BAT-NiMh45
Manual

Battery Backup Module
For
HESC, V5SC & HPSC Series Power Supplies

Manufactured by
TRI-M ENGINEERING
Engineered Solutions for Embedded Applications

Technical Manual

P/N: BAT-NiMh45-MAN
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This manual is for integrators of applications of embedded systems. It contains information on hardware requirements and interconnection to other embedded electronics.

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CHAPTER 1: GENERAL DESCRIPTION

The BAT-NiMh45 creates a UPS system by plugging directly into the bottom of the HESC (including the V5SC-SER & HPSC) Vehicle Power Supplies. Each BAT-NiMh45 includes seven 4.5Ahr "A" size batteries for a nominal backup voltage of 8.4 volts. The BAT-NiMh45 can therefore supply a total of 37.8 watt-hrs of backup power and supply backup power for up to sixty minutes for a 37.8 watt load.

The BAT-NiMh45 includes Mosfet transistors for preventing deep discharge occurrences during extended power outages. The Mosfet transistors electrically isolate the BAT-NiMh45 from the HESC whenever the BE output of the HESC is de-asserted (pulled to 5V).

When ordered with the Real Time Clock option, the BAT-NiMh45-RTC can "awaken" from Sleep Mode at a programmed start-up time. A momentary "dry" contact on CN3 can also override the Sleep Mode and awaken the BAT-NiMh45-RTC. Tri-M Power supplies supporting the HESC-UPS18 firmware can program and read the RTC on the BAT-NiMh45-RTC. Tri-M Power Supplies with HESC-UPS firmware can use the BAT-NiMh45 for a UPS system, but without RTC support. Refer to section "Configuration and Installation" for listing of compatible power supplies and firmware support.

The BAT-NiMh45 has both a thermal fuse and a current fuse for protection against overcharging, and shorts on the battery output.

A digital I^2C temperature sensor provides temperature feedback for charge termination, which can be read by the HESC.

CHAPTER 2: Specifications

Description	BAT-NiMh45 specifications
Batteries	NiMh, Size A, 4.5A-Hr.
Nominal Battery Voltage	8.4 volts (seven cells * 1.2 volts)
Maximum Capacity	37.8 watt-hours
Charging Temperature Range	0C to 45C
Discharge Temerature Range	-10C to 64C
PC/104 footprint size	3.55" x 3.775", no PC/104 bus.
Weight	521 grams (including mounting hardware)

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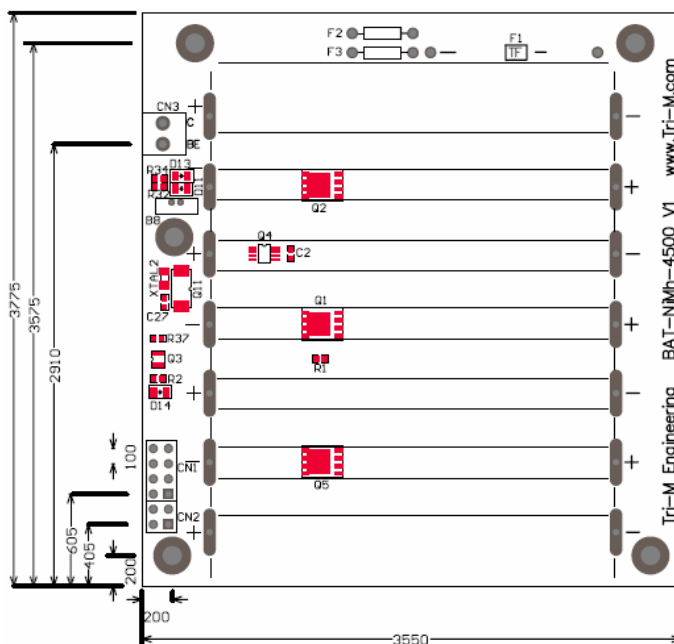
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CHAPTER 3: CONFIGURATION AND INSTALLATION

The BAT-NiMh45 mounts directly to the bottom of an HESC product by plugging CN1 into the mating connector on the bottom of an HESC unit. Four 0.6" standoffs are required (one per corner) to separate the BAT-NiMh45 and the HESC unit.

For high current power supplies such as the HPSC104-SER, the four pin connector CN2 can be installed. To have this connector factory installed please quote part number HPSC104-SER-HC when ordering. For high current applications CN2 plugs into the mating connector on the bottom of the HPSC104-SER.

The table below lists power supply compatibility with the BAT-NiMh45.

Model	Processor Type	Firmware Installed	RTC Support	High Current (CN2 compatible)	BAT-NiMh45 Ordering Number
HESC104	PIC16F877	HESC-UPS	No	No	BAT-NiMh45
HESC104-18F	PIC18F452	HESC-UPS18	Yes	No	BAT-NiMh45-RTC
HESC-SER	PIC16F877	HESC-UPS	No	No	BAT-NiMh45
HESC-SERD	PIC18F6720	HESC-UPS18	Yes	No	BAT-NiMh45-RTC
HESC104+	PIC18F6720	HESC-UPS18	Yes	No	BAT-NiMh45-RTC
V5SC-SER	PIC18F6720	HESC-UPS18	Yes	No	BAT-NiMh45-RTC
V5SC-SER-UPS	PIC18F6720	HESC-UPS18	No	No	BAT-NiMh45
HPSC104-SER	PIC18F6720	HESC-UPS18	Yes	Yes	BAT-NiMh45-RTC-HC
HPSC104-SER-UPS	PIC18F6720	HESC-UPS18	Yes	Yes	BAT-NiMh45-RTC-HC

*Note: The V5SC104 is not compatible with the BAT-NiMh45.

Note: All dimensions in Mils (1000 mils = 1 inch)
Unless otherwise stated

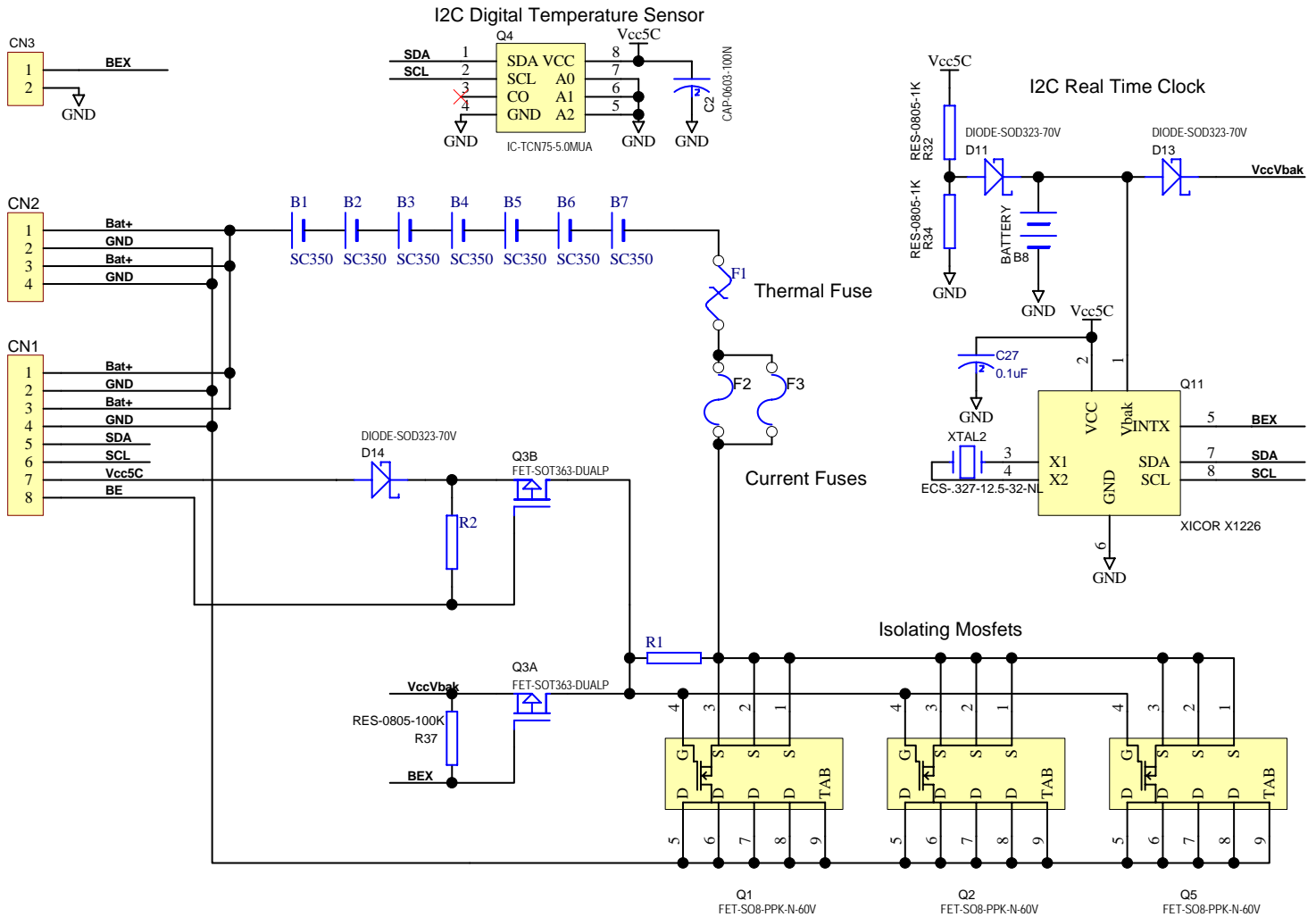**Tri-M Engineering**   Tel: 800.665.5600, 604.945.9565   5
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CHAPTER 4: BAT-NiMh45 Schematic

Figure 1: Batteries, Protection Fuse, Mosfets & I²C Temperature Sensor

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CHAPTER 5: Operation of BAT-NiMh45

The HESC communicates and programs the RTC through the I^2C data and clock signals. The HESC-UPS18 firmware provides the Host PC the function "RTC" to setup and read the RTC time in the BAT-NiMh45. The HESC-UPS18 firmware also provides functions RTCSU and RTCSD to setup and read the start-up and shutdown RTC times for the BAT-NiMh45.

Please refer to the HESC-UPS18 Firmware Manual for a description on how real time is managed and RTC variables stored into the EEprom of the HESC.

A momentary "dry" contact on CN3 overrides the Sleep Mode and awakens the BAT-NiMh45 by enabling the main Mosfets (Q1, Q2 & Q5). When the contact on CN3 is closed it uses a small current (current limited by 100K resistor) to pull the gate of the P-channel control Mosfet low, thus turning on the main Mosfets. The HESC will generate the Vcc5C voltage and when properly configured via the UPS start-up registers will pull the BE signal low keeping the main Mosfets enabled, thus allowing the momentary dry contact to be removed. Prolonged connection of the dry contact connected to CN3 will discharge the RTC battery and result in RTC time loss and erratic operation.

To configure the UPS registers to start-up the HESC on Sleep Mode override a variety of options are available.
1. Set the BattVminDef(0x8E) (battery minimum voltage) and the BATTSUen setting in the ChFlags_ExtDef (0x9E). This will enable start on battery voltage above the minimum start-up voltage.
    a. EEprom registers that need to be configured:
        i. BATTSUen - ChFlags_ExtDef (EEprom 0x9E), bit-2
        ii. BattVminDef(EEprom 0x8E)

2. When the BAT-NiMh45 main Mosfets are enabled the HESC will test the IGN input and generate a start-up request if the HESC is configured to start on the IGN input, and the IGN input is at the correct start-up level.
    a. EEprom registers that need to be configured:
        i. IgnHiOffEn - ChFlagsDef(EEprom 0x80), bit-3
        ii. IGNSUdebDef(EEprom 0xDA)
        iii. IGNSUDef(EEprom 0xDE)

CHAPTER 6: Thermal and Current Safety Fuses

The BAT-NiMh45 uses a thermal fuse with a set point of 84C. When the thermal fuse detects an excessive high battery temperature the thermal fuse will activate resulting in the isolation of the batteries from the charging circuit and load.

The BAT-NiMh45 also has two seven ampere SLO-BLO current fuses in parallel. When the battery current exceeds fourteen amperes, the fuses will activate resulting in the isolation of the batteries from the charging circuit and load.

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