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**Manual 99905678**

# TireHandler™ Radio Remote System

**Revised: 07-23-2018**



**Iowa Mold Tooling Co., Inc. is an Oshkosh Corporation Company**

# Table of Contents

# Section - 1 Introduction

## IMT Safety Precautions

- Read and follow all instructions
- Failure to abide by Safety Precautions may result in 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.
- Owner/operators of the equipment must abide by all applicable Federal, State, and Local laws concerning installation and operation of the equipment. 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 cables from the base unit connectors P1 and P2, 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 radio base unit before welding on the machine. Failure to disconnect the base unit may result in destruction of or damage to the base unit.
- Operate and store units only within the specified operation and storage temperatures defined in the specifications of this document.
- Keep high-energy RF devices away from handheld remotes. Activation of high-power communication radios, for instance, in close proximity to handheld remotes can result in interference and “false” circuit activation.
- Do not key 2-way radios while using the handheld remote.

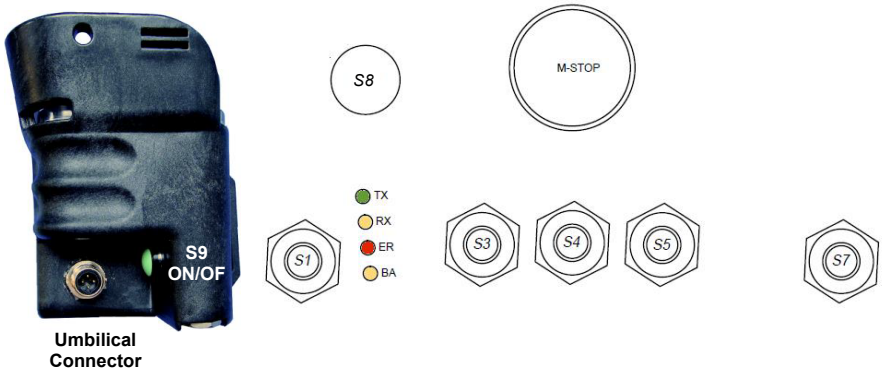
# Section - 2 Equipment

## Radio Remote System List of Equipment

| QTY | MODEL | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | MCB-2H02JS-10054 | 70735133 | TRANSM-RAD REM TOGGLE TH 5K-36K |
| 1 | BU-2H18XF-10054 | 70735134 | RECEIVER-RAD BASE TOGGLE TH 5K-36K |


***Note: It is possible to order the system with one part number. Specify WSMB-10054 in the purchase order to receive the parts listed in the table above. If an individual part needs to be ordered, use the part number listed in the table above.***

## Handheld Remote Layout and Labels


| SWITCH / LED | FUNCTION | SWITCH TYPE / DESCRIPTION |
|---|---|---|
| SI+<br>S1 | Fallback Arm Forward<br>Fallback Arm Reverse | 3 Position Momentary Toggle |
| S3+<br>S3 | Pad Rotate CW<br>Pad Rotate CCW | 3 Position Momentary Toggle ─<br>Proportional (Pulse Width Modulated) |
| S4+<br>S4 | Side Shift Left<br>Side Shift Right | 3 Position Momentary Toggle ─<br>Proportional (Pulse Width Modulated) |
| S5+<br>S5 | Body Rotate CW<br>Body Rotate CCW | 3 Position Momentary Toggle ─<br>Proportional (Pulse Width Modulated) |
| S7+ | Clamp | 3 Position Momentary Toggle ─<br>Proportional (Pulse Width Modulated) |
| S7 | Release Clamp | 3 Position Momentary Toggle ─<br>Proportional (Pulse Width Modulated)<br>Operates with S8 pressed (+) |
| S8+ (PRESSED) | Clamp Release Enable | Green Pushbutton |
| S9 | Power/Associate Switch | Green Pushbutton |
| STOP | Stop | Red Button – Pull Up to Enable Start<br>Push Down to Stop |
| LED1 | Tx (Green) | Transmit |
| LED2 | Rx (Amber) | Receive |
| LED3 | Error (Red) | Error Indication |
| LED4 | Battery (Amber) | Battery Indication |

## LED Diagnostic Information

| LED INFORMATION | CONDITION | COLOR |
|---|---|---|
| TX Short Blinking | Handheld is transmitting | Green |
| TX Long Blinking | Switch active on handheld | |
| RX Blinking (indication of RF signal integrity) | Base unit messages received | Amber |
| ERR* | Switch fault at power-up | Red |
| ERR** | Machine Stop depressed at power-up | |
| BATT Slow Blinking*** | Low battery Indication | Amber |

****LED's 1 and 3 will blink alternately with 2 and 4.***
*****LED's 1 and 2 will blink alternately with 3 and 4***
****** Replace batteries with four fresh batteries ASAP.***

## Battery Installation

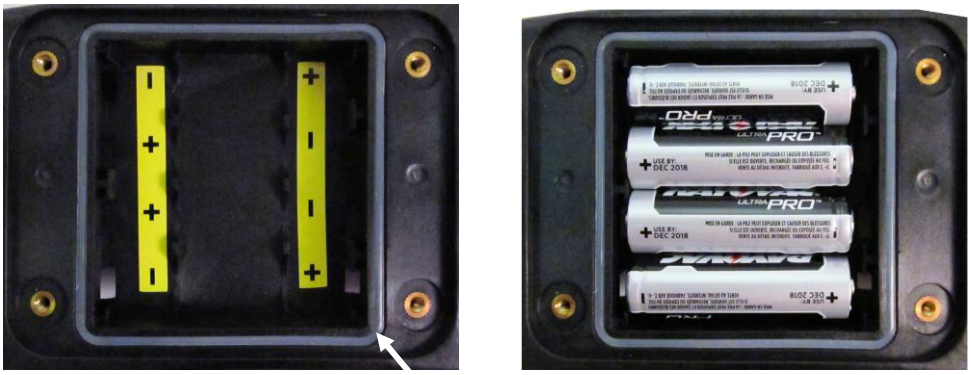
This SmaRT handheld unit is powered by four size AA batteries. When installing batteries, be sure to observe proper polarity as marked on the inside of the compartment to avoid damaging the unit.

To replace or install batteries in the handheld:

1. Loosen the four captive battery compartment cover screws on the rear of the remote and lift the cover from the handheld.

2. Install (or replace with) four (4) fresh size AA batteries. Observe the proper polarity by positioning the batteries as shown in Figure 3.

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




**CAUTION**

Be sure to observe proper polarity when placing batteries in the hand-held battery compartment.

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

# Handheld Radio Operation

## Turn ON the Unit

This remote is powered ON by pulling the large red STOP button UP and then pushing the green ON switch (S9).

## Turn OFF the Unit

The remote is turned OFF by pushing the large red STOP button down.

MCB-2H02JS-10054 is programmed to power down after FOUR minutes of inactivity. If the unit powers down due to inactivity, the ON switch (Green S9) can be used to re-activate the unit.

## Proportional Control

See Chapter 3

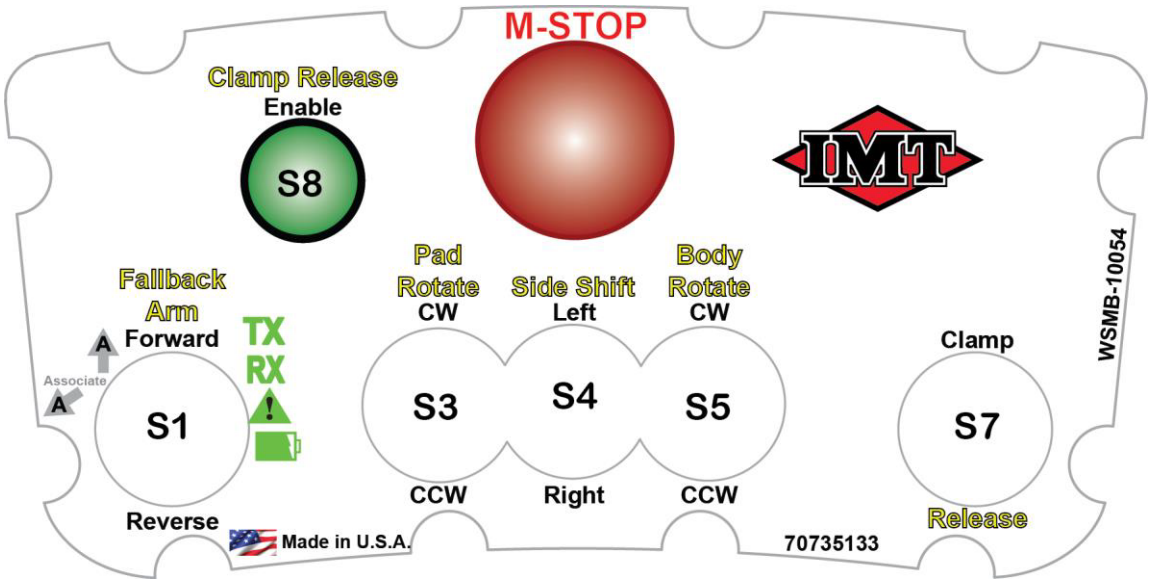
## Toggle Switches

Toggle switches S1, S3, S4, S5, and S7 are three position momentary toggle switches.

## Button Switches

S8 pressed enables the Clamp Release function for S7− (down).

M-Stop must be in the up position to allow Start (S9). Pushed down shuts down the MCB thus stopping any controlled functions.

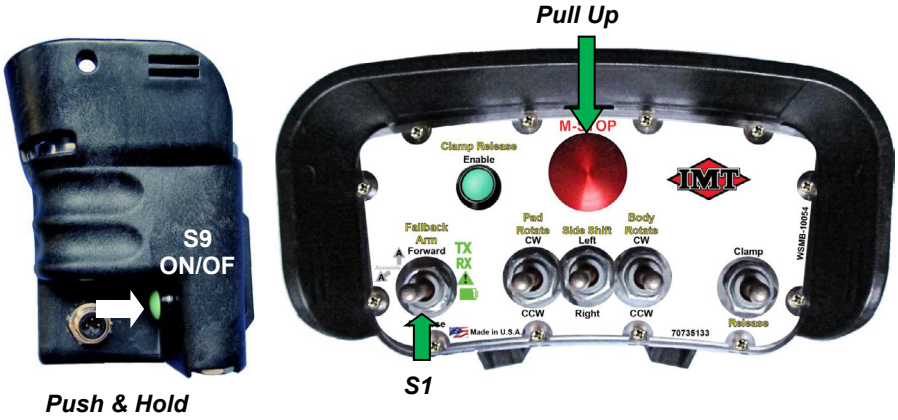


## ASSOCIATE MODE:

Associate Mode is used to establish the communications link between a remote and base unit on a 1-to-1 association basis. To associate there must be a clear line of sight between the handheld and the base, and both units must be OFF (powered down). Note: The remote is turned off by pushing the oversized mushroom STOP button. The SmaRT base unit is safely powered down by disconnecting P1 and P2 or by removing/turning-OFF the power source from the unit.

**⚠ CAUTION**

To prevent inadvertent movement to the machine, be sure to remove power from the Base Unit by disconnecting P1 & P2 or by turning OFF the power source before attempting to enter Associate Mode.




## TO ASSOCIATE:

1. Stand near to 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 handheld by pulling up.

3. Push and hold the Green Start button S9 and then immediately push and hold S1 UP (Forward). All four LEDs light solid.

4. Observe the LEDs. When RX goes OFF, power up the base unit. When the RX LED blinks, release S9 andS1.

A successful Association is indicated when LEDs TX and RX are rapidly blinking while the Battery and Warning LEDs are unlit.

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# Section - 3 Proportional Output

# Proportional Output MIN (Low End) & MAX (High End) Adjustments

## What You Need to Know Before You Adjust the Output Min and Max

- The operator must make sure the area around the controlled machine is safe to operate before performing dynamic MIN and MAX adjustments.
- The base unit must be powered for dynamic adjustment.
- The base unit LEDs and display should be close enough to be easily read.
- Adjust Mode timeout defaults to a ten (10) second window of opportunity, where the unit returns to normal operating mode if none of the switches are operated within the 10 second window. The timer resets to 10 seconds each time a toggle switch is operated while in Adjust Mode.
- Each toggle switch is adjusted using the following steps.

## Enter Adjust Mode

- Both the handheld, MCB-2H02JS, and base unit, BU-2H18XF, must be powered up and communicating with each other.
- To enter Adjust Mode, push and hold switch S1UP and then press the green push button for approximately 4 to 5 seconds until the bottom three base unit LEDs begin to flash (Figure 6) and CAL will show in the base unit display.
- Release switch S1 and green push button.


**Push and hold S1**


**Push and hold for approximately 5-seconds until LEDs flash**



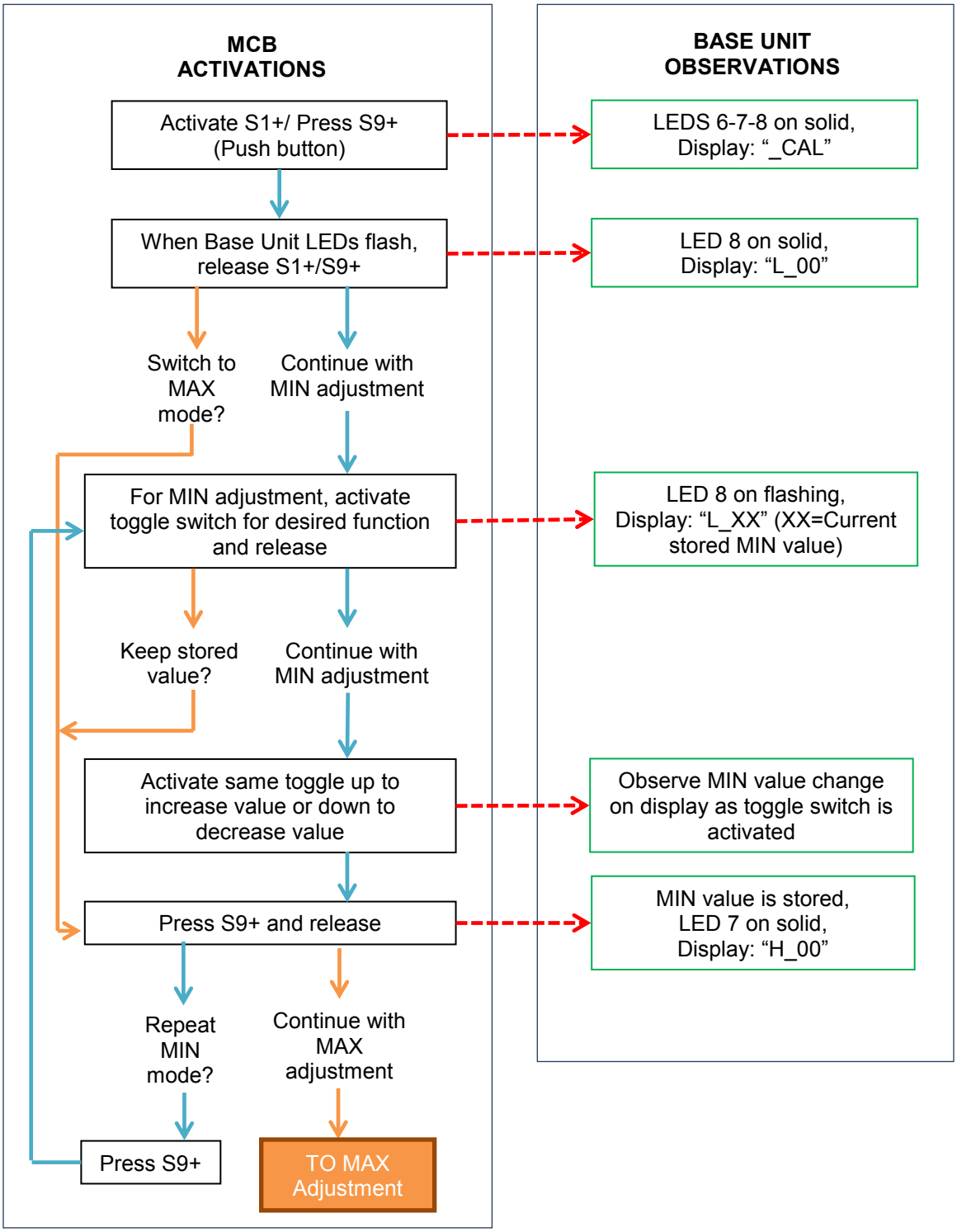
**PWM Function Switches**

**⚠ CAUTION**

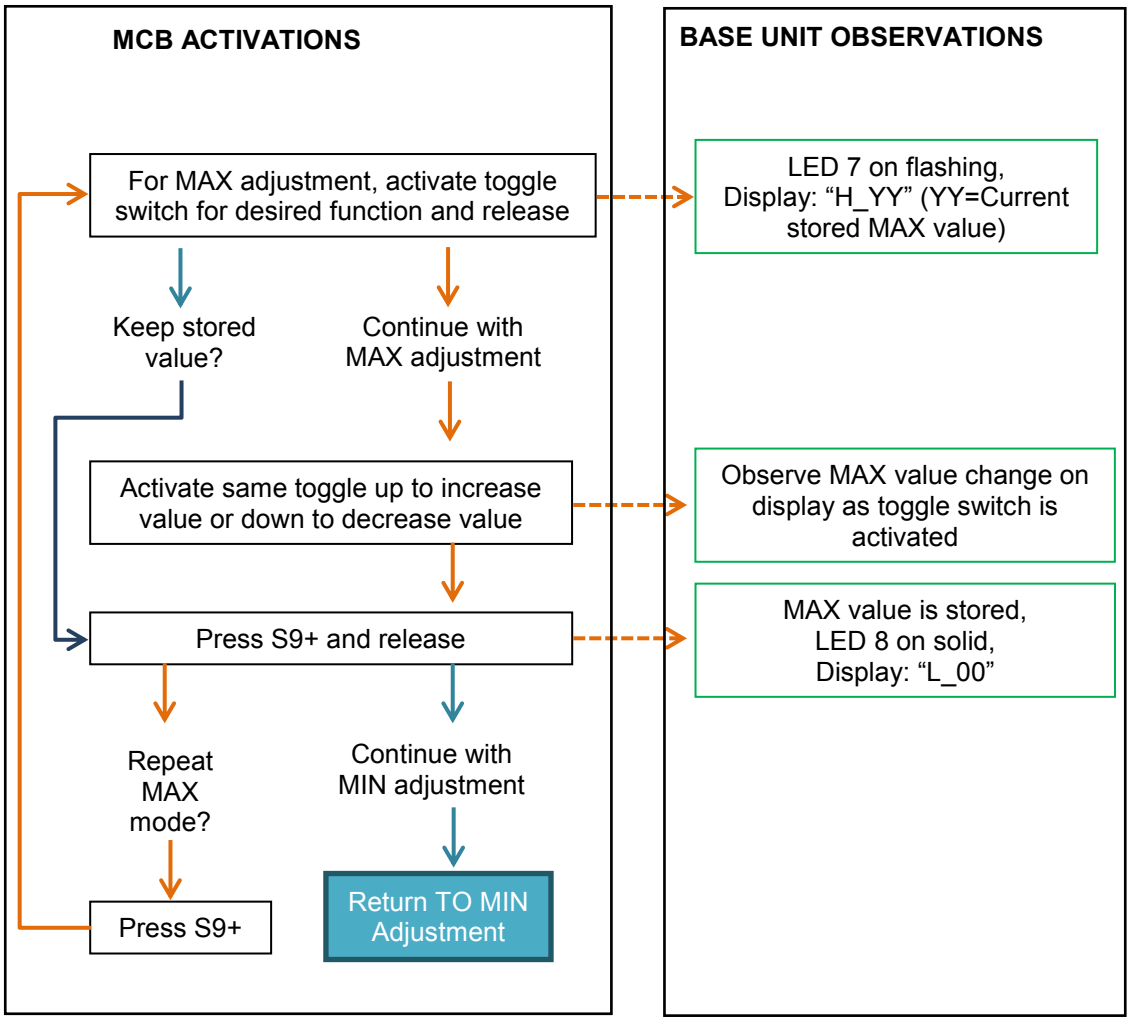
Be aware of toggle switches activation during this process. Base Unit outputs may be active during the toggle swtich adjustment process.

## Minimum Adjustment Procedure

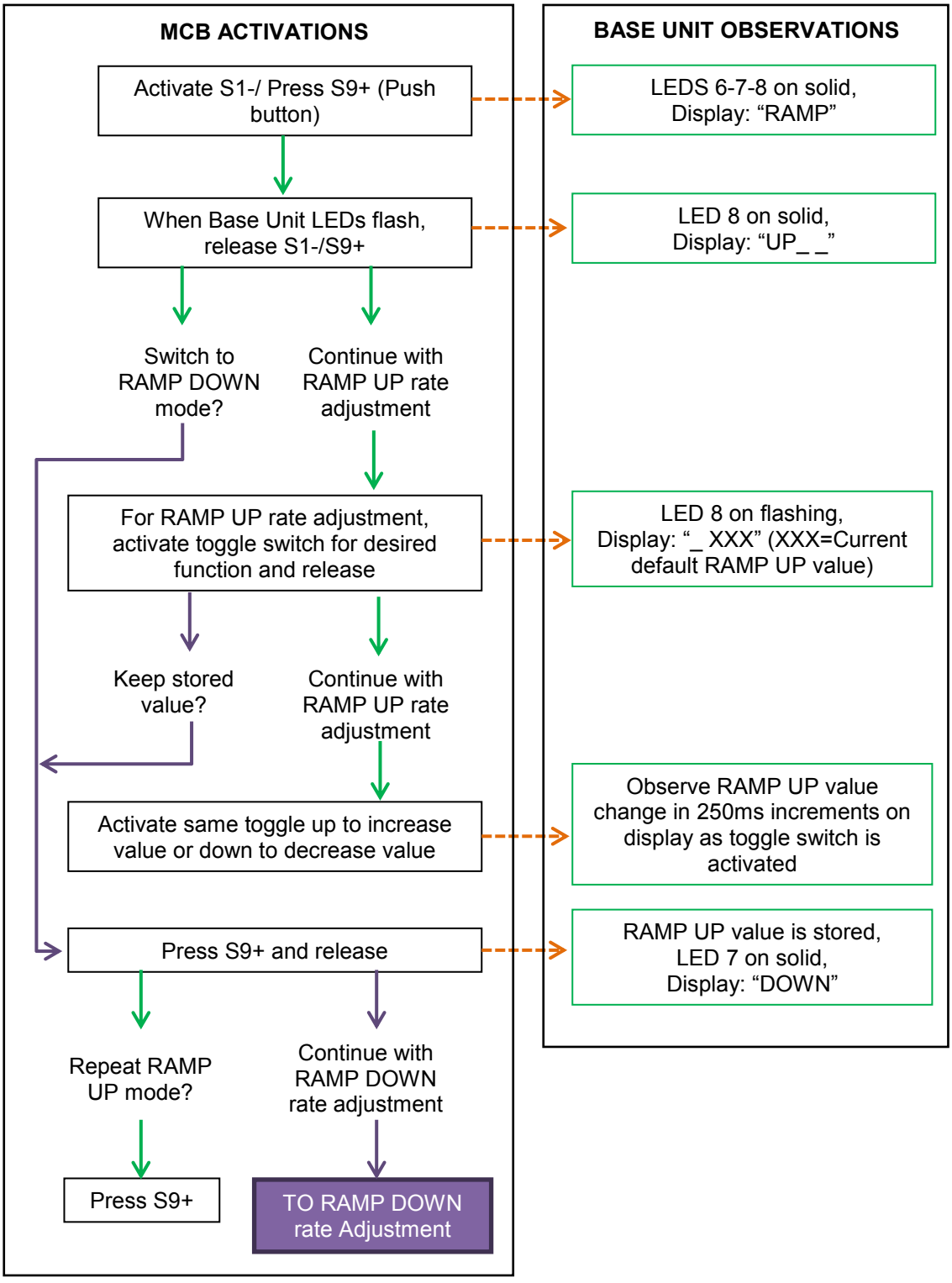
The following charts—Figure 7 through Figure 10—can be used to adjust the minimum, maximum, ramp-up rate, and ramp-down rate of Pad Rotate (S3), Side Shift (S4), Body Rotate (S5), and Clamp-functions (S7).



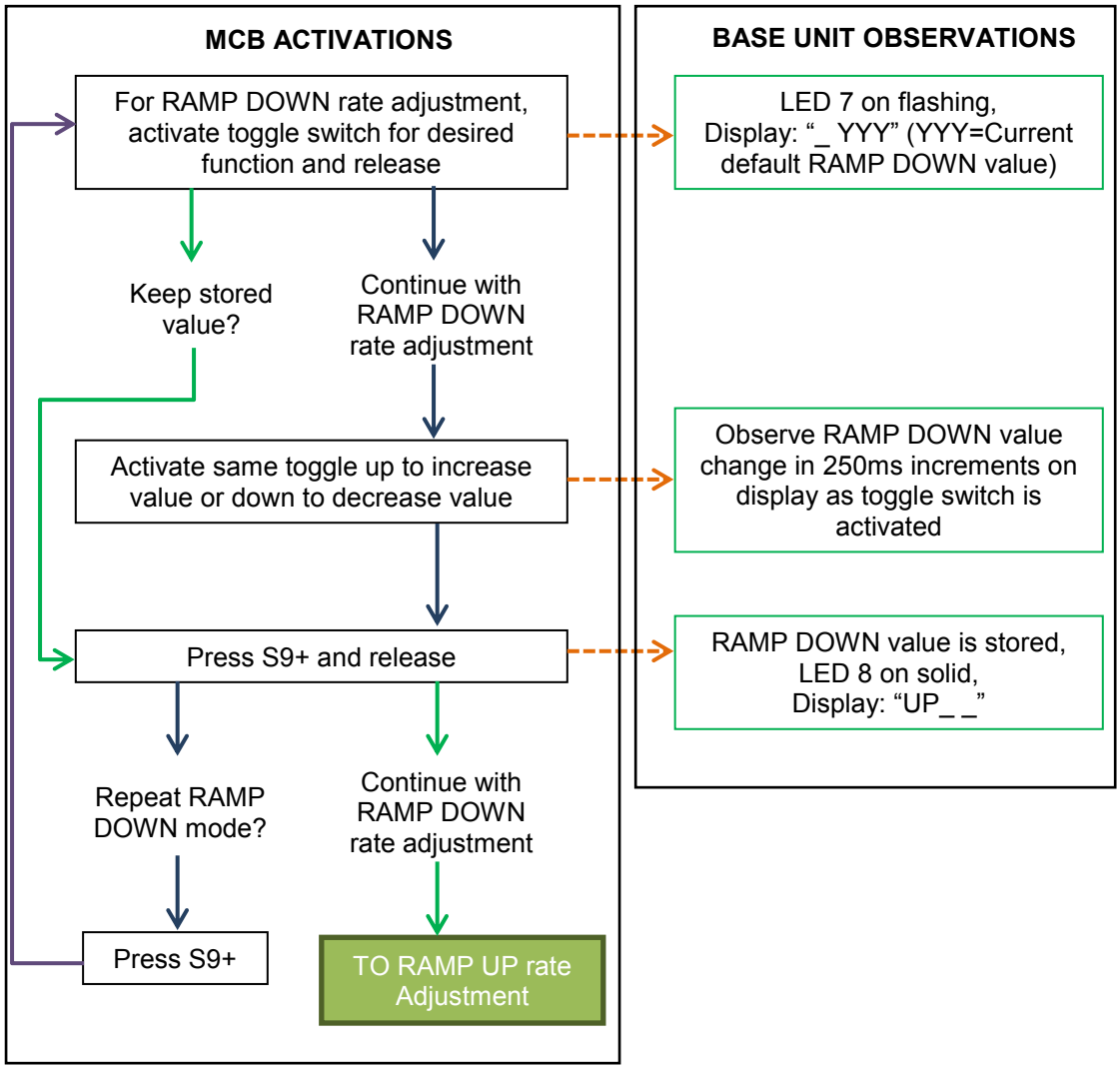
## Maximum Adjustment Procedure



## Ramp-Up Rate Adjustment Procedure



## Ramp-Down Rate Adjustment



### To Abandon Adjust Mode:

- At any point during adjustment, you can abandon Adjust Mode by pressing the M-Stop button.

### Exit Adjust Mode:

- Waiting approximately ten seconds for the adjustment procedure to timeout (LED 7 or LED 8 must be on solid only)
- By pressing the MCB STOP button.

### Function Default Settings:

- The values expressed in Table 4 are typical and may be adjusted depending on specific circumstances.

| | PROPORTIONAL SETTINGS | | | | RAMP SETTINGS | | | |
|---|---|---|---|---|---|---|---|---|
| | *FACTORY DEFAULT* | | *OPERATIONAL RANGE** | | *FACTORY DEFAULT* | | *OPERATIONAL RANGE*** | |
| | MIN (%) | MAX (%) | MIN (%) | MAX (%) | UP (ms) | DN (ms) | UP (ms) | DN (ms) |
| **CLAMP RELEASE** | 28 | 53 | 20 | 80 | 250 | 250 | 0-3000 | 0-3000 |
| **CLAMP** | 28 | 50 | 20 | 80 | 250 | 250 | 0-3000 | 0-3000 |
| **BODY ROTATE CCW** | 28 | 57 | 20 | 80 | 250 | 250 | 0-3000 | 0-3000 |
| **BODY ROTATE CW** | 25 | 51 | 20 | 80 | 250 | 250 | 0-3000 | 0-3000 |
| **PAD ROTATE CW** | 26 | 53 | 20 | 80 | 250 | 250 | 0-3000 | 0-3000 |
| **PAD ROTATE CCW** | 27 | 53 | 20 | 80 | 250 | 250 | 0-3000 | 0-3000 |
| **SIDE SHIFT RIGHT** | 27 | 55 | 20 | 80 | 250 | 250 | 0-3000 | 0-3000 |
| **SIDE SHIFT LEFT** | 25 | 53 | 20 | 80 | 250 | 250 | 0-3000 | 0-3000 |

*1% increments **250ms increments

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# Section - 4 Base Unit

## Hardware Configuration

| REQUIRED FIELDS | DESCRIPTION | DETAILS / NOTES |
|---|---|---|
| Control Power | 7-32VDC | Must be able to operate @ 32VDC |
| Radio Frequency (RF) | 2400MHz @ 100mW | Frequency Channel Hopping DSSS |
| Antenna Option | Internal | |
| Discrete Channels | 18 Available | FET, High-Side outputs |
| Digital Output Channels | 13 | 8 PWM; 5 On/Off |
| Link Loss Criteria | 0.5s | Five consecutively missed messages |
| Message Periodicity | 10x/s | One message every 10ms |
| CAN Information | J1939 | Refer to J1939 Standard |
| Internal CAN Termination | 1.0kΩ (default) | |
| Proportional Channel Info | PWM Frequency: 250Hz<br>Voltage: 24VDC<br>Load Resistance: 4.7Ω | |

## Safety Link

| BASE UNIT SAFETY LINK | |
|---|---|
| X | |
| ENABLED<br>When any of the following occurs:<br>• Machine Stop is pressed<br>• HH unit goes out of range<br>• HH unit deactivates due to loss of power, Inactivity timeout, or deliberate deactivation (off switch)<br>All latched outputs unlatch and all momentary outputs that are active deactivate. Upon activation of the HH, no outputs are allowed to be activated until all switches (unless masked) are first centered or returned to their neutral state. | DISABLED<br>When any of the following occurs:<br>• Machine Stop is pressed<br>• HH unit goes out of range<br>• HH unit deactivates due to loss of power, Inactivity timeout, or deliberate deactivation (off switch)<br>Then all latched outputs remain latched but all momentary commands that are active deactivate. **NOTE:** If HH unit is powered on and a momentary command that was deactivated due to range is still active when the HH returns in range, the output will immediately be active again |

# Base Unit Channel Configuration

| BASE UNIT CONFIGURATION | | | | | | | |
|---|---|---|---|---|---|---|---|
| CHANNEL | TYPE* | FUNCTION | ACTIVATED BY: | SETTINGS / COMMENTS | | PIN | |
| +VDC | +VDC IN | +VDC IN | | | | 1 | Base Unit socket P1 (GRAY) |
| M17 | UNUSED | | | | | 2 | |
| M9 | LO-HS-M | Fallback Arms Rev | S1- | | | 3 | |
| M10 | LO-HS-M | Fallback Arms Fwd | S1+ | | | 4 | |
| M11 | UNUSED | | | | | 5 | |
| M12 | LO-HS-M | Clamp Release Enable | S8(+) | | | 6 | |
| M13 | LO-HS-M | Crane Hourmeter | M1 OR M2 OR M3 OR M4 OR M5 OR M6 OR M7 OR M8 | | | 7 | |
| M14 | UNUSED | | | | | 8 | |
| M15 | UNUSED | | | | | 9 | |
| M16 | LO-HS-M | LINK/STOP | RF LINK<br>Loss of Link OR Stop | | | 10 | |
| M18 | UNUSED | | | | | 11 | |
| -VDC | -VDC IN | | | | | 12 | |
| M5 | PWM | Clamp Release | S7- AND S8(+) | MIN: 20% | MAX: 80% See Note 1 | 1 | Base Unit Socket PLUG P2 (BLACK) |
| M6 | PWM | Clamp | S7+ | MIN: 20% | MAX: 80% | 2 | |
| M7 | PWM | Body Rotate CCW | S5- | MIN: 20% | MAX: 80% | 3 | |
| M8 | PWM | Body Rotate CW | S5+ | MIN: 20% | MAX: 80% | 4 | |
| CAN H | | (Optional To Mcb) | Operational | Connect to MCB umbilical connector pin 2 | | 5 | |
| UMB PWR | | (Optional To Mcb) | Operational | Connect to MCB umbilical connector pin 1 | | 6 | |
| +VDC | | +VDC IN | | | | 7 | |
| CAN L | | (Optional To Mcb) | Operational | Connect to MCB umbilical connector pin 3 | | 8 | |
| M1 | PWM | Pad Rotate CW | S3+ | MIN: 20% | MAX: 80% | 9 | |
| M2 | PWM | Pad Rotate CCW | S3- | MIN: 20% | MAX: 80% | 10 | |
| M3 | PWM | Side Shift Right | S4- | MIN: 20% | MAX: 80% | 11 | |
| M4 | PWM | Side Shift Left | S4+ | MIN: 20% | MAX: 80% | 12 | |

*TYPES
XX-XX-XX

AI = ANALOG INPUT
AO= ANALOG OUTPUT
LI = LEVEL INPUT
LO = LEVEL OUTPUT
PWM=PULSE WIDTH MOD

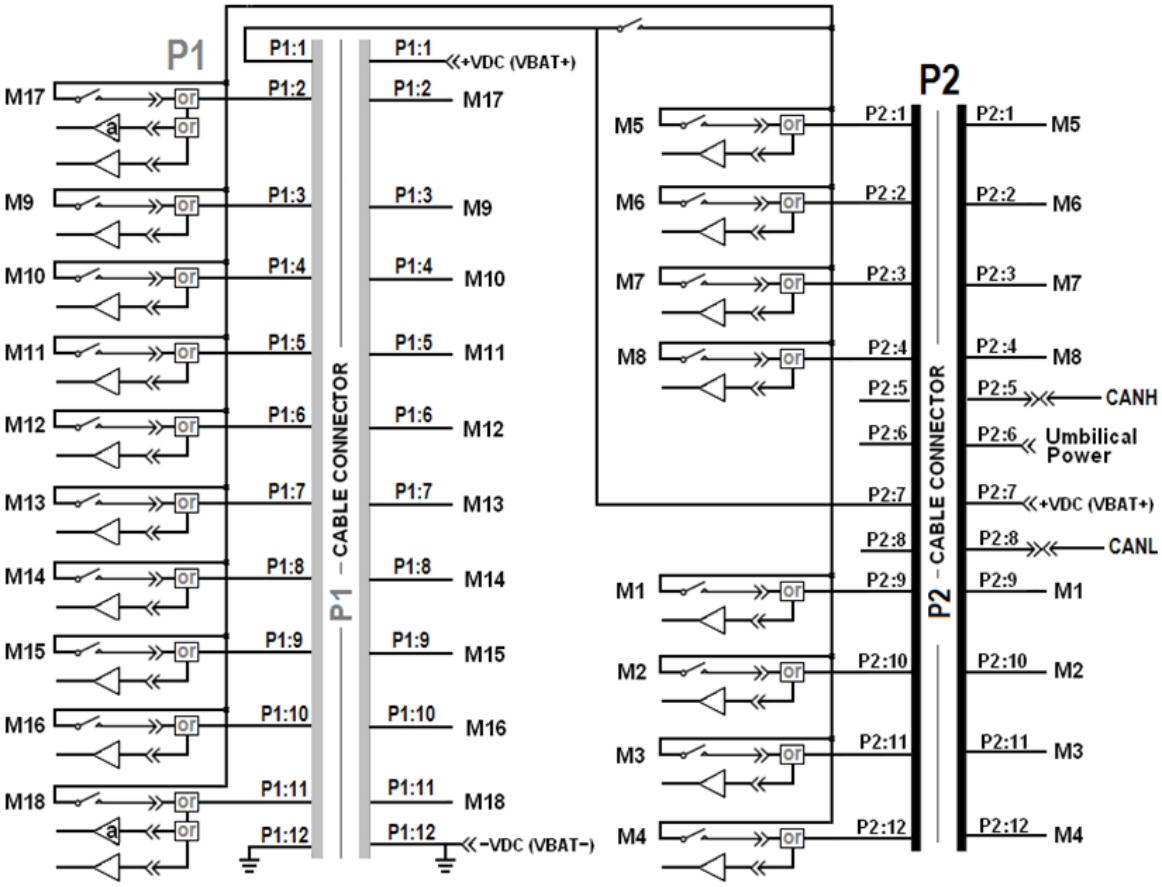
HS = HIGH SIDE
LS = LOW SIDE
NA = NOT APPLICABLE

M = MOMENTARY
LA = LATCHING
UN = UNLATCHING

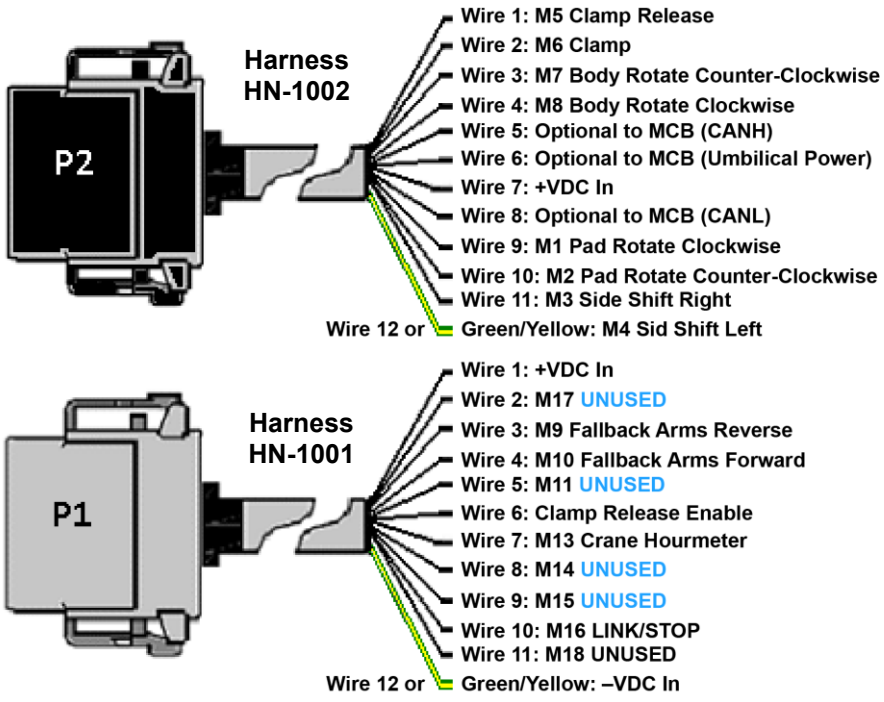
## NOTES:

1. Switch 8 (+) is used to enable Clamp Release (S7-) function. Operator may use the function once output M12 is enabled. Must be enabled again if no activity for 5-seconds.
2. The Machine Stop latches all functions off.
3. Outputs are not active during the minimum and maximum adjustment process and the ramp up/down adjustment process.

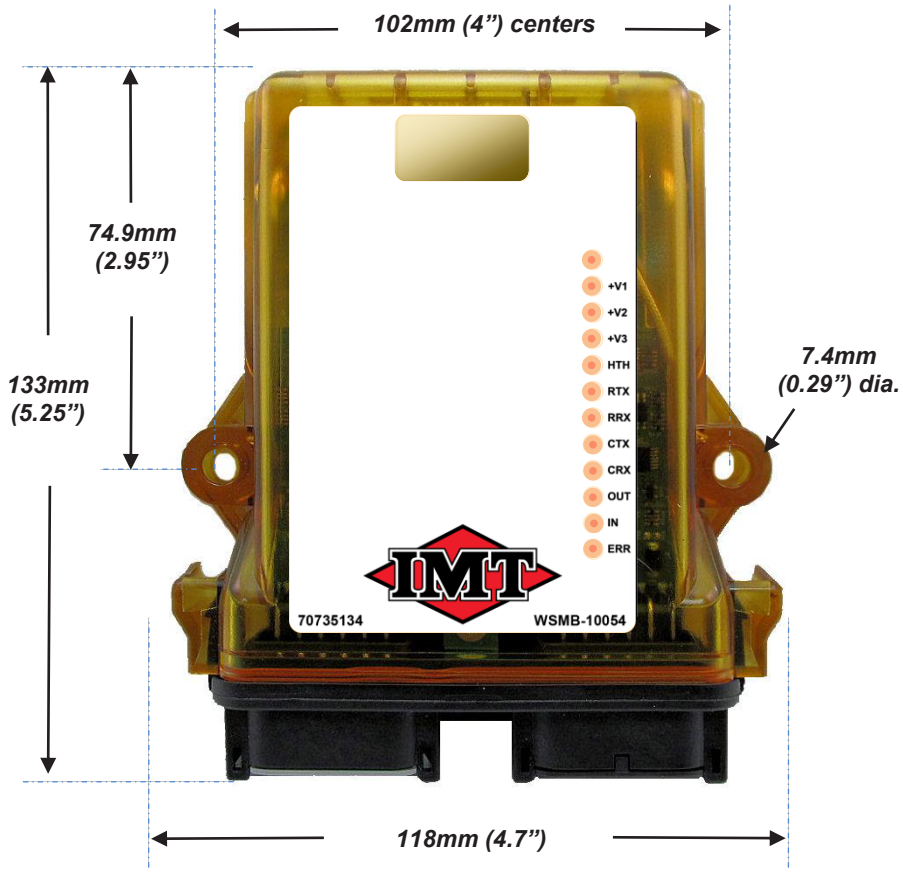
## Internal P1 & P2 Schematic

# Wiring Harness Connections (If Purchased)



## Base Unit Mounting




# Section - 5 Specifications

## Base Unit Specifications

| BASE UNIT SPECS | | |
|---|---|---|
| POWER | VIN | DESCRIPTION |
| Radio | Frequency | 2405 - 2480MHz |
| | RF Power | 100mW |
| | License | No license required (license free) |
| | Modulation | DSSS |
| | Antenna | Internal |
| Environment | Operating Temp | See De-Rating Curve chart below for details |
| | Storage Temp | -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 |
| Indicators (11) | Unmarked | Polarity reversed when lit |
| | +V1 | OK when active solid |
| | +V2 | OK when active solid |
| | +V3 | OK when active solid |
| | 1 (Health) | OK when active blinking |
| | 2 (RF TX) | Blinks when active |
| | 3 (RF RX) | Solid when receiving |
| | 4 (CAN TX) | Blinks when active |
| | 5 (CAN RX) | Solid when active |
| | 6 (OUT) | Solid when active |
| | 7 (IN) | Solid when active |
| | 8 (Error) | Solid—channel output high or low current<br>Blink—global voltage problem |

| BASE UNIT (CONTINUED) | | |
|---|---|---|
| POWER | VIN | DESCRIPTION |
| 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. |
| Outputs | Eighteen | FET—Open Drain |
| | Output Current | 2A per channel<br>15A Max. total @ 55º C |
| Display | LCD | One line, four character |
| Umbilical | CAN Bus | SAE J1939 |

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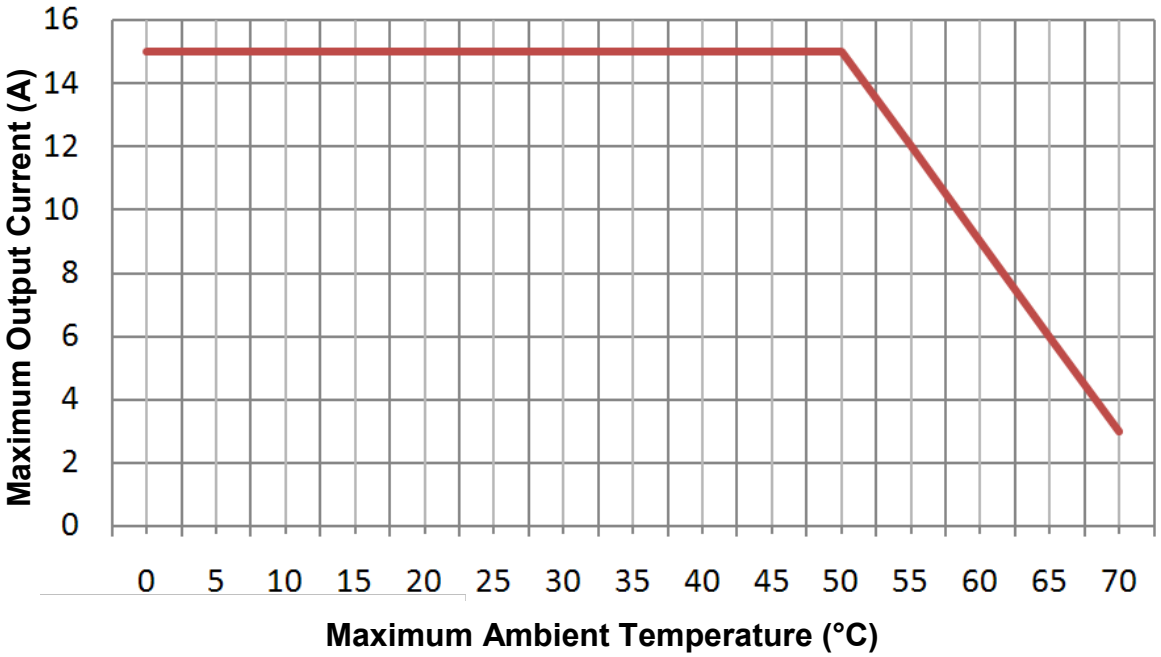
# Section - 6 Current Output

## Output Current De-Rating Curve



# Section - 7 Troubleshooting Guide

## Base Unit Troubleshooting Guide

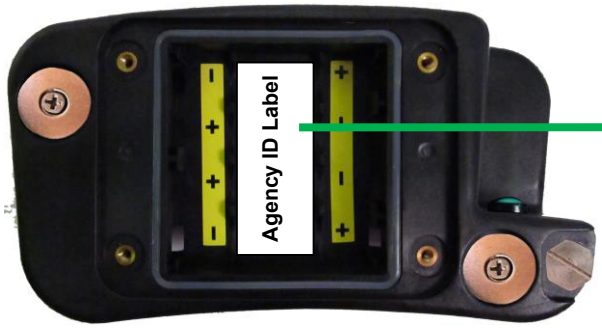
| INDICATION | SUGGESTIONS |
|---|---|
| Power LED (+V1,+ V2, +V3) not active | • Is +VDC input power present?<br>• Check input power polarity. |
| Health LED steady ON | • Indicates an internal component failure |
| TX/RX not active | • Check for obstructions preventing line-of-sight transmission<br>• Check that the handheld remote is active<br>• Re-associate the handheld remote to the base unit. |
| CTX/CRX not active | • Check CAN connection. |
| Out LED not active | • Check that the handheld LEDs are active when the appropriate buttons are pushed. |
| Error LED active | • Check the outputs for loose wiring, etc.<br>• Over-temperature channel indication.<br>• Over-current channel indication.<br>• Error condition exists. Active channel current consumption less than 1A typical.(This is not a problem in cases where less than 1A draw is a normal condition.) |
| In LED not active when expected | • Check that the input signal is referenced to P1:12. |

# Section - 9 Appendix

## Appendix A: Exposure to Radio Frequency Energy

SmaRT handheld remote units contain radio transceivers. When active, a handheld remote sends out radio frequency (RF) energy through its internal antenna. The SmaRT handheld remote complies with limits set by the FCC for operating distance from human tissue.

## Appendix B: Agency Identification Label Locations




✓*Note: The Agency ID label can be found at this location for all MCB handheld remote units.*


✓*Note: The Agency ID label can be found at this location for all SmaRT base units. The base unit label position is identical for both internal and external antenna base units.*

***Agency Identification Label Location***

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