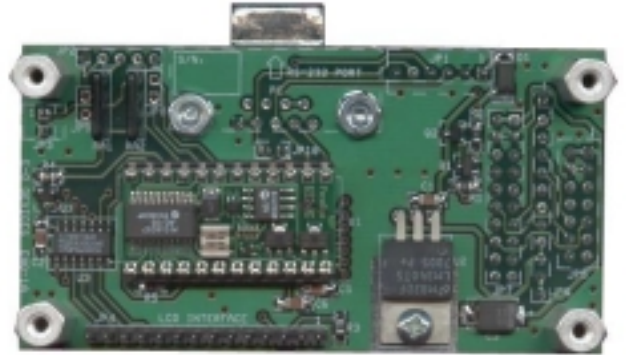


EHO – 1A **BASIC Programmable Laser Ranging Host Module**

FEATURES:

- A stand-alone host controller for ECH-1, ECH-2, ECH-4 and ERC-2 chronometers.
- Simple nonvolatile programming in BASIC.
- RS-232 DB9 interface for programming and data transfer.
- Includes 2 line x 16 character dot matrix LCD display (Optrex DMC-16207).
- Keypad / trigger button input port.
- On-board power management for battery operation.
- Operates from 7Vdc – 13Vdc (ERC-2 requires 12Vdc minimum).
- Module size just 3.4(L) x 1.75(W) x 1.3(D) inches and weighs 3 ounces.



(LCD removed for illustration)

DESCRIPTION:

The EHO-1A is a BASIC programmable laser ranging host module for the ECH-1, ECH-2, ECH-4, or ERC-2 chronometers for test or evaluation purposes. The EHO-1A is designed around the BASIC Stamp (microcontroller module) and is capable of being programmed, debugged and interfaced through the RS-232 serial port (DB-9 Connector P1). Using the free downloadable BASIC Stamp editor from www.parallaxinc.com, the EHO-1A may be programmed with any of the provided *.BS2 programs downloadable from www.eodevices.com.

The BASIC Stamp programmer may also be used to customize programs to user preferences. After the EHO-1A is programmed, it may be interfaced with by using a terminal program, such as the one supplied with the BASIC Stamp Editor, or by using the included 2 line x 16 character dot matrix LCD display (Optrex DMC-16207) and the keypad / trigger button input port.

The EHO-1A may be used to host any of the chronometer boards with the provided EETP (ECH ERC Test Program) by programming it with the “ECH_CVI.BS2” program. EETP is an easy to use GUI program that is capable of configuring each chronometer board, displaying measurements with minimum and maximum readings, and graphing results on a scalable strip chart.

The EHO-1A must be powered by a 7Vdc – 13Vdc power supply (ERC-2 requires a minimum of 12Vdc). Power may then be supplied to any of the supported chronometer boards through respective connection ports. It also has programmable on-board power management to help extend battery life during battery operation. Module size is just 3.4(L) x 1.75(W) x 1.3(D) inches and weighs only 3 ounces.

INTERFACE CONNECTIONS:

(all signals TTL compatible except SIN, SOUT and ATN) * See schematic diagram on page 6 *

Connector P1 (RS-232 port – DB-9 Connector)

Pin	Signal	Description
1	NC	No connection
2	SOUT	Serial Data Output (rs-232)
3	SIN	Serial Data Input (rs-232)
4	ATN	Attention Signal (for programming)
5	GND	Serial Ground
6	NC	No connection
7	NC	No connection
8	NC	No connection
9	NC	No connection

Connector JP1 (power / rs-232)

Pin	Signal	Description
1	+VIN	7 – 13 Vdc Power Supply Input
2	GND	Power Ground
3	SIN	Serial Data Input (rs-232) – alternate connection
4	SOUT	Serial Data Output (rs-232) – alternate connection
5	ATN	Attention Signal – alternate connection
6	GND	Serial Ground

Connector JP2 (keypad input port w/47K Ω pull-up resistors)

Pin	Signal	Description
1	GND	Keyswitch Ground
2	K_0	Key 0 input
3	K_1	Key 1 input
4	K_2	Key 2 input
5	K_3	Key 3 input

Connector JP3 (trigger button input port w/47K Ω pull-up resistor)

Pin	Signal	Description
1	K_TRG	Trigger Key input
2	GND	Trigger Ground

Connector JP4 (LCD display interface)

Pin	Signal	Description
1	GND	Display Ground
2	VCC	Display Power (+5V)
3	VCON	Display Contrast Voltage
4	DRS	Display Register Select (during display addressing)
5	GND	Display Ground
6	DE	Display Enable
7	DD7	Display Data Bit 7
8	DD6	Display Data Bit 6
9	DD5	Display Data Bit 5
10	DD4	Display Data Bit 4
11	DD3	Display Data Bit 3
12	DD2	Display Data Bit 2
13	DD1	Display Data Bit 1
14	DD0	Display Data Bit 0

Connector JP5 (ECH-2 and ECH-4 interface)

Pin	Signal	Description
1	+5V	+5Vdc (switched)
2	+5V	+5Vdc (switched)
3	GND	Module Ground
4	GND	Module Ground
5	NC	No Connection
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	DAV	Data Available Flag (ECH-1 and ECH-2)
10	HDI	Host Data Input (serial data to host)
11	HDO	Host Data Output (serial data from host)
12	HCLK	Host Serial Data Clock (from host)
13	CS	Chronometer Select (low active)
14	AUX	Auxiliary (reserved)

Connector JP6 (ERC-2 interface)

Pin	Signal	Description
1	VMAIN	+12Vdc (switched)
2	AUX	Auxiliary (reserved)
3	NC	No Connection
4	HDI	Host Data Input (serial data to host)
5	HCLK	Host Serial Data Clock (from host)
6	HDO	Host Data Output (serial data from host)
7	CS	Controller Select (low active)
8	NC	No Connection
9	+5V	+5Vdc (switched)
10	+5V	+5Vdc (switched)
11	GND	Module Ground
12	GND	Module Ground

Connector JP7 (ECH-1A interface)

Pin	Signal	Description
1	+5V	+5Vdc (switched)
2	+5V	+5Vdc (switched)
3	GND	Module Ground
4	GND	Module Ground
5	NC	No Connection
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection
10	HDI	Host Data Input (serial data to host)
11	HDO	Host Data Output (serial data from host)
12	HCLK	Host Serial Data Clock (from host)
13	AUX	Auxiliary (reserved)
14	CS	Chronometer Select (low active)
15	NC	No Connection
16	DAV	Data Available Flag
17	NC	No Connection
18	NC	No Connection
19	NC	No Connection
20	NC	No Connection

Jumper Options:

JP8	TRG-OPT	Trigger Option (closed, K_3 = K_TRG)
JP9	RES-OPT	Reset Option (closed, K_0 = RESET)
JP10	PROG	Program Port / Serial Port (closed for BASIC programming and debug operations and open for basic serial port function – no debug)

General Operation:

The EHO-1A Laser Ranging Host was designed to provide users of the ECH-1A, ECH-2A, ECH-4A or ERC-2A chronometers / range controllers a simple host device to complete a ranging or time interval measurement system.

The heart of the EHO-1A is a BASIC STAMP II microcontroller (BS2) by Parallax, Inc. It is a simple device programmable in Parallax's PBASIC language tailored for embedded applications.

The BS2 has 2K bytes of on-board nonvolatile EEPROM for storage of tokenized PBASIC programming and constant data. There are 32 bytes of RAM for variable storage.

The BS2 has 16 port pins. Their assignments are as follows:

Pin	Mnemonic	Signal Description
1	K_0	Keypad, key 0 input
2	K_1	Keypad, key 0 input
3	K_2	Keypad, key 0 input
4	K_3	Keypad, key 0 input
5	K_TRG	Trigger switch key input
6	DDAT	Display serial data output
7	DCLK	Display serial data clock
8	DE	Display enable (addresses display)
9	HDI	Host serial data input (from peripheral)
10	HDO/DRS	Host serial data output (to peripheral) & display register select combined signal. Functions as HDO only during CS low.
11	HCLK	Host serial data clock output
12	DAV	Data available flag (from ECH-1 and ECH-2)
13	AUX	Reserved
14	CS	Chronometer / Controller select (active low)
15	DPWR	Display power enable (active low)
16	MPWR	Main power enable (active high)

The EHO-1A host module has on-board power management at the control of the BS2. LCD display and associated circuitry has switched power via the DPWR signal (port pin 14). The main power and +5V to the peripheral module (ECH-1, -2, etc) can be switched via the MPWR signal (port pin 15).

The momentary pushbutton (S1) on the back of the EHO-1A module may be pressed to generate a local reset. The option jumpers JP8, JP9 and JP10 are used as follows. JP8 allows the Keypad Key 3 (K_3) to function as the trigger button if JP8 is closed. This essentially parallels the K_3 and K_TRG inputs, reducing the total switch inputs from 5 to 4. JP9 allows the Keypad Key 0 (K_0) to function in parallel with the local reset button. This is often useful if the BS2 is programmed to wake up after reset, perform a desired task then return to sleep until another reset is performed. This is a simple way to provide maximum battery life in handheld applications.

The power connector (JP1) feeds main power to the EHO-1 and contains RS-232 port connections for a single remote connection to a ranging system. This is ideal for stand-alone fixed ranging applications.

Included Software:

A software disk containing example programs for all peripheral products, the Parallax PBASIC editor software for programming the BS2 and a full manual for the BS2, accompanies the EHO-1A.

The disk contains the following files:

- STAMP2.EXE - Parallax, Inc. Programming Editor and Tokenizer for BS2
- MANUAL.TXT - BS2 Manual in ASCII Text File
- STAMP2_M.PDF - BS2 Manual in Adobe Acrobat PDF format (requires Acrobat reader which is available from Adobe (www.adobe.com) or through our web site (www.eodevices.com)).
- ECH1_01.BS2 - Example program for hosting the ECH-1A chronometer.
- ECH2_01.BS2 - Example program for hosting the ECH-2 chronometer.
- ECH4_01.BS2 - Example program for hosting the ECH-4 chronometer.
- ERC2_01.BS2 - Example program for hosting the ERC-2 ranging controller.

The BS2 Manual contains complete details of the PBASIC language and includes example programs.

Updates for Parallax Basic Stamp software and documents can be found at their web site: www.parallaxinc.com on the “downloads” page. Updates and further example programs can be found at www.eodevices.com as they become available.

At the time of this writing (or update), the Windows based STAMP2 editor v2.1 program was released as a download from Parallax, Inc.

Writing to the LCD:

The LCD display must be written to serially from the BS2. The BS2 instruction **SHIFTOUT** accomplishes this task. There are four LCD oriented subroutines available in each example program. They are:

DSP_INIT	Initialized the LCD Display
DSP_TEXT	Sends a text string to the LCD
DSP_CLR	Clears the LCD
DSP_DATA	Displays binary data on the LCD (up to 4 digits)

At the top of each example program is a section for EEPROM DATA. ASCII String data is stored in this location to be written to the LCD by the DSP_TEXT subroutine.

The LCD String format is as follows:

```
LABEL      DATA      L#P#,LENGTH,"STRING
INFO"
```

The LABEL can be any valid name for the string. DATA indicates to the tokenizer that this information will be stored in EEPROM. L#P# is the line number (1 or 2) and position number (1-16) where the first character of text is to be located in the LCD. LENGTH is the number of characters that follow inside the quotation marks. For the above example, this program line might look like this:

```
T_STRG      DATA      L2P1,11,"STRING INFO"
```

When the DSP_TEXT subroutine is called after the message pointer MSG is set to the string's label: MSG = T_STRG, the text message "STRING INFO" is displayed at the first position of line 2 on the LCD.

Similarly, BCD data can be written to the LCD using the DSP_DATA subroutine. To display data, a binary number to be displayed in the range of 0-9999 must be stored in VALUE. The LCD location pointer LOC must be set to the location of the first digit of a four-digit result. Before calling the DSP_DATA subroutine, a selection must be made between the two decimal point formats for the four-digit display (NNNN or NNN.N). An example follows:

To display the number 1234 beginning at character position 10 in line 1 of the LCD:

```
VALUE = 1234
LOC = L1P10
D_FLAG = XXXX
GOSUB DSP_DATA
```

To display the number 456.7 beginning at character position 3 in line 2 of the LCD:

```
VALUE = 4567
LOC = L2P3
D_FLAG = XXX_X
GOSUB DSP_DATA
```

Communicating with Peripheral Modules:

The examples programs each have slight differences in the data acquisition subroutines and should be examined closely before writing your own. The ECH-4 is especially unique since it uses a single bidirectional serial bus. The basic procedure is as follows:

Writing to a peripheral module:

Set the COMMAND variable to the command or data byte to be written to the module,

```
COMMAND = $00
```

Bring the chronometer select signal (CS) low to enable communication with the module,

```
LOW CS
```

Now use the BS2 SHIFTOUT instruction to send the byte to the module,

```
SHIFTOUT HDI,HCLK,MSBFIRST,[COMMAND]
```

Now bring CS back high to disable communication and acknowledge the end of a write,

```
HIGH CS
```

Reading from a peripheral module

Each module has its own manner of indicating that data is available to be read. See the individual examples for more information. Generally, the read is performed similarly to the write.

Bring the chronometer select signal (CS) low to enable communication with the module,

```
LOW CS
```

Now use the BS2 SHIF TIN instruction to read the byte from the module,

```
SHIF TIN HDI,HCLK,MSBP RE,[DAT ABYTE]
```

Now bring CS back high to disable communication and acknowledge the end of a write,

```
HIGH CS
```

The read information is now stored in the variable DAT ABYTE.

ORDERING CODES:

- EHO – 1A – XXX Basic Host System with LCD display and...
 - XXX = CH1 with ECH1A interface cable
 - XXX = CH2 with ECH-2A interface cable
 - XXX = CH4 with ECH-4A interface cable
 - XXX = RC2 with ERC-2A interface cable
- EHO – 1A – NL Basic Host w/o LCD display or interface cable

OPERATING SPECIFICATIONS:

PARAMETER	MIN.	TYP.	MAX.	UNIT
Supply Voltage ¹	7		13	Vdc
Supply Current ²	8		250	mA
RS-232 Baud Rate	300		38.4k	baud

NOTES:

1. When interfacing to ERC-2A a minimum of 12Vdc power supply must be used.
2. Minimum when display power and switched main power is turned OFF. Maximum is dependent upon attached peripheral module.

