



**SmaRT BU-xH8D
Base Unit Family**

900 MHz and 2.4 GHz Manual

U088.4.4-SmaRT_BU-xH8D

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:

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. The 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.
- Consult the dealer or an experienced radio/TV technician for help.

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.

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.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.

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.

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.

Partie 1 : 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.

Partie 2 : Cet émetteur radio (LOBSRF-305/309) 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.

Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.

The above RoHS statements apply only to 2.4 GHz devices.

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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.*
- ✓ *Power can be removed 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 high-pressure equipment to clean the handheld remote or base unit.*
- ✓ *Disconnect the BU-xH8D base unit before welding on the machine. Failure to disconnect the base unit may cause destruction of or damage to the unit.*
- ✓ *Keep high-energy radio frequency (RF) devices away from handheld remotes. Activating high-power communication radios, for instance, in close proximity to the handheld remotes can cause interference and “false” circuit activation.*
- ✓ *Operate and store units only within the specified operation and storage temperatures defined in this document’s Specifications section.*
- ✓ *Abide by the recommendations in Appendix A, Exposure to Radio Frequency Energy.*

Definitions/Notes

Associate/Association

SmaRT configuration method using a series of specific remote unit button presses to establish a communication link between a SmaRT handheld remote and a SmaRT base unit.

DSSS

Direct Sequence Spread Spectrum; an advanced wireless communication technology.

Dissociate/Disassociate/Dissociation

Dissolution of all established communication links between handhelds and a base unit.

FET

Field Effect Transistor. Type of transistor that relies on an electric field to control device conductivity.

SmaRT Handheld Remote Control Units

PTO – Push to Operate: Command broadcast only while a button is depressed. The command ends when the button is released.

DO – Designated ON/OFF: Handheld remote that uses a single button to both turn ON and turn OFF the remote.

OO – ON/OFF: Handheld remote that has a discrete ON button and an OFF button.

PG – Pistol Grip: Handheld remote that has a handle with a trigger with which the operator can hold the remote and use the trigger to enable functions or provide proportional control commands to the base unit outputs.

CB – Control Box: Remote control unit that can be handheld or attached to a belt or harness for convenience.

MCB – Mini Control Box: Compact remote control unit that is easily held or attached to a belt or harness for convenience.

SmaRT BU-xH8D

Remote base unit with six to eight outputs controlled by a SmaRT handheld remote unit or units. Each SmaRT BU-xH8D can communicate with up to eight SmaRT wireless handheld remotes.

SmaRT xH8D Remote Control System

SmaRT system consisting of at least one SmaRT BU-xH8D base unit and from one to eight SmaRT remote control units. The system operates in the 900MHz or 2.4GHz range and has six outputs with two analog input/outputs, or eight outputs depending on the base unit model.

Line of Sight (aka Direct-Line-of-Sight)

Type of communication between transceivers, or a transmitter and a receiver, where the pathway between the two units must be clear of obstacles.

TX/RX

Transmit/Receive

CAN TX/RX

Transmit/Receive over Control Area Network (CAN Bus).

BU-xH8D

Family of base unit that include BU-9H8D, BU-2H8D, BU-9H6D, BU-2H6D, and their various available configurations as listed in Table 5 and Table 6 of this manual.

1.0 SmarT BU-xH8D Base Unit

The BU-xH8D base units are the output/input modules of a SmarT Remote Control System. A basic SmarT control system consists of at least one Smart wireless remote transmitter, a BU-xH8D base unit, and the wiring harness that connects the base unit to the controlled apparatus. A single base unit can communicate with up to eight individual SmarT handheld remote units, depending on remote control type. The rugged construction, compact size, and multiple output/input versatility allow SmarT Systems to be used for many applications that require remote operation. A BU-xH8D base unit module can be chosen for 900 MHz (BU-9H8D) or 2.4 GHz (BU-2H8D) remote control systems.

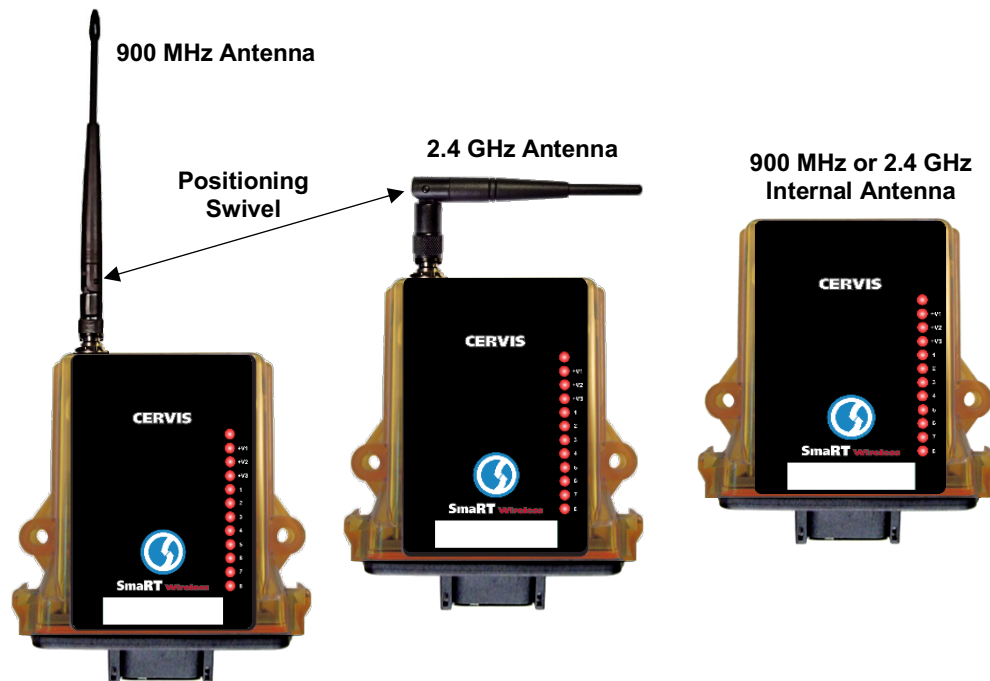


Figure 1. BU-xH8D External and Internal Antenna Base Units

Features

- Rugged, compact weatherproof high-impact polymer enclosures
- Operating Temp: -40°C to $+70^{\circ}\text{C}$ (-40°F to $+158^{\circ}\text{F}$)
- Storage Temp: -40°C to $+85^{\circ}\text{C}$ (-40°F to $+185^{\circ}\text{F}$)
- License-free frequency Direct Sequence Spread Spectrum Technology provides a generous line-of-sight communication range up to 300m (1000 ft.) when using the external antenna.
- 900 MHz @ 10 mW or 2.4 GHz @ 100 mW operating frequency
- +7 to +28 VDC Input Power
- Eight FET high-side switching or low-side switching outputs (2.5 A max each, 8 A max. total)
- Optional Six FET high-side or low-side switching and two analog inputs/outputs
- Twelve status/diagnostic LEDs
- Single connector interface for ease of wiring
- Internal or external antenna option
- CAN Bus capable

2.0 BU-xH8D Base Unit

The SmaRT BU-xH8D base unit features eight FET, 2.5 A (8 A max total) high-side switching outputs/inputs capable of digital or pulse-width-modulation (PWM) control @ 30–200 Hz. It accepts an input power operating voltage range from +7 to +28 VDC. The base unit provides a robust link with a handheld remote in congested radio environments using Channel-Hopping Direct Sequence Spread Spectrum (DSSS) wireless technology broadcasting 900 MHz @ 10 mW and 2.4 GHz @ 100 mW.

SmaRT base units feature seamless association to a SmaRT handheld remote control unit without the need to open either the remote or base unit case. All controlled apparatus connections to the base unit are made using a single wiring harness cable.

The compact base unit enclosure is constructed of rugged, heavy duty high-impact polymer. VDC power to the unit and output signals are ported using the heavy duty 12-pin connector (Figure 2) and wiring harness (Figure 6) that connects to connector P1. Power can be removed from the base unit by disconnecting the cable harness connector from P1.



P1 Connector. P1 PIN Numbers are enhanced here for ease of identification.

Figure 2. BU-xH8D P1 Twelve (12) Pin Connector

The unit has twelve status/diagnostic LEDs that are used to determine the state of the unit. Figure 3 illustrates the LEDs and indications.

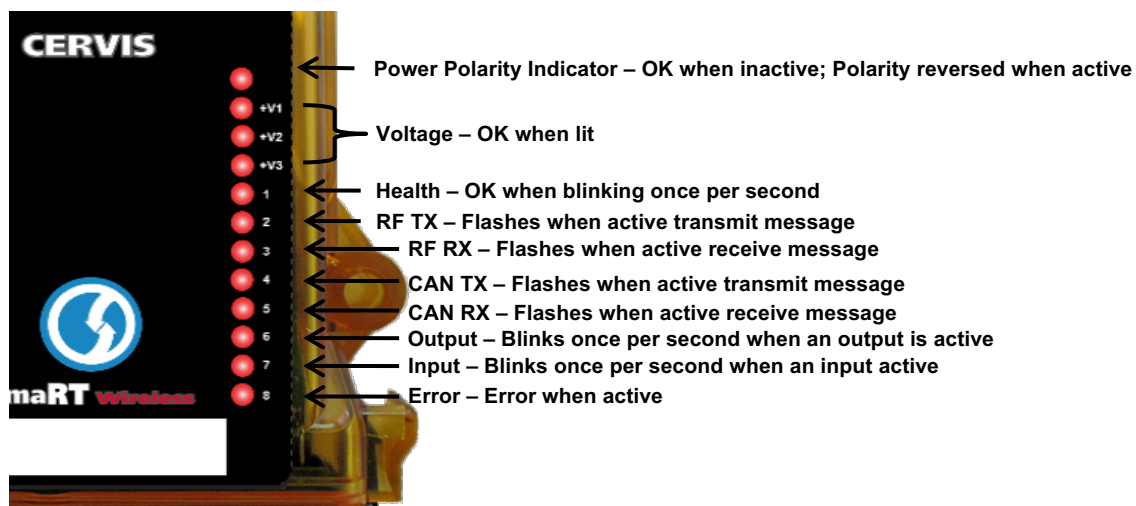


Figure 3. BU-xH8D Status LEDs

2.1 Base Unit Installation

Caution *Disable the machine on which the base unit is to be attached before installation.*



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

- Make sure that the configuration diagrams supplied with the system are available. Keep them where they can be easily accessed when needed.
- Make sure the wiring harness (12-pin connector cable) is at hand.
- Mount the receiver away from any intense radio or electric disturbance sources.
- Mount the unit where you have enough room for your wiring harness connections.
- Allow enough room to disconnect the wiring harness connector from P1 (to remove power from the base unit, troubleshoot, etc.) when necessary.
- Make sure that negative VDC (-VDC) is directly connected to the power supply negative terminal. Use this connection as the common for all inputs and outputs.
- Make sure that the mount is secure.
- Install the unit with P1 facing downward to keep water from entering the unit.
- In instances where there is an external antenna, connect the external antenna only as recommended by Cervis, Inc. with parts recommended by Cervis, Inc. (See Table 3 and Appendix A.) Under no circumstances can a signal amplifier be used!

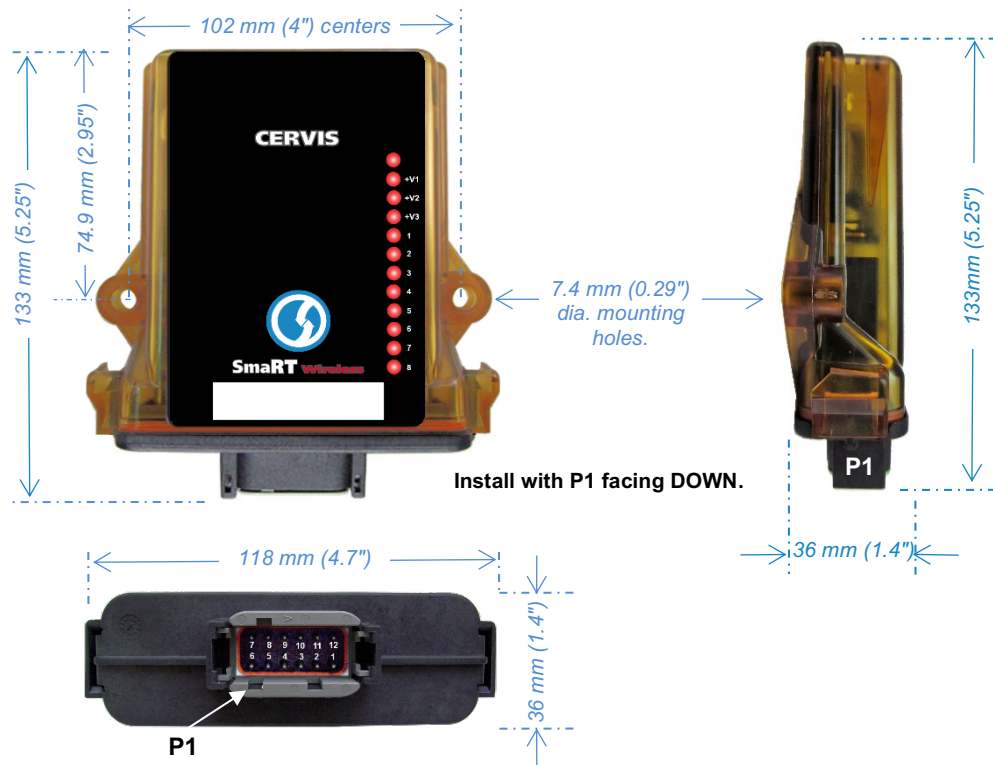


Figure 4. Base Unit Installation Dimensions

2.2 Base Unit Power

Power is supplied to the base unit through the harness cable. The cable attaches to the base unit P1 connector. Power can be removed from the base unit by disconnecting the 12-pin cable connector from the base unit P1 socket. To remove the cable connector from P1, pinch the latching ears of the connector (Figure 6) and pull the connector away from the unit.

2.3 Base Unit External Antenna

A base unit 900 MHz or 2.4 GHz external antenna attaches to the base unit using the connector shown in Figure 5. Extensions and extension kits are available. See Table 3 for detailed information.

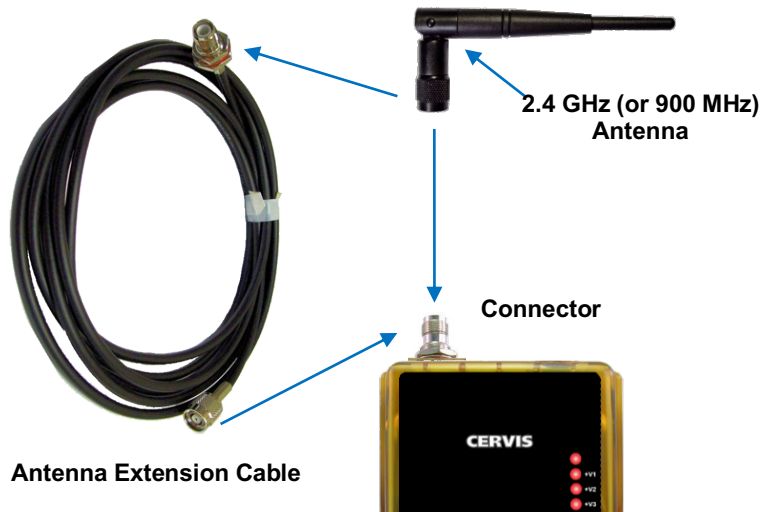


Figure 5. BU-xH8D with External Antenna and Extension Cable

2.4 Base Unit Cable and Field Wiring

✓ **Note:** Harness cable wires are individually marked on each wire's insulator. Connect negative VDC (–VDC) directly to the power supply negative terminal.

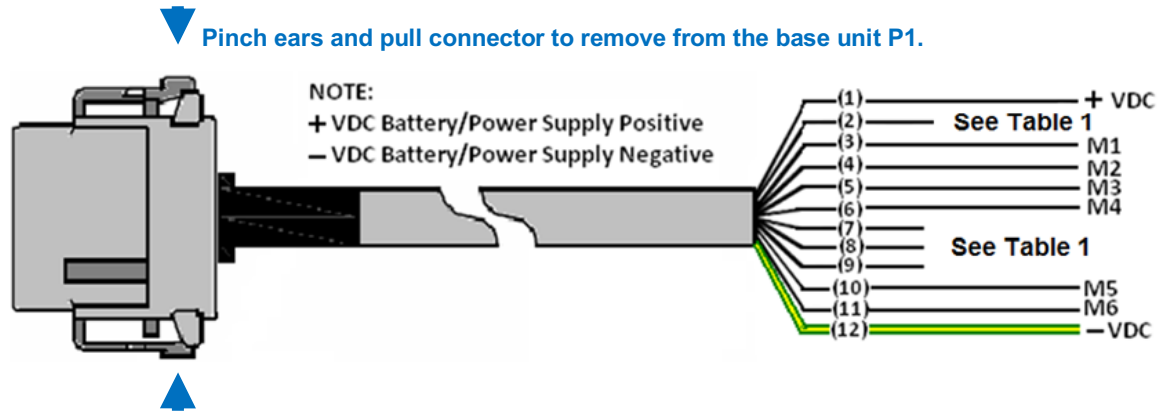


Figure 6. HN-1001 Wiring Harness Cable

Table 1. BU-xH8D Variant Wiring Table

Connection	BU-2H8D BU-9H8D	BU-2H8D-CAN BU-9H8D-CAN
P1:1	+VDC	+VDC
P1:2	M7	M7
P1:3	M1	M1
P1:4	M2	M2
P1:5	M3	M3
P1:6	M4	M4
P1:7	RS-232 TX	CANH
P1:8	RS-232 RX	CANL
P1:9	M8	M8
P1:10	M5	M5
P1:11	M6	M6
P1:12	–VDC	–VDC

Caution



To protect against short circuits, make sure the ends of all unused wires are insulated when making your connections.

3.0 BU-xH8D Operation

Initial Use Instructions

- You must have a clear line of sight to and be within range of the base unit while operating a SmaRT wireless remote.
- Each BU-xH8D typically can establish communication links with as many as eight different SmaRT PTO, DO, OO, pistol-grip, CB, and MCB remotes; or, with another SmaRT base unit. Each wireless remote used must Associate to establish communications with the base unit. Systems are associated at Cervis, Inc. before shipping. But, when necessary, the Associate procedure (see Appendix C) can be used to establish communications.
- Verify that the HN-1001 harness connections to the controlled device(s) are correct and that the wiring harness is firmly plugged into the BU-xH8D base unit P1.
- When necessary to remove power from the BU-xH8D, disconnect the wiring harness connector from base unit P1 or remove the power source from the base unit.

4.0 BU-xH8D Base Unit Specifications

Table 2. BU-xH8D Base Unit Specifications

Item	Description
Power	V_{in} +7 to +28 VDC
	Operating Power 1 W nominal
Environment	Operating Temp –40° C to 70° C (–40° F to 158° 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
Radio	Frequency 2405–2480 MHz @ 100 mW 906–924 MHz @ 10 mW
	License No license required
	Modulation DSSS
	Antenna Internal or External
Enclosure	Dimensions mm: 133 x 118 x 36 Inches: 5.24 x 4.65 x 1.42
	Weight 0.24 kg. (8 oz.)
	Durability High Impact Polymer
Indicators	Unnamed V _{in} polarity reversed when lit steady
	+V1, +V2, +V3 OK when lit steady
	1 Health (blinks once per second when active)
	2 RF TX (flashes when active)
	3 RF RX (flashes when active)
	4 CAN TX (flashes when active)
	5 CAN RX (flashes when active)
	6 Output (blinks once per second when active)
	7 Input (blinks once per second when active)
8 Error (solid when active)	
Outputs/Inputs (Eight total)	Outputs (6 or 8) Open-Drain FETs, high-side or low-side switching 2.5 A max. each output 8 A max. total output @ 55° C (131° F) PWM Range: 30 Hz to 200 Hz
	Analog (2) (optional) 0–10 V/4–20 mA input (M7 and M8 when chosen) 0–10 V output (M7 and M8 when chosen)

✓ **Note:** BU-xH8D-CAN units are internally terminated at 1.2 K Ω . Termination can be removed at the factory.

5.0 BU-xH8D (BU-xH8D-EXT) Antenna and Cable List

Table 3. Compatible BU-xH8D (BU-xH8D-EXT) External Antenna Details

Part	Cervis BIN
2.4 GHz Swivel Antenna, +3dBi	BB3-07
900 MHz Swivel Antenna, +3dBi	BB3-06
3 ft. antenna extension cable	J5-07
10 ft. antenna extension cable	J5-02
10 ft. antenna cable (J5-02) and external antenna (BB3-06)	EXT-10-900
3 ft. antenna cable (J5-07) and external antenna (BB3-06)	EXT-3-900

✓ **Note:** Only use the antenna recommended by Cervis, Inc. with the SmaRT base unit.

Table 4. Compatible BU-xH8D P1 Cable

Item	Part #	Wiring Harness
P1 Cable	BB6-01	HN-1001

6.0 SmarT BU-xH8D Base Unit Variations

2.4GHz and 900MHz Common Features:

Input Power 7–28VDC; No Suppression

Table 5. SmarT BU-2H8D Base Unit Variations

Model	Operating Frequency	RF Power	FET Channels	Antenna Type	Analog Channels	Serial Port	Display
BU-2H8D-INT-AV2	2.4 GHz	100 mW	8	Internal	(2) 0–10 V IN	RS-232	No
BU-2H8D-EXT-AV2	2.4 GHz	100 mW	8	External	(2) 0–10 V IN	RS-232	No
BU-2H8D-INT-AV2-CAN	2.4 GHz	100 mW	8	Internal	(2) 0–10 V IN	CAN	No
BU-2H8D-EXT-AV2-CAN	2.4 GHz	100 mW	8	External	(2) 0–10 V IN	CAN	No
BU-2H8D-INT-AI2	2.4 GHz	100 mW	8	Internal	(2) 4–20 mA IN	RS-232	No
BU-2H8D-EXT-AI2	2.4 GHz	100 mW	8	External	(2) 4–20 mA IN	RS-232	No
BU-2H8D-INT-AI2-CAN	2.4 GHz	100 mW	8	Internal	(2) 4–20 mA IN	CAN	No
BU-2H8D-EXT-AI2-CAN	2.4 GHz	100 mW	8	External	(2) 4–20 mA IN	CAN	No
BU-2H8D-INT-AO2	2.4 GHz	100 mW	8	Internal	(2) 0–10 V OUT	RS-232	No
BU-2H8D-EXT-AO2	2.4 GHz	100 mW	8	External	(2) 0–10 V OUT	RS-232	No
BU-2H8D-INT-AO2-CAN	2.4 GHz	100 mW	8	Internal	(2) 0–10 V OUT	CAN	No
BU-2H8D-EXT-AO2-CAN	2.4 GHz	100 mW	8	External	(2) 0–10 V OUT	CAN	No
BU-2H8D-INT	2.4 GHz	100 mW	8	Internal	N/A	RS-232	No
BU-2H8D-EXT	2.4 GHz	100 mW	8	External	N/A	RS-232	No
BU-2H8D-INT-CAN	2.4 GHz	100 mW	8	Internal	N/A	CAN	No
BU-2H8D-EXT-CAN	2.4 GHz	100 mW	8	External	N/A	CAN	No
BU-2H8D-INT-DIS-AV2	2.4 GHz	100 mW	8	Internal	(2) 0–10 V IN	RS-232	Yes
BU-2H8D-EXT-DIS-AV2	2.4 GHz	100 mW	8	External	(2) 0–10 V IN	RS-232	Yes
BU-2H8D-INT-DIS-AV2-CAN	2.4 GHz	100 mW	8	Internal	(2) 0–10 V IN	CAN	Yes
BU-2H8D-EXT-DIS-AV2-CAN	2.4 GHz	100 mW	8	External	(2) 0–10 V IN	CAN	Yes
BU-2H8D-INT-DIS-AI2	2.4 GHz	100 mW	8	Internal	(2) 4–20 mA IN	RS-232	Yes
BU-2H8D-EXT-DIS-AI2	2.4 GHz	100 mW	8	External	(2) 4–20 mA IN	RS-232	Yes
BU-2H8D-INT-DIS-AI2-CAN	2.4 GHz	100 mW	8	Internal	(2) 4–20 mA IN	CAN	Yes
BU-2H8D-EXT-DIS-AI2-CAN	2.4 GHz	100 mW	8	External	(2) 4–20 mA IN	CAN	Yes
BU-2H8D-INT-DIS-AO2	2.4 GHz	100 mW	8	Internal	(2) 0–10 V OUT	RS-232	Yes
BU-2H8D-EXT-DIS-AO2	2.4 GHz	100 mW	8	External	(2) 0–10 V OUT	RS-232	Yes
BU-2H8D-INT-DIS-AO2-CAN	2.4 GHz	100 mW	8	Internal	(2) 0–10 V OUT	CAN	Yes
BU-2H8D-EXT-DIS-AO2-CAN	2.4 GHz	100 mW	8	External	(2) 0–10 V OUT	CAN	Yes
BU-2H8D-INT-DIS	2.4 GHz	100 mW	8	Internal	N/A	RS-232	Yes
BU-2H8D-EXT-DIS	2.4 GHz	100 mW	8	External	N/A	RS-232	Yes
BU-2H8D-INT-DIS-CAN	2.4 GHz	100 mW	8	Internal	N/A	CAN	Yes
BU-2H8D-EXT-DIS-CAN	2.4 GHz	100 mW	8	External	N/A	CAN	Yes

Table 6. Smart BU-9H8D Base Unit Variations

Model	Operating Frequency	RF Power	FET Channels	Antenna Type	Analog Channels	Serial Port	Display
BU-9H8D-INT-AV2	900 MHz	10 mW	8	Internal	(2) 0–10 V IN	RS-232	No
BU-9H8D-EXT-AV2	900 MHz	10 mW	8	External	(2) 0–10 V IN	RS-232	No
BU-9H8D-INT-AV2-CAN	900 MHz	10 mW	8	Internal	(2) 0–10 V IN	CAN	No
BU-9H8D-EXT-AV2-CAN	900 MHz	10 mW	8	External	(2) 0–10 V IN	CAN	No
BU-9H8D-INT-AI2	900 MHz	10 mW	8	Internal	(2) 4–20 mA IN	RS-232	No
BU-9H8D-EXT-AI2	900 MHz	10 mW	8	External	(2) 4–20 mA IN	RS-232	No
BU-9H8D-INT-AI2-CAN	900 MHz	10 mW	8	Internal	(2) 4–20 mA IN	CAN	No
BU-9H8D-EXT-AI2-CAN	900 MHz	10 mW	8	External	(2) 4–20 mA IN	CAN	No
BU-9H8D-INT-AO2	900 MHz	10 mW	8	Internal	(2) 0–10 V OUT	RS-232	No
BU-9H8D-EXT-AO2	900 MHz	10 mW	8	External	(2) 0–10 V OUT	RS-232	No
BU-9H8D-INT-AO2-CAN	900 MHz	10 mW	8	Internal	(2) 0–10 V OUT	CAN	No
BU-9H8D-EXT-AO2-CAN	900 MHz	10 mW	8	External	(2) 0–10 V OUT	CAN	No
BU-9H8D-INT	900 MHz	10 mW	8	Internal	N/A	RS-232	No
BU-9H8D-EXT	900 MHz	10 mW	8	External	N/A	RS-232	No
BU-9H8D-INT-CAN	900 MHz	10 mW	8	Internal	N/A	CAN	No
BU-9H8D-EXT-CAN	900 MHz	10 mW	8	External	N/A	CAN	No
BU-9H8D-INT-DIS-AV2	900 MHz	10 mW	8	Internal	(2) 0–10 V IN	RS-232	Yes
BU-9H8D-EXT-DIS-AV2	900 MHz	10 mW	8	External	(2) 0–10 V IN	RS-232	Yes
BU-9H8D-INT-DIS-AV2-CAN	900 MHz	10 mW	8	Internal	(2) 0–10 V IN	CAN	Yes
BU-9H8D-EXT-DIS-AV2-CAN	900 MHz	10 mW	8	External	(2) 0–10 V IN	CAN	Yes
BU-9H8D-INT-DIS-AI2	900 MHz	10 mW	8	Internal	(2) 4–20 mA IN	RS-232	Yes
BU-9H8D-EXT-DIS-AI2	900 MHz	10 mW	8	External	(2) 4–20 mA IN	RS-232	Yes
BU-9H8D-INT-DIS-AI2-CAN	900 MHz	10 mW	8	Internal	(2) 4–20 mA IN	CAN	Yes
BU-9H8D-EXT-DIS-AI2-CAN	900 MHz	10 mW	8	External	(2) 4–20 mA IN	CAN	Yes
BU-9H8D-INT-DIS-AO2	900 MHz	10 mW	8	Internal	(2) 0–10 V OUT	RS-232	Yes
BU-9H8D-EXT-DIS-AO2	900 MHz	10 mW	8	External	(2) 0–10 V OUT	RS-232	Yes
BU-9H8D-INT-DIS-AO2-CAN	900 MHz	10 mW	8	Internal	(2) 0–10 V OUT	CAN	Yes
BU-9H8D-EXT-DIS-AO2-CAN	900 MHz	10 mW	8	External	(2) 0–10 V OUT	CAN	Yes
BU-9H8D-INT-DIS	900 MHz	10 mW	8	Internal	N/A	RS-232	Yes
BU-9H8D-EXT-DIS	900 MHz	10 mW	8	External	N/A	RS-232	Yes
BU-9H8D-INT-DIS-CAN	900 MHz	10 mW	8	Internal	N/A	CAN	Yes
BU-9H8D-EXT-DIS-CAN	900 MHz	10 mW	8	External	N/A	CAN	Yes

✓ **Note:** BU-xH8D-CAN units are internally terminated at 1.2 K Ω . Termination can be removed at the factory.

Appendix A: Exposure to Radio Frequency Energy

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

Appendix B: Agency Identification Label Locations

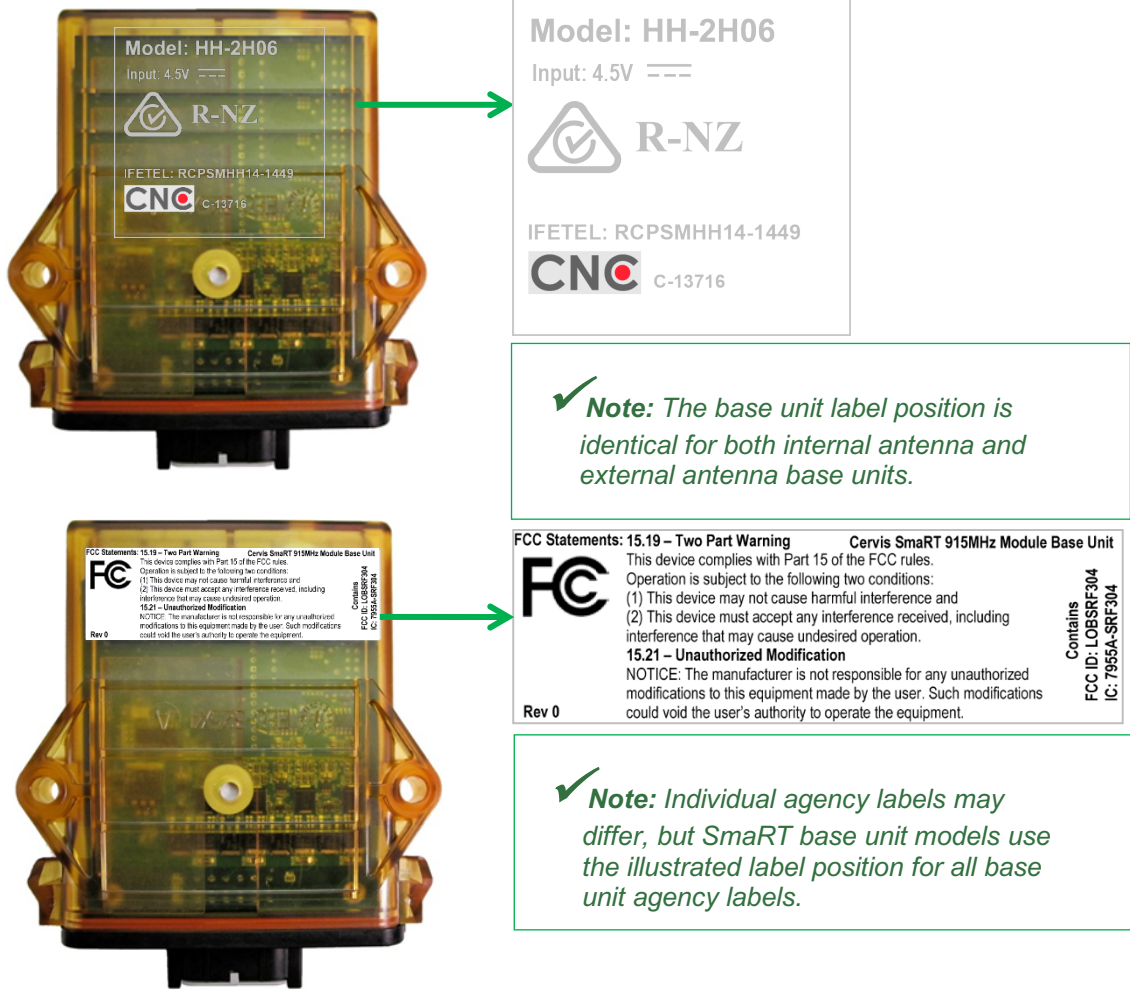


Figure 7. Agency Identification Label Locations

Appendix C: Typical Handheld to Base Unit Communication

Handheld remote and base unit communications are established at Cervis, Inc. before shipping when systems are ordered. However, it may be necessary to establish or re-establish communication between a remote and a base unit at some point. The Associate procedure is used to do this.

A standard Smart System consists of one handheld remote and one base unit. Each base unit can communicate with up to eight handheld remotes. Each handheld must first establish a communications link with the base unit before the base unit will recognize the handheld unit. This process is called “Association.”

In some cases, it may become necessary to break the communication link between the handheld and the BU-xH8D. This process is called “Dissociation.” *Be aware that when a handheld is dissociated from a base unit, all communication links to that particular base unit are erased from the base unit memory!* For instance, a particular BU-xH8D is associated to Handheld Remotes 1 through 5. Remote 2 dissociates—breaks the communication link—from the base unit. All five handheld remotes are removed from the base unit memory. The Associate procedure must be used by any handheld that now needs to control that BU-xH8D.

The following Associate and Dissociate procedures are general methods of associating or dissociating Cervis, Inc. handheld remotes to the BU-xH8D. Custom systems may have different Association methods unique to the custom system design.

C1: BU-xH8D/PTO-DO-OO Remote Communication

To Associate

The base unit and handheld must be OFF before attempting to associate. Base unit and Smart 2-, 4-, and 6-button handheld association is established using the following steps:

1. Remove power from the base unit and turn off (PTO – time out) the handheld device.
2. Stand near the base unit in unobstructed, clear line-of-sight with the handheld in hand.
3. Simultaneously press and hold the Associate (B1) and Dissociate (B2) buttons. The RX and ER LEDs light.
4. Continue to hold both buttons until the TX and RX LEDs light steady.
5. When the TX and RX LEDs light, release buttons B1 and B2. The ER and BA LEDs light.

✓ **Note:** *If the next button is not immediately pressed (in approximately 2 seconds), all LEDs flash and the Associate procedure is aborted. You must restart the process to establish the communication link.*

6. Immediately press and hold the Associate button (B1). All LEDs light.
7. The TX LED begins to slowly blink. Continue to hold button B1.
8. Apply power to the base unit.

The handheld and base unit begin to establish a communication link while the Associate button is held. Once the process is complete, all LEDs light briefly and then go out.

9. Release the Associate button. The Smart System is ready for use with that particular handheld remote.

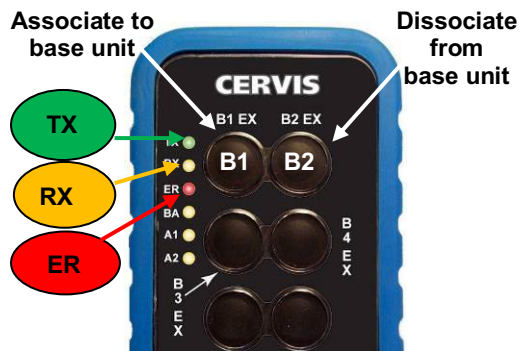


Figure 8. XX-2, 4, 6 Handheld Associate/Dissociate Buttons

To Dissociate

In some circumstances, it may become necessary to break the communication link—or dissociate—a base unit and a PTO handheld remote.

Caution



Using the following steps breaks all previously established handheld remote links. It will be necessary to perform the Association Procedure (Appendix C1, above) using each handheld to re-establish communication links with a base unit.

1. Remove power from the base unit.
2. Stand near the base unit in line of sight with the handheld in your hand.
3. Press and hold both the Associate button (B1) and Dissociate button (B2), see Figure 8). The RX and ER LEDs light.
4. Continue to hold both buttons until the TX and RX LEDs light steady.
5. When the TX and RX LEDs light, release buttons B1 and B2. The ER and BA LEDs light.

✓ **Note:** *If the next button is not pressed within the two-second interval, all LEDs flash and the procedure is aborted. Restart the process to break the communication link.*


6. Press and hold the Dissociate button (B2). (See Figure 8 above.) All LEDs light.
7. The TX LED begins to slowly blink. Continue to hold B2.
8. Apply power to the base unit while continuing to hold the Dissociate button.

The base unit and all previously linked handhelds begin to Dissociate communication links. Once the process is complete, all LEDs light briefly and then go out.

9. Release the Dissociate button (B2).

The Smart base unit will not communicate with any handheld remote units. A handheld remote must use the Association Procedure (Appendix C1) to re-establish a communication link with the base unit.

C2: BU-xH8D/CB Remote Communication

Caution  To prevent inadvertent machine movement, be sure to remove power from the base unit before attempting to Associate or Dissociate.

The console box remote must be **OFF** and the base unit must have power removed before beginning the Association process.

✓ **Note:** The Machine Stop button must be in the UP position before activating and using the console box remote.

To Associate (see Figure 9)

1. Stand near the base unit with the console box remote OFF and power removed from the base unit (P1 and P2 cables detached from the base unit, or the power source is removed.)
2. Twist to pull UP the red Stop button 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. Observe the LEDs. All the LEDs momentarily light solid. When only the TX LED begins to blink, power up the base unit while continuing to hold S13 and S12. When the TX, RX, ERR, and BAT light solid again, release S13 and S12.

Association is successful when the **TX** and **RX** LEDs are rapidly flashing in unison.

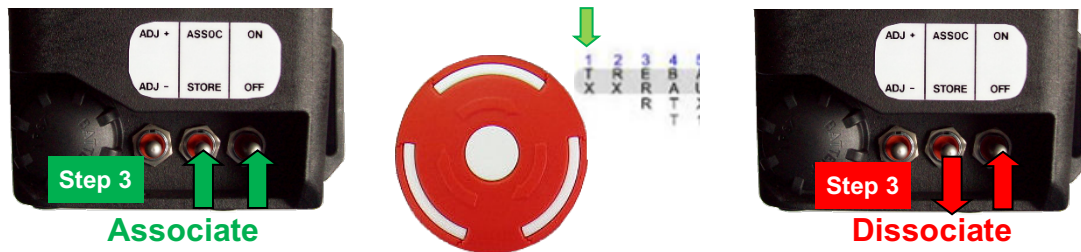


Figure 9. CB Associate and Dissociate Switch Actuations

To Dissociate (see Figure 9)

The console box remote must be **OFF** and the base unit must have power removed before beginning the Dissociation process.

✓ **Note:** The Machine Stop button must be in the UP position before activating and using the console remote.

1. Stand near the base unit with the console box remote OFF and power removed from the base unit (P1 and P2 cables detached from the base unit, or the power source is removed.)
2. Twist to pull UP the red Stop button on the remote.
3. Hold the Associate switch (S13) DOWN. While holding the Associate switch DOWN, activate the console remote by holding the ON switch (S12) UP. Continue to hold both switches.
4. Observe the LEDs. All LEDs momentarily light solid. When the TX LED begins to blink, power up the base unit while continuing to hold S13 and S12. When TX, RX, ERR, and BAT light solid again, release S13 and S12.

✓ **Note:** *Be aware that all remote associations to the base unit are now broken.*

C3: BU-xH8D/MCB Remote Communication

Caution



To prevent inadvertent machine movement, be sure to remove power from the base unit before attempting to Associate or Dissociate.

To Associate (see Figure 10)

The MCB remote must be **OFF** and the base unit must have power removed before beginning the Association process.

✓ **Note:** The Machine Stop button must be in the UP position before activating and using the mini console box remote.

1. Stand near the base unit with the remote **OFF** and **power removed** from the base unit (disconnect P1 and P2 or turn the source power OFF).
2. Release the **STOP** button on the MCB handheld remote by pulling it up.
3. Push and hold switch **S1 UP**; then, press the **Power ON** button. All four LEDs light solid.
4. Observe the LEDs. When the TX LED begins to blink, power up the base unit while continuing to hold S1 and the Power button. When all four LEDs light solid, release S1 and Power Button.

Association is successful when the TX and RX LEDs are rapidly flashing in unison.



Figure 10. MCB Switch Actuation for Associate and Dissociate

To Dissociate (see Figure 10)

The MCB remote must be **OFF** and the base unit must have power removed before beginning the Dissociation process.

✓ **Note:** The Machine Stop button must be in the UP position before activating and using the mini console box remote.

1. Stand near the base unit with the remote **OFF** and **power removed** from the base unit (disconnect P1 and P2 or turn the source power OFF).
2. Release the **STOP** button on the MCB handheld by pulling it up.
3. Push and hold switch **S1 DOWN**; then, press the **Power ON** button. All four LEDs light solid.
4. Observe the LEDs. When the TX LED begins to blink, power up the base unit while continuing to hold S1 and the Power button. When all four LEDs light solid, release S1 and the pushbutton.

✓ **Note:** Be aware that all remote associations to the base unit are now broken.



Declaration of Conformity

EU DECLARATION OF CONFORMITY

Manufacturer: Structured Mining Systems, Inc.
(d.b.a. Cervix, Inc.)
170 Thorn Hill Road
Warrendale, PA 15086 USA
Telephone No. (724) 741-9000

Date: February 14, 2018

This declaration of conformity is issued under the sole responsibility of the manufacturer. The undersigned hereby declares, on behalf of Structured Mining Systems, Inc. (d.b.a. Cervix, Inc.) of Warrendale, Pennsylvania, that the below referenced list of Industrial (ISM) radio equipment products, to which this declaration relates, is in conformity with the provision of the following European Union harmonization legislation:

- Council Directive 1999/5/EC (R&TTE)
- Council Directive 2006/95/EC (Low Voltage)
- Council Directive 2004/108/EC (Electromagnetic Compatibility)

Relevant Harmonized Standards or Other Technical Specifications:

- | | |
|--------------------------------|--------------------------------|
| ETSI EN 300 328-2 v1.2.1:2001 | ETSI EN 301 489-1 v1.9.2:2011 |
| IEC 60950-1 Ed 2.2; 2013-05-28 | ETSI EN 301 489-17 v2.2.1:2012 |

The technical documentation is maintained at the corporate headquarters of Structured Mining Systems, Inc. (d.b.a. Cervix, Inc.), 170 Thorn Hill Road, Warrendale, PA.

Products: (see other sections/areas of the product user manual for product images, accessories, components, and software, which allow the radio equipment to operate as intended)

<u>MODEL NUMBER</u>	<u>PART NUMBER</u>	<u>BATCH OR SERIAL NUMBER RANGE</u>
BU-2H6D-INT	07143500	_____ to _____
BU-2H6D-EXT	07143501	_____ to _____
BU-2H6D-INT-CAN	07143502	_____ to _____
BU-2H6D-EXT-CAN	07143503	_____ to _____
BU-2H6D-INT-DIS	07143504	_____ to _____
BU-2H6D-EXT-DIS	07143505	_____ to _____
BU-2H6D-INT-DIS-CAN	07143506	_____ to _____
BU-2H6D-EXT-DIS-CAN	07143507	_____ to _____
BU-2H8D-INT-AV2	07143550	_____ to _____
BU-2H8D-EXT-AV2	07143551	_____ to _____
BU-2H8D-INT-AV2-CAN	07143552	_____ to _____
BU-2H8D-EXT-AV2-CAN	07143553	_____ to _____
BU-2H8D-INT-AI2	07143554	_____ to _____
BU-2H8D-EXT-AI2	07143555	_____ to _____
BU-2H8D-INT-AI2-CAN	07143556	_____ to _____
BU-2H8D-EXT-AI2-CAN	07143557	_____ to _____
BU-2H8D-INT-AO2	07143558	_____ to _____
BU-2H8D-EXT-AO2	07143559	_____ to _____
BU-2H8D-INT-AO2-CAN	07143560	_____ to _____



Declaration of Conformity

<u>MODEL NUMBER</u>	<u>PART NUMBER</u>	<u>BATCH OR SERIAL</u>	<u>NUMBER RANGE</u>
BU-2H8D-EXT-AO2-CAN	07143561		to
BU-2H8D-INT	07143562		to
BU-2H8D-EXT	07143563		to
BU-2H8D-INT-CAN	07143564		to
BU-2H8D-EXT-CAN	07143565		to
BU-2H8D-INT-DIS-AV2	07143566		to
BU-2H8D-EXT-DIS-AV2	07143567		to
BU-2H8D-INT-DIS-AV2-CAN	07143568		to
BU-2H8D-EXT-DIS-AV2-CAN	07143569		to
BU-2H8D-INT-DIS-AI2	07143570		to
BU-2H8D-EXT-DIS-AI2	07143571		to
BU-2H8D-INT-DIS-AI2-CAN	07143572		to
BU-2H8D-EXT-DIS-AI2-CAN	07143573		to
BU-2H8D-INT-DIS-AO2	07143574		to
BU-2H8D-EXT-DIS-AO2	07143575		to
BU-2H8D-INT-DIS-AO2-CAN	07143576		to
BU-2H8D-EXT-DIS-AO2-CAN	07143577		to
BU-2H8D-INT-DIS	07143578		to
BU-2H8D-EXT-DIS	07143579		to
BU-2H8D-INT-DIS-CAN	07143580		to
BU-2H8D-EXT-DIS-CAN	07143581		to

Anthony M. Di Tommaso

Anthony M. Di Tommaso

Director of Product Development, Quality, & Finance

February 14, 2018

Date

