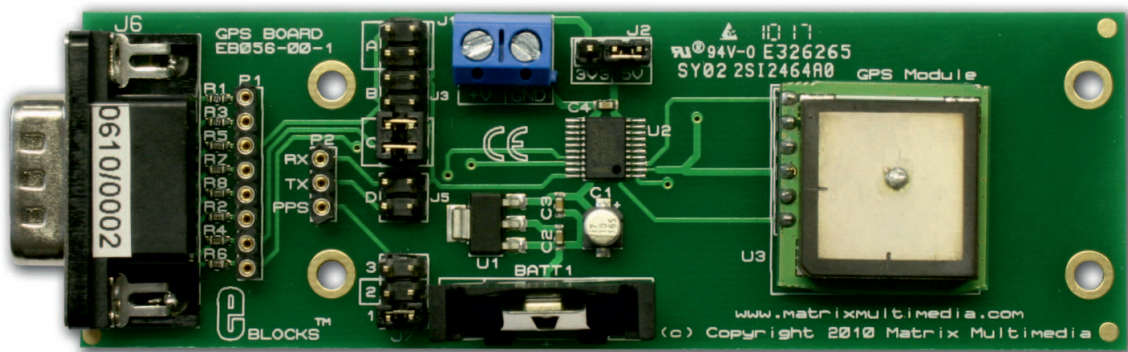


GPS board datasheet

EB056-00-1



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Appendix 1 Circuit diagram

1. About this document

This document concerns the E-blocks GPS board code EB056 version 1.

The order code for this product is EB056.

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.

If you still have problems please visit our forums at 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 UP500 GPS module from Fastrax. The GPS module uses multiple orbiting satellites to calculate its position. Once an initial position has been acquired the GPS receiver continues to send position information directly to the microcontroller ready for further processing. The GPS is also capable of streaming universal time and date data (UTC) directly to your microcontroller for use in your application.

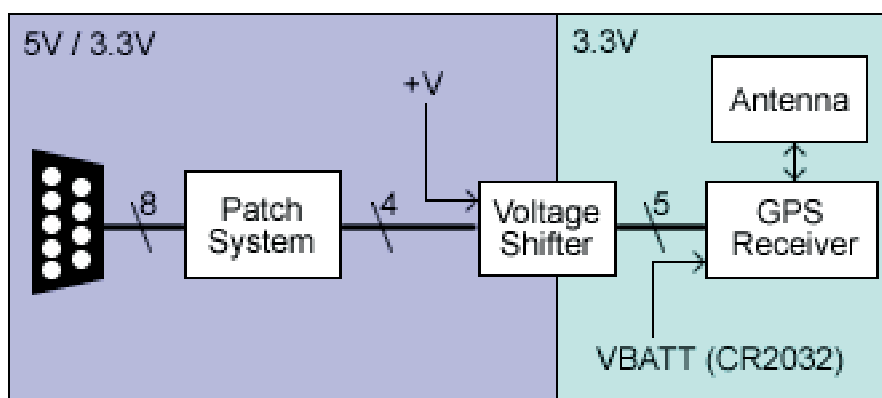
A set of jumper links and a patch system are installed which allow the GPS E-Block to easily be set for use with any microcontroller device.

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 and receive TTL level RS232 compatible waveforms.

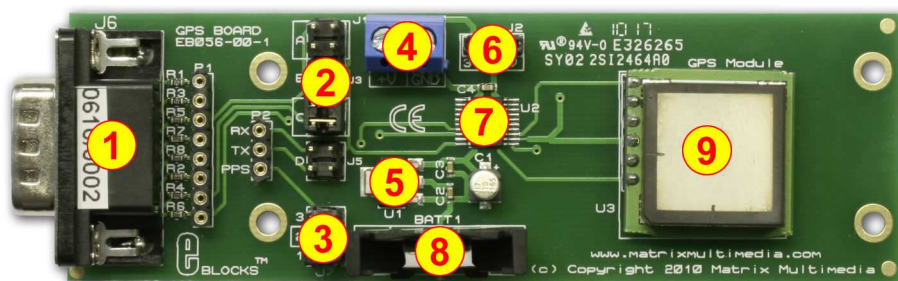
2. *Features*

- 30 Channel GPS Receiver Module
- Min resolution longitude 2.2m
- Min resolution latitude 2m
- Altitudes of -300m to 18,000m
- Velocities up to 515m/s
- Pulse per second output
- Fully compliant with all GPS satellites
- Battery Backup for instant on operation
- 3.3V or 5V operation

3. *Block schematic*



3. Board layout



EB056-74-1.jpg

1. 9-way downstream D-type connector
2. TX / RX patch system
3. PPS patch system
4. Input voltage screw terminal
5. 3.3V regulator
6. Input voltage selection system
7. Voltage level shifter
8. 3V battery holder
9. UP500 GPS module and antenna

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 PIC16F88x PIC16F19xx	Patch System

General Guide for PPS pin setting:

Jumper Settings	Description
1	PPS = Bit 0
2	PPS = Bit 4
3	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.

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-056 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 (Fastrax – UP500).

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 a PIC16F877A is being used then the GPS Board must be connected to Port C. The jumper settings on the EB056 should be set to B & 1. Please refer to the patch settings table on p4 for details.

The Patch System allows the user to route RX, TX and PPS 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.

4. GPS Receiver – UP500

The UP500 GPS receiver has several I/O that can be interfaced 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 as a logic high for one microsecond. The UP500 also has a hardware serial UART that links to the UART onboard the interfacing microcontroller. The UP500's UART runs at a fixed baud rate of 9600 and outputs the GPS signals in a NMEA format. For details regarding the content of the NMEA messages please refer to the NMEA standards datasheet. For more information on the modes and operations of the UP500 module please refer to the device datasheet, which can be found at:

www.fastraxgps.com

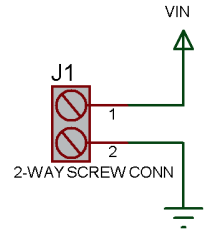
5. 3.3V operation

The EB056 GPS E-block is fully compatible with 3.3V systems.

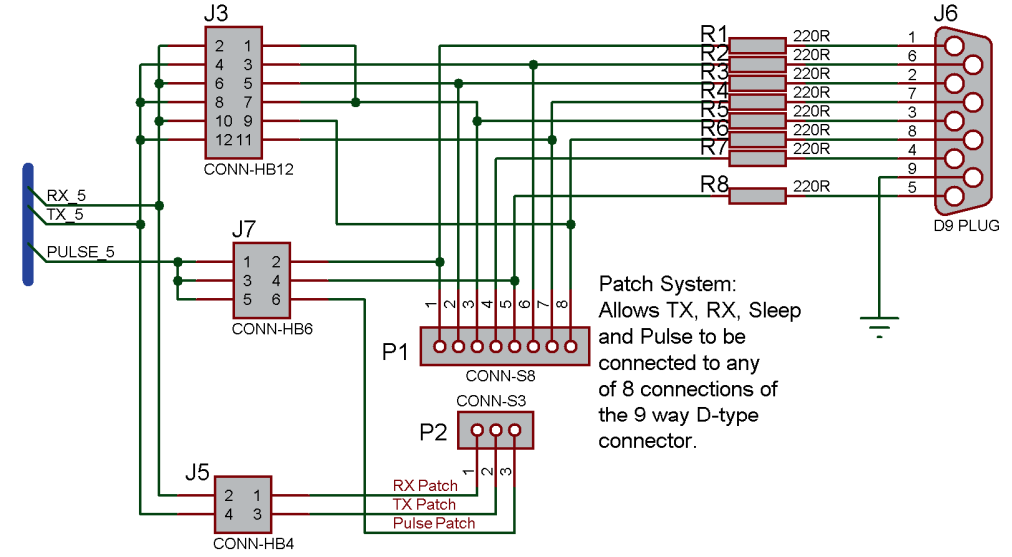
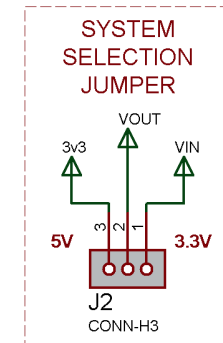
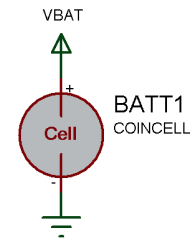
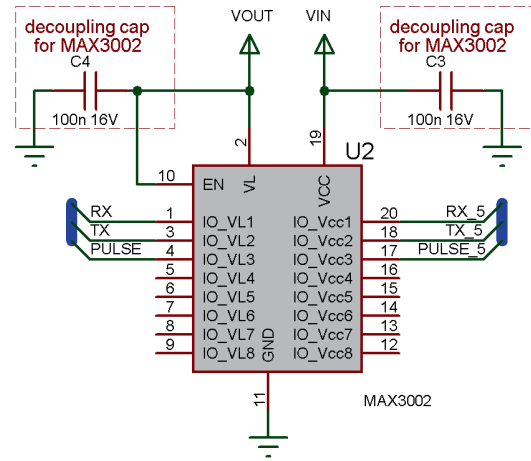
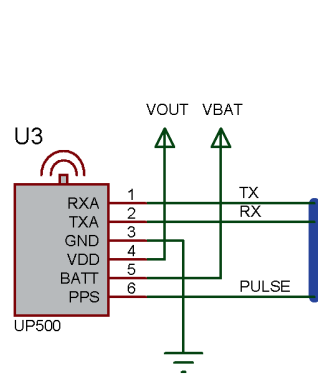
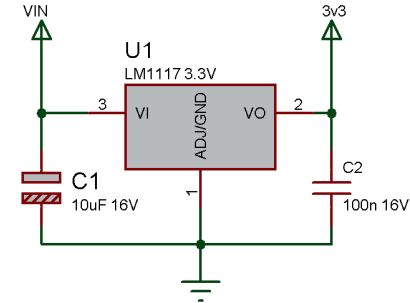
Appendix 1 – Circuit diagram

THIS SYSTEM INCLUDES:-

- F1 FEET
- F2 FEET
- F3 FEET
- B1 BAG
- L1 LABEL



VOLTAGE REGULATION CIRCUIT



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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