RECO

CRAGG RAILCHARGER™

Instruction Manual for

10DTC-12V
20DTC-12V
30DTC-24V
40DTC-12V
60DTC-12V

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1 WARNINGS, CAUTIONS, AND NOTES

Please read the entire instruction manual before using the battery charger.

Also, read the warnings, cautions, and notes in Table 1. Failure to observe the warnings and cautions can lead to equipment damage or personal injury.

If you have any questions concerning the manufacture, design, function, installation, operation or maintenance, contact Railway Equipment Company before proceeding.

Table 1. Warnings, Cautions, and Notes

Symbol	Description
	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate personal injury. It may also be used to alert against unsafe practices.
NOTE	NOTE indicates explanatory information that applies to the next step in the procedure. It is used to clarify and expand upon the importance of the procedural step when needed.
	**Hook up all DC connections before energizing the AC power, if the red led is on or the DC fuse blows you have hooked up the DC connections incorrectly.**

2 DESCRIPTION

The DTC charger has an input voltage range of **115/230VAC**, with a DC output voltage of 7 - 18.8VDC or 24 to 42.5VDC, depending on the model. Depending on the model, the DC output current ranges from 10A to 60A. The DTC has an operating temperature range of -40°F to +158°F (-40°C to +70°C) allowing it to work effectively in a wide temperature range.

The DTC also has a Temperature Compensation feature. Using the optional RTD Temperature Sensor, the charger can adjust the DC Output based on the temperature reading, there by extending the life of the battery and adhering to the manufacturer's specifications. Contact Railway it you need a longer thermocouple probe.

A remote voltage sense capability is used to compensate for voltage drop across wires between the charger and the battery.

A set of contacts are provided for monitoring the High and Low Battery Voltage, Current and Temperature alarms, which have user defined settings.

3 FEATURES

3.1 Standard Features

- Fully Automatic Charging
- Convection Cooled
- For use with Lead Acid and NiCad Batteries
- Temperature Compensation with Controlled Limits
- Adjustable Current Limit
- Battery Voltage Monitor with Relay Output
- Remote or Local Battery Voltage Sensing
- Equalization Feature to Extend Battery Life
- AAR/AREMA Terminals
- AC & DC Circuit Transient Protection
- Meets or Exceeds AAR/AREMA Specifications
- Rack Mounting Kit Available
- AC Input 115/230VAC 50, 60 Hz
- Operating Temperature -40°C to +70°C (-40°F to +158°F)
- ±1% Voltage Regulation
- <1 Volt Peak to Peak Output Ripple
- 2-Year Warranty

3.2 Optional Features

- Add on board with RS485 Port for Current Monitoring and Ethernet Port for Monitoring and Configuration.
- RTD Temperature Sensor that can be used with Temperature Compensation enabled.

3.3 Charger Regulation

The charger will regulate output voltage to less than ± 1 percent from full load to no load with a supply voltage of 115/230VAC. The output ripple is less than 1V at any load.

3.4 Top Panel Features and Components

This section describes the features and components that are on the front panel of the battery charger (see Figure 1).

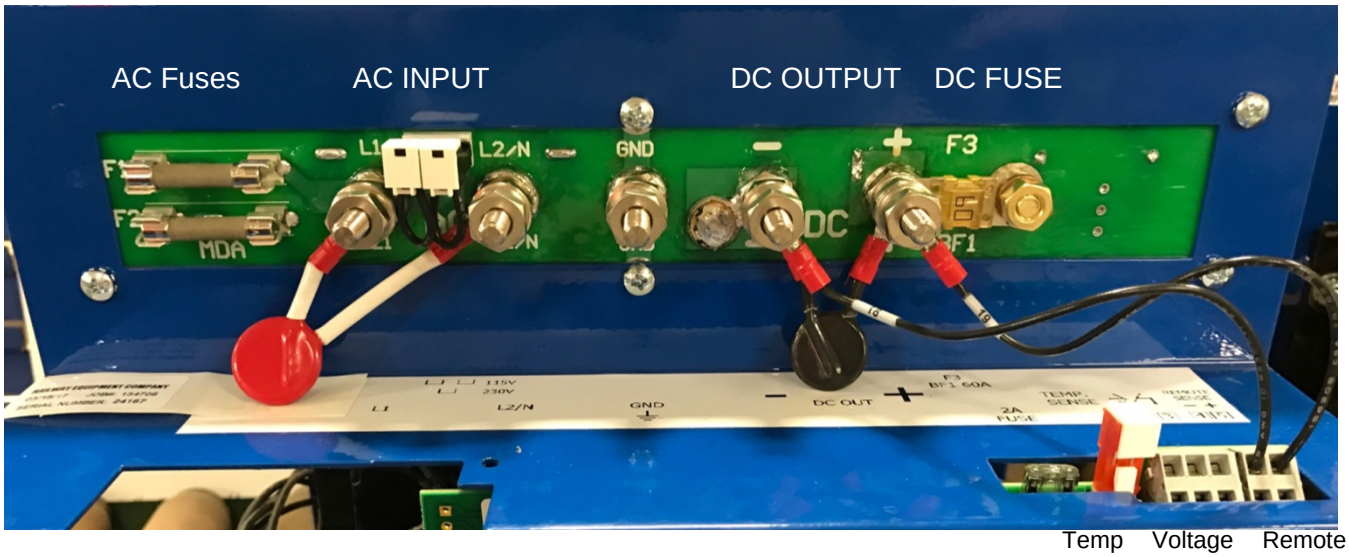


Figure 1. Top of Battery Charger (Model 40DTC-12V)

3.4.1 AC Terminal Posts, MOVs and Voltage Select Jumper

The AC terminal posts are used for connection AC Power to the battery charger. The battery charger can take an input voltage of 115VAC or 230VAC. Depending on which input voltage you are wishing to use, you will need to adjust the included jumpers for selecting either 115V or 230V input, refer to section 3.4.1.1 on how to change the voltage selection. The MOVs are used to protect the charger from voltage spikes. There is one installed across the AC Input terminal posts and across the DC Output terminal posts.

3.4.1.1 Using the Voltage Select Jumpers

From the factory, the DTC Battery Charger is shipped out with the voltage select jumpers in the 115V position. If you are using 115VAC for the incoming voltage then leave the jumpers on J1. If you wish to change so the Charger can work with 230VAC incoming, refer to the steps below:

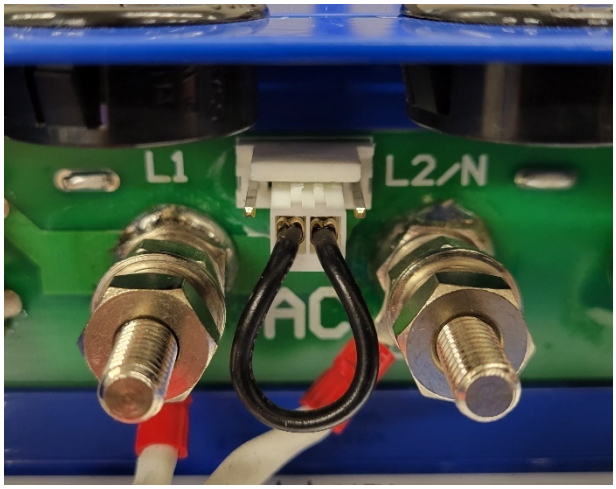
1. Make sure the DTC Battery Charger is not connected to AC power and there are no connections to the DC side.

2. Remove the terminal cover to get access to the terminal post.

3. Locate the voltage select jumpers on connector J1.

4. Remove both jumpers from the 4 pin connector.

5. Place one jumper back on the middle 2 pins. See image below:



6. Connect AC Power to the charger.

3.4.2 DC Terminal posts

The DC Output terminal posts are labeled **–** and **+**.

CAUTION: Be sure to observe correct polarity on battery and remote sense connections.

3.4.3 AC Fuses

The AC input fuses are labeled **F1 and F2**. These should be replaced with MDA, 250 Volt, slow blow fuses (use Cooper Bussman® part number BK/MDA-xx or equivalent).

Table 2. AC Fuse Ratings

Model Number	MDA Fuse Rating
10DTC-12V	6 Amp
20DTC-12V	6 Amp
30DTC-24V	15 Amp
40DTC-12V	15 Amp
60DTC-12V	15 Amp

3.4.4 DC Output Fuse

The DC output fuses is labeled **F3**. This will protect the customer load and battery charger from malfunctioning. This is a BF1, 58 Volt, slow blow fuse (use Littelfuse® or equivalent).

Table 3. DC Fuse Ratings

Model Number	BF1 Fuse Rating
10DTC-12V	30 Amp
20DTC-12V	30 Amp
30DTC-24V	60 Amp
40DTC-12V	60 Amp
60DTC-12V	100 Amp

3.4.5 Voltage Monitor Fuse

The voltage monitor relay is protected with a 2 Amp, 32 VDC, fast acting mini fuse (use Littelfuse® part number 0297002 or equivalent).

3.4.6 Remote Voltage Sense

It is recommended that two separate wires be connected from the battery terminals to the remote voltage sensor input terminals on the charger. If the batteries to be charged are located more than 12 feet from the charger, there will be significant voltage drop through the wires.

3.4.7 Ethernet Port (Requires Optional Add on Board)

This RJ45 Ethernet connection is used for accessing the charger, either via its internal webpage or via the Remote Monitoring Server.

3.4.8 Voltage Monitor Relay

The voltage monitor provides a Form C dry contact relay which can be used to indicate when the battery voltage, current and temperature are either above or below the parameter settings.
The voltage monitor circuit is independent from the battery charger system and the AC power and operates from the battery voltage.
The “normally open” contact is closed when the battery voltage, current and temperature is between the high and low settings.
The relay is rated for 2 Amps at 60 VDC, or 2 Amps at resistive loads. The mechanical contact life is 5,000,000 operations. Minimum inductive life @ .5 Amps, 12vdc is 50,000 times.

The voltage monitor can be used for an alarm by connecting the coil of an indication relay to the normally open relay contact terminals on the battery charger, with power for the relay supplied by others.

The voltage monitor relay is protected with a 2 Amp, 32 VDC, fast acting mini fuse (use Littelfuse® part number 0297002 or equivalent).

3.4.9 Temperature Input

When the temperature sensor is connected and Temperature Compensation is enabled, the battery charger will adjust the output voltage up or down depending on the probe temperature and the Temperature Compensation Rate (See **TABLE 5**). The probe end can be placed between battery cells to accurately monitor battery temperature. If the remote temperature sensor is not used, the temperature compensation function will be fixed at 77°F. **NOTE: The RTD Temperature sensor is optional.**

3.5 Front Panel Features

Figure 2. Front of Battery Charger (Model 40DTC-12V).

3.5.1 Display

The display is a long life OLED display. It enters “sleep mode” after inactivity to extend the life of the display. To “wake” the display, touch any control button.

3.5.2 Optional Add on Board

The optional add on board provides an Ethernet port, RS485 port and a microSD memory card slot.

3.5.3 OK LED

The OK LED is on when the DC Output Voltage is between the **HIGH VOLTAGE FAULT** and **LOW VOLTAGE FAULT** settings (see section **7.3.1** for configuration).

3.5.4 FAULT LED

The FAULT LED has three different states, OFF, ON and FLASH. In addition to the FAULT LED, the display will show fault description. The fault conditions are described in the table below. In the case of AC Power Lost, the display will go into sleep mode after 30 seconds to preserve battery power. To wake the display, touch any control button.

Table 4. Fault LED States

Description	FAULT LED (Red)
No Fault	OFF
Battery Temperature Fault	ON
DC Output Current Fault	ON
DC Output Voltage Fault	ON
Temp Comp On, No Temp Probe Connected	ON
AC Power Lost	FLASH
DC Output Fuse Blown	FLASH
DC Output Reverse Polarity	FLASH

4 OPERATION

4.1 Front Panel Display and Push Button Controls

The front panel has a digital display and four control buttons. The Display will auto dim after several minutes of inactivity. Once a button is pressed the display will return to full brightness.

SET-UP AND ADJUSTMENTS: To change settings do the following:

Figure 3. Push Button Controls

MODE LEFT/MODE RIGHT
Pushing the **MODE LEFT** or **MODE RIGHT** push button will cycle left or right through the menus. Each time you press one of the **MODE** buttons, you will advance one menu selection.

VALUES INCREASE/VALUE DECREASE
The **VALUES INCREASE** and **DECREASE** push button allows you to change the displayed values.
NOTE: Values that are changed will be saved after 15 minutes, or when you return to the status screen.

5 INSTALLATION

Warning: Before connecting power to the battery charger, make sure AC power is turned off. Connect AC power to the battery charger per label below the terminal posts.

5.1 Mounting

5.1.1 Shelf Mount

The charger is designed to allow enough air flow through the bottom of the charger when it is set on a shelf.

5.1.2 Wall Mount

Use the two-four keyed slots on the back of the charger for mounting to a wall.

5.1.3 Rack Mount

Optional Rack Mount brackets are available for purchase. These attached to the sides of the charger and allow for mounting at various depths.

20DTC - P/N 31084708
30/40/60DTC - P/N 31084709

5.2 Output Connections

CAUTION: WHEN CONNECTING WIRES FROM THE BATTERY TERMINALS TO THE CHARGER, VERIFY THE VOLTAGE POLARITY.

1. Connect the wires that will go between the battery and the DC Out terminal posts labeled **–** and **+**.

2. Connect those wires to the battery posts. The charger should now power up from the battery.

5.3 Input Connections

1. Connect the AC wires to the AC Input terminal posts. These terminal posts are labeled **LINE 1**, **LINE 2/NEUTRAL** and **GND**.

2. Select a Voltage of either 115VAC or 230VAC using the Voltage Selection Jumpers.

3. Apply AC power to the charger.

5.4 Temperature Sensor Input

The Temperature Sensor is an RTC temperature probe. Plug the connector end into the temperature input on the Charger, and the other end can be placed between the individual cells of the battery bank. **NOTE: The RTD Temperature sensor is optional.**

5.5 Voltage Monitor Relay

Wire size should be minimum 18GA, maximum 16GA. This is a Form C dry contact relay with a Normally Open and Normally Closed set of contacts.

5.6 Remote Voltage Sense

This is done by removing the two pre-installed jumper wires from the remote voltage sense terminals and the DC output terminals and replacing them with wires from the battery terminals to the remote voltage sense terminals. If the remote voltage sensing function is not used, leave the two jumpers from remote voltage sense terminals to the DC output terminals connected.

CAUTION: WHEN CONNECTING WIRES FROM THE BATTERY TERMINALS TO THE CHARGER, VERIFY THE VOLTAGE POLARITY.

1. Disconnect the two jumper wires from the remote voltage sense terminals inside the wire terminal area and the DC battery output terminals.
   NOTE: Before connecting the two wires to the battery terminals, make sure that the polarity is correct to avoid other equipment damage and prevent personnel injury.

2. Using minimum 18GA, maximum 16GA wire, connect two wires to the remote voltage sensing input terminals using a WAGO 210-719 terminal block operating tool on the terminal insertion tabs.

3. Ensuring proper polarity, connect the two wires to the battery terminals.

6 BASIC SETUP PROCEDURE

Go to the **SET POINTS** menu.
Set the **PASSWORD** to **5**.
Leave **USER LEVEL** at **BASIC**.
Select **BATTERY TYPE** (**LEAD ACID** or **NI-CAD**)
Set **NUMBER OF CELLS** per your battery bank.
Set **VOLTS PER CELL** to battery manufacturers specs.

The charger should be ready to operate.

7 SET-UP AND ADJUSTMENTS:

Controller Menu

The controller has 4 Menu Screens:

1. **STATUS**
2. **FAULT HISTORY**
3. **SET POINTS**
4. **FACTORY DEFAULTS**

Menu Screen Selection:
To select the desired Menu Screen, press the **MODE LEFT** or **RIGHT** button until ****** MENU SELECT ****** is displayed, on line 1, and then use the **INCREASE** or **DECREASE** Value button to select the appropriate menu. Once the appropriate menu is selected, use the **MODE LEFT** or **RIGHT** buttons to view the contents of the menu.

NOTE: Use the Increase or Decrease buttons to change set point values.

7.1 STATUS

The STATUS Screen can display **BASIC** or **ADVANCED** information based on what the **USER LEVEL** is set to.

7.1.1 BASIC

DC OUTPUT VOLTAGE – Displays the DC output voltage.
DC OUTPUT CURRENT – Displays the DC output current.
TEMP COMP AND BATTERY TEMP – Displays whether or not **TEMPERATURE COMPENSATION** is enabled or disabled, and displays the temperature of the batteries if a temperature probe is installed. If there isn't a temperature probe installed, this field will be blank.

7.1.2 ADVANCED

TOTAL OUTPUT POWER – This displays the total output power provided over time.

RESETTABLE OUTPUT POWER – This is a resettable display of output power utilized over time. To reset this meter to zero, press the **DECREASE** button.

OUTPUT WATTS – This displays the real time output power.

TOTAL HOUR METER – This displays the total hours this battery charger has been operating.

RESETTABLE HOUR METER – This displays the total hours this battery charger has been operating since this counter has been reset. To reset this counter to zero, press the **DECREASE** button.

AC VOLTAGE and **AC CURRENT** – Displays the voltage that the charger is set up for, and also displays the current being used by the charger.

AC FREQUENCY – This displays the input AC line frequency.

POSITIVE CABLE RESISTANCE – This displays the resistance of the DC + cable between the charger and the battery.

NEGATIVE CABLE RESISTANCE – This displays the resistance of the DC - cable between the charger and the battery.

CIRCUIT BOARD TEMP – This displays the internal circuit board temperature.

7.2 FAULT HISTORY MENU

NOTE: Some faults may not show in Fault History until there is an actual fault. Press the decrease or increase button to reset the fault count.

OUTPUT RELAY/EQ RELAY – Shows the number of times the battery charger's voltage monitor relay has cycled, and the number of times the battery charger has entered equalization.

POWER UP COUNTER – Shows the number of times the battery charger input power was turned on.

DAYS COUNTER – Shows the total number of days the battery charger has been operating.

TOTAL SECOND COUNTER – Shows the total number of seconds the battery charger has been operating.

HIGH VOLTAGE FAULT COUNTER – Shows the number of times the battery charger voltage's monitor relay has cycled do to a high voltage fault.

LOW VOLTAGE FAULT COUNTER – Shows the number of times the battery charger voltage's monitor relay has cycled do to a low voltage fault.

HIGH CURRENT FAULT COUNTER – Shows the number of times the battery charger voltage's monitor relay has cycled do to a high current fault.

LOW CURRENT FAULT COUNTER – Shows the number of times the battery charger voltage's monitor relay has cycled do to a low current fault.

CHARGER OVER TEMP WARNING COUNTER – Show the number of instances a charger over temperature warning has occurred.

CHARGER OVER TEMP FAULT COUNTER – Shows the number of times that a charger over temperature fault has occurred.

BATTERY OVER TEMP WARNING COUNTER – Show the number of instances a battery over temperature warning has occurred.

BATTERY OVER TEMP FAULT COUNTER – Shows the number of times that a battery over temperature fault has occurred.

AC POWER LOST COUNTER – Shows the number of occasions that the AC line voltage was lost (with the charger connected to a battery).

7.3 SETPOINTS MENU

Under the **SET POINTS** menu, the user defined variables are entered. The parameter screens are:

PASSWORD – To change any user defined parameter, use the increase button to enter the password of **5**. To prevent others from changing parameters, return the password to **0** after making changes.
NOTE: If the password is left at **5**, it will automatically reset to **0** after ten minutes.

USER LEVEL (Requires password)
The options are **BASIC** and **ADVANCED**.

BASIC - Access to the basic menu options
ADVANCED – Access to the advanced menu options

BATTERY TYPE – The options are **GENERIC LEAD ACID**, **GENERIC NI-CAD**.

GENERIC LEAD ACID – The type of battery being used is Lead Acid.
GENERIC NI-CAD –The type of battery being used is Ni-Cad.
NOTE: Also included are presets for several specific brands such as **GNB Absolyte** and **SAFT SPL NI-CAD.**

NUMBER OF CELLS –

NI-CAD - 5-12 cells are useable.
LEAD ACID - **5-8** cells are useable.

VOLTS PER CELL\TOTAL VOLTS –

NI-CAD – The values range from **1.2-1.6VDC**
LEAD ACID – The values range from **2-2.45VDC.**
For **GNB Absolyte** and **SAFT SPL NI-CAD** this value is fixed base on the manufacturers spec. **TOTAL VOLTS** is a calculation of **NUMBER OF CELLS** x **VOLTS PER CELL**.

TEMPERATURE COMPENSATION – When the temperature sensor is connected, the battery charger will adjust the output voltage up or down depending on the temperature of the batteries. Selecting a brand of battery (GNB, SAFT, etc.) from the "**BATTERY TYPE**" menu may enable this feature if that is the manufacturer's suggested use. See **TABLE 5** for Temperature Compensation rates. By default this is disabled.

Table 5. Temperature Compensation Rates

Battery Type	Compensation Mode	Compensation Slope	Low Temp Limit	High Temp Limit
Lead Acid	50% V/T	1.47mV/°F/cell	2.35 volts/cell@ +3°F	2.20 volts/cell@ +116°F
Lead Acid	100% V/T	3.0mV/°F/cell	2.35 volts/cell@ +37°F	2.20 volts/cell@ +95F
Ni-Cad	50% V/T	0.967mV/°F/cell	No Limit	No Limit
Ni-Cad	100% V/T	1.94mV/°F/cell	No Limit	No Limit

CURRENT SET POINT – This setting is used to adjust the maximum output current limit.

HIGH VOLTAGE FAULT – This adjustment is for setting the voltage level when the voltage monitor relay toggles for an over voltage fault.

LOW VOLTAGE FAULT – This is used to set the voltage below which the voltage monitor relay changes state. As an example, it could be set for 10% below the normal battery output voltage, to trigger an alert before the voltage dropped to a point where it would no longer operate the equipment it was attached to.

7.3.1 ADVANCED SET POINTS

HIGH CURRENT FAULT – The parameter is the high amperage setting. The voltage monitor relay will toggle if the current is higher than the selected current.

LOW CURRENT FAULT – The voltage monitor relay will toggle if the current is lower than the selected current. This should be set lower than the expected lowest current output, as when the batteries are fully charged and no equipment is running.

HIGH BATTERY TEMP – This setting allows the user to set the temperature that will trigger a high battery temperature fault. If a high battery temperature fault occurs, the voltage monitor relay will toggle. Factory default value is 160 degrees F.

LOW BATTERY TEMP – This setting allows the user to set the temperature that will trigger a low battery temperature fault. If a low battery temperature fault occurs, the voltage monitor relay will toggle. Factory default value is -40 degrees F.

SELECT F OR C – This is used to choose the temperature units of measure. The choices are F for Fahrenheit and C for Celsius. Factory default is F.

CHARGER OVER TEMP PROTECTION – This cannot be disabled without calling tech support at (763-972-2200). When enabled, if the temperature of the battery charger becomes critical, it automatically decreases the output current limit so to reduce the potential of failure from overheating. Factory default is ENABLED.

BATTERY OVER TEMP PROTECTION – When enabled the charger will go to 50% of the set current output when the battery temp exceeds the **HIGH BATTERY TEMP** set point. If the battery temp exceeds the **HIGH BATTERY TEMP** set point by 10°F, then the charger will go to 0% output. The charger will go back to 100% output once the temperature has dropped 5°F below the **HIGH BATTERY TEMP** set point. Factory default is ENABLED.

EQUALIZATION – This is used to enable or disable the equalization charge function. If enabled, the remaining screens will appear when the **MODE** button is pushed. If equalization is disabled, the following 4 Equalization screens are hidden from view.

EQ FREQUENCY IN DAYS (viewable if **EQUALIZATION** is enabled) – This is used to set the frequency at which equalization charge cycle will occur. It will increment in days.

EQUALIZATION RUN TIME IN xx HOURS (viewable if **EQUALIZATION** is enabled) – This sets the length of time the equalization charge cycle will run in hours. This can be set in 1 hour increments from 1 to 24.

EQUALIZATION VOLTAGE SETPOINT (viewable if **EQUALIZATION** is enabled) – Set the voltage that you want the charger to produce for the equalization charge cycle.

PRESS INCREASE TO RUN EQUALIZATION (viewable if **EQUALIZATION** is enabled) – By pressing the **INCREASE** button, the equalization cycle will begin.

AC VOLTAGE TYPE – used for displaying what voltage the charger is setup for. This does not affect the performance of the charger.

AC POWER FAULT RELAY – When AC power is lost the Voltage Monitor Relay will open. Factory default is ENABLED.

MY IP ADDRESS – Shows the chargers IP address. (DHCP is enabled by default)

PROG REV & DATE – This displays the firmware revision level and the date that revision was released.

7.4 FACTORY DEFAULTS

FOR FACTORY DEFULTS PRESS DECREASE – This is to allow the user to return most settings to the original factory settings by pressing the **DECREASE** button. A password of **5** is required to change this setting.

8 HOSTED WEB PAGE (REQUIRES ADDON BOARD)

Settings can be changed from the hosted web page as well as from the push buttons and display on the front of the charger.

8.1 Login

To login, look up the IP address under the **SET POINTS - MY IP ADDRESS (SECTION 7.3.1** of this manual**)**, and enter it in to your browser. The format should look like this http://192.168.4.99:50000. Make sure to add the port number of **:50000** after the IP address.

NOTE: If connecting directly to the charger from a computer, the computer and charger need to be on the same subnet. If the computer doesn't support Ethernet crossover detection, a crossover Ethernet cable would be required.

8.2 Status page

Shows information about the status of the battery charger.

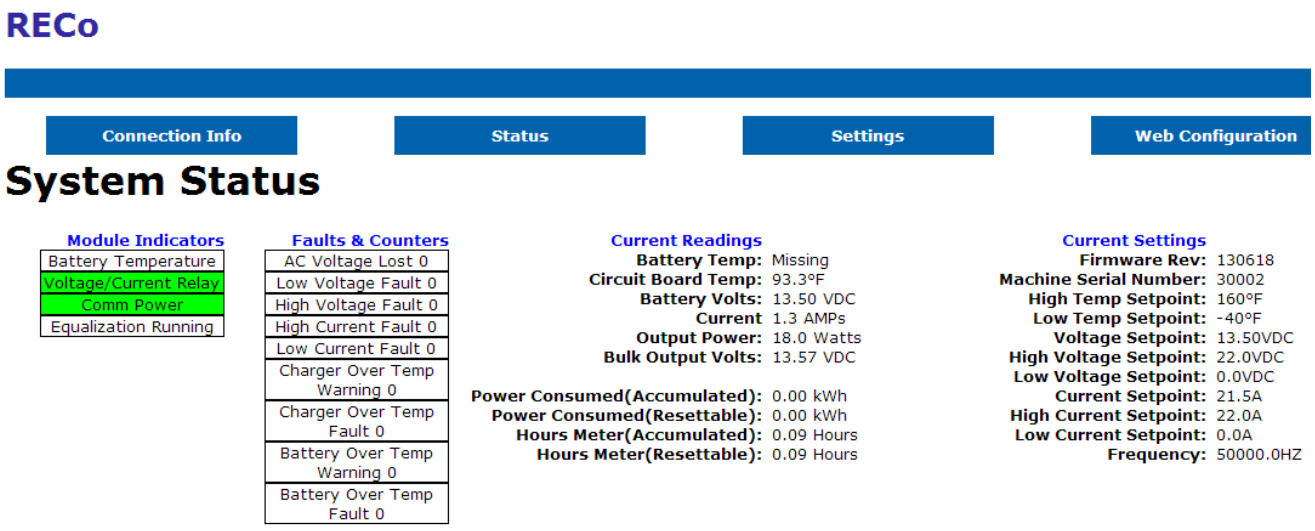


Figure 4. System Status

8.3 Settings

Settings tab allow you to change the settings. The **username** is **admin**, and the **password** is **5**.

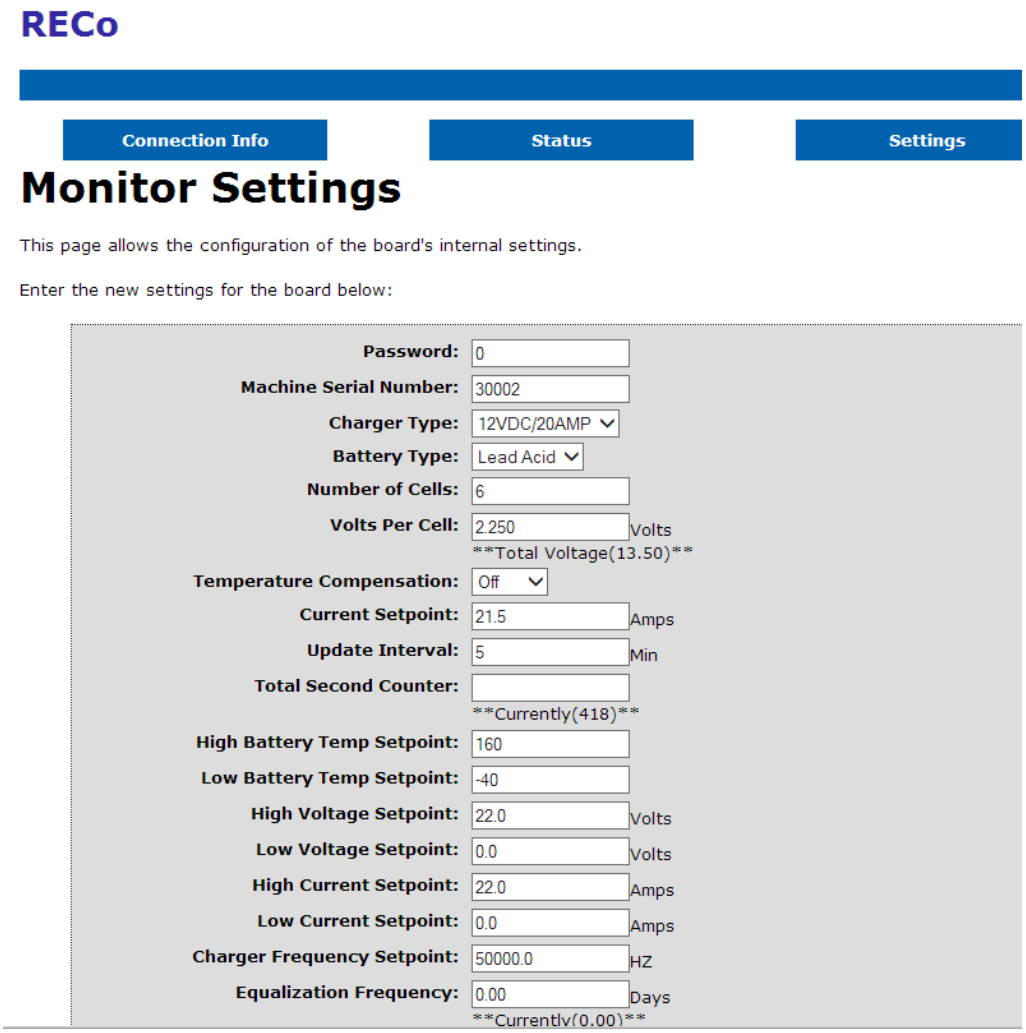


Figure 5. Monitor Settings

9 SPECIFICATIONS

Table 6. General Specifications

Description	Specification	
Input Voltage	115/230VAC ± 15%, 50, 60 Hz	
Voltage Regulation	± 1%	
Voltage Ripple	< 1 volt ripple, peak to peak at maximum output current	
Operating Temperature (0-95% non-condensing humidity)	-40°F to +158°F	-40°C to +70°C

Table 7. Model Specifications

Model No.	Cells	115VAC Amps	230VAC Amps	Output Amps	Output Volts	Width x Height x Depth	Ship Weight
10DTC-12V	5–8 Lead Acid 5–12 NiCad	4.2 Amps	2.1 Amps	10 Amps	7 to 18.8 Volts	12.00 x 10.12 x 8.75 inches	40 lbs.
						30.5 x 25.7 x 22.2 cm	18.1 kg
20DTC-12V	5–8 Lead Acid 5–12 NiCad	8.0 Amps	4.0 Amps	20 Amps	7 to 18.8 Volts	12.00 x 10.12 x 8.75 inches	40 lbs.
						30.5 x 25.7 x 22.2 cm	18.1 kg
40DTC-12V	5–8 Lead Acid 5–12 NiCad	14 Amps	7.0 Amps	40 Amps	7 to 18.8 Volts	13.00 x 13.75 x 11.75 inches	52 lbs.
						33.0 x 34.9 x 29.8 cm	23.6 kg
60DTC-12V	5–8 Lead Acid 5–12 NiCad	18 Amps	9.0 Amps	60 Amps	7 to 18.8 Volts	13.00 x 13.75 x 11.75 inches	74 lbs.
						33.0 x 34.9 x 29.8 cm	33.6 kg
30DTC-24V	11–18 Lead Acid 19–26 NiCad	20 Amps	10 Amps	30 Amps	24 to 42.5 Volts	13.00 x 13.75 x 11.75 inches	63 lbs.
						33.0 x 34.9 x 29.8 cm	28.6 kg