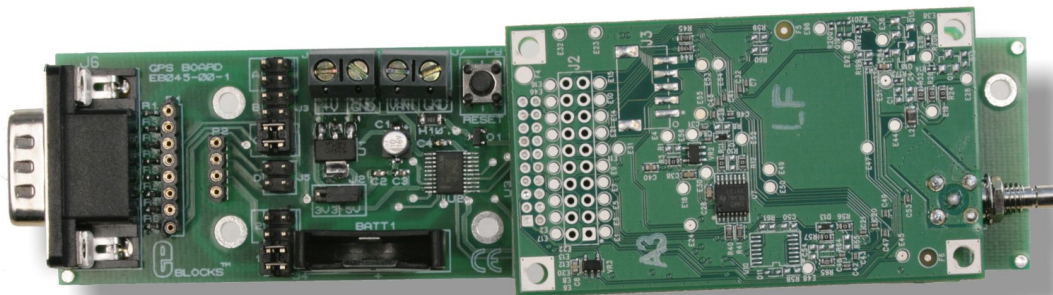


# **GPS board datasheet**

## **EB045-00-1**



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Appendix 1    Circuit diagram

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## ***1. About this document***

This document concerns the E-blocks GPS board code EB045 version 1.

The order code for this product is EB045.

### ***1. Trademarks and copyright***

E-blocks is a trademark of Matrix Multimedia Limited.

### ***2. Other sources of information***

There are various other documents and sources that you may find useful:

#### ***Getting started with E-Blocks.pdf***

This describes the E-blocks system and how it can be used to develop complete systems for learning electronics and for PICmicro programming.

#### ***PPP Help file***

This describes the PPP software and its functionality. PPP software is used for transferring hex code to a PICmicro microcontroller.

#### ***C and assembly strategies***

This is available as a free download from our web site.

### ***3. Disclaimer***

The information in this document is correct at the time of going to press. Matrix Multimedia reserves the right to change specifications from time to time. This product is for development purposes only and should not be used for any life-critical application.

### ***4. Technical support***

If you have any problems operating this product then please refer to the troubleshooting section of this document first. You will find the latest software updates, FAQs and other information on our web site: [www.matrixmultimedia.com](http://www.matrixmultimedia.com).

If you still have problems please visit our forums at [www.matrixmultimedia.com/mmforums](http://www.matrixmultimedia.com/mmforums)

## 2. General information

### 1. Description

This E-block allows investigation of the global positioning system used in modern satellite navigation equipment. The board allows GPS to be added to microcontrollers and other processors that do not have GPS peripherals embedded into them. The board uses a state of the art Jupiter 31 GPS module from Navman Wireless. The GPS module uses several orbiting satellites to calculate its position. Once a initial position has been acquired the GPS receiver continues to send position information directly to the microcontroller ready for further processing.

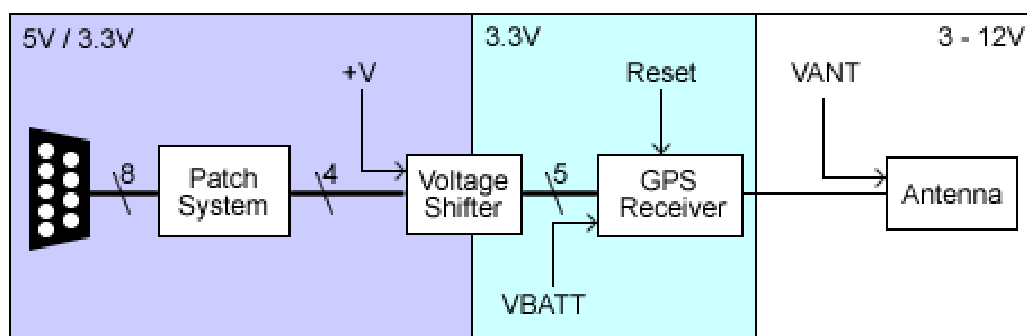
A set of jumper links and a patch system are installed which allow the GPS E-Block to easily be set for use with any microcontroller device.

The upstream device (i.e. Multiprogrammer) connected to this board must have an integrated UART module available, or the firmware must be able to send TTL level RS232 compatible waveforms.

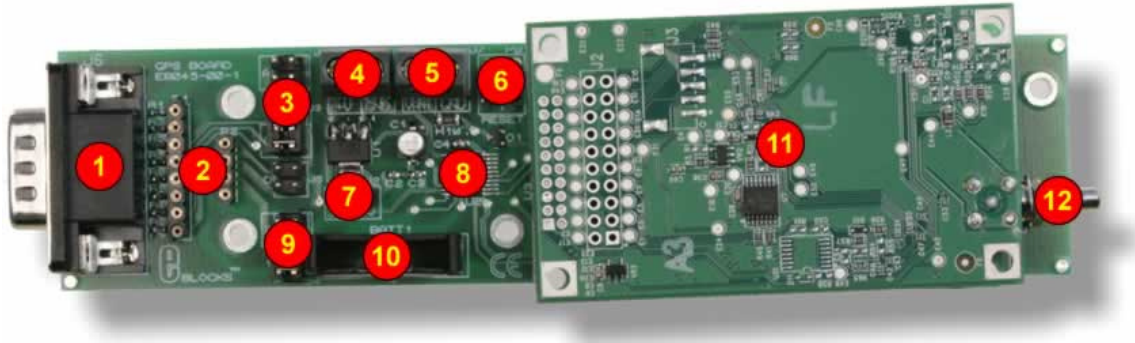
### 2. Features

- 20 Channel GPS Receiver Module
- Min resolution longitude 2.2m
- Min resolution latitude 2m
- Altitudes of -300m to 18,000m
- Velocities up to 515m/s
- Low power consumption sleep mode
- Pulse per second output
- Fully compliant with all GPS satellites
- Battery Backup for instant on operation
- Antenna boost voltage
- Manual and software reset
- 3.3V or 5V operation

### 3. Block schematic



### 3. Board layout



EB045-74-1.jpg

1. 9-way downstream D-type connector
2. Patch system
3. RX and TX selection jumper pins
4. Voltage input screw terminals
5. Antenna boost voltage screw terminals
6. Reset switch
7. Voltage selection system
8. Voltage shifting circuitry
9. PPS and Sleep selection jumper pins
10. Backup battery socket
11. Jupiter 31 GPS module
12. GPS antenna socket

General Guide for RX and TX pin settings:

Jumper at A	Jumper at B	Jumper at C	Jumper at D
PIC16F88 PIC16F87	PIC16F627(A) PIC16F628(A) PIC16F648A	PIC16F7x PIC16F7x7 PIC16F87x PIC16F87xA	PIC16C6x PIC16CC7x Patch System

General Guide for PPS and Sleep pin settings:

Jumper Settings	Description
1	Hardwired PPS and Sleep selection PPS = Bit 0, Sleep = Bit 3
2	Patch System

If using a PIC16F88, insert board to Port B and jumper settings = A & 1  
 If using a PIC16F877A, insert board to Port C and jumper settings = C & 1

## **4. Testing this product**

The following program will test the circuit.

The test file can be downloaded from [www.matrixmultimedia.com](http://www.matrixmultimedia.com).

### ***Items Required.***

- 1 x Multiprogrammer E-Blocks with 16F877A
- 1 x GPS E-Block (unit under test)
- 1 x LCD Display E-Block
- 1 x Current Limited Power Supply set to 12.5V and 60mA

### ***Setting up the test.***

- 16F877A in 40-way socket on Multiprogrammer
- SW2 set to XTAL Mode on Multiprogrammer
- 19.6608 MHz Crystal in Multiprogrammer
- LCD Display E-Block connected to Port B on Multiprogrammer
- LCD E-Block DEFAULT jumper setting
- Wire connection between +V on Multiprogrammer to +V on LCD E-block
- GPS E-block connected to Port C on Multiprogrammer
- Connect 14V of Multiprogrammer to VANT of GPS E-block
- Connect +V of Multiprogrammer to +V of GPS E-block
- J2 of GPS E-block – jumper in 5V position
- J3 of GPS E-block – jumper in position C
- J4 of GPS E-block – jumper in position 1
- Insert a CR2032 Battery into position BATT1 (Optional)
- Connect the Multiprogrammer to a power supply

1. Set up the configuration as specified above.
2. Download the GPS\_Tester.hex file to the Multiprogrammer with the GPS E-block and LCD E-Block connected and wired.

### ***EB-045 GPS Board Test Routine***

1. Allow the system a couple of minutes to allow the GPS receiver to acquire communications with satellites in the vicinity.
2. The LCD E-block should then start showing location information.
3. Move the multiprogrammer and the location information should be updated.
4. (Optional) If you are using the CR2032 battery then power down the multiprogrammer and then re-apply power, the location information should start being acquired within a few seconds.

## 5. Circuit description

The circuit as can be seen in the circuit diagram below (See Appendix 1 – Circuit diagram), is made up of four main components: the patch system, the voltage regulation, the backup battery and the GPS receiver (Navman Wireless - Jupiter 31).

### 1. *Patch System*

The design of this product enables you to use this board with many standard PICmicro devices. This is achieved by identifying the up-stream device, then selecting the corresponding jumper setting on the GPS E-block. This will configure the board with the correct pin-out for the Microcontroller selected. Jumper setting A, B, and C are used for selecting the appropriate pins for RX and TX: the dedicated RS232 lines. Jumper settings 1 and 2 are used to set the correct pins for PPS and Sleep GPS signals.

The microcontroller that is being used determines which port and which jumper. For example, if an PIC16F877A is being used, the GPS Board must be connected to Port C, with the jumper settings C & 1.

The following tables illustrate the correct jumper settings:

Table 1. Jumper settings for RX and TX selection.

Jumper at A	Jumper at B	Jumper at C	Jumper at D
PIC16F88 PIC16F87	PIC16F627(A) PIC16F628(A) PIC16F648A	PIC16F7x PIC16F7x7 PIC16F87x PIC16F87xA	PIC16C6x PIC16CC7x Patch System

The following table shows the settings that can be used for PPS and Sleep data lines:

Jumper Settings	Description
1	Hardwired PPS and Sleep selection PPS = Bit 0, Sleep = Bit 3
2	Patch System

The Patch System allows the user to route RX, TX, PPS and Sleep to any of the 8 input bits required. This allows great flexibility, as the user can then use a different device other than those specified in Table 1. When using the GPS Board with up-stream devices that are not mentioned in the above table, such as Atmel AVR® Board or other processor boards, then the patch system will be required.

### 2. *Voltage Regulation*

The GPS E-Block requires a 3.3V supply to power the GPS receiver circuitry. The 3.3V supply can be taken from a 5 volt supply on a 5 volt system by setting jumper J2 to the 5V position. This enables the voltage regulator U1 to drop the supply voltage down to 3.3 volts. If you are using a 3.3 volt supply then the jumper J2 can be set to the 3V3 position to bypass the voltage regulator U1. The voltage shifter U2 is responsible for ensuring that all of the data signals are converted between the correct voltages. The chip converts the signals from the input voltage source +V to the output voltage source 3.3V. This operation is bi-directional so signals coming from the GPS module will be converted back from the 3.3 volt supply to the +V supply.

### 3. *Backup Battery*

The backup battery supplies power to the SRAM and real time clock during powered down conditions, therefore enabling much faster positional acquisition times.

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#### ***4. GPS Receiver – Jupiter 31***

The Jupiter 31 GPS receiver has several outputs that can be received by a microcontroller device. PPS or Pulse per second is a signal used to synchronise with the satellite systems. The pulse occurs once a second and is available for one microsecond. The Jupiter 31 has a hardware serial UART that links to the UART onboard the interfacing microcontroller. The Jupiter 31's UART runs at a fixed baud rate of 4800 and outputs the GPS signals in a NMEA format. For details regarding the content of the NMEA messages please refer to the Jupiter 31 device datasheet. The Jupiter 31 also has an input which controls the sleep function of the module. When in sleep mode the power consumption of the module will be significantly reduced. The module is placed into sleep mode by setting the device into push to fit mode. Push to fit mode will take a GPS reading and then go straight into Sleep mode. Sending a logical 1 on the sleep input will wake up the device to collect the next sample before reverting back to the sleep mode. For more information on the modes and operations of the Jupiter 31 module please refer to the device datasheet.

The datasheet for this device which can be found at: [www.navman.com](http://www.navman.com)

#### ***5. 3.3V operation***

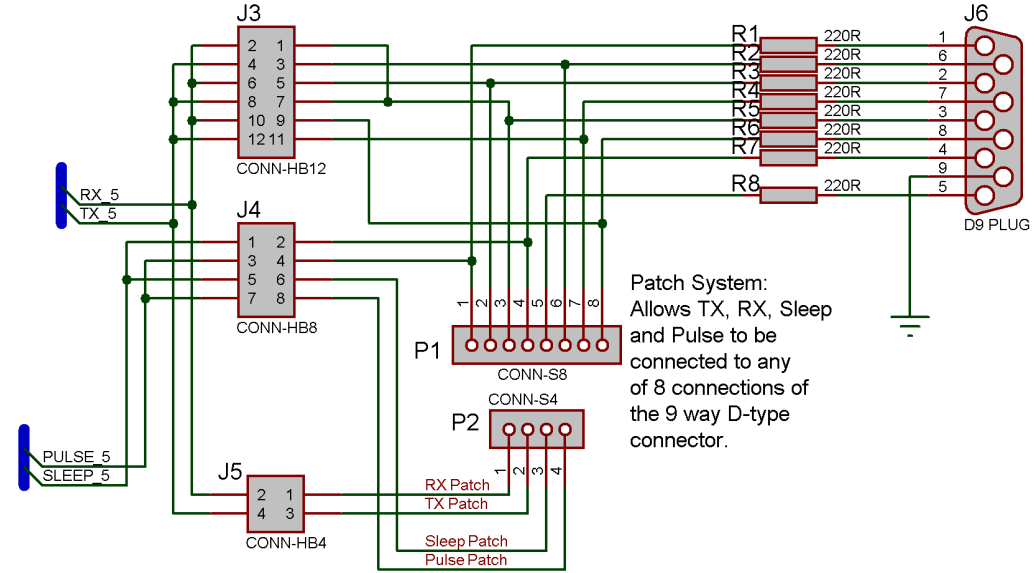
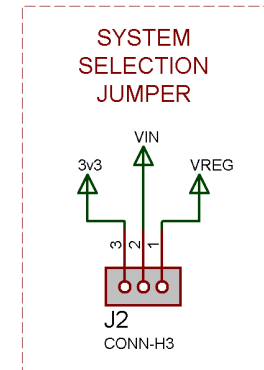
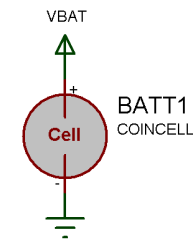
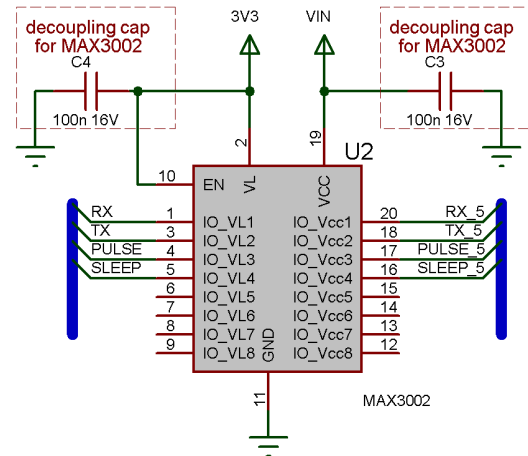
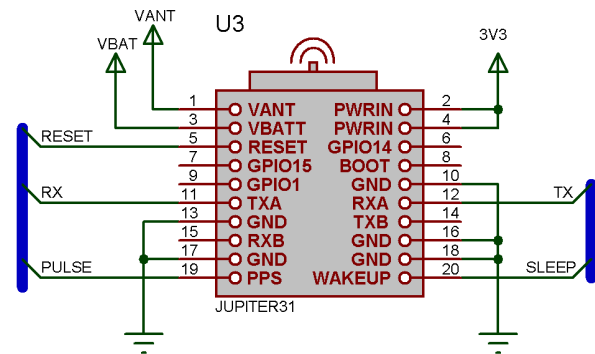
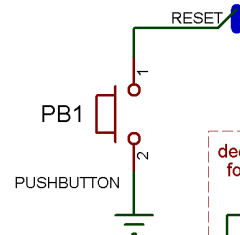
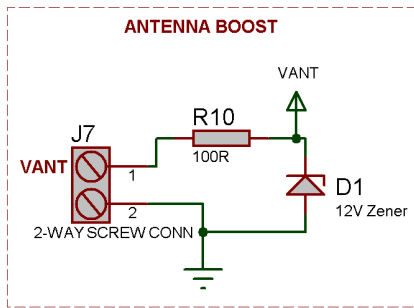
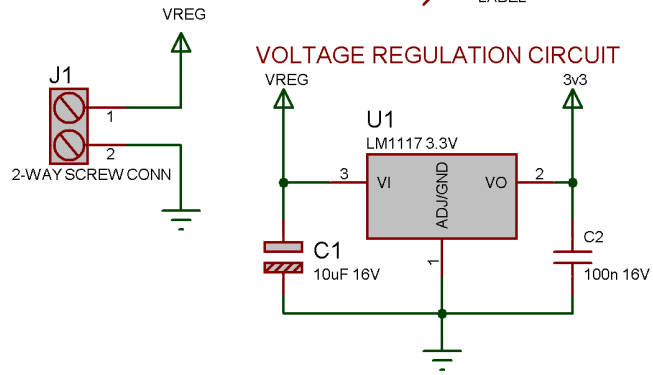
The EB045 GPS E-block is fully compatible with 3.3V systems.





Appendix 1 – Circuit diagram

THIS SYSTEM INCLUDES:-



Patch System:  
Allows TX, RX, Sleep  
and Pulse to be  
connected to any  
of 8 connections of  
the 9 way D-type  
connector.

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