RF SCOUT PLUS

INSTRUCTION MANUAL

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WARNING

Powering RF sensors above +30dBm (1W) will cause failure

If existing directional couplers are used for the RF scout, ensure that the coupling charts are consulted for the line power level. Use total combined power for coupling value when multiple channels are present on the line.

Directional couplers should be set to the value on the provided chart. To ensure accurate measurements, the directional couplers should have a minimum of 30 dB directivity.

RF Scout "Ideal Coupling Levels" to give +20dBm at the sensor input for Forward Power.		
Power Level (kW)	Forward Coupling	Reflected Coupling
100	-60.00	-50.00
90	-59.54	-49.54
80	-59.03	-49.03
70	-58.45	-48.45
60	-57.78	-47.78
50	-56.99	-46.99
45	-56.53	-46.53
40	-56.02	-46.02
35	-55.44	-45.44
30	-54.77	-44.77
25	-53.98	-43.98
20	-53.01	-43.01
15	-51.76	-41.76
10	-50.00	-40.00
5	-65.99	-55.99
2	-62.01	-52.01
1	-59.00	-49.00

Packing List:

Each controller shall contain the following:

- RF Scout Plus with connector
- AC Line Power Cord
- User Manual

Controller Specifications:

Dimensions	3.5” H x 19.0” W x 10.75” D
Input Power Requirements	110-230VAC @ 50/60Hz
Input Power Consumption	40W (controller only)
Interlock Rating	3A @5-253VAC
Storage Temperature	-25 to 85˚C (-13 to 185˚F)
Operating Temperature	-15 to 50˚C (5 to 122˚F)
Weight	6.0 pounds

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Introduction

The Dielectric RF Scout monitors RF transmission system VSWR and forward power and is designed to aid in detecting VSWR problems as they develop. In many cases this will allow the transmitter operator to detect and remedy transmission system issues which may be contributing to elevated VSWR before they affect operations. The unit continuously monitors line forward and reflected power and utilizes a logic controller in order to calculate VSWR. The system displays the values and can store data and alarms in internal memory. User settable alarm levels are accessible for all alarms. Additionally, the system can be configured to monitor transmission line pressure and temperature.

The RF Scout monitoring and communications capabilities offer a high degree of flexibility. The unit's status is available to local operators via the front panel touch-screen interface. Also, the data is available to remote terminals via an Ethernet interface with FTP or HTTP. There are also points for remote monitoring available on the rear connector.

1 Setup

The RF Scout is configured at the factory with default values for the calibration factors, alarm limits and interface settings. In some instances the pre-configured values may suit the particular system it is going into; however, it is necessary for the installer to ensure that all pertinent calibration values are set properly after the system is installed. This includes the sensor calibration factors, coupling factors and alarm limits. Additionally, the operator should ensure that the proper IP address, date, and time are entered.

Setting	***Shipped Value***	***Unit***
Forward Coupling	50	dBm
Forward Offset	0.35	V
Forward 20 dBm	2.0	V
Reflected Coupling	40	dBm
Reflected Offset	0.35	V
Reflected 20 dBm	2.0	V
Power Sensor Type	Standard	-
Pressure Sensor	Sensor OFF	-
Temperature Sensor	Sensor OFF	-

Table 1.1 – Parameters as Shipped

2 Installation

RF Scout Monitoring System installation has been designed to be as simple as possible. The system is comprised of:

(i) Dual directional coupler for appropriate waveguide or coax line size

(ii) Tru Power sensors, Dielectric Part No. R97730 or Low Power Sensor Part No. 11000005351 (for use below 5kW)

(iii) Sensor cables

(iv) RF Scout Rack Mount module

(v) Optional pressure sensor, Dielectric Part No. R78740

(vi) Optional temperature sensor, Dielectric Part No. 11000005843

2.1 Coupler Placement

The dual directional coupler has to be inserted into the line to be monitored. Ensure that the coupler orientation is such that the forward and reverse coupling ports are set up correctly.

It is essential that the power flow through the coupler is in the appropriate direction. At the time of installation note the forward and reverse coupling values as these are required for accurate calibration of the RF Scout monitoring system. For optimum accuracy, the coupling levels are routinely set to provide a +20dBm signal to the forward power sensor under normal operating power levels.

2.2 RF Power Sensors

The RF power sensors supplied with the RF Scout system have been calibrated at the factory to ensure system accuracy. The sensor units include a type N (male) connector for connection to the directional coupler ports on the line to be monitored. There is also a 3-pin D-sub connector to facilitate connection of the cabling between the sensor and the rack mount module. The rack mount module supplies a ground and +24V to the sensor. The output signal from the sensor corresponding to the measured power level is then relayed back to the rack mount module using the other pin available.

The maximum input power level to the sensor must not exceed 1W (30dBm).

THERE ARE CALIBRATION VALUES MARKED ON EACH POWER SENSOR. THESE VALUES MUST BE RECORDED AND REFERENCED TO THE APPROPRIATE COUPLER PORTS FOR USE IN THE CALIBRATION SET UP.

2.3 Signal Selection

The RF Scout utilizes a number of mathematical algorithms to ensure optimum accuracy of forward power measurement. This is primarily to account for the various peak to average ratios present in the various broadcast signals to be considered. The various options are presented in section 3.1.4.2 Signal Type Menu.

2.4 Rack Mount Module

The RF Scout Plus rack mount module is built as a 3 ½" height unit to fit a standard 19" rack. This unit houses the monitoring processor and all of the monitoring system interconnections. The front of the unit allows an operator interface via push buttons while the rear panel allows access to the information being monitored by a number of different modes.

2.4.1 Front Panel

The front panel of the RF Scout Plus allows the user to quickly ascertain the important parameters of the system being monitored on the touch screen interface. In addition the displays backlight changes color depending on the current system status. The touch screen also allows configuration of important system parameters which are explained in more depth in later sections.

Figure 2.1 – RF Scout Plus Front Panel

2.4.2 Rear Panel

The rear panel of the unit provides spring-clamp style connections for all monitoring equipment as well as a RJ-45 connection for Ethernet connectivity. Additionally there is a standard PC power plug connection for incoming AC power. The remote connections provide a 24VDC signal when the corresponding alarm is active. Providing a 24VDC input to the RESET pin will reset a strikeout situation in the system.

Figure 2.2 – RF Scout Plus Rear Panel

Pin	Label	Description
1	RTD WHT	3-Wire RTD White Lead
2	RTD RED	3-Wire RTD Red Lead
3	RTD RED	3-Wire RTD Red Lead
4	RTD SHLD	3-Wire RTD Shield (If applicable)
5	+24V	+24VDC for remote application
6	-V	DC Common for remote application
7	REMOTE INTLK	+24VDC available at this pin when interlock is energized
8	REMOTE VSWR	+24VDC available at this pin when VSWR alarm exists
9	REMOTE FWD	+24VDC available at this pin when forward power alarm exists
10	REMOTE PRESS	+24VDC available at this pin when pressure alarm exists
11	REMOTE RESET	Provide +24VDC to this pin to reset VSWR strikeout
12	REMOTE –V	DC Common for remote application
13	FWD +24V	+24VDC for forward power sensor supply
14	FWD –V	DC Common for forward power sensor supply
15	FWD SIG	Signal return from forward power sensor
16	REF +24V	+24VDC for reflected power sensor supply
17	REF –V	DC Common for reflected power sensor supply
18	REF SIG	Signal return from reflected power sensor
19	PRESS +24V	+24VDC for pressure sensor supply
20	PRESS –V	DC Common for pressure sensor supply (for non-loop powered sensor)
21	PRESS SIG	Signal return from pressure sensor
22	INTLK NO	Normally open transmitter interlock contact
23	INTLK COM	Common transmitter interlock contact
24	INTLK NC	Normally closed transmitter interlock contact
-	LAN	Local Area Network access at the IP address set
-	120-240 VAC	Incoming power 100-240VAC at 50/60Hz

Table 2.1 – Connector Description

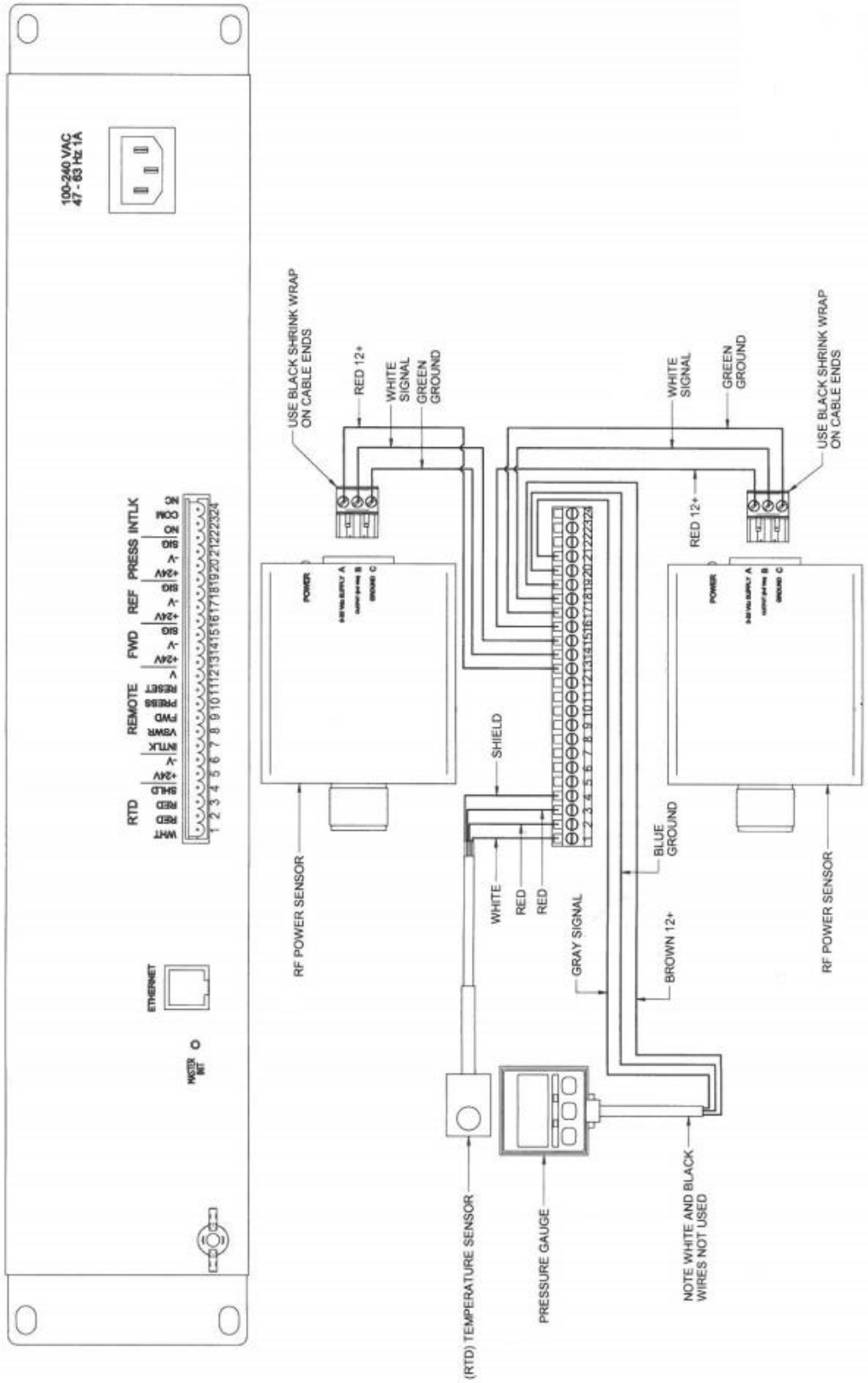

Figure 2.3 – Typical Wiring Diagram

3 Operation

The RF Scout Plus provides two ways for the operator to view the system. First, all values can be set and observed via the touch screen interface. Additionally, the RF Scout Plus utilizes a website to allow remote viewing of alarms, history of the unit, and the ability to reset a VSWR strikeout.

3.1 Touch Screen Interface

The main menu offers options for status viewing and configuration as well as an indication of the current operating mode. Three buttons along the bottom allow for navigation to alarm status, setup, and help pages.

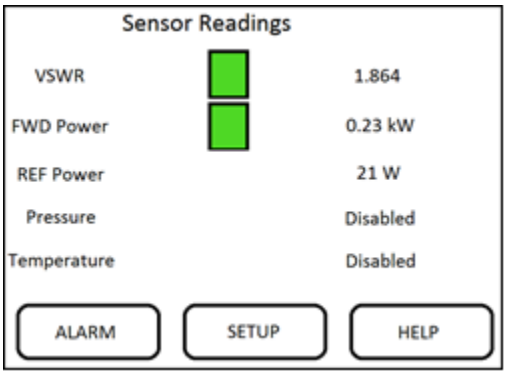

Figure 3.1 – RF Scout Plus Main Screen

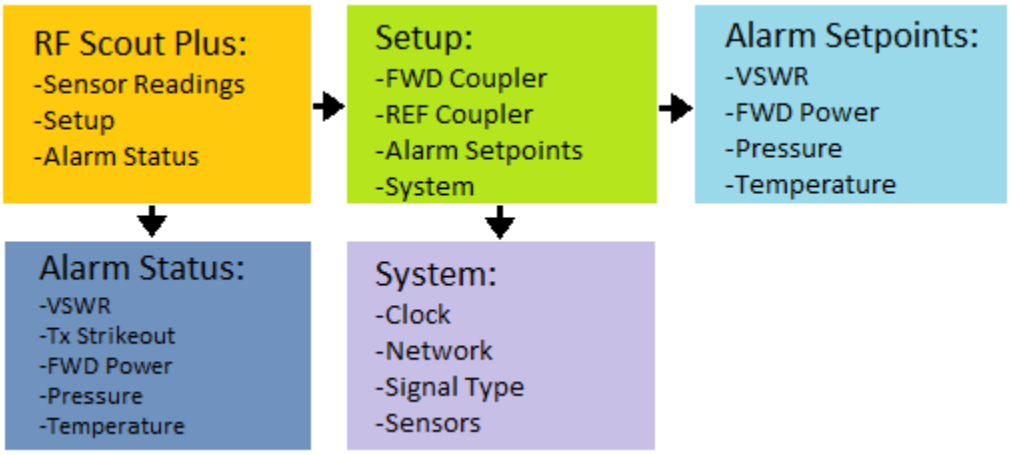

Figure 3.2 – Menu Flow Block Diagram

Function	Explanation	Unit	Range

Sensor Readings	Displayed on main screen	-	-
Alarm Status	Changes screen to show current alarm status, when selected	-	-
Setup	Changes screen to allow setup changes, when selected	-	-

Table 3.1 – Main Menu Functions

3.1.1 Sensor Readings

Five sensor readings are available on the main screen in all RF Scout Plus units: VSWR, forward power, reflected power, pressure and temperature.

Function	Explanation	Unit	Range
VSWR	VSWR reading	-	1-2
FWD Power	Forward Power reading	kW	0-50
REF Power	Reflected Power reading	W	0-200
Pressure	Pressure reading (if enabled)	psi	-
Temperature	Temperature Reading (if enabled)	˚F	-

Table 3.2 – Sensor Readings

3.1.2 Alarm Status

The alarm status screen, accessed by pressing the “Alarm” button from the main screen, provides quick viewing of the current alarm status of the system. When the box to the right of the title is illuminated, the alarm is active. If the Tx Strikeout alarm is active, it requires user intervention to clear. This can be accomplished by pressing the “RESET” button on the page.

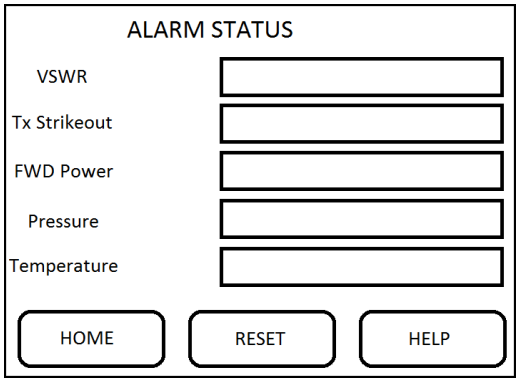

Figure 3.3 Alarm Status Screen

Function	Explanation	Unit	Range
VSWR Alarm	VSWR Alarm Status	-	-
Tx Strikeout	Transmitter Strikeout Status	-	-

FWD Power	FWD Power Alarm Status	-	-
Pressure	Pressure Alarm Status	-	-
Temperature	Temperature Alarm Status	-	-
HOME	Select to return to the main screen	-	-
RESET	Select to reset a Transmitter Strikeout condition	-	-
HELP	Select for help using the screen	-	-

Table 3.3 – Alarm Status Functions

3.1.3 Setup Menu

The setup screen, accessed by pressing the "Setup" button from the main screen, provides the ability to set various system parameters. The configuration parameters have been broken into multiple categories for easier access.

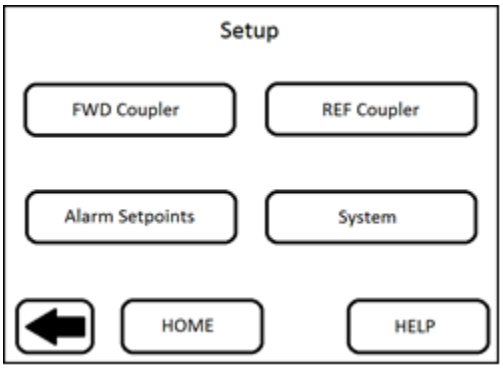

Figure 3.4 – Setup Menu

Function	Explanation	Unit	Range
FWD Coupler	Changes screen to show and adjust FWD coupler settings (coupling, offset, 20dBm voltage), when selected	-	-
REF Coupler	Changes screen to show and adjust REF coupler settings (coupling, offset, 20dBm voltage), when selected		
Alarm Setpoints	Changes screen to show and adjust alarm setpoints, when selected	-	-
System	Changes screen to show and adjust system settings, when selected	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.4 – Setup Functions

3.1.3.1 Coupler Configuration

The coupler configuration screens, accessed by pressing the "FWD Coupler" or "REF Coupler" buttons from the setup menu, allows input of the calibration factors for the Dielectric RF Power

sensors. The coupling value should be entered as a positive value (-60dBm should be entered as 60.00). To enter the values, the user simply touches the value to be changed and enters the new value on the keyboard that pops-up.

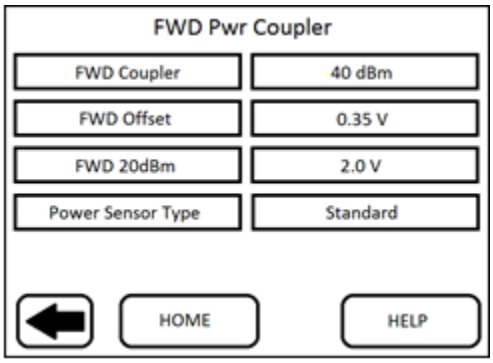

Figure 3.5 – Forward Coupler Menu

Function	Explanation	Unit	Range
FWD Coupler	Forward Power Sensor coupling value (inverted)	dBm	0-70
FWD Offset	Forward Power Sensor offset voltage	V	0-1
FWD 20dBm	Forward Power Sensor Voltage at 20dBm	V	0-3
Power Sensor Type	Type of power sensor to be used, either “Standard” or “Low Power”	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.5 – Forward Coupler Configuration Functions

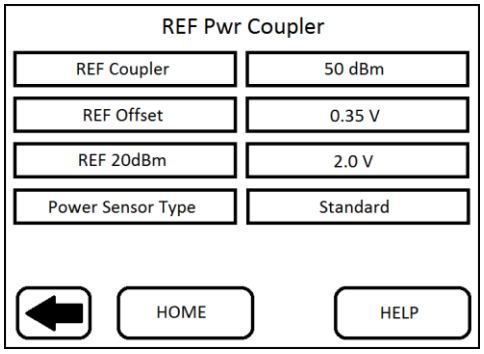

Figure 3.6 – Reflected Coupler Menu

Function	Explanation	Unit	Range
REF Coupler	Reflected Power Sensor coupling value (inverted)	dBm	0-70
REF Offset	Reflected Power Sensor offset voltage	V	0-1
REF 20dBm	Reflected Power Sensor Voltage at 20dBm	V	0-3

Power Sensor Type	Type of power sensor to be used, either “Standard” or “Low Power”	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.6 – Reflected Coupler Configuration Functions

3.1.3.2 Alarm Setpoints Menu

THERE ARE CALIBRATION VALUES MARKED ON EACH POWER SENSOR. THESE VALUES MUST BE RECORDED AND REFERENCED TO THE APPROPRIATE COUPLER PORTS FOR USE IN THE CALIBRATION SET UP.

The alarm setpoints screens, accessed by pressing the “Alarm Setpoints” button on the setup screen, allows the operator to adjust alarm levels for the various system alarms. The first page provides selection of the various setpoints.

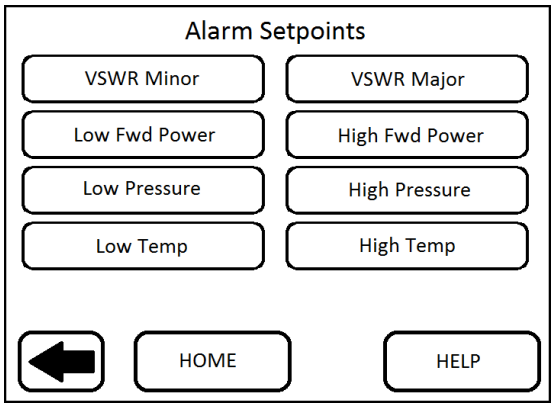

Figure 3.7 – Alarm Setpoints Menu

Function	Explanation	Unit	Range
VSWR Minor	Adjust Minor VSWR alarm setpoint, when selected	-	-
VSWR Major	Adjust Major VSWR alarm setpoint, when selected	-	-
Low Fwd PWR	Adjust Low Forward Power alarm setpoint, when selected	-	-
High Fwd	Adjust High Forward Power alarm setpoint, when selected	-	-

Power			
Low Pressure	Adjust Low Pressure alarm setpoint, when selected	-	-
High Pressure	Adjust High Pressure alarm setpoint, when selected	-	-
Low Temp	Adjust Low Temperature alarm setpoint, when selected	-	-
High Temp	Adjust High Temperature alarm setpoint, when selected	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.7 – Alarm Setpoint Functions

Each setpoint can be adjusted by touching the value and entering the desired setpoint. Additionally, the alarm can be disabled if the user does not need the alarm indication. The buttons below the value enables and disables each alarm.

3.1.3.2.1 VSWR Alarms

Two types of VSWR alarm are discussed in this section, minor and major. The minor alarm creates a VSWR warning. While this alarm is active the screen backlight will be orange until the VSWR either drops to below the setpoint or rises above the major level. If the VSWR rises above the major setpoint, the backlight turn red and the transmitter will be shut down for two seconds to prevent damage. If this scenario causes the transmitter to be shut down three times within a ten minute timeframe, the unit will enter the "strikeout" mode which interlocks the transmitter until the operator manually resets the count.

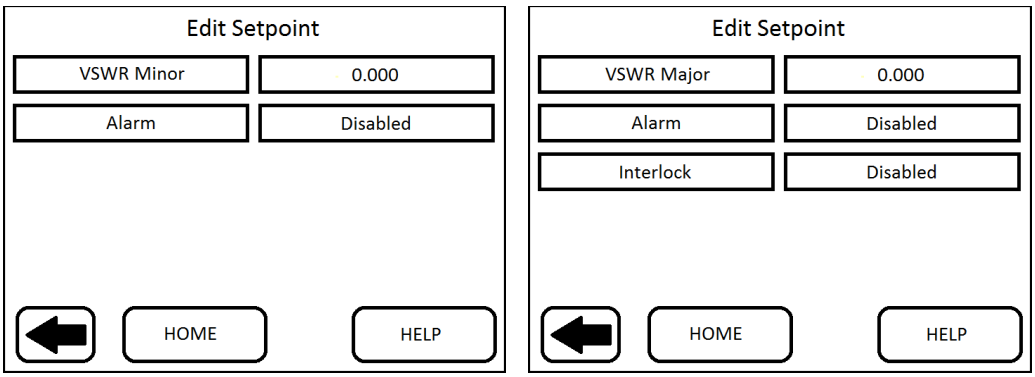

Figure 3.8 – VSWR Alarm Setpoints

Function	Explanation	Unit	Range
VSWR (Minor/Major)	Current setpoint for associated alarm	-	0-2
Alarm	Toggles between enabled and disabled for the associated alarm.	-	-
Interlock	Toggles between enabled and disabled for the Major VSWR alarm	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.8 – VSWR Alarm Setpoint Functions

3.1.3.2.2 RF Power Alarms

High and low setpoints for forward power, pressure, and temperature are provided on the other screens from the alarm setpoints menu.

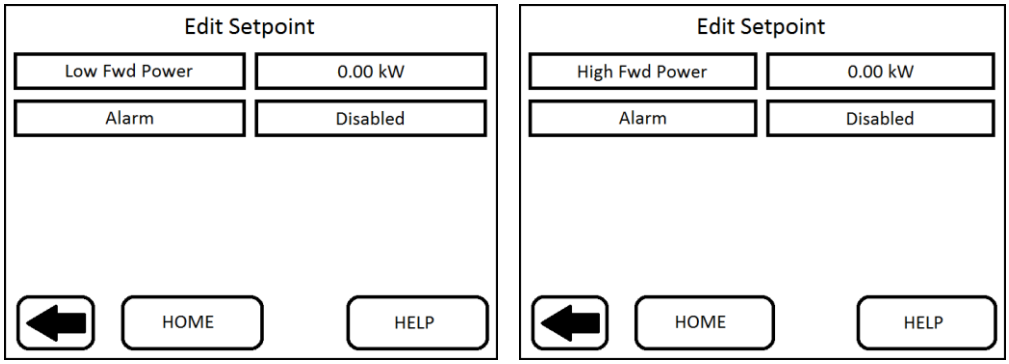

Figure 3.9 – Forward Power Alarm Setpoints

Function	Explanation	Unit	Range
Fwd Power (Low/High)	Current setpoint for associated alarm.	kW	0-100
Alarm	Toggles between enabled and disabled for the associated alarm.	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.9 – Forward Power Alarm Setpoint Functions

3.1.3.2.3 Temperature Alarms

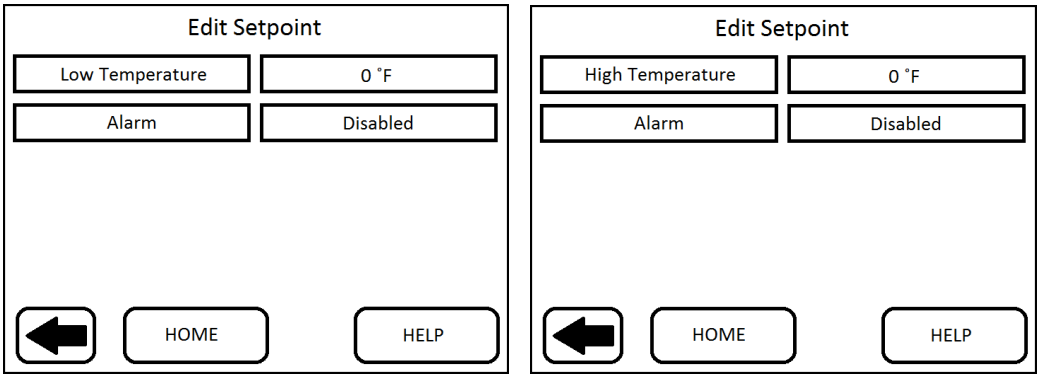

Figure 3.10 – Temperature Alarm Setpoints

Function	Explanation	Unit	Range
Temperature (Low/High)	Current setpoint for associated alarm.	˚F	0-999
Alarm	Toggles between enabled and disabled for the associated alarm.	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.10 – Temperature Alarm Setpoint Functions

3.1.3.2.4 Pressure Alarms

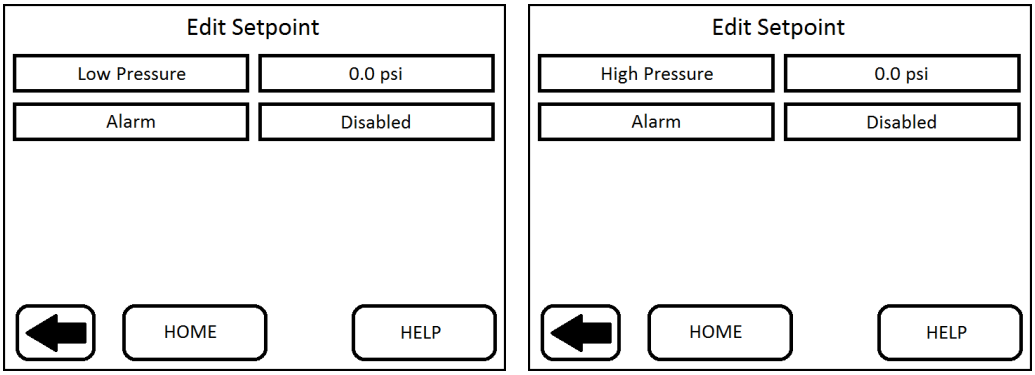

Figure 3.11 – Pressure Alarm Setpoints

Function	Explanation	Unit	Range
Pressure (Low/High)	Current setpoint for associated alarm.	psi	0-99
Alarm	Toggles between enabled and disabled for the associated alarm.	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.11 – Pressure Alarm Setpoint Functions

3.1.4 System Settings

The system settings, accessed by pressing the “System” button from the setup screen, provides the user the ability to change system factors such as TCP/IP settings, date, time, and signal type and to enable or disable temperature and pressure sensors. Setting the proper signal type is critical to ensuring proper sensor readings.

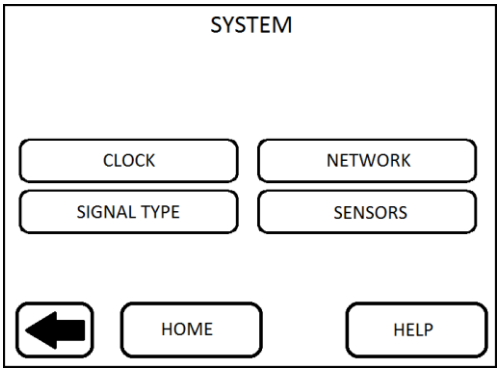

Figure 3.12 – System Menu

Function	Explanation	Unit	Range
CLOCK	Adjust system date and time	-	-
SIGNAL TYPE	Select signal type to correct scaling	-	-
NETWORK	Adjust system IP address	-	-
SENSORS	Enable or disable temperature/pressure sensors	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.12 – System Settings Menu Functions

3.1.4.1 Clock

The Clock screen shows the user the current system date and time. The user can adjust the date and time by pressing the value to be changed.

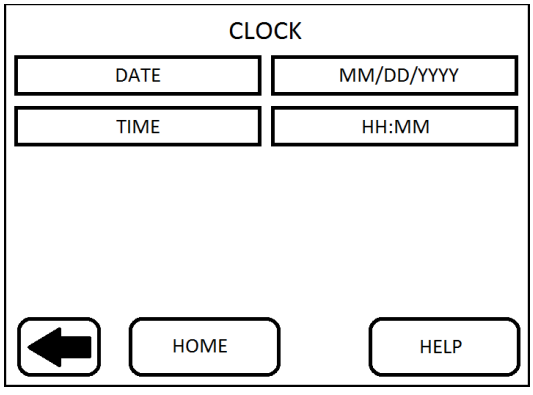

Figure 3.13 – Clock Menu

Function	Explanation	Unit	Range
Date	Shows current date	-	-
Time	Shows current time	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.13 – Clock Functions

3.1.4.2 Signal Type

The signal type screen allows the user to select the type of signal in the line being monitored. This is necessary for the unit to perform correct math and ensure accurate readings. Enter the value corresponding with the signal type in the system. The current signal is highlighted and displayed at the top of the screen.

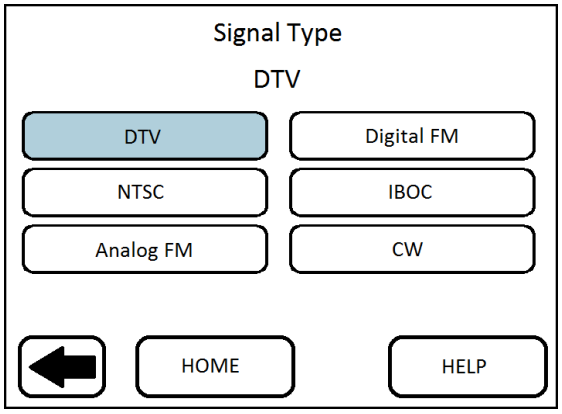

Figure 3.14 – Signal Type Menu

Function	Explanation	Unit	Range
DTV	Digital Television Signal	-	-
NTSC	Analog Television Signal	-	-
Analog FM	Analog FM Signal	-	-
Digital FM	Analog FM w/ IBOC injected	-	-
IBOC	IBOC-FM Signal	-	-
CW	Continuous Wave Signal	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.14 – Signal Type Functions

3.1.4.3 Network

The IP setting page allows the user to adjust all IP values to allow network interoperability. This value will be the address that the unit can be connected to for web based control.

The default values are:

IP: 192.168.0.100
Subnet: 255.255.255.0
Gateway: 192.168.0.1

These settings are all user adjustable. Each value may be adjusted be choosing the value and typing in the new value using the pop-up keyboard. After making the necessary changes push the ENTER command, then return to the main screen by pressing HOME. This will ensure that the new IP address has been changed and will be retained, even after loss of power.

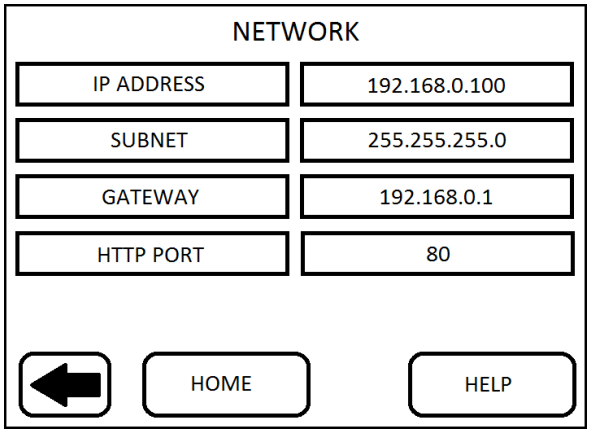

Figure 3.15 – Network Menu

Function	Explanation	Unit	Range
IP ADDRESS	Change IP address	-	-
SUBNET	Change subnet	-	-
GATEWAY	Change gateway	-	-
HTTP Port	Change http port	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.15 – Network Functions

3.1.4.4 Sensors

The sensors button, accessed from the system menu, allows a user to enable or disable the optional temperature and/or pressure sensor.

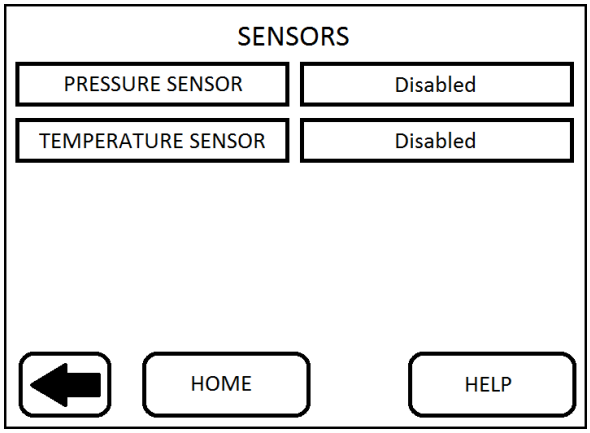

Figure 3.16 – Sensors Menu

Function	Explanation	Unit	Range
PRESSURE SENSOR	Enable/disable pressure sensor	-	-
TEMPERATURE SENSOR	Enable/disable temperature sensor	-	-
HOME	Select to return to the main screen	-	-
HELP	Select for help using the screen	-	-

Table 3.16 – Sensor Functions

3.2 Web Interface

The RF Scout Plus incorporates a website that can be viewed from any standard web browser with Java Runtime. The website is accessed by pointing your browser to the units IP address. This will initialize the Java applet and show the website. Any computer with network capabilities and the Java Runtime can view the website.

To view the webpage a few guidelines must be followed:

1) The units Subnet and Gateway (accessed through the Network menu) must match those of the computer trying to access the RF Scout Plus.
2) The IP address of the RF Scout Plus must be changed from the default setting to a free IP address on the user's network.
3) Users must log in to view the website, the default username and password are "admin" and "password" respectively.

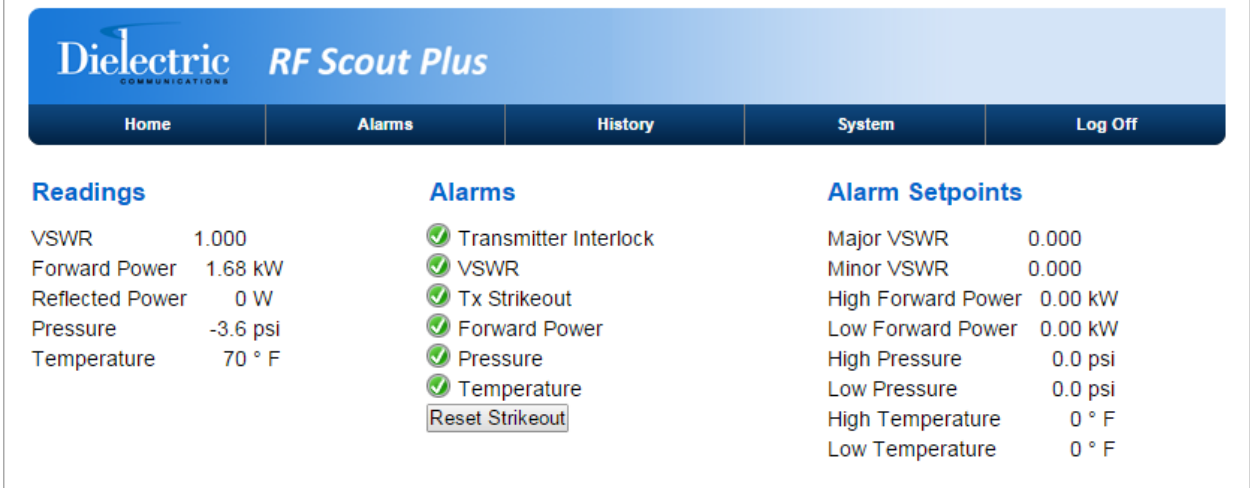

Figure 3.17 – RF Scout Plus Website

Once connection to the website has been established the user can access a range of functions for the RF Scout Plus. On the home screen, shown above, the user can check the status of the system, view alarm setpoints, and reset a VSWR strikeout condition that would be causing the transmitter interlock to be active. The alarm status is similar to the touch screen interface, if the alarm is active, the button to the left of the title will illuminate red. The “Alarms” and “History” tabs at the top of the screen allow the user to view and access .csv log files for previous alarms and the overall history of the system. Finally the “System” tab allows the user to configure the unit’s IP address, manage username and password options, upload firmware, view and manage other system information, reboot the system, or perform a factory reset.