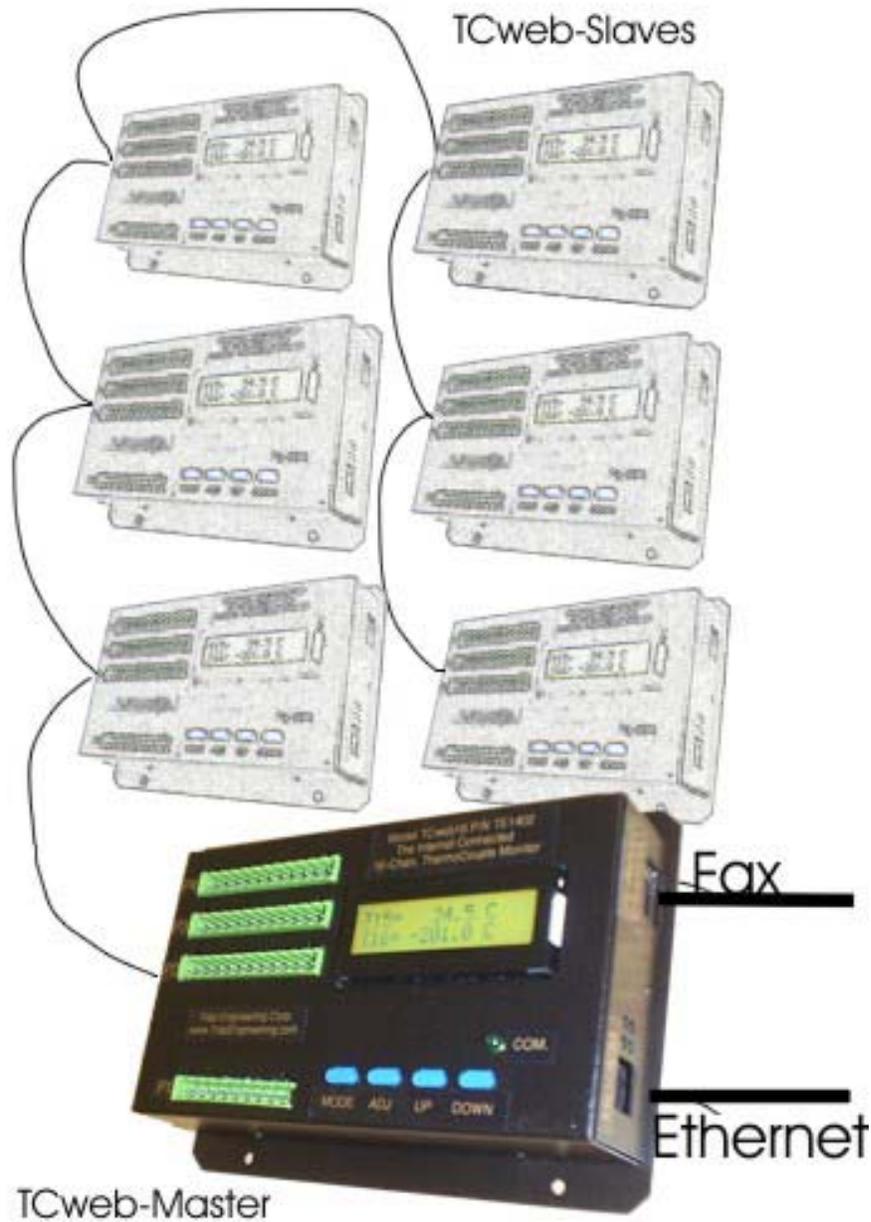# TCweb Technical Manual
Temperature Acquisition System for your LAN and the Internet

DOC. NO. TE1440

Tidal Engineering Corporation
Revision – A
PROPRIETARY

TCweb User's Manual

Part Number TE1440

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1. Added Appendix B - TCweb Modem version Setup for Microsoft Windows Dial-up networking.
2. Added Appendix C – Configuring Microsoft HyperTerminal to connect to the TCweb over Telnet.

Table of Contents

1 Overview of the TCweb

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 it's 56K data modem. The TCweb allows you to acquire and log temperatures remotely from anywhere in the world. With 256K Bytes of Flash Memory standard and expandable to a full 8 MegaBytes of optional Flash Memory, the TCweb allow 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.

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^{o} Celsius
Open Check Current   150 μA
Accuracy $\pm 2^{o}$ 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   256 Kilobytes Standard Flash, 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
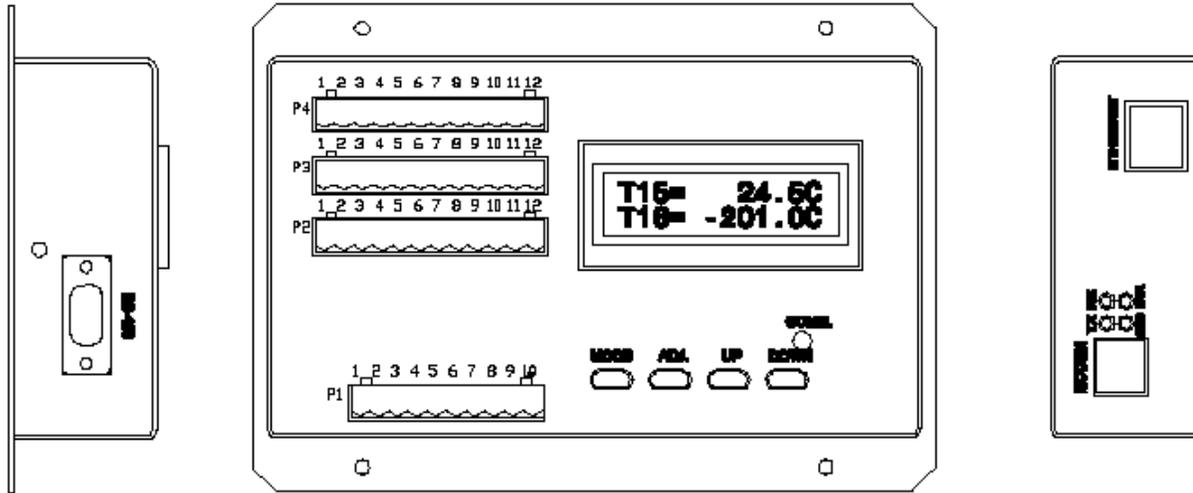
3 Description

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

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 backplate as shown in the figure below The TCweb measurements and the mounting holes are indicated.
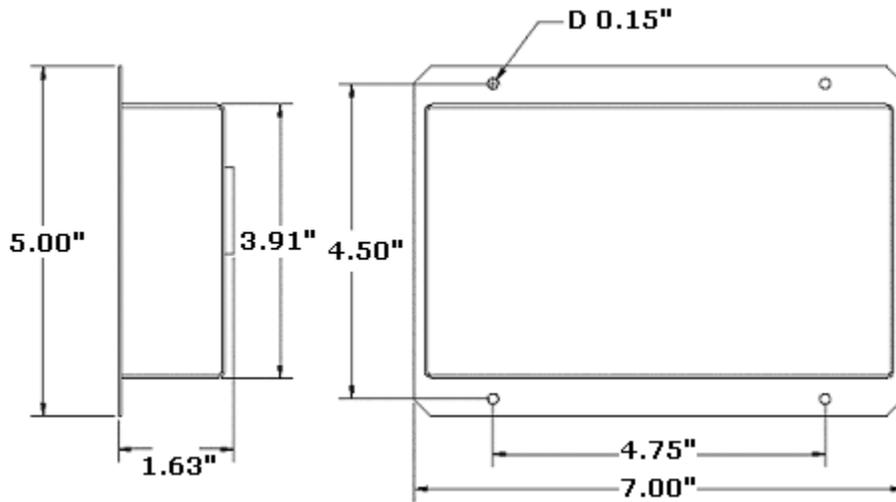

Figure 2 TCweb Mounting Dimensions

The unit may be mounted in any orientation.

4 Preparation for Use/Quick Start

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.
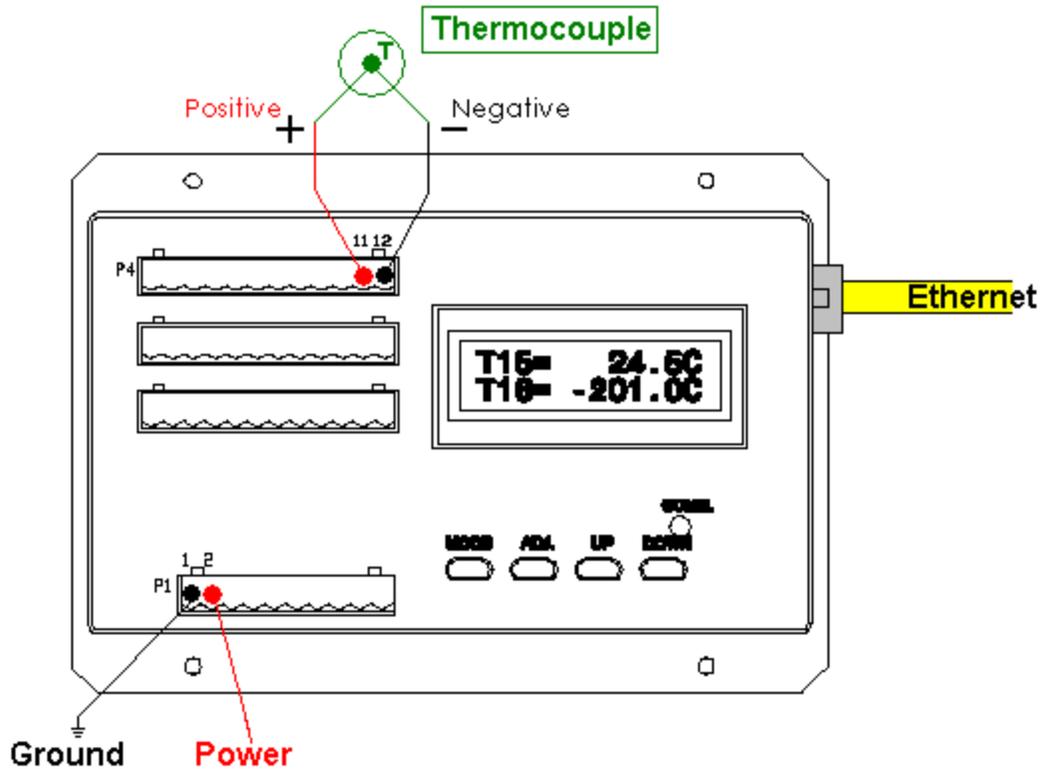

Figure 3 Quick Setup Connections

1. Plug the supplied 10 position terminal plug into the socket on the front of the unit labeled "P1." Plug one of the 12position 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.
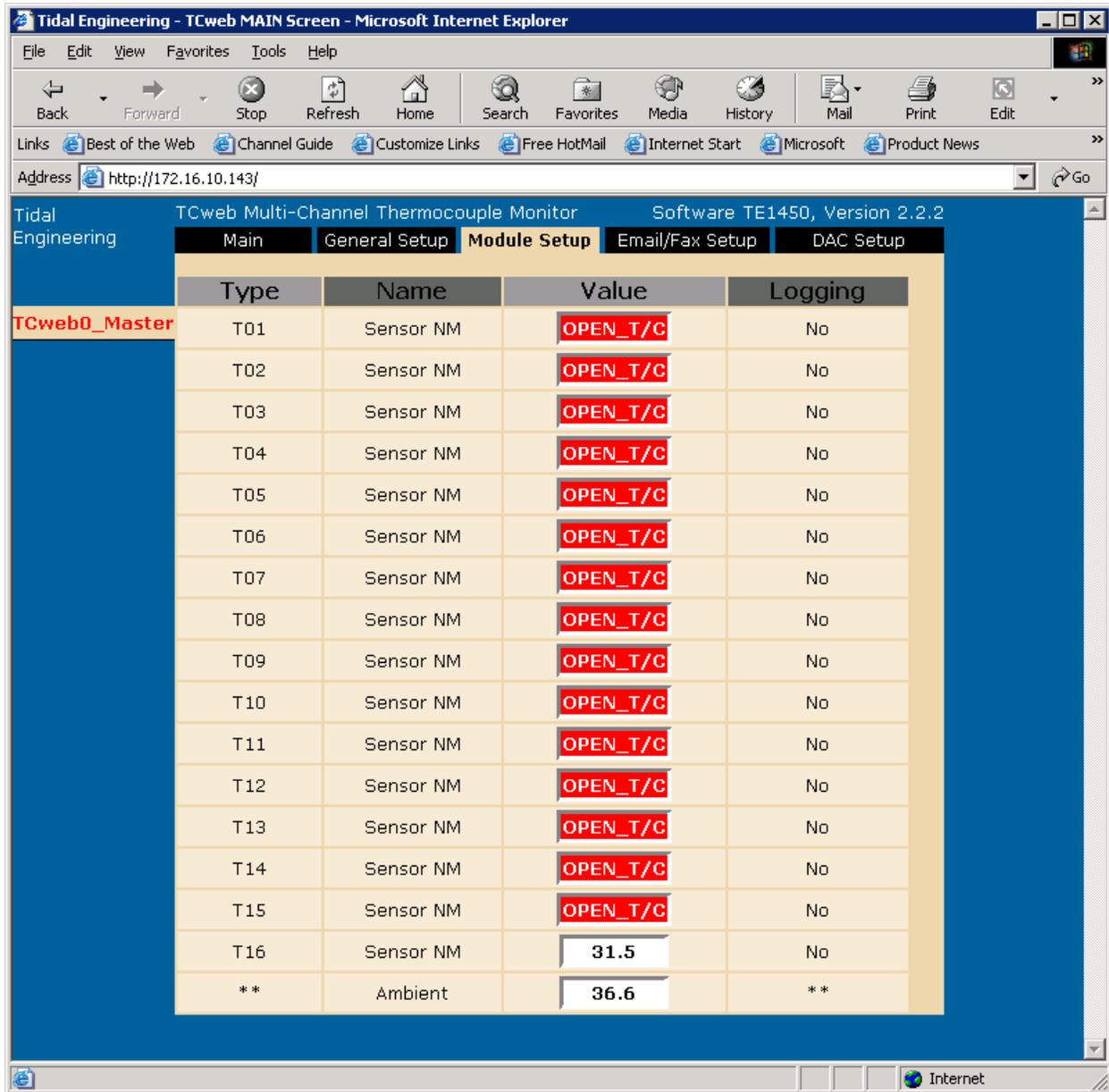
Figure 4 TCweb - Main Screen

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
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.

5.1.2 Scan Mode
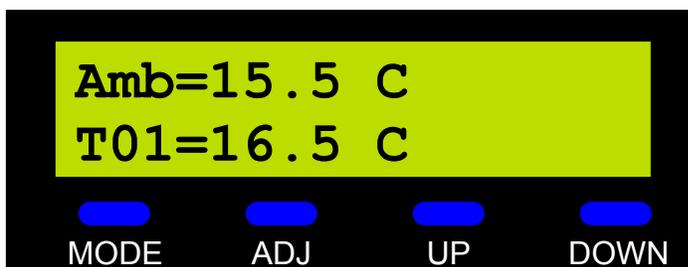
When powered the TCweb display starts in the Scan Mode, stepping through all of the sensor readings from the Thermocouples, as well as the ambient temperature of the module. An examples screen from this mode is shown above. The letter before the number of the channel is the type of thermocouple. Use 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:

```
S02J07=31.4 C
S02B08=159.2 C
```
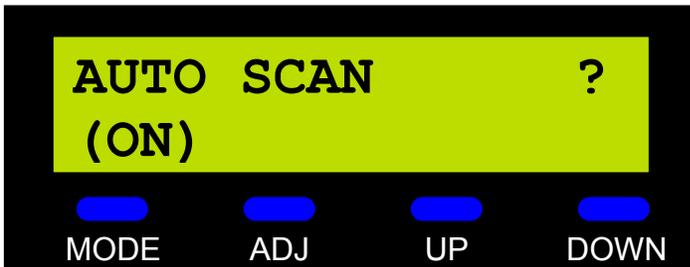MODE   ADJ   UP   DOWN
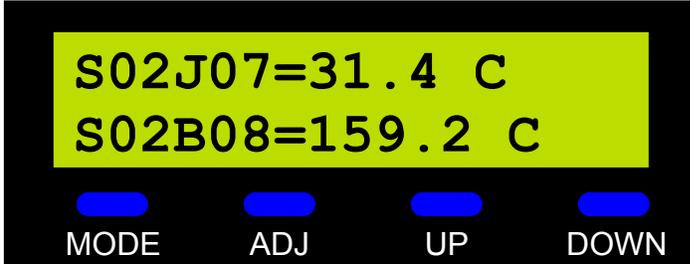
5.1.3 Menu Mode: AutoScan
To enter the Menu Mode, depress the MODE button to go to the AutoScan Set menu. The current value of AutoScan is displayed, either On or Off.

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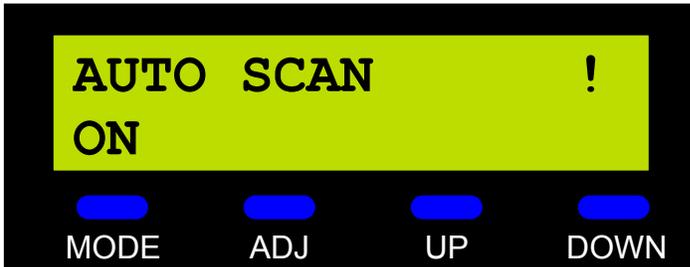
To toggle the value, hit ADJ and then UP or DOWN. While editing, ADJ will save the settings, and MODE will cancel and advance to the next menu.

```
AUTO SCAN          ?
(ON)
```
MODE   ADJ   UP   DOWN

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.

```
UNITS F/C          !
CENTIGRADE
```
MODE   ADJ   UP   DOWN
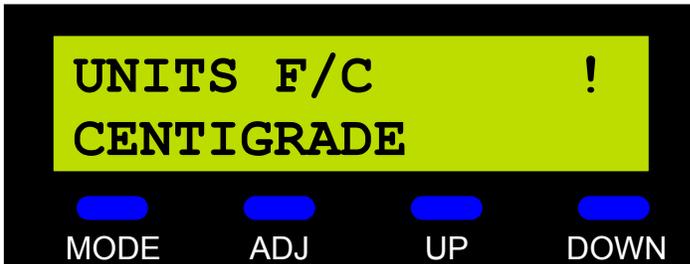
5.1.5 Menu Mode: IP Settings

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."

```
DHCP/STATIC      ?
(DHCP)

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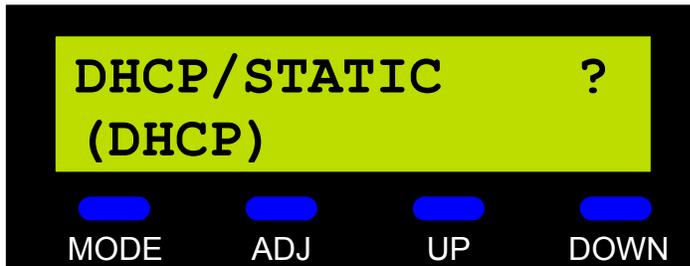
The next three screens operate similarly. They are TCP/IP Address, Net Mask, and Gateway, respectively. If the DHCP/Static is set to "Static," an exclamation point is displayed, and you have the option of editing the values. In DHCP mode an asterisk is displayed, and you can only view the values.

```
IP ADDRESS       *
27.182.81.82

 MODE    ADJ     UP    DOWN
```
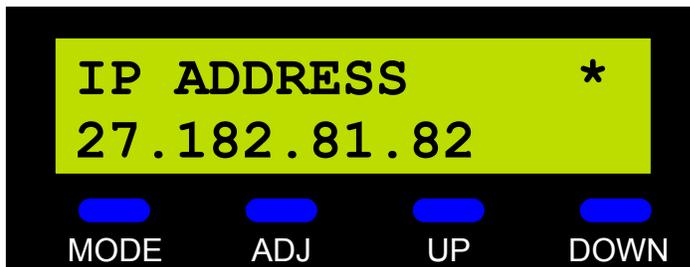
Here too, ADJ accesses editing. The editor goes digit by digit as you adjust it, and the digit being adjusted blinks. While editing, UP and DOWN increment and decrement the value. MODE advances to the next value, and ADJ saves the changes and goes to the next screen. However, when editing the last value, 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.

```
NET MASK         ?
255.255.255.000

 MODE    ADJ     UP    DOWN
```
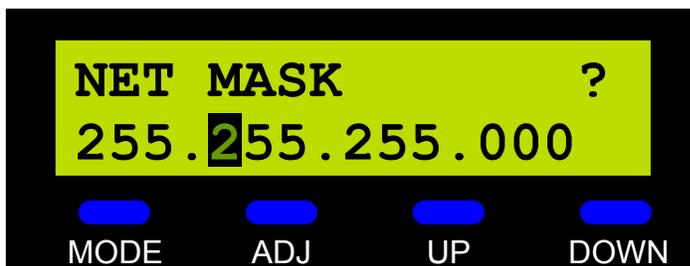
The next screen brings you back to the first digit, enabling you to start again.

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. 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.
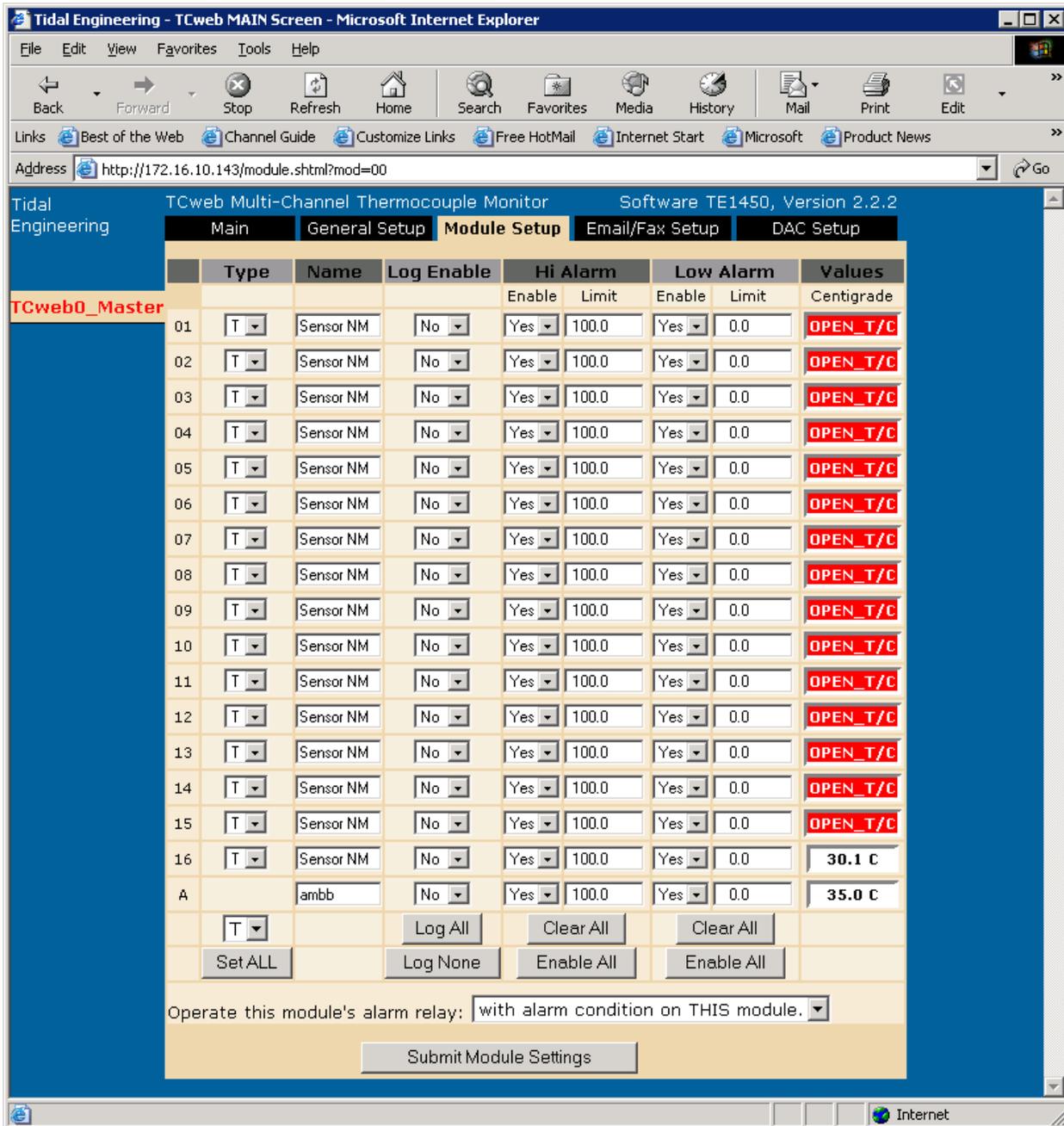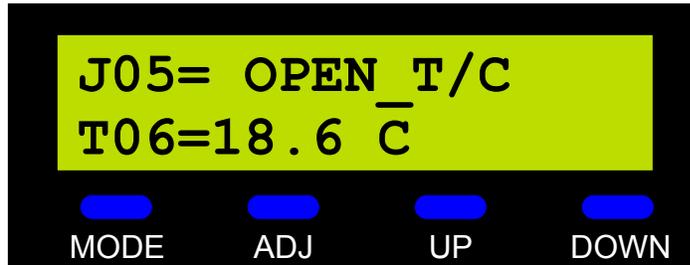
Figure 5 Module Setup Page

5.3 Error Messages

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

```
J05= OPEN_T/C
T06=18.6 C
```
MODE   ADJ   UP   DOWN

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.

```
S02R12= COMM_ERR
S02K13= COMM_ERR
```
MODE   ADJ   UP   DOWN
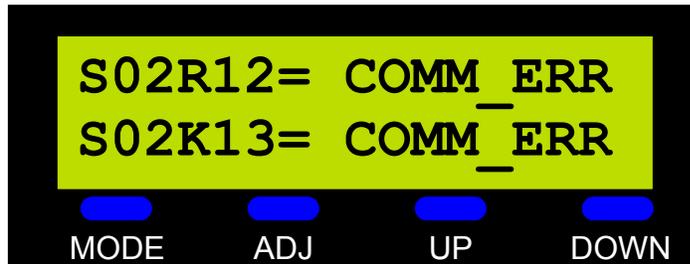
The Communications Error message is generated if communication with a slave, via the serial connectors, is corrupted. This can occur if the lines are severed, if the lines are crossed, if the slave is unplugged, or if there is noise on the communication line. A condition that causes a communication error will always effect all of the channels for that unit.

5.4 Attaching Wires to the Unit

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.

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 DAC Setup. 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.
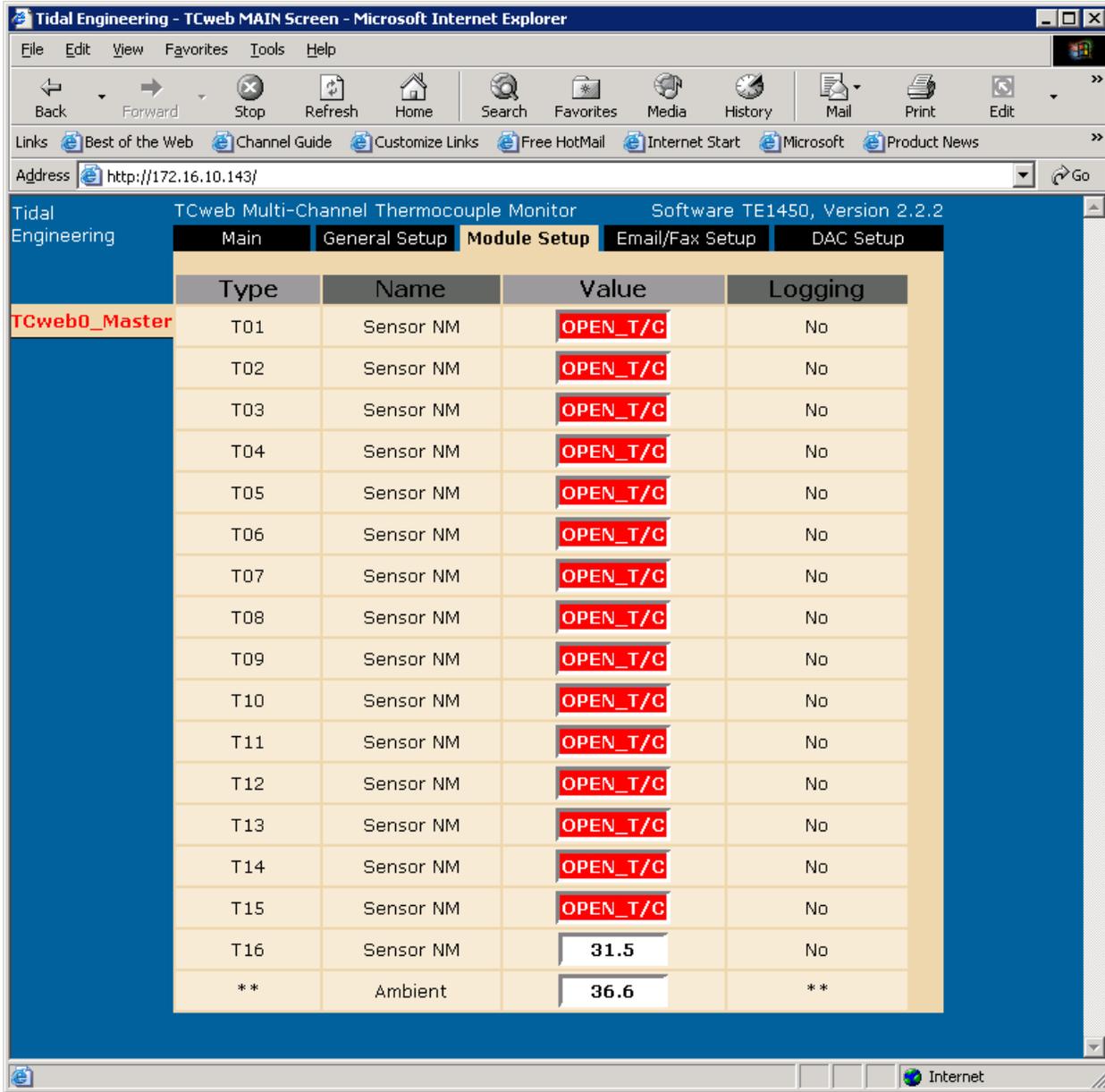
6.1 Main

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.
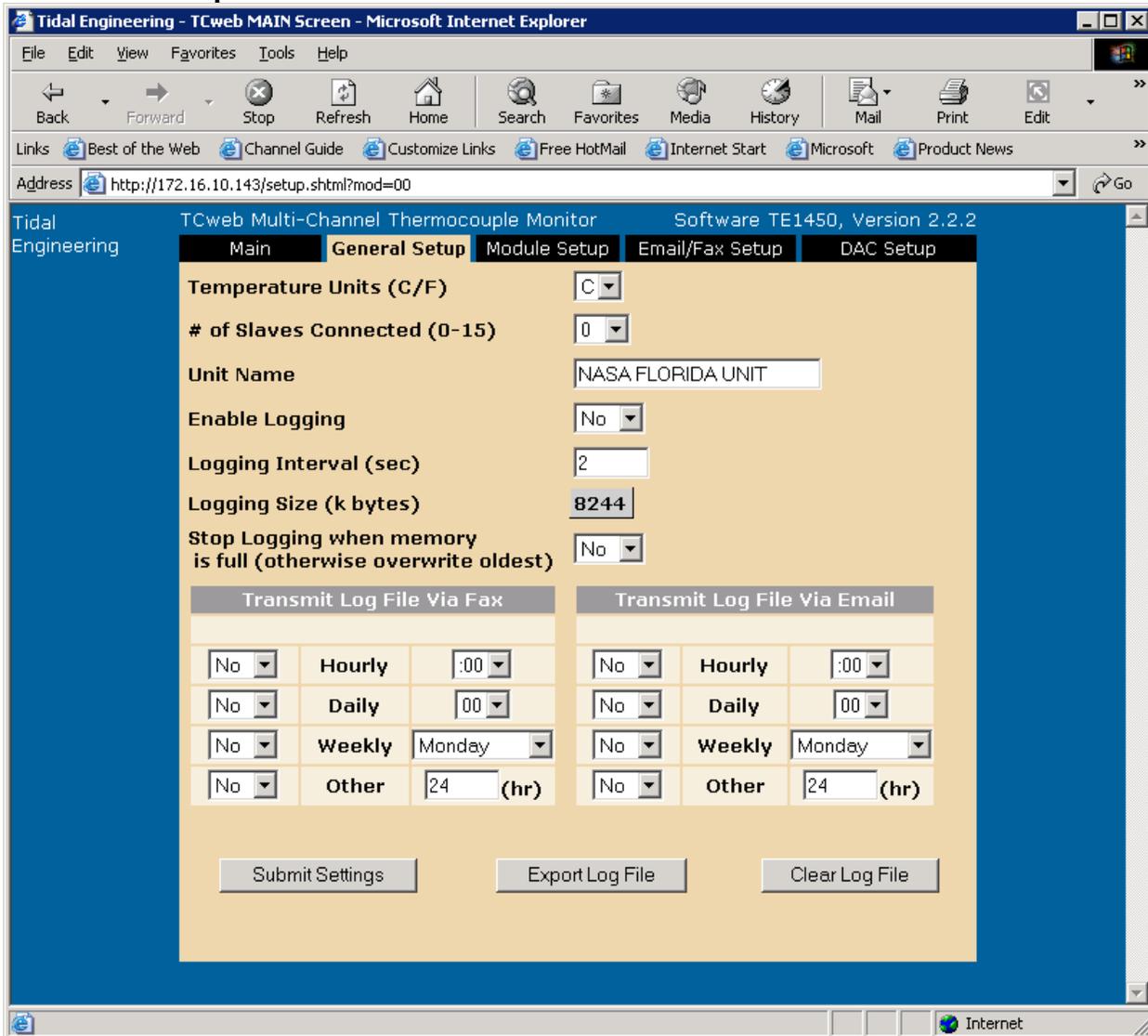
6.2 General Setup

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 sampling of the selected channels.

The log file can be transmitted via e-mail or fax at regular intervals. Select the interval, and the method. The e-mail address(es) and fax number(s) 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 Module Setup

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.

6.2.1 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.

6.2.2 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.

6.2.3 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.

This 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 flyout 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.

6.5 E-mail/Fax
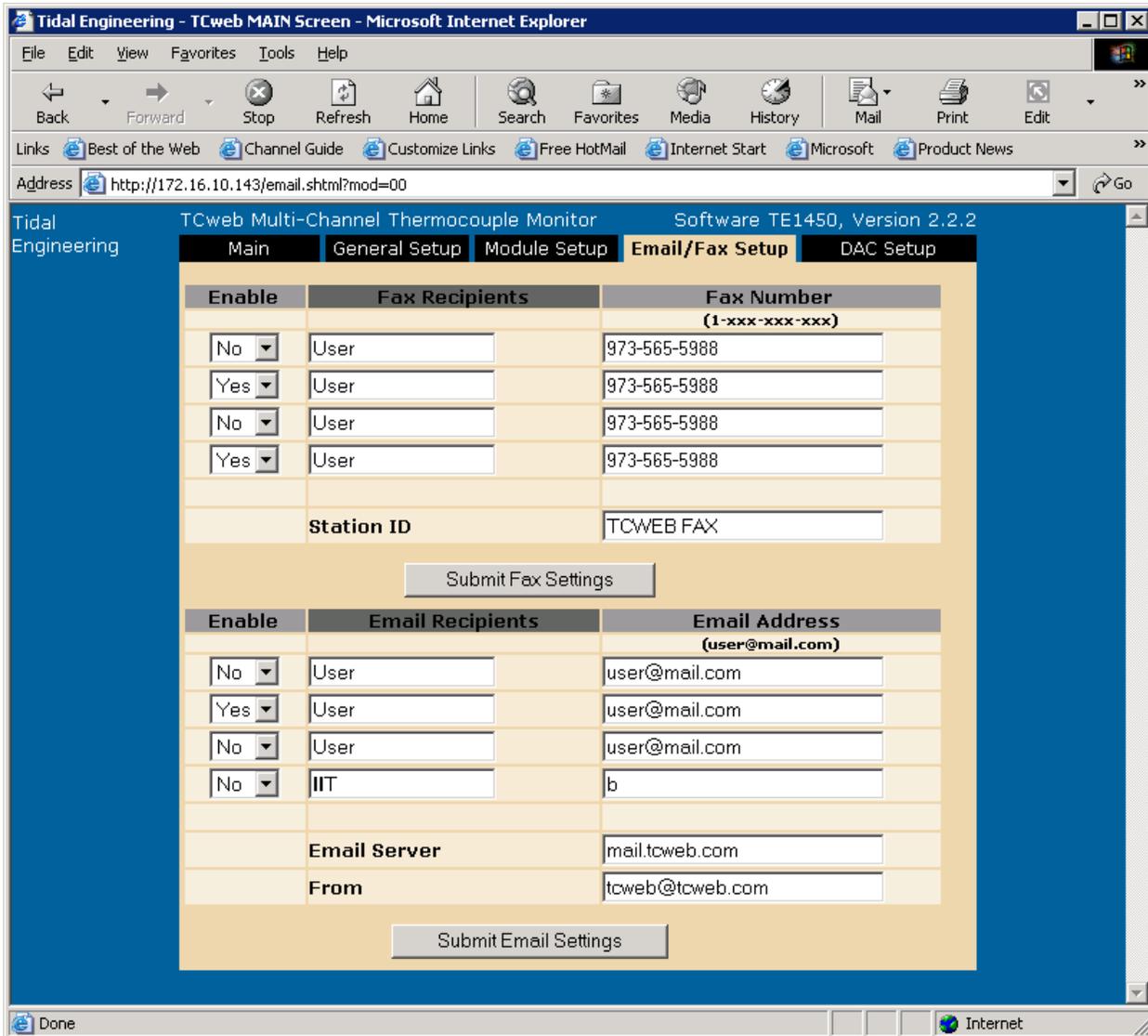
Figure 8: TCweb E-mail/Fax Screen

These two sections allow you to input where the alarm notifications and log files will be set. For each entry, you can select whether or not the alarm notification will go to that entry by checking or unchecking the "Enable" box, entering a name for that recipient, and entering the address of the recipient, either a fax number or e-mail address. Here too, Submit will send your changes to the TCweb and save them.
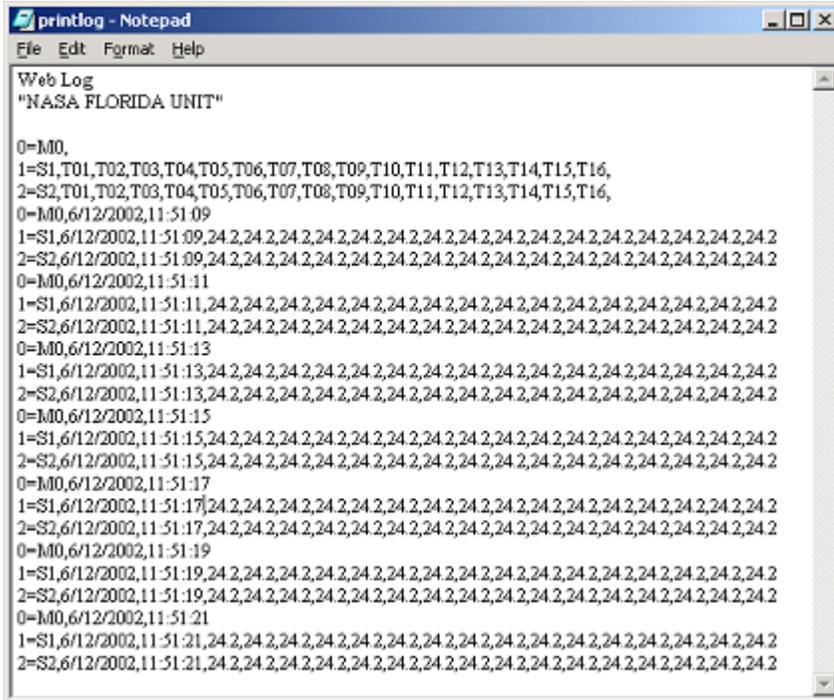
6.6 Data File

Figure 9: 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.

6.7 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:
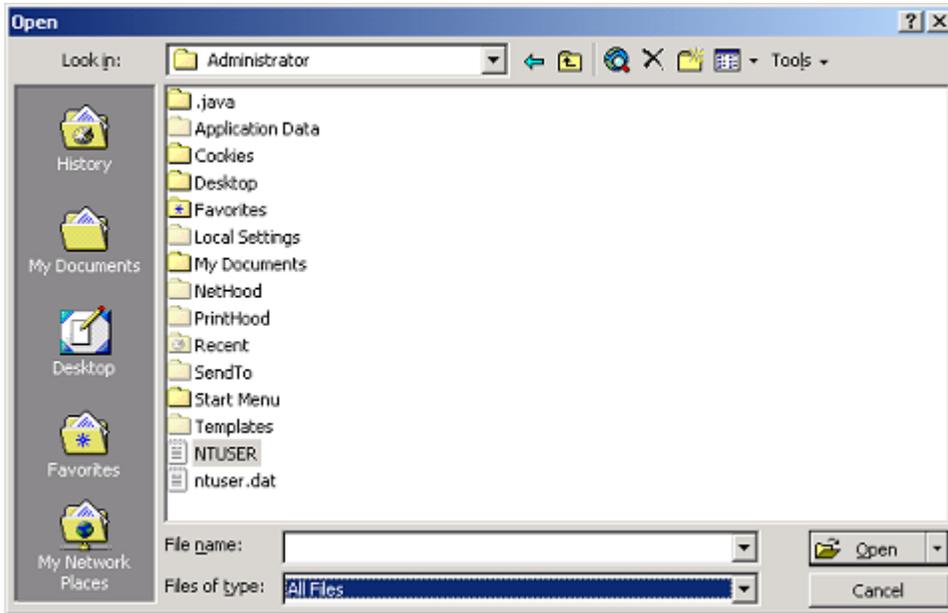
Change the dropdown list entitled "Files of type:" to "All Files" and find where you saved the log file. When you hit open, Excel detects that it is not a regular Excel file, but a data file that has to be converted to an Excel file, so it brings up this series of dialogs:
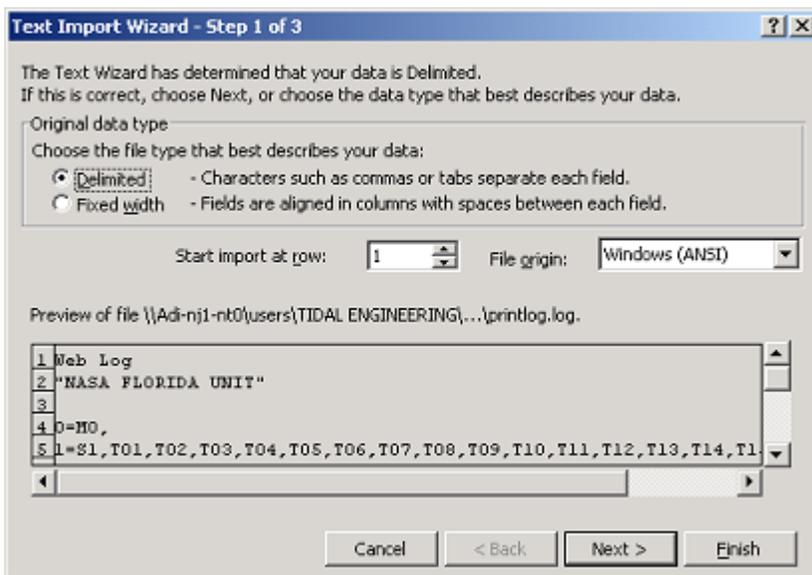
The file is Delimited, so select that setting, and hit "Next."
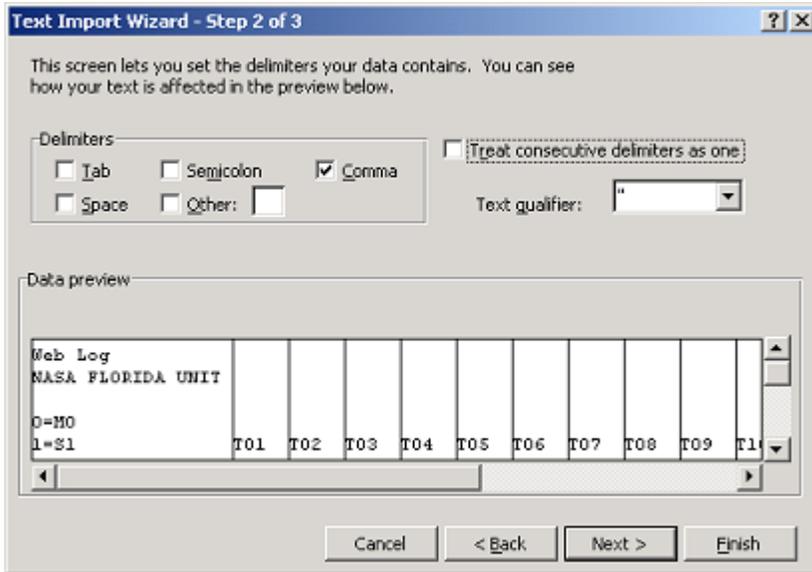
The different values are separated by commas by the TCweb, so change the Delimiter from Tab to Comma, and leave everything else as it is. Press "Next" to proceed.
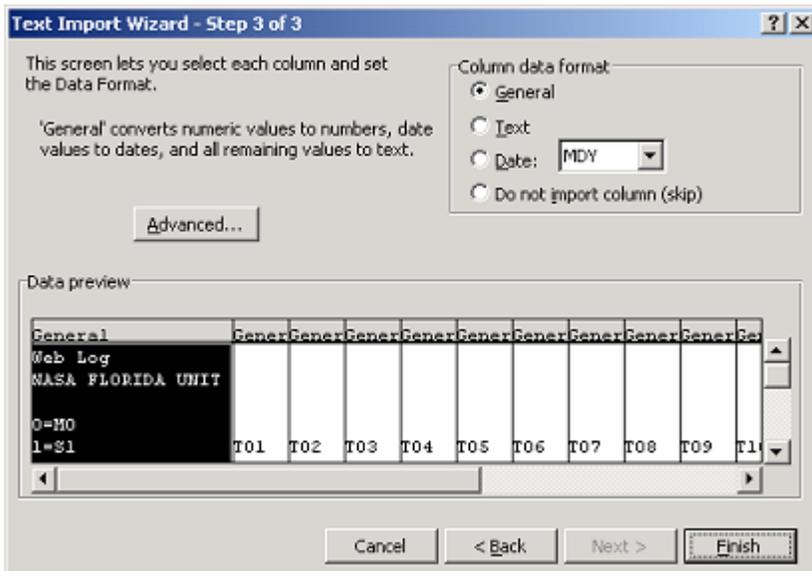
The default values are fine here, as the Column Data Format "General" will suffice for all of the columns.

Press "Finish" to see:

Microsoft Excel - printlog

File Edit View Insert Format Tools Data Window Help

A1 = Web Log

	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=M0														
5	1=S1	T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13	T14	T15
6	2=S2	T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13	T14	T15
7	0=M0	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=M0	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=M0	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=M0	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=M0	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=M0	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=M0	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

printlog

Ready   NUM SCRL

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.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
2	NASA FLORIDA UNIT													
3														
4	0=M0													
5	1=S1			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13
6	2=S2			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13
7	0=M0	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=M0	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=M0	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=M0	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=M0	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=M0	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=M0	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
28														
29														

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:

			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T1:
2	NASA FLORIDA UNIT															
3																
4	0=M0															
5	0=M0	6/12/2002	11:51:09													
6	0=M0	6/12/2002	11:51:11													
7	0=M0	6/12/2002	11:51:13													
8	0=M0	6/12/2002	11:51:15													
9	0=M0	6/12/2002	11:51:17													
10	0=M0	6/12/2002	11:51:19													
11	0=M0	6/12/2002	11:51:21													
12	1=S1			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T1:
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	
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	
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	
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	
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	
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	
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	
20	2=S2			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T1:
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	
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	
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=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	
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	
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	
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	
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:

			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T1:
10	0=M0	6/12/2002	11:51:19													
11	0=M0	6/12/2002	11:51:21													
12	1=S1			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T1:
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	
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	
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	
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	
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	
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	
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	
20	2=S2			T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T1:
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	

Now, select "Chart" from the "Insert" menu, to bring up the following series of dialogs:
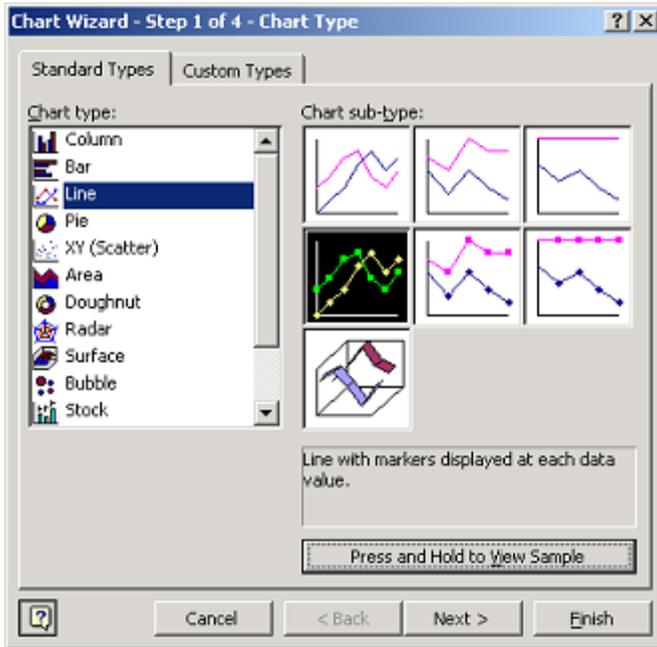
Select "Line" from the "Standard Types" menu, and then either the icon highlighted here, "Line with markers displayed at each data value," or the icon directly above it.

Hit "Next >" to continue.
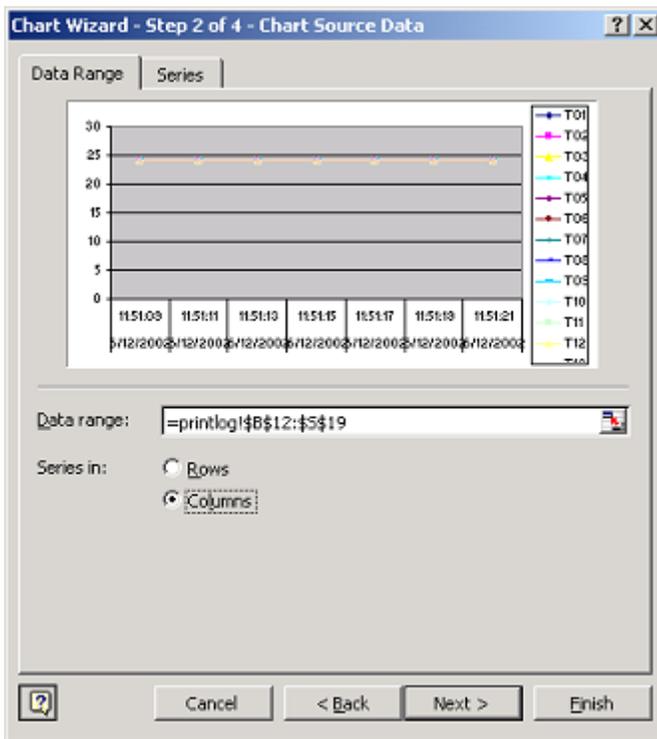
This dialog has the correct "Data range" if you selected the right cells before entering the Chart Wizard. Choose "Series in: Columns" and then select "Next >."
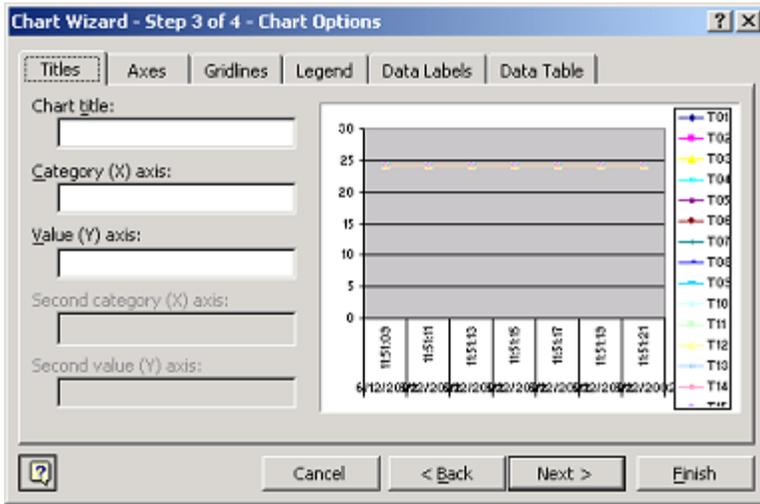
This dialog offers you the most opportunity for customization of your graph. Each of the tabs allows you to format the graph in different ways. Feel free to change anything on this graph, and observe the resulting changes on the preview of the finished graph. For purposes of simplicity, the graph in this tutorial remains unchanged. "Next >" takes you to the last Chart Wizard dialog.
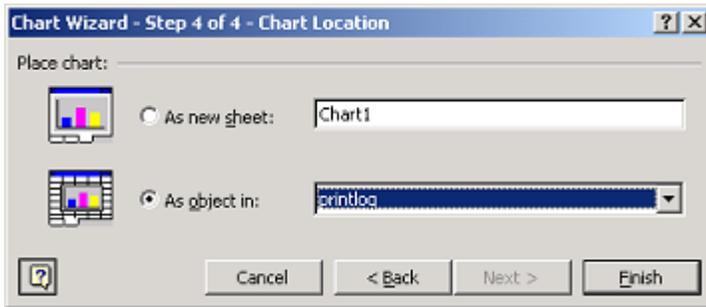
Here, too, the choice is yours: Either place the chart in its own new sheet, or create it as an object in a current project. If you leave the settings the Wizard comes up with, the graph will appear right in the window where you inputted the data. The final step is to press "Finish," which yields the completed graph:
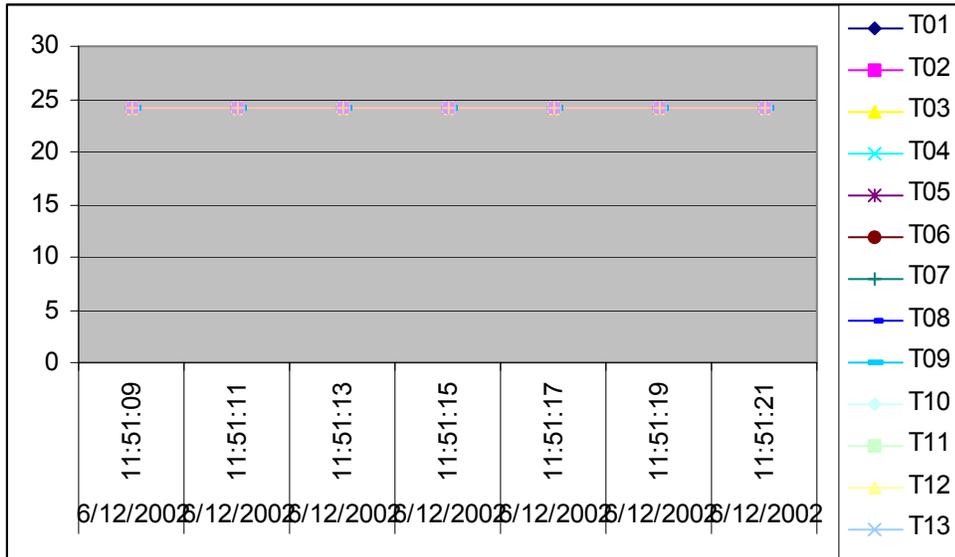
7 Telnet Syntax

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.

8 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.
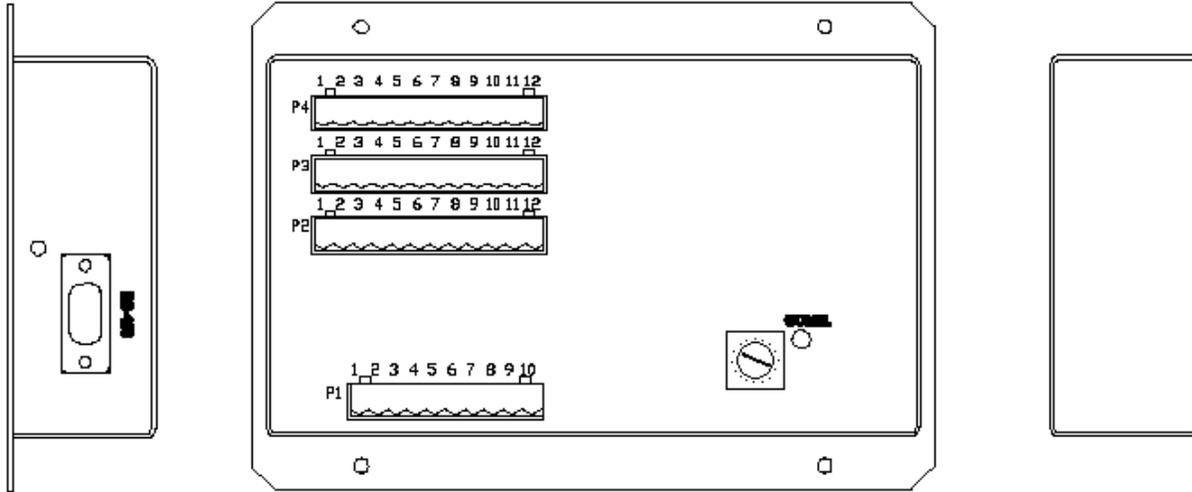
Figure 10: Diagram of TCweb Slave

8.1 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."

8.2 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.
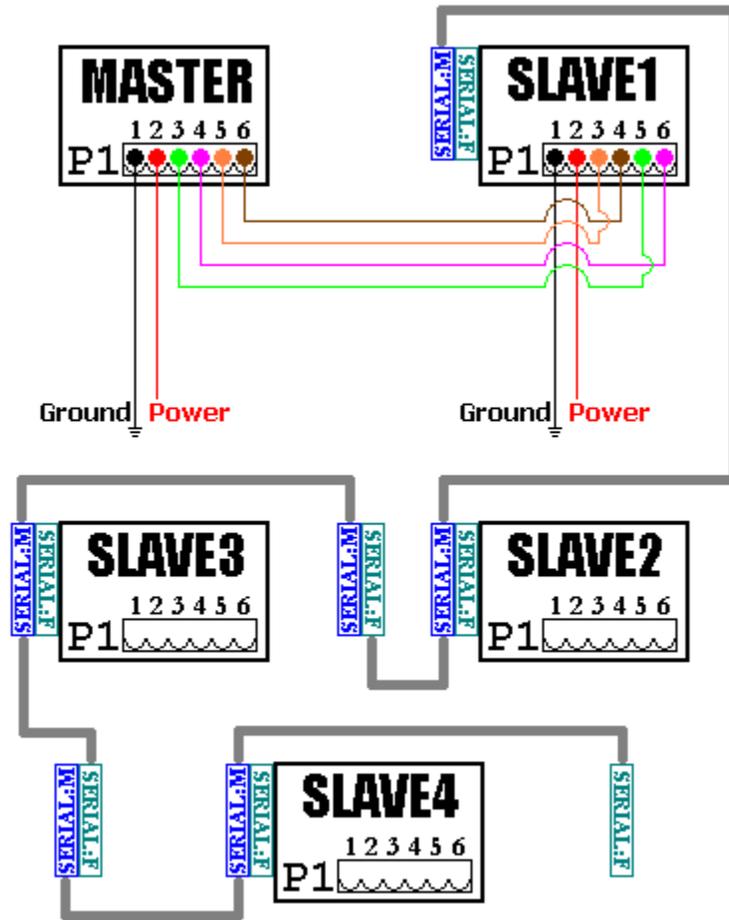

Figure 11 Master Slave Connection Diagram

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."

9 Troubleshooting

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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.
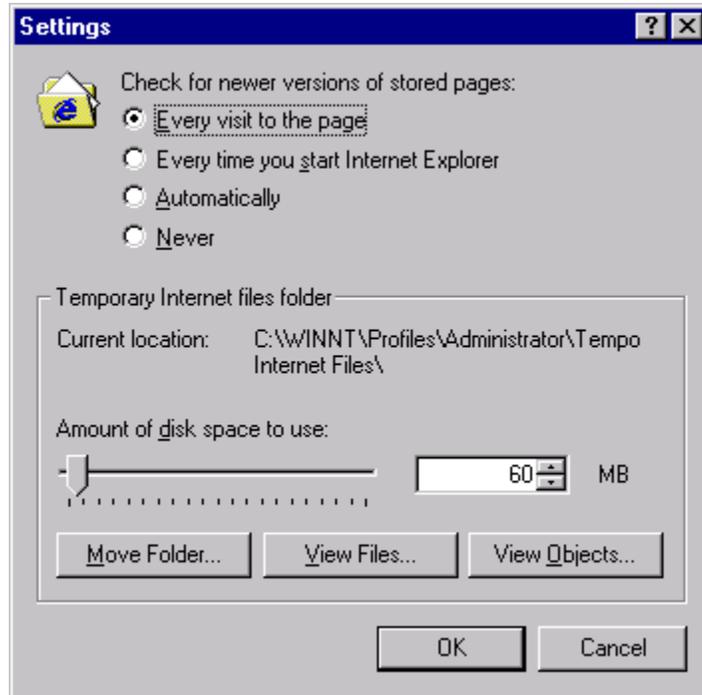
Figure 2 Internet Explorer Temporary Files Settings

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 Microsoft Dial-up Networking to connect to the TCweb Modem version.

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.

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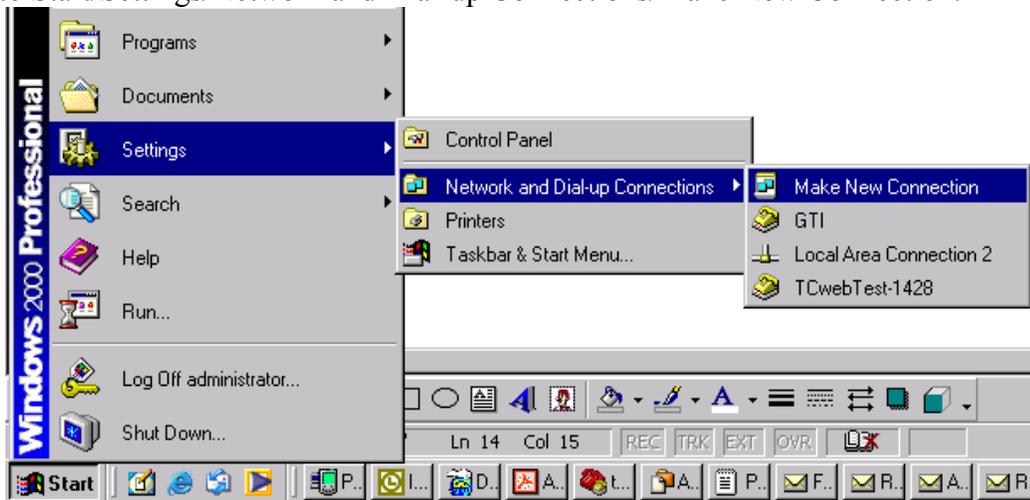
2. The Network Connection Wizard window should appear as shown below:

3. Select Dial-up to private network and click Next>
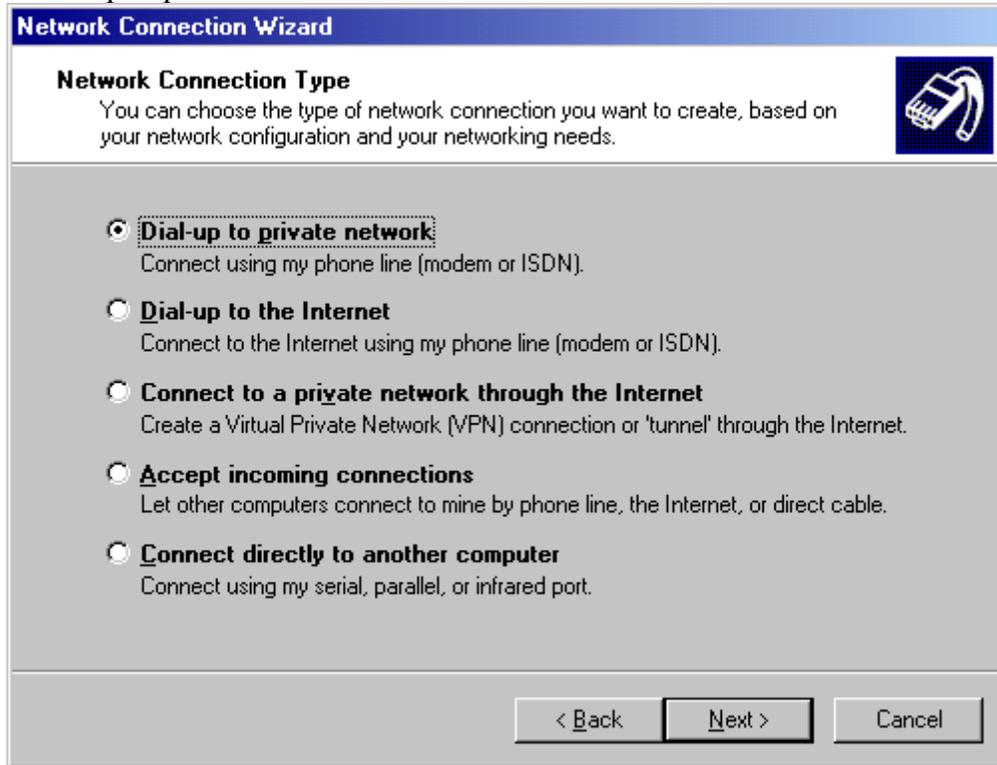
4. Select the modem from the list and click Next>.
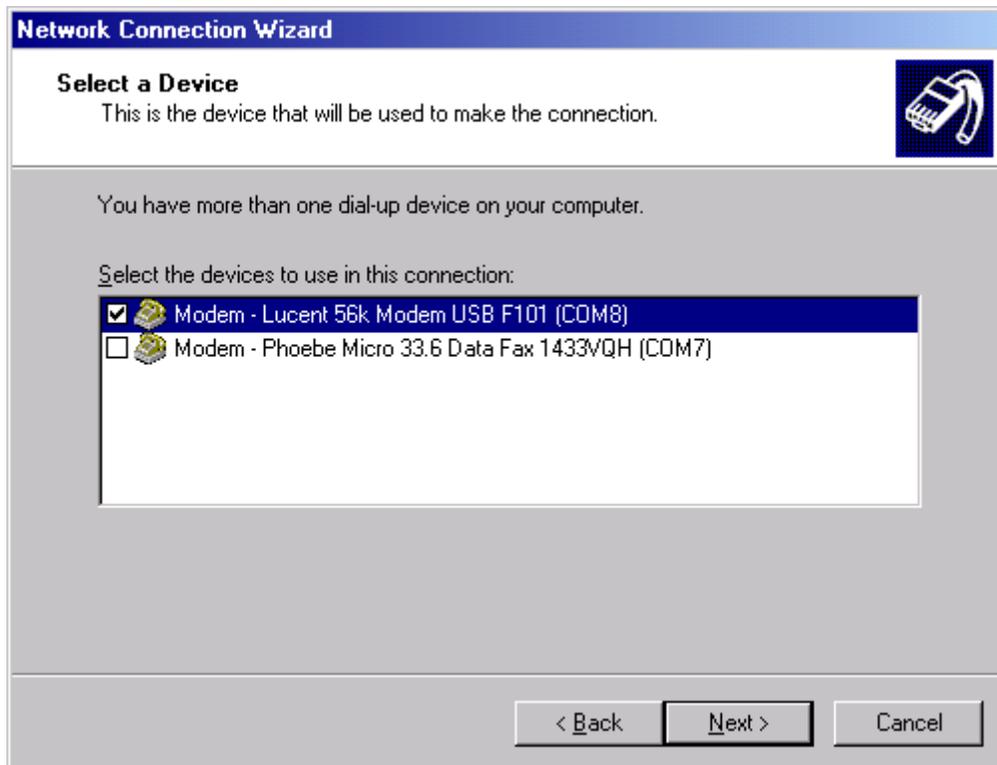
5. Enter the telephone number and click Next>

Network Connection Wizard

Phone Number to Dial
You must specify the phone number of the computer or network you want to connect to.

Type the phone number of the computer or network you are connecting to. If you want your computer to determine automatically how to dial from different locations, check Use dialing rules.

Area code:

Phone number:
973-555-5555

Country/region code:

☐ Use dialing rules

< Back   Next >   Cancel

6. Choose Create this connection "For all users" or "Only for myself" as appropriate and click Nest>.

Network Connection Wizard

Connection Availability
You may make the new connection available to all users, or just yourself.

You may make this connection available to all users, or keep it only for your own use. A connection stored in your profile will not be available unless you are logged on.

Create this connection:

◉ For all users

○ Only for myself

< Back   Next >   Cancel
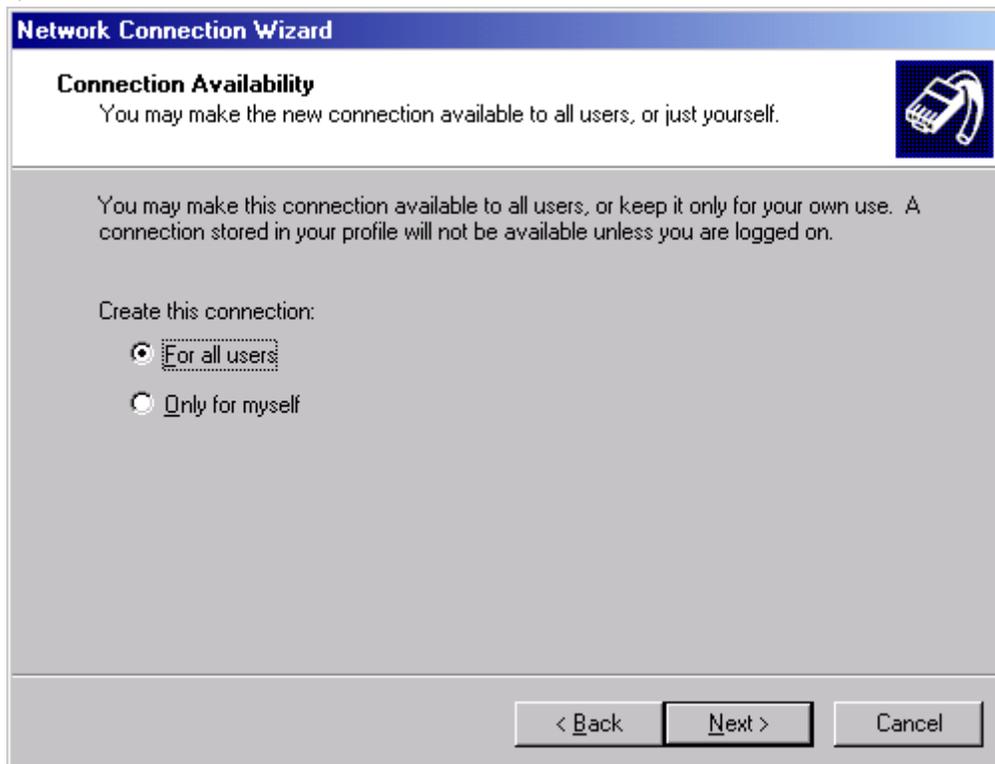
7. Type a connection name and click Finish.

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

   User Name: name
   Password: password
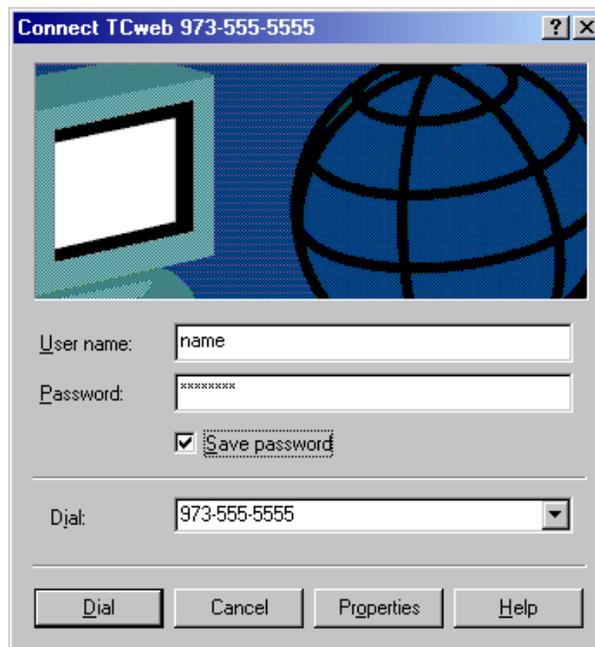
9. Click the Network tab and the screen should appear as shown below. Make sure the "Type of dial-up server I am calling:" is set to "PPP…" and uncheck all Components except Internet Protocol (TCP/IP) and Network Monitor Driver. Then click OK.
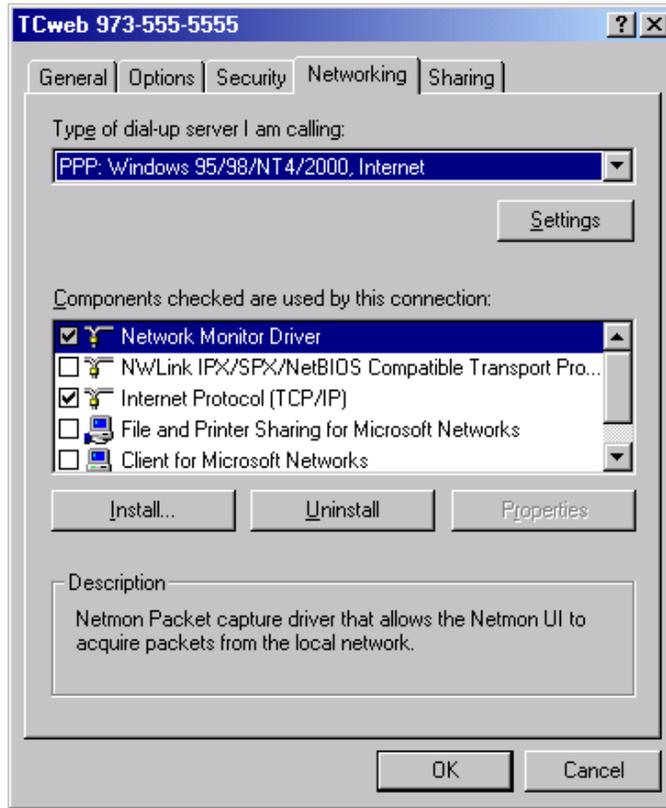
10. The Connect screen should appear as shown below. Click Dial to connect to TCweb.
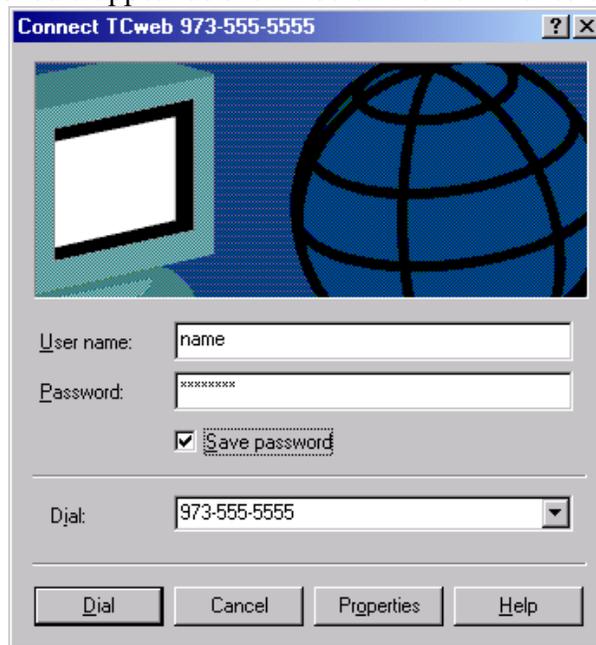
11. The Connection will progress from

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.
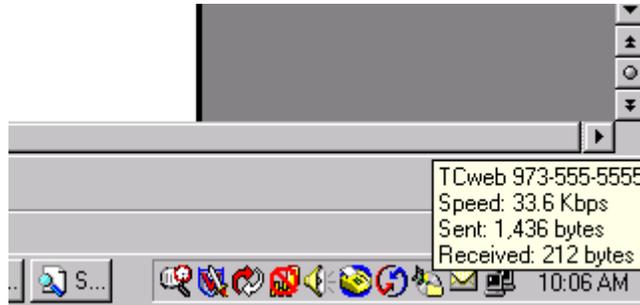
13. The TCweb will use an IP address of 10.1.10.1 and will assign an IP address to the PC of
10.1.10.2 with a netmask of 255.255.255.255.

To view the TCweb's Web page, open Internet explorer and type 10.1.10.1 in the address bar as
shown below.
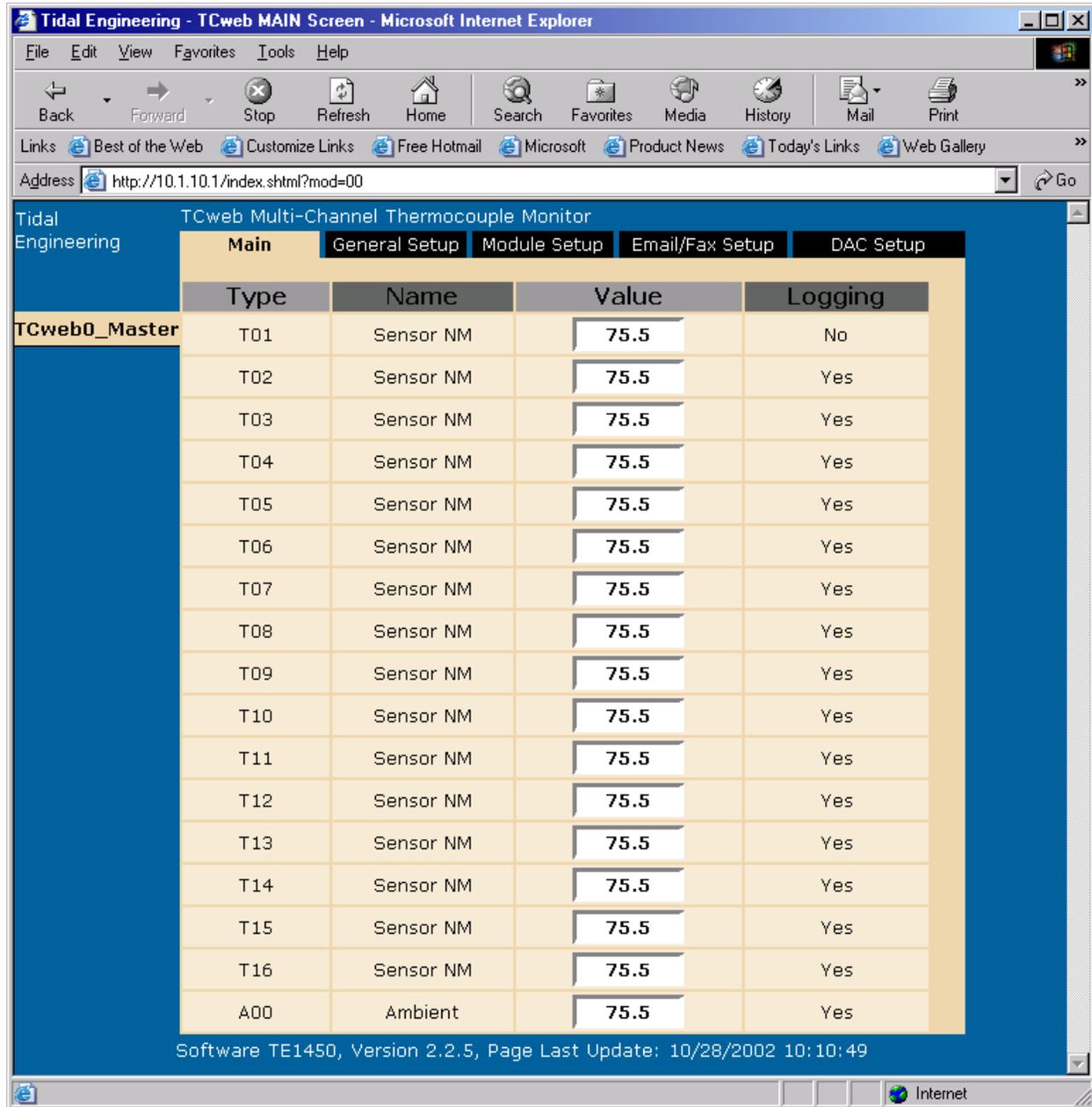
Appendix C - Configuring Microsoft HyperTerminal to connect to the TCweb over Telnet.

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.
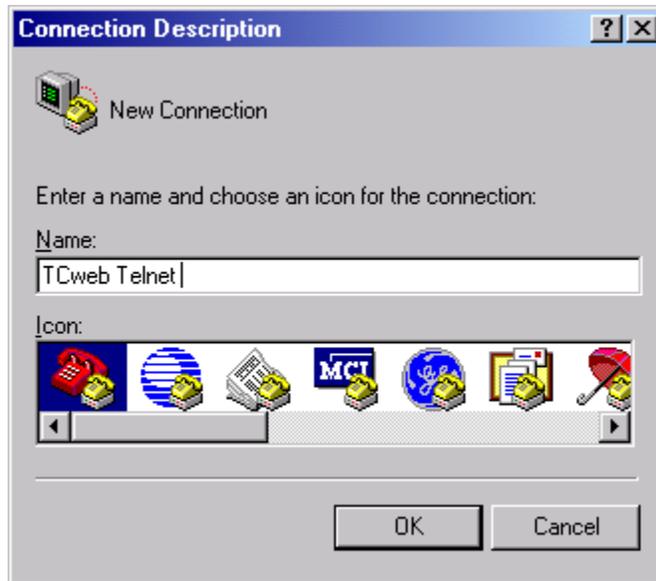
2. The connection Properties window should appear. Drop down the "Connect Using" list and select TCP/IP (Winsock).
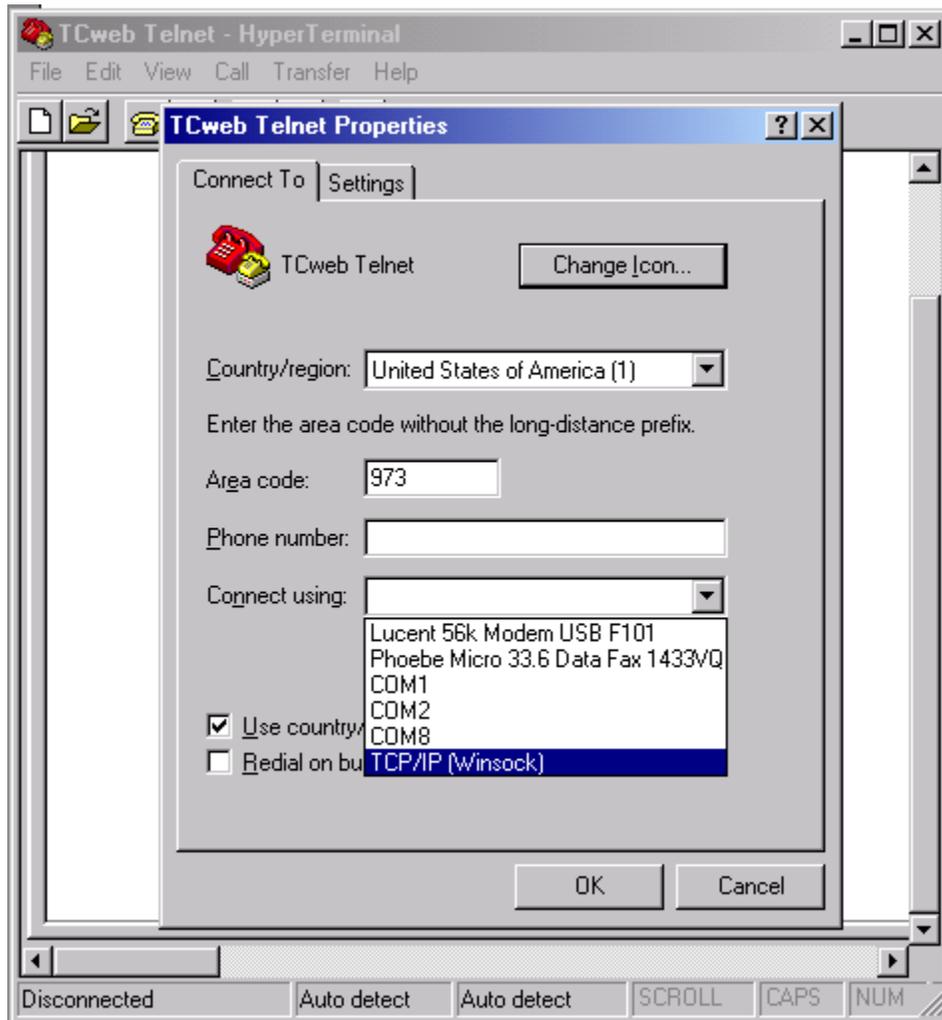
3. Type the TCweb's IP address in the Host address text window. For Ethernet connections, the IP address can be obtained from the front of the master TCweb module. The IP address for Modem units is always 10.1.10.1 .
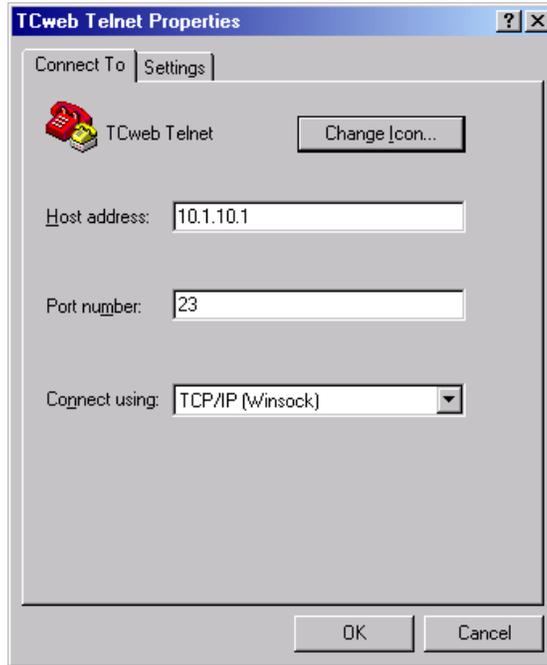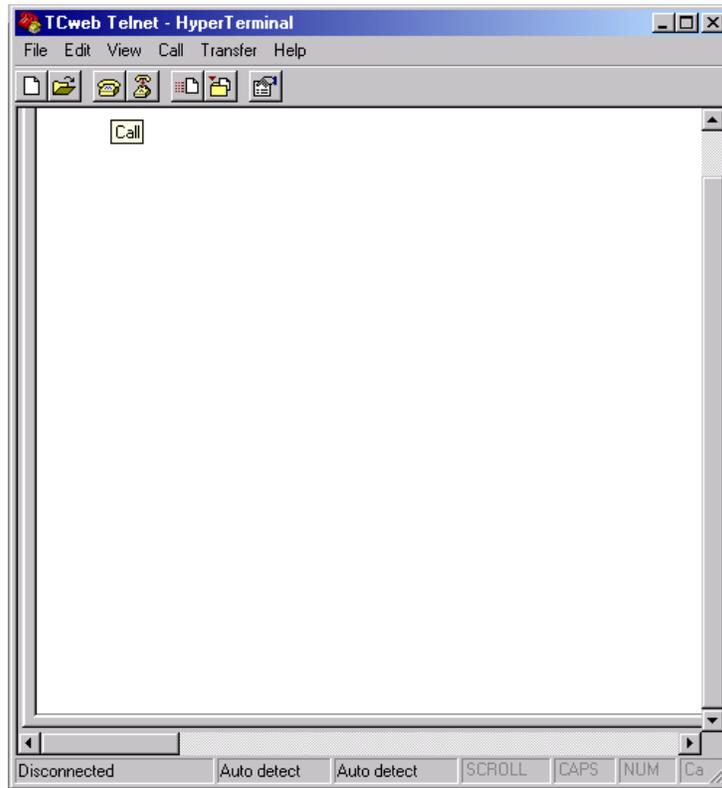

4. Press the settings tab and click the "ASCII Setup.." button.
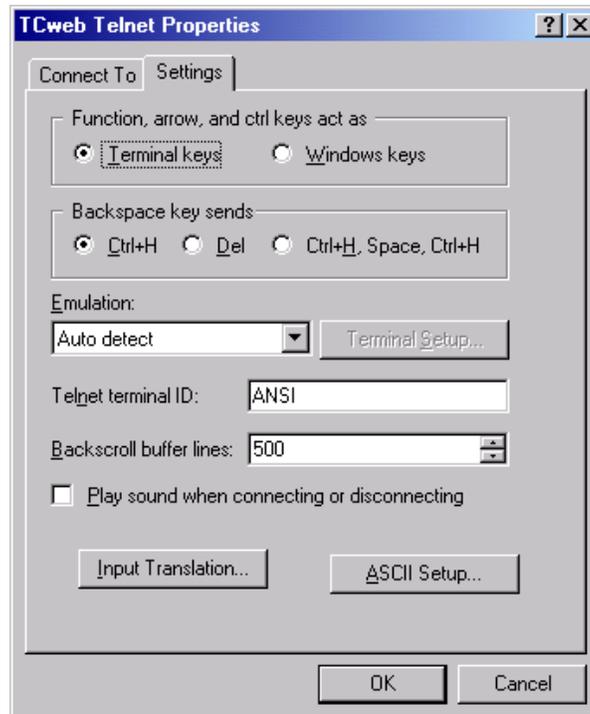
5.   The ASCII Setup window will appear. Check the box that says, "Echo typed characters locally" as shown below. Then click OK.
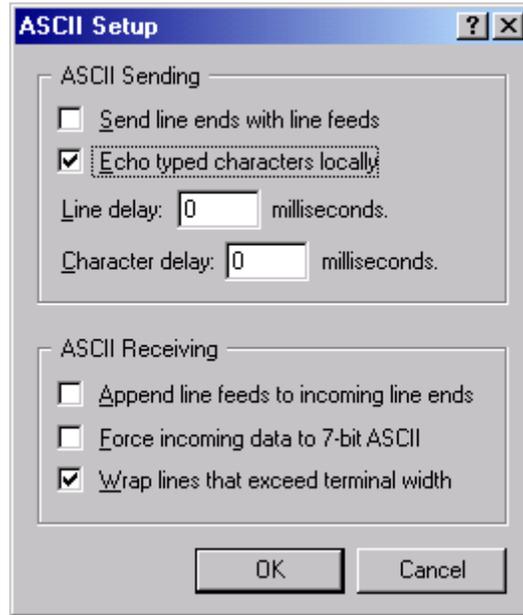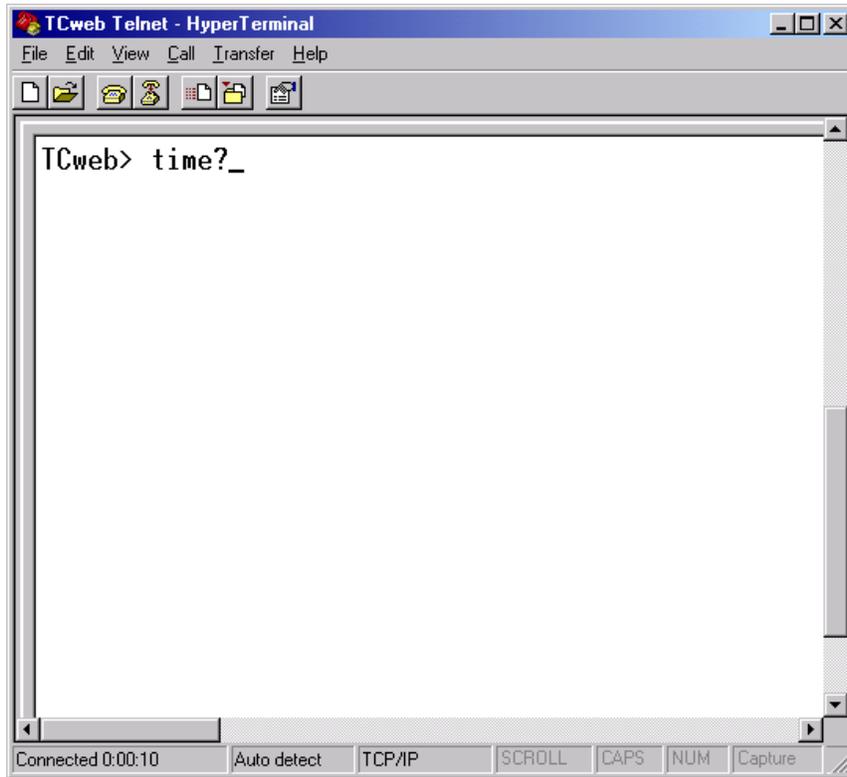

6.   Press the Call icon on the toolbar to connect to the TCweb unit (Telephone on hook).

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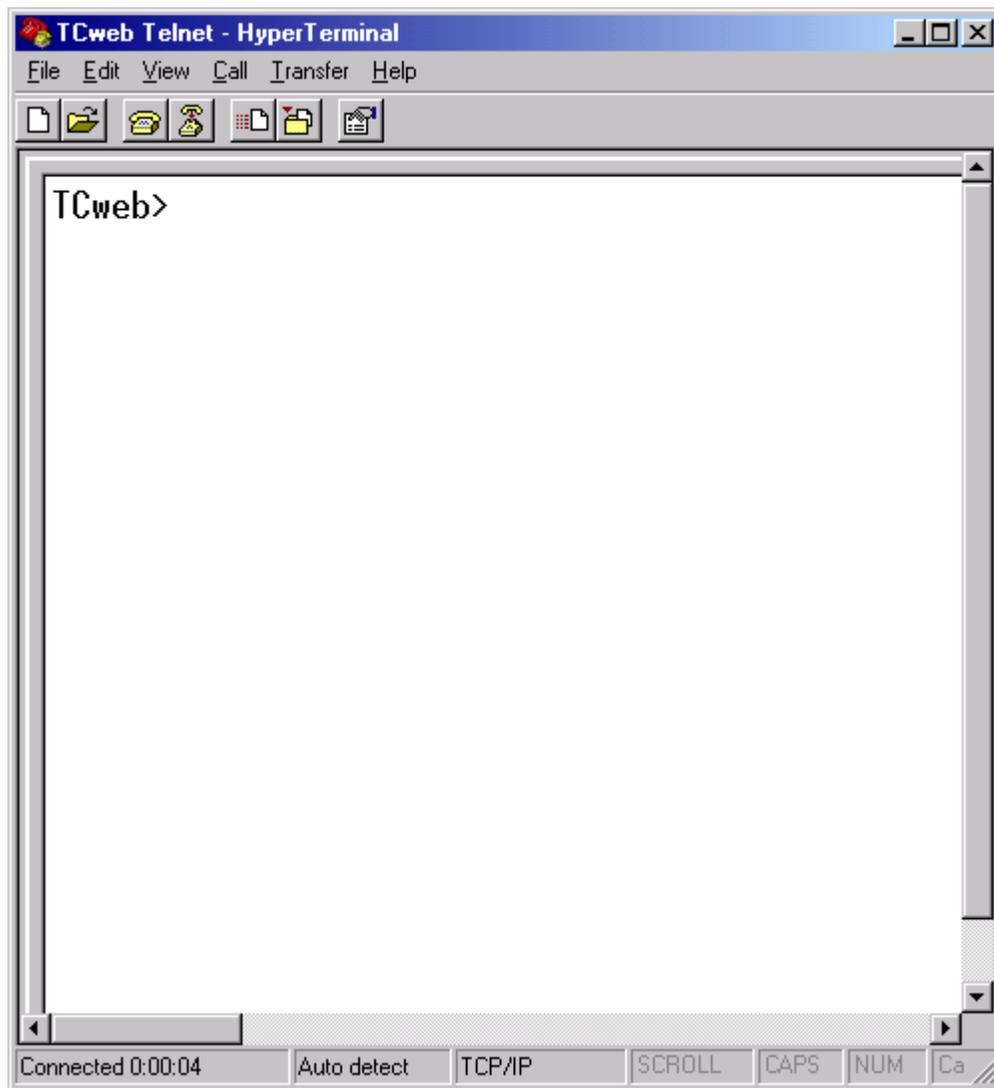
8. Type "time?" in the text window as shown below and press Enter.

9. The TCweb unit will respond with the current time setting.
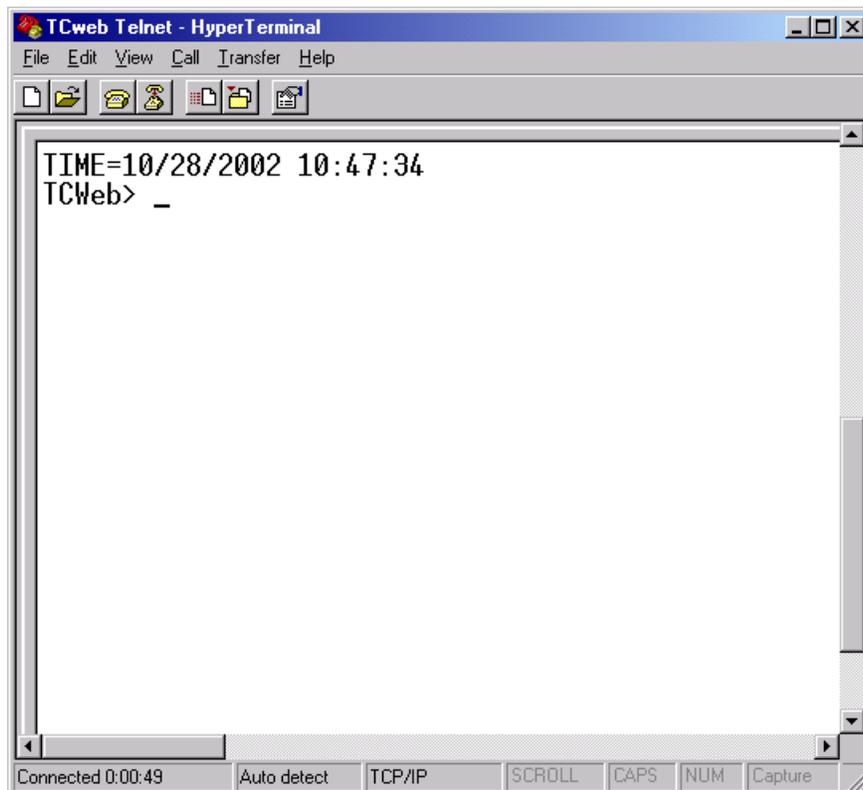
TCweb Errata
Documented Errata (Last updated August 30, 2002) Version 2.1.6

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.
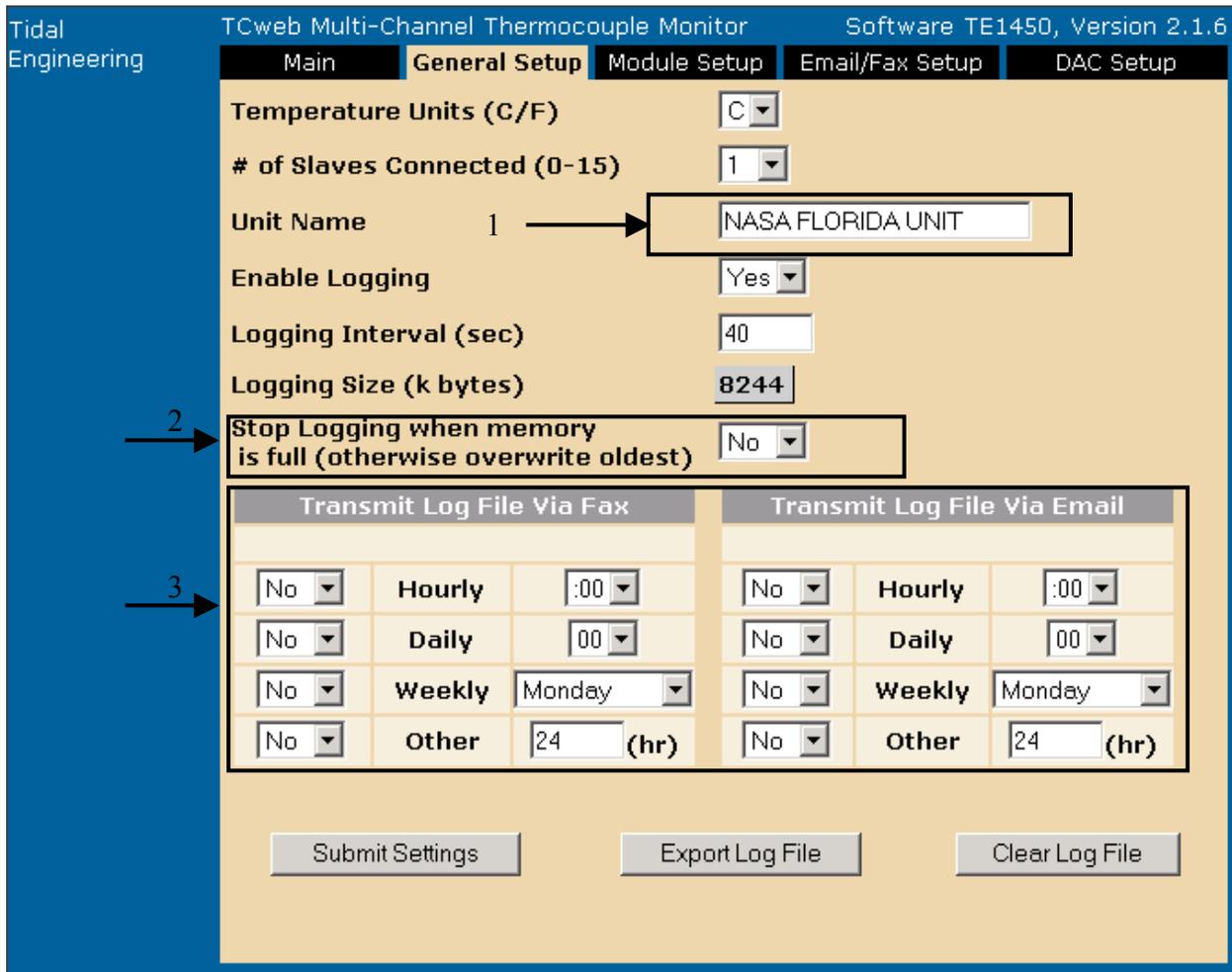
General Setup Page

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