



P3010
Los Angeles LRV

CAR BODY



Section 0200 RUNNING MAINTENANCE & SERVICING MANUAL

LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line.

Total number of pages in this section (0200) is **540** consisting of the following:

Original	0	October 2020
Revision	1	April 2021
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<u>PAGE</u>	<u>CHANGE NO.</u>	<u>PAGE</u>	<u>CHANGE NO.</u>
i	4		
ii through xix	0		
xx	4		
xxi through xxx	0		
1-1 through 1-4	0		
2-1 through 2-64	0		
3-1	2		
3-2	0		
4-1 through 4-8	0		
5-1 through 5-28	0		
5-29	4		
5-30 through 5-46	0		
6-1 through 6-6	0		
7-1 through 7-337	0		
7-338	2		
7-339 through 7-346	0		
8-1 through 8-16	0		
I-1 through I-6	0		
A-1 through A-2	0		
B-1 through B-10	4		

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SAFETY SUMMARY

Some of the procedures in this section are preceded by warnings/cautions regarding potential hazards in handling this equipment. These warnings/cautions should be carefully read and understood before proceeding. Failure to observe these precautions may result in serious injury to personnel performing the work and/or bystanders. The key warnings for this equipment are as follows:

Electrical - The electrical equipment described in this section operates at voltages and currents that are extremely dangerous to life. Personnel should closely observe all generally prescribed cautions and warnings before performing any work on the LRV.

Chemicals – Follow safety precautions for handling hazardous chemicals as provided by the manufacturer. The manufacturer's warnings should be closely heeded to avoid personal injury.

Location – Special caution should be taken when accessing or servicing equipment located on the roof and under the car.

Weight – To prevent possible personal injury when attempting to remove or install equipment on the vehicle, adequate support of a lifting device must be used to prevent the equipment from falling. Personnel's failure to heed these warnings could result in severe injury or death and or damage to the equipment.

Contact – Some components in this equipment attain temperatures that can cause severe burns. Closely follow all warnings and recommended procedures for handling these components.

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TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
LIST OF EFFECTIVE PAGES.....	i
SAFETY SUMMARY	iii
TABLE OF CONTENTS	v
LIST OF ILLUSTRATIONS	xxi
LIST OF TABLES.....	xxix
1.0 GENERAL DESCRIPTION	1-1
1.1 Introduction.....	1-1
1.2 Reference Data	1-2
1.3 List of Acronyms	1-2
2.0 FUNCTIONAL DESCRIPTION	2-1
2.1 Introduction.....	2-1
2.2 Equipment Locations.....	2-2
2.2.1 Cab Equipment	2-2
2.2.1.1 Cab Console	2-2
2.2.1.2 Console Panels.....	2-2
2.2.1.2.1 Console Panel 1	2-2
2.2.1.2.2 Console Panel 2	2-2
2.2.1.2.3 Console Panel 3	2-2
2.2.1.2.4 Console Panel 4	2-2
2.2.1.3 Operator's Seat.....	2-6
2.2.1.4 Trainer's Seat.....	2-7
2.2.1.5 Cab Light.....	2-7
2.2.1.6 Cab Console Light	2-7
2.2.1.7 Sun Shade	2-7
2.2.1.8 Windshield Wiper	2-7
2.2.1.9 Cab Heater.....	2-7
2.2.1.10 Defroster / Demister.....	2-7
2.2.1.11 Heater / Defroster Panel	2-8
2.2.1.12 Front Destination Sign	2-8
2.2.1.13 Coupler Loop Switch.....	2-8
2.2.1.14 Foot Rest	2-8
2.2.1.15 Foot Switch	2-8
2.2.1.16 Arm Rest	2-8
2.2.1.17 Radio Power Supply	2-9
2.2.1.18 Cab Speakers	2-9
2.2.1.19 Upper Control Panel	2-9
2.2.1.20 Control and Relay Panels	2-9
2.2.1.20.1 ACP1A / ACP1B Panels	2-9
2.2.1.20.2 CRP1A / CRP1B Panels	2-9
2.2.1.20.3 CRP2A / CRP2B Panels	2-10
2.2.1.20.4 CRP3A / CRP3B Panels	2-10
2.2.1.20.5 CRP4A / CRP4B Panels	2-10
2.2.1.20.6 CRP5A / CRP5B Panels	2-10
2.2.1.20.7 CRP6A / CRP6B Panels	2-10
2.2.1.20.8 CRP7A / CRP7B Panels	2-10

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
2.2.1.20.9 CRP8A Panel.....	2-10
2.2.1.20.10 Electronic Control Unit (ECU)	2-10
2.2.1.20.11 Event Recorder.....	2-11
2.2.1.20.12 TCN Controller.....	2-11
2.2.1.20.13 Hour Meter / Odometer Panel.....	2-11
2.2.1.20.14 Trainline Interface Module	2-11
2.2.1.20.15 Communication Control Unit (CCU)	2-11
2.2.1.20.16 Monitoring and Diagnostic System (MDS) Control Unit.....	2-11
2.2.1.20.17 ATC Enclosure.....	2-11
2.2.1.21 Bypass Panel.....	2-11
2.2.1.22 Circuit Breaker Panel A and B	2-12
2.2.1.23 Fire Extinguisher	2-12
2.2.1.24 Convenience Outlet	2-12
2.2.1.25 Cab Camera.....	2-12
2.2.1.26 Forward View Camera	2-12
2.2.1.27 Rear View Monitors.....	2-12
2.2.1.28 Local Bus Contactor.....	2-12
2.2.1.29 Remote I/O.....	2-12
2.2.1.30 Ethernet Switch.....	2-12
2.2.1.31 Ethernet Switch (Camera).....	2-13
2.2.1.32 Ethernet Switch (Wireless).....	2-13
2.2.1.33 Track Brake Panel	2-13
2.2.1.34 12Vdc Power Supply.....	2-13
2.2.1.35 Wayside Worker Alert System (WWAS) Module	2-13
2.2.1.36 Master Controller	2-13
2.2.1.36.1 Master Controller Operation.....	2-13
2.2.1.36.2 Master Controller Handle Positions and Modes.....	2-15
2.2.1.37 DC / DC Converter.....	2-18
2.2.1.38 HSC-V Control Panel.....	2-18
2.2.1.39 Washer Reservoir	2-18
2.2.1.40 Horn Controller Panel	2-18
2.2.2 Exterior Equipment	2-18
2.2.2.1 Exterior Speaker	2-18
2.2.2.2 Exterior Mirror	2-18
2.2.2.3 Skirts	2-18
2.2.2.4 Windows	2-21
2.2.2.4.1 Windshield	2-21
2.2.2.4.2 Bodyside Window #2 (Gasket Mounted).....	2-21
2.2.2.4.3 Bodyside Window w/ Destination Sign (Gasket Mounted)	2-21
2.2.2.4.4 Door Window (Gasket Mounted).....	2-22
2.2.2.4.5 Bodyside Window #1 (Gasket Mounted).....	2-22
2.2.2.4.6 Cab Door Window (Framed)	2-22
2.2.2.4.7 Hinged Window RH and LH (Framed)	2-22
2.2.2.5 Rear View Camera.....	2-22
2.2.3 Interior Equipment.....	2-23
2.2.3.1 Stanchions and Grab Rails	2-23
2.2.3.2 Passenger Door Pushbutton.....	2-23
2.2.3.3 Windscreens	2-23
2.2.3.4 Ceiling Panels	2-23

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
2.2.3.5 Return Air Grille.....	2-23
2.2.3.6 Ceiling Lights	2-37
2.2.3.7 Door Indicators.....	2-37
2.2.3.7.1 Door Out Of Service Sign	2-37
2.2.3.7.2 Door Closing Chime.....	2-37
2.2.3.7.3 Door Closing Light	2-37
2.2.3.8 Automatic Passenger Counter (APC) Sensor.....	2-37
2.2.3.9 Interior View Camera	2-37
2.2.3.10 Interior Speaker	2-38
2.2.3.11 Passenger Emergency Intercom	2-38
2.2.3.12 Manual Door Release Handle.....	2-38
2.2.3.13 Interior Passenger Information Sign	2-38
2.2.3.14 Side Destination Sign.....	2-38
2.2.3.15 Floor Panels.....	2-38
2.2.3.16 APC Analyzer.....	2-39
2.2.4 Seats.....	2-39
2.2.4.1 2P LH & RH 36" Cantilever w/Grab Bar, No Stanchion	2-39
2.2.4.2 2P LH & RH 36" Cantilever w/Grab Bar, w/Stanchion	2-39
2.2.4.3 2P LH & RH 34" Cantilever Door Pocket w/Grab Bar, w/Stanchion	2-39
2.2.4.4 2P Longitudinal Flip Seat.....	2-40
2.2.4.5 2P LH & RH Cantilever, Reserved.....	2-40
2.2.4.6 2P LH & RH Sandbox Seat.....	2-40
2.2.5 Electric Locker Equipment	2-45
2.2.5.1 Auxiliary Circuit Breaker.....	2-45
2.2.5.2 AC Circuit Breaker Panel	2-45
2.2.5.3 LVDC Terminal Block.....	2-49
2.2.5.4 High Speed Circuit Breaker Control Panel.....	2-49
2.2.5.5 APC COPILOTpc.....	2-49
2.2.5.6 Network Video Recorder (NVR).....	2-49
2.2.5.7 Electronic Control Unit, Center Truck	2-50
2.2.5.8 Terminal Board	2-50
2.2.5.9 Ethernet Switch.....	2-50
2.2.5.10 Track Brake Contactor Panel.....	2-50
2.2.5.11 Convenience Outlet	2-50
2.2.5.12 Electronic Control Unit Pull Down Resistor	2-50
2.2.5.13 ARP1B Relay Panel.....	2-50
2.2.5.14 Pantograph Manual Crank.....	2-50
2.2.5.15 Emergency Ladder.....	2-50
2.2.5.16 Emergency Tool Enclosure.....	2-50
2.2.6 Undercar Mounted Equipment.....	2-51
2.2.6.1 Coupler	2-51
2.2.6.2 TWC Antenna	2-51
2.2.6.3 Sanding Device.....	2-51
2.2.6.4 Main Reservoir.....	2-51
2.2.6.5 Brake Supply Reservoir	2-51
2.2.6.6 Air Compressor	2-51
2.2.6.7 Brake Control Unit (Motor Truck)	2-51
2.2.6.8 Brake Control Unit (Center Truck)	2-57
2.2.6.9 Auxiliary Power Supply	2-57

TABLE OF CONTENTS

Chapter/Para		Page
2.2.6.10	Battery / Battery Circuit Breaker Box	2-57
2.2.6.11	Propulsion Inverter.....	2-57
2.2.6.12	Line Reactor.....	2-57
2.2.6.13	Knife Switch	2-57
2.2.6.14	Horn	2-57
2.2.7	Roof Mounted Equipment	2-58
2.2.7.1	High Speed Circuit Breaker (HSCB).....	2-58
2.2.7.2	Lightning Arrestor.....	2-58
2.2.7.3	Brake Resistor	2-58
2.2.7.4	Pantograph	2-58
2.2.7.5	Auxiliary Fuse Box	2-58
2.2.7.6	Heating, Ventilation and Air Conditioning (HVAC) Unit.....	2-58
2.2.7.7	Roof Shrouds	2-61
2.2.7.8	Silent Alarm.....	2-61
2.2.7.9	Radio Antenna	2-61
2.2.7.10	GPS Antenna.....	2-61
2.2.7.11	WLAN Antenna	2-61
2.2.7.12	Wayside Worker Alert System (WWAS) Antenna.....	2-61
2.2.7.13	Roof Mounted Camera	2-62
2.2.8	Articulation Section	2-62
2.2.8.1	Ceiling Panels	2-62
2.2.8.2	Side Panels.....	2-62
2.2.8.3	External Panels.....	2-62
2.2.8.4	Turntables	2-62
2.2.8.5	Rub Plates	2-62
2.2.8.6	Bellows Assembly	2-62
2.2.8.7	Articulation Middle Frame and Pivot Bearing Assembly	2-64
2.2.8.8	Articulation Shaft and Rubber Bearing.....	2-64
2.2.8.9	Balancing Device Assembly.....	2-64
2.2.8.10	Articulation Wiring	2-64
3.0	SPECIAL TOOLS AND MATERIALS	3-1
3.1	Introduction.....	3-1
3.2	Special Tools	3-1
4.0	SCHEDULED MAINTENANCE TASKS.....	4-1
4.1	Introduction.....	4-1
4.2	Scheduled Maintenance Index	4-1
5.0	PREVENTATIVE MAINTENANCE.....	5-1
5.1	Introduction.....	5-1
5.2	Safety Information	5-1
5.3	Preventative Maintenance Procedures	5-7
5.3.1	Cab Equipment	5-7
5.3.1.1	Cab Console	5-7
5.3.1.2	Console Panels.....	5-7
5.3.1.2.1	Console Panel 1	5-7
5.3.1.2.2	Console Panel 2	5-7
5.3.1.2.3	Console Panel 3	5-8
5.3.1.2.4	Console Panel 4	5-8

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
5.3.1.3 Operator's Seat.....	5-8
5.3.1.3.1 Test Operation of Seat Controls	5-8
5.3.1.3.2 Inspect Seat Cushions	5-9
5.3.1.3.3 Clean Seat Assembly.....	5-9
5.3.1.3.4 Inspect Fasteners	5-9
5.3.1.4 Trainer's Seat.....	5-9
5.3.1.5 Cab Light.....	5-9
5.3.1.6 Cab Console Light	5-9
5.3.1.7 Sun Shade	5-10
5.3.1.7.1 Cab Side Window Shades	5-10
5.3.1.7.2 Windshield Shade	5-12
5.3.1.8 Windshield Wiper	5-15
5.3.1.9 Cab Heater.....	5-17
5.3.1.10 Defroster / Demister.....	5-17
5.3.1.11 Heater / Defroster Panel	5-17
5.3.1.12 Front Destination Sign	5-17
5.3.1.13 Coupler Loop Switch.....	5-18
5.3.1.14 Foot Rest	5-18
5.3.1.15 Foot Switch	5-18
5.3.1.16 Arm Rest	5-18
5.3.1.17 Radio Power Supply	5-19
5.3.1.18 Cab Speakers	5-19
5.3.1.19 Upper Control Panel	5-19
5.3.1.20 Control and Relay Panels	5-19
5.3.1.20.1 ACP1A / ACP1B Panels	5-19
5.3.1.20.2 CRP1A / CRP1B Panels	5-19
5.3.1.20.3 CRP2A / CRP2B Panels	5-19
5.3.1.20.4 CRP3A / CRP3B Panels	5-19
5.3.1.20.5 CRP4A / CRP4B Panels	5-19
5.3.1.20.6 CRP5A / CRP5B Panels	5-19
5.3.1.20.7 CRP6A / CRP6B Panels	5-19
5.3.1.20.8 CRP7A / CRP7B Panels	5-20
5.3.1.20.9 CRP8A Panel.....	5-20
5.3.1.20.10 Electronic Control Unit (ECU)	5-20
5.3.1.20.11 Event Recorder.....	5-20
5.3.1.20.12 TCN Controller	5-20
5.3.1.20.13 Hour Meter / Odometer Panel.....	5-20
5.3.1.20.14 Trainline Interface Module	5-20
5.3.1.20.15 Communication Control Unit (CCU)	5-20
5.3.1.20.16 Monitoring and Diagnostic System (MDS) Control Unit.....	5-20
5.3.1.20.17 ATC Enclosure.....	5-20
5.3.1.21 Bypass Panel	5-21
5.3.1.22 Circuit Breaker Panel A and B	5-21
5.3.1.23 Fire Extinguisher	5-21
5.3.1.24 Convenience Outlet	5-21
5.3.1.25 Cab Camera.....	5-22
5.3.1.26 Forward View Camera	5-22
5.3.1.27 Rear View Monitors.....	5-22
5.3.1.28 Local Bus Contactor.....	5-22

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
5.3.1.29 Remote I/O.....	5-22
5.3.1.30 Ethernet Switch.....	5-22
5.3.1.31 Ethernet Switch (Camera).....	5-23
5.3.1.32 Ethernet Switch (Wireless).....	5-23
5.3.1.33 Track Brake Panel	5-23
5.3.1.34 12Vdc Power Supply.....	5-24
5.3.1.35 Wayside Worker Alert System (WWAS) Module	5-24
5.3.1.36 Master Controller	5-25
5.3.1.36.1 Clean All Parts with Dry Compressed Air.....	5-26
5.3.1.36.2 Visually Check Mechanical Connections and Detent Disk	5-26
5.3.1.36.3 Replace Snap-Action Switches Type S826a and S826c.....	5-26
5.3.1.36.4 Exchange Wear and Tear Parts and Detent Mechanism	5-27
5.3.1.37 DC / DC Converter.....	5-28
5.3.1.38 HSC-V Control Panel	5-28
5.3.1.39 Washer Reservoir	5-28
5.3.1.40 Horn Controller Panel	5-29
5.3.2 Exterior Body Equipment	5-29
5.3.2.1 Exterior Components	5-29
5.3.2.2 Exterior Speaker	5-30
5.3.2.3 Exterior Mirror	5-30
5.3.2.4 Skirts	5-32
5.3.2.5 Windows	5-32
5.3.2.5.1 Inspecting Laminates	5-32
5.3.2.5.2 Inspecting Assemblies	5-32
5.3.2.5.3 Inspecting Gaskets	5-32
5.3.2.6 Rear View Camera.....	5-32
5.3.3 Interior Equipment.....	5-33
5.3.3.1 Stanchions and Grab Rails	5-33
5.3.3.2 Windscreens	5-33
5.3.3.3 Ceiling Panels	5-33
5.3.3.4 Interior Speakers.....	5-33
5.3.3.5 Interior View Camera	5-33
5.3.3.6 Passenger Emergency Intercom	5-33
5.3.3.7 Side Destination Sign.....	5-33
5.3.3.8 Floor Panels	5-34
5.3.3.8.1 Cleaning Restrictions	5-34
5.3.3.8.2 Abrastop™ Cleaning Procedure	5-34
5.3.3.8.3 Graffiti Cleaning Procedure.....	5-35
5.3.3.9 APC Analyzer.....	5-35
5.3.3.10 Automatic Passenger Counter (APC) Sensor.....	5-36
5.3.3.10.1 Vehicle Number Assignment.....	5-36
5.3.3.10.2 COPilotpc Battery	5-36
5.3.3.11 Door Control Unit	5-37
5.3.4 Seats.....	5-38
5.3.4.1 General Cleaning	5-38
5.3.4.2 Seat Cushion Inspection	5-38
5.3.5 Electric Locker Equipment	5-38
5.3.5.1 Auxiliary Circuit Breaker.....	5-38
5.3.5.2 AC Circuit Breaker Panel	5-39

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
5.3.5.3 LVDC Terminal Block.....	5-39
5.3.5.4 High Speed Circuit Breaker Control Panel.....	5-39
5.3.5.5 APC COPILOTpc.....	5-39
5.3.5.6 Network Video Recorder (NVR).....	5-39
5.3.5.7 Electronic Control Unit, Center Truck	5-39
5.3.5.8 Terminal Board	5-39
5.3.5.9 Ethernet Switch.....	5-40
5.3.5.10 Track Brake Contactor Panel.....	5-40
5.3.5.11 Convenience Outlet	5-40
5.3.5.12 Electronic Control Unit Pull Down Resistor.....	5-40
5.3.5.13 ARP1B Relay Panel.....	5-40
5.3.6 Undercar Mounted Equipment.....	5-41
5.3.6.1 Coupler	5-41
5.3.6.2 TWC Antenna	5-42
5.3.6.3 Sanding Device.....	5-42
5.3.6.4 Main Reservoir.....	5-42
5.3.6.5 Brake Supply Reservoir	5-42
5.3.6.6 Air Compressor.....	5-42
5.3.6.7 Brake Control Unit (Motor Truck)	5-42
5.3.6.8 Brake Control Unit (Center Truck)	5-42
5.3.6.9 Auxiliary Power Supply	5-42
5.3.6.10 Battery / Battery Circuit Breaker Box	5-42
5.3.6.11 Propulsion Inverter.....	5-42
5.3.6.12 Line Reactor.....	5-43
5.3.6.13 Knife Switch	5-43
5.3.6.14 Horn	5-43
5.3.7 Roof Mounted Equipment	5-43
5.3.7.1 High Speed Circuit Breaker (HSCB)	5-43
5.3.7.2 Lightning Arrestor.....	5-43
5.3.7.3 Brake Resistor	5-43
5.3.7.4 Pantograph	5-43
5.3.7.5 Auxiliary Fuse Box	5-43
5.3.7.6 Heating, Ventilation and Air Conditioning (HVAC) Unit.....	5-43
5.3.7.7 Roof Shrouds	5-43
5.3.7.8 Silent Alarm.....	5-44
5.3.7.9 Radio Antenna	5-44
5.3.7.10 GPS Antenna	5-44
5.3.7.11 WLAN Antenna	5-44
5.3.7.12 Wayside Worker Alert System (WWAS) Antenna.....	5-44
5.3.7.13 Roof Mounted Camera	5-44
5.3.8 Articulation Section	5-44
5.3.8.1 Ceiling Panels	5-44
5.3.8.2 Side Panels.....	5-44
5.3.8.3 External Panels.....	5-45
5.3.8.4 Turntables	5-45
5.3.8.5 Rub Plates	5-45
5.3.8.6 Bellows Assembly	5-45

TABLE OF CONTENTS

Chapter/Para		Page
5.3.8.7	Articulation Middle Frame and Pivot Bearing Assembly	5-45
5.3.8.7.1	Articulation Middle Frame	5-45
5.3.8.7.2	Pivot Bearing Assembly	5-45
5.3.8.8	Articulation Shaft and Rubber Bearing.....	5-46
5.3.8.9	Balancing Device	5-46
5.3.8.10	Articulation Wiring	5-46
6.0	LUBRICATION.....	6-1
6.1	Introduction.....	6-1
6.1.1	Lubrication of Operator's Seat	6-1
6.1.2	Pantograph	6-1
6.1.3	Master Controller	6-1
6.1.3.1	Apply Key Lock Spray to the Key Lock Cylinder of the Transfer Switch (TS)	6-4
6.1.3.2	Lubricate Moving Parts	6-4
6.1.4	Windows	6-5
6.1.4.1	Hinged Window.....	6-5
6.1.4.2	Cab Door.....	6-5
7.0	CORRECTIVE MAINTENANCE.....	7-1
7.1	Introduction.....	7-1
7.2	Safety Precautions	7-1
7.3	Corrective Maintenance Standard Shop Practices	7-4
7.3.1	Mounting Hardware.....	7-4
7.3.2	Torquing Practices and Procedures.....	7-4
7.3.3	Torquing Methods	7-4
7.3.4	General Guide for Maximum Torque Values	7-8
7.3.5	Software Programming	7-12
7.4	Removal.....	7-13
7.4.1	Cab Equipment	7-13
7.4.1.1	Cab Console	7-15
7.4.1.2	Console Panels.....	7-17
7.4.1.2.1	Console Panel 1	7-17
7.4.1.2.2	Console Panel 2	7-18
7.4.1.2.3	Console Panel 3	7-19
7.4.1.2.4	Console Panel 4	7-20
7.4.1.3	Operator's Seat.....	7-21
7.4.1.4	Trainer's Seat.....	7-21
7.4.1.5	Cab Light.....	7-24
7.4.1.6	Cab Console Light	7-24
7.4.1.7	Sun Shades	7-26
7.4.1.7.1	Front Sun Shade.....	7-26
7.4.1.7.2	Side Sun Shade	7-29
7.4.1.8	Windshield Wiper	7-29
7.4.1.9	Cab Heater.....	7-29
7.4.1.10	Defroster / Demister.....	7-32
7.4.1.11	Defroster Ducting	7-32
7.4.1.12	Heater / Defroster Panel	7-37
7.4.1.13	Front Destination Sign	7-37

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
7.4.1.14 Coupler Loop Switch.....	7-40
7.4.1.15 Foot Rest	7-40
7.4.1.16 Foot Switch	7-40
7.4.1.17 Arm Rest.....	7-44
7.4.1.18 Radio Power Supply	7-45
7.4.1.19 Cab Speakers	7-46
7.4.1.20 Upper Control Panel	7-48
7.4.1.21 Control and Relay Panels	7-48
7.4.1.21.1 ACP1A Panel.....	7-48
7.4.1.21.2 Electronic Control Unit (ECU), A-Unit	7-51
7.4.1.21.3 Communication Control Unit (CCU)	7-51
7.4.1.21.4 TCN Controller (A-Unit).....	7-54
7.4.1.21.5 Event Recorder.....	7-54
7.4.1.21.6 CRP6A Panel.....	7-57
7.4.1.21.7 CRP7A Panel.....	7-57
7.4.1.21.8 CRP8A Panel.....	7-60
7.4.1.21.9 Trainline Interface Module	7-60
7.4.1.21.10 CRP2A and CRP2B Panel.....	7-63
7.4.1.21.11 CRP4A and CRP4B Panel.....	7-63
7.4.1.21.12 CRP1A and CRP1B Panel.....	7-66
7.4.1.21.13 CRP3A and CRP3B Panel.....	7-66
7.4.1.21.14 CRP5A and CRP5B Panel.....	7-69
7.4.1.21.15 ACP1B Panel.....	7-69
7.4.1.21.16 ATC Enclosure.....	7-72
7.4.1.21.17 Hour Meter / Odometer Panel.....	7-72
7.4.1.21.18 Electronic Control Unit (ECU), B-Unit	7-75
7.4.1.21.19 Monitoring and Diagnostic System (MDS) Control Unit	7-75
7.4.1.21.20 TCN Controller (B-Unit).....	7-78
7.4.1.21.21 CRP6B Panel.....	7-78
7.4.1.21.22 CRP7B Panel.....	7-81
7.4.1.22 Bypass Panel	7-81
7.4.1.23 Circuit Breaker Panel A and B	7-84
7.4.1.24 Fire Extinguisher	7-84
7.4.1.25 Convenience Outlet	7-87
7.4.1.26 Cab Camera.....	7-87
7.4.1.27 Forward View Camera	7-90
7.4.1.28 Rear View Monitors.....	7-90
7.4.1.29 Local Bus Contactor.....	7-93
7.4.1.30 Remote I/O.....	7-93
7.4.1.31 Ethernet Switch.....	7-96
7.4.1.32 Ethernet Switch (Camera).....	7-96
7.4.1.33 Ethernet Switch (Wireless).....	7-99
7.4.1.34 Track Brake Panel	7-99
7.4.1.35 12Vdc Power Supply.....	7-102
7.4.1.36 Wayside Worker Alert System (WWAS) Module	7-102
7.4.1.37 Master Controller	7-105
7.4.1.38 DC / DC Converter.....	7-106
7.4.1.39 HSC-V Control Panel.....	7-109

TABLE OF CONTENTS

<u>Chapter/Para</u>		<u>Page</u>
7.4.1.40	Washer Reservoir	7-109
7.4.1.41	Horn Controller Panel	7-113
7.4.2	Exterior Body Equipment	7-113
7.4.2.1	Exterior Speaker	7-115
7.4.2.2	Exterior Mirror	7-115
7.4.2.3	Skirts	7-118
7.4.2.3.1	Hinged Skirts	7-118
7.4.2.3.2	Stationary Skirts.....	7-118
7.4.2.4	Windows	7-118
7.4.2.4.1	Bonded Windows (Windshield)	7-118
7.4.2.4.2	Gasket Mounted Windows	7-127
7.4.2.4.3	Framed Windows	7-128
7.4.2.4.3.1	Cab Door Window.....	7-128
7.4.2.4.3.2	Hinged Window RH and LH.....	7-128
7.4.2.5	Rear View Camera.....	7-130
7.4.3	Interior Equipment.....	7-130
7.4.3.1	Stanchions and Grab Rails	7-132
7.4.3.2	Passenger Door Pushbutton.....	7-132
7.4.3.3	Windscreens	7-137
7.4.3.3.1	End Windscreen	7-137
7.4.3.3.2	Center Windscreen	7-137
7.4.3.4	Ceiling Panels	7-137
7.4.3.4.1	Center and End Ceiling Panel.....	7-137
7.4.3.4.2	Side Access Cover.....	7-137
7.4.3.5	Return Air Grille.....	7-143
7.4.3.6	Ceiling Lights	7-143
7.4.3.7	Door Indicators.....	7-147
7.4.3.7.1	Door Out of Service Sign	7-147
7.4.3.7.2	Door Closing Chime.....	7-147
7.4.3.7.3	Door Closing Light	7-147
7.4.3.8	Automatic Passenger Counter (APC) Sensor.....	7-148
7.4.3.9	Interior View Camera	7-148
7.4.3.10	Interior Speaker	7-149
7.4.3.11	Passenger Emergency Intercom	7-149
7.4.3.12	Manual Door Release Handle.....	7-151
7.4.3.13	Interior Passenger Information Sign	7-151
7.4.3.14	Side Destination Sign.....	7-154
7.4.3.15	Floor Panels.....	7-154
7.4.3.16	APC Analyzer.....	7-157
7.4.4	Seats	7-157
7.4.4.1	2P LH & RH 36" Cantilever w/Grab Bar, No Stanchion	7-159
7.4.4.2	2P LH & RH 36" Cantilever w/Grab Bar, w/Stanchion	7-159
7.4.4.3	2P LH & RH 34" Cantilever Door Pocket w/Grab Bar, w/Stanchion	7-162
7.4.4.4	2P Longitudinal Flip Seat	7-162
7.4.4.4.1	Bottom Seat Cushion Removal.....	7-167
7.4.4.4.2	Seat Back Cushion Removal	7-167
7.4.4.5	2P LH & RH Cantilever, Reserved.....	7-167

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
7.4.4.6 2P LH & RH Sandbox Seat.....	7-169
7.4.4.6.1 Cushion Removal.....	7-169
7.4.5 Electric Locker Equipment	7-171
7.4.5.1 Auxiliary Circuit Breaker.....	7-171
7.4.5.2 AC Circuit Breaker Panel	7-172
7.4.5.3 LVDC Terminal Block.....	7-172
7.4.5.4 High Speed Circuit Breaker Control Panel.....	7-175
7.4.5.5 APC COPILOTpc.....	7-175
7.4.5.6 Network Video Recorder (NVR).....	7-176
7.4.5.7 Electronic Control Unit, Center Truck	7-176
7.4.5.8 Terminal Board	7-177
7.4.5.9 Ethernet Switch.....	7-177
7.4.5.10 Track Brake Contactor Panel.....	7-179
7.4.5.11 Convenience Outlet	7-179
7.4.5.12 Electronic Control Unit Pull Down Resistor.....	7-180
7.4.5.13 ARP1B Relay Panel.....	7-180
7.4.6 Undercar Mounted Equipment.....	7-181
7.4.6.1 Coupler	7-182
7.4.6.2 TWC Antenna	7-185
7.4.6.3 Sanding Device.....	7-187
7.4.6.4 Main Reservoir.....	7-191
7.4.6.5 Brake Supply Reservoir	7-193
7.4.6.6 Air Compressor	7-193
7.4.6.7 Brake Control Unit (Motor Truck)	7-195
7.4.6.8 Brake Control Unit (Center Truck)	7-199
7.4.6.9 Auxiliary Power Supply	7-202
7.4.6.10 Battery Box	7-204
7.4.6.11 Battery Circuit Breaker Box.....	7-204
7.4.6.12 Propulsion Inverter.....	7-209
7.4.6.13 Line Reactor.....	7-213
7.4.6.14 Knife Switch	7-213
7.4.6.15 Horn	7-216
7.4.7 Roof Mounted Equipment	7-216
7.4.7.1 High Speed Circuit Breaker (HSCB)	7-218
7.4.7.2 Lightning Arrestor.....	7-218
7.4.7.3 Brake Resistor	7-221
7.4.7.4 Pantograph	7-221
7.4.7.5 Auxiliary Fuse Box	7-225
7.4.7.6 Heating, Ventilation and Air Conditioning (HVAC) Unit.....	7-225
7.4.7.7 Roof Shrouds	7-227
7.4.7.7.1 Roof Shroud Group A	7-227
7.4.7.7.2 Roof Shroud Group B	7-227
7.4.7.7.3 Roof Shroud Group C	7-227
7.4.7.8 Silent Alarm.....	7-227
7.4.7.9 Radio Antenna	7-237
7.4.7.10 GPS Antenna.....	7-237
7.4.7.11 WLAN Antenna	7-240
7.4.7.12 Wayside Worker Alert System (WWAS) Antenna.....	7-240
7.4.7.13 Roof Mounted Camera	7-243

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
7.4.8 Articulation Section	7-245
7.4.8.1 Ceiling Panels	7-245
7.4.8.2 Side Panels.....	7-246
7.4.8.3 External Panels.....	7-248
7.4.8.4 Turntables	7-248
7.4.8.5 Rub Plates	7-250
7.4.8.6 Bellows Assembly	7-250
7.4.8.7 Articulation Middle Frame and Pivot Bearing Assembly	7-251
7.4.8.8 Articulation Shaft and Rubber Bearings.....	7-251
7.4.8.9 Balancing Device	7-253
7.4.8.10 Articulation Wiring	7-253
7.5 Installation.....	7-256
7.5.1 Cab Equipment	7-256
7.5.1.1 Cab Console	7-256
7.5.1.2 Console Panels.....	7-257
7.5.1.2.1 Console Panel 1	7-257
7.5.1.2.2 Console Panel 2	7-257
7.5.1.2.3 Console Panel 3	7-257
7.5.1.2.4 Console Panel 4	7-257
7.5.1.3 Operator's Seat.....	7-257
7.5.1.4 Trainer's Seat.....	7-257
7.5.1.5 Cab Light.....	7-258
7.5.1.6 Cab Console Light	7-258
7.5.1.7 Sun Shades	7-258
7.5.1.7.1 Front Sun Shade.....	7-258
7.5.1.7.2 Side Sun Shade	7-258
7.5.1.8 Windshield Wiper	7-259
7.5.1.9 Cab Heater.....	7-259
7.5.1.10 Defroster / Demister.....	7-260
7.5.1.11 Defroster Ducting	7-260
7.5.1.12 Heater / Defroster Panel	7-262
7.5.1.13 Front Destination Sign	7-263
7.5.1.14 Coupler Loop Switch.....	7-263
7.5.1.15 Foot Rest	7-263
7.5.1.16 Foot Switch	7-263
7.5.1.17 Arm Rest	7-264
7.5.1.18 Radio Power Supply	7-264
7.5.1.19 Cab Speakers	7-264
7.5.1.20 Upper Control Panel	7-265
7.5.1.21 Control and Relay Panels	7-265
7.5.1.21.1 ACP1A Panel.....	7-265
7.5.1.21.2 Electronic Control Unit (ECU)	7-265
7.5.1.21.3 Communication Control Unit (CCU).....	7-266
7.5.1.21.4 TCN Controller (A-Unit).....	7-266
7.5.1.21.5 Event Recorder	7-266
7.5.1.21.6 CRP6A Panel.....	7-267
7.5.1.21.7 CRP7A Panel.....	7-267
7.5.1.21.8 CRP8A Panel.....	7-267
7.5.1.21.9 Trainline Interface Module	7-268

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
7.5.1.21.10 CRP2A and CRP2B Panel.....	7-268
7.5.1.21.11 CRP4A and CRP4B Panel.....	7-268
7.5.1.21.12 CRP1A and CRP1B Panel.....	7-269
7.5.1.21.13 CRP3A and CRP3B Panel.....	7-269
7.5.1.21.14 CRP5A and CRP5B Panel.....	7-270
7.5.1.21.15 ACP1B Panel.....	7-270
7.5.1.21.16 ATC Enclosure.....	7-270
7.5.1.21.17 Hour Meter / Odometer Panel.....	7-271
7.5.1.21.18 Electronic Control Unit (ECU)	7-271
7.5.1.21.19 Monitoring and Diagnostic System (MDS) Control Unit	7-271
7.5.1.21.20 TCN Controller (B-Unit).....	7-272
7.5.1.21.21 CRP6B Panel.....	7-272
7.5.1.21.22 CRP7B Panel.....	7-272
7.5.1.22 Bypass Panel.....	7-273
7.5.1.23 Circuit Breaker Panel A and B	7-273
7.5.1.24 Fire Extinguisher	7-274
7.5.1.25 Convenience Outlet	7-274
7.5.1.26 Cab Camera.....	7-274
7.5.1.27 Forward View Camera	7-275
7.5.1.28 Rear View Monitors.....	7-275
7.5.1.29 Local Bus Contactor.....	7-277
7.5.1.30 Remote I/O.....	7-277
7.5.1.31 Ethernet Switch.....	7-277
7.5.1.32 Ethernet Switch (Camera).....	7-278
7.5.1.33 Ethernet Switch (Wireless).....	7-278
7.5.1.34 Track Brake Panel	7-278
7.5.1.35 12Vdc Power Supply.....	7-279
7.5.1.36 Wayside Worker Alert System (WWAS) Module	7-279
7.5.1.37 Master Controller	7-279
7.5.1.38 DC / DC Converter.....	7-280
7.5.1.39 HSC-V Control Panel.....	7-280
7.5.1.40 Washer Reservoir	7-280
7.5.1.41 Horn Controller Panel	7-281
7.5.2 Exterior Body Equipment	7-281
7.5.2.1 Exterior Speaker	7-281
7.5.2.2 Exterior Mirror	7-282
7.5.2.3 Skirts	7-283
7.5.2.3.1 Hinged Skirts	7-283
7.5.2.3.2 Stationary Skirts.....	7-283
7.5.2.4 Windows	7-284
7.5.2.4.1 Bonded Windows (Windshield)	7-284
7.5.2.4.2 Gasket Mounted Windows	7-287
7.5.2.4.3 Framed Windows	7-287
7.5.2.4.3.1 Cab Door Window.....	7-287
7.5.2.4.3.2 Hinged Window RH and LH.....	7-288
7.5.2.5 Rear View Camera.....	7-288
7.5.3 Interior Equipment.....	7-289
7.5.3.1 Stanchions and Grab Rails	7-289
7.5.3.2 Passenger Door Pushbutton.....	7-290

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
7.5.3.3 Windscreens	7-290
7.5.3.3.1 End Windscreen	7-290
7.5.3.3.2 Center Windscreen	7-290
7.5.3.4 Ceiling Panels	7-291
7.5.3.4.1 Center and End Ceiling Panel.....	7-291
7.5.3.4.2 Side Access Cover	7-291
7.5.3.5 Return Air Grille.....	7-291
7.5.3.6 Ceiling Lights	7-292
7.5.3.7 Door Indicators.....	7-292
7.5.3.7.1 Door Out of Service Sign	7-292
7.5.3.7.2 Door Closing Chime.....	7-293
7.5.3.7.3 Door Closing Light	7-293
7.5.3.8 Automatic Passenger Counter (APC) Sensor.....	7-293
7.5.3.8.1 Automatic Passenger Counter (APC) Sensor Replacement	7-294
7.5.3.8.2 Automatic Passenger Counter (APC) Sensor Programming.....	7-294
7.5.3.8.3 Automatic Passenger Counter (APC) Sensor Verification	7-299
7.5.3.9 Interior View Camera	7-304
7.5.3.10 Interior Speaker	7-304
7.5.3.11 Passenger Emergency Intercom	7-305
7.5.3.12 Manual Door Release Handle.....	7-305
7.5.3.13 Interior Passenger Information Sign	7-305
7.5.3.14 Side Destination Sign.....	7-306
7.5.3.15 Floor Panels.....	7-307
7.5.3.16 APC Analyzer.....	7-308
7.5.3.16.1 Analyzer Firmware	7-308
7.5.4 Seats.....	7-308
7.5.4.1 2P LH & RH 36" Cantilever w/Grab Bar, No Stanchion	7-308
7.5.4.2 2P LH & RH 36" Cantilever w/Grab Bar, w/Stanchion	7-314
7.5.4.3 2P LH & RH 34" Cantilever Door Pocket w/Grab Bar, w/Stanchion	7-315
7.5.4.4 2P Longitudinal Flip Seat	7-316
7.5.4.4.1 Bottom Seat Cushion Assembly	7-316
7.5.4.4.2 Seat Back Cushion Assembly.....	7-316
7.5.4.5 2P LH & RH Cantilever, Reserved.....	7-316
7.5.4.6 2P LH & RH Sandbox Seat.....	7-317
7.5.5 Electric Locker Equipment	7-318
7.5.5.1 Auxiliary Circuit Breaker.....	7-318
7.5.5.2 AC Circuit Breaker Panel	7-318
7.5.5.3 LVDC Terminal Block.....	7-319
7.5.5.4 High Speed Circuit Breaker Control Panel.....	7-319
7.5.5.5 APC COPILOTpc.....	7-319
7.5.5.5.1 CoPilotPC Rack Commissioning	7-319
7.5.5.5.2 CoPilot PC Software Upload.....	7-320
7.5.5.6 Network Video Recorder (NVR).....	7-321
7.5.5.7 Electronic Control Unit, Center Truck	7-321
7.5.5.8 Terminal Board	7-321
7.5.5.9 Ethernet Switch.....	7-322
7.5.5.10 Track Brake Contactor Panel.....	7-322

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
7.5.5.11 Convenience Outlet	7-322
7.5.5.12 Electronic Control Unit Pull Down Resistor.....	7-323
7.5.5.13 ARP1B Relay Panel.....	7-323
7.5.6 Undercar Mounted Equipment.....	7-323
7.5.6.1 Coupler	7-323
7.5.6.2 TWC Antenna	7-324
7.5.6.3 Sanding Device.....	7-324
7.5.6.4 Main Reservoir.....	7-325
7.5.6.5 Brake Supply Reservoir	7-325
7.5.6.6 Air Compressor.....	7-326
7.5.6.7 Brake Control Unit (Motor Truck)	7-326
7.5.6.8 Brake Control Unit (Center Truck)	7-327
7.5.6.9 Auxiliary Power Supply	7-327
7.5.6.10 Battery Box	7-327
7.5.6.11 Battery Circuit Breaker Box.....	7-328
7.5.6.12 Propulsion Inverter.....	7-329
7.5.6.13 Line Reactor.....	7-329
7.5.6.14 Knife Switch	7-330
7.5.6.15 Horn	7-330
7.5.7 Roof Mounted Equipment	7-330
7.5.7.1 High Speed Circuit Breaker (HSCB)	7-330
7.5.7.2 Lightning Arrestor.....	7-331
7.5.7.3 Brake Resistor	7-331
7.5.7.4 Pantograph	7-331
7.5.7.5 Auxiliary Fuse Box	7-332
7.5.7.6 Heating, Ventilation and Air Conditioning (HVAC) Unit.....	7-332
7.5.7.7 Roof Shroud Group A	7-332
7.5.7.8 Roof Shroud Group B	7-333
7.5.7.9 Roof Shroud Group C	7-333
7.5.7.10 Silent Alarm.....	7-333
7.5.7.11 Radio Antenna	7-334
7.5.7.12 GPS Antenna.....	7-334
7.5.7.13 WLAN Antenna	7-334
7.5.7.14 Wayside Worker Alert System (WWAS) Antenna.....	7-335
7.5.7.15 Roof Mounted Camera	7-335
7.5.8 Articulation Section	7-337
7.5.8.1 Ceiling Panels	7-337
7.5.8.2 Side Panels.....	7-337
7.5.8.3 External Panels.....	7-338
7.5.8.4 Turntables	7-338
7.5.8.5 Rub Plates	7-340
7.5.8.6 Bellows Assembly	7-340
7.5.8.6.1 Mounting the Folding Bellow.....	7-341
7.5.8.7 Articulation Middle Frame and Pivot Bearing Assembly	7-342
7.5.8.8 Articulation Shaft and Rubber Bearings.....	7-343
7.5.8.9 Balancing Device	7-343
7.5.8.10 Articulation Wiring	7-344

TABLE OF CONTENTS

<u>Chapter/Para</u>	<u>Page</u>
8.0 TROUBLESHOOTING	8-1
8.1 Introduction	8-1
8.2 Troubleshooting.....	8-1
8.3 APC Fault Messages.....	8-3
8.4 Touch-it Test Functions	8-10
8.5 Test Ride Software.....	8-12
8.5.1 Requirements	8-12
8.5.2 Software Requirements.....	8-12
8.5.3 Setup.....	8-13
8.5.4 Using the Program.....	8-15
INDEX.....	I-1
APPENDIX A - RWK-LAM-158 Rework for Articulation Turntable Paint	A-1
and Sealant	
APPENDIX B - Exterior Component Locations and Sealant Defects	B-1

LIST OF ILLUSTRATIONS

Figure	Title	Page
2-1:	Cab Equipment Locations (3 Sheets).....	2-3
2-2:	Operator's Seat Adjustments	2-6
2-3:	Exterior Equipment Location	2-19/20
2-4:	Stanchions, Grab Rails and Windscreens.....	2-25/26
2-5:	Passenger Pushbutton on End Windscreens.....	2-27
2-6:	Passenger Pushbutton on Center Windscreens	2-28
2-7:	Ceiling Panels	2-29/30
2-8:	Ceiling Lights.....	2-31/32
2-9:	Interior Passenger Information Sign, Destination Sign,..... Passenger Emergency Intercom, APC Analyzer and Floor Panels	2-33/34
2-10:	Floor Panel Arrangement	2-35/36
2-11:	Seating Location (2 Sheets)	2-41/42
2-12:	Electric Locker Equipment.....	2-45
2-13:	Front Articulation Electric Locker Equipment Locations, A-Unit	2-46
2-14:	Front Articulation Electric Locker Equipment Locations, B-Unit	2-47
2-15:	Side Articulation Electric Locker, A and B-Unit.....	2-48
2-16:	Undercar Mounted Equipment Location (2 Sheets)	2-53/54
2-17:	Roof Mounted Equipment Location.....	2-59/60
2-18:	Articulation Equipment Locations	2-63
5-1:	Replace Snap Action Switches Type S826a and S826c.....	5-26
5-2:	Exchange Wear and Tear Parts and Detent Mechanism.....	5-27
5-3:	Adjustment of Exterior Mirror Detent Tension	5-31
5-4:	Correct Method of Reseating Connectors.....	5-37
6-1:	Lubricate Baseplate Tube of Operator's Seat	6-2
6-2:	Lubricate Fore/Aft Slide of Operator's Seat.....	6-3
6-3:	Lubricate Master Controller Moving Parts	6-5
7-1:	Standard Grade Marking Chart	7-5
7-2:	Metric Grade Marking Chart (2 Sheets)	7-6
7-3:	Cab Console.....	7-16
7-4:	Console Panels	7-17

LIST OF ILLUSTRATIONS

Figure	Title	Page
7-5:	Console Panel 1	7-18
7-6:	Console Panel 2	7-19
7-7:	Console Panel 3	7-20
7-8:	Console Panel 4	7-21
7-9:	Operator's Seat	7-22
7-10:	Trainer's Seat	7-23
7-11:	Cab Light	7-25
7-12:	Cab Console Light.....	7-26
7-13:	Sun Shades (2 Sheets)	7-27
7-14:	Windshield Wiper	7-30
7-15:	Cab Heater	7-31
7-16:	Defroster / Demister	7-33
7-17:	Defroster Ducting (2 Sheets)	7-34
7-18:	Heater Defroster Panel.....	7-38
7-19:	Front Destination Sign.....	7-39
7-20:	Coupler Loop Switch	7-41
7-21:	Foot Rest	7-42
7-22:	Foot Switch.....	7-43
7-23:	Arm Rest	7-44
7-24:	Radio Power Supply.....	7-45
7-25:	Cab Speaker	7-47
7-26:	Upper Control Panel.....	7-49
7-27:	ACP1A Panel	7-50
7-28:	Electronic Control Unit (ECU), A-Unit.....	7-52
7-29:	Communication Control Unit (CCU)	7-53
7-30:	TCN Controller (A-Unit)	7-55
7-31:	Event Recorder	7-56
7-32:	CRP6A Panel	7-58
7-33:	CRP7A Panel	7-59
7-34:	CRP8A Panel	7-61

LIST OF ILLUSTRATIONS

Figure	Title	Page
7-35:	Trainline Interface Module.....	7-62
7-36:	CRP2A and CRP2B Panel	7-64
7-37:	CRP4A and CRP4B Panel	7-65
7-38:	CRP1A and CRP1B Panel	7-67
7-39:	CRP3A and CRP3B Panel	7-68
7-40:	CRP5A and CRP5B Panel	7-70
7-41:	ACP1B Panel	7-71
7-42:	ATC Enclosure	7-73
7-43:	Hour Meter / Odometer Panel	7-74
7-44:	Electronic Control Unit (ECU), B-Unit.....	7-76
7-45:	Monitoring and Diagnostic System (MDS) Control Unit	7-77
7-46:	TCN Controller (B-Unit)	7-79
7-47:	CRP6B Panel	7-80
7-48:	CRP7B Panel	7-82
7-49:	Bypass Panel	7-83
7-50:	Circuit Breaker Panel A and B.....	7-85
7-51:	Fire Extinguisher.....	7-86
7-52:	Convenience Outlet.....	7-88
7-53:	Cab Camera	7-89
7-54:	Forward View Camera.....	7-91
7-55:	Rear View Monitors	7-92
7-56:	Local Bus Contactor	7-94
7-57:	Remote I/O	7-95
7-58:	Ethernet Switch	7-97
7-59:	Ethernet Switch (Camera)	7-98
7-60:	Ethernet Switch (Wireless)	7-100
7-61:	Track Brake Panel.....	7-101
7-62:	12Vdc Power Supply	7-103
7-63:	Wayside Worker Alert System (WWAS)	7-104
7-64:	Fixing Screw of the Master Controller	7-106

LIST OF ILLUSTRATIONS

Figure	Title	Page
7-65:	Master Controller	7-107
7-66:	DC / DC Converter	7-108
7-67:	HSC-V Control Panel	7-110
7-68:	Washer Reservoir (2 Sheets)	7-111
7-69:	Horn Controller Panel.....	7-114
7-70:	Exterior Speaker.....	7-116
7-71:	Exterior Mirror.....	7-117
7-72:	Hinged Skirt.....	7-119/120
7-73:	Stationary Skirts	7-121/122
7-74:	Windshield.....	7-123/124
7-75:	Gasket Mounted Windows	7-125
7-76:	Framed Windows	7-126
7-77:	Cab Door Window	7-129
7-78:	Rear View Camera	7-131
7-79:	Stanchions and Grab Rails.....	7-133/134
7-80:	End Windscreen	7-135
7-81:	Center Windscreen.....	7-136
7-82:	Center and End Ceiling Panels	7-139/140
7-83:	Side Access Cover	7-141/142
7-84:	Return Air Grille	7-144
7-85:	Ceiling Lights.....	7-145/146
7-86:	Passenger Emergency Intercom	7-150
7-87:	Interior Passenger Information Sign (Cab).....	7-152
7-88:	Interior Passenger Information Sign (Electric Locker).....	7-153
7-89:	Side Destination Sign	7-155
7-90:	Cutting Lines (in red)	7-156
7-91:	APC Analyzer	7-158
7-92:	2P LH & RH 36" Cantilever w/Grab Bar, No Stanchion.....	7-160
7-93:	2P LH & RH 36" Cantilever w/Grab Bar, w/Stanchion.....	7-161

LIST OF ILLUSTRATIONS

Figure	Title	Page
7-94:	2P LH & RH 34" Cantilever Door Pocket w/Grab Bar, w/Stanchion	7-163
7-95:	2P Longitudinal Flip Seat	7-165/166
7-96:	2P LH & RH Cantilever, Reserved	7-168
7-97:	2P LH & RH Sandbox Seat	7-170
7-98:	Front Articulation Electric Locker, A Unit.....	7-173
7-99:	Front Articulation Electric Locker, B Unit.....	7-174
7-100:	Side Articulation Electric Lockers, A and B Unit	7-178
7-101:	Cutout Cock Locations	7-183/184
7-102:	Coupler.....	7-185
7-103:	TWC Antenna.....	7-186
7-104:	Sanding Device	7-189/190
7-105:	Main Reservoir	7-192
7-106:	Brake Supply Reservoir.....	7-194
7-107:	Air Compressor	7-197/198
7-108:	Brake Control Unit (Motor Truck)	7-200
7-109:	Brake Control Unit (Center Truck).....	7-201
7-110:	Auxiliary Power Supply.....	7-203
7-111:	Battery Box.....	7-205/206
7-112:	Battery Circuit Breaker Box	7-207/208
7-113:	Propulsion Inverter	7-211/212
7-114:	Line Reactor	7-214
7-115:	Knife Switch.....	7-215
7-116:	Horn.....	7-217
7-117:	High Speed Circuit Breaker (HSCB)	7-219
7-118:	Lightning Arrestor	7-220
7-119:	Brake Resistor.....	7-222
7-120:	Pantograph.....	7-224
7-121:	Auxiliary Fuse Box.....	7-226
7-122:	Heating, Ventilation and Air Conditioning (HVAC) Unit	7-229/230

LIST OF ILLUSTRATIONS

Figure	Title	Page
7-123:	Roof Shroud, Group A.....	7-231/232
7-124:	Roof Shroud, Group B.....	7-233/234
7-125:	Roof Shroud, Group C.....	7-235/236
7-126:	Silent Alarm	7-236
7-127:	Radio Antenna.....	7-238
7-128:	GPS Antenna	7-239
7-129:	WLAN Antenna.....	7-241
7-130:	Wayside Worker Alert System (WWAS) Antenna	7-242
7-131:	Roof Mounted Camera.....	7-244
7-132:	Ceiling Panels	7-246
7-133:	Side and External Panels	7-247
7-134:	Turntable (2 Sheets).....	7-249
7-135:	Articulation Middle Frame and Pivot Bearing Assembly.....	7-252
7-136:	Articulation Wiring (2 Sheets)	7-254
7-137:	Adjustment of Rear View Monitor.....	7-276
7-138:	Aligning Flanged Screw Heads with Slots.....	7-309
7-139:	Back Onserts Flush With Top of Seat Frame.....	7-309
7-140:	Bottom Onsert Stud Fully Engaged in the Seat Frame Key Slot.....	7-310
7-141:	Seat Back Tabs	7-310
7-142:	Cushions Comes into Contact With Seat Back Tabs	7-311
7-143:	Seat Cushion Stud Shown in Mounting Slot With Seat Pushed Back	7-311
7-144:	Pushing the Seat Cushion Back While Installing.....	7-312
7-145:	Installing Hardware While Seat Cushion Is Pushed Back Fully	7-312
7-146:	Properly Installed and Secured Seat Cushions.....	7-313
7-147:	Side View of Properly Installed Onserts	7-313
7-148:	Front Waterfall Edge Should be Flush Against the Seat Frame.....	7-314
7-149:	End Ply and Rubber Profile	7-341
7-150:	Lubricating the Suspension Frame.....	7-341
7-151:	Mounting the Bellow in the Suspension Frame	7-341

LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Title</u>	<u>Page</u>
7-152:	Turnbuckle and Wire Rope.....	7-342
7-153:	Slewing Bearing / Articulation Shaft Bearing Orientation	7-344

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LIST OF TABLES

Table	Title	Page
1-1.	Reference Data	1-2
2-1.	LA P3010 System Suppliers	2-1
3-1.	Special Tools & Materials	3-1
4-1.	Scheduled Maintenance	4-1
5-1.	Compatible Cleaning Agents	5-18
7-1.	Standard Fastener Torques for LACMTA P3010 LRV	7-8
7-2.	Standard Metric Torques for LACMTA P3010 LRV	7-9
7-3.	Software Programming Table	7-12
8-1.	Car Body and Articulation Troubleshooting	8-1
8-2.	APC Output (CSV) File Troubleshooting	8-9
8-3.	APC Door State Troubleshooting Reference Table	8-10
8-4.	APC Sensor State Troubleshooting Reference Table	8-10

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CHAPTER 1.0

GENERAL DESCRIPTION

1.1 Introduction

The information contained in this section includes scheduled maintenance tasks, corrective maintenance, lubrication and component removal and installation information for the following Car Body and Articulation equipment:

- Cab equipment
- Exterior body equipment
- Interior equipment
- Seating
- Electric Locker equipment
- Undercar mounted equipment
- Roof mounted equipment
- Articulation section

The main components of the LRV are described below:

- The car body consists of two (2) car sections joined together by an articulation section. The articulation section provides attachment and support for the A and B-Units
- Each LRV is equipped with an ergonomically designed cab at each end of the vehicle. Although there are slight differences in component configurations, the cabs are considered operationally identical
- Each LRV is equipped with three, two-axle trucks, one unpowered truck mounted under the articulation unit and one powered truck under each end of the vehicle. The trucks provide support for the car body, traction motors, gear units and friction brake equipment and also provide automatic height control and leveling for the vehicle
- The P3010 LRVs are designed to permit the operation of up to three (3) cars in a train under normal conditions. The coupler is self-centering, fully automatic, mechanical, electrical and pneumatic and is mounted to the front of the car

- A pantograph located on the roof of the A-Unit of the car enables the transfer of power from the overhead catenary to the vehicle
- The propulsion equipment is located on the underfloor of the A and B-Units of the LRV and is the major subsystem of the car, driving the wheels and controlling the vehicle acceleration and deceleration

1.2 Reference Data

Table 1-1. Reference Data

Length of Car (centerline over anticlimber)	26,548mm (87 ft. 1 in.)
Width of Car, Overall	2,652mm (8 ft. 8 in.)
Height of Car Floor From Top of Rail	996mm (3 ft. 3 in.)
Height of Coupler Center Line Face from Top of Rail	510mm (1 ft. 8 in)
Top Operational Speed	105 km/h (65 mph)
Car Wash Speed	Less than 2.4 km/h (1.5 mph)
Maximum Acceleration Rate	1.34 m/s/s (3.0 mphps)
Full Service Braking Rate	1.56 m/s/s (3.5 mphps)
Construction Material	LAHT Steel and Stainless Steel
Seating Capacity	68 passengers
Car Weights	
AW0 (empty car operating weight)	45,000 kg (99,208 lbs)
AW1 (68 Passengers + 1 Operator)	49,830 kg (109,856 lbs)
AW2 (68 Passengers + 1 Operator + 95 standees)	56,480 kg (124,517 lbs)
AW3 (68 Passengers + 1 Operator + 143 standees)	59,840 kg (131,925 lbs)

1.3 List of Acronyms

<u>Acronym</u>	<u>Description</u>
2P	Two Passenger
ACP1A	Audio Control Panel 1A
ACP1B	Audio Control Panel 1B
ADU	Aspect Display Unit
AMP	Amperes
APC	Automatic Passenger Counter
ARP1B	Articulation Relay Panel 1B
ATC	Automatic Train Control
ATO	Automatic Train Operation
ATP	Automatic Train Protection
ATP ACK	ATP Acknowledge
BCU	Brake Control Unit
CCU	Communication Control Unit
cm	Centimeter
CRP1A	Cab Relay Panel 1A
CRP1B	Cab Relay Panel 1B

<u>Acronym</u>	<u>Description</u>
CRP2A	Cab Relay Panel 2A
CRP2B	Cab Relay Panel 2B
CRP3A	Cab Relay Panel 3A
CRP3B	Cab Relay Panel 3B
CRP4A	Cab Relay Panel 4A
CRP4B	Cab Relay Panel 4B
CRP5A	Cab Relay Panel 5A
CRP5B	Cab Relay Panel 5B
CRP6A	Cab Relay Panel 6A
CRP6B	Cab Relay Panel 6B
CRP7A	Cab Relay Panel 7A
CRP7B	Cab Relay Panel 7B
CRP8A	Cab Relay Panel 8A
DMS	Deadman Switch
ECU	Electronic Control Unit
ESNA	Elastic Stop Nut Division
FSB	Full Service Brake
ft.	Feet
ft-lbs.	Foot-Pounds
GPS	Global Positioning System
HCS-V	Hanning Communication System (Bi-Directional)
HRSB	High Rate Service Brake
HSCB	High Speed Circuit Breaker
HVAC	Heating, Ventilation and Air Conditioning
Hz	Hertz
in.	Inch
in-lbs.	Inch-Pounds
IPA	Isopropyl Alcohol
kg	Kilogram
kgf	Kilogram Force
Km/h	Kilometer per Hour
LACMTA	Los Angeles County Metropolitan Transportation Authority
lbs.	Pounds
LED	Light Emitting Diode
LH	Left Hand
LRV	Light Rail Vehicle
LVDC	Low Voltage Direct Current
MCS	Master Controller Switches
MDS	Monitoring and Diagnostic System
mm	Millimeter
MOV	Metal Oxide Varistor
mph	Miles Per Hour
mphps	Miles Per Hour Per Second
Nm	Newton Meter
NVR	Network Video Recorder

<u>Acronym</u>	<u>Description</u>
OCS	Overhead Contact System
Oz	Ounce
PAD	Personal Alert Device
PCB	Printed Circuit Board
PBED	Power / Brake Effort Demand
psig	Pressure Per Square Inch, Gauge
PWM	Pulse Width Modulated
RH	Right Hand
RMSM	Running Maintenance and Servicing Manual
SCEB	Slide Controlled Emergency Brake
SDS	Safety Data Sheet
TCN	Train Control Network
TOD	Train Operator Display
TS	Transfer Switch
TTEM	Tools and Test Equipment Manual
TWC	Train to Wayside Communication
Vac	Volts, Alternating Current
Vdc	Volts, Direct Current
WLAN	Wireless Local Area Network
WWAS	Wayside Worker Alert System

CHAPTER 2.0

FUNCTIONAL DESCRIPTION

2.1 Introduction

The devices, equipment and components covered in this section of the manual are supplied by multiple subcontractors who are identified below.

Table 2-1. LA P3010 System Suppliers

System	Supplier
ATC / TWC	Hitachi Rail STS, USA, Inc. (formerly Ansaldo, STS – USA)
Floor Panels	Baultar Concept
Coupler	Dellner Inc.
Stanchions and Windscreens	GG Schmitt
Articulation Bellows	HUBNER Manufacturing Corporation
Doors	IFE North America, Inc.
Automatic Passenger Counters (APC)	INIT
Truck and Suspension	Kinki Sharyo Co. Ltd / Penn Machine Company
Car Body and Articulation	Kinki Sharyo Co. Ltd.
Track Brakes	Knorr Brake Company, LLC
Friction Brakes	Knorr Brake Company, LLC
Passenger Seating	Kustom Seating
Heating, Ventilation and Air Conditioning (HVAC)	Merak North America
Windows	NASG Holdings Inc.
Wayside Worker Alert System (WWAS)	ProTran Technology, LLC
Communications	Rail Transit Consultants, Inc.
Event Recorder	Rail Transit Consultants, Inc.
Monitoring and Diagnostic Systems (MDS)	Rail Transit Consultants, Inc.
Rear View Monitors	Rail Transit Consultants, Inc.
Battery	Saft America Inc.
Data Communications (TCN)	SAIRA FAR Americas, Inc.
Lighting and Destination Signs	Teknoware USA (formerly Trans-Lite, Inc.)
Propulsion	Toyo Denki USA, Inc.
Pantograph	TransTech Power Transfer Systems
Auxiliary Inverter	PowerTech Converter Corp. (formerly KB Powertech Corp. USA)
Operator's Seat	USSC Group

2.2 Equipment Locations

Additional information regarding the following equipment can be found in Section 0200 Car Body of the Illustrated Parts Catalog or in the specific equipment sections of the Illustrated Parts Catalog.

2.2.1 Cab Equipment

See Figure 2-1, Sheets 1 thru 3.

2.2.1.1 Cab Console

The Cab Console is located in the Operator's cab of the A and B-Units. The console consists of a fabricated body designed to mount on the cab desk. The console consists of four panels. These panels include various train indicators, lighting and door controls, ATP Unit, miscellaneous controls. Several devices are mounted within the console body. A communication handset is located on the right front of the console.

All of the interconnections to lamps, switches, and mounted components are harnessed and terminated in multi-pin connectors.

2.2.1.2 Console Panels

See Figures 2-1, Sheets 2 and 3 and Figures 7-3 through 7-8.

2.2.1.2.1 Console Panel 1

Console Panel 1 is located on the left side of the console and consists of the Train Operator Display and a toggle switch for the Left Front Door. See Figures 2-1 and 7-5.

2.2.1.2.2 Console Panel 2

Console Panel 2 is located above the notch and consists of the Mirror Adjust, Hazard Warning, and Lighting Control Switches. See Figures 2-1 and 7-6.

2.2.1.2.3 Console Panel 3

Console Panel 3 is located center of the console and consists of the Door Controls, Heater Controls, Emergency Pushbutton, Aspect Display Unit (ADU), and other miscellaneous controls. See Figures 2-1 and 7-7.

2.2.1.2.4 Console Panel 4

Console Panel 4 is located on the right side of the console and consists of the Train Operator Display and two toggle switches, one for the Right Front Door and one for the ATP ACK. See Figures 2-1 and 7-8.

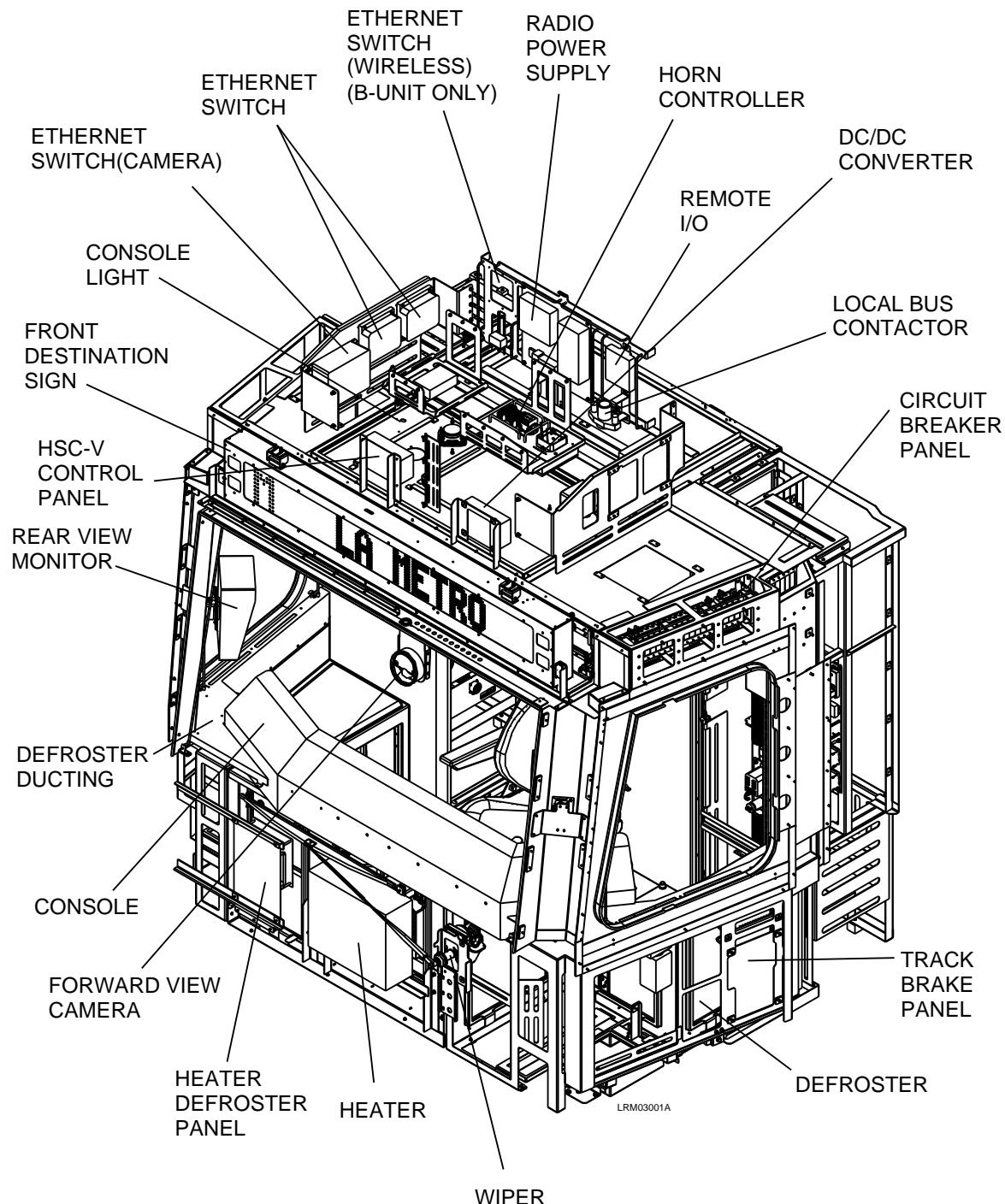


Figure 2-1: Cab Equipment Locations
(Sheet 1 of 3)

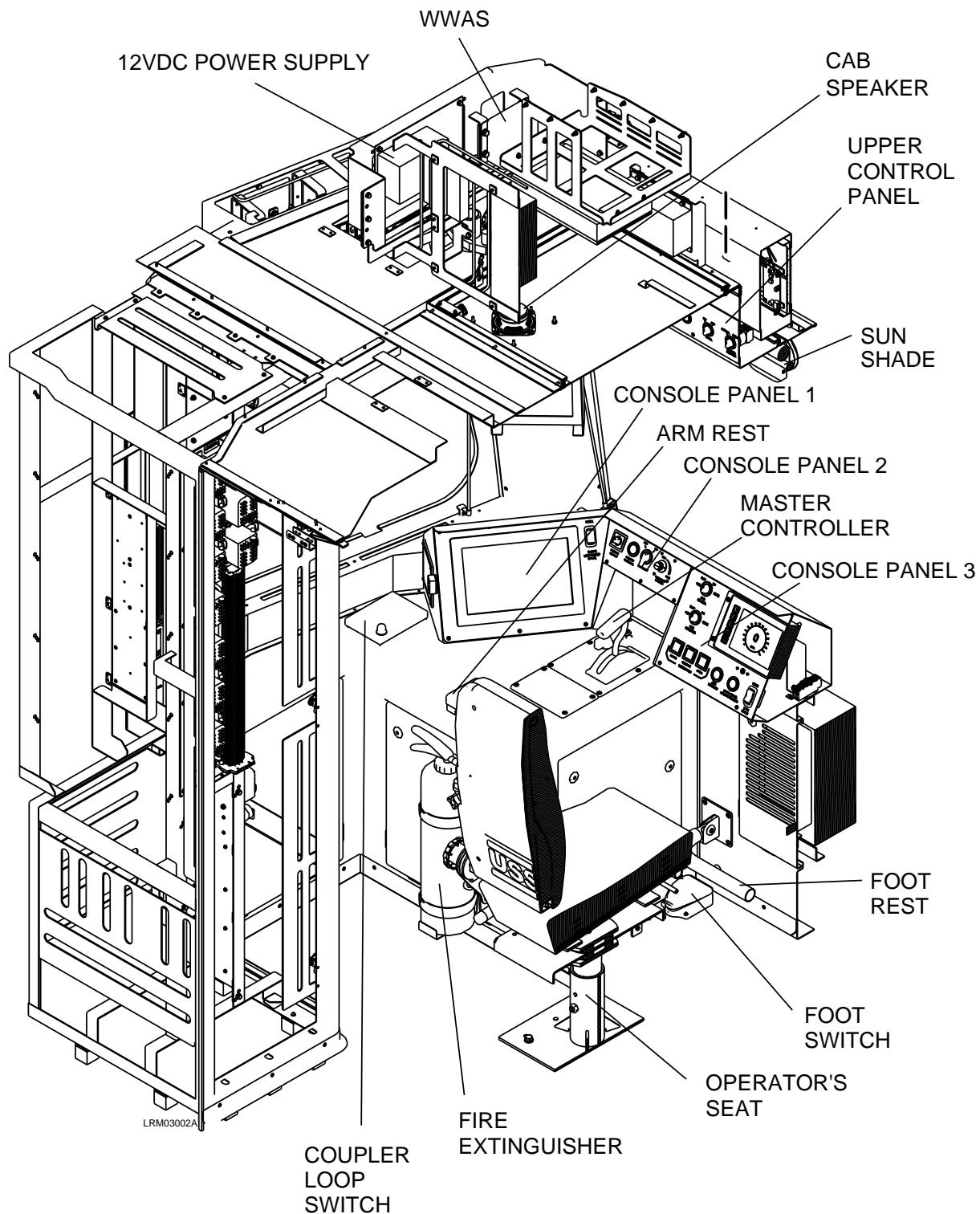


Figure 2-1: Cab Equipment Locations
(Sheet 2 of 3)

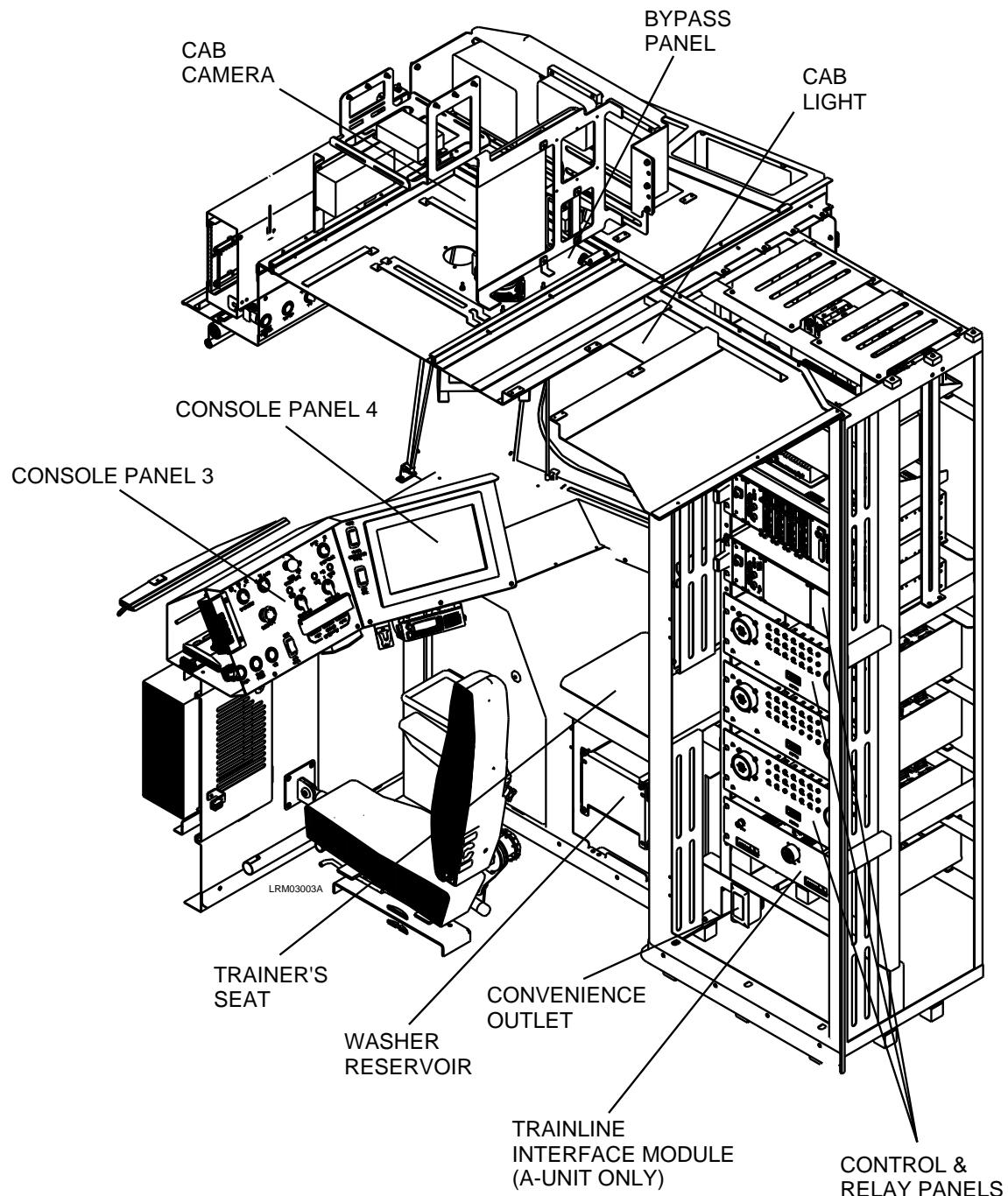


Figure 2-1: Cab Equipment Locations
(Sheet 3 of 3)

2.2.1.3 Operator's Seat

There is one Operator's seat located in each A and B-Unit cab. See Figures 2-1, 2-2 and Figure 7-9. The Operator's seats are designed for maximum comfort of the Operator and are adjustable to include the following:

- Recline
- Fore/Aft
- Vertical Height
- Swivel
- Lumbar Support
- Armrest

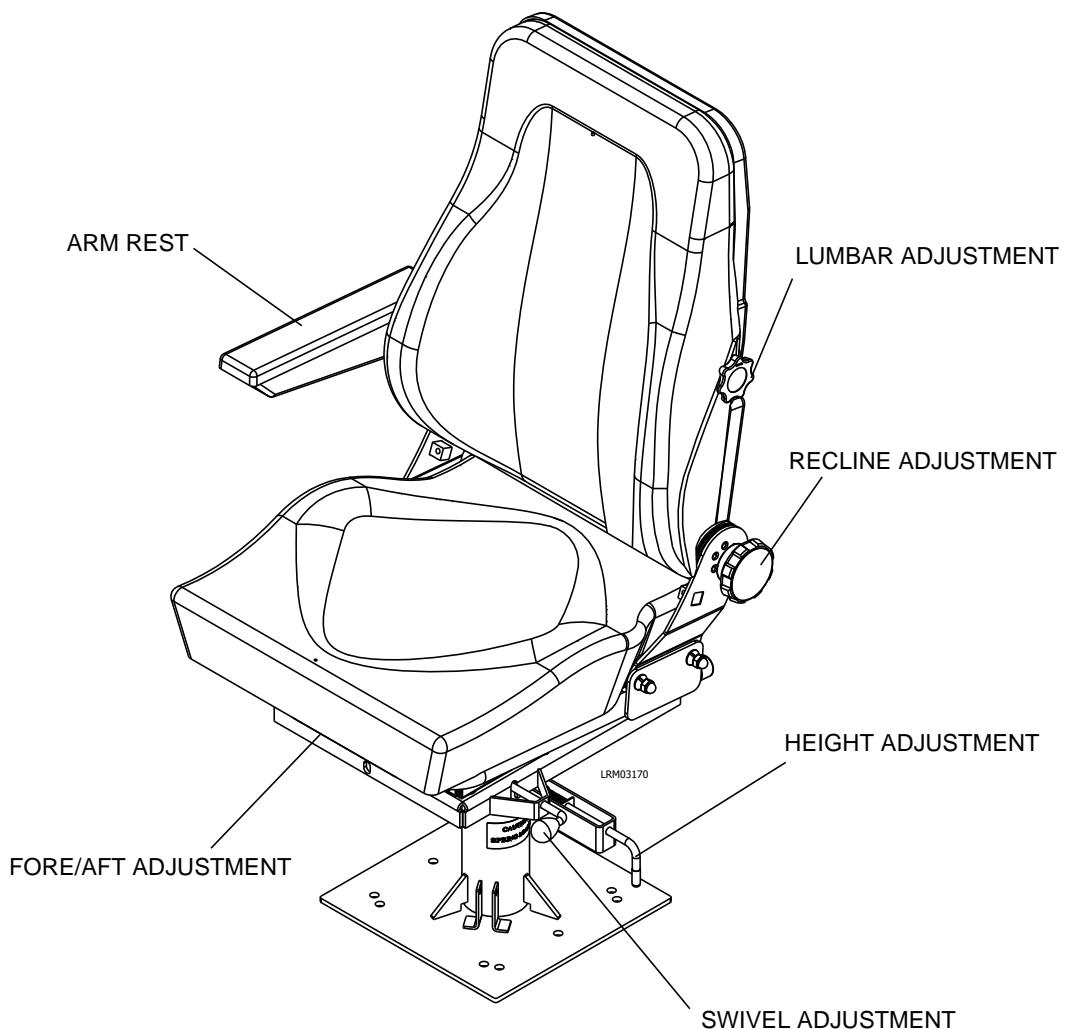


Figure 2-2: Operator's Seat Adjustments

2.2.1.4 Trainer's Seat

The Trainer's Seat is located under the right side cab window. See Figures 2-1 and 7-10.

2.2.1.5 Cab Light

The Cab Light is located in the cab ceiling above the Operator. See Figures 2-1 and 7-11. Refer to Section 0600, Lighting of the Running Maintenance and Servicing Manual.

2.2.1.6 Cab Console Light

The Cab Console Light is located in the cab ceiling above the console. See Figures 2-1 and 7-12. The Cab Console Light is manually adjustable ± 30 degrees from the centerline of the light. Light output from this fixture is adjustable via a dimmer control located on Console Panel 2. Refer to Section 0600, Lighting of the Running Maintenance and Servicing Manual.

2.2.1.7 Sun Shade

There are three sun shade assemblies per Operator's cab, one on the front windshield and one on the left and right side cab windows. See Figures 2-1 and 7-13. The sun shade is designed to give the Operator maximum viewing without glare. The sun shade assemblies consist of a rolling curtain, roller supports and curtain rails. The shades are the pull down/spring-release-up type. Each curtain roller is held at the top by a roller support on either end and guided up or down along the window by curtain rails on either side. The curtain rails run the length of the window and act as a means of holding the curtain against the window so that they do not swing/sway with train motion.

2.2.1.8 Windshield Wiper

There is one windshield wiper assembly per A and B-Unit cab, located on the front windshields. See Figures 2-1 and 7-14. The wiper keeps the windshield free of rain and improves Operator visibility during wet weather. For operation of the Windshield Wiper, refer to Section 900 series system circuits of UER0677 (circuit sheet 952).

NOTE: The windshield wiper motor assembly must be accessed from underneath the cab console. Because of the wiper motors location, in the event of wiper motor failure, the car must be taken to the shop for repair.

2.2.1.9 Cab Heater

There is one Cab Heater in each A and B-Unit cab. See Figures 2-1 and 7-15. It is located to the right of the Operator under the cab desk. The Cab Heater provides cab heat for the Operator's comfort. For operation of the Cab Heater, refer to Section 700 series system circuits of UER0677 (circuit sheet 703).

2.2.1.10 Defroster / Demister

There are two Defroster / Demisters located in each A and B-Unit cab. See Figures 2-1 and 7-16. They are located under the side windows on the left and right side. For operation of the Defroster / Demister, refer to Section 700 series system circuits of UER0677 (circuit sheet 704).

2.2.1.11 Heater / Defroster Panel

There is one Heater / Defroster Panel located in each A and B-Unit cab. See Figures 2-1 and 7-18. It is located to the right of the Operator under the cab desk. The Heater / Defroster Panel provides control for the cab heater and defroster / demister and includes the relays CFR, CHLR, CHHR, CDFR, CDLR and CDHR. For operation of the Heater / Defroster Panel, refer to Section 700 series system circuits of UER0677 (circuit sheets 703 & 704).

2.2.1.12 Front Destination Sign

There is one Front Destination Sign located on the front of each A and B-Unit cab. See Figures 2-1 and 7-19. The destination display is an amber monochrome LED array capable of displaying 13 characters with a 6 in. (15 cm) character height. Up to 100 characters may be scrolled across the display. The route code display is a full color LED array displaying a single 6 in. (15 cm) high character. There are three display matrix PCB's for the destination, and one display matrix PCB for the route code display.

The sign assembly is 68 in. (172.7 cm) wide, 10.5 in. (26.6 cm) high, and 4.18 in. (10.6 cm) deep. It has a display window that is 59.75 in. (151.76 cm) wide and 6.45 in. (16.34 cm) high. The left side of the sign has a power connection, a Harting M12 connector for the network connection, and a plug for the left marker light. The right side has a plug for the right marker light. Construction is lightweight aluminum with a wrinkle black powder-coat finish. For operation of the Front Destination Sign, refer to Section 800 series system circuits of UER0677 (circuit sheet 827).

2.2.1.13 Coupler Loop Switch

The Coupler Loop Switch is located in the left side cab desk and serves as a distribution point for 17 - 30 Vdc power to activate subsystems as well as a termination and switching point for trainline wiring. See Figures 2-1 and 7-20. For operation of the Coupler Loop Switch, refer to Section 850 series system circuits (circuit sheets 851 & 852).

Manual operation of the control box is accomplished by use of the manual lever.

2.2.1.14 Foot Rest

The Foot Rest is located in front of the Operator's Seat and is designed to pivot out of the way for the 95% male Operator and then be pivoted down for the 5% female Operator. See Figures 2-1 and 7-21.

2.2.1.15 Foot Switch

There is one Foot Switch in each A and B-Unit cab. See Figures 2-1 and 7-22. It is located on the floor in front of the Operator Seat. The Foot Switch provides a push-to-talk switch.

2.2.1.16 Arm Rest

There is one Arm Rest in each A and B-Unit cab. See Figures 2-1 and 7-23. It is located on the cab desk behind the Master Controller. The Arm Rest provides support for the Operator's arm while in operation.

2.2.1.17 Radio Power Supply

There is one Radio Power Supply in each A and B-Unit cab. See Figures 2-1 and 7-24. It is located in the cab ceiling. The Radio Power Supply provides power to the radio equipment. For operation of the Radio Power Supply, refer to Section 800 series system circuits of UER0677 (circuit Sheet 821).

2.2.1.18 Cab Speakers

There are two Cab Speakers in each A and B-Unit cab. See Figures 2-1 and 7-25. They are located in the cab ceiling on either side of the cab.

2.2.1.19 Upper Control Panel

There is one Upper Control Panel located in the cab of each A and B-Unit cab mounted on the Front Destination Sign cover. See Figures 2-1 and 7-26. The Upper Control Panel has the following controls:

- Lamp Test pushbutton
- Local Indicator
- Local two position rotary switch
- Coupler three position switch
- Uncouple mechanical pushbutton
- Car Wash pushbutton
- ATO two position switch
- HVAC Shutter two position switch
- Reset pushbutton

2.2.1.20 Control and Relay Panels

See Figures 2-1, Sheets 2 and 3 and Figures 7-27 through 7-48.

2.2.1.20.1 ACP1A / ACP1B Panels

There is one ACP1A (Audio Control Panel 1A) located in the right side electric locker on the A-Unit and one ACP1B (Audio Control Panel 1B) located in the right side electric locker on the B-Unit. See Figures 2-1, 7-27 and 7-41. Refer to Section 2.8.5.7 of Section 1400, Communications for information on programming the ACP(s).

2.2.1.20.2 CRP1A / CRP1B Panels

There is one CRP1A (Cab Relay Panel 1A) located in the left side electric locker behind the Operator's Seat on the A-Unit and one CRP1B (Cab Relay Panel 1B) located in the left side electric locker behind the Operator's Seat on the B-Unit. See Figures 2-1 and 7-38. Refer to KI Drawing UD01450, Rev. H (Sheets 180-181).

2.2.1.20.3 CRP2A / CRP2B Panels

There is one CRP2A (Cab Relay Panel 2A) located in the left side electric locker on the A-Unit and one CRP2B (Cab Relay Panel 2B) located in the left side electric locker on the B-Unit. See Figures 2-1 and 7-36. Refer to KI Drawing UD01450, Rev. H (Sheets 180-181).

2.2.1.20.4 CRP3A / CRP3B Panels

There is one CRP3A (Cab Relay Panel 3A) located in the left side electric locker behind the Operator's Seat on the A-Unit and one CRP3B (Cab Relay Panel 3B) located in the left side electric locker behind the Operator's Seat on the B-Unit. See Figures 2-1 and 7-39. Refer to KI Drawing UD01450, Rev. H (Sheets 180-181).

2.2.1.20.5 CRP4A / CRP4B Panels

There is one CRP4A (Cab Relay Panel 4A) located in the left side electric locker on the A-Unit and one CRP4B (Cab Relay Panel 4B) located in the left side electric locker on the B-Unit. See Figures 2-1 and 7-37. Refer to KI Drawing UD01450, Rev. H (Sheets 180-181).

2.2.1.20.6 CRP5A / CRP5B Panels

There is one CRP5A (Cab Relay Panel 5A) located in the left side electric locker behind the Operator's Seat on the A-Unit and one CRP5B (Cab Relay Panel 5B) located in the left side electric locker behind the Operator's Seat on the B-Unit. See Figures 2-1 and 7-40. Refer to KI Drawing UD01450, Rev. H (Sheets 180-181).

2.2.1.20.7 CRP6A / CRP6B Panels

There is one CRP6A (Cab Relay Panel 6A) located in the right side electric locker on the A-Unit and one CRP6B (Cab Relay Panel 6B) located in the right side electric locker on the B-Unit. See Figures 2-1, 7-32 and 7-47. Refer to KI Drawing UD01450, Rev. H (Sheets 180-181).

2.2.1.20.8 CRP7A / CRP7B Panels

There is one CRP7A (Cab Relay Panel 7A) located in the right side electric locker on the A-Unit and one CRP7B (Cab Relay Panel 7B) located in the right side electric locker on the B-Unit. See Figures 2-1, 7-33 and 7-48. Refer to KI Drawing UD01450, Rev. H (Sheets 180-181).

2.2.1.20.9 CRP8A Panel

There is one CRP8A (Cab Relay Panel 8A) located in the right side electric locker on the A-Unit. See Figures 2-1 and 7-34. Refer to KI Drawing UD01450, Rev. H (Sheets 180-181).

2.2.1.20.10 Electronic Control Unit (ECU)

There is one ECU located in the right side electric locker on the A and B-Units. See Figures 2-1, 7-28 and 7-44.

2.2.1.20.11 Event Recorder

There is one Event Recorder located in the right side electric locker on the A-Unit. See Figures 2-1 and 7-31.

2.2.1.20.12 TCN Controller

There is one TCN Controller located in the right side electric locker on the A and B-Units. See Figures 2-1 and 7-30.

2.2.1.20.13 Hour Meter / Odometer Panel

There is one Hour Meter / Odometer Panel located in the right side electric locker on the B-Unit. See Figures 2-1 and 7-43. For operation of the Hour Meter / Odometer Panel, refer to Section 250 series system circuits of UER0677 (circuit sheet 278).

2.2.1.20.14 Trainline Interface Module

There is one Trainline Interface Module located in the right side electric locker on the A-Unit. See Figures 2-1 and 7-35. For operation of the Trainline Interface Module, refer to Section 800 series system circuits of UER0677 (circuit sheet 809).

2.2.1.20.15 Communication Control Unit (CCU)

There is one CCU located in the right side electric locker on the A-Unit. See Figures 2-1 and 7-29. For operation of the CCU, refer to Section 1400, Communications of the Running Maintenance and Servicing Manual.

2.2.1.20.16 Monitoring and Diagnostic System (MDS) Control Unit

There is one MDS Control Unit located in the right side electric locker on the B-Unit. See Figures 2-1 and 7-45.

2.2.1.20.17 ATC Enclosure

There is one ATC Enclosure located in the right side electric locker on the B-Unit. See Figures 2-1 and 7-42.

2.2.1.21 Bypass Panel

There is one Bypass Panel located in each A and B-Unit cab above the right side window. See Figures 2-1 and 7-49.

The Bypass and Cutout Panel consists of fifteen switches. The switch functions include several bypass and cutout features. Each switch is configured with a hard plastic cover designed to prevent inadvertent operation and includes a means to seal each switch closed. The seal must be broken to allow operation of the switch. For operation of the Bypass Panel, refer to Section 250 series system circuits of UER0677 (circuit sheets 276 & 277).

2.2.1.22 Circuit Breaker Panel A and B

There is one Circuit Breaker Panel in each A and B-Unit cab located in the bulkhead above the left side desk. See Figures 2-1 and 7-50. For operation of the Circuit Breaker Panel A and B, refer to Section 200 series system circuits of UER0677 (circuit sheets 211 through 216).

2.2.1.23 Fire Extinguisher

There is one fire extinguisher in each A and B-Unit cab located at floor level in front of the left side desk. See Figures 2-1 and 7-51. It is held in place with a cushioned fire extinguisher bracket and can be lifted from its bracket to provide access to nearby equipment.

2.2.1.24 Convenience Outlet

There is one convenience outlet located in the right side electric locker in each A and B-Unit cab. See Figures 2-1 and 7-52. For operation of the Convenience Outlet, refer to Section 200 series system circuits of UER0677 (circuit sheet 205).

2.2.1.25 Cab Camera

There is one Cab Camera located in the right side of the cab ceiling in each A and B-Unit. See Figures 2-1 and 7-53.

2.2.1.26 Forward View Camera

There is one Forward View Camera located below the Destination Sign in each A and B-Unit. See Figures 2-1 and 7-54.

2.2.1.27 Rear View Monitors

There are two Rear View Monitors located on the front pillars in each A and B-Unit. See Figures 2-1 and 7-55.

2.2.1.28 Local Bus Contactor

There is one Local Bus Contactor located in the cab ceiling in each A and B-Unit. When closed, it energizes the local bus circuit breakers. See Figures 2-1 and 7-56. For operation of the Local Bus Contactor, refer to Section 200 series system circuits of UER0677 (circuit sheet 218).

2.2.1.29 Remote I/O

There is one Remote I/O located in the cab ceiling in each A and B-Unit. See Figures 2-1 and 7-57. For operation of the Remote I/O, refer to Section 800 series system circuits of UER0677 (circuit sheets 816 & 819).

2.2.1.30 Ethernet Switch

There are two Ethernet Switches located in the cab ceiling in each A and B-Unit. See Figures 2-1 and 7-58. For operation of the Ethernet Switch, refer to Section 800 series system circuits of UER0677 (circuit sheets 801, 802, 805 & 806).

2.2.1.31 Ethernet Switch (Camera)

There is one Ethernet Switch (Camera) located in the cab ceiling in each A and B-Unit. See Figures 2-1 and 7-59.

2.2.1.32 Ethernet Switch (Wireless)

There is one Ethernet Switch (Wireless) located in the cab ceiling in the B-Unit. See Figures 2-1 and 7-60.

2.2.1.33 Track Brake Panel

There is one Track Brake Panel located under the left side cab desk in each A and B-Unit. See Figures 2-1 and 7-61.

2.2.1.34 12Vdc Power Supply

There is one 12Vdc Power Supply located in the cab ceiling in each A and B-Unit cab. See Figures 2-1 and 7-62. For operation of the 12Vdc Power Supply, refer to Section 200 series system circuits of UER0677 (circuit sheet 216).

2.2.1.35 Wayside Worker Alert System (WWAS) Module

There is one Wayside Worker Alert System (WWAS) located in the cab ceiling in each A and B-Unit cab. See Figures 2-1 and 7-63. For operation of the WWAS, refer to Section 800 series system circuits of UER0677 (circuit sheet 849).

2.2.1.36 Master Controller

There is one Master Controller located on the left side of the cab desk in each A and B-Unit cab. See Figures 2-1, 7-64 and 7-65. The master controller is intended to control traction and brake of the vehicle by the Operator.

2.2.1.36.1 Master Controller Operation

The Master Controller is used by the train operator to command braking and propulsion on the train. The Master Controller includes a Deadman feature and includes a Control Switch (Transfer Switch) and Direction Control Switch (Reverser) and is supplied as a single integrated unit. The Master Controller utilizes a nominal 28.5 VDC from the battery voltage for its operation.

Each master controller is provided with a two-position Transfer Switch to select the cab status. The Transfer Switch is mechanically interlocked with the Master Controller and Reverser Switch. The positions are:

- OFF - In the OFF position, all cab controls are non-functional except some specific functions. The key is removable in this switch position.
- ON - In the ON position, console controls are functional, and all other consoles throughout the train are disabled, except for some specific functions. The key shall not be removable in this position.

A Master Controller key will enable the Transfer Switch.

A three-position, (FORWARD, NEUTRAL, REVERSE), rotary type Reverser Switch is provided on the Master Controller. The Transfer Switch and the Reverser Switch is mechanically interlocked so that the Reverser Switch cannot be moved from the NEUTRAL position unless the associated Transfer Switch is in the ON position. The Transfer Switch shall not be able to be moved from the ON position by using the Master Controller key unless the Reverser Switch is in the NEUTRAL position.

The Reverser Switch is interlocked such that the Master Controller handle must be in the Full Service Brake (FSB) position in order to move the Reverser Switch out of either the FORWARD or REVERSE position.

The Drive / Brake switch is manually operated through the Drive / Brake handle.

The entire deflection range is divided into 45° braking range (38° from coast to High Rate Service Brake (HRSB) and an additional 7° for Slide Controlled Emergency Brake (SCEB) and 45° power range, with a notched neutral (coast) position.

Furthermore, detents are in the EB (SCEB), TB (HRSB, FSB, BMIN, COAST, PMIN, and P5 positions. The end of the acceleration and braking zone are limited by mechanical end stops.

The Master Controller is equipped with a deadman function, which activates a full service brake when the handle is released. In the rest position, the handle is positioned at 12° counterclockwise from the vehicle longitudinal line. To operate the train it is necessary to rotate the handle counterclockwise between 75° and 90° from the rest position. The Operator must hold the handle beyond 70° counterclockwise of the rest position to avoid causing a deadman brake application. The handle is spring-loaded such that the handle will return to the rest position when released.

The operated handle is driving an encoder which provides a Pulse Width Modulated (PWM) signal for the Power / Brake effort demand (PBED) depending on the actual deflection. This signal is:

- High level: Vcc-3 V (Vcc ... supply voltage)

- Low level: 0V ... 5 V

Output current: up to 300mA

Nominal output frequency: 432 Hz

Pulse width: variable 5.2 % ... 91 %

The PBED values can be verified with an oscilloscope per the table below.

X-axis	Master Controller Positions	Type of Detent	Degrees of Rotation
Nominal PBED %	Command		
5.2	EB	Heavy Notch	+45
16.6	TB	Heavy Notch	+38
16.6	FSB	Light Notch	+31
45.4	Bmin	Light Notch	+7.5
47.4	Coast		
50.0	Coast	Light Notch	0
52.0	Coast		
53.8	Pmin	Light Notch	-7.5
71.1	P5	Light Notch	-26.25
91.0	Pmax		-45

2.2.1.36.2 Master Controller Handle Positions and Modes

Dual LEDs are mounted internally in the Master Controller to indicate various handle positions and modes. A window in the main handle cover will indicate the positions of the controller. A strip will rotate as the controller handle is moved and will be illuminated in the window as follows:

- Pmin or any Power position- Green shall be illuminated,
- COAST position- Yellow shall be illuminated,
- Bmin or any Brake position- RED shall be illuminated,
- FSB position- RED shall be illuminated,
- TB position- RED shall be illuminated,
- EB position- RED shall be illuminated.

The graphic below represents the Position Indicator Strip that will be illuminated to identify the handle positions.



The following tables define the positions where the contacts of the Master Controller Switches (MCS), Reverser Switches, and Transfer Switches are closed. The connector pins for these signals are defined on the applicable circuit sheets in the tables.

Master Controller Handle Position											
CAM Switch	Function	BRAKING					COAST	POWERING			Circuit Sheet
		EB	TB	FSB	BRAKING	B Min		P Min	POWERING	PMax	
MCS-1	HRSB										259/260
MCS-2	Cab Prop. Inh bit										261
MCS-3	Cab Interlock										253
MCS-4	Deadman										262
MCS-5	Cab Prop. Inh bit										261
MCS-6	M TL										259/260
MCS-7	ATP										904
MCS-8	SCEB										255
MCS-9	SCEB										255
MCS-10	Emergency										255
MCS-11	SCEB										259/260
MCS-12	CM TL										259/260
MCS-13	Emergency										255
MCS-14	Track Brake										408
MCS-15	Cab Interlock										253
MCS-16	Sanding										412
MCS-17	ATP										904
DMS	Deadman										262

Legend:

	CLOSED
	OPEN

NOTE: The Deadman Switch (DMS) is OPEN when the Master Controller Handle is released

CAM SWITCH	REVERSER SWITCH POSITION			CIRCUIT SHEET
	REVERSE	NEUTRAL	FORWARD	
RS-1				SPARE
RS-2				SPARE
RS-3				254
RS-4				254
RS-5				253
RS-6				253
RS-7				SPARE
RS-8				SPARE

Legend:

CLOSED
OPEN

CAM SWITCH	TRANSFER SWITCH POSITION		CIRCUIT SHEET
	OFF	ON	
TS-1			253
TS-2			253
TS-3			253
TS-4			253
TS-5			SPARE
TS-6			SPARE
TS-7			SPARE
TS-8			SPARE

Legend:

CLOSED
OPEN

2.2.1.37 DC / DC Converter

There is one DC / DC Converter located in the cab ceiling in each A and B-Unit cab. See Figures 2-1 and 7-66. For operation of the DC / DC Converter, refer to Section 600 series system circuits of UER0677 (circuit sheet 602).

2.2.1.38 HSC-V Control Panel

There is one HSC-V Control Panel located in the cab ceiling in each A and B-Unit cab. See Figures 2-1 and 7-67. For operation of the HSC-V Control Panel, refer to Section 900 series system circuits of UER0677 (circuit sheet 905).

2.2.1.39 Washer Reservoir

The Windshield Wiper Reservoir is located inside the desk to the right of the Operator. See Figures 2-1 and 7-68. This equipment is accessible through the right side cover. The washer reservoir supplies washer fluid to clean the windshield and can be filled from the exterior of the car through an access cover. For operation of the Washer Reservoir, refer to Section 900 series system circuits of UER0677 (circuit sheet 952).

2.2.1.40 Horn Controller Panel

There is one Horn Controller Panel located in the cab ceiling in each A and B-Unit cab. See Figures 2-1 and 7-69. For operation of the Horn Controller Panel, refer to Section 800 series system circuits of UER0677 (circuit sheet 829).

2.2.2 Exterior Equipment

See Figure 2-3.

2.2.2.1 Exterior Speaker

There are eight exterior speakers, four mounted in the roof shrouds on the A-Unit and four on the B-Unit. See Figures 2-3 and 7-70.

2.2.2.2 Exterior Mirror

There are four exterior mirrors, two mounted on the A-Unit and two on the B-Unit. See Figures 2-3 and 7-71. The mirrors are located on both the right and left sides of each cab. These mirrors enable the Operator to supervise the loading and unloading at all doorways of the vehicle when the vehicle doors are open, and verify that all the doors on the train are clear of passengers. The mirrors are also a back-up in an event the rear view camera and/or rear view monitor malfunction. The mirror positions are designed to be adjustable from the controller located on the Cab Console. For operation of the Exterior Mirror, refer to 900 series system circuits of UER0677 (circuit sheet 951).

2.2.2.3 Skirts

There are twenty hinged skirts and four stationary skirts, ten hinged and two stationary skirts on the A-Unit and ten hinged and two stationary on the B-Unit. See Figures 2-3, 7-72 and 7-73. These skirts prevent damage to undercar equipment from other trains, track repairs, and debris. Refer to KI drawing UA09446, Rev. D.

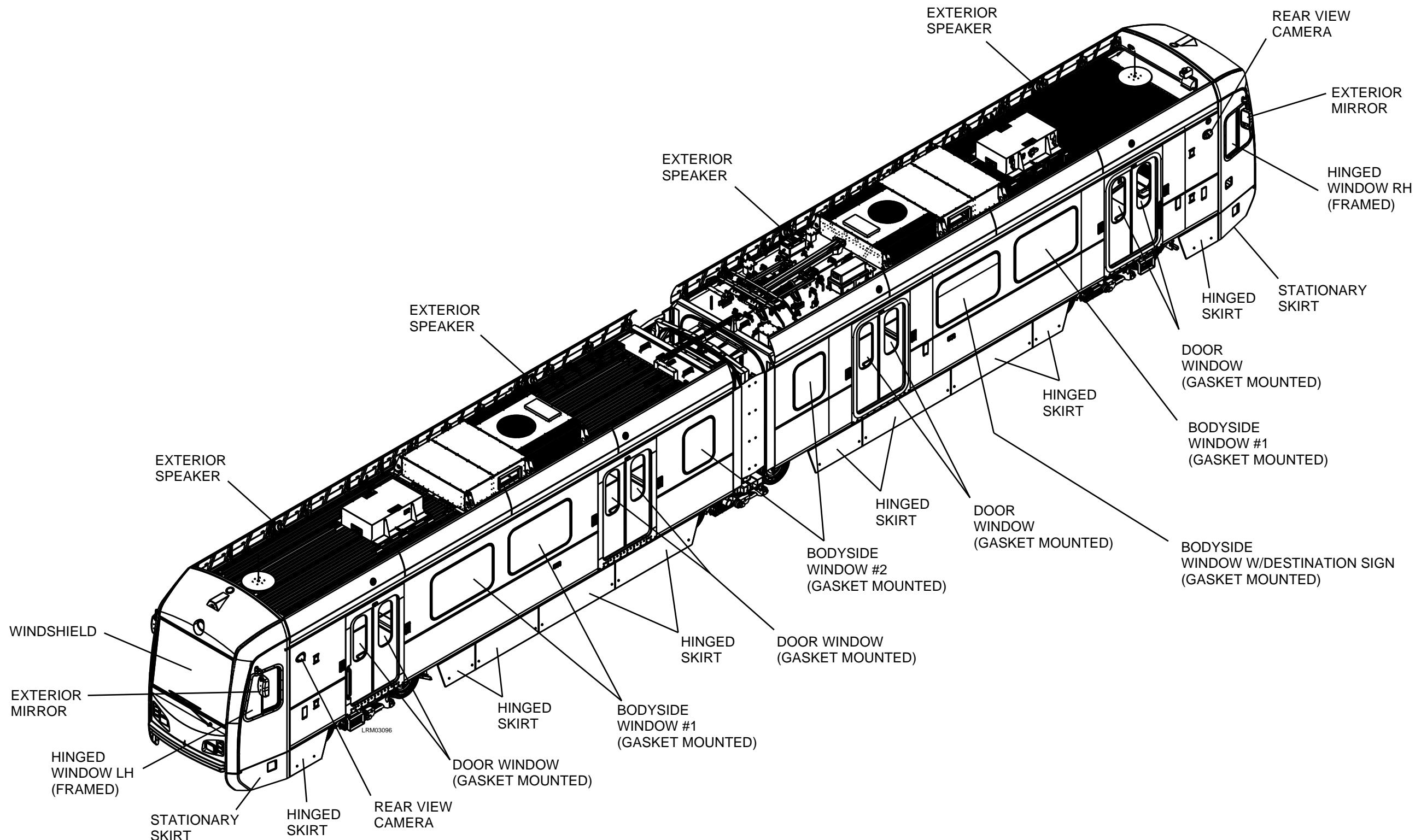


Figure 2-3: Exterior Equipment Location

2.2.2.4 Windows

Glass laminate glazings are assemblies of glass fused together using various plastics to both add strength and increase safety in cases of glazing failure. See Figures 2-3 and 7-74 through 7-77. Glass used in these assemblies can be of either annealed (untreated) or chemically-strengthened (treated) varieties, each with its own application. Plastics in these assemblies are either contained between layers of glass or applied to exposed glass faces, depending on the intended use of the chosen plastic.

The glass laminates are to be used in multiple applications, such as: windshield, door windows or passenger side windows. Depending on the intended use and location on the LRV, different window tinting is used in the lamination process to adjust the light transmittance. Various films are applied to the interior face of the laminates for uses such as spall prevention and anti-vandal damage. In some instances, black paint is used to provide a border between viewing fields.

The windows provided range from 0.250" to 0.625" in thickness and are tested according to ANSI Z26.1 and the CFR 49 Part 223 standards. All windows contain a tinted interlayer.

For framed glass windows, laminates are mounted into frames constructed from aluminum extrusion using neoprene gasket extrusions. These assemblies are for other functions such as the ability to open/close for ventilation.

2.2.2.4.1 Windshield

Glass only – Glass laminate ranging from 0.578" to 0.623" in thickness intended for installation on the front face of the LRV. Window provides two (2) viewing areas separated by a black paint border. Viewing area 1 is located at the top and contains no tinting. Viewing area 2 is the majority of the laminate and contains a blue gradient sun-band towards the top to reduce immediate sunlight from above while still providing a clear line of sight in front of the operator. Sun-band is also intended to reduce glare. The interior face is laminated with SpallShield for spall prevention. See Figures 2-3 and 7-74. Refer to KI drawing UA09508, Rev. D.

2.2.2.4.2 Bodyside Window #2 (Gasket Mounted)

Glass and Gasket – Glass laminate ranging from 0.363" to 0.389" in thickness with accompanying gasket intended for installation along the side of the LRV. Window is of a single tinted viewing area with vandal film applied on the interior face. Along the perimeter of the window, aluminum foil tape is applied for a moisture barrier. See Figures 2-3 and 7-75. Refer to NASG drawing 750250, Rev. F.

2.2.2.4.3 Bodyside Window w/ Destination Sign (Gasket Mounted)

Glass and Gasket – Glass laminate ranging from 0.363" to 0.389" in thickness with accompanying gasket intended for installation along the side of the LRV. Window consists of two (2) viewing areas with vandal film applied on the interior face. Viewing area 1 is located at the top of the window with no tinting. This area is intended for a destination sign and is separated from viewing area 2 using a black paint border. Viewing area 2 is a majority of the window and contains grey tint. Along the perimeter of the window, aluminum foil tape is applied for a moisture barrier. See Figures 2-3 and 7-75. Refer to drawing NASG 750251, Rev E.

2.2.2.4.4 Door Window (Gasket Mounted)

Glass and Gasket – Glass laminate ranging from 0.363" to 0.389" in thickness with accompanying gasket intended for installation into passenger egress doors of the LRV. Window is of a single viewing area and contains grey tint. Vandal film is applied to the interior face of the laminate. Along the perimeter of the window, aluminum foil tape is applied for a moisture barrier. See Figures 2-3 and 7-75. Refer to NASG drawing 750253, Rev. G.

2.2.2.4.5 Bodyside Window #1 (Gasket Mounted)

Glass and Gasket – Glass laminate ranging from 0.363" to 0.389" in thickness with accompanying gasket intended for installation along the side of the LRV. Window is of a single tinted viewing area with vandal film applied on the interior face. Along the perimeter of the window, aluminum foil tape is applied for a moisture barrier. See Figures 2-3 and 7-75. Refer to NASG drawing 750254, Rev. G.

2.2.2.4.6 Cab Door Window (Framed)

Framed glass – Drop sash window assembly consisting of two (2) 0.239" to 0.250" thick glass laminates, top panel with the ability to slide up and down to open/close the assembly. The top panel is adjustable via two (2) latch sub-assemblies and locks in four (4) positions. Both laminates contain a grey tinted PVB and are protected by a layer of vandal film on the interior face. Along the perimeter of each laminate, aluminum foil tape is applied for a moisture barrier. See Figures 2-3 and 7-77. Refer to NASG drawing 750259, Rev. P.

2.2.2.4.7 Hinged Window RH and LH (Framed)

Framed glass – Hinged window assembly consisting of two (2) 0.363" to 0.389" thick glass laminates; rectangular panel with the ability to rotate open towards the interior side. Intended for the cab compartment, the window assembly allows for adequate ventilation. Both laminates contain a grey tinted PVB and are protected by a layer of vandal film on the interior face. Along the perimeter of each laminate, aluminum foil tape is applied for a moisture barrier. See Figures 2-3 and 7-76. Refer to NASG drawings 750267, Rev. S and 750268, Rev. Q.

2.2.2.5 Rear View Camera

There are four rear view cameras, two mounted on the A-Unit and two on the B-Unit. See Figures 2-3 and 7-78. The rear view cameras are located on both the right and left sides of each cab. These cameras enable the Operator to supervise the loading and unloading at all doorways of the vehicle when the vehicle doors are open and verify that the last door on the train is clear of passengers with the Rear View Monitors that are located on the front pillars in each A and B-Unit. Refer to RTC drawing RTC2254, Rev. D. Refer to Section 3.11 of Section 0200, Car Body of the Heavy Repair Maintenance Manual for paint repairs.

2.2.3 Interior Equipment

See Figures 2-4 through 2-10 and 7-79 through 7-91.

2.2.3.1 Stanchions and Grab Rails

There are several types of stanchions and grab rails per car. See Figures 2-4 and 7-79. The stanchions are mounted to the ceiling and either to a seat back or as part of a windscreen. The grab rails are either mounted in between the stanchions or separately in the articulation and bicycle areas. All stanchions and grab rails function as support bars for personnel and passengers during loading, unloading, stopping, starting and traveling.

2.2.3.2 Passenger Door Pushbutton

There are sixteen passenger door pushbuttons per car, eight in each A and B-Unit. See Figures 2-5, 2-6, 7-80 and 7-81. They are mounted to the windscreen stanchions. A passenger door pushbutton, when activated, opens the nearest doors.

2.2.3.3 Windscreens

There are sixteen windscreens per car. See Figures 2-4, 7-80 and 7-81. There are two located at each of the eight door openings. The windscreens function as barriers to wind and weather when the car doors are open for passenger loading and unloading. Refer to Section 3.11 of Section 0200 Car Body of the Heavy Repair Maintenance Manual for paint repairs and also UER0701, Vandalism Repair / Removal Procedure.

2.2.3.4 Ceiling Panels

There are center ceiling panels, end ceiling panels and side access covers throughout the A and B-Units. See Figures 2-7 and 7-82. The ceiling panels make up the car ceiling. The side access covers allow access to the door equipment and also serve as mounting for the interior cameras, interior speakers, automatic passenger counters, door closing light, door closing chime and door out of service signs. The same numbered ceiling panels are interchangeable. Ceiling panel (4) is unique as it has the shaft opening for the pantograph hand crank on the A-Unit Only. The end ceiling panels near the articulation area are also unique and not interchangeable. Refer to KI drawing UA09259, Rev. G.

2.2.3.5 Return Air Grille

There are two return air grilles per car. See Figures 2-7 and 7-84. They are located one each in the A and B-Units. Air is drawn through the return air grille by the HVAC units from the passenger compartments of the car for re-circulation. The return air grille can be opened by the two latches keyed for maintenance access. There are two additional safety features beyond the latches, a metal catch and two chains. When the catch is disengaged, the grille will hang by the two safety chains. These need to be disengaged for the grille to hang free by its hinge to allow full access to the HVAC unit.

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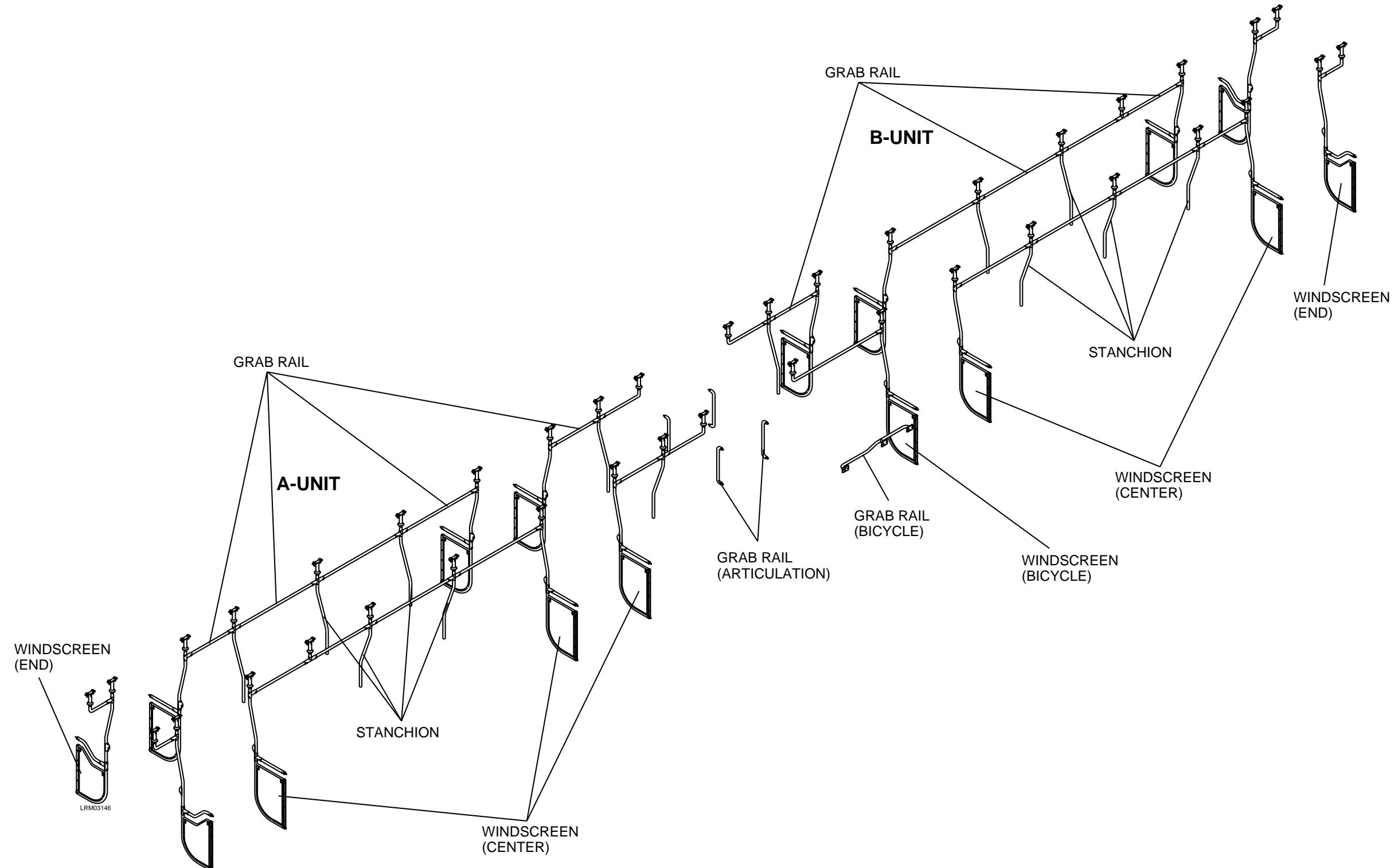


Figure 2-4: Stanchions, Grab Rails and Windscreens

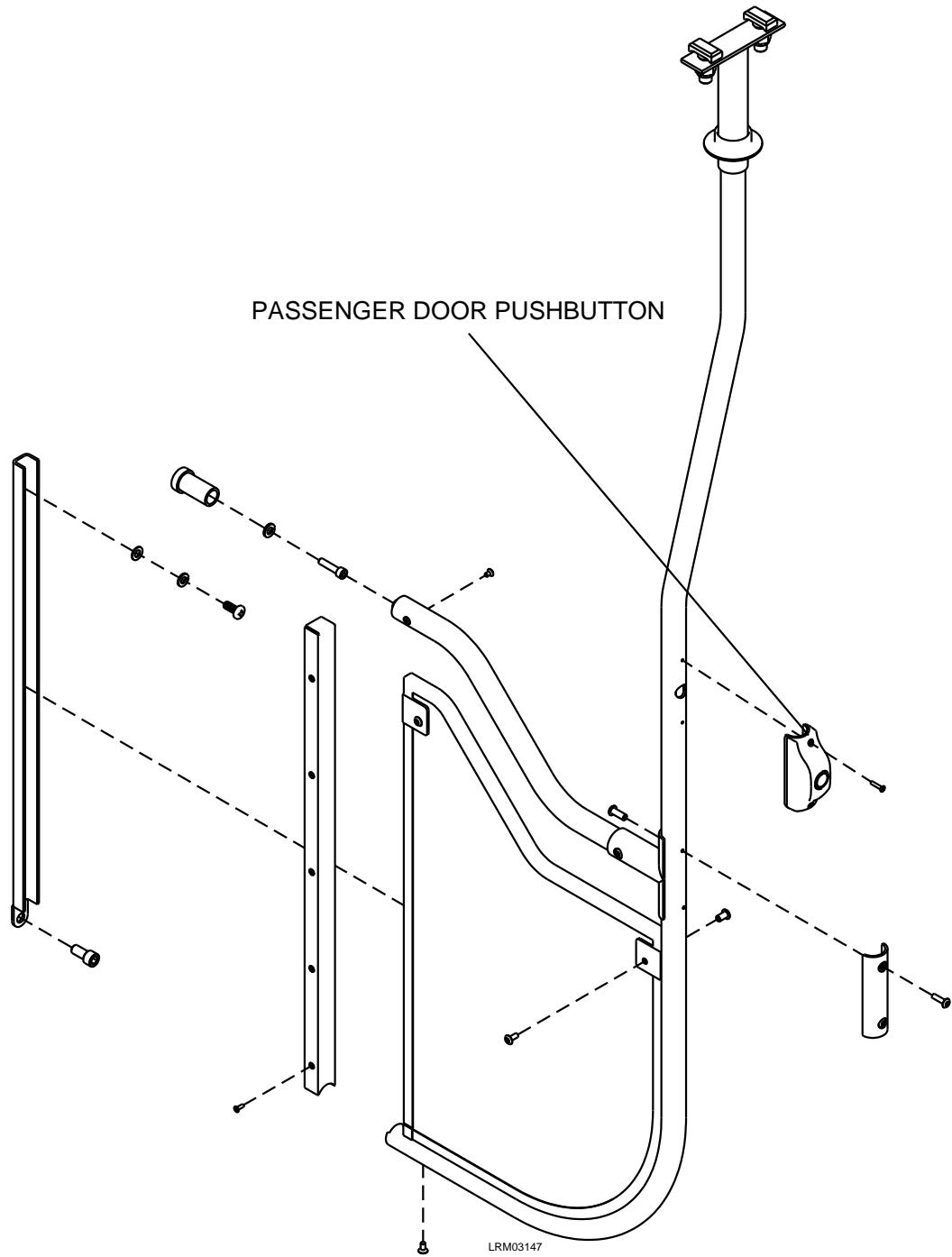


Figure 2-5: Passenger Pushbutton on End Windscreens

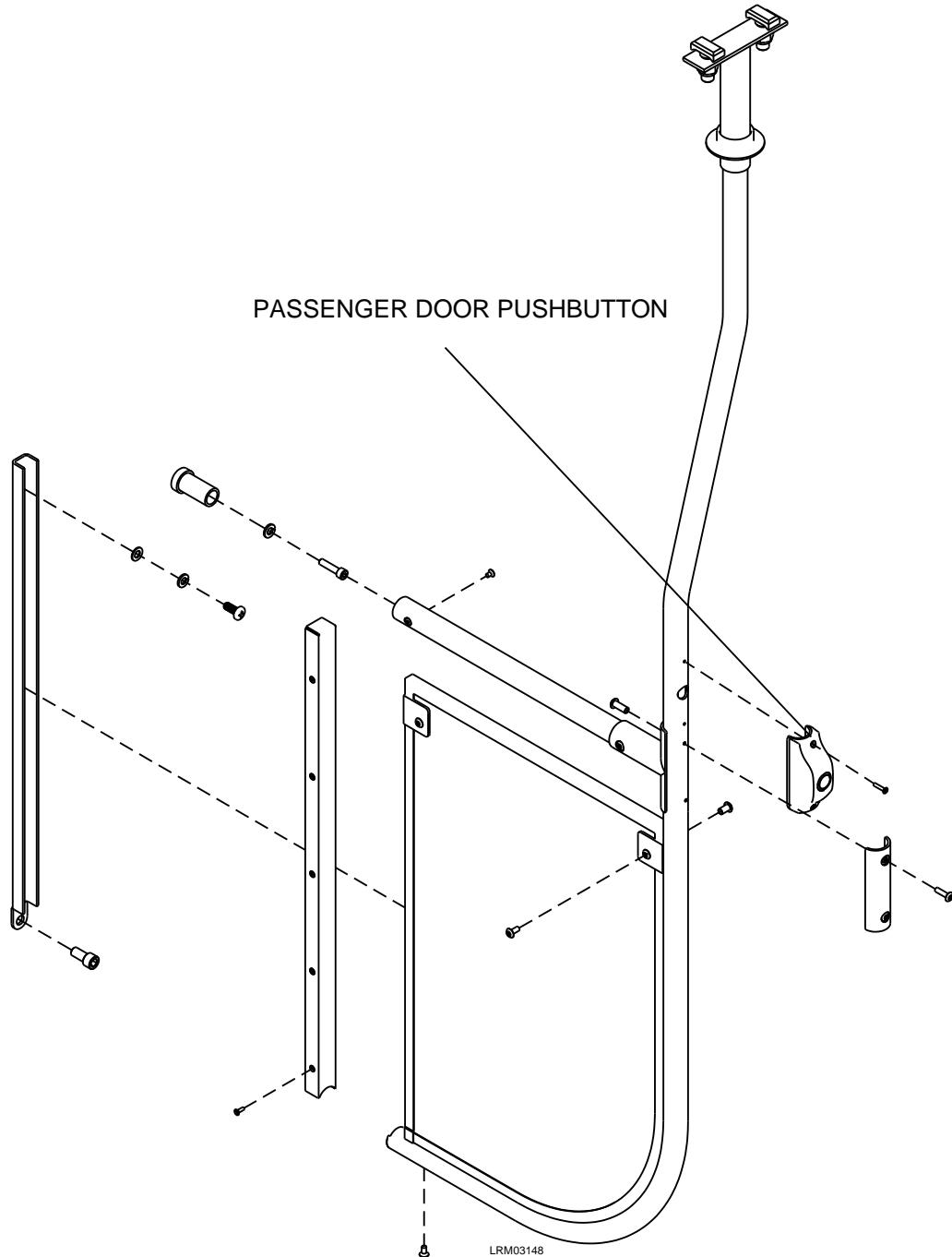


Figure 2-6: Passenger Pushbutton on Center Windscreens

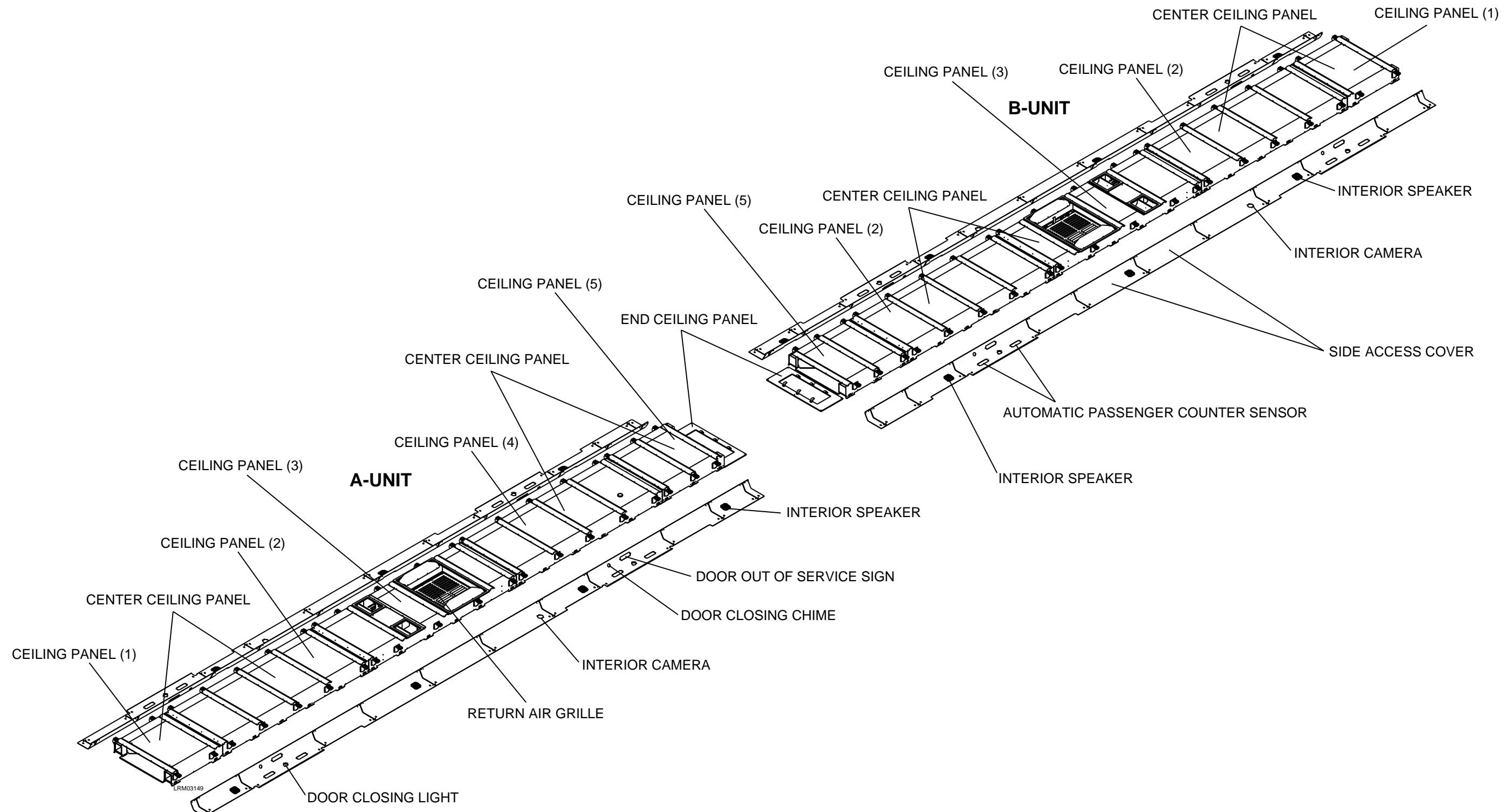


Figure 2-7: Ceiling Panels

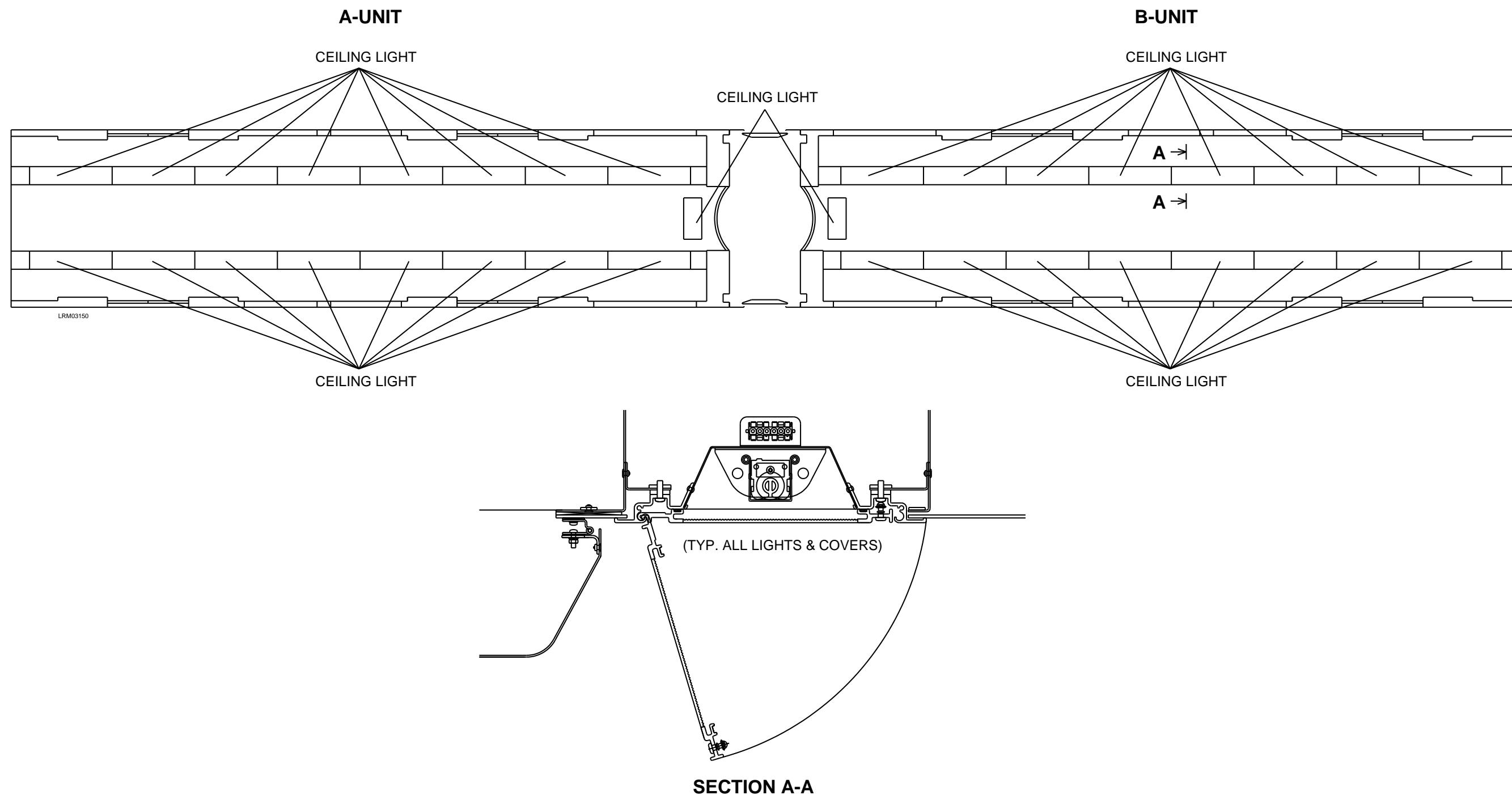


Figure 2-8: Ceiling Lights

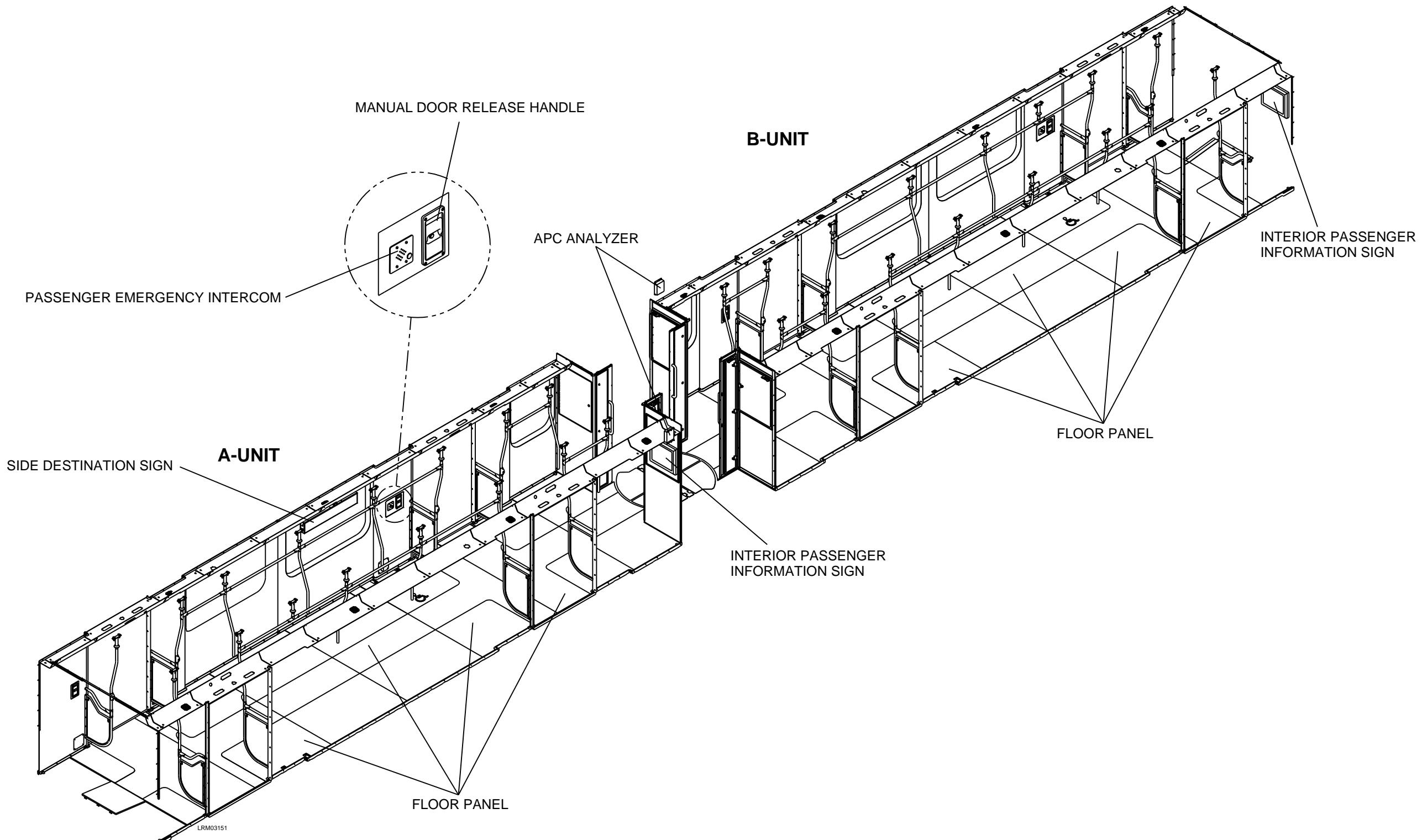


Figure 2-9: Interior Passenger Information Sign, Destination Sign, Passenger Emergency Intercom, APC Analyzer and Floor Panels

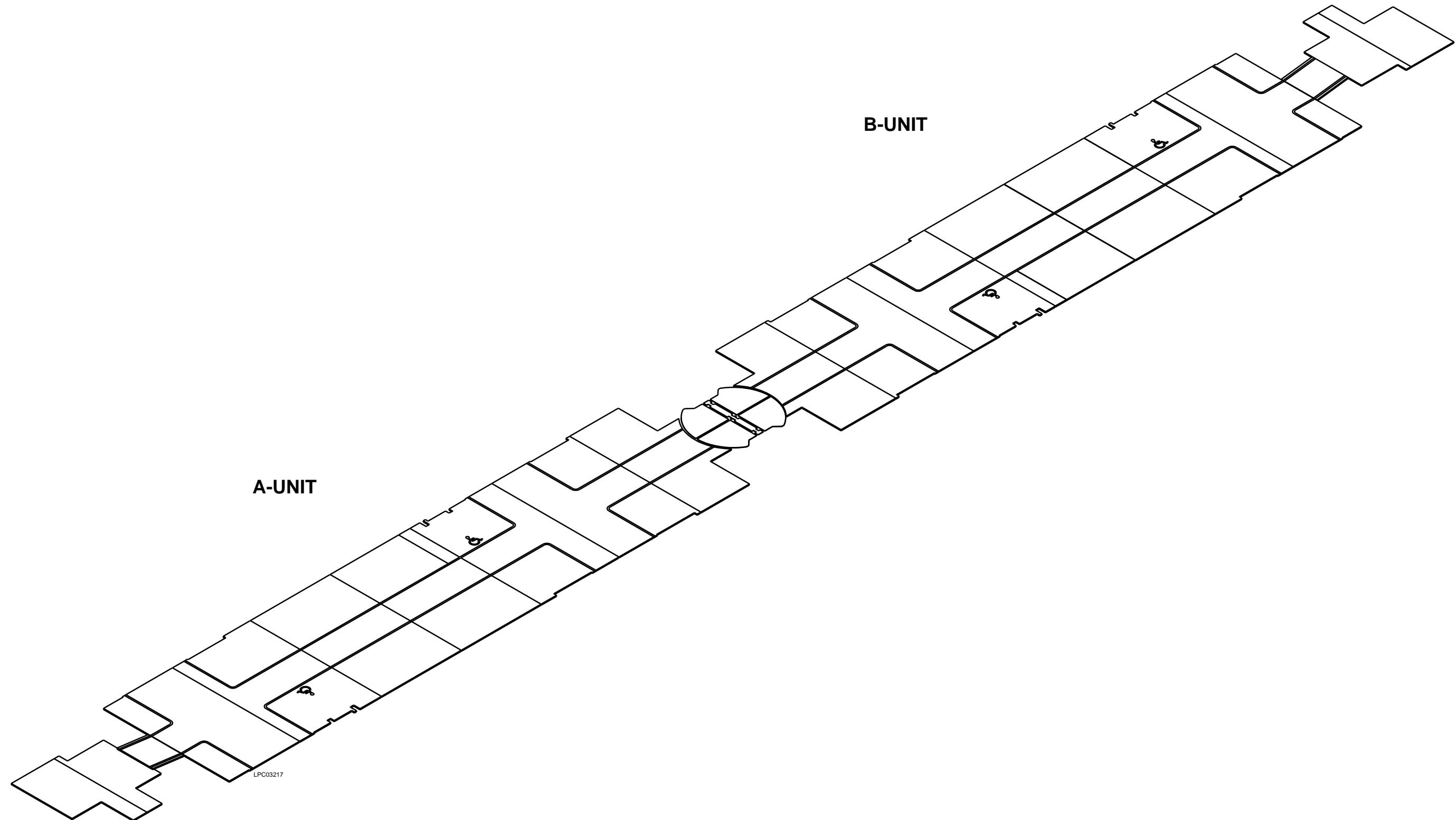


Figure 2-10: Floor Panel Arrangement

2.2.3.6 Ceiling Lights

There are thirty-four ceiling lights per car. See Figures 2-8 and 7-85. There are sixteen ceiling lights in each A and B-Unit and two ceiling lights near the articulation area.

2.2.3.7 Door Indicators

See Figures 2-7 and 7-83.

2.2.3.7.1 Door Out Of Service Sign

There are eight door out of service signs per car. They are located above each door opening. When lit, the door located directly below the lit sign is out of service. See Figures 2-7 and 7-83.

2.2.3.7.2 Door Closing Chime

There are eight door closing chimes per car. They are located above each door opening. The warning chime is used to indicate that the doors are closing after the chime sounds. See Figures 2-7 and 7-83.

2.2.3.7.3 Door Closing Light

There are eight door closing lights per car. They are located above each door opening. The door closing light blinks when the doors are about to close. See Figures 2-7 and 7-83.

2.2.3.8 Automatic Passenger Counter (APC) Sensor

There are sixteen automatic passenger counter sensors per car. See Figures 2-7 and 7-83. Two are located at each of the eight door openings. The automatic passenger counter sensors keep track of the number of passengers entering or leaving any doorway and also tracks what stations are being used the most. Refer to Sections 2.2.3.16 and 7.4.3.8 in this manual section for additional information.

Each vehicle has sixteen sensors; with two sensors per door. IRMA 3D utilizes rapid pulses of laser light using the invisible IR range. As an object passes through the light field, it is reflected back and detected by the sensor. The distance (height) is then calculated by taking the period of time between transmission of the light and the reception of the light pulse by the sensor. This allows IRMA 3D to reliably distinguish people from other objects.

If a sensor is replaced the new sensor must be configured correctly at the door where it is installed. Refer to Section 7.5.3.8.2 of this manual section for sensor configuration. Similarly if a sensor is returned to INIT it is important to inform INIT the door where the sensor was removed.

2.2.3.9 Interior View Camera

There are four interior view cameras per car. See Figures 2-7 and 7-83. Two are located each in the A and B-Unit mounted on the side access covers. The interior view cameras provide security for the passengers.

2.2.3.10 Interior Speaker

There are fourteen interior speakers per car. Seven are located each in the A and B-Unit mounted on the side access covers. See Figures 2-7 and 7-83. The interior speakers provide the passengers a means by which to hear Operator announcements.

2.2.3.11 Passenger Emergency Intercom

There are four passenger emergency intercoms per car. See Figures 2-9 and 7-86. One is located at each of the four wheelchair areas. The passenger emergency intercoms allow the passengers to communicate with the Operator during an emergency situation.

2.2.3.12 Manual Door Release Handle

There are eight manual door release handles per car. See Figures 2-9 and 7-86. They are located at the left side of each door opening. The manual door release handle is used to manually open the adjacent set of doors.

2.2.3.13 Interior Passenger Information Sign

There are four interior passenger information signs per car. See Figures 2-9, 7-87 and 7-88. Two are located near the articulation area and two are mounted on the cab partition wall. The interior passenger information signs displays only the next three stations and the terminal station.

2.2.3.14 Side Destination Sign

There are two side destination signs per car. See Figures 2-9 and 7-89. One each is located at the window near the center doors on each A and B-Unit. Side destination signs are visible from the outside of the car and display the final stop.

2.2.3.15 Floor Panels

The Abrastop™ / Foam Lite system combines the Abrastop™ Floor Covering and an integrated sub-floor of epoxy foam and a bottom layer of fiberglass to provide structural support for passenger load. See Figures 2-9, 2-10 and 7-90. It results in a flooring system that is durable and light-weight. The wheelchair area is designated by a blue background flooring with a white ADA wheelchair symbol incorporated into the floor covering material. Refer to Sections 7.4.3.15 and 7.5.3.15 of this manual section and KI drawing UA09651, Rev. D.

2.2.3.16 APC Analyzer

There are two APC Analyzers per car. See Figure 2-9 and Figure 7-91. One each is located above the windows near the articulation area in the A and B units. The APC Analyzers are the central component of the passenger counting system. The data from each Automatic Passenger Counter (APC) sensor is transferred to the APC Analyzers which, in turn, transfers the data to the COPILOTpc.

The connected sensors record the people passing through the doors (boarding and unboarding) and records the number for each door. This data gets transferred to the analyzer and from the analyzer to the on-board computer (COPILOTpc).

Analyzer A and B are located inside the access panel on the left side, near the articulation locker. If the Analyzer unit needs to be replaced for any reason, it must have the latest firmware loaded.

2.2.4 Seats

There are seats to accommodate 68 passengers. The transverse seating adjacent to the doorway and across from the wheelchair area (four seats per vehicle) is designated seating for passengers with disabilities. See Figure 2-11, Sheets 1 and 2 and 7-92 through 7-97.

2.2.4.1 2P LH & RH 36" Cantilever w/Grab Bar, No Stanchion

The two-passenger cantilever seats with grab bar are fixed seats mounted to the car wall and supported by a cantilever kit. See Figures 2-11 and 7-92. The seat pairs are bolted together using five sets of screws, washers, and nuts. These seats have no moving parts. Each seat pair has a fixed grab bar mounted on the seat back. The seat and back cushions are removable. Refer to Kustom Seating drawings KSU-ASY-007669, Rev. K and KSU-ASY-007670, Rev. K.

2.2.4.2 2P LH & RH 36" Cantilever w/Grab Bar, w/Stanchion

The two-passenger cantilever seats with grab bar and stanchion are fixed seats mounted to the car wall and supported by a cantilever kit. See Figures 2-11 and 7-93. The seat pairs are bolted together using five sets of screws, washers, and nuts. These seats have no moving parts. Each seat pair has a fixed grab bar and stanchion mounted on the seat back. The seat and back cushions are removable. Refer to Kustom Seating drawings KSU-ASY-007671, Rev. K and KSU-ASY-007672, Rev. K.

2.2.4.3 2P LH & RH 34" Cantilever Door Pocket w/Grab Bar, w/Stanchion

The two-passenger cantilever door pocket seats with grab bar are fixed seats mounted to the car wall and supported by a cantilever kit. See Figures 2-11 and 7-94. The seat pairs are bolted together using five sets of screws, washers, and nuts. These seats have no moving parts. Each seat pair has a fixed grab bar and stanchion mounted on the seat back. The seat and back cushions are removable. Refer to Kustom Seating drawings KSU-ASY-007675, Rev. L and KSU-ASY-007676, Rev. L.

2.2.4.4 2P Longitudinal Flip Seat

The two-passenger flip seats are mounted to the floor. See Figures 2-11 and 7-95. The seat is similar in configuration and style to other fixed seats except the bottom portion of the seat is mounted to the seat back on a pivot. This allows the seat bottom to be moved to a vertical position to create space for parking a wheelchair. The seat and back cushions are removable using a safety screwdriver. The flip seat is designed to stay in the last selected position. There is no catch or latch required to keep the seat in that position. Refer to Kustom Seating drawing KSU-ASY-007679, Rev. I.

2.2.4.5 2P LH & RH Cantilever, Reserved

The two-passenger cantilever reserved seats are fixed seats mounted to the car wall and supported by a cantilever kit. See Figures 2-11 and 7-96. The seat pairs are bolted together using five sets of screws, washers, and nuts. These seats have no moving parts. Each seat pair has a fixed grab bar with stanchion mounted on the seat back. The back cushions feature different upholstery depicting a cane, a dog and a crutch. The seat and back cushions are removable. Refer to Kustom Seating drawings KSU-ASY-007871, Rev. F and KSU-ASY-007874, Rev. F.

2.2.4.6 2P LH & RH Sandbox Seat

The two-passenger sandbox seats are fixed seats mounted on a sandbox. See Figures 2-11 and 7-97. The seat pairs are bolted together using five sets of screws, washers, and nuts. These seats have no moving parts. Each seat pair has a fixed grab bar mounted on the seat back. The seat and back cushions are removable. The seat assembly is mounted to the seat box via two front hinges and secured in place by two quarter-turn maintenance locks along the back of the seat. When the two maintenance locks are unlatched the entire seat pair can be rotated forward to access the sand box. Refer to Kustom Seating drawings KSU-ASY-007711, Rev. I and KSU-ASY-007741, Rev. I.

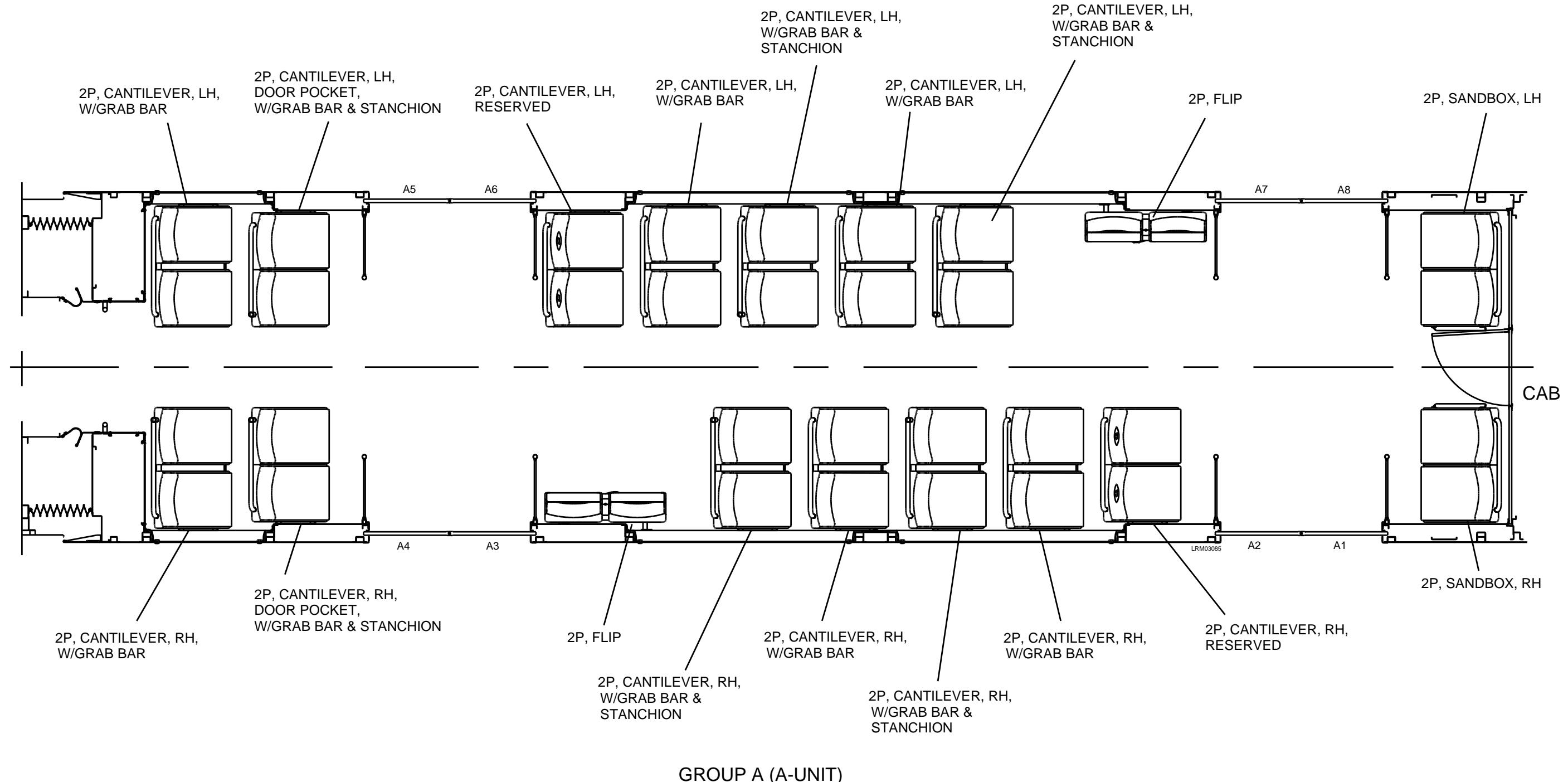


Figure 2-11: Seating Location
(Sheet 1 of 2)

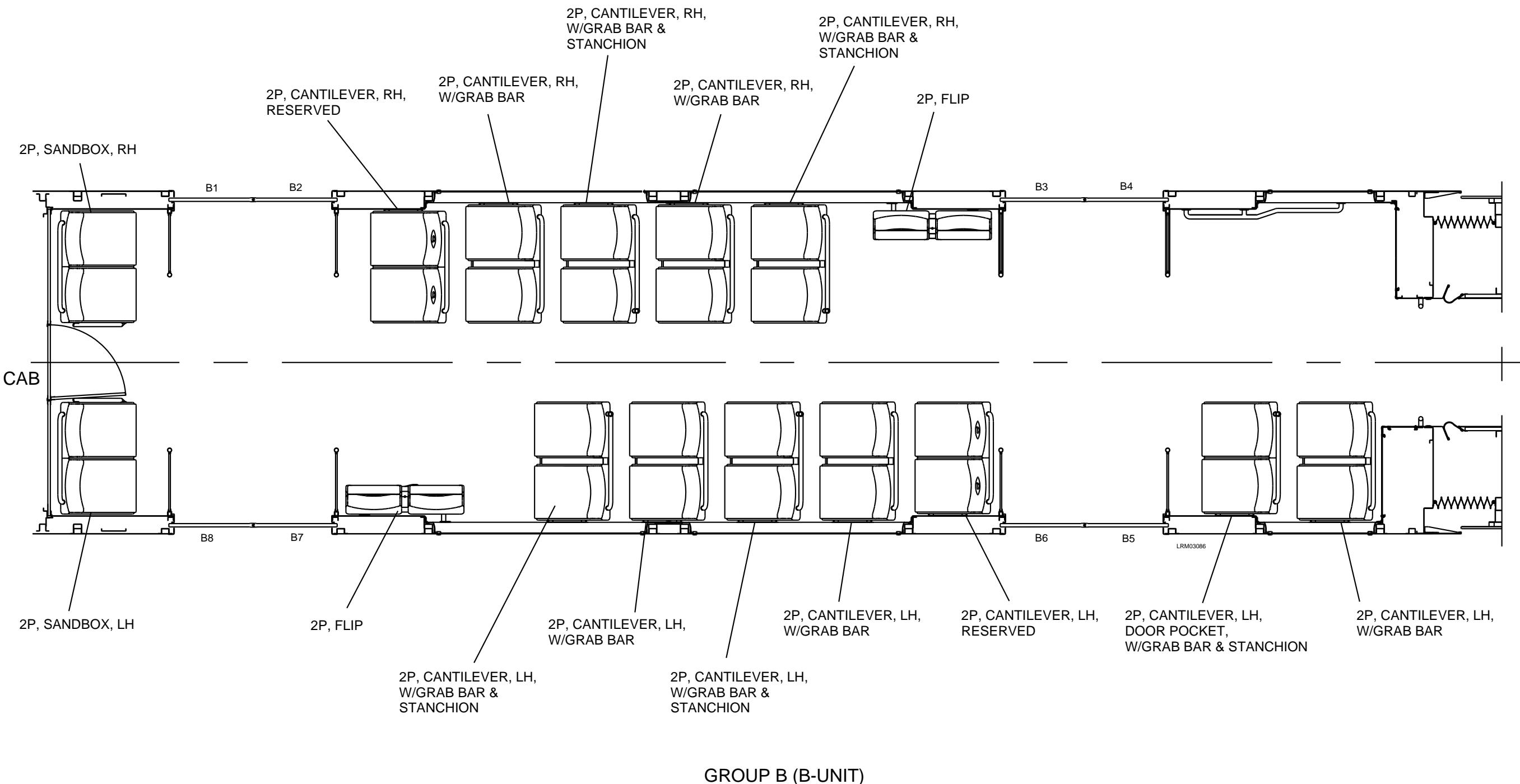


Figure 2-11: Seating Location
(Sheet 2 of 2)

2.2.5 Electric Locker Equipment

There are four electric lockers per car. They are located adjacent to the articulation section. They are the full width of the articulation bulkhead and run from ceiling to floor. The electric lockers function as housing for circuit breakers, convenience outlets and other electronic and emergency equipment. See Figures 2-12 through 2-15 and 7-98 through 7-100.

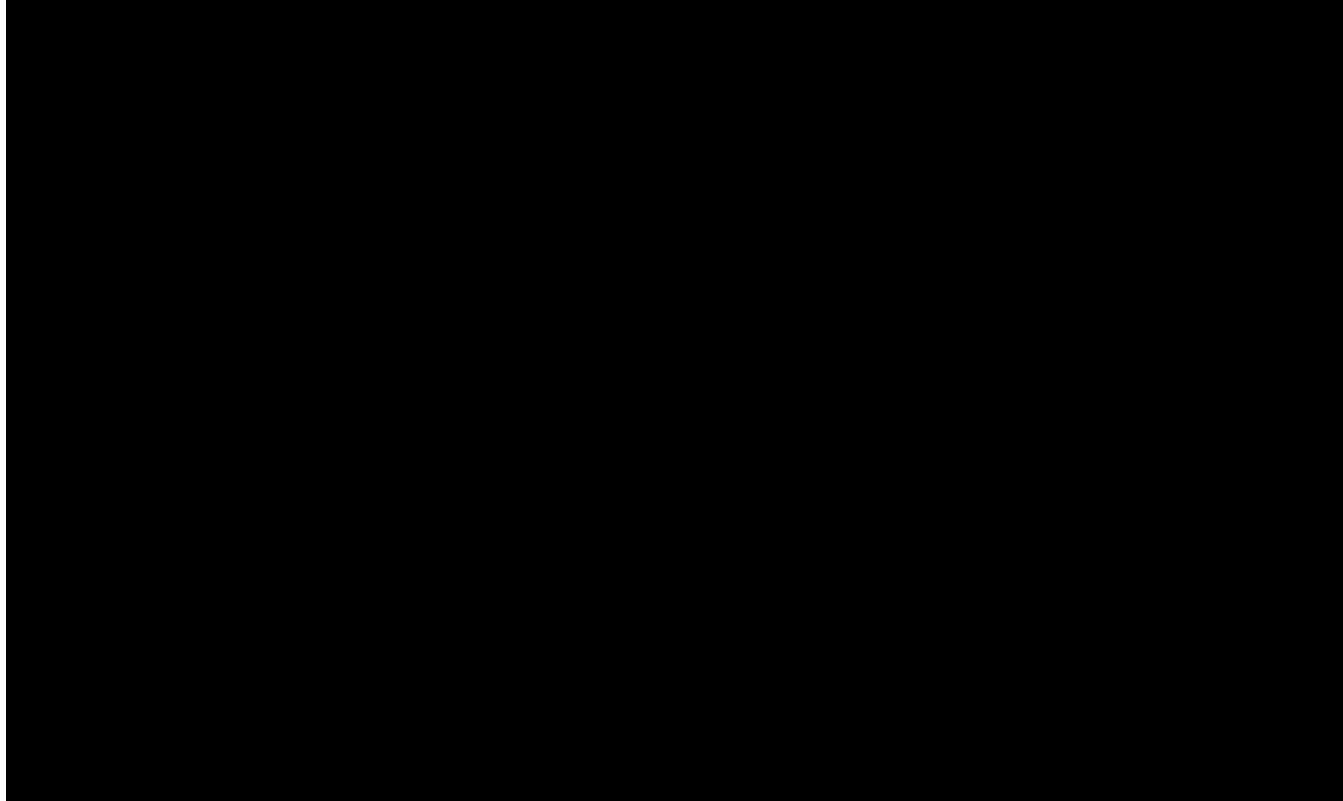


Figure 2-12: Electric Locker Equipment

2.2.5.1 Auxiliary Circuit Breaker

There is one auxiliary circuit breaker located in the A-Unit electric locker. See Figures 2-12, 2-13 and 7-98. The auxiliary circuit breaker provides circuit protection and a power disconnect for the 208VAC three-phase and 120VAC single phase on the AC Circuit Breaker Panel on the B-Unit. For operation of the Auxiliary Circuit Breaker, refer to 200 series system circuits of UER0677 (circuit sheet 204).

2.2.5.2 AC Circuit Breaker Panel

There is one AC circuit breaker panel located in each A and B-Unit electric locker. See Figures 2-12, 2-13, 2-14 and 7-98 and 7-99. The AC circuit breaker panel provides circuit protection and a power disconnect to the 208VAC three-phase and 120VAC single phase circuits on the car. For operation of the AC Circuit Breaker Panel, refer to 200 series system circuits of UER0677 (circuit sheet 204).

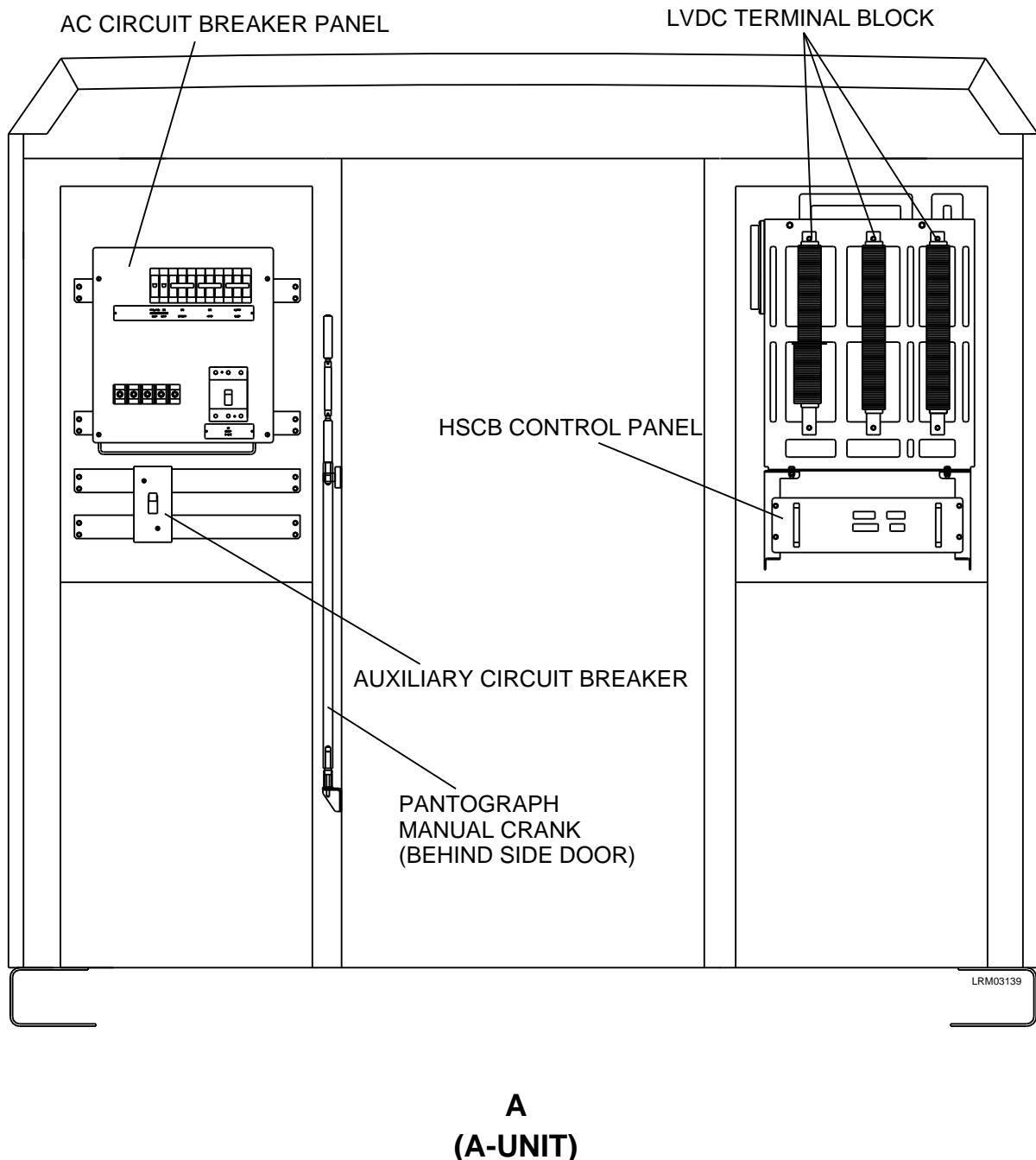
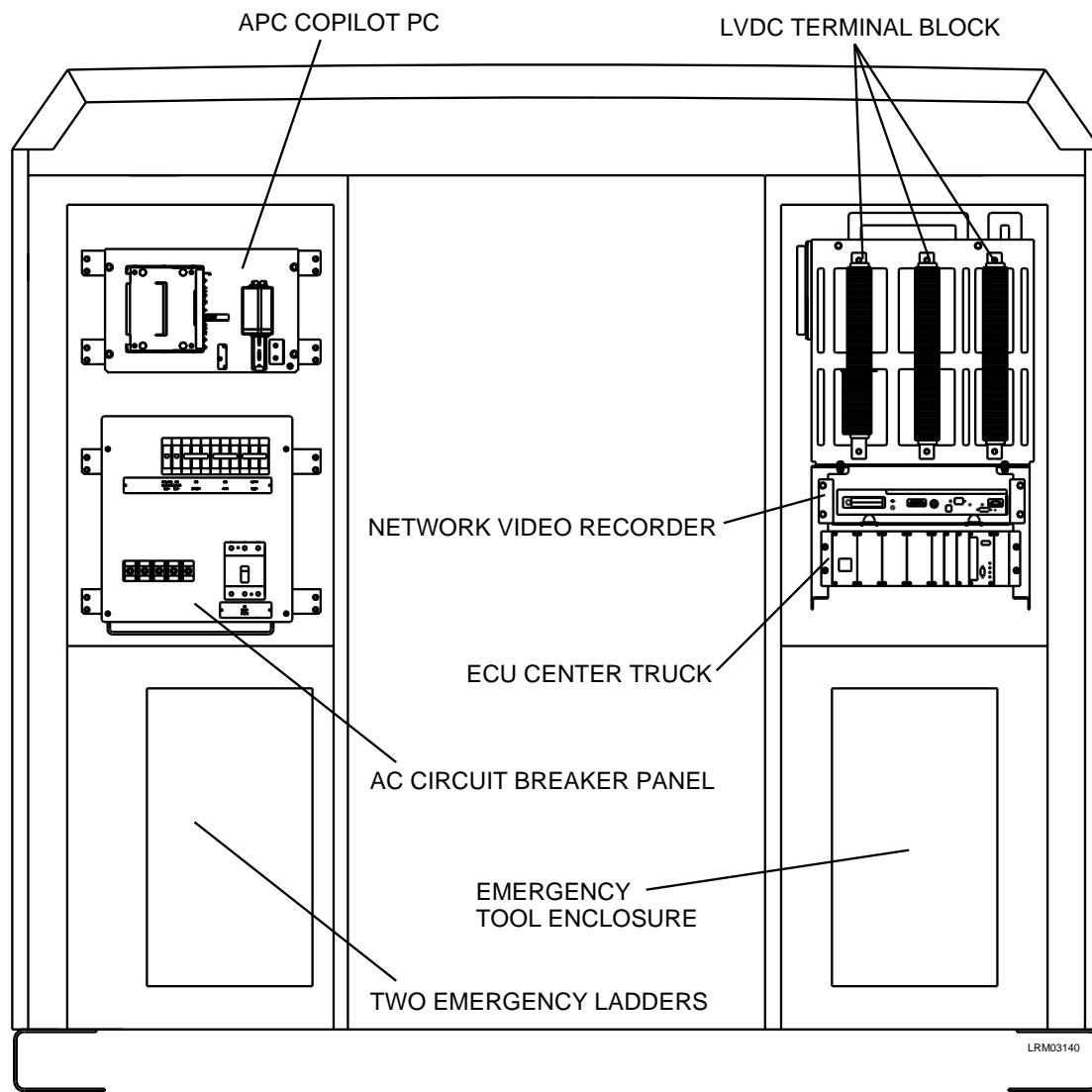


Figure 2-13: Front Articulation Electric Locker Equipment Locations, A-Unit



B
(B-UNIT)

Figure 2-14: Front Articulation Electric Locker Equipment Locations, B-Unit

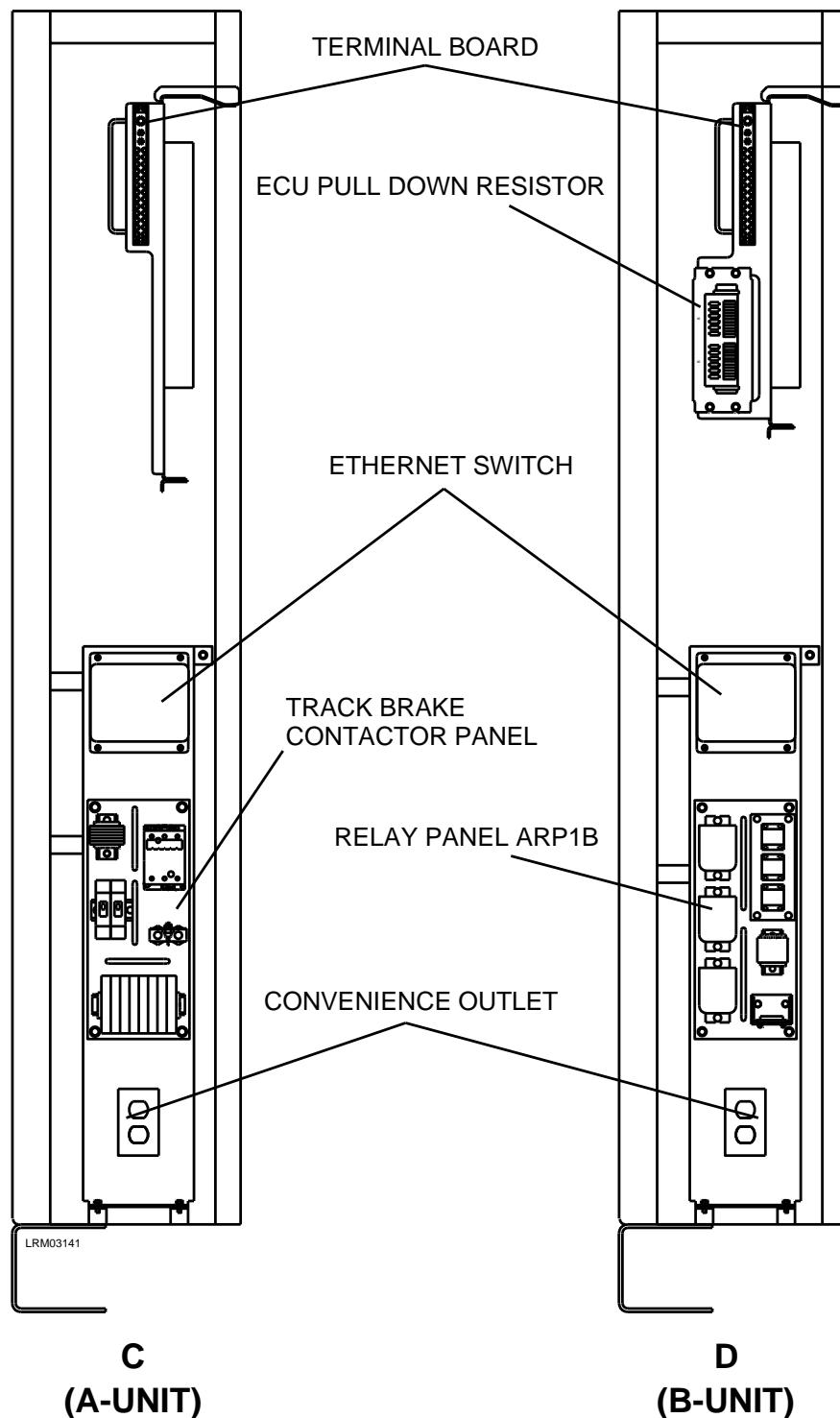


Figure 2-15: Side Articulation Electric Locker, A and B-Unit

2.2.5.3 LVDC Terminal Block

There are three LVDC Terminal Blocks in each A and B-Unit electric locker. See Figures 2-12, 2-13, 2-14 and 7-98 and 7-99. The LVDC Terminal Blocks distribute low voltage wiring between the car body and the articulation.

2.2.5.4 High Speed Circuit Breaker Control Panel

There is one high speed circuit breaker control panel located in the A-Unit electric locker. See Figures 2-12, 2-13 and 7-98. Refer to Section 2.15 of the Propulsion Running Maintenance and Servicing Manual, Section 0700. For operation of the HSCB Control Panel, refer to section 200 series system circuits of UER0677 (circuit sheet 202).

2.2.5.5 APC COPILOTpc

There is one APC COPILOTpc mounted on the APC Rack, which is located in the B-Unit electric locker. See Figures 2-12, 2-14 and 7-99. The APC COPILOTpc receives data from the Automatic Passenger Counter (APC) analyzers and assigns a time and location to the passenger data and stores it for download by the MDS system to the wayside servers for analysis. Refer to Section 8.3 of this manual section.

The COPILOTpc is an on-board computer that is based on Windows XP Embedded technology and is located in the APC System Rack. The COPILOTpc has the same functionality as a PC, with a large number of different interfaces capabilities, and switchable inputs and outputs.

The COPILOTpc tasks are:

- Receive data, station name, and vehicle motion information from the CCU
- Collect count data from analyzers to output to CSV format
- Trigger door open signal based on analyzer/door configuration
- Data transfer between Copilot and vehicle CCU

There are various connections that serve particular purposes which are project dependent.

- The front of the COPILOTpc contains 2 LEDs to indicate the operating mode (Power Status, CPU Status), 2 USB interfaces, 1 connector for monitor (VGA), 1 reset button, and 1 button to shut down the device (Off)
- The rear of the COPILOTpc contains two connectors; a 96-pin VG socket board and antenna connector for WLAN

2.2.5.6 Network Video Recorder (NVR)

There is one network video recorder located in the B-Unit electric locker. See Figures 2-12, 2-14 and 7-99.

2.2.5.7 Electronic Control Unit, Center Truck

There is one electronic control unit, center truck located in the B-Unit electric locker. See Figures 2-12, 2-14 and 7-99.

2.2.5.8 Terminal Board

There is one terminal board located in each A and B-Unit electric locker. See Figures 2-12, 2-15 and 7-100.

2.2.5.9 Ethernet Switch

There is one Ethernet switch located in each A and B-Unit electric locker. See Figures 2-12, 2-15 and 7-100.

2.2.5.10 Track Brake Contactor Panel

There is one track brake contactor panel located in the A-Unit electric locker. See Figures 2-12, 2-15 and 7-100.

2.2.5.11 Convenience Outlet

There is one convenience outlet in each A and B-Unit electric locker. See Figures 2-12, 2-15 and 7-100.

2.2.5.12 Electronic Control Unit Pull Down Resistor

There is one electronic control unit pull down resistor located in the B-Unit electric locker. See Figures 2-12, 2-15 and 7-100.

2.2.5.13 ARP1B Relay Panel

There is one ARP1B relay panel located in the B-Unit electric locker. See Figures 2-12, 2-15 and 7-100.

2.2.5.14 Pantograph Manual Crank

There is one pantograph manual crank located in the A-Unit electric locker. See Figures 2-12 and 2-13.

2.2.5.15 Emergency Ladder

There are two emergency ladders, located in the B-Unit electric locker. See Figure 2-14.

2.2.5.16 Emergency Tool Enclosure

There is one emergency tool enclosure located in the B-Unit electric locker. See Figure 2-14.

2.2.6 Undercar Mounted Equipment

See Figure 2-16, Sheets 1 and 2 and 7-101 through 7-116.

2.2.6.1 Coupler

There is one Coupler mounted on the front of each end of the A and B-Unit and is designed to enable rail vehicles to couple automatically. See Figures 2-16 and 7-102. The coupler enables any one vehicle to connect to and control all other vehicles in a train and provides fully automatic mechanical, electrical, and pneumatic connections between married pairs.

2.2.6.2 TWC Antenna

There are two types of TWC Antennas mounted underneath the car on both the A and B-Unit. See Figures 2-16 and 7-103. The TWC antennas receive and transmit signals to and from the TWC subsystem and TWC loops mounted between the rails.

2.2.6.3 Sanding Device

There are two Sanding Devices mounted underneath the car on both the A and B-Unit. See Figures 2-16 and 7-104. There are four sand ejectors mounted underneath the car on the sandboxes. The sanding equipment is attached to the bottom of the sandbox underneath the car. The sanding system deposits sand immediately in front of the leading wheels on both motor trucks. Sanding is provided during wheel slip-slide, emergency braking (EB) and slide controlled emergency brake (SCEB).

2.2.6.4 Main Reservoir

There are two Main Reservoirs mounted underneath the car on the B-Unit. See Figures 2-16 and 7-105. The main reservoir provides air for the friction brake system, sanding, and leveling valve system.

2.2.6.5 Brake Supply Reservoir

There is one Brake Supply Reservoir mounted underneath the car on the A-Unit and two Brake Supply Reservoirs on the B-Unit. See Figures 2-16 and 7-106. The brake supply reservoirs serve to provide air to the apply and release brake applications.

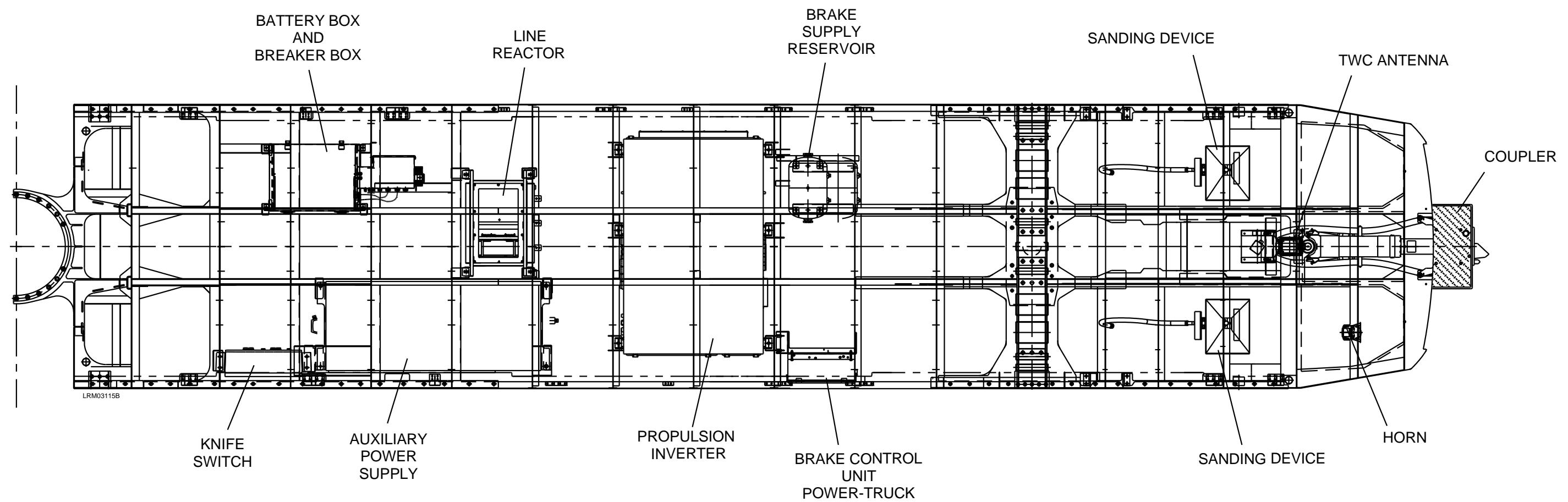
2.2.6.6 Air Compressor

There is one Air Compressor mounted underneath the car on the B-Unit and has the capacity to supply all the pneumatic loads for both the friction brake and air suspension subsystems. See Figures 2-16 and 7-107.

2.2.6.7 Brake Control Unit (Motor Truck)

There is one Brake Control Unit (Motor Truck) mounted underneath the car on each A and B-Unit. The Brake Control Unit (BCU) houses the sensors and pneumatic controls for the electro-pneumatic braking. See Figures 2-16 and 7-108.

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A-UNIT

Figure 2-16: Undercar Mounted Equipment Location
(Sheet 1 of 2)

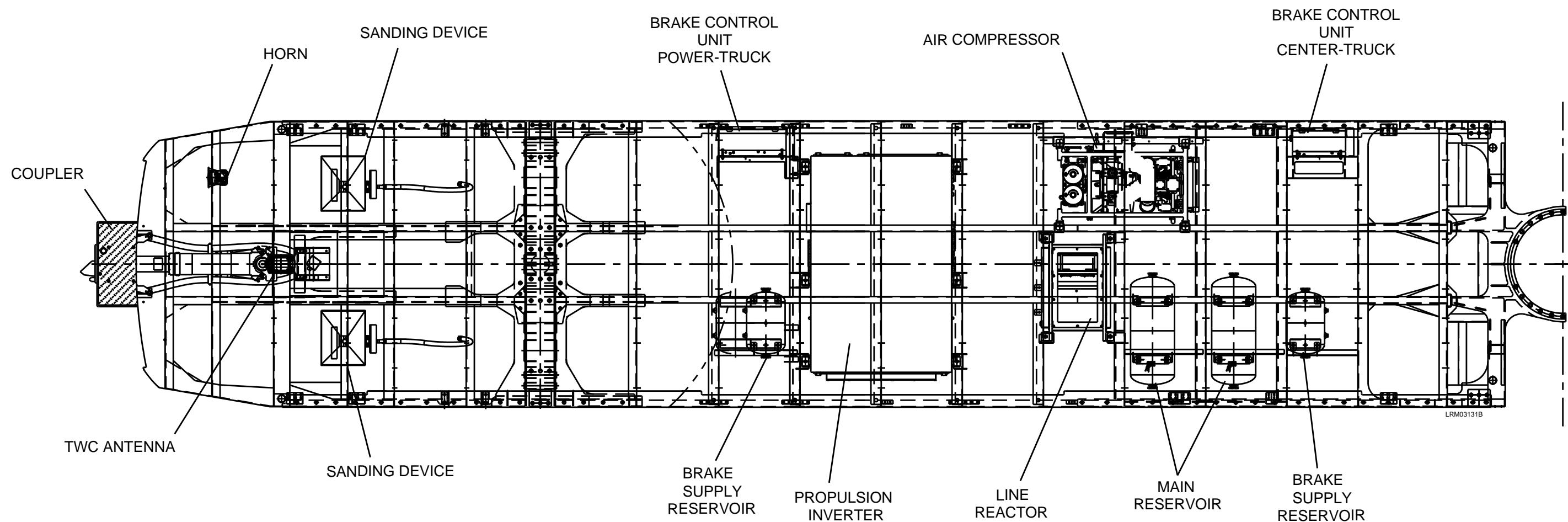
**B-UNIT**

Figure 2-16: Undercar Mounted Equipment Location
(Sheet 2 of 2)

2.2.6.8 Brake Control Unit (Center Truck)

There is one Brake Control Unit (Center Truck) mounted underneath the car on the B-Unit. The Brake Control Unit (BCU) houses the sensors and pneumatic controls for the electro-pneumatic braking. See Figures 2-16 and 7-109.

2.2.6.9 Auxiliary Power Supply

There is one Auxiliary Power Supply mounted underneath the car on the A-Unit. It functions to supply 120 Vac, 208 Vac and 28.5 Vdc battery. See Figures 2-16 and 7-110.

2.2.6.10 Battery / Battery Circuit Breaker Box

There is one Battery / Battery Circuit Breaker Box mounted underneath the car on the A-Unit, which is capable of being opened, to provide accessibility to all battery cells for inspection and servicing. See Figures 2-16, 7-111 and 7-112.

2.2.6.11 Propulsion Inverter

There is one Propulsion Inverter mounted underneath the car on each A and B-Unit. The Propulsion Inverter controls all power to the traction motors during acceleration and braking. See Figures 2-16 and 7-113.

2.2.6.12 Line Reactor

There is one Line Reactor mounted underneath the car on each A and B-Unit. See Figures 2-16 and 7-114. The line reactor provides impedance to reduce the generated harmonics and is cooled by natural convection. The operation of the inverter can create harmonic currents in the rails that can adversely impact the signaling system equipment through conducted and inductive electromagnetic emissions. The line reactor, along with the inverters and filter capacitors, make up a filter which reduces the effect of these harmonics on track signaling.

2.2.6.13 Knife Switch

There is one Knife Switch mounted underneath the car on the A-Unit. See Figures 2-16 and 7-115. The knife switch is a four position switch used to disconnect the main power supply (overhead catenary) from the propulsion and/or auxiliary systems. The positions are run, auxiliary, off and shop power.

2.2.6.14 Horn

There is one Horn mounted underneath the car on each A and B-Unit. The horn, when activated, is used to sound for alerts and emergency. See Figures 2-16 and 7-116.

2.2.7 Roof Mounted Equipment

See Figure 2-17 and 7-117 through 7-130.

2.2.7.1 High Speed Circuit Breaker (HSCB)

The HSCB is located on the roof of the A-Unit. See Figures 2-17 and 7-117. This device provides rapid interruption of the 750 volt primary supply to the vehicle when tripped (at 3200 amps) by an overcurrent fault. A two-part water and dust proof enclosure provides total electrical isolation of the breaker.

2.2.7.2 Lightning Arrestor

The Lightning Arrestor is located on the roof of the A-Unit near the articulation section. The lightning arrestor contains a Metal Oxide Varistor (MOV) to absorb energy from high energy impulses such as lightning. See Figures 2-17 and 7-118.

2.2.7.3 Brake Resistor

There is one Brake Resistor located on the roof of each A and B-Unit. See Figures 2-17 and 7-119. These air-cooled brake resistors have stainless steel resistive elements that are used to dissipate the energy stored in the filter capacitors during dynamic braking. Each brake resistor is provided with a perforated cover and sides to prevent debris from entering the resistors along with a solid metal heat shield to prevent heat from being transmitted to the roof of the LRV.

2.2.7.4 Pantograph

The Pantograph is located on the roof of the A-Unit near the articulation section. See Figures 2-17 and 7-120. The pantograph provides power from the Overhead Contact System (OCS) to the car and can be automatically raised and lowered from the cab and also manually raised and lowered using the pantograph hand crank in the ceiling of the A-Unit.

2.2.7.5 Auxiliary Fuse Box

The Auxiliary Fuse Box is located on the roof of the A-Unit near the pantograph. The auxiliary fuse box contains the 175A fuse for the auxiliary power supply. See Figures 2-17 and 7-121.

2.2.7.6 Heating, Ventilation and Air Conditioning (HVAC) Unit

There is one HVAC Unit located on the roof of each A and B-Unit adjacent to the brake resistors. See Figures 2-17 and 7-122. This unit has the necessary elements to make the functions of the ventilation, heating and cooling of passenger areas. Each individual HVAC unit is secured to the car body roof mounts and sealed into place; it requires only connection to the car electrical system for start-up and operation. The HVAC unit consists of an all stainless steel support frame, with stainless steel walkable covers (with the exception of the grills over the condenser coils and condenser fan). The unit is divided into two major halves, the compressor-condenser section and the evaporator section.

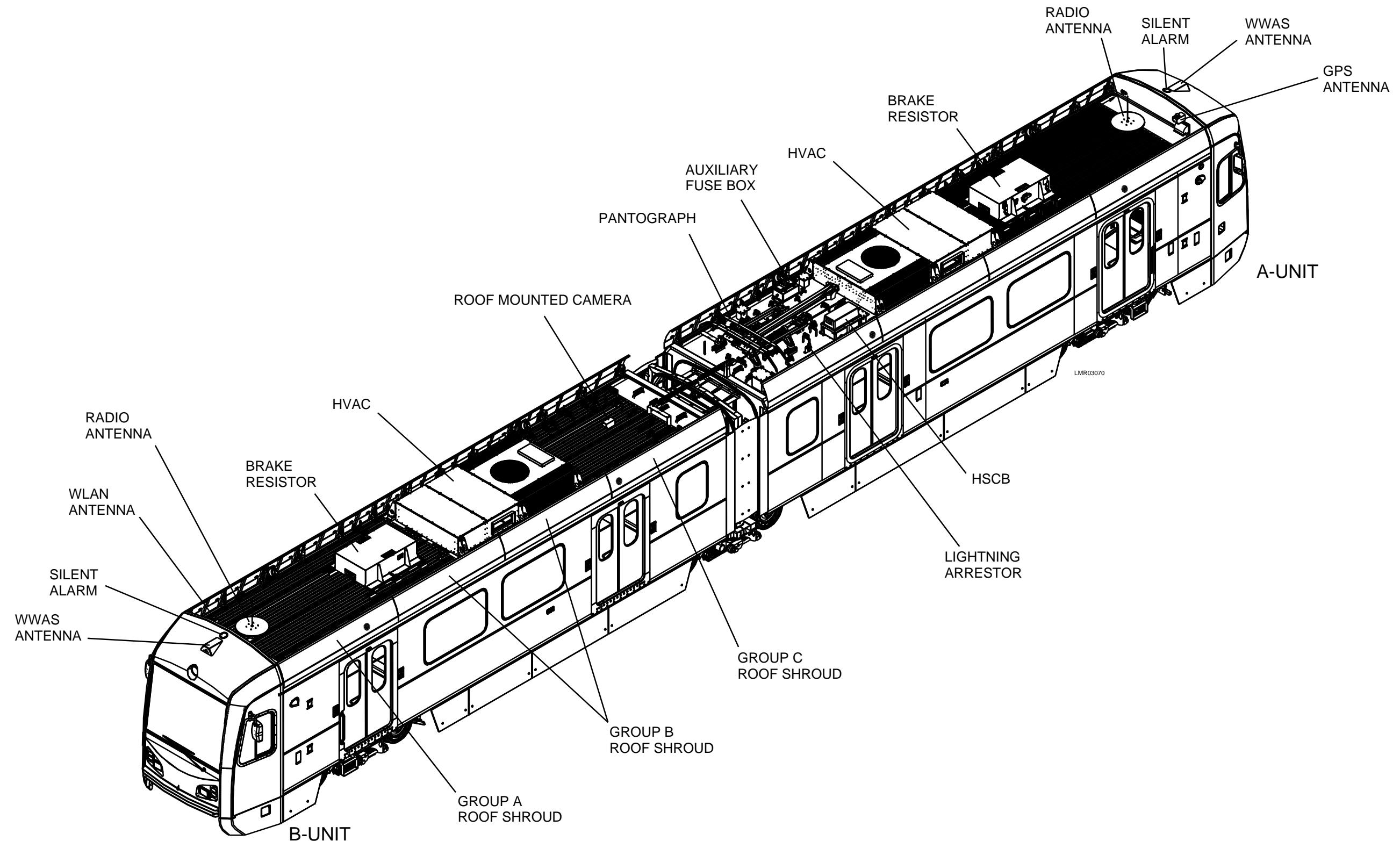


Figure 2-17: Roof Mounted Equipment Location

2.2.7.7 Roof Shrouds

There are three types of Roof Shrouds on the roof of each A and B-Unit. See Figures 2-17 and 7-123 through 7-125. The Roof Shrouds are attached to the roof mounted brackets which are welded to the roof. The Shrouds permit water to run-off and sufficient air-flow for proper equipment cooling.

2.2.7.8 Silent Alarm

There is one Silent Alarm located on the roof of each A and B-Unit above the cab. See Figures 2-17 and 7-126. This alarm is a flashing amber colored LED that functions as an externally visible indication that the silent alarm has been activated from the cab console. This alarm is visible from above the vehicle at a distance of 500 feet.

2.2.7.9 Radio Antenna

There is one Radio Antenna located on the roof of each A and B-Unit. See Figures 2-17 and 7-127. The Radio Antenna is located adjacent to the Global Positioning System (GPS) antenna on the A-Unit and adjacent to the WLAN antenna on the B-Unit. It is a small whip antenna fixed to a perpendicular ground plane. The radio antenna is connected to the I-com radio used for the train Operators communications.

2.2.7.10 GPS Antenna

The GPS Antenna is located on the roof of the A-Unit adjacent to the radio antenna. See Figures 2-17 and 7-128. The GPS Antenna is a small rounded dome antenna that provides the LRV with location data. The GPS antenna continuously receives a satellite signal when available. The collected data provides the LRV with current location and time that is then distributed to onboard subsystems via the Vehicle Management System.

2.2.7.11 WLAN Antenna

The WLAN Antenna is located on the roof of the B-Unit adjacent to the radio antenna. See Figures 2-17 and 7-129. The WLAN antenna is a small rounded dome antenna that provides wireless connectivity from the LRVs Ethernet network to the wayside. This antenna is connected to a wireless access point on the LRV that allows the LRV to upload/download data to designated access points on the wayside.

2.2.7.12 Wayside Worker Alert System (WWAS) Antenna

There is one WWAS Antenna on the roof of each A and B-Unit adjacent to the silent alarm. See Figures 2-17 and 7-130. This antenna sends and receives signals to the WWAS to alert the train Operator with an audible and visual notification. The WWAS train unit communicates with other WWAS devices for alarms such as track worker, high rail and speed restriction.

2.2.7.13 Roof Mounted Camera

There is one Roof Mounted Camera located on the B-Unit roof. See Figure 2-17 and 7-131. The roof mounted camera provides footage of proper pantograph contact with the overhead catenary.

NOTE: Not all vehicles have a roof mounted camera, however, ALL vehicles are wired to accept a roof mounted camera.

This camera is physically the same as the Interior Camera.

2.2.8 Articulation Section

See Figures 2-18 and 7-132 through 7-136.

The articulation is located at the center of the LRV and mounted on the center truck bolster. The articulation serves as a flexible connection between the A and B-Unit which enables the LRV to travel on horizontally and vertically curved track.

2.2.8.1 Ceiling Panels

There are three ceiling panels in the articulation. One center panel and two outer panels make up the ceiling. See Figures 2-18 and 7-132.

2.2.8.2 Side Panels

There are two side panels with inspection covers (for Cars 1001 through 1028 only) and flexible rubber panels in the articulation. See Figures 2-18 and 7-133.

2.2.8.3 External Panels

There are three external panels on each side of the articulation. These panels protect the bellows from track debris. See Figures 2-18 and 7-133.

2.2.8.4 Turntables

There are four turntables that serve as a floor for the articulation. They are secured to the articulation middle frame. The turntables are level with the floors in the A and B-Units. See Figures 2-18 and 7-134.

2.2.8.5 Rub Plates

There are ten rub plates. The turntables rest and rotate on the rub plates. See Figures 2-18 and 7-134.

2.2.8.6 Bellows Assembly

There are two bellows assemblies mounted on the articulation middle frame on the A and B-Unit ends. See Figures 2-18, 7-132 and 7-134. The bellows are seated over a flange and secured by a turnbuckle. The turnbuckles are accessible once the turntables are removed. The bellows encircle the articulation and provide weather protection.

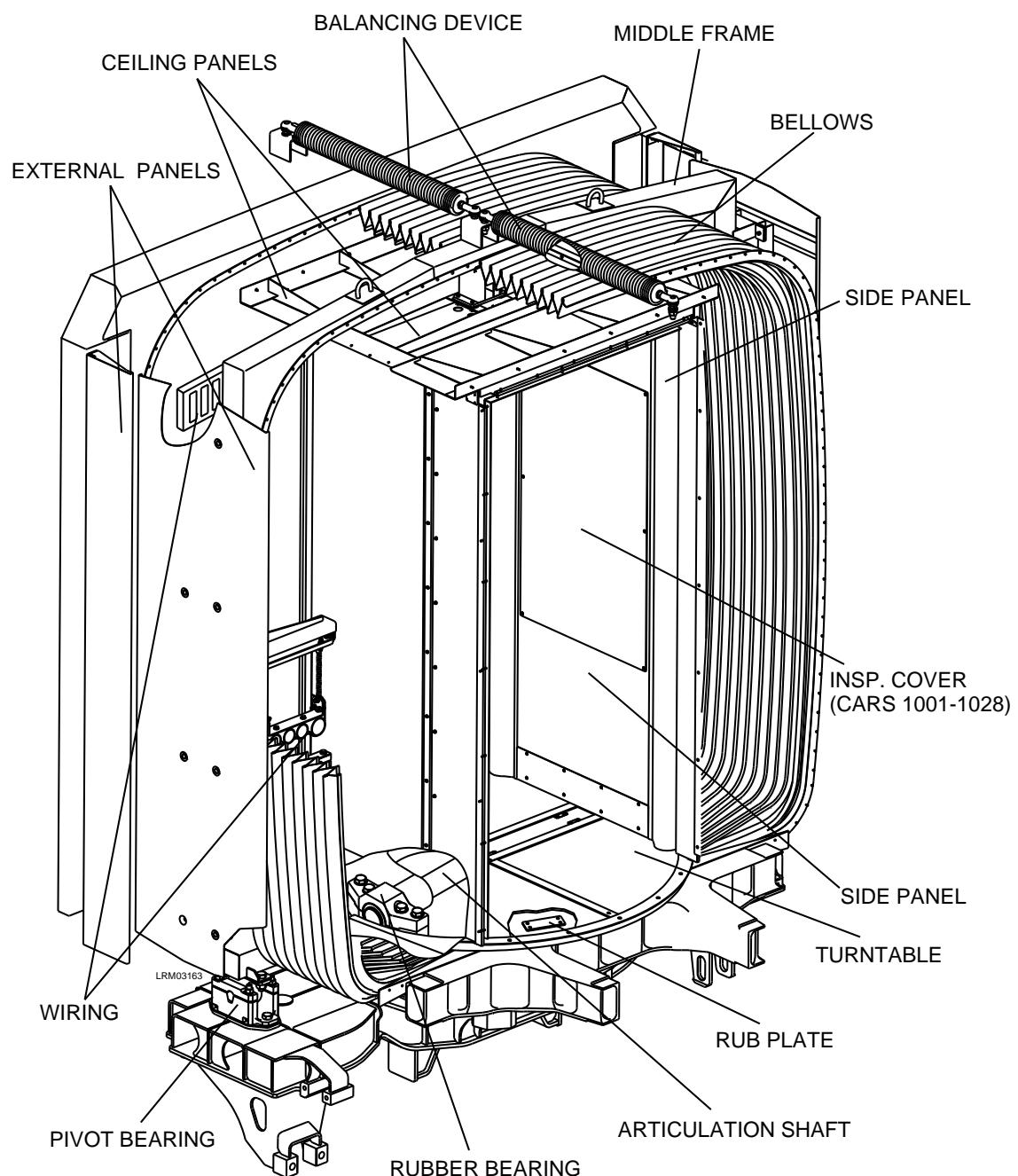


Figure 2-18: Articulation Equipment Locations

2.2.8.7 Articulation Middle Frame and Pivot Bearing Assembly

Two pivot bearing assemblies are mounted between the articulation middle frame and the center truck bolster. Each assembly consists of bearing supports, a pivot shaft and two bearing caps. The pivot shafts provide free movement along the horizontal axis. See Figures 2-18 and 7-135.

2.2.8.8 Articulation Shaft and Rubber Bearing

The articulation shaft and rubber bearings are mounted to the B-Unit arm. The A-Unit arm mounts to the slewing bearing. The articulation connection provides free movement in the circular direction (yaw) around the vertical axis. See Figures 2-18 and 7-135.

2.2.8.9 Balancing Device Assembly

Two balancing device assemblies are mounted between the A-Unit and B-Unit ends and the articulation middle frame. Together, the assemblies dampen the oscillations at the top of the articulation joint along the horizontal axis (pitch). See Figures 2-18 and 7-133.

2.2.8.10 Articulation Wiring

The articulation wiring is mounted on both sides of the articulation connecting the A and B-Unit. Articulation wiring has both low and high voltage lines. See Figures 2-18 and 7-136.

CHAPTER 3.0

SPECIAL TOOLS AND MATERIALS

3.1 Introduction

Table 3-1 lists the special tools or materials required for servicing the Car Body and Articulation equipment. Suitable equivalents, if available, may be substituted.

3.2 Special Tools

Table 3-1. Special Tools & Materials

Special Tools & Materials	Specification
Degreaser, cleaner	Baultar Premium
Graffiti cleaner	BAM20 CR 3001 or Soy-It
Lubricant grease	Lubriplate 110
Key lock spray	Super-Lube Dri-Film Lubricant Spray (part no. 11016)
Lubrication grease	Low-Temperature Lubrication Grease OPTITEMP TT1 dark brown (article no. 1-4931-305612)
Sealant	Bostik 70-01A
Sealant	Silicone Sealant KE3483B
Adhesive	Bostik 70-08A
Lubrication Grease	CRC Electrical Silicone Lubricant
Butyl Tape	EP7313 13 4119
Touchit Display	TCH01T000000/005
Touchit Bracket	CAB000003220/001
CanUSB Interface	PCH100000210/001
CanUSB Cable	PCH000001133/004
Sealant	Sikaflex-221
Sealant	Sikaflex 221 (Gray)
Sealant	Bostik 70-03 (Black)
Sealant	Loctite 243
Scotchbrite Pad	3M Maroon
Sealant	Loctite 242
Activator	Sika Activator UH-2 LUM
Adhesive	3M Neoprene Adhesive (3M 1099 or equivalent)

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CHAPTER 4.0

SCHEDULED MAINTENANCE TASKS

4.1 Introduction

This chapter provides scheduled maintenance tasks in the form of a quick reference table. A thorough visual inspection should be performed before proceeding. Obvious malfunctions from damage observed during the visual inspection are to be corrected.

4.2 Scheduled Maintenance Index

Table 4-1 is a scheduled maintenance index, which lists maintenance intervals and each maintenance task for the Car Body and Articulation equipment. The reference column indicates the section of this manual that details these maintenance procedures.

Table 4-1. Scheduled Maintenance

Maintenance Interval	Part Description	Scheduled Maintenance Task	Section 0200 Car Body Running Maintenance & Servicing Manual Section Reference
Daily	Operator's Seat	Operate seat through a full functional test. Make sure all seat controls operate properly	5.3.1.3.1
Daily	Operator's Seat	Inspect seat cushions for condition and cleanliness	5.3.1.3.2
Daily	Cab Light	Functionally test the Cab Light for proper operation	5.3.1.5 & Section 0600
Daily	Cab Console Light	Functionally test the Cab Console Light for proper operation	5.3.1.6 & Section 0600
Daily	Front Destination Sign	Visually inspect all signs	5.3.1.12
Daily	Wayside Worker Alert System	Visually inspect for damage	5.3.1.35
Daily	Windows	Wipe clean window assembly	5.3.2.5.1
Daily	Windows	Visually inspect window assembly	5.3.2.5.2
Daily	Windows	Visually inspect gaskets for damage	5.3.2.5.3
Daily	Grab Rails	Inspect for loose or missing hardware and clean	5.3.3.1
Daily	Side Destination Signs	Visually inspect for defective LED's	5.3.3.7
Weekly	Floor Panels	Clean floor panels (Abrastop™)	5.3.3.8
10,000 miles	Operator's Seat	Clean seat assembly	5.3.1.3.3
10,000 miles	Operator's Seat	Inspect seat for loose or missing fasteners	5.3.1.3.4

Table 4-1. Scheduled Maintenance (cont'd.)

Maintenance Interval	Part Description	Scheduled Maintenance Task	Section 0200 Car Body Running Maintenance & Servicing Manual Section Reference
10,000 miles	Windshield Sun Shade	Visually inspect for rips, holes, loose hardware, proper operation and alignment	5.3.1.7
10,000 miles	Side Window Sun Shade	Visually inspect for rips, holes, loose hardware, proper operation and alignment	5.3.1.7
10,000 miles	Windshield Wiper	Inspect wiper arm flex	5.3.1.8
10,000 miles	Electronic Control Unit	Visually inspect for damage and loose connectors	5.3.1.20.10 & Section 1300
10,000 miles	Fire Extinguisher	Visually inspect for damage	5.3.1.23
10,000 miles	Cab Camera	Visually inspect for loose components. Clean lens of camera	5.3.1.25
10,000 miles	Forward View Camera	Visually inspect for loose components. Clean lens of camera	5.3.1.26
10,000 miles	Rear View Monitors	Visually inspect for loose components. Clean screen of displays	5.3.1.27
10,000 miles	Ethernet Switches	Visually inspect for loose components and secure panel mounting hardware	5.3.1.30
10,000 miles	Ethernet Switch (camera)	Visually inspect for loose components and secure panel mounting hardware	5.3.1.31
10,000 miles	Ethernet Switch (wireless)	Visually inspect for loose components and secure panel mounting hardware	5.3.1.32
10,000 miles	12Vdc Power Supply	Visually inspect for loose components and secure panel mounting hardware	5.3.1.34
10,000 miles	Wayside Worker Alert System	Test function of unit	5.3.1.35
10,000 miles	DC / DC Converter	Visually inspect for loose components and secure panel mounting hardware	5.3.1.37
10,000 miles	HSC-V Control Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.38
10,000 miles	Horn Controller Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.40
10,000 miles	Exterior Mirror	Visually inspect for damage, cracked glass and loose hardware	5.3.2.3
10,000 miles	Cab Hinged Window	Operate window to ensure smooth movement	5.3.2.5.2
10,000 miles	Rear View Camera	Visually inspect for damage and dirt	5.3.2.6 & Section 1900
10,000 miles	Stanchions	Visually inspect for loose components and secure mounting hardware	5.3.3.1
10,000 miles	Windscreens	Visually inspect for loose components and secure mounting hardware	5.3.3.2
10,000 miles	Interior View Camera	Visually inspect the lens for cracks and scratches	5.3.3.5
10,000 miles	Passenger Emergency Intercom	Verify operation	5.3.3.6

Table 4-1. Scheduled Maintenance (cont'd.)

Maintenance Interval	Part Description	Scheduled Maintenance Task	Section 0200 Car Body Running Maintenance & Servicing Manual Section Reference
10,000 miles	Seats	Functionally check flip seat operation. Seat must stow correctly and lower correctly with five pound force	5.3.4
10,000 miles	Seats	Clean the upholstery	5.3.4.1
10,000 miles	Ethernet Switches	Visually inspect for loose components and secure panel mounting hardware	5.3.5.9
10,000 miles	Sanding Device	Visually inspect air lines and ejector alignment. Verify operation	5.3.6.3
10,000 miles	Roof Mounted Camera	Visually inspect the lens for cracks and scratches	5.3.7.13
30,000 miles	Cab Console	Visually inspect for adverse wear and loose components	5.3.1.1
30,000 miles	Console Panel 1	Visually inspect for loose components and secure panel mounting hardware	5.3.1.2.1
30,000 miles	Console Panel 2	Visually inspect for loose components and secure panel mounting hardware	5.3.1.2.2
30,000 miles	Console Panel 3	Visually inspect for loose components and secure panel mounting hardware	5.3.1.2.3
30,000 miles	Console Panel 4	Visually inspect for loose components and secure panel mounting hardware	5.3.1.2.4
30,000 miles	Trainer's Seat	Visually inspect for damage and loose hardware	5.3.1.4
30,000 miles	Windshield Wiper	Visually inspect for loose components and proper operation	5.3.1.8
30,000 miles	Cab Heater	Visually inspect for loose components and secure mounting hardware. Check for airflow exiting the heater outlet	5.3.1.9
30,000 miles	Cab Defroster / Demister	Visually inspect for loose components and secure mounting hardware. Check for airflow exiting the heater outlet	5.3.1.10
30,000 miles	Foot Switch	Visually inspect for loose components and proper operation	5.3.1.15
30,000 miles	Bypass Panel	Visually inspect for loose components and secure panel mounting hardware. Replace any missing seals	5.3.1.21
30,000 miles	Convenience Outlets	Visually inspect for loose components and proper operation	5.3.1.24
30,000 miles	Remote I/O	Visually inspect for loose components and secure panel mounting hardware	5.3.1.29
30,000 miles	Interior View Camera	Clean the lens	5.3.3.5
30,000 miles	Seats	Visually check for loose or missing hardware	5.3.4.2
30,000 miles	Seats	Visually check components for wear and damage	5.3.4.2

Table 4-1. Scheduled Maintenance (cont'd.)

Maintenance Interval	Part Description	Scheduled Maintenance Task	Section 0200 Car Body Running Maintenance & Servicing Manual Section Reference
30,000 miles	Convenience Outlets	Visually inspect for loose hardware and damage	5.3.5.11
30,000 miles	Balancing Device	Visually inspect for damage	5.3.8.9
30,000 miles	Door Control Unit	Visually inspect for loose connectors and wiring damage	5.3.3.11
60,000 miles	Heater Defroster Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.11
60,000 miles	Coupler Loop Switch	Visually inspect for loose components and secure mounting hardware	5.3.1.13
60,000 miles	Foot Rest Assembly	Visually inspect for loose components and proper operation	5.3.1.14
60,000 miles	Arm Rest	Visually inspect for loose components and secure mounting hardware	5.3.1.16
60,000 miles	Radio Power Supply	Visually inspect for loose components and secure panel mounting hardware	5.3.1.17
60,000 miles	Cab Speakers	Visually inspect for loose components and secure mounting hardware	5.3.1.18
60,000 miles	Upper Control Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.19
60,000 miles	ACP1A / ACP1B Panels	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.1
60,000 miles	CRP1A / CRP1B Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.2
60,000 miles	CRP2A / CRP2B Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.3
60,000 miles	CRP3A / CRP3B Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.4
60,000 miles	CRP4A / CRP4B Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.5
60,000 miles	CRP5A / CRP5B Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.6
60,000 miles	CRP6A / CRP6B Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.7
60,000 miles	CRP7A / CRP7B Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.8
60,000 miles	CRP8A Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.9
60,000 miles	Event Recorder	Visually inspect for loose components and secure mounting hardware	5.3.1.20.11
60,000 miles	TCN Controller	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.12
60,000 miles	Hour Meter / Odometer Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.13

Table 4-1. Scheduled Maintenance (cont'd.)

Maintenance Interval	Part Description	Scheduled Maintenance Task	Section 0200 Car Body Running Maintenance & Servicing Manual Section Reference
60,000 miles	Trainline Interface Module	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.14
60,000 miles	Communication Control Unit (CCU)	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.15
60,000 miles	Monitoring and Diagnostic System (MDS) Control Unit	Visually inspect for loose components and secure panel mounting hardware	5.3.1.20.16
60,000 miles	Circuit Breaker Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.1.22
60,000 miles	Convenience Outlets	Functionally test for proper operation	5.3.1.24
60,000 miles	Local Bus Contactor	Visually inspect for loose components and secure panel mounting hardware	5.3.1.28
60,000 miles	Track Brake Panel	Visually inspect for loose components and secure panel mounting hardware. Blow out any dust or foreign matter from enclosure	5.3.1.33
60,000 miles	Washer Reservoir	Visually inspect of signs of leakage, dents, breaks and other signs of deterioration. Check for loose and missing hardware. Check drain for clogs and corrosion.	5.3.1.39
60,000 miles	Exterior Speaker	Visually inspect for loose hardware, electrical connections	5.3.2.2 & Section 1400
60,000 miles	Windows	Check handles and latches for proper operation	5.3.2.5
60,000 miles	Interior Speakers	Visually inspect for loose components and proper operation	5.3.3.4 & Section 1400
60,000 miles	APC Analyzer	Visually inspect for loose cables and that the green power LED is lit	5.3.3.9
60,000 miles	Automatic Passenger Counter (APC) Sensor	Visually inspect for loose components	5.3.3.10
60,000 miles	Auxiliary Circuit Breaker	Visually inspect for loose components and secure panel mounting hardware	5.3.5.1
60,000 miles	AC Circuit Breaker Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.5.2
60,000 miles	LVDC Terminal Block	Visually inspect for loose components and secure panel mounting hardware	5.3.5.3
60,000 miles	HSCB Control Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.5.4
60,000 miles	APC COPILOTpc	Visually inspect for loose components and secure panel mounting hardware	5.3.5.5
60,000 miles	Network Video Recorder	Visually inspect for loose components and secure mounting hardware	5.3.5.6
60,000 miles	Electronic Control Unit Center Truck	Visually inspect for loose components and secure panel mounting hardware	5.3.5.7

Table 4-1. Scheduled Maintenance (cont'd.)

Maintenance Interval	Part Description	Scheduled Maintenance Task	Section 0200 Car Body Running Maintenance & Servicing Manual Section Reference
60,000 miles	Terminal Board	Visually inspect for loose components and secure panel mounting hardware	5.3.5.8
60,000 miles	Track Brake Contactor Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.5.10
60,000 miles	Convenience Outlets	Functionally test for proper operation	5.3.5.11
60,000 miles	Electronic Control Unit Pull Down Resistor	Visually inspect for loose components and secure panel mounting hardware	5.3.5.12
60,000 miles	ARP1B Relay Panel	Visually inspect for loose components and secure panel mounting hardware	5.3.5.13
60,000 miles	Coupler Height Adjustment	Check coupler height	5.3.6.1
60,000 miles	Bellows Assembly	Visually inspect for dirt and debris accumulation in the bellow	5.3.8.6
60,000 miles	Operator's Seat	Lubricate baseplate tube	6.1.1
60,000 miles	Operator's Seat	Lubricate fore/aft slide	6.1.1
120,000 miles	Front Destination Sign	Clean exterior sign display window	5.3.1.12
120,000 miles	Exterior Components	Visually inspect to check for damaged sealant and if found, replace	5.3.2.1
120,000 miles	Skirts	Inspect for damage, cracks, pitting, discoloration and other signs of deterioration	5.3.2.4
120,000 miles	Ceiling Panels	Visually inspect	5.3.3.3
120,000 miles	Floor Panels	Visually inspect the seals	5.3.3.8
120,000 miles	Automatic Passenger Counter (APC) Sensor	Clean the optic of the sensor with a soft cotton cloth	5.3.3.10
120,000 miles	Automatic Passenger Counter (APC) Sensor	Visually inspect for loose cables	5.3.3.10
120,000 miles	Roof Shrouds	Inspect the Roof Shrouds for cuts, cracks, pitting, discoloration and other signs of deterioration	5.3.7.7
120,000 miles	Ceiling Panels	Visually inspect for loose hardware and damage	5.3.8.1
120,000 miles	Side Interior Panels	Visually inspect for loose hardware and damage	5.3.8.2
		Inspect for cleanliness	5.3.8.2
120,000 miles	External Panels	Visually inspect for loose hardware and damage	5.3.8.3
120,000 miles	Turntables	Visually inspect for damage	5.3.8.4

Table 4-1. Scheduled Maintenance (cont'd.)

Maintenance Interval	Part Description	Scheduled Maintenance Task	Section 0200 Car Body Running Maintenance & Servicing Manual Section Reference
120,000 miles	Rub Plates	Visually inspect for damage	5.3.8.5
120,000 miles	Bellows Assembly	Visually inspect suspension cable for sufficient tension	5.3.8.6
120,000 miles	Art. Middle Frame	Visually inspect for damage	5.3.8.7.1
120,000 miles	Pivot Bearing	Visually inspect for damage	5.3.8.7.2
120,000 miles	Bellows Assembly	Visually inspect rubber parts	5.3.8.6
120,000 miles	Art. Shaft and Bearing	Visually inspect for damage	5.3.8.8
120,000 miles	Master Controller	Apply lubricant to the key lock cylinder of the Transfer Switch	6.1.3.1
960,000 miles	Articulation Wiring	Visually inspect for damage	5.3.8.10
1 million switching cycles or every 5 years	Master Controller	Clean all parts with dry compressed air	5.3.1.36.1
		Visually check all mechanical connections and the detent desk for any discernable damage	5.3.1.36.2
		Replace all snap-action switches	5.3.1.36.3
		Replace detent spring complete and detent spring short	5.3.1.36.4
		Lubricate detent mechanism and gears	5.3.1.36.4

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CHAPTER 5.0

PREVENTATIVE MAINTENANCE

5.1 Introduction

This chapter provides inspection and adjustment procedures for the Car Body and Articulation equipment.

5.2 Safety Information

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

BEFORE INSPECTING A CIRCUIT BREAKER PANEL, MAKE SURE THE PANTOGRAPH IS LOWERED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

THE USE OF AN AIR JET, WHICH MUST BE LESS THAN 30 PSIG (2.1 BAR), TO BLOW PARTS CLEAN OR TO BLOW THEM DRY AFTER BEING CLEANED WITH A SOLVENT WILL CAUSE PARTICLES OF DIRT AND/OR DROPLETS OF THE CLEANING SOLVENT TO BE AIRBORNE. THESE PARTICLES AND DROPLETS MAY CAUSE SKIN AND/OR EYE IRRITATION. PERSONAL EYE PROTECTION MUST BE WORN TO PROTECT THE EYES FROM POSSIBLE INJURY. WHEN USING AN AIR JET DO NOT DIRECT IT TOWARD ANOTHER PERSON. IMPROPER USE OF AN AIR JET COULD RESULT IN BODILY INJURY.

CAUTION

DO NOT SCRUB WITH ABRASIVES OR USE BRUSHES FOR CLEANING. DO NOT USE GASOLINE. AGGRESSIVE CLEANING PROCEDURES OR AUTOMATED WASHING EQUIPMENT WILL EVENTUALLY RESULT IN VISUAL HAZING, LOSS OF LIGHT TRANSMISSION AND COATING DELAMINATION.

CAUTION

WEAR SAFETY SHOES AND HARD HATS WHEN WORKING WHERE OBJECTS MIGHT FALL.

WARNING

CLEANING MATERIALS CAN BE TOXIC AND DANGEROUS TO HANDLE. READ THE HANDLING INSTRUCTIONS BEFORE USING, AND FOLLOW THE MANUFACTURER'S RECOMMENDATIONS.

WARNING

USE THE PROPER LIFTING EQUIPMENT TO REMOVE AND REPLACE HEAVY COMPONENTS. ALSO MAKE SURE THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. NEVER ATTEMPT TO PERFORM A TWO PERSON OPERATION ALONE. KNOW AND FOLLOW EMERGENCY PROCEDURES.

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

WARNING

ALL AIR SUPPLY AND/OR ELECTRIC CURRENT TO THESE DEVICES AND/OR ANY COMPONENT PARTS MUST BE CUT-OFF BEFORE THESE DEVICES AND/OR COMPONENT PART ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT.

WARNING

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THESE DEVICES AND/OR ANY COMPONENT PARTS ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THESE DEVICES AND/OR COMPONENT PARTS.

WARNING

TO PREVENT RECEIVING ELECTRICAL SHOCK WHEN PERFORMING ELECTRICAL TEST, HANDS MUST BE CLEAR OF ELECTRICAL COMPONENTS, CONTACTS AND HOUSING AND THERE MUST BE NO BODILY CONTACT WITH THE WORK BENCH. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE INJURY OR DEATH.

WARNING

BE CAREFUL WHEN WORKING WITH THE BATTERY, AS ITS ELECTROLYTE IS A STRONG CAUSTIC AGENT AND CAN CAUSE SEVERE BURNS. ALWAYS WEAR SAFETY GOGGLES OR FACE SHIELD, RUBBER GLOVES, AND LIQUID/CHEMICAL-PROOF APRON. AVOID MATERIALS THAT INDUCE STATIC ELECTRICITY.

WARNING

IN CASE ELECTROLYTE BECOMES IN CONTACT WITH SKIN, FLUSH IMMEDIATELY WITH PLENTY OF WATER. IN CASE OF CONTACT WITH EYES, FLUSH WITH WATER AT LEAST 15 MINUTES AND IN ALL CASES GET IMMEDIATE MEDICAL ATTENTION.

WARNING

NEVER ALLOW AN EXPOSED FLAME OR SPARK TO COME NEAR THE BATTERY CELLS PARTICULARLY WHILE THEY ARE BEING CHARGED BECAUSE THIS GAS MIXTURE CAN BE IGNITED. NEVER SMOKE WHILE PERFORMING ANY SERVICE ON THE BATTERY. AVOID STATIC ELECTRICITY INDUCED MATERIALS.

WARNING

DO NOT LAY ANY TOOLS OR METAL PARTS ON TOP OF CELLS AS THIS ACTION MAY CAUSE AN ARC THAT CAN IGNITE THE GASES. TO PREVENT AN ARC OR SPARK WHEN THE BATTERIES ARE EITHER CONNECTED OR DISCONNECTED, THE CHARGING AND LOAD CIRCUITS MUST BE DISCONNECTED FIRST.

WARNING

A LOOSE CONNECTION ON THE BATTERY CAN CAUSE ERRATIC BATTERY PERFORMANCE AND/OR DAMAGE TO THE BATTERY AND/OR THE RISK OF AN EXPLOSION. PROPER TORQUE MUST BE APPLIED ON ALL BATTERY CONNECTIONS.

WARNING

REMOVE ALL RINGS, WRISTWATCHES, AND ITEMS OF CLOTHING WITH METAL PARTS WHEN WORKING ON THE BATTERY.

WARNING

SAFETY EQUIPMENT MUST BE USED WHEN WORKING ON THE BATTERY INCLUDING INSULATED TOOLS, RUBBER GLOVES, LIQUID/CHEMICAL-PROOF APRON, SAFETY SHOES, GOGGLES OR FACE SHIELD.

AVOID MATERIALS THAT INDUCE STATIC ELECTRICITY.

WARNING

SHUT OFF POWER TO THE CAR BEFORE ATTEMPTING TO SERVICE ANY ROOF MOUNTED EQUIPMENT.

WARNING

MUCH OF THE EQUIPMENT ON THESE CARS OPERATES AT VOLTAGE AND CURRENT LEVELS THAT ARE HAZARDOUS AND LIFE THREATENING. PROPER PRECAUTIONS SHOULD BE TAKEN AND METRO SAFETY RULES, PRACTICES AND PROCEDURES CLOSELY OBSERVED.

WARNING

INSULATED GLOVES MUST BE WORN AND EXTREME CARE TAKEN TO PREVENT BURNS WHEN HANDLING HEATED PARTS.

WARNING

ARTICULATION WIRING ON THESE CARS OPERATES AT VOLTAGE AND CURRENT LEVELS THAT ARE HAZARDOUS AND LIFE THREATENING. PROPER PRECAUTIONS SHOULD BE TAKEN AND METRO SAFETY RULES, PRACTICES AND PROCEDURES CLOSELY OBSERVED.

CAUTION

THE EQUIPMENT OPERATING PROCEDURES DESCRIBED BELOW SHOULD BE FOLLOWED AS GIVEN TO AVOID THE POSSIBILITY OF DAMAGE TO EQUIPMENT AND/OR BODILY INJURY.

CAUTION

WEAR PROPER PPE EQUIPMENT WHEN WORKING UNDER THE CAR.

The importance of safe operation and maintenance cannot be over stressed. The following are some important points for maintenance personnel to observe:

1. Wear an insulated hard hat when working on the vehicle roof or any of the roof-mounted components.
2. Wear safety shoes and hard hats when working where objects might fall.
3. Never work on equipment while electrical power is applied unless it is absolutely necessary as part of the maintenance program. Verify that power is removed by checking with reliable equipment.
4. Attach a tag with the name of the person who removed the power from the equipment. That person knows why the power was removed and when it will be safe to restore it. Only the individual whose name appears on the tag or a person who has his approval should remove the tag and restore power.
5. Use proper lifting equipment to remove and replace heavy components. Make sure the components are securely fastened to the lifting device.
6. Never attempt to perform a two person operation alone. Know and follow emergency procedures.
7. Never take any short cuts that are not clearly defined and approved.

WARNING

THE MASTER CONTROLLER CONTAINS LIVE VOLTAGE COMPONENTS. THERE IS A RISK OF ELECTRIC SHOCK! ALWAYS CONSIDER THE FOLLOWING SAFETY RULES BEFORE CARRYING OUT WORK ON THE MASTER CONTROLLER:

- ENSURE THAT THE MAIN SWITCH, LOCATED INSIDE THE VEHICLE, IS TURNED TO THE “OFF” POSITION BEFORE CARRYING OUT WORK ON THE MASTER CONTROLLER.
- CLEARLY MARK YOUR WORK AREA.
- ENSURE THAT THE MAIN SWITCH CANNOT ACCIDENTALLY BE SWITCHED ON.
- DISCONNECT.
- MAKE SURE THAT THERE IS NO VOLTAGE.
- BESIDES THE MAIN ELECTRIC CIRCUIT ALSO DISCONNECT ADDITIONAL AND AUXILIARY CIRCUITS.
- INSULATE OR COVER ADJACENT ENERGIZED PARTS.

WARNING

THE MASTER CONTROLLER CONTAINS COMPONENTS THAT ARE SUBJECT TO MECHANICAL STRESS. THERE IS A RISK OF CRUSHING!

- USE ONLY APPROPRIATE TOOLS FOR MAINTENANCE WORK ON THE MASTER CONTROLLER COMPONENTS.
- ENSURE THAT COMPONENTS, WHICH ARE SUBJECT TO MECHANICAL STRESS, ARE SECURED BEFORE INSTALLING OR DISMANTLING THESE COMPONENTS.

WARNING

THE MASTER CONTROLLER CONTAINS SHARP-EDGED PARTS. RISK OF INJURY!

- USE ONLY APPROPRIATE TOOLS FOR MAINTENANCE WORK ON THE MASTER CONTROLLER COMPONENTS.
- WEAR PROTECTIVE GLOVES WHEN WORKING WITH SHARP-EDGED COMPONENTS.

5.3 Preventative Maintenance Procedures

5.3.1 Cab Equipment

See Figure 2-1.

5.3.1.1 Cab Console

Inspect the cab console for adverse wear and loose components every 30,000 miles. See Figures 2-1 and 7-3.

5.3.1.2 Console Panels

See Figures 2-1 and 7-4.

5.3.1.2.1 Console Panel 1

Inspect the Train Operator Display screen for scratches and loose hardware every 30,000 miles. See Figures 2-1 and 7-5.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Inspect the toggle switch for damage and looseness every 30,000 miles.

5.3.1.2.2 Console Panel 2

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Inspect the switches and controls for loose mechanical connections and worn wiring every 30,000 miles. See Figures 2-1 and 7-6.

5.3.1.2.3 Console Panel 3

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Inspect the switches and controls for loose mechanical connections and loose hardware every 30,000 miles. See Figures 2-1 and 7-7.

5.3.1.2.4 Console Panel 4

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Inspect the Train Operator Display screen for scratches and loose hardware every 30,000 miles. See Figures 2-1 and 7-8.

Inspect the toggle switches for damage and looseness every 30,000 miles.

5.3.1.3 Operator's Seat

See Figures 2-1 and 7-9.

5.3.1.3.1 Test Operation of Seat Controls

The following tasks are to be performed daily:

1. Place one hand on the lower seat back cushion. With the other hand, operate the lumbar control. The lumbar support mechanism should move.
2. Turn both seat recline control knobs counterclockwise until the seat back is free to move.
3. Verify operation of the armrest by moving it up and down.
4. Operate the fore / aft handle and verify that the seat slides smoothly in both directions. The seat should lock once the handle is released.

5. Lift up on the swivel control and verify that the seat swivels from forward to 45 degrees. Verify that the seat locks in both positions when control is released.
6. While seated in the seat, operate the vertical height control. The seat should lower while seated and raise when weight is taken off the seat.

5.3.1.3.2 Inspect Seat Cushions

The following tasks are to be performed daily:

1. Visually inspect seat cushions for damage. If damage is greater than 1 inch in any direction, replace the cushion.
2. Visually inspect the seat cushions for cleanliness. If necessary, clean cushion surface with a 50% mixture of Simple Green (or equivalent) with water. Wipe dry.

5.3.1.3.3 Clean Seat Assembly

The following tasks are to be performed every 10,000 miles:

1. Use a 50% mixture of Simple Green (or equivalent) with water to thoroughly clean complete seat assembly, including frame, knobs, and levers.
2. Wipe dry.

5.3.1.3.4 Inspect Fasteners

The following tasks are to be performed every 10,000 miles:

1. Visually inspect seat assembly for missing fasteners. Replace as needed. Refer to Section 7.3.4 of this manual section.
2. Physically touch each fastener to ensure that it is not loose.

5.3.1.4 Trainer's Seat

Inspect the Trainer's Seat for damage and loose hardware every 30,000 miles. See Figures 2-1 and 7-10.

5.3.1.5 Cab Light

Functionally test the cab light for proper operation daily. Refer to Section 0600, Lighting of the Running Maintenance and Servicing Manual for maintenance information.

5.3.1.6 Cab Console Light

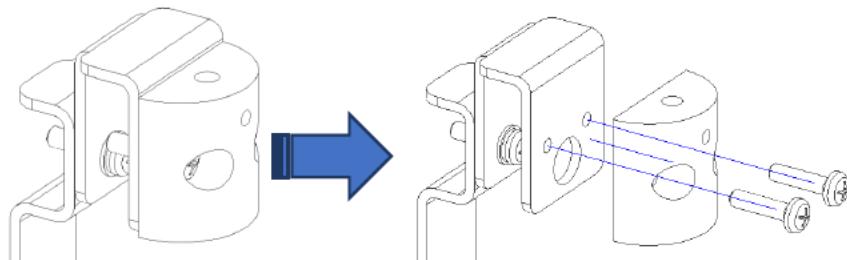
Functionally test the cab light for proper operation daily. Refer to Section 0600, Lighting of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-1 and 7-12.

5.3.1.7 Sun Shade

Visually inspect all sun shades for rips, holes, loose hardware, proper operation and alignment every 10,000 miles. Sun shades should lock in place when pulled down and retract fully with no fraying of the edges of the fabric. The sun shades can be cleaned using a clean damp cloth. See Figures 2-1 and 7-13. Reset the tension / alignment as follows:

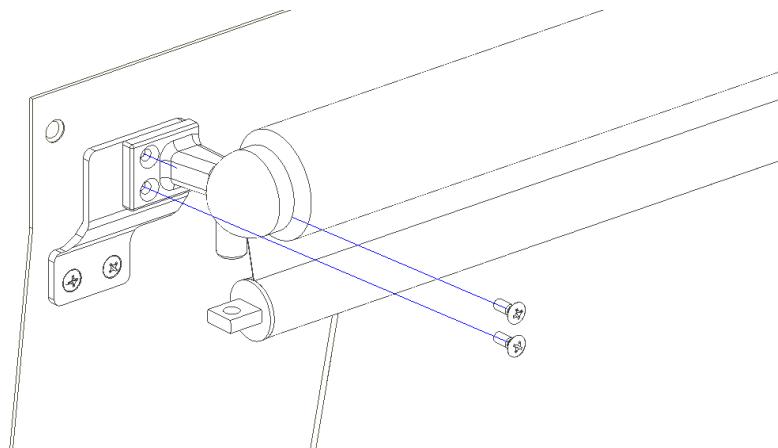
5.3.1.7.1 Cab Side Window Shades

1. Pull the shade down approximately 6 inches.
2. Using a 3/32" Allen wrench, loosen the set screws in the two bottom guide rod holders.
3. Remove the two screws securing each lower guide rod holder. Set them aside for reinstallation.

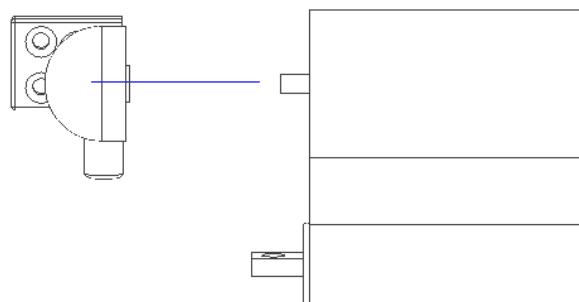


4. Remove the rubber bumpers and slide the guide rods through the curtain rod eye rings to remove them. The rubber bumpers, guide rods and guide rod holders can be removed and set aside.
5. Check to see if the shade fabric is centered when fully rolled up. If yes, then proceed to step 6. If not, follow steps 5a-5d to ensure the fabric rolls up evenly to avoid fraying edges.
 - a. Pull shade so that it is fully extended.
 - b. Center the fabric inside the curtain rod.
 - c. Retract the shade while holding the curtain rod.
 - d. Ensure that the shade rolls up evenly/centered and is not creeping towards one side.

6. Remove (2) screws from the left side (spring side) upper mushroom end caps. Hold the curtain assembly while removing the screws.



7. Remove the curtain assembly and left side mushroom cap.
8. Remove the left side (spring side) mushroom end cap from the curtain assembly.



9. Allow the spring to unwind completely.
 10. Rewind the spring with **14** full rotations (turning clockwise).
- NOTE: DO NOT exceed 14 rotations on the cab side window shades.
11. Place left side mushroom cap back on the curtain assembly.
 12. Insert the curtain assembly into the right-side mushroom cap and reinstall the (2) screws to install the left side mushroom cap.
 13. Install the cab side window guide rods.
 - a. Slide the guide rods thru the curtain rod end caps.
 - b. Install one rubber bumper onto the top of each guide rod (above the curtain rod end caps) about 1 inch from the top of the guide rod.

- c. Insert the guide rods into the bottom guide rod holders.
- d. Secure the bottom guide rod holders by reinstalling the (2) screws each into the brackets. Apply Loctite 242 to the screws before installing.
- e. Insert the guide rods into the upper mushroom caps. Push the guide rods all the way up into the upper mushroom end cap. While holding the guide rods so that they are all the way up into the upper mushroom cap, tighten the set screws in the bottom guide rod holders so that they are snug against the guide rods.

NOTE: Ensure that the guide rod cannot be moved vertically after tightening the set screw.

- f. Slide the rubber bumpers up the guide rods so that they are against the upper guide rod holders.



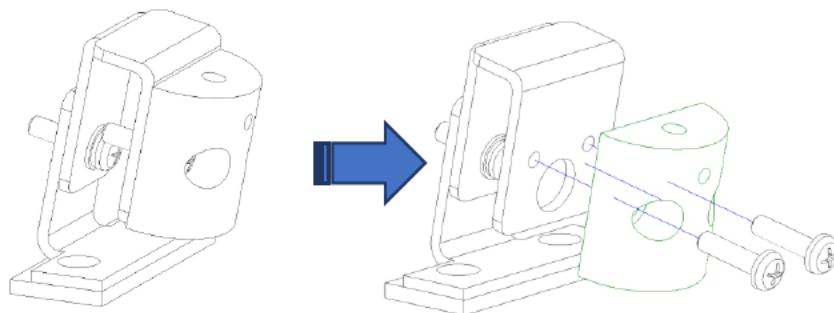
14. Apply silicone to a clean rag and wipe it on the guide rods.

NOTE: This is a vendor recommendation to eliminate any binding issues and promote easy and smooth operation.

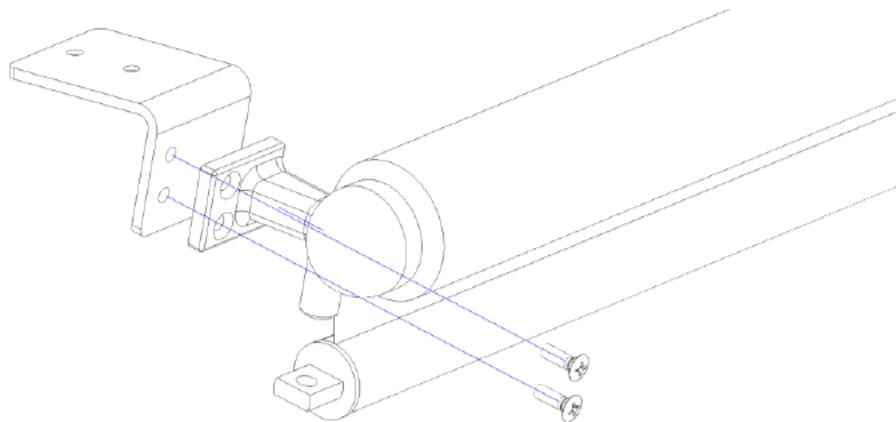
15. Test the shade for proper operation. The shade should lock in place and retract smoothly and fully. The fabric should also roll up centered to keep the edges from fraying.

5.3.1.7.2 Windshield Shade

1. Pull the shade down approximately 6 inches.
2. Using a 3/32" Allen wrench, loosen the set screws in the two bottom guide rod holders.
3. Remove the two screws securing each lower guide rod holder. Set them aside for reinstallation.

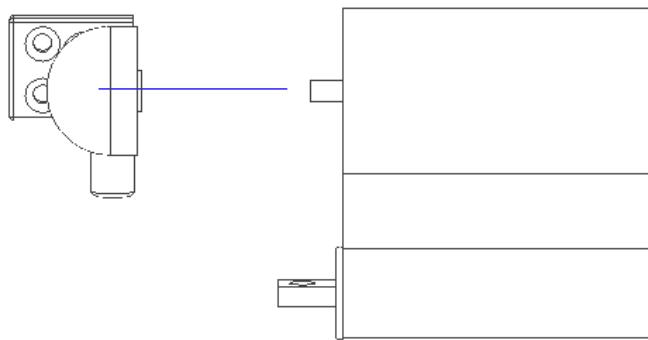


4. Remove the rubber bumpers and slide the guide rods through the curtain rod eye rings to remove them. The rubber bumpers, guide rods and guide rod holders can be removed and set aside.
5. Check to see if the shade fabric is centered when fully rolled up. If yes, then proceed to step 6. If not, follow steps 5a through 5d to ensure the fabric rolls up evenly to avoid fraying edges.
 - a. Pull shade so that it is fully extended.
 - b. Center the fabric inside the curtain rod.
 - c. Retract the shade while holding the curtain rod.
 - d. Ensure that the shade rolls up evenly / centered and is not creeping towards one side.
6. Remove (2) screws from the left side (spring side) upper mushroom end caps. Hold the curtain assembly while removing the screws.



7. Remove the curtain assembly and left side mushroom cap.

8. Remove the left side (spring side) mushroom end cap from the curtain assembly.



9. Allow the spring to unwind completely.
 10. Rewind the spring with **18** full rotations (turning clockwise).
- NOTE: DO NOT exceed 18 rotations on the windshield shades.
11. Place left side mushroom cap back on the curtain assembly.
 12. Insert the curtain assembly into the right-side mushroom cap and reinstall the (2) screws to install the left side mushroom cap.
 13. Install the windshield window guide rods.
 - a. Slide the guide rods thru the curtain rod end caps.
 - b. Install one rubber bumper onto the top of each guide rod (above the curtain rod end caps) about 1 inch from the top of the guide rod.
 - c. Insert the guide rods into the bottom guide rod holders.
 - d. Secure the bottom guide rod holders by reinstalling the (2) screws each into the brackets. Apply Loctite 242 to the screws before installing.
 - e. Insert the guide rods into the upper mushroom caps. Push the guide rods all the way up into the upper mushroom end cap. While holding the guide rods so that they are all the way up into the upper mushroom cap, tighten the set screws in the bottom guide rod holders so that they are snug against the guide rods.

NOTE: Ensure that the guide rod cannot be moved vertically after tightening the set screw.

- f. Slide the rubber bumpers up the guide rods so that they are against the upper guide rod holders.



14. Apply silicone to a clean rag and wipe it onto the guide rods.

NOTE: This is a vendor recommendation to eliminate any binding issues and promote easy and smooth operation.

15. Test the shade for proper operation. The shade should lock in place and retract smoothly and fully. The fabric should also roll up centered to keep the edges from fraying.

5.3.1.8 Windshield Wiper

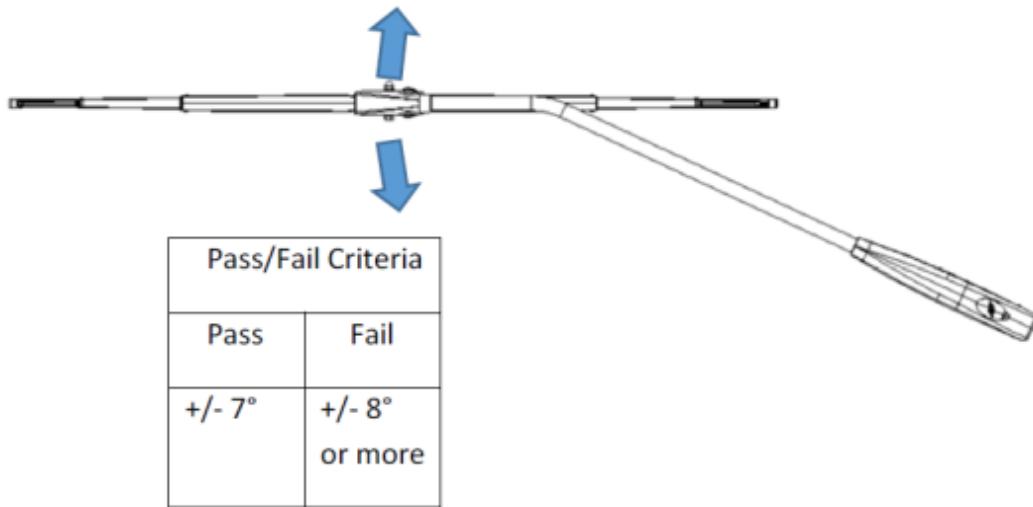
See Figures 2-1 and 7-14.

WARNING

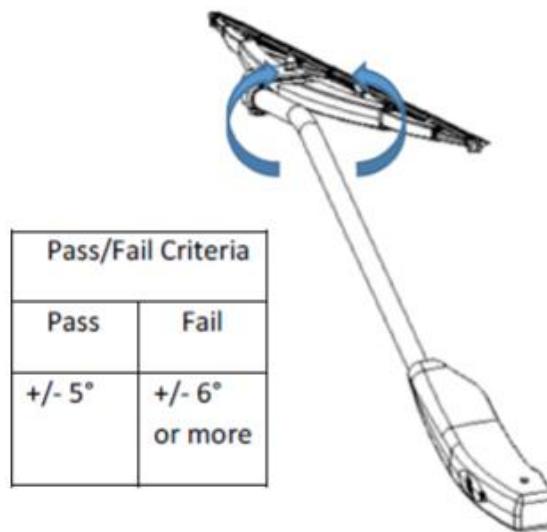
BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Perform periodic inspection of the components of the windshield wiper assembly every 10,000 miles, or as needed, as follows:

1. Inspect wiper arm flex by holding the wiper arm assembly at the mounting head and GENTLY moving it up and down.



2. Inspect wiper arm rotational play by holding the mounting head and rotating the arm at its axis GENTLY.



Should any arm fail one or more of the above inspections, it is recommended that the arm be replaced to prevent in service failures. Further, it is recommended that the inspection technician use best judgement when determining the serviceability of the wiper arm and replace an arm that is suspected of potentially causing a service failure if it technically passes both inspection.

Perform periodic visual inspections of the components of the windshield wiper assembly every 30,000 miles, or as needed, as follows:

1. Inspect the rubber parts of the wiper arm of the windshield wiper assembly for cuts, tears, rips, wear, and other visual signs of deterioration.
2. Inspect the metallic parts of the windshield wiper assembly for corrosion, scratches, dents, missing paint, and other visual signs of deterioration.
3. Inspect the electrical connections of the wiper engine for corrosion, broken wires, loose or missing securing bolt, excessive heating, discoloration, and other visual signs of deterioration.
4. Inspect the washer supply and return lines for signs of leakage, dents, breaks, and other visual signs of deterioration.
5. Make any and all necessary repairs.

5.3.1.9 Cab Heater

Visually inspect for loose components and secure mounting hardware. Check for airflow exiting the heater outlet every 30,000 miles. See Figures 2-1 and 7-15.

5.3.1.10 Defroster / Demister

Visually inspect for loose components and secure mounting hardware. Check for airflow exiting the heater outlet every 30,000 miles. See Figures 2-1, 7-16 and 7-17.

5.3.1.11 Heater / Defroster Panel

Visually inspect for loose components and secure panel mounting hardware. Check for airflow exiting the heater outlet every 60,000 miles. See Figures 2-1 and 7-18.

5.3.1.12 Front Destination Sign

Visually inspect all sign displays on a daily basis for LED's that do not illuminate when a message is displayed. See Figures 2-1 and 7-19.

Clean exterior sign display every 120,000 miles as follows:

Display windows are made of Lexan plastic. Certain solvents can destroy the surface and create a permanent haze or fogging effect. Use only those cleaning agents listed in Table 5-1.

CAUTION

DO NOT SCRUB WITH ABRASIVES OR USE BRUSHES FOR CLEANING. DO NOT USE GASOLINE. AGGRESSIVE CLEANING PROCEDURES OR AUTOMATED WASHING EQUIPMENT WILL EVENTUALLY RESULT IN VISUAL HAZING, LOSS OF LIGHT TRANSMISSION AND COATING DELAMINATION.

1. Select the appropriate cleaning agent from Table 5-1.
2. Apply the cleaning agent with a soft cloth or cellulose sponge. Do not scrub the surface aggressively.
3. Allow the cleaning agent to clean the surface. If necessary, apply cleaning agent several times.
4. When finished, wipe the surface dry. Then perform a final wash with soap, and rinse with plain water.
5. Dry the surface to prevent spotting.

Table 5-1. Compatible Cleaning Agents

Surface Substance	Cleaning Agent
Normal dust, dirt, grime	Aqueous solutions of soaps and detergents such as: Fantastik; Joy; Neleco-Placer; Formula 409; Lysol; Pine-Sol; Hexcel, F.O. 554; Mr. Clean; Top Job; Windex
Oils, paint, etc	Organic solvents such as: Aliphatic Hydrocarbons; Naphtha (VM&P Grade); Kerosene, Petroleum Spirits
Bugs	Alcohols such as: Isopropyl Alcohol; Methanol
Graffiti, lipstick, marking pen ink	Butyl Cellosolve™

5.3.1.13 Coupler Loop Switch

Visually inspect for loose components and secure mounting hardware every 60,000 miles. See Figures 2-1 and 7-20.

5.3.1.14 Foot Rest

Visually inspect for loose components and proper operation every 60,000 miles. See Figures 2-1 and 7-21.

5.3.1.15 Foot Switch

Visually inspect for loose components and proper operation every 30,000 miles. See Figures 2-1 and 7-22.

5.3.1.16 Arm Rest

Visually inspect for loose components, rips, holes and proper operation every 60,000 miles. See Figures 2-1 and 7-23.

5.3.1.17 Radio Power Supply

Visually inspect for loose components and proper operation every 60,000 miles. See Figures 2-1 and 7-24.

5.3.1.18 Cab Speakers

Visually inspect for loose components and proper operation every 60,000 miles. See Figures 2-1 and 7-25.

5.3.1.19 Upper Control Panel

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-26.

5.3.1.20 Control and Relay Panels

5.3.1.20.1 ACP1A / ACP1B Panels

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1, 7-27 and 7-41.

5.3.1.20.2 CRP1A / CRP1B Panels

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-38.

5.3.1.20.3 CRP2A / CRP2B Panels

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-36.

5.3.1.20.4 CRP3A / CRP3B Panels

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-39.

5.3.1.20.5 CRP4A / CRP4B Panels

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-37.

5.3.1.20.6 CRP5A / CRP5B Panels

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-40.

5.3.1.20.7 CRP6A / CRP6B Panels

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1, 7-32 and 7-47.

5.3.1.20.8 CRP7A / CRP7B Panels

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1, 7-33 and 7-48.

5.3.1.20.9 CRP8A Panel

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-34.

5.3.1.20.10 Electronic Control Unit (ECU)

Visually inspect for damage and loose connectors every 10,000 miles. Refer to Section 1300, Friction Brakes of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-1, 7-28 and 7-44.

5.3.1.20.11 Event Recorder

Visually inspect for loose components and secure mounting hardware every 60,000 miles. See Figures 2-1 and 7-31.

5.3.1.20.12 TCN Controller

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1, 7-30 and 7-46.

5.3.1.20.13 Hour Meter / Odometer Panel

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-43.

5.3.1.20.14 Trainline Interface Module

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-35.

5.3.1.20.15 Communication Control Unit (CCU)

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-29.

5.3.1.20.16 Monitoring and Diagnostic System (MDS) Control Unit

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-1 and 7-45.

5.3.1.20.17 ATC Enclosure

Refer to Section 1500, ATC / TWC of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-1 and 7-42.

5.3.1.21 Bypass Panel

Visually inspect for loose components and secure panel mounting hardware every 30,000 miles. Replace any missing seals. See Figures 2-1 and 7-49.

5.3.1.22 Circuit Breaker Panel A and B

WARNING

BEFORE INSPECTING A CIRCUIT BREAKER PANEL, MAKE SURE THE PANTOGRAPH IS LOWERED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Visually inspect the cab circuit breaker panel for loose or worn hardware every 60,000 miles. See Figures 2-1 and 7-50.

5.3.1.23 Fire Extinguisher

See Figures 2-1 and 7-51.

Perform visual inspections of the fire extinguisher every 10,000 miles as follows:

1. Examine nozzle and hose for obstructions.
2. Check that tamper seal is intact.
3. Check pressure gauge and recharge extinguisher if necessary.
4. Weigh unit and have it recharged if weight loss exceeds 10% below the initial charged weight.
5. Immediately after any use, the extinguisher must be recharged by a qualified fire equipment service company.

5.3.1.24 Convenience Outlet

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Visually inspect the convenience outlet every 30,000 miles and functionally test it every 60,000 miles for proper operation. See Figures 2-1 and 7-52.

5.3.1.25 Cab Camera

Visually inspect for loose components and clean the lens of the camera with a clean, lint free cloth with any commercially available glass cleaner every 10,000 miles. See Figures 2-1 and 7-53.

5.3.1.26 Forward View Camera

Visually inspect for loose components and clean the lens of the camera with a clean, lint free cloth with any commercially available glass cleaner every 10,000 miles. See Figures 2-1 and 7-54.

5.3.1.27 Rear View Monitors

Visually inspect for loose components and clean the screen surface with a clean, lint free cloth with any commercially available glass cleaner every 10,000 miles. See Figures 2-1 and 7-55.

NOTE: The liquid cleaner should not be sprayed directly on the screen surface. Spray the cloth first and then wipe the screen clean.

5.3.1.28 Local Bus Contactor

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Perform visual inspection of hardware and wires every 60,000 miles. See Figures 2-1 and 7-56.

5.3.1.29 Remote I/O

Perform visual inspection of hardware and wires every 30,000 miles. See Figures 2-1 and 7-57.

5.3.1.30 Ethernet Switch

Perform visual inspection of hardware and wires every 10,000 miles. See Figures 2-1 and 7-58.

5.3.1.31 Ethernet Switch (Camera)

Perform visual inspection of hardware and wires every 10,000 miles. See Figures 2-1 and 7-59.

5.3.1.32 Ethernet Switch (Wireless)

Perform visual inspection of hardware and wires every 10,000 miles. See Figures 2-1 and 7-60.

5.3.1.33 Track Brake Panel

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

THE USE OF AN AIR JET, WHICH MUST BE LESS THAN 30 PSIG (2.1 BAR), TO BLOW PARTS CLEAN OR TO BLOW THEM DRY AFTER BEING CLEANED WITH A SOLVENT WILL CAUSE PARTICLES OF DIRT AND/OR DROPLETS OF THE CLEANING SOLVENT TO BE AIRBORNE. THESE PARTICLES AND DROPLETS MAY CAUSE SKIN AND/OR EYE IRRITATION. PERSONAL EYE PROTECTION MUST BE WORN TO PROTECT THE EYES FROM POSSIBLE INJURY. WHEN USING AN AIR JET DO NOT DIRECT IT TOWARD ANOTHER PERSON. IMPROPER USE OF AN AIR JET COULD RESULT IN BODILY INJURY.

Visually inspect connections, wires, blow out any dust or foreign matter from the enclosure using dry, low pressure (30 psig), compressed air every 60,000 miles. See Figures 2-1 and 7-61.

5.3.1.34 12Vdc Power Supply

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Visually inspect the 12Vdc power supply for loose or worn hardware every 10,000 miles. See Figures 2-1 and 7-62.

5.3.1.35 Wayside Worker Alert System (WWAS) Module

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Perform visual inspection of hardware and wires daily. See Figures 2-1 and 7-63.

Perform a functional test every 10,000 miles using the following steps:

- Choose observation site and be sure proper personnel are notified to advise train operators,
- Key up the first cab for testing,
- Turn on the PAD and confirm the WWAS Sounds the alarm and the visual indication is present on the TOD,
- Acknowledge the alarm on a TOD and confirm the alarm is silenced,
- Change ends and direction and confirm proper operation in the other cab.

5.3.1.36 Master Controller

WARNING

THE MASTER CONTROLLER CONTAINS LIVE VOLTAGE COMPONENTS. THERE IS A RISK OF ELECTRIC SHOCK! ALWAYS CONSIDER THE FOLLOWING SAFETY RULES BEFORE CARRYING OUT WORK ON THE MASTER CONTROLLER:

- ENSURE THAT THE MAIN SWITCH, LOCATED INSIDE THE VEHICLE, IS TURNED TO THE “OFF” POSITION BEFORE CARRYING OUT WORK ON THE MASTER CONTROLLER.
- CLEARLY MARK YOUR WORK AREA.
- ENSURE THAT THE MAIN SWITCH CANNOT ACCIDENTALLY BE SWITCHED ON.
- DISCONNECT.
- MAKE SURE THAT THERE IS NO VOLTAGE.
- BESIDES THE MAIN ELECTRIC CIRCUIT ALSO DISCONNECT ADDITIONAL AND AUXILIARY CIRCUITS.
- INSULATE OR COVER ADJACENT ENERGIZED PARTS.

WARNING

THE MASTER CONTROLLER CONTAINS COMPONENTS THAT ARE SUBJECT TO MECHANICAL STRESS. THERE IS A RISK OF CRUSHING!

- USE ONLY APPROPRIATE TOOLS FOR MAINTENANCE WORK ON THE MASTER CONTROLLER COMPONENTS.
- ENSURE THAT COMPONENTS, WHICH ARE SUBJECT TO MECHANICAL STRESS, ARE SECURED BEFORE INSTALLING OR DISMANTLING THESE COMPONENTS.

WARNING

THE MASTER CONTROLLER CONTAINS SHARP-EDGED PARTS. RISK OF INJURY!

- USE ONLY APPROPRIATE TOOLS FOR MAINTENANCE WORK ON THE MASTER CONTROLLER COMPONENTS.
- WEAR PROTECTIVE GLOVES WHEN WORKING WITH SHARP-EDGED COMPONENTS.

The following tasks should be performed at one million switching cycles or every five years:

5.3.1.36.1 Clean All Parts with Dry Compressed Air

Clean all parts of the Master Controller with dry compressed air using a compressed-air pistol. See Figures 2-1, 7-64 and 7-65.

5.3.1.36.2 Visually Check Mechanical Connections and Detent Disk

1. Visually check all mechanical connections for any discernable damage.
2. Visually check the detent disk for any damage.

5.3.1.36.3 Replace Snap-Action Switches Type S826a and S826c

1. Remove cables by releasing the contact screws on the snap-action switches. See Figure 5-1 below.

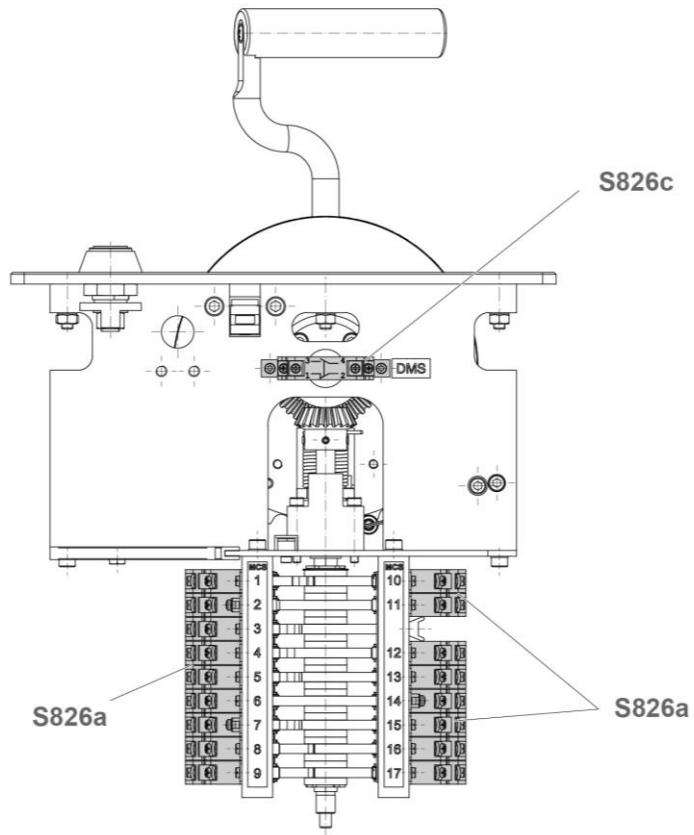


Figure 5-1: Replace Snap Action Switches Type S826a and S826c

2. Remove cable ties if needed.
3. Release the fixing screws from the snap-action switches and remove the snap-action switches.
4. Put the new snap-action switches in the appropriate position and screw them tight.
5. Connect the cables and secure with cable ties if needed.
6. Use the continuity tester to check that the wiring is correct, and the replaced snap-action switches are functioning correctly.
7. Record results in the work log.

5.3.1.36.4 Exchange Wear and Tear Parts and Detent Mechanism

1. Loosen the two fixing screws to remove detent spring short (1) and detent spring complete (2). See Figure 5-2.

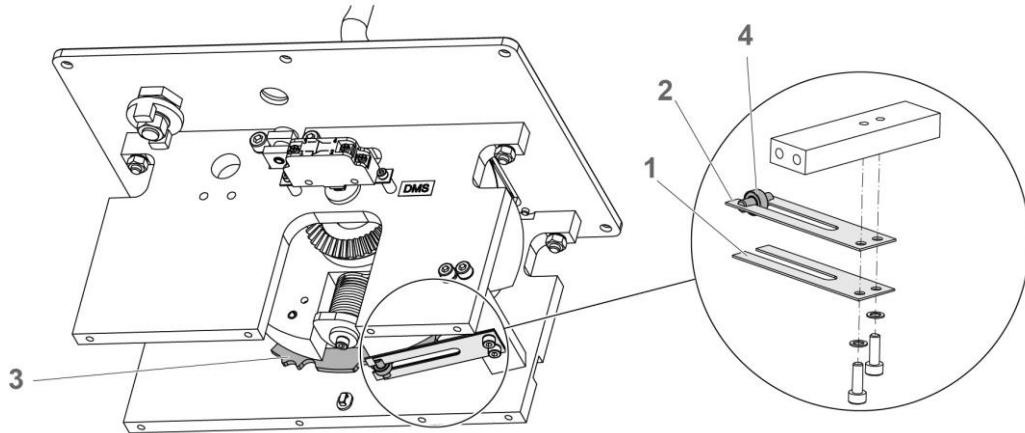


Figure 5-2: Exchange Wear and Tear Parts and Detent Mechanism

2. Clean the detent disk (3) with a cleaning cloth.
3. Grease the detent disk (3) slightly with low temperature lubrication grease. Refer to Section 6.1.3, Master Controller of this manual section.
4. Reattach the new detent spring short (1) and new detent spring complete (2), using the two fixing screws.
5. Grease the detent roller (4) slightly.
6. Check to make sure that all replaced elements are properly in place!
7. Make sure that the detent roller (4) runs on the center of the detent disk (3)!

5.3.1.37 DC / DC Converter

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Perform visual inspection of hardware and wires every 10,000 miles. See Figures 2-1 and 7-66.

5.3.1.38 HSC-V Control Panel

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Perform visual inspection of hardware and wires every 10,000 miles. See Figures 2-1 and 7-67.

5.3.1.39 Washer Reservoir

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Perform the following periodic visual inspections of the components of the washer reservoir every 60,000 miles, or as needed. See Figure 7-68.

1. Inspect the washer bottle and the supply lines for signs of leakage, dents, breaks and other visual signs of deterioration.
2. Inspect the metallic parts of the washer reservoir for corrosion, scratches, dents, missing paint, and other visual signs of deterioration.

3. Check washer bottle for loose or missing mounting hardware.
4. Check drain for clogs, corrosion or other signs of deterioration.

5.3.1.40 Horn Controller Panel

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Perform visual inspection of hardware and wires every 10,000 miles. See Figure 7-69.

5.3.2 Exterior Body Equipment

See Figure 2-3.

5.3.2.1 Exterior Components

Visually inspect the exterior components on the LRV for damaged sealant every 120,000 miles. Refer to Appendix B of this manual section for additional information on the location of the exterior components with visible sealant and the three types of sealant defects.

The causes of exterior sealant deterioration can be exterior elements such as UV, wind, rain, car wash/cleaning solvents, debris, etc.

There are two kinds of sealant defects that will require repair:

1. Minor cracks within the sealant

- To repair (V-groove repair):
 - Cut out a v-groove from the sealant in the damaged area using a utility knife or other suitable tools. For cracks near the edge of joints, insert a knife vertically along the edge and follow with approximately 45 degree cut from the opposite edge to form a right angle cut out
 - Clean surfaces (Note that Isopropyl Alcohol (IPA) is incompatible with Sikaflex. Make sure that surface is completely dry and there is no residue from cleaning solutions as sealant will not adhere properly otherwise)
 - Apply masking tape to protect surfaces
 - Apply sealant to fill the void and smooth out
 - Remove masking tape immediately after applying and smoothing the sealant

2. Cracks that extend to and expose the substrate surface. This includes delamination of sealant from the substrate.

- To repair (complete removal):
 - Completely remove the sealant in the damaged area using a utility knife or other suitable tools
 - Clean surfaces (Note that IPA is incompatible with Sikaflex. Make sure that surface is completely dry and there is no residue from cleaning solutions as sealant will not adhere properly otherwise)
 - Apply masking tape to protect surfaces
 - Apply sealant to fill the void and smooth out
 - Remove masking tape immediately after applying and smoothing the sealant

5.3.2.2 Exterior Speaker

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Visually inspect the exterior speakers for loose hardware and electrical connections every 60,000 miles. See Figures 2-3 and 7-70. Refer to Section 1400, Communications of the Running Maintenance and Servicing Manual for maintenance information.

5.3.2.3 Exterior Mirror

Visually inspect for damage, cracked glass, loose hardware every 10,000 miles. See Figures 2-3 and 7-71.

Replace any damaged exterior mirrors with new ones as needed. Tighten and torque loose hardware in accordance with the chart listed in Section 7.3.4 of this manual section.

To adjust the detent tension of the exterior mirror:

1. Remove the top and bottom caps. See Figure 5-3.
2. Loosen the 3/8-16 lock nut and torque to 20 ft-lbs.
3. Turn the 3/8-16 lock nut in $\frac{1}{4}$ to $\frac{1}{2}$ turn increments until the desired detent tension is achieved (tightening the lock nut increases detent tension and loosening decreases detent tension).
4. Insert the top and bottom caps.

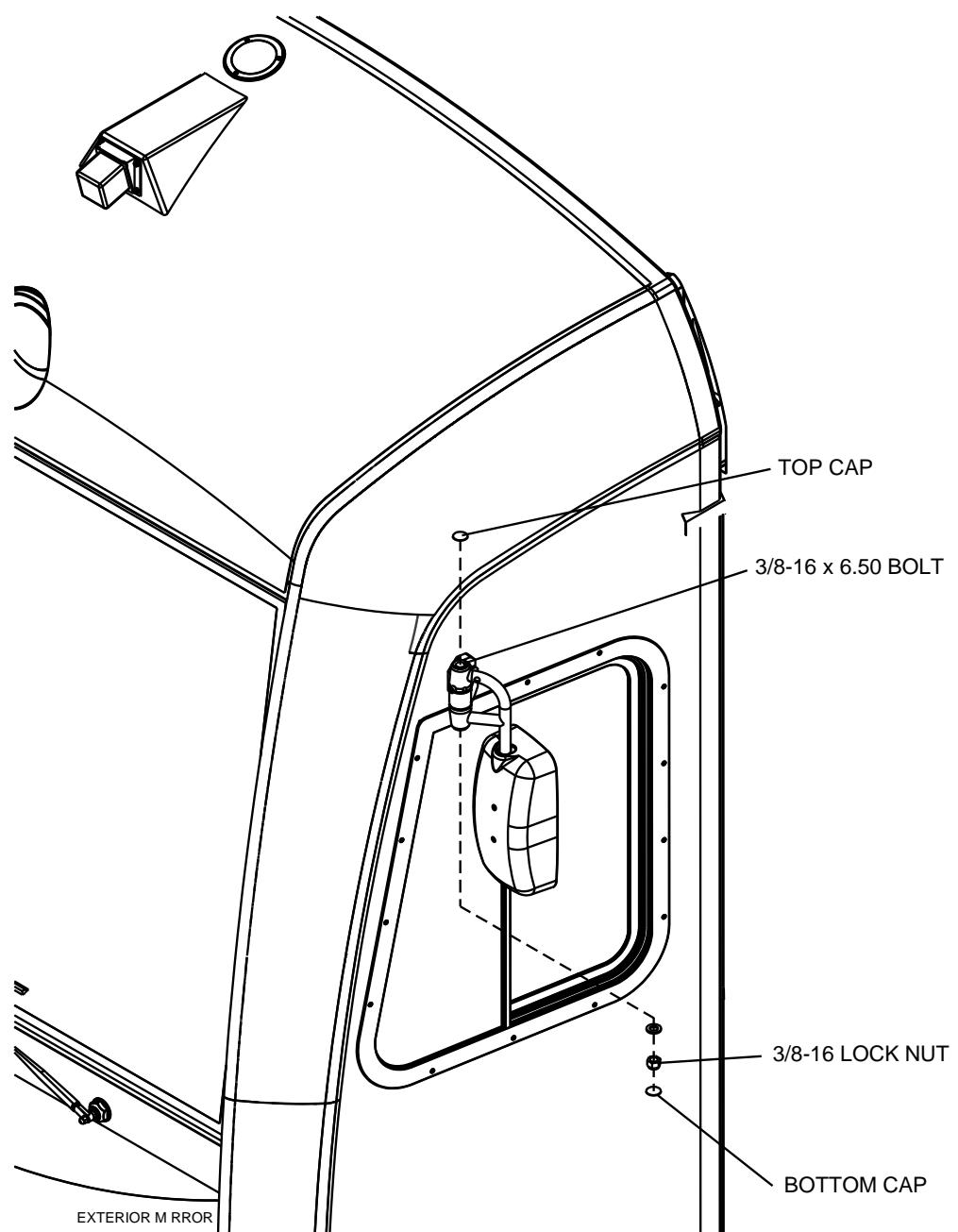


Figure 5-3: Adjustment of Exterior Mirror Detent Tension

5.3.2.4 Skirts

Inspect for loose hardware, damage, cracks, pitting, discoloration and other signs of deterioration every 120,000 miles. See Figures 2-3, 7-72 and 7-73.

5.3.2.5 Windows

See Figures 2-3, 7-74 through 7-77.

5.3.2.5.1 Inspecting Laminates

Visually inspect and clean each laminate before and after use of the LRV on a daily basis. Inspections should be for any of the following:

- Scratches: if on interior face with vandal film still intact, vandal film can be removed when scratches become excessive
- Chips: document location and monitor for further wear
- Cracks: replace immediately

5.3.2.5.2 Inspecting Assemblies

Visually inspect each assembly (cab door and hinged windows) for any corrosion, bends/dents or debris on a daily basis. Manually inspect moving features to check for internal damages. Clear debris if present and document any damages. If the window assembly becomes inoperable, replace assembly component or assembly immediately.

Open and close cab hinged window to ensure smooth operation. If there is indication of binding, apply a small amount of CRC Electrical Silicone to the hinged.

5.3.2.5.3 Inspecting Gaskets

Visually inspect all gaskets for damages on a daily basis. For some gaskets, a filler key gasket is used to tighten the seal. Check filler keys as well for damage. Damages could include, but are not limited to:

- Scratches: monitor for further damage
- Cuts (partial separation): document and monitor for further damage
- Cuts (complete separation): replace immediately
- Corrosion (Dry Rot): replace immediately
- Missing filler key: replace immediately

5.3.2.6 Rear View Camera

Visually inspect for damage and dirt every 10,000 miles. See Figures 2-3 and 7-78.

5.3.3 Interior Equipment

5.3.3.1 Stanchions and Grab Rails

Visually inspect the stanchions and grab rails every 10,000 miles for loose or missing hardware. The stanchions and grab rails can be cleaned using a solution of mild detergent and water applied with a soft cloth. Operators should check the stanchions and grab rails as part of daily pre-operations check. See Figures 2-4 and 7-79.

5.3.3.2 Windscreens

Visually inspect the windscreens every 10,000 miles for loose or missing hardware. The windscreens can be cleaned using a solution of mild detergent and water applied with a soft cloth. See Figures 2-4, 7-80 and 7-81. Graffiti etchings should be repaired. Use paint to match Nevamar S6012T Neutral Gray, Textured.

5.3.3.3 Ceiling Panels

Visually inspect the ceiling panels every 120,000 miles for loose hardware or other damage. Clean the ceiling panels using a solution of mild detergent and water applied with a soft cloth. Stains may be removed by wetting the surface, sprinkling lightly with baking soda and then wiping clean with a damp cloth. See Figures 2-7 and 7-82.

5.3.3.4 Interior Speakers

Visually inspect the interior speakers for loose components and proper operation every 60,000 miles. See Figures 2-7 and 7-83.

5.3.3.5 Interior View Camera

Visually inspect the interior view camera every 10,000 miles for loose hardware and the camera lens for scratches or cracks. Clean the camera lens every 30,000 miles. See Figure 2-7 and 7-83.

5.3.3.6 Passenger Emergency Intercom

Visually inspect the passenger emergency intercom every 10,000 miles for damage and proper operation. See Figures 2-9 and 7-86.

5.3.3.7 Side Destination Sign

Visually inspect the side destination sign on a daily basis for defective LED's. See Figures 2-9 and 7-89.

5.3.3.8 Floor Panels

Visually inspect the seals once every 120,000 miles. If seal appears to be cracked or damaged, refer to seal repair procedure. See Figures 2-9 and 2-10.

Clean the floor panels (Abrastop™) at least once or twice a week. Refer to Sections 5.3.3.8.1 through 5.3.3.8.3 of this manual section for cleaning restrictions and procedures.

5.3.3.8.1 Cleaning Restrictions

Abrastop™ floor covering withstands most chemicals and common solvents (acetone and/or alcohols, food products, oils, etc.). However, it is preferable to avoid any prolonged contact with any chemicals, solvents or other liquids. Any spills should be wiped dry and rinsed with water.

The following products are not acceptable for use on the floor surface:

- Any product containing dichloromethane (methylene chloride) or N-methylpyrrolidone,
- Acetic acid (concentrated vinegar),
- Strongly acidic or alkaline products (pH below 2 or above 12),
- Never wax the floor so that its anti-skid properties are not adversely affected,
- Never use floor polisher on Abrastop™ flooring.

Before using any other product on the floor surface, make a preliminary spot test or contact Baultar for assistance. Avoid long term water exposure onto the floor covering surface. This will cause permanent floor covering discoloration. Carpet or other media that can maintain water / moisture on the floor covering for a sustained period should be avoided.

5.3.3.8.2 Abrastop™ Cleaning Procedure

Baultar Premium cleaner should not be used straight from the bottle, but should be diluted in water at 1:128 (1.00 oz per US gallon of water or 100 mL of detergent into 12.80 L of water). Clean using a mop with the pre-diluted product.

To remove embedded dirt, it is recommended to proceed with a deep-down cleaning. Dilute Baultar Premium at 1:25 (5.00 oz per US gallon of water or 500 mL per 12.50 L of water). Spread the solution and let stand for a little while. If necessary, use a soft pad or brush to scrub the floor and rinse.

5.3.3.8.3 Graffiti Cleaning Procedure

Directions for use:

1. Work only on a small surface area at a time, e.g. from 500.00 to 1000.00 cm².
2. Pour a small amount of BAM20 CR 3001 on the area to be treated.
3. Rub with a clean rag until the graffiti disappears*.
4. Wipe dry with a clean rag.
5. If the graffiti still persists, repeat this procedure as needed.
6. Rinse with water, and wipe dry.

WARNING

USE ONLY WITH SOLVENT-RESISTANT GLOVES (NITRILE OR BUTYL RUBBER) AND SAFETY GLASSES. REFER TO THE SAFETY DATA SHEET (SDS) FOR MORE DETAILS.

*The BAM20 CR 3001 contain a light abrasive to improve its efficiency. In order to reduce the local gloss variation, it is recommended to avoid unnecessary rubbing of the floor. Use light circular rubbing movements and wait 30 seconds to let the product work. If the stains persist, use more pressure on the second cleaning.

NOTE: BAM20 CR 3001 is safe to use on Abrastop™, but may affect other surfaces. If doubtful, make a preliminary spot test on a concealed surface.

Alternative product to the BAM20 CR 3001 is the Soy-It Graffiti Remover. It is recommended to expose the graffiti area for 15-30 seconds and wipe dry using a clean and non-abrasive rag. Depending on the graffiti, it may be appropriate to follow the first attempt by a second application of Graffiti Remover. Immediately after the graffiti removal, the floor surface must be rinsed with water in order to remove any residual graffiti remover in contact with Abrastop™.

If Soy-It Graffiti Remover is left for an extended period of time (more than one hour) on the surface of Abrastop™, it will permanently discolor it. Alternative Graffiti cleaning procedure: The use of dry ice blast cleaning may also be used on Abrastop™ floor covering.

Refer to Section 0200, Car Body of the Heavy Repair Maintenance Manual for additional information.

5.3.3.9 APC Analyzer

Visually inspect the APC Analyzer every 60,000 miles for loose cables and ensure that the green power LED is lit. See Figure 2-9 and Figure 7-91.

5.3.3.10 Automatic Passenger Counter (APC) Sensor

The following should be performed every 60,000 miles:

Visually inspect the Automatic Passenger Counter Sensor for loose components. See Figure 2-7 and Figure 7-83.

The following should be performed every 120,000 miles:

Clean the optic of the APC sensor with a soft cotton cloth as follows:

- Use clean water with a few drops of dish detergent.
- Wipe the sensor with the cloth.
- After cleaning, rinse with clean water.
- Dry the sensor with a clean dry cloth or with low air pressure.

Visually inspect the sensor for loose cables every 120,000 miles. The functionality of the system depends on tight connections between cables. Partial connections can cause equipment to malfunction.

5.3.3.10.1 Vehicle Number Assignment

The APC system is commissioned in Palmdale for every vehicle before delivering to LA Metro. Part of the commissioning is to assign the vehicle number on the COPILOTpc backplane via Test Function.

To change or assign a vehicle number:

- Enter test function 10106
- Enter vehicle number, PRESS OK
- Enter test function 10205 to RESTART
- Enter test function 10104 to verify vehicle number

5.3.3.10.2 COPILOTpc Battery

The COPILOTpc is equipped with the VARTA Microbattery lithium manganese dioxide (LiMnO_2). These cells offer excellent shelf life, good high-rate and low-rate capability, a wide operating temperature range and availability in button and cylindrical cell designs. The COPILOTpc uses CR ½ AA model.

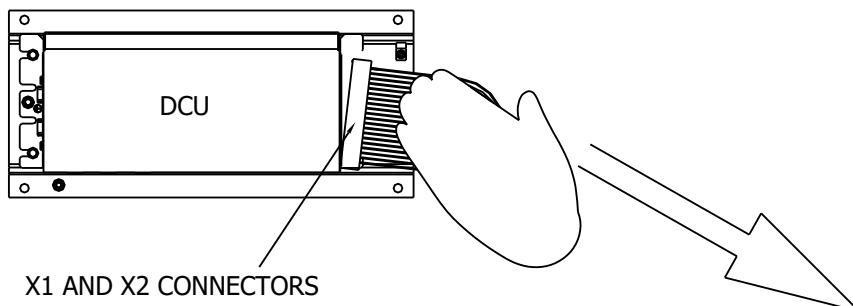
*Do not attempt to replace batteries. Send the COPILOTpc unit back to INIT for repair or replacement.

5.3.3.11 Door Control Unit

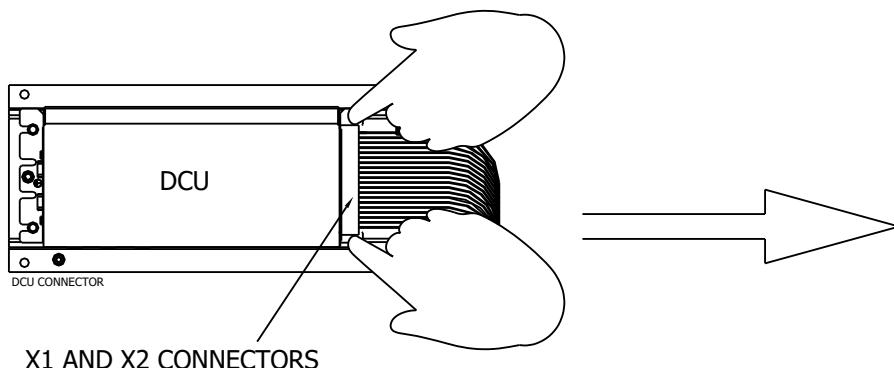
Visually inspect the door control unit every 30,000 miles for wiring damage and ensure X1 and X2 connectors are properly seated.

NOTE: Never pull on the wire harness in any manner.

Use your hands to check only the top and bottom of the X1 and X2 connectors to ensure they are seated. If the connector is loose then it must be reseated. See Figure 5-4.



INCORRECT METHOD



CORRECT METHOD

Figure 5-4: Correct Method of Reseating Connectors

5.3.4 Seats

Inspection includes checking for wear, damage, loose or missing fasteners, and misaligned components. Specific inspection instructions are provided below. See Figures 2-11 and 7-92 through 7-97.

5.3.4.1 General Cleaning

1. Clean the upholstery (every 10,000 miles, and at every subsequent maintenance interval).
2. Use a vacuum cleaner to clean the upholstery on the seat bottom cushions and seat back cushions.

WARNING

CLEANING MATERIALS CAN BE TOXIC AND DANGEROUS TO HANDLE. READ THE HANDLING INSTRUCTIONS BEFORE USING, AND FOLLOW THE MANUFACTURER'S RECOMMENDATIONS.

3. If necessary, use an upholstery cleaner compatible with the seat cushion covering material. Follow the directions provided with the upholstery cleaning material.

5.3.4.2 Seat Cushion Inspection

After cleaning the seat cushions, visually check the seat external surfaces for wear and damage every 30,000 miles. Check for splits and tears in the seat fabric. Replace damaged seat cushions.

5.3.5 Electric Locker Equipment

5.3.5.1 Auxiliary Circuit Breaker

WARNING

BEFORE INSPECTING A CIRCUIT BREAKER PANEL, MAKE SURE THE PANTOGRAPH IS LOWERED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Visually inspect the auxiliary circuit breaker for loose or worn hardware every 60,000 miles. See Figures 2-13 and 7-98.

5.3.5.2 AC Circuit Breaker Panel

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Visually inspect the AC circuit breaker panel for loose or worn hardware every 60,000 miles. See Figures 2-13, 2-14, 7-98 and 7-99.

5.3.5.3 LVDC Terminal Block

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-13, 2-14, 7-98 and 7-99.

5.3.5.4 High Speed Circuit Breaker Control Panel

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-13 and 7-98.

5.3.5.5 APC COPILOTpc

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-14 and 7-99.

5.3.5.6 Network Video Recorder (NVR)

Visually inspect for loose components and secure mounting hardware every 60,000 miles. See Figures 2-14 and 7-99.

5.3.5.7 Electronic Control Unit, Center Truck

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-14 and 7-99.

5.3.5.8 Terminal Board

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-15 and 7-100.

5.3.5.9 Ethernet Switch

Visually inspect for loose components and secure panel mounting hardware every 10,000 miles. See Figures 2-15 and 7-100.

5.3.5.10 Track Brake Contactor Panel

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-15 and 7-100.

5.3.5.11 Convenience Outlet

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Visually inspect the convenience outlet every 30,000 miles and functionally test it every 60,000 miles for proper operation. See Figures 2-15 and 7-100.

5.3.5.12 Electronic Control Unit Pull Down Resistor

Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-15 and 7-100.

5.3.5.13 ARP1B Relay Panel

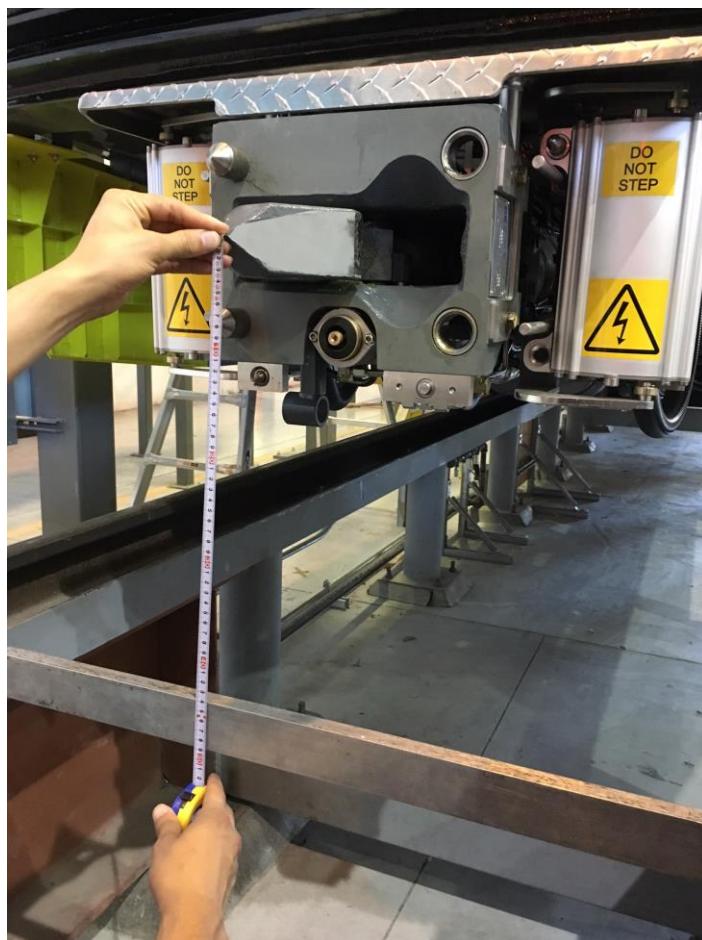
Visually inspect for loose components and secure panel mounting hardware every 60,000 miles. See Figures 2-15 and 7-100.

5.3.6 Undercar Mounted Equipment

5.3.6.1 Coupler

Measure the Coupler height every 60,000 miles using the following:

1. Place a straight edge on the track to obtain a true reading.
2. Use a measuring tape to check the coupler height from the tip of the coupler hook down to the bottom of the straight edge. Refer to the graphic below.
3. Coupler height should be 510mm with a tolerance of \pm 10mm.



4. If the coupler height is not within specification or tolerance, the trucks may need to be shimmed. Refer to Section 4.0 of the Car Body Running Maintenance and Servicing Manual for height adjustment information.

Refer to Section 0300, Coupler of the Running Maintenance and Servicing Manual for additional maintenance information. See Figures 2-16 and 7-102.

5.3.6.2 TWC Antenna

Refer to Section 1500, ATC / TWC of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-103.

5.3.6.3 Sanding Device

Visually inspect the sanding equipment air lines and ejector alignment and verify operation every 10,000 miles. See Figure 2-16 and 7-104.

Clean nozzles with small brush to ensure sand is not clogged.

5.3.6.4 Main Reservoir

Refer to Section 1300, Friction Brakes of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-105.

5.3.6.5 Brake Supply Reservoir

Refer to Section 1300, Friction Brakes of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-106.

5.3.6.6 Air Compressor

Refer to Section 1300, Friction Brakes of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-107.

5.3.6.7 Brake Control Unit (Motor Truck)

Refer to Section 1300, Friction Brakes of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-108.

5.3.6.8 Brake Control Unit (Center Truck)

Refer to Section 1300, Friction Brakes of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-109.

5.3.6.9 Auxiliary Power Supply

Refer to Section 0900, Auxiliary Inverter of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-110.

5.3.6.10 Battery / Battery Circuit Breaker Box

Refer to Section 1100, Battery of the Running Maintenance and Servicing Manual for maintenance information on the battery. See Figures 2-16, 7-111 and 7-112.

5.3.6.11 Propulsion Inverter

Refer to Section 0700, Propulsion of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-113.

5.3.6.12 Line Reactor

Refer to Section 0700, Propulsion of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-114.

5.3.6.13 Knife Switch

Refer to Section 0700, Propulsion of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-115.

5.3.6.14 Horn

Refer to Section 1400, Communications of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-16 and 7-116.

5.3.7 Roof Mounted Equipment

5.3.7.1 High Speed Circuit Breaker (HSCB)

Refer to Section 0700, Propulsion of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-17 and 7-117.

5.3.7.2 Lightning Arrestor

Refer to Section 0700, Propulsion of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-17 and 7-118.

5.3.7.3 Brake Resistor

Refer to Section 0700, Propulsion of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-17 and 7-119.

5.3.7.4 Pantograph

Refer to Section 0800, Pantograph of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-17 and 7-120.

5.3.7.5 Auxiliary Fuse Box

Refer to Section 0700, Propulsion of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-17 and 7-121.

5.3.7.6 Heating, Ventilation and Air Conditioning (HVAC) Unit

Refer to Section 0500, HVAC of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-17 and 7-122.

5.3.7.7 Roof Shrouds

Visually inspect the Roof Shrouds every 120,000 miles for cuts, cracks, pitting, discoloration and other signs of deterioration. Check for loose and missing hardware and replace as necessary. See Figures 2-17 and 7-123 through 7-125.

5.3.7.8 Silent Alarm

Refer to Section 0600, Lighting of the Running Maintenance and Servicing Manual for maintenance information. See Figures 2-17 and 7-126.

5.3.7.9 Radio Antenna

There is no maintenance needed on the Radio Antenna. See Figures 2-17 and 7-127.

5.3.7.10 GPS Antenna

There is no maintenance needed on the GPS Antenna. See Figures 2-17 and 7-128.

5.3.7.11 WLAN Antenna

There is no maintenance needed on the WLAN Antenna. See Figures 2-17 and 7-129.

5.3.7.12 Wayside Worker Alert System (WWAS) Antenna

There is no maintenance needed on the WWAS antenna. See Figures 2-17 and 7-130.

5.3.7.13 Roof Mounted Camera

Visually inspect the lens for cracks and scratches every 10,000 miles. See Figures 2-17 and Figure 7-131.

5.3.8 Articulation Section

See Figures 2-18 and 7-132 through 7-136.

5.3.8.1 Ceiling Panels

Visually inspect the ceiling panels every 120,000 miles for loose or missing hardware. Inspect for scratches, dents or any other signs of deterioration. See Figures 2-18 and 7-132.

5.3.8.2 Side Panels

Visually inspect the interior panels every 120,000 miles for loose or missing hardware. Inspect for scratches, dents or any other signs of deterioration. See Figures 2-18 and 7-133.

Clean the interior panels with a 50% solution of mild cleanser and water.

5.3.8.3 External Panels

Visually inspect the external panels every 120,000 miles for loose or missing hardware. Inspect for scratches, dents or any other signs of deterioration. See Figures 2-18 and 7-133.

5.3.8.4 Turntables

Visually inspect the turntables every 120,000 miles for loose or missing hardware. Inspect for scratches or any other signs of deterioration. See Figures 2-18 and 7-134. The turntable finish surface is Abrastop™. Refer to Section 5.3.3.8 of this manual section for additional information.

5.3.8.5 Rub Plates

Visually inspect the rub plates every 120,000 miles for excessive wear, bends, cracks, pitting, discoloration or any other signs of deterioration. See Figures 2-18 and 7-134.

5.3.8.6 Bellows Assembly

The following tasks should be performed every 120,000 miles:

1. Inspect the rubber parts of the bellows for cuts, tears and rips. See Figures 2-18 and 7-133 and 7-134.
2. Inspect the rubber profile for cracks, wear or brittleness.

The following task should be performed every 120,000 miles:

Inspect the suspension cable for sufficient tension.

The following tasks should be performed every 60,000 miles:

NOTE: The turntable needs to be removed before performing this task. Refer to Section 7.4.8.4 of this manual section.

Visually inspect for dirt and debris accumulation in the bellow. Clean as needed with industrial vacuum cleaner.

5.3.8.7 Articulation Middle Frame and Pivot Bearing Assembly

5.3.8.7.1 Articulation Middle Frame

Visually inspect the articulation middle frame every 120,000 miles for corrosion, missing paint and any other signs of deterioration. See Figures 2-18 and 7-135.

5.3.8.7.2 Pivot Bearing Assembly

Inspect the rubber parts of the pivot bearing assembly every 120,000 miles for cuts, tears, wear and other signs of deterioration. See Figures 2-18 and 7-135.

Inspect the metallic parts of the pivot bearing assembly for corrosion, scratches, missing paint and other signs of deterioration.

5.3.8.8 Articulation Shaft and Rubber Bearing

Visually inspect the articulation shaft every 120,000 miles for corrosion, scratches, missing paint and other signs of deterioration. See Figures 2-18 and 7-135.

Inspect the rubber bearing for cuts, wear and other signs of deterioration.

5.3.8.9 Balancing Device

Visually inspect the balancing device every 30,000 miles for loose or missing hardware, corrosion, scratches and missing paint. See Figures 2-18 and 7-133.

Inspect the spring for signs of a loss of tension.

5.3.8.10 Articulation Wiring

WARNING

ARTICULATION WIRING ON THESE CARS OPERATES AT VOLTAGE AND CURRENT LEVELS THAT ARE HAZARDOUS AND LIFE THREATENING. PROPER PRECAUTIONS SHOULD BE TAKEN AND METRO SAFETY RULES, PRACTICES AND PROCEDURES CLOSELY OBSERVED.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN THE ARTICULATION, ENSURE THAT THE BATTERY CIRCUIT BREAKER IS IN THE OFF POSITION. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

Visually inspect the articulation wiring every 960,000 miles for loose or missing hardware, insulation cuts, discoloration, heat damage or any other signs of deterioration. See Figures 2-18 and 7-136.

CHAPTER 6.0

LUBRICATION

6.1 Introduction

This chapter provides lubrication procedures for the Car Body and Articulation equipment.

6.1.1 Lubrication of Operator's Seat

The following items are to be lubricated every 60,000 miles:

- Baseplate Tube
- Fore / Aft Slide

1. With the base in the lowest position, apply Lubriplate 110 through the grease fitting (1) until it comes out the top of the baseplate tube (2). See Figure 6-1.
2. Wipe off excess grease.
3. Place the seat in full aft position and apply a small amount of Lubriplate 110 to the front of the slide rail (1). See Figure 6-2.
4. Move the seat to the forward position and apply a small amount of Lubriplate 110 to the rear of the slide rail (2).
5. Wipe off excess grease.

6.1.2 Pantograph

Refer to Section 0800, Pantograph of the Running Maintenance and Servicing Manual for lubrication of the pantograph equipment.

6.1.3 Master Controller

WARNING

MIXING LUBRICANTS WITH OTHER LUBRICANTS CAN CAUSE EXPLOSIVE FUMES. RISK OF EXPLOSION!

- **DO NOT MIX LUBRICANTS WITH OTHER LUBRICANTS.**
- **OBSERVE THE MANUFACTURER'S INSTRUCTIONS.**

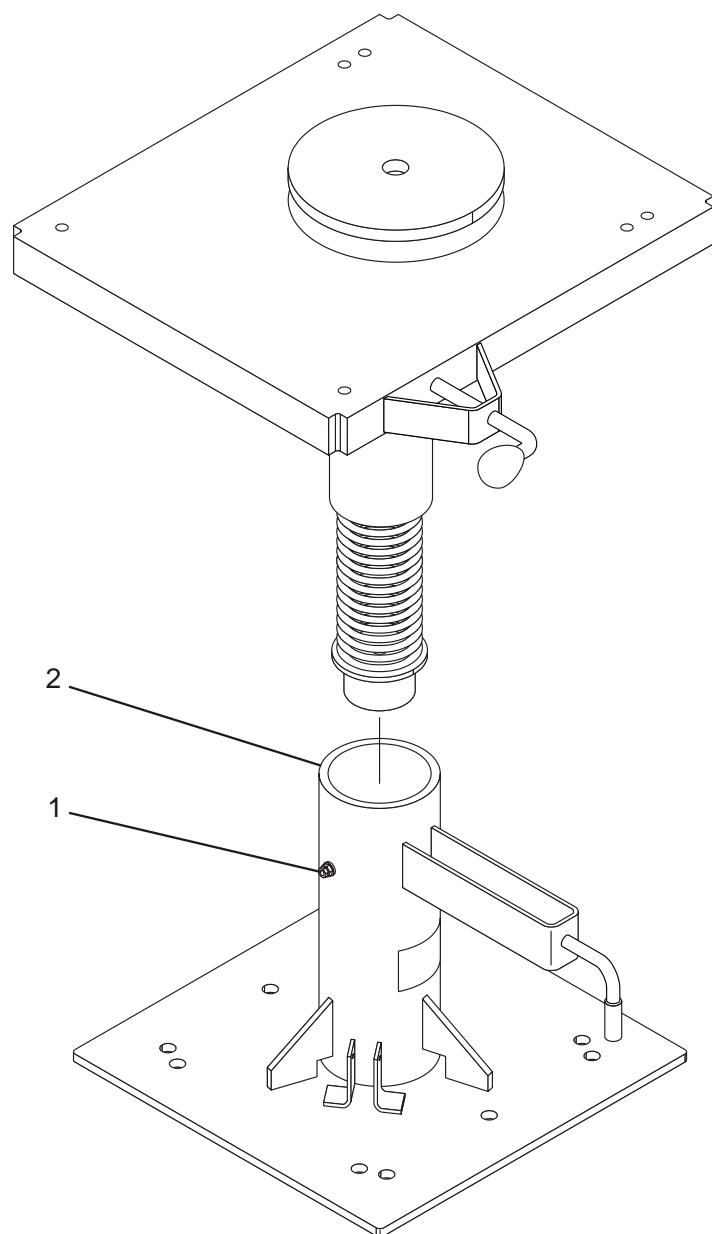


Figure 6-1: Lubricate Baseplate Tube of Operator's Seat

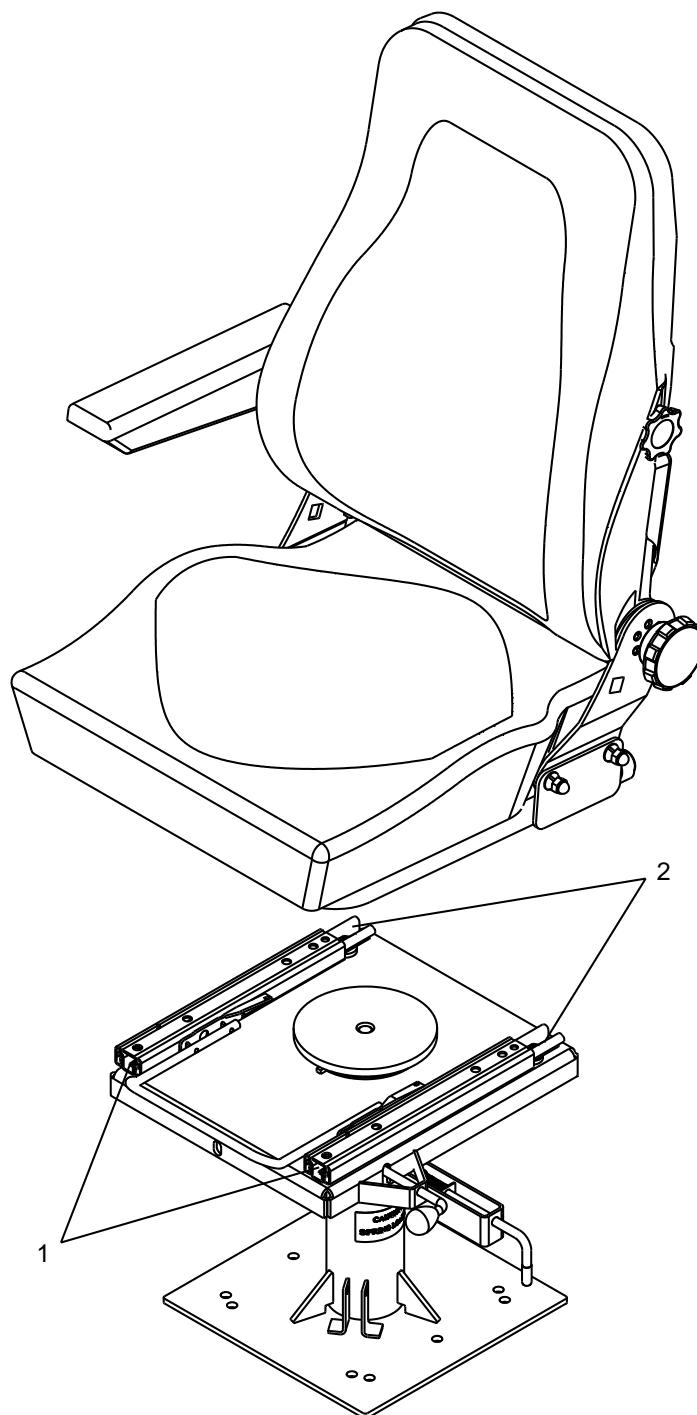


Figure 6-2: Lubricate Fore/Aft Slide of Operator's Seat

WARNING

LUBRICANTS COULD POSE POTENTIAL HUMAN HEALTH RISKS.

- **OBSERVE THE MANUFACTURER'S INSTRUCTIONS.**
- **DO NOT EAT, DRINK OR SMOKE WHILE HANDLING LUBRICANTS.**
- **WASH HANDS THOROUGHLY WITH SOAP AND WATER AFTER HANDLING LUBRICANTS.**

CAUTION

LUBRICANTS CAN BE HARMFUL TO THE ENVIRONMENT.

- **ENSURE THAT LUBRICANTS DO NOT ENTER ANY SEWER SYSTEM OR BODY OF WATER, OR SEEP INTO THE GROUND.**
- **DISPOSE OF LUBRICANTS ACCORDING TO THE LOCALLY APPLICABLE NATIONAL REGULATIONS.**

6.1.3.1 Apply Key Lock Spray to the Key Lock Cylinder of the Transfer Switch (TS)

1. Apply key lock spray every 120,000 miles to the key lock cylinder of the transfer switch. Refer to Table 3-1, Special Tools & Materials.
2. Turn the key a few times back and forth.
3. Remove any surplus key lock spray using a cleaning cloth.

6.1.3.2 Lubricate Moving Parts

1. Remove old grease and abrasion with the cleaning cloth. See Figure 6-3.
2. Apply new low-temperature lubrication grease with a brush to:
 - detent roller (1) and detent disk (2)
 - gears

Refer to Table 3-1, Special Tools & Materials.

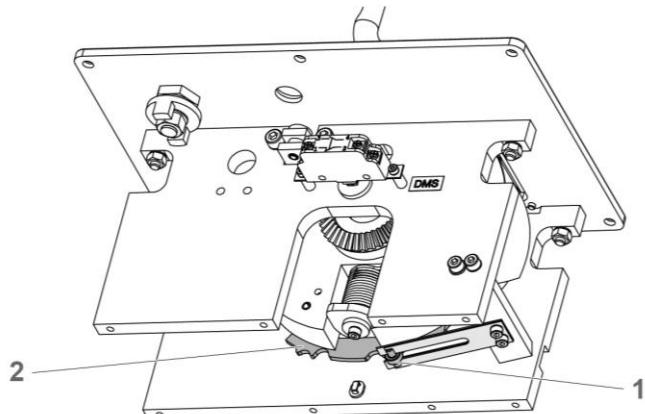


Figure 6-3: Lubricate Master Controller Moving Parts

6.1.4 Windows

6.1.4.1 Hinged Window

CAUTION

SILICONE SHOULD NOT COME IN CONTACT WITH GLASS OR GASKETS.

If either the latches or the hinges begin to not operate correctly without any obvious indication of damage, a small amount of CRC Electrical Silicone can be applied to the mating surfaces of the joint in question. If the lubrication does not improve the operation of the component or if the operation is only improved for a short duration, the component will likely need to be replaced.

6.1.4.2 Cab Door

CAUTION

SILICONE SHOULD NOT COME IN CONTACT WITH GLASS OR GASKETS.

If the handles begin to not operate correctly with any obvious indication of damage or obstruction, a small amount of CRC Electrical Silicone can be applied to the mating surfaces of the joint in question. If the lubrication does not improve the operation of the component or if the operation is only improved for a short duration, the component will likely need to be replaced.

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CHAPTER 7.0

CORRECTIVE MAINTENANCE

7.1 Introduction

This chapter provides general guidelines on component removal and installation of the Car Body and Articulation equipment.

7.2 Safety Precautions

The following statements of warning and caution apply to the handling of the Car Body and Articulation and appear as appropriate throughout this manual.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

TO PREVENT RECEIVING ELECTRICAL SHOCK WHEN PERFORMING ELECTRICAL TEST, HANDS MUST BE CLEAR OF ELECTRICAL COMPONENTS, CONTACTS AND HOUSING AND THERE MUST BE NO BODILY CONTACT WITH THE WORK BENCH. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE INJURY OR DEATH.

WARNING

WHEN REMOVING DAMAGED GLASS, WEAR LEATHER GLOVES AND SAFETY GLASSES TO PREVENT SKIN AND EYE INJURY.

WARNING

DO NOT ATTEMPT TO MOVE THE WINDSHIELD UNTIL THE WINDOW HAS BEEN FREED ON ALL SIDES.

CAUTION

WEAR SAFETY SHOES AND HARD HATS WHEN WORKING WHERE OBJECTS MIGHT FALL.

WARNING

USE THE PROPER LIFTING EQUIPMENT TO REMOVE AND REPLACE HEAVY COMPONENTS. ALSO MAKE SURE THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. NEVER ATTEMPT TO PERFORM A TWO PERSON OPERATION ALONE. KNOW AND FOLLOW EMERGENCY PROCEDURES.

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

WARNING

ALL AIR SUPPLY AND/OR ELECTRIC CURRENT TO THESE DEVICES AND/OR ANY COMPONENT PARTS MUST BE CUT-OFF BEFORE THESE DEVICES AND/OR COMPONENT PART ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT.

WARNING

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THESE DEVICES AND/OR ANY COMPONENT PARTS ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THESE DEVICES AND/OR COMPONENT PARTS.

WARNING

WHEN REMOVING OR INSTALLING THE BATTERY, ALWAYS GET ASSISTANCE AND USE A SUITABLE LIFTING DEVICE TO AVOID PERSONAL INJURY. BEWARE OF POSSIBLE SHARP EDGES AND BURRS.

WARNING

MUCH OF THE EQUIPMENT ON THESE CARS OPERATES AT VOLTAGE AND CURRENT LEVELS THAT ARE HAZARDOUS AND LIFE THREATENING. PROPER PRECAUTIONS SHOULD BE TAKEN AND METRO SAFETY RULES, PRACTICES AND PROCEDURES CLOSELY OBSERVED.

WARNING

INSULATED GLOVES MUST BE WORN AND EXTREME CARE TAKEN TO PREVENT BURNS WHEN HANDLING HEATED PARTS.

WARNING

THE MASTER CONTROLLER CONTAINS LIVE VOLTAGE COMPONENTS. THERE IS A RISK OF ELECTRIC SHOCK! ALWAYS CONSIDER THE FOLLOWING SAFETY RULES BEFORE CARRYING OUT WORK ON THE MASTER CONTROLLER:

- ENSURE THAT THE MAIN SWITCH, LOCATED INSIDE THE VEHICLE, IS TURNED TO THE “OFF” POSITION BEFORE CARRYING OUT WORK ON THE MASTER CONTROLLER.
- CLEARLY MARK YOUR WORK AREA.
- ENSURE THAT THE MAIN SWITCH CANNOT ACCIDENTALLY BE SWITCHED ON.
- DISCONNECT.
- MAKE SURE THAT THERE IS NO VOLTAGE.
- BESIDES THE MAIN ELECTRIC CIRCUIT ALSO DISCONNECT ADDITIONAL AND AUXILIARY CIRCUITS.
- INSULATE OR COVER ADJACENT ENERGIZED PARTS.

WARNING

THE MASTER CONTROLLER IS HEAVY. RISK OF INJURY AND DAMAGE TO THE DEVICE!

TAKE CARE WHEN HANDLING THE DEVICE.

DURING TRANSPORT, DO NOT CARRY THE DEVICE BY ITS HANDLE OR LEVER.

CAUTION

MOISTURE AND DUST CAN DAMAGE THE MASTER CONTROLLER. IF THE DEVICE IS TO BE STORED FOR A PROLONGED PERIOD OF TIME,

- STORE IT IN ITS ORIGINAL PACKAGING,
- STORE IT IN A DRY AND DUST-FREE LOCATION.

CAUTION

DURING REMOVAL AND INSTALLATION, ENSURE THAT DIRT CAUSED BY SURROUNDING CONSTRUCTION ACTIVITIES DOES NOT GET INTO THE MASTER CONTROLLER.

7.3 Corrective Maintenance Standard Shop Practices

The following paragraphs provide mounting hardware and torqueing practices applicable to all installation and removal work of the Car Body and Articulation equipment.

7.3.1 Mounting Hardware

All fastening bolts on the LACMTA P3010 LRV are Grade 5, or higher. When removing any component from the vehicle, replacement fasteners MUST BE Grade 5 or better. See Figures 7-1 and 7-2.

7.3.2 Torquing Practices and Procedures

All safety related fasteners, including truck and brake equipment bolts and all fasteners exposed to fatigue loads must be torqued to a minimum preload equal to 75% of their proof load and torqued striped after torquing by paint or equally approved means. All other fasteners must be torqued so that they do not loosen in service.

7.3.3 Torquing Methods

1. Select the correct wrench and avoid using wrenches that are oversized or undersized for the torque required.
2. Pull the wrench - Pulling is no more accurate than pushing, however, when a part fails unexpectedly, finger and knuckle injuries are prevented.
3. Add the run-down resistance - Tight threads and locknuts produce added resistance to the desired torque. Read the scale on the last rotation or as close to the make-up point as possible, then add the ft-lbs. (or in-lbs.) of resistance to the desired torque to obtain the value required.
4. Don't stop at set or seizure - When a fastener pops it has seized. Accurate torque settings are not possible before the point of last rotation. To break a set, back off and again apply torque. Lightly lubricate the thread and seat when conditions allow.

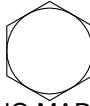
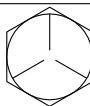
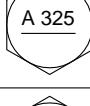
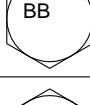
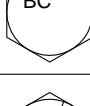
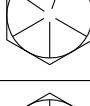
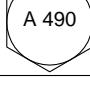
Grade Marking	Specification	Material
 NO MARK	SAE-Grade 1	Low or Medium Carbon Steel
	ASTM-A 307	Low Carbon Steel
	SAE-Grade 2	Low or Medium Carbon Steel
	SAE-Grade 5	Medium Carbon Steel, Quenched and Tempered
	ASTM-A 449	
	SAE-Grade 5.2	Low Carbon Martensite Steel, Quenched and Tempered
	ASTM-A 325 Type 1	Medium Carbon Steel, Quenched and Tempered
	ASTM-A 325 Type 2	Low Carbon Martensite Steel, Quenched and Tempered
	ASTM-A 325 Type 3	Atmospheric Corrosion (Weathering) Steel Quenched and Tempered
	ASTM-A 354 Grade BB	Low Alloy Steel, Quenched and Tempered
	ASTM-A 354 Grade BC	Low Alloy Steel, Quenched and Tempered
	SAE-Grade 7	Medium Carbon Alloy Steel, Quenched and Tempered Roll Threaded After Heat Treatment
	SAE-Grade 8	Medium Carbon Alloy Steel, Quenched and Tempered
	ASTM-A 354 Grade BD	Alloy Steel, Quenched and Tempered
	ASTM-A 490	Alloy Steel, Quenched and Tempered

Figure 7-1: Standard Grade Marking Chart

Property Class Marking	Property Class Designation	Material
	4.6	Low or Medium Carbon Steel
	4.8	Low or Medium Carbon Steel, Fully or Partially Annealed
	5.8	Low or Medium Carbon Steel, Cold Worked
	8.8	Medium Carbon Steel, Quenched and Tempered
	A325M Type 1	
	8.8	Low Carbon Boron Steel, Quenched and Tempered
	A325M Type 2	
	A325M Type 3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered
	9.8	Medium Carbon Steel, Quenched and Tempered
	9.8	Low Carbon Boron Steel, Quenched and Tempered
	10.9	Medium Carbon Alloy Steel, Quenched and Tempered
	A490M Type 1	

Figure 7-2: Metric Grade Marking Chart
(Sheet 1 of 2)

Property Class Marking	Property Class Designation	Material
 10.9	10.9	Low Carbon Boron Steel, Quenched and Tempered
 A490M 10S	A490M Type 2	
 A490M 10S3	A490M Type 3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered
 12.9	12.9	Alloy Steel Quenched and Tempered

Figure 7-2: Metric Grade Marking Chart
(Sheet 2 of 2)

7.3.4 General Guide for Maximum Torque Values

When manufacturer's specifications are not available, Tables 7-1 and 7-2 may be used as a guide to the maximum allowed torque for a given fastener and thread (standard or metric).

Table 7-1. Standard Fastener Torques for LACMTA P3010 LRV

Diameter / Pitch	Force / Torque	Stainless Steel Group 1, 2, 3 Condition CW		Steel Fastener			
				Grade 5		Grade 8	
		A	B	A	B	A	B
1/4 - 20	ft-lbs.	6	5	8	6	12	9
	Nm	8	6	11	8	16	12
	kg cm	80	60	110	80	165	120
5/16 - 18	ft-lbs.	13	10	17	13	25	18
	Nm	18	14	23	18	34	24
	kg cm	180	140	230	180	350	250
3/8 - 16	ft-lbs.	24	18	31	23	44	33
	Nm	33	24	42	31	60	45
	kg cm	330	250	430	320	610	460
7/16 - 14	ft-lbs.	38	28	49	37	70	53
	Nm	52	38	67	50	95	72
	kg cm	530	390	680	510	970	730
1/2 - 13	ft-lbs.	58	43	76	57	105	80
	Nm	78	58	103	77	142	108
	kg cm	800	590	1050	790	1450	1100
5/8 - 11	ft-lbs.	115	85	150	125	210	160
	Nm	155	115	205	170	285	215
	kg cm	1590	1190	2070	1730	2900	2200
3/4 - 10	ft-lbs.	140	105	265	200	370	280
	Nm	190	145	360	270	500	380
	kg cm	1940	1500	3660	2770	5120	3870
7/8 - 9	ft-lbs.	225	170	430	320	600	450
	Nm	305	230	585	435	815	610
	kg cm	3110	2350	5940	4430	8300	6220
1 - 8	ft-lbs.	340	255	640	480	910	580
	Nm	460	345	870	650	1230	925
	kg cm	4700	3530	8850	6640	12500	9400

NOTE A: DO NOT USE LUBRICANT FOR FASTENERS – DRY

NOTE B: TO BE OILED OR WAXED ON THREADS OF FASTENERS - LUBRICATED

Table 7-2. Standard Metric Torques for LACMTA P3010 LRV

		Grade 4.6 (4T)		Grade 4.8		Grade 5.6 (5T)	
Nominal diameter	Torque Conversion	Dry	Oil	Dry	Oil	Dry	Oil
M5	ft-lbs.	1.8	1.6	2.4	2.1	2.2	1.8
	N*m	2.5	2.1	3.3	2.8	3	2.5
	kgf cm	25	21	34	29	31	26
M6	ft-lbs.	2.9	2.6	4.1	3.6	3.8	3.2
	N*m	3.9	3.5	5.6	4.8	5.1	4.3
	kgf cm	40	35	57	49	52	44
M8	ft-lbs.	7.2	6.3	10.3	8.9	8.9	7.4
	N*m	9.8	8.5	14	12	12	10
	kgf cm	100	85	140	120	130	110
M10	ft-lbs.	16	13	20	17	18	15
	N*m	22	17	27	23	25	21
	kgf cm	220	170	270	230	250	210
M12	ft-lbs.	27	22	35	30	32	27
	N*m	37	30	47	40	43	36
	kgf cm	380	300	480	410	440	370
M14	ft-lbs.	44	34	55	48	50	43
	N*m	60	46	75	65	68	58
	kgf cm	620	470	760	650	690	590
M16	ft-lbs.	70	53	89	74	81	66
	N*m	95	72	120	100	110	90
	kgf cm	1000	730	1200	1000	1100	920
M18	ft-lbs.	89	74	118	100	111	96
	N*m	120	100	160	135	150	130
	kgf cm	1300	1000	1650	1400	1500	1300
M20	ft-lbs.	125	103	170	144	155	133
	N*m	170	140	230	195	210	180
	kgf cm	1800	1400	2300	2000	2100	1800
M22	ft-lbs.	177	140	229	195	207	177
	N*m	240	190	310	265	280	240
	kgf cm	2500	1950	3160	2700	2900	2400
M24	ft-lbs.	221	181	295	247	266	221
	N*m	300	245	400	335	360	300
	kgf cm	3100	2500	4000	3400	3600	3100
M27	ft-lbs.	340	262	428	361	384	325
	N*m	460	355	580	490	520	440
	kgf cm	4700	3600	5900	5000	5300	4500
M30	ft-lbs.	465	358	575	487	524	443
	N*m	630	485	780	660	710	600
	kgf cm	6500	4900	8000	6800	7200	6100

NOTE: The M6 female fasteners on the cab door hinge are fastened to M4 studs and should be torqued to no more than 2.1 Nm (19 in-lbs.).

Table 7-2. Standard Metric Torques for LACMTA P3010 LRV (continued)

		Grade 5.8		Grade 6.8 (6T)		Grade 8.8 (7T)	
Nominal diameter	Torque Conversion	Dry	Oil	Dry	Oil	Dry	Oil
M5	ft-lbs.	3	2.5	3.5	3	4.6	3.8
	N*m	4.1	3.4	4.7	4	6.2	5.2
	kgf cm	41	35	48	41	63	53
M6	ft-lbs.	5.1	4.3	6	5	7.4	6.6
	N*m	6.9	5.8	8	6.8	10	8.9
	kgf cm	70	59	81	69	110	91
M8	ft-lbs.	12	10	14	12	18	16
	N*m	17	14	19	16	25	22
	kgf cm	170	140	200	170	260	220
M10	ft-lbs.	24	21	28	24	37	32
	N*m	33	28	38	32	50	43
	kgf cm	340	290	390	330	510	440
M12	ft-lbs.	43	36	49	42	67	57
	N*m	58	49	67	57	91	77
	kgf cm	590	500	680	580	930	790
M14	ft-lbs.	68	58	81	66	111	89
	N*m	92	78	110	90	150	120
	kgf cm	940	790	1100	920	1500	1300
M16	ft-lbs.	103	89	125	103	170	140
	N*m	140	120	170	140	230	190
	kgf cm	1500	1200	1700	1400	2300	2000
M18	ft-lbs.	148	125	170	140	229	192
	N*m	200	170	230	190	310	260
	kgf cm	2000	1700	2300	2000	3200	2700
M20	ft-lbs.	207	177	236	207	325	273
	N*m	280	240	320	280	440	370
	kgf cm	2800	2400	3300	2800	4500	3800
M22	ft-lbs.	280	236	325	273	443	376
	N*m	380	320	440	370	600	510
	kgf cm	3900	3300	4500	3800	6100	5200
M24	ft-lbs.	354	302	413	347	560	480
	N*m	480	410	560	470	760	650
	kgf cm	4900	4200	5700	4900	7800	6600
M27	ft-lbs.	524	443	605	509	811	701
	N*m	710	600	820	690	1100	950
	kgf cm	7200	6100	8400	7100	11000	9700
M30	ft-lbs.	708	605	811	693	1106	959
	N*m	960	820	1100	940	1500	1300
	kgf cm	9800	8300	11000	9600	15000	13000

Table 7-2. Standard Metric Torques for LACMTA P3010 LRV (continued)

		Grade 9.8		Grade 10.9		Grade 12.9	
Nominal diameter	Torque Conversion	Dry	Oil	Dry	Oil	Dry	Oil
M5	ft-lbs.	5.1	4.4	6.5	5.5	7.4	6.5
	N*m	6.9	5.9	8.8	7.5	10	8.8
	kgf cm	71	60	90	77	110	89
M6	ft-lbs.	8.9	7.4	11	9.6	13	11
	N*m	12	10	15	13	18	15
	kgf cm	120	100	150	130	180	150
M8	ft-lbs.	21	18	27	23	32	27
	N*m	28	24	36	31	43	36
	kgf cm	290	250	370	320	430	370
M10	ft-lbs.	42	35	53	45	62	53
	N*m	57	48	72	61	84	72
	kgf cm	580	490	740	630	860	730
M12	ft-lbs.	74	62	96	81	111	96
	N*m	100	84	130	110	150	130
	kgf cm	1000	850	1300	1100	1500	1300
M14	ft-lbs.	118	96	148	125	170	148
	N*m	160	130	200	170	230	200
	kgf cm	16000	1400	2000	1700	2400	2000
M16	ft-lbs.	177	155	229	199	266	229
	N*m	240	210	310	270	360	310
	kgf cm	2500	2100	3200	2700	3700	3200
M18	ft-lbs.			317	273	369	317
	N*m			430	370	500	430
	kgf cm			4400	3700	5100	4300
M20	ft-lbs.			450	384	524	450
	N*m			610	520	710	610
	kgf cm			6200	5300	7300	6200
M22	ft-lbs.			612	524	715	605
	N*m			830	710	970	820
	kgf cm			8400	7200	9900	8400
M24	ft-lbs.			811	664	885	738
	N*m			1100	900	1200	1000
	kgf cm			11000	9100	13000	11000
M27	ft-lbs.			1106	960	1328	1106
	N*m			1500	1300	1800	1500
	kgf cm			16000	13000	18000	16000
M30	ft-lbs.			1550	1328	1770	1550
	N*m			2100	1800	2400	2100
	kgf cm			21000	18000	25000	21000

7.3.5 Software Programming

Newly installed equipment should be checked for correct programming per the table below.

Table 7-3. Software Programming Table

Equipment	Software Verification	Manual Section
APC Copilot	TOD SW Version Screen	0200 RMSM
APC Analyzers	TOD SW Version Screen	0200 RMSM
APC Sensors	PTU - IRMA A21	0200 RMSM
APS	TOD SW Version Screen	0900 TTEM PRODIAG 3000 Manual
DCUs	TOD SW Version Screen	0400 TTEM Service Terminal User Manual ST03A
HVAC	TOD SW Version Screen	0500 TTEM PTU User Manual
PLUs	TOD SW Version Screen	0700 TTEM PTU Manual
ECUs/BCUs	TOD SW Version Screen	1300 TTEM Service Terminal User Manual ST03A
PIDs	TOD SW Version Screen	1400 TTEM Communications Equipment Programming Guide
CCU	TOD SW Version Screen	1400 TTEM Communications Equipment Programming Guide
MDS	TOD SW Version Screen	1400 TTEM Communications Equipment Programming Guide
TODs	TOD SW Version Screen	1400 TTEM Communications Equipment Programming Guide
TCN	TOD SW Version Screen	1400 TTEM Communications Equipment Programming Guide
Destination Signs	PTU - PTE LACMTA	1400 TTEM Destination Sign PTU User Manual
ATC	TOD SW Version Screen	1500 RMSM
Event Recorder	TOD SW Version Screen	1600 RMSM
NVR	TOD SW Version Screen	1900 RMSM

7.4 Removal

The following sections contain the instructions for the removal of the following equipment:

- Cab equipment
- Seats
- Electric Locker equipment
- Undercar mounted equipment
- Roof mounted equipment
- Interior mounted equipment
- Exterior mounted equipment
- Articulation section equipment

7.4.1 Cab Equipment

See Figures 2-1 and 7-3 through 7-69.

The Cab Equipment consists of the following components:

- one Cab Console in each A and B-Unit cab,
- four Console Panels in each Cab Console,
- one Operator's seat in each A and B-Unit cab,
- one Trainer's seat in each A and B-Unit cab,
- one Cab Light in each A and B-Unit cab,
- one Cab Console Light in each A and B-Unit cab,
- one Windshield Sun Shade and two side window Sun Shades in each A and B-Unit cab,
- one Windshield Wiper Assembly in each A and B-Unit cab,
- one Cab Heater Assembly in each A and B-Unit cab,
- two Defroster / Demister Assemblies in each A and B-Unit cab,
- one set Defroster / Demister ducting in each A and B-Unit cab,

- one Heater / Defroster Panel in each A and B-Unit cab,
- one Front Destination Sign in each A and B-Unit cab,
- one Coupler Loop Switch in each A and B-Unit cab,
- one Foot Rest Assembly in each A and B-Unit cab,
- one Foot Switch in each A and B-Unit cab,
- one Arm Rest in each A and B-Unit cab,
- one Radio Power Supply in each A and B-Unit cab,
- two Cab Speakers in each A and B-Unit cab,
- one Upper Control Panel in each A and B-Unit cab,
- one set of Control and Relay Panels in each A and B-Unit cab,
- one Bypass Panel in each A and B-Unit cab,
- one Circuit Breaker Panel in each A and B-Unit cab,
- one Fire Extinguisher in each A and B-Unit cab,
- one Convenience Outlet in each A and B-Unit cab,
- one Cab Camera in each A and B-Unit cab,
- one Forward View Camera in each A and B-Unit cab,
- two Rear View Monitors in each A and B-Unit cab,
- one Local Bus Contactor in each A and B-Unit cab,
- one Remote I/O in B-Unit cab,
- two Ethernet Switches in each A and B-Unit cab,
- one Ethernet Switch (Camera) in each A and B-Unit cab,
- one Ethernet Switch (Wireless) in each A and B-Unit cab,
- one Track Brake Panel in each A and B-Unit cab,
- one 12Vdc Power Supply in each A and B-Unit cab,
- one Wayside Worker Alert System in each A and B-Unit cab,

- one Master Controller in each A and B-Unit cab,
- one DC / DC Converter in each A and B-Unit cab,
- one HSC-V Control Panel in each A and B-Unit cab,
- one Washer Reservoir in each A and B-Unit cab,
- one Horn Controller Panel in each A and B-Unit cab.

7.4.1.1 Cab Console

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

TO PREVENT RECEIVING ELECTRICAL SHOCK WHEN PERFORMING ELECTRICAL TEST, HANDS MUST BE CLEAR OF ELECTRICAL COMPONENTS, CONTACTS AND HOUSING AND THERE MUST BE NO BODILY CONTACT WITH THE WORK BENCH. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE INJURY OR DEATH.

1. Disconnect the power from the Console (1) by removing the two connectors (6) from the console. See Figure 7-3.
2. Remove the screws (2), in 23 places that secure Console Panels 1, 3, and 4 to the console.
3. Carefully disconnect the connector from each panel and set aside.
4. Remove the M5 ESNA nut (5) and M5 plain washer (4) from under the cab desk.
5. Remove the M5 screw (3) and M5 plain washer (4) from inside the Console (1).
6. Repeat for nine locations.
7. Carefully remove the Console (1).

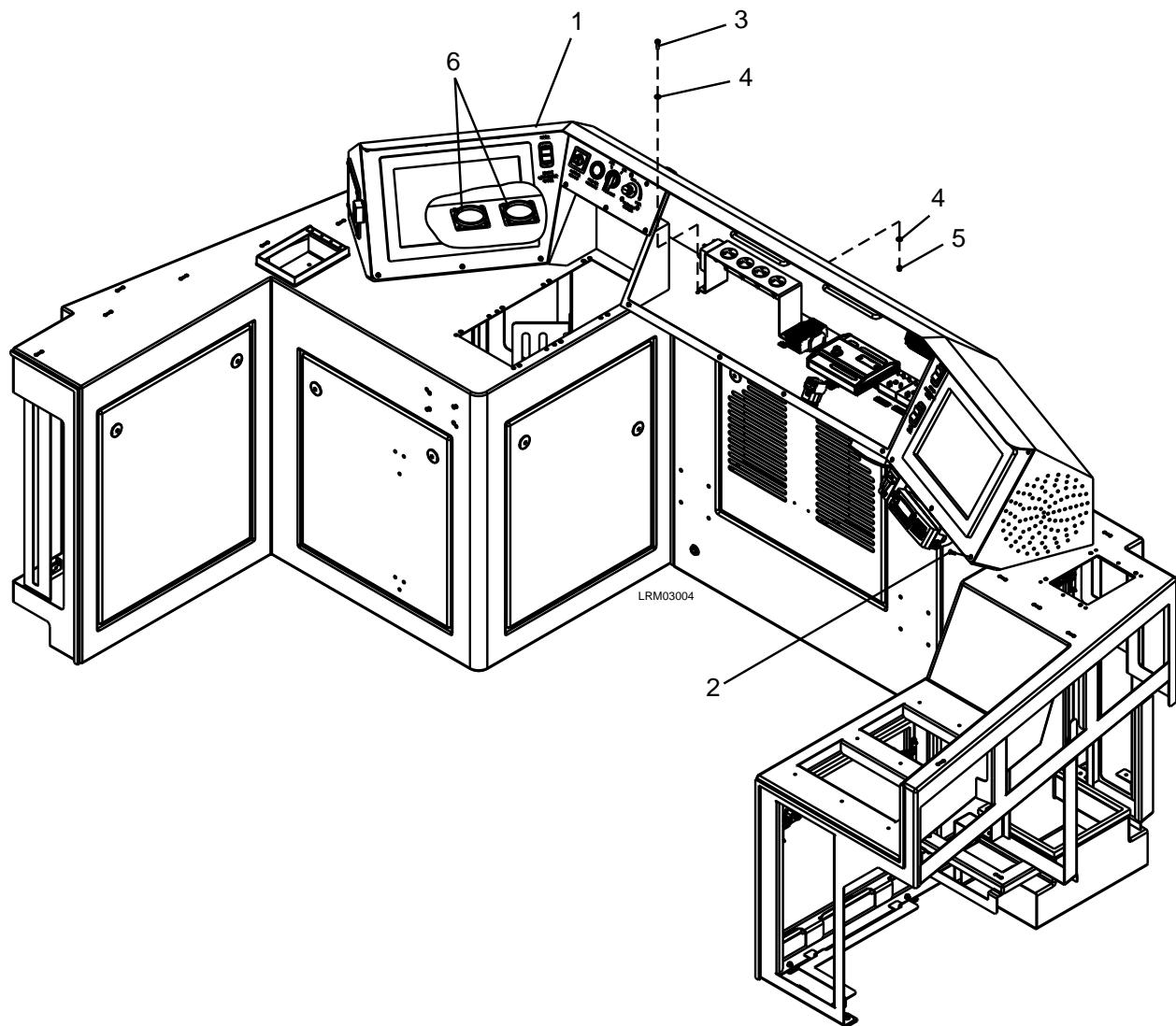


Figure 7-3: Cab Console

7.4.1.2 Console Panels

See Figure 7-4.

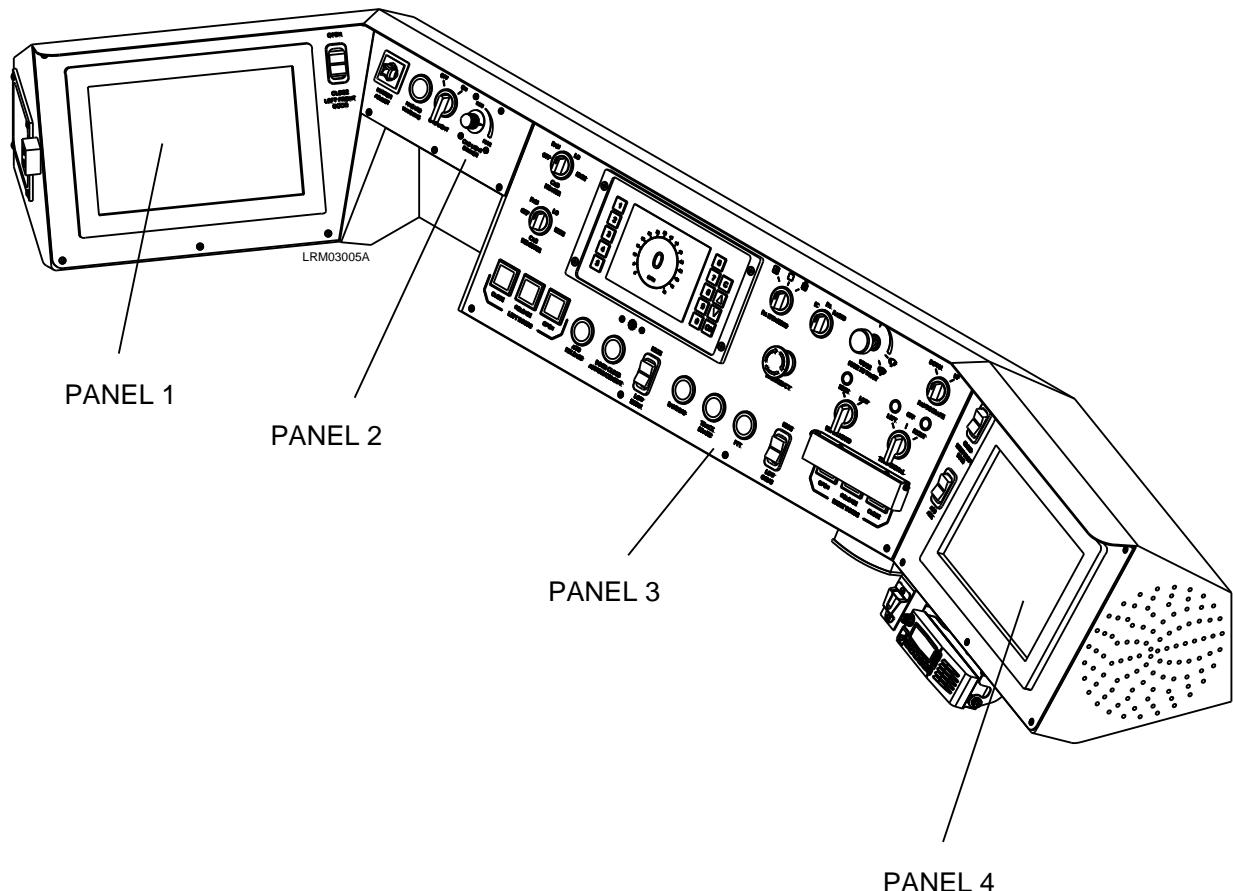


Figure 7-4: Console Panels

7.4.1.2.1 Console Panel 1

1. Remove the seven #8-32 flat head screws (1) from the panel. See Figure 7-5.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Carefully remove the panel and disconnect the connector.

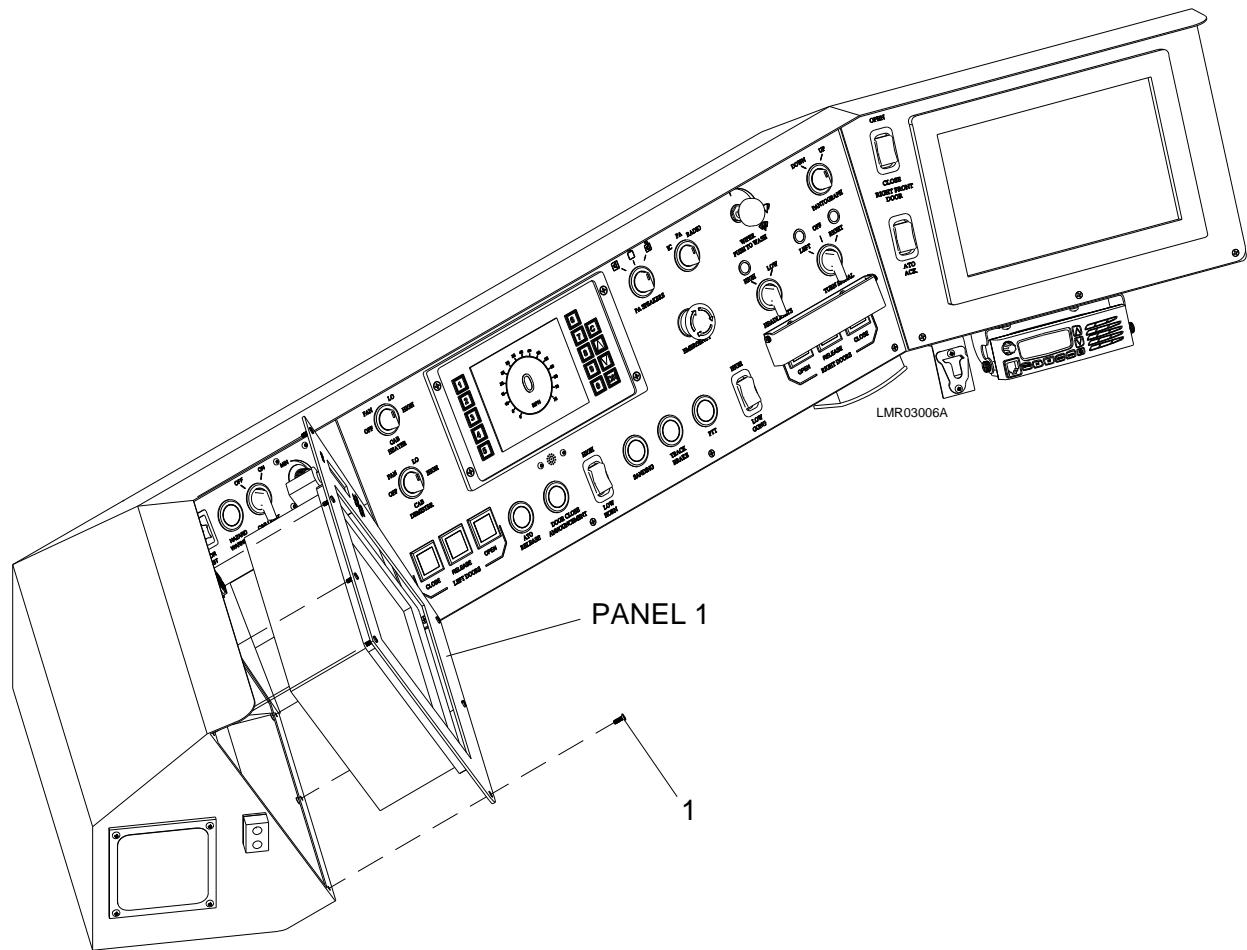


Figure 7-5: Console Panel 1

7.4.1.2.2 Console Panel 2

1. Remove the six #8-32 flat head screws (1) from the panel. See Figure 7-6.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Carefully remove the panel and disconnect the connector.

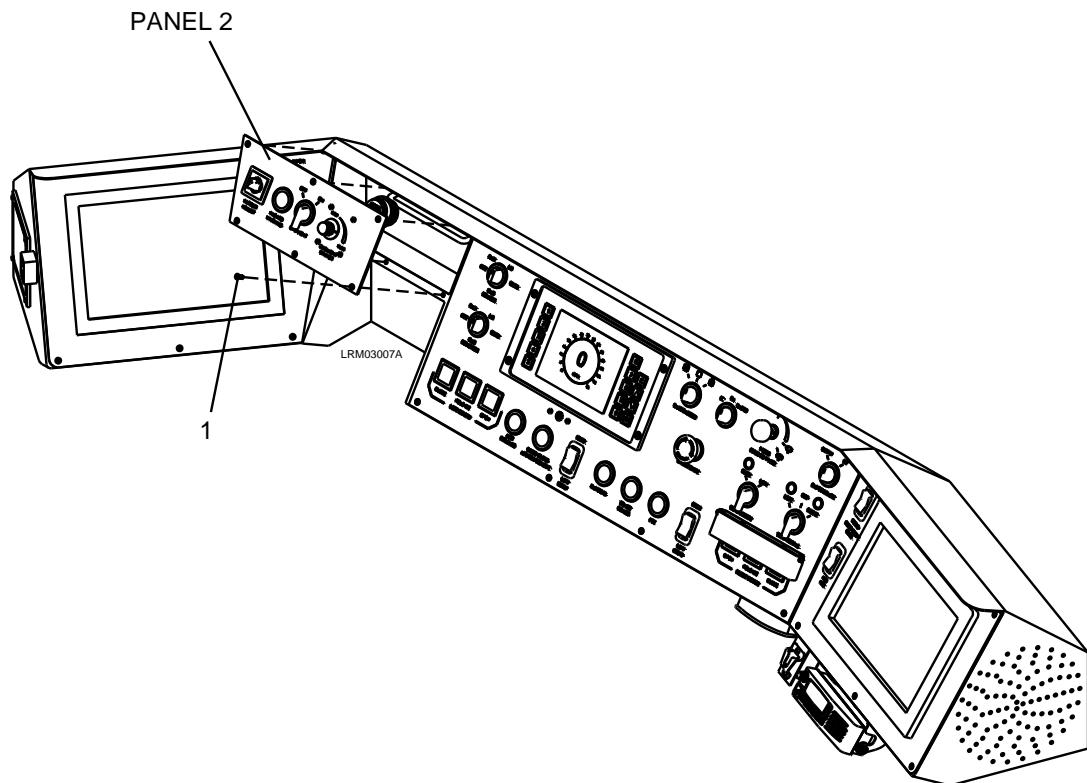


Figure 7-6: Console Panel 2

7.4.1.2.3 Console Panel 3

1. Remove the nine #8-32 flat head screws (1) from the panel. See Figure 7-7.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Carefully remove the panel and disconnect the two connectors.

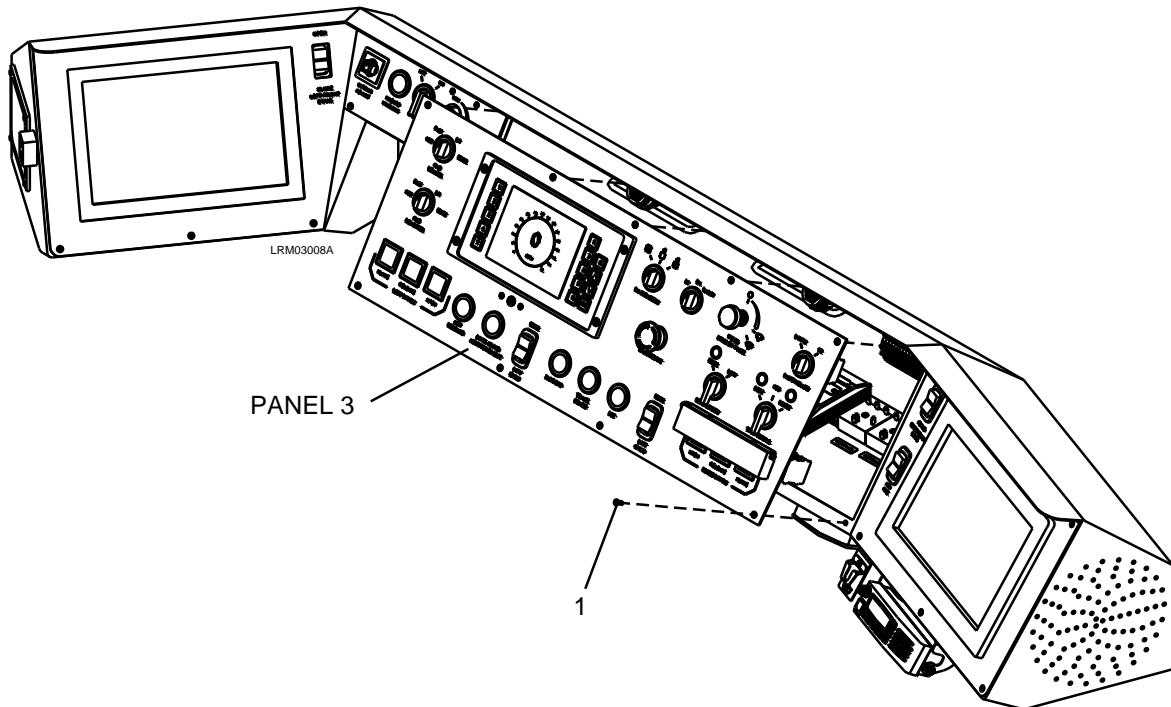


Figure 7-7: Console Panel 3

7.4.1.2.4 Console Panel 4

1. Remove the seven #8-32 flat head screws (1) from the panel. See Figure 7-8.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Carefully remove the panel and disconnect the connector.

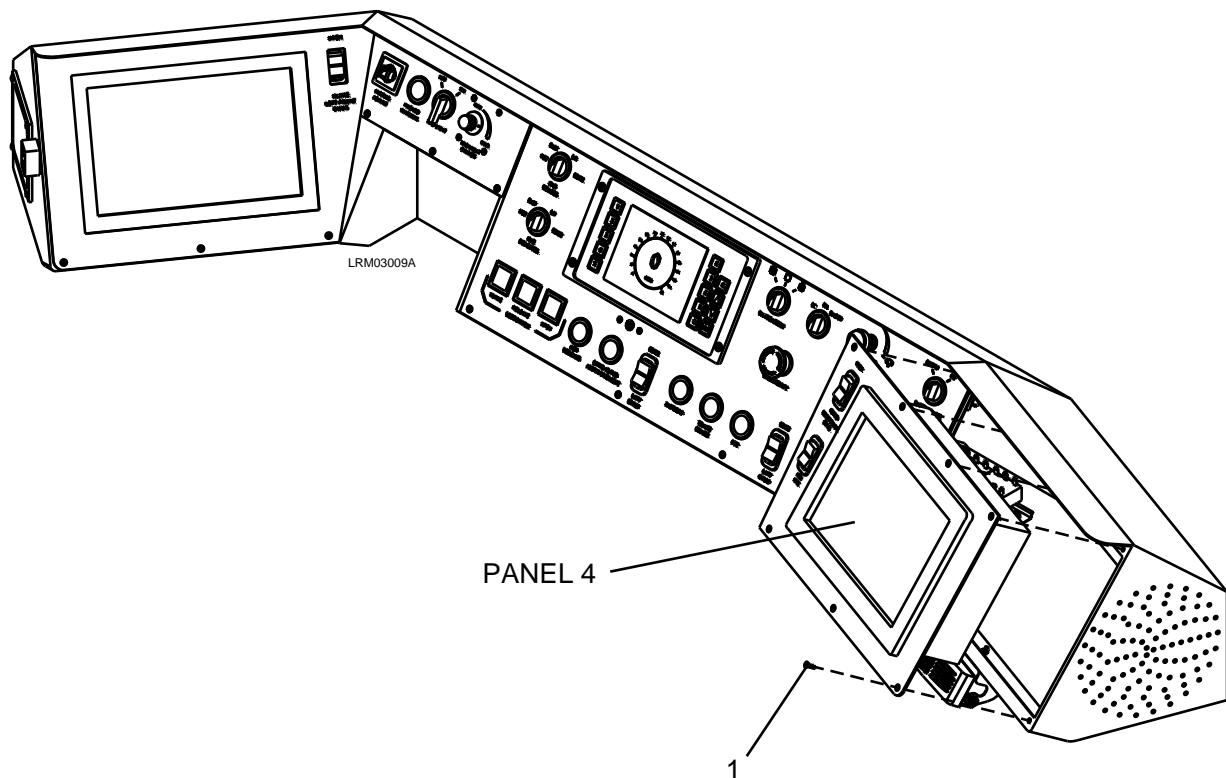


Figure 7-8: Console Panel 4

7.4.1.3 Operator's Seat

1. Remove the four M10 x 35 bolts (2), M10 lock washers (3), and M10 plain washers (4). See Figure 7-9.
2. Carefully remove the seat (1).

7.4.1.4 Trainer's Seat

1. Remove the nine M4 ESNA nuts (2) and M4 plain washers (3). See Figure 7-10.
2. Carefully remove the seat (1).

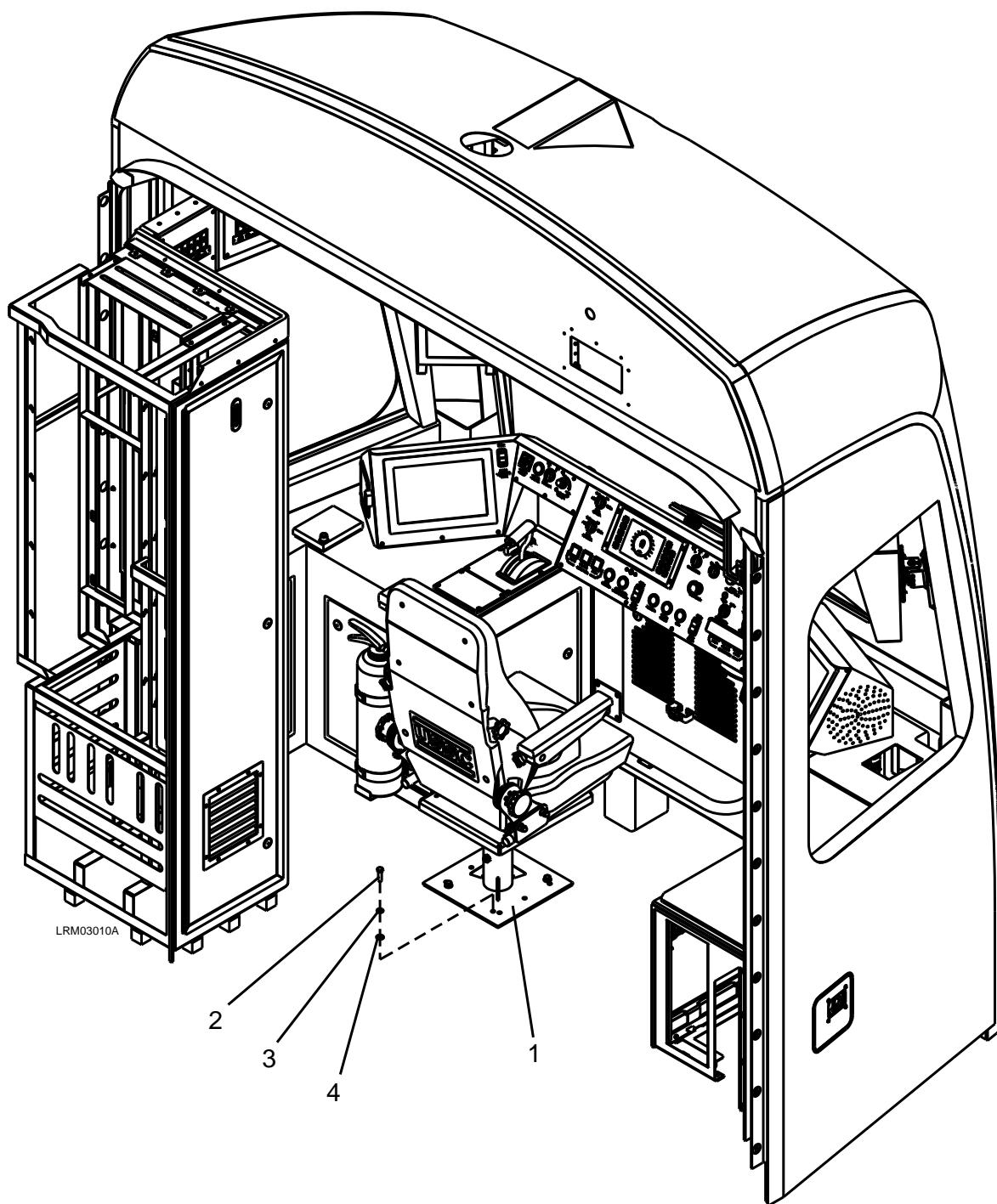


Figure 7-9: Operator's Seat

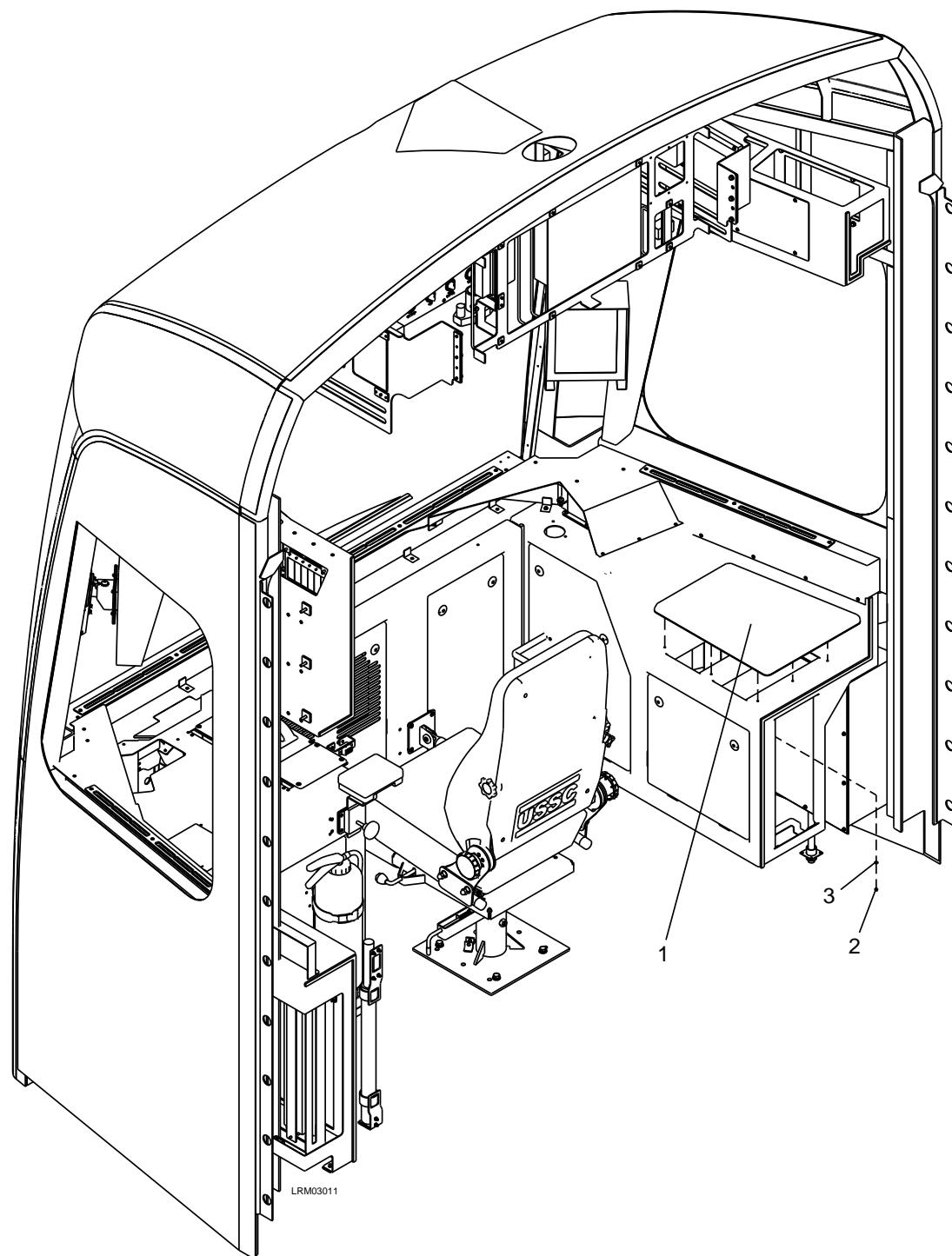


Figure 7-10: Trainer's Seat

7.4.1.5 Cab Light

1. Unfasten the two captive 8-32 torx head screws (6) from the lens door (2). Open the lens door (2). See Figure 7-11.
2. Remove the six M4 x 16 screws (3), M4 lock washers (4) and M4 plain washers (5).

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

3. Disconnect the connector and remove the light fixture (1).

7.4.1.6 Cab Console Light

1. Unlock the two locks (7) and lower the cab ceiling panel (1) to access the Cab Console Light (6). See Figure 7-12.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the connector to the Cab Console Light (6).
3. Remove the three M4 hex nuts (3), M4 plain washers (4), M4 lock washers (5) and the M4 x 25 screws (2).
4. Carefully remove the Cab Console Light (6).

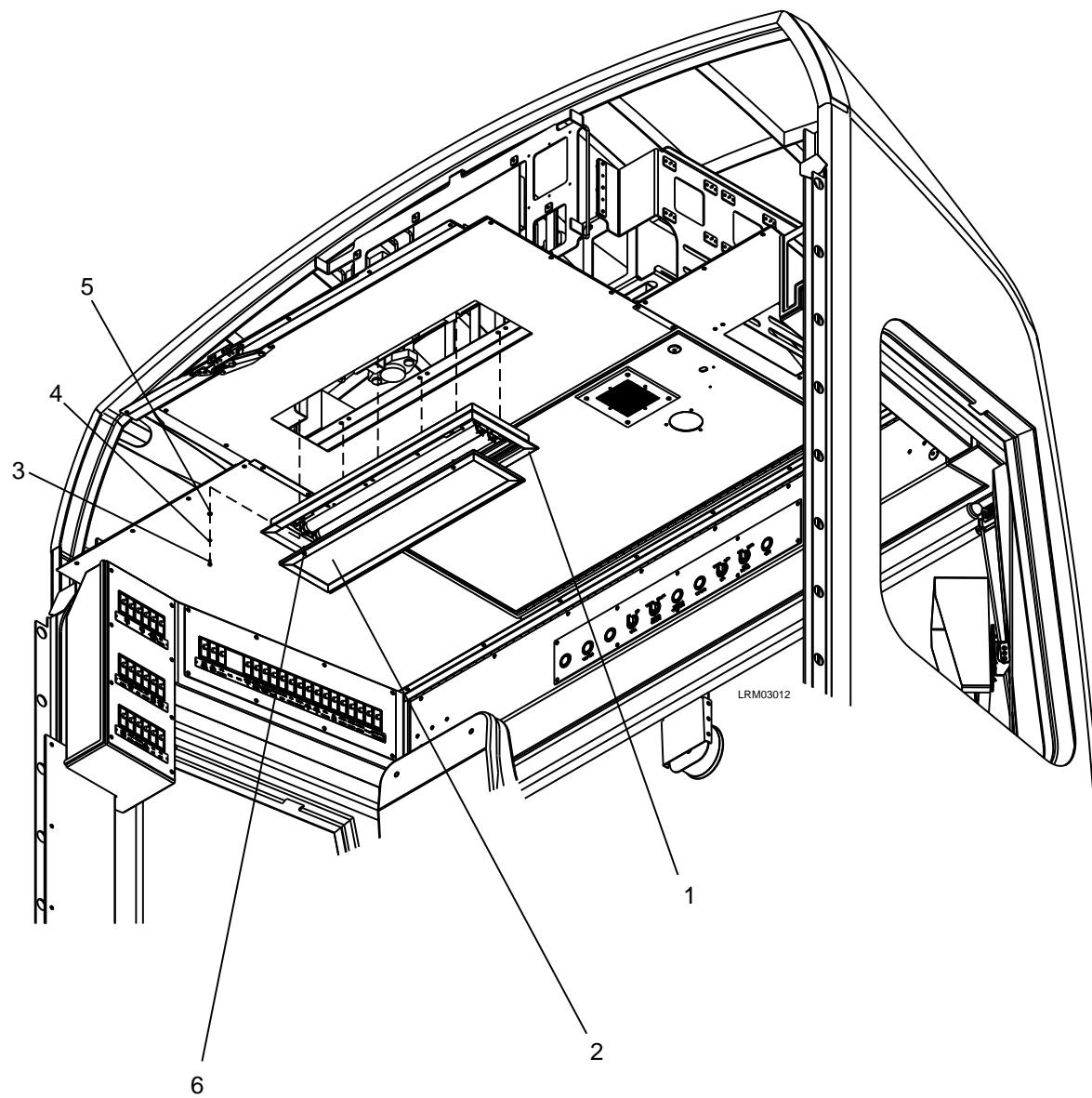


Figure 7-11: Cab Light

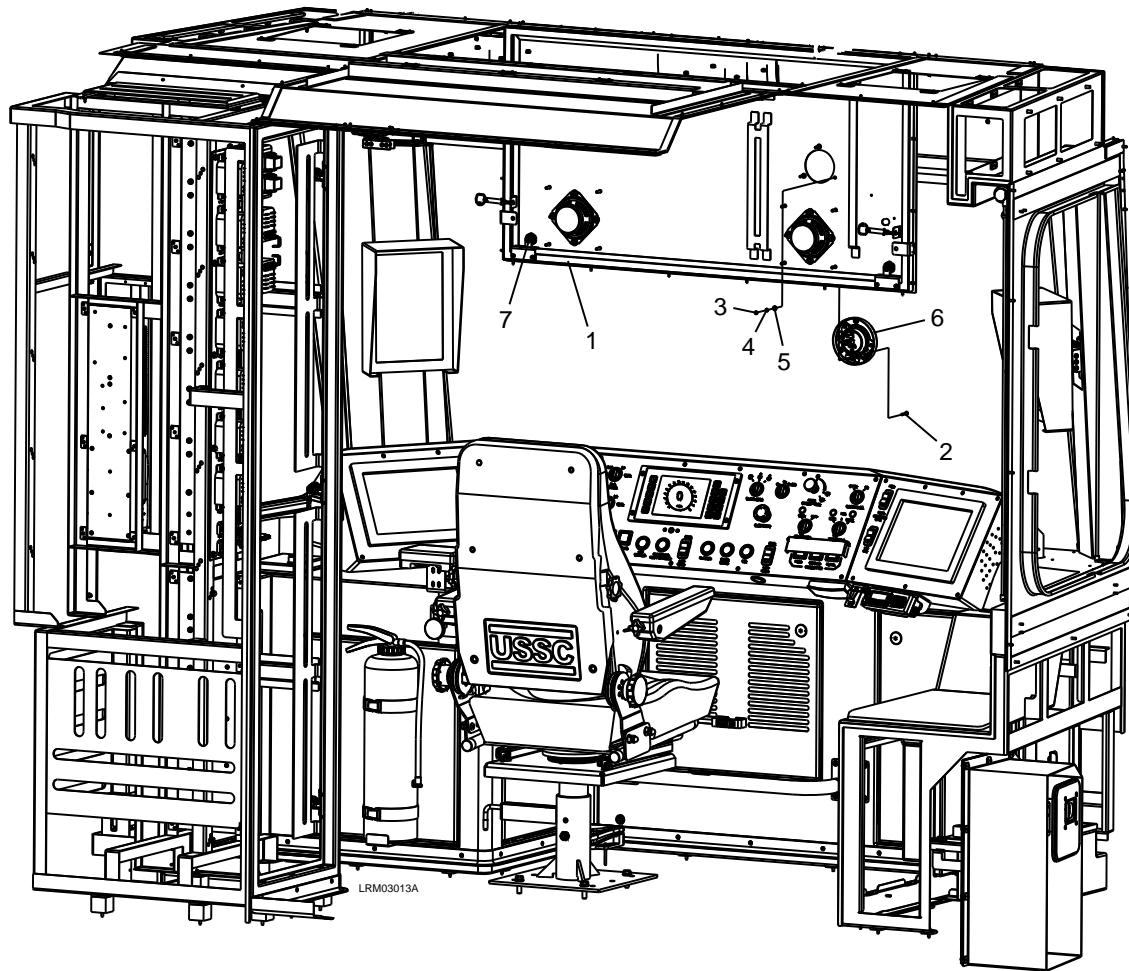


Figure 7-12: Cab Console Light

7.4.1.7 Sun Shades

See Figure 7-13, Sheets 1 and 2.

7.4.1.7.1 Front Sun Shade

1. Ensure that the front sun shade (1) is completely in the up position. See Figure 7-13, Sheet 1.
2. Remove the two M4 x 16 screws (3), M4 lock washers (4), and the M4 plain washers (5) on cars 1001 and 1002 or the M4 x 12 screws (7) on cars 1003 and later from each of the up-rights (8).
3. Remove the two M4 x 12 screws (6) from each of the upper brackets (2).
4. Carefully remove the front sun shade (1).

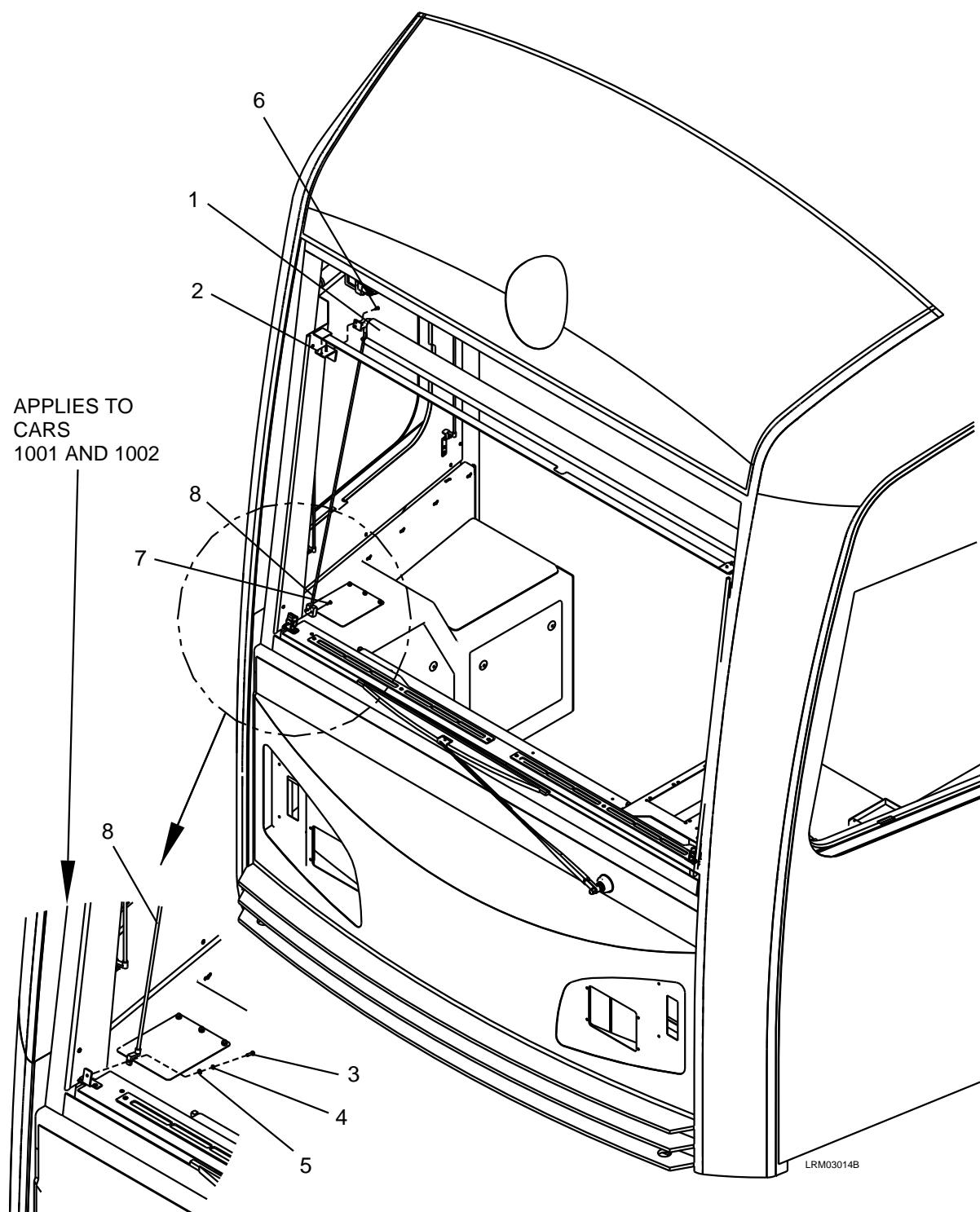


Figure 7-13: Sun Shades
(Sheet 1 of 2)

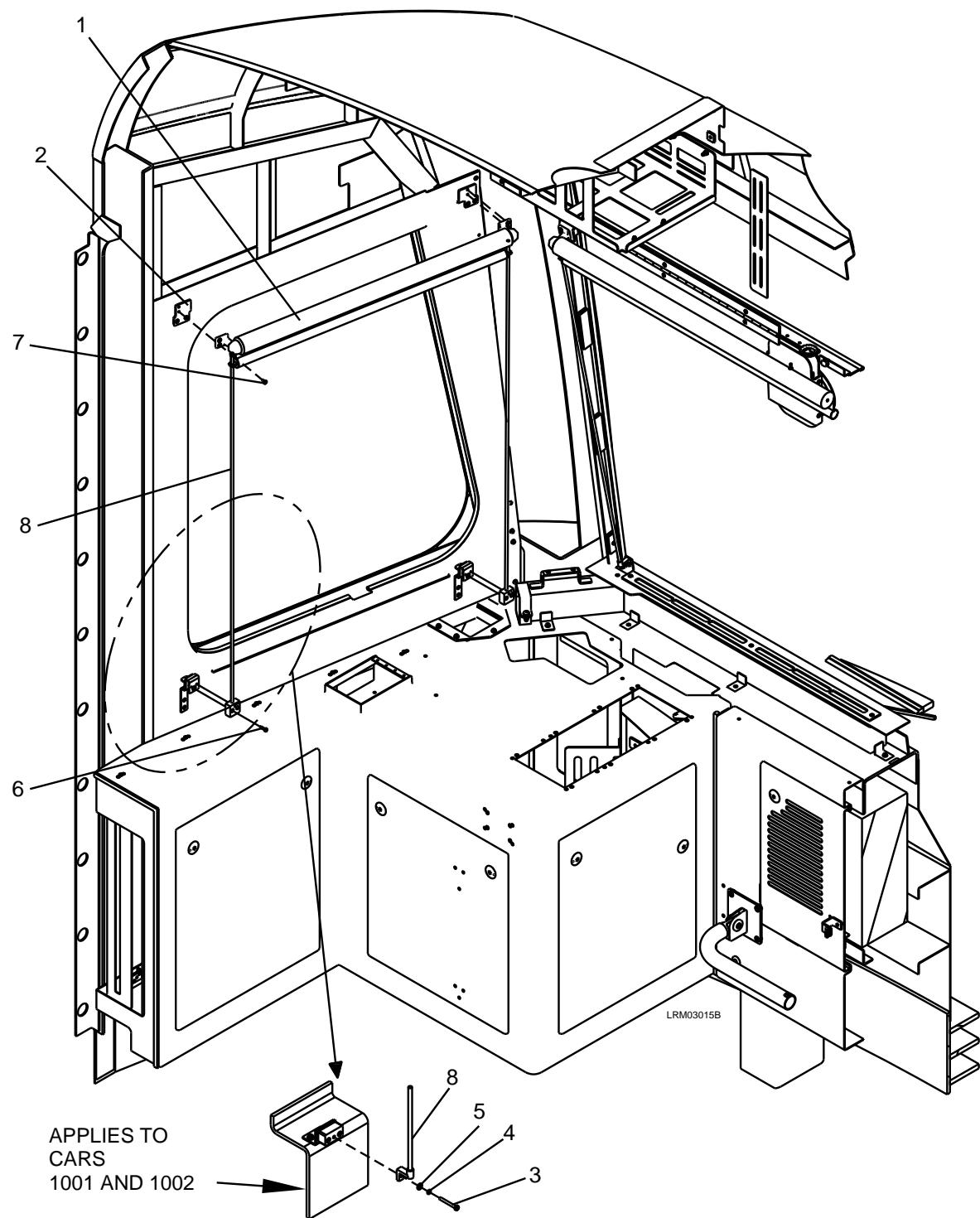


Figure 7-13: Sun Shades
(Sheet 2 of 2)

7.4.1.7.2 Side Sun Shade

1. Ensure that the side sun shade (1) is completely in the up position. See Figure 7-13, Sheet 2.
2. Remove the M4 x 35 screw (3), the M4 lock washer (4), and the M4 plain washer (5) on Cars 1001 and 1002 or the M4 x 12 screws (6) on Cars 1003 and later from each of the up-rights. (8)
3. Remove the two M4 x 10 screws (7) from each of the upper brackets (2).
4. Carefully remove the side sun shade (1).

7.4.1.8 Windshield Wiper

1. Unlock the two locks (10) and remove the left cab desk access panel (11). See Figure 7-14.
2. Remove the master controller connector.
3. Remove the six mounting bolts and remove the master controller to gain access to the Wiper Motor Assembly (1).
4. From the outside of the car, open the screw cover (6) and remove the M14 nut (4).
5. Carefully remove the wiper arm (2 & 3) and spanner nut (5) along with the sealant.
6. From the inside of the car, remove the three M6 x 18 bolts (7), M6 lock washers (8), and M6 plain washers (9).
7. Disconnect the wiper motor plug. Carefully remove the Wiper Motor Assembly (1) along with the spacer (12) and wiper spacer (13).

7.4.1.9 Cab Heater

1. Unlock the two locks and remove the front access panel (5). See Figure 7-15.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Remove the electrical connector to the Cab Heater (1).
3. Remove the four M8 x 25 bolts (2), M8 lock washers (3), and M8 plain washers (4).
4. Carefully remove the Cab Heater (1).

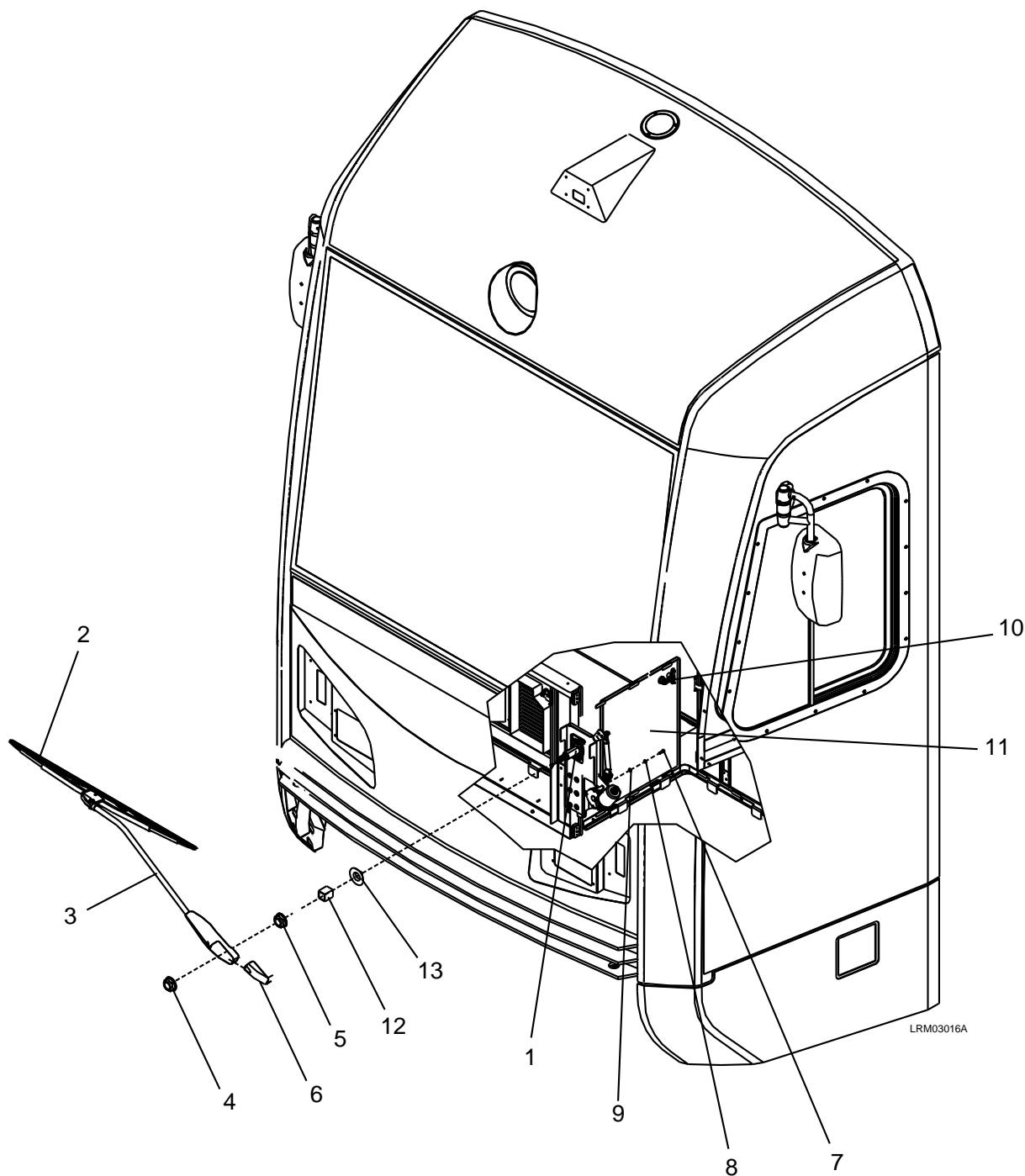


Figure 7-14: Windshield Wiper

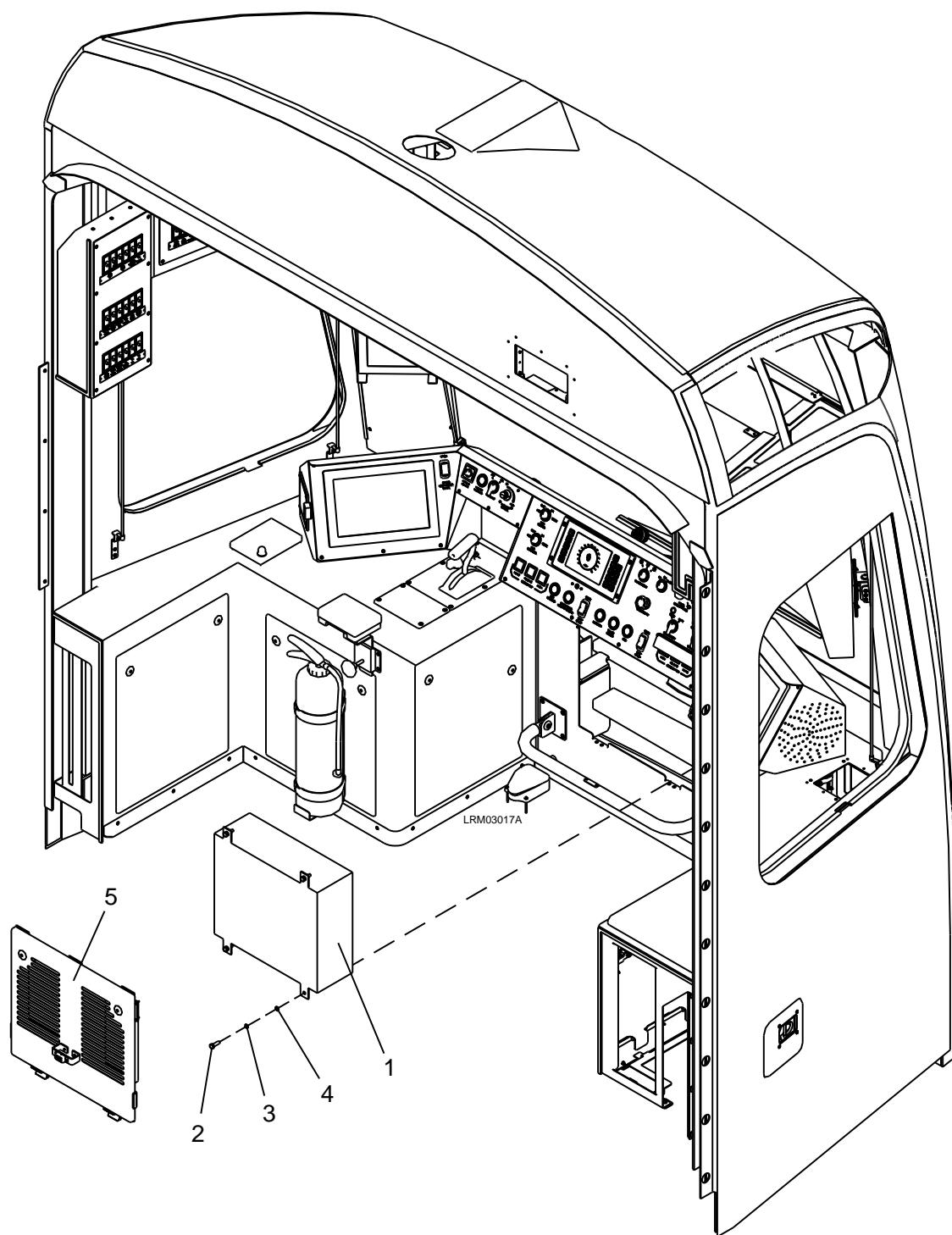


Figure 7-15: Cab Heater

7.4.1.10 Defroster / Demister

1. Unlock the two locks and remove the left cab access panel. See Figure 7-16.
2. Remove the master controller connector.
3. Remove the six mounting bolts and remove the master controller to gain access to the Defroster / Demister (1).
4. Remove the two bolts (11) and remove the duct joint (12).
5. Remove the four M6 ESNA nuts (10), M6 plain washers (9), M6 x 20 bolts (7), and M6 plain washers (8).
6. Remove the duct joint (6).
7. Remove the four M6 x 20 bolts (2), M6 lock washers (3), M6 plain washers (4), and special washers (5).
8. Carefully remove the Defroster / Demister (1).

7.4.1.11 Defroster Ducting

1. Remove the six M4 x 10 screws (23). See Figure 7-17.
2. Remove the two defroster duct outlets (10).
3. Remove the three M4 x 10 screws (23).
4. Remove the defroster duct outlet (9).
5. Remove the three M4 x 10 screws (23).
6. Remove the defroster duct outlet (8).
7. Remove the three M4 x 10 screws (23).
8. Remove the front window duct cover (7).
9. Remove the eight M4 x 10 screws (23).
10. Remove the right side window duct cover (6).
11. Remove the eight M4 x 10 screws (23).
12. Remove the left side window duct cover (5).
13. Remove the two M6 ESNA nuts (26), M6 plain washers (25), M6 x 20 screws (27), and M6 plain washers (28).
14. Remove the duct joint (15).
15. Repeat steps 13 and 14 for the opposite duct joint (15).

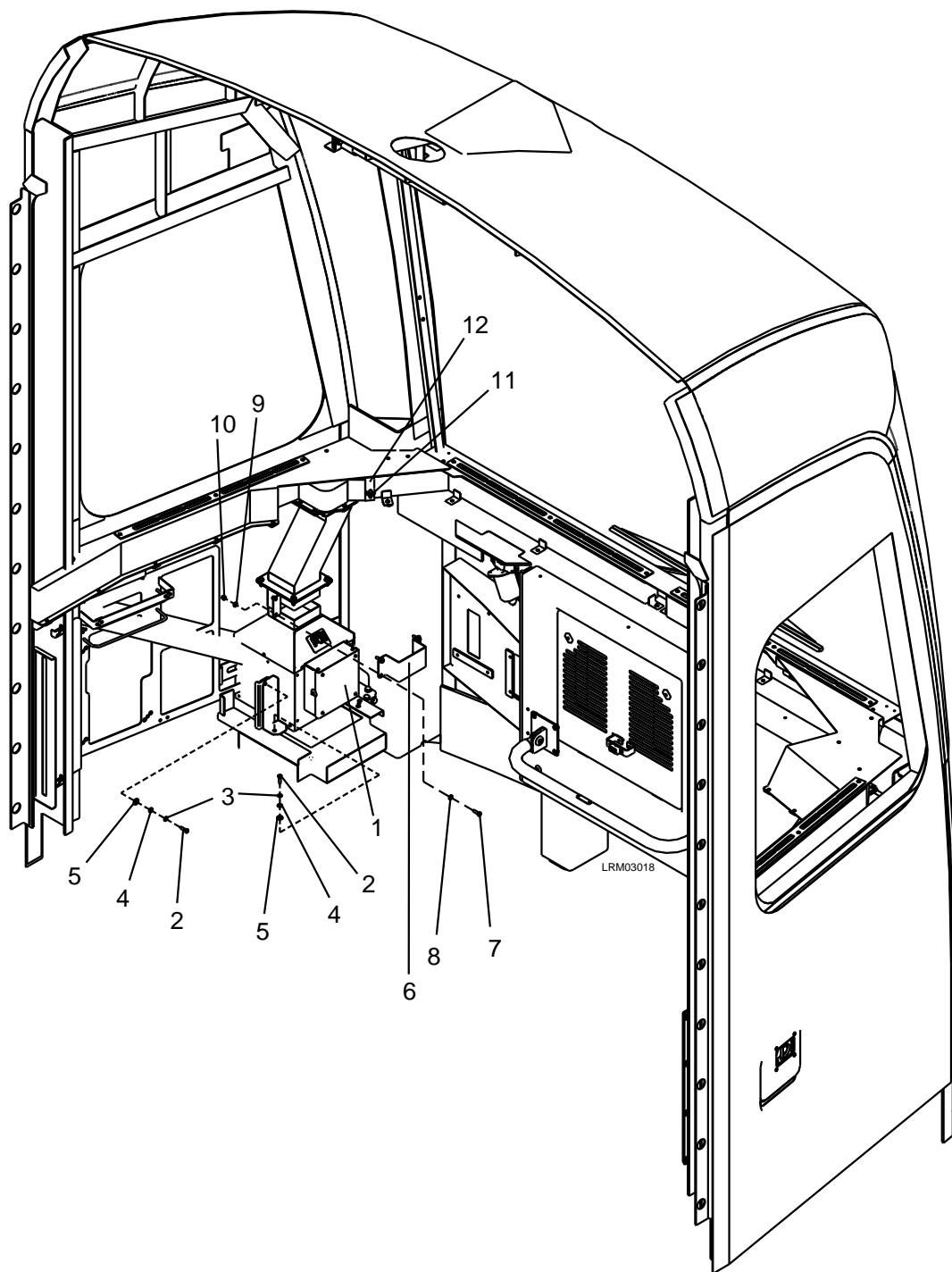


Figure 7-16: Defroster / Demister

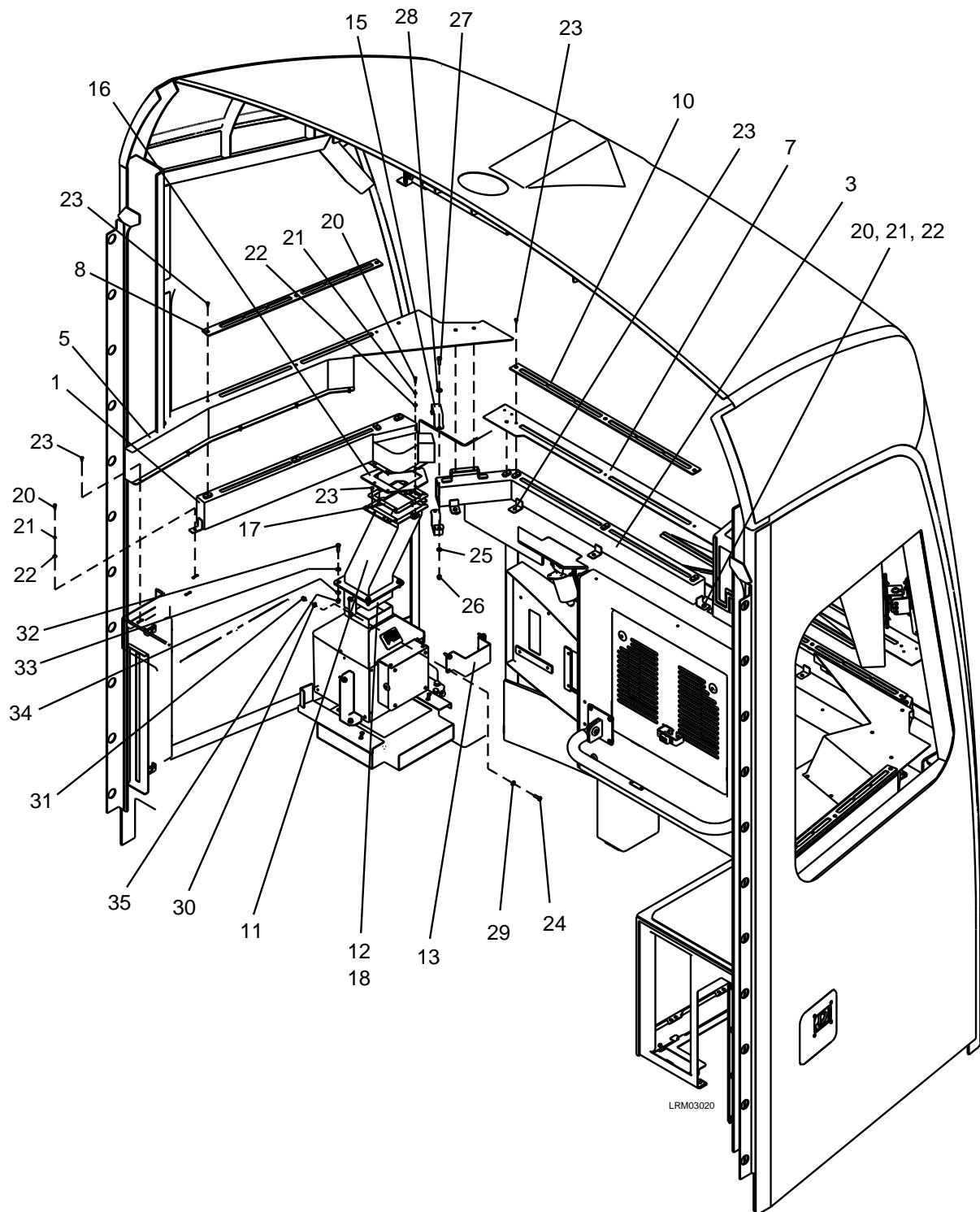


Figure 7-17: Defroster Ducting
(Sheet 1 of 2)

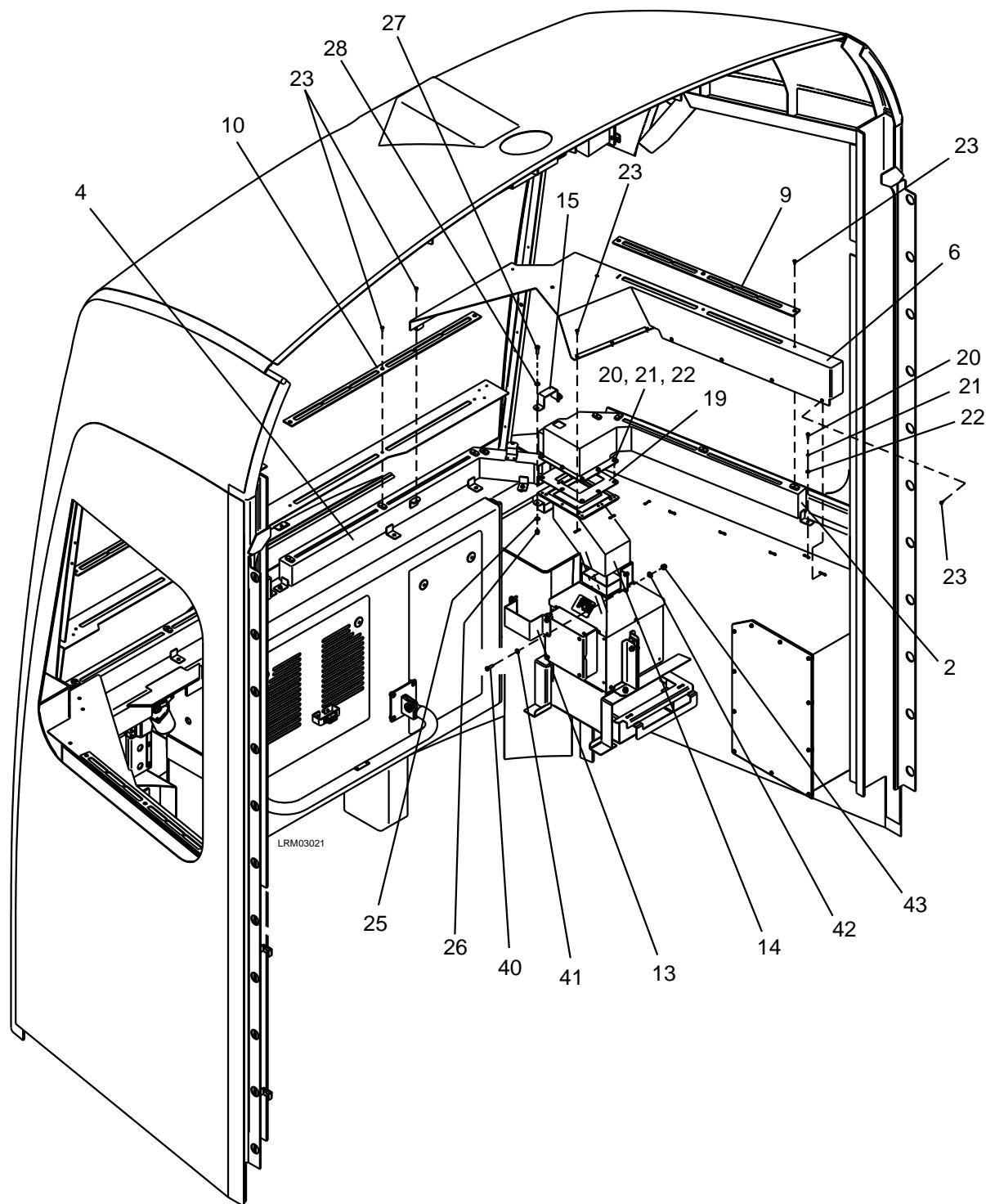


Figure 7-17: Defroster Ducting
(Sheet 2 of 2)

16. Remove the M4 x 12 screws (20), M4 lock washers (21) and M4 plain washers (22).
17. Remove the three M4 x 10 screws (23).
18. Carefully remove the cab defroster duct (3).
19. Repeat step 16 thru 18 for the opposite cab defroster duct (4).
20. Remove the six M4 x 10 screws (20), M4 lock washers (21), and M4 plain washers (22).
21. Carefully remove the cab defroster duct (2).
22. Remove the packing (19).
23. Remove the four M6 ESNA nuts (31), M6 plain washers (30), M6 x 20 bolts (24), and M6 plain washers (29).
24. Remove the duct joint (13).
25. Remove the cab defroster duct (14).
26. Remove the six M4 x 10 screws (20), M4 lock washers (21), and M4 plain washers (22).
27. Carefully remove the cab defroster duct (1).
28. Remove the packing (16).
29. Remove the eight M4 x 10 screws (23).
30. Remove the packing (17).
31. Remove the four M6 ESNA nuts (35), M6 plain washers (34), M6 x 20 bolts (32), and M6 plain washers (33).
32. Remove the cab defroster duct (11).
33. Remove the packing (18).
34. Remove the four M6 ESNA nuts (43), M6 plain washers (42), M6 x 20 bolts (40), and M6 plain washers (41).
35. Remove the duct joint (13).
36. Remove the cab defroster duct (12).

7.4.1.12 Heater / Defroster Panel

1. Unlock the two locks (6) and remove the cab access panel (1). See Figure 7-18.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Remove all electrical connections to the WAGO terminal blocks.
3. Remove the four M6 x 20 bolts (2), M6 lock washers (3) and M6 plain washers (4).
4. Carefully remove the Heater / Defroster Panel (5).

7.4.1.13 Front Destination Sign

1. Disconnect the electrical connectors from the Front Destination Sign (1). See Figure 7-19.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Remove the two M8 x 20 screws (2), M8 lock washers (3) and M8 plain washers (4).
3. Carefully remove the Front Destination Sign (1) by lifting up off the bracket (5).

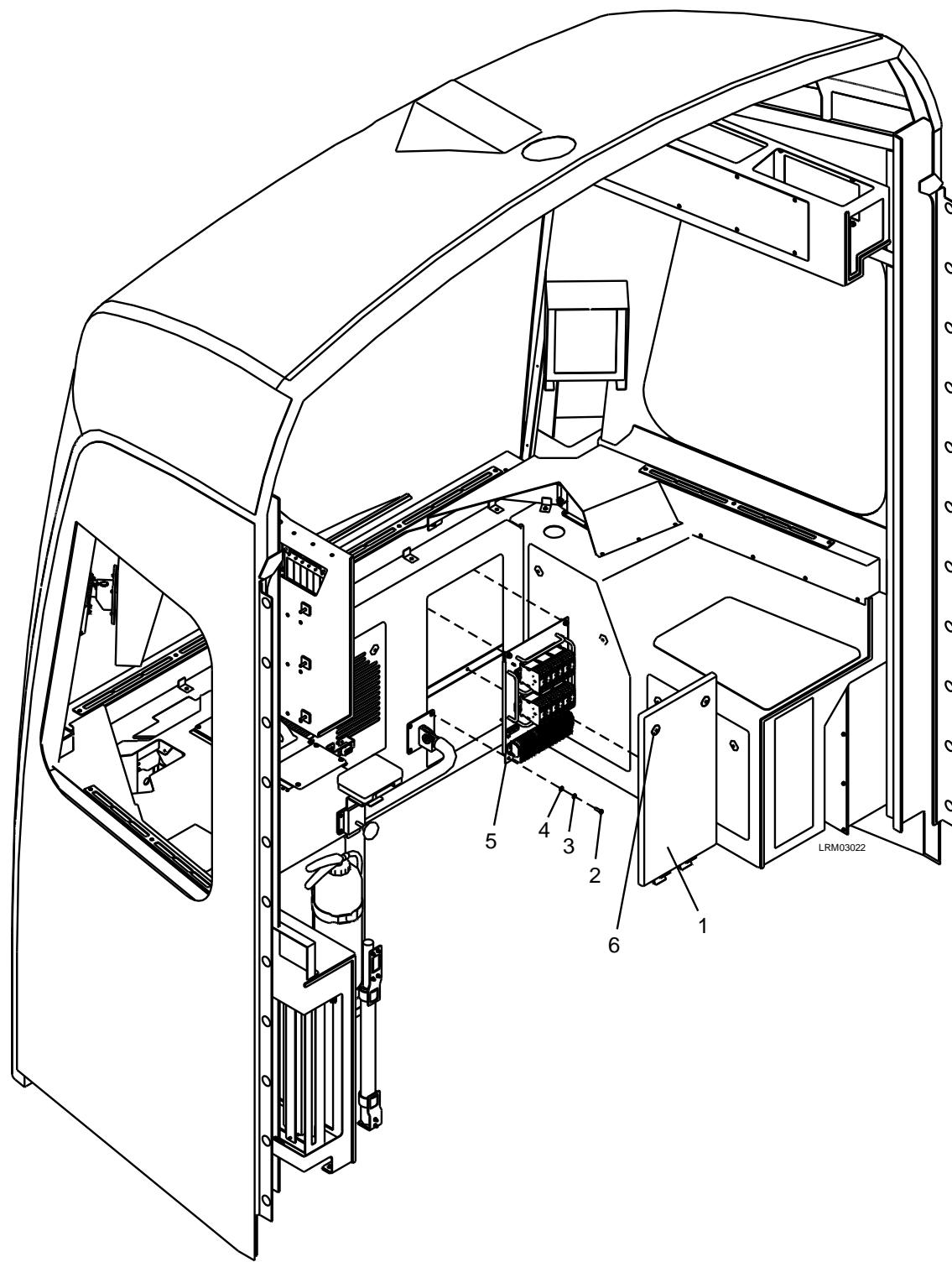


Figure 7-18: Heater Defroster Panel

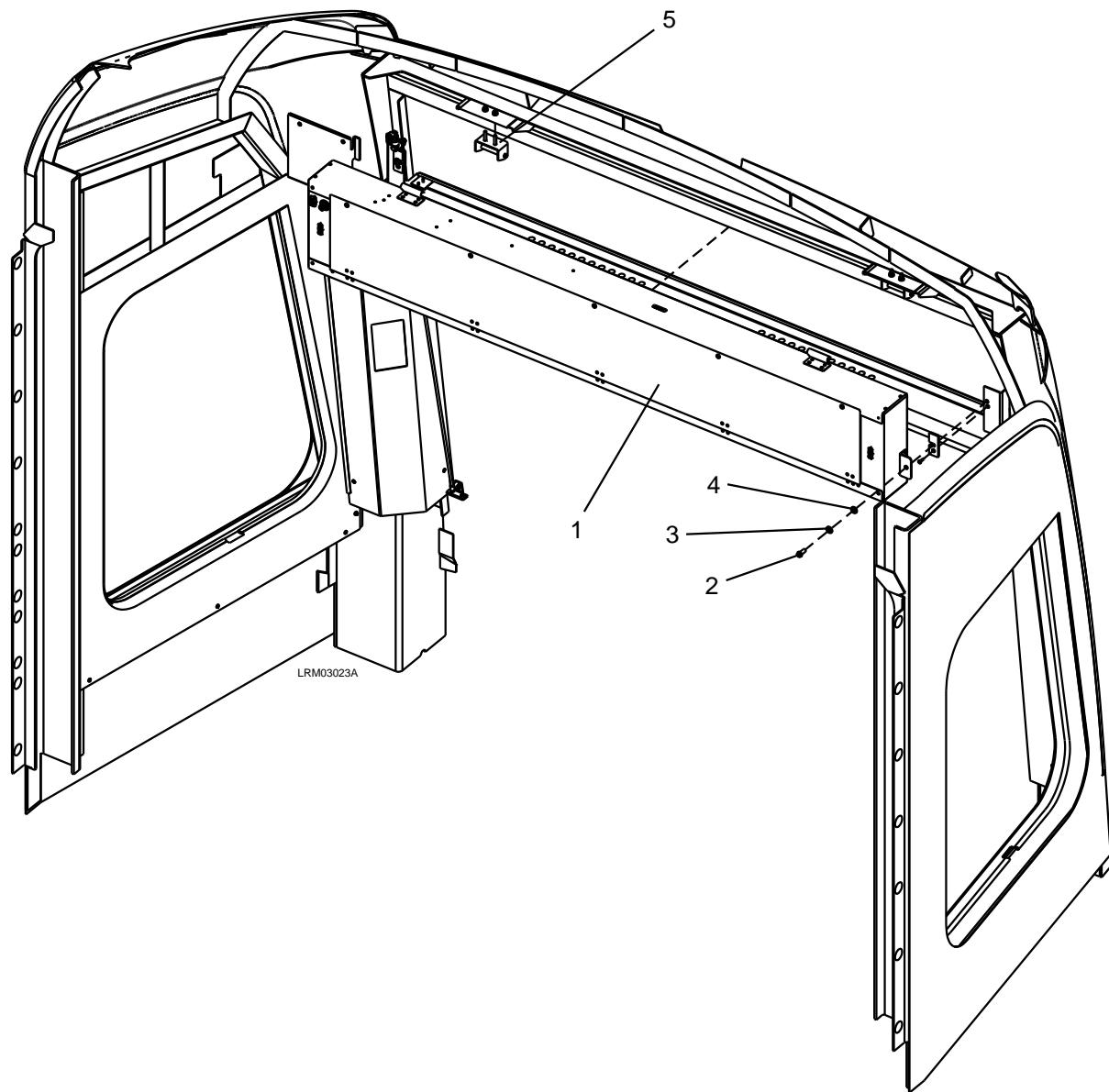


Figure 7-19: Front Destination Sign

7.4.1.14 Coupler Loop Switch

1. Lift the coupler loop switch cover (1). See Figure 7-20.

WARNING

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2. Remove the #8-32 electrical connections.
3. Remove the three #10-32 screws (2) from the coupler loop switch handle (3).
4. Carefully remove the Coupler Loop Switch (4).

7.4.1.15 Foot Rest

1. Unlock the two locks (10) and remove the access cover (9). See Figure 7-21.
2. Remove the eight M6 ESNA nuts (5), M6 plain washers (4) and M6 x 25 screws (3).
3. Carefully remove the Foot Rest (1).
4. Remove the two M3 ESNA nuts (8), M3 plain washers (7), and M3 x 12 screws (6).
5. Remove the magnetic catch (2).

7.4.1.16 Foot Switch

1. Remove the #8-32 electrical connections.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Remove the two M4 x 50 screws (2), M4 lock washers (3), and M4 plain washers (4). See Figure 7-22.
3. Remove the Foot Switch (1).

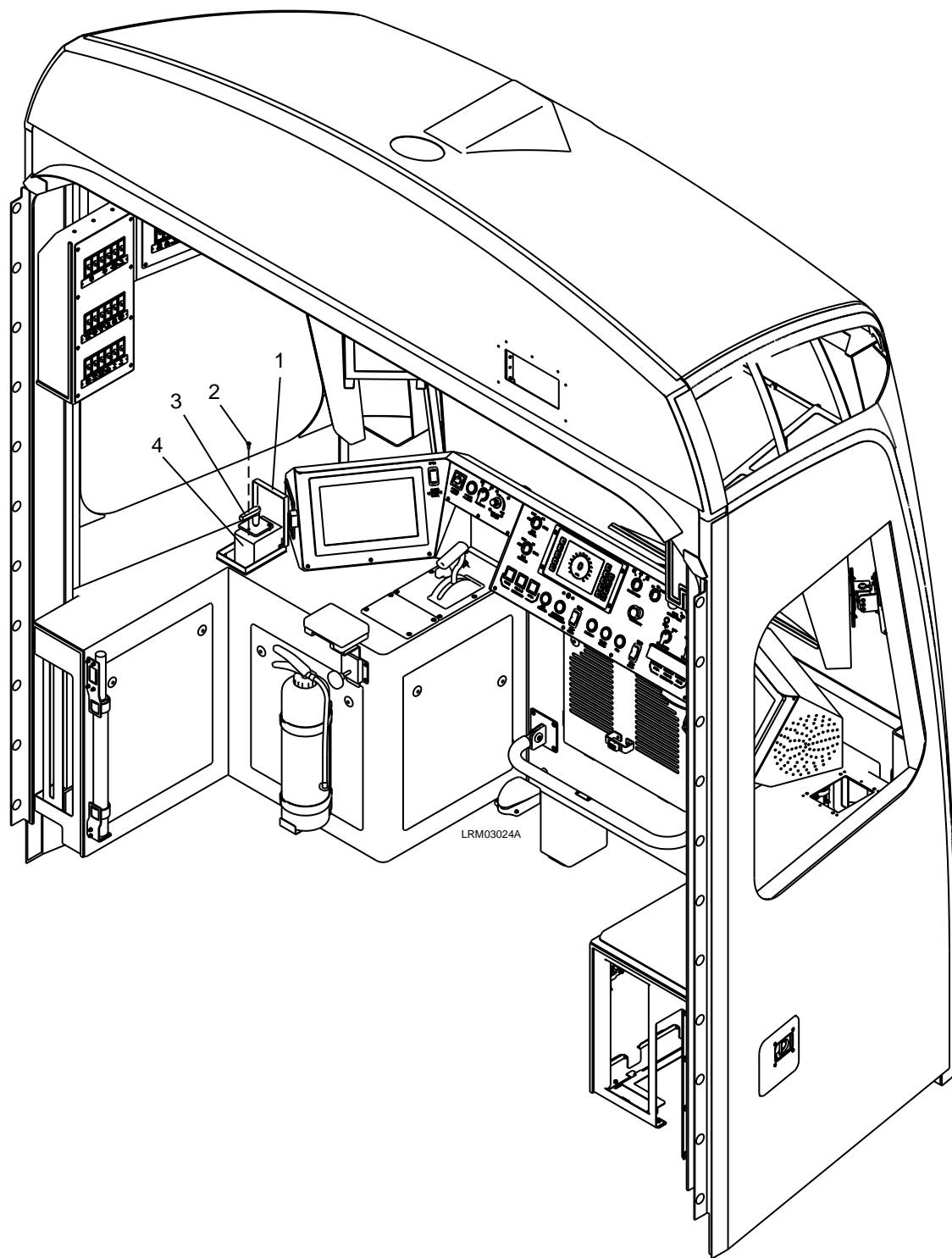


Figure 7-20: Coupler Loop Switch

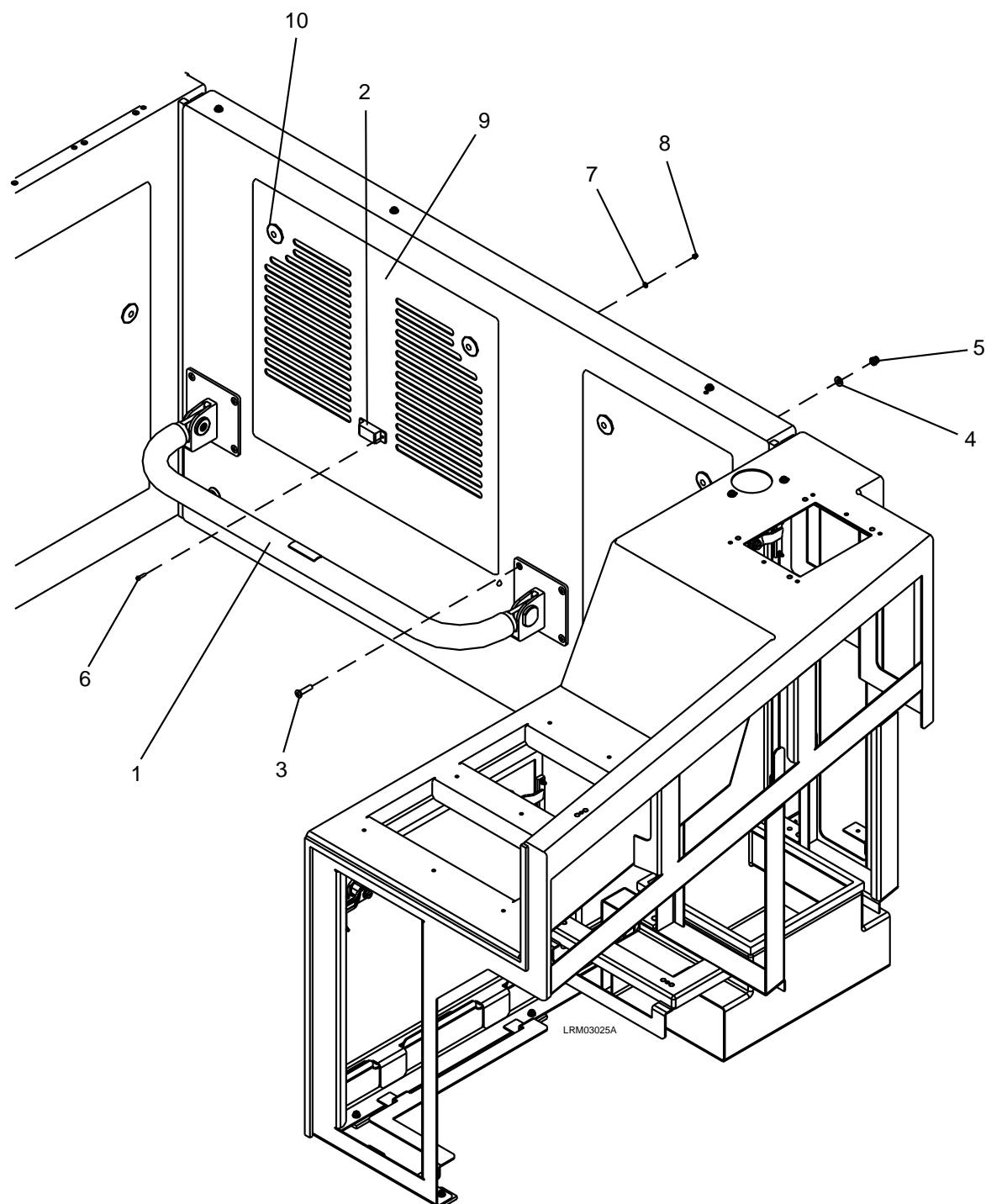


Figure 7-21: Foot Rest

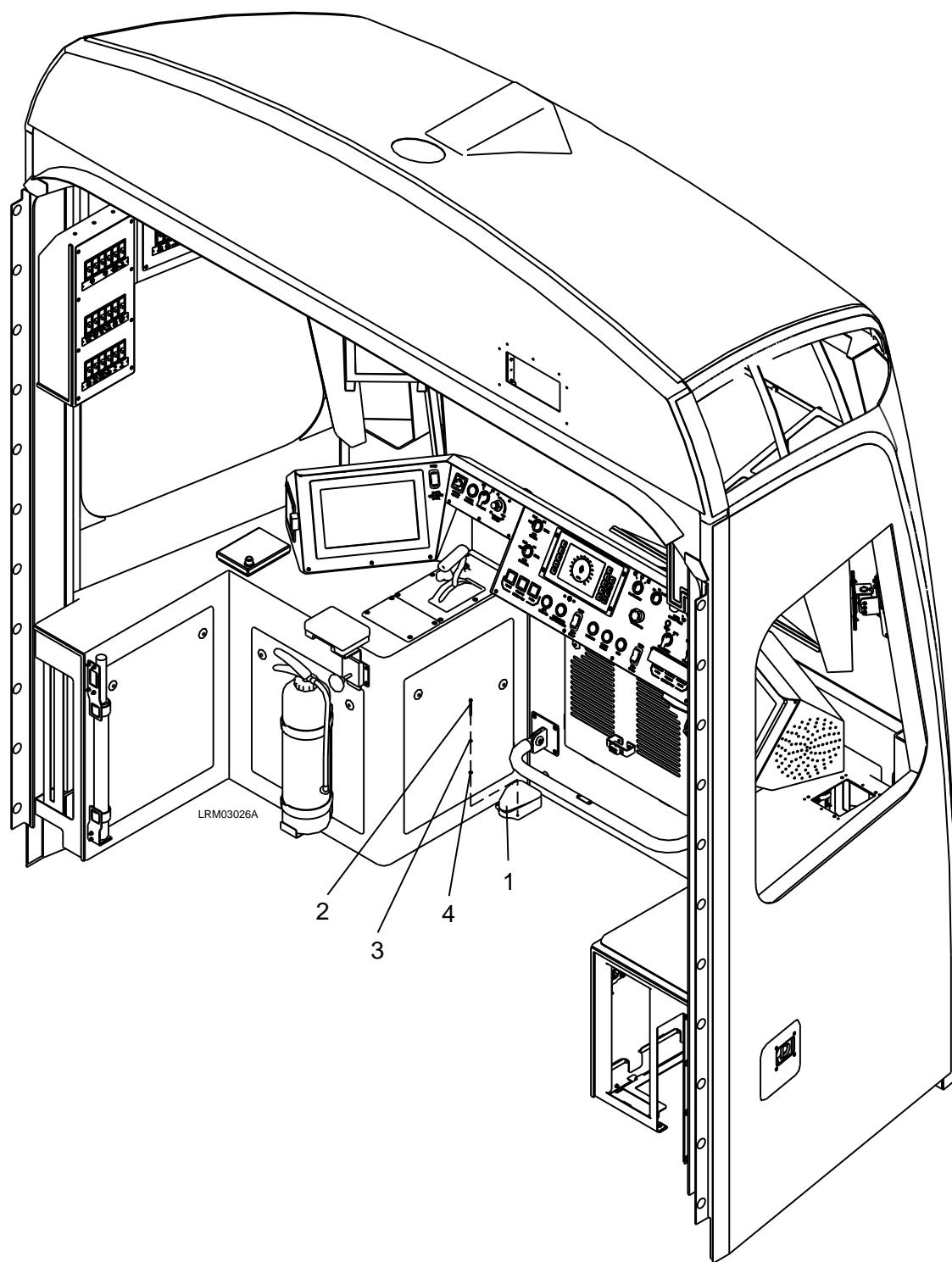


Figure 7-22: Foot Switch

7.4.1.17 Arm Rest

1. Remove the four M4 x 10 screws (2). See Figure 7-23.
2. Remove the Arm Rest (1).

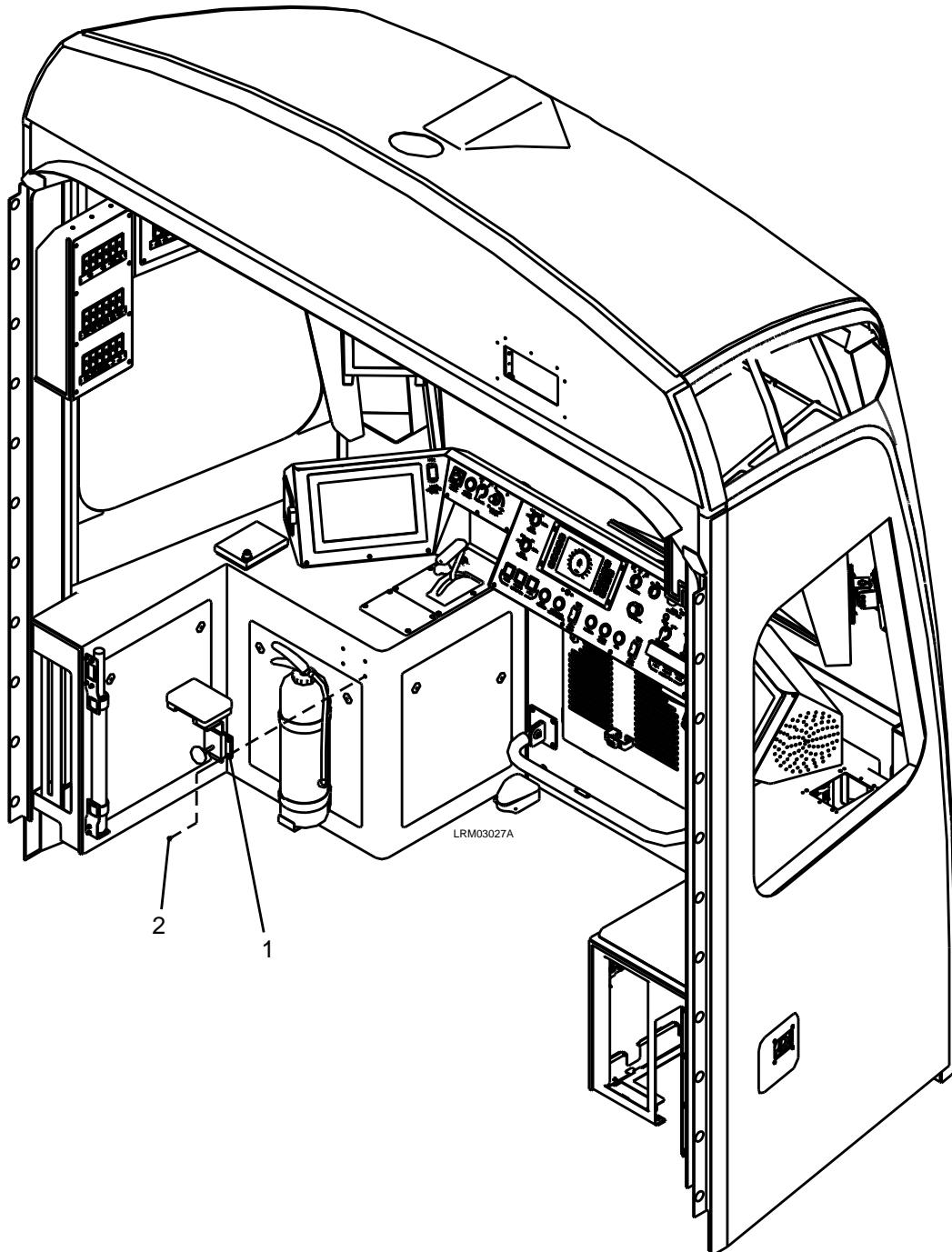


Figure 7-23: Arm Rest

7.4.1.18 Radio Power Supply

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the Radio Power Supply (1). See Figure 7-24.

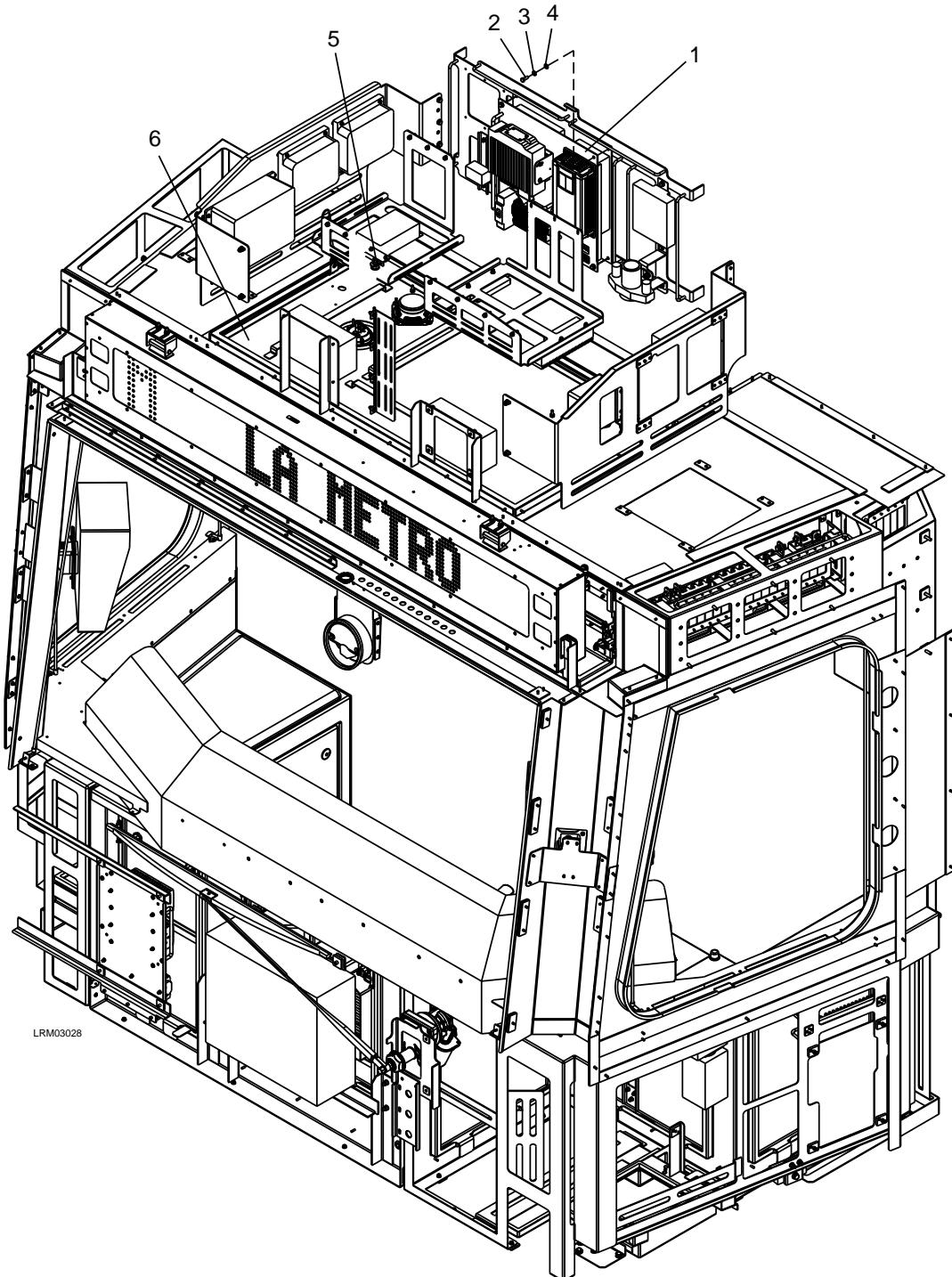


Figure 7-24: Radio Power Supply

WARNING

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2. Remove all electrical connections to the WAGO terminal blocks.
3. Remove the four M6 x 16 bolts (2), M6 lock washers (3), and M6 plain washers (4).

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

4. Carefully remove the Radio Power Supply (1).

7.4.1.19 Cab Speakers

WARNING

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1. Unlock the two locks (11) and lower the cab ceiling panel (1) to access the cab speaker hardware and disconnect the 1/4" Faston electrical connections. See Figure 7-25.
2. Remove the four M6 hexagon nuts (5), M6 lock washers (6), M6 plain washers (7), and M6 x 20 screws (4).
3. Remove the speaker grill (2).
4. Remove the four lock nuts (8), and plain washers (9).
5. Remove the speaker (3).
6. Remove the speaker gasket (10).

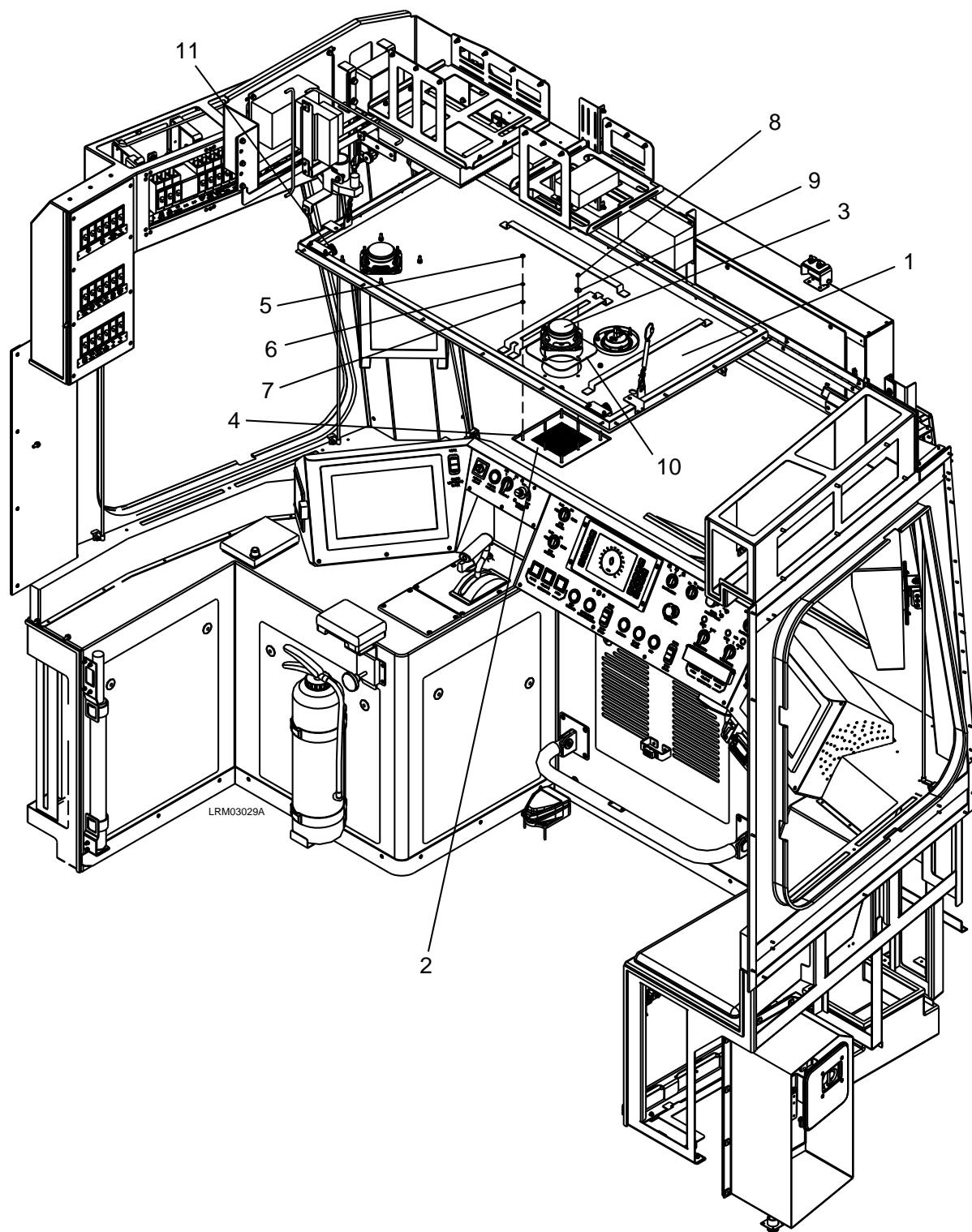


Figure 7-25: Cab Speaker

7.4.1.20 Upper Control Panel

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Rotate the front destination sign cover (5) to access the Upper Control Panel (1) hardware and disconnect the electrical connector (6). See Figure 7-26.
2. Remove the ten M4 ESNA nuts (4), M4 plain washers (3), and M4 x 14 screws (2).
3. Carefully remove the Upper Control Panel (1).

7.4.1.21 Control and Relay Panels

7.4.1.21.1 ACP1A Panel

1. Open the right side electric locker door located in the A-Unit.

WARNING

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2. Disconnect the electrical connectors (5) to the ACP1A Panel (1). See Figure 7-27.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the ACP1A Panel (1).

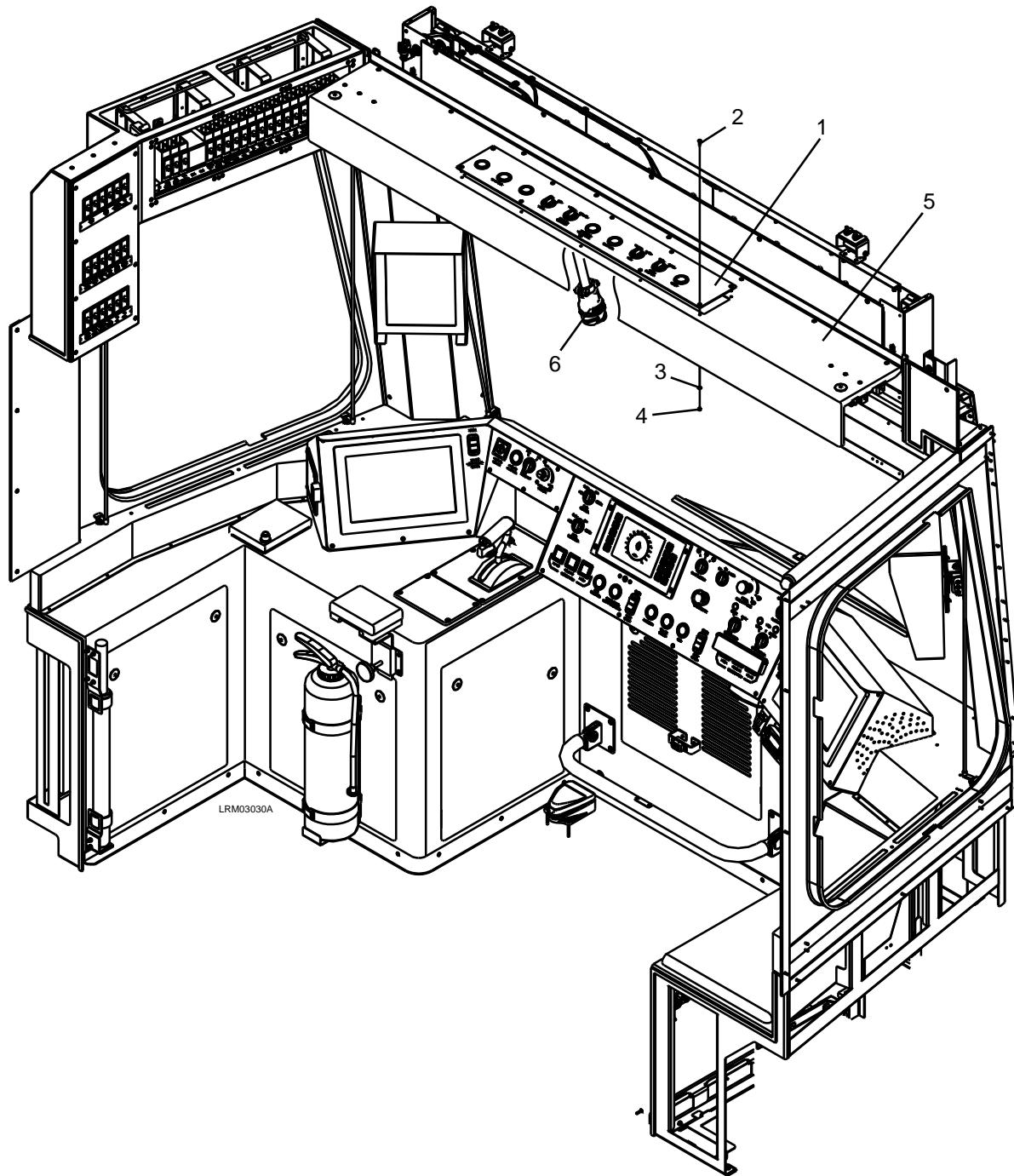


Figure 7-26: Upper Control Panel

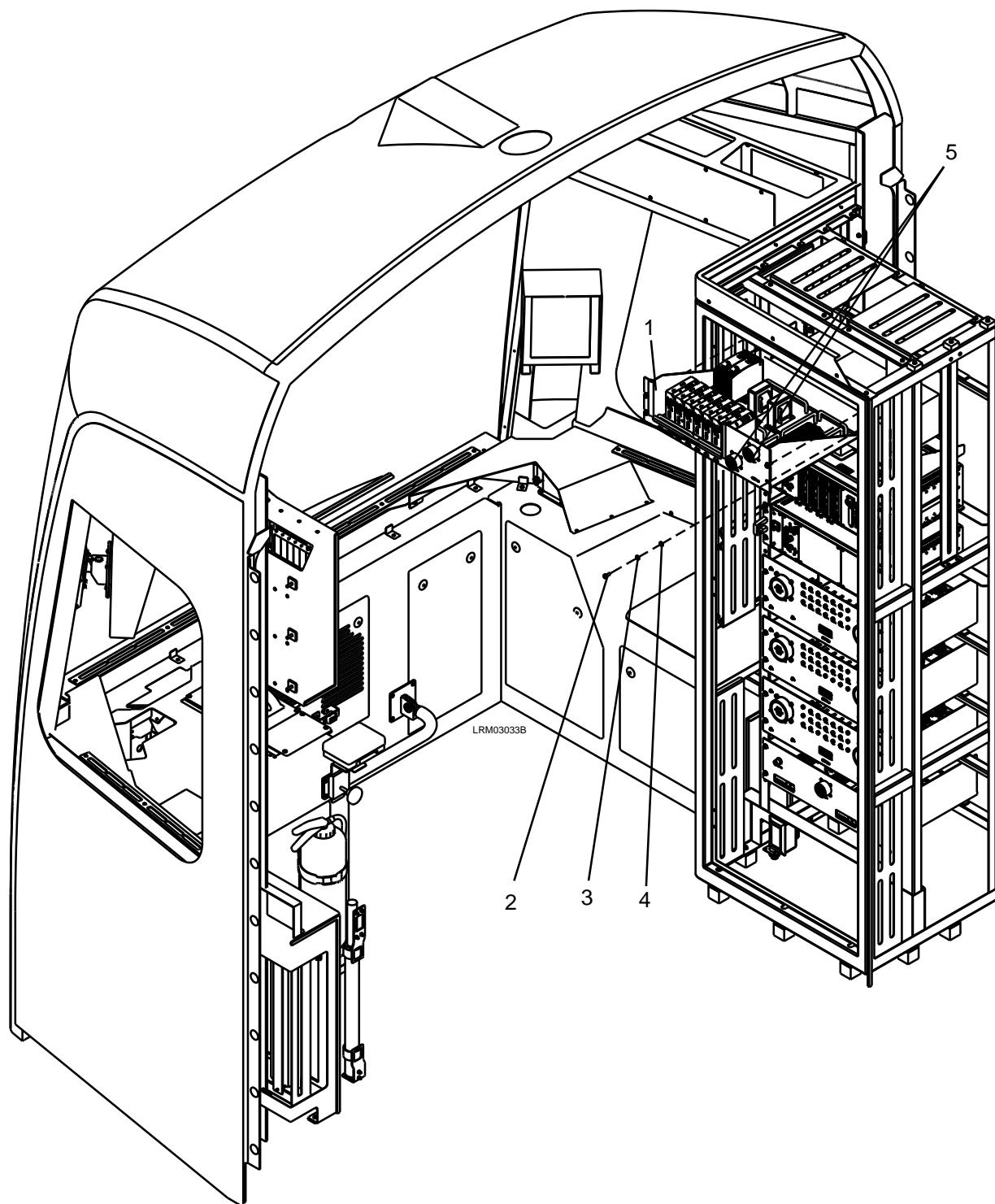


Figure 7-27: ACP1A Panel

7.4.1.21.2 Electronic Control Unit (ECU), A-Unit

1. Open the right side electric locker door located in the A-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the ECU (1). See Figure 7-28.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the ECU (1).

7.4.1.21.3 Communication Control Unit (CCU)

1. Open the right side electric locker door located in the A-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the CCU (1). See Figure 7-29.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CCU (1).

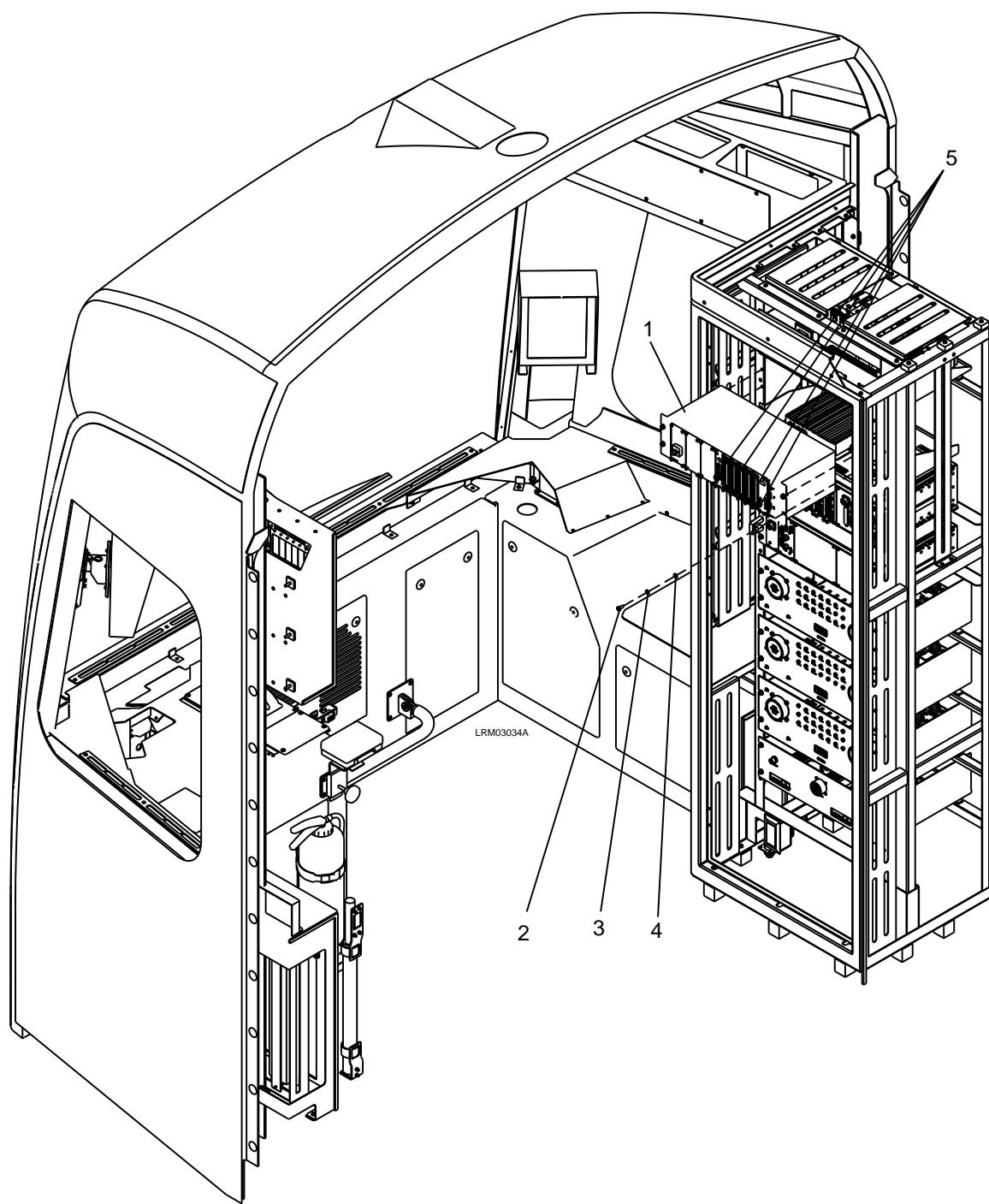


Figure 7-28: Electronic Control Unit (ECU), A-Unit

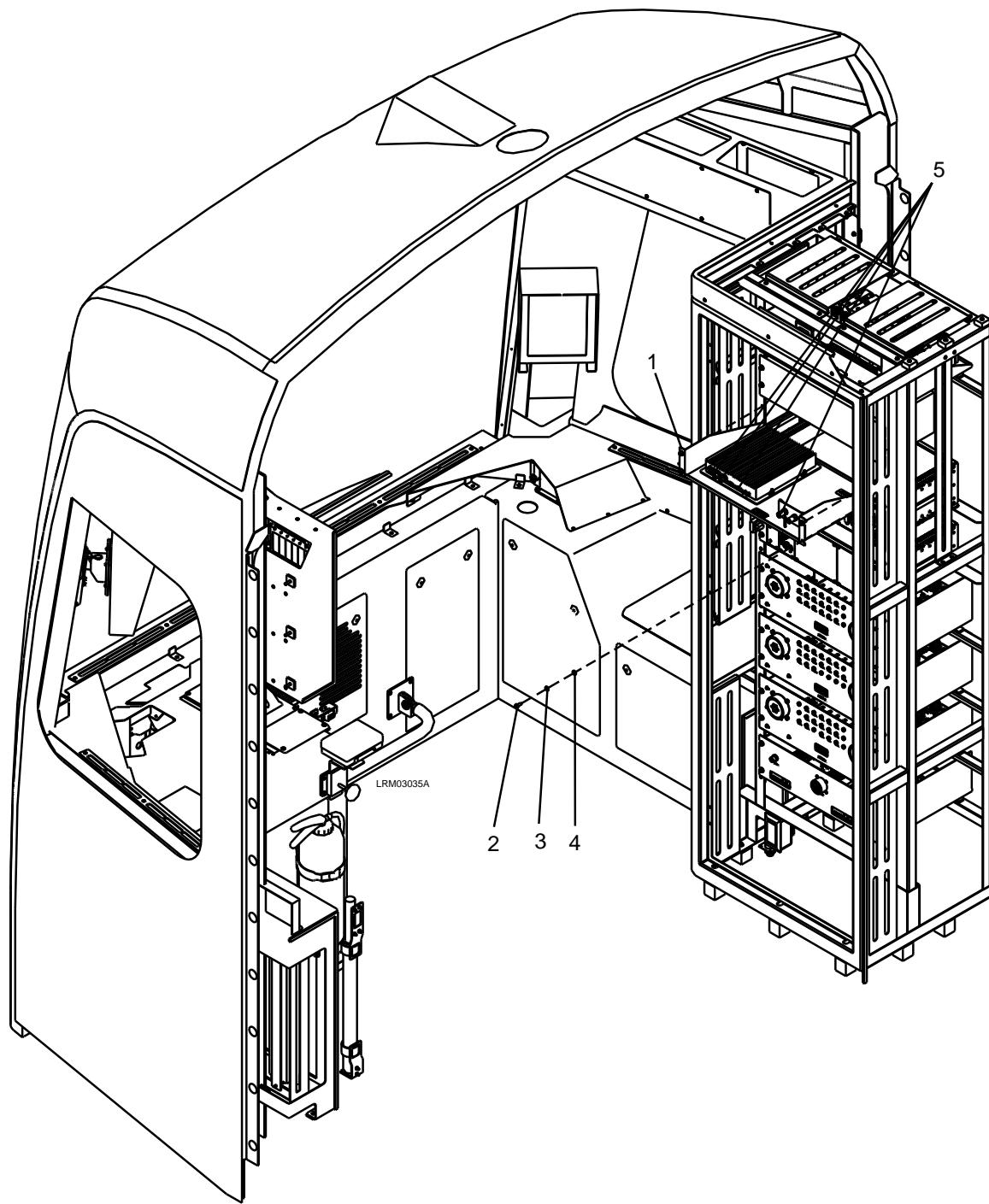


Figure 7-29: Communication Control Unit (CCU)

7.4.1.21.4 TCN Controller (A-Unit)

1. Open the right side electric locker door located in the A-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the TCN Controller (A-Unit) (1). See Figure 7-30.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the TCN Controller (A Unit) (1).

7.4.1.21.5 Event Recorder

1. Open the right side electric locker door located in the A-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the Event Recorder (1). See Figure 7-31.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the Event Recorder (1).

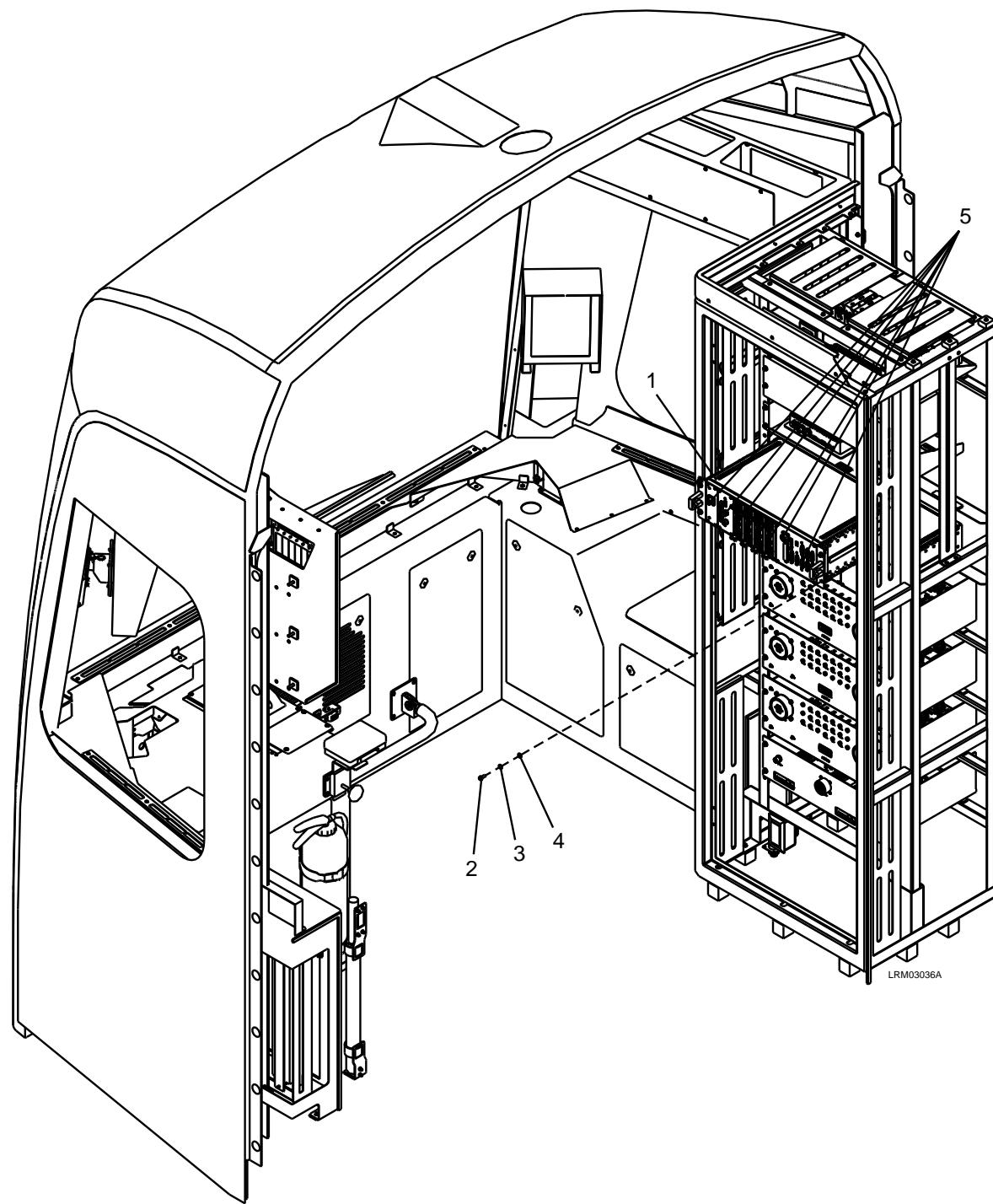


Figure 7-30: TCN Controller (A-Unit)

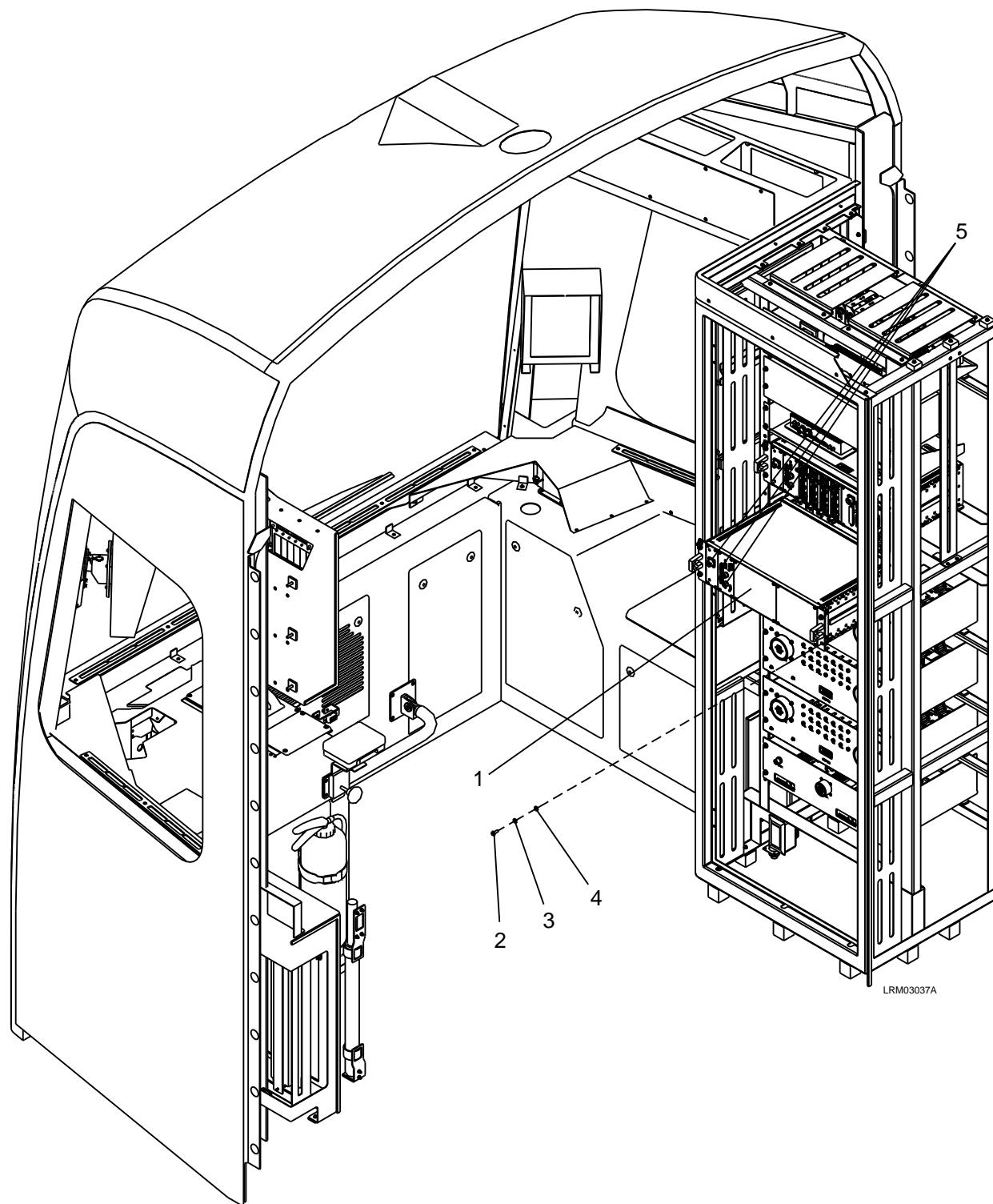


Figure 7-31: Event Recorder

7.4.1.21.6 CRP6A Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the right side electric locker door located in the A-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the CRP6A Panel (1). See Figure 7-32.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CRP6A Panel (1).

7.4.1.21.7 CRP7A Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the right side electric locker door located in the A-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the CRP7A Panel (1). See Figure 7-33.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CRP7A Panel (1).

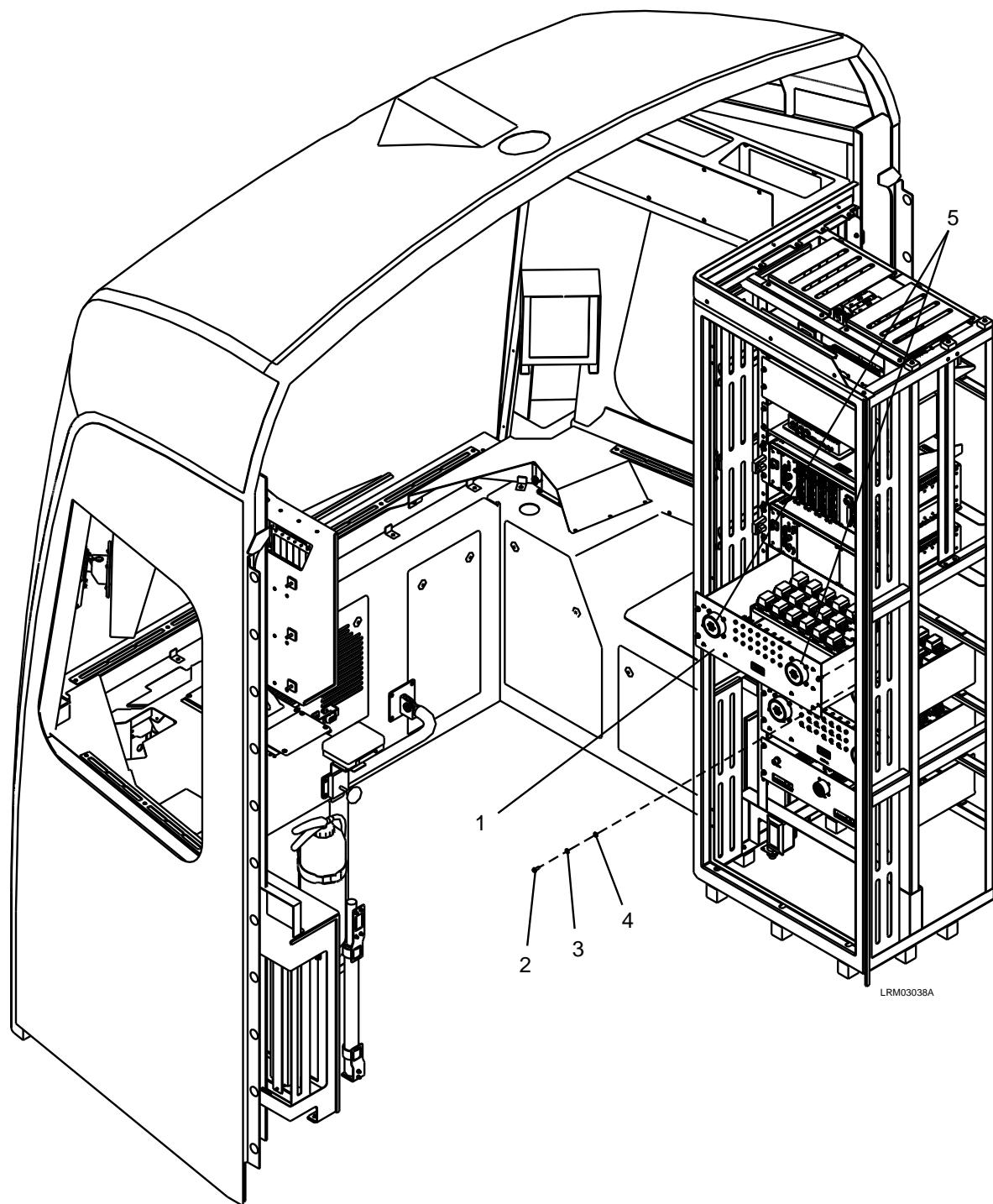


Figure 7-32: CRP6A Panel

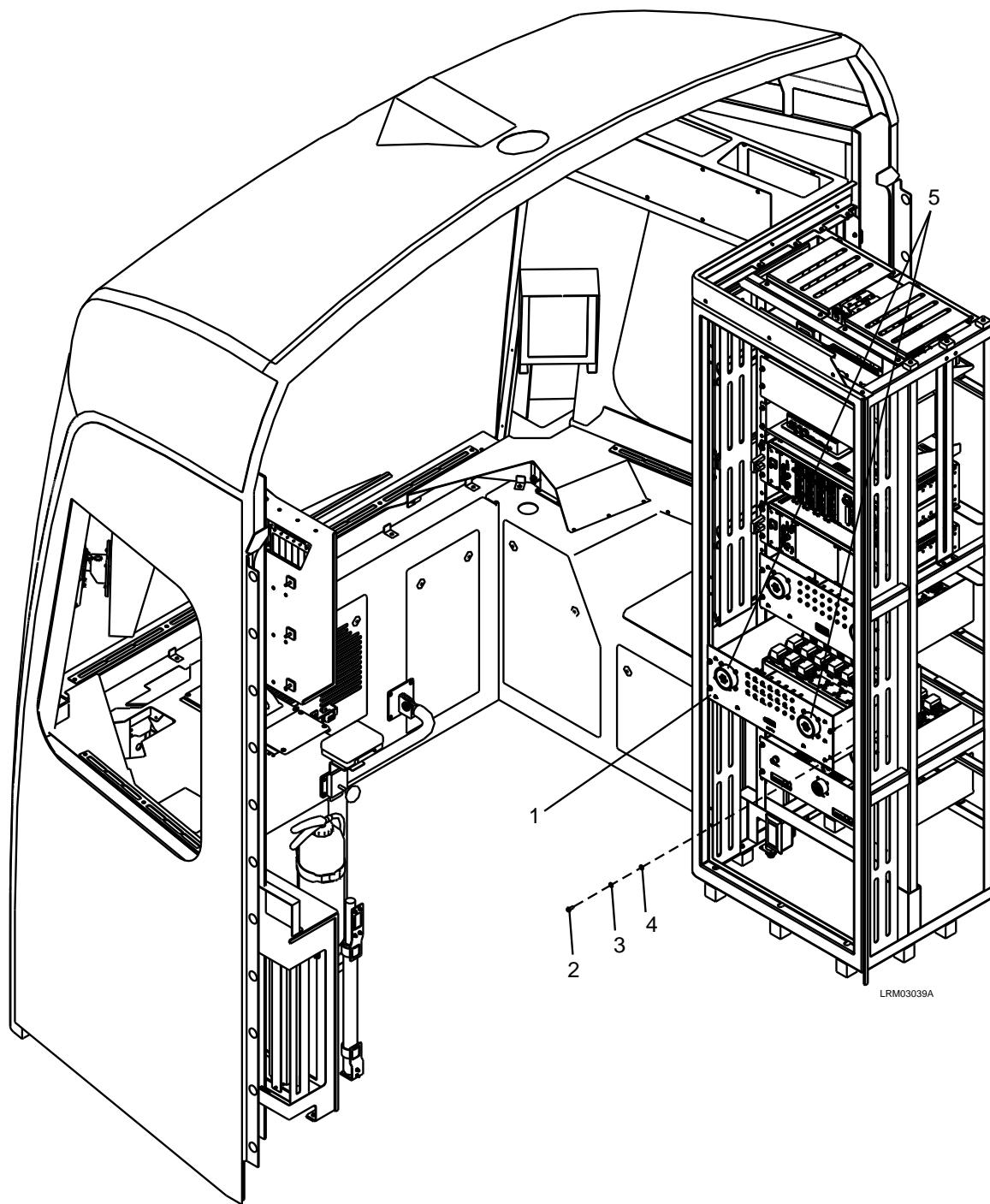


Figure 7-33: CRP7A Panel

7.4.1.21.8 CRP8A Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the right side electric locker door located in the A-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the CRP8A Panel (1). See Figure 7-34.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CRP8A Panel (1).

7.4.1.21.9 Trainline Interface Module

1. Open the right side electric locker door located in the A-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the Trainline Interface Module (1). See Figure 7-35.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the Trainline Interface Module (1).

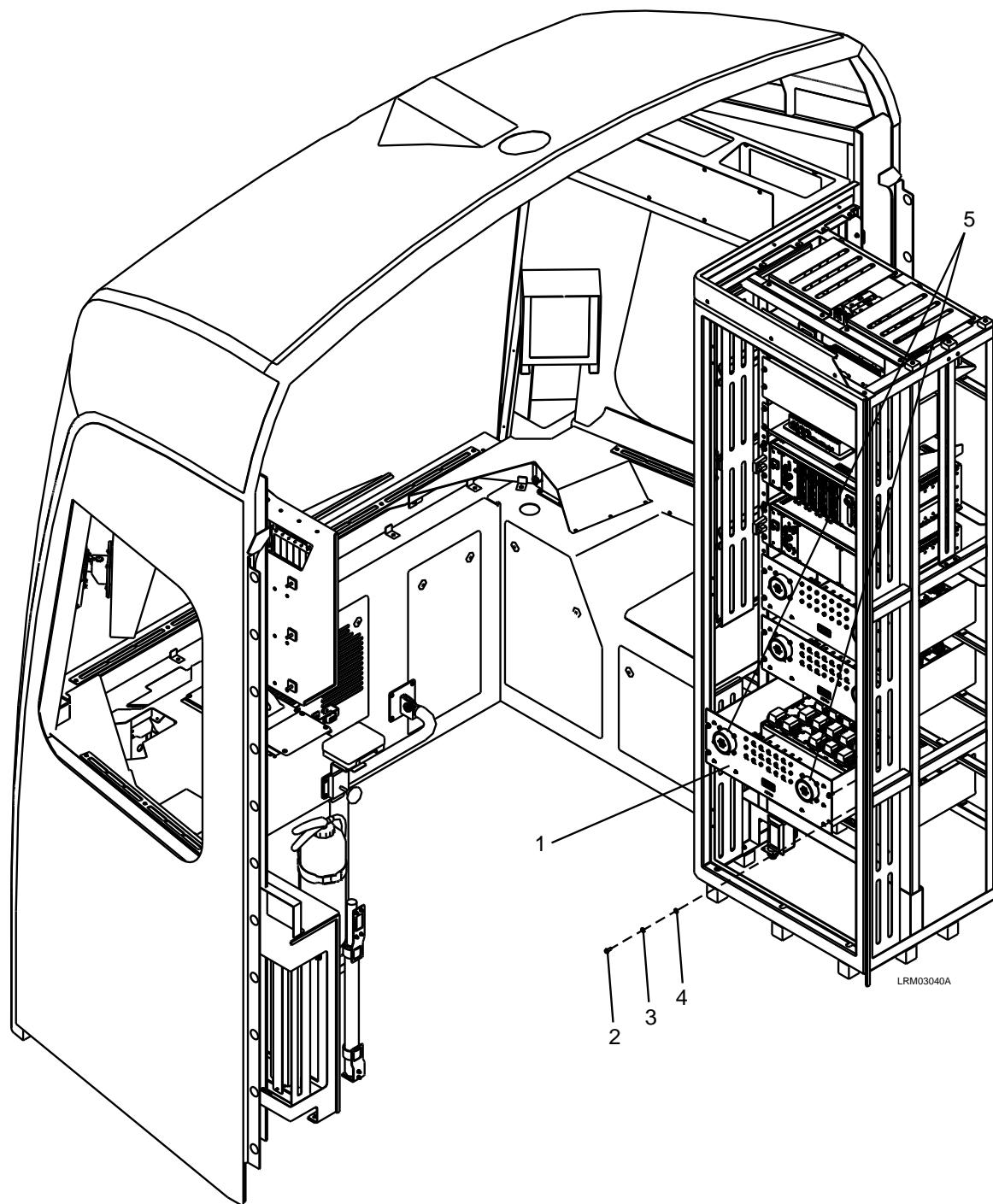


Figure 7-34: CRP8A Panel

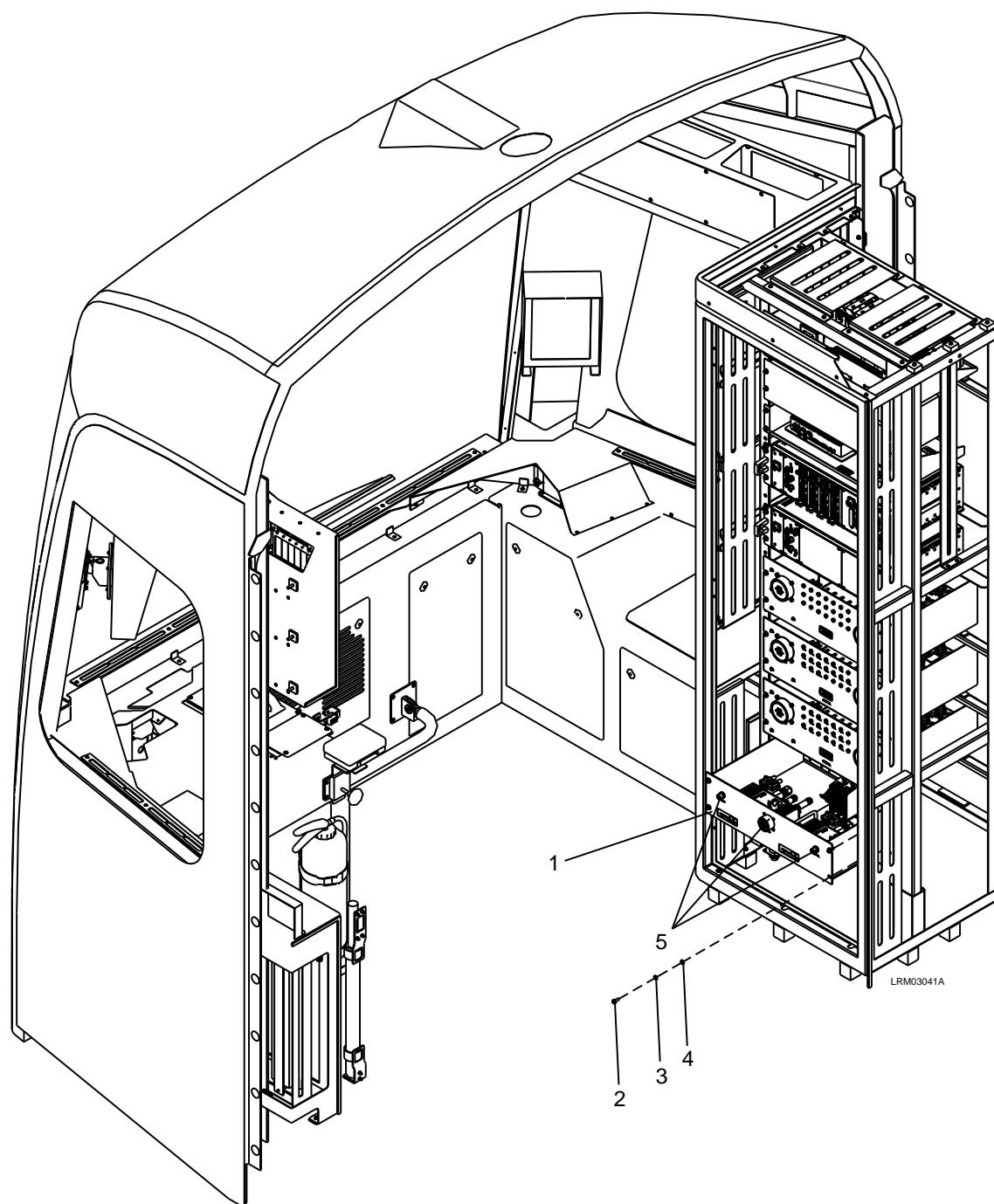


Figure 7-35: Trainline Interface Module

7.4.1.21.10 CRP2A and CRP2B Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the left side electric locker door located in the A-Unit / B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the WAGO terminal electrical connections to the CRP2A / CRP2B Panel (1). See Figure 7-36.
3. Remove the ten M6 x 16 bolt (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CRP2A / CRP2B Panel (1).

7.4.1.21.11 CRP4A and CRP4B Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the left side electric locker door located in the A-Unit / B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the WAGO terminal electrical connections to the CRP4A / CRP4B Panel (1). See Figure 7-37.
3. Remove the five M6 x 16 bolt (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CRP4A / CRP4B Panel (1).

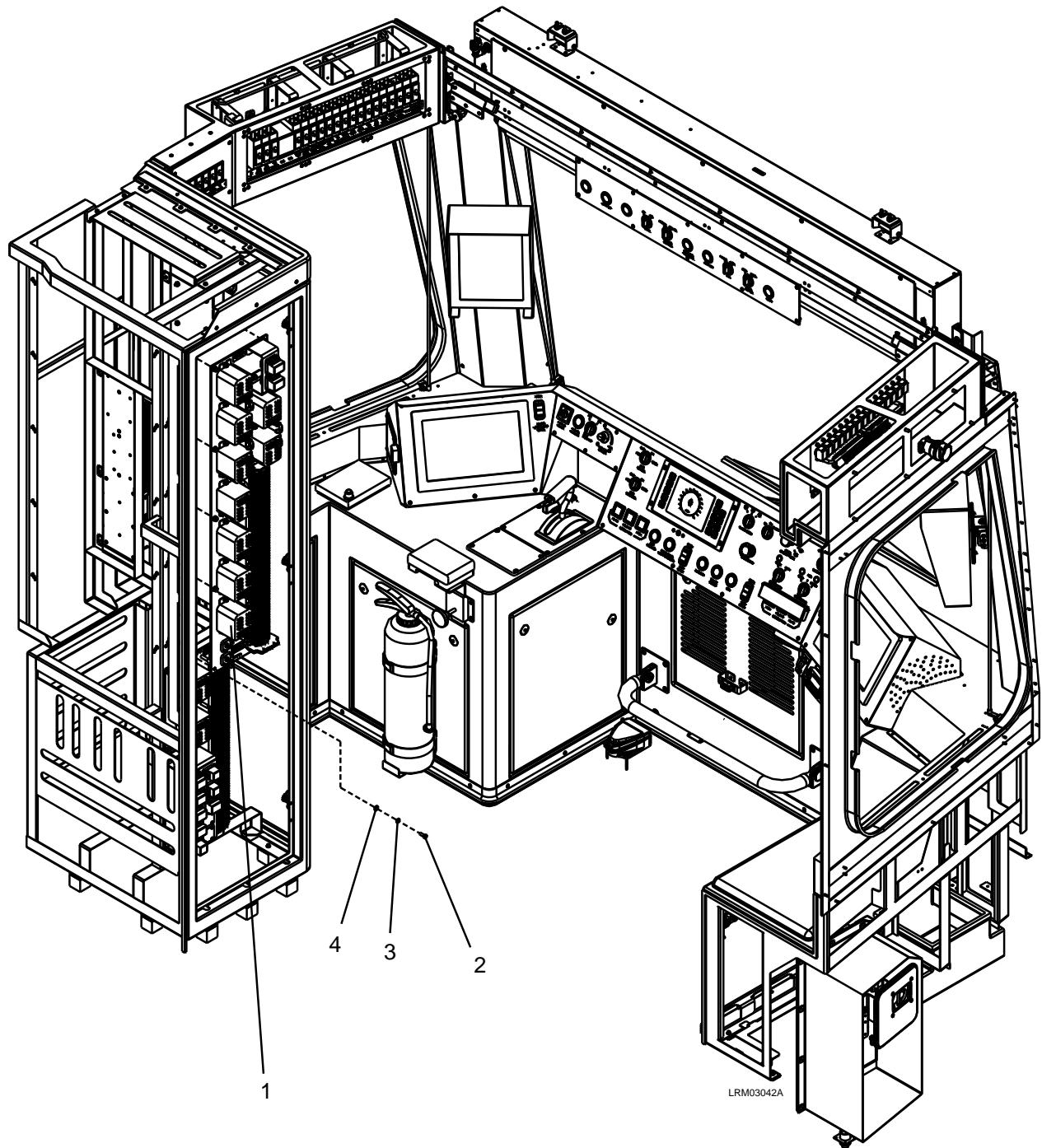


Figure 7-36: CRP2A and CRP2B Panel

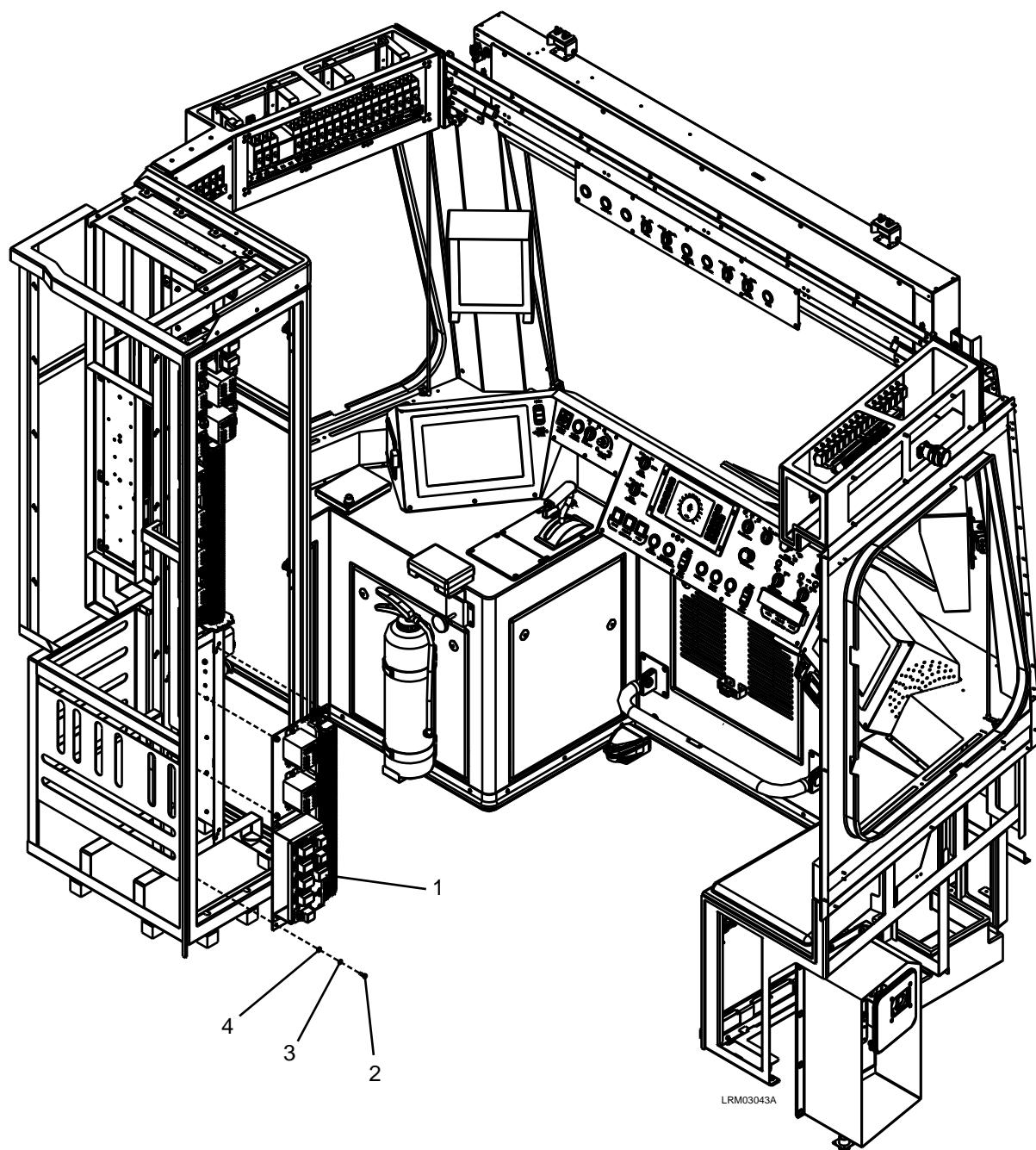


Figure 7-37: CRP4A and CRP4B Panel

7.4.1.21.12 CRP1A and CRP1B Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the left side electric locker door located behind the Operator's seat in the A-Unit / B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the WAGO terminal electrical connections to the CRP1A / CRP1B Panel (1). See Figure 7-38.
3. Remove the ten M6 x 16 bolt (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CRP1A / CRP1B Panel (1).

7.4.1.21.13 CRP3A and CRP3B Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the left side electric locker door located behind the Operator's seat in the A-Unit / B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the WAGO terminal electrical connections to the CRP3A / CRP3B Panel (1). See Figure 7-39.
3. Remove the eight M6 x 16 bolt (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CRP3A / CRP3B Panel (1).

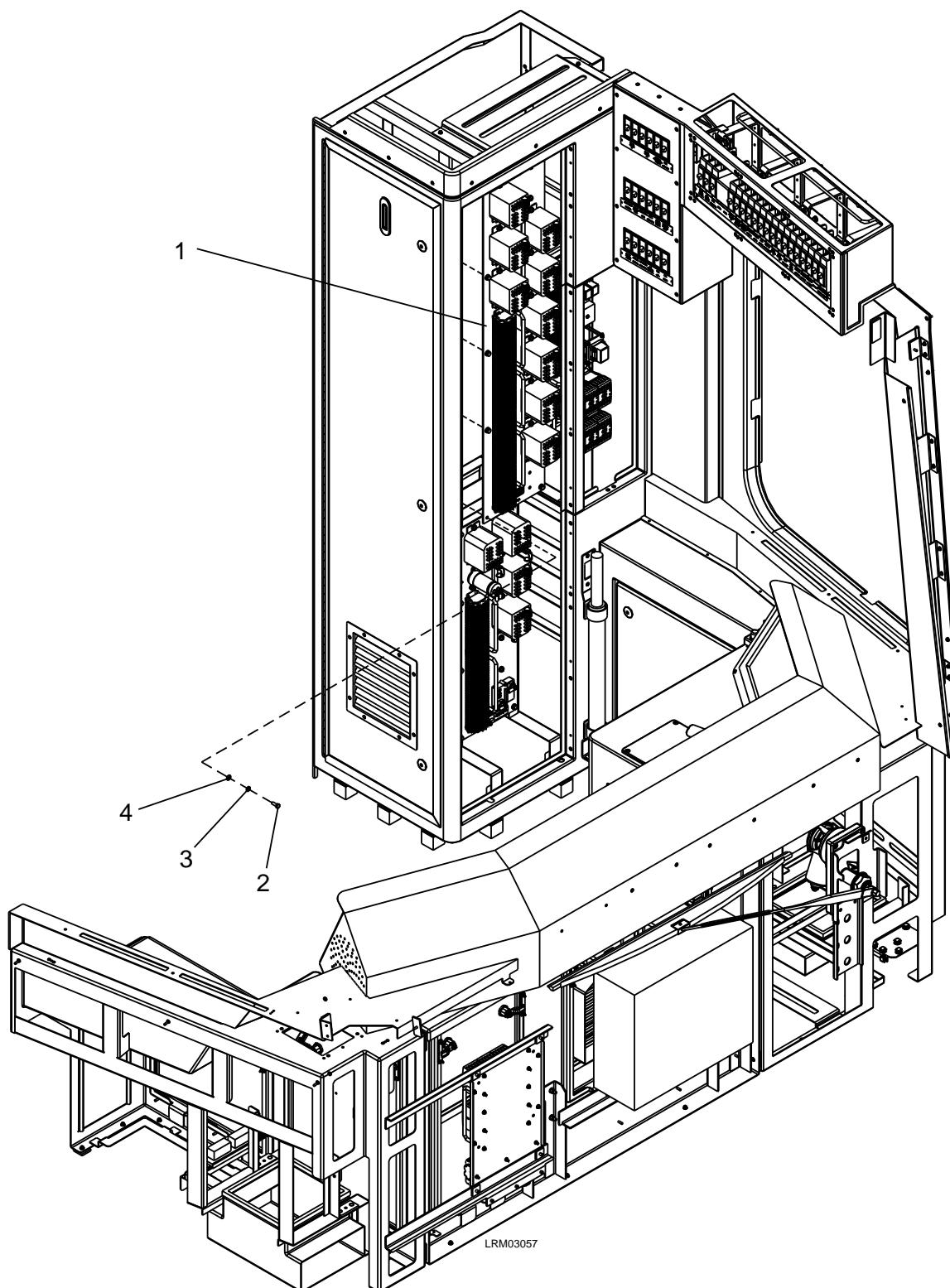


Figure 7-38: CRP1A and CRP1B Panel

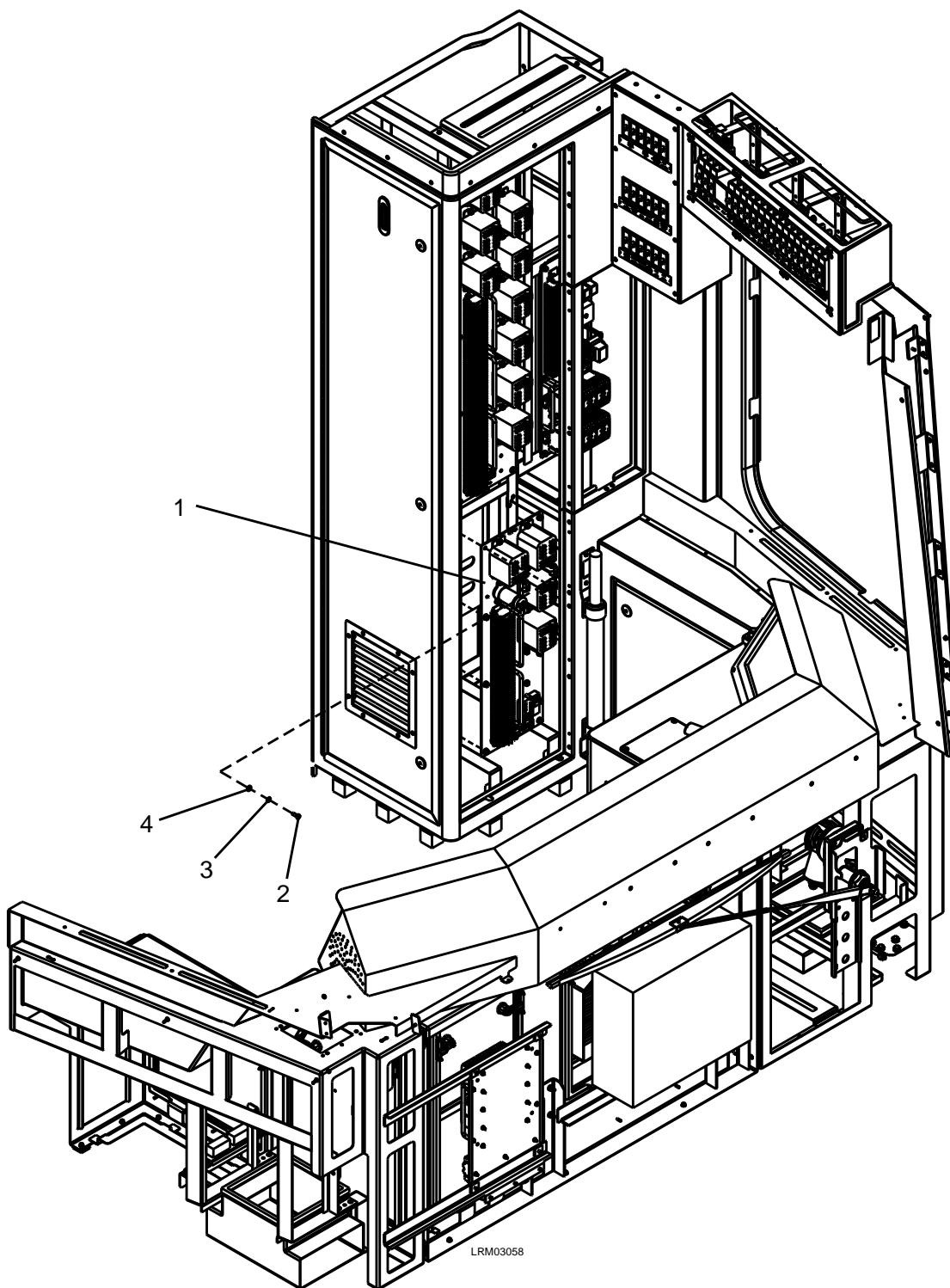


Figure 7-39: CRP3A and CRP3B Panel

7.4.1.21.14 CRP5A and CRP5B Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the left side electric locker door located behind the Operator's seat in the A-Unit / B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the WAGO terminal electrical connections to the CRP5A / CRP5B Panel (1). See Figure 7-40.
3. Remove the six M6 x 16 bolt (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CRP5A / CRP5B Panel (1).

7.4.1.21.15 ACP1B Panel

1. Open the right side electric locker door located in the B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the ACP1B Panel (1). See Figure 7-41.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the ACP1B Panel (1).

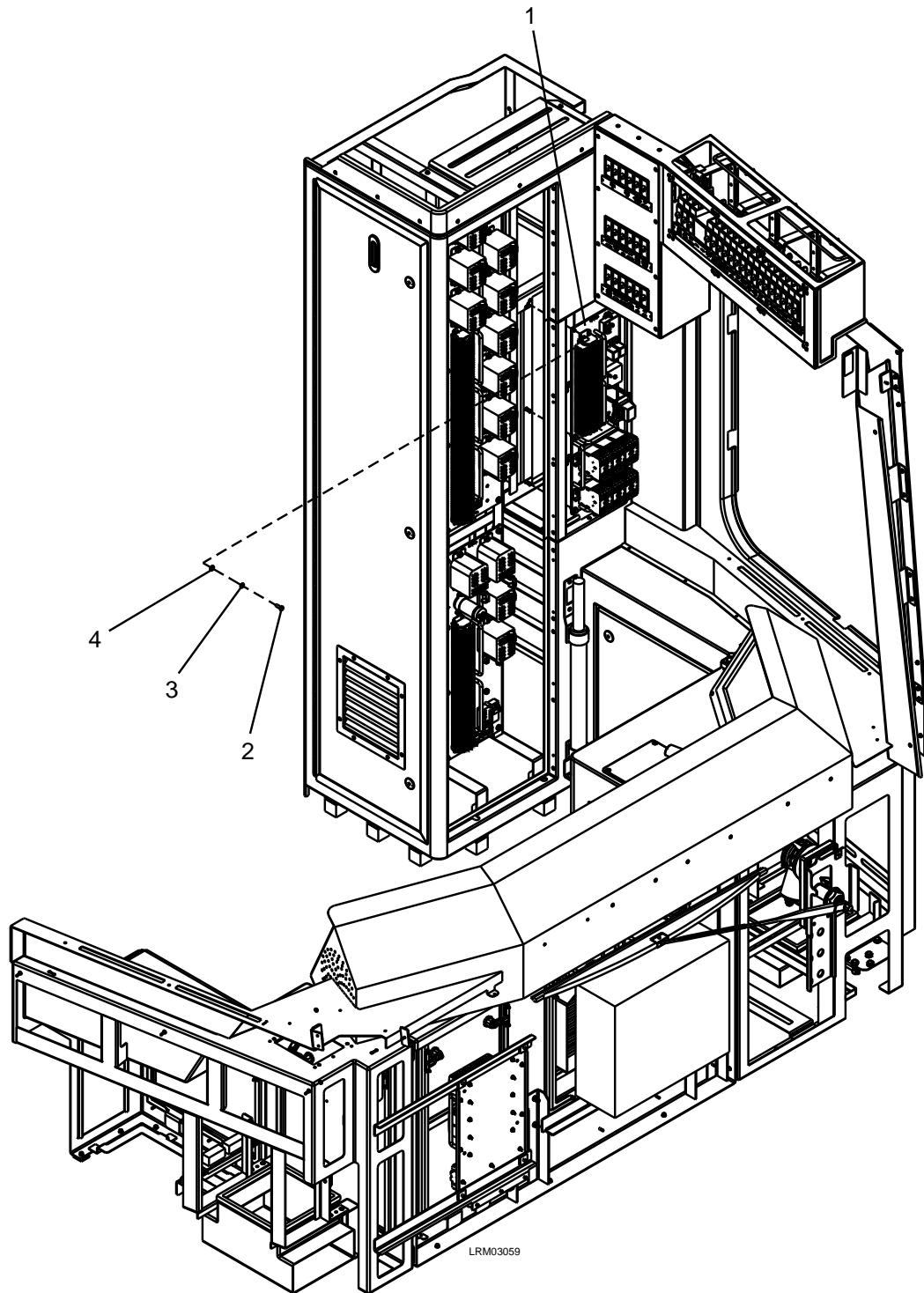


Figure 7-40: CRP5A and CRP5B Panel

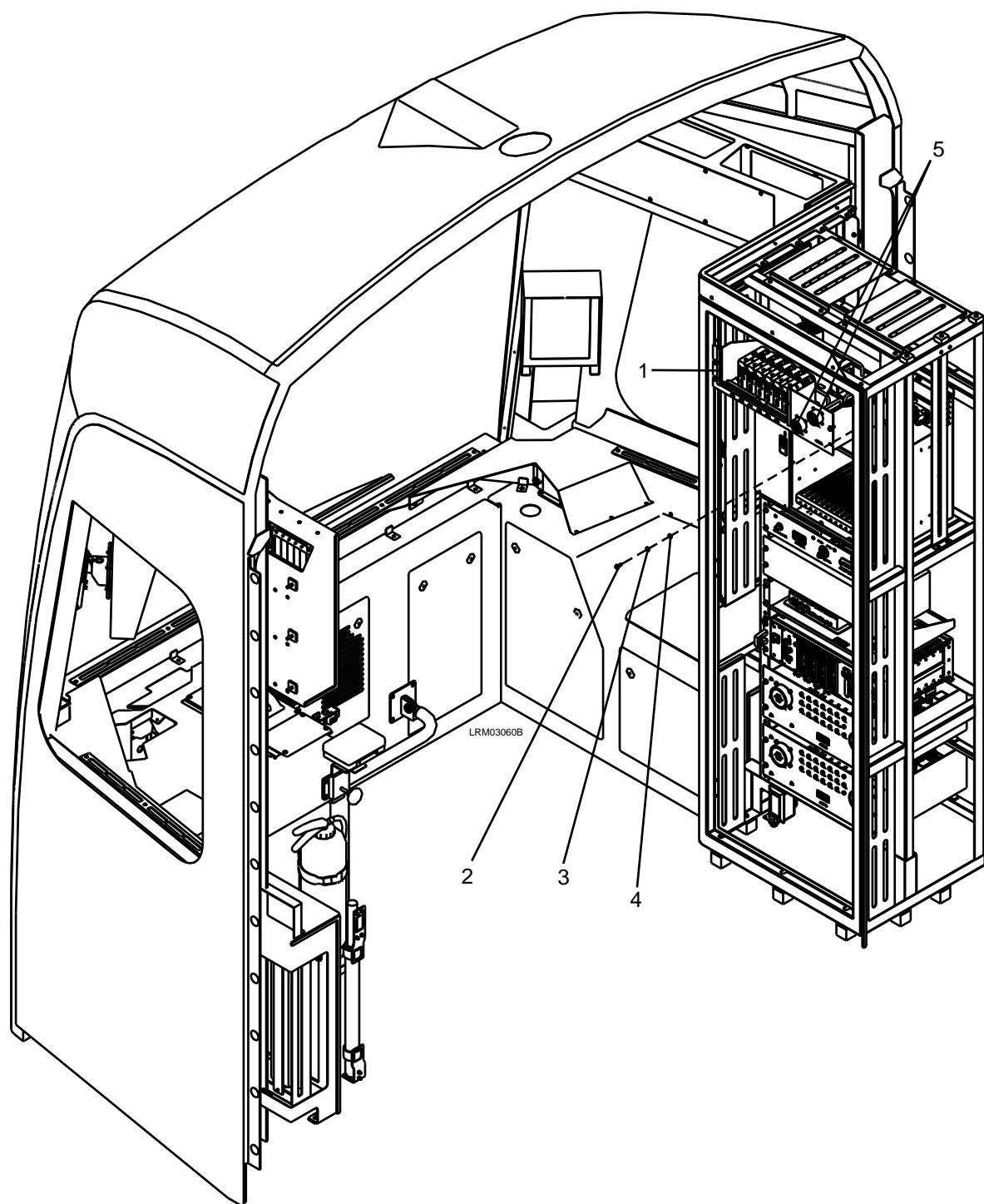


Figure 7-41: ACP1B Panel

7.4.1.21.16 ATC Enclosure

1. Open the right side electric locker door located in the B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the ATC Enclosure (1). See Figure 7-42.
3. Remove the eight M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the ATC Enclosure (1).

7.4.1.21.17 Hour Meter / Odometer Panel

1. Open the right side electric locker door located in the B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the Hour Meter / Odometer Panel (1). See Figure 7-43.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the Hour Meter / Odometer Panel (1).

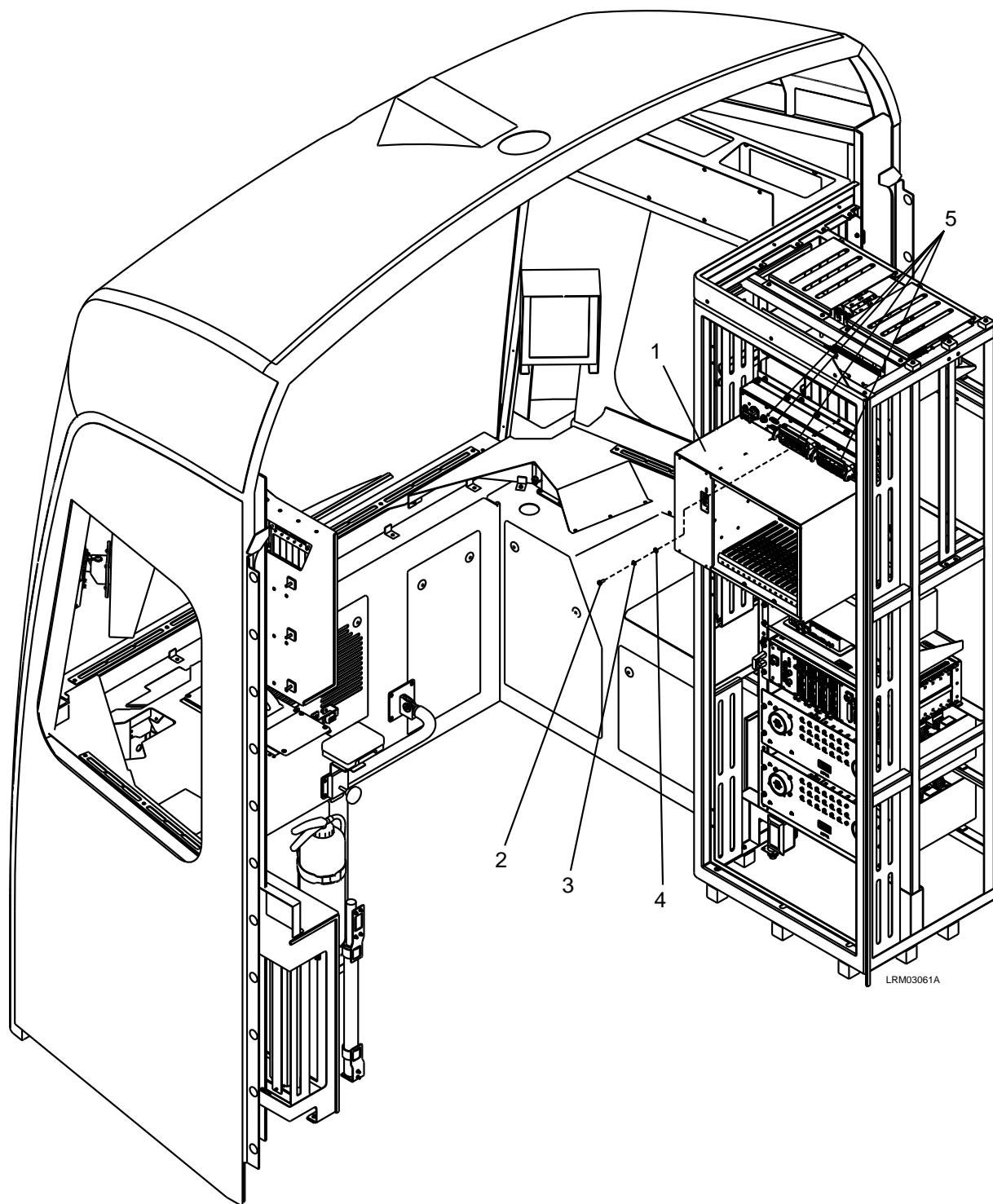


Figure 7-42: ATC Enclosure

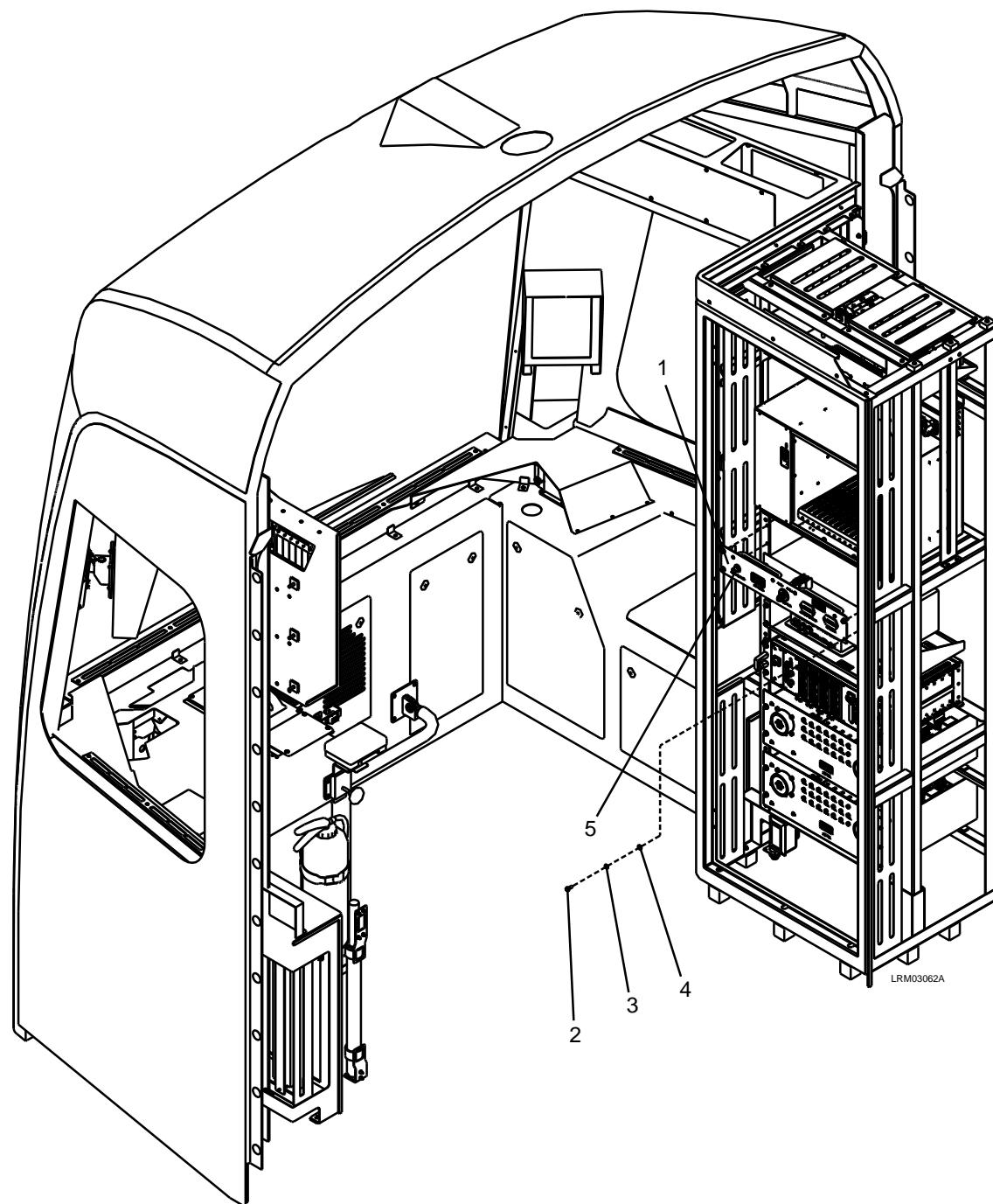


Figure 7-43: Hour Meter / Odometer Panel

7.4.1.21.18 Electronic Control Unit (ECU), B-Unit

1. Open the right side electric locker door located in the B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the ECU (1). See Figure 7-44.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the ECU (1).

7.4.1.21.19 Monitoring and Diagnostic System (MDS) Control Unit

1. Open the right side electric locker door located in the B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the MDS Control Unit (1). See Figure 7-45.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the MDS Control Unit (1).

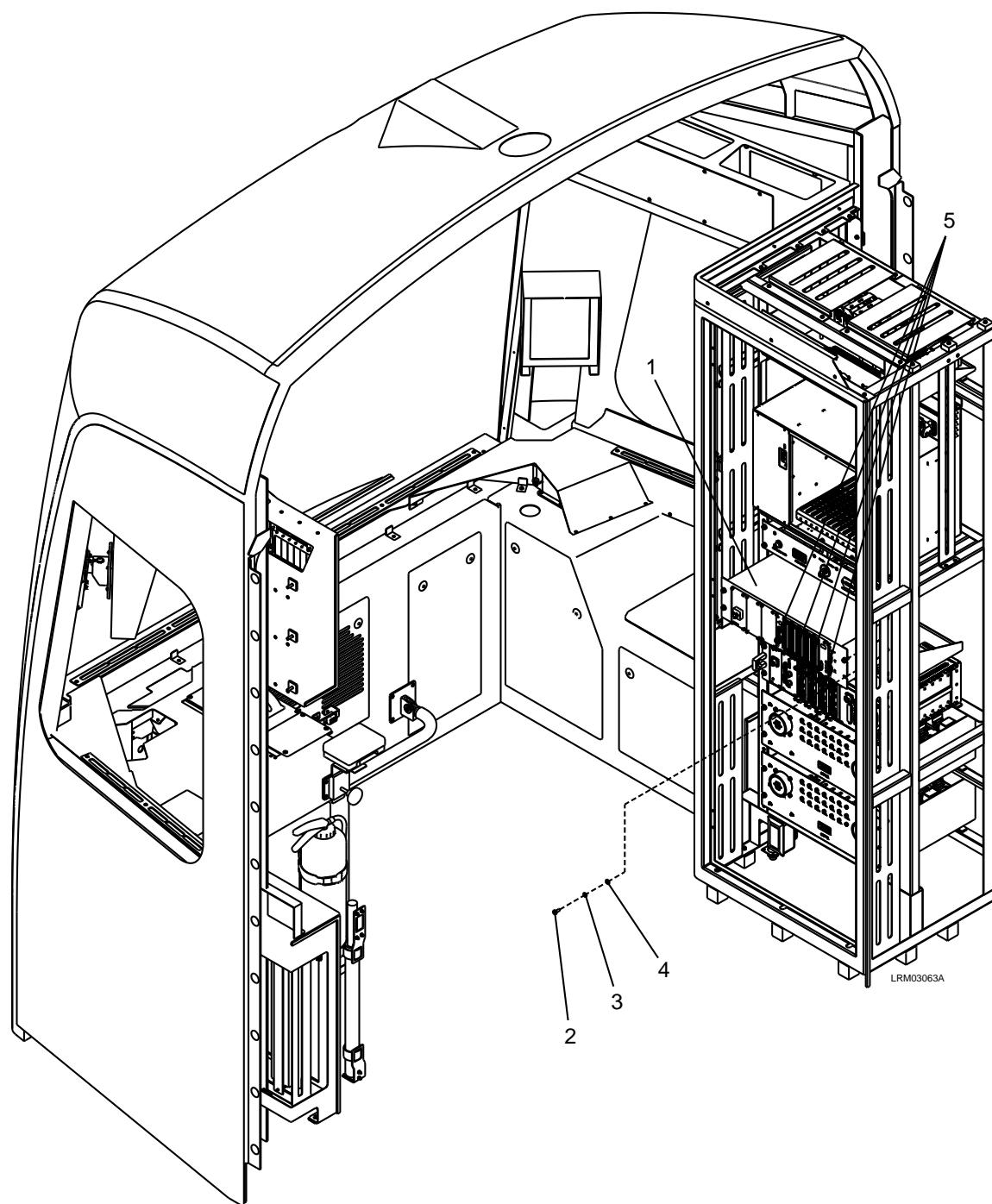


Figure 7-44: Electronic Control Unit (ECU), B-Unit

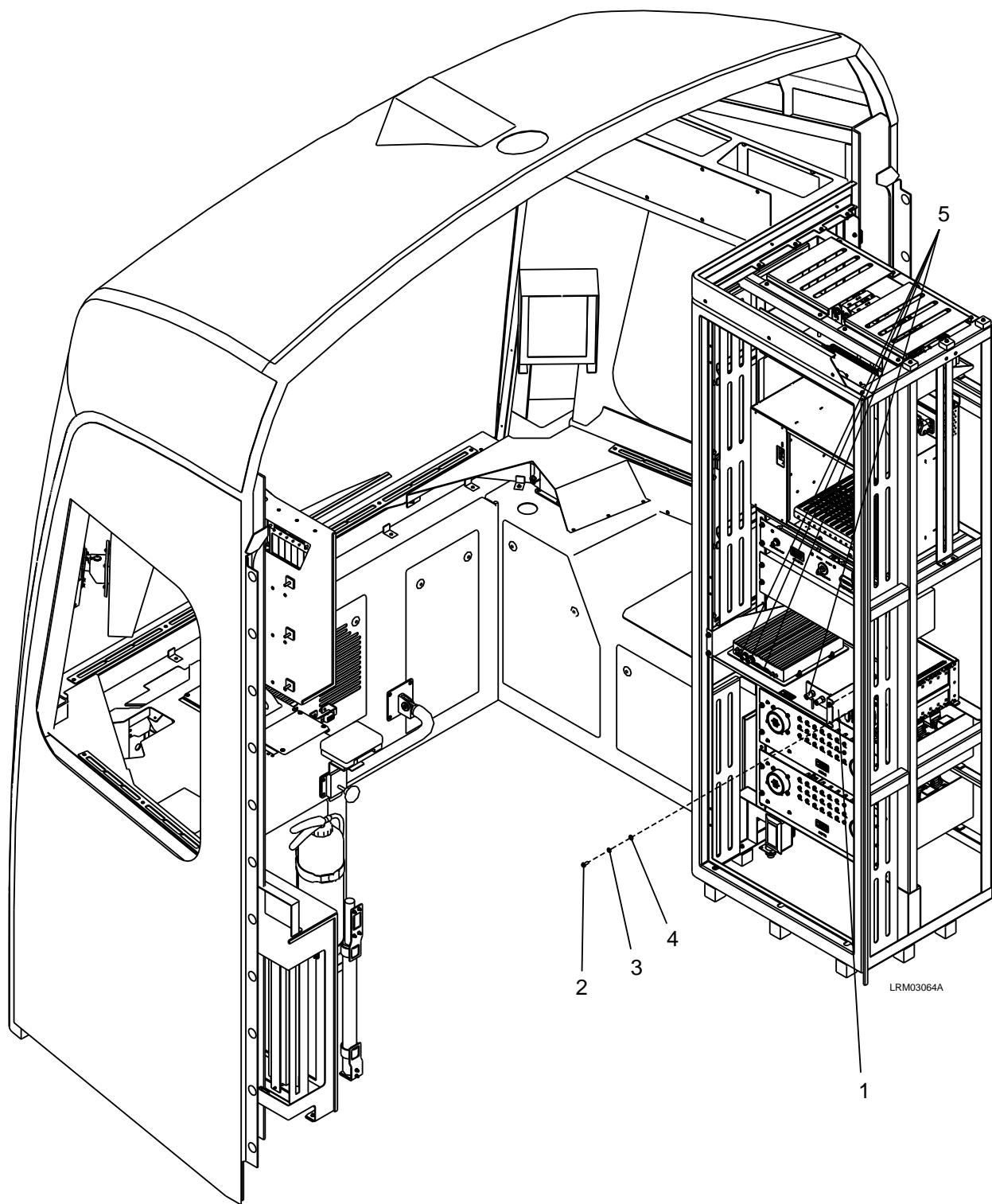


Figure 7-45: Monitoring and Diagnostic System (MDS) Control Unit

7.4.1.21.20 TCN Controller (B-Unit)

1. Open the right side electric locker door located in the B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the TCN Controller (B-Unit) (1). See Figure 7-46.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the TCN Controller (B-Unit) (1).

7.4.1.21.21 CRP6B Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the right side electric locker door located in the B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the CRP6B Panel (1). See Figure 7-47.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CRP6B Panel (1).

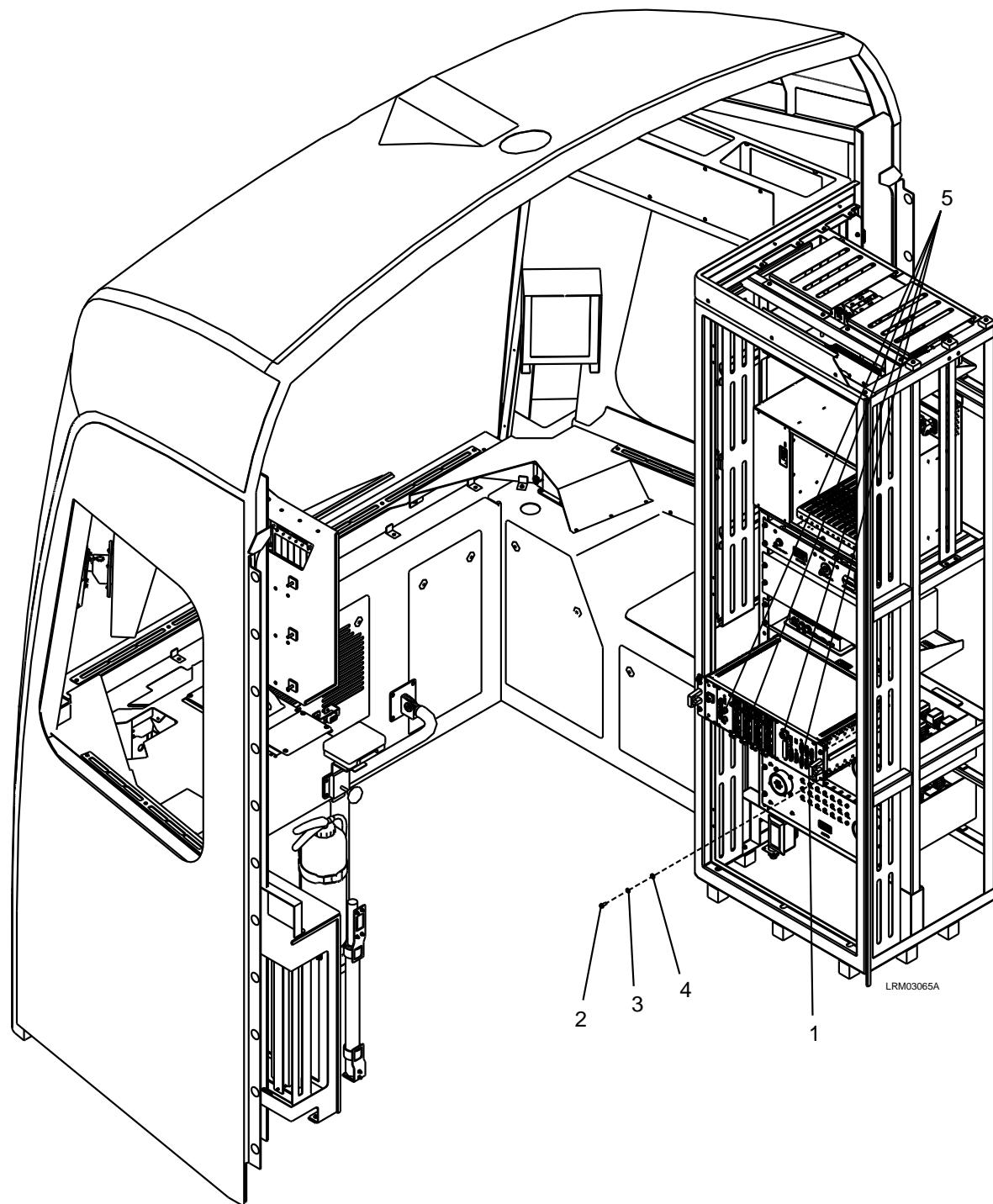


Figure 7-46: TCN Controller (B-Unit)

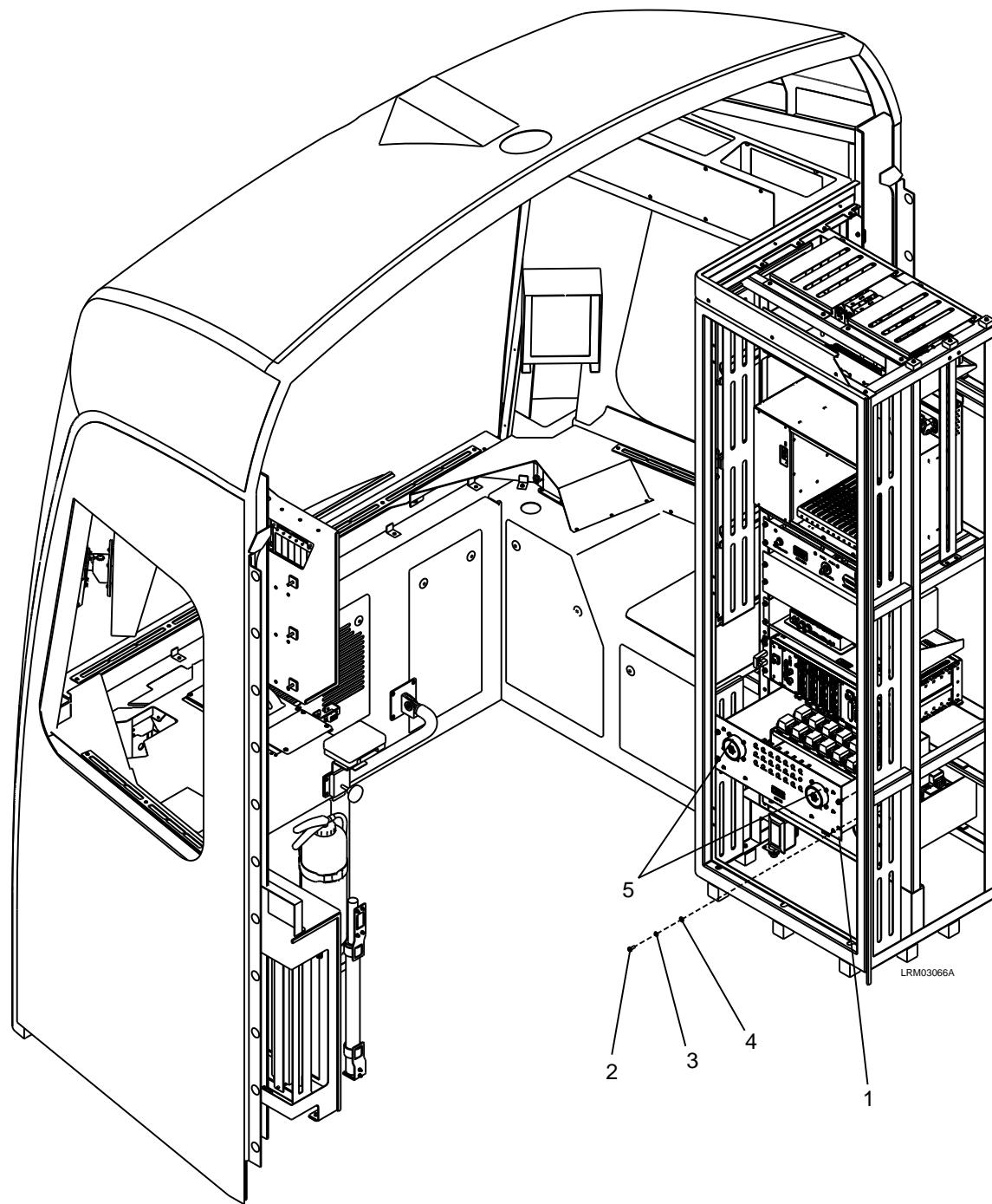


Figure 7-47: CRP6B Panel

7.4.1.21.22 CRP7B Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the right side electric locker door located in the B-Unit.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Disconnect the electrical connectors (5) to the CRP7B Panel (1). See Figure 7-48.
3. Remove the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Carefully remove the CRP7B Panel (1).

7.4.1.22 Bypass Panel

1. Remove the six M4 x 12 screws (2). See Figure 7-49.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Carefully remove the bypass panel (1) and disconnect the electrical connector (3).

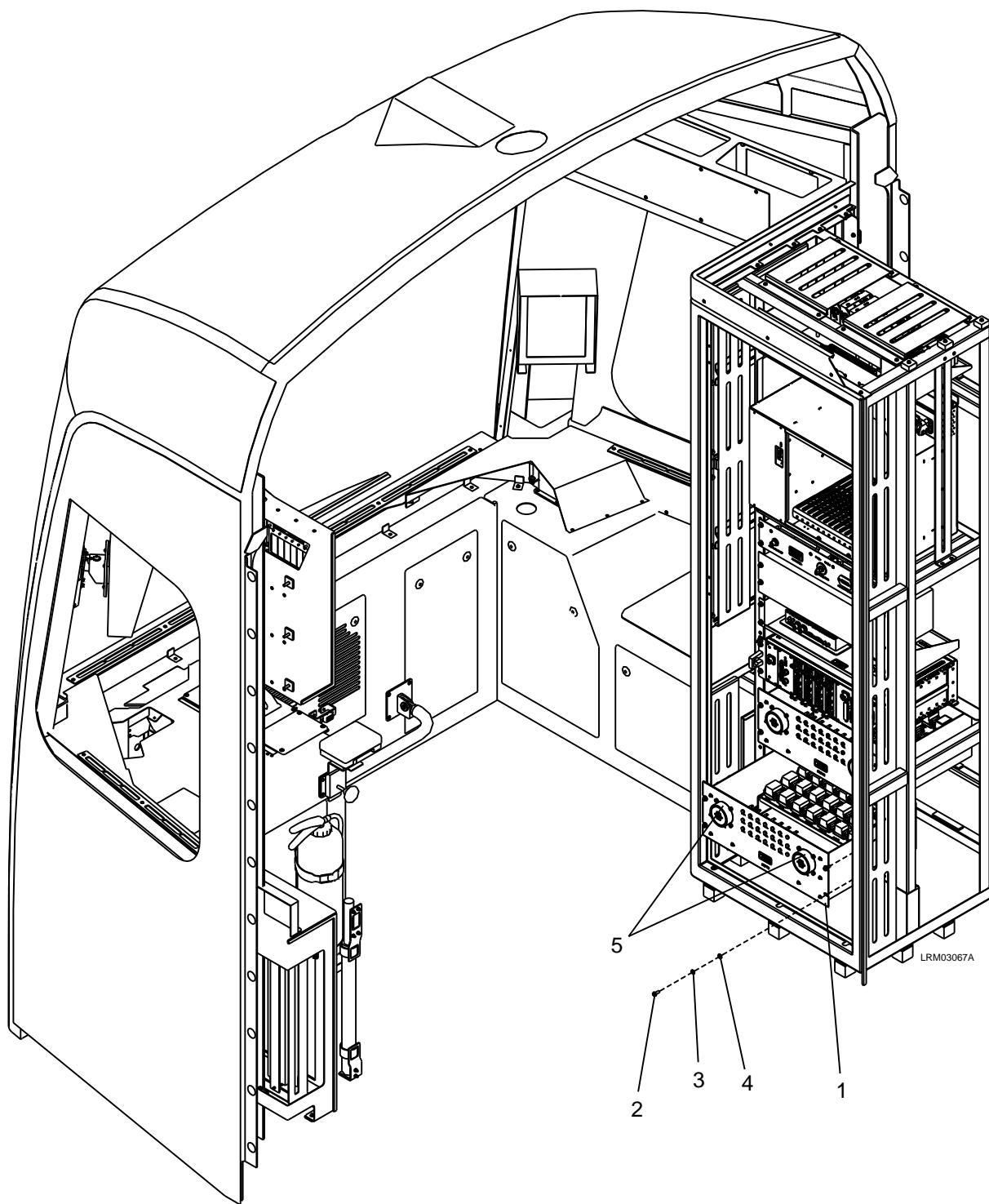


Figure 7-48: CRP7B Panel

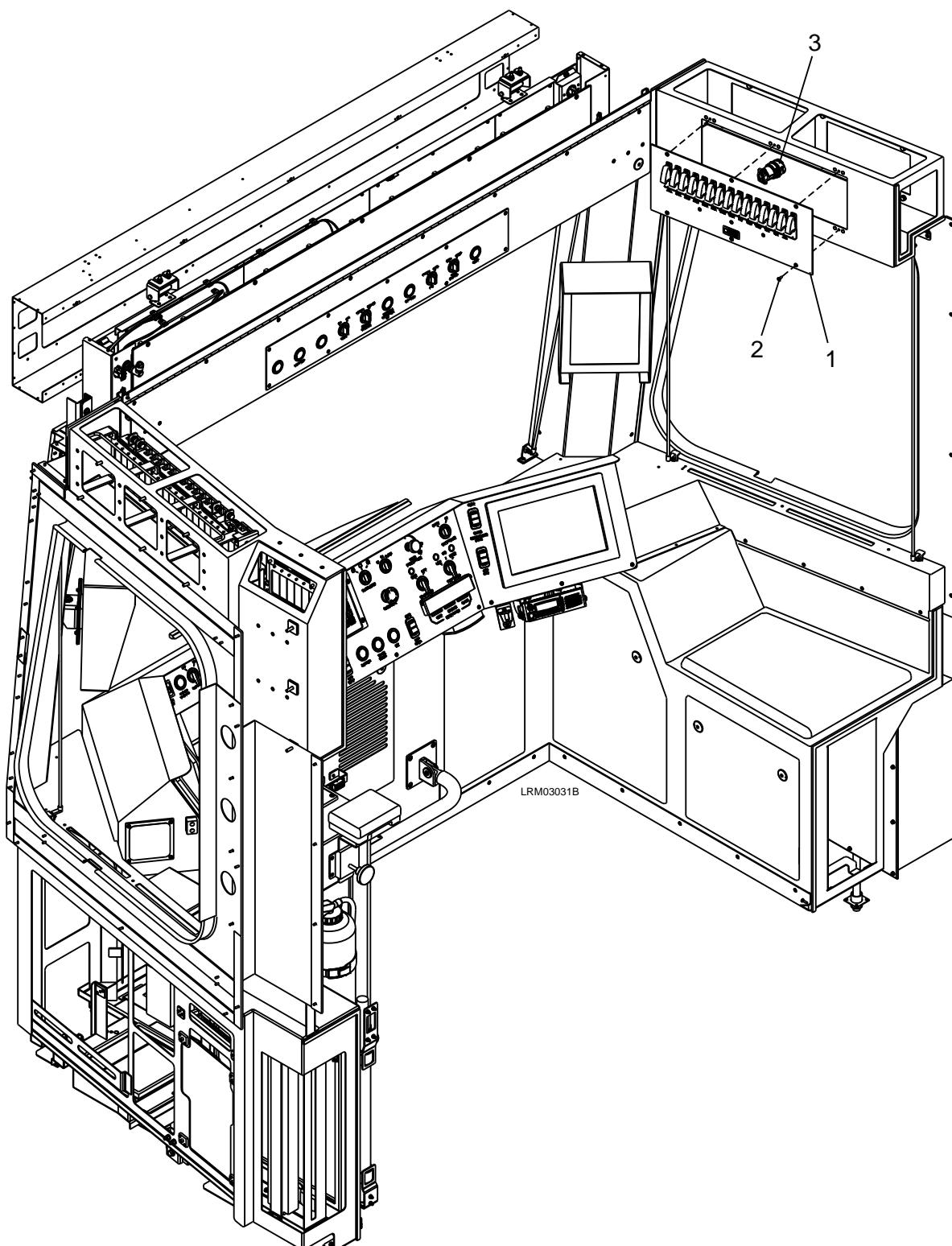


Figure 7-49: Bypass Panel

7.4.1.23 Circuit Breaker Panel A and B

1. Remove the eight M4 x 12 screws (9). See Figure 7-50.
2. Remove the cover (2).
3. Remove the eight M4 x 12 screws (9).
4. Remove the cover (3).
5. Remove the eight M6 x 20 screws (6), M6 lock washers (7), and M6 plain washers (8).
6. Remove the circuit breaker bracket (4).
7. Remove the eight M6 x 20 screws (6), M6 lock washers (7), and M6 plain washers (8).
8. Remove the circuit breaker bracket (5).
9. Remove the 16 M6 x 20 screws (10), M6 lock washers (11), and M6 plain washers (12).
10. Carefully remove the circuit breaker cabinet (1).

7.4.1.24 Fire Extinguisher

1. Remove the Fire Extinguisher (1) from the bracket (2). See Figure 7-51.
2. Remove the console cabinet access cover to access the bracket (2) mounting hardware.
3. Remove the five M5 ESNA nuts (5), M5 plain washers (4), and M5 x 16 screws (3).
4. Remove the bracket (2).

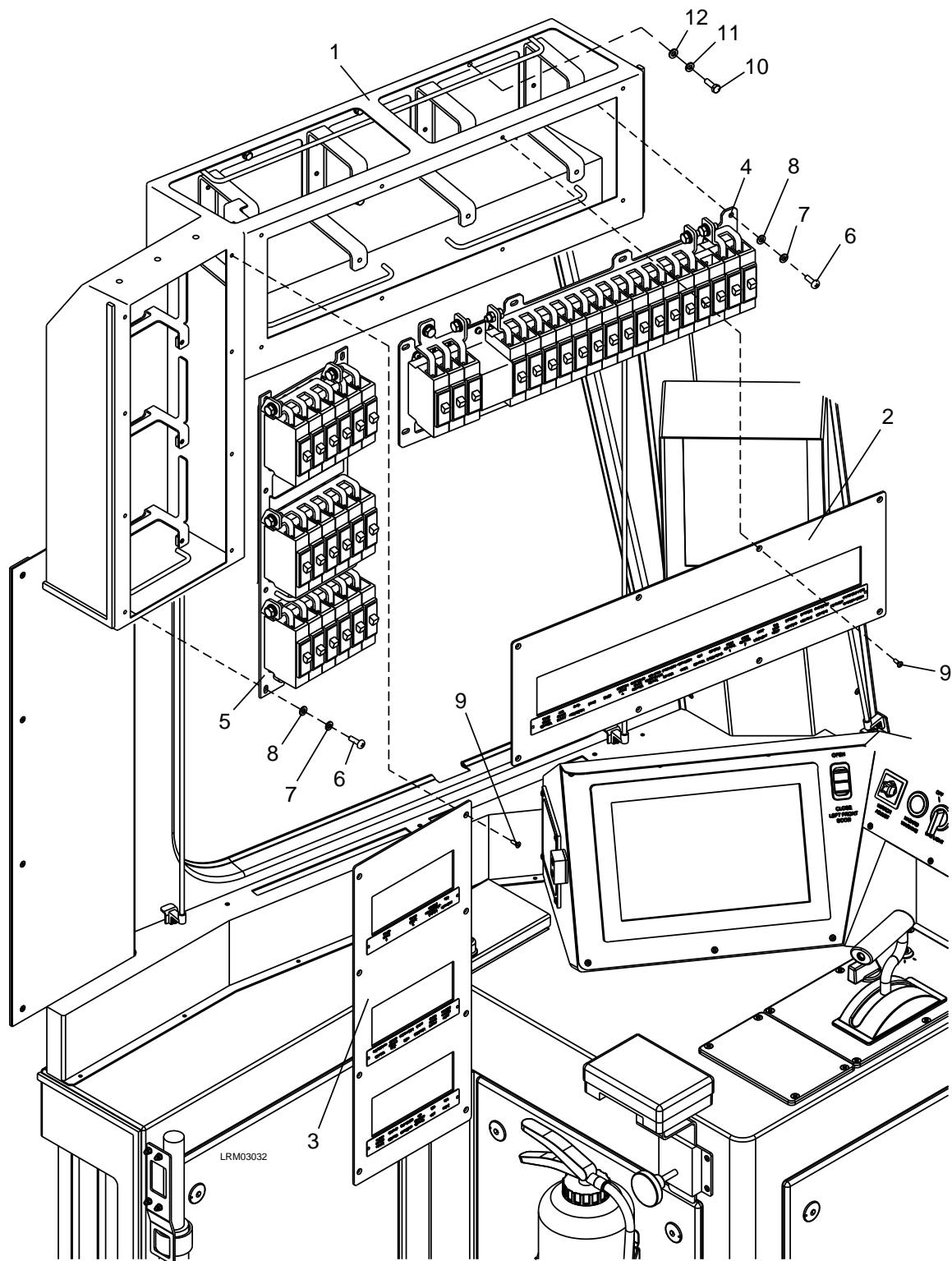


Figure 7-50: Circuit Breaker Panel A and B

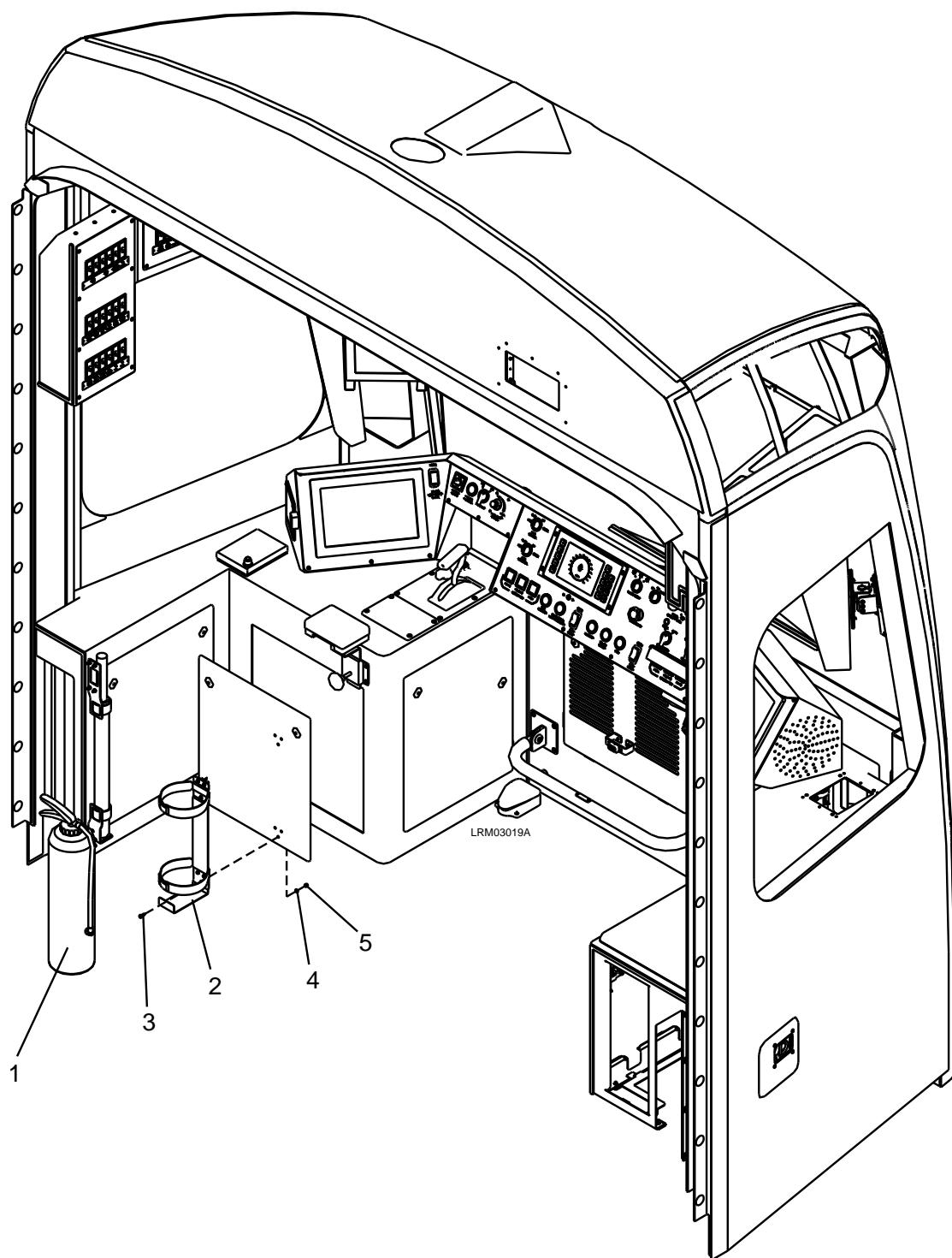


Figure 7-51: Fire Extinguisher

7.4.1.25 Convenience Outlet

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove the two screws (3) that secure the face plate (2) to the receptacle (4) and remove the face plate (2). See Figure 7-52.
2. Remove the two screws (5) that secure the receptacle (4) to the gang box (1).
3. Carefully remove the receptacle (4) from the gang box (1) and disconnect the #10-32 wires.
4. Remove the two M6 x 16 screws (6), M6 lock washers (7), and M6 plain washers (8).
5. Carefully remove the gang box (1) pulling the wires through the grommet.

7.4.1.26 Cab Camera

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (9) and lower the cab ceiling panel (3) to access the Cab Camera (1) and disconnect the electrical connector. See Figure 7-53.
2. Remove the two screws (2) from the camera housing.
3. Carefully remove the housing.
4. Remove the two M3 nuts (4), M3 lock washers (5), M3 plain washers (6), M3 x 12 screws (7), and M3 plain washers (8).
5. Carefully remove the Cab Camera (1).

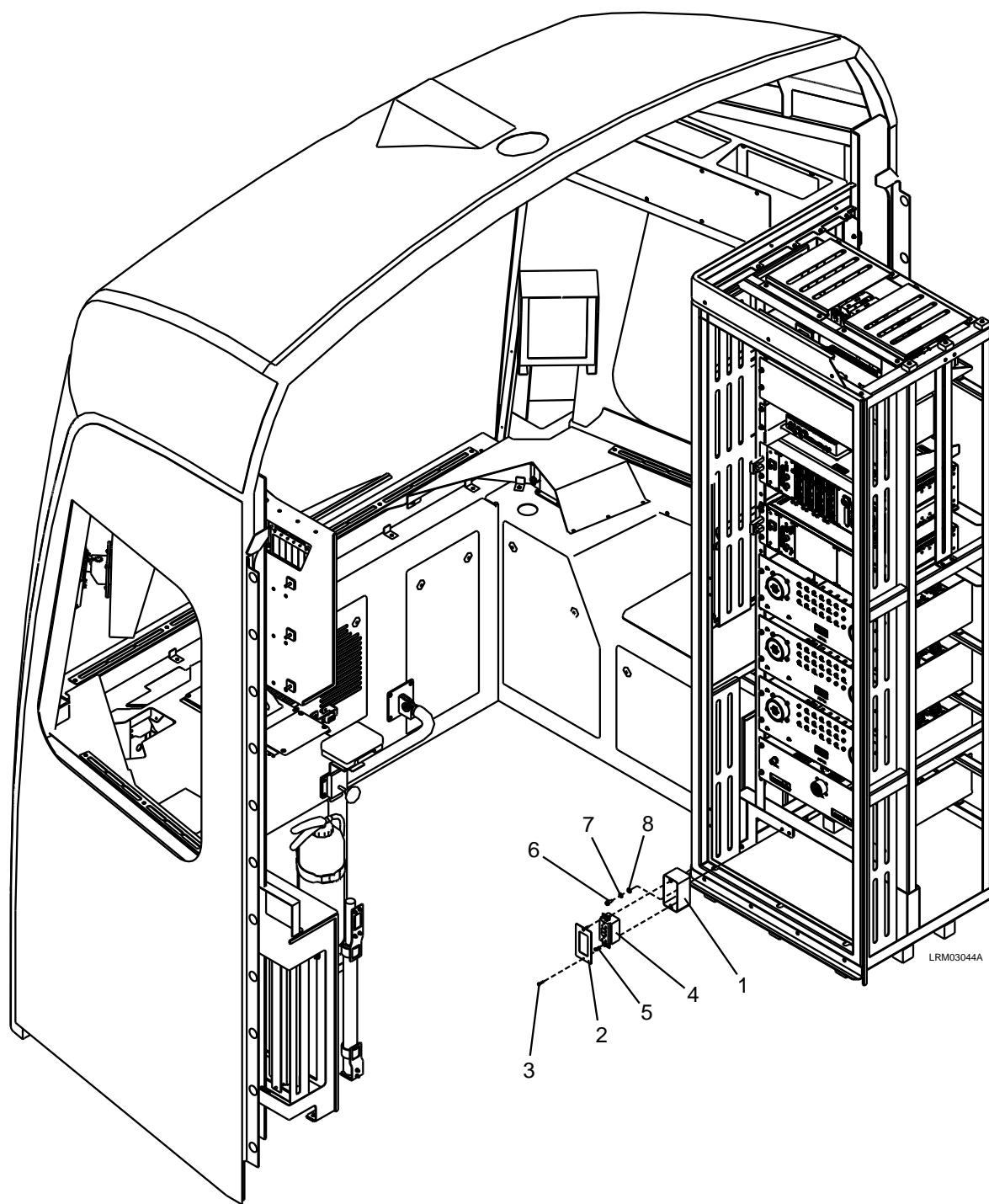


Figure 7-52: Convenience Outlet

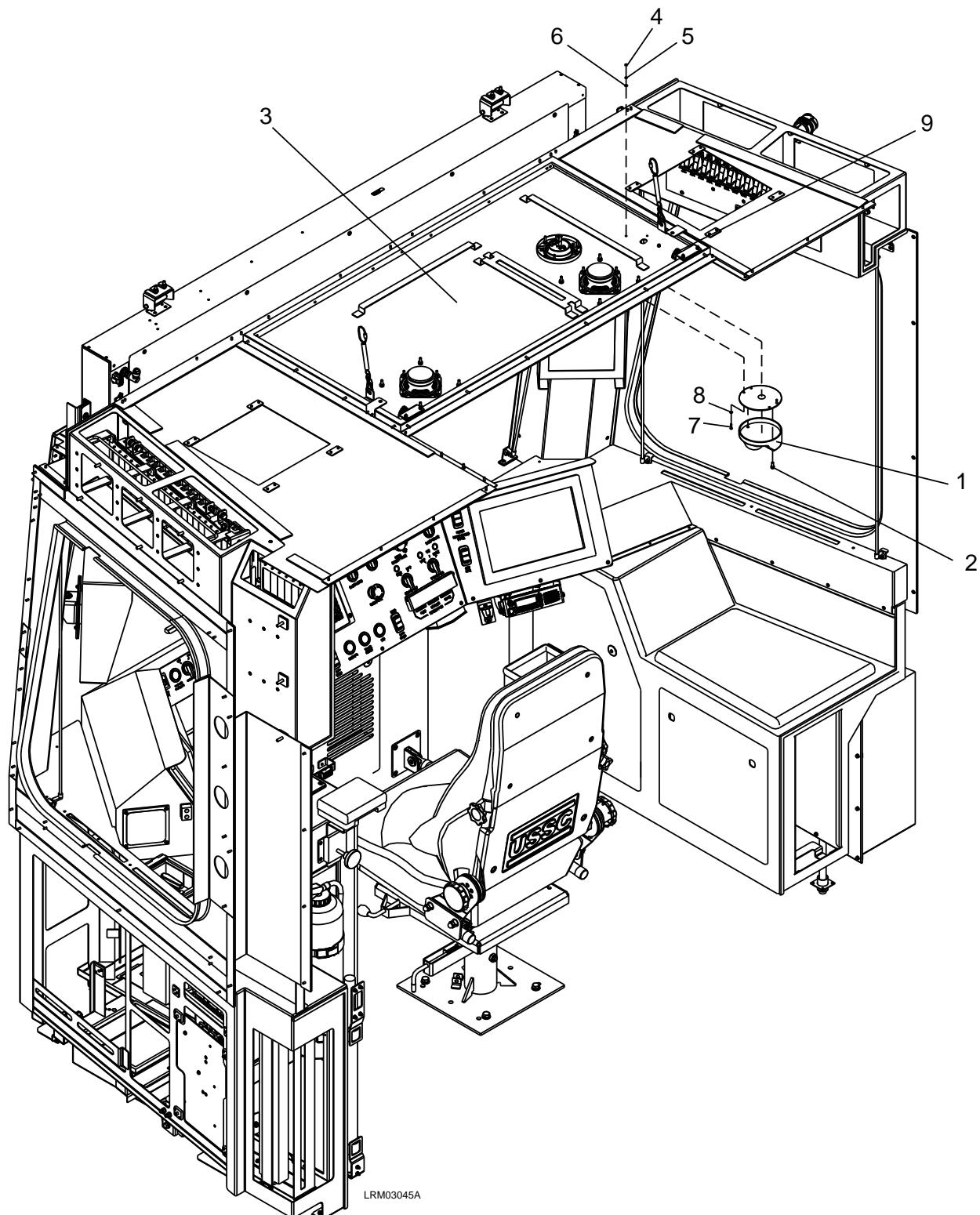


Figure 7-53: Cab Camera

7.4.1.27 Forward View Camera

1. Remove six M4 x 10 screws (3) from cover (2). See Figure 7-54.
2. Remove the cover (2).

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

3. Disconnect the electrical connector.
4. Remove the two M4 x 12 screws (4) and M4 plain washers (5).
5. Remove the Forward View Camera (1) with bracket (6).
6. Remove the two screws (7) from the camera housing.
7. Carefully remove the housing.
8. Remove the four M4 ESNA nuts (8), M4 plain washers (9), M4 x 12 screws (10), and M4 plain washers (11).
9. Remove Forward View Camera (1) from bracket (6).

7.4.1.28 Rear View Monitors

1. Disconnect the electrical connector.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Remove the four M5 x 16 bolts (4), M5 lock washers (5), and M5 plain washers (6) from the base plate (2). See Figure 7-55.
3. Carefully remove the Rear View Monitor assembly (1).
4. Remove the four M4 x 8 screws (7), M4 lock washers (8), and M4 plain washers (9) from the Rear View Monitor (1) and remove the Bracket Assembly (3).

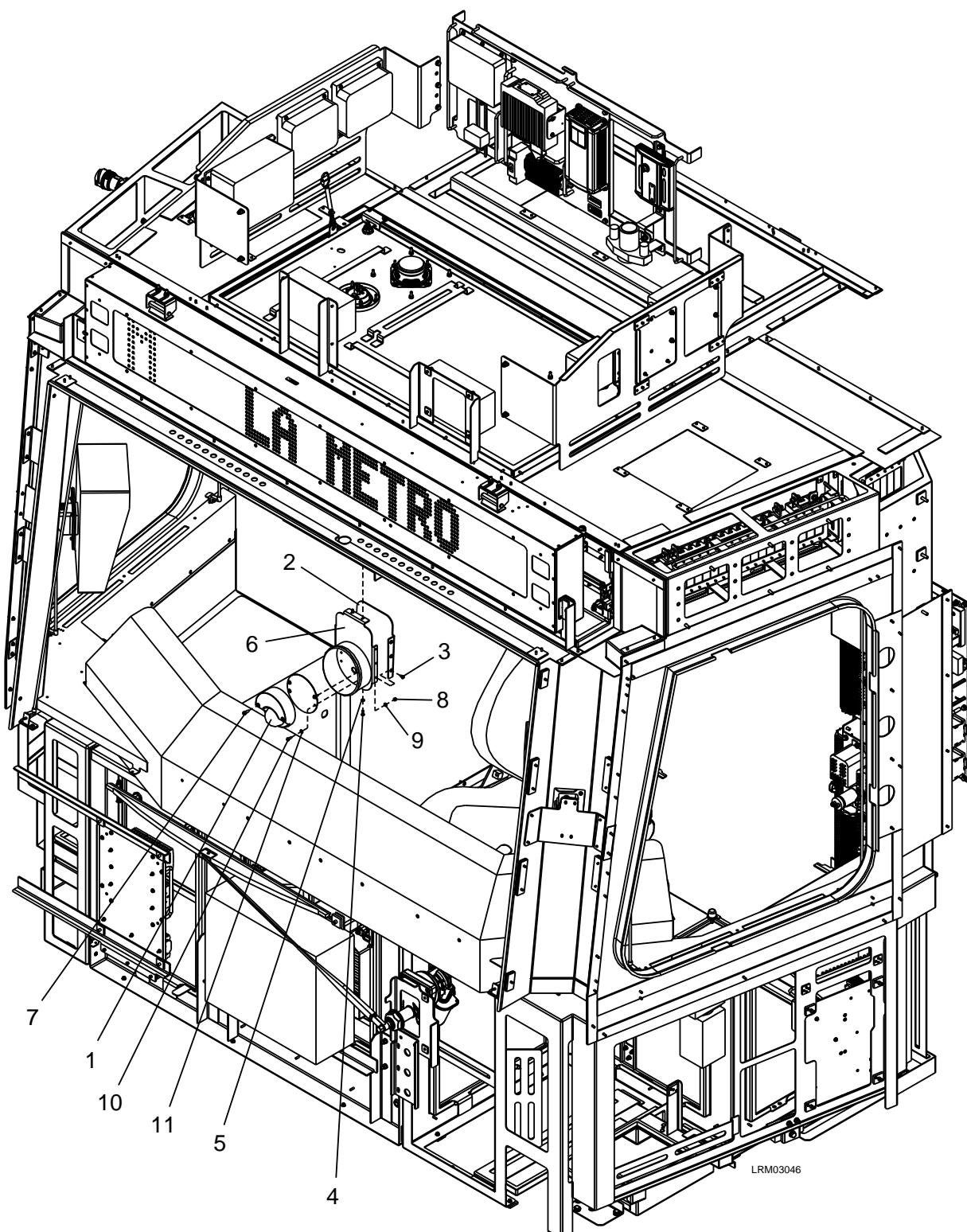


Figure 7-54: Forward View Camera

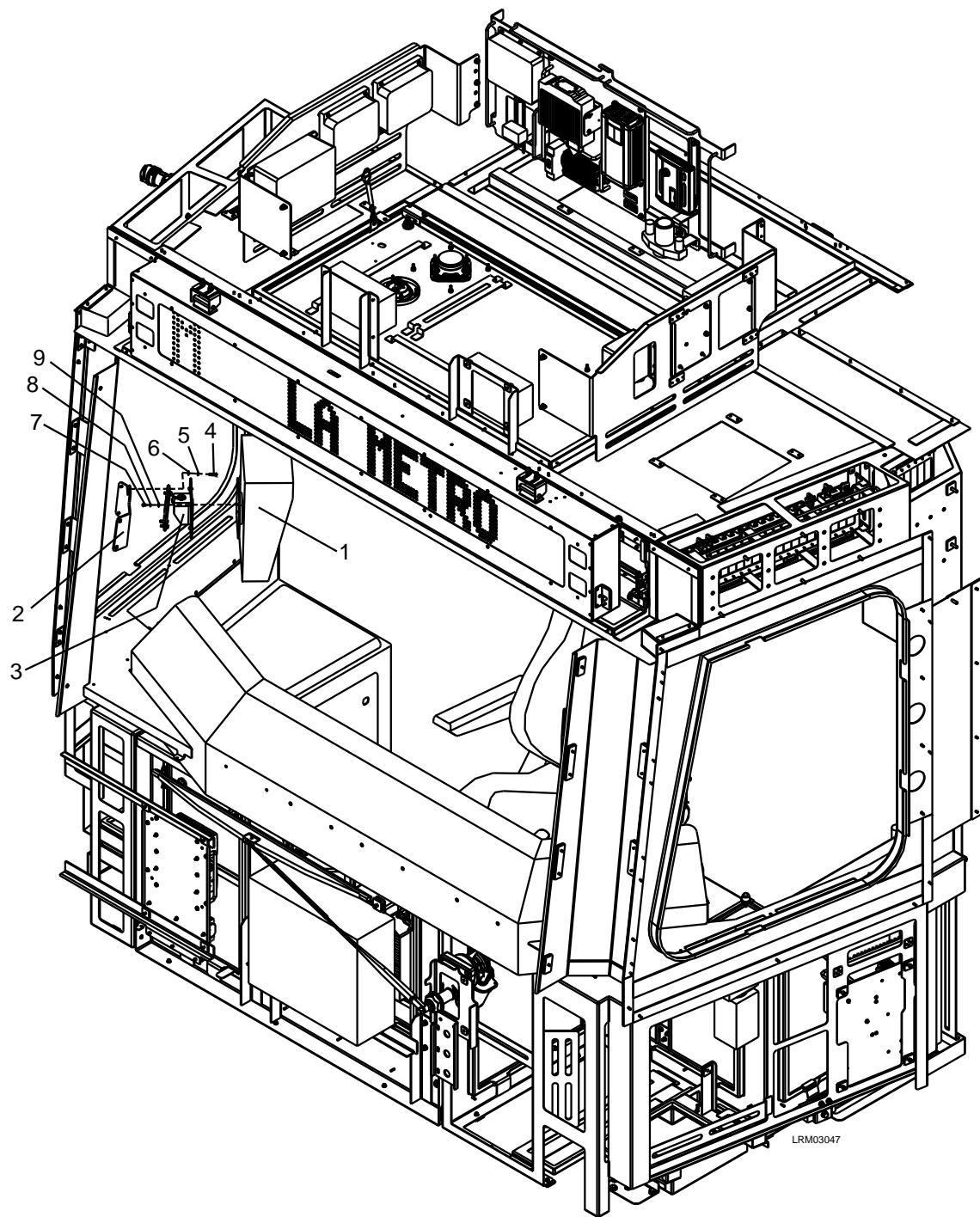


Figure 7-55: Rear View Monitors

7.4.1.29 Local Bus Contactor

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the Local Bus Contactor (1) and disconnect the #6 and 1/2-20 electrical connections. See Figure 7-56.
2. Remove the two M6 ESNA nuts (2), M6 plain washers (3), and M6 x 16 bolts (4).
3. Carefully remove the Local Bus Contactor (1).

7.4.1.30 Remote I/O

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (2) and lower the cab ceiling panel (3) to access the Remote I/O (1) and disconnect the electrical connectors. See Figure 7-57.
2. Remove the Remote I/O (1) by unlatching the lever located on the side.
3. Carefully remove the Remote I/O (1).

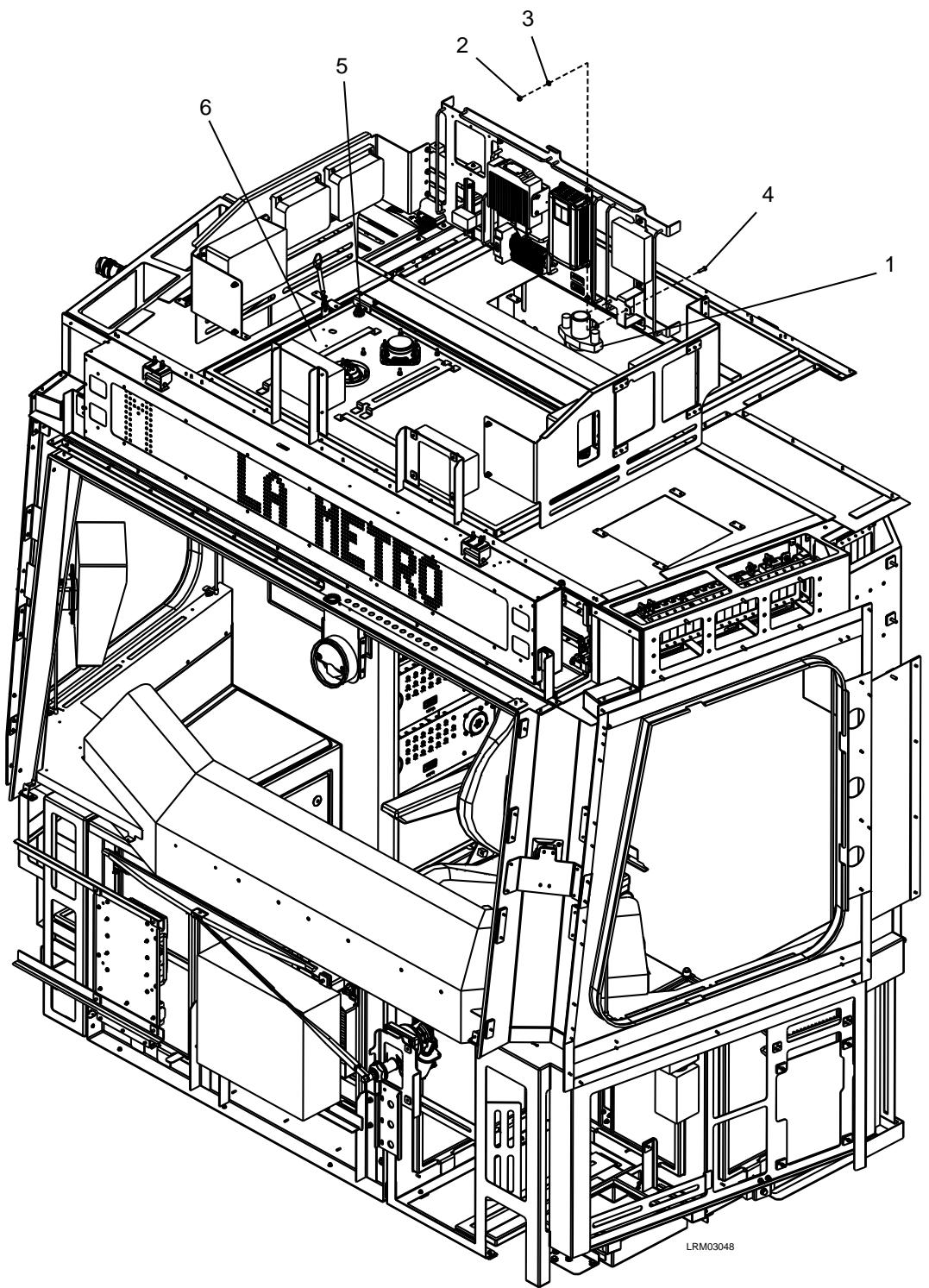


Figure 7-56: Local Bus Contactor

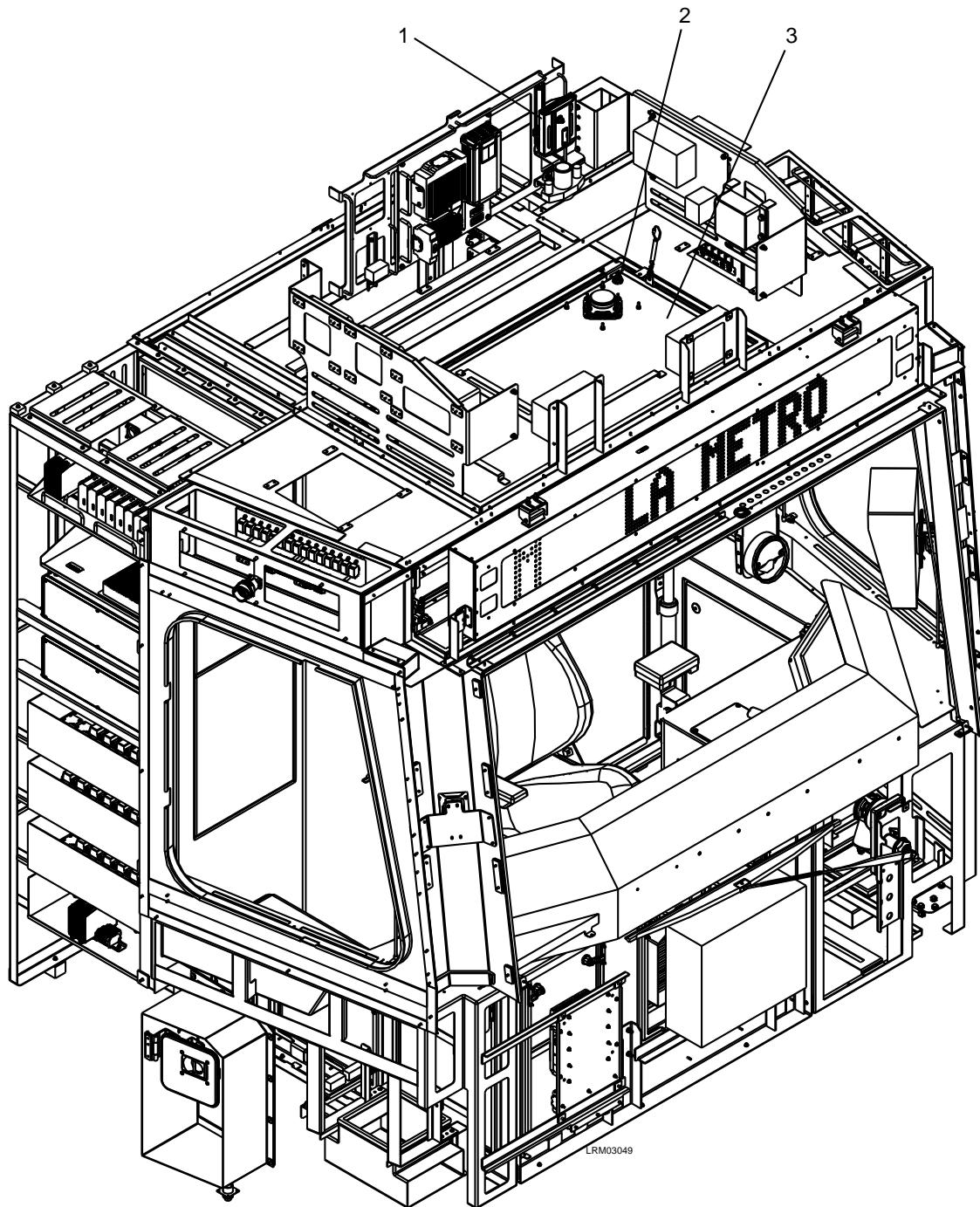


Figure 7-57: Remote I/O

7.4.1.31 Ethernet Switch

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the Ethernet Switch (1) and disconnect the electrical connectors. See Figure 7-58.
2. Remove the four M4 x 30 screws (2), M4 lock washers (3), and M4 plain washers (4).
3. Carefully remove the Ethernet Switch (1).

7.4.1.32 Ethernet Switch (Camera)

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the Ethernet Switch (Camera) (1) and disconnect the electrical connectors. See Figure 7-59.
2. Remove the four M4 x 20 screws (2), M4 lock washers (3), and M4 plain washers (4).
3. Carefully remove the Ethernet Switch (Camera) (1).

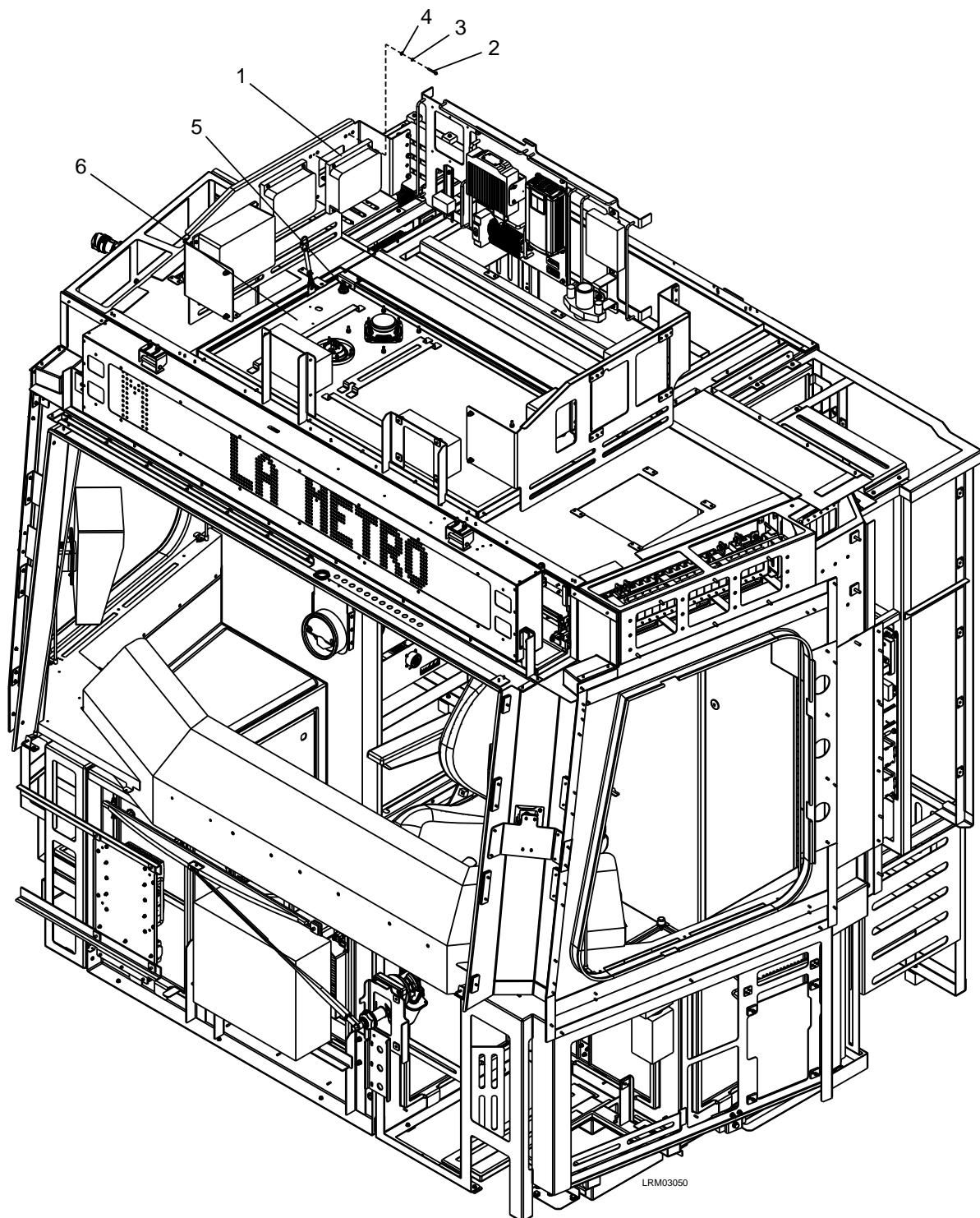


Figure 7-58: Ethernet Switch

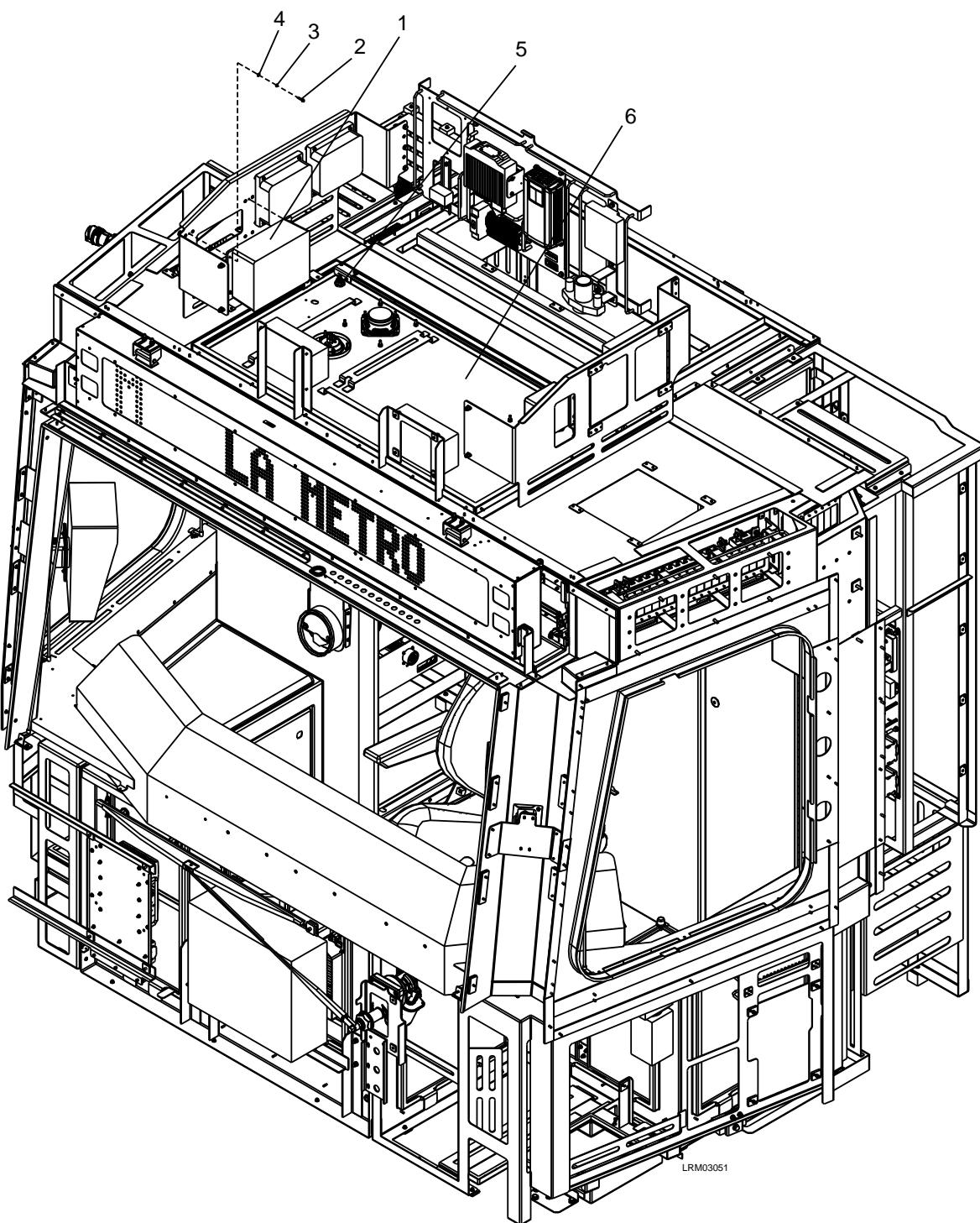


Figure 7-59: Ethernet Switch (Camera)

7.4.1.33 Ethernet Switch (Wireless)

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (5) and lower the cab ceiling panel (6) located in the B-Unit to access the Ethernet Switch (Wireless) (1) hardware and disconnect the electrical connectors. See Figure 7-60.
2. Remove the six M4 x 12 screws (2), M4 lock washers (3), and M4 plain washers (4).
3. Carefully remove the Ethernet Switch (Wireless) (1).

7.4.1.34 Track Brake Panel

1. Remove the cab access panel to the left of the Operator's Seat.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2. Remove the WAGO terminal electrical connections to the Track Brake Panel (1). See Figure 7-61.
3. Remove the four M8 x 20 bolts (2), M8 lock washers (3), and M8 plain washers (4).
4. Carefully remove the Track Brake Panel (1).

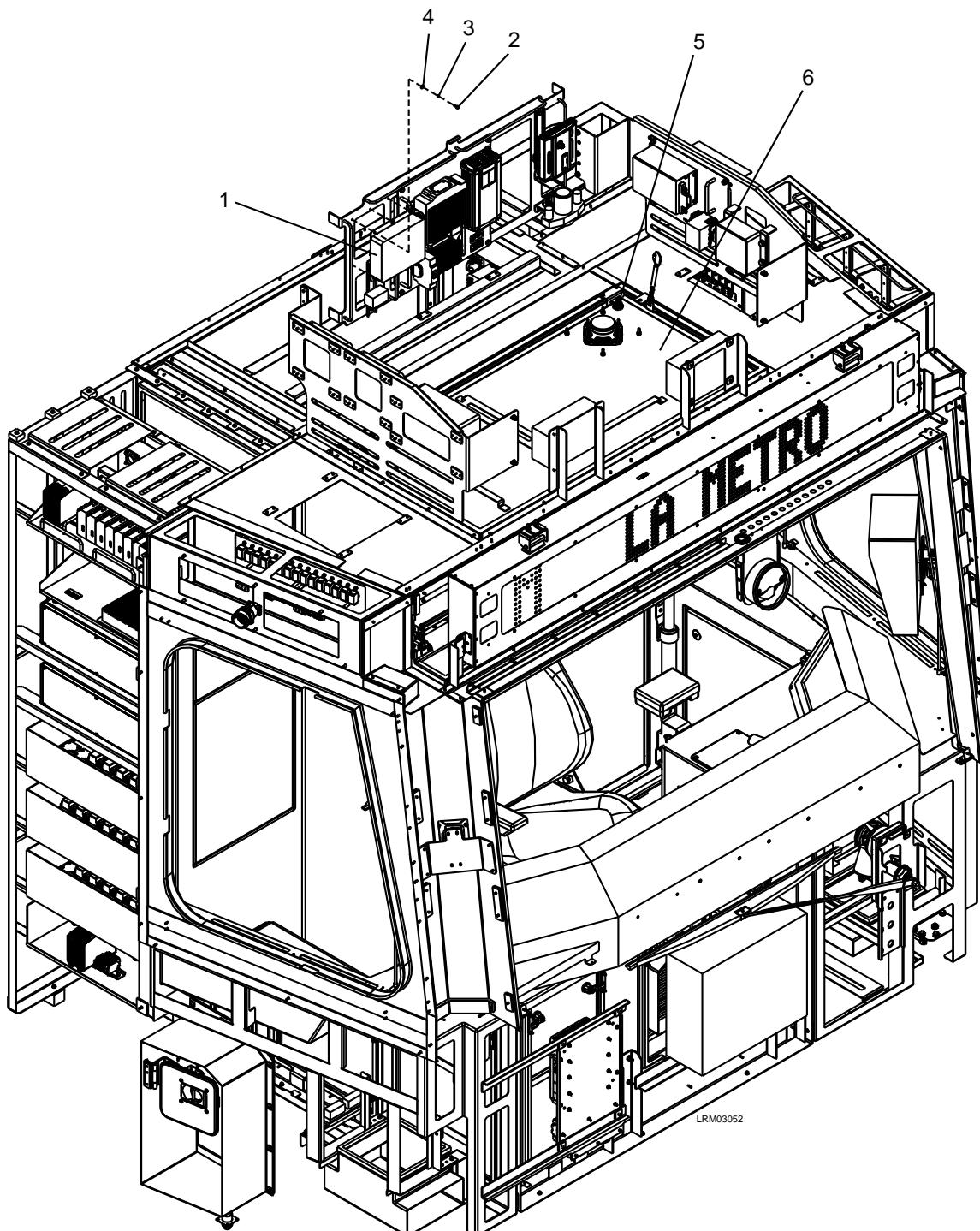


Figure 7-60: Ethernet Switch (Wireless)

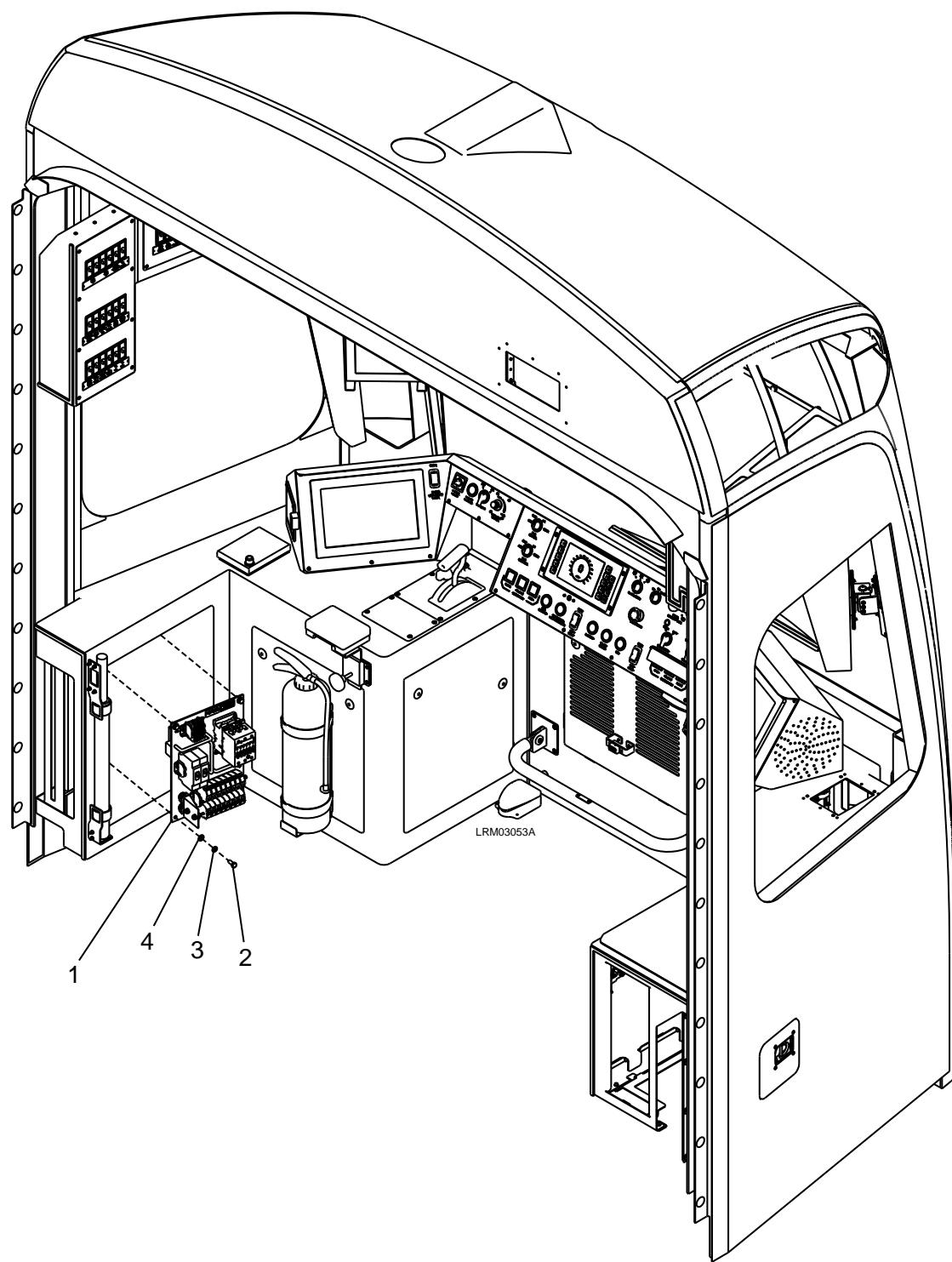


Figure 7-61: Track Brake Panel

7.4.1.35 12Vdc Power Supply

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the 12Vdc Power Supply (1) and disconnect the WAGO terminal electrical connection. See Figure 7-62.
2. Remove the four M6 x 16 bolts (2), M6 lock washers (3), and M6 plain washers (4).
3. Carefully remove the 12Vdc Power Supply (1).

7.4.1.36 Wayside Worker Alert System (WWAS) Module

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the WWAS (1) and disconnect the electrical connectors. See Figure 7-63.
2. Remove the four M8 x 20 bolts (2), M8 lock washers (3), and M8 plain washers (4).
3. Carefully remove the WWAS (1).

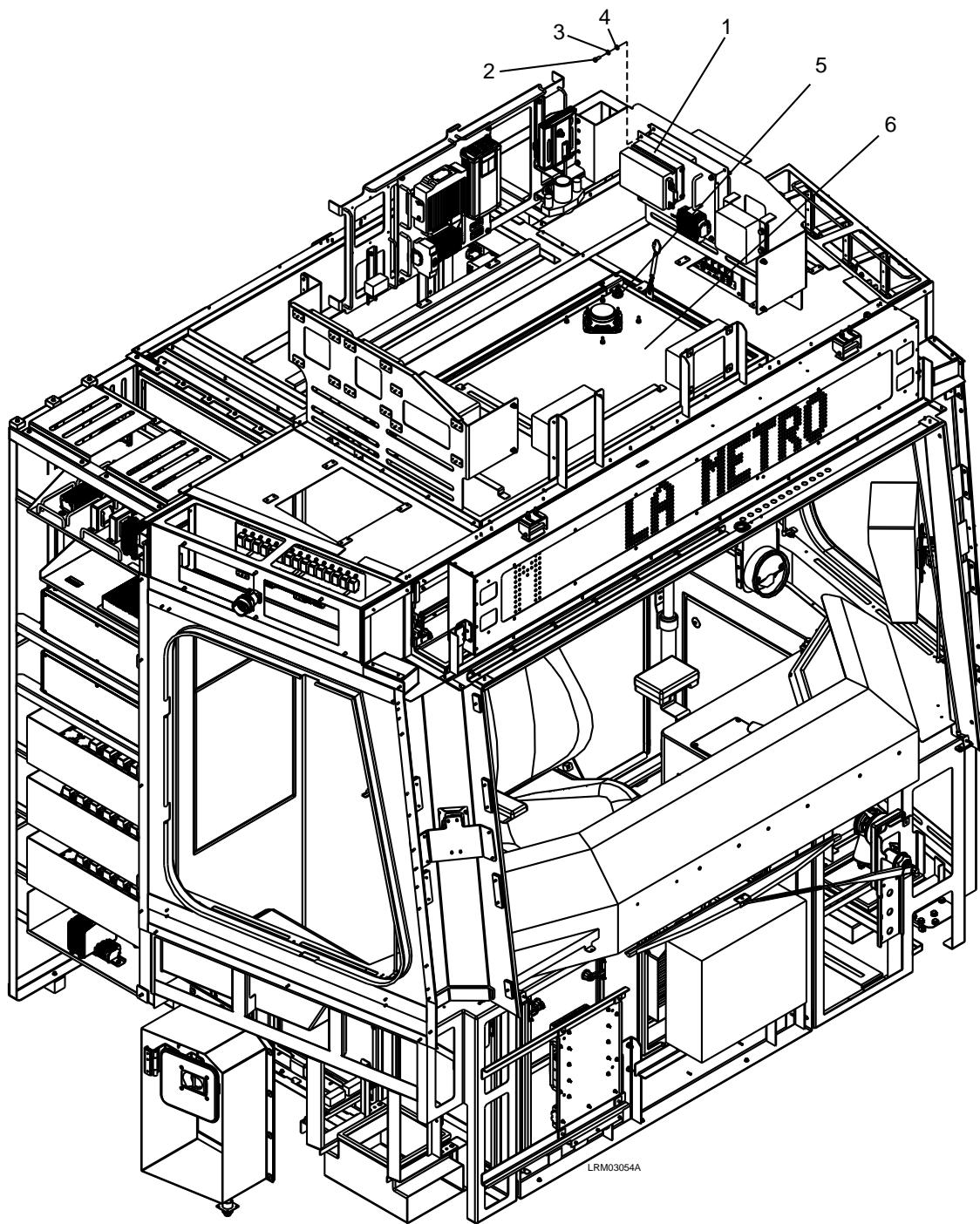


Figure 7-62: 12Vdc Power Supply

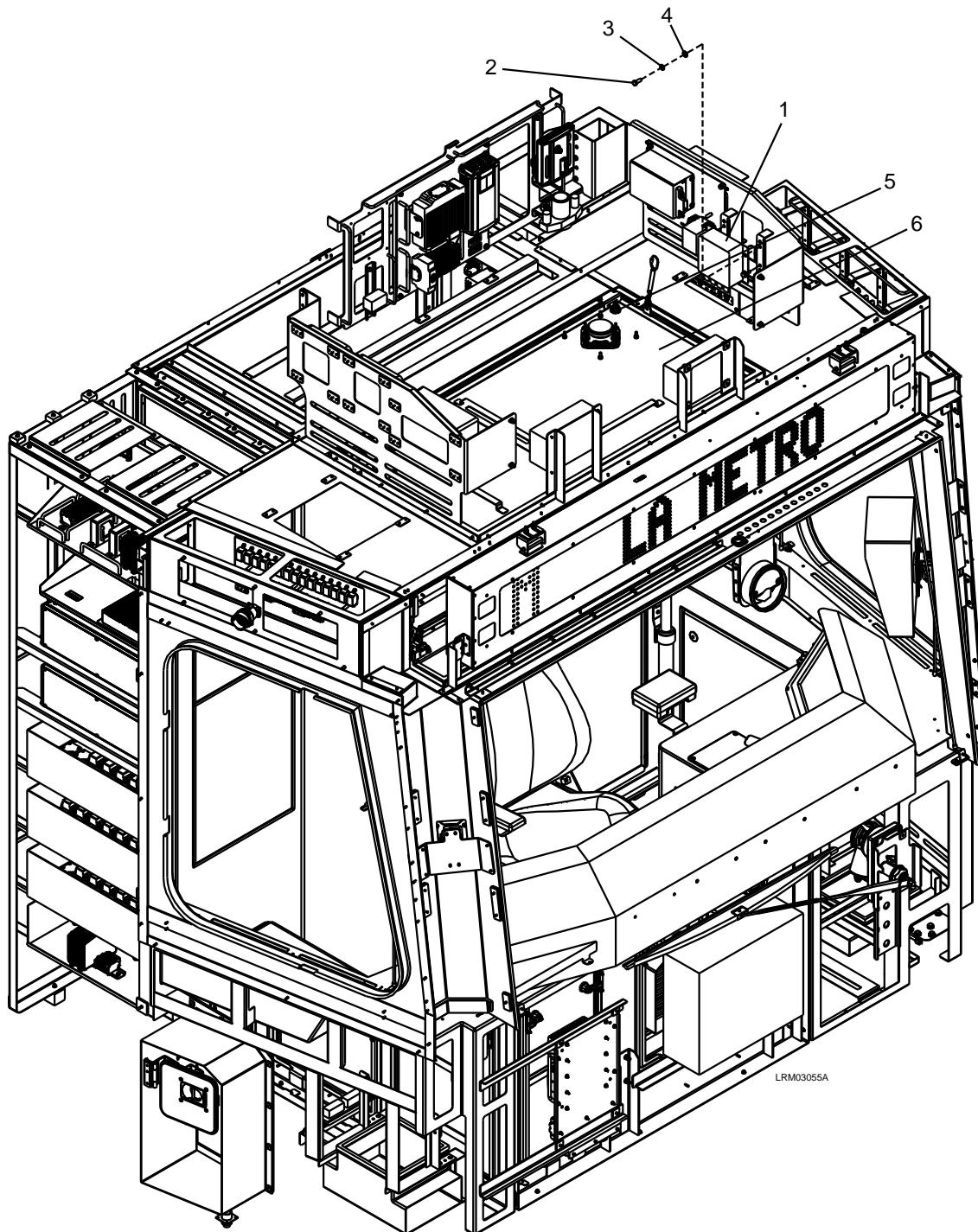


Figure 7-63: Wayside Worker Alert System (WWAS)

7.4.1.37 Master Controller

WARNING

THE MASTER CONTROLLER CONTAINS LIVE VOLTAGE COMPONENTS. THERE IS A RISK OF ELECTRIC SHOCK! ALWAYS CONSIDER THE FOLLOWING SAFETY RULES BEFORE CARRYING OUT WORK ON THE MASTER CONTROLLER:

- **ENSURE THAT THE MAIN SWITCH, LOCATED INSIDE THE VEHICLE, IS TURNED TO THE “OFF” POSITION BEFORE CARRYING OUT WORK ON THE MASTER CONTROLLER.**
- **CLEARLY MARK YOUR WORK AREA.**
- **ENSURE THAT THE MAIN SWITCH CANNOT ACCIDENTALLY BE SWITCHED ON.**
- **DISCONNECT.**
- **MAKE SURE THAT THERE IS NO VOLTAGE.**
- **BESIDES THE MAIN ELECTRIC CIRCUIT ALSO DISCONNECT ADDITIONAL AND AUXILIARY CIRCUITS.**
- **INSULATE OR COVER ADJACENT ENERGIZED PARTS.**

WARNING

THE MASTER CONTROLLER IS HEAVY. RISK OF INJURY AND DAMAGE TO THE DEVICE!

TAKE CARE WHEN HANDLING THE DEVICE.

DURING TRANSPORT, DO NOT CARRY THE DEVICE BY ITS HANDLE OR LEVER.

CAUTION

MOISTURE AND DUST CAN DAMAGE THE MASTER CONTROLLER. IF THE DEVICE IS TO BE STORED FOR A PROLONGED PERIOD OF TIME,

- **STORE IT IN ITS ORIGINAL PACKAGING,**
- **STORE IT IN A DRY AND DUST-FREE LOCATION.**

CAUTION

DURING REMOVAL AND INSTALLATION, ENSURE THAT DIRT CAUSED BY SURROUNDING CONSTRUCTION ACTIVITIES DOES NOT GET INTO THE MASTER CONTROLLER.

1. Remove the electrical connectors (3) to the Master Controller (1). See Figures 7-64 and 7-65.
2. Remove the ten M6 x 16 screws (2).
3. Carefully remove the Master Controller (1).

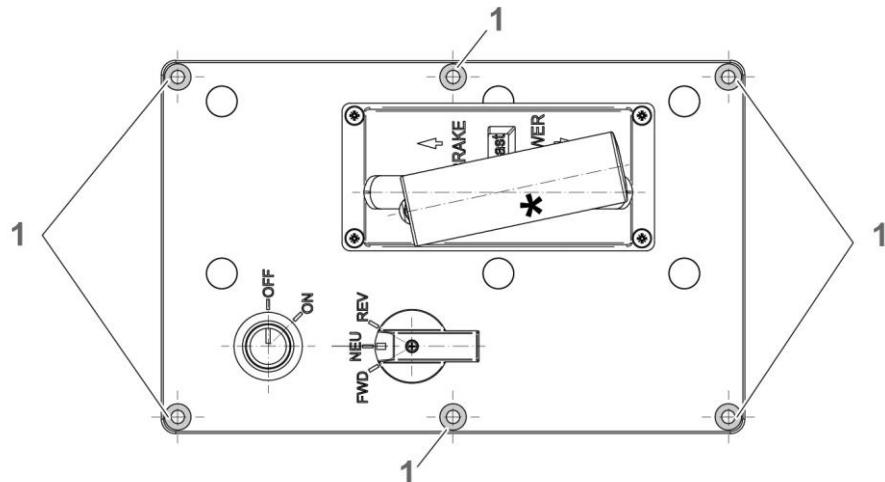


Figure 7-64: Fixing Screw of the Master Controller

7.4.1.38 DC / DC Converter

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the DC / DC Converter (1) and disconnect the electrical connector. See Figure 7-66.
2. Remove the four M6 x 16 bolts (2), M6 lock washers (3), and M6 plain washers (4).
3. Carefully remove the DC / DC Converter (1).

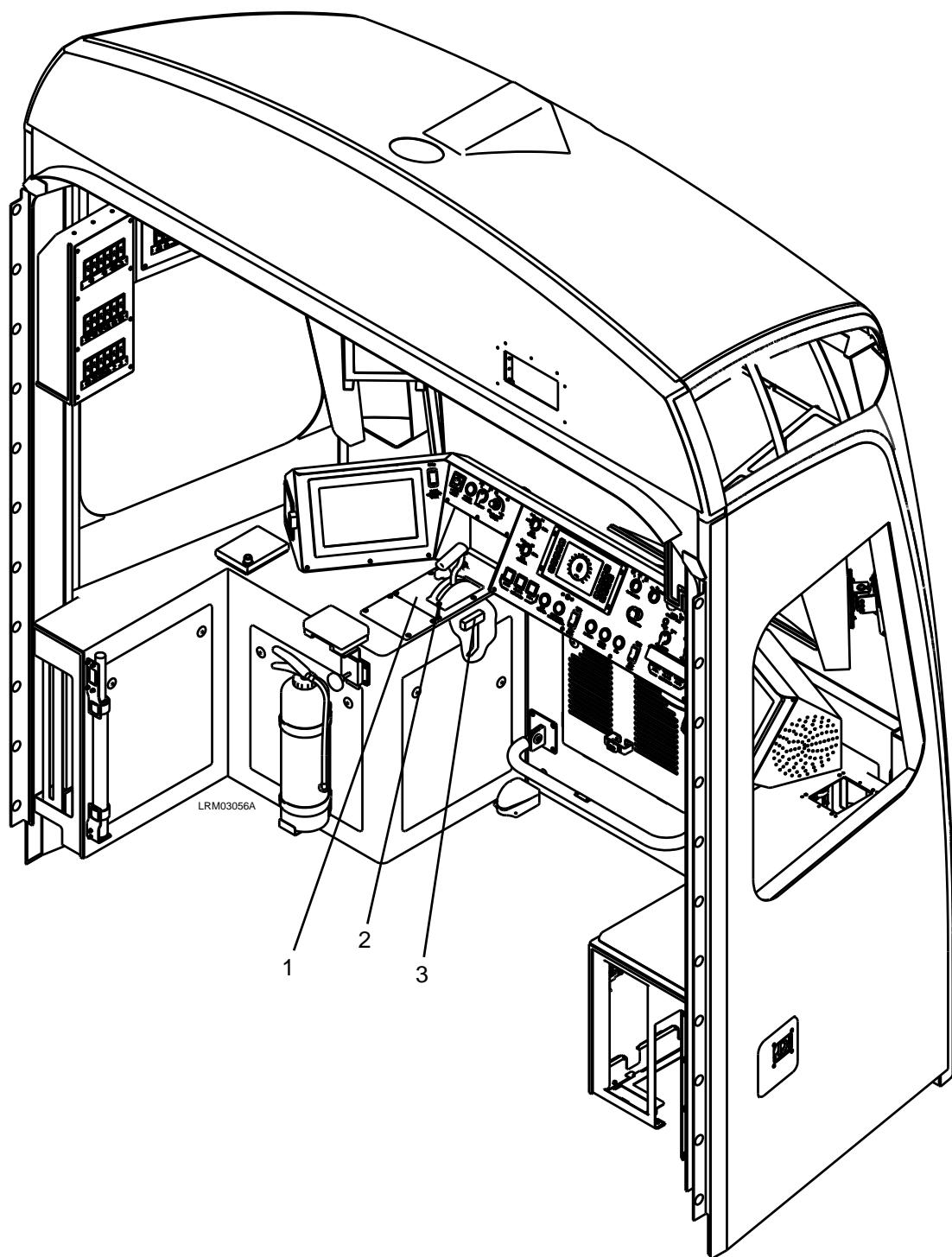


Figure 7-65: Master Controller

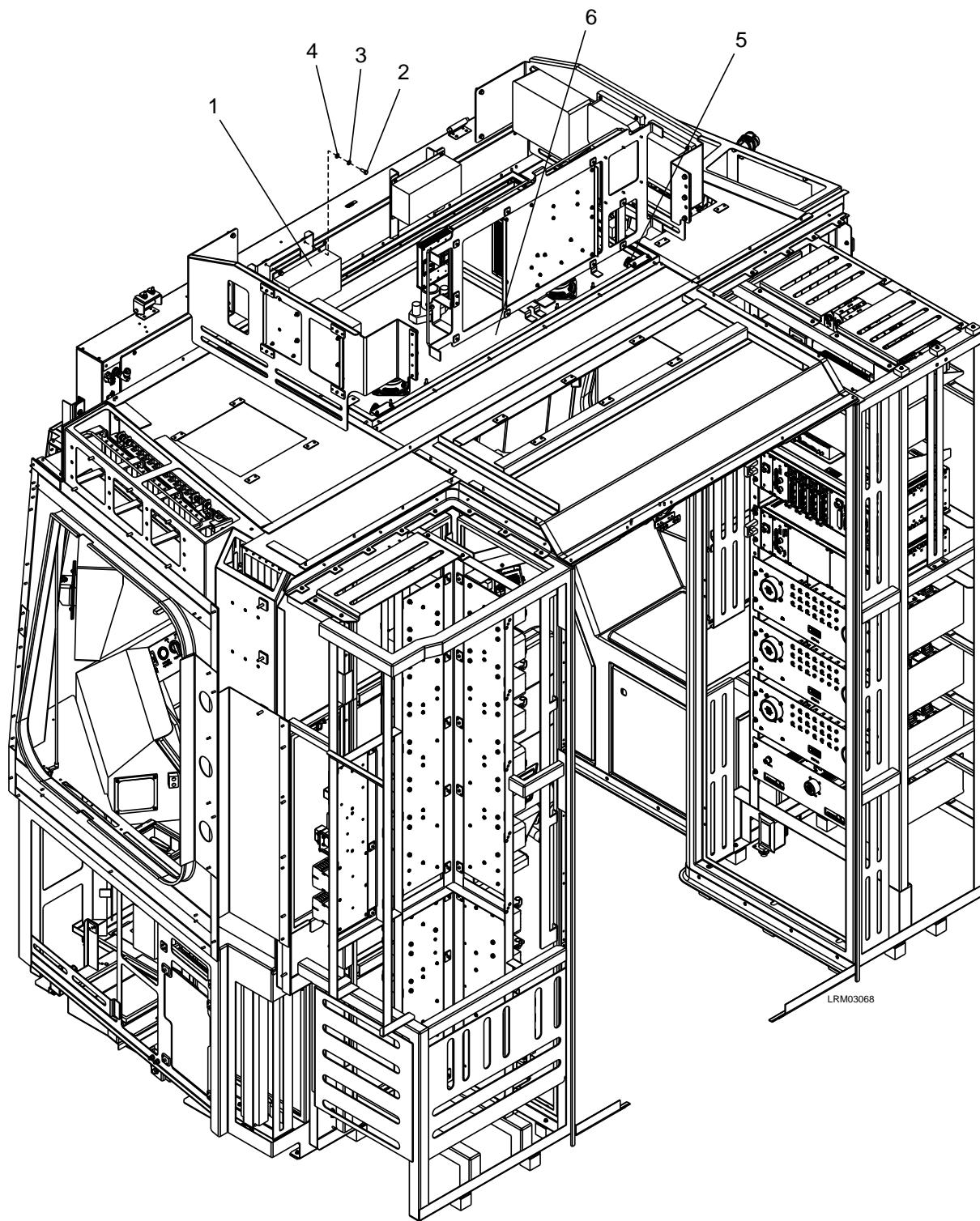


Figure 7-66: DC / DC Converter

7.4.1.39 HSC-V Control Panel

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the HSC-V Control Panel (1) and disconnect the electrical connector. See Figure 7-67.
2. Remove the four M4 x 12 bolts (2), M4 lock washers (3), and M4 plain washers (4).
3. Carefully remove the HSC-V Control Panel (1).

7.4.1.40 Washer Reservoir

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

TO PREVENT RECEIVING ELECTRICAL SHOCK WHEN PERFORMING ELECTRICAL TEST, HANDS MUST BE CLEAR OF ELECTRICAL COMPONENTS, CONTACTS AND HOUSING AND THERE MUST BE NO BODILY CONTACT WITH THE WORK BENCH. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE INJURY OR DEATH.

1. Remove the cab access panel to the right of the Operator's seat. See Figure 7-68, Sheet 1.
2. Remove the M4 bolts (10), M4 lock washers (13), and M4 plain washers (14) in 11 places that secure the panel (2).
3. Carefully remove the cover (2) and gasket (3).
4. Disconnect the supply line and electrical connector from the washer bottle (1).
5. Remove the M6 screws (7), M6 lock washers (8), and M6 plain washers (9) in four places, from the washer bottle (1).

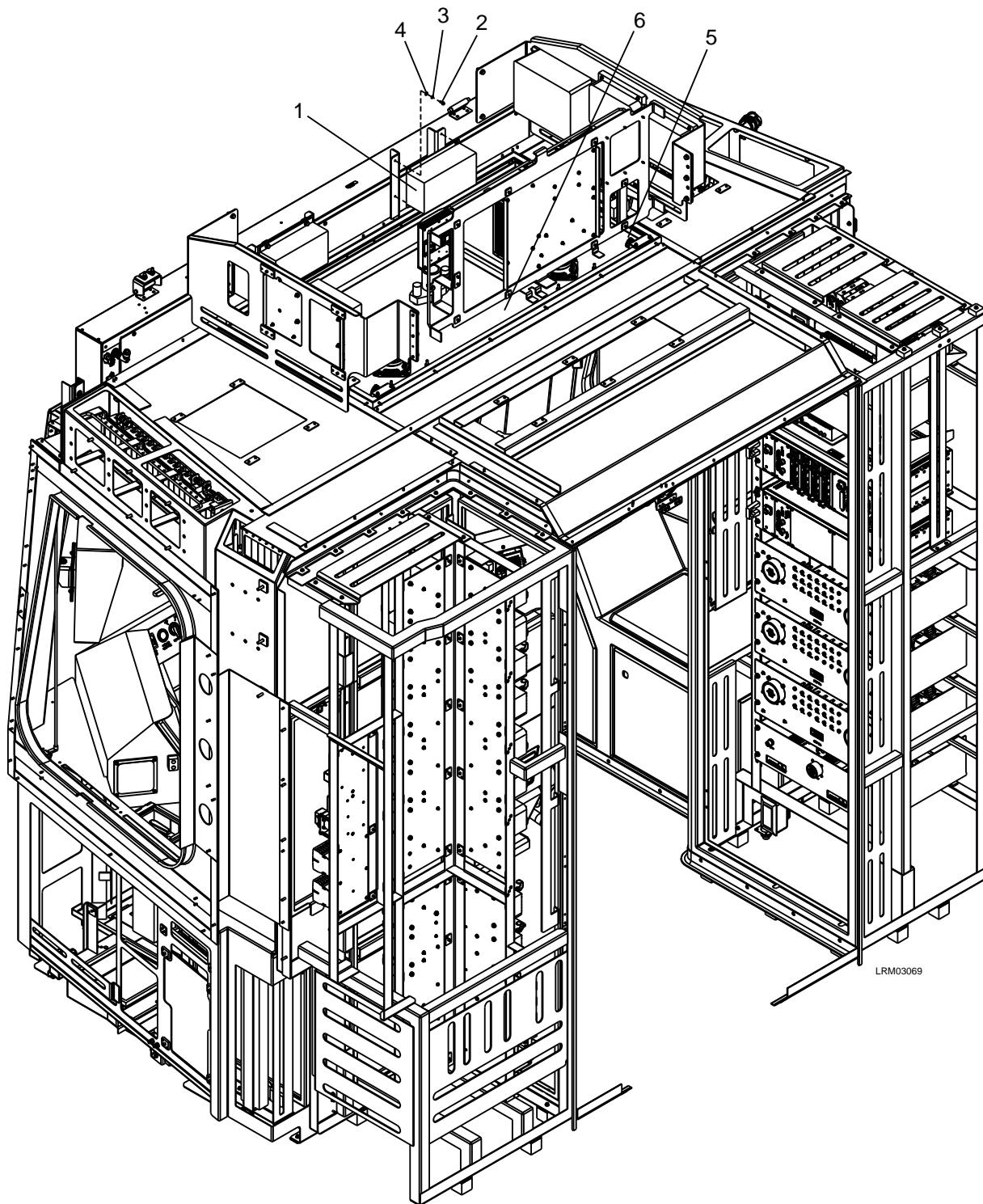


Figure 7-67: HSC-V Control Panel

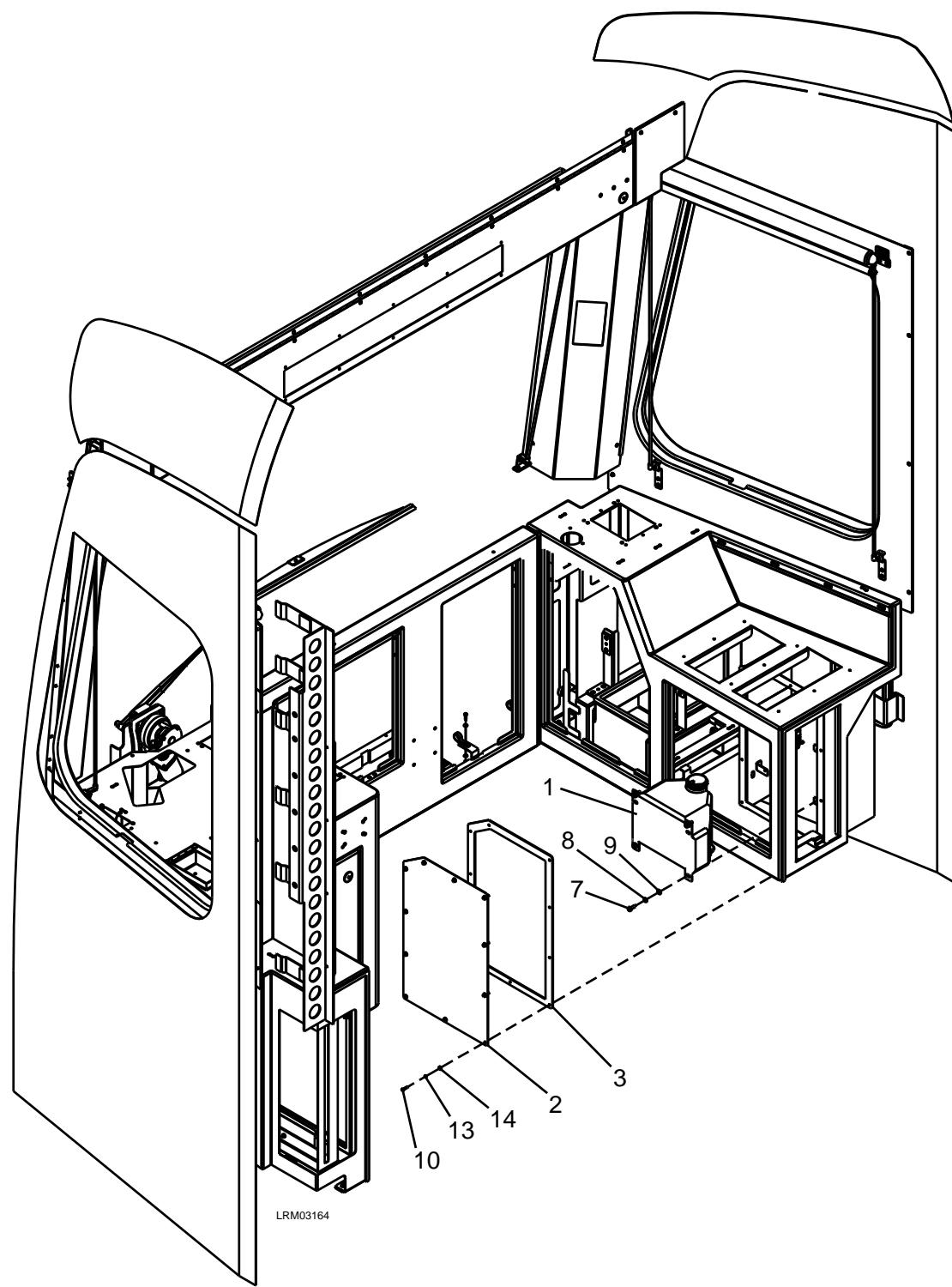


Figure 7-68: Washer Reservoir
(Sheet 1 of 2)

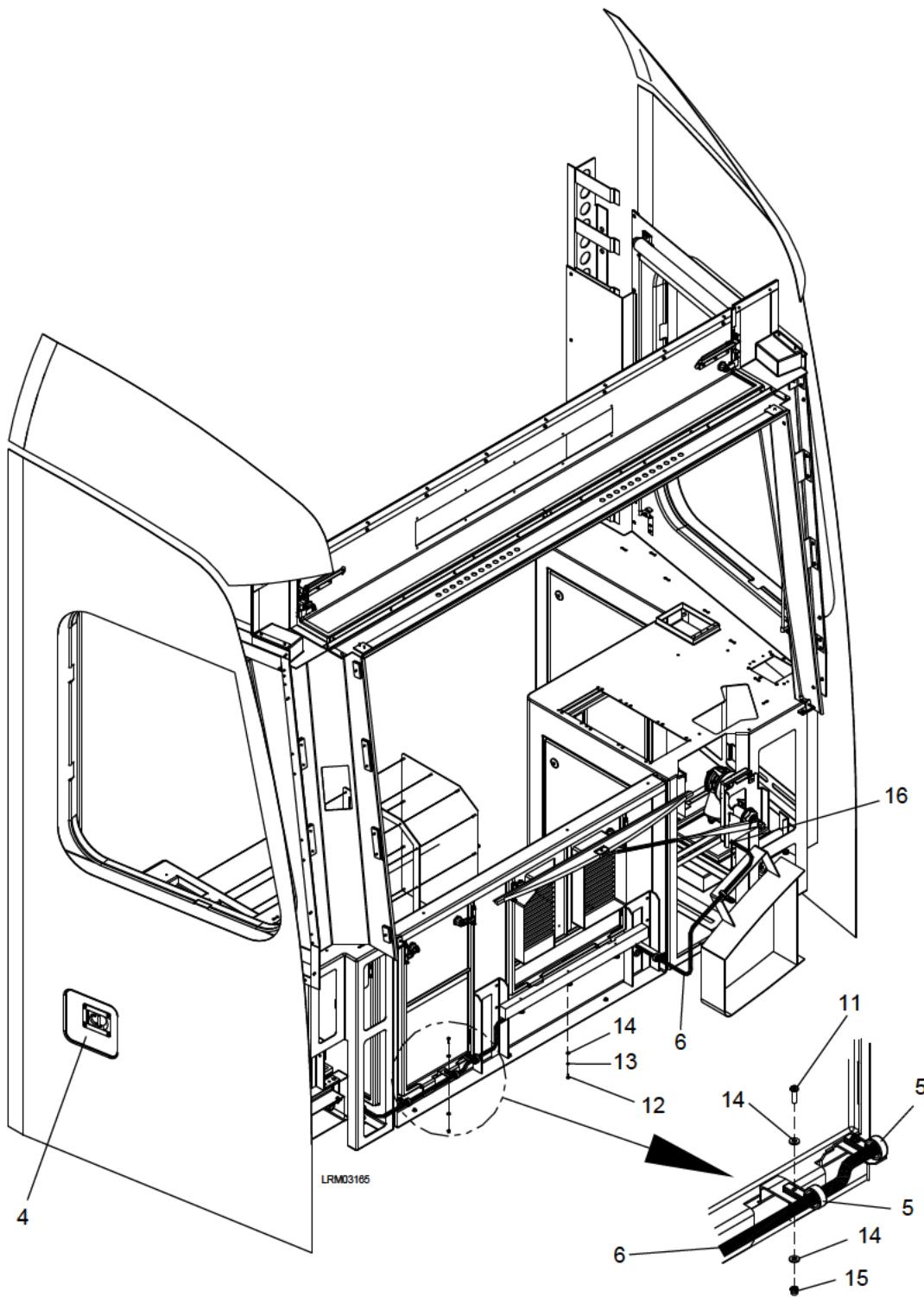


Figure 7-68: Washer Reservoir
(Sheet 2 of 2)

6. Carefully remove the washer bottle (1) from the enclosure.
7. Remove the cab access panels below the cab console and to the right of the Operator's seat to expose the washer bottle supply line (6) and clamps (5). See Figure 7-68, Sheet 2.
8. Remove the M4 screws (11 and 12), M4 lock washers (13), M4 plain washers (14) and M4 nuts (15) that secure the clamps (5).
9. Remove the cable tie (16) from the supply line (6).
10. Remove the supply line (6) from the clamps (5) and disconnect from the wiper motor according to Section 7.4.1.8 of this manual section.

7.4.1.41 Horn Controller Panel

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Unlock the two locks (6) and lower the cab ceiling panel (7) to access the Horn Controller Panel (1) and disconnect the WAGO terminal electrical connections. See Figure 7-69.
2. Remove the four M4 screws (2), M4 lock washers (3), and M4 plain washers (4) from the Horn Controller Panel (1).
3. Carefully remove the Horn Controller Panel (1).

7.4.2 Exterior Body Equipment

See Figures 2-3 and 7-70 through 7-78.

The exterior body equipment consists of all equipment that is fastened and mounted to the exterior. The exterior body equipment consists of the following components:

- four Exterior Speakers on each A and B-Unit
- two Exterior Mirrors on each A and B-Unit
- ten hinged and two stationary Skirts on each A and B-Unit
- five types of Windows on each A and B-Unit
- two Exterior Cameras on each A and B-Unit

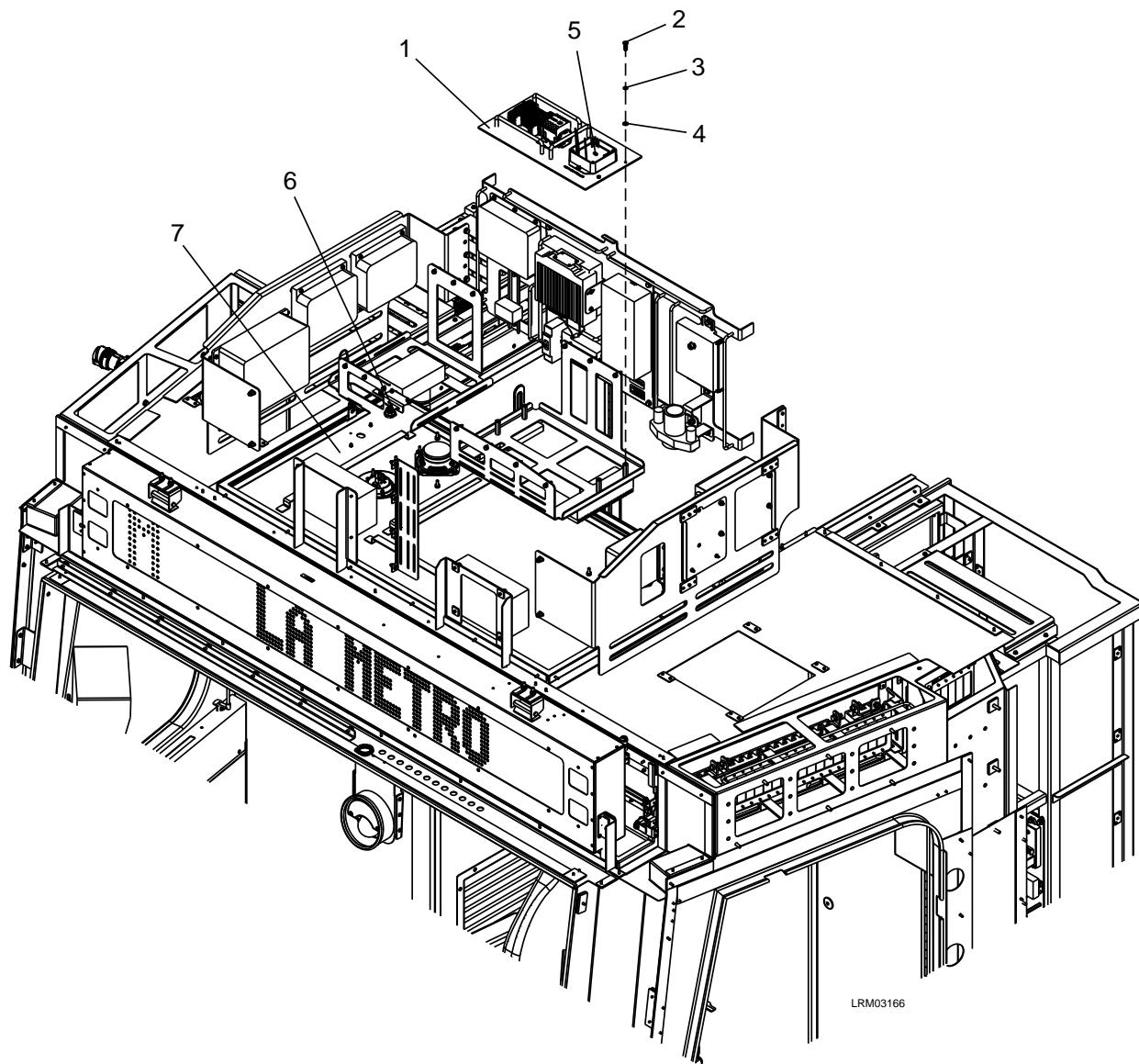


Figure 7-69: Horn Controller Panel

7.4.2.1 Exterior Speaker

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the #6 electrical connections (10) from the Exterior Speaker (1) by removing the screw (7) from the cover (8) and the cover gasket (9). See Figure 7-70.
2. Remove the four M4 ESNA nuts (2) and M4 plain washers (3), M4 x 20 screws (5), and M4 plain washers (4).
3. Carefully remove the Exterior Speaker (1) from the mounting bracket (6).

7.4.2.2 Exterior Mirror

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove power to the fixture.
2. Carefully remove all existing sealant.
3. Remove the two M8 x 35 bolts (2), M8 lock washers (3), and M8 plain washers (4). See Figure 7-71.
4. Carefully remove the Exterior Mirror (1) from the car body and disconnect the electrical connector (5) from the car body connector (6).

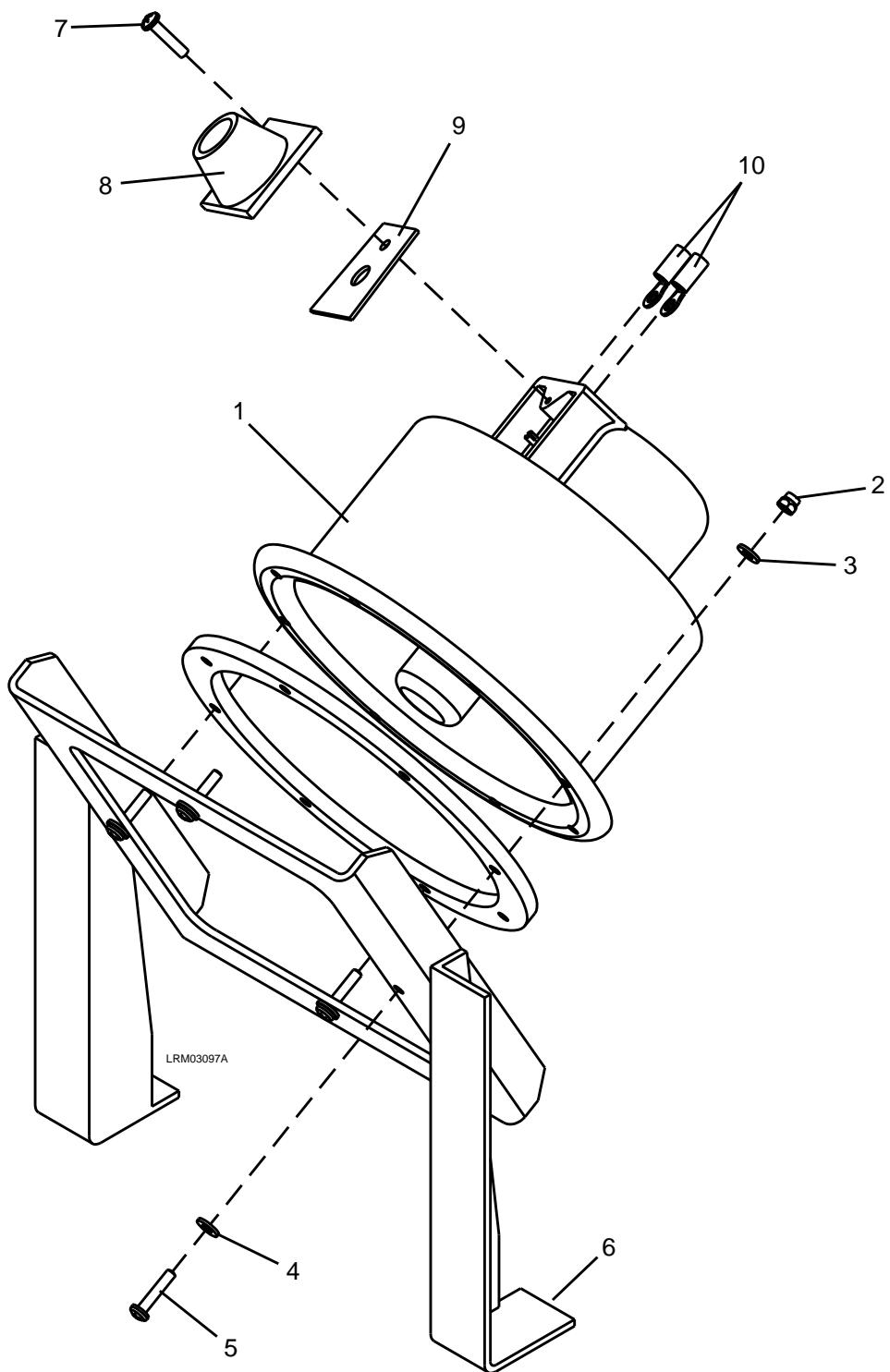


Figure 7-70: Exterior Speaker

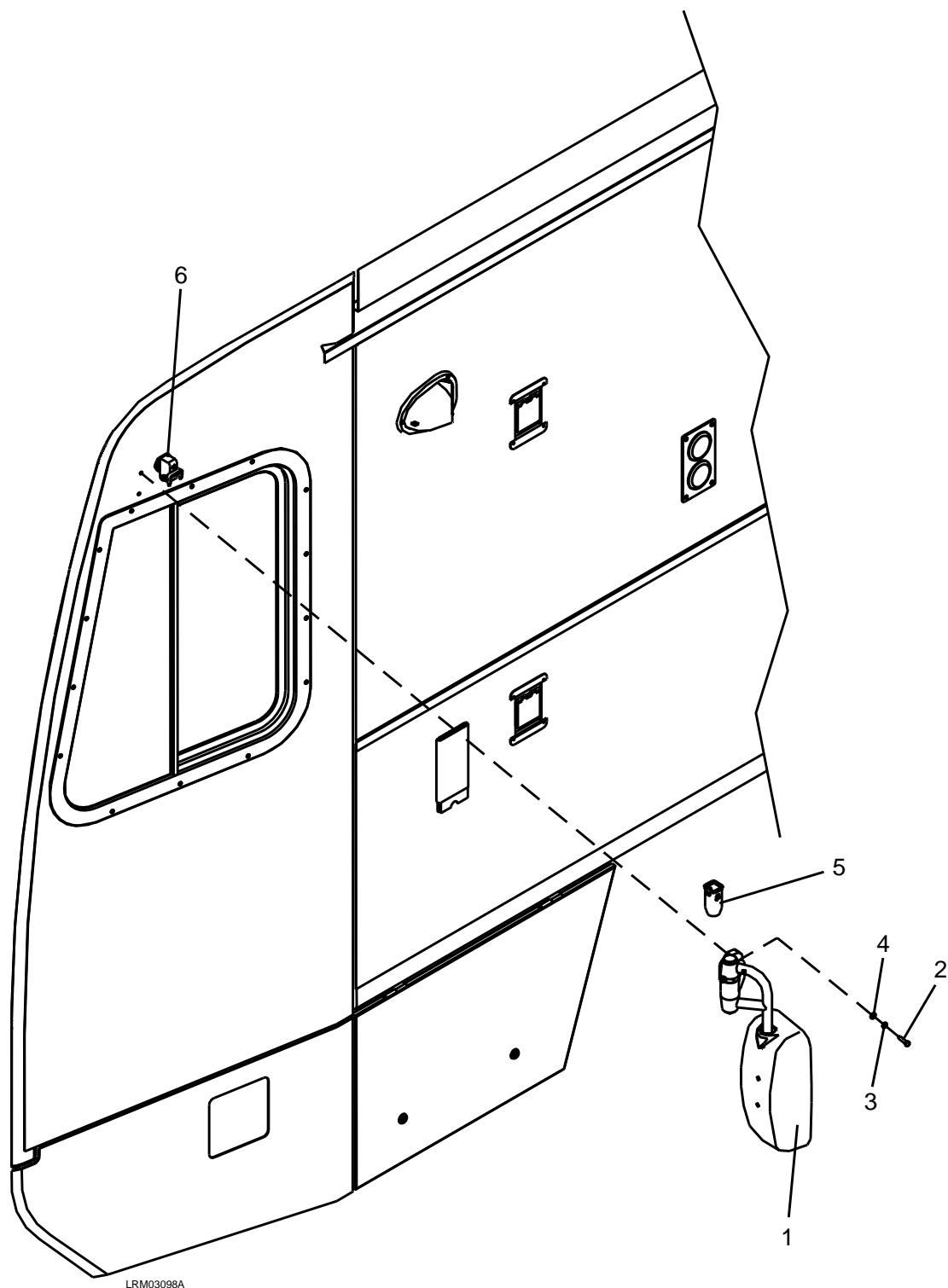


Figure 7-71: Exterior Mirror

7.4.2.3 Skirts

See Figures 7-72 and 7-73.

7.4.2.3.1 Hinged Skirts

1. Unlock the latches (2) and open the Hinged Skirt (1). See Figure 7-72.
2. Remove the M8 nut (4), M8 x 25 bolt (5), M8 plain washer (7), and M8 lock washer (6) from the damper (3).
3. Remove the M5 screws (9) from the hinge (8).
4. Carefully remove the Hinged Skirt (1) and liner (10).

7.4.2.3.2 Stationary Skirts

1. Remove the six M8 ESNA nuts (2), M8 plain washers (3), M8 x 35 socket head screws (5) and M8 plain washers (4). See Figure 7-73.
2. Remove shims (6).
3. Carefully remove the Stationary Skirt (1).

7.4.2.4 Windows

See Figures 7-74 through 7-77.

7.4.2.4.1 Bonded Windows (Windshield)

WARNING

DO NOT ATTEMPT TO MOVE THE WINDSHIELD UNTIL THE WINDOW HAS BEEN FREED ON ALL SIDES.

WARNING

WHEN REMOVING DAMAGED GLASS, WEAR LEATHER GLOVES AND SAFETY GLASSES TO PREVENT SKIN AND EYE INJURY.

WARNING

TO PREVENT POSSIBLE PERSONAL INJURY WHEN ATTEMPTING TO REMOVE OR INSTALL WINDOW EQUIPMENT WEIGHING MORE THAN 50 LBS. (23 KG), ADEQUATE SUPPORT OF A LIFTING DEVICE MUST BE USED. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

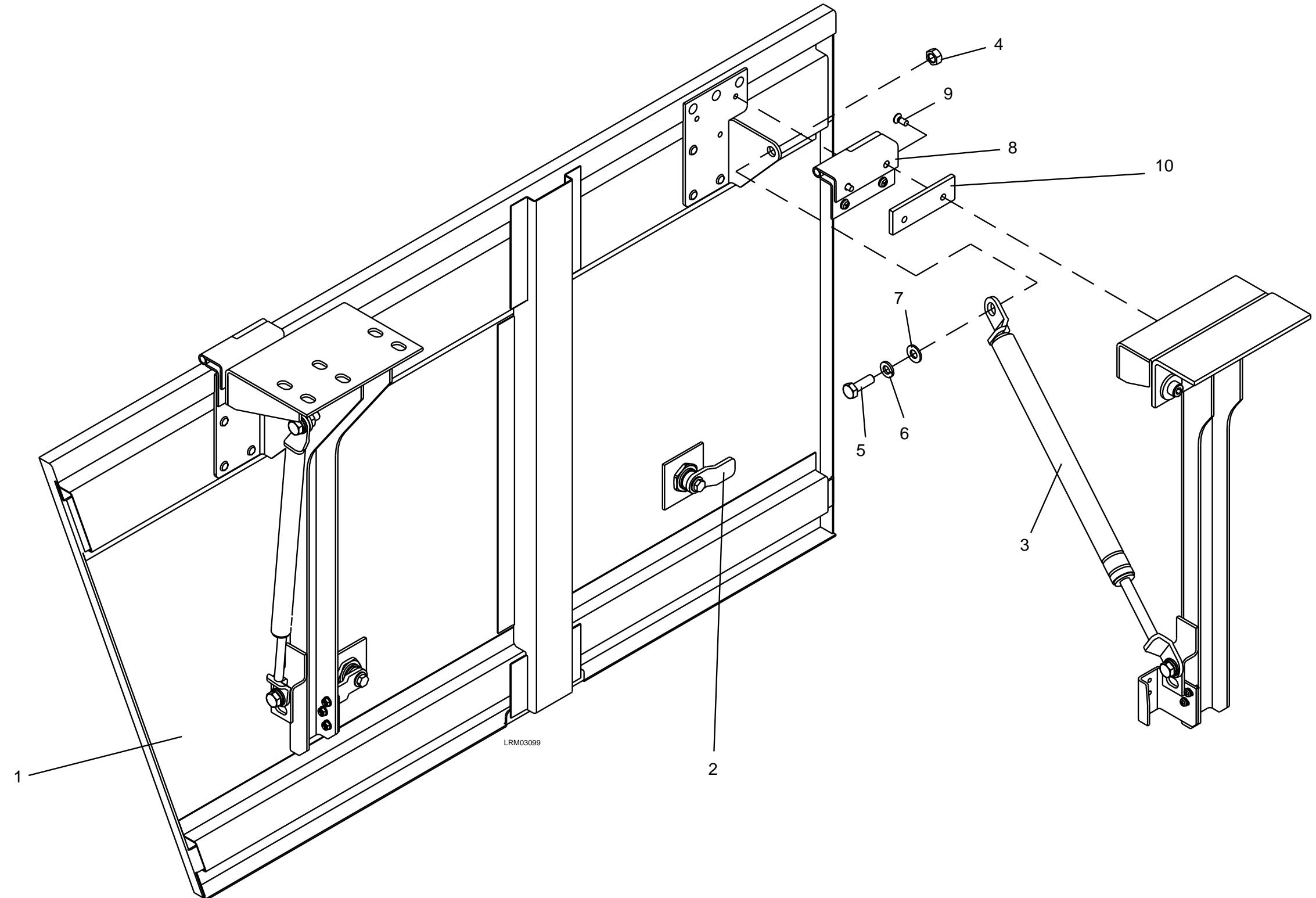


Figure 7-72: Hinged Skirt

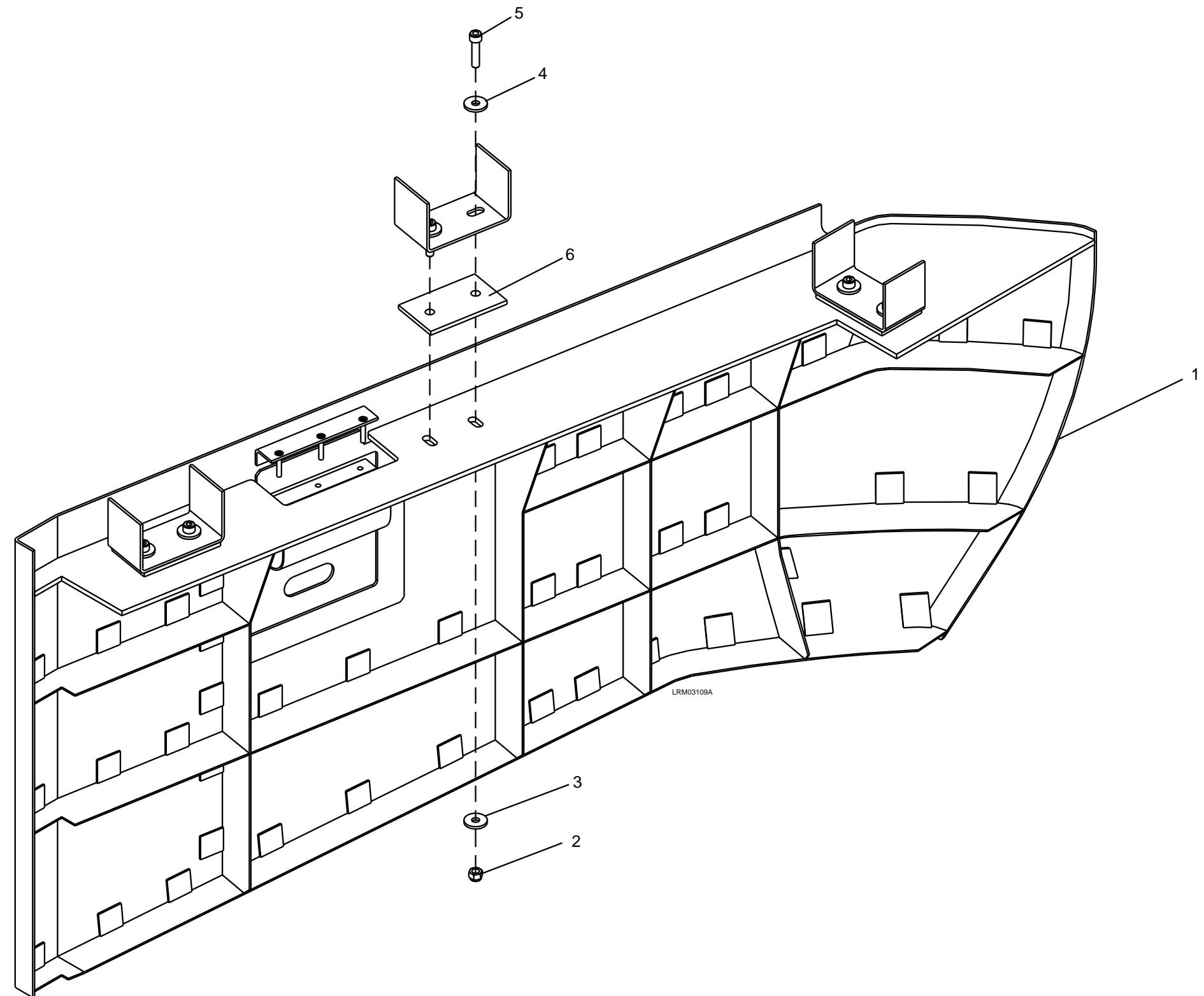


Figure 7-73: Stationary Skirts

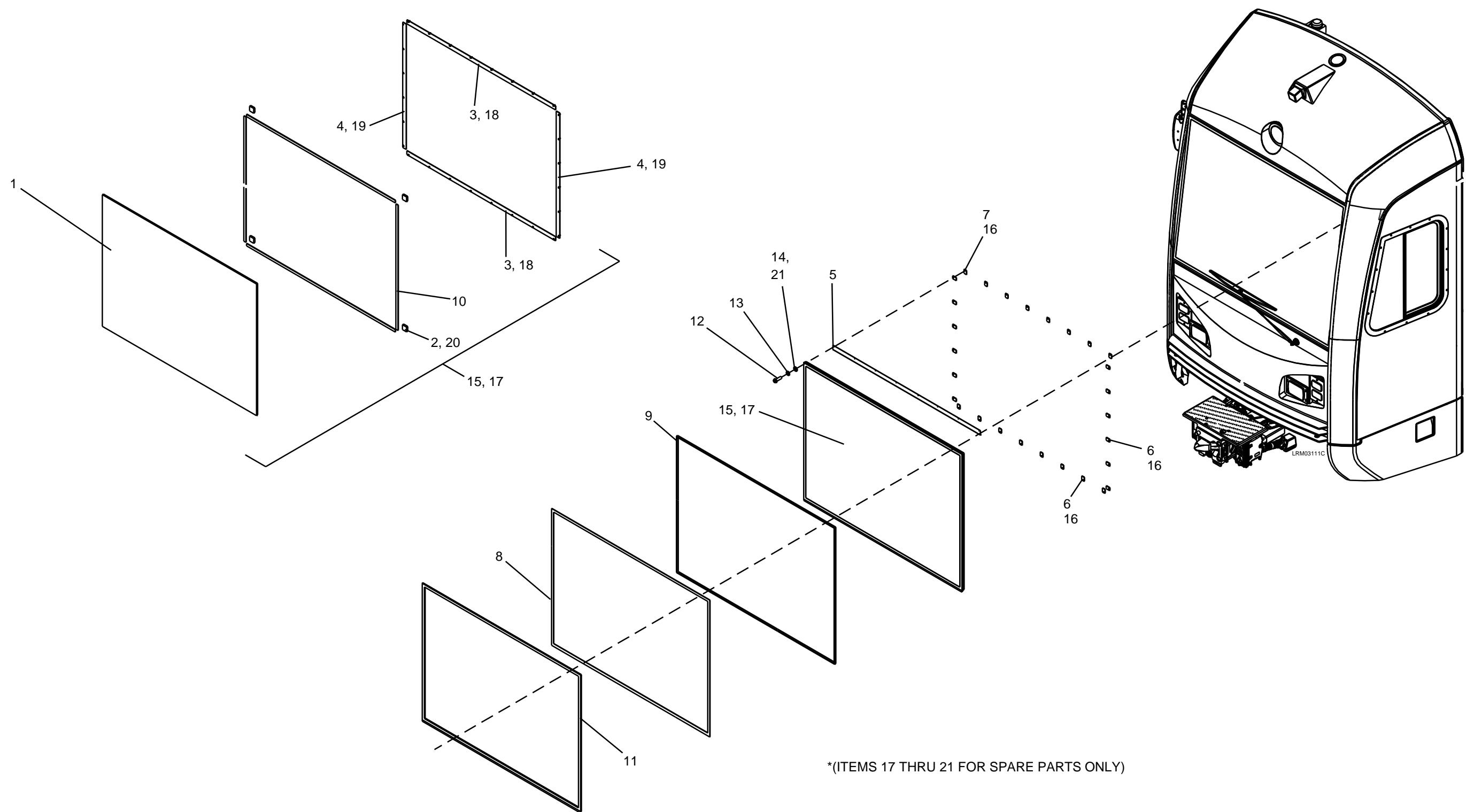


Figure 7-74: Windshield

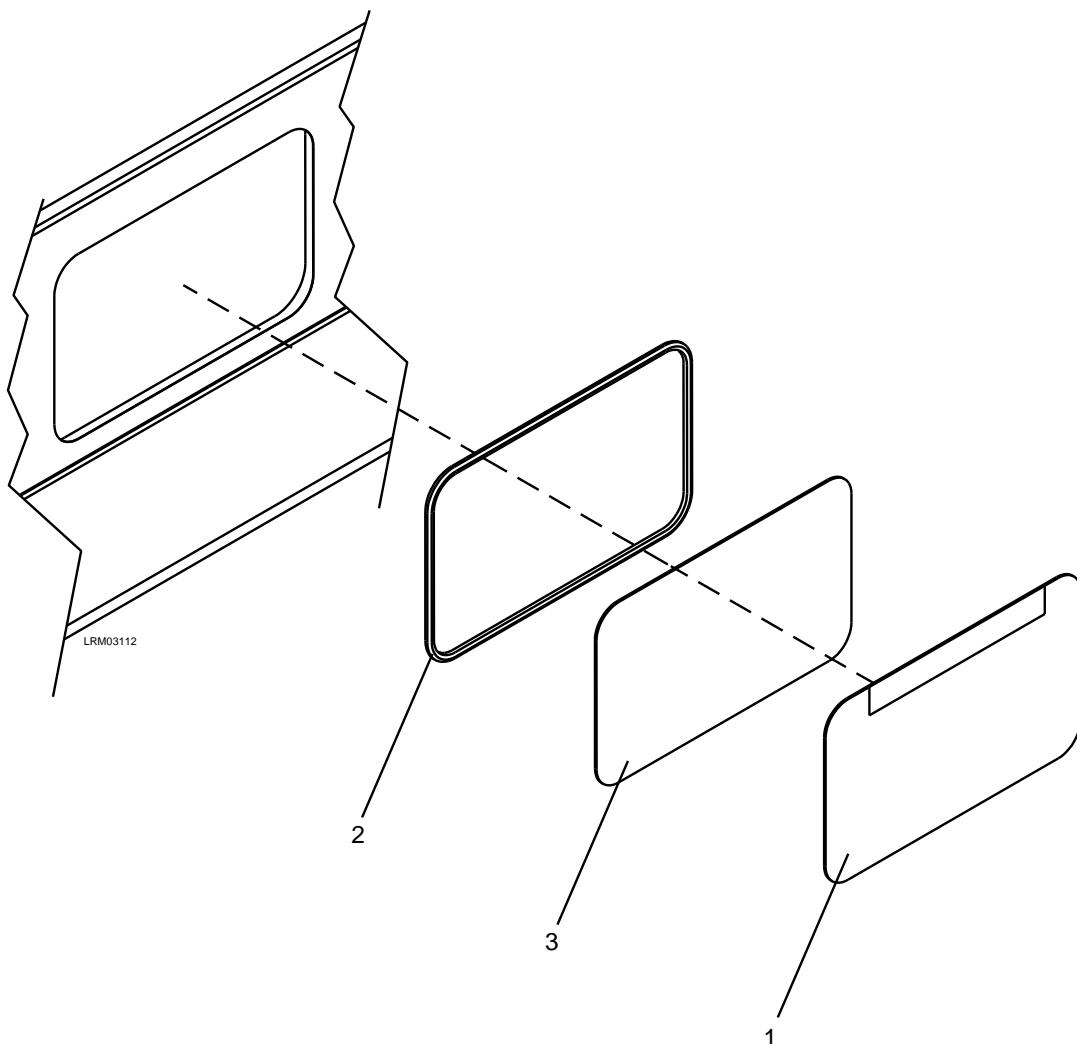


Figure 7-75: Gasket Mounted Windows

1. Tape the entire area below the cab windshield (1) and cab exterior using masking tape and plastic sheeting.
2. Using a razor blade, carefully score the sealant (11) at the bond line to the body and windshield.

NOTE: Take care not to scratch the cab exterior.

NOTE: Take care to handle the razor blade carefully. Keep fingers and hands away when cutting. Cut away from your body.

3. After scoring, carefully peel away the sealant (11) and sealant support (8 and 9) and discard.
4. Attach an appropriate lifting device to the windshield (1).
5. Remove the 28 screws (12), lock washers (13), and flat washers (14) from the windshield frame.

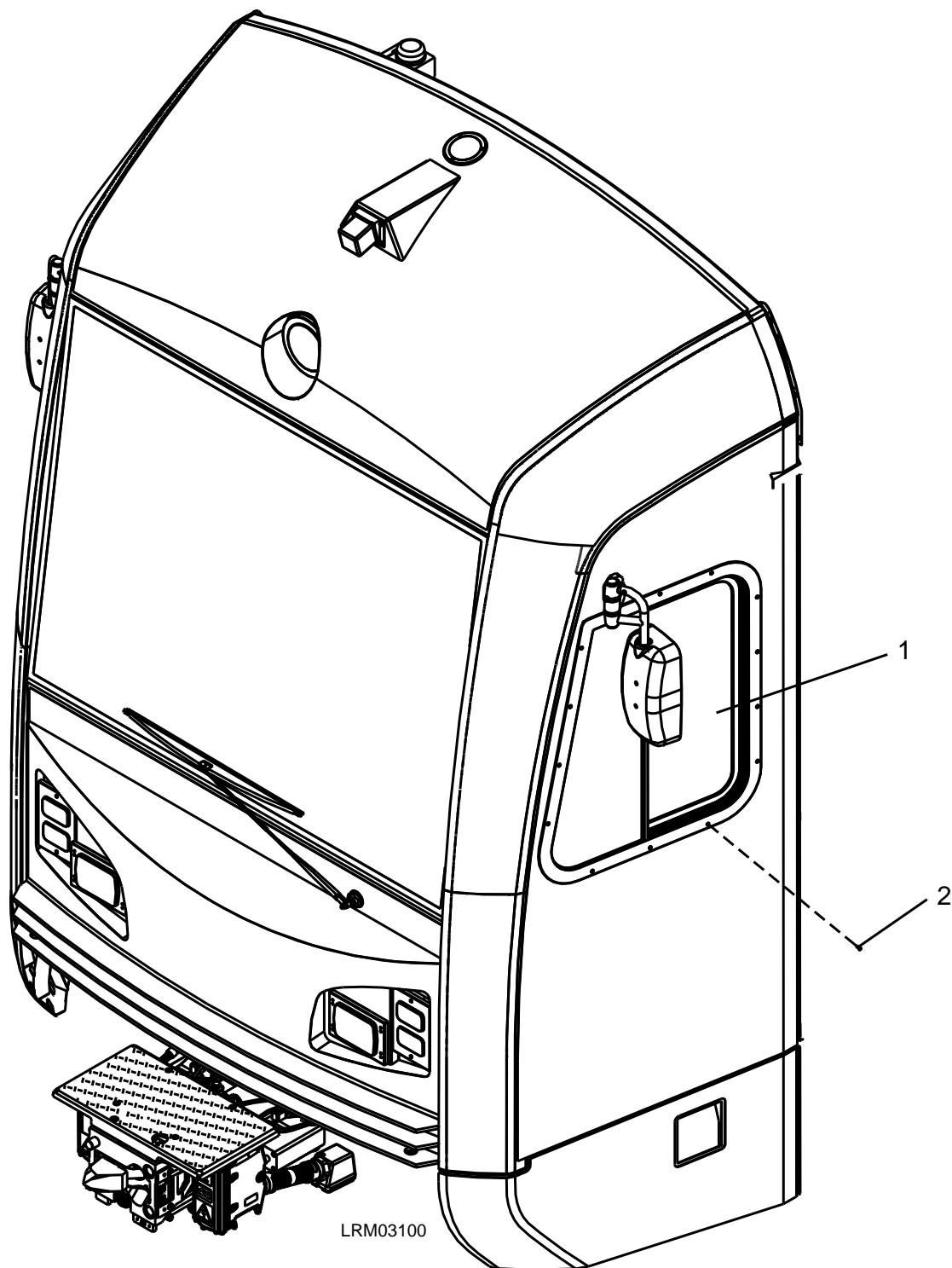


Figure 7-76: Framed Windows

6. Using an appropriate overhead lifting device or equivalent, remove the Windshield (1) from the car body.
7. Set aside the zinc chromate coated shims (6 and 7) for reinstallation. The additional shims (15) are for Cars 1039 and later. Note the screw location for each shim stack up as they are removed and make sure to reuse the appropriate shim stack ups in the same fastening locations upon reinstallation.
8. Clean car body brackets (3 and 4) free of old sealant remnants.

7.4.2.4.2 Gasket Mounted Windows

The following gasket mounted window types are:

- Bodyside Window #1
- Bodyside Window w/Destination Sign
- Door Window
- Bodyside Window #2

WARNING

WHEN REMOVING DAMAGED GLASS, WEAR LEATHER GLOVES AND SAFETY GLASSES TO PREVENT SKIN AND EYE INJURY.

WARNING

TO PREVENT POSSIBLE PERSONAL INJURY WHEN ATTEMPTING TO REMOVE OR INSTALL WINDOW EQUIPMENT WEIGHING MORE THAN 50 LBS. (23 KG), ADEQUATE SUPPORT OF A LIFTING DEVICE MUST BE USED. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

1. Ensure that the Window (1) will not move when disengaged from the gasket (2). See Figure 7-75.
2. Remove the filler key (3) from the exterior of the gasket (2).
3. Remove the Window (1) from the gasket (2) using the appropriate lifting device.
4. Remove the gasket (2) from the car body.

7.4.2.4.3 **Framed Windows**

The following framed window types are:

- Cab Door Window
- Hinged Window RH and LH

WARNING

WHEN REMOVING DAMAGED GLASS, WEAR LEATHER GLOVES AND SAFETY GLASSES TO PREVENT SKIN AND EYE INJURY.

WARNING

TO PREVENT POSSIBLE PERSONAL INJURY WHEN ATTEMPTING TO REMOVE OR INSTALL WINDOW EQUIPMENT WEIGHING MORE THAN 50 LBS. (23 KG), ADEQUATE SUPPORT OF A LIFTING DEVICE MUST BE USED. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

7.4.2.4.3.1 Cab Door Window

1. Remove the screws (5) and lock washers (4) that hold the cab door window (2) in place from the cab door (1). See Figure 7-77.
2. Carefully remove the outer frame (3) and cab door window (2).

7.4.2.4.3.2 Hinged Window RH and LH

1. Ensure that the Framed Window (1) will not move when disengaged from the car body. See Figure 7-76.
2. Remove the screws (2) that hold the Framed Window (1) in place.
3. Carefully remove the Framed Window (1).

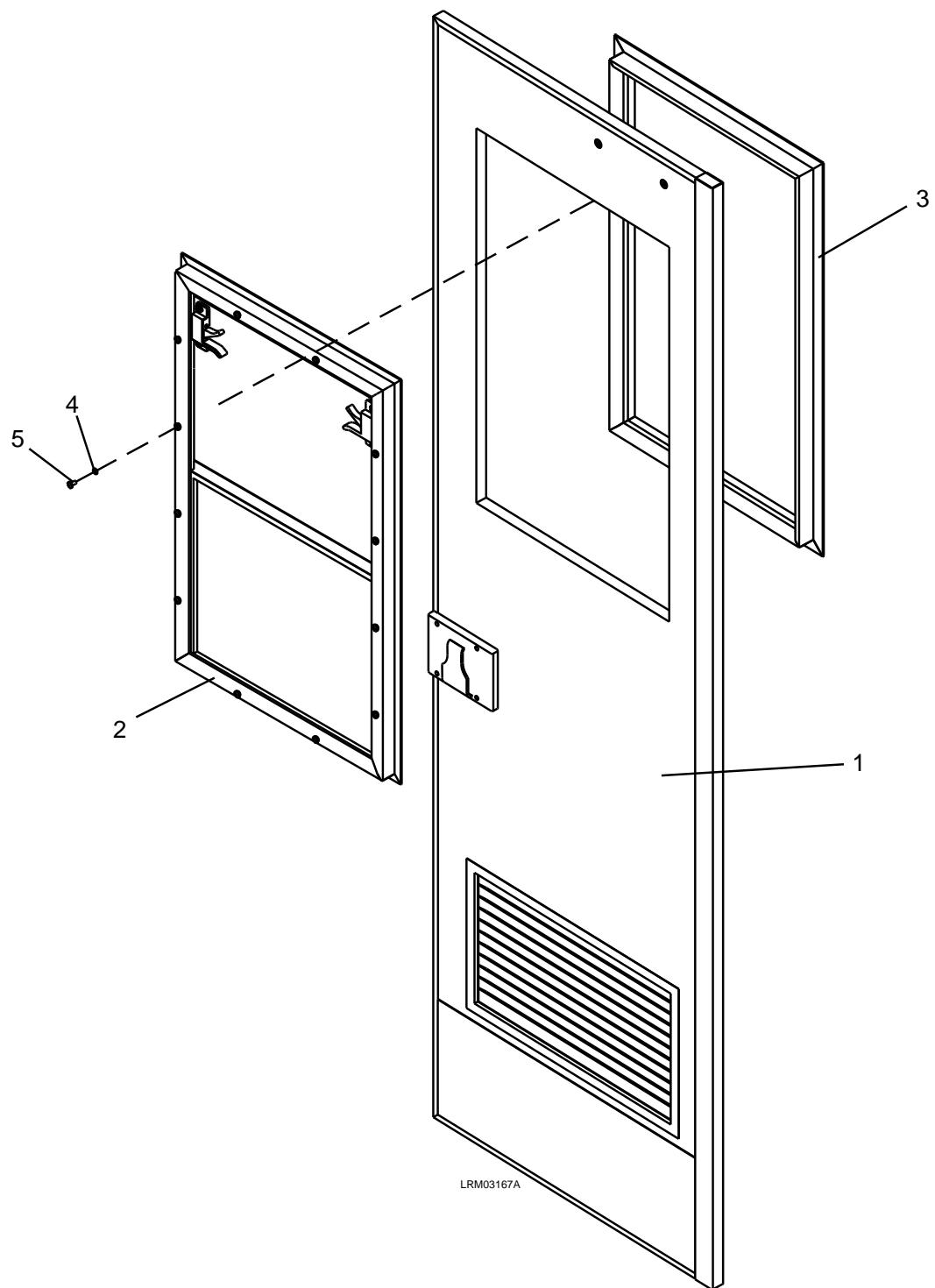


Figure 7-77: Cab Door Window

7.4.2.5 Rear View Camera

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove power to the fixture.
2. Carefully remove all existing sealant.
3. Remove the three M6 x 20 screws (3). See Figure 7-78.
4. Carefully remove the Rear View Camera (1) and gasket (2) from the car body and disconnect the electrical connector (4) from the Rear View Camera (1).

7.4.3 Interior Equipment

See Figures 2-4 through 2-10 and 7-79 through 7-91.

The interior equipment consists of the following:

- Stanchions and Grab Rails
- sixteen Passenger Door Pushbuttons
- sixteen Windscreens
- Ceiling Panels
- two Return Air Grilles
- thirty-four Ceiling Lights
- eight Door Out of Service Signs
- eight Door Closing Chimes
- eight Door Closing Lights
- sixteen Automatic Passenger Counter (APC) Sensors
- four Interior View Cameras
- fourteen Interior Speakers
- four Passenger Emergency Intercoms
- eight Manual Door Release Handles
- four Interior Passenger Information Signs
- two Destination Signs
- Floor Panels
- APC Analyzer

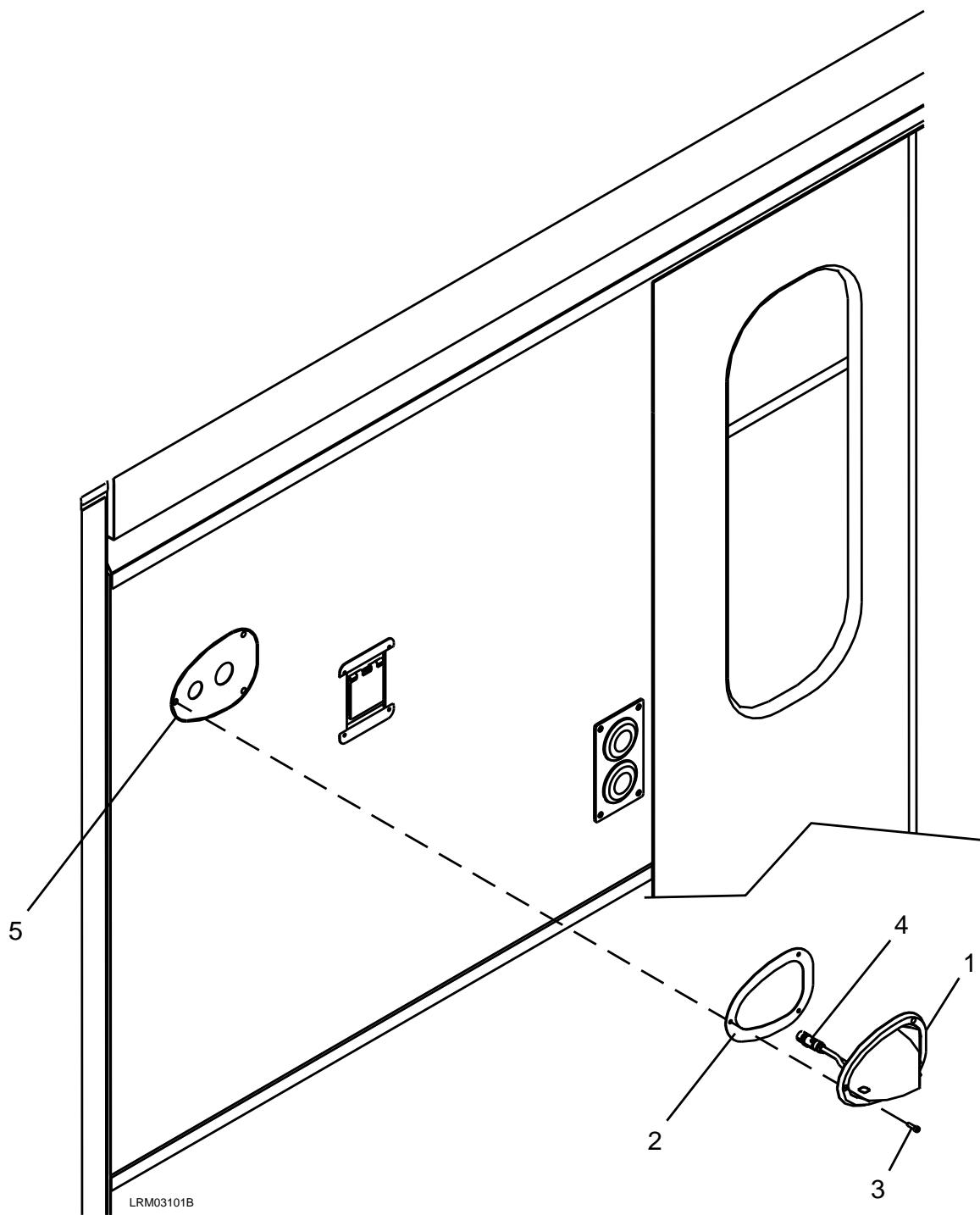


Figure 7-78: Rear View Camera

7.4.3.1 Stanchions and Grab Rails

1. Remove the M6 x 35 screw (1) from the bottom of Stanchion (2). See Figure 7-79.
2. Remove the ten M6 x 12 screws (3) from the cross fitting (4) and the tee fitting (5).
3. Remove the M4 x 8 screw (6) from the stanchion support (7).
4. Remove the Stanchion (2), cross fitting (4), Grab Rail (8) and tee fitting (5).
5. Remove the two M16 nuts (9) and M16 plain washers (10) from the stanchion support (7).

NOTE: Step 6 is for Cars 1001 through 1025.

6. Remove the two stanchion hole covers (12), stanchion support (7) and two M16 x 40 halfen bolts (11).

NOTE: Step 7 is for Cars 1026 and later.

7. Remove the stanchion hole cover (13), stanchion support (7) and two M16 x 40 halfen bolts (11).
8. Repeat steps 1 through 7 for the remaining Stanchions (2) and Grab Rails (8).

7.4.3.2 Passenger Door Pushbutton

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove the two M4 x 20 screws (1) from the Interior Passenger Pushbutton (2). See Figures 7-80 and 7-81.
2. Remove the Interior Passenger Pushbutton (2) to access the wiring.
3. Disconnect the electrical connector and remove the Interior Passenger Pushbutton (2).

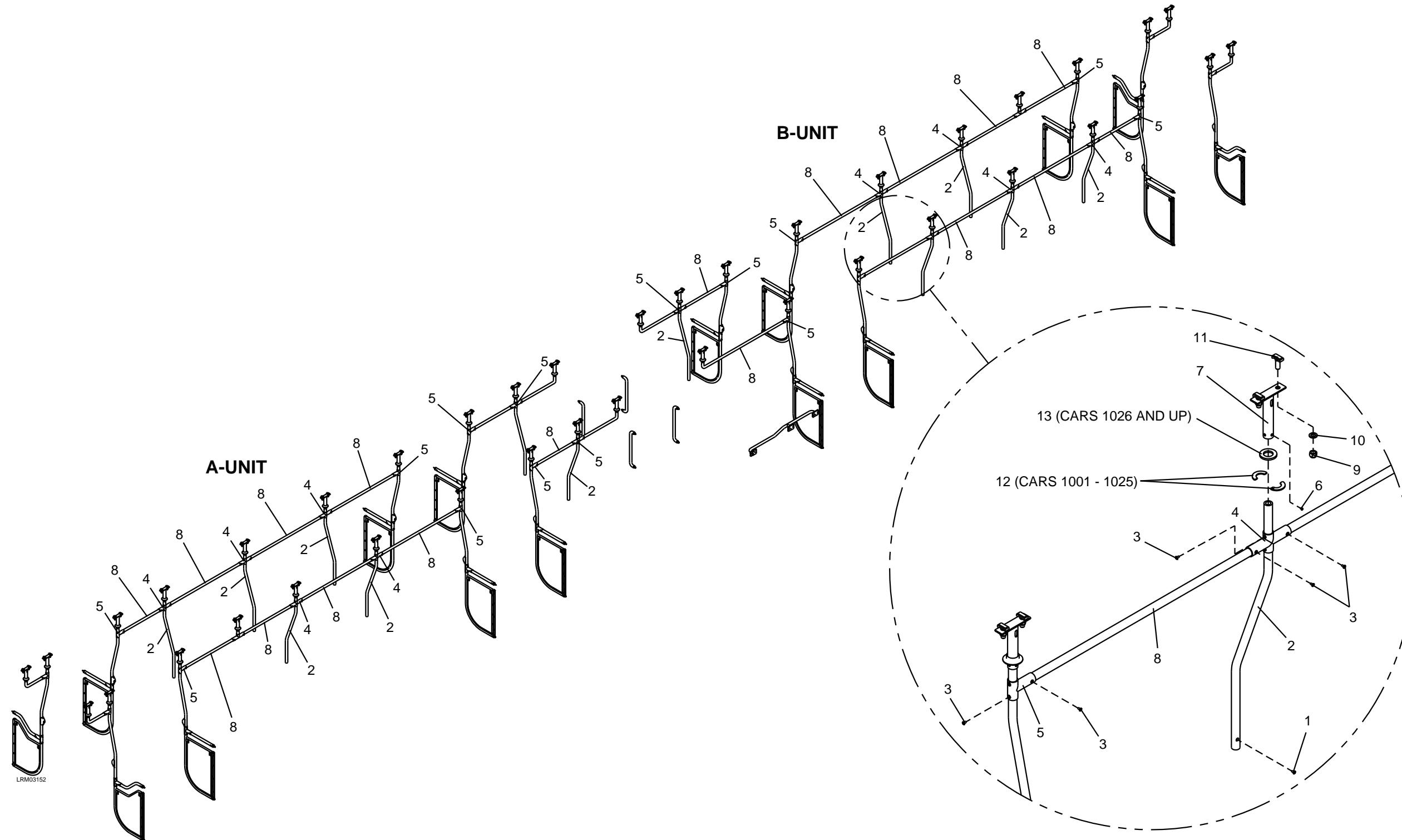


Figure 7-79: Stanchions and Grab Rails

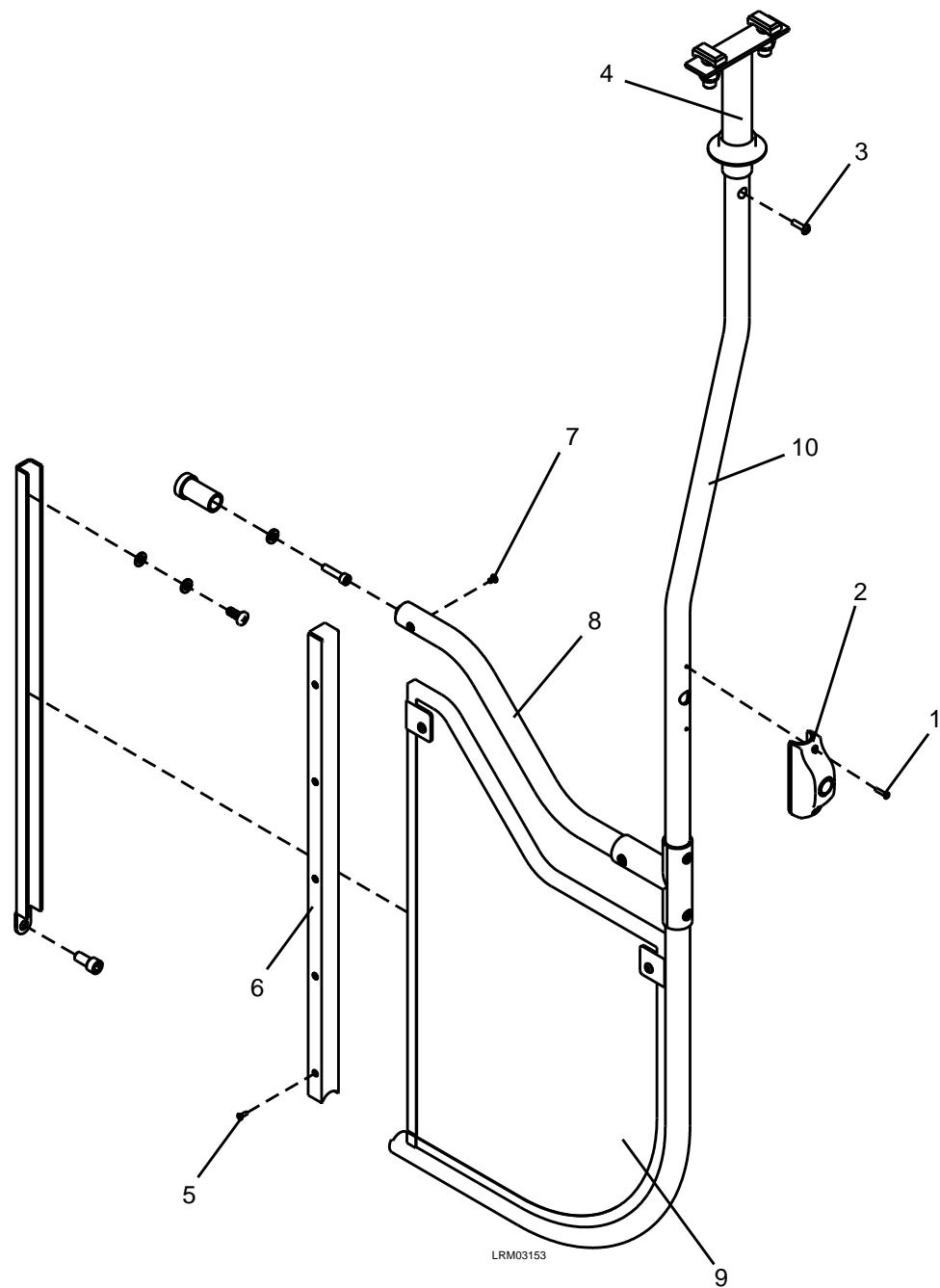


Figure 7-80: End Windscreen

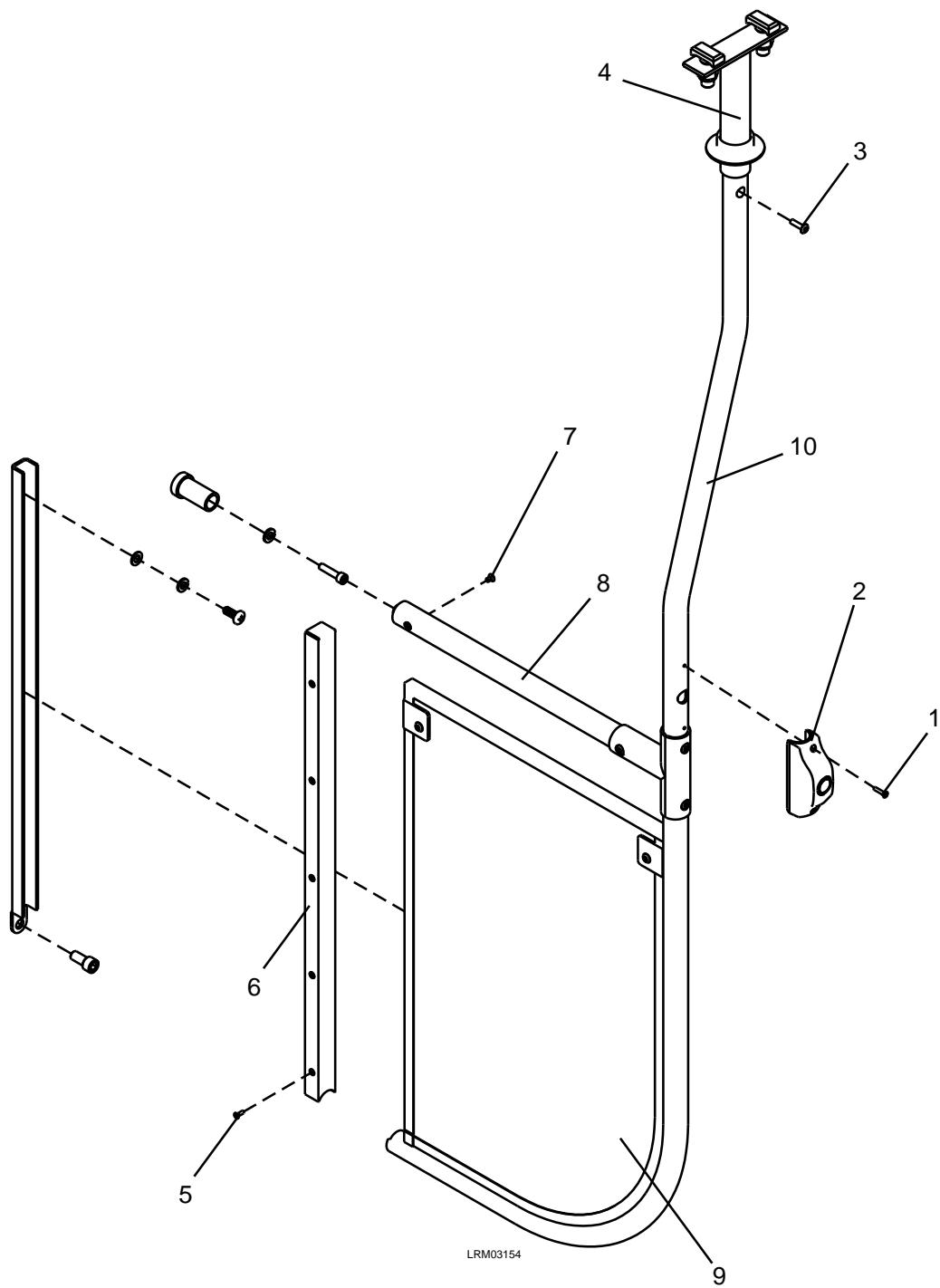


Figure 7-81: Center Windscreen

7.4.3.3 Windscreens

7.4.3.3.1 End Windscreen

1. Remove the M4 x 8 screw (3) from the stanchion support (4). See Figure 7-80.
2. Remove the ten M4 x 8 screws (5) from the wall channel (6).
3. Remove the two M5 x 8 screws (7) from the grab rail (8).
4. Remove the End Windscreen (9) along with the stanchion (10).

7.4.3.3.2 Center Windscreen

1. Remove the M4 x 8 screw (3) from the stanchion support (4). See Figure 7-81.
2. Remove the ten M4 x 8 screws (5) from the wall channel (6).
3. Remove the two M5 x 8 screws (7) from the grab rail (8).
4. Remove the Center Windscreen (9) along with the stanchion (10).

7.4.3.4 Ceiling Panels

7.4.3.4.1 Center and End Ceiling Panel

1. Remove the three M4 x 10 screws (1) from the air diffuser (2). See Figure 7-82.
2. Remove the air diffuser (2).
3. Repeat steps 1 and 2 for the remaining air diffusers (2).
4. Remove the four M4 x 16 screws (3) from the ceiling panel (4). The ceiling panels are ship-lapped; the ceiling panel (4) nearest the return air grille must be removed first before adjacent ceiling panels (4) are removed.
5. Remove the end light fixture. Refer to Section 7.4.3.6 of this manual section.
6. Remove the five M4 x 20 screws (5) from the End Ceiling Panel (6).
7. Remove the End Ceiling Panel (6).
8. Repeat steps 5 through 7 for the remaining End Ceiling Panel (6).

7.4.3.4.2 Side Access Cover

1. Turn the two locks (1) to open the Side Access Cover (2). See Figure 7-83.
2. Remove the three M4 nuts (3), M4 lock washers (4), M4 plain washers (5), packing (6) and M4 x 14 screws (7) from the hinge (8).
3. Repeat step 2 for the remaining two hinges (8).
4. Remove the side access cover (2).
5. Repeat step 4 for the remaining Side Access Covers (2).

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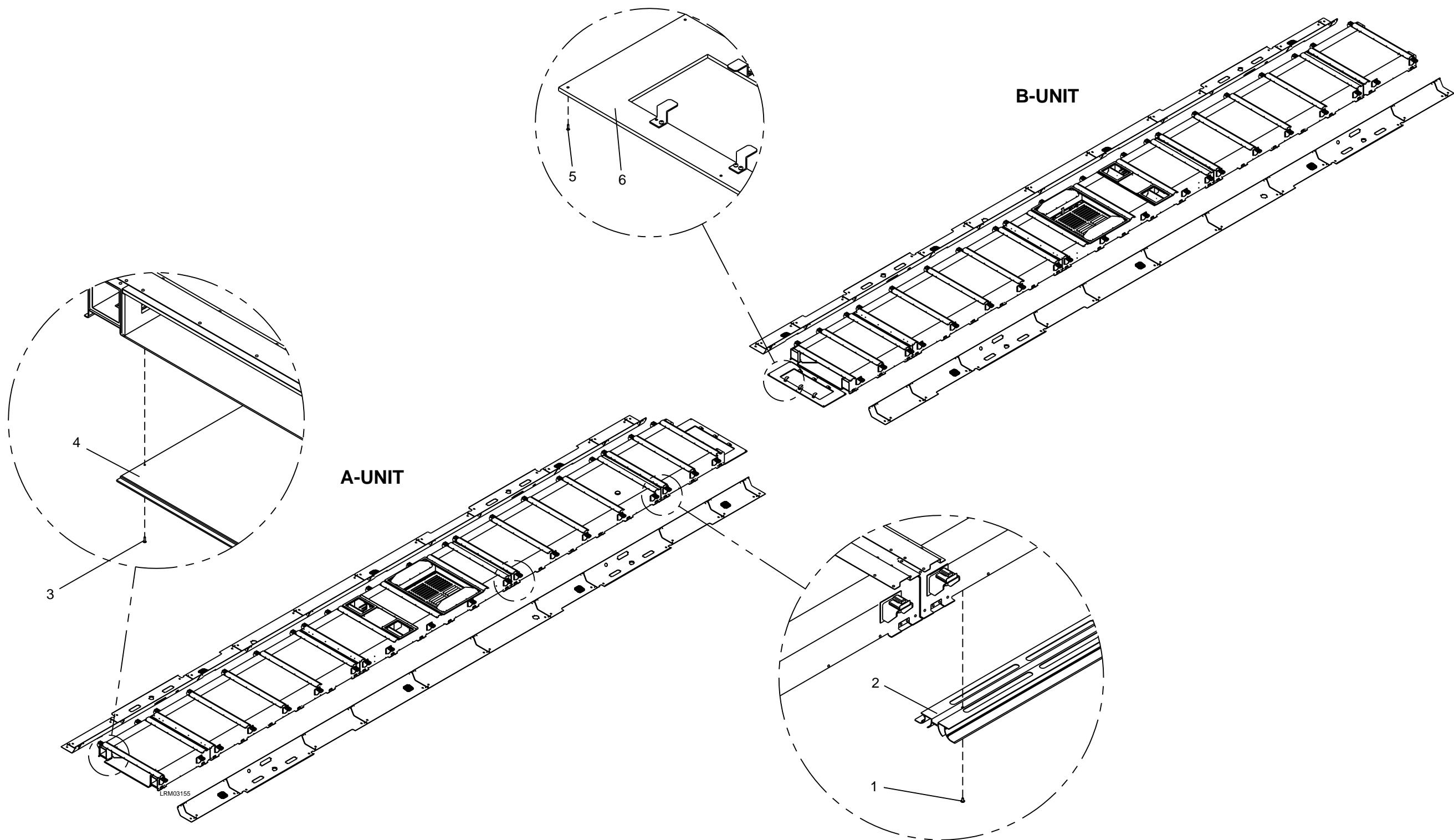


Figure 7-82: Center and End Ceiling Panels

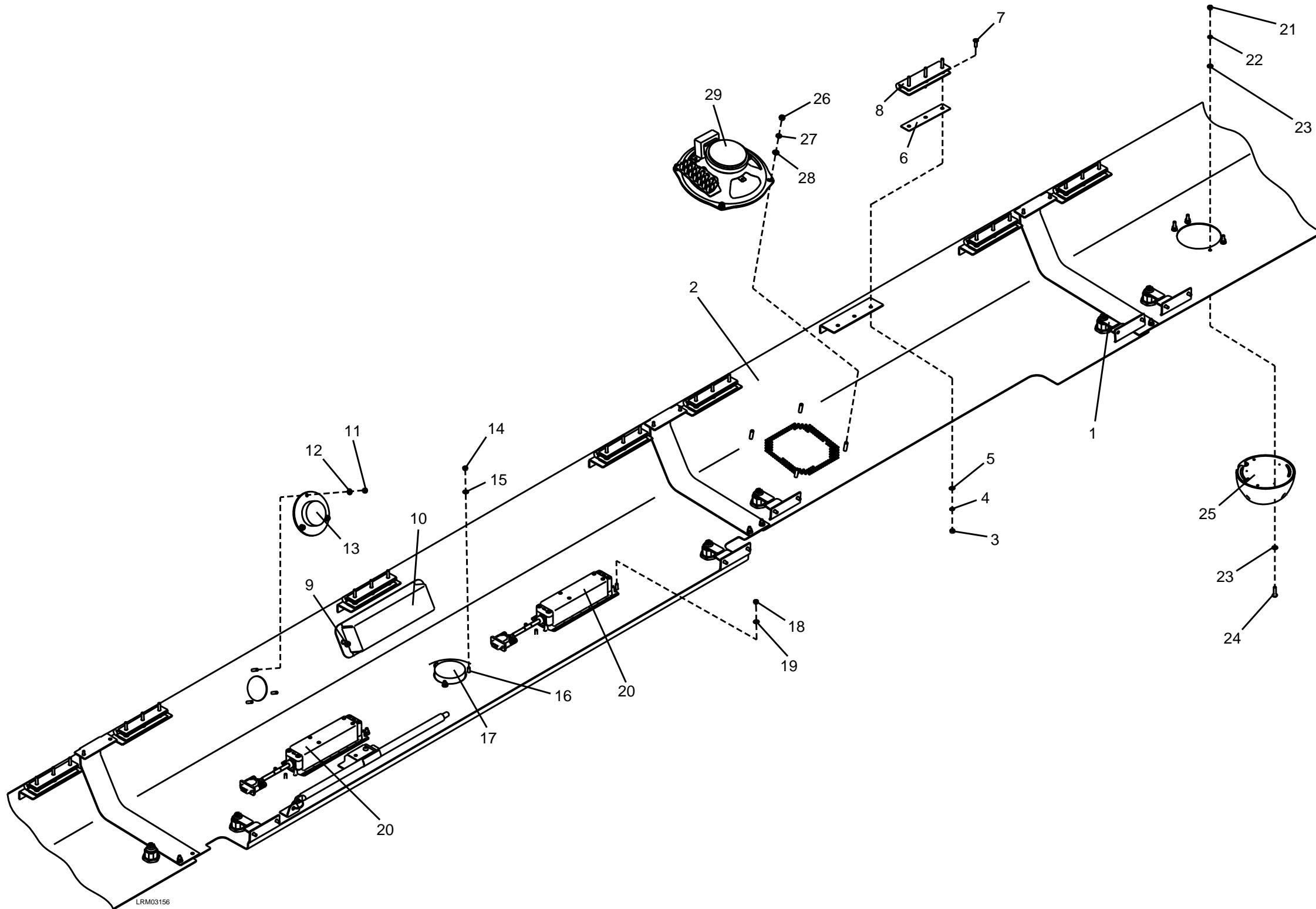


Figure 7-83: Side Access Cover

7.4.3.5 Return Air Grille

1. Using a crew key, unlock and open the Return Air Grille (2). See Figure 7-84.
2. Unhook the safety catch (9).
3. Unhook the two safety chains (3) and let the return air grille open fully on its hinge.
4. Remove the fourteen M4 x 16 screws (4), M4 lock washers (5) and M4 plain washers (6) from the return air grille frame (7).
5. Remove the Return Air Grille (2) and packing (8).

7.4.3.6 Ceiling Lights

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Turn the three screws (1) counterclockwise one-quarter turn to release the ceiling light cover (2). See Figure 7-85.
2. Remove the eight M4 x 16 screws (3) and liners (4).
3. Lower the Ceiling Light (5) enough to access the wiring.
4. Disconnect the electrical connector from the Ceiling Light (5).
5. Remove the Ceiling Light (5).
6. Repeat steps 1 through 5 for the remaining Ceiling Lights (5).

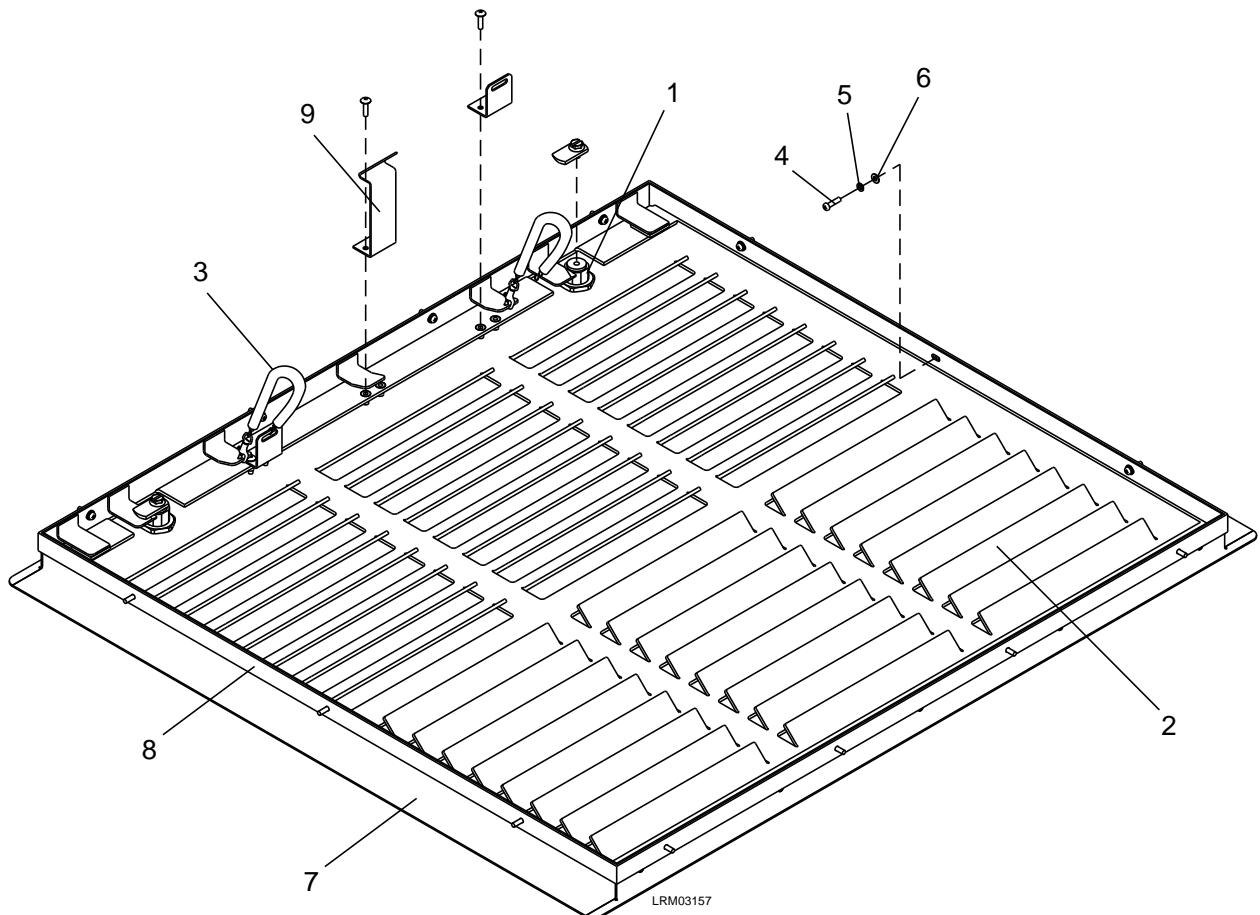


Figure 7-84: Return Air Grille

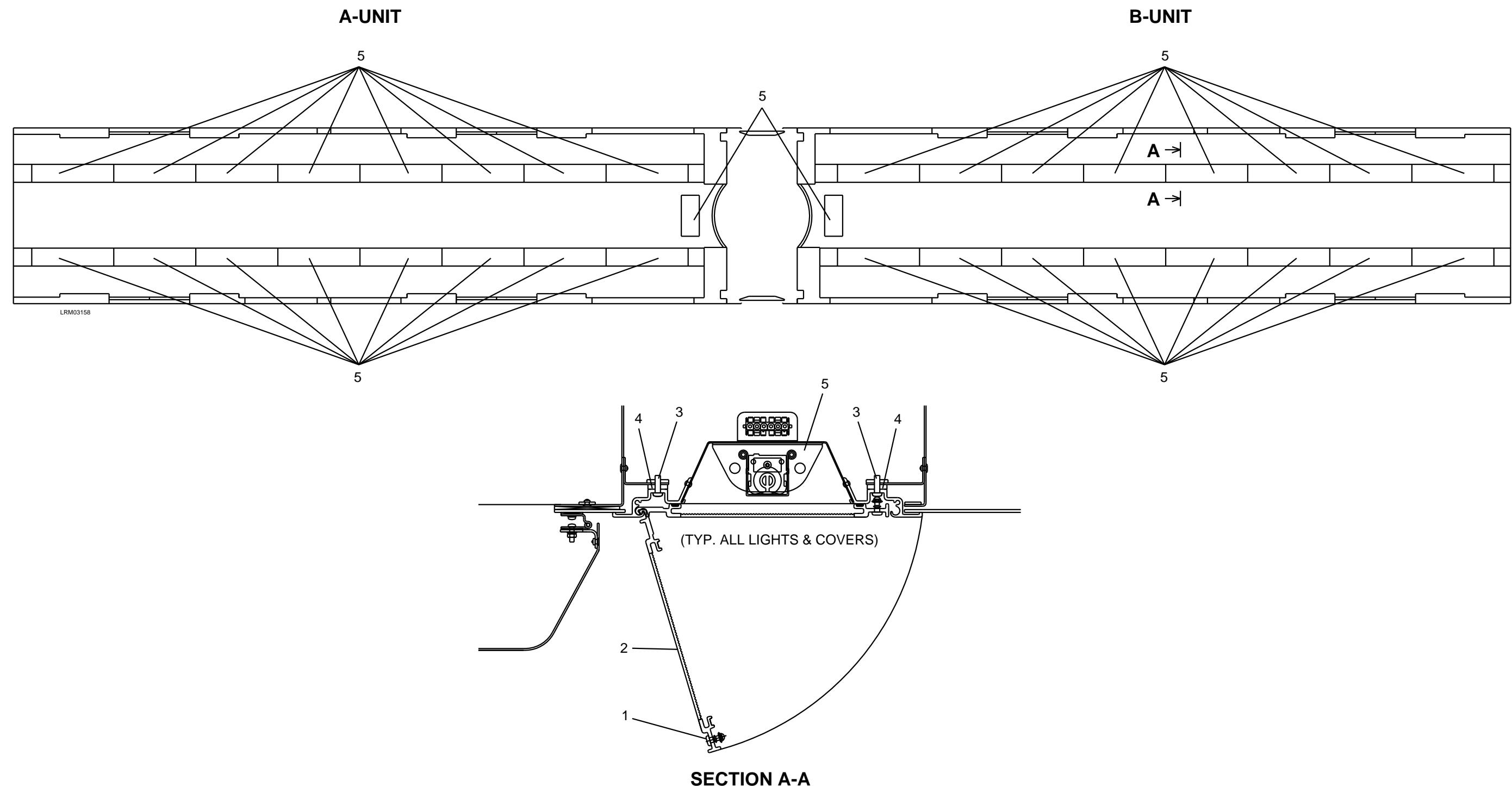


Figure 7-85: Ceiling Lights

7.4.3.7 Door Indicators

7.4.3.7.1 Door Out of Service Sign

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the side access cover.
2. Disconnect the electrical connector from the Door Out Of Service Sign (10). See Figure 7-83.
3. Remove the two M5 nuts (9) from the Door Out Of Service Sign (10).
4. Remove the Door Out Of Service Sign (10).
5. Close and lock the side access cover using a crew key.

7.4.3.7.2 Door Closing Chime

1. Using a crew key, unlock and open the side access cover.
2. Disconnect the electrical connector from the Door Closing Chime (13). See Figure 7-83.
3. Remove the three M4 nuts (11) and M4 plain washers (12).
4. Remove the Door Closing Chime (13).
5. Close and lock the side access cover using a crew key.

7.4.3.7.3 Door Closing Light

1. Using a crew key, unlock and open the side access cover.
2. Disconnect the electrical connector from the Door Closing Light (17). See Figure 7-83.
3. Remove the three M4 nuts (14), M4 plain washers (15) and M4 x 16 screws (16).
4. Remove the Door Closing Light (17).
5. Close and lock the side access cover using a crew key.

7.4.3.8 Automatic Passenger Counter (APC) Sensor

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the side access cover.
2. Disconnect the electrical connector from the Automatic Passenger Counter sensor (20). See Figure 7-83.
3. Remove the four M4 nuts (19) and M4 plain washers (18).
4. Remove the Automatic Passenger Counter sensor (20).
5. Repeat steps 1 through 3 for the remaining Automatic Passenger Counter sensor (20).
6. Close and lock the side access cover using a crew key.

7.4.3.9 Interior View Camera

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the side access cover.
2. Disconnect the electrical connector from the Interior View Camera (25). See Figure 7-83.
3. Remove the four M4 nuts (21), M4 lock washers (22), eight M4 plain washers (23) and M4 x 16 screws (24).
4. Remove the Interior View Camera (25).
5. Close and lock the side access cover using a crew key.

7.4.3.10 Interior Speaker

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the side access cover.
2. Disconnect the Faston connectors from the Interior Speaker (29). See Figure 7-83.
3. Remove the four M5 nuts (26), M5 lock washers (27) and M5 plain washers (28).
4. Remove the Interior Speaker (29).
5. Close and lock the side access cover using a crew key.

7.4.3.11 Passenger Emergency Intercom

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove the four M4 x 16 screws (1) from the Passenger Emergency Intercom (2). See Figure 7-86.
2. Remove the Passenger Emergency Intercom (2) enough to access the wiring.
3. Disconnect the electrical connector from the Passenger Emergency Intercom (2).
4. Remove the Passenger Emergency Intercom (2).

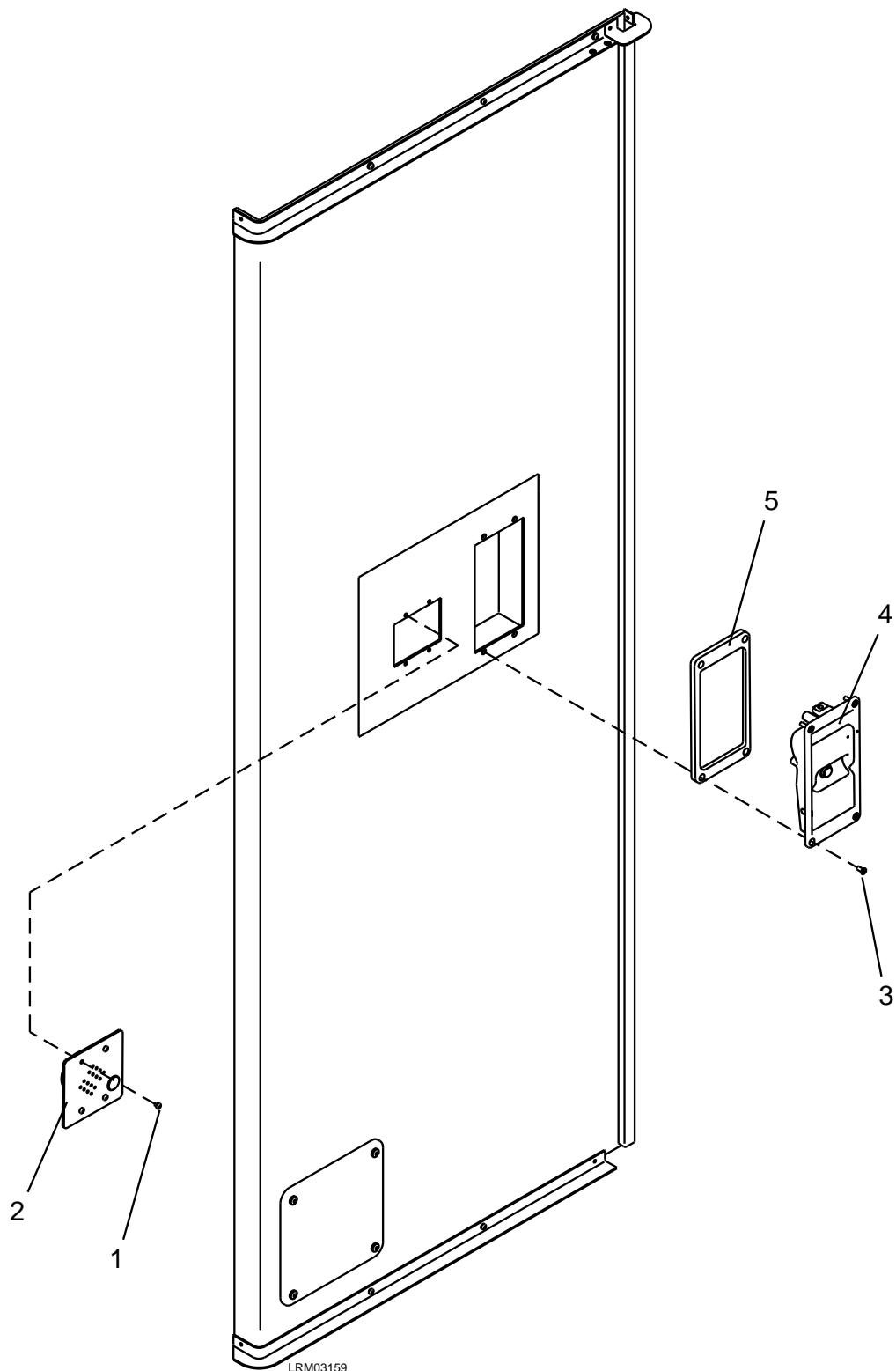


Figure 7-86: Passenger Emergency Intercom

7.4.3.12 Manual Door Release Handle

1. Remove the four M5 x 20 screws (3) from the Manual Door Release Handle (4). See Figure 7-86.
2. Remove the Manual Door Release Handle (4) enough to access the bowden cable.
3. Disconnect the cable.
4. Remove the Manual Door Release Handle (4) and the bracket (5).

7.4.3.13 Interior Passenger Information Sign

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove the three M4 x 10 screws (1) from the cover (2). See Figures 7-87 and 7-88.
2. Remove the cover (2) and packing (3).
3. Remove the eighteen M5 x 20 screws (4), M5 lockwashers (5) and M5 plain washers (6).
4. Remove the Interior Passenger Information Display (7) enough to access the wiring.
5. Disconnect the electrical connector from the Interior Passenger Information Display (7).
6. Remove the Interior Passenger Information Display (7).
7. Remove the four M4 x 12 screws (8).
8. Remove the two brackets (9 & 10) and the packing (11).

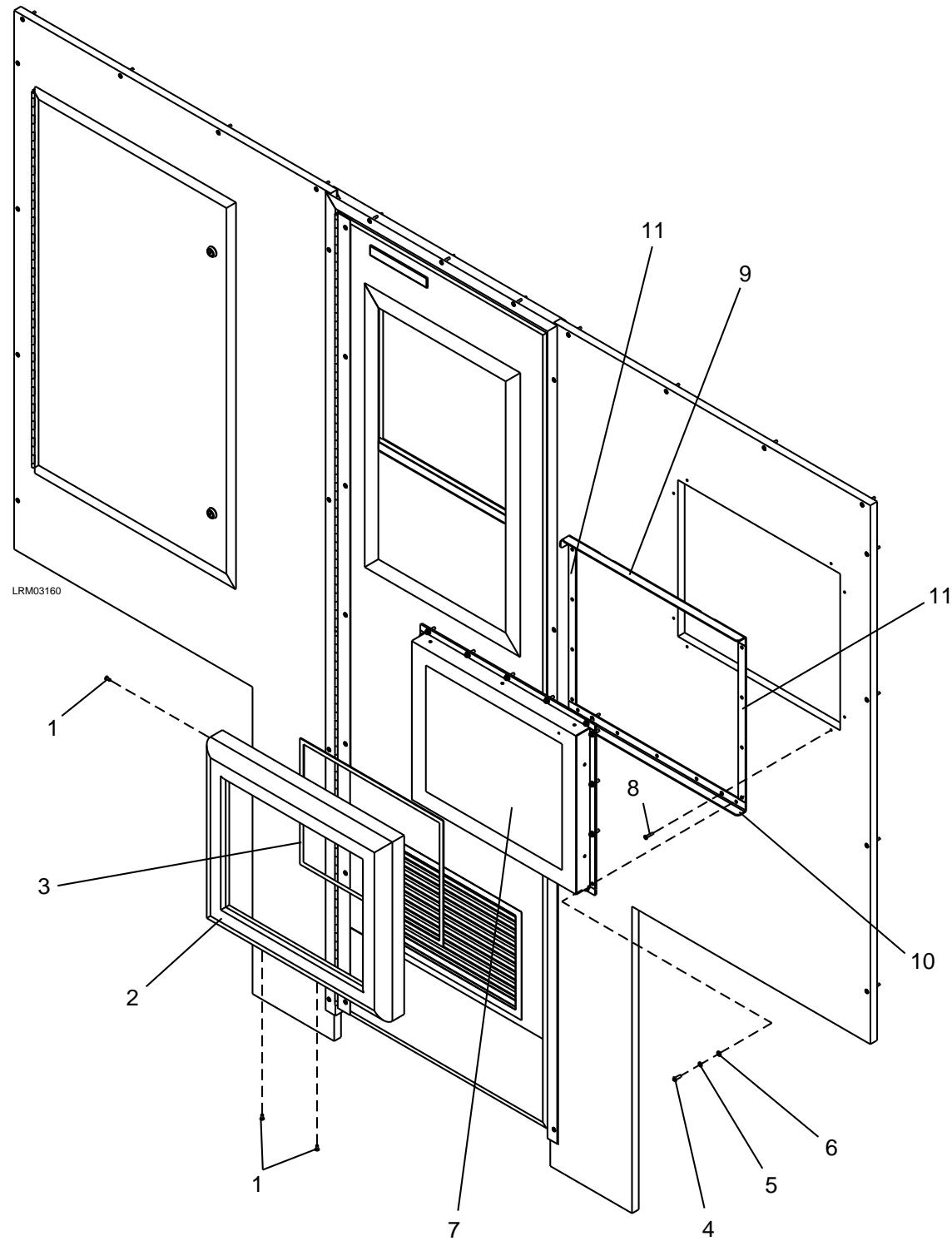


Figure 7-87: Interior Passenger Information Sign (Cab)

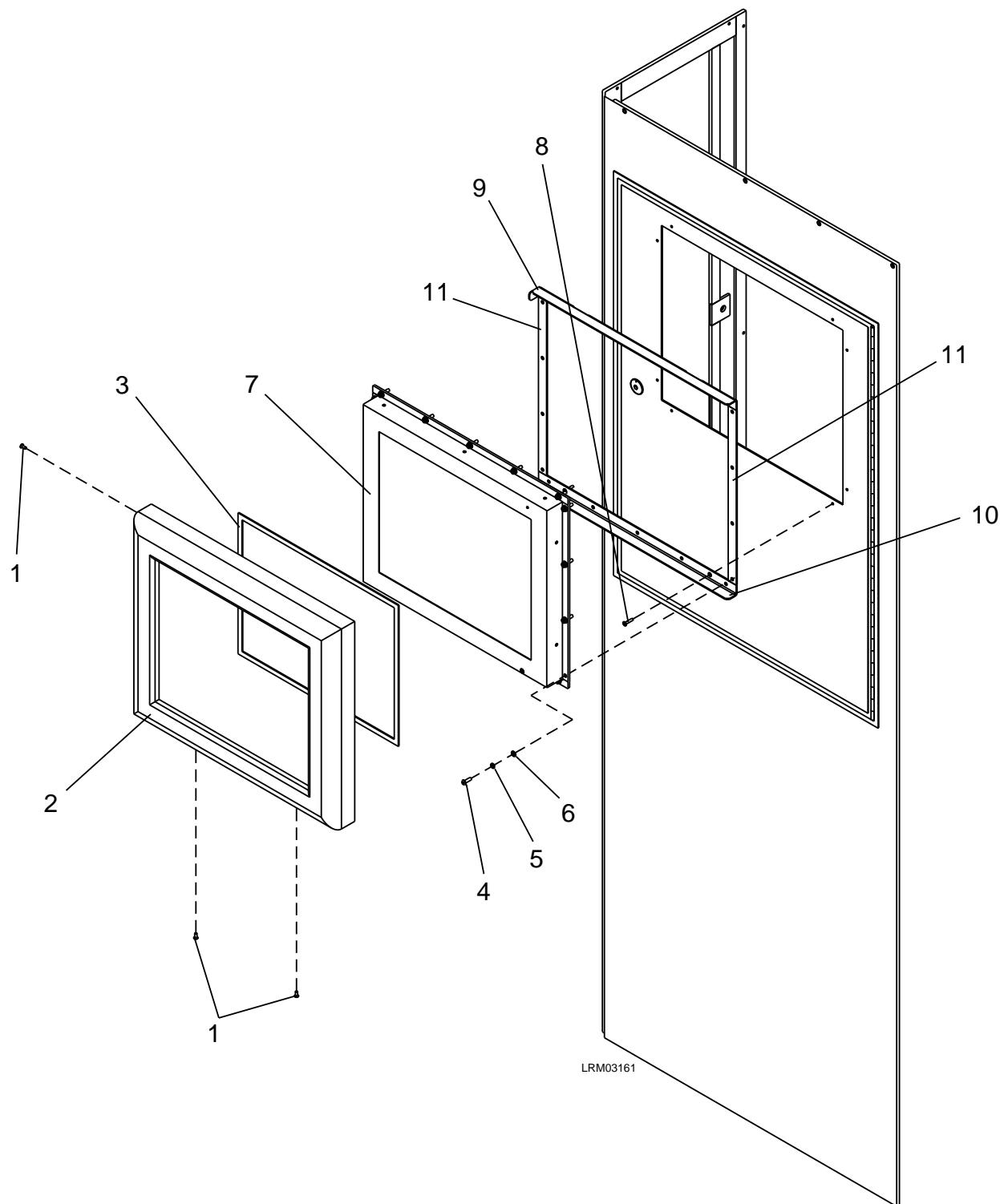


Figure 7-88: Interior Passenger Information Sign (Electric Locker)

7.4.3.14 Side Destination Sign

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove the seven M4 x 12 screws (1) and M4 plain washers (2) from the cover (3). See Figure 7-89.
2. Remove the cover (3) and the three packing (4).
3. Disconnect the electrical connectors to the Side Destination Sign (5).
4. Remove the four M5 x 16 screws (6), M5 lock washers (7) and M5 plain washers (8).
5. Rotate the Side Destination Sign (5) and remove from the brackets (9).

NOTE: Only proceed with steps 6 and 7 if brackets (9) are damaged.

6. Remove the eight M4 x 16 screws (10), M4 lock washers (11) and M4 plain washers (12) from the brackets (9).
7. Remove the brackets (9) and packing (13).

7.4.3.15 Floor Panels

CAUTION

WHEN GRINDING OUT THE SEAMS OR CUTTING THE FLOOR COVERING, IT IS MANDATORY TO USE THE DUST MASKS AND ALL OTHER PROTECTIVE GARMENTS & GLOVES ALONG WITH THE USE OF A SHOP VAC™.

FOR THE OTHER PARTS OF THESE OPERATIONS, NO ADDITIONAL SAFETY MEASURES NEED BE TAKEN, OTHER THAN THE USE OF SAFETY GLASSES, SAFETY WORK BOOTS AND PROTECTIVE GLOVES.

Remove any seats, stanchions or other equipment which may prevent easy removal of the panel.

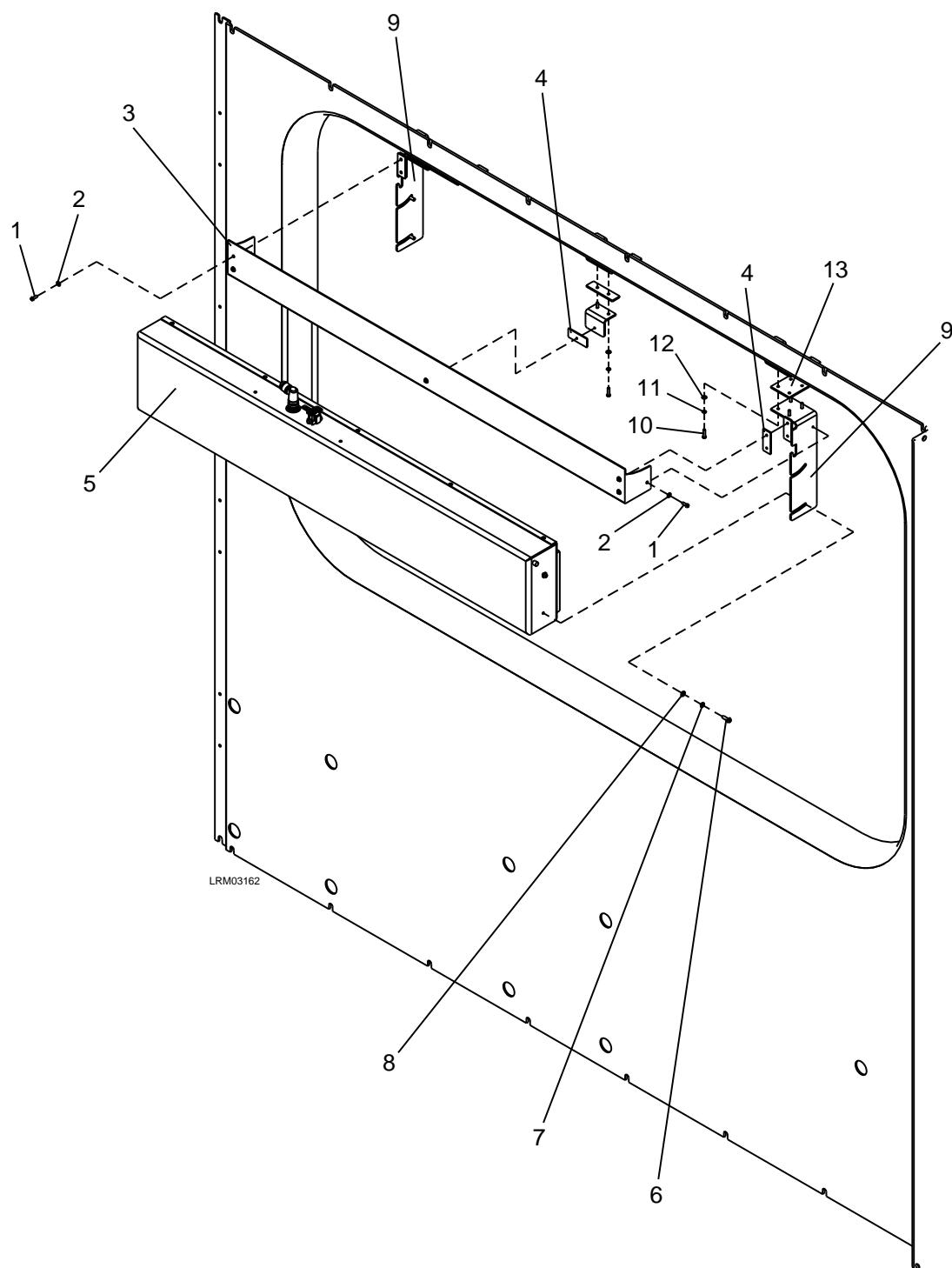


Figure 7-89: Side Destination Sign

1. Locate the floor structures to cut the panels at both side of those.
2. Protect the adjacent panels using masking tape and cardboard or particle board to avoid any damage to the panels during the removal process.
3. Set up the circular saw with a diamond blade of 13.00 mm thickness in order to cut all the Abrastop™ panels. Cut the panel on each side of the floor structure. Use a straight edge as reference to make straight cuts. See Figure 7-90.

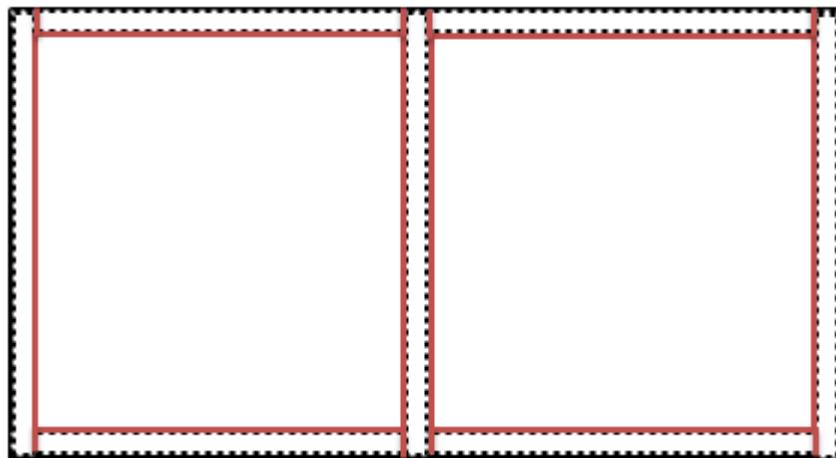


Figure 7-90: Cutting Lines (in red)

NOTE: Make sure an assistant is holding the Shop Vac™ close to the circular saw when cutting; so as to avoid dust proliferation into the air. Dust masks must be worn during this step.

4. Remove the flooring sections cut out.

NOTE: Protect the openings made in the floor to prevent injuries.

5. Cut the panels left over the structures in four sections with the carbide router.

NOTE: Be certain that the direction of rotation of the router is towards the panel which is to be removed and use a Shop Vac™ close to the router; so as to avoid dust proliferation in the air. Use the carbide router because it is impossible to fully cut the panel with the circular saw without damaging the adjacent wall.

6. Using a multi-tool, cut all of the glued joint remaining that could retain the panel to any structures. Remove and discard the remaining sections of the panel.
7. With the same multi-tool or with a paint scraper, remove excess glue on the structure.
8. Cut the sealant flush on the edges of the adjacent flooring panel and external walls.
9. Prepare all bounding surface according to the adhesive manufacturer recommendations.
10. If required, inspect, clean or change the insulation present in the under pan.

7.4.3.16 APC Analyzer

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the side access cover.
2. Disconnect the electrical connectors from the APC Analyzer (4). See Figure 7-91.
3. Remove the six M4 x 12 bolts (1), M4 lock washers (2) and M4 plain washers (3).
4. Remove the APC Analyzer (4).
5. Close and lock the side access cover using a crew key.

7.4.4 Seats

See Figures 2-11 and 7-92 through 7-97.

The seating arrangement consists of six kinds of passenger seats.

- six 2P LH 36" Cantilever w/Grab Bar, No Stanchion and five 2P RH 36" Cantilever w/Grab Bar, No Stanchion each A and B-Unit
- four 2P LH 36" Cantilever w/Grab Bar, w/Stanchion and four 2P RH 36" Cantilever w/Grab Bar, w/Stanchion on each A and B-Unit
- two 2P LH 34" Cantilever Door Pocket w/Grab Bar, w/Stanchion and one 2P RH 34" Cantilever Door Pocket w/Grab Bar, w/Stanchion on each A and B-Unit
- four 2P Longitudinal Flip Seats on each A and B-Unit
- two 2P LH Cantilever, Reserved and 2P RH Cantilever, Reserved on each A and B-Unit
- two 2P LH Sandbox Seats / 2P RH Sandbox Seats on each A and B-Unit

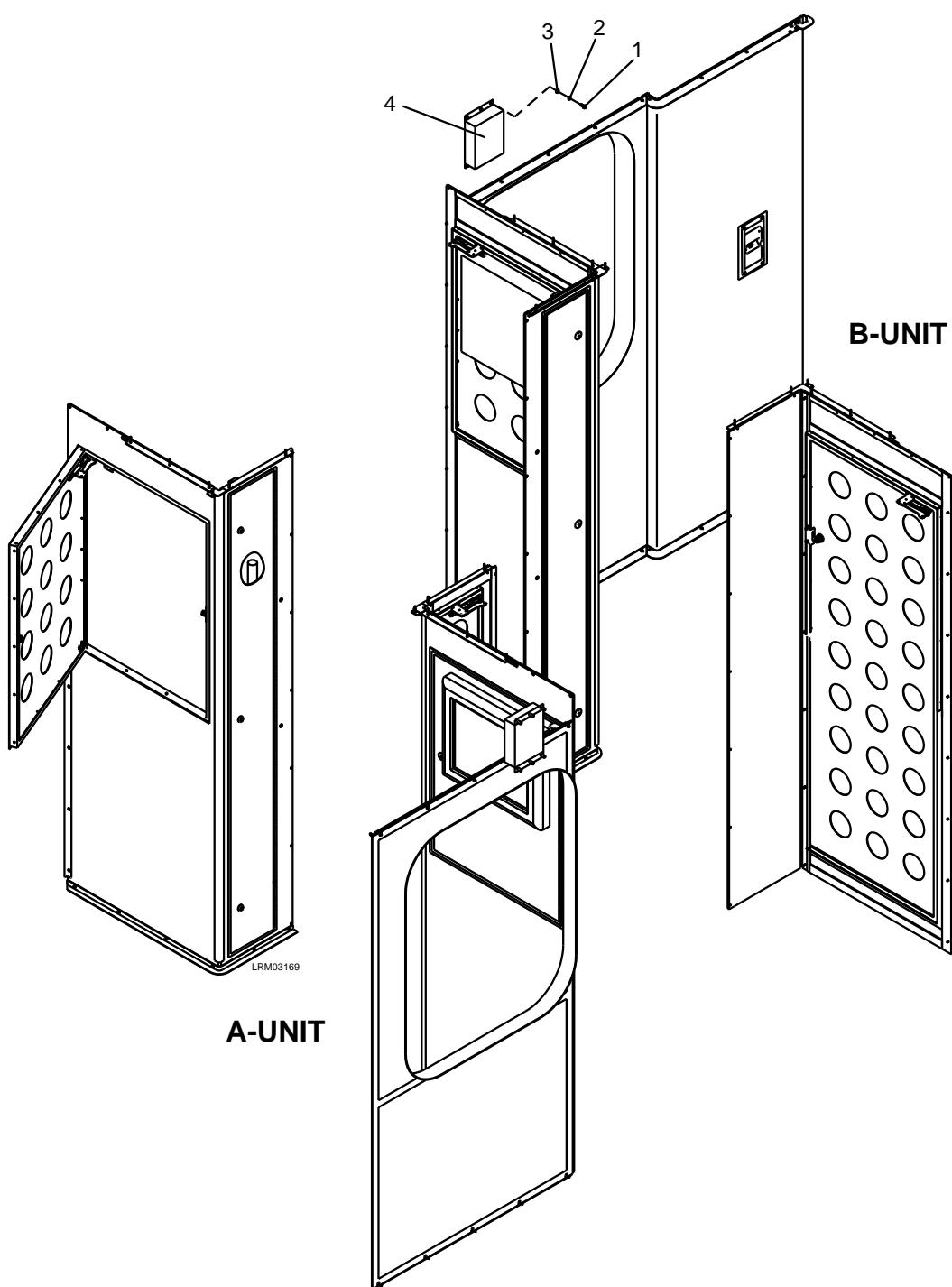


Figure 7-91: APC Analyzer

7.4.4.1 2P LH & RH 36" Cantilever w/Grab Bar, No Stanchion

1. Remove four lock nuts (4) and flat washers (15) from the cushion assemblies (3).
2. Remove the cushion assemblies (3).

NOTE: Only lift the front of the bottom cushion just enough to clear the threaded studs out of the mounting plate hole. Lifting the front higher while rear screws are still engaged in the slots will distort or damage the profile of the seat frame resulting in bottom cushion fit failure.

3. Lift the front of the bottom seat cushion (3) and pull the cushion forward to release the rear clips.
4. Remove the seatback cushions (14) by pulling down on the cushions to release the seatback cushions from the slots in the seat frame assembly (1). See Figure 7-92.
5. Remove three screws (8), three lock washers (9), three plain washers (10), four screws (5), four lock washers (6), and four plain washers (7) that attach the seat assembly (1) to the cantilever (2).
6. Remove the seat frame assembly (1) from the cantilever (2).
7. Remove the four M12 screws (11), M12 lock washers (12), and M12 plain washers (13) that mount the cantilever (2) to the wall of the car.

7.4.4.2 2P LH & RH 36" Cantilever w/Grab Bar, w/Stanchion

1. Remove the attaching hardware (14) that mounts the seat assembly to the car grab pole (15). See Figure 7-93.
2. Remove four lock nuts (4) and flat washers (17) from the cushion assemblies (3).
3. Remove the cushion assemblies (3).

NOTE: Only lift the front of the bottom cushion just enough to clear the threaded studs out of the mounting plate hole. Lifting the front higher while rear screws are still engaged in the slots will distort or damage the profile of the seat frame resulting in bottom cushion fit failure.

4. Lift the front of the bottom seat cushion (3) and pull the cushion forward to release the rear clips.
5. Remove the seatback cushions (16) by pulling down on the cushions to release the seatback cushions from the slots in the seat frame assembly (1).
6. Remove three screws (8), three lock washers (9), three plain washers (10), four screws (5), four lock washers (6), and four plain washers (7) that attach the seat assembly (1) to the cantilever (2).
7. Remove the seat frame assembly (1) from the cantilever (2).
8. Remove the four M12 screws (11), M12 lock washers (12), and M12 plain washers (13) that mount the cantilever (2) to the wall of the car.

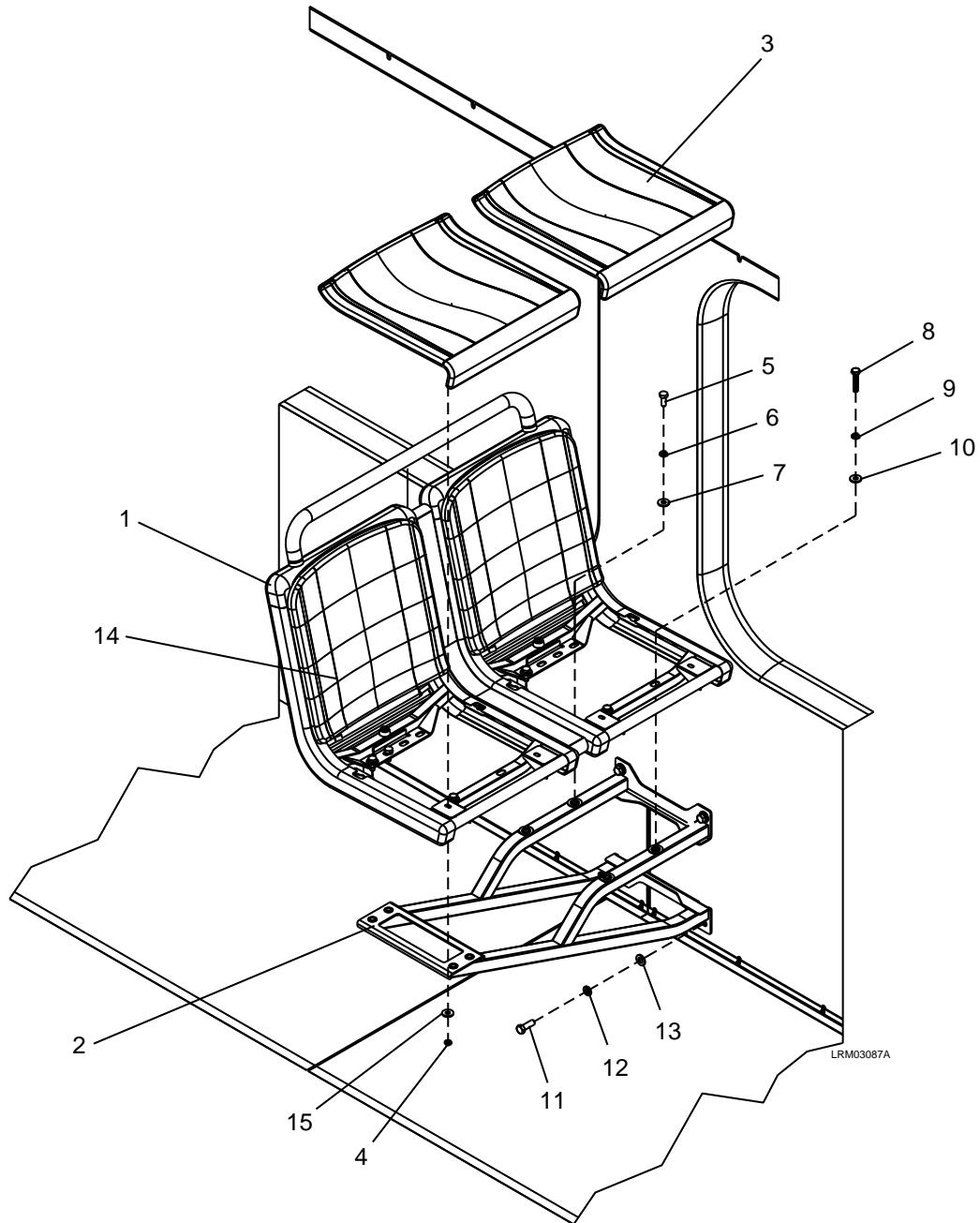


Figure 7-92: 2P LH & RH 36" Cantilever w/Grab Bar, No Stanchion

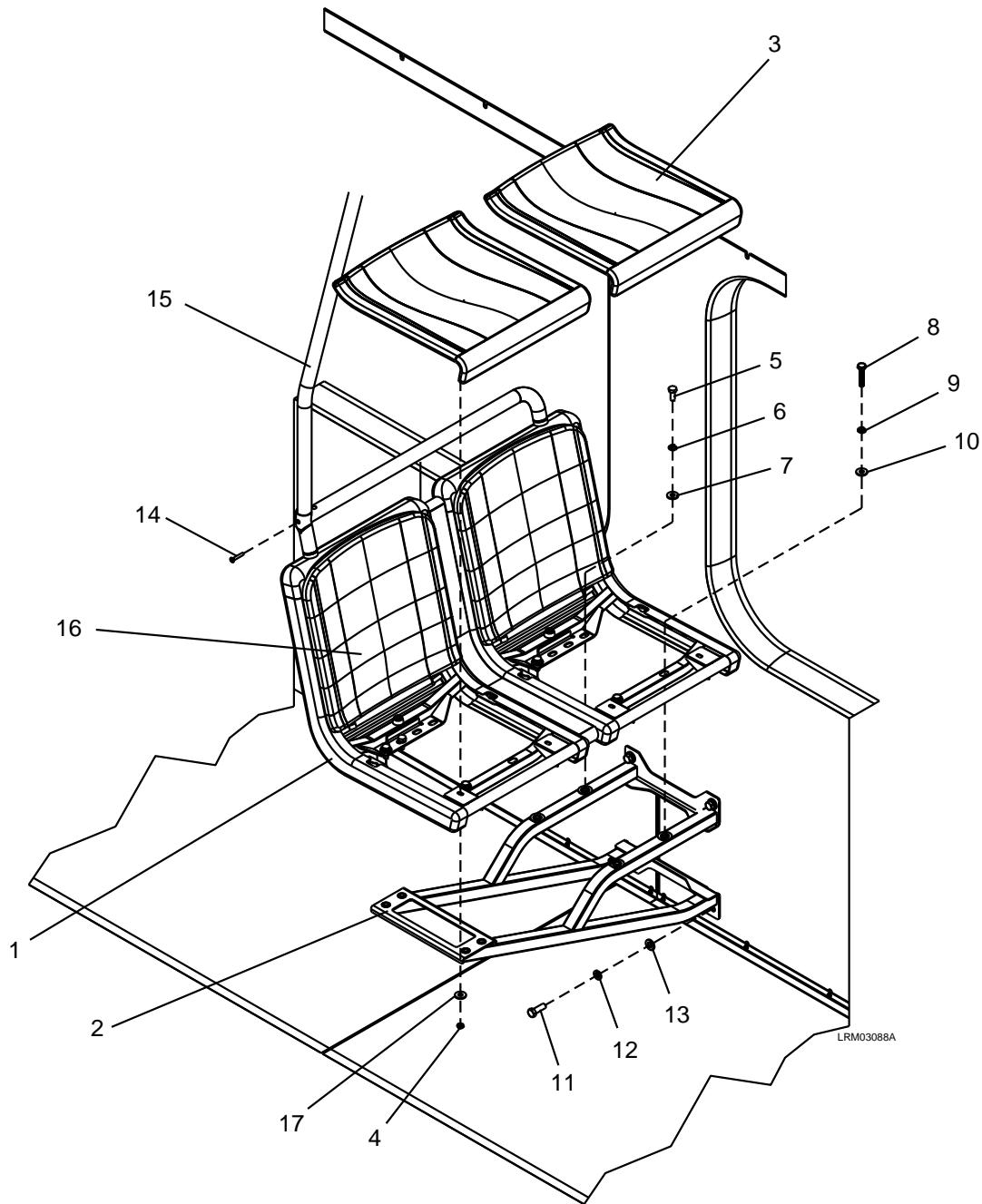


Figure 7-93: 2P LH & RH 36" Cantilever w/Grab Bar, w/Stanchion

7.4.4.3 2P LH & RH 34" Cantilever Door Pocket w/Grab Bar, w/Stanchion

1. Remove the attaching hardware (14) that mounts the seat assembly to the car grab pole (15). See Figure 7-94.
2. Remove four lock nuts (4) and flat washers (17) from the cushion assemblies (3).
3. Remove the cushion assemblies (3).

NOTE: Only lift the front of the bottom cushion just enough to clear the threaded studs out of the mounting plate hole. Lifting the front higher while rear screws are still engaged in the slots will distort or damage the profile of the seat frame resulting in bottom cushion fit failure.

4. Lift the front of the bottom seat cushion (3) and pull the cushion forward to release the rear clips.
5. Remove the seatback cushions (16) by pulling down on the cushions to release the seatback cushions from the slots in the seat frame assembly (1).
6. Remove three screws (8), three lock washers (9), three plain washers (10), four screws (5), four lock washers (6), and four plain washers (7) that attach the seat assembly (1) to the cantilever (2).
7. Remove the seat frame assembly (1) from the cantilever (2).
8. Remove the four M12 screws (11), M12 lock washers (12), and M12 plain washers (13) that mount the cantilever (2) to the wall of the car.

7.4.4.4 2P Longitudinal Flip Seat

NOTE: The steps in Section 7.4.4.4.1 and 7.4.4.4.2 of this manual section are for cushion assembly removal and are not required to remove the flip seat assembly.

1. Remove the two M12 x 35 bolts (2), M12 lock washers (3), and M12 plain washers (4) that secure the seat assembly to the floor. See Figure 7-95.
2. Remove the two M12 x 35 bolts (5), M12 lock washers (6), and M12 plain washers (7) that secure the seat assembly to the wall.
3. Carefully remove the flip seat assembly (1).

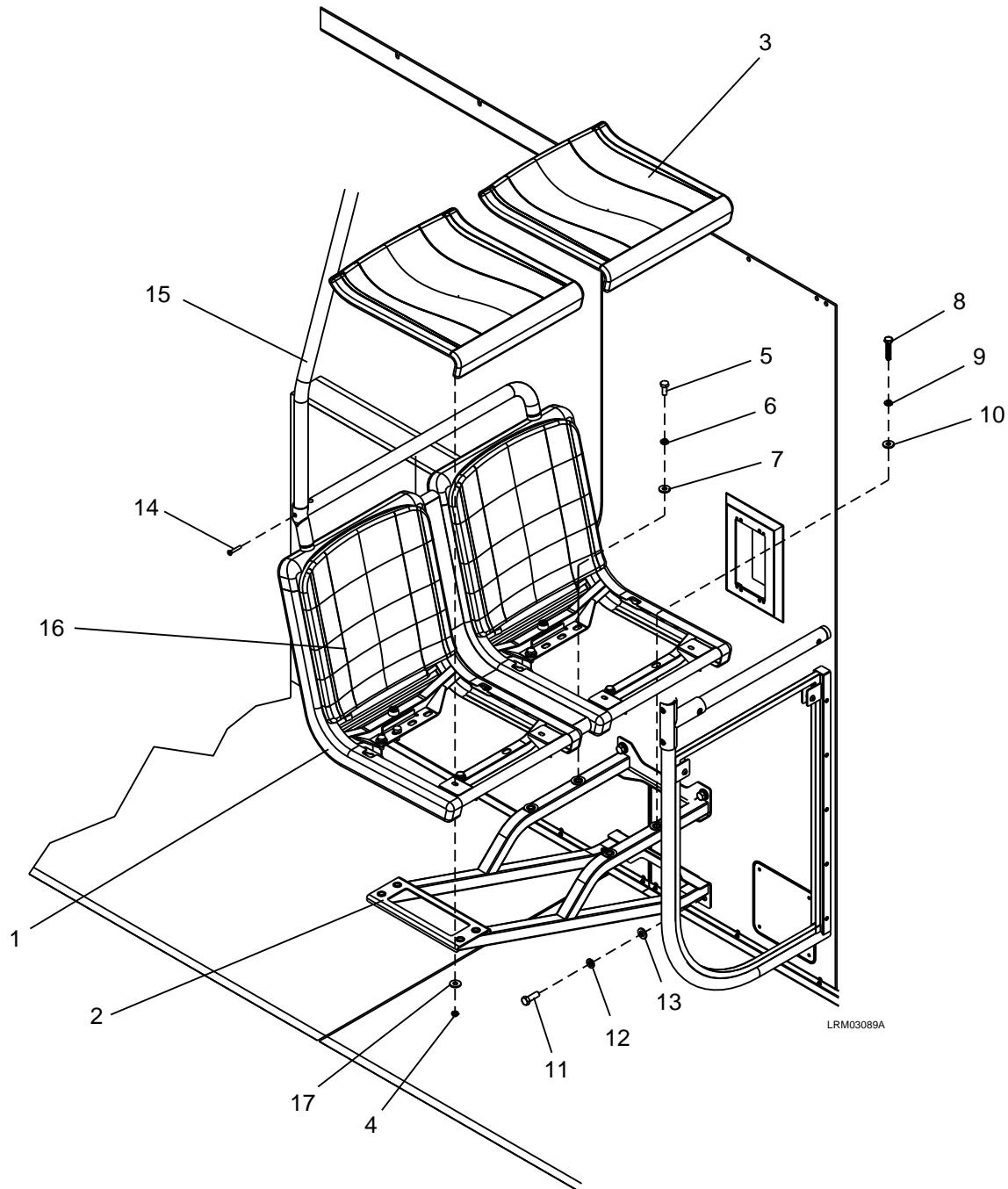


Figure 7-94: 2P LH & RH 34" Cantilever Door Pocket w/Grab Bar, w/Stanchion

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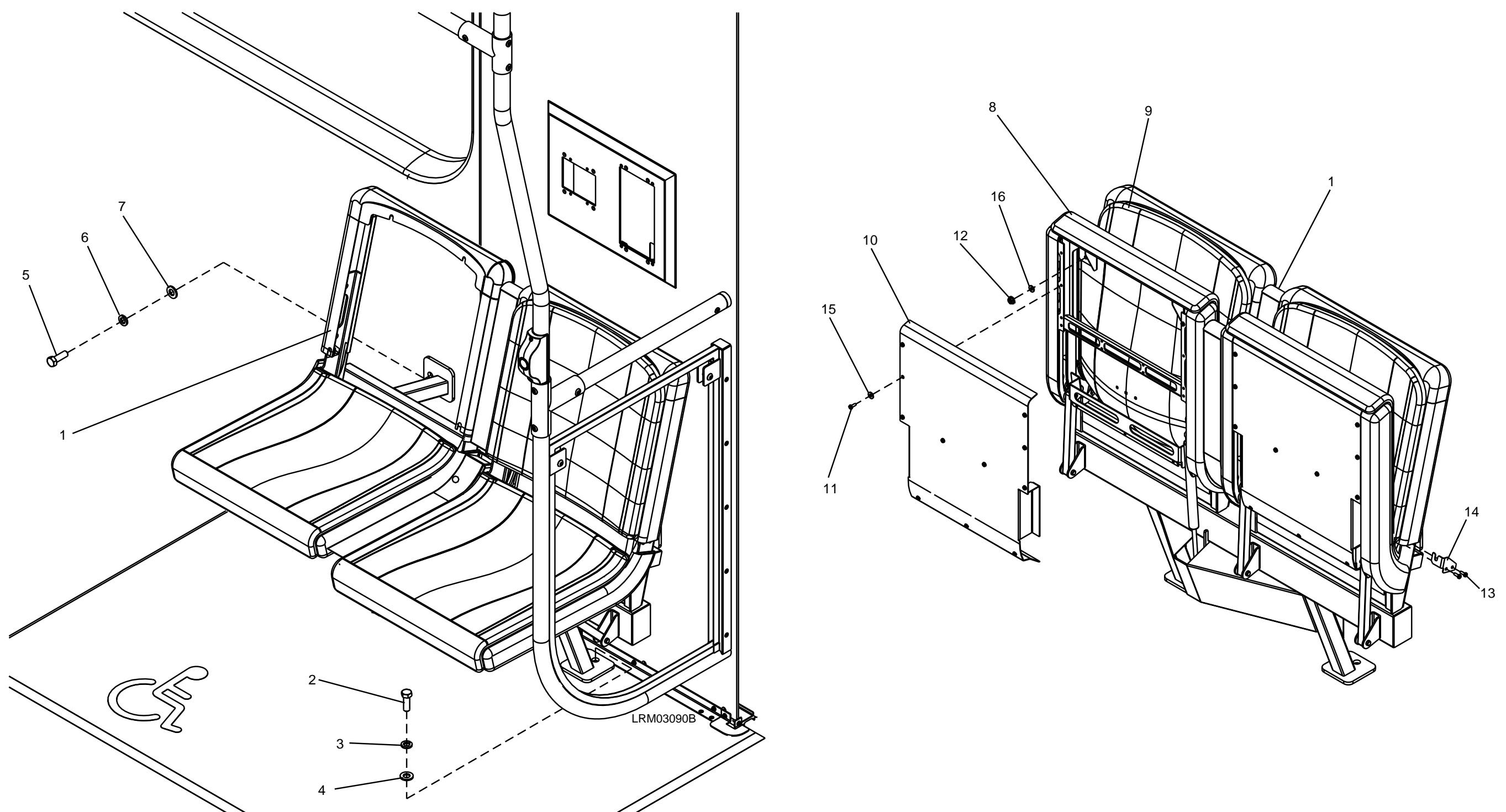


Figure 7-95: 2P Longitudinal Flip Seat

7.4.4.4.1 Bottom Seat Cushion Removal

1. With the seat bottom in the up position, remove the eleven #10-32 x 1/2" spanner head screws (11) and #10 plain washers (15) that attach the close out panel (10) to the seat assembly (1). See Figure 7-95.
2. Remove the close out panel (10).
3. Remove the two 1/4-20 lock nuts (12) and flat washer (16) that secure the cushion assembly (8) to the seat frame.

NOTE: Only lift the front of the bottom cushion just enough to clear the threaded studs out of the mounting plate hole. Lifting the front higher while rear screws are still engaged in the slots will distort or damage the profile of the seat frame resulting in bottom cushion fit failure.

4. Remove the bottom seat cushion (8) by lifting the front edge and pulling the cushion forward to release the rear clips.

7.4.4.4.2 Seat Back Cushion Removal

1. With the seat in the bottom position, remove the two #10-32 x 1/2" spanner head screws (13) securing the onsert keeper (14). See Figure 7-95.
2. Slide the onsert keeper (14) down and remove.
3. Pull straight downward on the seatback cushion assembly (9) to disengage the top clips from the seat frame.

7.4.4.5 2P LH & RH Cantilever, Reserved

1. Remove four lock nuts (4) and flat washers (15) from the cushion assemblies (3).
2. Remove the cushion assemblies (3).

NOTE: Only lift the front of the bottom cushion just enough to clear the threaded studs out of the mounting plate hole. Lifting the front higher while rear screws are still engaged in the slots will distort or damage the profile of the seat frame resulting in bottom cushion fit failure.

3. Lift the front of the bottom seat cushion (3) and pull the cushion forward to release the rear clips.
4. Remove the seatback cushions (14) by pulling down on the cushions to release the seatback cushions from the slots in the seat frame assembly (1). See Figure 7-96.

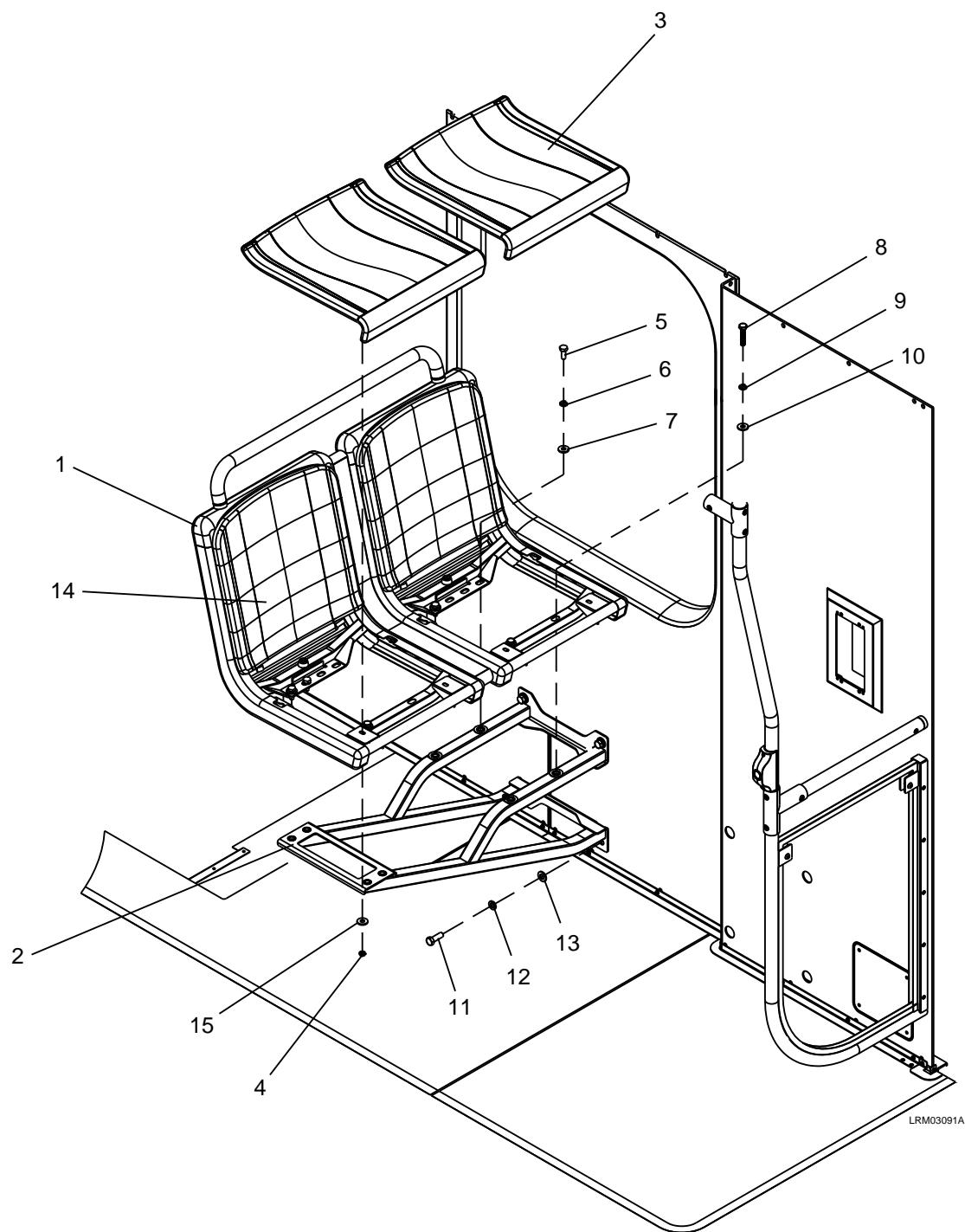


Figure 7-96: 2P LH & RH Cantilever, Reserved

5. Remove three screws (8), three lock washers (9), three plain washers (10), four screws (5), four lock washers (6), and four plain washers (7) that attach the seat assembly (1) to the cantilever (2).
6. Remove the seat frame assembly (1) from the cantilever (2).
7. Remove the four M12 screws (11), M12 lock washers (12), and M12 plain washers (13) that mount the cantilever (2) to the wall of the car.

7.4.4.6 2P LH & RH Sandbox Seat

1. Turn the latches (2) to unlock the seat. See Figure 7-97.
2. Remove the six M6 x 20 bolts (3) and M6 lock washers (4).
3. Carefully remove the Seat Assembly (1) to a level area.
4. Remove four M6 x 20 bolts (8) and M6 lock washers (9) and remove the two hinges (7).
5. Remove four M6 x 20 screws (6). Remove the bracket (4) from the Seat Assembly (1).

7.4.4.6.1 Cushion Removal

1. Remove four lock nuts (11) and flat washers (13) from the cushion assemblies (10). See Figure 7-97.
2. Remove the cushion assemblies (10).

NOTE: Only lift the front of the bottom cushion just enough to clear the threaded studs out of the mounting plate hole. Lifting the front higher while rear screws are still engaged in the slots will distort or damage the profile of the seat frame resulting in bottom cushion fit failure.

3. Lift the front of the bottom seat cushion (10) and pull the cushion forward to release the rear clips.
4. Remove the seatback cushions (12) by pulling down on the cushions to release the seatback cushions from the slots in the seat frame assembly (1). See Figure 7-97.

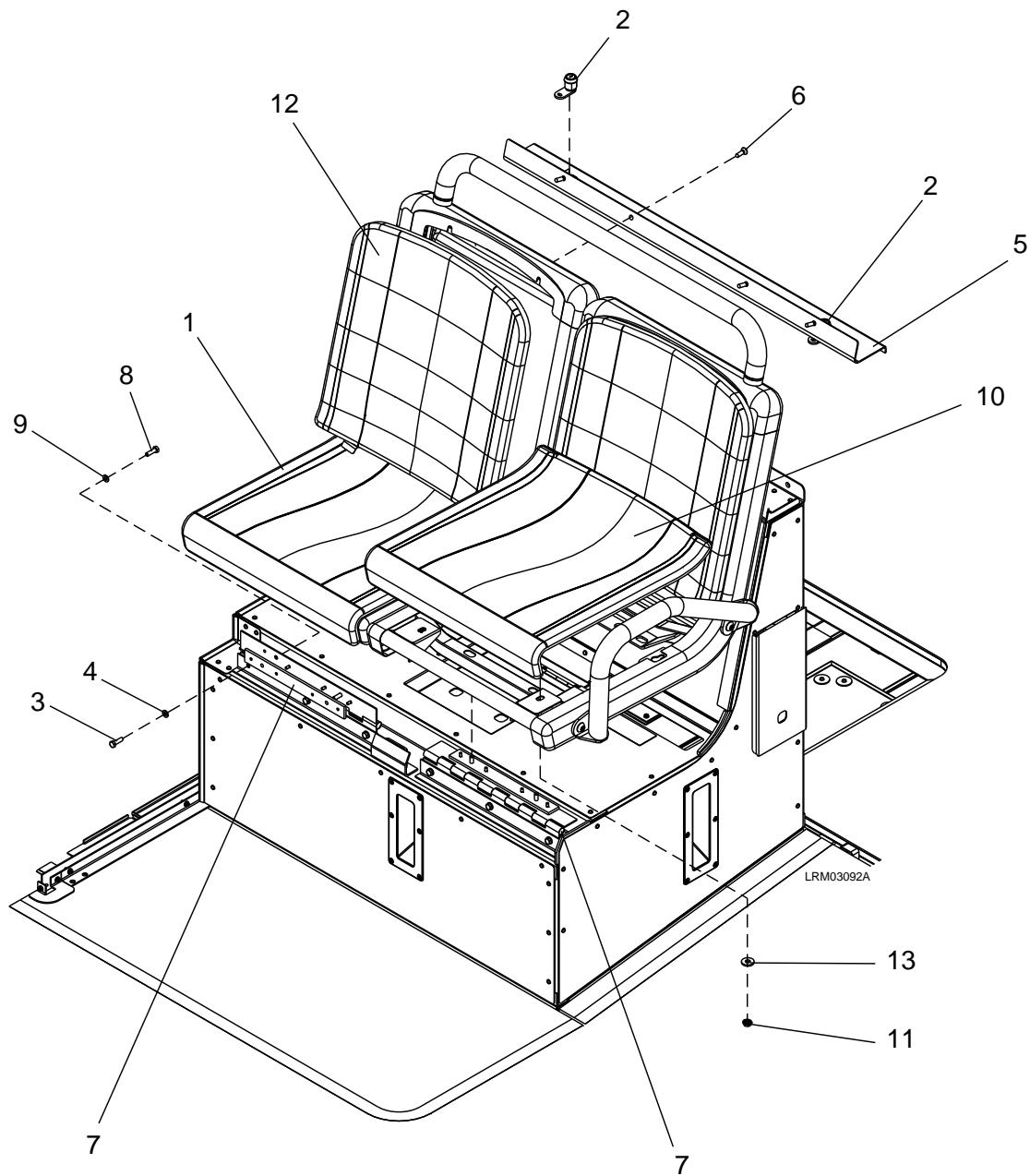


Figure 7-97: 2P LH & RH Sandbox Seat

7.4.5 Electric Locker Equipment

See Figures 2-12 through 2-15 and 7-98 through 7-100.

The electric lockers consist of the following equipment:

- one Auxiliary Circuit Breaker
- two AC Circuit Breaker Panels
- six LVDC Terminal Blocks
- one High Speed Circuit Breaker Control Panel
- one APC COPILOTpc
- one Network Video Recorder (NVR)
- one Electronic Control Unit, Center Truck
- two Terminal Boards
- two Ethernet Switches
- one Track Brake Contactor Panel
- two Convenience Outlets
- one Electronic Control Unit Pull Down Resistor
- one ARP1B Relay Panel

7.4.5.1 Auxiliary Circuit Breaker

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the A-Unit electric locker door.
2. Disconnect the #6 electrical connections to the Auxiliary Circuit Breaker (4). See Figure 7-98.
3. Remove the two M4 x 80 screws (1), M4 lock washers (2) and M4 plain washers (3) from the auxiliary circuit breaker (4).
4. Remove the Auxiliary Circuit Breaker (4).
5. Close and lock the A-Unit electric locker door using a crew key.

7.4.5.2 AC Circuit Breaker Panel

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

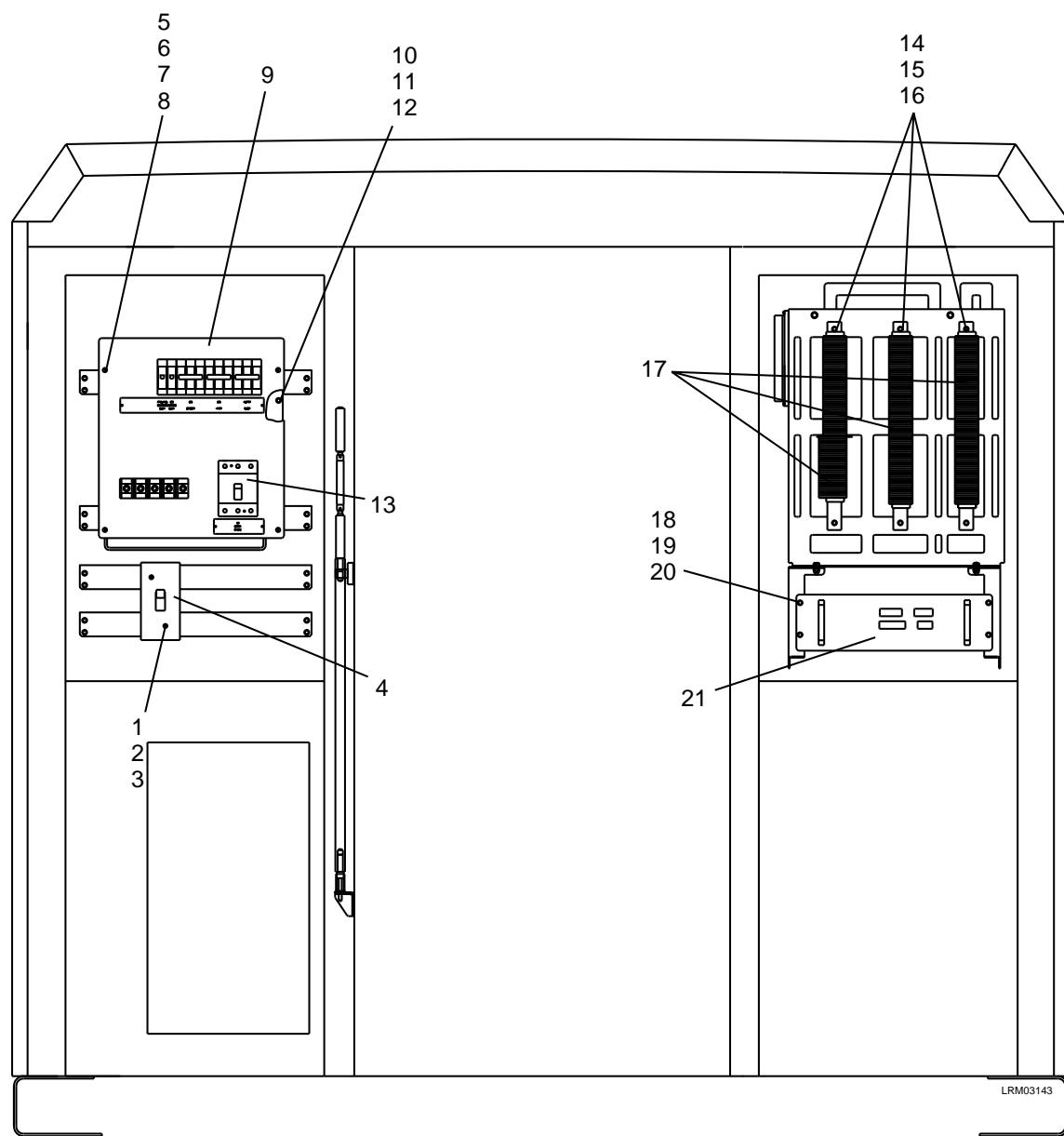
1. Using a crew key, unlock and open the electric locker door.
2. Remove the four M4 x 12 screws (5), M4 lock washers (6), M4 plain washers (7) and protection rubber (8) from the cover (9). See Figures 7-98 and 7-99.
3. Remove the cover (9).
4. Disconnect the #6 electrical connections to the AC Circuit Breaker Panel (13).
5. Remove the four M6 x 35 bolts (10), M6 lock washers (11) and M6 plain washers (12).
6. Remove the AC Circuit Breaker Panel (13).
7. Close and lock the electric locker door using a crew key.

7.4.5.3 LVDC Terminal Block

WARNING

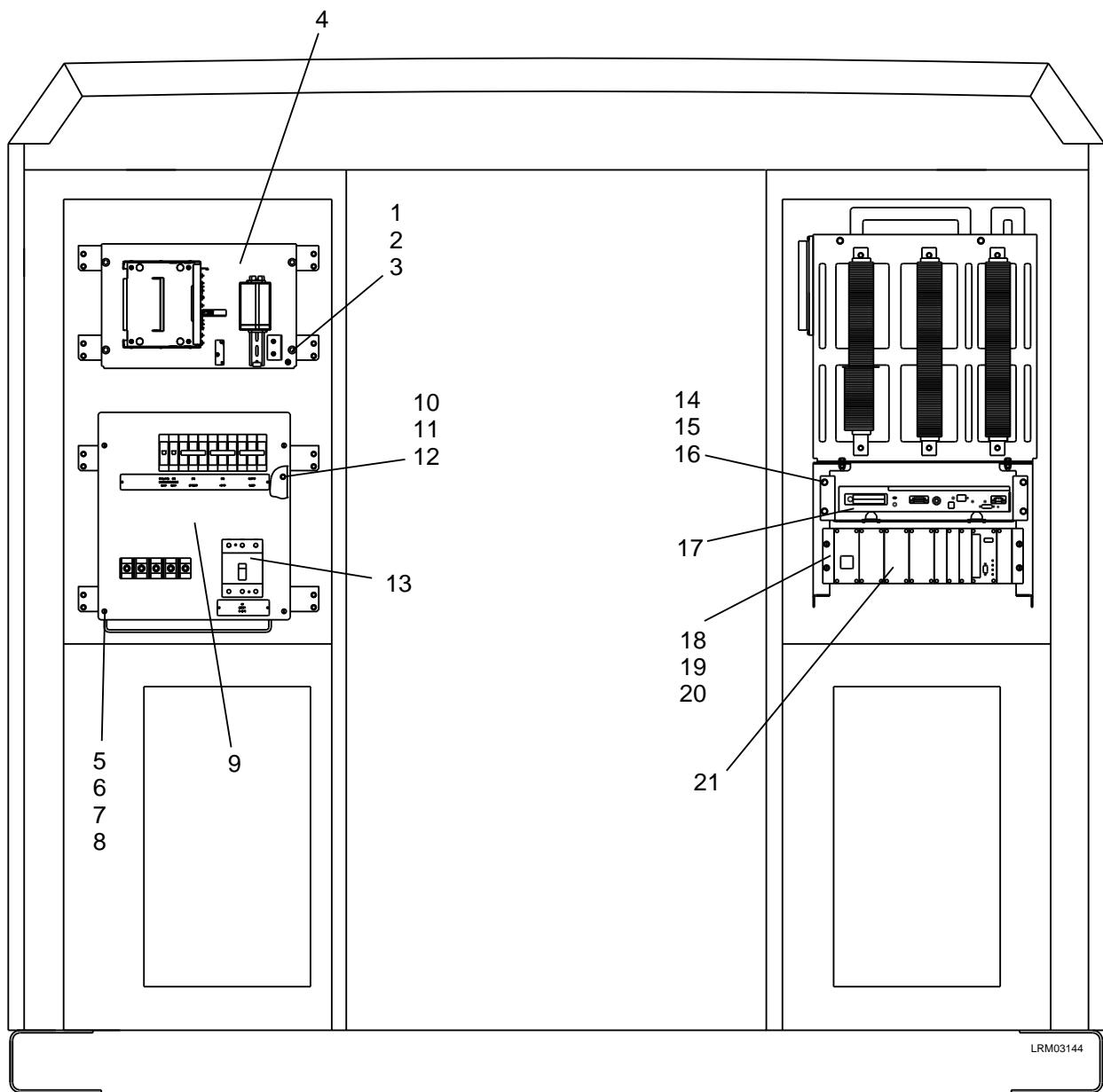
BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the electric locker door.
2. Disconnect the WAGO terminal electrical connections from the LVDC Terminal Block (17). See Figures 7-98 and 7-99.
3. Remove the two M5 x 16 bolts (14), M5 lock washers (15) and M5 plain washers (16).
4. Remove an LVDC Terminal Block (17).
5. Repeat steps 2 and 3 for the remaining two LVDC Terminal Block (17).
6. Close and lock the electric locker door using a crew key.



A-UNIT

Figure 7-98: Front Articulation Electric Locker, A Unit



B-UNIT

Figure 7-99: Front Articulation Electric Locker, B Unit

7.4.5.4 High Speed Circuit Breaker Control Panel

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the A-Unit electric locker door.
2. Disconnect the electrical connectors from the High Speed Circuit Breaker Control Panel (21). See Figure 7-98.
3. Remove the four M6 x 20 bolts (18), M6 lock washers (19) and M6 plain washers (20).
4. Remove the High Speed Circuit Breaker Control Panel (21).
5. Close and lock the A-Unit electric locker door using a crew key.

7.4.5.5 APC COPILOTpc

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the B-Unit electric locker door.
2. Disconnect the electrical connectors and WAGO terminals from the APC COPILOTpc Rack (4). See Figure 7-99.
3. Remove the four M6 x 20 bolts (1), M6 lock washers (2) and M6 plain washers (3).
4. Remove the APC COPILOTpc Rack (4).
5. Close and lock the B-Unit electric locker door using a crew key.

7.4.5.6 Network Video Recorder (NVR)

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the B-Unit electric locker door.
2. Disconnect the electrical connectors from the Network Video Recorder (17). See Figure 7-99.
3. Remove the four M8 x 20 bolts (14), M8 lock washers (15) and M8 plain washers (16).
4. Remove the Network Video Recorder (17).
5. Close and lock the B-Unit electric locker door using a crew key.

7.4.5.7 Electronic Control Unit, Center Truck

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the B-Unit electric locker door.
2. Disconnect the electrical connectors from the Electronic Control Unit, Center Truck (21). See Figure 7-99.
3. Remove the four M6 x 16 screws (18), M6 lock washers (19) and M6 plain washers (20).
4. Remove the Electronic Control Unit, Center Truck (21).
5. Close and lock the B-Unit electric locker door using a crew key.

7.4.5.8 Terminal Board

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the electric locker door.
2. Disconnect the WAGO electrical connections from the Terminal Board (4). See Figure 7-100.
3. Remove the four M5 x 35 screws (1), M5 lock washers (2) and M5 plain washers (3).
4. Remove the Terminal Board (4).
5. Repeat steps 1 through 3 for the remaining Terminal Board (4).
6. Close and lock the electric locker door using a crew key.

7.4.5.9 Ethernet Switch

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the electric locker door.
2. Disconnect the electrical connectors from the Ethernet Switch (8). See Figure 7-100.
3. Remove the M5 x 16 screws (5), M5 lock washers (6) and M5 plain washers (7).
4. Remove the Ethernet Switch (8).
5. Repeat steps 1 through 3 for the remaining Ethernet Switch (8).
6. Close and lock the electric locker door using a crew key.

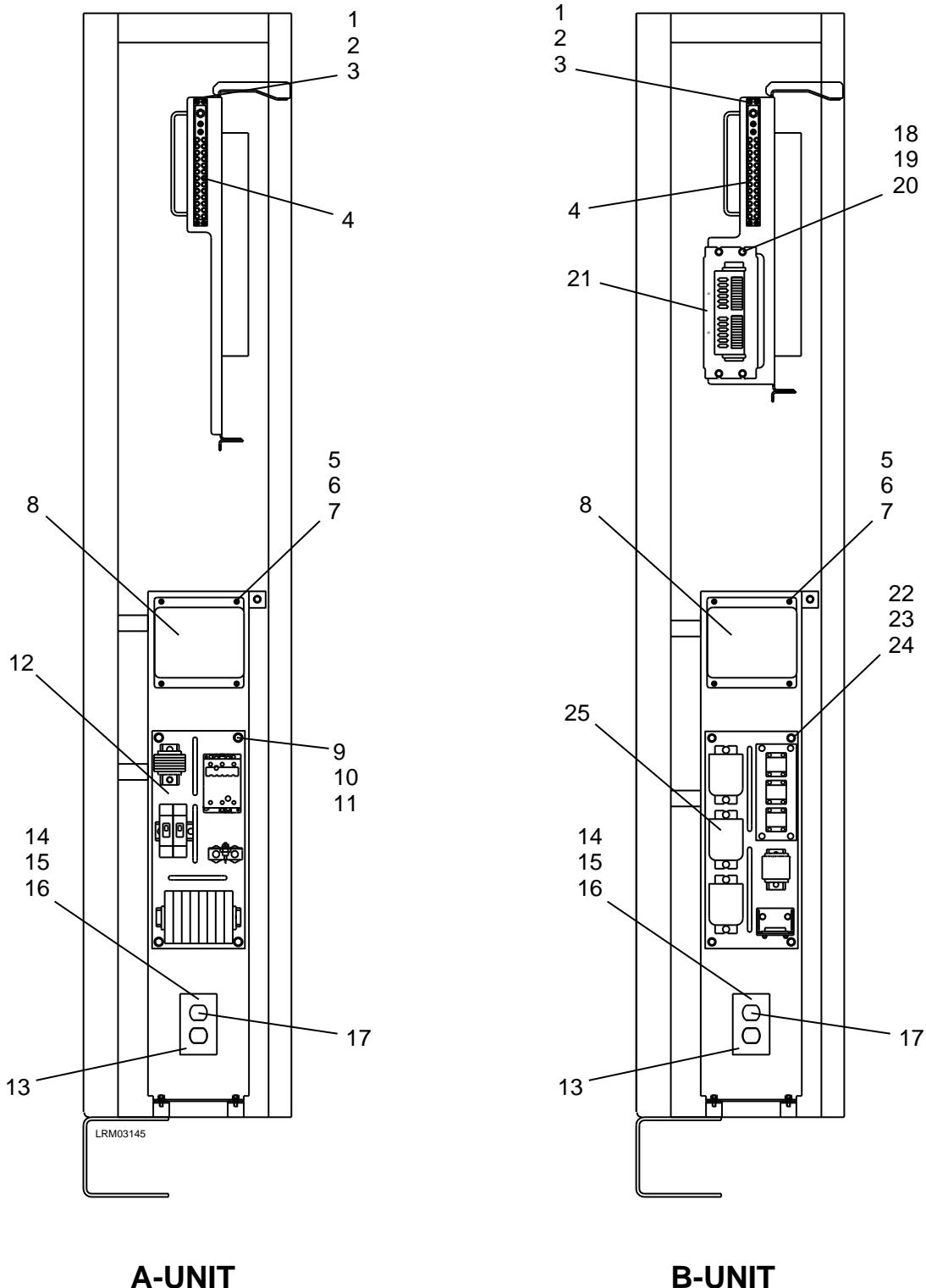


Figure 7-100: Side Articulation Electric Lockers, A and B Unit

7.4.5.10 Track Brake Contactor Panel

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the A-Unit electric locker door.
2. Disconnect the WAGO electrical connections from the Track Brake Contactor Panel (12). See Figure 7-100.
3. Remove the four M8 x 25 bolts (9), M8 lock washers (10) and M8 plain washers (11).
4. Remove the Track Brake Contactor Panel (12).
5. Close and lock the A-Unit electric locker door using a crew key.

7.4.5.11 Convenience Outlet

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the electric locker door.
2. Remove the cover (13). See Figure 7-100.
3. Disconnect the #10 electrical connections from the Convenience Outlet (17).
4. Remove the two M4 x 16 screws (14), M4 lock washers (15) and M4 plain washers (16).
5. Remove the Convenience Outlet (17).
6. Repeat steps 1 through 4 for the remaining Convenience Outlet (17).
7. Close and lock the electric locker door using a crew key.

7.4.5.12 Electronic Control Unit Pull Down Resistor

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the B-Unit electric locker door.
2. Disconnect the WAGO electrical connections from the Electronic Control Unit Pull Down Resistor (21). See Figure 7-100.
3. Remove the four M6 x 16 bolts (18), M6 lock washers (19) and M6 plain washers (20).
4. Remove the Electronic Control Unit Pull Down Resistor (21).
5. Close and lock the B-Unit electric locker door using a crew key.

7.4.5.13 ARP1B Relay Panel

NOTE: To remove an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the B-Unit electric locker door.
2. Disconnect the electrical connector from the ARP1B Relay Panel (25). See Figure 7-100.
3. Remove the four M8 x 25 bolts (22), M8 lock washers (23) and M8 plain washers (24).
4. Remove the ARP1B Relay Panel (25).
5. Close and lock the B-Unit electric locker door.

7.4.6 Undercar Mounted Equipment

The undercar mounted equipment consists of all equipment that is fastened and mounted to the underside of the vehicle. See Figures 2-16 and 7-101 through 7-116. The undercar mounted equipment consists of the following components:

- one Coupler on each A and B-Unit
- two types of TWC Antennas on each A and B-Unit
- two Sanding Devices on each A and B-Unit
- two Main Reservoirs on the B-Unit
- one Brake Supply Reservoir on the A-Unit and two Brake Supply Reservoirs on the B-end
- one Air Compressor on the B-Unit
- one Brake Control Unit (Motor Truck) on each A and B-Unit
- one Brake Control Unit (Center Truck) on the A-Unit
- one Auxiliary Power Supply on the A-Unit
- one Battery / Battery Circuit Breaker Box on the A-Unit
- one Propulsion Inverter on each A and B-Unit
- one Line Reactor on each A and B-Unit
- one Knife Switch on the A-Unit
- one Horn on each A and B-Unit

7.4.6.1 Coupler

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THESE DEVICES AND/OR ANY COMPONENT PARTS ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THESE DEVICES AND/OR COMPONENT PARTS.

1. Disconnect the electrical connectors (7) to the car body. See Figure 7-102.
2. Close the Coupler Cutout Cock by rotating the handle 90 degrees so that the indicator on the Cutout Cock handle is perpendicular to the airline. See Figure 7-101 for location of the Coupler Cutout Cock.
3. Disconnect the air connections to the Coupler (1).
4. Remove the four M24 ESNA nuts (5) and M24 plain washers (4), M24 x 170 bolts (2), and M24 plain washers (3).
5. Carefully remove the Coupler (1) from the mounting bracket (6).

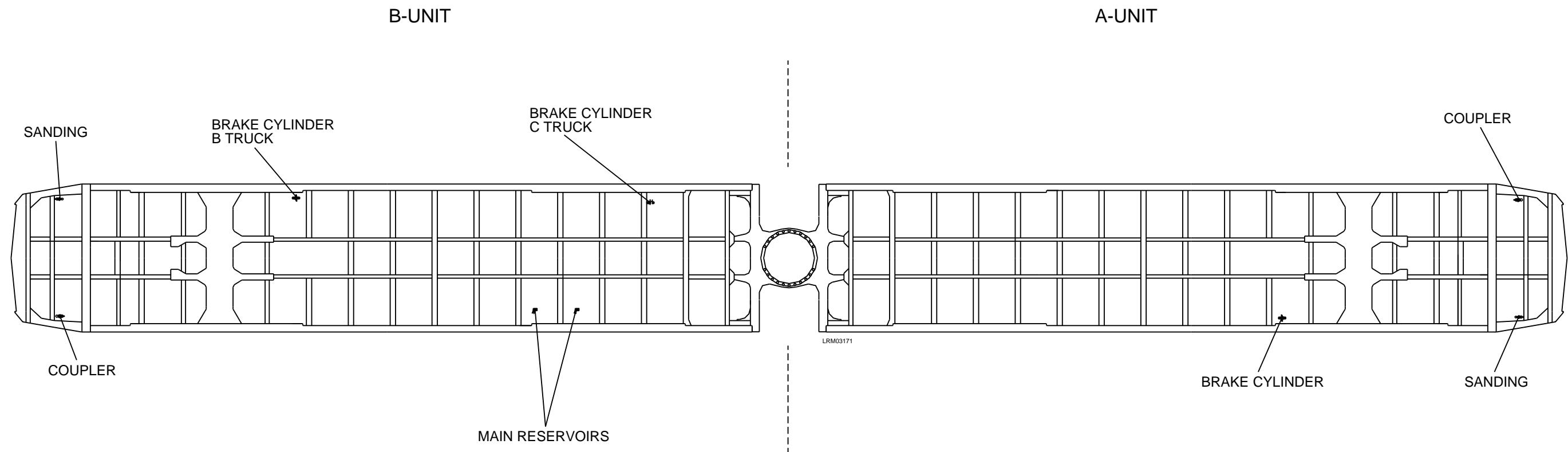


Figure 7-101: Cutout Cock Locations

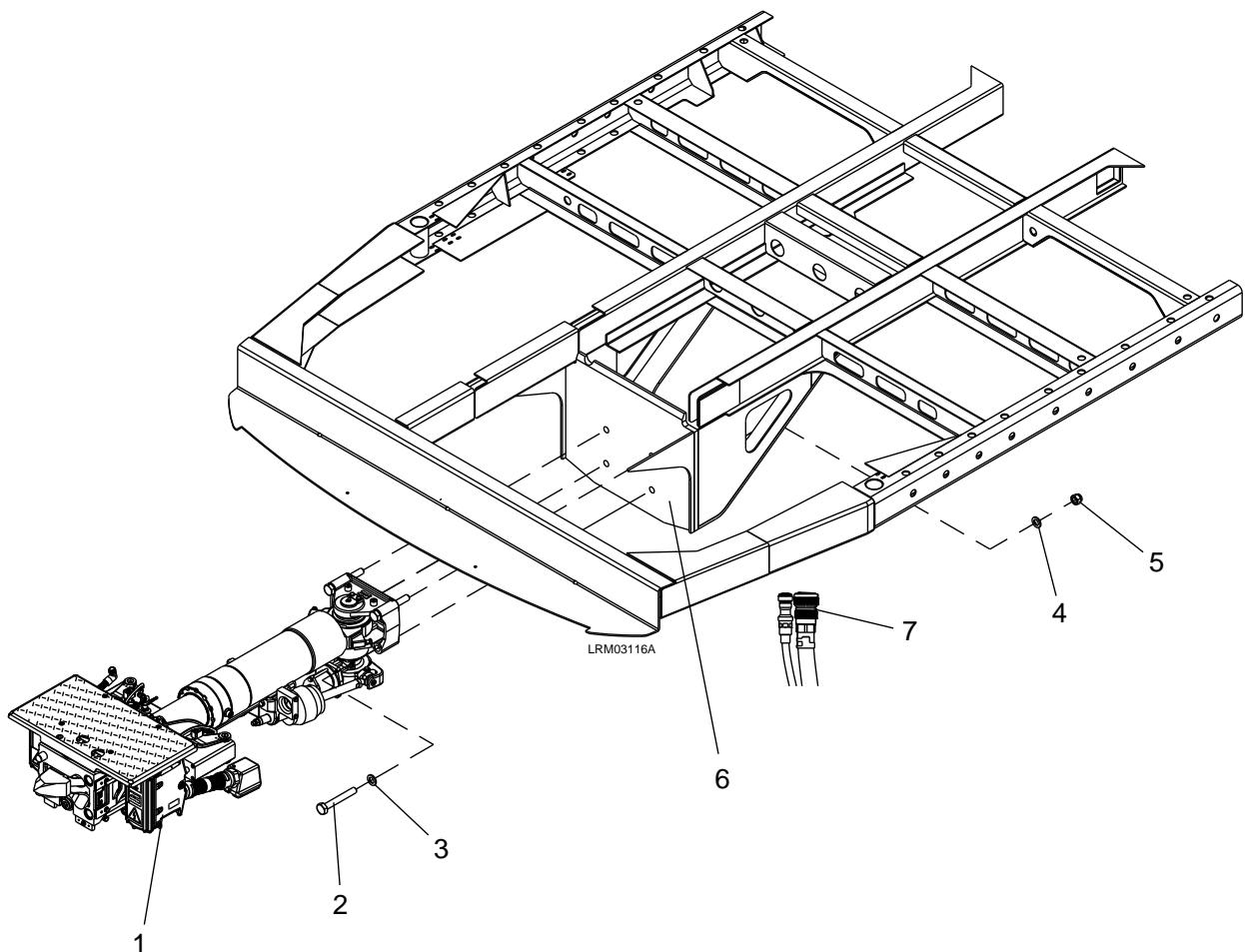


Figure 7-102: Coupler

7.4.6.2 TWC Antenna

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the electrical connectors (17 and 18) from the two TWC Antennas (1 and 2).
2. Remove the four M6 ESNA nuts (6), M6 plain washers (5), M6 x 25 bolts (3) and M6 plain washers (4). See Figure 7-103.
3. Carefully remove the TWC Antenna (1).

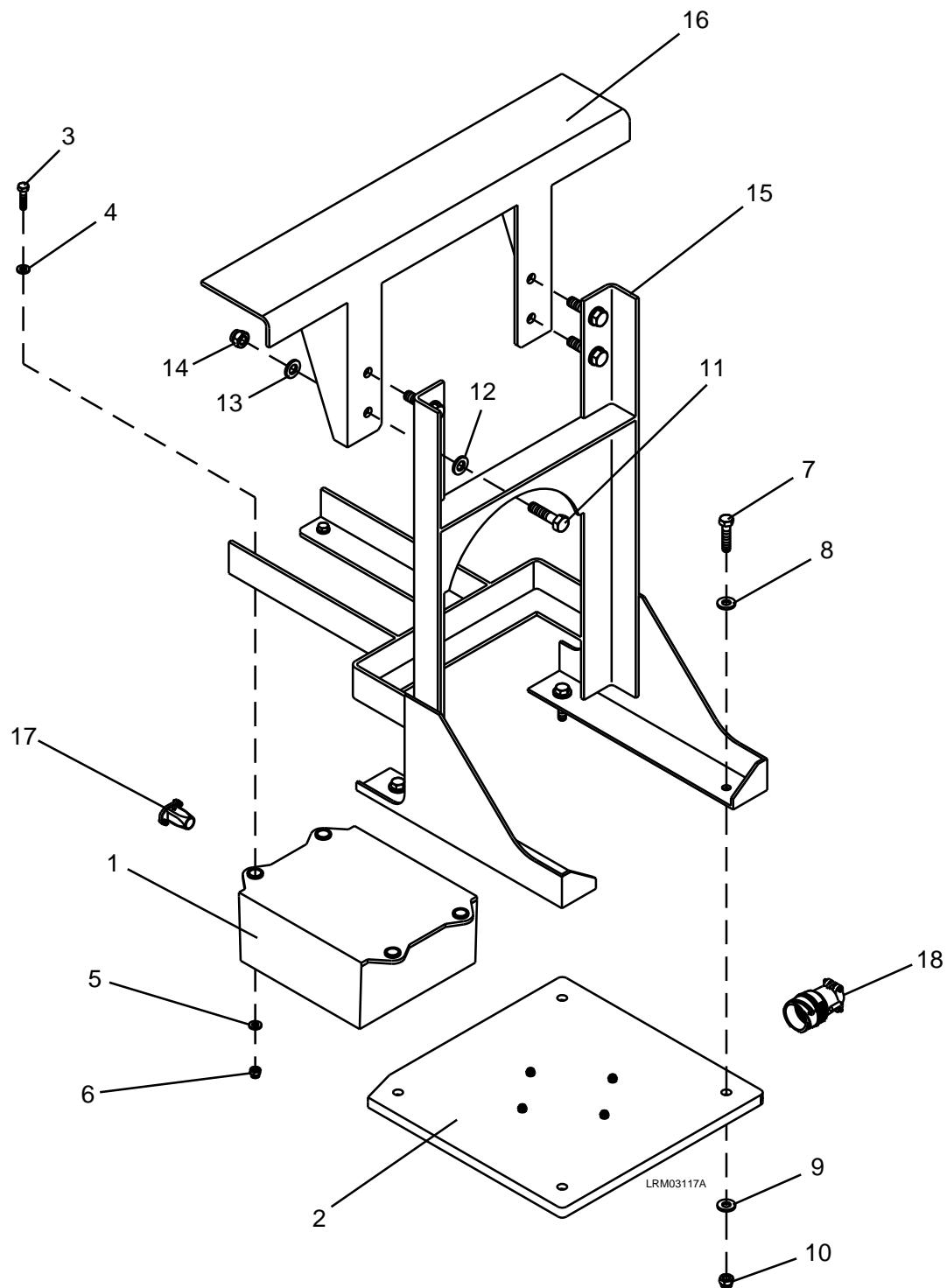


Figure 7-103: TWC Antenna

4. Remove the four M8 ESNA nuts (10), M8 plain washers (9), M8 x 35 bolts (7) and M8 plain washers (8).
- 5 Carefully remove the TWC Antenna (2).
6. Remove the four M10 ESNA nuts (14), M10 plain washers (13), M10 x 40 bolts (11) and M10 plain washers (12).
7. Carefully remove the TWC antenna bracket (15) from car body bracket (16).

7.4.6.3 Sanding Device

WARNING

BEFORE WORK IS PERFORMED, MAKE SURE THAT THE AIR COMPRESSOR CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION.

WARNING

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THESE DEVICES AND/OR ANY COMPONENT PARTS ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THESE DEVICES AND/OR COMPONENT PARTS.

1. Close the Sanding Cutout Cock by rotating the handle 90 degrees so that the indicator on the Cutout Cock handle is perpendicular to the airline. See Figure 7-101 for location of the Sanding Cutout Cock.
2. Disconnect the air connection from the Sand Ejector (1). See Figure 7-104.
3. Loosen the hose clamp (5) and remove the hose (4) from the sanding pipe (6).
4. Remove the two M10 ESNA nuts (9), M10 plain washers (8) and M10 x 30 bolts (7).
5. Remove the pipe clamp (3).
6. Remove the sanding pipe (6) from the Sand Ejector (1).
7. Remove the three M10 ESNA nuts (10) and M10 plain washers (11).
8. Carefully remove the Sand Ejector (1) and gasket (2) from the sandbox.

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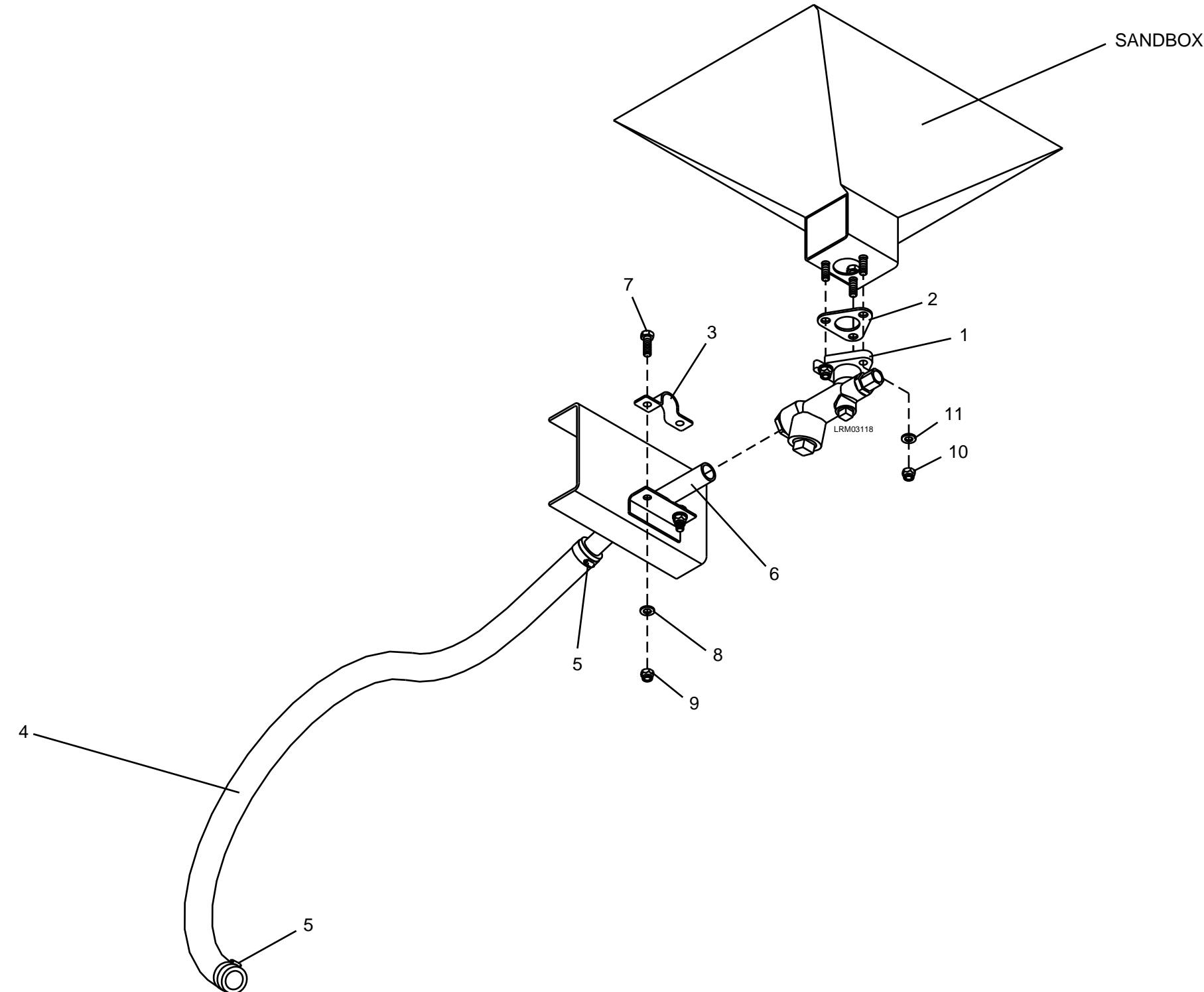


Figure 7-104: Sanding Device

7.4.6.4 Main Reservoir

WARNING

BEFORE WORK IS PERFORMED, MAKE SURE THAT THE AIR COMPRESSOR CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION.

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

WARNING

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THESE DEVICES AND/OR ANY COMPONENT PARTS ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THESE DEVICES AND/OR COMPONENT PARTS.

1. Turn off the Air Compressor circuit breaker in the B-Unit cab.
2. Open drain cock (7) and drain the air supply to the Main Reservoir (1). See Figure 7-105.
3. Disconnect the fittings from the Main Reservoir (1).
4. Remove the drain cock (7) from the Main Reservoir (1) by turning the drain cock counterclockwise.
5. Remove the four M12 ESNA nuts (5), M12 plain washers (4), M12 x 35 bolts (2) and M12 plain washers (3).
6. Carefully remove the Main Reservoir (1) from car body brackets (6).

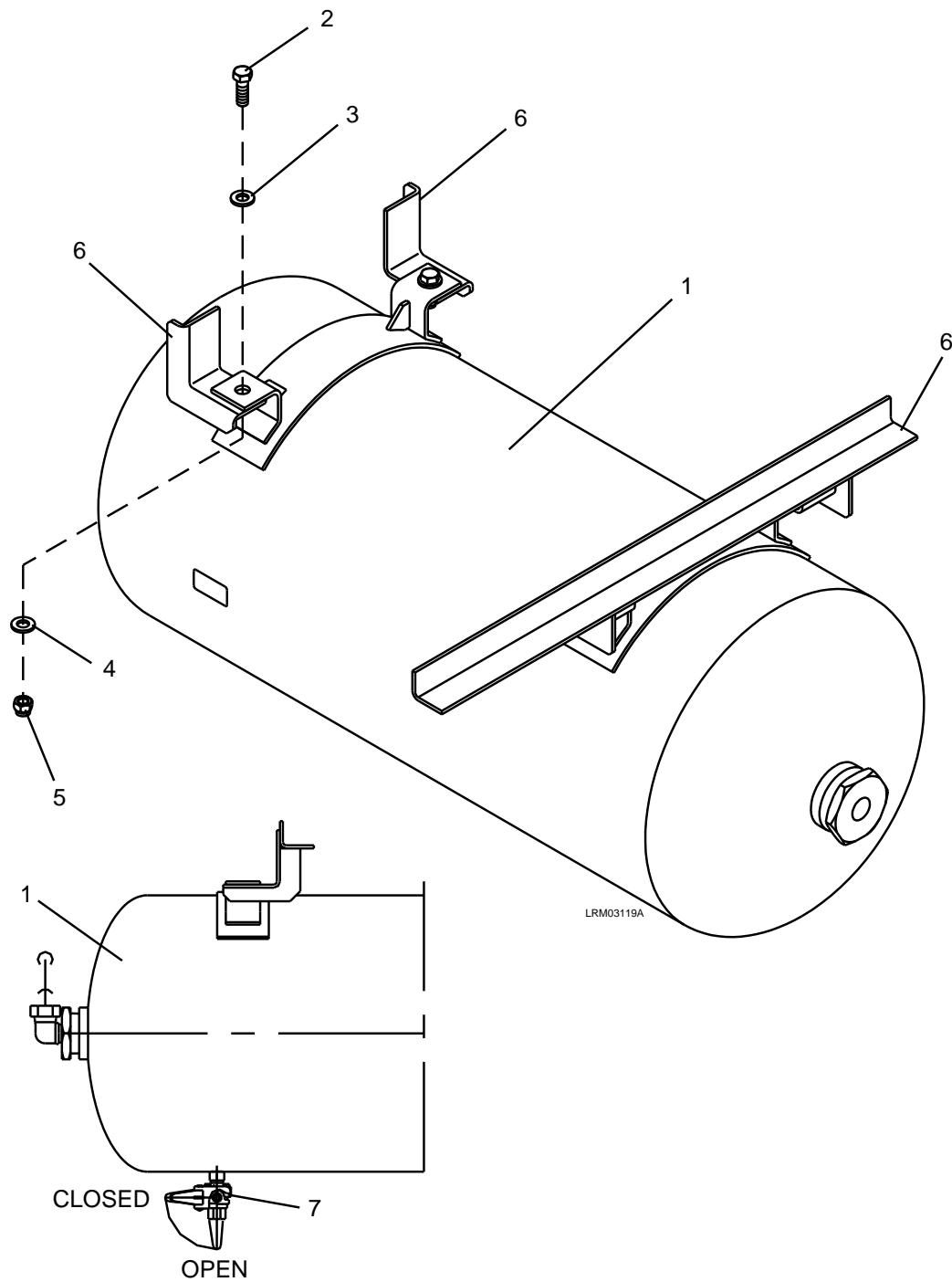


Figure 7-105: Main Reservoir

7.4.6.5 Brake Supply Reservoir

WARNING

BEFORE WORK IS PERFORMED, MAKE SURE THAT THE AIR COMPRESSOR CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION.

WARNING

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THESE DEVICES AND/OR ANY COMPONENT PARTS ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THESE DEVICES AND/OR COMPONENT PARTS.

1. Turn off the Air Compressor circuit breaker in the B-Unit cab.
2. Close the Brake Cylinder Cutout Cock by rotating the handle 90 degrees so that the indicator on the Cutout Cock handle is perpendicular to the airline. See Figure 7-101 for location of the Brake Cylinder Cutout Cock.
3. Open the Main Reservoir drain cock to purge the air from the system.
4. Carefully disconnect the fittings from the Brake Supply Reservoir (1). See Figure 7-106.
5. Remove the four M12 ESNA nuts (5), M12 plain washers (4), M12 x 35 bolts (2) and M12 plain washers (3).
6. Carefully remove the Brake Supply Reservoir (1) from car body brackets (6).

7.4.6.6 Air Compressor

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

WARNING

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THESE DEVICES AND/OR ANY COMPONENT PARTS ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THESE DEVICES AND/OR COMPONENT PARTS.

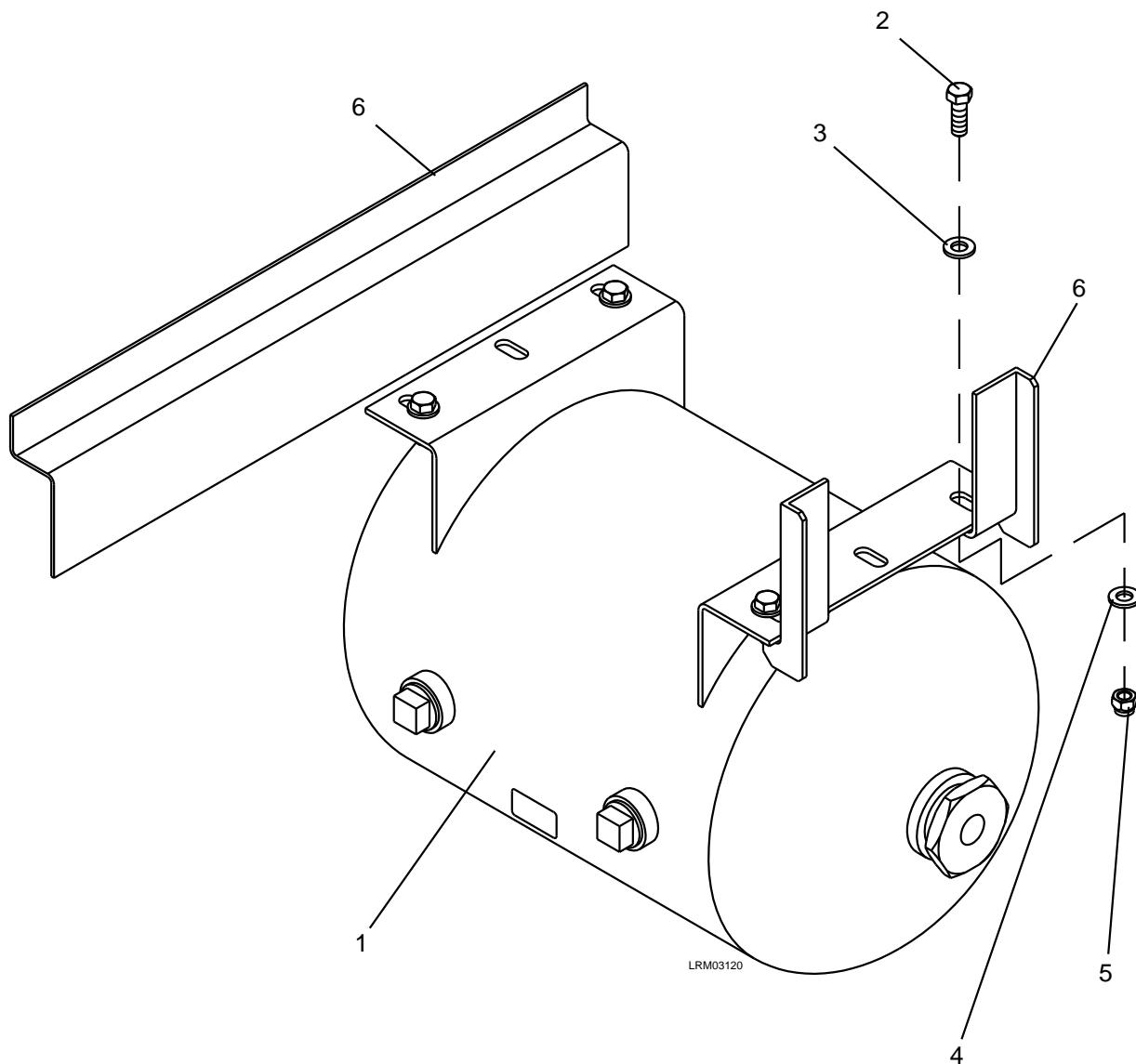


Figure 7-106: Brake Supply Reservoir

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Turn off the Air Compressor circuit breaker in the B-Unit cab.
2. Disconnect the electrical connectors (7) from the Air Compressor (1). See Figure 7-107.
3. Open cutout cock and drain the air supply to the Main Reservoir (1).
4. Carefully disconnect the fitting (8) from the Air Compressor (1).
5. Remove the four M12 ESNA nuts (5) and M12 plain washers (4), M12 x 45 bolts (2), and M12 plain washers (3).
6. Carefully remove the Air Compressor (1) from the mounting bracket (6).

7.4.6.7 Brake Control Unit (Motor Truck)

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THESE DEVICES AND/OR ANY COMPONENT PARTS ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THESE DEVICES AND/OR COMPONENT PARTS.

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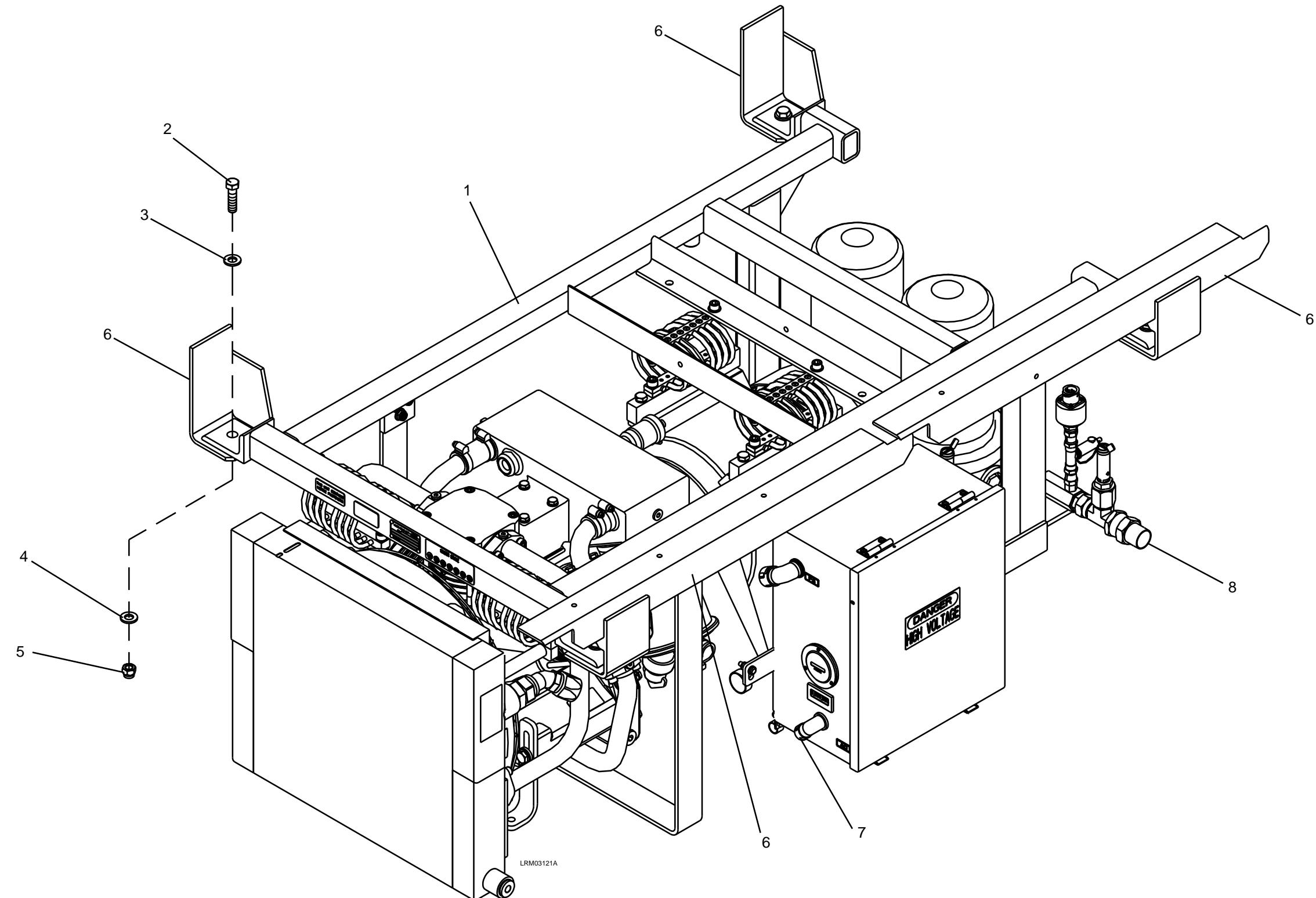


Figure 7-107: Air Compressor

1. Turn off the Air Compressor circuit breaker in the B-Unit cab.
2. Disconnect the electrical connector (7) to the Brake Control Unit (1). See Figure 7-108.
3. Close the Brake Cylinder Cutout Cock by rotating the handle 90 degrees so that the indicator on the Cutout Cock handle is perpendicular to the airline. See Figure 7-101 for location of the Brake Cylinder Cutout Cock.
4. Open the Main Reservoir drain cock to purge the air from the system.
5. Carefully disconnect the fittings (8) from the Brake Control Unit (1).
6. Open the cover of the Brake Control Unit (1).
7. Remove the four M12 ESNA nuts (5) and M12 plain washers (4), M12 x 85 bolts (2), and M12 plain washers (3).
8. Carefully remove the Brake Control Unit (1) from the mounting bracket (6).

7.4.6.8 Brake Control Unit (Center Truck)

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THESE DEVICES AND/OR ANY COMPONENT PARTS ARE REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THESE DEVICES AND/OR COMPONENT PARTS.

1. Turn off the Air Compressor circuit breaker in the B-Unit cab.
2. Disconnect the electrical connector (7) to the Brake Control Unit (1). See Figure 7-109.

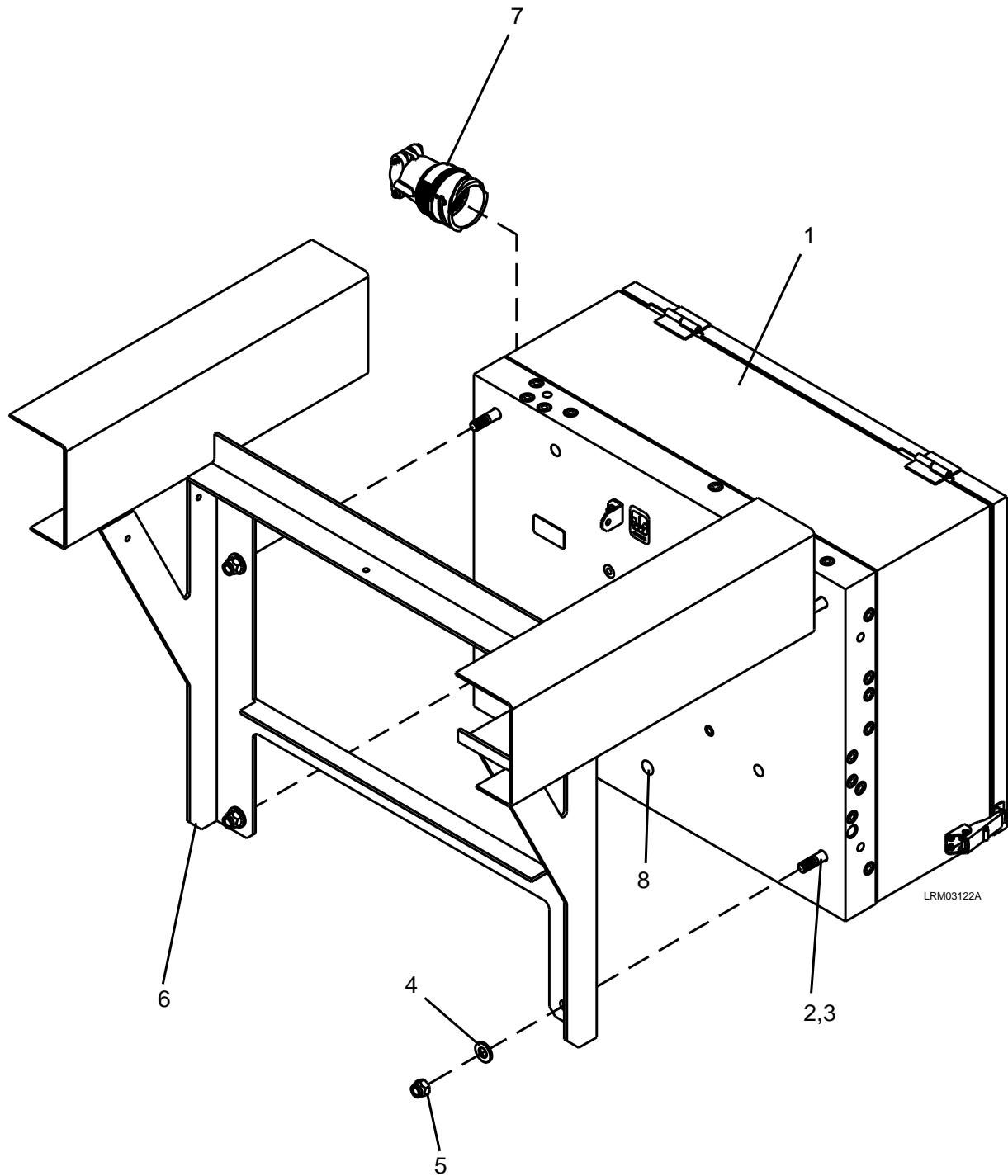


Figure 7-108: Brake Control Unit (Motor Truck)

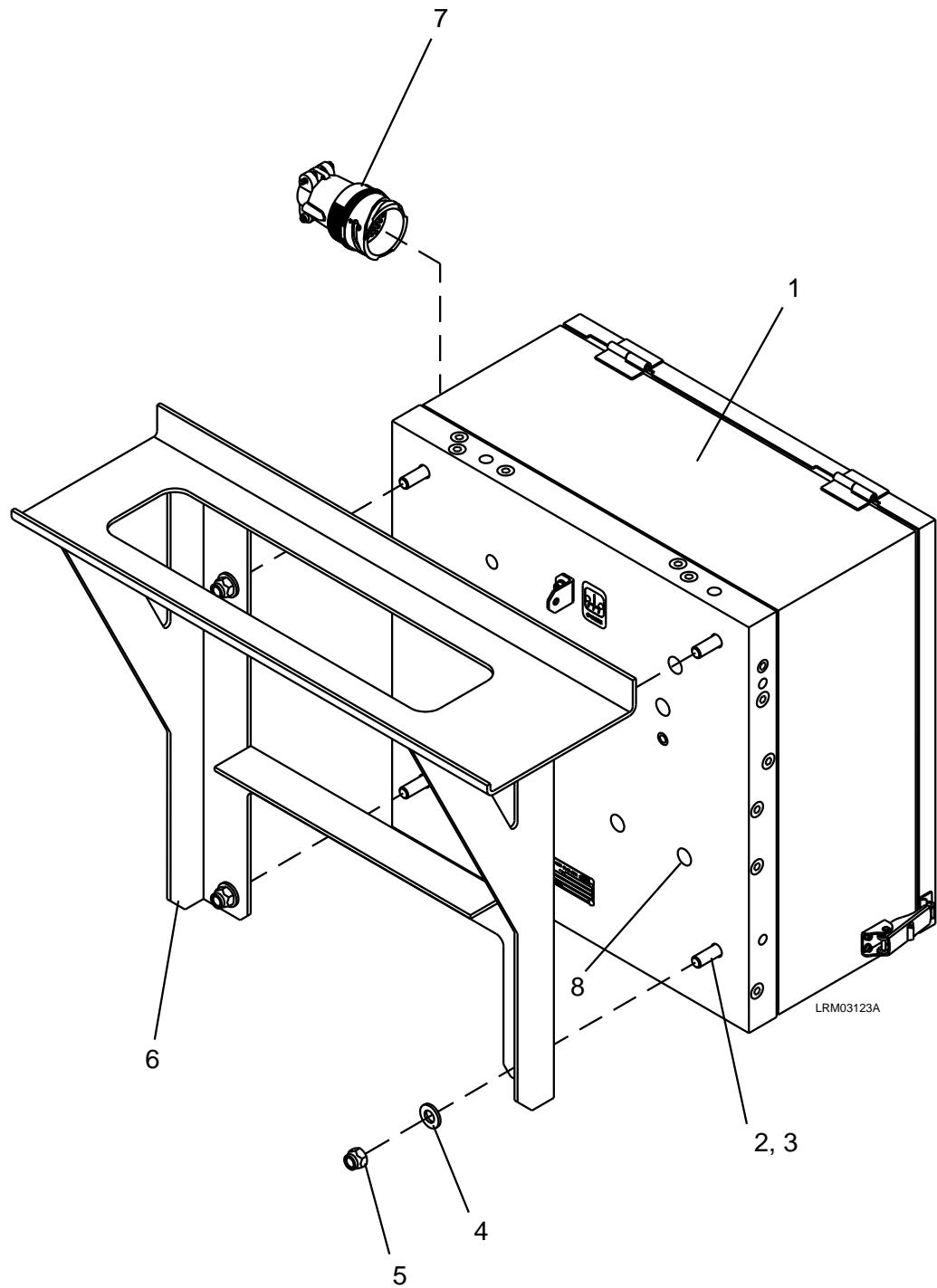


Figure 7-109: Brake Control Unit (Center Truck)

3. Close the Brake Cylinder Cutout Cock by rotating the handle 90 degrees so that the indicator on the Cutout Cock handle is perpendicular to the airline. See Figure 7-101 for location of the Brake Cylinder Cutout Cock.
4. Open the Main Reservoir drain cock to purge the air from the system.
5. Carefully disconnect the fittings (8) from the Brake Control Unit (1).
6. Open the cover of the Brake Control Unit (1).
7. Remove the four M12 ESNA nuts (5) and M12 plain washers (4), M12 x 70 bolts (2), and M12 plain washers (3).
8. Carefully remove the Brake Control Unit (1) from the mounting bracket (6).

7.4.6.9 Auxiliary Power Supply

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the electrical connectors (7) to the Auxiliary Power Supply (1).
2. Remove the four M12 ESNA nuts (5) and M12 plain washers (4), M12 x 40 bolts (2), and M12 plain washers (3). See Figure 7-110.
3. Carefully remove the Auxiliary Power Supply (1) from the mounting brackets (6). Refer to Section 0900, Auxiliary Inverter of the Heavy Repair Maintenance Manual for additional information.

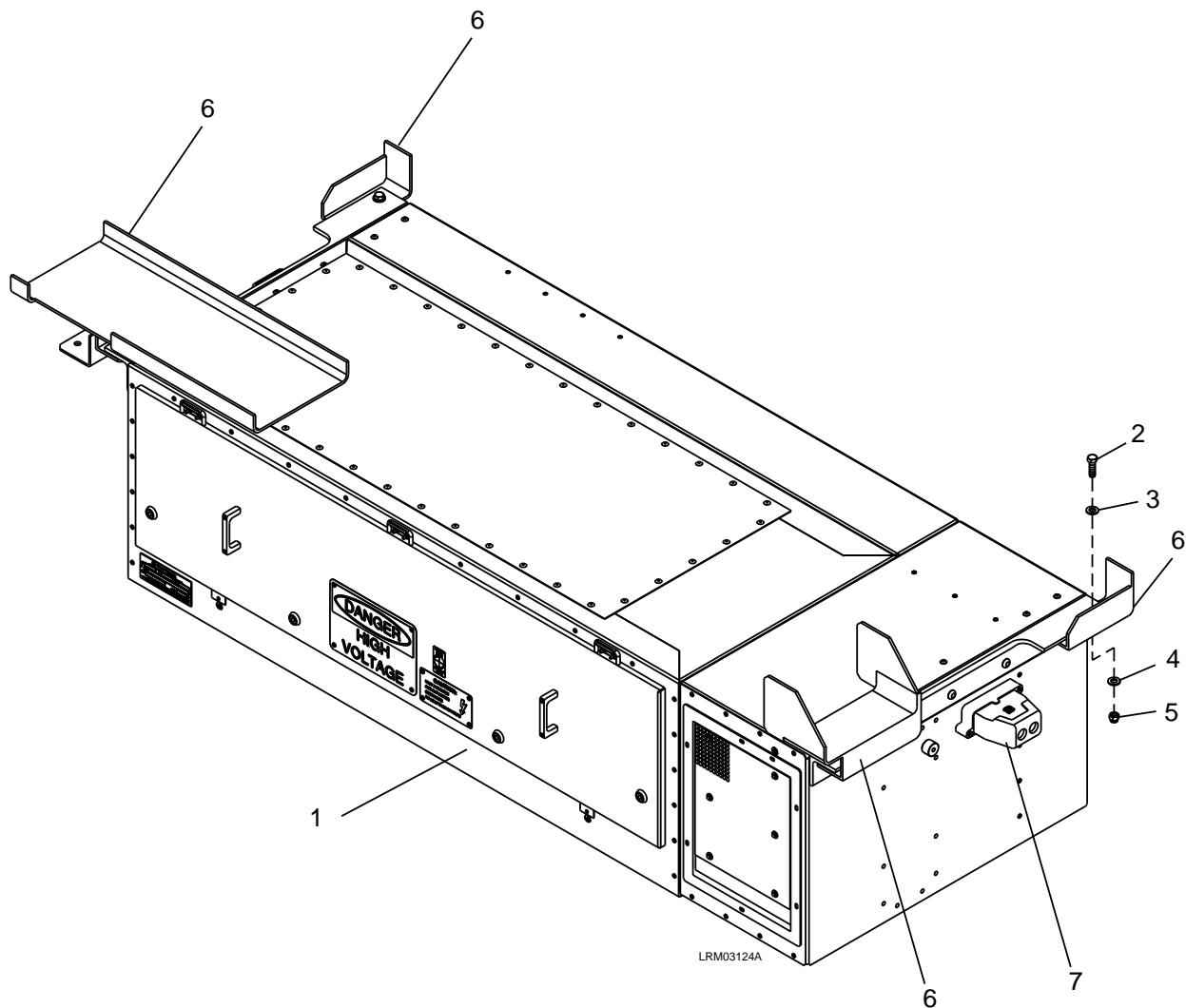


Figure 7-110: Auxiliary Power Supply

7.4.6.10 Battery Box

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

NOTE: The batteries must be removed before removing the Battery Box (1). Refer to Section 1100, Battery of the Heavy Repair Maintenance Manual for the removal of the batteries.

1. Remove the five M12 hex nuts (5), M12 plain washers (4), M12 x 40 bolts (2), and M12 plain washers (3). See Figure 7-111.
2. Carefully remove the Battery Box (1) from car body brackets (6).

7.4.6.11 Battery Circuit Breaker Box

1. Open the door of the Battery Circuit Breaker Box (1).
2. Open the battery compartment and disconnect the positive battery terminal.
3. Remove the four M5 x 12 screws (3), M5 plain washers (4), and M5 lock washers (5). See Figure 7-112.
4. Remove the cover (2).
5. Disconnect the M8 electrical connections to the 150A circuit breaker (6).
6. Remove the two M4 screws (7), and M4 plain washers (8).
7. Carefully remove the 150A circuit breaker (6).
8. Disconnect the M6 and M10 electrical connections from the 400A circuit breaker (9).
9. Remove the four M5 screws (10), and M5 plain washer (11).
10. Carefully remove the 400A circuit breaker (9).
11. Disconnect the 3/8-16 electrical connections to the brick diode (16).
12. Remove the four 1/4" ESNA nuts (14), 1/4" plain washers (13), and 1/4" x 1.00" bolts (12).
13. Carefully remove the brick diode (16 and 22).

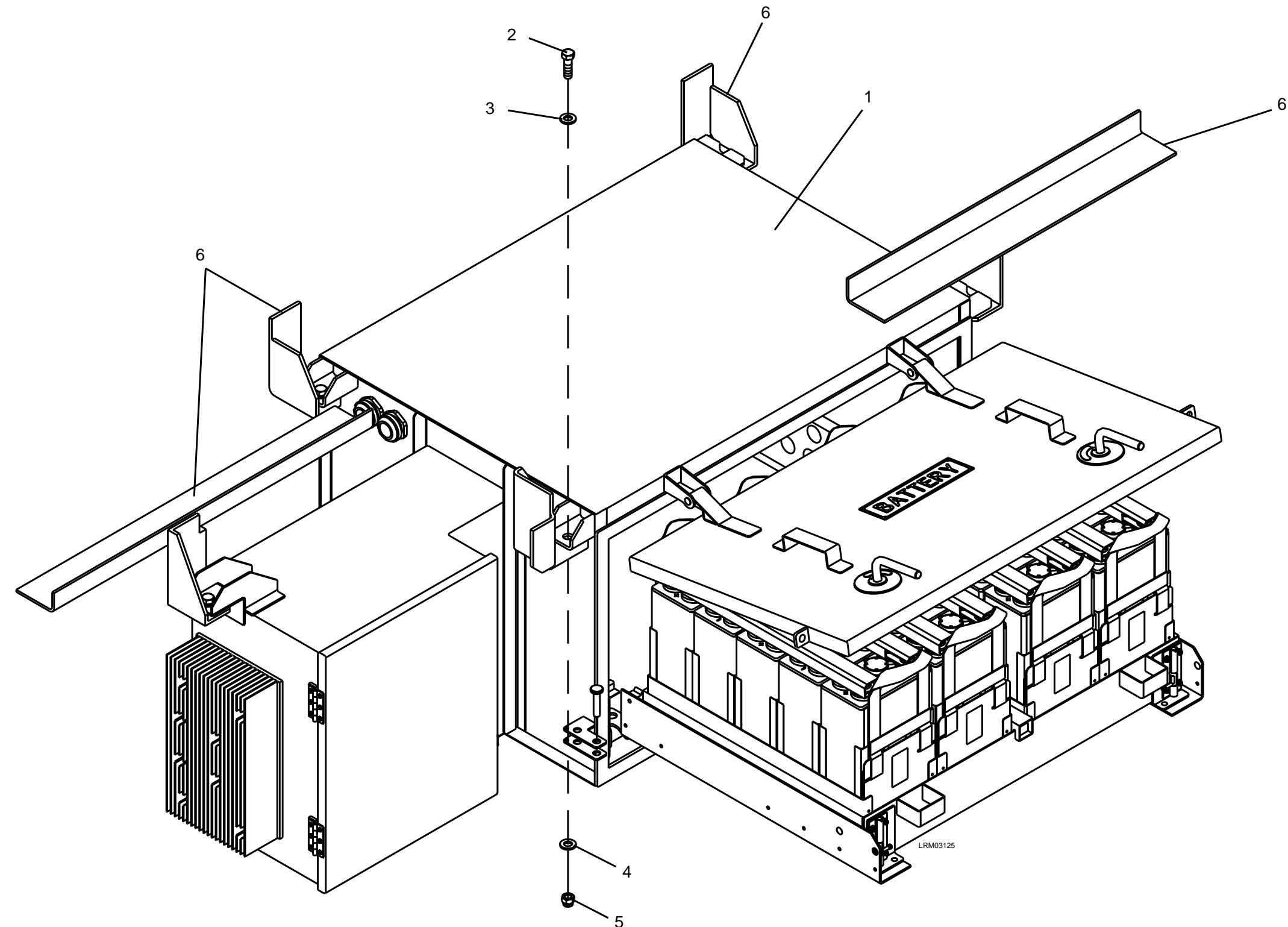


Figure 7-111: Battery Box

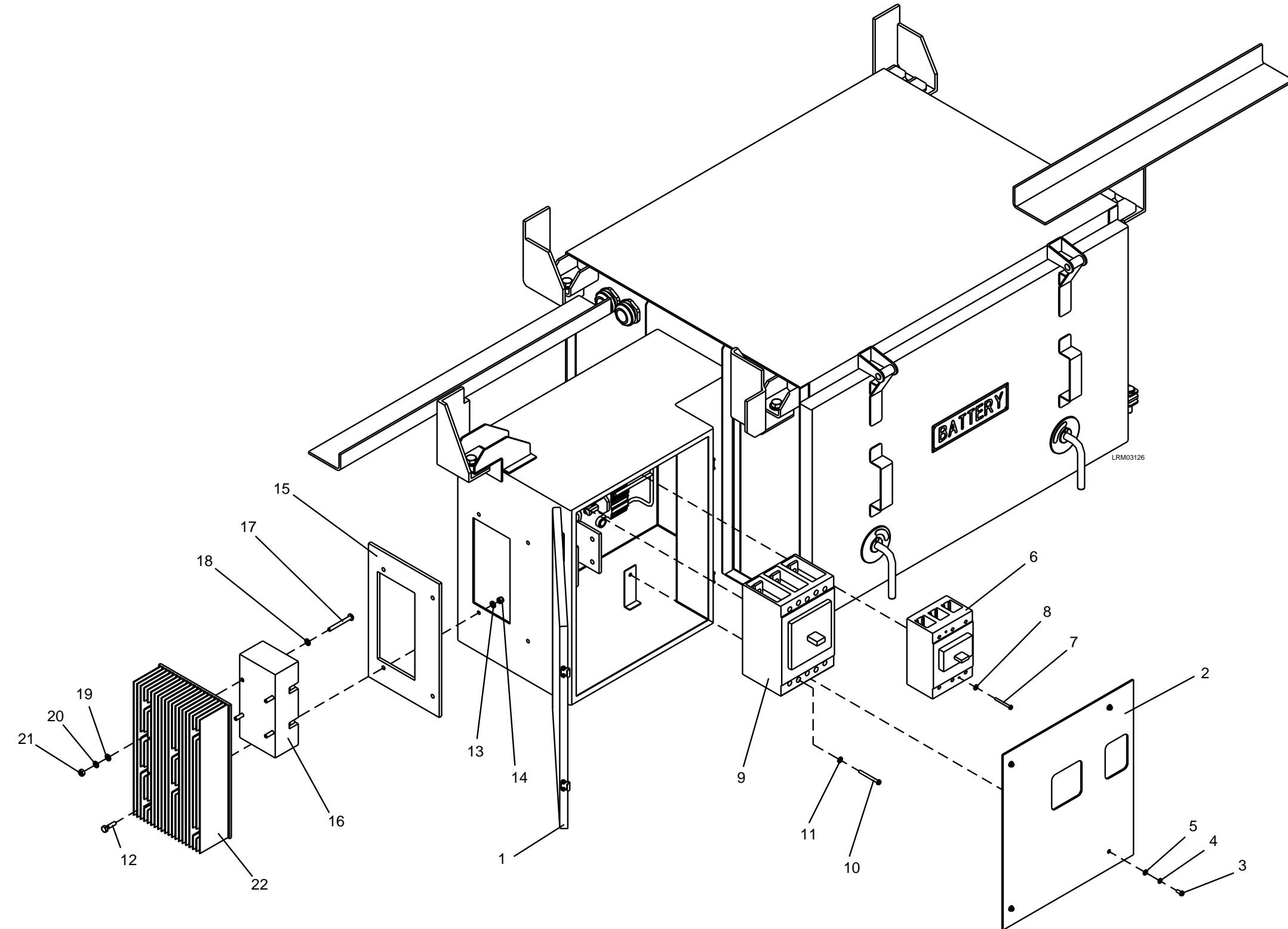


Figure 7-112: Battery Circuit Breaker Box

14. Remove the gasket (15).
15. Remove the four 1/4" hex nuts (21), 1/4" lock washers (20), 1/4" plain washer (19), 1/4 x 2-1/4" screw (17), and 1/4" plain washer (18).
16. Carefully remove the brick diode (16) from the heatsink (22).

7.4.6.12 Propulsion Inverter

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the electrical connectors (7) and M8 hardware to the Propulsion Inverter (1).

NOTE: Refer to the Heavy Repair Maintenance Manual, Section 0700, Propulsion for the locations of ring terminals that need to be disconnected for the removal of the propulsion inverter.

2. Remove the four M16 ESNA nuts (5) and M16 plain washers (4), M16 x 45 bolts (2), and M16 plain washers (3). See Figure 7-113.
3. Carefully remove the Propulsion Inverter (1) from the mounting brackets (6). Refer to Section 0700, Propulsion of the Heavy Repair Maintenance Manual for additional information.

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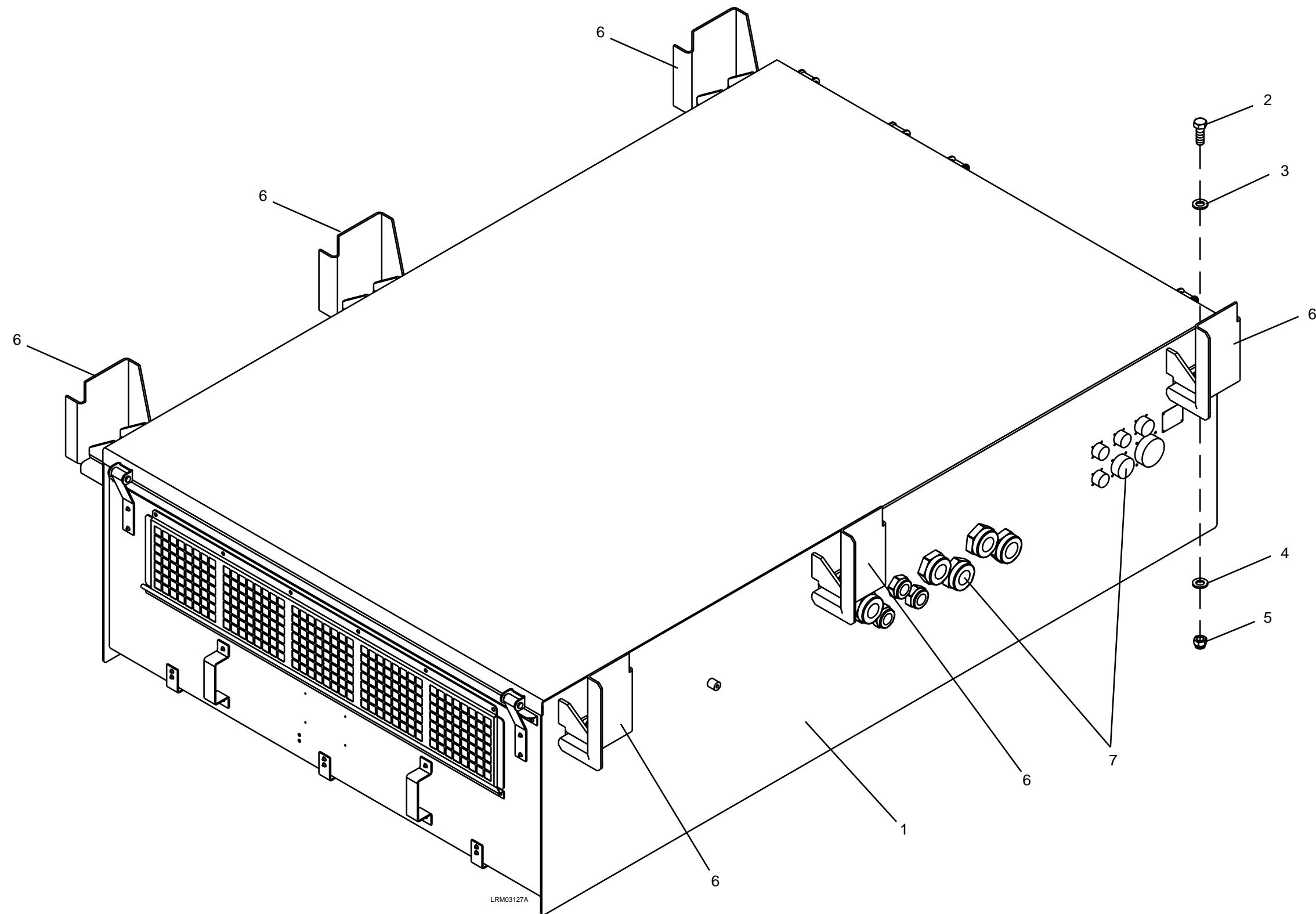


Figure 7-113: Propulsion Inverter

7.4.6.13 Line Reactor

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the 3/8-16 electrical connections (7) to the Line Reactor (1).
2. Remove the four M16 ESNA nuts (5) and M16 plain washers (4), M16 x 45 bolts (2), and M16 plain washers (3). See Figure 7-114.
3. Carefully remove the Line Reactor (1) from the mounting brackets (6). Refer to Section 0700, Propulsion of the Heavy Repair Maintenance Manual for additional information.

7.4.6.14 Knife Switch

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Open the cover and disconnect the 3/8-16 electrical connections (7) to the Knife Switch (1).
2. Remove the four M12 ESNA nuts (5) and M12 plain washers (4), M12 x 40 bolts (2), and M12 plain washers (3). See Figure 7-115.
3. Carefully remove the Knife Switch (1) from the mounting brackets (6).

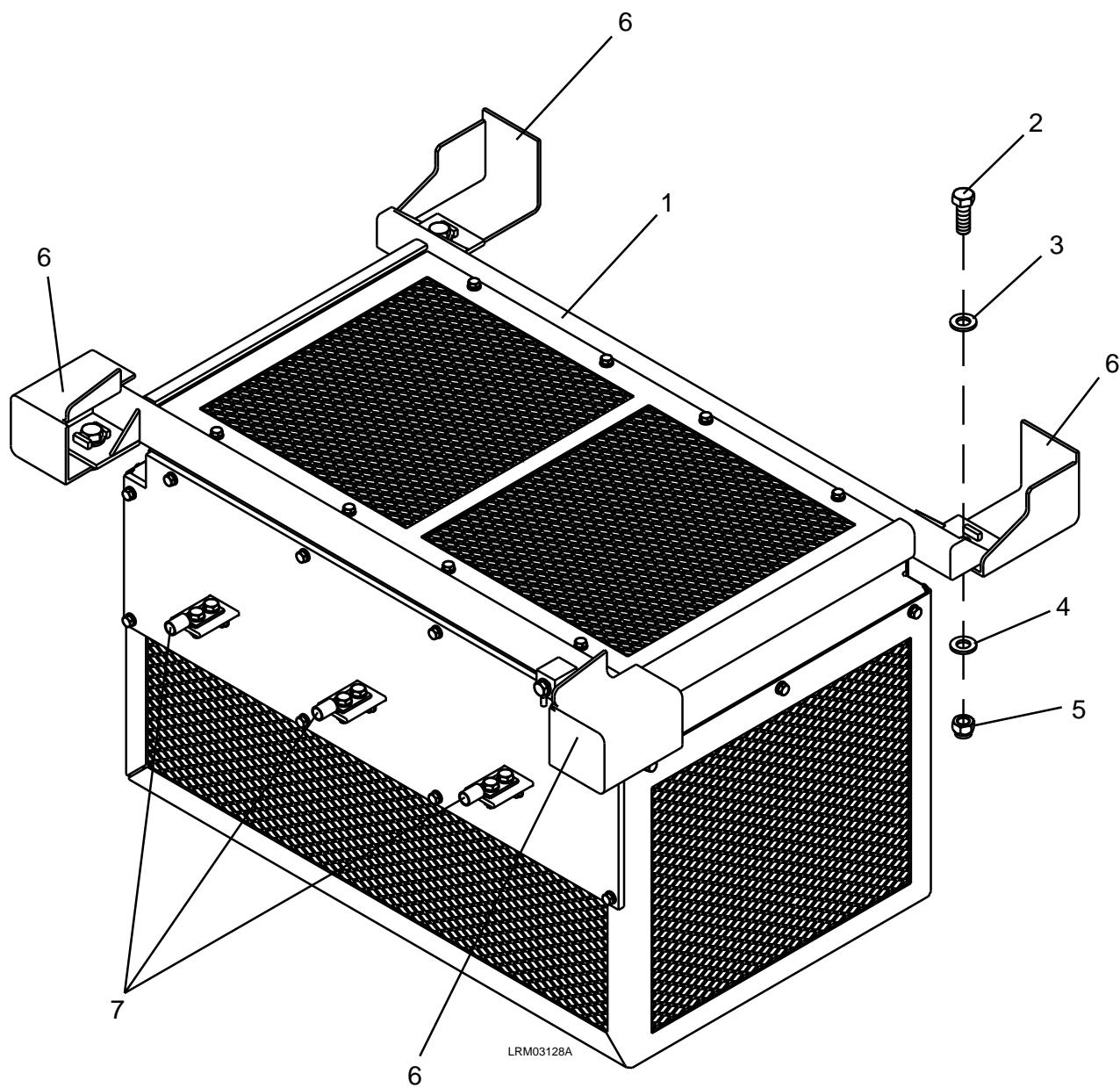


Figure 7-114: Line Reactor

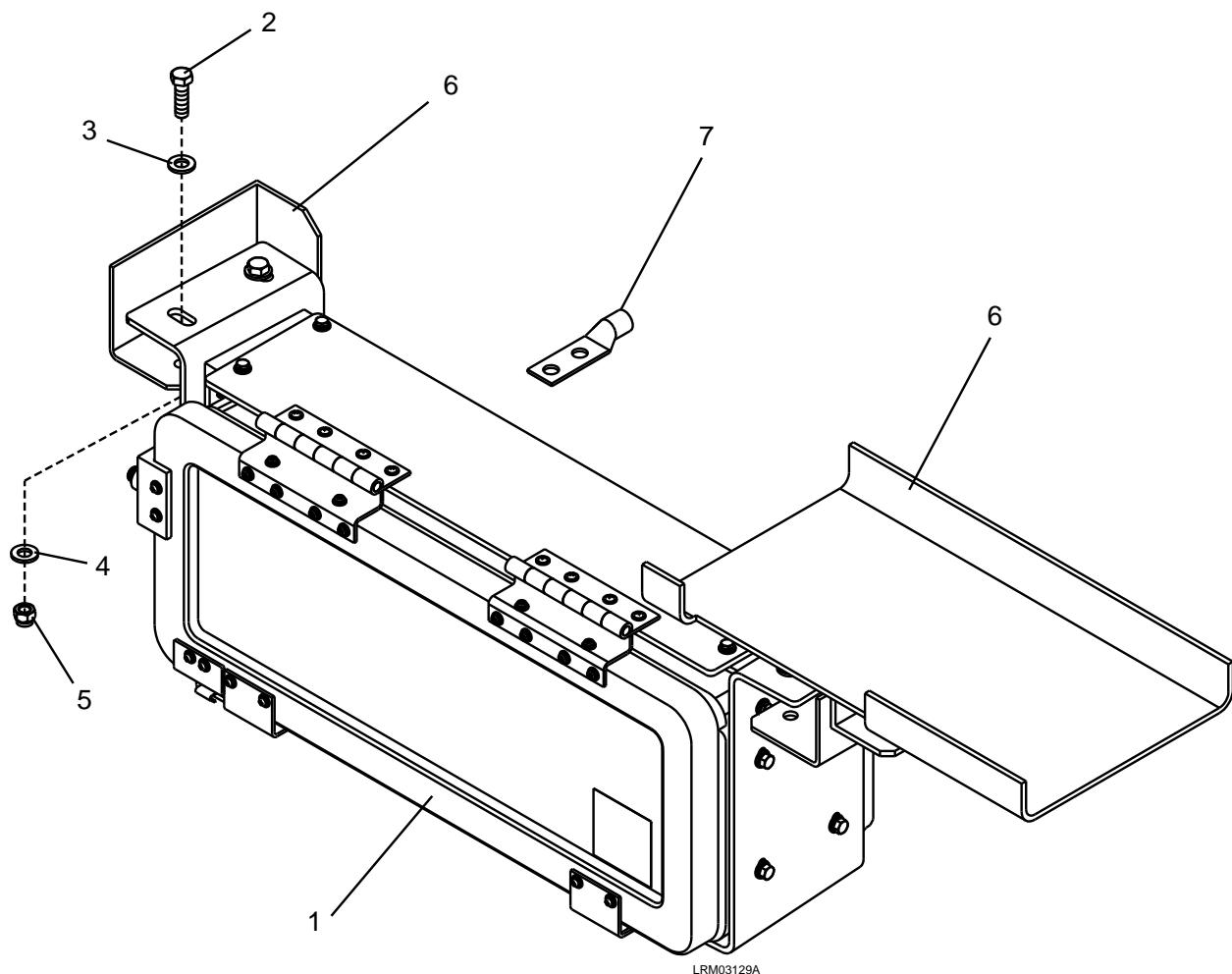


Figure 7-115: Knife Switch

7.4.6.15 Horn

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the 1/4" Faston electrical connections (7) to the Horn (1).
2. Remove the four M6 ESNA nuts (5) and M6 plain washers (4), M6 x 25 bolts (2), and M6 plain washers (3). See Figure 7-116.
- 3 Carefully remove the Horn (1) from the mounting bracket (6).

7.4.7 Roof Mounted Equipment

See Figures 2-17 and 7-117 through 7-131.

The roof mounted equipment consists of all equipment that is fastened and mounted to the roof. The roof mounted equipment consists of the following components:

- one High Speed Circuit Breaker (HSCB) on the A-Unit
- one Lightning Arrestor on the A-Unit
- one Brake Resistor on each A and B-Unit
- one Pantograph on the A-Unit
- one Auxiliary Fuse Box on the A-Unit
- one HVAC Unit on each A and B-Unit
- three types of Shrouds on each A and B-Unit
- one Silent Alarm Light on each A and B-Unit
- one Radio Antenna on each A and B-Unit
- one GPS Antenna on the B-Unit
- one WLAN Antenna on the A-Unit
- one Wayside Worker Alert System (WWAS) Antenna on each A and B-Unit
- one Roof Mounted Camera on the B-unit

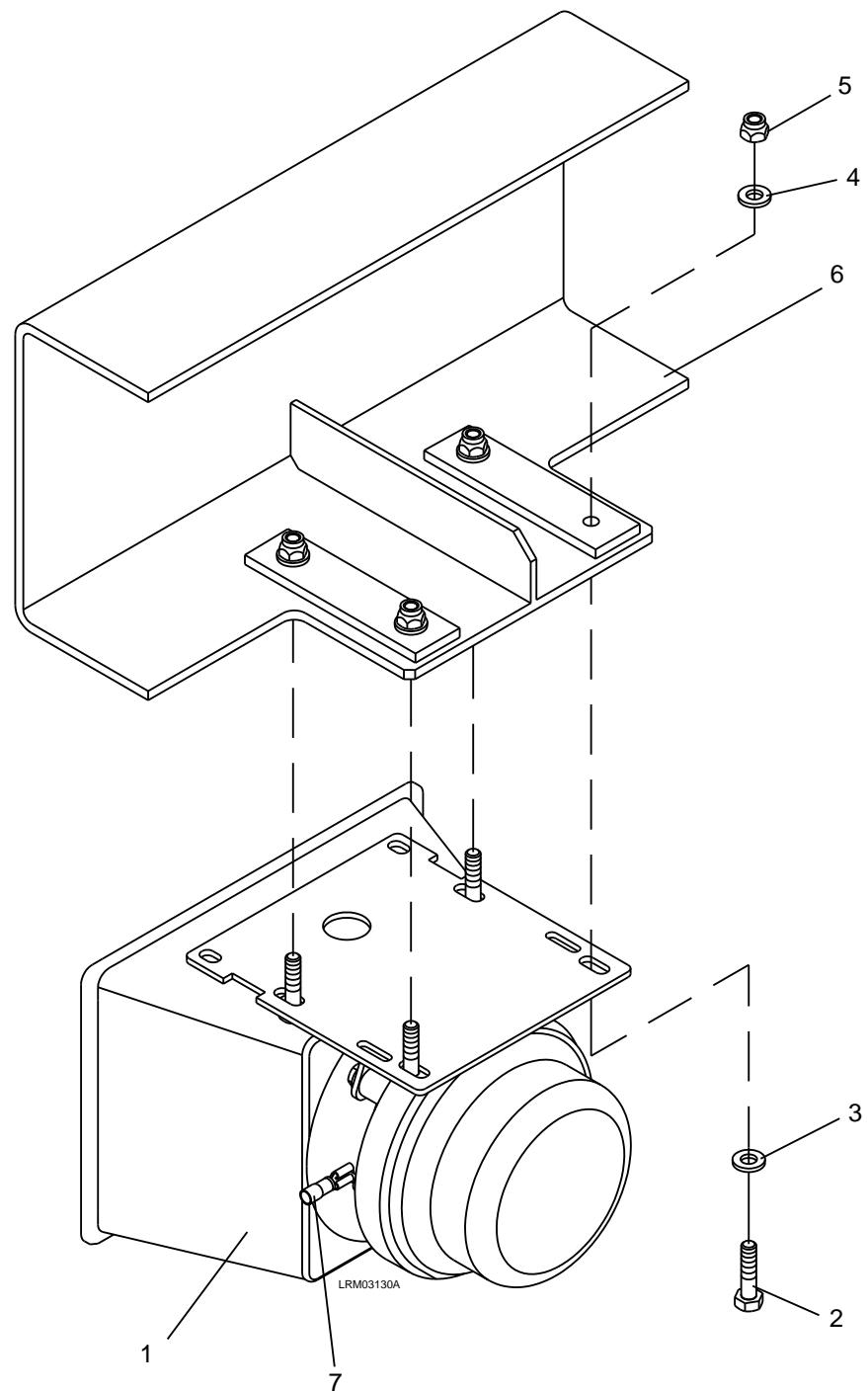


Figure 7-116: Horn

7.4.7.1 High Speed Circuit Breaker (HSCB)

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the electrical connectors (6 and 7) and M12 hardware from the HSCB (1).

NOTE: Refer to the Heavy Repair Maintenance Manual, Section 0700, Propulsion for the locations of ring terminals that need to be removed for removal of the High Speed Circuit Breaker.

2. Remove the four M12 ESNA nuts (5) and M12 plain washers (4), M12 x 35 bolts (2), and M12 plain washers (3). See Figure 7-117.
3. Carefully remove the HSCB (1) from the mounting bracket.

7.4.7.2 Lightning Arrestor

WARNING

THE PANTOGRAPH MUST BE LOWERED BEFORE WORKING ON THE LIGHTNING ARRESTOR.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the electrical connections (8) from the Lightning Arrestor (1) by removing the two 3/8-16 nuts (5), 3/8 lock washers (6), and 3/8 plain washers (7).
2. Remove the two 5/16 x 5/8 bolts (2), 5/16 lock washers (3), and 5/16 plain washers (4). See Figure 7-118.
3. Carefully remove the Lightning Arrestor (1).

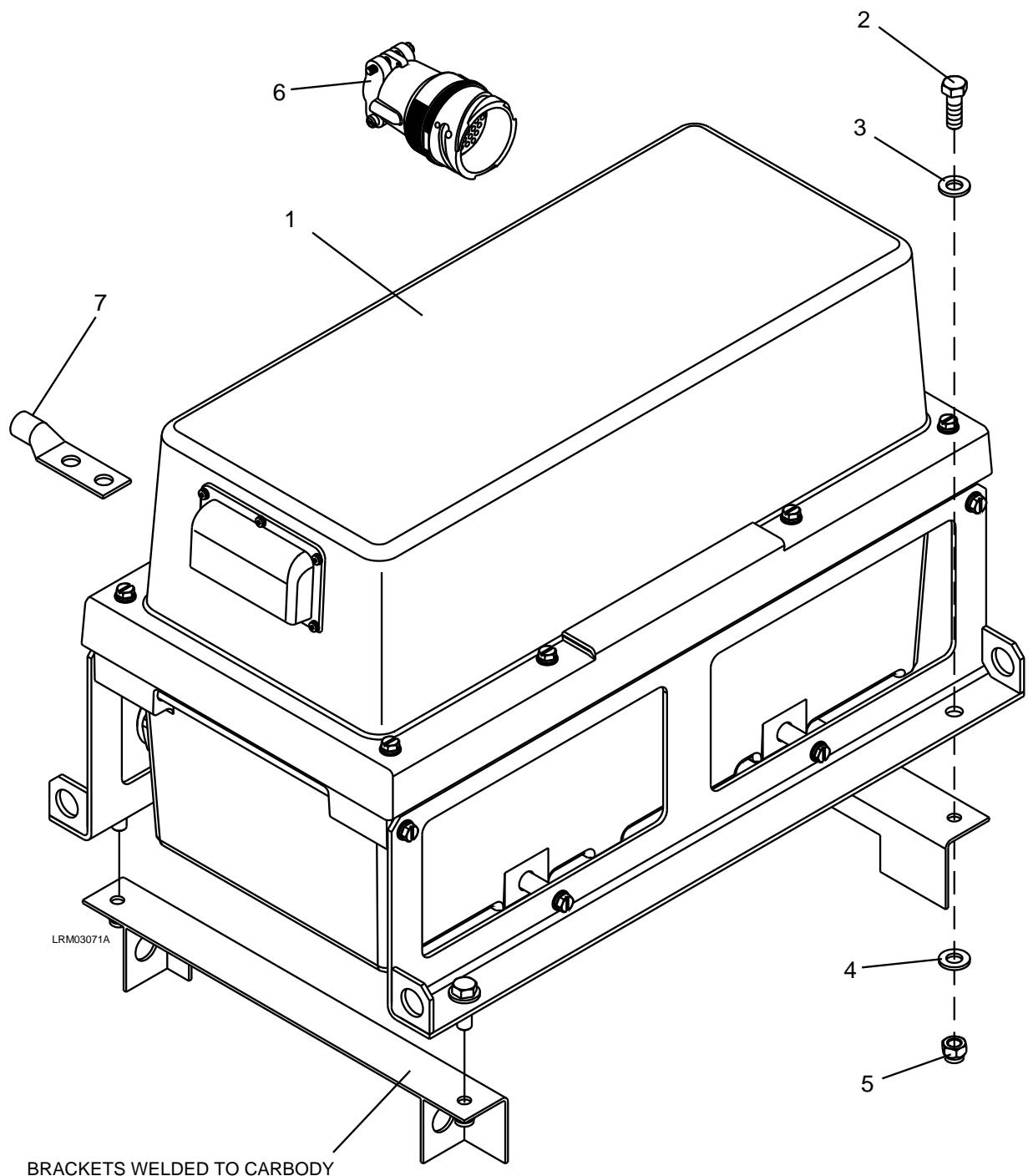


Figure 7-117: High Speed Circuit Breaker (HSCB)

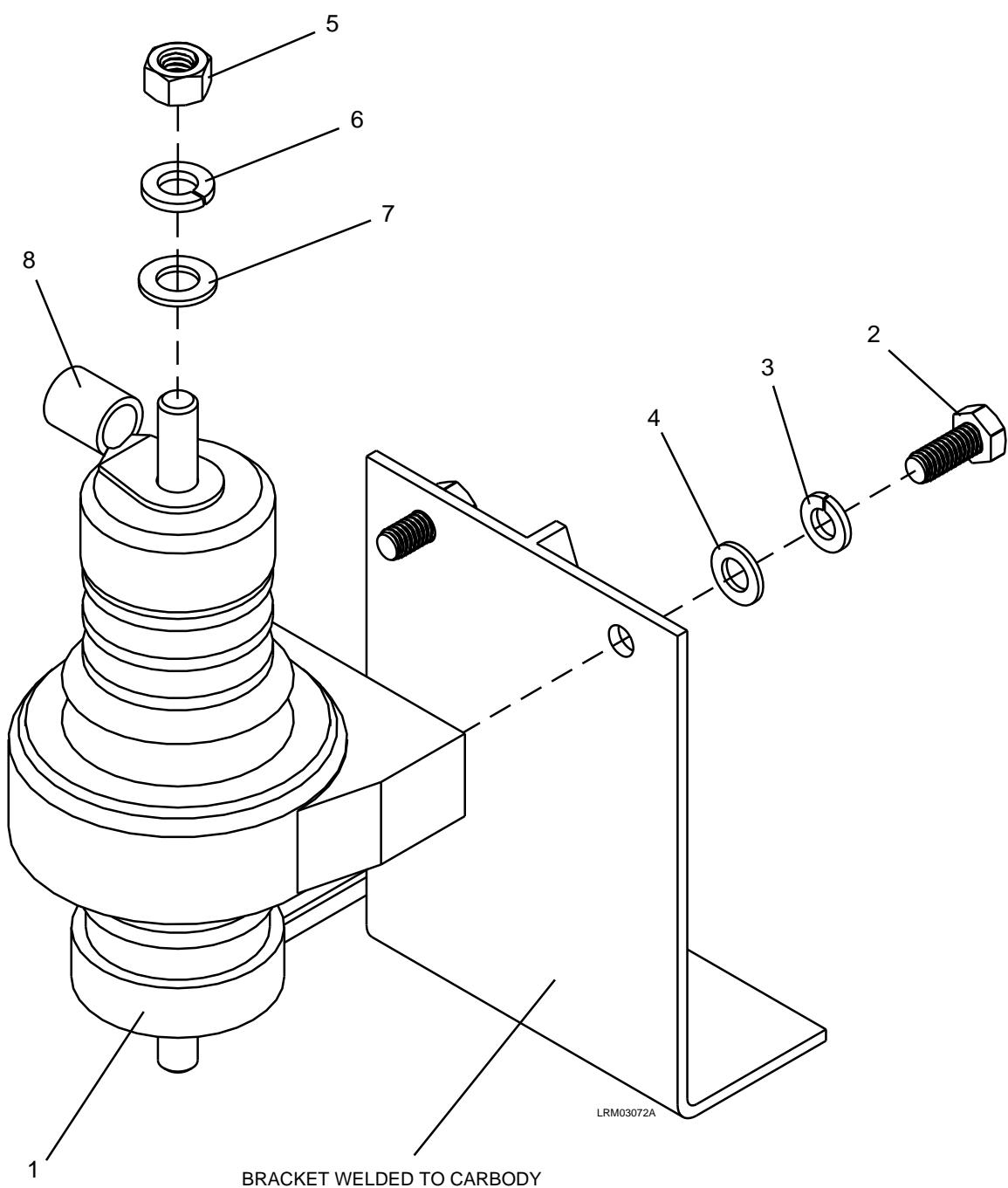


Figure 7-118: Lightning Arrestor

7.4.7.3 Brake Resistor

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

WARNING

INSULATED GLOVES MUST BE WORN AND EXTREME CARE TAKEN TO PREVENT BURNS WHEN HANDLING HEATED PARTS.

1. Disconnect the 3/8-16 electrical connections (5) from the Brake Resistor (1).
2. Remove the six 1/2 x 1-1/4 bolts (2), 1/2 lock washers (3), and 1/2 plain washers (4). See Figure 7-119.
3. Carefully remove the Brake Resistor (1). Refer to Section 0700, Propulsion of the Heavy Repair Maintenance Manual for additional information.

7.4.7.4 Pantograph

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

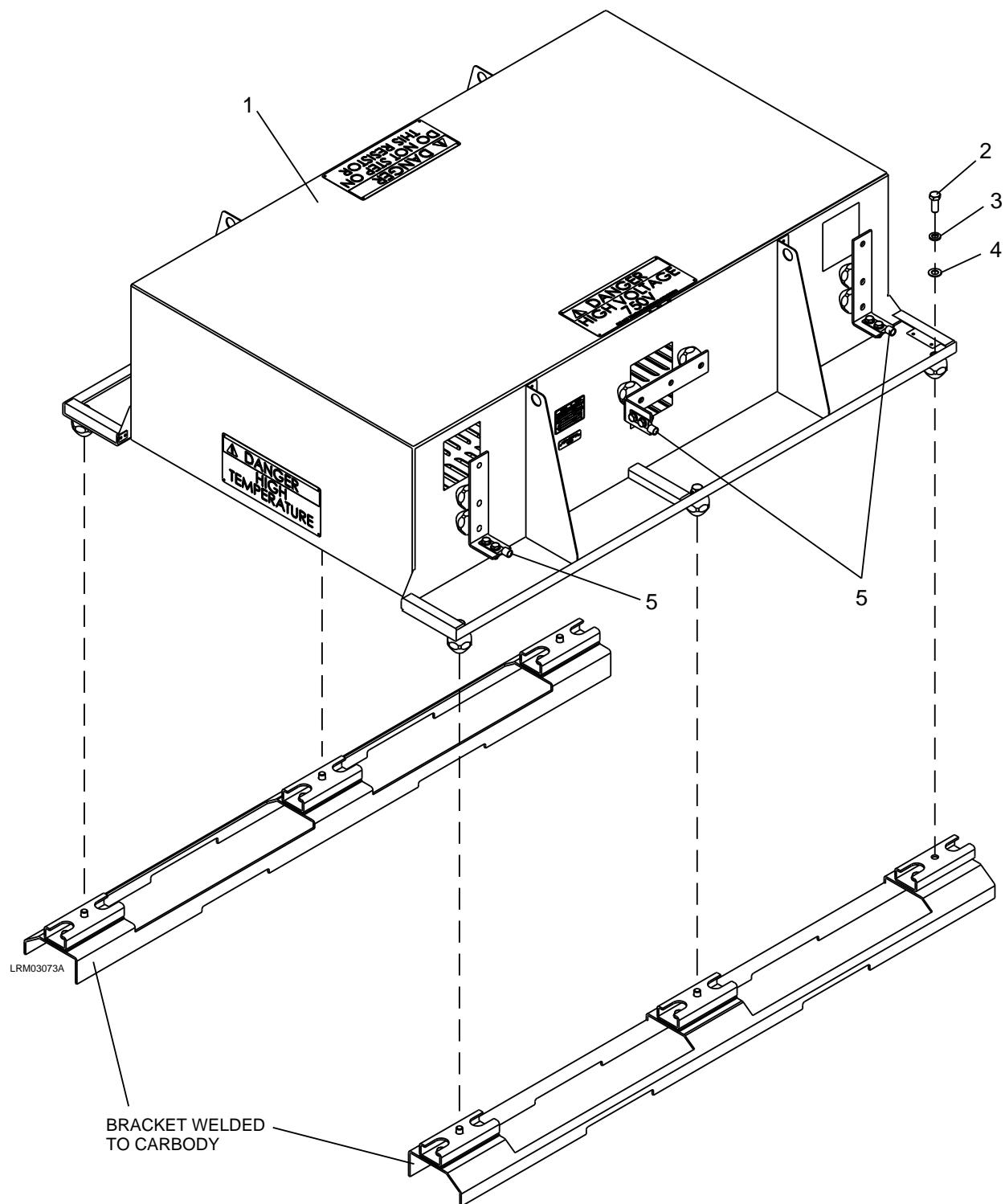


Figure 7-119: Brake Resistor

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

CAUTION

DO NOT ALLOW THE PANTOGRAPH TO RISE WITHOUT THE DAMPER AND COLLECTOR HEAD INSTALLED, THIS CAN DAMAGE THE UNIT.

WARNING

WHEN PERFORMING ANY MAINTENANCE ON THE PANTOGRAPH, IT IS ALWAYS NECESSARY TO INSTALL THE REAR SAFETY PIN. FAILURE TO INSTALL THE SAFETY PIN CAN RESULT IN SERIOUS INJURY.

1. Lower the pantograph (1).
2. Install the rear safety pin. See Figure 7-120.
3. Disconnect the electrical connector (5) from the Pantograph (1).
4. Remove the four M6 x 60 bolts (6), M6 plain washers (7), and nuts (8) from the gearbox assembly (9).
5. Remove the four 3/4 x 1-1/4 bolts (2), 3/4 lock washers (3), and 3/4 plain washers (4).
6. Carefully remove the Pantograph (1). Refer to Section 0800, Pantograph of the Heavy Repair Maintenance Manual for additional information.

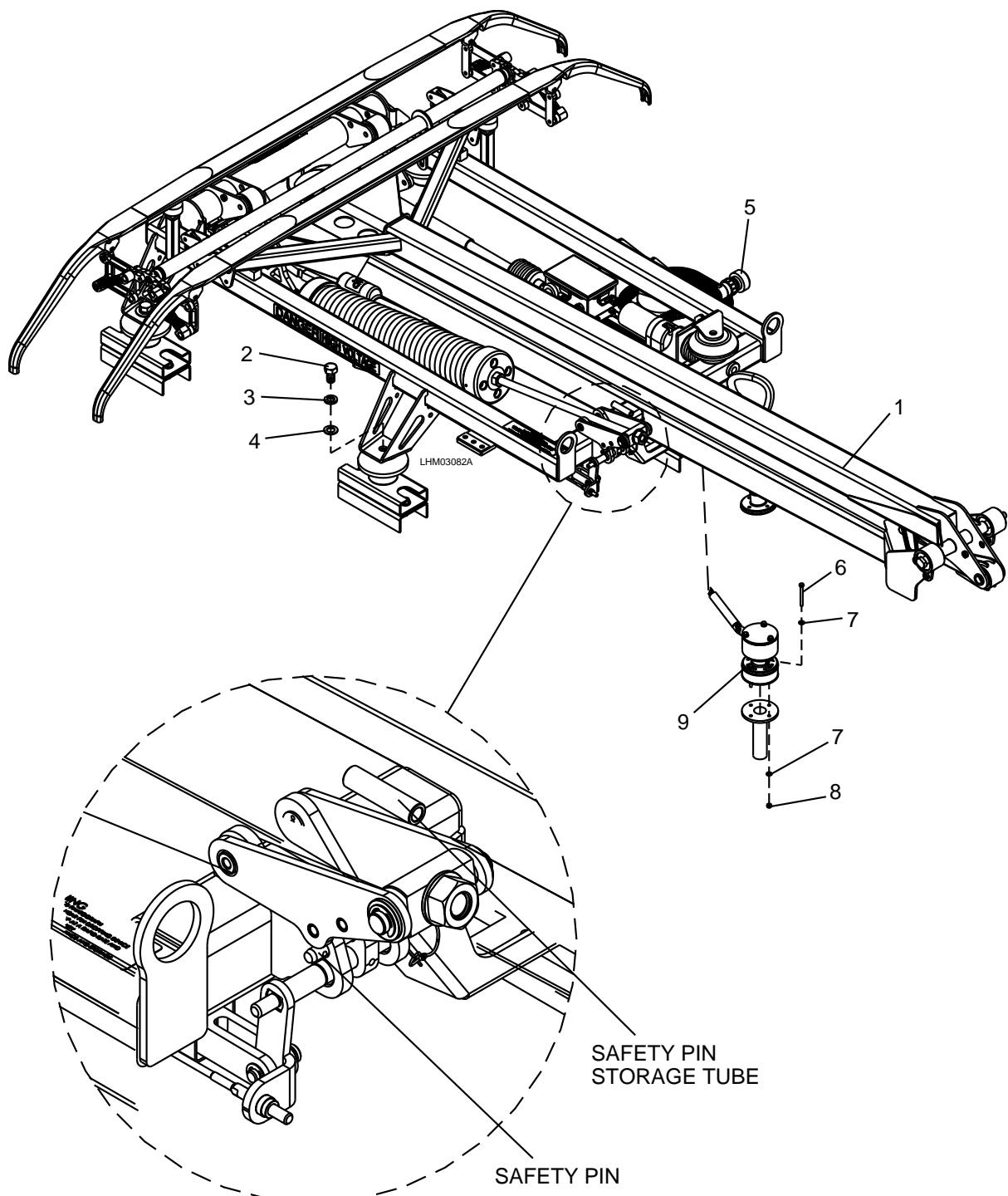


Figure 7-120: Pantograph

7.4.7.5 Auxiliary Fuse Box

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the 3/8-16 electrical connections (6) from the Auxiliary Fuse Box (1).

NOTE: Refer to the Heavy Repair Maintenance Manual, Section 0700, Propulsion for the locations of ring terminals that need to be removed for removal of the Auxiliary Fuse Box.

2. Remove the four 3/8 ESNA nuts (5) and 3/8 plain washers (4), 3/8 x 1-1/4 bolts (2), and 3/8 plain washers (3). See Figure 7-121.
3. Carefully remove the Auxiliary Fuse Box (1) from the mounting bracket.

7.4.7.6 Heating, Ventilation and Air Conditioning (HVAC) Unit

WARNING

USE PROPER LIFTING EQUIPMENT TO REMOVE AND INSTALL COMPONENTS THAT WEIGH 50 LBS. (23 KG) OR MORE. ENSURE THAT THE COMPONENT IS SECURELY FASTENED TO THE LIFTING DEVICE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the electrical connectors from the HVAC Unit (1).
2. Remove the six M14 ESNA nuts (5) and M14 plain washers (4), M14 x 50 bolts (2), and M14 plain washers (3). See Figure 7-122.
3. Carefully remove the HVAC Unit (1) from the mounting bracket. Refer to Section 0500, HVAC of the Heavy Repair Maintenance Manual for the proper use of the lifting jig during HVAC unit replacement.

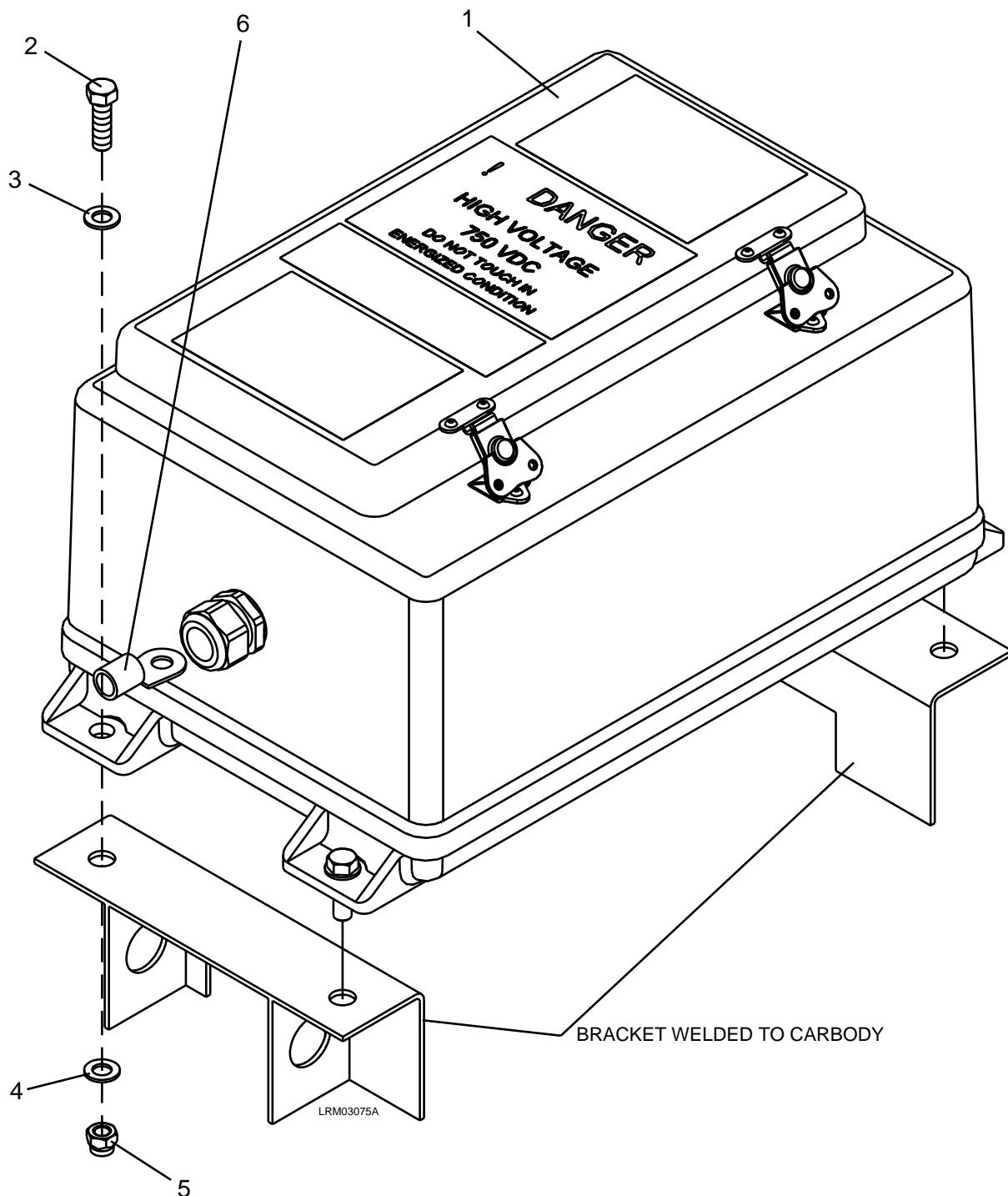


Figure 7-121: Auxiliary Fuse Box

7.4.7.7 Roof Shrouds

7.4.7.7.1 Roof Shroud Group A

1. Remove the eight M10 ESNA nuts (2) and M10 plain washers (3). See Figure 7-123.
2. Carefully remove the Roof Shroud (1).
3. Repeat steps 1 and 2 for the remaining Group A Shrouds.

7.4.7.7.2 Roof Shroud Group B

1. Remove the eight M10 ESNA nuts (2) and M10 plain washers (3). See Figure 7-124.
2. Carefully remove the Roof Shroud (1).
3. Repeat steps 1 and 2 for the remaining Group B Shrouds.

7.4.7.7.3 Roof Shroud Group C

1. Remove the eight M10 ESNA nuts (2) and M10 plain washers (3). See Figure 7-125.
2. Carefully remove the Roof Shroud (1).
3. Repeat steps 1 and 2 for the remaining Group C Shrouds.

7.4.7.8 Silent Alarm

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove power to the fixture.
2. Carefully remove all existing sealant.
3. Remove the three M4 x 20 screws (2), and M4 plain washers (3). See Figure 7-126.
4. Remove the Silent Alarm (1) and disconnect the electrical connector (4).

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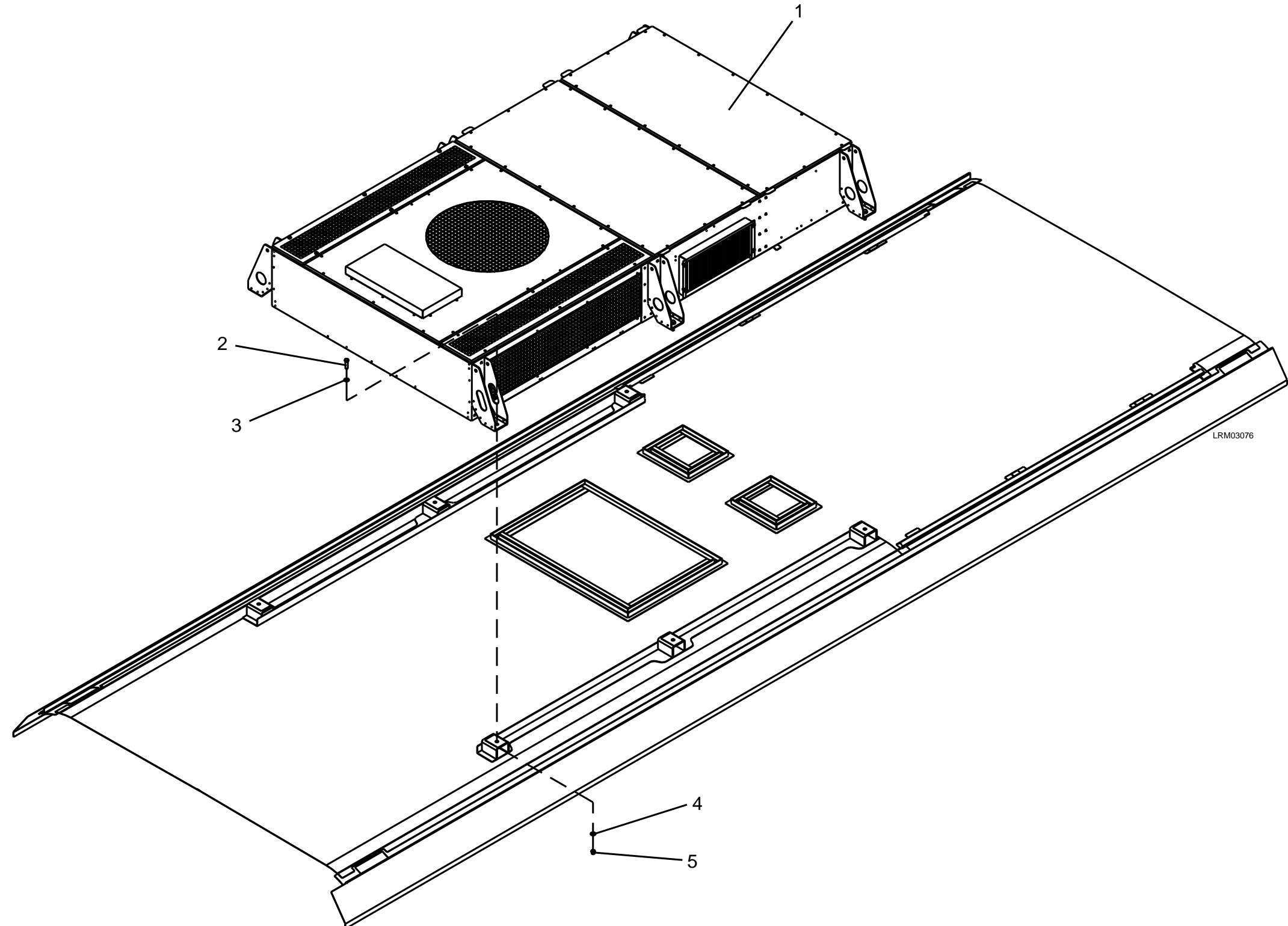


Figure 7-122: Heating, Ventilation and Air Conditioning (HVAC) Unit

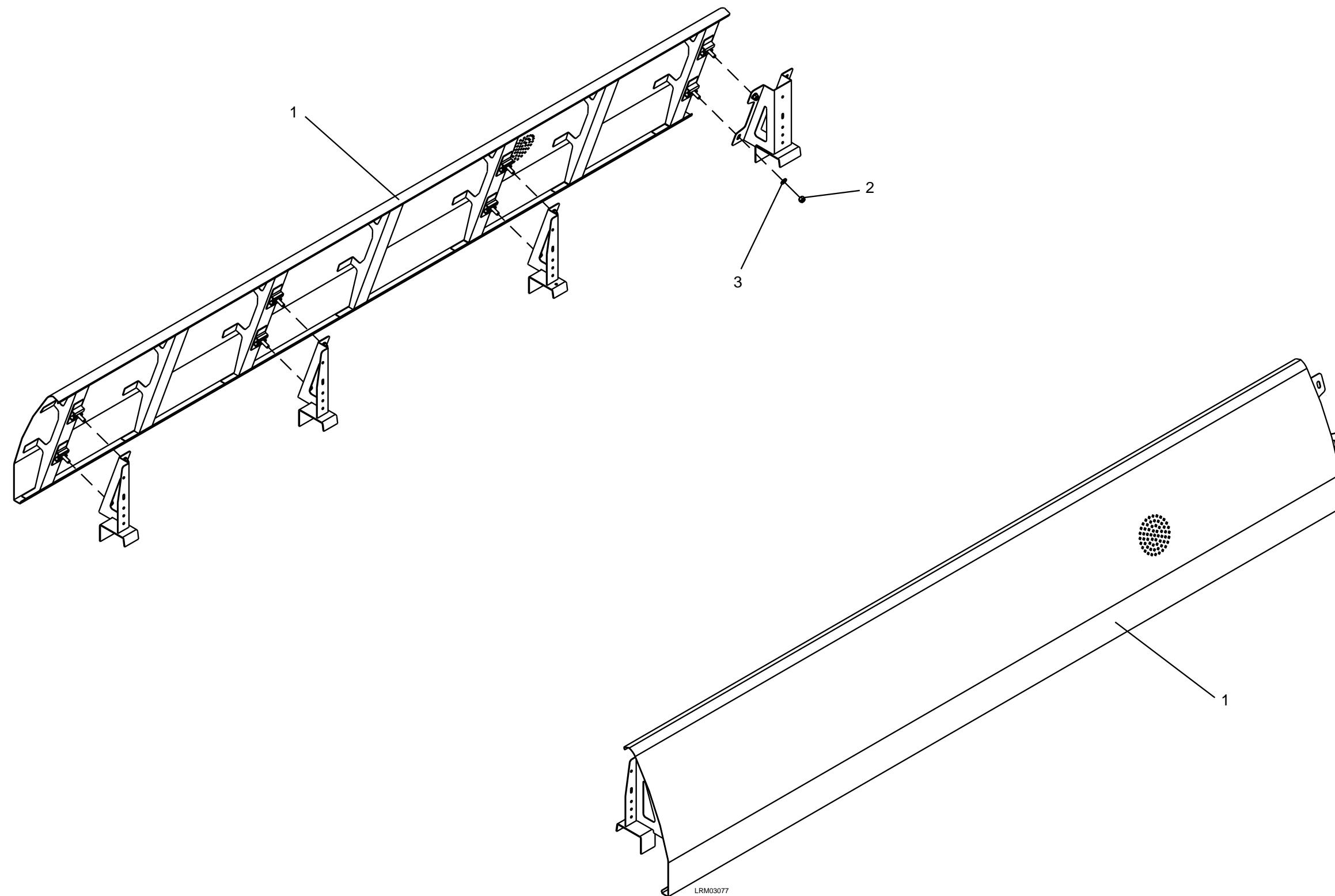


Figure 7-123: Roof Shroud, Group A

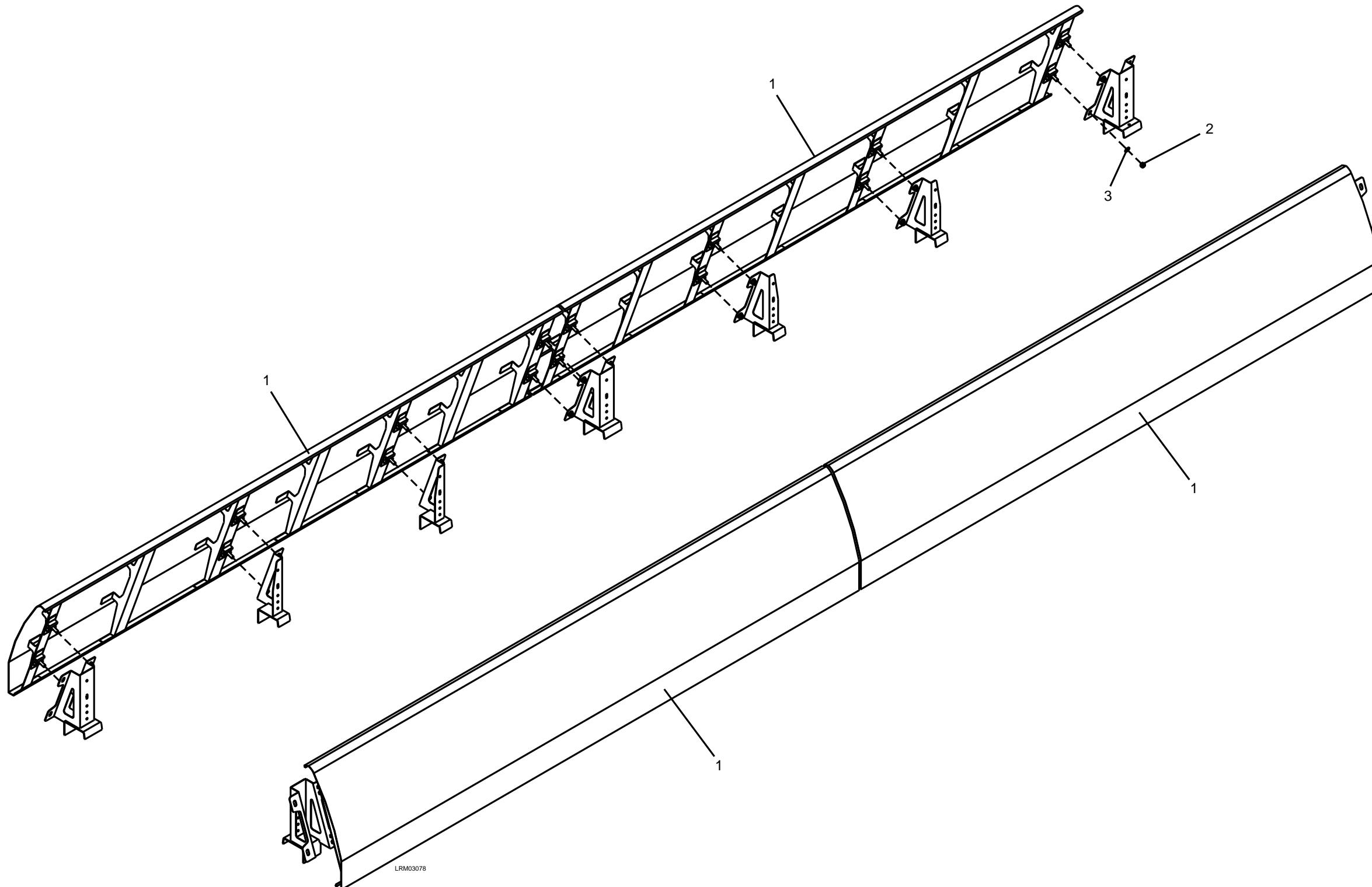


Figure 7-124: Roof Shroud, Group B

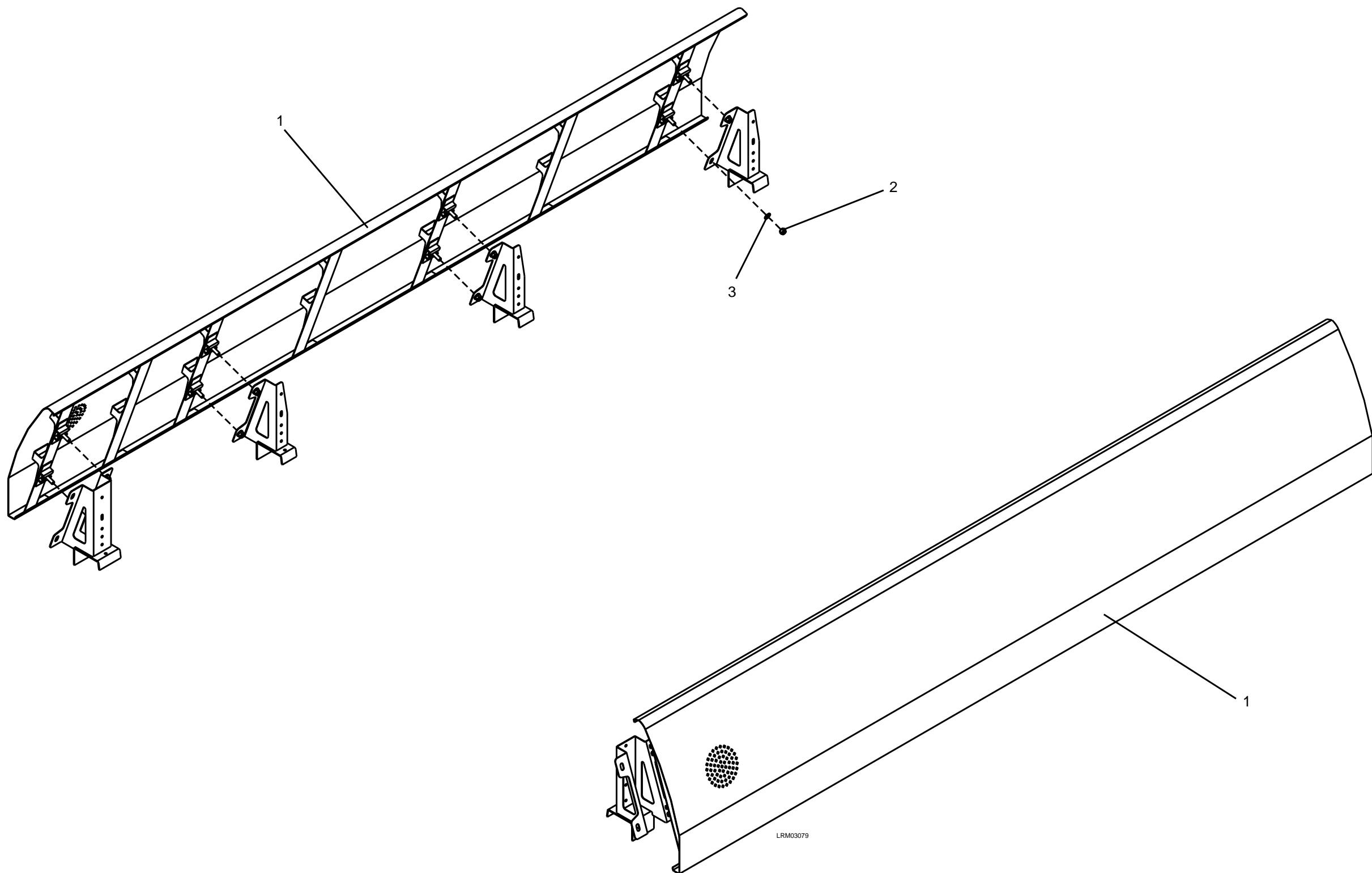


Figure 7-125: Roof Shroud, Group C

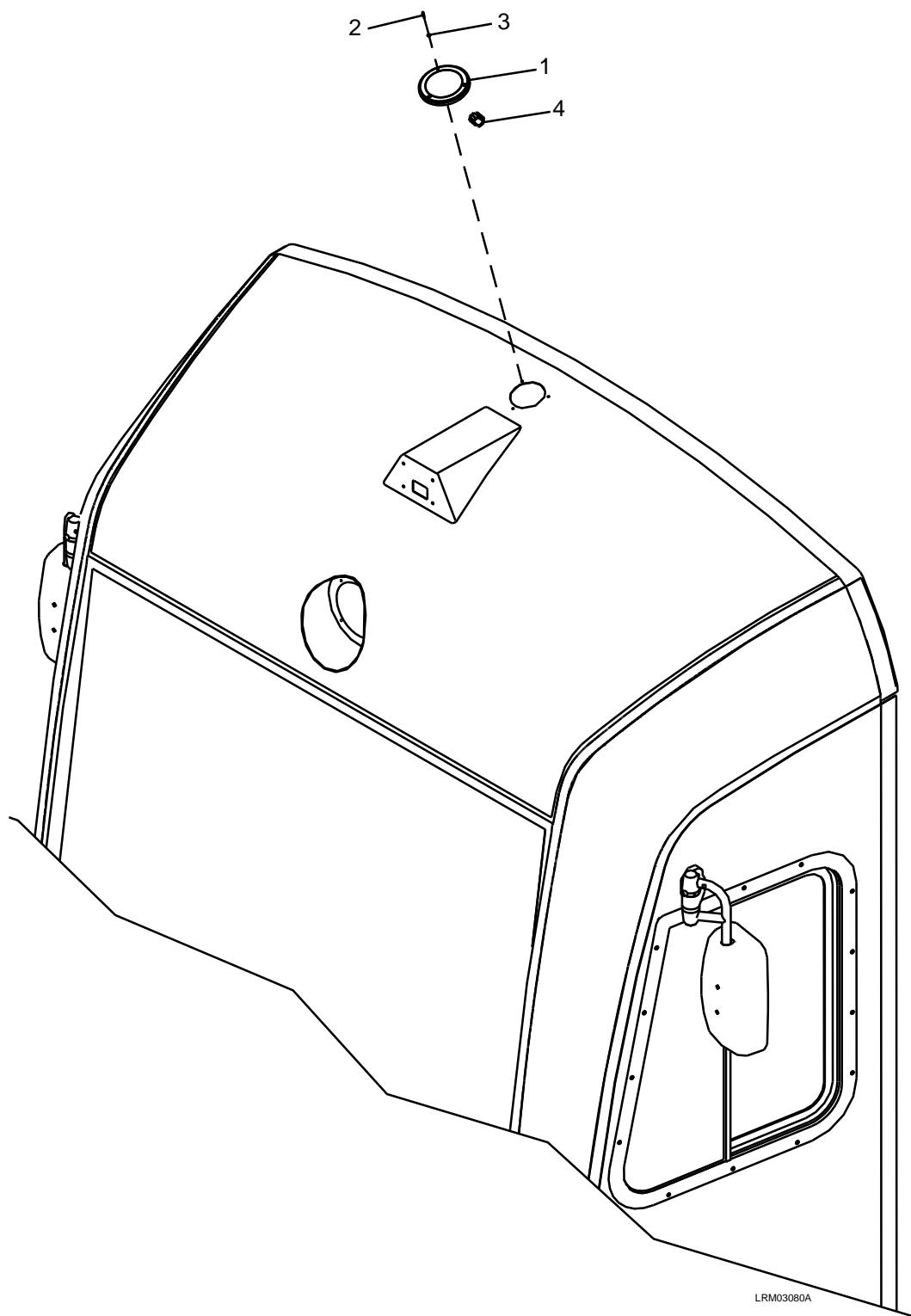


Figure 7-126: Silent Alarm

7.4.7.9 Radio Antenna

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove the antenna mast (1) by turning counterclockwise.
2. Remove the gasket (2). See Figure 7-127.
3. Disconnect the antenna cable.
4. Remove the hex nut (3), internal lock washer (4), and O-ring (5).
5. Remove the coupling nut (6) and base (7).

7.4.7.10 GPS Antenna

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove the six M4 x 8 screws (5), M4 lock washers (6), and M4 plain washers (7). See Figure 7-128.
2. Remove the cover (3).
3. Remove the electrical connector to the GPS Antenna (1).
4. Remove the GPS Antenna (1) by turning the unit counterclockwise.
5. Remove the gasket (8).
6. Remove the three M4 x 16 screws (4), M4 lock washers (6), and M4 plain washers (7).
7. Remove the mounting bracket (2).

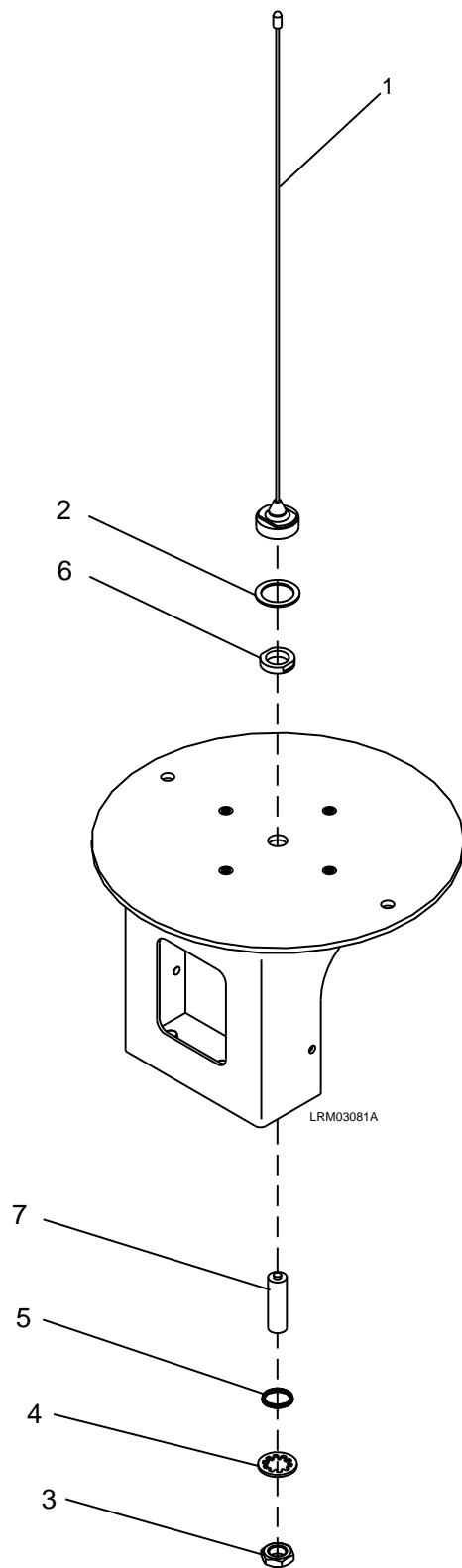


Figure 7-127: Radio Antenna

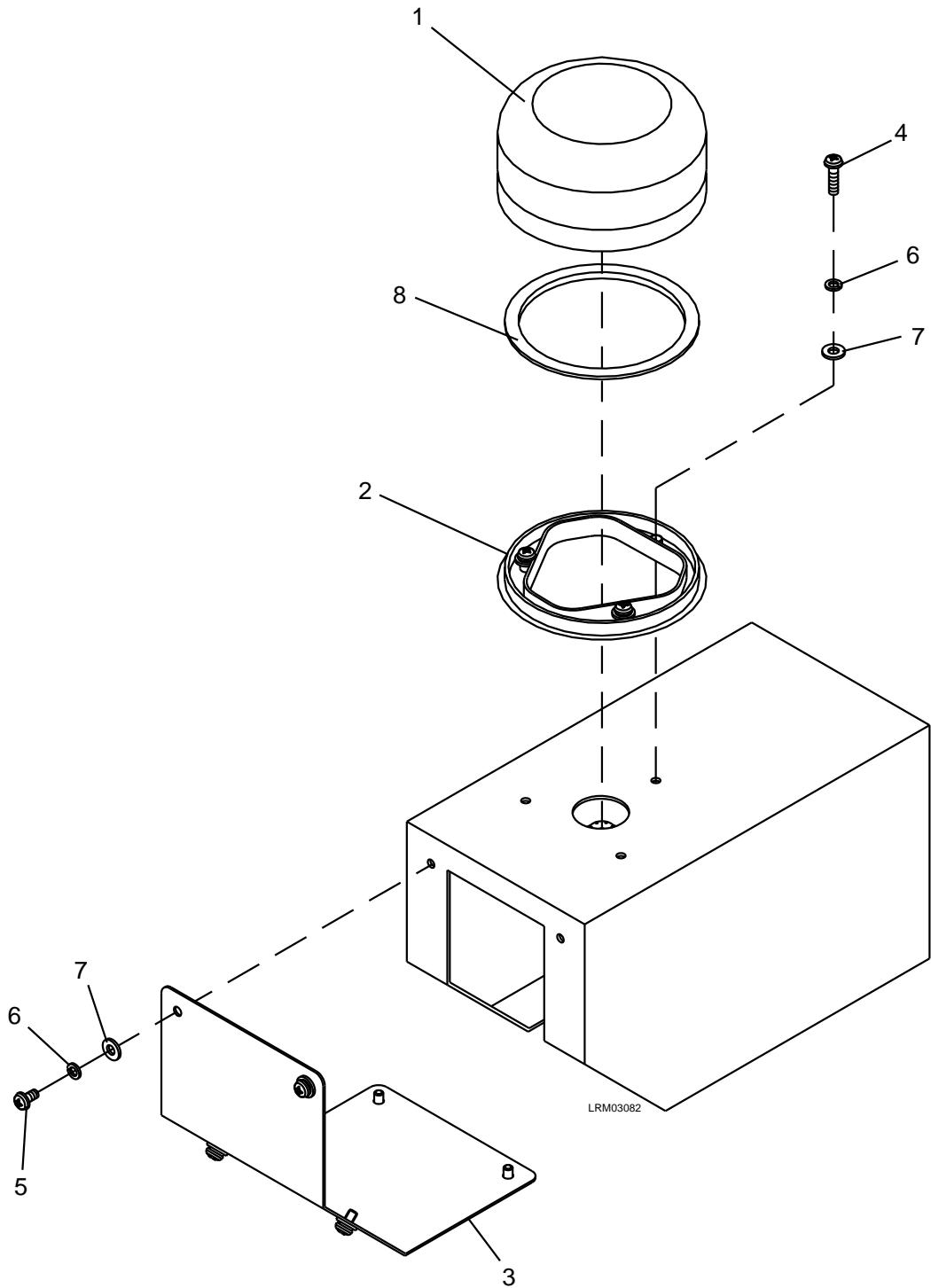


Figure 7-128: GPS Antenna

7.4.7.11 WLAN Antenna

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove the six M4 x 12 screws (4), M4 lock washers (5), and M4 plain washers (6). See Figure 7-129.
2. Remove the cover (3).
3. Remove the electrical connectors to the WLAN Antenna (1).
4. Remove the split nut (2).
5. Carefully remove the WLAN Antenna (1).

7.4.7.12 Wayside Worker Alert System (WWAS) Antenna

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Remove the four M6 x 20 screws (8), M6 lock washers (9), and M6 plain washers (10). See Figure 7-130.
2. Carefully remove the WWAS antenna (1) and remove the cable.
3. Remove the gasket (4).
4. Remove the two M5 nuts (7), M5 lock washers (6) and M5 plain washers (5).
5. Carefully remove the mounting block (3).
6. Remove the gasket (2).

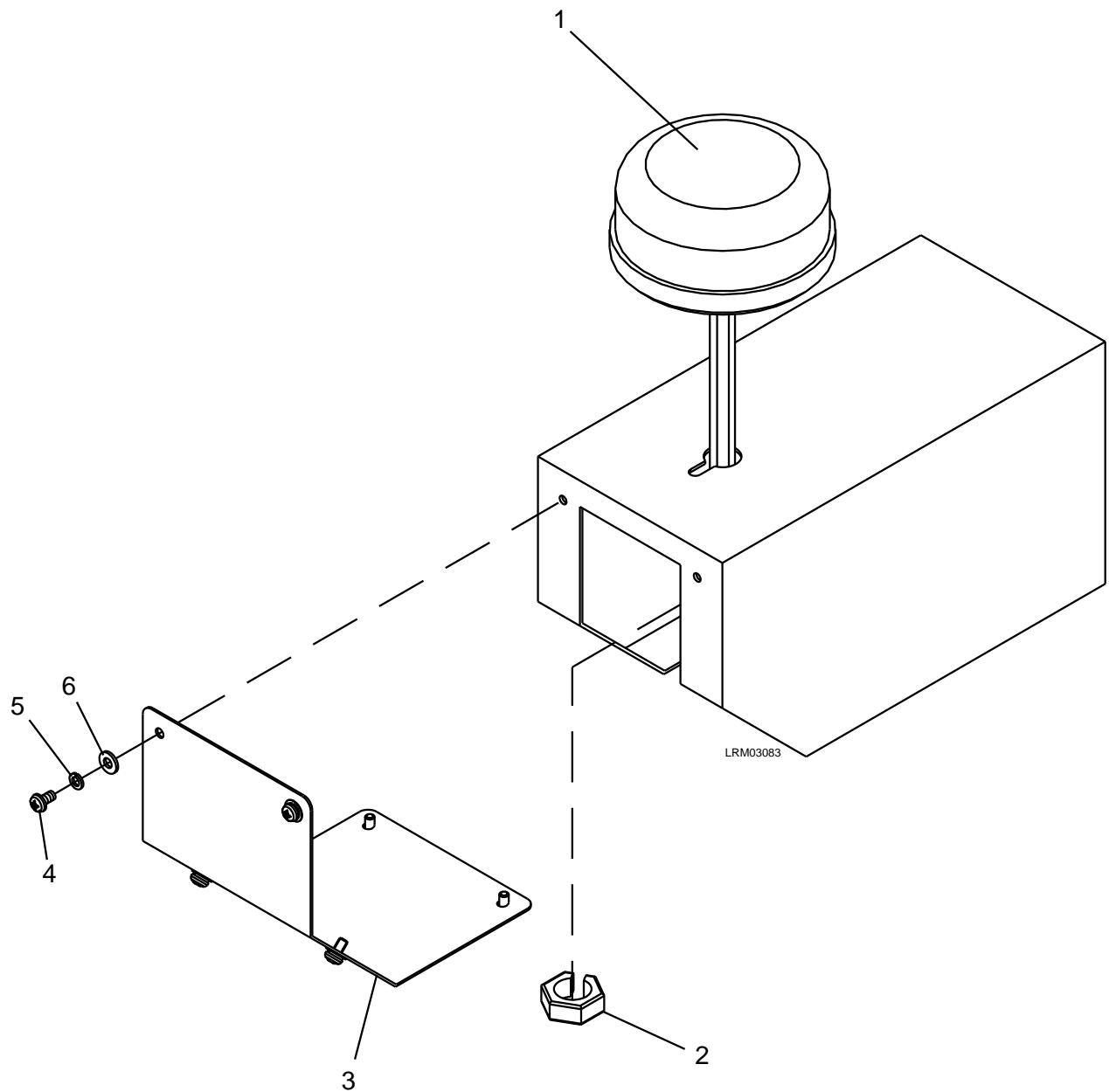


Figure 7-129: WLAN Antenna

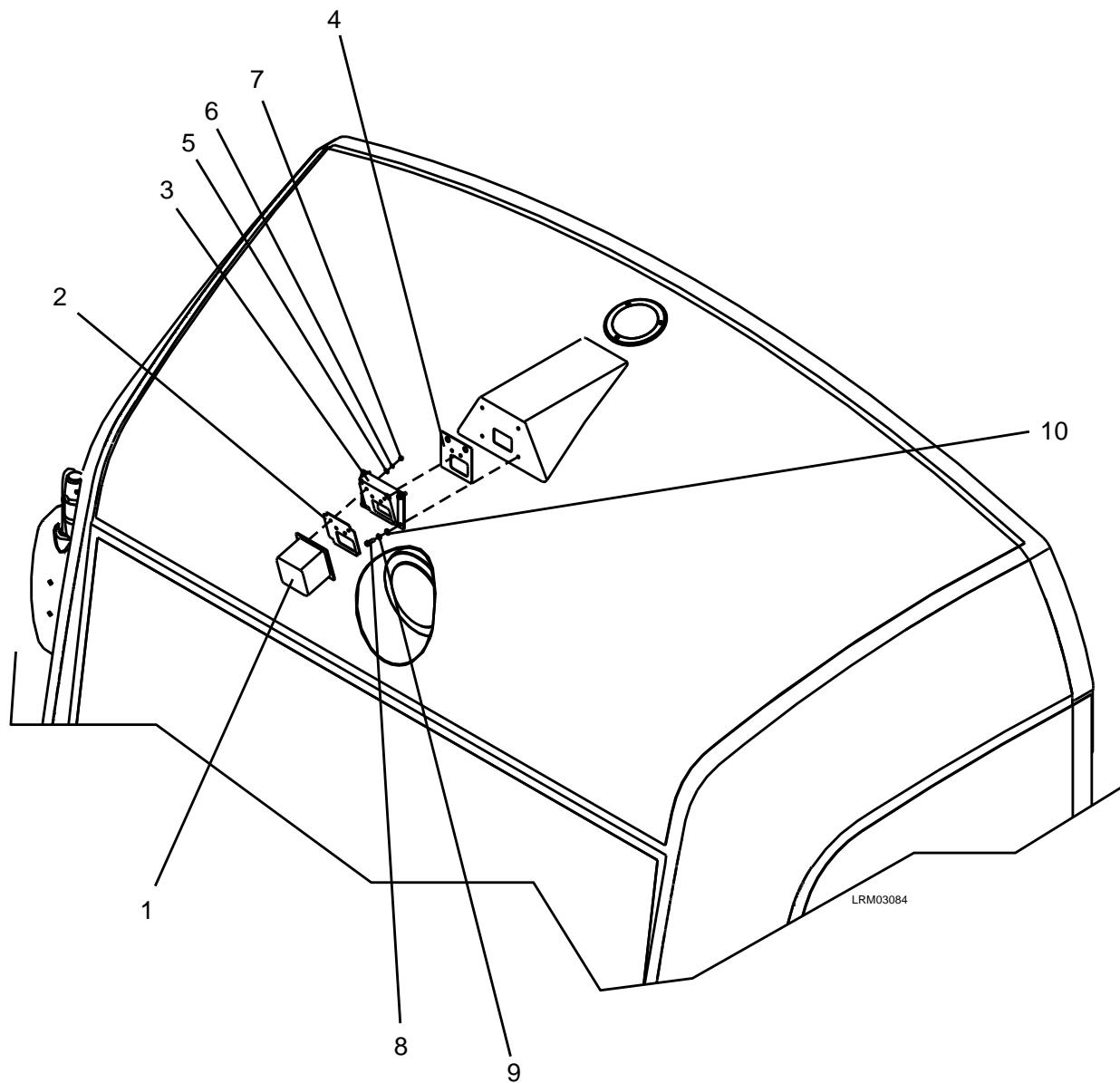


Figure 7-130: Wayside Worker Alert System (WWAS) Antenna

7.4.7.13 Roof Mounted Camera

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Disconnect the electrical connection (4) from the receptacle. See Figure 7-131.
2. Remove the four M6 x 16 bolts (7), M6 lock washers (8), and M6 plain washers (9).
3. Carefully remove the Roof Mounted Camera Assembly from the roof junction box (1)
4. Install the four M6 plain washers (9), M6 lock washers (8), and M6 x 16 bolts (7), that were removed in step 2 above. Torque the bolts to 6.9 Nm (5 ft-lbs.).
5. Install the dust cover (3) onto the receptacle.

NOTE: The following steps are to remove the Camera (6) from the bracket.

6. Disconnect the electrical connection (5) from the cable assembly (4)
7. Remove the two screws (10) from the camera housing.
8. Carefully remove the housing.
9. Remove the four M4 x 12 screws (11), M4 lock washers (12) and plain washers (13).
10. Carefully remove the Roof Mounted Camera (6) from the bracket.

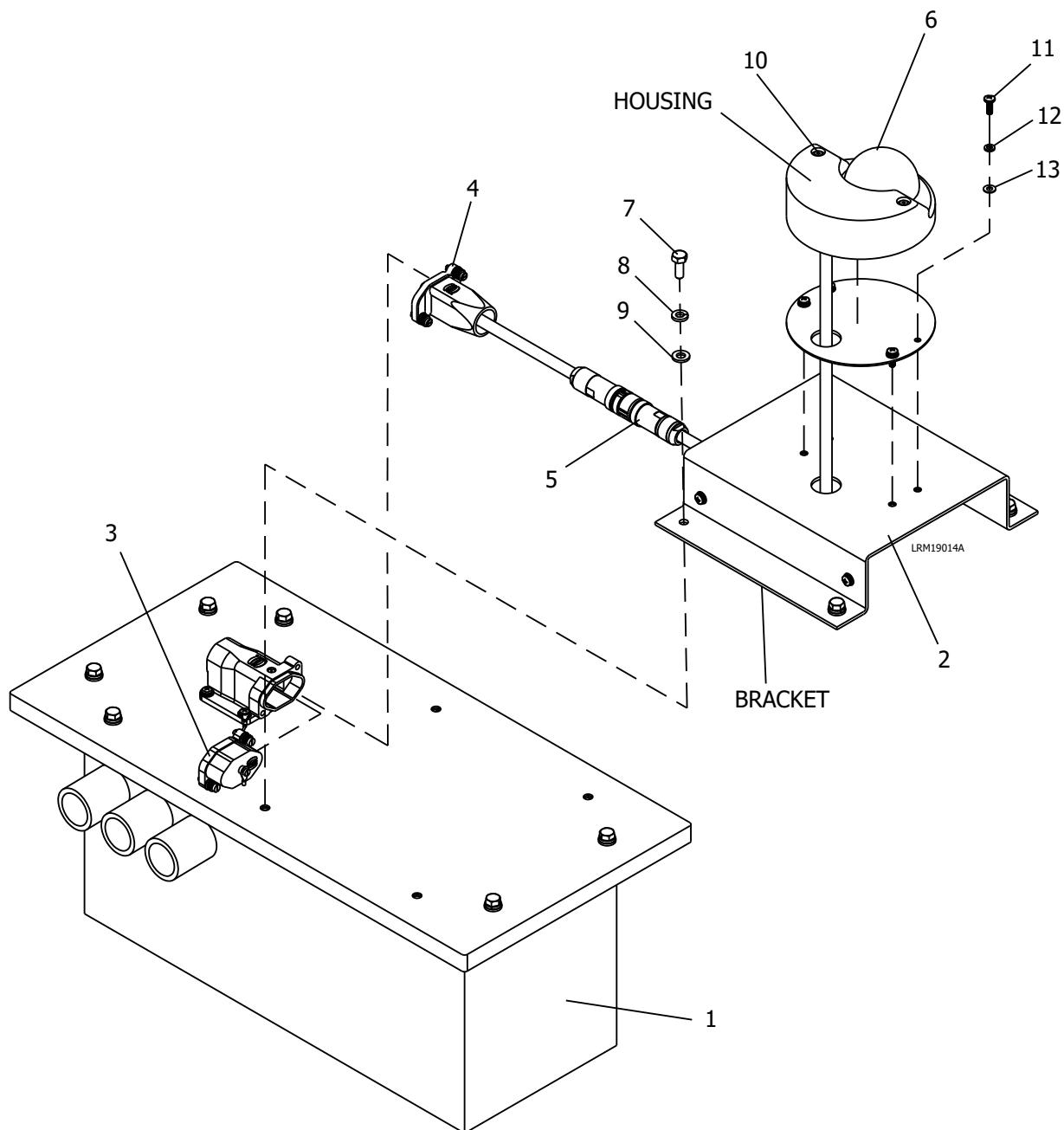


Figure 7-131: Roof Mounted Camera

7.4.8 Articulation Section

The articulation equipment consists of the following components:

See Figures 2-18 and 7-132 through 7-136.

- three Ceiling Panels
- two Side Panels with Inspection Covers
- three External Panels on each side
- four Turntables
- ten Rub Plates
- two Bellows
- one Articulation Middle Frame and two Pivot Bearing assemblies
- one Articulation Shaft and two Rubber Bearings
- two Balancing Devices
- Articulation Wiring

7.4.8.1 Ceiling Panels

1. Remove the four M4 x 10 oval head screws (1) from the cover (2). See Figure 7-132.
2. Remove the cover (2).
3. Remove the four M10 x 25 bolts (3), M10 lock washers (4) and M10 plain washers (5) from the center ceiling panel (7).
4. Remove the two rubber shims (6).
5. Remove the center ceiling panel (7).
6. Remove the twelve M4 x 12 pan head screws (8) and M4 lock washers (9) from the two outer Ceiling Panels (10).
7. Remove the twelve M4 x 20 flat head screws (11) from the two outer ceiling panels (10).
8. Remove the two outer Ceiling Panels (10).
9. Remove the two packing (12).

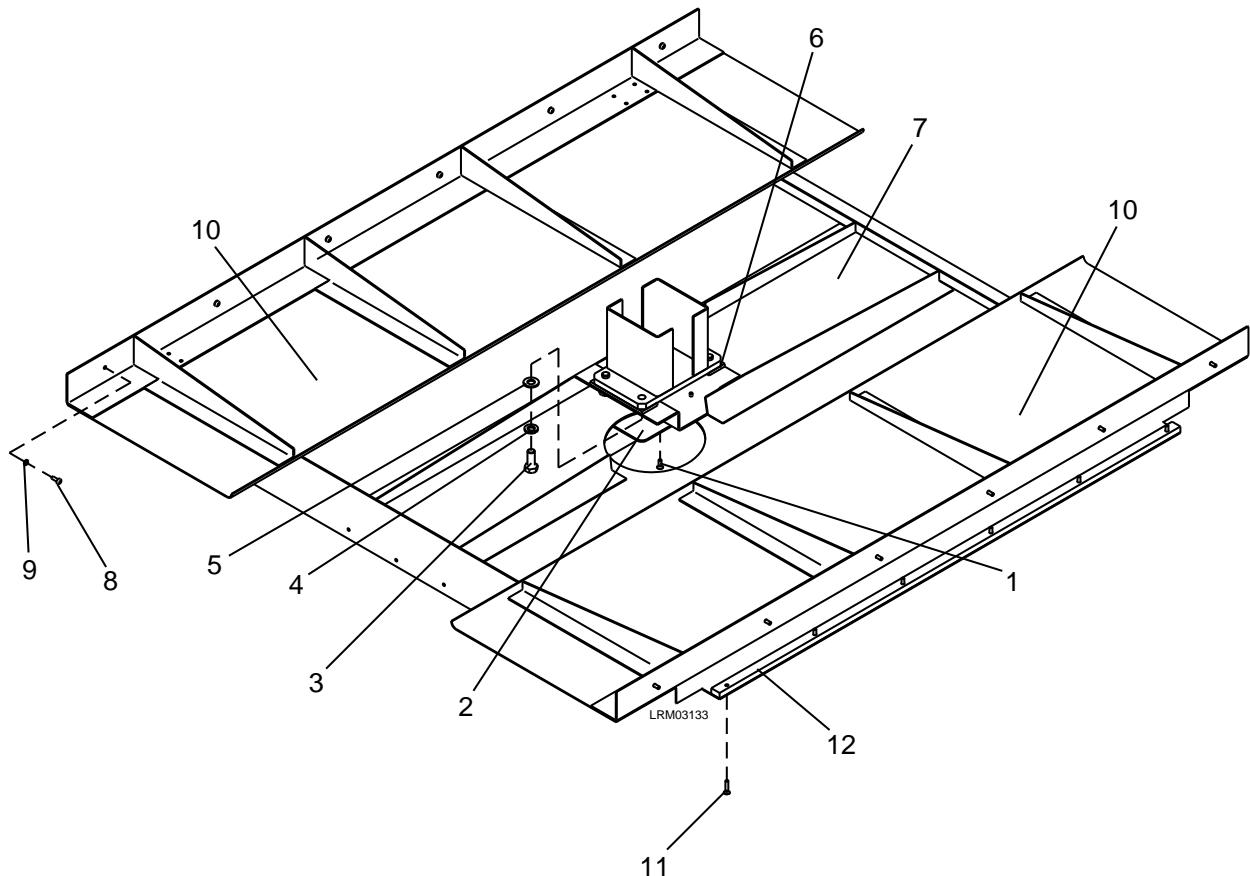


Figure 7-132: Ceiling Panels

7.4.8.2 Side Panels

NOTE: Steps 1 and 2 are for cars 1001 through 1028 only.

1. Remove the eight M4 x 12 oval head screws (1) from the inspection cover (2). See Figure 7-133.
2. Remove the inspection cover (2).
3. Remove the three M4 x 16 oval head screws (3) from the top trim (4).
4. Remove the top trim (4).
5. Remove the four M4 x 16 flat head screws (5) from the Side Panel (6).
6. Remove the eight M4 x 12 oval head screws (7) from the bottom trim (8).
7. Remove the bottom trim (8).
8. Remove the ten M4 x 20 flat head screws (9) from the Side Panel (6).

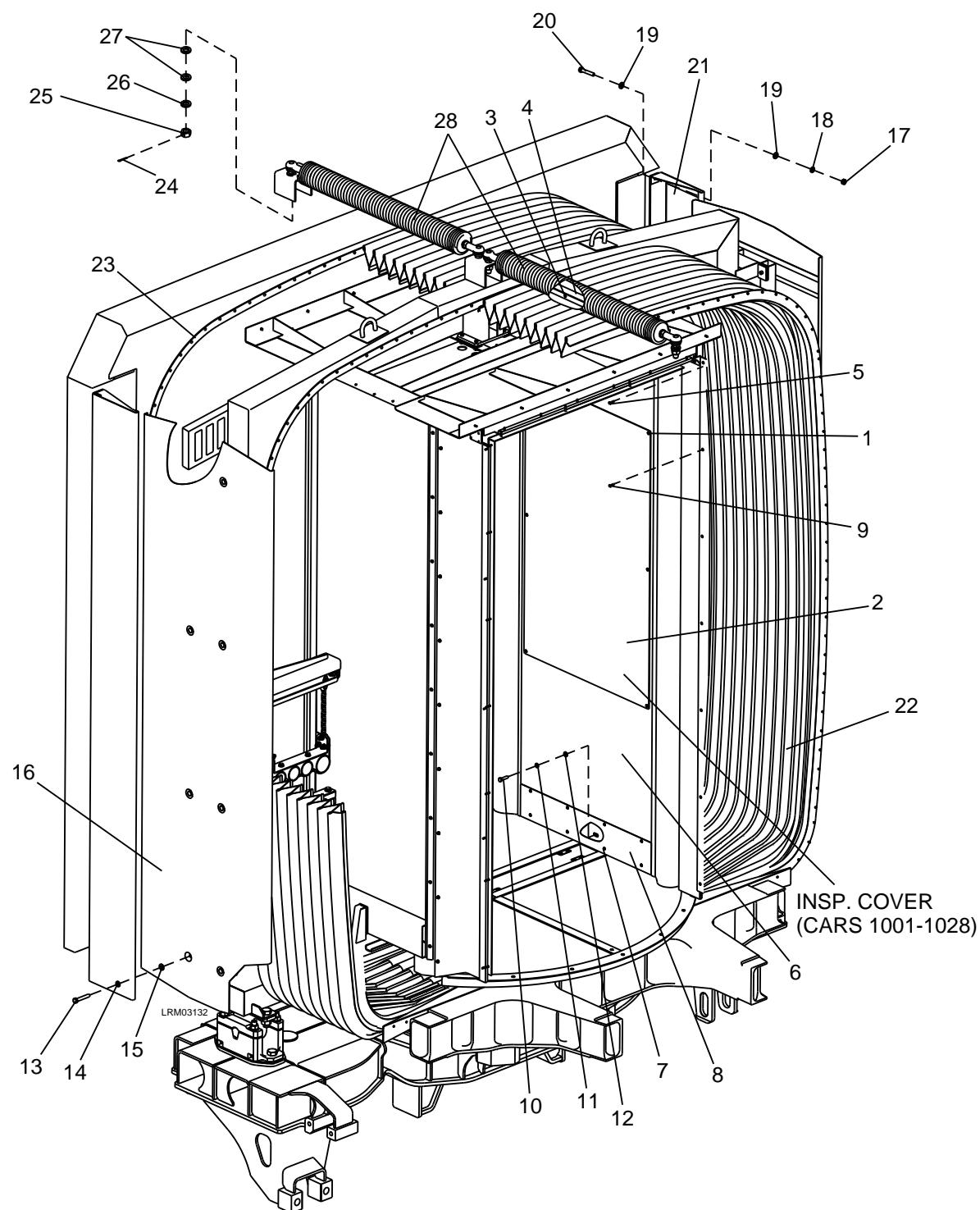


Figure 7-133: Side and External Panels

9. Remove the two M8 x 25 bolts (10), M8 lock washers (11) and M8 plain washers (12) from the Side Panel (6).
10. Remove the Side Panel (6).
11. Repeat steps 1 through 10 for the remaining Side Panel (6).

7.4.8.3 External Panels

1. Remove the eight M10 x 60 bolts (13), M10 lock washers (14) and M10 plain washers (15) from the External Panel (16). See Figure 7-133.
2. Remove the External Panel (16).
3. Remove the eight M6 nuts (17), eight M6 lock washers (18), sixteen M6 plain washers (19) and eight M6 x 25 bolts (20) from the external cover (21).
4. Remove the external cover (21).
5. Repeat steps 1 through 4 for the three remaining external covers (21).

7.4.8.4 Turntables

NOTE: To access the turntables, first remove the ceiling panels and side panels. Refer to Sections 7.4.8.1 and 7.4.8.2 of this manual section.

1. Cut the sealant around the eight stoppers (6) and the two floor covers (2) using a sharp knife. Trace the outline of the stoppers with the knife so that the sealant will remain in place when the turntables are removed. See Figure 7-134, Sheet 1.
2. Remove the five M5 x 12 flat head screws (1) from the floor cover (2).
3. Remove the floor cover (2).
4. Remove the eight M5 x 12 flat head screws (5) from the stopper brackets (6).
5. Remove the Turntable (7). The left panel is removed first, followed by the right panel. Refer to Figure 7-134, Sheet 2 for panel orientation.
6. Repeat steps 1 through 5 for the remaining Turntable (7).

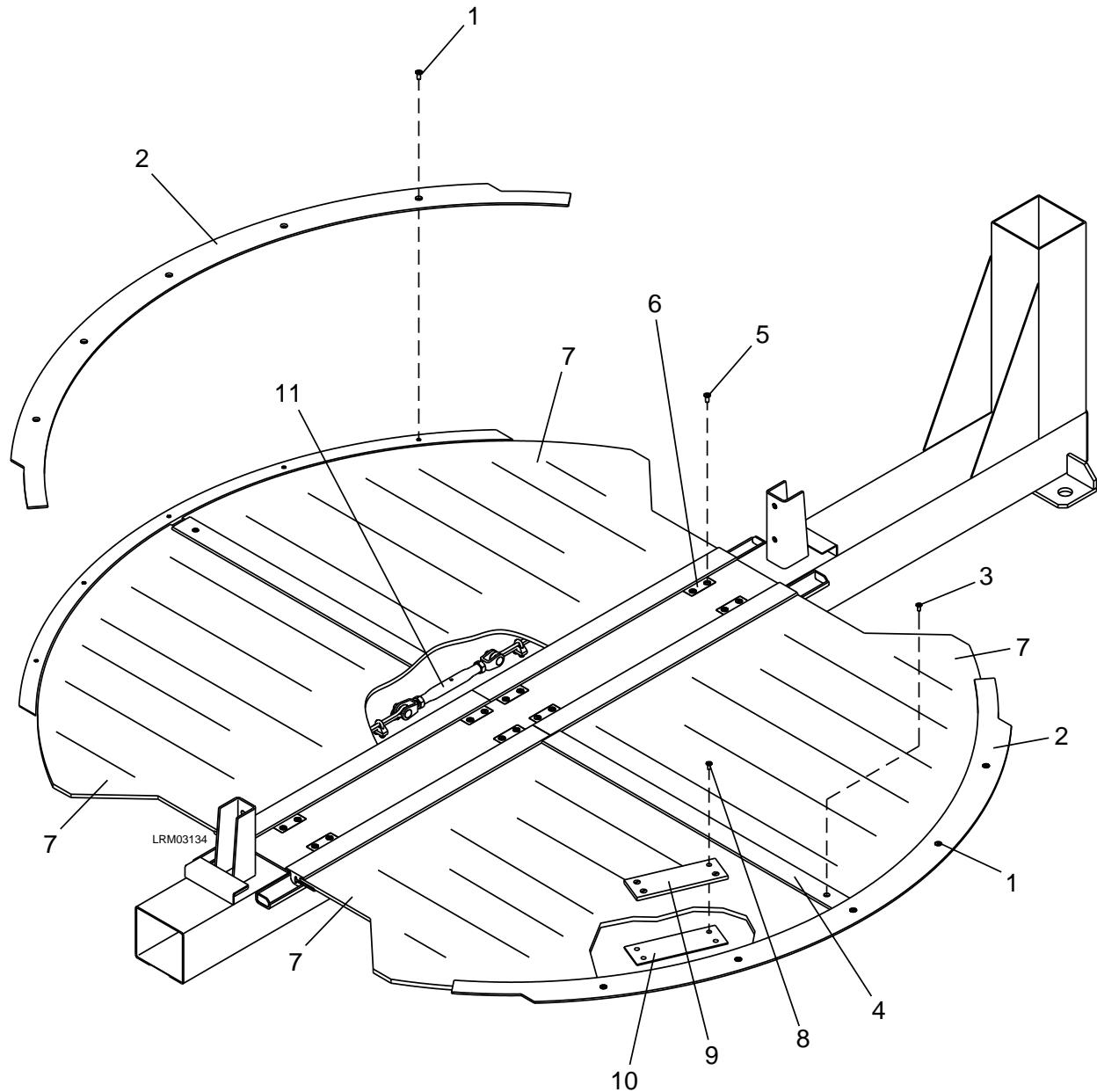


Figure 7-134: Turntable
(Sheet 1 of 2)

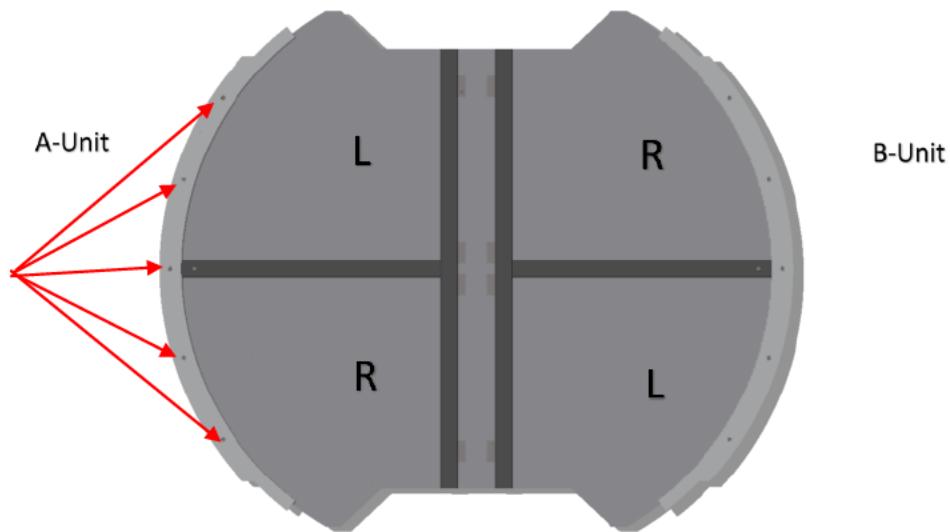


Figure 7-134: Turntable
(Sheet 2 of 2)

7.4.8.5 Rub Plates

NOTE: To access the rub plates, first remove the ceiling panels, side panels and turntables. Refer to Sections 7.4.8.1, 7.4.8.2 and 7.4.8.4 of this manual section.

1. Remove the four M5 x 12 flat head screws (8) from the Rub Plate (9). See Figure 7-134, Sheet 1.
2. Remove the Rub Plate (9).
3. Remove the liner (10).
4. Repeat steps 1 through 3 for the remaining nine Rub Plates (9).

7.4.8.6 Bellows Assembly

NOTE: The turntables must be removed to access the turnbuckles. Refer to Section 7.4.8.4 of this manual section.

1. Rotate the two turnbuckles (11) to loosen the Bellows (22). See Figures 7-133 and 7-134.
2. Remove the Bellows (22) from the bellows frame (23). See Figure 7-133.
3. Repeat steps 1 and 2 for the remaining Bellows (22).

7.4.8.7 Articulation Middle Frame and Pivot Bearing Assembly

NOTE: To access the articulation middle frame and pivot bearings, first remove the external panels, ceiling panels, side panels, turntables, bellows and articulation wiring. Refer to Sections 7.4.8.1 through 7.4.8.6 and 7.4.8.10 of this manual section.

1. Support the Articulation Middle Frame (4) using a crane and the two eyebolts on top of the frame.
2. Remove the four M20 nuts (1), M20 lock washers (2) and M20 x 50 bolts (3) from the Articulation Middle Frame (4). See Figure 7-135.
3. Remove the eight M16 nuts (5), M16 plain washers (6) and M16 x 120 bolts (7).
4. Remove the four bearing caps (8) and eight packing (9) from the pivot bearing support (10).
5. Remove the Articulation Middle Frame (4).
6. Remove the two bearing supports (11) with the pivot shafts (12).
7. Remove the four M20 nuts (13), M20 lock washers (14) and M20 x 65 bolts (15) from the pivot bearing support (10).
8. Remove the two pivot bearing supports (10) and shims (16).

7.4.8.8 Articulation Shaft and Rubber Bearings

NOTE: To access the articulation middle frame and pivot bearings, first remove the external panels, ceiling panels, side panels, turntables, bellows and articulation wiring. Refer to Sections 7.4.8.1 through 7.4.8.6 and 7.4.8.10 of this manual section.

1. Remove the articulation middle frame and turntable. Refer to Sections 7.4.8.4 and 7.4.8.7 of this manual section.
2. Remove the eight M22 x 190 bolts (17), M22 plain washers (18) and nut plates (19) from the upper articulation shaft bearings (20). See Figure 7-135.
3. Remove the upper articulation shaft bearings (20).
4. Using a lifting device, lift the B-Unit articulation arm (25) high enough to clear the A-Unit articulation arm (26).
5. Remove the two Articulation Shaft Rubber Bearings (22) and the two shims (23).
6. Pull the articulation shaft (24) through the B-Unit articulation arm (25).

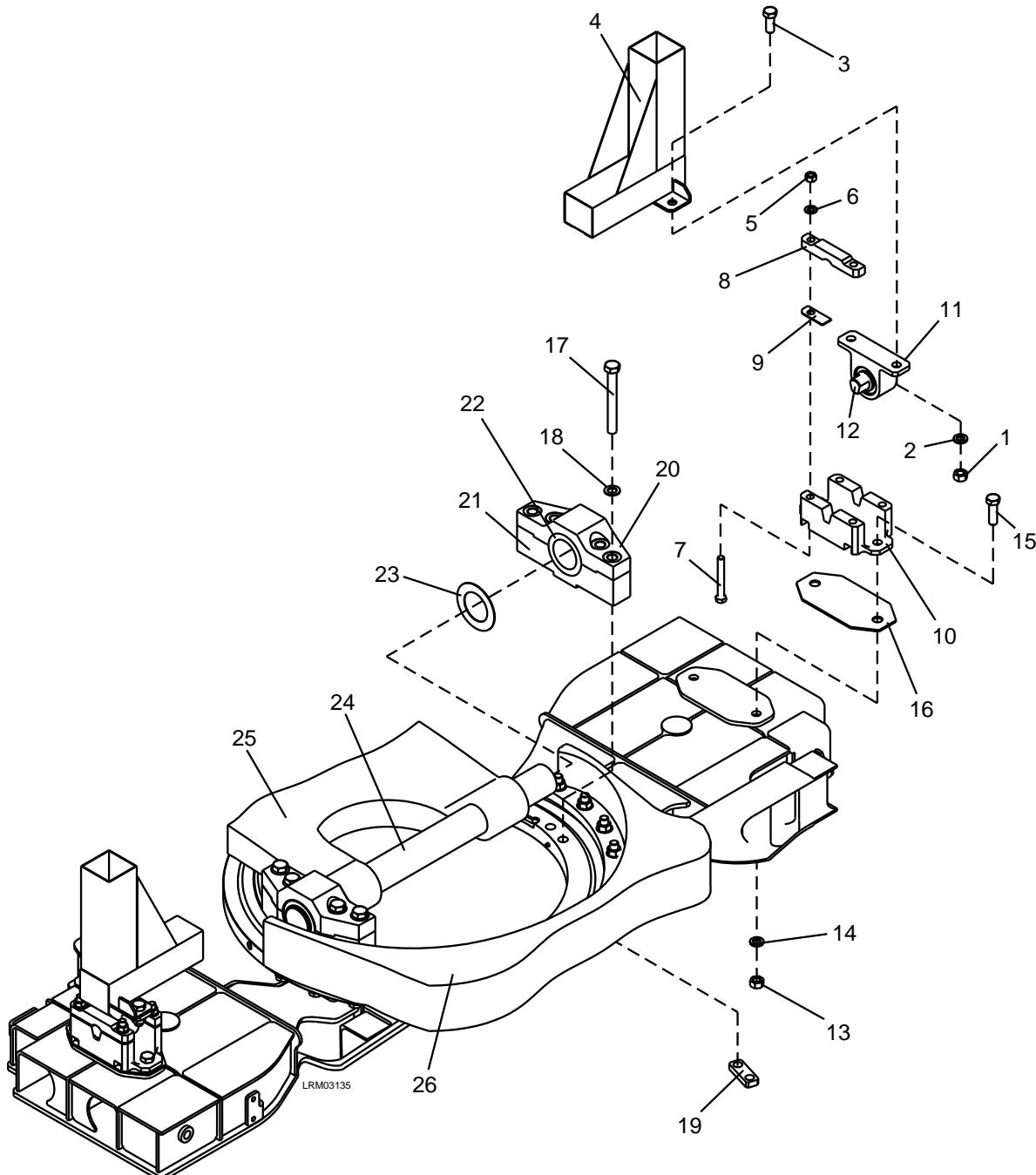


Figure 7-135: Articulation Middle Frame and Pivot Bearing Assembly

7.4.8.9 Balancing Device

1. Remove the two split pins (24), two M16 nuts (25), two M16 lock washers (26) and four M16 plain washers (27) from the Balancing Device (28). See Figure 7-133.
2. Remove the Balancing Device (28).

7.4.8.10 Articulation Wiring

WARNING

ARTICULATION WIRING ON THESE CARS OPERATES AT VOLTAGE AND CURRENT LEVELS THAT ARE HAZARDOUS AND LIFE THREATENING. PROPER PRECAUTIONS SHOULD BE TAKEN AND METRO SAFETY RULES, PRACTICES AND PROCEDURES CLOSELY OBSERVED.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

NOTE: First remove the side panels to access the articulation wiring. Refer to Section 7.4.8.2 of this manual section.

1. Remove the four M6 x 25 bolts (1), M6 lock washers (2) and M6 plain washers (3) from the lid (4). See Figure 7-136.
2. Remove the lid (4) from the terminal box (5).
3. Remove the two M10 lock nuts (6), M10 plain washers (7) and M10 x 65 bolts (8).
4. Remove the cable cleat holder (9) and the cable cleat (10).
5. Remove the two M10 lock nuts (11), four M10 plain washers (12) and two M10 x 75 bolts (13) from the washer (14).
6. Remove the washer (14) and cable cleat (15).
7. Repeat steps 1 through 6 for the five remaining terminal boxes (5), five cable cleats (10) and two cable cleats (15).
8. Remove the locking head (16), strap (17) and spacer blocks (18).
9. Repeat step 8 for the remaining three locking heads (16), three straps (17) and spacer blocks (18).

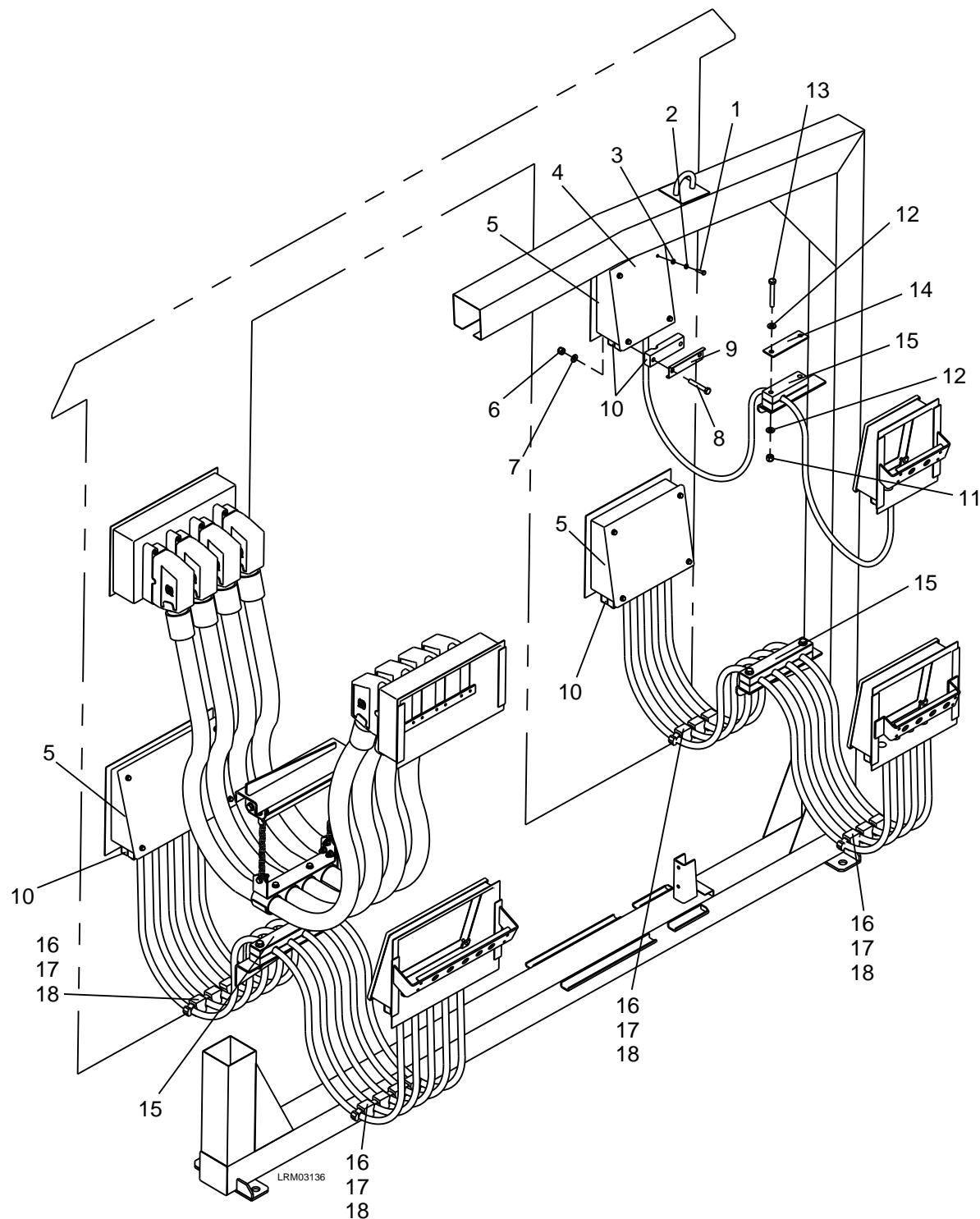


Figure 7-136: Articulation Wiring
(Sheet 1 of 2)

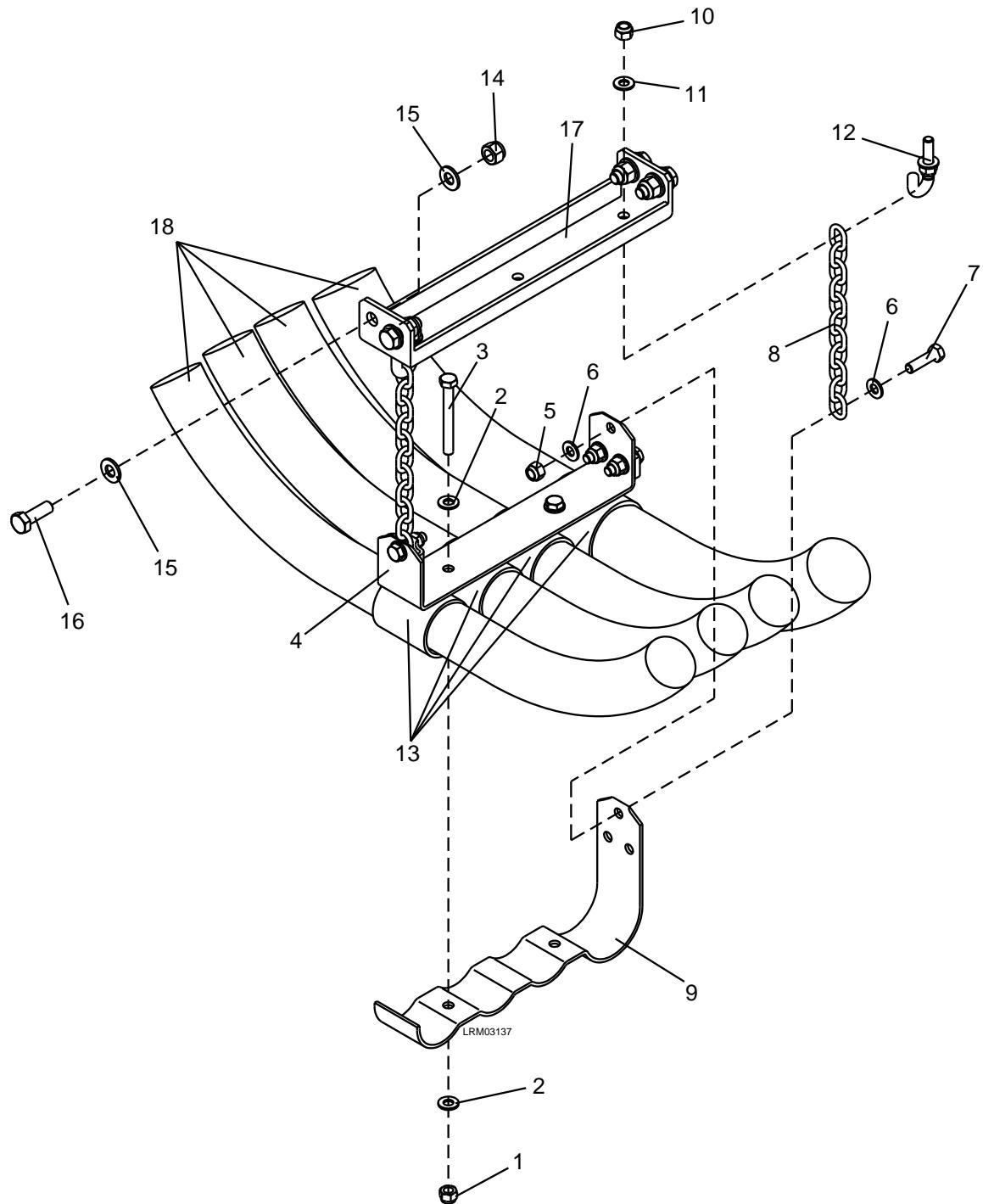


Figure 7-136: Articulation Wiring
(Sheet 2 of 2)

10. Remove the two M8 lock nuts (1), four plain washers (2) and two M8 x 55 bolts (3) from the bracket (4). See Figure 7-136.
11. Remove the M8 lock nut (5), two M8 plain washers (6) and M8 x 30 bolt (7) from the lifting chain (8).
12. Repeat step 11 for the remaining three M8 lock nuts (5), plain washers (6) and M8 x 30 bolts (7).
13. Remove the clamp (9).
14. Remove the lifting chain (8).
15. Remove the M8 lock nut (10), M8 plain washer (11) and chain support (12).
16. Repeat steps 11, 14 and 15 for the remaining chain (8) and chain support (12).
17. Remove the four packing (13).
18. Remove the M10 lock nut (14), two plain washers (15) and M10 x 30 bolt (16) from the bracket (17).
19. Repeat step 18 for the remaining three M10 lock nuts (14), six plain washers (15) and three M10 x 30 bolts (16).
20. Remove the bracket (17).
21. Remove the four articulation cables (18).

7.5 Installation

7.5.1 Cab Equipment

7.5.1.1 Cab Console

1. Carefully place the Console (1) on the cab desk and align the mounting holes. See Figure 7-3.
2. Place M5 plain washer (4) over M5 screw (3) and insert into one of the mounting holes.
3. From under the cab desk, place a M5 plain washer (4) over the M5 screw (3) and then the M5 ESNA nut (5).
4. Repeat steps 2 and 3 for the remaining mounting locations.
5. Torque the nuts (5) with the information listed in Section 7.3.4 of this manual section.
6. Connect the connector to Console Panel 1 and align the mounting holes and insert the screws (3) that were removed in Section 7.4.1.1, step 2.
7. Repeat step 5 for the remaining Console Panels 2, 3, and 4.
8. Connect the two connectors (6) to the Console (1).

7.5.1.2 Console Panels

See Figure 7-4.

7.5.1.2.1 Console Panel 1

1. Connect the connector to the panel wiring. See Figure 7-5.
2. Align the mounting holes and insert the seven #8-32 flat head screws (1).
3. Tighten the screws (1).

7.5.1.2.2 Console Panel 2

1. Connect the connector to the panel wiring. See Figure 7-6.
2. Align the mounting holes and insert the six #8-32 flat head screws (1).
3. Tighten the screws (1).

7.5.1.2.3 Console Panel 3

1. Connect the two connectors to the panel wiring. See Figure 7-7.
2. Align the mounting holes and insert the nine #8-32 flat head screws (1).
3. Tighten the screws (1).

7.5.1.2.4 Console Panel 4

1. Connect the connector to the panel wiring. See Figure 7-8.
2. Align the mounting holes and insert the seven #8-32 flat head screws (1).
3. Tighten the screws (1).

7.5.1.3 Operator's Seat

1. Carefully align the Operator's Seat (1) over the mounting holes in the cab floor. See Figure 7-9.
2. Insert the four M10 x 35 bolts (2), M10 lock washers (3), and M10 plain washers (4) into the holes.
3. Tighten the bolts (2) and torque per the chart listed in Section 7.3.4 of this manual section.

7.5.1.4 Trainer's Seat

1. Carefully place the Trainer's Seat (1) into the mounting holes. See Figure 7-10.
2. Install the nine M4 ESNA nuts (2) and M4 plain washers (3) on the studs.
3. Tighten the nine M4 ESNA nuts (2) and torque to 1.5 Nm (13 in-lbs.).

7.5.1.5 Cab Light

1. Connect the connector to the Cab Light (1). See Figure 7-11.
2. Carefully place the Cab Light (1) and align the mounting holes.
3. Install the six M4 x 16 screws (3), M4 lock washers (4) and M4 plain washers (5).
4. Tighten the six M4 screws (3) and torque to 1.5 Nm (13 in-lbs.).
5. Close the lens door (2) and fasten the two captive 8-32 torx head screws (6).

7.5.1.6 Cab Console Light

1. Unlock the two locks (7) and lower the cab ceiling panel (1). See Figure 7-12.
2. Install the Cab Console Light (6) and align the mounting holes.
3. Install the three M4 x 25 screws (2), M4 plain washers (4), M4 lock nuts (5), and M4 hex nuts (3).
4. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
5. Carefully raise the cab ceiling panel (1).

7.5.1.7 Sun Shades

See Figure 7-13.

7.5.1.7.1 Front Sun Shade

1. Align the upper brackets (2) with the mounting holes. See Figure 7-13.
2. Insert the two M4 x 12 screws (6) into each of the upper brackets (2).
3. Align the mounting holes of the up-rights (8)
4. Insert the two M4 x 16 screws (3), M4 lock washers (4), and the M4 plain washers (5) on Cars 1001 and 1002 or the M4 x 12 screw (7) on Cars 1003 and later into each of the up-rights. (8)
5. Tighten all of the hardware and torque to 1.5 Nm (13 in-lbs.).
6. Ensure that the front sun shade (1) slides up and down.

7.5.1.7.2 Side Sun Shade

1. Align the upper brackets (2) with the mounting holes. See Figure 7-13.
2. Insert the two M4 x 10 screws (6) into each of the upper brackets (2).
3. Align the mounting holes of the up-rights (8).

4. Insert the M4 x 35 screw (3), the M4 lock washer (4), and the M4 plain washer (5) on Cars 1001 and 1002 or the M4 x 12 screw (6) on Cars 1003 and later, into each of the up-rights (8) and torque to 1.5 Nm (13 in-lbs.).
- 5 Ensure that the side sun shade (1) slides up and down.

7.5.1.8 Windshield Wiper

1. Unlock the two locks (10) and remove the left cab desk access panel (11). See Figure 7-14.
2. Remove the master controller connector.
3. Remove the six mounting bolts and remove the master controller to gain access to the Wiper Motor Assembly (1).
4. From inside the car, install the Wiper Motor Assembly (1). Install the wiper spacer (13) and the spacer (12) on the spindle of the Wiper Motor Assembly (1).
5. Install the three M6 x 18 bolts (7), M6 lock washers (8), and M6 plain washers (9).
6. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
7. Carefully install spanner nut (5) and torque to 27.1 Nm (20 ft-lbs.). Apply silicone sealant around the spanner nut (5).
8. Connect the wiper motor plug. Before mounting the wiper arm (2 and 3), cycle the wiper switch once and allow it to return to the parked position.
9. Install the wiper arm (2 and 3) ensuring that it is parallel to the black masking of the windshield. Hold the wiper arm (2 and 3) steady in position.
10. Install the M14 nut (4). Tighten and torque to 34 Nm (25.5 ft-lbs.).
11. Close the screw cover (6).
12. Run the wiper system in low-speed for a few cycles. Verify the wiper swipes a 90 degree sweep and the park position is parallel to the black masking of the windshield.

7.5.1.9 Cab Heater

1. Unlock the two locks and remove the front access panel (5). See Figure 7-15.
2. Carefully install the Cab Heater (1) aligning the mounting holes.
3. Insert the four M8 x 25 bolts (2), M8 lock washers (3), and M8 plain washers (4).

4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Install the electrical connector to the Cab Heater (1).
6. Close the front access panel (5).

7.5.1.10 Defroster / Demister

1. Unlock the two locks and remove the left cab access panel. See Figure 7-16.
2. Remove the master controller connector.
3. Remove the six mounting bolts and remove the master controller to gain access to the Defroster / Demister (1).
4. Carefully install the Defroster / Demister (1) aligning the mounting holes.
5. Insert the four M6 x 20 bolts (2), M6 lock washers (3), M6 plain washers (4), and special washers (5).
6. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
7. Install the duct joint (6).
8. Install the four M6 ESNA nuts (10), M6 plain washers (9), M6 x 20 bolts (7), and M6 plain washers (8).
9. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
10. Close the left cab access panel.

7.5.1.11 Defroster Ducting

1. Install the cab defroster duct (12) onto the demister. See Figure 7-17.
2. Install the duct joint (13) around the cab defroster duct (12).
3. Install the four M6 ESNA nuts (43), M6 plain washers (42), M6 x 20 bolts (40), and M6 plain washers (41).
4. Install the packing (18) aligning the mounting holes.
5. Install the cab defroster duct (11) into the duct joint (13).
6. Install the four M6 ESNA nuts (35), M6 plain washers (34), M6 x 20 bolts (32), and M6 plain washers (33).
7. Tighten the hardware installed in steps 3 and 6.
8. Install the packing (17) aligning the mounting holes.

9. Install the eight M4 x 10 screws (23).
10. Tighten the hardware.
11. Install the packing (16) aligning the mounting holes.
12. Carefully install the cab defroster duct (1) aligning the mounting holes.
13. Install the six M4 x 10 screws (20), M4 lock washers (21), and M4 plain washers (22).
14. Tighten the hardware.
15. Install the cab defroster duct (14) onto the demister.
16. Install the duct joint (13) around the cab defroster duct (14).
17. Install the four M6 ESNA nuts (31), M6 plain washers (30), M6 x 20 bolts (24), and M6 plain washers (29).
18. Tighten the hardware.
19. Install the packing (19) aligning the mounting holes.
20. Carefully install the cab defroster duct (2) aligning the mounting holes.
21. Install the six M4 x 10 screws (20), M4 lock washers (21), and M4 plain washers (22).
22. Tighten the hardware.
23. Carefully install the cab defroster duct (3) aligning the mounting holes.
24. Install the three M4 x 10 screws (23).
25. Install the M4 x 12 screws (20), M4 lock washers (21) and M4 plain washers (22).
26. Tighten the hardware.
27. Repeat step 23 thru 26 for the opposite cab defroster duct (4).
28. Install the duct joint (15) aligning the mounting holes.
29. Install the two M6 ESNA nuts (26), M6 plain washers (25), M6 x 20 screws (27), and M6 plain washers (28).
30. Tighten the hardware.
31. Repeat steps 28 and 30 for the opposite duct joint (15).
32. Install the left side window duct cover (5) aligning the mounting holes.
33. Install the eight M4 x 10 screws (23).

34. Tighten the hardware.
35. Install the right side window duct cover (6) aligning the mounting holes.
36. Install the eight M4 x 10 screws (23).
37. Tighten the hardware.
38. Install the front window duct cover (7) aligning the mounting holes.
39. Install the three M4 x 10 screws (23).
40. Tighten the hardware.
41. Install the defroster duct outlet (8) aligning the mounting holes.
42. Install the three M4 x 10 screws (23).
43. Tighten the hardware.
44. Install the defroster duct outlet (9) aligning the mounting holes.
45. Install the three M4 x 10 screws (23).
46. Tighten the hardware.
47. Install the two defroster duct outlets (10) aligning the mounting holes.
48. Install the six M4 x 10 screws (23).
49. Tighten the hardware.

7.5.1.12 Heater / Defroster Panel

1. Unlock the two locks (6) and remove the cab ceiling panel (1). See Figure 7-18.
2. Carefully install the Heater / Defroster Panel (5) aligning the mounting holes.
3. Insert the four M6 x 20 bolts (2), M6 lock washers (3) and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Install all electrical connections to the WAGO terminal blocks.
6. Install the cab ceiling panel (1).

7.5.1.13 Front Destination Sign

1. Carefully install the Front Destination Sign (1) by hanging on the bracket (5). See Figure 7-19.
2. Apply Locktite to the M8 x 20 screws (2).
3. Install the two M8 x 20 screws (2), M8 lock washers (3) and M8 plain washers (4).
4. Tighten the hardware.
5. Connect the electrical connectors.

7.5.1.14 Coupler Loop Switch

1. Lift the coupler loop switch cover (1). See Figure 7-20.
2. Carefully install the Coupler Loop Switch (4) aligning the mounting holes.
3. Install the three #10-32 screws (2) into the coupler loop switch handle (3).
4. Install the #8-32 electrical connections and torque to 3.5 Nm (30 in-lbs.).

7.5.1.15 Foot Rest

1. Unlock the two locks (10) and remove the access cover (9). See Figure 7-21.
2. Install the magnetic catch (2).
3. Install the two M3 ESNA nuts (8), M3 plain washers (7) and M3 x 12 screws (6).
4. Tighten the hardware.
5. Carefully install the Foot Rest (1) aligning the mounting holes.
6. Install the eight M6 ESNA nuts (5), M6 plain washers (4) and M6 x 25 screws (3).
7. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
8. Close the access cover (9).

7.5.1.16 Foot Switch

1. Install the Foot Switch (1) aligning the mounting holes. See Figure 7-22.
2. Install the #8-32 electrical connections and torque to 3.5 Nm (30 in-lbs.).
3. Insert the two M4 x 50 screws (2), M4 lock washers (3), and M4 plain washers (4).
4. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).

7.5.1.17 Arm Rest

1. Install the Arm Rest (1) aligning the mounting holes. See Figure 7-23.
2. Install the four M4 x 10 screws (2).
3. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).

7.5.1.18 Radio Power Supply

1. Unlock the two locks (5) and lower the cab ceiling panel (6). See Figure 7-24.
2. Carefully install the Radio Power Supply (1) aligning the mounting holes.
3. Install the four M6 x 16 bolts (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Install all electrical connections to the WAGO terminal blocks.
6. Close the cab ceiling panel (6).

7.5.1.19 Cab Speakers

1. Unlock the two locks (11) and lower the cab ceiling panel (1). See Figure 7-25.
2. Install the speaker grill (2) aligning the mounting holes.
3. Install the four M6 hexagon nuts (5), M6 lock washers (6), M6 plain washers (7), and M6 x 20 screws (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Install the speaker gasket (10).
6. Install the Cab Speaker (3).
7. Install the four lock nuts (8), and plain washers (9).
8. Tighten the hardware.
9. Connect the 1/4" Faston electrical connections.
10. Close the cab ceiling panel (1).

7.5.1.20 Upper Control Panel

1. Rotate the front destination sign cover (5) to access the upper control panel mounting. See Figure 7-26.
2. Carefully install the Upper Control Panel (1) aligning the mounting holes.
3. Install the ten M4 x 14 screws (2), M4 plain washers (3), and M4 ESNA nuts (4).
4. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
5. Connect the electrical connector (6).
6. Close the front destination sign cover (5).

7.5.1.21 Control and Relay Panels

7.5.1.21.1 ACP1A Panel

1. Open the right side electric locker door located in the A-Unit. See Figure 7-27.
2. Carefully install the ACP1A Panel (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the ACP1A Panel (1).
6. Close the right side electric locker door located in the A-Unit.

7.5.1.21.2 Electronic Control Unit (ECU)

1. Open the right side electric locker door located in the A-Unit. See Figure 7-28.
2. Carefully install the ECU (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the ECU (1).
6. Close the right side electric locker door located in the A-Unit.

7.5.1.21.3 Communication Control Unit (CCU)

1. Open the right side electric locker door located in the A-Unit. See Figure 7-29.
2. Carefully install the CCU (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the CCU (1).
6. Close the right side electric locker door located in the A-Unit.

7.5.1.21.4 TCN Controller (A-Unit)

1. Open the right side electric locker door located in the A-Unit. See Figure 7-30.
2. Carefully install the TCN Controller (A-Unit) (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the TCN Controller (A-Unit) (1).
6. Close the right side electric locker door located in the A-Unit.

7.5.1.21.5 Event Recorder

1. Open the right side electric locker door located in the A-Unit. See Figure 7-31.
2. Carefully install the Event Recorder (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the Event Recorder (1).
6. Close the right side electric locker door located in the A-Unit.

7.5.1.21.6 CRP6A Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the right side electric locker door located in the A-Unit. See Figure 7-32.
2. Carefully install the CRP6A Panel (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the CRP6A Panel (1).
6. Close the right side electric locker door located in the A-Unit.

7.5.1.21.7 CRP7A Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the right side electric locker door located in the A-Unit. See Figure 7-33.
2. Carefully install the CRP7A Panel (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the CRP7A Panel (1).
6. Close the right side electric locker door located in the A-Unit.

7.5.1.21.8 CRP8A Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the right side electric locker door located in the A-Unit. See Figure 7-34.
2. Carefully install the CRP8A Panel (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3) and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the CRP8A Panel (1).
6. Close the right side electric locker door located in the A-Unit.

7.5.1.21.9 Trainline Interface Module

1. Open the right side electric locker door located in the A-Unit. See Figure 7-35.
2. Carefully install the Trainline Interface Module (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3) and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the Trainline Interface Module (1).
6. Close the right side electric locker door located in the A-Unit.

7.5.1.21.10 CRP2A and CRP2B Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the left side electric locker door located in the A-Unit / B-Unit. See Figure 7-36.
2. Carefully install the CRP2A / CRP2B Panel (1) aligning the mounting holes.
3. Install the ten M6 x 16 bolts (2), M6 lock washers (3) and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connections to the CRP2A / CRP2B Panel (1) WAGO terminals.
6. Close the left side electric locker door located in the A-Unit / B-Unit.

7.5.1.21.11 CRP4A and CRP4B Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the left side electric locker door located in the A-Unit / B-Unit. See Figure 7-37.
2. Carefully install the CRP4A / CRP4B Panel (1) aligning the mounting holes.
3. Install the five M6 x 16 bolt (2), M6 lock washers (3) and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connections to the CRP4A / CRP4B Panel (1) WAGO terminals.
6. Close the left side electric locker door located in the A-Unit / B-Unit.

7.5.1.21.12 CRP1A and CRP1B Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the left side electric locker door located behind the Operator's seat in the A-Unit / B-Unit. See Figure 7-38.
2. Carefully install the CRP1A / CRP1B Panel (1) aligning the mounting holes.
3. Install the ten M6 x 16 bolt (2), M6 lock washers (3) and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connections to the CRP1A / CRP1B Panel (1) WAGO terminals.
6. Close the left side electric locker door located behind the Operator's seat in the A-Unit / B-Unit.

7.5.1.21.13 CRP3A and CRP3B Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the left side electric locker door located behind the Operator's seat in the A-Unit / B-Unit. See Figure 7-39.
2. Carefully install the CRP3A / CRP3B Panel (1) aligning the mounting holes.
3. Install the eight M6 x 16 bolt (2), M6 lock washers (3) and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connections to the CRP3A / CRP3B Panel (1) WAGO terminals.
6. Close the left side electric locker door located behind the Operator's seat in the A-Unit / B-Unit.

7.5.1.21.14 CRP5A and CRP5B Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the left side electric locker door located behind the Operator's seat in the A-Unit / B-Unit. See Figure 7-40.
2. Carefully install the CRP5A / CRP5B Panel (1) aligning the mounting holes.
3. Install the six M6 x 16 bolt (2), M6 lock washers (3) and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connections to the CRP5A / CRP5B Panel (1) WAGO terminals.
6. Close the left side electric locker door located behind the Operator's seat in the A-Unit / B-Unit.

7.5.1.21.15 ACP1B Panel

1. Open the right side electric locker door located in the B-Unit. See Figure 7-41.
2. Carefully install the ACP1B Panel (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3) and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the ACP1B Panel (1).
6. Close the right side electric locker door located in the B-Unit.

7.5.1.21.16 ATC Enclosure

1. Open the right side electric locker door located in the B-Unit. See Figure 7-42.
2. Carefully install the ATC Enclosure (1) aligning the mounting holes.
3. Install the eight M6 x 16 screws (2), M6 lock washers (3) and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the ATC Enclosure (1).
6. Close the right side electric locker door located in the B-Unit.

7.5.1.21.17 Hour Meter / Odometer Panel

1. Open the right side electric locker door located in the B-Unit. See Figure 7-43.
2. Carefully install the Hour Meter / Odometer Panel (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the Hour Meter / Odometer Panel (1).
6. Close the right side electric locker door located in the B-Unit.

7.5.1.21.18 Electronic Control Unit (ECU)

1. Open the right side electric locker door located in the B-Unit. See Figure 7-44.
2. Carefully install the ECU (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the ECU (1).
6. Close the right side electric locker door located in the B-Unit.

7.5.1.21.19 Monitoring and Diagnostic System (MDS) Control Unit

1. Open the right side electric locker door located in the B-Unit. See Figure 7-45.
2. Carefully install the MDS Control Unit (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the MDS Control Unit (1).
6. Close the right side electric locker door located in the B-Unit.

7.5.1.21.20 TCN Controller (B-Unit)

1. Open the right side electric locker door located in the B-Unit. See Figure 7-46.
2. Carefully install the TCN Controller (B-Unit) (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the TCN Controller (B-Unit) (1).
6. Close the right side electric locker door located in the B-Unit.

7.5.1.21.21 CRP6B Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the right side electric locker door located in the B-Unit. See Figure 7-47.
2. Carefully install the CRP6B Panel (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the CRP6B Panel (1).
6. Close the right side electric locker door located in the B-Unit.

7.5.1.21.22 CRP7B Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Open the right side electric locker door located in the B-Unit. See Figure 7-48.
2. Carefully install the CRP7B Panel (1) aligning the mounting holes.
3. Install the four M6 x 16 screws (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors (5) to the CRP7B Panel (1).
6. Close the right side electric locker door located in the B-Unit.

7.5.1.22 Bypass Panel

1. Carefully install the Bypass Panel (1) aligning the mounting holes. See Figure 7-49.
2. Install the six M4 x 12 screws (2).
3. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
4. Connect the electrical connector (3).

7.5.1.23 Circuit Breaker Panel A and B

1. Carefully install the circuit breaker cabinet (1) aligning the mounting holes. See Figure 7-50.
2. Install the 16 M6 x 20 screws (10), M6 lock washers (11), and M6 plain washers (12).
3. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
4. Install the circuit breaker bracket (5) aligning the mounting holes.
5. Install the eight M6 x 20 screws (6), M6 lock washers (7), and M6 plain washers (8).
6. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
7. Install the circuit breaker bracket (4) aligning the mounting holes.
8. Install the eight M6 x 20 screws (6), M6 lock washers (7), and M6 plain washers (8).
9. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
10. Install the cover (3) aligning the mounting holes.
11. Install the eight M4 x 12 screws (9).
12. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
13. Install the cover (2) aligning the mounting holes.
14. Install the eight M4 x 12 screws (9).
15. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).

7.5.1.24 Fire Extinguisher

1. Remove the console cabinet access cover to access the bracket (2) mounting. See Figure 7-51.
2. Install the bracket (2) aligning the mounting holes.
3. Install the five M5 x 16 screws (3), M5 plain washers (4), and M5 ESNA nuts (5).
4. Install the console cabinet access cover.
5. Install the Fire Extinguisher (1) into the bracket (2).

7.5.1.25 Convenience Outlet

1. Carefully install the gang box (1) aligning the mounting holes and pulling the wires through the grommet. See Figure 7-52.
2. Install the two M6 x 16 screws (6), M6 lock washers (7), and M6 plain washers (8).
3. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
4. Carefully install the receptacle (4) into the gang box (1) connecting the #10-32 wires and torque to 2.5 Nm (22 in-lbs.).
5. Install the two screws (5) that secure the receptacle (4) to the gang box (1).
6. Install the face plate (2) to the receptacle (4) using the two screws (3).

7.5.1.26 Cab Camera

1. Unlock the two locks (9) and lower the cab ceiling panel (3) to access the Cab Camera mounting. See Figure 7-53.
2. Carefully install the Cab Camera (1) aligning the mounting holes.
3. Install the two M3 plain washers (8), M3 x 12 screws (7), M3 plain washers (6), M3 lock washers (5), and M3 nuts (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Carefully install the housing.
6. Install the two screws (2) to secure the camera housing.
7. Raise the cab ceiling panel (3) and secure.

Refer to Section 7.5 and Table 7-3 of Section 1900, CCTV of the Running Maintenance and Servicing Manual for additional information.

7.5.1.27 Forward View Camera

1. Install Forward View Camera (1) onto bracket (6) aligning the mounting holes. See Figure 7-54.
2. Install the four M4 plain washers (11), M4 x 12 screws (10), M4 plain washers (9), and M4 ESNA nuts (8).
3. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
4. Carefully install the housing aligning the mounting holes.
5. Install the two screws (7) to secure the camera housing.
6. Install the Forward View Camera (1) onto bracket (6) aligning the mounting holes.
7. Install the two M4 x 12 screws (4) and M4 plain washers (5).
8. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
9. Connect the electrical connector.
10. Install the cover (2) aligning the mounting holes.
11. Install six M4 x 10 screws (3) into the cover (2).
12. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).

Refer to Section 7.5 and Table 7-3 of Section 1900, CCTV of the Running Maintenance and Servicing Manual for additional information.

7.5.1.28 Rear View Monitors

1. Place the bracket assembly (3) on the Rear View Monitor Assembly (1) and align the mounting holes. See Figure 7-55.
2. Install the four M4 x 8 screws (7), M4 lock washers (8), and M4 plain washers (9) to secure the bracket assembly (3).
3. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
4. Carefully place the Rear View Monitor Assembly (1) onto the base plate (2) aligning the mounting holes.
5. Install the four M5 x 16 bolts (4), M5 lock washers (5), and M5 plain washers (6) to secure the Rear View Monitor Assembly (1).
6. Ensure that the Rear View Monitor is centered (not rotated one way or the other). The stop screw should be in the middle of the cutout on the mounting bracket. See Figure 7-137.
7. After the Rear View Monitor is centered, tighten the M8 bolt (hand tighten, no torque required) so that it cannot be rotated.

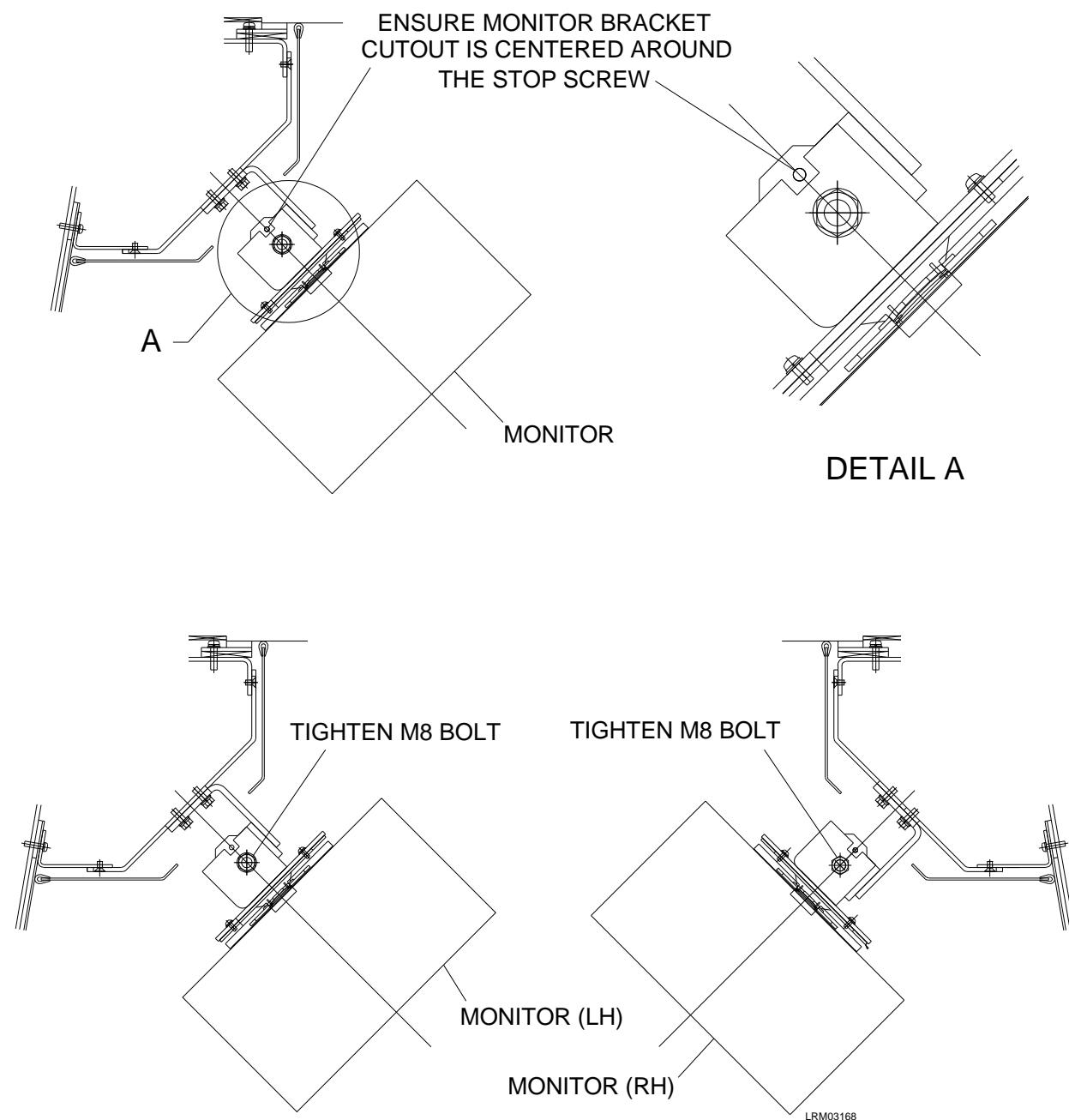


Figure 7-137: Adjustment of Rear View Monitor

8. Tighten the hardware from step 5 above and torque per the chart listed in Section 7.3.4 of this manual section.
9. Connect the electrical connector.

Refer to Section 7.5 and Table 7-3 of Section 1900, CCTV of the Running Maintenance and Servicing Manual for additional information.

7.5.1.29 Local Bus Contactor

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the Local Bus Contactor (1) mounting. See Figure 7-56.
2. Carefully place the Local Bus Contactor (1) on the mounting bracket aligning the mounting holes.
3. Install the two M6 ESNA nuts (2), M6 plain washers (3), and M6 x 16 bolts (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the #6 and 1/2-20 electrical connections and torque to 1 Nm (10 in-lbs.) and 77 Nm (57 ft-lbs.) respectively.
6. Raise the cab ceiling panel (6) and secure.

7.5.1.30 Remote I/O

1. Unlock the two locks (2) and lower the cab ceiling panel (3) to access the Remote I/O (1) mounting. See Figure 7-57.
2. Carefully install the Remote I/O (1) into the din rail ensuring the latch clicks in place.
3. Connect the electrical connectors.
4. Raise the cab ceiling panel (3) and secure.

7.5.1.31 Ethernet Switch

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the Ethernet Switch (1) mounting. See Figure 7-58.
2. Carefully install the Ethernet Switch (1) on the mounting bracket aligning the mounting holes.
3. Install the four M4 x 30 screws (2), M4 lock washers (3), and M4 plain washers (4).
4. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
5. Connect the electrical connectors.
6. Raise the cab ceiling panel (6) and secure.

7.5.1.32 Ethernet Switch (Camera)

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the Ethernet Switch (Camera) (1) mounting. See Figure 7-59.
2. Carefully install the Ethernet Switch (Camera) (1) on the mounting bracket aligning the mounting holes.
3. Install the four M4 x 20 screws (2), M4 lock washers (3), and M4 plain washers (4).
4. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
5. Connect the electrical connectors.
6. Raise the cab ceiling panel (6) and secure.

7.5.1.33 Ethernet Switch (Wireless)

1. Unlock the two locks (5) and lower the cab ceiling panel (6) located in the B-Unit to access the Ethernet Switch (Wireless) (1) mounting. See Figure 7-60.
2. Carefully install the Ethernet Switch (Wireless) (1) on the mounting bracket aligning the mounting holes.
3. Install the six M4 x 12 screws (2), M4 lock washers (3), and M4 plain washers (4).
4. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
5. Connect the electrical connectors.
6. Raise the cab ceiling panel (6) and secure.

7.5.1.34 Track Brake Panel

1. Remove the cab access panel to the left of the Operator's Seat. See Figure 7-61.
2. Carefully install the Track Brake Panel (1) aligning the mounting holes.
3. Install the four M8 x 20 bolts (2), M8 lock washers (3), and M8 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Install the electrical connections to the WAGO terminals.
6. Install the cab access panel to the left of the Operator's Seat.

7.5.1.35 12Vdc Power Supply

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the 12Vdc Power Supply (1). See Figure 7-62.
2. Carefully install the 12Vdc Power Supply (1) to the mounting bracket aligning the mounting holes.
3. Install the four M6 x 16 bolts (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connections to the WAGO terminals.
6. Raise the cab ceiling panel (6) and secure.

7.5.1.36 Wayside Worker Alert System (WWAS) Module

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the WWAS (1) mounting. See Figure 7-63.
2. Carefully install the WWAS (1) to the mounting bracket aligning the mounting holes.
3. Install the four M8 x 20 bolts (2), M8 lock washers (3), and M8 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connectors.
6. Raise the cab ceiling panel (6) and secure.

7.5.1.37 Master Controller

1. Carefully install the Master Controller (1) into the cab desk. See Figures 7-64 and 7-65.
2. Install the ten M6 x 16 screws (2).
3. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
4. Install the electrical connectors (3).

7.5.1.38 DC / DC Converter

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the DC / DC Converter (1). See Figure 7-66.
2. Carefully install the DC / DC Converter (1) to the mounting bracket aligning the mounting holes.
3. Install the four M6 x 16 bolts (2), M6 lock washers (3), and M6 plain washers (4).
4. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
5. Connect the electrical connector.
6. Raise the cab ceiling panel (6) and secure.

7.5.1.39 HSC-V Control Panel

1. Unlock the two locks (5) and lower the cab ceiling panel (6) to access the HSC-V Control Panel mounting (1). See Figure 7-67.
2. Carefully install the HSC-V Control Panel (1) to the mounting bracket aligning the mounting holes.
3. Install the four M4 x 12 bolts (2), M4 lock washers (3), and M4 plain washers (4).
4. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
5. Connect the electrical connector.
6. Raise the cab ceiling panel (6) and secure.

7.5.1.40 Washer Reservoir

1. To gain access to the wiper motor, refer to Section 7.5.1.8 of this manual section.
2. Carefully install the supply line (6), the cable tie (16) and the clamps (5) and connect to the wiper motor. See Figure 7-68, Sheets 1 and 2.
3. Install the M4 screws (11 and 12), M4 lock washers (13), M4 plain washers (14), and M4 nuts (15) that secure the clamps (5), tighten and torque to 1.5 Nm (13 in-lbs.)
4. Carefully install the washer bottle (1) into the enclosure aligning the mounting holes.
5. Install the M6 screws (7), M6 lock washers (8), and M6 plain washers (9) in four places, into the washer bottle (1) mounting holes.
6. Torque the screws using the torque chart in Section 7.3.4 of this manual section.

7. Connect the supply line and electrical connector to the washer bottle (1).
8. Carefully install the cover (2) and gasket (3) aligning the mounting holes.
9. Install the M4 bolts (10), M4 lock washers (13), and M4 plain washers (14), 11 places that secure the panel (2), tighten and torque to 1.5 Nm (13 in-lbs.).
10. Replace all the cab access panels that were removed.

7.5.1.41 Horn Controller Panel

1. Unlock the two locks (6) and lower the cab ceiling panel (7). See Figure 7-69.
2. Carefully install the Horn Controller Panel (1) aligning the mounting holes.
3. Install the four M4 screws (2), M4 lock washers (3), and M4 plain washers (4).
4. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
5. Install all electrical connections to the WAGO terminal blocks.
6. Close the cab ceiling panel (7).

7.5.2 Exterior Body Equipment

7.5.2.1 Exterior Speaker

1. Carefully place the Exterior Speaker (1) onto the mounting bracket (6) aligning the mounting holes. See Figure 7-70.
2. Install the four M4 x 20 screws (5), M4 plain washers (4), M4 plain washers (3), and M4 ESNA nuts (2).
3. Torque the hardware to 1.5 Nm (13 in-lbs.).

WARNING

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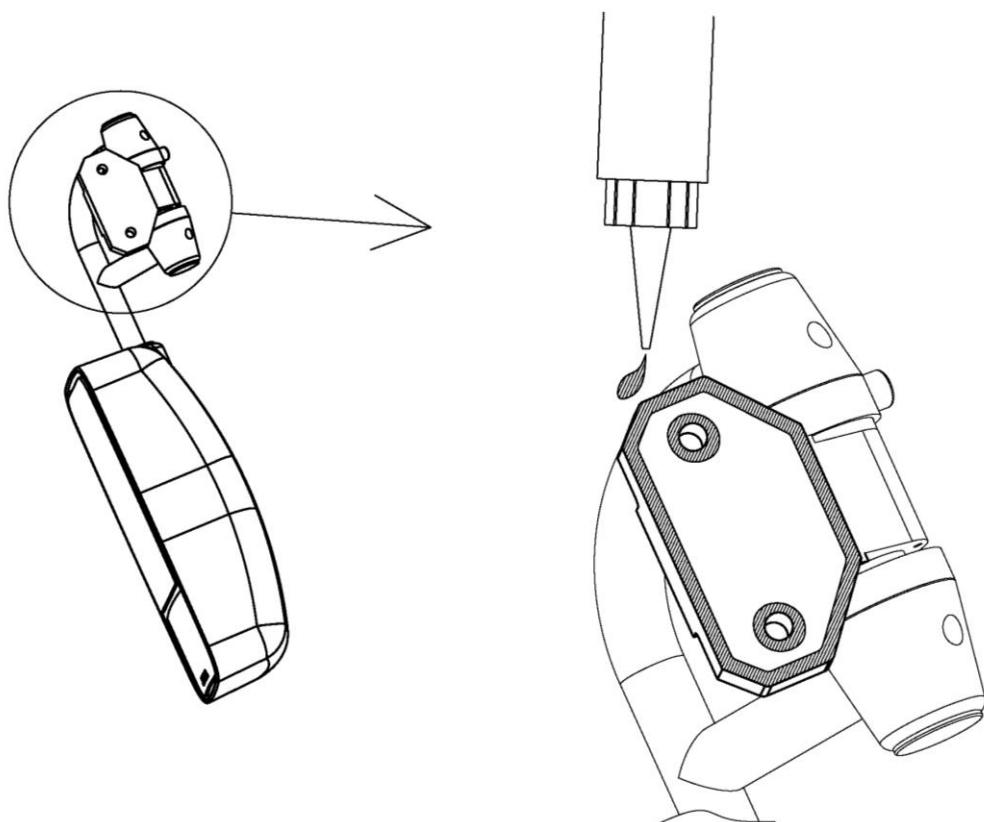
4. Connect the #6 electrical connections (10) to the Exterior Speaker (1) and torque to 1 Nm (10 in-lbs.).
5. Place the cover gasket (9) and cover (8) onto the speaker and install the screw (7). Tighten the screw (7).

7.5.2.2 Exterior Mirror

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Carefully remove all sealant residue.
2. Scuff mounting surface with 3M Maroon Scotchbrite pad to achieve proper sealant adhesion.
3. Connect the electrical connector (5) to the car body connector (6). See Figure 7-71.
4. Apply silicone sealant KE3483B or urethane sealant Sikaflex-221 to the edge of entire circumference on contact surface of mirror base plate to carbody and entire circumference of mounting holes. Refer to the graphic below.



5. Carefully place the Exterior Mirror (1) onto the car body aligning the mounting holes.
6. Apply silicone sealant KE3483B or urethane sealant Sikaflex-221 to thread holes for the mounting bolts on the carbody.
7. Install the two M8 x 35 bolts (2), M8 lock washers (3), and M8 plain washers (4).
8. Torque the hardware to 14 Nm (oily) per the chart listed in Section 7.3.4 of this manual section.
9. Carefully remove excess sealant.
10. Adjust the detent tension of the Exterior Mirror using the adjustment procedure in Section 5.3.2.3 of this manual section. See Figure 5-3.

NOTE: Ensure that the equipment is properly sealed from water ingress via localized water spray or by using the car wash.

7.5.2.3 Skirts

See Figures 7-72 and 7-73.

7.5.2.3.1 Hinged Skirts

1. Carefully install the Hinged Skirt (1) and liner (10) aligning the mounting holes. See Figure 7-72.
2. Install the M5 screws (9) into the hinge (8).
3. Align the damper (3) to the mounting hole and install the M8 x 25 bolt (5), M8 lock washer (6), M8 plain washer (7), and the M8 nut (4).
4. Tighten and torque per the chart listed in Section 7.3.4 of this manual section.
5. Close the Hinged Skirt (1) and lock the latches (2).

7.5.2.3.2 Stationary Skirts

1. Carefully place the Stationary Skirt (1) and shims (6) onto the car body aligning the mounting holes. See Figure 7-73.
2. Loosely install the six M8 x 35 socket head screws (5) and M8 plain washers (4), M8 plain washers (3), and M8 ESNA nuts (2).
3. Ensure that the Stationary Skirt (1) is square to the car body.
4. Tighten and torque per the chart listed in Section 7.3.4 of this manual section.

7.5.2.4 Windows

See Figures 7-74 through 7-77.

7.5.2.4.1 Bonded Windows (Windshield)

NOTE: Steps 1-16 are for building up a windshield assembly (17). KI provides completed windshield assemblies (17) as capital spare parts and recommends purchasing complete assemblies when needed. If starting with a complete assembly (17) start from step 17.

1. Apply masking tape to brackets (18 and 19) to protect from excess adhesive. See Figure 7-74.

NOTE: On one side of the bracket the tape should cover approximately 15 mm, covering the pre-drilled holes. This will be the adhesive side. The other side of the bracket the tape should cover approximately 25 mm, from the edge without the holes.

2. Clean the brackets (18 and 19) with isopropyl alcohol (IPA) and a cotton cloth prior to installation to the windshield to allow for proper adhesion.
3. Peel off the protective film on the windshield (1) and clean the windshield with Isopropyl Alcohol (IPA) using a clean cotton cloth.
4. Check for any imperfections using the Laminate Inspection Criteria.
5. Apply self-adhesive protective film to the windshield. On the rail side leave 100mm gap from the edge of the windshield to mask off with 1" masking tape (two strips overlapping).

NOTE: One strip to hold down the film and one to protect the laminate from the Bostik.

6. Evenly place 5mm thick teflon (or polyvinyl chloride) spacers around the edge of the windshield. Note: Each long side should have four evenly spaced spacers and each short side should have three. The spacers in the corners will be shared between adjacent brackets. Eighteen spacers are needed.
7. Begin applying Bostik 70-08A adhesive to the windshield. Start the bead of adhesive approximately 60mm in from the corner making sure to set it down center, about 7-10mm in from the edge of the windshield (1).
8. Continue running the bead until coming close to a spacer, skip the spacer and continue until coming to end, 60mm from the perpendicular edge.
9. Place a bracket (18 and 19) making sure it is evenly spaced between the windshield edges (approximately 32-33 mm from the edge) and overhanging the windshield approximately 17mm. After confirming that the bracket is correctly located so that mounting holes are aligned, use 5 clamps per side to secure it in place. Begin to place clamps on the spacers and apply pressure.

NOTE: The bracket may move when clamping. Double check measurements and make adjustments as required.

10. Repeat steps 6 thru 9 for all four brackets (18 and 19).
 11. After 24 hours check that the adhesive has cured properly.
 12. After adhesive is cured, remove all clamps and spacers.
 13. Overfill the channels where the spacers were located using Bostik 70-08 adhesive until no visible air pockets exist.
 14. Backfill both sides, top and bottom, with Bostik 70-08 adhesive.
- NOTE: Make an adhesive coupon with application date and time to ensure full cure.
15. Apply tape around the frame to keep adhesive from oozing out and scrape off excess adhesive. The finish should be even and smooth with no bubbles or clumps.
 16. Allow adhesive to fully cure.
 17. Tape the entire area below the cab windshield (1) using masking tape and plastic sheeting.

WARNING

TO PREVENT POSSIBLE PERSONAL INJURY WHEN ATTEMPTING TO REMOVE OR INSTALL WINDOW EQUIPMENT WEIGHING MORE THAN 50 LBS. (23 KG), ADEQUATE SUPPORT OF A LIFTING DEVICE MUST BE USED. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

18. Attach suction cups and lifting harness to the outside surface of the windshield (1).
 19. Test lift the windshield to ensure it is safely secured and hanging straight up and down for easy installation. Lower the windshield and adjust the position of the suction cups and length of hoist harness strap as necessary.
- NOTE: DO NOT ATTEMPT THIS PROCESS WITH LESS THAN FOUR (4) PERSONNEL
20. Using Isopropyl Alcohol (IPA) and cotton cloth, thoroughly clean the windshield brackets (18 and 19) and painted carbody surface to ensure proper sealant adhesion.
 21. Place two 10mm shims on the bottom carbody edge where the windshield will rest.
 22. Lift and position the windshield assembly (17) into place on the cab frame. Set the windshield on the 10mm shims placed in step 21.
 23. Using a scale, measure and check the perimeter gap around the entire windshield. The windshield should be evenly spaced at 10mm on all sides to the frames and 25mm to the glass in all four corner locations.
 24. Once the correct position is achieved, fasten the windshield assembly (17) to the carbody frame by inserting screws (12) lock washers (13) and special washers (20) into the four corners of the window frame. See Figure 7-74.

25. On the inside top of the cab between the windshield assembly frame rail and the carbody, insert the black L-shaped cover (5) with the L channel facing the rear of the car and zinc chromate coated shims between the windshield assembly (17) and cab frame from the inside at all screw locations along the top of the windshield assembly.
26. Release the suction device and remove the windshield lifting support from the windshield. Carefully move the hoist, suction device, and windshield support out of the installation area.
27. Insert zinc chromate coated shims (6 and 7) between the windshield and cab frame from the inside at all remaining hole locations. The additional shims (16) are for Cars 1039 and later.
28. Install screws (12), lock washers (13), and special washers (21) at all hole locations ensuring that they go thru the holes in all of the shims inserted between the windshield assembly (17) and cab frame.
29. Remove any tape applied in step 17 and thoroughly clean the windshield edges and frame rails with Isopropyl Alcohol (IPA) in order to remove any residue or foreign material.
30. Place sealant support (8) into all four corners of the windshield by inserting it into the space between the frame rail and glass (it should fit tightly in the space).
31. Install sealing support (8) around the entire windshield perimeter sticking it directly over the exposed screw heads. Cut the corners at a 45 degree angle and do not over-lap, over lapping will cause the finished sealant surface to sag.
32. Apply masking tape to the car body and around the edge of the windshield just past the frame rail. On the top allow a 10mm overlap to the car body on to the black finished paint. Total width should be approximately $33\text{mm} \pm 1\text{mm}$ tape line to tape line at the top. The sides should measure $25\text{mm} \pm 1\text{mm}$ wide and the bottom should measure $47\text{mm} \pm 1\text{mm}$ wide.
33. Prepare six tubes of Bostik 70-01A sealant (11) verifying that the material has not expired.
34. Using a pneumatic caulking gun generously apply the Bostik 70-01A sealant over the entire seal support foam. Apply the sealant from top to bottom around the entire perimeter of the windshield between the tape lines. Also prepare a sealant coupon noting application date and time to be able to gauge when the sealant on the car is cured.
35. Using a spatula, trowel off the excess and smooth it out to achieve an even and flush finish to the taped windshield surface.
36. Visually inspect the entire windshield sealant application for voids, lumps, etc.
37. Add additional sealant as required until finished sealant is visually smooth and even.

7.5.2.4.2 Gasket Mounted Windows

The following gasket mounted window types are:

- Bodyside Window #1
- Bodyside Window w/Destination Sign
- Door Window
- Bodyside Window #2

1. Install the gasket (2) into the car body. See Figure 7-75.

WARNING

TO PREVENT POSSIBLE PERSONAL INJURY WHEN ATTEMPTING TO REMOVE OR INSTALL WINDOW EQUIPMENT WEIGHING MORE THAN 50 LBS. (23 KG), ADEQUATE SUPPORT OF A LIFTING DEVICE MUST BE USED. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

2. Install the Window (1) into the gasket (2) using the appropriate lifting device.
3. Install the filler key (3) into the channel located in the gasket (2).
4. Ensure that the Window (1) is seated properly into the gasket (2).

7.5.2.4.3 Framed Windows

The following framed window types are:

- Cab Door Window
- Hinged Window RH and LH

7.5.2.4.3.1 Cab Door Window

1. Carefully place the outer frame (3) into the cab door (1). See Figure 7-77.
2. Carefully place the cab door window (2) into the cab door (1) aligning the mounting holes in the outer frame (3)
3. Insert the #10-32 x 3/8" screws (5) and #10 lock washers (4) into the mounting holes.
4. Tighten the screws and torque to 2.5 Nm (22 in-lbs.).

7.5.2.4.3.2 Hinged Window RH and LH

1. Install sealant and butyl tape on the flange side of the Framed Window (1) facing the car body. See Figure 7-76.
2. Carefully install the Framed Window (1) into the car body opening aligning the mounting holes.
3. Install the mounting screws (2) that hold the Framed Window (1) in place and tighten.

7.5.2.5 Rear View Camera

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Scuff mounting surface with 3M Maroon Scotchbrite pad to achieve proper sealant adhesion.
2. Connect the electrical connector (4) to the Rear View Camera (1). See Figure 7-78.
3. Temporarily install the camera. Trace around the camera unit with a pencil (this is in preparation for the sealant application).
4. Carefully remove the Rear View Camera (1).
5. Apply Sikaflex 221 (gray) silicone sealant (5) to the mounting area.
6. Ensure that the gasket (2) is properly placed on the Rear View Camera (1).
7. Carefully place the Rear View Camera (1) and gasket (2) onto the carbody aligning the mounting holes.
8. Install and tighten the three M6 x 20 screws (3) and torque per the chart listed in Section 7.3.4 of this manual section.
9. Ensure that the gasket (2) is properly aligned and not outside the Rear View Camera (1) edge.

10. If gasket (2) is out of place, loosen the three M6 x 20 screws (3) and using a putty knife, push the gasket into place and tighten the three M6 x 20 screws (3).

11. Remove all excessive sealant from around the Rear View Camera (1).

NOTE: Ensure that the equipment is properly sealed from water ingress via localized water spray or by using the car wash.

Refer to Section 7.5 and Table 7-3 of Section 1900, CCTV of the Running Maintenance and Servicing Manual for additional information.

7.5.3 Interior Equipment

7.5.3.1 Stanchions and Grab Rails

1. Align the stanchion support (7) with the hole in the ceiling. See Figure 7-79.

NOTE: Step 2 is for Cars 1001 through 1025.

2. Place the two stanchion hole covers (12), two M16 x 40 halfen bolts (11), M16 plain washers (10) and M16 nuts (9) and tighten.

NOTE: Step 3 is for Cars 1026 and later.

3. Place the stanchion hole cover (13), two M16 x 40 halfen bolts (11), M16 plain washers (10) and M16 nuts (9) and tighten.

4. Place tee fitting (5) and cross fitting (4) on grab rail (8).

5. Place the stanchions (2) through the tee fitting (5) and cross fitting (4).

6. Align the M4 x 8 screws (6) with the stanchion support (7), tighten and torque to 1.5 Nm (13 in-lbs.).

7. Insert the ten M6 x 12 screws (3) into the tee fitting (5) and cross fitting (4), tighten and torque per the chart listed in Section 7.3.4 of this manual section.

8. Insert the M6 x 35 screws (1) into the bottom of the stanchion (2), tighten and torque per the chart listed in Section 7.3.4 of this manual section.

9. Repeat steps 1 through 8 for the remaining Stanchions (2) and Grab Rails (8).

7.5.3.2 Passenger Door Pushbutton

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Connect the electrical connector to the Passenger Door Pushbutton (2). See Figures 7-80 and 7-81.
2. Align the holes in the Passenger Door Pushbutton (2) with the holes in the stanchion (10).
3. Insert two M4 x 20 screws (1), tighten and torque to 1.5 Nm (13 in-lbs.).

7.5.3.3 Windscreens

7.5.3.3.1 End Windscreen

1. Align the End Windscreen (9) and stanchion (10) with the wall channel (6). See Figure 7-80.
2. Insert the two M5 x 8 screws (7) into the grab rail (8) and tighten.
3. Insert the ten M4 x 8 screws (5) into the wall channel (6), tighten and torque to 1.5 Nm (13 in-lbs.).
4. Insert the M4 x 8 screw (3) into the stanchion support (4), tighten and torque to 1.5 Nm (13 in-lbs.).
5. Torque the M5 screws per the chart listed in Section 7.3.4 of this manual section.

7.5.3.3.2 Center Windscreen

1. Align the Center Windscreen (9) and stanchion (10) with the wall channel (6). See Figure 7-81.
2. Insert the two M5 x 8 screws (7) into the grab rail (8) and tighten.
3. Insert the ten M4 x 8 screws (5) into the wall channel (6), tighten and torque to 1.5 Nm (13 in-lbs.).
4. Insert the M4 x 8 screw (3) into the stanchion support (4), tighten and torque to 1.5 Nm (13 in-lbs.).
5. Torque the M5 screws per the chart listed in Section 7.3.4 of this manual section.

7.5.3.4 Ceiling Panels

7.5.3.4.1 Center and End Ceiling Panel

1. Align the End Ceiling Panel (6). See Figure 7-82.
2. Insert the five M4 x 20 screws (5), tighten and torque to 1.5 Nm (13 in-lbs.).
3. Install the end light fixture. Refer to Section 7.5.3.6 of this manual section.
4. Repeat steps 1 through 3 for the remaining End Ceiling Panel (6).
5. Align the ceiling panel (4).
6. Insert the four M4 x 16 screws (3), tighten and torque to 1.5 Nm (13 in-lbs.). The ceiling panels are ship-lapped; the ceiling panel (4) must start at the end of the A and B-Units and work towards the return air grille.
7. Repeat steps 5 and 6 for the remaining ceiling panels (4).
8. Align the air diffuser (2).
9. Insert the three M4 x 10 screws (1), tighten and torque to 1.5 Nm (13 in-lbs.).
10. Repeat steps 8 and 9 for the remaining air diffusers (2).

7.5.3.4.2 Side Access Cover

1. Align the packing (6) with the hinge (8). See Figure 7-83.
2. Insert the three M4 x 14 screws (7), M4 plain washers (5), M4 lock washers (4) and M4 nuts (3), tighten and torque to 1.5 Nm (13 in-lbs.).
3. Repeat steps 1 and 2 for the remaining two hinges (8).
4. Turn the two locks (1) to close the Side Access Cover (2).

7.5.3.5 Return Air Grille

1. Align the packing (8) with the holes in the return air grille frame (7). See Figure 7-84.
2. Insert the fourteen M4 plain washers (6), M4 lock washers (5) and M4 x 16 screws (4), tighten and torque to 1.5 Nm (13 in-lbs.).
3. Hook the safety catch (9).
4. Hook the two safety chains (3) onto the return air grille frame (7).
5. Close and lock the Return Air Grille (2) using a crew key.

7.5.3.6 Ceiling Lights

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Align the Ceiling Light (5) with the brackets. See Figure 7-85.
2. Connect the electrical connector to the Ceiling Light (5).
3. Insert the eight liners (4) and M4 x 16 screws (3), tighten and torque to 1.5 Nm (13 in-lbs.).
4. Turn the three screws (1) clockwise one-quarter turn to close the Ceiling Light (5).

7.5.3.7 Door Indicators

7.5.3.7.1 Door Out of Service Sign

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the side access cover.
2. Align the Door Out Of Service Sign (10) with the holes in the side access cover (2). See Figure 7-83.
3. Insert the two M5 nuts (9), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the electrical connector to the Door Out Of Service Sign (10).
5. Close and lock the side access cover using a crew key.

7.5.3.7.2 Door Closing Chime

1. Using a crew key, unlock and open the side access cover.
2. Align the Door Closing Chime (13) with the holes in the side access cover (2). See Figure 7-83.
3. Insert the three M4 plain washers (12) and M4 nuts (11), tighten and torque to 1.5 Nm (13 in-lbs.).
4. Connect the electrical connector to the Door Closing Chime (13).
5. Close and lock the side access cover using a crew key.

7.5.3.7.3 Door Closing Light

1. Using a crew key, unlock and open the side access cover.
2. Align the Door Closing Light (17) with the holes in the side access cover (2). See Figure 7-83.
3. Insert the three M4 x 16 screws (16), M4 plain washers (15) and M4 nuts (14), tighten and torque to 1.5 Nm (13 in-lbs.).
4. Connect the electrical connector to the Door Closing Light (17).
5. Close and lock the side access cover using a crew key.

7.5.3.8 Automatic Passenger Counter (APC) Sensor

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

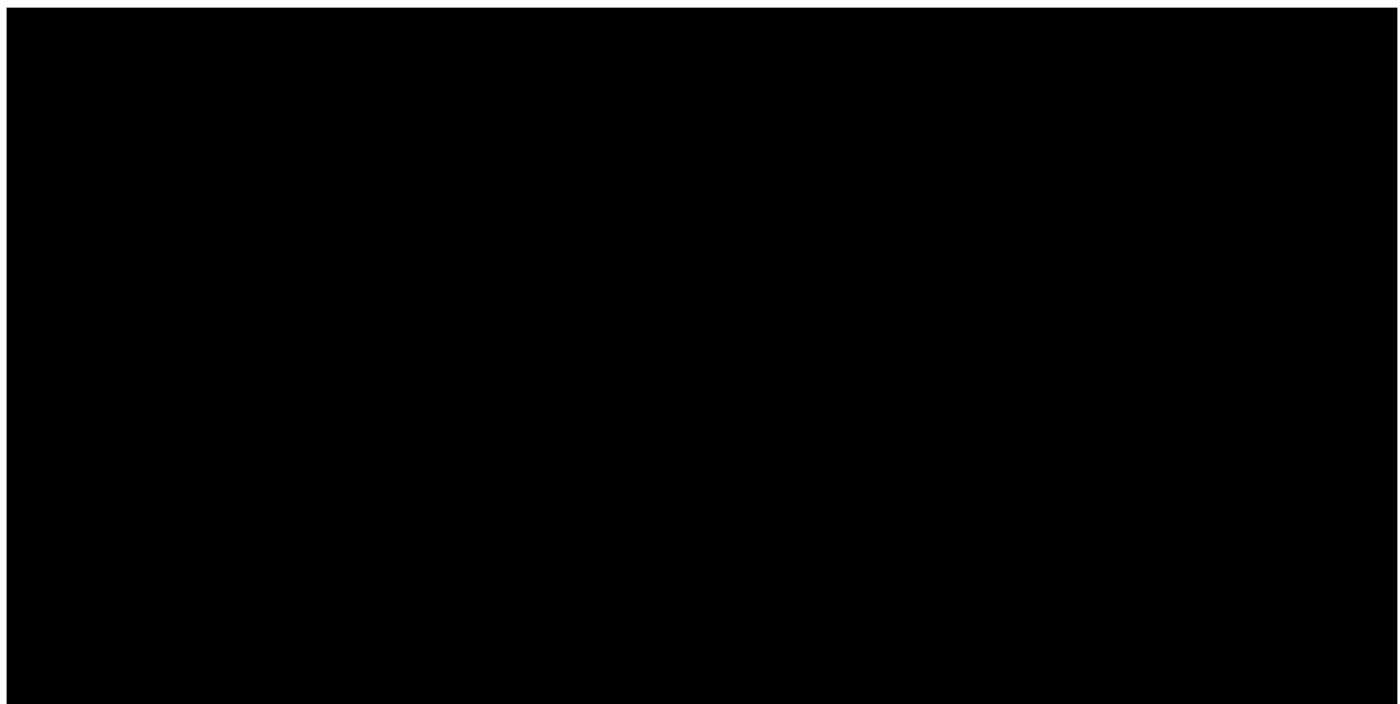
1. Using a crew key, unlock and open the side access cover.
2. Align the Automatic Passenger Counter Sensor (20) with the holes in the side access cover (2). See Figure 7-83.
3. Insert the four M4 plain washers (19) and M4 nuts (18), tighten and torque to 1.5 Nm (13 in-lbs.).
4. Connect the electrical connector to the Automatic Passenger Counter Sensor (20).
5. Close and lock the side access cover using a crew key.

7.5.3.8.1 Automatic Passenger Counter (APC) Sensor Replacement

In the case of when a sensor needs to be replaced, it is important to reconfigure the new sensor to the door portal and the door leaf. The PTU is utilized on the vehicle to properly program the sensor to the correct location. Refer to Section 7.5.3.8.2 of this manual section for information on how to program a new APC sensor.

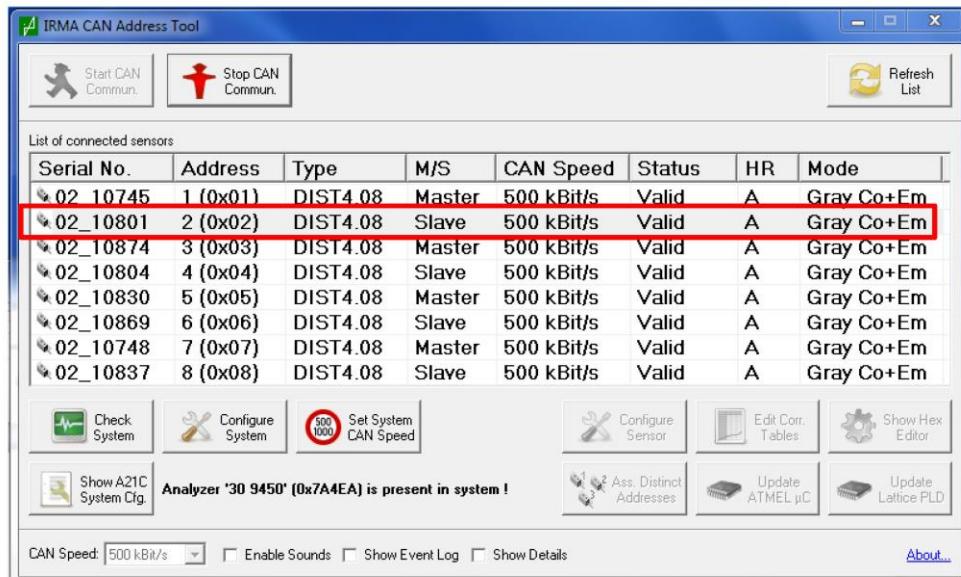
7.5.3.8.2 Automatic Passenger Counter (APC) Sensor Programming

To program a new sensor, the user will use the IRMA A21 Software with the same setup as shown below.

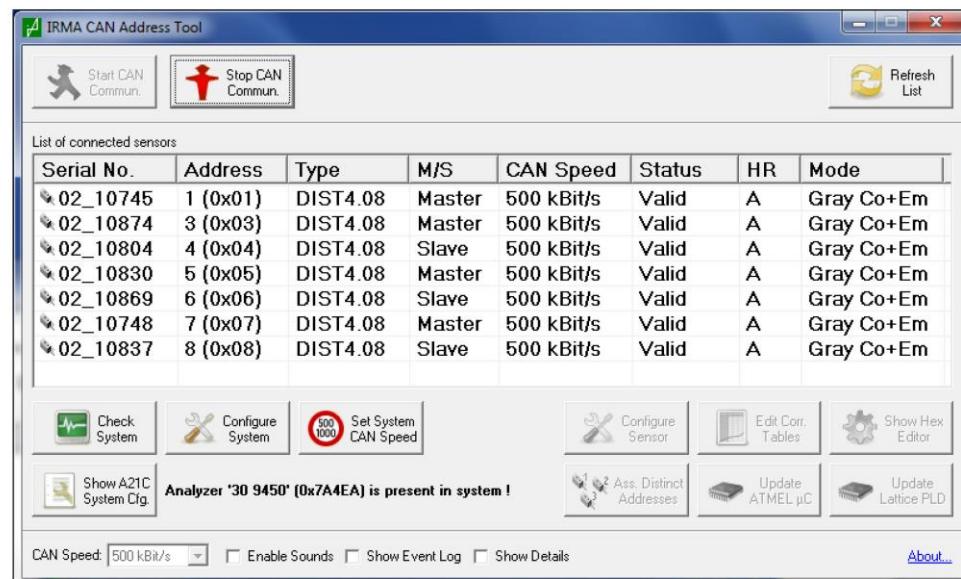


The following example describes a sensor replacement and how it should be configured.

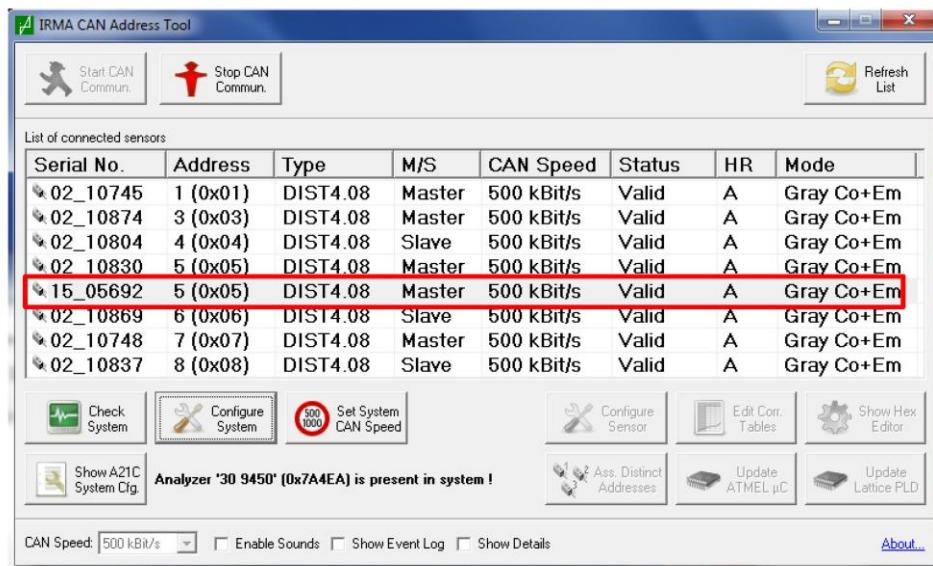
1. Start IRMA A21. Verify that the proper settings are set. Then click on “Edit” -> “Sensor Configuration.” A new window will show, click “Start CAN Commun.”
2. A list of all Sensors’ serial numbers will be displayed. For this example, sensor serial number 02_10801 will be replaced with a new un-programmed sensor. See the figure below.



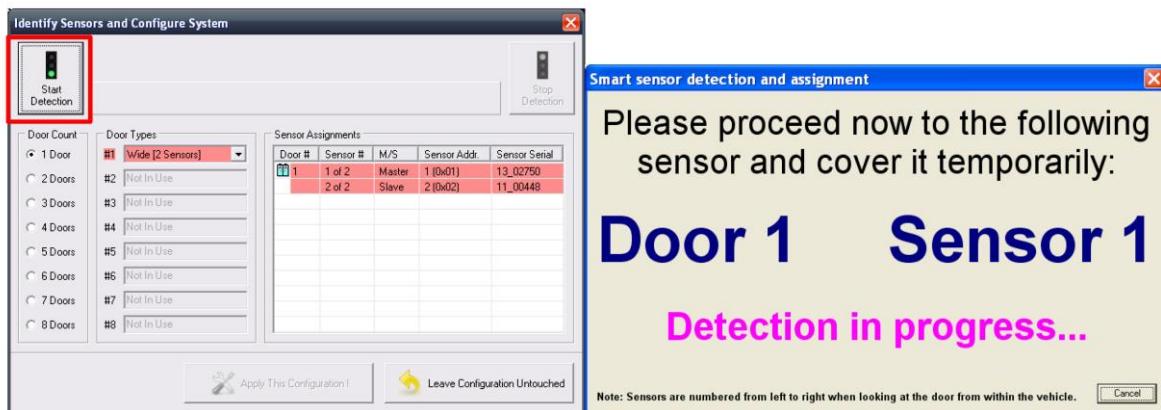
- Once the sensor is physically removed from the CAN communication line, the user will notice the serial number is no longer listed as shown below.



- When the new sensor is installed to replace the damaged one, the new serial number will appear on the list as shown below. This sensor is not yet programmed as the user notices the address number is duplicated.



5. To start the configuration process, click on the “Configure System” tab. A new window will open, click on “Start Detection.”

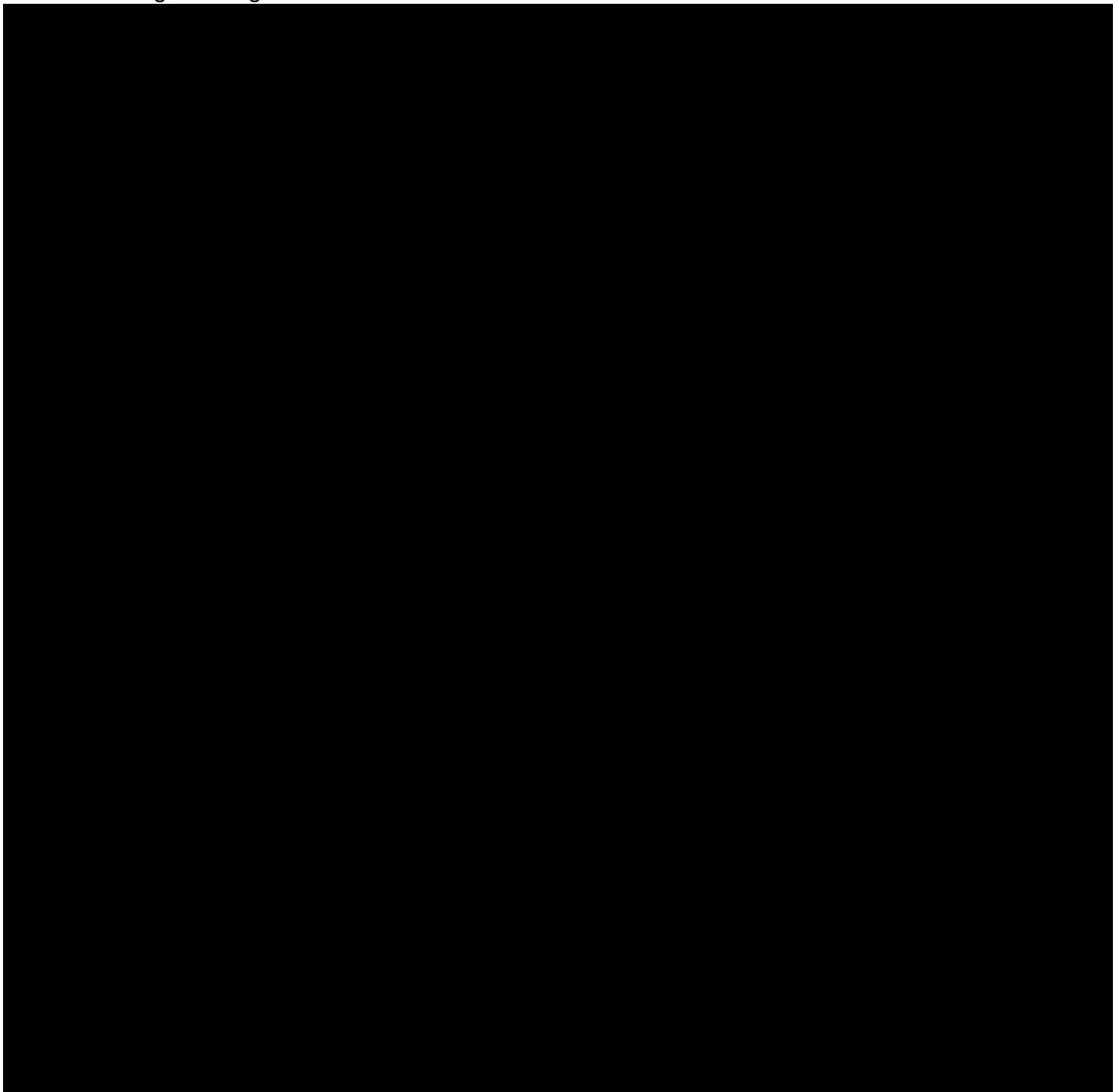


6. Hold a stack of papers or cardboard under the sensor to program. All sensors will need to be re-programmed (regardless if it's being replaced or not) for the changes to take effect.

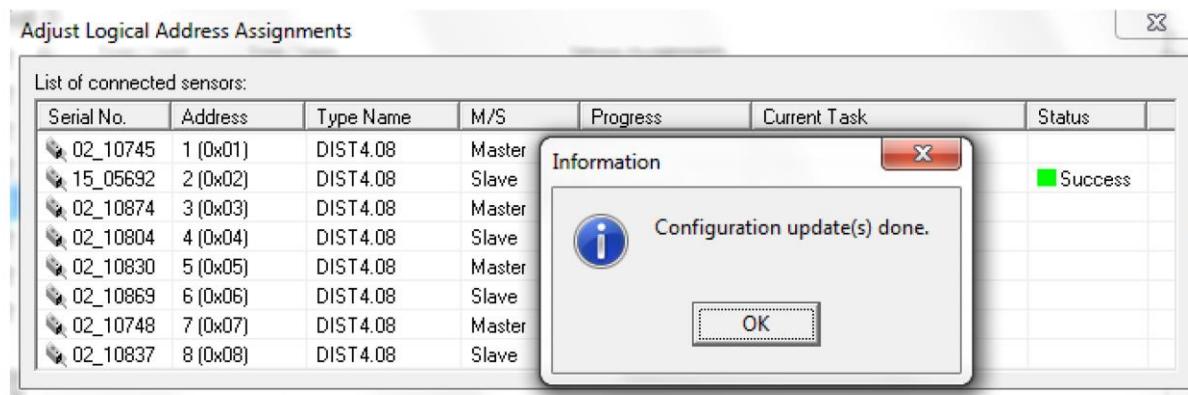


7. Follow the diagram below on what order to program the sensors.

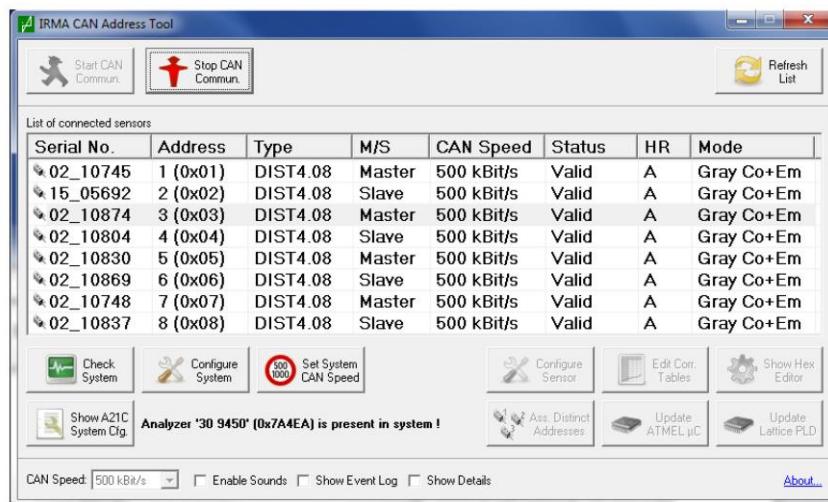
a. Programming on A side of vehicle:



8. When finished, click on “Apply This Configuration”. A notification will show indicating that the configuration is complete.



9. The new replaced sensor serial number 15_05692 should follow the proper Address and Master/Slave configuration as shown below.



10. Sensor program is now complete.

7.5.3.8.3 Automatic Passenger Counter (APC) Sensor Verification

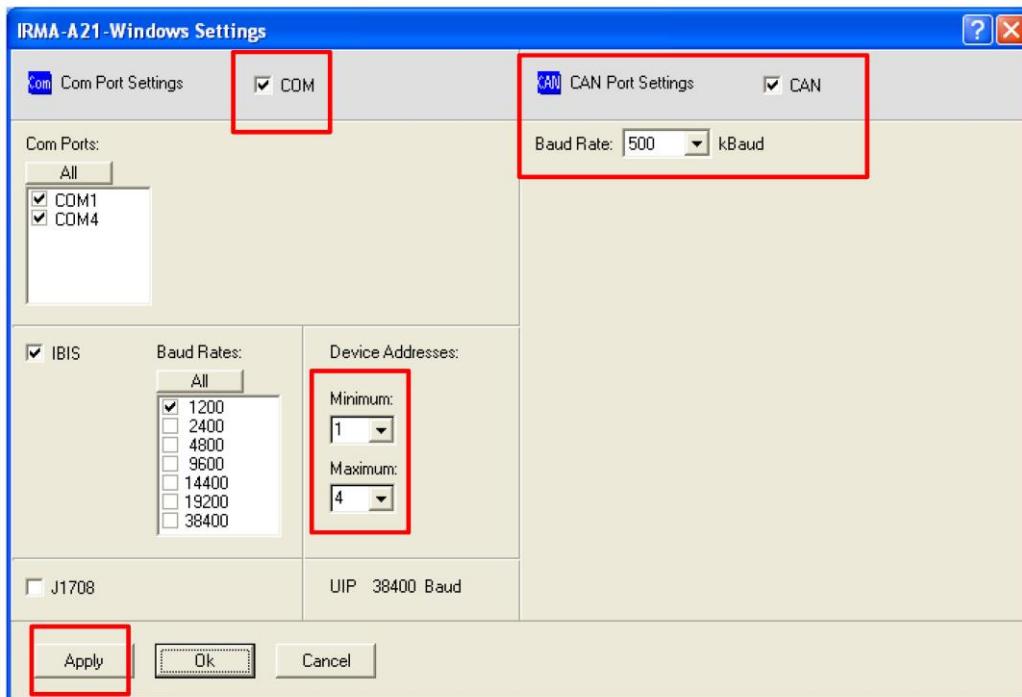
By using the IRMA A21 Software, the user can test the functionality of the sensor and verify settings of the IRMA Analyzer.

Required items:

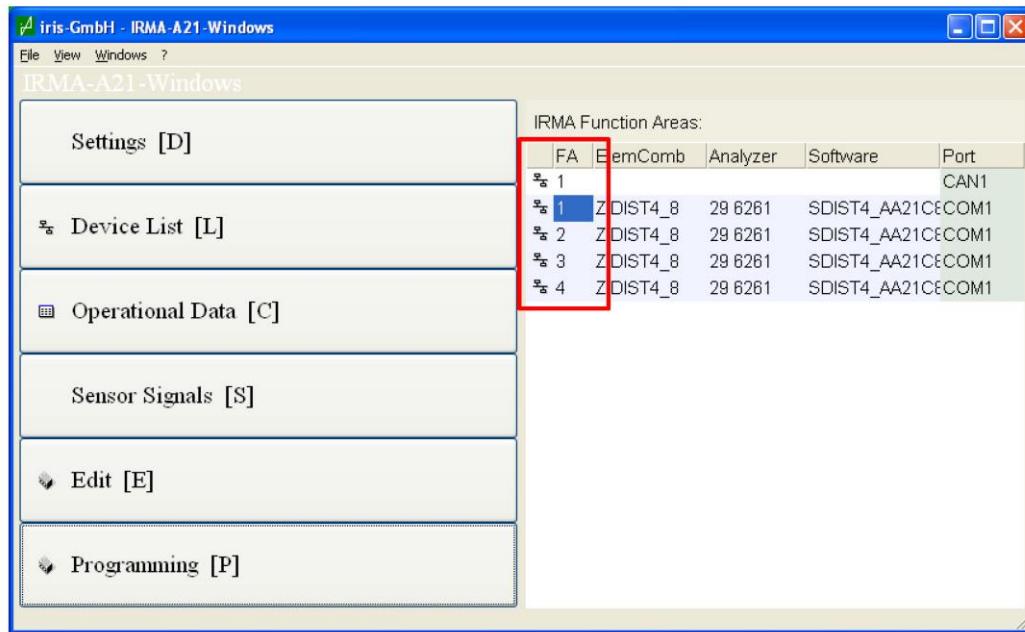
- RS232 Cable
- RS232 to USB Converter device (needed if laptop does NOT have RS232 port)
- CAN cable, K-CAN-02-2m
- CAN/USB device (with cable)
- IRMA A21 software download link: <https://www.irisgmbh.de/us/support/>
Click on IRMA-Setup Release 5.1.9

To verify functionality of the sensor:

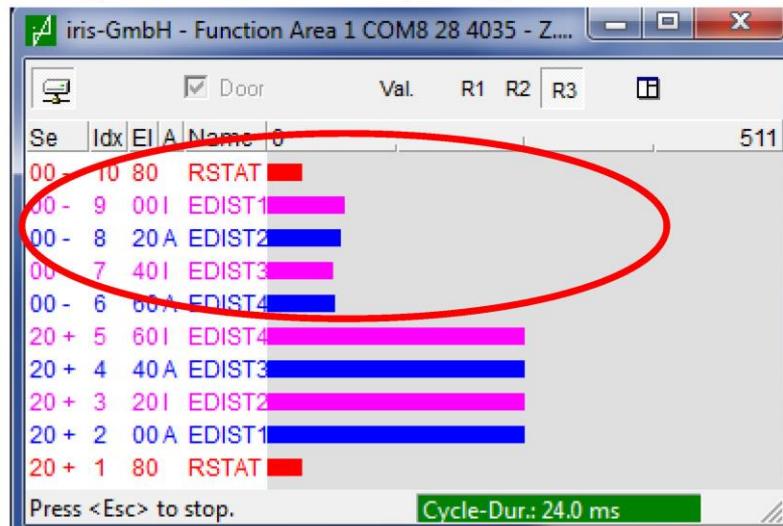
1. Connect the Serial COM cable from the laptop to the Analyzer.
2. Open the IRMA A21 software. Click on Settings.
3. Verify COM and CAN are checked and baud rate is 500 kBaud. Device Addresses are Min 1 and Max 4. Click Apply. See screenshot below.



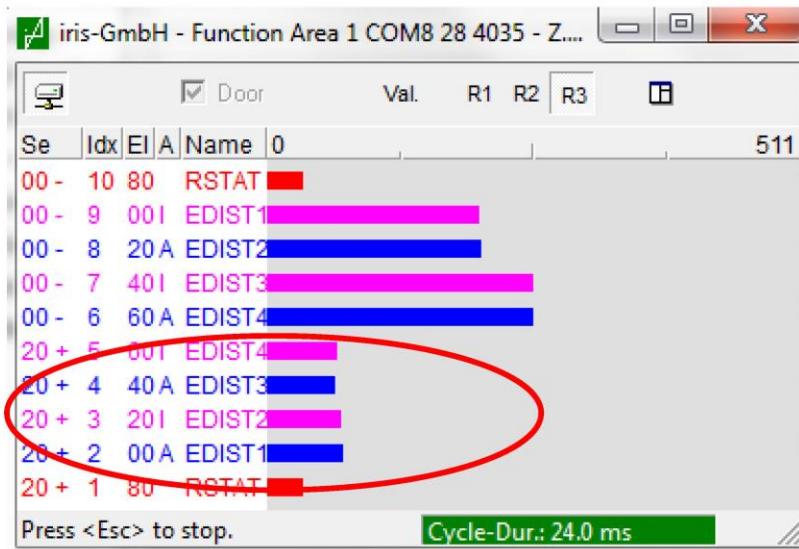
4. The following screen will show next. Starting from the top, double-click on any FA number to test the functionality of a pair of sensors.



5. Press "B" on the keyboard to start; this will activate the sensors. Of the two sensors, one is configured as Master and the other as Slave.
- a. When facing the doorway from inside the vehicle, hovering over the left sensor is the Master; blue/pink bars will fluctuate. See the screen shot below.

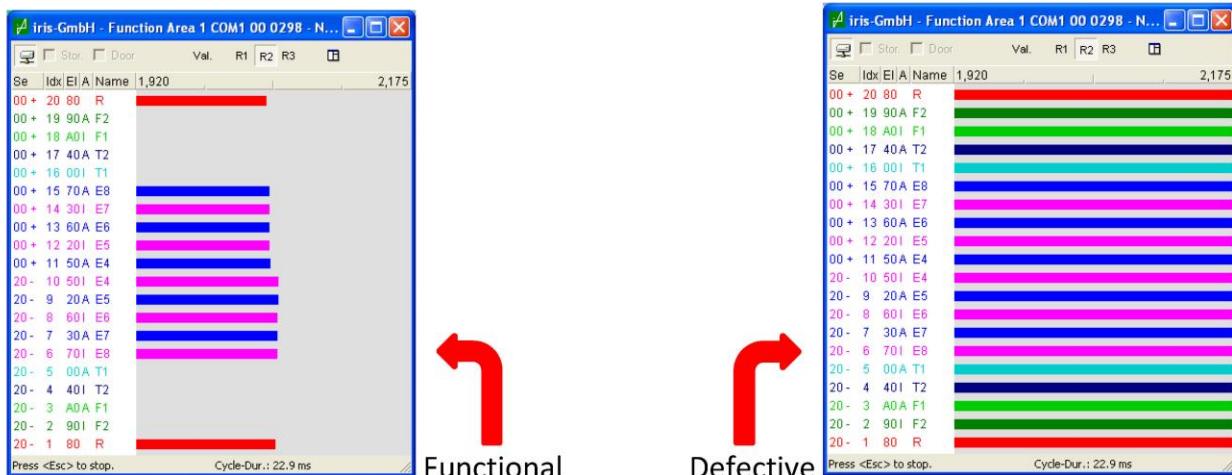


- b. When hovering over the right sensor is the Slave; blue/pink bars will fluctuate. See the screen shot below.



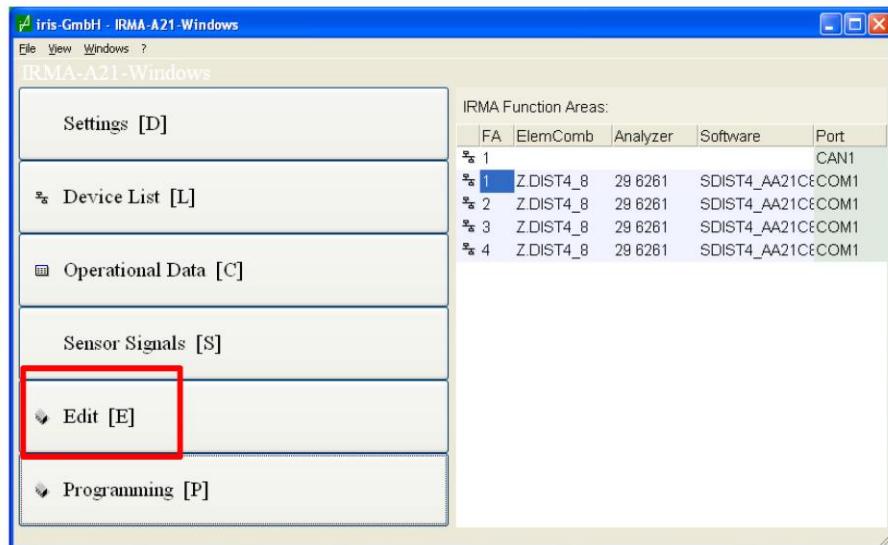
NOTE: To correct a misconfigured sensor, repeat the instructions in Section 7.5.3.8.2, of this manual section, and follow the order of sensor programming shown in the diagrams of step 7.

6. Once sensors are activated, the colored bars will show and will fluctuate as people walk underneath the sensors. See the graphic below to know the difference between a functional sensor and defective sensor. If defective as shown below, the issue would either be on the sensor cables or the sensor itself.

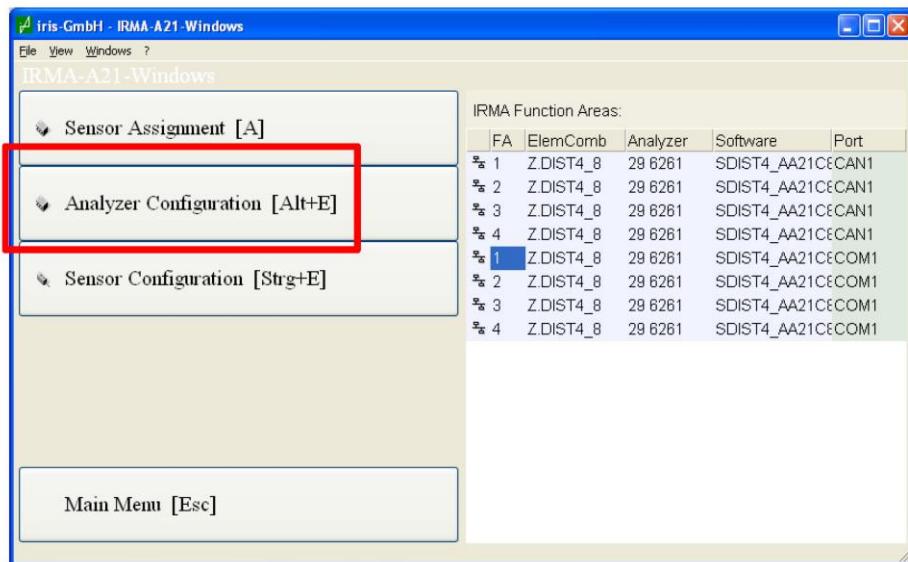


7. To verify Analyzer settings, proceed as follows:

a. On the main screen, click on Edit.

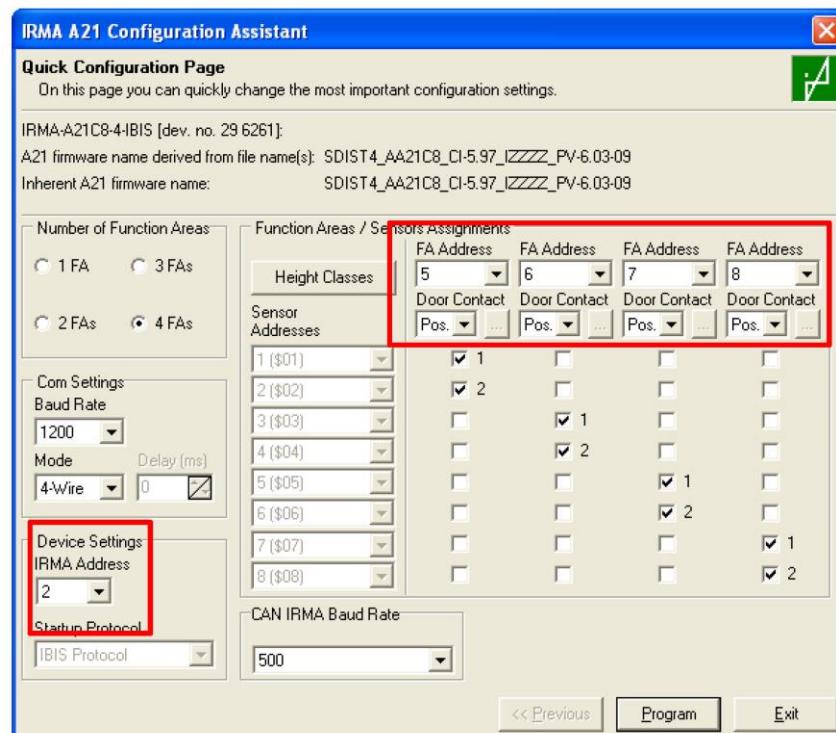


b. Click on Analyzer Configuration.



c. The following screenshot is what should already be set for Analyzer B on Cab B.

- For Analyzer B on CAB B
 - FA Addresses are from **FA 5 – FA 8**
 - Door contacts are positive. *Note: This setting sets the polarity of the door contacts to dictate the counting direction -> boarding or alighting.
 - IRMA address is set to value **2**
- For Analyzer A on CAB A
 - FA Addresses are from **FA 1 – FA 4**
 - Door contacts are positive
 - IRMA address is set to value **1**



7.5.3.9 Interior View Camera

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the side access cover.
2. Align the holes in the Interior View Camera (25) with the holes in the side access cover (2). See Figure 7-83.
3. Insert the eight M4 plain washers (23), four M4 x 16 screws (24), M4 lock washers (22) and M4 nuts (21), tighten and torque to 1.5 Nm (13 in-lbs.).
4. Connect the electrical connector to the Interior View Camera (25).
5. Close and lock the side access cover using a crew key.

Refer to Section 7.5 and Table 7-3 of Section 1900, CCTV of the Running Maintenance and Servicing Manual for additional information.

7.5.3.10 Interior Speaker

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the side access cover.
2. Align the Interior Speaker (29) with the holes in the side access cover (2). See Figure 7-83.
3. Insert the four M5 plain washers (28), M5 lock washers (27) and M5 nuts (26), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the Faston connectors to the Interior Speaker (29).
5. Close and lock the side access cover using a crew key.

7.5.3.11 Passenger Emergency Intercom

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Connect the electrical connector to the Passenger Emergency Intercom (2). See Figure 7-86.
2. Align the holes in the Passenger Emergency Intercom (2).
3. Insert the four M4 x 16 screws (1), tighten and torque to 1.5 Nm (13 in-lbs.).

7.5.3.12 Manual Door Release Handle

1. Connect the cable to the Manual Release Door Handle (4). See Figure 7-86.
2. Align the bracket (4) and the Manual Release Door Handle (4).
3. Insert the four M5 x 20 screws (3), tighten and torque per the chart listed in Section 7.3.4 of this manual section.

7.5.3.13 Interior Passenger Information Sign

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Align the two packing (11) and brackets (9 & 10). See Figures 7-87 and 7-88.
2. Insert the four M4 x 12 screws (8), tighten and torque to 1.5 Nm (13 in-lbs.).
3. Align the Interior Passenger Information Sign (7) with the wall panel.
4. Insert the eighteen M5 plain washers (6), M5 lock washers (5) and M5 x 20 screws (4), tighten and torque per the chart listed in Section 7.3.4 of this manual section.

5. Connect the electrical connector to the Interior Passenger Information Sign (7).
6. Align the packing (3) and the cover (2) with the Interior Passenger Information Sign (7).
7. Insert the three M4 x 10 screws (1), tighten and torque to 1.5 Nm (13 in-lbs.).

7.5.3.14 Side Destination Sign

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

NOTE: Skip steps 1 through 3 if only installing a new sign and the brackets are not damaged.

1. Align the packing (13) and bracket (9) with the holes in the window mask. See Figure 7-89.
2. Insert the four M4 plain washers (12), M4 lock washers (11) and M4 x 16 screws (10), tighten and torque to 1.5 Nm (13 in-lbs.).
3. Repeat steps 1 and 2 for the remaining bracket (9).
4. Place the Side Destination Sign (5) in the slots of the brackets (9).
5. Insert the four M5 plain washers (8), M5 lock washers (7) and M5 x 16 screws (6), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
6. Connect the electrical connectors to the Side Destination Sign (5).
7. Align the three packing (4) and the cover (3) with the holes in the brackets (9).
8. Insert the seven M4 plain washers (2) and M4 x 12 screws (1), tighten and torque to 1.5 Nm (13 in-lbs.).

7.5.3.15 Floor Panels

CAUTION

WHEN CUTTING ABRASTOP™ PANELS, ALWAYS WEAR NIOSH APPROVED DUST MASKS AND USE A DUST COLLECTOR OR SHOP VAC™ TO LIMIT DUST PROLIFERATION.

FOR ALL OTHER OPERATION, NO OTHER PARTICULAR SAFETY MEASURES NEED TO BE TAKEN, OTHER THAT THE USE OF GLASSES, SAFETY SHOES AND PROTECTIVE GLOVES, THE USE OF WHICH WE STRONGLY RECOMMEND WHEN HANDLING CLEANING SOLVENTS AND ADHESIVE. WASH HANDS FREQUENTLY WITH A SOFT HAND CLEANSER AND CLEAN RINSE WATER. IN CASE OF A SPILL OR ACCIDENT, PLEASE FOLLOW THE EMERGENCY INSTRUCTIONS FOUND ON THE CONTAINER LABELS.

1. Dry-fit flooring panel to ensure proper fit before gluing. Minimum gap around the Panel is 3.00 mm (0.13 in), however nominal gap should be 5.00 mm (0.19 in). Cut the panel if required using a circular saw with diamond tip blade and a straight edge.
2. Clean the surface of the structure. Follow adhesive recommendations for proper surface preparation.
3. Apply appropriate shims 1 per approximately 30.00 cm (12.00 in) on the structure where the panel will be installed. Top of the shim shall be levelled, adjust if required in order to have a flat support for the floor panel.
4. Ensure that proper fire retardant material is applied to the structure.
5. Dry-fit flooring panel to ensure proper fit before gluing. Minimum gap around the Panel is 3.00 mm (0.13 in), however nominal gap should be 5 mm (0.19 in). Cut the panel if required using a circular saw with diamond tip blade and a straight edge.
6. Using the pneumatic actuator, apply a triangular bead of adhesive to the structure, all around the panel about 12.00 mm (0.50 in) from all the edges and around all openings.
7. Lower the Abrastop™ panel into place.
8. Insert 5.00 mm (0.19 in) shims #OT72-1004 to ensure proper spacing between each panel. Center the panel in the car to achieve equal spacing along the wall and wedge it in place.
9. Install levelling clips ≈ 1 per 25.00 cm (10.00 in) between glued panels and check for proper levelling.

Refer to Section 0200 Car Body of the Heavy Repair Maintenance Manual for additional information.

7.5.3.16 APC Analyzer

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Using a crew key, unlock and open the side access cover.
2. Align the holes in the APC Analyzer (4) with the holes in the bracket. See Figure 7-91.
3. Insert the six M4 plain washers (3), M4 lock washer (3) and M4 x 12 bolts (1), tighten and torque to 1.5 Nm (13 ft-lbs).
4. Connect the electrical connectors to the APC Analyzer (4).
5. Close and lock the side access cover using a crew key.

7.5.3.16.1 Analyzer Firmware

If one of the APC Analyzer units is replaced, it is important to confirm the proper firmware version is loaded onto the replacement unit. The Analyzer firmware version is displayed on the Train Operator Display (TOD)'s software version screen. If the Analyzer requires a firmware update, see Section 7.5.5.5.2 of this manual section for details.

7.5.4 Seats

7.5.4.1 2P LH & RH 36" Cantilever w/Grab Bar, No Stanchion

NOTE: The cantilever must be installed in the car before the seat assembly is installed on the cantilever.

1. Position cantilever (2) along the car wall aligning the mounting holes. See Figure 7-92.
2. Install the four M12 screws (11), M12 lock washers (12), and M12 flat washers (13) that mount the cantilever (2) to the wall of the car. Tighten the screws finger tight.
3. Make sure the cantilever (2) is correctly positioned and torque the screws to 47 Nm (34.7 ft-lbs.).
4. Install the seat frame assembly (1) on the cantilever assembly (2) using three screws (8), three lock washers (9), three flat washers (10), four screws (5), four lock washers (6), and four flat washers (7). Torque the screws according to Section 7.3.4 of this manual section.

5. Install the two seatback cushions (14) by aligning both flanged screw heads with the slots in the upper frame. Push the seatback cushions (14) up to fully engage the slots and to ensure they are flush with the top of the seat frame assembly (1). See Figures 7-138 and 7-139.

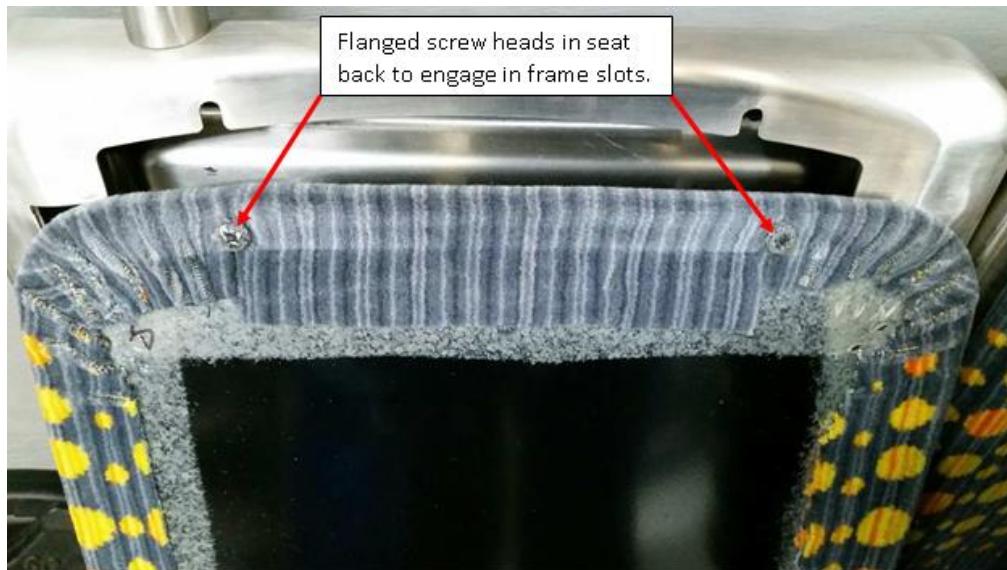


Figure 7-138: Aligning Flanged Screw Heads with Slots



Figure 7-139: Back Onserts Flush With Top of Seat Frame

6. Install the two bottom seat cushions (3) by aligning the screw heads of seat bottom into the keyhole slots in the seat frame assembly (1).
7. Push the bottom seat cushions (3) down and towards the back to engage and retain the screw heads into the keyhole slots and ensuring the back edge of cushions comes into contact and pushes seat back tabs to retain back in position. Bottom seat cushion (3) front studs will fall into the front frame slots. See Figures 7-140 through 7-143.



Figure 7-140: Bottom Onsert Stud Fully Engaged in the Seat Frame Key Slot

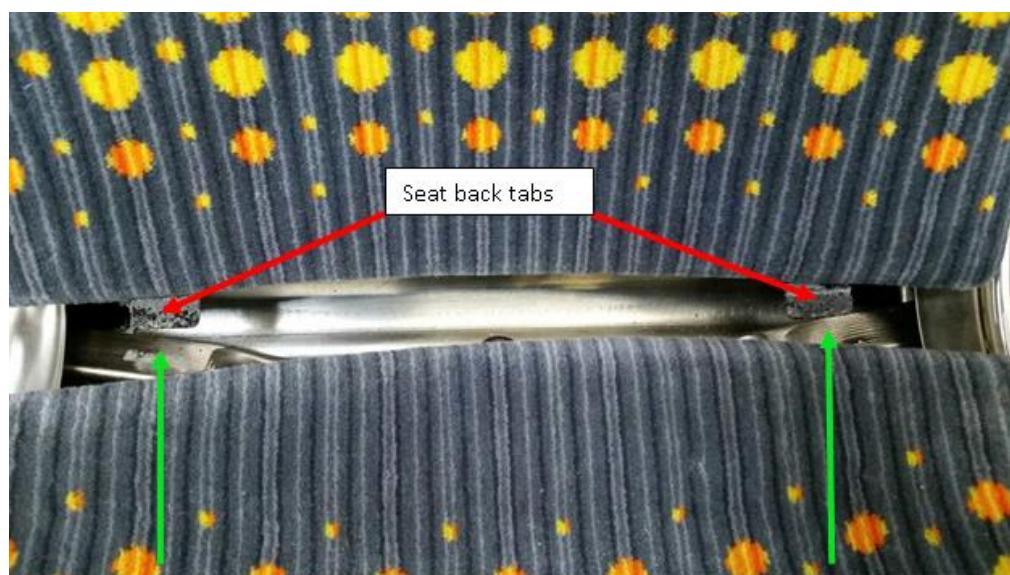


Figure 7-141: Seat Back Tabs



Figure 7-142: Cushions Comes into Contact With Seat Back Tabs



Figure 7-143: Seat Cushion Stud Shown in Mounting Slot With Seat Pushed Back

8. Use your knee or a clamp to push the bottom seat cushion back while installing the four flat washers (15) and lock nuts (4). Torque the lock nuts (4) to 8.5Nm (6.3 ft-lbs.). See Figures 7-144 and 7-145.
9. When properly installed, the bottom seat cushions (3) should be flush with the curve of the seat frame assembly (1) and support the seatback cushions (14). If there is a visible gap between the cushion and the frame, the cushion needs to be adjusted to its original shape. See Figures 7-146 through 7-148.



Figure 7-144: Pushing the Seat Cushion Back While Installing



Figure 7-145: Installing Hardware While Seat Cushion Is Pushed Back Fully



Figure 7-146: Properly Installed and Secured Seat Cushions



Figure 7-147: Side View of Properly Installed Onserts



Figure 7-148: Front Waterfall Edge Should be Flush Against the Seat Frame

7.5.4.2 2P LH & RH 36" Cantilever w/Grab Bar, w/Stanchion

1. Position cantilever (2) along the car wall aligning the mounting holes. See Figure 7-93.
2. Install the four M12 screws (11), M12 lock washers (12), and M12 flat washers (13) that mount the cantilever (2) to the wall of the car. Tighten the screws finger tight.
3. Make sure the cantilever (2) is correctly positioned and torque the screws to 47 Nm (34.7 ft-lbs.).
4. Install the seat frame assembly (1) on the cantilever assembly (2) using three screws (8), three lock washers (9), three flat washers (10), four screws (5), four lock washers (6), and four flat washers (7). Torque the screws according to Section 7.3.4.
5. Install the two seatback cushions (16) by aligning both flanged screw heads with the slots in the upper frame. Push the seatback cushions (16) up to fully engage the slots and to ensure they are flush with the top of the seat frame assembly (1). See Figures 7-138 and 7-139.
6. Install the two bottom seat cushions (3) by aligning the screw heads of seat bottom into the keyhole slots in the seat frame assembly (1).
7. Push the bottom seat cushions (3) down and towards the back to engage and retain the screw heads into the keyhole slots and ensuring the back edge of cushions comes into contact and pushes seat back tabs to retain back in position. Bottom seat cushions (3) front studs will fall into the front frame slots. See Figures 7-140 through 7-143.

8. Use your knee or a clamp to push the bottom seat cushion back while installing the four flat washers (17) and lock nuts (4). Torque the lock nuts (4) to 8.5Nm (6.3 ft-lbs.). See Figures 7-144 and 7-145.
9. When properly installed, the bottom seat cushions (3) should be flush with the curve of the seat frame assembly (1) and support the seatback cushions (16). If there is a visible gap between the cushion and the frame, the cushion needs to be adjusted to its original shape. See Figures 7-146 through 7-148.
10. Install the car grab pole (15) in the stanchion using the attaching hardware (14).

7.5.4.3 2P LH & RH 34" Cantilever Door Pocket w/Grab Bar, w/Stanchion

1. Position cantilever (2) along the car wall aligning the mounting holes. See Figure 7-94.
2. Install the four M12 screws (11), M12 lock washers (12), and M12 flat washers (13) that mount the cantilever (2) to the wall of the car. Tighten the screws finger tight.
3. Make sure the cantilever (2) is correctly positioned and torque the screws to 47 Nm (34.7 ft-lbs.).
4. Install the seat frame assembly (1) on the cantilever assembly (2) using three screws (8), three lock washers (9), three flat washers (10), four screws (5), four lock washers (6), and four flat washers (7). Torque the screws according to Section 7.3.4.
5. Install the two seatback cushions (16) by aligning both flanged screw heads with the slots in the upper frame. Push the seatback cushions (16) up to fully engage the slots and to ensure they are flush with the top of the seat frame assembly (1). See Figures 7-138 and 7-139.
6. Install the two bottom seat cushions (3) by aligning the screw heads of seat bottom into the keyhole slots in the seat frame assembly (1).
7. Push the bottom seat cushions (3) down and towards the back to engage and retain the screw heads into the keyhole slots and ensuring the back edge of cushions comes into contact and pushes seatback tabs to retain back in position. Bottom seat cushion (3) front studs will fall into the front frame slots. See Figures 7-140 through 7-143.
8. Use your knee or a clamp to push the bottom seat cushion back while installing the four flat washers (17) and lock nuts (4). Torque the lock nuts (4) to 8.5 Nm (6.3 ft-lbs.). See Figures 7-144 and 7-145.
9. When properly installed, the bottom seat cushions (3) should be flush with the curve of the seat frame assembly (1) and support the seatback cushions (16). If there is a visible gap between the cushion and the frame, the cushion needs to be adjusted to its original shape. See Figures 7-146 through 7-148.
10. Install the car grab pole (15) in the stanchion using the attaching hardware (14).

7.5.4.4 2P Longitudinal Flip Seat

1. Carefully align the Flip Seat (1) over the mounting holes. See Figure 7-95.
2. Install the two M12 x 35 bolts (5), M12 lock washers (6) and M12 plain washers (7) through the wall mount brackets.
3. Install the two M12 x 30 bolts (2), M12 lock washers (3), and M12 plain washers (4) through the floor mount brackets.
4. Torque the hardware to 47 Nm (34.7 ft-lbs.).

7.5.4.4.1 Bottom Seat Cushion Assembly

1. Align the rear clips on the cushion assembly (8) with the slotted holes in the seat frame. See Figure 7-95.
2. Insert the clips and slide the cushion assembly (8) back to engage the clips.
3. Push down on the front of the cushion assembly (8) to secure it in place.
4. Install two 1/4 flat washers (16) and lock nuts (12) to secure the cushion assembly (8).
5. With the seat bottom in the up position, install eleven #10-32 x 1/2" spanner head screws (11) and #10 plain washers (15) to secure the close out panel (10) to the seat assembly (1).

NOTE: Apply medium strength Loctite to the screws.

7.5.4.4.2 Seat Back Cushion Assembly

1. With the seat bottom in the bottom position, align the top clips of the back cushion assembly (9) with the slots in the seat frame. Slide the back cushion assembly (9) up to engage the clips. See Figure 7-95.
2. Slide the onsert keeper (14) up to engage with the lower clip of the back cushion assembly (9).
3. Install two #10-32 x 1/2" spanner head screws (13) to secure the onsert keeper (14).

7.5.4.5 2P LH & RH Cantilever, Reserved

1. Position cantilever (2) along the car wall aligning the mounting holes. See Figure 7-96.
2. Install the four M12 screws (11), M12 lock washers (12), and M12 flat washers (13) that mount the cantilever (2) to the wall of the car. Tighten the screws finger tight.
3. Make sure the cantilever (2) is correctly positioned and torque the screws to 47 Nm (34.7 ft-lbs.).

4. Install the seat frame assembly (1) on the cantilever assembly (2) using three screws (8), three lock washers (9), three flat washers (10), four screws (5), four lock washers (6), and four flat washers (7). Torque the screws according to Section 7.3.4 of this manual section.
5. Install the two seatback cushions (14) by aligning both flanged screw heads with the slots in the upper frame. Push the seatback cushions (14) up to fully engage the slots and to ensure they are flush with the top of the seat frame assembly (1). See Figures 7-138 and 7-139.
6. Install the two bottom seat cushions (3) by aligning the screw heads of seat bottom into the keyhole slots in the seat frame assembly (1).
7. Push the bottom seat cushions (3) down and towards the back to engage and retain the screw heads into the keyhole slots and ensuring the back edge of cushions comes into contact and pushes seat back tabs to retain back in position. Bottom seat cushion (3) front studs will fall into the front frame slots. See Figures 7-140 through 7-143.
8. Use your knee or a clamp to push the bottom seat cushion back while installing the four flat washers (15) and lock nuts (4). Torque the lock nuts (4) to 8.5 Nm (6.3 ft-lbs.). See Figures 7-144 and 7-145.
9. When properly installed, the bottom seat cushions (3) should be flush with the curve of the seat frame assembly (1) and support the seatback cushions (14). If there is a visible gap between the cushion and the frame, the cushion needs to be adjusted to its original shape. See Figures 7-146 and 7-148.

7.5.4.6 2P LH & RH Sandbox Seat

1. Install the bracket (5) onto the back of the Seat Assembly (1) aligning the mounting holes. See Figure 7-97.
2. Install the four M6 x 20 screws (6).
3. Install the two hinges (7) to the bottom of the Seat Assembly (1) aligning the mounting holes.
4. Install the four M6 x 20 bolts (8) and M6 lock washers (9). Torque the hardware using Tables 7-1 and 7-2.
5. Install the two seatback cushions (12) by aligning both flanged screw heads with the slots in the upper frame. Push the seatback cushions (12) up to fully engage the slots and to ensure they are flush with the top of the seat frame assembly (1). See Figures 7-138 and 7-139.
6. Install the two bottom seat cushions (10) by aligning the screw heads of seat bottom into the keyhole slots in the seat frame assembly (1).
7. Push the bottom seat cushions (10) down and towards the back to engage and retain the screw heads into the keyhole slots and ensuring the back edge of cushions comes into contact and pushes seat back tabs to retain back in position. Bottom seat cushion (10) front studs will fall into the front frame slots. See Figures 7-140 through 7-143.

8. Using your knee or a clamp to push the bottom seat cushion back while installing the four flat washers (13) and lock nuts (11). Torque the lock nuts (11) to 8.5Nm (6.3 ft-lbs). See Figures 7-144 and 7-145.
9. When properly installed, the bottom seat cushions (10) should be flush with the curve of the seat frame assembly (1) and support the seatback cushions (12). If there is a visible gap between the cushion and the frame, the cushion needs to be adjusted to its original shape. See Figures 7-146 through 7-148.
10. Carefully place the Seat Assembly (1) onto the sandbox aligning the mounting holes of the hinges (7).
11. Insert the six M6 x 20 bolts (3) and M6 lock washers (4). Torque the hardware using Tables 7-1 and 7-2.
12. Turn the latches (2) to lock the seat.

7.5.5 Electric Locker Equipment

7.5.5.1 Auxiliary Circuit Breaker

1. Using a crew key, unlock and open the A-Unit electric locker door.
2. Align the mounting holes of the Auxiliary Circuit Breaker (4) with the holes in the brackets. See Figure 7-98.
3. Insert the two M4 plain washers (3), M4 lock washers (2) and M4 x 80 screws (1), tighten and torque to 1.5 Nm (13 in-lbs.).
4. Connect the #6 electrical connections to the Auxiliary Circuit Breaker (4) and torque to 1.5 Nm (13 in-lbs.).
5. Close and lock the A-Unit electric locker door using a crew key.

7.5.5.2 AC Circuit Breaker Panel

1. Using a crew key, unlock and open the electric locker door.
2. Align the mounting holes in the AC Circuit Breaker Panel (13). See Figures 7-98 and 7-99.
3. Insert the four M6 plain washers (12), M6 lock washers (11) and M6 x 35 bolts (10), tighten and torque per the chart listed in Section 7.3.4 of this manual section
4. Connect the #6 electrical connections to the AC Circuit Breaker Panel (13) and torque to 1.5 Nm (13 in-lbs.).
5. Align the holes in the cover (9).
6. Insert the four protection rubber (8), M4 plain washers (7), M4 lock washers (6) and M4 x 12 screws (5), tighten and torque to 1.5 Nm (13 in-lbs.).
7. Close and lock the electric locker door using a crew key.

7.5.5.3 LVDC Terminal Block

1. Using a crew key, unlock and open the electric locker door.
2. Align the holes in the LVDC Terminal Block (17). See Figures 7-98 and 7-99.
3. Insert the two M5 plain washers (16), M5 lock washers (15) and M5 x 16 bolts (14), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Repeat steps 1 and 2 for the remaining two LVDC Terminal Blocks (17).
5. Connect the WAGO electrical connections to the LVDC Terminal Blocks (17).
6. Close and lock the electric locker door using a crew key.

7.5.5.4 High Speed Circuit Breaker Control Panel

1. Using a crew key, unlock and open the A-Unit electric locker door.
2. Align the holes in the High Speed Circuit Breaker Control Panel (21). See Figure 7-98.
3. Insert the four M6 plain washers (20), M6 lock washers (19) and M6 x 20 bolts (18), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the electrical connectors to the High Speed Circuit Breaker Control Panel (21).
5. Close and lock the A-Unit electric locker door using a crew key.

7.5.5.5 APC COPILOTpc

1. Using a crew key, unlock and open the B-Unit electric locker door.
2. Align the holes in the APC COPILOTpc Rack (4). See Figure 7-99.
3. Insert the four M6 plain washers (3), M6 lock washers (2) and M6 x 20 bolts (1), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the electrical connectors and WAGO terminals to the APC COPILOTpc Rack (4).
5. Close and lock the B-Unit electric locker door using a crew key.

7.5.5.5.1 CoPilotPC Rack Commissioning

If the CoPilotPC rack is replaced, the vehicle number will need reassigned to the backplane (quick mount bracket). The backplane contains an EEPROM that saves the vehicle number data. To reassign vehicle number, follow the steps below using the Touchit device:

1. Connect Touchit device to XST11 on the CoPilotPC.
2. Enter Test Function 10106.

3. Enter vehicle number, PRESS OK.
4. Enter Test Function 10205 to RESTART.
5. Enter Test Function 10104 to verify.

7.5.5.5.2 CoPilot PC Software Upload

If the CoPilot PC unit is replaced, it is important to confirm the proper software version is loaded onto the replacement unit. The CoPilot software version is displayed on the Train Operator Display (TOD)'s software version screen.

The CoPilot software and Analyzer firmware are loaded onto the CoPilot together. The CoPilot will push the firmware to the Analyzers. In the event that not all devices need new software, that device will ignore the upgrade. To upgrade the devices, the Touchit device and a USB thumb drive with the software/firmware files are required.

The USB drive must only have the APC related files on them:

- autorun.bat
- F20150625_V00XX.pC0 (where XX is the recent parameter number)
- INITenableTF10408noInput
- uncomp_d_chkdsk_V0100.sC0
- V0001.wC0
- V0101.gC0
- V17XX.xC0 (where XX is the recent software number)

To upload the files,

1. Connect Touchit device to XST11 on the CoPilotPC.
2. Insert USB stick on the USB port of the CoPilotPC
3. CoPilotPC will extract the file automatically. Display will indicate file extraction.
4. System will reboot. (This may take up to 10 minutes before reboot occurs).
5. After reboot, if USB stick is left in and the CoPilot enters the BIOS (blue scrolling) screen, press the restart button. While rebooting (again), remove the USB stick.
6. Confirm the software versions displayed on the TOD's software version screen.

If Analyzer firmware does not display on the TOD:

1. Unplug power from Analyzer A labeled "P".
2. Restart the APC system by pressing on the Reset button on the CoPilotPC OR enter test function 10201 on the Touchit.
3. Wait for the system to boot.
4. Insert power plug back into Analyzer A.

7.5.5.6 Network Video Recorder (NVR)

1. Using a crew key, unlock and open the B-Unit electric locker door.
2. Align the holes in the Network Video Recorder (17). See Figure 7-99.
3. Insert the four M8 plain washers (16), M8 lock washers (15) and M8 x 20 bolts (14), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the electrical connectors to the Network Video Recorder (17).
5. Close and lock the B-Unit electric locker door using a crew key.

7.5.5.7 Electronic Control Unit, Center Truck

1. Using a crew key, unlock and open the B-Unit electric locker door.
2. Align the holes in the Electronic Control Unit, Center Truck (21). See Figure 7-99.
3. Insert the four M6 plain washers (20), M6 lock washers (19) and M6 x 16 screws (18), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the electrical connectors to the Electronic Control Unit, Center Truck (21).
5. Close and lock the B-Unit electric locker door using a crew key.

7.5.5.8 Terminal Board

1. Using a crew key, unlock and open the electric locker door.
2. Align the holes in the Terminal Board (4). See Figure 7-100.
3. Insert the four M5 plain washers (3), M5 lock washers (2) and M5 x 35 screws (1), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the WAGO electrical connections to the Terminal Board (4).
5. Repeat steps 1 through 3 for the remaining Terminal Board (4).
6. Close and lock the electric locker door using a crew key.

7.5.5.9 Ethernet Switch

1. Using a crew key, unlock and open the electric locker door.
2. Align the holes in the Ethernet Switch (8). See Figure 7-100.
3. Insert the four M5 plain washers (7), M5 lock washers (6) and M5 x 16 screws (5), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the electrical connectors to the Ethernet Switch (8).
5. Repeat steps 1 through 2 for the remaining Ethernet Switch (8).
6. Close and lock the electric locker door using a crew key.

7.5.5.10 Track Brake Contactor Panel

1. Using a crew key, unlock and open the A-Unit electric locker door.
2. Align the holes in the Track Brake Contactor Panel (12). See Figure 7-100.
3. Insert the four M8 plain washers (11), M8 lock washers (10) and M8 x 25 bolts (9), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the electrical connections to the Track Brake Contactor Panel (12) WAGO terminals.
5. Close and lock the A-Unit electric locker door using a crew key.

7.5.5.11 Convenience Outlet

1. Using a crew key, unlock and open the electric locker door.
2. Align the holes in the Convenience Outlet (17). See Figure 7-100.
3. Insert the two M4 plain washers (16), M4 lock washers (15) and M4 x 16 screws (14), tighten and torque to 1.5 Nm (13 in-lbs.).
4. Connect the #10 electrical connections to the Convenience Outlet (17) and torque to 2.5 Nm (22 in-lbs.).
5. Install the cover (13).
6. Repeat steps 1 through 4 for the remaining Convenience Outlet (17).
7. Close and lock the electric locker door using a crew key.

7.5.5.12 Electronic Control Unit Pull Down Resistor

1. Using a crew key, unlock and open the B-Unit electric locker door.
2. Align the holes in the Electronic Control Unit Pull Down Resistor (21). See Figure 7-100.
3. Insert the four M6 plain washers (20), M6 lock washers (19) and M6 x 16 bolts (18), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the electrical connections to the Electronic Control Unit Pull Down Resistor (21) WAGO terminals.
5. Close and lock the B-Unit electric locker door using a crew key.

7.5.5.13 ARP1B Relay Panel

NOTE: To install an individual relay, refer to Section 3.2.21.17 of the Car Body Heavy Repair Maintenance Manual.

1. Using a crew key, unlock and open the B-Unit electric locker door.
2. Align the holes in the ARP1B Relay Panel (25). See Figure 7-100.
3. Insert the four M8 plain washers (24), M8 plain washers (23) and M8 x 25 bolts (22), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
4. Connect the electrical connector to the ARP1B Relay Panel (25).
5. Close and lock the B-Unit electric locker door using a crew key.

7.5.6 Undercar Mounted Equipment

7.5.6.1 Coupler

1. Carefully place the Coupler (1) on the mounting bracket (6) aligning the mounting holes. See Figure 7-102.
2. Install the four M24 x 170 bolts (2), M24 plain washers (3), M24 plain washers (4), and M24 ESNA nuts (5).
3. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
4. Refer to Section 5.3.6.1 of this manual section for instructions on adjusting the coupler height.
5. Connect the electrical connectors (7) to the Coupler (1).
6. Connect the air connections to the Coupler (1).

7. Open the Coupler Cutout Cock by rotating the handle 90 degrees so that the indicator on the Cutout Cock handle is parallel to the airline. See Figure 7-101 for location of the Coupler Cutout Cock.
8. Pressurize the air system.
9. Apply leak detector to the fittings after the system is pressurized.

7.5.6.2 TWC Antenna

1. Place the TWC antenna bracket (15) on the car body bracket (16) aligning the mounting holes. See Figure 7-103.
2. Install the four M10 x 40 bolts (11), M10 plain washers (12), M10 plain washers (13), and M10 ESNA nuts (14).
3. Carefully place the TWC Antenna (2) onto the TWC antenna bracket (15) aligning the mounting holes.
4. Install the four M8 x 35 bolts (7) M8 plain washers (8), M8 plain washers (9), and M8 ESNA nuts (10).
5. Carefully place the TWC Antenna (1) onto the TWC antenna bracket (15) aligning the mounting holes.
6. Install the four M6 x 25 bolts (3), M6 plain washers (4), M6 plain washers (5), and M6 ESNA nuts (6).
7. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
8. Connect the electrical connectors (17 and 18) to the two TWC Antennas (1 and 2).

7.5.6.3 Sanding Device

1. Carefully install the Sand Ejector (1) and gasket (2) onto the sandbox. See Figure 7-104.
2. Install the three M10 ESNA nuts (10), and M10 plain washers (11).
3. Insert the sanding pipe (6) into the Sand Ejector (1).
4. Install the pipe clamp (3) aligning the mounting holes.
5. Install the two M10 x 30 bolts (7), M10 plain washers (8), and M10 ESNA nuts (9).
6. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
7. Install the Hose (4) onto the sanding pipe (6) and tighten the hose clamp (5).
8. Connect the air connection to the Sand Ejector (1).

9. Open the Sanding Cutout Cock by rotating the handle 90 degrees so that the indicator on the Cutout Cock handle is parallel to the airline. See Figure 7-101 for location of the Sanding Cutout Cock.

10. Pressurize the air system.

11. Apply leak detector to the fittings after the system is pressurized.

7.5.6.4 Main Reservoir

1. Carefully install the Main Reservoir (1) on the mounting brackets (6) aligning the mounting holes. See Figure 7-105.
2. Install the four M12 x 35 bolts (2), M12 plain washers (3), M12 plain washers (4), and M12 ESNA nuts (5).
3. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
4. Connect the fittings to the Main Reservoir (1).
5. Apply thread sealant to the threads of the drain cock (7).
6. Install the drain cock (7) into the Main Reservoir (1).
7. Close the drain cock (7).
8. Turn on the Air Compressor circuit breaker in the B-Unit cab and pressurize the air system.
9. Apply leak detector to the fittings after the system is pressurized.

7.5.6.5 Brake Supply Reservoir

1. Carefully install the Brake Supply Reservoir (1) on the mounting brackets (6) aligning the mounting holes. See Figure 7-106.
2. Install the four M12 x 35 bolts (2), M12 plain washers (3), M12 plain washers (4), and M12 ESNA nuts (5).
3. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
4. Connect the fittings to the Brake Supply Reservoir (1).
5. Close the Main Reservoir drain cock.
6. Open the Brake Cylinder Cutout Cock by rotating the handle 90 degrees so that the indicator on the Cutout Cock handle is parallel to the airline. See Figure 7-101 for location of the Brake Cylinder Cutout Cock.
7. Turn on the Air Compressor circuit breaker in the B-Unit cab and pressurize the air system.
8. Apply leak detector to the fittings after the system is pressurized.

7.5.6.6 Air Compressor

1. Carefully install the Air Compressor (1) on the mounting bracket (6) aligning the mounting holes. See Figure 7-107.
2. Install the four M12 x 45 bolts (2), M12 plain washers (3), M12 plain washers (4), and M12 ESNA nuts (5).
3. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
4. Connect the electrical connectors (7) to the Air Compressor (1).
5. Connect the air connection (8) to the Air Compressor (1).
6. Close the Main Reservoir drain cock.
7. Turn on the Air Compressor circuit breaker in the B-Unit cab and pressurize the air system.
8. Apply leak detector to the fittings after the system is pressurized.

7.5.6.7 Brake Control Unit (Motor Truck)

1. Carefully place the Brake Control Unit (1) on the mounting bracket (6) aligning the mounting holes. See Figure 7-108.
2. Open the cover of the Brake Control Unit (1).
3. Install the four M12 x 85 bolts (2), M12 plain washers (3), M12 plain washers (4), and M12 ESNA nuts (5).
4. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
5. Connect the electrical connector (7) to the Brake Control Unit (1).
6. Connect the air connection (8) to the Brake Control Unit (1).
7. Close the Main Reservoir drain cock.
8. Open the Brake Cylinder Cutout Cock by rotating the handle 90 degrees so that the indicator on the Cutout Cock handle is parallel to the airline. See Figure 7-101 for location of the Brake Cylinder Cutout Cock.
9. Turn on the Air Compressor circuit breaker in the B-Unit cab and pressurize the air system.
10. Apply leak detector to the fittings after the system is pressurized.

7.5.6.8 Brake Control Unit (Center Truck)

1. Carefully place the Brake Control Unit (1) on the mounting bracket (6) aligning the mounting holes. See Figure 7-109.
2. Open the cover of the Brake Control Unit (1).
3. Install the four M12 x 70 bolts (2), M12 plain washers (3), M12 plain washers (4), and M12 ESNA nuts (5).
4. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
5. Connect the electrical connector (7) to the Brake Control Unit (1).
6. Connect the air connection (8) to the Brake Control Unit (1).
7. Close the Main Reservoir drain cock.
8. Open the Brake Cylinder Cutout Cock by rotating the handle 90 degrees so that the indicator on the Cutout Cock handle is parallel to the airline. See Figure 7-101 for location of the Brake Cylinder Cutout Cock.
9. Turn on the Air Compressor circuit breaker in the B-Unit cab and pressurize the air system.
10. Apply leak detector to the fittings after the system is pressurized.

7.5.6.9 Auxiliary Power Supply

1. Carefully install the Auxiliary Power Supply (1) on the mounting bracket (6) aligning the mounting holes. See Figure 7-110.
2. Install the four M12 x 40 bolts (2), M12 plain washers (3), M12 plain washers (4), and M12 ESNA nuts (5).
3. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
4. Connect the electrical connectors (7) to the Auxiliary Power Supply (1). Refer to Section 0900, Auxiliary Inverter of the Heavy Repair Maintenance Manual for additional information.

7.5.6.10 Battery Box

1. Carefully install the Battery Box (1) on the mounting bracket (6) aligning the mounting holes. See Figure 7-111.
2. Install the five M12 x 40 bolts (2), M12 plain washers (3), M12 plain washers (4), and M12 ESNA nuts (5).
3. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
4. Refer to Section 1100, Battery of the Heavy Repair Maintenance Manual for the installation of the batteries.

7.5.6.11 Battery Circuit Breaker Box

1. Open the door of the Battery Circuit Breaker Box (1). See Figure 7-112.
2. Carefully install the brick diode (16) to the heatsink (22) aligning the mounting holes.
3. Install the four 1/4 x 2-1/4" screws (17), 1/4" plain washers (18), 1/4" plain washer (19), 1/4" lock washers (20), and 1/4" hex nuts (21).
4. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
5. Install the gasket (15) aligning the mounting holes.
6. Carefully install the brick diode assembly (16 and 22) to the Battery Circuit Breaker Box (1) aligning the mounting holes.
7. Install the four 1/4" x 1.00" bolts (12), 1/4" plain washers (13), and 1/4" ESNA nuts (14).
8. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
9. Connect the 3/8-16 electrical connections to the brick diode (16).
10. Torque the electrical connections per the torque chart in Section 7.3.4 of this manual section.
11. Carefully install the 400A circuit breaker (9) aligning the mounting holes.
12. Install the four M5 screws (10), and M5 plain washer (11).
13. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
14. Connect the M6 and M10 electrical connections from the 400A circuit breaker (9).
15. Torque the electrical connections per the torque chart in Section 7.3.4 of this manual section.
16. Carefully install the 150A circuit breaker (6) aligning the mounting holes.
17. Install the two M4 screws (7), and M4 plain washers (8).
18. Tighten the hardware and torque to 1.5 Nm (13 in-lbs).
19. Connect the M8 electrical connections to the 150A circuit breaker (6).
20. Torque the electrical connections per the torque chart in Section 7.3.4 of this manual section.
21. Insert the cover (2).

22. Insert the four M5 x 12 screws (3), M5 plain washers (4), and M5 lock washers (5).
23. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.
24. Reconnect the positive battery terminal.
25. Close the door of the Battery Circuit Breaker Box (1).

7.5.6.12 Propulsion Inverter

1. Carefully install the Propulsion Inverter (1) on the mounting brackets (6) aligning the mounting holes. See Figure 7-113.
2. Install the four M16 x 45 bolts (2), M16 plain washers (3), M16 plain washers (4), and M16 ESNA nuts (5).
3. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
4. Connect the electrical connectors (7) and M8 hardware to the Propulsion Inverter (1).

NOTE: Refer to the Heavy Repair Maintenance Manual, Section 0700, Propulsion for the locations of ring terminals that need to be connected for the installation of the propulsion inverter.

7.5.6.13 Line Reactor

1. Carefully install the Line Reactor (1) on the mounting brackets (6) aligning the mounting holes. See Figure 7-114.
2. Install the four M16 x 45 bolts (2), M16 plain washers (3), M16 plain washers (4), and M16 ESNA nuts (5).
3. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
4. Connect the 3/8-16 electrical connections (7) to the Line Reactor (1). Refer to Section 0700, Propulsion of the Heavy Repair Maintenance Manual for additional information.
5. Torque the electrical connections to 42 Nm (31 ft-lbs.).

7.5.6.14 Knife Switch

1. Carefully install the Knife Switch (1) on the mounting brackets (6) aligning the mounting holes. See Figure 7-115.
2. Install the four M12 x 40 bolts (2), M12 plain washers (3), M12 plain washers (4), and M12 ESNA nuts (5).
3. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
4. Open the cover and connect the 3/8-16 electrical connections (7) to the Knife Switch (1).
5. Torque the electrical connections to 42 Nm (31 ft-lbs.).
6. Close and latch the Knife Switch (1) cover.

7.5.6.15 Horn

1. Carefully install the Horn (1) on the mounting bracket (6) aligning the mounting holes. See Figure 7-116.
2. Install the four M6 x 25 bolts (2), M6 plain washers (3), M6 plain washers (4), and M6 ESNA nuts (5).
3. Torque the hardware using the torque chart in Section 7.3.4 of this manual section.
4. Connect the 1/4" Faston electrical connections to the Horn (1).

7.5.7 Roof Mounted Equipment

7.5.7.1 High Speed Circuit Breaker (HSCB)

1. Carefully place the HSCB (1) on the mounting bracket aligning the mounting holes.
2. Insert the four M12 plain washers (3), M12 x 35 bolts (2), M12 plain washers (4), and M12 ESNA nuts (5). See Figure 7-117.
3. Tighten and torque the hardware using the chart in Section 7.3.4 of this manual section.
4. Connect the electrical connector and M12 hardware (6 and 7) to the HSCB (1) and torque to 49 Nm (36 ft-lbs.).

NOTE: Refer to the Heavy Repair Maintenance Manual, Section 0700, Propulsion for the locations of ring terminals that need to be connected for installation of the High Speed Circuit Breaker.

7.5.7.2 Lightning Arrestor

1. Carefully place the Lightning Arrestor (1) on the mounting bracket aligning the mounting holes.
2. Insert the two 5/16 plain washers (4), 5/16 lock washers (3), and 5/16 x 5/8 bolts (2). See Figure 7-118.
3. Tighten and torque the hardware to 18 Nm (13 ft-lbs.).
4. Connect the electrical connections (8) to the Lightning Arrestor (1) and install the two 3/8 plain washers (7), 3/8 lock washers (6), and 3/8-16 nuts (5) and torque to 33 Nm (24.3 ft-lbs.).

7.5.7.3 Brake Resistor

1. Carefully place the Brake Resistor (1) on the mounting bracket aligning the mounting holes.
2. Insert the six 1/2 plain washers (4), 1/2 lock washers (3), and 1/2 x 1-1/4 bolts (2). See Figure 7-119.
3. Tighten and torque the hardware to 109 Nm (80 ft-lbs.).
4. Connect the 3/8-16 electrical connections (5) to the Brake Resistor (1) and torque to 63 Nm (46 ft-lbs.). Refer to Section 0700, Propulsion of the Heavy Repair Maintenance Manual for additional information.

7.5.7.4 Pantograph

1. Carefully place the Pantograph (1) on the mounting brackets aligning the mounting holes. See Figure 7-120.
2. Insert the four 3/4 plain washers (4), 3/4 lock washers (3), and 3/4 x 1-1/4 bolts (2).
3. Tighten and torque the hardware to 176 Nm (130 ft-lbs.).
4. Carefully place the gearbox (9) onto the roof flange support aligning the mounting holes.
5. Insert the four M6 x 60 bolts (6), M6 plain washers (7), and nuts (8).
6. Tighten and torque the hardware to 14 Nm (10 ft-lbs.)
7. Connect the electrical connector (5) to the Pantograph (1).
8. Remove the rear safety pin and store in the storage tube. Refer to Section 0800, Pantograph of the Heavy Repair Maintenance Manual for additional information.

7.5.7.5 Auxiliary Fuse Box

1. Carefully place the Auxiliary Fuse Box (1) on the mounting bracket aligning the mounting holes.
2. Insert the four 3/8 plain washers (3), 3/8 x 1-1/4 bolts (2), 3/8 plain washers (4), and 3/8 ESNA nuts (5). See Figure 7-121.
3. Tighten and torque the hardware using the chart in Section 7.3.4 of this manual section.
4. Connect the 3/8"-16 electrical connections (6) to the Auxiliary Fuse Box (1) and torque to 24.4 Nm (18 ft-lbs.).

NOTE: Refer to the Heavy Repair Maintenance Manual, Section 0700, Propulsion for the locations of ring terminals that need to be connected for installation of the Auxiliary Fuse Box.

7.5.7.6 Heating, Ventilation and Air Conditioning (HVAC) Unit

1. Carefully place the HVAC Unit (1) on the mounting brackets aligning the mounting holes.
2. Insert the six M14 plain washers (3), M14 x 50 bolts (2), M14 plain washers (4), and M14 ESNA nuts (5). See Figure 7-122.
3. Tighten and torque the hardware using the chart in Section 7.3.4 of this manual section.
4. Connect the electrical connectors to the HVAC Unit (1). Refer to Section 0500, HVAC of the Heavy Repair Maintenance Manual for additional information.

7.5.7.7 Roof Shroud Group A

1. Carefully place the Roof Shroud (1) on the mounting brackets aligning the mounting holes.
2. Insert the eight M10 plain washers (3), and M10 ESNA nuts (2). See Figure 7-123.
3. Tighten and torque the hardware using the chart in Section 7.3.4 of this manual section.
4. Repeat steps 1 thru 3 for the remaining Group A Shrouds.

7.5.7.8 Roof Shroud Group B

1. Carefully place the Roof Shroud (1) on the mounting brackets aligning the mounting holes.
2. Insert the eight M10 plain washers (3), and M10 ESNA nuts (2). See Figure 7-124.
3. Tighten and torque the hardware using the chart in Section 7.3.4 of this manual section.
4. Repeat steps 1 thru 3 for the remaining Group B Shrouds.

7.5.7.9 Roof Shroud Group C

1. Carefully place the Roof Shroud (1) on the mounting brackets aligning the mounting holes.
2. Insert the eight M10 plain washers (3), and M10 ESNA nuts (2). See Figure 7-125.
3. Tighten and torque the hardware using the chart in Section 7.3.4 of this manual section.
4. Repeat steps 1 thru 3 for the remaining Group C Shrouds.

7.5.7.10 Silent Alarm

1. Scuff mounting surface with 3M Maroon Scotchbrite pad to achieve proper sealant adhesion.
2. Connect the electrical connector (4) to the Silent Alarm (1).
3. Carefully align the Silent Alarm (1) mounting holes. See Figure 7-126.
4. Apply KE3483B silicone sealant and install the three M4 x 20 screws (2), and M4 plain washers (3).
5. Tighten the hardware and torque to 1.5 Nm (13 in-lbs.).
6. Apply silicone sealant KE3483B around perimeter of alarm base.

NOTE: Ensure that the equipment is properly sealed from water ingress via localized water spray or by using the car wash.

7.5.7.11 Radio Antenna

Refer to Section 1400, Communications of the Running Maintenance and Servicing Manual for installation information.

7.5.7.12 GPS Antenna

1. Install the mounting bracket (2) aligning the mounting holes.
2. Install the three M4 plain washers (7), M4 lock washers (6), and M4 x 16 screws (4). See Figure 7-128.
3. Install the gasket (8).
4. Install the GPS Antenna (1) by turning the unit clockwise.
5. Install the electrical connector to the GPS Antenna (1).
6. Install the cover (3) aligning the mounting holes.
7. Install the six M4 plain washers (7), M4 lock washers (6), and M4 x 8 screws (5).
8. Tighten and torque the hardware to 1.5 Nm (13 in-lbs.)

7.5.7.13 WLAN Antenna

1. Carefully install the WLAN Antenna (1) into the mounting hole on the bracket.
2. Install the split nut (2). See Figure 7-129.
3. Install the electrical connectors to the WLAN Antenna (1).
4. Install the cover (3) aligning the mounting holes.
5. Install the six M4 plain washers (6), M4 lock washers (5), and M4 x 8 screws (4).
6. Tighten and torque the hardware to 1.5 Nm (13 in-lbs.).

7.5.7.14 Wayside Worker Alert System (WWAS) Antenna

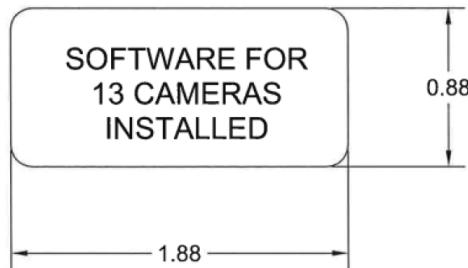
1. Install the gasket (2) onto the mounting block (3). See Figure 7-130.
2. Install the mounting block (3) onto the WWAS Antenna (1).
3. Install the two M5 plain washers (5), M5 lock washers (6) and M5 nuts (7).
4. Install the gasket (4).
5. Install the cable to the WWAS Antenna (1) and align the mounting holes to the bracket.
6. Install the four M6 plain washers (10), M6 lock washers (9), and M6 x 20 screws (8).
7. Tighten the hardware and torque per the chart listed in Section 7.3.4 of this manual section.

7.5.7.15 Roof Mounted Camera

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

1. Confirm that the NVR has a camera that is provisioned for 13 cameras. This can be confirmed by inspecting the installed NVR and confirming that the NVR has the label stating "Software for 13 cameras installed" on the left side of the NVR over the hard drives. See below for a drawing of the required label:



NOTE: If this label is not present then an NVR that is provisioned must be installed. Refer to Section 1900 of the Running Maintenance and Servicing Manual for removal of the current NVR and Section 7.5.9 of that same manual section for installation of a properly provisioned NVR.

2. Install Roof Mounted Camera (6) onto bracket aligning the mounting holes. See Figure 7-131.
3. Install the four M4 plain washers (13), M4 lock washers (12) and M4 x 12 screws (11) and tighten.
4. Carefully install the housing with two screws (10) and tighten.
5. Connect the electrical connection (5) to the cable assembly (4).
6. Remove the dust cap (3) from the receptacle.
7. Remove the four M6 x 16 bolts (7), M6 lock washers (8), and M6 plain washers (9) from the roof junction box (1).
8. Install the Roof Mounted Camera Assembly (2) onto the roof junction box (1) aligning the mounting holes.
9. Install the four M6 x 16 bolts (7), M6 lock washers (8), and M6 plain washers (9) that were removed in step 7 above. Torque the bolts to 6.9 Nm (ft-lbs.).
10. Connect the cable (4) to the receptacle and tighten the screws.
11. Connect a PTU to the vehicle network.
12. Open the Genetec Config Tool on the PTU and connect to the NVR on the vehicle.
13. Select unit enrollment from the main window
14. Confirm manufacturer named “ONVIF” is present. If not, click the gear in the upper left hand corner, add “ONVIF” then click save.
15. Click “Start Discovery”
16. Once camera discovery has completed, add the roof camera at IP address 172.16.0.123.
17. Close Genetec Config tool and connect to Security Desk to validate that the camera is properly recording.

7.5.8 Articulation Section

7.5.8.1 Ceiling Panels

1. Align the packing (12) with the holes in the Outer Ceiling Panel (10). See Figure 7-132.
2. Insert the six M4 x 20 flat head screws (11), tighten and torque to 1.5 Nm (13 in-lbs.).
3. Insert the six M4 lock washers (9) and M4 x 12 pan head screws (8), tighten and torque to 1.5 Nm (13 in-lbs.).
4. Repeat steps 1 through 3 for the remaining Outer Ceiling Panel (10).
5. Align the two rubber shims (6) with the holes in the Center Ceiling Panel (7).
6. Insert the four M10 plain washers (5), M10 lock washers (4) and M10 x 25 bolts (3) and tighten.
7. Align the cover (2) and insert four M4 x 10 oval head screws (1), tighten and torque to 1.5 Nm (13 in-lbs.).
8. Torque the M10 hardware per the chart listed in Section 7.3.4 of this manual section.

7.5.8.2 Side Panels

1. Insert the two M8 plain washers (12), lock washers (11) and M8 x 25 bolts (10) into the holes in the Side Panel (6) and tighten. See Figure 7-133.
2. Insert the ten M4 x 20 flat head screws (9) into the Side Panel (6) and tighten.
3. Align the bottom trim (8) with the Side Panel (6).
4. Insert the eight M4 x 12 oval head screws (7) and tighten.
5. Insert the four M4 x 16 flat head screws (5) into the Side Panel (6) and tighten.
6. Align the top trim (4) with the Side Panel (6).
7. Insert the three M4 x 16 oval heads screws (3) and tighten.

NOTE: Steps 8 and 9 are for Cars 1001 through 1028 only.

8. Align the inspection cover (2) with the Side Panel (6).
9. Insert the eight M4 x 12 oval head screws (1) and tighten.
10. Repeat steps 1 through 9 for the remaining Side Panel (6).
11. Torque the M4 hardware to 1.5 Nm (13 in-lbs.).
12. Torque the M8 hardware per the chart listed in Section 7.3.4 of this manual section.

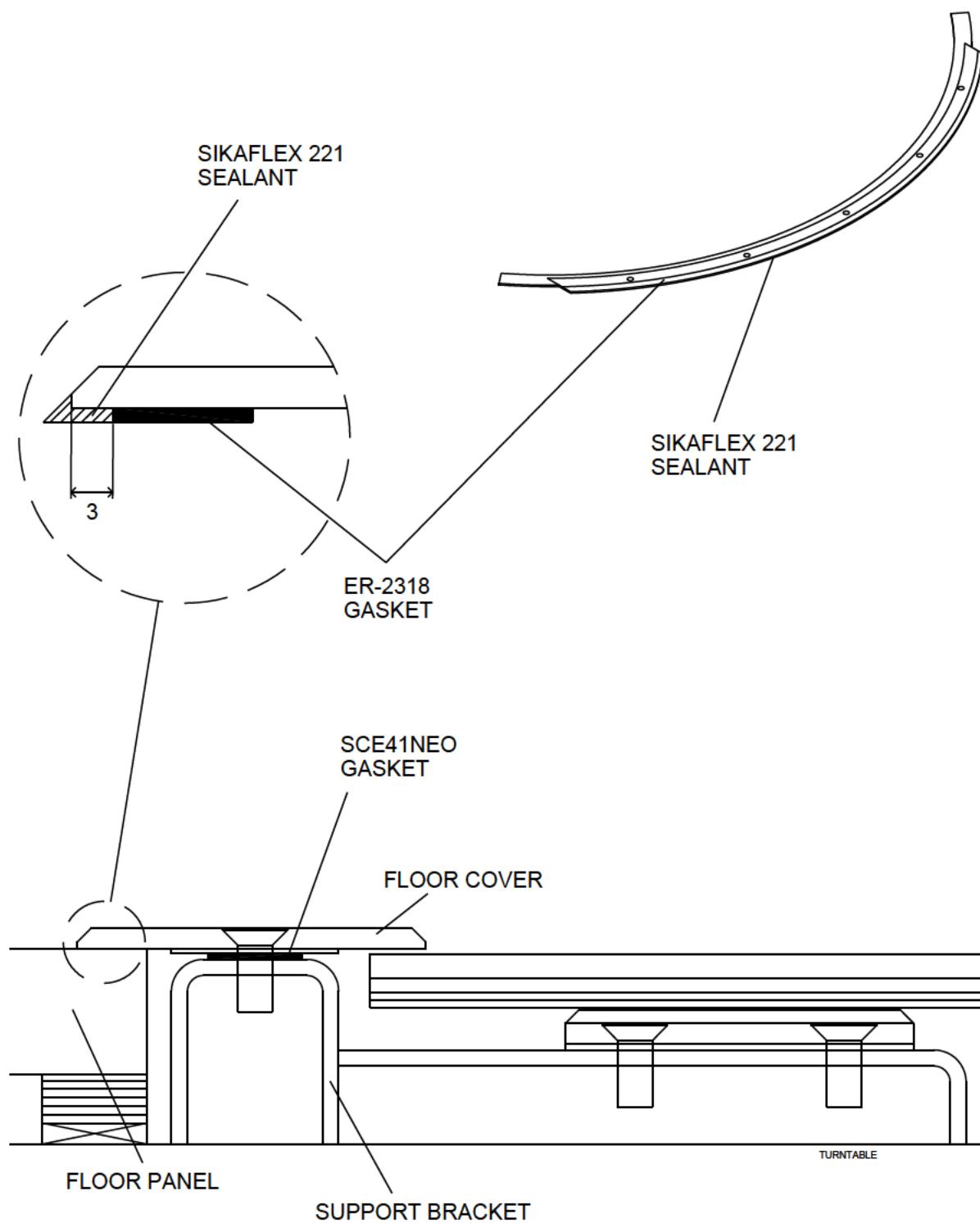
7.5.8.3 External Panels

1. Align the holes in the external cover (21). See Figure 7-133.
2. Insert the eight M6 x 26 bolts (20), sixteen M6 plain washers, eight M6 lock washers (18) and eight M6 nuts (17) and tighten.
3. Repeat steps 1 and 2 for the remaining three external covers (21).
4. Align the holes in the External Panel (16).
5. Insert the eight M10 plain washers (15), M10 lock washers (14) and M10 x 60 bolts (13) and tighten.
6. Repeat steps 4 and 5 for the remaining External Panel (16).
7. Torque the hardware per the chart listed in Section 7.3.4 of this manual section.

7.5.8.4 Turntables

NOTE: Before installing the turntables, visually inspect the turntables to ensure the M4 x 10 flat head screw (3) is not protruding beyond the bottom of the Turntable (7). If the screw is protruding, remove the screw and replace with a measured M4 x 10 flat head screw using Loctite 242 and tighten only until the top of the screw is flush with the support rubber (4). See Figure 7-134, Sheet 1.

1. Inspect the support brackets ensuring no bare metal or rust is visible. Repair as necessary by referring to document RWK-LAM-158 in Appendix A of this manual section.
2. Clean the top surface of the support bracket using IPA and a clean towel to ensure the surface is free of any dirt/dust.
3. Adhere SCE41NEO gasket along the top surface of the support bracket. Use a sharp blade to trim excess at the ends.
4. Press SCE41NEO gasket with a bare finger to sense the mounting hole locations. Using a punch, create five holes in the gasket corresponding to the mounting holes.
5. Align the holes in the Turntable (7) with the holes in the articulation middle frame. Place the right panel first followed by the left panel. Ensure the stopper brackets (6) are properly seated. See Figure 7-134, Sheet 2 for panel orientation.
6. Add Sikaflex-221 sealant on the threads of the eight M5 x 12 flat head screws (5), insert, tighten and torque per the chart listed in Section 7.3.4 of this manual section. Use a soapy solution to remove excess sealant from the screw heads.
7. Add Bostik 70-03 black sealant around the edges of the four stopper brackets (6) and smooth over to ensure they are even.
8. Clean the underside of the floor cover (2) using IPA and a clean towel to ensure the surface is free of any dirt/dust. Apply Sika Activator UH-2 LUM.
9. Adhere ER-2318 gasket with 3M Neoprene Adhesive 1099 or equivalent along the underside of the floor cover (2). Refer to the graphic below.



10. Add Sikaflex-221 sealant to the underside outer edge of the floor cover (2).
11. Align the holes in the floor cover (2).
12. Apply Loctite 243 to the threads and tapered part of the five M5 x 12 flat head screws (1), insert, tighten and torque per the chart listed in Section 7.3.4 of this manual section. Use a soapy solution to remove any excess after tightening the screws (1).
13. Inspect the Sikaflex-221 application at the interface of the floor cover (2) and floor panel. Backfill any voids and smooth the fillet using a soapy solution, clean any excess from the floor panel.
14. Repeat steps 1 through 7 for the remaining Turntable (7).

7.5.8.5 Rub Plates

1. Align the holes of a liner (10) and a Rub Plate (9). See Figure 7-134, Sheet 1.
2. Add Sikaflex-221 sealant on the threads of the four M5 x 12 flat head screws (8), insert, tighten and torque per the chart listed in Section 7.3.4 of this manual section.
3. Add Sikaflex-221 sealant around the edge of the Rub Plate (9). Use a soapy solution to remove excess sealant from the screw heads and to smooth the fillet around the Rub Plate (9).
4. Repeat steps 1 through 3 for the remaining nine Rub Plates (9).

7.5.8.6 Bellows Assembly

NOTE: The turntables must be removed to access the turnbuckles. Refer to Section 7.5.8.4 of this manual section.

1. Align the Bellows (22) with the bellows frame (23). See Figure 7-133.
2. Gently tap bellows in place.
3. Rotate the turnbuckle (11) until bellows are sufficiently tightened. See Figure 7-134, Sheet 1.
4. Repeat steps 1 through 3 for the remaining Bellows (22).

7.5.8.6.1 Mounting the Folding Bellow

1. Press the end ply with the integrated wire rope into the slot of the rubber profile around the contour of the suspension frame, as shown in Figure 7-149.

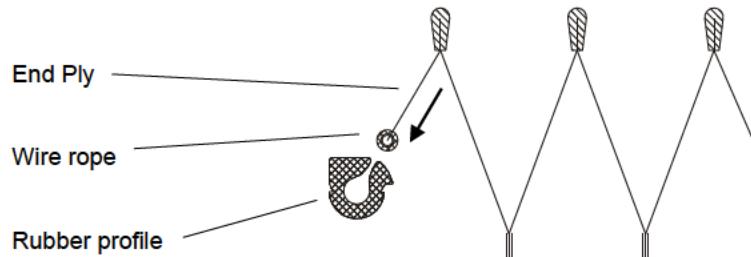


Figure 7-149: End Ply and Rubber Profile

2. Apply a lubricant (soap spray, etc) into the suspension frame, as shown in Figure 7-150.

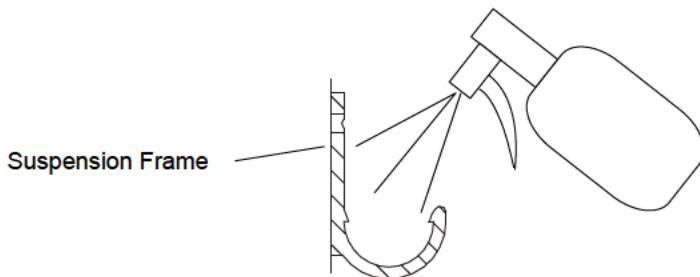


Figure 7-150: Lubricating the Suspension Frame

3. Place the folding bellows accurately centered into the suspension frame and carefully hammer the end ply with integrated wire rope and rubber profile around the entire contour of the suspension frame using a PVC Hammer and a block of wood/plastic (or similar). See Figure 7-151.

NOTE: Make sure not to damage the bellow when hammering the rubber profile.

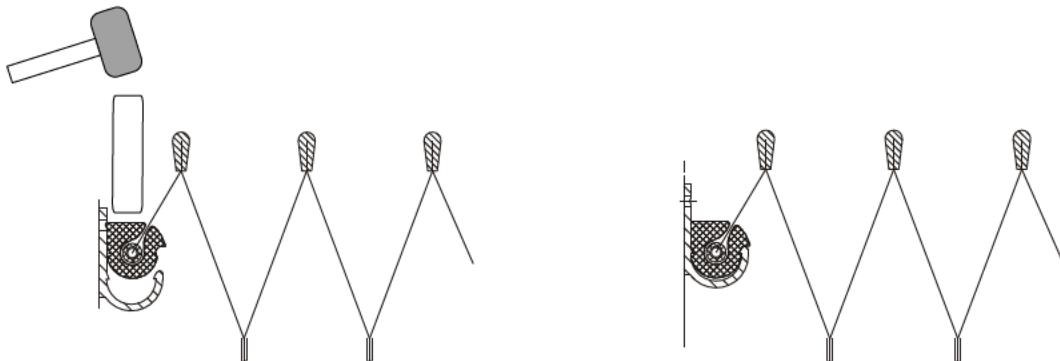


Figure 7-151: Mounting the Bellow in the Suspension Frame

4. Connect the ends of the wire ropes with the turnbuckle.
5. Tension the wire rope by turning the turnbuckle sleeve, using a drive pin (\varnothing approximately 3.5 mm) or an adjustable crescent wrench. In any case, the tension has to be strong enough so that it is not possible to pull the connecting-fabric including integrated wire rope completely out of the suspension frame. The wire rope has to be forced fit in the corner and radius areas. With a rubber hammer, slightly hammer in the corner and radius areas onto the wire rope for proper positioning. The turn buckle has a variable length of approx. ± 50 mm. See Figure 7-152.

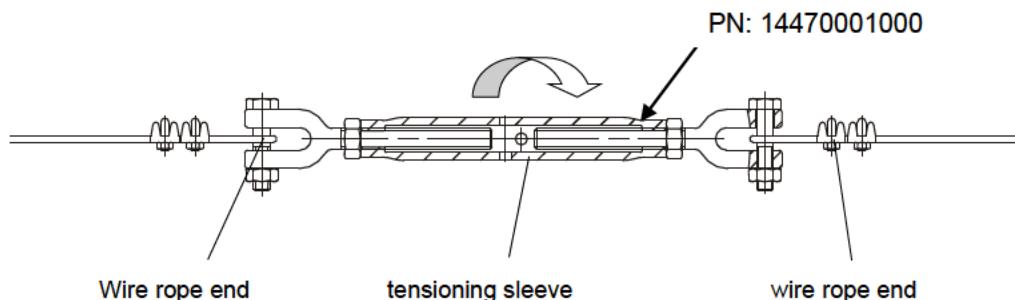


Figure 7-152: Turnbuckle and Wire Rope

7.5.8.7 Articulation Middle Frame and Pivot Bearing Assembly

NOTE: To access the articulation middle frame and pivot bearings, first remove the external panels, ceiling panels, side panels, turntables, bellows and articulation wiring. Refer to Sections 7.4.8.1 through 7.4.8.6 and 7.4.8.10 of this manual section.

1. Support the Articulation Middle Frame (4) using a crane and the two eyebolts on top of the frame.
2. Align the shim (16) and the pivot bearing support (10). See Figure 7-135.
3. Insert the two M20 x 65 bolts (15), M20 lock washers (14) and M20 nuts (13) and tighten.
4. Insert the bearing support (11) with pivot shaft (12).
5. Align the four packing (9) and the two bearing caps (8).
6. Insert the four M16 x 120 bolts (7), M16 plain washers (6) and M16 nuts (5) and tighten.
7. Repeat steps 1 through 5 for the remaining pivot bearing assembly.
8. Align the holes in the Articulation Middle Frame (4).
9. Insert the four M20 x 50 bolts (3), M20 lock washers (2) and M20 nuts (1) and tighten.
10. Torque the hardware per the chart listed in Section 7.3.4 of this manual section.

7.5.8.8 Articulation Shaft and Rubber Bearings

NOTE: To access the articulation middle frame and pivot bearings, first remove the external panels, ceiling panels, side panels, turntables, bellows and articulation wiring. Refer to Sections 7.4.8.1 through 7.4.8.6 and 7.4.8.10 of this manual section.

1. Using a lifting device, lift the B-Unit articulation arm (25) high enough to clear the A-Unit articulation arm (26).
2. Insert the articulation shaft (24) through the B-Unit articulation arm (25). See Figures 7-135 and 7-153.
3. Insert the two shims (23) and Articulation Shaft Rubber Bearings (22).
4. Align the lower articulation shaft bearings (21).
5. Lower the B-Unit articulation arm (25).
6. Align the upper articulation bearings (20).
7. Insert the eight M22 x 190 bolts (17), M22 plain washers (18) and nut plates (19), tighten and torque per the chart listed in Section 7.3.4 of this manual section.

7.5.8.9 Balancing Device

1. Align the Balancing Device (28). See Figure 7-133.
2. Insert the four M16 plain washers (27), two M16 lock washers (26) and two M16 nuts (25), tighten and torque per the chart listed in Section 7.3.4 of this manual section.
3. Insert two split pins (24).
4. Repeat steps 1 through 3 for the remaining Balancing Device (28).

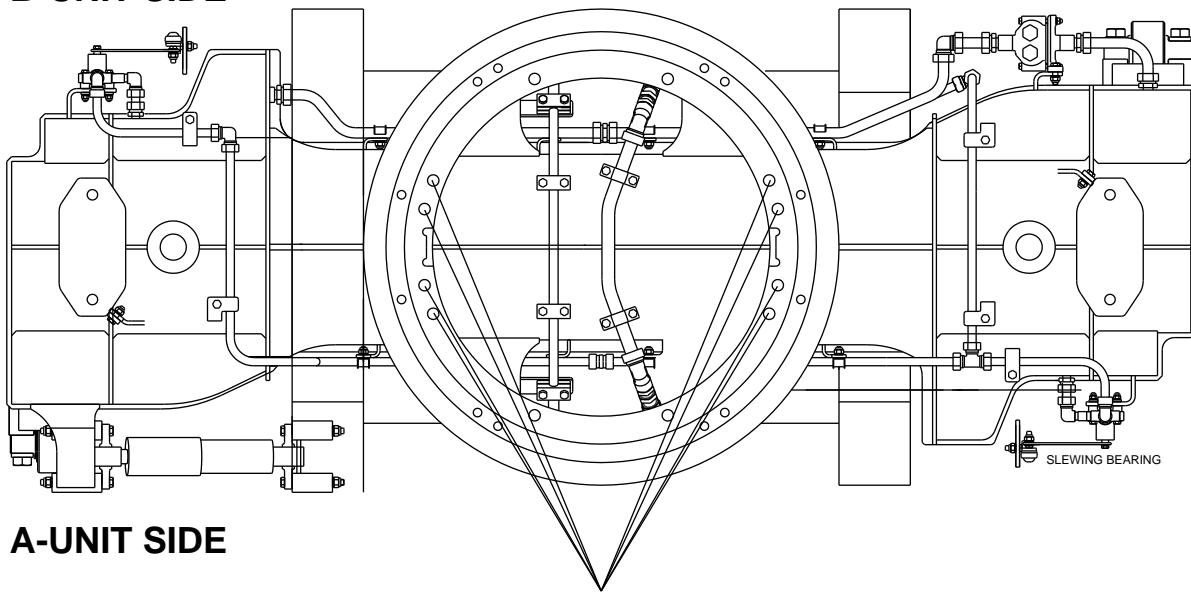
B-UNIT SIDE

Figure 7-153: Slewing Bearing / Articulation Shaft Bearing Orientation

7.5.8.10 Articulation Wiring**WARNING**

ARTICULATION WIRING ON THESE CARS OPERATES AT VOLTAGE AND CURRENT LEVELS THAT ARE HAZARDOUS AND LIFE THREATENING. PROPER PRECAUTIONS SHOULD BE TAKEN AND METRO SAFETY RULES, PRACTICES AND PROCEDURES CLOSELY OBSERVED.

WARNING

BEFORE INSPECTING ANY ELECTRICAL EQUIPMENT IN AN ELECTRICAL SYSTEM, MAKE SURE THAT THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

NOTE: First remove the side panels to access the articulation wiring. Refer to Section 7.4.8.2 of this manual section.

1. Insert the four articulation cables (18).
2. Align the holes in the bracket (17). See Figure 7-136.
3. Insert the four M10 x 30 bolts (16), eight plain washers (15) and four M10 lock nuts (14) and tighten.
4. Insert the four packing (13).
5. Insert the chain support (12), M8 plain washer (11) and M8 lock nut (10) and tighten.
6. Insert the lifting chain (8).
7. Repeat steps 5 and 6 for the remaining lifting chain (8).
8. Align the clamp (9).
9. Insert an M8 x 30 bolt (7), two M8 plain washers (6) and M8 lock nut (5) and tighten.
10. Repeat step 9 for the remaining three M8 x 30 bolts (7), six M8 plain washers (6) and three M8 lock nuts (5).
11. Insert the two M8 x 55 bolts (3), four M8 plain washers (2) and M8 lock nuts (1) and tighten.
12. Insert the spacer blocks (18), strap (17) and locking head (16). See Figure 7-136.
13. Repeat step 12 for the remaining spacer blocks (18), straps (17) and locking heads (16).
14. Align a cable cleat (15) and washer (14).
15. Insert four M10 plain washers (12), two M10 x 75 bolts (13) and two M10 lock nuts (11) and tighten.
16. Repeat step 15 for the remaining two cable cleats (15).
17. Align the cable cleat (10) and the cable cleat holder (9).
18. Insert two M10 x 65 bolts (8), M10 plain washers (7) and M10 lock nuts (6) and tighten.
19. Align the lid (4) with the terminal box (5).
20. Insert four M6 plain washers (3), M6 lock washers and M6 x 25 bolts (1) and tighten.
21. Repeat steps 17 through 20 for the remaining five cable cleats (10) and terminal boxes (5).
22. Torque all hardware per the chart listed in Section 7.3.4 of this manual section.

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CHAPTER 8.0

TROUBLESHOOTING

8.1 Introduction

This chapter provides troubleshooting procedures for the Car Body and Articulation equipment.

8.2 Troubleshooting

Table 8-1. Car Body and Articulation Troubleshooting

Symptom	Possible Cause	Remedy
Cab console light does not illuminate.	Lamp is defective.	Replace lamp.
	Dimmer control defective.	Replace dimmer control.
	Circuit breaker is tripped.	Verify that circuit breaker is ON.
Cab ceiling light does not illuminate.	Lamp is defective.	Replace lamp.
	Circuit breaker is tripped.	Verify that circuit breaker is ON.
	Problem with control circuit.	Troubleshoot control circuit.
Operators Seat - Fore/aft seat adjustment not operating smoothly.	Slides are worn.	Replace slides.
Operators Seat - Lumbar adjustment not working correctly.	Lumbar mechanism is defective.	Replace seat back.
Operators Seat - Seat back does not recline.	Only one knob is loosened.	Loosen both knobs.
Operators Seat - Seat back does not stay in desired recline position.	Only one knob is tight.	Tighten both knobs.
Operators Seat - Seat does not raise up when vertical adjustment lever is actuated.	Occupant seated.	Stand up and retry.
	Defective height adjustment mechanism.	Replace pedestal base.
Operators Seat - Swivel will not lock into position.	Defective swivel release mechanism.	Replace pedestal base.
Operators Seat - Swivel does not rotate smoothly.	Defective swivel base bearing.	Replace pedestal base.
Operators Seat - Seat wobbles when weight is shifted side to side.	Pedestal floor fastener is loose or missing.	Check all pedestal fasteners with a wrench to ensure that they are tight.
	Defective swivel base bearing.	Replace pedestal base.
Window Glass Leaking	Cracks	Inspect laminate for any cracks, both from the inside and out; replace laminate if any are found.
	Bad Seal	If no cracks, inspect seal for damage; patch or reseal if required.

Table 8-1. Car Body and Articulation Troubleshooting (cont'd.)

Symptom	Possible Cause	Remedy
Window Glass and Gaskets Leaking	Cracks	Inspect laminate for any cracks, both from the inside and out; replace laminate if any are found.
	Bad Gasket or filler keys	If no cracks, inspect gasket for damage; remove laminate and replace gasket if required
Framed Window Glass Leaking	Cracks	Inspect laminate for any cracks, both from the inside and out; replace laminate if any are found.
	Bad gasket on window	Inspect each gasket (six in total on hinged windows, four on cab door window), replace damaged gasket if required (window unit disassembly required)
	Bad seal on frame	Inspect butyl shim on the exterior of the LRV (located behind frame flange); dismount window and replace butyl if required
Hinged Windows - Framed Window Glass Opening/Closing	Damaged latch	Inspect latch and lubricate/replace if required
	Damaged hinge	Inspect hinges and lubricate/replace if required
Cab Door Window – Framed Window Glass Opening/Closing	Damaged Handle	Inspect each (2) handle and lubricate/replace if required
	Damaged lock rack	Inspect lock rack for damage and replace if required
Loose Grabrails and Stanchions	Check hardware	Tighten or replace loose or missing hardware
Seat upholstery has contaminants.	Check the seat bottom and seat back upholstery for contaminants.	If the seat bottom and/or seat back upholstery components are contaminated, remove the contaminants using appropriate tools such as a stiff bristled nylon brush and vacuum. Use an approved solvent/detergent and clean, lint-free cloths, if necessary.
Seat upholstery is worn or damaged.	Check the seat bottom and seat back upholstery for wear.	Replace the seat bottom and/or seat back.
Flip seat	Check force required to raise and lower the seat.	Tighten mounting hardware as necessary.
	Check that the seat stays up and down as required.	Remove any obstructions and clean contaminants from the pivot components.
	Check free movement.	Remove any obstructions and clean contaminants from the pivot components.

8.3 APC Fault Messages

The APC will send the MDS fault messages when a fault is detected. The sequence of messages is as follows:

Device Class: APC Analyzer (Class Code 14)					
Device State	Fault Name	Description	Cause	Corrective Action	TOD Display
301	No Connection	COPilotPc has no connection to the APC analyzer	No connection.	Check CAN port connection on Analyzer.	Analyzer A – No Connection or Analyzer B – No Connection
302	Count request failed	COPilotPc failed to request counts from APC analyzer	Intermittent connection	Check connection	Analyzer A – Count Action Failed or Analyzer B – Count Action Failed
304	Configuration mismatch	COPilotPc and APC analyzer configuration mismatch	Wrong configuration	Adapt configuration	Analyzer A – Configuration Mismatch or Analyzer B – Configuration Mismatch
305	System error	APC analyzer report to COPilotPc a system error	Error in the APC analyzer	Check APC analyzer and APC sensors	Analyzer A – System Error or Analyzer B – System Error
308	Software update failed	COPilotPc failed to update the analyzer	Software update error	Check APC analyzer and run the update manually	Analyzer A – Software Update Failed or Analyzer B – Software Update Failed

Device Class: COPILOTpc Real Time Clock (Class Code 37)					
Device State	Fault Name	Description	Cause	Corrective Action	TOD Display
300	Defective	COPILOTpc has no connection to the integrated RTC clock	Internal hardware error	Replace COPILOTpc unit	COPILOTpc Real Time Clock - Defective
306	Low battery*	RTC clock report to COPILOTpc low battery voltage	Internal hardware error	Replace COPILOTpc unit	COPILOTpc Real Time Clock – Low Battery

*Do not attempt to replace batteries. Send the COPILOTpc unit back to INIT for repair or replacement.

Device Class: COPILOTpc System PIC (Class Code 52)					
Device State	Fault Name	Description	Cause	Corrective Action	TOD Display
300	Defective	COPILOTpc has no connection to the integrated PIC	Internal hardware error	Replace COPILOTpc unit	COPILOTpc System PIC - Defective

Device Class: COPILOTpc Internal EEPROM (Class Code 53)					
Device State	Fault Name	Description	Cause	Corrective Action	TOD Display
300	Defective	COPILOTpc has no connection to the integrated EEPROM	Internal hardware error	Replace COPILOTpc unit	COPILOTpc Internal EEPROM - Defective

Device Class: COPILOTpc External EEPROM (Class Code 54)					
Device State	Fault Name	Description	Cause	Corrective Action	TOD Display
300	Defective	COPILOTpc has no connection to the external EEPROM	Internal hardware error or error with EEPROM in the backplane	Replace COPILOTpc unit or the backplane (mounting plate)	COPILOTpc External EEPROM - Defective

Device Class: COPILOTpc CompactFlash Card (Class Code 63)					
Device State	Fault Name	Description	Cause	Corrective Action	TOD Display
308	Full	The CF card of COPILOTpc is full	No files can be uploaded	Check the connection between COPILOTpc and MDSB	COPILOTpc CompactFlash Card - Full

Device Class: COPILOTpc APC Sensor (Class Code 110)					
Device State	Fault Name	Description	Cause	Corrective Action	TOD Display
300	Defective	The connection between the APC analyzer and APC sensor is non functional	Sensor failure or connection issue	Check sensor and sensor cable	Sensor Function Area 1 (Doors A5/A6) – Defective or Sensor Function Area 2 (Doors A7/A8) – Defective or Sensor Function Area 3 (Doors A1/A2) – Defective or Sensor Function Area 4 (Doors A3/A4) – Defective or Sensor Function Area 5 (Doors B5/B6) – Defective or Sensor Function Area 6 (Doors B7/B8) – Defective or Sensor Function Area 7 (Doors B1/B2) – Defective or Sensor Function Area 8 (Doors B3/B4) - Defective

Device Class: COPILOTpc APC Sensor (Class Code 110) (cont'd.)					
Device State	Fault Name	Description	Cause	Corrective Action	TOD Display
301	No Connection	APC Analyzer has no connection to the APC sensor	The APC analyzer cannot connect to the requested sensor	Check sensor and sensor cable	Sensor Function Area 1 (Doors A5/A6) – No Connection or Sensor Function Area 2 (Doors A7/A8) – No Connection or Sensor Function Area 3 (Doors A1/A2) – No Connection or Sensor Function Area 4 (Doors A3/A4) – No Connection or Sensor Function Area 5 (Doors B5/B6) – No Connection or Sensor Function Area 6 (Doors B7/B8) – No Connection or Sensor Function Area 7 (Doors B1/B2) – No Connection or Sensor Function Area 8 (Doors B3/B4) - No Connection

Device Class: COPILOTpc APC Sensor (Class Code 110) (cont'd.)					
Device State	Fault Name	Description	Cause	Corrective Action	TOD Display
309	Sabotage	APC sensor is sabotaged	Sensor failure	Check sensor and if sensor is covered	Sensor Function Area 1 (Doors A5/A6) – Sabotage or Sensor Function Area 2 (Doors A7/A8) – Sabotage or Sensor Function Area 3 (Doors A1/A2) – Sabotage or Sensor Function Area 4 (Doors A3/A4) – Sabotage or Sensor Function Area 5 (Doors B5/B6) – Sabotage or Sensor Function Area 6 (Doors B7/B8) – Sabotage or Sensor Function Area 7 (Doors B1/B2) – Sabotage or Sensor Function Area 8 (Doors B3/B4) - Sabotage

Device Class: COPILOTpc APC Sensor (Class Code 110) (cont'd.)					
Device State	Fault Name	Description	Cause	Corrective Action	TOD Display
311	Illegal request	Counts from PC sensor are requested during "door open" state	Different door state between APC analyzer and COPILOTpc unit	Check APC analyzer door input	Sensor Function Area 1 (Doors A5/A6) – Illegal Request or Sensor Function Area 2 (Doors A7/A8) – Illegal Request or Sensor Function Area 3 (Doors A1/A2) – Illegal Request or Sensor Function Area 4 (Doors A3/A4) – Illegal Request or Sensor Function Area 5 (Doors B5/B6) – Illegal Request or Sensor Function Area 6 (Doors B7/B8) – Illegal Request or Sensor Function Area 7 (Doors B1/B2) – Illegal Request or Sensor Function Area 8 (Doors B3/B4) - Illegal Request

In addition to the APC fault messages sent to the MDS, troubleshooting tips for errors found in the APC System's output (CSV) file are shown below.

Table 8-2. APC Output (CSV) File Troubleshooting

Symptom	Corrective Action
1. Station name not populated correctly (different station name populated)	a. Check the Automatic Announcement and Display System route was set correctly at the start of the trip, including the vehicle location at the start and the chosen starting station.
2. Station name populated as "NOT IN STATION"	a. Check the data entry is located at a valid station (e.g. not a motorman platform) b. Check the wheel diameter of all vehicles in the consist is set correctly
3. Station name populated as "CANCELLED ROUTE"	a. Check the Automatic Announcement and Display System route was set correctly at the start of the trip b. Check the Automatic Announcement and Display System route was not cancelled prior to reaching the vehicle's final destination
4. GPS data empty/repeated	a. Check the GPS transceiver is physically connected to the CCU Computer. b. Check the GPS transceiver is transmitting messages to the CCU Computer c. Check the GPS application is installed and running on the CCU Computer.
5. GPS data incorrect	a. Check the first door open time is plausible (i.e. the expected time the vehicle was at the station). b. Check the GPS transceiver is transmitting correct coordinates to the CCU Computer.
6. No count in or out (one doorway/all doorways)	a. Check doors on the LRV were not cutout during revenue service. b. Check vehicle fault logs for No Connection Errors (Analyzers/Sensors).
7. Error codes associated with the APC_Door_State and APC_Sensor_State data	a. See APC_Door_State and APC_Sensor_State troubleshooting reference tables. APC_Sensor_State values correspond to APC fault messages displayed on the TOD.
8. File not populated with any data	a. Check the A-end Embedded Controller is functioning and the IAADS Application is running.

Table 8-3. APC Door State Troubleshooting Reference Table

APC_Door_State	Meaning	APC Fault Code Reference
-1	Unknown	N/A (check for APC faults on TOD)
0	Closed	N/A
1	Open	N/A

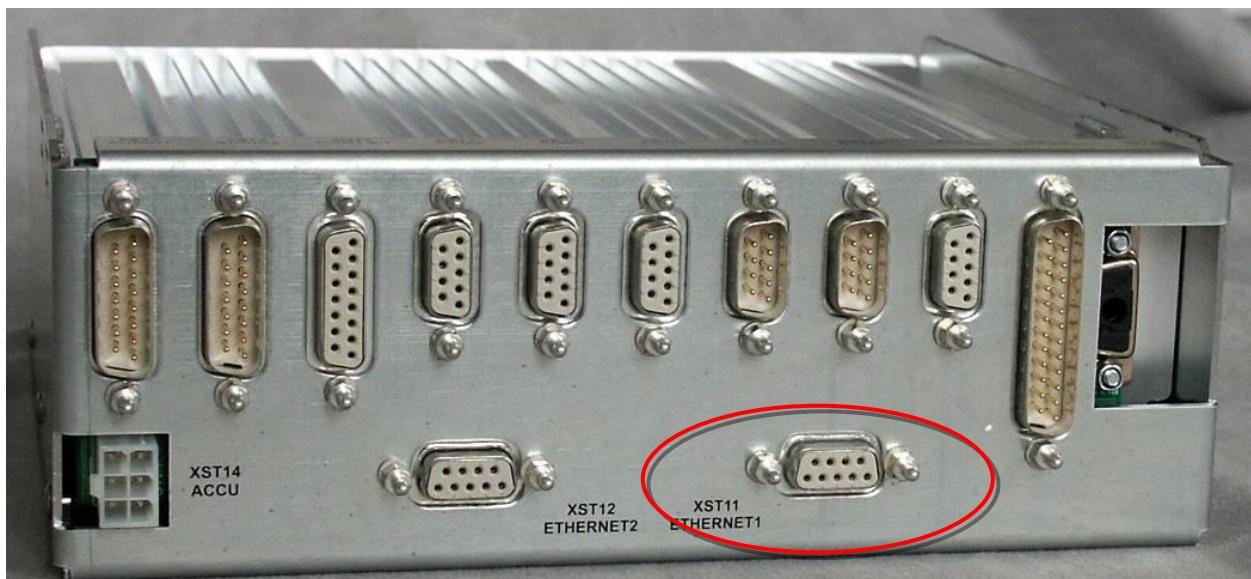
Table 8-4. APC Sensor State Troubleshooting Reference Table

APC_Sensor_State	Meaning	APC Fault Code Reference
-1	Unknown	N/A (check for APC faults on TOD)
0	OK	Class Code 100, Device State 100
1	Sabotaged	Class Code 100, Device State 309
2	Fault (this is a general term)	N/A (check for specific fault on TOD)
3	Not Connected	Class Code 100, Device State 301
4	Invalid/Illegal Request	Class Code 100, Device State 311

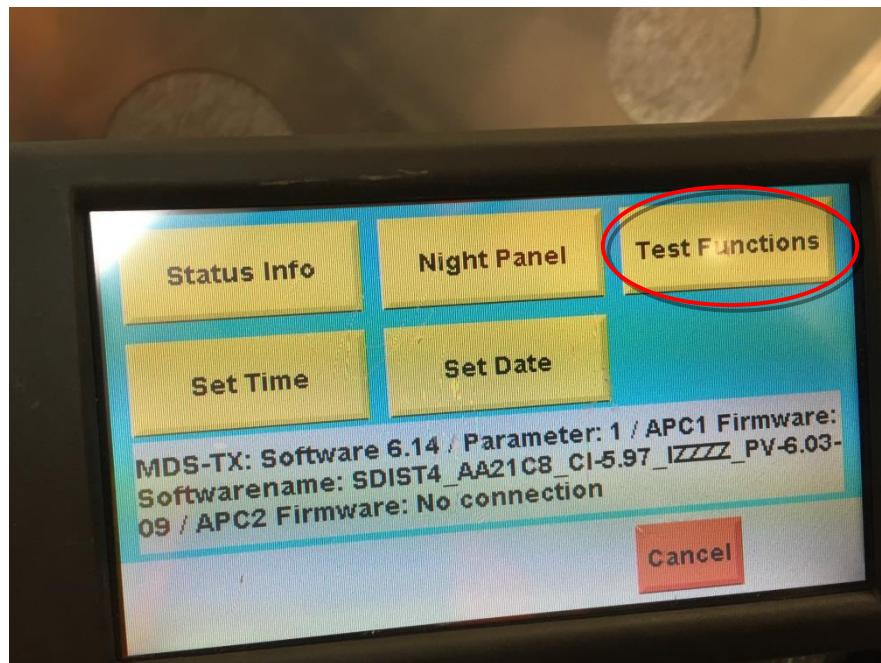
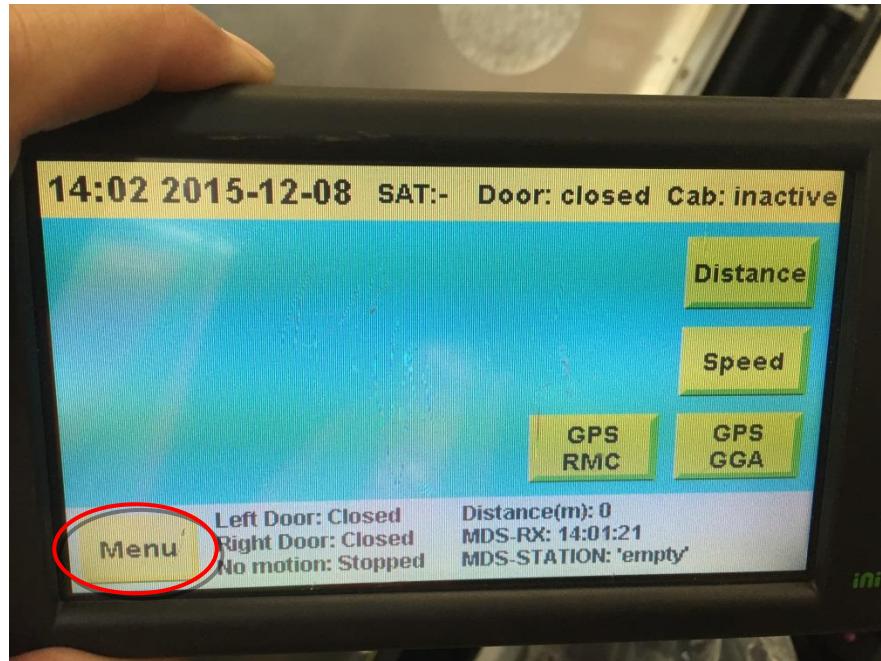
8.4 Touch-it Test Functions

Test Functions are performed to ensure the APC system functions correctly as a whole. The following are necessary to ensure stability of the system. A touch-it is used to enter test functions. This particular device interfaces with the on-board computer; COPILOTpc.

1. Connect Touch-it device to XST11 of COPILOTpc bracket. See figure below.



- Once booted, press Menu on the screen. Go to "Test Functions" and enter password "4444".



3. Enter the following test functions:

10104	Verify correct vehicle number is displayed.
110001	Verify a Local IP Address (10.x.y.92) is displayed.
10103	Verify COPILOTpc software. All software versions should be the same.
80102	Current parameter archive. All parameter archives should be the same on each COPILOTpc.
500001; port 2	Toggle Ignition. Key on and off the vehicle and notice the toggle between value "1" (key on) and "0" (key off).
300001	Verify GPS coordinates are displayed. This information is provided by MDS.
200610	Verify door status (open/closed). Open and close doors. "O" for open and "C" for close.
200611	Send gathered way (collect counts). Enter this to collect current counts from the analyzer.
200612	View counts by entering desired FA (door) number.

8.5 Test Ride Software

The Test Ride software can be used as part of a maintenance routine to ensure and verify communication is working and counts are displayed accurately.

8.5.1 Requirements

- Laptop with battery
- Installed sensors to specified doors
- CANusb device with cable
- Test to be performed on a vehicle that is in revenue service and has been previously commissioned by INIT

8.5.2 Software Requirements

All modern computers should be able to run IRMA-Test Ride. It is recommended to use a laptop based on Centrino Technology for power and battery consideration.

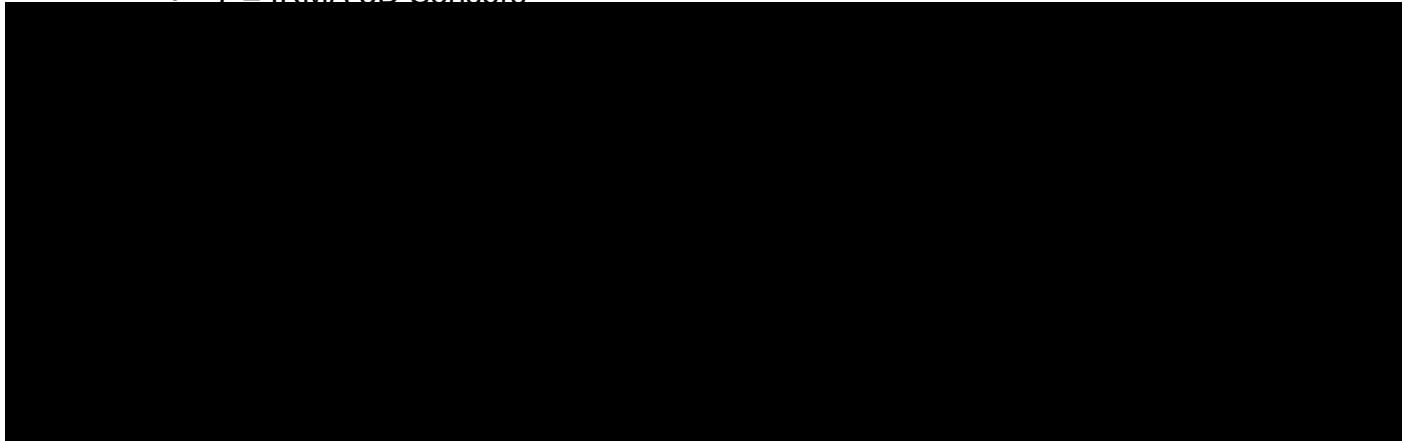
The IRMA-Test Ride software has been successfully tested on Windows 98, Windows ME, Windows 2000, Windows XP and Windows 7 operating systems. For Windows 7, it is recommended to run the software with administrative privileges.

The current version of the Test-Ride software is available for download as a zip-file from the IRIS-GmbH website, www.irisgmbh.com in the section "Technical Documents" → "Service Software".

8.5.3 Setup

The following equipment is shown on the graphic below:

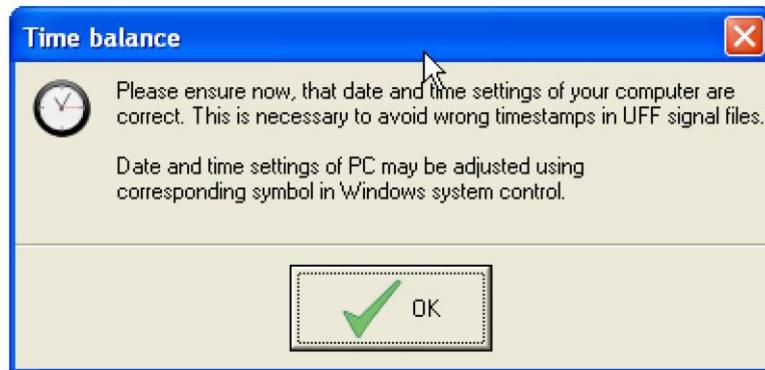
- 1 = CAN cable
- 2 = CANUSB device
- 3 = USB cable from CANUSB to laptop
- 4 = Analyzer unit
- 5 = CAN cable
- 6 = CAN cable
- 7 = IRMA 3D Sensors



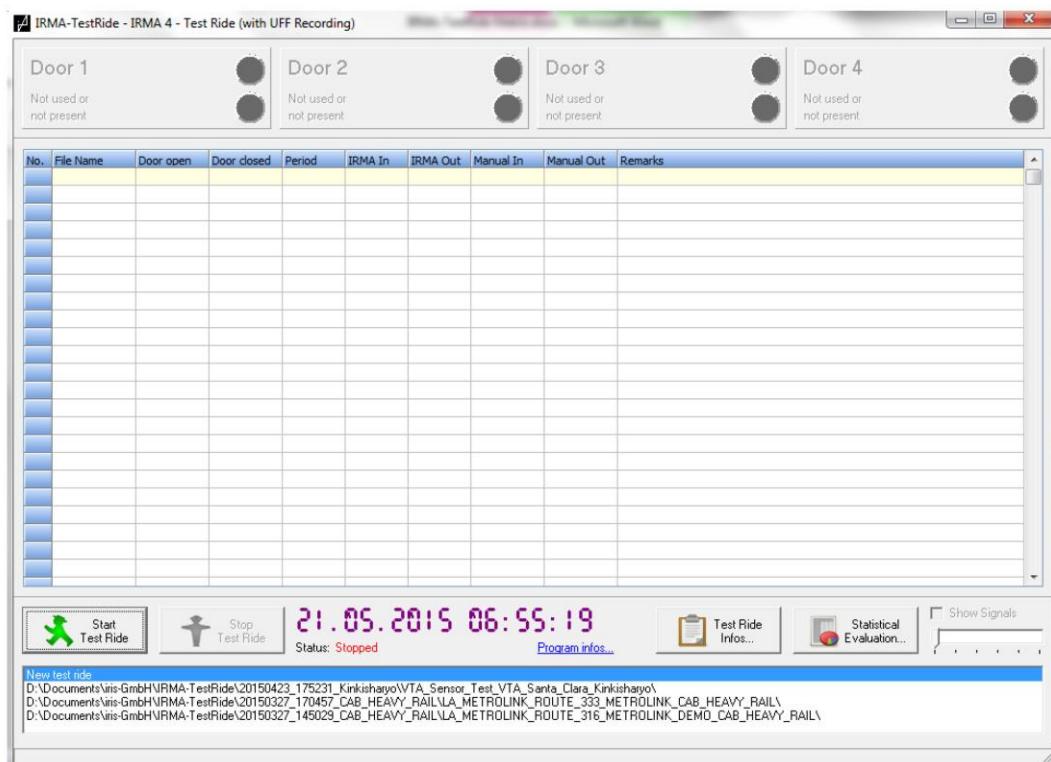
The Test Ride software will be utilized on the Laptop. From the Laptop the USB connector will plug into the CANusb. From the CANusb a T junction cable will be utilized to connect the sensors. Then a Dsub9 Termination cable will connect the analyzer to the T junction cable and then to the CANusb. This set up can either be connected on the A end of the vehicle or the B end. **Note: The IRMA Test Ride software will only record data from the sensors/ analyzer that the laptop is connected to. This means we are only looking at four doors for the test ride.

1. It is preferred to make the above connections to the nearest Analyzer from the vehicle door.
2. Once the software is downloaded from the IRIS-GmbH website, unzip/extract the files to a new folder and open “IRMA-Test Ride Setup”.
3. Go through the Setup Wizard to install the software.
4. For this test procedure, click on “IRMA-TestRide”.

5. A pop-up window, as shown below, will show regarding “Time balance”, click “OK”.

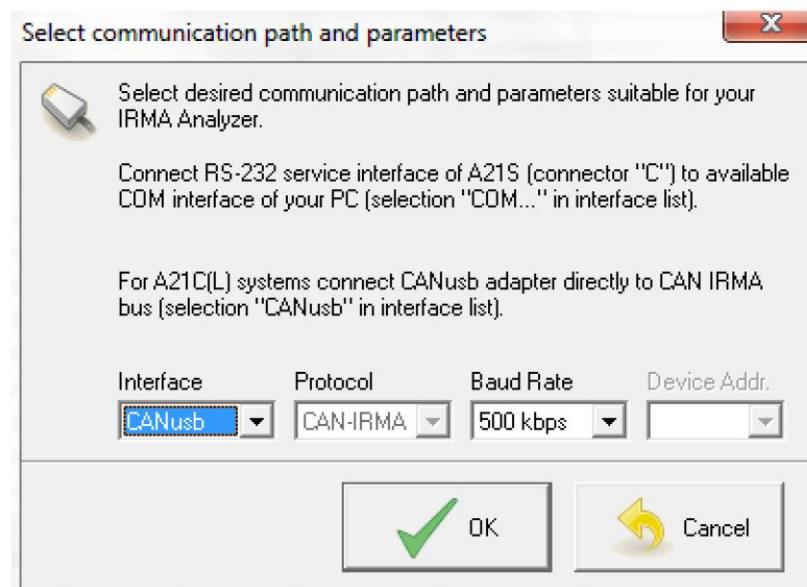


6. You should now be on the main window and ready to start Test Ride.



8.5.4 Using the Program

1. On the bottom left of the window, click on “Start Test Ride”.
2. As shown below, make sure CANusb is selected and the baud rate set at 500 kbps. Click OK.



3. Fill in the required general information shown below and click “OK”.

General informations on test ride

Customer/Project	Type	Width	Height	Vehicle Door No.
Location/Route	Door 1:	[] cm	[] cm	[]
Vehicle type	Door 2:	[] cm	[] cm	[]
Manufacturer	Door 3:	[] cm	[] cm	[]
Number plate	Door 4:	[] cm	[] cm	[]

Analyzer product name Device no.

Firmware

Sensors

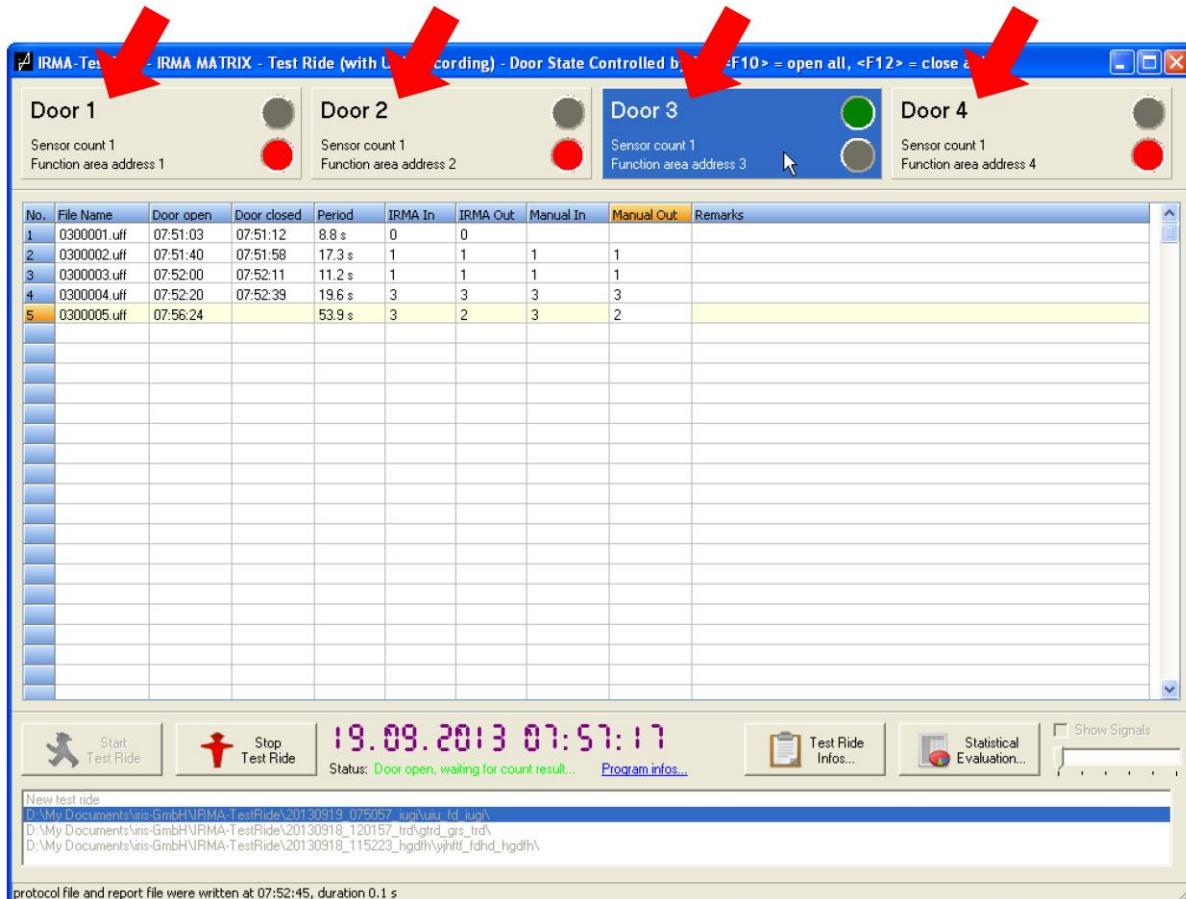
DIST500.3-E05 OC030-0.ICIF01, 01_08213, 1.5.0.165
DIST500.3-E05 OC030-0.ICIF01, 01_08220, 1.5.0.165
DIST500.3-E05 OC030-0.ICIF01, 01_08224, 1.5.0.165
DIST500.3-E05 OC030-0.ICIF01, 01_08232, 1.5.0.165

User

Root directory for signal files

OK Cancel

4. The doors are now ready for automatic counting. Have people walk in and out through the doors by first enabling them, then people opening doors and walking in/out, the program will automatically count the passengers (IRMA in, IRMA out). Verify that the counts are correct as they are displayed on the screen.



5. The GREEN indicator on top of the screen indicates sensors are activated (door open) and count ready. The RED indicates not in use. Each time a sensor is turned on (door open) a new row is created indicating what time the door was opened/closed and the passenger counts during that time frame.
6. Test each door until it's been confirmed that sensors are counting correctly. Once completed on one side of the vehicle, turn over to the other side of the vehicle and make the same connections on the analyzer so that the user can test the other set of sensors using the Test Ride software.

INDEX

12Vdc Power Supply, 2-13, 5-24, 7-102, 7-279

A

Abrastop™ Floor Panels, 5-34
AC Circuit Breaker Panel, 2-45, 5-39, 7-172, 7-318
Adjustment, 5-1
Air Compressor, 2-51, 5-42, 7-193, 7-326
Analyzer Firmware, 7-308
APC Analyzer, 2-39, 5-35, 7-157, 7-308
APC COPILOTpc, 2-49, 5-39, 7-175, 7-319
APC Faults, 8-3
APC Sensor, 2-37, 5-36, 7-148, 7-293
APC Sensor Programming, 7-294
APC Sensor Replacement, 7-294
APC Sensor Verification, 7-299
APC Vehicle Number Assignment, 5-36
Arm Rest, 2-8, 5-18, 7-44, 7-264
ARP1B Relay Panel, 2-50, 5-40
Articulation, 2-62, 5-44, 7-245, 7-337
Articulation Middle Frame, 2-64, 5-45, 7-251, 7-342
Articulation Shaft, 2-64, 5-46, 7-251, 7-343
Articulation Wiring, 2-64, 5-46, 7-253, 7-344
ATC Enclosure, 2-11, 5-20, 7-72, 7-270
Auxiliary Circuit Breaker, 2-45, 5-38, 7-171, 7-318
Auxiliary Fuse Box, 2-58, 5-43, 7-225, 7-332
Auxiliary Power Supply, 2-57, 5-42, 7-202, 7-327

B

Balancing Device, 2-64, 5-46, 7-253, 7-343
Battery, 2-57, 5-42
Battery Box, 7-204, 7-327
Battery Circuit Breaker Box, 2-57, 5-42, 7-204, 7-328
Bellows, 2-62, 5-45, 7-250, 7-340
Bodyside Window w/ Destination Sign, 2-21
Brake Control Unit
 Center Truck, 2-57, 5-42, 7-199, 7-327
 Motor Truck, 2-51, 5-42, 7-195, 7-326
Brake Resistor, 2-58, 5-43, 7-221, 7-331
Brake Supply Reservoir, 2-51, 5-42, 7-193, 7-325
Bypass Panel, 2-11, 5-21, 7-81, 7-273

C

Cab, 1-1, 5-7, 7-256
Cab Camera, 2-12, 5-22, 7-87, 7-274
Cab Console, 2-2, 5-7, 7-15, 7-256
Cab Console Light, 2-7, 5-9, 7-24, 7-258
Cab Door, 6-5
Cab Equipment, 7-13
Cab Heater, 2-7, 5-17, 7-29, 7-259
Cab Light, 2-7, 5-9, 7-24, 7-258
Cab Speakers, 2-9, 5-19, 7-46, 7-264
Cantilever Reserved Seat, 2-40
Cantilever Seat, 2-39
Car Body, 1-1
Ceiling Lights, 2-37, 7-143, 7-292
Ceiling Panels, 2-23, 2-62, 5-33, 5-44, 7-137, 7-245, 7-291, 7-337
 Center and End, 7-291

C

Circuit Breaker Panel A and B, 2-12, 5-21, 7-84, 7-273
 Cleaning
 Floor Panels, 5-34
 Cleaning Agents, 5-18
 Communication Control Unit (CCU), 2-11, 5-20, 7-51, 7-266
 Components, 1-1
 Console Panel 1, 2-2, 5-7, 7-17, 7-257
 Console Panel 2, 2-2, 5-7, 7-18, 7-257
 Console Panel 3, 2-2, 5-8, 7-19, 7-257
 Console Panel 4, 2-2, 5-8, 7-20, 7-257
 Console Panels, 7-17, 7-257
 Control and Relay Panels, 2-9, 5-19, 7-48, 7-265
 ACP1A, 2-9, 5-19, 7-48, 7-265
 ACP1B, 2-9, 5-19, 7-69, 7-270
 CRP1A, 2-9, 5-19, 7-66, 7-269
 CRP1B, 2-9, 5-19, 7-66, 7-269
 CRP2A, 2-10, 5-19, 7-63, 7-268
 CRP2B, 2-10, 5-19, 7-63, 7-268
 CRP3A, 2-10, 5-19, 7-66, 7-269
 CRP3B, 2-10, 5-19, 7-66, 7-269
 CRP4A, 2-10, 5-19, 7-63, 7-268
 CRP4B, 2-10, 5-19, 7-63, 7-268
 CRP5A, 2-10, 5-19, 7-69, 7-270
 CRP5B, 2-10, 5-19, 7-69, 7-270
 CRP6A, 2-10, 5-19, 7-57, 7-267
 CRP6B, 2-10, 5-19, 7-78, 7-272
 CRP7A, 2-10, 5-20, 7-57, 7-267
 CRP7B, 2-10, 5-20, 7-81, 7-272
 CRP8A, 2-10, 5-20, 7-60, 7-267
 Convenience Outlet, 2-12, 2-50, 5-21, 5-40, 7-87, 7-179, 7-274, 7-322
 CoPilot PC Software Upload, 7-320
 COPILOTpc Battery, 5-36
 CoPilotPC Rack Commissioning, 7-319

Coupler, 1-1, 2-51, 5-41, 7-182, 7-323
 Coupler Height, 5-41
 Coupler Loop Switch, 2-8, 5-18, 7-40, 7-263

D

DC / DC Converter, 2-18, 5-28, 7-106, 7-280
 Defroster, 5-17
 Defroster / Demister, 2-7, 7-32
 Detent Tension
 Exterior Mirror, 5-30
 Door Closing Chime, 2-37, 7-147, 7-293
 Door Closing Light, 2-37, 7-147, 7-293
 Door Indicators, 2-37, 7-147, 7-292
 Door Out of Service Sign, 2-37, 7-147, 7-292
 Ducting, 7-32

E

Electric Locker, 2-45, 5-38, 7-171, 7-318
 Electronic Control Unit (ECU), 2-10, 5-20, 7-51, 7-75, 7-265, 7-271
 Electronic Control Unit Pull Down Resistor, 2-50, 5-40, 7-180, 7-323
 Electronic Control Unit, Center Truck, 2-50, 5-39, 7-176, 7-321
 Emergency Ladder, 2-50
 Emergency Tool Enclosure, 2-50
 Ethernet Switch, 2-12, 2-50, 5-22, 5-40, 7-96, 7-177, 7-277, 7-322
 Camera, 2-13, 5-23, 7-96, 7-278
 Wireless, 2-13, 5-23, 7-99, 7-278
 Event Recorder, 2-11, 5-20, 7-54, 7-266
 Exterior, 2-18, 5-29, 7-113, 7-281
 Exterior Mirror, 2-18, 5-30, 7-115, 7-282
 Exterior Speaker, 2-18, 5-30, 7-115, 7-281
 External Panels, 2-62, 5-45, 7-248, 7-338

F

Fire Extinguisher, 2-12, 5-21, 7-84, 7-274
 Flip Seat, 2-40
 Floor Panels, 2-38, 5-34, 7-154, 7-307
 Graffiti, 5-35
 Foot Pedal, 5-18
 Foot Rest, 2-8, 5-18, 7-40, 7-263
 Foot Switch, 2-8, 7-40, 7-263
 Forward View Camera, 2-12, 5-22, 7-90, 7-275
 Front Destination Sign, 2-8, 5-17, 7-37, 7-263
 Front Sun Shade, 7-26

G

GPS Antenna, 2-61, 5-44, 7-237, 7-334
 Grab Rails, 2-23, 5-33, 7-132, 7-289

H

Heater / Defroster Panel, 2-8, 5-17, 7-37, 7-262
 High Speed Circuit Breaker, 2-58, 5-43, 7-218, 7-330
 High Speed Circuit Breaker Control Panel, 2-49, 5-39, 7-175, 7-319
 Hinged Window, 6-5
 Horn, 2-57, 5-43, 7-216, 7-330
 Horn Controller Panel, 2-18, 5-29, 7-113, 7-281
 Hour Meter, 2-11, 5-20, 7-72, 7-271
 HSC-V Control Panel, 2-18, 5-28, 7-109, 7-280
 HVAC Unit, 2-58, 5-43, 7-225, 7-332

I

Inspection, 5-1
 Installation, 7-1
 Interior, 2-23, 5-33, 7-130, 7-289
 Interior Passenger Information Sign, 2-38, 7-151, 7-305

Interior Speaker, 2-38, 5-33, 7-149, 7-304

Interior View Camera, 2-37, 5-33, 7-148, 7-304

K

Knife Switch, 2-57, 5-43, 7-213, 7-330

L

Lightning Arrestor, 2-58, 5-43, 7-218, 7-331
 Line Reactor, 2-57, 5-43, 7-213, 7-329
 Local Bus Contactor, 2-12, 5-22, 7-93, 7-277
 LVDC Terminal Block, 2-49, 5-39, 7-172, 7-319

M

Main Reservoir, 2-51, 5-42, 7-191, 7-325
 Manual Door Release Handle, 2-38, 7-305
 Manual Release Handle, 7-151
 Master Controller, 2-13, 5-25, 6-1, 7-105, 7-279
 Cleaning, 5-26
 Exchange Parts, 5-27
 Handle Positions, 2-15
 Operation, 2-13
 Release Snap-Action Switches, 5-26
 Visually Check, 5-26
 Monitoring and Diagnostic System (MDS) Control Unit, 2-11, 5-20, 7-75, 7-271
 Mounting, 7-4

N

Network Video Recorder, 2-49, 5-39, 7-176, 7-321

O

Odometer Panel, 2-11, 5-20, 7-72, 7-271
 Operator's Seat, 2-6
 Clean, 5-9
 Inspect, 5-9
 Inspect Fasteners, 5-9
 Installation, 7-257
 Location, 2-6
 Lubrication, 6-1
 Operation, 5-8
 Removal, 7-21

P

Pantograph, 1-2, 2-58, 5-43, 6-1, 7-221, 7-331
 Pantograph Manual Crank, 2-50
 Passenger Door Pushbutton, 2-23, 7-132, 7-290
 Passenger Emergency Intercom, 2-38, 5-33, 7-149, 7-305
 Pivot Bearing Assembly, 5-45, 7-251
 Propulsion, 1-2
 Propulsion Inverter, 2-57, 5-42, 7-209, 7-329

R

Radio Antenna, 2-61, 5-44, 7-237, 7-334
 Radio Power Supply, 2-9, 5-19, 7-45, 7-264
 Rear View Camera, 2-22, 5-32, 7-130, 7-288
 Rear View Monitors, 2-12, 5-22, 7-90, 7-275
 Reference Data, 1-2
 Remote I/O, 2-12, 5-22, 7-93, 7-277
 Removal, 7-1, 7-13
 Return Air Grille, 2-23, 7-143, 7-291
 Roof, 2-58, 5-43, 7-216, 7-330
 Roof Mounted Camera, 2-62, 5-44, 7-243, 7-335

Roof Shrouds, 2-61, 5-43, 7-227

 Group A, 7-227, 7-332
 Group B, 7-227, 7-333
 Group C, 7-227, 7-333
 Rub Plates, 2-62, 5-45, 7-250, 7-340

S

Safety, 5-1, 7-1
 Safety Summary, iii
 Sandbox Seat, 2-40
 Sanding Device, 2-51, 5-42, 7-187, 7-324
 Scheduled Maintenance Index, 4-1
 Scheduled Maintenance Tasks, 4-1
 Seats, 2-39, 7-157, 7-308
 Cleaning, 5-38
 Cushion Inspection, 5-38
 Side Access Cover, 7-137, 7-291
 Side Destination Sign, 2-38, 5-33, 7-154, 7-306
 Side Panels, 2-62, 5-44, 7-246, 7-337
 Side Sun Shade, 7-29
 Silent Alarm, 2-61, 5-44, 7-227, 7-333
 Skirts, 2-18, 5-32, 7-283
 Hinged, 7-118, 7-283
 Stationary, 7-118, 7-283
 Software Programming, 7-12
 Software Requirements, 8-12
 Special Tools, 3-1
 Stanchions, 2-23, 5-33, 7-132, 7-289
 Sun Shades, 2-7, 5-10, 7-26, 7-258
 Front Sun Shade, 7-258
 Side Sun Shade, 7-258
 System Suppliers, 2-1

T

TCN Controller, 2-11, 5-20
 A-Unit, 7-54, 7-266
 B-Unit, 7-78, 7-272
 Terminal Board, 2-50, 5-39, 7-177, 7-321
 Test Ride Software, 8-12

T

Torque Values, 7-8
Torquing, 7-4
Touch-it Test Functions, 8-10
Track Brake Contactor Panel, 2-50, 5-40, 7-179, 7-322
Track Brake Panel, 2-13, 5-23, 7-99, 7-278
Trainer's Seat, 2-7, 5-9, 7-21, 7-257
Trainline Interface Module, 2-11, 5-20, 7-60, 7-268
Troubleshooting, 8-1
Truck, 1-1
Turntables, 2-62, 5-45, 7-248, 7-338
TWC Antenna, 2-51, 5-42, 7-185, 7-324

Windscreens, 2-23, 5-33, 7-137, 7-290
Center, 7-137, 7-290
End, 7-137, 7-290
Windshield, 2-21
Windshield Wiper, 2-7, 5-15, 7-29, 7-259
WLAN Antenna, 2-61, 5-44, 7-240, 7-334

U

Undercar, 2-51, 5-41, 7-181, 7-323
Upper Control Panel, 2-9, 5-19, 7-48, 7-265

W

Washer Reservoir, 2-18, 5-28, 7-280
Wayside Worker Alert System, 2-13, 5-24, 7-102, 7-279
Wayside Worker Alert System
Antenna, 2-61, 5-44, 7-240, 7-335
Windows, 2-21, 5-32, 6-5, 7-118, 7-284
 Bodyside, 2-21
 Bodyside Window #1, 2-22
 Bonded, 7-118, 7-284
 Cab Door, 2-22
 Door, 2-22
 Framed, 7-128, 7-287
 Gasket Mounted, 7-127, 7-287
 Glass, 2-21
 Hinged, 2-22
 Inspecting Assemblies, 5-32
 Inspecting Gaskets, 5-32
 Inspecting Laminates, 5-32

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APPENDIX A

RWK-LAM-158

Rework for Articulation Turntable Paint and Sealant

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KINKISHARYO International, L.L.C.

Rework Procedure

Project: *Los Angeles County Metropolitan Transportation Authority LRV-P3010.*

Work Instruction No.: RWK-LAM-158

Work Instruction Title: Rework for Articulation Turntable Paint and Sealant

Prepared By: Louie Rodriguez
Date: May 24, 2019
Reviewed By: QA Manager
Reviewed By: Production Manager
Approved By Manufacturing Engineering:
Approved By Responsible Manger :
Approved by Safety Manager:
Approved by Document Control:

Revision	Revision Date	Description	Approval/ Date
0	Nov 9 th , 2018	Initial issue.	LR 11.09.18
1	Dec 3 rd , 2018	Revised for Metro comments; added Para 7.2.1, 7.4.1	LR 12.03.18
2	Dec 14 th , 2018	Added instruction to replace hardware; added instruction to apply sealant between stitch welds; re-sequenced Para 7.6. Added detailed sketches throughout; removed all ref. to M4 hardware and taps (fixed typo). Added Bostik 70-01A application to stopper areas.	LR 12.14.18

Work Instruction	(RWK) Rework for Articulation Turntable Paint and Sealant	RWK-LAM-158	Rev.: 3
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Revision	Revision Date	Description	Approval/ Date
3	May 24, 2019	Added Addendum 1 Added Sika 206 G+P to Para 5.0 and in the procedure Revised Para 7.6.1, added Para 7.6.2	LR 05.24.19

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1.0 Reference Documents

Document No.	Revision	Document Title	Remark
UA10809	NA	Drawing, Articulation Floor Assembly	Use latest revision
EN-LAM-391	NA	Engineering Notice, Addition of the Sealant for Floor Trim Cover at Articulation	Use latest revision
UA09711	NA	Articulation Floor Support	Use latest revision

2.0 BOM

Item No.	Part. No.	Description	Qty./Car	Supplied by	Remarks
1					
2					
3					
4					
5					

Work Instruction	(RWK) Rework for Articulation Turntable Paint and Sealant	RWK-LAM-158	Rev.: 3
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3.0 Safety

Personnel shall be familiar with and follow all KILLC L.A. Factory Safety Rules, Safety Notices, Policies and Procedures. In addition, personnel shall read and understand all applicable SDS for chemical(s) specified within this work instruction and any supporting documents such as Drawing's, Basic Work Handbook, etc. prior to use. Personnel shall use standard Personal Protective Equipment (PPE) as specified by KILLC policy and any supplemental PPE as prescribed in this work instruction and applicable SDS.

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4.0 Scope of Work

Paint failure and rust was discovered on articulation areas, on the revenue cars.

The work outlined in this procedure will be to remove the articulation floor assembly and cover trim; remove rust, rework paint and apply sealant to the areas specified in this instruction. Goal is to rework and return LRV back to production per applicable drawing(s).

Work Instruction	(RWK) Rework for Articulation Turntable Paint and Sealant	RWK-LAM-158	Rev.: 3
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5.0 Tools, Equipment & Chemicals (where required)

- Masking tape
- Screwdriver (Battery)
- T-25 Torx drive bit
- #2 Philips drive bit
- Impact screwdriver
- Hammer
- #1 Trade size extractor with tap handle
- Die grinder (Dremel) with cut-off wheels
- Angle grinder, with flap disc
- Drill motor (battery)
- Center punch
- Drill bit, 4.2mm
- Tap, M5x0.8
- 4" Drill mount quick strip wire brush (Model #PWW040WIRD01G)
- 4 in. x 1 in. Non-Woven Drill Mount Quick-Strip Disc (Model #PNW040100D01G)
- 3/4 in. End Wire Brush (Model#PWW075ENDD01G)
- Vacuum
- Sand paper, 80-100 grit
- Sanding discs, 80-100 grit
- Sealant, Sika 221 (Gray)
- Bostik 70-03A (Black)
- Primer for sealant, Sika 206 (or equiveland)
- Rust convertor, Rust Mort
- Imron Industrial Strength Primer 9P01 (White) or 9P03 (Black)
- Imron 9T00-A Activator
- Industrial strength paint, ref. Charcoal Gray RAL 6337
- Accelerator, VG-805
- Mixing cup(s)
- China Brush(s)
- Isopropyl Alcohol (IPA)
- Acetone
- Clean towels, cotton or paper
- Caulk gun
- Soapy water solution (100:1 ratio)

Work Instruction	(RWK) Rework for Articulation Turntable Paint and Sealant	RWK-LAM-158	Rev.: 3
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6.0 Applicable Documentation

- Safety Data Sheet(s) for applicable chemicals
- Technical Data Sheet(s) for applicable chemicals
- ER-2906 Painting Specification

7.0 PROCEDURE

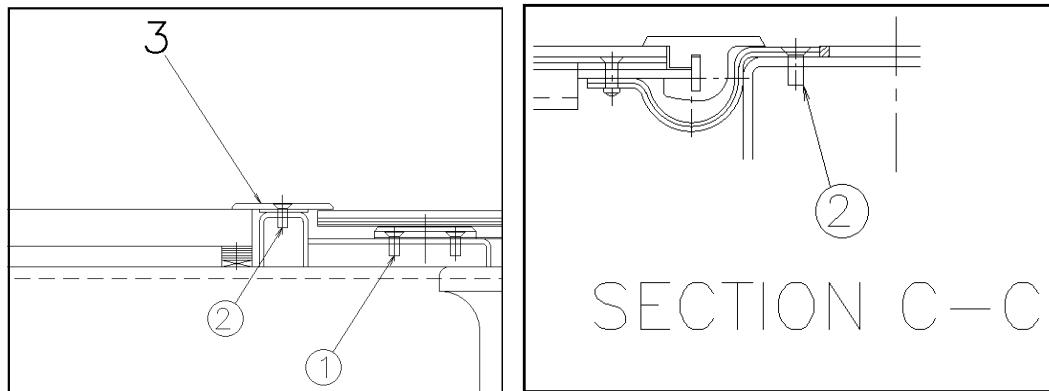
7.1 Preparation

1. Gather all necessary tools as listed in Para. 5.0

7.2 Articulation Floor Panel Removal

1. Using screwdriver and T25 torx drive bit, remove the S2 hardware (STFM5) from the UA10809-3 cover (trim ring) and articulation floor stoppers (both sides, A-B car); set the trim rings aside for re-use. Proceed to remove the turntable assembly (articulation floor panels) and set aside for re-use.

Note: STFM5 hardware to be discarded and replaced with new hardware



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Note: If the turntable is the old design (UA09336), it will need to be replaced with new design unit (UA10808) as shown below.



7.2.1 Seized or Broken Hardware

7.2.1.1 Seized

If hardware is seized, proceed to attempt to remove with Impact Screwdriver and T25 or #2 Philips drive bit. When using the impact screwdriver, during each impact with hammer, the screwdriver bit rotates counter-clockwise incrementally. Repeat strikes with hammer as necessary to be able to loosen the hardware with screwdriver and T25 or #2 Phillips drive bit. **Note:** Prior using impact screwdriver, tape and protect the trim ring to avoid scratching.



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7.2.1.2 Broken hardware

If during the removal process hardware breaks, perform the following steps to remove.

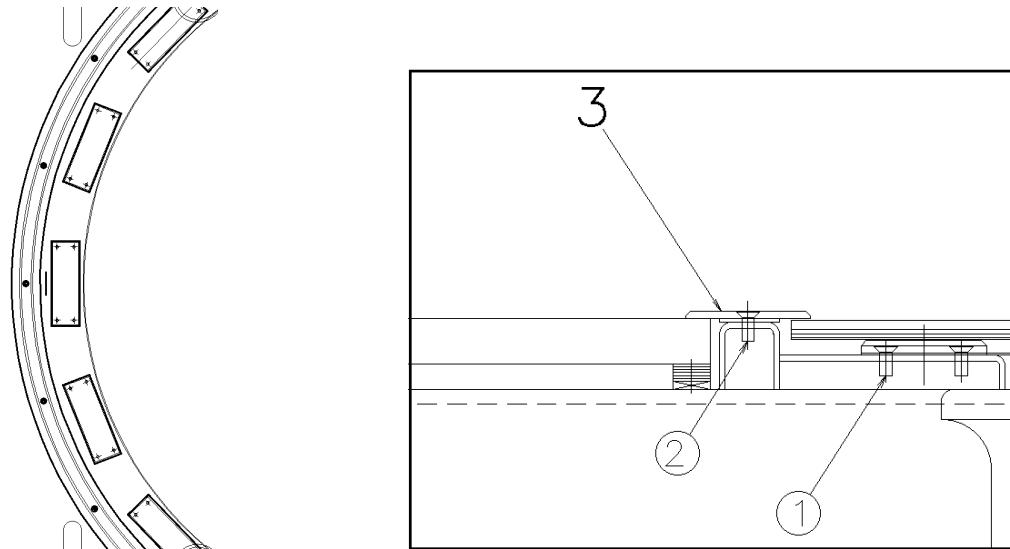
1. Using a die grinder (Dremel tool) and cut-off wheel, proceed to cut the hardware, down to the mounting surface.
2. Use an angle grinder equipped with flap wheel, grind the hardware flush to the mounting surface. **Note:** Take care to not grind into the mounting surface(s).
3. Indicate center of the hardware and mark using a permanent marker. Use a center punch to indent.
4. Proceed to drill the hardware using 4.2mm drill bit.
5. If the hardware is not removed during drilling, proceed use a trade size #1 screw extractor and tap handle to remove the hardware.
6. Proceed to chase the threads using M5x0.8 tap.

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7.3 Rub Plate Removal

1. Using driver and #2 Philips bit, remove the S1 (SPFM5) hardware from each rub plate and remove the rub plate(s); set rub plates aside for reuse. Inspect rub plates for damage, replace as necessary. **Note:** refer to para 7.2.1 for seized or broken hardware.

Note: SPFM5 hardware to be discarded and replaced with new hardware



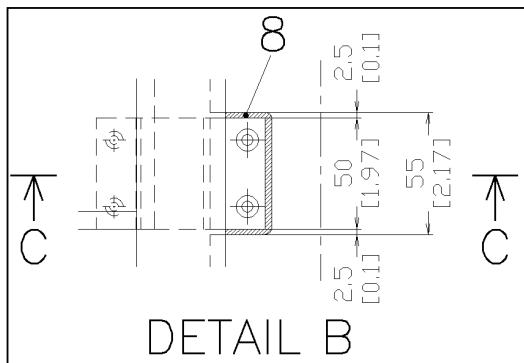
7.4 Masking and rust removal

1. Apply masking tape to protect the floor panel and sealant (carbody side and articulation middle frame).

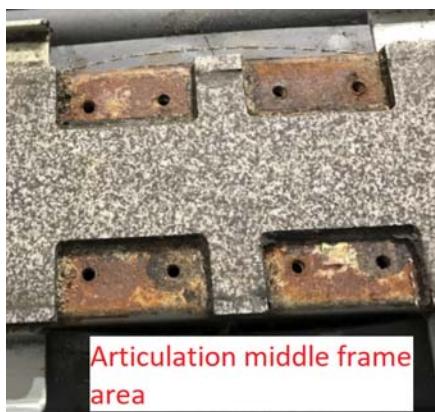


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- Using blade, proceed remove the Bostik 70-03A Black sealant (item 8) from the stopper areas in the articulation middle frame.



- Using drill motor and rust removal wheel(s), proceed to remove all loose paint and rust from the mounting channel, rub plate mounting areas and stopper mounting locations on the articulation middle frame. The metal shall be cleaned until all signs of rust are removed.
- Proceed to abrade (scuff) the metal using 80-100 grit sand paper or disc prior to priming; this will promote the primer to adhere.



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5. Use a vacuum to thoroughly clean the rework areas of rust, debris and grit.
6. Follow-up cleaning with Acetone and clean towel(s).

7.4.1 Rust mort application

Application of Rust Mort converts existing rust to an insoluble black coating prior to priming and painting.

1. After mechanically removing the rust, don prescribed PPE as specified in the Rust Mort Safety Data Sheet (SDS).
2. Using a brush, apply Rust Mort to the affected area(s); proceed to apply multiple coats, keeping the rework area wet with Rust Mort until all rust is converted or removed. Remove any excess Rust Mort by rinsing with water and a brush. Refer to Technical Data Sheets (TDS) for additional information.

7.5 Priming and Painting

1. Mix a small amount (50-100ml) of Imron Industrial Strength Primer 9P01 (White) or 9P03 (Black) and Imron 9T00-A Activator. Mix ratio 8 Parts base to 1 Part activator, by volume. **Note:** Pot life not to exceed (4) hours after mixing.
2. Prior to priming, thoroughly clean the rework area using Acetone. Verify cleaned surfaces are dry and dust free prior to proceeding.
3. Apply primer by China brush, covering the reworked areas. **Note:** Application temperature range is 35°F-110°F.

7.5.1 Painting (Top Coat)

Note: Do not exceed 48 hours between priming and top coat. If time has exceeded, surface must be scuffed to ensure adhesion between coats.

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1. Mix a small amount (50-100ml) of Industrial Strength Charcoal Gray (RAL 6334) and activator. Mix ratio 4 Parts base to 1 Part activator, by volume.
Note: Pot life not to exceed (1.5) hours after mixing.
2. Prior to painting, verify primed surface is clean, dry and dust free prior to proceeding.
3. Apply top coat by China brush, covering the primed areas. **Note:** Application temperature range is 35°F-110°F.
4. At temperature range specified in step 3, allow top coat to dry for 4 hours between coats. **Note:** Do not exceed 48 hours between coats. If time has exceeded, surface must be scuffed to ensure adhesion between coats.
5. Repeat steps 3 and 4, (1X) to allow for 2 coats total.
6. Allow to dry for 18 hours (minimum) prior to returning to production.
7. Note: Curing can be expedited using Imron VG-805 accelerator. Mixing ratio is 64 parts paint and 1 part for accelerator
8. Curing time 10-12 hours cure time when using accelerator.

Re-assembly

9. After paint curing, proceed to chase the M5 threads (M5x0.8 tap) on the mounting channel, articulation frame where the stoppers mount and rub plate installation locations.

Work Instruction	(RWK) Rework for Articulation Turntable Paint and Sealant	RWK-LAM-158	Rev.: 3
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7.6 Sealing and Re-assembly

7.6.1 Primer and Sealant Application

7.6.1.1 Sika Primer application

1. Using a lint free towel and acetone, proceed to thoroughly clean the sealant application area; allow to dry thoroughly.
2. Shake the Sika Primer-206 G+P can very thoroughly until mixing ball rattles freely; continue shaking for another minute prior to application.
3. Ideal application and surface temperature are between 15 °C and 25 °C (59 °F and 77 °F).
4. Using acid brush, apply Sika primer 206 G+P primer. Per the Technical Data Sheet (TDS), surfaces must be clean, dry and free from grease, oil, dust and contaminants.
5. Sika Primer-206 G+P must be applied once only. Care must be taken to ensure that this single application gives adequately dense coverage. Consumption and method of application depend on the specific nature of the substrates. Tightly reseal container immediately after each use.
6. Application temperatures is as follows:
 - For temperatures \geq 59°F flash-off time is 10 minutes (minimum)
 - For temperatures <59° F flash-off time is 30 minutes (minimum)
 - For either temperature range, do not exceed 24 hrs. prior to sealant application after primer.

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7.6.1.2 Sealant Application

Prior to re-assembly, apply a bead of Sika 221 Gray sealant between the areas of the stitch welds; ensure the bead is continuous and complete. Smooth the bead using 100:1 water and soap solution



Work Instruction	(RWK) Rework for Articulation Turntable Paint and Sealant	RWK-LAM-158	Rev.: 3
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7.6.2 Re-assembly

Note: Re-assembly to be performed using new hardware.

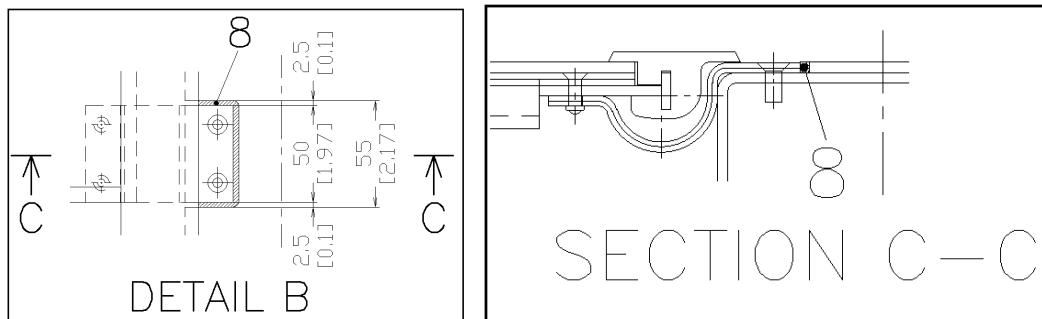
1. Reinstall the rub plates that were removed in previous steps.
2. Add Sika 221 sealant to the hardware threads of the SPFM5 hardware and proceed to re-install and tighten the hardware; torque to 3.4 N·M. Use a clean towel wetted with 100:1 water and soap solution and remove any excess sealant that has squeezed out around the screwheads and onto the rub plates.
3. Apply a fillet of Sika 221 sealant around the rub plates as shown; ensure the fillet is continuous and complete. Use soapy water solution (100:1) to smooth the fillet.



4. Install the UA10808 Articulation Turntable, add Sika 221 sealant to the hardware threads of the STFM5 hardware as shown and proceed fasten the hardware to articulation turntable stoppers; torque STFM5 hardware to 3.4 N·M. Use a clean towel wetted with 100:1 water and soap solution and remove any excess sealant that has squeezed out around the screwheads and onto the stoppers.

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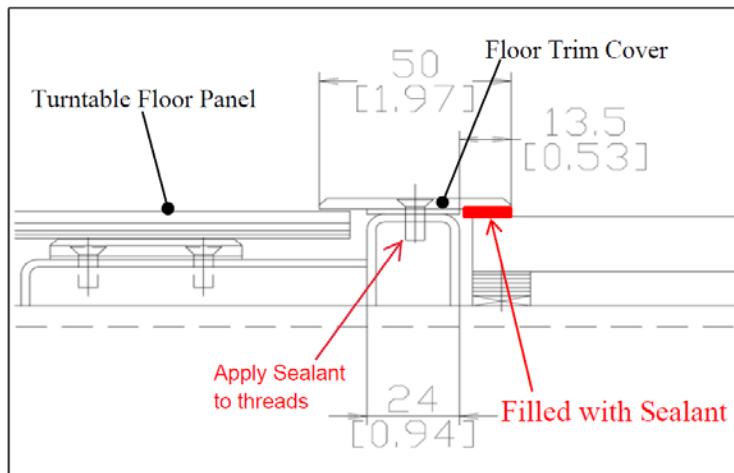
5. Apply Bostik 70-03A Black sealant (item 8) in the areas around the stoppers and articulation middle frame floor panel. Clean and remove excess material.



6. Using IPA and clean towel, thoroughly clean the backside of the trim ring.
7. Using an acid brush, apply Sika Primer 210 to the bonding surface of the trim ring, allow to dry 10-30 mins.
8. Apply a bead of Sika 221 to the UA10809-3 floor trim cover and floor panel (carbody side only), ensure the bead is continuous and complete.
9. Re-install the UA10809-3 cover, add Sika 221 sealant to the hardware threads of the STFM5 hardware as shown and proceed fasten the hardware to covers; torque hardware to 3.4 N·M.
10. Use a clean towel wetted with 100:1 water and soap solution and remove any excess sealant that has squeezed out around the screwheads and onto the covers. Remove the masking materials.

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11. Use soapy water solution (100:1) to smooth the material that has squeezed out into a fillet. Allow sealant to cure for 24 hours(min) prior to returning the vehicle to service. Remove masking material.



Work Instruction	(RWK) Rework for Articulation Turntable Paint and Sealant	RWK-LAM-158	Rev.: 3
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7.7 QA Inspection

1. QA, Inspect rework for quality and completeness.

8.0 Completion of Work

1. Complete the following table acknowledging work has been completed and inspected, in its entirety, of the instruction contained within this document.

Applicable Car Number	
Applicable NCR Number	
Work Done By	
Date(s) Work Performed	
Work Inspected By	
Date(s) Inspected	

Work Instruction	(RWK) Rework for Articulation Turntable Paint and Sealant	RWK-LAM-158	Rev.: 3
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Addendum I

1.0 Scope

Adding Sealant (Sika 221) to Articulation Floor Support.

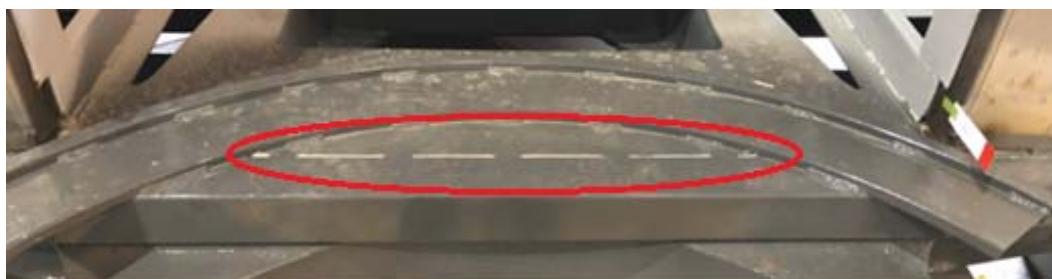
On a number of cars, Sika 221 was not installed at the UA09711-2 floor support and end underframe structure.

2.0 Inspection

Remove the articulation floor panels per Para. 7.3

Inspect the articulation floor support for presence of Sika 221 as shown below

Present



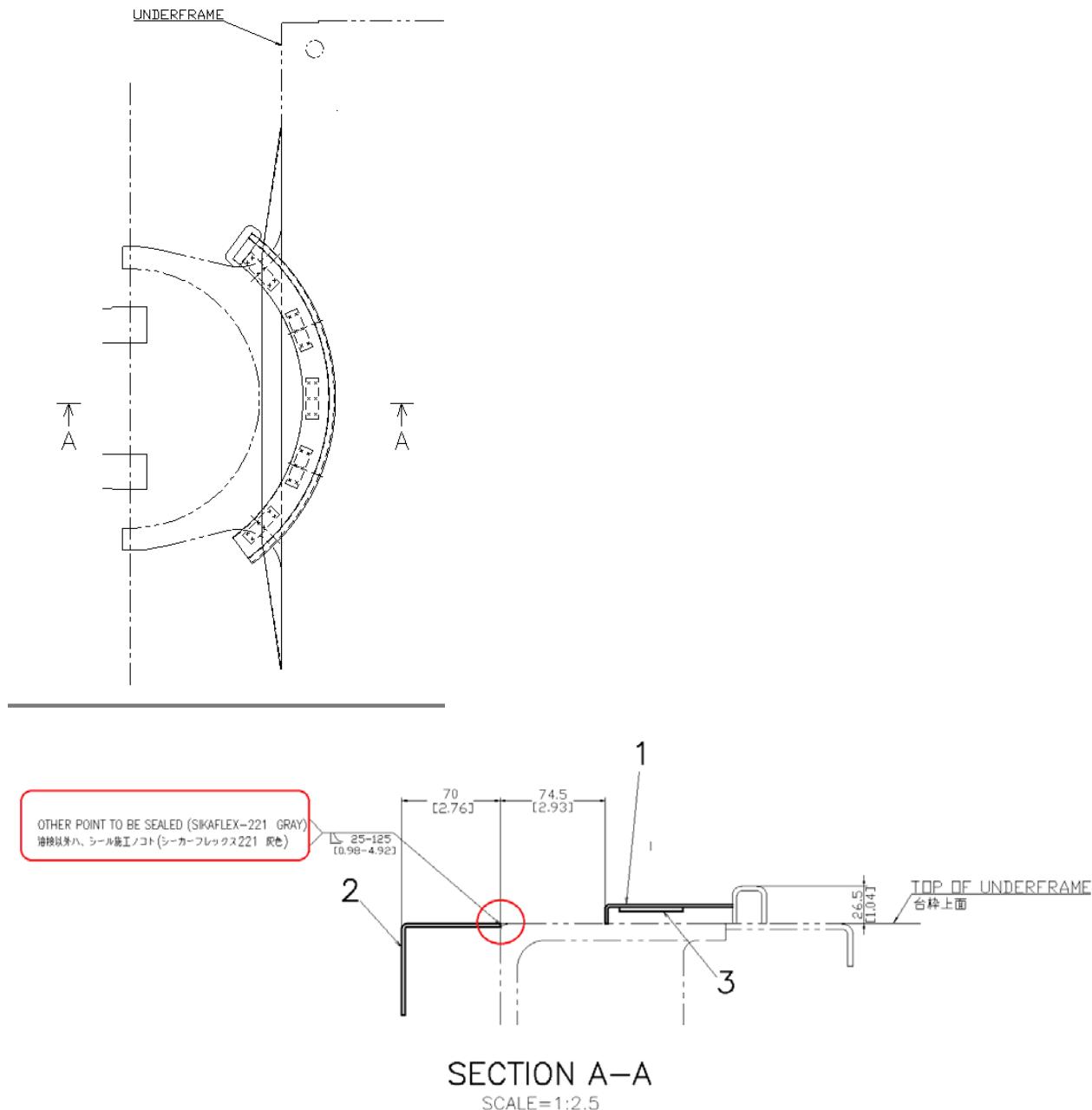
Missing



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3.0 Rework

1. Using a stiff bristle brush and vacuum, proceed to clean the rework area. Remove any dirt, grit or FOD from the sealant application area.
2. Don required PPE.
3. Apply Sika Primer and Sika 221 Sealant per Para. 7.6.1 between the stitch welds as shown below.



Work Instruction	(RWK) Rework for Articulation Turntable Paint and Sealant	RWK-LAM-158	Rev.: 3
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Completed Work



4. Perform any other required rework contained in this instruction.

Work Instruction	(RWK) Rework for Articulation Turntable Paint and Sealant	RWK-LAM-158	Rev.: 3
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APPENDIX B

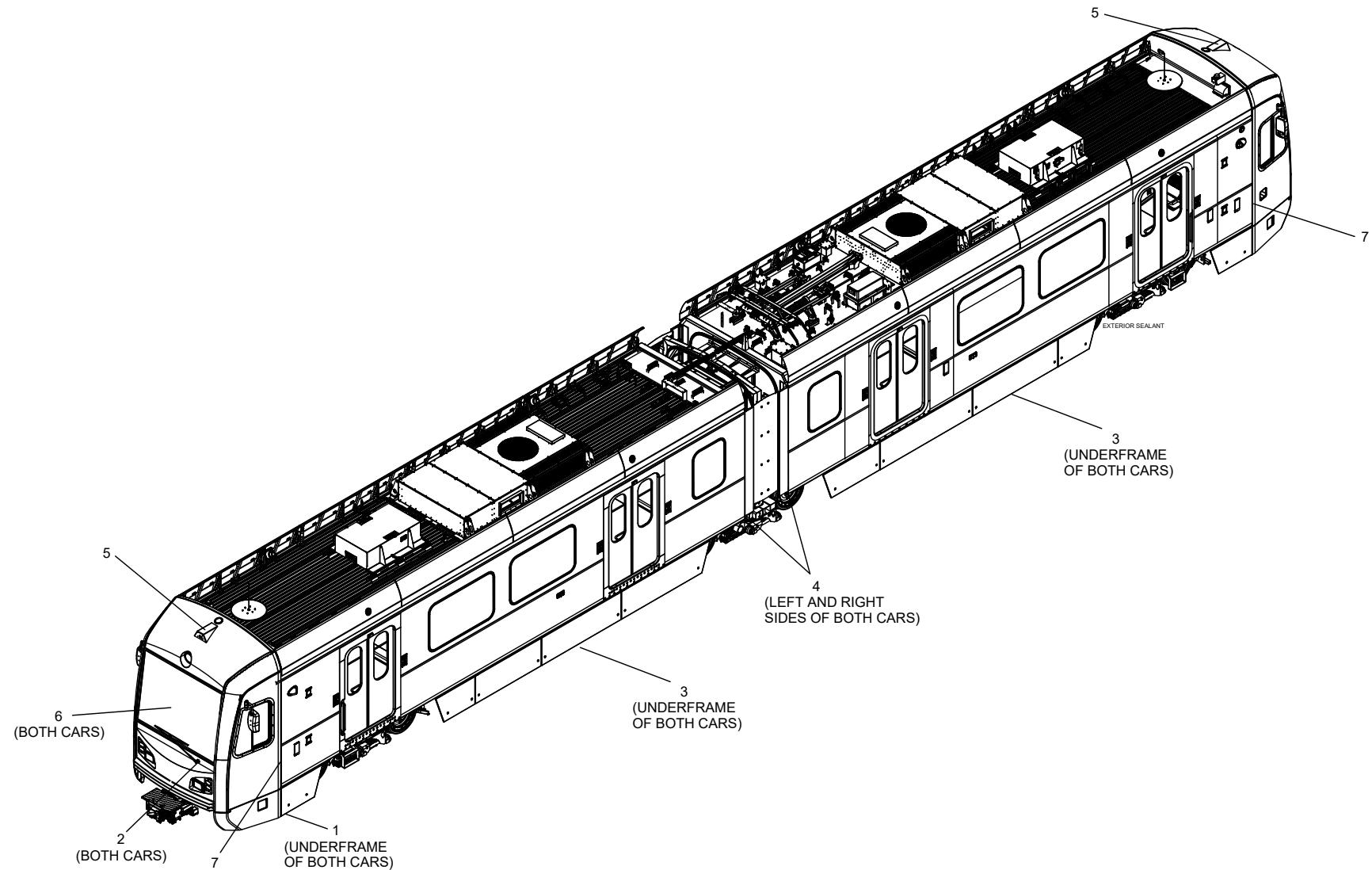
Exterior Component Locations and Sealant Defects

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Exterior Sealant Inspection

The following exterior components should be checked for damaged sealant. Refer to the figure on the following page.

Component	Callout	Description	Sealant
J Connector Enclosure	1	Underframe, A/B Cars	SIKA-221
Windshield Wiper	2	Small fillet around Carbody Interface, A/B Cars	SIKA-221
Subfloor Panels	3	Underframe of Carbody	3M 2000+
Articulation Cover	4	Joint Between Articulation Covers and Carbody	SIKA-221
WWAS Antenna	5	Small Fillet around Carbody Interface, A/B Cars	SIKA-221
Windshield Install	6	Perimeter of Windshield, A/B Cars	Bostik 70-01A
Cab to Carbody Interface	7	Joint Between Cab and Carbody, A/B Cars	SIKA-221



Sealant Defects

There are three types of sealant defects that require monitoring or repair:

1. Minor cracks that are mostly cosmetic and functionally watertight should be monitored but are not required to be repaired urgently.

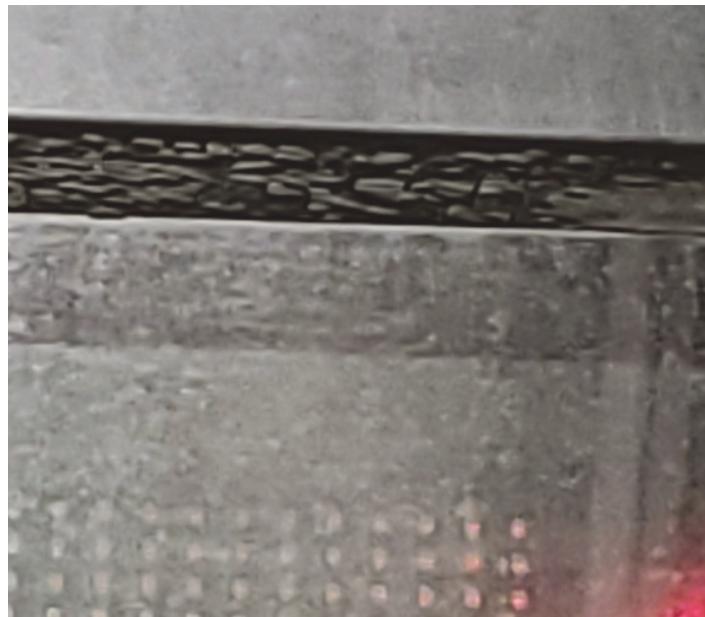




2. Intermediate cracks that are still functionally watertight should be closely monitored and addressed if the condition worsens.



3. Major cracks that may have compromised watertightness should be repaired urgently.





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