4

Demobilization

4.1 Overview

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

4.2 Removing the WRU from the Field

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

To undeploy the WRU:

1 Prerequisites:

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

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

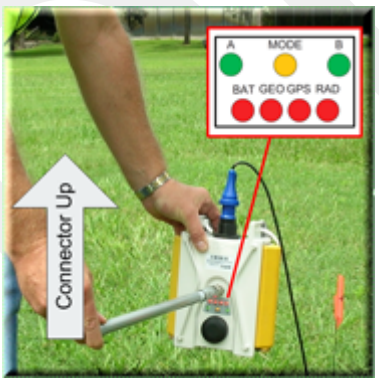


Figure 4–1 Power Off the Unit

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

Figure 4–2 Undeployed Unit

4 Optional: Remove batteries, antenna, or geophone as described in *"Disassemble the WRU" on page 59*.

4.3 Disassemble the WRU

This section describes the process to disassemble the WRU prior to demobilization.

To disassemble the WRU:

1 Undeploy the equipment as described in *"Removing the WRU from the Field" on page 58*.
2 Remove the antenna from the unit.
3 Remove the geophone from the unit.
4 Remove the batteries from the unit.
   - Press the catch on the battery latch.
   - Lift the lever, but do not lift the bail from the molded area on the battery.

- Continue to lift the lever using the bail to push the battery out of the connector.

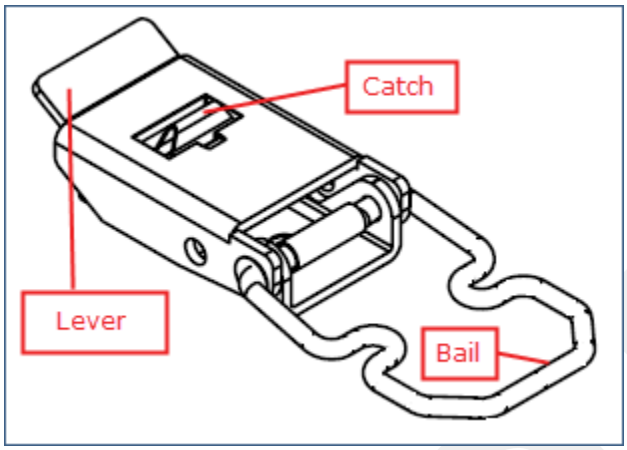


Figure 4–3 Removing the Battery

5 Secure the equipment in the transport vehicle.

5

Maintaining the Equipment

WARNING

In order to comply with FCC radio frequency (RF) exposure requirements, the RT System 2 units must be installed so that a minimum separation distance of 20 cm is maintained between the antenna(s) and the body of all persons at all times during normal operation.

WARNING

AVERTISSEMENT

Afin de se conformer aux exigences de la FCC en matière d'exposition aux radiofréquences (RF), les unités RT System 2 doivent être installées de manière à garder en permanence une distance minimale de 20 cm entre la ou les antennes et le corps de toute personne en mode de fonctionnement normal.

5.1 Units

TBD

5.2 Antennas

Ensure that the antennas are snug.

TBD

5.3 Geophones

Ensure that the geophone connection is clean and snug.

TBD

5.4 Cautions

TBD

6

Troubleshooting and Tips

6.1 Best Practices

This section provides some tips on working with the equipment.

6.1.1 24 Ah Batteries

In order to maintain the best possible communication channel, observe the following tips:

- Place a fully charged 24 Ah battery on the backhaul every day.
- Keep extra 24 Ah batteries charged up at the staging area.
- Store 24 Ah batteries at the staging area when not in use. Deep discharging of the batteries can shorten their lifespan considerably.

6.1.2 LIU

When temperature swings are extreme, or weather is severe, store the LIU boxes in the recording truck at night.

CAUTION *Do not allow the LIU battery to remain connected at a voltage of 22V or less. Damage to the equipment could occur.*

6.1.3 Urban Environments

The following could impact your configuration in urban environments:

- You may need to use repeaters when crossing a road.
- You may need to extend the antenna with coaxial cable
- You may need to adjust WRU placement and antenna strength when crossing a road.
- You will need to consider the presence of power lines and buildings when placing WRUs and backhaul components.

6.1.4 Ethernet Cables

Use CAT6 enhanced quality cables.

6.1.5 Fiber Optic Cables

The fiber optic cables have an environmentally-sealed connector. See the following figure for an illustration of how the connectors work:

Figure 6–1 Fiber Optic Cable Connector

6.1.6 Antennas

When placing or selecting antennas in, consider the following:

- In areas where there is a steep inclination, smaller gain antennas may provide a better signal.
- In areas where there is a steep inclination, try to reduce the inclination by going up or down at an angle rather than straight up or down.
- Use repeaters to cover overpass and steep inclination situations.
- If you need more signal strength, use an extender with a riser to elevate the antenna. This is the typical scenario with the LIU at the backhaul location.

6.2 Troubleshooting

TBD

6.2.1 Backhaul Troubleshooting Flow

This document shows the recommended steps to use when troubleshooting the backhaul.

Indications that there are issues with the backhaul communication include the following:

- Missing pings
- Dropped line with a red arrow indicating the point of lost communication
- LIU unformed

The following figures illustrate the recommended process flow when troubleshooting backhaul communication issues:

TBD

Figure 6–2 Troubleshooting – Check LIU

TBD

Figure 6–3 Troubleshooting – Check Fluidmesh Radios

6.2.2 Fluidmesh Radios

TBD

Table 6–1 Troubleshooting Fluidmesh Radios

Problem	Solutions
Not communicating	• Try sending a ping command in a CMD window to the IP address of the radio. • If you are trying to connect directly with a computer, make sure you have configured a private network (see *"Create a Private Network" on page 38*). • Ensure that you have configured the radios as follows: - FM1100 = mesh POINT (remote backhaul) - FM3100 = mesh END (central backhaul)
Cannot access GUI	If you configure two FM1100 radios on the same mast to be a mesh POINT and a mesh END, they will communicate over the switch and lock everything else out of the communication loop. They must both be configured as mesh POINTs
GUI not responding	It takes one full minute to see the alignment statistics in the Fluidmesh GUI (from the browser), so be sure to wait for it.

7

Batteries

This chapter provides information about the batteries and battery requirements used in the Wireless Seismic, Inc. RT System 2.

7.1 Lithium Ion Batteries

This section provides information regarding the characteristics, use, and handling of lithium ion batteries. See the following sections for details:

7.1.1 Specifications

The RT System 2 uses one or two custom intelligent lithium-ion batteries with self-contained charging circuitry that protects the batteries from overcharge, discharge, short circuits, or extreme temperature charging.

Battery specifications are shown in the following table:

Table 7–1 Lithium Ion Battery Specifications

Item	Description	Value
Voltage	Nominal	3.7 VDC
	Shut-off	2.8 VDC
	Full (90%) charge	4.1 VDC
	Overcharge Voltage	4.28 VDC
	Over Discharge Voltage	2.80 VDC
Current	Maximum Charge Current	2 A
	Consumption Active Mode	4.2 mA maximum
	Consumption Sleep Mode	66 μA maximum
Full (90%) charge mAh	Approximately 12,000 mAh at nominal voltage	—
Full (90%) charge mWh	Approximately 44,400 mWh at nominal voltage	—

Table 7–1 Lithium Ion Battery Specifications (cont.)

Item	Description	Value
Capacity		48.8 Watt hours
Connector	5-pin	—
LED	One LED that indicates charging status when connected to the charging station as follows	• Green – Charged • Red – Charging • Amber – Transitional phase between charging and charged, or charge temperature limits exceeded
Label	One bar code serial number label	—
Temperature	Operating	From -40°C to +85°C
	Charging	From -5°C to +45°C
	Ambient Storage	• From -20°C to +45°C for a maximum period of one month • From -20°C to +35°C for a maximum of 6 months, after which time the battery packs will need to be recharged to above 50% capacity

7.1.2 Handling and Safety Guidelines

Observe the following handling and safety guidelines:

- If a battery pack has leaking fluids, do not touch any fluids. Dispose of a leaking battery pack. In case of eye contact with fluid, do not rub eyes. Immediately flush eyes thoroughly with water for at least 15 minutes, lifting upper and lower lids until no evidence of the fluid remains. Seek medical attention.
- Do not disassemble, crush, or puncture a battery
- Do not short the external contacts on a battery
- Do not dispose of a battery in fire or water
- Do not expose a battery to temperatures above 60 °C (140 °F)
- Keep the battery away from children
- Avoid exposing the battery to excessive shock or vibration
- Do not use a damaged battery
- Lithium Ion battery packs MUST be completely discharged before disposal
- Although there may be local or state restrictions, lithium ion batteries are considered by the Federal Government as “non-hazardous universal waste”. There are restrictions for large quantity handlers of universal waste that define

labeling, containment, and so on. Whenever possible the batteries must be discharged before disposal. Battery leads/contacts should be taped off to prevent accidental shorting. Each battery pack should be placed in a plastic bag.

- Recycling is encouraged when practical and applicable. The batteries contain recyclable material and are accepted by several battery recycling companies. Refer to one of the following for more information on recycling and disposal:
  - http://www.swe.com
  - http://www.rbrc.org
  - http://www.call2recycle.org
  - 1-800-8-BATTERY
  - 1-877-2-RECYCLE

7.1.3 Transportation

In the United States, large lithium ion battery shipments (more than 24 cells or 12 batteries per package) are regulated as hazardous material (Class 9) by the Federal Government and are subject to the regulations described in the following:

- Code of Federal Regulations, Title 49 Transportation. http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?sid=92868a82add6feba6afa796572133179&c=ecfr&tpl=/ecfrbrowse/Title49/49tab_02.tpl
- International Air Transport Association (IATA) http://www.iata.org/whatwedo/cargo/dangerous_goods/pages/lithium_batteries.aspx

Batteries can be ground shipped only if all of the following conditions are met:

- Box used meets the 1.2 m drop test box (“UN” rated box) for packaging
- Battery pack terminals are protected to prevent a short circuit
- Gross weight does not exceed 30 kg (66 pounds)
- Outer package is labeled with the current required label. An example is shown in the following figure.

Figure 7–1 Example Battery Shipping Label

Batteries can be air shipped only if all of the following conditions are met:

- Box used meets the 1.2 m drop test box (“UN” rated box) for packaging
- Maximum weight of each package does not exceed 10 kg (22 lbs)
- Battery pack terminals are protected to prevent a short circuit
- Outer package is labeled with the current required label. An example is shown in the previous figure (*“Example Battery Shipping Label” on page 69*).

WARNING

The information contained in this document is intended to provide general awareness of battery regulations; it is not comprehensive, and the requirements referenced herein may have changed. Nothing in this chapter or the Deployment Guide constitutes legal advice or is intended to address any specific legal, compliance, or regulatory issues that may arise in particular circumstances. This chapter and the Deployment Guide are not intended to replace current, official regulations regarding the packaging and shipment of hazardous materials or independent legal counsel on these issues. You are solely responsible for compliance with all applicable laws, regulations, and other requirements. Please refer to an official copy of the current version of these documents for the latest information.

7.1.4 Storage

Proper storage and maintenance of Lithium Ion batteries is essential to maximize their useful life and avoid catastrophic failure. Observe the following storage precautions:

- Remove the batteries from the WRU for storage
- The recommended storage temperature for Lithium ion batteries is as follows:
  - From -20°C to +45°C for a maximum period of one month
  - From -20°C to +35°C for a maximum of 6 months, after which time the battery packs will need to be recharged to above 50% capacity
  - Storing at cooler temperatures slows down self discharge and capacity loss over time. Store the batteries at 25°C or less if possible
- The recommended storage charge levels are as follows:
  - Charge (or discharge) batteries to a 30% to 50% charge level before placing into storage. Higher or lower charge levels can reduce the battery life.
  - Never store the battery completely depleted of charge unless for disposal.
  - Periodic charging is necessary to maintain 30% to 50% charge when stored for a long period of time
- Store batteries in a well ventilated area
- Do not leave batteries unused for extended periods of time, either in the product or in storage. When a battery has been unused for 6 months, check the charge status and charge or dispose of the battery as appropriate.
- Routinely check the battery's charge status
- Consider replacing the battery with a new one if you note either of the following conditions:
  - The battery run time drops below about 80% of the original run time
  - The battery charge time increases significantly

7.2 Charging Lithium Ion Batteries

This section describes charging precautions and provides an overview of the battery charger.

7.2.1 Charging Precautions

Observe the following charging precautions:

- Prior to charging, inspect the battery for any visible damage to the case or connector that could create an electrical shortage.
- The temperature range over which the battery can be charged is -5°C to +45°C. Charging the battery outside of this temperature can cause the battery to become hot or to break.
- Be absolutely sure that only a 5 V source is used when charging the battery.
- Care should be taken to charge batteries on a fireproof surface.
- Do not charge batteries near flammable items or liquids.
- Keep a Class C Dry Chemical fire extinguisher nearby.

- Do not continue recharging the battery if it does not recharge within the specified charging time.
- A lithium ion battery should NEVER be left unattended while charging.

7.2.2 Battery Charger

The lithium ion battery charger is designed to operate from a single 10 A, 120 VAC service line.

The power supply to charge the battery pack is a 5VDC regulated voltage supply.

Figure 7–2 Battery Charger

Figure 7–3 Serial Number Label and LED Indicator

7.3 LIU Battery

TBD

8

Batteries

Ce chapitre fournit des informations sur les batteries utilisées dans le système RT System 2 de Wireless Seismic, Inc.

8.1 Batteries au lithium-ion

Cette section fournit des informations sur les caractéristiques, l'utilisation et la manipulation des batteries au lithium-ion. Reportez-vous aux sections suivantes pour en savoir plus:

- *"Spécifications" on page 73*
- *"Directives en matière de manipulation et de sécurité" on page 74*
- *"Transport" on page 75*
- *"Entreposage" on page 77*

8.1.1 Spécifications

Le RT System 2 utilise une ou deux batteries au lithium-ion intelligentes et personnalisées, dotées d'un circuit de charge autonome qui protège les batteries contre les surcharges, décharges, courts-circuits ou changements extrêmes de température.

Le tableau suivant indique les spécifications des batteries:

Tableau 8–1 Spécifications des batteries au lithium-ion

Élément	Description	Valeur
Tension	Nominale	3,7 V c.c.
	Arrêt	2,8 V c.c.
	Charge complète (90 %)	4,1 V c.c.
	Tension de surcharge	4,28 V c.c.
	Les surtensions de décharge	2,80 V c.c.
Courant	Courant de charge maximum	2 A
	Mode de consommation active	4,2 mA maximum
	Mode veille la consommation	66 µA maximum

Tableau 8–1 Spécifications des batteries au lithium-ion (cont.)

Élément	Description	Valeur
Charge complète (90 %) mAh	Environ 12 000 mAh à la tension nominale	
Charge complète (90 %) mWh	Environ 44 400 mWh à la tension nominale	
Connecteur	5 broches	
DEL	Une DEL qui indique l'état de charge lors de la connexion à la station de charge, de la manière suivante :	• Vert : chargé • Rouge : en train de charger • Orange : phase transitionnelle entre l'état de chargement et l'état chargé, ou dépassement des limites de la température de charge
Étiquette	Une étiquette indiquant le numéro de série sous forme de code à barres	
Température	Fonctionnement	De -40°C à +85°C
	Chargement	De -5°C à +45°C
	Entreposage à température ambiente	• De -20°C à +45°C durant une période maximum d'un mois • De -20°C à +35°C durant 6 mois maximum ; passé ce délai, les blocs-batteries doivent être rechargés à plus de 50 % de leur capacité

8.1.2 Directives en matière de manipulation et de sécurité

Respecter les directives suivantes en matière de manipulation et de sécurité :

- Si un bloc-batterie présente une fuite de liquides, ne pas toucher les liquides. Jeter le bloc-batterie en cas de fuite. En cas de contact oculaire avec du liquide, ne pas se frotter les yeux. Rincer immédiatement les yeux avec de l'eau pendant au moins 15 minutes, en soulevant les paupières supérieures et inférieures jusqu'à ce qu'il n'y ait plus de trace de liquide. Consulter un médecin.
- Ne pas démonter, écraser ou percer une batterie
- Ne pas court-circuiter les contacts externes d'une batterie
- Ne pas jeter une batterie dans le feu ou l'eau

- Ne pas exposer une batterie à des températures supérieures à 60 °C (140 °F)
- Maintenir la batterie à l'écart des enfants
- Éviter d'exposer la batterie à des vibrations ou chocs excessifs
- Ne pas utiliser une batterie endommagée
- Les blocs-batteries au lithium-ion DOIVENT être entièrement déchargés avant leur élimination
- Bien qu'il puisse exister des restrictions locales ou nationales, les batteries au lithium-ion sont considérées comme des « déchets universels non dangereux » par le gouvernement fédéral. Il existe des restrictions qui s'appliquent à ceux qui gèrent de grandes quantités de déchets universels ; celles-ci définissent l'étiquetage, le confinement, etc. Dans la mesure du possible, les batteries doivent être déchargées avant de les jeter. Les conducteurs/contacts de batterie doivent être fixés de manière à éviter un court-circuit accidentel. Chaque bloc-batterie doit être placé dans un sac en plastique.
- Le recyclage est encouragé lorsqu'il est réalisable. Les batteries contiennent des matériaux recyclables et sont acceptées par plusieurs entreprises de recyclage de batteries. Reportez-vous à l'un des éléments suivants pour obtenir plus d'informations sur le recyclage et l'élimination :
  - http://www.swe.com
  - http://www.rbrc.org
  - http://www.call2recycle.org
  - 1-800-8-BATTERY
  - 1-877-2-RECYCLE

8.1.3 Transport

Aux États-Unis, les expéditions de grandes quantités de batterie au lithium-ion (plus de 24 piles ou 12 batteries par colis) sont réglementées comme des matières dangereuses (classe 9) par le gouvernement fédéral et sont soumises aux règlements décrits ci-après :

- Code of Federal Regulations, Title 49 Transportation. http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?sid=92868a82add6feba6afa796572133179&c=ecfr&tpl=/ecfrbrowse/Title49/49tab_02.tpl
- International Air Transport Association (IATA) http://www.iata.org/whatwedo/cargo/dangerous_goods/pages/lithium_batteries.aspx

Les batteries ne peuvent être expédiées par voie terrestre que si toutes les conditions suivantes sont satisfaites :

- La boîte utilisée satisfait le test de chute de 1,2 m (boîte classée « UN ») de boîte d'emballage
- Les bornes de bloc-batterie sont protégées pour éviter un court-circuit
- Le poids brut ne dépasse pas 30 kg (66 livres)
- L'emballage extérieur porte l'étiquette requise en vigueur. La figure suivante en montre un exemple.

Exemple 8–1 Example Battery Shipping Label

Les batteries ne peuvent être expédiées par voie aérienne que si toutes les conditions suivantes sont satisfaites :

- La boîte utilisée satisfait le test de chute de 1,2 m (boîte classée « UN ») de boîte d'emballage
- Les bornes de bloc-batterie sont protégées pour éviter un court-circuit
- Le poids brut de chaque colis ne dépasse pas 10 kg (22 livres)
- L'emballage extérieur porte l'étiquette requise en vigueur. La figure précédente en montre un exemple (*"Example Battery Shipping Label" on page 76*).

AVERTISSEMENT

Les informations contenues dans le présent document ont pour but de fournir une connaissance générale des règlements s'appliquant aux batteries. Elles ne sont pas exhaustives, et les conditions mentionnées dans ce document peuvent avoir changées. Rien dans le présent chapitre ou dans le Guide de déploiement ne constitue un avis juridique ou est destiné à répondre aux problèmes juridiques, de conformité, ou réglementaires spécifiques qui peuvent survenir dans des circonstances particulières. Le présent chapitre et le Guide de déploiement ne sont pas destinés à remplacer les règlements officiels en vigueur concernant l'emballage et l'expédition de matières dangereuses ou un conseil juridique indépendant sur c es questions. Vous êtes seul responsable du respect de toutes les lois, règlements et autres exigences. Veuillez vous reporter à une copie officielle de la version en vigueur de ces documents pour obtenir les dernières informations.

8.1.4 Entreposage

Un entreposage et un entretien adéquats des batteries au lithium-ion est indispensable pour optimiser leur durée de vie utile et éviter une défaillance catastrophique. Respecter les précautions suivantes en matière d'entreposage :

- Retirer les batteries de l'unité distante sans fil avant l'entreposage
- Température d'entreposage recommandée des batteries au lithium-ion :
  - De -20°C à +45°C durant une période maximum d'un mois
  - De -20°C à +35°C durant 6 mois maximum ; passé ce délai, les blocs-batteries doivent être rechargés à plus de 50 % de leur capacité
  - L'entreposage à basses températures ralentit la décharge naturelle et la perte de capacité au fil du temps. Entreposer les batteries à 25°C ou moins si possible
- Niveaux de charge d'entreposage recommandés :
  - Charger (ou décharger) les batteries à un niveau de charge de 30 % à 50 % avant de les entreposer. Des niveaux de charge inférieurs ou supérieurs peuvent réduire la durée de vie des batteries.
  - Ne jamais entreposer des batteries entièrement déchargées, sauf en cas d'élimination.
  - Un chargement périodique est nécessaire pour maintenir une charge de 30 % à 50 % en cas d'entreposage de longue durée
- Entreposer les batteries dans un endroit bien aéré
- Ne pas laisser les batteries inutilisées pendant de longues durées, qu'elles soient dans le produit ou placées en entreposage. Si une batterie n'a pas été utilisée pendant 6 mois, vérifier l'état de charge et charger ou éliminer la batterie, le cas échéant.

- Vérifier régulièrement l'état de charge de la batterie
- Envisager le remplacement de la batterie par une nouvelle en cas de constat d'une des conditions suivantes :
  - L'autonomie de la batterie descend en dessous d'environ 80 % de son autonomie initiale
  - Le temps de charge de la batterie augmente sensiblement

8.2 Chargement des batteries au lithium-ion

Cette section décrit les précautions de chargement et présente le chargeur de batterie.

8.2.1 Précautions de chargement

Respecter les précautions de chargement suivantes :

- Avant de la charger, inspecter la batterie pour détecter les signes éventuels de dommages sur le boîtier ou les connecteurs susceptibles de créer un court-circuit.
- La batterie peut être chargée dans la plage de température de -5°C à +45°C. En cas de chargement de la batterie en dehors de cette plage, la batterie peut devenir très chaude ou se rompre.
- Être absolument sûr de l'utilisation d'une source de 5 V lors du chargement de la batterie.
- Prendre soin de charger les batteries sur une surface ininflammable.
- Ne pas charger les batteries à proximité d'objets ou de liquides inflammables.
- Conserver un extincteur à poudre chimique de classe C à proximité.
- Ne pas continuer de recharger la batterie si elle ne se recharge pas dans le temps de chargement spécifié.
- NE JAMAIS laisser une batterie au lithium-ion sans surveillance lorsqu'elle est en train de charger.

8.2.2 Chargeur de batterie

Le chargeur de batterie au lithium-ion est conçu pour fonctionner à partir d'une ligne de service simple 120 V c.a., 10 A.

Le bloc d'alimentation servant à charger le bloc-batterie fournit une tension régulée de 5 V c.c.

Exemple 8–2 Chargeur de batterie

Exemple 8–3 Étiquette avec numéro de série et voyant DEL

8.3 LIU de batterie

TBD

A

Legal Information

A.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 System 2 complies with FCC Section 15.203 requirements as follows:

- The RT System 2 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 System 2 shall be used with only the supplied antennas (*Table A–1*) attached to the WRU or LIU with an integrated type N male connector.

Table A–1 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	25º	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

Table A–1 Antenna Specifications (cont.)

Model	Frequency (MHz)	Gain	Vertical Bandwidth	Weight	Dimension (Length x Diameter)
WSI 65-0082	2400-2485	7.4 dBi	20º	5.4 oz 153 g	18.5 x 0.75 in 470 x 19 mm
WSI 65-0131	2400-2485	4 dBi	50º	3.2 oz 90 g	8.7 x 0.75 in 221 x 19 mm

WARNING

In order to comply with FCC radio frequency (RF) exposure requirements, the RT System 2 units must be installed so that a minimum separation distance of 20 cm is maintained between the antenna(s) and the body of all persons at all times during normal operation.

FCC equipment authorization has been granted as follows:

- The 5Mbps Line Interface Unit has been granted FCC equipment authorization under the FCC Identifier YZO-00600.
- The 5Mbps Wireless Remote Unit has been granted FCC equipment authorization under the FCC Identifier YZO-00103.

A.2 Industry Canada Compliance

The Wireless Remote Unit has been granted Industry Canada (IC) approval and certification per RSS-210 Issue8 and RSS-102 Issue 4 as:

- 5Mbps WRU:
  - Model number 10-0017
  - IC: 10081A-WSI00103

The Line Interface Unit (LIU) has been granted Industry Canada (IC) approval and certification per RSS-210 Issue 8 and RSS-102 Issue 4 as:

- 5Mbps LIU:
  - Model Number 10-0016
  - IC: 10081A-WSI00600

B

l'information juridique

B.1 Conformité avec les règles et règlements de la FCC

La Federal Communications Commission (FCC) règlemente l'utilisation d'antennes dans l'article suivant : Code of Federal Regulations – Title 47, Part 15 – Radio Frequency Devices, Subpart C – Intentional Radiators, Section 15.203 Antenna Requirement.

REMARQUE

Cet équipement a été testé et jugé conforme aux limites fixées pour un appareil numérique de classe A, conformément à la partie 15 des règles de la FCC. Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles lorsque l'équipement est utilisé dans un environnement commercial. Cet équipement génère, utilise et peut émettre l'énergie des fréquences radio et, s'il n'est pas installé et utilisé conformément au mode d'emploi, peut causer des interférences nuisibles avec les communications radio. Le fonctionnement de cet équipement dans une zone résidentielle est susceptible de provoquer des interférences nuisibles, auquel cas l'utilisateur devra corriger les interférences à ses propres frais.

Lorsqu'il est utilisé comme prévu, le RT System 2 respecte les conditions de l'article 15.203 de la FCC de la manière suivante :

- Les antennes du RT System 2 doivent être installées et manipulées par des professionnels spécifiquement désignés pour cela.
- Les changements ou modifications non expressément approuvés par Wireless Seismic, Inc. peuvent annuler l'autorisation de l'utilisateur d'utiliser l'équipement.
- Le RT System 2 doit être utilisé uniquement avec les antennes fournies (*Tableau B–1*) branchées à l'unité distante sans fil ou à la station de base à l'aide d'un connecteur mâle de type N intégré.

Tableau B–1 Spécifications des antennes

Modèle	Fréquence (MHz)	Gain	Largeur de bande verticale	Poids	Dimensions (Longueur x Diamètre)
WSI 65-0067	2400-2485	9 dbi	14°	0,8 lb 0,5 kg	27 x 0,6 po 690 x 15 mm
WSI 6060-001-01	2400-2485	7 dBi	18°	0,6 lb 0,3 kg	21 x 0,6 po 540 x 15 mm

Tableau B–1 Spécifications des antennes (cont.)

Modèle	Fréquence (MHz)	Gain	Largeur de bande verticale	Poids	Dimensions (Longueur x Diamètre)
WSI 65-0023	2400-2485	5 dBi	25º	0,5 lb 0,2 kg	12 x 0,6 po 355 x 15 mm
WSI 65-0025	2400-2485	2 dBi à 2,4	120°	1,6 oz 45,4 g	7.6 x 0,5 po 193 x 12,7 mm
WSI 65-0082	2400-2485	7,4 dBi	20º	5,4 oz 153 g	18,5 x 0,75 in 470 x 19 mm
WSI 65-0131	2400-2485	4 dBi	50º	3,2 oz 90 g	8,7 x 0,75 in 221 x 19 mm

AVERTISSEMENT

Afin de se conformer aux normes de la FCC en matière d'exposition aux radiofréquences (RF), les unités RT System 2 doivent être installées de manière à garder en permanence une distance minimale de 20 cm entre la ou les antennes et le corps de toute personne en mode de fonctionnement normal.

L'autorisation d'équipement de FCC a été accordée comme suit :

- Le 5Mbps unité d'interface de ligne a reçu l'autorisation d'équipement de la FCC sous l'identifiant YZO-00600.
- Le 5Mbps unité lointaine sans fil a reçu l'autorisation d'équipement de la FCC sous l'identifiant YZO-00103.

B.2 Industrie Canada Conformité

L'unité distante sans fil a reçu l'approbation et la certification d'Industrie Canada (IC) par rapport à CNR-210 8^{e} édition et CNR-102 4^{e} édition :

- 5Mbps WRU
  - Numéro de modèle : 10-0017
  - Numéro de certification IC : IC: 10081A-WSI00103

L'unité d'interface de ligne a reçu l'approbation et la certification d'Industrie Canada (IC) par rapport à CNR-210 8^{e} édition et CNR-102 4^{e} édition :

- 5Mbps LIU
  - Numéro de modèle : 10-0016
  - Numéro de certification IC : IC: 10081A-WSI00600

C

Fluidmesh Radio Specifications

The information in this chapter is reproduced here for your convenience from the Fluidmesh data sheet available at the following location:

http://www.fluidmesh.com/press-room/product-literature/doc_details/160-fluidmesh-mito-series

C.1 The Fluidmesh Mito Series

The Fluidmesh® MITO Series is a MIMO-based tri-band wireless Ethernet product line designed and manufactured specifically for multi-service backhaul applications.

MITO - The Revolution in Wireless Backhauling

With the MITO product line, Fluidmesh has developed a revolutionary wireless backhaul solution that is capable of offering extreme performances with a small form factor. MITO is a unique 2x2 MIMO solution with integrated directional antennas which has allowed Fluidmesh to break the mould and create a product line that is a game changer in the wireless backhauling arena. You won't need to install external antennas. You won't need to deal with coaxial cables, lighting suppressors, and grounding. The Fluidmesh

1100 MITO and the Fluidmesh 3100 MITO have an integrated radio-antenna solution with an outdoor rated enclosure that is slightly bigger than two decks of cards. The Fluidmesh 11oo MITO mounts a 2x2 MIMO patch antenna and can be used to create point to point, point to multipoint, and mesh networks providing unparalleled performances and a compact form factor. The Fluidmesh 3100 MITO mounts a 2x2 MIMO sector antenna and is designed for medium and large point to multipoint deployments with up to 150 clients.

Tri-band Radio operating at 4.9 GHz, and 5.1-5.8 GHz

The Fluidmesh MITO Series features one tri-band radio and can operate at 4.9 GHz, and 5.1-5.8 GHz and modulate up to 300 Mbps. The preferred frequency can be easily selected through a web based interface.

Optimized Prodigy Transmission Protocol for maximum Reliability

The Fluidmesh MITO Series employs Prodigy, Fluidmesh's proprietary high performance 'intelligent' transmission protocol, built to overcome the limits of standard license-free protocols and to deliver a wireless infrastructure with a higher level of reliability. Prodigy was developed to transmit any IP-compatible traffic including data, video, and voice. At the base of our innovative transmission protocol, there is a traffic optimization algorithm that allows every Fluidmesh device to assign a specific level of priority and reliability to every packet transmitted. This process allows the wireless network to automatically adjust its transmission parameters based on the type of traffic

transmitted. The overall result is a better, more reliable, multi-service wireless infrastructure.

Compact Design for Easy Installation

The Fluidmesh MITO Series has a compact form factor designed for low visual impact deployments. The integrated panel antenna makes for easy installation and supports a range of up to 30 miles in line of sight. The provided low-power POE injector guarantees a straight-forward set-up.

FluidThrottle™

The Fluidmesh MITO Series is based on the innovative FluidThrottle™ technology which allows the user to limit the total cost of ownership of the wireless network by paying only for the amount of bandwidth required. Additional throughput can be easily achieved by upgrading the system with software plug-ins in case the bandwidth requirements increase over time. This solution makes Fluidmesh the most cost-effective and flexible wireless solution provider in the market.

FluidMAX™

The Fluidmesh MITO Series supports the patent-pending FluidMAX™ technology and can be used to create Point-to-Point, Point-to-Multipoint, and Mesh architectures. Thanks to FluidMAX™, the Fluidmesh MITO Series can operate with a centralized medium access control protocol, or with a distributed medium access control protocol, depending on the network layout. That means that our units can operate in either CSMA or TDMA. The decision is made automatically by the network based on its layout and requires no user intervention.

EasyMesh® Platform and FMQuadro Interface

The Fluidmesh MITO Series includes EasyMesh™. The EasyMesh technology allows the user to set the same range of private IP addresses across the entire network. The Fluidmesh MITO Series also includes the FMQuadro™ web interface which allows the user to configure, monitor, and troubleshoot the wireless network in real time without the need of additional software or a server. The unit comes with a built-in spectrum analyzer, a real-time bandwidth monitoring tool, and a wizard to facilitate the configuration of the system.

AES-128 Encryption Support (FIPS-197 Compliant)

The Fluidmesh MITO Series includes support for 128 bit AES Encryption at the link-level which can be used for FIPS-197 compliance. Because AES Is Implemented in hardware, there is no loss in terms of performance when AES is enabled.

Simple Network Management Protocol (SNMP) Support

The Fluidmesh MITO Series supports SNMP version 3. The Simple Network Management Protocol allows the user to centrally manage the mesh devices with a SNMP server and to receive automatic alarms in case of network failure.

C.2 Fluidmesh 1100 with MITO Technology

RADIO

♦ Frequency Bands:	5.15-5.25 and 5.725-5.825 GHz (US, FCC) 5.470-5.725 GHz (Europe, ETSI) 4.940 - 4.990 GHz (US,FCC)
♦ Modulation:	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
♦ Modulation speed:	Up to 300 Mbps
♦ TX Power:	Up to 27 dBm, depending on configuration and regulatory constraints
♦ AX Sensitivity 5GHz:	-96d8@6.5Mbps;-75dB@300Mbps
♦ Antenna Type:	2x2 MIMO
♦ Antenna Gain:	14.6-16.1 dBi
♦ Antenna Polarization:	Dual Linear
♦ Cross-pol Isolation:	22dB minimum
♦ Max VSWR:	1.6:1
♦ H-pol Beamwidth:	43 deg.
♦ V-pol Beamwidth:	41 deg.
♦ Elevation Beamwidth:	15 deg.

ELECTRICAL

♦ Power input:	Passive PoE 15V DC, 0.8A, (pairs 4,5+; 7,8 return)
♦ Power consumption:	Max 8W
♦ Power over Ethernet Injector:	Included, 90/260V 50/60 Hz AC input

ENVIRONMENTAL

♦ Operating Temperature:	-30°C to +80°C
♦ Storage Temperature:	-30°C to +80°C
♦ Humidity:	95% condensing
♦ Weather Rating:	IP65
♦ Wind Survivability:	120 mph
♦ Shock & Vibration:	ETSI 300-019-1.4

PHYSICAL

♦ Interfaces:	Two (2) Internal Ethernet 10/100BaseT autosensing, RJ45
♦ Dimensions (mm):	294 (h) X 80 (w) X 30(d)
♦ Weight (Kg):	0.4
♦ Enclosure material:	Outdoor UV Stabilized Plastic

OPTIONAL SOFTWARE PLUG-INS

- Ethernet Capacity Plug-in up to 1 Mbps (included)
- Ethernet Capacity Plug-in up to 2.5 Mbps
- Ethernet Capacity Plug-in up to 5 Mbps
- Ethernet Capacity Plug-in up to 10 Mbps
- Ethernet Capacity Plug-in up to 30 Mbps
- Ethernet Capacity Plug-in up to 60 Mbps
- Unlimited Wired Ethernet Capacity Plug-in (up to 100 Mbps)
- 802.1Q VLAN Support
- AES-128 Encryption

C.3 Fluidmesh 3100 with MITO Technology

RADIO

Frequency Bands:	5.15-5.25 and 5.725-5.825 GHz (US, FCC) 5.470-5.725 GHz (Europe, ETSI) 4.940 - 4.990 GHz (US,FCC)
Modulation:	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
Modulation speed:	Up to 300 Mbps
TX Power:	Up to 27 dBm, depending on configuration and regulatory constraints
AX Sensitivity 5GHz:	-96d8@6.5Mbps;-75dB@300Mbps
Antenna Type:	2x2 MIMO
Antenna Gain:	14.6-17.1 dBi
Antenna Polarization:	Dual Linear
Cross-pol Isolation:	22dB minimum
Max VSWR:	1.5:1
H-pol Beamwidth:	72 deg.
V-pol Beamwidth:	93 deg.
Elevation Beamwidth:	8 deg.

ELECTRICAL

Power input:	Passive PoE 24V DC, 1A, (pairs 4,5+; 7,8 return)
Power consumption:	Max 8W
Power over Ethernet Injector:	Included, 90/260V 50/60 Hz AC input

ENVIRONMENTAL

Operating Temperature:	-30°C to +75°C

- Storage Temperature: -30°C to +75°C
- Humidity: 95% condensing
- Weather Rating: IP65
- Wind Survivability: 120 mph
- Shock & Vibration: ETSI 300-019-1.4

PHYSICAL

- Interfaces: One (1) Internal Ethernet 10/100BaseT autosensing, RJ45
- Dimensions (mm): 370 (h) X 80 (w) X 70(d)
- Weight (Kg): 1.6
- Enclosure material: Anodized Aluminum

OPTIONAL SOFTWARE PLUG-INS

- Ethernet Capacity Plug-in up to 10 Mbps
- Ethernet Capacity Plug-in up to 30 Mbps
- Ethernet Capacity Plug-in up to 60 Mbps
- Unlimited Wired Ethernet Capacity Plug-in (up to 100 Mbps)
- 802.1Q VLAN Support
- AES-128 Encryption

C.4 MITO Series General Characteristics

NETWORK

- Protocols: UDP, TCP, IP, RTP, RTCP, RTSP, HTIP, HTIPS, ICMP, ARP
- Medium Access Control (MAC) Protocols: Centralized Polling-based, Distributed CSMA/CA-based
- Web-based interface for remote management
- Multicast support
- UPnP support
- NMP support
- 802.1Q VLAN Support

SECURITY

- Full VPN compatibility
- Full compatibility with all encryption and authentication standards (AES, 3DES, RSA, HTIPS, SSL, etc.)
- AES-128 (FIPS-197 Compliant) Link-level Encryption

APPROVALS

- FCC CFR 47 Part 15, class B
- Industry Canada RSS 210

- CE!

SUPPLIED ACCESSORIES

- PoE Injector with US/EU/UK Power Cord
- Pole Mounting Kit (i.e.Pole Mounting Kit Max O.D. 2 in.)

WARRANTY

- Two (2) years on parts and labor
- Three (3) years optional extended warranty plan with advanced replacement
- Five (5) years optional extended warranty plan with advanced replacement

Fluidmesh Networks, Inc.
18 Tremont Street, Suite 730
Boston, MA 02108
U.S.A.
Tel. +1 {617) 209-6080
Fax. +1 {866} 458-1522

www.fluidmesh.com
info@fluidmesh.com

EMEA Headquarters {Italy}
Tel. +39.02.0061.6189

UK Branch
Tel. +44.2078.553.132

D

LED Indicators

This chapter provides the possible LED status and error indicators for WRUs and LIUs.

Table D–1 5Mbps WRU Power On Sequence LED Indications

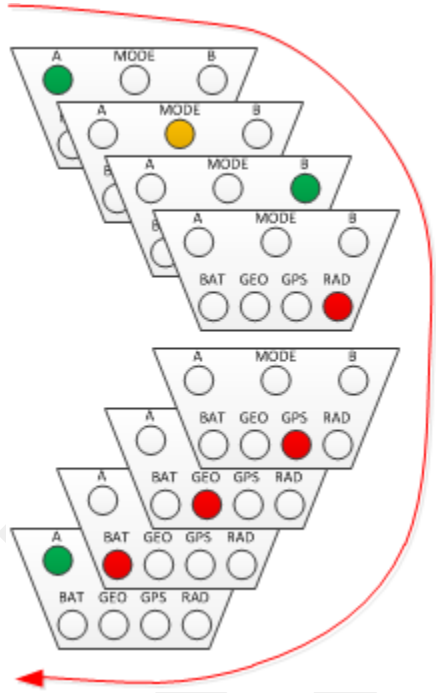
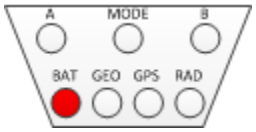
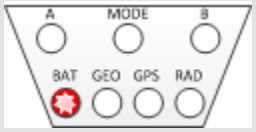
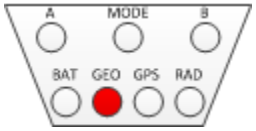
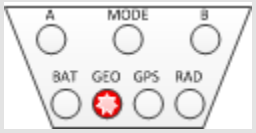
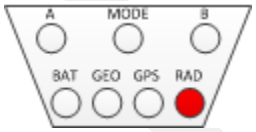
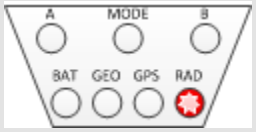
	LED Indicators	Summary	Description
1		Hard Reset	The LEDs light up in clockwise rotation starting and ending with the A battery LED in the following cases: • When the batteries are attached • Anytime the unit resets itself • In between updating firmware applications
2		Check for New Firmware	Solid MODE Approximately 5 seconds

Table D–1 5Mbps WRU Power On Sequence LED Indications (cont.)

	LED Indicators	Summary	Description
3		Update Arm	Solid BAT Approximately 30 seconds, then repeats *step 1* and *step 2* LED sequence
		Programming/ Verifying Arm	Flashing BAT Approximately 30 seconds
4		Update Xmega	Solid GEO Approximately 15 seconds, then *step 1* and *step 2* LED sequence
		Programming Xmega	Flashing GEO Approximately 15 seconds
5		Update Radio	Solid RAD Approximately 1-2 seconds, then *step 1* and *step 2* LED sequence
		Programming Radio	Flashing RAD Approximately 1-2 seconds

Once the power on sequence is complete, the LED indicators in the following table can be seen.

Table D–2 WRU LED Status Indications

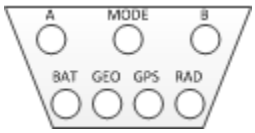
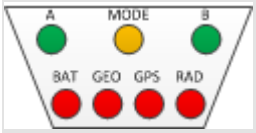
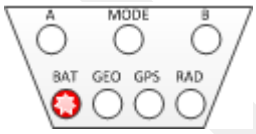
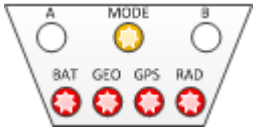
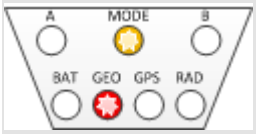
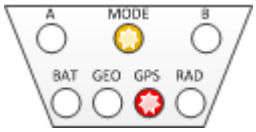
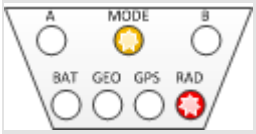
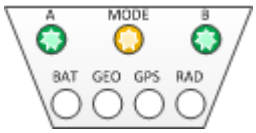
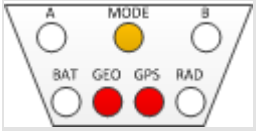
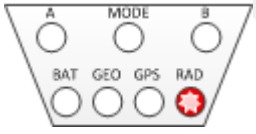
LED Indicators	Summary	Description
	Undeployed Standby Armed Dead Batteries	If no LEDs are on (lit up), it can be one of the following scenarios: • Unit Undeployed • Unit in Standby mode • Unit in Armed mode • Batteries dead When you do a tilt test on a unit with no LEDs on, the following may occur: • An Undeployed unit deploys and begins the self tests • A unit in Standby mode displays an LED error condition • A unit in Armed mode will continue to display no lit LEDs • A unit with dead batteries will continue to display no lit LEDs **NOTE:** Battery state is shown in the RT System 2 user interface tables. For example, the Ground Equipment Table.
	Geo Down Tilt Detected	All LEDs are on solid
	Battery test in progress	Flashing: • MODE • BAT
	Battery A in use	A flashing
	Self test in progress	Flashing: • MODE • BAT • GEO • GPS • RAD

Table D–2 WRU LED Status Indications (cont.)

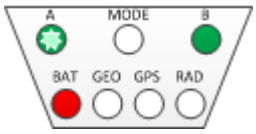
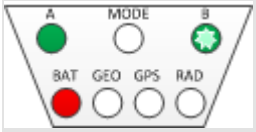
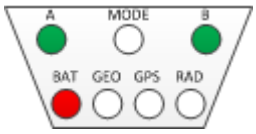
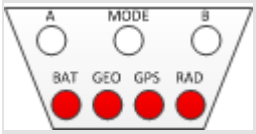
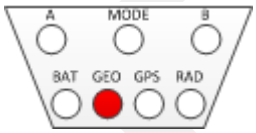
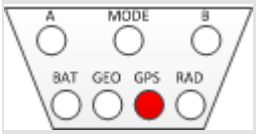
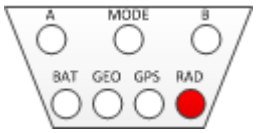
LED Indicators	Summary	Description
	Geophone test in progress	Flashing: • MODE • GEO
	Acquiring GPS fix	Flashing: • MODE • GPS
	Neighbor discovery in progress	Flashing: • MODE • RAD
	Neighbor discovered	Flashing: • A • MODE • B
	Continue (lay flat to move to next test)	Solid: • MODE • GEO • GPS **NOTE:** To skip a test during the self-test process, tilt the unit vertical (geophone down) until you see this triangle of LEDs. Tilt the unit back to horizontal to continue.
	Sleeping	RAD flashing

Error LEDs remain persistent throughout the self-discovery process and are turned off upon completion. If certain self-tests fail, it is possible that the WRU will power down.

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).

Table D–3 WRU LED Error Indications

LED Indicators	Summary	Description
	Single battery failure (B)	A flashing Solid: • B • BAT
	Single battery failure (A)	B flashing Solid: • A • BAT
	Both batteries failure	Solid: • A • B • BAT
	Self test failure	Solid: • BAT • GEO • GPS • RAD
	Geophone failure	GEO solid
	No GPS fix	GPS solid GPS fix within 10 m within 1 min not found
	No neighbor detected	RAD solid If this is the first WRU deployed, this is the expected condition.

TBD

Table D–4 LIU LED Discipline Indications

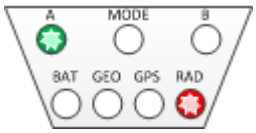
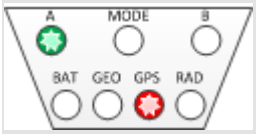
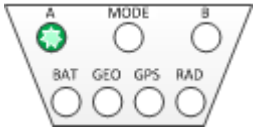
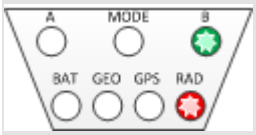
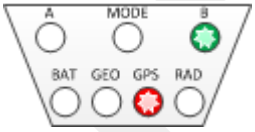
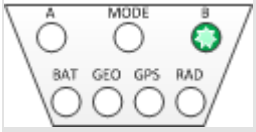
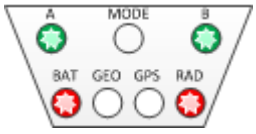
LED Indicators	Summary	Description
	Disciplining to radio	Flashing: • A • RAD
	Disciplining to GPS	Flashing: • A • GPS
	Disciplining	A flashing
	Disciplined to radio	Flashing: • B • RAD
	Disciplined to GPS	Flashing: • B • GPS
	Disciplined	B flashing
	Incorrectly dropped out of cycle mode	Flashing: • A • B • BAT • RAD

Table D–4 LIU LED Discipline Indications (cont.)

LED Indicators	Summary	Description
	Armed	No lights

E

Weighted Mast

This section describes the mast that uses weights to maintain stability.

E.1 Specifications

Tripod Weight = 50 lbs (22.73 kg)

Minimum mast height = 53” (includes 6” for mounting)

Base size = 48” (1.2m) x 48” (1.2m)

Supports up to 12 – 16” x 8” blocks

Pre-galvanized steel frame

Accepts up to 2.5” mast (not included)

Figure E–1 Weighted Mast

E.2 Hardware Supplied

The following hardware is supplied with the tripod mast:

- 4 - Bolt, Carriage 1/4 - 20 x 3/4"
- 12 - Bolt, Carriage 1/4 - 20 x 5/8"
- 4 - Bolt, 1/4 - 20 x 3/4" Hex Head
- 4- Bolt, 1/4 - 20 x 1/2" Hex Head
- 24-Nut, 1/4 - 20
- 24 - Lock washer, 1/4 Int. tooth

E.3 Assembly Instructions

This section provides instructions and illustrations for assembly of the tripod.

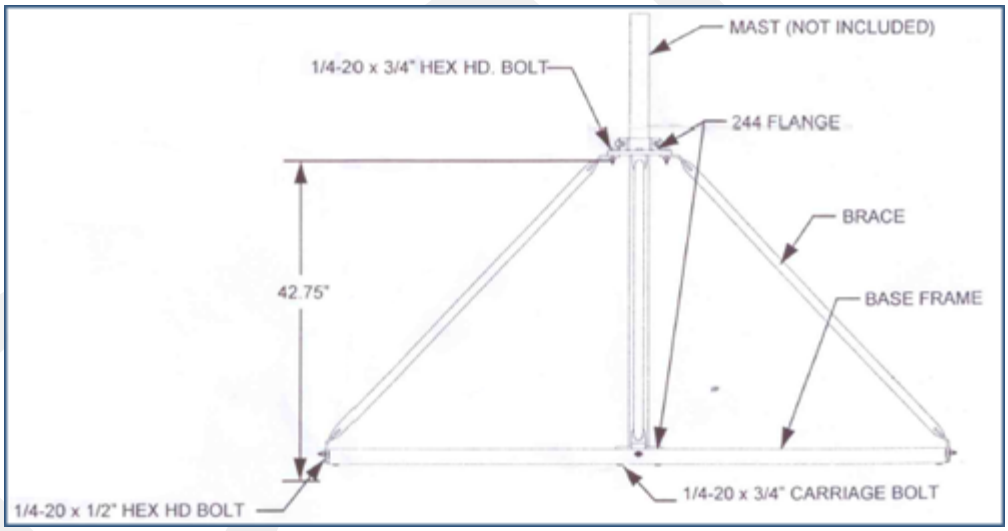


Figure E–2 Tripod Assembly – Front View

To assemble the tripod:

1. Assemble one 244 Flange to the Center Support Plate using four 1/4-20 x 3/4" carriage Bolts, Lock washers and Hex Nuts. Make sure to assemble the Bolts with the Heads on the underside of the frame. Hex Nut should be on the top side of the frame.
2. Assemble Base Frame and Center Support Plate using twelve 1/4-20 x 5/8" carriage Bolts, Lock washers and Hex Nuts. Make sure to assemble the Bolts with the Heads on the underside of the frame. Hex Nut should be on the top side of the frame.
3. Assemble the four (4) Braces to the upper support flange using four 1/4-20x3/4 Hex Head Bolts, Lock washers and Nuts.

4 Assemble the other end of the braces to the base frame using the four (4) 1/4-20 x 1/2" Hex Head Bolts, Lock washers, and Nuts.

5 Insert Bolts into upper and lower flange.

6 Slide the mast (not included) into position and tighten securely and weigh.

Wade Antenna Ltd.

Ontario, Canada

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