

# RoboScrub 20

## Service Manual



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## Technical Specifications

### Technical Specifications

**Model** RoboScrub 20  
All Models beginning with: MR20-AI

MODEL	AUTONOMOUS MAX RIDE 20 (MR20-AI SERIES)
DIMENSIONS WITH SQUEEGEE	56 IN LENGTH X 29 IN WIDTH X 45 IN HEIGHT (142.24 CM X 73.66 CM X 114.3 CM)
WEIGHT	342 LBS (155.13 KG)
WEIGHT WITH BATTERIES AND FULL SOLUTION	691 LBS (313.43 KG)
SOLUTION TANK CAPACITY	16 GAL (60 L)
CLEANING PATH WIDTH	20 IN (50.8 CM)
SQUEEGEE WIDTH	25 IN (63.5 CM)
MINIMUM TURN AROUND AISLE WIDTH	54 IN (137.16 CM)
MAXIMUM MANUAL PRODUCTIVITY RATE	24,500 FT <sup>2</sup> \HR (2276 M <sup>2</sup> \HR)
MAXIMUM AUTONOMOUS PRODUCTIVITY RATE	20,400 FT <sup>2</sup> \HR (1895 M <sup>2</sup> \HR)
MAXIMUM MANUAL SPEED	3 MPH (4.8 KPH)
MAXIMUM AUTONOMOUS SPEED	1.5 MPH (2.4 KPH)
SCRUB HEAD TYPE	DISC
BRUSH PRESSURE	FLOATING - LOCKED
BRUSH MOTOR	400-600 WATTS
BRUSH SPEED	180 RPM
SOLUTION FLOW (LOW TO HIGH)	0-0.4 GPM (0-1.5 LPM)
VACUUM MOTOR	550 WATTS
VACUUM AIRFLOW	69 CFM (32.56 L\SEC)
VACUUM WATERLIFT	68 IN H <sub>2</sub> O (172.72 CM H <sub>2</sub> O)
SOUND PRESSURE\DECIBEL RATING	68 DBA
BATTERIES	(2) 12V 234Ah AGM SEALED, MAINTENANCE-FREE
BATTERY CHARGER	OFFBOARD/SHELF
MAXIMUM RUN TIME	3.30 - 4 HOURS
MACHINE VOLTAGE	24 VDC
MAXIMUM INCLINE/DECLINE GRADE LEVEL	0% ROBOTIC, 2% MANUAL
APPROVALS	NONE
IP PROTECTION CLASS	IPX4

## **Wearable Items**

Wearable items such as brushes, filters, gaskets, hoses, bulbs, switches, squeegee blades, cords, tires, wheels, carbon brushes, are not covered by warranty, unless defective within the first 90 days.

## **Damage by Operator**

Warranty does not cover damage caused by operator abuse, improper use or lack of negligence.

## Limited Warranty

### Minuteman International Made Simple Commercial Limited Warranty

#### REVISION Q EFFECTIVE 4/10/18

Minuteman International, Inc. warrants to the original purchaser/user that the product is free from defects in workmanship and materials under normal use. Minuteman will, at its option, repair or replace without charge, parts that fail under normal use and service when operated and maintained in accordance with the applicable operation and instruction manuals. All warranty claims must be submitted through and approved by factory authorized repair stations.

This warranty does not apply to normal wear, or to items whose life is dependent on their use and care, such as belts, cords, switches, hoses, rubber parts, brushes, electrical motor components or adjustments. Parts manufactured by Minuteman are covered by and subject to the warranties and/or guarantees of their manufacturers. Please contact Minuteman for procedures in warranty claims against these manufacturers.

**Special warning to purchaser** – Use of replacement filters and/or pre-filters not manufactured by Minuteman or its designated licensees, will void all warranties expressed or implied. A potential health hazard exists without original equipment replacement.

All warranted items become the sole property of Minuteman or its original manufacturer, whichever the case may be.

Minuteman disclaims any implied warranty, including the warranty of merchantability and the warranty of fitness for a particular purpose. Minuteman assumes no responsibility for any special, incidental or consequential damages.

This limited warranty is applicable only in the U.S.A. and Canada, and is extended only to the original user/purchaser of this product. Customers outside the U.S.A. and Canada should contact their local distributor for export warranty policies. Minuteman is not responsible for costs or repairs performed by persons other than those specifically authorized by Minuteman. This warranty does not apply to damage from transportation, alterations by unauthorized persons, misuse or abuse of the equipment, use of non-compatible chemicals, or damage to property, or loss of income due to malfunctions of the product.

If a difficulty develops with this machine, you should contact the dealer from whom it was purchased.

This warranty gives you specific legal rights, and you may have other rights which vary from state to state. Some states do not allow the exclusion or limitation of special, incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above exclusions and limitations may not apply to you.

Model	Parts	Labor	Poly	Travel**
Cord Electric Group	5yrs	3yrs	12yrs	90 days
Battery Auto Scrubbers (incl. on board charger)	5yrs	3yrs	12yrs	90 days
Battery and Manual Sweepers	3yrs	3yrs	12yrs	90 days

**Exceptions.....**

Model	Parts	Labor	Poly	Travel**
Port A Scrub, all models (incl. on board charger)	1yr	6months	12yrs	90 days
A3S Blower	1yr	1yr	0	0
Phenom Dual Motor Upright Vacuums	2yrs	2yrs	0	0
Explosion Proof Vacuum	1yr	1yr	0	0
Propane Burnisher	1yr	1yr	0	90 days
E14BQP and E14115 scrubber	1yr	1yr	12yrs	90 days
EZ-Mop	1yr	1yr	0	90 days
ROS-17	1yr	1yr	0	90 days

\*\*Travel, 2 hours max

<i>Stand-alone Battery Chargers:</i>	One year
<i>Replacement Parts:</i>	Ninety days
<i>Batteries:</i>	0-3 months full replacement, 4-12 months pro-rate
<i>Polypropylene Plastic Tanks:</i>	12yr warranty, no additional labor

## Testing and Troubleshooting

### Disconnect Batteries



## Remove back panel

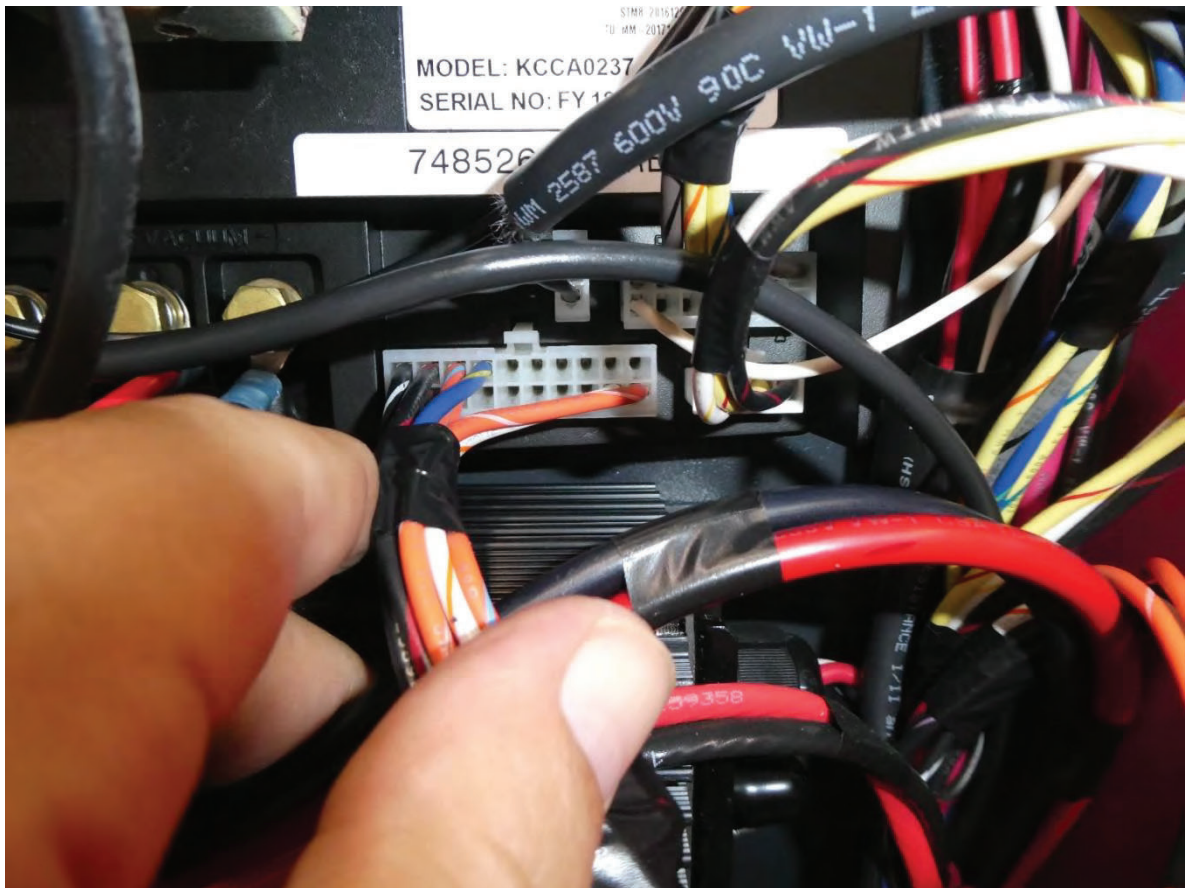




## Secure panel for ease of access



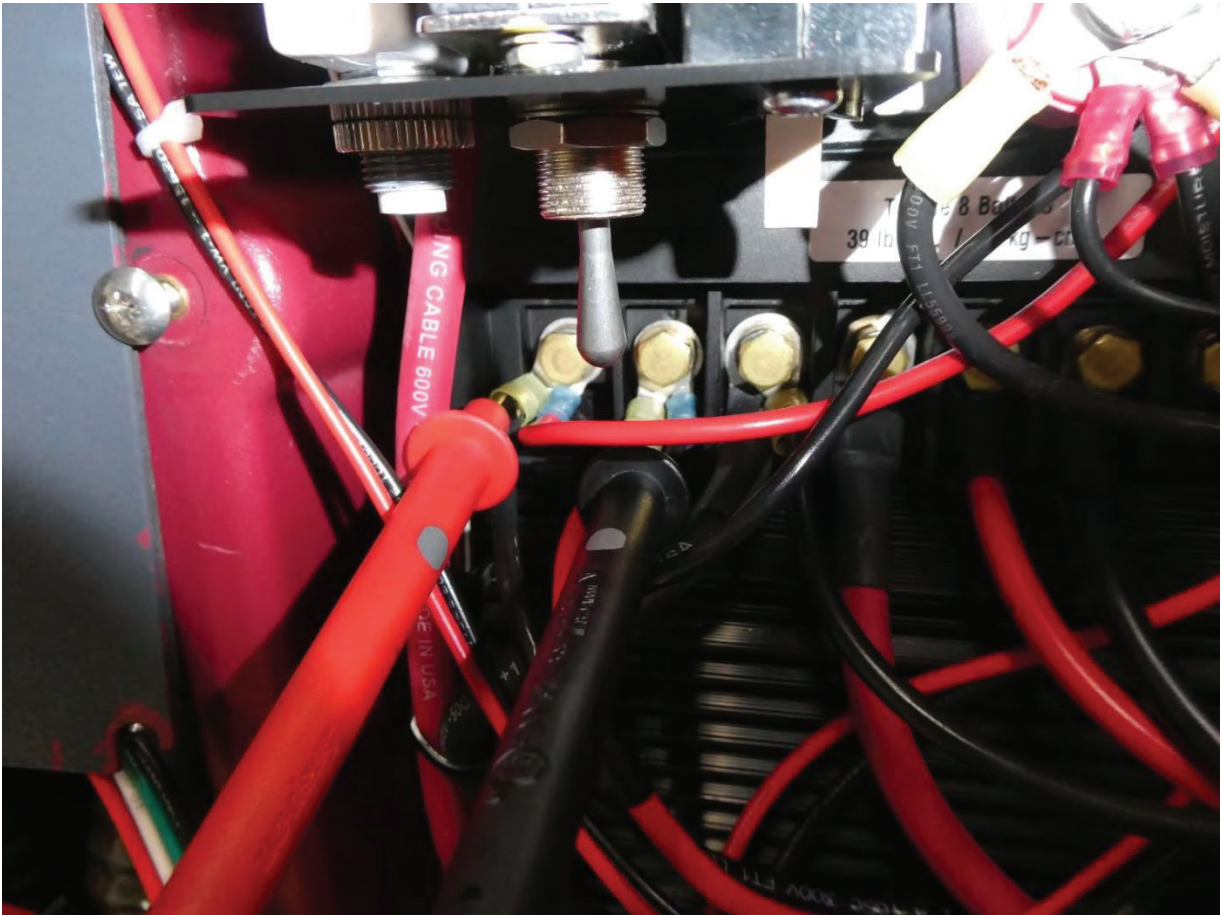
### Locate and disconnect P3 connector from controller



Place probes on pins 20 (BLK/PNK) and 10 (BLK/WHT). Set meter to OHMs. Depress Accelerator Pedal. Reading should be 0.3 (Static) to 1.7 (Full Throttle)



**Plug P3 back into Controller. Place probes on Controller leads as shown.**



1. Reconnect batteries.
2. Turn machine on.
3. Sit on seat to activate seat switch.
4. With meter in lap, select Forward on Right Touch Pad and depress Accelerator Pedal. At static (Stopped) voltage should be 0.0 VDC. As pedal is depressed the voltage should increase all the way up to 24 VDC. (Full Throttle)
5. Place machine in reverse reading should be 0.0 VDC to 12VDC (Full Throttle).

## Testing Pedal Circuit

### Bypass Seat Switch Circuit



## Bypass Seat Switch Circuit

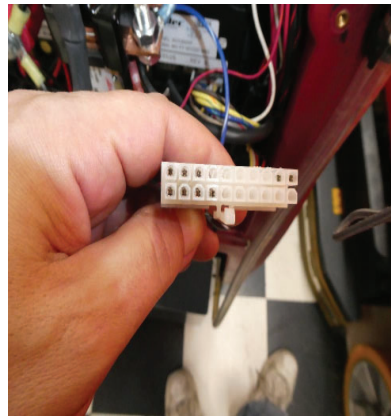
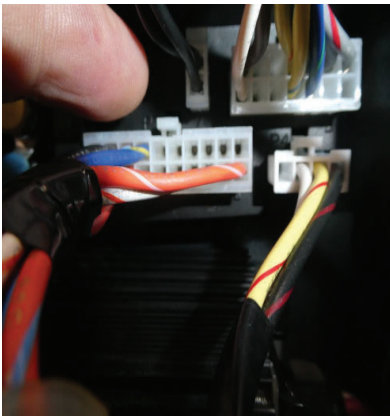


## Remove back access cover

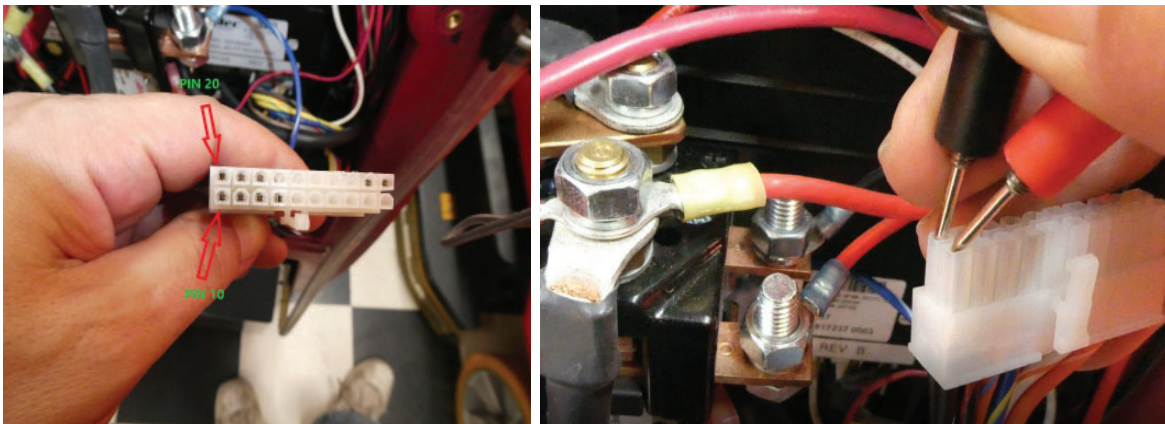




Locate P3 connector on Kinetec Drive Controller  
and disconnect



Set meter to ohms. Place probes on PIN 20 (BLK/WHT WIRE) and PIN 10 (BLK/PINK WIRE)



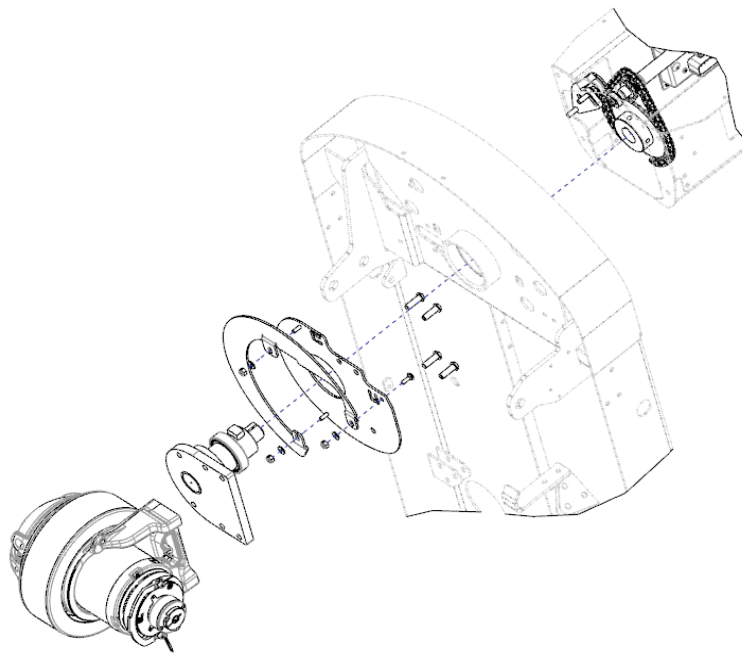
Static Pedal(not pressed) should read 0.3 OHMS +/- 0.1

Fully activated pedal should read 1.7 OHMS +/- 0.1

\*If reading not within above readings, replace\*



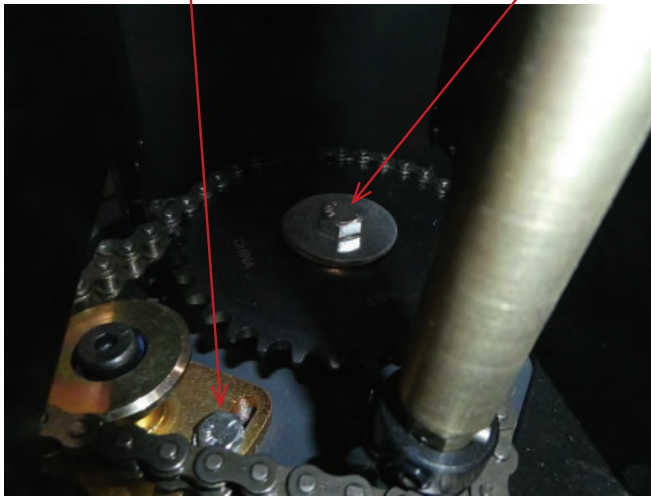
THESE INSTRUCTIONS ARE A GUIDELINE FOR REPLACEMENT OF DRIVE WIRING PLATES  
FOR THE MR20 AUTONOMOUS MACHINE

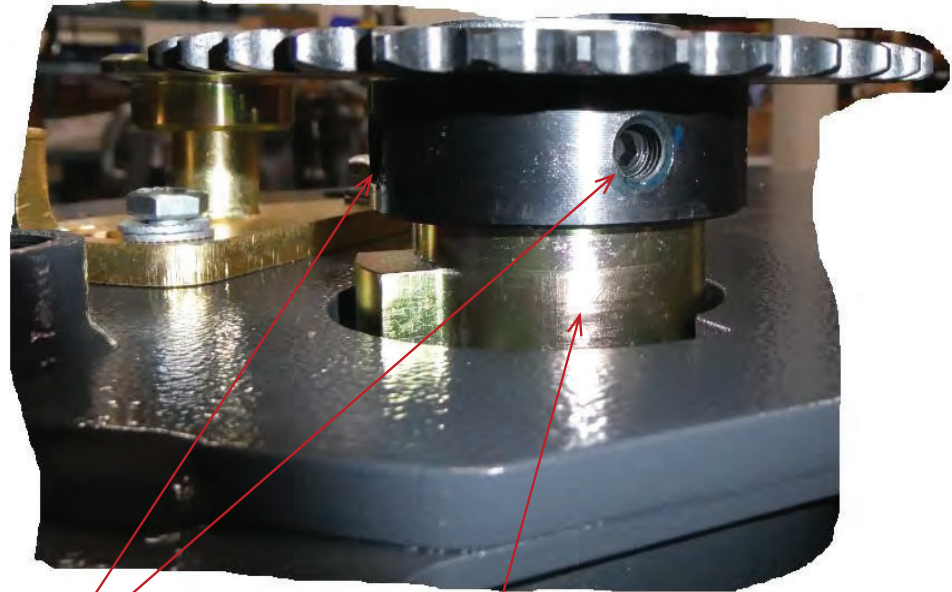


LOOSEN CHAIN TENSIONER  
TO GAIN CHAIN SLACK

REMOVE SCREW &  
WASHER FROM LARGE  
SPROCKET

REMOVE MASTER LINK  
THEN REMOVE CHAIN  
FROM SPROCKETS



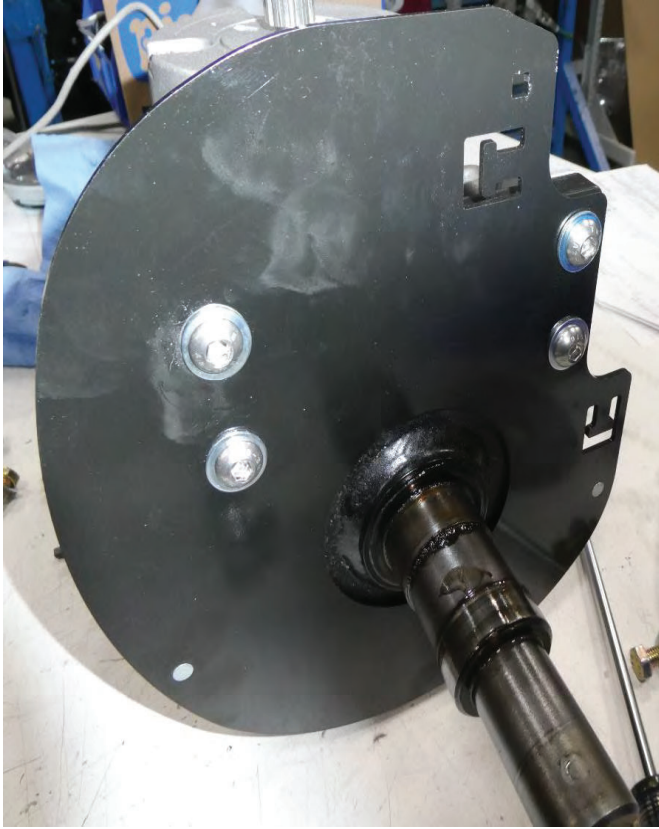


LOOSEN BOTH SET SCREWS  
AND REMOVE SPROCKET  
FROM STEERING SPINDLE

REMOVE STEERING PIVOT  
STOP AND KEY (NOT SHOWN)  
FROM STEERING SPINDLE

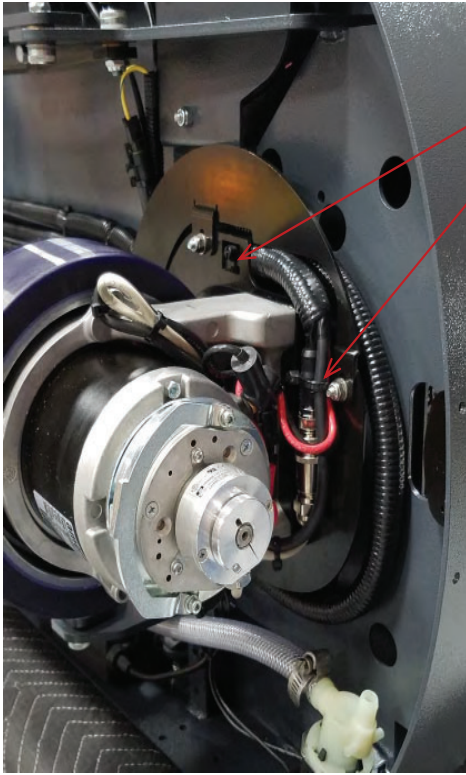


REMOVE STEERING  
SPINDLE/DRIVE MOTOR AND  
PLACE ON WORKBENCH



REMOVE OLD DRIVE WIRING  
PLATE AND REPLACE WITH  
NEW DRIVE WIRING PLATE





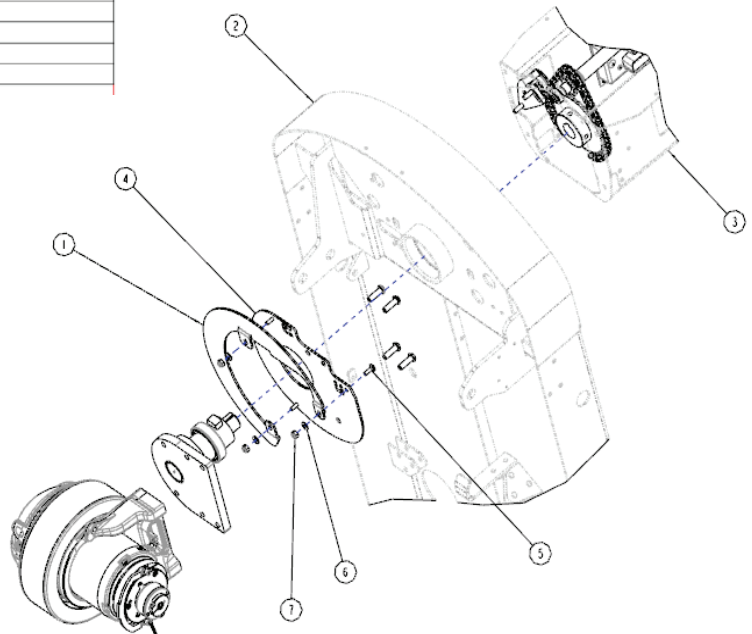
TIE WRAPS

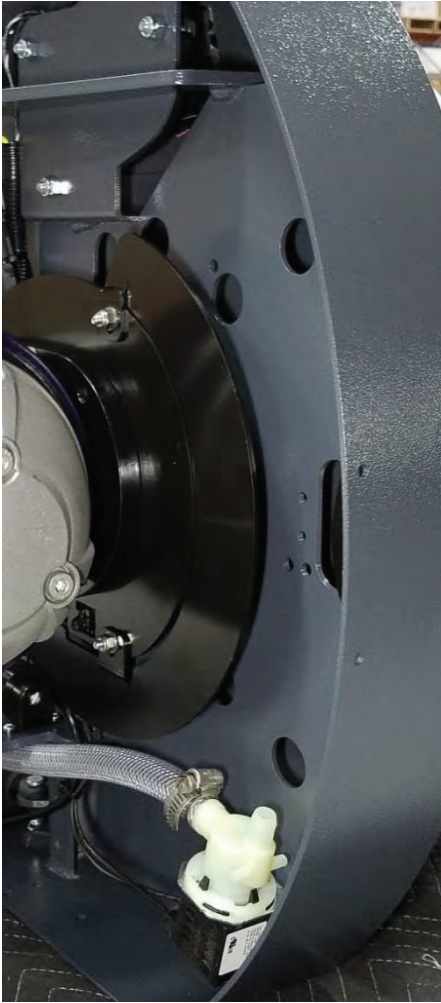
REINSTALL DRIVE MOTOR  
ORIENTED LIKE SHOWN.  
WRAP THE CABLE CONDUIT  
LOOSELY AROUND THE DRIVE  
MOTOR AND HOLD IN  
POSITION WITH TIE WRAPS

INSTALL SUPPLEMENTAL DRIVE  
PLATE  
(SEE FOLLOWING PARTS DIAGRAM)

BILL OF MATERIAL			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172636	1	PLATE, DRIVE WIRING (SUPPLEMENTAL)
2	REFERENCE	1	WELDMENT, FRAME, 20 AUTO
3	REFERENCE	1	WELDMENT, TOWER, MR20 AUTO
4	246253	1	PLATE, DRIVE WIRING
5	711606	1	BLT-CARR 10-32 X .625 SS
6	712764	3	WASHER-FLAT #10 SS
7	731242	3	NUT-NYLOC 10-32 18-8 SS
8	999929	1	INSTRUCTIONS, K-172636

NOT SHOWN





ROTATE DRIVE MOTOR TO  
VERIFY CABLES ARTICULATE  
PROPERLY

REASSEMBLE MACHINE IN  
REVERSE ORDER OF  
ASSEMBLY

## Brake Release

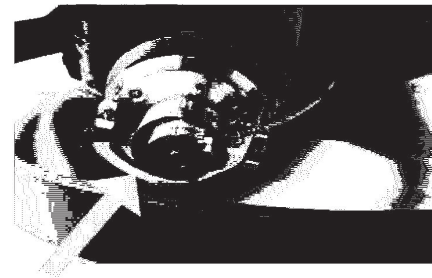
# BRAKE RELEASE

## BRAKE RELEASE PROCEDURE

The RoboScrub is stopped via an electromagnetic brake, located on the front drive wheel assembly. When the accelerator pedal is pressed the electromagnetic brake releases, which allows the RoboScrub to move forward or backward. When pressure is removed from the accelerator pedal, the electromagnetic brake presses against the front drive wheel to stop the RoboScrub.

If the RoboScrub is inoperable or immobile, it can be manually moved by releasing the electromagnetic brake by performing the following steps:

1. Turn the RoboScrub off using the ignition key.
2. Locate the electromagnetic brake on the front drive wheel assembly.
3. Place a small, flathead screwdriver between the wheel and the brake release lever. This will bypass the electromagnetic brake.
4. Slowly push the RoboScrub to a safe location where it can remain until a service technician arrives to perform repairs.
5. Once you have moved the RoboScrub to a safe place, remove the screwdriver from the front drive wheel assembly to activate the electromagnetic brake.



## WARNING!

- DO NOT PERFORM THE BRAKE RELEASE PROCEDURE ON AN INCLINE/DECLINE. IT IS UNSAFE TO PUSH THE ROBOSCRUB ON AN INCLINE/DECLINE, AS IT'S DIFFICULT TO STOP.
- CHECK FOR AND CLEAN UP ANY RESIDUAL WATER OR LIQUIDS ON THE FLOOR BEFORE PERFORMING THE BRAKE RELEASE PROCEDURE.
- TWO PEOPLE ARE REQUIRED TO MOVE THE ROBOSCRUB ONCE THE BRAKE IS RELEASED, ONE PERSON TO STEER AND ONE TO PUSH.
- THE BRAKE RELEASE PROCEDURE REQUIRES YOU TO ACCESS THE UNDERSIDE OF THE ROBOSCRUB AND PHYSICALLY PUSH. USE PRECAUTION WHEN PERFORMING THIS TASK TO AVOID INJURY.
- DO NOT RUSH WHEN PUSHING THE ROBOSCRUB. THE FASTER YOU TRY TO PUSH, THE SLOWER THE MACHINE WILL MOVE.
- PUSH SLOWLY AND BE CAUTIOUS NOT TO SLIP ON WET FLOORS.
- DO NOT ATTEMPT TO PERFORM THIS BRAKE RELEASE PROCEDURE IF YOU HAVE ANY HEALTH ISSUES OR PHYSICAL LIMITATIONS.



MinuteMan RoboScrub 20 Removing the MinuteMan Cowling, Wheel, E-Stop, Key Switch, UI Screen and Control Console

## Removing the MinuteMan Cowling, Wheel, E-Stop, Key Switch, UI Screen and Control Console

To remove the MinuteMan Cowling, remove the 5/32" hex screw on each side of the upper portion of the cowling, as well as the five 1/8" hex screws that secure the Slanted LIDAR shield.



Use a socket wrench (with extension) and 7/16 socket to remove the two screws in the two front-most holes (one on the left side and one on the right) near the Planar LIDAR.





MinuteMan RoboScrub 20 Removing the MinuteMan Cowling, Wheel, E-Stop, Key Switch, UI Screen and Control Console

The cowling can be lifted up and off the two hooks at the top of the unit.





MinuteMan RoboScrub 20 Removing the MinuteMan Cowling, Wheel, E-Stop, Key Switch, UI Screen and Control Console

Use a 3/4" socket to remove the locking nut and washer. Pull the wheel straight up to remove.



There is a semi-circle key that is present. Be sure it does not fall out or get lost.



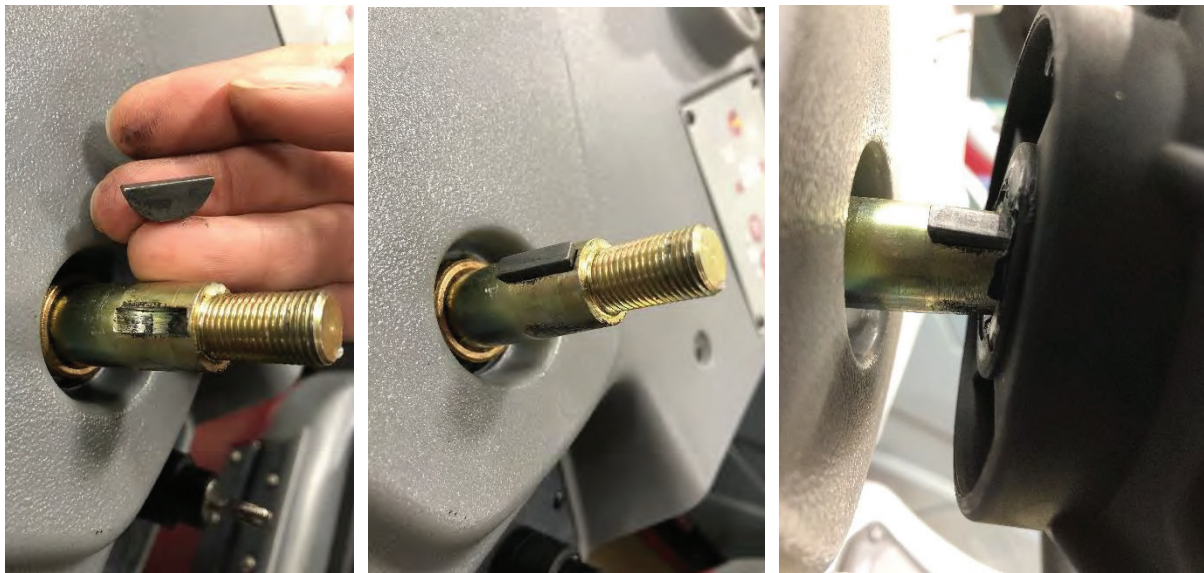


MinuteMan RoboScrub 20 Removing the MinuteMan Cowling, Wheel, E-Stop, Key Switch, UI Screen and Control Console

Use a 3/4" socket to remove the locking nut and washer. Pull the wheel straight up to remove.



There is a semi-circle key that is present. Be sure it does not fall out or get lost.

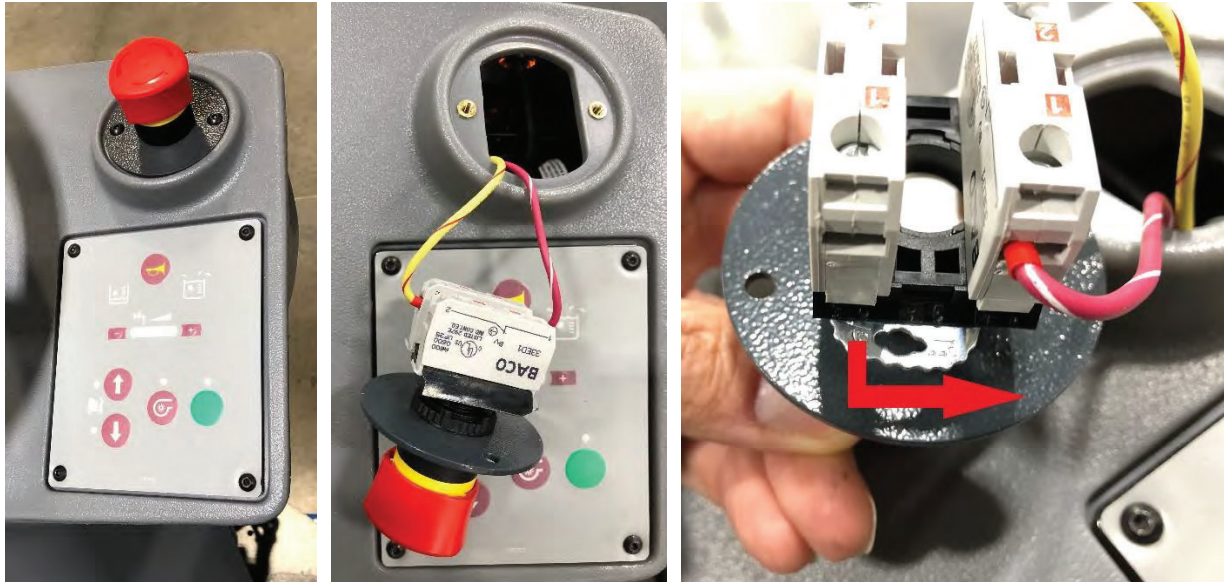






MinuteMan RoboScrub 20 Removing the MinuteMan Cowling, Wheel, E-Stop, Key Switch, UI Screen and Control Console

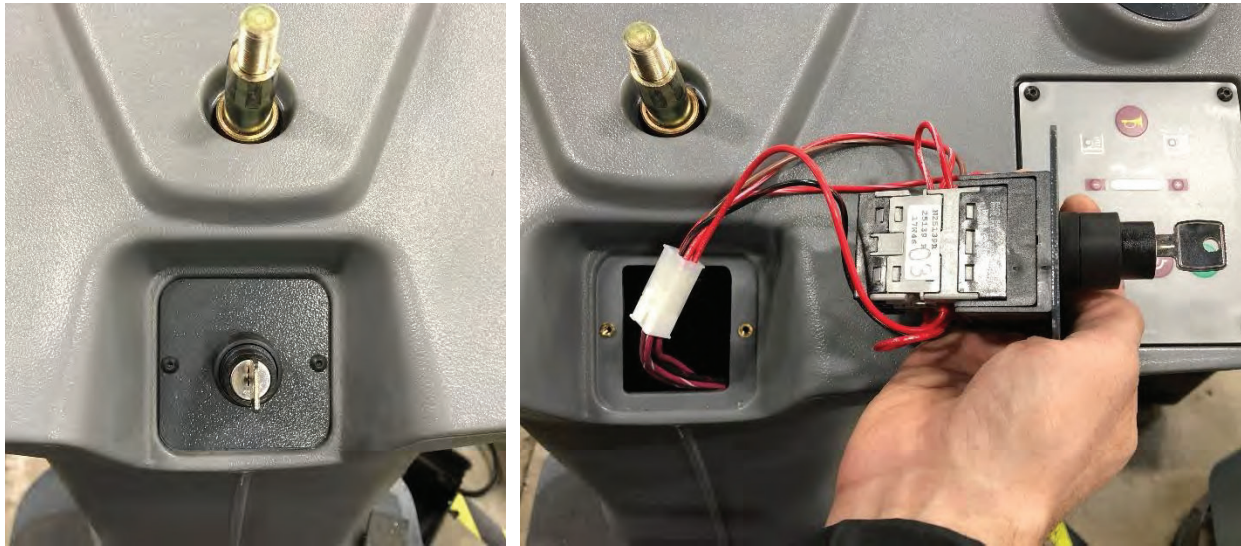
Use a 3/32" hex key to remove the two screws that secure the E-Stop. Slide over the metal lock to free the connector.



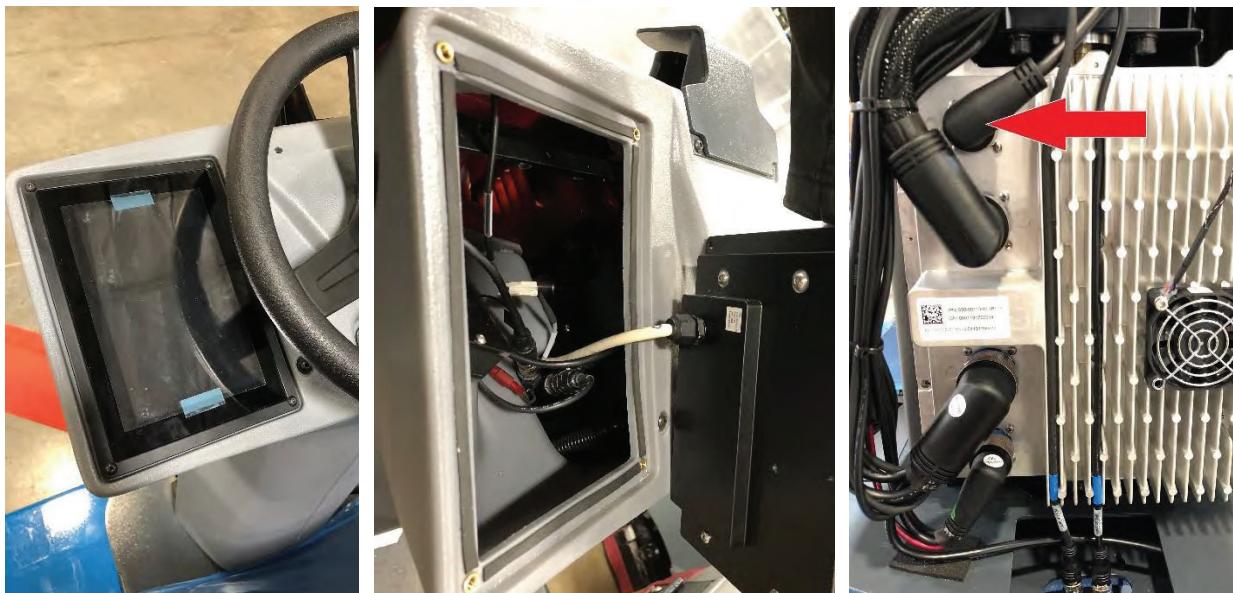


MinuteMan RoboScrub 20 Removing the MinuteMan Cowling, Wheel, E-Stop, Key Switch, UI Screen and Control Console

Use a 3/32" hex key to remove the two screws that secure the Key Switch. Decouple the white connector to free the hardware.



Use a 3/32" hex key to remove the four screws that secure the UI Screen. Do not attempt to disconnect the cable from the UI. Disconnect from the BCM.





MinuteMan RoboScrub 20 Removing the MinuteMan Cowling, Wheel, E-Stop, Key Switch, UI Screen and Control Console

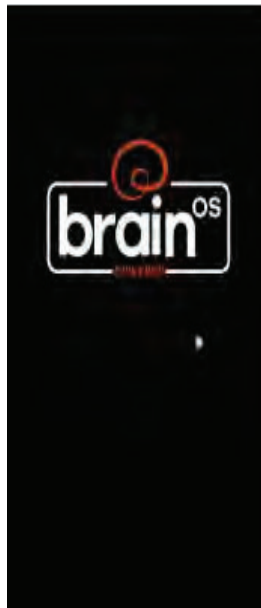
Use a 3/32" hex key to remove the four screws that secure the Control Console. Carefully unplug the two cables from the rear of the Control Console.



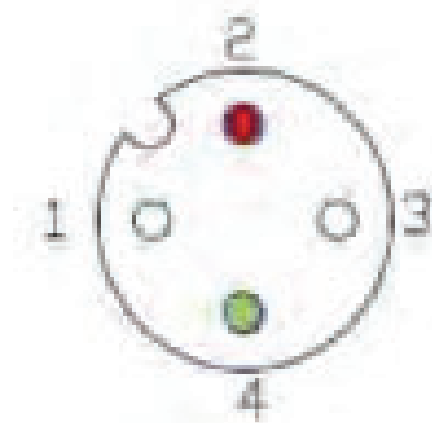
## 2D Camera

# 2D CAMERA

If machine software does not boot up/freeze during start-up, the most likely cause is the right 2D camera is not working. This is the only camera that **HAS TO BE WORKING** for the software to boot up.



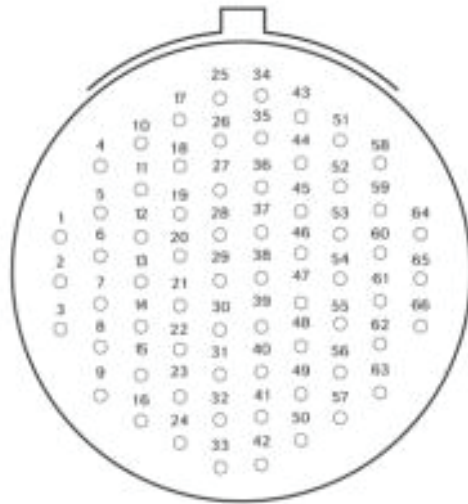
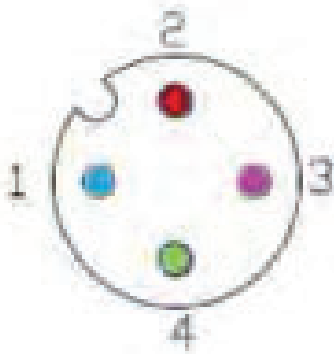
Disconnect the 2D Camera affected and check for 5VDC on pins 2 and 4.



If this is the right camera or front camera and voltage is present, please swap it with the left camera and test to ensure that the issue follows the camera. If the issue follows the camera it may need to be replaced.



If voltage is not present, test the following for continuity for the suspect camera.



Cable Pairs to check			
Camera	M12 Connector	Description	D38999 Up Trunk
Right 2D RGB	1	USB1P	5
	2	P5V	4
	3	USB1N	6
	4	GND	12
Center 2D RGB	1	USB1P	2
	2	P5V	1
	3	USB1N	3
	4	GND	7
Left 2D RGB	1	USB1P	8
	2	P5V	15
	3	USB1N	9
	4	GND	21

If no continuity present, replace UP TRUNK.

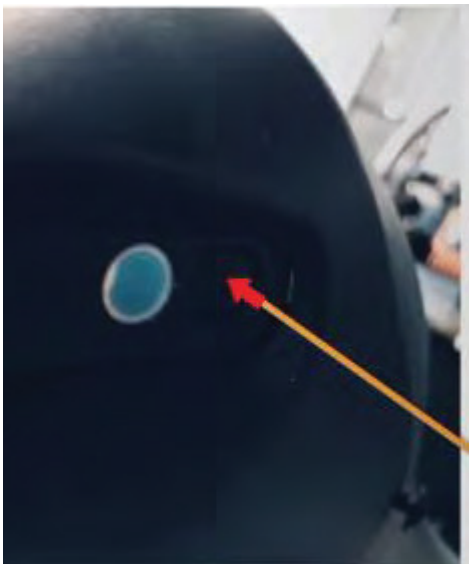


## 3D Camera

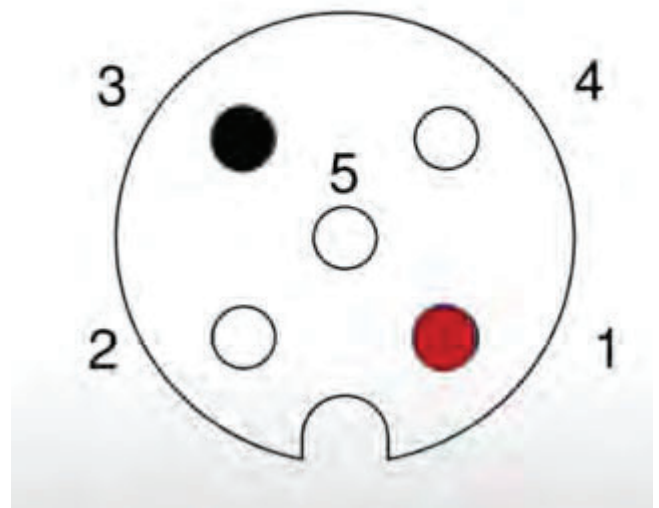
If you receive a side IFM error, check to see if the camera has power. If the LED is blinking or lit the camera has power. In this case, try resetting the communication cable going to the camera on the UP Trunk as well as the UP Trunk connection on the BCM.



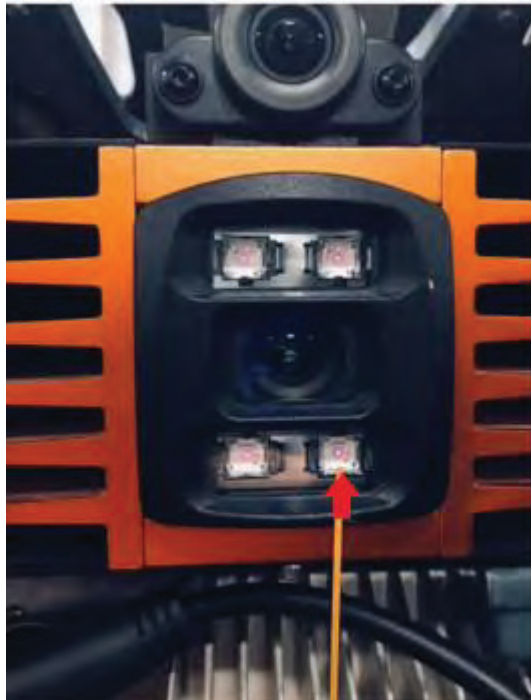
If the LED is not blinking or lit, check voltage on the power cable to confirm there is 24VDC. If there is power to camera may need to be replaced.



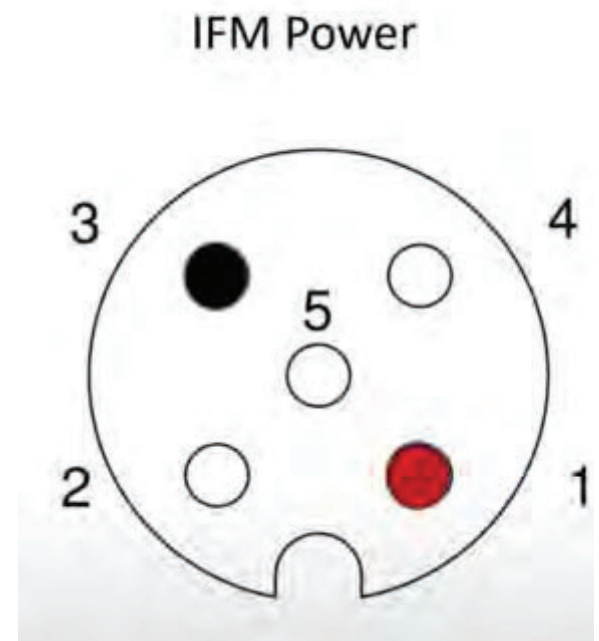
IFM Power



If you receive a front IFM error, check to see if the camera has power. If the four LED's on the front of the camera are blinking or lit, the camera has power. In this case, try resetting the communication cable going to the camera from the UP Trunk as well as the UP Trunk connection to the BCM.

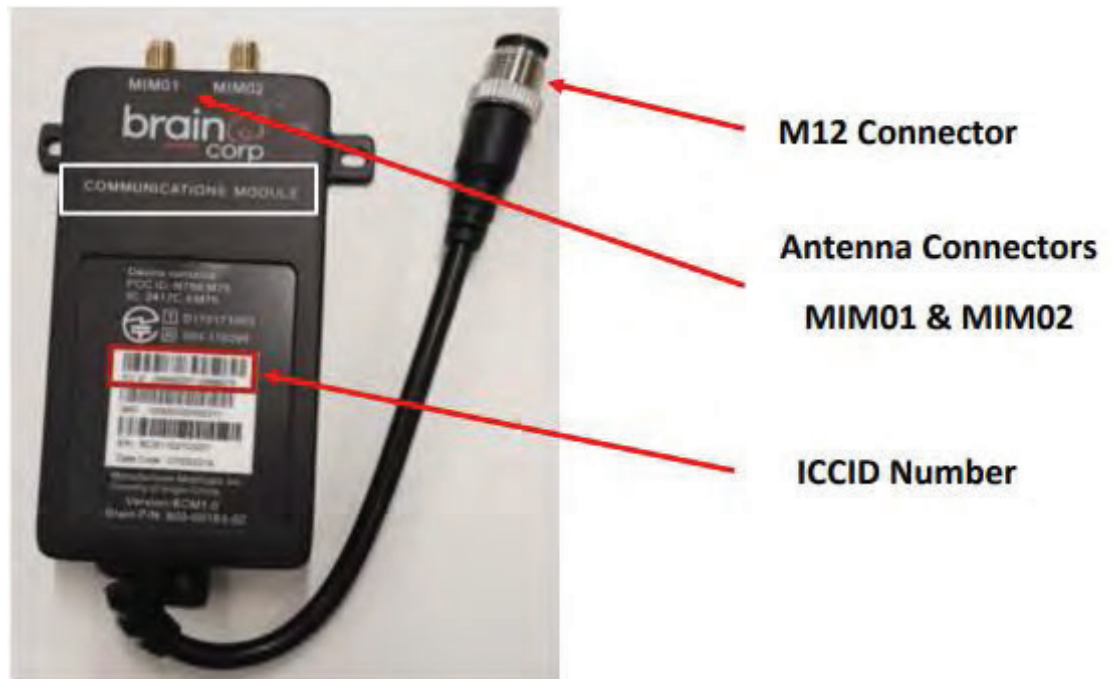


If the four LED's are not blinking or lit, check voltage on the power cable to confirm there is 24VDC. If there is power the camera may need to be replaced.

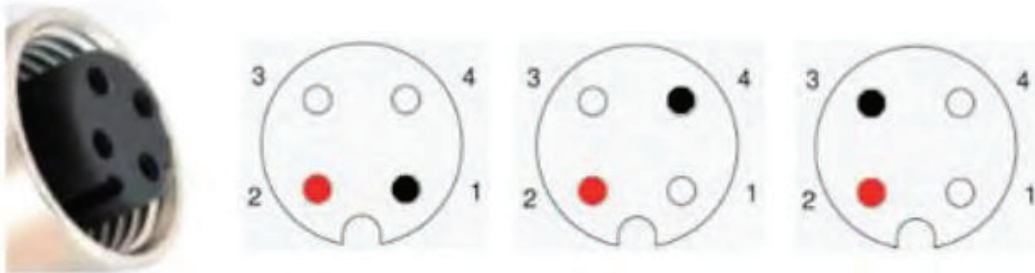


## Modem

From the modem, there are four connections which interface with the Modem: USB Power connector, micro USB Data connector and 2 antenna connectors: MIM01 and MIM02.



Using a digital Multimeter, measure the voltage at the pins on the M12 female connector as shown below. (note the location of the M12 notch)(voltage should be 5 VDC) If there is voltage measured across ALL three pins, contact tech support for further assistance.

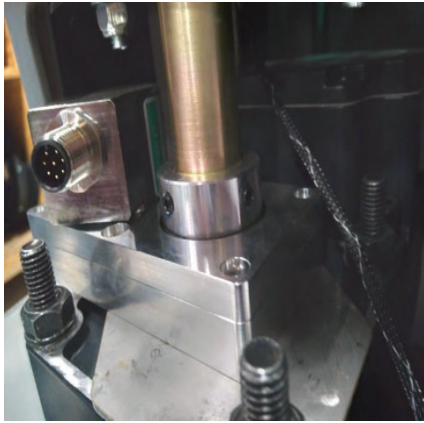


## Steering

Place steering wheel in zero position as shown below

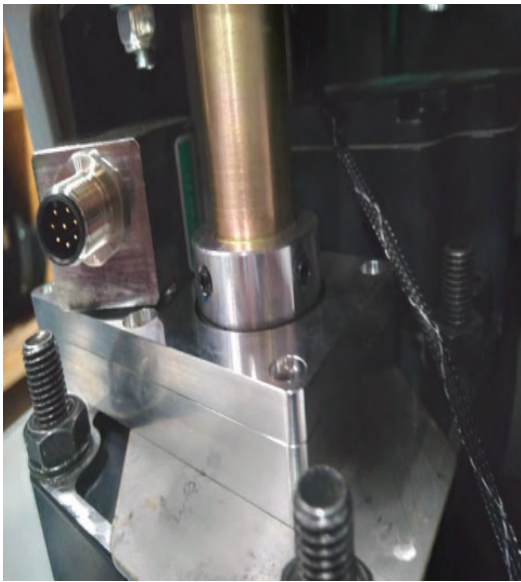


Verify that drive wheel is also in the zero position as shown below.

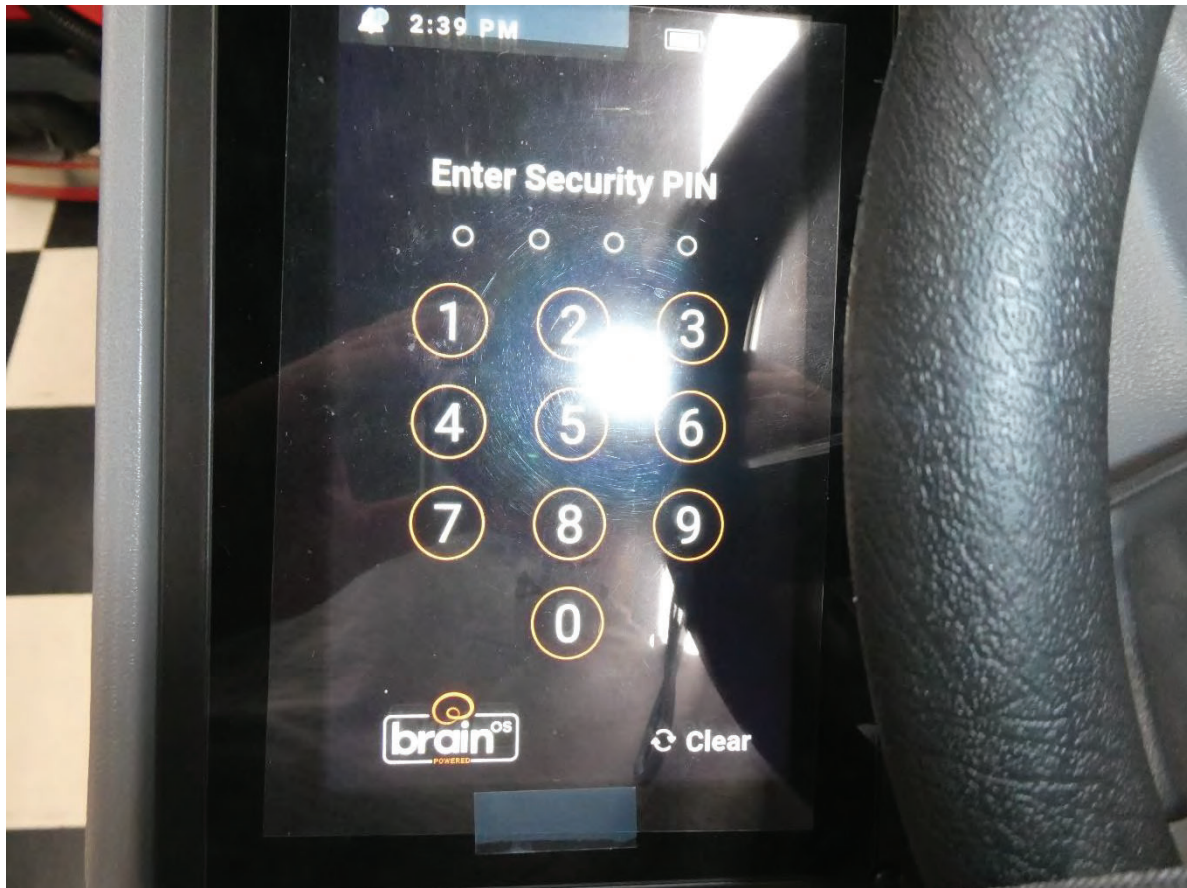




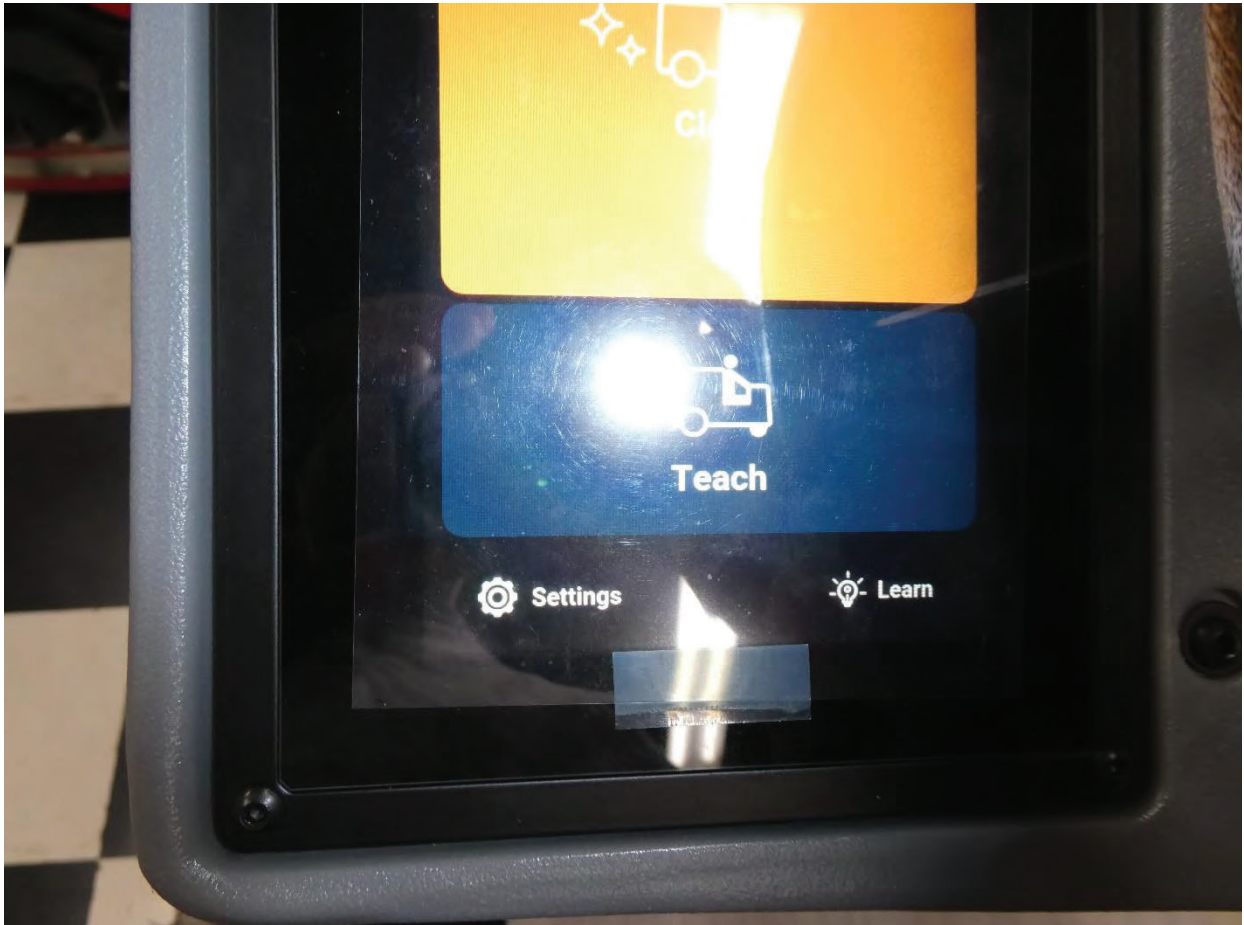
If Steering wheel and Drive wheel do not line up, remove front cowling and check for loose/missing Encoder set screws or slack/jumped gear in steering gear assembly.

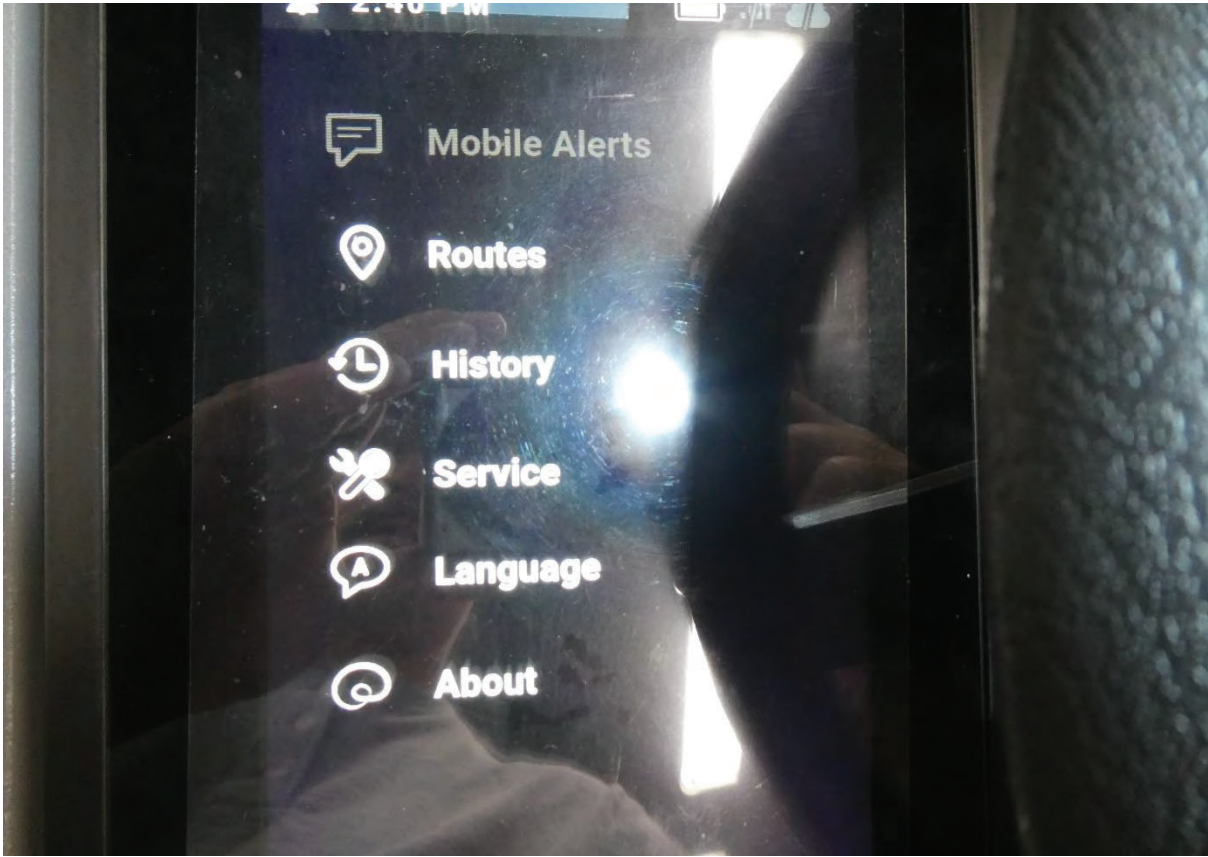


Turn machine on when prompted enter Operator PIN 1337

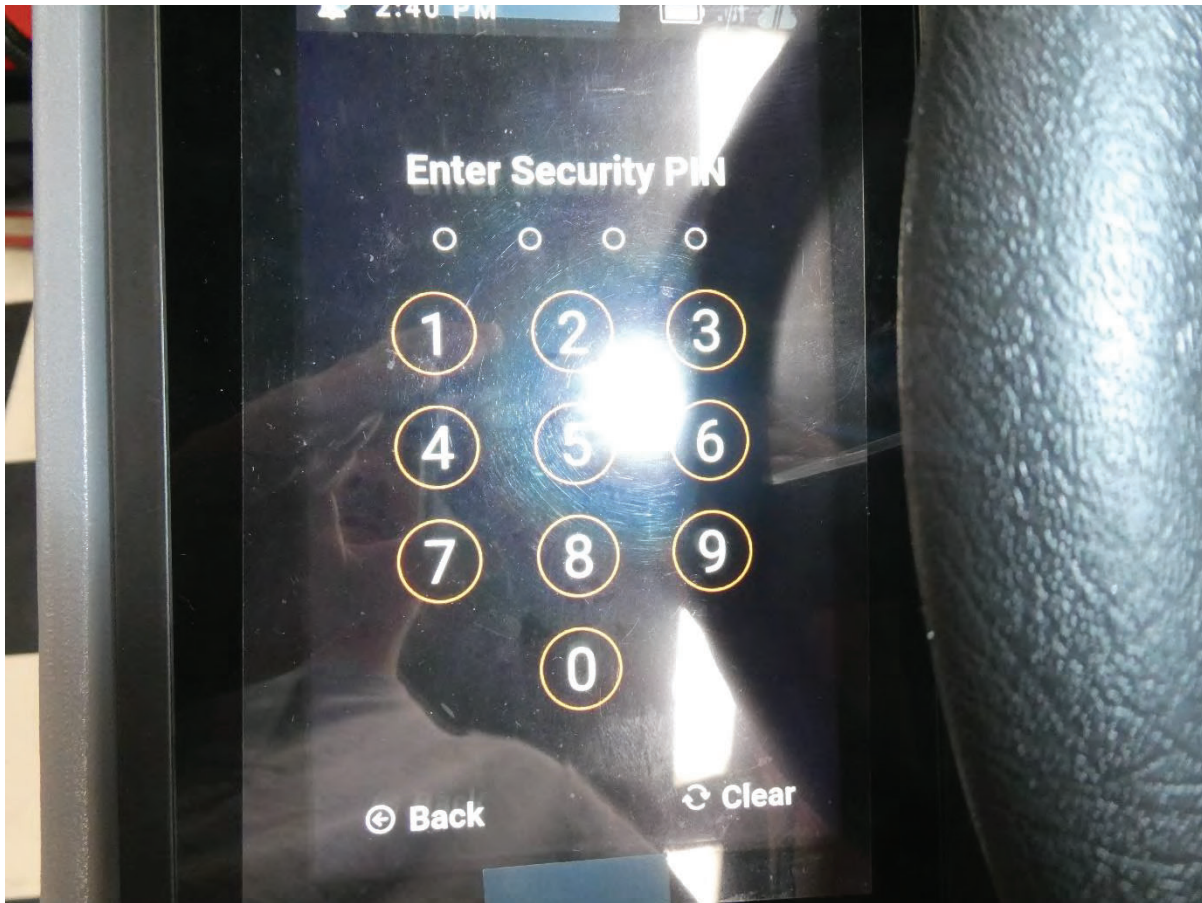


**Enter Settings**

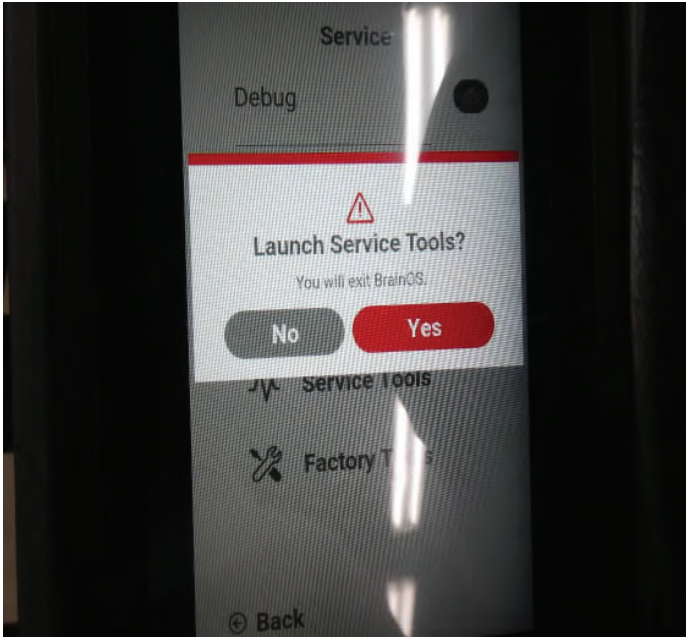
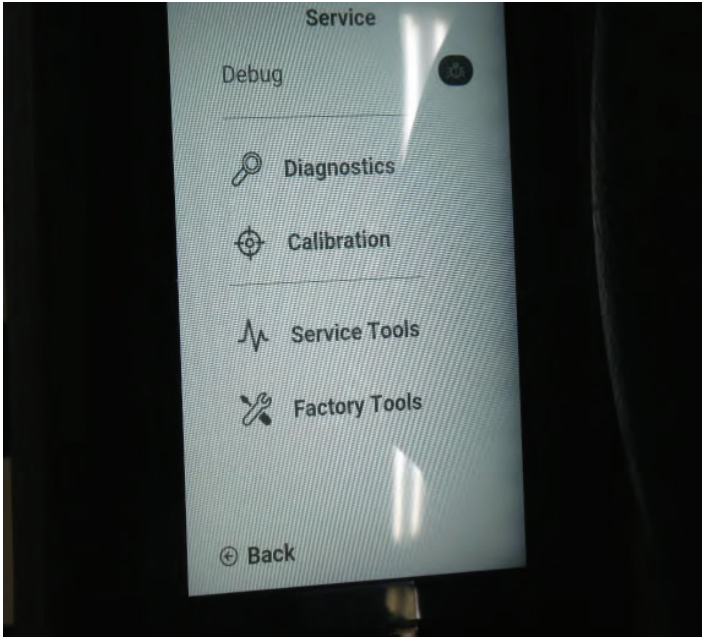




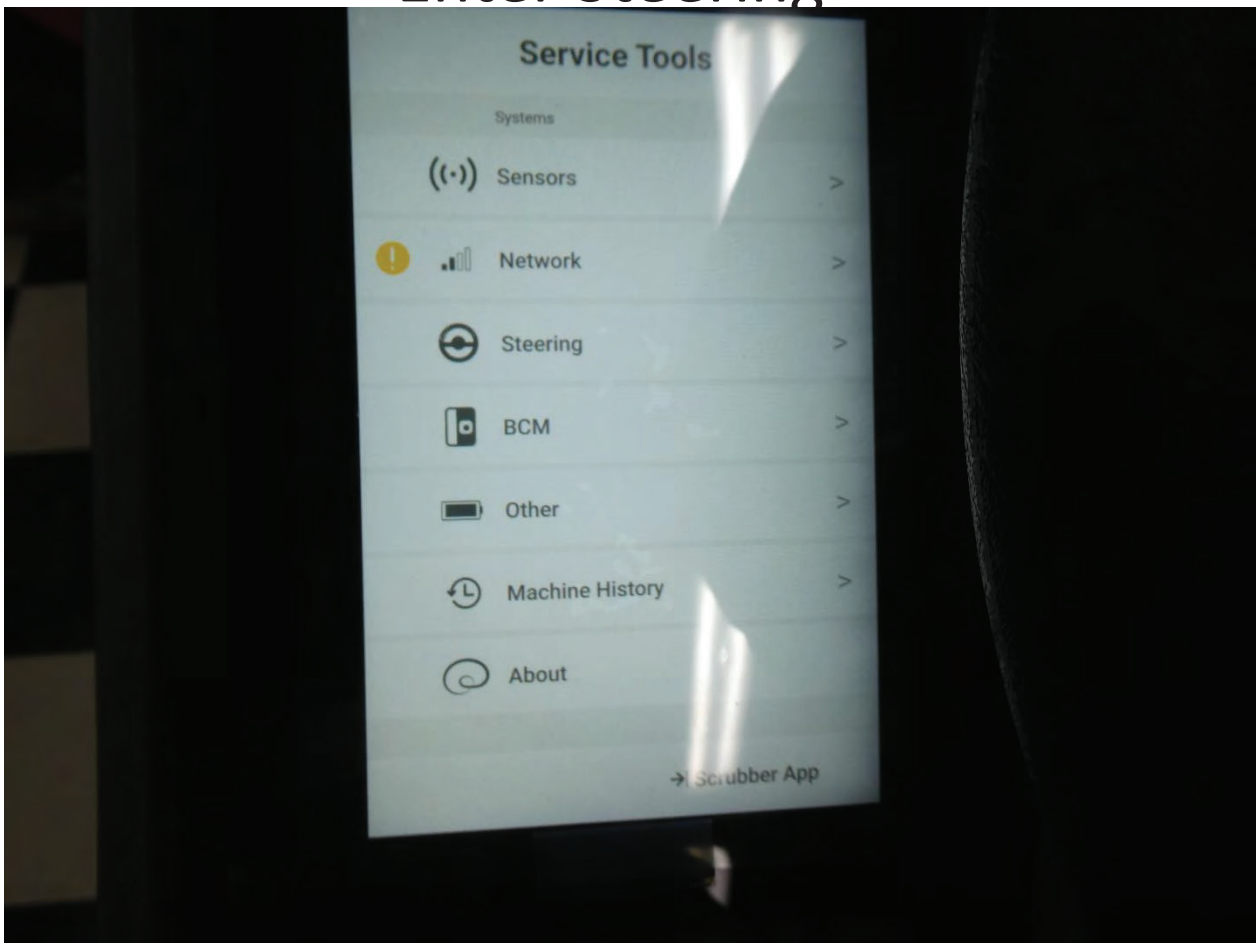
Enter service PIN(if you do not have one contact Minuteman Tech Support



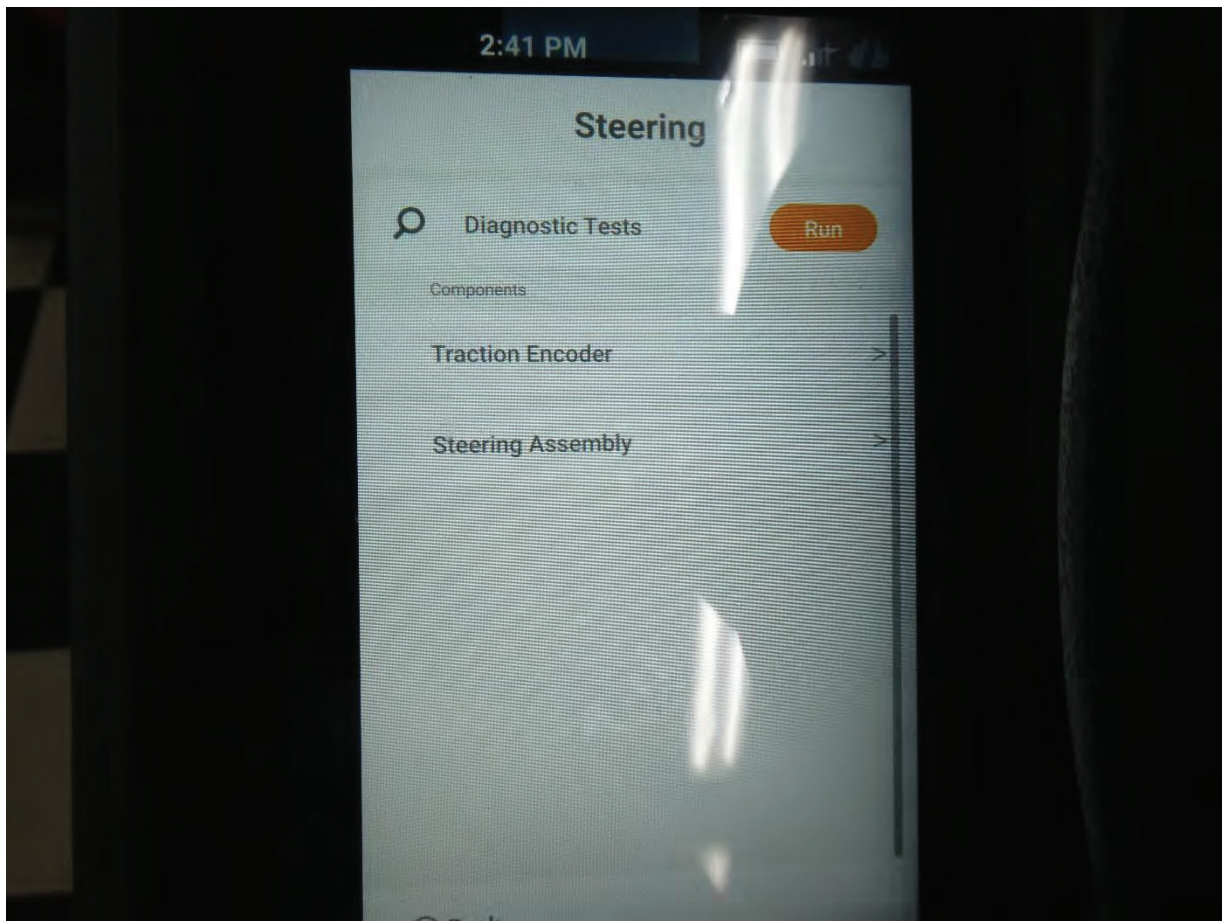
### Enter Service Tools



## Enter Steering

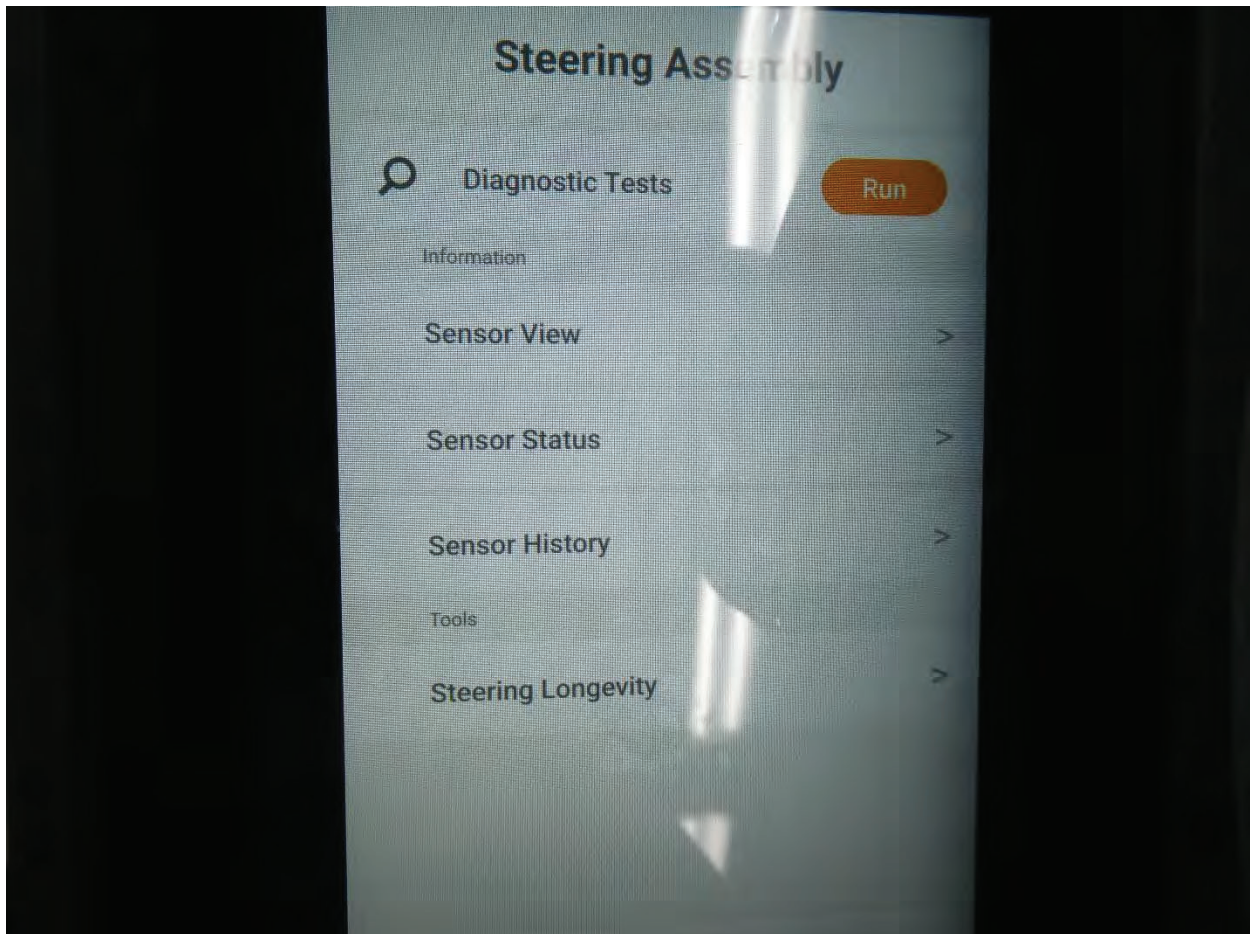


## Enter Steering Assembly

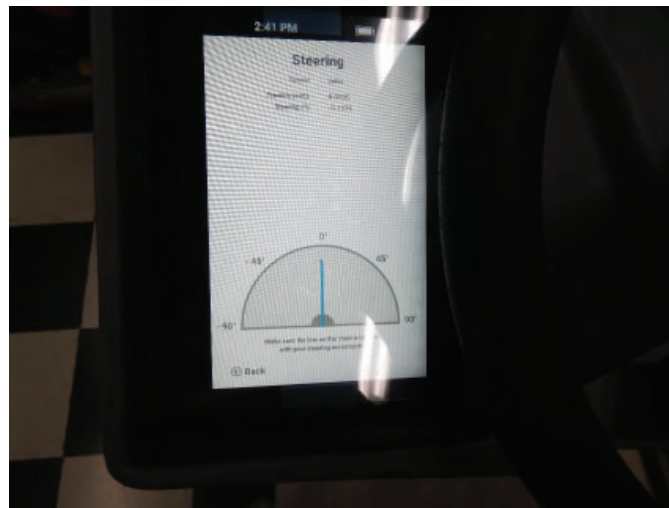




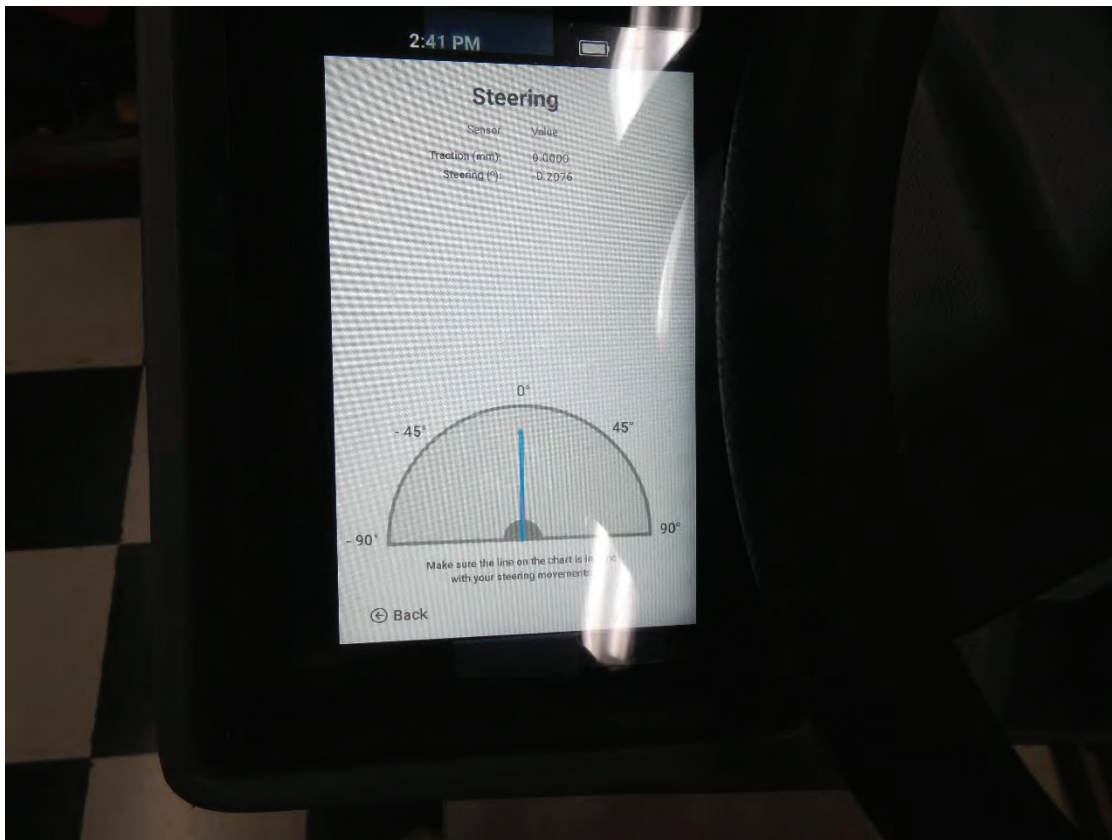
## Enter Sensor View



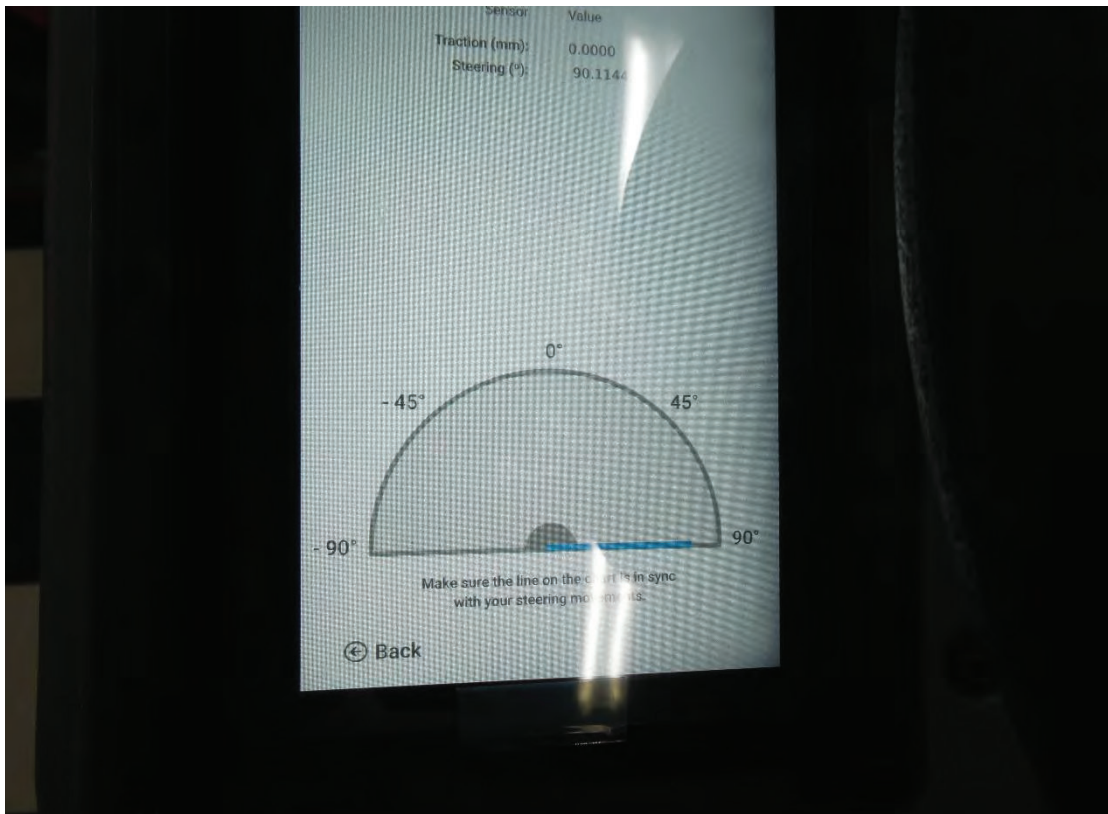
Move steering from left to right the return to zero position and recheck screen/encoder position.



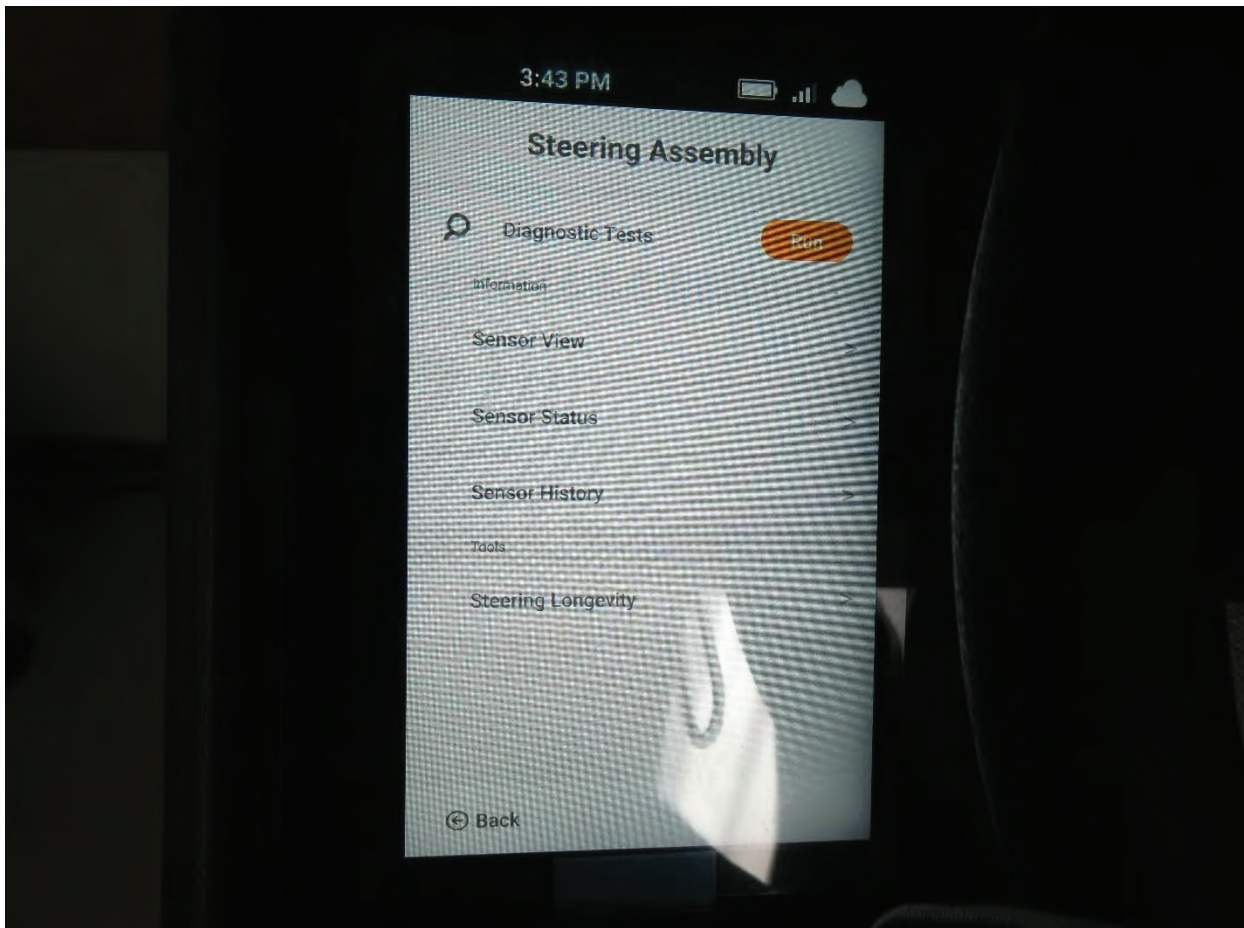
Move steering from left to right then return to the zero position and recheck screen / encoder position.



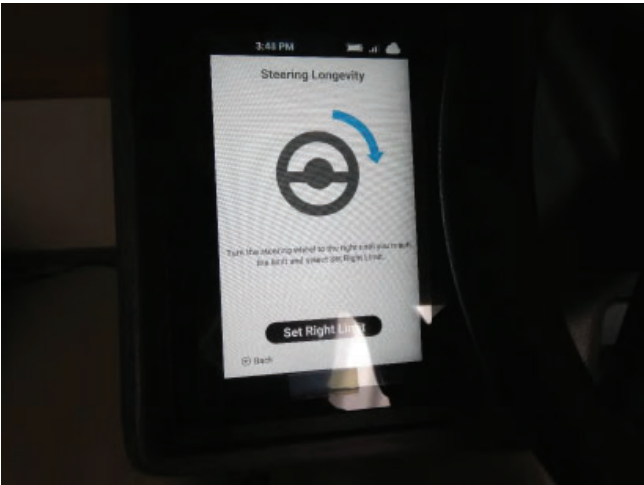
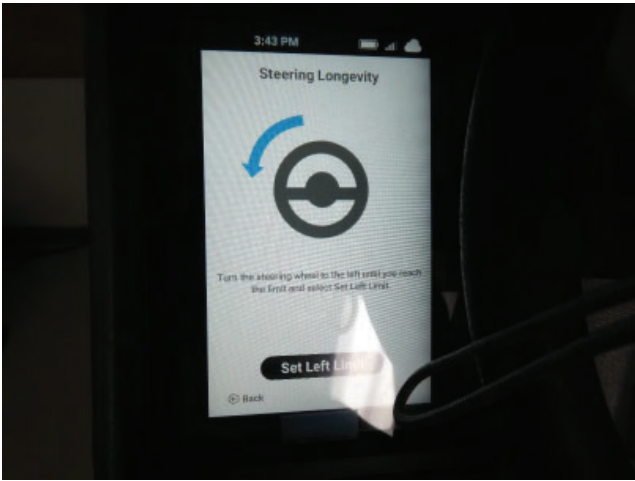
Move steering right until it stops. (Screen / encoder should line up with 90 degree mark) Do the same for the left. If offset return to zero and re-adjust.



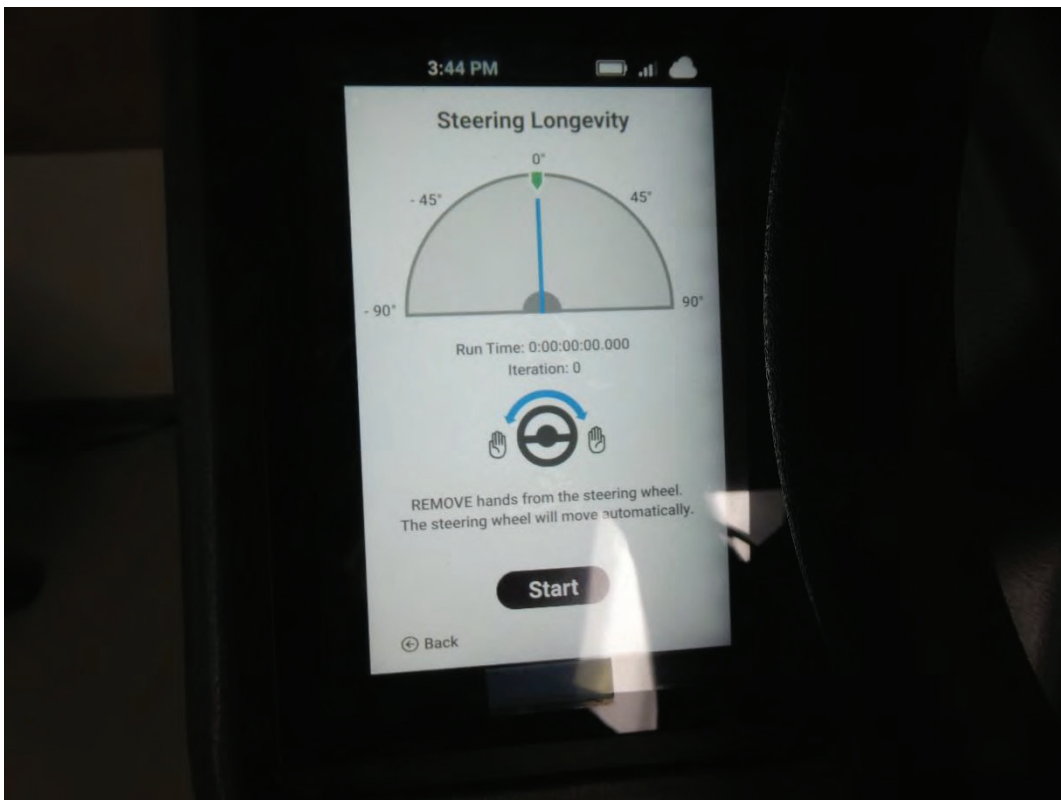
Back out to Steering Assembly screen. Enter steering longevity.



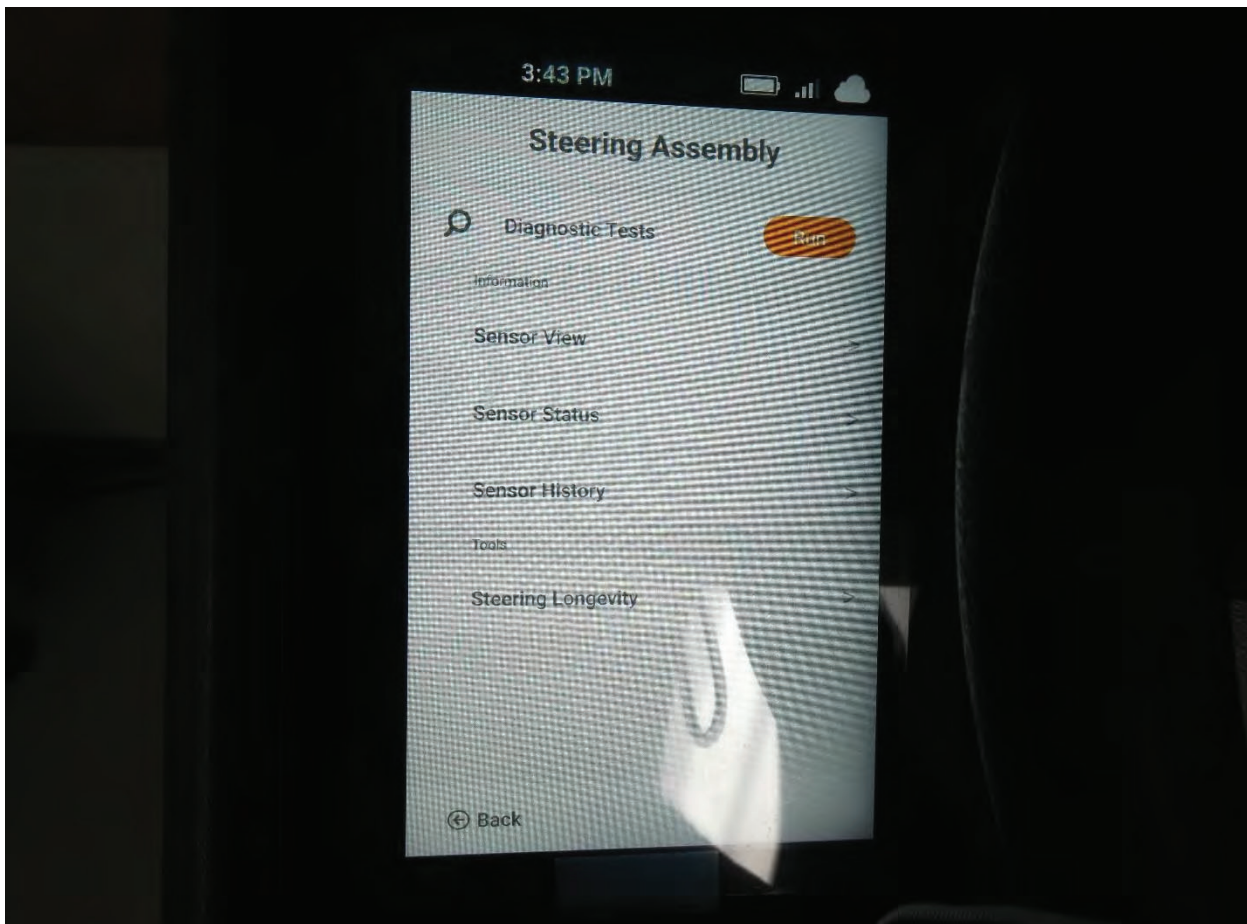
Follow on-screen instructions



Follow on-screen instruction, press start. (Steering wheel will start moving left and right) After a minimum of 5 times in both directions, select cancel.

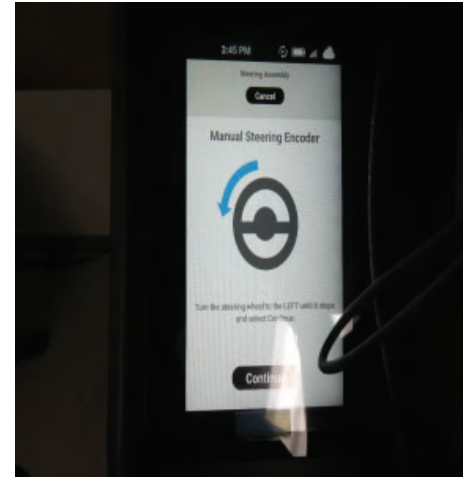
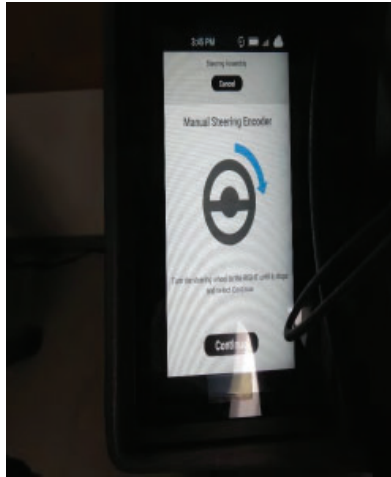
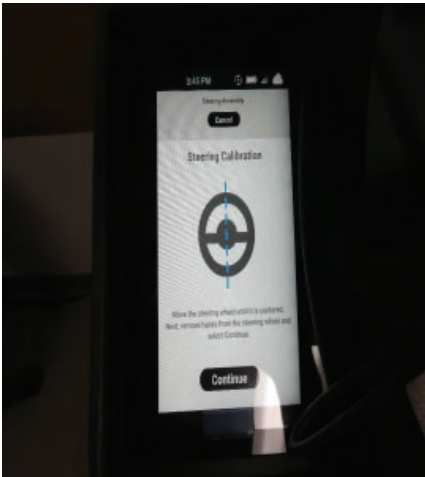


Back out to steering assembly screen and select run.

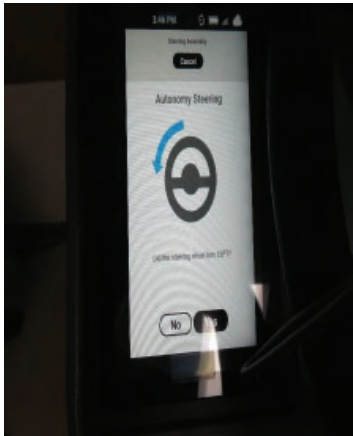
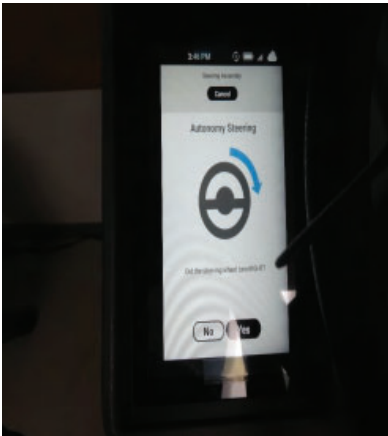
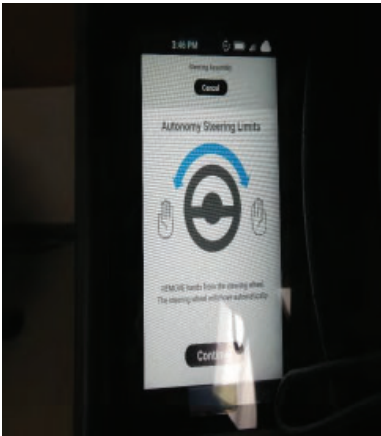




Follow on-screen instructions.



Continued



After Diagnostic run screen will show SUCCESS with a green check mark steps are complete.

## Replacing the MinuteMan BCM

First, begin by disconnecting the battery connector at the rear of the machine.

To remove the MinuteMan Cowling, remove the 5/32" hex screw on each side of the upper portion of the cowling, as well as the five 1/8" hex screws that secure the Slanted LIDAR shield.



Use a socket wrench (with extension) and 7/16 socket to remove the two screws in the two front-most holes (one on the left side and one on the right) near the Planar LIDAR.

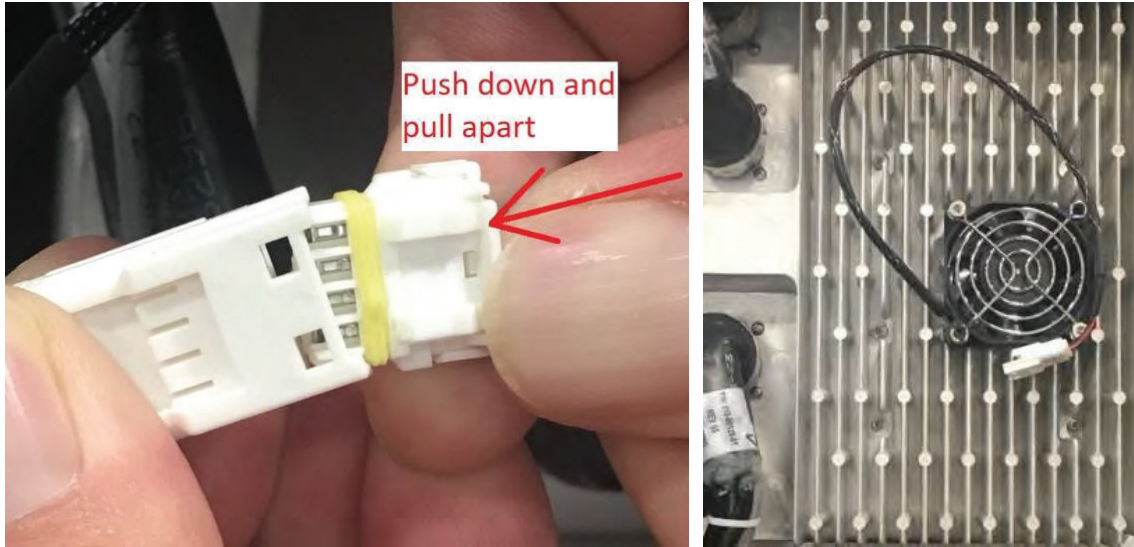




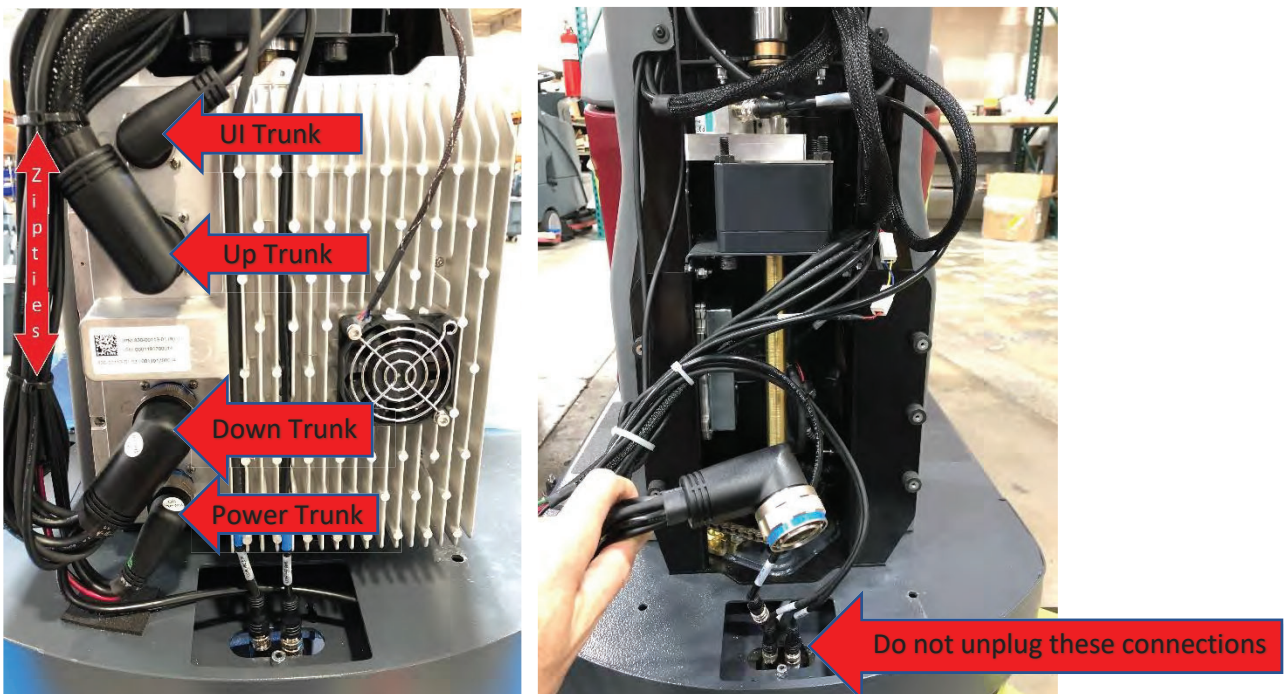
The cowling can be lifted, up and off the two hooks at the top of the unit.



Unscrew the four bundled black connectors that couple to the BCM. Decouple the fan connector.



Cut the indicated zip ties and place the BCM to the side. Remove the six 3mm hex screws that secure the BCM.



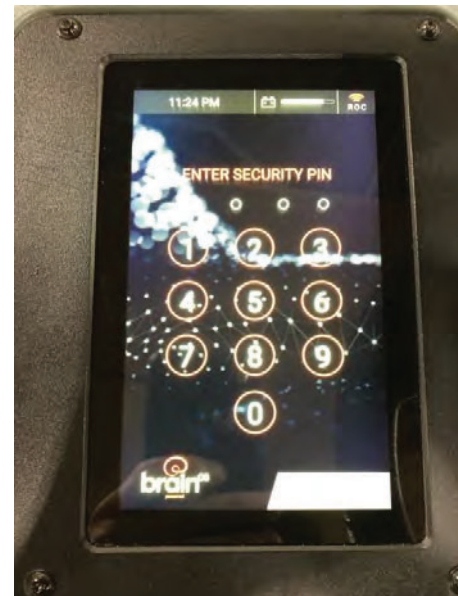
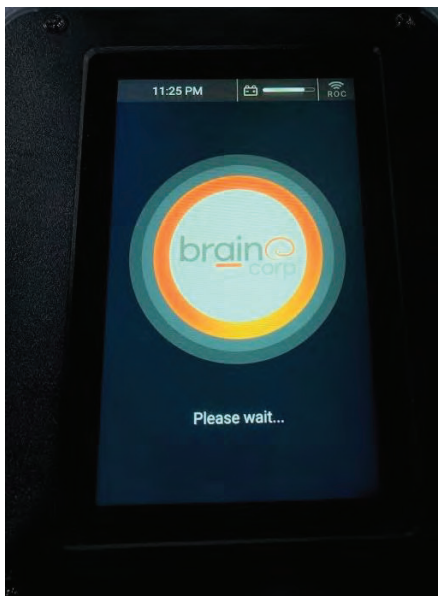


\* Be sure to reconnect the green grounding cable (if present) when replacing the Brain Module.

Follow the instructions in the reverse order to re-assemble. Power on the machine and make sure the robot can establish ROC connection.

## Verify ROC Connectivity

Power on the unit and verify that the screen loads past the spinning Brain logo and ends on the Security PIN screen.

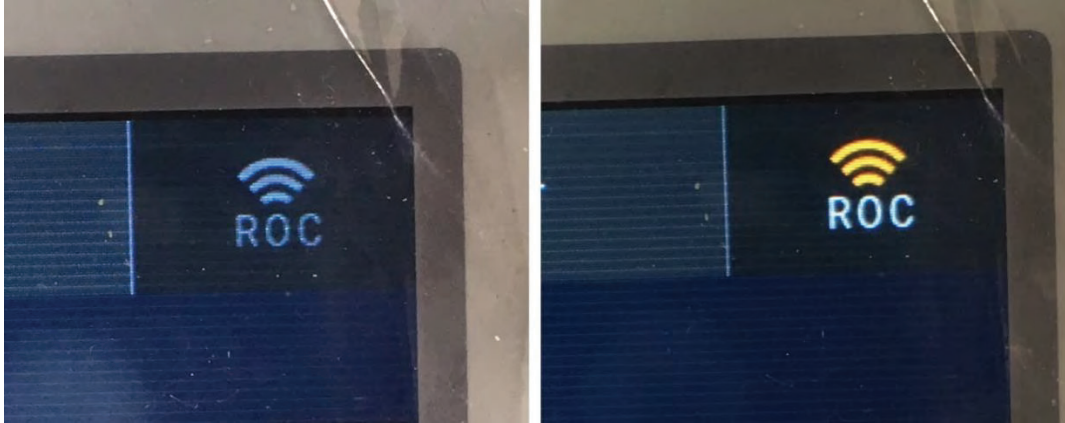


The ROC icon located in the upper right corner of the UI screen will only be illuminated (turn orange) once the PIN screen has loaded and the modem is able to connect to the ROC. The icon is either illuminated or not, meaning the strength of the signal does not correlate to the number of “signal bars”.



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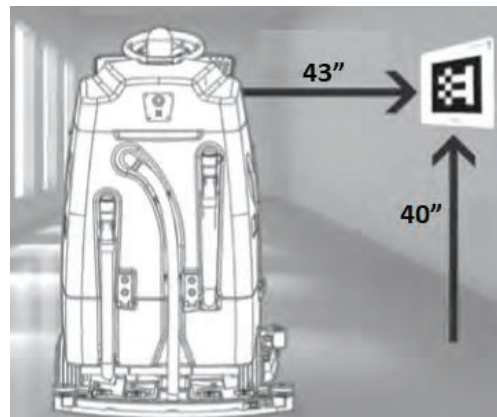
Replacing the MinuteMan BCM



Site connectivity may be limited depending on building architecture or cellular signal infrastructure. Moving the scrubber to a different part of the property (or even outside the building) may improve connectivity.

### Train a short test route

Print the home marker found on the following page. Afix it to a vertical surface that may be read by the side camera on the right of the scrubber dashboard. Orient the scrubber dashboard about two feet from the home marker.







Enter the PIN code and select **Teach Route**. Teach a short route that starts and ends at the same home marker location.

## ROUTE - TEACH A NEW CLEANING ROUTE

This is the course your ICE RS26 robotic scrubber, powered by Brain OS follows during cleaning.

Before your robotic scrubber, powered by Brain OS can clean on its own, an operator must drive the Brain-enabled scrubber through each desired cleaning route and save the route to memory.

### WARNING!

ROUTES SHOULD NOT INCLUDE DRIVING INTO AN ELEVATOR. THE MACHINE SHOULD ALWAYS BE MANUALLY OPERATED WHEN IN AN ELEVATOR OR AROUND AUTOMATIC DOORS.

### TEACHING AND SAVING ROUTES

1. Initiate power on the Brain-enabled scrubber using the momentary key/ignition
2. Using the touchscreen move the blinking cursor to highlight "teach route."
3. The user interface will instruct operator to drive to the home location code.
4. If the machine is not positioned properly in front of home location code, an error code will appear on the user interface LCD touchscreen stating "Error! Home Location Not Found" or "Machine is too close." If too close, you will see a red highlight around the home location code.
5. If the home location code is visible within the live video camera view and the Brain-enabled scrubber is within the appropriate distance from the code, the machine will begin scanning and state "Scanning Home Location." You will see a green highlight around the image of the code on the UI.
6. Once the Brain-enabled scrubber completes scanning the home location code, a "Success" message appears.
7. Using the touchscreen, select an available slot to assign the new cleaning route. In some cases, the cursor will automatically move to the next available route.
8. The Brain-enabled scrubber will indicate it's now ready to learn a route by stating "Ready. I will learn as you drive." The LCD screen will shift to "Learning Mode."
9. Drive the machine through the entire desired cleaning route. This allows the machine to map and store the new route in memory.  
**NOTE:** The machine will not recall the component settings (water level, solution level and scrub deck pressure). This is to allow the end user to choose the appropriate settings based on need for the day or cleaning area. The robot operator should decide on water, solution and scrub deck level and adjust before each route is selected.
10. The robot completes its map by running a loop. It is important to finish the desired cleaning route at the home location where the route was started. A route cannot be saved in memory without completing this step. Always start and stop in the exact same location at the home location code.
11. Select "Save" by pressing the save button.
12. The user interface will ask "Are you sure you want to save this route?"
13. Press the button again to indicate "Yes."
14. The Brain OS software will automatically save the route and will then appear on the "Run Route" menu option when selected.



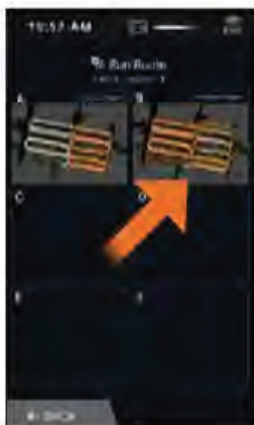
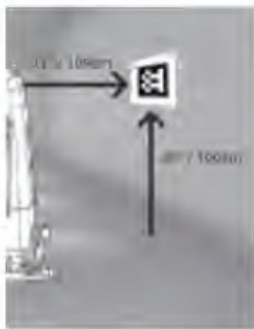
## DELETING A ROUTE

Follow the instructions to delete a route



1. Drive to the desired Home Location Code.
2. Select Service on the user interface LCD screen.
3. A new menu of options will appear. Choose "Routes."
4. Robotic Scrubber will scan the Home Location Code and retrieve the programmed routes for that location.
5. The list of home location codes that have been saved to memory will appear. Select the home location code that is to be deleted.
6. From the list of saved cleaning routes now displayed, touch and highlight the route to be deleted and select "Delete."
7. Confirm by pressing delete a second time
8. The route will disappear.

## RUNNING AN AUTONOMOUS CLEANING ROUTE



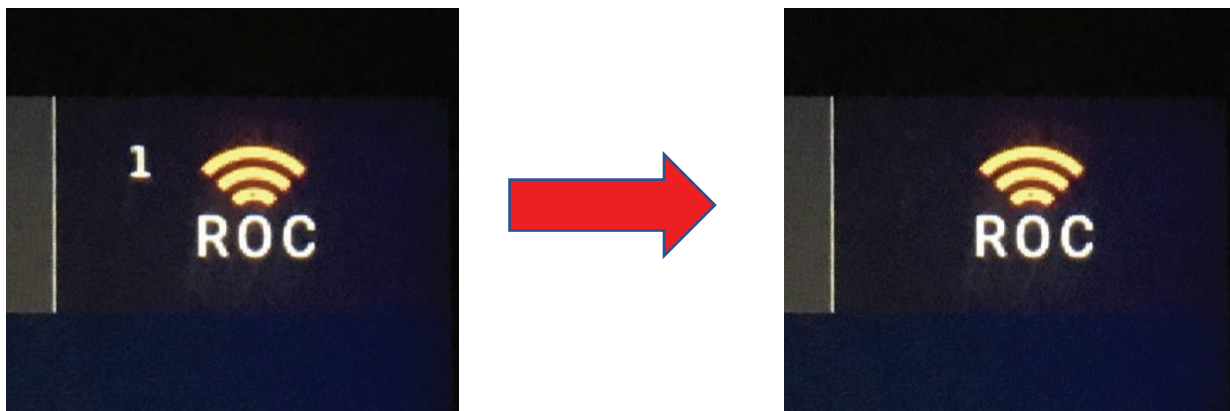
1. Position the Brain-enabled scrubber in front of the home location code.
2. All operations should begin and end at the home location code.
3. If the Brain-enabled scrubber is not positioned properly in front of the home location code, a message will appear on the user interface LCD screen stating "Drive to Scan My Home Location." The robotic scrubber cannot scan the code if the Brain-enabled scrubber is not properly positioned.
4. When the Brain-enabled scrubber sees the home location code, it will be visible via the live video image on the user interface LCD screen and scanning animations will appear on the LCD screen. A message will appear on the user interface LCD screen stating "Scanning Home Location."
5. Once the Brain-enabled scrubber completes scanning the home location code, a "Success" message appears.
6. Select a cleaning route via the user interface LCD screen by selecting the desired route.
7. Step off of the machine and secure the safety straps by pulling them from their housing and clasping them to the front screws and clasping them to the front screws on the sides of the machine.
8. Walk to the rear of the machine and press the flashing blue button to begin autonomous operation.
9. As the machine starts autonomous operation, inspect it to ensure proper cleaning function (i.e. deck and scrubbing function, squeegee function, squeegee adjustment, rear squeegee water pickup, side skirt wiping, etc.)



MinuteMan RoboScrub 20

Replacing the MinuteMan BCM

When replaying the short route, ensure that the robot follows the path without difficulty. At some point during the replay, step in the robots path and continue to block it until an assist is triggered.



The goal is to leave the unit powered on until the assist file has been uploaded to the ROC. Once received, it may be reviewed by a Tech Ops team member.

# Lower Lidar Removal

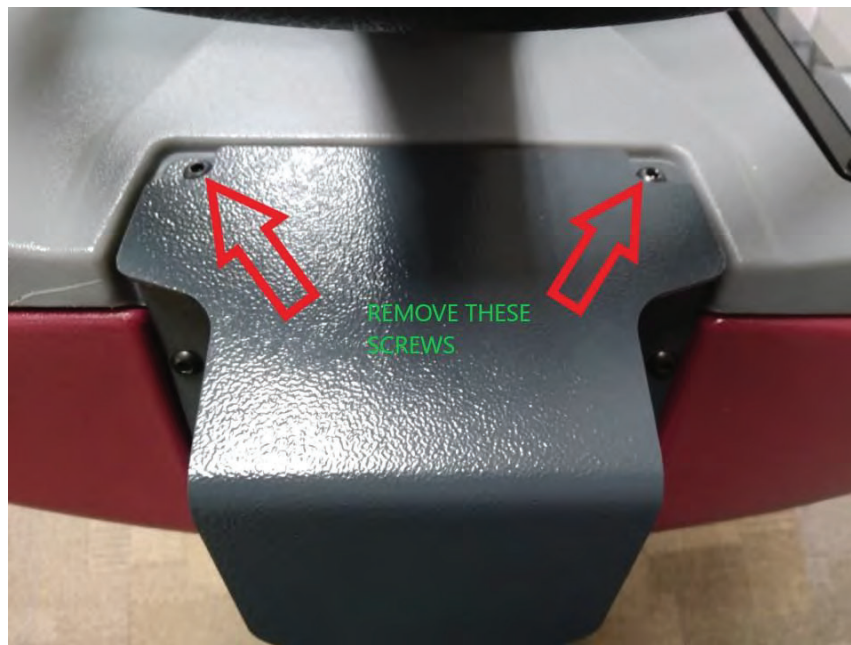
# Front Panel Removal



1. Remove these three screws.



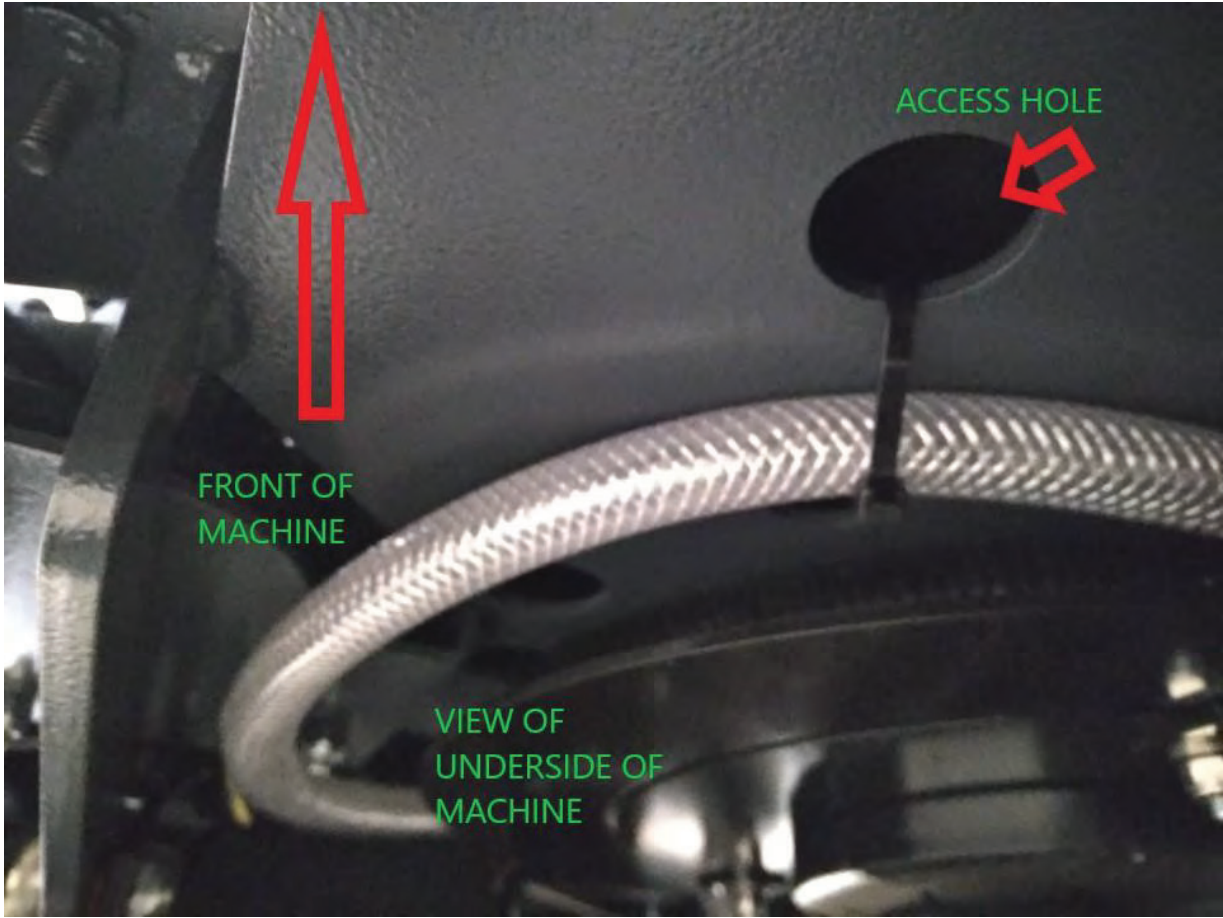
2. Remove these two screws. Remove Upper Lidar cover plate.





3. Remove two nuts positioned inside frame underneath. There are two access holes to allow for removal.



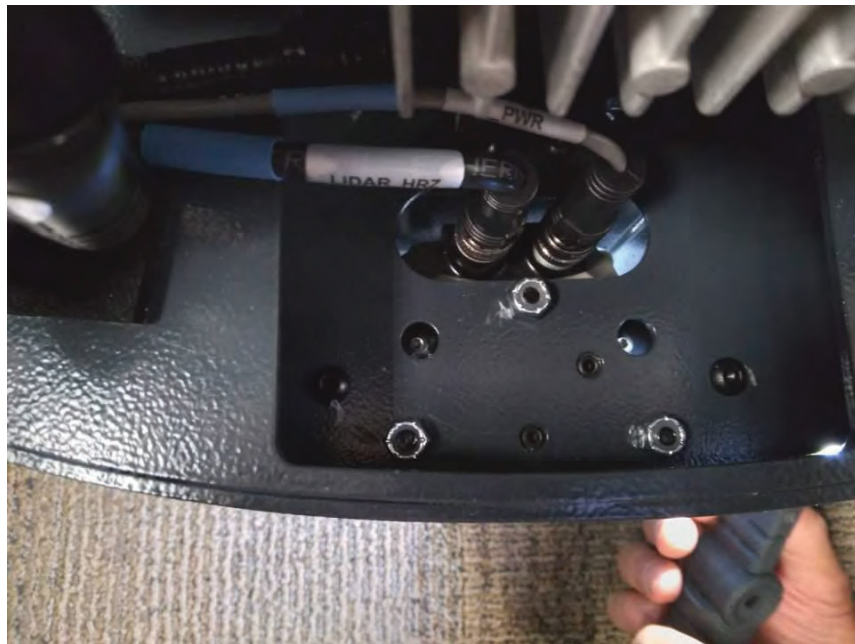


4. Remove screw on each side as shown in pictures below.

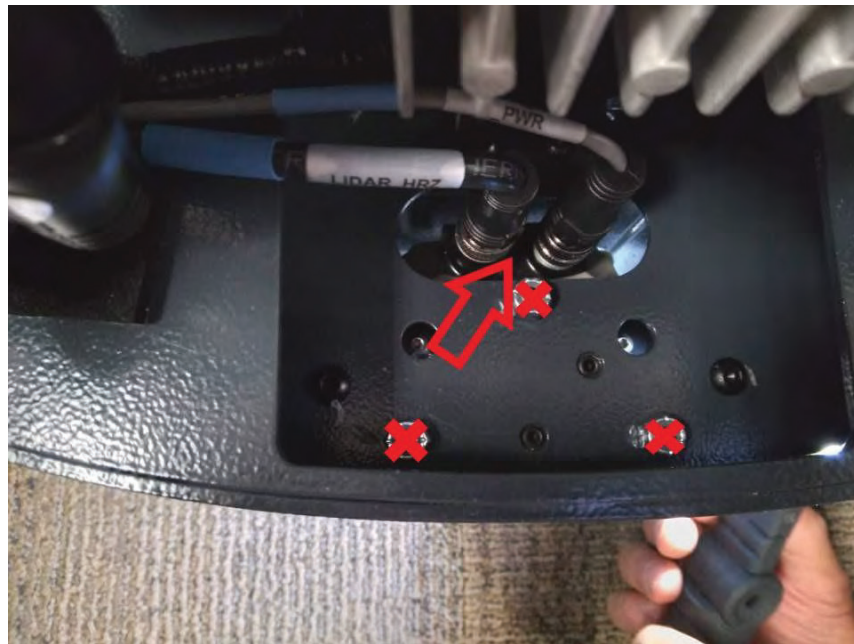




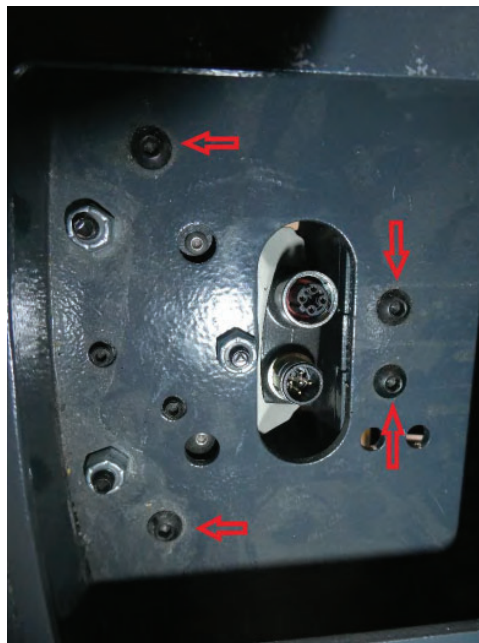
## Removal of lower jaw and Lidar.

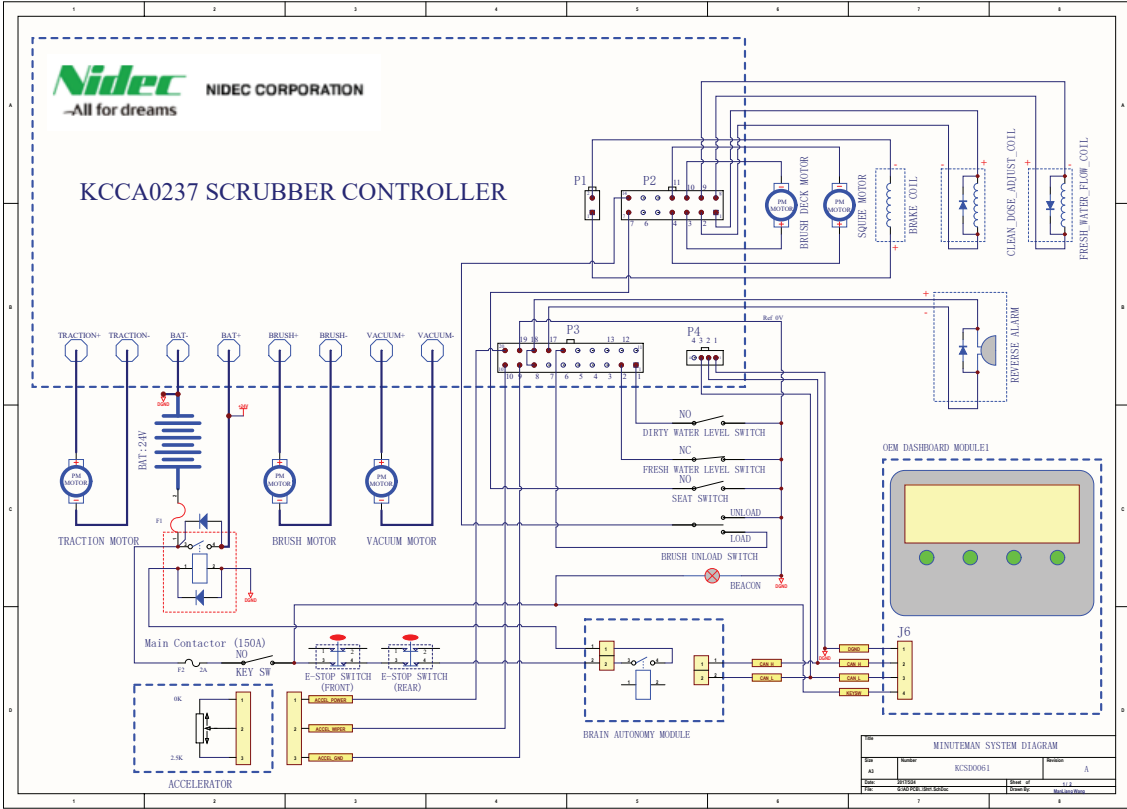


# 1. Disconnect cables.



2. Remove these four screws. Then remove bracket.



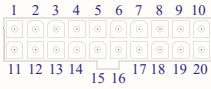




## KCCA0237 SCRUBBER CONTROLLER SOCKET CONNECTION DETAILS

## FOR P1 MINUTEMAN SCRUBBER CONTROL PANEL

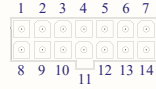
### P3 TILLER INTERFACE



THE P3 CONNECTOR FITTED TO THE P3 IS A MOLEX MINI-FIT Jr. PART.  
THE MATING CONNECTOR PART NUMBER IS AS FOLLOWS:  
MOLEX Mini-Fit Jr. 20 SOCKET RECEPTACLE:39-01-2200  
MOLEX Mini-Fit Jr. CRIMP TERMINAL:39-00-0039

PIN NUMBER	DESCRIPTION
1	DIRTY WATER LEVEL SWITC
2	FRESH WATER LEVEL SWITCH
3	N/A
4	N/A
5	N/A
6	N/A
7	N/A
8	KEYSWITCH REF(B+)
9	ACCELERATOR GND
10	ACCELERATOR IN
11	N/A
12	N/A
13	N/A
14	N/A
15	N/A
16	REF 24V
17	ALARM OUTPUT
18	KEYSWITCH IN
19	REF 0V
20	ACCELERATOR POWER

### P2 TILLER INTERFACE



THE P2 CONNECTOR FITTED TO THE P2 IS A MOLEX MINI-FIT Jr. PART.  
THE MATING CONNECTOR PART NUMBER IS AS FOLLOWS:  
MOLEX Mini-Fit Jr. 14 SOCKET RECEPTACLE:39-01-2140  
MOLEX Mini-Fit Jr. CRIMP TERMINAL:39-00-0039

PIN NUMBER	DESCRIPTION
1	DETERGENT PUMB POWER
2	DETERGENT PUMB OUTPUT
3	BRUSH DECK OUT A
4	SQUEE OUT A
5	N/A
6	N/A
7	SEAT SWITCH
8	WATER VALVE POWER
9	WATER VALVE OUTPUT
10	BRUSH DECK OUT B
11	SQUEE OUT B
12	N/A
13	N/A
14	BRUSH UNLOAD SWITCH

### P1 BRAKE



THE P1 CONNECTOR FITTED TO THE P1 IS A MOLEX MINI-FIT Jr. PART.  
THE MATING CONNECTOR PART NUMBER IS AS FOLLOWS:  
MOLEX Mini-Fit Jr. 2 SOCKET RECEPTACLE:39-01-2020  
MOLEX Mini-Fit Jr. CRIMP TERMINAL:39-00-0039

PIN NUMBER	DESCRIPTION
1	BRAKE+
2	BRAKE-

### P4 TILLER INTERFACE



THE P4 CONNECTOR FITTED TO THE P4 IS A MOLEX MINI-FIT Jr. PART.  
THE MATING CONNECTOR PART NUMBER IS AS FOLLOWS:  
MOLEX Mini-Fit Jr. 20 SOCKET RECEPTACLE:39-01-4041  
MOLEX Mini-Fit Jr. CRIMP TERMINAL:39-00-0039

PIN NUMBER	DESCRIPTION
1	DGND
2	CAN H
3	CAN L
4	N/A

### REVISION LOG

REV A - ECN00XXX - 24May2017  
- Initial Release

Title				MINUTEMAN SYSTEM DIAGRAM			
Size		Number		Revision			
A3		KCS0061		A			
Date:	2017024	Sheet of	2 / 2				
File:	G:\AD PCB\I\SHZ_SchDoc	Drawn By:	ManLiang Wang				

3. Remove these two screws. Now Lidar is ready to remove.



## Error Codes

# How to read Kinetek Error Codes

**Step one.** Locate the rear panel and remove the 7 screws and remove the panel.



**Step Two.** Locate the Nidec/ Kinetek controller.



**Step Three.** Find the red light in the bottom right of the controller.



**Step Four.** If the light is flashing the board has an error it will blink in a series of fast flashes and then slow flashes. Count the flashes and see the table below to get your hex code. See document Kinetec error codes.pdf to find what is wrong with your machine. Example 4 fast and 10 slow would be code 4A.

Flashes	Code
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F

## Specifications

Outputs	Current Limit	Operating Voltage	Continuous Current
Traction	150A	24/36 VDC	70A
Brush	120A		60A
Vacuum	50A		30A
Squeegee Actuator	7A		4A
Brush Deck Actuator	7A		4A
Brake	10A		4A
Beeper	10A		4A
Valve	10A		4A
Aux 1 Out	5A		2A
Aux 2 Out	5A		2A

## Terminal Definitions

P1 Connector (Output)	
Pin 1	Brake Out P
Pin 2	Brake Out N

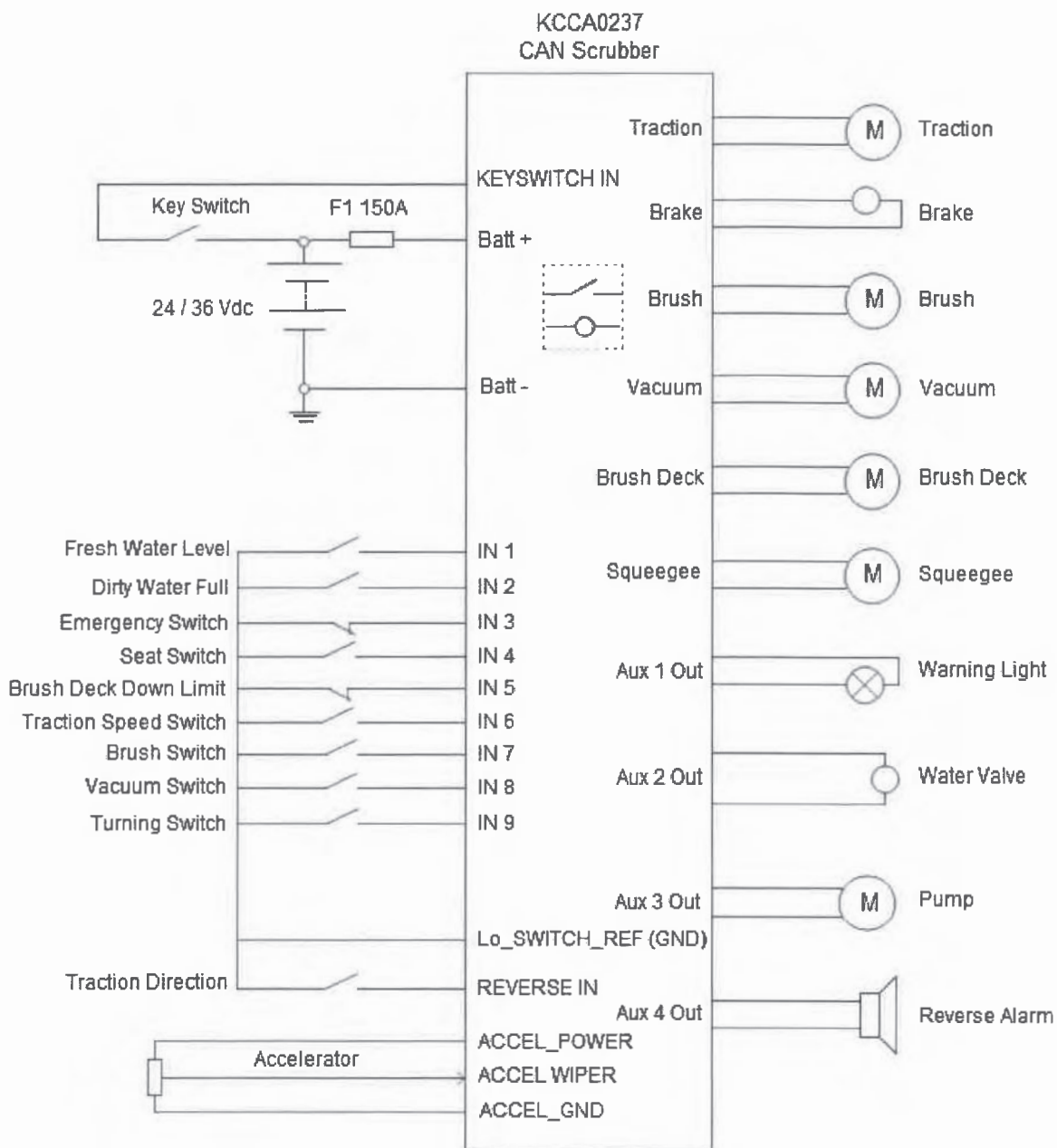
P2 Connector (Input/Output)	
Pin 1	Auxiliary Power (B+)
Pin 2	Water Valve N
Pin 3	Brush Deck Motor N
Pin 4	Squeegee Motor N
Pin 5	Switch Ref Lo
Pin 6	Squeegee Switch In
Pin 7	Aux2 In
Pin 8	Auxiliary Power (B+)
Pin 9	Aux2 Out
Pin 10	Brush Deck Motor P
Pin 11	Squeegee Motor P
Pin 12	Switch Ref Hi
Pin 13	Brush Deck Switch In
Pin 14	Water Valve Switch In

P3 Connector (Input/Output)	
Pin 1	Motor Temp
Pin 2	Brush Speed In
Pin 3	Traction Speed In
Pin 4	Start Switch In
Pin 5	Aux1 In
Pin 6	Status Indicator LED
Pin 7	Aux1 Out
Pin 8	Key Switch Ref (B+)
Pin 9	Accelerator Ref Lo
Pin 10	Accelerator In
Pin 11	Vacuum Motor Switch In
Pin 12	Brush Motor Switch In
Pin 13	Direction Switch In
Pin 14	5V Power/Aux4 In
Pin 15	Aux5 In
Pin 16	Switch Ref Hi
Pin 17	Alarm Out
Pin 18	Key Switch In
Pin 19	Switch Ref Lo
Pin 20	Accelerator Ref Hi

P4 Connector (Programming)	
Pin 1	DGND
Pin 2	CAN H
Pin 3	CAN L
Pin 4	KEY SWITCH IN

## Wiring Diagram

The scrubber controller is available in both internal and external relay versions. KCCA0237 uses internal relays for connecting the battery to the power circuits.



## KCCA0237 ERROR CODE TABLE

Error Code	Description
0x12	EEPROM ERROR
0x1A	BATTERY LOW(ALL FUNCTION OFF)
0x21	BATTERY LOW(TRACTION ONLY)
0x23	MCU OVER TEMPERATURE
0x26	PRECHARGE FAILURE(TRACTION)
0x29	TRACTION LEFT NULL ERROR
0x2D	BRUSH NULL ERROR
0x2E	VACUUM NULL ERROR
0x2F	SQUEE NULL ERROR
0x31	BRUSH ADJUSTMENT TIMEOUT
0x32	SOLENOID WELDED(TRACTION)
0x33	SOLENOID DIDN'T CLOSE(TRACTION)
0x37	THROTTLE FAULT
0X3A	BRAKE FAULT
0X3B	ALARM FAULT
0X3C	AUX1 FAULT
0X3D	AUX2 FAULT
0x3F	BRUSH DECK NULL ERROR
0x42	TRACTION STALLED MOTOR
0x44	TRACTOIN REVERSE SHORT CICUIT PROTECTION
0x4C	TRACTOIN FORWARD SHORT CICUIT PROTECTION
0x4D	BRUSH OVER CURRENT PROTECTION
0x4E	BRUSH SHORT CIRCUIT PROTECTION
0x59	TRACTION LEFT DRAIN FAULT
0x5B	TRACTION RIGHT DRAIN FAULT
0x5C	TRACTION REVERSE OVER CURRENT PROTECTION
0x5D	TRACTION FORWARD OVER CURRENT PROTECTION
0x61	BRUSH DRAIN FAULT
0x62	SUPPLY OUT OF RANGE
0X64	BRUSH DECK OVER CURRENT PROTECTION
0x65	VACUUM SHORT CIRCUIT PROTECTION
0X66	BRUSH DECK SHORT CIRCUIT PROTECTION
0X67	SQUEEGEE OVER CURRENT PROTECTION
0x68	VACUUM OVER CURRENT PROTECTION
0X69	SQUEEGEE SHORT CIRCUIT PROTECTION
0X6A	VALVE FAULT
0x6C	TRACTION RIGHT NULL ERROR
0x71	TRIAL TIMEOUT
0x72	SOLENOID WELDED(OTHERS)
0x73	SOLENOID DIDN'T CLOSE(OTHERS)
0x74	SQUEE STALLED MOTOR
0x75	BRUSH DECK STALLED MOTOR
0x76	PRECHARGE FAILURE(OTHERS)
0x77	BRUSH STALLED MOTOR
0x78	VACUUM STALLED MOTOR
0X83	MOSFET OVER TEMPERATURE
0xA2	HIGH BATTERY PROTECTION

## List of Error Codes

The following table provides detailed information for the available Assist, Alert, Startup and Error codes displayed on the current UI.

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
0	Error	UNKNOWN_ERROR	Unknown Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect the machine.</li> <li>2. Restart the machine.</li> <li>3. If the issue continues, contact customer service.</li> </ol>	2
1	Error	RECOVERABLE_FROM_HOME	Unknown Error	<ol style="list-style-type: none"> <li>1. Restart the machine.</li> <li>2. If the issue continues, contact customer service.</li> </ol>	2
4	Startup	Navstack crashed during startup	Unknown Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> <p>Contact supervisor if issue continues.</p>	2
100	Assist	MotionErrorCode.STEERING_ESTIMATOR_ERROR	Steering Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> <p>Contact supervisor if issue continues.</p>	3
101	Assist	MotionErrorCode.WHEEL_SLIPPAGE	Steering Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> <p>Contact supervisor if issue continues.</p>	3



Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
102	Assist	Large front column angle prediction error	Steering Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> Contact supervisor if issue continues.	3
103	Assist	PATH_BLOCKED	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
104	Assist	MACHINE_ERROR	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
105	Assist	DRIVING BACKWARD DETECTED	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
106	Assist	OFF_PATH	Machine is Off Path	<ol style="list-style-type: none"> <li>1. Follow the arrow and drive the machine to the highlighted path.</li> <li>2. Make sure the path is clear.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
200	Alert	RECOVERY_TANK_FULL	Recovery Tank Full	Drain the recovery tank.	2
200	Assist	RECOVERY_TANK_FULL	Recovery Tank Full	<ol style="list-style-type: none"> <li>1. Drain the recovery tank.</li> <li>2. Drive the machine back to the route.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	2

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
102	Assist	Large front column angle prediction error	Steering Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> Contact supervisor if issue continues.	3
103	Assist	PATH_BLOCKED	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
104	Assist	MACHINE_ERROR	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
105	Assist	DRIVING BACKWARD DETECTED	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
106	Assist	OFF_PATH	Machine is Off Path	<ol style="list-style-type: none"> <li>1. Follow the arrow and drive the machine to the highlighted path.</li> <li>2. Make sure the path is clear.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
200	Alert	RECOVERY_TANK_FULL	Recovery Tank Full	Drain the recovery tank.	2
200	Assist	RECOVERY_TANK_FULL	Recovery Tank Full	<ol style="list-style-type: none"> <li>1. Drain the recovery tank.</li> <li>2. Drive the machine back to the route.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	2

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
204	Alert	BRUSH_ERROR	Brush Error	<ol style="list-style-type: none"> <li>1. Inspect the brushes and pads for damage or debris.</li> <li>2. Adjust or replace as needed.</li> <li>3. If the issue continues, contact customer service.</li> </ol>	1
204	Assist	BRUSH_ERROR	Brush Error	<ol style="list-style-type: none"> <li>1. Inspect the brushes and pads for damage or debris.</li> <li>2. Adjust or replace as needed.</li> <li>3. If no issues are found, press the Start/Pause button to resume.</li> <li>4. If the issue continues, contact customer service.</li> </ol>	1
205	Alert	VACUUM_ERROR	Vacuum Error	<ol style="list-style-type: none"> <li>1. Inspect the vacuum and hose for damage or debris.</li> <li>2. If the hose is broken, contact customer service.</li> </ol>	1
205	Assist	VACUUM_ERROR	Vacuum Error	<ol style="list-style-type: none"> <li>1. Inspect the vacuum and hose for damage or debris.</li> <li>2. If the hose is clear, press the Start/Pause button to resume.</li> <li>3. If the hose is broken, contact customer service.</li> </ol>	1
206	Alert	SQUEEGEE_ERROR	Squeegee Error	<ol style="list-style-type: none"> <li>1. Inspect the squeegee for damage or debris.</li> <li>2. Adjust or replace as needed.</li> <li>3. If the issue continues, contact customer service.</li> </ol>	1

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
206	Assist	SQUEEGEE_ERROR	Squeegee Error	<ol style="list-style-type: none"> <li>1. Inspect the squeegee for damage or debris.</li> <li>2. Adjust or replace as needed.</li> <li>3. If no issues are found, press the Start/Pause button to resume.</li> <li>4. If the issue persists, contact customer service.</li> </ol>	1
207	Alert	SCRUB_DECK_ERROR	Scrub Deck Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Inspect the scrub deck for damage.</li> <li>3. Turn on the machine.</li> <li>4. If the issue continues or damage is detected, contact customer service.</li> </ol>	1
207	Assist	SCRUB_DECK_ERROR	Scrub Deck Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, press the Start/Pause button to resume.</li> <li>3. If the issue continues, contact customer service.</li> </ol>	1
208	Alert	NO_BRUSH_ERROR	No Brush Detected	<ol style="list-style-type: none"> <li>1. Make sure the brushes and pads are properly installed.</li> <li>2. If the issue continues, contact customer service.</li> </ol>	1
208	Assist	NO_BRUSH_ERROR	No Brush Detected	<ol style="list-style-type: none"> <li>1. Make sure brushes or pads are properly installed.</li> <li>2. If no issues are found, press the Start/Pause button to resume.</li> <li>3. If the issue continues, contact customer service.</li> </ol>	1
209	Alert	SEAT_SENSOR_TRIGGERED	Seat Sensor Triggered	Verify the seat is empty.	3

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
209	Assist	SEAT_SENSOR_TRIGGERED	Seat Sensor Triggered	<ol style="list-style-type: none"> <li>1. Make sure the seat is empty.</li> <li>2. To resume, press the Start/Pause button.</li> </ol>	3
210	Alert	SCRUBBER_ERROR_STATE	Processor Error	<ol style="list-style-type: none"> <li>1. Restart the machine.</li> <li>2. If the issue continues, contact customer service.</li> </ol>	1
210	Assist	UNKNOWN PROBLEM WITH MACHINE	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect the machine.</li> <li>2. Restart the machine.</li> <li>3. If the issue continues, contact customer service.</li> </ol>	3
211	Assist	PROBLEM WITH THROTTLE	Throttle Error	<ol style="list-style-type: none"> <li>1. Inspect the throttle.</li> <li>2. If no issues are found, press the Start/Pause button to resume.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	3
212	Assist	PROBLEM WITH BRAKE	Brake Pedal Error	<ol style="list-style-type: none"> <li>1. Inspect the brake pedal.</li> <li>2. If no issues are found, press the Start/Pause button to resume.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	3
215	Assist	SLANTED LIDAR NOT CONVERGED	Sensor Check in Progress	<ol style="list-style-type: none"> <li>1. Drive the machine approximately 10 to 15 feet (3-5m) along the path.</li> <li>2. To resume, press the Start/Pause button.</li> </ol>	3
216	Alert	ESTOP ENGAGED	Emergency Stop Engaged	<ol style="list-style-type: none"> <li>1. Inspect the machine and the surrounding area.</li> <li>2. If clear, release the emergency stop.</li> </ol>	3
216	Assist	FIRMWARE SAFTEY STOP XXX	Safety Stop	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
217	Alert	SENSOR_CHECK_IN_PROGRESS	Sensor Check in Progress	<ol style="list-style-type: none"> <li>1. Drive the machine 10-15 feet along the route.</li> <li>2. To resume, press the Start/Pause button.</li> </ol>	2
217	Assist	FIRMWARE_PAUSE/FW_FOOTPRINT_VIOLATION	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
218	Assist	Firmware Steering Motor Malfunction	Steering Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> <p>Contact supervisor if issue continues.</p>	3
219	Assist	FIRMWARE_STOP	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
222	Assist	PEDAL_PRESSED	Pedal Pressed	<ol style="list-style-type: none"> <li>1. Make sure the pedal is clear.</li> <li>2. To resume, press the Start/Pause button.</li> </ol>	3
223	Assist	FIRMWARE_PLANAR_LIDAR_TIMEOUT	Sensor Error	<ol style="list-style-type: none"> <li>1. Clean all the sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage or obstructions.</li> <li>3. If no issues are found, press the Start/Pause button to resume.</li> </ol>	3

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
224	Assist	FIRMWARE_SLANTED_LIDAR_TIMEOUT	Sensor Error	<ol style="list-style-type: none"> <li>1. Clean all the sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage or obstructions.</li> <li>3. If no issues are found, press the Start/Pause button to resume.</li> </ol>	3
225	Assist	FIRMWARE_BOTH_LIDARS_TIMEOUT	Sensor Error	<ol style="list-style-type: none"> <li>1. Clean all the sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage or obstructions.</li> <li>3. If no issues are found, press the Start/Pause button to resume.</li> </ol>	3
226	Assist	FIRMWARE_LEFT_IFM_TIMEOUT	Left Sensor Not Responding	<ol style="list-style-type: none"> <li>1. Clean the left sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage.</li> <li>3. Restart the machine.</li> </ol>	3
227	Assist	FIRMWARE_RIGHT_IFM_TIMEOUT	Right Sensor Not Responding	<ol style="list-style-type: none"> <li>1. Clean the right sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage.</li> <li>3. Restart the machine.</li> </ol>	3
228	Assist	FIRMWARE_LEFT_INVALID_FLOOR_HEIGHT	Left Sensor Not Responding	<ol style="list-style-type: none"> <li>1. Clean the left sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage.</li> <li>3. Restart the machine.</li> </ol>	3
229	Assist	FIRMWARE_RIGHT_INVALID_FLOOR_HEIGHT	Right Sensor Not Responding	<ol style="list-style-type: none"> <li>1. Clean the right sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage.</li> <li>3. Restart the machine.</li> </ol>	3

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
230	Assist	FIRMWARE_LEFT_IFM_OBSTACLE_TOO_CLOSE	Left Side Obstacle Detected	<ol style="list-style-type: none"> <li>1. Inspect the machine and the surrounding area.</li> <li>2. Drive past any obstacles.</li> <li>3. If clear, press the Start/Pause button to resume.</li> </ol>	3
231	Assist	FIRMWARE_RIGHT_IFM_OBSTACLE_TOO_CLOSE	Right Side Obstacle Detected	<ol style="list-style-type: none"> <li>1. Inspect the machine and the surrounding area.</li> <li>2. Drive past any obstacles.</li> <li>3. If clear, press the Start/Pause button to resume.</li> </ol>	3
232	Assist	FIRMWARE_PLANAR_OBSTACLE_TOO_CLOSE	Potential Hazard Detected	<ol style="list-style-type: none"> <li>1. Inspect the machine.</li> <li>2. Make sure the path of the machine is clear or drive past any obstacles.</li> <li>3. If the path is clear, press the Start/Pause button to resume.</li> </ol>	3
233	Assist	FIRMWARE_CLIFF_TOO_CLOSE	Cliff Detected	<ol style="list-style-type: none"> <li>1. Make sure the machine is not operating near stairs or escalators</li> <li>2. To resume, press the Start/Pause button</li> </ol>	3
234	Assist	FIRMWARE_PLANAR_MARKER_NOT_FOUND	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, press the Start/Pause button to resume.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	3



Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
235	Assist	FIRMWARE_SLANTED_MARKER_NOT_FOUND	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, press the Start/Pause button to resume.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	3
236	Assist	SOAP_VALVE_ERROR	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, press the Start/Pause button to resume.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	3
237	Assist	WATER_VALVE_ERROR	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, press the Start/Pause button to resume.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	3
300	Assist	Path Too Far	Machine is Off Path	<ol style="list-style-type: none"> <li>1. Follow the arrow and drive the machine to the highlighted path.</li> <li>2. Make sure the path is clear.</li> <li>3. To resume, press the Start/Pause button</li> </ol>	3
301	Assist	Path is Empty	Machine is Off Path	<ol style="list-style-type: none"> <li>1. Follow the arrow and drive the machine to the highlighted path.</li> <li>2. Make sure the path is clear.</li> <li>3. To resume, press the Start/Pause button</li> </ol>	3
302	Assist	No Valid Move	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
303	Assist	All Paths Will Stuck	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
304	Assist	Start Pose Colliding	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
305	Assist	Path Too Close	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
306	Assist	Too Dangerous	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
307	Assist	Touching Obstacle	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
308	Assist	Decision Loop	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	2

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
309	Assist	Path is Behind	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
401	Error	HOMING_TIMEOUT	Unknown Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> Contact supervisor if problem continues.	2
411	Error	HOMING_TIMEOUT	Unknown Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> Contact supervisor if problem continues.	2
500	Assist	ESTOP_PRESSED	Emergency Stop Engaged	<ol style="list-style-type: none"> <li>1. Inspect the machine and the surrounding area.</li> <li>2. If clear, release the emergency stop.</li> </ol>	3
501	Error	GYRO_STUCK	Gyro Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Disconnect the battery cable for 15 seconds.</li> <li>3. Reconnect the cable and turn on the machine.</li> <li>4. If the issue continues, contact customer service.</li> </ol>	1
502	Error	GYRO_NOISY	Home Marker Scan Error	<ol style="list-style-type: none"> <li>1. Return to the Home Marker.</li> <li>2. Scan the Home Marker again.</li> <li>3. Do not move the machine until the scan is complete. <b>4. If the issue continues, contact your supervisor.</b></li> </ol>	1
503	Error	MOVED_TOO_MUCH	Home Marker Scan Error	<ol style="list-style-type: none"> <li>1. Return to the Home Marker.</li> <li>2. Scan the Home Marker again.</li> <li>3. Do not move the machine until the scan is complete.</li> </ol>	1

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
504	Error	IMU_TIMEOUT	Gyro Error	Gyro error. Please restart the machine.	1
40007	Error	MCU_STATUS_STEERING_OUT_OF_RANGE	Steering Calibration Adjustment Needed	<ol style="list-style-type: none"> <li>1. Drive the machine back to the charging station.</li> <li>2. Turn off the machine.</li> </ol> Notify your supervisor of this issue and include the error code number. This machine will need to be recalibrated.	3
507	Assist	FIRMWARE_ESTOP	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
508	Assist	PATH_BLOCKED	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
509	Error	FLASH_FIRMWARE_FAULT			
510	Assist	MANUAL_FOLLOWING_RESULT_INVALID	Path Following Error	Restart the machine. If the issue continues, contact your supervisor.	1
511	Assist	MOTION_POSE_INVALID	Path Following Error	Restart the machine. If the issue continues, contact your supervisor.	1
512	Assist	MOTION_CONTROL_INVALID	Path Following Error	Restart the machine. If the issue continues, contact your supervisor.	1

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
513	Assist	PERCEPTS_INVALID	Path Following Error	Restart the machine. If the issue continues, contact your supervisor.	1
514	Assist	PERCEPTION_POSE_INVALID	Path Following Error	Restart the machine. If the issue continues, contact your supervisor.	1
700	Error	DISCONNECTED_ERROR	Unknown Error	1. Turn off the machine. 2. Wait 15 seconds. 3. Turn on the machine.  Contact supervisor if problem continues.	2
800	Error	CURTAIN_LIDAR_TRIGGERED	Unknown Error	1. Turn off and inspect the machine. 2. Restart the machine. 3. If the issue continues, contact customer service.	2
5001	Startup	UNCALIBRATED	Uncalibrated Sensor	Sensor(s) not calibrated. Go to Settings to calibrate or contact customer service.	1
5002	Startup	FRONT_IFM_NOT_RESPONDING	Upper Sensor Not Responding	1. Clean the upper sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5003	Startup	FRONT_IFM_ERROR	Upper Sensor Not Responding	1. Clean the upper sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5004	Startup	LEFT_IFM_NOT_RESPONDING	Left Sensor Not Responding	1. Clean the left sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
5005	Startup	RIGHT_IFM_NOT_RESPONDING	Right Sensor Not Responding	1. Clean the right sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5006	Startup	SLANTED_LIDAR_NOT_RESPONDING	Upper Sensor Not Responding	1. Clean the upper sensors with a clean microfiber cloth. 2. Inspect for damage or obstructions. 3. Restart the machine.	1
5007	Startup	PLANAR_LIDAR_NOT_RESPONDING	Lower Sensor Not Responding	1. Clean the lower sensors with a clean microfiber cloth. 2. Inspect for damage or obstructions. 3. Restart the machine.	1
5008	Startup	ROBOT_STATE_NOT_RESPONDING	Machine Not Responding	Restart the machine.	1
5010	Startup	ODOMETER_NOT_RESPONDING	Odometer Not Responding	Restart the machine.	1
5011	Startup	TF_NOT_RESPONDING	Transformer Not Responding	Restart the machine.	1
5013	Startup	FRONT_IFM_ERROR	Upper Sensor Not Responding	1. Clean the upper sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
5014	Startup	LEFT_IFM_NOT_RESPONDING	Left Sensor Not Responding	<ol style="list-style-type: none"> <li>1. Clean the left sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage.</li> <li>3. Restart the machine.</li> </ol>	1
5015	Startup	RIGHT_IFM_NOT_RESPONDING	Right Sensor Not Responding	<ol style="list-style-type: none"> <li>1. Clean the right sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage.</li> <li>3. Restart the machine.</li> </ol>	1
5016	Startup	SLANTED_LIDAR_NOT_RESPONDING	Upper Sensor Not Responding	<ol style="list-style-type: none"> <li>1. Clean the upper sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage.</li> <li>3. Restart the machine.</li> </ol>	1
5017	Startup	PLANAR_LIDAR_NOT_RESPONDING	Lower Sensor Not Responding	<ol style="list-style-type: none"> <li>1. Clean the lower sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage.</li> <li>3. Restart the machine.</li> </ol>	1
5019	Startup	RIGHT_RGB_NOT_RESPONDING	Sensor Not Responding	Restart the machine.	1
5021	Startup	FRONT_IFM_ERROR	Upper Sensor Not Responding	<ol style="list-style-type: none"> <li>1. Clean the upper sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage.</li> <li>3. Restart the machine.</li> </ol>	1
5022	Startup	FRONT_IFM_ERROR	Upper Sensor Not Responding	<ol style="list-style-type: none"> <li>1. Clean the upper sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage.</li> <li>3. Restart the machine.</li> </ol>	1

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
5023	Startup	FRONT_IFM_ERROR	Upper Sensor Not Responding	1. Clean the upper sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5024	Startup	LEFT_IFM_NOT_RESPONDING	Left Sensor Not Responding	1. Clean the left sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5025	Startup	LEFT_IFM_NOT_RESPONDING	Left Sensor Not Responding	1. Clean the left sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5026	Startup	LEFT_IFM_NOT_RESPONDING	Left Sensor Not Responding	1. Clean the left sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5027	Startup	RIGHT_IFM_NOT_RESPONDING	Right Sensor Not Responding	1. Clean the right sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5028	Startup	RIGHT_IFM_NOT_RESPONDING	Right Sensor Not Responding	1. Clean the right sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1



Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
5029	Startup	RIGHT_IFM_NOT_RESPONDING	Right Sensor Not Responding	1. Clean the right sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5030	Startup	SLANTED_LIDAR_NOT_RESPONDING	Upper Sensor Not Responding	1. Clean the upper sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5031	Startup	SLANTED_LIDAR_NOT_RESPONDING	Upper Sensor Not Responding	1. Clean the upper sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5032	Startup	SLANTED_LIDAR_NOT_RESPONDING	Upper Sensor Not Responding	1. Clean the upper sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5033	Startup	PLANAR_LIDAR_NOT_RESPONDING	Lower Sensor Not Responding	1. Clean the lower sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5034	Startup	PLANAR_LIDAR_NOT_RESPONDING	Lower Sensor Not Responding	1. Clean the lower sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
5035	Startup	PLANAR_LIDAR_NOT_RESPONDING	Lower Sensor Not Responding	1. Clean the lower sensors with a clean microfiber cloth. 2. Inspect for damage. 3. Restart the machine.	1
5036	Startup	IFM_FIRMWARE_UPDATE_ERROR	Sensor Update Error	Restart the machine.	1
6000	Assist	DIRTY_PLANAR	Lower Sensor Dirty	Inspect and clean the bottom sensor Reboot the machine If the issue continues, contact your supervisor.	3
6001	Assist	DIRTY_SLANTED	Upper Sensor Dirty	Inspect and clean the upper sensor Reboot the machine If the issue continues, contact your supervisor.	3
6002	Assist	DIRTY_FRONT_DEPTH_CAMERA	Front Camera Dirty	1. Inspect and clean the sensor. 2. Reboot the machine. 3. If the issue continues, contact your supervisor	3
8100	Assist	SENSOR_ERROR	Sensor Error	1. Clean all the sensors with a clean microfiber cloth. 2. Inspect for damage or obstructions. 3. If no issues are found, press the Start/Pause button to resume.	3

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
8200	Assist	SENSOR_ERROR	Sensor Error	<ol style="list-style-type: none"> <li>1. Clean all the sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage or obstructions.</li> <li>3. If no issues are found, press the Start/Pause button to resume.</li> </ol>	3
8300	Assist	SENSOR_ERROR	Sensor Error	<ol style="list-style-type: none"> <li>1. Clean all the sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage or obstructions.</li> <li>3. If no issues are found, press the Start/Pause button to resume.</li> </ol>	3
8400	Assist	SENSOR_ERROR	Sensor Error	<ol style="list-style-type: none"> <li>1. Clean all the sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage or obstructions.</li> <li>3. If no issues are found, press the Start/Pause button to resume.</li> </ol>	3
8500	Assist	SENSOR_ERROR	Sensor Error	<ol style="list-style-type: none"> <li>1. Clean all the sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage or obstructions.</li> <li>3. If no issues are found, press the Start/Pause button to resume.</li> </ol>	3
8600	Assist	SENSOR MONITORING ERROR: SONARS	Sensor Error	<ol style="list-style-type: none"> <li>1. Clean all the sensors with a clean microfiber cloth.</li> <li>2. Inspect for damage or obstructions.</li> <li>3. If no issues are found, press the Start/Pause button to resume.</li> </ol>	3
8610	ASSIST T	ROBOT_STATE: NO ROBOT MESSAGE	Unknown Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect the machine.</li> <li>2. Restart the machine.</li> <li>3. If the issue continues, contact customer service.</li> </ol>	2

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
8800	Assist	MACHINE_ERROR	Path is Blocked	<ol style="list-style-type: none"> <li>1. Make sure the path is clear.</li> <li>2. Drive past any obstacles.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	2
9001	Assist	IMPACT_DETECTED	Impact Detected	<ol style="list-style-type: none"> <li>1. Inspect the machine and the surrounding area.</li> <li>2. Drive past any obstacles.</li> <li>3. If clear, press the Start/Pause button to resume.</li> </ol>	3
9010	Assist	LEFT_SIDE_OBSTACLE	Left Side Obstacle Detected	<ol style="list-style-type: none"> <li>1. Inspect the machine and the surrounding area.</li> <li>2. Drive past any obstacles.</li> <li>3. If clear, press the Start/Pause button to resume.</li> </ol>	3
9011	Assist	RIGHT_SIDE_OBSTACLE	Right Side Obstacle Detected	<ol style="list-style-type: none"> <li>1. Inspect the machine and the surrounding area.</li> <li>2. Drive past any obstacles.</li> <li>3. If clear, press the Start/Pause button to resume.</li> </ol>	3
10000	Assist	LOST	Route Lost	<ol style="list-style-type: none"> <li>1. Drive the machine to the Home Marker.</li> <li>2. Restart the route.</li> </ol>	2
10001	Assist	OFF_PATH	Machine is Off Path	<ol style="list-style-type: none"> <li>1. Follow the arrow and drive the machine to the highlighted path.</li> <li>2. Make sure the path is clear.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
20001	Error	ROUTE_CLOSURE_FAILED	Route Error	Retrain the route, starting and ending at the same Home Marker.	2

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
20002	Error	ROUTE_TOO_SHORT	Route Error	Retrain the route to be at least two minutes long.	2
20003	Error	IMU_ERROR	Gyro Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Disconnect the battery cable for 15 seconds.</li> <li>3. Reconnect the cable and turn on the machine.</li> <li>4. If the issue continues, contact customer service.</li> </ol>	1
20004	Error	ROUTE_IS_BACKWARDS	Route Error	<ol style="list-style-type: none"> <li>1. Retrain the route.</li> <li>2. Do not drive backwards while training the route.</li> </ol>	2
20005	Error	LIDAR_DELAY	Sensor Error	<ol style="list-style-type: none"> <li>1. Clean the lower sensor with a clean microfiber cloth.</li> <li>2. Inspect for damage or obstructions.</li> <li>3. If the issue continues, contact customer service.</li> </ol>	1

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
20006	Error	ROUTE_CANNOT_CONNECT	Route Error	Retrain the route, starting and ending at the same Home Marker.	2
20007	Error	ROUTE_FAILED	Route Error	Route failed to save. Retrain the route.	2
20008	Error	ROUTE_ENDPOINTS_EMPTY	Route Error	Retrain the route, starting and ending at the same Home Marker.	1
20009	Error	IMU_ZERO	Gyro Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Disconnect the battery cable for 15 seconds.</li> <li>3. Reconnect the cable and turn on the machine.</li> <li>4. If the issue continues, contact customer service.</li> </ol>	1

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
29999	Error	MAPPING_SAVE_ERROR	Unknown Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> Contact supervisor if problem continues.	2
30000	Error	COMMUNICATION_ERROR	Unknown Error	<ol style="list-style-type: none"> <li>1. Restart the machine.</li> <li>2. If the issue continues, contact customer service.</li> </ol>	2
30001	Error	ROUTE_LOADING_FAILED	Unknown Error	Failed to load route data. Please try again.	2
40002	Assist	STEERING_IMU_MISMATCH	Steering Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> Contact supervisor if issue continues.	2

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
40003	Assist	PROBLEM WITH USB CONNECTION	USB Connection Error	<ol style="list-style-type: none"> <li>1. Restart the machine.</li> <li>2. If the issue continues, contact your supervisor.</li> </ol>	1
40004	Assist	IMU ERROR	Gyro Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect the machine.</li> <li>2. Restart the machine.</li> <li>3. If the issue continues, contact customer service.</li> </ol>	1
40005	Assist	MACHINE_CONTROLLER_ERROR	System Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> <p>If the issue continues, contact your supervisor.</p>	
40006	Assist	STEERING ENCODER ERROR	Steering Error	<ol style="list-style-type: none"> <li>1. Turn off the machine.</li> <li>2. Wait 15 seconds.</li> <li>3. Turn on the machine.</li> </ol> <p>If the issue continues, contact your supervisor.</p>	2



Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
40007	Error	STEERING_OUT_OF_RANGE	Steering Calibration Adjustment Needed	<ol style="list-style-type: none"> <li>1. Drive the machine back to the charging station.</li> <li>2. Turn off the machine.</li> <li>3. Notify your supervisor of this issue and include the error code number. This machine will need to be recalibrated.</li> </ol>	1
50001	Assist	ESCALATOR DETECTED	Potential Hazard Detected	<ol style="list-style-type: none"> <li>1. Inspect the area for ramps, escalators, or potential drops.</li> <li>2. Drive the machine further along the path.</li> <li>3. To resume, press the Start/Pause button.</li> </ol>	3
60161	Assist	Pulsing the ESTOP solid state relay failed to be detected	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, restart the machine.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	2
60173	Assist	CAN Send Failure	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, restart the machine.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	2

Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
60400	Assist	ESTOP_CODE_GYRO_STEERING_MISMATCH	Calibration Error	<ol style="list-style-type: none"> <li>1. Drive the machine back to the charging station.</li> <li>2. Turn off the machine.</li> <li>3. Notify your supervisor of this issue and include the error code number. This machine will need to be recalibrated.</li> </ol>	1
60422	Assist	Moving while stopped in autonomous mode	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, restart the machine.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	2
60423	Assist	Significant movement in manual with no one in the seat	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, restart the machine.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	2
60424	Assist	ESTOP_CODE_NO_MOVEMENT	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, restart the machine.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	2

**Testing Manual/Auto Switch**

Set Meter to DC voltage

Place Black Probe on Main Battery Negative



# Component Testing Guide

## Diodes

### Where Used:

On all automatic scrubbers and battery powered burnishers and vacuums.

### Purpose:

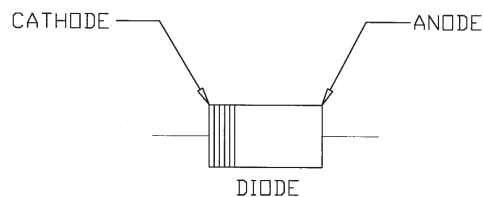
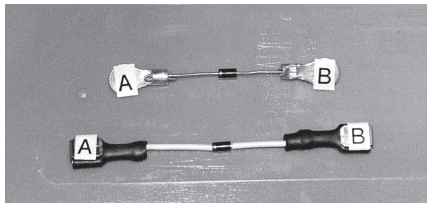
A diode is a one-way electrical check valve that prevents electrical current from flowing in one direction. This allows us to protect a circuit and electrical components from electrical spikes. A diode also allows us to prevent back feeding of current in a shared circuit.

### How to Test:

To test a diode, you will need a continuity tester or an OHM meter.

#### To test the diode:

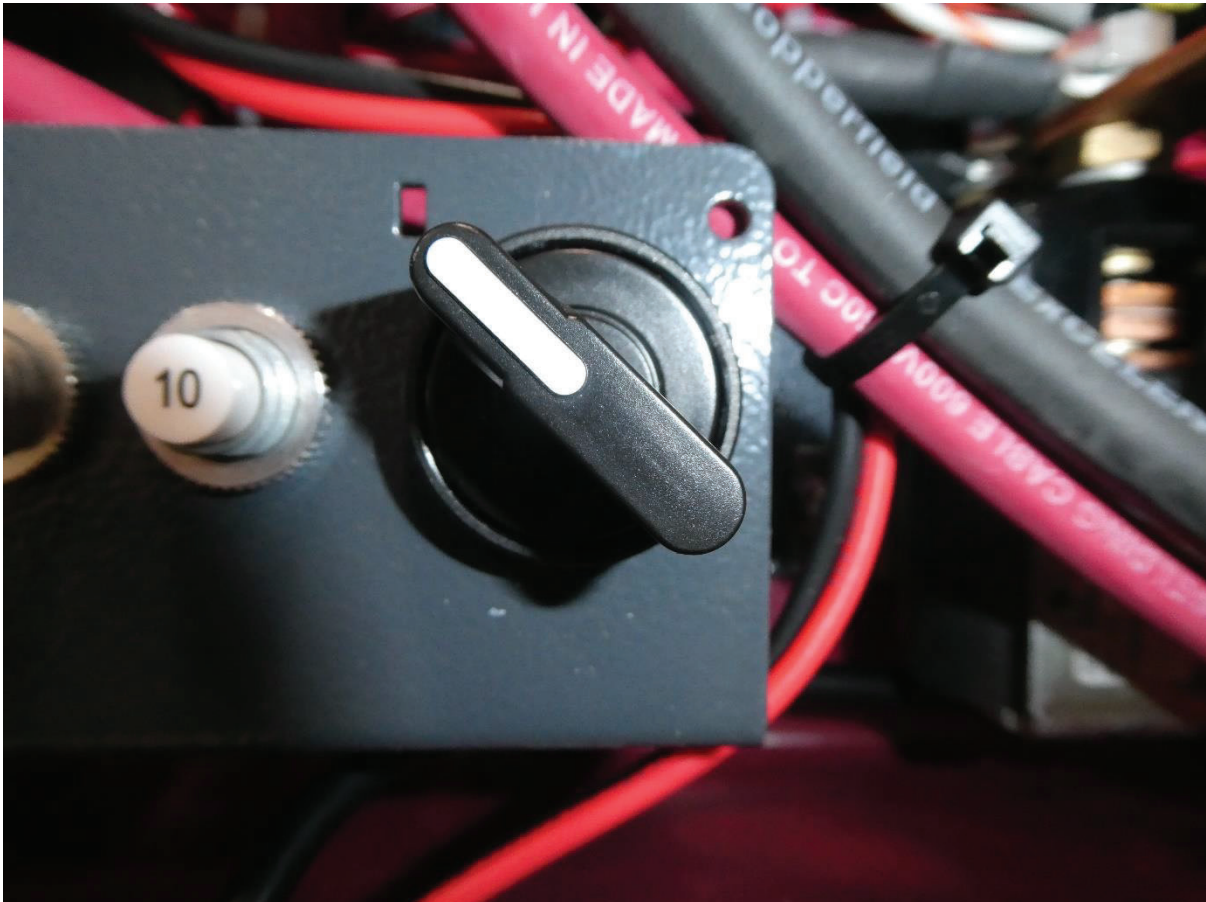
- 1). Put your OHM meter on the highest scale, i.e. R x 10,000 scale and “zero” out your meter and remove the diode from the circuit.
- 2). Put the red lead of your OHM meter on the cathode side of the diode (the side with the silver or white band - In Photo - Side “A” ).
- 3). Put the black lead from your OHM meter on the opposite side of the diode. (In Photo - Side B). Your OHM meter or continuity tester should show no counting through the diode if it does, your diode is defective and must be replaced.
- 4). Reverse the leads and check the diode again. The red lead should be on the “B” side as shown in the photo, and the black lead should be on the cathode or a side of the diode. At this time your OHM meter or continuity tester will show continuity.

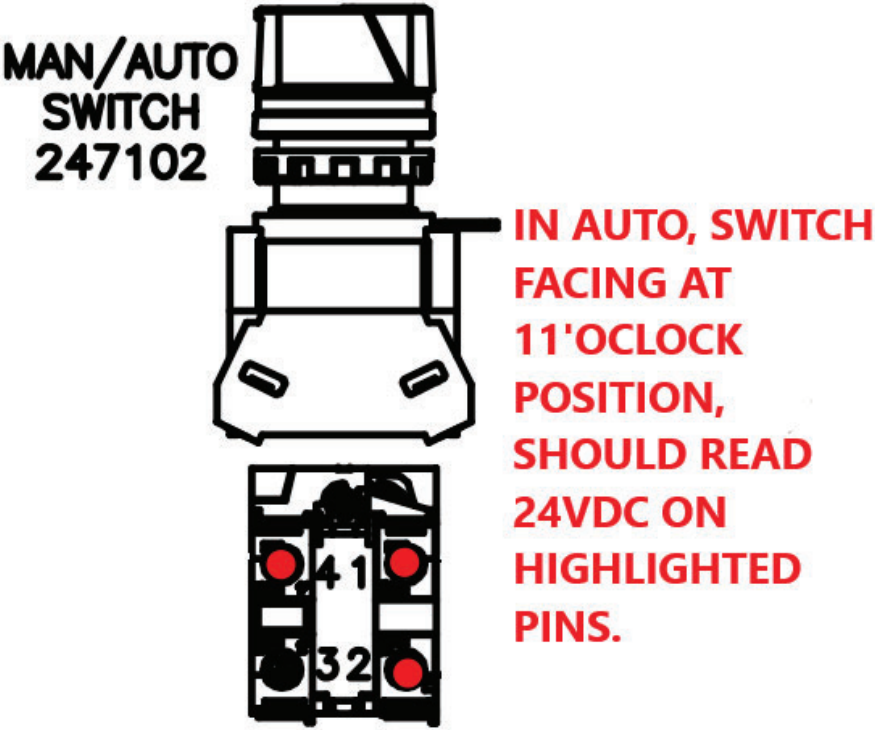


**NOTE:** If the customer has had repeated tripping of the circuit breaker the breaker must be replaced and the components in the circuit must be tested for excessive current draw. A circuit breaker valve drops each time it is tripped.

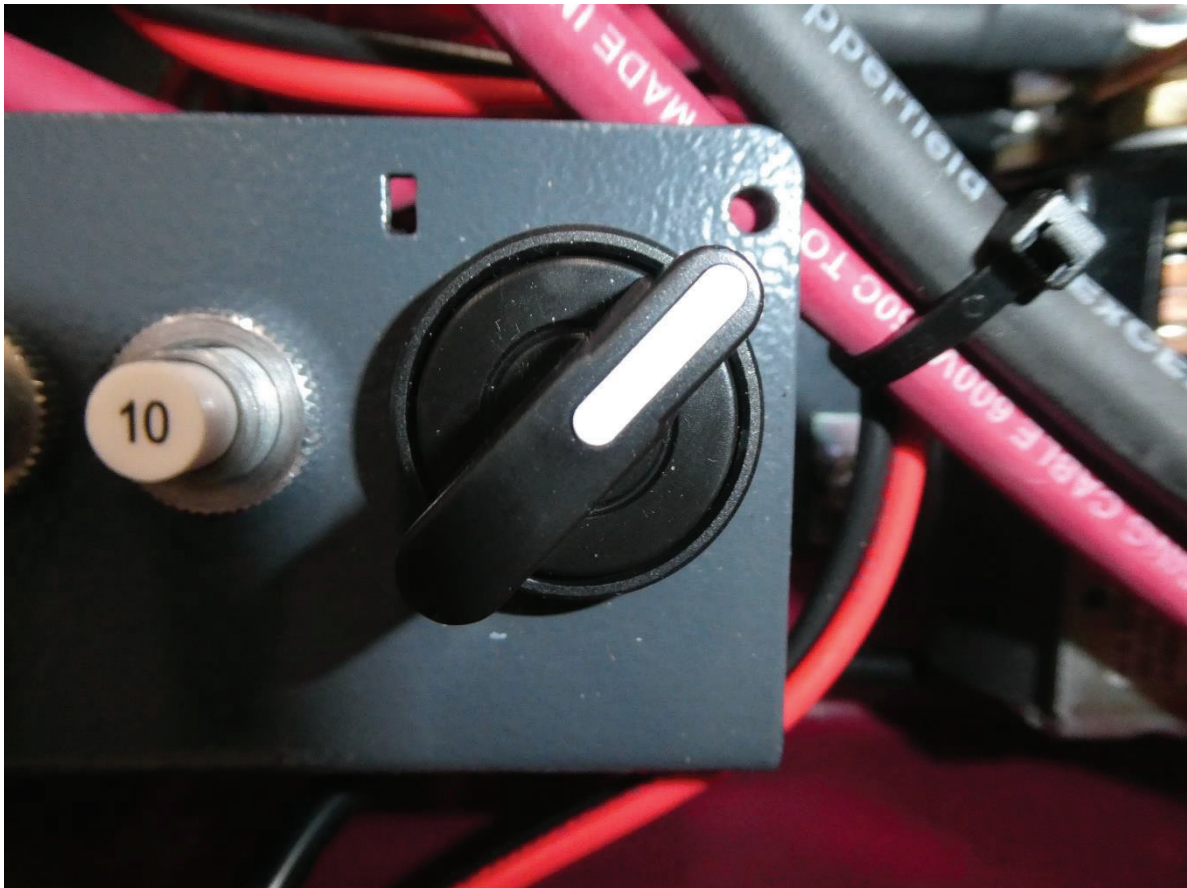
**CAUTION:** These tests should only be performed by a qualified technician. Working with electricity can be dangerous. When using jumper wires to help diagnosis an electrical component, care must be exercised to prevent a short circuit from occurring. Do not allow the two test leads (jumpers) to touch or personal injury or damage to the equipment will result.

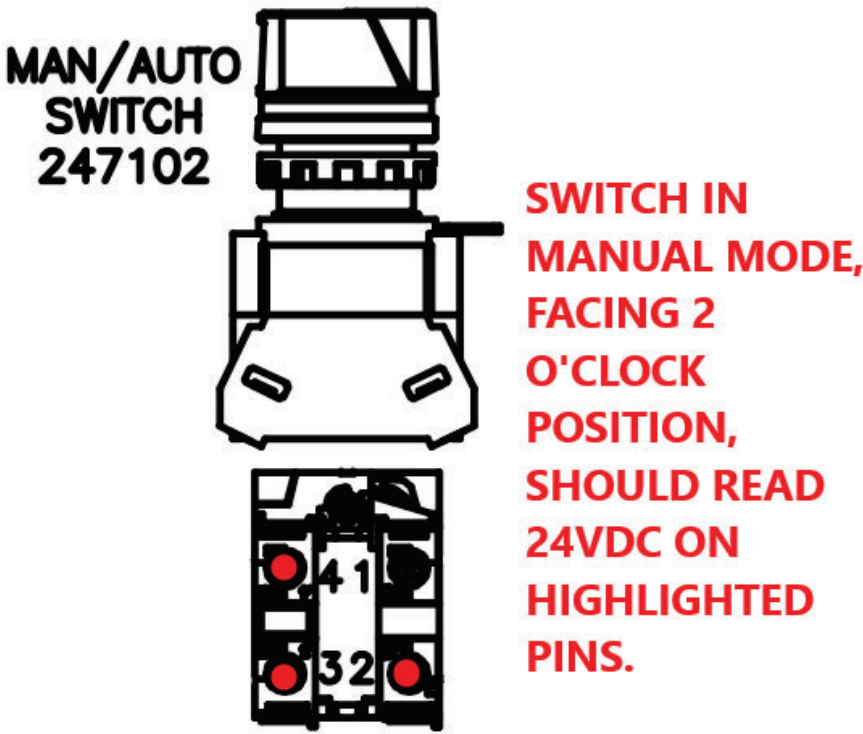
## Set Switch in Auto Position (11 o'clock)





Place Switch in Manual Position (2 o'clock)







Error Code #	Error Type	Back-end Error Title (not shown in UI)	Title	Instructions	Critical Level
60442	Assist	Safety Mechanical Relay Test VCU Failed to Stop Communicating	Machine Error	<ol style="list-style-type: none"> <li>1. Turn off and inspect machine.</li> <li>2. If no issues are found, restart the machine.</li> <li>3. If the issue continues, contact your supervisor.</li> </ol>	2
60461	Assist	ESTOP_CODE_SAFETY_ZONES _STEERING_OFFSET	Calibration Error	<ol style="list-style-type: none"> <li>1. Drive the machine back to the charging station.</li> <li>2. Turn off the machine.</li> <li>3. Notify your supervisor of this issue and include the error code number. This machine will need to be recalibrated.</li> </ol>	1

Error Code	Error Name	Error Description
1	NO_ERROR	
2	UNKNOWN	An unknown error occurred.
3	SYSTEM_ERROR	An unexpected error occurred.
4	MACHINE_ERROR	
5	TIMEOUT	The test failed to complete within the allotted time.
6	VCU_CONNECTION_ERROR	
7	TRACTION_ENCODER_ERROR	Unable to get necessary information from the traction encoder.
8	STEERING_ENCODER_ERROR	Unable to get necessary information from the steering encoder.
9	VEHICLE_CONTROLLER_ERROR	Unable to determine drive state.
10	IMU_ERROR	The IMU failed to detect the expected maneuvers.
11	ESTOP_NOT_DETECTED	Software e-stop failed to activate.
12	START_BUTTON_NOT_DETECTED	Failed to detect the Start/Pause button.
13	PRESENCE_SENSOR_NOT_DETECTED	Failed to detect the user standing on or off the platform.
14	FLASH_FIRMWARE_ERROR	Flash firmware failed to upload due to no USB connection to STM.
15	MISSING_DEPENDENCY	An internal error occurred in the Factory App.
16	BOOTH_MARKER_NOT_FOUND	Failed to read the Home Marker.
17	CALIBRATION_DATA_DOES_NOT_EXIST	Unable to find required data on the machine.
18	BATTERY_FAILURE	Failed to collect any voltage data from the battery.
19	VOLTAGE_TOO_LOW	The voltage on the battery is too low.
20	VOLTAGE_TOO_HIGH	The voltage on the battery is too high.
21	NETWORK_UNREACHABLE	Failed to ping google.com.
22	CANNOT_ENTER_AUTONOMY	Failed to enter autonomy.
23	UPPER_LIDAR_CONFIG_MISSING	
24	UPPER_LIDAR_CONNECTION_ERROR	Failed to connect to upper LIDAR.
25	UPPER_LIDAR_BRACKET_MISSING	Failed to detect upper LIDAR mounting bracket.
26	UPPER_LIDAR_OUT_OF_TOLERANCE	Upper LIDAR position or orientation is out of tolerance.
27	LOWER_LIDAR_CONFIG_MISSING	
28	LOWER_LIDAR_CONNECTION_ERROR	Failed to connect to or read from lower LIDAR.
29	LOWER_LIDAR_BRACKET_MISSING	Failed to detect lower LIDAR mounting bracket
30	LOWER_LIDAR_OUT_OF_TOLERANCE	Lower LIDAR position or orientation is out of tolerance.
31	LIDAR_CONVERGENCE_FAILURE	LIDARs failed to converge.
32	LEFT_3D_CAMERA_ERROR	
33	LEFT_3D_CONNECTION_ERROR	Failed to connect to left 3D camera.
34	LEFT_3D_CALIBRATION_FAILED	An unknown exception occurred while calibrating.
35	LEFT_3D_CAMERA_BAD_READING	Invalid readings collected from 3D camera.
36	LEFT_3D_OUT_OF_TOLERANCE	The physical placement of the left 3D camera is out of the maximum allowed tolerance.

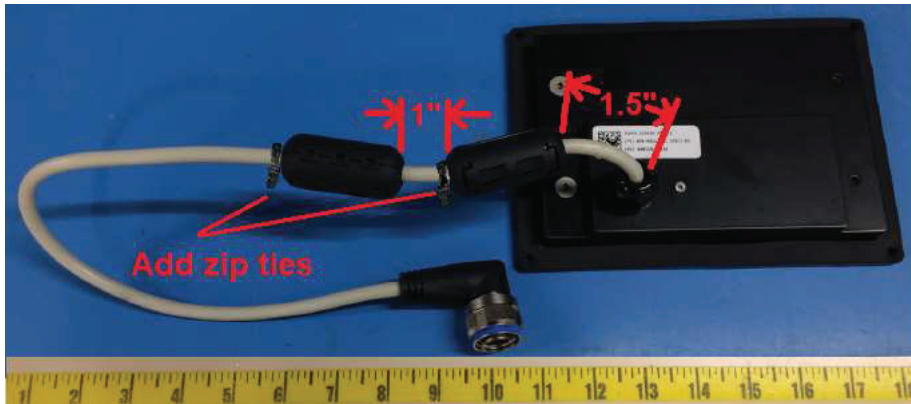
37	LEFT_3D_CONFIG_UPDATE_FAILED	Unable to write configuration to left 3D camera.
38	FRONT_3D_CAMERA_ERROR	
39	FRONT_3D_CONNECTION_ERROR	Failed to connect to front 3D camera.
40	FRONT_3D_CAMERA_BAD_READING	Invalid readings collected from 3D camera.
41	FRONT_3D_CALIBRATION_FAILED	An unknown exception occurred while calibrating.
42	FRONT_3D_OUT_OF_TOLERANCE	The physical placement of the front 3D camera is out of the maximum allowed tolerance.
43	FRONT_3D_CONFIG_UPDATE_FAILED	Unable to write configuration to front 3D camera.
44	RIGHT_3D_CAMERA_ERROR	
45	RIGHT_3D_CONNECTION_ERROR	Failed to connect to right 3D camera.
46	RIGHT_3D_CAMERA_BAD_READING	Invalid readings collected from 3D camera.
47	RIGHT_3D_CALIBRATION_FAILED	An unknown exception occurred while calibrating.
48	RIGHT_3D_OUT_OF_TOLERANCE	The physical placement of the right 3D camera is out of the maximum allowed tolerance.
49	RIGHT_3D_CONFIG_UPDATE_FAILED	Unable to write configuration to right 3D camera.
50	LEFT_2D_CONNECTION_ERROR	Failed to connect to Left 2D Camera.
51	LEFT_2D_CAMERA_ERROR	
52	FRONT_2D_CONNECTION_ERROR	Failed to connect to Front 2D Camera.
53	FRONT_2D_CAMERA_ERROR	
54	RIGHT_2D_CONNECTION_ERROR	Failed to connect to Right 2D Camera.
55	RIGHT_2D_CAMERA_ERROR	
56	USER_ERROR	
57	STEERING_LIMITS_TOO_CLOSE	
58	OBJECT_DETECTED_DURING_CALIBRATION	Area surrounding the machine is not empty.
59	UNIDENTIFIED_BOOTH	Booth identification has not been completed.
60	NO_CALIBRATION_FILES_FOUND	
61	INCORRECT_NUMBER_OF_GYRO_READINGS	
62	INCORRECT_NUMBER_OF_HEADING_READINGS	
63	LOWER_LIDAR_PROTECTOR_ERROR	
64	MISCONFIGURED_BOOTH	Invalid calibration algorithm selected.
65	MISSING_EOL_ROUTE	Unable to locate EOL route.
66	PRESENCE_SENSOR_TRIGGERED_DURING_AUTONOMY	The presence sensor was triggered during autonomy.
67	SIDE_LIDAR_TRIGGERED_DURING_AUTONOMY	The side LIDAR safety curtain was interrupted during autonomy.
68	MACHINE_IN_ESTOP	Test cannot continue while machine is in e-stop.
69	UNEXPECTED_STAGE	The machine has entered an unexpected state.
70	UNABLE_TO_DETERMINE_LEFT_LIMIT	
71	UNABLE_TO_DETERMINE_CENTER	Unable to determine center steering angle.
72	UNABLE_TO_DETERMINE_RIGHT_LIMIT	
73	DELTA_THROTTLE_ACCELERATION_MISMATCH	Sign of the change of throttle does not match the sign of the change of the change of encoder steps.

74	THROTTLE_SPEED_MISMATCH	Sign of the throttle does not match the sign of the change of encoder steps.
75	ENCODER_STD_DEV_TOO_HIGH	The standard deviation of the change of encoder steps is above a threshold.
76	UNEXPECTED_HEADING_CHANGE	Expected machine to move straight, but machine turned.
77	RIGHT_WHEEL_LIMIT_LEFT_OF_CENTER	Expected traction encoder to register right limit to the right of center.
78	LEFT_WHEEL_LIMIT_RIGHT_OF_CENTER	Expected traction encoder to register left limit to the left of center.
79	WHEEL_FAILED_TO_TURN_IN_AUTONOMY	User unable to confirm autonomous wheel control.
80	UNABLE_TO_DETERMINE_MINIMUM_THROTTLE	Machine did not move after trying all throttle values.
81	LOWER_LIDAR_PROTECTOR_BLOCKING_RAYS	
82	LOWER_LIDAR_RAYS_INSIDE_FOOTPRINT	
83	LOWER_LIDAR_RAYS_TOO_CLOSE	
84	UNABLE_TO_GET_UNIT_VECTORS	Unable to get unit vectors for 3D Camera.
85	UNKNOWN_CAMERA_ERROR	User rejected live camera feed.
86	UNEXPECTED_FRAME_RATE	Frame rate from the camera is too low.
87	BATTERY_CHARGE_TOO_LOW	The charge on the battery below 75%.
88	LEFT_2D_CAMERA_NO_DATA	No data collected from Left 2D Camera.
89	FRONT_2D_CAMERA_NO_DATA	No data collected from Front 2D Camera.
90	RIGHT_2D_CAMERA_NO_DATA	No data collected from Right 2D Camera.
91	LOWER_LIDAR_NO_DATA	No data collected from Lower LIDAR.
92	UPPER_LIDAR_NO_DATA	No data collected from Upper LIDAR.
93	MODEM_NOT_CONNECTED	LTE Modem is not connected.
94	TOUCH_SCREEN_NOT_CONNECTED	Touch Screen is not connected.
95	MODEM_NOT_COMMUNICATING	Unable to communicate with Modem.
96	LEFT_BLINKER_ERROR	
97	RIGHT_BLINKER_ERROR	
98	IMU_DATA_TOO_NOISY	The machine's movement was above the allowed threshold.
99	KIT_NOT_RUNNING	The kit is not running.
100	MODEM_NOT_REGISTERED	Unable to find LTE Modem network interface.
101	MODEM_NETWORK_NOT_CONNECTED	Unable to determine machine IP address.
102	MODEM_PING_REQUEST_FAILURE	Unable to ping the internet.
103	MODEM_DNS_FAILURE	Unable to perform DNS lookup.
104	UNEXPECTED_IMAGE_FORMAT	Unexpected image format received from camera.
105	UNKNOWN_SIDE_LIDAR_ERROR	Something is wrong with the side LIDAR.
106	UNKNOWN_CALIBRATION_BOOTH	An unknown Home Marker was detected.
107	MISSING_MACHINE_FILE	The machine file is missing.
108	MISSING_FIRMWARE_UPDATED_FILE	The firmware must be updated.
109	MISSING_BASELINE_FILES	The baseline 3D camera tests must be run.
110	MISSING_UNIT_VECTOR_FILES	The 3D camera unit vector files are missing.

111	MISSING_DEPTH_DUMPS	The 3D camera data dumps are missing.
112	MISSING_IFM_CALIBRATIONS	The 3D camera calibrations must be run.
113	MISSING_LIDAR_CALIBRATIONS	The LIDAR calibrations must be run.
114	INVALID_CALIBRATION_FILES	Calibration files were found but are invalid.
115	STEERING_LONGEVITY_INVALID_LIMITS	Invalid limits set for the Steering Longevity tool.
116	UNKNOWN_ROC_CONNECTION_ERROR	Unable to communicate with the ROC.
117	UNKNOWN_CARRIER_CONNECTION_ERROR	Unable to acquire an LTE signal.
118	CONTROLLER_FW_MISMATCH	Incorrect Controller FW Version
119	MISSING_STEERING_CALIBRATION	Missing steering offset calibration.
120	LOWER_LIDAR_PING_ERROR	Lower LIDAR not responding to ping requests.
121	UPPER_LIDAR_PING_ERROR	Upper LIDAR not responding to ping requests.
122	LEFT_3D_CAMERA_PING_ERROR	Left 3D Camera not responding to ping requests.
123	RIGHT_3D_CAMERA_PING_ERROR	Right 3D Camera not responding to ping requests.
124	FRONT_3D_CAMERA_PING_ERROR	Front 3D Camera not responding to ping requests.
125	LEFT_3D_CONFIG_TIMEOUT_ERROR	Took too long to verify the configuration of the Left 3D Camera.
126	LEFT_3D_CONFIG_READ_ERROR	Unable to read the configuration of the Front 3D Camera.
127	LEFT_3D_CONFIG_COMPARE_ERROR	Unexpected configuration on the Front 3D Camera.
128	RIGHT_3D_CONFIG_TIMEOUT_ERROR	Took too long to verify the configuration of the Right 3D Camera.
129	RIGHT_3D_CONFIG_READ_ERROR	Unable to read the configuration of the Right 3D Camera.
130	RIGHT_3D_CONFIG_COMPARE_ERROR	Unexpected configuration on the Right 3D Camera.
131	FRONT_3D_CONFIG_TIMEOUT_ERROR	Took too long to verify the configuration of the Front 3D Camera.
132	FRONT_3D_CONFIG_READ_ERROR	Unable to read the configuration of the Front 3D Camera.
133	FRONT_3D_CONFIG_COMPARE_ERROR	Unexpected configuration on the Front 3D Camera.
134	ROCD_NOT_RUNNING	The ROCD service is not running.
135	NOT_CONNECTED_TO_ROC	Unable to get connection to the ROC.
136	NOT_PROVISIONED	Machine is not provisioned.
137	ROC_PENDING_UPLOADS_ERROR	Unable to determine the number of pending uploads.
138	UNABLE_TO_EXIT_ESTOP_STATE	Test cannot continue while machine is in E-stop.
139	MINIMUM_THROTTLE_TOO_HIGH	The minimum throttle required to move the robot is too high.
140	INVALID_BOOTH_ID_ERROR	Booth ID not found in database.
141	INVALID_BOOTH_LIDAR_CONFIGURATION	LiDAR configuration not found for selected booth.
142	INVALID_BOOTH_3D_CAMERA_CONFIGURATION	3D camera configuration not found for selected booth.
143	KINETEK_PARAM_MISMATCH	Kinetek Parameter Mismatch
144	INSUFFICIENT_VISIBLE_MARKERS	Insufficient visible markers.
145	INCORRECT_MARKER_PATTERN_DETECTED	Incorrect marker pattern detected.
146	MARKERS_OUT_OF_FIELD_OF_VIEW	Markers were detected outside of the field of view.
147	MARKER_LOCALIZATION_ERROR	Markers were detected outside of the field of view.

Failure to install Ferrite can cause lines on the display screen.

Installation in



Ferrite P/N 275-00156-01 Ferrite Core, Hinged, 348ohm, 10mm ID

Install 1 ferrite approximately 1.5" from the connector on the LCD

Install 1 ferrite approximately 1.0" from the first ferrite

Place zip ties next to the ferrites as shown. These should be snug but not too tight

***E-Stop circuit BCM side troubleshooting***

- Turn the key to ON.
- Locate Pins 59 and 52 on the down trunk.
- Check for connectivity from the Master Contactor/E-Stop, Trunk side (Red) to Pin 59 on Down Trunk. (Figure A)
- Check for connectivity from the Master Contactor/E-Stop, Trunk side (Black) to Pin 52 on the Down Trunk. (Figure B)
- Check for 24VDC on Master Contactor, Machine side (Red/BLK) to machine ground. (Figure C and D)
- Reconnect Master Contactor/E-Stop and now check for 24VDC between pins 59 and 52 on down trunk.

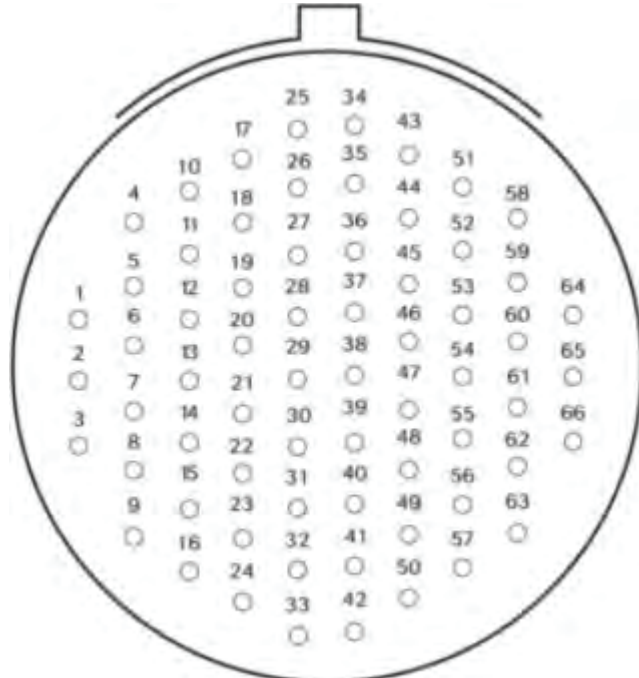


Figure A.

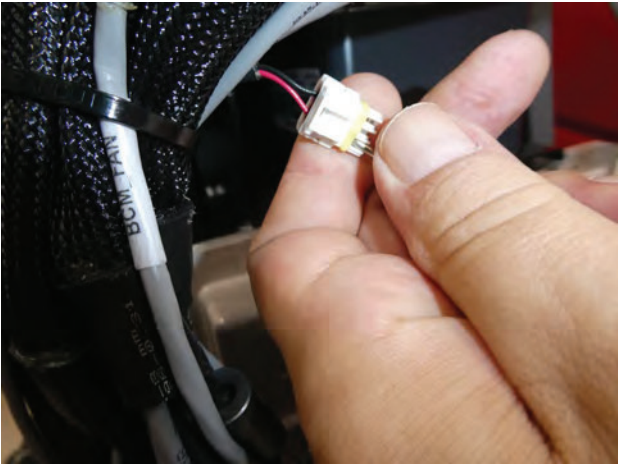


Figure B.

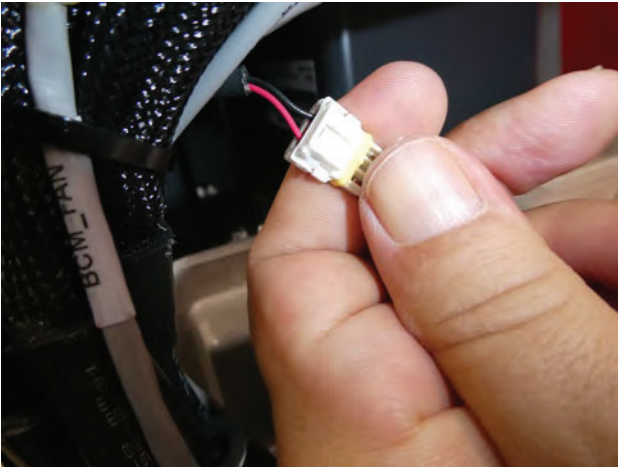




Figure C.

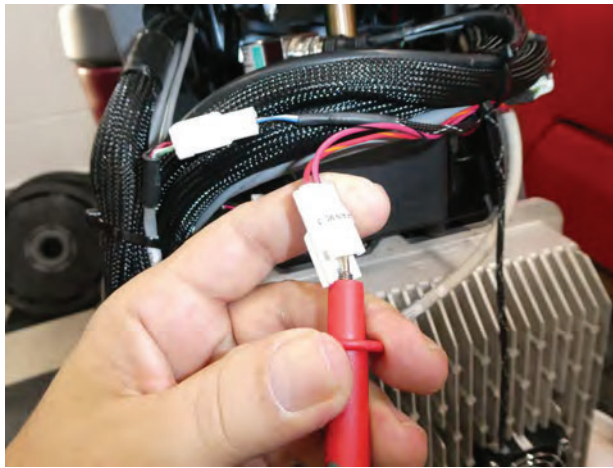
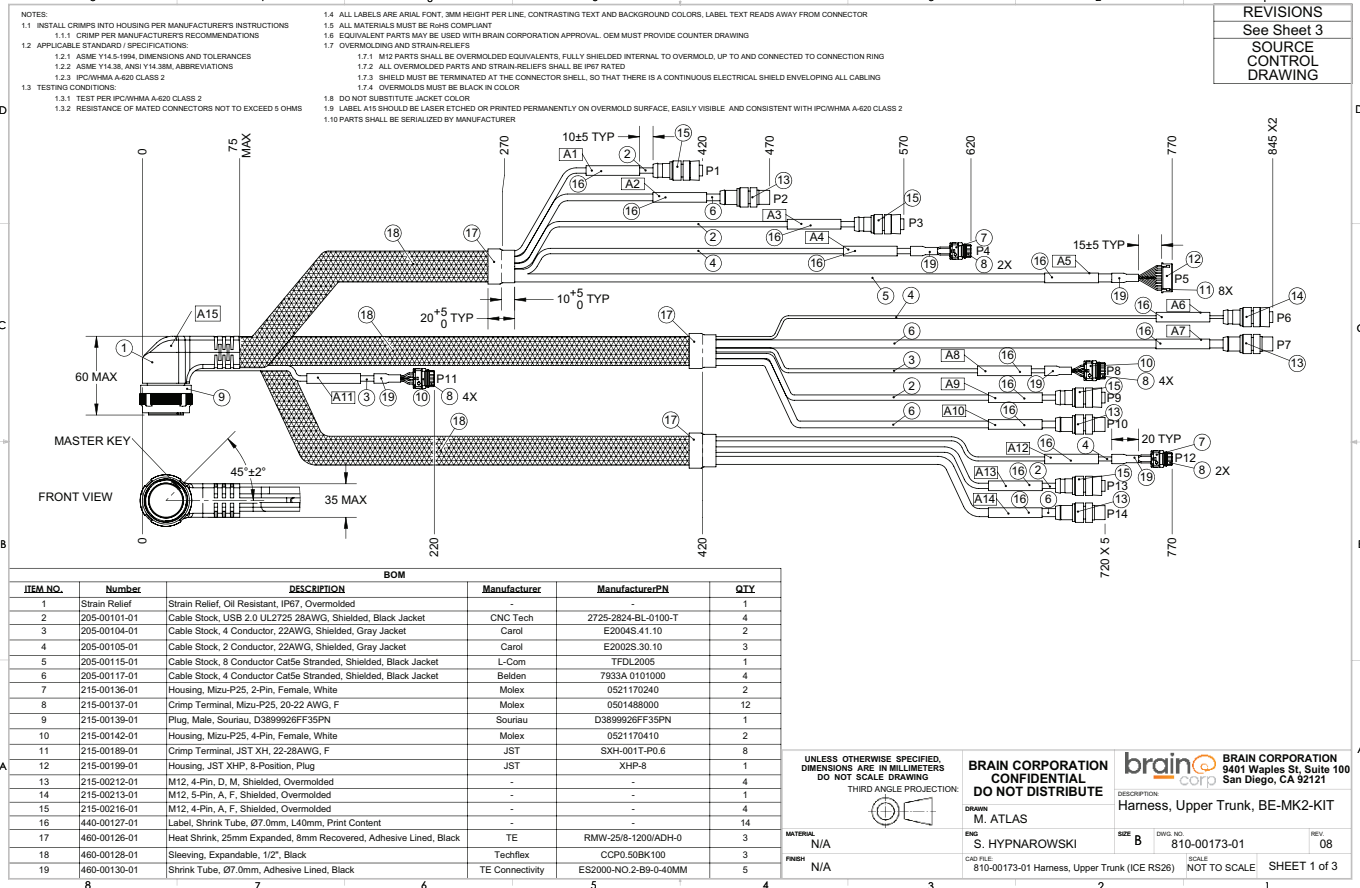


Figure D.







Pinout and Labeling							
D38999 Pin	Signal Name	Label	Wire Color	Pin	Label ID	Connector ID	Connector Description
10	USB4P		GREEN	1			
17	USB_5V_1		RED	2			
11	USB4N	LTE_MODEM	WHITE	3	A1	P1	M12, 4-Pin, A, F
19	GND		BLACK	4			
	SHELL		DRAIN	SHELL			
27	GE1_0		WORANGE	1			
36	GE1_2		WGREEN	2			
28	GE1_1	DEPTH_RIGHT_ETH	ORANGE	3	A2	P2	M12, 4-Pin, D, M
37	GE1_3		GREEN	4			
	SHELL		DRAIN	SHELL			
5	USB1P		GREEN	1			
4	PSV		RED	2			
6	USB1N	CAM_RIGHT_USB	WHITE	3	A3	P3	M12, 4-Pin, A, F
12	GND		BLACK	4			
	SHELL		DRAIN	SHELL			
38	RLAY12_1-		BLACK	1			
29	RLAY12_1+	TURN_SIGNAL_RIGHT	RED	2	A4	P4	Mizu-P25, 2-Pin, F
	SHELL		DRAIN	-			
61	GND		BRN	1			
64	KEY_ON_IN		WBROWN	2			
65	USB3P		WBLUE	3			
66	USB3N		BLUE	4			
82	CANL_BCPU	VIB	WORANGE	5	A5	P5	JST XHP, 8-Position
83	CANH_BCPU		ORANGE	6			
57	CANH		WGREEN	7			
56	CANL		GREEN	8			
	SHELL		DRAIN	-			
49	P12V		RED	1			
50	GND	LIDAR_SLANTED_PWR	BLACK	3	A6	P6	M12, 5-Pin, A, F
	SHELL		DRAIN	SHELL			
32	STE0_0		WORANGE	1			
41	STE0_2		WGREEN	2			
33	STE0_1	LIDAR_SLANTED_ETH	ORANGE	3	A7	P7	M12, 4-Pin, D, M
42	STE0_3		GREEN	4			
	SHELL		DRAIN	SHELL			
43	GND		BLACK	1			
44	P12V		RED	2			
45	NVC	DEPTH_SENSOR_FAN	WHITE	3	A8	P8	Mizu-P25, 4-Pin, F
	SHELL		DRAIN	-			
1	PSV		RED	2			
3	USB0N		WHITE	3			
7	GND	CAM_FRONT_USB	BLACK	4	A9	P9	M12, 4-Pin, A, F
	SHELL		DRAIN	SHELL			
25	GE0_0		WORANGE	1			
34	GE0_2		WGREEN	2			
26	GE0_1	DEPTH_FRONT_ETH	ORANGE	3	A10	P10	M12, 4-Pin, D, M
35	GE0_3		GREEN	4			
	SHELL		DRAIN	SHELL			
43	GND		BLACK	1			
44	P12V		RED	2			
45	FAN_SENS	BCM_FAN	WHITE	3	A11	P11	Mizu-P25, 4-Pin, F
	SHELL		DRAIN	-			
48	RLAY12_2-		BLACK	1			
47	RLAY12_2+	TURN_SIGNAL_LEFT	RED	2	A12	P12	Mizu-P25, 2-Pin, F
	SHELL		DRAIN	-			
8	USB2P		GREEN	1			
15	PSV		RED	2			
9	USB2N		WHITE	3			
21	GND	CAM_LEFT_USB	BLACK	4	A13	P13	M12, 4-Pin, A, F
	SHELL		DRAIN	SHELL			
30	GE2_0		WORANGE	1			
39	GE2_2		WGREEN	2			
31	GE2_1	DEPTH_LEFT_ETH	ORANGE	3	A14	P14	M12, 4-Pin, D, M
40	GE2_3		GREEN	4			
	SHELL		DRAIN	SHELL			
-	-	P/N: 810-00173-01 Rev: 08 Date: MMY <MFR> <LOT CODE> <SN>	-	-	A15	-	-

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**BRAIN CORPORATION**  
8401 Waples St, Suite 100  
San Diego, CA 92121

DESCRIPTION:  
Harness, Upper Trunk, BE-MK2-KIT

DRAWN:  
M. ATLAS

REV: 08

MATERIAL:  
N/A

ENG:  
S. HYPNAROWSKI

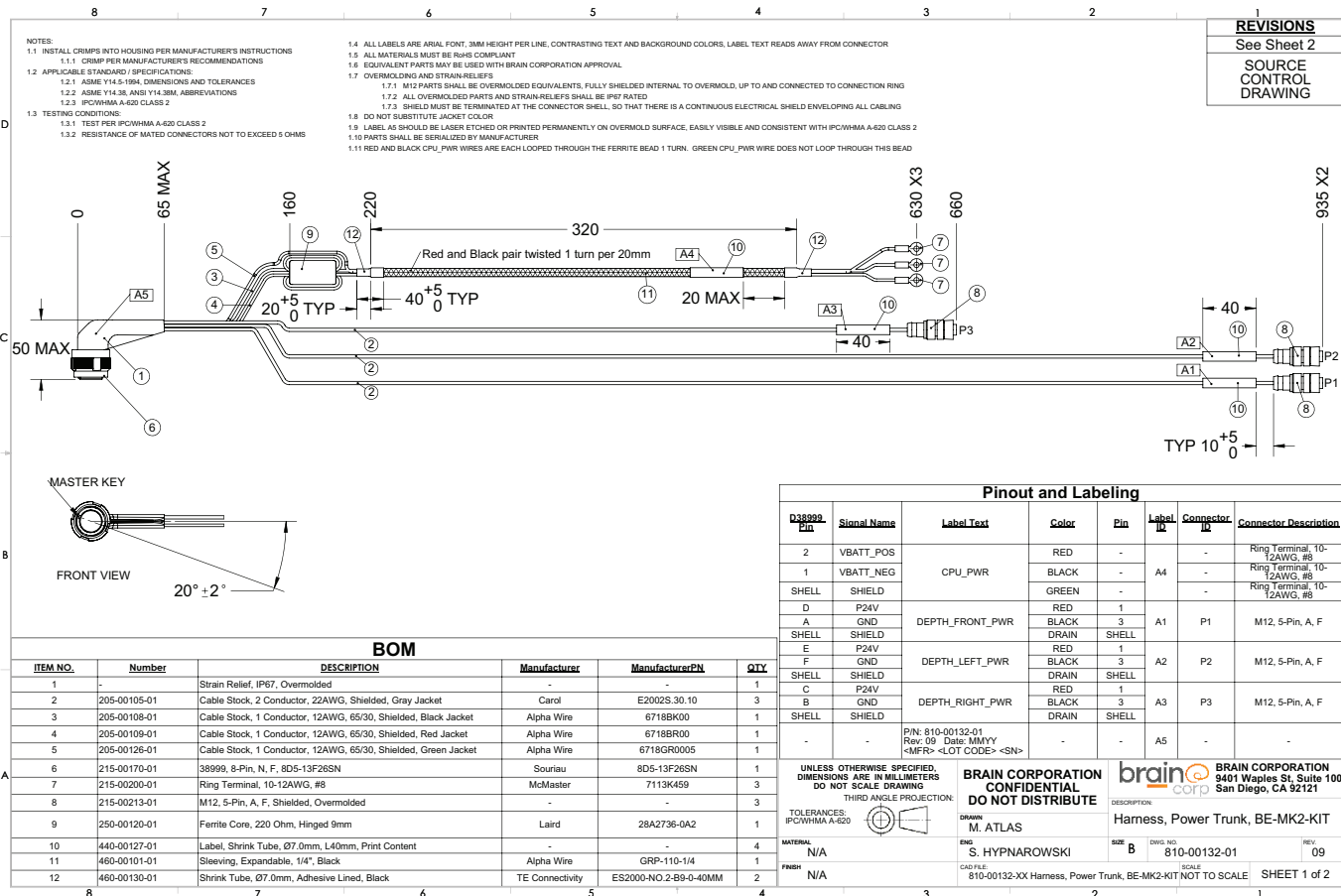
DATE:  
810-00173-01

FINISH:  
N/A

SCALE:  
NOT TO SCALE


SHEET 2 of 3

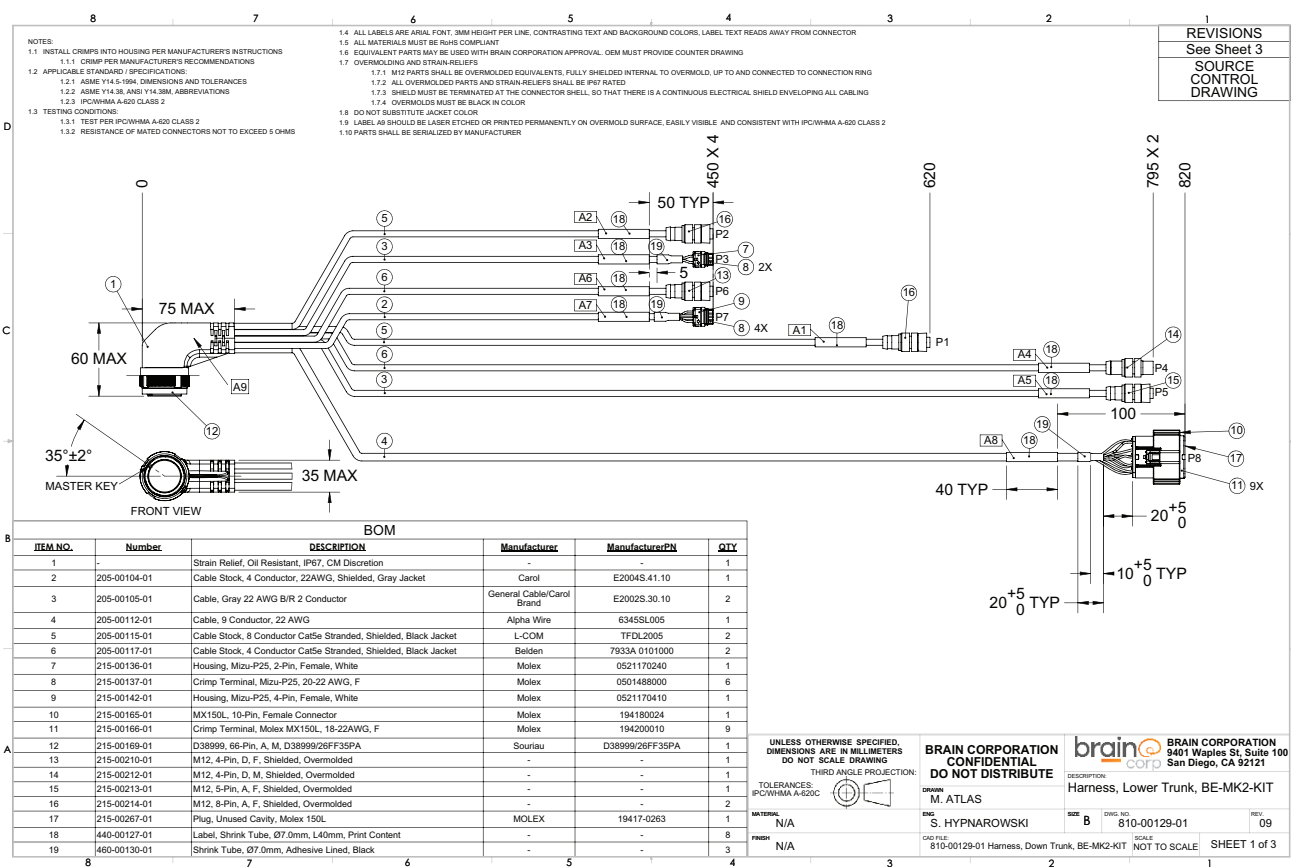




## REVISIONS

REV.	DESCRIPTION	DATE	APPROVED
01	INITIAL RELEASE	2017-06-28	JW
02	Decreased VBATT_IN by 380mm, to 620mm.	2017-08-28	JD
03	Changed ring terminal size to #8 studs.	2017-10-17	KM
04	Added potting to the boof, added a pinout table to the drawing, and brought sub-trunk drawings into the main document.	2017-10-19	SLH
05	Changed exit/keying angle from 45° degrees to 20°.	2017-11-09	KM
06	Dimensioned sleeving, increased length of DEPTH_FRONT_PWR from 650mm to 850mm, reduced length of DEPTH_RIGHT_PWR from 850mm to 650mm.	2018-02-15	KM
07	Regenerated CAD and drawing for better manageability and readability (consolidated sub-assembly drawings and removed unnecessary detail). Changed pinout for DEPTH_LEFT_PWR and DEPTH_RIGHT_PWR at the 8D5-13F26SN connector. Added note to twist red and black connectors 1 turn per 20mm. Added manufacturer traceability number to label A5.	2018-03-05	KM
08	Replaced all field-installable M12 connectors with shielded overmolded equivalents. Changed A5 label from a heatshrink label to laser engraving on the strain relief. Decreased the D38999 maximum height from 70mm to 45mm.	2018-05-14	KM
09	Added dedicated shield return line, bundled in BATT+ and BATT- wrap. Increased length of W1 and W2 from 850mm to 925mm to make sensor installation and replacement easier. Reformatted drawing notes. Changed Number, item 4. Changed ME and drawn by to SH and MA. Joggled the origin of ordinate dimensions. Changed the description of the part to BE-Mk2-KIT.	2018-08-07	MA

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		DRAWN: M. ATLAS		DESCRIPTION: Harness, Power Trunk, BE-MK2-KIT	
MATERIAL: N/A	ENG: S. HYPNAROWSKI	SIZE: B	DWG. NO. 810-00132-01	REV. 09	
FINISH: N/A	CAD FILE: 810-00132-XX Harness, Power Trunk, BE-MK2-KIT	SCALE: NOT TO SCALE	SHEET 2 of 2		



REVISIONS
See Sheet 3
SOURCE CONTROL DRAWING

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THIRD ANGLE PROJECTION

TOLERANCES: IPCWHMA A-820C

MATERIAL: N/A

FINISH: N/A

DRAWN: M. ATLAS

ENG: S. HYPNAROWSKI

CAD FILE: 810-00129-01 Harness, Down Trunk, BE-MK2-KIT

DESCRIPTION: Harness, Lower Trunk, BE-MK2-KIT

SIZE: B

ENG NO: 810-00129-01

SCALE: NOT TO SCALE

REV: 09


SHEET 1 of 3





REVISIONS

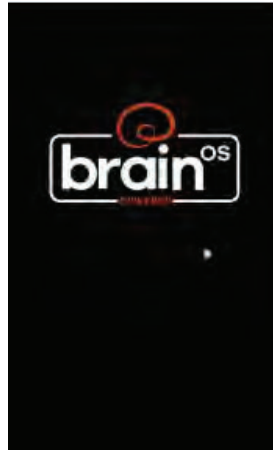
REV.	DESCRIPTION	DATE	APPROVED
01	INITIAL RELEASE	2017-06-29	JD
02	Added revision column to BOM table. Swapped Absolute Encoder M12 pins 5 and 6. Increased Steering cable to 800mm.	2017-10-17	KM
03	Added boot callout, and removed audio cable from assembly.	2017-10-18	SLH
04	Changed connector exit orientation from 45° to 20°.	2017-11-08	KM
05	Moved drain wires of sub-assembly cables to the connector shell, and added an EMI braid to the D38999 connector to close the gap between subassembly shields and the connector shell.	2017-12-14	KM
06	Changed the drawing format for ease of readability. Consolidated all sub-assemblies into an overview drawing, so that all cable assemblies are captured within a single revision. Swapped Start-Pause 3V3 and START_PAUSE pins to match BCM schematic.	2018-03-06	KM
07	Changed connector exit orientation from 20° to 35°.	2018-04-05	KM
08	Replaced all field-installable M12 connectors with shielded overmolded equivalents. Changed A9 label from a heatshrink label to laser engraving on the strain relief. Decreased D38999 maximum height from 70mm to 55mm.	2018-05-12	KM
09	Specified proper cable types. New notes block. Changed 38999 Overmold Dimensions. Added Molex plug to open 150L connector terminal. Changed engineer and drawn by to SH and MA. Joggled the origin of ordinate dimensions. Added dimensions and tolerances to drawing. Changed description to BE-Mk2-KIT.	2018-08-08	MA, SH

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	<small>DRAWN:</small> M. ATLAS	<small>DESCRIPTION:</small> Harness, Lower Trunk, BE-MK2-KIT		
<small>MATERIAL:</small> N/A	<small>ENG:</small> S. HYPNAROWSKI	<small>SIZE:</small> B	<small>DWG. NO.:</small> 810-00129-01	<small>REV.:</small> 09
<small>FINISH:</small> N/A	<small>CAD FILE:</small> 810-00129-01 Harness, Down Trunk, BE-MK2-KIT		<small>SCALE:</small> NOT TO SCALE	<small>SHEET 3 of 3</small>

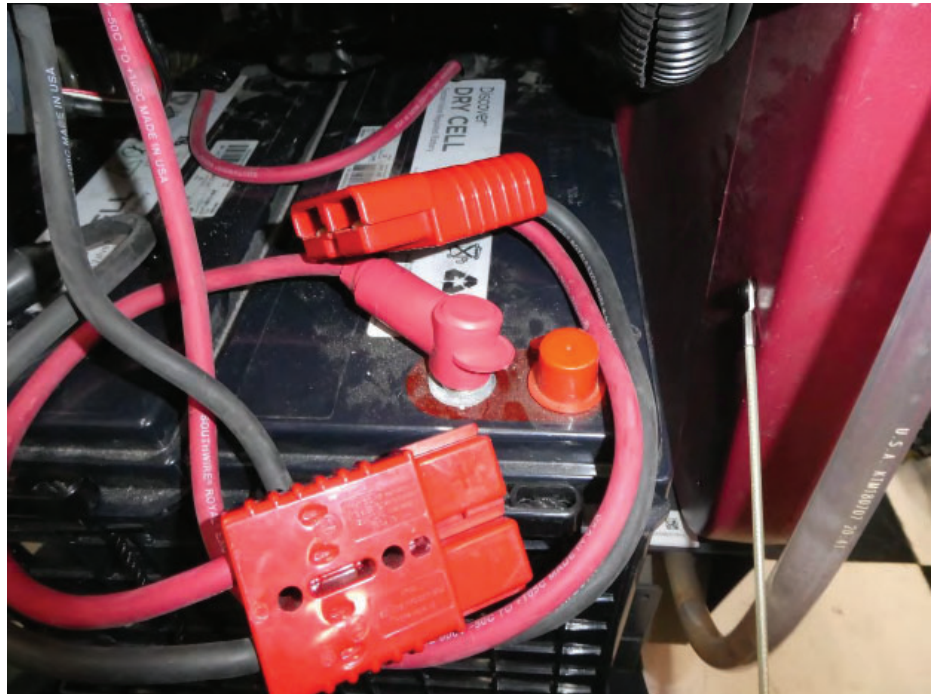
## Hard Reset Process

# Hard Reset Process

The following steps are to be done once Modem and Right 2D Camera have been confirmed working properly and Brain Program still will not load.



Turn key to off position, disconnect batteries.



- Wait between 5-10 minutes to allow capacitors in BCM (Brain Unit) to bleed stored power off.
- Reconnect batteries, turn key switch to on position.
- Allow machine to stay turned on for a minimum of 15 minutes, if after 20 minutes program does not load, repeat the above steps.
- A minimum of 5 of these hard restarts needs to be completed before contacting Brain or Minuteman Technical Support.

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