 258				
PTO3-48D-240H	440	19.2	19.2	3	4/4	12	280	100 - 1750	100 - 1120	100 - 400	19 x 13.3 x 13.7	3/0	94	D
						18	260	100 - 1625	100 - 1040	100 - 372				
						24	240	100 - 1500	100 - 960	100 - 343				
PTO3-48F-60H	440	4.8	28.8	3	1/6	12	70	100 - 438	100 - 280	100 - 100	20 x 19.2 x 13.8	3/0	70	F
						18	65	100 - 407	100 - 260	100 - 93				
						24	60	100 - 375	100 - 240	100 - 86				
PTO3-48F-120H	440	9.6	28.8	3	2/6	12	140	100 - 875	100 - 560	100 - 200	20 x 19.2 x 13.8	3/0	78	F
						18	130	100 - 813	100 - 520	100 - 186				
						24	120	100 - 750	100 - 480	100 - 172				
PTO3-48F-180H	440	14.4	28.8	3	3/6	12	210	100 - 1313	100 - 840	100 - 300	20 x 19.2 x 13.8	3/0	86	F
						18	195	100 - 1219	100 - 780	100 - 279				
						24	180	100 - 1125	100 - 720	100 - 258				
PTO3-48F-240H	440	19.2	28.8	3	4/6	12	280	100 - 1750	100 - 1120	100 - 400	20 x 19.2 x 13.8	3/0	94	F
						18	260	100 - 1625	100 - 1040	100 - 372				
						24	240	100 - 1500	100 - 960	100 - 343				
PTO3-48F-300H	440	24	28.8	3	5/6	12	320	100 - 2000	100 - 1280	100 - 458	20 x 19.2 x 13.8	3/0	102	F
						18	320	100 - 2000	100 - 1280	100 - 458				
						24	300	100 - 1875	100 - 1200	100 - 429				
PTO3-48F-320H	440	28.8	28.8	3	6/6	12	320	100 - 2000	100 - 1280	100 - 458	20 x 19.2 x 13.8	3/0	110	F
						18	320	100 - 2000	100 - 1280	100 - 458				
						24	320	100 - 2000	100 - 1280	100 - 458				
PTO3-80D-36H	440	4.8	19.2	3	1/4	36	40	100 - 250	100 - 160	100 - 58	19 x 13.3 x 13.7	3/0	54	D
						40	36	100 - 225	100 - 144	100 - 52				

3.5 kW Technical Specifications (cont.)

Charger Model Number	AC Input 480V 3PH.				DC Output			8 Hour Capacity Range (Ah)	Opportunity/ Flex Standard Capacity Range (Ah)	Bloc Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Weight (lbs)	Cabinet Type
	Voltage	Nominal Amp Draw (A)	Max Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)							
PTO3-80D-72H	440	9.6	19.2	3	2/4	36	80	100 - 500	100 - 320	100 - 115	19 x 13.3 x 13.7	3/0	62	D
						40	72	100 - 450	100 - 288	100 - 103				
PTO3-80D-108H	440	14.4	19.2	3	3/4	36	120	100 - 750	100 - 480	100 - 172	19 x 13.3 x 13.7	3/0	70	D
						40	108	100 - 675	100 - 432	100 - 155				
PTO3-80D-144H	440	19.2	19.2	3	4/4	36	160	100 - 1000	100 - 640	100 - 229	19 x 13.3 x 13.7	3/0	94	D
						40	144	100 - 900	100 - 576	100 - 206				
PTO3-80F-36H	440	4.8	28.8	3	1/6	36	40	100 - 250	100 - 160	100 - 58	20 x 19.2 x 13.8	3/0	70	F
						40	36	100 - 225	100 - 144	100 - 52				
PTO3-80F-72H	440	9.6	28.8	3	2/6	36	80	100 - 500	100 - 320	100 - 115	20 x 19.2 x 13.8	3/0	78	F
						40	72	100 - 450	100 - 288	100 - 103				
PTO3-80F-108H	480	14.4	28.8	3	3/6	36	120	100 - 750	100 - 480	100 - 172	20 x 19.2 x 13.8	3/0	86	F
						40	108	100 - 675	100 - 432	100 - 155				
PTO3-80F-144H	480	19.2	28.8	3	4/6	36	160	100 - 1000	100 - 640	100 - 229	20 x 19.2 x 13.8	3/0	94	F
						40	144	100 - 900	100 - 576	100 - 206				
PTO3-80F-180H	480	24	28.8	3	5/6	36	200	100 - 1250	100 - 800	100 - 286	20 x 19.2 x 13.8	3/0	102	F
						40	180	100 - 1125	100 - 720	100 - 258				
PTO3-80F-216H	480	28.8	28.8	3	6/6	36	240	100 - 1500	100 - 960	100 - 343	20 x 19.2 x 13.8	3/0	110	F
						40	216	100 - 1350	100 - 864	100 - 309				

Charger Model Number	AC Input 480V 3PH.				DC Output			8 Hour Capacity Range (Ah)	Opportunity/ Flex Standard Capacity Range (Ah)	Bloc Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Weight (lbs)	Cabinet Type
	Voltage	Nominal Amp Draw (A)	Max Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)							
PTO3-48D-60Y	480	4.8	19.2	3	1/4	12	80	100 - 500	100 - 320	100 - 115	19 x 13.3 x 13.7	3/0	54	D
						18	80	100 - 500	100 - 320	100 - 115				
						24	60	100 - 375	100 - 240	100 - 86				
PTO3-48D-120Y	480	9.6	19.2	3	2/4	12	160	100 - 1000	100 - 640	100 - 229	19 x 13.3 x 13.7	3/0	62	D
						18	160	100 - 1000	100 - 640	100 - 229				
						24	120	100 - 750	100 - 480	100 - 172				
PTO3-48D-180Y	480	14.4	19.2	3	3/4	12	240	100 - 1500	100 - 960	100 - 343	19 x 13.3 x 13.7	3/0	70	D
						18	240	100 - 1500	100 - 960	100 - 343				
						24	180	100 - 1125	100 - 720	100 - 258				
PTO3-48D-240Y	480	19.2	19.2	3	4/4	12	320	100 - 2000	100 - 1280	100 - 458	19 x 13.3 x 13.7	3/0	94	D
						18	320	100 - 2000	100 - 1280	100 - 458				
						24	240	100 - 1500	100 - 960	100 - 343				
PTO3-48F-60Y	480	4.8	28.8	3	1/6	12	80	100 - 500	100 - 320	100 - 115	20 x 19.2 x 13.8	3/0	70	F
						18	80	100 - 500	100 - 320	100 - 115				
						24	60	100 - 375	100 - 240	100 - 86				
PTO3-48F-120Y	480	9.6	28.8	3	2/6	12	160	100 - 1000	100 - 640	100 - 229	20 x 19.2 x 13.8	3/0	78	F
						18	160	100 - 1000	100 - 640	100 - 229				
						24	120	100 - 750	100 - 480	100 - 172				

3.5 kW Technical Specifications (cont.)

Charger Model Number	AC Input 480V 3PH.				DC Output			8 Hour Capacity Range (Ah)	Opportunity/ Flex Standard Capacity Range (Ah)	Bloc Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Weight (lbs)	Cabinet Type
	Voltage	Nominal Amp Draw (A)	Max Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)							
PTO3-48F-180Y	480	14.4	28.8	3	3/6	12	240	100 - 1500	100 - 960	100 - 343	20 x 19.2 x 13.8	3/0	86	F
						18	240	100 - 1500	100 - 960	100 - 343				
						24	180	100 - 1125	100 - 720	100 - 258				
PTO3-48F-240Y	480	19.2	28.8	3	4/6	12	320	100 - 2000	100 - 1280	100 - 458	20 x 19.2 x 13.8	3/0	94	F
						18	320	100 - 2000	100 - 1280	100 - 458				
						24	240	100 - 1500	100 - 960	100 - 343				
PTO3-48F-300Y	480	24	28.8	3	5/6	12	320	100 - 2000	100 - 1280	100 - 458	20 x 19.2 x 13.8	3/0	102	F
						18	320	100 - 2000	100 - 1280	100 - 458				
						24	300	100 - 1875	100 - 1200	100 - 429				
PTO3-48F-320Y	480	28.8	28.8	3	6/6	12	320	100 - 2000	100 - 1280	100 - 458	20 x 19.2 x 13.8	3/0	110	F
						18	320	100 - 2000	100 - 1280	100 - 458				
						24	320	100 - 2000	100 - 1280	100 - 458				
PTO3-80D-36Y	480	4.8	19.2	3	1/4	36	40	100 - 250	100 - 160	100 - 58	19 x 13.3 x 13.7	3/0	54	D
						40	36	100 - 225	100 - 145	100 - 52				
PTO3-80D-72Y	480	9.6	19.2	3	2/4	36	80	100 - 500	100 - 320	100 - 115	19 x 13.3 x 13.7	3/0	62	D
						40	72	100 - 450	100 - 290	100 - 103				
PTO3-80D-108Y	480	14.4	19.2	3	3/4	36	120	100 - 750	100 - 480	100 - 172	19 x 13.3 x 13.7	3/0	70	D
						40	108	100 - 675	100 - 430	100 - 155				
PTO3-80D-144Y	480	19.2	19.2	3	4/4	36	160	100 - 1000	100 - 640	100 - 229	19 x 13.3 x 13.7	3/0	94	D
						40	144	100 - 900	100 - 575	100 - 206				
PTO3-80F-36Y	480	4.8	28.8	3	1/6	36	40	100 - 250	100 - 160	100 - 58	20 x 19.2 x 13.8	3/0	70	F
						40	36	100 - 225	100 - 145	100 - 52				
PTO3-80F-72Y	480	9.6	28.8	3	2/6	36	80	100 - 500	100 - 320	100 - 115	20 x 19.2 x 13.8	3/0	78	F
						40	72	100 - 450	100 - 290	100 - 103				
PTO3-80F-108Y	480	14.4	28.8	3	3/6	36	120	100 - 750	100 - 480	100 - 172	20 x 19.2 x 13.8	3/0	86	F
						40	108	100 - 650	100 - 430	100 - 155				
PTO3-80F-144Y	480	19.2	28.8	3	4/6	36	160	100 - 1000	100 - 640	100 - 229	20 x 19.2 x 13.8	3/0	94	F
						40	144	100 - 900	100 - 575	100 - 206				
PTO3-80F-180Y	480	24	28.8	3	5/6	36	200	100 - 1250	100 - 800	100 - 286	20 x 19.2 x 13.8	3/0	102	F
						40	180	100 - 1125	100 - 720	100 - 258				
PTO3-80F-216Y	480	28.8	28.8	3	6/6	36	240	100 - 1500	100 - 960	100 - 343	20 x 19.2 x 13.8	3/0	110	F
						40	216	100 - 1350	100 - 865	100 - 309				

3.5 kW Technical Specifications (cont.)

Charger Model Number	AC Input 600V 3PH.				DC Output			8 Hour Capacity Range (Ah)	Opportunity/ Flex Standard Capacity Range (Ah)	Bloc Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Weight (lbs)	Cabinet Type
	Voltage	Nominal Amp Draw (A)	Max Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)							
PTO3-48D-60C	600	3.8	15.2	3	1/4	12	80	100 - 500	100 - 320	100 - 115	19 x 13.3 x 13.7	2/0	54	D
						18	80	100 - 500	100 - 320	100 - 115				
						24	60	100 - 375	100 - 240	100 - 86				
PTO3-48D-120C	600	7.6	15.2	3	2/4	12	160	100 - 1000	100 - 640	100 - 229	19 x 13.3 x 13.7	2/0	62	D
						18	160	100 - 1000	100 - 640	100 - 229				
						24	120	100 - 750	100 - 480	100 - 172				
PTO3-48D-240C	600	11.4	15.2	3	3/4	12	240	100 - 1500	100 - 960	100 - 343	19 x 13.3 x 13.7	2/0	70	D
						18	240	100 - 1500	100 - 960	100 - 343				
						24	180	100 - 1125	100 - 720	100 - 258				
PTO3-48D-240C	600	15.2	15.2	3	4/4	12	320	100 - 2000	100 - 1280	100 - 458	19 x 13.3 x 13.7	2/0	78	D
						18	320	100 - 2000	100 - 1280	100 - 458				
						24	240	100 - 1500	100 - 960	100 - 343				
PTO3-48F-60C	600	3.8	28.8	3	1/6	12	80	100 - 500	100 - 320	100 - 115	20 x 19.2 x 13.8	3/0	70	F
						18	80	100 - 500	100 - 320	100 - 115				
						24	60	100 - 375	100 - 240	100 - 86				
PTO3-48F-120C	600	7.6	28.8	3	2/6	12	160	100 - 1000	100 - 640	100 - 229	20 x 19.2 x 13.8	3/0	78	F
						18	160	100 - 1000	100 - 640	100 - 229				
						24	120	100 - 750	100 - 480	100 - 172				
PTO3-48F-180C	600	11.4	28.8	3	3/6	12	240	100 - 1500	100 - 960	100 - 343	20 x 19.2 x 13.8	3/0	86	F
						18	240	100 - 1500	100 - 960	100 - 343				
						24	180	100 - 1125	100 - 720	100 - 258				
PTO3-48F-240C	600	15.2	28.8	3	4/6	12	320	100 - 2000	100 - 1280	100 - 458	20 x 19.2 x 13.8	3/0	94	F
						18	320	100 - 2000	100 - 1280	100 - 458				
						24	240	100 - 1500	100 - 960	100 - 343				
PTO3-48F-300C	600	19	28.8	3	5/6	12	320	100 - 2000	100 - 1280	100 - 458	20 x 19.2 x 13.8	3/0	102	F
						18	320	100 - 2000	100 - 1280	100 - 458				
						24	300	100 - 1875	100 - 1200	100 - 429				
PTO3-48F-320C	600	22.8	28.8	3	6/6	12	320	100 - 2000	100 - 1280	100 - 458	20 x 19.2 x 13.8	3/0	110	F
						18	320	100 - 2000	100 - 1280	100 - 458				
						24	320	100 - 2000	100 - 1280	100 - 458				
PTO3-80D-36C	600	3.8	15.2	3	1/4	36	40	100 - 250	100 - 160	100 - 58	19 x 13.3 x 13.7	2/0	54	D
						40	36	100 - 225	100 - 145	100 - 52				
PTO3-80D-72C	600	7.6	15.2	3	2/4	36	80	100 - 500	100 - 320	100 - 115	19 x 13.3 x 13.7	2/0	62	D
						40	72	100 - 450	100 - 290	100 - 103				
PTO3-80D-108C	600	11.4	15.2	3	3/4	36	120	100 - 750	100 - 480	100 - 172	19 x 13.3 x 13.7	2/0	70	D
						40	108	100 - 675	100 - 430	100 - 155				
PTO3-80D-108C	600	15.2	15.2	3	4/4	36	120	100 - 750	100 - 480	100 - 172	19 x 13.3 x 13.7	2/0	70	D
						40	108	100 - 675	100 - 430	100 - 155				

3.5 kW Technical Specificationts (cont.)

Charger Model Number	AC Input 600V 3PH.				DC Output			8 Hour Capacity Range (Ah)	Opportunity/ Flex Standard Capacity Range (Ah)	Bloc Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Weight (lbs)	Cabinet Type
	Voltage	Nominal Amp Draw (A)	Max Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)							
PTO3-80F-36C	600	3.8	28.8	3	1/6	36	40	100 - 250	100 - 160	100 - 58	20 x 19.2 x 13.8	3/0	70	F
						40	36	100 - 225	100 - 145	100 - 52				
PTO3-80F-72C	600	7.6	28.8	3	2/6	36	80	100 - 500	100 - 320	100 - 115	20 x 19.2 x 13.8	3/0	78	F
						40	72	100 - 450	100 - 290	100 - 103				
PTO3-80F-108C	600	11.4	28.8	3	3/6	36	120	100 - 750	100 - 480	100 - 172	20 x 19.2 x 13.8	3/0	86	F
						40	108	100 - 650	100 - 430	100 - 155				
PTO3-80F-144C	600	15.2	28.8	3	4/6	36	160	100 - 1000	100 - 640	100 - 229	20 x 19.2 x 13.8	3/0	94	F
						40	144	100 - 900	100 - 575	100 - 206				
PTO3-80F-180C	600	19	28.8	3	5/6	36	200	100 - 1250	100 - 800	100 - 286	20 x 19.2 x 13.8	3/0	102	F
						40	180	100 - 1125	100 - 720	100 - 258				
PTO3-80F-216C	600	22.8	28.8	3	6/6	36	240	100 - 1500	100 - 960	100 - 343	20 x 19.2 x 13.8	3/0	110	F
						40	216	100 - 1350	100 - 865	100 - 309				

Maintenance and Service

⚠ WARNING WARNING: THERE ARE DANGEROUS VOLTAGES WITHIN THE BATTERY CHARGER CABINET. ONLY A QUALIFIED PERSON SHOULD ATTEMPT TO ADJUST OR SERVICE THIS BATTERY CHARGER.

The charger requires minimal maintenance. Connections and terminals should be kept clean and tight. The unit (especially the heatsink) should be periodically cleaned with low pressure air 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. For service, contact your sales representative or call: 1-877-7HAWKER (US and Canada only).

Any data, descriptions or specifications set forth herein are subject to change without notice. Before using the product(s), the user is advised and cautioned to make its own determination and assessment of the suitability of the product(s) for the specific use in question and is further advised against relying on the information contained herein as it may relate to any general use or indistinct application. It is the ultimate responsibility of the user to ensure that the product is suited, and the information is applicable to the user's specific application. The product(s) featured herein will be used under conditions beyond the manufacturer's control and therefore all warranties, either express or implied, concerning the fitness or suitability of such product(s) for any particular use or in any specific application, are disclaimed. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the product itself.

NOTES

CHARGING SOLUTIONS

PTO™ MOD3

PTO™ MOD3 Battery Charger

OWNER'S MANUAL

Models: PTOM1, PTOM3, and PTOM3C (Standard and Flex)

HAWKER®

www.hawkerpowersource.com

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CONTENTS

Important Safety Instructions

⚠ WARNING THE SHIPPING PALLET MUST BE REMOVED FOR PROPER AND SAFE OPERATION.

1. This manual contains important safety and operating instructions. Before using the battery charger, read all instructions, **CAUTIONs**, and **WARNINGs** on the battery charger, the battery, and the product using the battery.
2. This charger has been designed to only charge lead-acid and lithium batteries. Read and understand all setup and operating instructions before using the battery charger to prevent damage to the battery and to the charger.
3. **Do not** touch non-insulated parts of the output connector or the battery terminals to prevent electrical shock.
4. During charge, batteries produce hydrogen gas, which can explode if ignited. Never smoke, use an open flame, or create sparks in the vicinity of the battery. Ventilate well when the battery is in an enclosed space.
5. **Do not** connect or disconnect the battery plug while the charger is on. Doing so will cause arcing and burning of the connector, resulting in charger damage or battery explosion.
6. Lead-acid batteries contain sulfuric acid which causes burns. **Do not** get in eyes, on skin, or on clothing. In cases of contact with eyes, flush immediately with clean water for 15 minutes. Seek medical attention immediately.
7. Only factory-qualified personnel can service this equipment. De-energize all AC and DC power connections before servicing the charger.
8. The charger is **not** for outdoor use.
9. Do not expose the charger to moisture. Operating **conditions** should be 32° to 113°F (0° to 45°C); 0 to 70% relative humidity.
10. Do not operate the charger if it has been dropped, received a sharp hit, or otherwise damaged in any way.
11. For continued protection and to reduce the risk of fire, install chargers on a floor of non-combustible material such as stone, brick or grounded metal.

Technical Information

There are two nameplates located on the outside of the charger and should be used to check the application before installation. The “Main” nameplate includes the UL model number and the ratings of the cabinet at its full capacity, while the “Configured Ratings” nameplate includes the part number and the ratings of the cabinet as configured. The Configured Ratings nameplate label must be replaced when adding or removing modules permanently in the field.

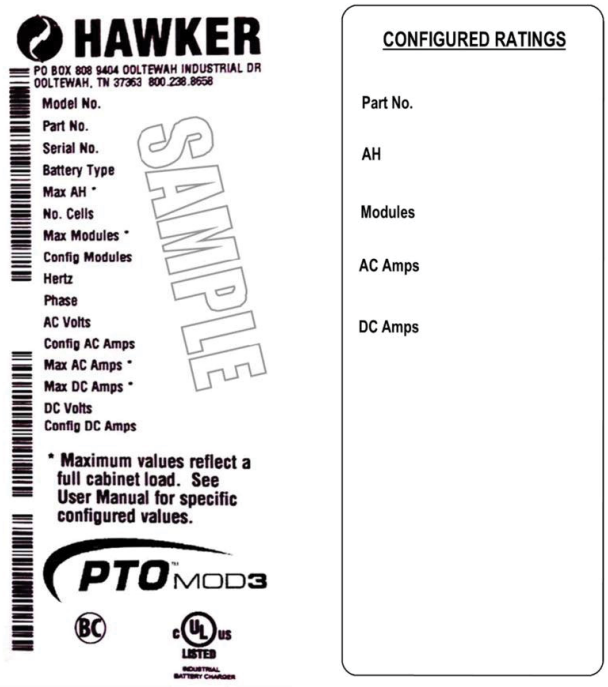
Part Number and UL Model Number
The UL model number specifies the characteristics of a full cabinet charger, while the part number specifies the characteristics of the cabinet as configured, plus all options. The part number is required in any discussion or correspondence regarding this unit.

Technical Information (cont.)

Single Display Cabinet:

PTOM3 - 48F - 240YR

- Model type
- Phase
- (-) for Standard or (C) for CEC
- Max DC Volts
- Cabinet Size
- Max DC Current @ Max DC Volts
- Input Voltage Code
- Options



Nameplate Labels

Cabinet Size/Gauge Letter Codes

The following table describes the letter codes to be used in charger part numbers to indicate the DC output voltage(s) of the charger.

Letter Code	Module Positions	Standard Cable Gauge	Comments
C	3	2/0	Three slot, 3.5kW cabinet
F	6	3/0	Six slot, 3.5kW cabinet

AC Line Voltage Letter Codes

The following table describes the letter codes used in the charger part number to indicate the nominal AC line voltage(s) and frequency at which the charger is designed to operate.

Letter Code	Voltage(s) (Volts RMS)	Line Frequency (Hertz)	Comments
C	600	50/60	600 VAC only
G	208/220/240	50/60	208/220/240 VAC
H	440	50/60	440 VAC only
Y	480	50/60	480 VAC only

Specialty Charger Options List

Suffix	Description
1	15 Ft of DC cable
2	20 Ft of DC cable
3	25 Ft of DC cable
4	30 Ft of DC cable
E	LAN (Ethernet Compatible)
F	Red/Green Next Battery Capable – used in conjunction with BSI and BSS
R	Remote control capable (order remote control separately)
V	PLC capable

Technical Information (cont.)

Serial No.
This is the serial number that indicates complete information about the charger. It must be supplied with the part number on any correspondence or discussion regarding this charger.

Battery Type
The chemical content of the battery this charger is designed to charge: L-A = lead-acid.

Max Ah
This number indicates the maximum ampere-hours (Ah) capacity of this charger. Charging batteries of Ah capacities not specified here will cause the charger to deviate from the specifications.

No. Cells
This is the number of cells this charger is designed to charge.

Max Modules
This is the maximum number of power modules that can be installed into the charger cabinet.

Config Modules
This is the actual number of power modules installed in the charger cabinet.

Hertz
This is the frequency in cycles per second of the AC input voltage this charger is designed to operate on. Do not operate charger at a different frequency or from a generator with unstable frequency.

Phase
Number "1" indicates a Single Phase Charger and number "3" indicates a Three Phase Charger.

AC Volts
This is the input voltage accommodated by this charger.
Failure to use the correct voltage will result in damage to the charger and/or the battery.

IMPORTANT: THE CHARGER WILL OPERATE ONLY ON NOMINAL AC LINE VOLTAGES INDICATED ON THE NAMEPLATE.

Config AC Amps
This is the AC current that this charger will draw with the number of power modules shown in Config Modules on the nameplate.

Max AC Amps
This is the maximum AC current this charger will draw from AC power. This charger must be connected to a branch circuit protection in accordance with the National Electrical Code NFPA70 and local codes. (AC breaker/fuse values can be found on a decal outside the charger.)

Max DC Amps
This is the maximum DC current that this charger cabinet will deliver to a discharged battery when fully populated with power modules.

DC Volts
This is the rated DC output voltage of the charger.

Config DC Amps
This is the DC current that this charger will deliver to a discharged battery with the originally furnished (Config Modules) number of power modules.

CEC
This logo is applied to chargers that are certified with the California Energy Commission in compliance with Appliance Efficiency Regulations:

cULus
This logo is applied to chargers that have been tested to applicable standards and requirements by Underwriters Laboratories (UL) and the Canadian Standards Association (CSA):

Installation

⚠ WARNING THE SHIPPING PALLET MUST BE REMOVED FOR PROPER AND SAFE OPERATION

Location
For maximum trouble-free service, choose a location which is free of excess moisture, dust and corrosive fumes. Also, avoid locations where temperatures are high or where liquids will drip on the charger. Follow charger warning label when mounting on or over a combustible surface. Do not obstruct the ventilation openings.

Wall/Floor Mount Cabinet Chargers
The charger must be permanently mounted in a vertical position. The lower part of the charger must be at least 12 inches from the charger below if installed above another charger, and the upper part 12 inches from the ceiling. The distance between two chargers must be no less than 12 inches. Use the mounting kit supplied with the charger. See the Mounting Dimensions section at the end of this manual for proper wall and floor mounting.

NOTE: Ambient temperature cannot exceed 113°F (45°C).

Electrical Connections
To prevent failure of the charger, be sure it is connected to the correct line voltage.

⚠ WARNING MAKE SURE THE POWER TO THE CHARGER IS OFF AND THE BATTERY IS DISCONNECTED BEFORE CONNECTING THE INPUT POWER TO THE TERMINALS OF THE CHARGER.

Connecting Input Power
Connect the input power to the appropriate terminals, **including ground**. For screw-type terminals, torque to 15 in-lb. Follow your local and National Electric Code in making these connections.

AC Circuit Protection
The user must provide suitable branch circuit protection and a disconnect method from the AC power supply to the charger to allow for safe servicing.

Breaker/Fuse Chart

AC Amps (A)	Breaker/Fuse size (A)
1–12	15
12.1–16	20
16.1–20	25
20.1–24	30
24.1–28	35
28.1–32	40
32.1–36	45
36.1–40	50
40.1–48	60
48.1–56	70
56.1–64	80
64.1–72	90
72.1–80	100
80.1–88	110
88.1–100	125

DC Plug Polarity
The charging cables are connected to the DC output of the charger with the red cable to the positive bus bar, and the black cable to the negative bus bar. The red cable is terminated into the "+" side of the battery connector, and the black cable is terminated into the "-"side of the connector. The output polarity of the charger must be observed when connecting to the battery (read warning above). Improper connection will open the DC fuses in the power modules.

⚠ DANGER FAILURE TO GROUND THE CHARGER COULD LEAD TO FATAL ELECTRIC SHOCK. Follow local and National Electric Code for ground wire sizing.

Grounding the Charger
Connect incoming grounding conductor to the ground lug provided on the charger support panel. Torque the ground wire to 15 in-lb. This lug is marked as shown:

Description of Operation

General
The HAWKER® PTO™ MOD3 series of chargers are compatible with batteries at 24, 36, 48 volts or 72, 80 volts, depending on model.
HAWKER® PTO™ MOD3 chargers are microprocessor-controlled. The processor calculates the battery's capacity so that the charging profile can be automatically adapted to the battery's actual state over a wide range of capacities. The charging coefficient is maintained absolutely on all types of batteries. HAWKER® PTO™ MOD3 chargers adapt to the battery's capacity and its discharge level.
HAWKER® PTO™ MOD3 chargers can easily be set to charge flooded batteries used in cold or freezer storage applications, standard flooded or opportunity profiles. This battery charger is also designed to charge flooded and sealed lead-acid storage batteries within the range of the cell and amp-hour rating as marked on the nameplate.

Auto Start Charge
When a battery is connected to the charger, the control board senses the voltage and after a 20 second delay, the charger starts charging the battery automatically.

Charging Current
Charging current is determined by the charger based on battery voltage and its state of charge. Charging current declines automatically as battery voltage rises during the charge. As the battery charges, the graphical LCD display will output various charge parameters including the charging current.

AC Power Fail
If the AC power fails while the battery is connected to the charger during a charge cycle, the charger will reset and start a new charge cycle when power is restored. All charger settings as well as the time and date are preserved.

Series Charging
In series charging, the voltages of both batteries add up and must match charger's nameplate DC volts rating. The charger's amp-hour rating must be equal to each of the batteries' Ah rating. Charge cycle will not start unless both batteries are connected.

Glossary

Charge Blockout
This function prevents the charger from charging the battery during the block out time window. If a charge cycle has started before the block out window it is inhibited during the block out window and will automatically restart the charge cycle at the end of the block out window.

Charging Profile
The charging profile defines the rate of current charge over time. The charger adapts to the battery's condition and level of discharge.

Cold Profile
This is a charging profile that allows the configuration of the charger for use with batteries in cold storage application. The profile is an IEI (constant current, constant voltage, constant current) type with a number of user configurable parameters.

Thin Plate Pure Lead (TPPL)
This is an advanced lead acid battery design used in HAWKER FLEX® batteries. TPPL technology provides longer service life, higher power density, longer shelf life and fast recharge capabilities.

HAWKER FLEX® Bloc Profile
This charging profile allows charging of HAWKER FLEX® bloc batteries at rates up to 0.7C.

HAWKER FLEX® Standard Profile
This charging profile allows charging of HAWKER FLEX® 2v cell batteries at rates up to 0.25C.

Equalization Charging
Equalization charging, performed after normal charging, balances the electrolyte densities in the battery's cells.

Glossary (cont.)

Opportunity Profile
The OPPOR charge profile is used when opportunity charging is desired. It has a start rate of 25% of the batteries rated amp hour capacity, requires one complete recharge in every 24 hours of service and must have an equalize charge done once a week which is programmed to run automatically.

Operation: During opportunity charging the user can plug the battery in and charge it during breaks, lunch or any work stoppage time. One time per day the battery must receive a full standard recharge. The complete charge must be programmed for a delay that's long enough so that the complete charge will not occur during normal operation. Sufficient time should be scheduled after the full charge to allow the battery to completely cool to ambient temperatures before use.

NOTE: The user must configure the charger for the day of the week that the equalize charge will take place.

Standard Flooded
The profile is an IEI (constant current, constant voltage, constant current) type with a number of user-configurable parameters.

Refresh Charging
Refresh or maintenance charging enables the battery to be maintained at maximum charge all the time that it is connected to the charger. Refresh charge is applied at predetermined intervals after charge is complete and battery remains connected to charger.

Abbreviations and Acronyms

Abbreviation/ Acronym	Explanation/Description
Ah	Ampere-Hours
AWG	American Wire Gauge
AVAIL	Available
BBWC	Battery Boss Wireless Communication
CEC	California Energy Commission
DoD	Depth of Discharge
GND	Ground

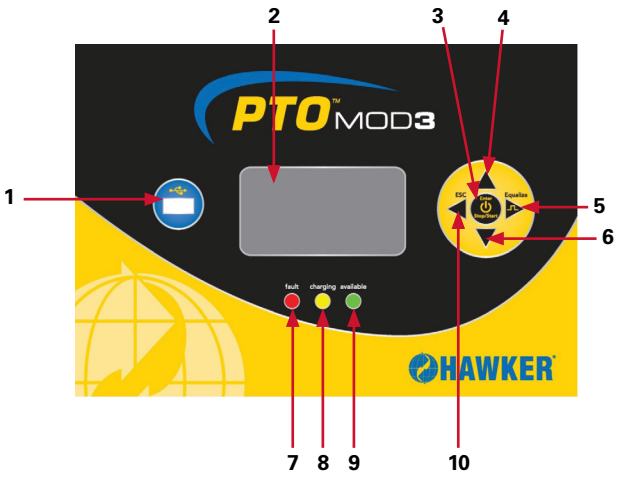
Abbreviation/ Acronym	Explanation/Description
kW	Kilowatt
L-A	Lead-Acid
LCD	Liquid Crystal Display
LED	Light Emitting Diode
TFT	Thin Film Transistor
USB	Universal Serial Bus

Operating Instructions

The HAWKER® PTO™ MOD3 series of chargers are compatible with batteries at 24, 36, 48 volts or 72, 80 volts (depending on the version supplied).

Battery voltage and amp-hour size must be programmed into the charger for it to charge properly. Several charging profiles are available (Standard Flooded, Opportunity, Cold) based on the configuration chosen by the operator. If the charger is loaded with the Flex firmware then the selectable profiles (Flex Standard and Flex Bloc) are available. Furthermore, Equalization and Refresh charges are integrated.

Ref	Function	Description
1	USB Port	Log charge data, and update firmware
2	Graphical LCD Display	Display charger operation info/Menus
3	ENTER/STOP & START button	Select menu items/Enter values/Stop and restart battery charge
4	Navigate UP button	Navigate menus/Change values
5	Navigate RIGHT/ EQUALIZE button	Scroll right/Start equalize or desulfation
6	Navigate DOWN button	Navigate menus/Change values
7	RED fault indicator	OFF = no fault FLASHING = fault detected
8	YELLOW charging indicator	OFF = charge paused FLASHING = countdown ON = charging in progress
9	GREEN charge complete indicator	OFF = charger OFF or battery not available FLASHING = charge complete ON = charger in idle mode
10	Navigate LEFT/ESC button	Enter Main Menu/Scroll left/ Exit menus



Charger Control Panel

Setting up the Charger

Start Menu
When the charger is idle, the display shows "CONNECT BATTERY". To enter the Start Menu, press and hold <ESC>, the Start Menu is then displayed. The current menu is automatically exited after two minutes of inactivity or can be exited voluntarily by pressing the <ESC> button.

1. Select a menu option using the Navigate Up/ Down buttons. The selected menu will be highlighted.
2. Display the highlighted menu screen by pressing the ENTER/STOP & START button.
3. Return to the main menu by pressing the <ESC> button.

Main Menu
Navigate to the main menu by selecting Setup under the Start Menu.

Idle Screen Display

Start Menu Display

Main Menu

Date
Sets the date of the charger (MM/DD/YY).

Time
Sets the time of the charger (24 Hr Clock).

DST (Daylight Saving Time)
Enable or disable automatic clock adjustment for daylight saving time. When enabled, time will move ahead one hour at 02:00 on the second Sunday in March and will move back one hour at 02:00 on the first Sunday of November. The charger must be powered up at the time of the change for it to take effect.

Language
Selects the language displayed in the menus.

Units
Selects metric or English units for temperature, length and cable gauge.

Display Contrast
Adjusts the brightness of the LCD display.

Main Menu (cont.)

Enter Password
This is where the password is entered to gain access to service level menus by authorized HAWKER® service personnel.
1. Use the Up/Down buttons to select the correct alphanumeric character.
2. Use the Left/Right buttons to move the cursor either left or right.
3. Once the correct password is entered press Select.

If the correct password is entered the display will automatically jump to the main menu with the service level menu displayed.

System Setup
- Enter Password
- Change Password
- USB
- Charge Prof. Config
- Constant Current
- Equalize
- Start Charge
- Post Charge
- Charger Config

Change Password
Enter the current password used to reach the above menu. If the password is entered correctly the display will ask to enter a new password. After a new password is entered press the Enter button. Don't forget the new password or you will not be able to get into the charger settings anymore.

USB
Memo Data
Enables the storage of charge Memorizations to a USB data storage device (i.e. memory stick, thumb drive). To record memos:
1. Insert the data storage device in the USB port on the front of the charger.
2. Go to Start Menu->Enter Password->USB->Record Memo. Select "ON".
3. Display will show "Memo File: .csv".
4. The default file name is the charger serial number. Name the file and press the ENTER/STOP & START button to save.
5. Remove data storage device from USB port. The file, in CSV format (usable with Memo Report or Excel), will be stored in the data storage device under the name "MDDDHHMM.CSV" where:
   M: Memorization data file
   DDD: Day of the year
   HH: Hour of file creation
   MM: Minute of file creation

Save Setup Params: Enables the storage of the charger Setup Parameters to a USB data storage device (i.e. memory stick, thumb drive).
Load Setup Paramrs: Enables the uploading of the charger Setup Parameters from a USB data storage device (i.e. memory stick, thumb drive).
Load Control FW: Enables the updating of the chargers internal firmware. Firmware updates will be provided by HAWKER®.
Load Module FW: Enables the updating of the power modules internal firmware. Firmware updates will be provided by HAWKER®.

Charge Prof. Config

Battery Cells
This allows the charger to be adjusted for the number of cells in the battery being charged. Allowable cell settings: 12, 18, 24, 36, 40. Scroll to find correct battery and hit ENTER/STOP & START to select. It is critical this be set to match the battery and match the module types in the charger.

Battery Capacity
This adjusts the battery Ah capacity used by the charger to determine start and finish rates, and must match the Ah capacity of the battery being charged. Allowable Ah sizes: 100Ah to 2500Ah. This must match the battery Ah size because this charger does not read a BBWC nor is it automatic like the HAWKER LIFEPLUS® series chargers.

Charge Prof. Config (cont.)

Battery Temperature
Defines the average operating battery temperature before the charge. It is recommended the average electrolyte temperature be entered, especially in cold areas and when Opportunity charging. If not in Cold profile, ranges allowed from 60°F to 149°F. If in Cold profile, range is 5°F to 50°F.

Profile
For selecting the right charging profile for the application. To set the correct profile the charger will need to have the appropriate firmware loaded. If a HAWKER FLEX® battery you will need to have firmware FLEX-VX.XX or if it's a flooded battery you need to have PTOM3-VX.XX in the charger. (verify X.XX is the latest available version if you are updating the charger)
To install firmware follow all steps below. If you have the appropriate firmware installed already, skip to step 8.

1. Insert flash drive in USB port with appropriate firmware installed.
2. Enter password and go to USB menu.
3. Select Load Control FW.
4. Using the DOWN arrow button, select firmware file from the list on screen and hit Select button.
5. Firmware will automatically load at this point. Wait until it finishes and splashes the HAWKER® startup screen before removing the flash drive.
6. Reenter password.
7. Scroll down to Charger Prof. Config and select Profile.
8. Select Standard, Opportunity, or Cold. If the charger is loaded with the Flex firmware, the selectable profiles are Flex Bloc and Flex Standard.

Charge Coefficient
Change setting for California Energy Commission compliant chargers. Allowable range 1% to 9%. Should normally be at 9%.

Configuration

Constant Current Configuration

⚠ CAUTION This mode is for use by trained service technicians only. For instructions on use see charger service manual.

Equalize Configuration
Equalize Days: select day or days of the week to equalize the battery. Any combination of one or more days may be selected or none may be selected. Hit enter next to day to be selected.
Delay Time Aft Chg: Sets the delay between the normal charge and the equalization charge from 0 to 24 hrs.
Duration: Sets the equalization time from 00:05 to 23:59 (hh:mm).

Note: if duration is set below 5 minutes, the charge will default back to the factory setting for that profile. If not using this charger to equalize the battery, select No Days of the Week for equalize.

Start Charge Configuration
Charge Delay

- Charge Delay Type: OFF or Time After Connect
- Time After Connect: Charge is delayed for the amount of time entered.

Charge Blockout:

- ON/OFF: Sets charge block out ON or OFF.
- Block-out Days: Select day or days of the week to block out charge. Any combination of one or more days may be selected, or none may be selected.
- Block-out Start – Sets block-out start time. Block-out End – Sets block-out end time.

Cond Charge %: Sets conditional charge %. The charger will only commence the charge if the battery has reached the limit of **depth of discharge (DoD)** of more than x%. For example, if the user wants to charge the battery only if it is discharged more than 30%, the parameter 30 must be entered in the conditional charge. A value of 0 disables the function. Allowed range 0 to 70%.
Daily Chg Countdown: Set time delay in minutes for charger to perform complete charge when running Opportunity profile. This setting is not used with other profiles. Allowed range 0 to 480 minutes.

Configuration (cont.)

Post Charge Configuration
Cool-Down
- Cool-Down On/Off: Sets this function ON or OFF. If enabled, the charger will not show available after a charge until the time set has expired, allowing batteries to cool.
- Cool-Down Time: Sets time for Cool-Down.

Refresh ON/OFF:
- Sets refresh mode ON or OFF.
- Once charging is complete, as long as the battery remains connected, refresh charging is automatically initiated to retain the battery's charge.

CHARGER CONFIG
Cabinet Bay Size: This can only be accessed by entering the higher level password. Select cabinet size to match the actual cabinet size.
Number of Modules: This can only be accessed by entering the higher level password. Enter number of modules installed in charger. Limited by the cabinet selected in Cabinet Bay Size.
DC Cable Setup
- Cable Length: Select the length of DC cables from the charger to the battery terminals. One-foot increments from 2 to 200 ft (0.6 to 60.9 m).
- Cable Size: Sets the DC cable gauge. Selections #2, #1, 1/0, 2/0, 3/0, 4/0 AWG.

Charger Options:
- Select Options: choices are Remote, BSI or Electrovalve. If using one of these charger options, that option must be enabled.
- I/O Test is used to test the functionality of each option. Use the Up and Down buttons to highlight the correct I/O test. Particular option must be enabled first.
  - Test Inputs: Push the appropriate button on the external device and observe state of the test box in the menu.
  - Test Outputs: Push the Up button to start the test and the Down button to stop the test.

Serial Number
The charger serial number can be changed. This number must match the number on the charger nameplate attached to the side of the cabinet.

Asset Number
Each charger may be assigned a unique asset number using any combination of alphanumeric characters.

Reset Memos
Resets and clears all memorizations and status history.

⚠ WARNING ONCE THE MEMORIZATIONS AND STATUS HAVE BEEN CLEARED, THEY CANNOT BE RECOVERED.

Charging the Battery

Once the charger is set up by a qualified service person, charging begins when a battery of the proper type, capacity and voltage is connected to the charger. With the charger in idle mode (no battery connected), the display will show the following information:

Ref	Description
1	Charger Type
2	Charge Profile
3	Firmware Version
4	System Time and Date

Charger Idle Display

Charging the Battery (cont.)

Starting a Charge Cycle
The charger will start automatically when a battery is connected, or by pushing the ENTER/STOP & START button if the battery is already connected.

Delayed Start
If the charger is programmed for delayed start, charging will begin following that delay. When the battery is plugged into the charger, the display shows the time remaining before the programmed charging starts.

Countdown
Effective charging starts after a 20-second countdown. The charger uses Profile, Capacity and Temperature settings programmed in the Configuration menu.

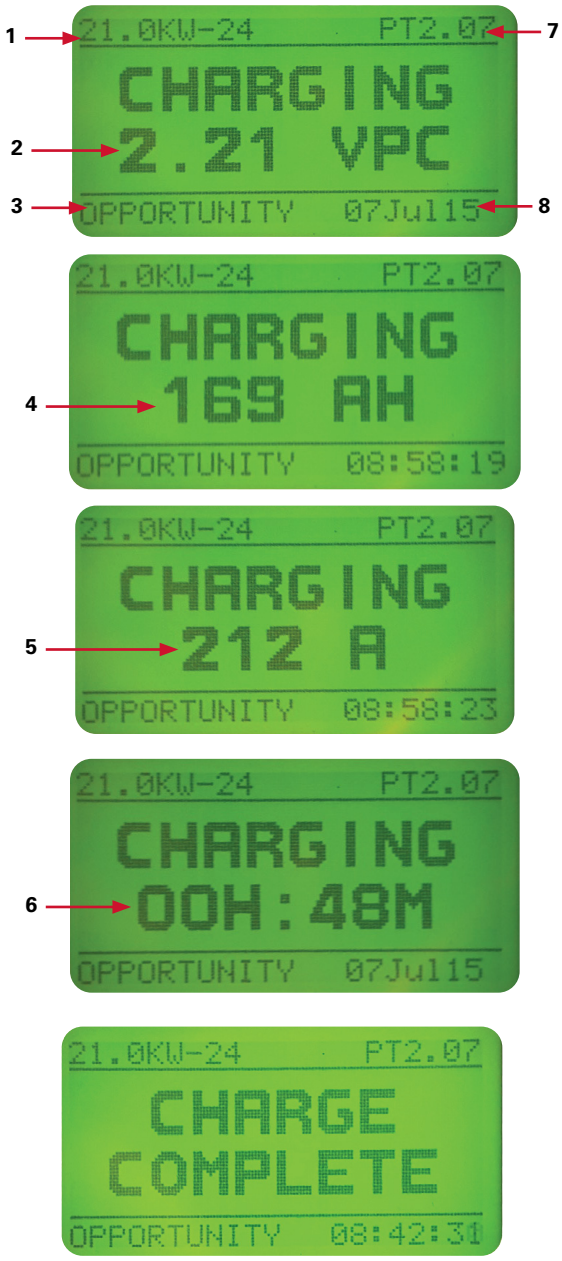
Charge Display
A few moments into the effective charge, the display will begin alternating between the following charging information:

Ref	Description
1	Charger Type
2	Volts Per Cell
3	Charge Profile
4	Ah Returned to Battery
5	DC Amps
6	Charge Time
7	Firmware Version
8	System Time and Date

End of Charge without Equalization
The GREEN charge complete indicator comes on after proper end of charge. The GREEN charge complete indicator is on and the display shows CHARGE COMPLETE. The display shows:
1. Total charging time.
2. Amp-hours restored to the battery.

If the battery remains plugged in and refresh charge has been enabled, refreshes will occur to maintain an optimal charge.
The battery is now ready for use. Push the ON/OFF button before unplugging the battery.

End of Charge with Equalization
An Equalize charge can be started manually or automatically.



End of Charge Display

Charging the Battery (cont.)

Manual Start

1. At the end of charge, press the Equalize navigation button. The equalize button can also be pressed any time during the charge and an equalize charge will be started after charging is complete.
2. The start of the equalization charge is indicated by the message Equalize Charge. During the equalization charge, the charger displays the output current and alternates to battery voltage, voltage per cell and remaining time.
3. The battery will be available when the green LED comes back on and the display shows AVAIL.
4. The battery is now ready for use. If the battery remains plugged in and Refresh charge has been enabled, refreshes will occur to maintain an optimal charge.

Automatic Start

If an equalization day has been programmed in Charger configurations, the equalization charge will start automatically on the programmed day of the week after charging is complete.
The battery will be available when the green LED comes back on and the display shows Charge Complete. The battery is now ready for use. If the battery remains plugged in and Refresh charge has been enabled, refreshes will occur to maintain an optimal charge.

Charger Information

To access charger information, select “Charger” under the Start Manu:

Version

Shows the controller version that is normally displayed in upper right corner of display.

Serial Number

This number indicates complete information about the specific charger and will match the charger nameplate. It must be supplied with the part number on any correspondence or discussion regarding this charger.

Asset Number

Enables the customer to assign a charger asset number.

Charger Information (cont.)

Status

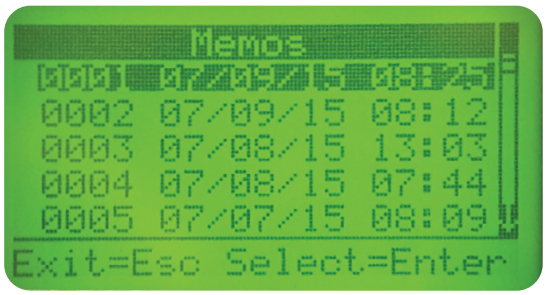
Status	Description
Connects	Total number of times a battery was connected during the life of the charger.
Comp Chg	Total number of charges normally completed.
Part Chg	Total number of charges terminated before completion.
Comp EQ	Total number of equalizes normally completed.
Part EQ	Total number of equalizes terminated before completion.
kAh Return	Total number of amp hours returned over the life of the charger.
Batt Disconn	Total number of times a battery was disconnected during the life of charger.
DF1 etc.	Number of faults recorded over the life of the charger. (see fault codes)

Modules
The module status is listed in ascending order from 1 to 3 or 1 to 6, numbered from left to right.
<OK> the module is inserted and functioning properly.
<Fault> if a module is inserted in this slot, contact a servicing agent.
<Unavailable> there is no module inserted in this slot.

Module LED Status
The modules have LED indicators on the front. These can be observed to determine the status of that particular module:
Flashing Green: Module in Standby
Solid Green: Module in Use
Red: Module Fault
No LEDs: Module Fault (assuming not in energy saver mode)

Memorization Access
On the main Start Menu, select Memos and press Enter.

Modules Screen



Memorizations Display Screen

Memorizations Display Screen
The display lists memos in ascending order, one being the most recent charge cycle.
Memos are stored for one year from the date recorded.

Displaying a Charge Cycle
Proceed as follows:
1. Select a record (Memo x) using the ▲ / ▼ buttons.
2. Display the first History screen by pressing Enter.
3. Display the second History screen by pressing ▼.
4. Return to the Main Menu by pressing Esc.

When the charge history is displayed, use the ▲ / ▼ to scroll through the parameters.

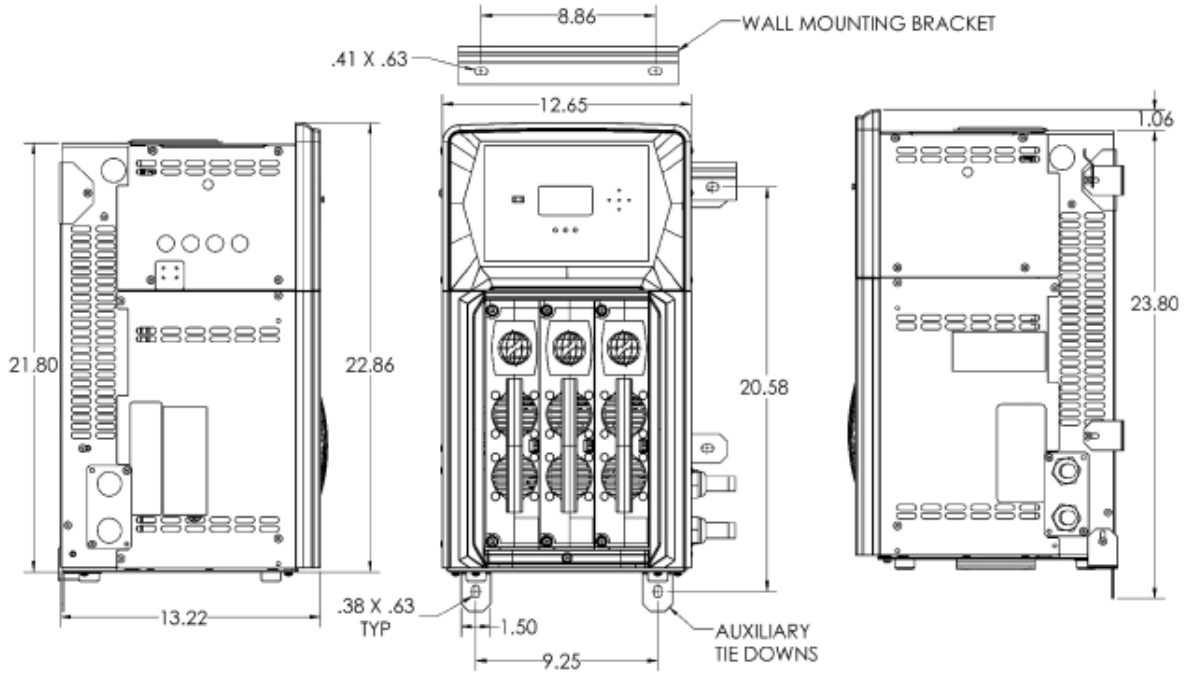
Fault Codes

In case of a fault, one of the corresponding fault codes listed below will appear on the display. If it is a critical fault, charging will stop and the RED fault indicator will be illuminated.

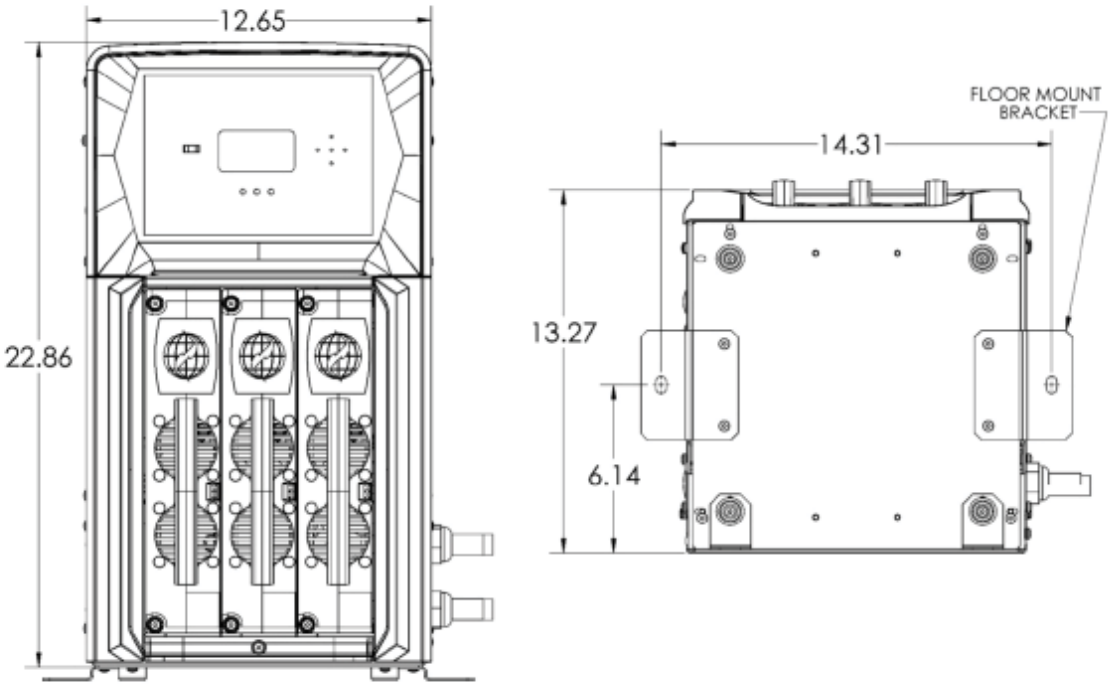
Fault	Cause	Solution
DF1	Low output current	Check input voltage and fuses. Call for service.
DF2	Output fault	Check for proper battery connection (reversed polarity). Check output fuse. Call for service.
DF3	Improper battery	Battery voltage too high (>2.4 Vpc) or too low (<1.8 Vpc). Use proper charger for battery. Check Batt Cells in Setup.
DF4	The battery has been discharged more than 80% of its capacity	Prevent battery over-discharging. Battery charge gauges and lift interrupts may need calibration.
DF5	Start time with full start rate current applied or charge cycle taper and finish time is exceeded	Check the battery temperature. Check the configuration in the menu (charge cable parameters). Check that the battery is the correct cell size for the charger.
DF6	Occurs when the overall charge cycle time limit is exceeded (14 Hrs).	Check the battery temperature. Check the configuration in the menu (charge cable parameters). Check that the battery is the correct cell size for the charger.
DF7	CHK BATT	Check battery (temperature, gravity, etc). Check the battery operation. Check cable parameters in Charger Config menu.
DFMx	One or more module in fault – the charge process continues – the fault module(s) is (are) displayed + RED fault indicator flashing	Check power modules. If all modules in DF1 fault, a DF1 error will follow. Call for service.

CABINET MOUNTING DIMENSIONS

3-Bay Mounting Dimensions

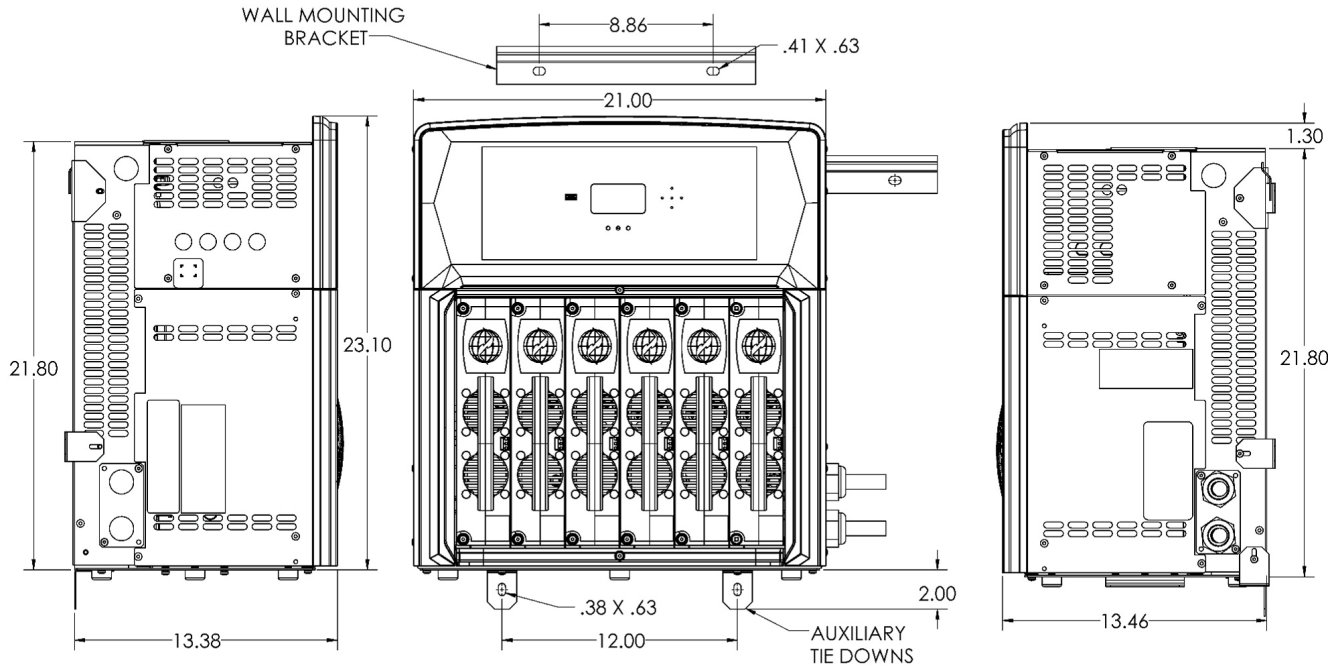


Dimensions shown are in inches.

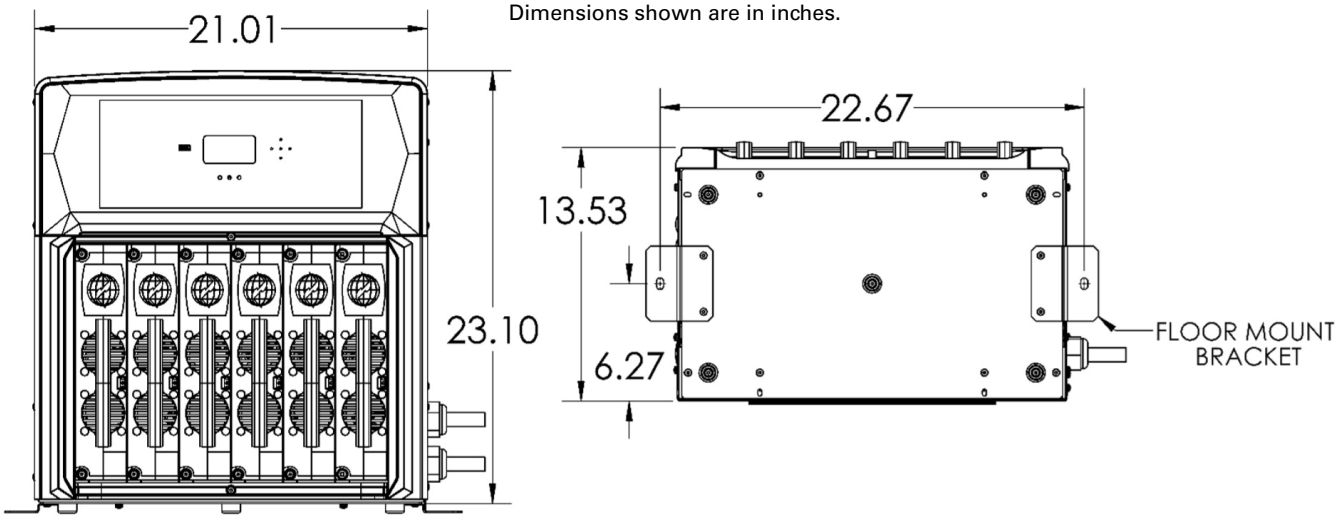


CABINET MOUNTING DIMENSIONS

6-Bay Mounting Dimensions



Dimensions shown are in inches.

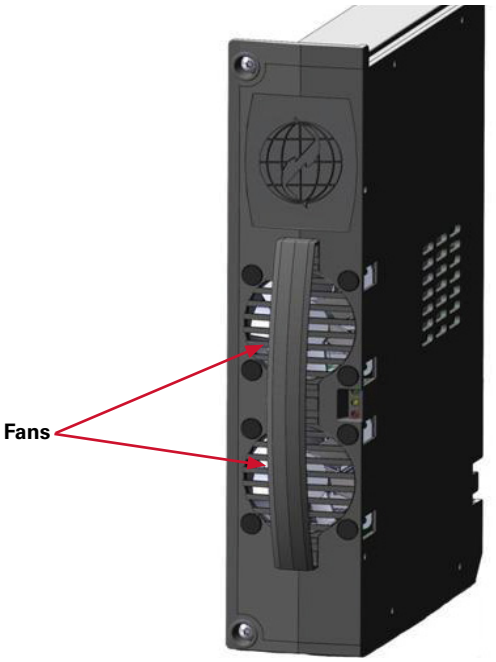


Maintenance and Service

⚠ CAUTION THERE ARE DANGEROUS VOLTAGES WITHIN THE BATTERY CHARGER CABINET. ONLY QUALIFIED PERSONNEL SHOULD ATTEMPT TO ADJUST OR SERVICE THIS BATTERY CHARGER.

The charger requires a minimum of maintenance. Connections and terminals should be kept clean and tight. Follow recommended installation and make sure ventilation openings are not blocked.

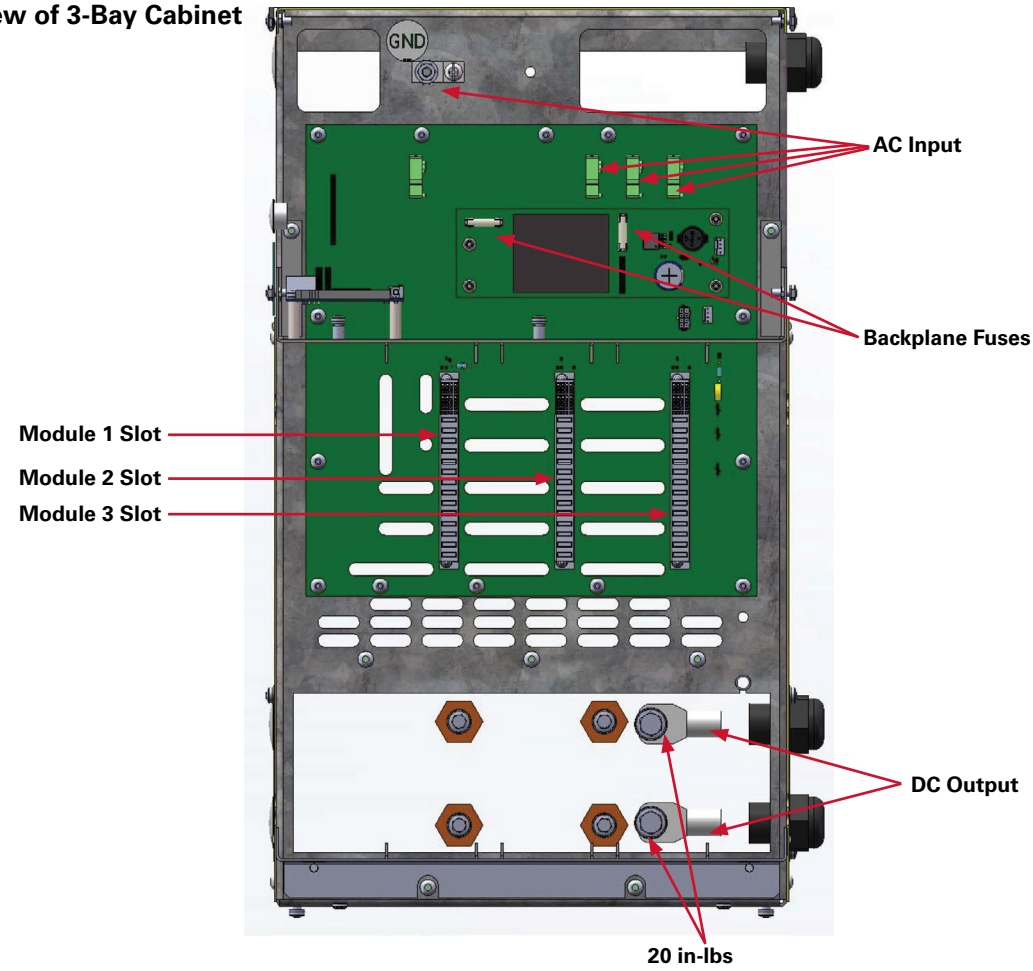
Note: Module shown is the first generation. If you have V2+ modules they no longer have the yellow LED on the front.



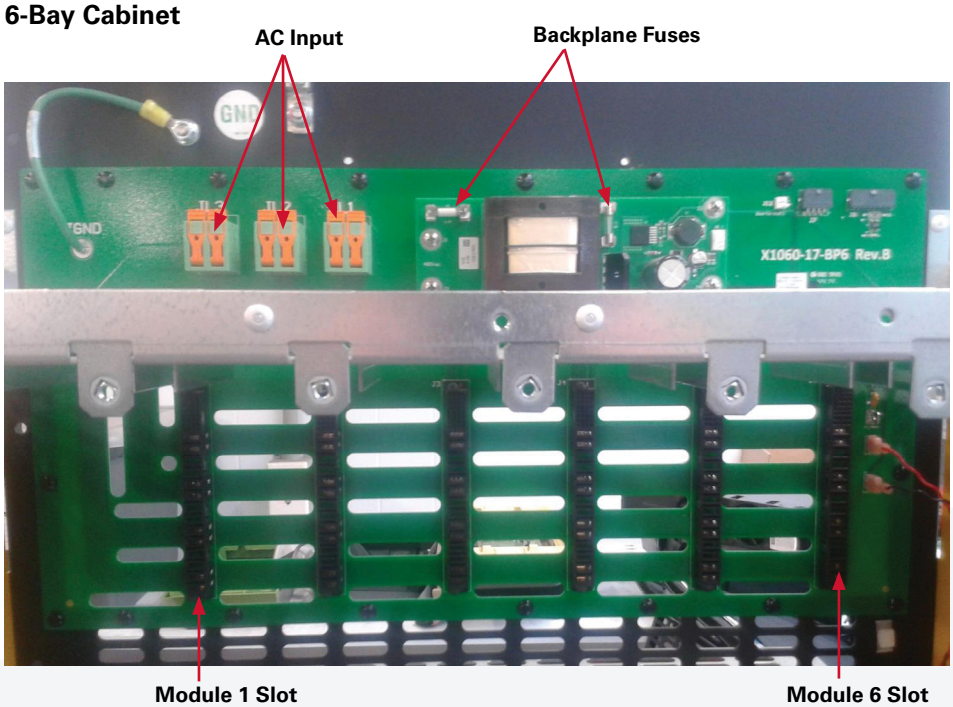
Module Front

Component Locations

Inside View of 3-Bay Cabinet



Inside View of 6-Bay Cabinet



TECHNICAL SPECIFICATIONS

Technical Specifications for 480V, 1 phase

	AC Input				DC Output									
Charger Model Number	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)	8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
PTOM1-24C-80Y	480	5.8	17.4	1	1/3	12	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	54
PTOM1-48C-50Y	480	7.1	21.3	1	1/3	18	50	100-313	100-200				
						24	50	100-313	100-200				
PTOM1-24C-160Y	480	11.6	17.4	1	2/3	12	160	100-1000	100-640	23.1 x 12.7 x 14.1	2/0	C	62
PTOM1-48C-100Y	480	14.2	21.3	1	2/3	18	100	100-625	100-400				
						24	100	100-625	100-400				
PTOM1-24C-240Y	480	17.4	17.4	1	3/3	12	240	100-1500	100-960	23.1 x 12.7 x 14.1	2/0	C	70
PTOM1-48C-150Y	480	21.3	21.3	1	3/3	18	150	100-938	100-600				
						24	150	100-938	100-600				
PTOM1-24F-80Y	480	5.8	34.8	1	1/6	12	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	70
PTOM1-48F-50Y	480	7.1	42.6	1	1/6	18	50	100-313	100-200				
						24	50	100-313	100-200				
PTOM1-24F-160Y	480	11.6	34.8	1	2/6	12	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	78
PTOM1-48F-100Y	480	14.2	42.6	1	2/6	18	100	100-625	100-400				
						24	100	100-625	100-400				
PTOM1-24F-240Y	480	17.4	34.8	1	3/6	12	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	86
PTOM1-48F-150Y	480	21.3	42.6	1	3/6	18	150	100-938	100-600				
						24	150	100-938	100-600				
PTOM1-24F-320Y	480	23.2	34.8	1	4/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	94
PTOM1-48F-200Y	480	28.4	42.6	1	4/6	18	200	100-1250	100-800				
						24	200	100-1250	100-800				
PTOM1-48F-250Y	480	35.5	42.6	1	5/6	18	250	100-1563	100-1000	23.17 x 21 x 13.77	3/0	F	102
						24	250	100-1563	100-1000				
PTOM1-48F-300Y	480	42.6	42.6	1	6/6	18	300	100-1875	100-1200	23.17 x 21 x 13.77	3/0	F	110
						24	300	100-1875	100-1200				

Technical Specifications for 208/220/240V, 3 phase

	AC Input				DC Output								
Charger Model Number	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)	8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
PTOM3-48C-40G	208/220/240	7.4/7.0/6.4	22.2	3	1/3	12	40	100-250	100-160	23.1 x 12.7 x 14.1	2/0	C	54
						18	40	100-250	100-160				
						24	40	100-250	100-160				
PTOM3-48C-80G	208/220/240	14.8/14/12.8	22.2	3	2/3	12	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	62
						18	80	100-500	100-320				
						24	80	100-500	100-320				

Technical Specifications for 208/220/240V, 3 phase (cont.)

Charger Model Number	AC Input				DC Output								
	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)	8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
PTOM3-48C-120G	208/220/240	22.2/21/19.2	22.2	3	3/3	12	120	100-750	100-480	23.1 x 12.7 x 14.1	2/0	C	70
						18	120	100-750	100-480				
						24	120	100-750	100-480				
PTOM3C48C-40G	208/220/240	7.4/7.0/6.4	22.2	3	1/3	12	40	100-250	100-160	23.1 x 12.7 x 14.1	2/0	C	54
						18	40	100-250	100-160				
						24	40	100-250	100-160				
PTOM3C48C-80G	208/220/240	14.8/14/12.8	22.2	3	2/3	12	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	62
						18	80	100-500	100-320				
						24	80	100-500	100-320				
PTOM3C48C-120G	208/220/240	22.2/21/19.2	22.2	3	3/3	12	120	100-750	100-480	23.1 x 12.7 x 14.1	2/0	C	70
						18	120	100-750	100-480				
						24	120	100-750	100-480				
PTOM3-80C-25G	208/220/240	7.7/7.3/6.7	23.1	3	1/3	36	25	100-155	100-100	23.1 x 12.7 x 14.1	2/0	C	54
						40	25	100-155	100-100				
PTOM3-80C-50G	208/220/240	15.4/14.6/13.4	23.1	3	2/3	36	50	100-315	100-200	23.1 x 12.7 x 14.1	2/0	C	62
						40	50	100-315	100-200				
PTOM3-80C-75G	208/220/240	23.1/21.9/20.1	23.1	3	3/3	36	75	100-470	100-300	23.1 x 12.7 x 14.1	2/0	C	70
						40	75	100-470	100-300				
PTOM3C80C-25G	208/220/240	7.7/7.3/6.7	23.1	3	1/3	36	25	100-155	100-100	23.1 x 12.7 x 14.1	2/0	C	54
						40	25	100-155	100-100				
PTOM3C80C-50G	208/220/240	15.4/14.6/13.4	23.1	3	2/3	36	50	100-315	100-200	23.1 x 12.7 x 14.1	2/0	C	62
						40	50	100-315	100-200				
PTOM3C80C-75G	208/220/240	23.1/21.9/20.1	23.1	3	3/3	36	75	100-470	100-300	23.1 x 12.7 x 14.1	2/0	C	70
						40	75	100-470	100-300				
PTOM3-48F-40G	208/220/240	7.4/7.0/6.4	44.4	3	1/6	12	40	100-250	100-160	23.17 x 21 x 13.77	3/0	F	70
						18	40	100-250	100-160				
						24	40	100-250	100-160				
PTOM3-48F-80G	208/220/240	14.8/14/12.8	44.4	3	2/6	12	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	78
						18	80	100-500	100-320				
						24	80	100-500	100-320				
PTOM3-48F-120G	208/220/240	22.2/21/19.2	44.4	3	3/6	12	120	100-750	100-480	23.17 x 21 x 13.77	3/0	F	86
						18	120	100-750	100-480				
						24	120	100-750	100-480				
PTOM3-48F-160G	208/220/240	29.6/28/25.6	44.4	3	4/6	12	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	94
						18	160	100-1000	100-640				
						24	160	100-1000	100-640				
PTOM3-48F-200G	208/220/240	37/35/32	44.4	3	5/6	12	200	100-1250	100-800	23.17 x 21 x 13.77	3/0	F	102
						18	200	100-1250	100-800				
						24	200	100-1250	100-800				
PTOM3-48F-240G	208/220/240	44.4/42/38.4	44.4	3	6/6	12	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	110
						18	240	100-1500	100-960				
						24	240	100-1500	100-960				
PTOM3C48F-40G	208/220/240	7.4/7.0/6.4	44.4	3	1/6	12	40	100-250	100-160	23.17 x 21 x 13.77	3/0	F	70
						18	40	100-250	100-160				
						24	40	100-250	100-160				

Technical Specifications for 208/220/240V, 3 phase (cont.)

Charger Model Number	AC Input				DC Output									
	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)	8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
PTOM3C48F-80G	208/220/240	14.8/14/12.8	44.4	3	2/6	12	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	78
						18	80	100-500	100-320				
						24	80	100-500	100-320				
PTOM3C48F-120G	208/220/240	22.2/21/19.2	44.4	3	3/6	12	120	100-750	100-480	23.17 x 21 x 13.77	3/0	F	86
						18	120	100-750	100-480				
						24	120	100-750	100-480				
PTOM3C48F-160G	208/220/240	29.6/28/25.6	44.4	3	4/6	12	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	94
						18	160	100-1000	100-640				
						24	160	100-1000	100-640				
PTOM3C48F-200G	208/220/240	37/35/32	44.4	3	5/6	12	200	100-1250	100-800	23.17 x 21 x 13.77	3/0	F	102
						18	200	100-1250	100-800				
						24	200	100-1250	100-800				
PTOM3C48F-240G	208/220/240	44.4/42/38.4	44.4	3	6/6	12	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	110
						18	240	100-1500	100-960				
						24	240	100-1500	100-960				
PTOM3-80F-25G	208/220/240	7.7/7.3/6.7	46.2	3	1/6	36	25	100-155	100-100	23.17 x 21 x 13.77	3/0	F	70
						40	25	100-155	100-100				
PTOM3-80F-50G	208/220/240	15.4/14.6/13.4	46.2	3	2/6	36	50	100-315	100-200	23.17 x 21 x 13.77	3/0	F	78
						40	50	100-315	100-200				
PTOM3-80F-75G	208/220/240	23.1/21.9/20.1	46.2	3	3/6	36	75	100-470	100-300	23.17 x 21 x 13.77	3/0	F	86
						40	75	100-470	100-300				
PTOM3-80F-100G	208/220/240	30.8/29.2/26.8	46.2	3	4/6	36	100	100-625	100-400	23.17 x 21 x 13.77	3/0	F	94
						40	100	100-625	100-400				
PTOM3-80F-125G	208/220/240	38.5/36.5/33.5	46.2	3	5/6	36	125	100-780	100-500	23.17 x 21 x 13.77	3/0	F	102
						40	125	100-780	100-500				
PTOM3-80F-150G	208/220/240	46.2/43.8/40.2	46.2	3	6/6	36	150	100-940	100-600	23.17 x 21 x 13.77	3/0	F	110
						40	150	100-940	100-600				
PTOM3C80F-25G	208/220/240	7.7/7.3/6.7	46.2	3	1/6	36	25	100-155	100-100	23.17 x 21 x 13.77	3/0	F	70
						40	25	100-155	100-100				
PTOM3C80F-50G	208/220/240	15.4/14.6/13.4	46.2	3	2/6	36	50	100-315	100-200	23.17 x 21 x 13.77	3/0	F	78
						40	50	100-315	100-200				
PTOM3C80F-75G	208/220/240	23.1/21.9/20.1	46.2	3	3/6	36	75	100-470	100-300	23.17 x 21 x 13.77	3/0	F	86
						40	75	100-470	100-300				
PTOM3C80F-100G	208/220/240	30.8/29.2/26.8	46.2	3	4/6	36	100	100-625	100-400	23.17 x 21 x 13.77	3/0	F	94
						40	100	100-625	100-400				
PTOM3C80F-125G	208/220/240	38.5/36.5/33.5	46.2	3	5/6	36	125	100-780	100-500	23.17 x 21 x 13.77	3/0	F	102
						40	125	100-780	100-500				
PTOM3C80F-150G	208/220/240	46.2/43.8/40.2	46.2	3	6/6	36	150	100-940	100-600	23.17 x 21 x 13.77	3/0	F	110
						40	150	100-940	100-600				

Technical Specifications for 440V, 3 phase

Charger Model Number	AC Input				DC Output			8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)						
PTOM3-48C-60H	440	5.3	15.9	3	1/3	12	70	100-440	100-280	23.1 x 12.7 x 14.1	2/0	C	54
						18	65	100-405	100-260				
						24	60	100-375	100-240				
PTOM3-48C-120H	440	10.6	15.9	3	2/3	12	140	100-875	100-560	23.1 x 12.7 x 14.1	2/0	C	62
						18	130	100-815	100-520				
						24	120	100-750	100-480				
PTOM3-48C-180H	440	15.9	15.9	3	3/3	12	210	100-1315	100-840	23.1 x 12.7 x 14.1	2/0	C	70
						18	195	100-1220	100-780				
						24	180	100-1125	100-720				
PTOM3C48C-60H	440	5.3	15.9	3	1/3	12	70	100-440	100-280	23.1 x 12.7 x 14.1	2/0	C	54
						18	65	100-405	100-260				
						24	60	100-375	100-240				
PTOM3C48C-120H	440	10.6	15.9	3	2/3	12	140	100-875	100-560	23.1 x 12.7 x 14.1	2/0	C	62
						18	130	100-815	100-520				
						24	120	100-750	100-480				
PTOM3C48C-180H	440	15.9	15.9	3	3/3	12	210	100-1315	100-840	23.1 x 12.7 x 14.1	2/0	C	70
						18	195	100-1220	100-780				
						24	180	100-1125	100-720				
PTOM3-80C-36H	440	5.3	15.9	3	1/3	36	40	100-250	100-160	23.1 x 12.7 x 14.1	2/0	C	54
						40	36	100-225	100-144				
PTOM3-80C-72H	440	10.6	15.9	3	2/3	36	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	62
						40	72	100-450	100-288				
PTOM3-80C-108H	440	15.9	15.9	3	3/3	36	120	100-750	100-480	23.1 x 12.7 x 14.1	2/0	C	70
						40	108	100-675	100-432				
PTOM3C80C-36H	440	5.3	15.9	3	1/3	36	40	100-250	100-160	23.1 x 12.7 x 14.1	2/0	C	54
						40	36	100-225	100-144				
PTOM3C80C-72H	440	10.6	15.9	3	2/3	36	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	62
						40	72	100-450	100-288				
PTOM3C80C-108H	440	15.9	15.9	3	3/3	36	120	100-750	100-480	23.1 x 12.7 x 14.1	2/0	C	70
						40	108	100-675	100-432				
PTOM3-48F-60H	440	5.3	31.8	3	1/6	12	70	100-440	100-280	23.17 x 21 x 13.77	3/0	F	70
						18	65	100-405	100-260				
						24	60	100-375	100-240				
PTOM3-48F-120H	440	10.6	31.8	3	2/6	12	140	100-875	100-560	23.17 x 21 x 13.77	3/0	F	78
						18	130	100-815	100-520				
						24	120	100-750	100-480				
PTOM3-48F-180H	440	15.9	31.8	3	3/6	12	210	100-1315	100-840	23.17 x 21 x 13.77	3/0	F	86
						18	195	100-1220	100-780				
						24	180	100-1125	100-720				
PTOM3-48F-240H	440	21.2	31.8	3	4/6	12	280	100-1750	100-1120	23.17 x 21 x 13.77	3/0	F	94
						18	260	100-1625	100-1040				
						24	240	100-1500	100-960				

Technical Specifications for 440V, 3 phase (cont.)

Charger Model Number	AC Input				DC Output			8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)						
PTOM3-48F-300H	440	26.5	31.8	3	5/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	102
						18	320	100-2000	100-1280				
						24	300	100-1875	100-1200				
PTOM3-48F-320H	440	31.8	31.8	3	6/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	110
						18	320	100-2000	100-1280				
						24	320	100-2000	100-1280				
PTOM3C48F-60H	440	5.3	31.8	3	1/6	12	70	100-440	100-280	23.17 x 21 x 13.77	3/0	F	70
						18	65	100-405	100-260				
						24	60	100-375	100-240				
PTOM3C48F-120H	440	10.6	31.8	3	2/6	12	140	100-875	100-560	23.17 x 21 x 13.77	3/0	F	78
						18	130	100-815	100-520				
						24	120	100-750	100-480				
PTOM3C48F-180H	440	15.9	31.8	3	3/6	12	210	100-1315	100-840	23.17 x 21 x 13.77	3/0	F	86
						18	195	100-1220	100-780				
						24	180	100-1125	100-720				
PTOM3C48F-240H	440	21.2	31.8	3	4/6	12	280	100-1750	100-1120	23.17 x 21 x 13.77	3/0	F	94
						18	260	100-1625	100-1040				
						24	240	100-1500	100-960				
PTOM3C48F-300H	440	26.5	31.8	3	5/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	102
						18	320	100-2000	100-1280				
						24	300	100-1875	100-1200				
PTOM3C48F-320H	440	31.8	31.8	3	6/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	110
						18	320	100-2000	100-1280				
						24	320	100-2000	100-1280				
PTOM3-80F-36H	440	5.3	31.8	3	1/6	36	40	100-250	100-160	23.17 x 21 x 13.77	3/0	F	70
						40	36	100-225	100-144				
PTOM3-80F-72H	440	10.6	31.8	3	2/6	36	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	78
						40	72	100-450	100-288				
PTOM3-80F-108H	440	15.9	31.8	3	3/6	36	120	100-750	100-480	23.17 x 21 x 13.77	3/0	F	86
						40	108	100-675	100-432				
PTOM3-80F-144H	440	21.2	31.8	3	4/6	36	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	94
						40	144	100-900	100-576				
PTOM3-80F-180H	440	26.5	31.8	3	5/6	36	200	100-1250	100-800	23.17 x 21 x 13.77	3/0	F	102
						40	180	100-1125	100-720				
PTOM3-80F-216H	440	31.8	31.8	3	6/6	36	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	110
						40	216	100-1350	100-864				
PTOM3C80F-36H	440	5.3	31.8	3	1/6	36	40	100-250	100-160	23.17 x 21 x 13.77	3/0	F	70
						40	36	100-225	100-144				
PTOM3C80F-72H	440	10.6	31.8	3	2/6	36	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	78
						40	72	100-450	100-288				

Technical Specifications for 440V, 3 phase (cont.)

Charger Model Number	AC Input				DC Output			8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)						
PTOM3C80F-108H	440	15.9	31.8	3	3/6	36	120	100-750	100-480	23.17 x 21 x 13.77	3/0	F	86
						40	108	100-675	100-432				
PTOM3C80F-144H	440	21.2	31.8	3	4/6	36	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	94
						40	144	100-900	100-576				
PTOM3C80F-180H	440	26.5	31.8	3	5/6	36	200	100-1250	100-800	23.17 x 21 x 13.77	3/0	F	102
						40	180	100-1125	100-720				
PTOM3C80F-216H	440	31.8	31.8	3	6/6	36	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	110
						40	216	100-1350	100-864				
PTOM3-48C-60Y	480	4.8	14.4	3	1/3	12	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	54
						18	80	100-500	100-320				
						24	60	100-375	100-240				
PTOM3-48C-120Y	480	9.6	14.4	3	2/3	12	160	100-1000	100-640	23.1 x 12.7 x 14.1	2/0	C	62
						18	160	100-1000	100-640				
						24	120	100-750	100-480				
PTOM3-48C-180Y	480	14.4	14.4	3	3/3	12	240	100-1500	100-960	23.1 x 12.7 x 14.1	2/0	C	70
						18	240	100-1500	100-960				
						24	180	100-1125	100-720				
PTOM3C48C-60Y	480	4.8	14.4	3	1/3	12	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	54
						18	80	100-500	100-320				
						24	60	100-375	100-240				
PTOM3C48C-120Y	480	9.6	14.4	3	2/3	12	160	100-1000	100-640	23.1 x 12.7 x 14.1	2/0	C	62
						18	160	100-1000	100-640				
						24	120	100-750	100-480				
PTOM3C48C-180Y	480	14.4	14.4	3	3/3	12	240	100-1500	100-960	23.1 x 12.7 x 14.1	2/0	C	70
						18	240	100-1500	100-960				
						24	180	100-1125	100-720				
PTOM3-80C-36Y	480	4.8	14.4	3	1/3	36	40	100-250	100-160	23.1 x 12.7 x 14.1	2/0	C	54
						40	36	100-225	100-144				
PTOM3-80C-72Y	480	9.6	14.4	3	2/3	36	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	62
						40	72	100-450	100-288				
PTOM3-80C-108Y	480	14.4	14.4	3	3/3	36	120	100-750	100-480	23.1 x 12.7 x 14.1	2/0	C	70
						40	108	100-675	100-432				
PTOM3C80C-36Y	480	4.8	14.4	3	1/3	36	40	100-250	100-160	23.1 x 12.7 x 14.1	2/0	C	54
						40	36	100-225	100-144				
PTOM3C80C-72Y	480	9.6	14.4	3	2/3	36	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	62
						40	72	100-450	100-288				
PTOM3C80C-108Y	480	14.4	14.4	3	3/3	36	120	100-750	100-480	23.1 x 12.7 x 14.1	2/0	C	70
						40	108	100-675	100-432				
PTOM3-48F-60Y	480	4.8	28.8	3	1/6	12	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	70
						18	80	100-500	100-320				
						24	60	100-375	100-240				

Technical Specifications for 440V, 3 phase (cont.)

Charger Model Number	AC Input				DC Output								
	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)	8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
PTOM3-48F-120Y	480	9.6	28.8	3	2/6	12	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	78
						18	160	100-1000	100-640				
						24	120	100-750	100-480				
PTOM3-48F-180Y	480	14.4	28.8	3	3/6	12	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	86
						18	240	100-1500	100-960				
						24	180	100-1125	100-720				
PTOM3-48F-240Y	480	19.2	28.8	3	4/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	94
						18	320	100-2000	100-1280				
						24	240	100-1500	100-960				
PTOM3-48F-300Y	480	24	28.8	3	5/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	102
						18	320	100-2000	100-1280				
						24	300	100-1875	100-1200				
PTOM3-48F-320Y	480	28.8	28.8	3	6/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	110
						18	320	100-2000	100-1280				
						24	320	100-2000	100-1280				
PTOM3C48F-60Y	480	4.8	28.8	3	1/6	12	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	70
						18	80	100-500	100-320				
						24	60	100-375	100-240				
PTOM3C48F-120Y	480	9.6	28.8	3	2/6	12	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	78
						18	160	100-1000	100-640				
						24	120	100-750	100-480				
PTOM3C48F-180Y	480	14.4	28.8	3	3/6	12	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	86
						18	240	100-1500	100-960				
						24	180	100-1125	100-720				
PTOM3C48F-240Y	480	19.2	28.8	3	4/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	94
						18	320	100-2000	100-1280				
						24	240	100-1500	100-960				
PTOM3C48F-300Y	480	24	28.8	3	5/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	102
						18	320	100-2000	100-1280				
						24	300	100-1875	100-1200				
PTOM3C48F-320Y	480	28.8	28.8	3	6/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	110
						18	320	100-2000	100-1280				
						24	320	100-2000	100-1280				
PTOM3-80F-36Y	480	4.8	28.8	3	1/6	36	40	100-250	100-160	23.17 x 21 x 13.77	3/0	F	70
						40	36	100-225	100-144				
PTOM3-80F-72Y	480	9.6	28.8	3	2/6	36	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	78
						40	72	100-450	100-288				
PTOM3-80F-108Y	480	14.4	28.8	3	3/6	36	120	100-750	100-480	23.17 x 21 x 13.77	3/0	F	86
						40	108	100-675	100-432				
PTOM3-80F-144Y	480	19.2	28.8	3	4/6	36	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	94
						40	144	100-900	100-576				

Technical Specifications for 440V, 3 phase (cont.)

Charger Model Number	AC Input				DC Output								
	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)	8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
PTOM3-80F-180Y	480	24	28.8	3	5/6	36	200	100-1250	100-800	23.17 x 21 x 13.77	3/0	F	102
						40	180	100-1125	100-720				
PTOM3-80F-216Y	480	28.8	28.8	3	6/6	36	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	110
						40	216	100-1350	100-864				
PTOM3C80F-36Y	480	4.8	28.8	3	1/6	36	40	100-250	100-160	23.17 x 21 x 13.77	3/0	F	70
						40	36	100-225	100-144				
PTOM3C80F-72Y	480	9.6	28.8	3	2/6	36	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	78
						40	72	100-450	100-288				
PTOM3C80F-108Y	480	14.4	28.8	3	3/6	36	120	100-750	100-480	23.17 x 21 x 13.77	3/0	F	86
						40	108	100-675	100-432				
PTOM3C80F-144Y	480	19.2	28.8	3	4/6	36	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	94
						40	144	100-900	100-576				
PTOM3C80F-180Y	480	24	28.8	3	5/6	36	200	100-1250	100-800	23.17 x 21 x 13.77	3/0	F	102
						40	180	100-1125	100-720				
PTOM3C80F-216Y	480	28.8	28.8	3	6/6	36	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	110
						40	216	100-1350	100-864				

Technical Specifications for 600V, 3 phase

Charger Model Number	AC Input				DC Output								
	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)	8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
PTOM3-48C-60C	600	3.8	11.4	3	1/3	12	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	54
						18	80	100-500	100-320				
						24	60	100-375	100-240				
PTOM3-48C-120C	600	7.6	11.4	3	2/3	12	160	100-1000	100-640	23.1 x 12.7 x 14.1	2/0	C	62
						18	160	100-1000	100-640				
						24	120	100-750	100-480				
PTOM3-48C-180C	600	11.4	11.4	3	3/3	12	240	100-1500	100-960	23.1 x 12.7 x 14.1	2/0	C	70
						18	240	100-1500	100-960				
						24	180	100-1125	100-720				
PTOM3-48F-60C	600	3.8	22.8	3	1/6	12	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	70
						18	80	100-500	100-320				
						24	60	100-375	100-240				
PTOM3-48F-120C	600	7.6	22.8	3	2/6	12	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	78
						18	160	100-1000	100-640				
						24	120	100-750	100-480				

Technical Specifications for 600V, 3 phase (cont.)

Charger Model Number	AC Input				DC Output								
	Voltage	Nominal Amp Draw (A)	Max Rated Cabinet Amps	Phase	# Modules/ # Bays	Cells	Max Current (A)	8 Hour Capacity Range (Ah)	Opportunity Capacity Range (Ah)	Dimensions H x W x D (in)	Charger Cable (AWG)	Cabinet Type	Weight (lbs)
PTOM3-48F-180C	600	11.4	22.8	3	3/6	12	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	86
						18	240	100-1500	100-960				
						24	180	100-1125	100-720				
PTOM3-48F-240C	600	15.2	22.8	3	4/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	94
						18	320	100-2000	100-1280				
						24	240	100-1500	100-960				
PTOM3-48F-300C	600	19	22.8	3	5/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	102
						18	320	100-2000	100-1280				
						24	300	100-1875	100-1200				
PTOM3-48F-320C	600	22.8	22.8	3	6/6	12	320	100-2000	100-1280	23.17 x 21 x 13.77	3/0	F	110
						18	320	100-2000	100-1280				
						24	320	100-2000	100-1280				
PTOM3-80C-36C	600	3.8	11.4	3	1/3	36	40	100-250	100-160	23.1 x 12.7 x 14.1	2/0	C	54
						40	36	100-225	100-144				
PTOM3-80C-72C	600	7.6	11.4	3	2/3	36	80	100-500	100-320	23.1 x 12.7 x 14.1	2/0	C	62
						40	72	100-450	100-288				
PTOM3-80C-108C	600	11.4	11.4	3	3/3	36	120	100-750	100-480	23.1 x 12.7 x 14.1	2/0	C	70
						40	108	100-675	100-432				
PTOM3-80F-36C	600	3.8	22.8	3	1/6	36	40	100-250	100-160	23.17 x 21 x 13.77	3/0	F	70
						40	36	100-225	100-144				
PTOM3-80F-72C	600	7.6	22.8	3	2/6	36	80	100-500	100-320	23.17 x 21 x 13.77	3/0	F	78
						40	72	100-450	100-288				
PTOM3-80F-108C	600	11.4	22.8	3	3/6	36	120	100-750	100-480	23.17 x 21 x 13.77	3/0	F	86
						40	108	100-675	100-432				
PTOM3-80F-144C	600	15.2	22.8	3	4/6	36	160	100-1000	100-640	23.17 x 21 x 13.77	3/0	F	94
						40	144	100-900	100-576				
PTOM3-80F-180C	600	19	22.8	3	5/6	36	200	100-1250	100-800	23.17 x 21 x 13.77	3/0	F	102
						40	180	100-1125	100-720				
PTOM3-80F-216C	600	22.8	22.8	3	6/6	36	240	100-1500	100-960	23.17 x 21 x 13.77	3/0	F	110
						40	216	100-1350	100-864				

NOTES

PO BOX 808
Ooltewah, TN 37363
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1-877-7HAWKER (USA and Canada only)
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