RT 1000

Deployment Guide

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R01

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Preliminary

wireless SEISMIC

When Real-time Matters

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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 following table describes the typical seismic data acquisition users. The expected users of this document are as follows:

- Crew (Layout/Juggies)
- Technician (LTU)
- Troubleshooter
- Bosses (Line Crew)

Table 1–1 Roles and Responsibilities

Role	Responsibility
Bosses (Line Crew)	Responsibilities: • Supervise line crew personnel (juggies) • Drive and maintain the trucks used to transport personnel and equipment to and from field operations • Co-ordinate crew members boarding and exiting helicopters • Arrange the safe and orderly transport of equipment. Reports to: • Coordinator (Staging) **NOTE:** May occasionally visit the doghouse for clarification of instructions or updates on line status.

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Table 1–1 Roles and Responsibilities (cont.)

Role	Responsibility
Coordinator (Staging Coordinator / Landing Zone (LZ) Coordinator)	Responsibilities: • Journey management of all vehicles (including helicopters) and personnel to specific points within the prospect • Knowledge of all personnel in the prospect; knows when anyone enters or leaves the prospect, and where they go when they are there • Ensures that ground electronics (bag drops) arrive at the proper location • Controls inventory and general maintenance of equipment • Maintains constant contact with the crew and recorder • Oversees the testing of fresh equipment to be staged for the next layout. Reports to: • TBD **NOTE:** This role may be split in two, one person coordinating helicopter operations, and the other coordinating all line crew operations.
Coordinator (Survey)	Responsibilities: • Manages the survey crews. Survey work takes place in advance of the seismic crew, sometimes weeks or even months ahead of seismic crew mobilization. • Attempts to flag or stake every point starting with the *planned* receiver and source coordinates (delivered by the Oil Company Geophysicist or Birddog) • Adjusts flags or stakes when necessary based on physical accessibility (whether or not a vibrator or drill rig can get to a location), permitted corridor, and archeological or wildlife exclusion zones • Flags all access points and roads (in cooperation with the Staging Coordinator) • Delivers the *actual* coordinates to the Observer to be loaded into the Central Recording System • Provides updates to these coordinates during the project if ground conditions or permit conditions change • Ensures that the Central Recording System is configured with the correct datum and projection information Reports to: • TBD
Crew (Layout/Juggies)	Responsibilities: • Lay out the ground electronics • Pick up the ground electronics Reports to: • TBD

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Table 1–1 Roles and Responsibilities (cont.)

Role	Responsibility
Crew (Source)	Responsibilities: • Operators drive the vibrator trucks • Licensed shooters set off the dynamite • All crew remain in constant voice and data communication with the recorder during production **NOTE:** The source on a land seismic survey is usually either vibroseis or dynamite. Other source types such as poulter charges, accelerated weight drops, or shotguns may be used as well. One job may have multiple source types due to access or permit issues, such as steep slopes, masonry construction, and so on. Reports to: • TBD
Drillers	Responsibilities: • Drill source holes • May also load charge into the hole Reports to: • TBD
Geophysicist (Oil Company)	Responsibilities: • Survey design • Budget • Delivery of the final data to the Oil Company • Makes final decisions on recording parameters with the help of the Birddog • Visits the field once or twice during the project • Works closely with the Birddog to protect the interests of the Oil Company **NOTE:** The Geophysicist likely works on either an asset team responsible for oil or gas production in the field where the seismic shoot is taking place, or on a technical team responsible for all the company's seismic activity. Reports to: • TBD
HSE Manager	Responsibilities: • Ensures the health and safety of every person on the prospect • Ensures there is minimal environmental impact • Verifies that all environmental regulations are followed • Maintains any medical facilities in the field, such as a small first-response clinic or ambulance • Visits the Doghouse infrequently • Helps with the HSE component of the daily and final reports Reports to: • TBD

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Table 1–1 Roles and Responsibilities (cont.)

Role	Responsibility
Observer	Responsibilities: • Primary operator of the Central Recording System • Works in the Doghouse full-time • Coordinates all field activities during production • Monitors the status of the ground electronics • Organizes troubleshooting activities • Performs daily and monthly equipment tests • Controls source activation (vibrators, dynamite, and others) • Ensures the quality of the recorded data • Documents the recording operations • Determines, with the Staging Manager, which ground electronics need to be laid out and picked up in advance of or following source production • Remains aware of contractual obligations and works with the Crew to enforce them Reports to: • TBD
Observer (Junior/JO)	Responsibilities: • Usually an Observer-in-training, and will take over the Observer's role when the Observer is taking a break • May also be the primary user of the voice radios in coordinating the operations • Works in the Doghouse nearly full-time Reports to: • TBD
Observer (Senior/SO)	Responsibilities: • Supervises overall seismic operations in the absence of the Party Manager Reports to: • TBD
Office Clerk	Responsibilities: • Maintains an office in the hotel or camp • Coordinates shipping to and from the field • Coordinates data delivery • Reports on deliveries • Meets with the Party Manager, Observer, and HSE manager at the end of each shift to provide detailed information for daily reporting Reports to: • TBD

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Table 1–1 Roles and Responsibilities (cont.)

Role	Responsibility
Oil Company representative (Birddog)	Responsibilities: • Makes independent observations and reports directly to the Oil Company, acting as oversight • Ensures that the contract is followed and that the seismic crew is always acting in the best interest of the Oil Company • A frequent visitor to the doghouse, keeps informed on all HSE and production statistics by *over-the-shoulder* observation of and conversations with the Observer • Often walks the line to ensure that geophones are properly coupled to the ground (*planted*), and ensures that the Observer is performing regular Quality Control (QC) of noise, leakage and geophone response (used to detect bad plants). Reports to: • Oil Company **NOTE:** The Birddog is either an employee of the Oil Company or is contracted directly by the Oil Company. He is often trained as a Geophysicist, and has frequently worked as an Observer, surveyor, or party chief in the past.
Party Manager / Party Chief	Responsibilities: • Leads the seismic crew; responsible for all operations • Acts as the primary point of contact for the Birddog • Maintains awareness of all HSE and data quality activities • Maintains focus on maximizing production and minimizing costs • A frequent visitor to the doghouse, keeps informed on all HSE and production statistics by *over-the-shoulder* observation of and conversations with the Observer Reports to: • TBD
Technician (LTU)	Responsibilities: • Builds and maintains the backhaul network using a ruggedized laptop or tablet PC running the Hardened Rib Application (HRA). This application has some of the functionality of the CSS, but streamlined for use as a troubleshooting tool. • In frequent communication with the Doghouse Reports to: • TBD

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Table 1–1 Roles and Responsibilities (cont.)

Role	Responsibility
Technician (Vibrator)	Responsibilities: • Maintains the mechanical and electronic health of the vibrators • Visits the Doghouse at job startup to set up the source controller communications and parameters • Returns to the Doghouse as maintenance requires Reports to: • TBD
Troubleshooters	Responsibilities: • Frequently visits the Doghouse to obtain a troubleshooting report (either printed or a file that can be loaded to a GPS device), which contains line/station numbers of failures as well as verbal instructions from the Observer. • Corrects ground equipment failures Reports to: • Observer

1.3 Other Documents

All RT 1000 documents are described in the *RT 1000 Documents Guide* (P/N 90-0001).

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:

- Directory Path TBD

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

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

- 361 Centennial Parkway, Suite 230
  Louisville, CO 80027
  (720) 242-9916
- 13100 Southwest Freeway, Suite 150
  Sugar Land, TX 77478
  (832) 532-5080
- support@wirelessseismic.com

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2

Layout

2.1 Overview

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

2.2 Mobilization

Mobilization is the physical preparation for moving to the seismic data acquisition site.

2.2.1 Prerequisites

In preparation for mobilization, define the following:

- Survey
- Back haul plan
- TBD

2.2.2 Getting Ready

Collect all of the following:

NOTE

Please refer to Table 9–1 Antenna Specifications, on page 31 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:
  - WRUs
  - LTUs

NOTE

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

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- Antennas
- Geophones
- Batteries
- Extra batteries

NOTE

The batteries 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
  - Any other third-party equipment
  - Any other shot-related equipment
  - Two-way radios

2.2.3 Prepare the Equipment

Ensure that the central recording system has the latest software available installed (see cross-reference TBD in the *RT 1000 Operators Guide*)

Ensure that the ground equipment has the latest firmware available installed (see cross-reference TBD in the *RT 1000 Operators Guide*)

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

2.3 At the Site

You can prepare the central recording system hardware and software while the ground equipment is being placed in the field.

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2.3.1 Set Up the Central Recording System

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

2.3.2 Lay 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 2–1 WRU

The LTU is shown in the following figure:

Illustration TBD

Figure 2–2 LTU

An example geophone is shown in the following figure

Illustration TBD

Figure 2–3 Geophone

2.3.2.1 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 9–1 Antenna Specifications, on page 31*) 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.

2.3.2.2 Assemble the Ground Equipment

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

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To assemble the ground equipment:

1 Gather the equipment:
   - WRU or LTU
   - Antenna
   - Geophone
   - Batteries
2 Attach one or more batteries to the unit.
   - Steps TBD.

Image showing battery installation TBD.

Figure 2–4 Installing the Battery

3 Attach the geophone to the unit.
   - Steps TBD.

Image showing geophone installation TBD.

Figure 2–5 Installing the Geophone

4 Attach the antenna to the unit.
   - Steps TBD.

Image showing antenna installation TBD.

Figure 2–6 Installing the Antenna

2.3.2.3 Place the Ground Equipment in the Field

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

To deploy the ground equipment:

1 Prerequisites:
   - The WRU or LTU is assembled with battery, geophone, and antenna
2 Pick up the unit and point the geophone connector end towards the ground as shown in the following figure. All of the LEDs illuminate:

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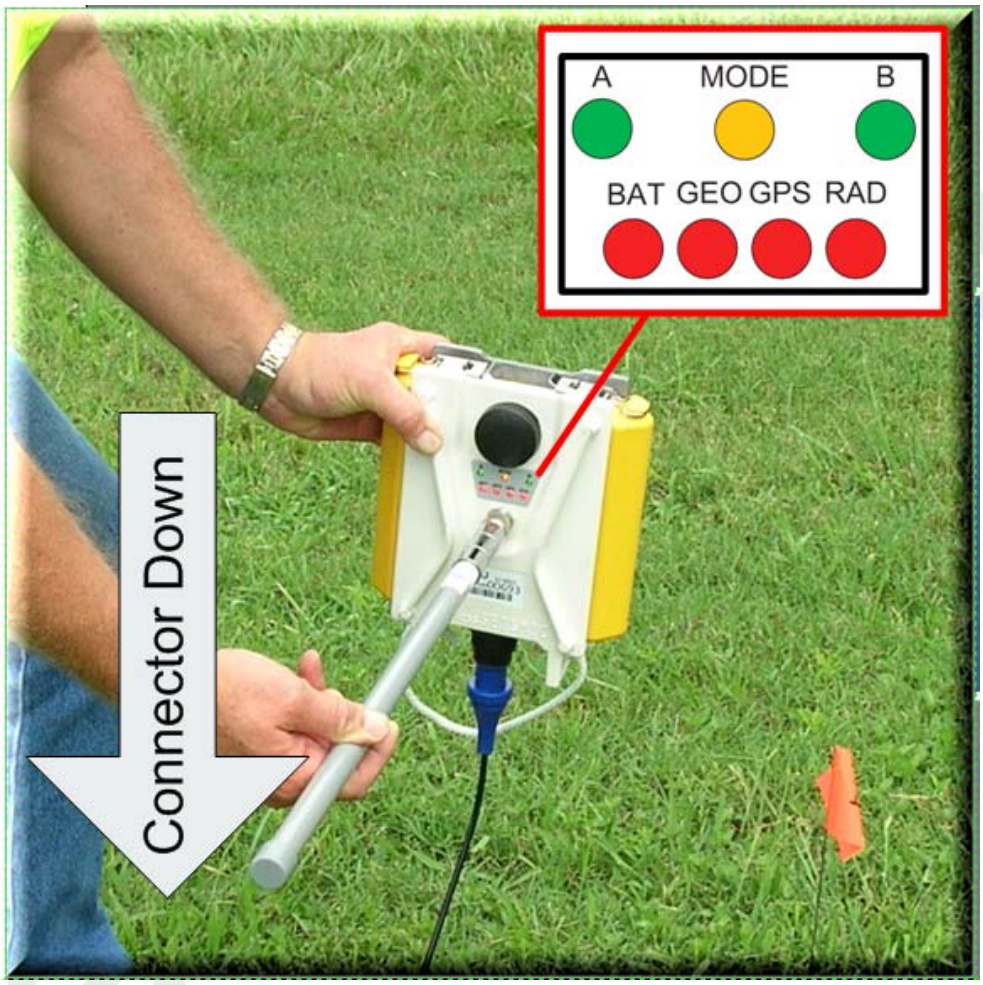

Figure 2–7 Power on the Unit

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

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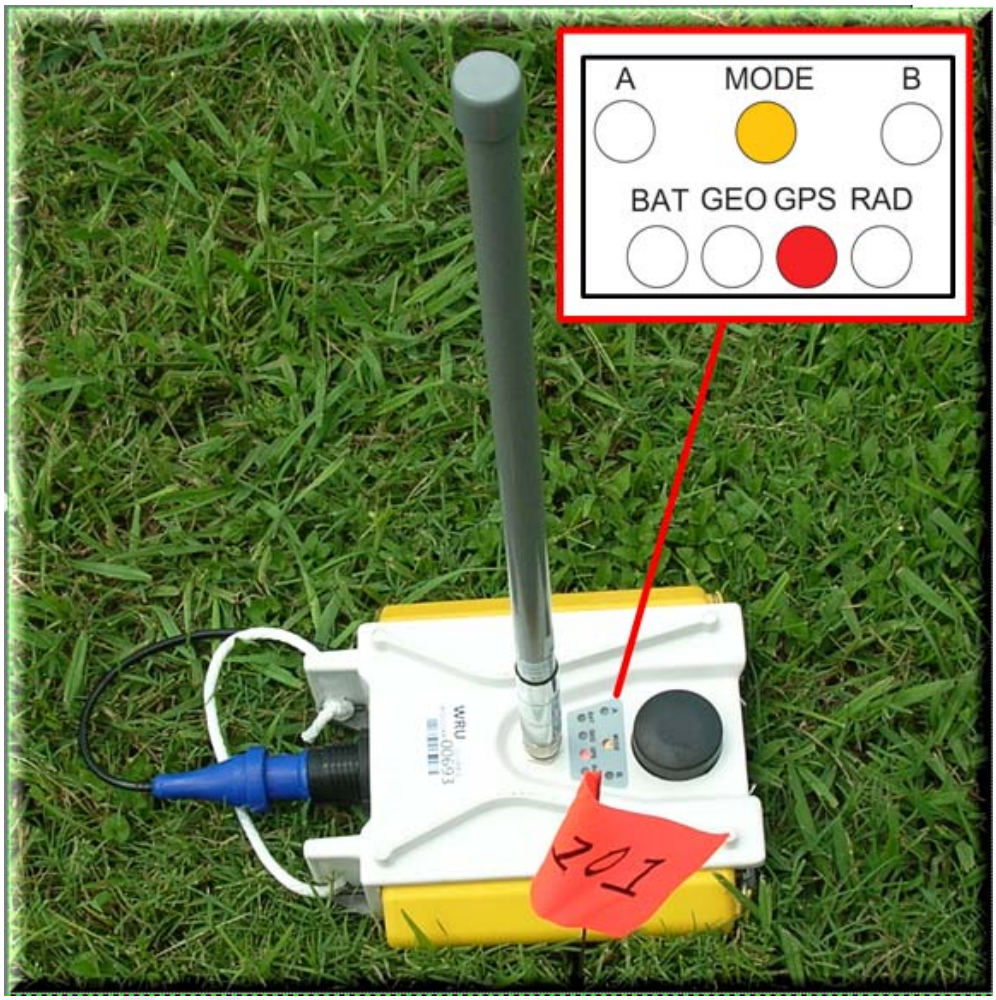

Figure 2–8 Place the Unit

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. The following table describes when user action is required.

Table 2–1 LED Indicators

LED State	Description
Flashing	A test is in progress. No user action required.
Solid green	The test is complete. No user action for green LED.

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Table 2–1 LED Indicators

LED State	Description
Solid red	The test failed as indicated below: • A or B LED plus red BAT — battery depleted • MODE plus red GEO — geophone not within limits • MODE plus red GPS — GPS fix within 10 m within 1 min not found • MODE plus red RAD — no neighbor found

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3

Software

3.1 Overview

For this release, your computer hardware and ground electronics comes with all software installed.

3.2 Installing the Software

TBD

3.3 Upgrading the Software

TBD

3.4 Upgrading the Firmware

TBD

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4
Backhaul

4.1 Overview

TBD

The following figure shows the backhaul components:

TBD

Figure 4–1 Backhaul Components

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5

Testing and Maintaining the Equipment

5.1 Overview

This chapter describes internal and external tests for the ground 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.

5.2 Testing the Layout

TBD

5.2.1 Line Tests

TBD

5.2.2 Source Control Tests

TBD

5.2.3 Acquisition Parameter Testing

TBD

5.2.4 Built-In-Self-Test (BIST)

TBD

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5.3 Maintaining the Equipment

TBD

5.3.1 Units

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5.3.2 Antennas

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5.3.3 Geophones

TBD

5.3.4 Cautions

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6

Rolling

You can roll the line or roll the stations.

6.1 Rolling the Line

6.1.1 Overview

This chapter describes how to move the ground equipment across the survey area when rolling the line.

Rolling a line segment in your seismic data acquisition project means that you can set up part of the equipment and then start firing shots and gathering data. Once shooting is complete for a specified line segment, you can pick up the equipment and move it to a new location while shooting continues on a different line segment.

You should follow best practices as recommended by your company or the industry; however, the following should be considered when planning your roll procedures:

- Pickup and layout crews pick up lines behind production and lay them out ahead of production. Depending on battery charge state, equipment may circulate through staging or go directly from one line to the next.
- In order to make most efficient use of layout crews, it is common to lay out entire receiver lines at a time even if they are longer than the template. This way crews don't need to spend time walking or driving from one line to the next picking up or laying out small amounts of equipment. However, if the size of the survey is large and receivers per line multiplied by the number of lines is larger than the number of channels available, it may be necessary to roll in the inline direction. In this case, it is necessary to be able to pick up and lay out WRUs in quantities smaller than a rib; for example increments of six WRUs.
- During inline roll operations, it may be desirable to add newly deployed WRUs to an existing (discovered) rib. The Observer can instruct the last WRU in a rib to poll for neighbors during recording. Newly added WRUs can begin recording immediately.

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6.1.2 Process

This section describes how to move the equipment from one location to another.

To roll the equipment:

1. Follow the instructions in *"Undeploy the Ground Equipment" on page 26* to undeploy ground equipment.
2. Move the equipment to the new location, being sure to secure it firmly in the transport vehicle and perform any desired maintenance (such as replacing depleted batteries).
3. Follow the instructions in *"Lay Out the Equipment" on page 15* to redeploy the equipment.

6.2 Rolling the Station

TBD

6.2.1 Overview

TBD

6.2.2 Process

TBD

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7

Demobilization

7.1 Overview

This chapter describes how to prepare (undeploy) the ground electronics for transport at the end of a project (demobilization).

7.2 Undeploy the Ground Equipment

This section describes the process to ready the ground equipment for movement to a new physical location or to remove it in preparation for demobilization.

To undeploy the ground equipment:

1 Prerequisites:

- The WRU or LTU is assembled with battery, geophone, and antenna
- The WRU or LTU is in an active, transitional, or ready state

2 Pick up the unit and point the geophone connector end towards the sky as shown in the following figure. All of the LEDs illuminate:

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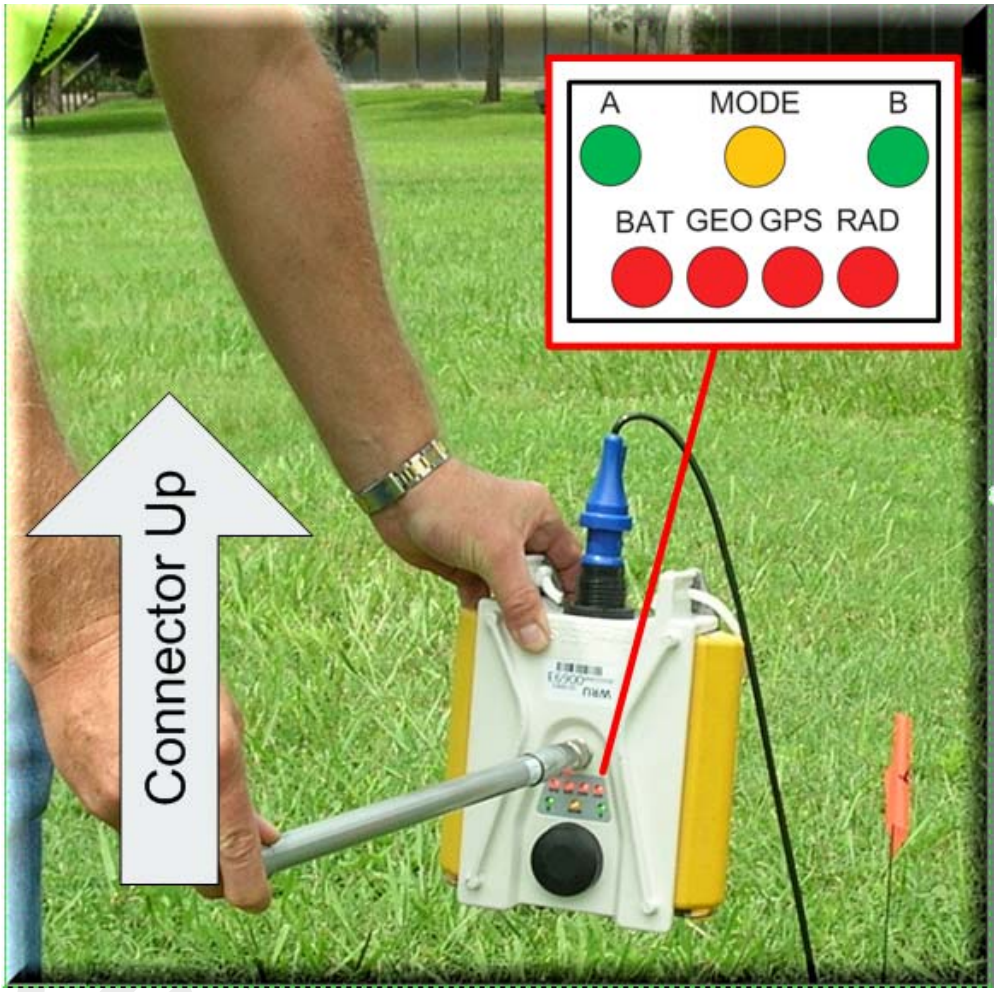

Figure 7–1 Power Off the Unit

3 Place the unit flat in the transportation vehicle. on the ground as shown in the following figure. The unit shuts down. The LEDs on the top of the unit are off:

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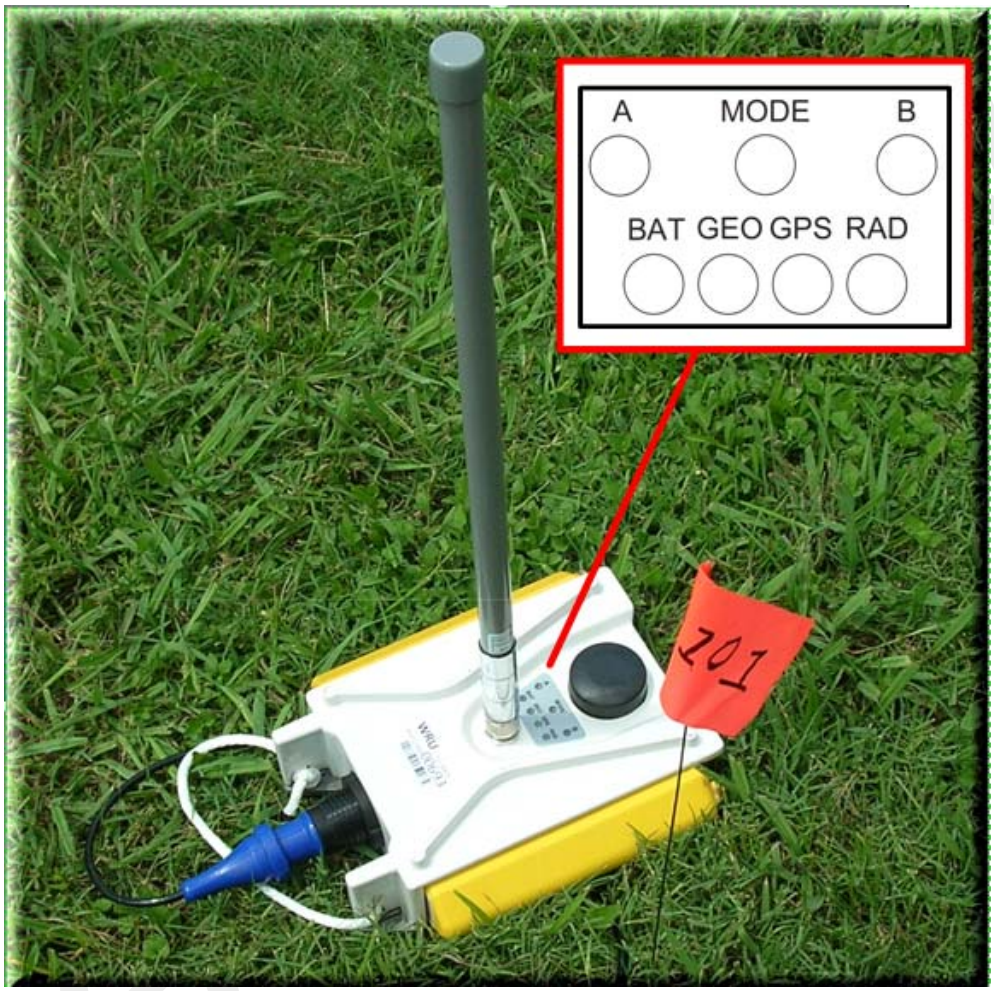

Figure 7–2 Undeployed Unit

4 Optional: Remove batteries, antenna, or geophone as described in *"Disassemble the Ground Equipment" on page 28*.

7.3 Disassemble the Ground Equipment

This section describes the process to disassemble the ground equipment prior to demobilization.

To disassemble the ground equipment:

1 Undeploy the equipment as described in *"Undeploy the Ground Equipment" on page 26*.

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2 Remove the antenna from the unit.

- Steps TBD.

Image showing antenna installation TBD.

Figure 7–3 Installing the Antenna

3 Remove the geophone from the unit.

- Steps TBD.

Image showing geophone installation TBD.

Figure 7–4 Installing the Geophone

4 Remove one or more batteries from the unit.

- Steps TBD.

Image showing battery installation TBD.

Figure 7–5 Installing the Battery

5 Secure the equipment in the transport vehicle.

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8

Troubleshooting

8.1 Overview

TBD

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Legal Information

9.1 FCC Rules and Regulations Compliance

The Federal Communications Commission (FCC) regulates the use of antennas in the "*Code of Federal Regulations – Title 47, Part 15 – Radio Frequency Devices, Subpart C – Intentional Radiators, Section 15.203 Antenna Requirement*."

NOTE

> *This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

When used as intended, the RT 1000 complies with FCC Section 15.203 requirements as follows:

- 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.
- The RT 1000 shall be used with only the supplied antennas (*Table 9–1*) attached to the WRU with an integrated type N male connector.

Table 9–1 Antenna Specifications

Model	Frequency (MHz)	Gain	Vertical Bandwidth	Weight	Dimension (Length x Diameter)
WSI 65-0023	2400-2485	5 dBi	25º	0.5 lbs 0.2 kg	12 x 0.6 in 355 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

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Table 9–1 Antenna Specifications (cont.)

Model	Frequency (MHz)	Gain	Vertical Bandwidth	Weight	Dimension (Length x Diameter)
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

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.

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