



INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS





HRSN2 Series with Battery Backup


TO PREVENT POTENTIAL INJURY OR DAMAGE TO PROPERTY, READ THIS MANUAL CAREFULLY AND COMPLETELY.

IMPORTANT SAFETY INSTRUCTIONS

Basic safety precautions should always be followed, including the following: Failure to follow instructions can cause severe injury and/or death.


 This is the safety-alert symbol. When you see this symbol on your equipment or in this manual, look for one of the following signal words and be alert to the potential for personal injury.

 **WARNING** warns about hazards that could cause serious personal injury, death or major property damage and if ignored presents a potential hazard.


 **CAUTION** warns about hazards that will or can cause minor or moderate personal injury and/or property damage and if ignored presents a potential hazard. It can also make consumers aware of actions that are unpredictable and unsafe.


Notice: A notice indicates special instructions that are important but not related to hazards.




 **WARNING** - Read and follow all instructions in this IOM manual and on the equipment. Failure to follow instructions can cause severe injury and/or death.





 **WARNING** – **Risk of Electric Shock.** All electrical wiring **MUST** be in conformance with applicable local codes, regulations, and the National Electric Code (NEC). Hazardous voltage can shock, burn, and cause death or serious property damage. To reduce the risk of electric shock, do NOT use an extension cord to connect unit to electric supply. Provide a properly located electrical receptacle. **Before working on any electrical equipment, turn off power supply to the equipment.**

 **WARNING** – To reduce the risk of electric shock replace damaged wiring immediately.

 **WARNING** – Ground all electrical equipment before connecting to electrical power supply. Failure to ground all electrical equipment can cause serious or fatal electrical shock hazard.

 **WARNING** – Do NOT ground to a gas supply line.

 **WARNING** – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.

 **WARNING** – Failure to bond all electrical equipment to system structure will increase risk for electrocution and could result in injury or death. To reduce the risk of electric shock, see installation instructions and consult a professional electrician on how to bond all electrical equipment. Also, contact a licensed electrician for information on local electrical codes for bonding requirements.




 **CAUTION** – Potential pinch point. Equipment connected to or driven by this device may start unexpectedly and may cause personal injury or entrapment in linkage systems.

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ACTUATOR OPERATIONAL CONCEPTS

The HRSN2 Series actuators ending in “20” or in “2X” have an internal battery backup system and are quarter-turn industrial electric actuators designed to operate valves and dampers in municipal, heavy commercial or industrial applications. These units are NEMA 4/4X, IP67 rated, and feature on/off or proportional control versions to interface to most field control signals. The HRSN2 Series with battery backup operate on 24vac or 24vdc power supplies. Hayward offers 120v and 230v transformers packaged in stainless steel wall mounted enclosures sized to provide the required power for the actuator and the battery system.

The battery pack and charge controller are housed in a side-mounted enclosure that is integral to the actuator lower housing. Wiring of the actuator and battery system is completed through access to a single terminal location. The battery system is designed to provide a minimum of two years of field service (depending on application and actual conditions of use). The battery pack is field replaceable.

Notice: The actuator is shipped with the battery system disconnected until the unit is commissioned after all installation procedures have been completed (see pg 18 or 23).

Notice: Read the project specifications and understand the application before making an actuator selection. If in doubt, consult with the project engineer to clarify what is actually required for a fully operational installation. We have provided in this document all the tools necessary to determine how the various levels interface to the outside world. If there are any questions, please contact Hayward Flow Control Technical Services.

Notice: HRSN2 Series actuators are fully assembled, calibrated and tested prior to leaving our factory. In most cases, after you have mounted the actuator to your device, you should be able to operate the actuator from fully CLOSED (CW) to fully OPEN (CCW) and back again, and find that no adjustments are needed. The assembly can be put into service immediately. However, should it be necessary to make adjustments to the end-of-travel positions to overcome any device related issues (i.e. valve shaft incorrectly timed to the drive stem), the procedures outlined below should be followed to put the assembly into service. Note that there is a maximum adjustment range of +/- 3° at each end of travel.

[Pages 10-11 - Travel limits and Auxiliary switch cams, HRSN2A, 2R Series](#)

[Pages 14-15 - Travel limits and Auxiliary switch cams, HRSN2B, 2S Series](#)

TECHNICAL INFORMATION

ACTUATOR SPECIFICATIONS (20 SERIES)		HRSN2A	HRSN2B	HRSN2R	HRSN2S
Supply	Torque Output (in-lb / Nm)	310 / 35	310 / 35	440 / 50	440 / 50
	Current Draw (Start / Run / LRA)	2.1A / 1.2A / 2.3A	2.1A / 1.2A / 2.3A	2.1A / 1.2A / 2.3A	2.1A / 1.2A / 2.3A
24VAC	Speed (90°) DC-60Hz/50Hz, seconds	8 / 8	8 / 8	10 / 10	10 / 10
24VDC	Motor - 24V DC Perm Magnet 2 Pole Brush	6W	6W	6W	6W
	On/Off / Proportional	Duty Cycle (IEC60034) 75% (S2-15 min) / 75% (S4-75%) Motor Protection, Temp / Class All - 130°C / Class B Motor Starts, per hour, Max All - 600			
120VAC	Requires 120:24 Transformer Pack, 100VA	HRSBBC120-100	HRSBBC120-100	HRSBBC120-100	HRSBBC120-100
	Transformer Current Draw (Inductive)	0.9A	0.9A	0.9A	0.9A
	Speed (90°) DC-60Hz/50Hz, seconds	8 / 8	8 / 8	10 / 10	10 / 10
	Motor - 24V DC Perm Magnet 2 Pole Brush	6W	6W	6W	6W
	On/Off / Proportional	Duty Cycle (IEC60034) 75% (S2-15 min) / 75% (S4-75%) Motor Protection, Temp / Class All - 130°C / Class B Motor Starts, per hour, Max All - 600			
230VAC	Requires 230:24 Transformer Pack, 100VA	HRSBBC230-100	HRSBBC230-100	HRSBBC230-100	HRSBBC230-100
	Transformer Current Draw (Inductive)	0.45A	0.45A	0.45A	0.45A
	Speed (90°) DC-60Hz/50Hz, seconds	8 / 8	8 / 8	10 / 10	10 / 10
	Motor - 24V DC Perm Magnet 2 Pole Brush	6W	6W	6W	6W
	On/Off / Proportional	Duty Cycle (IEC60034) 75% (S2-15 min) / 75% (S4-75%) Motor Protection, Temp / Class All - 130°C / Class B Motor Starts, per hour, Max All - 600			
All	Manual Override	Bottom 8mm Hex Shaft	Hand Wheel	Bottom 8mm Hex Shaft	Hand Wheel
	Environmental Rating	NEMA 4/4X & IP67			
	Electrical Entry (2)	1/2" EMT or Polyamide gland			
	Control	On/Off, Proportional			
	Auxiliary Switch - End of Travel	(2) Form A Volt-Free, Rated 3A @ 250vac			
	Ambient Operating Range	-22°F to +158°F (-30°C to +70°C)			
	Humidity Range	0-95% RH			
	Altitude Limit	9850 ft / 3000 m			
	BATTERY SPECIFICATIONS	HRSN2A~2S (20 SERIES)			
	Type	Lithium Ion 22.2v pack with charge / discharge control			
	Cell Arrangement	Bank of 8 (eight) x 2.8V w/ logic control			
	Service Life - @ Rated Torque Cycle Drain	10,000 cycles @ 5% Stored energy drain per cycle			
	Enclosure	6 x 4 x 4, Aluminum enclosure, bottom EMT entry			

CONVENTIONS USED IN THIS MANUAL

Below are Terms and Definitions used throughout this manual.

1. XTS product manufactured without Torque Switches. **Note: No HRSN2 models are available with TS.**
2. FS product manufactured without/with Fail Safe built-in. **Note: HRSN2-2X models are not available with LCS.**
3. LCS is an industry acronym for a Local Control Station. **Note: HRCK2-(LCS) models are not available with FS.**
4. CW is Clockwise and CCW is Counterclockwise.

Use this table to efficiently select the actuator and wiring diagram you require.

ACTUATOR OPTIONS

Control	Voltage	Torque Switches	Fail Safe	Local Control Station	IOM	Wiring Diagram Page
On/Off	24VDC/VAC	XTS	FS	None	This IOM	33
Proportional	24VDC/VAC	XTS	FS	None	This IOM	34
On/Off	120VAC *	XTS	FS	None	This IOM	35
Proportional	120VAC *	XTS	FS	None	This IOM	35
On/Off	230VAC *	XTS	FS	None	This IOM	35
Proportional	230VAC *	XTS	FS	None	This IOM	-

* Requires use of a transformer to convert supply voltage to 24V.

ACTUATOR HANDLING AND INSTALLATION

SHIPPING AND HANDLING

- Position on arrival:
 - A separate actuator arrives in the FULLY CLOSED (CW) position. The red/green position indicator (see illustration) shows RED.
 - A 2 way ball valve assembly arrives in the FULLY OPEN (CCW) position and the position indicator shows GREEN.
 - A 2 way butterfly valve assembly arrives nearly CLOSED (5°) position and the position indicator shows mostly RED.
- Storage: This unit should not be stored outside unless it is powered up and has proper conduit terminations. When not powered up, it should be stored in a clean, dry environment at all times.
- This quarter-turn actuator has been factory tested and calibrated to operate between 0° and 90°. Most products will not require recalibration of these settings. If any travel adjustment is necessary, please refer to the proper Adjusting End of Travel Cams section for instructions.
- Notice:** The HRSN2 series actuators do not have mechanical stops. Use caution when operating the manual override. Do not attempt to operate with a rotation greater than 95°.
- Notice:** Protect the actuator from moisture by installing it with water tight EMT fittings and proper conduit drainage. Supply power to the unit to keep the internal heater warm at the time of installation.



The actuator has a red and green position indicator. RED color in the indicator window means the actuator is fully CW, while GREEN means it is fully CCW.



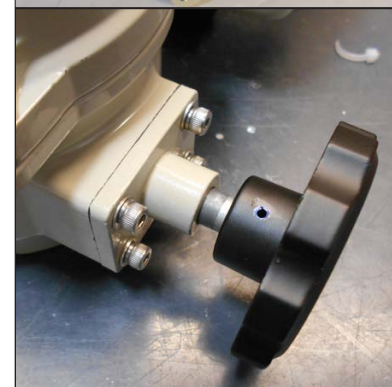
WARNING – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.

INSTALLATION NOTES



CAUTION – Please follow the following guidelines for proper installation.

- Do NOT install battery backup units in direct sunlight.
- These actuators are designed to be used between a horizontal and upright position. Do NOT mount the assembly with the actuator top below a horizontal position (i.e. upside down).
- When installing conduit, use proper techniques for entry into the actuator. Use drip loops to prevent conduit condensate from entering the actuator.
- Both EMT conduit ports MUST use proper equipment to protect the NEMA 4X integrity of the housing.
- The internal heater is to be used in ALL applications.
- Do NOT install the actuator outdoors or in humid environments unless it is powered up and the heater is functioning.
- Use proper wire size to prevent actuator failure (see Wire Sizing Chart for proper wire sizing).
- All terminals accept 14-18AWG solid/stranded wire.
- Notice:** Do NOT parallel wire multiple battery backup actuators. Battery Backup units are designed to operate as stand-alone devices.



Two distinct manual override options allow a user to position the valve or damper with or without power.



WARNING – DO NOT operate the BOTTOM manual override when power is present. Do not use powered tools to turn any manual override. Geartrain damage and/or personal injury may occur.

PRODUCT MOUNTING AND SETUP

Notice: All HRSN2 Series actuators rotate CW to close the output shaft out the bottom of the actuator **when viewed from above**. On HRSN2A & 2R models, the cam shaft and the indicator rotate CW to close, but on HRSN2B & 2S models, the cam shaft and the indicator rotate CCW to close.

1. The battery system should remain UNPLUGGED until AFTER the actuator has been mounted and tested for proper travel and end stop calibration.
 - The battery system will be connected during the Commissioning Procedure.
2. Fully CLOSE the valve or damper to which the actuator is to be mounted.
 - Keep in mind the OUTPUT SHAFT rotates CW (as viewed from above the unit) when driving CLOSED.
3. Assemble necessary linkage hardware and attach the actuator to the valve or damper.
4. Center the actuator on the valve or damper drive shaft and tighten all hardware.
5. **Before applying power to the unit**, rotate the manual override or handwheel (if applicable) from the fully CW to the fully CCW position to check for unobstructed manual operation of the valve or damper.
6. HRSN2 Series actuators utilize a removable terminal block to simplify field wiring and testing.
 - To remove a terminal block from the PCB receiver, pull straight out in a direction parallel to the PCB.
 - In the photo at right, the LEFT side of the terminal block (between the PCB mounting screws) is pulled out to the LEFT.
 - After wiring, reinsert the terminal strip into the receiver. This is a keyed pair and can only be inserted one way.
 - Screw terminals are rated to accept 14AWG down to 18AWG solid or stranded wire. **TERMINAL NUMBERING HAS #1 AT THE BOTTOM.**
7. Refer to your product part number to determine which wiring diagram to follow when wiring up the actuator.
8. Note that although terminals are labeled as 1-8 and A-D, not all terminals are used on all models.

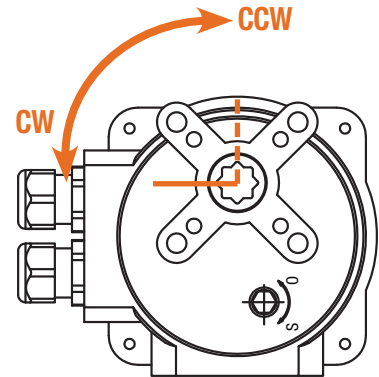


CAUTION – Be sure to make field connections to the proper terminal as identified by the LABEL and not the position!

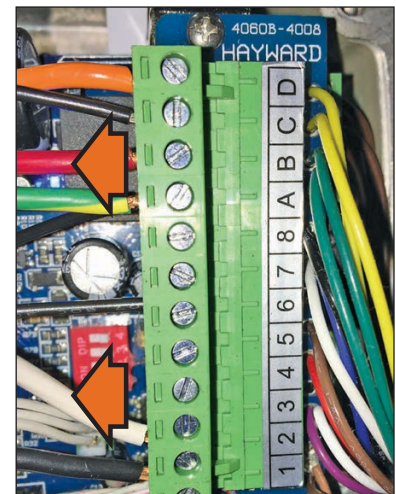
9. Make the electrical connections per the appropriate Wiring Diagram for your actuator.
10. Connect POWER and CONTROL to the correct terminals.
11. Terminals A~D on each actuator are for the (adjustable) aux switches. These are dry type (volt free) Form A contacts rated 250VAC @ 3A Max.



CAUTION – This device may be connected to multiple power sources (mains power and internal battery) and may start unexpectedly unless both power sources are disconnected.



Note that the rotation seen from below is a mirror of the direction viewed from above.



Removable terminal blocks facilitate ease of field wiring and testing. To remove a terminal block from the PCB receiver, pull straight OUT in a direction parallel to the PCB. Use caution when reinserting block - make sure all pins are aligned before seating.

COMPONENT IDENTIFICATION



Introduction:

The HRSN2 Series Battery Backup units are fitted with a battery storage enclosure mounted directly onto the actuator as shown.

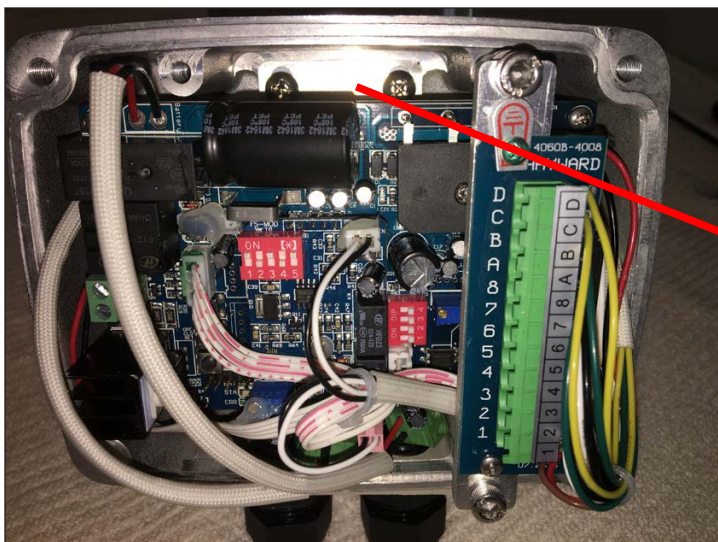
All wiring for the battery pack is complete and an internal disconnect for the battery system is provided.



WARNING –

Do NOT install battery backup units in direct sunlight.

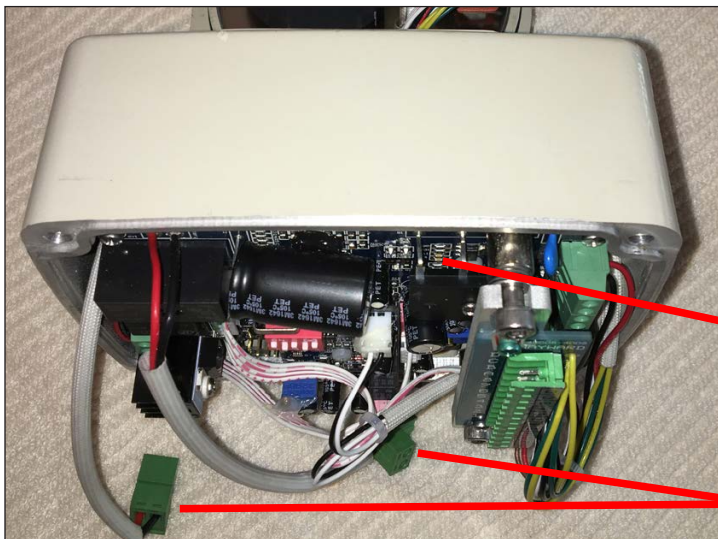
Battery and Controls Enclosure



Battery Pack (Behind)
(12 terminal plug removed for clarity)

All field terminations are made inside this enclosure

Notice: The battery system should remain UNPLUGGED until AFTER the actuator has been mounted and tested for proper travel and end stop calibration.



Control Board

Battery Disconnect
(Male/Female Pair)

120/230V TRANSFORMER MOUNTING AND SETUP

Notice: All HRSN2 Series Battery Backup units require a 100VA 24vac / 5A 24vdc power supply directly into the actuator terminal block.

Power Supply:

The HRSN2 Series Battery Backup units require a 100VA 24vac / 5A 24vdc power supply directly into the actuator terminal block.

To facilitate various site power availability, an optional enclosure is offered which houses an appropriately sized toroidal transformer to supply the 24V power to the actuator. Mounted separately, the enclosure is a NEMA 4X / IP65 9 x 7 x 6 hinged door cabinet.

Mounted to a back plane, the transformer primary and secondary are pre-wired to a six position dual terminal block.

Notes:

The enclosure, while NEMA 4X rated, should NOT be installed in direct sunlight. If installed outdoors, it should be installed in the shade under a rain hood using rain-tight conduit fittings and connectors.

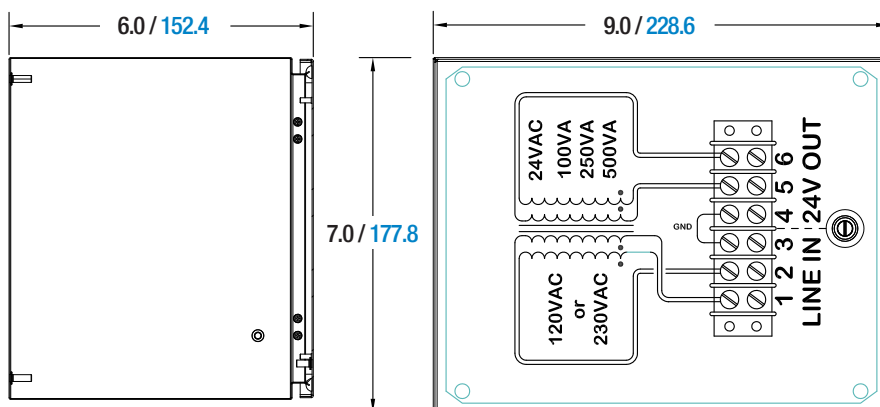
The Enclosure is a sealed NEMA 4X type stainless steel type without conduit holes or knock-outs. This allows complete flexibility when mounting. The enclosure can be oriented in any direction, and can be mounted on wall, floor, ceiling, uni-strut or any other fixed surface. Conduit penetrations by others. Interconnect wiring between transformer panel and actuator by others per the supplied wiring diagram.



HRSN2 Series Transformer Enclosure
(120/230VAC Installations)



HRSN2 Series Transformer
(120/230VAC Installations)



HRSN2 Series Transformer Enclosure
Dimensional Data

Model	Line	Power	Size in / mm	Weight lbs / kg
HRSBBC120-100	120VAC	100VA	9.0 W x 7.0 H x 6.0 D 228.6 W x 177.8 H x 52.4 D	12 / 5.5
HRSBBC120-250	120VAC	250VA		14 / 6.4
HRSBBC120-500	120VAC	500VA		20 / 9.1
HRSBBC230-100	230VAC	100VA		12 / 5.4
HRSBBC230-250	230VAC	250VA		14 / 6.4
HRSBBC230-500	230VAC	500VA		20 / 9.1

ROTATION OF HRSN2A, 2R COMPONENTS

Output drive rotation

ALL HRSN2 Series actuators rotate CW to CLOSE. This means that when viewed from above, the OUTPUT shaft (out the bottom of the actuator) will drive CW to CLOSE when commanded to do so. It is an important distinction to make for the HRSN2 Series because while the OUTPUT shaft functions the same for all HRSN2 models, the position indicator for HRSN2A & 2R models behaves differently than it does on the HRSN2B & 2S models. The end-of-travel cams also function differently.

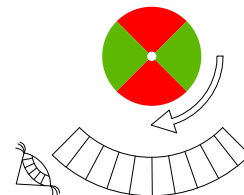
Component rotation

It is often helpful to describe the rotation of components from one fixed point of view, as such, we give **all descriptions of rotation "as viewed from above"**.

Component	CW (CLOSE) Command	CCW (OPEN) Command
Visual Indicator	Rotates CW	Rotates CCW
Cam 1-2 Behavior	Cam 1 Engages Switch 1 from the front	Cam 2 Engages Switch 2 from the rear
Output Drive	Drive CW (CLOSE)	Drive CCW (OPEN)

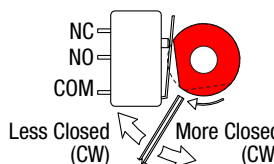
Drive CW (Closed)

Indicator rotates 90° CW to CLOSE.



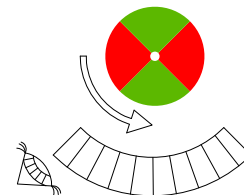
VIEWING ANGLE 90°

Cam approaches switch from the FRONT side of the switch.



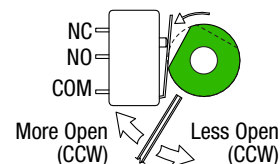
Drive CCW (Open)

Indicator rotates 90° CCW to OPEN.

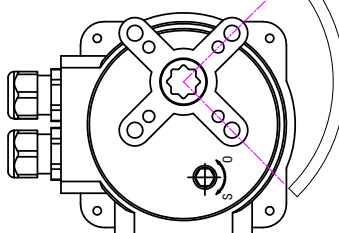


VIEWING ANGLE 90°

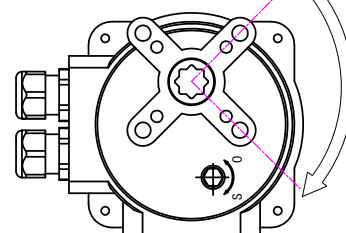
Cam approaches switch from the BACK side of the switch.



2A, 2R FULL CW



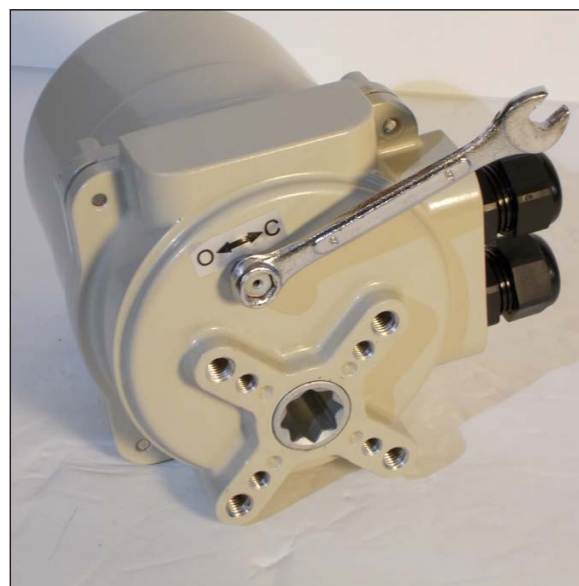
2A, 2R FULL CCW



Manual Override - when powered off ONLY

HRSN2A & 2R feature a bottom mounted hex shaft override which differs from the HRSN2B & 2S models.

The photo at right shows the label and 8mm hex shaft under the actuator. CW rotation (from this view) of the shaft will CLOSE the actuator and CCW rotation of the shaft will OPEN the actuator.



Bottom mounted Manual Override on HRSN2A, 2R models (Uses 8mm socket)

WARNING

DO NOT operate manual override when power is present. Geartrain damage and personal injury may occur.

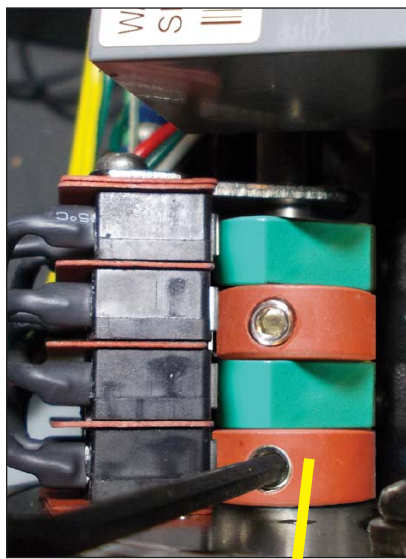
DO NOT operate manual override beyond 90° of rotation on proportionally controlled models -- it will permanently damage the position potentiometer.

Do not use powered tools to turn the manual override -- it will **DAMAGE** the gear train or motor and **VOID** the warranty.

This actuator has been factory calibrated and tested to stop at 0 degrees for CW position and to stop at 90 degrees for CCW position. Most installations onto valves or dampers will likely not require recalibration of these settings. Please mount the valve or damper and proceed on these pages **only** if adjustments are required.

⚠ WARNING – Serious Damage to the actuator will result if the motor is allowed to drive the gear train into the mechanical stop! Remove power from this device BEFORE making any travel adjustments.

⚠ CAUTION! - There are dual power sources in this actuator. Disconnect both sources of power.



Cam 1 - CW Cam

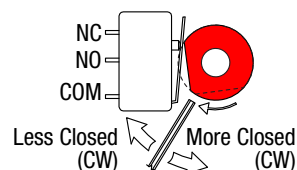
This page corresponds to HRSN2A & HRSN2R models.

Adjust CW Cam (Bottom)

1. Cam 1 is the bottom cam and is the end-of-travel adjustment for the actuator CW position. With POWER OFF and the actuator at its required CW position, use a sharp 2.5mm hex key to free up the cam set screw. **Take care not to let the hex key slip at this stage, it can easily strip out.** Once it is free adjust it as described below:

- Rotate the hex key to the RIGHT 10-15 degrees until you hear a click. This will reset the switch roller arm.
- Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
- Now SLOWLY rotate the hex key to the LEFT, pushing the cam, until you hear the “click” on the bottom switch. The click means correct adjustment has been achieved.
- Tighten the cam set screw.

Cam approaches switch from the FRONT side of the switch.



2. **Apply power** and test for the correct CW position:

- Drive the actuator CCW at least 15-20 degrees.
- Drive the actuator CW until the cam stops the electrical travel.
- Check to be sure this is the correct CW position you require

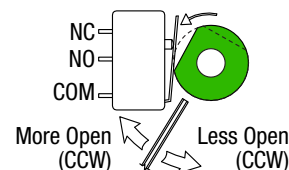
3. Repeat the steps of item 1 if further adjustment is needed.

Adjust CCW Cam (Second from Bottom)

4. Cam 2 is the second cam up from the bottom and is the end-of-travel adjustment for the actuator CCW position. With POWER OFF and the actuator at its required CCW position, use a 2.5mm hex key to free up the cam set screw. Once it is free adjust it as described below:

- Rotate the hex key to the LEFT 10-15 degrees until you hear a click. This will reset the switch roller arm.
- Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
- Now SLOWLY rotate the hex key to the RIGHT, pushing the cam, until you hear the “click” on the second switch. The click means correct adjustment has been achieved.
- Tighten the cam set screw.

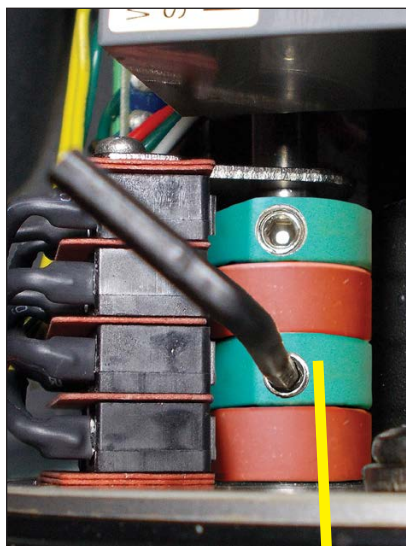
Cam approaches switch from the BACK side of the switch.



5. **Apply power** and test for the correct CCW position:

- Drive the actuator CW at least 15-20 degrees.
- Drive the actuator CCW until the cam stops the electrical travel.
- Check to be sure this is the correct CCW position you require

6. Repeat the steps of item 4 if further adjustment is needed.

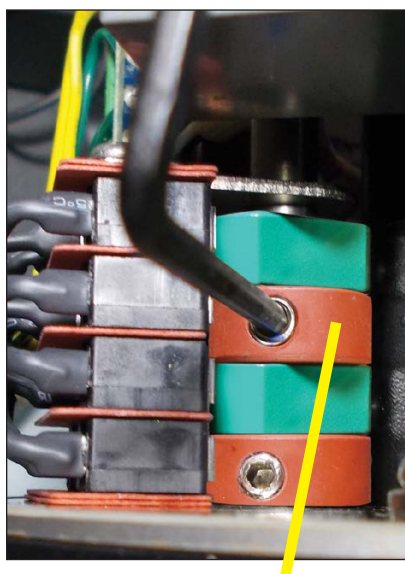


Cam 2 - CCW Cam

This actuator has been factory calibrated and tested to stop at 0 degrees for CW position and to stop at 90 degrees for CCW position. Most installations onto valves or dampers will likely not require recalibration of these settings. Please mount the valve or damper and proceed on these pages **only** if adjustments are required.

⚠ WARNING – Serious Damage to the actuator will result if the motor is allowed to drive the gear train into the mechanical stop! Remove power from this device BEFORE making any travel adjustments.

⚠ CAUTION! - There are dual power sources in this actuator. Disconnect both sources of power.



Cam 3 - CW Auxiliary Cam

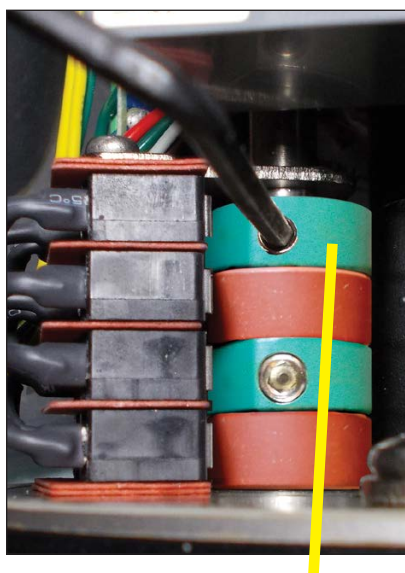
This page corresponds to HRSN2A & HRSN2R models.

Adjust CW Auxiliary Cam

1. Cam 3 is the third cam up from the bottom and is the CW auxiliary switch adjustment, an optional switch typically used to indicate the actuator reached its CW position.
2. Drive the actuator to its CW position. Use a sharp 2.5mm hex key to free up the cam set screw. **Take care not to let the hex key slip at this stage, it can easily strip out.** Once it is free adjust it as described below:
 - Rotate the hex key to the RIGHT 10-15 degrees until you hear a click. This will reset the switch roller arm.
 - Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
 - Now SLOWLY rotate the hex key to the LEFT, pushing the cam, until you hear the “click” on the bottom switch.
 - Continue to rotate the cam between 3 and 5 degrees to the LEFT to make sure the auxiliary cam switch changes state before the actuator reaches its end of travel electrically.
 - Tighten the cam set screw.
3. An easy indicator of correct CW Aux cam setting is to look at the setscrew on the #3 cam. It should be about one-half the setscrew diameter to the LEFT of the #1 cam setscrew.

Adjust CCW Auxiliary Cam

1. Cam 4 is the fourth cam up from the bottom and is the CCW auxiliary switch adjustment, an optional switch typically used to indicate the actuator reached its CCW position.
2. Drive the actuator to its CCW position. Use a 2.5mm hex key to free up the cam set screw. Once it is free adjust it as described below:
 - Rotate the hex key to the LEFT 10-15 degrees until you hear a click. This will reset the switch roller arm.
 - Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
 - Now SLOWLY rotate the hex key to the RIGHT, pushing the cam, until you hear the “click” on the bottom switch.
 - Continue to rotate the cam between 3 and 5 degrees to the RIGHT to make sure the auxiliary cam switch changes state before the actuator reaches its end of travel electrically.
 - Tighten the cam set screw.
3. An easy indicator of correct CCW Aux cam setting is to look at the setscrew on the #4 cam. It should be about one-half the setscrew diameter to the RIGHT of the #2 cam setscrew.



Cam 4 - CCW Auxiliary Cam

PROPORTIONAL CONTROL SETUP

The process of setting the potentiometer correctly is a function of the model of the actuator. Be sure to use the photo reference for the correct actuator model to prevent damage to the potentiometer.

Notice: This page is for visual reference ONLY. Contact OEM customer before making changes.

Loosen Gear Setscrews:

During the initial setup, BEFORE changing actuator rotation, be sure the sector gear setscrews (2) are loose enough to allow the sector gear / potentiometer pinion gear to rotate freely by hand. This will prevent damage to the potentiometer if initial settings are incorrect.

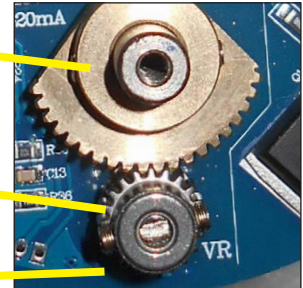
Check to be sure:

- Two (2) setscrews, loose, in the sector gear.
- Two (2) setscrews, tight, in the potentiometer pinion gear.

Sector Gear

Potentiometer
Pinion Gear

Potentiometer
(beneath)



Proper Sector Gear/Potentiometer Pinion Gear Behavior:

HRSN2A, 2R Models, normal operation:

When viewed from ABOVE the actuator, when it is driving to the full CW (closed) position:

- The sector gear rotates CW.
- The potentiometer pinion gear rotates CCW.

When viewed from ABOVE the actuator, when it is driving to the full CCW (open) position:

- The sector gear will rotate CCW.
- The potentiometer pinion gear rotates CW. until the actuator reaches its full CCW position.
- **Note: If the setting of this procedure is incorrect, the sector gear will overdrive and damage the potentiometer.**

HRSN2A, 2R Models, initial gear mesh setup:

Because the potentiometer itself has a limited angle of rotation and can be easily damaged by overdriving its limits, take care to initially set it up.

- With the sector gear setscrews loosened as described, lift the sector gear so it is not meshed with the pinion gear.
- Place the actuator geartrain in the full CW position.
- Rotate the potentiometer pinion gear to its full CCW direction, then back one to two teeth.
- Rotate the sector gear and place it where the second or third tooth from the end meshes with the pre-positioned potentiometer gear.
- The goal is that the sector gear is always meshed with the pinion gear from CW position to CCW position and never hits the potentiometer end stops.
- Tighten the two M3 setscrews on the sector gear.

HRSN2A, 2R Model Notes:

- Photos show the correct alignments of sector gear to potentiometer pinion gear when the actuator is in its FULL CW position (CW cam tripped) and FULL CCW position (CCW cam tripped), respectively.
- Note that the sector gear rotates CCW, and the pinion gear rotates CW as the actuator drives CCW (Open).
- Be sure the potentiometer pinion gear is rotated fully CCW before aligning the two gear sets.
- During any movements, pull the sector gear UP on the camshaft to clear the pinion gear teeth. This will allow proper rotation and alignment of components. (disregard shaft top deviation from correct model in the photos).

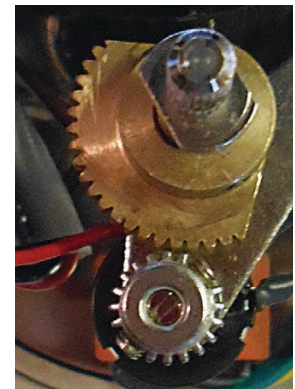


Photo shows the correct alignment of sector gear and pinion gear when the actuator is in its FULL CW position (CW cam tripped).

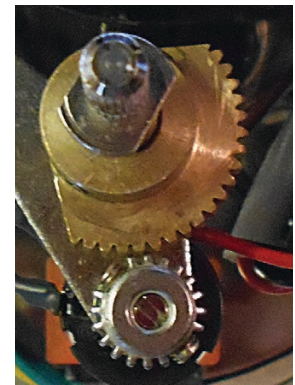


Photo shows the correct alignment of sector gear and pinion gear when the actuator is in its FULL CCW position (CCW cam tripped).

ROTATION OF HRSN2B, 2S COMPONENTS

Output drive rotation

ALL HRSN2 Series actuators rotate CW to CLOSE. This means that when viewed from above, the OUTPUT shaft (out the bottom of the actuator) will drive CW to CLOSE when commanded to do so. It is an important distinction to make for the HRSN2 Series because while the OUTPUT shaft functions the same for all HRSN2 models, the position indicator for HRSN2B & 2S models behaves differently than it does on the HRSN2A & 2R models. The end-of-travel cams also function differently.

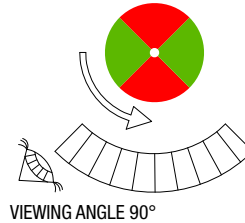
Component rotation

It is often helpful to describe the rotation of components from one fixed point of view, as such, we give **all descriptions of rotation "as viewed from above"**.

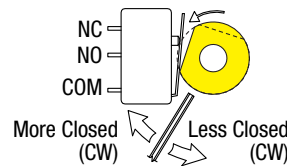
Component	CW (CLOSE) Command	CCW (OPEN) Command
Visual Indicator	Rotates CCW	Rotates CW
Cam 1-2 Behavior	Cam 1 Engages Switch 1 from the rear	Cam 2 Engages Switch 2 from the front
Output Drive	Drive CW (CLOSE)	Drive CCW (OPEN)

Drive CW (Closed)

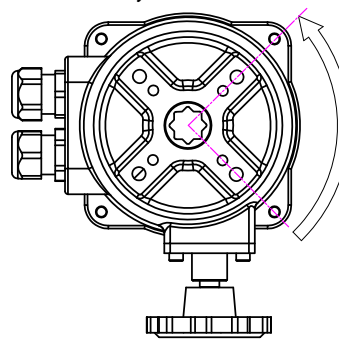
Indicator rotates 90° CCW to CLOSE.



Cam approaches switch from the BACK side of the switch.

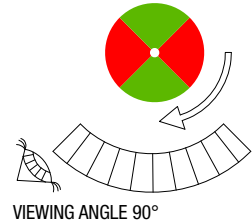


2B, 2S FULL CW

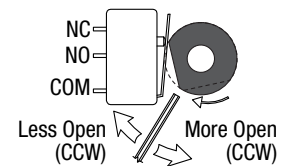


Drive CCW (Open)

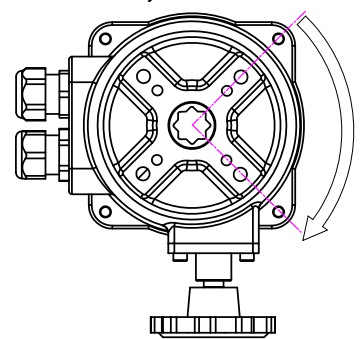
Indicator rotates 90° CW to OPEN.



Cam approaches switch from the FRONT side of the switch.



2B, 2S FULL CCW

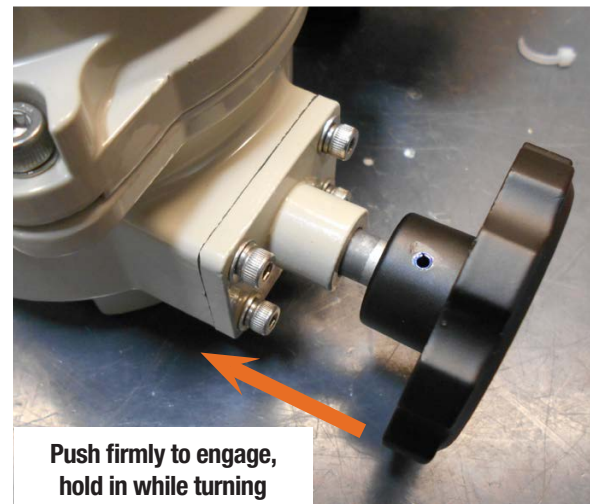


Manual Override - when powered off ONLY

HRSN2B & 2S feature a side mounted engageable handwheel which differs from the HRSN2A & 2R models (see photo at right). Engage the manual override by pressing the handwheel in firmly before rotating it. CW rotation of the handwheel will CLOSE the actuator and CCW rotation of the handwheel will OPEN the actuator.

Notice: The handwheel on HRSN2B & 2S models is disengaged from the drive system during normal operation.

Also, the HRSN2B & 2S models have LIMITED rotation angles of less than 105°. There are HARD mechanical stops in the geartrain which prevent the manual or automatic operation of the actuator beyond those limitations.



Engageable Handwheel Manual Override, HRSN2B, 2S models

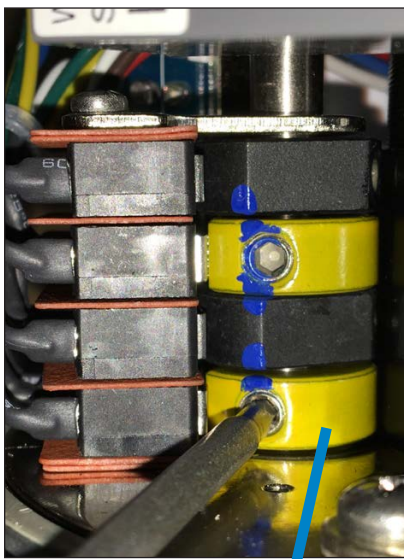


WARNING – Attempts to use the hand wheel system to move the geartrain beyond the 105° rotation limits will void the product warranty.

This actuator has been factory calibrated and tested to stop at 0 degrees for CW position and to stop at 90 degrees for CCW position. Most installations onto valves or dampers will likely not require recalibration of these settings. Please mount the valve or damper and proceed on these pages **only** if adjustments are required.

⚠ WARNING – Serious Damage to the actuator will result if the motor is allowed to drive the gear train into the mechanical stop! Remove power from this device BEFORE making any travel adjustments.

⚠ CAUTION! - There are dual power sources in this actuator. Disconnect both sources of power.



Cam 1 - CW Cam

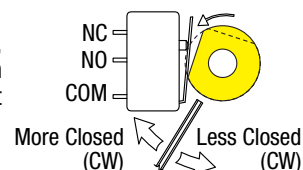
This page corresponds to HRSN2B & HRSN2S models.

Adjust CW Cam (Bottom)

1. Cam 1 is the bottom cam and is the end-of-travel adjustment for the actuator CW position. With POWER OFF and the actuator at its required CW position, use a sharp 2.5mm hex key to free up the cam set screw. **Take care not to let the hex key slip at this stage, it can easily strip out.** Once it is free adjust it as described below:

- Rotate the hex key to the LEFT 10-15 degrees until you hear a click. This will reset the switch roller arm.
- Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
- Now SLOWLY rotate the hex key to the RIGHT, pushing the cam, until you hear the “click” on the bottom switch. The click means correct adjustment has been achieved.
- Tighten the cam set screw.

Cam approaches switch from the BACK side of the switch.



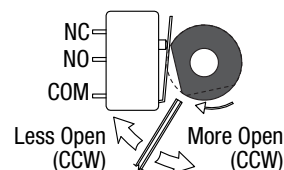
2. **Apply power** and test for the correct CW position:
 - Drive the actuator CCW at least 15-20 degrees.
 - Drive the actuator CW until the cam stops the electrical travel.
 - Check to be sure this is the correct CW position you require
3. Repeat the steps of item 1 if further adjustment is needed.

Adjust CCW Cam (Second from Bottom)

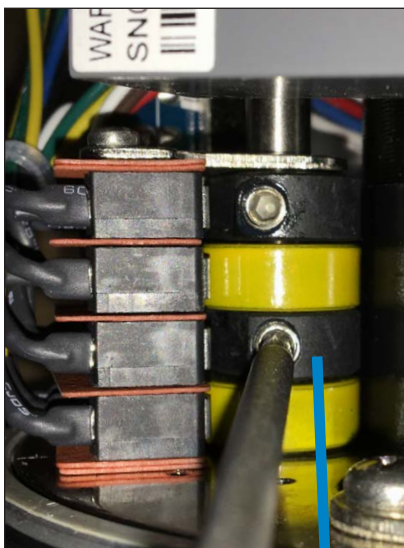
4. Cam 2 is the second cam up from the bottom and is the end-of-travel adjustment for the actuator CCW position. With POWER OFF and the actuator at its required CCW position, use a 2.5mm hex key to free up the cam set screw. Once it is free adjust it as described below:

- Rotate the hex key to the RIGHT 10-15 degrees until you hear a click. This will reset the switch roller arm.
- Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
- Now SLOWLY rotate the hex key to the LEFT, pushing the cam, until you hear the “click” on the second switch. The click means correct adjustment has been achieved.
- Tighten the cam set screw.

Cam approaches switch from the FRONT side of the switch.



5. **Apply power** and test for the correct CCW position:
 - Drive the actuator CW at least 15-20 degrees.
 - Drive the actuator CCW until the cam stops the electrical travel.
 - Check to be sure this is the correct CCW position you require
6. Repeat the steps of item 4 if further adjustment is needed.

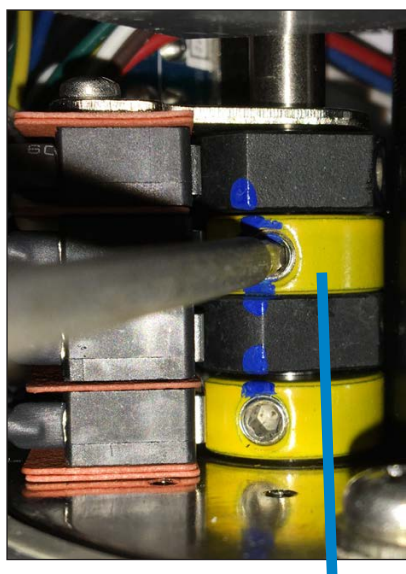


Cam 2 - CCW Cam

This actuator has been factory calibrated and tested to stop at 0 degrees for CW position and to stop at 90 degrees for CCW position. Most installations onto valves or dampers will likely not require recalibration of these settings. Please mount the valve or damper and proceed on these pages **only** if adjustments are required.

⚠ WARNING – Serious Damage to the actuator will result if the motor is allowed to drive the gear train into the mechanical stop! Remove power from this device BEFORE making any travel adjustments.

⚠ CAUTION! - There are dual power sources in this actuator. Disconnect both sources of power.



Cam 3 - CW Auxiliary Cam

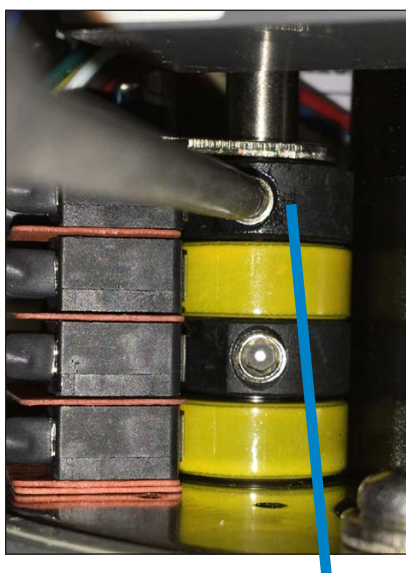
This page corresponds to HRSN2B & HRSN2S models.

Adjust CW Auxiliary Cam

1. Cam 3 is the third cam up from the bottom and is the CW auxiliary switch adjustment, an optional switch typically used to indicate the actuator reached its CW position.
2. Drive the actuator to its CW position. Use a sharp 2.5mm hex key to free up the cam set screw. **Take care not to let the hex key slip at this stage, it can easily strip out.** Once it is free adjust it as described below:
 - Rotate the hex key to the LEFT 10-15 degrees until you hear a click. This will reset the switch roller arm.
 - Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
 - Now SLOWLY rotate the hex key to the RIGHT, pushing the cam, until you hear the “click” on the bottom switch.
 - Continue to rotate the cam between 3 and 5 degrees to the RIGHT to make sure the auxiliary cam switch changes state before the actuator reaches its end of travel electrically.
 - Tighten the cam set screw.
3. An easy indicator of correct CW Aux cam setting is to look at the setscrew on the #3 cam. It should be about one-half the setscrew diameter to the RIGHT of the #1 cam setscrew.

Adjust CCW Auxiliary Cam

1. Cam 4 is the fourth cam up from the bottom and is the CCW auxiliary switch adjustment, an optional switch typically used to indicate the actuator reached its CCW position.
2. Drive the actuator to its CCW position. Use a 2.5mm hex key to free up the cam set screw. Once it is free adjust it as described below:
 - Rotate the hex key to the RIGHT 10-15 degrees until you hear a click. This will reset the switch roller arm.
 - Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
 - Now SLOWLY rotate the hex key to the LEFT, pushing the cam, until you hear the “click” on the bottom switch.
 - Continue to rotate the cam between 3 and 5 degrees to the LEFT to make sure the auxiliary cam switch changes state before the actuator reaches its end of travel electrically.
 - Tighten the cam set screw.
3. An easy indicator of correct CCW Aux cam setting is to look at the setscrew on the #4 cam. It should be about one-half the setscrew diameter to the LEFT of the #2 cam setscrew.



Cam 4 - CCW Auxiliary Cam

PROPORTIONAL CONTROL SETUP

The process of setting the potentiometer correctly is a function of the model of the actuator. Be sure to use the photo reference for the correct actuator model to prevent damage to the potentiometer.

Notice: This page is for visual reference ONLY. Contact OEM customer before making changes.

Loosen Gear Setscrews:

During the initial setup, BEFORE changing actuator rotation, be sure the sector gear setscrews (2) are loose enough to allow the sector gear / potentiometer pinion gear to rotate freely by hand. This will prevent damage to the potentiometer if initial settings are incorrect.

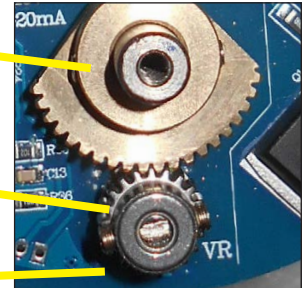
Check to be sure:

- Two (2) setscrews, **loose**, in the sector gear.
- Two (2) setscrews, **tight**, in the potentiometer pinion gear.

Sector Gear

Potentiometer
Pinion Gear

Potentiometer
(beneath)



Proper Sector Gear/Potentiometer Pinion Gear Behavior:

HRSN2B, 2S Models, normal operation:

When viewed from ABOVE the actuator, when it is driving to the full CW (closed) position:

- The sector gear rotates CCW.
- The potentiometer pinion gear rotates CW.

When viewed from ABOVE the actuator, when it is driving to the full CCW (open) position:

- The sector gear will rotate CW.
- The potentiometer pinion gear rotates CCW. until the actuator reaches its full CCW position.
- **Note: If the setting of this procedure is incorrect, the sector gear will overdrive and damage the potentiometer.**

HRSN2B, 2S Models, initial gear mesh setup:

Because the potentiometer itself has a limited angle of rotation and can be easily damaged by overdriving its limits, take care to initially set it up.

- With the sector gear setscrews loosened as described, lift the sector gear so it is not meshed with the pinion gear.
- Place the actuator geartrain in the full CW position.
- Rotate the potentiometer pinion gear to its full CW direction, then back one to two teeth.
- Rotate the sector gear and place it where the second or third tooth from the end meshes with the pre-positioned potentiometer gear.
- The goal is that the sector gear is always meshed with the pinion gear from CW position to CCW position and never hits the potentiometer end stops.
- Tighten the two M3 setscrews on the sector gear.

HRSN2B, 2S Model Notes:

- Photos show the correct alignments of sector gear to potentiometer pinion gear when the actuator is in its FULL CW position (CW cam tripped) and FULL CCW position (CCW cam tripped), respectively.
- Note that the sector gear rotates CCW, and the pinion gear rotates CW as the actuator drives CCW (Open).
- Be sure the potentiometer pinion gear is rotated fully CCW before aligning the two gear sets.
- During any movements, pull the sector gear UP on the camshaft to clear the pinion gear teeth. This will allow proper rotation and alignment of components. (disregard shaft top deviation from correct model in the photos).

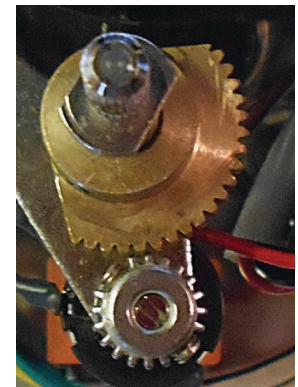


Photo shows the correct alignment of sector gear and pinion gear when the actuator is in its FULL CW position (CW cam tripped).

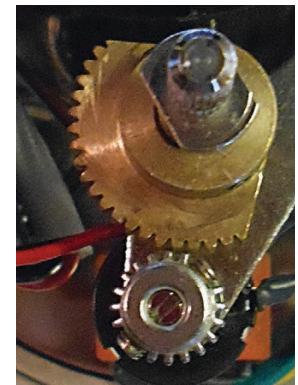


Photo shows the correct alignment of sector gear and pinion gear when the actuator is in its FULL CCW position (CCW cam tripped).

COMMISSIONING

The end stop travel (cams) of this actuator have been factory set and tested to respond between 0° and 90° degrees rotation. If NO changes to end stops are required, this unit is ready to be put into service immediately using this procedure. IF changes to the cam positions are required, refer to pages 10~11 or 14~15 before proceeding.

Conceptually this procedure first establishes correct direction and control; these **MUST** be verified in order to proceed. Any actuator must drive CW when commanded to do so, and STOP when the actuator reaches the full CW travel position. The same applies for the CCW operation.



WARNING – Follow these directions carefully and in order. Actuator damage due to improper testing and commissioning will **NOT** be covered under warranty.

Notice: This procedure has many sections with the text “**IMMEDIATELY remove power from the actuator to STOP movement**”. Quick action is necessary in case of any unexpected or uncontrolled movement to keep the actuator from possibly driving past the limits of the valve or damper attached, and to simply keep the actuator in a known position for a quick, efficient installation.

Commissioning - On/Off Control

After the actuator and valve (damper) assembly have been installed with power and control connected, **BEFORE** applying power, use the manual override to rotate the actuator to a mid-travel position.

1. Be sure there are NO movement commands active, and apply power.
 - A. The actuator should NOT move.
 - I. If it does move, **IMMEDIATELY remove power from the actuator to STOP movement**.
 - a. Proceed to step 2.
 - II. If it does NOT move, proceed to step 3.
2. Check control wiring to terminals 1~8 on the actuator.
 - A. Remove field wiring from terminals 4, 6 & 7, then place a jumper between terminals 4 & 7. Do NOT apply external power to any of these terminals.
 - B. Re-apply power. The actuator will move CW.
 - C. After confirmation, remove power, then remove the jumper between terminals 4 & 7, and place a jumper between terminals 6 & 7.
 - D. Re-apply power, and the actuator will move CCW.
 - E. After confirmation, remove power, then remove the jumper between terminals 6 & 7, and replace the field wiring to terminals 4, 6 & 7.
 - F. Repeat step 1.
3. **Generate a remote CW move command** and verify the DIRECTION of the position indicator is CW.
 - A. If it is NOT, there is a problem with the field logic or wiring, troubleshoot accordingly.
 - B. If it is, proceed to step 4.
4. **Generate a remote CCW move command** and verify the DIRECTION of the position indicator is CCW.
 - A. If it is NOT, there is a problem with the field logic or wiring, troubleshoot accordingly.
 - B. If it is, proceed to step 5.
5. **If the actuator does NOT stop at the correct positions**, fails to move in the correct directions, or on fails to stop movement when the respective torque switch levers are depressed, **IMMEDIATELY STOP the operation of the actuator** and refer to the Table of Contents for the section to reference for the corrective action needed.
6. **The actuator may now be put into service.**



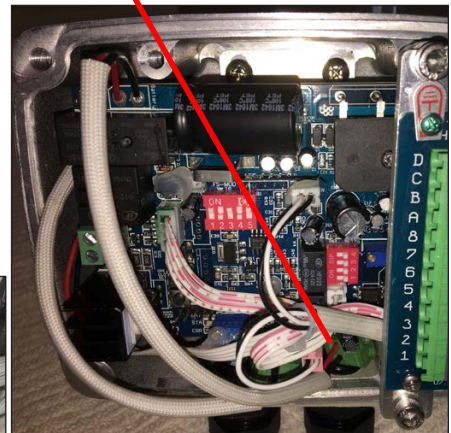
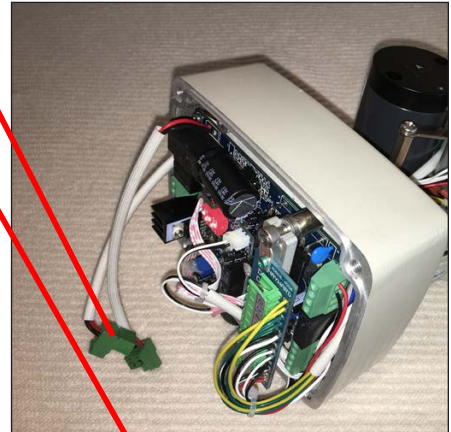
WARNING – **LETHAL** voltages may be present inside this actuator.

BATTERY SYSTEM CONNECTION

Connecting and Starting the Battery System

After the actuator has been fully installed in the field and wired to power and control systems, it is now possible to initialize the battery system. All HRSN2 Series Battery Backup units require a 100VA 24vac / 5A 24vdc power supply directly into the actuator terminal block. The initialization procedure is as follows:

1. Remove the side enclosure cover.
2. Locate the green two-pin connector halves.
 - Both halves are keyed to connect in only one direction.
 - Align with each other and plug together.
3. Apply 24V power to the actuator.
4. Replace the side enclosure cover.
5. Battery system must charge for 12 hours after powering up to provide 100% charge capacity.
6. The battery system employs a 22.2V Li Ion pack. The DC motor is driven directly by the battery pack upon loss of power. Refer to the section: Calibration - Continued, On/Off Control for setting the required fail safe direction (default is drive CW on loss of power).





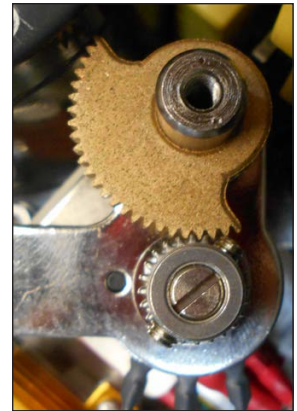
CALIBRATION

⚠ WARNING – Follow these directions carefully and in order. Actuator damage due to improper testing and commissioning will **NOT** be covered under warranty.

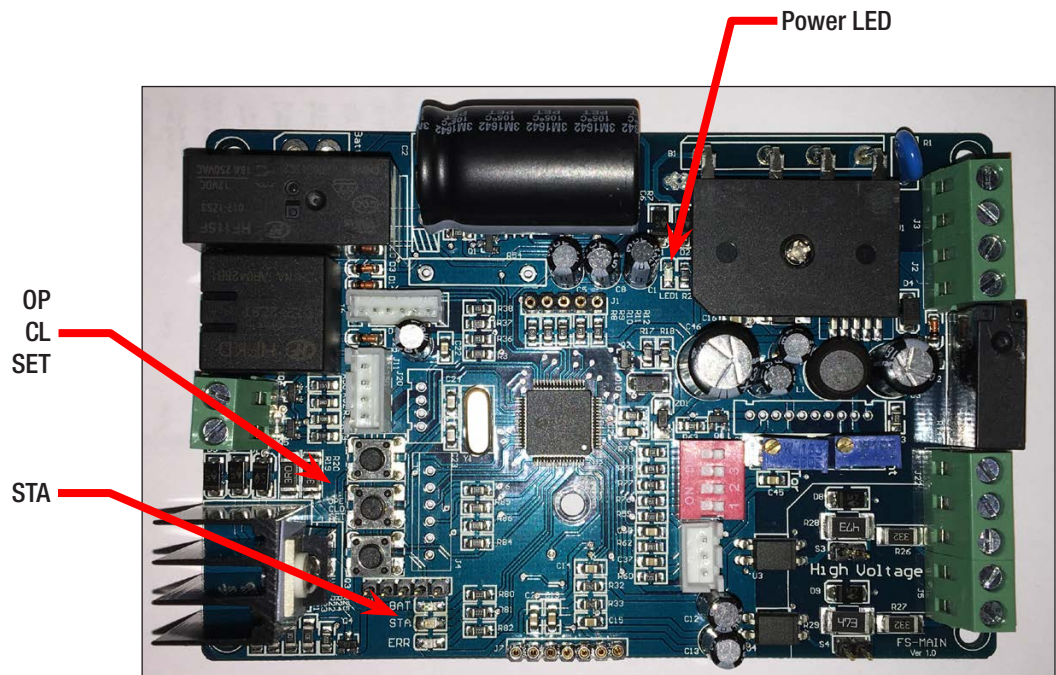
Calibration Procedure - On/Off Control

After completing all mounting and wiring procedures and main power is available, it is now possible to commission the actuator.

1. Position the actuator to a mid-stroke position.
2. Apply correct power according to the actuator model.
 - A. The blue POWER LED will turn on, and the green LED STA will turn on.
3. **Press the “SET” black pushbutton** on the Mod control board and hold it down for about three seconds, then release.
 - A. The grn STA LED will turn off and the unit will drive to the full CCW (Open) position. The actuator will stop when the pre-set cam positions are reached.
 - B. There are NO LED indicators to advise when the actuator is running.
4. When the actuator stops, **press the OP pushbutton ONCE.**
 - A. The actuator will drive to its full CW (Closed) position and stop when the pre-set cam positions are reached.
 - B. There are NO LED indicators to advise when the actuator is running.
5. When the actuator stops, **press the CL pushbutton ONCE.**
6. After data is stored (about 10 - 20 seconds), the unit will start to respond to the incoming 4-20mA control signals being sent to the actuator.
7. Slight adjustments may be made to trimmer VR2 if necessary to tune the feedback signal (20mA full CCW position only).
8. **Unit is now calibrated and is ready to be put into service.** No other calibration is necessary.

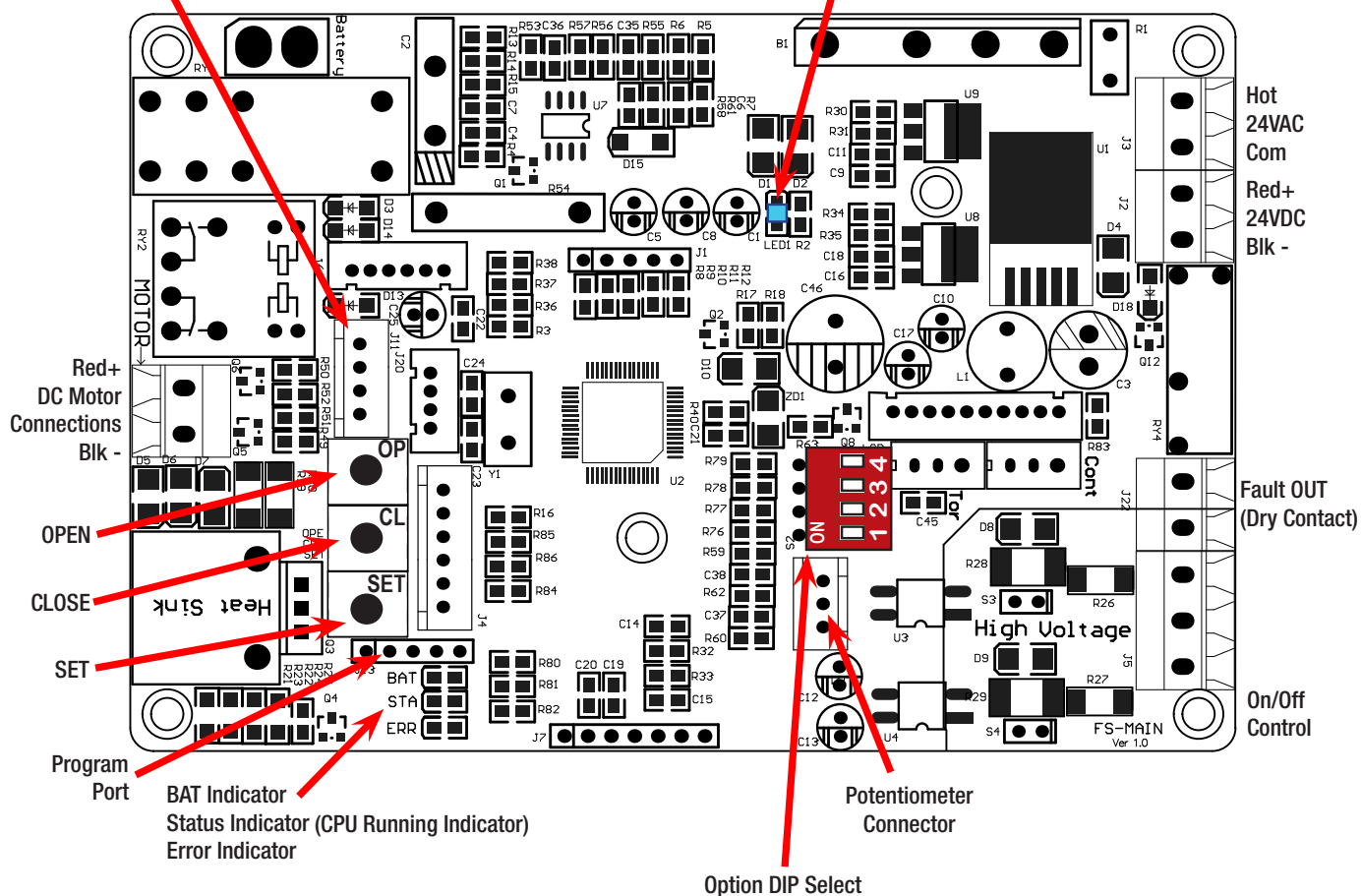


Alignment of the sector and potentiometer gear sets at actuator full CW position. (reference only).



Limit Switch Harness Connector

Power Indicator



Indicators Table

FUNCTION	COLOR	STATUS
Power Indicator	Blue	LED ON = Mains Power ON
		LED OFF = Mains Power OFF
BAT Indicator	Yellow	LED OFF = Battery Disconnected
		LED ON = Battery Charge Sufficient
		LED Flashing = Battery Charging
Status Indicator	Green	LED ON = System CPU Running
		LED OFF = System Stopped - Fault
Error Indicator	Red	LED OFF = Normal
		LED ON = Fault (Fault OUT Contact tripped)

Option DIP Select Table

DIP	FUNCTION - On/Off Failsafe Models
4 = Off	Factory Function
4 = On	Factory Function
3 = Off	Direct Acting (DA) Mode (Wiring Terminal #4 = CW)
3 = On	Reverse Acting (RA) Mode (Wiring Terminal #6 = CW)
1 = Off, 2 = Off	Fully CW upon loss of mains power (independent of DIP 3)
1 = Off, 2 = On	Invalid
1 = On, 2 = On	Fully CCW upon loss of mains power (independent of DIP 3)

COMMISSIONING

The end stop travel (cams) of this actuator have been factory set and tested to respond between 0° and 90° degrees rotation. If NO changes to end stops are required, this unit is ready to be put into service immediately using this procedure. IF changes to the cam positions are required, refer to pages 10~11 or 14~15 before proceeding.

Conceptually this procedure first establishes correct direction and control; these **MUST** be verified in order to proceed. Any actuator must drive CW when commanded to do so, and STOP when the actuator reaches the full CW travel position. The same applies for the CCW operation.



WARNING – Follow these directions carefully and in order. Actuator damage due to improper testing and commissioning will **NOT** be covered under warranty.

Notice: This procedure has many sections with the text “**IMMEDIATELY remove power from the actuator to STOP movement**”. Quick action is necessary in case of any unexpected or uncontrolled movement to keep the actuator from possibly driving past the limits of the valve or damper attached, and to simply keep the actuator in a known position for a quick, efficient installation.

Commissioning - Proportional Control

1. After the actuator and valve (damper) assembly have been installed with power and control connected, BEFORE applying power, use the manual override to rotate the actuator to a mid-travel position.
2. Set the control signal selection jumpers, refer to the Proportional PCB detail page.
3. **Generate a mid-travel command (12mA)**, and apply power.
 - A. The actuator should move only to match the incoming signal, if at all.
 - I. If the actuator moves and continues to move **away** from midpoint, **IMMEDIATELY remove power from the actuator to STOP movement**.
 - a. Place a meter in series with terminal 3 (sig-in) (– lead) and the wire coming from the field controller (+ lead), it **MUST** read +12mA (with power ON).
 - i. If it does NOT, check the polarity of the incoming analog signal to make sure it is (+)12mA.
 - ii. Return to step 3.
 - II. If the actuator moves momentarily and then STOPS at the mid stroke position, proceed to step 4.
 - III. If the actuator does not move at all, rotate the handwheel slightly in either direction to offset the controller.
 - a. The actuator should move back to the midpoint position and then STOP.
 - b. Proceed to step 4.
4. **Generate a CW move command (4mA)** and verify the DIRECTION of the position indicator is CW.
 - A. The actuator should run CW and run until it reaches its CW end of travel position.
 - B. Measure terminals 5 (+) and 6 (–) to read 4mA (2vdc).
 - C. While power is on, an analog feedback signal OUT provides an electronic position of the actuator... i.e. 4mA = full CW and 20mA = full CCW positions (reference actuator terminals #5 (+) and #6(–)).
5. **Generate a CCW move command (20mA)** and verify the DIRECTION of the position indicator is CCW.
 - A. The actuator should run CCW and run until it reaches its CW end of travel position.
 - B. Measure terminals 5 (+) and 6 (–) to read 20mA (10vdc).



WARNING – **LETHAL** voltages may be present inside this actuator.



WARNING – Serious Damage to the actuator will result if the motor is allowed to drive the gear train into the mechanical stop! Remove power from this device **BEFORE** making any travel adjustments.

COMMISSIONING - CONTINUED

- C. While power is on, an analog feedback signal OUT provides an electronic position of the actuator... i.e. 4mA = full CW and 20mA = full CCW positions.
6. **If the actuator does NOT stop at the correct positions**, fails to move in the correct directions, or fails to stop movement when the respective torque switch levers are depressed, **IMMEDIATELY STOP the operation of the actuator** and refer to the Table of Contents for the section to reference for the corrective action needed.
7. Check the full scale response of the analog signals into and out of the actuator by referring to the section: Calibration - Proportional Control for the proper voltage of the actuator.
8. **If the actuator stops at the correct positions and generates a feedback signal representative of the position of the actuator, the actuator can be put into service and is fully operational.**

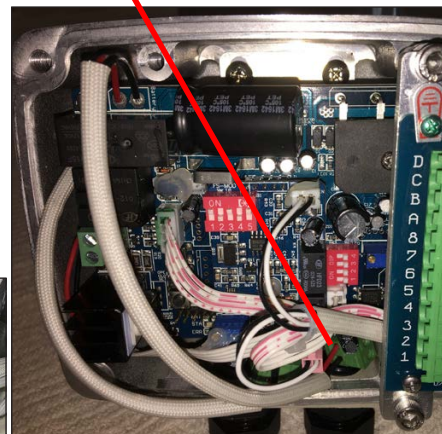
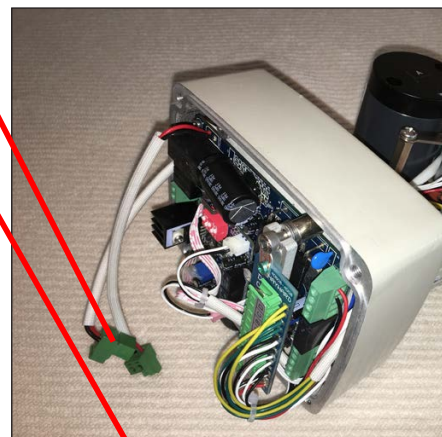
PROPORTIONAL CONTROL

BATTERY SYSTEM CONNECTION

Connecting and Starting the Battery System

After the actuator has been fully installed in the field and wired to power and control systems, it is now possible to initialize the battery system. All HRSN2 Series Battery Backup units require a 100VA 24vac / 5A 24vdc power supply directly into the actuator terminal block. The initialization procedure is as follows:

1. Remove the side enclosure cover.
2. Locate the green two-pin connector halves.
 - Both halves are keyed to connect in only one direction.
 - Align with each other and plug together.
3. Apply 24V power to the actuator.
4. Replace the side enclosure cover.
5. Battery system must charge for 12 hours after powering up to provide 100% charge capacity.
6. The battery system employs a 22.2V Li Ion pack. The DC motor is driven directly by the battery pack upon loss of power. Refer to the section: Calibration - Continued, Proportional Control for setting the required fail safe direction (default is drive CW on loss of power).



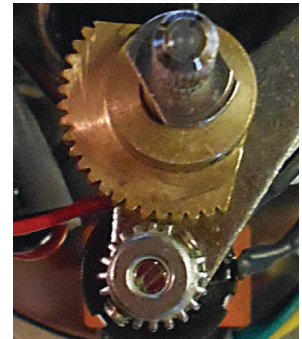
CALIBRATION

⚠ WARNING – Follow these directions carefully and in order. Actuator damage due to improper calibration will NOT be covered under warranty.

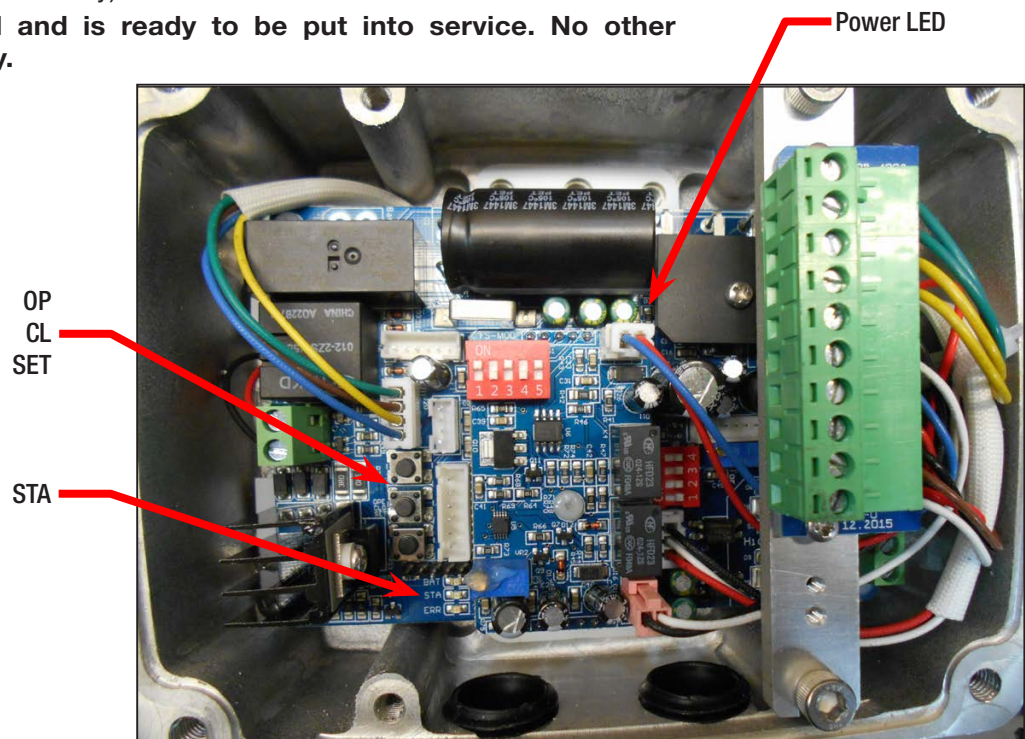
Calibration Procedure - Proportional Control

After completing all mounting and wiring procedures and the Commissioning has been performed, it is now possible to calibrate the analog response of the actuator.

1. Position the actuator to a mid-stroke position.
2. Apply correct power according to the actuator model.
 - A. The blue LED D1 will turn on, and grn LED STA will turn on.
3. Generate a 50% INPUT signal to the actuator and wait for approximate 50% travel position to be reached.
4. **Press the “SET” black pushbutton** on the Mod control board and hold it down for about three seconds, then release.
 - A. The grn STA LED will turn off and the unit will drive to the full CCW (Open) position. The actuator will stop when the pre-set cam positions are reached.
 - B. There are NO LED indicators to advise when the actuator is running.
5. When the actuator stops, **press the OP pushbutton ONCE**.
 - A. The actuator will drive to its full CW (Closed) position and stop when the pre-set cam positions are reached.
 - B. There are NO LED indicators to advise when the actuator is running.
6. When the actuator stops, **press the CL pushbutton ONCE**.
7. After data is stored (about ten - 20 seconds), the unit will start to respond to the incoming 4-20mA control signals being sent to the actuator.
8. Slight adjustments may be made to trimmer VR2 if necessary to tune the feedback signal (20mA full CCW position only).
9. **Unit is now calibrated and is ready to be put into service. No other calibration is necessary.**



Alignment of the sector and potentiometer gear sets at actuator full CW position. (reference only).



CALIBRATION - CONTINUED

Function DIP Select Table

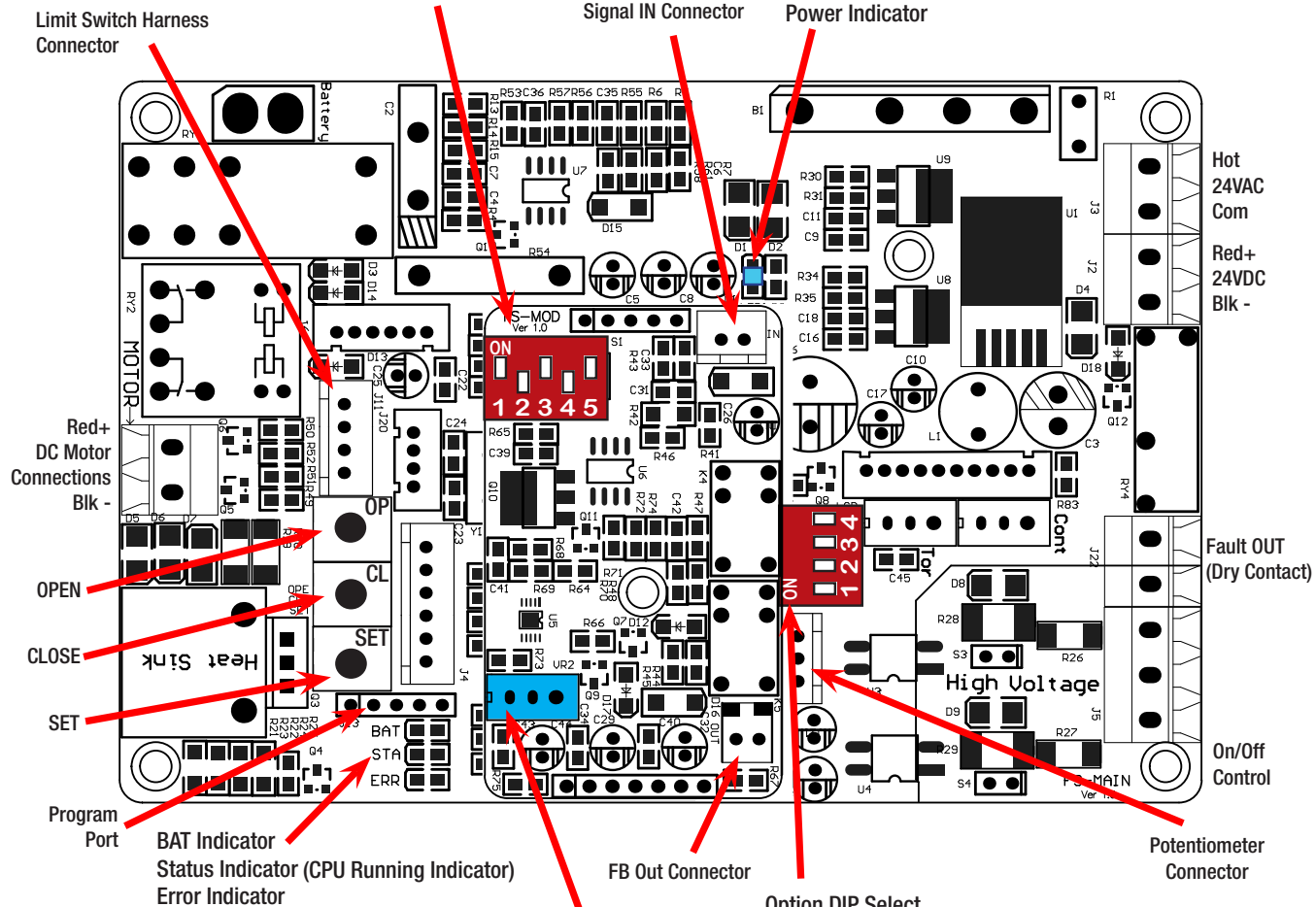
DEFAULT

DIP	ON	OFF	FUNCTION
1	4-20mA	0(2)-10V	Input
2	0-10V	2-10V/4-20mA	
3	4-20mA	0(2)-10V	Feedback
4	0-10V	2-10V/4-20mA	
5	Mod	On/Off	Control

Function DIP Select

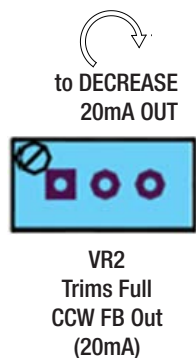
Signal IN Connector

Power Indicator



Indicators Table

FUNCTION	COLOR	STATUS
Power Indicator	Blue	LED ON = Mains Power ON
		LED OFF = Mains Power OFF
BAT Indicator	Yellow	LED OFF = Battery Disconnected
		LED ON = Battery Charge Sufficient
		LED Flashing = Battery Charging
Status Indicator	Green	LED ON = System CPU Running
		LED OFF = System Stopped - Fault
Error Indicator	Red	LED OFF = Normal
		LED ON = Fault (Fault OUT Contact tripped)



Option DIP Select Table

DEFAULT

DIP	FUNCTION - Proportional Failsafe Models
4 = Off	Factory Function
4 = On	Factory Function
3 = Off	Direct Acting (DA) Mode (4mA = Closed CW)
3 = On	Reverse Acting (RA) Mode (20mA = Closed CW)
1 = Off, 2 = Off	Fully CW upon loss of mains power (independent of DIP 3)
1 = Off, 2 = On	Invalid
1 = On, 2 = On	Fully CCW upon loss of mains power (independent of DIP 3)

TROUBLESHOOTING


WARNING – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections. If it is necessary to troubleshoot with live power to the actuator, please use **EXTREME CAUTION**, and follow your company's safety protocols and procedures at all times.

After completing all mounting and wiring procedures and main power is available, if the actuator does NOT respond as expected, the following procedure(s) may help in identifying the problem.

Symptom	Target	Action
Actuator does not move when commanded to do so.	Power Source	Measure incoming power AT the actuator terminal block. Reference the correct wiring diagram.
	Control Problem	Generate move commands by the field device. Measure correct voltage changes between HOT and terminal #6 (CCW) and HOT and terminal #4 (CW).
	Wire Sizing	Check for correct wire size per Wire Sizing Chart.
Supply and controls are measured to be correct, but actuator still does not move.	Overtorque	Remove the actuator from the driven device. If the actuator now moves, the torque required by the mechanical device exceeds that of the actuator. Increase actuator size.
		With the actuator removed from the mechanical equipment, manually rotate the valve or damper through its intended range of travel to check for mechanical problems.
	Insufficient power supply and/or incorrect wire size during installation.	Measure the voltage between terminals 1 & 2 WHILE commanding the actuator to move. The measured voltage cannot drop more than 10%.
	Cams improperly set.	REMOVE POWER. Check to see if cams rotate freely on the cam shaft using your finger. Cams MUST be secure and set according to the procedures in the Adjusting CW/CCW End of Travel section.
Motor is extremely hot to the touch.	Control “noise” or excessive duty cycle	Check for stray voltage fluctuations on the incoming control signals. The on/off line voltage actuators have a maximum 25% duty cycle. While the low voltage models have a 75% duty cycle.
		Check for parallel wiring of multiple on/off actuators. Review the site as-built wiring diagrams to verify.
Actuator does not stop at correct position at either end of travel	Actuator is out of quadrant	The manual override system has been employed to rotate the actuator beyond its intended angle of rotation. Use the manual override to rotate the actuator back into its correct quadrant of operation.
	Travel cams and/or mechanical stops not positioned correctly	Reset end-of-travel cams and/or mechanical stops as detailed in the Adjusting CW/CCW End of Travel section.

TROUBLESHOOTING


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After completing all mounting and wiring procedures and main power is available, if the actuator does NOT respond as expected, the following procedure(s) may help in identifying the problem.

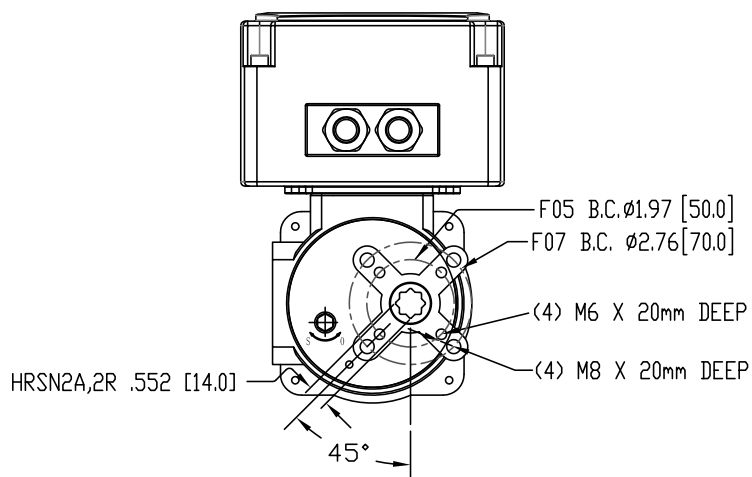
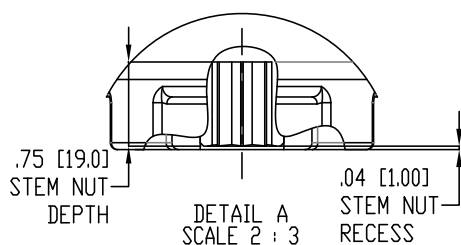
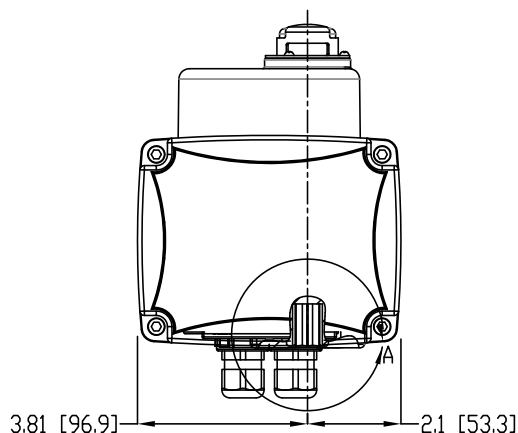
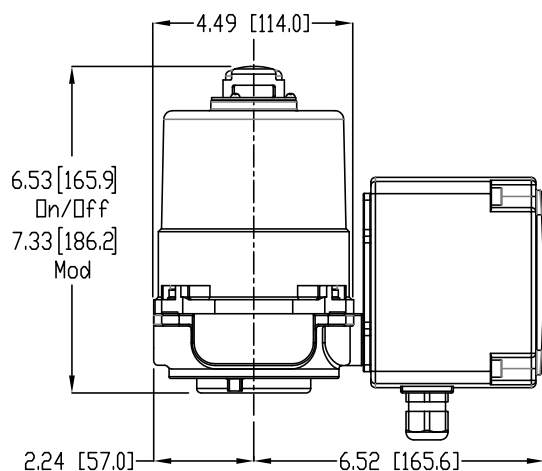
Symptom	Target	Action
Actuator does not move when commanded to do so.	Power Source	Measure incoming power AT the actuator terminal block. Reference the correct wiring diagram.
	Control Problem	Generate move commands by the field device. For most analog control systems, reversing the polarity will render the control system output as invalid. Check the polarity of the analog control signals as they are connected to the actuator. The actuator will NOT respond to inverted control signals.
	Wire Sizing	Check for correct wire size per Wire Sizing Chart.
Supply and controls are measured to be correct, but actuator still does not move.	Overtorque	Remove the actuator from the driven device. If the actuator now moves, the torque required by the mechanical device exceeds that of the actuator. Increase actuator size.
		With the actuator removed from the mechanical equipment, manually rotate the valve or damper through its intended range of travel to check for mechanical problems.
	Insufficient power supply and/or incorrect wire size during installation.	Measure the voltage between terminals 1 & 2 WHILE commanding the actuator to move. The measured voltage cannot drop more than 10%.
	Cams improperly set.	REMOVE POWER. Check to see if cams rotate freely on the cam shaft using your finger. Cams MUST be secure and set according to the procedures in the Adjusting CW/CCW End of Travel section.
Motor is extremely hot to the touch.	Control “noise” or excessive duty cycle	Check for stray voltage fluctuations on the incoming control signals. Analog control signals are susceptible to “noise” and send unstable control data to the actuator. This results in a never-ending motor drive scenario with the usual result being thermal overload of the drive motor.
		Check for parallel wiring of multiple on/off actuators. Review the site as-built wiring diagrams to verify.
Actuator does not stop at correct position at either end of travel	Actuator is out of quadrant	The manual override system has been employed to rotate the actuator beyond its intended angle of rotation. Use the manual override to rotate the actuator back into its correct quadrant of operation.
	Travel cams and/or mechanical stops not positioned correctly	Reset end-of-travel cams and/or mechanical stops as detailed in the Adjusting CW/CCW End of Travel section.

TROUBLESHOOTING

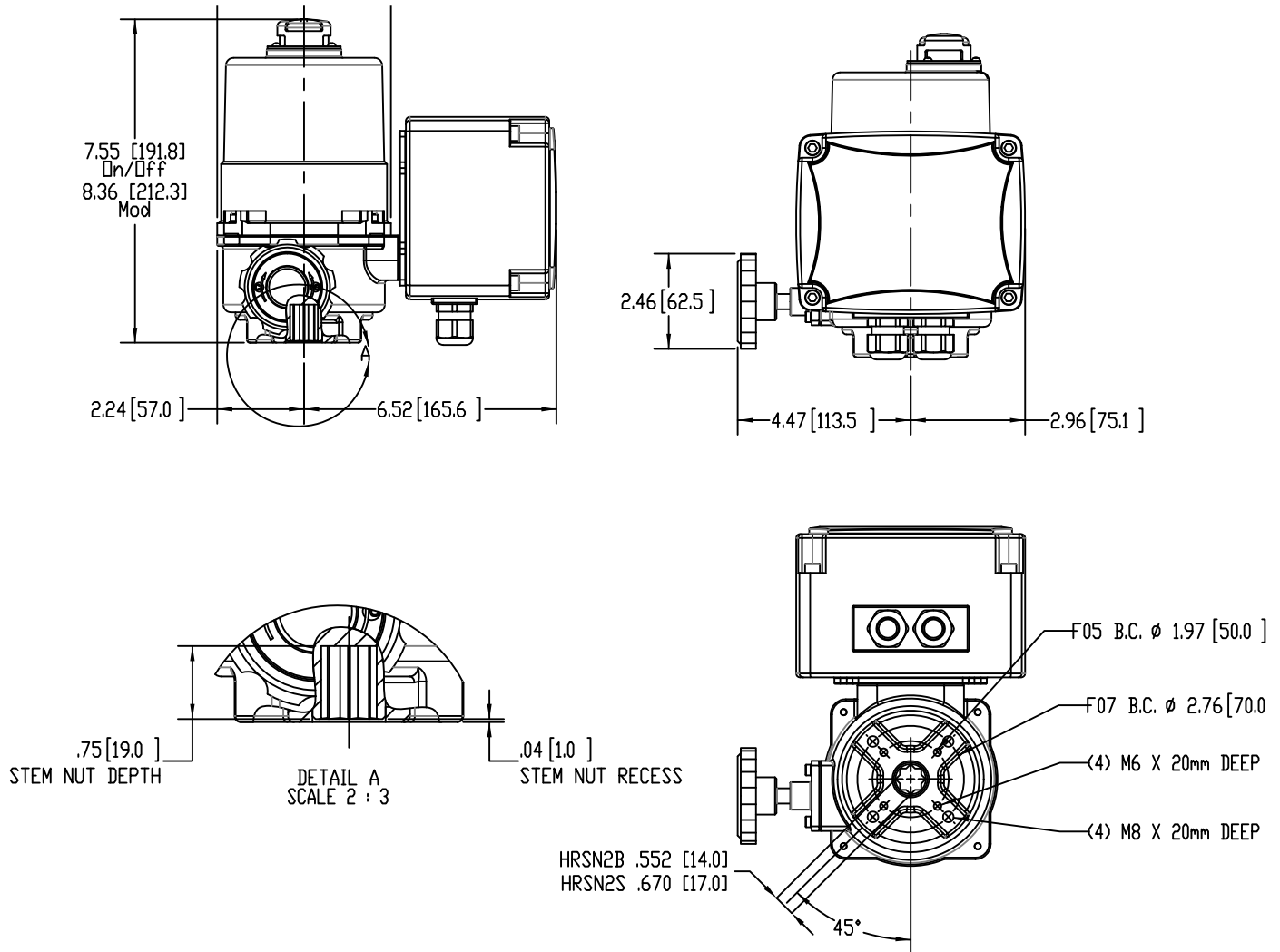
Upon loss of mains power if the actuator does NOT respond as expected, the following procedure(s) may help in identifying the problem.

Symptom	Target	Action
Actuator does not move to expected Fail-Safe position upon loss of mains power	Stored Energy device not connected	After actuator commissioning, plug the two-pin green connectors together (ref pg 19 or 22). The BAT status LED must be ON when power is On (ref pg 18 or 21).
	Stored Energy device not charged	Unit must charge for at least twelve hours after initial connection is made.
	Fail-Safe direction incorrectly set	Reset 4 position DIP Switch (see pg 18, 21 & below).
Actuator does not complete the move to the full end of travel position upon loss of mains power	Stored Energy device not sufficiently charged	Unit must charge for at least twelve hours after initial connection is made. Yellow BAT status indicator must be on or flashing when mains power is ON and stored energy device is plugged into connector.
	Fault OUT contact is closed. ERR indicator on PCB is ON	Motor current draw exceeds the capacity of the stored energy device. Check valve torque and charge time.
		Mains power ON time is insufficient between power failures - increase ON time.
		Stored energy demand cycle has depleted the life of the device - replace stored energy pack.
		Stored energy device disconnected - reconnect two-pin plug. Stored energy device voltage drops below 18.5VDC.

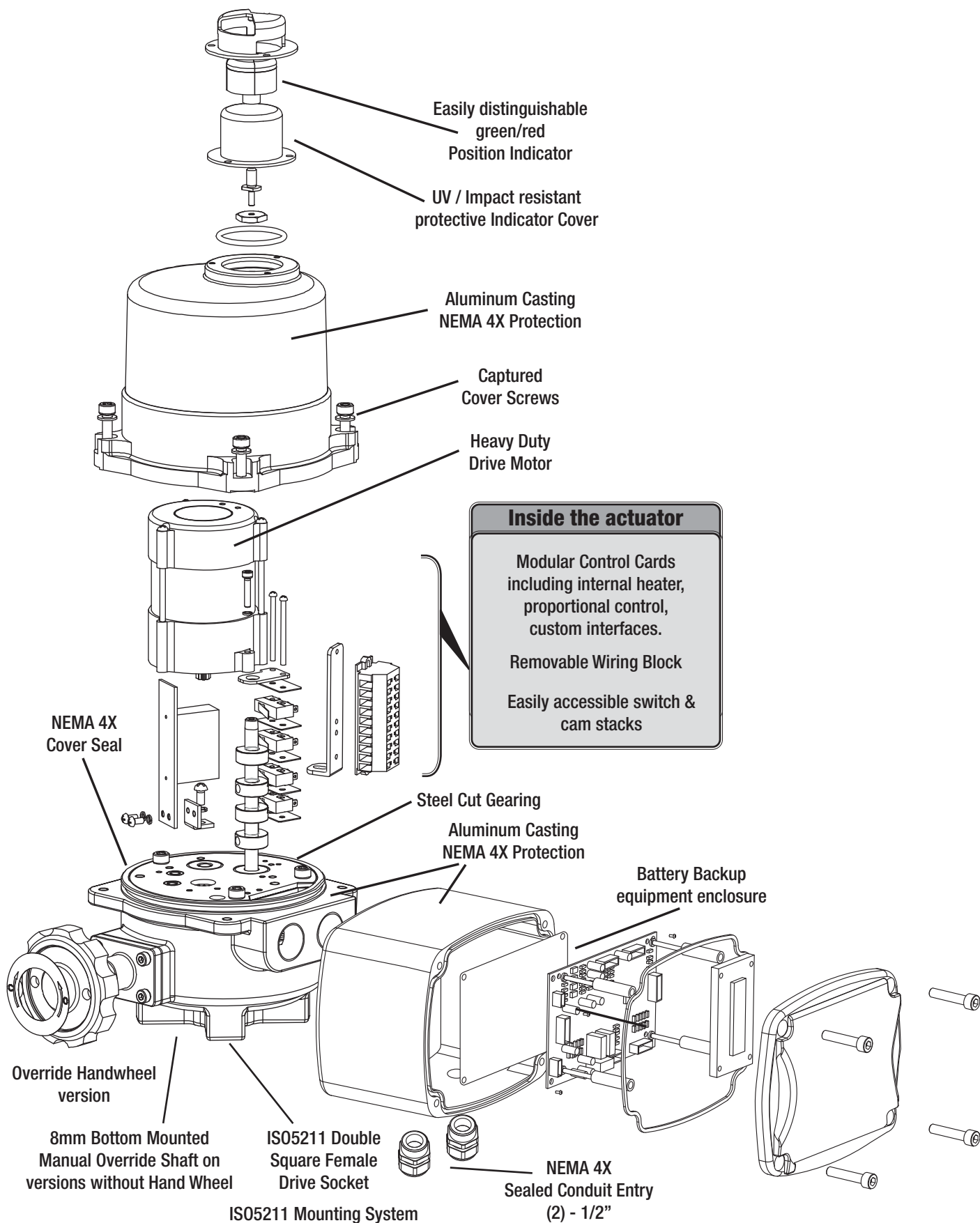
4 position DIP Setting On/Off units	Default	DIP 4 stays OFF and is reserved for Factory function
	Direct Acting	DIP 3 OFF = Direct Acting (Term 6 drives CCW)
	Fail CW	DIP 1 & 2 OFF = Fail CW on loss of mains power (Independent of DIP 3)
	Reverse Acting	DIP 3 ON = Reverse Acting (Term 6 drives CW)
	Fail CW	DIP 1 & 2 OFF = Fail CW on loss of mains power (Independent of DIP 3)
	Direct Acting	DIP 3 OFF = Direct Acting (Term 6 drives CCW)
4 position DIP Setting Proportional units	Fail CCW	DIP 1 & 2 ON = Fail CCW on loss of mains power (Independent of DIP 3)
	Reverse Acting	DIP 3 ON = Reverse Acting (Term 6 drives CW)
	Fail CCW	DIP 1 & 2 ON = Fail CCW on loss of mains power (Independent of DIP 3)
	Default	DIP 4 stays OFF and is reserved for Factory function
	Direct Acting	DIP 3 OFF = Direct Acting (4mA = CW)
	Fail CW	DIP 3 OFF = Direct Acting Feedback OUT (CW = 4mA)
	Reverse Acting	DIP 1 & 2 OFF = Fail CW on loss of mains power (Independent of DIP 3)
		DIP 3 ON = Reverse Acting (20mA = CW)
		DIP 3 ON = Reverse Acting Feedback OUT (CW = 20mA)
	Direct Acting	DIP 1 & 2 OFF = Fail CW on loss of mains power (Independent of DIP 3)
		DIP 3 OFF = Direct Acting (4mA = CW)
		DIP 3 OFF = Direct Acting Feedback OUT (CW = 4mA)
	Reverse Acting	DIP 1 & 2 ON = Fail CCW on loss of mains power (Independent of DIP 3)
		DIP 3 ON = Reverse Acting (20mA = CW)
		DIP 3 ON = Reverse Acting Feedback OUT (CW = 20mA)
	Fail CCW	DIP 1 & 2 ON = Fail CCW on loss of mains power (Independent of DIP 3)

MECHANICAL DATA


COVER REMOVAL CLEARANCE			OVERRIDE		WEIGHT
MODEL	TYPE	IN/MM	MM	# TURNS FOR 90°	LBS/KG
HRS2A	on/off - All	4.93 / 125	8mm hex	Approximately 7.5 turns 90°	12.1 / 5.5
	Mod - LV / HV				14.3 / 6.5
HRS2R	on/off - All	4.93 / 125		Approximately 7.5 turns 90°	12.1 / 5.5
	Mod - LV / HV				14.3 / 6.5

MECHANICAL DATA


COVER REMOVAL CLEARANCE		HANDWHEEL		WEIGHT
MODEL	TYPE	IN/MM	IN/MM # TURNS FOR 90°	LBS/KG
HRS2B	on/off - All	4.93 / 125	2.46 / 62.5 12 turns 90°	12.5 / 5.7
	Mod - LV / HV			14.7 / 6.7
HRS2S	on/off - All	4.93 / 125	2.46 / 62.5 12 turns 90°	12.5 / 5.7
	Mod - LV / HV			14.7 / 6.7



WIRE SIZING CHART

Wire sizing data is provided in the table below to assist in the selection of the proper wire size for HRSN2 Series actuators using various wire sizes over distance. Be sure to reference the correct voltage and do not exceed the indicated length of the wire run for each model.



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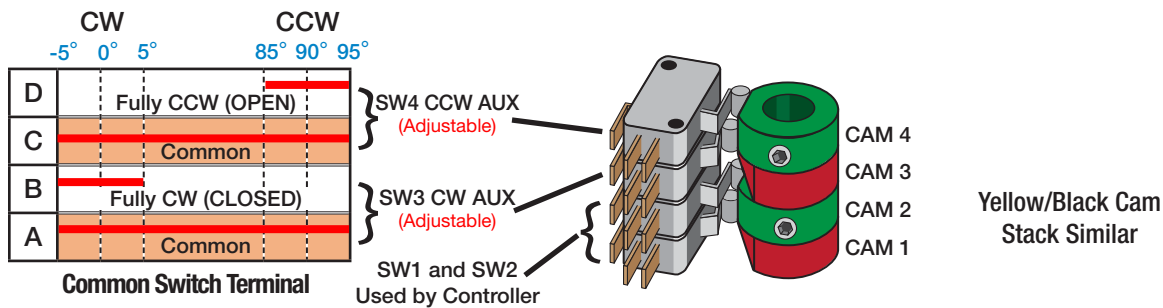
Maximum distance between Actuator and Power Supply (ft)

ACTUATOR		HRSN2	HRSN2	HRSN2
Voltage		24VAC/VDC	120VAC	230VAC
AWG	Amps	2.1	0.90 (x1.5 inductive)	0.45 (x1.5 inductive)
18		81	612	2329
16		129	962	3661
14		206	1554	5913
12		327	2377	9044
10		520	4040	15374
8		827	6030	22947

*** 120VAC~230VAC (Transformer)**

The wire run data is calculated for the transformer primary. To calculate the secondary wire run distance, use the 24VAC/VDC column data.

AUXILIARY SWITCH CAM MAPPING

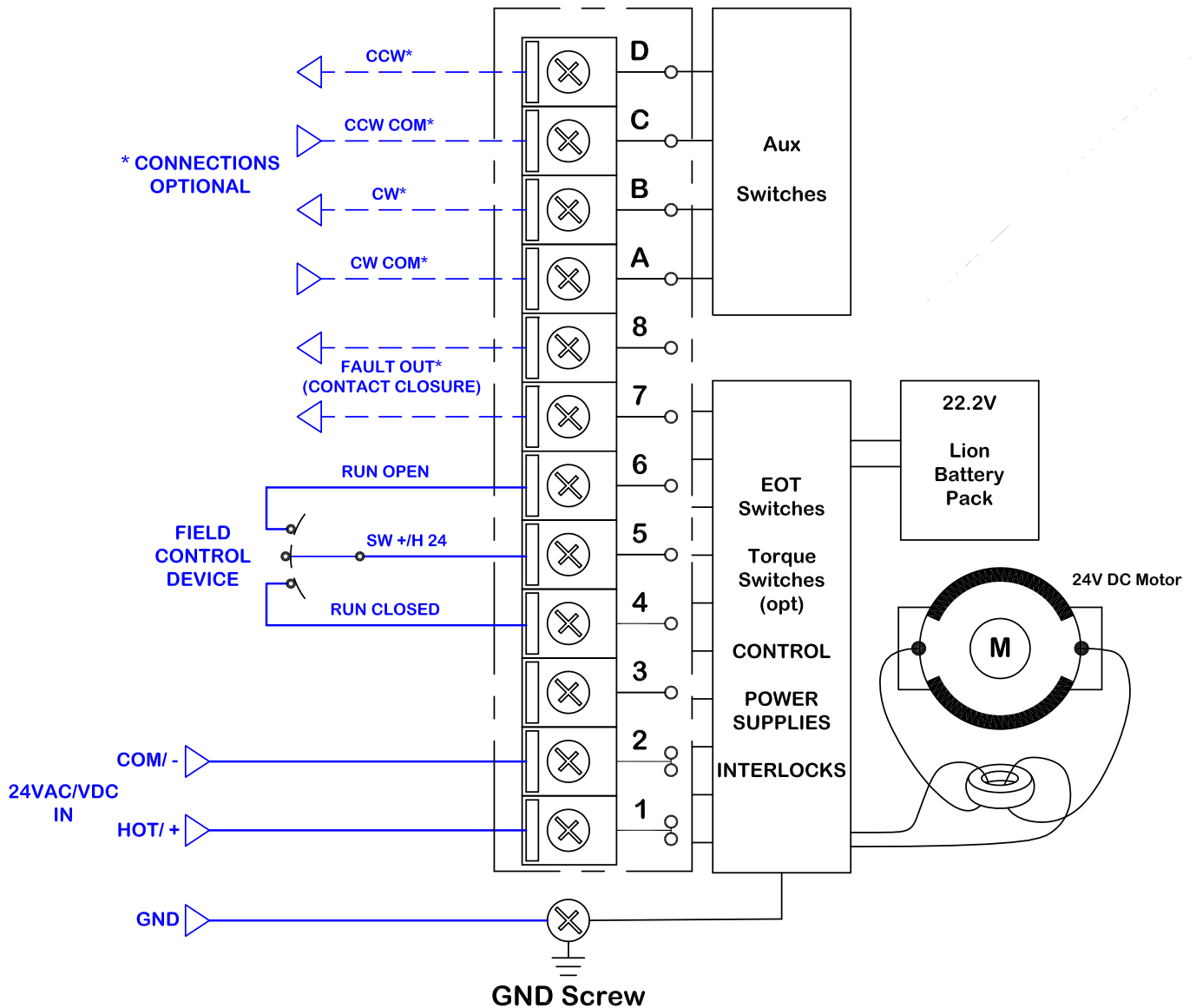


Auxiliary Switch Function

The illustration above describes how the rotation of the actuator drive shaft activates either auxiliary switch depending on the position, CW or CCW. The auxiliary switches allow a signal current to flow along different paths and ultimately allows the actuator position to be known by reading the electrical outputs of B or D. Reference the proper wiring diagram for your actuator as needed.

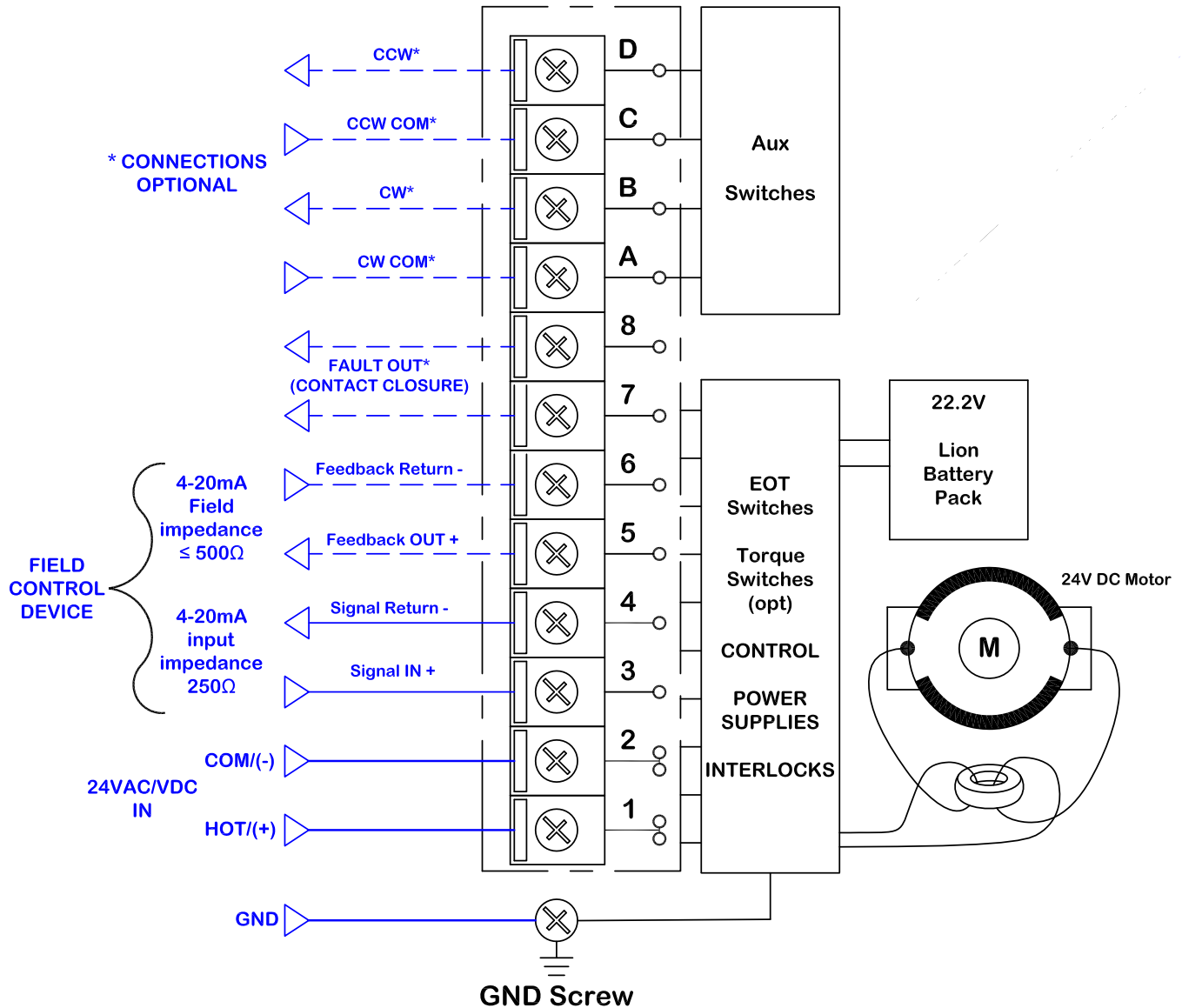
WIRING DIAGRAMS
HRSN2A-2S..20 24vac/vdc On/Off

- ✓ • On/Off Control
- ✗ • Torque Switches
- ✓ • Battery Backup
- ✗ • LCS



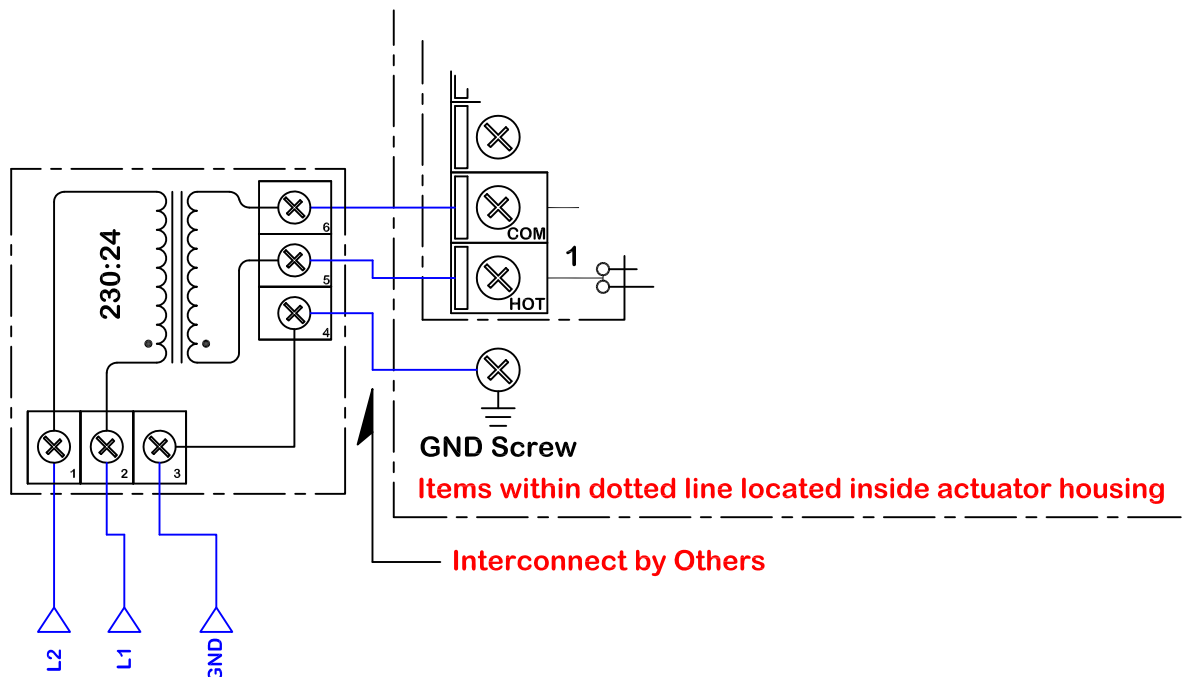
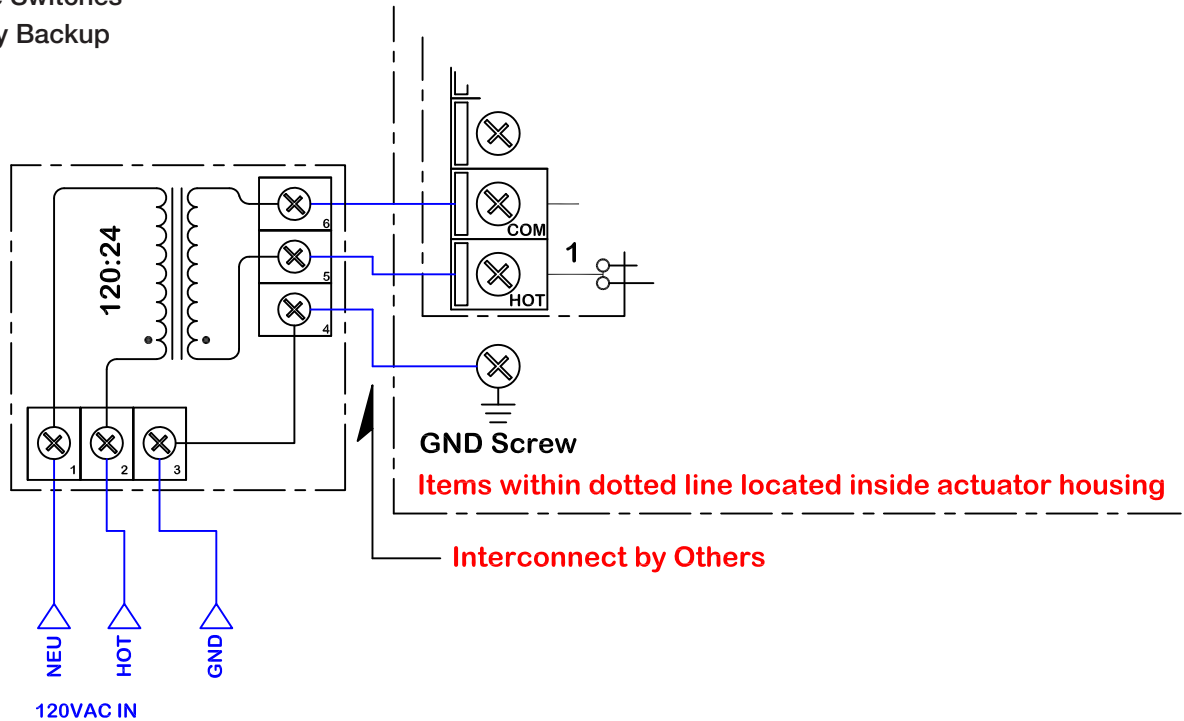
WIRING DIAGRAMS
HRSN2A-2S..20 24vac/vdc Proportional

- ✓ • Proportional Control
- ✗ • Torque Switches
- ✓ • Battery Backup
- ✗ • LCS



WIRING DIAGRAMS

- ✓ • On/Off Control
- ✓ • Proportional Control
- ✗ • Torque Switches
- ✓ • Battery Backup
- ✗ • LCS

HRSN2A-2S..20 120/230vac
All Control Types


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