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Installation and Operation Manual for the Model 3141 Channel Power Monitor

Manual 7-9587-2



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Version Number	Version Date
1	08/19/15
2	10/07/15

Symbols Commonly Used



WARNING !!!



High Voltage



CAUTION or ATTENTION



Hot Surface



Important Information



ESD Electrostatic Discharge



Training Video Available



Electrial Shock Hazard



Heavy Lifting



Safety Glasses Required

Changes to this Manual

We have made every effort to ensure this manual is accurate. If you discover any errors, or if you have suggestions for improving this manual, please send your comments to our Angola, New York facility to the attention of the Technical Publications Department. This manual may be periodically updated. When inquiring about updates to this manual refer to the manual part number and revision number on the revision page following the front cover.

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GENERAL DESCRIPTION

The Bird Model 3141 Channel Power Monitor (CPM) is a multiple-channel power monitoring system that is capable of continuously monitoring power and VSWR performance simultaneously for up to 16 channels and is scalable to accommodate any-sized radio system operating between 144 and 960 MHz. The CPM evaluates and monitors LMR systems by checking the key elements of the transmission path in real time and alerting users of degraded performance or failures.

The CPM system can be setup to monitor radio performance, combiner loss, and antenna/feedline characteristics providing continuous information on the health of each component it monitors. This performance data can be viewed on any computer, or any mobile device running on the Android operating system. The unit features data logging enabling long term monitoring of system performance and

trend analysis. In addition, the CPM will identify critical changes in performance and generate alarms. The system provides user notification of alarm conditions and status changes via the SNMP format.

The CPM system is composed of a CPM display unit and individual power sensors as shown in **Figure 1**. Two types of power sensors are available for use in the system including a directional and non-directional model. The CPM display unit occupies one rack unit of space. The display unit can be interfaced with using either the front panel display and buttons or via an internet connection and network accessible webpage. The front of the display unit is shown in **Figure 2** and the rear is shown in **Figure 3**. **Table 1** lists the specifications for the CPM display unit. Specifications for the two types of power sensors are listed in separate manuals. The non-directional sensor model 4044 is covered



Item	Description	Part Number
1	CPM Display Unit	3-25848
2	Non-Directional Power Sensor	4044
3	Directional Power Sensor	4045

Figure 1: CPM system components.

in Bird Technologies manual# 920-4044 and the directional sensor model 4045 is covered in manual# 920-4045.

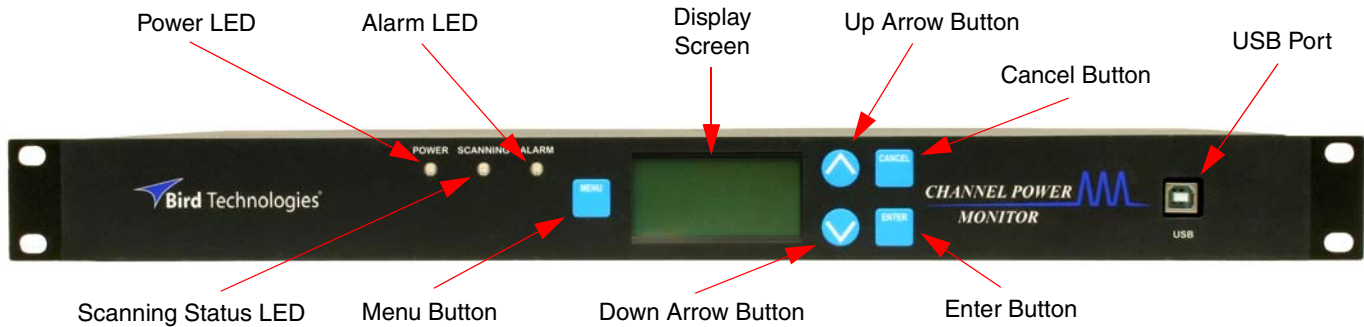
UNPACKING

Each major component of the CPM system is individually packaged and shipped via motor freight or UPS. It is important to report any visible damage to the carrier immediately. It is the customer's respon-

sibility to file damage claims with the carrier within a short period of time after delivery (1 to 5 days).

THEORY OF OPERATION

The CPM is capable of monitoring up to 16 individual power sensors simultaneously. A typical CPM installation is shown in **Figure 4**. In this example both non-directional and directional sensors are used to monitor system performance. In the exam-

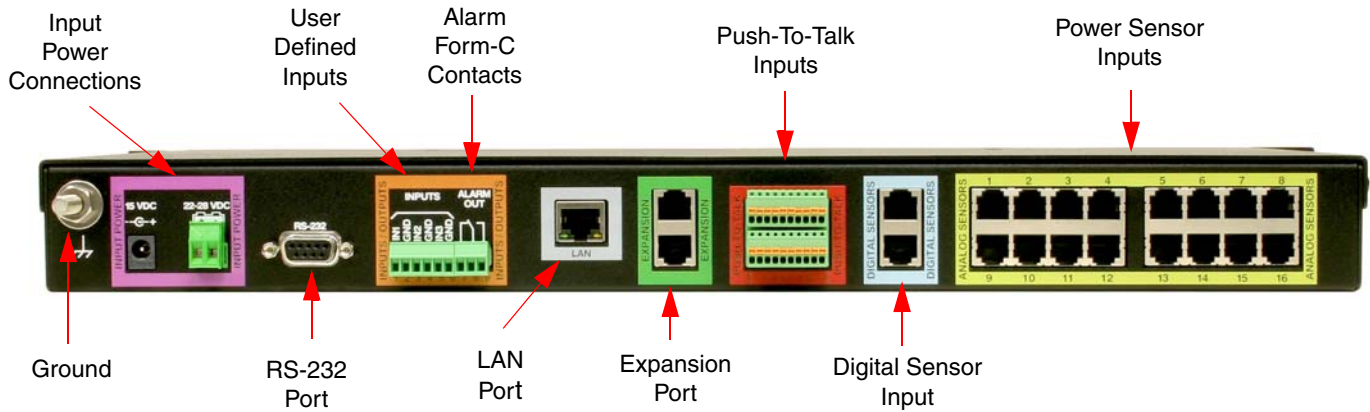


Item	Description
Power LED	When illuminated (green) it indicates that the unit is powered on.
Scanning Status LED	This LED blinks (green) when the system is in the scanning mode. The scanning mode is the normal mode of operation. It is important to note that SNMP messages will not be sent from the CPM system unless it is running in the scanning mode.
Alarm LED	When illuminated (red) it indicates that an alarm has been triggered.
Display Screen	Backlit 4 line LCD display which is used to show the setup menus, diagnostic screen, and scanning mode screens.
Menu Button	When pressed will return the user to the main default display.
Up Arrow Button	When pressed will scroll the user up through menu screens. When configuring a menu item this button is used to change values of menu items.
Down Arrow Button	When pressed will scroll the user down through menu screens. When configuring a menu item this button is used to change values of menu items.
Cancel Button	When pressed it will discard any menu changes and will exit from the configuration mode.
Enter Button	Used to accept changes on menu screens.
USB Port	This port is used to load firmware updates into the CPM display unit.

Figure 2: Front panel of the CPM Display Unit.

ple shown in figure 4 non-directional power sensors are placed between each radio and the inputs of the combiner. These sensors measure the power through the radios and transmission lines. Changes in a radios output power level as measured at the CPM can generate alarms. A non-

directional sensor is placed in-line at the output of the combiner to measure forward power and reflected power, thus providing a measurement of total output power and the capability of measuring VSWR. With such positioning of directional and non-directional sensors it is possible to spot degra-



Item	Description
input Power Connections	The +15 VDC connector is fed from an external AC adapter and is the normal method for powering the unit. The 22-28 VDC terminal pins are for a battery backup input.
User Defined Inputs	There are 3 user defined inputs which can be connected to sensors/contacts of the customers choice. When the customers device connects the IN1/2/3 terminal to the associated GND terminal an alarm condition will be generated in the CPM display unit.
Alarm Form-C Contacts	Whenever the CPM generates an alarm these contacts will change state. During normal operation (CPM display unit powered-up) the NO to Com terminals will have no continuity and likewise the NC to COM terminals will have continuity. When an alarm condition is detected these two contact pairs will change state and will stay that way until the alarm condition is cleared.
Push-To-Talk Inputs	When the push-to-talk feature is enabled (via software) these pins (1 for each of the 16 power sensor input channels) must be connected to ground in order to enable monitoring for that channel. The push-to-talk feature makes sure the transmitter is on before allowing power monitoring to take place.
Power Sensor inputs	There are 16 inputs, one for each channel. RJ-25 connectors are used to couple analog voltages from the individual sensors.
Ground	This is the chassis ground lug for the display unit. The display unit must be properly grounded.
RS-232 Port	Currently not used.
LAN Port	This Ethernet connection is used to access the web page interface.
Expansion Port	Currently not used.
Digital Sensor input	Currently not used.

Figure 3: Rear Panel of the CPM Display Unit.

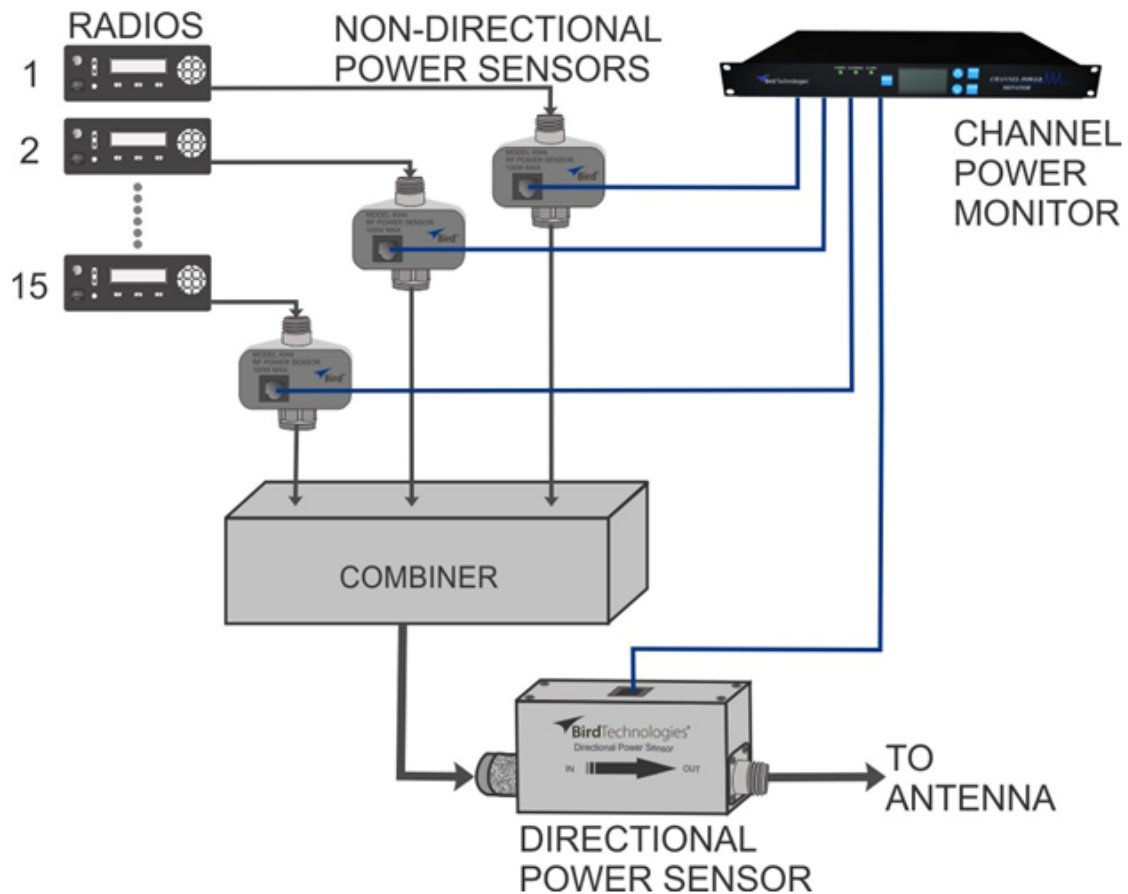


Figure 4: Typical Channel Power Monitor installation.

ation or failure at specific points in the system. This power sensor based measurement approach helps improve reliability of the LMR system.

INSTALLATION

Bird Technologies provides the power monitor display unit and the power sensors. All additional parts required for installation must be supplied by the customer. All work should be performed by qualified personal who are familiar with the communications system.

Required Tools

Phillips Screwdriver (#2)
 Slotted Screwdriver (1/8)
 Slotted Screwdriver (3/32)
 Cable pliers

Installation Procedure

The power monitor display unit is designed for indoor mounting in a common 19-inch relay rack or cabinet. The power sensors are designed for in-line mounting in the communications system RF signal path. The following steps are required for proper installation of the CPM system.

- 1) Install the power monitor display unit into the rack or cabinet with the four mounting screws included with the hardware kit (part# 3-16509) which is included with your shipment. Make sure you use a nylon washer under the head of the screws in order to protect the front panel. Torque the mounting screws to no more than 15 in/lbs. Overtightening the mounting screws may damage the front panel.
- 2) Install the power sensors in-line in the communications system based on where power mea-

measurements are desired. The power sensors have N-style input and output connectors.



WARNING: Do not make or break cable connections to the power sensors while the circuit is under transmit power. Shut down the transmitter before installing or removing power sensors.

- 3) Connect each power sensor to the monitoring unit. Type RJ25 (6 pin) connectors are used at both ends of this cable.
- 4) If you have a supervisory alarm system, connect its wiring harness to the alarm output terminals.
- 5) If you have alarm sensors to monitor (up to three maximum) connect their wiring harness to the alarm input terminals.
- 6) If backup voltage is available connect it to the backup voltage terminals.
- 7) Connect the output of the external power supply assembly (15 VDC) to the power input connector.
- 8) The monitoring unit does not have an on/off switch so the unit will power-up as soon as either the power supply or backup voltage is connected.

OPERATION

The power monitor is software directed so control of the system is accomplished via user interface with the front panel using the display screen and the five front panel buttons which are all light blue in color. When the CPM is first powered-up it defaults to the Scanning Mode of operation. This is the normal operating mode. Factory default values will have been programmed into the unit and the customer will need to setup the unit and adjust these default values prior to placing the system into service. All of the possible display screens and adjustable values are discussed in detail in the sections below.

Main Screen

This is the central display screen in the software tree as it allows access to three branches for interaction including the scan mode, the setup menus, and the diagnostic display. The main display

screen is shown in **Figure 5** and can be accessed anytime by pressing the blue Menu button on the front panel. The three branches in the power monitors software tree which originate at this central default display (scan, setup, and diagnostics) can be entered using front panel buttons as follows; UP ARROW button for the Setup branch, DOWN ARROW button for the Diagnostic branch, and the ENTER button for the Scan branch.

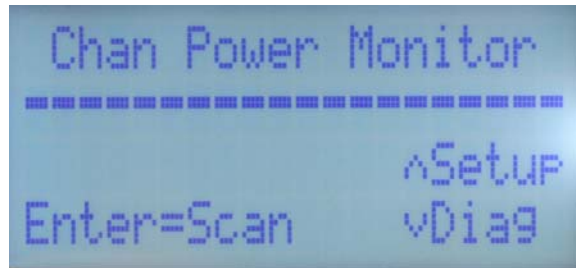


Figure 5: Main display screen.

The setup branch allows the user to change the way the power monitor operates. This branch is typically accessed once when the system is initially setup. The diagnostic branch will allow the user to look closely at particular power sensors throughout the system in a one at a time fashion. The Scan display is the normal display screen for the power monitor, called the Scanning screen, and gives the user an at-a-glance overview of all the channels.

FRONT PANEL BUTTON FUNCTIONS

Up Arrow = setup
Down Arrow = diagnostics
Enter = scanning

Channel Setup

This screen allows the user to look at the setup of all sixteen channels in the system one at a time by using the scroll buttons (up and down arrow buttons) to rotate through the channels. Refer to **Figure 6**. The status of the selected channels alarm triggering is listed and can be either enabled or disabled. When the channel is disabled it will not be used during scanning and any alarming activity for that channel will be ignored. The VSWR Alarm threshold is shown and its setting can be either none, 1.25, 1.50, 1.75, or 2.0. The Forward Alarm threshold is a four digit number that can range from 0000 to 9999 Watts. Sensor Power describes the operating range of the power sensor attached to the displayed channel. The system currently uses

either 0 to 100 Watt (non-directional) sensors or 0 to 500 Watt (directional Sensors).

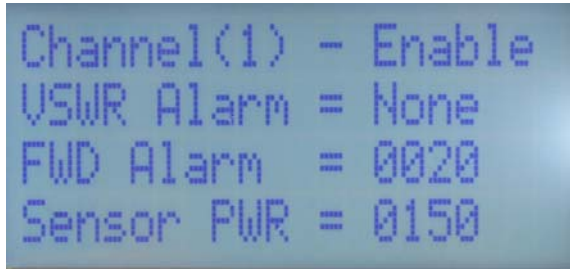


Figure 6: Channel Setup.

A fifth menu item is associated with this setup page but is only displayed when in the editing mode. That menu item is called PTT which means Push-to-talk. The push-to-talk feature can be either enabled or disabled by the user. When this feature is enabled the back panel push-to-talk input sensor pin (see **Figure 7**) for the desired channel must be in the active state or alarming notifications for that channel will be disabled. To be active the input sensor pin must be connected to any one of the four ground terminals on the plug. The ground terminals are located in the four corners and the individual input pins are numbered to correspond with the channels shown on the display.

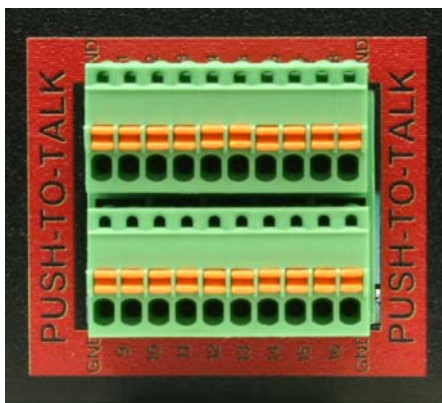


Figure 7: Push-to-talk input terminals.

Bird Technologies recommends dry contact relays be used to couple the push-to-talk signal from the radios to these CPM terminals. Such that the push-to talk function of the radio would energize the relay and the dry contacts of the relay would be

connected to the appropriate input terminals on the rear of the CPM. This will ensure isolation between the equipment. Optical isolators are another good alternative worth consideration.

Changes to the channel setup menu items can be made by pressing the Enter button. A cursor will appear at the first menu item. When you enter the channel configuration screen you can only exit after setting all the options.

FRONT PANEL BUTTON FUNCTIONS

Menu = Return to the main screen.

Up Arrow = Scroll through setup options until reaching the main screen.

Down Arrow = Scroll through setup options until reaching the main screen.

Enter = Configure the channel. While configuring the channel use the arrow buttons to change values. Use the enter button to select an option and to jump to the next option. After all the configuration options are configured use the up arrow button to exit the screen.

User Input Setup

The user input configuration screen allows the customer to enable/disable the inputs and to configure the logic of the contacts by using the front panel buttons, see **Figure 8**. Note that when a user input is disabled it will not be scanned and any alarm triggering on the port is ignored.

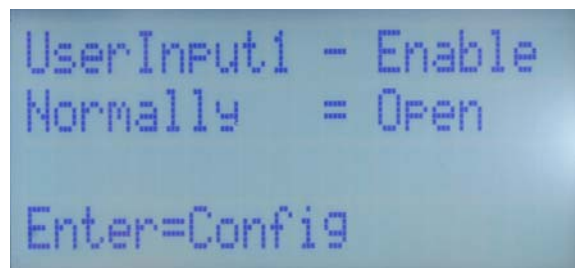


Figure 8: User input.

Changes to the user input menu items can be made by pressing the Enter button. A cursor will appear at the first menu item. When you enter the configuration screen you can only exit after setting all the options.

FRONT PANEL BUTTON FUNCTIONS

Menu = Return to the main screen.

Up arrow = Scroll through the setup options until reaching the main screen.
 Down arrow = Scroll through the setup options until reaching the main screen.
 Enter = Configure the user input. While configuring the input use the arrow buttons to change values. Use the enter button to select an option and to jump to the next option.

USER INPUT ALARMS

The CPM will generate an alarm whenever a user input (IN1, IN2, IN3) changes its relationship with its associated ground pin. See **Figure 9**. The user inputs can be programmed for normally open or normally closed operation. Note that normal operation is defined as the display unit powered up, operating as usual, with no alarms occurring. For the normally open configuration, no continuity between the user input and its associated ground would be the no alarm condition. To generate an alarm the users equipment would need to establish continuity between the user input and its associated ground.

Likewise, the normally closed configuration would be the exact opposite. Continuity between the user input pin and its associated ground would be the no alarm condition. To generate an alarm the users equipment would need to break the continuity between the user input and its associated ground.

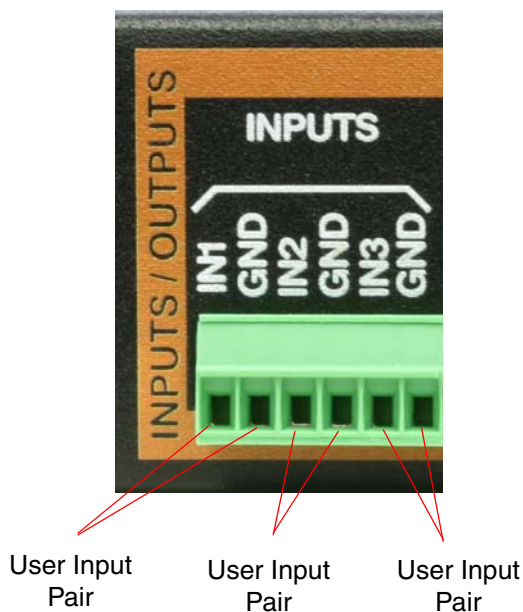


Figure 9: User Input terminals.

Configure Ethernet

If you wish to configure the units Ethernet settings press the Enter button when this screen is displayed, see **Figure 10**. Ethernet settings that can be configured include the IP address, Gateway address, and the Subnet Mask. This screen also displays the current IP address and IP configuration style (static or dynamic).

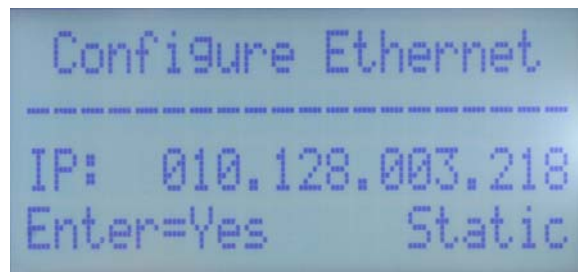


Figure 10: Configure Ethernet.

To configure the power monitors ethernet settings press the Enter button. The screen shown in **Figure 11** will appear and the user will be queried for static or dynamic IP configuration. press the Up Arrow for static and the Down Arrow for dynamic.

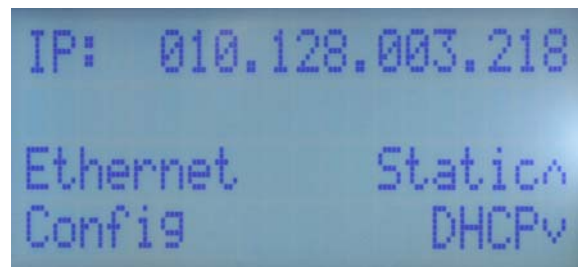


Figure 11: Choose the IP configuration style.

If dynamic is chosen then the processor in the power monitor will format the fields for address, gateway, and subnet mask. If static is chosen the display shown in **Figure 12** will appear and the user will have to manually enter values for the address, gateway, and subnet mask.

While editing the fields use the arrow buttons to change values. Use the enter button to select an option and to jump to the next option. After selecting all of the values use the Enter button to accept

the changes or the Cancel button to not accept the changes. After choosing to edit the ethernet options you must go through all of the values before exiting the screen.

FRONT PANEL BUTTON FUNCTIONS

Enter = Edit the ethernet options.
Cancel = Exit to the configure Ethernet screen.

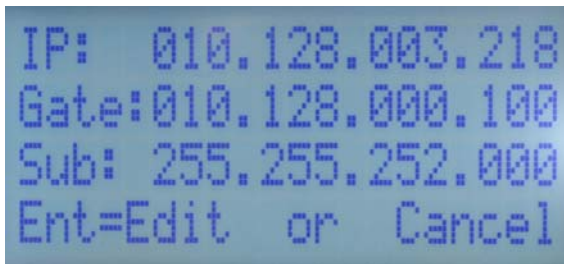


Figure 12: Static IP fields.

Configure SNMP

The user has the ability to configure the SNMP Interface for the power monitor. Press the Enter button when the SNMP configure screen appears on the display as shown in **Figure 13**.



Figure 13: Configure SNMP.

SNMP settings of the power monitoring unit which can be configured include the IP address, Gateway address, and the Port. Refer to **Figure 14**. These values represent where the trap messages will be sent. While editing the options use the arrow buttons to change values. Use the enter button to select an option and to jump to the next option. After selecting all of the values use the Enter button to accept the changes or the Cancel button to not accept the changes. After choosing to edit the

SNMP options you must go through all of the values before exiting the screen.

FRONT PANEL BUTTON FUNCTIONS

Enter = Edit the SNMP options.
Cancel = Exit to the configure SNMP screen.

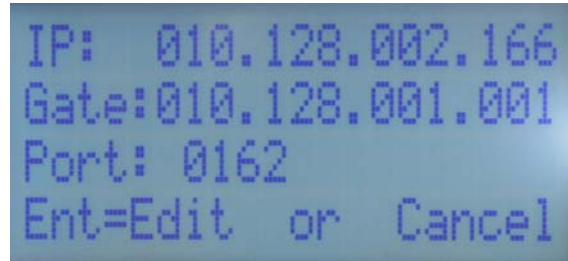


Figure 14: SNMP fields.

System Options

To change the system options press the Enter button when this screen is displayed, see **Figure 15**.



Figure 15: System Options.

System Options that can be changed include turning the webpage interface on or off, and turning the SNMP on or off. Refer to **Figure 16**. When the Webpage is off you cannot connect to the unit via the Ethernet. When SNMP is off the unit will not send traps when alarms are triggered.

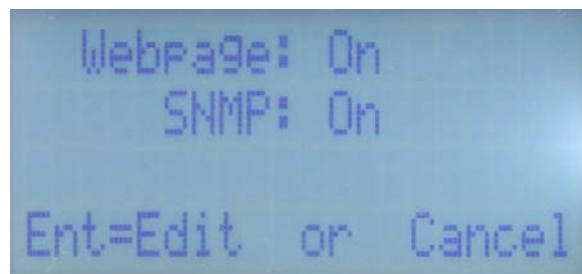


Figure 16: System option fields.

While editing the options use the arrow buttons to change values. Use the enter button to select an option and to jump to the next option. After selecting all of the values use the Enter button to accept the changes or the Cancel button to not accept the changes. After choosing to edit the options you must go through all of the values before exiting the screen.

FRONT PANEL BUTTON FUNCTIONS

Enter = Edit the System options.
 Cancel = Exit to the System Option screen.

System Information

There are no customer interactions associated with this page. The Channel Power Monitor's current software version is displayed along with the current webpage interface software version. Refer to **Figure 17**.

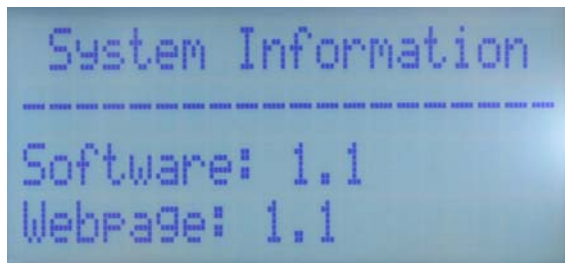


Figure 17: System Information.

Channel Diagnostics

This screen allows the user to look at all 16 channels, one at a time, using the scroll keys. See **Figure 18**. The forward and reflected power (in Watts) will be shown in a graph display for the selected channel. The VSWR for the selected channel will appear as a number in the upper right corner of the display screen. Alarming will not be triggered while this screen is displayed and the webpage will not be accessible.



Figure 18: Channel diagnostics.

FRONT PANEL BUTTON FUNCTIONS

Menu = Return to the main screen.

Scanning

This is the scanning mode display screen. See **Figures 19 and 20**. This screen is the usual display shown when the power monitor is in its normal operating condition after installation and setup. It displays a selected parameter in a numerical format for all sixteen channels. Channels 1 through 8 are shown on the first screen and channels 9 through 16 are shown on a second screen. Movement between the two screens is accomplished with the Up and Down Arrow buttons. The selected parameter can be either, forward power, reflected power, or VSWR. Forward and reflected power are displayed in Watts. The user can rotate between forward, reflected and VSWR readings by scrolling through forward, reflected and VSWR readings by scrolling using the UP and Down arrow buttons.

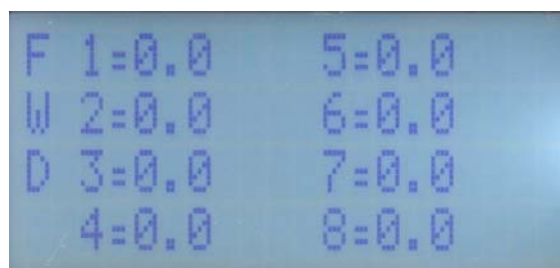


Figure 19: Scanning display channels 1 - 8.



Figure 20: Scanning display channels 9 - 16.



Reflected power can only be measured using the 4045 power sensor. This sensor has a measurement range of 0 to 50 Watts.

If the Webpage and SNMP options are enabled they will be functional while this screen is displayed. In addition, the front panel Scanning LED will illuminate only while in this mode of operation.

Alarm Contacts

A set of form-C alarm contacts are available at the rear of the unit as shown in **Figure 21**. During normal operation (display unit powered up, operating as usual, with no alarms occurring) continuity will exist between the center terminal and the left-most terminal. There will be no continuity between the center terminal and the right-most terminal. During an alarm condition the alarm contacts will change states. There will be no continuity between the center and left-most terminal and there will be continuity between the center and right-most terminal. Which is the exact opposite of the no alarm positions.

Note: The graphic above the terminals shows the position of the center contact in a normal no alarm condition. Normal is defined as the display unit powered up, operating as usual, with no alarms occurring.

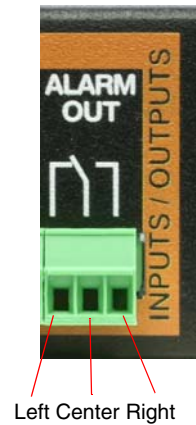


Figure 21: Alarm form-C contacts.

SNMP NOTIFICATIONS

The SNMP feature is designed to provide reliable internet notification of an alarm occurrence. Simple Network Management Protocol (SNMP) is an inter-

Table		Graph		Settings
Channel	Channel Forward Power	Channel Reflected Power	Channel VSWR	
Channel_1	0.0 Watts	0.0 Watts	1.00	
Channel_2	0.0 Watts	0.0 Watts	1.00	
Channel_3	0.0 Watts	0.0 Watts	1.00	
Channel_4	0.0 Watts	0.0 Watts	1.00	
Channel_5	0.0 Watts	0.0 Watts	1.00	
Channel_6	0.0 Watts	0.0 Watts	1.00	
Channel_7	0.0 Watts	0.0 Watts	1.00	
Channel_8	0.0 Watts	0.0 Watts	1.00	
Channel_9	0.0 Watts	0.0 Watts	1.00	
Channel_10	0.0 Watts	0.0 Watts	1.00	
Channel_11	0.0 Watts	0.0 Watts	1.00	
Channel_12	0.0 Watts	0.0 Watts	1.00	
Channel_13	0.0 Watts	0.0 Watts	1.00	
Channel_14	0.0 Watts	0.0 Watts	1.00	
Channel_15	0.0 Watts	0.0 Watts	1.00	
Channel_16	0.0 Watts	0.0 Watts	1.00	
User_1	Normally Open		■ OK	
User_2	Normally Open		■ OK	
User_3	Normally Open		■ OK	

Figure 22: Webpage Interface default screen.

net standard protocol for managing devices on IP networks. With the SNMP feature enabled a trap message will be sent to designated host computer whenever the CPM detects an alarm condition.

It is the customers responsibility to ensure the destination computer is running suitable trap receiver software. A typical trap message has the following format;

Channel_X type alarm
X = channel number
Type = FRWD, VSWR, USER

So a minimum forward power alarm on channel 5 would appear as;
Channel_5 FRWD Alarm

WEBPAGE INTERFACE

The power monitors webpage feature allows the user to establish a convenient interface with the unit. The webpage can be accessed either directly (on-site) via a laptop or remotely (off-site) via an internet connection. The webpage interface gives the user a detailed overview of all the channels in the system, the ability to label channels with custom labels, a graphical presentation of up to three parameters at a time, and a logging function.

Appendix A and B provide instructions on how to properly direct connect your laptop computer to the LAN port on the rear panel of the power monitor. Once you are properly connected the web page interface screen will appear in your web-browsers window. The default screen is the Title page as shown in **Figure 22**.

The Title page shows all current values from the unit. If an alarm is triggered, the corresponding box will turn red. The forward and reflected power are shown in Watts. VSWR for each channel is also shown in the right most column. The user alarm inputs (1 through 3) are shown below the power values. The status (enabled or disabled) for each alarm input is shown and the contact logic (normally open or closed) is shown. An alarm condition is indicated by the OK green box changing into an ALARMED red box.

The Graph page shown in **Figure 23** allows the user to display three different parameters on the graph at the same time. Each plot line is individually selected. Values that can be selected for display include the forward power, reflected power, or VSWR for any of the sixteen channels.

The Settings page (shown in **Figure 24**) allows the user to interact with the settings in the power moni-

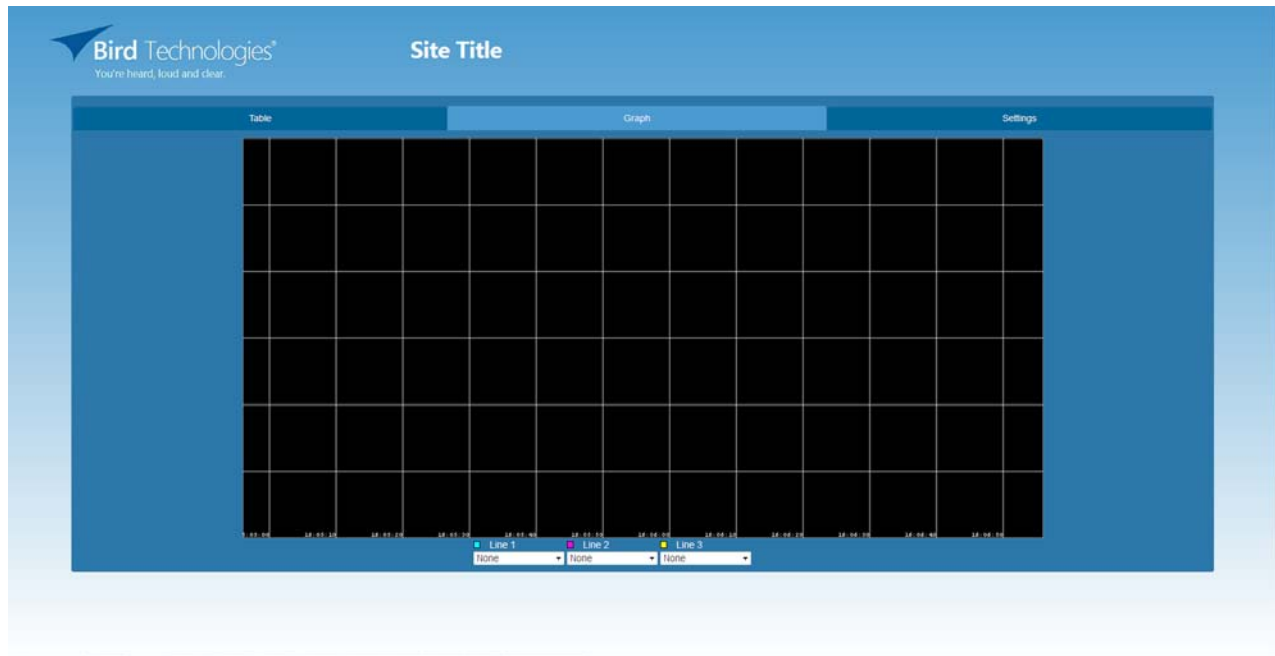


Figure 23: Web Page Interface graph display.

Bird Technologies
You're heard, loud and clear.

Site Title

Channel	<input checked="" type="checkbox"/> Enable/Disable	Sensor Power	<input checked="" type="checkbox"/> PTT	VSWR Alarms	Min Power Alarms
Channel_1	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	20
Channel_2	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_3	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_4	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_5	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_6	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_7	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_8	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_9	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_10	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_11	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_12	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_13	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_14	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_15	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0
Channel_16	<input checked="" type="checkbox"/>	100	<input type="checkbox"/>	Disable ▾	0

User_1	Enable <input checked="" type="checkbox"/>	Normally Open ▾	■ OK
User_2	Enable <input checked="" type="checkbox"/>	Normally Open ▾	■ OK
User_3	Enable <input checked="" type="checkbox"/>	Normally Open ▾	■ OK

SNMP	IP: 10 128 2 166	Port: 162	Default Gateway: 10 128 1 1
------	------------------	-----------	-----------------------------

Download Log File Delete Log File Submit Settings Not Logging ▾

Enter Site Name Below
Site Title

Firmware Rev. 1.1 Webpage Rev. 1.1

Figure 24: Web Page Interface settings display.

tor unit. The first column on the extreme left allows a descriptive name to be used for each channel. Click in the box and type in the desired descriptive label for the associated channel. A site name can be entered using the box in the lower right side of the display screen.

The second column permits monitoring of the individual channels to be either enabled or disabled. A check mark in the box means enabled and no check mark means disabled. The third column is used to describe the power sensor connected to each channel input. A value of 100 describes the directional sensor (model # 4044) and a value of 500 describes the directional sensor (model # 4045). The fourth column is used to enable or disable the push-to-talk feature for each channel. A check mark in the box means enabled and no check mark means disabled. The fifth column is for

setting the alarm threshold for VSWR. Selection for each channel is made from a drop-down menu and includes the following choices; none, 1.25, 1.50, 1.75, and 2.00. When the VSWR alarm threshold is exceeded an alarm is triggered. The last column is for the minimum power alarm for forward power. Click on the box and type in the desired threshold value. A value of zero in this box means the forward power alarm is disabled.

The user alarm inputs (1 through 3) are shown below the power values. The first column on the extreme left allows a descriptive name to be used for each alarm input. Click in the box and type in the desired descriptive label for the associated alarm input. The status (enabled or disabled) for each alarm input is shown in the next column. A check mark in the box means enabled and no check mark means disabled. The third column

shows the contact logic (normally open or closed) for each alarm input. Change the contacts logic by choosing from the drop down menu associated with each alarm. The final column shows the current status of the alarm input, green OK for no alarm condition and red ALARMED for an alarming condition. Press the Submit button after making any changes to the settings page.

SNMP settings can also be changed from the settings page. SNMP values that can be changed include the IP address, Gateway address, and the Port. These values represent where the trap messages will be sent. Click on the box and type in the desired value. Remember to press the Submit Settings button to save your changes.



Figure 25: IP Address and Dialog Box.

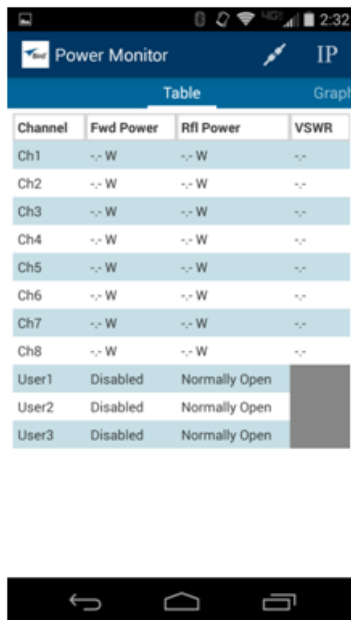


Figure 26: Default display.

A logging function is available for use by the user. The log creates a file containing all the information from the main (default) screen. The logging schedule (when log entries are made to the file) is determined by the user using the drop down menu at the bottom of the page. Choices include not logging, log critical events, and log everything. The log file can be erased by pressing the delete log file button at the bottom of the page. When you want to examine the log file you must download it from the power monitor by pressing the Download Log File button. Note: when you download the log file be patient, it takes some time for the power monitor to format the data and transfer it to your computer.

ANDROID APP

An App is available for the Android operating system which allows the user to interface with the power monitor using an Android based cell phone or tablet.

IP Address / Name Dialog

This field will accept any value and check if it is a valid IP address, see **Figure 25**. If it is a valid IP address, the user will be given the option to give the IP address a name. If it is not a valid IP address, it will check to see if the entered value is a name already given to an IP address. If it is not a name given to an IP address, the user is given the option to enter an IP address to associate with the first value entered. In this way, the user will be able to give easy to remember names to sites on his/her network. It is not required to give the IP address a name.

Default Screen

The views of the title page are similar on the app to the views on the web page. Refer to **Figure 26**.

Graph Display

Two values can be graphed at one time. To select values to be graphed, simply press the box of the value on the table view until it is highlighted. Then swipe to the graph view. See **Figure 27**.

Settings

The settings page is similar to that of the web page. The main differences being that a user cannot change the SNMP settings with the Android app and the user cannot download the Log file. The Settings display is shown in **Figure 28**.

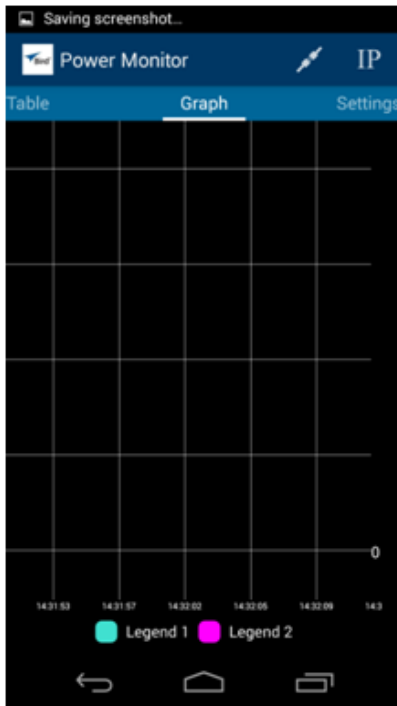


Figure 27: Graph display.

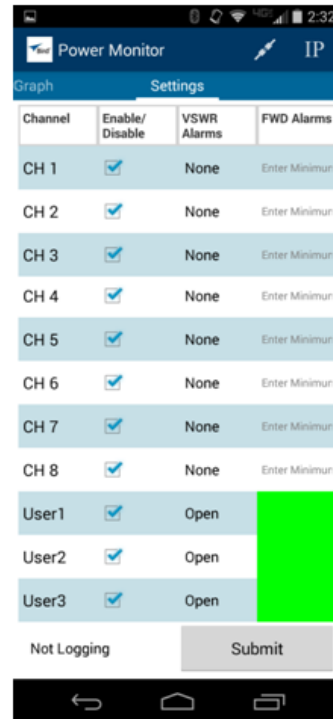


Figure 28: Settings display.

Specification	Value
Input Voltage	115 / 230 VAC @ 50 / 60 Hz
Operating Power	< 10 Watts
Back-up Power (Optional)	22 - 28 VDC
Ethernet	One RJ45 jack
Alarm Outputs	One NO, One NC
User Inputs	Three monitored user inputs, configurable as NO or NC
Push-to-Talk (PTT)	16 PTT inputs
Sensor Inputs	16 RJ25 jacks
Operating Temperature	0° C to 50° C (32° F to 122° F)
Storage Temperature	-20° C to +80° C (-4° F to 176° F)
Humidity	95% +/- 5% max. (non condensing)
Altitude	up to 3,048 m (10,000 feet)
Dimensions (D, W, H)	13.34 cm x 48.26 cm x 4.45 cm (5.25" x 19" x 1.75")
Weight	0.85 kg (2 lbs.)
CPM Display Unit Specifications.	

APPENDIX A

Ethernet Connectivity

The LAN connector on the rear panel of the Power Monitor provides for 10/100 BASE-T Ethernet connection using the TCP/IP or DNS protocol. The control unit deck is shipped from the factory with a default TCP/IP address of “192.168.1.1”. A direct connection (at the installation site) should be established the first time you interface to the power Monitor using the fixed IP mentioned above. Once the initial communications are established the IP address in the unit can be changed to permit a connection to the internet. The initial direct connection should be made with an Ethernet crossover cable. **Figure A1** shows the pinout for a CAT-5 crossover cable.

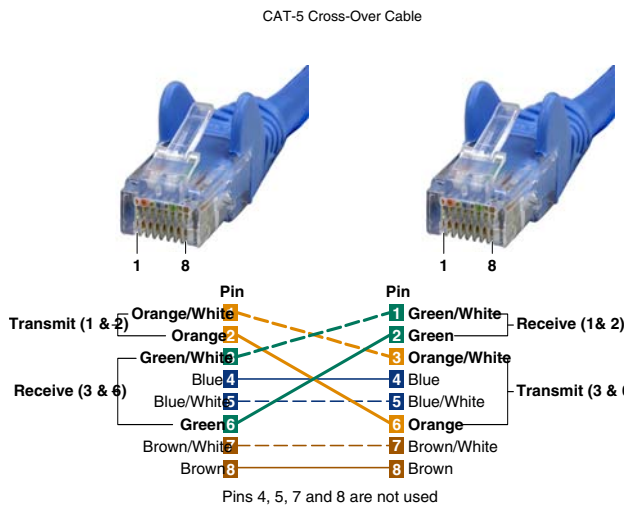


Figure A1: CAT-5 Crossover cable pinout.

Procedure

To direct connect your laptop computer to the LAN port on the unit perform the following steps;

- 1) Connect your laptop network port to the LAN connector on the unit using a standard CAT-5 Crossover cable.



The rear panel LAN connector has two built-in bi-color status LED's which will aid you in establishing communications. The meaning of each LED is shown in **Table A1**.

LINK LED (left side)		ACTIVITY LED (right side)	
Color	Meaning	Color	Meaning
Off	No Link	Off	No Activity
Amber	10 Mbps	Amber	Half-Duplex
Green	100 Mbps	Green	Full-Duplex

Table A1: LAN port status LED's

- 2) The left-most (LINK) status LED built-in to the LAN port connector should illuminate amber or green indicating that a good physical connection is established between your computer and the unit. After a few moments of initialization the right-most LED should flash occasionally.
- 4) Insure that your laptop's IP address is compatible with the default address of the unit. This may require changes be made to the Ethernet adaptor address on your laptop (refer to **Appendix B**). Your laptop's IP address will need to be set to “192.168.1.2” along with a subnet mask of “255.255.255.0”. The right-most (ACTIVITY) status LED built-in to the LAN port connector will turn amber or green and flash occasionally indicating good TCP/IP communications are established between the laptop and the control unit.
- 5) Launch your web browser software on the laptop.
- 6) In your web browsers address box type-in the IP address of the unit “http://192.168.1.1” and press the ENTER button. The home screen (System Summary) of the SNMP feature should appear in your laptop's browser window.

APPENDIX B

Changing Your Service Computers IP Address

When you initially direct connect your service computer to the Power Monitor it will be necessary to change the laptops IP address. The procedure for doing this varies depending upon your operating system. As an example, this appendix illustrates how to make the change using the Microsoft XP operating system. The procedure for other operating systems will vary slightly from this example. Consult with your IT support personnel if needed. To change the IP address (assuming the Microsoft XP operating system is being used) perform the following in a step-by-step fashion;

- 1) Select “Start” from the status menu.
- 2) Single click the “Control Panel” choice from the “Start” pop-up menu as shown in **Figure B1**.
- 3) From the “Control Panel” icon selections double click on the “Network Connections” icon. Refer to **Figure B2**.
- 4) When the “Network Connections” folder opens double click on the “Local Area Connection” icon. See **Figure B3**.
- 5) The “Local Area Connection Status” box will open. Single click the “Properties” tab as shown in **Figure B4**. **Note:** If you do not have the cable connected between the service computer and the Power Monitor the “Local Area Connection Status” box will not open. Instead proceed to step 6.
- 6) The “Local Area Connection Properties” box will open. Use the arrow buttons to scroll down the list until the “Internet Protocol (TCP/IP)” choice is highlighted as shown in **Figure B5**. Click the “Properties” tab at the right-center of the box.
- 7) Select the “Use the following IP address” bubble. Make sure the circle is filled-in. Refer to **Figure B6**.
- 8) Enter the new IP address and subnet mask values as shown in **Figure B7**. To interface your computer to the Power Monitor use an IP address of “192.168.1.2” and a subnet mask of “255.255.255.0”.
- 9) Click on the “OK” tab to initiate the changes. This completes the procedure. Close any open boxes.

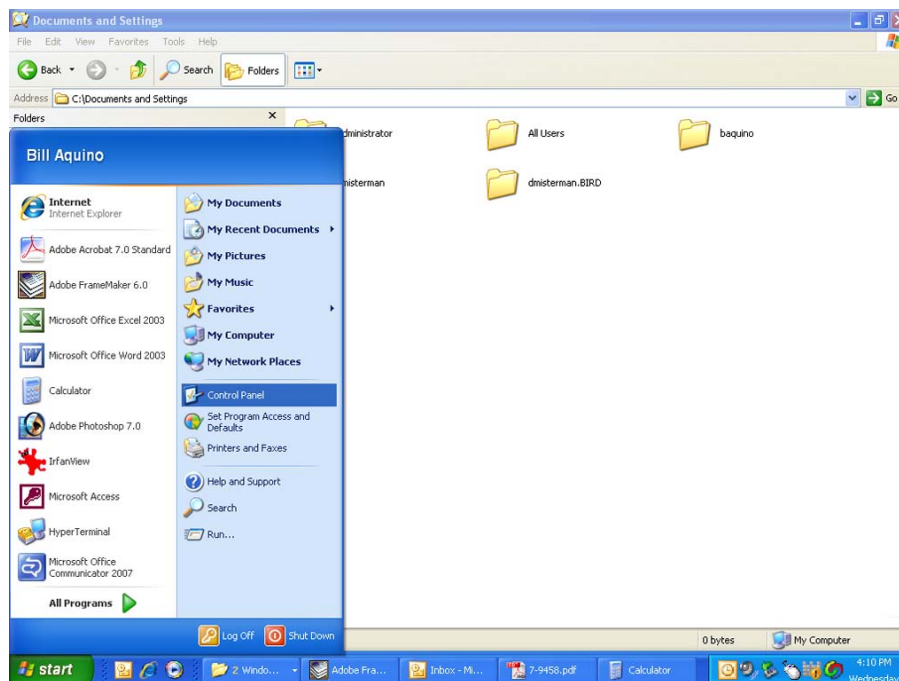


Figure B1: Choose the “Control Panel” icon.

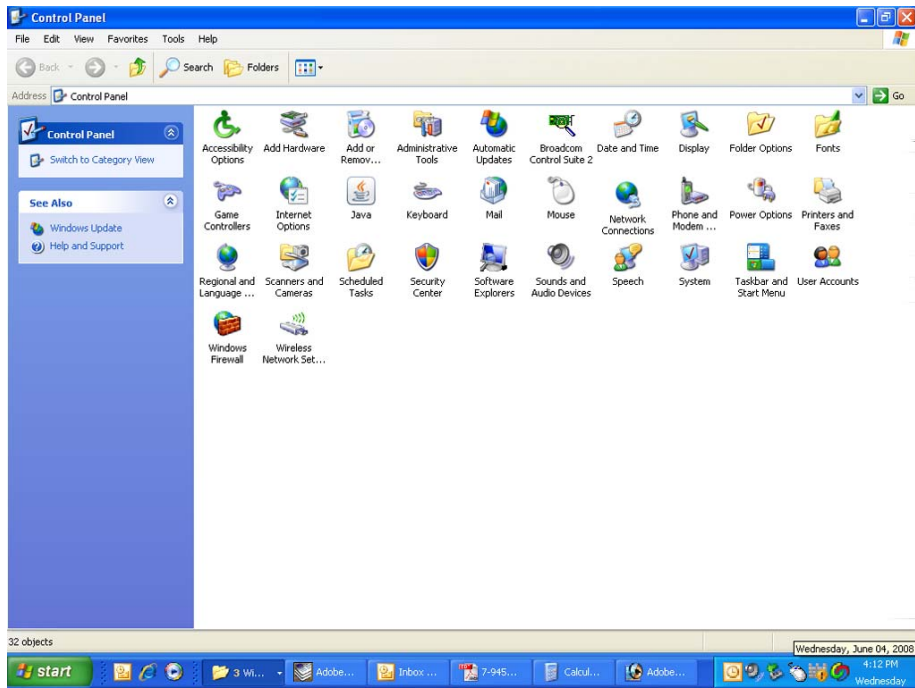


Figure B2: Select the “ Network Connections” icon.

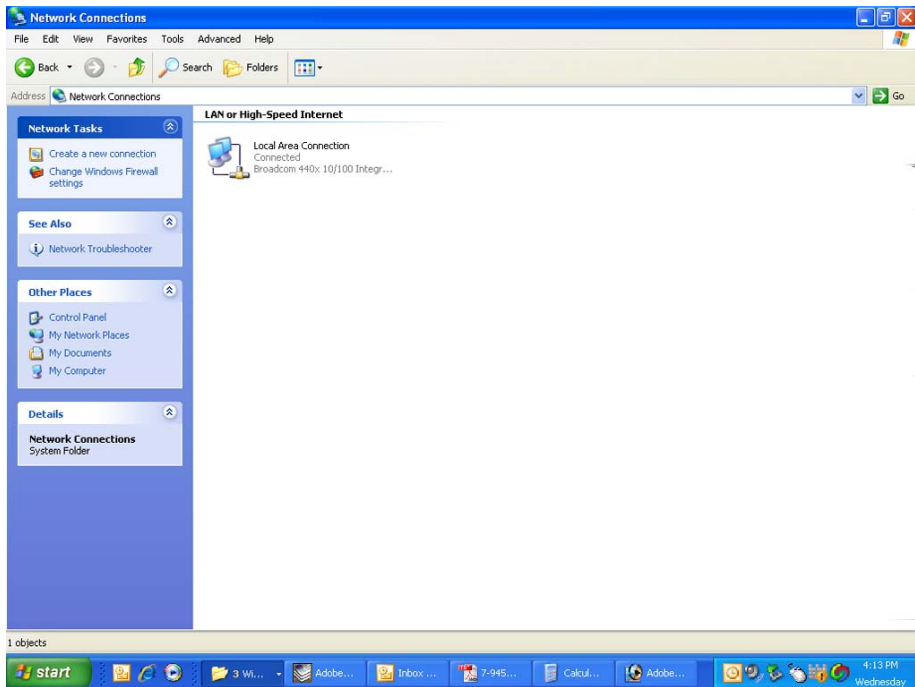


Figure B3: Select the “Local Area Connection” icon.

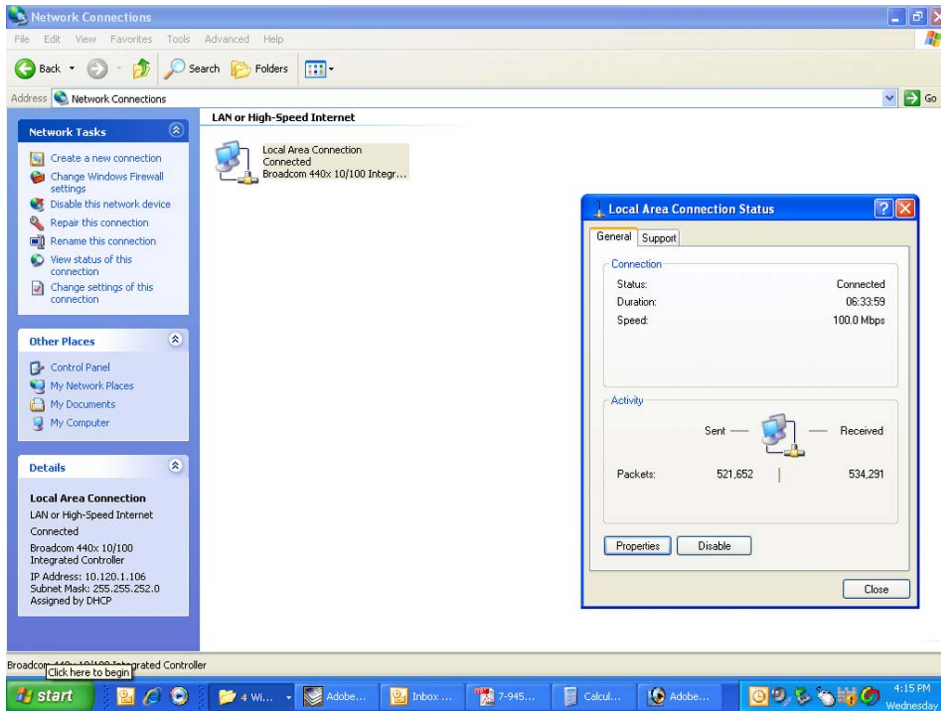


Figure B4: Select the “Properties” tab.

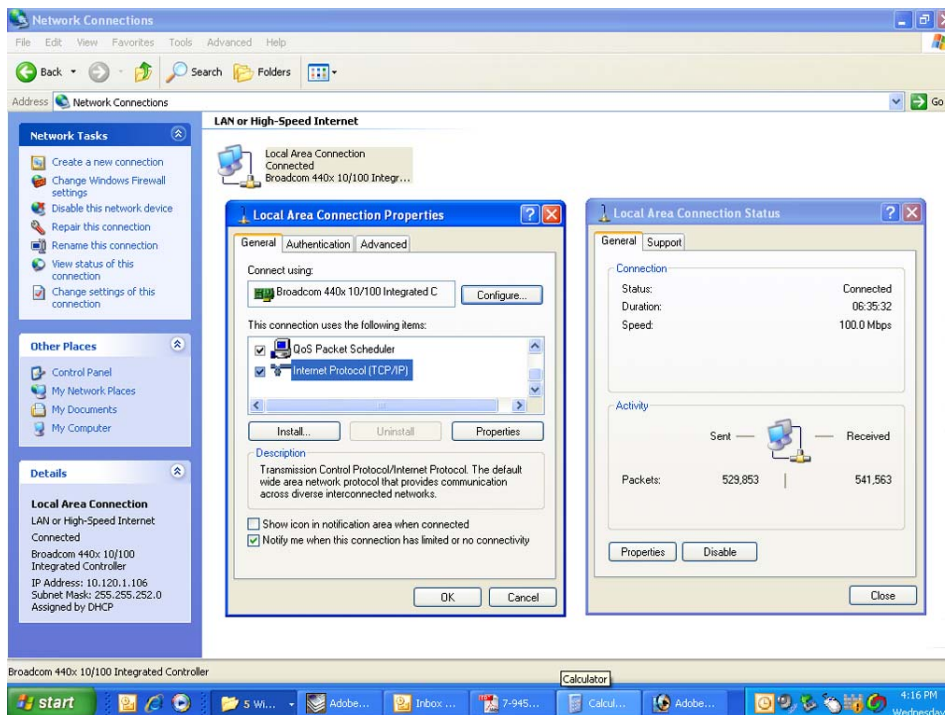


Figure B5: Make sure the “Internet Protocol (TCP/IP)” choice is highlighted. Then select “OK”.

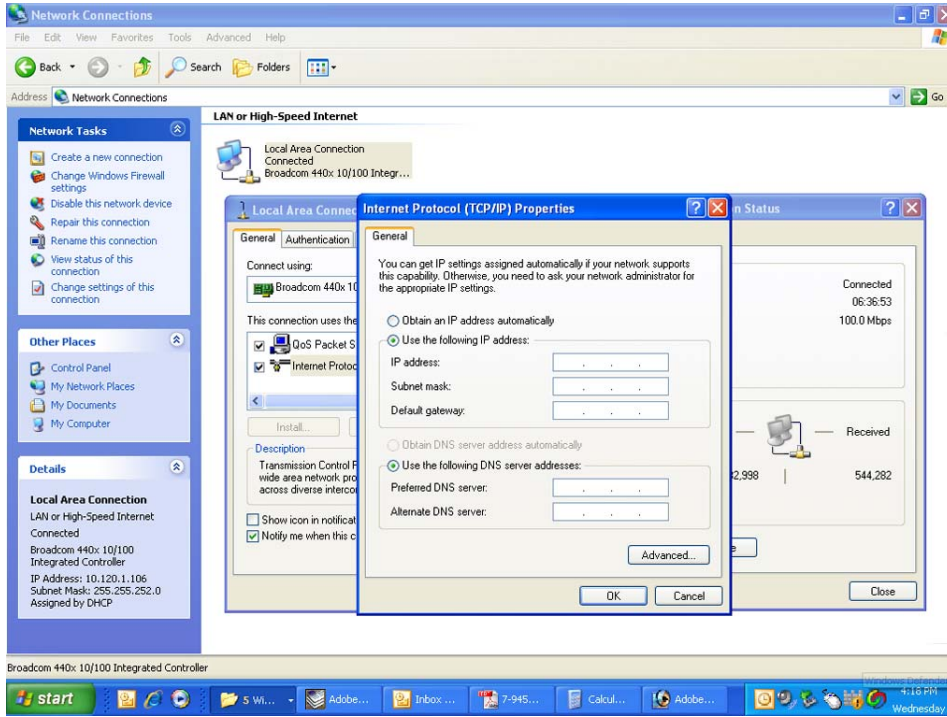


Figure B6: Select “Use the Following IP Address”.

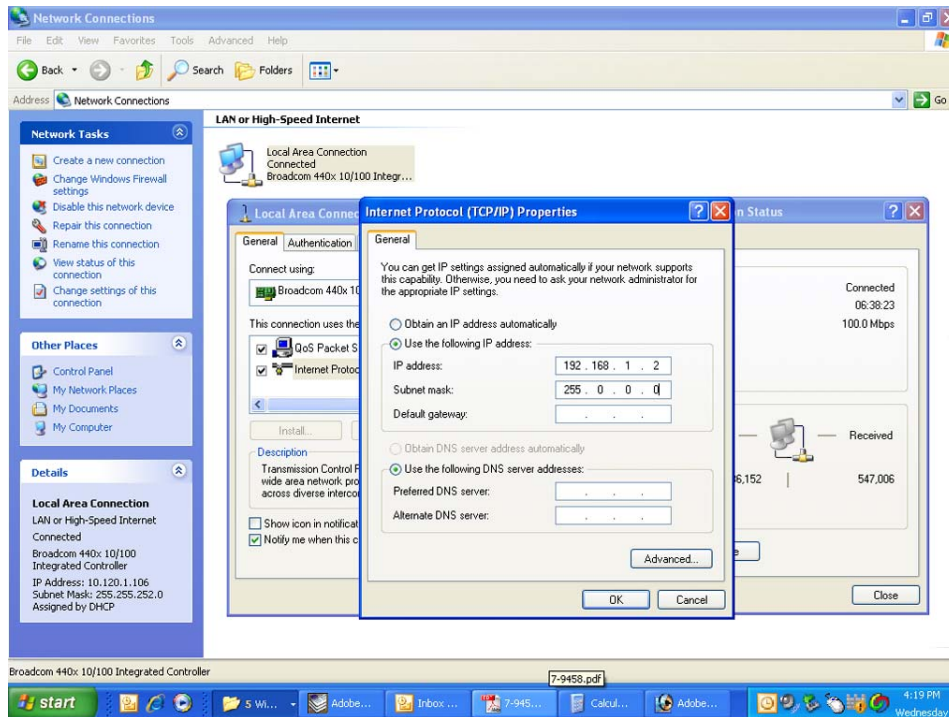


Figure B7: Enter the new IP Address and Subnet Mask values.

Celsius to Fahrenheit Conversion Table

CELCIUS	FAHRENHEIT
105	221.0
104	219.2
103	217.4
102	215.6
101	213.8
100	212.0
99	210.2
98	208.4
97	206.6
96	204.8
95	203.0
94	201.2
93	199.4
92	197.6
91	195.8
90	194.0
89	192.2
88	190.4
87	188.6
86	186.8
85	185.0
84	183.2
83	181.4
82	179.6
81	177.8
80	176.0
79	174.2
78	172.4
77	170.6
76	168.8
75	167.0
74	165.2
73	163.4
72	161.6
71	159.8
70	158.0
69	156.2
68	154.4
67	152.6

CELCIUS	FAHRENHEIT
66	150.8
65	149.0
64	147.2
63	145.4
62	143.6
61	141.8
60	140.0
59	138.2
58	136.4
57	134.6
56	132.8
55	131.0
54	129.2
53	127.4
52	125.6
51	123.8
50	122.0
49	120.2
48	118.4
47	116.6
46	114.8
45	113.0
44	111.2
43	109.4
42	107.6
41	105.8
40	104.0
39	102.2
38	100.4
37	98.6
36	96.8
35	95.0
34	93.2
33	91.4
32	89.6
31	87.8
30	86.0
29	84.2
28	82.4

CELCIUS	FAHRENHEIT
27	80.6
26	78.8
25	77.0
24	75.2
23	73.4
22	71.6
21	69.8
20	68.0
19	66.2
18	64.4
17	62.6
16	60.8
15	59.0
14	57.2
13	55.4
12	53.6
11	51.8
10	50.0
9	48.2
8	46.4
7	44.6
6	42.8
5	41.0
4	39.2
3	37.4
2	35.6
1	33.8
0	32.0
-1	30.2
-2	28.4
-3	26.6
-4	24.8
-5	23.0
-6	21.2
-7	19.4
-8	17.6
-9	15.8
-10	14.0
-11	12.2

CELCIUS	FAHRENHEIT
-12	10.4
-13	8.6
-14	6.8
-15	5.0
-16	3.2
-17	1.4
-18	-0.4
-19	-2.2
-20	-4.0
-21	-5.8
-22	-7.6
-23	-9.4
-24	-11.2
-25	-13.0
-26	-14.8
-27	-16.6
-28	-18.4
-29	-20.2
-30	-22.0
-31	-23.8
-32	-25.6
-33	-27.4
-34	-29.2
-35	-31.0
-36	-32.8
-37	-34.6
-38	-36.4
-39	-38.2
-40	-40.0
-41	-41.8
-42	-43.6
-43	-45.4
-44	-47.2
-45	-49.0
-46	-50.8
-47	-52.6
-48	-54.4
-49	-56.2
-50	-58.0

Return Loss vs. VSWR

Return Loss	VSWR
30	1.06
25	1.11
20	1.20
19	1.25
18	1.28
17	1.33
16	1.37
15	1.43
14	1.50
13	1.57
12	1.67
11	1.78
10	1.92
9	2.10

Watts to dBm

Watts	dBm
300	54.8
250	54.0
200	53.0
150	51.8
100	50.0
75	48.8
50	47.0
25	44.0
20	43.0
15	41.8
10	40.0
5	37.0
4	36.0
3	34.8
2	33.0
1	30.0

dBm = 10log P/1mW
Where P = power (Watt)

Insertion Loss

Input Power (Watts)

	50	75	100	125	150	200	250	300	
Insertion Loss	3	25	38	50	63	75	100	125	150
	2.5	28	42	56	70	84	112	141	169
	2	32	47	63	79	95	126	158	189
	1.5	35	53	71	88	106	142	177	212
	1	40	60	79	99	119	159	199	238
	.5	45	67	89	111	134	178	223	267

Output Power (Watts)

Free Space Loss

Distance (miles)

	.25	.50	.75	1	2	5	10	15	
Frequency (MHz)	150	68	74	78	80	86	94	100	104
	220	71	77	81	83	89	97	103	107
	460	78	84	87	90	96	104	110	113
	860	83	89	93	95	101	109	115	119
	940	84	90	94	96	102	110	116	120
	1920	90	96	100	102	108	116	122	126

Free Space Loss (dB)

Free space loss = 36.6 + 20log D + 20log F
Where D = distance in miles and F = frequency in MHz

