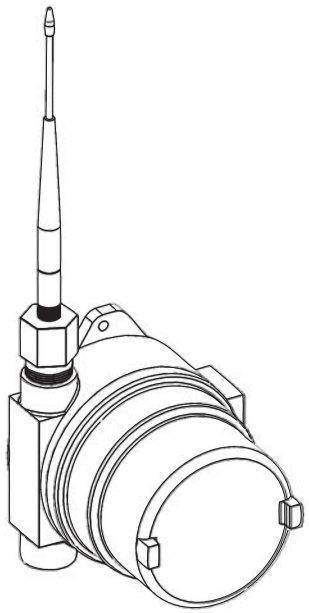
Installation and Operations Manual

8410 Wireless Field Transceiver

Transmitter and receiver for wireless RS-232 and RS-485 data communications



Automation Solutions for oil & gas, defense and aviation applications

Varec®

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Varec, Inc.
5834 Peachtree Corners East
Norcross (Atlanta), Georgia 30092
Phone: (770) 447-9202
Fax: (770) 662-8939

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Contents

1 Introduction

This manual provides the information that the user needs to install, maintain, and troubleshoot the Varec 8410 Wireless Field Transceiver (8410 WFT).

1.1 Overview

The 8410 WFT provides secure wireless communications between the field instrument and the 8420 Wireless Base Transceiver (WBT), which is located in the control room. Both units are able to provide simultaneous slave/repeater functionality.

The 8410 WFT and the 8420 WBT provide wireless links between a variety of instruments and devices. The units can be configured to provide wireless communications with most RS-232 and RS-485 serial devices including the Varec 4590 TSM, Varec 2900 FTT, and Varec 8130 RTU.

1.2 Function and System Design

The 8410 WFT provides wireless 900 MHz RS-232 and RS-485 data communications.

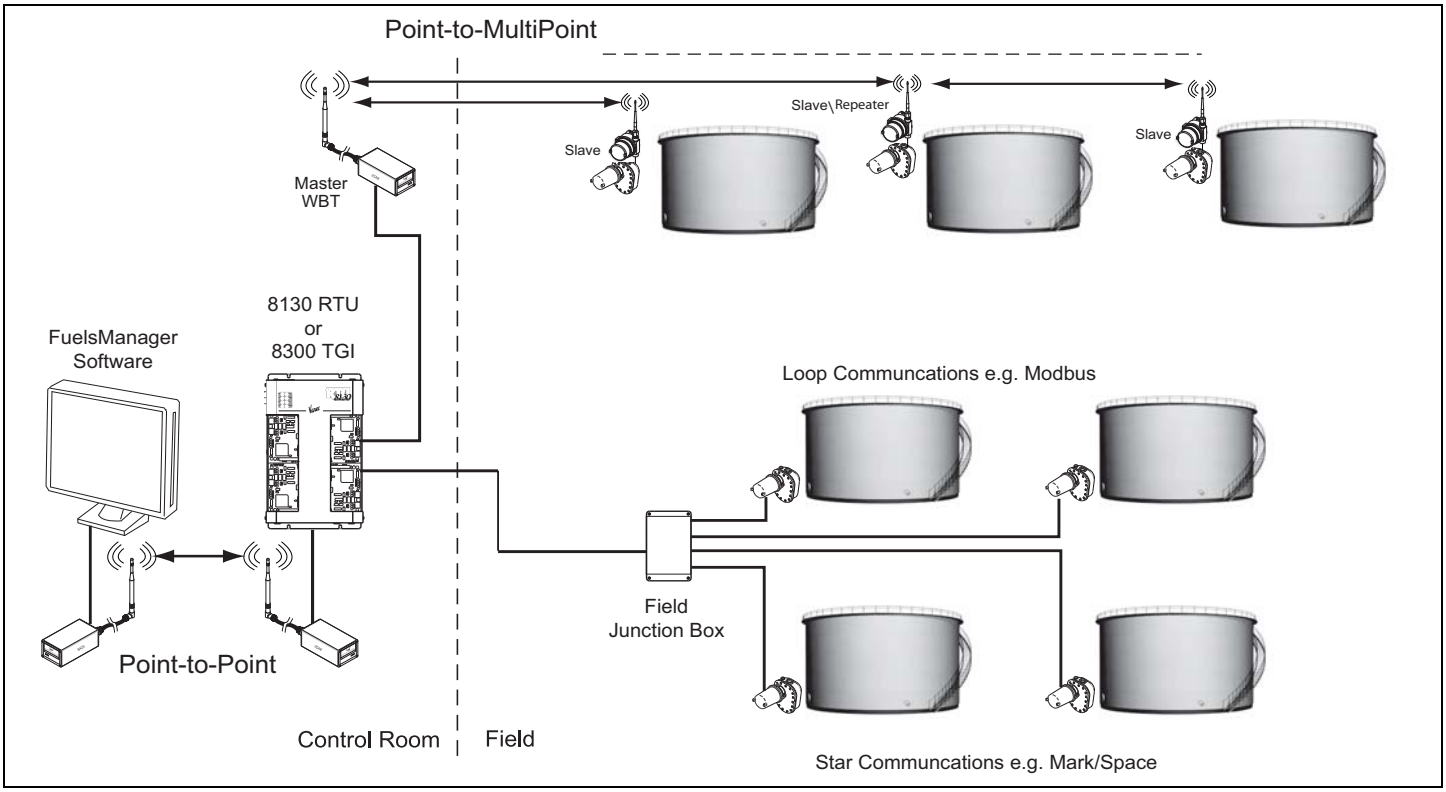

Figure 1-1: Example of Point-to-Point and Multipoint Systems

Varec's wireless products are able to function over point-to-point or multipoint systems. Traditionally, a multipoint network is used in applications where data is collected from many instruments and reported back to one central site.

Note It is important to note the differences between point-to-point and point-to-multi-point systems. In a point-to-point system all data communications are acknowledged, whether sent from the master to the slave or from the slave to the master. In a point-to-multipoint system outbound communications from the master are sent a user-defined number of times. The receiving unit, slave or repeater, will accept the first packet received that meets security requirements. A point-to-point system is limited to one master and one slave transceiver. Repeaters may be added to extend the reach of the network, but no other master or slave may be added. In a point-to-multipoint system, the transceiver—designated as a master— is able to communicate with numerous slaves. In its simplest form, a tank gauge multipoint network functions with the master (8420 WBT) broadcasting its messages to all slaves (8410 WFT) and the slaves responding to the master when given data by the connected tank gauge transmitter.

1.2.1 Internal system design

A. Antenna
B. Antenna Feed-Thru
C. Electronics Assembly
D. O-Ring
E. Housing

All standard electronics for the 8410 WFT are contained on the circuit board (C). This includes power, field communications, a 3-wire temperature input, and a 24V DC out.

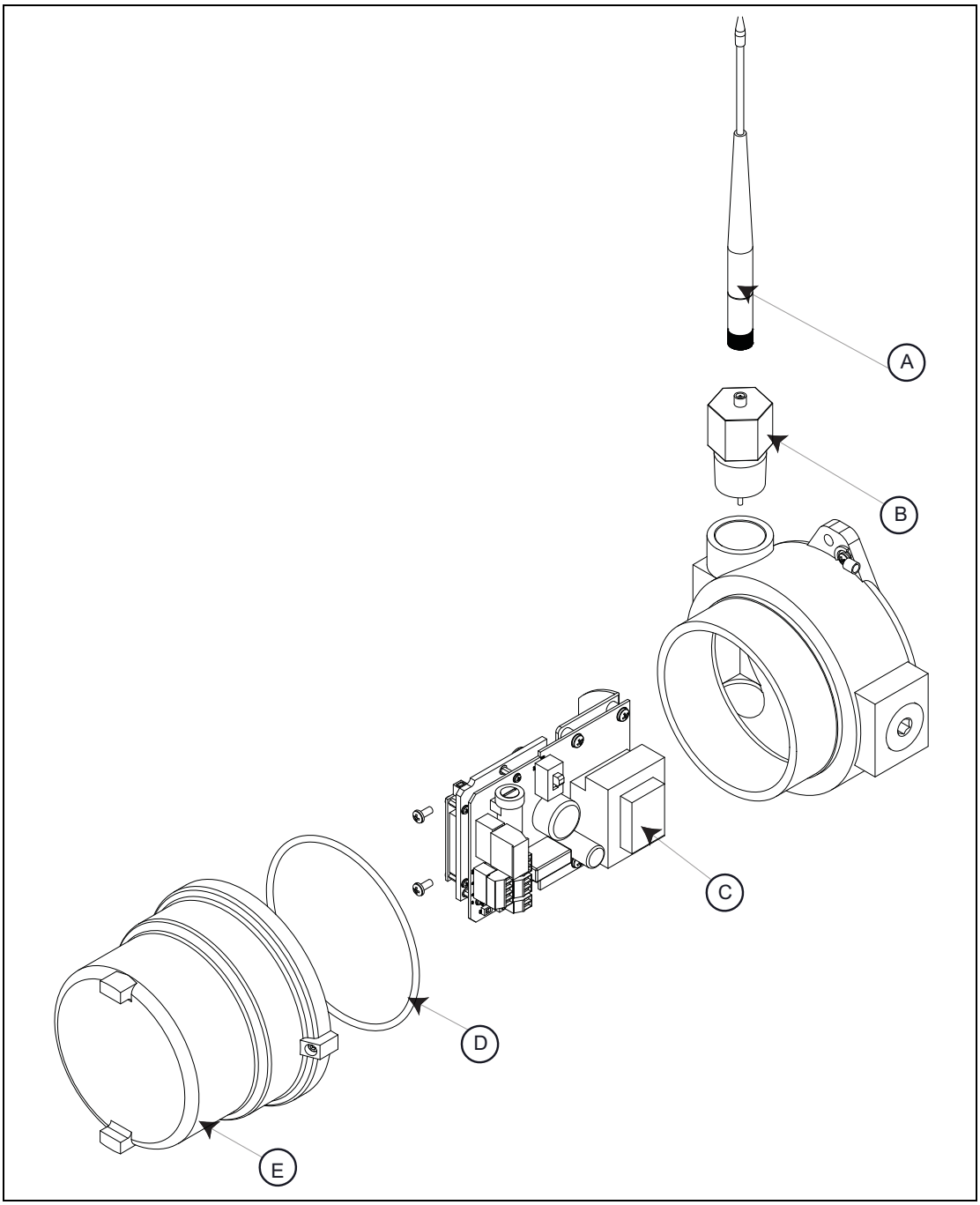

Figure 1-2: 8410 WFT System Components

1.3 Understanding Data Communication Configurations

The 8410 WFT's versatility allows the user to establish data communication links using a variety of configurations. This makes it possible to extend the range of the 8410 WFT and operate in a number of applications. This section describes the two main categories of communication configurations: Point-to-Point and Point-to-Multipoint.

1.3.1 Point-to-Point systems

A point-to-point system is limited to one master and one slave transceiver. Repeaters may be added in to extend the reach of the network, but no other master or slave may be added.

The example below shows the most common and straightforward link, a master communicating to a slave in a point-to-point link.

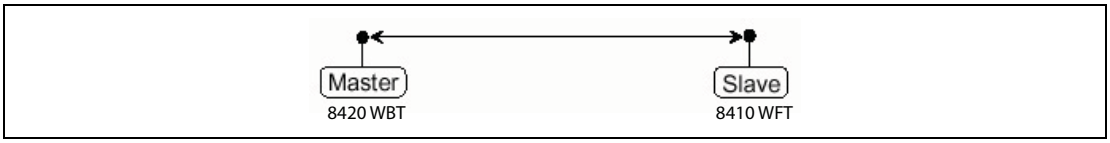

Figure 1-3: A Master Communicating to a Slave in a Point-to-Point Link

The following diagram shows how a link might be set up using a repeater. The repeater may be sitting on a hilltop or other elevated structure to link the master to the slave. In this setup, it may be desirable to use an external omni-directional antenna on the repeater. To extend the range, Yagi antennas may be used on either or both of the master and slave transceiver.

When a repeater is used, the network capacity is cut in half.

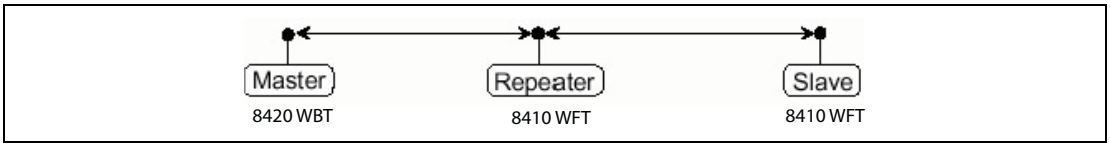

Figure 1-4: A Link Setup Using a Repeater

The example below shows a link with two repeaters between the master and slave. With two repeaters there is clearly more flexibility in getting around obstacles and a greater total range is possible. Once again, it would be desirable to use external omni-directional antennas with the repeaters, and attaching a Yagi to the master and slave to increase the range of the link.

When two repeaters are used there is no further degradation in the network capacity of the link.

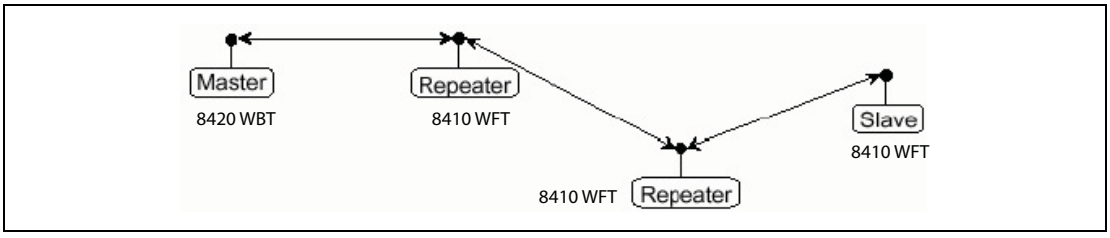

Figure 1-5: A Link with Two Repeaters Between the Master and Slave

1.3.2 Point-to-Multipoint systems

In a point-to-multipoint system the transceiver, designated as a master, is able to communicate with numerous slaves. In its simplest form, a multipoint network functions with the master broadcasting its messages to all slaves and the slaves responding to the master when given data by the device connected to the data port.

Figure 1-6 depicts a standard point-to-multipoint system. In this example, any data sent from the master is broadcasted to all three slaves, one of which receives it through a multipoint repeater. The data is in turn sent out of the RS-232 or RS-485 port of each of the three slaves.

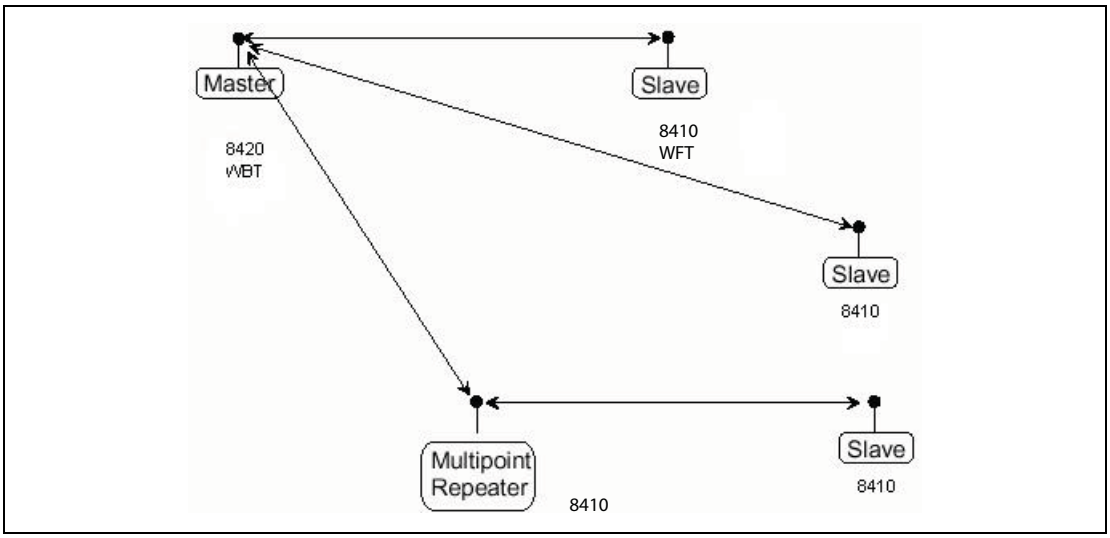

Figure 1-6: A Standard Point-to-Multipoint System Using a Multipoint Repeater

Figure 1-7 shows a point-to-multipoint system using a slave/repeater at one of the sites. This system works in the same manner as a standard multipoint system with repeaters. However, the number of radios needed is reduced with the use of the multipoint slave/repeater feature.

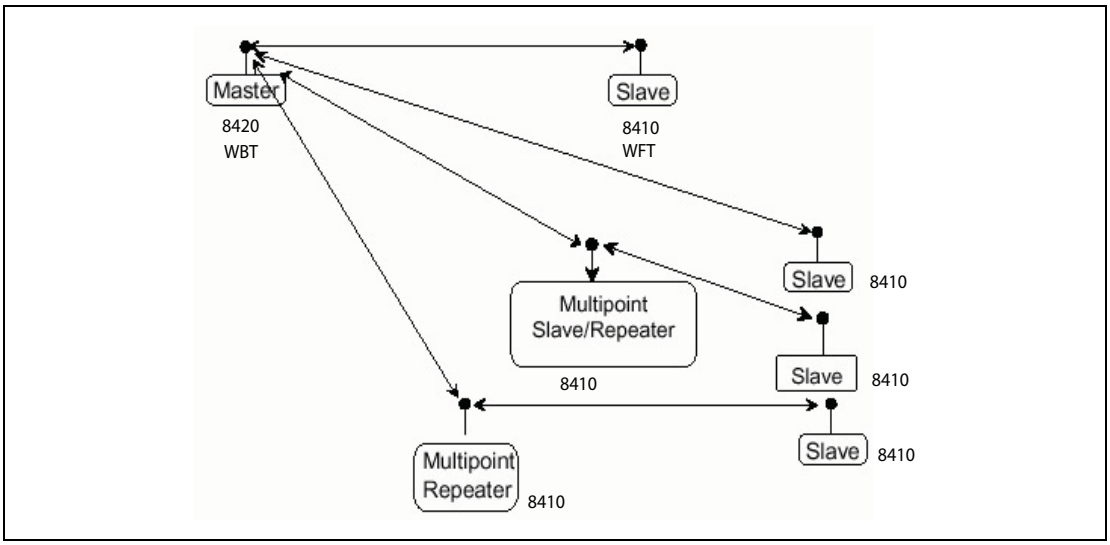

Figure 1-7: A Point-to-Multipoint System Using the Multipoint Slave/Repeater Feature

1.4 Choosing Point-to-Point or Point-to-Multipoint Operation

It is important to note the differences between point-to-point and point-to-multipoint systems. In a point-to-point system all packets are acknowledged, whether sent from the master to the slave or from the slave to the master. In a point-to-multipoint system, outbound packets from the master or repeater to slaves or other repeaters are sent a user-defined number of times. The receiving transceiver, slave or repeater, will accept the first packet received that passes the 32-bit CRC. However, the packet is not acknowledged. On the return trip to the master, all packets sent are acknowledged or retransmitted until they are acknowledged.

Traditionally, a multipoint network is used in applications where data is collected from many instruments and reported back to one central site. As such, the architecture of such a system is different from point-to-point applications. The number of radios in a point-to-multipoint system is influenced by the following parameters:

1. Size of the blocks of data. The longer the data blocks, the smaller the system capacity.
2. Baud rate.
3. The amount of contention between slaves. Polled slaves verses timed slaves.
4. Use of repeaters. Using the repeater setting in a multipoint network will decrease overall system capacity by 50%.

For example, if the network will be polling slaves once a day to retrieve sparse data, several hundred slaves could be configured to a single master. However, if each slave will be transmitting data more frequently, the system will be closer to capacity and fewer slaves should be linked to the master.

For examples and additional information on data communication links, please consult Varec, Inc.

2 Preparing for Installation

This chapter provides a pre-installation checklist, safety information, unpacking instructions, and an overview of the installation steps for the 8410 WFT.

2.1 Pre-Installation Checklist

Before you install the 8410 WFT in the field be sure:

1. The field device is operating correctly.
2. There is sufficient space to install the transmitter and accessories, such as conduit and cabling. Refer to Figure 2-1 for housing dimensions.

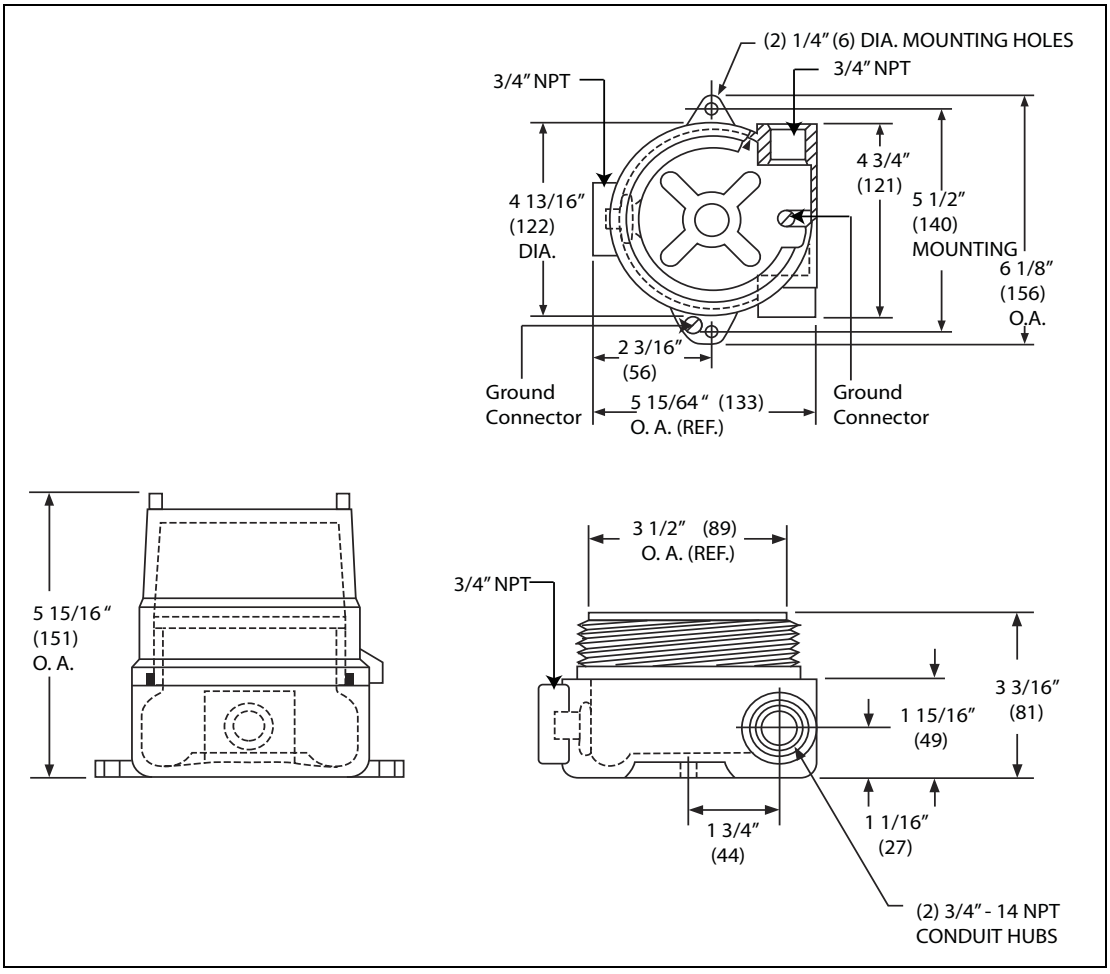

Figure 2-1: 8410 Wireless Field Transceiver Dimensions

3. To have the correct field connections at the field device ready to connect to the 8410 WFT, such as power and communications.
4. To be in compliance with the safety guidelines described in Section 2.2, "General Safety Guidelines" on page 8.

2.2 General Safety Guidelines

The user should follow safety guidelines provided by the Occupational Safety and Health Administration (OSHA) for additional protection. Information may also be obtained from the following sources:

- National Electric Code (NEC)
- National Fire Protection Association (NFPA)
- Instrument Society of America (ISA)
- Factual Mutual Research Corporation (FM)
- Underwriters Laboratories Incorporated (UL)

When in doubt about the safety of an area, the user should check with the local safety authorities. Always observe equipment labels and warning signs posted in the area.

2.3 Unpacking

Varec 8410 Wireless Field Transceivers are shipped fully assembled and ready for installation.

To unpack the 8410 WFT:

1. Place the shipping container on a secure bench.
2. Open the shipping container, taking care not to damage the contents.
3. Carefully remove the transceiver from the shipping container and place it on the bench.
4. Inspect the transceiver for shipping damage. Report any damage to the carrier.

Note If the transceiver must be stored prior to installation, it should be repacked in its shipping container and stored in a temperature-and humidity-controlled environment.

2.4 Installation Overview

To install the transceiver, follow the pre-site preparation steps shown in the following flowchart:

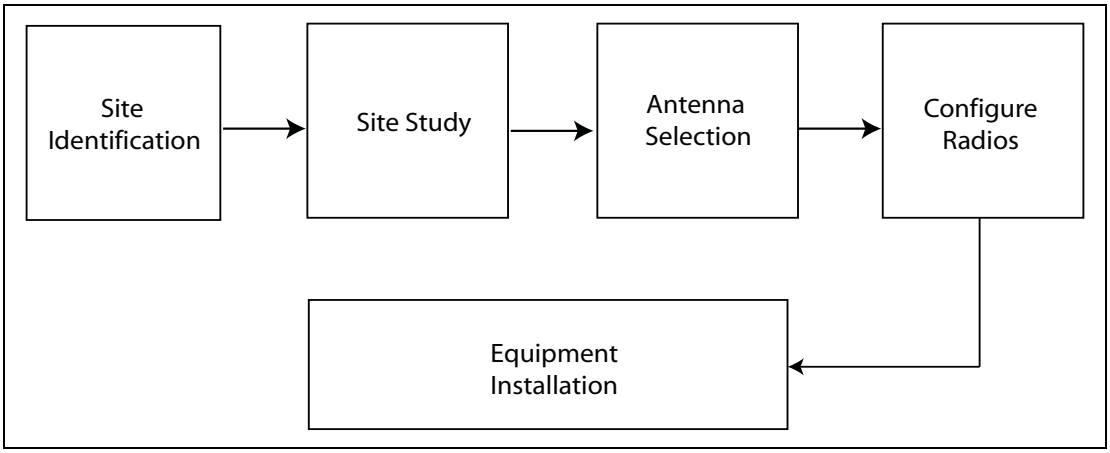

Figure 2-2: 8410 WFT Installation Sequence

2.5 Installation Checklist

By following a simple process to install the 8410 WFT, one can ensure a pain-free installation resulting in a successful robust communications system.

The following sections will help guide you through the pre-site preparation process.

2.5.1 Identifying your sites

Identify sites with “Line of Sight”. If you cannot see it, you cannot talk to it. In general, higher is better, however:

- Long cable runs can decrease the signal strength and are more susceptible to noise
- A higher antenna is able to broadcast over a larger area
- A higher antenna may pick up more noise and interference from other RF signals in the area
- A high antenna or cables are more susceptible to damage from lightning strikes

2.5.2 Completing a site study

To complete a site study, do the following:

- Verify that all antenna locations have line of site to the master radio or to a nearby repeater.
- Plan a sight outline with slaves/repeaters and determine how each unit will communicate back to the master.

2.5.3 Selecting an antenna

An antenna is a device that is made to efficiently radiate and receive radiated electromagnetic waves.

There are several important antenna characteristics that should be considered when choosing an antenna for your application:

- Antenna radiation patterns/antenna type
- Power gain
- Directivity
- Polarization

Consult with Varec, Inc. to choose the proper antennas for each 8410 WFT and 8420 WBT location.

2.5.4 Configuring radios

To configure the radios, do the following:

- Configure all slave/repeater radios
  This is most easily done on the bench; however, radios may be programmed in the field if necessary. Refer to the *FreeWave ToolSuite Manual* for more information.
- Verify that there is a proper communications link to the master.

2.5.5 Installing cables and antennas properly

To properly install cables and antennas, ensure that:

- There are no major bends in the RF cables
- All RF connections are secure and waterproof

2.5.6 Surge protection

Caution Surges caused by near or direct lightning strikes can severely damage the equipment.

Varec recommends installing surge protection on any exterior antenna or antenna cables.

3 Mounting

The 8410 WFT can be mounted in multiple ways:

- The enclosure has three 3/4 inch NPT entries.
- The electronics and antenna can be arranged to best suit the installation.

Note Please read Section 2.2, "General Safety Guidelines" on page 8 before mounting the transceiver.

3.1 Installation Safety Guidelines

Always use Class I, Division 1 approved wiring practices when installing in hazardous areas. This equipment should be installed only by qualified personnel familiar with the installation of tank gauging equipment.

Caution should be exercised when entering any area that is posted or otherwise assumed to contain hazardous gases. Always follow OSHA guidelines. Obtain a hot permit before removing the transceiver cover with power applied.

To prevent shock hazards, the housing of all units should be properly grounded in accordance with the National Electric Code. A grounding conductor should be wired to the grounding terminal provided on the 8410 WFT.

! Warning Before attempting installation of the 8410 WFT, review the General Safety Guidelines described in Chapter 2. Installation and maintenance personnel should become familiar with any hazards present as well as any agency requirements before working with any equipment.

4 Wiring

This chapter contains a variety of terminals and switches used for wiring and configuring the AC and DC versions of the 8410 WFT as shown in Table 4-1 on page 15 and Table 4-3 on page 18.

Wiring diagrams, Figure 4-1 on page 16 and Figure 4-2 on page 18, are also shown for the AC and DC low voltage versions of the 8410 WFT.

Table 4-2 on page 17 and Table 4-4 on page 19 describe the connector assignments for the AC and DC versions of the 8410 WFT.

4.1 8410 WFT Connectors, Switches, and Wiring Diagram (AC Version)

Table 4-1 lists the connectors and switches for wiring the AC version of the 8410 WFT.

AC Version		
Connector	**Purpose**	**Notes**
J4	AC IN	110/220 VAC
J5	RTD Feedthrough IN	
J6	RTD Feedthrough OUT	
J8	Serial Communications	RS-232/RS-485
J9	24VDC OUT	
SW1	RS-232/RS-485 Switch	
SW2	AC Voltage Selector	
SW3	Radio Setup Button	Puts radio in setup mode

Table 4-1: AC Wiring Headers and Switches

Figure 4-1 on page 16 shows the wiring diagram for the AC version of the 8410 WFT.

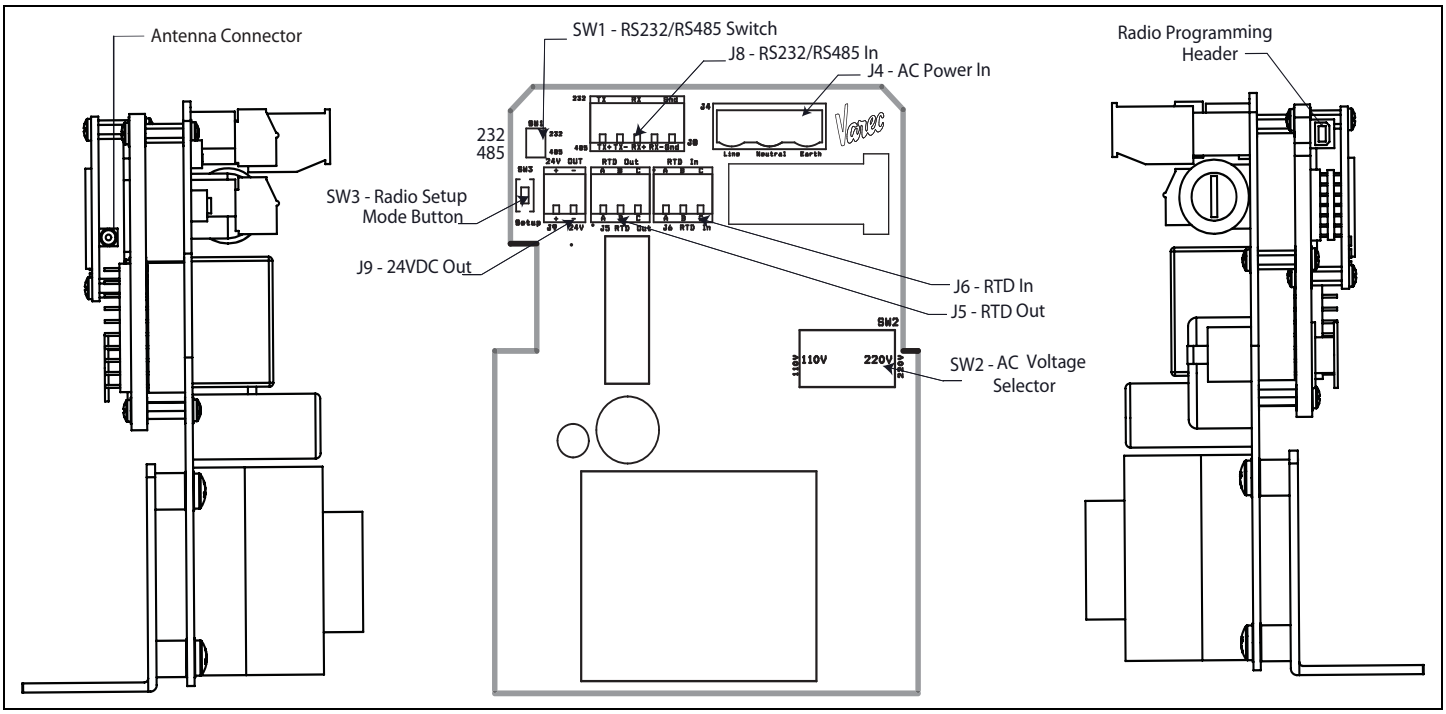

Figure 4–1: 8410 WFT Wiring — AC Version

4.1.1 Connector assignments for the AC version

Table 4-2 lists the connector assignments of the headers for wiring the AC version of the 8410 WFT.

Terminal Assignments			
Connector	**Name**	**Pin #**	**Pin**
J4	AC IN	1	Line
		2	Neutral
		3	Earth
J5	RTD OUT	1	A
		2	B
		3	C
J6	RTD IN	1	A
		2	B
		3	C
J8	RS-232/RS-485	1	TX+
		2	TX-
		3	RX+
		4	RX-
		5	GND
J9	24V DC Out	1	VDC+
		2	VDC-
For RS-232 - Set SW 1 to 232			
J8	RS-232	1	+
		3	-
		5	GND
For 2-Wire RS-485 - Set SW 1 to 485			
J8	RS-485	1	+
		2	-
		5	GND
SW1	Up Position	RS-232	
	Down Position	RS-485	

Table 4-2: Connector Assignments for the AC Version

Note Make sure that SW2, the 110/220 switch, is in the correct position before applying power to the 8410 WFT.

4.2 8410 WFT Connectors, Switches, and Low Voltage Wiring Diagram (DC Version)

Table 4-3 lists the connectors and switches for wiring the DC version of the 8410 WFT.

Low Voltage Version		
Connector	**Purpose**	**Notes**
J1	Voltage In	30-65 VAC / 6-90 VDC
J5	RTD Feedthrough IN	
J6	RTD Feedthrough OUT	
J8	Serial Communications	RS-232/RS-485
J9	24VDC OUT	
SW1	RS-232/RS-485 Switch	
SW3	Radio Setup Button	Puts radio in setup mode
SW6 and SW7	Voltage Selector	Selects AC/DC and high/low DC voltage.

Table 4-3: DC Wiring Connectors and Switches

Figure 4-2 shows the wiring diagram for the low voltage version of the 8410 WFT.

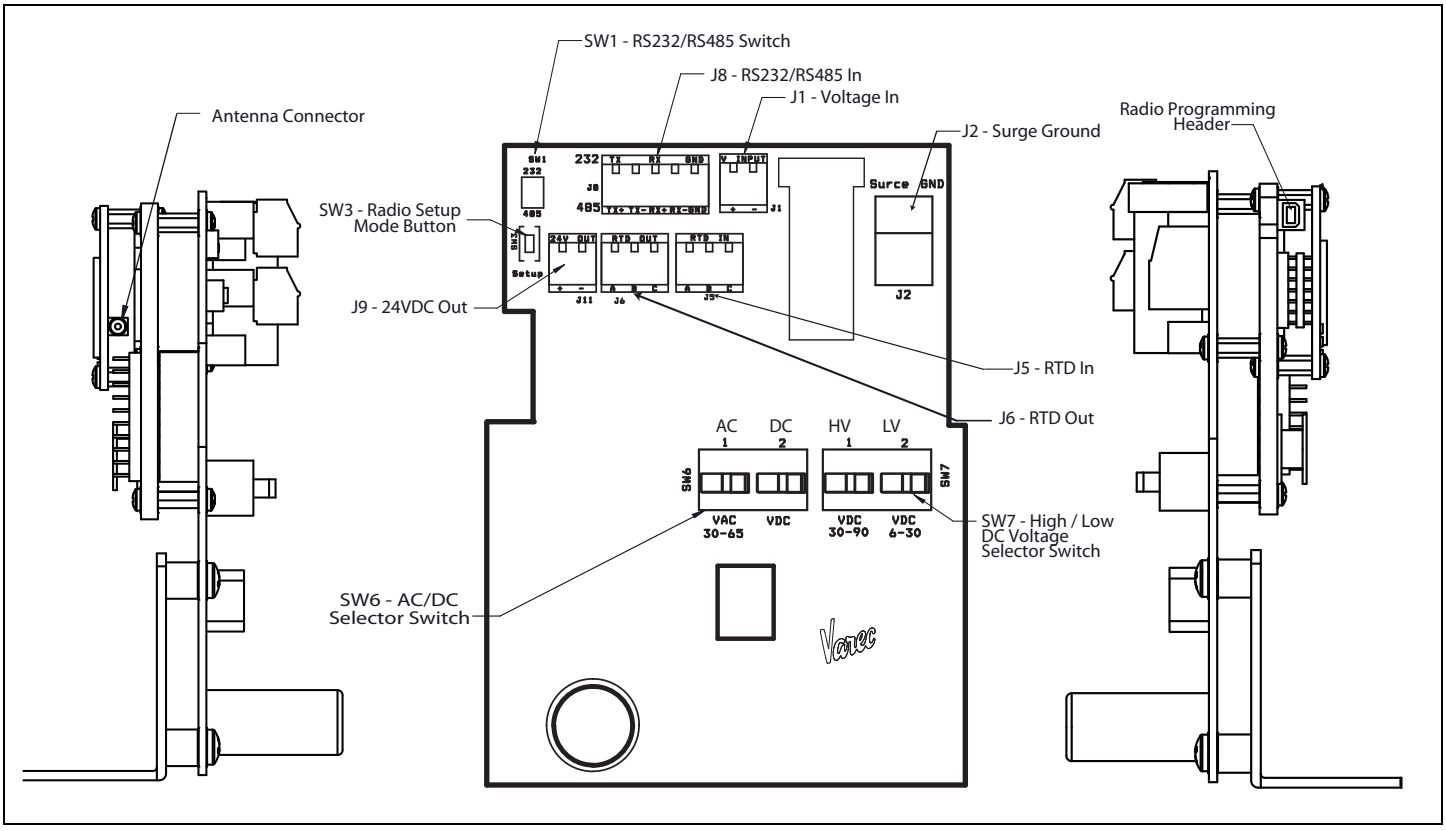

Figure 4-2: 8410 WFT Wiring — Low Voltage Version

4.2.1 Connector assignments for the low voltage version

Table 4-4 lists the connector assignments for wiring the low voltage version of the 8410 WFT.

Terminal Assignments			
Connector	**Name**	**Pin #**	**Pin**
J1	Voltage In	1	+
		2	-
J2	Surge GND	1	Earth
		2	Earth
J5	RTD In	1	A
		2	B
		3	C
J6	RTD Out	1	A
		2	B
		3	C
J8	RS-232/RS-485	1	TX+
		2	TX-
		3	RX+
		4	RX-
		5	GND
J9	24V DC Out	1	VDC+
		2	VDC-
For RS-232 - Set SW 1 to 232			
J8	RS-232	1	+
		3	-
		5	GND
For 2-Wire RS-485 - Set SW 1 to 485			
J8	RS-485	1	+
		2	-
		5	GND

SW1	Up Position	RS-232
	Down Position	RS-485

Table 4-4: Terminal Assignments for the Low Voltage Version

Note Make sure that the AC/DC and high/low voltage switches are in the correct position before applying power to the 8410 WFT.

5 Setting Up the Transceiver Using Tool Suite

5.1 Setting Up a Transceiver Using Tool Suite

Depending on the radio type, a radio may be configured via EZ Config, HyperTerminal, or FreeWave Tool Suite. The following link will allow the user to gain access to the FreeWave Tool Suite, which describes, in detail, how to configure radios and run diagnostics:

http://www.freewave.com

6 LED Operations

This chapter lists the point-to-multipoint and point-to-point LED operations for the 8410 WFT.

The LEDs located on the radio module provide diagnostic and communication information. Refer to Table 6-1 on page 24 and Table 6-2 on page 25 for details.

6.1 LED Operations on a Point-to-Multipoint System

Figure 6-1 shows the location of the LEDs on the radio module.

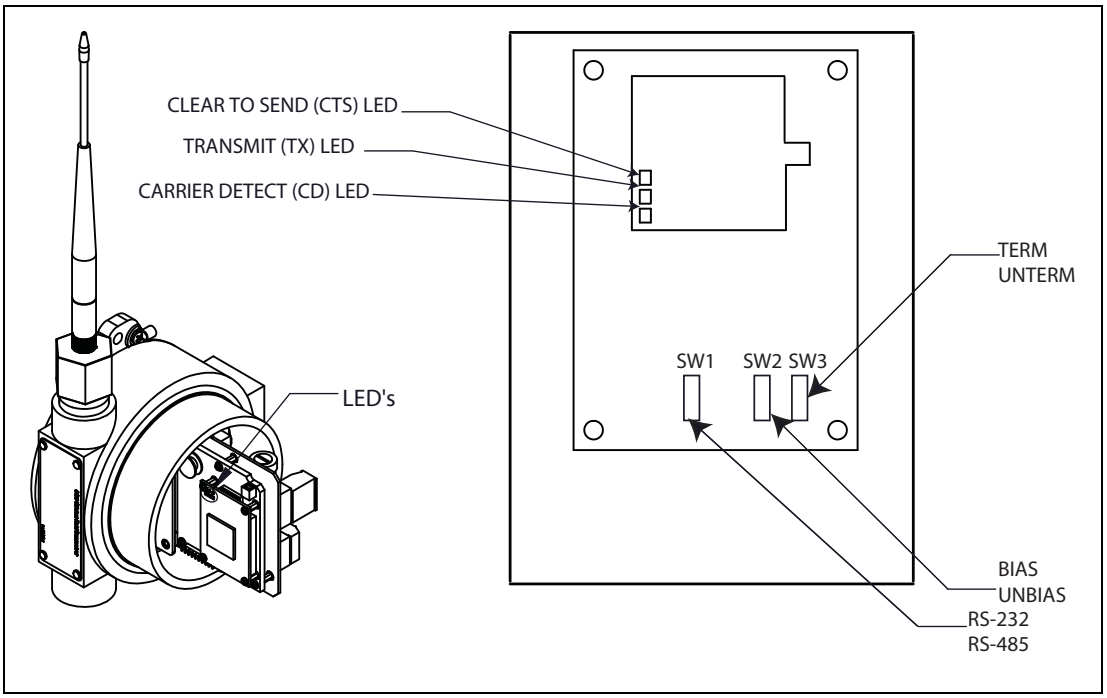

Figure 6-1: 8410 WFT LEDs — Location

When using RS-485 connectivity, during periods of no communications, all devices on the network are in a high-impedance state. To prevent false data indications, the data lines are typically held in a non-asserted state using a small bias current. This bias current is normally provided at the host, but can be provided at the 8410 WFT using switch SW2.

Note In most applications, SW2 should be set to BIAS (up) position.

When using RS-485 connectivity, the devices at the physical ends of the network are typically terminated. Setting switch SW3 in the up position (TERM), terminates the RS-485 network at the 8410 WFT using a 100 ohm resistor. This switch is normally set in the UNTERM position.

When using RS-232 communication, set SW1 to RS-232 (up).

When using RS-485 communications, set SW1 to RS-485 (down).

6.1.1 Point-to-Multipoint operation LEDs

Table 6-1 lists the point-to-multipoint operation LEDs for the 8410 WFT.

	Master			Slave			Repeater		
Condition	Carrier Detect (CD)	Transmit (TX)	Clear to Send (CTS)	Carrier Detect (CD)	Transmit (TX)	Clear to Send (CTS)	Carrier Detect (CD)	Transmit (TX)	Clear to Send (CTS)
Powered, not linked	Solid red bright	Solid red dim	Off	Solid red bright	Off	Blinking red	Solid red bright	Off	Blinking red
Repeater and slave linked to master, no data	Solid red bright	Solid red dim	Off	Solid green	Off	* Solid red bright	Solid green	Solid red, dim	* Solid red bright
Repeater and slave linked to master, master sending data to slave	Solid red bright	Solid red dim	Off	Solid green	Off	* Solid red bright	Solid green	Solid red, dim	* Solid red bright
Repeater and slave linked to master, slave sending data to master	Solid green RCV data or Solid red bright	Solid red dim	Interm. flash red	Solid green	Interm. flash red	* Solid red bright	Solid green	Solid red bright	* Solid red bright
Master with diagnostics program running	Solid red bright	Solid red dim	Interm. flash red	Solid green	Interm. flash red	* Solid red bright	Solid green	Solid red bright	* Solid red bright
Setup Mode	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green

* In an idle condition, Clear to Send LED will be solid red with a solid link, as the link weakens the Clear to Send LED light on the Repeater and Slave will begin to flash.

Table 6-1: Point-to-Multpoint Operation LEDs

6.2 LED Operations on a Point-to-Point System

6.2.1 Point-to-Point operation LEDs

Table 6-2 lists the point-to-point operation LEDs for the 8410 WFT.

	Master			Slave			Repeater		
Condition	Carrier Detect (CD)	Transmit (TX)	Clear to Send (CTS)	Carrier Detect (CD)	Transmit (TX)	Clear to Send (CTS)	Carrier Detect (CD)	Transmit (TX)	Clear to Send (CTS)
Powered, not linked	Solid red bright	Solid red bright	Solid red bright	Solid red bright	Off	Blinking red	Solid red bright	Off	Blinking red
Linked, no repeater, sending sparse data	Solid green	Interm. flash red	Interm. flash red	Solid green	Interm. flash red	Interm. flash red	n/a	n/a	n/a
Master calling slave through repeater	Solid red bright	Solid red dim	Solid red bright	Solid red bright	Off	Blinking red	Solid red bright	Off	Blinking red
Master linked to repeater, not to slave	Flashing orange	Solid red dim	Solid red bright	Solid red bright	Off	Blinking red	Solid red bright	Solid red dim	Solid red bright
Repeater linked to slave	Solid green	Interm. flash red	Interm. flash red	Solid green	Interm. flash red	Interm. flash red	Solid green	Interm. flash red	Interm. flash red
Mode 6 – Waiting for ATD Command	Solid red bright	Off	Blinking red	Solid red bright	Off	Blinking red	n/a	n/a	n/a
Setup Mode	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green

Table 6-2: Point-to-Point Operation LEDs

7 Factory Default Settings

8410 WFTs are shipped from the factory with the following settings:

Operation Mode	Default
Point-to-Point Slave	1

Table 7-1: Operation Mode Setting

Set Baud Rate	Default
Point-to-Point Slave	1
Set Baud Rate	Default
Baud Rate	115200
(A) Data Parity	0
(B) Modbus RTU	0
(C) RS-232/RS-485	0
(D) Setup Port	3
(E) Turn Off Delay/ On Delay	0/0
(F) Flow Control	0

Table 7-2: Baud Rate Setting

Radio Parameters	Default
(0) FREQ KEY	5
(0) HOP TABLE VERSION	0
(1) HOP TABLE SIZE	112
(2) HOP FREQ OFFSET	0
(3) Frequency Zone	All 1's (Enabled)
(4) Government Rules	0
(1) MAX PACKET SIZE	8
(2) MIN PACKET SIZE	9
(3) XMT RATE	1
(4) RF DATA RATE	3
(5) RF XMT POWER	10
(6) SLAVE SECURITY	0
(7) RTS TO CTS	0
(8) RETRY TIMEOUT	255
(9) LOW POWER MODE	0
(A) High Noise	0
(B) MCU Speed	0
(C) Remote LED	0

Table 7-3: Radio Parameters Settings

Multipoint Parameters	Default
(0) NUMBER OF REPEATERS	1
(1) MASTER PACKET REPEAT	2
(2) MAX SLAVE RETRY	9
(3) RETRY ODDS	9
(4) DTR CONNECT	0
(5) REPEATER FREQUENCY	0
(6) NETWORK ID	255
(7) RESERVED	-
(8) MULTI MASTER SYNC	0
(9) 1 PPS ENABLE DELAY	255
(A) SLAVE/REPEATER	0
(B) DIAGNOSTICS	0
(C) SUBNET ID	"Disabled"
Rx ID	F
Tx ID	F
(D) RADIO ID	Not Set

Table 7-4: Multipoint Parameters Settings

8 Specifications

8.1 General

Item	Specification
Data Port	RS-232 and RS-485
Dimensions	See Figure 2-1 on page 7 for details
Power	• 110/120 VAC (AC Version) • 30 - 65 VAC and 6 - 90 VDC (Low Voltage Version)
Antenna	• N-type female connector (External antenna required) • SMA connector
FCC Identifier	KNY-42182112519
IC Identifier	2329B-FGR2

Table 8-1: General

8.2 Transmit

Item	Specification
Frequency	902 to 928 MHz
Output Power	10 mW to 1 W (+30 dBm). See RF transmit power settings.
Range	60 miles Line of Sight, 0 db antenna gain
Modulation	Spread spectrum GSK, 120 or 170 Kbps
Spreading method	Frequency hopping
Occupied bandwidth	230 kHz

Table 8-2: Transmit

8.3 Receive

Item	Specification
Frequency	902 to 928 MHz
Sensitivity	• -110 dBm at 10-4 bit error rate • -108 dBm at 10-6 bit error rate
Selectivity	• 20 dB at $f_c \pm 115$ kHz • 60 dB at $f_c \pm 145$ kHz
System gain	140 dB

Table 8-3: Receive

8.4 Data Transmission

Item	Specification
Data rate	• 115.2 Kbps sustained throughput* • 57.6 Kbps sustained throughput* with repeaters
Error detection	32-Bit CRC, retransmit on error
Data encryption	Substitution, dynamic key
Max Link throughput	Kbaud standard speed, 38.4 Kbaud low speed
Data interface	RS-232/RS-485 1200 Baud to 230.4k Baud, async, full duplex TTL (RF board-level only)

Table 8-4: Data Transmission

Note * At 100% receive success rate. RF data rate setting of 2.

8.5 Power Requirements

Item	Definition
Supply voltage	• 110/120 VAC (AC Version) • 30- 65 VAC and 6- 90 VDC (DC Version)
AC current	• 110/120 VAC: 500 mA
Transmit current, for 1 W power at 100% duty cycle	• 6 VDC: 1 A • 12 VDC: 500 mA • 30 VDC: 200 mA

Table 8-5: Power Requirements

8.6 Operating Environment

Item	Specification
Temperature	-40 °F to +167 °F (-40° C to +75° C)
Humidity	0 to 95% humidity non-condensing

Table 8-6: Operating Environment

9 Ordering Information

To order the 8410 Wireless Field Transceiver, use Varec model number N8410.

9.1 Order Codes

Figure 9-1 lists the order codes and their descriptions when ordering the 8410 WFT.

	Power Supply					
	A	110/220 VAC 50/60Hz				
	B	6 – 90 VDC and 30 – 65 VAC				
		Antenna Connection				
		S	RP-SMA			
		N	"N" Type Female			
			Antennas			
			Y6	Maxrad – Yagi – 6.4dB Gain, 14" N Female		
			Y9	Maxrad – Yagi – 9.0dB Gain, 20.5" N Female		
			OU	Ventech Omni – Unity Gain, 8" RP-SMA		
			O2	Maxrad Omni – Unity Gain, 14" N Female		
			O3	Maxrad Omni – 3dB Gain, 23" N Female		
			O5	Maxrad Omni – 5dB Gain, 48" N Male		
			O7	Maxrad –Omni – 7dB Gain, 96" N Male		
				Note: Yagi antennas provide increased RF range in one direction. Omni-Directional antennas provide 360 degree coverage for communication in any direction. Option OU mounts directly to the 8410. All other options require cabling and mounting.		
				Antenna Mounts		
				00	None	
				MY	Maxrad Yagi Mount	
				ML	Light Duty Mast Mount for under 30'	
				MT	Light Duty Mast Mount for over 30"	
				MH	Heavy Duty Mast Mount	
				MC	Cast Mount Bracket	
				MW	Wall Mount for Antennas over 30" (Two required)	
					Lightning Protection	
					0	None
					L	Cushcraft Inline Lightning Arrestor, 2x "N" Type Female Antenna
						Note: Antenna option "L" is not compatible with Antenna Connection "S", or Antenna "OU"
N8410-						**Complete product designation**

Table 9-1: 8410 WFT Order Codes

Document Code
IOM095GVAE4112

Varec, Inc. • 5834 Peachtree Corners East, Norcross (Atlanta), GA 30092 USA
Tel: +1 (770) 447-9202 • Fax: +1 (770) 662-8939
www.varec.com

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