



**BU-xH20XF Base Units**

**User Manual**

U102.0.2

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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) This device may not cause harmful interference and
- (2) 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 base unit.
- Connect the equipment into an outlet on a circuit different from that to which the base unit 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/services/environmental-workplace-health/reports-publications/radiation/safety-code-6-health-canada-radiofrequency-exposure-guidelines-environmental-workplace-health-health-canada.html>.

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

*Le programme d'installation de cet équipement radio doit s'assurer que l'antenne est située ou fait telle qu'elle n'émet pas de champ RF dépassant les limites de Santé Canada pour la population générale ; consulter le Code de sécurité 6, disponible auprès de Santé Canada site Web*

*<https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/safety-code-6-health-canada-radiofrequency-exposure-guidelines-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. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

## 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 (E.I.R.P.) is not more than that necessary for successful communication.

*Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (P.I.R.E.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.*

**Part 2:** This radio transmitter (LOBSRF-305/309) 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.

*Le présent émetteur radio (LOBSRF-305/309) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.*

## 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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## Note to the Manual User

- ✓ **Note:** The standard SmaRT base unit can operate at either 900 MHz or 2.4 GHz frequencies using Direct Sequence Spread Spectrum (DSSS) wireless technology. To avoid repetition and possible confusion, the base unit may be referred to as the “BU-xH20XF” throughout this document where “x” represents either 900 MHz as “9” (for BU-9H20XF) or 2.4 GHz as “2” (for BU-2H20XF).

## Related Documents

- **System-related Cervis, Inc. Engineered System Approval (ESA) or Design (ESD) document**
- **Appropriate SmaRT remote control unit user manual**

Contact us with any questions during installation or troubleshooting at (724) 741-9000.

## Cautions and Notes

Cautions warn users of dangerous circumstances or conditions to be aware of. These conditions may cause harm, or even death, to personnel or destruction of equipment. See the following example:

### CAUTION



Prevent inadvertent machine movement while establishing the communication link between SmaRT base units and remote control units. Always disconnect power from the base unit before attempting to Associate.

Notes—such as the following example—contain information that may be useful to the user or are pertinent to system operation.

- ✓ **Note:** Cervis, Inc.-provided harness wires are either color-coded or individually numbered to aid in properly wiring the controlled devices to the P1 and P2 base unit connectors.

## 1.0 Safety Instructions

### CAUTION



Carefully read these instructions to install and use the system properly, to keep it in safe working condition, and to reduce the risks of misuse.

**Do not** use this system in potentially explosive atmospheres.

Any use other than that specified in this manual is **DANGEROUS**.

Strictly adhere to the following instructions.

✓ **Note:** To comply with United States Federal Communications Commission (FCC) radio frequency (RF) exposure compliance requirements, do not co-locate or operate this device and its antenna in conjunction with any other antenna or transmitter.

### CAUTION



Certain adjustments may need to be made while the controlled machinery is active. During these adjustments, all personnel must be at a safe distance from the machine to avoid risk of injury or accidental death.

## 1.1 What You MUST Do

- **Strictly adhere** to this manual's installation instructions.
- Make sure that professional and competent personnel carry out the installation.
- Make sure that all site and prevailing safety regulations are fully followed.
- Make sure that this manual is **permanently available** to the operator and maintenance personnel.
- Keep the remote unit out of reach of **unauthorized personnel**.
- At the beginning of each work day, make sure that the **Stop Button** and other safety measures are working.
- When in doubt, press the **Stop Button**.
- Whenever several systems have been installed, make sure the remote unit you are about to use is the correct one. **Identify** the machine controlled by the remote unit on the remote unit label (customer supplied).
- Cervis, Inc. recommends installing an **audible or visual warning device** on the machine, indicating that the machine is electrically active and that the remote unit has control.
- **Service** the equipment periodically.
- When carrying out repairs, only use parts supplied by Cervis, Inc. dealers.

## 1.2 What You MUST NOT Do

- **Never** make changes to the system that Cervis, Inc. has not studied and approved.
- **Never** power the equipment with anything other than with the specified power supply.
- **Never** allow unqualified personnel to operate the equipment.
- **Never** leave the equipment **ON** after use. Always use the **Stop Button** to avoid accidental movements.
- **Never** use the system when visibility is limited.
- **Never** abuse the remote control unit. Avoid dropping it.
- **Never** use the system if failure is detected.

## 2.0 Base Unit BU-xH20XF



*Figure 1. SmaRT BU-xH20XF base unit*

The versatile BU-9H20XF and BU-2H20XF base units feature twenty Field Effect Transistor (FET) high-side switching outputs or switch-to-power digital inputs, and Controlled Area Network (CAN) Bus control capability. Ten channels have current sense for added control capability. The BU-xH20XF accepts a broad range of input power, with operating voltages ranging from 7 VDC to 28 VDC. The rugged weatherproof enclosure allows these units to operate worry-free in harsh weather conditions. Two 12-wire color-keyed weatherproof connecting cables connect the controlled devices.

Using Channel-Hopping Direct Sequence Spread Spectrum (DSSS) wireless technology at 900 MHz or 2.4 GHz frequencies, the base unit creates a robust link with a SmaRT handheld remote in congested radio environments. SmaRT base units feature seamless association to SmaRT remote units without the need to open either device. Figure 4 shows multiple examples of the various SmaRT remote control units available.

### Features

- DSSS Technology (900 MHz @ 10mW; 2.4 GHz @ 100 mW)
- 20 Dedicated FET Outputs/Inputs
- Current Sense Capable
- Four-Character Display Option
- 12 Diagnostic Light-Emitting Diodes (LEDs)
- Power Cutoff FET
- Pulse Width Modulation (PWM) Control
- Dual Analog Input Capable
- Dual Connectors for Ease of Wiring
- Translucent Case (reduced hole drilling)
- Weatherproof
- CAN Bus Capable
- Compact Design

**Table 1. Smart BU-xH20XF Options**

Model	Freq.	RF	Antenna	Input Power	Serial Port Type	Display	Channels
BU-2H20XF-EXT-AV2-CAN	2.4 GHz	100 mW	External	7–28 VDC	CAN	No	20 FET
BU-2H20XF-INT-AV2-CAN	2.4 GHz	100 mW	Internal	7–28 VDC	CAN	No	20 FET
BU-2H20XF-INT-AVI-CAN	2.4 GHz	100 mW	Internal	7–28 VDC	CAN	No	20 FET
BU-9H20XF-EXT-AV2-CAN	900 MHz	10 mW	External	7–28 VDC	CAN	No	20 FET
BU-9H20XF-INT-AV2-CAN	900 MHz	10 mW	Internal	7–28 VDC	CAN	No	20 FET
BU-9H20XF-EXT-DIS-AV2-CAN	900 MHz	10 mW	External	7–28 VDC	CAN	Yes	20 FET
BU-9H20XF-INT-DIS-AV2-CAN	900 MHz	10 mW	Internal	7–28 VDC	CAN	Yes	20 FET

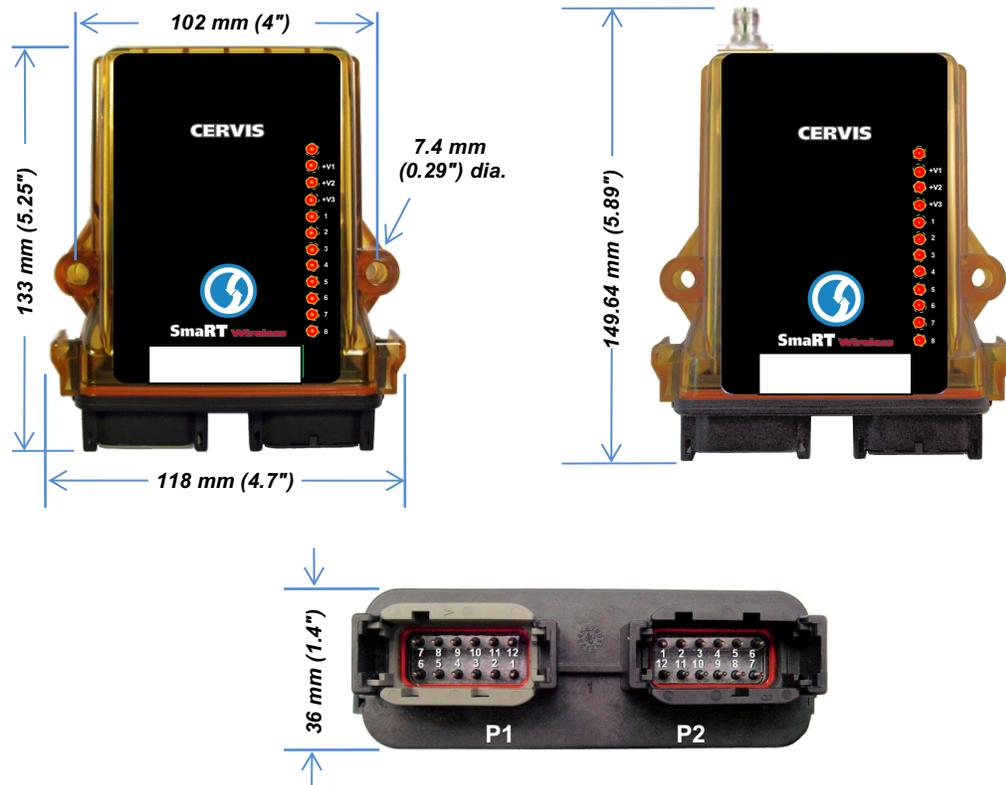
## 2.1 BU-xH20XF Base Unit Installation

### CAUTION



Make sure the machine the base unit will be installed on is disabled during installation.

Use the configuration diagrams Cervis, Inc. supplied as a guide when mounting the base unit and connecting the wiring harnesses. Figure 2 shows the dimensions for drilling mounting holes. Figure 3 shows the wiring diagram and connector pinout.



**Figure 2. BU-xH20XF Base Unit Mounting Dimensions**

## 2.2 BU-xH20XF Base Unit Wiring Diagram and Connectors Pinout

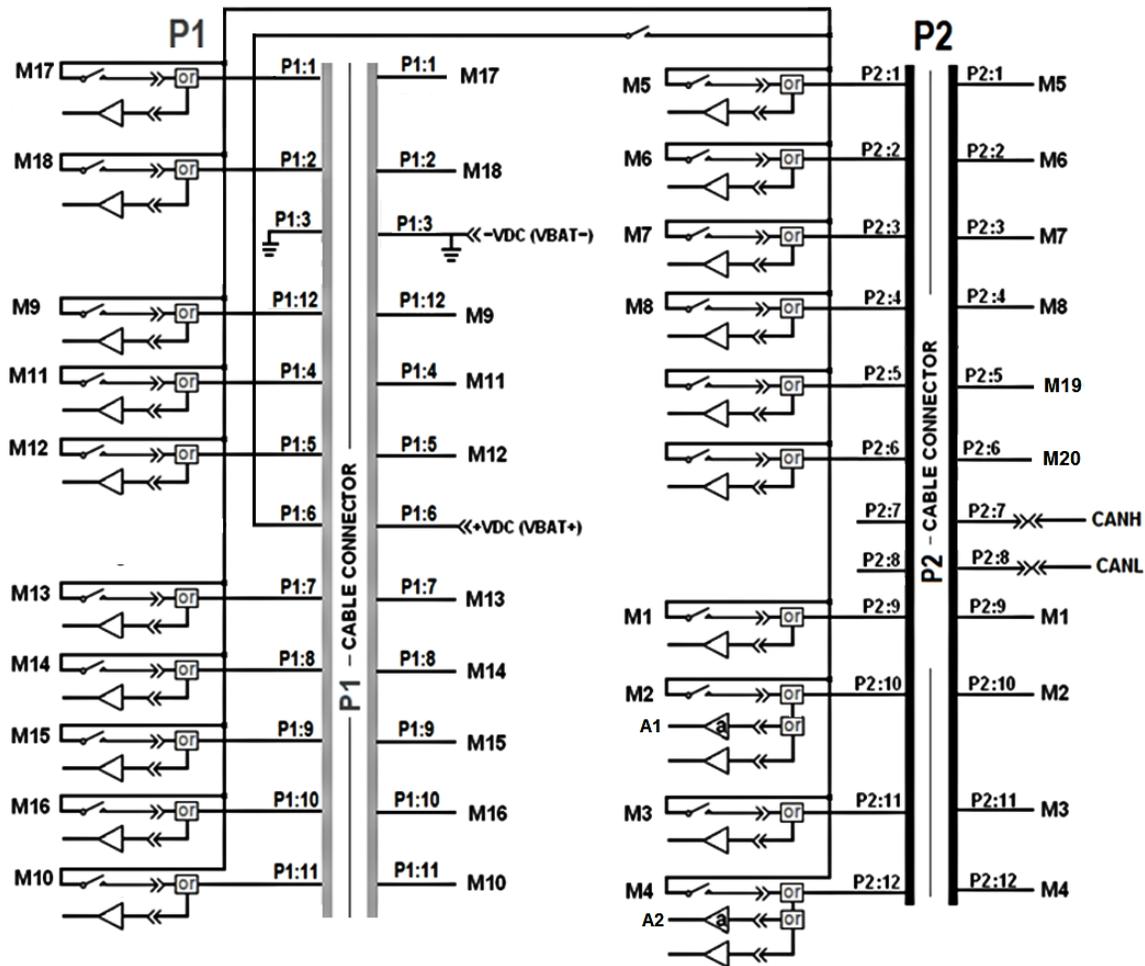


Figure 3. BU-xH20XF Field Wiring

Table 2. BU-xH20XF P1 and P2 Connectors Pinout

P1 Pin	Assigned	P1 Pin	Assigned
P1:1	M17	P1:7	M13
P1:2	M18	P1:8	M14
P1:3	-VDC	P1:9	M15
P1:4	M11	P1:10	M16
P1:5	M12	P1:11	M10
P1:6	+VDC	P1:12	M9

P2 Pin	Assigned	P2 Pin	Assigned
P2:1	M5	P2:7	CANH
P2:2	M6	P2:8	CANL
P2:3	M7	P2:9	M1
P2:4	M8	P2:10	M2
P2:5	M19	P2:11	M3
P2:6	M20	P2:12	M4

### 3.0 Smart BU-xH20XF in Smart Remote Systems

The basic standard Smart Remote Control System consists of at least one Smart base unit, a Smart handheld remote unit, and the wiring harness that connects the base unit to the controlled apparatus. A single base unit can communicate with up to eight various Smart handheld remote units – including the PTO-xH06, the PG-xH14 pistol grip, the OO-218, and the MCB-xH4JS handheld remotes. Figure 4 displays a sample of the Smart remote units available.

Communication between the base unit and the remote units is established at the factory using the Associate process, which can also be easily performed on site when necessary using the Smart remote. Each Smart remote unit manual describes the manual Associate processes for each remote control unit in detail.



Figure 4. Smart BU-xH20XF with Smart Remote Unit Examples

## 4.0 Associate Mode

Before it is shipped, communication between the SmaRT BU-xH20XF and SmaRT remote unit is established while the system is still at the factory. The process can also be applied in the field when necessary – for example, when replacing or adding a remote unit. Access to—and the exact button or switch sequencing used in—Associate mode varies, depending on the type of SmaRT remote the base unit is communicating with. Refer to the appropriate SmaRT remote unit manual or Cervis, Inc. Engineering Spec Sheet for complete Associate Mode details.

### CAUTION



Prevent inadvertent machine movement while establishing the communication link between SmaRT base units and remote control units. **Always disconnect power from the base unit before attempting to enter Associate mode.**

### Associate Example

The following example lists the steps taken to associate a standard SmaRT CB-xH console box remote with a SmaRT BU-xH20XF base unit.

1. Stand near the base unit with the remote unit OFF and power disconnected from the base unit (detach cables from the base unit, or remove the power source).
2. Release the red stop button (twist-up or pull-up) on the remote.
3. Hold the **Associate** switch (**S13**) UP. While holding the Associate switch UP, activate the console remote by holding the ON switch (**S12**) UP. Continue to hold both switches.
4. When the remote unit's **TX** LED is blinking at once per second, apply power to base unit.
5. All remote unit LEDs illuminate for approximately one second. Release switches **S13** and **S12** when they go out.

The remote unit **TX** and **RX** and base unit **RTX** and **RRX** LEDs flash, indicating that the communication link is established.



Figure 5. CB-xH Remote to BU-xH20XF Base Unit Associate Example

## 5.0 Smart BU-xH20XF Specifications

Table 3. Smart BU-xH20XF Specifications

Item	Description			
Power	V <sub>in</sub>	+7 to +28 VDC		
Radio	Frequencies	BU-2H20XF: 2405–2480MHz @ 100mW BU-9H20XF: 906–924MHz @ 10mW		
	License	License-Free		
	Modulation	DSSS		
	Antenna	Internal or External (RP-TNC)		
Environment	Operating Temp	–20° C to 55° C (–4° F to 131° F)		
	Storage Temp	–40° C to 85° C (–40° F to 185° F)		
	Humidity	0 to 100%		
	Vibration/Shock	IEC60068-2-6 10 Hz to 150 Hz @ 1.0 g peak acceleration 10.0 g peak shock acceleration		
Enclosure	Dimensions	mm: 133 x 118 x 36 (inch: 5.25 x 4.7 x 1.4)		
	Durability	High Impact Polymer		
	Mounting Holes	mm: 7.40 dia.; 102 center-to-center Inch: 0.29 dia.; 4.00 center-to-center		
LED Indicators (11 Red)	Unmarked	Inactive		
	+V1, +V2, +V3	OK when lit solid		
	1	Health:	blinks 1x/sec when active	
	2	RF Transmit:	flashes when active	
	3	RF Receive:	flashes when active	
	4	CAN Transmit:	flashes when active	
	5	CAN Receive:	flashes when active	
	6	Output:	blinks 1x/sec when active	
	7	Input:	blinks 1x/sec when active	
8	Error:	solid when error present		
Outputs/Inputs	20	FET—Open Drain		
	Current	2 A per channel 8 A Max. @ 55° C / 131° F		
Digital I/O (20)	Assignments	M1 P2–9 M4 P2–12 M7 P2–3 M10 P1–11 M13 P1–7 M16 P1–10 M19 P2–5	M2 P2–10 M5 P2–1 M8 P2–4 M11 P1–4 M14 P1–8 M17 P1–1 M20 P2–6	M3 P2–11 M6 P2–2 M9 P1–12 M12 P1–5 M15 P1–9 M18 P1–2
Analog (2)	Assignments	A1–M2 P2:10	A2–M4 P2:12	
Optional Umbilical Communications	CAN Bus	SAE J1939		

## 6.0 LED Diagnostic Troubleshooting

*Table 4. SmARt BU-xH20XF LED Troubleshooting Hints*

Indication	Cause	Solution†
<b>Unmarked LED active</b>	Input power polarity is reversed.	<ul style="list-style-type: none"> <li>✓ Adjust wiring connections to achieve correct polarity.</li> </ul>
<b>+V1, +V2, +V3 Power LED not active</b>	Electrical signals not activating the LEDs.	<ul style="list-style-type: none"> <li>✓ Is +VDC input power present?</li> <li>✓ Check input power polarity.</li> </ul>
<b>RTX/RRX not active</b>		<ul style="list-style-type: none"> <li>✓ Check for obstructions preventing line-of-sight transmission.</li> <li>✓ Check that the remote unit is active.</li> <li>✓ Re-associate the remote unit with the base unit.</li> </ul>
<b>CTX/CRX not active</b>		<ul style="list-style-type: none"> <li>✓ Check CAN wiring.</li> <li>✓ Check that the remote unit is active.</li> <li>✓ Re-associate the remote unit to the base unit.</li> </ul>
<b>Out LED not active</b>		<ul style="list-style-type: none"> <li>✓ Check that the remote unit LEDs are active when the appropriate buttons are pushed.</li> <li>✓ Check that startup sequence was followed.</li> </ul>
<b>ERR LED active</b>		Over-temperature or over-current channel indication.
<b>Health LED blinking rapidly</b>	Indicates an internal problem.	<ul style="list-style-type: none"> <li>✓ Contact Cervis, Inc. service department.</li> </ul>

† – If the recommended solutions do not resolve the issue, contact the Cervis, Inc. service department.

## Appendix A: Exposure to Radio Frequency Energy

SmaRT handheld and base unit units contain radio transceivers. When active, handheld remote units send out radio frequency (RF) energy through an internal antenna.

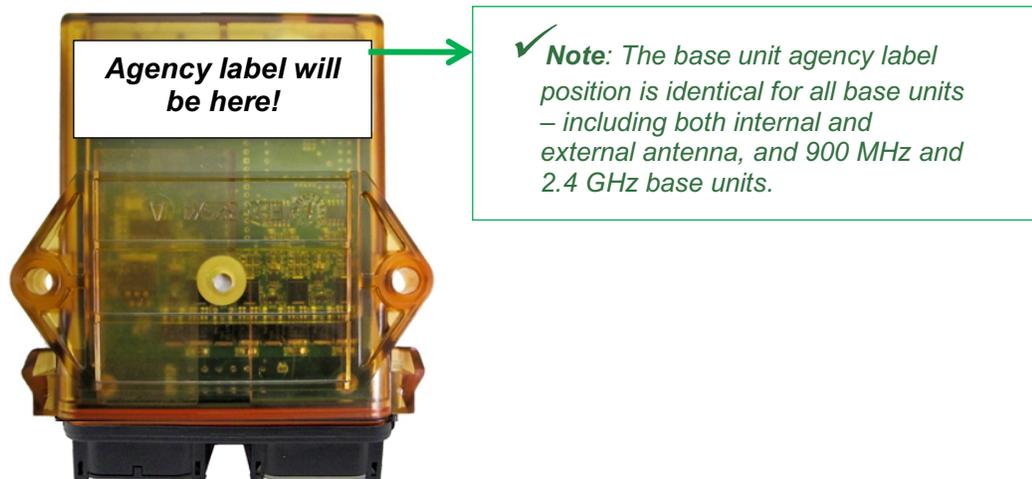
For optimal performance—and to ensure that human exposure to RF energy does not exceed the recommended guidelines—always follow these instructions/precautions.

When using the handheld remote unit:

1. Hold the remote unit so that the top buttons are away from the body in the direction of the base unit.
2. Keep the remote at least 15 mm ( $\frac{5}{8}$  inch) away from the body.
3. Only use carrying cases, belt clips, or holders approved by Cervis, Inc.

When active, SmaRT base units send out RF energy through an internal or external antenna. Mount base units with an external antenna to ensure that the antenna is at least 20 cm away from the human body. Only use external antennas recommended by Cervis, Inc.

## Appendix B: Agency Identification Label Locations



**Figure 6. Agency Identification Label Locations**

