



ESENSORS

Specializing in Network Sensors

Instruction Manual

HVAC Monitor Model EM32-F

Wi-Fi Websensor

Version 6.0

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CONTENTS

Introduction to the EM32-F.....	7
How the Websensor EM32-F Works.....	7
Technical specifications.....	8
EM32-F Hook-up.....	9
EM32-F Network Settings.....	10
EM32-F User Interface.....	13
Simple HTTP Request.....	23
Troubleshooting the EM32-F.....	24
Reset.....	25
Quick Reference (Keyboard Short-cuts).....	26

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Introduction

Introduction

The Esensors, Inc. Wi-Fi Websensor EM32-F is an electronic device *classified* as a *Smart Sensor*. EM32-F is designed to utilize the Internet to transmit temperature, relative humidity, and illumination data from a remote acquisition point to a host computer or hosted database.

The EM32-F offers built-in signal conditioning and an embedded mini-webserver. Users are able to access the sensor using Hypertext Transfer Protocol (HTTP) based commands.

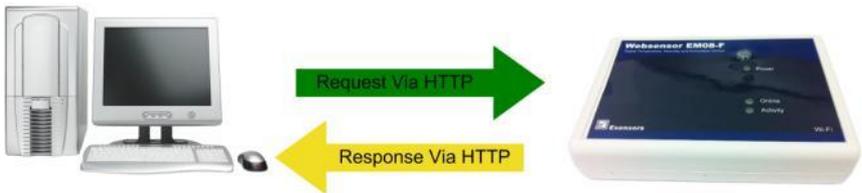


Figure 1 - EM32-F HTTP: Request/Response

Figure 1 (above) shows Websensor EM32-F returning data via a HTTP: response.

Simply, EM32-F's function is to send a response (by a HTTP: message) upon request from a *central website* or the *User's PC*.

The EM32-F supports DHCP and a user configurable *IP address*. It's IP address gives it uniqueness on the network which it is attached to. It is through the IP address, that EM32-F is able to take its' place on the Internet, becoming fully accessible to query by the user

EM32F Technical Specifications

EM32-F consists of a base unit with one communication port. Within the base unit are microcomputers, which handle the Internet protocol, the communication port, sensors and sensor signal conditioning. The EM32-F has no switches, keyboard or display because it functions as a sensor, not as a computer.

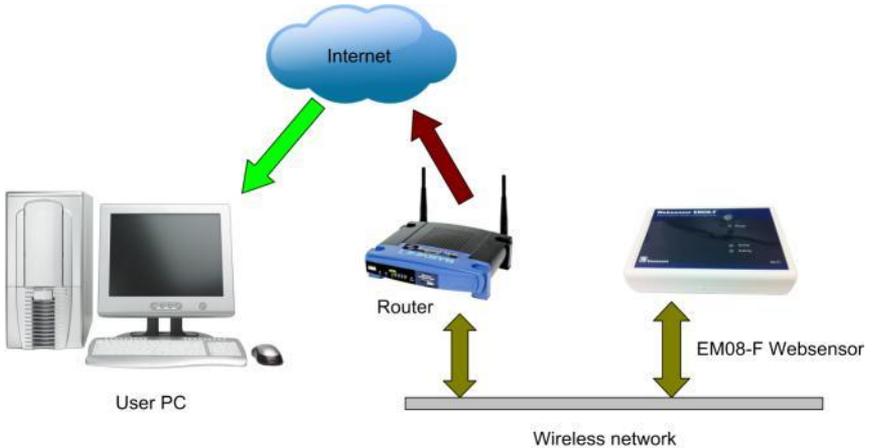


Figure 2 – How EM32-F works.

Technical specifications

- Compatible with 802.11bWi-Fi networks & Mixed mode bgn
- Supported Wifi channels 1 to 11.
- Support AES and TKIP(WEP(64 bit /128 bit), WPA Personal /WPA2 Personal) security protocols
- Built-in HTTP interface
- Standard XML data output
- Open Source Plugins in VBScript and C languages
- Temperature accurate to +/- 0.2 Celsius with range from -40 to +123.8 Celsius
- Fahrenheit and Celsius temperature scales.
- Humidity accurate to +/- 3% RH with range from 1% to 99% Relative Humidity
- Light sensor with range from 0 to 3270 Lux

EM32F Hook up

Compatibility with Earlier Websensors

Compatibility with the earlier models of Websensor has been maintained. Any version of the Websensor will always return temperature, relative humidity and illumination data by sending:

<http://192.168.254.102/index.html?em>

192.168.254.102 is EM32-F's factory default IP address

EM32-F Hook-up

a. Powering up the EM32-F

The EM32-F is powered by the 9V adaptor included with the unit. Remove the adaptor from the pack, and plug the power jack to the wall supply connector of EM32-F shown in figure 3. Plug the adaptor brick to a standard 120V wall socket. The Power LED should turn on at this time.



Figure 3 – Location of AC Wall Supply, USB connectors.

EM32F Network Settings



Figure 4 – Location of RESET SWITCH.

Configuring the EM32-F

Any computer or cellular phone with Wi-Fi adaptor can be used to set up the EM32-F. The main factory default settings of EM32-F are:

IP Address: 192.168.254.102
Subnet Mask: 255.255.255.0
WLAN Type: Ad hoc
WLAN SSID: **EM32F_Setup**
Security Type: None

To communicate with EM32-F device, the computer or cell phone must connect to **EM32F_Setup**, which is an ad hoc network hosted by EM32-F device in factory default state.

EM32F Network Settings



Figure 5. EM32-F connected straight to a PC/ cell phone.

First, check with the IP settings of your computer or cellular Phone. The option to "Obtain an IP address automatically" should be selected. EM32-F comes with a DHCP server which can automatically assign IP address to another computer connected to the **EM32F_Setup** network. If your computer is using static IP, make sure the IP address is in the same subnet with EM32-F device and has an IP **other than** 192.168.254.102.

Next, scan the Wi-Fi networks on the computer. The Ad hoc network EM32F_Setup, which is established by the EM32-F, should be shown in the network list, as shown in figure 7. Connect to EM32F_Setup. No key is required. Now EM32-F is connected and can be pinged.

Note: Please do not power up multiple EM32-F devices with default settings at the same time since they have same IP address.

EM32F Network Settings

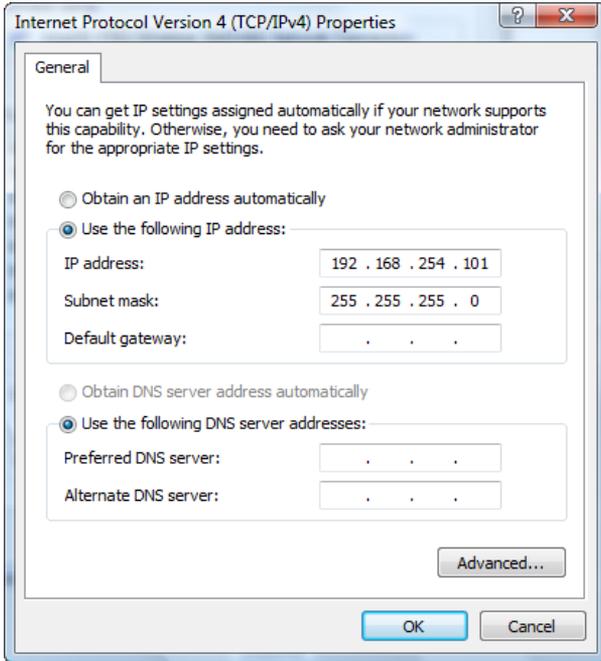


Figure 6. PC network settings



Figure 7 - Ad hoc network EM32F_Setup

EM32F User Interface

Connecting to other wireless networks is simple. Click the Network Configuration link on the device's webpage. Check checkbox Change WLAN Settings, choose WLAN type and input SSID, security Type, security key, IP address etc if required by the desired network and click the "Submit" button. Please note for WPA\WPA2 PSK authentication, due to the intensive computation requirements of computing the PSK, a significant amount of time is required to calculate the PSK (approximately 30 to 40 seconds). The device performs the calculation once and the result is stored and retrieved later when making a network connection. During the calculation, the Power LED(Green) is OFF, Activity LED (Amber) and Online LED(green) are solid ON. Please do NOT test the network connectivity until the calculation is completed (Power LED is back to solid ON and Activity LED is off or blinking). The Online LED will keep blinking when device is connecting to the network and become solid on when it is connected.

User interface

Overview

The overview page shows the product information specific to the EM32-F. This includes the device version, build, serial number, network info and technical specifications of the device.

Sensor Status

The SENSOR STATUS screen depicts the same information as the MAIN (HOME) page

From the Sensor Status screen it is possible to alter the temperature units by clicking on the "Change Temperature Unit" button.

EM32F User Interface

Websensor EM32 Ver.1 Application

Overview

Welcome!

Device Version: EM32F V1.1.5422
Build Date: Apr 1 2013 20:55:52
Serial Number: 702240B
Connected to: Esensors
WiFi Module Ver: R18P12
Current Time: 4/8/2013 3:13:46 PM

This site demonstrates the power, flexibility, and scalability of a websensor Model EM32 made by Esensors, Inc. Everything you see is powered by a mini web server inside the websensor EM32.

Web Sensor EM32 Technical Specs:

- Compatible with 802.11b/g/n Wi-Fi networks
- Support for AES and TKIP(WEP, WPA/WPA2) security
- Built-in HTTP interface
- Provide standard XML data output
- Open Source Plugins in VBScript and C languages
- Temperature accurate to +/- 0.2 Celsius with range from -40 to +123.8 Celsius
- Automatic convert temperature to either Fahrenheit or Celsius
- Humidity accurate to +/- 3% RH with range from 1% to 99% Relative Humidity
- Light sensor detect illumination between 0 to 3270 Lux

For more information on EM32, please visit Esensors website <http://www.eesensors.com>.

Figure 8 – The OVERVIEW Screen

Websensor EM32 Ver.1 Application

Sensor Status

Connected to: Esensors
Device Serial Number: 702240B
Device Status: OK
Temperature: 78.3F
Humidity(%): 19.2
Illumination(Lx): 2569
Power LED: ●
Activity LED: ●
Buttons: A

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Figure 9 – Sensor Status screen.

EM32F User Interface

Visualizing Outputs

The VISUALIZING OUTPUTS screen permits simple graphs to be depicted for the temperature and relative humidity data points the Websensor collects.

Altering the ranges is easily accomplished by “left clicking” in the value areas and entering the desired range numbers. Next, click on the “Update Chart” button to effect the change. Reference Figure 10 for a typical data capture. Note that the Temperature range has been changed to display between 50 and 100 degrees Fahrenheit.

Plot Settings

Left: Temperature min 50 max 90

Right: Humidity min 0 max 2000

Updating Interval : 2 seconds, must > 1

Stop after Ploting Done

Save Settings to Device

Update Chart

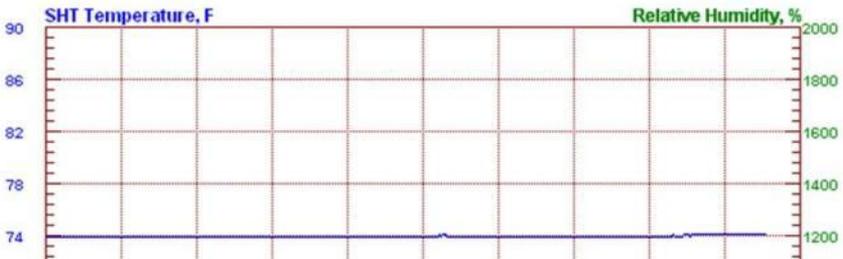


Figure 10 – Visualizing Outputs screen

Sensor Settings:

This page is password protected. The default user name is *admin* and the default password is *password*. The sensor settings page allows you to set the maximum and minimum threshold levels for each of the sensors (Temperature, humidity, illumination) on the EM32-F. You have to enable 'Send alarm email' to turn on the email alerting. The minimum time between alarms is determined by the 'alarm interval' so that it does not flood you mailbox. 'Email peak values' on this page can be enabled if you want the EM32-F to email daily peak measurements. The Trip time is the minimum time interval for with the threshold has to be violated to initiate the alert. The return time is the minimum time interval for with the measurement should fall within the threshold for the alarm to go off.

The range of each sensor is provided on this page. In order to selectively send alarms in any particular direction (ie, alarm when readings cross upper limit only), the other limit can be substituted with the sensor's range value.

Alarm interval or time between alarms is a feature that helps avoid multiple alerts from the same event. In the event when sensor readings fluctuate around the set limits, alarm intervals can be set appropriately to avoid sending repeated alerts/ warnings.

EM32F User Interface

Illumination Threshold, range: 0-3270 Lx

Lower limit: Lx

Upper limit: Lx

Illum Trip Time: Sec. Time tick is 1.5 Sec.

Return Time: Sec.

Temperature Threshold, range: -40-255.2 F

Lower limit: F or C, default is F

Upper limit:

Temp Trip Time: Sec. Time tick is 1.5 Sec.

Return Time: Sec.

Relative Humidity Threshold, range: 0-100%

Lower limit: %

Upper limit:

Humd Trip Time: Sec. Time tick is 1.5 Sec.

Return Time: Sec.

Enable send alarm email, Note 1

Alarm Interval: minutes, must be <1638 min. Note 2

email max/min values every day

Figure 11 – Sensor settings screen

EM32F User Interface

Email settings

This page is password protected. The default user name is *admin* and the default password is *password*. The email settings page allows you to setup email address(es) to which alerts and reports are to be sent. Please note that the 'send alarm' feature in sensor settings page should be enabled for the EM32-F to send emails to the specified address(es). The unit does not support SSL/TLS or any encryption. Proper Network DNS and Gateway settings are required for the device to access SMTP server out of your network.

The screenshot shows a web form for configuring email settings. It includes the following fields and elements:

- SMTP Server:** A text input field.
- Port:** A text input field containing the value "6553".
- User Name:** A text input field.
- Password:** A text input field.
- From:** A text input field.
- To:** A text input field.
- CC:** A text input field.
- Device Description:** A text area with the placeholder text "Put device description here, like Web sensor in Main Building, Room 322." and a small cursor icon in the bottom right corner.
- Save & Send Test email:** A button located at the bottom of the form.

Figure 12 – Email settings screen

Sensor Log:

The Sensor log page has the information about the sensor log, the alarm log, the daily peak log and historic peak log. The page also shows a summary of the alarm thresholds that you have set up for the device.

Sensor Alarm Log

Sensor Alarm Record	Triggered Value	Occured Time
Illum Low Disarm	1183Lx	Thu Apr 12 2012 12:28:48 GMT-0400 (Eastern Daylight Time)
Illum Low	812.5Lx	Thu Apr 12 2012 12:28:15 GMT-0400 (Eastern Daylight Time)
Illum Low Disarm	1010Lx	Thu Apr 12 2012 12:27:51 GMT-0400 (Eastern Daylight Time)
Illum Low	4.2Lx	Wed Apr 11 2012 21:25:10 GMT-0400 (Eastern Daylight Time)
Illum Low Disarm	1300Lx	Wed Apr 11 2012 15:51:34 GMT-0400 (Eastern Daylight Time)
Illum Low	997.7Lx	Wed Apr 11 2012 15:51:31 GMT-0400 (Eastern Daylight Time)
Illum	174	Wed Apr 11

Figure 13 – Sensor Log screen

EM32F User Interface

Network Configuration

This page is password protected. The default user name is *admin* and the default password is *password*. The NETWORK CONFIGURATION page enables the user to set up the device IP & host name using the web interface.

When the NETWORK CONFIGURATION link is clicked the NETWORK CONFIGURATION page appears; see Figure 11.

From the NETWORK CONFIGURATION screen it is possible to change the various addresses involved in any IP addressable device. Once changes are made it is necessary to “left click” on the “Submit” button to have the changes take effect.

If you are authorized to make changes on this page, settings may be changed any time (Password required). In this way the page is protected from being changed inadvertently (or maliciously). Hardware lock is not implemented by default as in some of the earlier versions of websensors. The Set Device clock will set your PC’s time to the device. If the device loses power, the time will be lost.

When you change the IP address though the webpage interface, the next page displayed is the “Reboot in Progress” page depicted in Figure 12

EM32F User Interface

MAC Address:	<input type="text" value="00:04:A3:CA:20:44"/>
Host Name:	<input type="text" value="EM32B_WIF195"/> must be less than 16 bytes
	<input type="checkbox"/> Enable DHCP
IP Address:	<input type="text" value="192.168.254.195"/>
Gateway:	<input type="text" value="192.168.254.1"/>
Subnet Mask:	<input type="text" value="255.255.255.0"/>
Primary DNS:	<input type="text" value="4.2.2.1"/>
Secondary DNS:	<input type="text" value="192.168.254.1"/>
HTTP Port No. :	<input type="text" value="80"/>
	<input type="checkbox"/> Change WLAN Settings
WLAN Type:	<input type="radio"/> Ad hoc <input checked="" type="radio"/> Infrastructure
WLAN SSID:	<input type="text"/>
Security Type:	<input type="text" value="None"/> ▾
Security Key:	<input type="text"/>
	<input type="checkbox"/> Change User Name and Password
User Name:	<input type="text"/> <= 8 characters
Password:	<input type="text"/> <= 10 characters
Re-enter Password:	<input type="text"/>
	<input type="button" value="Submit"/>
	<input type="button" value="Set Device Clock"/>

Figure 14 – Network Configuration screen

The screenshot shows the 'Reboot In Progress...' screen of the 'Websensor EM32 Ver.1 Application'. On the left is a red sidebar menu with the following items: Overview, Sensor Status, Visualizing Outputs, Sensor Log, Sensor Settings, Network Configuration, Server Configuration, email Configuration, and SNMP Configuration. The main content area has a red header with the title 'Reboot In Progress...'. Below the title, it states: 'Your network settings were successfully saved, and the device is now rebooting to configure itself with the new settings.' A note follows: 'Please note for WPA\WPA2 PSK authentication, due to the intensive computation requirements of computing the PSK, a significant amount of time is required to calculate the PSK (approximately 30 to 40 seconds). The device performs the calculation once and the result is stored and retrieved later when making a network connection. During the calculation, the Power LED is off and Activity LED is blinking. Please do NOT test the network connectivity until the calculation is completed (Power LED is back to solid ON and Activity LED is off or blinking).' Below this is a line indicating the device's location: 'Your device is now located at: http://EM32B_WIF19B'. A dashed line separates this from the 'Reconnection Instructions' section, which contains two numbered items: 1. 'Did you change the hostname?' with the instruction 'You should be able to access your device by clicking the link above.' and 2. 'Did you change the MAC address?' with the instruction 'The DHCP server probably assigned the device a new IP address, but'.

Figure 12 – “Reboot in Progress” screen

You can confirm the change by typing the new IP on the address bar. Or, ping the new address from a command prompt screen.

Refer to the Quick Reference section for more administrative “keyboard short-cut” commands.

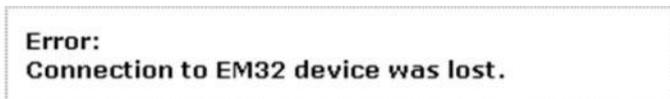


Figure 14 – Error Message – CONNECTION LOST.

The reason for the “Error: Connection to EM32 device was lost” message is because the browser still points to the former IP address. When the new IP address is entered into the address bar the screen will correctly display the EM32-F MAIN (Home) Page.

Http Request

Simple Http Request

Websensor EM32-F outputs a data string when it receives http request. This simple approach enables end users to develop their own application to monitor data. The data format is supported in all the plug-in's provided on the CD including Esensors' Data logger program (used to monitor temperature and relative humidity & issue email alerts upon threshold violation).

The string can be obtained by typing the device IP followed in the address bar of the browser.

<http://192.168.254.102/index.htm?em>

or

<http://192.168.254.102/index.html?em>

A Sample Return String:

N123456TF: 71.2HU:24.5%IL:218

- Where 123456 is device serial number,
- Temperature in Fahrenheit TF is 71.2,
- Relative Humidity HU is 24.5%,
- Illumination IL is 218

See Figure 15 (below) for a sample screen depicting the returned string.

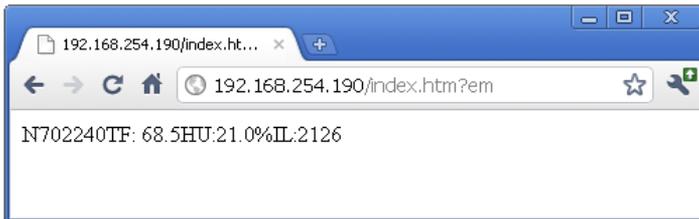


Figure 15 Sample Return String on screen

Basic Troubleshooting Instructions

1. **Did you change the IP address?**

The DHCP server probably assigned the device a new IP address, but your computer's network cache has saved the old MAC address for the new IP. From the command prompt in Windows, enter "nbtstat -R" or "arp -d" to clear old values and try again. Make sure you launch the command prompt as administrator.

2. **Did you try the IP address?**

Try accessing the device directly at the IP address just inputted if DHCP was turned off. (Example: enter "http://192.168.5.23/" into your browser). If this fails, then the IP address you set is not reachable. Accessing device via IP address is more reliable than using host name since some networks may have troubles dealing with host name. If you forgot the IP address and the host name of EM32 device, try Step 3 below.

3. **Use Ethernet Discoverer to hunt EM32 devices**

Microchip's Ethernet Discoverer is a very nice tool to list all EM32 devices on the same subnet. Double click *Microchip Ethernet Discoverer.exe*, Click "Discover Devices" button, the IP address, Host name and MAC address of all EM32 devices will be listed. It is also helpful to check EM32's IP address when it is automatically assigned by DHCP server. *Microchip Ethernet Discoverer.exe* do not need to be installed, it can be copied to and executed from any location. (This utility program can be found on the supplied CD in the "Manual" Folder within the "EM32" Folder

Reset

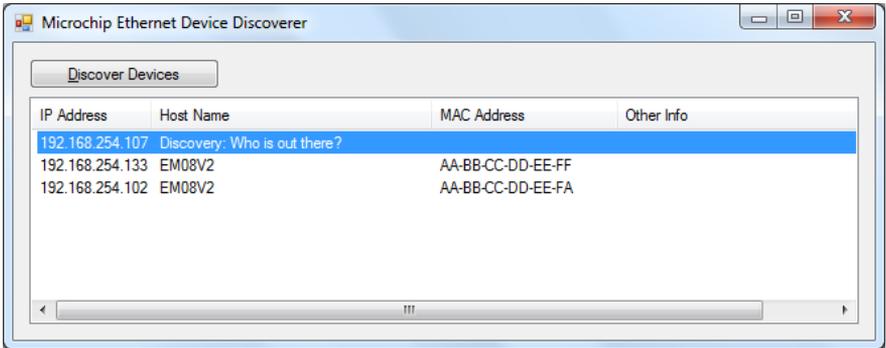


Figure 16 – Microchip Ethernet Device Discover screen

4. **Still not working? Device Reset**

You can restore the factory default settings by erasing the device's flash ROM.

Resetting the EM32-F

- Hold the button by inserting a paper clip into the small hole on the left side panel of the device and then re-power the device.
- The device enters boot loading state which will last for four seconds, both Power LED and Activity LED are extinguished in this state, then they will flash for three times and enter startup state.
- Continue holding the button, the device will enter restoration state, In this state you will notice the Power LED and Activity LED are solid ON in this state.
- You should not release the button until both LEDs are extinguished, which means restoration is done.

Quick Reference

- The whole procedure takes about eight to ten seconds.
The factory default IP address is “192.168.254.102”.

The factory default settings of EM32-F are:

IP Address: 192.168.254.102

Subnet Mask: 255.255.255.0

WLAN Type: Ad hoc

WLAN SSID: **EM32F_Setup**

Security Type: None

User name: admin

Password: password

All sensors alerts are turned off by setting
threshold levels to physical limits

Quick Reference

**Display sensor measurements, using EM32V2 as the
host name:**

<http://EM32v2/index.htm/?em>

Display sensor measurements:

<http://192.168.254.102/index.htm?em>

Change Temp unit to C:

<http://192.168.254.102/index.htm?etpC>

Change Temp unit to F:

<http://192.168.254.102/index.htm?etpF>

Change Temp unit from C to F or F to C:

<http://192.168.254.102/index.htm?etpX>

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