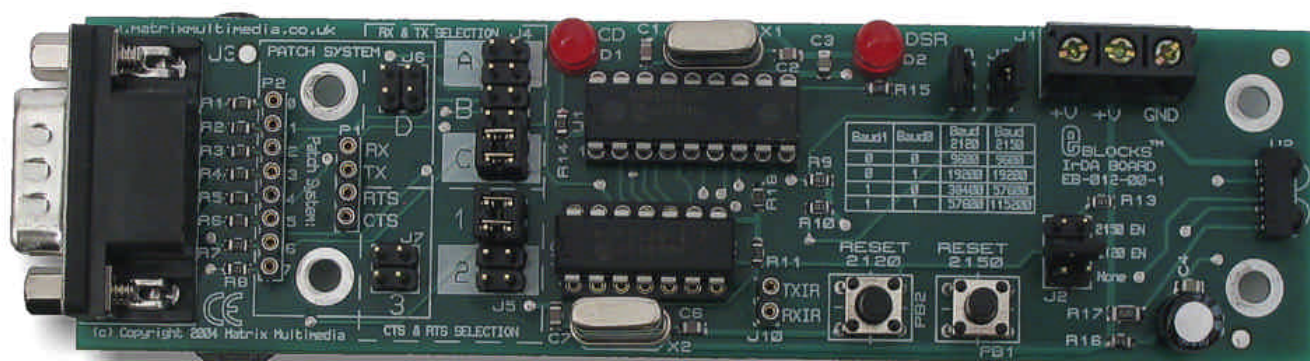


IR/IrDA Transceiver Receiver Board Datasheet



Contents

1. About this document
 2. General information
 3. Board Layout
 4. Getting Started
 5. Circuit Description
- Appendix
- 1 Circuit Diagram

1 About this document

This document concerns the Matrix IrDA Board code EB-012-00-1.

Trademarks and Copyright

PIC, PICmicro are registered trademarks of Arizona Microchip Inc.

E-blocks is a trademark of Matrix Multimedia Limited.

EB-012-00-1 and associated software and documentation are Copyright ©2004 Matrix Multimedia Limited.

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

For strategy information for creating 'C' and Assembly code for the IR/IrDA board see the E-Blocks members area. This can be found at www.matrixmultimedia.com/eblocks

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.

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.co.uk. If you still have problems please email us at: support@matrixmultimedia.co.uk. When emailing please state the operating system, the version of PPP you are using.

2 General information

This E-block allows investigation of IrDA standard wireless connectivity. This board can be used as a Secondary device for “point to point” applications, such as communication to a PalmOS® IrDA compatible device. It can also be used as a stand alone IrDA Encoder / Decoder. The board offers a range of user selectable baud rates. There is also a facility to directly access the infrared transceiver so that other infrared protocols can be investigated (e.g. television remote controls).

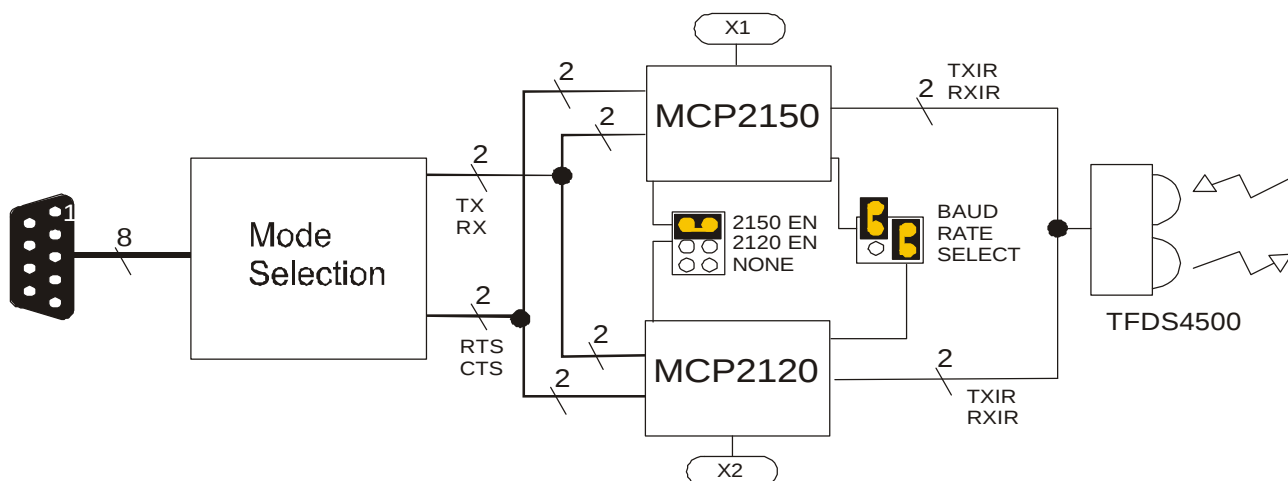
A set of jumper links are available which allow the IrDA E-block to easily be set for all PICmicro® microcontroller IrDA compatible devices. A patch system on board makes it compatible with numerous other devices.

Flowcode macros that make this device easier to use are available.

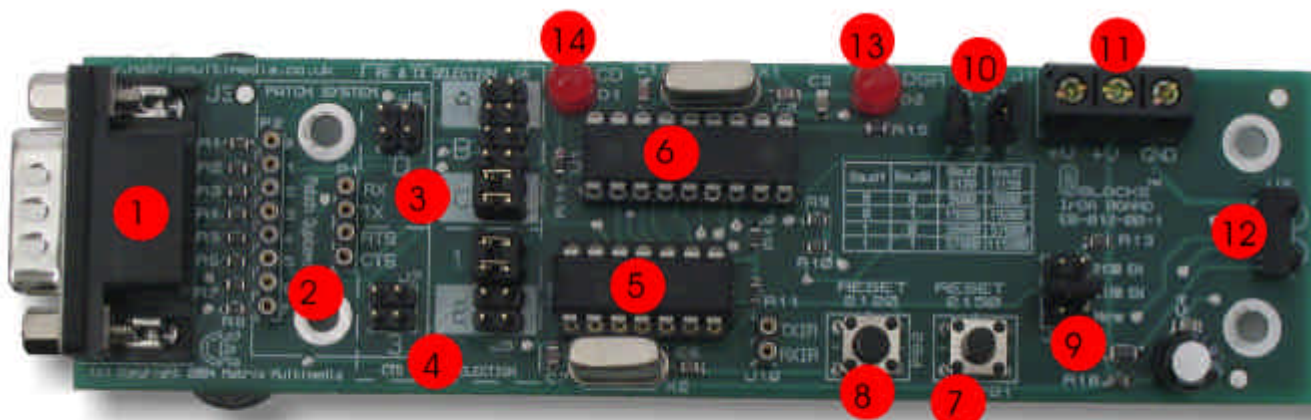
Features

- Operates as a “Point to Point” Secondary IrDA application
- Or a stand alone IrDA Encoder / Decoder
- Direct infrared transmission and reception also available
- User selectable Baud rate
- Flowcode macros available

Block schematic



3 IrDA Board Layout



Important: Please note that the mode selection jumpers are orientated in the correct way – i.e. with the metal connect strips HORIZONTAL as shown in the picture above.

- 1) 9-way downstream D-type connector
- 2) Patch system
- 3) RX & TX mode selection jumper pins
- 4) CTS & RTS mode selection jumper pins
- 5) MCP2120
- 6) MCP2150
- 7) Reset for MCP2150
- 8) Reset for MCP2120
- 9) MCP device enable jumper
- 10) Baud rate selection jumpers
- 11) Screw terminals
- 12) TFDU4100 serial infrared transceiver
- 13) DSR LED
- 14) CD LED

General Guide for CTS and RTS settings

Jumper Settings	Description
1	Hardware Flow Control (RX = bit 4, TX = bit 0)
2	No flow control
3	Hardware flow control (Patch)

General Guide for TX and RX 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

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

For more information on see Section 4 – Circuit Description

4 Getting Started

As can be seen the circuit diagram (Appendix 1) consists of, which are: MCP2150, MCP2120, Connectors and a serial infrared transceiver. The following program will test all parts of this circuit. To test this board you will need to apply +5V to the IrDA Board via the screw terminal and then set the appropriate bits using the 9-Way D-type connector. The details of the IrDA configuration are stated in the Chapter 4 Circuit Description.

Testing the IrDA Board – IRDASYS1.hex and IRDAREC.hex

The following instructions explain the steps to test and use your IrDA Board. The instructions assume that PPP is installed and functional. It also assumes that you are confident in sending a program to the PIC via the Multiprogrammer.

The following test requires two IR / IrDA boards to be used to test the functionality of the MCP2120. To test the MCP2150, a laptop / palm or similar device with IR capability is required. Although this test routine allows you to select which test you want to complete.

The systems that are required:

System 1

- Multi-programmer board
 - a. 19.6608 MHz crystal
 - b. PIC16F877A (40 pin device)
 - c. XT setting
 - d. Loaded with "IRDASYS1.HEX" firmware
- LCD board
 - a. Connected to Port B
- Switch board
 - a. Connected to Port A
- IR / IrDA board
 - a. Connected to Port C
 - b. Patch systems "C" and "1" selected
 - c. Link block connected on J8 and J9 (selecting baud rate 57600 / 11500)

This is the board under test

System 2

- Multi-programmer board
 - a. 19.6608 MHz crystal
 - b. PIC16F877A (40 pin device)
 - c. XT setting
 - d. Loaded with "IRDAREC.HEX" firmware
- LCD board
 - a. Connected to Port B
- IR / IrDA board
 - a. Connected to Port C
 - b. Patch systems "C" and "1" selected
 - c. MCP2120 Enabled – using jumper on link J2
 - d. Link block connected on J8 and J9 (selecting baud rate 57600 / 11500)

Laptop / Palm / other Infrared device

This device is used to test the functionality of the MCP2150. It requires that the device can send an ASCII "CR" character return. The instructions will concentrate on the Laptop, as this will be the most widely accessible device.

Setting up the laptop for Infrared use.

The laptop will require that the "HyperTerminal" program is installed and the Infrared device is available.

Installing / enable Infrared on you laptop

In the toolbar there should be an Infrared icon present. This will show the status of the Infrared communication – if there is an Infrared connection made or not. If there is not an Infrared Icon,. It means that the Infrared has not been enabled.

To enable the Infrared, enter the windows help file via the Start menu > Help. In the "Search" tab enter "Infrared". This will bring up a list of relevant topics. Locate the topic "To display the Infrared Monitor Icon on the taskbar". This will bring up the instructions that will enable the Icon to be displayed.

Next, you may need to enable Infrared communication. In the Help file, again in the Infrared search there is a topic "To turn on infrared communication". This shows instructions to enable Infrared Communication.

In the options Tab there will be information stating which port the application is supported on. For example the Port may be COM4. Take a note of this port as it will be required when setting up the HyperTerminal program.

Setting up the HyperTerminal on your laptop

Open the HyperTerminal program via the start menu Start > Programs > Accessories > Communications > HyperTerminal. Enter a relevant name for the connection description. Click "OK". Now the next pop-up screen will appear. In the box labelled "Connect Using" enter the port that the Infrared port is using (see above for details about finding this information). Click "Ok". The laptop is ready to be used for Infrared communication.

Test Procedure

Messages will appear on the System1 LCD display.

Testing MCP2150

- 1) Apply power Multiprogrammer board.
 - a. Ensure that +V is connected to all of the board via the screw terminals
- 2) Enable the MCP2150 device
 - a. Using the jumper link connect the top links labeled "2150 EN" on connector J2 of the IR / IrDA board – the DSR light will illuminate
 - b. CD will illuminate when communication has been stabled between the board and the laptop
 - c. Ensure jumpers J8 and J9 are ON
- 3) Press SW0 then SW2
 - a. This sets up the board rate.
- 4) Point the Infrared port of the Laptop to the Infrared device (U2) on the IR / IrDA Board
 - a. This should illuminate the CD Led to confirm IR communication is established
- 5) While In the HyperTerminal program
 - a. Press the "ENTER" button on the keyboard

- b. This is equivalent to the ASCII Character Return (CR)
- 6) The IR / IrDA board will receive this then send the string "TEST" which should appear on the HyperTerminal screen.
- 7) The LCD now shows the words "Test Complete"
- 8) The program then returns to the beginning so the you can Test the MCP2120 or re-test the MCP2150

Testing MCP2150

This test requires System1 and System 2 – with the Infrared devices (U2) pointing at each other.

- 1) Apply power both Multiprogrammer boards.
 - a. Ensure that +V is connected to all of the board via the screw terminals
- 2) Enable the MCP2120 device on both IR / IrDA Board
 - b. Using the jumper link connect the top links labeled "2150 EN" on connector J2 of the IR / IrDA board
 - c. Ensure jumpers J8 and J9 are ON
- 3) Press SW1 then SW3 on System1
 - d. This sets up the board rate.
 - e. Ensuring that the boards are pointing at each other
- 4) The IR / IrDA board will receive this then send the "F". When System2 receives this "F" it then sends "D" to System1. When this "D" is received the test is complete
- 5) The LCD now shows the words "Test Complete"

The program then returns to the beginning so the MCP2120 can be tested or a re-test of the MCP2150

Pressing the reset on System1 Multiprogrammer at any time will allow you to start either test from the beginning.

This should fully test the functionality of the IR / IrDA board.

4 Circuit description

The circuit as can be seen in the circuit diagram below (See Appendix 1 – Circuit diagram), made up sections: Connectors, MCP2150 circuitry, MCP2120 circuitry and an infrared transceiver circuitry.

The product has been designed to enable you to use this device with many standard PICmicro devices. This is achieved by identifying the PICmicro® microcontroller. Then by selecting the corresponding jumper setting on the IRDA board. This will configure the board with the correct pin-out for that particular device. Jumper setting A, B, C and D are used for selecting the appropriate pins for RX and TX. Jumper settings 1, 2 and 3 are used to set the correct pins for RTS and CTS. The following tables illustrate the correct jumper settings.

Jumper Setting A	Jumper Setting B	Jumper Setting C		Jumper Setting D
		PIC16F devices	PIC16C devices	
PIC16F87	PIC16F627/A	PIC16F73	PIC16C63	PATCH SYSTEM
PIC16F88	PIC16F628/B	PIC16F737	PIC16CR63	
	PIC16F648A	PIC16F74	PIC16C65/A/B	
		PIC16F746	PIC16RC65	
		PIC16F76	PIC16C66	
		PIC16F767	PIC16C73/A/B	
		PIC16F77	PIC16C74/A/B	
		PIC16F777	PIC16C745	
		PIC16F870/1	PIC16C765	
		PIC16F873/A	PIC16C77	
		PIC16F874/A	PIC16C773	
		PIC16F876/A	PIC16C774	
		PIC16F877/A	PIC16C774	
CONNECT BOARD TO PORT B		CONNECT BOARD TO PORT C		

Table 1. Jumper settings for TX and RX selection.

The following table (Table 2) shows the settings that can be used for CTS and RTS.

Jumper Setting 1		Jumper Setting 2		Jumper Setting 3	
CTS	RTS	CTS	RTS	CTS	RTS
Bit 4	Bit 0	CTS not used	RTS not used	Patch	Patch

Table 2. Jumper settings for RTS and CTS selection

The Patch System allows the user to route TX, RX, CTS and RTS to any 8 of the bits that they require. This allows great flexibility, as the user can then use a different device other than specified in Table 1.

This board allows the user to select either the MCP2120 or the MCP2150 by placing enabling the device using J2 jumper block. This effectively enables one device and disables the other. By selecting “none” on the J2 jumper block, both devices can be disabled – this is required if direct connection to the infrared transceiver is required.

Both the MCP2120 and the MCP2150 have individual clocks. The board also enables the user to select the baud rate that is used. This is achieved using jumpers on J8 and J9. By having the jumper connected you select a 1 as input. The two jumpers create a binary input that sets the baud rate. The following table illustrates the settings and baud rates that are available:

Baud1 (J9)	Baud0 (J8)	Baud for MCP2120	Baud for MCP2150
0	0	9600	9600
0	1	19200	19200
1	0	38400	57600
1	1	57600	115200

The MCP2150 is compatible with the Physical layer of the IrDA standard. Therefore, this device uses six main I/Os, which are: RX, TX, CTS, RTS, TXIR and RXIR. RXIR and TXIR are the input or output from the serial infrared sensor. RX and TX are the communication to and from the controlling device, which could be a PICmicro® microcontroller. CTS and RTS are used as hardware flow control when communicating.

The MCP2120 uses only the bottom layer of the IrDA protocol, and is therefore used as a stand alone Infrared Decoder / Encoder. The MCP2120 device only uses the RX, TX, RXIR and TXIR I/Os as described above. Thus there is no need to implement hardware flow control at this level the IrDA standard. This makes the operation quick and easy to use.

This E-block can also be used for investigating general infrared communication and prototyping such projects. This is required if, for example, you wish to develop a TV remote control unit or want to allow an existing remote control to communicate with your microcontroller. To do this, disable both the 2150 and 2120 devices by setting J2 to “none” and connect TXIR and RXIR of J10 to the appropriate port pin on the P2 patch block.

For more information on using the IR / IrDA Board please visit the “C and ASM strategy guide” for this board in the E-blocks Members area at www.matrixmultimedia.com/eblocks

To find out more information about the IR and IrDA devices used on this board please look at the specific datasheet for these devices – which can be found on Microchip’s website at www.microchip.com

Appendix 1 – Circuit Diagram

