



SmaRT 904
Remote Control System
Manual

U009.1-SmaRT_904_system-R

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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 receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

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Notes/Definitions:

Association

SmaRT Method of configuration 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 advanced 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. Once the button is released, the command ends.

PTO-904

Remote handheld unit that can control a four output base unit.

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

Transmit

RX

Receive

1.0 SmaRT 904 Remote Control System

The standard SmaRT 904 Remote Control System consists of a 4-button PTO-904 wireless handheld transmitter, a BU-904F base unit, and the wiring harness that is used to connect the base unit to the controlled apparatus. A single base unit is capable of communicating with up to eight PTO-904 Handheld units. The rugged construction, compact size, and multiple output versatility allow for SmaRT Systems to be used for many applications that require remote operation.



Figure 1. PTO-904 Handheld Remote and BU-904F Base Unit

1.1 Features

- IP65 Enclosure
- Operating Temp: -20°C to +55°C
- Storage Temp: -40°C to +85°C
- PTO-904 Handheld has four Push-to-Operate (PTO) buttons
- Handheld powered by three AAA Batteries (+3.6VDC to 4.5VDC)
- Base Unit +9VDC to +16VDC Input Power
- Four FET high-side switching outputs (8A max.)
- License Free Frequency, 900MHz Direct Sequence Spread Spectrum Technology
- 300' (100m) Range
- Rugged high-impact polymer enclosure
- Removable rubber bumper (handheld)
- Lanyard
- Compact Weatherproof Design
- Five base unit and three handheld diagnostic LEDs
- Single connector interface for ease of wiring

1.2 PTO-904 Handheld Remote

The SmaRT PTO-904 Handheld Remote features a 300' handheld-to-base unit communication range providing four function press-to-operate (PTO) control. Using direct sequence spread spectrum (DSSS) wireless technology at 900MHz, the handheld unit provides a robust link with a base unit in congested radio environments. SmaRT handheld units feature seamless association to a SmaRT BU-904F Base Unit without the need to open either case.

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 bumper that covers the back and sides of the unit extending beyond the recessed faceplate. A convenient lanyard that attaches to the remote is provided.

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-904

1.3 BU-904F Base Unit

The SmaRT BU-904F Base Unit features four FET, 8A max high-side switching outputs. It accepts an input power operating voltage range from +9 to +16VDC. Using Direct Sequence Spread Spectrum (DSSS) wireless technology at 900MHz, the base unit provides a robust link with a handheld in congested radio environments

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 to the base unit are made using a single cable.

The base unit compact enclosure is constructed of rugged, heavy duty high impact plastic—the type commonly used by the automotive industry. VDC power to the unit and output signals are ported using the heavy duty 12-pin-automotive-type connector shown in Figure 3 below.



Figure 3. Female Twelve (12) Pin Connector

The unit has five status/diagnostic LEDs that are used to determine the state of the unit. The LEDs are shown in Figure 4 below.

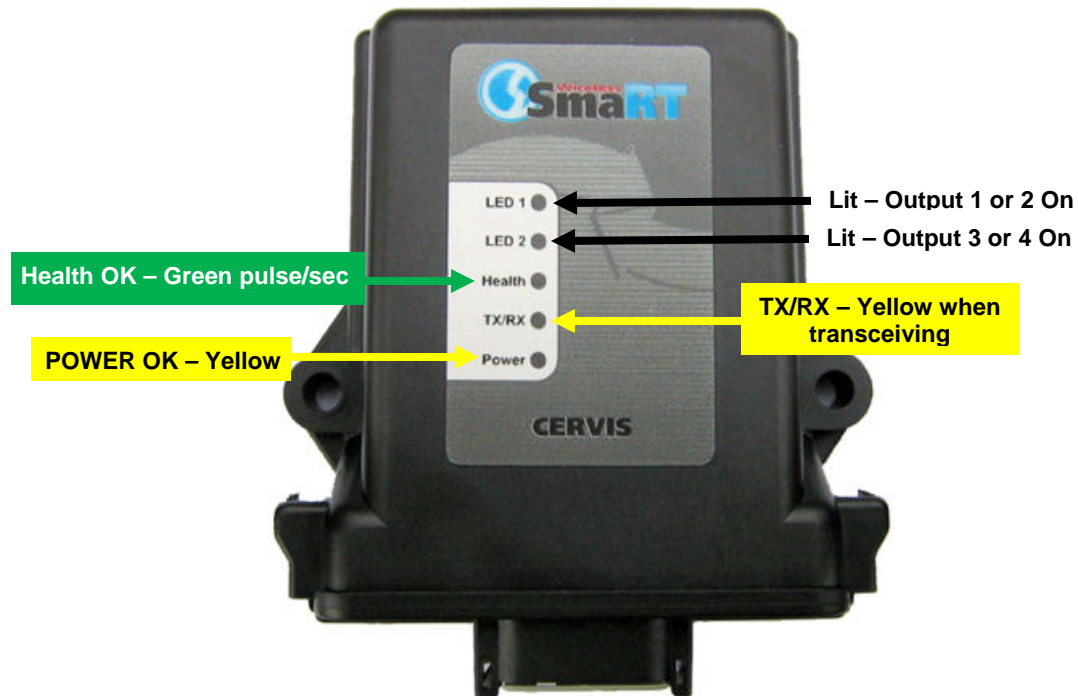


Figure 4. BU-904F LEDs

1.4 Handheld ↔ Base Unit Communication

A standard Smart 904 System comes with one PTO-904 Handheld Remote and one BU-904F Base Unit, but each BU-904F is capable of communicating with up to eight PTO-904 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.

1.4.1 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.
3. Simultaneously press and hold the Association and Disassociation buttons (see Figure 5). 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 yellow.
5. When the LINK LED flashes yellow, 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 5 below). The RX extinguishes, the TX lights steady green, and the LINK LED lights steady yellow.
7. Apply power to the base unit while continuing to hold the Association button.

The base unit and handheld begin Association to establish a communication link. Once the process is complete, the yellow LINK LED extinguishes, the RX begins flashing red, and the TX 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 904 System is ready for use with that particular handheld remote.

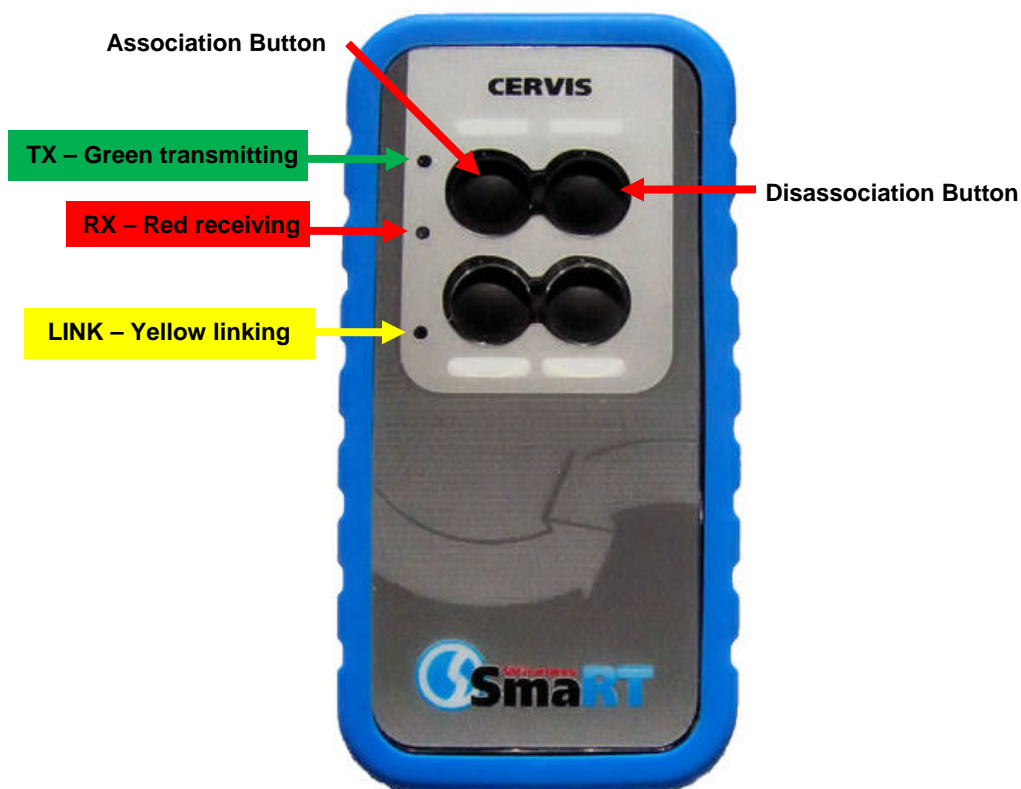


Figure 5. Handheld PTO Buttons

1.4.2 Handheld ↔ Base Unit Disassociation

In some circumstances it may become necessary to break the communication link between 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



Completion of the following steps will break all established handheld remote links previously established. It will be necessary to perform the Association Procedure (1.4.1 above) using each handheld to re-establish communication links with the 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 buttons (see Figure 5). TX lights steady green.
4. Continue to hold both buttons for the five seconds it takes for the LINK LED to begin flashing yellow.
5. When LINK flashes yellow, release the two 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 establish the Association.*

6. Press and hold the Disassociation button. (See Figure 5 above.) The RX extinguishes, the TX lights steady green, and the LINK LED lights steady yellow.
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 yellow 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 BU-904F Base Unit will not communicate with any handheld remote units. A handheld remote must use the Association Procedure (1.4.1) to re-establish a communication link with the base unit.

2.0 Handheld Battery Installation or Change

The SmaRT handheld unit is powered by three size AAA batteries. 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 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 6 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 6 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.

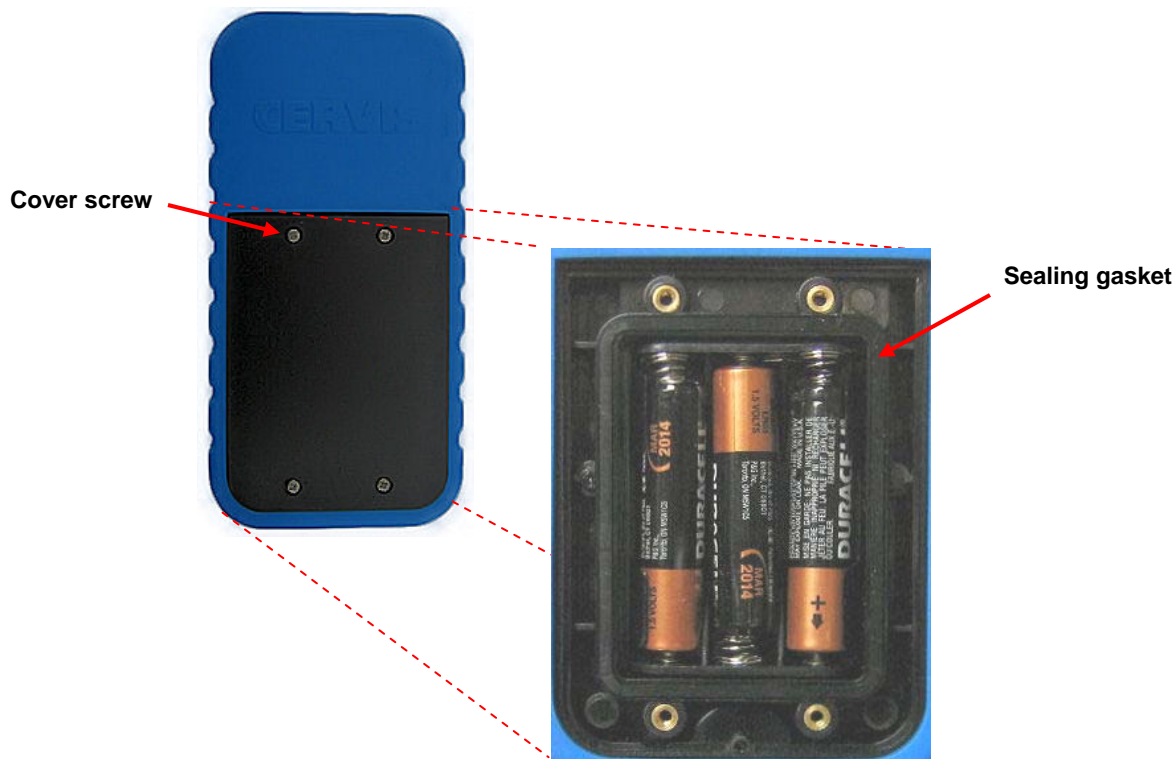


Figure 6. Handheld Battery Installation

✓ **Note:** Cover screws must be tightened enough to assure the 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 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 in mounting the base unit and connecting your wiring harness. Mounting of the base unit is left much to your discretion with the following guidelines:

- Before installing, make sure that the configuration diagrams supplied with the system are available. Keep them where they are available at all times.
- Make sure the wiring harness is at hand.
- Always mount the receiver away from any intense radio or electric disturbance sources.
- Make sure the mount is secure. Mount the unit where you have enough room for your wiring harness connections.

✓ Note: Harness cable wires are individually marked on the insulator of each wire.

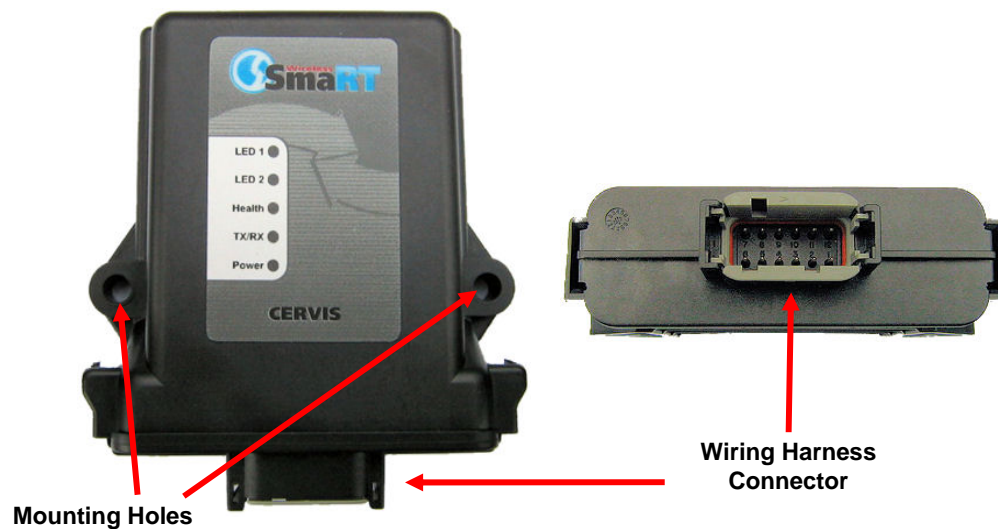


Figure 7. Base Unit

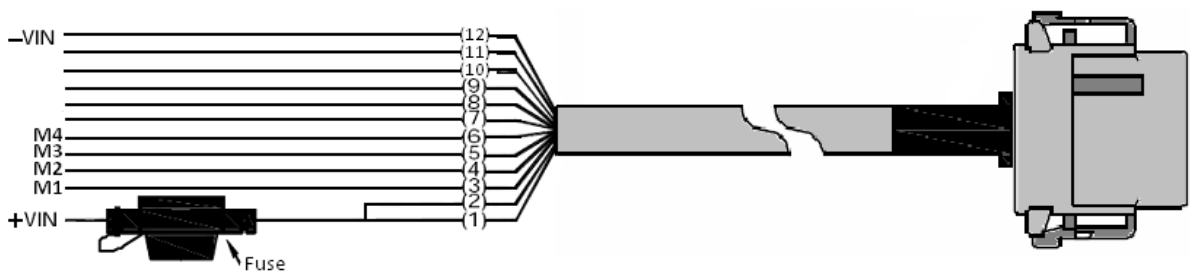


Figure 8. Wiring Harness Cable

4.0 Using the SmaRT PTO-904 Handheld Remote

The front panel of the SmaRT PTO-904 Handheld Remote has four (4) push-to-operate buttons and three (3) diagnostic LEDs. PTO buttons 1 and 2 have dual functions as described in Figure 9.



Figure 9. PTO-904 Front Panel

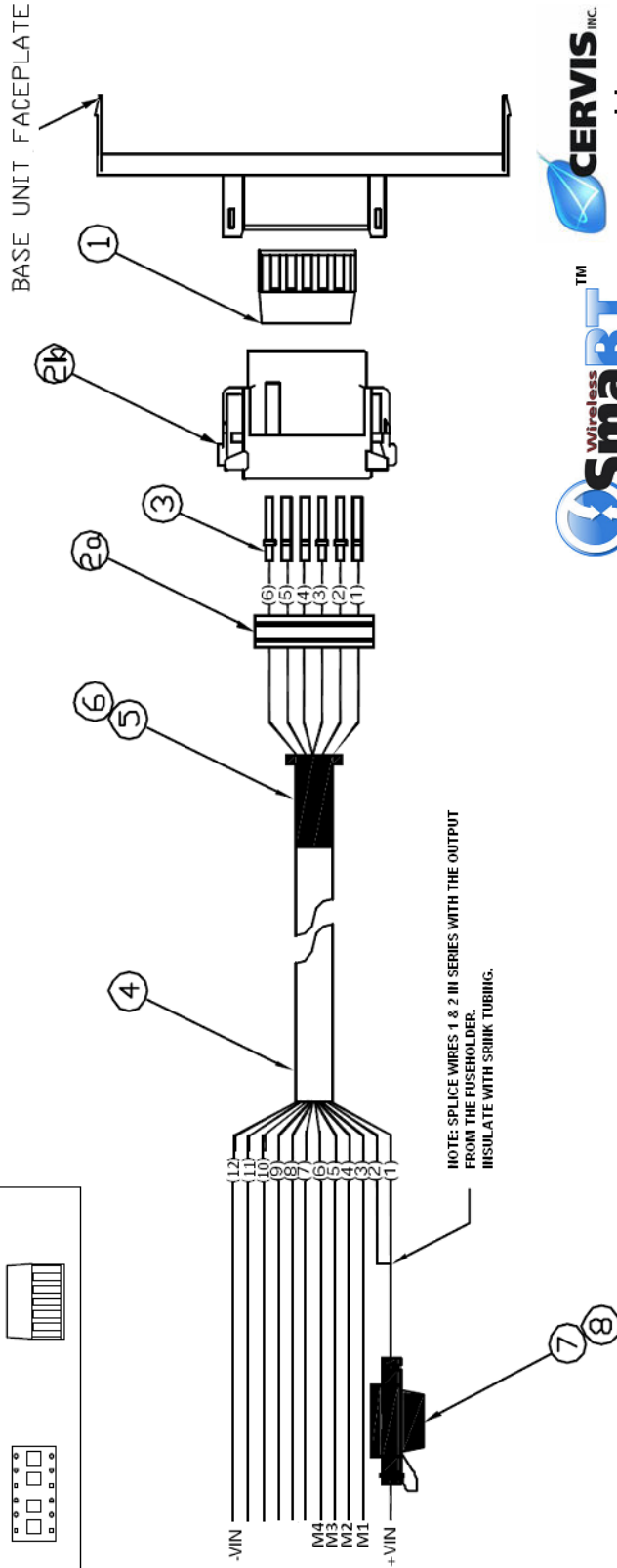
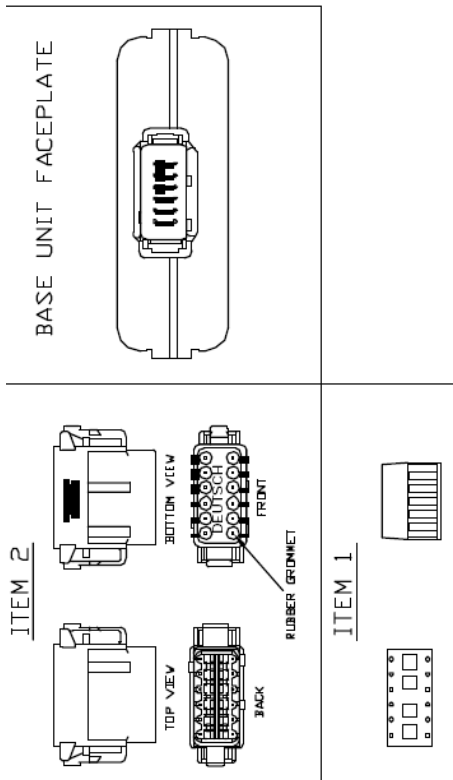
5.0 Operate the System

1. Communication between the handheld and base unit must be established using the Association Procedure (1.4.1).
2. You must be line of sight of the base unit while holding the handheld, within 300 ft. (100m) of the unit.
3. Each button is push-to-operate (PTO). Each is dedicated to its assigned (or hardwired) output driven by the base unit. The output is only controlled when the appropriate button is pressed and held.

6.0 Base Unit BU-904F Wiring Harness

ITEM	DESCRIPTION	CERVIS PART#	QTY
1	WEDGE BLOCK	357	1
2	PLUG	Y2-03	1
3	SOCKET CONTACT	358	8
4	12 COND. CABLE	9936K29	36"
5	INNER RUBBER BOOT	B2-05C	1
6	OUTER RUBBER BOOT	B2-05D	1
7	FUSE HOLDER	TBD	1
8	15 AMP FUSE	TBD	1

Note: 2a and 2b create item 2.



7.0 Specifications

7.1 Handheld

Table 1 - Handheld 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 bumper
Indicators	Green Transmit
	Red Receive
	Yellow Link
Control Functions	Pushbuttons Four function
	Style Push-to-operate
	Button Life 5-million operations (typical)

7.2 Base Unit

Table 2 - Base Unit Specifications

Item	Description
Power	V_{in} +9VDC to +16VDC
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 @ 1.0g peak acceleration 10.0g peak shock acceleration
Radio	Frequency 904-924MHz 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
Indicators	Power Yellow OK Red/green Fault TX/RX Green Receive Red Transmit Health Green Pulse/Sec. OK LED1 Green Output 1 or 2 Active LED2 Green Output 3 or 4 Active
Outputs	Four (4) Open-Drain FETs 8A max. total output



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