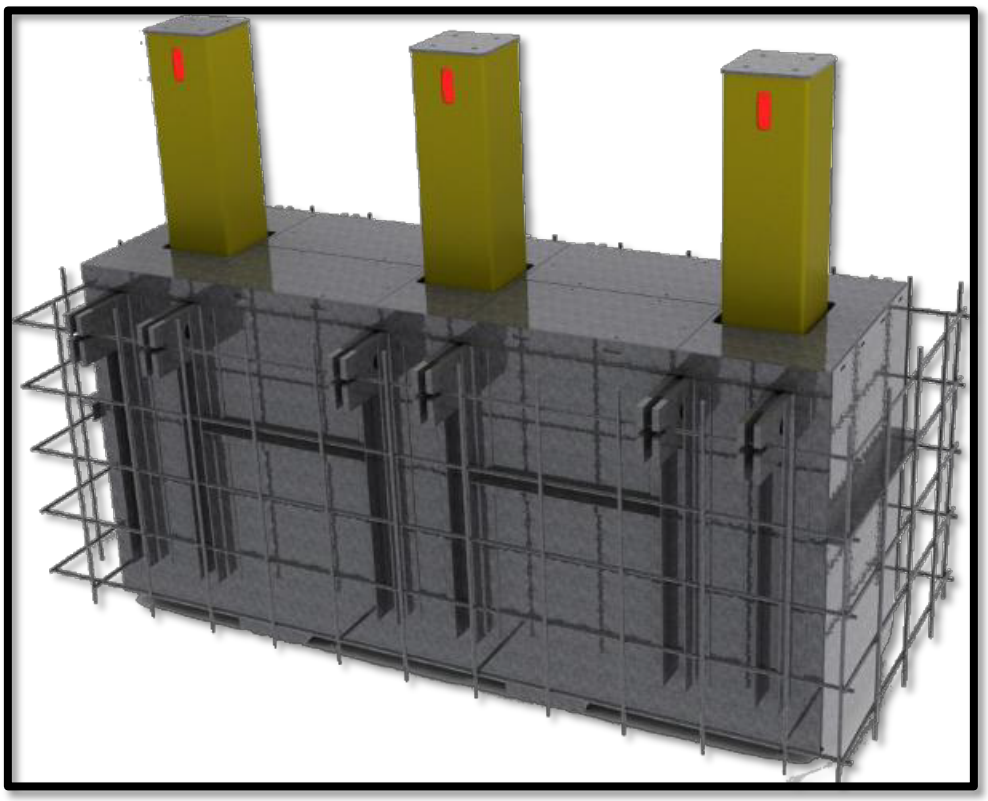
Maintenance Manual

RSS-4000 Series Electric Pop Up Bollard Vehicle Barrier



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Contents

Attachments

INTRODUCTION

This manual provides Maintenance Procedures for the RSS-4000 series electric popup bollard vehicle barrier system. It is **NOT** intended to be all encompassing and personnel are highly encouraged to review this manual prior to performing maintenance on RSSI Barriers.

GENERAL

The RSS-4000 series Popup Bollard barrier is a modern "best-of-breed" electrically operated, retractable, shallow foundation, anti-ram vehicle barricade that, when properly configured, can operate with a continuous duty cycle in all climates with minimal maintenance and expense. The barrier is DoD approved and certified to meet DOS impact condition designation K12, L3 or ASTM F2656 impact condition designation M50, P1. The barrier is capable of stopping and destroying a 15,000 lbs vehicle traveling at speeds of up to 50 mph. The barrier was independently tested and certified to operate 1,500,000+ cycles with zero failure, minimal downtime and maintenance. When properly installed the barrier rests completely flush with the existing roadway surface in the Down (roadway open) position. An Allen-Bradley MPAI series IP-67 servo electromechanical actuator with manual override and rapid reverse smoothly and quietly rotates an arresting element to an above ground position of 36" without obstructing line-of-sight vision.

BEFORE YOU BEGIN

- Read and understand all instructions and procedures before you begin to maintain the barriers.
- Read and observe all Warning hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.
- Follow your company's safety guidelines, to include lockout procedures.
- Use the proper tools when required to help avoid serious personal injury and damage to components.
- After review of this manual, recommend a conference call with the RSSI factory to discuss any questions regarding procedures we may not have addressed or that require further clarification.

HOW TO OBTAIN ADDITIONAL FACTORY SUPPORT

If you have any issues or questions, on-site personnel are highly encouraged to contact RSSI's Service department. **WE CAN HELP YOU!** Normal office hours are 7:00 AM Central Standard Time to 3:30 PM Central Standard Time, Monday - Friday. After hour support is available with prior coordination. Additionally, we have several how-to videos on our website.

Telephone	Email	Training Videos
+1 (850) 871-9300	service@rssi.com	www.rssi.com/support/videos

HAZARD ALERT MESSAGE AND SYMBOLS

WARNING
A Warning alerts you to an instruction or procedure that you must follow exactly to avoid serious personal injury and damage to components.

CAUTION
A Caution alerts you to an essential installation or maintenance procedure or statement, which, if not strictly observed, could result in damage to the system, equipment or injury.

NOTE
A Note alerts you to an essential installation or maintenance procedure, condition, or statement.

GENERAL SAFETY

Personnel MUST comply with the following important safety instructions DURING installation activities for the RSS-4000 series electric popup bollard vehicle barrier system.

- Read and comply with all safety rules in this manual.
- A fully trained maintenance person must perform all work.
- Do not operate this equipment when you are distracted or under the influence of drugs, alcohol or medication causing diminished control.
- Never operate this equipment when a vehicle, person or any obstruction is in the way of full operation of the RSS-4000.
- Prior to start-up of the RSS-4000 series electric popup bollard vehicle barrier system, all electrical connections to the barrier will be isolated (disconnected) IAW local Lock Out Procedures.
- All Ethernet terminations should be tested with Ethernet cable tester (TIA/EIA 568A standard)
- Use special care when removing any inspection plates as these plates are very heavy.
- Never operate this equipment when a vehicle, person or any obstruction is in the way of full operation of the RSS-4000.

BARRIER DESCRIPTION

- The RSS-4000 Series Electric Popup Bollard Vehicle Barrier consists of a shallow steel vault assembly that is hot dip galvanized with a skid resistant top plate.

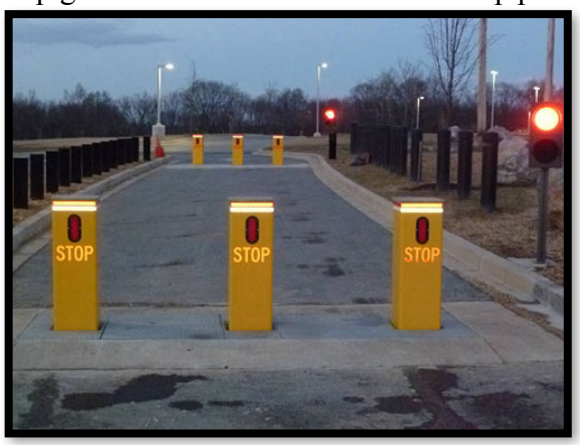


Figure 1, RSS-4000

BARRIER MAINTENANCE

Maintenance of the RSS-4000 barrier consists of routine Preventative Maintenance Procedures, which RSSI recommends quarterly or semi-annually and non-routine maintenance procedures. Preventative Maintenance Procedures can be found in Attachment 4. Non-routine Maintenance Procedures are addressed in this section.

EMERGENCY MANUAL OPERATION

Tools needed: Always have these tools readily available

1. Cordless impact wrench or ratchet wrench with TORX 45 bit
2. Cordless drill with adapter for 15/16 socket
3. Flashlight and gloves

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel

WARNING

- **Place traffic cones and block roadway from traffic to ensure worker safety**
- **Use the proper tools when required to help avoid serious personal injury and damage to components.**
- **Never operate this equipment when a vehicle, person or any obstruction is in the way of full operation of the RSS-4000.**

Lowering Barrier (Open Roadway)

1. Determine which top plate to remove (directly over actuator)

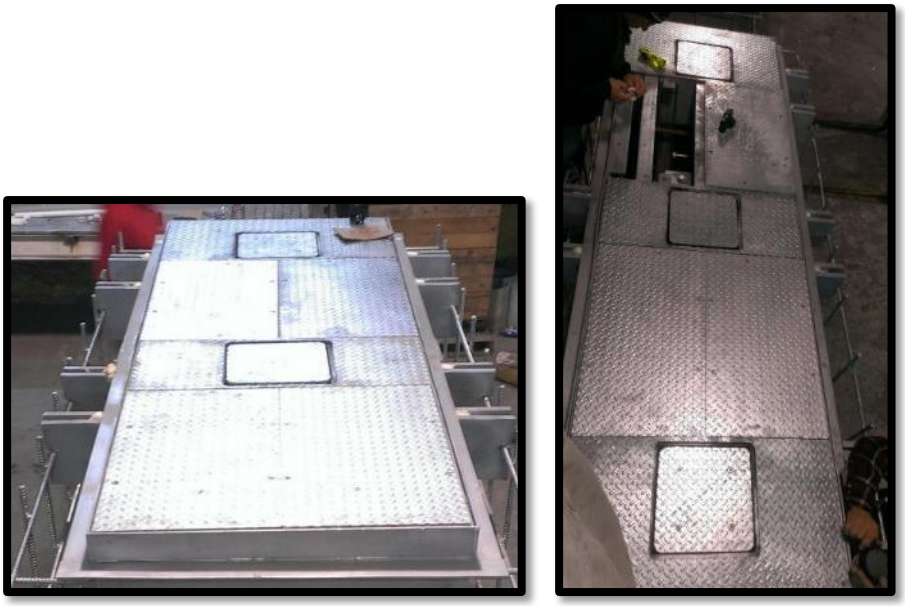


Figure 3, Top Plate, RSS-4000

2. Using cordless impact wrench or ratchet wrench with TORX 45 bit to remove 6 top plate screws

Figure 4, Remove Top Plate Screws

3. Remove top plate and relocate in a safe place (plates weigh approx.. 75 lbs, use gloves and a buddy)
4. Using flashlight, visually inspect actuator for debris that could interfere with operation

WARNING

Remove power from barrier (Barrier Control Panel)

5. Disconnect power to the barrier by turning off the Main Disconnect and lock out with a wire tie or IAW local lockout procedures.

Figure 5, Main Disconnect

6. Remove metal cylinder cover from Manual Brake Overdrive (counterclockwise).

Figure 6, Cylinder Cover

7. Hand turn the 15/16 nut clockwise while applying light pressure to engage the manual drive downward lining up the tabs inside the notches while going down. The Brass Ring will lower and lock as you screw down.

Figure 7, Manual Drive

8. Once tabs and notches are lined up and Manual Drive is down, turn locking nut (right below 15/16 nut) clockwise to Lock Manual Brake Overdrive in place. Brass ring will pop up into place.

Figure 8, Lock Manual Drive

WARNING

NEVER use impact wrench or tool to rotate manual screw (Drill only)

9. Then switch to a cordless drill and set the drill on the slowest RPM setting. Lower the barrier by using the drill (no pressure) and operating it on reverse setting (counterclockwise) until it reaches the full down position. DO NOT OVERDRIVE.

Figure 9, Warning Label

NOTE

The Manual Nut is equipped with an internal clutch. It will engage at max physical limits or if the load is too great.

WARNING

Improper operation of manual screw will damage actuator

10. To release Manual Drive slide the brass ring down and turn locking nut (counterclockwise) out of notches. Then turn 15/16 nut counterclockwise to disengage Manual Drive. Manual Drive will move upward and pop when fully disengaged. DO NOT OPERATE BARRIER UNTIL MANUAL BRAKE OVERDRIVE IS FULLY DISENGAGED. Screw metal cylinder back onto Manual Drive careful not to damage O-Ring or cross-thread.

Figure 10, Release Manual Drive

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel

WARNING

- **Place traffic cones and block roadway from traffic to ensure worker safety**
- **Use the proper tools when required to help avoid serious personal injury and damage to components.**
- **Never operate this equipment when a vehicle, person or any obstruction is in the way of full operation of the RSS-4000.**

Raising Barrier (Close Roadway)

1. Remove metal cylinder cover from Manual Drive (counterclockwise).
2. Hand turn the 15/16 nut clockwise while applying light pressure to engage the manual drive downward lining up the tabs inside the notches while going down. Brass Ring will lower as you screw down.
3. Once tabs and notches are lined up and Manual Drive is down, turn locking nut (right below 15/16 nut) clockwise to Lock Manual Brake Overdrive in place. Brass ring will pop up into place.
4. Then switch to a cordless drill and set the drill on the slowest RPM setting. Raise the barrier by using the drill (no pressure) and operating it forward (clockwise) on the slowest RPM setting until it reaches the full up position.
5. To release Manual Drive slide the brass ring down and turn locking nut (counterclockwise) out of notches. Then turn 15/16 nut counterclockwise to disengage Manual Drive. Manual Drive will move upward and pop when fully disengaged. DO NOT OPERATE BARRIER UNTIL MANUAL BRAKE OVERDRIVE IS FULLY DISENGAGED.

Figure 11, Warning Label

6. Place top plate back in place and install 6 screws, start all screws before tightening (anti-seize)
7. After condition requiring Emergency Manual Operation has been corrected (power restored or components repaired, reinstate power to the barrier by turning on the Main Disconnect

Figure 12, Main Power Disconnect

8. Push in drive fuses (FU1) in BCP
9. Return barrier to service.

WARNING

If barrier will be down for maintenance for an extended period, leave Main Disconnect power off, ensure it is locked and TAGGED out.

Troubleshooting Procedures.

The following Table contains the most common Trouble Shooting items for the barrier systems. If you encounter an issue not listed or want to discuss with a technician, please contact the factory.

Table 1, Trouble Shooting Procedures

STEP	Condition (Proble	Cause (Possible Reason)	Corrective Action	Verify Corrective Action
1	E01 and/or E14 on Active Alarm Screen with Servo Drive fuse FU1 pushed in	Loss of communication to Servo Drive Note- It is normal to get an E01 with Fuse FU1 pulled (drive has no power)	Check Ethernet cable from servo drive box inside of barrier to the Ethernet switch inside the BCP with Ethernet cable tester. Re-terminate the RJ45 connections and test cable again.	If the Condition still exists, go to step #2.
2	E01 and/or E14 on Active Alarm Screen with Servo Drive fuse FU1 pushed in	Loss of communication to Servo Drive	Use known good spare Ethernet cable above ground and bypass existing cable in ground and test. (Advanced method) Use windows laptop and DOS command prompt and use PING command to isolate Ethernet network connectivity, Laptop can be plugged directly into servo drive box inside barrier.	If the Condition still exists but Ethernet cables all check good, go to step #3
3	E01 on Active Alarm Screen with Servo Drive fuse FU1 pushed in	Loss of power to Servo Drive	At the BCP, check for Red light at Fuse holder FU1; if red light is lit, replace fuse. Check for 220 vac at top contacts of FU1; find A/C power source issue at CB1 or Main rotary cutoff switch.	If the Condition still exists, go to step #4
4	E01on Active Alarm Screen with Servo Drive fuse FU1 pushed in	Loss of power to Servo Drive	Test 220 vac power from BCP to Servo Drive Box inside barrier with Volt Meter, if bad, verify Power J-box waterproof splices are good, Re- terminate bad splices.	If the Condition still exists, and you've checked steps 1-4, replace Servo Drive Panel inside barrier. Refer to Atch 11, Replace the Servo Drive Panel in Barrier on Page 45 or call
5	Loss of Power Alarm on active alarm screen	BBP has experienced Loss of normal power	Test incoming commercial power to BBP at CB1, if good, check battery output at inverter (24-26vdc) then clear active alarm by pressing ALARM RESET on maint touch screen main menu.	Alarm should clear (Green No Alarms) on maint touch screen main menu. If the Condition still exists, call RSSI

STEP	Condition (Problem)	Cause (Possible Reason)	Corrective Action	Verify Corrective Action
6	E09 – Bus under voltage on active alarm page or in alarm history.	Incoming commercial main power too low for load.	Check voltage (220-240v) while running barrier at BBP at CB1. If less than 208vac, incoming power is too low. Contact Electric provider	Confirm Electrical voltage If confirmed and condition still exists, Call RSSI
7	Sump pump not working	Power problem (no power) If C/B pops, pump could be internally shorted goto step 9	In the BCP check for 120V across SP and NEUTRAL- terminal blocks. If no power, check CB 1 and CB 4; reset if	Confirm sump pump operation
8	Sump pump not working	Debris blocking sump pump discharge	Clean area around sump pump and check sump pump drain lines (PVC)	Confirm sump pump operation
9	Sump pump not working	Sump pump bad	Replace sump pump	Refer to Atch 6, Replace Sump Pump on page 32
10	Barrier has slowed down moving to up position, hesitates,	Possible broken spring(s)	Check spring assembly for broken springs; if found replace	Refer to Component Repair Section for Spring Replacement Procedures pg 38
11	Vehicles crossing barrier making a clunking	Top plates loose	Inspect all top plates screws, tighten or replace	Verify by observing vehicles cross barrier. If the Condition still exists, check item
12	Vehicles crossing barrier making a clunking noise	Down position set wrong	Using “Setting positions procedure” JOG/TEACH Down position Flush with the roadway.	Verify by observing vehicles cross barrier. Refer to Atch 2, Initiate Advanced Maintenance Operations, Page 19
13	The barrier safety loops don't detect	Loop detector tuning	Retune loop detector by removing and inserting front plug with no vehicle on loop. Indicator lights should display solid green when tuned.	Retest loop detector, if the Condition still exists, check item #14.
14	The barrier safety loops	Bad loop detector	Replace loop detector.	Retest, if the Condition still exists, check item #15. Refer to Atch 7, Replace Safety Loop Sensor on page 35
15	The barrier safety loops don't	Bad safety loop in roadway	Inspect roadway for cracks through Safety Loop wires. Replace if bad.	Safety Loop Installation can be found in the Installation Manual, Retest safety loop, if the Condition still exists after checking items #13-15, call RSSI
16	Touchscreens hard to operate or touchscreen area controls	Touchscreen mount clips too tight	On back of touchscreen locate 4 black mount clips and loosen excessively tight clips, reposition clips evenly.	Check operation of touchscreen If condition still exists, check item #17

STEP	Condition (Problem)	Cause (Possible Reason)	Corrective Action	Verify Corrective Action
17	Touchscreens hard to operate or touchscreen area controls seem out of	Bad Touchscreen	Replace touchscreen	Check operation of touchscreen Refer to Atch 16, Replacing Touchscreens on page 60 If condition still exists, after checking item #16-17, Call RSSI
18	Barrier heat grid system doesn't seem	Thermostat not set properly	Confirm thermostat set to 40 degrees.	Retest heat, if the Condition still exists, check item # 19.
19	Barrier heat grid system doesn't seem to work	Thermostat Location	Ensure thermostat is located in an area near barriers where ambient temperature is used to	Retest heat, if the Condition still exists, check item # 20.
20	Barrier heat grid system doesn't seem	Debris in barrier covering heat system	Clean out barrier vault	Retest heat, if the Condition still exists, check item #21.
21	Barrier heat grid system doesn't seem to work	Thermostat Bad	Turn thermostat to lowest setting and confirm contactor H1 does not pull in. Jump out thermostat input by placing a jumper wire between I 1/15 and +24 vdc. If contactor H1 pulls	Retest heat grid system If conditions still exists after checking items #18-21, call RSSI

NOTE
If you encounter an issue not listed or want to discuss with a technician, please contact the factory. See page 3, HOW TO OBTAIN ADDITIONAL FACTORY SUPPORT.

Battery Backup Panel (BBP) Recovery/Restart Procedures

The BBP is designed to automatically switch to battery power when normal power is lost and to switch back when normal power is restored. The BBP will also fully charge the batteries after an outage. The system will provide approximately 200 cycles of backup power to operate the barriers during a power outage (2 each 12 volt batteries). Should the power outage last longer than the battery life, the power inverter will shut down when the batteries voltage drops below approximately 20VDC.

TO RECOVER WHEN MAIN POWER RETURNS

1. Power inverter must be reset, after batteries are recharged, by flipping the power switch on top to the OFF position and then back ON, check for solid green light.
2. Check battery charger DC Ammeter to confirm batteries are recharging.
3. Allow batteries to charge at least 12 hours before conducting a test of the BBP.
4. After batteries are charged perform the below Functional Checkout to test the system.

FUNCTIONAL TEST CHECKOUT

1. Turn off CB1 (main power source) Contactor C1 should de-energize and Emergency contactor C2 should energize simultaneously.
2. Check voltages at terminals 3L1 and 3L2 = approx. 245VAC (no load)
3. Test barrier operation on BBP.
4. Turn CB1 back on and after approx. 4 seconds, the emergency contactor C2 should de-energize and C1 should energize.
5. Return to normal operations

NOTE: Ensure Switch on top of Invertor is set to 60 Hz for domestic (US) systems

Ethernet and Device Testing Procedures

The following table identifies all devices in the RSSI Barrier Network.

IP ADDRESS	DEVICE/LOCATION
192.168.1.1	Gateway (For future use)
192.168.1.10	PLC in BCP
192.168.1.11	Servo Drive Inside Barrier
192.168.1.12	Maintenance Touch Screen in BCP
192.168.1.13	Point I/O

Table 1, IP Address Listing

If you receive a loss of communications Alarm or have to change out a device, you may have to conduct Ethernet tests of connectivity to all the nodes/devices (PLC, Touchscreen, Servo Drive).

1. Using a laptop, connect your Ethernet cable to an empty port on the Ethernet switch in the BCP.
2. Set the static TCP/IP address on your laptop to 192.168.1.200 with subnet mask 255.255.255.0
3. Go to a DOS PROMPT and type PING 192.168.1.10 you should get replies from the PLC.
4. Go to a DOS PROMPT and type PING 192.168.1.11 you should get replies from the Servo Drive.
5. Go to a DOS PROMPT and type PING 192.168.1.12 you should get replies from the Maintenance Touchscreen in the BCP.
6. If you do not get replies from the devices, ensure your laptop is on the correct subnet again and troubleshoot connectivity problems to any device. Test Ethernet cabling end to end with an Ethernet cable tester.

Component Repair/Replacement Procedures

If there is a component to repair/replace that is not covered in this manual, contact the RSSI Service Manager for assistance (see page 3, HOW TO OBTAIN ADDITIONAL FACTORY SUPPORT).

- Repairs should only be performed by a factory trained technician.
- Most repairs (LED lights, fuses, pins or screws, and sump pump) will be simple remove and replace and traditional skill sets (electrical, plumbing, and mechanical) can easily handle these tasks.
- Critical electrical components, Servo Drive, Actuator, PLC, and Communication Systems require more specialized skill sets. With this manual, and the phone support of a RSSI factory technician, these tasks can be easily performed.

Detailed Component Repair and Replacement Procedures are outlined in Attachments 4-15

16 Attachments

1. Barrier Control From Maintenance Touch Screen
2. Initiate Advanced Maintenance Operations (From Maintenance Touch Screen in BCP)
3. Removing Barrier Insert from Vault
4. Preventative Maintenance Checklist
5. Replace Actuator
6. Replace Water/Debris Sensor
7. Replace Sump Pump
8. A. Replace Feig Loop Sensor
   B. Replace EMX Loop Sensor
9. Replace Spring
10. Replace Servo Drive Fuse
11. Replace LED Traffic Light
12. Replace IR Sensor
13. Replace Servo Drive Panel in Barrier
14. Replace Bollard LED Lights
15. A. Replace Surge Protection Module in BBP
    B. Replace Voltage Monitor Module in BBP
16. Replace Surge Protection Module in BBP
17. Replace 24 VDC Power Supply in BCP
18. Replacing and Setting Up Touchscreens

* * END OF SECTION * *

ATTACHMENT 1- BARRIER CONTROL FROM MAINTENANCE TOUCH SCREEN

1. From the MAIN MENU, press the BARRIER CONTROL button (See Fig 7).

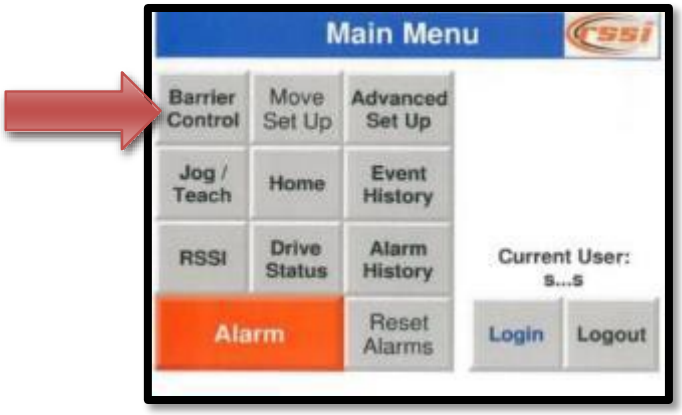


Figure 7, Main Menu

2. Inside the BARRIER CONTROL menu use the MOVE CLOSED/OPEN buttons to operate the barrier a few cycles, measure the post assembly in the CLOSED (UP) position to ensure it reaches 35-36 inches and ensure the OPEN(DOWN) position is all the way down and out of roadway. (See Fig 8)

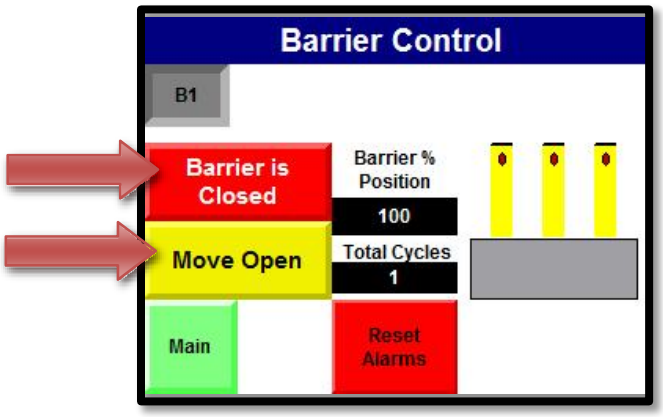


Figure 8, Barrier Control Menu

NOTE
If the Peak Current is higher than 20 Amp, call RSSI for support.

NOTE
If the barrier post assembly is not flush with the roadway (protruding from barrier), refer to Step 5 in Attachment 2.

FROM THE MAINTENANCE TOUCH SCREEN IN THE BCP

Homing the Barrier

1. Turn on Fuse FU1. On the maintenance touch screen in the BCP, go to the main screen and check for any alarms and reset or clear.
2. At the Main Screen, go to the LOGIN box and login: "**RSSI"** password: "**32404"**.
3. Ensure the area is clear for movement of the barrier. Once you have logged in at the Main screen, select the HOME box and then at the HOME menu press the red HOME button. The Home button will flash while homing and barrier will creep down, once it has completed the process the green BARRIER HOMED button will appear. The barrier is now homed, select Main to return to main screen.

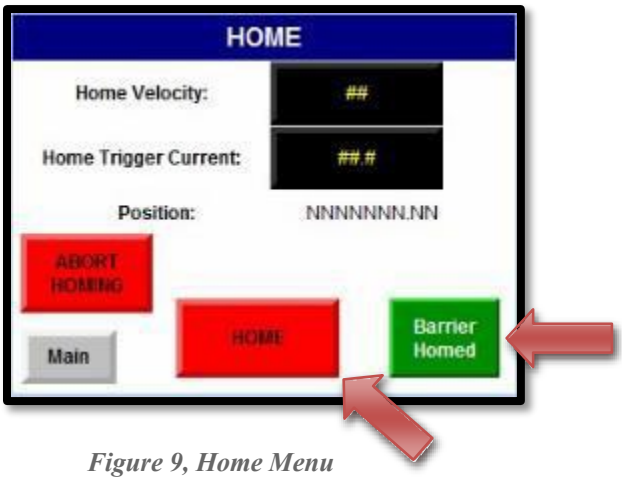


Figure 9, Home Menu

Barrier Control

1. From the MAIN MENU, press the BARRIER CONTROL button (See Fig 10).

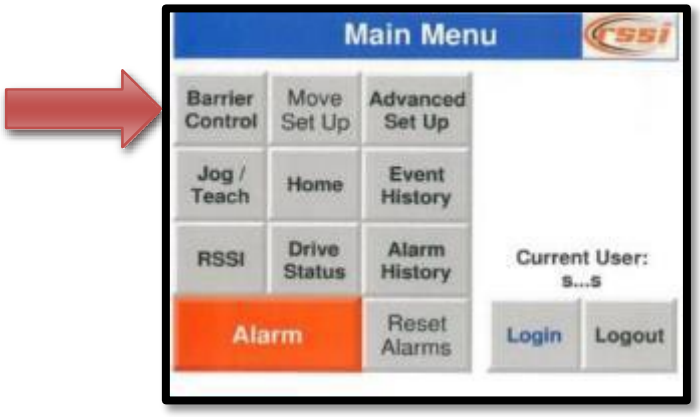


Figure 10, Main Menu

2. Inside the BARRIER CONTROL menu use the MOVE CLOSED/OPEN buttons to operate the barrier a few cycles, measure the post assembly in the CLOSED(up) position to ensure it reaches 35-36 inches and ensure the OPEN(down) position is all the way down and out of roadway. (See Fig 11)

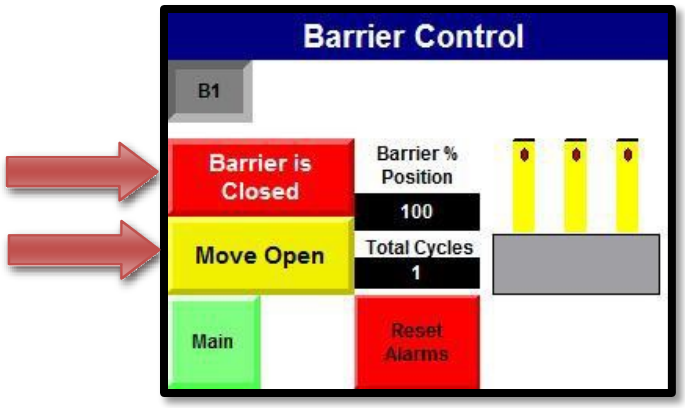


Figure 11, Barrier Control Menu

NOTE
If the Peak Current is higher than 20 Amp, it may indicate that the barrier position needs to be adjusted. Refer to Step 5 in Attachment 2.

NOTE
If the barrier post assembly is not flush with the roadway (protruding from barrier), refer to Step 5 in Attachment 2.

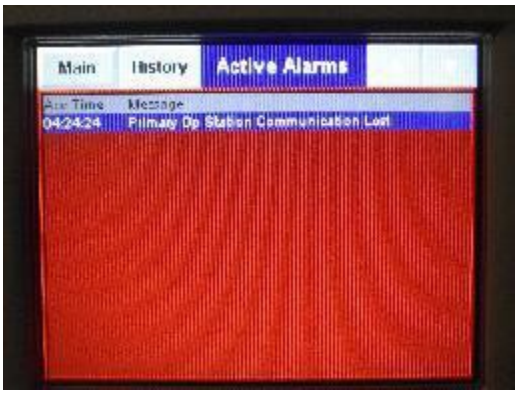
ATTACHMENT 2 - INITIATE ADVANCED MAINTENANCE OPERATIONS (FROM MAINTENANCE TOUCH SCREEN IN BCP)

The Maintenance Touchscreen located in the BCP (Barrier Control Panel).

NOTE

If you're unsure of the impact of changing a setting, please contact RSSI. See page 3, HOW TO OBTAIN ADDITIONAL FACTORY SUPPORT.

1. ALARM Screen: Clear Active alarms before proceeding).

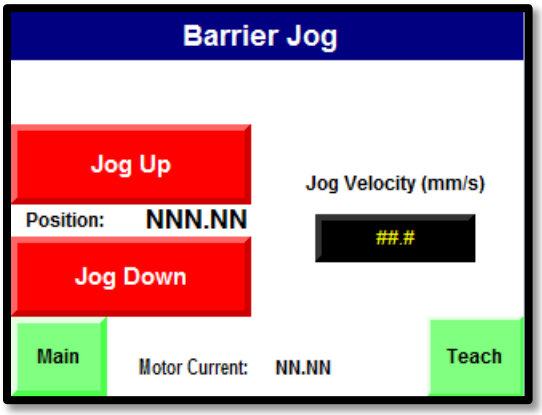


2. LOGIN Screen User= RSSI, PW=32404

3. DRIVE STATUS screen: Drive Status must be DRIVE OK – if it is not, resolve by checking trouble shooting table on page 10.

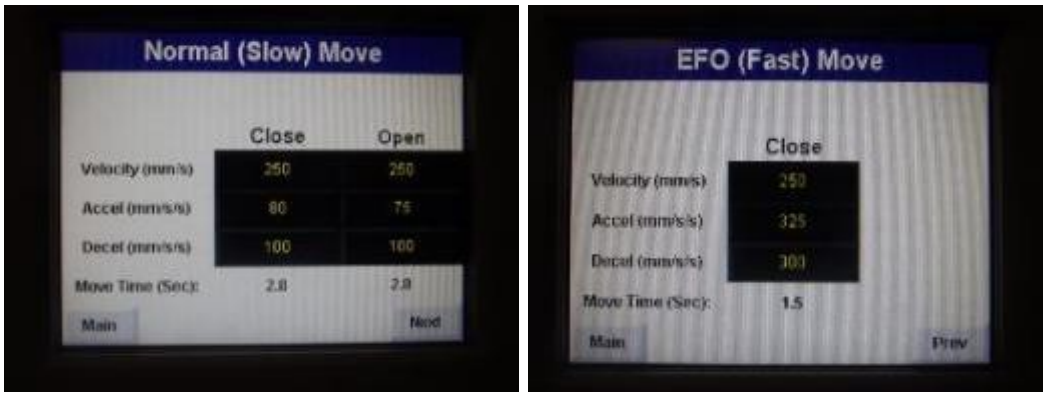
4. HOME Screen: Technician can HOME barrier or abort HOMING, if barrier gets out of HOME again, the touchscreen will show message and direct technician to re-home. If barrier doesn't complete Homing in 30-45 seconds, verify Drive Status in Item 3 above. If Drive is OK, attempt to HOME again. If it doesn't complete Homing a 2nd time, pressing the abort homing button will stop HOMING procedure. Contact RSSI for assistance.

5. JOG/TEACH screens: use JOG to position barrier–then TEACH open/closed lane positions. Closed position should read around -180 and open position should read -2 to -5 depending on roadway. Make sure barrier clears all vehicle including snow removal trucks and doesn't bounce when vehicles roll over barrier.

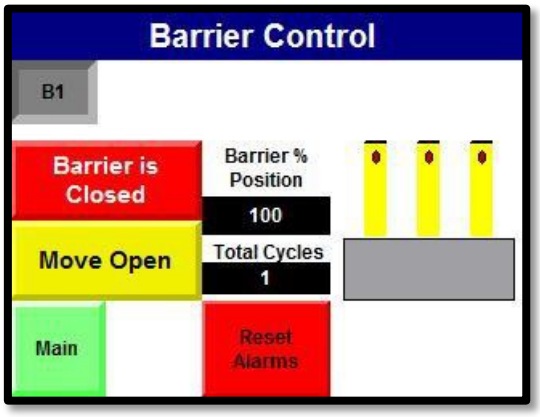


CAUTION
DO NOT change any other settings on this screen without FIRST contacting RSSI. Doing so may change the operating characteristics of your barrier.

6. MOVE screen: using accel/decel to select speed of barrier EFO speed (use defaults)



7. Barrier Control Screen: run barrier through a series of open/close movements while monitoring theAMP indicator. Should be less than 15 amps close lane and less than 10 amps open lane. T/shoot high amp movements before proceeding. Recheck Manual Screw, must be Disengaged.



ATTACHMENT 3- REMOVING BARRIER INSERT FROM VAULT

Tools needed: Always have these tools readily available

1. Cordless impact wrench or ratchet wrench with TORX 45 bit
2. Lifting Straps
3. Forklift

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel.

WARNING

- **Place traffic cones and block roadway from traffic to ensure worker safety.**
- **Use the proper tools to avoid serious personal injury and damage to components.**
- **Never operate this equipment when a vehicle, person or any obstruction is in the way of full operation of the RSS-4000.**

CAUTION

Review Emergency Manual Operation Procedures on page 8

1. Disconnect power to the barrier by turning off the Main Disconnect and lock out with a wire tie or IAW local lockout procedures.

2. Disengage Servo Drive fuse

3. Remove top plate screws with TORX 45 bit, then remove top plates

4. Remove pins that secure insert to vault.

5. Attach Straps or chains, then align forklift to remove Insert. Secure all wiring while insert is being removed from vault. Place the insert securely next to the vault, do not damage wiring.

WARNING

Ensure Straps/Chains are rated to support Insert, approximately 6000lbs

ATTACHMENT 4 - PREVENTATIVE MAINTENANCE CHECKLIST

Make copies of this checklist for maintenance activity for each barrier and maintain a copy in the maintenance binder for the Warranty/Historical Record. For assistance, please call RSSI's service department at (850) 871-9300 or email service@rssi.com.

Name of Person Performing Maintenance:	
Barrier Location:	Barrier Model No:
Barrier Serial No:	Voltage:
Barrier Cycle Count:	Date:

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel.

WARNING

Place traffic cones and block roadway from traffic to ensure worker safety

<u>Refer to Attachment 3 on disconnecting power and removing insert from vault.</u>

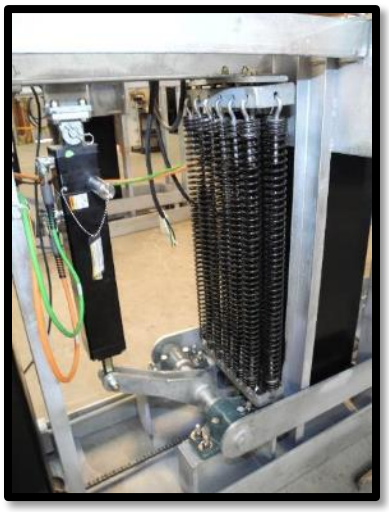
Preventative Maintenance Steps

1. Turn power on to unit (if necessary) to check for proper voltage.
2. Place necessary traffic safety cones to ensure worker safety.
3. Check operation of unit by operating the barrier 3 times. Ensure that the post assembly rotates smoothly and reaches full UP and DOWN positions.
4. Check LED safety lights on barrier for proper operation.
5. Make sure the vehicle barrier is in the UP position and disconnect power to the barrier by turning off the Main Disconnect and lock out with a wire tie or IAW local lockout procedures.

6. Remove Access Plates. Using a cordless drill with a T-45 TORX Head Bit, remove the screws from the access plates. After all screws are removed, move the access plates from the barrier.

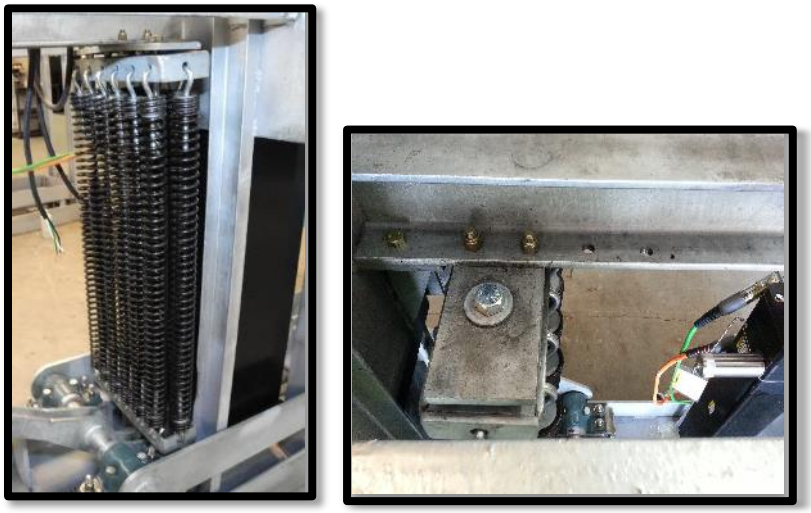
7. Check sump pump and drainage ports (if applicable). Make sure that the drain ports and/or sump pump are clear of debris and the sump pump operates properly.

8. Check Actuator & Spring Assembly Clevis Brackets, Bolts, and Pins. If these connections are not kept tight, it might cause loose motion that could result in excessive wear. Apply lubrication.

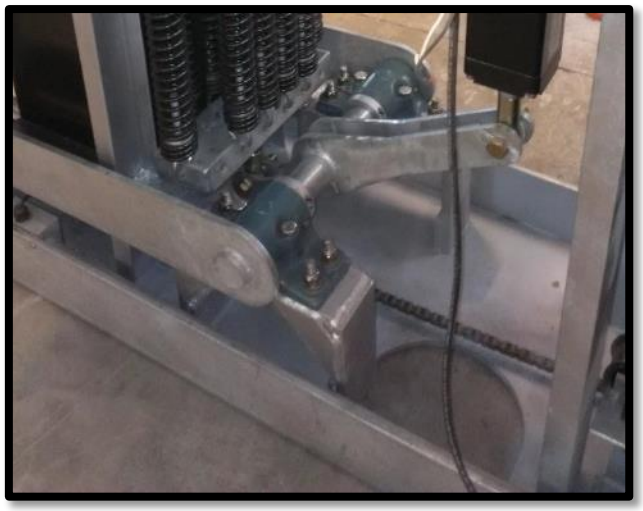


9. Check Chain and Pulleys for excessive wear or debris. Apply lubrication.

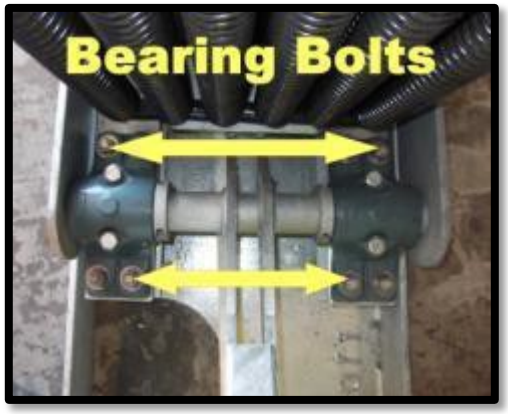
10. Check Spring Assembly. Make sure springs are not broken. Also, check the anchor bolts to ensure none are loose. A loose fit or broken spring might cause excessive wear and improper barrier operation. Apply lubrication.



11. Check Actuator and Spring Assembly Rod-eyes. If these connections are not kept tight, it might cause loose motion that could result in excessive wear. Apply lubrication.



12. Check Split Journal Bearing Bolts. Make sure these are tight. A loose fit might cause excessive wear and improper bollard operation.



13. Check the unit interior for dirt and debris. Check retaining pins anchoring the barrier insert to the vault. Clean or adjust as necessary.
14. Inspect Servo Drive Panel in barrier.
    a. Check cables for damage and ensure all connectors are seated properly.
    b. Check for corrosion on Ethernet Termination at the Servo Drive Panel.
    c. Check for signs of water intrusion in power connector at Servo Drive Panel.
    d. Check Mounting Bolts/Nuts for the Servo Drive Panel. Make sure they are tight.
    e. Check that Servo Drive Panel is not sitting in water (if so, re-check item #7).
15. Check bollards and touch up paint as needed.
16. Check the vault interior for dirt and debris. Remove as necessary.
17. Install Insert back into Vault.
18. Replace the access cover plates and screws. Apply Permatex anti-seize lubricant or equal to screws.
19. Reinstate power to the barrier by turning on the Main Disconnect

20. Remove traffic safety cones.
21. Return barrier to NORMAL operation.
22. Complete this checklist, report any deficiencies to your supervisor, and maintain a copy in files.

ATTACHMENT 5 - REPLACE ACTUATOR

Tools needed: Always have these tools readily available

1. Cordless impact wrench or ratchet wrench with TORX 45 bit
2. Cordless drill with adapter for 15/16 socket
3. Flashlight and gloves

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel.

WARNING

- **Place traffic cones and block roadway from traffic to ensure worker safety.**
- **Use the proper tools to avoid serious personal injury and damage to components.**
- **Never operate this equipment when a vehicle, person or any obstruction is in the way of full operation of the RSS-4000.**

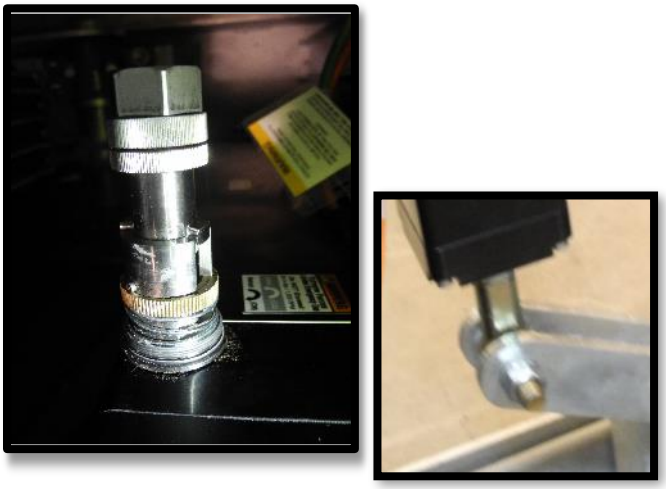
CAUTION
Review Emergency Manual Operation Procedures on page 8

Refer to Attachment 3 on disconnecting power and removing insert from vault.

- Disconnect the power (orange) and control (green) cables from actuator, taking care not to contaminate connectors with dirt, debris and water. Protect if necessary.

- Engage and adjust the manual adjustment screw (review Manual Operating Procedures on Page 8) on top of actuator until you can easily remove the connecting bolt at the actuator

rod end.



WARNING

DO NOT hammer out pins, this will damage the actuator

- Remove actuator mount pin, taking care not to let actuator fall. Remove actuator.

- Inspect all pins and mounting hardware for excessive wear and replace if necessary.
- Install new actuator in reverse order, adjust manual adjustment screw by hand until rod eye can be slipped back into pivot arm and easily pinned.

WARNING

(DO NOT FORCE). MANUAL ADJUSTMENT LOCKOUT MUST BE DISENGAGED BEFORE ACTUATOR IS MOVED ELECTRICALLY AGAIN OR DAMAGE WILL OCCUR. (review manual screw lockout adjustment instructions on page 8)

- Re-connect power and control connectors, taking great care to line up keyways and hand tightening connectors back onto the actuator. Inspect connector's ends for dirt and water.

WARNING

DO NOT OVER-TIGHTEN, DAMAGE TO SEAL MAY OCCUR.

WARNING

MANUAL ADJUSTMENT LOCKOUT SCREW MUST BE DISENGAGED BEFORE ACTUATOR IS MOVED ELECTRICALLY AGAIN OR DAMAGE WILL OCCUR.

- Clear barrier area of tools and top plates

- Place insert back into vault.

- Reinstate power to the barrier by turning on the Main Disconnect

- Push in Servo drive fuse
- Home the barrier then set positions from the Maintenance Touchscreen (see Attachments 1&2)
- Reinstall top plate over actuator with 6 each TORX 45 screws you removed or replace if corroded or damaged
- Run the barrier up and down from barrier control menu.
- Return barrier to service.

ATTACHMENT 6 – Replacing Water/Debris Sensor

1. Remove cable from bottom of sensor.

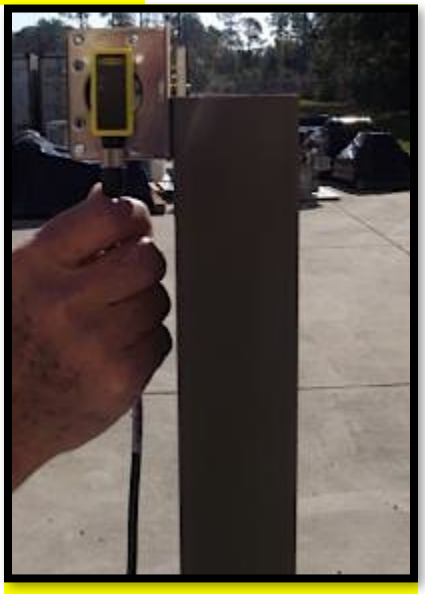
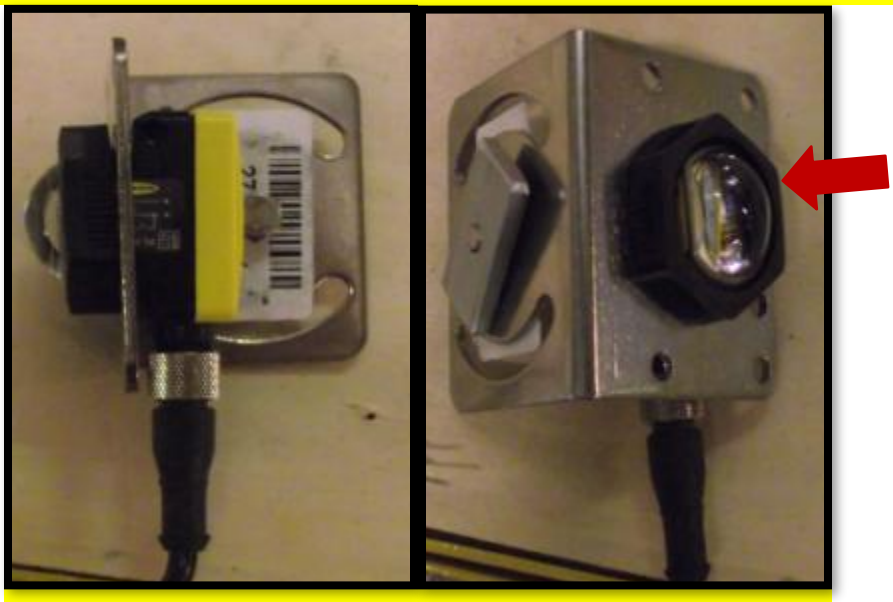


Figure 1, IR Sensor and Mounting Bracket

2. Remove Sensor from mounting bracket by removing 1-1/2” nut from front of sensor or by removing two screws from sensor. This will depend on the type of sensor you have onsite.



Replace Pic w/ diffusor sensor ***Figure 2, IR Pole Top***

3. Align IR Beams and/or adjust Sensor. Ensure the mounting bracket did not move during installation.

    - Each sensor has a green Power ON/OFF indicator and yellow indicators for the selected modulation frequency. In addition, receivers have a yellow LED that lights when the outputs are conducting, plus a 4-element light bar that indicates signal strength, relative to the switch point (the higher the number lit, the more light is received).

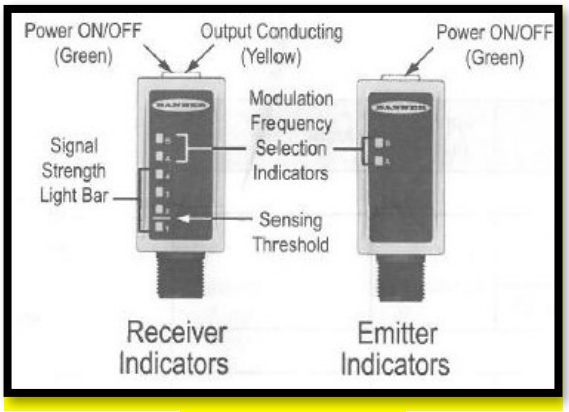


Figure 6, IR Sensor

    - Adjust the emitter first, then the receiver. Verify that both sensors are wired for the same modulation frequency, then adjust the emitter's position until the receiver signal strength light bar indicates its highest amount of signal received (the highest number lit). Tighten the emitter mounting hardware, then repeat the process for the receiver.
    - To achieve the best crosstalk immunity, position a single matched emitter within the receiver's field of view (15 degrees). When it is necessary to position an alternate emitter in the receiver's field of view, sensor alignment is required to ensure

Need Manual recommended adjustments/pics on the Diffusor sensor.

ATTACHMENT 7 – REPLACE SUMP PUMP

TOOLS NEEDED:

4. Phillips Head Screw Driver
5. Wire cutter and crimper
6. Waterproof Connectors
7. Heat Gun

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

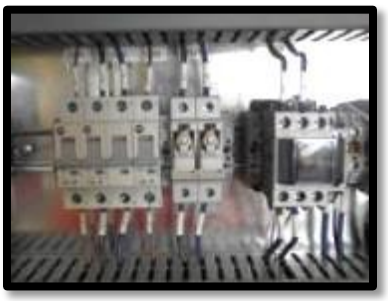
All Maintenance Operations must be coordinated with site personnel.

WARNING

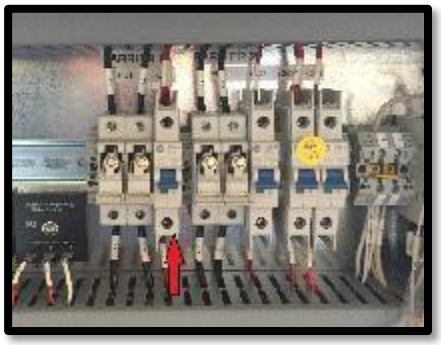
- **Place traffic cones and block roadway from traffic to ensure worker safety.**
- **Use the proper tools to avoid serious personal injury and damage to components.**

Refer to Attachment 3 on disconnecting power and removing insert from vault.

1. Turn off Drive Fuse inside BCP.



2. Turn off 120V circuit breaker to Sump Pump

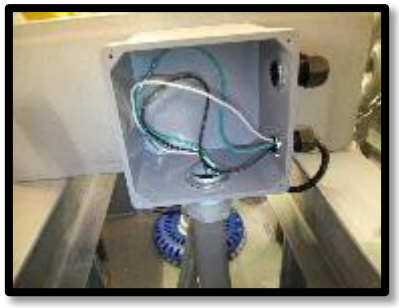


3. Remove Top Plate from Barrier and Cover from Power JBox.

6. Cut SP1 (black wire), 2 (white wire), and Ground (green wire) terminations to sump pump inside Power JBox.

7. Cut zip ties on older sump pump wires. Then disconnect PVC pipe by removing set screw on top of PVC pipe. Then remove sump pump from barrier.

8. Install new pump, then connect 1”PVC. Run new sump pump wires to Power JBox. Only the SP1 (black wire), 2 (white wire), and Ground (green wire).



9. Terminate Black wire to SP1,White wire to 2 and Green wire to Ground inside the Power JBox using water proof connectors.

10. Reinstate power to the barrier by turning on the Main Disconnect

11. Return power to the Sump Pump by turning back on the circuit breaker. The Sump Pump will cycle once power is restored, if no water is present pump will stop.
12. Re-install cover on Power JBox, then re-install steel top plate.
13. Once the top plate is replaced and traffic lane is clear, turn on breaker FU1 inside Panel.
14. Return barrier to normal operation.

ATTACHMENT 8a –Replace FEIG Loop Sensor

Please refer to Attachment 7b for EMX Loop Sensors.

TOOLS NEEDED

1. Phillips Head Screw Driver

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel

1. Turn off the power to the barrier you're working on (24v power supply).
2. Remove the frequency plug with the wires from the safety loops.

3. Make note of the sensitivity settings on Safety Loop Sensor.
4. Disconnect the terminations from the defective Safety Loop Sensor.
5. Remove safety loop sensor from Din Rail and replace with new one.
6. Reattach terminations for Safety Loop Sensor and set dip switches for sensitivity.
   - Factory settings are to the left, reset bottom two dipswitches to the right (train to infinity and normally open).
   - Top two dipswitches are sensitivity settings. Factory settings are to the left (low sensitivity), reset sensitivity to high (top two dipswitches to the right

NOTE
Sensitivity settings are Low, Medium Low, Medium High, High

7. Replace frequency plug and restore power to the barrier. Loop detector should flash red/ green and then go to solid green indicator light.). Test safety loop sensitivity and make adjustments as needed.

NOTE

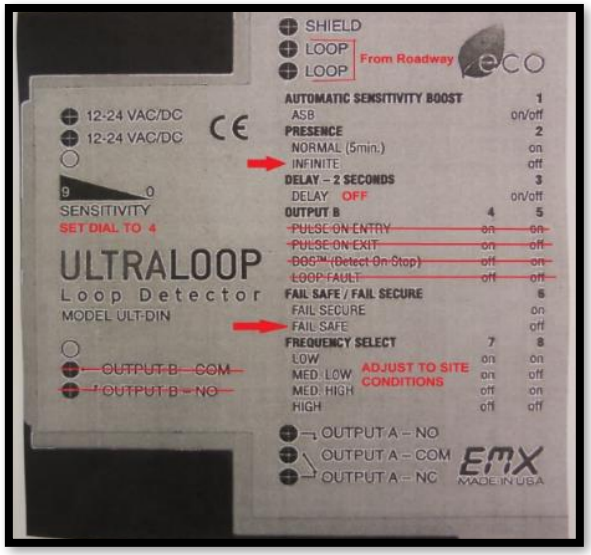
Ensure safety loops are clear before powering safety loop detectors.

8. Conduct a test of safety loops for functionality.
9. Return barrier to operation.

Attachment 8b- Replace EMX Loop Sensor

1. Remove the incoming loop wires from the sensor.

2. Make note of the settings on Safety Loop Sensor.
3. Disconnect the terminations from the defective Safety Loop Sensor.
4. Remove safety loop sensor from Din Rail and replace with new one.
5. Reattach terminations for Safety Loop Sensor and set dip switches.
   - Recommended Factory Settings:



ATTACHMENT 9 – REPLACE SPRING

TOOLS NEEDED:

1. One electric or air impact drill
2. 1-1/8th inch socket and 1-1/8th inch open or boxed end wrench.
3. TORX 45 bit

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel

WARNING

- **Place traffic cones and block roadway from traffic to ensure worker safety.**
- **Use the proper tools to avoid serious personal injury and damage to components.**
- **Never operate this equipment when a vehicle, person or any obstruction is in the way of full operation of the RSS-4000.**

<u>Refer to Attachment 3 on disconnecting power and removing insert from vault.</u>

1. Using the Barrier Controls, raise the barrier to the UP position. This will take the tension off the spring assembly.

2. Disconnect power to the barrier by turning off the Main Disconnect and lock out with a wire tie or IAW local lockout procedures.

3. Turn off the power to the barrier you're working on (Turn off FU fuse in BCP).

4. Loosen Tension Bolts and Bracket; the tension bolts and brackets plate will be fully tightened.

5. Loosen the tension bolts evenly, until spring assembly has some slack in the springs.

6. Remove broken spring by taking hook from top and bottom of the spring brackets. Install new spring in reverse order.

7. Tighten tension bolts evenly all the way to mounting bolts/nuts.
8. Install insert back into vault then put top plates back on barrier.
9. Reinstate power to the barrier by turning on the Main Disconnect

10. Open the Barrier Control Panel and turn ON the Servo Drive of the affected barrier by re-engaging the Servo Drive fuse.
11. Conduct an operational test…exercise barrier 8-10 cycles while observing spring assembly functionality.
12. Replace top plate.
13. Return barrier to service.

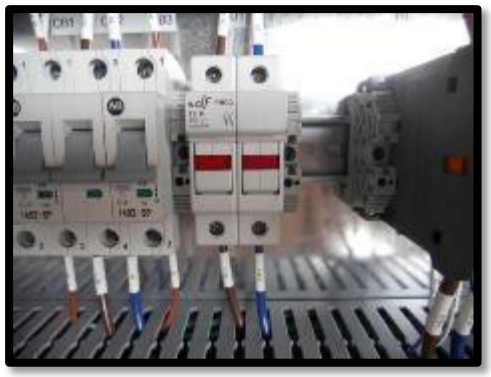
ATTACHMENT 10 - REPLACE SERVO DRIVE FUSE

TOOLS NEEDED: None

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel

1. Ensure Servo Drive Fuse is closed



2. Disconnect power to the barrier by turning off the Main Disconnect and lock out with a wire tie or IAW local lockout procedures.

3. Dis-engage Servo Drive Fuse Holder

4. Remove old Fuse, check with meter and replace with new one

5. Reinstate power to the barrier by turning on the Main Disconnect

6. Re-engage Servo Drive Fuse Holder
7. Servo Drive should power up
8. Return barrier to service.

ATTACHMENT 11 – REPLACE LED TRAFFIC LIGHT

TOOLS NEEDED

1. Phillips Head Screwdriver
2. Pliers

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

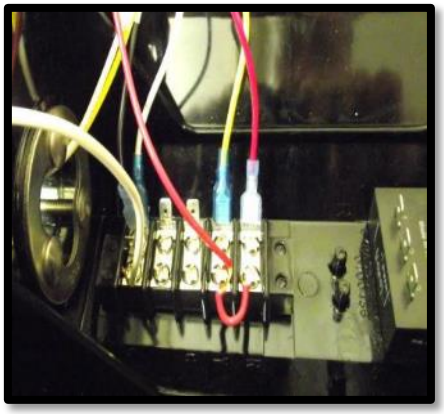
All Maintenance Operations must be coordinated with site personnel. Turn off the power to the barrier you're working on (24v power supply).

1. Loosen exterior Traffic Lens Cover wing screws (use pliers if not hand tight)

2. Open hinged cover to access LED light and interior terminal connections.

3. Loosen Tabs holding lens in place with a Phillips Head Screw Driver.

4. Remove wires for old LED Light from interior terminal block.



5. Remove old LED light and replace with new LED light.
6. Rewire new LED light to interior terminal block.
7. Tighten Tabs holding lens in place with a Phillips Head Screw Driver.
8. Close hinged cover and tighten cover wing screws.
9. Turn power back on (24v power supply) and conduct an operational test to verify Traffic Light functionality.
10. Return barrier to service.

ATTACHMENT 12 – REPLACE IR or Diffusor Sensor

8. Remove cable from bottom of sensor.

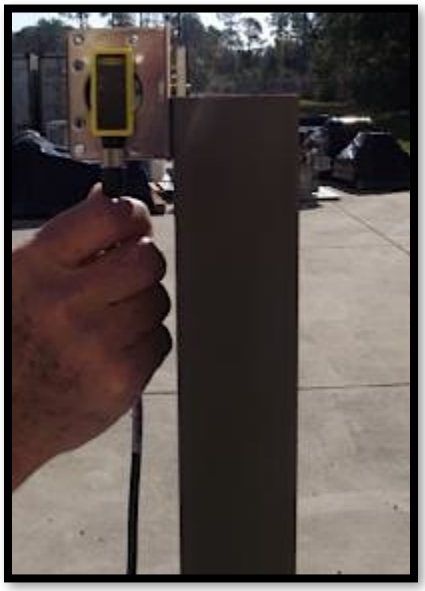
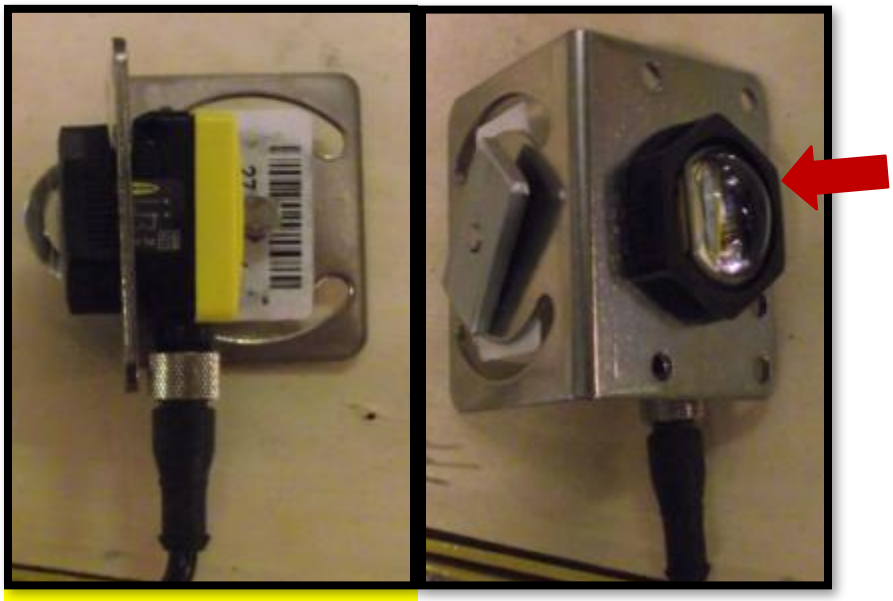


Figure 1, IR Sensor and Mounting Bracket

9. Remove Sensor from mounting bracket by removing 1-1/2" nut from front of sensor or by removing two screws from sensor. This will depend on the type of sensor you have onsite.



Replace Pic w/ diffusor sensor

Figure 2, IR Pole Top

10. Align IR Beams and/or adjust Sensor. Ensure the mounting bracket did not move during installation.

    - Each sensor has a green Power ON/OFF indicator and yellow indicators for the selected modulation frequency. In addition, receivers have a yellow LED that lights when the outputs are conducting, plus a 4-element light bar that indicates signal strength, relative to the switch point (the higher the number lit, the more light is received).

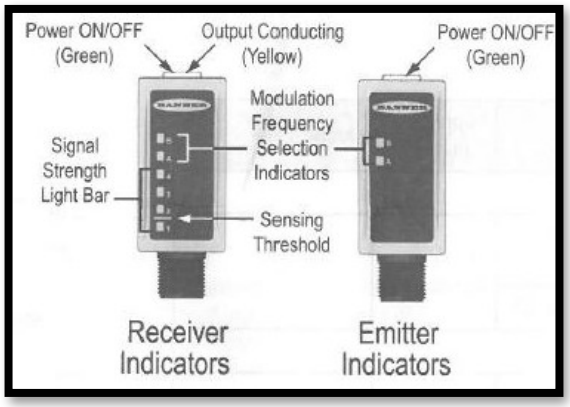


Figure 6, IR Sensor

    - Adjust the emitter first, then the receiver. Verify that both sensors are wired for the same modulation frequency, then adjust the emitter's position until the receiver signal strength light bar indicates its highest amount of signal received (the highest number lit). Tighten the emitter mounting hardware, then repeat the process for the receiver.
    - To achieve the best crosstalk immunity, position a single matched emitter within the receiver's field of view (15 degrees). When it is necessary to position an alternate emitter in the receiver's field of view, sensor alignment is required to ensure

Need Manual recommended adjustments/pics on the Diffusor sensor.

ATTACHMENT 13 - REPLACE SERVO DRIVE PANEL IN BARRIER

The Servo Drive Panel is a waterproof housing and can be easily removed and replaced as a sealed unit. Do not remove sealed actuator cable connectors from the Servo Drive Panel, remove the connectors at the actuator; remove sealed unit and cables together. The replacement unit will include the cables and can be easily reconnected. The Power and Ethernet connectors are removed at the sealed servo Panel unit and reconnected to the new Servo Drive Panel unit.

WARNING

The Servo Drive Panel should ONLY be opened at the RSSI factory. It is considered a "LRU" Line Replacement Unit. Opening this box VOIDS THE WARRANTY.

TOOLS NEEDED

1. Cordless impact wrench or ratchet wrench with TORX 45 bit
2. 3/4 inch wrench
3. 7/16 inch wrench
4. Flashlight and gloves

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel

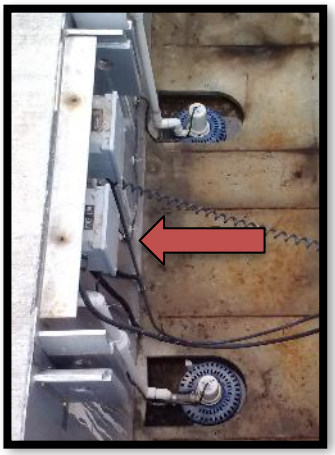
WARNING

- **Place traffic cones and block roadway from traffic to ensure worker safety.**
- **Use the proper tools to avoid serious personal injury and damage to components.**
- **Never operate this equipment when a vehicle, person or any obstruction is in the way of full operation of the RSS-4000.**

<u>Refer to Attachment 3 on disconnecting power and removing insert from vault.</u>

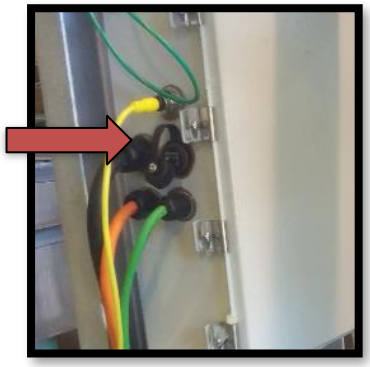
CAUTION
DO NOT FORCE CONNECTORS TOGETHER, they are keyed in and must be aligned correctly, hand tighten only.

1. Disconnect actuator cables taking care not to drop into dirt or debris (protect connectors)
2. Disconnect Power Cable to Servo Drive from inside J-Box in vault.

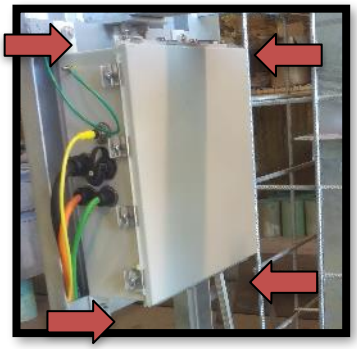


3. Remove plastic ties that hold the actuator cables to barrier beams

4. Disconnect yellow debris sensor cable from sealed drive unit taking care not to contaminate with dirt or debris.



5. Disconnect Ethernet cable from sealed drive unit taking care not to contaminate with dirt or debris.
6. Remove the 4 nuts that secure the sealed Servo Drive Panel to the side of the barrier (3/4”).



7. Disconnect small ground wire from Servo Drive Panel to frame of barrier (7/16”).

8. Remove Servo Drive Box, taking care to guide the actuator and power cables out also.
9. Slide in new Servo Drive Panel taking care to guide the actuator and power cables in carefully.
10. Install the 4 nuts that secure the sealed Servo Drive Panel to the inside of the barrier
11. Reconnect small ground wire from Servo Drive Panel to frame of barrier

NOTE
Use corrosion block to protect connectors.

12. Install Ethernet cable to sealed unit
13. Re-terminate power cable in J-Box using crimp and solder splices.
14. Run the actuator cables back the same way and secure to barrier beams with zip ties
15. Reconnect actuator connectors to actuator.
16. Clear area of tools and top plates.
17. Install Insert back into barrier vault.
18. Reinstate Power to barrier

19. Home the barrier and set positions from the Secondary Operator or Maintenance Touchscreen (see Attachments 1&2)
20. Reinstall top plates with TORX 45 screws you removed or replace if corroded or damaged
21. Run the barrier up and down from barrier control menu.
22. Return barrier to service.

ATTACHMENT 14 - REPLACE BOLLARD LED LIGHTS

TOOLS NEEDED:

1. Phillips Head Screw Driver
2. Wire Cutters/Stripper
3. Water proof Butt Splices and Electrical Tape (in Spare Parts Kit)
4. Heat Gun

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel

WARNING

- **Place traffic cones and block roadway from traffic to ensure worker safety.**
- **Use the proper tools to avoid serious personal injury and damage to components.**
- **Never operate this equipment when a vehicle, person or any obstruction is in the way of full operation of the RSS-4000.**

1. Disconnect power to the barrier by turning off the Main Disconnect and lock out with a wire tie or IAW local lockout procedures.

2. Turn off the power to the barrier you're working on (24v power supply).
3. Remove screws holding LED in place.

4. Remove tape and cut wires on the inside of the water proof butt splices.

Replace w/ pic of LED with pigtail plug

5. Rewire LED Lights, terminate with a waterproof butt splice and tape connection.
6. Reinstate power to the barrier by turning on the Main Disconnect

7. Conduct a test to verify LED Lights are functioning properly.
8. Return barrier to operation.

ATTACHMENT 15a - REPLACE TIME DELAY RELAY IN BBP

TOOLS NEEDED: None

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel.

1. Disconnect power to the barrier by turning off the Main Disconnect and lock out with a wire tie or IAW local lockout procedures.

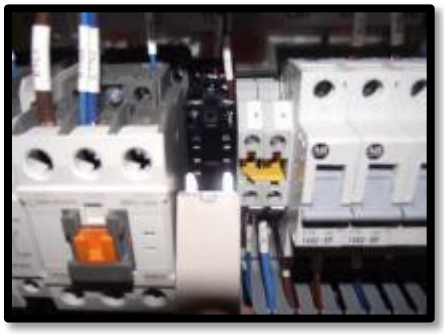
2. Turn off top switch on inverter.

3. Turn off main incoming power to BBP (CB1).

4. Grasp Time Delay Relay with thumb and finger then pull straight out.

5. Ensure Time Delay Relay dip switches are set properly (out of the box, all dip switches are set to the left; adjust the top dip switch to right and leave the remaining three to the left)

6. Install new Time Delay Relay, be cautious as you line up the pins. Ensure dial on the relay is set to 4 seconds.



7. Return main incoming power to BBS by turning on CB1. Ensure Contactor C1 engages.
8. Turn Inverter switch back to the ON position.
9. Reinstate power to the barrier by turning on the Main Disconnect
10. Return barrier to normal operation.

ATTACHMENT 15b - Replace Voltage Monitor Relay In BBP

NOTE:
The newer barrier systems include a Voltage Monitor Module versus a Time Delay Relay in the BBP. The instructions below are for replacement of the Voltage Monitor Module

TOOLS NEEDED: Small electrical screwdriver

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

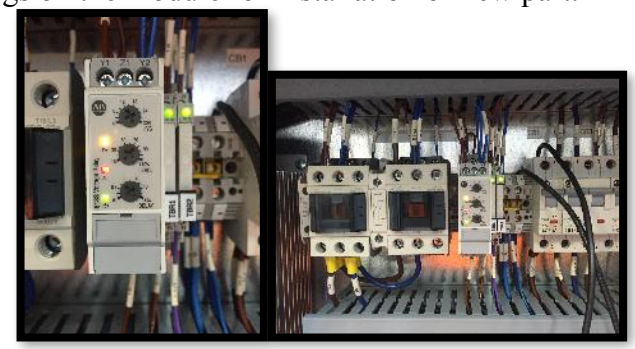
All Maintenance Operations must be coordinated with site personnel.

1. Disconnect power to the barrier by turning off the Main Disconnect and lock out with a wire tie or IAW local lockout procedures.

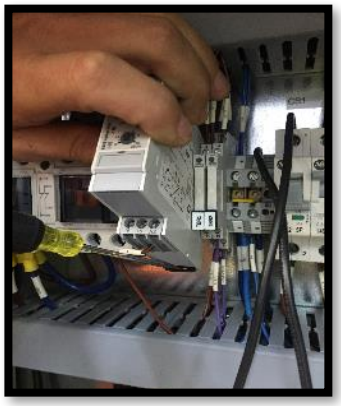
2. Turn off top switch on inverter.

3. Turn off main incoming power to BBP (CB1).

4. Note the wiring and settings on the module for installation of new part.

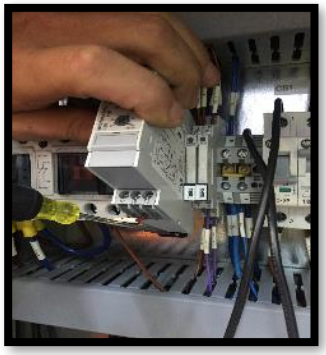


5. Grasp Voltage Monitor Module and release from dinrail with small screwdriver



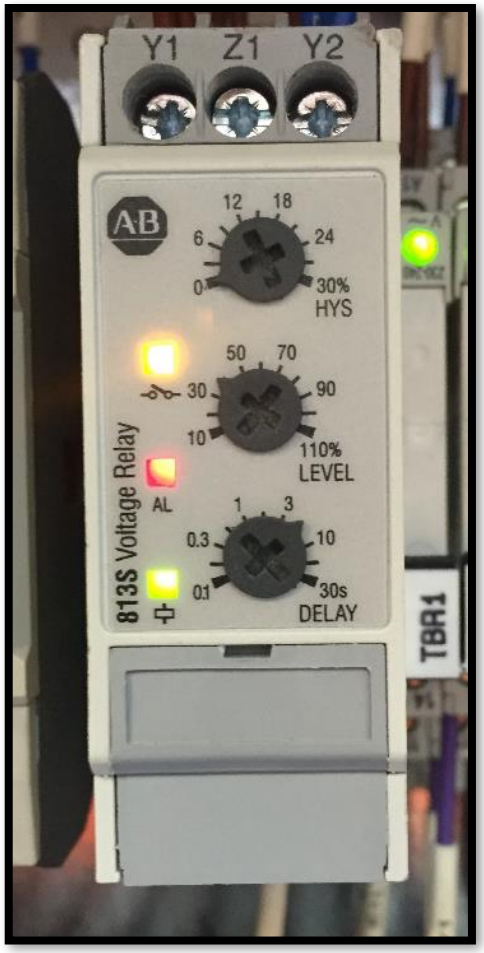
6. Disconnect all wires then remover defective module.

7. Replace wires on new module and re-install onto dinrail, reverse procedure above.



8. Turn Inverter switch back to the ON position.
9. Reinstate power to the barrier by turning on the Main Disconnect
10. Return barrier to normal operation.

Factory Default Settings below:



ATTACHMENT 16 - REPLACE SURGE PROTECTION MODULE IN BBP

TOOLS NEEDED: None

BEFORE YOU INITIATE MAINTENANCE OPERATIONS

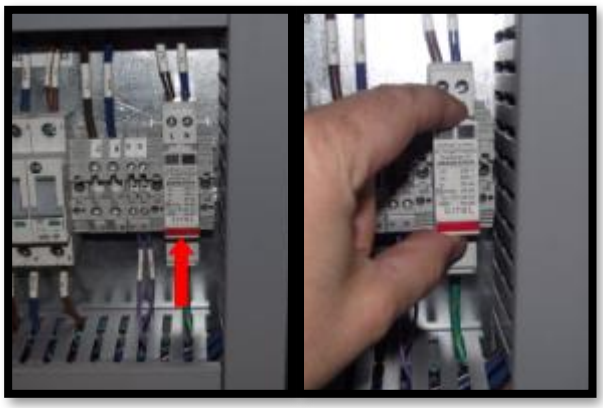
All Maintenance Operations must be coordinated with site personnel.

NEED PICS OF INTERMATIC SPD for RSS4000, the one below is for DOS versions only.

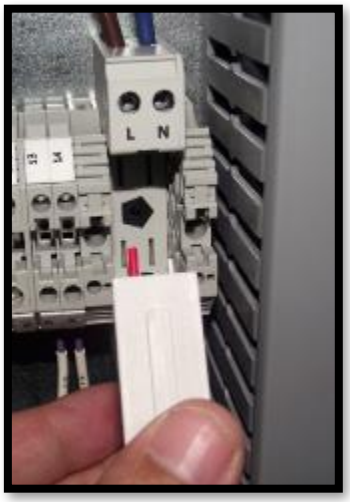
NOTE
Surge Protection Module is equipped with RED indicators on the front of device to inform you if the device has Failed. Please ensure the Module has Failed before replacing.

1. Turn off ALL Circuit Breakers

2. Locate the Surge Protection Module, then using your thumb and finger pull out pluggable center module from device.



3. Install new pluggable module into Surge Protection Device. Ensure tabs are lined up and module is seated securely.



4. Turn ON CB1, wait 4 seconds for transfer switch, then turn on CB2, & CB3. Then monitor Surge Protection Module to ensure it does not Fail once power is turned on.
5. Return barrier to normal operation.

ATTACHMENT 17 - REPLACE 24 VDC POWER SUPPLY IN BCP

TOOLS NEEDED:

a. Small Phillips Head Screwdriver
b. Small Straight Head Screwdriver
c. Volt Meter

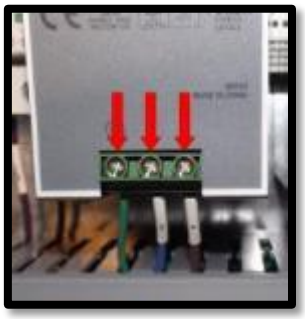
BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel.

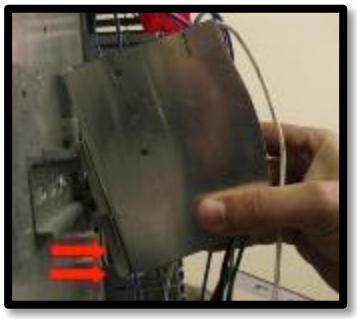
1. Disconnect power to the barrier by turning off the Main Disconnect and lock out with a wire tie or IAW local lockout procedures.

2. Turn the 24V breaker to the OFF position.

3. Remove the 3 wires on the TOP and BOTTOM of the affected 24VDC Power Supply. (note wire locations for re-termination)



4. Remove Power Supply from the Panel railing by pulling down on white tab on the bottom of the Power Supply, then pulling out and up from the bottom of the Power Supply.



5. Install the new Power Supply onto Panel railing by reversing step 4 above.
6. Re-terminate the three wires on the TOP and BOTTOM of the new Power Supply.
7. Reinstate power to the barrier by turning on the Main Disconnect

8. Then turn on the affected 24VDC breaker.
9. Ensure 24VDC devices have powered up (check for 24 VDC with Voltmeter).
10. Return barrier to normal operation.

ATTACHMENT 18 – REPLACING TOUCHSCREENS

Replace Touchscreens

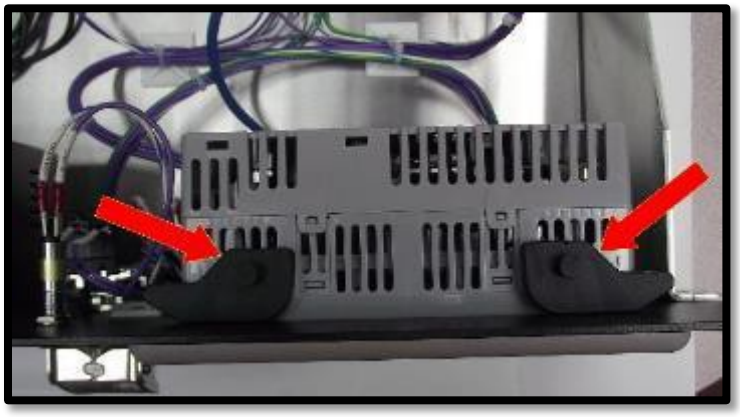
BEFORE YOU INITIATE MAINTENANCE OPERATIONS

All Maintenance Operations must be coordinated with site personnel

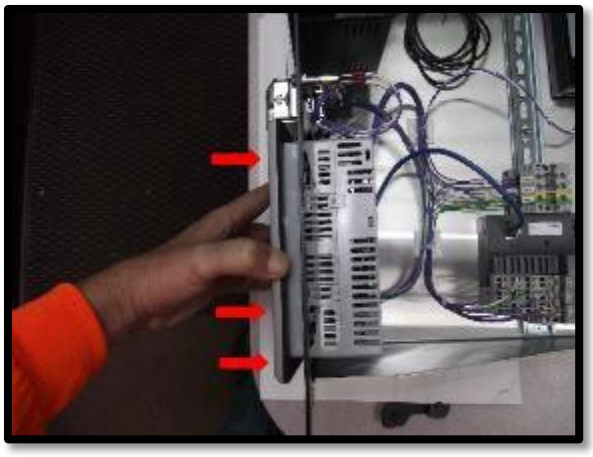
1. Remove (unplug) 24vdc power and Ethernet patch cable

2. Locate 4 black plastic locking clips on rear of screen

3. Remove by rotating plastic clips until they release



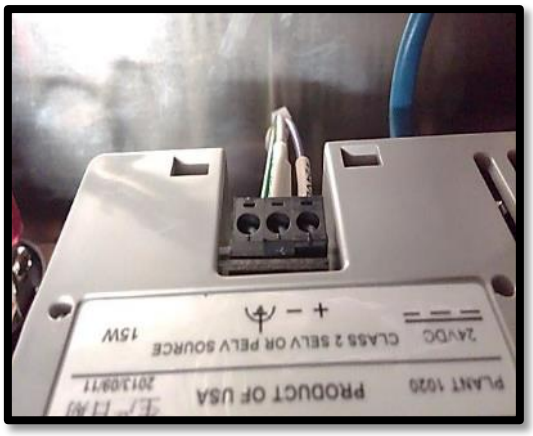
4. Replace with new touchscreen



5. Attach 4 black plastic locking clips by rotating until snug against faceplate

CAUTION
Do not over tighten clips, this will cause sensitivity issues on touchscreen

6. Replace (plug in) the 24vdc and Ethernet patch cable



7. Allow touch Screen to reboot then test operation. Call RSSI if you have any issues with operation.