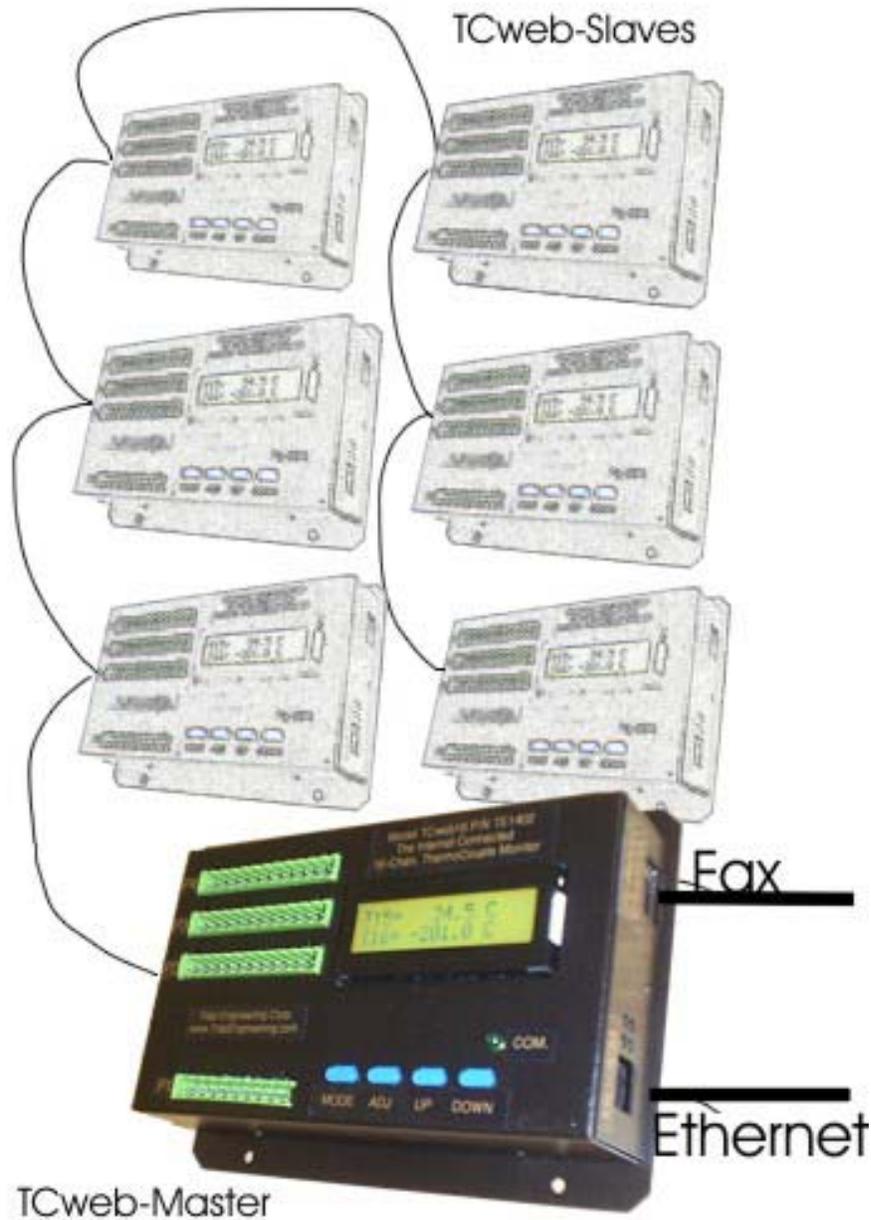


TCweb / eChamber Gateway Technical Manual

Temperature Acquisition System & Temperature Controller Gateway
for your LAN and the Internet



DOC. NO. TE1440

Tidal Engineering Corporation
Revision – C

PROPRIETARY

TCweb / eChamber Gateway User's Manual

Part Number TE1440

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1 Overview of the TCweb and eChamber Gateway



Tidal Engineering's TCweb Thermocouple Monitor is an economical and versatile data acquisition system for thermocouples and other sensors that connects to a Local Area Network (LAN) with its 10 BaseT Ethernet port or to a remote computer over its 56K data modem or external GSM cellular modem for wireless communication. The TCweb allows you to acquire and log temperatures remotely from anywhere in the world. In addition to the 256K Bytes of Flash Memory used by the program, you can expand to a full 8 Mega Bytes of optional Flash Memory for logging. The TCweb allows you to log each input every second, and download it at to a computer over a network where it can be viewed, archived or converted to various graphical formats.

The TCweb supports B, E, J, K, R, S, and T-type thermocouples, allowing flexibility in temperature range and equipment. The unit's integrated cold junction compensation automatically compensates for the ambient temperature, and displays the value of the ambient temperature along with the values of the thermocouples. Sixteen thermocouples can be connected to and logged by the unit.

The TCweb is expandable using slave units through the master's RS-485 communication's port. Up to fifteen slave units can be connected to expand the total number of sensors connected and logged to 256.

In addition to passively logging data, the TCweb has a real-time alarm monitoring and alert system. When the value of a thermocouple crosses the high or low limit you have set, an alarm is triggered, and the unit responds by sending e-mail to a user at a specified address e-mail address. In addition, a Form C alarm relay can be used to activate an audible and/or visual alert.

The TCweb Master unit incorporates a Liquid Crystal Display (LCD) and four pushbuttons that provide local interface to the sensor data and unit setup. Data is displayed to tenth of a degree

precision in either Celsius or Fahrenheit, and the TCweb provides two digital-to-analog output channels to re-transmit two analog voltages for charting.

The eChamber Gateway upgrade connects the TCweb to the industry's most popular environmental chamber temperature controllers. Using a web base interface, users can monitor and control all aspects of their environmental chambers, from reading sensor temperatures to sending control commands such as setting new setpoints and starting profiles. Listed among the environmental test chambers for which Tidal's eChamber Gateway may be specified are the tens-of-thousands of the third-generation VersaTenn III chambers from SPX's Tenney and Lunaire Environmental divisions, together with Watlow Electronic Manufacturing Company's 942 and F4 Series. The eChamber gateway is supported by Tidal's PC-Based Multi-Chamber Environmental Lab monitoring software, eChamber Manager.

2 Specifications

2.1 Thermocouple Specifications

Channels per Unit	16 Differential
Maximum Linked Units	16 (one Master, 15 slaves, 256 sensors max.)
Thermocouple Types	B, E, J, K, R, S, T
Display Dimensions	Degrees Celsius or Degrees Fahrenheit
Display Resolution	0.1° Celsius
Open Check Current	150 μ A
Accuracy	$\pm 2^\circ$ Celsius (excluding thermocouple error)

2.2 Scanning and Data Logging Specifications

Scan Interval	2 to 32000 seconds
Alarm Relay	1 Form C contact: 0.6 Amperes at 125 Volts AC 2.0 Amperes at 30 Volts DC
Auto Scan	Automatically cycles through channels
Scan Rate	16 sensors per interval per module, up to 128 sensors per second
Data Memory	8 Megabytes Optional Flash
DAC Outputs	2 Channels, each 0 to 5 Volts DC with Programmable Scaling

2.3 Operation Specifications

Operating Temperature	32° to 122° Fahrenheit (0° to 50° Celsius)
Storage Temperature	-4° to 158° Fahrenheit (-20° to 70° Celsius)
Humidity	20% to 90%, non-condensing
Environmental Air	No corrosive gases
Warm-Up Time	5 Minutes typically to 1° Celsius repeatability
Cold Junction Compensation	Built-in Semiconductor Sensor: Analog Device: AD22103
Common Mode Range	-1.25 to +1.25 Volts DC
Absolute Maximum Ratings	Fault protected inputs to ± 30 Volts DC

2.4 Equipment Specifications

Size	Length: 7 inches Width: 5 inches Height: 1.625 inches
Display (Master Unit Only)	Backlit Liquid Crystal Display, 2 rows of 16 characters
Communication Interfaces	Ethernet: 10 BaseT RJ-45 Serial: RS-485
Converter	24 Bit LTC2415

Modem Specifications: V.90/56K Kilobytes Baud Rate
 (OPTIONAL) Serial, Binary, Asynchronous Data Format
 XON/XOFF or RTS/CTS Flow Control
 40 Character Command Buffer
 Industry-standard error correction and data compression

Modem Compatibility ITU V.90, K56flex; ITU-T V.34 enhanced, V.34, V.32bis, V.32, V.22bis, V.22; Bell 212A and 103/113; ITU-T V.29, V.42, V.42bis; ITU-T V.21 & V.23 in international versions

Mating Plugs (to Unit) P1: 10 position, 5 mm Removable Plug,
 P2, P3, P4: 12 position, 5 mm Removable Plug,
 P9: 9 position, D-Sub male serial connector
 P/N AMP 747321-4

External Power Supply 2.5 Watts, 12 to 28 Volts DC

2.5 Configuration Table

TCweb Configuration List

	P/N	Model	Ethernet	Modem 33.6	GSM 1800	GSM 1900	Chamber Monitor	DAQ
1	TE1299-1	TCweb - Ethernet	✓					
2	TE1299-3	TCweb - Ethernet/Modem	✓	✓				
3	TE1299-5	TCweb -GSM 1800	✓		✓			
4	TE1299-6	TCweb -GSM 1900	✓			✓		
5	TE1513-1	Synergy eChamber Gateway	✓				✓	
6	TE1513-2	Synergy eChamber Gateway - Modem	✓	✓			✓	
7	TE1513-3	Synergy eChamber Gateway - GSM 1800	✓		✓		✓	
8	TE1513-4	Synergy eChamber Gateway - GSM 1900	✓			✓	✓	
9	TE1516-1	Synergy eChamberPlus Gateway	✓				✓	
10	TE1516-2	Synergy eChamberPlus Gateway - Modem	✓	✓			✓	✓
11	TE1516-3	Synergy eChamberPlus Gateway - GSM 1800	✓		✓		✓	✓
12	TE1516-4	Synergy eChamberPlus Gateway - GSM 1900	✓			✓	✓	✓
13	TE1299-4	Slave Module	Adds an additional 16 thermocouple channels					
14	TE1408-2	8 MB Flash Storage Option	Adds an additional 8 MB flash storage					

*GSM 1800 wireless standard for Europe
 *GSM 1900 wireless standard for North America
 *All Synergy eChamber models are available with or without TCweb sensors

3 Description

3.1 General Layout

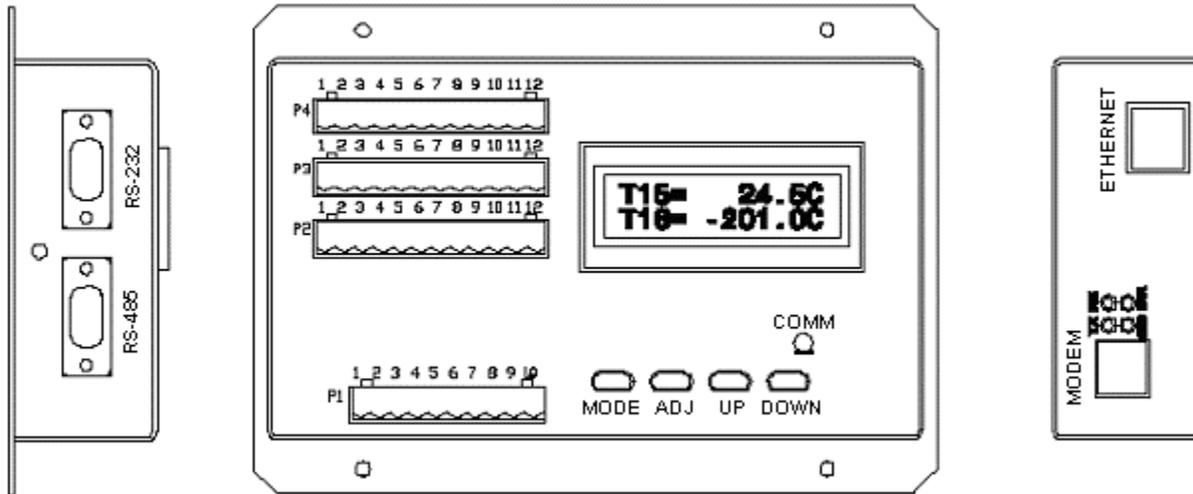


Figure 1: Diagram of TCweb Master

This diagram indicates the different physical features of the TCweb, including buttons, ports, indication lights, and the LCD Screen.

The RJ-45 Ethernet cable plugs into the “Ethernet” port, and the RS-485 Serial cable plugs into the “RS-485” port. The four multi-sockets on the front of the unit are where the power, thermocouples, communication lines, and relays connect to the unit.

3.2 Port Assignments

The four pluggable headers are numbered from the bottom up, with the 10-slot socket at the bottom labeled “P1” for Port 1. See Figure 1. Going up, the next three are “P2,” “P3,” and “P4.” Within the sockets, the connections are numbered from left to right, so the leftmost connection is “1,” the next is “2,” and so on. Each connection is identified in the manual by the Plug identifier and connection identifier: “P1-1” is the bottommost, leftmost socket. The following tables define the TCweb connections by signal and by plug number:

3.2.1 Thermocouple (TC) Connection Table:

Sensor	Positive Lead	Negative Lead	Description
TC 1	P2-5	P2-6	Thermocouple 1
TC 2	P2-7	P2-8	Thermocouple 2
TC 3	P2-9	P2-10	Thermocouple 3
TC 4	P2-11	P2-12	Thermocouple 4
TC 5	P3-1	P3-2	Thermocouple 5
TC 6	P3-3	P3-4	Thermocouple 6
TC 7	P3-5	P3-6	Thermocouple 7
TC 8	P3-7	P3-8	Thermocouple 8

TC 9	P3-9	P3-10	Thermocouple 9
TC 10	P3-11	P3-12	Thermocouple 10
TC 11	P4-1	P4-2	Thermocouple 11
TC 12	P4-3	P4-4	Thermocouple 12
TC 13	P4-5	P4-6	Thermocouple 13
TC 14	P4-7	P4-8	Thermocouple 14
TC 15	P4-9	P4-10	Thermocouple 15
TC 16	P4-11	P4-12	Thermocouple 16

3.2.2 Power Connection Table:

Signal	Connection	Description
Ground	P1-1	TCweb Power Return
Power	P1-2	TCweb Power, 12 to 28 VDC

3.2.3 RS-485 Connection Table:

Signal	Connection	Description
COMM RX+	P1-6	Communications Receive: Positive Lead
COMM RX-	P1-3	Communications Receive: Negative Lead
COMM TX+	P1-4	Communications Transmit: Positive Lead
COMM TX-	P1-5	Communications Transmit: Negative Lead

3.2.4 Relay Connection Table:

Signal	Connection	Description
Common	P1-8	Alarm Relay Common
Normally Open	P1-9	Alarm Relay contact opens under normal conditions
Normally Closed	P1-10	Alarm Relay contact closes under alarm conditions

The following tables list connections by plug number:

3.2.5 Connector P1:

Connection	Signal	Description
P1-1	Ground	TCweb Power Return
P1-2	Power	TCweb Power, 12 to 28 VDC
P1-3	COMM RX-	RS-485 Receive: Negative
P1-4	COMM TX+	RS-485 Transmit: Positive
P1-5	COMM TX-	RS-485 Transmit: Negative
P1-6	COMM RX+	RS-485 Receive: Positive
P1-7	Not Connected	
P1-8	Relay: Common	Alarm Relay: Common Line
P1-9	Relay: NC	Alarm Relay: Normally Closed
P1-10	Relay: NO	Alarm Relay: Normally Open

3.2.6 Connector P2:

Connection	Signal	Description
P2-1	Signal Return	Isolated return for DAC voltages
P2-2	DAC1	Digital to Analog Converter 1, 0 to 5 VDC
P2-3	DAC2	Digital to Analog Converter 2, 0 to 5 VDC
P2-4	No Connection	
P2-5	TC 1 +	Thermocouple 1, Positive
P2-6	TC 1 -	Thermocouple 1, Negative
P2-7	TC 2 +	Thermocouple 2, Positive
P2-8	TC 2 -	Thermocouple 2, Negative
P2-9	TC 3 +	Thermocouple 3, Positive
P2-10	TC 3 -	Thermocouple 3, Negative
P2-11	TC 4 +	Thermocouple 4, Positive
P2-12	TC 4 -	Thermocouple 4, Negative

3.2.7 Connector P3

Connection	Signal	Description
P3-1	TC 5 +	Thermocouple 5, Positive
P3-2	TC 5 -	Thermocouple 5, Negative
P3-3	TC 6 +	Thermocouple 6, Positive
P3-4	TC 6 -	Thermocouple 6, Negative
P3-5	TC 7 +	Thermocouple 7, Positive
P3-6	TC 7 -	Thermocouple 7, Negative
P3-7	TC 8 +	Thermocouple 8, Positive
P3-8	TC 8 -	Thermocouple 8, Negative
P3-9	TC 9 +	Thermocouple 9, Positive
P3-10	TC 9 -	Thermocouple 9, Negative
P3-11	TC10 +	Thermocouple 10, Positive
P3-12	TC 10 -	Thermocouple 10, Negative

3.2.8 Connector P4:

Connection	Signal	Description
P4-1	TC 11 +	Thermocouple 11, Positive
P4-2	TC 11 -	Thermocouple 11, Negative
P4-3	TC 12 +	Thermocouple 12, Positive
P4-4	TC 12 -	Thermocouple 12, Negative
P4-5	TC 13 +	Thermocouple 13, Positive
P4-6	TC 13 -	Thermocouple 13, Negative
P4-7	TC 14 +	Thermocouple 14, Positive
P4-8	TC 14 -	Thermocouple 14, Negative
P4-9	TC 15 +	Thermocouple 15, Positive
P4-10	TC 15 -	Thermocouple 15, Negative
P4-11	TC 16 +	Thermocouple 16, Positive
P4-12	TC 16 -	Thermocouple 16, Negative

The following table list RS-232 9 pin & 25 pin connections by plug number.

3.2.8 RS-232 9 Pin & 25 Pin Connections:

Connection	Description
1	Shield Ground
2	Transmitted Data (TD)
3	Received Data (RD)
4	Request To Send (RTS)
5	Clear To Send (CTS)
6	DCE Ready (DSR)
7	Signal Ground (GRD)
8	Received Line Signal Carrier Detector (CD)
9	Reserved for Testing
10	Reserved for Testing
11	Unassigned
12	Secondary Received Line Signal Detector
13	Secondary Clear To Send
14	Secondary Transmitted Data
15	Transmitter Signal Element Timing
16	Secondary Received Data
17	Receiver Signal Element Timing
18	Local Loop back / Quality Detector
19	Secondary Request To Send
20	DTE Ready (DTR)
21	Remote Loop back

22	Ring Indicator
23	Data Signal Rate Select
24	Transmit Signal Element Timing
25	Test Mode

Connecting the thermocouples to the TCweb is described the chapter “Unit Operation.”

3.3 Unit Mounting

The TCweb is mounted by the four holes in its back-plate as shown in the figure below. The TCweb measurements and the mounting holes are indicated.

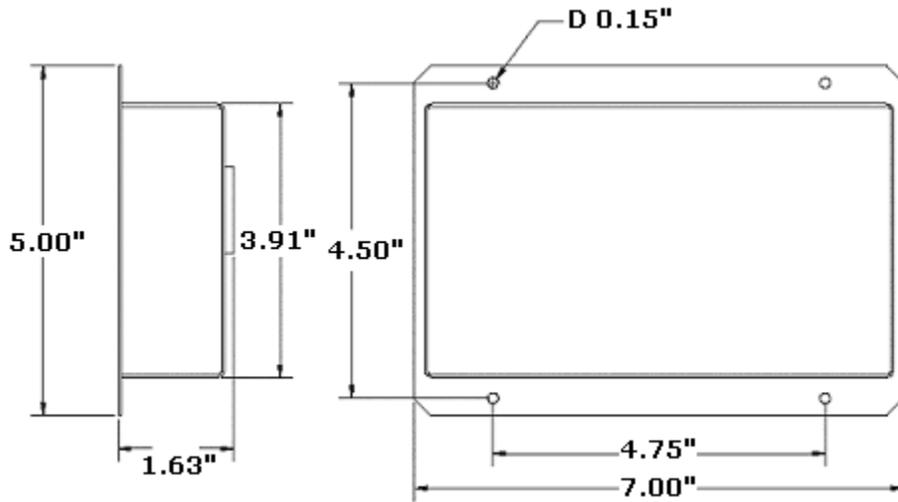


Figure 2 TCweb Mounting Dimensions

The unit may be mounted in any orientation.

4 Preparation for Use/Quick Start

4.1 Attaching Wires & Setting up the Unit

This Quick Start Guide will guide you through the fundamentals of the TCweb, setting up the unit and connecting to the unit via the Internet.

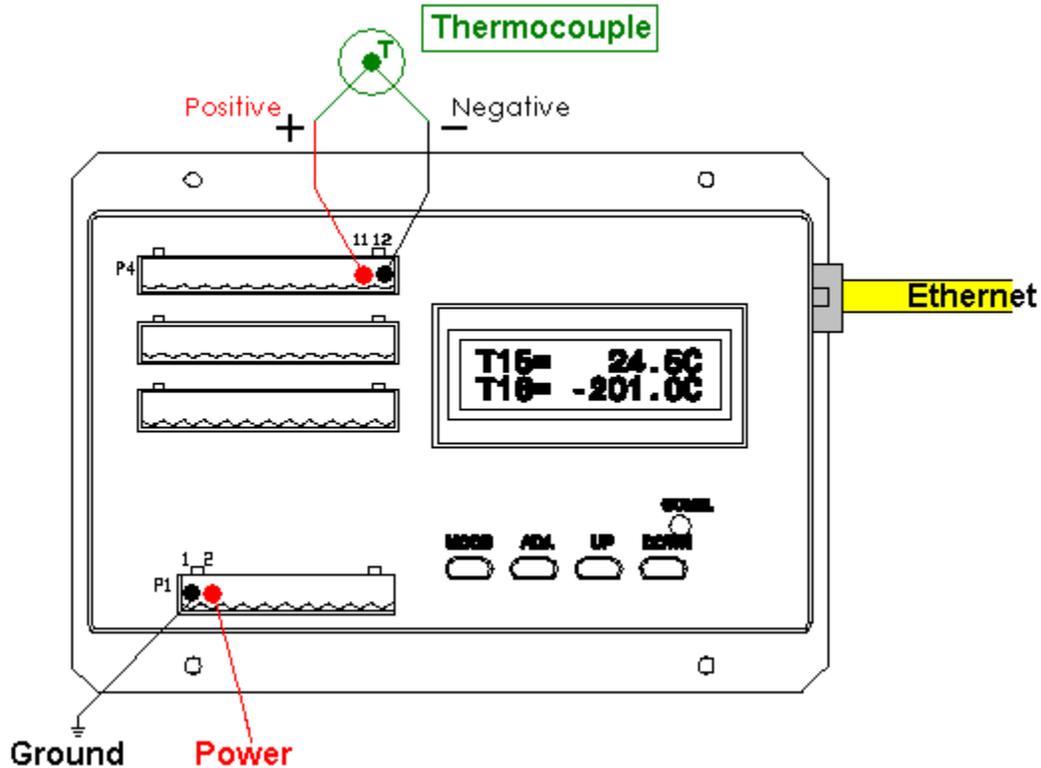


Figure 3 Quick Setup Connections

1. Plug the supplied 10 position terminal plug into the socket on the front of the unit labeled "P1." Plug one of the 12 position terminal plugs into the socket labeled "P4."
2. Plug in an RJ-45 Ethernet cable into the socket on the side of the unit, and plug the other end of the cable into an Ethernet Hub. Alternatively, you can connect the TCweb directly to a PC's Ethernet jack using an Ethernet "Crossover cable".
3. Connect the negative terminal of the DC power source into the P1-1, the left-most slot in the P1 terminal plug. Insert the positive terminal of the power cable into the P1-2, and tighten the holding screws on both positions.
4. Insert the negative wire of the thermocouple into P4-12, the right-most slot of the P4 terminal plug, and the positive wire into P4-11. Tighten the holding screws.
5. Press the MODE button on the front of the unit twice, or until the first line of the LCD reads "DHCP/Static." This screen allows you to set the type of IP address the unit will

use: one assigned automatically by a DHCP server or a static IP address that you will input into the unit. If the second line of the screen displays the correct setting, proceed to step eight. If not, go to the next step.

6. To change the setting, press the ADJ button to change from viewing to editing. Press UP or DOWN until the correct setting is displayed, then ADJ again to save the value.
7. Press MODE to go the next menu. The next three screens operate similarly, and together, they are used to specify the TCP/IP Network configuration for the unit. They are IP Address, Net Mask, and Gateway, respectively. If you have set the IP type to "Static," you can edit the values. If you have selected "DHCP," you can only view the values. Whether you input the IP address or it is assigned by a DHCP server, take note of the IP address, because you will need it to access the unit over the Internet. To edit the values: press the ADJ button to put the TCweb into edit mode. The editor goes digit by digit as you adjust it, and the digit being adjusted blinks. While editing, UP and DOWN do just that to the value. MODE advances to the next value, and ADJ saves the changes and goes to the next screen. However, when editing the last value, pressing MODE will cancel the edit mode and restore the prior value. To save the changes, press the ADJ button. Pressing MODE at the last value is the only way to cancel any mistakes. To go from menu to menu without editing, press MODE.
8. When you are done with the IP address, go to a computer connected to the same LAN that the TCweb is on or the one connected directly to the TCweb with a cross over cable, Open a browser window, and on the URL address line, type in the IP address that you read from the TCP/IP address menu on the front of the TCweb unit.
9. In the browser window that comes up, you should be able to see what temperature the thermocouple is detecting in the box labeled "T16." See Figure 4 below.

Note: Thermocouples, power lines, relay contacts, and others all connect to the TCweb through the four multi-connection plugs on the front of the TCweb. The supplied terminal plugs are 5mm spacing. The "P1" socket is a 10 position connector, and the other three, "P2," "P3," and "P4," are 12 position connectors. To attach a wire, first strip approximately 3/16 of an inch of the insulation off the wire, exposing the conductor. Then, insert the wire into the exposed cavity in the terminal plug, and tighten the locking screw.

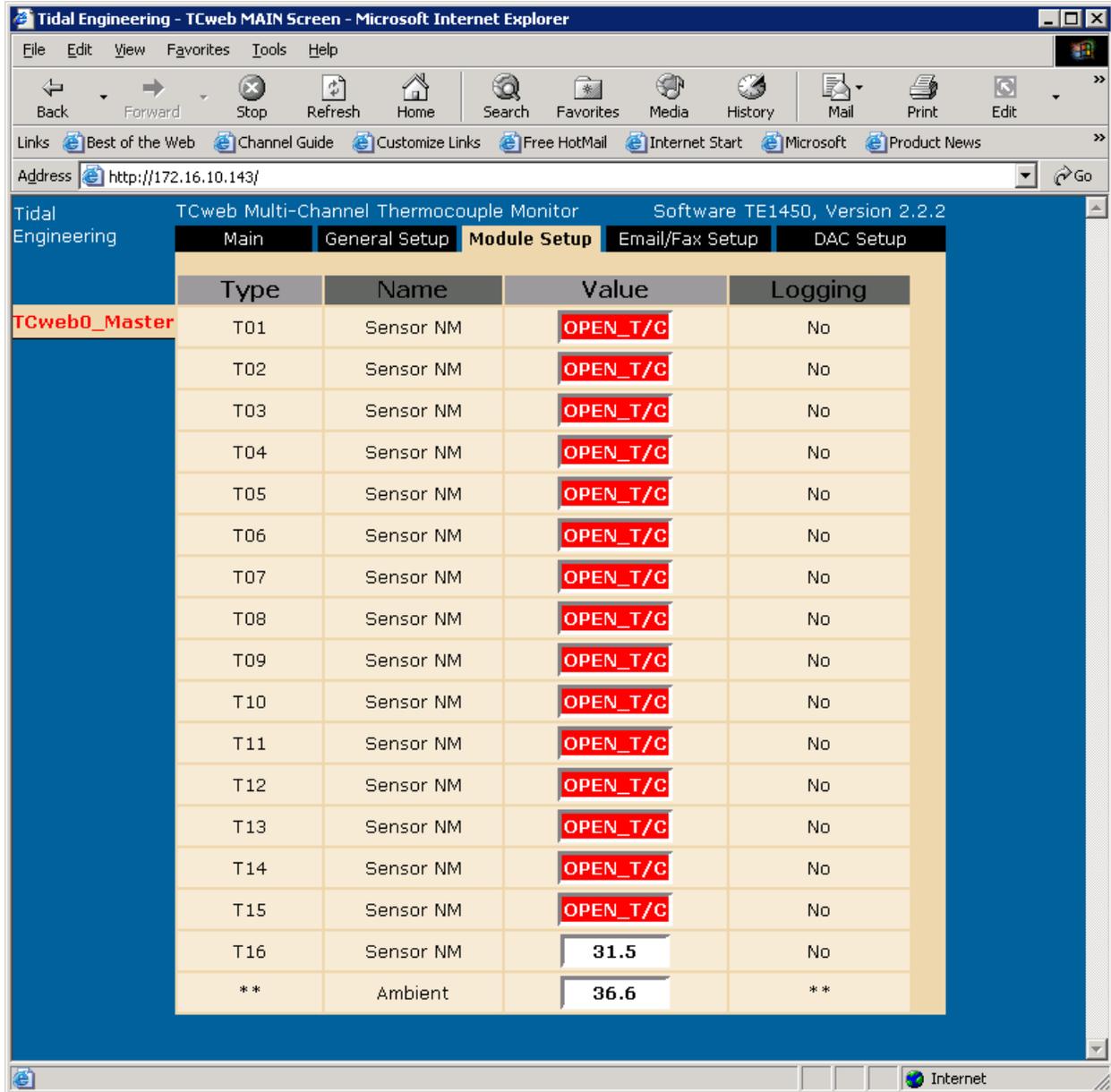
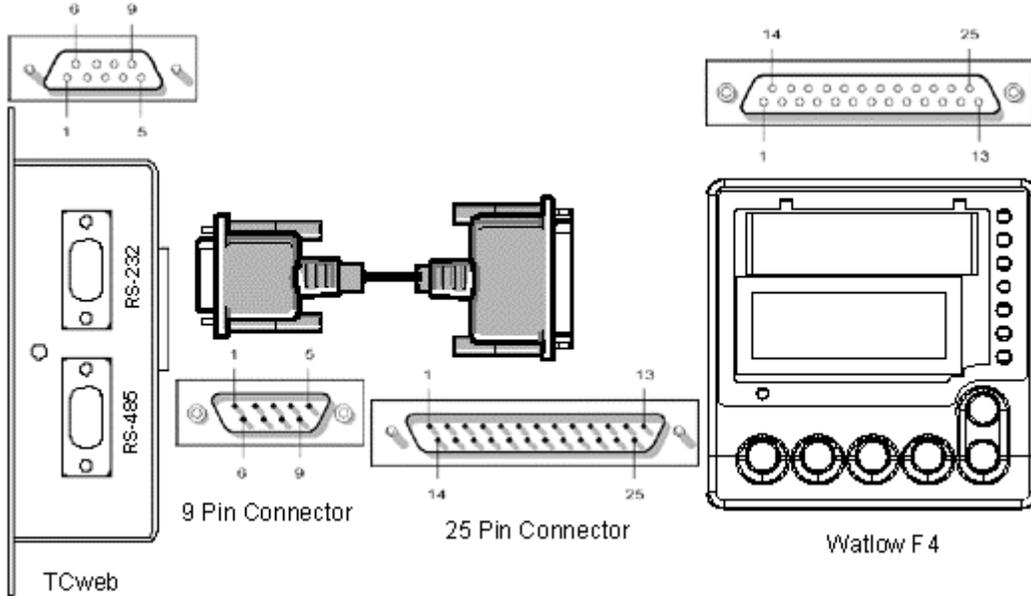


Figure 4 TCweb - Main Screen

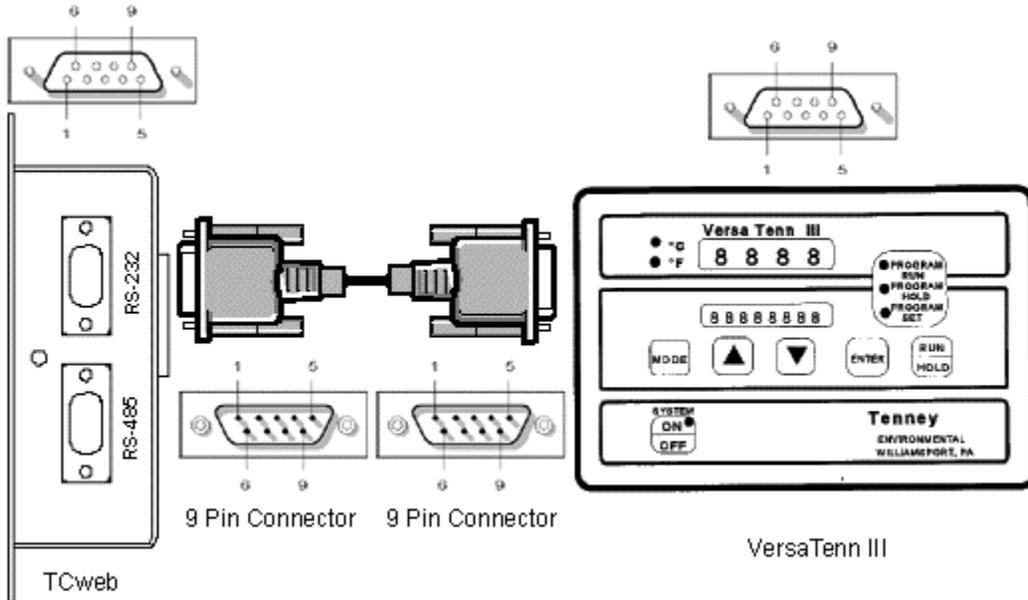
4.2 Connecting to the Watlow F4

For monitoring environmental chambers using the Watlow F4 controller, connect the 9 pin connector on the TCweb to the 25 pin connector on the back of your environmental chamber. If a 25 pin port is not available, contact your chamber distributor about installing the correct wiring.

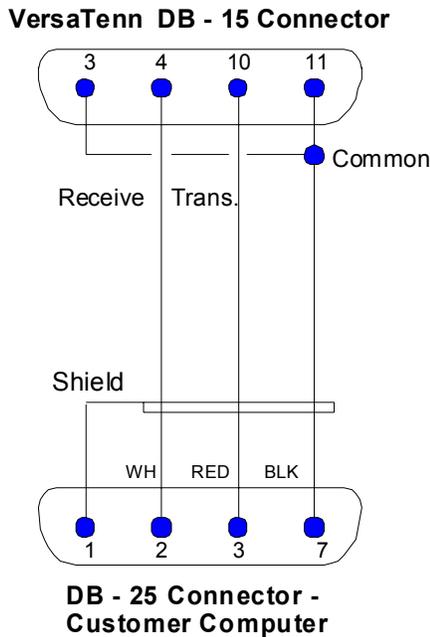


4.3 Connecting to the VersaTenn III

For monitoring environmental chambers using the VersaTenn III controller, connect the 9 pin connector on the TCweb to the 9 pin connector on the back of your environmental chamber. If a 9 pin port is not available, contact your chamber distributor about installing the correct wiring.



RS232 / 423 Interface Wiring Diagram



5 Unit Operation

5.1 LCD and Button Operation

5.1.1 Overview

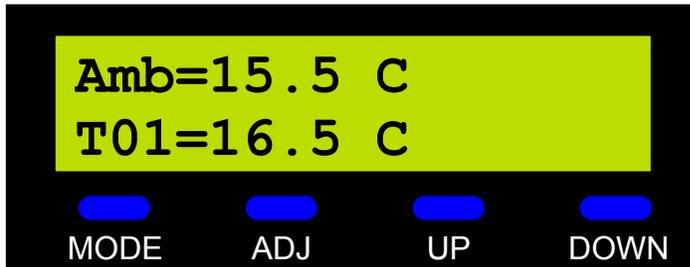
The TCweb has four buttons: MODE, ADJ (Adjust), UP, and DOWN. These buttons are used in conjunction with the Liquid Crystal Display to set the TCweb’s Display Parameters and the IP Parameters. The following table is an overview of the functions of each button in the different modes:

Button	Menu Mode		Scan Mode
	View Menu	Edit Menu	
Mode	Advance to next menu	Advance to next field	Enter Menu Mode
Adjust	Enters Edit Menu	Save Menu setting	Display Sensor Name *No decimals on eChamber
Mode &Up	Returns to Scan Mode	Cancel Edit Menu & Return to View Menu	Switch display to next unit
Mode &Down			Switch display to previous unit
Up	Advance to next menu	Increment value or switch to next selection	Advance to next sensor. Briefly display a sensor name.
Down	Return to previous menu	Decrement value or switch to next selection	Advance to previous sensor. Briefly display a sensor name.

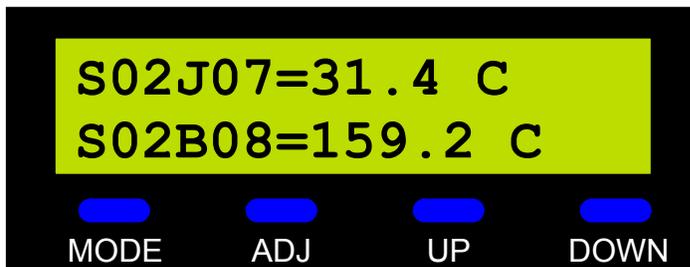
A few general guidelines: ADJ, when in a parameter display screen, toggles between editing and viewing. That is, to edit a value displayed on the screen, press the ADJ button. Then, when you have finished editing the value, hit ADJ again to save the value. The MODE button cycles through the different menus, and when you are editing, acts as a “cancel” button that will exit the edit mode and restore the former value, disregarding changes you made while editing. UP and DOWN will cycle through values while editing, and shift the part of the menu displayed in the screen for large menus. The asterisk displayed in the top right of the screen indicates that the value is Read-Only and can’t be manually changed, as in a DHCP assigned IP address. The exclamation point indicates that the value can be changed manually. And finally, the question mark means that the value is currently being edited. When a value is being edited, it will either be in parenthesis or blink.

NOTE: Sensors readings are optional on all Synergy eChambers.

5.1.2 Scan Mode

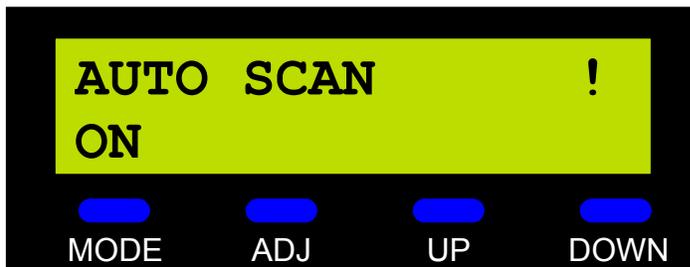


When powered the TCweb display starts in the Scan Mode, stepping through all of the sensor readings from the Thermocouples, as well as the ambient temperature of the module. An examples screen from this mode is shown above. The letter before the number of the channel is the type of thermocouple. Use UP and DOWN to cycle through the values. This will also temporarily display the name of the sensor that you have set or will set through the web interface. To see the names without cycling, or for a longer duration, press and hold the ADJ button. If AutoScan is turned on, the values will cycle automatically at three-second intervals. You can use UP and DOWN in Auto Scan mode to manually select a sensor. In that case, the scanning will pause for ten seconds before resuming the AutoScan. If there are any slaves attached to the master, their values can be viewed by holding MODE and pressing either UP or DOWN. AutoScan and manual cycling work the same when viewing the slaves as they do for the master. The letter “S” for slave prefaces each channel of the display, followed by the unit number, then the Channel information:

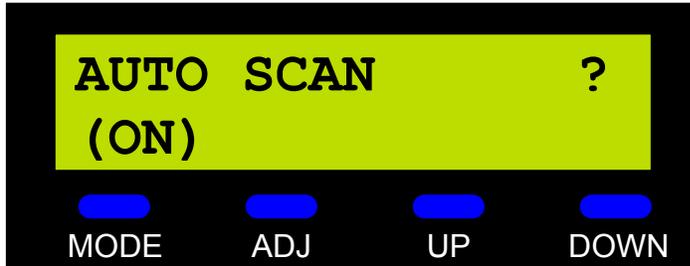


5.1.3 Menu Mode: AutoScan

To enter the Menu Mode, depress the MODE button to go to the AutoScan Set menu. The current value of AutoScan is displayed, either On or Off.



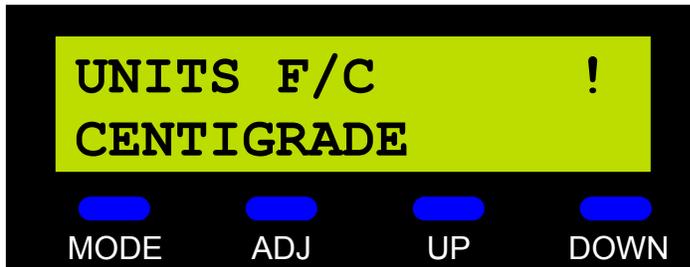
To toggle the value, hit ADJ and then UP or DOWN. While editing, ADJ will save the settings, and MODE will cancel and advance to the next menu.



If you have saved the value with ADJ, MODE will advance to the next menu.

5.1.4 Menu Mode: Displayed Units

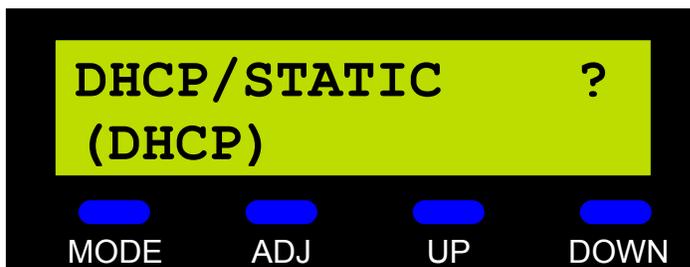
The next menu is the Units Set menu, selecting either "C" for Celsius or "F" for Fahrenheit. This menu acts like the AutoScan Set menu, ADJ to edit, UP and DOWN to toggle, MODE to advance.



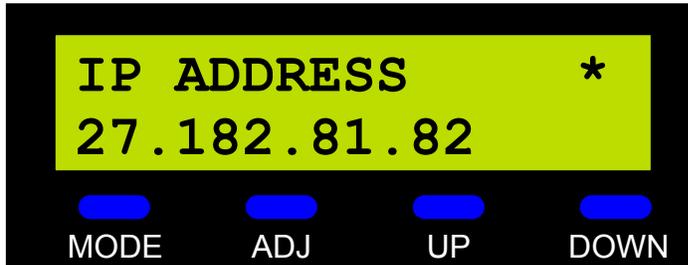
5.1.5 Menu Mode: IP Settings

DHCP/Static Set is next. This allows you to choose whether the unit's IP address will be set by a DHCP server or by your static IP address input. This is another toggle function, and works like the Auto Scan selection.

NOTE: Logging stops when the TCweb is searching for a DHCP server. This occurs when the unit switches from "Static" to "DHCP."



The next three screens operate similarly. They are TCP/IP Address, Net Mask, and Gateway, respectively. If the DHCP/Static is set to “Static,” an exclamation point is displayed, and you have the option of editing the values. In DHCP mode an asterisk is displayed, and you can only view the values.



Here too, ADJ accesses editing. The editor goes digit by digit as you adjust it, and the digit being adjusted blinks. While editing, UP and DOWN increment and decrement the value. MODE advances to the next value, and ADJ saves the changes and goes to the next screen. However, when editing the last value, MODE, will cancel the editing and restore the prior value. To save the changes, you must press ADJ. Pressing MODE at the last value is also the only way to cancel any mistakes.



The next screen brings you back to the first digit, enabling you to start again.

5.2 Alarm Relay Operation

The TCweb has an alarm relay contact that will trigger in the event of an alarm condition on any or all of the units or on an attached controller. This feature is set up in the section “Web Interface: Module Setup.” The Form C relay contact can be used to activate an annunciator, buzzer, light, or signal another system when there is an alarm.

Common	P1-8
Normally Open	P1-9
Normally Closed	P1-10

Reprinted here is the Relay Connection Table. To set up the buzzer, connect the corresponding leads to the buzzer to the appropriate channels. The “Normally Closed” line will open when the unit turns off, as in the event of a power failure. The “Normally Open” line is closed when the unit detects an alarm condition, as you’ve set them in the web interface, and wants to communicate the alarm.

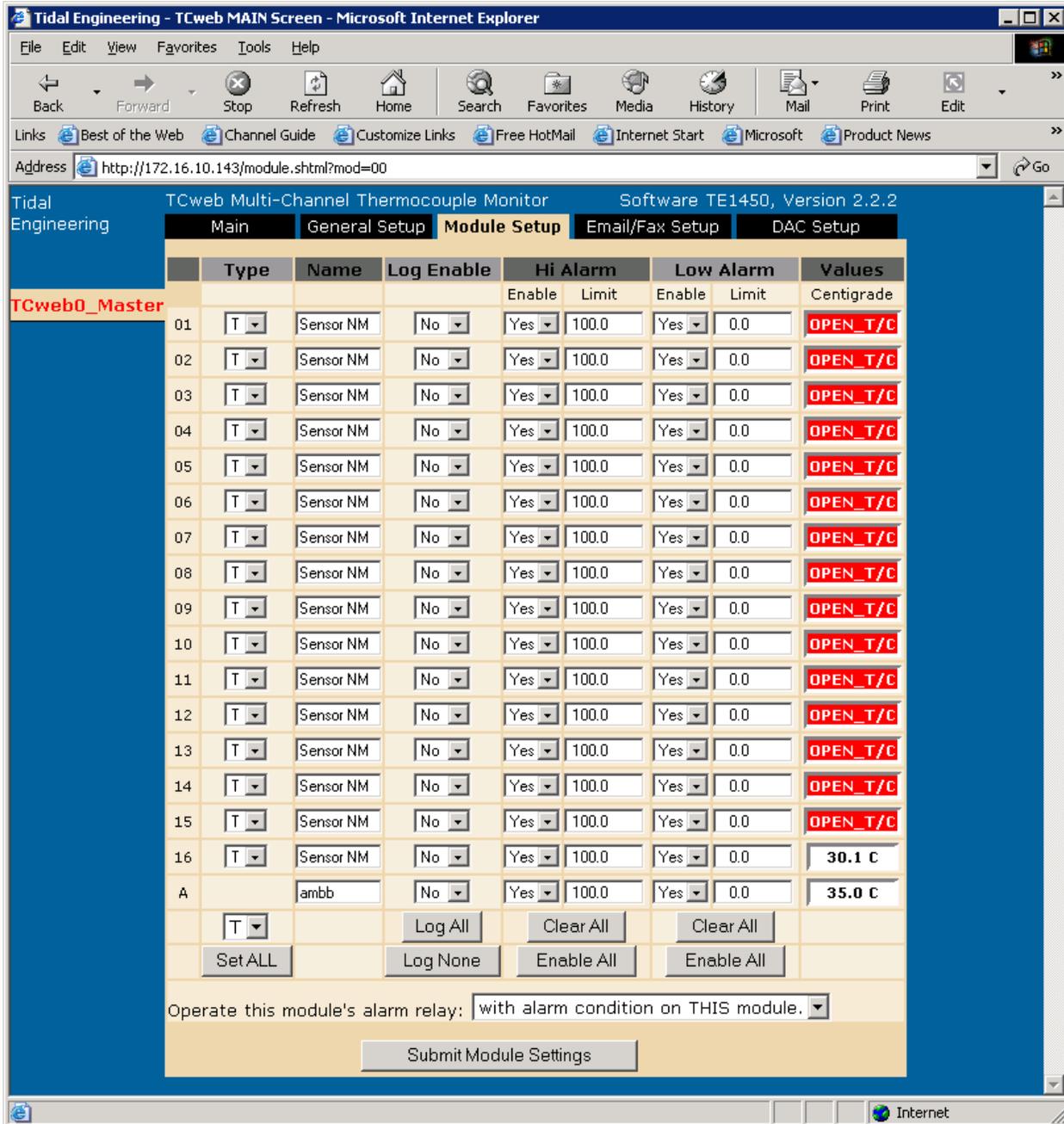
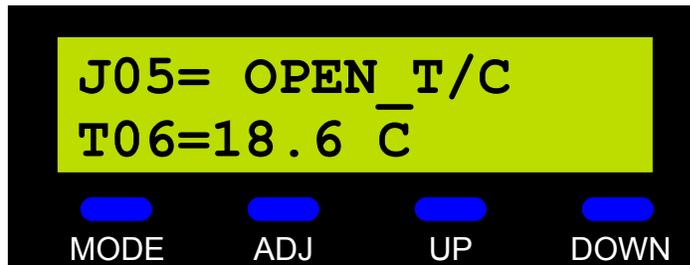


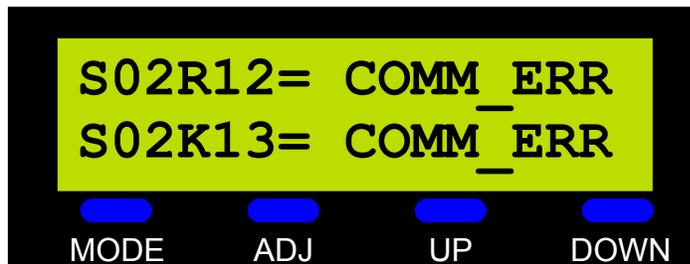
Figure 5 Module Setup Page

5.3 Error Messages

If there an open thermocouple is detected, an error message will be displayed.



The "Open T/C" message is displayed when the channel opens. This indicated that there is on open circuit on a thermocouple. This can occur if there was no thermocouple there, if the thermocouple has come unplugged, or if the thermocouple has been broken. This condition will trigger an alarm if the channel that is open has a "Low Limit" Alarm enabled.



The Communications Error message is generated if communication with a slave, via the serial connectors, is corrupted. This can occur if the lines are severed, if the lines are crossed, if the slave is unplugged, or if there is noise on the communication line. A condition that causes a communication error will always effect all of the channels for that unit.

6 Web Interface

The TCweb's myriad functions can be accessed on a local area network or from the Internet if the network is setup appropriately. To reach the Web Interface, open a browser, and in the address line, type the IP address of the unit. This address is either the static IP address set using the web interface or the one assigned by the DHCP server if you selected the DHCP option. In the either case, the address can be viewed in the IP menu on the unit, as described in the "Unit Operation" section above. There are five screens that constitute the online interface: Main, General Setup, Module Setup, Email/Fax Setup and either DAC Setup in the TCweb or Chamber Setup in the eChamber. You can switch between these screens using the tabs at the top of each TCweb window.

In all of the screens, there is a tab along the left side of the window that indicates the number of slaves that are configured and the currently selected unit. On some pages, there is a "Submit" button. This button will save the changes that you have made, send them to the unit, and return to the same screen.

6.1 Main

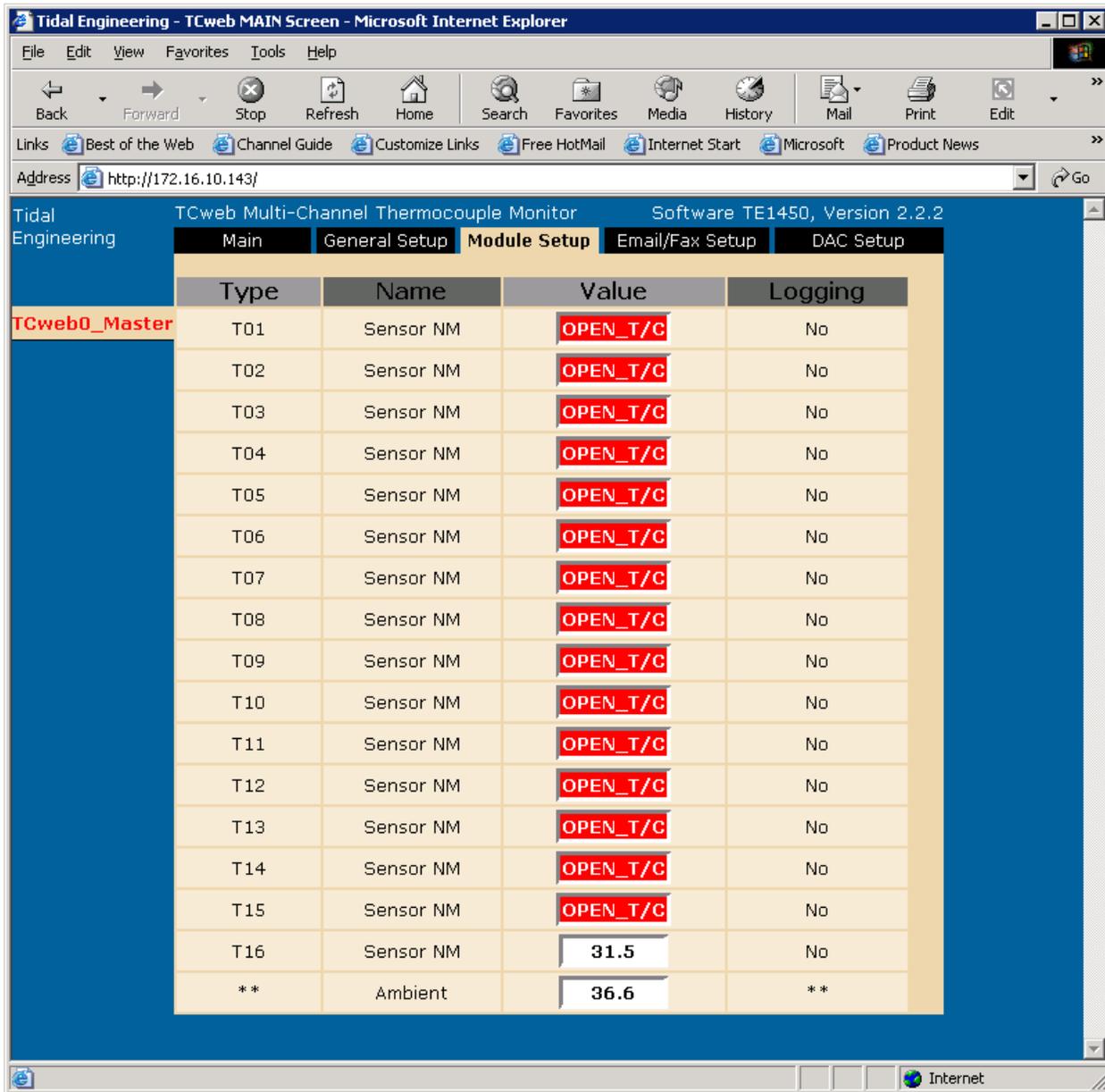


Figure 6: TCweb Main Screen

The Main Screen is the first to come up when the TCweb is addressed by the browser. This screen displays the temperature from each of the Sensors, the ambient temperature of the unit, the units that the temperatures are in, whether logging is taking place or not, and if there are any alarms.

Also on this screen, you can select which unit to view, if there are Slave units are connected to the master.

6.2 General Setup

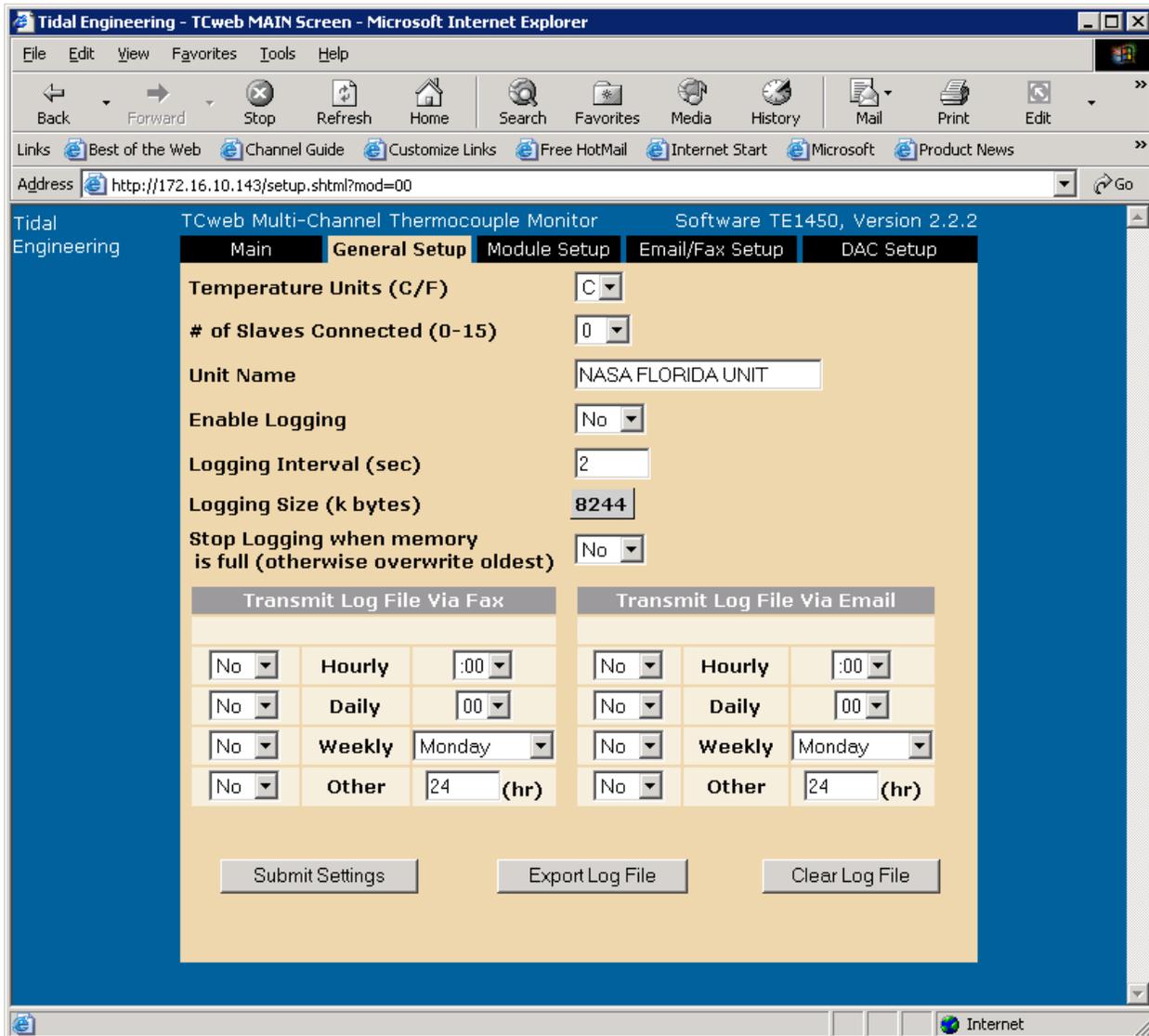


Figure 7: TCweb General Setup Screen

The General Setup screen allows you to set general parameters for the TCweb. Drop-down menus allow you to choose the units the temperature is displayed in, either Celsius or Fahrenheit, and the number of slaves connected. In the box labeled “Unit Name,” you can enter a descriptive name for the unit. This name will be included in alarm e-mails and faxes, and will also appear in data logs.

This screen controls the logging features of the TCweb, allowing you to record the values of particular channels over time into a data file, and then download the file or send it to another location.

Each module channel has its own check box to select it for logging. In addition, the “Enable Logging” check box on the General Setup screen is the overall enable to turn all logging on or off. The “Logging Interval” is the time between successive logging of the selected channels.

The log file can be transmitted via e-mail at regular intervals. Select the interval, and the method. The e-mail address(es) that the device will transmit to are set in the E-mail/Fax screen.

To save the settings, click “Submit Settings.” If “Enable Logging” is checked, logging will begin immediately.

Recall from above that Logging will be momentarily halted if, on the master unit, the mode of IP addressing is switched from “Static” to “DHCP.”

To download the data file, press the “Export Log File” button, and a dialog will come up allowing you to save the file to your computer. The format of the file is discussed below the description of the different screens. Pressing “Clear Log File” erase the TCweb’s flash data log memory.

6.2.1 General Setup eChamber Gateway

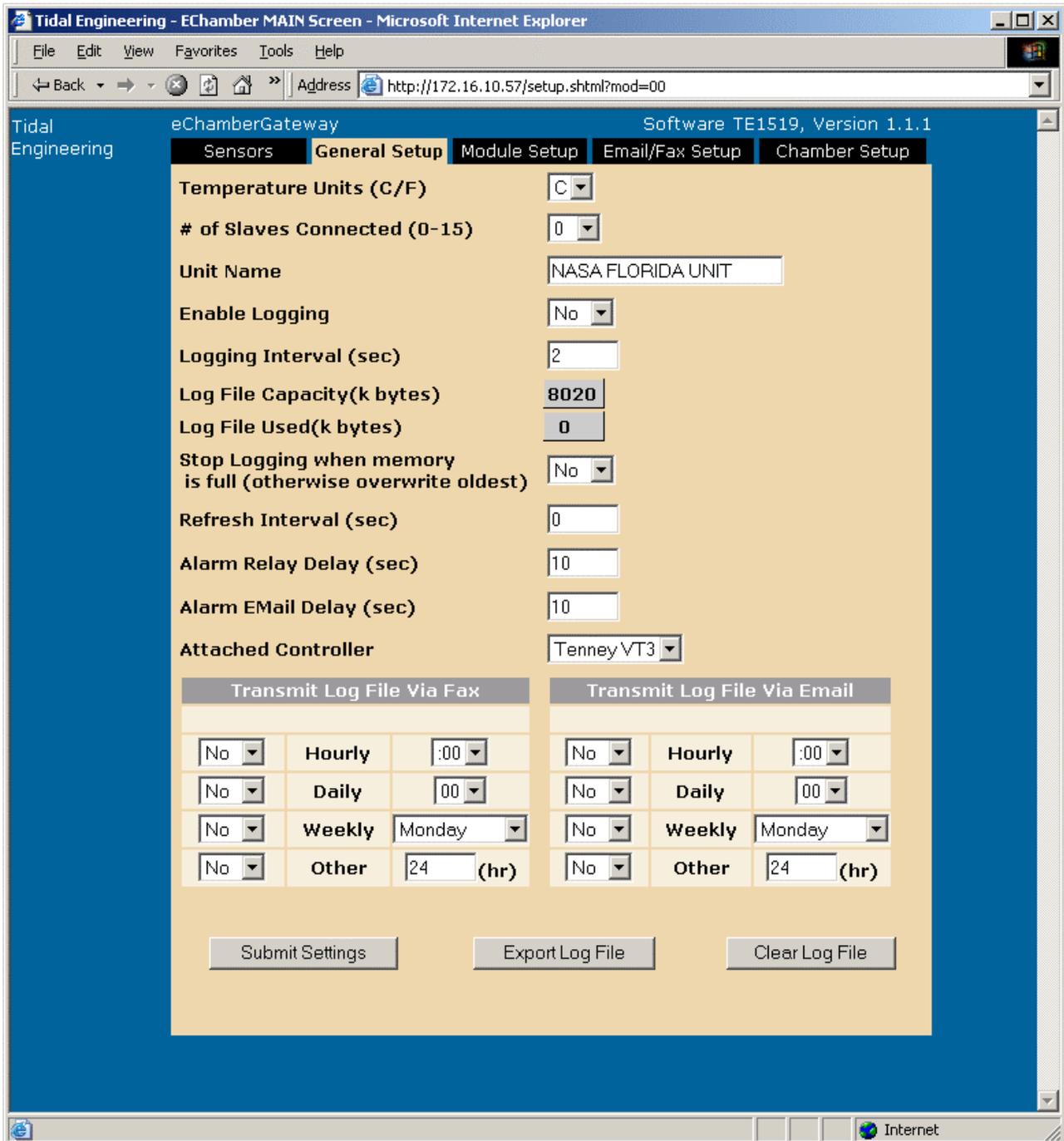


Figure 8 eChamber General Setup Screen

The eChamber General setup screen has four additional fields. The Refresh Interval sets the frequency at which the Chamber page will be automatically refreshed. This option should not be set below 30 seconds as it may take the page up to 30 seconds to load, depending on your connection speed. The Alarm Relay Delay specifies how long an alarm condition must exist before the alarm relay is triggered and either a buzzer sounds or an alarm light flashes. The delay setting allows the user to avoid nuisance alarms when an alarm condition only exists for a short time. The Alarm

Email Delay specifies how long an alarm condition must exist before an email notification is sent out. Use the Attached Controller field to set which controller is attached to your system.

6.3 Module Setup

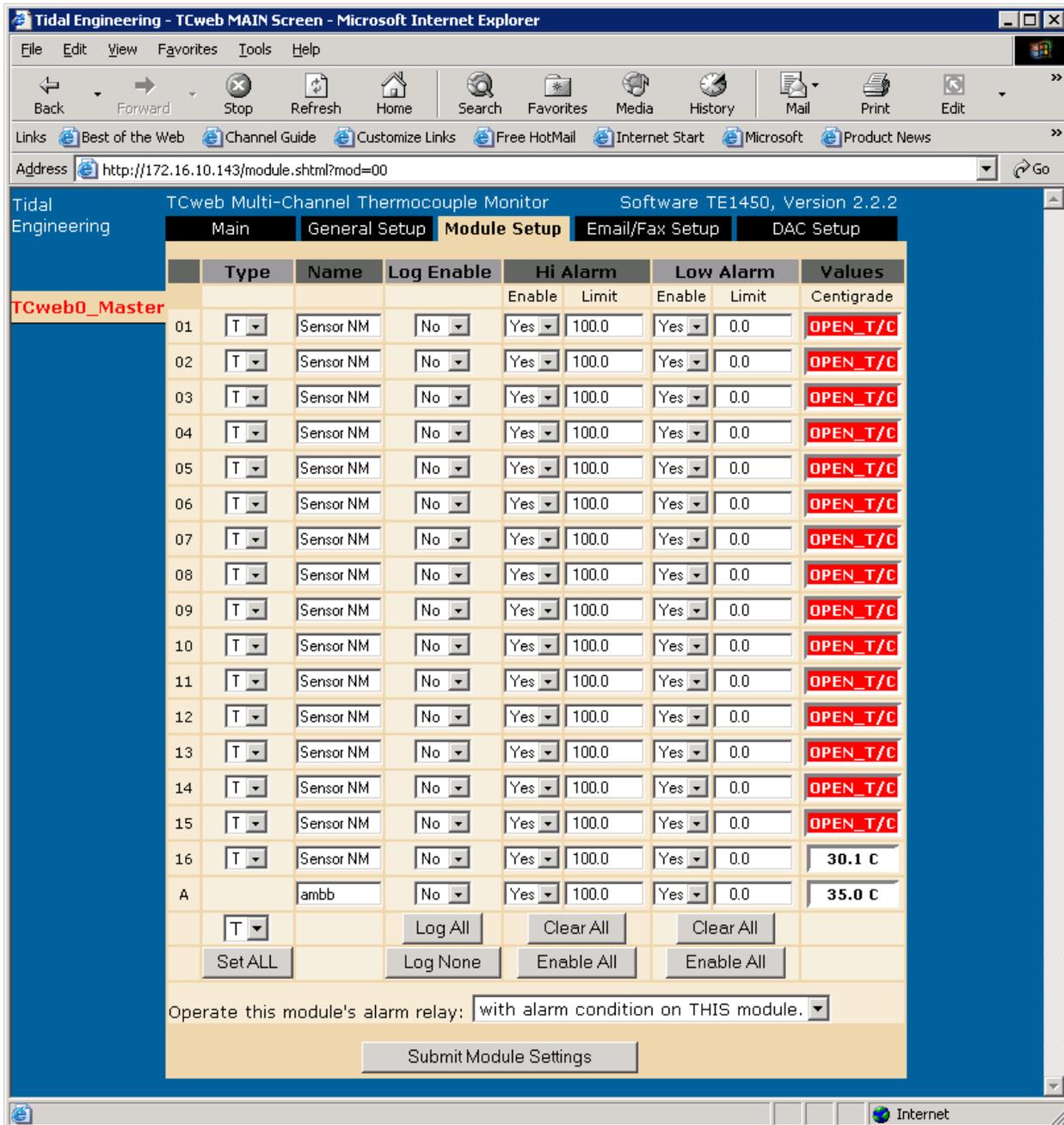


Figure 9 TCweb Module Setup Screen

The Module Setup Screen is used to configure each module. You can set the type of thermocouple in each position for each module, enter a Sensor name, enable logging and set Hi and Lo alarm limits. In addition, you can set the operation mode for the Alarm relay on each module. To save the settings, press the “Submit” button. To check or edit the settings for another unit, select the tab for the unit on the left side of the screen.

6.3.1 Set All

At the bottom of the Type Column, there is a drop down and a “Set All” button that can be used to set all the sensors on the selected module to one type.

6.3.2 Log All

At the bottom of the Log Enable Column, there is a “Set All” button that can be used to enable logging on all the sensors on the selected module. Similarly, there is a “Set None” button that can be used to disable logging on all the sensors on the selected module.

6.3.3 Clear All Alarms

At the bottom of the Hi Alarm and Lo Alarm Columns, there is a “Clear All” button that can be used to Disable alarms on all the sensors on the selected module. Similarly, there is a “Set All ” button that can be used to enable alarms on all the sensors on the selected module.

The Module screen allows you to set which channels will trigger alarms, and at what temperatures those alarms will go off. For each channel, a text box allows entry of the alarm limit for both high and low temperatures, and the “Enable” check box to turn that high or low alarm on or off.

At the bottom is the setting for the Alarm Relay. You can choose which situations will trigger the relay on the unit indicated by the fly-out in the top left.

The “Submit Module Settings” button saves the values to the TCweb. Like the Main Screen, the tabs on the left controls which unit – master or one of the slaves – you are setting the alarm conditions.

6.4 E-mail

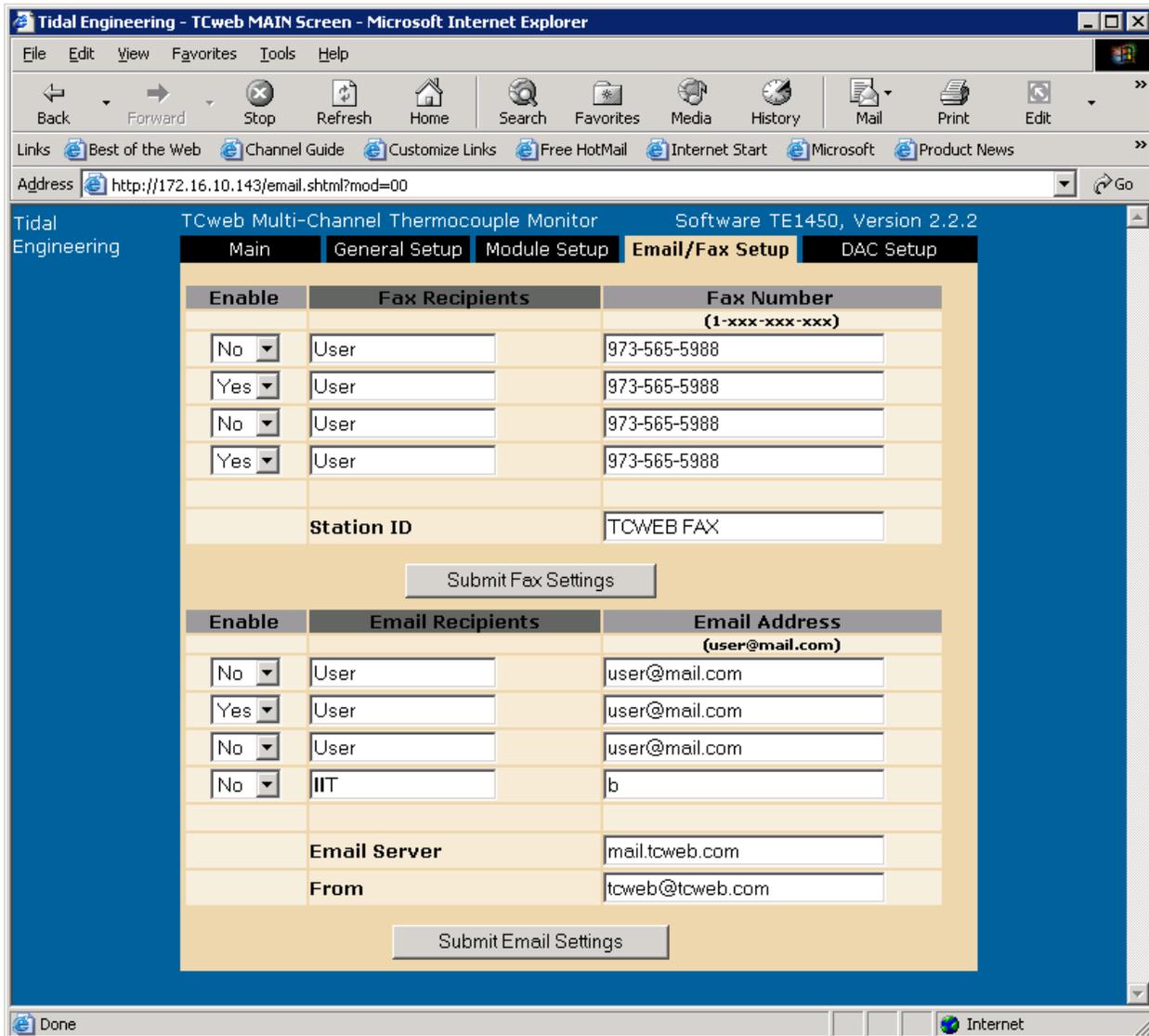


Figure 10: TCweb E-mail Screen

This section allows you to enter where the alarm notifications and log files will be sent. You can select whether or not the alarm notification will go to that entry by checking the “Enable” box, entering a name for that recipient, and entering the address of the recipient. Press Submit to send your changes to the TCweb and save them.

6.5 eChamber Gateway Chamber Setup

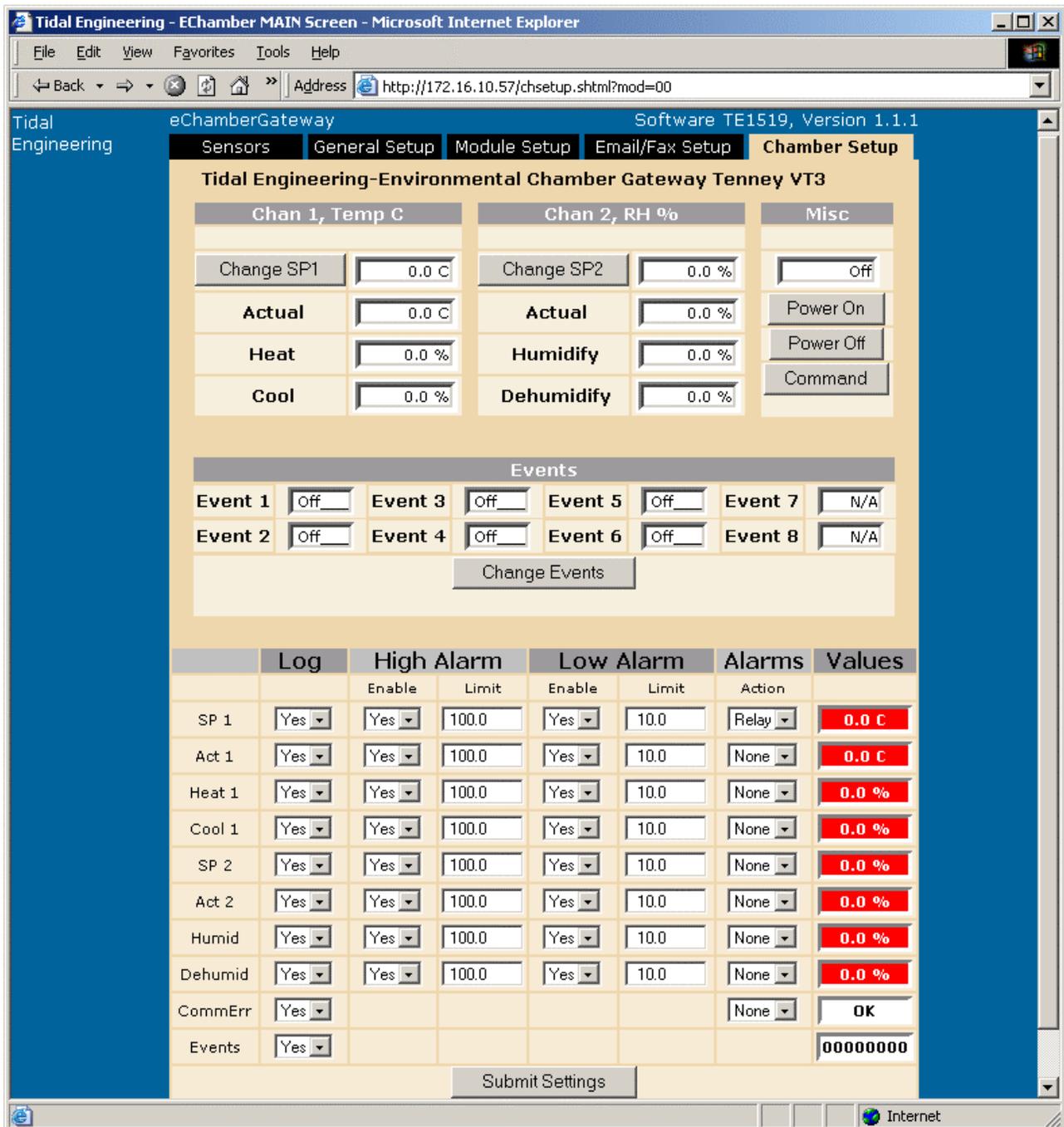


Figure 11 eChamber Gateway Chamber Screen

The eChamber Gateway version of the TCweb has an additional page called Chamber Setup. This page allows the user to interact with the chamber controller directly. The Chamber Setup page displays data such as the chamber’s temperature, humidity, percent cooling, percent heating, event states and the power state.

6.5.1 Setting & Reading Values

With the eChamber Gateway you can remotely set and read chamber data as if you were at the chamber in person. Using the web interface, you can power your environmental chamber on and off, change setpoints and change events. Additionally, you can use the Command feature to set or read any chamber parameters for which the OEM has provided a command set.

Changing Setpoints

To change the setpoint, press the Change SP1 button. Next you will see the Change Set Point 1 dialog box. Enter the desired value, enter the password “TE123” (case insensitive) and press change.

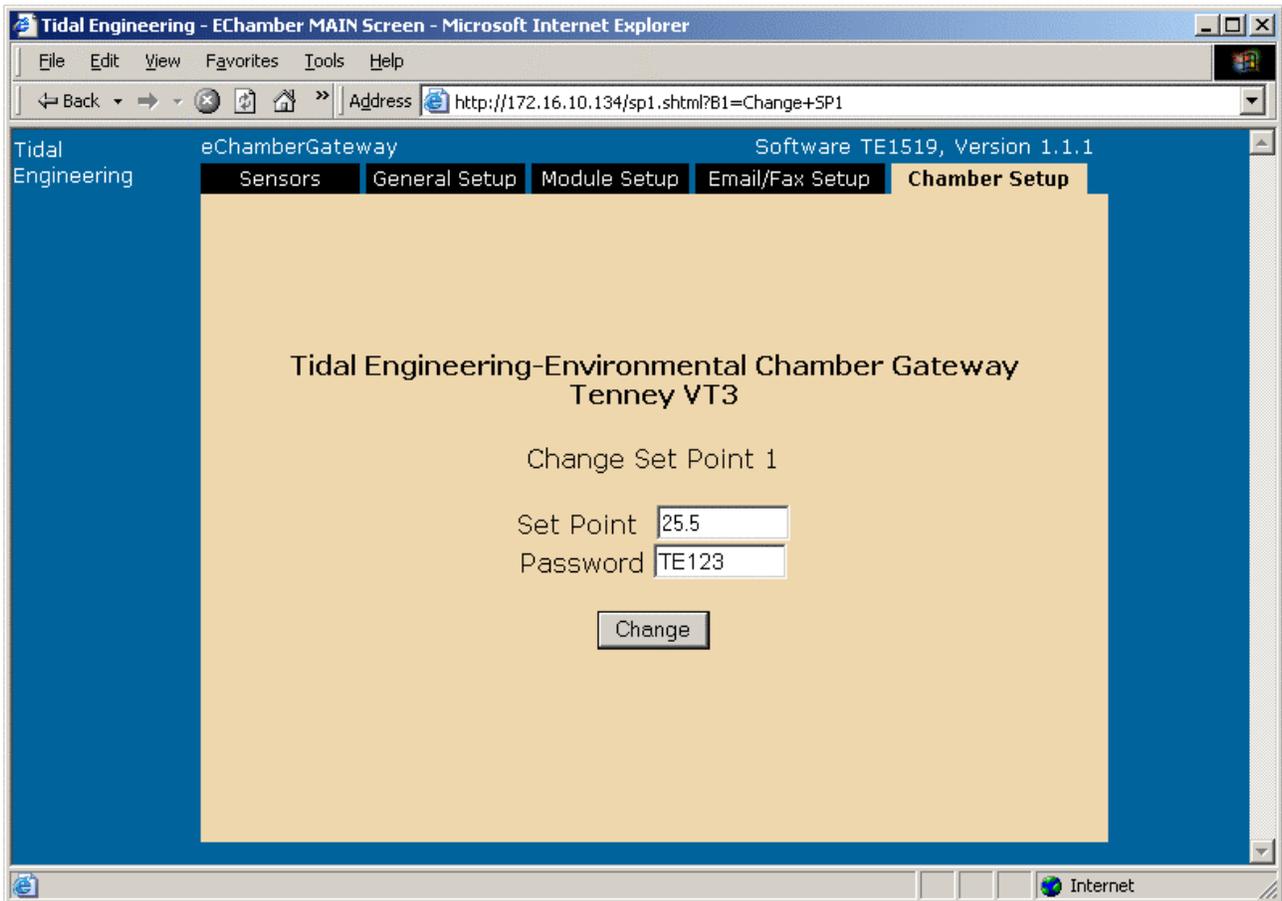


Figure 12 Change Setpoint Screen

After pressing Change, you go back to the Main chamber screen.

Changing Events

To change the events, press the Change Events button.

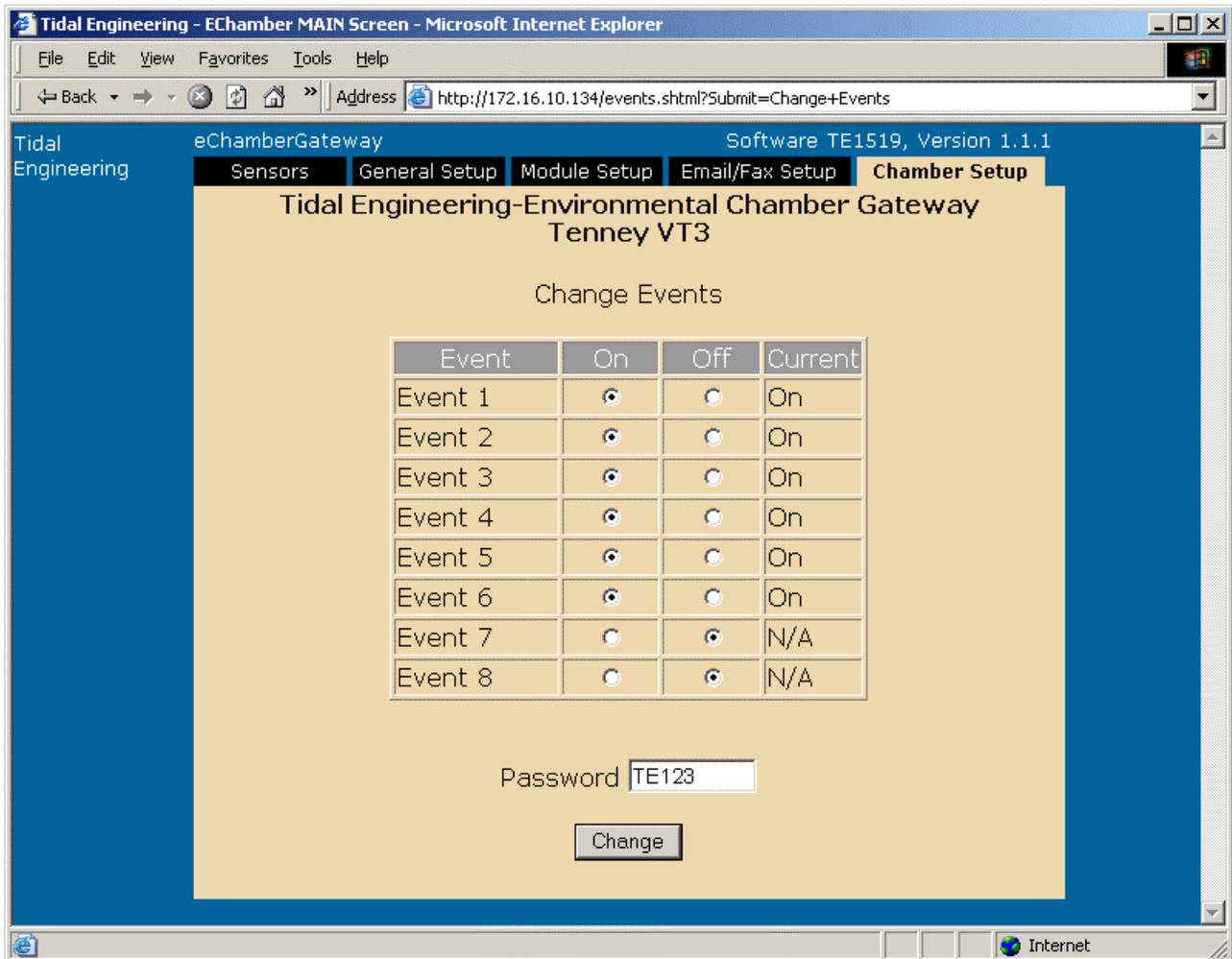


Figure 13 Change Events Screen

Select the desired events states, enter the password “TE123”. You will return to the Chamber Setup screen.

Sending Commands

The Command feature allows the user to send any query or set command to the environmental controller. There are two types of command interfaces: ASCII and Modbus. The command interface is automatically set when you select the type of controller you are using, see the General Setup section for more information.

Sending Commands with ASCII

Using the ASCII interface, in the command field, enter the desired command and press submit. You will next see a Processing screen. Press the Return button to return to the Command window. The response to the query or set command is displayed in the Value field under the Last Result heading. To use the Command feature you will need a list of available commands and command syntax which is available from your environmental chamber distributor or in the appendices at the end of this document..

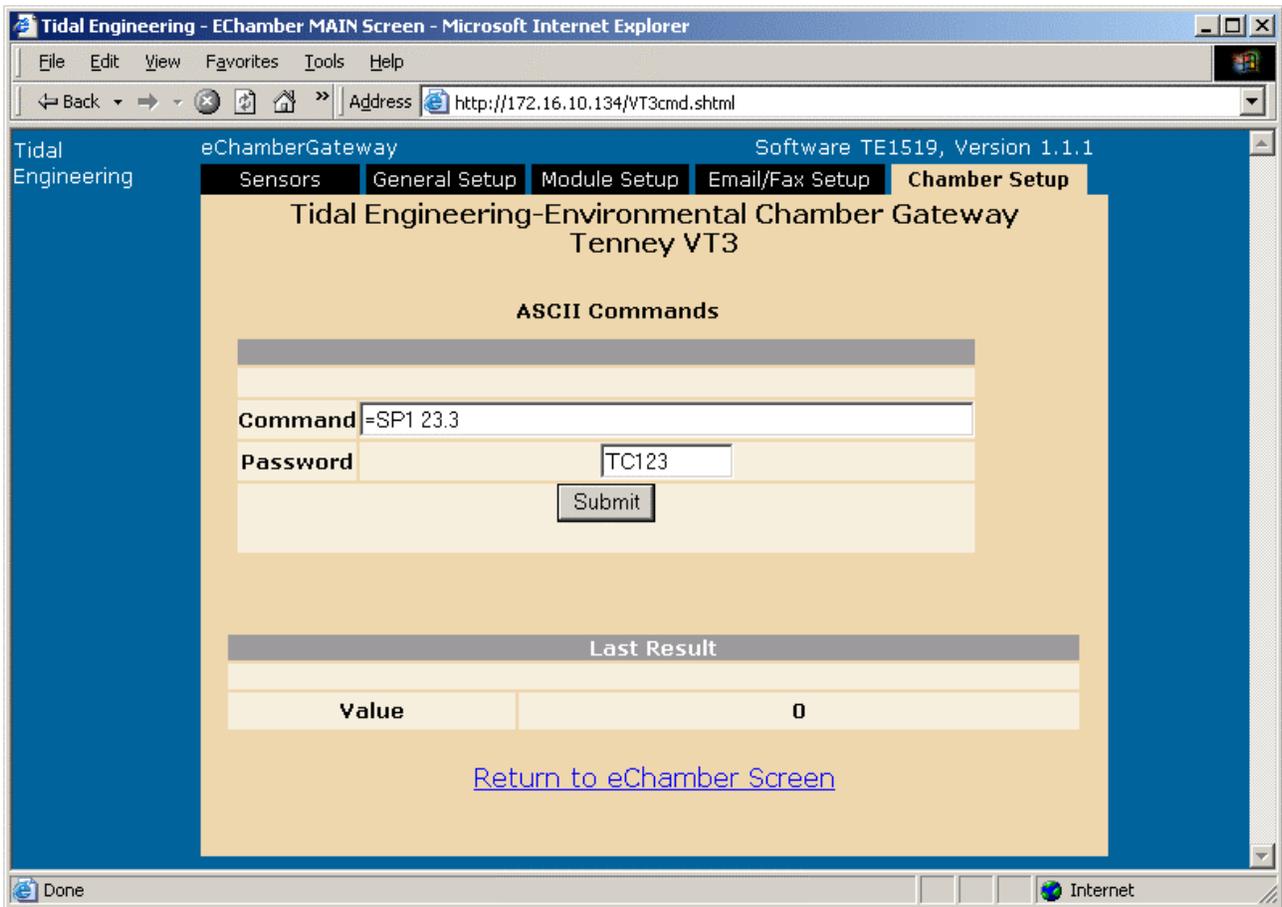


Figure 14 ASCII Command Screen

Sending Commands with Modbus TCP/IP

Using the Modbus TCP/IP interface to write a value, enter the register, data value, password and press the Submit button. After processing the command, the result will be displayed in the Value field just below the Last Result header. The read a value, simply enter the register and press submit. To use the Command feature you will need a list of available registers, their parameters and syntax which is available form your environmental chamber distributor or in the appendices at the end of this document.

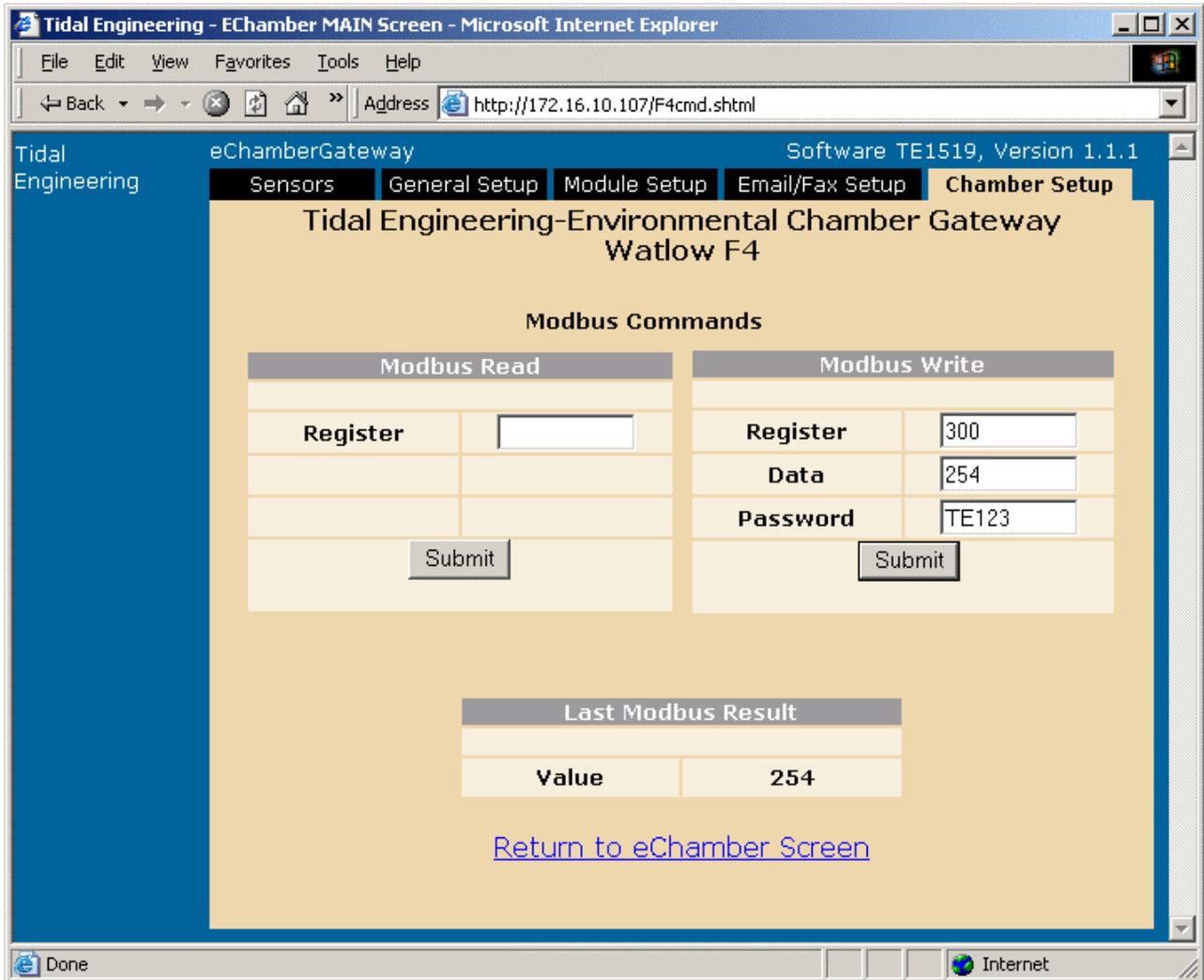


Figure 15 Command Modbus

6.5.2 Logging & Alarms

The eChamber gateway offers logging capabilities to track the state of your chamber throughout your testing process. The Chamber Setup screen allows you to set which chamber readings will be logged. To log a chamber reading, go to that parameter's row and, using the dropdown box, set the Log value to Yes. The eChamber displays the last readings in the column titled Values located on the lower right hand side.

In addition to the alarms already on your environmental chamber, you can specify eChamber Gateway alarms. To set a parameter’s alarm range, go to it’s appropriate row and set the high and low alarm values. To then enable functioning or the alarms, set the Enable value to Yes. Use the Action column to specify if the alarm condition should trigger the eChamber’s Relay alarm.

7 Log Files

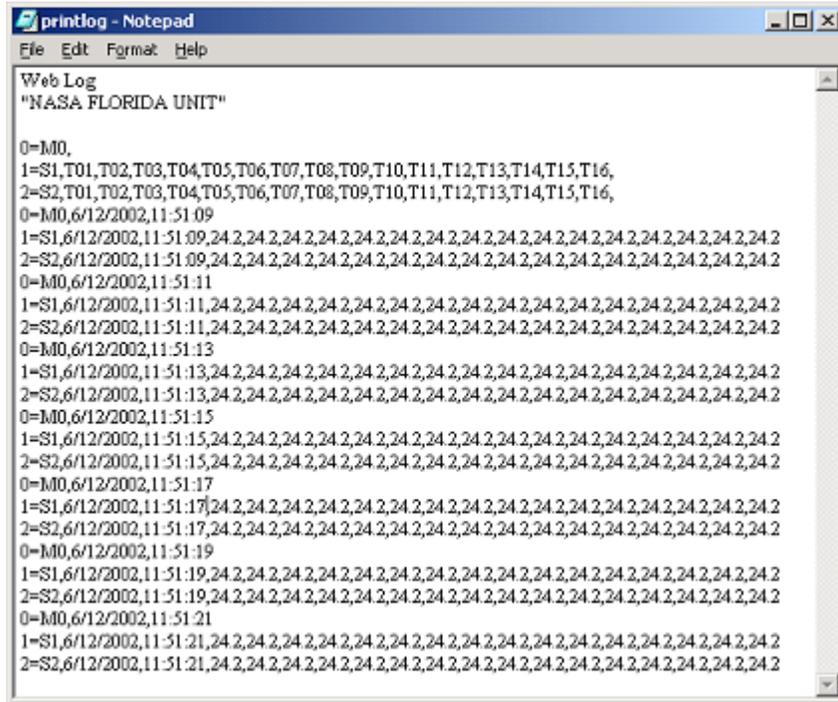


Figure 16: Example Log File

This is a sample data file. The file is a text document, and the format is as follows:

The first line carries the words “Web Log.” The second line has the name of the unit you defined, on the “General Setup” screen, in quotes, and then an empty line.

The next block is the header or “definition” block, which repeats the channels that are being recorded, as you set them in the “Logging” screen. The unit number is followed by an equals sign, then the unit type identifier, either “M” for master or “S” for slave. The unit number is repeated, and then a comma follows. Then there is a list of all of the channels selected to record for this logging from that unit, separated by commas. In the example file here, the master has zero channels being recorded, and the two slaves have all of their channels being recorded.

Then the data begins. At each sample, the block format is repeated, again beginning with unit number, equal sign, unit type identifier, unit number, and comma. Then the date is displayed, followed by a comma, and the time, also followed by a comma. The next set of entries on each line is values for the channels indicated by the header block. See the appendices for information on manipulating log file data in Excel.

8 Modbus/TCP Interface

8.1 Modbus/TCP Overview

Excerpted from Sena Technologies www.Sena.com
(http://www.sena.com/download/tutorial/tech_Modbus_v1r0c0.pdf)

MODBUS/TCP

MODBUS/TCP is a communication protocol designed to allow industrial equipment such as Programmable Logic Controllers, computers, operator panels, motors, sensors, and other types of physical input/output devices to communicate over a network.

Modbus/TCP was invented by Modicon/Group Schneider and is today is one of the most popular protocols embedded inside the TCP/IP frames of Ethernet. Modbus/TCP basically embeds a Modbus frame into a TCP frame in a simple manner. This is a connection-oriented transaction, which means every query expects a response.

This query/response technique fits well with the master/slave nature of Modbus, adding to the deterministic advantage that Switched Ethernet offers industrial users. The use of OPEN Modbus within the TCP frame provides a totally scaleable solution from ten nodes to ten thousand nodes without the risk of compromise that other multicast techniques would give.

MODBUS® TCP/IP has become an industry de facto standard because of its openness, simplicity, low cost development, and minimum hardware required to support it. At this moment there are more than 200 MODBUS® TCP/IP devices available in the market. It is used to exchange information between devices, monitor and program them. It is also used to manage distributed I/Os, being the preferred protocol by the manufacturers of this type of devices.

MODBUS TCP/IP uses TCP/IP and Ethernet to carry the MODBUS messaging structure. MODBUS/TCP requires a license but all specifications are public and open so there is no royalty paid for this license. Making use of TCP/IP also offers the use of embedded Web pages to make life even more user friendly! Simply `surf' your plant intranet for the information you need by using your web browser.

Performance from a MODBUS TCP/IP system

The performance basically depends on the network and the hardware. If you are running MODBUS® TCP/IP over the Internet, you won't get better than typical Internet response times. However, for communicating for debug and maintenance purposes, this may be perfectly adequate and save you from having to catch a plane or go to site on a Sunday morning!

For a high-performance Intranet with high-speed Ethernet switches to guarantee performance, the situation is completely different.

How can existing MODBUS devices communicate over MODBUS TCP/IP?

MODBUS® TCP/IP is simply MODBUS® protocol with a TCP wrapper. It is therefore extremely simple for existing MODBUS® devices to communicate over MODBUS® TCP/IP. To do this a gateway device is required to convert MODBUS protocol to MODBUS TCP/IP.

Advantages of MODBUS/TCP

The key advantages of this protocol can be summarized as follows

- *It is scalable in complexity. A device, which has only a simple purpose, need only implement one or two message types to be compliant.*
- *It is highly scalable in scope. A collection of devices using MODBUS/TCP to communicate can range up to 10,000 or more on a single switched Ethernet network.*
- *It is simple to administer and enhance. There is no need to use complex configuration tools when adding a new station to a Modbus/TCP network.*
- *There is no vendor-proprietary equipment or software needed. Any computer system or microprocessor with Internet style (TCP/IP) networking can use MODBUS/TCP.*
- *It is very high performance, limited typically by the ability of the computer operating systems to communicate. Transaction rates of 1000 per second or more are easy to achieve on a single station, and networks can be easily constructed to achieve guaranteed response times in the millisecond range.*
- *It can be used to communicate with the large installed base of MODBUS devices, using conversion products, which require no configuration.*

8.2 Monitoring Sensor Data: Automated Solutions MiniHMI Example Application

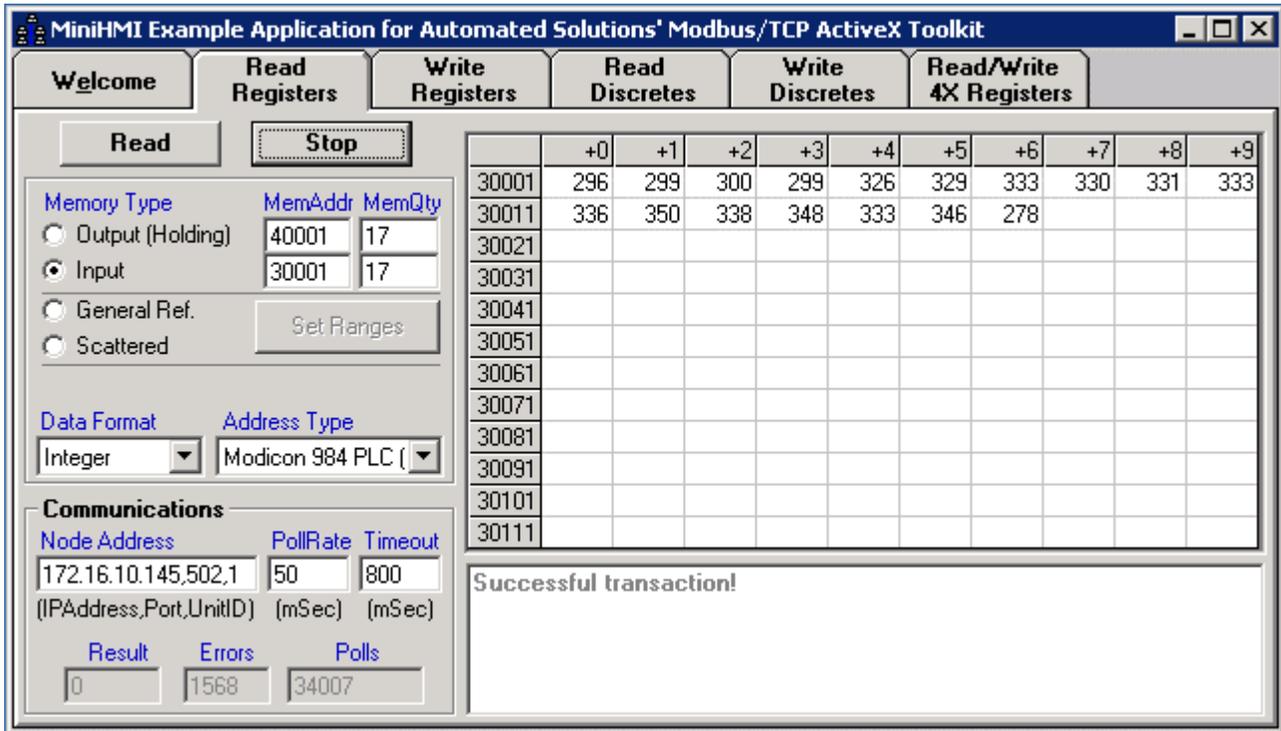


Figure 17 Automated Solutions MiniHMI

Using a simple Modbus/TCP program, such as Automated Solutions’ MiniHMI, you can query all 17 Master sensors and up to 255 additional sensors, if all 15 slave modules are attached. In the above figure, the master module’s 17 sensors are being automatically queried every 50 milliseconds (with a timeout of 800 milliseconds).

To configure the communications to work with the TCweb, set the Node Address to the IP address of your TCweb, flowed by Port 502 and a unit ID of 1. The Data Format should be set to integer and the Address Type to Modicon 984 PLC. To select which address range to read, type in the beginning register address in the MemAddr field. In the MemQty field, add the number of addresses beyond the starting address that you want to monitor. Select the Input option button for reading address data. To Read the addresses once, press the Read button. To monitor continuously, press the Auto Poll button (now reading Stop).

The data displayed is unformatted raw data. Each value must be divided by 10 in order to display the correct value, with a tenths degree precision (296 / 10 = 29.6 C).

The table below may be used for reference when selecting which sensors to monitor.

Module	Register Locations Sensors 1-16, Ambient
Master	30001-30016, 30017
Slave 1	30018-30033, 30034
Slave 2	30035-30050, 30051

Slave 3	30052-30067, 30068
Slave 4	30069-30084, 30085
Slave 5	30086-30101, 30102
Slave 6	30103-30118, 30119
Slave 7	30120-30135, 30136
Slave 8	30137-30152, 30153
Slave 9	30154-30169, 30170
Slave 10	30171-30186, 30187
Slave 11	30188-30203, 30204
Slave 12	30205-30220, 30221
Slave 13	30222-30237, 30238
Slave 14	30239-30254, 30255
Slave 15	30256-30271, 30272

8.3 Monitoring Chamber Data: Automated Solutions MiniHMI Example Application

Monitoring chamber values over Modbus/TCP is similar to monitoring the TCweb sensors. Enter the register addresses to monitor in the MemAddr field and the range in the MemQty field and press either the Read button or the Auto Poll button. See the Appendixes for specific controller addresses.

9 Telnet Syntax

Command Syntax	Description	Comments
TCWEBMxx?	Here, xx is the two digit number of the unit you are querying: 00 for the master, 01 for the first slave, and so on up to 15 for the fifteenth slave.	Response: UNITNAME, TCWEBM01, C, T01=13.1, T02=8.1, ... , K16=- 23.1, Amb=25.2
TCWEBM?	This command is the same as the previous one, but it works only for the master	
QUIT	Breaks the connection with the TCweb	
\r	Returns the version number	
TIME=	TIME=mm/dd/yyyy hh:mm:ss	Example: TIME=10/07/2002 10:59:04
TIME?	Query TCweb Real Time Clock	Typical Response: TIME=10/07/2002 10:59:04

Note: See appendix C for the procedure to setup Microsoft HyperTerminal to connect to the TCweb over a TCP/IP connection using Telnet.

10 Master/Slave Setup

One of the powerful and unique features of the TCweb is its ability to link multiple units together, increasing the channel capacity to a maximum of 256 sensors. The slave units resemble the master unit, but rather than the screen and buttons, they have a hexadecimal selector switch.

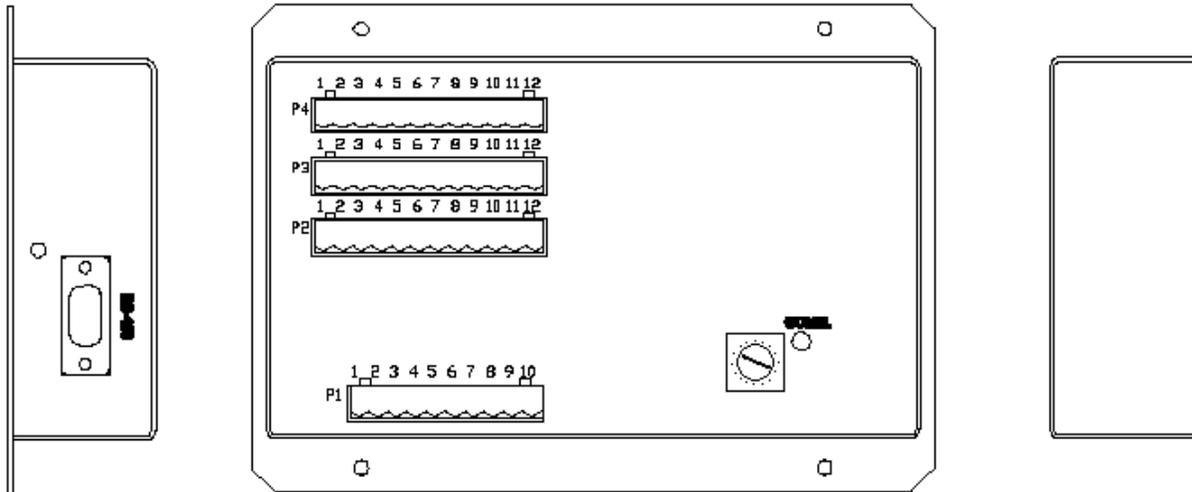


Figure 18: Diagram of TCweb Slave

10.1 Setting the Slave Identifier

Set the slave’s number using the hexadecimal Slave Address switch. Set the first slave to value “1,” the second slave to value “2,” and so on. As this is a hexadecimal switch, the tenth slave is set to “A,” the eleventh to “B,” up to the fifteenth to “F.”

10.2 Connecting the Slaves

COMM RX+	P1-6
COMM RX-	P1-3
COMM TX+	P1-4
COMM TX-	P1-5

Refer to the diagram below for a graphical depiction of the connection scenario. The first slave is connected to the master through the P1 connectors on the front of the two units. Reprinted here is an excerpt the slot assignment table from above, referring to the Communications Port slots in the first socket. The T in the TX stands for “Transmit,” and the R in RX stands for “Receive.” This table is the same for both the master and the slave. However, the master’s transmit must be connected to the slave’s receive, and the slave’s transmit must be connected to the master’s receive. Using a four-wire cable, connect the slots according to the following chart.

Master		Slave	
RX-	P1-3	P1-5	TX-
TX+	P1-4	P1-6	RX+
TX-	P1-5	P1-3	RX-
RX+	P1-6	P1-4	TX+

To connect the second slave and every other slave, you use the serial port on the side of the units. Each subsequent slave can be connected from Slave1 using a straight through ribbon cable assembly. Generally, this consists of a ribbon cable with D-sub crimp connectors spaced along its

length. As they are all connected essentially in parallel, the order that they are plugged does not matter; the selector switch on the front determines the number of each slave.

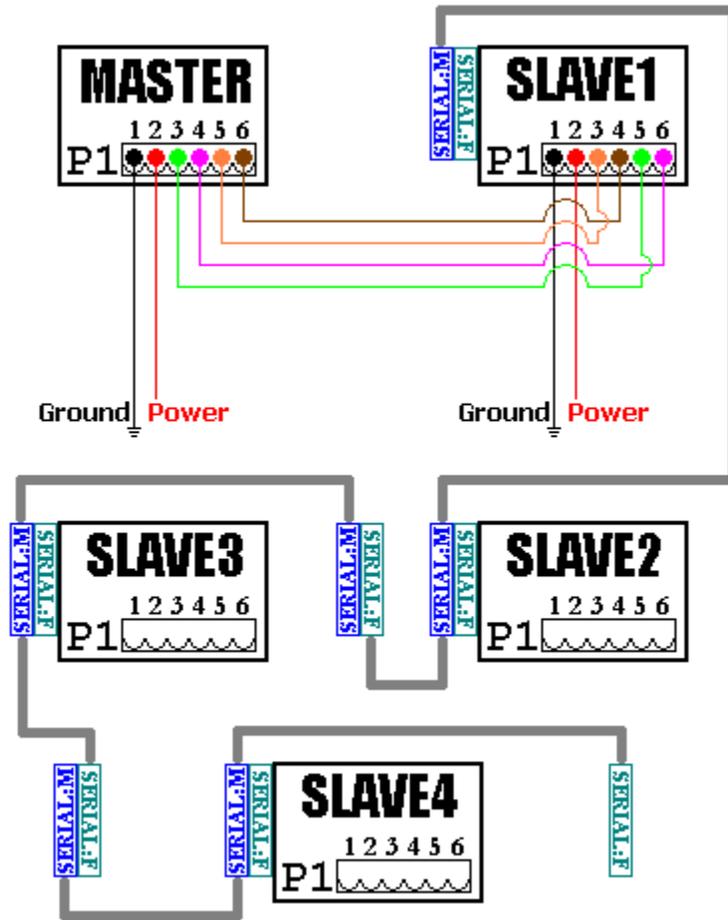


Figure 19 Master Slave Connection Diagram

In this diagram, the successive slaves are connected with the TCweb Slave Cable (P/N TE 1467), which is arranged like this:



The “Serial: M” plug is a 9 pin D-sub serial male (P/N AMP 747321-4) that can connect to the serial port on the unit, and the “Serial: F” plug is a 9 pin D-sub serial female (AMP P/N 747318-4) that is used to connect successive cables.

When you are done setting up the slaves, remember to set the number of slaves to the correct number on the web interface, as described above in “Web Interface: General Setup.”

11 Troubleshooting

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Appendix

Appendix A - Configuring Internet Explorer to connect to TCweb

The web server works seamlessly with Microsoft Internet Explorer version 5.0 and higher. You must, however, adjust the default settings in Internet Explorer. Open Internet Explorer and from the Tools menu, select Internet Options. (Figure 1).

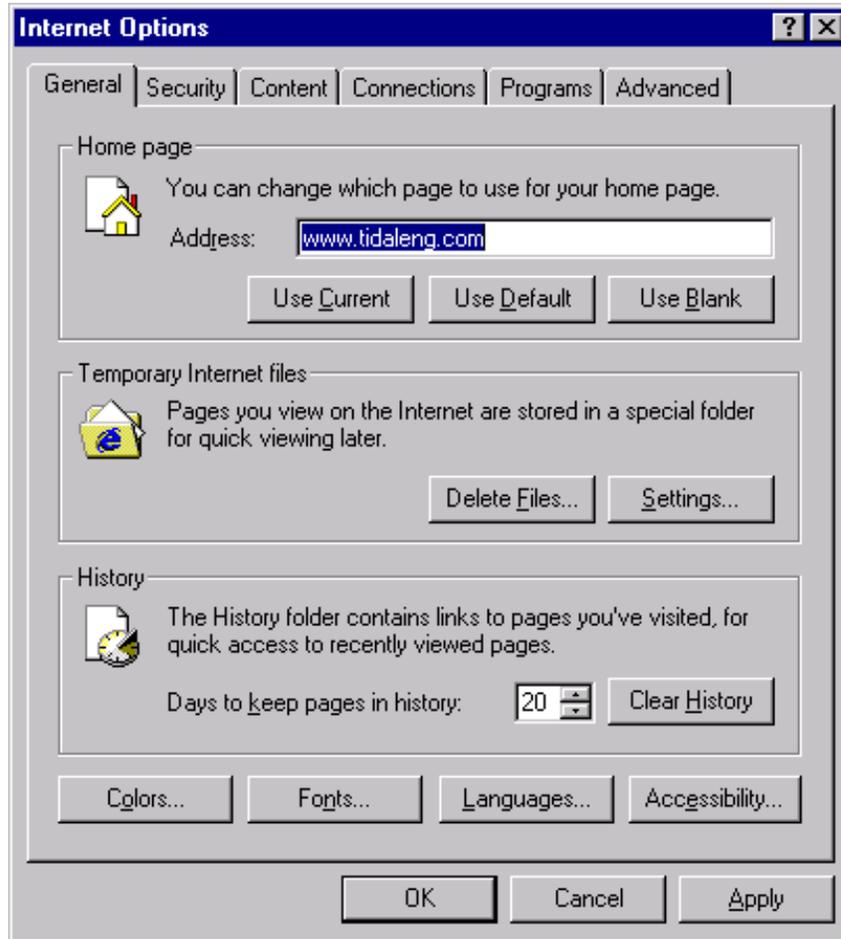


Figure 1 Internet Explorer Internet Options

Click the Settings.. button under Temporary Internet Files.

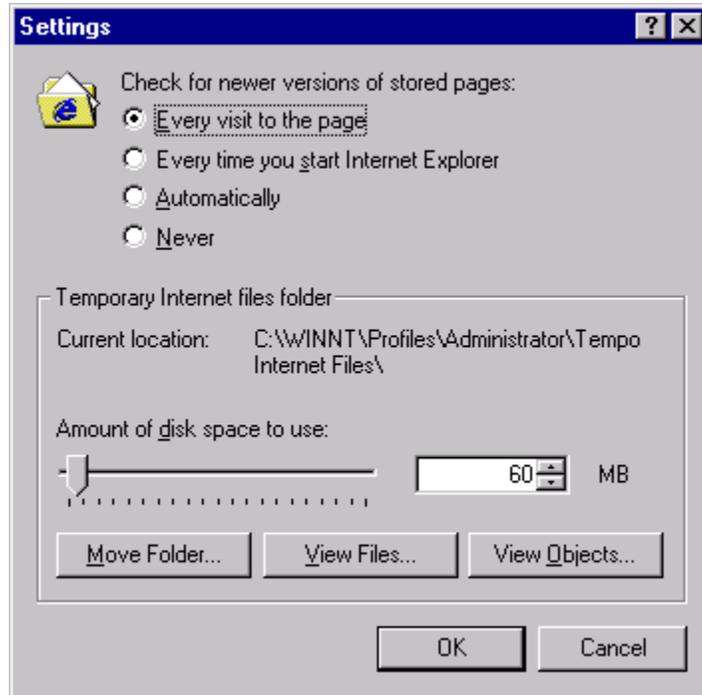


Figure 2 Internet Explorer Temporary Files Settings

In the Settings screen, select the “Every visit to the page” option (Figure 2). Press OK to save the configuration.

Caution: The TCweb may work unpredictably if this setting is not changed.

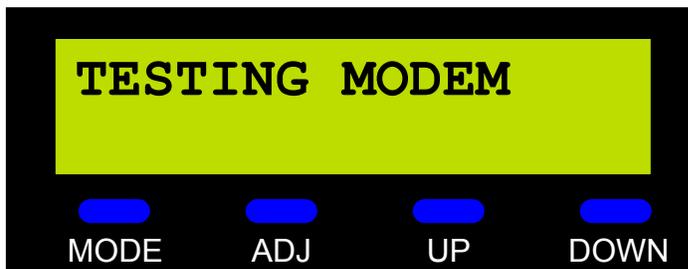
Appendix B - Configuring Dial-up Networking to connect to the TCweb Modem

The TCweb Modem version includes an embedded 56K modem and can be dialed into to using Microsoft Dial-up networking. The TCweb unit appears as an Internet Service Provider (ISP). Once connected to, the PC can control and monitor the unit using the embedded web page and telnet interfaces. This appendix describes setting up Microsoft Dial-Up networking to connect to a TCweb unit equipped with an optional modem.

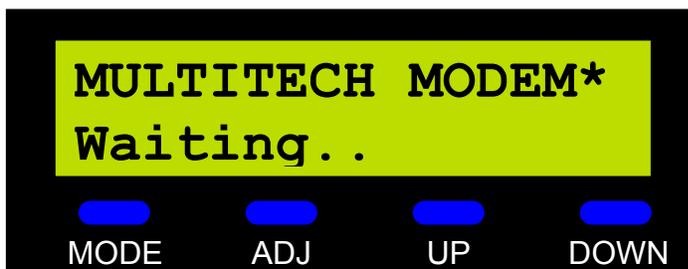
Modem Hardware & Firmware Confirmation

The first step is to confirm that your TCweb unit has the proper hardware and firmware . Confirm the existence of a modem RJ-45 jack by looking on the right side of the unit, under the blue buttons, it looks like a standard 4 line phone jack.

If you have an RJ-45 jack, your next step is to confirm that the TCweb recognizes the modem. Cycle the power on the TCweb. During the boot process you should see a window that notifies the user that the operating system is searching for and testing the modem. The testing process takes about 5 to 10 seconds.



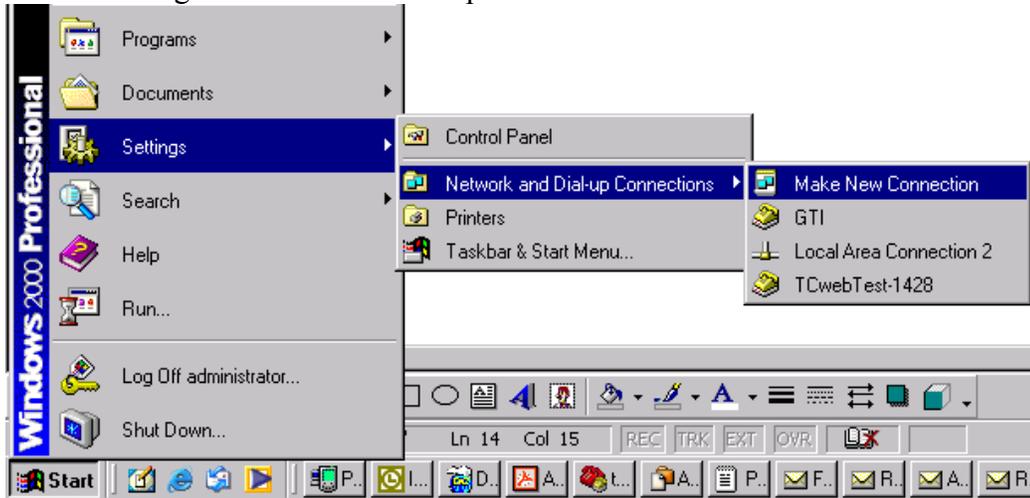
After the boot process completes, cycle through the main screens by pressing the Mode button. If the TCweb has found the modem you will see a screen indicating the TCweb's Multitech Modem has successfully loaded and is waiting for a connection.



Windows 2000

Windows 2000 provides a Network Connection Wizard to help setup a Dial-up Network Connection. Follow the instructions below:

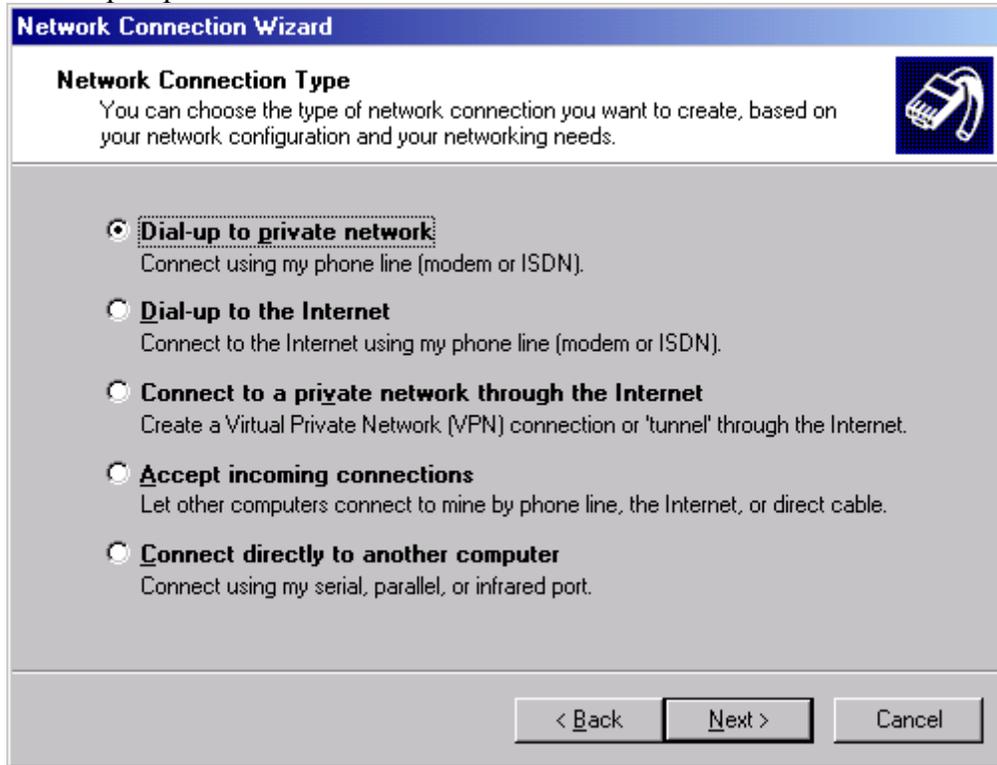
1. Go to Start/Settings/Network and Dial-up Connections/Make New Connection.



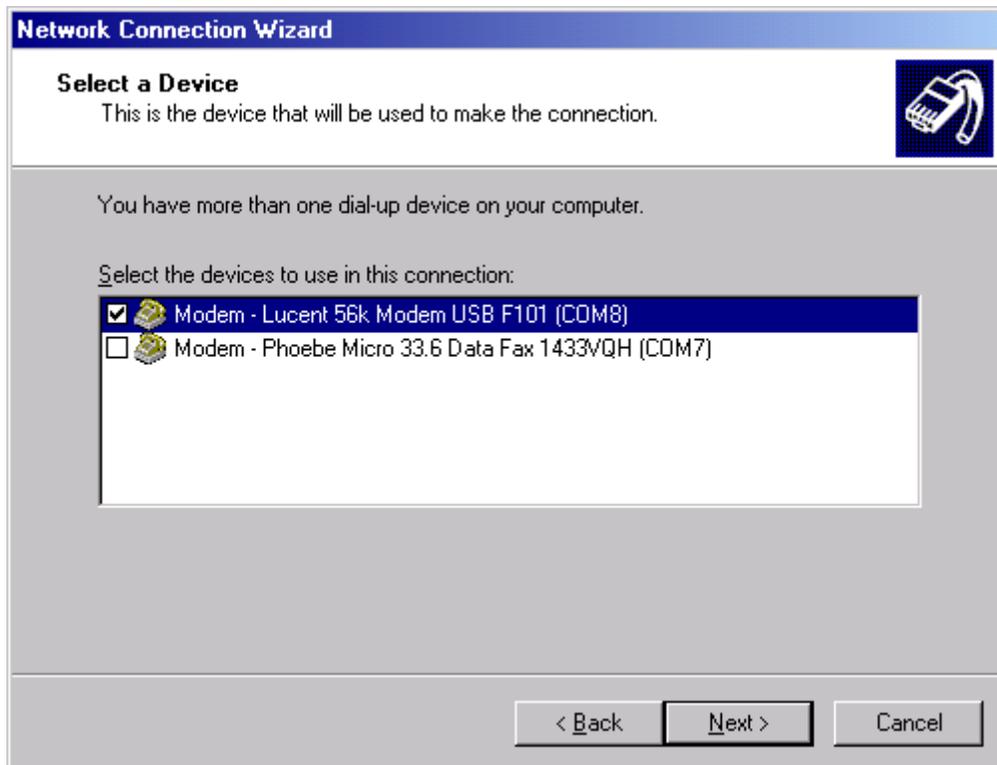
2. The Network Connection Wizard window should appear as shown below:



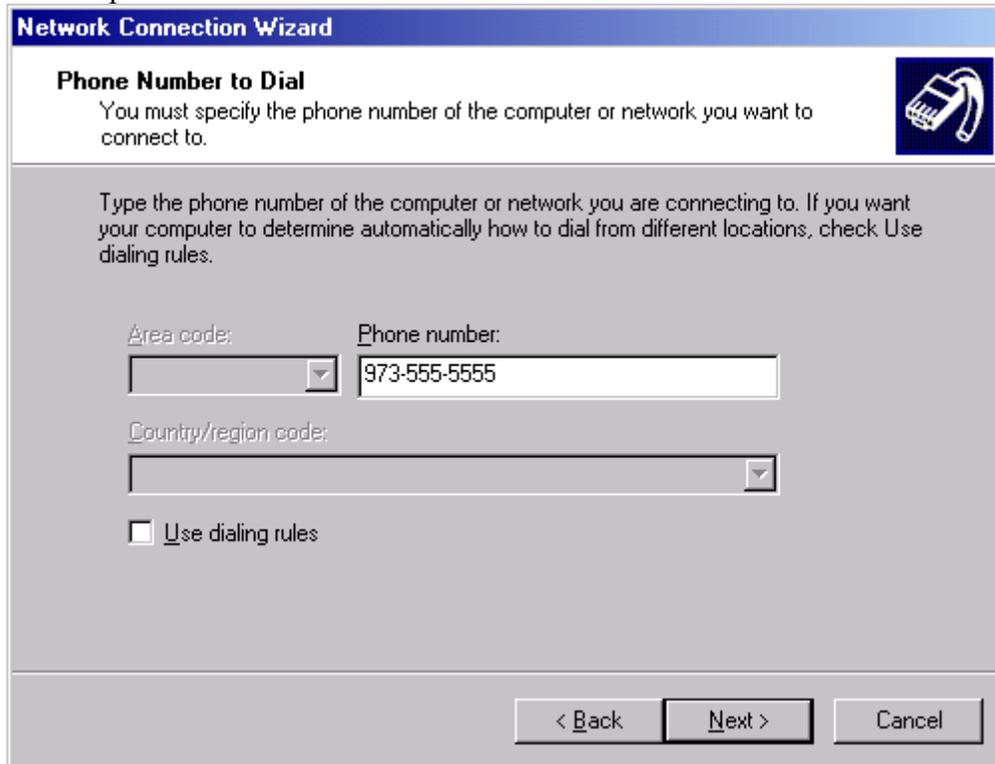
3. Select Dial-up to private network and click Next>



4. Select the modem from the list and click Next>



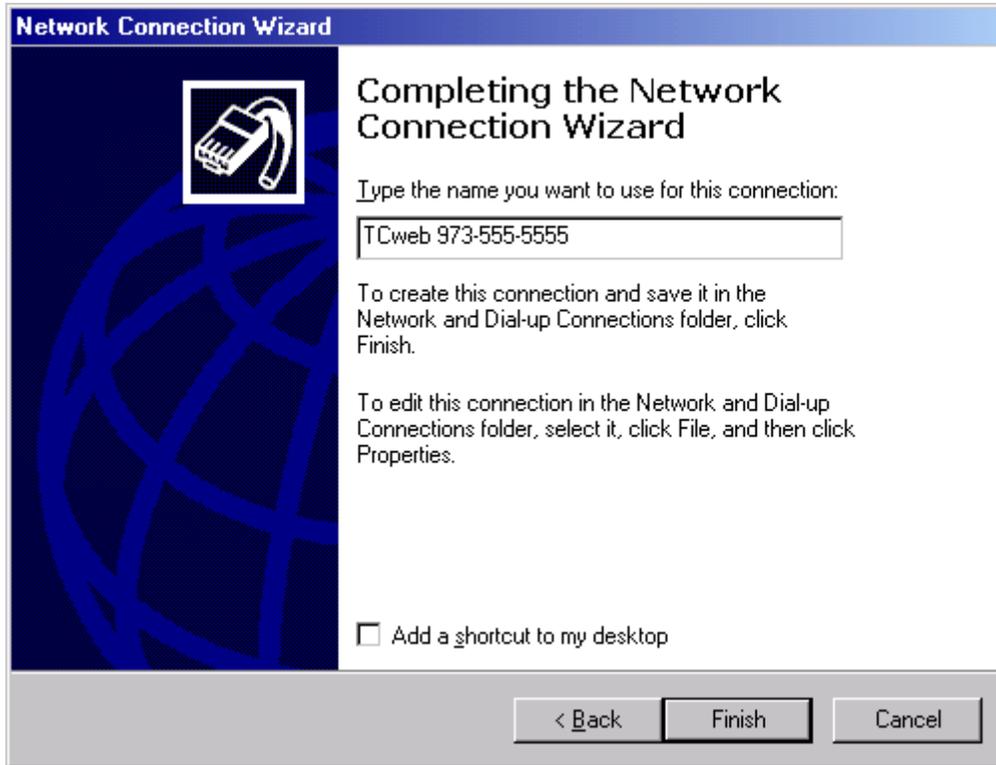
5. Enter the telephone number and click Next>



6. Choose Create this connection “For all users” or “Only for myself” as appropriate and click Next>.



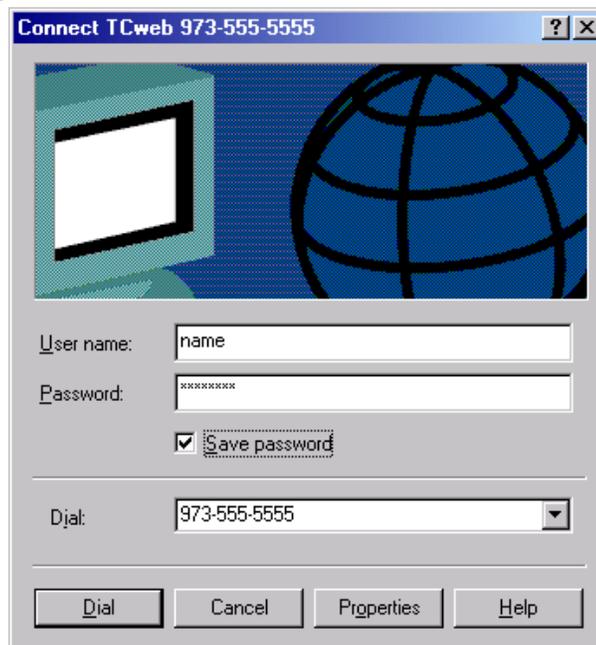
7. Type a connection name and click Finish.



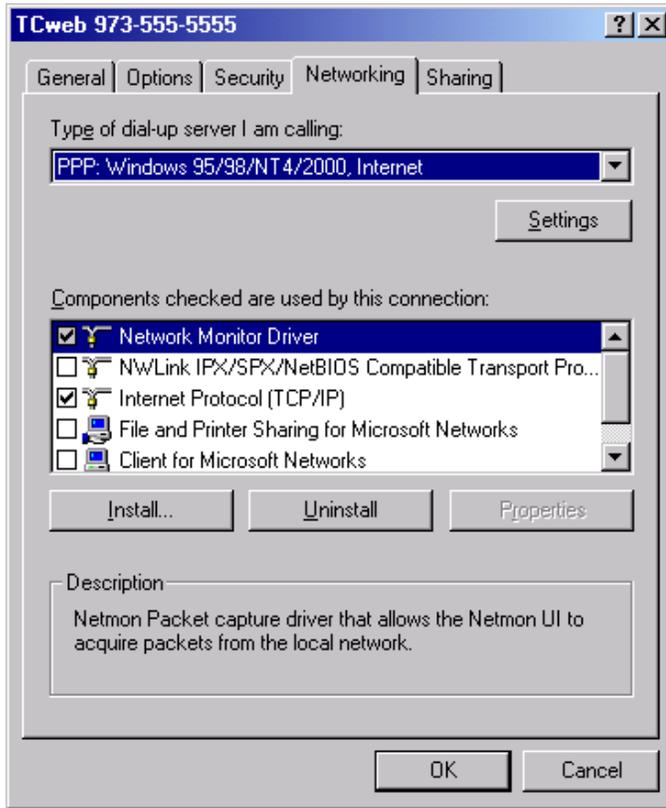
8. The Connect window should open as shown below. Enter User name and Password as follows, then click Properties:

User Name: Tidal

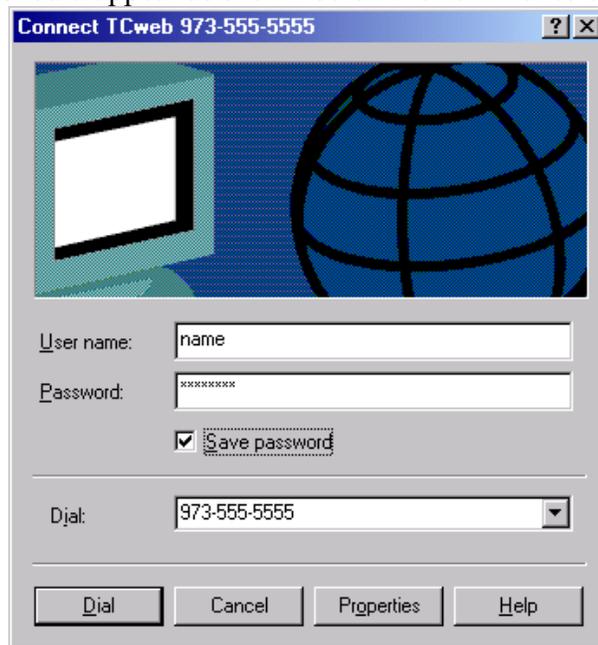
Password: Randolph



9. Click the Network tab and the screen should appear as shown below. Make sure the “Type of dial-up server I am calling:” is set to “PPP...” and uncheck all Components except Internet Protocol (TCP/IP) and Network Monitor Driver. Then click OK.



10. The Connect screen should appear as shown below. Click Dial to connect to TCweb.



11. The Connection will progress from



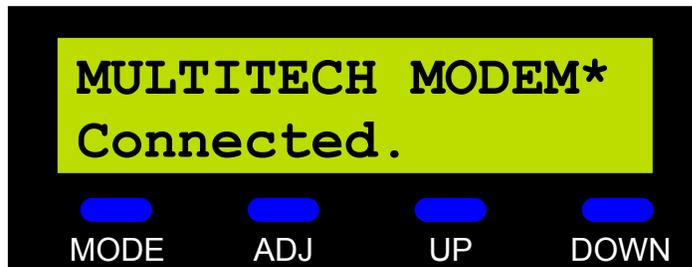
to



12. Once connected, a Dial-up networking icon should appear in the bottom lower right hand corner of the desktop. You can verify the connection speed by moving your mouse over the icon.

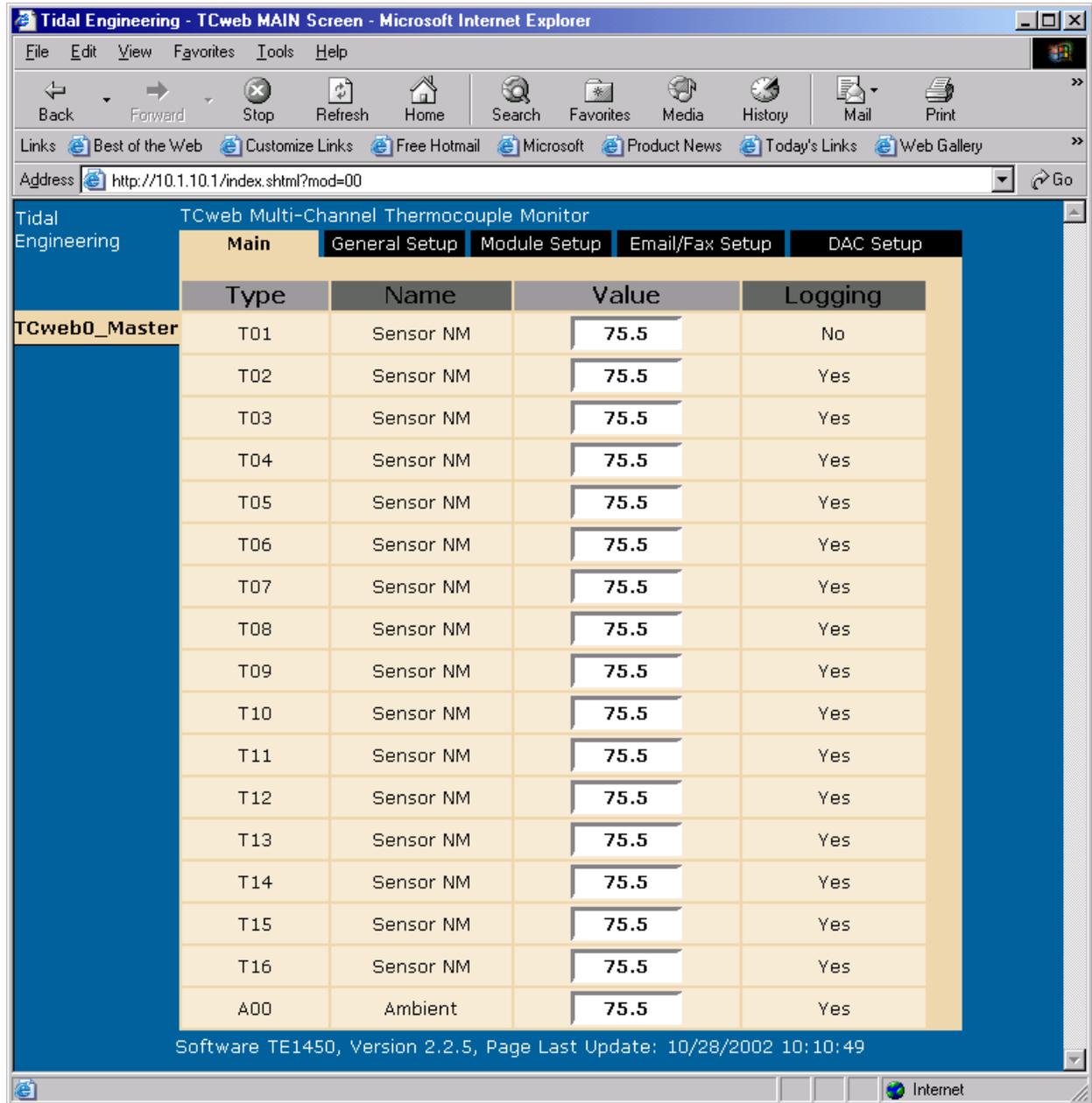


13. After connecting, the modem monitoring LED screen on the TCweb that used to read “Waiting..” will now read “Connected”.



14. The TCweb will use an IP address of 10.1.10.1 and will assign an IP address to the PC of 10.1.10.2 with a net mask of 255.255.255.255.

To view the TCweb's Web page, open Internet explorer and type 10.1.10.1 in the address bar as shown below.



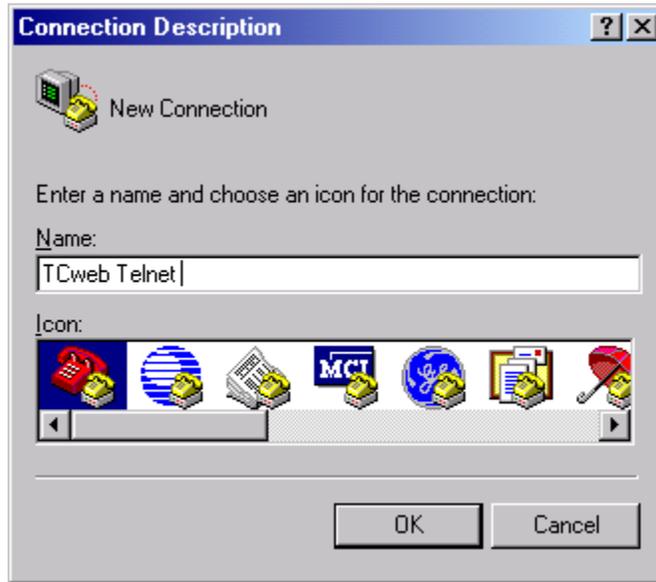
Appendix C - Configuring HyperTerminal to connect to the TCweb over Telnet.

The TCweb Internet based thermocouple monitoring system includes a telnet server for connection over networks, modems and the Internet. This appendix describes setting up Microsoft HyperTerminal to connect to a TCweb unit over a TCP/IP connection. Other Telnet client programs can also be used and should be setup similarly. See section 7 for a description of the Telnet commands and their syntax.

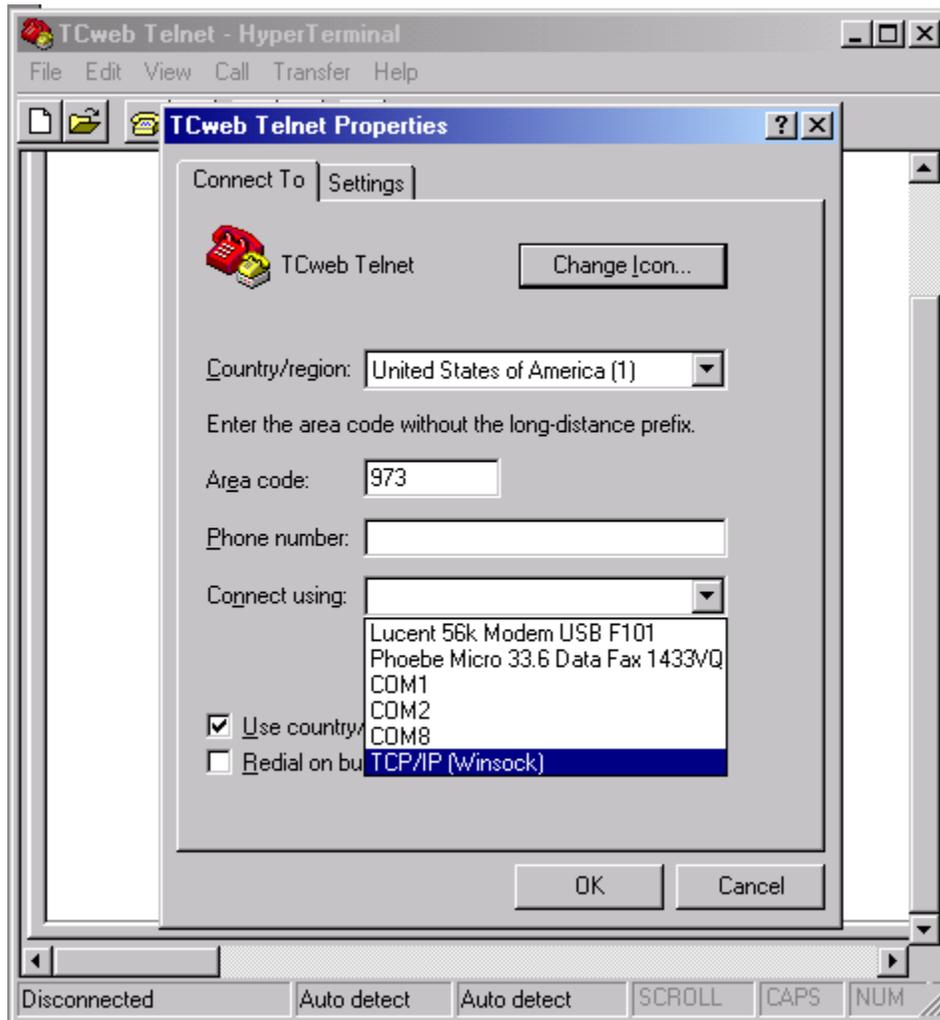
Windows 2000

The screen shots below were taken on a Windows 2000 workstation. Windows 98, Windows ME and Windows XP have a similar version of HyperTerminal. The HyperTerminal version included with Windows 95 however does not support Telnet TCP/IP Winsock. To setup HyperTerminal to connect to the TCweb follow the instructions below:

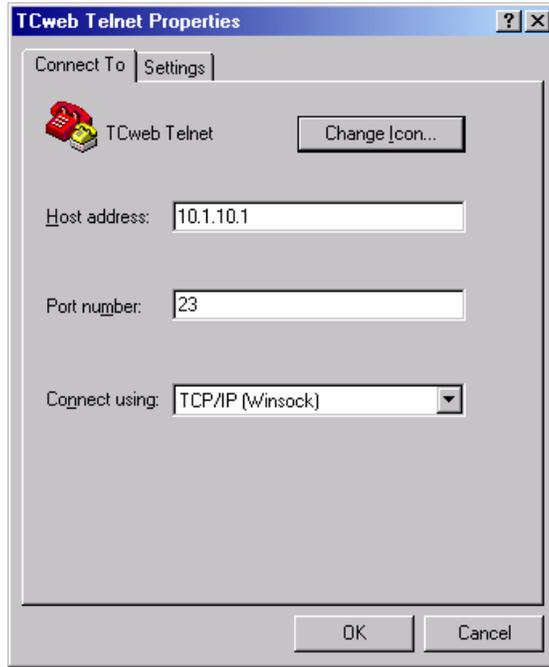
1. Go the Windows Start button and select Programs/Accessories/Communications/HyperTerminal.
The Connection Description window will appear. Type in a Connection name and click OK.



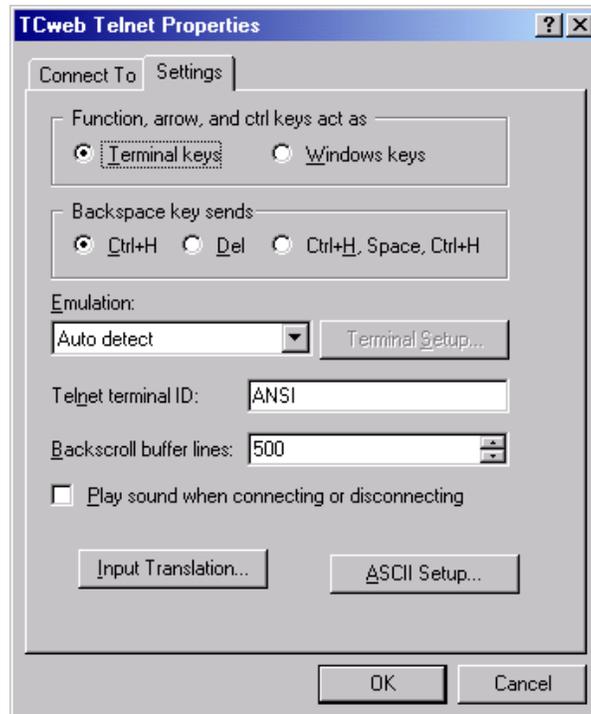
2. The connection Properties window should appear. Drop down the “Connect Using” list and select TCP/IP (Winsock).



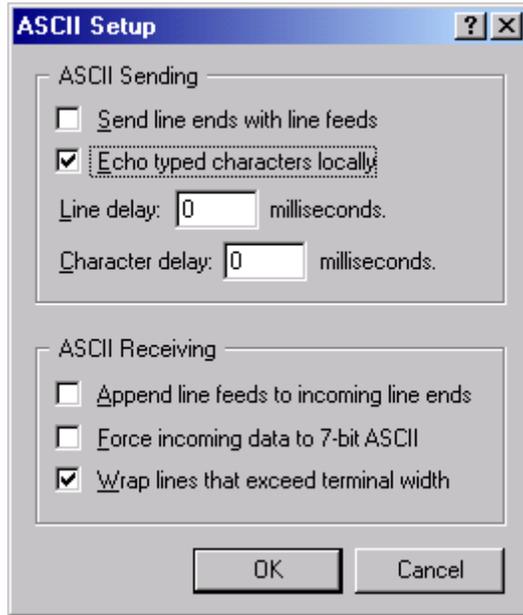
3. Type the TCweb’s IP address in the Host address text window. For Ethernet connections, the IP address can be obtained from the front of the master TCweb module. The IP address for Modem units is always 10.1.10.1 .



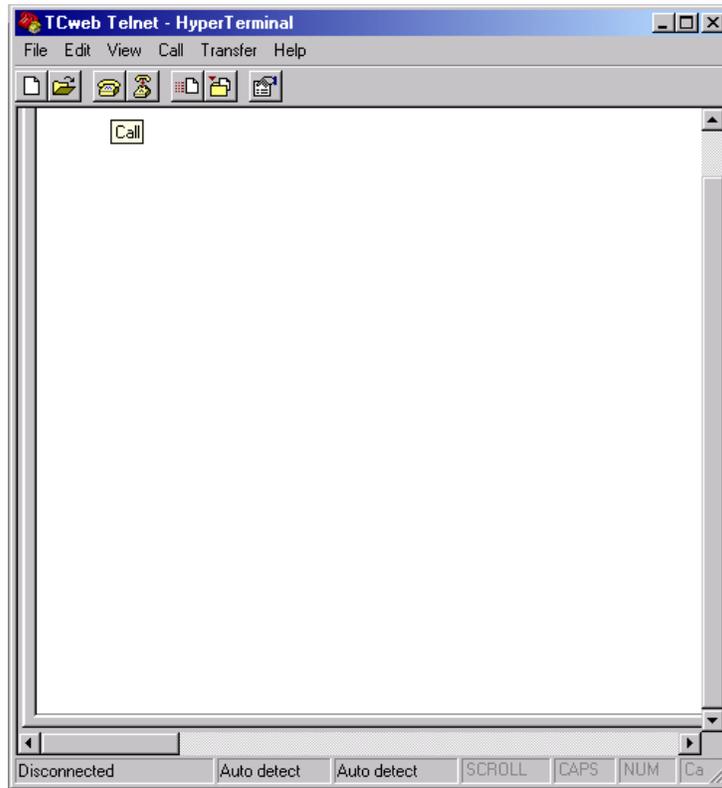
4. Press the settings tab and click the “ASCII Setup..” button.



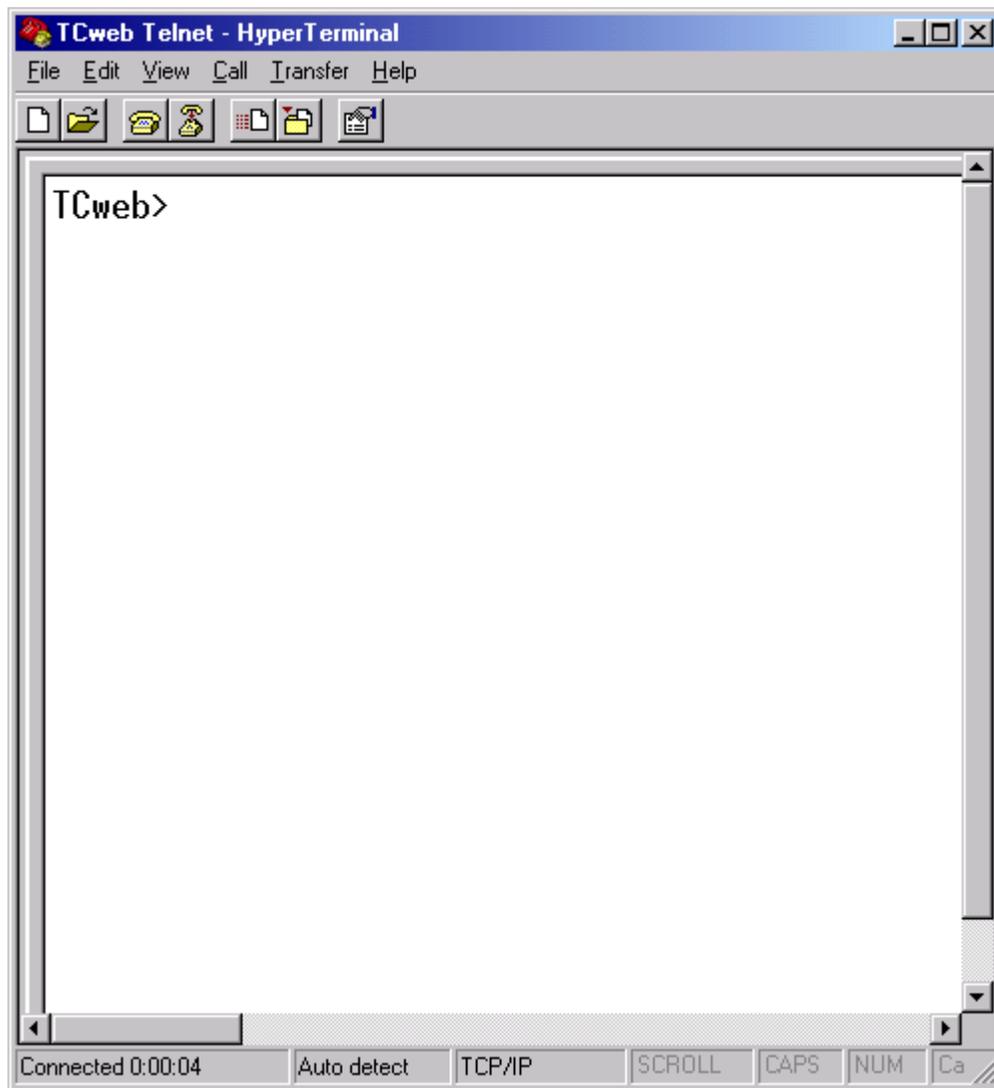
5. The ASCII Setup window will appear. Check the box that says, “Echo typed characters locally” as shown below. Then click OK.



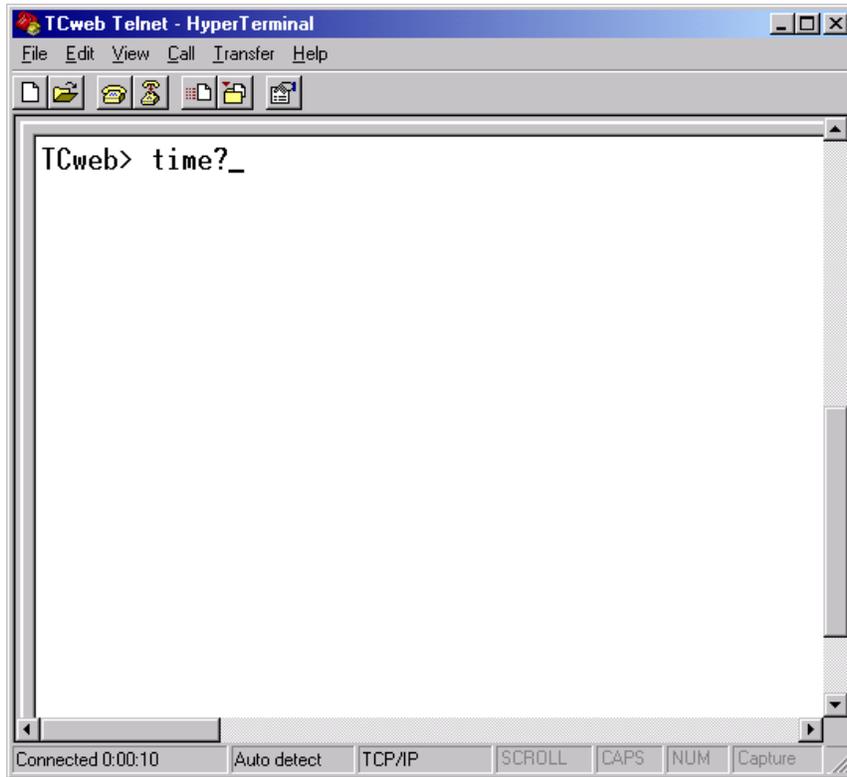
6. Press the Call icon on the toolbar to connect to the TCweb unit (Telephone on hook).



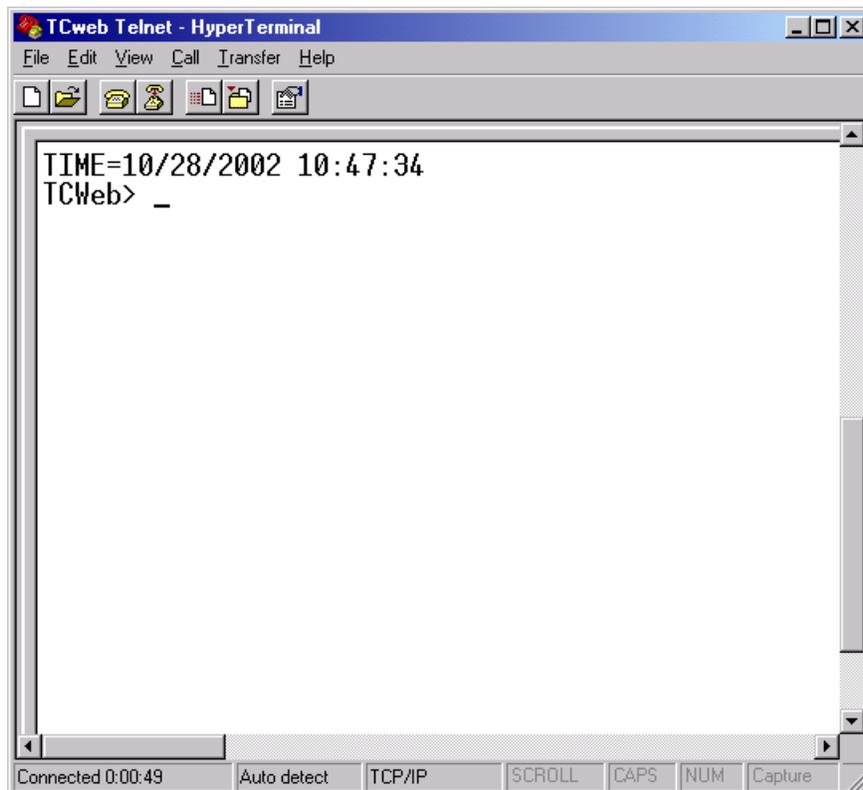
7. The TCweb will respond to the connection with the text “TCweb>” as shown below. The status bar at the bottom will say, “Connected hh:mm:ss” where hh:mm:ss is the connection time.



8. Type “time?” in the text window as shown below and press Enter.

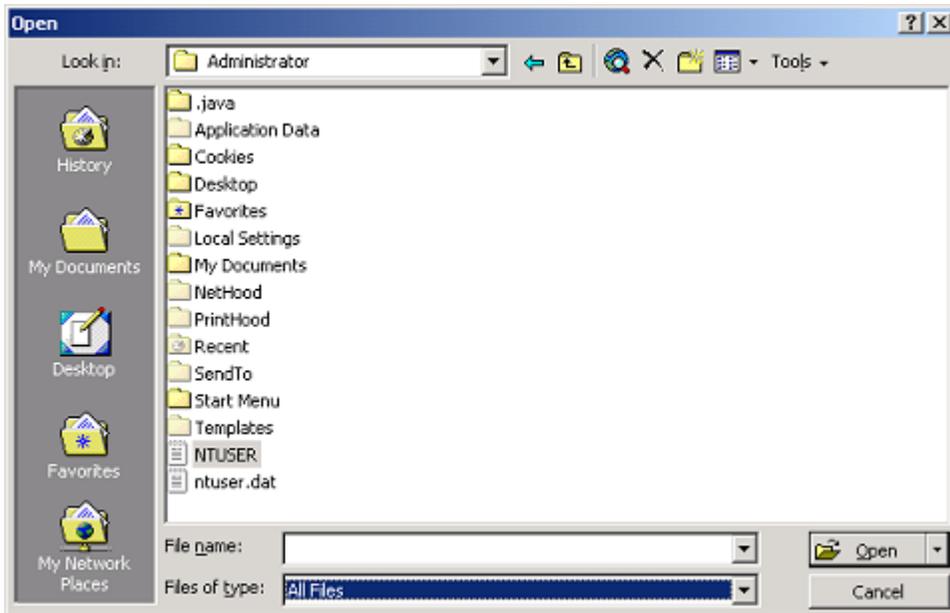


9. The TCweb unit will respond with the current time setting.

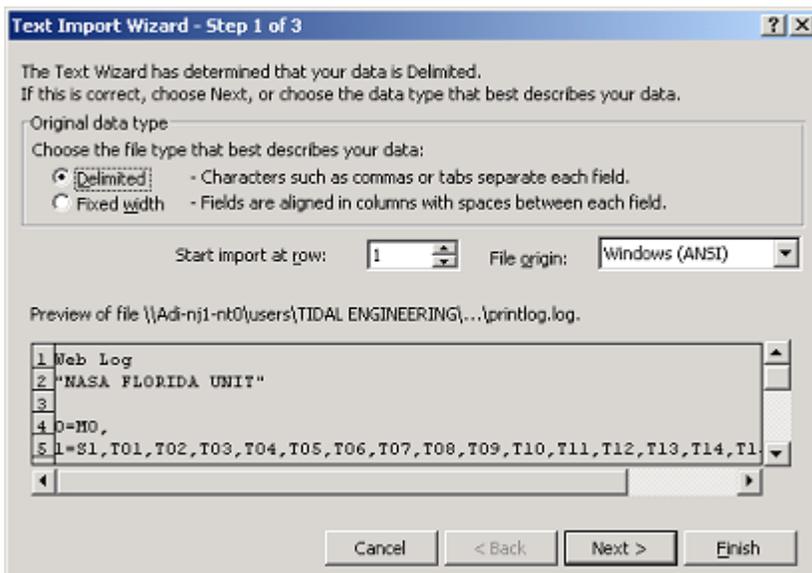


Appendix D - Manipulating Log File Data in EXCEL

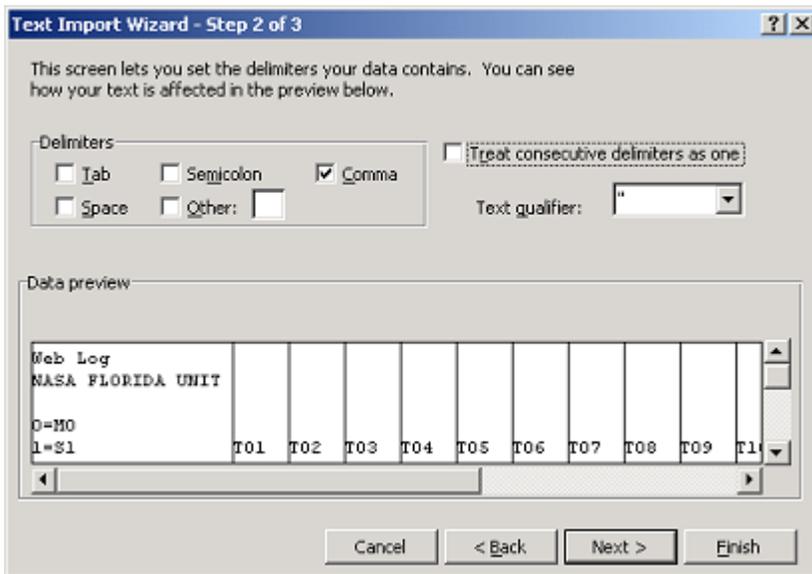
Using the program Microsoft Excel, you can convert the data from the log file into a graph. To start, open Excel, and hit Open, which will bring up this dialog:



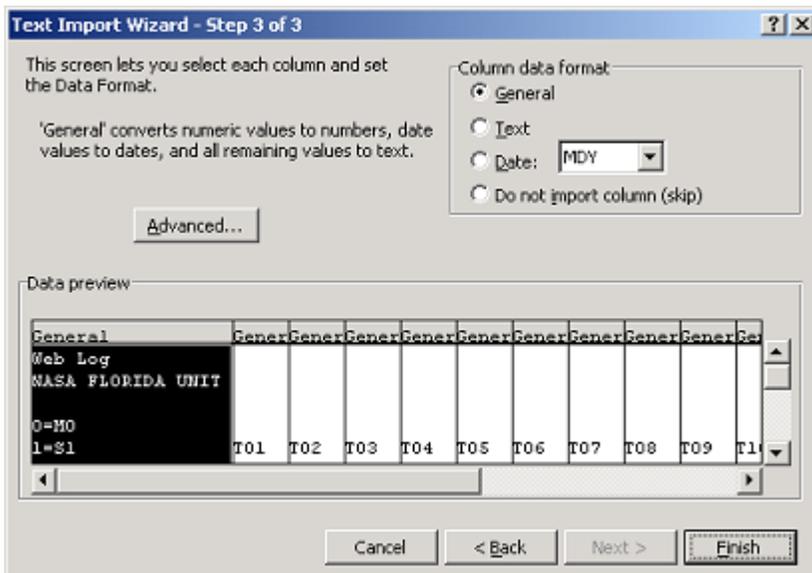
Change the fly-out entitled “Files of type:” to “All Files” and find where you saved the log file. When you hit open, Excel detects that it is not a regular Excel file, but a data file that has to be converted to an Excel file, so it brings up this series of dialogs:



The file is Delimited, so select that setting, and hit “Next.”



The different values are separated by commas by the TCweb, so change the Delimiter from Tab to Comma, and leave everything else as it is. Press “Next” to proceed.



The default values are fine here, as the Column Data Format “General” will suffice for all of the columns.

Press “Finish” to see:

The screenshot shows an Excel spreadsheet with the following data structure:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Web Log														
2	NASA FLORIDA UNIT														
3															
4	0=MD														
5	1=S1	T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13	T14
6	2=S2	T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13	T14
7	0=MD	6/12/2002	11:51:09												
8	1=S1	6/12/2002	11:51:09	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
9	2=S2	6/12/2002	11:51:09	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
10	0=MD	6/12/2002	11:51:11												
11	1=S1	6/12/2002	11:51:11	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
12	2=S2	6/12/2002	11:51:11	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
13	0=MD	6/12/2002	11:51:13												
14	1=S1	6/12/2002	11:51:13	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
15	2=S2	6/12/2002	11:51:13	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
16	0=MD	6/12/2002	11:51:15												
17	1=S1	6/12/2002	11:51:15	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
18	2=S2	6/12/2002	11:51:15	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
19	0=MD	6/12/2002	11:51:17												
20	1=S1	6/12/2002	11:51:17	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
21	2=S2	6/12/2002	11:51:17	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
22	0=MD	6/12/2002	11:51:19												
23	1=S1	6/12/2002	11:51:19	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
24	2=S2	6/12/2002	11:51:19	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
25	0=MD	6/12/2002	11:51:21												
26	1=S1	6/12/2002	11:51:21	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
27	2=S2	6/12/2002	11:51:21	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2

This looks just like the log file, only in Excel, but it is not yet ready to be graphed. You have to clean it up a little bit.

Next, you have to separate the different interleaved units. Each line starts with the unit number, so, using the sort function, you can easily separate the different units. First, highlight all of the data, including the header block.

The screenshot shows the same Excel spreadsheet as above, but with rows 4 through 27 highlighted in blue. This highlights the data rows, including the header block for the units (rows 5-6) and the subsequent data points for units 0=MD, 1=S1, and 2=S2.

Then, from the “Data” menu, select “Sort” to bring up this dialog:



The only column that you want to sort by is Column A, and in ascending order. Make sure that you are not sorting by anything other than Column A, as you want to maintain the order that the rows are in and only separate each of the different units. Hit “OK” to proceed.

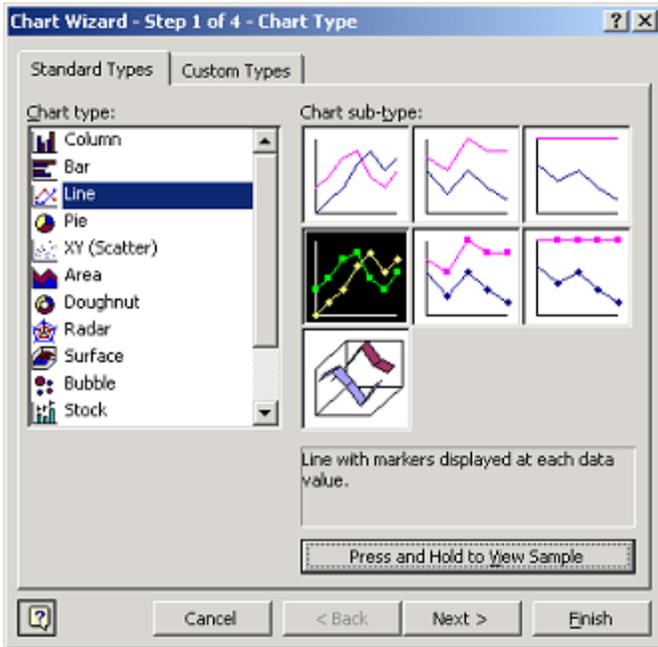
This is what comes up:

2	NASA FLORIDA UNIT															
3																
4	0=MD															
5	0=MD	6/12/2002	11:51:09													
6	0=MD	6/12/2002	11:51:11													
7	0=MD	6/12/2002	11:51:13													
8	0=MD	6/12/2002	11:51:15													
9	0=MD	6/12/2002	11:51:17													
10	0=MD	6/12/2002	11:51:19													
11	0=MD	6/12/2002	11:51:21													
12	1=S1			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13
13	1=S1	6/12/2002	11:51:09	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
14	1=S1	6/12/2002	11:51:11	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
15	1=S1	6/12/2002	11:51:13	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
16	1=S1	6/12/2002	11:51:15	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
17	1=S1	6/12/2002	11:51:17	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
18	1=S1	6/12/2002	11:51:19	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
19	1=S1	6/12/2002	11:51:21	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
20	2=S2			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13
21	2=S2	6/12/2002	11:51:09	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
22	2=S2	6/12/2002	11:51:11	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
23	2=S2	6/12/2002	11:51:13	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
24	2=S2	6/12/2002	11:51:15	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
25	2=S2	6/12/2002	11:51:17	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
26	2=S2	6/12/2002	11:51:19	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
27	2=S2	6/12/2002	11:51:21	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
28																
29																

Now, the data is ready for graphing. You can graph, at most, all of the channels logged from one unit on each graph, without rearranging the data in the Excel file. If you put the data blocks next to each other, so the different times line up, it could be possible to graph them all at once, but for most purposes, it is much easier to just graph each unit separately. To do so, start by highlighting all of the data for one unit, including the date, time, and channel name:

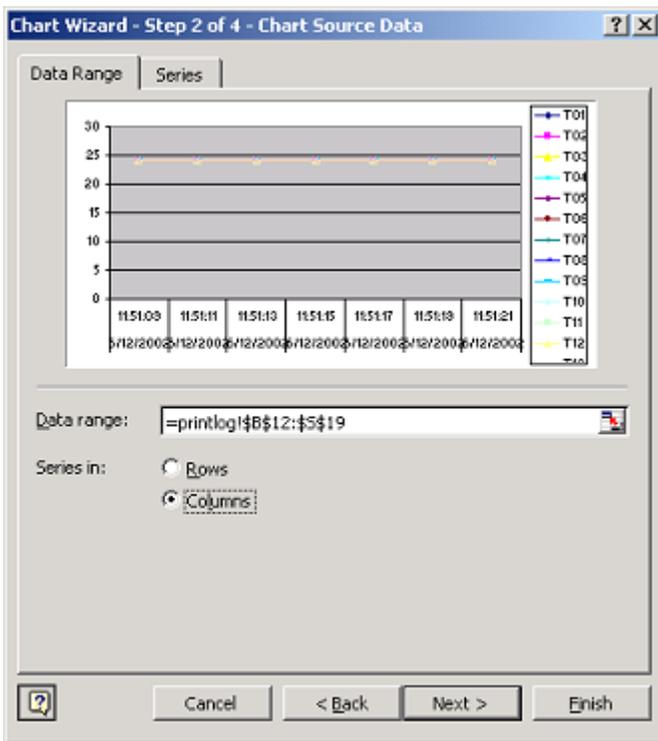
10	0=MD	6/12/2002	11:51:19													
11	0=MD	6/12/2002	11:51:21													
12	1=S1			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13
13	1=S1	6/12/2002	11:51:09	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
14	1=S1	6/12/2002	11:51:11	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
15	1=S1	6/12/2002	11:51:13	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
16	1=S1	6/12/2002	11:51:15	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
17	1=S1	6/12/2002	11:51:17	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
18	1=S1	6/12/2002	11:51:19	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
19	1=S1	6/12/2002	11:51:21	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
20	2=S2			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13
21	2=S2	6/12/2002	11:51:09	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2

Now, select “Chart” from the “Insert” menu, to bring up the following series of dialogs:

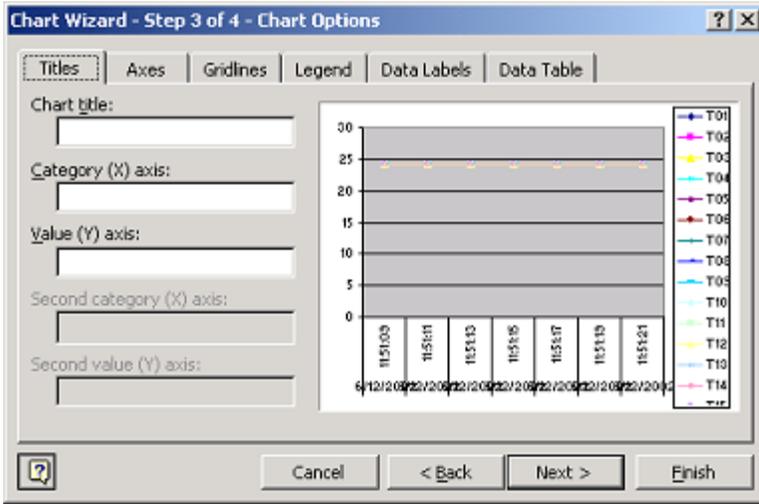


Select “Line” from the “Standard Types” menu, and then either the icon highlighted here, “Line with markers displayed at each data value,” or the icon directly above it.

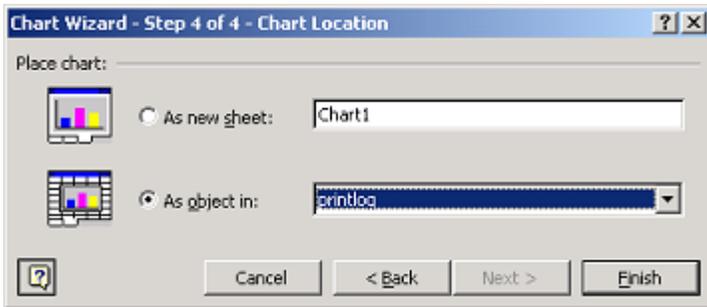
Hit “Next >” to continue.



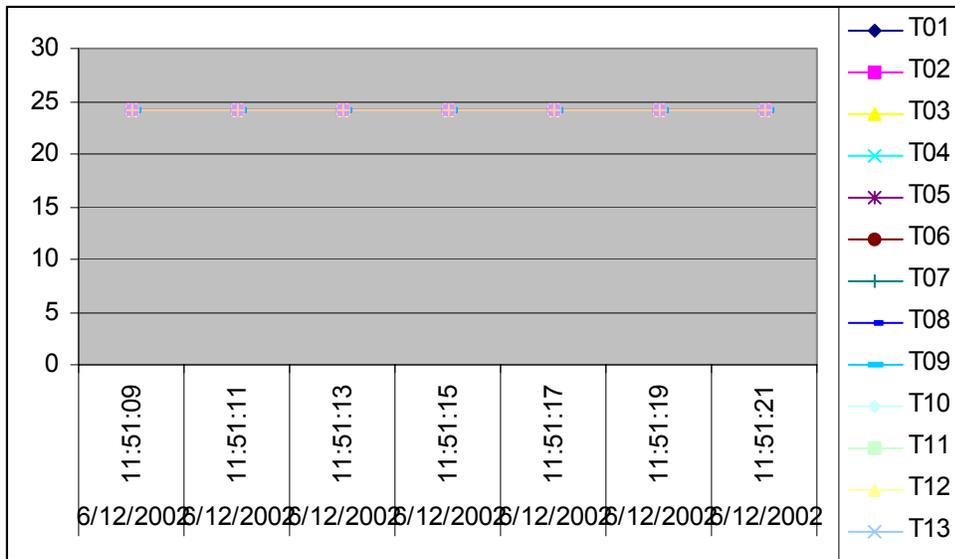
This dialog has the correct “Data range” if you selected the right cells before entering the Chart Wizard. Choose “Series in: Columns” and then select “Next >.”



This dialog offers you the most opportunity for customization of your graph. Each of the tabs allows you to format the graph in different ways. Feel free to change anything on this graph, and observe the resulting changes on the preview of the finished graph. For purposes of simplicity, the graph in this tutorial remains unchanged. “Next >” takes you to the last Chart Wizard dialog.



Here, too, the choice is yours: Either place the chart in its own new sheet, or create it as an object in a current project. If you leave the settings the Wizard comes up with, the graph will appear right in the window where you inputted the data. The final step is to press “Finish,” which yields the completed graph:



Appendix E – Watlow F4 Controllers

The following table displays the available Modbus/TCP register addresses used on the Watlow F4 controller. See the section on the Web Interface – eChamber Chamber Gateway Chamber Setup for Modbus/TCP communication via the eChamber web interface or see the section on Modbus/TCP for information on communicating over Modbus/TCP with a third party application.

Address	Data
319	Setpoint 2
100	Actual 1
104	Actual 2
103	Heat 1
111	Heat 2
107	Cool 1
115	Cool 2
2001	Event 1
2011	Event 2
2021	Event 3
2031	Event 4
2041	Event 5
2051	Event 6
2061	Event 7
2071	Event 8
602	R1H
612	R2H
606	Analog input 1 dec places
616	Analog input 2 dec places

Appendix F – VersaTenn III Controllers

This section intentionally left blank.

TCweb Errata

Documented Errata (Last updated August 30, 2002) Version 2.1.6

The following is a list of known issues in the TCweb Multi-Channel Thermocouple Monitor. Each item is divided into three parts. First is a description of the symptoms, or how the issue manifests. Second is an explanation of the status, or how the issue is currently handled. Third is a resolution that illustrates an appropriate method for working around the issue. The following information is accurate as of version 2.1.6.

General Setup Page

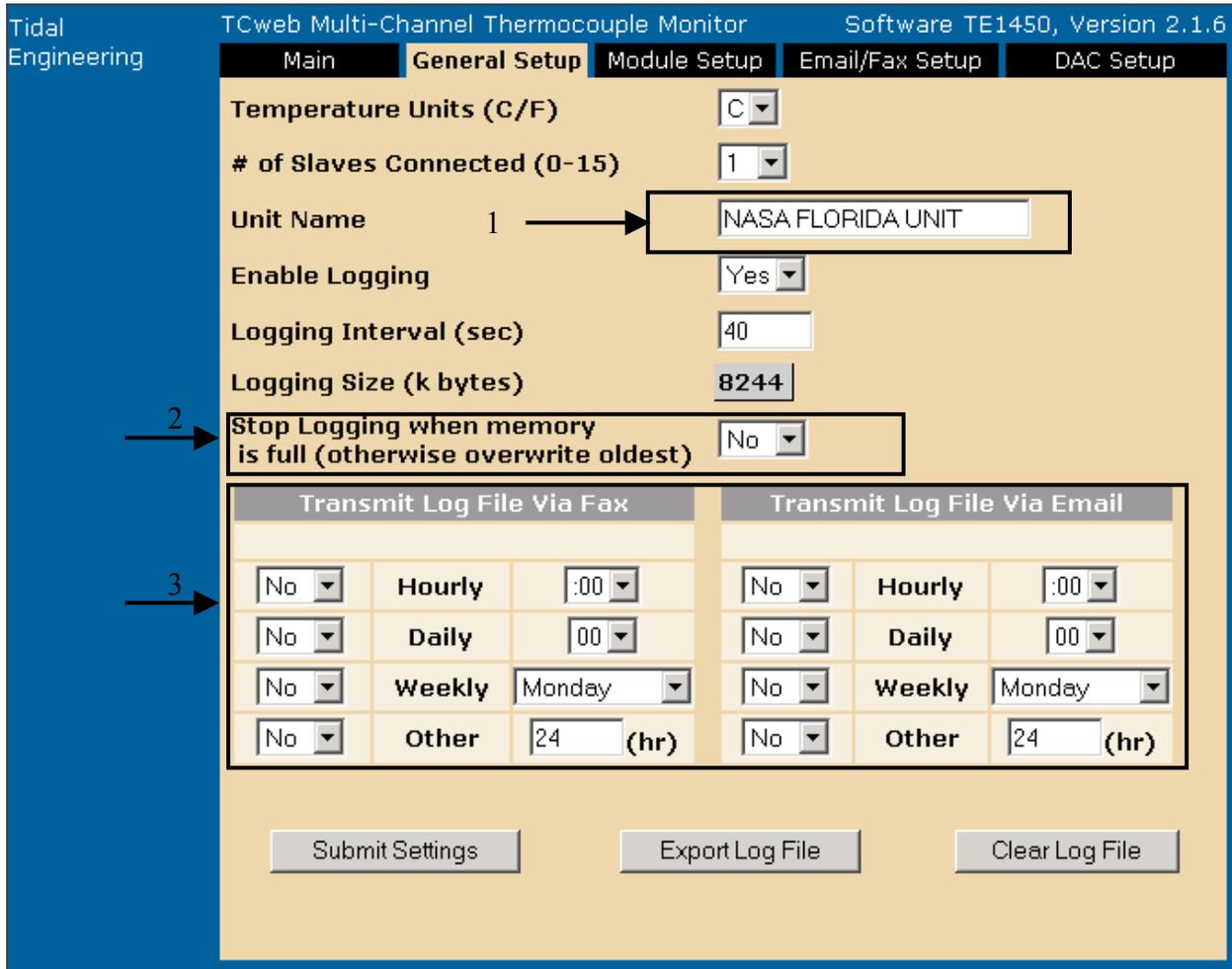


Figure 3 TCweb Setup Page

1. Weird characters in Unit name field

Version 2.1.6

Symptoms:

Certain characters due to HTML coding will not be displayed properly. For instance: In the Unit name field on Setup page if user enters TCweb's Module, it will be returned as TCWEB%27s Module. This also applies to Sensor name field on the module page.

Status:

Characters are displayed as encoded by the HTML, and characters exceeding the limit are chopped off.

Resolution:

Re-enter the name, avoiding the special characters, and hit submit.

2. Overwrite existing log

Version 2.1.6

Symptoms:

After logging for an extended period of time, user cannot enable the logging button on Setup page, even though the option to overwrite the oldest data is enabled.

Status:

When 8-mg flash is full, logging is stopped. The option to overwrite the oldest data is under development.

Resolution:

Export Log and save the file. Clear log and enable log on the Status page.

3. Transmit Log via email or fax

Version 2.1.6

Symptoms:

Transmit Log via Fax-Email does not work.

Status:

This feature is under development

Email-Fax Setup

1. Alarm messages not received over email or fax

Version 2.1.6

Symptoms:

User does not receive Email/Fax alarm messages sent to the recipients on the Email-Fax page.

Status:

This feature is under development

DAC Setup

1. DAC Setup Page is empty

Version 2.1.6

Status:

This feature is under development

