

EZ Web Lynx

User Manual for 5V and 3.3V versions

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EZ Web Lynx

1. Design. Connect. Realize with EZ Web Lynx

EZ Web Lynx is a simple embedded Ethernet integration device to get your products online fast!

This tiny unit can easily be added to any existing electronic design to gain Ethernet capability, reducing development and engineering time. Its dynamic web pages are easily programmed in HTML with no other technical knowledge or programming languages needed!

There are 3.3V and 5V versions available to fit your design requirements. Start out with one of our development kits to see how EZ Web Lynx can work for you. See Section 2 of this manual on the Development Kits for more details.

1.1 Overview of Capabilities

- **Three types of Command Interfaces -**

- Serial AT Command Interface** - Allows the user to configure and operate the device without the need for a network connection.

- UDP Server Interface** - Included with EZ Web Lynx to accept AT commands and works with the EZ Web Lynx IDE to configure the device.

- HTTP CGI Interface** - Commands can be issued to the EZ Web Lynx using HTTP CGI GET and POST commands.

- **Digital Inputs** - Pins 1 - 11 on EZ Web Lynx 5V or pins 1 - 17 on EZ Web Lynx 3.3V can be used as digital inputs.

- **Digital Outputs** - Any of the I/O pins can also be used as a digital output.

- **Analog Inputs** - Pins 1 - 5 on the 5V EZ Web Lynx or pins 1 - 6 on the 3.3V EZ Web Lynx can be used as analog inputs. These inputs have the range GND-Vdd and a resolution of 0.01V

- **I2C Temperature Sensor** - 2 pins can be used to communicate with Dallas sensors to monitor temperatures in Fahrenheit or Celsius.

- **Device Lock** - Password protects EZ Web Lynx from changing the configuration of the device.

- **Pin Lock** - Allows I/O pins to be individually locked in their current state to prevent mode configurations from being modified.
 - **Data Registers** - Volatile and non-volatile registers are available and consist of 256 8-bit register locations.
 - **Serial Capture Buffer** - Allows the device to automatically capture a specific frame of serial data based on user-specified start and stop conditions.
 - **E-mail** - EZ Web Lynx has the ability to send event-driven and/or daily status e-mails.
 - **Character LCD** - Information read by EZ Web Lynx can be displayed on a character LCD.
 - **Device ID** - Allows identification of a particular device in an environment with multiple EZ Web Lynx devices.
 - **IP Configuration** - EZ Web Lynx allows for full modification of its networking settings, allowing it to be used in all network environments.
-

1.2 General Use

EZ Web Lynx was designed to offer a quick and easy way to get an existing or a new product online. Its versatility allows quick adaptation into limitless applications and be monitored from remote locations. The following are some general examples of how EZ Web Lynx could be used:

1.2.1 Industrial Environment

Incorporate EZ Web Lynx into any industrial device to allow for local or remote monitoring of equipment status. You can observe what functions are on, which are off, if your machine is on schedule, or has the correct settings.

1.2.2 Laboratory Equipment

Adding EZ Web Lynx to your lab equipment allows you to audit the results from various devices faster and monitor many at the same time. In addition, EZ Web Lynx can notify you via e-mail when a test is done.

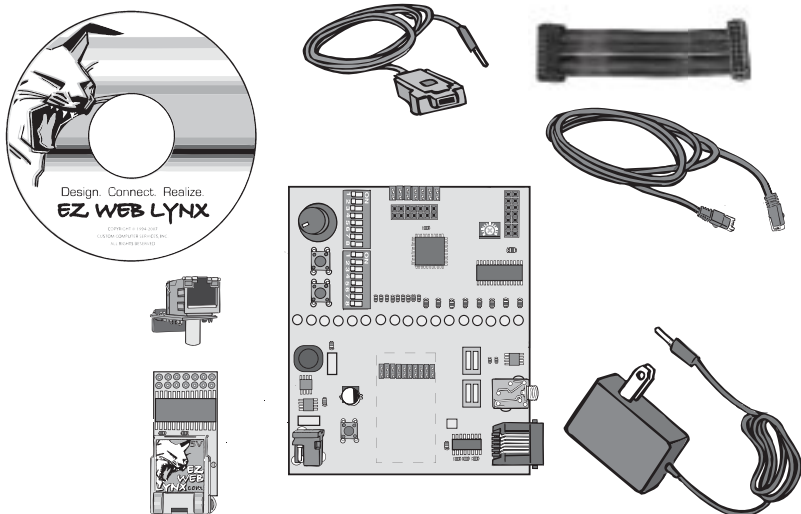
1.2.3 Consumer Products

EZ Web Lynx will give you a competitive edge with your products by providing an innovative way to communicate over the Internet. This could be useful in appliances like an oven or refrigerator. This would allow you to start pre-heating your oven from work, or make sure you did not forget to turn it off after leaving for a trip. With EZ Web Lynx e-mail functions, you can receive a notification email if you forgot to close the refrigerator door, or if the temperature is too warm in the freezer. For detailed directions on how to set up a similar example, please see Section 4.4 “Application Ideas: Industrial Refrigeration.”

1.2.4 Hobbyists

EZ Web Lynx is a cost-effective module that can be incorporated into even the smallest projects. It is ideal for someone who wants to develop their own device at home to monitor from any computer connected to the Internet. For example, if you wanted to set up a home weather station, EZ Web Lynx can be embedded into your weather monitoring system. You can view the results and current conditions of your rooftop equipment from the comfort of your home workspace.

2. Development Kit Hardware Setup & Software Installation



2.1 Contents of Kit

The EZ Web Lynx Development Kit includes everything you need to get your project started. Included in the development kit is:

- Two EZ Web Lynx devices
- Docking Station for programming and testing
- Host Ribbon Cable
- Network cable
- 9V Power Supply
- Serial to PC Cable

2.2 Software Installation

1. Insert the EZ Web Lynx CD in the CD-ROM drive.
 2. Run D:\setup_ezweblynx.exe where D: is your CD-ROM drive.
 3. Follow the on-screen instructions to install the EZ Web Lynx software to your computer.
-

2.3 Hardware Setup

Plug the EZ Web Lynx module into the connector on the docking station. The Ethernet jack on the EZ Web Lynx should be facing toward the bottom edge of the docking station.

1. Plug the 9V power supply into the power connector on the bottom-left corner of the docking station. This will supply power to the docking station as well as the EZ Web Lynx module.
2. Set the EZ Web Lynx IP address settings to match your network. This can be accomplished in two ways. The first is to use the serial interface on a PC to change the settings. The second method involves a direct network connection between the EZ Web Lynx and a PC.
 - a. To change the EZ Web Lynx IP settings using the serial interface:
 1. Connect the supplied CPC—DB9 serial cable to the RS-232 port on the right side of the docking station and to the DB9 serial port on the PC.
 2. The red and white DIP switches are used to isolate the RS-232 port from the EZ Web Lynx. To enable use of the serial port, switch both DIP switches next to the RS-232 port into the CLOSED position. The switches should be flipped toward the LEDs.
 3. Pin 8 on the EZ Web Lynx is shared with the serial port. So the analog and digital inputs on the docking station do not interfere with the serial port, make sure BOTH of the number 8 switches on the blue and white banks in the top-left corner of the docking station are in the OFF position. They should be pointed toward the knob/buttons.
 4. Open a terminal program on the PC (Hyperterminal, etc.). The default port settings are 9600 baud/8 data bits/no parity/1 stop bit/no flow control (8-N-1). Change the terminal program's settings to match this. Character echo is, by default, enabled on the EZ Web Lynx. Turn off the terminal program's local echo option.
 5. 1)Type "AT" (no quotes) and hit the enter key. The EZ Web Lynx should respond with an "OK" and then prompt you for the next command. The "AT" command does not perform any function other than force a response from the device to ensure the device is alive. If the EZ Web Lynx does not display the characters as you type them or does not respond to the command, re-check your cable connection, switches, and terminal settings from steps 1-6.

6. Use the appropriate AT commands to change the network settings to match those from your network. Refer to the manual's chapter on the "Command Set" for details on all of the legal AT commands. The IP address should be one that isn't used by any other device on the network. The netmask, gateway, and DNS should be the same as the PC[s] on the network.
 7. The AT commands follow the format "AT*KEY=VALUE" where KEY is "AIP" (change the IP address), "ANMASK" (netmask), "AGW" (gateway), or "ADNS" (DNS server) to change those respective settings. Value is the desired result.
 8. DHCP may also be used to dynamically assign an IP address to the device. To use DHCP, a DHCP server must be present on the network. Most networks do have a DHCP server; often a router will be acting as one. To enable DHCP, type "AT*DHCP=1" and press the enter key. The device should respond with an "OK" message.
 9. After changing the IP settings, the device must be reset before the changes will take effect. To do this, either type "AT*RESET=1" or simply press the RESET button on the docking station. When a new ">" prompt appears on the terminal screen, the device is ready to go.
 10. Confirm the settings by typing "AT*KEY?" where KEY is the setting you would like to check. For example, to check the IP address, type "AT*IP?". The EZ Web Lynx will respond with the following "AT*IP=RESPONSE" where RESPONSE is the IP address of the device.
- b. To change the EZ Web Lynx IP settings by establishing a direct network connection with a PC:
1. This method involves directly connecting the EZ Web Lynx to a PC and changing the settings of the PC to match the default settings of the EZ Web Lynx. This will allow the PC to communicate over the network connection to the EZ Web Lynx. The following instructions assume a PC running Windows XP. The procedure may differ slightly for other operating systems.
 2. Most computers will require a crossover cable in order to make a direct network connection. This cable IS NOT included with your EZ Web Lynx. Some Network Interface Controllers (NIC) have a feature called automatic crossover which will allow the use of a standard network cable.

3. Plug the crossover cable into the Ethernet jack on the EZ Web Lynx and into the Ethernet jack on the computer.
 4. Open the Windows Control Panel and choose Network Settings. Right-click on the Local Area Network and choose Properties.
 5. In the Local Area Connection Properties window, click the Properties button.
 6. In the box that says “This connection uses the following items”, click on “Internet Protocol (TCP/IP)” and then click the Properties button.
 7. Select the “Use the following IP address” radio button and use the following settings:
 - IP Address: 192.168.100.200
 - Subnet mask: 255.255.255.0
 - Default Gateway: 192.168.100.1
 8. Select the “Use the following DNS server addresses” and leave the fields blank.
 9. Click on the OK button on any open windows.
 10. The computer may pause for a moment while it resets its network connection. After a moment, the Local Area Network should indicate that it has connected.
 11. The computer will now have an IP address that will allow it to communicate directly with the EZ Web Lynx over the network connection.
4. With the network settings appropriately assigned, the EZ Web Lynx software will now be able to connect to the device to change settings, and download web pages. See the EZ Web Lynx IDE chapter in the user manual for details on using the software.
-

2.4 Docking Station

The docking station includes the following features for programming and testing EZ Web Lynx operations:

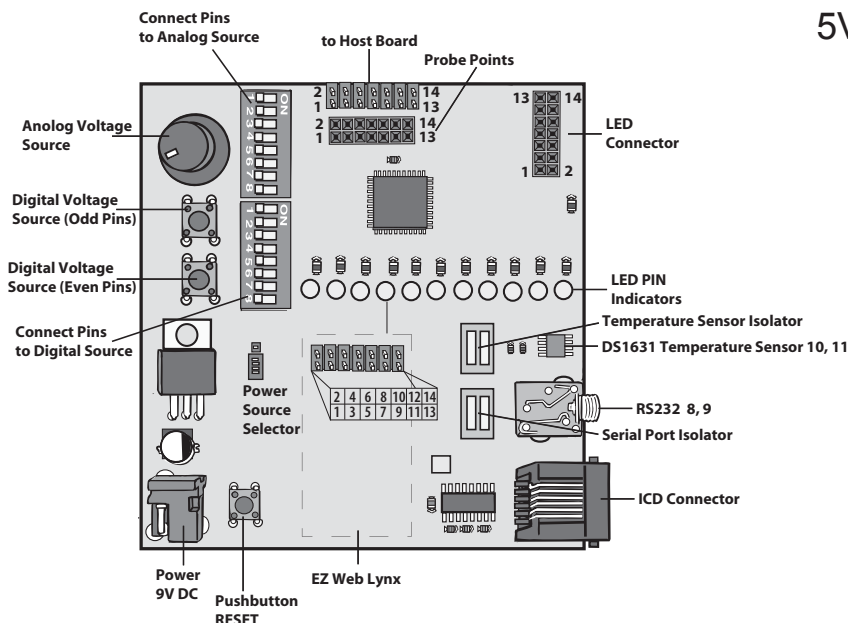
- 1 - 14- pin connector to host the EZ Web Lynx module
(See Section 4.3 for mates)
- 2 - Red/Green bi-color LEDs to indicate the high/low state of each pin
- 3 - User terminal block to allow access to each of the I/O pins on the EZ Web Lynx
- 4 - RS-232 level converter and serial connector for Personal Computer to EZ Web Lynx serial communications with a DIP switch to isolate RS-232 chip from device
- 5 - Connector for 2x16 LCD module (LCD module not included)
- 6 - Dallas DS1631 Temperature sensor with isolating DIP switch
- 7 - In-Circuit Debugger/Programmer connector for advanced programming

On the Docking Station, adjust the switch the following settings

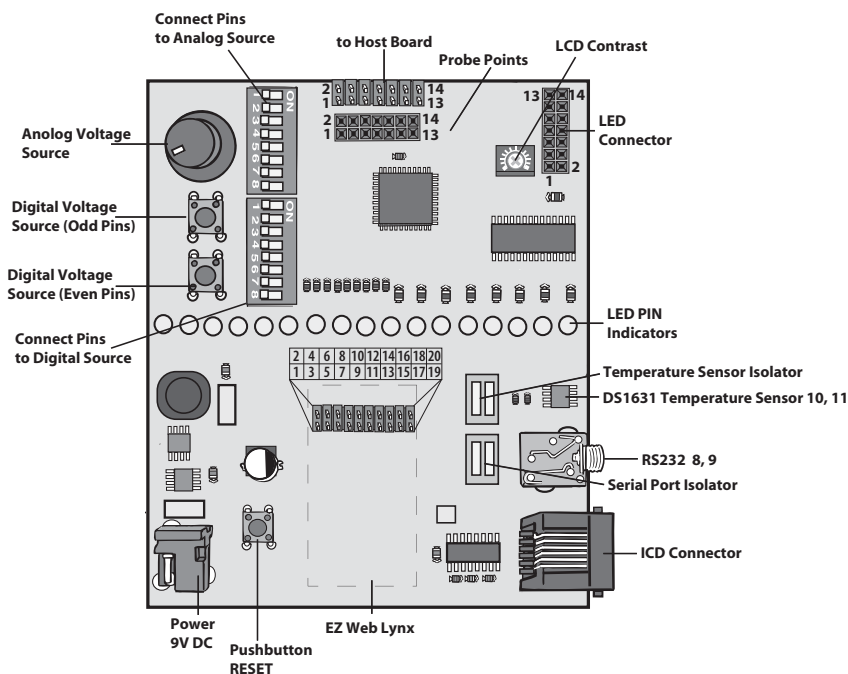
1. Connect the temperature sensor to the EZ Web Lynx.
2. Connect EZ Web Lynx pin 1 to the analog input source.
3. Connect pins 2-4 to the digital input source.
4. All other pins should be left unconnected.



5V



3.3V



2.5 Example 1 Project and Hardware Check

The following steps will create a simple webpage. The project will be downloaded to the board and viewed in a web browser to check your hardware setup.

1. Open the EZ Web Lynx IDE by double clicking on ezweblynx.exe
2. Click on the New Project button under the File ribbon. Select a project directory and name the project. Click save to create the project.
3. The IDE will create two default HTML files for use with the project:
 - 1) index.htm is the default HTML file for display in a web browser.
 - 2) error404.htm is the web page that is displayed when a browser is unable to display the project. By default index.htm is opened displaying a simple hello web page.
4. Highlight and delete the sample text. Type your own custom text such as "Hello World"
5. Save project from the File ribbon to save all changes to any files that have been included in the project.
6. File ribbon also provides additional features such as: creation of new html files to be included, opening of included html files, and printing. Download project to target board by selecting in the Target ribbon "Select Device".
7. A window will pop up displaying all EZ Web Lynx devices found on the network. See section 4.6 to set up your network to allow for proper functioning of the EZ Web Lynx.
8. Click Create Image and save the cds file to the project directory.
9. Click "change settings" to verify the IP address and ID of your development kit. Write down this IP address so you can access the web page through a browser.
10. Click "upload project".
11. Open up a web browser on your computer and go to the address **http://YourIP** and replace YourIP with the IP address that was written down in step 11.
12. The website that was created using the IDE should now be displayed showing "Hello World".

Congratulations, your network is now set up for use with your new EZ Web Lynx module. The following chapters will explore more advanced features of the IDE.

2.5.1 Exec/Read Keys

In addition to simple PIN I/O the EZ Web Lynx has capabilities for writing and reading various preprogrammed commands. These commands include sending serial data, displaying to an LCD, setting up event driven emails, reading the included temperature sensor, and various other functions. The below steps implement such commands to the sample project.

1. Move the cursor to a new line after the image and type “EZ Web Lynx ID: “.
2. Select the HTML Ribbon and open the command drop down box. Select “READ KEY” and click insert. Either type “ID” or use the drop down box to select ID. Click Ok.
3. Move the cursor to a new line and type “Temperature is: “
4. Make sure “READ KEY” is still selected and click insert. This time we want to read the command “TEMPF0”. After selecting the value click Ok.
5. Open the command drop down box and select “EXEC KEY” and click insert. Type “PIN_OUTPUT3” in the key field and type 1 in the value field. This will drive PIN 3 of the EZ Web Lynx module to high.
6. The window should look similar to the following:



2.5.2 Conditionals

The EZ Web Lynx command set also includes the conditional statements if and else. These conditionals can be used in conjunction with PIN voltage levels or command values to generate different HTML. The if command will only include the surrounding HTML when the conditional resolves to true. So if the statement is false, then the module will not include the surrounded HTML on the webpage. These can be very useful to programmers allowing for custom embedded device driven web content.

1. Execute the EZ Web Lynx IDE by navigating to the previously chosen install directory and double click on ezwebllynx.exe
2. Now the PIN 2 ANALOG command probably disappeared, so to make it reappear simply click on the right line of the column and drag the mouse to the right. This will expand the second column so the command can be seen again.
3. Place your cursor in the top row of the newly created column and open the command drop down box under the HTML Ribbon. Select "IF PIN X=N". Click insert. Type 1 in the "X" value field and high in the "a" value field.
4. Move the cursor to the right of this command and type "Danger".
5. Open the command drop down box and select "ELSE". Now type Safe after the else command.
6. Open the command drop down box and select "ENDIF".
7. Place your cursor in the bottom row of the newly created column and open the command drop down box. Select "IF PIN X[<|>]N". Click insert. Type 2 in the "X" value field. Select the greater than operator in the "OPT" value field. Type 3 in the "a" value field. This command will evaluate to true if the analog voltage on pin 2 is greater than 3V.
8. Move the cursor to the right of this command and type "Danger".

9. Open the command drop down box and select "ELSE".
Now type Safe after the else command.
10. Open the command drop down box and select "ENDIF".
11. Your window should now look like:



2.5.3 Simulator

The advantage of the IDE over other HTML editors is the ability to simulate the functioning of the website before downloading to the module. Using the simulate sliding window values can be assigned to various commands and pins so that commands can be properly simulated. Follow these steps to set up and use the included simulator.

1. Move the mouse over to the left side of the IDE and hover over the Simulate tab. This slide out tab allows for values to be assigned to pins and commands so that included HTML commands can be simulated.
2. To simulate the current project start by typing "Test EZWeb" in the "ID" field contained in the top subsection.
3. Next set PIN 1 to HIGH, and PIN 2 to 2.5V in the middle subsection.
4. Now select a blank text field under the Key subsection and type "TEMPF0". Set the value to 80.
5. Move the mouse away from the simulate tab to cause it to slide back.
6. Click on the Internet Explorer tab to view the results of our simulation. This window will display the currently opened webpage like it would be displayed in a browser.
7. After opening the Internet Explorer tab, the IDE should look similar to the following (Note the Image will not be displayed in this simulation):



2.5.4 HTML creation

The IDE also includes a standard HTML editor that can be used to generate web pages without the need for the visual editor. To use this, select the HTML tab. All changes that are made in this editor will also be reflected in the visual tab and the Internet Explorer tab. Additionally the Body tab can be used to add HTML into the body section of the webpage. The IDE includes support for CSS style sheets and meta tags. To access these, use the corresponding tabs. Every project created using the EZ Web Lynx IDE will include a default CSS sheet.

2.5.5 Controlling Web Content through Hardware

This section will describe how to use the EZ Web Lynx board to control the project created throughout this exercise book.

1. Follow the steps from Section 2.5 to download the finished project to the EZ Web Lynx board.
2. Open up a web browser and navigate to the module's IP address.
3. The EZ Web Lynx development module includes a potentiometer, push button, and temperature sensor that will provide the necessary data to the module. This data will then be displayed in your web browser effectively enabling your embedded board to be viewed through a web application.
4. First, before we can use the development module's input devices, we need to set up the board. The included development board has two DIP switch banks of 8 switches per bank. These switches connect pins on the EZ Web Lynx modules to the input devices.
5. To put the potentiometers input on pin 2, flip the DIP switch labeled number 2, in the bank directly next to the Potentiometer, to the ON position.
6. We also need to attach the input of one of the digital buttons to pin 1. To do this flip the DIP switch labeled number 1, in the bank next to the two digital buttons, to the ON position.
7. Move the potentiometer and refresh the webpage. Notice how the "PIN 2 ANALOG" command changes value corresponding to your input voltage. Additionally the danger text should change displaying the state of the device.
8. Use the push button to change the state of PIN 1 and refresh the webpage. Notice the change in the "PIN 1" command as well as the danger text.
9. The actual temperature read by the on board sensor should also be displayed at the bottom of the page.

2.6 Using the EZ Web Lynx Development Kit

The blue bank of switches next to the knob isolates or connects the potentiometer to the numbered pin on the EZ Web Lynx device. This allows the EZ Web Lynx to be connected to a variable analog voltage source. When a switch is in the ON position, that number pin on the EZ Web Lynx is connected to the analog source. If it is not in the ON position, then the pin is not connected to the analog source.¹

The push buttons provide a digital input to the EZ Web Lynx's input pins. The blue bank of switches next to the buttons connect or isolate the buttons from the EZ Web Lynx. When a switch is in the ON position, that number pin on the EZ Web Lynx is connected to the digital source. The pin will be normally low and will be pulled high when the button is pushed. The top button, labeled "EVEN," controls even-numbered pins 2, 4, 6, and 8. The bottom button, labeled "ODD," controls odd-numbered pins 1, 3, 5, and 7. If a switch is not in the ON position, then the pin is not connected to the digital source.²

The "To Host" socket is for connecting the EZ Web Lynx pad to another device using the supplied ribbon cable. The EZ Web Lynx pad does not supply power to the +5V/+3.3V pin on the Host Connector.

The 3-pin header just below the bottom blue bank of switches chooses from where the Docking Station and EZ Web Lynx will be powered. If the shunt is in the "Adaptor" position, power will be supplied through the wall adapter. If the shunt is in the "Host" position, a 5V/3.3V power source should be connected through the "To Host" socket to power the Docking Station and EZ Web Lynx.

¹ Only pins 1-5 on the EZ Web Lynx 5V and 1-6 on the EZ Web Lynx 3.3V are capable of acting as analog inputs.

² Pin 8 is also used for serial communication, so make sure both number 8 switches are not in the "ON" position if using the serial functions of the device.

The two sets of red switches on the right side of the Docking Station are used to isolate the temperature sensor and serial port from the EZ Web Lynx. The switches on the top relate to the temperature sensor and the those on the bottom to the serial port. If using pins 8 or 9 as digital I/O, put the bottom switches in the OPEN position. If using the serial port, do not put them in the OPEN position.³ If using pins 10 or 11 as digital I/O, put the top switches in the OPEN position. If using the temperature sensor, do not put them in the OPEN position.⁴

The 2x7 female header in the top-right corner of the board is used for connecting an LCD to the EZ Web Lynx. See the “LCD” section for more information.

The black 6-pin modular jack on the bottom-right corner of the board is used for connecting an in-circuit debugger/programmer (ICD) to reprogram your EZ Web Lynx with custom firmware. This header provides access to the programming pins needed to reprogram the processor on the EZ Web Lynx.⁵

2.6.1 Manually Compiling and Loading Files to the EZ Web Lynx

Web pages and other files can be manually written, compiled, and loaded onto the EZ Web Lynx without the use of the IDE. To do this a command-line utility, named CSFS, as well as a file-transfer program are utilized.

³ The serial port on the Docking Station is connected through an RS-232 level converter chip. This converts the TTL levels used on the EZ Web Lynx to RS-232 levels used by computers. When using the serial port to connect the EZ Web Lynx to another device, check that device's specifications to see whether it uses TTL or RS-232 levels for serial communication.

⁴ The Dallas DS1631 temperature sensor uses the I2C serial communication protocol and requires pull-up resistors on the data and clock lines. The Docking station includes 4.7k resistors on both lines. When using the EZ Web Lynx on custom hardware, these resistors must be included. See the “Temperature Sensor” section for more information.

⁵ Reprogramming your EZ Web Lynx using an ICD is for advanced users only. Damage caused by reprogramming the EZ Web Lynx or the cost of reprogramming the device to factory specifications is not covered by your warranty. Contact EZ Web Lynx technical support for more information.

2.6.2 Creating a Downloadable Image (Compiling)

The web pages that are to be stored on the EZ Web Lynx must be compiled to a binary image that can be parsed and read by the device. This is accomplished using the CSFS utility (csfs.exe) that is included in the directory to which the IDE was installed. The program will compile all files from a given directory into one file that is, in turn, downloaded to the EZ Web Lynx. All files that are to be compiled and downloaded must be in one folder. This folder should not contain any files that are not to be downloaded, nor should it contain any sub-directories. CSFS is best used from a command prompt. The usage is as follows:

```
csfs INPUT_DIR OUTPUT_FILE
```

Where INPUT_DIR is the directory that contains all of the files to be compiled and OUTPUT_FILE is the name of the file that is to be created. The output file may be given any name. The program will display a list of the files that were compiled before completing and returning control back to the command prompt.



2.6.3 Downloading the Binary Image

Once a binary file has been created using the CSFS utility, it must be downloaded to the EZ Web Lynx using the Trivial File Transfer Protocol [TFTP]. There are many TFTP client programs available, including a command-line program included in most versions of Windows. From a Windows command prompt, the usage for the TFTP program is as follows:

```
tftp -i IP_ADDRESS put LOCAL_FILE image.cds
```

Where IP_ADDRESS is the IP address of the EZ Web Lynx device and LOCAL_FILE is the name of the binary file created with the CSFS utility. The remote file name (the last parameter) must be "image.cds" or the EZ Web Lynx will not accept the file transfer.

Other TFTP client programs are widely available and may be used to complete this transfer. If using a different program, ensure that the following settings are in place:

- Octet mode (also known as image mode or binary mode) will ensure that the TFTP software transmits the CSFS image exactly as it was created
- Block size must be 512 bytes (characters)

These are standard TFTP specifications, but some programs may override these parameters by default. Once the file transfer is complete, the uploaded files are viewable from a web browser.

2.6.4 Other Notes Regarding CSFS and Web Pages

Some points to keep in mind when creating web pages and images to use on the EZ Web Lynx:

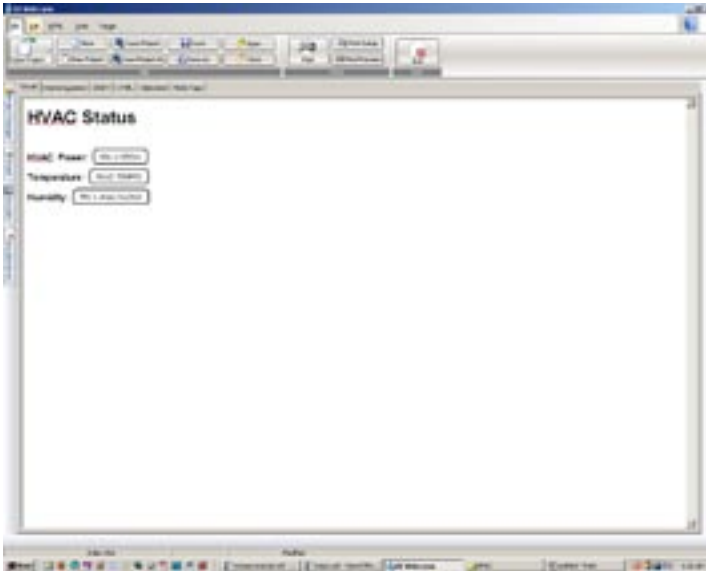
- The EZ Web Lynx will look for a file named “index.htm” when accessing the device from a web browser and a file name is not specified. For example, when you type “http://192.168.100.210/” in the address bar of the web browser to access your device, the EZ Web Lynx will try to load a page named “index.htm.” You should include a file with this name as the default page you would like to have displayed.
- When a requested page cannot be found in the device’s memory, a very basic 404 error (file not found) web page will be displayed. You can include a file named error404.htm in the downloaded image if you would like a custom 404 page to be displayed instead.
- Internet Explorer will automatically replace any error pages that are less than a specified size with its own default error page.
- The device must parse all characters in a web page when looking for custom HTML tags. Keep unnecessary spaces, tabs, newlines, and comments to a minimum to improve loading times.
- CSS may be included directly in the <head> section of web pages or may be linked to by inserting a <link> tag in the <head> section. By doing this, one file can be used for multiple web pages—saving on the amount of memory used on the device. The EZ Web Lynx will also tell the browser to cache all files with a .css extension so it only has to be loaded from the device one time. Because of this, if a CSS file is changed, the page must be fully reloaded (CTRL+F5 in most browsers) to see the changes take effect.

```
<link type="text/css" rel="stylesheet" href="style.css"/>
```

- To decrease loading times, the EZ Web Lynx directs the browser to cache all images. Large images, JPEG files, and BMP files are particularly taxing on the device and can take a long time to load. If possible, relatively low-resolution GIF images are recommended because of their relatively small file size and, therefore, quicker loading times.
-

3. IDE Overview

The EZ Web Lynx IDE is an integrated development environment (IDE) designed to assist developers in creating a web application using an EZ Web Lynx device. The IDE provides a visual interface for creating a HTML document and also allows for editing the document as raw HTML. The IDE can be used for configuration of an EZ Web Lynx device settings and to upload an HTML image to the device.



3.1 Editor Features

The EZ Web Lynx IDE has five ribbon menus with useful features in each one to make development quick and easy. The following are a few specific features that require additional information:



3.1.1 File Formats

When working with the IDE several files may be created or used. The following are some of the files that may be encountered. All files must be in 8.3 format.

- **CDS** - A CCS Data Stream file. This contains an image of the web application that may be uploaded to a device. These files are created by opening a project and selecting “Create Image” from the target menu.
- **PJT** - A project file. The project file contains a list of the files that are included when creating an image that will be uploaded to the device.
- **HTM** - A web page document. An HTML document is a plain text file with special tags indicating the formatting. An HTML document may consist of text, images, tables and hyperlinks to other sites. HTML is a standard format for web pages and is known for its ability to allow users to view information and follow hyperlinks to other locations of interest. For more information on HTML documents visit www.w3.org
- **JPG or .GIF or .PNG** - An Image file. Image files may be included in the project so that HTML documents may reference them. A web browser may then display an image on a web page.
- **CSS** - A file containing a Cascading Style Sheet. These files contain information about how an HTML document should be presented by the web browser.



3.1.2 Using the Editor

The IDE provides an HTML editor with several ways of viewing an open document. Select from one of tabs at the top of the editor window for the various ways to view and work on the document. Developers may find it useful to switch between modes. The following modes are available:

- **Visual** - Working in visual mode allows for quick editing of the document with minimal knowledge of HTML and provides real-time editing. Specific options such as changing fonts, inserting custom tags, and inserting tables are only available in this mode. Other views require tags to be manually typed in.
- **Internet Explorer** - At some point a developer will want to know what the document will look like in a web browser. This may be different than in the visual view because of dynamic content. The 'Internet Explorer' mode gives the developer a powerful tool to simulate what the document will look like when the EZ Web Lynx processes the dynamic content. A developer can also change values in the simulate slide out menu to view how the device responds in different settings. The editor is 'read only' in this mode.
- **Body** - In an HTML document, the body section defines the content of the document. If the developer finds it easier to edit the HTML directly then this mode will allow editing HTML content without having to work with items such as the style sheet or tags that may be found in the HEAD section.
- **HTML** - This mode shows the full raw HTML document in plain text. This allows the developer the greatest flexibility when editing an HTML document.
- **Style sheet** - This view gives the developer an ability to edit or add to the style sheet for the document. A Cascading Style Sheet describes the presentation of a document. The style sheet displayed here is found in the head section of the HTML document.
- **Meta-Tags** - Allows for viewing the Meta-Tags for the open document. This view is read only. Meta-Tags provide information about the document such as keyword, content, description and author. For example, `<META name="description" content="EZ Web Lynx" />` instructs the web browser that the page is about EZ Web Lynx. This is often utilized to enable search engines and web crawlers to rank the page. Any number of Meta-Tags can be placed in the header section.

3.1.3 File Tab

Developing a web application consists of creating one or more HTML files. Also in order to place your application on the EZ Web Lynx device each file must be part of the project. This ribbon allows for creating new projects and adding HTML files. Support for printing is also provided.

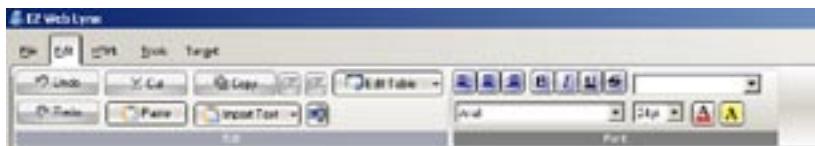


Open Project	Opens a saved project into the IDE
New Project	Creates a new project
Save Project	Saves the project settings
Save Project As	Prompts the user for a project name to save the curently open project
New	Creates a new blank HTML file an adds it to the current project
Save	Saves the HTML file that is open (use 8.3 format for file name)
Save As	Prompts for the file name to save the file currently open
Open	Opens an HTML file to edit
Close	Closes the project
Print	Prints the file displayed in the print tab
Printer Setup	Select the printer and printer options
Print Preview	Preview the printer document
Exit	Exit the software



3.1.4 Edit Tab

To provide the developer with an easy way to edit documents, an option-rich editor has been included. Depending on editing mode and where the cursor is, some options may not be available.



Undo	Undo the last edit to the program
Redo	Redo the last undo
Cut	Move the selected text to the clipboard
Copy	Copy the selected text to the clipboard
Paste	Move text from the clipboard to the editor
Import Text with line breaks	Load text from a file into the editor keeping the line breaks
Import Text without line breaks	Load text from a file without the line breaks
Decrease list indent	Un-indents a list item by one level
Increase list indent	Increases the indent of a list item by one level
Remove innermost span	Removes the innermost span. To set formatting options HTML documents use a span tag for example <code> text </code> This option removes the innermost span at the cursor location.
Edit table	Allows the insertion/deletion of the selected table rows or columns
Font settings tool bar	The font settings tool bar allows the user to change the font style for the selected text



• Table/Lists

HTML items such as tables, lists and cell option commands can be inserted into the document.

Unordered List	Inserts an unordered list at the cursor position (ie. Bullet points)
Ordered List	Inserts an ordered list at the cursor position (ie. 1,2,3...)
Insert Table	Brings up the insert table dialog to insert a tab
Table Settings	Select the number of columns, number of rows, the width in pixels, and the table class and table style. Table class and table style are taken from the style sheet.
Cell Options	The user can change the cell spacing and cell padding in this dialog. The user can also change the cell class and the cell style in this dialog. Cell class and Cell styles can be defined in the style sheet.

• Commands

To assist the developer in using dynamic content for the EZ Web Lynx Server, some options have been provided.

Select an EZ Web Lynx command from the pull down menu in the tab and press insert for the command to be placed at the current cursor position. A dialog box appears and the user is allowed to enter any parameters for the command. Please see the list of commands in the EZ Web Lynx documentation for a better understanding of what the parameters are and how the commands effect the display.

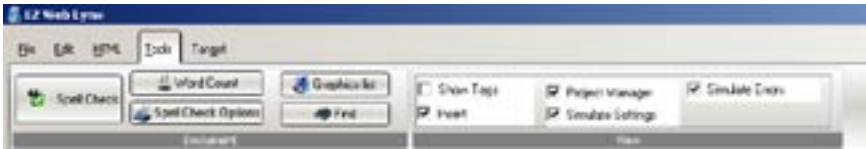
After inserting a command, the developer may click on a command and select 'Edit device CMD' to edit the parameters for a command in the HTML document. A dialog box opens, allowing the user to change the parameters for the command easily without having to worry about the syntax for the command.

• Hyperlink

Make Hyperlink	Creates a hyperlink out of the selected text using the link in the 'link edit' box. The selected text may now be clicked on to take the user to a location providing more information about the text.
Remove Hyperlink	Removes the hyperlink at the current cursor locations
Anchor	Adds an anchor at the current cursor position. An anchor creates a link within current document

3.1.6 Tools Tab

The EZ Web Lynx IDE is a functional editor and some common editor functions have been provided to assist the developer.



• Document

Spell Check	Spell checks the open HTML document
Word Count	Displays the number of words in the HTML document
Spell Check Options	Displays settings for spell checking
Graphics List	Shows a list of graphic files used by the HTML document

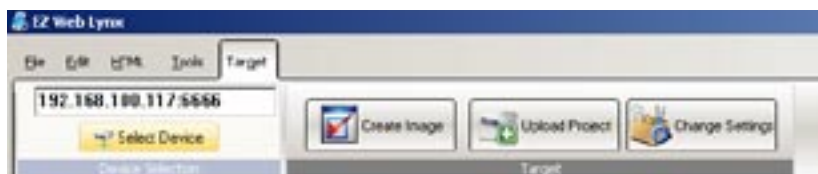
• View

Show Tags	Box checked - the tags are displayed in the HTML editor view
Insert	Box checked - the insert slide out menu becomes visible
Project Manager	Box checked - the project manager becomes visible. The Project Manager allows all pages and images of the current project to be viewed.
Simulate Settings	Box checked - the settings for how the document will be simulated
Simulate Errors	Box checked - a list of errors that occurred the last time the project was simulated will be visible. (See Section 3.9)



3.1.7 Target

The IDE allows for transferring a project to the device as well as viewing and changing device settings.



- **Create Image:** After loading a project, use this option to create an image of the current project and save it to a disk. The image file format does not support sub-directories. This means that any links to images or files in the project must be to the same directory. Once the an image is created, it may be uploaded it to one or more EZ Web Lynx devices.

- **Select Device:** Press 'Select Device' to choose which device to communicate with.

The select device dialog box on the left will list all the devices found on the local network. The refresh button refreshes this list.

If the IP address and port of the device is know, it can be entered manually or be selected from the device list. Press select to choose the device

- **Upload Image:** After a device is selected, the project can be uploaded to the device. Clicking upload image prompts the user for an image file and uploads that file to the device selected.

- **Change Settings:** The network settings for the EZ Web Lynx device may need to be viewed or changed at times. The settings that can be changed include IP Address, Gateway, DHCP, Netmask, ID, UDP Port, HTTP Port, and TFTP Port. A device must be selected to use this option.

If the IDE is behind a firewall and has problems communication with the device, then the firewall settings may need to be changed. By default the IDE uses UDP ports 7124 and 7123 to detect the device. The firewall may also need to be set to allow for UDP, TFTP, and HTTP traffic to and from the device. Note that the ports used can be set differently for each device. Contact your system administrator for assistance.

3.1.8 Slide-out Windows

Along the left side of the IDE window is a series of slide-out windows for the user to quickly include files, insert document tools or simulate the web view.



- **Project Manager:** Contains a list of files in the current project. Checking a file will include the file in the project image that can be uploaded to the device. The device does not support sub-directories.

It is recommended that all files in the project be kept in the same directory, as the file will always be placed in the root directory on the device.

To add an add existing file to the project select add. To remove a file from the current project highlight the project in the list and select remove.

All files must be in short (8.3) format.

- **Insert Tab:** This window allows for easy insertion of images, lists, and other HTML objects as well as EZ Web Lynx commands.

Position the cursor in the editor and click the command to insert. This option is available only when the editor is in the visual mode.

- **Simulate:** A visualization of the dynamic content output. Choose the Internet Explorer mode in the editor.

This mode will simulate any of the EZ Web Lynx commands. Any of the network settings, ID, serial number, Pin status, and key values may be entered or changed. Press the refresh button to update the display using the current settings.

- **Simulate Errors:** This window displays potential problems that were detected the last time the IDE simulated dynamic content. Some problems that are detected are, missing Endif tags and key values with incorrect parameters.

3.1.9 Using Command-line Parameters

Some users may find it useful to create a project outside of the IDE or the user may want to automate the process of uploading a project to a device. To support this some functions of the IDE can be invoked from the command line as follows.

<i>-P Project_file Image_file</i>	Creates an image from the project file and saves it as Image_file
<i>-D source_dir Image_file</i>	Creates an image using all files in source_dir and saves it as Image_file. This allows an image to be created without the project file created by the IDE.
<i>-U IPAddress:port Image_file</i>	Uploads the Image file to the device at IP Address:port. Note that port is the UDP command port for the device.



3.1.10 Help File

The Help File included with the EZ Web Lynx IDE enables users to obtain details for programming. The Help File has three topics: 1)IDE Function explanations 2) Basic HTML tags, and 3) Custom HTML tags.



3.2 Custom Web Pages

One of the features of the EZ Web Lynx is the ability to create and upload custom web pages to the device. Using a set of custom HTML tags (see **Section 4.14** HTML Instruction Set), the web pages interact with the EZ Web Lynx device to view the conditions of the I/O ports, change the device settings, view incoming data, and more. The EZ Web Lynx IDE has the ability to create, simulate, compile, and upload web pages from a PC to any EZ Web Lynx device. (See **Section 4.9** for creating and uploading web pages to an EZ Web Lynx device.) Some key information regarding the custom web pages:

- The EZ Web Lynx 5V device has 927kB of Flash memory available for storing web pages. The EZ Web Lynx 3.3V device has 896kB available.
- There are two pages that the device may look for, and therefore, should be part of the pages loaded onto the device:
 - index.htm will be loaded when the IP address accessed by a web browser and no file is specified in the URL
 - error404.htm will be loaded when the requested file cannot be found. If not provided, a simple 404 page will be generated.
- File types supported:
 - HTML (.htm extension)
 - XML (.xml)
 - Text (.txt)
 - GIF (.gif)
 - JPEG (.jpg)
 - PNG (.png)
 - Icons (.ico)
 - Cascading Style Sheets (.css)
 - All other file extensions will be read as plain text
- Files should be in 8.3 character format
- Custom HTML tags will be processed in any type of file, as they are read, except for within images of supported types.



3.2.1 HTML Instruction Set

The EZ Web Lynx allows customized, dynamic web content, created by using a set of custom HTML tags. These tags interact with the EZ Web Lynx when a web page is loaded; allowing the web pages to change based on the current state of the EZ Web Lynx.

The tags in the HTML instruction set are different from the commands in the Command Set. HTML instructions may only be used in the context of a web page. Commands from the command set may be included in web pages by using the READ and EXEC custom HTML tags.

Tag	Values	Description
<!--(PIN x)-->	x is a pin number	The element is replaced with 0 if the pin is low and 1 if it is high. The PIN will be set to input mode.
<!--(PIN x ltag/htag)-->	x is a pin number ltag is the text if the pin is low htag is the text if the pin is high	The element is replaced with ltag if the pin is low and htag if it is high. The PIN will be set to input mode.
<!--(PIN x ANALOG)-->	x is a pin number	The element is replaced with a number of the form x.xx representing the pin voltage. This pin will be set to analog mode and direction set to input.
<!--(PIN x ANALOG*a/b+c-d,p)-->	x is a pin number a is a number to multiply the analog voltage by (*a is optional) b is a number to divide the analog voltage by (/b is optional) c is a number to add to the analog voltage (+c is optional) d is a number to subtract from the analog voltage (-d is optional) p is the number of decimal places	The element is replaced with a number representing the calculation result. This pin will be set to analog mode and direction set to input. The operators (*/+/-) must be used in this order.

Tag	Values	Description
<!--(SERIAL DATA x y)-->	x and y are the beginning and ending index of the last serial frame captured	The element is replaced with the last serial frame of data from character index x to y. If you want to read the full serial frame, use the READ HTML extension documented below. See the chapter titled Serial Buffering.
<!--(IF PIN x = n)-->	x is a pin number n is 0 or 1	If the statement is false text is removed up to the ELSE or ENDIF.
<!--(IF PIN x < a)-->	x is a pin number	If the statement is false text is removed up to the ELSE or ENDIF.
<!--(IF PIN x > a)-->	a is a number in the range (0.00-5.00) (5 V version) or (0.00-3.30) (3.3 V version)	If the statement is false text is removed up to the ELSE or ENDIF.
<!--(IF KEY = n)--> <!--(IF KEY != n)--> <!--(IF KEY < n)--> <!--(IF KEY <= n)--> <!--(IF KEY > n)--> <!--(IF KEY >= n)-->	KEY is a valid key (see chapter titled Command Set) n can be an integer or float depending on which key is used	If the command's VALUE does not follow this conditional check, text is removed up to the ELSE or ENDIF.
<!--(ELSE)-->		Used for the IF directive
<!--(ENDIF)-->		Used for the IF/ELSE directive
<!--(EXEC KEY=VALUE)-->		Executes a command from the command set.
<!--(READ KEY)-->		Reads a command from the command set.

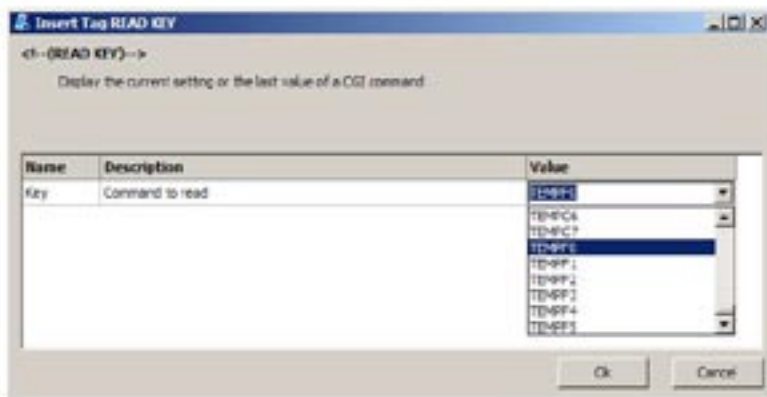
3.2.2 Example web page for reading temperature sensor

This example shows how to create a basic web page using the EZ Web Lynx IDE that displays the temperature of the sensor on the docking station. This web page will be uploaded to the device and viewed using a web browser.

- Open the EZ Web Lynx IDE software.
- Click the “New Project” button to create a new project—name this project tempsnsr.pjt.
- The visual tab should be showing in the editor window—if not, click the “visual” tab to open this view.
- Delete the default web page by highlighting all of the text and pressing the delete key
- Open the HTML toolbar by clicking the “HTML” option in the menu bar at the top of the window.
- In the “Commands” drop-down menu, select the “READ KEY” option—this is the HTML tag that will allow you to read any of the commands from the AT command set.



- Click the “Insert” button.
- In the dialog box that pops up, double-click the “Value” box to get a list of valid keys that can be read.
- Select the TEMPF0 key from the drop-down menu and click the OK button.



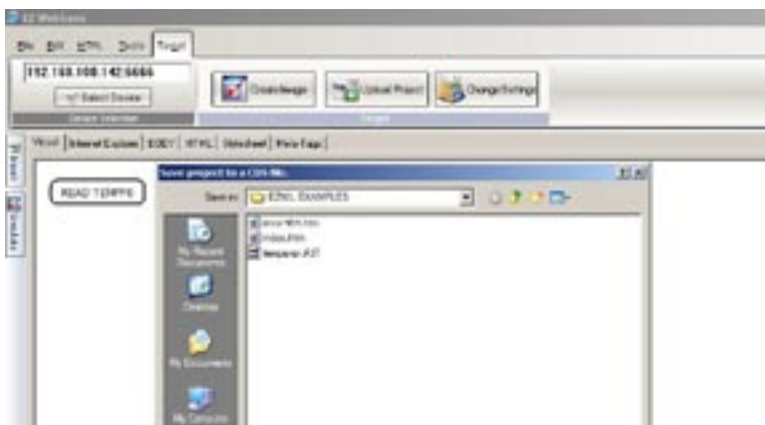
- This will insert the `<!--(READ TEMPF0)-->` HTML tag in the document. Switch to the “BODY” tab to view the HTML code that was created by inserting this tag. In the dialog box that pops up, double-click the “Value” box to get a list of valid keys that can be read.



- In the “Target” toolbar, click the “Select Device” button.
- A dialog box will open showing any available EZ Web Lynx devices on the local network. If you do not see your device, refer to the Networking Quick-Start Guide to correctly configure the device for your network.
- Select the device in the box on the left and click the “Select” button.



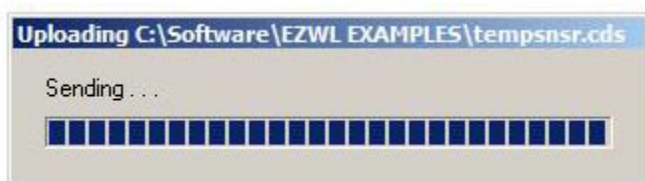
- In the “Target” toolbar, click the “create image” button.
- Save the file image as “tempdata.cds” and click the OK button.



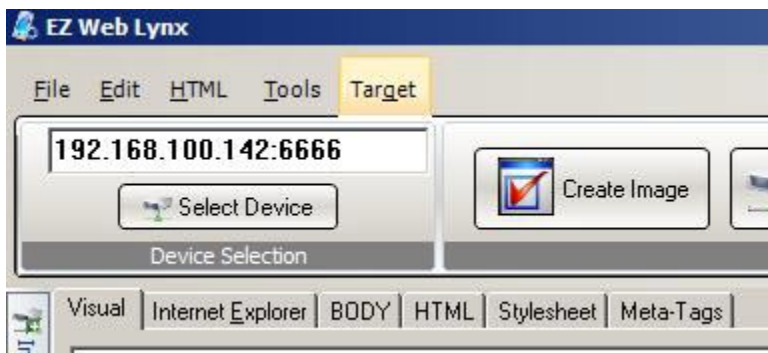
- Click the “Upload Project” button and select the “tempdata.cds” file that was just created.



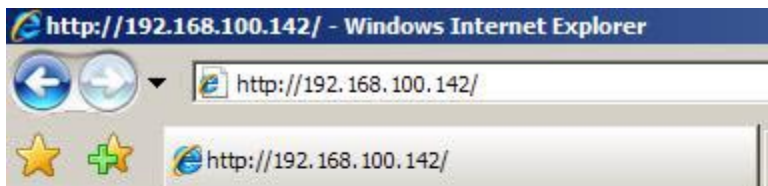
- A progress bar will appear showing how much of the download has been completed. When the upload is finished, a window will appear indicating that the data has been uploaded.



- To view the web page, open a web browser and type the IP address of the device in the web browser's toolbar. The device's IP address can be found on the far-left side of the "Target" toolbar.



- In the web browser, the page that is loaded from the EZ Web Lynx will show the temperature of the sensor on the Docking Station.



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3.2.3 Example web page using conditional HTML tags

This example will show how to create a web page using the IF, ELSE, and ENDIF conditional HTML tags. The web page will then be simulated using the EZ Web Lynx IDE simulator feature.

- Create a new project using the same method as the previous example. Name this project “analog.pjt” and save the project. Insert the following tags, in order, using the same method as in the previous example:

PIN 1 ANALOG



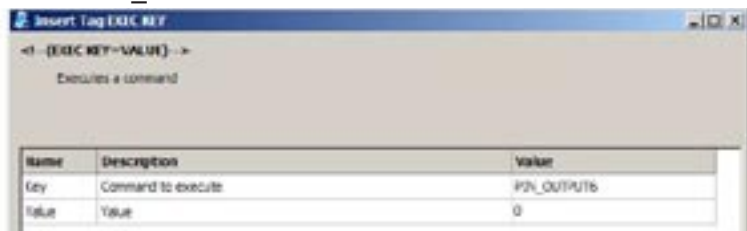
IF PIN 1>2.50



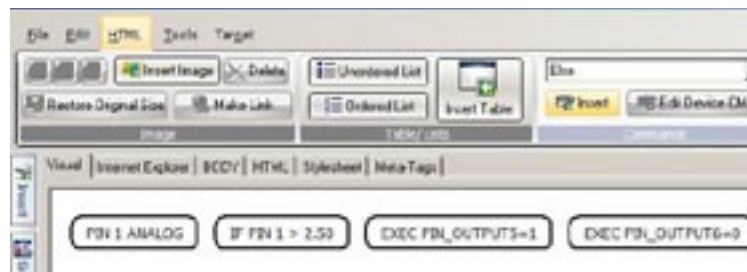
EXEC PIN OUTPUT5=1



EXEC PIN_OUTPUT6=0



ELSE



EXEC PIN_OUTPUT5=0



EXEC PIN_OUTPUT6=1



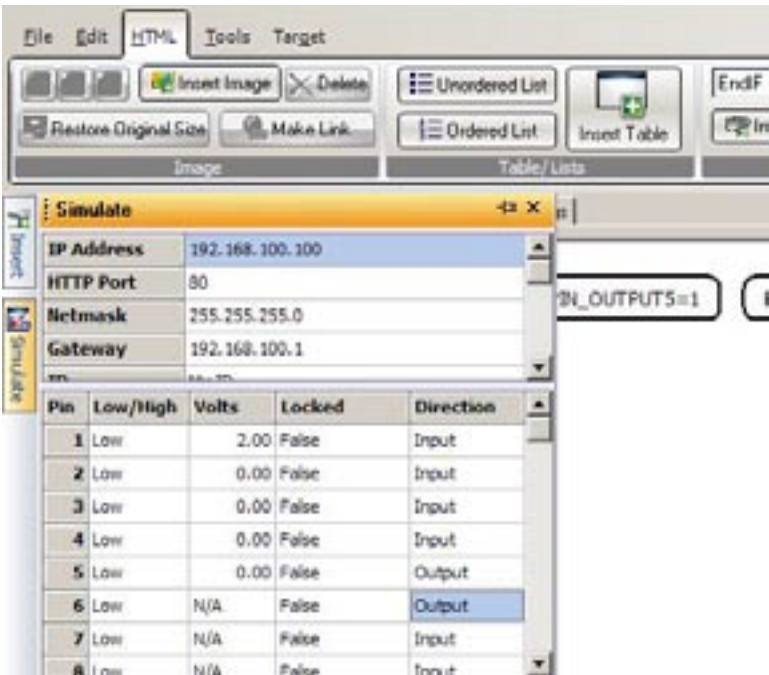
ENDIF



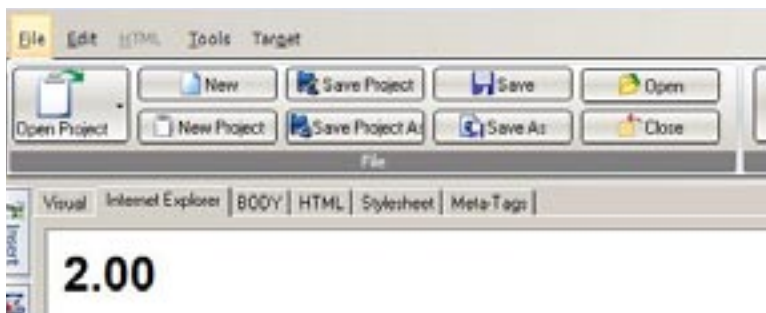
- The final page in the “visual” tab should look like this:



- Place the mouse cursor over the simulate sidebar on the left side of the window. This window is used to change the settings for the IDE's simulator. Change the these settings:
PIN 1: Volts (2.00) Direction(Input) all others don't care
PIN 5: Direction (Output) all others don't care
PIN 6: Direction (Output) all others don't care



- Open the “Internet Explorer” tab. This tab is used to display the results of the simulated web page. The page should display the voltage you entered for pin 1 in the simulator tab.



- Place the mouse cursor over the simulate sidebar once again. This time, the “Low/High” setting for pin 5 will display “Low” indicating that the device outputted a low voltage on the pin. Likewise, pin 6 should display “High”.

Pin	Low/High	Volts	Locked	Direction
1	Low	2.00	False	Input
2	Low	0.00	False	Input
3	Low	0.00	False	Input
4	Low	0.00	False	Input
5	Low	0.00	False	Output
6	High	N/A	False	Output

- Change the “Volts” setting on pin 1 to 3.00. The simulator will now display this voltage on the “Internet Explorer” view, show pin 5 as “High” and show pin 6 as “Low” in the simulator tab.

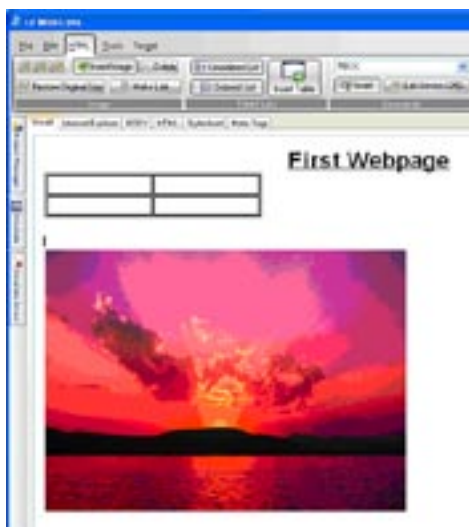
Pin	Low/High	Volts	Locked	Direction
1	Low	3.00	False	Input
2	Low	0.00	False	Input
3	Low	0.00	False	Input
4	Low	0.00	False	Input
5	High	0.00	False	Output
6	Low	N/A	False	Output

- This web page can be loaded to the EZ Web Lynx device using the same method as the previous example if desired.

3.2.4 Example 2: Using the Visual Editor

The visual tab provides a simple visual HTML editor that allows for quick editing of your project with minimal knowledge of HTML syntax and provides real time editing. Additionally, users can change font type/size, and inserting tables/images/custom tags/links. The following exercise will demonstrate how to use this window.

1. Open the Example 1 project, index.htm from the IDE. Click the Visual tab to work in visual editing mode.
2. Highlight the text and click on the Edit ribbon to change the font type, size, and layout.
3. Click on “center”, “bold”, and “underline”. Type “First Webpage” for the title.
4. Move cursor to a new line and if needed remove the title formatting.
5. Click the HTML ribbon to insert a table and image.
6. Click “Insert Table”, and edit table properties for a table with 2 rows and 2 columns. Click OK.
7. Leave the table elements blank for now.
8. Move cursor to a new line and click the “Insert Image” button.
9. Browse to an image file saved on the hard drive. Select and click OK.
10. The following is an example of what your page may look like.



3.3 Pin Input

The main purpose of the EZ Web Lynx is to be able to control/monitor an embedded device. This section will explore the use of custom HTML tags that will interface with the EZ Web Lynx Development kit. Consult the included manual for a more in depth discussion of all the included commands. Follow the steps below to add HTML tags that will control input of pins on the EZ Web Lynx module.

1. Place cursor in the first element of the table inserted in Example 1. Type the following text into the field: "Pin 1".
2. Select the HTML Ribbon and open up the drop down box in the commands sub section. Select "PIN X"
3. Place cursor into the top right table element and click Insert. Make sure that the value is "1" and click Ok. This tag will be replaced with a 1 or 0 depending on the current state of PIN 1
4. Now place cursor in the bottom left table element and type "Pin 2 Voltage".
5. Open up the command drop down box and select "PIN X" Analog.
6. Place cursor into the bottom right table element and click Insert. Make sure that the value is "2" and click Ok. This tag will be replaced with the analog voltage of the current state of PIN 2
7. Now the window should look similar to the following:



4. Using EZ Web Lynx

EZ Web Lynx is designed to communicate with equipment in three ways to make integration with a device quick and easy.

4.1 Command Interfaces

EZ Web Lynx users can communicate with the equipment through three interfaces: Serial AT, UDP Server, and HTTP CGI. These allow for configuration and control of the device. See the **Command Set** section for information on the specific commands and their functions.

4.1.1 Serial AT Command Interface

The serial AT interface allows the user or other processors to configure and operate the device without the need for a network connection. The default serial settings are 8N1, 9600 baud, and no flow control. All commands are preceded with "AT*". In order to write (execute) a command, use the following formats:

- AT*KEY=VALUE<CR><LF>
- AT*PIN_OUTPUT1=1
- AT*PIN_INPUT2?

To quickly repeat the last command, press the ! key (Shift +1). If the KEY and VALUE are valid, the command interface will return an OK message. If either is invalid, the interface will return an ERROR message along with an error code. See **Table T3.1.1** for descriptions of each of the error codes. This table should also be referenced for any errors in the UDP Server Interface, and errors not returned from GET or POST HTTP.

To read a command from the AT interface, use the following format:
AT*KEY?<CR><LF>

If the KEY is valid and readable, the interface will return the following message: KEY=VALUE<CR><LF>

T4.1.1 Error Messages

Code	Description
1	Bad command or invalid key.
2	Pin number out of the valid range.
3	Pin is locked. Cannot change setting.
4	Invalid register issued to REG or NVREG command.
5	Invalid number of bytes issued to REG or NVREG command.
6	Attempt to read a write-only command.
7	Attempt to write a read-only command.
8	Value out of range.
9	Pin does not have analog capability (PIN_ANALOG command).
10	System is locked—cannot change settings
11	Bad password issued to UNLOCK command.
12	Attempt to use I2C (to read temperature, etc.) when the I2C bus does not appear valid.
13	Resource is busy, try again later.
14	Timeout performing desired action.

4.1.2 UDP Server Interface

The EZ Web Lynx also includes a UDP server for accepting AT commands. The EZ Web Lynx IDE uses this feature to configure the device. For a more specialized use, a custom application could be developed to communicate with the EZ Web Lynx. The interface for the UDP AT commands is the same as for the serial AT interface. The default UDP port for commands is port 6666. This port can be changed using the IDE or any of the AT command interfaces (serial, UDP HTTP).

4.1.3 HTTP (Web) CGI Interface

Commands can be issued to the EZ Web Lynx using HTTP CGI GET and POST commands. GET commands can be issued from any web browser or from a custom application, and are appended to the end of the URL. The following is an example of a GET command:

```
http://www.website.com/filename.htm?KEY1=VALUE1&KEY2=VALUE2&KEY3=VALUE3...
```

The total number of characters in the filename and the KEY/VALUE pairs must be less than 256. Sets of commands that contain 256 characters or more must be split into multiple GET requests.

See **Section 3.8** for additional Command Set information.

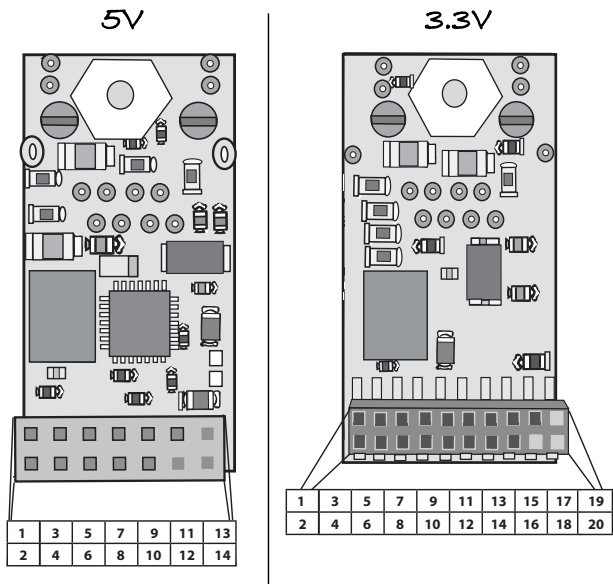
See **Table T4.1.1** for a description of the error codes.

HTML POST requests are similar to GET requests but are embedded within HTML pages. POST requests usually take the form of HTML forms similar to the following:

```
<form name="thisform" action="" method="post">
  <input type="radio" name="DHCP" value="1"/> DHCP
  <input type="radio" name="DHCP" value="0"/> NO DHCP
</form>
```

In POST requests, the name field represents the KEY and the value field represents the VALUE for the command to be executed.

4.2 Connections



T4.2a

5V EZ Web Lynx

Pin Number	Description
1	Analog Input 1/Digital I/O
2	Analog Input 2/Digital I/O
3	Analog Input 3/Digital I/O
4	Analog Input 4/Digital I/O
5	Analog Input 5/Digital I/O
6	Pulse Counter (not available on all hardware revisions)
7	PWM (not available on all hardware revisions)
8	TX - Serial Data Transmit (from EZ Web Lynx to PC or other serial device)/Digital I/O
9	RCV - Serial Data Receive (from PC to EZ Web Lynx)/Digital I/O
10	Dallas DS1621 or DS1631 I ² C Temp Sensor SCL (clock) line/Digital I/O
11	Dallas DS1621 or DS1631 I ² C Temp Sensor SDA (data) line/Digital I/O
12	RST (Active-low Reset)
13	Vdd (5V)
14	GND

T4.2b**3.3V EZ Web Lynx**

<i>Pin Number</i>	<i>Description</i>
1	Analog Input 1/Digital I/O
2	Analog Input 2/Digital I/O
3	Analog Input 3/Digital I/O
4	Analog Input 4/Digital I/O
5	Analog Input 5/Digital I/O
6	Analog Input 6/Digital I/O
7	Digital I/O
8	TX - Serial Data Transmit (from EZ Web Lynx to PC or other serial Device)/Digital I/O
9	RCV - Serial Data Receive (from PC to EZ Web Lynx)/Digital I/O
10	Dallas DS1621 or DS1631 I ² C Temp Sensor SCL (clock) line/Digital I/O
11	Dallas DS1621 or DS1631 I ² C Temp Sensor SDA (data) line/Digital I/O
12	Digital I/O
13	Digital I/O
14	Digital I/O
15	Digital I/O
16	Digital I/O
17	Digital I/O
18	RST (Active-low Reset)
19	Vdd (3.3V)
20	GND



To install the EZ Web Lynx, connect Vdd to a voltage source (5V or 3.3V) and GND to circuit ground. RST should be left floating when not in use. To reset the EZ Web Lynx, pull this pin to ground. A common connection would be to a switch or pushbutton between RST and ground. Connect the Ethernet jack to any 10Mbps network switch or hub. Then connect the input/output pins as desired. The following sections describe in greater detail how these I/O pins can be used.



4.3 Digital Input

Any of the I/O pins (pins 1-11 on EZ Web Lynx 5V or pins 1-17 on EZ Web Lynx 3.3V) can be used as digital inputs. When configured as a digital input, any of the other features of the pin (Serial, I²C, Analog) are unavailable.

4.4 Digital Output

Any of the I/O pins referenced for digital inputs can be used for digital output. When configured as a digital output, any of the other features of the pin are unavailable.

4.5 Analog Input

Pins 1-5 on the 5V module or 1-6 on the 3.3V module can be used as analog inputs. These inputs have the range GND-Vdd and a resolution of .02V for the 5V module and .01V for 3.3V module. The analog input should be used consecutively, starting from Pin 1. For example, if one analog input is needed, use Pin 1; if 2 are needed, use Pin1 and Pin 2; if 3 are needed, use Pin 1, Pin 2, and Pin 3; etc. The use of analog pins out of order may produce undesirable results.

4.6 I²C Temperature Sensor

EZ Web Lynx can be connected directly to an I²C temperature sensor such as the Dallas DS1621 or DS1631. Connect Pin 10 to the SCL pin on the sensor and Pin 11 to the SDA pin on the sensor. Pull up resistors must be used on both the SDA and SCL lines (4.7kΩ recommended). For additional information, see **Section 4.9.3**. These connections are already present if using the EZ Web Lynx Development Kit.

4.7 Serial Communication

To use the serial port on the EZ Web Lynx, Pin 8 is the TX line (from the EZ Web Lynx to the PC or other device) and Pin 9 is the RCV line. The EZ Web Lynx transmits and receives using TTL levels (GND-Vdd) so if connecting to a PC or other RS232 serial device, an RS232 level converter chip must be used. The default serial settings are 8N1, 9600 baud, and no flow control. The serial baud rate may be changed using the EZ Web Lynx command set.

4.8 Command Set

The EZ Web Lynx uses a set of commands to change settings, control input and output pins, and take sensor readings. The chart of AT commands refers to these commands that can be issued to the device. These commands can be sent to the device via the serial or UDP command interface or by using the “READ KEY” or “WRITE KEY” HTML tags. See **T3.8**. The specifics of operating each of these interfaces is discussed in Sections 3.1-3.1.3. The command set works on a KEY=VALUE system. Each command has a unique key and range or set of values associated with it. Most commands can be read or executed (write). Reading a key generally displays a value that is associated with that key. Writing a key usually changes that value. The majority of keys can be written or read, however, there are a few that can only do one or the other.

The following table lists the valid keys, acceptable values, and the results of reading and writing each key.

T4.8

Key	Read	Write	Values
PIN_OUTPUTxx	xx is the pin number. Reading this command will return the current setting (0=set low, 1=set high, 2=floating/high impedance)	If 0 is written, pin is set to low. If 1 is written, pin is set to high. If 2 is written, pin set to floating/high impedance.	0 = set low 1 = set high 2 = floating/high impedance.
PIN_INPUTxx	xx is the pin number. Samples the current state of the pin and returns the value (1=high, 0=low).	N/A	N/A
PIN_ANALOGxx	xx is the pin number. Reads the analog voltage on the specified pin and returns it in the form XX.X. Specifying a pin that does not have analog capability will return an error.	Sets the specified pin to be an analog input.	Value is ignored.
PIN_LOCKxx	xx is the pin number. Returns whether the specified pin is currently locked (1=locked, 0=unlocked).	Lock or unlock the specified pin so its state (Analog/Digital, Input/Output, High/Low) cannot be changed.	1=lock pin 0=unlock pin

(T4.8 cont'd)

Key	Read	Write	Values
REGxx	xx is the register number (0-255). Reads the 8-bit value stored to this location.	Write the 8-bit value to this register.	0-255 See section 4.9.4 for more information.
REG16_xxx	xx is the register number (0-255). Reads the 16-bit value stored at this location.	Write the 16-bit value to this register.	0-65535 See section 4.9.4 for more information.
REG32_xxx	xx is the register number (0-255) Read the 32-bit value stored to this location	Write the 32-bit value to this register.	32-bit value See section 4.9.4 for more information
NVREGxx	The same as REGxx, but contents are read from nonvolatile memory.	The same as REGxx, but the contents are saved to non-volatile memory. Frequent writes can affect the lifetime of the non-volatile memory.	0-255 See section 4.9.4 for more information.
NVREG16_xxx	The same as REG16_xx, but contents are read from nonvolatile memory.	The same as REG16_xx, but the contents are saved to non-volatile memory. Frequent write can affect the lifetime of the non-volatile memory.	0-65535 See section 4.9.4 for more information.
NVREG32_xxx	The same as REG32_xx, but contents are read from non-volatile memory.	The same as REG32_xx, but the contents are saved to non-volatile memory. Frequent write can affect the lifetime of the non-volatile memory.	32-bit value See scetion 4.9.4 for more information.
T2S	The current TCP/IP<->SERIAL (T2S) settings.	Set T2S settings. Be aware that enabling T2S will lock IN-PUT11 to be an output pin, and the serial interface for handling AT commands will be disabled. It takes a power cycle for new settings to take effect.	See 4.9.13 for more information. See Note 1.

(T4.8 cont'd)

Key	Read	Write	Values
STRINGxx	xx is the register number (0-255). Returns the string stored in the volatile location specified.	Saves the string to the specified volatile register.	A string. There are only 256 non-volatile location, and one non-volatile location is used for null termination of string. See section 4.9.10 for more information.
NVSTRINGxx	xx is the register number (0-255). Returns the string stored in non-volatile location specified.	Saves the string to the specified non-volatile location specified. You will be prevented from writing past the non-volatile space. Frequent writes can affect the lifetime of the non-volatile memory.	A string. There are only 256 non-volatile locations, and one non-volatile location is used for null termination of string. See section 4.9.10 for more information.
PWM_DUTYxx	Returns the current duty cycle of Input xx. Not all pins have this capability	Sets the PWM duty of Input xx to the desired value. Will also set the pin to output. Not all pins have this capability.	0-255. 0 is 0% duty cycle (pin is set low), 255 is 100% duty cycle (pin is set high)
SERIAL_BAUD	N/A	Changes the serial baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
SERIAL_ECHO	N/A	Turn on/off echoing of all characters received on the serial port.	1=echo on 0=echo off
SERIAL_START	Returns the serial capture buffer start value as a list of hexadecimal values.	Change the serial capture buffer start value.	Accepts a comma-separated list of hexadecimal digits. The digits can, but need not be, preceded by "0x". For example, the value 0x41,42,0x43" will be interpreted as "ABC." (no "" needed)

(T4.8 cont'd)

Key	Read	Write	Values
SERIAL_END	Returns the serial capture buffer end value as a list of hexadecimal values.	Change the serial capture buffer end value.	Accepts a comma-separated list of hexadecimal digits. The digits can, but need not be, preceded by "0x". For example, the value "0x41,42,0x43" will be interpreted as "ABC." (no "" needed)
SERIAL_KBHIT	Returns how many characters are contained in the last serial capture buffer.	Write a 0 to mark this frame as received. This command will then return 0 until another frame is received.	0
SERIAL_GET	Returns the last received serial buffer, or the last string written manually.	Overwrite the string buffer with this string.	A string.
SERIAL_SEND	N/A	Send characters out the serial port.	Accepts a comma separated list of hexadecimal digits. The digits can, but need not be, preceded by "0x". For example, the value "0x41,42,0x43" will be interpreted as "ABC." (no "" needed)
COUNTERSxx	Returns the number of transition changes that have occurred on Input xx since reset or change. Not all pins have this capability.	Overwrite the current value holding the number of counted transitions.	0-65535 This value is lost on a power-cycle
LCD_GOTO	N/A	Change the cursor position on the LCD screen.	value is in form x,y. x-horizontal position (1-16) y-vertical position (1-2)

(T4.8 cont'd)

Key	Read	Write	Values
LCD_SEND	N/A	Write a string to the LCD. All input pins have to be unlocked prior to writing, else the command is ignored.	Accepts a string of characters. Several special characters are allowed: <ul style="list-style-type: none"> • \f—Clear LCD, return cursor to top left. • \n—Put cursor at beginning of next line. • \r—Put cursor to beginning of current line. • \s—Move cursor one position right without altering contents • \b—Backspace See Note 1
DHCP	Return whether DHCP is enabled or disabled	Enable or disable DHCP*	1=Enable 0=Disable
FIX_RS232	N/A	Writing any non-zero value to this register will cause the RS232 Input pins to be reset to a mode where RS232 is functional. This may require a power-cycle to take affect.	N/A
FACTORY	N/A	Writing a 55 to this register will cause the device to be reset to factory defaults. All configuration will be reset, and all web pages uploaded will be deleted.	N/A
AIP	Return the value of the IP address that will take effect after the device is reset.	Change the value of the IP addresses that will take effect after the device is reset.*	Must be in dotted-quad form (192.168.100.210, for example) This value is only used if DHCP is not enabled.
IP	Return the current IP address	N/A	N/A

*Changes to networking configurations are stored internally and do not take effect until the EZ Web Lynx is reset.

(T4.8 cont'd)

Key	Read	Write	Values
AGW	Return the value of the gateway address that will take effect after the device is reset.	Change the value of the netmask that will take effect after the device is reset.*	Must be in dotted-quad form (192.168.100.210, for example) This value is only used if DHCP is not enabled.
GW	Return the current gateway address.	N/A	N/A
ANMASK	Return the value of the netmask that will take effect after the device is reset.	Change the value of the netmask that will take effect after the device is reset.*	Must be in dotted-quad form (For Ex., 255.255.255.0) This value is only used if DHCP is not enabled.
NMASK	Return the current netmask	N/A	N/A
HTTP	Returns the TCP port used for HTTP.	Change the TCP port used for HTTP.*	0-65535 0 will disable HTTP service 80 is default
HTTP_USER	Returns the current HTTP username stored to the unit.	Write a new HTTP username to the unit. This username is only used for authenticated webpages.	A string, max 20 characters. See 4.9.12 for more information.
HTTP_PASS	Returns the current HTTP password stored to the unit.	Write a new HTTP password to the unit. This password is only used for authenticated webpages.	A string, max 20 characters. See 4.9.12 for more information.
TFTP	Returns the UDP port used for TFTP file transfers.	Change the UDP port for TFTP.*	0-65535 0 will disable 69 is default
UDP	Returns the UDP command port.	Change the UDP command port.*	0-65535 0 will disable 6666 is default
UPD_TX	Returns the current UDP TX port.	Set the UDP TX port.	This port is used by the UDP_SEND command, and any related commands that use UDP_SEND. See UDP_SEND for more information.

* Changes to networking configurations are stored internally and do not take effect until the EZ Web Lynx is reset.

(T4.8 cont'd)

Key	Read	Write	Values
UDP_HOST	Returns the current UDP TX hostname/IP address	Set the UDP TX hostname/IP address	This hostname is used by the UDP_SEND command, and any related commands that use UDP_SEND. See UDP-SEND for more information. This can be an IP address or hostname. If a hostname is used, make sure your DNS is set properly. See Note 1
UDP_SEND	N/A	Sends the specified string to the configured port and host. While it is sending the serial interface will be blocked until transmission is complete or transmission times out.	Any string. See Note 1
HWTYPE	Returns the current EZWebLynx hardware type/revision.	N/A	0 = 5V Revision 1 1 = 5V Revision 2 2 = 3.3V Revision 1
DNS	Returns the current DNS server. This value is dynamic; if DHCP is enabled it is the value received from the DHCP server, if DHCP is disabled it is the DNS server configured with the ADNS command.	N/A	An IP address. This is the IP address of the DNS server that is currently being used by the software.
ADNS	Returns the static DNS server IP address.	Writes the static DNS server IP address.*	An IP address. This is the IP address of the DNS server that will be used by the software if DHCP is disabled. This value is only used if DHCP is not enabled.
BOUND	Returns the current status of the DHCP client	N/A	0-DHCP is not bound or disabled. 1-DHCP is bound and connected to server.

(T4.8 cont'd)

Key	Read	Write	Values
MAC	Returns the MAC address of the unit.	N/A	A 6 byte MAC address.
LINK	Read the current link status.	N/A	Returns 1 if Ethernet is connected to the device, 0 if it is not connected.
RESET	N/A	Reboot the device (for IP configuration changes to take effect)	1=Reboot Device
ANNOUNCE_PORT	Read the port that announce messages will be broadcast on.	Change the port that announce messages will be broadcast on. Also changes the port that listens for announce message requests. (CAUTION)	0-65535 7123 is default (always listens on announce_port + 1 for announce requests).
ANNOUNCE_NOW	N/A	Causes the EZ Web Lynx to broadcast a number of announce messages over the network.	Value is the number of announce messages to broadcast (1-255) 0 will stop any broadcast currently enqueued.
TEMPyxx	Reads the current temperature from an attached Dallas DS1621/1631 I ² C temperature sensor. y is F or C (Fahrenheit or Celsius). xx is the I ² C address of the temperature sensor (0-7).	N/A	N/A
ID	Returns the ID string programmed into the device.	Changes the ID string of the device.	Any string up to 25 characters.
SSN	Returns the serial number of the device.	N/A	N/A
VER	Returns the current firmware revision of the EZ Web Lynx.	N/A	N/A

(T4.8 cont'd)

Key	Read	Write	Values
LOCK	Returns 1 if locked, 0 if un-locked.	Prevents ANY changes (web pages or configuration) until unlocked.	VALUE contains the new password to use.
UNLOCK	N/A	Unlocks the device after being locked	VALUE must contain the password specified when LOCK was executed.
EMAIL_TO	Read the TO field of any future emails.	Edit the TO field of any future emails.	String
EMAIL_FROM	Read to FROM field of any future emails.	Edit the FROM field of any future emails.	String
EMAIL_SUBJECT	Read the subject line of any future emails.	Edit the subject line of any future emails.	String
EMAIL_NOW	N/A	Send a status email immediately.	1=Send email All other values ignored
EMAIL_HOST	Returns the current SMTP server used for sending email.	This command changes the SMTP server that the EZ Web Lynx will communicate with to send email.	The value can be either the domain name (i.e.: ezweblynx.com) or the IP address of the SMTP server.
EMAIL_USER	Returns the current SMTP/E-mail server username.	Sets the current SMTP/E-mail server username.	If your SMTP/E-mail server requires authentication, then you will need to use EMAIL_USER and EMAIL_PASS to set your username and password. These values are strings.
EMAIL_PASS	Returns the current SMTP/E-mail server password.	Sets the current SMTP/E-mail server password.	If your SMTP/E-mail server requires authentication, the you will need to use EMAIL_USER and EMAIL_PASS to set your username and password. These values are strings.

(T4.8 cont'd)

Key	Read	Write	Values
EMAIL_PORT	Returns the current TCP port of the SMTP/E-mail server	Sets the TCP port of the SMTP/E-mail server.*	An integer, representing the TCP port (0-65535). Default is 25.
TRIGGER_SAFETY	Returns the current triggering safety method.	Set the current triggering safety method.	0 = safety off 1 = safety on (default) If the safety is on, a trigger cannot fire again until it's action has stopped. For example, if the unit triggers on an input going high, it will not trigger again until the input goes low. See section 4.9.11 for more information
TRIGGER_DELAY	Returns the current triggering delay.	Set the current trigger delay.	0-4294967295 (seconds). This is the delay between trigger events before a trigger can fire again. Most actions have a minimum value of 5 seconds, except e-mail which is 300 seconds. See section 4.9.11 for more information
TRIGGER_INSPECT_x	x is trigger number. Read the trigger's inspect algorithm.	x is trigger number. Set the trigger's inspect algorithm.	See section 4.9.11.1 of this document for format.
TRIGGER_ACTION_x	x is trigger number. Read the trigger's action algorithm	x is trigger number. Set the trigger's action algorithm.	See section 4.9.11.2 of this document for format.

Note 1: This feature is disabled by default on Rev1 5V Modules. If you would like this feature enabled on these units, please contact CCS technical support.

4.9 Features

There are many unique features of the EZ Web Lynx that can be incorporated into your project. The following section describes in more detail how some of these special features work.

4.9.1 Device Lock

The EZ Web Lynx can be password-protected to prevent any other users from changing the configurations of the device. To lock the device, use the LOCK command as described in the Command Set section and specify a password. When locked, the device will not allow changes to the IP configuration, serial configuration, email configuration, or device ID. To unlock the device, call the UNLOCK command with the correct password.

4.9.2 Pin Lock

The I/O pins on the EZ Web Lynx can be individually locked in their current state by using the PIN_LOCK command. When locked, a pin's current I/O direction (input/output), latch (high or low when configured as output), and analog/digital/I²C/serial mode configurations cannot be modified. The PIN_LOCK command is also used to unlock a pin.

4.9.3 I²C Temperature Sensor

Pins 10 and 11 have a secondary purpose for communication with a Dallas DS1621 or DS1631 I²C temperature sensor. To use either of these sensors, connect pin 10 to the SCL pin on the sensor. To use either of these sensors, connect Pin 10 to the SCL pin on the sensor and Pin 11 to the SDA line. Both of these lines need to be pulled up with 4.7Ω resistors. Connect the Vdd and GND lines between the EZ Web Lynx and the sensor. The A0, A1, and A2 lines can be connected to either Vdd or GND to create the I²C address for the particular device. The temperature sensor can then be monitored in either Fahrenheit or Celsius using the TEMP commands in the preceding **Table 3.8**.

4.9.4 Data Registers

To change a value in the registers, send either the REG (volatile) or NVREG (non-volatile) commands to the EZ Web Lynx. Both sets of registers follow the same syntax:

AT*REGxxx=y -or- AT*NVREGxxx=y

The value xxx is replaced with the register number that you wish to access (0-255); y is the value that you wish to store.

Multi-byte values can be stored with the REG16_xxx, REG32_xxx, NVREG16_xxx or NVREG32_xxx commands. A multi-byte value allocates multiple 8-bit registers. For example:

AT*REG32_0=1000

This example would write an 0xE8 to register 0, a 0x3 to register 1, and 0x00 to register 2 and 3. That means the next available free register is 4.

4.9.5 Serial Capture Buffer

The EZ Web Lynx includes a feature that allows the device to automatically capture a specific frame of serial data based on user-specified start and stop conditions. This feature is extremely useful if using the EZ Web Lynx in a serial device where information needs to be processed frequently, or that sends out a specific serial error code that must be captured.

To enable the serial capture buffer, a start and stop sequence must be specified to the device. This is done by sending the commands:

- AT*SERIAL_START=A,B,C...
- AT*SERIAL_END=D,E,F...

The values of each of these commands is a single hexadecimal character or comma-separated list of characters. The start and end buffers may each be up to 20 characters long. When the EZ Web Lynx detects the specified start sequence on the serial port, it begins internally buffering the characters. The device stops buffering characters when it detects the complete sequence of end characters. The EZ Web Lynx will buffer up to 125 serial characters, including the start and stop characters.

To check the status of the serial buffer and access the buffered stream, two commands are used:

- AT*SERIAL_KBHIT
- AT*SERIAL_GET

SERIAL_KBHIT is used to check how many characters are buffered in the last complete (start and stop sequence detected by the EZ Web Lynx) frame that was received. This value includes the start and stop characters. If the command returns 0, no characters have been buffered yet. This value may be cleared by executing this command with a value of 0. The serial buffer will still be available to the user after having been cleared.

SERIAL_GET returns the received serial stream. This stream will include both the start and stop sequences.

Additionally, the EZ Web Lynx includes a custom HTML tag for viewing serial data. The <!--(SERIAL_DATA x y)--> tag will print all received serial characters from index x to index y where the first character is index 0.

The following is an example of how this can be used when writing a web page.

```
...
<!--(IF READ SERIAL_KBHIT>0)-->
  Serial Data:<!--(SERIAL_DATA 3 15)-->
<!--(ELSE)-->
  NO SERIAL DATA!
<!--(ENDIF)-->
...
```

This will display any serial data from the third character to the 15th character. Otherwise, it will display “NO SERIAL DATA” on the web page.

See **Section 2.7.12** HTML Instruction Set for details.



4.9.6 Email

The EZ Web Lynx has the ability to send event-driven email alerts as well as a timed status email. See section 4.9.11 for information on how to setup event driven email alerts

An email notice would look something like this:

```
Subject: Warning: Temperature Too Warm
Status of EzWebLynx#6474
PIN 1: UNLOCKED
      DIGITAL: input, high
PIN 2: UNLOCKED
      DIGITAL: input, high
PIN 3: UNLOCKED
      DIGITAL: input, high
PIN 4: UNLOCKED
      DIGITAL: input, high
PIN 5: UNLOCKED
      DIGITAL: input, high
PIN 6: UNLOCKED
      DIGITAL: input, high
PIN 7: UNLOCKED
      DIGITAL: input, high
PIN 8: UNLOCKED
      SERIAL
PIN 9: UNLOCKED
      SERIAL
PIN 10: UNLOCKED
      I2C
PIN 11: UNLOCKED
      I2C TEMP: 84.3F
                        29.0C
```

The user is also be able to request a status email be sent immediately.

The user is be able to configure the email options using the AT interface (serial, UDP or HTTP). The email will contain the state (input or output, analog or digital, high/low/analog voltage) of each of the inputs. If the EZ Web Lynx is configured to read a temperature sensor, the current temperature will be sent in the email, as well.



4.9.7 LCD

The EZ Web Lynx is programmed to operate a 2x16 character LCD. The LCD can be used to assist in configuring the EZ Web Lynx before installing in an end-product. The LCD uses pins 1-8 of the EZ Web Lynx. Therefore, when the LCD is being used, those pins will be locked. In addition, because pin 8 is used, the serial interface cannot be used when the LCD is being used.



An LCD may also be incorporated into a product that uses the EZ Web Lynx. Using the same commands, the LCD can be controlled by the EZ Web Lynx device. To accomplish this, connect the LCD to the EZ Web Lynx in the following manner:

LCD Pin	5V EZ Web Lynx Pin
Vss (Power Supply)	5v supply ¹
Vdd (Ground)	GND
Vo (Contrast Adjust)	See Note*
RS (Register Select)	Pin 8
R/~W (Read/Write)	Pin 7
E (Enable)	Pin 6
D0	N/C
D1	N/C
D2	N/C
D3	N/C
D4	Pin 1
D5	Pin 2
D6	Pin 3
D7	Pin 4

* The Vo pin needs a voltage between 0.0-0.5V to adjust the LCD contrast. The most common way is to connect a potentiometer between Vdd and Vss, and use the potentiometer's output voltage to adjust the contrast.

¹ Most LCD modules require a 5V supply to power the LCD. A separate 5V source may be needed when using the 3.3V EZ Web Lynx. See the specifications on the datasheet for your particular LCD.



4.9.8 Device ID

To make identification of a particular device in an environment with multiple EZ Web Lynx devices, the user may assign a custom device ID to each module. This is accomplished using the ID command. This ID string may contain up to 25 characters.

4.9.9 IP Discovery Announcements

If DHCP is enabled on an EZ Web Lynx module and no serial interface is available to determine the IP address of the device, a special UDP packet will be broadcast over the network to allow a user to determine the IP address of the device. This packet will be broadcast to the UDP announce port (default is 7123) specified in the ANNOUNCE_PORT command. The packet will contain the IP and MAC address of the device (in the packet's header), the device ID, and the UDP command port to be used for the UDP command interface. Using network monitoring software, these announce messages can be listened for and an unknown IP address of a device determined.

This packet will be broadcast at a rate of 3 seconds per announcement. The broadcast is triggered in one of two ways. First, the announcements are made 5 times each time the device is reset. Second, announcements can be requested using the ANNOUNCE_NOW command.

The EZ Web Lynx always accepts requests for announcements (using the ANNOUNCE_NOW command) on the UDP announce port + 1 (default is 7124). This way, all that needs to be known is the UDP announce port to allow anyone to find the IP address of an EZ Web Lynx. The device allows the user to modify the UDP announce port. However, extreme caution must be taken to remember this port, or it may be very difficult to find a device with an unknown IP address.



4.9.10 String Storage

Strings can be saved to memory, useful if you want to display descriptive identifiers in your website or e-mails. Strings can be saved to volatile memory (STRING) or volatile memory (NVSTRING)

Here is an example of storing a string (using an AT command):

```
AT*NVSTRING10=hello
```

This will store "hello", starting at location 10 (location 10 holds 'h', location 11 holds 'e', etc). A null-terminator is also stored, therefore the total space required to hold this string is 6 locations. Therefore, any attempt to store a string at locations 11, 12, 13, 14 or 15 will cause this string to be corrupted.

It is the customer's application's responsibility to keep track of where strings are stored and to prevent strings from overwriting themselves. If you are developing a web site that allows the user to modify NVSTRINGs, it is easy to prevent a string from overwriting another string by using the HTML Form parameter MAXLENGTH.

These registers are shared with the registers used by the REG and NVREG commands (see section 4.9.4).



4.9.11 Triggering

The ezWebLynx can be used to send an E-Mail or UDP packet if certain conditions occur.

E-Mails are sent to the configured server (see EMAIL_USER, EMAIL_PASS, EMAIL_TO, EMAIL_FROM, EMAIL_SUBJ, EMAIL_HOST and EMAIL_PORT).

UDP packets are sent to the configured server (see UDP_TX and UDP_HOST).

TRIGGER_SAFETY configures the unit's safety algorithm. If the safety is on, a trigger cannot fire again until it's action has stopped. Some examples: if the safety is on and the unit triggers on an input going high, it will not trigger again until the input goes low; if the safety is off and the unit triggers on an input going high, it will trigger again after the TRIGGER_DELAY has expired even if the input is still high.

TRIGGER_DELAY configures the time between triggers. Most methods have a minimum value of 5 seconds, except for e-mail which is 300 seconds.

The 5V Rev1 EzWebLynx modules only support 1 trigger. The other EzWebLynx modules support 4 triggers. The 5V Rev1 does not support sending a UDP packet on a trigger by default, if you wish to have this feature enabled please contact CCS technical support.

4.9.11.1 Triggering Inspect Algorithm

The 'inspect' configuration tells the trigger system what event to look for.

The following are valid and can be set with the TRIGGER_INSPECTxx command:

DISABLED or 0

This trigger is disabled.

TIME,x

x seconds has elapsed. Trigger safety and trigger delay are ignored for this inspect. A minimum time of 300 seconds is forced for Email, 5 seconds for other methods.

SERIAL

A serial message matched the start/stop parameters (see SERIAL_START, SERIAL_END and SERIAL_GET)

INPUT,x,y

INPUTx has changed to desired state. y can be 0 (low) or 1 (high)

TEMPx,y,z,v

Temperature has passed a certain point. x can F (fahrenheit) or C (celsius). y is the I2C address of the temperature sensor. z can be 0 (temp of y has gone below v), or z can be 1 (temp of y has gone above v). v is the temperature, can be sent in hundredths (ex 72.50). Negative temperatures are allowed.

ANALOG,y,z,v

Analog voltage has passed a certain point. y is the pin number to read. z can be 0 (gone lower) or 1 (gone higher). v is the voltage, can be sent in hundredths (ex 2.50),



4.9.11.2 Triggering Action Algorithm

The 'action' configuration tells the trigger system what to do when a trigger fires. The following are valid and can be set with the TRIGGER_ACTIONx command:

DISABLED or 0

This trigger is disabled.

UDP,x

Send a UDP packet to configured server. x is the NVSTRING to send (see the NVSTRINGxx command). The UDP configuration is already stored with the commands UDP_TX and UDP_HOST.

SERIAL

Same as UDP, but instead of a variable packet, it sends the contents of the serial buffer.

EMAIL

Sends an e-mail.



4.9.12 Authenticated Web Pages

It is possible to password protect a webpage. A password protected webpage requires the browser to authenticate it's user to the server. If the user provides faulty authentication (wrong username or password), the ezWebLynx server will give the user a HTTP 401 error and will not display the requested webpage.

The ezWebLynx HTTP server gets authentication configuration from the file 'htaccess.txt'. This file must be a part of the project and compiled into the image.cds. If 'htaccess.txt' is not compiled into the image.cds then no webpages will be password protected.

htaccess.txt must follow this format:

```
username|password|file1|file2|file3
```

username and password is a hardcoded username that is always valid. If these fields are blank then there will be no hardcoded username/password. A dynamic username and password can also be saved with the HTTP_USER and HTTP_PASS commands.

If the hardcoded username/password from the htaccess.txt is blank, and the variable username/password from HTTP_USER and HTTP_PASS is blank, then all pages are considered unlocked even if there are pages specified in the htaccess.txt file.

After the username and password, the files that are to be protected are entered. There is no limit to the number of files that can be specified.

To prevent un-authorized users from reading htaccess.txt and getting the hardcoded username and password, it is a good idea to make sure htaccess.txt is one of the files specified to be password protected.

You can send CGI data to an authenticated webpage using the POST method.

You can NOT send CGI data to an authenticated webpage using the GET method.



4.9.13 TCPIP <-> SERIAL (T2S)

T2S is a method for acting as a TCPIP<->SERIAL converter. The EZWebLynx module can either connect to a remote device or listen for incoming connections – once a connection is made all TCP/IP packets are sent over the serial port, and all incoming serial messages are sent over TCP/IP.

If T2S is enabled, the serial interface will be disabled for handling AT commands. The EZWebLynx will only listen for AT commands over the serial interface for 10 seconds after power-up. If you need to disable the T2S functionality, you have 10 seconds from power-up to issue that command over the serial interface (you can still issue AT commands over the UDP interface or HTTP/CGI at any time).

The AT*T2S command takes 3 different parameter sets:

- AT*T2S=0
Disables the T2S functionality.
- AT*T2S=OPEN,hostname,portnumber
Attempts to open the portnumber (0-65535) to the hostname (0-255). The hostname is actually an NVSTRING parameter (see the documentation for NVSTRINGxx key). The hostname stored to the NVSTRING can be a fully qualified hostname (www.someserver.com) or an IP address. In order to use a hostname the DNS must be configured properly.
- AT*T2S=LISTEN,portnumber
Listens to the portnumber (0-65535) for incoming connections.

A power-cycle is required to change the T2S settings. If T2S is enabled (OPEN or LISTEN), it will also disable serial echo (use SERIAL_ECHO=1 to re-enable, but this isn't recommended until after T2S has been disabled again) and will lock INPUT11 as a digital output (use PIN_LOCKxx to disable lock, but not recommended until after T2S has been disabled again).

On power-up, if T2S is enabled (OPEN or LISTEN) it first waits 10 seconds to give the user time to disable the T2S functionality. After this 10 seconds has expired, the T2S functionality will start. If it is in OPEN mode it will attempt to open the specified hostname/port, if it cannot connect to this hostname/port it will retry in a few seconds. If it is in LISTEN mode it will listen to the port for connections. Once a connection is made, if there has been 2 minutes of inactivity (no serial or TCPIP) the connection will be closed. If a connection is closed in OPEN mode it will wait a few seconds before reconnecting. If a connection is closed in LISTEN mode it will go back to listening for connections immediately.

If T2S is enabled, INPUT11 is used as a connection status. It will be low if there is no connection, high if a connection has been made.

4.10 IP Configuration

The EZ Web Lynx allows for full modification of its networking settings to allow it to be used in any network environment. Changes can be made using any of the command interfaces (serial, UDP, or HTTP). Any changes made to the network configurations will not take effect until the device is reset.

The following is a description of each of the network settings:

DHCP: DHCP is a networking protocol that allows for a unique IP address to be assigned dynamically to each device on a particular network. In order for DHCP to work, there must be a DHCP server enabled on the network. The default setting is DHCP disabled.

DNS: Changes the primary DNS server used to resolve domain names to IP addresses. This is used only for the email functionality of the EZ Web Lynx.

IP Address: All devices on a network must have a unique IP address. The default IP address for the EZ Web Lynx is 192.168.100.210. IP addresses in the range 192.168.0.0 through 192.168.255.255 are reserved for private networks and, therefore, will likely be used for the EZ Web Lynx.

Netmask: The netmask is used when translating an IP address from a local network to a different network over the Internet. The default value is 255.255.255.0. If the device is only being accessed from the local network, then the default value generally does not need to be changed.

Gateway: This is the IP address of the node in the network that acts as an interface from the network to the Internet. The default gateway is 192.168.100.1. If the device is only being accessed from the local network, then the default value generally does not need to be changed.

For several of the IP configurations, two sets of commands exist. The first is a read-only command that displays the current active setting for that command. These commands include IP, GW, and NMASK. The second set of commands are readable and writable, and deal with the setting that will take place after a restart. These commands include AIP, AGW, and ANMASK. Writing to these commands will change the particular setting only after the device is reset. Reading these commands will return the value that will be active after the device is reset. Changes to the IP configurations will only take effect after the device is reset.

For example, to change the device's IP address, enter the following command:

```
AT*AIP=IP_ADDRESS
```

Where IP_ADDRESS is the desired IP address of the device. To check that it was entered correctly, enter the following command:

```
AT*AIP?
```

The device will respond with the IP address that you entered in the first command. However, this is not the IP address of the device, yet. Re-set the device to force this new IP address to take effect. After reset, to check the new IP address, enter the following command:

```
AT*IP?
```

The device will respond with its current IP address, which should be the address entered in the AIP command.

•—————•

5. Additional Information

5.1 General Specifications

<i>Specification</i>	5V	3.3V
Physical Dimensions	Length: 1.625" Width: 0.7" Height: 1.0"	Length: 1.5" Width: 0.75" Height: 0.875"
I/O Pins	11 Digital I/O pins – 9 w/ add'l features: -5 Analog -2 Serial Communication -2 I ² C (DS1621/1631 temperature sensors)	17 Digital I/O pins – 10 w/ add'l features: -6 Analog -2 Serial Communication -2 I ² C (DS1621/1631 temperature sensors)
Programming Method	HTML for custom web content	
Supported Network Protocols	HTTP – View HTML pages/send CGI UDP – Command interface, IP broadcasts SMTP – Email TFTP – Uploading/download HTML pages ICMP – (Ping) DHCP	
Ethernet Port	10Mbps Half Duplex (IEEE 802.3)	
Memory for HTML pages	927kB	896kB

5.2 Electrical Specifications

<i>Specification</i>	5V		3.3V	
	<i>Minimum</i>	<i>Maximum</i>	<i>Minimum</i>	<i>Maximum</i>
Supply Voltage (Vdd)	4.5V	5.5V	3.1V	3.6V
Supply Current¹	175 mA @5V	N/A	150mA @3.3V	N/A

¹Minimum supply current needed for EZ WEB LYNX with no peripherals (LEDs, temperature sensor, etc)

Specification	5V		3.3V	
	Minimum	Maximum	Minimum	Maximum
Input Low Voltage (Digital) Pin 1-7, 10, 11 Pin 8, 9 Reset ² Pin 1-6, 8, 9, Reset ² Pin 7, 10-17	GND GND GND	0.8 V 0.2*Vdd 0.2 V	GND GND	0.2*Vdd 0.8 V
Input High Voltage (Digital) Pin 1-7, 10, 11 Pin 8, 9 Pin 1-6, 8, 9 Pin 7, 10-17	2.0 V 0.8* Vdd	Vdd Vdd	1.7 V 0.8*Vdd	Vdd Vdd
Output Low Voltage (Digital)	GND	0.6 V	GND	0.4 V
Output High Voltage (Digital)	Vdd-0.7 V	Vdd	2.4 V	Vdd
Pin Current Source (Output) Pin 1-7 Pin 8-11		25 mA		2 mA 25 mA
Pin Current Sink (Input) Pin 1-7 Pin 8-11		25 mA		2 mA 25 mA

² Voltage level to force the device to reset



5.3 Host Inter-connects

	Header	Screw
5V	2 x 7 M .1" Sullins Electronics Corp. P/N: PEC14DAAN	.375" length 6-32 thread
3.3V	2 x 10 M 2mm Hirose Electric Co. Ltd. P/N: A3C - 20P - 2DSA or A3 - 20PA - 2SV(71)	6mm (.236") length M3.0 x .5 thread



5.4 Application Ideas

Industrial Refrigeration

In commercial food preparation facilities, temperature control is critical to safe and successful operations. The EZ Web Lynx is perfect for incorporating into an industrial refrigeration or freezing system to monitor the temperature. Install a DS1631 temperature sensor to monitor the refrigerator temperature. Connect the temperature sensor to an EZ Web Lynx. Configure the EZ Web Lynx to email the maintenance staff when the temperature rises above the desired temperature. The DS1631 temperature sensor has a resolution of 0.5°C, so the EZ Web Lynx can easily monitor the temperature at a very accurate level.

Additionally, a web page can be written using the EZ Web Lynx IDE that allows the supervisor or maintenance personnel to monitor the temperature from anywhere. The HTML code might look something like this:

```
<html>
<body>
<title>Temperature of <!--(READ ID)--></title>
<h1>Temperature of <!--(READ ID)--></h1>
<p>
    <!--(IF TEMPFO < 36.0)-->
        <font color="#0000FF">
    <!--(ELSE)-->
        <!--(IF TEMPFO < 38.5)-->
            <font color="#FFFF00">
        <!--(ELSE)-->
            <font color="#FF0000">
        <!--(ENDIF)-->
    <!--(ENDIF)-->
    <!--(READ TEMPFO)-->
</p>
</body>
</html>
```

5.5 Test Equipment

Laboratory test equipment often has a serial interface limiting its usefulness, and thus, requiring a person to monitor it. Using the EZ Web Lynx's serial buffering capability, the test equipment can be monitored via a web page that will display the last information outputted by the test equipment. The test equipment will respond with STATUS_CONTINUE. if the test is still running; STATUS_PASS. if the test passed; or STATUS_FAIL. if the test fails. The web page could be written as follows:

```
<html>
<title>Lab Test Equipment Status</title>
<body>
    <!--(EXEC SERIAL_START=53,54,41,54,55,53)-->
    <!--(EXEC SERIAL_END=2E)-->
    </p>
    Results:<!--(READ SERIAL_GET)-->
    </p>
</body>
</html>
```

In this HTML example, the first two commands set up the EZ Web Lynx to buffer any data from when it sees the word "STATUS" until it sees a period. The last HTML command reads the results that the lab equipment sent to the EZ Web Lynx. Now, the results of the testing can be seen over the Internet using any web browser.



6. Technical Support & Warranty Information

Questions or help using the EZ Web Lynx device or Development Kit?
Email support@ezweblynx.com or call (262) 522-6500, ext. 42.

CCS guarantees all hardware products for any manufacturing defects within 1 year of purchase date. Defective hardware will be refunded or replaced. Any replacement items will be shipped UPS ground by CCS; if a customer requires a different shipping method than aforementioned, customer agrees to pay the difference.

After 1 Year Guarantee:

CCS will repair or replace most malfunctioning products (of the same model/revision only) for a fixed price. Repairs beyond malfunctioning will be quoted before repair occurs.

- Customer agrees to pay shipping both ways. This is not included in the fixed price for repair or replacement.
- If CCS is not able to find a defect, or if only firmware was updated, then the customer will only be charged shipping to return the product.

Please call customer service at (262) 522-6500 or email sales@ezweblynx.com for repair/replacement cost.



6.1 High Volume Sales

CCS, Inc. offers a large quantity discount for orders over 100 units. Please contact Sales for a quote at sales@ezweblynx.com or by calling 262-522-6500.

NOTES