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## Integrated Battery Control System Installation Manual

### 1. Introduction

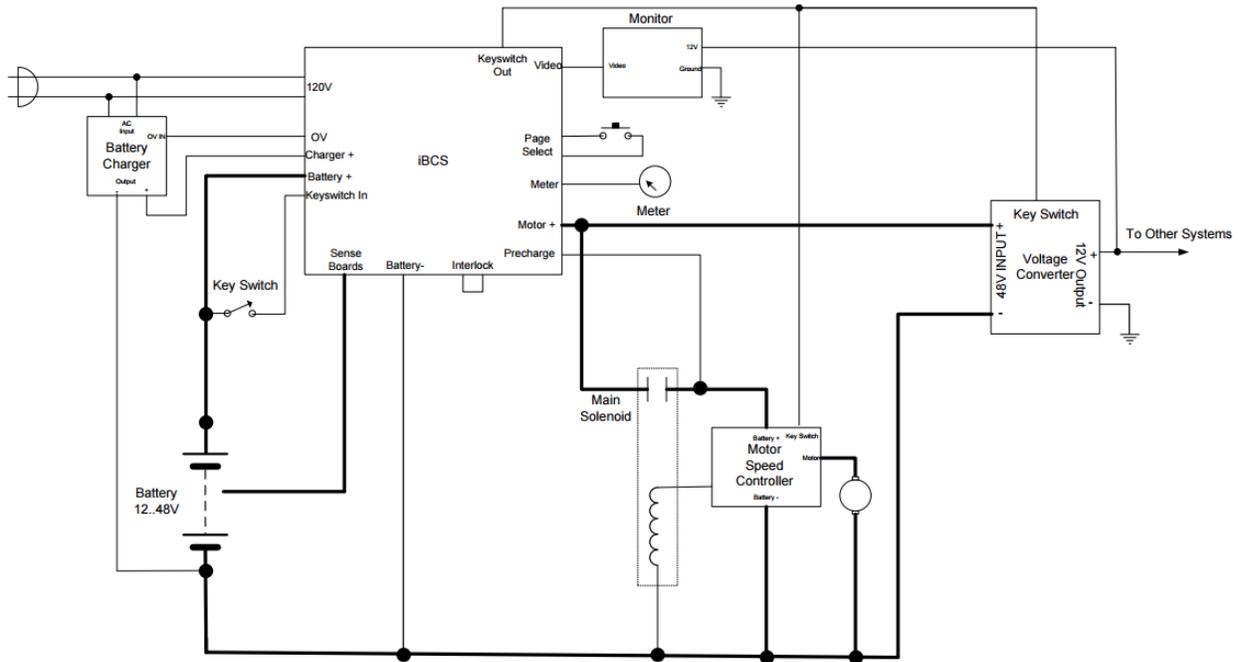
The Integrated Battery Control System (iBCS) has all the power control and battery management functions for Lithium Ion battery systems in one convenient package:

- 10 second Motor Controller Pre-charge
- Key Switch Output with 2 second delay and Low Voltage Disconnect
- 200 A output to control motor with low voltage disconnect
- Elite Power Solutions Energy Management System Computer
- Shunt to measure battery current
- State-of-Charge (SOC) calculation and display
- AC detector to prevent cart drive away when plugged in
- Connector Interlock to prevent operation when connected to AC

Typical uses for the iBCS are golf carts, electric cars, or RV and boat house power. The iBCS is also well suited for stationary power systems.

The iBCS uses Elite Power Solutions sense board strings to monitor the voltage and temperature of individual battery cells. This assures the safety and longevity of the batteries.

## 2. Typical circuitry for golf cart application



## 3. Theory of Operation

The power supply that runs the electronics is turned on by the key switch. Turning on the key switch produces a 30 second pulse which momentarily activates the power supply. This will allow the EMS computer to boot up. Pre-charge output is turned on by the pulse, and will be turned off after 30 secs. If the battery voltage is above the preset threshold, the UV output will go high and keep the power supply running.

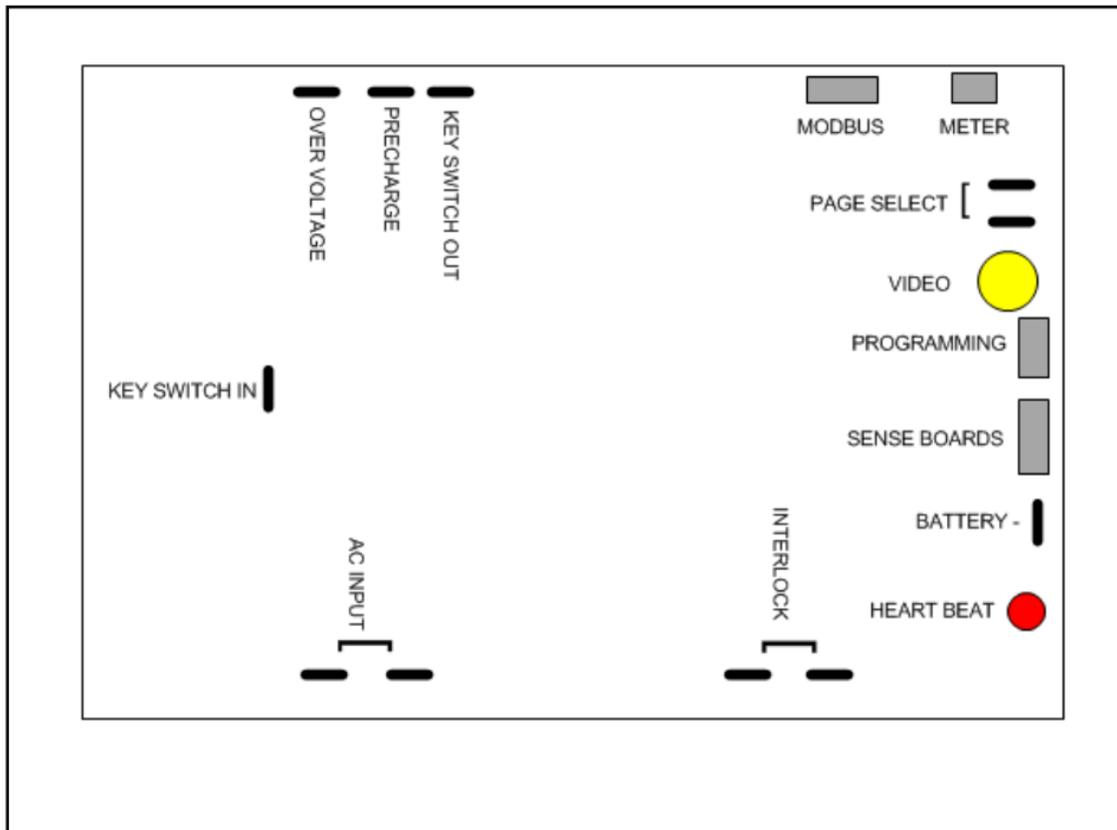
If AC is connected, it will force the power supply to keep running regardless of the state of the UV output and the key switch input. This allows the EMS computer to run and keep track of the state of charge while the battery is being charged.

If the UV output goes low, the motor + output and the Key switch output will turn off. UV being high when key switch is OFF only when AC input is active to enable the power to the EMS and thus UV can sustain high. AC input or Interlock input will disable key switch output and Motor+.

The OV output is used to shut off a charger when a specified battery voltage threshold is reached after a specified time delay.

24 V to 48 V operation is standard. If 12 V operation is required, install jumper J1 (inside the enclosure).

## 4. Inputs and Outputs



Caution: some outputs produce battery voltage and some outputs produce 12V. Be sure the circuits you use are compatible with the output voltages.

### Key switch In

Accept up to 60 V output signal from the golf cart key switch. It is used to turn all the functions of the (iBCS) on and off. To permanently enable the iBCS, connect the key switch input to "Battery +" directly.

### Over Voltage

Its output is used to signal the battery charger to shut off. Normally at 12 V & during an over voltage condition, goes to 0 V

### Precharge

Turns on to battery voltage for 30 seconds when key switch turned on.

### Key switch Out

turns on to battery voltage for 10 seconds after key switch turned on. This output turns off when battery voltage goes below a set threshold in the EMS Computer.

<b>Battery + Input</b>	connect to "Battery +".
<b>Charger + Input</b>	connect to "Charger +".
<b>Motor + Output</b>	to motor controller or load (s) + terminal. Rated at 200 A continuous & 300 A pulse. Controlled by key switch input. This output turns off when battery voltage goes below a set threshold in the EMS Computer. The AC input and the interlock will also turn this output off.
<b>Battery – Input</b>	connect to "Battery –".
<b>Sense Boards Input</b>	connect to Sense Boards.
<b>MODBUS</b>	MODBUS interface for connection to computer.
<b>Meter</b>	connection to Analog SOC Gauge. It is referenced to 12 V (chassis) ground.
<b>AC Input</b>	120/240V connection; battery charger input is connected here. This input disables the "Battery +" output when 120V/240V present. If this function is not needed, do not connect this input.
<b>Interlock Input</b>	This input disables the Motor + output to keep the golf cart from driving away during charging. If not used, connect the two terminals together.
<b>Programming Port</b>	For factory use only to configure the EMS computer.
<b>Video Output</b>	Standard, composite, 60Hz, RS-170 video for connection to a video monitor. The monitor can be used to display an overview of system status and individual cell voltages and temperatures.
<b>Page Select</b>	A normally open push button connected here will scroll through the display pages on the video monitor. If the monitor is not in use, leave this input unconnected.
<b>Modbus Interface</b>	The MODBUS interface uses RS-232 signal levels for communicating with a computer. The Pinout of the connector is as follows:  1 receive data 2 transmit data 3 ground 4 ground

5 interface select

Pins 4 and 5 need to be connected to enable the MODBUS interface. The MODBUS interface cannot be used at the same time as the analog state of charge meter.

A cable to connect the MODBUS to a PC via a DB-9 connector is available from Elite Power Solutions with part number of EMS-CBL-DB9. The connector is a JST XHP-5.

For information on the MODBUS protocol and commands, manual is available at [www.elitepowersolutions.com/technicaldownloads](http://www.elitepowersolutions.com/technicaldownloads).