



## BU-xH1R 900 MHz and 2.4 GHz

Base Units Manual U099.0.2

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#### FCC Statements

- 15.19 Two Part Warning
- This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:
- (1) ζ2
- This device may not cause harmful interference and This device must accept any interference received, including interference that may cause undesired operation.

#### 15.21 - Unauthorized Modification

NOTICE: The manufacturer is not responsible for any unauthorized modifications to this equipment made by the user. Such modifications could void the user's authority to operate the equipment.

#### 15.105(b) - Note

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

#### Industry Canada Statement

This device complies with Canadian RSS-210.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website https://www.canada.ca/en/health-canada/servic places-public /safety-code-6-health-c anada-radiofreque canada.html.

Le présent appareil est conforme à la norme CNR-210 d'Industrie Canada.

L'installateur de cet équipement radio doit s'assurer que l'antenne est située ou orientée de façon à ne pas émettre un champ RF dépassant les limites de Santé Canada pour la population générale; consulter le Code de sécurité 6, disponible sur le site Web de Santé Canada https://www mental-workplace-health/reports-publications/ra radiofrequency-exp environmental-workplace-health-health-canada.html

#### Industry Canada Statement

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. Le fonctionnement est soumis aux deux conditions suivantes : (1) cet appareil ne doit pas causer d'interférences, et (2) cet appareil doit accepter toute interférence, y compris les interférences susceptibles de causer un fonctionnement non désiré de l'appareil.

#### IC Unlicensed Devices EIRP Statements for Removable Antennas

Part 1: Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that necessary for successful communication.

Partie 1 : Conformément à la réglementation d'Industrie Canada, cet émetteur radio ne peut fonctionner qu'avec une antenne dont le type et le gain maximal (ou inférieur) sont approuvés pour l'émetteur par Industrie Canada. Pour réduire les interférences radioélectriques potentielles avec d'autres utilisateurs, le type d'antenne et son gain doivent être choisis de telle sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne soit pas supérieure à celle nécessaire pour une communication réussie.

Part 2: This radio transmitter (LOBSRF-305) has been approved by Industry Canada to operate with the antenna type listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Partie 2 : Cet émetteur radio (LOBSRF-305) a été approuvé par Industrie Canada pour fonctionner avec le type d'antenne indiqué ci-dessous avec le gain maximal admissible et l'impédance d'antenne requise pour chaque type d'antenne indiqué. Il est strictement interdit d'utiliser avec cet appareil un type d'antenne ne figurant pas dans cette liste ou ayant un gain supérieur au gain maximum indiqué pour ce type.

#### **RoHS Compliance Statement**

Cervis, Inc. complies with the requirements of Restriction of Hazardous Substances (RoHS/WEEE) Specification based on in-house practice and

declaration of compliance from our vendors. For additional information concerning RoHS compliance, please contact Cervis, Inc. at:

CERVIS, Inc.

170 Thorn Hill Road • Warrendale, PA 15086

Phone: 724 741 9000 • Fax: 724 741 9001



This product may contain material that may be hazardous to human health and the environment. In compliance with EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE): Do not dispose of the product as unsorted municipal waste.

- This product should be recycled in accordance with local regulations. Contact local authorities for detailed information.
- This product may be returnable to the distributor for recycling. Contact your distributor for details



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#### Cervis, Inc. Safety Precautions

- Read and follow all instructions.
- Failure to abide by Safety Precautions may cause equipment failure, loss of authority to operate the equipment, and personal injury.
- Use and maintain proper wiring. Follow equipment manufacturer instructions. Improper, loose, and frayed wiring can cause system failure, equipment damage, and intermittent operation.
- Changes or modifications made to equipment not expressly approved by the manufacturer will void the warranty.
- Equipment owner/operators must abide by all applicable Federal, State, and Local laws concerning equipment installation and operation. Failure to comply could result in penalties and could void user authority to operate the equipment.
- Make sure that the machinery and surrounding area is clear before operating. Do not activate the remote control system until certain that it is safe to do so.
- Turn off the handheld remote and remove power from the base unit before attempting any maintenance. This will prevent accidental operation of the controlled machinery.
- Remove power from the Base Unit by detaching the 12-pin cable from the base unit connector P1 or by removing the source power from the circuit.
- Use a damp cloth to keep units clean. Remove mud, concrete, dirt, etc., after use to prevent obstructing or clogging the buttons, levers, wiring, and switches.
- Do not allow liquid to enter the handheld or base unit enclosures. Do not use highpressure equipment to clean the handheld remote or base unit.
- Disconnect the radio base unit before welding on the machine. Failure to disconnect the base unit may cause destruction of or damage to the base unit.
- Operate and store units only within the specified operation and storage temperatures defined in this document's specifications.
- Keep high-energy radio frequency (RF) devices away from handheld remotes. Activating high-power communication radios, for instance, in close proximity to handheld remotes can cause interference and "false" circuit activation.
- Do not key two-way radios while using the handheld remote.



## 1.0 SmaRT BU-xH1R Base Unit and Handheld Remote Control

## **Note**: The "x" in BU-xH1R represents both 900 MHz (9) and 2.4 GHz (2) base units.

A standard SmaRT BU-xH1R remote control system consists of a SmaRT BU-xH1R base unit and a SmaRT handheld remote control unit. A SmaRT system can communicate in congested radio environments using Channel-Hopping Direct Sequence Spread Spectrum (DSSS) wireless technology in both the 900 MHz or 2.4 GHz range. System options offer selection from a variety of SmaRT remote control units—some of which are shown in Figure 1. Though standard systems generally use one remote, BU-xH1R base units can communicate with up to eight remotes on a first-come/first-served basis.

Communication between a remote control and base unit is established at the factory using the Associate Procedure, a process that can also be performed in the field. The procedure seamlessly links the SmaRT handheld remote and the BU-xH1R base unit without the need to open the enclosures of either unit.

**Note**: Associate and Dissociate details are available in the manual of the particular SmaRT handheld remote that is used in a SmaRT wireless remote control system.



Figure 1. SmaRT BU-xH1R with SmaRT Handheld Remote Control Examples



## 2.0 SmaRT BU-xH1R Base Unit

The SmaRT BU-2H1R5 and BU-9H1R5 base units feature one Form C relay output and five Form A relay outputs. CAN bus capable base units—BU-2H1R3 and BU-9H1R3—have one Form C and three Form A relay outputs. The BU-xH1R family of base units accepts a broad range of operating input power with model-dependent operating voltages of 7–32 VDC, 7–28 VAC, and 100–240 VAC. All connections are made using the single 12-wire cable harness that fits to the base unit keyed connector to guard against cross connection.

SmaRT base units feature seamless association with a SmaRT handheld unit without the need to open the case. Using Channel-Hopping Direct Sequence Spread Spectrum (DSSS) wireless technology at 900 MHz or 2.4 GHz, the base unit provides a robust link with a SmaRT handheld remote in congested radio environments with an extensive line-of-sight communications range. BU-9H1R3 and BU-2H1R3 CAN units provide a CAN bus interface for applications requiring wired connectivity.

The rugged weatherproof enclosure allows the unit to operate worry-free in harsh weather conditions.

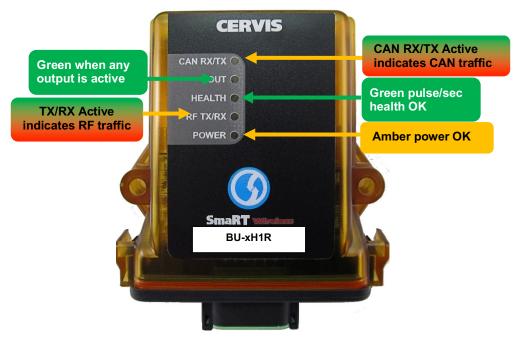


Figure 2. BU-xH1R LEDs

Input power depends of the type of BU-xH1R used. Refer to Appendix A for the list of BU-xH1R5 and BU-xH1R3 hardware options.



#### **BU-xH1R Base Unit Features**

- Channel-Hopping DSSS Technology 900 MHz @ 10 mW, 2.4 GHz @ 100 mW
- One Form C Relay
- Up to Five Form A (SPST) Relay Outputs Standard Operation
- Single Connector for Wiring Ease
- Diagnostic LEDs
- CAN bus Capable
- Weatherproof Case

### 2.1 Base Unit Installation



Make sure the machine that the base unit will be attached to is disabled during installation.

Use the configuration diagrams supplied by Cervis, Inc. to guide you in mounting the base unit and connecting your wiring harness cables. Mounting of the base unit is left much to your discretion with the following guidelines:

- Before installing, make sure that the configuration diagrams supplied with the system are available. Keep them where they are available at all times.
- Make sure the wiring harness cable HN-1003 is at hand.
- Always mount the base unit away from any intense radio or electric disturbance sources.
- Make sure the mount is secure. Mount the unit where you have enough room for your wiring harness connections.
- Mount so that the connectors are positioned down to avoid water pooling (see Figure 3).

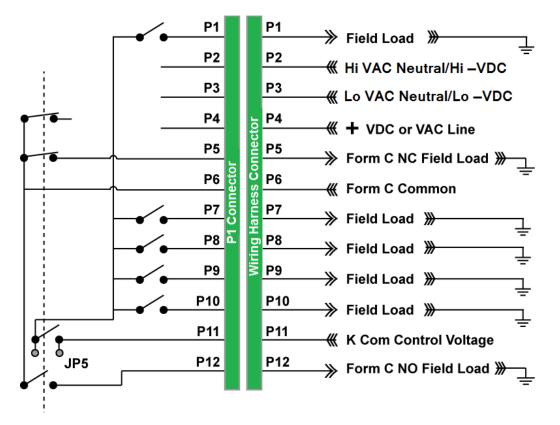


Figure 3. Mounting Holes and Cable Connector P1



## 2.2 SmaRT BU-xH1R5 P1 Connector Wiring





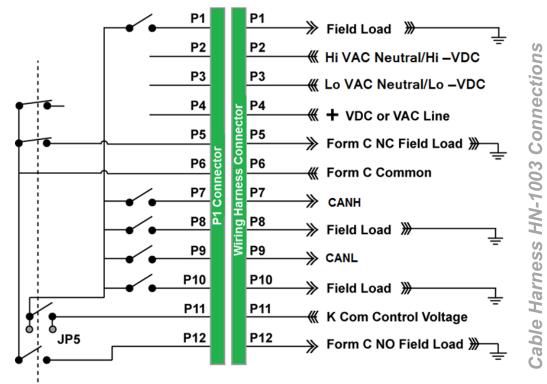
### Figure 4. BU-xH1R5 P1 Connector Standard Wiring

#### Table 1. SmaRT BU-xH1R5 P1 Connector Pin Assignments

Pin	Name	Description	Pin	Name	Description
1	K1	Form A Relay	7	K5	Form A Relay
2	L3	Hi VAC Neutral/Hi –VDC	8	K4	Form A Relay
3	L2	Lo VAC Neutral/Lo –VDC	9	K3	Form A Relay
4	L1	+VDC or VAC Line	10	K2	Form A Relay
5	K6	Form C Relay NC	11	KCOM	Control Voltage
6	K6	Form C Relay Common	12	K6	Form C Relay NO

## 2.3 SmaRT BU-xH1R3 P1 Connector Wiring





JP5 when installed (factory) isolates Form A relays from the Form C relay.

### Figure 5. BU-xH1R3 P1 Connector CAN Wiring

#### Table 2. SmaRT BU-xH1R3 P1 Connector Pin Assignments

Pin	Name	Description	
1	K1	Form A Relay	
2	L3	Hi VAC Neutral/Hi –VDC	
3	L2	Lo VAC Neutral/Lo –VDC	
4	L1	+VDC or VAC Line	
5	K6	Form C Relay NC	
6	K6	Form C Relay Common	

Pin	Name	Description
7	CAMH	CANH
8	K4	Form A Relay
9	CANL	CANL
10	K2	Form A Relay
11	KCOM	Control Voltage
12	K6	Form C Relay NO



## 2.4 Base Unit Troubleshooting

#### Table 3. Base Unit LED Troubleshooting

Indication	Cause	Interpretation – Recommendation
Power LED not active	Is input power present?	Check input power polarity.
Power LED Red or Green	Indicates an internal component failure.	Contact Cervis, Inc. service department.
CAN RX/TX not active		<ul> <li>✓ Is the system using CAN?</li> <li>✓ Check for obstructions preventing line-of-sight transmission.</li> <li>✓ Check that the handheld remote is active.</li> <li>Re-associate the handheld remote to the base unit.</li> </ul>
RF TX/RX not active	Electrical signals not activating the LEDs.	<ul> <li>✓ Is the system using RF?</li> <li>✓ Check for obstructions preventing line-of-sight transmission.</li> <li>✓ Check that the handheld remote is active.</li> <li>Re-associate the handheld remote to the base unit.</li> </ul>
Out LED not active		<ul> <li>Check that the handheld LEDs are active when the appropriate buttons are pushed.</li> </ul>
Health LED rapidly blinking Amber	Indicates an internal problem.	Contact Cervis, Inc. service department.
Health LED blinking Red	Over-temperature indicated.	<ul> <li>✓ Check the outputs for loose wiring, etc.</li> <li>✓ Active channel current consumption less than 1 A typical. (This is not a problem in cases where less than 1 A draw is a normal condition.)</li> </ul>

The base unit may reset if its supply voltage drops below a minimum volt level, even momentarily. Minimum supply voltages are:

### CAUTION



• 7 VDC for a BU-xH1R-LVD

- 16 VDC for a BU-xH1R-LVA
- 90 VAC for a BU-xH1R-HVU

If the supply voltage drops below minimum input volts for a consistent period of time, the LEDs (including the TX/RX LEDs if transceiving) will dim and flicker.

These circumstances are symptoms of a battery or power source that cannot sustain the present current load. This situation should be remedied as soon as possible.

# 3.0 Specifications

## Table 4. SmaRT BU-xH1R Base Unit Specifications

ltem	Description			
Power	See Appendix A			
Environment	Operating Temp	–25° C to 60° C (–4° F to 131° F)		
	Storage Temp	–40° C to 85° C (–40° F to 185° F)		
	Humidity	0 to 100%		
Radio	Frequency	906–924 MHz or 2405–2480 MHz		
	License	None required (License Free)		
	Modulation	DSSS		
	Antenna	Internal or external by device		
Enclosure	Dimensions	119 mm x 133 mm x 36 mm (5.24" x 4.69" x 1.42")		
	Durability	High Impact Polymer		
	Mounting Holes	7.4 mm (0.29") dia.		
		102 mm center-to-center (4" center-to-center)		
Indicators	CAN RX/TX	ndicates CAN traffic: Green – Receive Red – Transmit		
	Out	Green – Output Active		
	Health	Green – Pulse/sec. OK		
	TX/RX	Indicates RF traffic: Green – Receive Red – Transmit		
	Power	Yellow – OK Red/Grn– Fault		
Outputs	Relays	One Form C Three to Five Form A, model-dependent		
	Current	7 A max switching @ 45° C (113° F) for K1 through K5 combined 100 mA min @ 5 VDC 6 A max switching @ 45° C (113° F) for K6		
CAN	Protocol	SAE J1939		



## Appendix A: BU-xH1R Hardware Options

### Table 5. BU-xH1R Hardware Options

Model Name	Frequency/ RF Power	# of Channels /Relay Types	Input Power	Antenna	Serial Port	AC Suppression
BU-9H1R5-INT-LVD	900 MHz/10 mW	6/Form C, 5 Form A	7–32 VDC	Internal	NA	Yes
BU-9H1R3-INT-LVD-CAN	900 MHz/10 mW	4/Form C, 3 Form A	7–32 VDC	Internal	CAN	Yes
BU-9H1R5-INT-LVD-NOS	900 MHz/10 mW	6/Form C, 5 Form A	7–32 VDC	Internal	NA	No
BU-9H1R3-INT-LVD-NOS-CAN	900 MHz/10 mW	4/Form C, 3 Form A	7–32 VDC	Internal	CAN	No
BU-9H1R5-INT-LVA	900 MHz/10 mW	6/Form C, 5 Form A	9–35 VAC	Internal	NA	Yes
BU-9H1R3-INT-LVA-CAN	900 MHz/10 mW	4/Form C, 3 Form A	9–35 VAC	Internal	CAN	Yes
BU-9H1R5-INT-LVA-NOS	900 MHz/10 mW	6/Form C, 5 Form A	9–35 VAC	Internal	NA	No
BU-9H1R3-INT-LVA-NOS-CAN	900 MHz/10 mW	4/Form C, 3 Form A	9–35 VAC	Internal	CAN	No
BU-9H1R5-INT-HVU	900 MHz/10 mW	6/Form C, 5 Form A	100–240 VAC	Internal	NA	Yes
BU-9H1R3-INT-HVU-CAN	900 MHz/10 mW	4/Form C, 3 Form A	100–240 VAC	Internal	CAN	Yes
BU-9H1R5-INT-HVU-NOS	900 MHz/10 mW	6/Form C, 5 Form A	100–240 VAC	Internal	NA	No
BU-9H1R3-INT-HVU-NOS-CAN	900 MHz/10 mW	4/Form C, 3 Form A	100–240 VAC	Internal	CAN	No
BU-9H1R5-EXT-LVD	900 MHz/10 mW	6/Form C, 5 Form A	7–32 VDC	External	NA	Yes
BU-9H1R3-EXT-LVD-CAN	900 MHz/10 mW	4/Form C, 3 Form A	7–32 VDC	External	CAN	Yes
BU-9H1R5-EXT-LVD-NOS	900 MHz/10 mW	6/Form C, 5 Form A	7–32 VDC	External	NA	No
BU-9H1R3-EXT-LVD-NOS-CAN	900 MHz/10 mW	4/Form C, 3 Form A	7–32 VDC	External	CAN	No
BU-9H1R5-EXT-LVA	900 MHz/10 mW	6/Form C, 5 Form A	7–28 VAC	External	NA	Yes
BU-9H1R3-EXT-LVA-CAN	900 MHz/10 mW	4/Form C, 3 Form A	7–28 VAC	External	CAN	Yes
BU-9H1R5-EXT-LVA-NOS	900 MHz/10 mW	6/Form C, 5 Form A	7–28 VAC	External	NA	No
BU-9H1R3-EXT-LVA-NOS-CAN	900 MHz/10 mW	4/Form C, 3 Form A	7–28 VAC	External	CAN	No
BU-9H1R5-EXT-HVU	900 MHz/10 mW	6/Form C, 5 Form A	100–240 VAC	External	NA	Yes
BU-9H1R3-EXT-HVU-CAN	900 MHz/10 mW	4/Form C, 3 Form A	100–240 VAC	External	CAN	Yes
BU-9H1R5-EXT-HVU-NOS	900 MHz/10 mW	6/Form C, 5 Form A	100–240 VAC	External	NA	No
BU-9H1R3-EXT-HVU-NOS-CAN	900 MHz/10 mW	4/Form C, 3 Form A	100–240 VAC	External	CAN	No
BU-2H1R5-INT-LVD	2.4 GHz/100 mW	6/Form C, 5 Form A	7–32 VDC	Internal	NA	Yes
BU-2H1R3-INT-LVD-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	7–32 VDC	Internal	CAN	Yes
BU-2H1R5-INT-LVD-NOS	2.4 GHz/100 mW	6/Form C, 5 Form A	7–32 VDC	Internal	NA	No
BU-2H1R3-INT-LVD-NOS-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	7–32 VDC	Internal	CAN	No
BU-2H1R5-INT-LVA	2.4 GHz/100 mW	6/Form C, 5 Form A	7–28 VAC	Internal	NA	Yes
BU-2H1R3-INT-LVA-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	7–28 VAC	Internal	CAN	Yes
BU-2H1R5-INT-LVA-NOS	2.4 GHz/100 mW	6/Form C, 5 Form A	7–28 VAC	Internal	NA	No
BU-2H1R3-INT-LVA-NOS-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	7–28 VAC	Internal	CAN	No
BU-2H1R5-INT-HVU	2.4 GHz/100 mW	6/Form C, 5 Form A	100–240 VAC	Internal	NA	Yes
BU-2H1R3-INT-HVU-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	100–240 VAC	Internal	CAN	Yes
BU-2H1R5-INT-HVU-NOS	2.4 GHz/100 mW	6/Form C, 5 Form A	100–240 VAC	Internal	NA	No
BU-2H1R3-INT-HVU-NOS-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	100–240 VAC	Internal	CAN	No
BU-2H1R5-EXT-LVD	2.4 GHz/100 mW	6/Form C, 5 Form A	7–32 VDC	External	NA	Yes
BU-2H1R3-EXT-LVD-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	7–32 VDC	External	CAN	Yes
BU-2H1R5-EXT-LVD-NOS	2.4 GHz/100 mW	6/Form C, 5 Form A	7–32 VDC	External	NA	No
BU-2H1R3-EXT-LVD-NOS-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	7–32 VDC	External	CAN	No
BU-2H1R5-EXT-LVA	2.4 GHz/100 mW	6/Form C, 5 Form A	7–28 VAC	External	NA	Yes
BU-2H1R3-EXT-LVA-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	7–28 VAC	External	CAN	Yes
	2.4 GHz/100 mW	6/Form C, 5 Form A	7–28 VAC	External	NA	No

Model Name	Frequency/ RF Power	# of Channels /Relay Types	Input Power	Antenna	Serial Port	AC Suppression
BU-2H1R3-EXT-LVA-NOS-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	7–28 VAC	External	CAN	No
BU-2H1R5-EXT-HVU	2.4 GHz/100 mW	6/Form C, 5 Form A	100–240 VAC	External	NA	Yes
BU-2H1R3-EXT-HVU-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	100–240 VAC	External	CAN	Yes
BU-2H1R5-EXT-HVU-NOS	2.4 GHz/100 mW	6/Form C, 5 Form A	100–240 VAC	External	NA	No
BU-2H1R3-EXT-HVU-NOS-CAN	2.4 GHz/100 mW	4/Form C, 3 Form A	100–240 VAC	External	CAN	No

**V** Note: BU-xH1R-CAN units are internally terminated at 4.3 k $\Omega$ .. Termination can be removed at the factory.

## Appendix B: BU-xH1R Wiring Harness

Table 6. BU-xH1R Wiring Harness				
	Wiring Harness	Part Number		

Cable P1	HN-1003
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Figure 6. HN-1003 Wiring Harness

## **Appendix C: Exposure to Radio Frequency Energy**

SmaRT handheld remote units contain radio transceivers. When active, a handheld remote sends out radio frequency (RF) energy through its internal antenna. The SmaRT handheld remote complies with limits set by the United States Federal Communications Commission (FCC) for operating distance from human tissue.



## **Appendix D: Agency Identification Label Location**

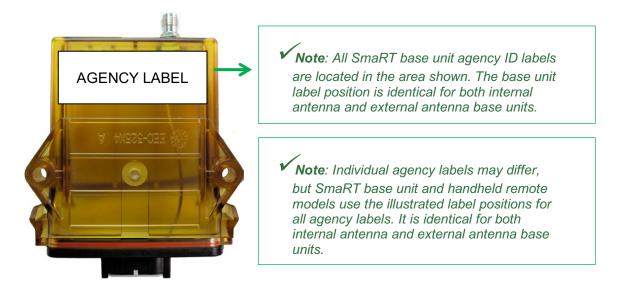


Figure 7. Agency Identification Label Locations

