RT 1000

Deployment Guide

January 31, 2012

Part Number: 90-0004

R03.h

wireless SEISMIC
Real Time Matters

Wireless Seismic, Inc.
13100 Southwest Freeway, Suite 150
Sugar Land, TX 77478
832.532.5080

To order additional copies of this document, send an email to your sales representative requesting the following:

- Part Number: 90-0004-PDF
- Part Number: 90-0004-Paper

Table of Contents

List of Figures

List of Tables

1 Overview

1.1 About this Guide

This document provides information on how to deploy the RT 1000 in the field.

1.2 Who Should Use this Guide

The expected users of this document are as follows:

- Crew (Layout/Troubleshooters)
- Technician (LTU)
- Bosses (Line Crew)

1.3 Related Documents

RT 1000-related documents are as follows:

- **"RT 1000 Documents Guide" (90-0001)** – Lists all of the RT 1000 documents with a brief description of each.
- **"RT 1000 Glossary" (90-0012)** – Lists and defines RT 1000 terms and acronyms. Includes some general seismic and geologic terms and acronyms.
- **Installation Guide (90-0003)** – TBD

1.4 Getting Help

To get help on the RT 1000 Central Recording System, consult the online help. You can find the help documents by clicking the help icon in the user interface, or by navigating to the following directory:

`C:\wsi\rt1000\vx.y\server\help\index.htm`

Where `vx.y` is the version number (for example, v1.3).

To get help on the RT 1000 deployment, consult this document.

If you cannot find the answers you need, please contact Wireless Seismic, Inc. Customer Support at:

13100 Southwest Freeway, Suite 150
Sugar Land, TX 77478
(832) 532-5048

support@wirelessseismic.com

2 Layout

This chapter describes how to prepare (mobilization) and layout (install) the ground electronics.

2.1 Prerequisites

In preparation for mobilization, define the following:

- Survey
- Backhaul plan
- TBD

2.2 Getting Ready

Collect all of the following:

NOTE

Please refer to "Antenna Specifications" on page 90 for the list of supported antennas. Use of accessories other than those specified in this document is not supported or warrantied.

- RT 1000 ground equipment (05-0002):
  - 1 Mbps WRUs (10-0001)
  - 5 Mbps WRUs (10-0017)

NOTE

You cannot mix 1Mpbs WRUs and 5Mbps WRUs in the same spread. You must use all of the same type.

  - LTUs (see *"3. Backhaul" on page 31*)

NOTE

The LTU includes the Base Station Unit (BSU), the Power over Ethernet (PoE), the battery, the backhaul, and the mast.

- One of the following antennas:
  - 9 dBi antenna (65-0067)
  - 7 dBi antenna (6060-001-01)
  - 5 dBi antenna (65-0023)
  - 2 dBi antenna (65-0025)
- Geophones
- WRU Batteries (0400-001-01)
- WRU Dummy Batteries (55-0009)
- Battery Charging System (10-0008)
- Battery Charger Shelf (10-0011) (optional)
- Antenna Extenders
- Fiber Backhaul
- Tools
- Manuals
- Consumables
- Spares (15-0003)
  - Mast Parts
  - Base Parts
  - Guy Lines
  - Antennas
  - Batteries
  - Cables
  - Connectors

NOTE

The batteries (when fully discharged) require 8 hours of continuous charging in the battery charger connected to an AC source; therefore, the battery charger will be located at the staging area or in town.

- Non-RT 1000 ground equipment:
  - Recording truck:
    - Power source (diesel, benzene or other type of fueled generator)
    - Heating, cooling and ventilation system
    - Antenna masts for voice radio, Data telemetry, source control, and possibly satellite phone and/or internet

  - Shock-mounted rack for PC, displays, servers, network devices, output devices, and so on
  - Thermal plotter or equivalent
  - Desk, chairs, small refrigerator, and coffeepot
  - Computer, monitors, keyboard, mice, and so on
  - External interfaces for installing and testing
- Safety equipment (vests, hard hats, and so on)
- Source controllers/Source Interface Unit (SIU)
- Any other third-party equipment
- Any other shot-related equipment
- Two-way radios

2.3 Preparing the Equipment

Ensure that the central recording system has the latest software available installed (see in the *RT 1000 Release Notes*).

Ensure that the ground equipment has the latest firmware available installed (see in the *RT 1000 Release Notes*).

Ensure that the industry standard best practices are followed for securing the equipment for transport.

2.4 Setting Up the Central Recording System

You can prepare the Central Recording System (CRS) hardware and software while the ground equipment is being placed in the field.

Set up the computer and peripheral equipment in the central recording system truck or trailer.

2.4.1 Setting up the Computer

Set up the CRS computer according to the instructions in the RT 1000 Installation Guide.

2.4.2 Connecting to the Source Controller

This section describes how to connect a source controller or Source Interface Unit (SIU) to the CRS. This release uses a Pelton Vib Pro™ source encoder/decoder.

See *“Central Recording Truck Components” on page 33* for an illustration of the connected components.

You must configure the following items on the Pelton Vib Pro:

- Interface card jumpers
  - Isolated remote start (J3, J4)
  - Negative-edge timebreak (J5, J6)
- Menu settings
  - **Start Delay** = 1000
  - **TimeBrk Act** = LOW
  - Make a note of the **VibratorID**. It must be entered as a parameter in the CSS. (MAIN MENU ⟶ 1. JOB PROFILE ⟶ 7. VibratorID)

NOTE

Detailed instructions on using the Pelton Vib Pro are beyond the scope of this document.

To connect and configure the Pelton Vib Pro:

1. Prerequisites:
   - The central recording system computer is installed
   - The CSS software is running
   - The Vib Pro is powered down
2. Open the back of the Vib Pro and remove the interface card. Use proper anti-static precautions.Refer to the Pelton documentation as necessary.

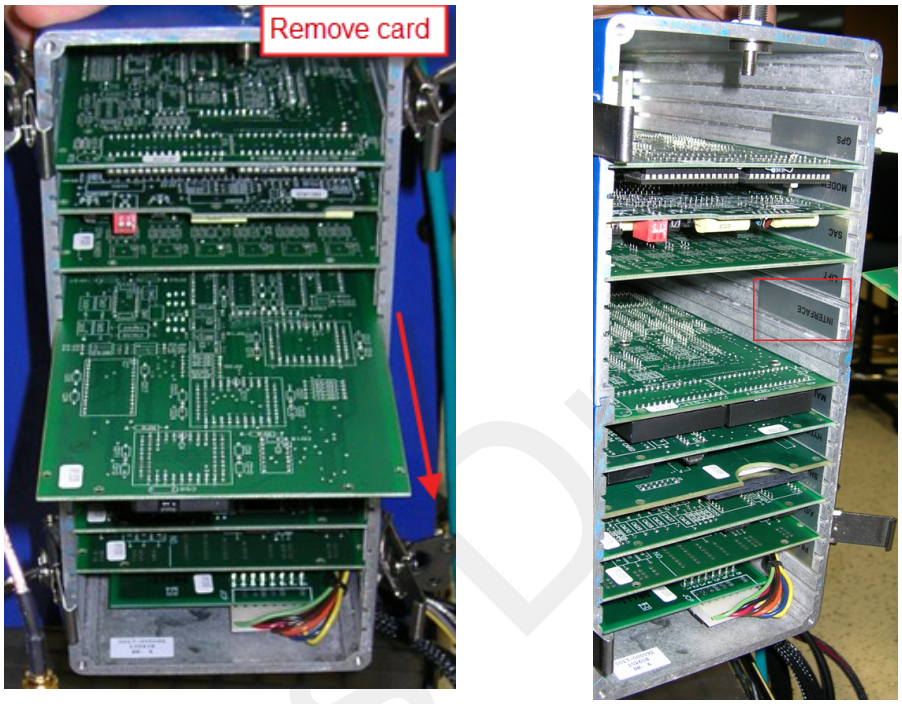

Figure 2–1 Pelton Vib Pro Interface Card in Slot

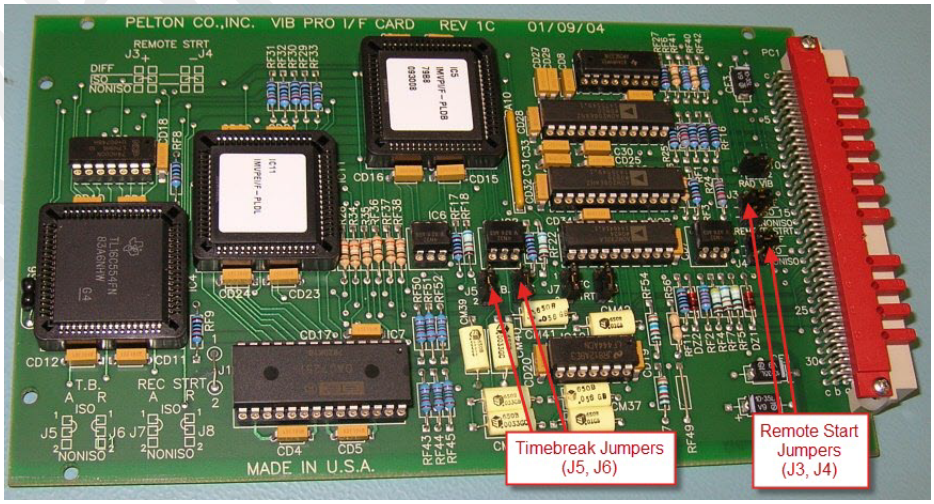

Figure 2–2 Pelton Vib Pro Interface Card

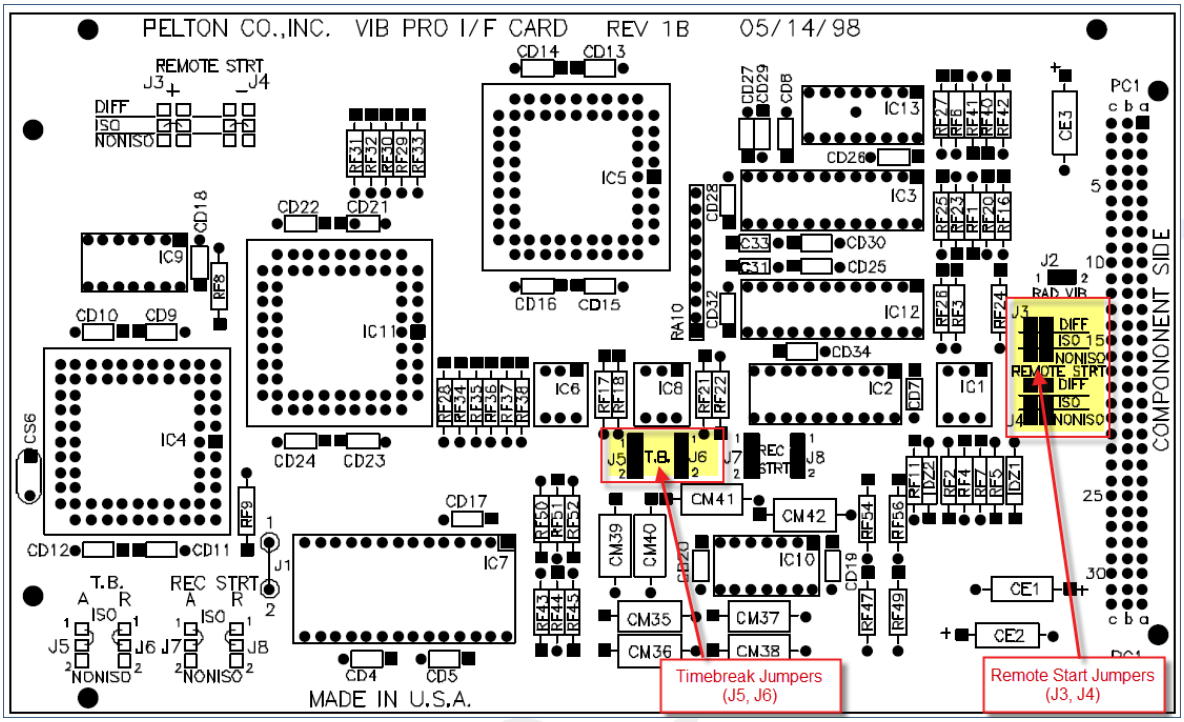

Figure 2–3 Pelton Vib Pro Interface Card Assembly Drawing

3 Connect the **Timebreak** and **Remote Start** jumpers as shown in the following figure:

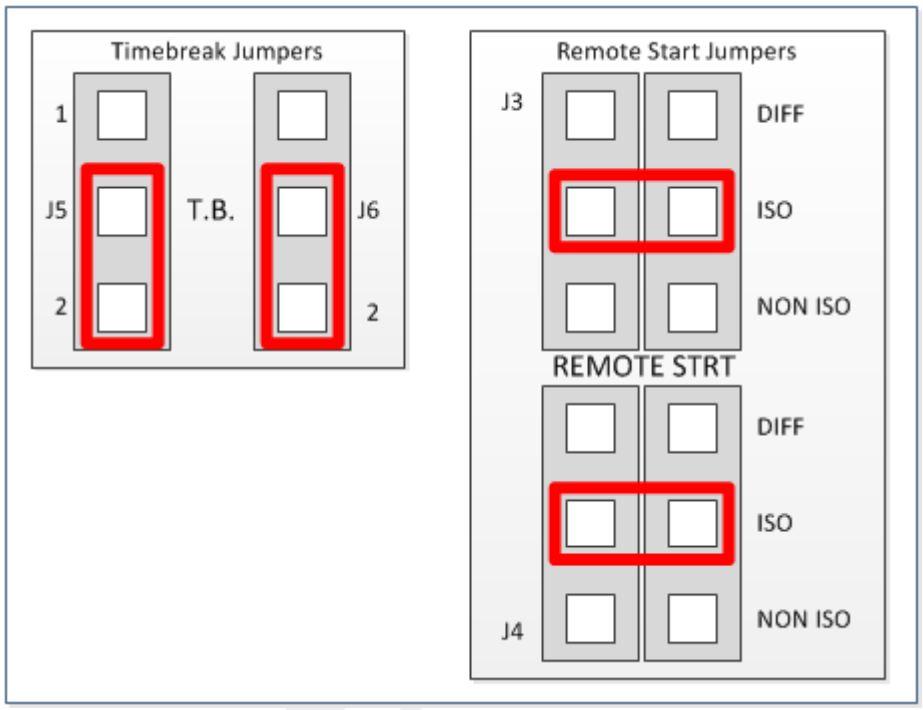

Figure 2–4 Pelton Vib Pro Jumpers

4 Slide the interface card into the Pelton Vib Pro and close the case.

5 Connect the Pelton analog output (JF: 27-pin connector) to the WRU's analog input (geophone connector) as shown in the following figures:

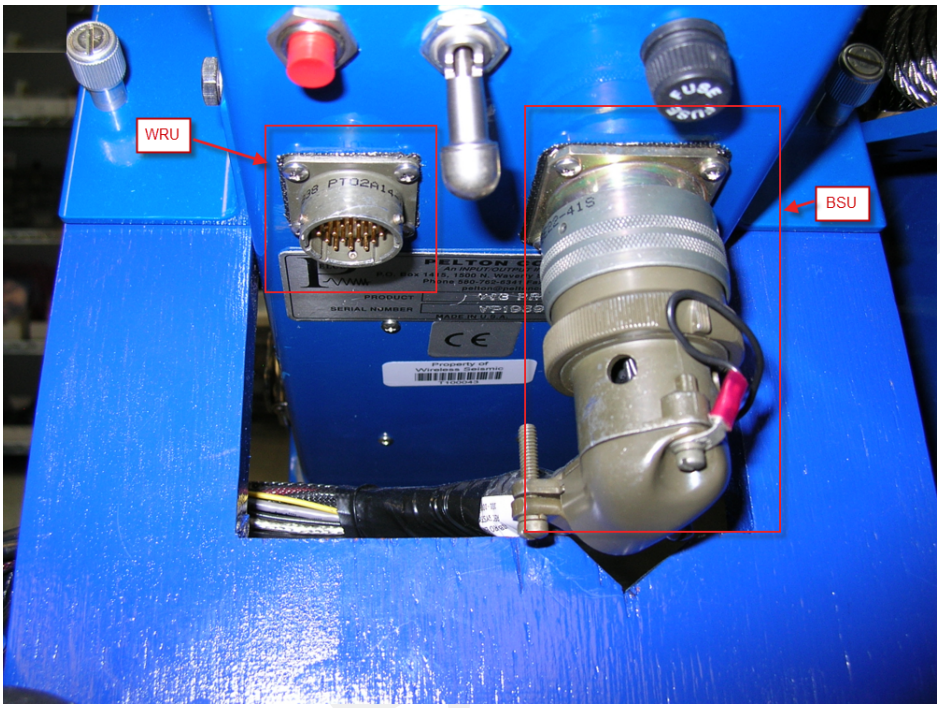

Figure 2–5 Pelton Analog Output Connection

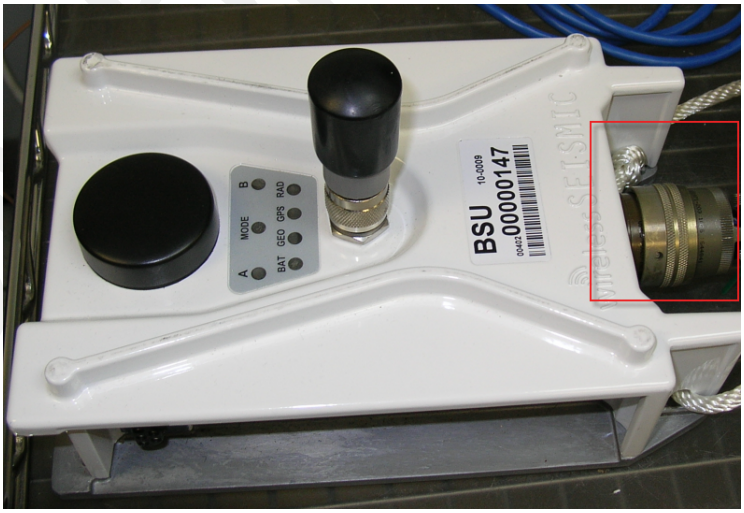

Figure 2–6 BSU Analog Input Connection

6 Connect the Pelton Vib Pro JE Connector to the WRU analog input (geophone connector).

7 Power on the Pelton Vib Pro.

8 Set **TimeBrk Act=LOW**
(Start ⟶ Menu (B) ⟶ MORE ⟶ 15. HARDWARE SETUP ⟶ 1. TimeBrk Act : HIGH).

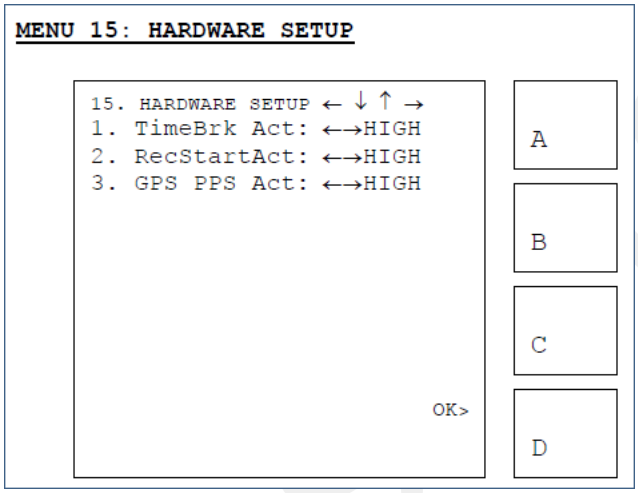

Figure 2–7 Pelton Vib Pro TimeBrk Act

9 Set the **Start Delay=1000**
(Start ⟶ Menu (B) ⟶ MORE ⟶ 10. RADIO ⟶ 11. StartDelay : 01000).

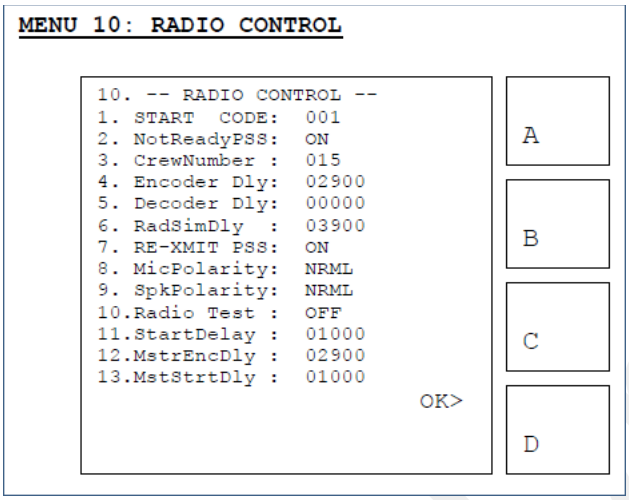

Figure 2–8 Pelton Vib Pro StartDelay

2.4.3 Source Interface Cables

The following table and figure show the cable used to connect the Pelton Vib Pro to the BSU and WRU.

Table 2–1 PELTON SOURCE CONTROL (60-0015) Cable Pin List

Signal Name	Wire Color	27-Pin Connector	RJ45 Plug	18-Pin Connector	2-Pin Connector
TX+	WHT/ORG * (WHT/GRN)	R	1	—	—
TX-	ORG * (GRN)	P	2	—	—
RX+	WHT/GRN * (WHT/ORG)	N	3	—	—
RX-	GRN * (ORG)	M	6	—	—
5V EXTERNAL NON ISO START	BLU	B	—	J	—
EXTERNAL START RETURN	GRN	A	—	K	—
5V TRIGGER IN 1	BRN	K	—	G	—
TRIGGER 1 RETURN	WHT	X	—	H	—

Table 2–1 PELTON SOURCE CONTROL (60-0015) Cable Pin List (cont.)

Signal Name	Wire Color	27-Pin Connector	RJ45 Plug	18-Pin Connector	2-Pin Connector
PWR	WHT/BLU (WHT/BLU)	b	5	—	—
PWR	BLU (BLU)	c	4	—	—
GND	WHT/BRN (WHT/BRN)	a	7	—	—
GND	BRN (BRN)	d	8	—	—
INPUT +	RED	—	—	—	N
INPUT -	BLU	—	—	—	U or A

WHT = White, ORG = Orange, GRN = Green, BLU = Blue, BRN = Brown, BLK= Black, YEL = Yellow
* Connect per Pin Numbers
Wire colors in parenthesis are for Ethernet cable wired per T-586A standard.

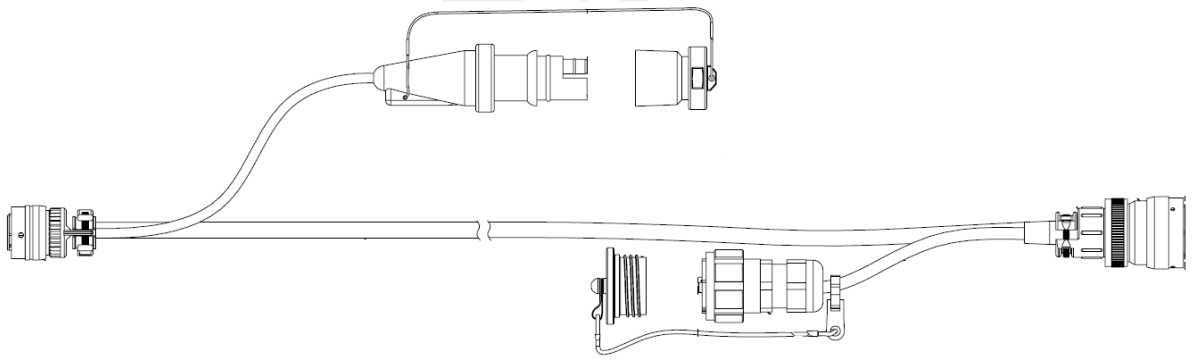

Figure 2–9 PELTON SOURCE CONTROL (60-0015) Cable

2.4.4 Trigger Pin-Outs

The following tables show the signals on each pin for the three possible cables used to connect a trigger to the CSS computer:

Table 2–2 BSU DATA-POWER (60-0007) Cable Pin List

Signal Name	Wire Color	27-Pin Connector	Twisted Pair
TX+	WHT/ORG * (WHT/GRN)	R	Twisted Pair
TX-	ORG * (GRN)	P	
RX+	WHT/GRN * (WHT/ORG)	N	Twisted Pair
RX-	GRN * (ORG)	M	
5V EXTERNAL NON ISO START	RED	B	Twisted Pair
EXTERNAL START RETURN	BLK	A	
EXT START ISO OUT	BLU	E	Twisted Pair
EXT START ISO RETURN	BLK	U	
5V TRIGGER IN 1	RED	K	Twisted Pair
TRIGGER 1 RETURN	WHT	X	
PWR	RED	b	
PWR	RED	c	
GND	BLK	a	
GND	BLK	d	

WHT = White, ORG = Orange, GRN = Green, BLU = Blue, BRN = Brown, BLK= Black, YEL = Yellow

* Connect per Pin Numbers

Wire colors in parenthesis are for Ethernet cable wired per T-586A standard.

The following cable (60-0004) has not yet been implemented.

Table 2–3 SIU Source Control (60-0004) Cable Pin List

Signal Name	Wire Color	27-Pin Connector
5V0 EXTERNAL START	RED	B
EXT. START RETURN	BLK	A
RS232 TX OUT	WHT	C
RX/TX RETURNS	BLK	S
RS232 RX IN	GRN	D
RX/TX RETURNS	BLK	T
EXT START ISO OUT	BLU	E
EXT START ISO RETURN	BLK	U
GND DIG (JUMPTRACK NO)	YEL	F
GND DIG (JUMPTRACK NO)	BLK	G
5V0 TRIGGER IN 3	BRN	H
TRIGGER RETURN	BLK	V
5V0 TRIGGER IN 2	ORG	J
TRIGGER RETURN	BLK	W
5V0 TRIGGER IN 1	RED	K
TRIGGER RETURN	WHT	X
—	—	L
TX+	WHT/ORG* (WHT/GRN)	R
TXN	ORG* (GRN/WHT)	P
RX+	WHT/GRN* (WHT/ORG)	N
RXY	GRN* (ORG/WHT)	M
—	—	Y
—	—	Z
PWR	RED	c
PWR	RED	b

Table 2–3 SIU Source Control (60-0004) Cable Pin List (cont.)

Signal Name	Wire Color	27-Pin Connector
GND	BLK	a
GND	BLK	d
WHT = White, ORG = Orange, GRN = Green, BLU = Blue, BRN = Brown, BLK= Black, YEL = Yellow * Connect per Pin Numbers Wire colors in parenthesis are for Ethernet cable wired per T-586A standard.		

The following cable (60-0012) has not yet been implemented.

Table 2–4 BSU at Recording Truck (60-0012) Cable Pin List

Signal Name	Wire Color	27-Pin Connector
TX+	WHT/ORG * (WHT/GRN)	R
TX-	ORG * (GRN/WHT)	P
RX+	WHT/GRN * (WHT/ORG)	N
RX-	GRN * (ORG/WHT)	M
PWR	WHT/BLU (WHT/BLU)	b
PWR	BLU (BLU)	c
GND	WHT/BRN (WHT/BRN)	a
GND	BRN (BRN)	d
Free Leads		
5V EXTERNAL NON ISO START	BLU	B
RETURN EXTERNAL NON ISO START	GRN	A
5V TRIGGER IN 1	BRN	K
TRIGGER 1 RETURN	WHT	X

Table 2–4 BSU at Recording Truck (60-0012) Cable Pin List (cont.)

Signal Name	Wire Color	27-Pin Connector
WHT = White, ORG = Orange, GRN = Green, BLU = Blue, BRN = Brown, BLK= Black, YEL = Yellow * Connect per Pin Numbers Wire colors in parenthesis are for Ethernet cable wired per T-586A standard.		

2.5 Laying Out the Equipment

You can lay out the ground equipment while the central recording system hardware and software is being prepared.

The WRU is shown in the following figure:

Illustration TBD

Figure 2–10 WRU

The BSU is shown in the following figure:

Illustration TBD

Figure 2–11 BSU

An example geophone is shown in the following figure

Illustration TBD

Figure 2–12 Geophone

2.5.1 Prerequisites

You can attach the batteries, antennas, and geophones to the ground equipment prior to going into to the field, or as you place each unit. If you are assembling as you place the units, ensure that you have sufficient quantities for each unit, plus a few spares.

The RT 1000 shall be used with only the supplied antennas (*Table A–1 Antenna Specifications, on page 90*) attached to the WRU with an integrated type N male connector.

- The RT 1000 antennas shall be installed and handled by professionals specifically designated for this purpose.
- Changes or modifications not expressly approved by Wireless Seismic, Inc. can void the users's authority to operate the equipment.

WARNING

In order to comply with FCC radio frequency (RF) exposure requirements, the RT 1000 units must be installed so that a minimum separation distance of 20 cm is maintained between the antenna(s) and all persons at all times during normal operation.

WARNING

AVERTISSEMENT

Afin de se conformer aux normes de la FCC en matière d'exposition aux radiofréquences (RF), les unités RT 1000 doivent être installées de manière à garder en permanence une distance minimale de 20 cm entre la ou les antennes et toute personne en mode de fonctionnement normal.

2.5.2 Assembling the Ground Equipment

This section describes the process to assemble the ground equipment prior to deployment.

To assemble the ground equipment:

1. Gather the equipment:
   - WRU or BSU
   - Antenna
   - Geophone
   - Batteries
2. Gather any special tools:
   - Optional: Nylon grip pliers
   - Optional: Loctite® 222
3. Attach one or more batteries to the WRU.
   - Press the battery into the connector.
   - Flip the bail over the molded area on the end of the battery.
   - Press the lever until the catch snaps to lock it in place.

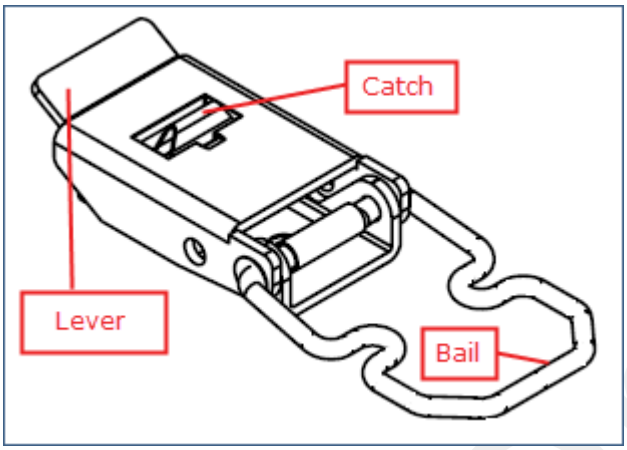

Figure 2–13 Battery Latch

Figure 2–14 Installing the Battery

4 Attach the geophone to the WRU.

Figure 2–15 Installing the Geophone

5 Attach the antenna to the WRU or BSU. Ensure that the antenna connection is clean, and the antenna is snug and does not wobble.

TBD

Figure 2–16 Installing the Antenna

TIP

When determining which antenna to use (5 dBi, 7 dBi, 9dBi), consider the distance between WRUs, and how much vegetation is in the area.

For distances of 10 m to 30 m, use a 5 dBi antenna.

Distances of 30 m or greater, use a 7 dBi antenna.

For sudden elevation changes, such as cliffs, use a 2 dBi or 5 dBi antenna.

In special situations such as tall grass and dense vegetation, or distances of 55 m or greater, use a 9 dBi antenna.

2.5.3 Placing the WRU in the Field

This section describes the process to ready the ground equipment for interaction with the central recording system (deployment).

To deploy the WRU:

1 Prerequisites:

- The WRU is assembled with battery, geophone, and antenna

NOTE

If you are using a WRU as a Repeater, the deployment instructions are the same, except a geophone is not required. Repeaters are added to the line segment in the Spread Manager. See the RT 1000 Operator Guide for more information.

If a geophone is not connected, you can skip the geophone test. See "D. LED Indicators" on page 100 for more information on skipping the test and the relevant LED status indicators.

2 Pick up the WRU and point the geophone connector end towards the ground as shown in the following figure. After a few seconds, all of the LEDs illuminate:

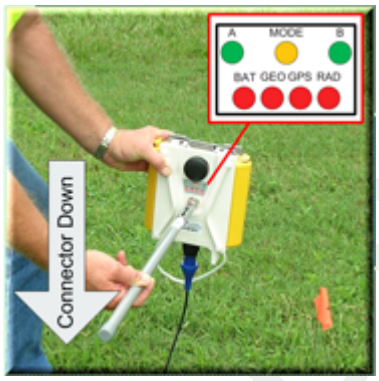

Figure 2–17 Power on the Unit

3 Place the unit flat on the ground as shown in the following figure:

Figure 2–18 Place the Unit

4 The unit will begin a series of internal and external tests. The LEDs on the top of the unit indicate the current test and whether the unit passes or fails each test.

NOTE

See *"D. LED Indicators" on page 100* for an explanation of the LED status and error conditions.

If a WRU self test fails, the WRU will continue to the next test.

You can skip a self-test by tipping the WRU geophone down and then returning it to the upright position (flat on the ground).

2.5.4 Placing the BSU in the Field

The BSU is part of the backhaul configuration. See *"3. Backhaul" on page 31* for more information.

3 Backhaul

3.1 Overview

In network communications, the *backhaul* is the part of the network that contains the links and equipment between the core network and the sub networks.

Wireless mesh networking is a method where each radio node in the network captures and disseminates its own data as well as serves as a relay for other radio nodes in the network sending data along a path, *hopping* from one node to the next.

Power over Ethernet (PoE) is a technology that passes electrical power along an Ethernet cable. PoE is used where DC power is not available and USB unsuitable. Power can be supplied at the end of a network span or somewhere in the middle. PoE *switches* supply power at the end of a span. PoE *injectors* supply power somewhere between the PoE switch and the powered device. They inject power and do not affect the data.

The RT 1000 Central Recording System is a fully connected mesh network of Wireless Remote Units (WRUs) that communicate in a relay pattern (bucket-brigade or string-of-pearls) with a Line Tap Unit (LTU) on the 2.4 GHz Industrial, Scientific, and Medical (ISM) radio band.

The LTU is composed of the following:

- Base Station Unit (BSU)
- Power over Ethernet (PoE)

CAUTION

Ensure that the PoE box is placed on the ground, or that a grounding cable is attached to avoid causing damage to the internal electronics during use.

- 24 Ah DC Battery or Power Supply
- Cables
- Mast, mast base, and guy-wires
- 5.8 GHz backhaul radios
- Antennas

The LTU communicates by way of the BSU with the Central Software System (CSS) computer in the central recording truck along a backhaul on the 5.8 GHz ISM radio band. Some smaller systems may not require a backhaul.

The Central Software System (CSS) communicates with the field units via the backhaul radios. The backhaul radios act as access points for the BSUs.

The following figure illustrates the possible LTU components:

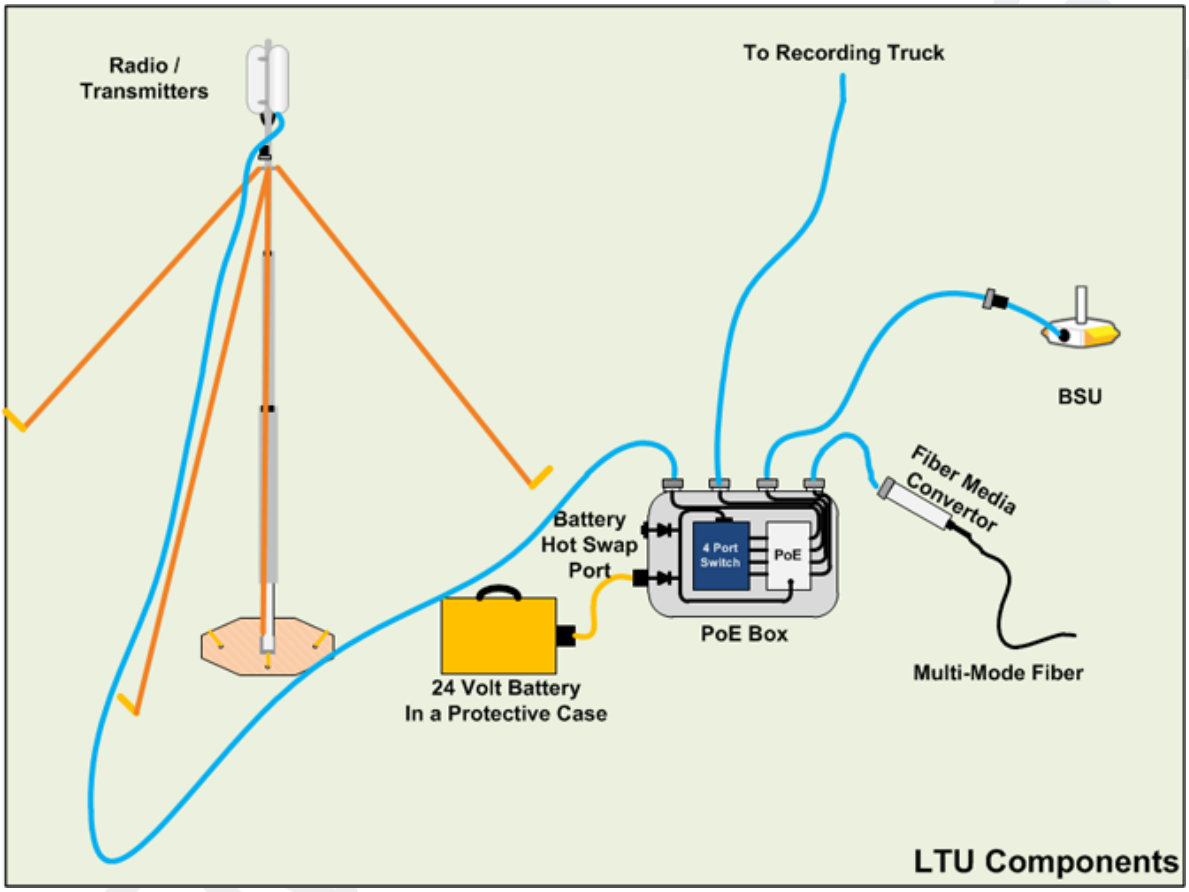

Figure 3–1 Possible LTU Components

The following figure illustrates the central recording truck components:

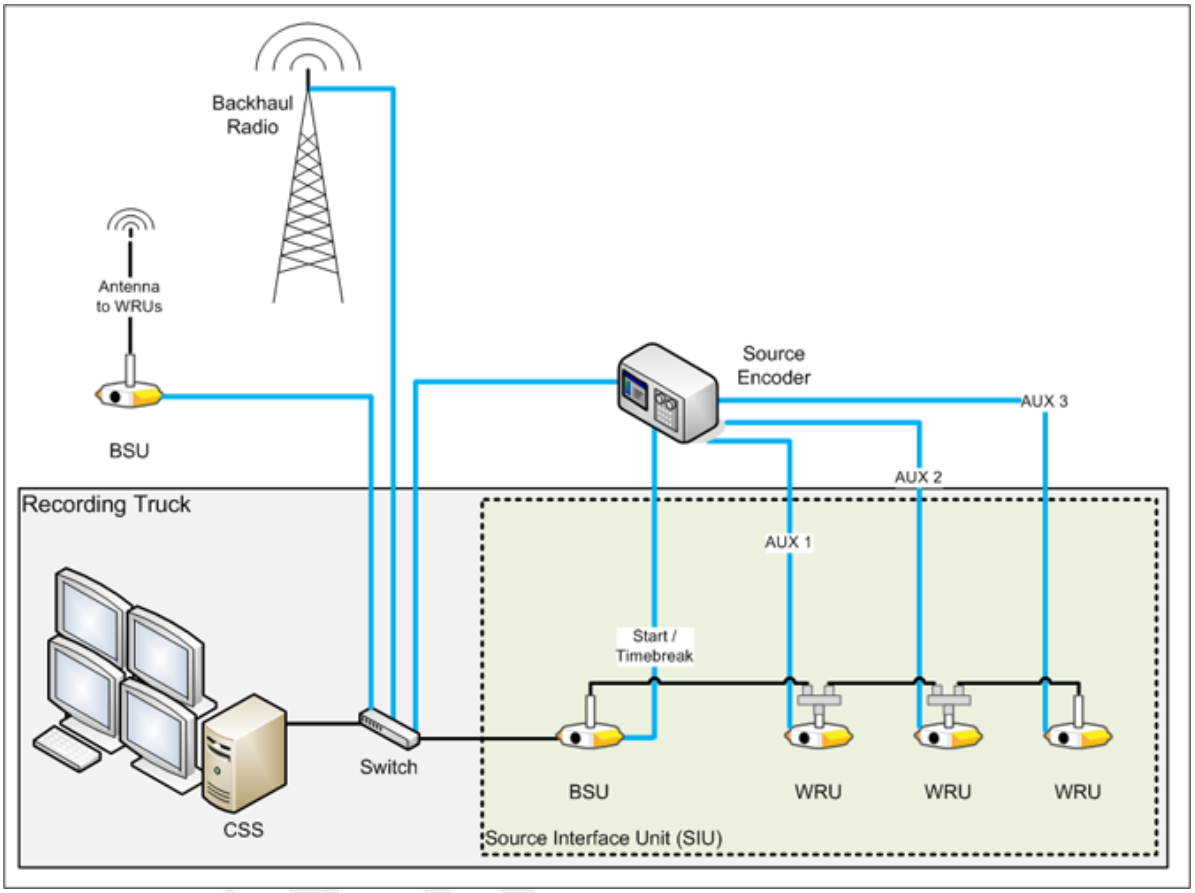

Figure 3–2 Central Recording Truck Components

NOTE

There can be from one to three WRUs in the Recording Truck as part of the SIU.

The following figure illustrates the components and data flow for a four-line, single-backhaul line with two root nodes example:

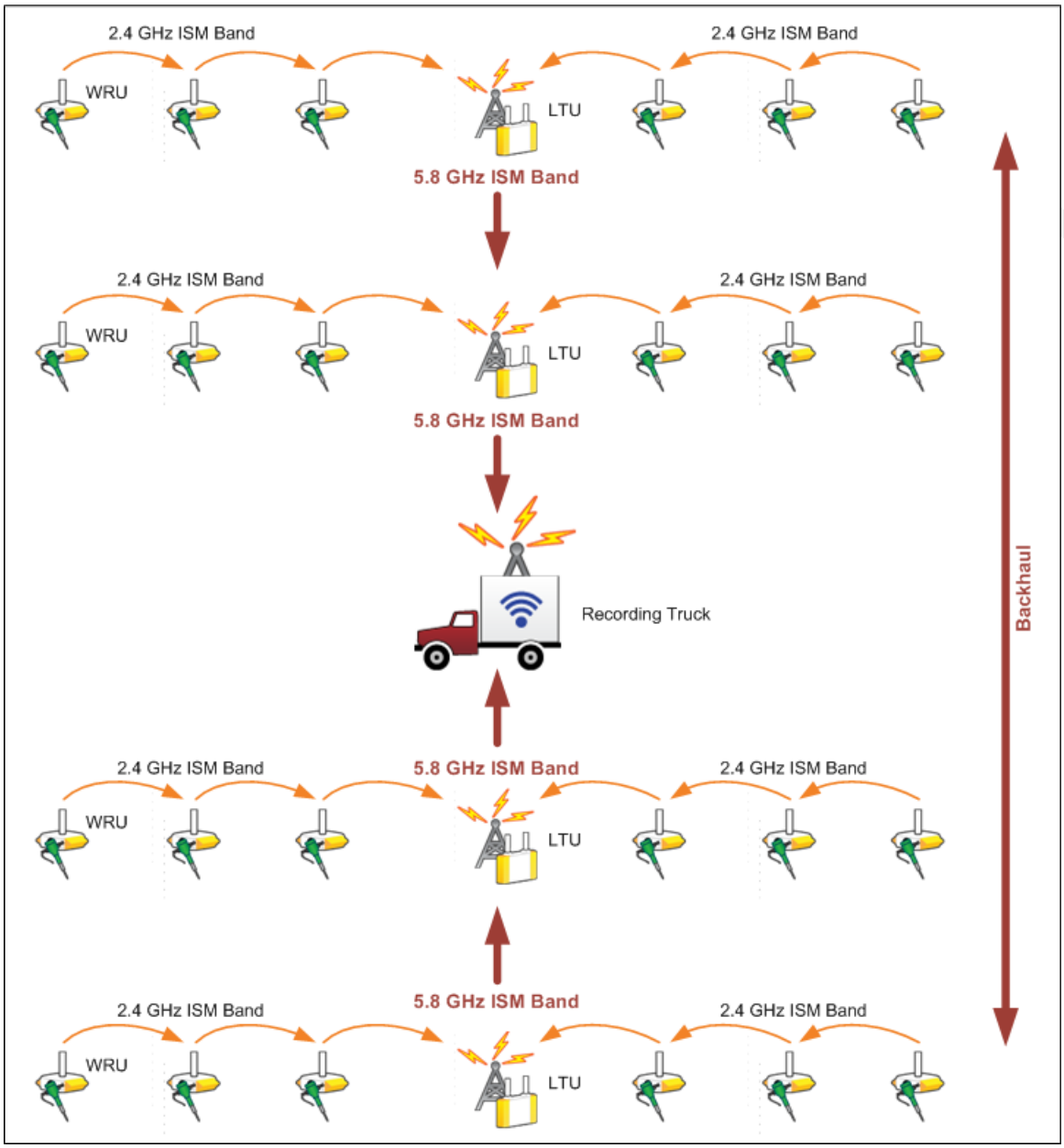

Figure 3–3 Single Backhaul Data Direction

3.2 Backhaul Components

The backhaul components are either *remote* backhaul components or *central* backhaul components. Remote components are the components that are not physically located next to the recording truck. Central components are physically located at the recording truck. Both remote and central backhauls are composed of the following:

- Base Station Unit (BSU) Kit
- Antenna
- Radio Kit
- Mast Kit

The following figure shows the backhaul components packed for transport:

TBD

Figure 3–4 Backhaul Components Packed for Transport

3.2.1 BSU Components

The following table lists the BSU kit components:

Table 3–1 Base Station Unit Kit

Remote Backhaul Components		Central Backhaul Components	
Item	**Reference**	**Item**	**Reference**
BSU (10-0009)	*"BSU" on page 35*	BSU (10-0009)	*"BSU" on page 35*
PoE Switch Unit (10-0012)	*"PoE Switch Unit" on page 36*	PoE Switch Unit (10-0012)	*"PoE Switch Unit" on page 36*
Battery (10-0015)	*"Battery and Power Supply" on page 37*	Power Supply, 24 V (75-0017)	*"Battery and Power Supply" on page 37*
Cable Assembly, BSU-to-PoE Switch (60-0008)	*"Cables" on page 38*	Cable Assembly, BSU at truck (60-0012)	*"Cables" on page 38*
Cable, PoE Switch-to-Battery (60-0011)	*"Cables" on page 38*	Cable, Power Supply-to-PoE (# TBD)	*"Cables" on page 38*
		Ethernet Cable, 25 ft (65-0046)	*"Cables" on page 38*

3.2.1.1 BSU

The Base Station Unit (BSU) is shown in the following figure:

Figure 3–5 Base Station Unit (BSU)

Before the Central Software System can communicate with the BSU, you must set up the backhaul.

NOTE

See "D. LED Indicators" on page 100 for an explanation of the LED status and error conditions.

3.2.1.2 PoE Switch Unit

Power over Ethernet (PoE) is a technology that passes electrical power along an Ethernet cable. PoE is used where DC power is not available and USB unsuitable.

Power can be supplied at the end of a network span or somewhere in the middle. PoE switches supply power at the end of a span. PoE injectors supply power somewhere between the PoE switch and the powered device. They inject power and do not affect the data.

The PoE is shown in the following figure:

Figure 3–6 PoE

3.2.1.3 Battery and Power Supply

Power is supplied to the LTU components by way of a 24 Ah DC battery or power supply.

TIP

The backhaul power requirements vary depending on the hardware in use and period of use. For example, you may be using one or two radios. Supply enough power to ensure there is enough power for the entire duration of the time you are using the backhaul.

A 24 Ah battery is adequate if a recharged battery is installed for every 12 hours of use.

Wireless Seismic, Inc. recommends using a protective battery case as shown in the following figure:

Figure 3–7 Protective Battery Case

3.2.1.4 Cables

The following cables are used in the backhaul:

- BSU-to-PoE Switch 27-pin to RJ45 (60-0008)
- BSU at Recording Truck 27-pin to RJ45 (60-0012)
- PoE Switch-to-Battery 2-pin to 2-pin (60-0011)
- Power Supply-to-PoE (# TBD)
- Ethernet Cable, 25 ft (65-0046)
- TBD – Fiber Optic Cable

To ensure a protected connection, be sure to use an Ethernet cable with a protective shell (65-0051) when connecting Ethernet cables to the PoE. An example is shown in the following figure:

Figure 3–8 Protective Ethernet Connector

3.2.2 Antennas

The following table lists the supported antennas for the BSUs and the WRUs. The remote and central backhauls use the same antennas:

Table 3–2 Antenna Specifications

Model	Frequency (MHz)	Gain	Vertical Bandwidth	Weight	Dimension (Length x Diameter)
WSI 65-0067	2400-2485	9 dbi	14°	0.8 lbs 0.5 kg	27 x 0.6 in 690 x 15 mm
WSI 6060-001-01	2400-2485	7 dBi	18°	0.6 lbs 0.3 kg	21 x 0.6 in 540 x 15 mm
WSI 65-0023	2400-2485	5 dBi	25°	0.5 lbs 0.2 kg	12 x 0.6 in 355 x 15 mm
WSI 65-0025	2400-2485	2 dBi @ 2.4	120°	1.6 oz 45.4 g	7.6 x 0.5 in 193 x 12.7 mm

The Fluidmesh radios have built-in antennas (see *"Radio Kit Components" on page 39* for details).

There is an *auto-power-leveling* feature built into the firmware. It works in conjunction with the RSSI parameters to keep the power at a defined level.

3.2.3 Radio Kit Components

The following table lists the Radio Kit components:

Table 3–3 Radio Kit

Remote Backhaul Components		Central Backhaul Components	
Item	**Reference**	**Item**	**Reference**
Radio, Fluidmesh® FM1100 (75-0014)	*"FM1100 Radio" on page 40*	Radio, Fluidmesh® FM3100 (75-0014)	*"FM1100 Radio" on page 40*
Software, Fluidmesh® FM1100-30 (47-0006)	*"FM3100 Radio" on page 41*	Software, Fluidmesh® FM3100-30 (47-00067)	*"FM3100 Radio" on page 41*

Refer to the Fluidmesh datasheet for FCC information and other technical specifications on the FM1100 and FM3100 radios. See one of the following locations for details:

- http://www.fluidmesh.com/press-room/product-literature/doc_details/160-fluidmesh-mito-series
- *"C. Fluidmesh Radio Specifications" on page 94*

The Fluidmesh radios can operate on at 4.9 GHz, and 5.1 - 5.8 GHz. The preferred frequency is configured through a user interface (see *"Configure the Radios" on page 46* for instructions).

Each radio is assigned a color that represents the channel assignment, allowing field personnel to quickly orient the radios in the proper direction. An example is shown in the following figure:

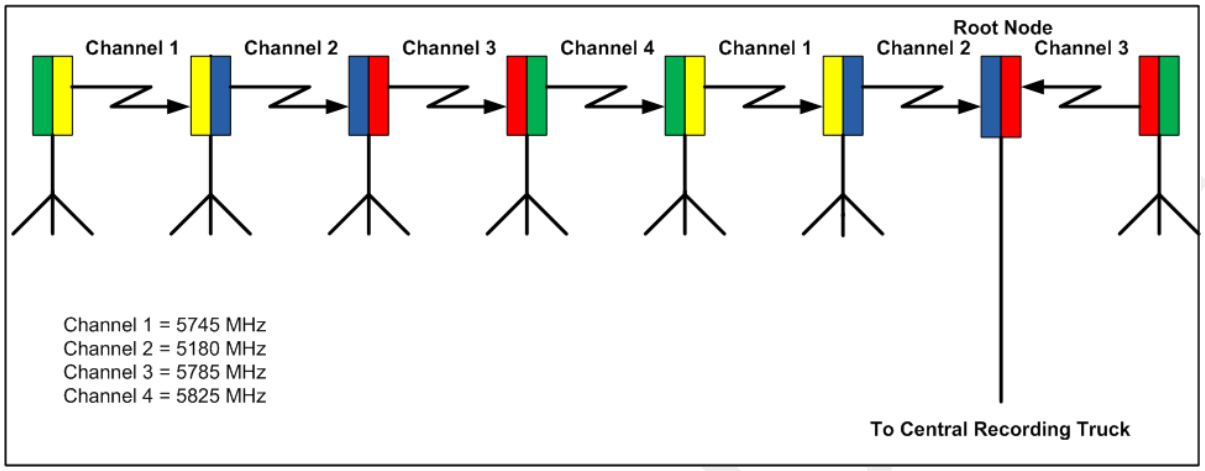

Figure 3–9 Channel Color Example

The Fluidmesh default IP address is 192.168.0.10.

3.2.3.1 FM1100 Radio

The FM1100 radio is used on the masts for the remote backhauls and is shown in the following figure:

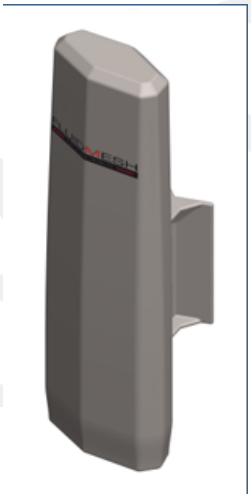

Figure 3–10 FM1100 Radio