HE104DX Manual

High Efficiency
Vehicle Power Supply
DC to DC Convertor

Manufactured by
TRI-M ENGINEERING
Engineered Solutions for Embedded Applications

Technical Manual

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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 HE104DX is a high efficiency, high performance DC to DC 60 watt converter that supplies +5V, -5V, +12V & -12V outputs. The HE104DX 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 HE104DX is specifically designed for vehicular applications and has two heavy-duty transient suppressors (3000W) that clamp the input voltage to safe levels, while maintaining normal power supply operation.

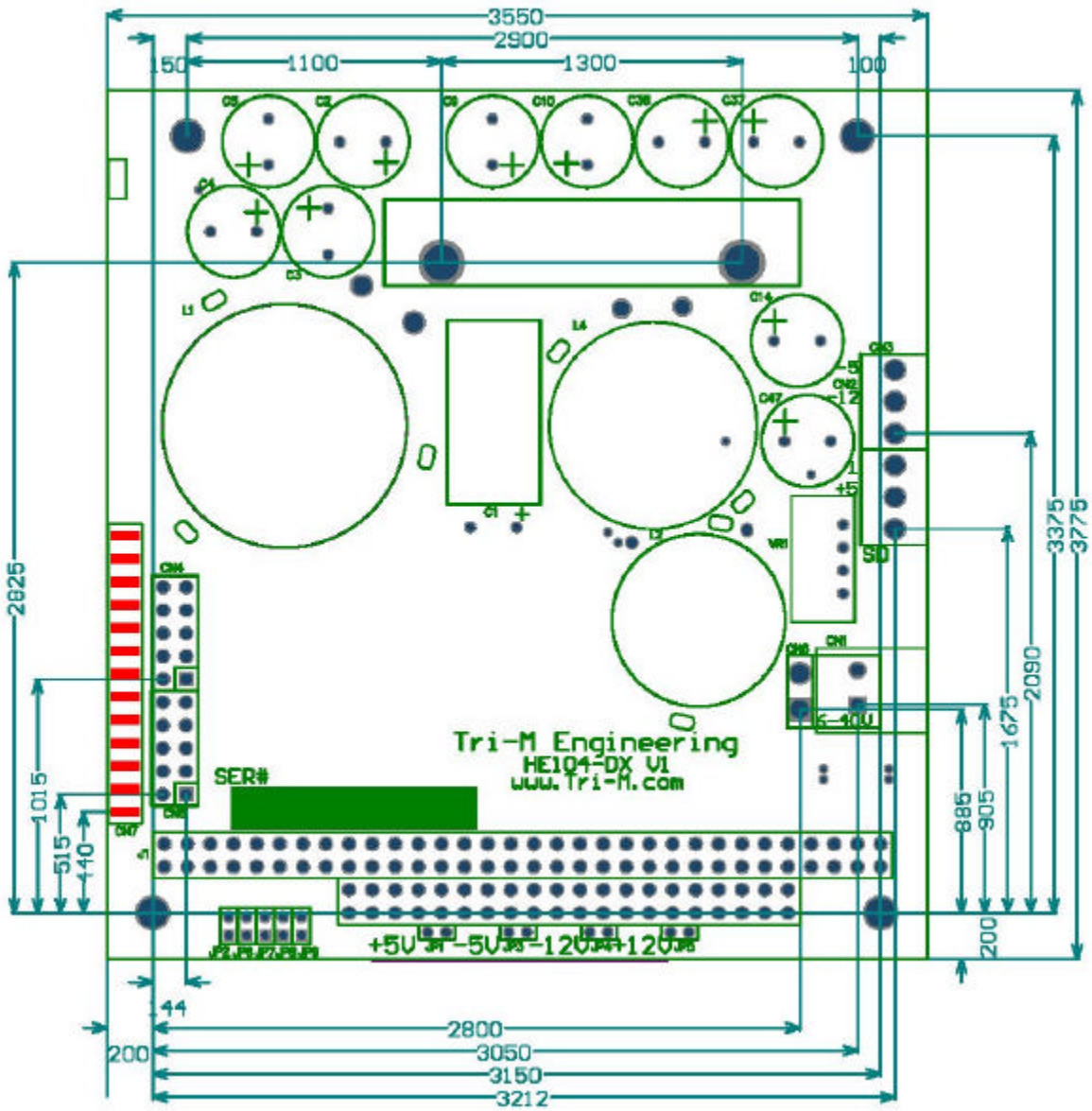
The HE104DX is a state-of-the-art Mosfet based design that provides outstanding line and load regulation with efficiencies up to 95 percent. Organic Semiconductor Capacitors provide filtering that reduces ripple noises below 20mV. The low noise design makes the HE104DX ideal for use aboard aircraft or military applications or wherever EMI or RFI must be minimized. The +5VDC and +12VDC outputs are controlled by a constant off-time current-mode architecture regulator that provides excellent line and load transient response.

The HE104DX has a opto-isolated on/off input (SD), allowing for remote control.

The HE104DX is PC/104 compliant with a 16-bit PC/104 bus. All generated voltages are provided to a connector block. A removable main input power plug allows the HE104DX to be easily installed.

FEATURES

- DC to DC converter for embedded applications.
- “Load Dump” transient suppression on input power supply.
- Operates from 6VDC to 40VDC input.
- PC/104 size and mounting holes.
- 60 watt power supply outputs.
- 5V, 12V, -12V, -5V, and battery charger outputs.
- Temperature range -40 to 85C.
- Optocoupled input for remote operation.



1.2 SPECIFICATIONS

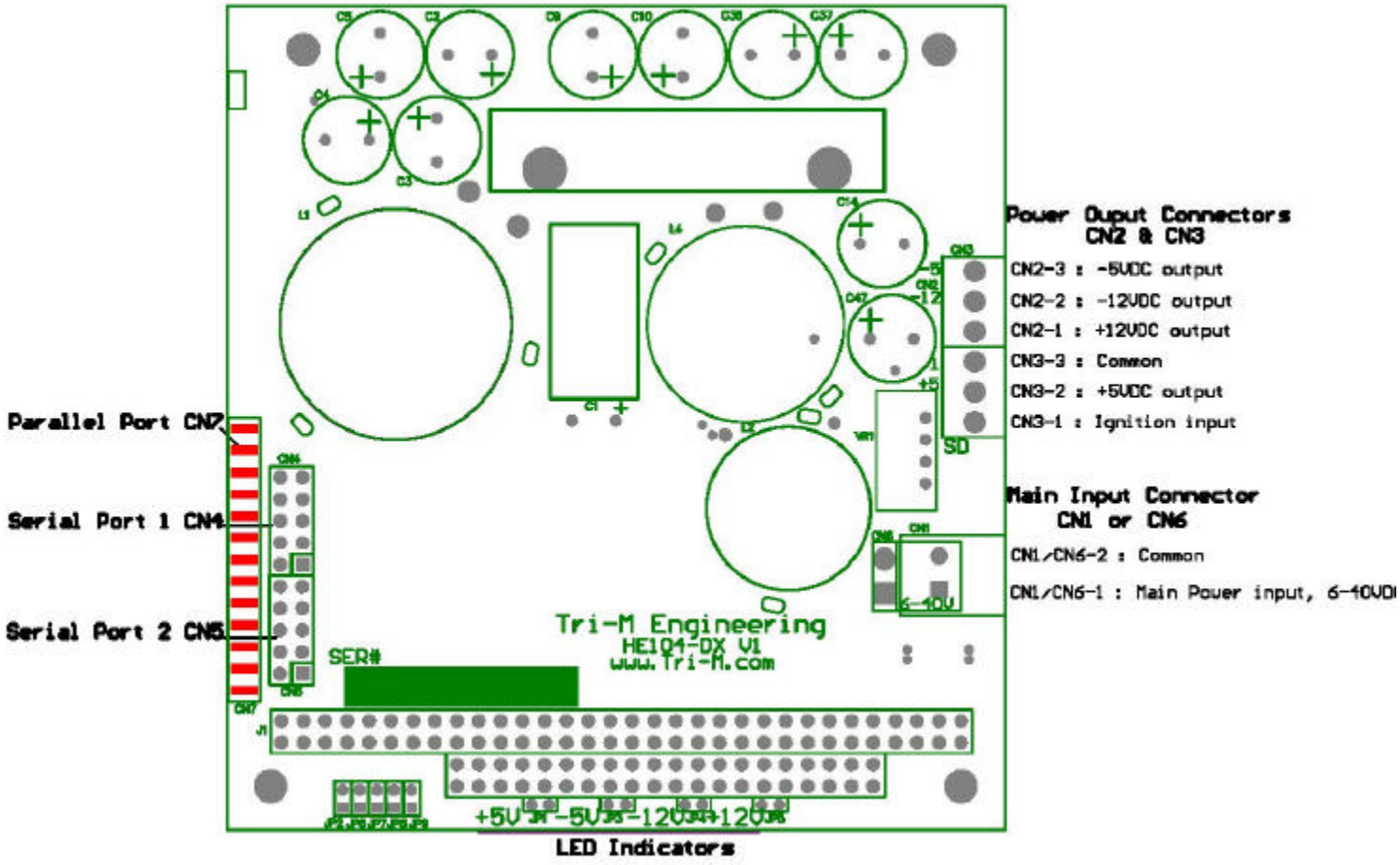
Power Supply Specifications	
Model	**HE104DX**
5V output*	12 A
12V output	2.5 A
-5V output	400 mA
-12V output	500 mA
Input Voltage Range	6 to 40V
Load Regulation**	< 60mV
Line Regulation	40mV
Output temp. drift**	< 40mV
Switching Freq.	75kHz
Max. Input Transient	125V for 100msec
Output Ripple**	< 20mV
Conducted Susceptibility**	> 57db
Efficiency	Up to 95%
Temp. Range	-40 to 85C
Quiescent current***	2 mA
Size, PC/104 form factor compliant***	3.55”W. x 3.75”L. x 0.6”H.

*Current rating includes current supplied to 12V, -12V and –5V regulators.
**Measured on the 5V output.
***LED’s disabled.

CHAPTER 2 CONFIGURATION AND INSTALLATION

2.1 Introduction

This chapter describes the configuration and installation of the HE104DX power supply. In addition, section 2.2 provides a formula to calculate the available +5VDC. Figure 2-1 shows the HE104DX 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, -5, and -12VDC regulators. To obtain the usable range of +5V output, "derate" according to the use of +12, -5, and -12VDC. Use the following formulae to calculate the maximum usable output.

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

Where: I[-5] = -5VDC current load
I[-12] = -12VDC current load
I[12] = 12VDC current load
Assuming 90 percent converter efficiency (actual efficiency may vary).

2.2.1 Main Input Power Connector

Input power is connected to the HE104DX by a removable connector block CN1. 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
- Terminal 2: Common (0VDC)

2.2.2 Output Power Connector

Output power is available via connector blocks CN2 & CN3. CN2 & CN3 are located immediately side-by-side.

- CN3-1: Position 4, SD (Ignition input, ie maintained contact closure) 6 – 40 VDC input
- CN3-2: Position 5, +5VDC output
- CN3-3: Position 6, common
- CN2-1: Position 7, +12VDC output
- CN2-2: Position 8, -12VDC output
- CN2-3: Position 9, -5VDC output

2.2.3 Ignition input

The HE104DX power supply outputs are turned on when 6VDC to 40VDC is applied to the ignition input signal SD on connector CN3-1.

If no remote control is required, this input can be tied to the main input power connector.

2.2.4 PC/104 Parallel Port Interface

The HE104DX provides a PC/104 bus to pass the signals through to the next PC/104 card.

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

Pin #	Signal	Pin #	Signal	Pin #	Signal	Pin #	Signal
A1	N/A	B1	GND	C0	GND	D0	GND
A2	SD7	B2	N/A	C1	N/A	D1	N/A
A3	SD6	B3	+5V	C2	N/A	D2	N/A
A4	SD5	B4	N/A	C3	N/A	D3	N/A
A5	SD4	B5	-5V	C4	N/A	D4	N/A
A6	SD3	B6	N/A	C5	N/A	D5	N/A
A7	SD2	B7	-12V	C6	N/A	D6	N/A
A8	SD1	B8	N/A	C7	N/A	D7	N/A
A9	SD0	B9	+12V	C8	N/A	D8	N/A
A10	N/A	B10	N/A	C9	N/A	D9	N/A
A11	AEN	B11	N/A	C10	N/A	D10	N/A
A12	N/A	B12	N/A	C11	N/A	D11	N/A
A13	N/A	B13	/IOW	C12	N/A	D12	N/A
A14	N/A	B14	/IOR	C13	N/A	D13	N/A
A15	N/A	B15	N/A	C14	N/A	D14	N/A
A16	N/A	B16	N/A	C15	N/A	D15	N/A
A17	N/A	B17	N/A	C16	N/A	D16	+5V
A18	N/A	B18	N/A	C17	N/A	D17	N/A
A19	N/A	B19	N/A	C18	N/A	D18	GND
A20	N/A	B20	N/A	C19	N/A	D19	GND
A21	N/A	B21	IRQ7				
A22	SA9	B22	N/A				
A23	SA8	B23	IRQ5				
A24	SA7	B24	N/A				
A25	SA6	B25	N/A				
A26	SA5	B26	N/A				
A27	SA4	B27	N/A				
A28	SA3	B28	N/A				
A29	SA2	B29	+5V				
A30	SA1	B30	N/A				
A31	SA0	B31	GND				
A32	GND	B32	GND				

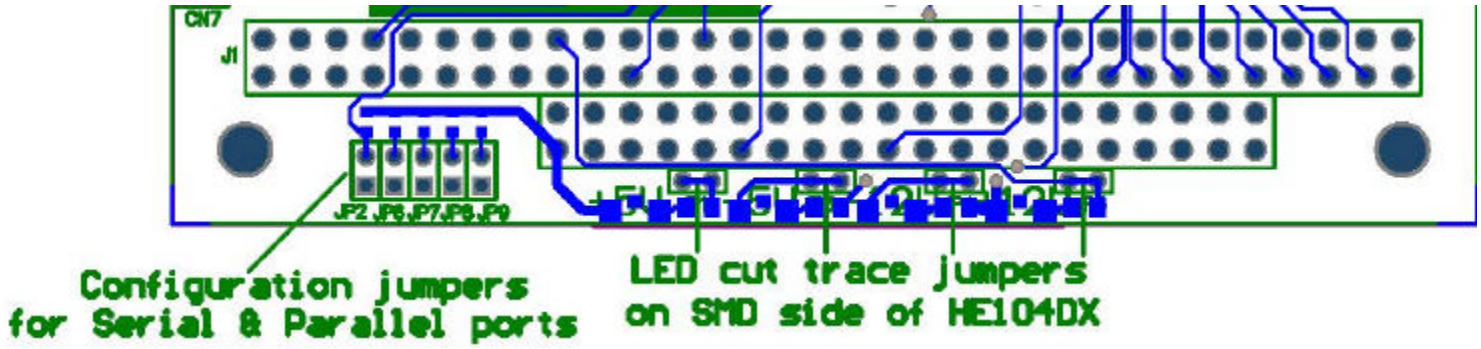
2.3 Jumper Selection

This section describes the function of each jumper, the location of it, the default setting, and how to change it.

2.3.1 LED Jumper Enable/Disable

These jumpers allow the LEDs to be disabled. This is most likely to be used when absolute minimum power consumption must be maintained, such as when operating off a limited battery source.

The location of each LED jumper shown in the diagram below.



Each LED is enabled by factory default. To disable any LED, remove the LED jumper (or cut the small PCB trace if no jumper is installed) associated with the LED. To re-enable any LED, re-install the associated jumper (or solder a short jumper wire between each of the jumper pads).

CHAPTER 3 SIO option

3.1 Description

The SIO option provides the HE104DX with a dual UART and a 1284 bi-directional parallel port accessible through the PC104 bus. The UARTs are software compatible to industry standard 16C550 and include enhanced features of 128 bytes of transmit and receive FIFOs, programmable transmit an receive FIFO trigger levels, transmit and receive FIFO counters, IRDA encoder/decoder, automatic RTS/CTS hardware flow control and automatic software (Xon/Xoff) flow control. Status registers provide interrupt priorities, received data errors and modem status. Each channel has programmable baud rates up to 460.8Kbps. The parallel port is compatible to IEEE1284 specification and supports Compatible Centronics, Extended Capability (ECP) and Enhanced Parallel Port (EPP) protocols. The bi-directional parallel port can be configured as a general-purpose input/output interface or connected to a printer or portable storage devices.

3.2 Configuration

Both serial ports and the parallel port use the standard PC COM and LPT port address and IRQ. The SIO chip decodes the PC/104 address lines A3 through A10 internally to select the serial ports as COM1, COM2, COM3 or COM4 and the parallel port as LPT1 or LPT2.

Device	JP9	JP8	JP7	JP6	JP2	Port	Address range	IRQ
Serial Port 1	OPEN	OPEN	-	-	-	COM1	3F8-3FF	4
Serial Port 1	CLOSE	OPEN	-	-	-	COM2	2F8-2FF	3
Serial Port 1	OPEN	CLOSE	-	-	-	COM3	3E8-3EF	4
Serial Port 1	CLOSE	CLOSE	-	-	-	COM4	2E8-2EF	3
Serial Port 2	-	-	OPEN	OPEN	-	COM1	3F8-3FF	4
Serial Port 2	-	-	CLOSE	OPEN	-	COM2	2F8-2FF	3
Serial Port 2	-	-	OPEN	CLOSE	-	COM3	3E8-3EF	4
Serial Port 2	-	-	CLOSE	CLOSE	-	COM4	2E8-2EF	3
Parallel Port	-	-	-	-	CLOSE	LPT1	378-37F	7
Parallel Port	-	-	-	-	OPEN	LPT2	278-27F	5

3.3 Pins description

3.3.1 Parallel port (CN7)

CN7	DB-25 Pin	Signal	Function	In/ Out	CN7	DB-25 Pin	Signal	Function	In/ Out
1	1	STRB-	Output data strobe	OUT	2	14	AUTOFD-	Auto feed	OUT
3	2	PD0	Data bit 0	I/O	4	15	ERR-	Printer error	IN
5	3	PD1	Data bit 1	I/O	6	16	INIT-	Initialize printer	OUT
7	4	PD2	Data bit 2	I/O	8	17	SLCTIN-	Selects printer	OUT
9	5	PD3	Data bit 3	I/O	10	18	GND	Signal Ground	N/A
11	6	PD4	Data bit 4	I/O	12	19	GND	Signal Ground	N/A
13	7	PD5	Data bit 5	I/O	14	20	GND	Signal Ground	N/A
15	8	PD6	Data bit 6	I/O	16	21	GND	Signal Ground	N/A
17	9	PD7	Data bit 7	I/O	18	22	GND	Signal Ground	N/A
19	10	ACK-	Character acknowledged	IN	20	23	GND	Signal Ground	N/A
21	11	BUSY	Printer busy	IN	22	24	GND	Signal Ground	N/A
23	12	PE	Out of paper	IN	24	25	GND	Signal Ground	N/A
25	13	SLCT	Printer selected	IN	26	N/A	GND	Signal Ground	N/A

Table 10: Parallel Port Connections

Note: CN7 is an edge mounted PCB connector with odd number pins located on the "top", and even number pins on the "bottom".

3.3.2 Serial ports (CN4 & CN5)

CN4 CN5	DB-9 Pin	Signal	Function	In/ Out	CN4 CN5	DB-9 Pin	Signal	Function	In/ Out
1	1	DCD1	Serial 1 Data Carrier Detect	IN	2	6	DSR1	Serial 1 Data Set Ready	IN
3	2	RXD1	Serial 1 Receive Data	IN	4	7	RTS1	Serial 1 Request To Send	OUT
5	3	TXD1	Serial 1 Transmit Data	OUT	6	8	CTS1	Serial 1 Clear To Send	IN
7	4	DTR1	Serial 1 Data Terminal Ready	OUT	8	9	RI1	Serial 1 Ring Indicator	IN
9	5	GND	Signal Ground		10		N/C	No connection	

Table 14: Serial Port COM1 Connection