

C4-H

TESTING PROCEDURES

VERSION 1.6



SMARTRISE

Document History

Date	Version	Summary of Changes
March 21, 2024	1.6	Added the High Oil Temperature test under Low Oil/Low Pressure.
March 11, 2024	1.5	Added the Low Oil Protection/MLT test under Low Oil/Low Pressure.
March 6, 2024	1.4	Added the Low Oil tests under Fire.
February 14, 2024	1.3	Added the Direction Counter Trip Reset test.
December 13, 2023	1.2	<p>Changed document & header titles to “C4-H Testing Procedures”.</p> <p>Changed the “Hydro:Evolved Test Procedure Introduction” title to “ C4-H Test Procedure Introduction”.</p> <p>Changed the “Hoistway Landing Slide Power to REF Test” title to “Shorting Electrical Equipment on the Hoistway Landing Side Test” & updated the testing procedure.</p> <p>Updated the testing procedure under the <i>Any Positively Broken Contact in the Safety String</i> section.</p> <p>Updated the testing procedure under the <i>Safety String to Ground</i> section.</p>
December 8, 2023	1.1	<p>Updated document presentation.</p> <p>Modified A17.1/B44-10 to A17.1/B44-19.</p> <p>Added Door Zone Input Stuck HI Test.</p> <p>Added the Door Zone Stuck High with Doors Open Test</p> <p>Added the Door Zone Stuck High In-Flight Test</p> <p>Added the SFM and SFP Relays Pre-Flight Test.</p> <p>Removed the In-Car Stop Switch Bypass section.</p> <p>Added FEO Phase I and Load Weighing Device Test.</p> <p>Added FEO Phase II and Load Weighing Device Test.</p> <p>Added the Hoistway Landing Slide Power to REF Test.</p> <p>Added the Camera Independence Test.</p> <p>Added the <i>Electronic Protective Devices (EPD) in Safety String</i> section.</p> <p>Added the <i>Ground Faults</i> section.</p> <p>Added the <i>Recycling Operations</i> section.</p> <p>Added the <i>Phase I under special conditions</i> section.</p> <p>Added the <i>Phase II under special conditions</i> section.</p>
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1 C4-H Test Procedure Introduction

This manual contains information how to test the C4-H controller.

1.1 Safety

The following safety measures are to be followed:

- Tests are to be performed by a qualified elevator mechanic only.
- Be certain that there are no passengers inside the elevator car when performing these tests.
- When performing a test that requires open doors, be sure to have proper personnel guarding the doors.
- When making hardware changes, be certain that all power has been disconnected from the elevator controller.

WARNING

FAILURE TO FOLLOW PROPER PRECAUTIONS CAN RESULT IN SERIOUS INJURY, DEATH, OR DAMAGE TO THE ELEVATOR AND/OR BUILDING.

2 Terminal and Emergency Stopping

2.1 Normal Terminal Stopping Device (NTSD)

Applicable Code – ASME A17.1 section 3.25.1

The following procedure describes how to test the NTSD.

1. Install a temporary jumper from M24 to the MM input on the MR board.
2. Toggle the NORMAL/INSPECTION and switch to NORMAL.
3. Enter a car call so the car is far enough away from the terminal landing being tested to do a full speed run by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
4. Navigate to MAIN MENU | DEBUG | ACCEPTANCE TEST.
5. Scroll and select NTS and save.
6. Verify the display shows Checking if in DZ.
7. Press the Enable and the Direction in which the test is being performed.

NOTE: The controller runs the car in the inputted direction to the terminal at high speed.

8. When NTS is triggered, the MR board displays one of the following alarms:
 - In the up direction – NTS Up P1-1, NTS Up P1-2, NTS Up P1-3, NTS Up P1-4, NTS Up P1-5, NTS Up P1-6, NTS Up P1-7, NTS Up P1-8.
 - In the down direction – NTS Dn P1-1, NTS Dn P1-2, NTS Dn P1-3, NTS Dn P1-4, NTS Dn P1-5, NTS Dn P1-6, NTS Dn P1-7, NTS Dn P1-8.

NOTE: The alarm may only be viewed in Alarms Logged. Navigate to ALARMS | LOGGED.

9. The car will come to a stop prior to the final limit and then do a correction run to the floor.
10. Remove jumper from M24 to the MM input on MR board.
11. Recycle the MR board to clear the fault.

2.2 Terminal Speed Reducing Device (TSRD) Test

Applicable Code – ASME A17.1 section 3.25.2

If the car is not at a terminal floor the car will first travel to the bottom floor prior to running test.

The following procedure describes how to test the TSRD.

1. Install a temporary jumper from M24 to the MM input on the MR board.
2. Toggle the NORMAL/INSPECTION and switch to NORMAL.
3. Navigate to MAIN MENU | DEBUG | ENTER CAR CALLS.
4. Enter a car call to the bottom landing.

5. Navigate to MAIN MENU | DEBUG | ACCEPTANCE TEST.
6. Scroll and select HYDRO TSRD and save.
7. Verify the display shows Prepare for Test then Parameter Setup.
8. Press the Enable and Up buttons.

NOTE: After the car starts, it runs at high speed and gets close to the top landing. The car faults out with TSRD OVERSPEED fault.

9. Remove jumper from M24 to the MM input on MR board.
10. Recycle the MR board to clear the fault.

2.2.1 Camera Independence Test

Applicable Code – ASME A17.1 section 3.25.2

The following procedure explains the Camera Independence test.

1. Install a temporary jumper from M24 to the MM input on the MR board.
2. Toggle the NORMAL/INSPECTION and switch to NORMAL.
3. Navigate to MAIN MENU | DEBUG | ENTER CAR CALLS.
4. Enter a car call so the car is far enough away from the terminal landing being tested to do a full speed run.
5. Navigate to MAIN MENU | DEBUG | ACCEPTANCE TEST.
6. Scroll and select HYDRO TSRD and save.
7. Verify the display shows Prepare for Test then Parameter Setup.
8. Press the Enable and Up buttons.
9. Verify that the active faults show "TSRD OVSP" on the 2 nodes (MRA and COPA).
10. Remove the Camera that is connected to the COP.
11. Verify that the active fault "CEDES3 Offline" is triggered only on the COPA node.

2.3 Car Buffer

If either the Enable or Direction are released prior to completion of the test, it will cancel the test immediately and perform an emergency stop.

Applicable Code – ASME A17.1 section 2.25.3

The following procedure describes how to test the car buffer.

1. Place a car call above the bottom landing to ensure the car can reach maximum contract speed by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
2. Install a temporary jumper from M24 to the MM input on the MR board.

3. To bypass BFL, place jumper from H120 to BFL.
4. Toggle the NORMAL/INSPECTION and switch to NORMAL.
5. Navigate to MAIN MENU | SETUP | SPEEDS | TEST BUFFER SPEED and set the speed to contract speed.
6. Navigate to MAIN MENU | DEBUG | ACCEPTANCE TEST | Car Buffer.
7. Verify the display shows In Door Zone Check.
8. Press and hold the Enable and the down buttons.
9. The car will hit the buffer at the set test speed.
10. Verify a SS buffer and CPLD fault.
11. Remove jumper from M24 to the MM input on MR board.
12. Verify car faults clear and the car relevels.
13. Remove jumper from BFL.

3 Normal Directional Limit Test

Applicable Code – ASME A17.1 section 3.25.1

The following procedure describes how to test for normal direction limit.

1. Enter a car call to the top or bottom terminal that is being tested by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
2. Toggle the NORMAL/INSPECTION switch to INSPECTION.
3. Run the car past the door zone of the terminal under inspection by pressing:
 - Enable and Up – If testing the upper terminal
 - Enable and Down – If testing the lower terminal
4. Verify the display shows a Normal Limit Reached alarm.
5. Recycle the MR board to clear the alarm.
6. Toggle the NORMAL/INSPECTION switch to Normal and the car relevels.

4 Releveling with In-Car Stop Switch

Applicable Code – ASME A17.1 sections 2.26.2.21

The following procedure describes how to test for releveling with the In-Car Stop switch.

1. Navigate to MAIN MENU | SETUP | FLOORS | ENABLE RELEVELING and select ON.
2. Stop the car in the door zone and turn on In-Car Stop switch.
3. Verify an IC Stop fault displays.
4. Bleed out valve SLOWLY to allow car to drop out of dead zone but NOT out of door zone.
5. Turn off In-Car Stop switch and the car relevels within a few seconds.

5 Redundancy

5.1 Safety Inputs

Applicable Code – ASME A17.1 section 2.26.9.3

- Testing Notes – The following testing notes are:
 - Software/Hardware electronic protective devices are monitored by redundant board inputs.
 - The redundant inputs are constantly compared with one another to verify proper operation of the input circuitry. If the inputs are not in the same state, a Redundancy fault is latched, and the car goes out of service.
 - Table 1 lists the electronic protective devices that are redundantly monitored by the Software/Hardware system.

Table 1: Electronic Protective Devices Monitored by the Software/Hardware System

Electronic Protective Device	Input Location
Machine Room Board	
Bottom Interlock	LFB/LRB
Middle Interlock(s)	LFM/LRM
Top Interlock	LFT/LRT
Machine Room Inspection Enable	Internal
Hoistway Access Top Up	ATU
Hoistway Access Top Down	ATD
Hoistway Access Bottom Up	ABU
Hoistway Access Bottom Down	ABD
Car Door Bypass	SWCAR
Hoistway Door Bypass	SWHO
Car Top Board	
Cartop Inspection Enable	507
Front Gateswitch	501
Rear Gateswitch	502
Car Operating Panel Board	
In-Car Stop Switch	SF2
Hoistway Access Enable	SF1

The following procedure describes how to test the safety inputs.

1. Locate the RDC jumper.
2. Remove the RDC jumper.
3. Verify a Redundancy fault exists and the car goes out of service.
4. Replace RDC jumper.
5. Recycle the MR board to clear the fault.

6 Battery Lowering Device Test

Applicable Code – A17.1 section 3.26.10

The following procedure describes how to test the Battery Lowering Device (BLD).

NOTE: The batteries need to have been fully charged for 24 hours.

1. Verify the BLD is wired correctly by matching the wires to the job specific information.
2. Remove all bypass jumpers.
3. Install a jumper between ML1 and ML2 on the BLD. Verify the BLD input is activated.
4. Turn off main disconnect switch.
5. Verify that the output voltages of the BLD match voltages according to job specific information.
6. The car lowers to the bottom floor and open the doors and then close.
7. Verify the door open button inside the car is operational.

NOTE: The Hall Call button does not work when testing the BLD.

7 Stop Ring Test

Applicable Code – ASME A17.1 section 3.17.1.2

The following procedure describes how to test stop ring.

1. Verify the hoistway and the car top are clear of any personnel.
2. Enter a car call to the top landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
3. Toggle the NORMAL/INSPECTION switch to INSPECTION.
4. Navigate to MAIN MENU | SETUP | MISCELLANEOUS | BYPASS TERM LIMITS and set to ON.
5. Navigate to SETUP | SPEEDS | INSPECTION SPEED and set the speed to less than contract speed so only the UPL valves are active.
6. Press and hold Enable and Up buttons. Run the car slowly up onto stop ring. Verify that only the UPL valve is active.
7. Observe the relief pressure.
8. When the test is complete, lower the car back down to the top landing door zone by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
9. Navigate to MAIN MENU | SETUP | MISCELLANEOUS | BYPASS TERM LIMITS and set to OFF.
10. Set the inspection speed back to its original value if the speed was changed.
11. Place the car back to normal operation.

8 Low Oil/Low Pressure

8.1 Low Oil

Applicable Code – A17.1 section 3.26.9

The following procedure describes how to test for low oil.

1. Enter a car call above the bottom landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
2. Pull the wire going to the Low Oil input.
NOTE: The wire can be pulled whether car is moving or if the car is sitting at the top landing.
3. The car should move down to the nearest landing and open the doors.
4. Verify the display shows a Low Oil fault.
5. Reconnect the wire to the Low Oil input.
6. Turn on DIP 1A on the MR board and press the Reset button to clear the fault.
7. Turn off DIP 1A on the MR board.

8.2 Low Oil Protection/MLT

Applicable Code– A17.1 section 3.26.9

The following procedure describes how to test for MLT.

1. Change the value of the parameter Max Runtime by navigating to | MAIN MENU | DEBUG | 08-0131 to 5.
2. Enter a car call above the bottom landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
3. While car is moving, the car will go into low oil mode and will move to the bottom landing.
4. Verify that the display shows a Low Oil MLT fault.
5. Turn on DIP 1A on the MR board and press the Reset button to clear the fault.
6. Turn off DIP 1A on the MR board.

8.3 High Oil Temperature

Applicable Code – A17.1 section 3.26.6.5

The following procedure describes how to test for High Oil Temperature.

The High Oil Temperature and the Low Oil should be connected in series.

1. Enter a car call above the bottom landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
2. Pull the wire going to the Low Oil input.
NOTE: The wire can be pulled whether car is moving or if the car is sitting at the top landing.
3. The car should move down to the nearest landing and the doors will open.
4. Verify the display shows a Low Oil fault.
5. Reconnect the wire to the Low Oil input.
6. Turn on DIP 1A on the MR board and press the Reset button to clear the fault.
7. Turn off DIP 1A on the MR board.

8.4 Low Pressure

Applicable Code – A17.1 section 3.26.8

The following procedure describes how to test for low pressure.

1. Enter a car call above the bottom landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
2. Pull the wire going to the Low Pressure input.
NOTE: The wire can be pulled whether the car is moving or if the car is stationary at the top landing.
3. The car stops.
NOTE: If the car stops at a door zone, the doors can be opened with door open button.
4. Verify the display shows a Low Pressure fault.
5. Reconnect the wire to the Low Pressure input.
NOTE: If the car stopped out of door zone, the car will relevel.

8.5 Leveling Zone Test

Applicable Code – ASME A17.1 section 2.26.1.6.7

The following procedure describes how to test the leveling zone.

1. Enter a car call to the bottom landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
2. Once the car stops at the door zone, toggle the NORMAL/INSPECTION switch to INSPECTION.
3. Apply 24V to the MM input to put the car in CONSTRUCTION mode.
4. Navigate to MAIN MENU | DEBUG | Enter Door Command. Select Door Open and press and hold the middle button to open the doors.

NOTE: The door icon will change from [|] to [<|>] while opening and then to < > when fully opened. Release the middle button and the doors remain open.

5. Press the UP and Enable buttons on the MR to move the car about 2-3 inches above the bottom landing. (Outside of the door zone.)
6. Verify a Lock Open fault displays.
7. Remove the jumper from MM and toggle the NORMAL/INSPECTION switch to Normal. The doors close.
8. Recycle the MR board to clear the faults.
9. The car moves back to door zone.

8.6 Pressure Test

Applicable Codes – ASME A17.1 sections 2.25.3 and 3.17.1.2

The pressure test ensures the motor's bypass valve and stop ring operate normally.

The following procedure describes how to test for pressure.

1. Verify the hoistway and the car top are clear of any personnel.
2. Enter a car call to the top landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
3. Toggle the NORMAL/INSPECTION switch to INSPECTION.
4. Navigate to MAIN MENU | SETUP | MISCELLANEOUS | BYPASS TERM LIMITS and set to ON.
5. Press and hold Enable and Up buttons. Run the car slowly up onto stop ring.
6. Verify the car stops on the stop ring.
7. Navigate to MAIN MENU | SETUP | MISCELLANEOUS | BYPASS TERM LIMIT and set to OFF.
8. Toggle the NORMAL/INSPECTION switch to NORMAL.

8.7 Hydro Rupture Setup

This test can be performed in either Inspection Mode or Normal Mode.

Setup and adjust the rupture valve while the car is moving at the highest speed possible down a multi-run floor. The controller may exhibit a low-pressure fault as a result of this test.

- a. If the Contract Speed is < 150 FPM, increase the Inspection Speed to 150 FPM and run the car on Inspection Mode. Go to Section 8.7.1.
- b. If the Contract Speed is > 150 FPM, run the car on Normal Mode. Go to Section 8.7.2.

8.7.1 Inspection Mode

Applicable Code – ASME A17.1 section 3.19.3.3.1.

The following procedure describes how to setup for hydro rupture on Inspection Mode.

1. Place a car call above the bottom landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
2. Toggle the NORMAL/INSPECTION switch to INSPECTION.
3. Navigate to MAIN MENU | SETUP | SPEEDS | INSPECTION SPEED and change the inspection speed to match the contract speed.
4. Press Enable and Down buttons then run the car on Inspection.

8.7.2 Normal Mode

Applicable Code – ASME A17.1 section 3.19.3.3.1

The following procedure describes how to setup for hydro rupture on Normal Mode.

1. Toggle the NORMAL/INSPECTION switch to NORMAL.
2. Place car call by navigating to MAN MENU | DEBUG | ENTER CAR CALLS.

9 Software/Hardware Monitored Electronic Protective

9.1 Interlocks

The sections below describe interlock test procedures.

9.1.1 Interlocks not in Bypass Mode

During this test, the Lock Clip Delay expires and relays SFM and SFP drop.

Applicable Codes – ASME A17.1 sections 2.11 and 2.26.2.14

The following procedure describes how to test the top, middle, and bottom interlocks that are not in Bypass Mode.

1. Enter a car call by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
2. While the car is running, open an interlock or remove the interlock wire from the MR board.
3. Verify the safety string opens and the car stops.
4. Verify an Interlock fault displays.
5. Replace any removed wires.

9.1.2 Interlocks in Bypass Mode

This test is only performed in Normal, Machine Room Inspection, or Hoistway Access modes of operation.

Applicable Codes – ASME A17.1 sections 2.11 and 2.26.2.14

The following procedure describes how to test the interlock using the Hoistway Door Bypass switch.

1. Place the Hoistway Door Bypass switch in the OFF position.
2. Enter a car call by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
3. Testing interlocks in Normal, MR Inspection, or Hoistway Access Mode?
 - a) If running the car in Normal Mode, go to step 4.
 - b) If running the car in MR Inspection Mode, press and hold Enable and (Up or Down) buttons. Go to step 4.
 - c) If running on Hoistway Access Mode, turn MR INSPECTION switch and Hoistway Access switch ON. Go to step 7.
4. Place the Hoistway Door Bypass switch in the Bypass position.
5. Verify the car immediately comes to a stop and does not run.

6. Place the Hoistway Door Bypass switch in the OFF position. The car relevels and the process ends.
7. Open door by navigating to MAIN MENU | DEBUG | Enter Door Command.
8. Place a jumper between 120 VAC to ABU.
9. Place the Hoistway Door Bypass switch in the Bypass position.
10. Verify the car immediately comes to a stop and does not run.
11. Remove jumper.
12. Turn MR INSPECTION switch to NORMAL.
13. Turn off Hoistway Access switch.
14. Place the Hoistway Door Bypass switch in the OFF position.
15. The car relevels and process ends.

9.2 Gate Switch not in Bypass Mode

During this test, relays SFM and SFP drop.

Applicable Codes – ASME A17.1 sections 2.14 and 2.26.2.15

The following procedure describes how to test the Gate switch not in Bypass Mode.

1. Enter a car call to a landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
2. While the car is running, remove the Gate switch wire from the CT board.
3. Verify the safety string opens and the car stops.
4. Verify Door Front Jumper fault.
5. After verification, replace the Gate switch wire.

9.3 In-Car Stop Switch in FEO Recall Mode

Applicable Codes – ASME A17.1 section 2.26.2.21 and 2.27.3.1.6(c)

Testing Notes – The In-Car Stop switch is NOT bypassed during initial FEO recall after the doors have closed and the car has begun to move.

NOTE: FEO Phase II recall is not included in this test.

The following procedure describes how to test the In-Car Stop Switch in FEO Recall Mode

1. Be prepared to activate the In-Car Stop switch.
2. Place the car away from the FEO main recall landing and be prepared to place the car on FEO recall.
3. Place the car on FEO recall.
4. After the car has started to recall, activate the In-Car Stop switch.

5. Relays SFM and SFP will immediately drop, safety string will open, and the car will stop.
6. To revert back to normal operation, deactivate the In-Car Stop switch.
7. Reset FEO.

9.4 Car Door Switch in Bypass Mode

This test is only performed in Normal, Machine Room Inspection, or Hoistway Access modes of operation.

Applicable Codes – ASME A17.1 sections 2.14 and 2.26.2.15

The following procedure describes how to test the Car Door switch in Bypass Mode.

1. Place the Car Door Bypass switch in the OFF position.
2. Enter a car call by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
3. Testing interlocks in Normal, MR Inspection, or Hoistway Access Mode?
 - a) If running the car in Normal Mode, go to step 4.
 - b) If running the car in MR Inspection Mode, press and hold the Enable and (Up or Down) buttons. Go to step 4.
 - c) If running on Hoistway Access Mode, turn MR INSPECTION and Hoistway Access switch ON. Go to step 7.
4. Place the Car Door Bypass switch in the Bypass position.
5. Verify the car immediately comes to a stop and does not run.
6. Place the Car Door Bypass switch in the OFF position. The car relevels and the process ends.
7. Open door by navigating to MAIN MENU | DEBUG | Enter Door Command.
8. Place a jumper between 120 VAC to ABU.
9. Place the Car Door Bypass switch in the Bypass position.
10. Verify the car immediately comes to a stop and does not run.
11. Remove jumper.
12. Turn MR INSPECTION switch to NORMAL.
13. Turn off Hoistway Access switch.
14. Place the Car Door Bypass switch in the OFF position.
15. The car relevels and process ends.

9.5 Inspection Speed Limit

Applicable Codes – ASME A17.1 sections 2.12.7.3.2 and 2.26.1.4

The following procedure describes how to test the inspection speed limit.

1. Navigate to MAIN MENU | SETUP | SPEEDS | INSPECTION SPEED.
2. Change the inspection speed to be greater than the contract speed.
3. Enter a car call to a landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
4. Verify the display shows an Invalid Inspection Speed fault and the car does not run.
5. Navigate to MAIN MENU | SETUP | SPEEDS | INSPECTION SPEED and reset the inspection speed back to the original value.

9.6 Door Zone Failure Tests

The sections below describe the Door Zone Sensor Failure test procedures.

9.6.1 Door Zone Stuck High with Doors Open Test

Applicable Codes – ASME A17.1 section 2.26.9.3.1

The following procedure describes how to test the Door Zone Stuck High with Doors Open test.

1. Set the controller to Automatic Mode.
2. Place the car inside the Door Zone.
3. Jump DZ to +24.
4. Place a car call or a hall call.
5. Open the hall door and/or in-car door while the car is moving outside of the DZ.
6. The car should fault and should not reattempt to move. The hall/car call is cleared, and the system does not permit the car to move – test by issuing a call.
7. To revert back to normal operation, disconnect the +24 from DZ.

9.6.2 Door Zone Stuck High In-Flight Test

Applicable Codes – ASME A17.1 section 2.26.9.4

The following procedure describes the Door Zone Stuck High In-Flight test.

1. Set the controller to Automatic Mode.
2. Place a car call or a hall call.
3. Jump DZ to +24 while the car is moving *and* is outside the DZ.
4. The car should fault and should not reattempt to move. The hall/car call is cleared, and the system does not permit the car to move – test by issuing a call.
5. To revert back to normal operation, disconnect the +24 from DZ.

9.7 Door Zone Input Stuck High Outside of Actual Door Zone

Applicable Codes – ASME A17.1 section 2.26.9.4

The following procedure describes how to test the Door Zone input stuck High outside of actual Door Zone.

1. Set the controller to Automatic Mode.
2. Place the car inside the door zone.
3. Jump DZ to +24.
4. Place a car call or a hall call.
5. The car should fault, and the car should not continue moving outside the Door zone (Leveling zone) and should not reattempt to move. The hall/car call is cleared.
6. To revert back to normal operation, disconnect the +24 from DZ.

9.8 SFP and SFM Relays Preflight Test

Applicable Codes – A17.1 section 2.26.9.4

The following procedure describes the SFP and SFM Relays Preflight test.

following procedure describes the Camera Failure In-Flight test.

1. Set the controller to Automatic Mode.
2. Place car calls to floors X and Y or place hall calls at floors X and Y.
3. Disconnect the SFM and/or SFP relays when the car stops at floor X *and* before traveling to floor Y.
4. The car should fault and should not reattempt to move. The hall/car call is cleared, and the system does not permit the car to move – test by issuing a call.
5. To revert back to normal operation, reconnect the SFM and/or SFP relays.

10 Emergency Operation

10.1 FEO

The following sections describe Fire Fighters' Emergency Operation (FEO) test procedures.

10.1.1 FEO – Interruption of Power

Applicable Code – ASME A17.1 sections 2.27.3.4

The following procedure describes how to test for interruption of power.

1. Recall the car using Fire Phase I.
2. Verify by running the car on Fire Phase II operation.
3. Reset the main line power.
4. Reset FEO using lobby key switch.

10.1.2 FEO Phase I and Battery Lowering Device

Applicable Code – A17.1 section 2.27.3.1.6(m)

The following procedure describes how to test FEO Phase I and Battery Lowering Device.

1. Create an input to Battery Power by navigating to MAIN MENU | SETUP | SETUP I/O | SETUP INPUT.
2. Enter a car call to any landing away from the FEO main recall landing by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
3. Set Hoistway Smoke to Main by navigating to MAIN MENU | SETUP | FIRE | HOISTWAY SMOKE | MAIN or ALT.
4. Remove power.
5. Set Smoke HA to OFF.
6. The car moves to fire recall floor.
7. Press DOB and car doors open.
8. Restore power.
9. Verify car calls and hall calls.

10.1.3 FEO Phase II and Battery Lowering Device

Applicable Code – A17.1 section 2.27.3.3.1(l)

The following procedure describes how to test FEO Phase II and Battery Lowering Device.

1. Create an input to Battery Power by navigating to MAIN MENU | SETUP | SETUP I/O | SETUP INPUT.
2. Set fire recall floor to a floor above the bottom landing by navigating to MAIN MENU | SETUP | FIRE | MAIN RECALL | FLOOR.
3. Place the car on FEO II.
4. Press DCB until doors close.
5. Place car call to a landing above main recall floor by navigating to MAIN MENU | DEBUG | ENTER CAR CALLS.
6. Remove power.
7. Verify the car stops.
8. Place car call below current landing.
9. Verify car doors open.
10. Restore power.
11. Reset FEO using lobby key switch.

10.1.4 FEO Phase I and Load Weighing Device

Applicable Codes – A17.1 section 2.27.3.1.6(m)

The following procedure describes the FEO Phase I and Load Weighing Device test.

1. This test must be performed on any FEO Phase I recall.
2. Place the car away from the main recall landing.
3. Jumper the car board input Full Load to C24.
4. Place the car on FEO Phase I.
5. Verify that car recalls as expected.
6. To revert back to normal operation, remove the jumper between C24 and Full Load.
7. Reset FEO service using lobby key switch.

10.1.5 FEO Phase II and Load Weighing Device

Applicable Codes – A17.1 section 2.27.3.31(l)

The following procedure describes the FEO Phase II and Load Weighing Device test.

1. Place the car on FEO Phase II.
2. Jumper the car board input Full Load to C24.
3. Enter car call below current floor.
4. Verify that the car answers car calls.

5. To revert back to normal operation, remove the jumper between C24 and Full Load.
6. Reset FEO service using lobby key switch.

10.1.6 Shorting Electrical Equipment on the Hoistway Landing Side

Applicable Codes – A17.1 section 2.27.3.3.6

The following procedure lists the instructions for shorting the Electrical Equipment on the Bottom Landing.

1. Activate FEO Phase II.
2. Using a jumper wire connect positive power terminal (H24), Up Button (UB), Down Button (DB) to REF / Door Frame.
3. H24 to REF DC voltage will read 0VDC.
4. The car will continue to operate on FEO Phase II Operation.
5. To revert back to normal operation, remove jumper from H24, UB, DB to REF / Door Frame (if tied to REF).
6. Reset H24 breaker.

10.2 Phase I under Special Conditions

The following sections describe the Phase I test procedures under special conditions.

10.2.1 Phase I Emergency Recall Operation After Device Actuation

The following sections describe the Phase I Emergency Recall Operation After Device Actuation tests (Above the Fire Recall Floor & Below the Fire Recall Floor).

10.2.1.1 Above the Fire Recall Floor on Battery Power

Applicable Codes – A17.1 section 3.27.1

The following procedure lists the instructions for each step of the Phase I Emergency Recall Operation After Device Actuation (Above the Fire Recall Floor on Battery Power) test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Battery Power input.
4. Navigate to SETUP | FIRE | MAIN RECALL | FLOOR.
5. Set the fire recall floor to any middle floor.
6. Place the car on the top floor.
7. Activate the Battery Power input.

NOTE: the car will start moving downwards.

8. While the car is still *above* the fire recall floor, rotate the Fire Recall Key switch to the ON position.

NOTE: the car will go to the Fire Recall Floor.

9. Verify that the doors open on arrival then close after 15s.
10. Press the DOB - the doors should open, then close after a couple of seconds.
11. To revert back to Normal operation:
 - i. deactivate the Battery Power input.
 - ii. reset Fire operation (using the key switch) after the car recalls to the fire recall floor.

10.2.1.2 Above the Fire Recall Floor on Low Oil

Applicable Codes – A17.1 section 3.27.1

The following procedure lists the instructions for each step of the Phase I Emergency Recall Operation After Device Actuation (Above the Fire Recall Floor on Low Oil) test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Low Oil input.
4. Navigate to SETUP | FIRE | MAIN RECALL | FLOOR.
5. Set the fire recall floor to any middle floor.
6. Place the car on the top floor.
7. Deactivate the Low Oil input.

NOTE: the car will start moving downwards.

8. While the car is still *above* the fire recall floor, rotate the Fire Recall Key switch to the ON position.

NOTE: the car will go to the Fire Recall Floor.

9. Verify that the doors open on arrival then close after 15s.
10. Press the DOB - the doors should open, then close after a couple of seconds.
11. To revert back to Normal operation:
 - i. activate the Low Oil input.
 - ii. Toggle the DIP A1 on the MR board from On to Off.
 - iii. reset Fire operation (using the key switch) after the car recalls to the fire recall floor.

10.2.1.3 Below the Fire Recall Floor on Battery Power

Applicable Codes – A17.1 section 3.27.1

The following procedure lists the instructions for each step of the Phase I Emergency Recall Operation After Device Actuation (Below the Fire Recall Floor on Battery Power) test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Battery Power input.
4. Navigate to SETUP | FIRE | MAIN RECALL | FLOOR.
5. Set the fire recall floor to any middle floor.
6. Place the car on the top floor.
7. Activate the Battery Power input.
NOTE: the car will start moving downwards.
8. While the car is *below* the fire recall floor, rotate the Fire Recall Key switch to the ON position.
NOTE: the car will go to the nearest landing below its current position.
9. Verify that the doors open on arrival then close after 15s.
10. Press the DOB - the doors should open, then close after a couple of seconds.
11. To revert back to Normal operation:
 - i. deactivate the Battery Power input.
 - ii. reset Fire operation (using the key switch) after the car recalls to the fire recall floor.

10.2.1.4 Below the Fire Recall Floor on Low Oil

Applicable Codes – A17.1 section 3.27.1

The following procedure lists the instructions for each step of the Phase I Emergency Recall Operation After Device Actuation (Below the Fire Recall Floor on Low Oil) test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Low Oil input.
4. Navigate to SETUP | FIRE | MAIN RECALL | FLOOR.
5. Set the fire recall floor to any middle floor.
6. Place the car on the top floor.
7. Deactivate the Low Oil input.
NOTE: the car will start moving downwards.
8. While the car is *below* the fire recall floor, rotate the Fire Recall Key switch to the ON position.
NOTE: the car will go to the nearest landing below its current position.
9. Verify that the doors open on arrival then close after 15s.

10. Press the DOB - the doors should open, then close after a couple of seconds.
11. To revert back to Normal operation:
 - i. activate the Battery Power input.
 - ii. Toggle the DIP A1 on the MR board from On to Off.
 - iii. reset Fire operation (using the key switch) after the car recalls to the fire recall floor.

10.2.2 Phase I Emergency Recall Operation Prior to Device Actuation

The following sections describe the Phase I Emergency Recall Operation Prior to Device Actuation tests (Above the Fire Recall Floor & Below the Fire Recall Floor).

10.2.2.1 Above the Fire Recall Floor on Battery Power

Applicable Codes – A17.1 section 3.27.2

The following procedure lists the instructions for each step of the Phase I Emergency Recall Operation Prior to Device Actuation (Above the Fire Recall Floor on Battery Power) test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Battery Power input.
4. Navigate to SETUP | FIRE | MAIN RECALL | FLOOR.
5. Set the fire recall floor to any middle floor.
6. Place the car on the top floor.
7. Rotate the Fire Recall Key switch to the ON position.

NOTE: the car will start moving downwards toward the Fire Recall Floor.
8. While the car is still *above* the fire recall floor, activate the Battery Power input.

NOTE: the car will go to the Fire Recall Floor.
9. Verify that the doors open on arrival then close after 15s.
10. Press the DOB - the doors should open, then close after a couple of seconds.
11. To revert back to Normal operation:
 - i. deactivate the Battery Power input.
 - ii. reset Fire operation (using the key switch) after the car recalls to the fire recall floor.

10.2.2.2 Above the Fire Recall Floor on Low Oil

Applicable Codes – A17.1 section 3.27.2

The following procedure lists the instructions for each step of the Phase I Emergency Recall Operation Prior to Device Actuation (Above the Fire Recall Floor on Low Oil) test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Low Oil input.
4. Navigate to SETUP | FIRE | MAIN RECALL | FLOOR.
5. Set the fire recall floor to any middle floor.
6. Place the car on the top floor.
7. Rotate the Fire Recall Key switch to the ON position.
NOTE: the car will start moving downwards toward the Fire Recall Floor.
8. While the car is still *above* the fire recall floor, deactivate the Low Oil input.
NOTE: the car will go to the Fire Recall Floor.
9. Verify that the doors open on arrival then close after 15s.
10. Press the DOB - the doors should open, then close after a couple of seconds.
11. To revert back to Normal operation:
 - i. activate the Low Oil input.
 - ii. Toggle the DIP A1 on the MR board from On to Off.
 - iii. reset Fire operation (using the key switch) after the car recalls to the fire recall floor.

10.2.2.3 Below the Fire Recall Floor on Battery Power

Applicable Codes – A17.1 section 3.27.2

The following procedure lists the instructions for each step of the Phase I Emergency Recall Operation Prior to Device Actuation (Below the Fire Recall Floor on Battery Power) test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Battery Power input.
4. Navigate to SETUP | FIRE | MAIN RECALL | FLOOR.
5. Set the fire recall floor to any middle floor.
6. Place the car on the bottom floor.
7. Rotate the Fire Recall Key switch to the ON position.
NOTE: the car will start moving upwards toward the Fire Recall Floor.
8. While the car is *below* the fire recall floor, activate the Battery Power input.
NOTE: the car will go to the nearest landing below its current position.
9. Verify that the doors open on arrival then close after 15s.

10. Press the DOB - the doors should open, then close after a couple of seconds.
11. To revert back to Normal operation:
 - i. deactivate the Battery Power input.
 - ii. reset Fire operation (using the key switch) after the car recalls to the fire recall floor.

10.2.2.4 Below the Fire Recall Floor on Low Oil

Applicable Codes – A17.1 section 3.27.2

The following procedure lists the instructions for each step of the Phase I Emergency Recall Operation Prior to Device Actuation (Below the Fire Recall Floor on Low Oil) test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Low Oil input.
4. Navigate to SETUP | FIRE | MAIN RECALL | FLOOR.
5. Set the fire recall floor to any middle floor.
6. Place the car on the bottom floor.
7. Rotate the Fire Recall Key switch to the ON position.
NOTE: the car will start moving upwards toward the Fire Recall Floor.
8. While the car is *below* the fire recall floor, deactivate the Low Oil input.
NOTE: the car will go to the nearest landing below its current position.
9. Verify that the doors open on arrival then close after 15s.
10. Press the DOB - the doors should open, then close after a couple of seconds.
11. To revert back to Normal operation:
 - i. activate the Low Oil input.
 - ii. Toggle the DIP A1 on the MR board from On to Off.
 - iii. reset Fire operation (using the key switch) after the car recalls to the fire recall floor.

10.2.3 Device Actuation at Recall Level on Battery Power

Applicable Codes – A17.1 section 3.27.3

The following procedure lists the instructions for each step of the Device Actuation at Recall Level on Battery Power test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Battery Power input.

4. Rotate the Fire Recall Key switch to the ON position.
NOTE: the car will recall to the Fire Recall Floor.
5. Verify that the doors remain open indefinitely.
6. Verify that the Fire Lamp is solid.
7. Activate the Battery Power input.
NOTE: the doors should open then close automatically after 15s.
8. Press the DOB - the doors should open, then close after a couple of seconds.
9. To revert back to Normal operation:
 - i. deactivate the Battery Power input.
 - ii. reset Fire operation (using the key switch) after the car recalls to the fire recall floor.

10.2.4 Device Actuation at Recall Level on Low Oil

Applicable Codes – A17.1 section 3.27.3

The following procedure lists the instructions for each step of the Device Actuation at Recall Level on Low Oil test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Low Oil input.
4. Rotate the Fire Recall Key switch to the ON position.
NOTE: the car will recall to the Fire Recall Floor.
5. Verify that the doors remain open indefinitely.
6. Verify that the Fire Lamp is solid.
7. Deactivate the Low Oil input.
NOTE: the doors should open then close automatically after 15s.
8. Press the DOB - the doors should open, then close after a couple of seconds.
9. To revert back to Normal operation:
 - i. activate the Low Oil input.
 - ii. toggle the DIP A1 on MR board from On to Off.
 - iii. reset Fire operation (using the key switch) after the car recalls to the fire recall floor.

10.3 Phase II under Special Conditions

The following sections describe the Phase II test procedures under special conditions.

10.3.1 Device Actuation with Phase II Emergency In-Car Operation in Effect on Battery Power

Applicable Codes – A17.1 section 3.27.4

The following procedure lists the instructions for each step of the Device Actuation with Phase II Emergency In-Car Operation in Effect test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Battery Power input.
4. Rotate the Fire Recall Key switch to the ON position.
NOTE: the car will recall to the Fire Recall Floor.
5. Rotate the Fire II Recall Key switch to the ON position.
NOTE: the car should go into Fire Phase II.
6. Press the DCB until the doors are fully closed.
7. Place a car call to the top floor – the car should start moving upwards.
8. While the car is moving, activate the Battery Power Input.
NOTE: the car should stop immediately and should not reattempt to move.
9. Verify that the car call was cleared.
10. Verify that any car call placed to any floor above the current floor will not latch.
11. Place a car call to any floor below the current floor - the car should the service the car call.
12. Press the DOB until the doors fully open.
13. Press the DCB until the doors fully close.
14. Deactivate the Battery Power input.
15. Verify that the Fire Lamp is solid.
16. Place a car call to the top floor - car should go to the top floor.
17. Place a car call to the bottom floor - car should start moving downwards.
18. While the car is moving, activate the Battery Power input.
NOTE: the car should stop immediately and should not reattempt to move.
19. Verify that the car call was cleared.
20. Place a car call to any floor below the current floor -> the car should service the car call.

21. Press the DOB until doors fully open.
22. Press the DCB until doors fully close.
23. Deactivate the Battery Power input.
24. Place a car call to the fire recall floor (if different than the current floor).

NOTE: the car should be move to the Fire Recall Floor.

25. Press the DOB until the doors fully open.
26. To revert back to Normal operation:
 - i. deactivate the Battery Power input.
 - ii. exit Fire II operation by turning the Fire II key switch to the OFF position.
 - iii. Reset Fire I operation (using the key switch) after the car recalls to the fire recall floor.

10.3.2 Device Actuation with Phase II Emergency In-Car Operation in Effect on Low Oil

Applicable Codes – A17.1 section 3.27.4

The following procedure lists the instructions for each step of the Device Actuation with Phase II Emergency In-Car Operation in Effect on Low Oil test.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to SETUP | SETUP INPUTS | RISER | Controller.
3. Assign the Low Oil input.
4. Rotate the Fire Recall Key switch to the ON position.

NOTE: the car will recall to the Fire Recall Floor.
5. Rotate the Fire II Recall Key switch to the ON position.

NOTE: the car should go into Fire Phase II.
6. Press the DCB until the doors are fully closed.
7. Place a car call to the top floor – the car should start moving upwards.
8. While the car is moving, deactivate the Low Oil Input.

NOTE: the car should stop immediately and should not reattempt to move.
9. Verify that the car call was cleared.
10. Verify that any car call placed to any floor above the current floor will not latch.
11. Place a car call to any floor below the current floor - the car should the service the car call.
12. Press the DOB until the doors fully open.
13. Press the DCB until the doors fully close.
14. Activate the Low Oil input.

15. Toggle Dip A1 on MR Board from On to Off.
16. Verify that the Fire Lamp is solid.
17. Place a car call to the top floor - car should go to the top floor.
18. Place a car call to the bottom floor - car should start moving downwards.
19. While the car is moving, deactivate the Low Oil input.
NOTE: the car should stop immediately and should not reattempt to move.
20. Verify that the car call was cleared.
21. Place a car call to any floor below the current floor -> the car should service the car call.
22. Press the DOB until doors fully open.
23. Press the DCB until doors fully close.
24. Activate the Low Oil input.
25. Place a car call to the fire recall floor (if different than the current floor).
NOTE: the car should be move to the Fire Recall Floor.
26. Press the DOB until the doors fully open.
 - i. activate the Low Oil input.
 - ii. toggle the DIP A1 on MR board from On to Off.
 - iii. exit Fire II operation by turning the Fire II key switch to the OFF position.
 - iv. reset Fire I operation (using the key switch) after the car recalls to the fire recall floor.

10.4 Emergency Power Test

The Emergency Power option on the Smartrise controller allows one or more cars to run on a generator during power outages. When the emergency power input is active, an Emergency Power fault is displayed and stops the car immediately until the Generator UP to Speed input is activated.

10.4.1 One Elevator Provided with Emergency Power at a Time

Applicable Code – A17.1 section 2.27.2

The following procedure describe how to test emergency power one elevator at a time.

1. Place the emergency power selector switch in the Automatic position.
2. Start and run the emergency generator.
3. The cars run by availability, one at a time, to the designated level.

NOTE: The car with the lowest index number will be placed into service. Adjusting the selector switch will take the currently selected car out of service at an available floor and the selected car will be placed into service.

4. Return to normal power.

10.4.2 All Elevators Provided with Emergency Power at the Same Time

Applicable Code – A17.1 section 2.27.2

The following procedure describe how to test emergency power for all elevators at the same time.

1. Start and run the emergency generator.
2. All cars run normally and a lamp indicating emergency power operation is on in the hall station.
3. Return to normal power.

11 Electronic Protective Devices (EPD) in Safety String

11.1 All EPD’s in Safety String

The sections below describe EPD’s in safety string test procedures.

11.1.1 Any Positively Broken Contact in the Safety String

Applicable Codes – ASME A17.1 section 3.26.4

The following procedure lists the instructions for each step for Any Positively Broken Contact in Safety String test.

1. This test works on any mode of operation.
2. Be prepared to activate the EPD.
3. With the car running, activate the EPD.
4. Relays feeding neutral to the Valves and the contactor feeding the hydraulic pump/soft starter will drop.
5. To revert back to normal operation, deactivate the EPD. If the car needs to be moved before the EPD can be deactivated, temporarily place a jumper across the EPD contact to bypass the EPD.
6. Remove jumper.

The table below lists Any Positively Broken Contact in Safety String troubleshooting procedure.

Table 2: Any Positively Broken Contact in Safety String Troubleshooting Procedure

Step	Information / Instruction for Each Step
Contactors Failed to Open	Verify the EPD is wired correctly. Verify that there are no jumpers in the safety string.

12 Ground Faults

12.1 EPD Input to REF

Applicable Codes – A17.1 section 2.26.9.3

The following procedure lists the instructions for each step of the EPD input to REF test.

1. Using a jumper wire, connect M24 to REF.
2. Power is removed from the M24 Bus.
3. M24 to REF DC voltage will read 0VDC.
4. To revert back to normal operation, remove jumper from M24 and REF.
5. Reset M24 breaker.

12.2 Safety String to Ground

Applicable Codes – A17.1 section 2.26.9.3

The following procedure lists the instructions for each step of the Safety String to Ground test.

1. Verify that all safety string contacts are closed.
2. Using a jumper wire, connect 120 to ground by shorting one of the terminals of the bottom landing locks to ground/metal frame.
3. Either:
 - The onboard fuse will open while the short is present, or
 - The breaker will open.
4. To revert back to normal operation, remove jumper from 120 and ground/metal frame.
5. Reset circuit breaker or power cycle the MR Board.

13 Recycling Operation

Applicable Codes – A17.1 section 3.26.7

The following procedure lists the instructions for the Recycling Operation.

1. Toggle the NORMAL/INSPECTION and switch to NORMAL.
2. Navigate to MAIN MENU | SETUP | HYDRO | JACK RESYNC | Duration.
3. Set the Jack Resync Duration to 10 seconds.
4. Place the car on the bottom floor.
5. Turn on DIP A3 on the MR Board

NOTE: the car should go into Normal (Captured) Mode.

6. Place several car calls to higher floors.

NOTE: the car should start servicing the calls.

7. Trigger the jack resync while the car calls are being serviced (Navigate to MAIN MENU | SETUP | HYDRO | JACK RESYNC | Activate jack resync).

8. Select YES.

NOTE: the car will continue servicing all latched calls.

9. Once the car services all the latched calls with the doors in the closed state, verify that:

- i. the car will go into the Jack Resync Mode.
- ii. the car will recall to the bottom floor.

10. After the car stops on the bottom floor, verify that:

- i. the car starts moving towards the pit at the levelling speed (not exceeding 20 FPM) for the duration set (see step 3).
- ii. the car moves back up to the bottom floor at levelling speed after completing the jack resync process.

14 Direction Counter Trip Reset

Applicable Codes – NA

The following procedure lists the instructions for the Direction Counter Trip Reset.

1. Navigate to MAIN MENU.
2. Go to SETUP.
3. Go to MISCELLANEOUS.
4. Go to DIR. COUNTER LIMIT.
5. Enter the Access Code (provided by Technical Support).
6. View the present value on the Direction Change Counter.
7. Set the number of direction changes limit to 10 increments more than the present value.
8. Move the car in various directions (10 times while monitoring the counter).
NOTE: the value on the Direction Change Counter increments with every change in direction.
9. Confirm that the car goes OOS after the 10th direction change.
NOTE: When the direction counter exceeds the limit, the counter cannot be reset again.
10. Set a new threshold for the number of direction changes.