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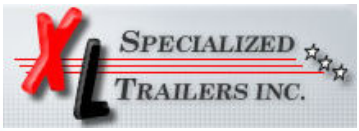

TM

SmaRT XL
Remote System

User Manual

DN: U016.2-SmaRT_XL_Remote_System-R

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.

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Figures

Notes/Definitions

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

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

Disassociation
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 the conductivity of the device.

IP65
IEC (International Electrotechnical Commission) rating that classifies the level of protection provided by an enclosure: **IP** (international protection); **6** (dust tight); **5** (water jetted from any direction on the enclosure shall have no harmful effects).

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

Latching
The device remains in the state in which it was commanded to be after the remote pushbutton is released.

SmaRT 90N Remote Control System
SmaRT system consisting of one SmaRT Base Unit and from one to eight SmaRT remote control units. The system operates in the 900MHz range and has N (some defined) number of outputs.
For instance, a SmaRT 904 Remote Control System operates in the 900MHz range, and a maximum of four outputs can be controlled by the remote.

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

Toggle
Alternate between one state and another with each push of a single pushbutton.

1.0 SmaRT XL Remote System

The SmaRT XL Remote System consists of a PTO-906-XL Handheld Remote 6-button, 7-function handheld transmitter; a SmaRT BU-908F Base Unit; and an HN-1001 Cable Wiring Harness. (An optional HN-1000 Fused Cable Wiring Harness is available.)

Figure 1. PTO-906-XL Handheld Remote and BU-908F Base Unit

The SmaRT PTO-906-XL Handheld Remote features a 300' handheld-to-base unit communication range providing seven function control. The handheld communicates with the base unit using direct sequence spread spectrum (DSSS) wireless technology at 900MHz. It provides a robust link with the base unit in congested radio environments. SmaRT handheld units feature seamless association to the SmaRT BU-908F Base Unit without the need to open either the handheld or base unit case.

2.0 XL Remote System PTO-906-XL Handheld

The handheld enclosure is constructed of rugged high-impact polymer with a polycarbonate face plate securely sealed and attached by eight screws. It is further protected by a removable rubber boot that covers the back and sides of the unit extending beyond the recessed faceplate. The convenient lanyard provided attaches to the unit through a recess on the bottom of the rubber boot.

The handheld is powered by three size AAA batteries. Three status/diagnostic LEDs are visible on the handheld faceplate as shown in Figure 2 below.

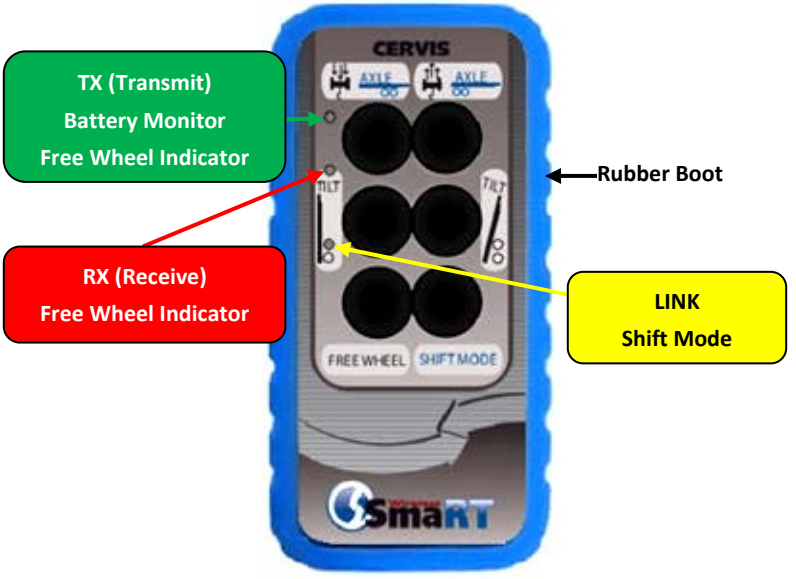

Figure 2. PTO-906-XL

2.1 Remote Handheld Features

- Compact weatherproof design
- Six buttons, seven function (push-to-operate and latching)
- Internal antenna
- 300’ (100m) range

- License free frequency, 900MHz Direct Sequence Spread Spectrum Technology (DSSS)
- Power saving auto-shutdown after 2-minutes of button inactivity
- Rugged high-impact polymer enclosure with removable rubber boot
- Convenient lanyard attaches to the unit (through the boot)
- Three diagnostic LEDs
- Free Wheel state and last-state of Shift Mode memory upon start following shutdown
- Powered by three AAA Batteries (+3.6VDC to 4.5VDC)
- Power monitor alerts you when voltage drops below 3VDC.

2.2 Battery Installation or Change

2.2.1 Batteries

The SmaRT handheld remote unit is powered by three size AAA alkaline batteries. When installing batteries, be sure to observe proper polarity as marked on the inside of the compartment to avoid damaging the unit.

2.2.2 Power Monitor

The handheld remote has a power monitor that alerts the user when the battery power drops below 3VDC. When the voltage drops below the threshold, the GREEN LED (top) slowly flashes at one second on, one second off intervals.

2.2.3 Replacement/Installation

To replace or install batteries in the handheld:

1. Remove the four small Phillips screws from the Battery Compartment cover and lift the cover from the handheld.
2. If installing batteries in an empty battery compartment, install three fresh size AAA batteries. Be sure to position the batteries as shown in Figure 3 below.

   If replacing expired batteries, remove the old batteries and install three fresh size AAA batteries.

Be sure to position the batteries as shown in Figure 3 below.

3. Replace the compartment cover and tighten the four Phillips screws. These screws should not be over-tightened, but they should be tight enough to assure the gasket provides a proper seal.

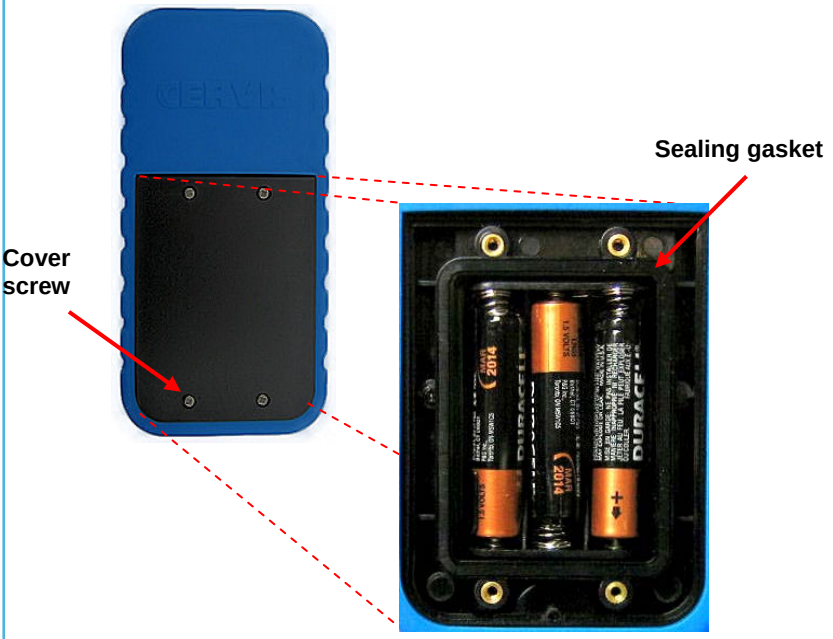

Figure 3. Handheld Battery Installation

Note: *Cover screws must be tightened enough to assure the sealing gasket is compressed. Do not over-tighten the screws.*

CAUTION *Be sure to observe proper polarity when placing batteries in the handheld battery compartment.*

3.0 SmaRT BU-908F Base Unit

The SmaRT BU-908F Base Unit features eight FET, high-side switching outputs. The base unit accepts a broad range of input power with operating voltages ranging from +7VDC to +32VDC source power.

Using Direct Sequence Spread Spectrum (DSSS) wireless technology at 900MHz, the base unit provides a robust link with a handheld in congested radio environments at ranges of up to 300' (100m). SmaRT base units feature seamless association to a SmaRT handheld unit without the need to open either the remote or base unit case. All controlled apparatus connections and VDC power to the base unit are made using a single cable with a heavy duty 12-pin connector through which output signals are also ported. Two styles of connecting cables, standard and an optional) are available, both weatherproof 12-wire bundled cables with the optional cable offering the added protection of an easily replaceable blade-type fuse.

The rugged weatherproof enclosure allows the unit to operate worry free in harsh weather conditions and environments. The base unit compact enclosure is constructed of rugged, heavy duty high impact plastic—the type commonly used by the automotive industry. Five status/diagnostic LEDs shown in Figure 4 below are used to determine the state of the unit.

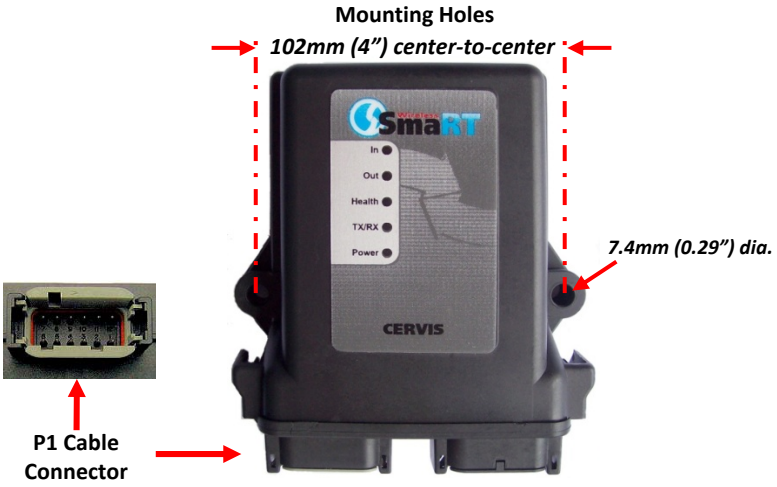

Figure 4. BU-908F Mounting and Cable Connection

3.1 Base Unit Features

- Capable of communicating to up to eight SmaRT handhelds
- License Free Frequency, 900MHz Direct Sequence Spread Spectrum Technology
- 300’ (100m) Range (direct line-of-sight)
- Eight FET high-side switching outputs
- Rugged compact high-impact polymer, weatherproof design IP65 Enclosure
- Single connector interface for ease of wiring
- Operating Temp: -20°C to +70°C (-4°F to 158°F)
- Free Wheel state and last-state of Shift Mode memory upon start following shutdown
- +7VDC to +32VDC Input Power
- Four diagnostic LEDs
- Easy two-hole mounting
- Choice of standard (Figure 5 below) or optional fused-cable (Figure 6 below) wiring harness

3.2 Base Unit Installation

CAUTION

Make sure the machine on which the base unit is to be attached is disabled during installation.

Use the configuration diagrams supplied by Cervis to guide you when mounting the base unit and connecting your wiring harness. Dimensions for drilling the holes for mounting the base unit are shown in Figure 4 above. Mounting of the base unit is left much to your discretion with the following guidelines:

- Make sure that the configuration diagrams supplied with the system are available.
- Make sure the cable wiring harness (below) is at hand.
- Always mount the receiver away from any intense radio or electric disturbance sources.
- Securely mount the unit with enough room for wiring harness connections.

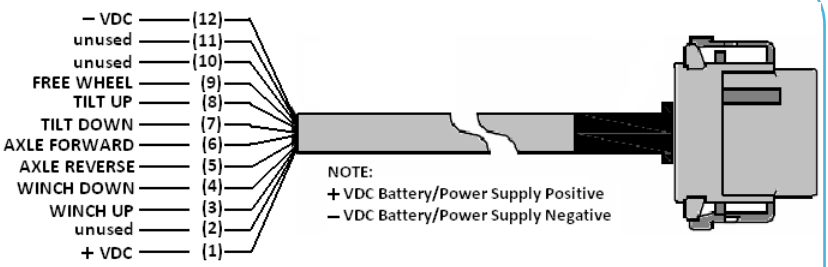

Figure 5. Standard Cable Wiring Harness HN-1001

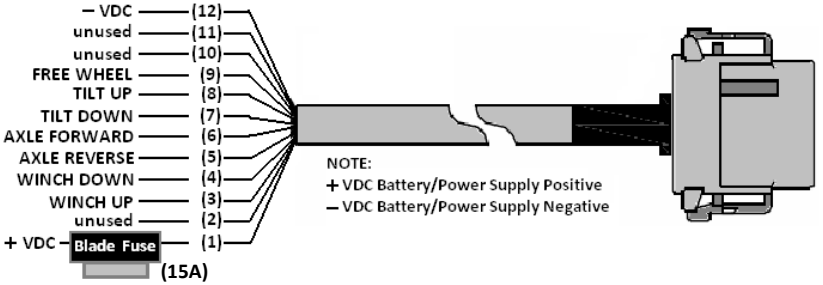

Figure 6. Optional Fused Cable Wiring Harness HN-1000

4.0 Handheld ↔ Base Unit Communication

A standard SmaRT System comes with one Handheld Remote and one SmaRT Base Unit. Each base unit is capable of communicating 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.

4.1 Handheld ↔ Base Unit Association

Handheld ↔ Base Unit Association is established using the following steps:

1. Remove power from the base unit.
2. Stand near the base unit in line of sight with the handheld in your hand.

✔ ***Note:*** *Make sure that the handheld is not active before performing Step 3. Association mode cannot be entered unless the unit is inactive prior to button sequencing.*

3. Simultaneously press and hold the Association and Disassociation buttons (see Figure 7). The TX LED lights steady green.
4. Continue to hold both buttons for the five seconds it takes for the LINK LED to begin flashing amber.
5. When the LINK LED flashes amber, release the two buttons. The RX LED flashes red allowing two (2) seconds for you to make the next button press.

✔ ***Note:*** *If the next button press is not performed within the two second interval that RX flashes red, the Association procedure is aborted and must be started anew to establish the communication link.*

6. Press and hold the Association button (see Figure 7 below). The RX LED extinguishes, the TX LED lights steady green, and the LINK LED lights steady amber.
7. Apply power to the base unit while continuing to hold the Association button.

The base unit and handheld begin to establish a communication link while the Association button is held. Once the process is complete,

the amber LINK LED extinguishes, the RX LED begins flashing red, and the TX LED lights steady green and remains so until the Association button is released.

8. Release the Association button.

The RX LED extinguishes, the TX LED flashes green for a brief time and then it too goes out. The SmaRT System is ready for use with that particular handheld remote.

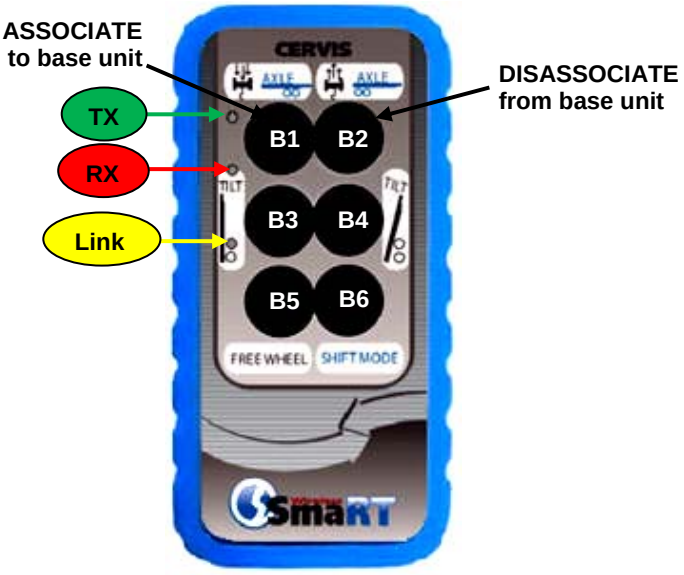

Figure 7. Associate, Disassociate Buttons, and LEDs

4.2 Handheld ↔ Base Unit Disassociation

In some circumstances it may become necessary to break the communication link, or disassociate a handheld and a base unit. The Disassociation procedure is almost identical to the Association procedure, except the Disassociation button is used and held throughout the process instead of the Association button.

CAUTION *Using the following steps will break all previously established handheld remote links. It will be necessary to perform the Association Procedure (4.1 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.

✔ ***Note:*** *Make sure that the handheld is not active before performing Step 3. Disassociation mode cannot be entered unless the unit is inactive prior to button sequencing.*

3. Press and hold both the Association and Disassociation buttons (see Figure 7). TX lights steady green.
4. Continue to hold both buttons for the five seconds it takes for the LINK LED to begin flashing amber.
5. When LINK flashes amber, release both buttons. The RX button flashes red allowing two (2) seconds for you to make the next button press.

✔ ***Note:*** *If the next button press is not performed within the two second interval that RX flashes red, the procedure is aborted and must be started anew to break the link.*

6. Press and hold the Disassociation button. (See Figure 7 above.) The RX extinguishes, the TX lights steady green, and the LINK LED lights steady amber.
7. Apply power to the base unit while continuing to hold the Disassociate button.

The base unit and all previously linked handhelds begin to Disassociate communications links. Once the Disassociation is complete, the amber LINK led extinguishes, the RX begins flashing red, and the TX lights steady green and remains so until the button is released.

8. Release the Disassociate button. The RX LED extinguishes, the TX LED flashes green for a brief time and then it too extinguishes.

The SmaRT base unit will not communicate with any handheld remote units. A handheld remote must use the Association Procedure (4.1) to re-establish a communication link with the base unit.

5.0 Using the SmaRT PTO-906-XL Handheld Remote

The front panel of the SmaRT PTO-906-XL Handheld Remote has six (6) buttons and three (3) diagnostic LEDs. PT0-906-XL buttons are Push-To-Operate (PTO) and/or latching. PTO buttons 1 and 2 have multiple functions as described in Figure 8 and Table 1 below. Each button has an area adjacent to it in which descriptive icons and text are printed.

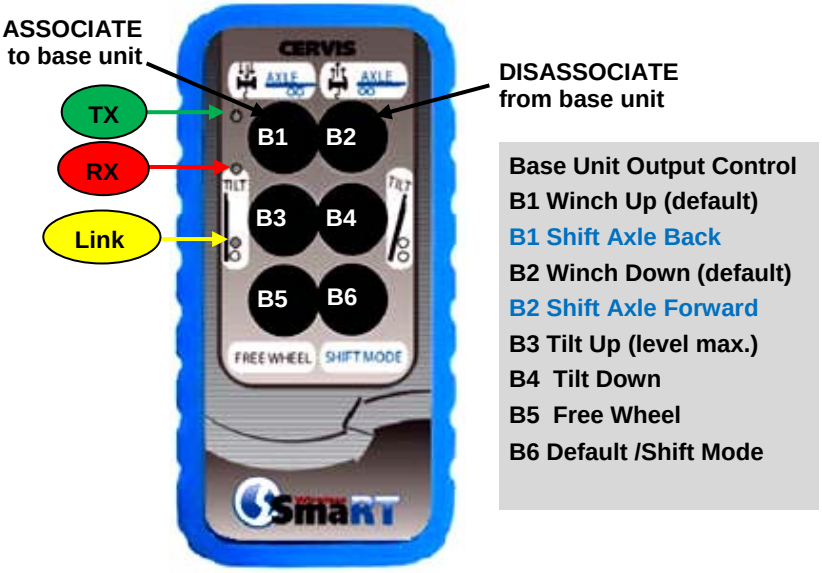

Figure 8. XL Handheld Remote Front Panel

Any button pressed turns on the handheld remote. Communication between the handheld and base unit must be established using the Association Procedure before the remote can be used to control the base unit. (See Heading 4.1.) Once communication is linked, the PTO-906-XL button assignments are made and the BU-908F outputs are controllable within 300' (100m) by using the handheld buttons provided the line-of-sight pathway is unobstructed.

5.1 Remote Unit Timeout

The remote timeout is two (2) minutes following the last button activity. This means that the remote unit powers down if there is two minutes of button inactivity.

✔ ***Note:*** *The FREE WHEEL state remains in the state to which it was last commanded when a remote handheld timeout occurs. For instance, if FREE WHEEL is engaged and the remote unit times out and shuts down, the base unit output will remain in the FREE WHEEL engaged state.*

5.2 Button Assignment and Control Function

Table 1. Button Assignment and Control Function

Button	Type	Control Function
B1	Multiple Function PTO: **Associate to Base** **Winch Down** **Axle Reverse**	This button is used to Associate the handheld and the base unit as described in Heading 4.1. **Once associated:** Button B2 is locked out while B1 is in use. B1 default is **Winch Down**. The AMBER LED is unlit while the remote is in DEFAULT MODE. The winch operates only while the button is held. **Axle Reverse** mode is set by first pressing and releasing B6 (Shift Mode). The AMBER LED is lit solid while the remote is in SHIFT MODE. Pressing B1 moves the axle toward the back end of the trailer. The axle moves only while the button is pressed.
B2	Multiple Function PTO: **Disassociate from Base** **Winch Up** **Axle Forward**	This button is used to Disassociate the handheld and the base unit as described in Heading 4.2. **Once associated:** Button B1 is locked out while B2 is in use. B2 default is **Winch Up**. The AMBER LED is unlit while the remote is in DEFAULT MODE. The winch operates only while the button is held. **Axle Forward** mode is set by first pressing and releasing B6 (Shift Mode). The AMBER LED is lit solid while the remote is in SHIFT MODE. Pressing B1 moves the axle toward the front end of the trailer. The axle moves only while the button is pressed.
B3	Single Function PTO	**Tilt Up.** Tilts the trailer bed only while the button is pressed.
B4	Single Function PTO	**Tilt Down.** Inclines the trailer bed only while the button is pressed.

Button	Type	Control Function
B5	Toggle/Latch	**Press to engage Free Wheel. Press to disengage Free Wheel.** The GREEN (top) and the RED LEDs are lit solid when Free Wheel is engaged.
B6	Toggle/Latch	**Press to set to Shift Mode. Press to set to Default.** The AMBER (bottom) LED is lit solid when the remote is in SHIFT MODE. The AMBER LED is unlit when the remote is in the DEFAULT MODE.

✔ ***Notes:*** *B6 Shift Mode cannot be toggled while B1 or B2 are being pressed.*

✔ ***Note:*** *No command is transmitted when:*
B1 and B2 are simultaneously pressed.
B3 and B4 are simultaneously pressed.

5.3 Handheld LEDs

Table 2. Handheld LEDs

LED	Action	Meaning
GREEN	RAPID FLASH	Remote sending command.
	SOLID	A button is active.
	SLOW FLASH	Low battery indication – change batteries.
RED	RAPID FLASH	Remote receiving response from the base unit.
AMBER	RAPID FLASH	Attempting to LINK (Associate) with the base unit, or error on base unit.
	SOLID	Remote is in SHIFT MODE. Buttons B1 and B2 are set for AXLE control.

5.4 Base Unit LEDs

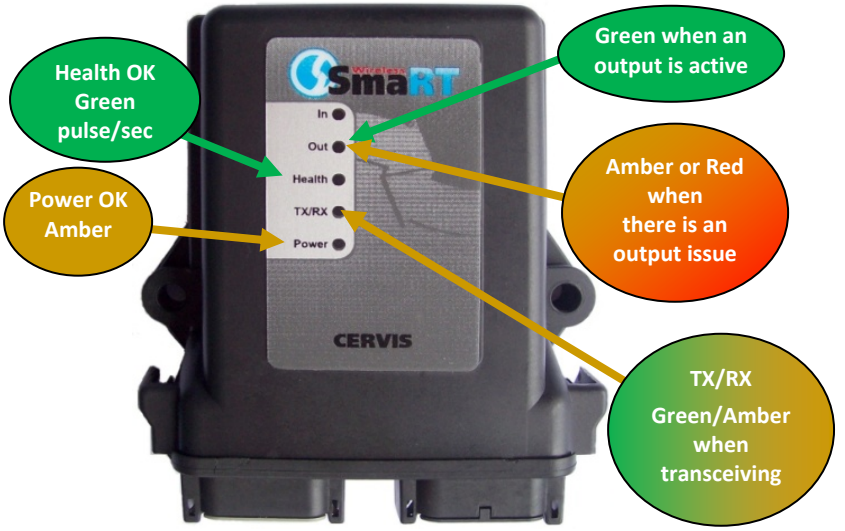

Figure 9. XL Remote System Base Unit LEDs

6.0 Specifications

6.1 Remote Handheld Specifications

Table 3. Handheld Remote Specifications

Item	Description	
Power	**V_{in}**	+3.6V to +4.5V
	Batteries	Three (3) AAA
	Auto-shutdown	5 Sec. of button inactivity
Environment	**$T_{Operating}$**	-20°C to 55°C
		(-4°F to 131°F)
	$T_{Storage}$	-40°C to 55°C
		(-40°F to 131°F)
	Humidity	0 to 100%
Radio	**Frequency**	904-924MHz
	License	License free
	Modulation	DSSS
	Antenna	Internal
Enclosure	**Dimensions**	119mm x 133mm x 36mm
		(5.24” x 4.69” x 1.42”)
	Total Weight	165.28 gr. (5.83 oz.)
	Durability	High Impact Polymer case
		Polycarbonate faceplate
		Impact absorbing boot
Indicators	**Green**	Transmit
	Red	Receive
	Amber	Link
Control Functions	**Buttons/Functions**	6- pushbutton/7-function
	Style	Push-to-operate/Latching
	Button Life	5-million operations (typical)

6.2 Base Unit Specifications

Table 4. Base Unit Specifications

Item	Description		
Power	**V_{in}**	+7VDC to +32VDC	
Environment	**$T_{Operating}$**	-20°C to 70°C (-4°F to 158°F)	
	$T_{Storage}$	-40°C to 85°C (-40°F to 185°F)	
	Humidity	0 to 100%	
	Vibration/Shock	IEC60068-2-6 10Hz to 150Hz @ 1.0*g* peak acceleration 10.0*g* peak shock acceleration	
Radio	**Frequency**	906-924MHz	
	License	No license required	
	Modulation	DSSS	
	Antenna	Internal	
Enclosure	**Dimensions**	119mm x 133mm x 36mm (5.24” x 4.69” x 1.42”)	
	Durability	High Impact Polymer	
	Mounting Holes	7.4mm (0.29”) dia. 102mm center-to-center (4” center-to-center)	
Indicators	**Out**	Green	Output On
	Health	Green Pulse/Sec.	OK
	TX/RX	Green	Receive
		Red	Transmit
	Power	Amber	OK
		Red/green	Fault

Item	Description		
Outputs	**Eight (8)**	Open-Drain FETs	
		4A per channel	
		12A max. total output	
	Assignments	Ch1: P1 – 3	Winch UP
		Ch2: P1 – 4	Winch Down
		Ch3: P1 – 5	Axle Reverse
		Ch4: P1 – 6	Axle Forward
		Ch5: P1 – 7	Tilt Down
		Ch6: P1 – 8	Tilt Up
		Ch7: P1 – 9	Free Wheel
		Ch8: P1 – 10	unused (spare)

7.0 XL Remote System Spare Parts List

Table 5

Item	Part Number
Protective Rubber Boot	RB-1001
Lanyard	LY-1002
Battery Cover with 4 Screws	BC-1003
AAA 1.5V Alkaline Batteries (pk. 3)	AB-1004
P1 Cable Wiring Harness	HN-1001
P1 Fused Cable Wiring Harness	HN-1000

8.0 Troubleshooting Hints

Table 6. Base Unit Troubleshooting Hints

Base Unit	Indication
Power LED not active	✓ Is +7 to +32VDC input power present? ✓ Check input power polarity.
Power LED Red or Green	Indicates an internal component failure.
TX/RX not active	✓ Check for obstructions preventing line-of-sight transmission. ✓ Check that the handheld remote is active. ✓ Re-associate the handheld remote to the base unit.
Health LED blinking Amber	Indicates an internal problem.
Health LED blinking Red	Over-temperature indicated.
Out LED not active	✓ Check that the handheld LEDs are active when the buttons are pushed. ✓ Are output buttons being simultaneously pressed? (Interlock Mode: Output buttons 1 and 2, 3 and 4, or 5 and 6 cannot be pressed at the same time).
Out LED Amber	✓ Over-temperature channel indication. ✓ Over-current channel indication. ✓ Active channel current consumption less than 1A typical. (This is not a problem in cases where less then 1A draw is a normal condition.) ✓ Check the outputs for loose wiring, etc.
Out LED pulsing Amber	Indicates an over-current condition.
Out LED slowly pulsing Amber	Over-temperature indication.

Table 7. Remote Handheld Troubleshooting Hints

Handheld Remote	Indication
No active LED when a button is pressed.	✓ Check the batteries. ✓ Batteries inserted properly? ✓ Check the battery contacts. ✓ Replace batteries with fresh, new AAA alkaline batteries.
Button are pressed, but no output action occurs.	✓ Is the line-of-sight path between the handheld and base unit obstructed? ✓ Is the base unit power LED illuminated? ✓ Is the base unit powered with +7 to +32VDC? ✓ Locate the handheld close to the base unit in a clear line-of-sight and try again. ✓ Re-associate the handheld with the base unit.

CAUTION

Push-To-Operate (PTO) means that the outputs under control should only operate when the appropriate button of the PTO-906-XL is pressed, and then only for the duration of time that particular PTO output button is pressed. Any unexpected motion that occurs when pressing any PTO output control button of the PT0-906-XL must be investigated.

Should a jerkiness of motion occur while constantly pressing an output button, immediately stop operation. Check the Out LED—and the other diagnostic LEDs—of the BU-908F for any indication of a problem.

Be aware that even if the diagnostic LEDs of the handheld and base unit do not indicate a problem, one may be present and further troubleshooting steps may be needed.

If a problem is found, do not operate the SmaRT System until the problem is resolved.

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