Wireless SmaRT™

HH-x10 Remote Control Unit Manual

DN: U089.1.1-SmaRT_HH-x10

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 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/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.

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.

Notes/Definitions

Associate
SmaRT configuration method using a series of specific remote unit button presses to establish a communication link between a SmaRT Remote Control Unit and a SmaRT Base Unit.

DSSS
Direct sequence spread spectrum; an advanced wireless communication technology.

Dissociate
Dissolution of established communication links between remote control units and base units involved in the process.

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

Document Conventions

✓ *Note: Notes are used to indicate points of interest or pertinent information.*

CAUTION ⚠ *Cautions are used to warn of serious consequences of actions or inactions that may result in injury, death, or serious damage to the equipment.*

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CERVIS

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.*

- ✓ *Equipment changes or modifications 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 you are certain that it is safe to do so.*

- ✓ *Turn off the remote control and disconnect power from the base unit before attempting any maintenance. This will prevent accidental operation of the controlled machinery.*

- ✓ *Power can safely be disconnected from the remote by removing the source power (batteries) from the unit.*

- ✓ *Power can be removed from the base unit by disconnecting 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 remote control or base unit enclosures. Do not use high-pressure equipment to clean the remote control or base unit.*

- ✓ *Disconnect the 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.*

1.0 SmaRT HH-x10 Remote Control Unit

Remote Control Features

- ✓ **License-free 900 MHz or 2.4 GHz Direct Sequence Spread Spectrum Technology (DSSS)**
- ✓ **Direct-line-of-sight communications up to 1000 ft. (330 m) range**
- ✓ **Powered by two AAA cell batteries**
- ✓ **Low Battery Warning and Low Battery Auto-Shutdown**
- ✓ **Discrete ON and OFF buttons**
- ✓ **Ten function buttons**
- ✓ **Diagnostic light-emitting diode (LED) indicators**
- ✓ **Rugged high-impact polymer enclosure; compact weatherproof design**
- ✓ **Removable rubber bumper and detachable lanyard or belt clip**
- ✓ **Operating temperature: –4° F to +131° F (–20° C to +55° C)**

SmaRT wireless high-power HH-x10 remote control units communicate with and control SmaRT base units operating in the 900 MHz or 2.4 GHz range. The HH-x10 remote control unit has individual ON and OFF buttons and ten function control buttons. The remote control has an automatic shutdown timeout – a period of time after which the remote turns itself off to conserve power if no function buttons are pushed.

Figure 1. HH-x10 6-LED Remote Control Button Assignments

The HH-x10 remote control can communicate with a wide variety of SmaRT base units using Channel-Hopping Direct Sequence Spread Spectrum (DSSS) wireless technology at 2.4 GHz or 900 MHz. A standard HH-x10 offers up to ten command functions, and up to twenty command functions with the dual use of the green button as both ON and SHIFT functions. It offers a robust link with a base unit in congested radio environments. SmaRT remote control units feature seamless association with SmaRT base units without needing to open either the remote control or base unit cases.

The weatherproof remote control enclosure is made of rugged high-impact plastic with a face plate securely sealed and attached by eight screws. It is further protected by a removable rubber bumper that covers the unit's back and sides. A lanyard that can be attached to the unit through a recess on the bottom of the rubber bumper is available; or the unit can be ordered with a convenient belt clip.

Two size "AAA" cell batteries power the SmaRT HH-x10, and it operates between 2.0 VDC to 3.2 VDC. Six visible status/diagnostic LEDs (see Figure 2) indicate transmit (**TX**) and receive (**RX**) activity, communications errors (**ERR**), and low battery (**BAT**) warning. Two additional LEDs—**A1** and **A2**—offer custom-programmed auxiliary status indications.

ASSOCIATE (button B1)

TX blinking Green when transmitting
RX blinking Amber when receiving

OFF Button

DISSOCIATE (button B2)

ERR blinking Red when error occurs
BAT blinking Amber when Low Battery

A1 (Auxiliary 1) Custom program use
A2 (Auxiliary 2) Custom program use

Protective Bumper

B1 through B10 are FUNCTION Buttons

ON Button

Figure 2. Standard Ten-Button Example

Notice in Figure 2 that the ten function pushbuttons are unassigned to specific SmaRT base unit outputs. This allows for maximum flexibility while programming to interface with the wide array of available SmaRT base units. An example of a custom programmed HH-x10 is shown as the center unit in Figure 1.

HH-x10 Remote Control Remote Options

The HH-x10 can be ordered with or without a belt clip. Table 1 lists the available models.

Table 1. HH-x10 Remote control Options

Model Name	Frequency	RF Power	Activation, Deactivation	Belt Clip
HH-9H10	900 MHz	10 mW	ON,OFF	NO
HH-9H10B	900 MHz	10 mW	ON,OFF	YES
HH-2H10	2.4 GHz	100 mW	ON,OFF	NO
HH-2H10B	2.4 GHz	100 mW	ON,OFF	YES
HH-9X10	900 MHz	100 mW	ON,OFF	NO
HH-9X10B	900 MHz	100 mW	ON,OFF	YES

2.0 Remote Control and Base Unit Communication

2.1 Associate HH-xH10 Remote Control to Base Unit

An HH-x10 remote control unit must establish a communications link with a base unit before it can be used for control. An HH-x10 remote (as part of a system) is associated with the system base unit before leaving Cervis, Inc. But, it is possible to associate an HH-x10 in the field either to address a communication problem or to add or replace a remote control unit. The procedure to establish the link is called "Association."

In situations where it is necessary to establish or re-establish remote control-to-base unit communications, use the following steps:
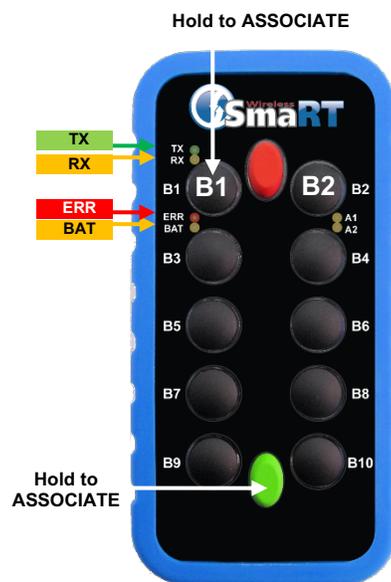
HH-9H10/2H10 Models:

1. Stand near the base unit with the remote control **OFF** and **power removed** from the base unit.
2. Push and <u>hold</u> the **B1** and **ON buttons**. All six LEDs light solid.
3. Observe the LEDs. When only the **TX** LED begins to blink, power up the base unit while continuing to hold **B1** and **ON**.
4. When all six LEDs light solid, release both buttons.

HH-9X10 Models:

1. Stand near the base unit with the remote control **OFF** and **power removed** from the base unit.
2. Push and <u>hold</u> the **B1** and **ON** buttons for approximately two seconds. The **A1**, **A2**, and **TX** LEDs light. Release the **B1** and **ON** buttons.
3. Press and hold button **B1**. Turn base unit power on. Release button **B1** when base unit powers up.

The remote control and base unit are connected when <u>both</u> the **TX** and **RX** LEDs on both devices start blinking simultaneously as messages pass between them. The SmaRT system is ready for use.

Figure 3. Associate an HH-x10 Remote Control to a Base Unit

2.2 Dissociate HH-xH10 Remote Control from Base Unit

In some circumstances, it may become necessary to break the communication link, or "dissociate" a remote control and a base unit. The dissociate procedure is almost identical to the associate procedure, except the dissociate button (**B2**) is used and held throughout the process instead of the Associate button (**B1**).

> **CAUTION**
> ⚠️
> *Using the following steps will break all previously established remote control links.*

HH-9H10/2H10 Models:

1. Stand near the base unit with the remote control **OFF** and **power removed** from the base unit.
2. Push and <u>hold</u> **B2** and the **ON button**. All six LEDs light solid.
3. Observe the LEDs. When only the **TX** LED begins to blink, power up the base unit while continuing to hold **B2** and **ON**.
4. When all six LEDs light solid, release both buttons.

HH-9X10 Models:

1. Stand near the base unit with the remote control **OFF** and **power removed** from the base unit.
2. Push and <u>hold</u> the **B2** and **ON** buttons for approximately two seconds. The **A1**, **A2**, and **TX** LEDs light. Release buttons **B2** and **ON**.
3. Press and hold button **B2**. Turn base unit power on. Release button **B2** when base unit powers up.
4. Remote control and base unit are disconnected when the **TX** LED (only) starts blinking.

<u>Established links with base units are removed</u>. To re-establish a communication link with a base unit, use the Associate Procedure (Section 2.1).
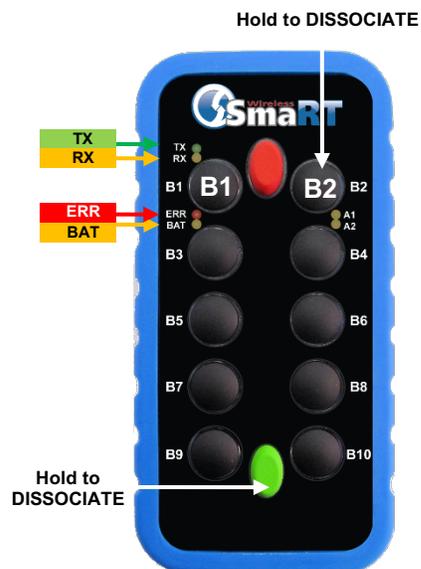
*Figure 4. Dissociate an HH-x10 Remote control from a Base Unit*

3.0 Battery Installation or Change

Two size "AAA" cell batteries power SmaRT HH-x10 remote control units. When installing batteries, be sure to observe proper polarity—as marked on the inside of the compartment—to avoid damaging the unit.

To replace or install remote control batteries:

1. Loosen the four small Phillips screws on the battery compartment cover, and lift the cover from the remote control. The screws remain attached to the cover.
2. If installing batteries in an empty battery compartment, install two fresh size "AAA" cell batteries. Be sure to position the batteries as illustrated in Figure 5 below.
3. If replacing expired batteries, remove the old batteries, and install two fresh size "AAA" cell batteries. (Discard the used batteries according to local regulations.) Be sure to position the batteries as illustrated in Figure 5 below.
4. Replace the compartment cover and tighten the four Phillips screws. Do not over-tighten these screws, but make sure they are tight enough to properly seal the gasket.

✓ **Note:** *Discard expired batteries according to local regulations.*
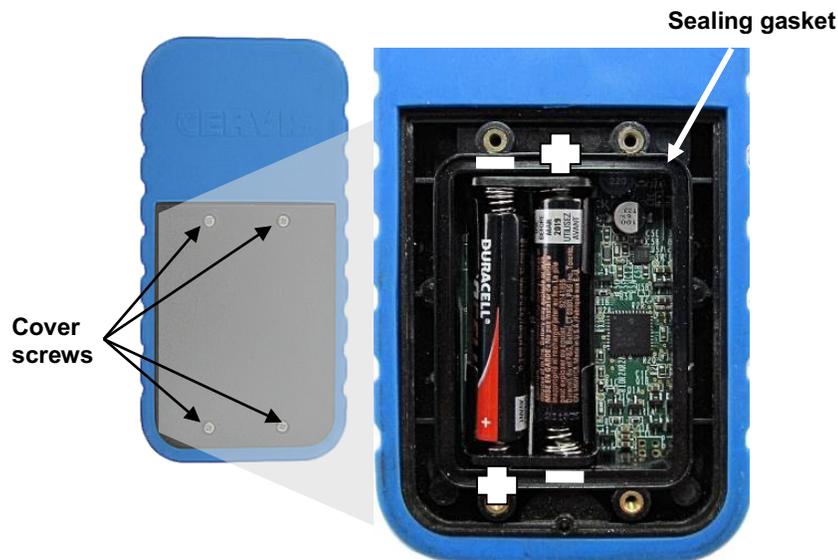
Figure 5. Remote Control Battery Installation

✓ **Note:** *Cover screws must be tight enough to compress the sealing gasket. Do not over-tighten the screws.*

CAUTION

⚠️ **Be sure to observe proper polarity when placing batteries in the remote control battery compartment.**

4.0 Using a Standard SmaRT Remote Control Unit

Remote control is achieved under the following conditions:

- Communication between the remote control and base unit must be established. If the remote control and base unit are not communicating while under power, the link must be established using the Associate Procedure (Section 2.1).

- You must be in clear line of sight of the base unit while holding the remote control – usually within approximately 300 m of the unit.

Usually, each button is programmed for a particular assigned function or hardwired output driven by the base unit. The control may be either:

- Momentary, where the command is active only while the button is engaged.

- Latched, where, once pushed, the output or function remains active when the button is released.

ASSOCIATE (button B1)
TX blinking Green when transmitting
RX blinking Amber when receiving

ERR blinking Red when error occurs
BAT blinking Amber when Low Battery

B1 through B10 are FUNCTION Buttons

OFF Button

DISSOCIATE (button B2)

A1 (Auxiliary 1) Custom program use
A2 (Auxiliary 2) Custom program use

ON, ASSOCIATE, and DISSOCIATE

Figure 6. HH-x10 Front Panel

Turn the HH-x10 remote control on by pushing and releasing the green **ON** button at the bottom of the unit. The remote control remains under power until either:

1. The red **OFF** button is pushed.
2. The Inactivity timeout occurs, where no button activity is sensed for a programmed amount of time (default=four minutes).

When the remote control is turned off—and the base unit Safety Link is enabled—all active base unit functions are deactivated.

5.0 Low Battery Warning and Low Battery Auto-Shutdown

At 2.1 VDC and below, the Amber battery (**BAT**) LED begins flashing approximately once per second to indicate a Low Battery Warning. Messages are still being transmitted, and the remote control can still be used; but Cervis, Inc. recommends installing a fresh set of two "AAA" cell batteries as soon as possible.

At 2.0 VDC, the Amber **BAT** LED will turn on solid, and the unit will begin a self power shutdown. The associated device will receive a low-battery power-down message.

✔ *Note: At 2.0 VDC, the **BAT** LED only lights for approximately 1.25 seconds. Be aware that you can easily miss this brief time. Once the remote control automatically shuts down, the unit will not function properly until a fresh set of two "AAA" cell batteries are installed.*

LOW BATTERY

The **BAT** LED begins flashing once per second, indicating that a LOW BATTERY (2.1 V or less) condition is present. Two fresh "AAA" cell batteries should be installed as soon as possible. The LED continues flashing at one-second intervals either unit the batteries are changed, or until the voltage level drops to 2.0 V and Auto-Shutdown occurs.

AUTO-SHUTDOWN

At 2.0 V, the **BAT** LED flashes briefly for approximately 1.25 seconds before the remote control unit automatically shuts down.

Two fresh "AAA" cell batteries must be installed before the transmitter can be used again.

Figure 7. HH-x10 Remote Low Battery Warning and Auto-Shutdown

6.0 Specifications

Table 2. SmaRT HH-x10 Remote Control Unit Specifications

Item	Description	
Power	V_{in}	+2.1 V to +3.2 VDC
	Source	Two "AAA" cell batteries
	Auto-shutdown	Four minutes of button inactivity (default)
	Low Battery Warning	≈2.1 V – batteries should be immediately replaced
	Low Battery Shutdown	≤2.0 V – batteries must be replaced to operate
Environment	**Operating Temp**	–20° C to 55° C (–4° F to 131° F)
	Storage Temp	–40° C to 55° C (–40° F to 131° F)
	Humidity	0 to 100%
Radio	**Frequency**	906–924 MHz @ 10 mW (HH-9H10)
		906–924 MHz @ 100 mW (HH-9X10)
		2405–2480 MHz @ 100 mW (HH-2H10)
	License	None required
	Modulation	DSSS
	Antenna	Internal
Enclosure	**Dimensions**	mm: 136.38 x 68.96 x 28.42
		inches: 5.37 x 2.68 x 0.92
	Total Weight	200 g/7.2 oz. (with lanyard or belt clip)
	Durability	High Impact Polymer case
		Polycarbonate faceplate
		Impact absorbing bumper
LED Indicators	**TX (Green)**	Transmit – Flashes when transmitting messages
	RX (Amber)	Receive – Flashes when receiving messages
	ER (Red)	Flashes when errors are detected
	BAT (Amber)	Blinks when low battery condition exists
	A1	Used when custom-programmed
	A2	Used when custom-programmed
Buttons	**Twelve**	Pushbuttons
	Number of Functions	Ten to twenty, program-dependent

7.0   Spare Parts List

Table 3. Spare Parts List

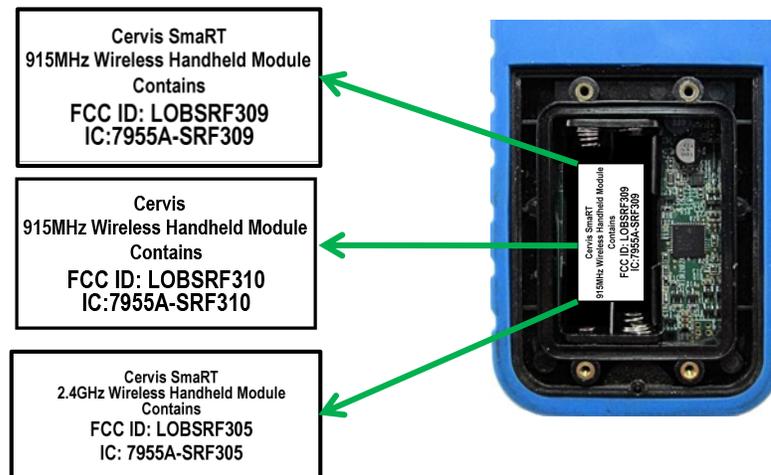| Item	Cervis, Inc. Bin Location
Protective Rubber Bumper	AA6-02
Lanyard	AA8-01B
Battery Cover with 4 Attached Screws	Call Cervis, Inc. @ 724-741-9000
AAA 1.5V Cell Batteries (Two-pack)	AA6-03
Belt Clip	AA5-07
Replacement Antenna	Disallowed

Appendix A: Exposure to Radio Frequency Energy

SmaRT remote control units contain radio transceivers. A handheld remote emits radio frequency (RF) energy through its internal antenna while active.

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

When using the handheld remote control unit:

- Hold the remote so that the top buttons are away from the body in the direction of the base unit.
- Keep the remote at least 15 mm (⅝ inch) away from the body.
- Only use carrying cases, belt clips, or holders approved by the Cervis, Inc.

Appendix B: Agency Identification Label Locations

Cervis SmaRT
915MHz Wireless Handheld Module
Contains
FCC ID: LOBSRF309
IC:7955A-SRF309

Cervis
915MHz Wireless Handheld Module
Contains
FCC ID: LOBSRF310
IC:7955A-SRF310

Cervis SmaRT
2.4GHz Wireless Handheld Module
Contains
FCC ID: LOBSRF305
IC: 7955A-SRF305

✓ *Note: The unit label location is identical for both 900 MHz and 2.4 GHz handheld remote control units.*

Figure 8. Agency Identification Label Locations