

CR05HB05 1U Rack-mount Smart Charger Specification

Document Number

DSCR05HB05 Rev1.0

Description

Inspired Energy LLC's Rack-Mounted System containing 5 independent Input Boost Chargers with Bluetooth Connectivity

Inspired Energy Part Number

CR05HB05

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Belt Clip Smart Charger Specification

TABLE OF CONTENTS

REVISION HISTORY3

1. INTRODUCTION3

1.1. SCOPE.....3

1.2. 5-BAY, RACK-MOUNTED SMART CHARGING SYSTEM OVERVIEW3

1.3. GENERAL PRECAUTIONS.....4

 1.3.1. Handling4

 1.3.2. Charge & Discharge.....4

 1.3.3. Storage.....4

2. REQUIREMENTS4

2.1. GENERAL REQUIREMENTS.....4

 2.1.1. Input Power4

 2.1.2. Power Supply.....4

 2.1.3. Operation.....4

 2.1.4. Terminal Specifications5

2.2. CHARGER ELECTRONICS.....5

 2.2.1. Overview of Operation.....5

 2.2.2. Environmental.....5

 2.2.3. DC Specifications6

 2.2.4. Pre-Regulator6

 2.2.5. Charging.....6

 2.2.6. Discharging6

 2.2.7. Charge Regulation/Measurement Accuracy.....7

 2.2.7.1. Charge Voltage7

 2.2.7.2. Charge Current.....7

2.3. CONTROL ELECTRONICS.....7

 2.3.1. USB Dedicated Charging Port7

 2.3.2. Bluetooth Operation7

2.4. MECHANICAL SPECIFICATIONS.....7

 2.4.1. Weight.....7

 2.4.2. Date/Revision Stamp.....8

 2.4.3. Mechanical Drawing9

2.5. ENVIRONMENTAL/SAFETY SPECIFICATIONS10

 2.5.1. EMC and Safety.....10

2.6. RELIABILITY10

 2.6.1. Warranty.....10



Belt Clip Smart Charger Specification

Specification Number	DSCR05HB05
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REVISION HISTORY

Revision	Release Date	Revisions	Issued By	Approved By
1.0	6/4/19	Production Release	KP	JAB

1. INTRODUCTION

1.1. Scope

This specification describes the physical, functional and electrical characteristics of a custom 5-Bay Rack-Mounted Smart Battery charger system produced by Inspired Energy, and is made up of a maximum of five (x5) MCLB05 units connected in parallel. This specification is the interface document between Inspired Energy and its customer. It is understood that the customer may create their own internal specification. However, this specification is the master that defines the overall system operation. The 5-bay rack-mounted smart charger systems produced will meet this specification.

1.2. 5-Bay, Rack-Mounted Smart Charging System Overview

This specification describes the physical, functional and electrical requirements for the 5-Bay, Rack-Mounted Smart Charging Systems.

Battery Model	CR05 Rack Part Number
NH2054	CR05HB05

Module Part Number	Description
CR05HB05	1 – CR05HB05, 1 – PSU

***NOTE: Hard case optional**

The MCLB05-2BV01 is capable of communicating with a Smart Battery through the System Management Bus (SMBus) and is fully SMBus Rev. 1.0, SBDS Rev. 1.1 and SCDS Rev. 1.1 compliant.

Redundant safety protection is provided by constant communications between the battery and charger and by monitoring the battery reported temperature, voltage and current.



Specification Number	DSCR05HB05
Specification Revision	1.0
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Belt Clip Smart Charger Specification

1.3. General Precautions

1.3.1. Handling

- Avoid shorting.
- Do not immerse in water.
- Do not disassemble or deform.
- Avoid excessive physical shock or vibration.
- Never cover or obstruct the airflow, as this will cause overheating.

1.3.2. Charge & Discharge

- Never use a charger or battery that appears to have suffered abuse.
- Only approved batteries should be charged.
- Never use a modified or damaged battery or charger.
- Specified product use only.
- Caution – during use the battery connector and charger may become warm.

1.3.3. Storage

- Store in a cool, dry and well-ventilated area.

2. REQUIREMENTS

2.1. General Requirements

2.1.1. Input Power

The input power should comply with the following parameters: 10-24V, 250W minimum.

2.1.2. Power Supply

A 24V DC, 250W power supply is supplied with the product, and meets the following agency and protection requirements:

- **Safety:** CUL/ UL/ GS/ BSMI/ PSE
- **EMI:** CE/ FCC Class B, conduction & radiation
- **Protection:** OVP (Over-voltage protection), SCP (Short-circuit Protection), OCP (Over-current protection), OTP (Over-temperature Protection)

2.1.3. Operation

Ambient Temperature Limits: Charge: 0°C to +45°C, Discharge -20°C to +50°C



Belt Clip Smart Charger Specification

Specification Number	DSCR05HB05
Specification Revision	1.0
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2.1.4. Terminal Specifications

Input terminal assignments (also refer to the mechanical drawing for additional details).

Terminal	Legend	Description
6-pin Molex	DC IN	24V DC, 10.4A input.

Output terminal assignments (also refer to the mechanical drawing for additional details).

Terminal	Legend	Description
5-pin XLR	XLR Output	Battery Voltage DC Outputs, PTC Limited 5A Max
5/16-18 Threaded Pos	Output +	Post Positive Voltage DC Output, 25A Max (Given a fully populated CR05HB05)
5/16-18 Threaded Neg	Output -	Post Negative Voltage DC Output, 25A Max (Given a fully populated CR05HB05)

2.2. Charger Electronics

2.2.1. Overview of Operation

The CR05 fits standard 19” racks with 1 or more standard spaces (1U), and requires a 12” depth. It is capable of providing all auxiliary battery functions needed to Charge/Discharge a Smart Battery, and will simultaneously charge all the batteries with a maximum rate of 5A per battery. The CR05 is designed only for use with Smart SMBus battery packs manufactured by Inspired Energy.

- Plug a battery into an open battery slot. The LEDs will flash once upon correct insertion
- The battery will automatically begin charging & the LEDs will indicate the charge status

LED Displays (5 total)	<ul style="list-style-type: none"> * Green flash: Charging ● Green solid: Charged ● Red solid: Error ● Blue solid: App Comm
---------------------------	---

Pertinent battery parameters are constantly monitored throughout the charge cycle to ensure safe and reliable operation. The battery thermistor is monitored as an independent and redundant safety monitor. SMBus Alarms are monitored and acted upon as defined in the Smart Charger Data Specification (SCDS).

The user is notified of operational mode and fault conditions by the on-board LEDs.

2.2.2. Environmental

- Storage/Transport: -20 to +60C.
- Discharging: -20 to +50C
- Charging: 0 to +45C



Belt Clip Smart Charger Specification

Specification Number	DSCR05HB05
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2.2.3. DC Specifications

Parameter	Limits	Remarks
Operating current consumption	<77mA	10-24V input power is applied.
Battery operating current consumption	<5mA	USB and Bluetooth outputs on
Note: If the battery remains in the unit with no AC input, it will discharge continuously at ~5mA.		

2.2.4. Pre-Regulator

A pre-regulator accepts any input between 10-24V and converts it to 23VDC up to 2.5A. If a voltage greater than 23V is applied, the regulators simply pass through this higher voltage to the chargers.

2.2.5. Charging

During charge, the charger reads the battery status, battery mode, battery current, battery voltage, and battery temp. The battery voltage and current are then relayed to the charger control IC which has been configured to deliver up to 16.8 volts and 4 amps, but not more than the maximum input voltage. The specified voltage, and current of the battery are constantly read from the battery then relayed to the charge control chip every second. Normal charge termination occurs when the battery reaches full charge, begins requesting 0 current and issues the TERMINATE_CHARGE_ALARM Warning.

Once fully charged, if the battery is left in the charger, the charger will re-initiate charge as requested by the battery. Typically, the battery will either request a trickle current, or will begin requesting current following a predetermined amount of self-discharge. The battery may be left in the charger indefinitely.

2.2.6. Discharging

The unit can be operated to provide backup power or remote battery power for off-grid applications.

Each battery pack contains short circuit protection and each board is diode-protected to prevent one battery from charging an adjacent battery.

The battery packs will discharge in parallel, and each output will be battery voltage. Depending on the batteries used, each CR05 unit can provide a battery array of up to 490Wh (using five (x5) 98Wh NH205X batteries).

WARNING!

- **DO NOT SHORT CIRCUIT. The battery packs are protected from damage but any source of short circuit will suffer damage &/or may become extremely hot, causing injury.**
- **Remove the battery packs and any personal jewelry (rings, bracelets etc) before working on the discharge circuit.**



Belt Clip Smart Charger Specification

Specification Number	DSCR05HB05
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2.2.7. Charge Regulation/Measurement Accuracy

2.2.7.1. Charge Voltage

The charge voltage is measured and regulated to $\pm 0.8\%$ of the battery requested value, up to 16.8V.

2.2.7.2. Charge Current

The charge current is measured and regulated to -14% +6% or to $\pm 50\text{mA}$, whichever is greater, of the battery requested value, up to 4A.

2.3. Control Electronics

2.3.1. USB Dedicated Charging Port

The MCLB05-2BV01 has a USB Dedicated Charging Port (DCP) that provides $\sim 2\text{A}$ at 5V for charging USB 2.0 devices, per BCL1.2 STD. This output is power limited, and the output voltage will be dropped as required to prevent the output current from exceeding 2.1A.

2.3.2. Bluetooth Operation

NOTE: The Inspired Energy Phone App ONLY functions with Inspired Energy Batteries.

Each MCLB05-2BV01 holster contains a Bluetooth connector module for pairing with the Inspired Energy Phone Application. When paired with the application and an Inspired Energy Battery is inserted, the user will be able to see various battery parameters on the application. An onboard Blue LED is provided to identify which MCL is currently being monitored by the IE Phone App. A long press of the phone application's User Interface will cause the Blue LED to turn on for 10 seconds.

2.4. Mechanical Specifications

2.4.1. Weight

Approximately 2.29lb. (1.04Kg)- One power supply brick.

Approximately 6.60lb. (2.99Kg)- One unpopulated CR05HB05 module.

Approximately 11.45lb. (5.19Kg)- One fully populated CR05HB05 module (Specified with five (x5) NH205X batteries).

Approximately 25.10lb. (11.39Kg)- One QK01CR05HB05 module. (Specified with case and five (x5) NH205X batteries)



Belt Clip Smart Charger Specification

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2.4.2. Date/Revision Stamp

A series of codes are printed on a label and attached to the side of the 1U rack. The printed label contains following information:

P/N: CR05HB05 1U Battery Rack
10-24VDC/250W In VDC Battery Out
Purchase Statement

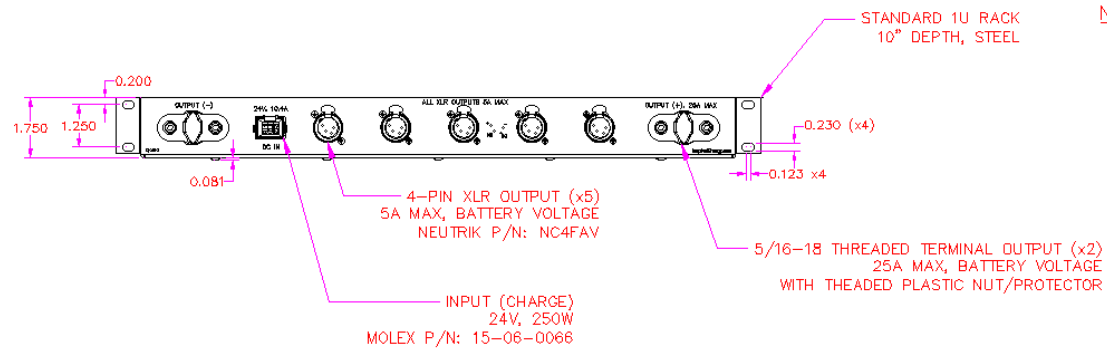
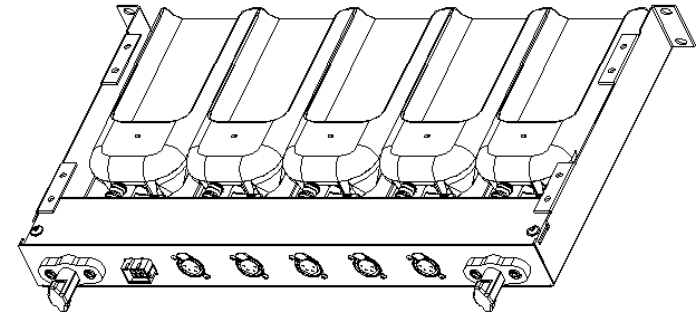
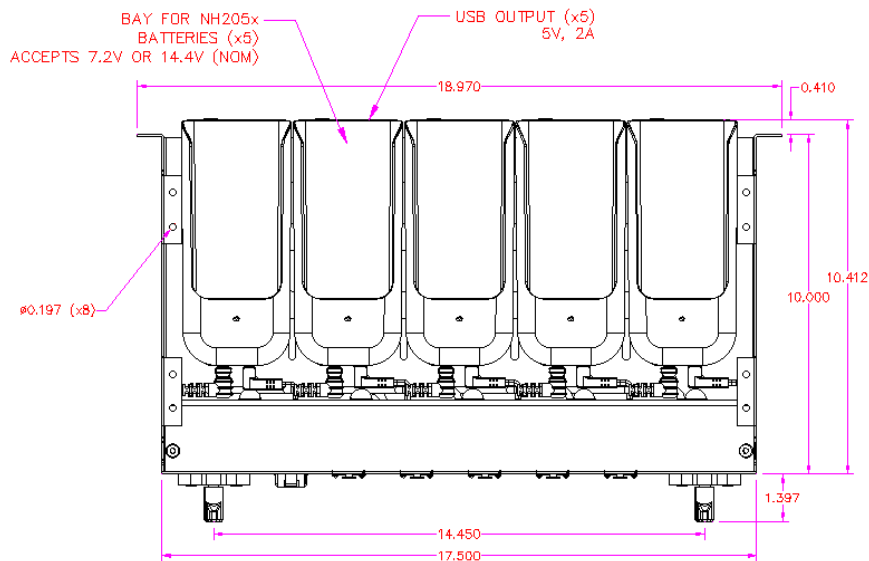
ZZ YYWW RR

ZZ = Manufacturing Site, YYWW = Manufacturing Date, RR = Unit Revision
Manufacturing Site: IE Manufacturing Date: Year(YY) & Week (WW) of Manufacture

Belt Clip Smart Charger Specification

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2.4.3. Mechanical Drawing



NOTES:

1. MAX UNIT POWER = 25A @ BATTERY VOLTAGE (7.2V OR 14.4V NOMINAL)
2. ALL OUTPUTS IN PARALLEL (25A MAX)
3. EACH XLR OUTPUT LIMITED BY A 5A RESETTABLE FUSE



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2.5. Environmental/Safety Specifications

2.5.1. EMC and Safety

MCLB05-2BV01 has been tested to meet the requirements of:

The Smart Charger/Calibrator has the following approvals and is labeled accordingly:

- EMC Directive
- WEEE Directive
- RoHS2 Directive
- EU Regulation (EC) REACH
- FCC Title 47 CFR
- Contains Transmitter Module FCC ID: ZAT26M1

Tested to:

- EN 55032
- EN 55024
- FCC Title 47 CFR, Part 15 Class B

2.6. Reliability

2.6.1. Warranty

A high-quality standard is maintained by Inspired Energy. All products are warranted against defects in workmanship, material and construction. The warranty period is one (1) year from the date of shipment from Inspired Energy.