

# HE104+DX Manual

*High Efficiency*  
**Vehicle Power Supply  
DC to DC Converter**

Manufactured by  
**TRI-M ENGINEERING**  
Engineered Solutions for Embedded Applications

## Technical Manual

P/N: HE104+DX MAN

5 July 2005

**TRI-M ENGINEERING**  
1407 Kebet Way, Unit 100  
Port Coquitlam, BC V3C 6L3  
Canada  
<http://www.Tri-M.com>  
Tel 604.945.9565  
North America 800.665.5600  
Fax 604.945.9566

## Table of Contents

<b>CHAPTER 1</b>	<b>INTRODUCTION.....</b>	<b>4</b>
1.1	GENERAL DESCRIPTION .....	4
1.2	FEATURES.....	4
1.3	SPECIFICATIONS .....	6
<b>CHAPTER 2</b>	<b>CONFIGURATION AND INSTALLATION .....</b>	<b>7</b>
2.1	INTRODUCTION.....	7
2.2	POWER CONSIDERATIONS.....	8
2.2.1	<i>Main (CN2) Input Power Connector .....</i>	<i>8</i>
2.2.2	<i>Output Power Connector.....</i>	<i>8</i>
2.2.3	<i>PCI-104 (Plus) and PC/104 Bus Connector.....</i>	<i>9</i>
2.2.4	<i>LED Enable/Disable .....</i>	<i>10</i>

## PREFACE

*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 INTRODUCTION

### 1.1 GENERAL DESCRIPTION

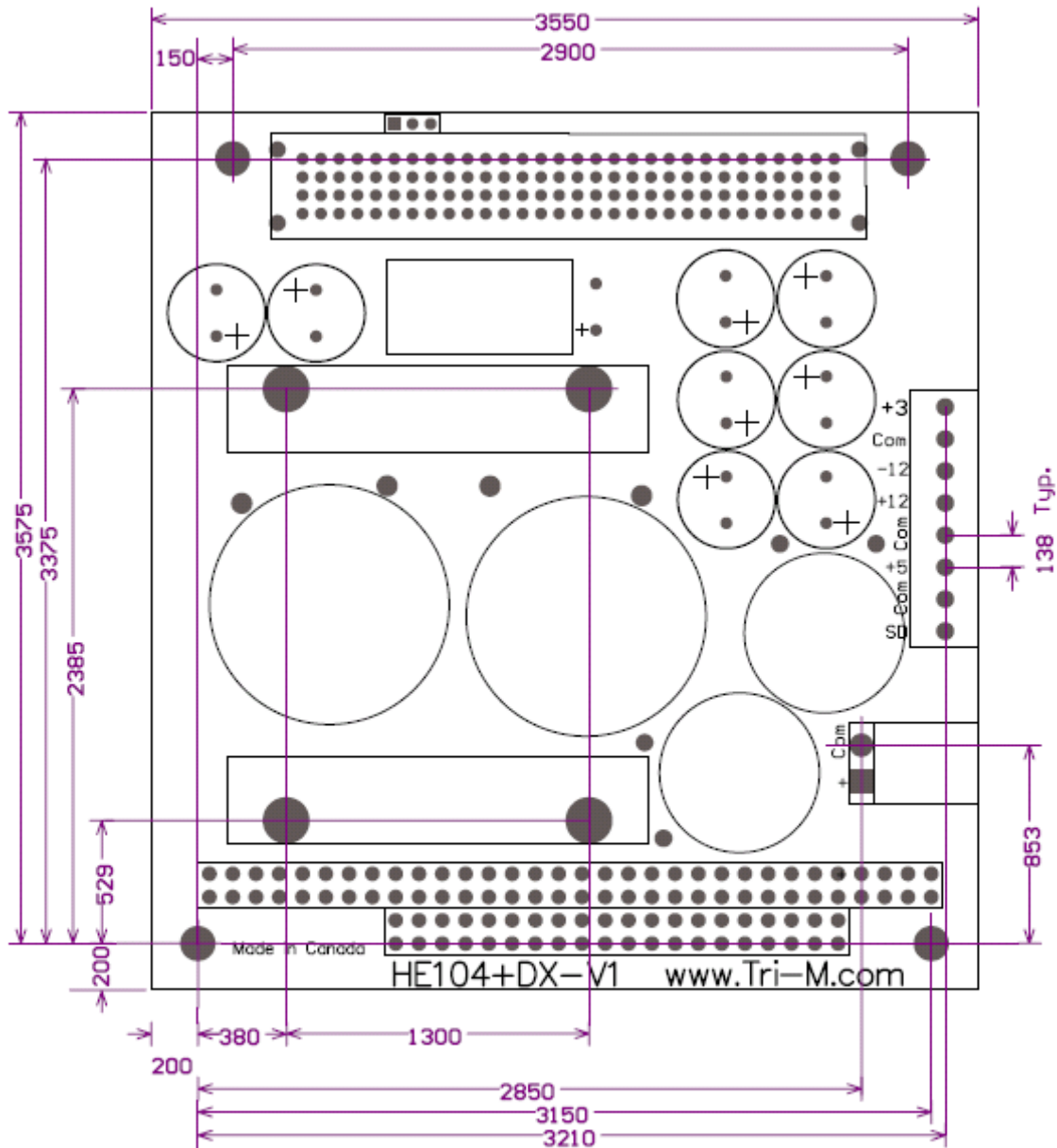
The HE104+DX is a high efficiency, high performance DC-to-DC converter that supplies +3.3V, +5V, +12V & -12V outputs to the PC/104 and the PCI-104 bus (also known as the Plus connector on the PC/104+ format). The HE104+DX is designed for low noise embedded computer systems, has a wide input range of 6-40V(>6:1) and is ideal for battery or unregulated input applications. The HE104+DX is specifically designed for vehicular applications and has heavy-duty transient suppressors (9000W on both main and secondary inputs) that clamp the input voltage to safe levels, while maintaining normal power supply operation.

The HE104+DX is a state-of-the-art Mosfet based design that provides outstanding line and load regulation with efficiencies up to 90 percent. Organic Semiconductor Capacitors provide filtering that reduces ripple noises below 20mV. The low noise design makes the HE104+DX ideal for use aboard aircraft or military applications or wherever EMI or RFI must be minimized. The +5VDC and +12VDC outputs are controlled by a constant frequency architecture regulator that provides excellent line and load transient response.

The HE104+DX has an opto-coupled on/off input (SD) to control the outputs of the HE104+DX. To enable the HE104+DX outputs, a 6 to 40V signal must be connected to the SD input. If remote control is not required, the SD input can be connected to the main power input. The common for the remote 6 to 40V signal must be connected to the HE104+DX common. If the SD input is connected directly to the main input power connector, the common for the SD input is already done.

### 1.2 FEATURES

- DC to DC converter for embedded applications.
- "Load Dump" transient suppression on input power supply.
- Operates from 6VDC to 40VDC input.
- PC/104+ compliant.
- 3.3V, 5V, 12V, -12V.
- Temperature range -40 to 85C.
- Opto-coupled inputs for remote control of the outputs.



**HE104+DX Mechanical**  
[www.Tri-M.com](http://www.Tri-M.com)

Note: All dimensions in mils (1000mils = 1 inch)

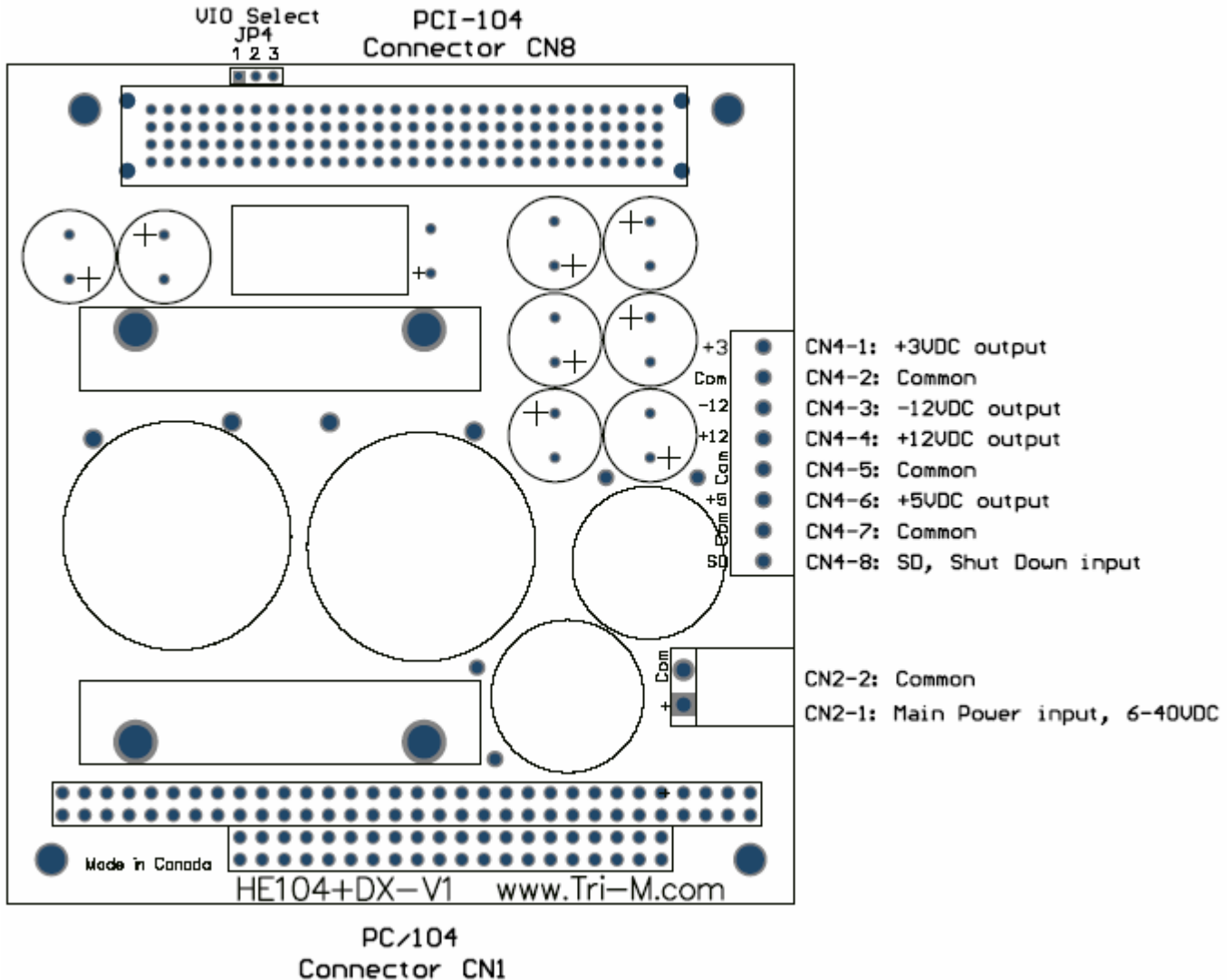
### 1.3 SPECIFICATIONS

<b>Power Supply Specifications</b>	
<b>Model</b>	<b>HE104+DX</b>
5V output	15A
12V output	3A
3.3V output	10A
-12V output	0.5A
Input Voltage Range	6 to 40V
Load Regulation (5V output)	< 60mV
Line Regulation	40mV
Output temp. drift (5V output)	< 40mV
Switching Freq.	75kHz
Max. Input Transient	125V for 100msec
Output Ripple (5V output)	< 20mV
Conducted Susceptibility (5V output)	> 57db
Efficiency (5V output)	Up to 90%
Temperature Range	-40 to 85C
Size, PC/104 size & mounting holes with PC/104 and PCI-104 (Plus) busses.	3.55"W. x 3.75"L. x 0.6"H.

## CHAPTER 2 CONFIGURATION AND INSTALLATION

### 2.1 Introduction

This chapter describes the configuration and installation of the HE104+DX power supply. In addition, section 2.2 provides a formula to calculate the available +5VDC. Figure 2-1 shows the HE104+DX connectors, jumpers and other options.



## 2.2 Power Considerations.

The +5V switching regulator is rated at 12A maximum output, however the +5V output supplies power to the +12, and -12VDC regulators. To obtain the usable range of +5V output, “derate” according to the use of +12, and -12VDC. Use the following formulae to calculate the maximum usable output.

$$\text{Usable +5Voutput} = 15A - \frac{(I[-12] * 2.4 + I[12] * 2.4)}{0.9}$$

Where:  $I[-12]$  = -12VDC current load  
 $I[12]$  = 12VDC current load

Assuming 90 percent converter efficiency (actual efficiency may vary).

### 2.2.1 Main (CN2) Input Power Connector

Input power is connected to the HE104+DX by removable connector blocks CN2. The power supply accepts DC input voltages in the range of 6VDC to 40VDC.

Unregulated vehicle power is connected as follows:

- Terminal 1: “hot” polarity, 6-40VDC
- Terminal 2: Common (0VDC)

### 2.2.2 Output Power Connector

Output power is available for use via connector block CN4 and is applied directly to the power and ground connections on the PC/104 bus and the PCI-104 (Plus) (refer to 2.2.3 for a listing of power and ground connections).

Note: SD is an opto-coupled input signal used to turn on/off the outputs. To enable the HE104+DX outputs, a 6 to 40V signal must be connected to the SD input. If remote control is not required, the SD input can be connected to the main power input. The common for the remote 6 to 40V signal must be connected to the HE104+DX common. If the SD input is connected directly to the main input power connector, the common for the SD input is already done.

#### CN4 Connections

- CN4-1: 3.3VDC output
- CN4-2: Common
- CN4-3: -12VDC output
- CN4-4: +12VDC output
- CN4-5: Common
- CN4-6: +5VDC output
- CN4-7: Common
- CN4-8: SD (ie maintained contact closure)

### 2.2.3 PCI-104 (Plus) and PC/104 Bus Connector

The table below lists the signals used on the PCI-104 (Plus) bus.

PC/104+ Bus Connector (CN8)				
Pin	A	B	C	D
1	GND	Not Used	+5V	Not Used
2	VI/O	Not Used	Not Used	+5V
3	Not Used	GND	Not Used	Not Used
4	Not Used	Not Used	GND	Not Used
5	GND	Not Used	Not Used	GND
6	Not Used	VI/O	Not Used	Not Used
7	Not Used	Not Used	GND	Not Used
8	+3.3V	Not Used	Not Used	+3.3V
9	Not Used	GND	Not Used	Not Used
10	GND	Not Used	+3.3V	Not Used
11	Not Used	+3.3V	Not Used	GND
12	+3.3V	Not Used	GND	Not Used
13	Not Used	GND	Not Used	+3.3V
14	GND	Not Used	+3.3V	Not Used
15	Not Used	+3.3V	Not Used	GND
16	Not Used	Not Used	GND	Not Used
17	+3.3V	Not Used	Not Used	+3.3V
18	Not Used	GND	Not Used	Not Used
19	Not Used	Not Used	VI/O	Not Used
20	GND	Not Used	Not Used	GND
21	Not Used	+5V	Not Used	Not Used
22	+5V	Not Used	GND	Not Used
23	Not Used	GND	Not Used	VI/O
24	GND	Not Used	+5V	Not Used
25	Not Used	VI/O	Not Used	GND
26	+5V	Not Used	GND	Not Used
27	Not Used	+5V	Not Used	GND
28	GND	Not Used	+5V	Not Used
29	+12V	Not Used	Not Used	Not Used
30	-12V	Not Used	Not Used	GND

Note: The VI/O voltage level is set to 3.3V by jumper JP4(2-3) and 5V by jumper JP4(1-2).

The table below lists the signals used on the PC/104 bus.

Pin #	Signal	Pin #	Signal	Pin #	Signal	Pin #	Signal
A1	Not Used	B1	GND	C0	GND	D0	GND
A2	Not Used	B2	Not Used	C1	Not Used	D1	Not Used
A3	Not Used	B3	+5V	C2	Not Used	D2	Not Used
A4	Not Used	B4	Not Used	C3	Not Used	D3	Not Used
A5	Not Used	B5	Not Used	C4	Not Used	D4	Not Used
A6	Not Used	B6	Not Used	C5	Not Used	D5	Not Used
A7	Not Used	B7	-12V	C6	Not Used	D6	Not Used
A8	Not Used	B8	Not Used	C7	Not Used	D7	Not Used
A9	Not Used	B9	+12V	C8	Not Used	D8	Not Used
A10	Not Used	B10	Not Used	C9	Not Used	D9	Not Used
A11	Not Used	B11	Not Used	C10	Not Used	D10	Not Used
A12	Not Used	B12	Not Used	C11	Not Used	D11	Not Used
A13	Not Used	B13	Not Used	C12	Not Used	D12	Not Used
A14	Not Used	B14	Not Used	C13	Not Used	D13	Not Used
A15	Not Used	B15	Not Used	C14	Not Used	D14	Not Used
A16	Not Used	B16	Not Used	C15	Not Used	D15	Not Used
A17	Not Used	B17	Not Used	C16	Not Used	D16	+5V
A18	Not Used	B18	Not Used	C17	Not Used	D17	Not Used
A19	Not Used	B19	Not Used	C18	Not Used	D18	GND
A20	Not Used	B20	Not Used	C19	Not Used	D19	GND
A21	Not Used	B21	Not Used				
A22	Not Used	B22	Not Used				
A23	Not Used	B23	Not Used				
A24	Not Used	B24	Not Used				
A25	Not Used	B25	Not Used				
A26	Not Used	B26	Not Used				
A27	Not Used	B27	Not Used				
A28	Not Used	B28	Not Used				
A29	Not Used	B29	+5V				
A30	Not Used	B30	Not Used				
A31	Not Used	B31	GND				
A32	GND	B32	GND				

### 2.2.4 LED Enable/Disable

There are no jumpers on the HE104+DX to disable the LEDs. If the LEDs must be disabled then the current limiting resistor can be easily removed. The HE104+DX can be factory ordered in this configuration for OEM quantities. Please contact Tri-M sales for details.