Installation, Operation and Maintenance Manual
MHE Intelligent Fast Charging Systems
DVS100 440VAC

English

20182-W-03-01

DECLARATION OF CONFORMITY

$C\epsilon$

THE MANUFACTURER

Company:	**BorgWarner Systems Lugo S.r.l**			
Address:	**Via Mensa 3/2**	ZIP Code: **48022**	Province:	**RA**
City:	**S. Maria in Fabriago – Lugo**		Country:	**Italy**

DECLARES THAT THE MACHINES

Series Names: **Posicharge SVS-80** (Product No. 10865)
Posicharge SVS-100 (Product No. 11000)
Posicharge SVS-200 (Product No. 10850)
Posicharge SVS-300 (Product No. 10855)

Description: **Industrial Battery Chargers for Electric Vehicles and Machineries**
Manufactured in: **S. Maria in Fabriago – Lugo**

COMPLY WITH THE DIRECTIVES

- **2014/35/EU** "Low Voltage Directive" of the 26th February 2014
- **2014/30/EU** "Electromagnetic Compatibility Directive" of the 26th February 2014
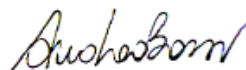
HARMONIZED STANDARDS:

- **EN 60335-1:2012** "Household and similar electrical appliances – Safety Part 1: General requirements"
- **EN 60335-2-29:2004/A2:2010** "Household and similar electrical appliances – Safety Part 2: Particular requirements for battery chargers"
- **EN 61000-6-2:2005;** "Generic standards – Immunity for industrial environments"
- **EN 61000-6-4:2007/A1:2011** "Generic standards – Emission standard for industrial environments"

DATE

06th February 2018

THE MANUFACTURER

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Andrea Bassi
General Manager – BorgWarner Systems Lugo S.r.l

20182-W-03-01

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1 Getting Started

Before you begin, take the time to familiarize yourself with the Cautions in Section 2, and read the installation instructions in Section 4 completely before you install your new DVS100.

To get your system up and running quickly perform the following steps:

1. Ensure the DVS100 siting requirements are followed. (Sections 4.5)
2. Connect the 3 phase utility power to the DVS100, and apply power to the DVS100. (Sections 4.6)
3. Install the BMID onto the battery pack. (Sections 3)
4. Once the BMID is installed, the battery pack may be connected to the charger.
5. If your BMID does not come pre-configured, you will need to initialize the new BMID. (Refer to BMID programming, document #06701-W-03)
6. Once the BMID has been properly programmed, the battery pack is ready to begin charging.

2   Safety Precautions – Read before using

The DVS100 is designed with the safety of the user as the highest priority. However, installation must comply with all local codes, and the following safety precautions must be read and observed.

2.1   Symbol usage

Throughout this manual, take special note of the information marked with the following symbols:

⚡ DANGER	Contains information about safety practices necessary to prevent personal injury or death.

⚠ WARNING	Contains information about safety practices necessary to prevent fire or equipment overheating.

⚡ DANGER	Contains information to prevent shock hazard or possible damage to the equipment during installation and service.

NOTE: Offers helpful information for installation or usage, but does not contain personnel or equipment safety related information.

⚠ CAUTION BEFORE YOU BEGIN	• Read all instructions and cautionary markings on the Industrial PosiCharge™ (DVS100) Assembly. • Make sure you also read the IMPORTANT SAFETY INSTRUCTIONS below. • Be sure to leave these instructions with the installed unit for future reference. • Only qualified personnel should install, use or service this charger. • Read and understand these Manufacturer's instructions and your employer's safety practices manual.

⚡ DANGER	ELECTRIC SHOCK CAN KILL: Touching live electrical parts can cause fatal shocks or severe burns. The battery terminals are always electrically live, and the output circuit is live whenever the battery is connected or being charged. The input power circuitry and internal circuits are live whenever input power is on. An incorrectly installed or improperly grounded charger is a hazard.

IMPORTANT INFORMATION – SAVE THESE INSTRUCTIONS

- The unit must be grounded properly with a grounding conductor of size equal to or larger than that recommended by local electrical codes or the installation section of this manual.
- Do not touch the uninsulated portion of the output battery connector or an uninsulated battery terminal.
- Only qualified service personnel may remove the front or back panels on the DVS100. There are no user serviceable parts inside. Refer all servicing to qualified service personnel. Opening the system or attempted installation or repair by other than qualified service personnel voids the warranty.
- Disconnect battery charger from input power and battery connections before installing or servicing. Lockout/tagout input power.
- Do not expose to rain or perform installation/service/repair work when in standing water.
- A Charge can be stopped by disconnecting the output cable connector or by pressing the stop button on the front panel. The DVS100 is designed to automatically stop a charge event to prevent arcing or burning of the charger connections in the event of a hot disconnect.
- The charging cables must be sized for the full rated current of the DVS100, and inspected frequently for wear, cuts and abrasion. Do not use worn, damaged, undersized, or poorly spliced cable.
- The DVS100 charging connector is subject to normal wear and tear, and may be damaged by misuse or abuse. Frequently inspect the connector for cracking, pitting of contacts, fraying of wires or signs of connector fatigue. A damaged charging connector should be replaced immediately.
- Do not install or place unit on, over or near combustible surfaces.
- Do not install unit near flammables.
- Do not block air intake or exhaust.
- Ensure that the Battery Monitor/Identifier (BMID) is properly installed according to the BMID installation instructions.
- Replace blown fuses only with same type and rating of fuse.
- Do not overload building wiring - be sure power supply system is properly sized, rated and protected to handle this unit. Use only on circuits provided with the minimum wire size specified in the installation section.
- Protective bollards or Armco barriers should be installed where charging equipment location is subject to damage from vehicle activity.
- Do not install unit where it will be exposed to direct sunlight.
- To avoid shock hazard, only install cables approved by PosiCharge™ for indoor use.
- Do not subject the cable or coupler to damage or stress. Do not step on the coupler cable.
- Do not hang from the coupler cable.
- Do not disassemble the DVS100.

2.2   Technical Support

This manual is intended to provide an authorized, fully trained installation technician with the information and guidance necessary to safely install the DVS100 equipment.

All non-standard tools are listed in 2.4. If parts or tools are needed in addition to those listed in this manual to perform service, this service is outside the scope of this manual and PosiCharge should be contacted directly for further assistance.

Training may be scheduled by contacting Customer Service at PosiCharge at:

<div align="center">

service@posicharge.com
866-POSICHARGE (866-767-4242)

</div>

2.3   ESD Precautions

Electronic circuits are sensitive to damage from electrostatic Discharge. Persons servicing this equipment should be trained in proper techniques for avoiding ESD damage to electronic circuits. As a minimum, when handling circuit boards, wear an appropriate ESD wrist strap connected to the equipment chassis.

2.4   Non-StandardTools

No.	Equipment Description	Suggested Supplier	Part Number
A.	Multimeter	Fluke	Model 79 or equivalent
B.	Bleed down resistor (100Ω, 10W) with Probe tips	---	---
C.	Metric socket set, deep well, 8MM to 17MM	---	---
D.	RS-232 Diagnostic Cable	---	---

3 System Description

The keypad and display provide the user interface to the charger. The display constantly updates the charger and battery status, and allows access to the programming menus through the keypad.

Four (4) status LEDs indicate when a charge is in progress, at 80% complete, fully charged, or in equalization. A fault/warning LED serves to alert the user to fault conditions.

The DVS100 works with a small monitoring device mounted on the battery called the battery monitor/identifier (BMID). As shown in Figure 3- 1, when a vehicle equipped with a BMID connects to the charger, the charger communicates with the BMID to ensure optimal charging.
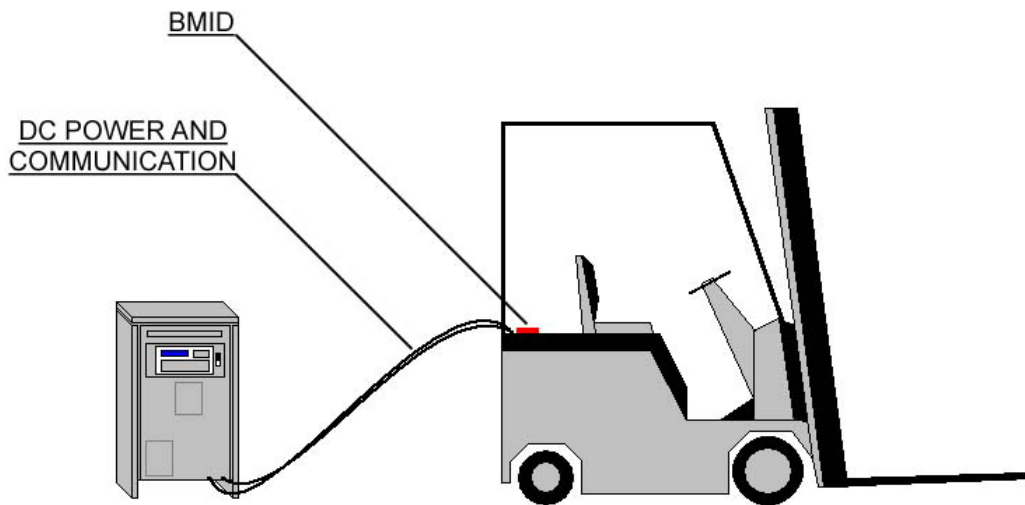
Figure 3- 1 Components of the Charging System

Typically, the battery dealer or another authorized service technician will install the BMID on the battery and configure it before delivery to the customer. BMIDs may also be configured on site through the charger front panel (see the "BMID Programming Manual").

Many different sizes and types of industrial battery packs may be charged with the DVS100. Choose the correct BMID and BMID programming for the nominal voltage and size of your pack.

⚠ WARNING	IMPROPER INSTALLATION CAN CAUSE FIRE

4 Installation

This section outlines the requirements and procedures for installing the DVS100. Read the entire section before proceeding with installation, and make sure you have read and understood the warnings in Section 2. Installation should be completed by an experienced electrician and should conform to all relevant electrical codes.

4.1 Preparation

Unpacking and Inspection

The DVS100 is provided fully assembled on a shipping pallet. It is surrounded by a protective shipping box. Remove the packaging and any other shipping materials prior to installation.

The following equipment is provided with each system:

- One DVS100 system
- DVS Installation Manual
- CD manual

The following equipment is shipped to truck retrofit location

- Two BMID system with related connectors
- Two BMID thermistor kit
- The "BMID Programming" Manual

NOTE: Additional connector sets and BMID kits may be purchased from your authorized DVS100 Dealer.

4.2   Wiring

4.2.1 General Guidelines

- Check utility configuration tag on DVS100 to make sure that rated input voltage matches local utility voltage. See Table 4-1 for details.

- See Table 4-1 for Input / Output parameters.

4.2.2 Ground Wire

- Green or green with a yellow stripe and attached to the compression lug provided.

4.2.3 Charging Cables / Cable Management System

- To avoid shock hazard, only install cables approved by PosiCharge™ for indoor use. Use H01N2-D (EN 50272-3) or similar type.

⚠ DANGER	**CABLES CARRY HIGH POWER/CURRENT** Damaged Cables and/or connectors can be a serious safety hazard. Cables must be secured with an Approved Cable Management System. Cables are to be kept off the floor. **Failure to use a Cable Management System may invalidate Product Warranty.**

4.2.4 Chassis Ground

- See Table 4-1 for wiring size and additional information.
- Use copper conductors only.
- Minimum ground wire size is listed. Refer to local electrical codes for reference.

4.2.5 Grounding

- DVS100 must be connected to an equipment-grounding conductor routed with the circuit conductors. Connections must comply with all local codes and ordinances (EN 50178 Part 1).
- The DVS100 must be grounded in accordance with the Facilities Utility grounding method.
- See Table 4-1 for minimum ground wire size.

4.3   Physical Installation

		The DVS100 weighs 240 kg. Always use appropriate equipment for handling the unit. Use a forklift of sufficient capacity to lift the unit.
⚠	CAUTION	Do not use hooks to lift the unit.
		Do not tip the unit. It must be kept in vertical position.

The external dimensions of the DVS100 are:
- Base: 51,9 x 62,3 cm (20.44 x 24.50 in)
- Height: 130.7 cm (51.47 in)

Location

Choose your installation location to:

- Avoid temperature and humidity extremes.
- Minimize moisture and dust.
- Provide adequate air circulation to prevent the buildup of fumes.
- Install on a cement pad minimum 18cm (7") above surrounding curbing or walkways for water flood control, see Figure 4- 1
- Maintain a minimum of 46cm (18") of clearance on the sides of the unit for proper ventilation.
- Maintain 91,5cm (36") minimum clearance on Front and Back for servicing as required by local codes.
- Do not install unit where it will be exposed to direct sunlight.
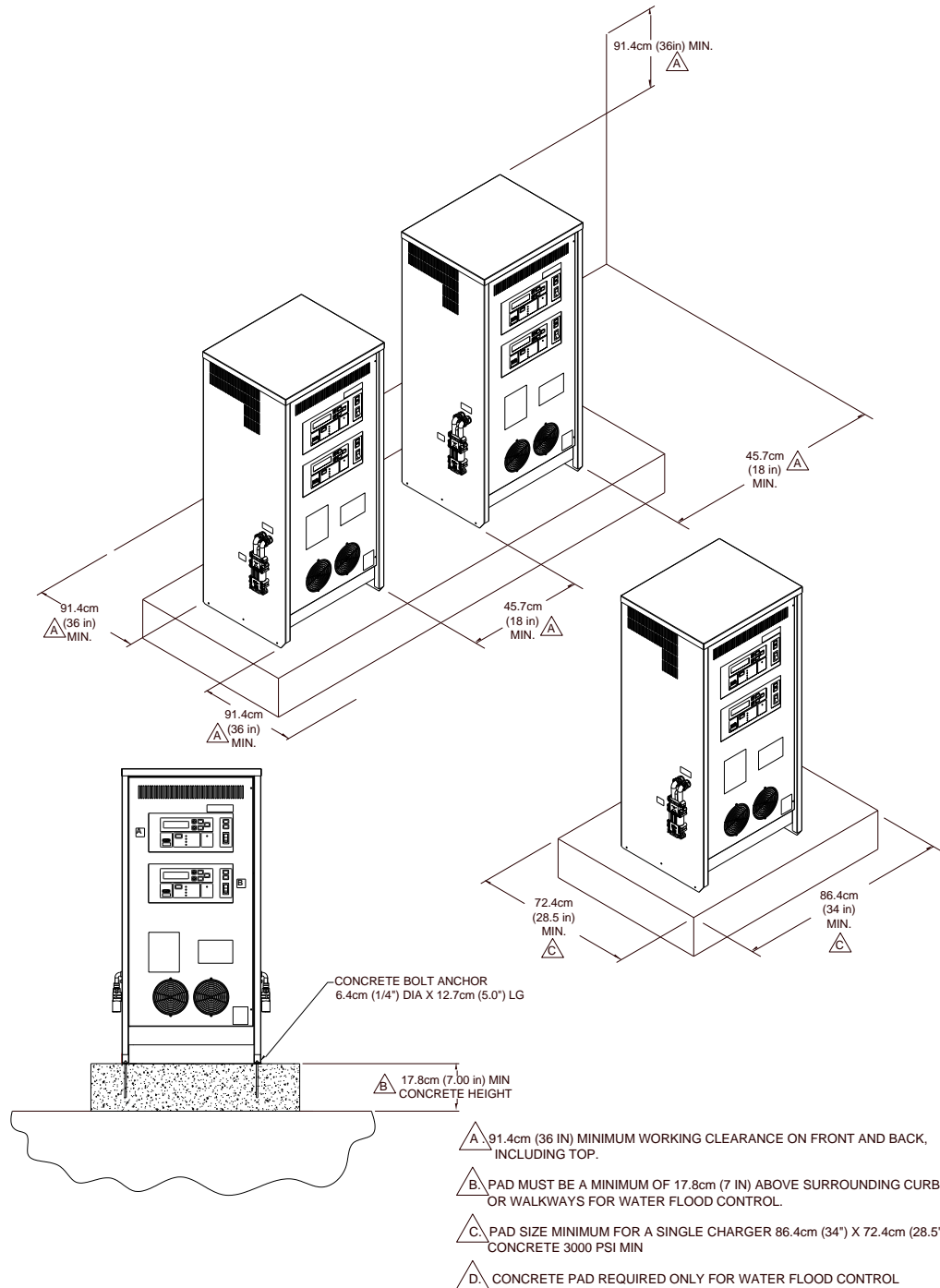
Figure 4- 1 DVS100 Installation

NOTE: We strongly recommend cement curbing, concrete filled steel pipe pillars, or similar protection to be placed around the DVS100 to prevent damage to the DVS100 from a moving vehicle.

The square mounting holes are 6.5mm X 6.5 mm.
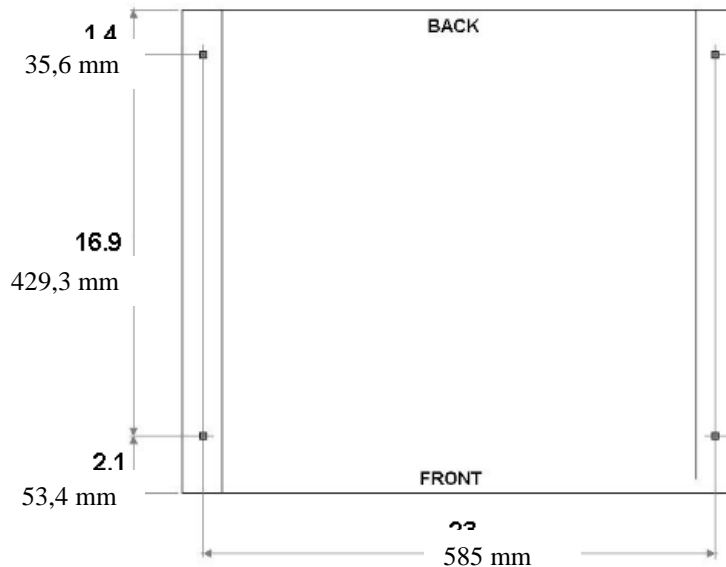
Figure 4- 2 Bolt Pattern for DVS100 Installation

4.4 Connecting AC (Utility) Power

⚠ CAUTION	Prior to connecting the unit to the utility ensure that: • The available grounding connection meets all state and local codes. • The main circuit breaker or other "line disconnect" device is within sight of the unit and is easily accessible to allow complete power down of the unit.
⚡ DANGER	Incorrect power wire installation, or failure to properly ground unit may result in a severe shock hazard.
⚠ CAUTION	Use Copper conductors only.

Utility power lines to DVS100 must be provided from an appropriately rated utility distribution panel.

The utility distribution panel must include a "branch" rated circuit breaker (CB). The CB may also be the "line disconnect" device.
Utility power must be 50/60Hz, 3 phase, 3 wire plus ground. There must be one wire for each phase plus one earth ground. See Table 4-1 for information on input current, utility requirement, and cable sizes. All phase wires must be rated for the full input AC current as listed.

Table 4-1 Utility and Wiring Information

Configuration	2 x 10kW
Input voltages	440 VAC ± 10%
Input AC Current at rated load (Amps)	30 A @ 440V
Input Frequency (Hz)	50 / 60
Number of input Phases (Excluding Ground)	3
Maximum Circuit Breaker Rating (Amps)	30 A, D-characteristic
Minimum Disconnect Switch Voltage Rating (VAC)	600
Minimum Inrush Current Capacity (Amps)	250A, 2 cycle start-up load
THD Max	35%
Minimum Input Conductor Size (mm^2)	10mm^2
Minimum Grounding Conductor Size (mm^2)	10mm^2
Minimum Ground Wire Terminal Torque (in-lb)	4-5 Nm

Table 4-2 Output Characteristics for DVS100

Configuration	Port A	Port B
Max Output Power	10 kW	10 kW
Max Output DC Range	16-120 V	16-120 V
Max Output DC Current	200 A	200 A
Minimum Output Wire Size (DC BUS +)	1x 70 mm²	1x 70 mm²
Minimum Output Wire Size (DC BUS -)	1x 70 mm²	1x 70 mm²
Output Cable Connector	320A Euro	320A Euro

Installation / Line Voltage Changeover Instructions

1. Remove the screws and open the front door of the DVS100.
2. Locate the AC Input Terminal Block. Refer to Figure 4- 3.
3. Bring utility wires from the Utility Distribution Panel through conduit, and route them to the AC Input Terminal Block and the Chassis Grounding Connector.
   NOTE: The grounding wire should have insulation that is green or green with yellow stripe.
4. Ensure good electrical connection by tightening all the screws properly.
5. Close the front door prior to switching on the utility power.

AC INPUT TERMINAL BLOCK

TRANSFORMER TAPS TERMINAL BLOCK
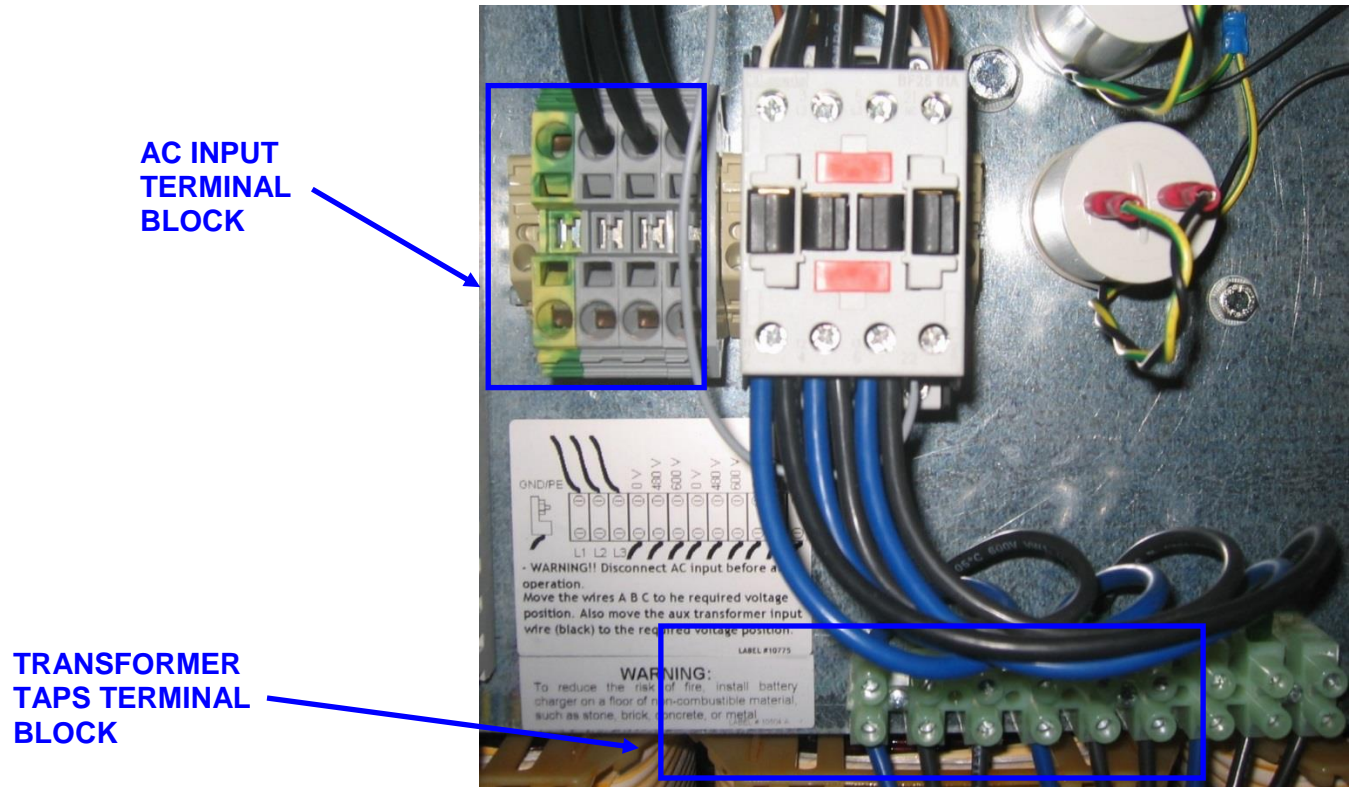
Figure 4- 3 AC Input Terminal Block

CHASSIS GROUND CONNECTOR
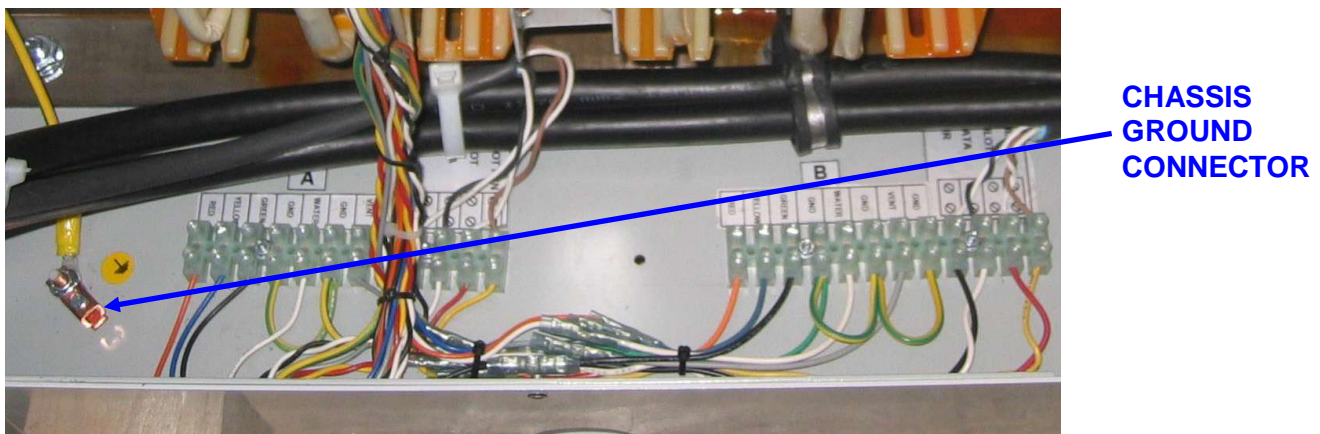
Figure 4- 4 Location of Chassis Ground Connector

5   Operation

5.1   Start Up

When you first power up your Industrial PosiCharge™, it will perform a lighting sequence test. The display will then show the initial Status Screen containing the model number, the software version and the output current capability. After five seconds, the screen will shift to the charge screens.

5.2   System Start Up – Emergency Off (EPO) Option

With the external AC Input applied to the system, display panel switches on the ON position, press the green ON button located on the front door assembly. See Figure 5- 1A.
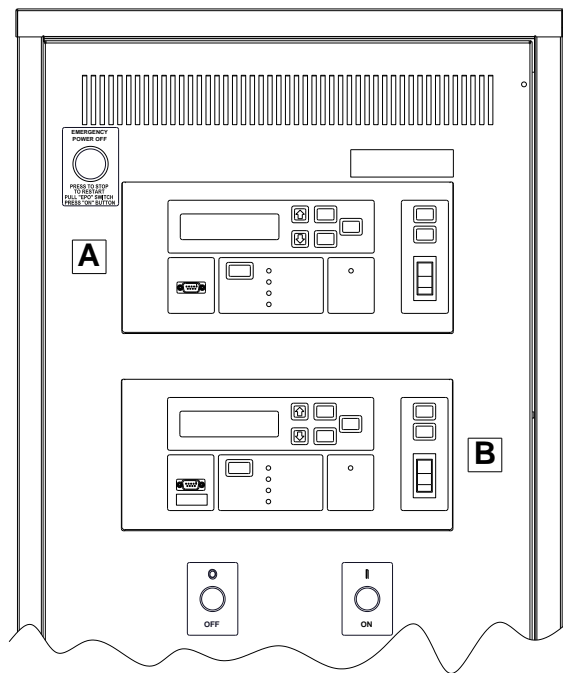
Figure 5- 1A ON/OFF/EPO Front Panel Buttons

Pressing the red OFF button terminates all output power.   Pressing the green ON button restarts the system.

In an Emergency, pressing the large, red Emergency OFF button will also remove all output power and input power to the Control 230VAC and 24VAC accessory. Before restarting the system after any emergency, be sure the system has been returned to a safe, operable condition before Pulling EPO and pressing the ON button to restart the system.

5.3   Language Selection

At the "Charger Ready Connect Vehicle" Screen, a standard password shall be required to gain entry to the Language Selection option.

In the "Charger Ready Connect Vehicle" screen, use the standard password to access the language options. After password has been accepted the "Charger Ready Connect Vehicle" screen will start flashing. Press the UP arrow and Hold to scroll through the language options, release when desired language is displayed; Press ENTER to accept the desired language.

```
┌─────────────────────────────┐
│ DVS100          200 Amps    │
│ Version    03.00.00.32      │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│ Charger Ready     US        │
│ Connect Vehicle             │
└─────────────────────────────┘
              │  Enter key code now, Hold key code until screen starts flashing
              ▼
┌─────────────────────────────┐
│ Charger Ready        EU     │
│ Connect Vehicle             │
└─────────────────────────────┘
              │  ⬆ ENTER
              ▼
┌─────────────────────────────┐
│ Chargeur Prêt               │
│ Relier le Véhicule          │
└─────────────────────────────┘
              │  ⬆ ENTER
              ▼
┌─────────────────────────────┐
│ Ladegerät bereit            │
│ Fahrzg anschließen          │
└─────────────────────────────┘
              │  ⬆ ENTER
              ▼
┌─────────────────────────────┐
│ Cargador Listo              │
│ Conecte el Vehículo         │
└─────────────────────────────┘
```

Press and Hold UP arrow to select language preference and ENTER to accept the selection made.

Figure 5- 2B Language Selection Screens

5.4   Charging

Step 1: Connect battery to charger
To start charging, simply connect the battery to the charger. Once the charge starts, and the "Charging" screen is displayed, the current is ramped up from zero to the target start current.

```
DVS100        200 Amps
Version   03.00.00.32
```

```
Charger Ready
Connect Vehicle
```
Vehicle Connected

```
Vehicle connected
Getting config info
```
Communication establi

```
Preparing to charge
Please wait...
```

```
Preparing to charge
Please wait 30 sec
```

```
Charging          73%   ▲
25.4V     150A     71F  ▼
```
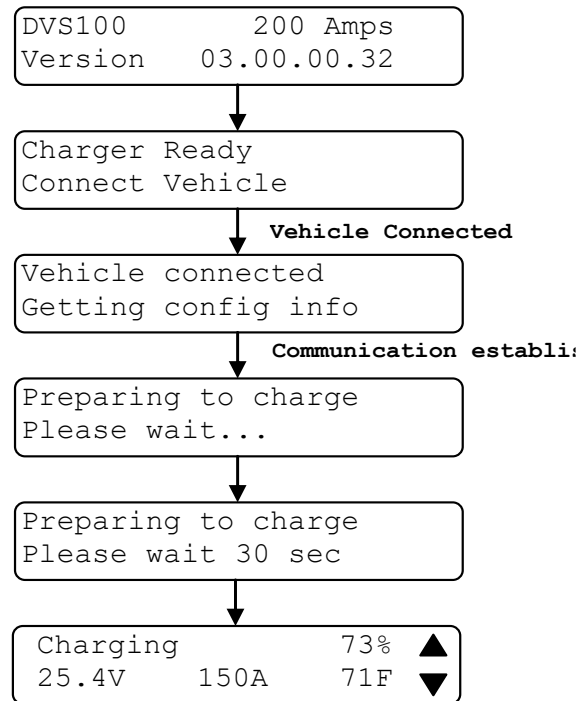
Figure 5- 3 Connecting Status Screens

The display screen will periodically update the charging data as the charge progresses. In addition, the front panel has several status LEDs which indicate the current status of the battery under charge, and whether it is scheduled for an equalization charge.
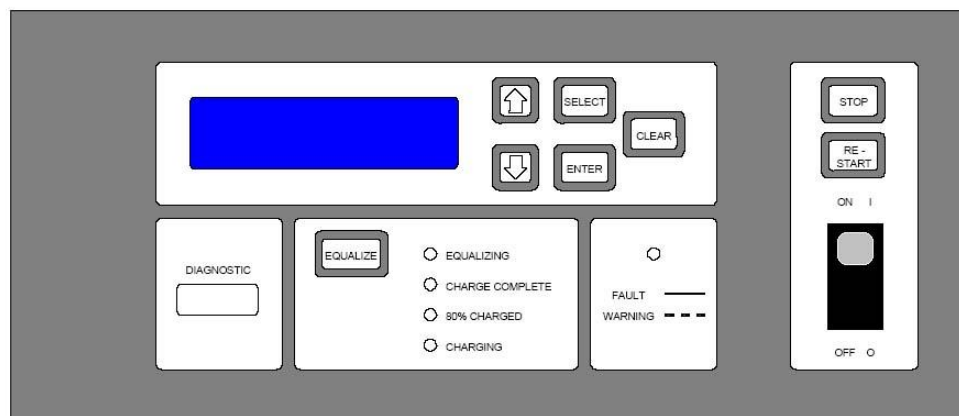
Figure 5- 4 Front Panel Layout
Table 5- 1 LED Labels and Meanings

LED Label	Color	When Steady Lit	When Flashing
Equalizing	green	Battery undergoing equalization	Equalization scheduled
Charge Complete	green	Charge Complete and stopped	N/A
80% Charged	green	The Battery SOC is >= 80%	N/A
Charging	amber	Battery connected and charging	N/A
Fault/Warning	red	Fault (charge stopped)	Warning (check log)

Step 2: Stop Charging

Once the battery has been fast-charged to the SOC preset in the BMID or Charger, the DVS100 will stop the charge and illuminate the "Charge Complete" LED.   If an equalization charge is scheduled for this battery pack, the Charge Complete will not illuminate until the equalization has been completed. The operator may stop charging at any time without waiting for the charge to complete, by pressing the "STOP" button or disconnecting the battery cables from the charger.

After a charge has been completed or stopped by the user, the screen will indicate the method in which the charge was stopped and the data values just before the end of charging will be displayed (see Figure 5- 5).

```
Chg Complete      100%          Chg Stopped       62%
                            Or
62.0V     0 A     23C          51.8V     0 A     10C
```

Figure 5- 5 Charge Complete Screens

Step 3:   Disconnect battery cables from charger

NOTE: If the operator disconnects the cables without pressing STOP, the charger will immediately stop charging and prevent any arcing.

5.5   Equalization

⚠️ CAUTION	Always run a full equalization charge *prior* to a fast charge on any battery pack that has had a cell replaced to ensure the pack is balanced.

Proper equalization is necessary for the health of the pack. Too little equalizing may lead to sulfation and decreased capacity, whereas excessive equalizing may lead to high water loss and more maintenance. We recommend equalizing at least once a week, possible more with heavy usage.

The equalization schedule is stored in the BMID and run automatically (see the "BMID Programming Manual" for information on how to modify the pre-set equalization schedule). To manually schedule an equalization during a charge, press the "Equalize" button at any time during a charge, the equalize light will start flashing indicating an equalization is scheduled, and the battery pack will be equalized following the fast charge.

To bypass the fast charge and start an equalization charge on a battery pack at any state of charge, press and hold the "Equalize" button for three (3) seconds, the equalize light will illuminate without flashing, and the charger will start a partial equalization on the pack without a fast charge.

Note: The charger EQ button may be configured to only work under certain conditions (EQ day of week, etc.). Please review the advanced features manual for details.

5.6 Viewing Charge Data Screens

While charging, the display screen is periodically updated with the latest charging data including voltage, current, and battery state of charge. During and after charging, the following additional data display screens may be viewed by scrolling between them using the UP and DOWN arrow keys (see Figure 5- 6). The display will return to the Charging screen if there is no button activity for 15 seconds.
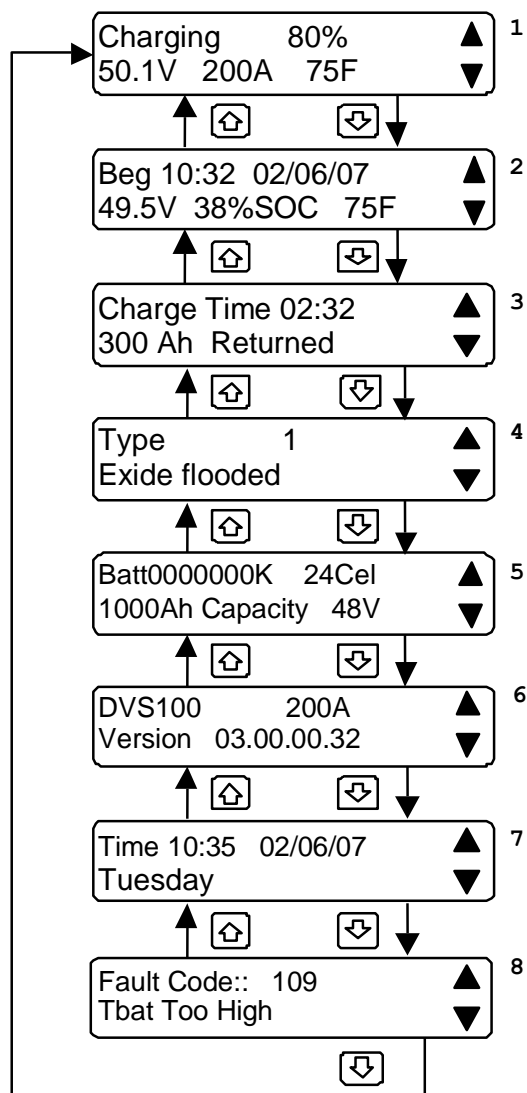
Figure 5- 6 Charging Data Screens

1.   <u>Charging data</u>. This screen displays the voltage, current, state-of-charge, and temperature of the battery. During a charge, the screen will say "Charging" and the data will be updated periodically.
2.   <u>Charge start data.</u> This screen shows the charge start date & time, as well as the voltage, state of charge, and temperature of the battery when charging started.
3.   <u>Charge time and Amp-hours</u>. This screen shows how long the battery has been under charge and how many ampere-hours have been returned to the battery. During charging, this data is updated periodically. After a charge is complete or stopped by the user, this screen retains the final charge time and amp-hour values.
4.   <u>Battery type</u>. This screen shows the Type code programmed into the BMID, along with a description of that type.
5.   <u>Battery configuration</u>. This screen shows the other battery configuration information programmed into the BMID: identification number, number of cells, capacity, and voltage.
6.   <u>Charger Configuration</u>. This screen shows the charger model number and software version.
7.   <u>Date & Time</u>. This screen shows the current date and time.
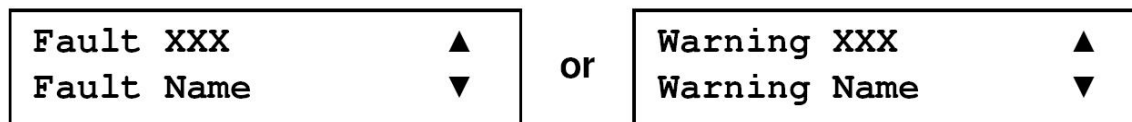8.   <u>Fault Description.</u> If there is an active fault or warning, the fault or warning code and description are displayed. See Section 5.5 for further information on Faults and Warnings.

5.7   Fault and Warning Screens

<u>Fault/Warning Screens</u>
In the event of a fault or a warning, a fault/warning screen will appear automatically (see Figure 5-7). The other screens shown above remain available through use of the up & down arrow buttons. If there is more than one fault or warning, there will be a screen for each one. The fault/warning screen shows an assigned fault number and the name, which indicates the type of fault or warning.

```
┌─────────────────────────┐        ┌─────────────────────────┐
│ Fault XXX          ▲    │        │ Warning XXX        ▲    │
│ Fault Name         ▼    │   or   │ Warning Name       ▼    │
└─────────────────────────┘        └─────────────────────────┘
```

Figure 5- 7 Fault or Warning Screens

The Fault/Warning Log data screens (see Figure 5- 8) allow the user to review the data from the last 50 fault or warning events in the charger. These data are stored in the charger and are preserved even if power is cut and restored to the charger.
1. <u>Event ID screen</u> - Shows the active (most recent) fault or warning event. Using the UP and DOWN arrow keys, scroll through the last 50 fault or warning events. For each fault or warning event, the date and time will be recorded to help locate a particular event. Once the desired event is displayed, press ENTER to open the log for that event. At any point in the log file press CLEAR to return to the Event ID screen.
2. <u>Fault/Warning Code</u> - Shows the fault code and the name of the selected fault or warning event. Check Table 6- 1 and Table 6- 2 for a complete listing of faults and warnings.
3. <u>Clearance Date</u> - Shows the date and time that the fault was cleared.
4. <u>Pre-fault State</u> - Shows the state of the charger when the fault or warning occurred. Either "Charging battery XXXXXXXX" or "Idle".
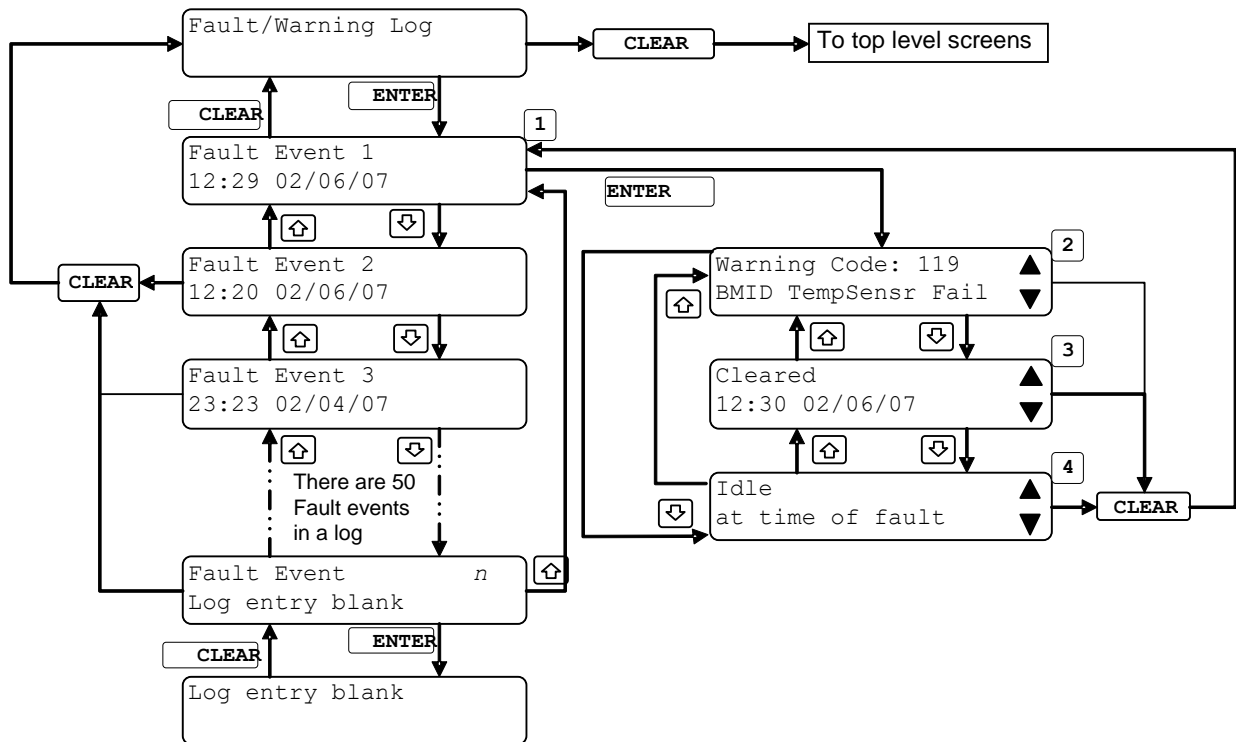
Figure 5- 8 Fault/Warning Log Data Screens

5.8 Charge Event Log

The charge event log data screens (see Figure 5- 9) allow the user to review the data from the last 250 fast charge or equalization events performed by the charger. These data are stored in the charger and are preserved even if power is removed from the charger.

1. Event ID screen - Shows the active (most recent) charge event. Using the UP and DOWN arrow keys the user may scroll through the last 250 charge events. For each charge event, the BMID number will be displayed to help the user locate a particular charge event. Once the desired event is displayed, press ENTER to open the log for that event. Press CLEAR at any point in the log to return to the Event ID screen.
2. Battery state screen - Shows the beginning and ending voltage, beginning and ending current, and beginning and ending states of charge (SOC) for the selected charge event.
3. Charge date screen - Shows the date and time recorded at the beginning and end of the selected charge event.
4. kWhrs Returned – Shows the cumulative kWhrs returned to the battery during the selected charge event.
5. Battery Temperature Screen - Shows the battery temperature at the beginning and end points of the selected charge event.
6. Charge Type- Shows the type of charge that was in progress during the selected charge event.
7. Cumulative charge data screen - Shows the elapsed time and cumulative Ah returned to the battery during the selected charge event.
8. Charge Start Code – Numerical code that tells the user the reason of the start of a charge during the selected charge event.
9. Charge Termination Reason - Shows the reason for terminating the charge during the charge event.
10. Battery Type - Shows the BMID reported battery type of the battery charged during the selected charge event.
11. Battery Data - Lists the BMID reported ID, number of cells, Ah capacity, and nominal voltage of the battery for the battery charged during the selected charge event.
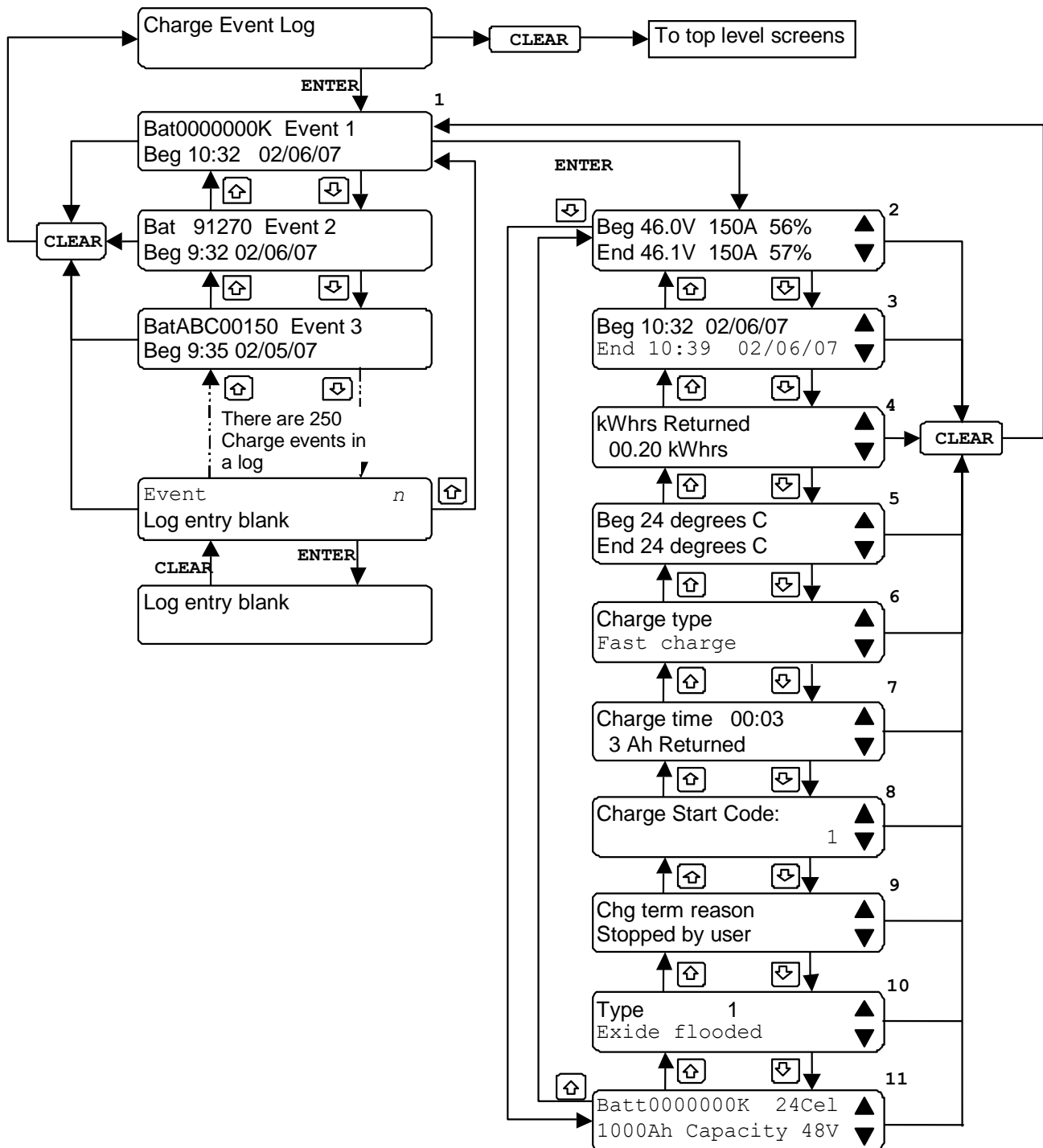
Figure 5- 9 Charge Event Log Data Screens

5.9   *Data Logs, Configuration, and Advanced Programming Features*

The Industrial PosiCharge™ user interface allows a trained user to configure many of the charge parameters and review recorded data. All configurations are done through menus accessibledirectly through the front panel display and keypad. By pressing the "Select" key, you may view and enter the top-level menus of the advanced features menu (see
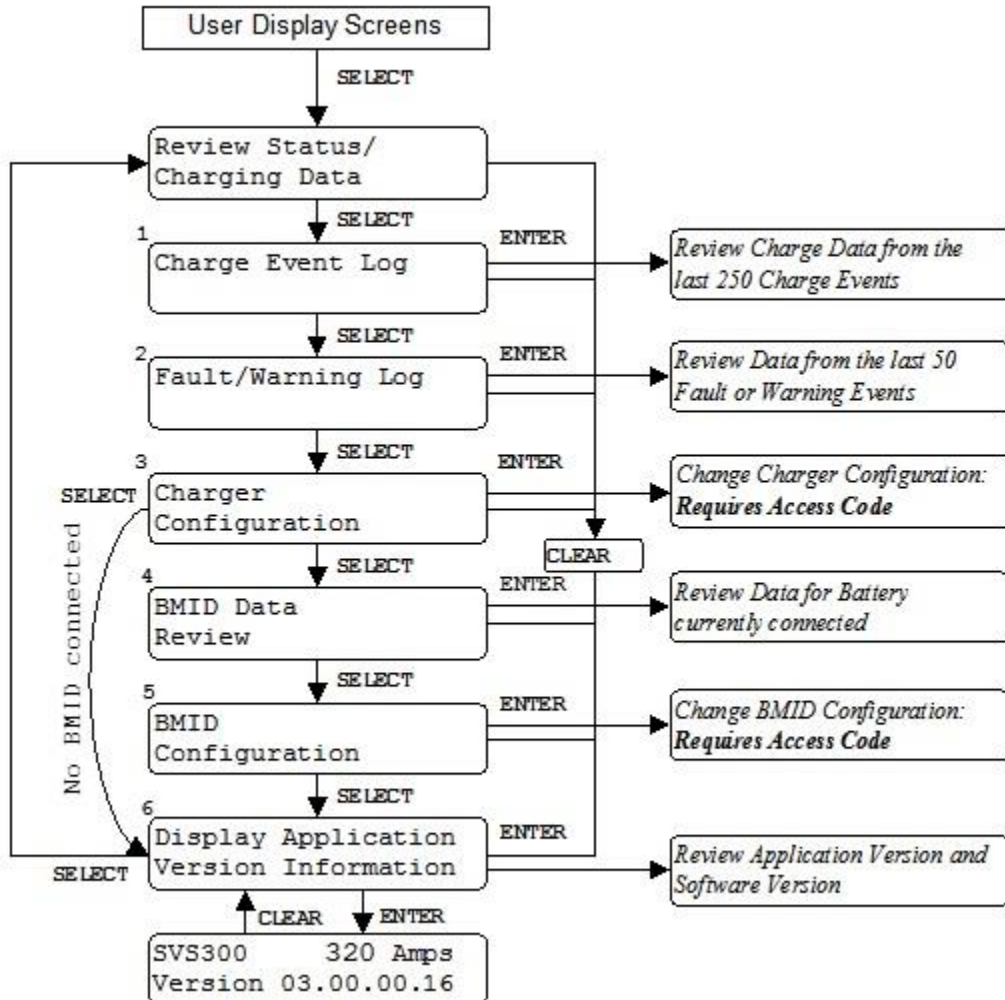
Figure 5- 10).

Details on how to access the advanced features and configuration menus are documented in this manual
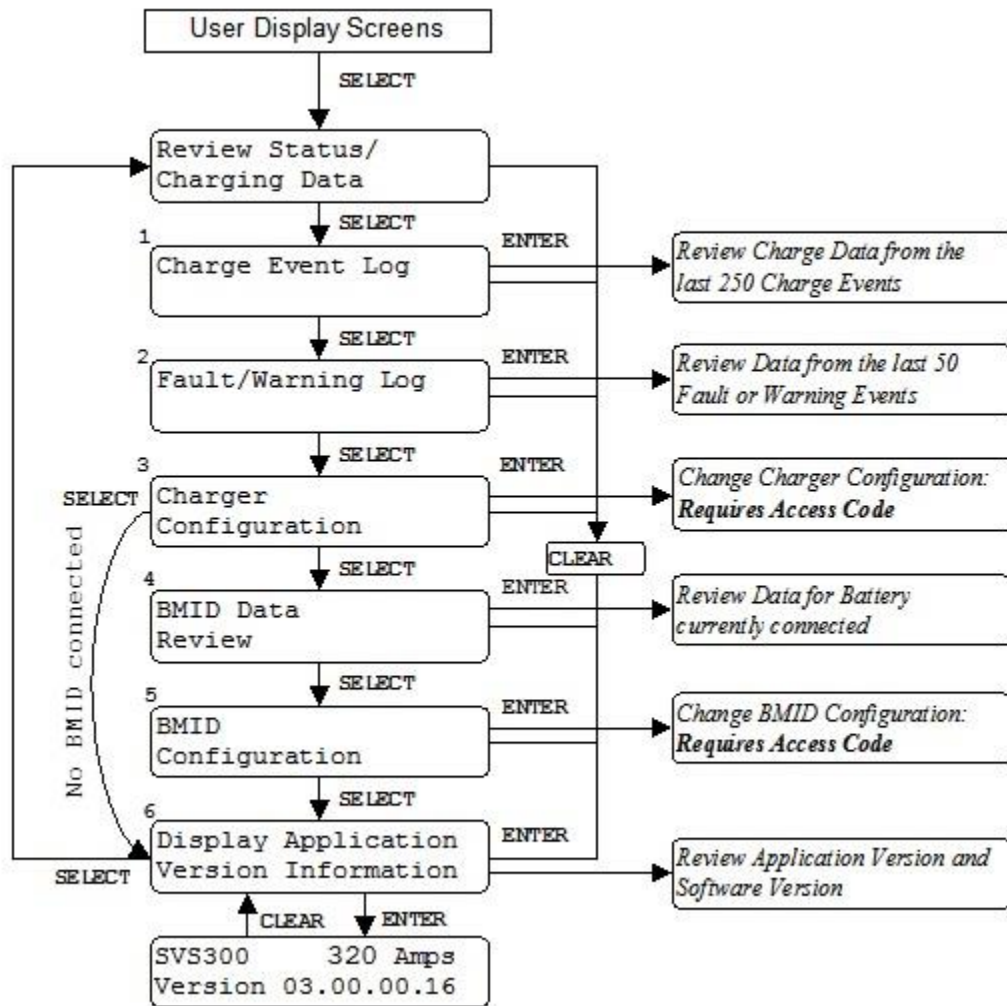
Figure 5- 10 Top Menu Items for the Advanced Features

1. <u>Charge Event Log</u> - Allows the user to scroll through the data from the last 250 charge events (Figure 5-8).
2. <u>Fault/Warning Log</u> - Allows the user to scroll through the last 50 fault or warning events (Figure 5-7).
3. <u>Charger configuration</u> - A programming mode for setting the date and time, the equalization status button, controlling charge times and setting special configurations. An access code is required to enter this mode (Figure 5-11).
4. <u>BMID Data Review</u> - Lists all of the BMID parameters along with all of the stored charge history and equalization data for the battery currently connected to the charger.
5. <u>BMID Configuration</u> - A programming mode for modifying the BMID parameters of the battery currently connected. An access code is required to enter this mode (# 06701).
6. <u>Display Application Version Information</u> – Allows user to view software version and hardware configuration information.

5.10   Programming Menus

Because errors in programming may lead to incorrect charging and reduced battery performance, the programming must be done by an Authorized Service Technician. The programming menus are protected from unauthorized use with an access code.

NOTE: Programming should only be performed by experienced fleet managers.

Contact your Authorized DVS dealer for the code, or call PosiCharge customer service at

service@posicharge.com
866-POSICHARGE (866-767-4242)

The programming menus can change the characteristics of a charge. Therefore, programming is not possible during active charging. If a programming menu is entered while a vehicle is charging, the charger will prompt for termination of the charge before allowing programming to continue. The process for entering either programming mode is shown in Figure 5- 11.

Figure 5- 11 Programming Menu Entry

Programming Menu Entry

1. To enter the programming modes from the main menu, press ENTER when the desired programming mode is SELECTED.
2. You will be prompted enter the access code. Contact your Authorized PosiCharge™ dealer for the code, or call PosiCharge customer service at
3.

<div align="center">

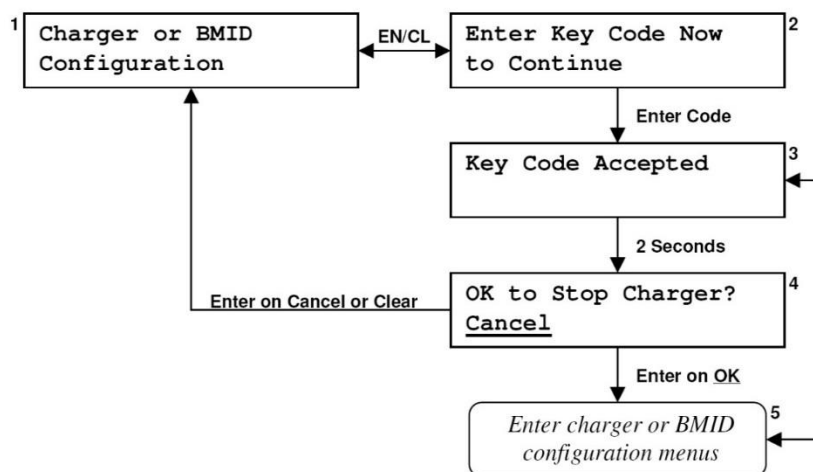service@posicharge.com
866-POSICHARGE (866-767-4242)

</div>

4. Once the access code has been accepted the screen will change and hold for five (5) seconds to indicate you have entered programming mode.
5. If programming mode is entered while the charger is charging, the user will be prompted to Cancel (Default) terminating the charge or to OK the programming mode. Use the UP and DOWN arrow keys to toggle between OK and Cancel, and press ENTER to choose the desired option or CLEAR to Cancel. If a vehicle is not connected, this step will be skipped.
6. After authorization, the selected programming mode is now active.

5.11 Charger Configuration

The charger stores configuration information for several parameters. Each of these, except Charge Algorithms, may be edited by the user from the charger configuration menu (see **Error! R eference source not found.**). These data are stored in the charger and are preserved even if power is removed from the charger.

1. *Clear Backup Memory Data* allows the user to clear the memory in the charger, which contains charge events, fault events, and charger configuration parameters.
2. *External Light Configuration* allows the user to set two modes of operation: Selector Mode and 3 external lights can be configured to monitor any of the 5 following states of Charger operation: Connected and Stop Charging, Connected and Charging, Connected and Equalizing, Port available and Fault or Warning.   This feature is only applicable in systems where external lights have been installed and connected to the charger.
3. *EQ Button Action Configuration* allows the user to configure the behavior of the EQ button*. The default setting is "Always Active.*
4. *Auto EQ* allows the user to turn the auto EQ feature on or off. *The default setting is "ON".*
5. *Fast Charge SOC Limit* allows the user to set the State of Charge limit for fast charging. *The default setting is "100%".*
6. *Full Charge Setup* allows the user to customize the behavior of the charger to exceed the fast charge SOC limit. *The default setting is "ON", start time default setting is "02:00" end time default setting is "06:00" military time and Full Charge is set to 0.5hrs*
7. *Reduced Charge Rate* allows the user to reduce their utility costs and/or reduce battery heating. For example, in a 2 shift operation with 8 hours of overnight shutdown it can make sense to reduce the charge rate over night to reduce battery heating since there is so much time available. Also, a user can choose to reduce the charge rate during peak utility rate charges to reduce utility costs. *The default setting is "OFF".*
8. *Temperature Readout Selection* allows the user to select Fahrenheit or Celsius for the temperature display. *The default setting is "Celsius".*

9. *Ventilation System* allows the user to configure the operation of a ventilation system. ***This feature is only applicable in systems where a ventilation system has been installed and connected to the charger****. If a Ventilation system is activated, the air pump system is disabled.* The default setting is "OFF"

10. *Air Circulation Control* allows the user to configure the operation of an Air Pump system ***This feature is only applicable in systems where an Air Pump system has been installed and connected to the charger. If an air pump system is activated, the ventilation system is disabled.*** *The default setting is "OFF".*

11. *Watering System* allows the user to set the configuration of a watering system ***This feature is only applicable in systems where a watering system has been installed and connected to the charger.*** The watering system is always set to turn on two hours into the EQ. *The default setting is "OFF"*

12. *Charger ID* allows the user to enter the charger ID (5 character numeric). *The default setting is "00000".*

13. *Set Date and Time* allows the user to set the date and time in the internal clock of the charger.

14. *Charge Time Control* allows the user to set scheduled charge delays for the charger. *The default setting is 6 hours.*

15. *Output Format Selection* allows the user to configure the format of their output data. The customers using the IVECs system can select the "IDS Mode" while customers that are not using IVECs can select "Standard Mode". *The default setting is "Standard Mode".* ***This menu is only available in the English US Menu screens. If IDS mode is required in Europe, set IDS Mode on the English US Menu screen and then go back to the preferred EU language to finish setting the rest of the Charger's Configuration.***

16. *Port Assignment* allows the installer to set the Port Assignment to Port A or Port B.

```
                    ┌──────────────────────────────┐
                    │ Charger Configuration        │ ──────┐
                    └──────────────────────────────┘       │
             CLEAR        ↑      ENTER    │      CLEAR      │
                                         ↓   ┌────────┐    │
                    ┌──────────────────────┐ │ CLEAR  │ → To top level screens
                    │ Enter key code now   │ └────────┘
                    │ to continue          │
                    └──────────────────────┘
                                 │
                                 ↓
                    ┌──────────────────────┐
                    │ Key code accepted    │   No charge in progress
                    └──────────────────────┘
                                 │
                                 ↓
  ┌────────┐  ENTER ┌──────────────────────┐  ⬆  ┌──────────────────────┐  ┌────────┐
  │ CLEAR  │ ←───── │ OK to Stop Charger?  │ ←── │ OK to Stop Charger?  │→ │ CLEAR  │
  └────────┘        │ Cancel               │  ⬇  │ OK                   │  └────────┘
                    └──────────────────────┘     └──────────────────────┘
                                                        │ ENTER
                                                        ↓
```
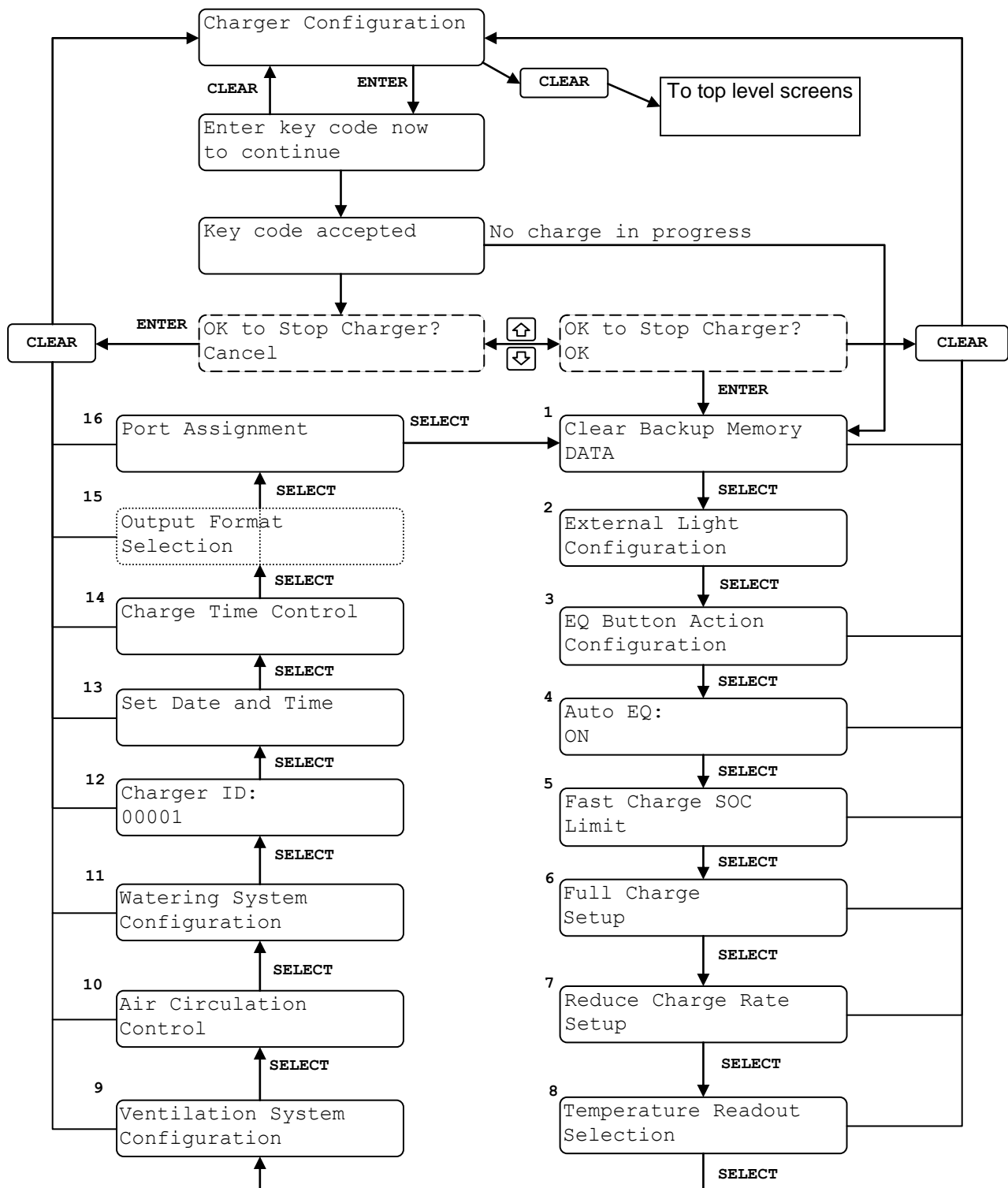
Figure 5- 12 Charger Configuration Options

The diagram lists the following configuration options:

16 — Port Assignment → SELECT
15 — Output Format Selection
14 — Charge Time Control
13 — Set Date and Time
12 — Charger ID: 00001
11 — Watering System Configuration
10 — Air Circulation Control
9 — Ventilation System Configuration

1 — Clear Backup Memory DATA
2 — External Light Configuration
3 — EQ Button Action Configuration
4 — Auto EQ: ON
5 — Fast Charge SOC Limit
6 — Full Charge Setup
7 — Reduce Charge Rate Setup
8 — Temperature Readout Selection

5.11.1 Clear Backup Memory

The clear battery backed RAM Data screens (See Figure 5- 13) allow the user to clear the battery-backed charger memory. This memory contains the charge event log, the fault event log, and the charger configuration parameters.

In the "Clear RAM Data?" screen, use the UP and DOWN arrows to choose "OK" or "Cancel". Press ENTER while "OK" is displayed to clear the memory; Press ENTER while "CANCEL" is displayed or press "CLEAR" to cancel clearing the memory.
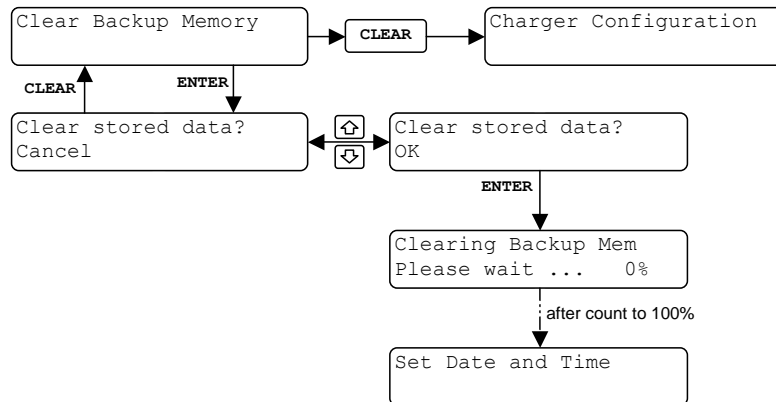

Figure 5- 13 Clear Backup Memory Menu
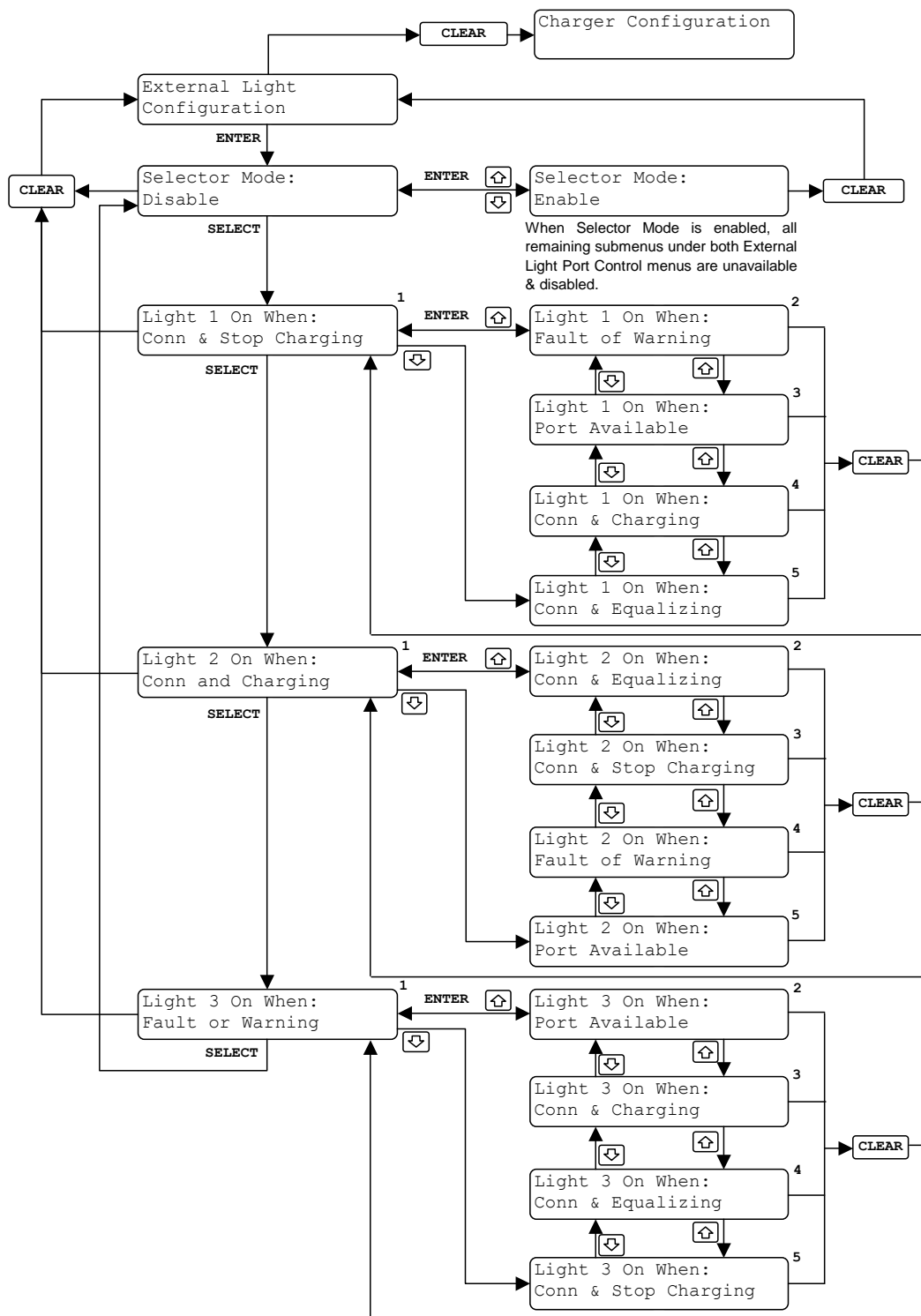
5.11.2 External Light Configuration

The External Light Configuration Menu (See Figure 5- 14) allows the user two modes of operation: Selector Mode and External Stack Lights.
- The Selector Mode (default=Disable) when Enabled it is used to provide, via the diagnostic port, the capability for external system commands to the Charger.   One example of the use of Selector Mode is the Truck Selector. In the Truck Selector application, Selector Mode is used to support turning a green or red light 'ON' to indicate which trucks are charged to a sufficient SOC for use, and which are not. The trucks that are ready for use (Green light = ready), red light = not available.
- The 3 external stack lights (default=Enable) can be configured to monitor any of 5 states of
  charger operation.

5.11.2.1   Selector Mode

From the "External Light Configuration" screen:
- Press <enter> to display the Selector Mode setting. *(Default is set to **Disable**)*
- Press <enter> to change Selector Mode setting.
- Use the <up> and <down> buttons to choose the selector mode setting followed by pressing <enter>.
- Press <clear> to exit

Figure 5- 14 External Light Configuration Menu
Note: The Selector Mode is mutually exclusive of the External Light function. If Selector Mode is enabled, External Light settings shall be ignored.

5.11.2.2   External Lights 1, 2 and 3

- Press <enter> to display the Light 1 setting. Figure 5- 14)
- Press <enter> again to select from the 5 Charger states of operation.
- Use the <up> and <down> buttons to choose the charger state you wish to monitor.
- Once the desired state is displayed, press <enter> to store the edited value.
- Press <clear> to exit.

5.11.3 EQ Button Action

The EQ Button Action menu is used to configure the actions of the front panel EQ button. The three valid configurations are:

1. ALWAYS_ACTIVE – The EQ button is always active.
2. DISABLED – The EQ button is disabled.
3. WORKS_ON_EQ_DAY_ONLY – The EQ button works on scheduled EQ day only.
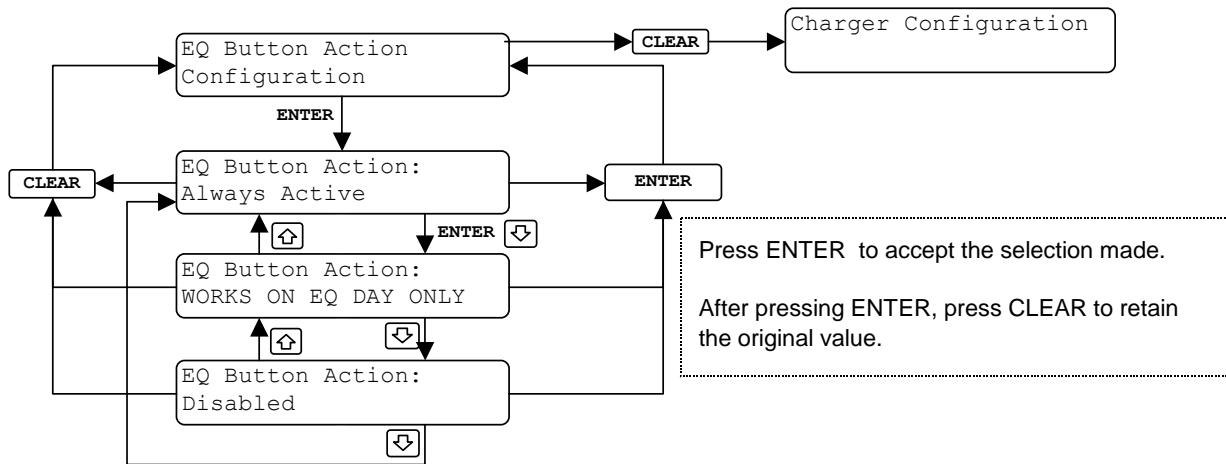

Figure 5- 15 EQ Button Action

5.11.3.1   Setting the EQ Button Action

From the "EQ Button Action" screen, press <enter> to display the current EQ button configuration. Press <enter> again and the programmable parameter will flash. Use the <up> and <down> buttons to toggle parameters. The display will continue to flash until you press <enter> to set the displayed parameter. Press <clear> to exit.

*DISABLED* - This setting causes the charger to ignore the EQ button.
ALWAYS ACTIVE - This is the default setting and causes the EQ button to be active at all times.
WORKS ON EQ DAY ONLY - This setting causes the EQ button to function only on the day of the week programmed in the BMID for equalization.

5.11.4 Auto EQ
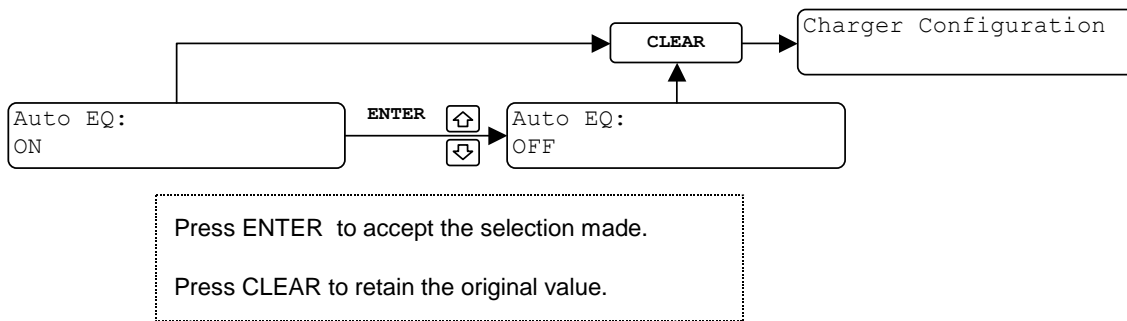
Figure 5- 16 Auto EQ Menu

5.11.5 Fast Charge SOC Limit

The charger can be configured to allow fast charging of batteries only up to a fixed percentage. This percentage of battery state of charge is calculated when the battery is first connected to the charger and is updated as the charging progresses.   If a battery is charged up to this limit and is not scheduled to full charge or equalize, the charging is stopped. If the charger is configured for full charging or equalizing during this period, charging will proceed past this SOC limit as the charger enters the full charge or equalization state.

This fast charge limit is also used in conjunction with the BMID programmed fast charge limit. The lower of these two parameters are used to terminate a fast charge session. This parameter can be set to 100% to allow only the BMID SOC limit to be the limiting point. If backup battery (or ultra-cap) power is lost, this parameter will need to be review and/or updated, as it will be set to a default value in this case.
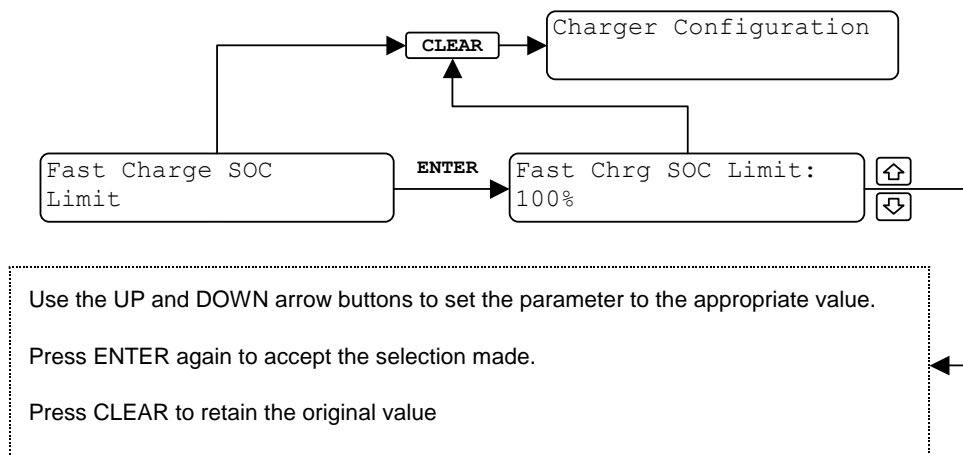
Figure 5- 17 Fast Charge SOC Limit Screens

5.11.5.1   Setting the Fast Charge SOC Limit

From the "Fast Charge SOC Limit" screen press <enter> to display the active Fast Charge SOC Limit setting. Press <enter> again and the adjustable parameter will flash. Use the <up> and <down> buttons to adjust the SOC limit. Once the desired limit is displayed, press <enter> to store the edited value and the display will stop flashing. Press <clear> to exit.
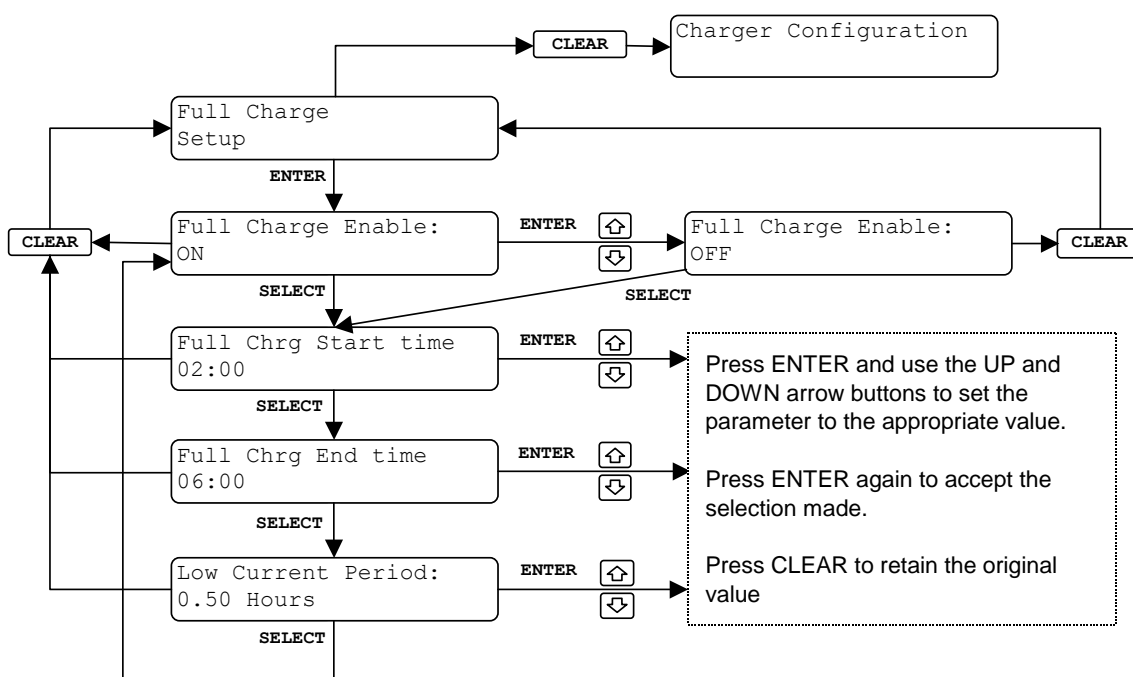
5.11.6 Full Charge Feature Configuration

The charger can be configured to allow a window of time per day to fully charge the battery. This is useful if there is a period of time when the batteries can be left on the charger without limiting other batteries from charging (i.e. after-hours) If the feature is enabled, the connected battery will be allowed to charge up to 100% SOC whenever the charger clock reads between the start and stop time.

In addition, a "topping-off" function can be programmed at the end of full charge that continues to charge the battery at a reduced rate past the 100% point. This acts as a mini-equalization that can benefit battery life and capacity.

5.11.6.1   Setting the Full Charge Feature Parameters

From the "Full/Overcharge Setup" screen press <enter> to display the Full Charge Enable status. Press <enter> again and the status (ON or OFF) will flash. Press <up> or <down> to toggle between ON and OFF. Press <enter> again to accept your selection. The remaining screens in this section are accessed by pressing the <select> button. From the "Full Charge Enable" screen, press <select> to display the "Full Charge Start Time" status. Press <enter> to edit the start time and press <enter> again to fix your selection in memory. Press <select> to display the "Full Charge End Time" screen. Press <enter> to edit the charge time using the <up> and <down> buttons. Press <enter> to accept edited value. Press <select> to move to the "Overcharge Period" screen and use the <enter>, <up>, and <down> buttons as before to edit. Remember to press <enter> to save your edits. Once you have pressed <enter> to save your edit, the display will stop flashing.
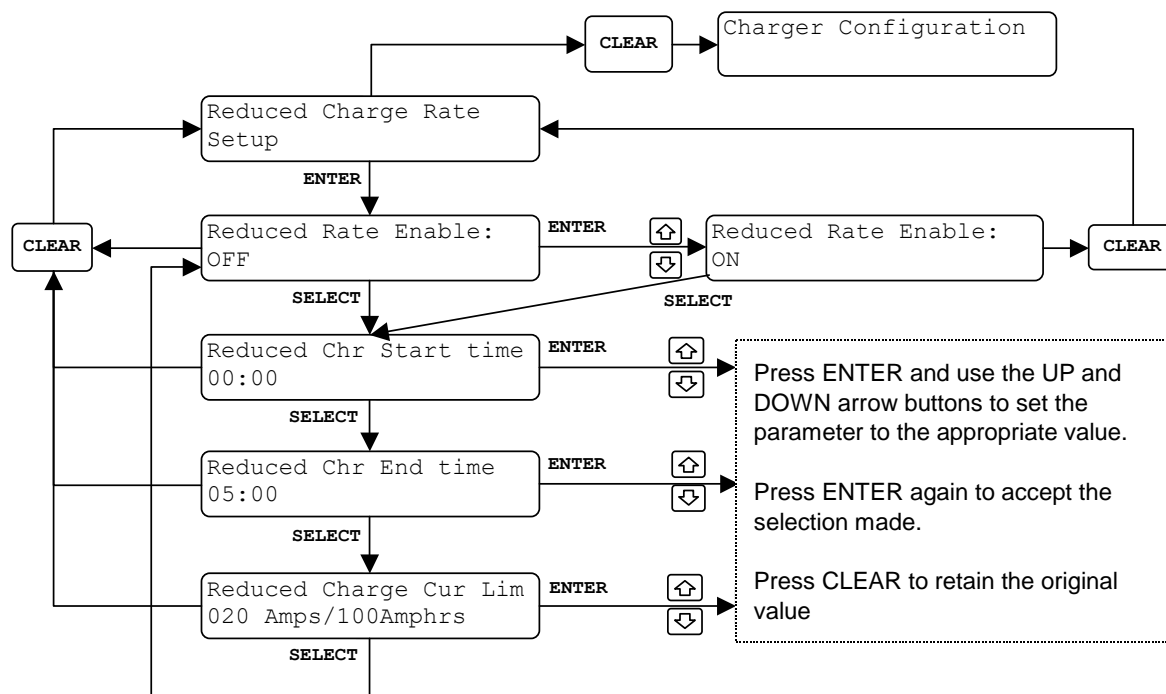
Figure 5- 18 *Full Charge Setup Screens*

5.11.7 Reduced Rate Charge Feature Configuration

The charger can be configured to allow a window of time per day to reduce the charge rate to the connected battery. This is useful if there is a period of time when the batteries left on the charger can charge at a slower rate to prevent heating issues or to reduce utility costs. If it is known that during certain periods the battery will not need to charge at maximum rate then the power delivered can be backed off by a programmable amount.

When this feature is enabled and the start and stop times are encountered, the maximum charge rate of the battery is limited to the charge rate programmed in this feature. For example, if a battery is connected to the charger at 11:00am, the battery capacity is 1000 amp hours, and its start rate is 50amps/100 amp-hours, the battery will normally start charging at 500amps. If the reduced rate feature is set to be enabled from 10:00am to 12:00pm, and the limit is 25amps/100 amp-hours, then as soon as the clock reaches 10:00 am, the current will drop from 500 to 250amps. The charging will continue with this rate limit until the window is closed at 12:00pm when the current limit returns to 500 amps.

5.11.7.1   Setting the Reduced Rate Charge Configuration

From the "Reduced Charge Rate Setup" screen, press <enter> to display the Reduced Rate Enable status. Press <enter> again to enable editing. Use the <up> and <down> buttons to toggle between "ON" and "OFF" and press <enter> to accept edits. Use the <select> button to cycle through the remaining screens. Edit the time and current limit parameters using the <enter>, <up>, and <down> buttons. Once editing is complete, use the <clear> button repeatedly to return to the top-level screen.

Figure 5- 19 Reduced Charge Rate Setup Screens

5.11.8 Temperature Readout Selection

Allows the user to set the battery temperature display format to either degrees Fahrenheit or Celsius.

From the "Temperature Readout Selection" screen, press <enter> to display the current format. Press <enter> again to enable editing. Use the <up> and <down> arrows to select the desired format for the temperature display and press <enter> to save your configuration. Press <clear> to exit.
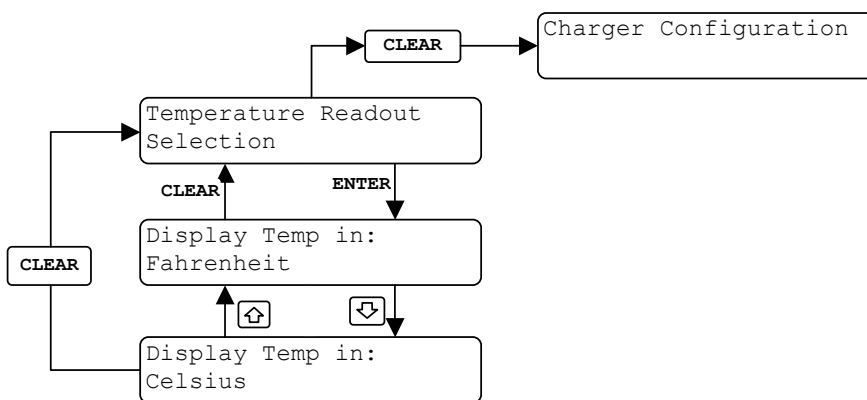
Figure 5- 20 Temperature Readout Selection Screens

5.11.9 Ventilation System

NOTE: This section is only applicable if a ventilation system has been installed and connected to the charger.

The Ventilation System menus allow the user to set the ventilation system control parameters. From this menu, the charger may be configured to turn the ventilation system off, to turn it on only during Equalization, or to turn it on any time the vehicle is being charged.

From the "Ventilation System" screen Press <enter> and then Press <enter> again and the status (ON or OFF) will flash. Press <up> or <down> to toggle between ON and OFF. Press <enter> again to accept your selection. Press <clear> to exit.
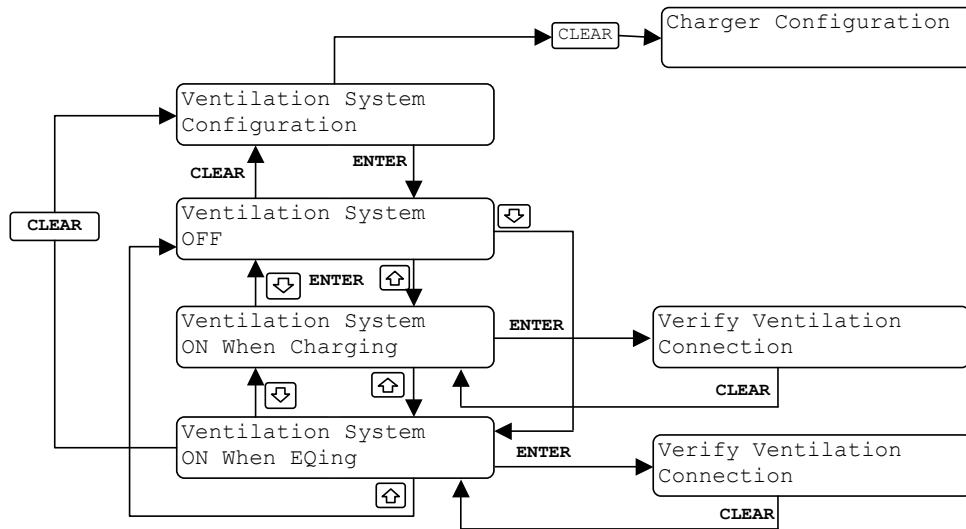
Figure 5- 21 Ventilation System Setup

5.11.10   Air Circulation Control

NOTE: This section is only applicable if an Air Pump System has been installed and connected to the charger.

The Air Circulation Control menus allow the user to set the Air Circulation control parameters. From this menu, the charger Air Circulation Control can be Enable.

From the "Air Circulation Control" screen Press <enter> and then Press <enter> again and the status (Enable or Disable) will flash. Press <up> or <down> to toggle between ON and OFF. Press <enter> again to accept your selection. Press <clear> to exit.
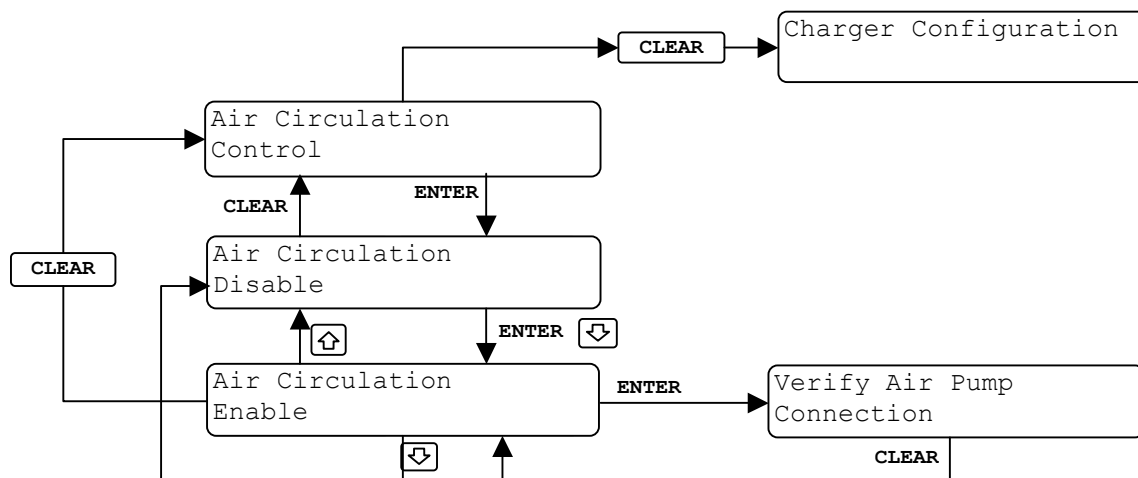

Figure 5- 22 Air Circulation Control Setup

5.11.11   Watering System

Allows the user to configure the charger to use any one of several pre-determined watering systems or to set up a custom watering profile that allows the user to program the duration of the watering period. The watering system, when active, is always set to turn on two hours into the EQ.

From the "Watering System Configuration" screen, press <enter> to display the Water System Configuration status. Press <enter> again to enable editing. Use the <up> and <down> buttons to toggle between "ON" and "OFF" and press <enter> to accept edits. Use the <select> button to cycle through the remaining screens. To set Watering System Type Press <enter> again to enable editing. Use the <up> and <down> buttons to toggle between the different types of Watering Systems and press <enter> to accept edits.

If you have selected the Watering System Type "Custom Mode", you will be able to edit the "ON Time" and you will be able to perform a watering system test. In "Custom Mode" press <enter> again to enable editing of the "Valve Turn On Time". Use the <up> and <down> buttons to set ON time "00:00 MIN" and press <enter> to accept edits. Once editing is complete, use the <clear> button to return to the "Water System Type" screen. From this screen, press <select> to enter the "Water System Test" screen. From this screen press <enter> to run the water test. There will be a 30 second count down and then watering will begin. Press the <stop> button to end the test. Press the <clear> button to exit.
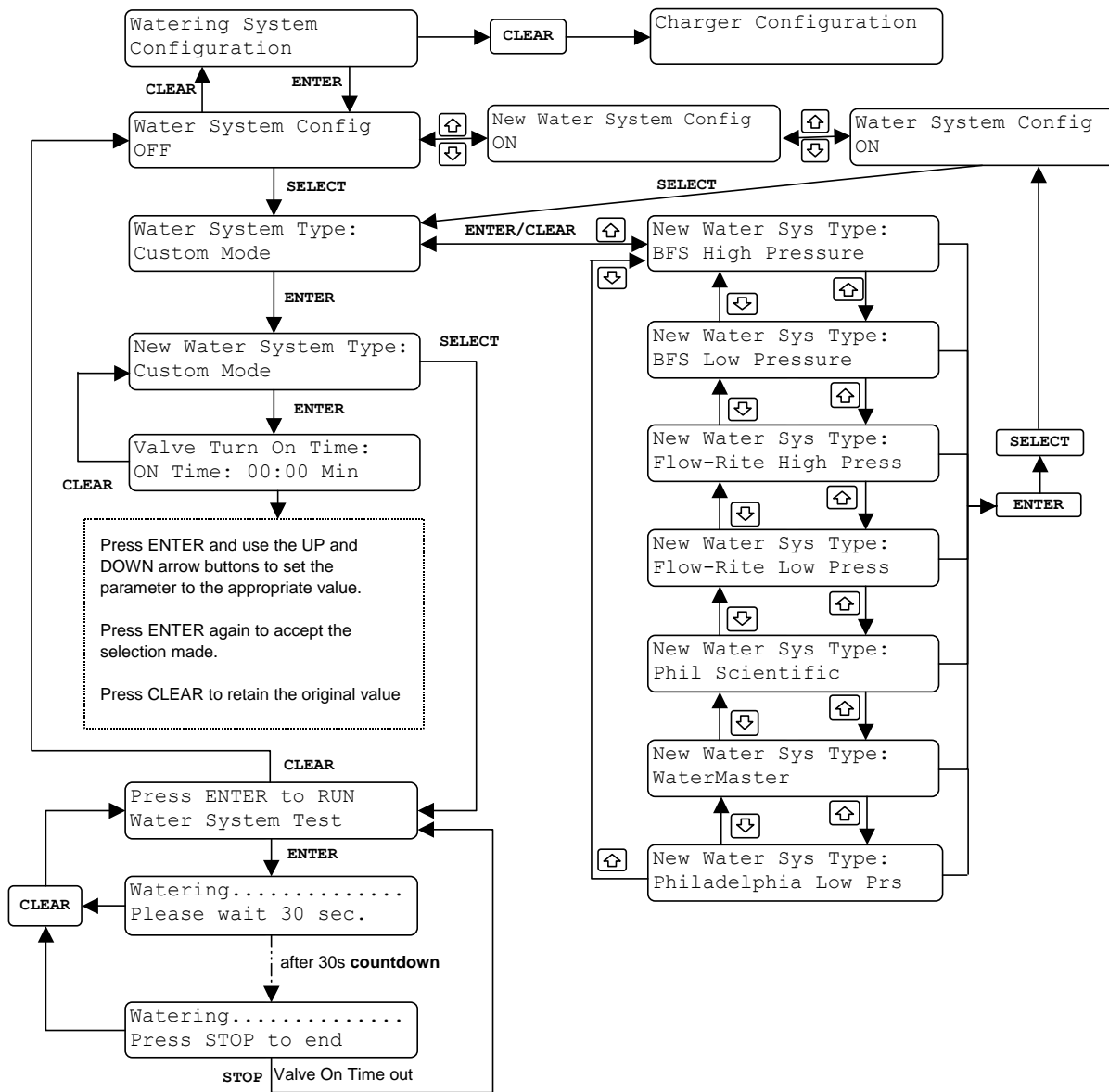
Figure 5- 23 Watering System Standard Screens

5.11.12 Charger ID

Allows the user to enter the 5-character numeric charger ID.

From the "Charger ID" screen Press <enter> and the Charger ID will flash. Use the <up> and <down> buttons to set the Charger ID. Press <enter> to accept the new value and press <clear> to return to higher level menus.
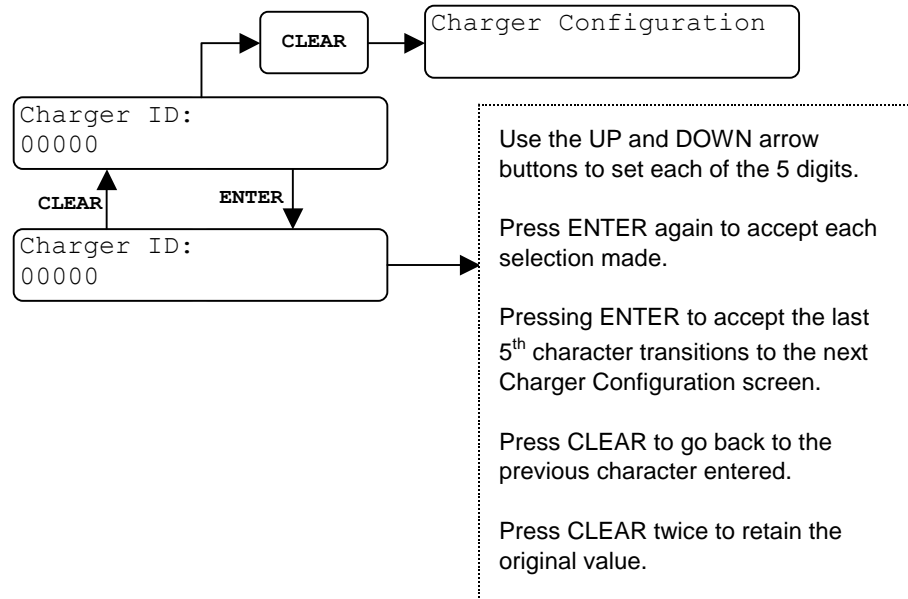
```
              CLEAR ──►  Charger Configuration
               ▲
               │
Charger ID:
00000
   ▲        │
 CLEAR    ENTER        Use the UP and DOWN arrow
               │       buttons to set each of the 5 digits.
Charger ID:
00000                  Press ENTER again to accept each
                       selection made.

                       Pressing ENTER to accept the last
                       5th character transitions to the next
                       Charger Configuration screen.

                       Press CLEAR to go back to the
                       previous character entered.

                       Press CLEAR twice to retain the
                       original value.
```
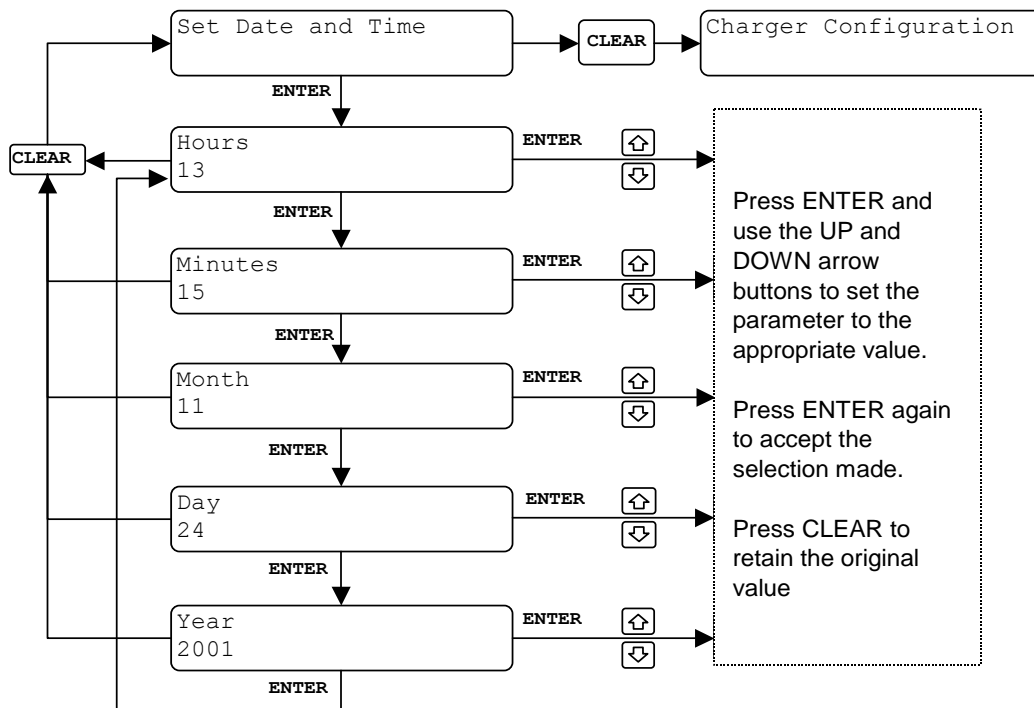
Figure 5- 24 Charger ID Screens

5.11.13 Date and Time

The Date and Time entry screens (see Figure 5- 25) allow the user to review and edit the date and time stamp in the charger. This internal date and time is used in all of the logging and scheduling functions. Changing the date and time will not affect previously logged data. These data are stored in the charger and are preserved even if power is removed from the charger.

Note: Incorrect programming of the date and time will result in incorrect time stamps in the log files and mistiming any "time of day" scheduling features possibly resulting in incorrect charging of the packs.

In each menu, press <enter> to enable editing (the value will start to flash) and use the <up> and <down> arrows to adjust the value. Press <enter> again to accept new value, or <clear> to cancel the editing and retain the old value.

1. Hours - Displays and edits the charger internal clock hours in 24-hour time (valid values 01-24).
2. Minutes - Displays and edits the charger internal clock minutes (valid values 00-59).
3. Month - Displays and edits the charger internal clock month (valid values 1-12)
4. Day - Displays and edits the charger internal clock day (valid values 1-31).
5. Year - Displays and edits the charger internal clock year (valid values 2000-2099)

Figure 5- 25 Date and Time setting menus

5.11.14   Charge Time Control

The Charge Time Control entry screens (see Figure 5- 26) allow the user to review and edit the scheduled charge delays for the charger.

In each menu, press <enter> to enable editing (the value will start to flash) and use the <up> and <down> arrows to adjust the value. Press <enter> again to accept new value, or <clear> to cancel the editing and retain the old value.

Auto Charge Restart – Displays and edits the number of hours before an automatic charge restart event. This event will take place if a vehicle is left connected to the charger for the time entered after its charge event has completed.
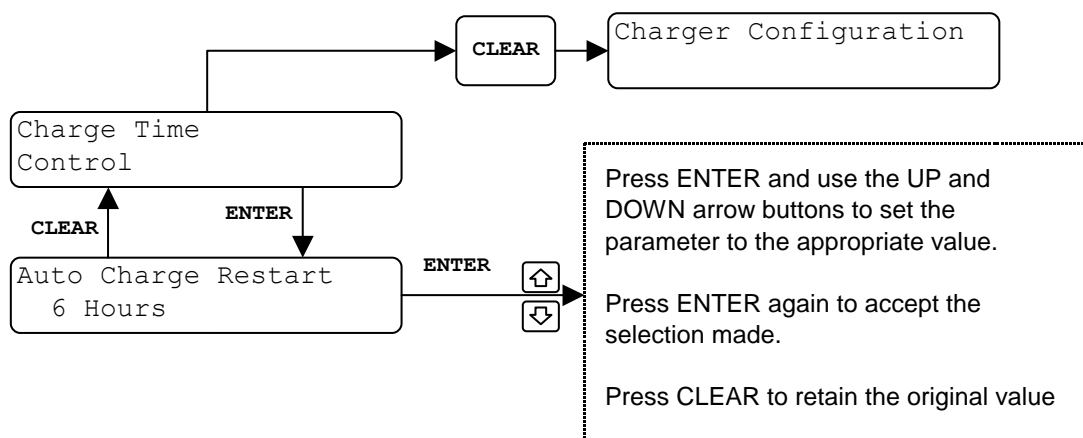
Figure 5- 26 Charger Time Control Menu

5.11.15   Output Format Selection Menu

The Output Format feature allows the user to select the format of their output data. The customers using the IVECs system can select the "IDS Mode" while customers that are not using IVECs can select "Standard Mode".

From the "Output Format Selection" screen, press <enter> to display the current data format. Press <enter> again to enable editing. Use the <up> and <down> arrows to select the desired data format for the Output Format display and press <enter> to save your configuration. Press <clear> to exit.
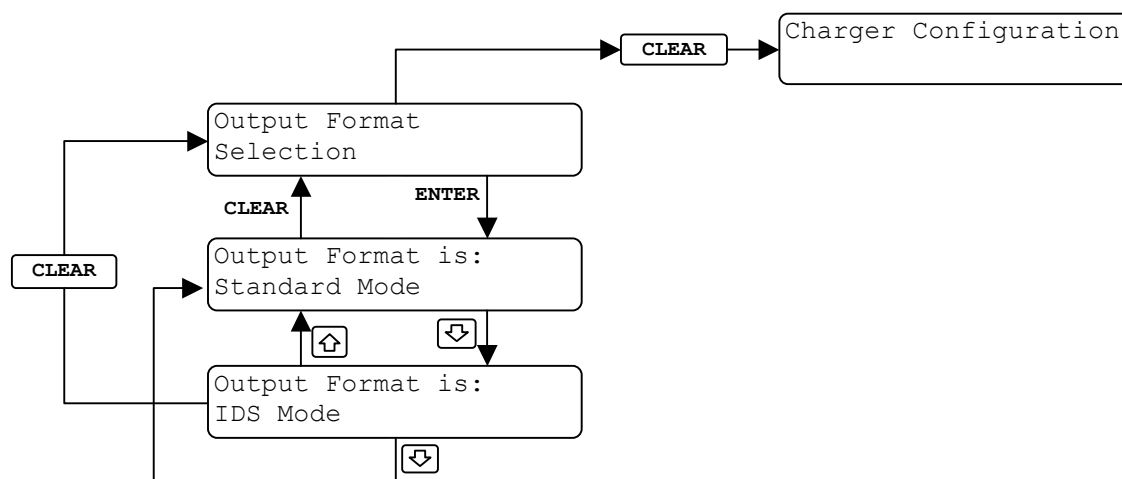
Figure 5- 27 Output Format Selection Menu

5.11.16   Port Assignment
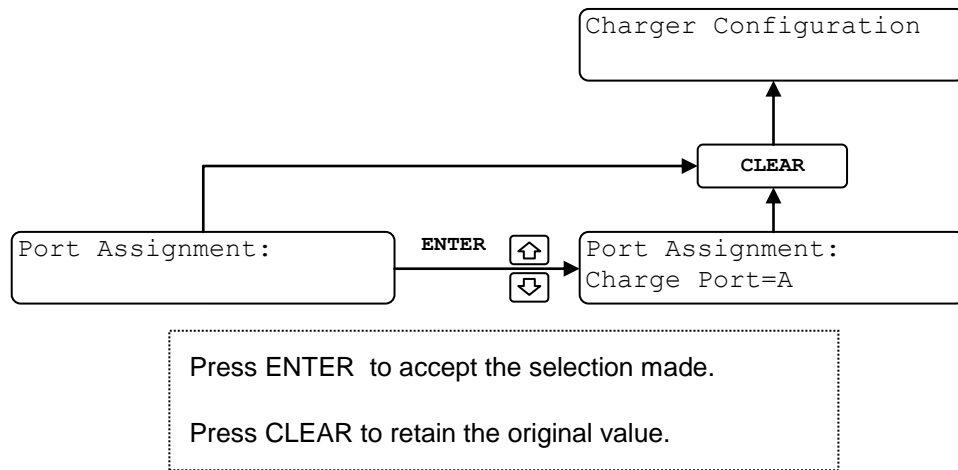
Figure 5- 28 Port Assignment Menu

6 Maintenance

6.1 General Maintenance

⚠ CAUTION	Always disconnect and lockout / tagout power to the unit before performing any maintenance.

Under most conditions, the DVS100 requires very little maintenance.

- The air inlet must be kept free from debris. Blow out or vacuum out dust accumulation periodically.
- As needed, repair or replace damaged or worn output cables and connectors.
All other servicing is to be performed by Authorized service personnel only.

Replacing DC Output Power Cables

Replacement cables may be purchased directly from your Authorized DVS100 dealer.

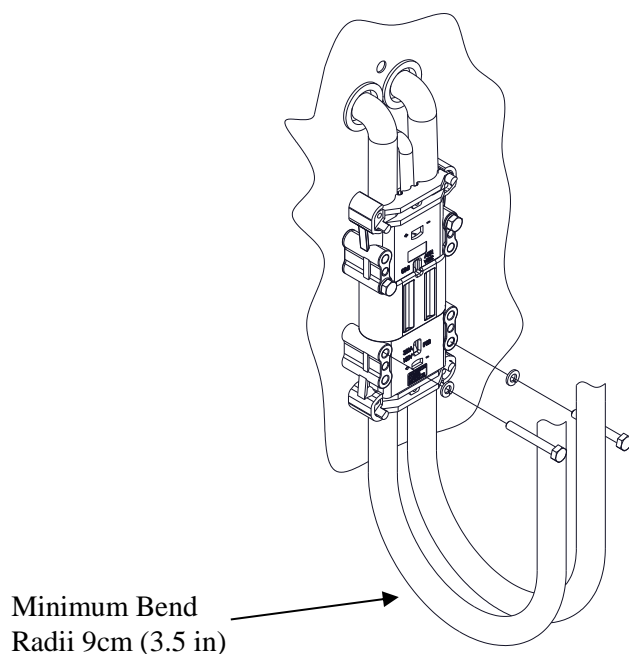| ⚠ WARNING	Use only connectors and cable that are rated for the full continuous current rating of the unit unless the output current of the unit has been adjusted to a lower value.

Minimum Bend
Radii 9cm (3.5 in)

Figure 6- 1 DC Output Cable Installation

IMPORTANT INFORMATION – SAVE THESE INSTRUCTIONS

To install output cable(s):

1. Install output cable(s) ensuring mounting screws and lock washers are properly installed and tightened. ***Recommended torque: 8.47 Nm (75 in-lbs)***
2. *Proper Cable management system is required to relieve stress concentration from output connector mounting hardware areas*

   Note: 1) Do not remove connector key(s) from Connector
   2) Minimum bend radii 9cm (3.5 inch) are required for output cables

External Interface Specifications (Diagnostic Port)

Located on the charger front panel is a 9-pin RS232 connector that will allow devices such as laptops to monitor the charger activity, data stream and charge history. As soon as the application software is up and running communications can begin. The diagnostic port is configured as a DCE device (Data Communications Equipment). Connect directly to a standard PC RS-232 port (DTE) found on a PC. The port is a DSUB 9 pin female connector. The serial port pin out is as follows:

Diagnostic port pin	Signal Description	Signal Characteristics	Signal Source	Signal Destination
1				
2	TXD	Serial data transmit from charger	Charger	Diagnostic tool
3	RXD	Serial data receive to charger	Diagnostic tool	Charger
4				
5	GND	Serial data ground reference	Common	Common
6				
7				
8				
9				
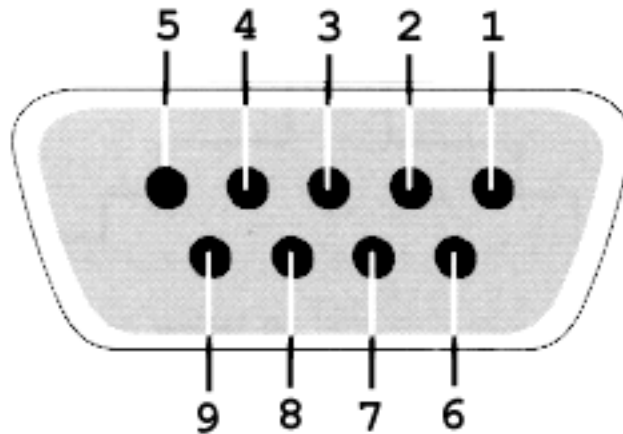
Figure 6- 2 Diagnostic port pinout

Table 6- 1 Fault Codes

Code	Fault Messages	Meaning
100	OS System Failure	Power on self test/OS failure
101	Pilot Int. Failure	Pilot interrupts stopped occurring
102	ADC Failure	A to D Converter failure
103	Invalid Pilot	Battery connected with invalid pilot circuit
104	Chrg Vdc Port Low	Battery voltage too low for charger
105	Chrg Vdc Port High	Battery voltage too high for charger
106	BMID Vbat Too Low	Battery voltage too low for BMID
107	BMID Vbat Too High	Battery voltage too high for BMID
108	Vbat Mismatch	BMID and terminal voltages don't match
109	Tbat Too High	Battery temp too high
110	Batt Over-discharge	Battery excessively discharged
111	BMID Comm Fail	BMID link lost after charge started
113	BMID Param Mismatch	BMID data doesn't match battery parameters
114	Powerstage Too Hot	Powerstage temperature over limit
115	Powerstage Shutdown	Powerstage shutdown autonomously
117	BMID Failure	BMID reporting a critical failure
118	Control Bd Supply	Control board logic supply failure
120	Current Too Low	Powerstage not producing desired current
121	ADC Ref Invalid	A to D Converter inputs invalid
122	HW Overvolt	Overvoltage detected in hardware
123	HW Overcurrent	Overcurrent detected in hardware

Table 6- 2 Warning Codes

Code	Warning Messages	Meaning
112	BMID Config	BMID data invalid, needs configuration
116	Early Chrg Term	Charge terminated unexpectedly
119	BMID TmpSnsor Fail	BMID temp sensor out of valid range
124	Failed Backup Battery	Battery Backed Up Ram Has Lost Data
125	Maximum Output Current Not Set	Maximum Output Current Not Set
126	Air System Failure	No Air Pressure has been detected.

7 Technical Specifications

Model number	INPUT				DUAL PORT OUTPUT		
	Number of Phases	Freq Hz	Voltage AC	Current AMPS	Voltage DC	Rating kW	Current AMPS
DVS100	3	50/60	440	30	16-120	10,0	200

12 to 40V: 200A+
72V: 138A
80V: 125A

12 to 40 cells
Flooded or Sealed battery
Up to 2500 Ah