The aim of this short document is to get your first program to run on the EZSBC1.

Conventions

Programs are displayed in this font:

```
REPEAT
OUTD 41,0
WAIT ontime
OUTD 41,1
WAIT offtime
UNTIL INKEY > 0
```

Keystrokes and Keys to press are shown as Ctrl-W and it should be understood to mean press the Ctrl key followed by the W key and letting go of the keys in the reverse order.

For the Impatient

- Install FTDI USB Virtual Comm port drivers.
- Install TeraTerm or another terminal emulator.
- Configure the terminal emulator for VT100 emulation
- Set the terminal for 57600,8N1 communication
- Connect the USB cable and find the new serial port
- Connect the terminal emulator to the new serial port
- Press any key
- Skip ahead to the Enter the Program section

Concepts

To distinguish between different parts of the controller we need to use the same terminology. EZSBC1 refers to the entire module, all the components on the PC board, the pins. Control BASIC or sometimes just BASIC refers to the language used to program the EZSBC1. It is likely to be slightly different from other BASIC dialects that you may be familiar with. The details of Control BASIC and its keywords and reserved words are described the Control BASIC Language Reference. All programs executed on the EZSBC1 are written in Control BASIC.

Input and Output can be very confusing because the direction depends on the viewpoint of the author or reader. In this document direction is described from the view of the EZSBC1. Pretend you are sitting on the EZSBC1 then IN or Input is towards you and OUT or Output is away from you (and the EZSBC1). When a signal is described as an Output then the EZSBC1 will drive the pin in some way. It will source some current and try to force a voltage on the pin. The EZSBC1 is in control of the state of the pin.

When a signal or a pin is described as an Input the EZSBC1 will try to 'read' or 'evaluate' the pin. In most cases the pin will approximate an open circuit, the EZSBC1 will draw little or no current from the pin or signal. Something other than the EZSBC1 should drive the pin or control the voltage on the pin.

When a BASIC program is not running on the EZSBC1 then it is waiting for user input. A program is still running on the EZSBC1 and it is referred to as the EZmon. It is a "monitor program", a program which is loaded onto a Single Board Computer (SBC) at the time of manufacture. It provides a few features and controls over the SBC. It provides a functionality that is always there and can be relied upon. It makes it easier to develop

software or programs on the Single Board Computer. Later in this document the features of EZmon will be described in some detail in the **Operation** section. Output to and from EZmon occurs via USB that emulates a serial port and will appear on the PC as a serial port. Before we can connect the EZSBC1 to the PC we need to get some drivers installed and some software configured.

FTDI Driver Installation

The EZSBC1 requires USB drivers for Windows and Apple PC's. On Linux systems it is recognized directly by built in drivers.

Point your favorite web browser to this page: http://www.ftdichip.com/FTDrivers.htm. Towards the bottom of the page you will find a link that says 'VCP or D2XX)'. Click on the VCP link to go to the Virtual COM port drivers. You should end up on this page: http://www.ftdichip.com/Drivers/VCP.htm. In the very right hand 'Comments' for the Windows drivers there is a note "Available as <u>setup executable</u>". If you are using Windows then download this file, it is the easiest to use. When I downloaded it the file name was CDM20824_Setup.exe. Run this downloaded program to install the drivers before connecting the EZSBC1 to the computer. You should get this window (or something similar).

softwar	e?		
	Name:	CDM20824_Setup.exe	
	Publisher:	Unknown Publisher	
	Type:	Application	
	From:	C:\Downloads\FTDI	
		Run Cancel	
Alwa	iys ask before	opening this file	

Press the 'Run' button to continue. Some windows may pop up depending on the exact version of Windows being used. On Windows XP a window briefly appears and closes. The drivers are now installed.

Tera Term Installation

On a Windows PC, point your favorite web browser here: http://en.sourceforge.jp/projects/ttssh2/. There is normally a big green button on the page with the word 'Download' in it. Press this button and a new page should open with a <u>teraterm-4.75.exe</u> and <u>teraterm-4.75.zip</u> link on it. (The version numbers may be higher.) Down load the teraterm-x.xx.exe file to your local machine. Double click the executable to install Tera Term.

You should get the normal Windows installation dialog box as shown below.

Open File	- Security W	arning	×
The pu softwar	ıblisher could re?	I not be verified. Are you sure you want to run this	
	Name:	teraterm-4.75.exe	
	Publisher:	Unknown Publisher	
	Type:	Application	
	From:	C:\Downloads\TeraTerm	
		Run Cancel]
Alwa	ays ask before	opening this file	
8	This file doe You should o decide what	s not have a valid digital signature that verifies its publisher. only run software from publishers you trust. <u>How can l</u> <u>software to run?</u>	

Click on the 'Run' button to Continue. A new window will pop up



Click on the 'Next' button to continue and you should see the License Agreement appear.

icense Agreement Please read the following important info	rmation before continuing.	1
Please read the following License Agree agreement before continuing with the in	ment. You must accept the terr stallation.	ns of this
License of Tera Term		_
Copyright (c) T.Teranishi.		
Copyright (c) TeraTerm Project.		
All rights reserved.		
Redistribution and use in source and bir are permitted provided that the followin	ary forms, with or without mod g conditions are met:	lification,
1. Redistributions of source code must this list of conditions and the following	retain the above copyright not ng disclaimer.	ice,
C I accept the agreement		
I do not accept the agreement		

Select the 'I accept the agreement' radio button to make the 'Next' button appear. Press the 'Next >' button and the Destination dialog should appear.

🕞 Setup - Tera Term		
Select Destination Location Where should Tera Term be installed?		
Setup will install Tera Term in To continue, click Next. If you would lil	to the following folder. ke to select a different folder, d	click Browse.
C:\Program Files\teraterm		Browse
At least 7.2 MB of free disk space is re	quired.	
	< Back Next >	Cancel

Click on the 'Next' button to install at the default location and the File Association dialog should appear.

Which components should be installed?	
Select the components you want to install; clear the comp install. Click Next when you are ready to continue.	ponents you do not want to
Custom installation	-
Tera Term & Macro	6.5 MB 🔺
TTSSH	1.7 MB
CygTerm+	0.1 MB
LogMeTT (Other installer is started)	3.4 MB
TTLEdit (Other installer is started)	1.9 MB
TeraTerm Menu	0.2 MB
TTProxy	0.3 MB
Collector	1.6 MB
Additional Plugins	0 1 MR
Current selection requires at least 8.9 MB of disk space.	

Leave the default options unchanged and press the 'Next >' button. The Language Selection dialog should appear.

🔂 Setup - Tera Term	
Select Language Which language shoud be used?	
Select the language of application's menu and dialog, then click Next.	
English	
O Japanese	
O German	
O French	
< Back Next >	Cancel

You can select any option except Japanese with English being the preferred selection to follow the documentation. Press the 'Next >' button and the Start menu folder should appear.

Setup - Tera Term		
Select Start Menu Folder Where should Setup place the progra	m's shortcuts?	
Setup will create the program	's shortcuts in the following	g Start Menu folder.
To continue, click Next. If you would l	ke to select a different fold	ler, click Browse.
Tera Term		Browse
🦳 Don't create a Start Menu folder		
	c Paula III	

Leave the default unchanged and press the 'Next >' button. The Additional Tasks dialog should appear.

🚏 Setup - Tera Term	
Select Additional Tasks Which additional tasks should be performed?	
Select the additional tasks you would like Setup to perform while installing Tera Term, then click Next.	
Create Tera Term shortcut to Desktop	
Create Tera Term shortcut to Quick Launch	
Associate .ttl file to ttpmacro.exe	
Associate telnet protocol to ttermpro.exe	
Associate ssh protocol to ttermpro.exe	
< Back Next >	Cancel

Press the 'Next >' button and the Ready to Install dialog should appear.

etup - Tera Term		
eady to Install Setup is now ready to begin installing	Tera Term on your computer.	
Click Install to continue with the instal change any settings.	lation, or click Back if you want i	to review or
Destination location: C:\Program Files\teraterm		<u> </u>
Setup type: Custom installation		
Selected components: Tera Term & Macro TTSSH Additional Plugins TTXRecurringCommand (Recu	rring Command can be used)	
Start Menu folder:		-
T		Þ
	< Back Install	Cance

Press the 'Install' button to complete the installation.

🗗 Setup - Tera Term	
	Completing the Tera Term Setup Wizard
	Setup has finished installing Tera Term on your computer. The application may be launched by selecting the installed icons.
	Click Finish to exit Setup.
R.	☐ Launch Tera Term
	Finish

Select the 'Launch TeraTerm' tickbox and press the 'Finish' button. Tera Term should start up and display a blank screen or a pop-up with a warning message about a serial port that it unavailable. Dismiss the message box if it appears.

On the Setup Menu select the Terminal option and set the dialog box as in the screen capture shown below.

ra Term: Terminal setup		
Terminal size	New-line Receive: CR 🔻	ОК
Term size = win size	Transmit: CR -	Cancel
Terminal ID: VT100	🗌 Local echo	Help
Answerback:	☐ Auto switch (VT<->	TEK)

On the Setup Menu select the Keyboard option and set the dialog box as follows and press OK.

X
ОК
Cancel
Help

On the Setup Menu select the Save Setup option and save the setup as the default as follows

Tera Term: Save	setup				? ×
Save in	teraterm		-	3 🖻 🖻 🛄 🔻	
My Recent Documents Desktop My Documents My Computer	Collector Collector Iang Ing Ing Itheme TERATERM.INI				
🧐 My Network	File name:	TERATERMIN		•	Save
Places	Save as type:	setup files (*.ini)			Cancel
		1			Help
-					//

Open the System (Properties) dialog from the Control Panel

em Propertie	5		?	
System Re	store Aut	omatic Updates	Remote	
General	Computer Name	Hardware	Advanced	
		System: Microsoft Windows Professional Version 2002 Service Pack 3 Registered to: Computer: Intel(R) Core(TM)2 CPU X9650 @ 3.00 3.17 GHz, 2.75 GB 4 Physical Address I	Extreme OGHz of RAM Extension	
		OK Cancel		

Click on the Hardware Tab

- /	Restore	Autom	atic Updates	Remote
General	Compu	uter Name	Hardware	Advanced
Device Ma	anager			
Ż	The Device Ma your computer. of any device.	nager lists all t Use the Device	he hardware devices e Manager to change	installed on the properties
			Device M	anager
Drivers —				
N	Driver Signing le	ets you make s	sure that installed drive	ers are
	compatible with Windows conne	Windows. Winects to Window	idows Update lets you s Update for drivers.	u set up how
	compatible with Windows conne Driver S	Windows. Win ects to Window Signing	Idows Update lets your subdate for drivers.	u set up how Jpdate
lardware	compatible with Windows conne Driver S Profiles	Windows. Win acts to Window Signing	Idows Update lets your supdate for drivers.	u set up how
lardware	compatible with Windows conne Driver S Profiles Hardware profil different hardwa	Windows. Win acts to Window Signing es provide a w are configuratio	Idows Update lets yours Update for drivers.	u set up how Jpdate
Hardware	compatible with Windows conne Driver S Profiles Hardware profil different hardwa	Windows. Win acts to Window Signing es provide a w are configuratio	Idows Update lets yours Update for drivers. Windows I windows I ray for you to set up ar ns. Hardware	u set up how Jpdate Ind store Profiles

and now open the Device Manager

🚇 Device Manager	
File Action View Help	
 TINY Acronis Devices Computer Disk drives Display adapters DVD/CD-ROM drives Floppy disk controllers Human Interface Devices IDE ATA/ATAPI controllers IEEE 1394 Bus host controllers Keyboards Mice and other pointing devices Monitors Network adapters Ports (COM & LPT) Processors Sound, video and game controllers System devices Universal Serial Bus controllers 	

and expand the Ports section. You should see something like this (or it may be empty). Make note of the Serial Port COM numbers that exist. On the screen capture it is COM4.



Now watch the Device Manager screen and plug the EZSBC1 into the USB cable. there will be some activity on the Device Manager and after a few seconds it should stabilize like the screen capture below and you may be prompted to restart Windows. If the yellow tick mark is present, save any unsaved work and restart the computer. If the tick mark is not present, skip over the next instruction to restart the machine.





After the restart, go back to the Device Manager screen and expand the Ports tab again.



There should now be a new Serial Port with a COM number, lets say COM6. (If you get a very high COM number such as COM55, don't be alarmed everything will still work. See Appendix A for a method to set the COM number down to some low number.)

Open TeraTerm and on the Setup menu select Serial Port. On the dialog box select the correct COM port for example COM6 and set the other parameters as follows:

Port:	СОМ6 🔽	ОК
Baud rate:	57600 💌	
Data:	8 bit 🔹	Cance
Parity:	none 💌	
Stop:	1 bit 💌	Help
	Van/Vaff =	

On the Setup Menu select 'Save setup...' and leave the defaults as they appear. Press the 'Save' button and the settings will now be restored when Tera Term opens again.

🖳 COM6:57600b	aud - Tera Term V	Г			
File Edit Setup	Control Window	Help			
Tera Term: Save	setup			?×	<u> </u>
Save in:	teraterm	•	G 🖸 🖻 🎞 🔻		
My Recent Documents Desktop My Documents My Computer My Network Places	Collector	TERATERM.INI setup files (*.ini)		Save Cancel Help	
					

The configuration of TeraTerm is now complete. Close any open dialog boxes and you should see this:

File Edit Setup Control Window Help

-

Note the title bar shows the Baud rate, com port and VT. Congratulations, you have correctly configured TeraTerm and the FTDI drivers and the EZSBC is ready for use.

On Linux, use minicom configured for VT100 emulation.

Press any key on the keyboard and you should see EZmon respond.

🖳 СОМ6:	57600baud - 1	Tera Term VT	2						
File Edit	Setup Contro	ol Window H	Help						
Control R-Run	BASIC vØ. S−Step	59. L-List	E-Edit	C-Configure	B-Bank	D-Download	K-Reset	T-Time & Date	
•									
									•

Press the Reset button on the EZSBC and you should see

1
-

Note the 'Cold Start' text. This indicates that the EZSBC1 was reset with the Reset button (or the K command from the terminal).

You are now ready to enter and run your first program.

Enter a Program

Blink A LED

Traditionally blinking an LED is the first program on an embedded controller, much like 'Hello World.' in a desktop programming language.

Type 'e' to enter the editor and type the code listed below. If the screen does not appear as in the screen capture below then another program has been loaded earlier. Skip to the section on 'Deleting an Entire Program' and follow the instructions before returning here.

🖳 COM6:57	7600baud - Tera Term VT	
File Edit S	Setup Control Window Help	
Editor	Z600baud - Tera Term VT Setup Control Window Help Ctrl-\ Help	
		T

'Blinky, flash the Red LED
RedLED=41
pinmode RedLED, out 'Pin 41 as output pin
repeat
 outd RedLED, 0 'Turn LED on
 wait 100 'do nothing for 100ms
 outd RedLED, 1 'LED off
 wait 100
until inkey > -1
end

```
COM6:57600baud-TeraTerm VT
File Edit Setup Control Window Hep
Editor |.... Ctrl-\Help
RedLED-41
Pinmode RedLED, out 'Pin 41 as output pin
repeat
outd RedLED, 0 'Turn LED on
wait 100
until RedLED, 1 'LED off
wait 100
until inkey > -1
end
```

When the screen looks like the screen capture shown above press *Ctrl-W* and note that the top of the screen has changed as in the screen capture below.

```
COM6:57600baud - Tera Term VT
                                                                                                                      _ 🗆 🗙
File Edit Setup Control Window Help
Editor |..... Save
'Blinky, flash the Red LED
RedLED=41
                          Save file (yes/no/cancel):
                                                                                                                           pinmode RedLED, out
                              'Pin 41 as output pin
repeat
     outd
              RedLED, Ø
                              ,
                                Turn LED on
                              ' do nothing for 100ms
'LED off
     wait 100
                              ,
    outd RedLED, 1
wait 100
until inkey > -1
end
                                                                                                                            -
```

The 'Save file (yes/no/cancel):' message is asking for permission to write the program into the memory on the EZSBC1. Press γ to save the program. If you press n the editor will quit without saving anything and c will not save the program but you will remain in the editor. This is what you should see:

Now press l and EZmon will list the program to the screen. It should look like this:

```
COM6:57600baud - Tera Term VT
                                                                                                         _ 🗆 X
File Edit Setup Control Window Help
                                                                                                              -
Control BASIC v0.59.
                    L-List
                             E-Edit
                                       C-Configure
                                                      B-Bank
                                                                D-Download
                                                                               K-Reset T-Time & Date
R-Run
         S-Step
Program Listing:
'Blinky, flash the Red LED
RedLED=41
PINMODE RedLED, OUT
                           'Pin 41 as output pin
REPEAT
    OUTD
            RedLED, 0
                             Turn LED on
    WAIT 100
                             do nothing for 100ms
    OUTD
            RedLED, 1
                           'LED off
    WAIT 100
UNTIL INKEY > -1
END
End of Listing
Control BASIC v0.59
                    L-List
                              E-Edit
                                       C-Configure
                                                      B-Bank
                                                                D-Download
                                                                               K-Reset T-Time & Date
R-Run
         S-Step
```

See how many words are now in upper case. The interpreter (actually the tokenizer) has recognized these words as valid Control BASIC reserved words and they will now be displayed in upper case. The variables were not changed, they are exactly as you typed them. If a variable changed case to upper case then you accidentally chose a variable name that is the same as a reserved word of Control BASIC. This is an error check of your program and it is recommended that variable names not be typed in all upper case letters. In fact, typing in lower case allows many errors to be found by listing the program and paying attention to the capitalization of the text on the screen.

We are now ready to run our first program. Press r to run the program and see the red LED flash on and off 5 times per second.

When the program is running you will see 'Start program' displayed on the terminal screen (unless the program cleared the screen). This is an indication that the program has started and is running. If the program encounters an error then it will stop running and display an error message on the terminal.

Press any key on the keyboard to end the program.

The terminal display should like like this:

```
COM6:57600baud - Tera Term VT
                                                                                                     _ 🗆 X
File Edit Setup Control Window Help
                                                                                                          -
Control BASIC v0.59.
R-Run
         S-Step
                   L-List E-Edit
                                      C-Configure
                                                     B-Bank
                                                              D-Download
                                                                             K-Reset T-Time & Date
Program Listing:
'Blinky, flash the Red LED
RedLED=41
PINMODE RedLED, OUT
                          'Pin 41 as output pin
REPEAT
    OUTD
                            Turn LED on
            RedLED, 0
    WAIT 100
                            do nothing for 100ms
    OUTD
            RedLED, 1
                          'LED off
    WAIT 100
UNTIL INKEY > -1
FND
End of Listing
Control BASIC v0.59.
                                      C-Configure
R-Run
                   L-List
                            E-Edit
                                                     B-Bank
                                                              D-Download
                                                                             K-Reset T-Time & Date
         S-Step
Start program
```

List the program again. Note that there are no 'GOTO' commands or line numbers in the program. The version of BASIC used on the EZSBC does not require line numbers or the use of GOTO commands. The GOTO command is supported but should be used sparingly. The target of GOTO or GOSUB commands are labels that can appear at the beginning of any line or on lines by themselves.

The first line 'Blinky, flash the Red LED is a comment. Comments start with 'and end at the end of the line. The next line RedLED=41 assigns the value 41 to a variable called RedLED. Pin 41 on the EZSBC1 is a phantom pin to give easy access to the onboard red LED. Three more phantom pins exist; 42, 43 and 44 for controlling the yellow, green and blue LEDs. Setting these pins to outputs and low turns on the LED associated with the phantom pin.

The line pinmode RedLED, out sets the phantom pin as an output pins, as the comment suggests. The lines between the repeat and until inkey > -1 are executed repeatedly until a key is pressed on the terminal emulator keyboard. The keyword INKEY returns the ASCII value of a key and -1 if a key has not been pressed. OUTD is the digital output command of Control BASIC. IND is the input command. The WAIT 100 line causes the program to do nothing for 100 milliseconds.

```
repeat
    outd RedLED, 0 ' Turn LED on
    wait 100 ' do nothing for 100ms
    outd RedLED, 1 'LED off
    wait 100
until inkey > -1
end
```

Now for a few more features of the EZmon editor. Press e to edit the program. You see the (old) program on the screen. Lets change the program so it is easy to change the rate at which the LED flashes. Change the program to the program in the screen capture.

💆 COM6:57600baud - Tera Term VT _ 🗆 X File Edit Setup Control Window Help |..... Ctrl-\ Help flash the Red LED Editor 'Blinky, RedLED=41 PINMODE RedLED, OUT 'Pin 41 as output pin LedDelay=200 REPEAT OUTD RedLED, 0 Turn LED on , WAIT LedDelay do nothing for LedDelay ms LED off OUTD RedLED, 1 WAIT LedDelay UNTIL INKEY > -1 END

The word LedDelay is a new variable and it is assigned the value 200. The delay can now be changed in a single location. Make the changes by navigating with the cursor keys and typing. You will see that typing inserts new characters. The up and down cursors change lines and left and right cursors move to the left and right. Home, End, PageUp, PageDown, Delete, Tab and Backspace all work if Tera Term or your favorite terminal emulator is configured correctly. Pressing the Insert key changes the mode to Overstrike and back to Insert mode if you press it again.

Ctrl-W y will save the changes and quit. Just remember, this is a remote terminal, it is completely unaware of the mouse, so keystrokes only.

Run the program again. The LED now flashes at half the earlier rate. While the program is running press *Ctrl-C* and see the text 'Ctrl-C detected' followed by a line that starts with a number followed by a colon maybe

10: UNTIL INKEY > -1

Now press the Space Bar and see the code appear a line at a time like this:

```
Ctrl-C detected
10: UNTIL INKEY > -1
6:
       OUTD RedLED, 0
                           ' Turn LED on
7:
       WAIT LedDelay
                            ' do nothing for LedDelay ms
8:
       OUTD RedLED, 1
                           ' LED off
      WAIT LedDelay
9:
10: UNTIL INKEY > -1
      OUTD RedLED, 0
                           ' Turn LED on
6:
      WAIT LedDelay
                           ' do nothing for LedDelay ms
7:
                           ' LED off
       OUTD RedLED, 1
8:
      WAIT LedDelay
9:
10: UNTIL INKEY > -1
```

6:	OUTD RedLED, 0	' Turn LED on
7:	WAIT LedDelay	' do nothing for LedDelay ms
8:	OUTD RedLED, 1	' LED off
9:	WAIT LedDelay	
10:	UNTIL INKEY > -1	
6:	OUTD RedLED, 0	' Turn LED on

You are stepping through the program a line at a time. The number before the colon is the line number to be executed next and the text is the program code to be executed. To continue running the program at full speed type g.

Change the program again so that it looks like the screen capture below

🖉 COM6:57600baud - Tera Term VT	_ 🗆 🗙
<u>File Edit Setup Control Window Help</u>	· · · · · · · · · · · · · · · · · · ·
Control BASIC v0.59. R-Run S-Step L-List E-Edit C-Configure B-Bank D-Download K-Reset T-Time & Date	
Program Listing: 'Blinky, flash the Red LED RedLED=41 PINMODE RedLED, OUT 'Pin 41 as output pin LedDelay=RND(-123) 'Initialize the random number generator REPEAT LedDelay=RND(500) OUTD RedLED, 0 'Turn LED on WAIT LedDelay 'do nothing for LedDelay ms OUTD RedLED, 1 'LED off WAIT LedDelay UNITL INKEY > -1	
End of Listing Control BASIC v0.59. R-Run S-Step L-List E-Edit C-Configure B-Bank D-Download K-Reset T-Time & Date	

and run the program. The LED now flashes in some unpredictable way, not very useful but good for demonstrating another feature of EZmon. LedDelay = RND(500) assigns a random value between 0 and 500 to LedDelay. Press *s* and note that the program starts in single step mode. After every line press *v* before pressing the Space Bar. As the variables are defined and their values change they can be examined. Since the delay changes randomly the only way to know the value is to print it to the screen or view it by single stepping the program.

Having an embedded controller is not much use if it does not run automatically when the power is applied or the reset button is pressed. That leads to the next section.

Running a Program Automatically

Stop the program if it is running. Press *c* and you will see the editor open up but it will not show the program.

Type Auto=y and save the edit (*Ctrl-W y*). See that the program started running immediately when you quit the



Start program

Program Ended. Start program

appear on the display. The program now runs automatically on start up and will restart if it ends, like a real embedded controller should.

Press the Reset button on the EZSBC1 and you will see this message appear on the terminal window:

일 C	ом6:	57600b	aud - Te	ra Term V	Т			_	
Eile	Edit	<u>S</u> etup	Control	<u>W</u> indow	Help				
Star	t pi	rogra	m						
Prog	gram	Ende	d.						
Star	t pi	rogra	M						
Prog	gram	Ende	d.						
Star	-t pi	rogra	M						
Pres	ss ai	ny ke	y to a	bort Au	torun.				
Auto	orun	in 1	09: m	876	54321				
	c pi	ogi u							-

Now press the reset button again and before the countdown gets to zero press a key on the terminal emulator keyboard and this is what you will see:

🖳 COM6:57600baud - Tera Term VT	
<u>File Edit S</u> etup C <u>o</u> ntrol <u>W</u> indow <u>H</u> elp	
Start program	
Program Ended.	
Start program	
Program Ended.	
Press any key to abort Autorun.	
Hutorun in 10.9.8.7.6.5.4.3.2.1. Start program	
Duran and have to about Outerum	
rress any key to abort Hutorun.	
Autorup in 10, 9, 8, 7	
Control BASIC v0 59	
R-Run S-Step L-List E-Edit C-Configure B-Bank D-Download K-Reset T-Time & Dat	e 🔤
	-

Change the Configuration parameters by pressing c and then typing the new entry till the screen looks like the first three lines on the screen capture. Save the changes to the Configuration parameters by typing *Ctrl-W* y.



Now the delay before the program starts is very long, around 50 seconds. As a precaution against never being able to regain control of the EZSBC1 values of x<5 are ignored 5 is used. The default value is 10 when the parameter is not specified. Specifying Bank=0 (the default) or Bank=1 selects from which bank the program is started.

See the CONF\$ keyword for more uses of the configuration area.

Memory Bank Selection

The EZSBC1's program memory is divided into two almost equal sized banks of memory, the first one Banko being 64k Byte in size and the second bank being 60k Byte in size. Four kilobytes of flash is 'stolen' from the second bank to implement the Configuration Area. The memory is divided into two banks for a few reasons. It is very useful to have a place to test pieces of code without going through the effort of saving the program to the host computer, loading a test program and the downloading the saved program again.

Some systems have two distinct behaviors. A good example of such a system is a data logger. When the system is in the field collecting data it is busy with one very specific task. When the system is retrieved and the data needs to be downloaded to a host computer the behavior and requirements are entirely different from the logging requirements. By having the option to split the program into the two banks the two resulting programs are much simpler to design and implement than one big program that has to perform both sets of tasks. By loading one program in each bank and selecting which bank's program executes, the system has two entirely different personalities, each one fairly easy to implement.

When EZmon is active, press the B key and a three lines of text will appear:

```
Current bank: 1
Bank #0 contents: 'Blinky, flash the Red LED
Bank #1 contents:
```

The first line of code from each bank is displayed as well as the currently active bank. Pressing 0 or 1 selects the appropriate bank, any other key causes no change. Since the first line of code is displayed it is good practice to make the first line of any program a comment describing the function of the program.

Specifying Bank=0 (the default) or Bank=1 in the Configuration area selects from which bank is active after power-up or reset.

Download a Program

It gets very tiresome to type long programs using only the editor function of EZmon. It is intended for making quick changes to programs in the field or while debugging. Writing programs is best done on the PC using your favorite programmers editor. Programmers Notepad and CodeLite are both free editors for writing programs. Don't write the program using Wordpad or similar word processors; they do not store the programs in ASCII format.

By pressing *D* at the prompt the Controller will wait for a program to save into the current bank. Immediately pressing Ctrl-D will clear the bank. Using the 'Send File' option on the TeraTerm **File** menu will download a program to the controller. The program <u>must</u> be in ASCII. For large programs the download operation can take some time. The controller writes the Flash in 256 byte blocks and each block is erased before the new code is written into the block of Flash. Also, the program in not stored in ASCII in the Flash but rather in a tokenized format to save space and increase execution speed. Tokenization occurs after the block is downloaded but before it is programmed into the Flash. When the controller is busy writing to the Flash, it can not save data arriving on the serial port. When the EZSBC1's buffer is nearly full or prior to programming or erasing the Flash, the controller sends the X-Off character to the host to temporarily suspend serial communication via the USB. When the controller is ready for more data it sends the X-On character to allow the host to resume sending data. To enable this feature to work Xon/Xoff flow control must be enabled on the serial port connecting to the controller

Deleting an Entire Program

A quick way to get a blank page (bank/program) is to 'Download' nothing, an empty program. Get to the EZmon prompt:

```
Control BASIC v0.59.
R-Run S-Step L-List E-Edit C-Configure B-Bank D-Download K-Reset T-Time & Date
```

Type '*d*'

You should see:

Send program. Use XON/XOFF flow control. Press Ctrl-D after download completes.

Now type Ctrl-D (Control key and D simultaneously) You should see:

Programmed bytes 0x100

Meaning that 256 bytes of the program memory was written to (out of 65535 bytes).

Setting the Time

```
Control BASIC v0.59
R-Run S-Step L-List E-Edit C-Configure B-Bank D-Download K-Reset T-Time & Date
```

Press *T* and you should see something like this:

Set Real Time Clock. Enter time as YYYY-MM-DD HH:MM:SS 2371-05-04 08:54:61

Now type the date and time exactly as shown using the - key next to the o on the keyboard, not the keypad -. Hours must be entered in 24 hour format so to specify 1PM, enter 13 in the hour position. Leading zeros must be entered. Any error will not update the time. A successful update will look like the screen capture below

🖳 COM6:57600baud - Tera Term VT _ 🗆 🗙 File Edit Setup Control Window Help Control BASIC v0.59 R-Run S-Step L-List E-Edit C-Configure **B-Bank** D-Download K-Reset T-Time & Date Set Real Time Clock. YYYY-MM-DD HH:MM:SS Enter time as 2371-05-04 08:59:50 2012-09-01 13:00:00 2012-09-01 13:00:00 Control BASIC v0.59 E-Edit C-Configure K-Reset T-Time & Date L-List **B-Bank** D-Download R-Run S-Step -

If you press the T-key again you will see that the time has advanced.

The Real Time Clock can be powered by connecting a Lithium coin cell to pin 38 of the EZSBC1 and it will keep time while the main power is off. There is an automatic power changeover circuit included on the EZSBC1.

Resetting the EZSBC1

There are two ways of resetting the EZSBC1. Pressing the reset button on the EZSBC1 performs a hardware reset on the module and the RSTn pin on the module will be driven low to reset external device which are tied to the pin. The USB-bus does not enumerate again when the reset button is pressed.

By pressing K at the prompt causes a hardware reset of the CPU on the EZSBC1. The USB bus is not reset allowing the terminal connection to be maintained. Also, the Reset pin (RSTn) on the controller board does not toggle when the Reset command is used. Some BASIC keywords have effects even after the program ends. A good example of such an instruction is the PWM command. Once the PWM command is given, the pin will be driven even after the program ends. The Reset command is useful to restore the IO-pins to their power on state without having to reset the entire system.

The RSTn pin has a pull-up resistor on the EZSBC1 and can be driven low by external components to reset the entire system. The reset controller used on the EZSBC1 will hold the reset pin low for a time (30ms) after the reset pulse disappears to ensure a valid reset condition for the EZSBC1. External components should not drive the RSTn pin high.

Reset the Comm Port Number

Not all programs are happy dealing with double digit COMxx number. You may want to use a data logging program that needs a low COMx port number and Windows assigned a large number such as COM55 (in this example). It is possible to reset the number.



In the Device Manager right click on the serial port with the number that you want to re-assign. Select the 'Properties' option.

Jocha		roperdes	
eneral	Port Settings Driv	rer Details	
Ţ	USB Serial Port (COM55)	
	Device type:	Ports (COM & LPT)	
	Manufacturer:	FTDI	
	Location:	Location 0	
This	device is working p	roperly.	
This If you the ti	device is working pr u are having problen roubleshooter.	roperly. ns with this device, click Troubleshoot to start	
This If you the t	device is working pr u are having problen roubleshooter.	roperly. ns with this device, click Troubleshoot to start Troubleshoot	
This If you the to Device	device is working pr u are having problen roubleshooter. usage:	roperly. ns with this device, click Troubleshoot to start Troubleshoot	×
This If you the tr Device Use th	device is working pr u are having problen roubleshooter. usage: is device (enable)	roperly. ns with this device, click Troubleshoot to start Troubleshoot	

and now select the 'Port Settings' tab and on the Port Settings tab, press the Advanced button.

COM Port Number: COM55	▼	ОК
USB Transfer Sizes		Cancel
Select lower settings to correct performance problems a	at low baud rates.	Dofaulto
Select higher settings for faster performance.	Derduits	
Receive (Bytes):		
Transmit (Bytes):		
BM Options	Miscellaneous Options	
Select lower settings to correct response problems.	Serial Enumerator	v
Latency Timer (msec):	Serial Printer	
	Cancel If Power Off	
Timeouts	Event On Surprise Removal	Γ
Minimum Read Timeout (msec):	Set RTS On Close	
	Disable Modem Ctrl At Startup	

Click the COM Port Number drop down item and it will show a list of available ports. On the machine used here it shows a ridiculous list of ports as in use.

COM6	
COM7 (in use)	
COM8 (in use)	
COM9 (in use)	
COM10 (in use)	
COM11 (in use)	
COM12 (in use)	
COM13 (in use)	
COM14 (in use)	
COM15 (in use)	
COM16 (in use)	
COM17 (in use)	
COM18 (in use)	
COM19 (in use)	
COM20 (in use)	
COM21 (in use)	
COM22 (in use)	
COM23 (in use)	
COM24 (in use)	
COM25 (in use)	
COM26 (in use)	
COM27 (in use)	
COM28 (in use)	
COM29 (in use)	
COM30 (in use)	
COM31 (in use)	
COM32 (in use)	
COM33 (in use)	
COM34 (in use)	
COM35 (in use)	-

It shows COM6 as unused so selecting it assigns it to the serial port. If all the ports are marked as 'in use' select one that you know is not (actually) in use.

	?	
	ОК	
	Cancel	
t low baud rates.	Defaulte	
Select higher settings for faster performance.		
Miscellaneous Options		
Serial Enumerator	V	
Serial Printer		
Cancel If Power Off		
Event On Surprise Removal		
Set RTS On Close		
Disable Modem Ctrl At Startup		
	t low baud rates. Miscellaneous Options Serial Enumerator Serial Printer Cancel If Power Off Event On Surprise Removal Set RTS On Close Disable Modem Ctrl At Startup	

Here I selected COM6 that is shown as in use. Press OK. Close all the menus. You may get an prompt

to restart the computer.



After re-starting the computer, re-visit the Device Manager and the serial port will have the assigned COM number.