

---

# **International® LT® and RH™ Series**

## **Operation and Maintenance Manual**

**Navistar, Inc.**

2701 Navistar Drive, Lisle, IL 60532 USA

---

## IMPORTANT

The information, specifications, and illustrations contained in this manual are based on data that was current at the time of publication. Navistar, Inc. reserves the right to make changes and/or improvements at any time without notification, liability, or without applying those changes or improvements to vehicles previously manufactured and/or sold.

### NOTICE

Be advised that this motor vehicle may be equipped with computer / recording devices. Their function is to allow an authorized individual to download data or information relating to the operation or performance of this vehicle.

The stored data or information may be neither downloaded nor retrieved except by the vehicle's registered owner, or, in the alternative, by another individual or entity authorized by the registered owner, (e.g., International® dealer) who may need this data or information to properly service or diagnose this vehicle for repair or following an accident.

Any access to this information without the owner's consent may be in violation of law and may subject that person or entity to criminal penalties.

### CALIFORNIA

#### Proposition 65 Warning



**WARNING** Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to [www.P65warnings.ca.gov/diesel](http://www.P65warnings.ca.gov/diesel)

Battery posts, terminals and other related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Wash hands after handling.

---

## IMPORTANT

It is important that the applicable vehicle identification number (VIN), engine serial number and or component feature codes are recorded. These numbers are required to obtain pertinent information for this vehicle or engine.

**VEHICLE IDENTIFICATION NUMBER (VIN)**

## ENGINE

Feature Code: \_\_\_\_\_ Serial Number: \_\_\_\_\_

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

## FRONT AXLE

Feature Code: \_\_\_\_\_ Serial Number: \_\_\_\_\_

--	--	--

## REAR AXLE

Feature Code: \_\_\_\_\_ Serial Number: \_\_\_\_\_

[illegible]

## TRANSMISSION

Feature Code: \_\_\_\_\_ Serial Number: \_\_\_\_\_

--	--

## TRANSFER CASE

Feature Code: \_\_\_\_\_ Serial Number: \_\_\_\_\_

--	--

## CUSTOMER ASSISTANCE CENTER

1-800-44-TRUCK (1-800-448-7825)

**Navistar, Inc.**

2701 Navistar Drive  
Lisle, IL 60532 USA  
[www.navistar.com](http://www.navistar.com)

---

## Summary of Changes

Section	Description	Revision Number
Manual	4328388R8 has been superseded by 4328701R1	
Section 6 – Operation	Reverse Towing Information	Revision 1
	Maxwell Engine Start Module	
Section 8 – Maintenance Intervals and Specifications	Underhood PDM Component Locations	
Section 4 – Controls and Features	Blindspotter 2.0 and Fusion 2.0	Revision 2
	Active Steering	Revision 3
Foreward	Components added to Green House Gas (GHG) Warranty Overview Section	Revision 4
Section 5 – Sleeper Features	Auto Start / Stop System and HVAC Controls	
Section 7 – Maintenance Instructions	DEF Tank Filling	
Section 8 – Maintenance Intervals	Updated Maintenance Intervals	
Section 5 – Sleeper Features	Updated to show new refrigerator configurations	Revision 5
Section 7 – Maintenance Instructions	Updated TPMS information	
Section 6 – Operation	Steering Wheel Airbag	Revision 6
	Intellipark™	
Section 8 – Maintenance Intervals	Updated Maintenance Intervals	
Section 6 – Operation	Comfort Clip	Revision 7
	International® T14 Transmission	
Section 7 – Maintenance Instructions	International® LT® Air Cleaner	

---

## Section 1 – Foreword

Preface.....	1
Cautions and Warnings.....	1
Assistance Guide.....	1
Component Code Numbers.....	2
Line Set Ticket.....	2
Vehicle Storage Instructions.....	2
Storage Duration – One Month or Less.....	3
Storage Duration – Over One Month .....	3
Storage Facilities .....	4
Diesel Exhaust Fluid (DEF) Storage.....	4
Exterior Noise Emissions.....	5
Noise Emissions Warranty.....	5
Tampering with Noise Control System Prohibited.....	5
Emission Control Systems.....	6
HD-OBD Foreword.....	6
Supplemental Federal Emission Control System Warranty.....	6
Reporting Safety Defects.....	9
U.S. Registered Vehicles.....	9
Canadian Registered Vehicles.....	9
Safety Recalls, Emission Recalls, and Authorized Field Changes.....	9
Customer Security Guide for International® Trucks.....	10
Optional Diamond Logic® Electronic Application Solutions....	12

## Section 2 – Model Description

Introduction.....	13
Available Models.....	13
Vehicle Identification.....	18
Vehicle Identification Number (VIN).....	18

Feature Codes.....	18
Engine Serial Number.....	18
Line Set Ticket.....	18
Exterior Components.....	19
Front View: LT® Series — Long Sleeper .....	19
Back View: LT® Series — Long Sleeper.....	20
Cab Entry and Exit.....	21
Hood.....	21
Raising the Hood.....	21
Lowering the Hood.....	22
Luggage Box Access.....	23
Driver-Side.....	23
Chassis Skirts.....	23
Extended Chassis Skirts (If Equipped).....	24

## Section 3 – Inspection Guide

Introduction.....	25
General Information.....	25
Tractor Inspection.....	26
Preparation.....	26
Exterior Lights Check .....	26
Left-Side Cab Area.....	27
Left-Side Engine Compartment.....	28
Left-Side Front of Tractor.....	29
Front of Tractor.....	30
Right-Side Front of Tractor.....	31
Right-Side Engine Compartment.....	33
Right-Side of Cab.....	34
Rear of Cab.....	35
Right-Side Under Vehicle.....	36
Right-Side Rear of Tractor.....	37

## Table of Contents

---

Rear of Tractor.....	38
Left-Side Rear of Tractor.....	39
Fifth Wheel and Coupling Area.....	40
Battery Box (Between Frame Rail).....	41
Cab Interior Inspection.....	42

### Section 4 – Controls / Features

Introduction.....	45
General Information.....	45
Electrical.....	45
Electrical System.....	45
Dash Components.....	46
Overhead Console.....	46
Base Electronic Gauge Cluster Overview.....	47
Controller Operation.....	48
Screen Layout.....	49
Overview.....	49
Main Viewer.....	49
Pop-ups.....	49
Transmission Information.....	54
Menu Items.....	54
Overview.....	55
Direct Drive Warning Indicators.....	58
Electronic Gauge Cluster Alarms.....	59
Sleeper Temperature General Text and Warning Messages.....	61
Light Control Module.....	61
Headlights.....	62
Daytime Running Lights (DRL).....	62
Lights On With Wipers.....	62
Parking Lights.....	62

Panel Lighting.....	62
Rocker Switches.....	62
Dome Lighting.....	62
Courtesy Lights.....	63
Steering Wheel Controls.....	64
Cruise Control.....	67
Steering Column and Switches.....	67
Center Dash Panel / Wing Panel.....	72
Auxiliary Gauges.....	73
Switches.....	74
Climate Control.....	78
Air Conditioning.....	87
Electronic Touchscreen.....	88
Vehicle Information Display.....	88
Door and Window Controls.....	89
Door Lock / Unlock.....	89
Cab Doors and Locks.....	89
Remote Keyless Entry Operation (Optional).....	89
Lock / Unlock from Interior.....	90
Automatic Door Lock Function.....	91
Driver / Passenger Windows.....	91
Manual Operation.....	91
Power Operation.....	92
Mirror Controls.....	92
Vent Window.....	92
Predictive Cruise Control (PCC) System.....	92
Vehicle Telematics.....	93
Overview.....	93
Telematics Module (If Equipped).....	93
Telematics Module Indicators.....	94
OnCommand® Link (If Equipped).....	94
Collision Warning Systems.....	95

Bendix® Blindspotter 2.0® .....	95
Bendix® Wingman® Advanced™ Collision Warning System.....	96
Bendix® Wingman® Fusion™ System.....	98
WABCO® OnGuard™ Collision Safety System.....	99
Active Steering.....	100
Driver Assist Steering Features.....	101
Driver Reward.....	101

## **Section 5 – Sleeper Features**

Introduction.....	103
General Information.....	103
Main Features.....	103
Lighting.....	105
Dome Light.....	105
Reading Lights.....	105
Floor Lights.....	105
Accent Lights.....	105
Sleeper Control Panel.....	106
General Information.....	106
Accent Light Dimmer Switch.....	107
Accent Light Switch.....	107
Sleeper Dome / Floor Light Switch.....	107
Auto Start / Stop System.....	107
Auto Start / Stop System and HVAC Controls.....	109
Heat Mode and ESPAR Heater.....	110
Vehicles Equipped with ESPAR Heaters.....	110
Vehicles Not Equipped with ESPAR Heaters.....	110
Air Conditioning Mode.....	111
Manual Climate Controls.....	111
No-Idle Heating.....	113

Power Receptacle.....	113
Radio Remote Control.....	113
Remote Power Inverter Panel.....	113
Windows.....	114
General Information.....	114
Bunk Restraint System.....	115
General Information.....	115
Adjustable Belts.....	115
Restraint Webbing System (Optional).....	115
Lower Bunk.....	117
General Information.....	117
Upper Bunk.....	118
General Information.....	118
Entering the Upper Bunk.....	119
Exiting the Upper Bunk.....	120
Cabinets / Storage.....	121
General Information.....	121
Cabinets.....	122
Under Bunk Refrigerator.....	122
Refrigerator Cabinet.....	122
Dresser Cabinet.....	123
Tower Wardrobe Cabinet.....	124
Airline Cabinets.....	125
Convenience Features.....	126
General Information.....	126
Sleeper Curtain.....	126
Power Sockets.....	126
Television Mount.....	126
Power Inverter.....	126
Speakers.....	126
Floor Covering.....	127
Sleeper Fan.....	127

## Table of Contents

---

### Section 6 – Operation

Operation Safety.....	129	Starting Procedures.....	148
General Information.....	129	General Information.....	148
Cab Controls.....	130	Engine Starting.....	149
Cab Access.....	131	After the Engine Starts.....	150
Driver-Side Cab.....	131	Engine Shutdown.....	150
Accessing Driver-Side Cab.....	132	Emergency Starting.....	150
Exiting Driver-Side Cab.....	132	Cold Weather.....	151
Passenger-Side Cab.....	133	General Information.....	151
Accessing Passenger-Side Cab.....	133	Cold Weather Starting.....	151
Exiting Passenger-Side Cab.....	134	Cold Weather Operation.....	152
Airbag System.....	134	Engine Idling.....	152
Airbag Readiness Lamp.....	135	Engine Idle Shutdown Timer (If Equipped).....	153
When Should the Airbag Inflate?.....	135	Winter Front Usage.....	153
What Makes the Airbag Inflate?.....	135	Hot Weather Operation.....	153
How Does the Airbag Restrain?.....	136	Operating Instructions.....	154
What Will You See After the Airbag Inflates?.....	136	Uphill and Downhill Operation.....	154
Servicing the Airbag-Equipped Vehicle.....	137	Steering.....	154
Adding Equipment to the Airbag-Equipped Vehicle.....	137	Stationary Steering Column.....	154
Airbag System Check.....	138	Tilt Steering Column (If Equipped).....	155
Replacing Airbag System Parts after a Crash.....	138	Adjustable Steering Column.....	155
Seat Belts.....	138	Electrical.....	155
General Information.....	138	Alternator.....	155
Operation.....	139	Battery.....	156
Comfort Clip (If Equipped).....	140	Maxwell® Engine Start Module (ESM).....	156
RollTek® SRS System Seat Belt Pretensioning Device.....	142	Circuit Breakers, Fuses and Fusible Links.....	158
Seats.....	142	Electrical Load Control and Shedding (ELCS).....	159
General Information.....	142	Engine.....	159
RollTek Rollover Protection System.....	144	Charge Air Cooler.....	160
RollTek Rollover Protection System Operation.....	146	Electronic Engine Controller.....	160
RollTek System Inspection and Service.....	148	Engine Brake.....	160
		Stalk Shifter Engine Brake.....	161
		Engine Brake With Allison Transmissions.....	161



Engine Brake With Eaton® UltraShift+®		Creep Mode.....	172
Transmission Special Driver Instructions.....	161	Power Take-Off Control.....	172
Engine Features.....	162	Coast Mode and Neutral Coast Mode (If	
HD-OBD Overview .....	162	Equipped).....	172
Self Diagnostics.....	163	Eaton Over-speed Protection .....	172
Air Compressor Cycling.....	163	International® T14 Drive Modes.....	172
Engine Oil.....	163	Rear Axles .....	173
Engine Performance Problems.....	164	Locking or Limited Slip Differentials.....	173
Fuel.....	164	Tandem Axle Power Divider Lock (PDL) Control. . .	173
Ultra Low Sulfur Diesel Fuel Requirements.....	164	Driver-Controlled Differential Lock.....	174
Unacceptable Fuel Blends.....	164	Rear Suspension.....	175
Hazards of Diesel Fuel / Gasoline Blends.....	164	Rear Air Ride Suspension.....	175
Additional Unsafe Practices.....	165	Rear Air Suspension Air Dump.....	175
Fuel and Lubricant Additives.....	165	Air Suspension System Faults.....	176
Fueling Procedures.....	165	Exhaust Aftertreatment.....	176
Fueling Precautions.....	165	Selective Catalytic Reduction System.....	176
Reserve Fuel.....	166	Introduction.....	176
Transmission.....	166	Diesel Exhaust Fluid.....	176
Transmission Fluid.....	166	DEF Tank.....	177
Transmission Fluid Temperature .....	166	Low DEF Level.....	177
Manual Transmissions.....	167	DEF Contamination or SCR System Fault.....	181
Engaging the Clutch.....	168	Exhaust Diesel Particulate Filter Regeneration.....	189
Hydraulic Clutch Actuation System.....	169	Parked Regeneration Procedure.....	192
Double Clutch Procedures.....	170	Regeneration Inhibit Switch.....	193
Clutch Brake.....	171	Two-Position Regeneration Inhibit Switch.....	193
Clutch Precautions.....	171	Three-Position Regeneration Inhibit Switch.....	193
Eaton® UltraShift+® Transmissions (If Equipped) . . .	171	Brakes.....	193
Eaton® Endurant™ Transmission.....	171	General Information.....	193
Allison Transmissions.....	171	Downhill Operation.....	193
International® T14 Transmissions.....	172	Air Brakes.....	194
Transmission Features (If Equipped).....	172	General Information.....	194
Hill Start Aid / Hill Brake (If Equipped).....	172		

## Table of Contents

---

Air Gauge, Low Air Pressure Beeper, and Warning Indicator.....	195
Reservoir Moisture Draining.....	195
Brake Application.....	196
Parking Brake.....	196
Parking Brake Reset.....	197
Parking Brake Alarm.....	197
Bendix® Intellipark™.....	197
Applying and Releasing the Parking Brake.....	197
Rollaway Prevention.....	198
Intellipark™ LED Operation.....	199
Parking the Vehicle When Parking Brake Cannot be Applied.....	200
Operating the Vehicle Using Parking Brake Interlock Override Mode.....	201
Bobtail Operation.....	201
Air Trailer Brake Release.....	201
Air Dryer.....	201
Trailer Brake Hand Control.....	202
Trailer Air Supply and Parking Brake Modular Controls.....	202
Parking Brake Indicator.....	203
Bobtail Proportioning System.....	204
Antilock Brake System (ABS).....	204
General Information.....	204
ABS Operation.....	204
ABS Self Check.....	205
Antilock Driving Tips.....	205
Automatic Traction Control (ATC) System.....	206
General Information.....	206
ATC System Check.....	206
ATC OFF ROAD or MUD / SNOW Switch.....	206

Stability Control Systems – Bendix® RSP / WABCO® RSC / Bendix® ESP.....	207
Towing Instructions.....	209
Tow Hooks (If Equipped).....	210
Towing Vehicle With Front Wheels Suspended.....	211
Towing Vehicles With Driver-Controlled Differential Lock.....	211
Removing Axle Shafts Before Towing.....	211
Installing Axle Shafts.....	213
Reverse Towing Vehicle With Rear Wheels Suspended.....	213
Tractor-Trailer Connections.....	215
Connecting / Disconnecting a Trailer to a Vehicle with Air Suspension.....	215
Fifth Wheel Operation.....	216
Fifth Wheel Slide Switch (If Equipped).....	216
Hookup.....	217
Un-Hook.....	217
Fifth Wheel Jaw Unlock Control.....	218
Fifth Wheel Jaw Monitoring.....	219

## Section 7 – Maintenance Instructions

Introduction.....	221
Maintenance Guidelines.....	221
Supporting Your Vehicle for Service.....	223
Chassis Lubrication.....	223
Air Conditioning Service Checks.....	224
HVAC Filters.....	224
Side Access HVAC Filter.....	225
Recirculation Filter.....	226
Sleeper HVAC Filter.....	227

Axles.....	227	Auto Start / Stop System Battery Cables:	
Front Axle.....	227	International® RH™ Vehicles Only.....	238
Inspection and Lubrication.....	227	High Current Relay.....	238
Normal Maintenance.....	228	Electrical Charging and Starting System Test.....	239
Alignment.....	228	Terminal Inspection-Cleaning-Corrosion Protection.....	239
Rear Axle.....	228	Accessory Feed Connections.....	239
Inspection and Lubrication.....	228	Fuses and Relays.....	239
Locking Differential.....	229	Engine.....	240
Brakes.....	229	General Information.....	240
General Information.....	229	Engine Fluids and Contaminated Material.....	240
Air Brakes.....	230	Scheduled Maintenance.....	240
Inspection and Adjustment.....	230	Air Induction System.....	241
Air Dryer.....	231	Air Restriction Gauge.....	241
General Information.....	231	Air Cleaner Element Service: LT® Vehicles Only.....	242
Desiccant Filter.....	232	Air Cleaner Element Service: International® RH™	
Purge Valve.....	232	Vehicles Only.....	244
Heater.....	232	Troubleshooting.....	246
Air Reservoir / Tanks Moisture Draining.....	232	Charge Air Cooler and Radiator Core Inspection and	
ABS Connections and Sensors.....	233	Cleaning.....	247
Cab.....	233	Inspection and Cleaning.....	247
Care of Vehicle.....	233	Cooling System.....	247
Washing and Waxing.....	233	Coolant Level Check.....	247
Bright Metal Care.....	233	Top-Off Coolant Fill Method.....	248
Upholstery Care.....	233	Top-Off Instructions for International® A26	
Exposed Rubber and Unpainted Plastic Parts.....	234	Engines.....	248
Clutch.....	234	Top-Off Instructions for Cummins® X15 Engines.....	249
Pedal Free Travel.....	234	Coolant and Optional Coolant Filter.....	250
Hydraulic Clutch.....	235	Coolant Concentration Freeze Point.....	250
Electrical.....	236	Antifreeze.....	251
Batteries.....	236	Fan Clutch.....	251
Auto Start / Stop System Battery Cables: LT®		Fuel System.....	251
Vehicles Only.....	237	Fuel Tank Draining and Cleaning.....	251

## Table of Contents

---

Crankcase Ventilation Filter.....	252
Frame.....	252
Noise Emissions – Exterior.....	252
Instructions for Proper Maintenance.....	252
Air Intake System.....	252
Body.....	252
Cooling System.....	253
Engine Noise Shields / Blankets.....	253
Exhaust System.....	253
Maintenance Record – Noise Control.....	254
DEF Tank Filling.....	255
Diesel Particulate Filter (DPF).....	255
Regeneration.....	255
Cleaning.....	256
Drive Shafts.....	256
Suspension (Air and Steel Springs).....	256
Front Suspension.....	257
Rear Suspension.....	257
Steering.....	257
General Information.....	257
Tightening Steering Intermediate Shaft Joint Bolts.....	258
Lubrication Points.....	258
Power Steering.....	258
Tires.....	259
Tire Warnings.....	259
Tire Maintenance .....	261
Tire Pressure Monitoring System (TPMS).....	261
Checking Inflation.....	262
Underinflation.....	262
Inspection.....	262
Loads.....	263
Dual Tires Matching.....	263

Dual Tires Mixing.....	263
Rotation.....	263
Rotation Is Advisable.....	263
Tire Replacement.....	264
Wheel and Tire Balancing.....	264
Wear.....	264
Irregular Wear.....	264
Use of Tire Chains.....	265
Wheels.....	265
Wheel and Wheel Nut Maintenance and Installation.....	265
Wheel Nut Torque Maintenance.....	266
Hub-Piloted Wheel Installation Procedures.....	266
Transmission.....	268

## Section 8 – Maintenance Intervals and Specifications

Lubrication and Maintenance Intervals .....	269
Maintenance Intervals.....	269
Lubrication and Fluids Charts.....	278
Components Requiring Lubrication.....	279
Components Requiring Fluid Check and Fill.....	280
Unit Refill Capacities.....	281
Cooling System Refill Capacities.....	281
Diesel Exhaust Fluid Tank.....	281
Crankcase and Oil Filters.....	281
Hydraulic Clutch System.....	281
Power Steering Systems.....	281
Transmission.....	282
Rear Axle Unit Refill Capacities.....	282
Lubricant and Sealer Specifications.....	283
Torque Specifications.....	287

Disc Wheel Nut Torque Chart.....	287
Fuse Charts.....	288
Typical Luggage Compartment Fuse Panel Layout.....	292
Typical Under-Hood Power Distribution Module (PDM) Fuse Panel Layout.....	292
LT® / RH™ Series Light Information.....	296
Filter List.....	297

## **Section 9 – Customer Assistance**

Service Information.....	299
International Truck Warranty Program.....	299

## **Section 10 – Index**

Index.....	301
------------	-----

# SECTION 1 — FOREWORD

## Preface

Your vehicle has been engineered and manufactured so that it can provide economical and trouble-free service. However, it is the owner's responsibility to see that the vehicle receives proper care and maintenance.

Making modifications to various parts, components, and systems of your vehicle, such as brake, suspension, and steering systems, can adversely affect the quality and reliability of your vehicle. Such modifications must be avoided.

**NOTE:** The contents of this manual will be general and may not reflect the most current vehicle configuration. If the content of this manual does not provide the explanation needed to understand or operate the feature you are using, please contact your local International dealer for the most up to date information.

## Cautions and Warnings

Throughout this manual, you will find Cautions and Warnings:



### WARNING

**Warnings advise you of hazards, the consequences, and what to do to prevent them, not only to prevent damage to your vehicle or property, but to help prevent situations and occurrences that could result in personal injury or death.**



### CAUTION

**Cautions will advise you of the proper care to be taken to prevent damage to your vehicle or property.**

Study this manual carefully. Do not operate your vehicle until you are completely familiar with the contents of this manual. Always retain this manual in your vehicle for reference. If you sell the vehicle, make sure the manual goes with it.

## Assistance Guide

When parts are required, always provide the unit code number, vehicle model, and vehicle serial number. Request the salesperson to assist you in obtaining this information upon delivery.

For information not given in this manual, or if you require services of trained service personnel, we urge you to contact a nearby International dealer or phone 1-800-44-TRUCK (87825) for assistance.

Every customer is entitled to the best service, both from the product itself and from the firm that sells and services that product.

## Foreword

---

For any reason, if you do not feel you are receiving these services in connection with the operation of your vehicle or the sales transaction, you should return to your selling dealer, so that these matters can be corrected to your satisfaction. If the matter is not resolved at that time, it is suggested that the following steps be taken:

### **Contact a Member of Management at the Dealer.**

Discuss the details of the difficulty. In most instances, any problem can be resolved to your satisfaction by the owner or manager in charge.

### **Contact Closest Navistar, Inc. Regional Sales Office.**

Should you desire to contact any of these offices, it is important to include the following information in your communication:

- Name under which new vehicle was purchased, address, and telephone number of purchaser
- Vehicle model, year, vehicle identification number, component code, and serial number
- Vehicle delivery date and present mileage
- Location where purchased
- Details of the problem

## **Component Code Numbers**

Code numbers are the basis for identifying the components used on International® trucks. They are used by sales personnel to order the truck, by manufacturing to build that truck, and by parts personnel to service the truck. Many items in this manual are identified by codes.

Code numbers are a combination of numbers and / or letters. These codes are listed on the Line Set Ticket, which is sometimes known as the vehicle specification card or code sheet.

### **Line Set Ticket**

Each vehicle is provided with a Line Set Ticket (code sheet), which lists identification code numbers of component units used to build the vehicle.

One copy of the Line Set Ticket is included in the literature provided with the vehicle. When replacement parts are required, take this copy with you to positively identify vehicle components to be sure of getting the correct parts.

**Be sure to return Line Set Ticket to vehicle after obtaining parts.**

## **Vehicle Storage Instructions**

When a vehicle is not used for an extended period of time, precautions must be taken to prevent deterioration of vehicle components. Vehicles that are out of service for extended periods of time can experience corrosion and other undesirable effects. Drive vehicle monthly to exercise the brakes, driveline, and steering. Run the vehicle long enough for the engine to reach operating temperature.

**NOTE: Losses occurring to a unit while it is in storage will not be considered for warranty reimbursement.**

**Storage Duration – One Month or Less**

1. Wash vehicles as necessary. Always wash vehicles that have been exposed to road salt.

**NOTE: Washing Instructions - Wash the vehicle with warm water and mild soap, then wipe wet surfaces with a chamois or soft cloth. DO NOT use hot water or strong soaps or detergents. DO NOT wash the vehicle in direct sun, or when the sheet metal is hot to the touch. This will streak the finish. DO NOT wipe dirt off dry surfaces, as this will scratch the finish.**

**NOTE: When vehicles are stored outside, particularly in coastal areas (salt water and high humidity atmosphere) or other areas of corrosive environment, paint and bright metal may require frequent washing and waxing to prevent deterioration. Determining washing frequency is the customer's responsibility.**

**NOTE: For vehicles exposed to ultraviolet rays of the sun, apply a coating of Bon Ami® soap, or similar product, to the inside surfaces of the windshield and windows, to shade the interior and prevent fading of the interior trim.**

2. Inspect painted surfaces; touch up all exposed primed or raw metal areas to prevent rust.
3. Apply a thick coat of wax to prevent discoloration from the elements; wax all chrome and stainless steel metal parts.
4. Check the radiator coolant for proper level and adequate freeze protection of -34°F (-36°C).
5. Cover open ends of vertical exhaust stack(s).

6. Drain air brake reservoirs and close the drain cocks.
7. Lubricate all exposed transmission, auxiliary transmission, and PTO shift rails.
8. Check state-of-charge eye in batteries and recharge if open circuit voltage is below 12.6 volts. Disconnect battery ground cables to prevent accidental starting or parasitic electrical loads from discharging the battery.

**Storage Duration – Over One Month**

Units in storage longer than one month should be driven until the engine reaches operating temperature.

1. Ensure all tires are inflated properly, remove vertical exhaust stack covers, and reconnect batteries.
2. Check all vehicle fluid levels and fill as required.
3. Start and run the vehicle at fast idle until it reaches operating temperature. To remove surface charge from the battery, built up from previous startups and short idle periods, operate the heater and / or air conditioner, headlights, and other accessories for several minutes.
4. Turn OFF heater and / or air conditioner and any other accessories; shut off the headlights. Park the vehicle and turn engine OFF.
5. Perform the procedure for **Storage Duration – One Month or Less**, if returning the vehicle to storage.

**NOTE: After every 30 additional days of storage, perform Items 1 through 5.**



### Storage Facilities

- Whenever possible, store vehicles indoors, protected from sunlight, in a dry, well ventilated area. If indoor storage is not available, select storage lots to eliminate conditions that cause deterioration.
- Park away from transformers and / or electrical motors, because when the protective wax in tire compound cracks, ozone in the air attacks the exposed areas.
- Park away from trees, high weeds and / or grass to prevent damage from tree or weed sap, and to minimize bird and insect stains.
- Park away from railroad tracks, paint shops, smoky industrial areas, and locations of possible road splash contact.
- If a vehicle is parked on an incline, install wheel chocks.

### Diesel Exhaust Fluid (DEF) Storage

DEF has a limited shelf life, both in the vehicle's DEF tank and in storage containers.

The following conditions are ideal for maintaining DEF quality and shelf life during prolonged transportation and storage:

- Storage temperature between 10° and 90°F (-12° and 32°C)
- Storage in sealed containers to avoid contamination
- Avoidance of direct sunlight

Long-term, in-vehicle storage (in excess of 6 months) is not recommended. If long term storage is necessary, periodic testing of the DEF is recommended to ensure proper DEF concentration.

## **Exterior Noise Emissions**

Many operators and owners of the type of vehicles described herein are subject to *Federal Motor Carrier Safety Regulations and Noise Emission Requirements*. All owners and operators are urged to obtain a copy and comply with these regulations. Copies of these regulations can be purchased from:

Superintendent of Documents  
U.S. Government Printing Office  
Washington, D.C. 20401  
<https://www.gpo.gov/>

## **Noise Emissions Warranty**

Navistar, Inc. warrants to the first person who purchases this vehicle for purposes other than resale and to each subsequent purchaser that this vehicle, as manufactured by Navistar, was designed, built, and equipped to conform at the time it left Navistar's control with all applicable U.S. Environmental Protection Agency Noise Control Regulations.

This warranty covers this vehicle as designed, built, and equipped by Navistar and is not limited to any particular part, component, or system of the vehicle manufactured by Navistar. Defects in design, assembly, or in any part, component, or system of the vehicle as manufactured by Navistar, which, at the time it left Navistar's control, caused noise emissions to exceed Federal standards, are covered by this warranty for the life of the vehicle.

## **Tampering with Noise Control System Prohibited**

Federal law prohibits the following acts or the causing thereof:

1. The removal or rendering inoperative by any person, other than for purposes of maintenance, repair, or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use; or
2. The use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

Among those acts presumed to constitute tampering are the acts listed as follows:

1. Air Intake System: Removing air cleaner, intake silencer, or piping
2. Acoustical Shielding (Body): Removing wheel well splash shields, cab shields, or acoustical (underhood) insulation
3. Cooling System: Removing or rendering inoperative the fan clutch and / or fan shrouds
4. Engine and Driveline System: Removing or rendering engine speed governor inoperative so as to allow engine speed to exceed manufacturer specifications, and / or engine block shield, oil sump shield, or transmission enclosures

5. Changes in hardware, software, calibration, or programmable parameters that increase engine operating speed or horsepower other than those provided by Navistar, Inc.
6. Exhaust System: Removing or rendering inoperative exhaust system components, including muffler, resonator, exhaust aftertreatment components, or tailpipe

**NOTE: Refer to Section 7 – Maintenance Instructions for proper maintenance, use, and repair of noise emission items.**

### Emission Control Systems

**NOTE: Federal and California emission system warranties are found in your Engine Operation and Maintenance Manual.**

#### HD-OBD Foreword

Heavy Duty On-Board Diagnostics (HD-OBD) is a U.S. Government mandated standard for all 2013 and later Class 4 and above vehicles with a Gross Vehicle Weight Rating (GVWR) of 14,001 pounds or more. The HD-OBD system monitors the engine and aftertreatment systems to verify they are operating within emissions limits. If an emissions fault is logged, the Malfunction Indicator Lamp (MIL) will illuminate and one or more fault codes will be set.

The HD-OBD system operates similarly to previous power train control systems by storing fault codes and turning on the MIL. If the problem that caused the fault goes away, the code will clear and the MIL will go out after certain operating conditions have been met. This may take several times operating the vehicle.

#### Supplemental Federal Emission Control System Warranty

The United States Environmental Protection Agency adopted new heavy-duty Greenhouse Gas (GHG) vehicle regulations on 15 September 2011. This vehicle may be certified to the GHG regulations. For certified vehicles, additional GHG emissions control system warranty covers certain vehicle components. This Supplemental GHG Federal Emission Control System Warranty coverage for these vehicle components will be managed according to current Federal Emission Control System Warranty process. The GHG emission control system warranty applies to the below listed vehicle components such that they meet the following two conditions:

1. The vehicle and / or GHG emission control system component is designed, built, and equipped so it conforms at the time of sale to the ultimate purchaser with the requirements of the GHG regulations and such component is an emission control and appears on the GHG vehicle emission certification label, and
2. The vehicle and / or GHG emission control system component is free from defects in materials and workmanship that cause the vehicle to fail to conform to the GHG requirements during the applicable supplemental warranty period.

## **Components Covered**

### **Applies to all certified models:**

The GHG emission-related warranty covers the following components such that they meet the two conditions listed above:

- Hybrid system components (where applicable)
- Components whose failure would increase a vehicle's evaporative emissions (for vehicles subject to evaporative emission standards)
- Tires

### **Applies only to certain certified fifth wheel equipped LT®, International® RH™, LoneStar®, and DuraStar®:**

The GHG emission-related warranty covers 1) vehicle speed limiters, 2) idle shutdown systems, and 3) fairings to the extent such emission-related components are included in the certified emission controls and are listed on the vehicle GHG certification label. The GHG emission-related warranty covers all components whose failure would increase a vehicle's emissions of air conditioning refrigerants for vehicles subject to air conditioning leakage standards.

### **Applies only to certified vehicles equipped with innovative technologies**

The GHG emission-related warranty covers components certified as innovative technologies that are part of the certified emission controls. Please contact your authorized International dealer for further information.

## **GHG Emission Control System Warranty Period**

The GHG emission control system warranty period begins on the date the new GHG certified vehicle is delivered to you. The period of coverage is the greater of the base mechanical warranty or:

- Five (5) years or 50,000 miles (80,000 km), whichever comes first, for spark-ignition and light heavy-duty diesel vehicles with GVWR below 19,500 pounds.
- Five (5) years or 100,000 miles (161,000 km), whichever comes first, for medium and heavy heavy-duty vehicles with GVWR equal to or greater than 19,500 pounds.
- Two (2) years or 24,000 miles (39,000 km), whichever comes first, for tires.

### **Additional components covered, applies to all certified models:**

#### **The GHG emission-related warranty covers the following components such that they meet the two conditions listed above:**

1. Hybrid system components (where applicable)
2. Components whose failure would increase a vehicle's evaporative emissions (for vehicles subject to evaporative emission standards)
3. Tires
4. Tire Pressure Monitoring System (TPMS)
5. Predictive cruise
6. No-Idle systems

7. Fuel fired heaters
8. Transmissions
9. Rear axles

**Applies only to certain certified fifth wheel equipped tractors: ProStar®, LoneStar®, TranStar®, DuraStar®, and 9900 models:**

**The GHG emission-related warranty covers:**

1. Vehicle speed limiters
2. Idle shutdown systems
3. Fairings to the extent such emission-related components are included in the certified emission controls and are listed on the vehicle GHG certification label

The GHG emission-related warranty covers all components whose failure would increase a vehicle's emissions of air conditioning refrigerants for vehicles subject to air conditioning leakage standards.

**Applies only to certified vehicles equipped with innovative technologies:**

The GHG emission-related warranty covers components certified as innovative technologies that are part of the certified

emission controls. Please contact your authorized International dealer for further information.

**Supplemental Federal Emission Control System Maintenance, Repair, and Replacement**

Your vehicle may comply with the Greenhouse Gas (GHG) regulations adopted by the Environmental Protection Agency on 15 September 2011. As owner or operator of a GHG compliant vehicle, your vehicle and GHG emissions control system components should be properly maintained and in good working order.

Repair and replacement of GHG emission control system components should be done to original vehicle manufacturers' specifications to ensure proper function of the vehicle. Tire replacement should be to tires with GHG emission performance as good, or better, than tires originally equipped on the vehicle. Consult with the tire manufacturer for tire specifications.

The United States Environmental Protection Agency allows limited modification of your vehicle and its GHG emission control system components. Please refer to applicable regulations for allowable and prohibited modifications.

## **Reporting Safety Defects**

### **U.S. Registered Vehicles**

If you believe that your vehicle has a defect that could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Navistar, Inc. To notify Navistar see the contact information listed in the front of the manual.

If NHTSA receives similar complaints, it may open an investigation and, if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you and your dealer, or Navistar.

To contact NHTSA, you may either call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153); go to <http://www.safercar.gov>; or write to: Administrator, NHTSA, 400 Seventh Street, SW., Washington, DC 20590. You can also obtain other information about motor vehicle safety from <http://www.safercar.gov>.

### **Canadian Registered Vehicles**

If you believe that your vehicle has a defect that could cause a crash or could cause injury or death, you should immediately contact Navistar Canada ULC and then Transport Canada.

To contact Navistar Canada ULC, you may either call the Regional Service Manager (Canadian Sales Region) 905-332-3323 or write to: Navistar Canada, 5500 North Service Road, Box 5337, Burlington, Ontario L7L 5H7.

To contact Transport Canada, Defect Investigations and Recalls, you may call 1-800-333-0510 or write to: Transport Canada, ASFAD, Place de Ville Tower C, 330 Sparks Street, Ottawa, Ontario K1A 0N5.

### **Safety Recalls, Emission Recalls, and Authorized Field Changes**

Safety Recalls, Emission Recalls, and Authorized Field Changes are field campaigns where owners are notified of modifications that may involve their vehicle. If you receive such notification, **PLEASE FOLLOW ALL INSTRUCTIONS PROVIDED IN THE CUSTOMER LETTER.** If your vehicle is part of a Safety Recall campaign, the recall service procedure must be completed to ensure safe operation of your vehicle. As a vehicle owner, you must provide International dealers with address corrections and changes to ensure that you receive all notifications. Please verify that your local dealer has your correct address. Dealers will also have a record of any outstanding campaigns that affect your vehicle.

### Customer Security Guide for International® Trucks

This guide has been prepared to help you protect your vehicle investment from theft. We realize the financial commitment you have made is significant, and that you depend on that vehicle to generate profits and a livelihood. Vehicle theft can be more than an economic crime. Protecting your vehicle from theft or hijacking can be crucial to the safety and security of the country and economy. While no system or device is 100 percent effective, our intention is to provide some tips that you or your drivers can use to reduce the risk of theft.

If you suspect vehicle theft activity, take a minute to tell the National Insurance Crime Bureau (NICB) at 1-800-TEL-NICB. You can make the free call anonymously, and you might be eligible for a reward. To learn more about vehicle theft and how you can protect yourself, visit the NICB's Web site, [www.nicb.org](http://www.nicb.org).

#### Add Layers of Protection

Four layers of protection are recommended for your vehicle – the more layers of protection on your vehicle, the more difficult it is to steal.

##### Layer 1: Common Sense

- Lock your doors.
- Remove your keys from the ignition.
- Close your windows completely.
- Park in well-lit areas.

- Drop a business card with your name on it between the glass and doorframe. This can aid in identifying the truck when it is recovered.
- Keep a copy of the Line Set Ticket in a location other than your truck for reporting purposes, and a copy of the VIN in your wallet.
- Photograph the interior and exterior of your truck from various angles and keep these photographs in a safe non-truck location or send them to your insurance agent.
- Report a theft as soon as it is discovered to the local police and to your insurance company.
- Post a *driver has no cash* sign on your door to discourage a robbery.
- Permanently mount your CB radio or remove it when you will be away from your truck.
- Do not discuss where your vehicle is located when you are not on the road.
- Do not share information about your specific destination or the load you are hauling.
- Be conscious of other vehicles that may be following you over long distances – call the police.
- Be suspicious of motorists who are signaling you to stop or pull over. Call the police, report the incident, and let the police respond.

**Layer 2: Visible or Audible Device**

- Audible alarm system
- Steering wheel locks
- Steering column collars
- Theft deterrent decals
- Wheel locks
- Window etching
- Mechanical or electronic steering locks that restrict the steering shaft U-joint, which are easy to use and provide a very high level of affordable theft protection.

**Layer 3: Vehicle Immobilizer**

- Fuse cutoffs
- Kill switches
- Starter, ignition, and fuel disablers
- Fuel cutoff switch

**Layer 4: Tracking System**

The final layer is a tracking system that emits a signal to the police or a monitoring service when the vehicle is reported stolen. If your vehicle has a tracking system and is stolen, it can oftentimes be recovered faster and with less damage.

---

**VIN:**

---

---

**Model / Year:**

---

---

**Engine Serial Number:**

---

---

**License Number:**

---

---

**Insurance Company:**

---

---

**Policy Number:**

---

---

**Phone Number:**

---

---

**Other:**

---



### Optional Diamond Logic® Electronic Application Solutions



#### **WARNING**

To prevent personal injury and / or death, or damage to property, read and understand the appropriate manual for the specific equipment in question before operating. This vehicle may be equipped from the factory with electrical switches intended to operate equipment that was installed by a Truck Equipment Manufacturer (TEM). Instructions, Cautions, and Warnings for this additional equipment will NOT be found in this manual.

**NOTE:** This vehicle may be equipped with electronic application-specific options not described in this operation and maintenance manual. Many of these features are supplied with rocker switches that have custom labels applied. The presence of these options as factory installed can be verified from the Line Set Ticket included with the vehicle. A TEM, however, may have installed some of these options after production. In that case, they will not appear on the Line Set Ticket. If installed by a TEM, you should receive an operating guide and / or training for the specific functions provided. Familiarize yourself with all of the switches that control chassis, engine, and body equipment, and seek adequate training on the function of all features before operating this vehicle.

## **SECTION 2 — MODEL DESCRIPTION**

### **Introduction**

This operator manual covers the International® LT® and RH™ Series models. Illustrations in this manual are used for reference only and may differ slightly from the actual vehicle. However, key components addressed in the manual are represented as accurately as possible. Models covered are shown on the following pages.

### **Available Models**

**NOTE:** Some vehicles may be equipped with additional aero equipment such as air fairings and cab side extenders to help increase vehicle aerodynamics and fuel economy.



**LT® 4 x 2 Lo-Rise Day Cab**



0000400068

**LT® 4 x 2 Day Cab with Air Fairing and Cab Side Extenders**

## Model Description

---



0000406073

**LT® 6 x 4 Lo-Rise Day Cab**



0000406063

**LT® 4 x 2 Hi-Rise Sleeper Cab with Aero (56-Inch)**



0000406074

**LT® 6 x 4 Day Cab with Air Fairing and Cab Side Extenders**



0000406064

**LT® 4 x 2 Lo-Rise Sleeper Cab (56-Inch)**



0000406070

**LT® 6 x 4 Lo-Rise Sleeper Cab (56-Inch)**



0000406080

**LT® 6 x 4 Hi-Rise Sleeper Cab with Aero (56-Inch)**

## Model Description

---



0000406065

**LT® 4 x 2 Hi-Rise Sleeper (73-Inch)**



0000406071

**LT® 6 x 4 Hi-Rise Sleeper (73-Inch)**



0000406066

**LT® 4 x 2 Sky-Rise Sleeper (73-Inch)**



0000406072

**LT® 6 x 4 Sky-Rise Sleeper (73-Inch)**



**RH™ 4 x 2 Day Cab**



**RH™ 4 x 2 Short Sleeper (56-Inch)**



**RH™ 6 x 4 Day Cab**



**RH™ 6 x 4 Short Sleeper (56-Inch)**

## Model Description

---

### Vehicle Identification

#### Vehicle Identification Number (VIN)



The Vehicle Identification Number (VIN) is located on the driver-side door. The VIN and model description are necessary when ordering replacement parts or service manuals.

#### Feature Codes

Feature Codes are the basis for identifying the components used on International® Trucks. They are used by sales personnel to order the truck, by manufacturing to build that truck, and by parts personnel to service the truck. Many items in this manual are identified by codes.

Feature Codes are a combination of numbers and / or letters. These codes are listed on the Vehicle Line Set Ticket, which is sometimes known as the vehicle specification card or code sheet.

#### Engine Serial Number

The engine dataplate provides the engine serial number as well as other engine information. For the location of this plate and more information about engine components and engine identification, refer to the applicable Engine Operation and Maintenance Manual.

#### Line Set Ticket

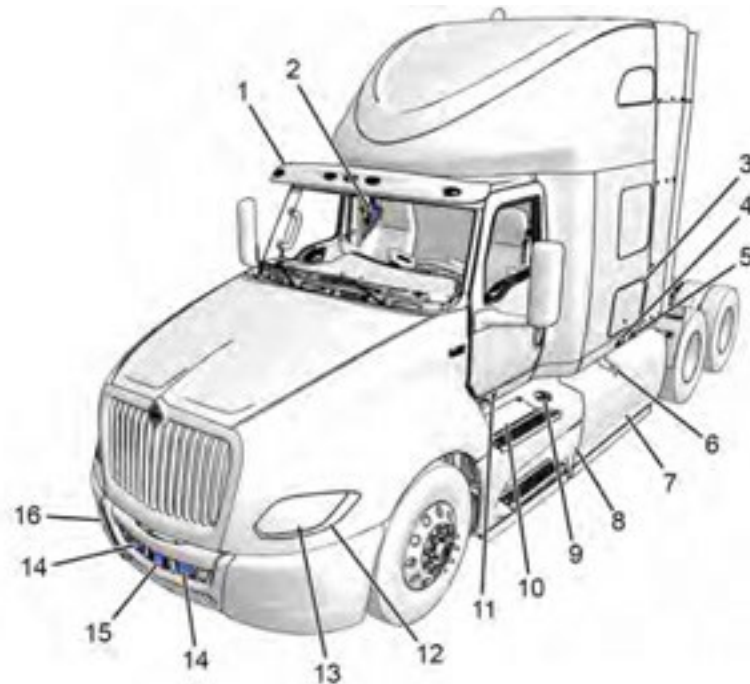
**NOTE: Be sure to return Line Set Ticket to vehicle after obtaining parts.**

Each vehicle is provided with a Line Set Ticket (code sheet), which lists identification code numbers of component units used to build the vehicle.

One copy of the Line Set Ticket is included in the literature provided with the vehicle. When replacement parts are required, take this copy with you to positively identify vehicle components and be sure of getting the correct parts.

## Exterior Components

### Front View: LT® Series — Long Sleeper



0000407061

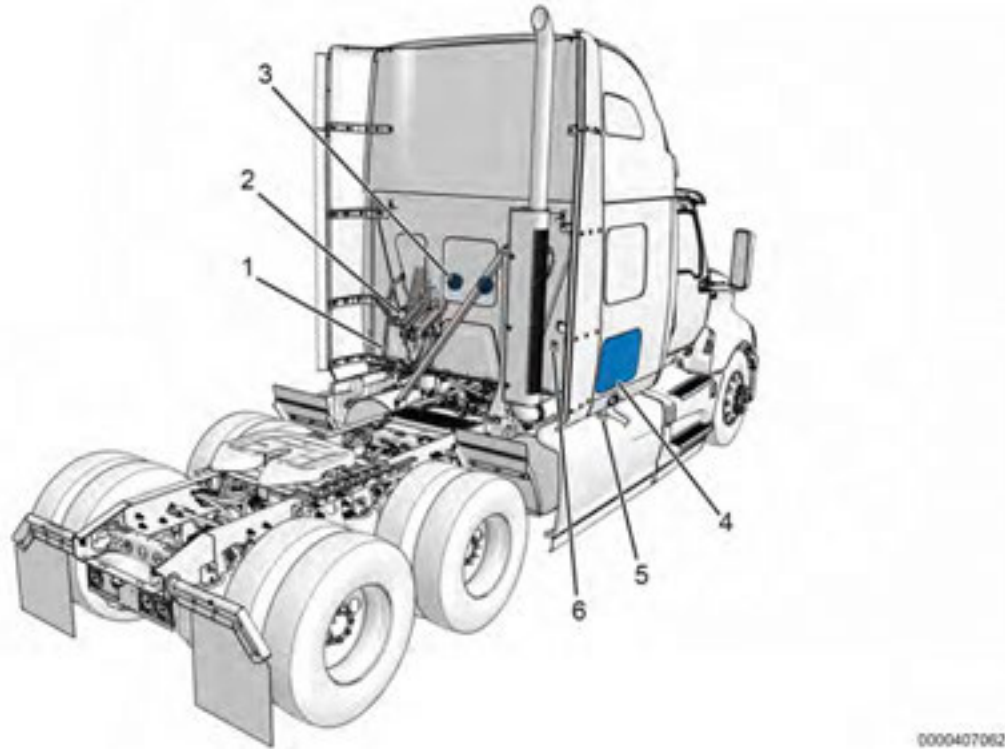
- |                                                     |                                        |                                                      |
|-----------------------------------------------------|----------------------------------------|------------------------------------------------------|
| 1. Sunshade (optional)                              | 6. Fuel cap                            | 12. Side marker / turn light                         |
| 2. Camera (optional)                                | 7. Chassis skirt (rear)                | 13. Headlight                                        |
| 3. Luggage door                                     | 8. Chassis skirt (front)               | 14. Fog light (2) (optional)                         |
| 4. External hookups for telephone and TV (optional) | 9. Diesel Exhaust Fluid (DEF) tank cap | 15. Radar for collision mitigation system (optional) |
| 5. External electrical hookup (shore power)         | 10. Access panel                       | 16. Bumper                                           |
|                                                     | 11. External hookup for block heater   |                                                      |



## Model Description

---

### Back View: LT® Series — Long Sleeper



- 1. Grab handle
- 2. Gladhand storage bracket

- 3. Work light (2)
- 4. Luggage door

- 5. Fuel cap
- 6. In-transit heat (optional)

## Cab Entry and Exit



### **WARNING**

To personal injury and / or death, or damage to property, do not step or climb upon any vehicle surface unless it is slip resistant and a handhold is provided.



### **WARNING**

To prevent personal injury and / or death, or damage to property, a three-point stance should be used (three out of four extremities should be in contact with the vehicle climbing system) at all times. Face inward towards the cab when entering and exiting. Always keep steps and handholds in continuous good repair. Make sure all attaching bolts and hardware are tight, thus eliminating any movement of steps and handholds. Keep steps, grab handles and shoes free of grease, mud, dirt, fuel, ice and snow. Use extra care during inclement weather.

## Hood

### Raising the Hood



1. Hood
2. Hood restraining shock
3. Cowl
4. Hood latch
5. Hood handle



### **WARNING**

**To personal injury and / or death, or damage to property, never put any part of your body beneath a raised hood unless the hood is all the way forward in its range of motion and is fully settled in the over center position.**



### **CAUTION**

**To prevent damage to the windshield wipers, return them to their normal position before opening or closing hood.**



### **CAUTION**

**To prevent damage to the hood and / or painted surfaces, use the following procedure.**

**NOTE: To avoid pinching, do not lift or lower the hood from the side.**

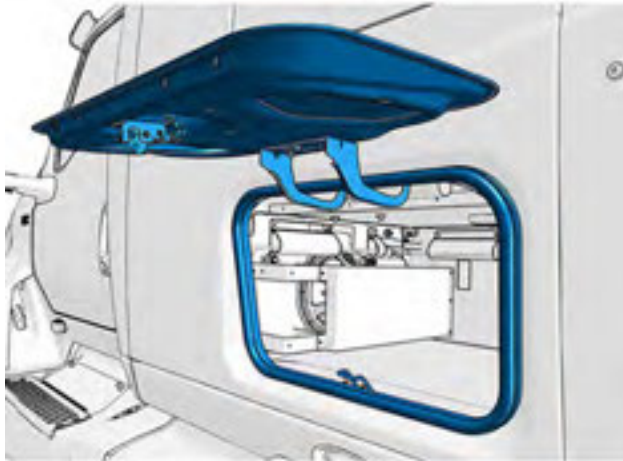
1. Before opening the hood make sure that there is enough room in front of the vehicle for the hood to open completely without pinning or pinching yourself between the hood and any other structures.
2. Release the latches on both sides of the cowl.
3. With both feet firmly on the ground, grasp the hood handle, pull the hood forward over center, and allow it to settle into the raised position.
4. Make certain that the hood restraining shock is fully extended before releasing hood.

### **Lowering the Hood**

1. Make sure that the hood has no tools, parts, or people in its path of motion.
2. Place both hands on the top edge of the grille, push the hood backward over center, and allow it to settle into lowered position.
3. Engage hood latches at both sides of cowl.

### Luggage Box Access

#### Driver-Side



0000406115

**NOTE:** Driver-side and passenger-side luggage boxes open in the same manner.

**NOTE:** Luggage box doors automatically lock when closed. Make sure you do not accidentally place and lock keys in the luggage box.

Open the luggage box door using the ignition / door key. The door will remain in a fully opened position. To close the door, firmly push the door down and into the locked position. The door will automatically lock when shut.

### Chassis Skirts

The optional chassis skirts on the International® LT® Series trucks are available to provide improved aerodynamics.

**NOTE:** If your vehicle is equipped with chassis skirts, they will be bolted on chassis skirts; you do not need to remove the chassis skirts to access the battery box. Just locate the plastic panel (battery door) behind the upper step above the front driver-side skirt.



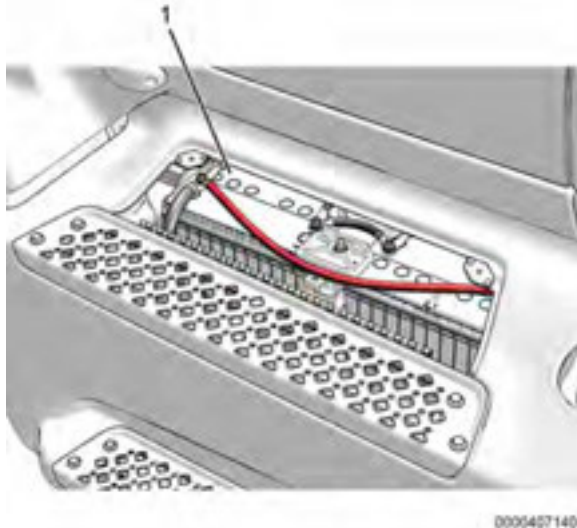
0000406116

1. Battery access

## Model Description

---

**NOTE:** Pull the battery access door knobs to release the magnetic hold on the knobs, and lift up the battery door to access the battery box. See the following illustration for reference.



1. Battery access

### Extended Chassis Skirts (If Equipped)

Optional extended chassis skirts are available for the LT® and RH™ Series trucks with sleeper and full aero package. While the passenger-side extended chassis skirt is stationary, the driver-side skirt opens to allow access to the deck ladder. To open, pull out on the upper right-hand corner of the extended chassis skirt and open to its full extension. To close, grab the upper right-hand corner of the extended chassis skirt and guide it to its fully closed position.

## SECTION 3 — INSPECTION GUIDE

### Introduction

#### General Information



#### WARNING

To prevent personal injury and / or death, or damage to property, when servicing the vehicle, park on a flat level surface, set the parking brake, turn the engine off, and install wheel chocks.



#### WARNING

To prevent personal injury and / or death, or damage to property, exercise care when working on vehicles with running engines that are equipped with an automatic fan clutch. The fan engages when engine coolant reaches a predetermined temperature or the refrigerant pressure (if equipped with air conditioning) reaches a predetermined setting. The fan will start with no advance warning.



#### WARNING

To prevent personal injury and / or death, or damage to property, if vehicle is equipped with an automatic transmission, have a qualified technician regularly check operation of transmission neutral start switch. If unit starts in gear, the vehicle may inadvertently move.

To be sure your vehicle is ready to operate, conduct a pre-trip inspection at the beginning of each work period. This section gives the operator suggested guidelines to be used in performing tractor and trailer pre-trip inspections. Safety is the most important and obvious reason for doing a pre-trip inspection. Depending on the optional features of the vehicle being used and any possible aftermarket items installed on the vehicle, these guidelines should be modified to include other necessary inspection points. Follow the steps in this section and check them off to ensure a proper vehicle inspection procedure. The pages in this section may be reproduced locally and used on a regular basis.

If any component or system does not pass this inspection, it must be corrected before operating the vehicle. Take your time going through the pre-trip inspection. Remember that a careful pre-trip inspection saves time by eliminating unscheduled stops to correct a faulty item.

Illustrations in this section identify key locations of inspection items. The illustrations herein are typical and may not represent all engine applications.

### Tractor Inspection

#### Preparation

**NOTE: Perform the following procedures prior to conducting the pre-trip inspection.**

1. Set parking brake.
2. Turn on parking lights and hazard lights.
3. Unhook the hood latches, raise the hood, unlatch and lower the optional tilt-away bumper.
4. Check under the vehicle for oil, fuel, or other fluid leaks, or other signs of damage.
5. Use pull cables or open drain cocks to allow air tanks to expel any existing water. Release pull cables or close drain cocks.
6. Install wheel chocks on tractor and trailer, if attached.
7. Start the engine and allow the air pressure to build up to normal operating pressure of 115 - 130 psi (793 - 896 kPa). Turn engine OFF.

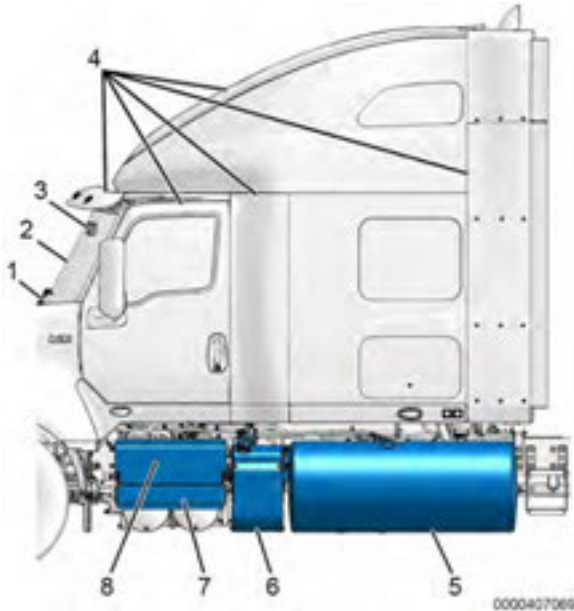
#### Exterior Lights Check

Perform an automatic check of all exterior lights by doing the following steps:

1. Place the ignition key in the ON or ACC position, place the transmission in Neutral (N), and set the parking brake.

2. Press the WORK LIGHT switch for approximately two seconds before releasing to activate this feature.
3. The exterior light check will now cycle all vehicle lights except the backup light(s). The test flashes the exterior lights ON and OFF in three, 2-second cycles. The first 2-second period illuminates parking lights (clearance, identification, side marker, and license plate lights), turn signal lights, low beam headlights, and fog lights. The second 2-second period illuminates parking lights (clearance, identification, side marker, and license plate lights), high beam headlights, brake lights, and work lights. The third 2-second period turns OFF all lights. This cycle repeats until deactivated by the operator.
4. Walk around vehicle and inspect illumination of lights.
5. To cancel this feature, do one of the following: press the brake pedal, manually turn on any external light, turn the key to OFF, or release the parking brake. The feature will automatically cancel approximately 10 minutes after activation if not deactivated by the operator.
6. To check the backup lights, there need to be two people. Keep the engine running. Depress the clutch (if applicable) and select reverse while the second person observes backup light operation.

### Left-Side Cab Area



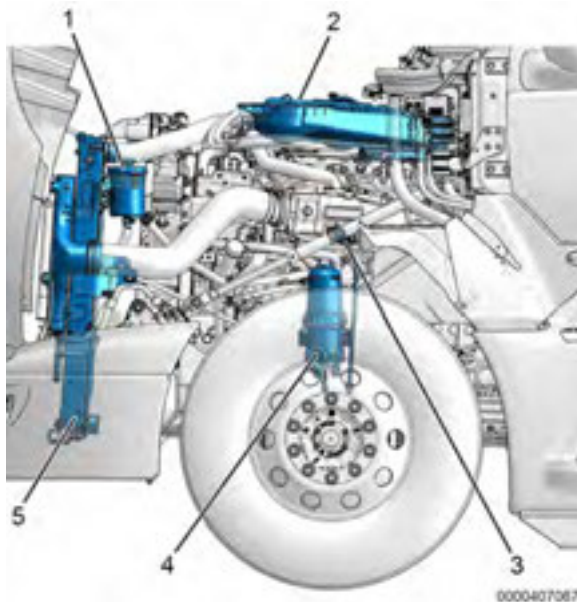
**NOTE:** To access the battery box, find the plastic panel (battery door) behind the upper step under the left-side cab, release the latches, and lift up the battery door.

### Inspection Items

1. Wipers: Check windshield wiper arms for proper spring tension and wiper blades for damage.
2. Windshield: Check for damage to windshield and clean if dirty.
3. Camera: Inspect for damage and secure mounting.
4. Cab structure: Check body panels such as doors, fairings, air shield, sunshade, and cab extenders for signs of breaks or damage. Check condition of cab mounting brackets and tilt hood latches.
5. Fuel tank(s): Check to see that the fuel tank(s) and cap(s) are secured and make sure there are no leaks or damage at the tank(s) or fuel lines.
6. Diesel Exhaust Fluid (DEF) tank: Check to see that the DEF tank and cap are secured and make sure there are no leaks or damage at the tank, DEF lines, or coolant lines.
7. Battery box: Inspect for damage and secure mounting of battery box. Remove battery box cover.
8. Batteries and cables: Check that batteries are secured and cases are not broken or leaking. Ensure cables are free from damage. Tops of batteries and terminals must be clean and free from foreign material. Replace battery box cover.



### Left-Side Engine Compartment

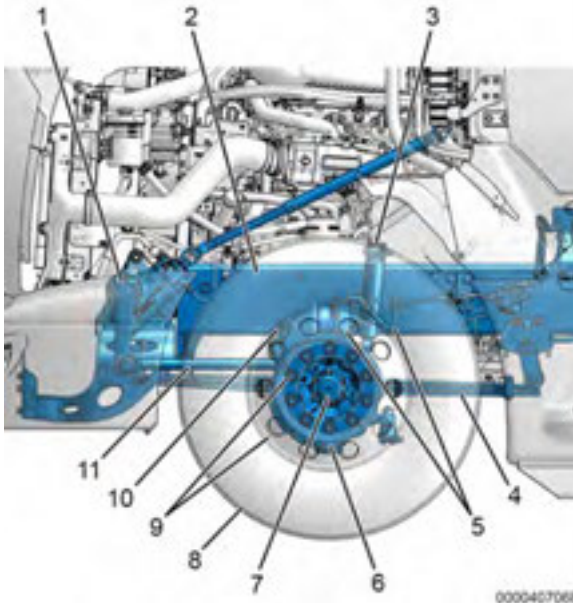


1. Power steering fluid: Verify that the fluid level is between the COLD and HOT (as applicable) MIN and MAX marks.
2. Air cleaner: Check air cleaner element, housing, and hoses for loose connections or damage. Check air filter restriction gauge for restriction reading. For element replacement, see **Air Cleaner Element Service** in the **Maintenance Instructions** section.
3. Oil level: Use dipstick to verify that the oil level is between the MAX and ADD marks.
4. Fuel / water separator: Check sight globe (if Davco® equipped, inform maintenance personnel if fuel level is at top of globe, which is an indication that the filter is due for replacement) and drain into cup periodically. Inspect for presence of water, and drain water as necessary. Check for leaks.
5. Radiator and charge air cooler: Check for loose mounting and damage. Inspect condition of all hoses for damage, cracks, and leaks. Inspect for foreign material on face of cooling package. Carefully brush away collected materials without bending cooling fins to maintain proper airflow through cooling package.

**NOTE: Check air lines and electrical wiring for proper security, and for damage, and chafing. Listen for audible air leaks.**

**NOTE: Check for signs of fluid puddles under vehicle, or wet components in the engine compartment.**

### Left-Side Front of Tractor



#### **WARNING**

To prevent personal injury and / or death, or damage to property, do not operate vehicle if there is loss of steering or suspension, which could cause loss of vehicle control, which could cause loss of vehicle control.



#### **WARNING**

To prevent personal injury and / or death, or damage to property, if wheels or tires must be changed, obtain expert tire service help. Mounting and demounting of tires should only be performed by qualified personnel using necessary safety procedures and equipment.

**NOTE:** Retread tires are not recommended for use on steering axles of trucks.

1. Steering gear: Look for missing or loose fasteners, power steering fluid leaks, and damage to power steering hoses.
2. Frame: Check for cracks or bends in frame. Make sure there are no loose, cracked, bent, broken or missing crossmembers or crossmember fasteners.
3. Shock absorber: Check for cracks, leaks, and missing or broken mounting bolts or bushings.
4. Spring suspension: Check condition of spring for cracks, breaks, or shifting. Inspect spring hanger fasteners, shackles, U-bolts, and nuts for wear, damage, and tightness.
5. Brake chamber and hoses: Check to see that the brake chambers are not cracked or damaged, and are securely mounted. Check for broken, loose or missing parts. Check for cracked, worn or frayed hoses, and for secure couplings.

6. Brake lining and drum: With brakes released, check to see that brake linings (where visible) are not worn excessively thin (less than 1/4 inch [6 mm]) or contaminated by lubricant.
7. Hub: Check for obvious leaks on outside or inside of wheel. Verify correct oil level in hub.
8. Tire: Check tread depth and tire inflation, and note if tread is evenly worn. Minimum tread depth is 4/32 inch (3 mm) on steering tires. Look for cuts or other damage to the tread or sidewalls. Check for missing, broken or damaged valve cap and stem.
9. Wheel and lug nuts: Check for damaged or bent wheel. Check to see that all lug nuts are present and not loose (look for rust trails around nuts). Ensure that no cracks or damage are present at wheel mount holes.
10. Slack adjuster: Check slack adjuster and chamber push rod travel. When pulled by hand, push rod should not move more than approximately 1 inch (25 mm). Angle between push rod and adjuster arm should be approximately 90 degrees when brakes are applied.
11. Steering linkage: Inspect connecting links, arms, rods, and steering intermediate shaft for worn, damaged, loose, or missing components.

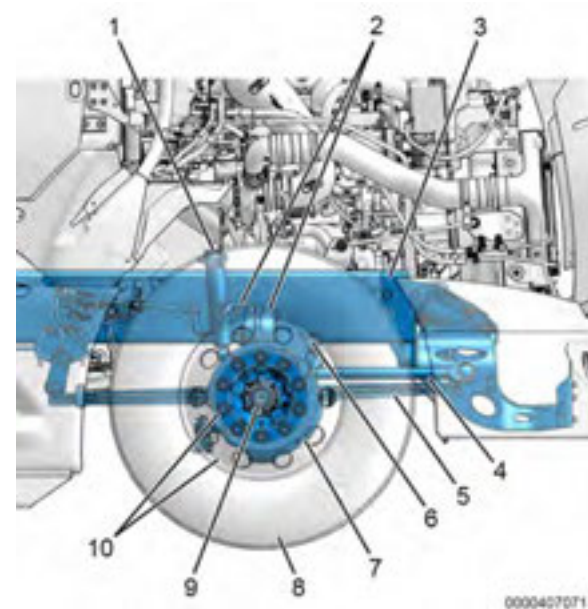
### Front of Tractor



1. Camera: (optional) Inspect for damage and secure mounting.
2. Lighting system: Lower hood and inspect parking, clearance, identification lights, turn signals, fog lights, and reflectors on hood, bumper, and cab. They should be clean, operational, and the proper color.

3. Grille: Inspect for damage and security. Check bug screen for damage and cleanliness.
4. Headlights: Lenses should be clean. If equipped, check daytime running lights.
5. Bumper: Inspect for damage and security.
6. Collision warning / safety system front sensor (if equipped): Check for damage and proper mounting. Ensure sensor's view is clear of mud, dirt, ice, or any material or objects.
7. Hood and fenders: Check hood panels and fenders for signs of breaks or damage. Ensure hood opens and closes properly.

### Right-Side Front of Tractor



### WARNING

To prevent personal injury and / or death, or damage to property, if wheels or tires must be changed, obtain expert tire service help. Mounting and demounting of tires should only be performed by qualified personnel using necessary safety procedures and equipment.



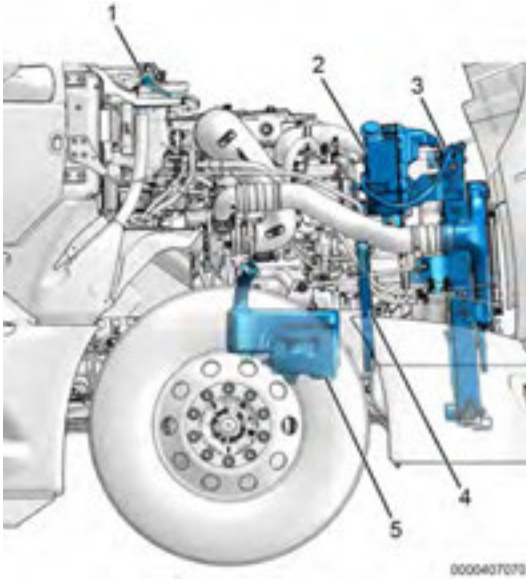
### WARNING

**To prevent personal injury and / or death, or damage to property, do not operate vehicle if there is loss of steering or suspension, which could cause loss of vehicle control.**

**NOTE: Retread tires are not recommended for use on steering axles of trucks.**

1. Shock absorber: Check for cracks, leaks, and missing or broken mounting bolts or bushings.
2. Brake chamber and hoses: Check to see that the brake chambers are not cracked or damaged, and are securely mounted. Check for broken, loose or missing parts. Check for cracked, worn or frayed hoses, and for secure couplings.
3. Frame: Check for cracks or bends in frame. Make sure there are no loose, cracked, bent, broken or missing crossmembers or crossmember fasteners.
4. Steering linkage: Inspect connecting links, arms, and rods for worn, damaged, loose, or missing components.
5. Spring suspension: Check condition of spring for cracks, breaks, or shifting. Inspect spring hanger fasteners, shackles, U-bolts, and nuts for wear, damage, and tightness.
6. Slack adjuster: Check slack adjuster and chamber push rod travel. When pulled by hand, push rod should not move more than approximately 1 inch (25 mm). Angle between push rod and adjuster arm should be approximately 90 degrees when brakes are applied.
7. Brake lining and drum: With brakes released, check to see that brake linings (where visible) are not worn excessively thin [less than 1/4 inch (6 mm)] or contaminated by lubricant.
8. Tire: Check tread depth and tire inflation, and note if tread is evenly worn. Minimum tread depth is 4/32 inch (3 mm) on steering tires. Look for cuts or other damage to the tread or sidewalls. See if valve caps and stems are missing, broken or damaged.
9. Hub: Check for obvious leaks on outside or inside of wheel. Verify correct oil level in hub.
10. Wheel and lug nuts: Check for damaged or bent wheel. Check to see that all lug nuts are present and not loose (look for rust trails around nuts). Ensure that no cracks or damage are present at wheel mount holes.

### Right-Side Engine Compartment



#### WARNING

To prevent personal injury and / or death, or damage to property, use only the following procedure to remove the pressure cap from the radiator or expansion tank. Allow the engine to cool first. Wrap a thick, heavy cloth around the cap. Unscrew the cap slowly to allow pressure to release from under the cap. After the pressure has been released, the pressure cap may be removed.

1. Cowl vent: Ensure air inlet cover is free of dirt and debris.
2. Coolant level: Do not remove pressure cap unless coolant is cool. Ensure fluid level is between the minimum and maximum fluid level range as marked on the plastic translucent reservoir.
3. Radiator and charge air cooler: Check for loose mounting and damage. Inspect condition of all hoses for damage, cracks, and leaks. Inspect for foreign material on face of cooling package. Carefully brush away collected materials without bending cooling fins to maintain proper airflow through cooling package.
4. Drive belts: Inspect all belts for frays, cracks, loose fibers, or visible signs of wear. With engine off, press on all belts to test for proper belt tensioner performance.
5. Windshield washer fluid level: Inspect the reservoir and see that the fluid level is enough to accomplish the upcoming mission. See Lubricant and Sealer Specifications chart, in the **Maintenance Intervals and Specifications** section, for the correct fluid type before filling. Do not use water in freezing climates.

**NOTE:** Check air lines and electrical wiring for proper security, damage, and chafing. Listen for audible air leaks.

**NOTE:** Check for signs of fluid puddles under vehicle or wet components in the engine compartment.

### Right-Side of Cab



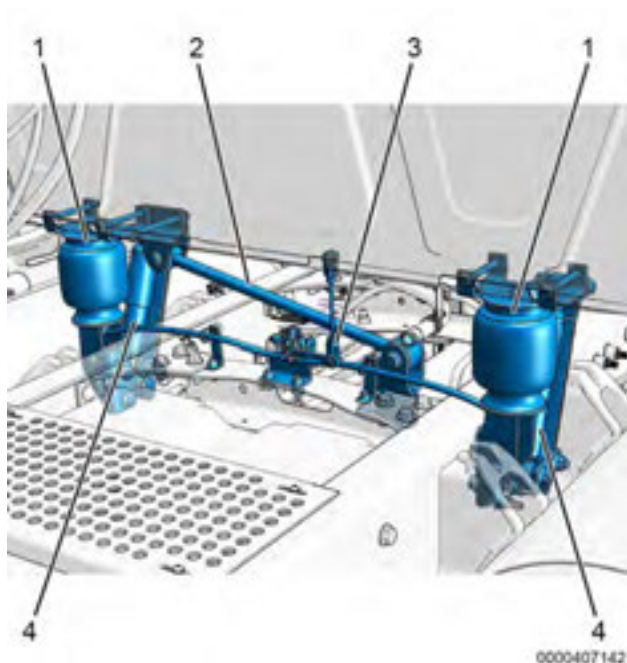
### WARNING

To prevent personal injury and / or death, or damage to property, maintain adequate clearance between all parts of the exhaust system and all hoses, wires and lines for engine cooling, brake system, fuel system, power steering system and electrical system. Heat damage to hoses, wires may cause vehicle malfunction.

1. Cab structure: Check body panels such as doors, fairings, air shield, and cab extenders for signs of breaks or damage. Check condition of cab mounting brackets and tilt hood latches.
2. Fuel tank: Check to see that the fuel tank and cap are secured and make sure there is no damage or leaks at the tank or fuel lines.



## Rear of Cab



1. Air suspension (2)
2. Torsion bar
3. Height control valve
4. Shock absorber (2)

### WARNING

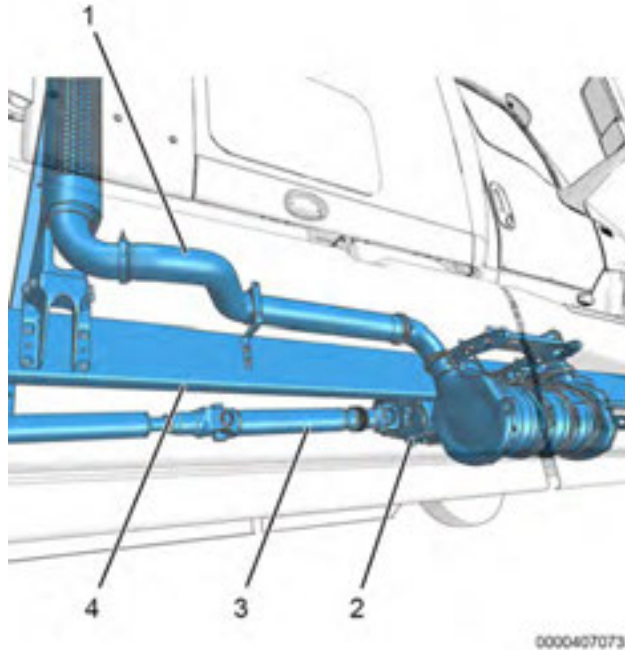
To prevent personal injury and / or death, or damage to property, maintain adequate clearance between all parts of the exhaust system and all hoses, wires and lines for engine cooling, brake system, fuel system, power steering system and electrical system. Heat damage to hoses, wires may cause vehicle malfunction.

### WARNING

To prevent personal injury and / or death, or damage to property, check for air leaks, loose components, and damage to air bag within the cab and suspension systems.



### Right-Side Under Vehicle



### WARNING

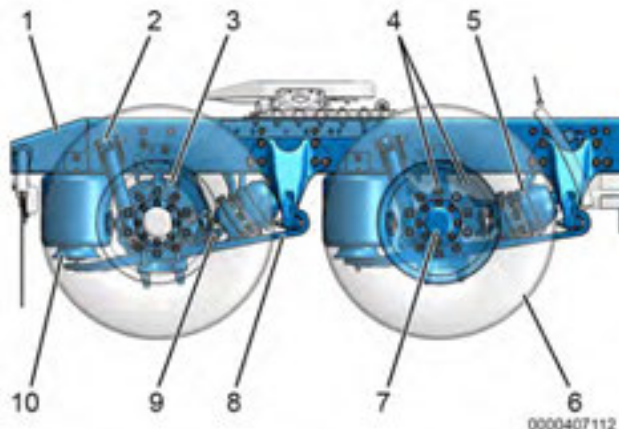
To prevent personal injury and / or death, or damage to property, maintain adequate clearance between all parts of the exhaust system and all hoses, wires and lines for engine cooling, brake system, fuel system, power steering system and electrical system. Heat damage to hoses, wires, or lines may cause vehicle malfunction.

**NOTE:** The illustration is for reference only and may differ from the actual vehicle.

1. Exhaust system: Check to see that all component parts are securely mounted and no cracks, holes, or severe dents are visible. Evidence of soot buildup around clamps or connections is a clear indicator of a leak being present. Ensure that all hoses, wires, and air lines are secured away from exhaust components.
2. Transmission: Inspect for leaks.
3. Drive shaft: Ensure that all shaft couplings are secure.
4. Frame: Check for cracks or bends in frame. Make sure there are no loose, cracked, bent, broken or missing crossmembers or crossmember fasteners.

**NOTE:** Check air lines and electrical wiring for proper security, damage, and chafing. Listen for audible air leaks.

### Right-Side Rear of Tractor



#### **WARNING**

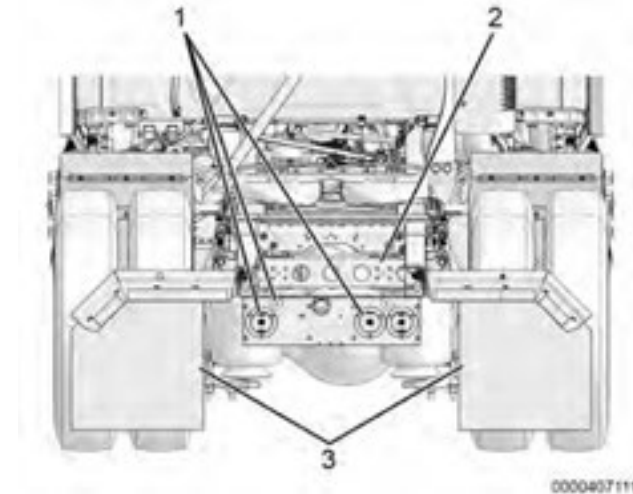
To prevent personal injury and / or death, or damage to property, if wheels or tires must be changed, obtain expert tire service help. Mounting and demounting of tires should only be performed by qualified personnel using necessary safety procedures and equipment.

1. Frame: Check for cracks or bends in frame. Make sure there are no loose, cracked, bent, broken, or missing crossmembers or crossmember fasteners.
2. Torque rods and shock absorbers: Check to see that torque rods are not cracked, broken, or missing. Check shock absorbers for cracks or leaks. There should be no missing or broken mounting bolts or worn bushings.
3. Brake lining and drum: With brakes released, check to see that brake linings (where visible) are not worn excessively thin (less than 1/4 inch [6 mm]) or contaminated by lubricant.
4. Wheel and lug nuts: Check for damaged or bent wheel. Check to see that all lug nuts are present and not loose (look for rust trails around nuts). Ensure that no cracks or damage are present at wheel mount holes.
5. Brake chamber and hoses: Check for cracked, worn or frayed hoses, and for secure couplings. Check to see that the brake chambers are not cracked or dented and that they are securely mounted. Check for broken, loose or missing parts.

6. Tires: Check tread depth and tire inflation, and note if tread is evenly worn. Minimum tread depth is 2/32 inch (2 mm) on all drive tires. Look for cuts or other damage to the tread sidewalls. See if valve caps and stems are missing, broken, or damaged. Check dual spacing to ensure that dual wheels are evenly separated, and that tires are not touching one another.
7. Hub: Check for obvious leaking on outside or inside of wheel. Inspect axle flanges and wheel seals for leaks and loose mounting hardware or broken items.
8. Spring suspension: Check condition of spring for cracks, breaks, or shifting. Inspect spring hanger fasteners, shackles, U-bolts, and nuts for wear, damage, and tightness.
9. Slack adjuster: Check slack adjuster and chamber push rod travel. When pulled by hand, push rod should not move more than approximately 1 inch (25 mm). Angle between push rod and adjuster arm should be approximately 90 degrees when brakes are applied.
10. Air suspension (if equipped): Check for air leaks, loose components, and damage to air bag. Inspect ride height valve and linkage for damage.

**NOTE: Check air lines and electrical wiring for proper security, damage, and chafing. Listen for audible air leaks.**

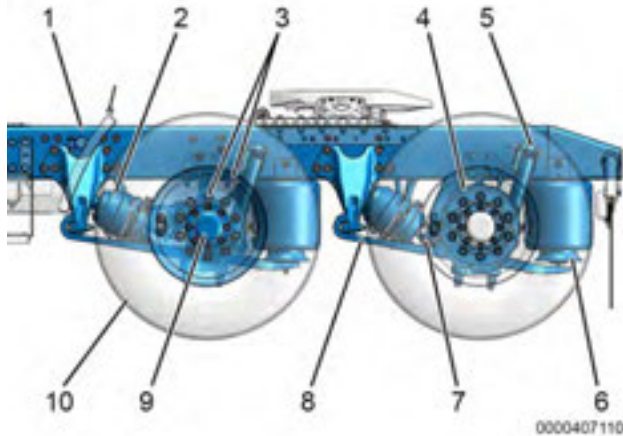
### Rear of Tractor



1. Lights and reflectors: Check to see that reflectors and lights are clean. Make sure none are missing or broken. Rear running lights should be clean, not broken and RED in color.
2. Frame: Check for cracks or bends in frame. Make sure there are no loose, cracked, bent, broken, or missing crossmembers or crossmember fasteners.
3. Mud flaps: Inspect rear mud flaps and mountings for damage and proper security.

**NOTE: Check air lines and electrical wiring for proper security, damage, and chafing. Listen for audible air leaks.**

### Left-Side Rear of Tractor



### WARNING

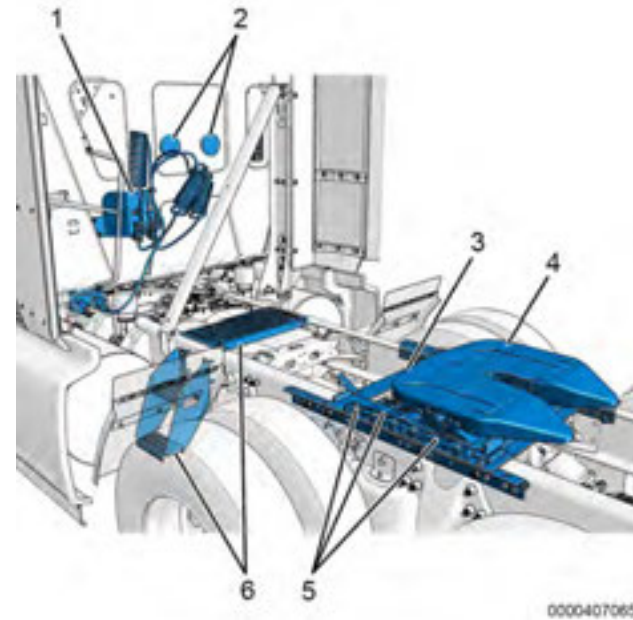
To prevent personal injury and / or death, or damage to property, if wheels or tires must be changed, obtain expert tire service help. Mounting and demounting of tires should only be performed by qualified personnel using necessary safety procedures and equipment.

1. Frame: Check for cracks or bends in frame. Make sure there are no loose, cracked, bent, broken, or missing crossmembers or crossmember fasteners.
2. Brake chamber and hoses: Check for cracked, worn or frayed hoses, and for secure couplings. Check to see that the brake chambers are not cracked or dented and that they are securely mounted. Check for broken, loose or missing parts.
3. Wheel and lug nuts: Check for damaged or bent wheel. Check to see that all lug nuts are present and not loose (look for rust trails around nuts). Ensure that no cracks or damage are present at wheel mount holes.
4. Brake lining and drum: With brakes released, check to see that brake linings (where visible) are not worn excessively thin (less than 1/4 inch [6 mm]) or contaminated by lubricant.
5. Torque rods and shock absorbers: Check to see that torque rods are not cracked, broken, or missing. Check shock absorbers for cracks or leaks. There should be no missing or broken mounting bolts or worn bushings.
6. Air suspension (if equipped): Check for air leaks, loose components, and damage to air bag. Inspect ride height valve and linkage for damage.

7. Slack adjuster: Check slack adjuster and chamber push rod travel. When pulled by hand, push rod should not move more than approximately 1 inch (25 mm). Angle between push rod and adjuster arm should be approximately 90 degrees when brakes are applied.
8. Spring suspension: Check condition of spring for cracks, breaks, or shifting. Inspect spring hanger fasteners, shackles, U-bolts, and nuts for wear, damage, and tightness.
9. Hub: Check for obvious leaking on outside or inside of wheel. Inspect axle flanges and wheel seals for leaks and loose mounting hardware or broken items.
10. Tires: Check tread depth and tire inflation, and note if tread is evenly worn. Minimum tread depth is 2/32 inch (2 mm) on all drive tires. Look for cuts or other damage to the tread and sidewalls. See if valve caps and stems are missing, broken or damaged. Check dual spacing to ensure that dual wheels are evenly separated, and that tires are not touching one another.

**NOTE: Check air lines and electrical wiring for proper security, damage, and chafing. Listen for audible air leaks.**

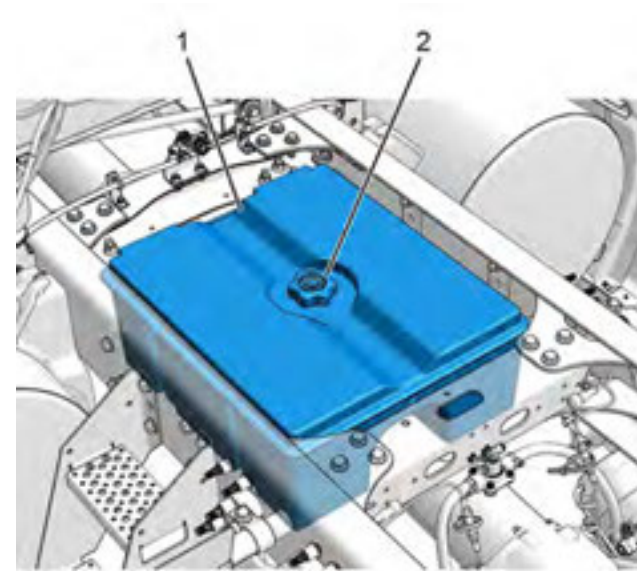
### Fifth Wheel and Coupling Area



1. Trailer coupling cords: Inspect air lines and electrical cord for cuts, chafing, damage, and proper security. Check air lines for audible air leaks.
2. Work light(s): Check operation, and clean as needed.

3. Sliding fifth wheel (optional): Check for loose or missing pins in the slide mechanism. If air powered, check for air leaks. Make sure that fifth wheel is not so far forward that tractor frame or mud flaps will strike trailer landing gear during turns.
4. Lubrication: Make sure that top surface (face) of the fifth wheel has a coat of grease.
5. Mounting bolts and release handle: Look for loose or missing mounting brackets, clamps, bolts or nuts. All locking pins must be in place and free of damage. Ensure that release handle is in the engaged position and the safety latch is functioning and free of damage.
6. Deck plate and access steps: Check to ensure that the deck plate and steps are clean, securely bolted in place, and clear of loose objects.

### Battery Box (Between Frame Rail)



0000407139

1. Battery box cover
2. Release handle

**NOTE: Deck plate(s) may need to be removed to gain access to battery box cover.**

**NOTE: Inspect battery box for damage and secure mounting of battery box. Remove battery box cover using 1/4 turn spring loaded latch.**

**NOTE: Check that batteries are secured and cases are not broken or leaking. Ensure cables are free from damage. Tops of batteries and terminals must be clean and free from foreign material. Replace battery box cover.**

### Cab Interior Inspection

1. Safety / emergency equipment: Prior to entering cab, verify that vehicle is equipped with the proper equipment. Walk around vehicle and check that all steps and grab handles, inside and out, as well as behind, are tight and clean. Use extreme caution and maintain 3-point contact at all times.
2. Doors: Check door latches for positive closing, latching, and locking.
3. Clutch / gearshift: Depress clutch pedal (if present) and verify transmission is in Neutral before turning on starter; keep depressed until engine reaches idling speed and vehicle is in Neutral.
4. Oil pressure builds: Check to see that oil pressure is building to a normal level. Engine oil pressure gauge should begin a gradual rise to normal operating range.
5. Low air alarm: The low air pressure alarm may sound immediately after the engine starts but before the air compressor has built up minimum 55 psi (379 kPa) pressure. The low air pressure alarm should stop when the air pressure reaches 60 - 76 psi (414 - 524 kPa). Let the air pressure build to governor cut-out pressure, which should occur between 115 and 130 psi (793 - 896 kPa).
6. Accelerator: Depress accelerator pedal and verify that it operates smoothly without any binding or irregular feel. Remove foot from accelerator and make sure engine returns to idle immediately.
7. Voltmeter: Check the gauge to see if the alternator is charging between 12.5 and 14.5 volts.
8. Steering play: Check for smooth operation. Check for excessive looseness in the steering linkages. The steering wheel should have less than 10 degrees free play (approximately 2 inches at rim of 18-inch steering wheel).
9. Seats: Be sure seats are firmly engaged to avoid forward or rearward movement when starting or stopping. Make sure that seats and tether straps are free from damage and secured to floor.
10. Horn(s): Check to see that horn(s) operate properly.
11. Mirrors: Check mirrors for proper adjustment, damage, cleanliness, and proper mounting. Check optional power mirrors and optional heated mirrors for proper operation if equipped.

12. Doors: Ensure windows are clean and operate properly and smoothly in both doors.
13. Windshield and wipers: Check windshield for cracks, dirt, illegal stickers or other obstructions to view. Ensure wipers and windshield washer are functioning properly.
14. Lighting indicators: Check to see that instrument panel indicators illuminate when corresponding lights are turned on.
15. Heater / defroster: Check to be sure that heater / defroster is working. Verify adequate air flow from louvers and vents. Operate temperature and mode controls to verify proper operation.
16. Air brake check: Check the air brakes in the following manner:
  - a. Install wheel chocks if necessary. Push in parking brake and start engine.
  - b. Check for air compressor or governor cut-out pressure at 125 - 135 psi (862 - 931 kPa). Shift into a low gear, and gently pull against service and parking brakes separately to make sure they hold.
  - c. Turn engine OFF and turn ignition back ON.
  - d. Without brake pedal applied, note air pressure drop for one minute. It should be less than 2 psi (14 kPa).
  - e. Depress and hold brake pedal and ensure pressure drops no more than 3 psi (21 kPa) per minute. For combination vehicles, there should be no more than 4 psi (28 kPa) per minute pressure drop.
  - f. Step on and off brake pedal and check that warning indicator and alarm come on at about 60 - 76 psi (414 - 524 kPa).
  - g. Step on and off brake pedal and check to make sure the parking brake knobs pop out from 20 - 45 psi (138 - 310 kPa).



## SECTION 4 — CONTROLS / FEATURES

### Introduction

#### General Information

The controls / features enable the driver to monitor and manage the operation of the majority of the vehicle's functions. This section describes and identifies various components within the overhead console, electronic gauge cluster, center dash panel / wing panel, steering column and switches, steering wheel controls, door and window controls, collision warning / safety systems, and electronic touchscreen.

#### Electrical



#### **WARNING**

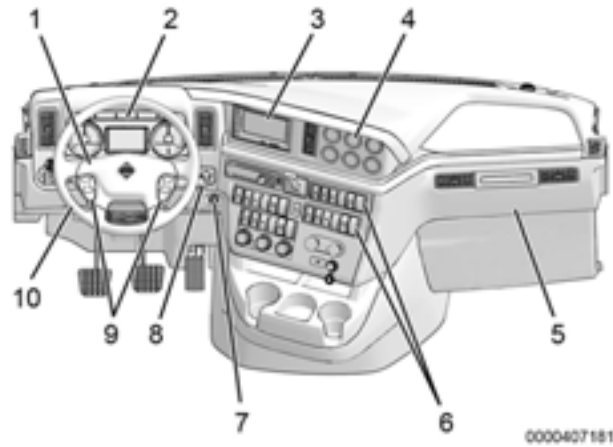
**To prevent personal injury and / or death, or damage to property, read and understand the appropriate manual for the specific equipment in question before operating. This vehicle may be equipped from the factory with electrical switches intended to operate equipment that was installed by a Truck Equipment Manufacturer (TEM). Instructions, Cautions, and Warnings for this additional equipment will NOT be found in this manual.**

**NOTE:** This vehicle may be equipped with electronic, application-specific options not described in this operator manual. Many of these features are supplied with rocker switches that have custom labels applied. The presence of these options as factory installed can be verified from the Line Set Ticket included with the vehicle. A TEM, however, may have installed some of these options after production. In that case, they will not appear on the Line Set Ticket. If installed by a TEM, you should receive an operating guide and / or training for the specific functions provided. Familiarize yourself with all of the switches that control chassis, engine, and body equipment and seek adequate training on the function of all features before operating this vehicle.

#### Electrical System

The electrical system provides a means to distribute the electrical power and provide the driver with controls and indications of vehicle performance. Unlike previous electrical systems, this system uses multiplexing for connecting to major functional areas of the truck with much less wiring. The system is controlled by the body controller, which provides interfaces to a majority of vehicle switches and sensors. The body controller also communicates with the standard and optional system controllers and modules in the vehicle.

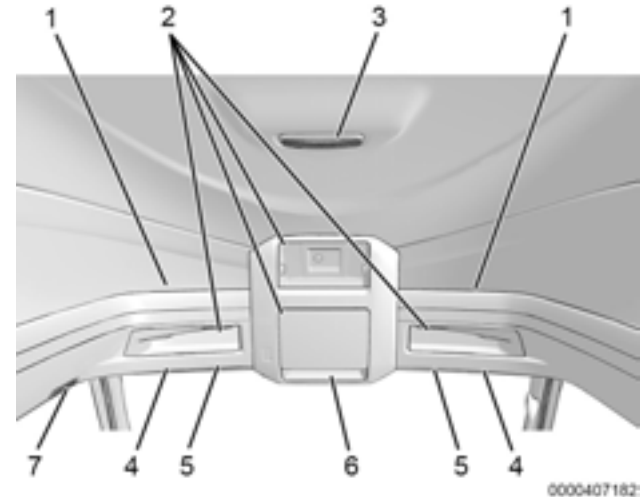
### Dash Components



1. City horn
2. Electronic Gauge Cluster
3. Storage / Infotainment unit (optional)
4. Gauge or switch panel (optional)
5. Glove box
6. Center control panel
7. Ignition
8. Premium cluster display control
9. Steering wheel switch (2)
10. Steering wheel

### Overhead Console

The overhead console contains storage area for the operator and other items for driver comfort.



1. Overhead storage and lock box (optional)
2. Storage compartment
3. Cab dome lighting
4. Sun visor (2)
5. Map light (2)
6. CB radio and telematics module location (if equipped)
7. Air horn

## **Base Electronic Gauge Cluster Overview**



### **CAUTION**

**To prevent damage to property / component, do not use cleaning products and / or window cleaners containing isopropyl alcohol to clean the lens of the electronic gauge cluster. Only use cleaning products and / or window cleaners that are detergent-based or ammonia free. Cleaning products and / or window cleaners that are alcohol-based may cause lens cracking.**

**NOTE:** If your vehicle is equipped with an electronic gauge cluster, refer to the Electronic Gauge Cluster Operation and Maintenance Manual.

**NOTE:** Certain pop-up alerts may appear on the screen when conditions apply. These alerts will not disappear until the operator has acknowledged the message; for more information, refer to the Electronic Gauge Cluster Operation and Maintenance manual.

The cluster display is an informational screen that is set up to display numerous functions, alerts, and indicators. The purpose of this cluster screen is to increase the operation, safety, and driver productivity, while reducing breakdowns and downtime. This cluster is comprised of analog gauges, indicators, and an information screen.

### **Gauges**

There are eight gauges in the electronic gauge cluster to help monitor the vehicle while in service. Most gauges have in-gauge warning indicators that turn on if the gauge pointer moves into an out-of-acceptable-range condition. When the ignition switch is turned on, the gauge indicators will be on. If any indicator fails to go out after starting engine, stop engine and determine cause of the gauge indication that is out of acceptable range. Metric versions of the gauges and speedometer are available as an option.

**NOTE:** The image below is an example of a possible gauge configuration and may not resemble the exact gauge configuration in every vehicle.



1. Water temperature gauge
2. Primary air brakes
3. Secondary air brakes
4. Fuel gauge
5. Speedometer
6. Diesel exhaust fluid gauge
7. Cluster display
8. Oil pressure
9. Tachometer

### Controller Operation

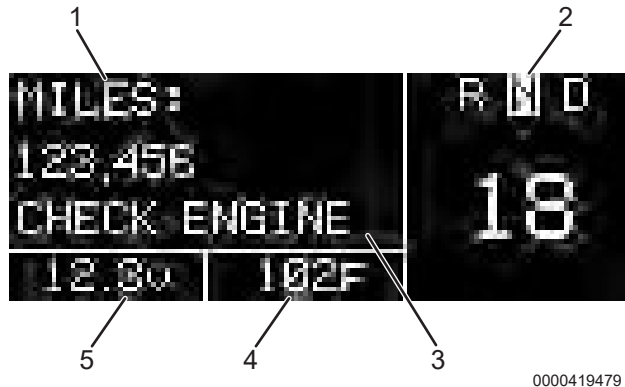
A push button is used to navigate through the different informational screens and alerts. Instructions on how to use the control switch are as follows:

1. To move through the cluster screens, push down on the cluster push button.
2. To bring up a menu, press and hold the push button.
3. To scroll through menu options, click / push down the push button until the desired option is highlighted.
4. To reset any of the trip counters or screens that can be reset, press the button in for 3 seconds or until the screen resets.
5. The units can be changed from miles to kilometers by pushing and holding the push button down while on the odometer screen.

## Screen Layout

### Overview

The cluster display has five sections:



1. Main viewer
2. Transmission information
3. Alerts and messages
4. Ambient temperature
5. Battery voltage

### Main Viewer

The main viewer of the display screen is where the different vehicle information is located.

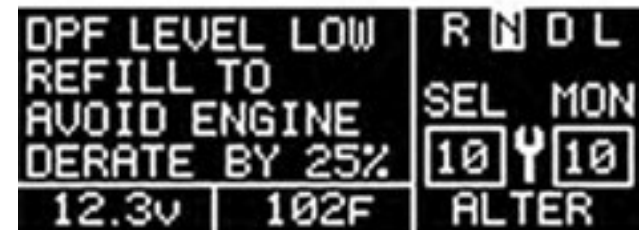
### Pop-ups



### WARNING

**To prevent personal injury and / or death, or damage to property, it is important to pay attention to the alerts as they could affect safety, operation, or productivity of the vehicle.**

The vehicle pop-ups will appear in the main viewer. Once the condition for the pop-up to disappear is reached, the pop-up will disappear and return as an alert.



0000454944

If there are multiple alerts active, then the first alert will be displayed for approximately 5 - 6 seconds before rolling to the next alert. Once all of the alerts have cycled through, the process will start over again.

## Controls / Features

The pop-ups and alerts that appear in the main viewer of the screen are messages to the operator and should not be ignored. Pop-ups and alerts may vary depending on condition. Refer to the following tables for common pop-ups and alerts that may appear on the screen:

**Vehicle Pop-Ups / Alerts**

Alert	Description
CHECK BATTERY VOLTAGE	The battery voltage is getting low and service may be required.
HIGH FORWARD REAR AXLE TEMPERATURE	The forward rear axle temperature is above threshold. Allow vehicle temperatures to cool down during heavy load conditions; if light stays ON consistently, service is required.
HIGH REAR REAR AXLE TEMPERATURE	The rear rear axle temperature is above the threshold. Allow vehicle temperatures to cool down during heavy load conditions; if light stays ON consistently, service is required.
LOAD SHED LEVEL 1	This tracks electrical load when the vehicle is not running, or if there is a problem with the charging system.
LOAD SHED FAULT	There is a fault in the load control; service is required.
CHECK A/C	Check the air conditioning system; service may be required.
SERVICE PARK BRAKE	The parking brake has a malfunction and needs to be serviced.

**Vehicle Pop-Ups / Alerts (cont.)**

Alert	Description
LOW WASHER FLUID	The washer fluid needs to be refilled.
ICY ROAD CONDITIONS	Icy road conditions are possible.
CHECK BODY CONTROLLER MODULE	Vehicle service is required.
CLUSTER FAULT	Vehicle service is required.

**Engine Pop-Ups / Alerts**

Alerts	Description
HIGH COOLANT TEMPERATURE	Coolant temperature is getting too hot; inspect coolant level and fill to proper level if needed. If level is correct, immediate vehicle service is required; do not operate for extended period of time.
LOW OIL PRESSURE	Oil pressure is below specification; inspect oil level and fill to proper level if needed. If level is correct, immediate vehicle service is required; do not operate for extended period of time.
LOW OIL LEVEL	Oil level is below specification; inspect oil level and fill to proper level if needed. If level is correct, vehicle service is required.

Engine Pop-Ups / Alerts (cont.)

Alerts	Description
LOW COOLANT LEVEL	Coolant level is below specification; inspect coolant level and fill to proper level if needed. If level is correct, vehicle service is required.
LOW DEF	Diesel Exhaust Fluid (DEF) is below specification; refill soon.
LOW DEF LV1	Diesel exhaust fluid is below specification; refill DEF tank. Engine performance is decreased by 25%.
LOW DEF LV2	Diesel exhaust fluid is below specification; refill DEF tank. Engine performance is decreased by 40%.
LOW DEF LV3	Diesel exhaust fluid is below specification; refill DEF tank. Engine performance is limited to 5 mph (8 km/h).
DEF QUALITY	The diesel exhaust fluid quality is below threshold; service DEF system soon.
DEF QLTY LV 1	The diesel exhaust fluid quality is below threshold; the engine performance will decrease by 25%. Service DEF system soon.

Engine Pop-Ups / Alerts (cont.)

Alerts	Description
DEF QLTY LV2	The diesel exhaust fluid quality is below threshold; the engine performance will decrease by 40%. Service DEF system soon.
DEF QLTY LV3	The diesel exhaust fluid quality is below threshold; the engine performance will decrease to 5 mph (8 km/h). Service DEF system soon.
SERVICE DPF	The diesel particulate filter (DPF) is full of ash; vehicle service is required.
CHNG ENG OIL	Engine oil change is required.
HIGH EXHAUST SYSTEM TEMPERATURE	This is normal operation when vehicle is under regeneration at low speeds.
HIGH OIL TEMPERATURE	Oil temperature is above specification; allow vehicle temperature to cool down during heavy engine load conditions. If light stays ON consistently, service is required.
WATER IN FUEL	There is water in the fuel system; immediate vehicle service is required.
CHK AIR FILTER	Inspect the air filter for restriction; if restriction is not identified, vehicle service is required.
REGEN NEEDED	Park the vehicle; exhaust regeneration is needed.

### Engine Pop-Ups / Alerts (cont.)

Alerts	Description
STOP VEHICLE	Bring the vehicle to a stop; there is a severe problem; service vehicle immediately.
STOP ENGINE	Stop the vehicle and turn the engine OFF; service vehicle immediately.
CHECK ENGINE	System fault in the engine; vehicle service is required.

### ABS Pop-Ups / Alerts

Alert	Description
BRAKE FLUID	Brake fluid is below specification; service vehicle soon.
CHECK ABS	Check for faults in the ABS system. Service vehicle soon.

### Transmission Pop-Ups / Alerts

Alert	Description
HI TRANS TEMP	Transmission temperature is above specification; allow vehicle temperature to cool down during heavy load conditions. If light stays ON consistently, service is required.
TRANS OIL FILT	Change transmission oil filter; vehicle service is required.

### Transmission Pop-Ups / Alerts (cont.)

Alert	Description
SERVICE TRANS	Transmission service is required; service vehicle soon.
CHECK TRANS	Check the transmission for faults; service vehicle soon.
CHNG TRAN OIL	Transmission oil change is about to be due; service is required soon.
HI RTRD TEMP	The retarder brake assist is over the threshold operating temperature. Allow vehicle temperature to cool down during heavy load conditions; if light stays ON consistently, service is required.
CLUTCH ABUSE	Warning the clutch is being abused and could result in clutch damage.

### Other Pop-Ups / Alerts

Pop-up	Description
WAIT FOR TRANSMISSION TO WARM UP	Wait for the transmission to warm up before putting the vehicle in motion.
PUSH BRAKE PEDAL TO ENGAGE GEAR	In order for the gear to be engaged, push the brake pedal.



Other Pop-Ups / Alerts (cont.)

Pop-up	Description
AUTO NEUTRAL	The Auto Neutral mode is engaged. For more information, see <b>Auto Neutral</b> in the <b>Operation</b> section of this manual.
RETARDER ON	The brake retarder is turned ON.
POWER DIVIDER LOCK ON	The power divider lock is engaged.
FRONT AXLE ENGAGED	The front steer axle 4 x 4 is engaged.
PTO ENGAGED	The Power Take-Off is engaged.
VSL OVRD ACTIVE	The vehicle speed limit override has been activated.
VSL OVRD EXPIRING	The vehicle speed limit override is about to turn OFF.

Other Pop-Ups / Alerts (cont.)

Pop-up	Description
DRIVER REWARD EXPECTED	This is a reward indication that results in higher vehicle speed limits.
DRIVER REWARD GOOD	This is a reward indication that results in higher vehicle speed limits.
DRIVER REWARD EXCELLENT	This is a reward indication that results in higher vehicle speed limits.
DRIVER REWARD PENALTY	This is a penalty indication that results in lower vehicle speed limits.
DRIVER REWARD INCREASING	This informs the operator that vehicle speed limit will increase soon.
DRIVER REWARD DECREASING	This informs the operator that vehicle speed limit will decrease soon.

### *Transmission Information*

The right-side of the viewing screen is designated for transmission information. This information could include but is not limited to: driver selected gear, current gear, service indicator, RND position, transmission secondary display information and special messages from the TCM. When equipped with a manual transmission vehicle speed can be found in this location as well.

### *Menu Items*

There is an option within the cluster display that allows the operator to change the language of the screens. The language can be set to English, Spanish, and French. Instructions on how to change the language are as follows.

1. Click the push button down until the Set Language option appears in the top left of the viewer screen.
2. Press and hold the push button to bring up the language menu.
3. To scroll through the options, click the push button down until the arrow is pointing at the desired language.
4. To select the desired language, leave the arrow pointing at the language until it times out.

### Overview








The electronic gauge cluster contains 25 individual LED warning indicators. These indicators are used to monitor vehicle








operation and indicate a WARNING or STOP condition. They are driven by the software in the electronic gauge cluster. At ignition, these will illuminate for 8 - 10 seconds, as part of the vehicle power-up sequence.














0000410426

## Controls / Features






Lamp #	Warning	Icon	Description
1	Wait to Start		Engine components are warming up; wait till indicator flashes to start engine.
2	DPF		Diesel particulate filter restriction.
3	HEST		High exhaust system temperature.
4	DEF		Diesel exhaust fluid low.
5	Left Turn		Turn signal – left.
6	Protect		Used with other warnings.
7	Transmission Warning		Fault in transmission.

Lamp #	Warning	Icon	Description
8	RSL		Red Stop Lamp; a serious problem has occurred, safely pull over, turn hazard flashers on, stop engine and do not start the engine until after being serviced.
9	MIL		Malfunction Indicator Lamp; service vehicle at the first available opportunity.
10	AWL		Amber Warning Light; service at first available opportunity.
11	Brake Failure		Brake failure (English hydraulic brakes).
11	Brake Failure		Brake failure (English air brakes).
11	Brake Failure		Brake failure (Metric).
12	Parking Brake		Parking brake (English).

Lamp #	Warning	Icon	Description
12	Parking Brake	 <small>0000406031</small>	Parking brake (Metric).
13	Right Turn	 <small>0000406037</small>	Turn signal – right.
14	Traction Control	 <small>0000406033</small>	Traction control is active.  <b>NOTE: Some models were equipped with Battery Voltage indicators in this location.</b>
14	Battery Voltage	 <small>0000406012</small>	Battery voltage is low.  <b>NOTE: The battery voltage indicator can be found in location 14 or location 20 depending on cluster model.</b>
15	Trailer ABS	 <small>0000406041</small>	Trailer antilock brakes.
16	ABS	 <small>0000406010</small>	Antilock Brake Malfunction; service vehicle immediately.

Lamp #	Warning	Icon	Description
17	Electronic Stability Control	 <small>0000406040</small>	Electronic Stability Control; a flashing indicator represents the electronic stability control is engaged, while a solid indicator represents a fault in the system.
18	PTO	 <small>0000406033</small>	Power Take-Off.
19	Seat Belt	 <small>0000406039</small>	Seat belt reminder.
20	Battery Voltage	 <small>0000406012</small>	Battery voltage is Low.  <b>NOTE: Some models were equipped with a SET indicator in this location.</b>
20	Cruise Set (if equipped)	SET <small>0000406017</small>	Cruise control speed is set.
21	Cruise Enabled	 <small>0000406016</small>	Cruise control is active / set.






## Controls / Features

Lamp #	Warning	Icon	Description
22	High Beam	 <small>000406021</small>	High beam lights – ON.
23	Engine Brake	 <small>000406023</small>	Engine brake is active.
24	Idle Shutdown	 <small>000406022</small>	Timer will turn OFF engine in 30 seconds.
25	Differential Lock	 <small>000406027</small>	Differential lock.
N/A	Airbag Readiness Lamp	 <small>0004020888</small>	Illuminates if there is an electrical problem with the airbag system.

**NOTE: If the MIL is illuminated, it is the vehicle owner's responsibility to have the fault repaired or face fines.**

### Direct Drive Warning Indicators

The direct drive warning indicators give information to the operator on various conditions of the vehicle. Eight spaces are available for the direct drive warning indicators located in between the High Beam and Cruise Control indicators. Blank cover plates will be used in spaces that do not have direct drive warning indicators installed at those locations.

Icon	Color	Description
 <small>000406044</small>	GREEN	Upshift requested
 <small>000406025</small>	AMBER	Range inhibited
 <small>000406042</small>	AMBER	Transmission temperature
ECON <small>000406021</small>	GREEN	Economy mode
 <small>000406024</small>	GREEN	Pusher axle
 <small>000406028</small>	GREEN	Message waiting

## Electronic Gauge Cluster Alarms

**WARNING**

To prevent personal injury and / or death, or damage to property, when an alarm sounds, stop normal vehicle operation and determine the source of the alarm condition.

The electronic gauge cluster will sound an audible alarm that accompanies out-of-range gauge readings along with the particular gauge warning lamps. The electronic gauge cluster alarms will also sound when any sensor (sender) unit fails, when there is an electronics system fault, and when the Red Stop Lamp is illuminated. The following chart lists the number of alarm beeps for these conditions or warning states:

Alarm Conditions	Audible Alarm Pattern	Additional Comments
<b>Fuel level gauge</b> low (only alarms on each ignition turn-on)	5 beeps	Electronic gauge cluster warning indicator illuminates.
<b>Sensor / Gauge out-of-range Reading</b>	3 long beeps (Air gauges will have 1 continuous tone)	Electronic gauge cluster warning indicator illuminates.
<b>Loss of Data for Single Gauge</b>	10 short beeps	Electronic gauge cluster warning indicator illuminates.
<b>Diesel Exhaust Fluid (DEF)</b> level low	1 beep	Electronic gauge cluster warning indicator illuminates.
<b>Selective Catalytic Reduction (SCR)</b> system fault	1 beep	Electronic gauge cluster warning indicator illuminates.
<b>Exhaust Diesel Particulate Filter Regeneration</b>	Continuous beeps	Critical soot level.
<b>Gauge sensor faults</b>	5 short beeps	Gauge pointer goes to the Fall position and gauge warning indicator illuminates.
<b>Red Stop</b> Lamp illuminates	Repeating single beep	Indicates what system is requesting the Red Stop Lamp.
<b>Loss of Communication Fault</b>	10 short beeps	Electrical system fault illuminates.
<b>Turn Signal Alarm</b> (Optional)	Continuous tone	Will not activate when hazard flashers are on. Alarm sounds if either turn signal is on for more than one mile.

## Controls / Features

---

Alarm Conditions	Audible Alarm Pattern	Additional Comments
<b>Headlight Warning Alarm</b>	5 beeps	Sounds one time immediately after ignition switch is turned to OFF position, when headlight switch is on, and the driver-side door is closed.
	Repeating single beep	Sounds when headlight switch is on, ignition switch is in OFF position, and the driver-side door is open.
<b>Electrical Load Control and Shedding (ELCS) Alarm</b> (Optional)	Continuous tone	The electronic gauge cluster will display the message Load Shedding in the LCD display and emit a continuous tone for 5 seconds that coincides with the start of the visual alert.
<b>High Exhaust System Temperature (HEST) Alarm</b>	3 beeps	Indicates that the High Exhaust System Temperature (HEST) indicator lamp has illuminated.
<b>CMS Level 5 / Braking too fast</b>	2 fast beeps	Electronic gauge cluster will display a warning screen.
<b>CMS Level 4</b>	Continuous single tone	Electronic gauge cluster will display a warning screen.
<b>CMS Level 3</b>	Continuous short beeps	Electronic gauge cluster will display a warning screen.
<b>CMS Level 2</b>	2 short beeps	Electronic gauge cluster will display a warning screen.
<b>ACC / CMS Level 1</b>	1 short beep	Electronic gauge cluster will display a warning screen.
<b>Lane Departure Imminent</b>	One-time 5 short beeps	Electronic gauge cluster will display a warning screen.
<b>Virtual Pop-ups</b>	3 long beeps	Electronic gauge cluster will display a warning screen.



### *Sleeper Temperature General Text and Warning Messages*



The operator of the vehicle can make adjustments to the sleeper temperature and / or sleeper blower speeds by using the SLPR TEMP and / or SLPR FAN instrument panel switches that are located on the center instrument panel / wing panel. When the operator makes a change with either of these two switches, the appropriate graphic for the sleeper temperature or sleeper blower speeds will be displayed in the general text and warning message area of the electronic gauge cluster.

### **Light Control Module**

On the left-side of the steering wheel is the Light Control Module (LCM). This module contains a light multi-switch for the fog lights, headlights, parking lights, and the option for rear fog lights. The rear fog lights are not standard on all models; the image below depicts a premium LCM.

Configurations are optional. Blank cover plates will be used in spaces that do not have switches installed at those locations. The LCM can be configured with any of the switch options from the center control panel, but the most common switches pertain to lighting.



1. Headlight OFF
2. Parking light
3. Headlight ON
4. Panel dimmer wheel
5. Rocker switch 1
6. Rocker switch 2
7. Rear fog light (optional)
8. Headlight multi-switch
9. Front fog light (optional)
10. AUTO headlights

### *Headlights*

The headlight switch is a multi-switch, with multiple settings for different applications. There are settings for fog lights, AUTO headlights, headlights OFF, daytime running lights, headlights ON, and parking lights. The headlights will be at 100% brightness with the headlight switch activated to the ON or AUTO positions. The fog lights, tail lights, markers, and clearance lights will be on as well. An alarm will sound if the headlight switch is on and the ignition switch is off.

Your vehicle may be equipped with an optional headlight warning alarm that sounds immediately after ignition switch is turned to OFF position, when headlight switch is ON, and the driver-side door is closed. It also sounds when headlight switch is ON, ignition switch is in OFF position, and the driver-side door is open.

The headlights are operated in a variety of modes:

### *Daytime Running Lights (DRL)*

The Daytime Running Lights feature provides for low beam headlights at 75% brightness whenever the parking brake is released and the ignition switch is in the ON position. The lights will stay on until the parking brake is engaged.

### *Lights On With Wipers*

This feature allows the headlights (low beam) to be automatically turned on when the windshield wipers are in steady or intermittent mode (not washer). The low beams will remain on until the ignition switch is turned to the OFF position or the headlights are cycled on and then off.

### *Parking Lights*

The parking lights, tail lights, markers, and clearance lights will turn ON when the headlight switch is in the park or headlight position.

### *Panel Lighting*

The panel lighting brightness is controlled by the panel dimmer wheel. To increase the brightness of the electronic gauge cluster lighting, scroll the wheel upward. To dim the electronic gauge cluster lighting, rotate the wheel downward.

### *Rocker Switches*



There are two rocker switches on the LCM. These switches may vary depending on the options chosen at the time of purchase. To turn the chosen component on, press on the top of the switch. To turn it off, press on the bottom of the switch. The light rocker switches can also be located in the center control panel.




### *Dome Lighting*

The overhead dome light is used for reading and for illumination when entering and exiting the vehicle. The dome light ON / OFF is also controlled by pushing on the lamp lens. When either entrance door is closed, the courtesy light will remain ON for approximately 20 seconds or until the ignition switch is turned ON. At that time, the lights will dim gradually until the light is off. The optional keyless entry key fob also turns on the light for a time period when the Unlock button is pressed, and turns off the light (dims gradually to off) when the lock button is pressed.

### *Courtesy Lights*

Either the driver-side or the passenger-side door activates the door-mounted courtesy lights to add light when getting in or out of the truck.

Switch	Item	Description
Sleeper Dome and Floor Light	 0000405956	Used to turn ON either the sleeper dome or floor light.
Cab Dome Light	 0000405955	Used to turn cab dome light on and off and make it possible to activate / deactivate the dome light when opening the doors.

Switch	Item	Description
Work Light	 0000405951	Used to turn work lights ON and OFF.
Floor Light	 0000405958	Activates the floor lights.
Lamp Check	 0000405953	Activates the exterior lights one by one around the truck.

### Steering Wheel Controls



1. City horn
2. Right-side controls
3. Left-side controls

**NOTE:** Steering wheel controls can be reconfigured for customer-defined preferences using Electronic Service Tool (EST).

**NOTE:** Optional Leather Wrapped Wheel With Controls Shown.

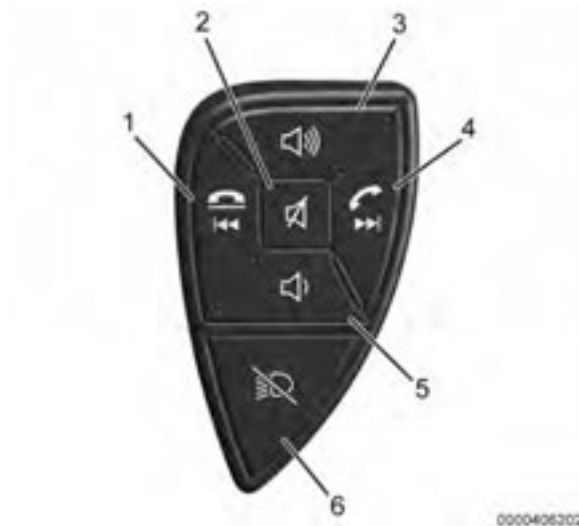
The steering wheel contains a variety of push-button switches to aid in the operation of the vehicle.

## Left-Side Steering Wheel Controls (If Equipped)



#	Switch	Description
1.	Cruise Control ON	Turns the cruise control ON.
2.	RES / +	Used to resume the desired speed set on the cruise control or to accelerate the cruise control to a faster speed.
3.	Cruise Control OFF	Turns the cruise control OFF.
4.	SET / -	Used to set the desired speed of the cruise control or to decrease the speed of the cruise control.
5.	Marker Interrupter	Used to toggle the marker lights ON or OFF. If the marker lights are ON, it will toggle them OFF. If the marker lights are OFF, it will toggle them ON.
6.	CANCEL	Cancels the cruise control speed.

### Right-Side Steering Wheel Controls (Optional)



#	Switch	Description
1.	Hang Up Call / Radio Rewind	Used to hang up a call using Bluetooth® or to change to the previous song / radio station.
2.	Mute	Mutes the volume of the radio and phone calls.
3.	Volume Increase	Increases the volume of the radio and phone calls.
4.	Answer Call / Fast Forward	Used to answer calls using the Bluetooth® or to change to the next song / radio station.
5.	Volume Decrease	Decreases the volume of the radio and phone calls.
6.	Headlight Interrupter	Used to toggle the headlights ON or OFF. If the headlights are ON, it will toggle them OFF. If the headlights are OFF, it will toggle them ON.

## Cruise Control



### WARNING

To prevent personal injury and / or death, or damage to property, do not use the cruise control system when unpredictable driving conditions are present. Such conditions include heavy traffic, roads that are winding, icy, snow covered, slippery, or with a loose surface. These conditions may cause wheel slippage and loss of vehicle control.

1. Press the ON position of the ON / OFF steering wheel control.
2. Bring the vehicle to the desired operating speed (above 35 mph [56 km/h]), and push the SET / – position of the steering wheel control.
3. Once in the cruise mode, the RES / + switch can be used to increase or decrease vehicle speed by pressing and holding the RES / + to increase the speed, or by pressing and holding the SET / COAST to decrease vehicle speed.
4. A slight tap on the brake or clutch pedal will deactivate the cruise but hold the selected speed in memory. To return to the predetermined speed, press the RES / + switch.
5. When you press the OFF position of the ON / OFF switch, or if the vehicle is shut off, the selected speed setting is canceled and removed from memory.

## Steering Column and Switches



1. Stalk shifter

Vehicles with an automatic transmission or an automated manual transmission will be controlled by a stalk shifter located on the right-side of the steering column.



1. Engine brake
2. Stalk shifter
3. Gear selector
4. Manual / Automatic mode button



### Stalk Shifter Operation

The stalk shifter is equipped with a variety of functions. The transmission has the capability to be manually controlled like a paddle shifter if the driver so chooses. The automatic gear selection is located on this component, and there is also the option for an engine brake to be controlled by the shifter stalk.

### Gear Selection

The automatic gear selection is controlled by rotating the knob at the end of the shifter stalk. To engage each automatic gear selection, rotate the knob at the end of the stalk forward or backward until the triangle indicator lines up with the desired gear. The instrument panel gauge cluster will display the selected transmission gear. Refer to the **Controls and Features Operation and Maintenance Manual** for more information on transmission gear display. The automatic gear selections may vary depending on the options chosen at the time of purchase.

### Manual / Automatic Mode

The manual / automatic mode is controlled by the actuation of the knob on the end of the shifter stalk. To put the vehicle into manual mode, push in towards the steering column on the knob at the end of the stalk shifter. Once in manual mode, push the stalk forward towards the instrument panel in order to downshift and pull the stalk back towards the operator to upshift gears. If the vehicle is in manual mode, push in on the knob again to return it to automatic mode.



### Engine Brake

The stalk shifter also has the capability for engine braking. There are three engine brake levels that the stalk can click into as indicated by the engine brake graphic on the stalk. To use the engine brake levels, push the stalk down towards the floor.

### Turn Signal Stalk



1. Turn signal stalk
2. Steering column adjuster

The steering column contains switches and levers to aid in the comfort of the operator and to assist the operator while driving the vehicle.

**Tilting and Telescoping Adjustment Lever** – Allows the steering wheel placement to be adjusted for driver comfort. Push down to adjust, and pull up to lock.

**Multi-function Turn Signal Stalk** – The multi-function turn signal switch is mounted on the left-side of the steering column below the steering wheel.



1. Washer fluid button
2. Turn signal indicator
3. Windshield wiper speed dial
4. Turn signal stalk
5. High beam headlights



**Signaling for a Turn** – When signaling your intention to make a turn, move the turn signal lever up or down to just past the point of resistance. The switch does not automatically cancel and will require manual cancellation.

**Lane Change** – The turn signal lever includes a lane change feature that allows the operator to signal the intention to change lanes without locking the switch into the full turn position. To use this feature, move turn signal lever up or down to the point where resistance to movement is felt. The turn signal lever will return to the OFF position when released.

**Windshield Wiper** – The electric wiper has two speeds (HIGH-LOW), which can be operated by rotating the WASHER / WIPER knob. The optional intermittent control provides five wiper ON / OFF cycle intervals, varying from 2 - 14 seconds. This is done by rotating the wiper control from the wiper OFF position to any of the five intermittent wiper interval positions.

**Automatic Intermittent Interval Control (Optional)** – This feature automatically changes the wiper speed from HIGH or LOW to the slowest intermittent speed when the parking brake has been set, and the wipers have been on for a predetermined length of time. When the parking brake is released, the wipers return to their previous speed.



### WARNING

To prevent personal injury and / or death, or damage to property, do not use the washers in freezing weather without first warming the windshield with the defrosters; otherwise, the washer solution may freeze on the windshield and obscure your vision and cause an accident.

Do not use radiator coolant or antifreeze in the windshield washer reservoir. Radiator coolant in the washer reservoir can severely reduce visibility when sprayed on the windshield.

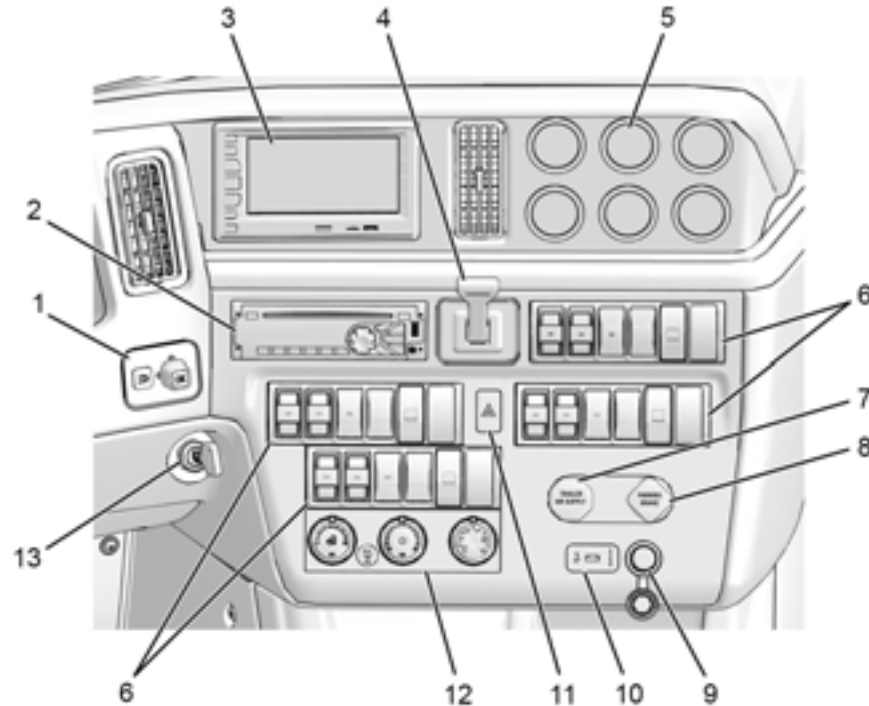
**NOTE:** Keep the fluid reservoir filled with Fleetrite Windshield Washer Solvent or equivalent.

**LOW / HIGH Beam** – When the turn signal stalk is pulled past the point of resistance, lights will switch to high beam position. When pulled again they will revert to low beam.

**Headlight Flash-To-Pass** – When the turn signal lever is pulled with the headlights OFF, the high beam lights will come on and stay on as long as the lever is held in the pulled position. When the low beam headlights are ON, the high beam lights can be made to flash if the lever is not lifted past the click or dimmer position. When the high beam headlights are ON, the low beam lights can be made to flash if the lever is not lifted past the click or dimmer position.

**Washer / Wiper Control** – The windshield washer, along with the windshield wipers, is controlled by the WASHER / WIPER knob on the turn signal switch lever. To operate the windshield washer, push in on the wiper knob to spray solution on the windshield. Wipers will start wiping and continue for two cycles.

### Center Dash Panel / Wing Panel





0000407115




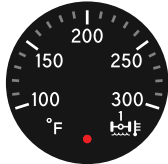
- |                                                          |                                |                             |
|----------------------------------------------------------|--------------------------------|-----------------------------|
| 1. Premium electronic cluster display control (optional) | 5. Auxiliary gauges (optional) | 10. USB outlet              |
| 2. Radio                                                 | 6. Switch packs                | 11. Hazard light switch     |
| 3. Vehicle information display (optional)                | 7. Trailer air supply          | 12. A/C and heater controls |
| 4. Trailer brake (optional)                              | 8. Parking brake               | 13. Ignition switch         |
|                                                          | 9. Auxiliary power outlet      |                             |

**NOTE:** If the vehicle was ordered with the option of an additional auxiliary power outlet and USB charger, the location will be dependant upon the other switches and gauges ordered.




### Auxiliary Gauges

The auxiliary gauges are located at the top of the center control panel. There are nine optional gauges. The center control panel has the option for six gauges to be displayed. The gauges displayed are dependent on the options chosen at the time of purchase. If no gauges are chosen, the respective area will be filled with a blank panel.

Gauge Name	Gauge	Displays
Air Application Pressure	 0000407074	Air brake pressure being applied to the brake system.
Axle 1	 0000407076	Axle pressure.





Gauge Name	Gauge	Displays
Axle 2	 0000407077	Axle pressure.
Boost Pressure	 0000407102	Amount of boost pressure produced by the turbocharger.
Engine Oil Temperature	 0000407103	Engine oil temperature.
Front Rear Axle Temperature	 0000407104	Temperature of the axle in front of the last axle on the tractor portion of the vehicle.





## Controls / Features





Gauge Name	Gauge	Displays
Rear Rear Axle Temperature	 0000407106	Temperature of the last axle on the tractor portion of the vehicle.
Transmission Oil Temperature	 0000407108	Temperature of the transmission fluid.
Voltmeter	 0000407109	Amount of voltage output from the battery.

### Switches





There are 40 different options for switches; up to 26 can be located in the center instrument panel. Locations of these switches will vary depending on the options installed. Blank cover plates will be used in spaces that do not have switches installed at those locations.





Switch	Icon	Description
Engine Brake ON / OFF	 0000405883	Activates or deactivates the engine brake.
Engine Brake Selector	 0000405884	A three-position switch that selects amount of engine braking (1 = Low, 2 = Medium, 3 = High).
Traction Disabled	 0000405885	Deactivates / activates traction control.
PTO	 0000405886	Used when vehicle has single PTO option.

Switch	Icon	Description
Fan Override	 0000405888	With the switch in ON position, engine fan mode is switched from AUTO to the constant ON.
PDL Lock	 0000405889	Used to lock together front and rear axle of a tandem for improved traction at low speeds on low-traction surfaces.
Differential Lock	 0000405890	Used when vehicle has single locking differential for improved traction on poor surfaces at low speeds.
Suspension Dump	 0000405843	Allows the operator to release air from air bags in a rear air suspension system when vehicle's speed is less than 5 mph (8 km/h).





Switch	Icon	Description
5th Wheel Slide	 0000405844	A momentary switch that, when held ON, releases the sliding 5th wheel (when ignition switch is in ON and vehicle speed is less than 2 mph [3 km/h]).
Engine Shutdown Override	 0000405847	Deactivates the engine shutdown.
Blank with LED	 0000405848	Free switch with LED light that can be utilized for driver's preference.
Blank without LED	 0000405851	Free switch that can be utilized for driver's preference.





## Controls / Features





Switch	Icon	Description
Heated Windshield		Activates the windshield heater.
Differential Lock Front Rear		Locks forward rear drive axle differential when vehicle has 6 x 4 independent locking differentials for improved traction on poor surfaces at low speeds.
Differential Lock Rear Rear		Locks rear drive axle differential when vehicle has 6 x 4 independent locking differentials for improved traction on poor surfaces at low speeds.
5th Wheel Unlock		Press and hold this momentary switch to unlock the fifth wheel jaw. Vehicle must be stationary, parking brake set, and ignition switch in the ON position.

Switch	Icon	Description
120V AC		Provides power to the sleeper AC electrical outlet.
Engine STOP / CLEAR		Engine shutoff.
0 / 5		Part of the anti-theft system.
1 / 6		Part of the anti-theft system.



Switch	Icon	Description
2 / 7	 0000405968	Part of the anti-theft system.
3 / 8	 0000405969	Part of the anti-theft system.
4 / 9	 0000405970	Part of the anti-theft system.
Traction Control Off Road	 0000405971	Enables and disables the Antilock Brake System (ABS) traction control feature.

Switch	Icon	Description
Inhibit Regen	 0000405973	Regeneration Inhibit switch. Used to prevent normal regeneration or parked regeneration.
Parked Regen	 0000405973	DPF regeneration activation when parked switch is used for engine aftertreatment. Manually initiates DPF regeneration.
Hill Start Aid	 0000405974	Assists driver in getting the vehicle in motion on a hill.
PTO 1	 0000405975	Used when vehicle has dual PTO option.

Switch	Icon	Description
PTO 2		Used when vehicle has dual PTO option.
Auto START / STOP		This switch allows driver to enable or disable the auto start / stop system. When enabled, allows automatic or manual remote start / stop of engine via ENGINE CNTL switch on the sleeper control panel. An LED in the switch informs driver of system status.
Transmission Mode		Activates Allison mode function (Econ, Diff Lock, PTO).
Rear Axle Load Distribution		Distributes load on rear axle.

### Climate Control

Your vehicle may be equipped with one of two climate control systems. Depending on the options chosen at the time of purchase, your vehicle may be equipped with a standard HVAC system or an automatic climate control system.

### Standard HVAC System



1. Recirculation button
2. Blower speed control dial
3. A/C button
4. Temperature control dial
5. Mode control dial
6. MAX defrost

### **Blower Speed Control**

Use this control to regulate the amount of air provided to the vents in any mode you select. Turn the knob clockwise to increase fan speed. Turning the control to the OFF position will shut off the fan but may not prevent outside air from entering the vehicle. Turning off the blower speed control also turns off the A/C compressor. The button in the middle of the dial controls the recirculation and fresh air in the cab.

### **Temperature Control**

Use the temperature dial control to regulate the temperature of the air discharged from the vents. The BLUE area of the control indicates cooler temperatures while the RED area indicates warmer temperatures. The center button of the dial controls the ON / OFF mode for the air conditioning.

### **Quick Settings**

The A/C system is equipped with two quick setting options for easy access of the Max Defroster and Max A/C modes. Pressing the Max Defrost will turn on the A/C and activate fresh hot air at high blower speed to be output from the vents. Moving the dial to the Max A/C setting will turn on the A/C and activate maximum cold air temperature, recirculation, and a high blower speed. The Max A/C and the Max Defroster can be overridden by adjusting the blower, temperature, or recirculation settings. However if you turn OFF the ignition with the control in MAX A/C or MAX Defrost mode, the next time you turn the ignition to the key ON position, the system will return to default MAX A/C or MAX Defrost operation unless the blower is OFF.

### **Recirculation Button**

**NOTE: Continuous use of the recirculate mode may make the inside air stuffy. Use of this mode for longer than 15 - 30 minutes is not recommended unless outside conditions require it.**

This button selects fresh air or recirculated air. The air will be recirculated when the light on the button is illuminated. Recirculation is locked out in defrost, mix, and adjacent dot positions. Use recirculation to block out any outside odors, smoke, or dust and to cool the interior rapidly upon initial startup in very hot or humid weather. This button is located in the center of the fan speed dial.

### **Max Defrost Button**

Pressing this button will direct the majority of the airflow to the windshield, while maintaining airflow to the side window outlets. A small amount of airflow is directed to the floor outlets. Temperature will be set to full hot and the blower will be set to high. The A/C will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture buildup on the windshield. Temperature and blower speed can be changed by adjusting the corresponding dial. If the MAX Defrost button is illuminated prior to key OFF position, the system will return to high blower, fresh air, A/C ON and full heat upon Key ON position when the control is set to any other setting except blower OFF.

### A/C Button

The A/C can be selected at any time, in any mode or temp to cool and / or dehumidify the cab air. The A/C is turned on when the light on the button is illuminated. To turn the A/C button ON or OFF, push the button in the center of the temperature dial.

The heater / defroster systems can be operated simultaneously with the air conditioner. Select the A/C button, adjust the temperature and mode to a comfortable setting, and the air conditioner will remove humidity while the heater keeps the cab at a comfortable temperature.

**NOTE: For trucks with sleeper A/C units, the air conditioner may be active when the sleeper blower is on, and the front blower is on, regardless of cab A/C button illumination.**

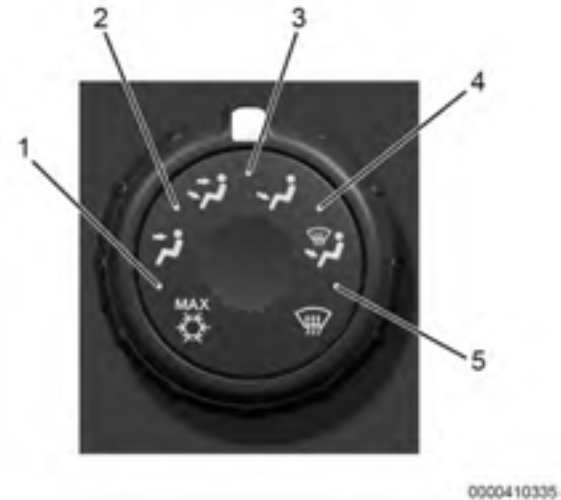
### Operation with Blower OFF




The temperature, recirculation button, and mode will continue to be adjustable after the blower is turned OFF with the key in the ON position. Pressing the recirculation button will close the fresh air door eliminating outside air from entering the vehicle.



### Mode Control


The dot between the mode control icons is an additional mix position between the two modes.

Use this control to direct the flow of air as follows:



Item	Description
	<p><b>MAX Air Conditioning Mode</b></p> <p>In this mode, the majority of the airflow is directed to the panel air outlets and the air is recirculated inside the vehicle while the rest of the air is directed to the floor. A/C is turned on, blower is set to high, temperature is set to full cold, and the inlet door is set to recirculation. The blower speed, temperature, and the inlet door can be adjusted using the dials. Use this mode to block out any outside odors, smoke, or dust and to cool the interior rapidly upon initial startup in very hot or humid weather.</p>
1. Dot	<p>In this mode, the majority of the air flow is directed to the panel air outlets, the rest of the air is directed to the floor. The A/C is on, and sets to full cold, recirculation, and the blower speed to medium. The blower speed, temperature, and the inlet door can be adjusted using the blower speed dial.</p>
	<p><b>Vent Mode</b></p> <p>In this mode, the majority of the airflow is directed to the panel air outlets, while the rest of the airflow is directed to the floor outlets.</p>
2. Dot	<p>This mode is a mix of the majority of the air directed to the panel air outlets and the rest to the floor outlets.</p>
	<p><b>Bi-Level Mode</b></p> <p>This mode is a split of equal airflow between the panel air outlets and the floor outlets.</p>

Item	Description
3. Dot	<p>This mode is a mix of some of the air directed to the panel air outlets and the majority to the floor outlets.</p>
	<p><b>Floor Mode</b></p> <p>In this mode, the majority of the airflow is being directed to the floor outlets. Smaller amounts of air will be directed to the windshield and side windows to help maintain clear windows.</p>
4. Dot	<p>This mode will increase airflow to the windshield, with some airflow being directed to the side window outlets and the floor outlets. The A/C will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture buildup on the windshield.</p>
	<p><b>Mix Mode</b></p> <p>In this mode, half of the airflow is directed to the defrost and side window air outlets and half of the airflow is directed to the floor air outlets, while A/C air will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture buildup on the windshield.</p>
5. Dot	<p>In this mode, there will be an increase in airflow to the windshield, maintaining airflow to the side window air outlets. The A/C will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture buildup on the windshield.</p>

Item	Description
	<p><b>Defrost</b></p> <p>In this mode, the majority of the airflow is directed to the windshield and side window air outlets, while a small amount is directed to the floor outlets. The A/C will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture buildup on the windshield.</p>
<p>To remove stale air or smoke while air conditioner is operating, you may want to open a vent window for a short period of time. Always park in the shade when possible. If your vehicle has been parked in the sun with the windows up, remove the overheated air inside by driving with windows down and the air conditioner ON for one or two city blocks.</p>	



### WARNING

To prevent personal injury and / or death, or damage to property, never drive the vehicle unless the windshield and all other windows are clear. A fogged, ice / snow covered, or dirty windshield or window limits vision, which could cause an accident. To improve defroster efficiency, remove ice and / or snow by hand from the windshield and windows with a non-metallic scraper.



### CAUTION

To prevent property damage and to clear system of humid air, operate blowers for 30 seconds at high speed, with the **AIR FLOW / AIR CONDITIONER** knob on the normal heating position before selecting the Defrost position. This will prevent fogging the glass, which can occur if humid air is blown onto a cool windshield.

**NOTE:** The vehicle may be equipped with heater shutoff valve(s) to prevent hot coolant from circulating through the heater core(s). Closing the valve(s) during hot weather operation will improve A/C system performance. If the valves are shut off, in-cab temperature adjustment may become limited. In addition, when shutoff valves are closed, defrosters will produce only cold air.

**Automatic Climate Control (If Equipped)**

**NOTE:** Depending on the options chosen at the time of purchase, the automatic climate control panel may come with Fahrenheit (shown below) or Celsius temperature markings.



1. Recirculation button
2. Blower speed control dial
3. A/C button
4. Temperature control dial
5. Mode control dial
6. Auto control button

**Automatic Climate Control (If Equipped)**

The automatic climate control system operates in two modes, full automatic mode and semi automatic mode. Full automatic mode will control all the functions of the A/C system (recirculation door, blower, A/C, temperature door, and air distribution mode) automatically to maintain the comfort of the cab according to the temperature dial setting. When the full automatic mode is ON, the AUTO indicator light located on the AUTO button will be illuminated. While the system is in full automatic mode, the operator can override the automatic mode by selecting / turning a separate button / dial to switch the system into semi automatic mode. When the system is in semi automatic mode, the AUTO indicator light will be extinguished.

**Semi Automatic Mode (If Equipped)**

If the AUTO button indicator light is not illuminated, the system will be operating in semi automatic mode. When the system is operating in semi automatic mode, the functions overridden by the operator will remain in the selected mode and all the others settings will be controlled automatically. When operating in the semi automatic mode, the system may not always maintain the temperature set point. Blower speed and air distribution mode will operate manually if overridden by the operator and will be controlled using the dials.

**Auto Button (If Equipped)**

This button is used to engage and disengage the full automatic climate control mode. When the button is pushed, the light will illuminate indicating that the system is in full automatic mode. If the button is pressed again, the indicator light will extinguish and the system will return to semi automatic mode.

### Blower Speed Control

Use this control to regulate the amount of air provided to the vents in any mode you select. Turn the knob clockwise to increase fan speed. Turning the control to the OFF position will shut off the fan but may not prevent outside air from entering the vehicle. Turning off the blower speed control also turns off the A/C compressor. The button in the middle of the dial controls the recirculation and fresh air in the cab.

### Temperature Control

Use the temperature dial control to set desired cabin temperature set point or to select Max Heat or Max Cool operations. The center button of the dial controls the ON / OFF mode for the air conditioning.

### Quick Settings

The A/C system is equipped with three quick setting options for easy access of the Max Defroster, Max Cool and Max Heat modes. Pressing the Max Defrost will turn on the A/C, activate fresh hot air at high blower speed to be output from the vents. Moving the dial to the Max Cool setting will turn on the A/C and activate maximum cold air temperature, recirculation, and a high blower speed. Moving the dial to the Max Heat setting will activate maximum hot air temperature, fresh air, and a high blower speed. These settings can be overridden by adjusting the Auto, blower, temperature, or recirculation settings. However, if the control is in Max Cool, Max Defroster or Max Heat mode prior to key OFF position, when the key is moved to the key ON position, the system will return to default Max Cool, Max

Defroster or Max Heat operation unless the blower is in the OFF position.

### Recirculation Button

This button selects fresh air or recirculated air. The air will be recirculated when the light on the button is illuminated. Recirculation is locked out in defrost, mix, and adjacent dot positions. Use recirculation to block out any outside odors, smoke, or dust and to cool the interior rapidly upon initial startup in very hot or humid weather. This button is located in the center of the fan speed dial. There are times during Auto or Semi-Auto operation where the system may prevent operation with the recirculation mode due to risks of fogging the windshield.

### A/C Button

The A/C can be selected at any time, in any mode or temp to cool and / or dehumidify the cab air. The A/C is turned on when the light on the button is illuminated. To turn the A/C button ON or OFF, push the button in the center of the temperature dial.

The heater / defroster systems can be operated simultaneously with the air conditioner. Select the A/C button, adjust the temperature and mode to a comfortable setting, and the air conditioner will remove humidity while the heater keeps the cab at a comfortable temperature.

**NOTE: For trucks with sleeper A/C units, the air conditioner may be active when the sleeper blower is on, and the front blower is on, regardless of cab A/C button illumination.**



Operation with Blower OFF




The temperature, recirculation button, and mode will continue to be adjustable even after the blower is turned OFF if the key is ON. Pressing the recirculation button will close the fresh air door eliminating outside air from entering the vehicle. If equipped with automatic climate control, the temperature door can be adjusted by using the temperature dial.

Mode Control



The dot between the mode control icons is an additional mix position between the two modes.



Use this control to direct the flow of air as follows:




Item	Description
 0000400781	<b>Vent Mode</b> In this mode, the majority of the airflow is directed to the panel air outlets, while the rest of the airflow is directed to the floor outlets.
1. Dot	This mode is a mix of the majority of the air directed to the panel air outlets and the rest to the floor outlets.
 0000400780	<b>Bi-Level Mode</b> This mode is a split of equal airflow between the panel air outlets and the floor outlets.
2. Dot	This mode is a mix of some of the air directed to the panel air outlets and the majority to the floor outlets.
 0000400782	<b>Floor Mode</b> In this mode, the majority of the airflow is being directed to the floor outlets. Smaller amounts of air will be directed to the windshield and side windows to help maintain clear windows.
3. Dot	This mode will increase airflow to the windshield, with some airflow being directed to the side window outlets and the floor outlets. The A/C will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture buildup on the windshield.

## Controls / Features

Item	Description
	<b>Mix Mode</b> <p>In this mode, half of the airflow is directed to the defrost and side window air outlets and half of the airflow is directed to the floor air outlets, while A/C air will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture build up on the windshield.</p>
4. Dot	<p>In this mode, there will be an increase in airflow to the windshield, maintaining airflow to the side window air outlets. The A/C will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture buildup on the windshield.</p>
	<b>Defrost</b> <p>In this mode, the majority of the airflow is directed to the windshield and side window air outlets, while a small amount is directed to the floor outlets. The A/C will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture buildup on the windshield.</p>
5. Dot	<p>In this mode, the majority of the airflow is directed to the windshield and side window air outlets, while a small amount is directed to the floor outlets. The A/C will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture buildup on the windshield.</p>

Item	Description
	<b>MAX Defrost</b> <p>In this mode, the majority of the airflow is directed to the windshield and side window air outlets, while a small amount is directed to the floor outlets. The A/C will be active and the inlet door will force fresh air into the cab to reduce humidity levels and moisture buildup on the windshield. The blower is set to high and temperature is set to full heat. Blower speed and temperature can be adjusted using the dials.</p>
	<b>MAX A/C</b> <p>In this mode, the majority of the airflow is directed to the panel air outlets and the air is recirculated inside the vehicle while the rest of the air is directed to the floor. A/C is turned on, blower is set to high, temperature is set to full cold, and the inlet door is set to recirculation. The blower speed and the inlet door can be adjusted using the dials. Use this mode to block out any outside odors, smoke, or dust and to cool the interior rapidly upon initial startup in very hot or humid weather.</p> <p><b>NOTE: Continuous use of the recirculate mode may make the inside air stuffy. Use of this mode for longer than 15 - 30 minutes is not recommended unless outside conditions require it.</b></p>

Item	Description
	<p><b>MAX Heat</b></p> <p>In this mode, the majority of the airflow is directed to the panel air outlets and the air is recirculated inside the vehicle while the rest of the air is directed to the floor. Heat is turned ON, blower is set to high, temperature is set to full heat, and the inlet door is set to recirculation. The blower speed and the inlet door can be adjusted using the dials. Use this mode to block out any outside odors, smoke, or dust.</p>
<p>To remove stale air or smoke while air conditioner is operating, you may want to open a vent window for a short period of time. Always park in the shade when possible. If your vehicle has been parked in the sun with the windows up, remove the overheated air inside by driving with windows down and the air conditioner ON for one or two city blocks.</p>	

**WARNING**

To prevent personal injury and / or death, or damage to property, never drive the vehicle unless the windshield and all other windows are clear. A fogged, ice / snow covered, or dirty windshield or window limits vision, which could cause an accident. To improve defroster efficiency, remove ice and / or snow by hand from the windshield and windows with a non-metallic scraper.

**CAUTION**

To prevent property damage and to clear system of humid air, operate blowers for 30 seconds at high speed, with the AIR FLOW / AIR CONDITIONER knob on the normal heating position before selecting the Defrost position. This will prevent fogging the glass, which can occur if humid air is blown onto a cool windshield.

**NOTE:** The vehicle may be equipped with heater shutoff valve(s) to prevent hot coolant from circulating through the heater core(s). Closing the valve(s) during hot weather operation will improve A/C system performance. If the valves are shut off, in-cab temperature adjustment may become limited. In addition, when shutoff valves are closed, defrosters will produce only cold air.

*Air Conditioning***CAUTION**

To prevent property damage, follow recommended service procedures and maintain adequate air flow through air exchange devices. Cleaning should be performed by a qualified technician.

Keep radiator area free of things like dirt and debris. Do not cover the condenser with a wire screen.

At least once or twice a month turn ON the air conditioner for a few minutes while the engine is running. This periodic operation keeps all the mechanical parts of your air conditioner in good operating condition.

It is normal for small amounts of water to drain out of the air conditioner module. This water is condensed moisture from air that is flowing through the evaporator coil.

Correct airflow may be restored by either replacing the filter(s), which can be done without tools, or by cleaning the filters. The filter(s) may be cleaned by rinsing with water.

**NOTE: If your air conditioning performance seems lower than expected, check the front of the A/C condenser for an accumulation of dirt or debris. Clean with a gentle water spray from behind the radiator and through the condenser as required. Check for dirt and debris in both the cab and sleeper HVAC intake filters that may reduce airflow.**

### Electronic Touchscreen

Your vehicle may be equipped with either the Driver Information Display or the Vehicle Infotainment System.

### Vehicle Information Display



## **Base System**

The optional Base Vehicle Information Display is an Android® based system that provides Truck Specific Navigation (North America only), vehicle information, diagnostics, trip status, vehicle and engine usage, fuel economy information, safety checklists, calculator, and video inputs for a rearview camera, using an interface that is very familiar to anyone who has used an Android® tablet or mobile phone. It has a USB port and micro SD card port for playing videos, viewing pictures, and updating the system's software. This unit also provides an interface for the optional SmartWave® tire pressure management system. Refer to the Vehicle Infotainment System operator reference card for additional information.

## **Premium Information Display**

The optional Premium Vehicle Information Display is an Android® based system that has all the features of the Base System, plus it supports Wi-Fi connectivity and has more memory and processing power than the Base Vehicle Information Display system. These upgrades allow the Premium System to have an internet browser, digital music playback from USB or SD Cards, and automatic software updates over the internet. The Premium System will also support the installation of Navistar approved Applications (also known as Apps). Refer to the Vehicle Information Display operator reference card for additional information.

## **Door and Window Controls**

### **Door Lock / Unlock**

#### *Cab Doors and Locks*

The cab door and sleeper luggage doors can be unlocked with the same key used for the ignition lock. There is also a keyless remote entry available.

**NOTE: The vehicle is delivered with two identical keys. If more keys are needed, order them through your authorized International Truck dealer. Record the key code and keep it in a secure place. A new key can be made if the keys are lost.**

With mechanical locks, only one door can be locked / unlocked at a time. Electrical locks can lock / unlock both doors by operating the key, keyless entry fob, by manipulating the lock or unlock buttons on the door pod modules, or by moving the inner door lock handle on either side.

#### *Remote Keyless Entry Operation (Optional)*

**NOTE: This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada. Operation is subject to the following two conditions:**

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

**NOTE: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.**



The remote keyless entry key fob is used to lock and unlock both cab doors from a distance of 30 feet. One depression of the lock button will lock all of the vehicle doors, while one depression of the unlock button unlocks all of the vehicle doors. The chirp function of the locking system is controlled by the body controller and is a programmable feature. The body controller receives a signal and chirps the horn when the doors are locked if the feature is programmed.

Pressing the lock button once will lock the driver- and passenger-side doors. Pressing a second time will sound the horn momentarily as a confirmation that the doors are locked.

Also, the optional keyless entry key fob turns on the interior light for a time period when its Unlock button is pressed, and it turns OFF the light (dims gradually to OFF) when its lock button is pressed. The panic (emergency) button, when pushed, causes the horn to chirp ON / OFF for 3 minutes, in unison with the headlights and park lights flashing. This feature works only when the ignition switch is in the OFF position.

The optional keyless entry system also allows the truck to stay running with the brakes applied and lights on for added safety and security while making deliveries during the night time. This feature allows the driver to lock and unlock the truck while outside of the truck while it is running.

**NOTE: Remote keyless entry functions vary depending on the options chosen at the time of purchase.**

Remote keyless entry auxiliary functions include but are not limited to the following:

- Auxiliary trailer power
- Work lights

To activate the remote keyless entry auxiliary functions press and hold the respective AUX button for less than one second. These functions can only be activated one at a time.

To deactivate a remote keyless entry auxiliary function press and hold the AUX button for 1 - 6 seconds.

*Lock / Unlock from Interior*



### **WARNING**

**To prevent personal injury and / or death, or damage to property, keep doors locked when vehicle is in motion to reduce the risk of personal injury in the event of an accident.**



1. Driver-side mirror control
2. Mirror directional control pad
3. Passenger-side mirror control
4. Window selector switch (crew cab only)
5. Passenger-side window control
6. Power lock
7. Power unlock
8. Driver-side window control
9. Heated mirror control

### **Locking the Door**

To lock, push the lock button on the lock symbol in the door control panel located by the vent window. Pressing the lock button on the lock symbol once locks all of the vehicle doors.

### **Unlocking the Door**

To unlock, push the unlock button on the unlock symbol in the door control panel located by the vent window. Pressing the unlock button once on the unlock symbol unlocks all the vehicle doors.

### *Automatic Door Lock Function*

The automatic lock function automatically locks the doors at a predetermined speed.

### **Driver / Passenger Windows**

#### *Manual Operation*

To lower door glass (driver-side door), turn window regulator handle clockwise. To raise glass, turn handle counterclockwise. Reverse this procedure for the passenger-side door.

### *Power Operation*

Trucks may have optional electrically operated driver-side and passenger-side windows. Controls for these window lifts are mounted in the door control panels located by the vent windows. The driver-side controls regulate window operation for both driver- and passenger-side. To lower or raise driver-side window, press and hold either up or down direction on the driver-side AUTO window control. To lower or raise passenger-side window, press and hold either up or down direction on the passenger-side AUTO window control.

For one touch windows down operation, press and release the window control in the Down direction. The window will then go to the full down position automatically.

### *Mirror Controls*

These controls provide the driver with the ability to operate both driver- and passenger-side flat mirrors. Use the mirror select switch to select which mirror is to be adjusted, and adjust the mirror using the mirror directional control pad.

The driver also has the ability to heat / defrost the mirrors by pushing the mirror heat button located on the driver door control panel.

### *Vent Window*

Vehicles are equipped with either a fixed or opening vent window. The opening vent window can be opened and closed to allow additional air flow into the cab.

## Predictive Cruise Control (PCC) System



### **WARNING**

To prevent personal injury and / or death, or damage to property, the Predictive Cruise Control (PCC) system is not to be used or relied upon to operate a vehicle. The system should be used in conjunction with other factory equipment and instrumentation to maintain safe operation. A vehicle equipped with the PCC system should be operated in the same safe manner as if the system were not installed. The system is not a substitute for normal safe driving procedures. It will not compensate for any driver impairment, such as drugs, alcohol, or fatigue. The PCC system is intended solely as an enhancement to the factory cruise control.

**NOTE:** Intervening or overriding the PCC system during operation may negatively impact the mentioned fuel economy benefits.



The PCC system works with the normal cruise control system and enhances it by using road map data to calculate the desired vehicle speed based on specific terrain. PCC is automatically activated when cruise control is activated. The PCC system provides improved fuel economy over the normal cruise control.

The PCC system features:

- **GPS-based Speed Management** – PCC controls the vehicle speed in order to maximize fuel economy on hilly roads, based on GPS measurement and 3D road map data. PCC calculates the desired speed for the vehicle to follow over an undulating terrain to minimize the downshifts during ascents and minimize use of brakes during descents.

The PCC system is compatible with International® A26 and Cummins® X15 engines, manual and Eaton® automatic transmissions and adaptive cruise control systems like the Bendix® Wingman® Fusion™ and WABCO® OnGuard™.

## Vehicle Telematics

### Overview

Vehicle telematics allow the customer to create vehicle health reports and remotely update the vehicle Over-The-Air (OTA). The vehicle may be equipped with one of the following systems:

- Telematics Module
- OnCommand® Link

The vehicle telematics will determine if the vehicle has an outdated calibration and provide the user with the ability to update the calibration. These updates can improve performance, drivability, fuel economy and engine reliability. In addition, these systems relay information to health reports that allow the user to monitor vehicle health and status to help improve uptime. For more information; refer to [www.internationaltrucks.com/support/oncommand-connection](http://www.internationaltrucks.com/support/oncommand-connection).






### Telematics Module (If Equipped)

The telematics module helps the dealer and user to determine health and status of the vehicle with information such as vehicle health, GPS location, aftertreatment status, Diagnostic Trouble Codes (DTC), warning lamps and basic trip information. The module will have an active data plan when the vehicle is delivered. The module is also able to update the ECM and specific customer programmable parameters to suit preferred driving conditions. Messages related to these updates will appear on the electronic gauge cluster. For more information on cluster messages; refer to the Electronic Gauge Cluster Operation Manual.

The telematics module is located in the overhead console and is visible to the operator. This module is equipped with a cellular data connection and a GPS satellite connection. The module is capable of a Bluetooth® connection and connecting to an external Wi-Fi source.

### Telematics Module Indicators

The telematics module displays four indicators that relay information such as cellular connectivity and signal strength, Wi-Fi strength, Bluetooth® connectivity and Global Positioning System (GPS) status. Refer to the following table for indicator information:

Indicator	Function	Description
	Searching for Signal	Displays that the module is powered ON and is searching for a cellular signal.
	Signal Strength	Displays the strength of the cellular signal using one bar for low signal and increases up to four bars for a strong signal.
	Wi-Fi	When this is illuminated, there is an active Wi-Fi connection, when it is not illuminated, the Wi-Fi has no active connection.
	Bluetooth®	When this is illuminated, there is an active Bluetooth® connection, when it is not illuminated, the Bluetooth® has no active connection.
	GPS	When this is illuminated, there is an active GPS connection, when it is flashing, the GPS is searching for a connection.

### OnCommand® Link (If Equipped)

The OnCommand® Link will be connected to the vehicle diagnostic connector when the vehicle is delivered. The OnCommand® Link allows the users to remotely update the Engine Control Module (ECM). Similar to the way software on a smart phone or computer is updated, the electronic modules on the vehicle can be updated at a customer facility over a safe, secure Wi-Fi connection. The OnCommand® Link can also capture health reports, allowing users to monitor vehicle health and status. For equipped vehicles, the OnCommand® Link product enables reprogramming of approved International® or Cummins® engine calibrations, which will help improve vehicle uptime.

All instructions and supporting information are hosted on our website. In order to begin using the OnCommand® Link OTA Programming device, you must first register and define your preferences. Visit [www.internationaltrucks.com/ota](http://www.internationaltrucks.com/ota) for registration and more information.

## Collision Warning Systems



### WARNING

To prevent personal injury and /or death, or damage to property, **ALWAYS** be aware that vehicles equipped with collision mitigation have reduced effectiveness when pulling double or triple trailers. Collision mitigation is designed and optimized for trucks and tractors that tow single trailers. Extremely careful driving is required when towing double or triple trailers. **NEVER USE NON-ABS EQUIPPED TRAILERS IN DOUBLE OR TRIPLE APPLICATIONS.** Trailers without ABS may become unstable during Collision Mitigation braking.

Collision warning systems use radar and / or cameras to determine the distance and relative speed of objects in front of the vehicle or to the side of the vehicle. They warn the driver of potentially dangerous situations through visual and audible alerts. Additionally, some system can take action to help the driver avoid such objects.

**NOTE:** All of these systems rely on cameras or radar to be fully functional. If there is a problem with either the camera or the radar, these systems may provide only limited functionality.

## Bendix® Blindspotter 2.0®



### WARNING

To prevent personal injury and / or death, or damage to property, Bendix® Blindspotter 2.0® is not to be used or relied upon to operate a vehicle. The system should be used in conjunction with rearview mirrors and other instrumentation to maintain safe operation. A vehicle equipped with Bendix® Blindspotter 2.0® should be operated in the same safe manner as if the system were not installed. The system is not a substitute for normal safe driving procedures. It will not compensate for any driver impairment, such as drugs, alcohol, or fatigue. Bendix® Blindspotter 2.0® is intended solely as an aid for an alert and conscientious professional driver.



### WARNING

To prevent personal injury and / or death, or damage to property, before using this feature, read and thoroughly understand the Bendix® Blindspotter 2.0® Driver Instruction Manual, and obtain proper training on the system.



### **WARNING**

To prevent personal injury, and / or death, or damage to property, be aware that Bendix® Blindspotter 2.0® may provide little or no warning for some hazards, such as pedestrians, animals, oncoming vehicles, and cross traffic.



### **WARNING**

To prevent personal injury and / or death, or damage to property, **NEVER** place obstructions such as covers, guards, or bumpers in front of the radar sensor as it can infringe on zone used to emit and receive radar waves and impair its functionality.

The optional Bendix® BlindSpotter® System uses side-looking radar to constantly monitor vehicles in the blind spot area. Its technology can detect moving or stationary objects in the lane next to the vehicle and alert the driver of their presence.

Visual and audible alerts are provided by the BlindSpotter® Side Object Display. Refer to the Bendix® BlindSpotter® driver instruction manual for complete operating instructions.

## **Bendix® Wingman® Advanced™ Collision Warning System**



### **WARNING**

To prevent personal injury and / or death, or damage to property, before using this feature, read and thoroughly understand the Bendix® Wingman® Advanced™ Collision Warning System's Driver Instruction Manual, and obtain proper training on the system.



### **WARNING**

To prevent personal injury and / or death, or damage to property, be aware that the Bendix® Wingman® Advanced™ Collision Warning System may provide little or no warning for some hazards, such as pedestrians, animals, oncoming vehicles, and cross traffic.



### **WARNING**

To prevent personal injury and / or death, or damage to property, **NEVER** place obstructions such as covers, guards, or bumpers in front of the radar sensor as it can infringe on zone used to emit and receive radar waves and impair its functionality.

**WARNING**

To prevent personal injury and / or death, or damage to property, the Bendix® Wingman® Advanced™ Collision Warning System is not to be used or relied upon to operate a vehicle. The system should be used in conjunction with rearview mirrors and other instrumentation to maintain safe operation. A vehicle equipped with the Bendix® Wingman® Advanced™ Collision Warning System should be operated in the same safe manner as if the system were not installed. The system is not a substitute for normal safe driving procedures. It will not compensate for any driver impairment, such as drugs, alcohol, or fatigue. The Bendix® Wingman® Advanced™ Collision Warning System is intended solely as an aid for an alert and conscientious professional driver.

The optional Bendix® Wingman® Advanced™ Collision Warning System uses forward looking radar to provide adaptive cruise control with braking. It also includes collision mitigation technology to assist the driver in various conditions.

The system provides the following features:

- **Alerts**
  - **Following Distance** – Provides audible and visual alerts that let the driver know when getting too close to forward vehicle.
  - **Impact** – Provides audible and visual alerts warning the driver that a collision with the forward vehicle is likely and that they should address the situation immediately.
  - **Stationary Object** – Provides audible and visual alerts that provide the driver up to a 3.0 second alert when a metallic object(s) may be blocking lane of travel.
- **Adaptive Cruise Control with Braking** – When cruise control is on with the speed set, the adaptive cruise control helps the driver maintain a set following distance behind a forward moving vehicle by automatically utilizing the engine retarder and foundation brakes.
- **Collision Mitigation** – Provides audible and visual alerts to the driver and applies the engine retarder and foundation brakes when the system determines a collision with a forward moving vehicle is imminent. The intervention can be up to two-thirds of the vehicle's braking capacity. Immediate driver action is required to potentially avoid or lessen the severity of a collision.

### Bendix® Wingman® Fusion™ System



#### WARNING

To prevent personal injury and / or death, or damage to property, the Bendix® Wingman® Fusion™ System is not to be used or relied upon to operate a vehicle. The system should be used in conjunction with brakes, rearview mirrors, and other instrumentation to maintain safe operation. A vehicle equipped with the Bendix® Wingman® Fusion™ System should be operated in the same safe manner as if the system were not installed. The system is not a substitute for normal safe driving procedures. It will not compensate for any driver impairment, such as drugs, alcohol, or fatigue. Please refer to the Bendix® Wingman® Fusion™ Operator Manual for additional warnings, system operation, and system limitations. The Bendix® Wingman® Fusion™ System is intended solely as an aid for an alert and conscientious professional driver.



#### WARNING

To prevent personal injury and / or death, or damage to property, **NEVER** place obstructions such as covers, guards, or bumpers in front of the radar sensor as it can infringe on zone used to emit and receive radar waves and impair its functionality.



#### WARNING

To prevent personal injury and / or death, or damage to property, before using this feature, read and thoroughly understand the Bendix® Wingman® Fusion™ System's Driver Instruction Manual, and obtain proper training on the system.



#### WARNING

To prevent personal injury and / or death, or damage to property, be aware that the Bendix® Wingman® Fusion™ System may provide little to no warning or stationary vehicle braking for some hazards, such as pedestrians, animals, oncoming vehicles, and cross traffic.

The optional Bendix® Wingman® Fusion™ system is an advanced safety system that integrates radar, camera, and brakes into a comprehensive driver assistance system that includes the following features not offered with the Bendix® Wingman® Advanced™ system.

- **Overspeed Alert and Actions** – System can read speed limit signs and notify the driver and fleet of overspeed travel with two levels of intervention.
- **Alert Prioritization** – Only the most critical alert is sounded to the driver to minimize distractions during potentially severe events.

- **Stationary Vehicle Braking** – This can automatically alert the driver up to 3.5 seconds before impact and apply vehicle brakes if the large, stationary, in-lane object is definitively identified as a vehicle.
- **Enhanced SafetyDirect** – This is a two-way communication channel and overspeed video capture and event video capture.
- **Lane Departure Warnings** – Alerts operator if vehicle is not traveling in the intended roadway path.

The following additional features are included with the Bendix® Wingman® Fusion™ 2.0 System (if equipped).

- **Enhanced Collision Mitigation** – This potentially removes up to twice as much vehicle speed as earlier collision mitigation systems.
- **Roadway Departure Warnings and Braking** – Alerts operator if vehicle has unintentionally left the roadway. If vehicle does not return to roadway, the system will engage emergency braking.
- **Active Cruise with Braking Auto-Resume** – Allows cruise control to resume after the system has applied braking and vehicle is above the minimum cruise control speed.
- **Active Cruise with Braking Stop & Driver Go** – Allows cruise control to resume after braking to a stop without having to push the resume switch. The driver needs only to press the accelerator pedal.

- **Multi-lane Automatic Emergency Braking** – Once collision mitigation braking event occurs and operator steers into an adjacent lane to avoid the forward vehicle, system continues to apply braking if it detects another forward vehicle in the new traffic lane.

Visual and audible alerts are provided by the Electronic Gauge Cluster and / or the Driver Interface Unit located in the instrument panel. Refer to the Electronic Gauge Cluster Operator Manual and the Bendix® Wingman® driver instruction manual for complete operating instructions.

### WABCO® OnGuard™ Collision Safety System



#### WARNING

To prevent personal injury and / or death, or damage to property, the WABCO® OnGuard™ Collision Safety System is intended solely as an aid for an alert and conscientious professional driver. It is not to be used or relied upon to operate a vehicle. The system should be used in conjunction with rearview mirrors and other instrumentation to maintain safe operation. A vehicle equipped with the WABCO® OnGuard™ Collision Safety System should be operated in the same safe manner as if the system were not installed. The system is not a substitute for normal safe driving procedures. It will not compensate for any driver impairment, such as drugs, alcohol, or fatigue.



### WARNING

**To prevent personal injury and / or death, or damage to property, before using this feature, read and thoroughly understand the WABCO® OnGuard™ Collision Safety System's Driver Instruction Manual, and obtain proper training on the system.**

### WABCO® OnGuard™ Display

Audible and visual alerts are provided by the Electronic Gauge Cluster and / or the OnGuard™ Display located in the instrument panel where it is easily visible and accessible.

The optional WABCO® OnGuard™ Collision Safety System assists the driver in maintaining a safe following distance with active braking. The system monitors the distance, speed and deceleration of a vehicle ahead to automatically alert the driver and decelerate the vehicle when a preset following distance is compromised. It sends audible and visual warnings through an in-cab instrument panel display and / or the Electronic Gauge Cluster so the driver is alerted to take the appropriate corrective action.

### Three Levels of OnGuard™ defense:

- **Collision Warning System** generates audible and visual alerts when the vehicle's following distance may result in a collision.
- **Adaptive Cruise Control** works in conjunction with conventional cruise control to maintain the set cruise speed when no vehicle is being tracked and maintains a minimum following interval when a target vehicle is being tracked.
- **Collision Mitigation System** provides automatic de-throttling of the engine and active braking when a potential collision is detected.

Refer to the WABCO® OnGuard™ driver instruction manual for complete operating instructions.

### Active Steering



### WARNING

**To prevent personal injury and / or death, or damage to property, always maintain safe operating procedures such as remaining in the appropriate lane, operating at safe speed, and maintaining safe distance between the vehicle and other vehicles on the road. The active steering system does not replace the need for a skilled, alert professional driver, reacting appropriately and in a timely manner. It will not compensate for any driver impairment, such as drugs, alcohol, or fatigue.**



If equipped, active steering aids the driver by providing a number of driver assist steering features.

### **Driver Assist Steering Features**

- **Variable Steering Effort** – allows for lighter (easier) steering at low speeds to aid in maneuvering and heavier (firmer) steering at higher speeds for easier control of the vehicle. It supports two steering profiles which can be chosen by the driver using the Premium Electronic Gauge Cluster.
- **Return to Center** – optimizes return to center as a function of steering wheel position and vehicle speed.
- **Pull Compensation** – compensates for vehicle, tire, road crown, and crosswind related leads and pulls. In addition to providing correction for immediate, unpredictable leads and pulls, a learned correction for ongoing conditions is stored on shutdown.
- **Steering Dampening** – reduces undesired steering wheel oscillations and improves steering feel.
- **Lane Keep Assistance System (LKAS)** – If the vehicle is traveling above a minimum speed and able to detect the lane boundaries, LKAS is capable of taking corrective steering action to assist the driver in keeping the vehicle inside the lane.

### **Driver Reward**

The driver reward feature is designed to give the driver programmable incentives for driving more efficiently. This is accomplished by measuring the driver's habits based on fuel economy, time at idle, or both. Rewards include higher maximum vehicle speed and higher cruise control speed limit. Lower maximum vehicle speed or cruise control speed limits may result as a penalty for failing to meet the standards.

The following driver reward visual indications appear in the form of text messages in the electronic gauge cluster digital display:

- **Expected** – Reward indication that results in higher vehicle speed limits
- **Good** – Reward indication that results in higher vehicle speed limits
- **Excellent** – Reward indication that results in higher vehicle speed limits
- **Penalty** – Penalty indication that results in lower vehicle speed limits
- **Increasing** – Informs the driver that the vehicle speed limit will soon be increased
- **Decreasing** – Informs the driver that the vehicle speed limit will soon be decreased



## SECTION 5 — SLEEPER FEATURES

### Introduction

#### General Information

There are two trim versions of sleepers available:

- International® LT® and RH™ Classic Series
- International® LT® and RH™ Diamond Series

The Black Cherry interior can only be added to the Diamond interior trim.

The International® LT® Series sleeper compartment comes in two sizes:

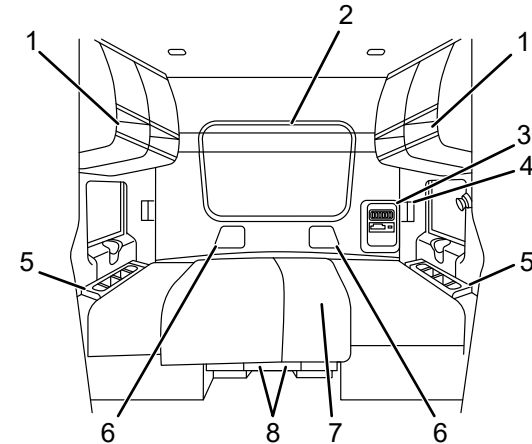
- 56-in (142 cm) short sleepers
- 73-in (185 cm) long sleepers

The RH™ Series sleeper compartment comes only in the size 56-in (142 cm) short sleepers.

#### Main Features

The sleeper compartments are designed to accommodate different needs, and your sleeper may or may not be equipped with all the features listed in this section.

Common features on the International® LT® and RH™ Series 56-in (142 cm) short sleeper models.



0000413722

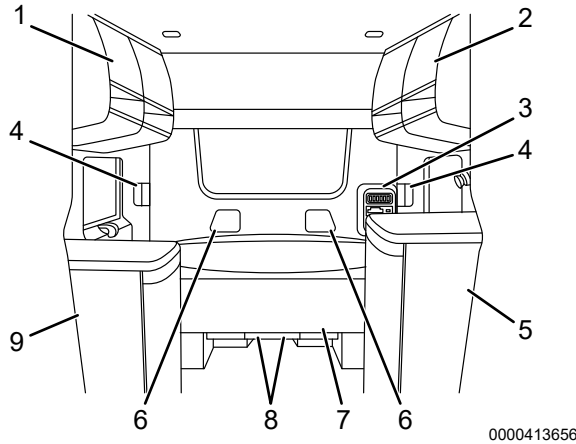
#### 56-in Short Sleeper Cab

1. Airline cabinet
2. Rear wardrobe cabinet
3. Control panel
4. Duct work vent
5. Cup holders and storage tray
6. Speaker
7. Lower bunk
8. Under bunk storage area

## Sleeper Features

---

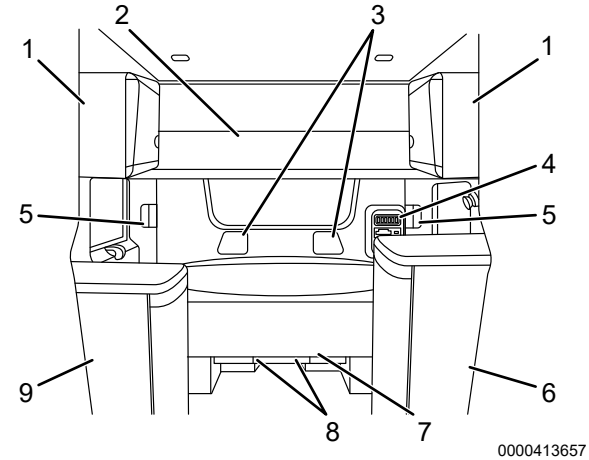
Common features on the International® LT® Series 73-in (185 cm) long sleeper model with lower bunk:



### 73-in Long Sleeper Cab

1. Airline cabinet (left)
2. Airline cabinet (right)
3. Control panel
4. Duct work vent
5. Tower cabinet
6. Speaker
7. Lower bunk
8. Under bunk storage area
9. Refrigerator cabinet or dresser cabinet

Common features on the International® LT® Series 73-in (185 cm) long sleeper model with lower and upper bunks:



### 73-in Long Sleeper Cab with Lower and Upper Bunks

1. Airline cabinet
2. Upper bunk
3. Speakers
4. Control panel
5. Duct work vent
6. Tower cabinet
7. Lower bunk
8. Under bunk storage area
9. Refrigerator cabinet or dresser cabinet

**NOTE:** Although not illustrated, the long sleeper models are equipped with the same cup holders and storage trays (both ends of lower bunk) as illustrated for the short sleeper model.

### Lighting

#### Dome Light

The sleeper dome light is a large fluorescent light located on the headliner of the sleeper compartment. The sleeper dome light can be controlled by switches located on the sleeper control panel and on the instrument panel. This two-switch arrangement permits the driver to turn the sleeper dome light on or off before entering the sleeper area without having to go back to the cab area.

#### Reading Lights

The bunk reading light is positioned on the side panel, left-side, to provide illumination for easy reading. If the sleeper compartment is equipped with the upper bunk option, a second reading light is provided at the head of the upper bunk. Depressing the switch on the housing will turn the reading light ON and OFF.

#### Floor Lights

There are two RED floor lights located under the lower bunk included with all sleeper cabs. These floor lights are controlled by the same two-switch arrangement as the sleeper dome light.

#### Accent Lights

Convenient accent lights are located on the sleeper compartment headliner and provide an additional level of illumination within the sleeper compartment. There are four accent lights in the long sleeper and two accent lights in the short sleeper. Two switches are located on the sleeper control panel for controlling the accent lights.

- **Accent Light Dimmer Switch:** Used for adjusting the brightness of the sleeper compartments accent lights.
- **Accent Light Switch:** Used for turning the accent lights on and off.

## Sleeper Features

### Sleeper Control Panel

#### General Information



The sleeper control panel comes with several optional features, but the main components are the switch pack, sleeper climate controls, and inverter control panel.

Number	Component	Description
1	Switch Pack	Equipped with locations for up to six switches.
2	Power Receptacle	Standard 12 volt power socket.
3	Climate Controls	Manual heater, ventilation, and air conditioning (HVAC) controls.
4	Inverter Control Panel	Controls the power inverter that allows the use of the items such as a TV, VCR, microwave, and hair dryer.
5	Radio Control Panel	Can be used to control the functions of the instrument panel-mounted radio from the sleeper.
6	Climate Controls	Optional LED electronic heater, ventilation, and air conditioning (HVAC) controls.

### Accent Light Dimmer Switch

This switch is used for adjusting the brightness and dimness of the sleeper compartment accent lights.

- Up position brightens the accent lights.
- Down position dims the accent lights.



### Accent Light Switch

This two-position switch operates the four accent lights located in the long sleeper ceiling or two accent lights located in the short sleeper ceiling.

- Press the top of the switch to turn the accent lights on.
- Press the bottom of the switch to turn the accent lights off.



### Sleeper Dome / Floor Light Switch

This two-position switch operates the large fluorescent dome light located in the sleeper ceiling and the three RED floor lights located under the lower bunk and the center instrument panel.

- Press the top of the switch to turn the dome light ON or OFF.
- Press the bottom of the switch to turn the floor lights ON or OFF.



### Auto Start / Stop System

#### General Information

This optional feature is designed to save fuel, reduce emissions, and lower operating costs. The system operates automatically based upon programmed parameters such as battery voltage levels, engine oil temperatures, and engine run times. Parameters are programmable for specific operations based upon customer needs.

## Sleeper Features

---

### Auto Start / Stop Switch

This switch is located on the instrument panel and allows the driver to enable or disable the AUTO START / STOP system.

- Press up to enable.
- Press down to disable.

**NOTE: To enable system, the switch must be pressed within 30 seconds of turning off the ignition switch.**

A status indicator light on the switch provides system status as follows:

- If the LED is off, the system has not been enabled.
- If the LED is steady on, the system has been enabled and the automatic start / stop of the engine will occur when the conditions are met (bunk switch is pressed, voltage is low, and engine oil temperature is low).
- If the LED is flashing at a slow rate, one of the interlocks is not set.
- If the LED is flashing fast, a fault has been detected after three attempts to start the vehicle.



### Safety Interlocks

To operate the Auto Start / Stop system, safety interlocks must be set as follows:

- Transmission is in Neutral.
- Parking brake is set.
- Clutch is not depressed (for transmissions with clutch pedal).
- Hood is closed.
- Vehicle speed is less than 5 mph (8 km/h).
- Ignition switch is in the OFF position.

Safety interlocks also double as an anti-theft feature when vehicle is running and will shut down engine immediately if parking brake is released, clutch is depressed, gear is taken out of Neutral, or vehicle speed is greater than 5 mph (8 km/h).



### Auto Start / Stop Mode

1. To enable, set all safety interlocks. (Transmission in Neutral, parking brake set, clutch not depressed, hood closed).
2. Turn the ignition key to ACC / ON and then OFF.
3. Depress and release Auto Start / Stop switch on the instrument panel within 30 seconds after turning off ignition. A GREEN LED will light steadily to indicate system is enabled. Once enabled, the system automatically operates based upon programmed parameters.
4. If equipped, depress NO IDLE HEAT or NO IDLE COOL switch on the bunk panel as desired. System will retain and resume settings after each run cycle.
5. Horn will sound before the engine starts.
6. To disable, depress and release AUTO START / STOP switch on the instrument panel.

### Auto Start / Stop System and HVAC Controls

The Auto Start / Stop system feature can minimize engine run time while maintaining a comfortable sleeper temperature by using the truck's HVAC system for heating and cooling. A temperature sensor located in the cold air return of the sleeper HVAC system monitors cab temperature.

The operator selects the desired temperature setting on the main sleeper HVAC control panel. When the AUTO START / STOP switch is enabled, the system will monitor and maintain

the sleeper temperature within a programmable range of 5 degrees.

When the engine starts, the system will automatically control fan speed and HVAC temperature to maintain a comfortable sleeper temperature.

To engage the Auto Start / Stop system using HVAC temperature control:

- Transmission is in Neutral.
- Parking brake is set.
- Key in accessory (ACC) position.
- Enable AUTO START / Stop switch with rear A/C switches.
- Set front HVAC blower speed to medium and full cold mode (blue portion of dial).
- Turn key to the OFF, Engine OFF position.
- Set sleeper temperature between 58°F to 84°F (14°C to 29°C).

The Auto Start / Stop system is now engaged and ready to operate. The system will control the rear blower. The vehicle will provide climate control based upon the settings of the sleeper-mounted HVAC panel. The fan speed will be forced to a low speed while the engine is off to preserve battery charge.

**NOTE: The operator will not be able to adjust fan speed or temperature when the engine is running. Temperature selection can be done with the engine off.**

## Sleeper Features

---

When the engine starts, the temperature and fan speed will be adjusted automatically to restore and maintain the desired temperature.

### *Heat Mode and ESPAR Heater*

The Auto Start / Stop system may be used in conjunction with fuel fired heaters. The system is configured to work with or without an ESPAR heater.

For vehicle's equipped with an ESPAR heater, the Auto Start / Stop system will not start the truck to heat the vehicle. For vehicles without an ESPAR heater, the Auto Start / Stop system will start the vehicle for both heating and cooling.

Heat will be provided by the fuel fired heater. If the vehicle does require a start due to low battery voltage or cold engine oil, the fuel fired heater will continue to operate.

The operator must engage the heater and choose the desired temperature setting on the vehicle's control panel.

### *Vehicles Equipped with ESPAR Heaters*

For vehicle's equipped with an ESPAR heater, the Auto Start / Stop system will not start the truck to heat the vehicle.

- DO NOT ACTIVATE the rear HVAC switch. The heat mode of automatic climate control will be disabled with this configuration.
- The Auto Start / Stop system will start the engine due to low batteries and cold oil.
- The ESPAR heater will continue to operate while the Auto Start / Stop system runs the engine.

- Releasing the park brake disables the ESPAR Heater.

### *Vehicles Not Equipped with ESPAR Heaters*

For vehicles not equipped with an ESPAR heater, the Auto Start / Stop system will start the vehicle for both heating and cooling.

Vehicle should be pre-conditioned to a comfortable sleeper temperature:

- Select desired temperature setting on sleeper panel control (available range is 58°F to 84°F / 14°C to 29°C).
- Engage Automatic Climate Control.
- Set front HVAC to the full heat mode and the fan speed to the first fan speed setting (sleeper fan speed is automatically adjusted to 33%).
- The system monitors sleeper temperature from the sensor located in the cold air return. When sleeper temperature is less than the operator-selected temperature by 5°F or more, the engine is started (system will increase fan speed from 33% to 50%).
- The system will increase the sleeper HVAC panel temperature setting by 10°F. Once target temperature is achieved, as measured by the sleeper sensor, the engine will continue to run until the RUN TIME timer expires.
- When the RUN TIME timer expires, the operator-selected temperature will be restored to original setting. Fan speed is returned to 33% and the engine will shut down.
- A programmable Engine-OFF timer will require that the engine must be off for 15 minutes before a restart is permitted.

### *Air Conditioning Mode*

The air conditioning mode operates much like the heat mode. The engine will be started when the sleeper temperature exceeds 5°F above the operator-selected temperature setting. The engine shall always be run for the length of the RUN TIME timer (default 20 minutes).

Vehicle should be pre-conditioned to a comfortable sleeper temperature:

- Select desired temperature setting on sleeper panel control (available range is 58°F to 84°F / 14°C to 29°C ).
- Engage Automatic Climate Control.
- Set front HVAC to the full cool mode and the fan speed to the half speed setting (sleeper fan speed is automatically adjusted to 33%).
- The system monitors sleeper temperature from the sensor located in the cold air return. When sleeper temperature is greater than the operator-selected temperature by 5 degrees or more, the engine is started (system will increase fan speed from 33% to 50%).
- The system will decrease the sleeper HVAC panel temperature setting by 10°. Once target temperature is achieved, as measured by the sleeper sensor, the engine will continue to run until the RUN TIME timer expires.
- When the RUN TIME timer expires, the driver selected temperature will be restored to original setting. Fan speed is returned to 33% and the engine will shut down.

- A programmable Engine-OFF timer will require that the engine must be off for 15 minutes before a restart is permitted.

### Manual Climate Controls

**NOTE: If sleeper air conditioning is desired and the main cab blower is not enabled, the air conditioner will not function and the message Activate Front Blower will appear on the electronic gauge cluster.**

The manual climate controls allow the operator to adjust the temperature and amount of air circulated through the sleeper compartment.



1. **Fan Control:** Turns the fan on and off, and controls the fan speeds. Fan speed will be limited to approximately 50% of maximum when the engine is not running.

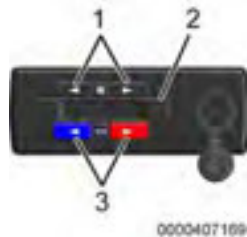
## Sleeper Features

---

2. **Temperature Control:** Use the temperature control to regulate the temperature of the air inside the sleeper compartment. This temperature is independent of the cab area. The blue area indicates cooler temperatures and the red area indicates warmer temperatures. When the air conditioner and front blower motor are on, the rear blower motor will run on low speed if the rear blower switch is in the OFF position.
3. **Power Receptacle:** Standard 12 volt power socket.

### Electronic Climate Controller

**NOTE:** If sleeper air conditioning is desired and the main cab blower is not enabled, the air conditioner will not function and the message **Activate Front Blower** will appear on the electronic gauge cluster.



The electronic climate controller provides easy adjustments of the sleeper's heating and air conditioning system by using the buttons.

1. **Fan Control Buttons:** Pressing the left button repeatedly will lower the fan speed to minimum, then turn the fan OFF. Pressing the right button turns the fan ON (if currently off), then raises the fan speed to maximum. Fan speed will be limited to approximately 50% of maximum when the engine is not running.
2. **Display:** This allows the operator to view the settings for fan speed and air temperature as they are being adjusted.
3. **Temperature Control Buttons:** Use these buttons to regulate the temperature of the air inside the sleeper compartment independent of the cab area. Press the left button to lower the temperature and the right button to raise the temperature.

**NOTE:** The temperature display is a representation of the current temperature set point, not actual sleeper temperature.

### No-Idle Heating

Optional fuel-fired heaters provide heat to the cab using only a fraction of the fuel that would be used by idling the vehicle's primary engine. The sleeper compartment heaters maintain the heat levels to the desired temperature set by the operator. Refer to the Operating Instructions provided with the heater.



**NOTE:** LT® and RH™ sleepers ordered with a factory-installed fuel fired heater option are equipped with a feature that operates the cab HVAC system at low blower, fresh air, floor mode whenever the auxiliary heater is being used. This low-speed operation during the use of a fuel fired heater allows fresh air to be drawn into the cab, limiting condensation buildup.

### Power Receptacle



A 12 volt power socket is located to the right of the sleeper climate controls. This power source provides a location to operate accessories.

### Radio Remote Control

The radio remote control gives the operator the ability to operate the instrument panel mounted radio from the sleeper compartment. For more information on the radio remote control, refer to the Radio Manual.

### Remote Power Inverter Panel

**NOTE:** The image below reflects a typical remote power inverter panel. Depending on the options chosen at the time of purchase, the remote power inverter installed on your vehicle may be different.



## Sleeper Features

---

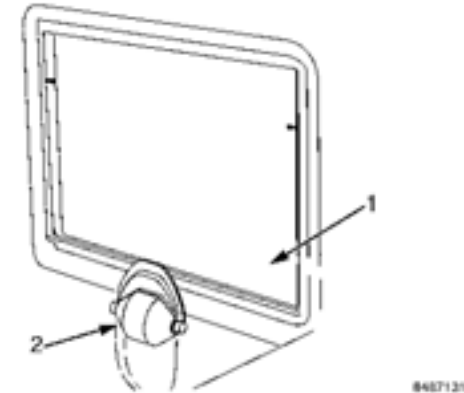
This optional feature allows the operator to control the power inverter (if equipped) from the sleeper compartment. The power inverter converts 12 volt DC current to 120 volt AC current for running the electrical features in the sleeper compartment.

1. **Fault Indicator Light:** This light is used to notify the operator that a fault exists with the power inverter. A solid RED light indicates the power inverter is in Over Temperature Mode. A blinking RED light indicates that the inverter is overloaded or DC voltage is too low. No light indicates that no fault exists.
2. **ON / OFF Buttons:** Press the System ON button to turn the power inverter on and the System OFF button to turn it off.
3. **Power Indicator Light:** The power inverter light will illuminate solid GREEN when the power inverter is powered on or in float charge State. A blinking GREEN light (one blink per second) indicates that the power inverter is in bulk or absorption charging state. A blinking GREEN light (two blinks per second) indicates that the power inverter is in load demand mode.

For more information on the remote power inverter panel; refer to the Power Inverter Manufacturer website.

## Windows

### General Information



1. Sleeper window
2. Handle

The sleeper compartment is equipped with a window on each side that can be opened for ventilation.

- Lift the handle to open the window.
- Lower the handle to close and lock the window.

Optional privacy curtains are provided to cover the sleeper windows. To install the curtains, place the curtain over the window and secure the curtain loops to the window frame. When not in use, store the curtains in one of the storage compartments.



## CAUTION

To prevent property damage, make sure windows are closed before washing the cab. Water can enter the cab through the window opening.

## Bunk Restraint System

### General Information



## WARNING

To prevent personal injury and / or death, or damage to property, always use occupant restraint system when vehicle is moving. Any location in the vehicle not equipped with a seat belt, bunk restraint belts, or sleeper berth restraint webbing should not be occupied when the vehicle is being operated.

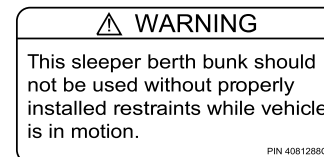
Two types of sleeper bunk occupant restraint systems are available with sleeper bunks supplied by Navistar, Inc. If the sleeper berth is not provided with one of these two types of restraint systems, that bunk is not intended to be occupied when the vehicle is in motion and must not be used when the vehicle is being operated. The description and recommended usage of the two available restraint systems for sleeper berth areas are as follows:

### Adjustable Belts

This two-belt system is standard with the sleeper lower bunk. To use the adjustable belt system, the bunk occupant should place one belt across the lower body (positioned above the occupant's knees but below the hips), and the other belt should be positioned across the upper body (above the hips but below the shoulders). Slack must be removed from belts after connecting the buckle by pulling the loose end of each belt to fit the connected belt snugly across the occupant's body.

### Restraint Webbing System (Optional)

The restraint webbing system is an option. If the vehicle is not equipped with the proper restraint webbing system, the following warning label will be present:

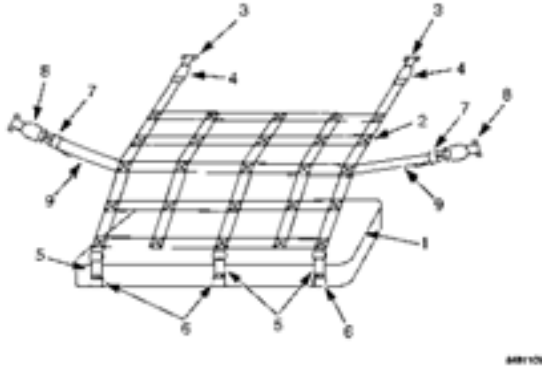


0000399542

## Sleeper Features

---

The optional restraint webbing system is secured around the bunk with seven buckles. The only restraint system provided with the optional upper bunk is the restraint webbing system. To use the restraint webbing system, follow these steps:



1. Bunk
2. Restraint webbing system
3. Rear latch
4. Rear buckle
5. Front latch
6. Front buckle
7. Side latch plate
8. Side buckle
9. Restraint strap

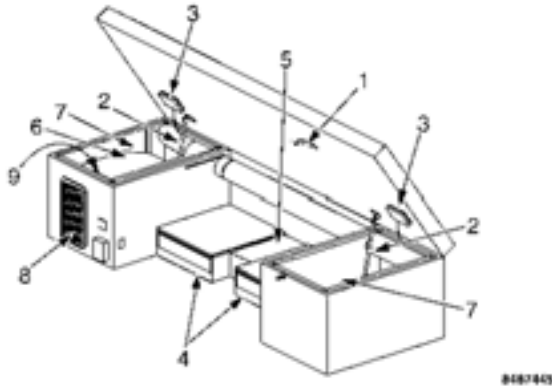
To install the restraint webbing system onto the sleeper bunk:

1. Enter the bunk and lay the restraint webbing system out on top of your body.
2. Insert two rear latches on the rear wall into two mating buckles (4) that are sewn to the restraint webbing system, making sure that both buckles are fully latched.
3. Insert three front latches that are sewn to the front of the restraint webbing system into the front buckles mounted at the front of the bunk. Determine that all three front buckles are fully latched.
4. The restraint webbing system is designed to be held up away from the reclining bunk occupant by the adjustable side latch plates on each side of the restraint webbing system. Insert two side latch plates that are sewn to the restraint webbing system into the side mating buckles located on the sleeper compartment side walls.
5. To adjust the restraint webbing system, pull the short straps at the side latch plates on each side of the restraint webbing system to tighten. Loosen the restraint webbing system by raising the side latch plates away from the restraint strap to allow the restraint strap to loosen through the latch plates.
6. Removal of the restraint webbing system is done by loosening both side latch plates, unlatching the side latch plates, unlatching the three buckles at the front of the bunk, and unlatching the two buckles attached to the rear wall.



## Lower Bunk

### General Information



Upper and lower bunks are available in the International® LT® and RH™ Series sleeper compartment. The lower bunk is standard while the upper bunk is an option. The lower bunk is hinged for access to the features under the bunk. Gas shocks aid in opening and closing of the lower bunk and hold the bunk in the raised position for access.

Item No.	Component	Description
1	Release latch	To open, press upward on the latch mechanism and lift the front edge of the bunk platform. To close, lower the bunk until the latch mechanism is locked in place.
2	Gas shocks	The lower bunk is fitted with two gas shocks to aid in opening, closing, and supporting the bunk in the opened position.
3	Lights	The lower bunk has two automatic lights that turn on as the bunk is raised and turn off when the bunk is lowered. These lights also operate when the exterior luggage doors are opened.
4	Lockboxes	Two lockboxes are provided under the bunk storage tray for securing valuables out of site.
5	Power inverter	The optional power inverter is stored under the bunk in the center compartment.
6	Sleeper HVAC components	The sleeper heating, ventilation, and air conditioning (HVAC) components are stored under the bunk.
7	Luggage compartment	Access to the luggage compartments can be achieved from the interior with the lower bunk in the raised position.

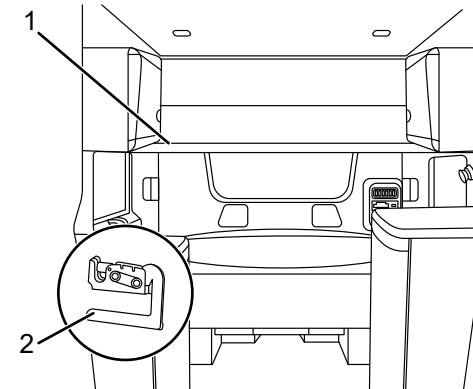
## Sleeper Features

Item No.	Component	Description
8	Sleeper HVAC intake	Allows air to enter sleeper HVAC unit. Do not block HVAC air intake.
9	Sleeper HVAC air intake filter	Replaceable / cleanable filter cleans air and protects heat exchanger from becoming plugged with lint and debris.

## Upper Bunk

### General Information

The optional upper bunk is hinged and can be raised and locked out of the way. Brackets are located on each side wall to hold the bunk in the down position, and a latch is located on the passenger-side to hold the bunk or release it from its stowed position. Access to the upper bunk is provided by steps that are attached to the driver-side tower cabinet.

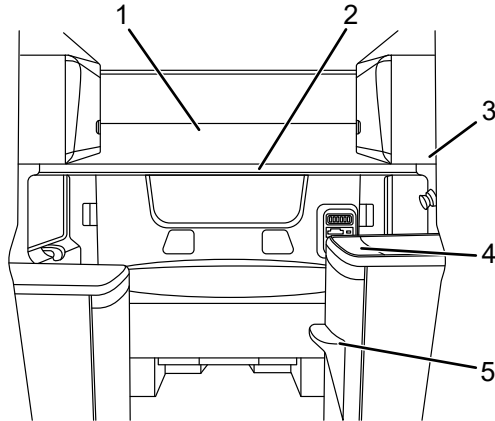


0000413658

1. Upper bunk
2. Release latch

**NOTE: The sleeper compartment is equipped with a dome light to aid entry and exit into the upper bunk. The dome light ON / OFF switches are located on the instrument panel and on the sleeper control panel.**

### Entering the Upper Bunk



0000413659

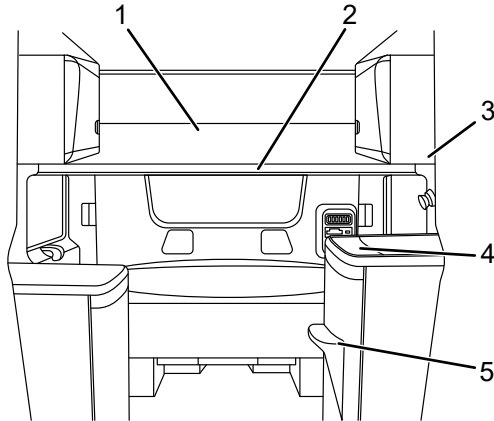
1. Upper bunk
2. Front bunk rail
3. Airline cabinet
4. Top step
5. Bottom step

1. Begin by facing the bottom step, placing your right foot on the bottom step. Grasp the front edge of the airline cabinet with your right hand and grasp the front bunk rail with your left hand. (The bunk area is designed for your head to be at the driver's side of the bunk.)
2. Step up on the bottom step and place your left foot on the top step while maintaining a firm grip on the front edge of the airline cabinet with your right hand and the front bunk rail with your left hand.
3. Release your right hand from the front edge of the airline cabinets and grasp the front bunk rail.
4. Step up on the top step with both feet and while keeping a firm grip with both hands on the front bunk rail, swing your right hip over onto the upper bunk.
5. Release your left hand from the front bunk rail and grip the front edge of the upper bunk, alongside your left hip.
6. Swing your legs up and to the right, positioning your body in the center of the upper bunk.

## Sleeper Features

---

### Exiting the Upper Bunk



0000413659

1. Upper bunk
2. Front bunk rail
3. Airline cabinet
4. Top step
5. Bottom step

1. While keeping a firm grip with both hands on the front edge of the upper bunk, sit up on the upper bunk, positioning your body above the top step and your legs over the front of the upper bunk.
2. Grab the front bunk rail with your right hand and the front edge of the upper bunk with your left hand. Pivot your body to the left, swinging your left leg down, and placing your left foot on the top step (Item 4). Release the front bunk rail with your right hand and grasp the front edge of the airline cabinet.
3. Grab the front bunk rail with your left hand and front edge of the airline cabinet with your right hand, and place your weight on the top step. Step down with your right foot to the bottom step.
4. Keeping a firm grip on the front bunk rail and the front edge of the airline cabinet, step down to the cab floor with your left foot followed by your right foot. You can now release the front bunk rail and front edge of the airline cabinet.

### Cabinets / Storage

#### General Information

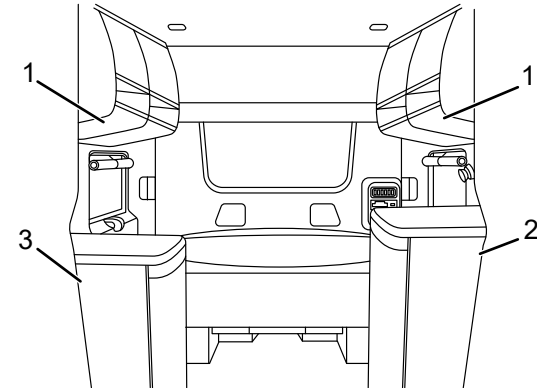


#### WARNING

To prevent personal injury and / or death, or damage to property, always remove all loose items from the interior and store appropriately when vehicle is in motion. Falling items can be a distraction to the driver, or a projectile can cause an accident.

**NOTE:** The following will describe and illustrate the standard cabinets and their storage functions for the International® LT® Series long sleeper. Your vehicle may not have all of these features.

The sleeper compartment is designed to accommodate several different types of cabinet configurations to fit all needs.



0000413660

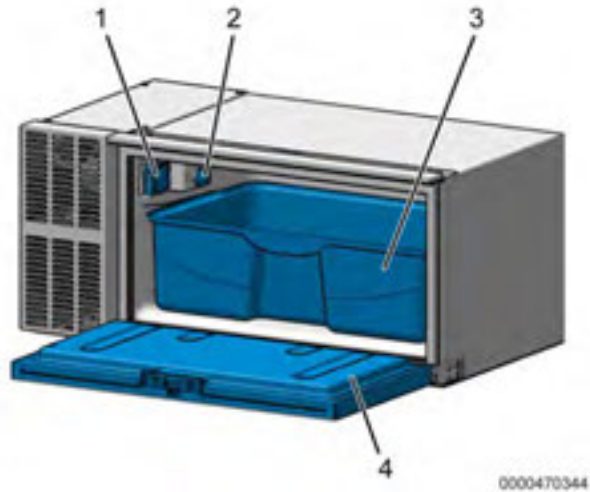
1. Airline cabinet
2. Tower wardrobe
3. Optional dresser cabinet or optional refrigerator cabinet

## Sleeper Features

---

### Cabinets

#### Under Bunk Refrigerator



1. Automatic light
2. Thermostat control knob
3. Pull out / removable bin
4. Flip down door

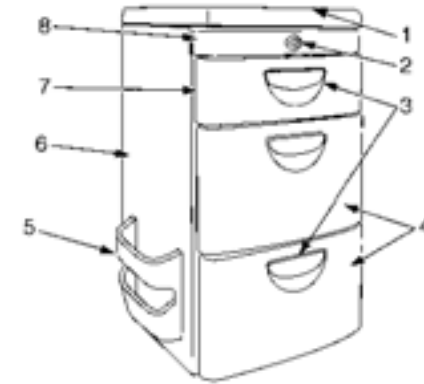
An optional under bunk refrigerator is available on select International® LT® and RH™ Series sleeper models and is located under the lower bunk.

#### Refrigerator Cabinet



Item	Name	Description
1	Refrigerator Cabinet	The refrigerator cabinet is available on select International® LT® Series long sleeper models and is located behind the passenger seat. The cabinet is required for vehicles that include the vertical refrigerator.
2	Drawer	A small drawer is provided for storage. To open, lift the handle from the bottom and then pull. To close, push the drawer shut until the lift release handle locks the drawer shut.
3	Work Table	The pull-out work table is held open or closed by friction. Pull to open. Push to close.
4	Refrigerator Door Handle	Pull to unlatch and open door. To close, push the door shut until the latch locks.
5	Refrigerator	The optional refrigerator is equipped with an adjustable thermostat, an automatic light, adjustable shelves, and a small freezer capable of making ice.
6	Magazine Pocket	This provides a storage area for books, magazines, and maps.

## Dresser Cabinet



8657137

1. **Dresser top:** The top of the dresser cabinet serves as a desktop.
2. **Release knob:** A release knob is used to open the work table. To open, depress the knob to extend it from the work table, then pull the work table open. To close the work table, depress the tab along the left-side of the work table, and slide the work table shut. Once the work table is closed, the knob needs to be pressed into a flush position with the work table. (This prevents the knob from getting hung on your clothing and other items as you move around in the sleeper compartment.)
3. **Lift release handle:** All drawers are equipped with lift release handles. To open the drawers, lift the handle from the bottom and slide the drawer open. To close,

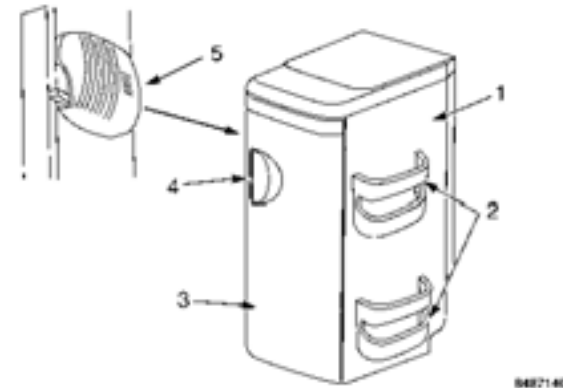
## Sleeper Features

---

push the drawer shut until the lift release handle locks the drawer shut.

4. **Large drawers:** Two large drawers are provided for storage.
5. **Magazine pocket:** This provides a storage area for books, magazines, and maps.
6. **Dresser cabinet:** The dresser cabinet is available on select International® LT® Series long sleeper models and is located behind the passenger's seat.
7. **Small drawer:** One small drawer is provided at the top of the dresser cabinet for storage.
8. **Work table:** Pull-out work table. **Important:** A release latch is located on the right-hand work table guide to allow the table to be stowed. To close, simply depress the release latch and slide the work table shut.

### Tower Wardrobe Cabinet

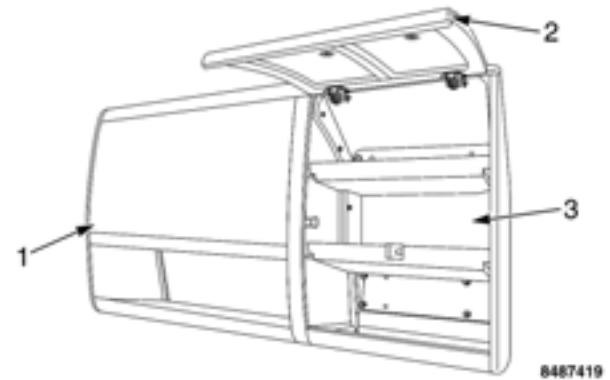


1. **Tower wardrobe:** The tower wardrobe cabinet is available on select International® LT® Series long sleeper models and is located behind the driver-side seat. The tower wardrobe cabinet provides hanging clothes storage. When equipped with the upper bunk option, the tower wardrobe cabinet provides steps for access to the upper bunk.
2. **Magazine pocket:** This provides a storage area for books, magazines, and maps.
3. **Door:** The optional door is provided on select International® LT® and RH™ Series sleeper models. Some models are fitted with no door or a snap-on cloth curtain.



4. **Lift release handle:** The optional door is equipped with a lift release handle. To open the door, lift the handle from the front and open the door. To close, push the door shut until the lift release handle locks the door shut.
5. **Internal light:** The internal light is mounted on the tower wardrobe cabinets that are equipped with a door. This automatic light turns on as the door is opened and turns off when the door is closed.

### Airline Cabinets



## Sleeper Features

---

1. **Airline cabinets:** These airline-style cabinets are mounted at the top of the side walls and can come in configurations of one, two, or three cabinets on each side of select International® LT® and RH™ Series sleeper models.
2. **Door:** Each airline cabinet is provided with its own pull-down door to secure stored items.
3. **Interior storage:** Interior storage is provided to secure items away from sight and prevent them from moving around while the vehicle is in motion.

## Convenience Features

### General Information

The sleeper cab is equipped with additional features that make living on the road easier and more convenient.

### Sleeper Curtain

Privacy curtains are available on all International® LT® and RH™ Series sleeper models to ensure privacy and to darken the cabin from outside light. Curtains are designed to separate the back of the driver-side / passenger-side seats and the sleeper compartment. When the curtains are not in use, they are easy to store by sliding them to the sides of the cab, wrapping the straps around them, and securing the straps to the snaps provided on the cab side walls.

### Power Sockets

Several 120 volt AC power sockets, for using electrical appliances within the sleeper, are distributed throughout the sleeper compartment.

### Television Mount

Mounted behind the passenger's seat and just below the airline cabinet is the optional television mount on select International® LT® and RH™ Series sleeper models. Straps are provided with the television mount to secure the television to the mount plate. A convenient antenna and power socket are located on the side wall next to the television mount.

### Power Inverter

The power inverter is available on select International® LT® and RH™ Series sleeper models and is used for converting 12 volt DC current to 120 volt AC current, so that devices such as a refrigerator, TV, VCR, microwaves, and hair dryers can be used within the sleeper compartment. For detailed information involving operation and features; refer to the Power Inverter Manufacturer website.

### Speakers

There are two standard coaxial speakers mounted on the rear wall of the sleeper compartment just above the lower bunk. An optional 10-inch subwoofer speaker is available for the sleeper compartment along with an amplifier that mounts under the lower bunk (driver-side luggage compartment).

### Floor Covering

The standard floor covering for the International® LT® and RH™ Series sleeper compartment is a durable rubber mat with cushioned insulation under the rubber mat.

An optional carpet insert is available on select International® LT® and RH™ Series sleeper models. It can easily be removed for cleaning.

### Sleeper Fan

The optional sleeper compartment fan is mounted on the headliner just behind the passenger seat. The sleeper fan is equipped with a push-button switch for turning the fan ON, OFF, and adjusting the fan speeds.

## SECTION 6 — OPERATION

### Operation Safety

#### General Information



#### WARNING

To prevent personal injury and / or death, or damage to property, do not operate a diesel engine near flammable vapors as this may cause the engine speed to increase uncontrollably and overspeed. Turning off the ignition switch will not slow or stop the engine due to uncontrollable fueling of the engine through flammable vapors being drawn into the engine air inlet. Operation of components, such as starter, alternator, electric motors, and static electricity, could also ignite flammable vapors.



#### WARNING

To prevent personal injury and / or death, or damage to property, do not exceed the truck's gross axle weight, gross vehicle weight, and gross combination weight ratings. Exceeding these ratings by overloading can cause component failure.



#### WARNING

To prevent personal injury and / or death, or damage to property, do not operate the truck in the possible presence of flammable vapors unless both a complete hazard analysis is performed and necessary additional safety processes and / or equipment such as vapor testing, air intake shutoff devices, and ventilation are utilized. The operator is responsible for using those processes and / or equipment to ensure that the diesel engine and all other components on the truck can be operated safely under the specific conditions and hazards that may be encountered.



#### WARNING

To prevent personal injury and / or death, or damage to property, always use occupant restraint system when vehicle is moving. Any location in the vehicle not equipped with a seat belt should not be occupied when the vehicle is being operated.



### WARNING

To prevent personal injury and / or death, or damage to property, always use the ashtray(s) provided for disposing of cigar, cigarette, or pipe ashes and tobacco. Failure to use an ashtray is a fire hazard.



### WARNING

To prevent personal injury and / or death, or damage to property, when parking your vehicle, do not leave transmission in gear. Always use parking brake. When parking on a grade, install wheel chocks and turn front wheels to keep the vehicle from rolling into the traveled portion of the roadway. Failure to follow these procedures could cause an unattended vehicle to move.



### WARNING

To prevent personal injury and / or death, or damage to property, never operate engines in enclosed areas without abundant forced ventilation (with garage doors and windows wide open), since exhaust gases from engine contain hazardous compounds. Maintain exhaust system in good operating condition.

This section contains information concerning the safe operation of your vehicle. It is extremely important that this information is read and understood before the vehicle is operated.

### Cab Controls

The cab controls and features are described in detail in the **Controls / Features** section of this manual. Read and understand the entire **Controls / Features** section of this manual before operating this vehicle.

## Cab Access



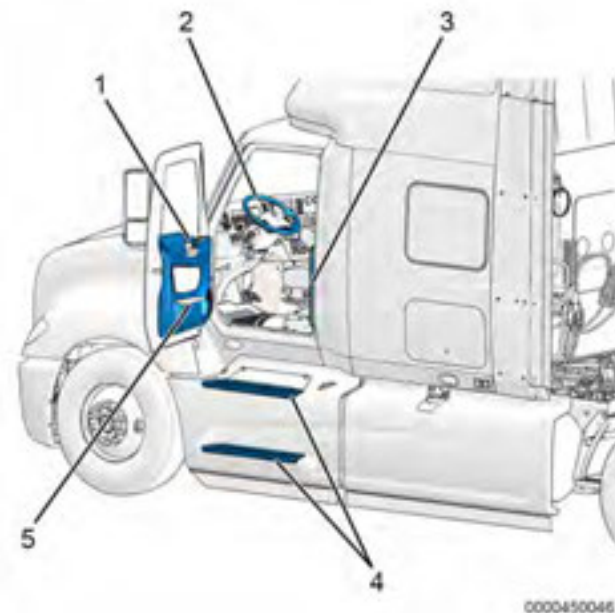
### WARNING

To prevent personal injury and / or death, or damage to property, observe the following:

- Always face toward the cab when entering and exiting.
- Do not hold anything in your hands when entering or exiting the cab.
- Always maintain three points of contact while entering and exiting the cab.
- Use only the vehicle components that are designated as handholds and steps or deck plates.
- Always put your foot flat on the top of the step or deck plate. Do not put your foot on the side or edge of the step or deck plate.
- Avoid direct contact with aftertreatment system components. They can remain hot after the engine has been shut down.
- Do not put your foot on a surface that does not have a slip-resistant, self-cleaning step material.
- If steps are mounted to a battery box, be sure the battery box cover is securely fastened before stepping.
- Keep all handholds, steps, and deck plates clean and free of mud, grease, spilled fuel, water, snow, ice or other slippery substances.

## Driver-Side Cab

The following illustration depicts the points of contact that should be used when accessing or exiting the driver-side of the cab.



1. Door pull handle
2. Steering wheel
3. Interior grab handle
4. Step (2)
5. Door storage compartment handhold

### Accessing Driver-Side Cab



#### **WARNING**

To prevent personal injury and / or death, or damage to property, if you need to switch your grip from one handhold to another as you climb, do so only when both feet are firmly in contact with the steps and one hand is firmly grasping a handhold.

**NOTE:** Depending on the options chosen at the time of purchase, the driver-side may be equipped with an interior and exterior grab handle to assist entering and exiting the cab.

1. Open the door and place any items you are carrying into the cab and out of the way.
2. While maintaining three points of contact with the vehicle at all times (two hands and one foot or one hand and two feet), use only the designated handholds and steps to climb up into the cab.
3. If you need to switch your grip from one handhold to another as you climb, do so only when both feet are firmly in contact with the steps and one hand is firmly grasping a handhold.

### Exiting Driver-Side Cab



#### **WARNING**

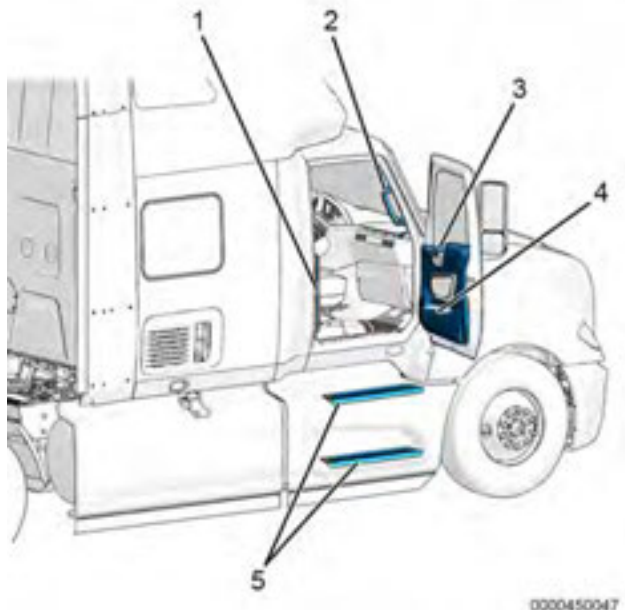
To prevent personal injury and / or death, or damage to property, if you need to switch your grip from one handhold to another as you climb, do so only when both feet are firmly in contact with the steps and one hand is firmly grasping a handhold.

**NOTE:** Depending on the options chosen at the time of purchase, the driver-side may be equipped with an interior and exterior grab handle to assist entering and exiting the cab.

1. While maintaining three points of contact with the vehicle at all times (two hands and one foot or one hand and two feet), use only the designated handholds and steps to climb down from the cab.
2. If you need to switch your grip from one handhold to another as you climb, do so only when both feet are firmly in contact with the steps and one hand is firmly grasping a handhold.

## Passenger-Side Cab

The following illustration depicts the points of contact that should be used when accessing or exiting the passenger-side of the cab.



1. Interior grab handle
2. A-pillar grab handle
3. Door pull handle
4. Door storage compartment grab handle
5. Step (2)

## Accessing Passenger-Side Cab



### WARNING

To prevent personal injury and / or death, or damage to property, if you need to switch your grip from one handhold to another as you climb, do so only when both feet are firmly in contact with the steps and one hand is firmly grasping a handhold.

**NOTE:** Depending on the options chosen at the time of purchase, the passenger-side may be equipped with an interior and exterior grab handle to assist entering and exiting the cab.

1. Open the door and place any items you are carrying into the cab and out of the way.
2. While maintaining three points of contact with the vehicle at all times (two hands and one foot or one hand and two feet), use only the designated handholds and steps to climb up into the cab.
3. If you need to switch your grip from one handhold to another as you climb, do so only when both feet are firmly in contact with the steps and one hand is firmly grasping a handhold.



### Exiting Passenger-Side Cab



#### **WARNING**

To prevent personal injury and / or death, or damage to property, if you need to switch your grip from one handhold to another as you climb, do so only when both feet are firmly in contact with the steps and one hand is firmly grasping a handhold.

**NOTE:** Depending on the options chosen at the time of purchase, the passenger-side may be equipped with an interior and exterior grab handle to assist entering and exiting the cab.

1. While maintaining three points of contact with the vehicle at all times (two hands and one foot or one hand and two feet), use only the designated handholds and steps to climb down from the cab.
2. If you need to switch your grip from one handhold to another as you climb, do so only when both feet are firmly in contact with the steps and one hand is firmly grasping a handhold.

### Airbag System

Your vehicle may be equipped with a driver-side frontal airbag located in the center of the steering wheel. If your vehicle is equipped, the word AIRBAG will be located in the center of the steering wheel. The airbag is designed to supplement protection provided by the seat belts.



#### **WARNING**

To prevent personal injury, and / or death, always wear the seat belt, even with airbags. Airbags are designed to work with seat belts, not replace them. Also, airbags are not designed to inflate in every accident. In some accidents seat belts are the only restraint.

Wearing your seat belt during an accident helps reduce the chance of hitting things inside the vehicle or being ejected from it. Airbags are supplemental restraints to the seat belts. Everyone in the vehicle should wear a seat belt properly, whether or not there is an airbag for that person.



#### **WARNING**

To prevent personal injury, and / or death, do not sit unnecessarily close to any airbag, such as sitting on the edge of the seat or leaning forward. Seat belts help keep the operator in position before and during an accident. Always wear a seat belt, even with airbags. The operator should sit as far back as possible while still maintaining control of the vehicle. The seat belts and the airbag are most effective when sitting well back and upright in the seat with both feet on the floor.



0000429898

### **Airbag Readiness Lamp**

An airbag readiness lamp is located in the instrument panel cluster. This lamp will illuminate if there is an electrical problem with the airbag system.

The system check includes the airbag sensor(s), operator sensing system (if equipped), airbag modules, wiring, and crash sensing and diagnostic module.

The airbag readiness lamp will illuminate for several seconds during the vehicle starting procedure. If the lamp does not illuminate, have the vehicle serviced immediately.

If the airbag readiness lamp remains lit after the vehicle is started or while driving, the airbag system may not be working properly. The airbag in the vehicle might not inflate in a crash, or it could even inflate unexpectedly during normal operation. If this condition exists, have the vehicle serviced immediately.

If there is a problem within the airbag system, a cluster message will be displayed.

### **When Should the Airbag Inflate?**

The airbag is designed to inflate if the impact exceeds the specific airbag system's deployment threshold. Deployment thresholds are used to predict how severe a crash is likely to be in time for the airbag to inflate and help restrain the operator. The vehicle has electronic sensors which assist the airbag system to determine the severity of the impact.

Airbags are designed to inflate in moderate to severe frontal or near-frontal crashes. This design helps to reduce the potential for severe injuries mainly to the operator's head and chest.

Whether an airbag will or should inflate is not based primarily on how fast the vehicle is traveling. It depends on the impact, the direction of the impact, and how quickly the vehicle slows down.

An airbag may inflate at different speeds, depending on whether the vehicle hits an object straight on or at an angle, and whether the object is fixed or moving, rigid or deformable, narrow or wide.

The airbag is not intended to inflate during vehicle rollovers, rear impacts, or in many side impacts.

In any particular crash, no one can say whether an airbag should have inflated simply because of the vehicle damage or repair costs.

### **What Makes the Airbag Inflate?**

As the airbag is deployed, the sensing system sends an electrical signal triggering a release of gas from the inflator. Gas from the inflator fills the airbag causing the bag to break out of the cover. The inflator, the airbag, and any related hardware are all part of the airbag module.

### How Does the Airbag Restrain?

In moderate to severe frontal or near frontal collisions, even belted occupants can contact the steering wheel or the instrument panel. In moderate to severe side collisions, even belted occupants can contact the inside of the vehicle.

The airbag supplements the protection provided by seat belts by distributing the force of the impact more evenly over the operator's body.

### What Will You See After the Airbag Inflates?

After the airbag inflates, it will then deflate rapidly. Some components of the airbag module will be hot to the touch for several minutes.

Parts of the airbag may be warm, but not too hot to touch. There could be smoke and dust coming from the vents in the deflated airbag. Airbag inflation does not prevent the operator from seeing out of the windshield or being able to steer the vehicle, nor does it prevent occupants from leaving the vehicle.



#### **WARNING**

To prevent personal injury, and / or death, occupants should exit the vehicle, if possible, as soon as it is safe to do so following an airbag deployment. There may be dust in the air when an airbag inflates, which could cause breathing problems for people with a history of asthma or breathing trouble. If breathing problems occur and exiting the vehicle is not possible, get fresh air by opening a window or a door. If breathing problems occur following airbag deployment, seek medical attention immediately.



#### **WARNING**

To prevent personal injury and / or death, or damage to property, use caution when restarting the engine after an accident has occurred.

An accident severe enough to inflate the airbags may have also damaged important functions in the vehicle, such as the fuel system, brake and steering systems. Even if the vehicle appears to be drivable after a moderate accident, there may be concealed damage that could make it difficult to safely operate the vehicle.

In accidents severe enough to inflate the airbag, windshields could be broken by vehicle deformation.

- Airbags are designed to inflate only once. After an airbag inflates, new parts will be required for the airbag system. If they are not obtained, the airbag system cannot protect the operator in the event of another accident. A new system will include airbag modules and possibly other parts.
- The vehicle has a crash sensing and diagnostic module which records information after a crash. See Vehicle Data Recording and Privacy and Event Data Recorders.
- Let only qualified technicians work on the airbag systems. Improper service can mean that an airbag system will not work properly. See your dealer for service.

### Servicing the Airbag-Equipped Vehicle

Airbags affect how the vehicle should be serviced. There are parts of the airbag system in several places around the vehicle. Your dealer and the service manual have information about servicing the vehicle and the airbag system.



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, be sure to follow proper service procedures by a qualified person. An airbag can still inflate for up to 10 seconds after the vehicle is turned off and the battery is disconnected. Avoid yellow connectors, as they are probably part of the airbag system.**

### Adding Equipment to the Airbag-Equipped Vehicle

Adding accessories that change the vehicle's frame, bumper system, height, front end, or side sheet metal, may keep the airbag system from working properly.

The operation of the airbag system can also be affected by changing, including improperly repairing or replacing, any parts of the following:

- Airbag system, including airbag modules, front sensors, sensing and diagnostic module, or airbag wiring
- Front seats, including stitching, seams, or zippers
- Seat belts
- Steering wheel, instrument panel, overhead console, ceiling trim, or pillar garnish trim
- Inner door seals, including speakers

Your dealer and the service manual have information about the location of the airbag modules and sensors, sensing and diagnostic module, and airbag wiring along with the proper replacement procedures.

If the vehicle must be modified because you have a disability and have questions about whether the modifications will affect the vehicle's airbag system, or if there are questions about whether the airbag system will be affected if the vehicle is modified for any other reason, call Customer Assistance.

### Airbag System Check

The airbag system does not need regularly scheduled maintenance or replacement. Make sure the airbag readiness light is working.



#### **WARNING**

To prevent personal injury and / or death, or damage to property, do not open or break the airbag coverings. If there are any opened or broken airbag coverings, the airbag may not work properly. Have the airbag covering and / or airbag module replaced. Contact your dealer if airbag service is needed.

### Replacing Airbag System Parts after a Crash



#### **WARNING**

To prevent personal injury and / or death, have the airbag system inspected and any necessary replacements made as soon as possible after an accident. A damaged airbag system may not properly protect the operator and other occupants of the vehicle.

If an airbag inflates, replace airbag system parts. See your dealer for service.

If the airbag readiness lamp stays on after the vehicle is started or comes on when driving, the airbag system may not work properly. Have the vehicle serviced immediately.

### Seat Belts

#### General Information



#### **WARNING**

To prevent personal injury and / or death, or damage to property, do not ride in the vehicle cargo area or on the outside of the vehicle. Ride only in designated seating positions or sleeper berth with seat belts or bunk restraints fastened and properly adjusted.



#### **WARNING**

To prevent personal injury and / or death, or damage to property, properly inspect and maintain seat belts.



#### **WARNING**

To prevent personal injury and / or death, or damage to property, any seat belt in use during an accident must be replaced. When replacement of any part of the seat belt is required, the entire belt must be replaced, both retractor and buckle sides.



## WARNING

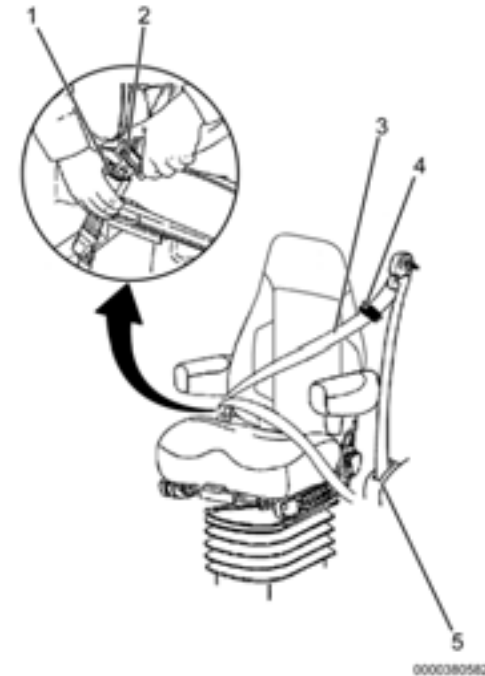
To prevent personal injury and / or death, or damage to property, do not cut, drill, braze, weld, strike, or probe any part of the RollTek® system. The RollTek® system contains components that use combustible chemicals. Keep all liquid chemicals away from RollTek components.

**NOTE:** Periodically inspect the seat belts for wear and function. Replace any parts whose performance is in doubt.

Safety belts must be worn by the driver and all passengers at all times. Before adjusting or fastening the safety belt, move the seat forward or backward and adjust the seat height as necessary. Sit erect and adjust the seat cushion and seatback for a comfortable driving position. In the event of a collision, a correct driving position maximizes the effectiveness of the safety belt.

Tether straps are installed on all suspension-type seats. Tether straps help secure the seat to the floor and are intended to restrain the seat and safety belt in case of an accident or sudden stop. The tethers are not adjustable and do not need any adjustment.

## Operation



1. Tongue
2. Buckle
3. Three-point seat belt
4. Clip
5. Retractor

To operate the seat belt follow these steps:

1. Slowly pull the three-point seat belt out of the retractor and slowly pull it across your lap far enough to engage the buckle. If the retractor locks too soon, allow the seat belt to retract slightly, then slowly pull it out again.
2. To fasten the seat belt, insert the tongue into the buckle until it latches. Give the seat belt a firm tug to ensure that the buckle is securely fastened.
3. The seat belt must be free to slide through the tongue, allowing the belt tension to equalize across hips and chest. The retractor is a locking type that allows the seat belt to come out and to adjust for body movement.
4. The seat belt will return to the retractor as the body returns to its original position. The retractor will retain moderate tension across the body in its operation mode.
5. The seat belt is equipped with a clip to eliminate the moderate belt tension across the body. It can be adjusted by pressing the button and sliding the clip along the seat belt.
6. To release the seat belt, push the button release latch on the buckle and give the seat belt a tug to assist the seat belt into the retractor.

### Comfort Clip (If Equipped)



#### **WARNING**

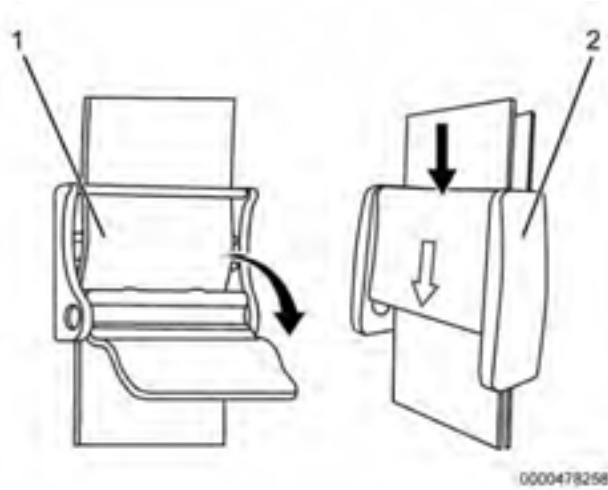
**To prevent personal injury and / or death, or damage to property, do not introduce more than one inch of slack in the seat belt when engaging Comfort Clip. Too much slack can reduce the effectiveness of the seat belt in the event of a collision.**



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, NEVER attempt to engage or disengage comfort clip while vehicle is in motion. ONLY engage or disengage Comfort Clip when vehicle is parked.**

**NOTE: Your vehicle may be equipped with one of two Comfort Clip options. Some vehicles may be equipped with a latch style mechanism and other vehicles may be equipped with a sliding style option.**



1. Latch style
2. Sliding style

The Comfort Clip sets the slack in the seat belt and allows the driver more range in mobility, allowing full steering turns and the ability to check side mirrors while remaining secure. In the event of sudden deceleration, the Comfort Clip disengages automatically, and the seat belt will lock.

To engage Comfort Clip:

1. Adjust the seat to its proper driving position and secure seat belt.
2. Adjust the seat belt height adjuster to comfortable driving position.
3. Tug the belt to create 1 in (2.5 cm) or two fingers of slack distance between torso and belt.
4. With the other hand, lift the Comfort Clip latch or press down on the sliding mechanism to engage Comfort Clip.

The Comfort Clip is now safely engaged.

**NOTE: ALWAYS disengage Comfort Clip when unbuckling seat belt. This will allow seat belt to fully retract.**

To disengage the Comfort Clip either:

- Lean forward in seat, and pull on shoulder belt.

OR

- Reach up and pull down Comfort Clip latch.

The Comfort Clip is now safely disengaged.



### RollTek® SRS System Seat Belt Pretensioning Device

The RollTek SRS system contains a seat belt pretensioning device. This activates when a rollover condition is detected by the RollTek system, and will tighten the lap and shoulder belt around the driver and / or passenger (if equipped).

#### Care of Seat Belts



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, do not bleach or re-dye seat belt webbing. Bleaching or re-dyeing may cause a weakening of the webbing.**

Clean the belts occasionally with mild soap; do not use cleaning solvents or abrasives.

The entire seat belt assembly should be inspected periodically for corrosion, wear, fraying, or weak spots. The retractor, latch, and buckle should be checked for proper function, and all seat belt mounting bolts should be tight at all times.

### Seats

#### General Information



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, do not adjust driver's seat while vehicle is moving. The seat could suddenly or unexpectedly move, causing the driver to lose control of vehicle.**



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, use caution and reduce speed when operating this vehicle over rough roads or surfaces as this can cause loss of vehicle control. Properly adjusted seats and seating systems may not compensate completely for severe road conditions. Ensure that head clearance will be maintained during all road conditions, as the seat may move up and decrease the available space.**



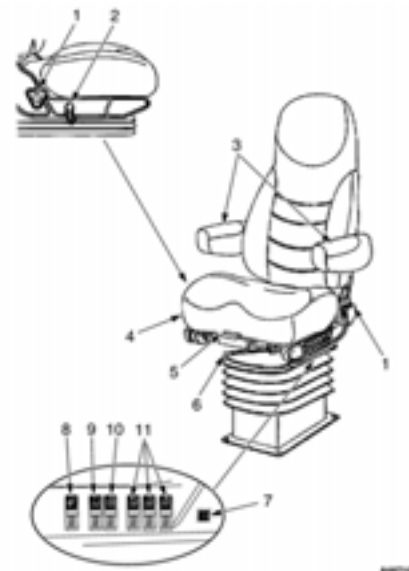
### CAUTION

To prevent property and / or component damage, **AVOID** using seat(s) in any reclined position that contacts the cab back panel or any components. Continued use of the seat(s) in these conditions can cause unnecessary wear and tear of the seat components, the cab back panel and / or cab components. **Warranty claims due to damage occurring under these conditions will not be honored.**

There are several seat options that can be used in the International® LT® and RH™ Series vehicles. If a different seat assembly than the one listed below is installed in your vehicle, see your authorized International Truck dealer.

The air suspension seats for the driver and passenger are equipped with features that adjust for maximum comfort and safety. Depending on which models are installed in the vehicle, some of these features may not apply.

### Seat Controls and Adjustments



## Operation

Item No.	Item	Description
1	Backrest Tilt	Rotate the handle to adjust the backrest recline angle.
2	Chugger Snubber	Move the handle down to isolate the seat from the fore and aft movement of the cab.
3	Armrests	Adjust armrests by lowering / raising to desired angle.
4	Swivel Seat	Turn release lock and press inward to allow seat to swivel towards the center and rear of the cab.
5	Cushion Front Tilt	Pull the handle up and out to adjust the tilt and length of the seat cushion.
6	Fore and Aft Movement	Press the lever sideways to unlock the seat and adjust the fore / aft position.
7	Back Cyclor	Press this button to activate the lumbar massage feature.  <b>NOTE: This feature operates from the truck air supply and does not turn off automatically when the truck is turned off. To avoid depleting the air tank(s) during shutdown periods, make sure the back cyclor is manually turned off prior to shutdown.</b>
8	Ride Height	Push the switch up to inflate the air suspension and increase the ride height. Push the switch down to deflate the air suspension and lower the ride height.

Item No.	Item	Description
9	Seat Cushion Side Support	Push the switch up to inflate the seat cushion side supports. Push the switch down to deflate the seat cushion side supports.
10	Backrest Side Support	Push the switch up to inflate the backrest side supports. Push the switch down to deflate the backrest side supports
11	Triple Lumbar	These three switches operate the three chamber lumbar supports. Push each switch up to inflate the upper, middle, or lower chamber, and push each switch down to deflate the chambers.

### RollTek Rollover Protection System

The International® LT® and RH™ Series vehicles are equipped with the RollTek Rollover Protection System. When used with seat belts, the RollTek Supplemental Restraint System (SRS) provides additional protection to the driver and passenger (if equipped) in rollover crashes. Sensors in the RollTek seat base activate the system when the truck enters an irrecoverable rollover. RollTek first tightens the lap and shoulder belts securing the driver and / or passenger (if equipped) to the seat. Second, it lowers the seat suspension, increasing seat stability and moving the driver and / or passenger away from the steering wheel and ceiling. The side-roll airbag deploys from the outboard side of the seatback as the seat is pulled down to its lowest position, providing protection to the driver and / or passenger in the point of contact with the cab in a rollover.

**WARNING**

To prevent personal injury and / or death, do not place seat covers or other objects on the seatback or block the side-roll airbag. Objects that block the side-roll airbag may prevent proper inflation and subsequent protection of driver / passenger in a rollover crash.

**WARNING**

To prevent personal injury and / or death, or damage to property, do not cut, drill, braze, weld, strike, or probe any part of the RollTek system. The RollTek system contains components that use combustible chemicals. Keep all liquid chemicals away from RollTek components.

**WARNING**

To prevent personal injury and / or death, or damage to property, do not attempt to service or modify the RollTek system as this could result in unintentional or improper deployment of the RollTek system. Contact an authorized International dealer for all service and maintenance.

**WARNING**

To prevent personal injury and / or death, or damage to property, the RollTek system must be replaced after being activated. Damaged seat belts and tethers, or seat belts and tethers that were worn in an accident, must be replaced, and their anchoring points must be checked.

**WARNING**

To prevent personal injury, keep hands and tools away from the scissor point under the seats.

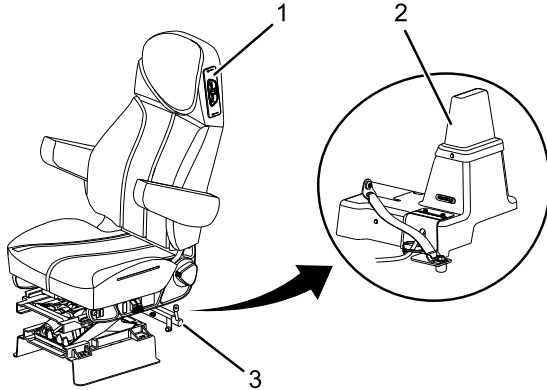
**WARNING**

To prevent personal injury and / or death, or damage to property, never touch any components if RollTek system has activated. When system is deployed, components will be hot.

## Operation

---

### *RollTek Rollover Protection System Operation*



0000391041

### **RollTek Supplemental Restraint System**

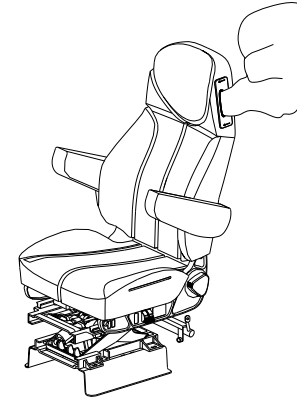
1. Side Roll Airbag (SRA)
2. RollTek SRS system seat belt pretensioner module cover
3. Inter Connect Point (ICP) bar

The RollTek SRS consists of a rollover crash sensor, seat and seat belt tensioning system, and a side rollover airbag. Located at the base of the driver's and / or passenger's (if equipped) seat, the rollover sensor continuously monitors the truck's angular rate at all times after completion of an initial diagnostic check.

During a life-threatening rollover event, the sensor compares the truck's acceleration, roll angle, and roll rate against

known rollover conditions. When the comparison indicates an irrecoverable rollover condition, the sensor deploys the side airbag.

### **Side Roll Airbag Deployed**

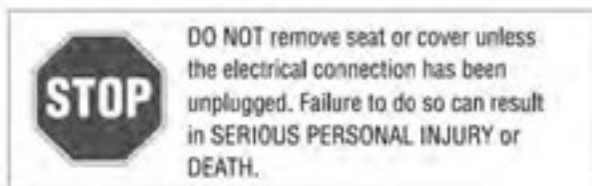


0000391042

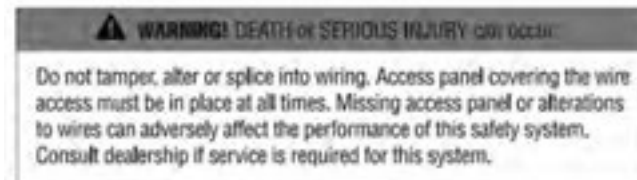
Upon receiving the signal from the rollover sensor, gas cylinders inside the seat base activate to tighten the lap and shoulder belts around the driver and / or passenger and lower the seat suspension. As the gas cylinders tighten the seat belt and lower the seat, a side-roll airbag will deploy from the outboard side of the seatback. The airbag will inflate between the driver's and / or passenger's head / neck and the side wall / door of the truck. The airbag will remain inflated for several seconds to provide added protection during multiple rollover events.

**RollTek SRS Module Cover Warning Labels****WARNING**

To prevent personal injury, and or death, pay special attention to the warning labels attached to the seat covers.

**RollTek Unit Cover First Warning Label**

0000391024

**RollTek Unit Cover Second Warning Label**

0000391025

There are two warning labels located on the RollTek Unit cover. The unit is located directly behind the driver-side seat and, if equipped, passenger-side seat.

### *RollTek System Inspection and Service*

#### **RollTek System SRS Diagnostic Lamp**



The operational readiness of the RollTek system is indicated by the side airbag graphic indicator on the electronic gauge cluster. The indicator comes on for approximately 6 seconds when the engine is started and then goes OFF. The indicator will remain ON if there is a problem with the RollTek system. The vehicle must be serviced at an International dealer if the SRS indicator does not come on when the engine is started, or if the SRS indicator remains illuminated. The Rolltek system may or may not be operational when the warning lamp is continuously illuminated, depending on the nature of the fault.

The air bag module may contain perchlorate material; for more information, see [www.dtsc.ca.gov/hazardouswaste/perchlorate](http://www.dtsc.ca.gov/hazardouswaste/perchlorate). Special handling may be required; follow appropriate rules and regulations when disposing of materials.

For all service and maintenance, contact an authorized International dealer.

## **Starting Procedures**

### **General Information**



#### **WARNING**

To prevent personal injury and / or death, or damage to property, never start the engine unless you're sure the transmission selector is in Neutral and the brake is applied; otherwise, accidental movement of the vehicle can occur.



#### **CAUTION**

To prevent starter damage, DO NOT crank the engine for more than 30 seconds at a time; wait 2 minutes after each try to allow the starter to cool.

### **NOTE: Before starting the engine:**

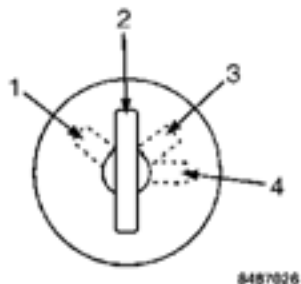
- Read and understand the Controls / Features section of this manual.
- Perform the left- and right-side engine compartment inspections outlined in the Inspection Guide section of this manual.
- If your vehicle has an optional battery disconnect switch, be sure that it is in the ON position. This switch is cab mounted or mounted on the battery box.

**NOTE:** Automated manual transmissions must be in Neutral and vehicles with a clutch pedal require the clutch pedal to be depressed before the starter will engage.

**NOTE:** Some automated transmissions will delay engine cranking until the transmission power up is complete.

### Engine Starting

The ignition switch has four key positions.



1. ACC (Accessory)
2. OFF
3. ON
4. START

**NOTE:** For additional information, see Engine Operation and Maintenance Manual.

1. Apply the parking brake and place the transmission in Neutral. If equipped with a clutch pedal, the clutch pedal must be depressed.
2. Turn OFF the headlights and all accessories.
3. Turn the key clockwise to the ON position.
4. Turn the key to the START position.
5. When the engine starts, release the key.
6. The key will return to the ON position and the engine will continue to run.
7. To stop the engine, rotate the key counterclockwise to the OFF position.
8. To place the ignition switch in ACC (Accessory) position, rotate key counterclockwise to the ACC position. Accessory features can now be used without engine operation.
9. To terminate ACC (Accessory) operation, rotate the key clockwise to the OFF position.



### After the Engine Starts

**NOTE: For additional information, see Engine Operation and Maintenance Manual.**

- Do not increase engine speed until the oil pressure gauge indicates normal pressure.
- Make sure the engine oil pressure is indicated on the gauge within 20 seconds after starting.
- Operate the engine for 3 - 5 minutes before operating at full power.
- Try to limit engine idle to 10 minutes. Excessive idling reduces fuel economy and may decrease oil life.
- When starting a cold engine, increase the engine speed (rpm) slowly to make sure adequate lubrication is available to the bearings.

### Engine Shutdown

**NOTE: For additional information, see Engine Operation and Maintenance Manual.**

Idle the engine for 3 - 5 minutes before shutting down. This few minutes of idling allows the lubricating oil and water to carry heat away from components heat-soaked by hot combustion / exhaust gases.

The larger the engine, the greater the need for this idling period. This will help avoid damage to turbocharger seals or like features of an engine which, after shutdown, will no longer be cooled by the circulation of oil and coolant.

1. Place the transmission in Neutral.
2. Apply the parking brake.
3. Turn off the headlights and all accessories.
4. Idle a hot engine for 2 - 5 minutes to allow the turbocharger to cool.
5. Rotate the key counterclockwise to the OFF position, and remove key from the ignition switch.

### Emergency Starting



#### **WARNING**

To prevent personal injury and / or death, or damage to property, the following procedure must be performed exactly as outlined; otherwise, a fire or a battery explosion could result.



#### **CAUTION**

To prevent electronic component damage, never exceed 16.0 volts to vehicle's electrical system. When it is necessary to jump-start a vehicle, the most reliable means is to connect charged 12 volt batteries.

**NOTE: The International® LT® and RH™ Series vehicles are equipped with a remote jump-start stud, located on the back of the battery box, which eliminates the need to remove the battery box cover when jump-starting is required.**

1. To prevent shorting of the electrical system, remove metal rings or watches and do not allow metal tools to contact the positive terminal of battery or jumper cables.
2. Place transmission in Neutral and set parking brake in both the discharged and booster vehicle.
3. Shut all electrical loads in both vehicles.
4. Eye protection should be worn if available. If not available, shield eyes when near either vehicle's batteries.
5. DO NOT permit vehicles to touch each other when jump starting.
6. Connect one end of the first jumper cable to positive (+) terminal of the dead battery or (+) terminal of dead battery jump start stud, and then connect the other end of the jumper cable to the positive (+) terminal of the booster battery.
7. Connect one end of the second jumper cable to the negative (-) terminal of the booster battery and the other end to chassis frame of the vehicle with the discharged battery. Do not attach the other end to the negative (-) battery terminal of the discharged battery, because a spark could occur and cause explosion of gases normally present around the battery.

8. With the engine running on the booster vehicle, allow the discharged batteries to charge for at least 5 minutes.
9. Attempt to start the discharged vehicle.
10. Reverse above procedure when removing the jumper cables.

### Cold Weather

#### General Information



**To prevent personal injury and / or death, or damage to property, do not use volatile starting aids such as ether, propane, or gasoline in the engine air intake system. Glow plugs and / or grid heater will ignite vapors, which are an explosion hazard.**

#### Cold Weather Starting

There are two optional features available on the International® LT® and RH™ Series trucks for frequently operating the vehicle in cold climates.

**Ether Injection System:** This temperature controlled system is automatically activated at air temperatures below 32°F (0°C) and injects a safe, metered amount of ether prior to engine cranking. The ether injection system is mounted to the left frame rail under the hood.

**Engine Block Heater:** For cold climates an optional engine block heater is available. The block heater utilizes an external power source to keep the engine coolant warm and a 120 volt socket for connecting to the external power source. The 120 volt socket is mounted below the driver-side door.

### *Cold Weather Operation*

In order to operate the engine in temperatures of 32°F (0°C) or lower, observe the following instructions:

- Make certain that batteries are of sufficient size and in fully charged condition. Check that all other electrical equipment is in optimum condition.
- Use permanent type engine antifreeze solution to protect against damage by freezing.
- At the end of each daily operation, drain water from fuel / water separator, if equipped.
- Fill fuel tank at end of daily operation to prevent condensation in fuel tank.
- Be sure to use proper cold weather lubricating oil, and be sure crankcase is at proper level.
- At temperatures of 20°F (-6°C) and below, it is recommended that you use an engine block mounted coolant heater to improve cold starting.
- If operating in arctic temperatures of -20°F (-29°C) or lower, consult your International Truck dealer for information about special cold weather equipment and precautions.

### *Engine Idling*



#### **CAUTION**

**To prevent property damage, adhere to this Caution. Because diesel engines are highly efficient, they use very little fuel while idling. As a result, idling in cold weather will not heat the engine to its normal operating temperature. This in turn can cause a buildup of heavy deposits of carbon and rust on valve stems, causing them to stick. Sticking valves can cause significant valve train damage. The colder the ambient temperature, the more likely this will occur.**

The following cold weather idling guidelines must be followed:

- Avoid extended idling (beyond 10 minutes) whenever possible to maximize engine and Diesel Particulate Filter (DPF) life. See **Exhaust Diesel Particulate Filter Regeneration** in this section for more information.
- Use a minimum 40 Cetane diesel fuel or utilize Cetane Index improvers from a reputable manufacturer.
- Maintain engine cooling system.
- Do not shut engine down after extended idling period. Drive the vehicle under load for several miles at normal operating temperatures to burn off any accumulated carbon and varnish in the exhaust DPF.
- Consider use of engine block heaters and approved winter fronts where conditions warrant.

### *Engine Idle Shutdown Timer (If Equipped)*

This vehicle may be equipped with an optional Idle Shutdown Timer that will limit engine idle time to comply with certain state and local regulations and / or owner / operator preferences. If the optional Idle Shutdown Timer is enabled, the engine will shut down after a preprogrammed time of extended idling. This will also shut down all electrical loads except for lights. Allowable idle times may vary from state to state and with owner / operator preferences. Idle times may also be dependent on vehicle conditions such as Parking Brake status, PTO (if equipped) status, transmission status, and others.

The vehicle owner or operator is responsible for compliance with all state and local regulations.

If the vehicle has this system enabled, the IDLE SHUT DOWN indicator will illuminate YELLOW in the electronic gauge cluster will turn on 30 seconds before engine shutdown. This indication will continue until the engine shuts down or the system is reset.



### *Winter Front Usage*

Except in extremely cold conditions, Navistar does not recommend the use of winter fronts or other restrictive devices mounted in front of the cooling module (such as, radiator and charge air cooler) on International® vehicles. The use of winter fronts or other air restrictive devices can affect engine emissions and / or cause OBD fault codes, high exhaust temperatures, power loss, excessive fan usage, and / or a reduction in fuel economy.

The appropriate selection of a winter front depends on the ambient conditions, vehicle type, vehicle usage (highway, rural, stationary), and the winter front opening sizes. If you use a winter front device, it should consist of a permanent opening above or directly in line with the fan center. The opening(s) should be appropriate in size for the vehicle application; for example, vehicles used at highway speeds can utilize smaller openings, while rural or stationary applications will require larger openings to prevent overheating. In any situation, avoid blockage of entire heat exchanger tubes or substantial variation in blockage of adjacent tubes.

### **Hot Weather Operation**

1. Keep cooling system filled with clean permanent antifreeze solution to protect against damage by overheating.
2. Fill fuel tank at end of daily operation to prevent condensation in tank.
3. Keep external surface of engine, radiator, charge air cooler, A/C condenser, and accessories clean to avoid dirt buildup.

Excessive coolant temperature could be experienced while driving in too high of transmission gear ratio, which would lug the engine. To correct the problem, increase engine speed by downshifting into the next lower gear to increase engine rpm, which will increase coolant flow through the radiator and increase fan speed.

### Operating Instructions



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, make sure your path is clear in all directions before moving your vehicle. All vehicles have blind spots. If necessary, ask for assistance when moving vehicle.**



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, do not operate an engine beyond the maximum governed speed.**

### Uphill and Downhill Operation

- Start the vehicle in motion by utilizing the highest gear speed in the transmission that will enable the engine to easily pull the load without slipping the clutch. Accelerate smoothly and evenly to engine rated speed. Rapid acceleration will result in high fuel consumption.
- When approaching a hill, depress accelerator smoothly to start the upgrade at full power, then shift down as needed to maintain vehicle speed.

- Prevent overspeeding of the engine when going down long and steep grades. The governor has no control over engine speed when it is being pushed by the loaded vehicle. Operate in a gear that will permit an engine speed below the Maximum Governed Speed or High-Idle rpm (no load).

### Steering

Be alert to any change (feel) in steering when driving. This change or feel includes increased steering effort, unusual sounds when turning, excessive wheel play, or pulling to either side. If any of the above are detected, have the vehicle inspected and repaired at once by a qualified mechanic.



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, do not adjust the steering column while the vehicle is moving. It could suddenly or unexpectedly move, causing the driver to lose control of vehicle.**



#### **CAUTION**

**To prevent property damage, do not lubricate the tilt or telescoping steering mechanism.**

### *Stationary Steering Column*

The International® LT® and RH™ Series vehicles are equipped with a standard stationary column. This steering column is non-adjustable.

### *Tilt Steering Column (If Equipped)*

The optional tilt steering column has infinite positions allowing adjustment toward or away from the driver through a 20-degree range. The tilt handle is located on the left-side of the column. To tilt the column, pull the lever towards the driver and move the steering wheel to the desired position. Release the lever to lock the column in position.

### *Adjustable Steering Column*



0000418896

1. Steering wheel
2. Release handle

If equipped with the optional tilting and telescoping steering column, the steering wheel can be adjusted as follows:

1. Grasp the steering wheel with your right hand and unlock the release handle with your left hand by pushing forward on the release handle.
2. Using both hands, grab the sides of the steering wheel and adjust the telescoping feature to the desired position and then the steering wheel tilt to the desired position.
3. Hold the steering wheel in the newly acquired position with your right hand and pull the release handle backward towards you, to the locked position, with your left hand.
4. Make certain the steering wheel is in the proper position and the column is locked.

### **Electrical**

#### *Alternator*



#### **CAUTION**

**To prevent property damage, avoid improper usage of fast charger, hookup of booster battery, or battery installation, which can cause damage to the electrical system or to the alternator.**

Many alternators used in International® Trucks are of the self-energizing type. Some engines may need to be revved briefly after starting to turn on the alternator. The alternator will then charge at idle. If the vehicle is to be warmed up prior to beginning operation, the operator should observe the voltmeter for charging indication before leaving the vehicle.

### Battery



#### **WARNING**

To prevent personal injury, and / or death, or damage to property, keep lighted tobacco, flames, sparks, or other ignition sources away from the batteries. Gas from the battery cells is flammable and can ignite and / or explode, including when jumper cables are being used.

In addition, inhaling the hydrogen gas produced by the normal operation of the battery could result in partial or permanent damage to the respiratory system.



#### **WARNING**

To prevent personal injury, and / or death, or damage to property, whenever disconnecting battery terminals, always disconnect ground terminal first. When reconnecting, always connect ground terminal last. Failure to follow this procedure could also result in a short to ground.



#### **WARNING**

To prevent personal injury, and / or death, or damage to property, always wear eye protection when working around batteries. **DO NOT** attempt to jump-start a vehicle with a frozen battery because the battery may rupture or explode. If a frozen battery is suspected, thaw out battery and recharge.



#### **WARNING**

To prevent personal injury, and / or death, or damage to property, **DO NOT** check battery condition by shorting (flashing) across terminals.

When working around the terminals and battery, use extra care to avoid shorting. A good practice is to use insulated pliers and screwdrivers.

*Maxwell® Engine Start Module (ESM)*



#### **WARNING**

To prevent personal injury and / or death, or damage to property, **DO NOT** jump-start the vehicle using the Maxwell® Engine Start Module (ESM). A high risk of arcing and / or damage to the battery or ESM can result from attempting to jump-start this module.



**WARNING**

To prevent injury and / or death, or damage to property, always have engine start module serviced by a qualified technician. The ESM is an extremely high voltage module and servicing should only be performed by qualified personnel using necessary safety procedures and equipment.



**WARNING**

To prevent personal injury and / or death, or damage to property, do not handle the engine start module while fully charged, always discharge prior to removal and / or handling. The engine start module power terminal can produce an extreme arcing hazard. Refer to the appropriate service manual for detailed instructions on discharge procedure.



**WARNING**

To prevent personal injury and / or death, or damage to property, **DO NOT** check module condition by shorting (flashing) across terminals.



**WARNING**

To prevent personal injury and / or death, or damage to property, do not connect battery cables to the starter positive terminal, this can cause a battery short and / or electrical arcing.



1. ESM battery positive terminal
2. ESM starter positive terminal
3. Push-to-Test button
4. Indicator lamp
5. ESM battery negative terminal



## Operation

The Maxwell® Engine Start Module (ESM) is an engine starting aid designed to start the vehicle without the use of the main vehicle batteries. The ESM is located next to the vehicle batteries but supplies power only to the vehicle starter. The vehicle will be started using the power stored in the ESM instead of battery power. This allows usage of vehicle features powered by the main vehicle batteries while the engine is not running. The ESM eliminates the risk of draining the batteries to the point of an engine no start condition. Indicator lamps and a push-to-test button are located on the top of the ESM. To activate the indicator lamps, press the push-to-test button and release. The indicators will illuminate and / or flash (depending on status) for 10 seconds. Holding the push-to-test button for 12 seconds will reset the module computer.

Refer to the following table for more information on the indicator lamps:

GREEN Lamp	RED Lamp	Description
Solid lamp	Not Illuminated	Ready to Start
Flashing Lamp	Not Illuminated	Charging: Wait Approx. 15 Minutes
Not Illuminated	Flashing	Stuck Push-to-Test Button
Not Illuminated	Solid Illumination	Internal Error: Hold Test Button for 10 Seconds
Flashing Lamp	Solid Illumination	Refer to Manufacturer's Operation Manual

**NOTE:** Refer to [www.maxwell.com](http://www.maxwell.com) for more information on the Maxwell® engine start module.

### *Circuit Breakers, Fuses and Fusible Links*



#### **WARNING**

To prevent personal injury and / or death, or damage to property, do not operate vehicle if there is loss of steering or suspension, which could cause loss of vehicle control., do not increase size of fuse or circuit breaker or change type of breaker supplied with your truck, as this could cause wiring to overheat and possibly burn. Electrical circuits are designed with a particular wire gauge to meet the fuse and circuit breaker current rating.



1. Fuse block access panel tab

The fuse block is located on the passenger-side underneath a removable panel in the instrument panel (glove box area). To access the fuse block locate the tab on the panel and pull up to release the retaining clips.

- Electrical circuits are protected by the electrical system controller, circuit breakers, fuses, or fusible links. For the size and location of circuit breakers, fuses and fusible links, please refer to the **Maintenance Intervals and Specifications** section of this manual.
- Fusible links consist of a length of lighter gauge wire in a circuit. In case of a short or overload, the fusible link opens (burns out) to protect the remainder of the circuit. Repair consists of installing a new fusible link with the same gauge wire as the opened fusible link.
- Circuit breakers interrupt the circuit when an overload or short occurs. Manual circuit breakers (Type III) can be reset by depressing the reset button on the breaker. Headlight and wiper circuits are protected by the Body Controller. Type II circuit breakers will reset automatically if the short is removed from the circuit.
- The various electrical units in the cab and engine compartments are protected by either fuses or circuit breakers. The power distribution center is located within the instrument panel (glove box area) on the passenger-side of the vehicle.

### *Electrical Load Control and Shedding (ELCS)*

Electrical Load Control and Shedding (ELCS) is an optional feature (standard with sleepers) intended to provide a convenient means of automatically shutting down electrical loads overnight in order to conserve energy and deliver sufficient power to start the engine. The system is active when the engine is not running, regardless of key state. The ELCS system does not include provisions for shutting down 120 volts ac circuits.

The ELCS will begin a sequence of events when the measured battery voltage is at or below 12.1 volts dc for a period of 30 seconds. The sequence of events will first start with providing the visual alert LOAD SHEDDING to the vehicle operator for at least 30 seconds. An audible alert, which consists of a continuous tone greater than 3 seconds and less than 6 seconds in duration, will coincide with the start of the visual alert.

The audible alert can be disabled by a vehicle maintainer if desired. The sequence will then disable a predefined group of features / electrical loads. These will remain disabled until the vehicle's key switch transitions to the Accessory or ON positions, and the measured voltage is above 12.1 volts dc.

### **Engine**

The engine for this vehicle is an electronically controlled diesel engine. A separate Engine Control Module (ECM) monitors and controls all engine functions. This ECM also communicates with the body electrical system which will generate or activate the necessary warning indicators to alert the driver of out-of-range operating conditions.

## Operation

---

For complete information on the engine in this vehicle and its optional features, refer to the Engine Operation and Maintenance Manual supplied with this vehicle.

**NOTE: For information pertaining to fuel and requirements, refer to the Engine Operation and Maintenance Manual provided with the vehicle.**

### *Charge Air Cooler*

Each engine is equipped with a charge air cooling system. The function of the charge air cooler is to cool the hot compressed air before it enters the engine's intake manifold. This system uses ambient air as the cooling medium by allowing the intake air to pass through a network of heat exchanging fins and tubes prior to entering the combustion chamber. The resulting cooler intake air is denser than uncooled air and will allow additional fuel to be injected for greater power while helping to reduce emissions.

### *Electronic Engine Controller*

Each vehicle contains an Engine Operation and Maintenance Manual in the driver-side door pocket. Refer to the Engine Operation and Maintenance Manual for detailed information on these engine control systems.

### *Engine Brake*



#### **WARNING**

To prevent personal injury and / or death, or damage to property, do not use the engine brake on slippery road surfaces. Doing so may cause wheel slippage and / or loss of vehicle control.

**NOTE: The engine brake should never be considered a substitute for the vehicle service brakes. The service brakes should always be viewed as the primary vehicle braking system. The engine brake cannot bring the vehicle to a complete stop. Only the service brakes can bring the vehicle to a complete stop.**

All of the optional braking features are controlled by the driver, using the ENGINE BRAKE ON / OFF switch on the steering wheel and the ENGINE BRAKE 1/2/3 power level selector switch located in the center control switch panel.



(0000405883)

To activate the engine brake, press the push button ENG BRAKE ON / OFF switch on the steering wheel (pressing this switch again will deactivate the system). The ENGINE BRAKE SELECTOR 1/2/3 switch is then used to adjust the amount of braking applied.



Using engine braking features can extend brake lining life. The features also allow the driver to slow the vehicle down or maintain a constant speed on steep road grades that would otherwise result in prolonged use of the service brake, which could cause brake fade. Refer to the Engine Operation and Maintenance Manual for detailed information on the engine braking system.

### *Stalk Shifter Engine Brake*



1. Engine brake
2. Shifter stalk
3. Gear selector dial
4. Manual / Automatic mode button

For vehicles with automatic transmissions or automated manual transmissions, there is a engine brake feature on the shifter stalk. The shifter stalk is located on the right-side of the steering column. To operate the engine brake controls, pull the shifter stalk down towards the floor. There are three different engine brake levels.

### *Engine Brake With Allison Transmissions*

When the Transmission Control Module (TCM) detects the engine brake has been enabled, it commands use of a preselected shift schedule in order to enhance the engine brake performance.

### *Engine Brake With Eaton® UltraShift® Transmission Special Driver Instructions*

Low or manual transmission mode can be used to maximize engine brake performance.

- Keep engine speed as close to 2,250 rpm as possible.
- Maintain brake pedal application until any desired downshifts are completed. Failure to do so may cause missed shifts.
- The gear display on the shift selector will stop blinking when the downshift is completed, and the driver will notice resumption of engine braking as an indication that the shift is completed.

When the transmission is in manual mode, engine protection upshifts are disabled. This could result in an undesirable engine overspeed condition. It is the operator's responsibility to prevent mechanical damage to the truck. Under these conditions, use service brakes and select the appropriate gear, as required, to keep the engine rpm within operating limits.

### *Engine Features*

The engines are electronically controlled diesel engines. The engine Engine Control Module (ECM) monitors and controls the injection process and other engine functions. The ECM also communicates with the Body Controller (BC) and alerts it to out-of-range operating conditions. The BC, in turn, generates engine function indicators and warning indicators. Since many of the engine performance features are owner selectable and electronically programmable, some of the operating parameters will vary from vehicle to vehicle. Some of these standard and optional monitored engine operating functions and warning indicators include:

Some Standard Features:

- **Engine Warm-Up Control (ECM)** – Adjusts injector operation as required.
- **Cold Ambient Protection (CAP)** – Aids engine warm up and maintains engine temperature.
- **Cruise Control** – Provides vehicle speed control.

Some Optional Features:

- **Engine Warning System** – This system illuminates the Red Stop Lamp and actuates a beeper when warning thresholds for coolant temperature, engine coolant level, and / or low engine oil pressure are exceeded.
- **Engine Shutdown System** – This system shuts down the engine after 30 seconds of operation beyond critical threshold values for coolant temperature and / or oil pressure.
- **Throttle Control for PTO Operation.**
- **Road Speed Limiting / Governor** – Programmable maximum speed.
- **Idle Shutdown Timer** – Shuts down engine after 5 minutes of idle time.

### *HD-OBD Overview*

The HD-OBD system uses many individual preprogrammed monitors to ensure the vehicle is meeting emissions standards. An HD-OBD monitor is a strategy to evaluate the performance of an emissions related system or component. All monitors are designed for execution in a prescribed frequency; some monitors run continuously, while some run a specific ratio against the number of drive cycles.

The operator will be alerted to emissions or other system problems when the Malfunction Indicator Lamp (MIL) illuminates. When the MIL illuminates, bring the vehicle in for service at the next available opportunity. The HD-OBD system does not change the way the vehicle should be driven, the recommended driving style, or the way you use the vehicle.

### *Self Diagnostics*

All warning lamps are located on the electronic gauge cluster. When the ignition switch is turned ON, the warning lamps are illuminated and remain on while the ECM runs normal start-up tests, then goes OFF. If a warning lamp stays on or comes on while operating the vehicle, it is an indication that the vehicle needs service. When the warning lamp is illuminated, a Diagnostic Trouble Code (DTC) will be generated. Take the vehicle to a service center as soon as possible as some optional features and / or engine power may be lost while the indicator is lit.

### *Air Compressor Cycling*

The engines can be equipped with one of two different types of air compressor and may have one or two cylinders.

- **Head Unloaded Air Compressor:** This single-cylinder, constantly engaged air compressor works in conjunction with the air governor and air dryer to pump compressed air to the air dryer and air tanks. When additional compressed air is not needed, air is shut off from the air compressor discharge line and confined to the air compressor cylinder and its head.

- **Clutched Air Compressor:** This high-capacity, two-cylinder air compressor is periodically engaged by using an ON / OFF clutch. It works in conjunction with air governor and air dryer to pump air to the air dryer and air tanks. When additional compressed air is not needed, the clutch is disengaged, compressor speed goes to zero, and all air pumping ceases. This system provides relatively low cylinder temperatures and sound versus other compressors during the unloaded cycle. It is used to promote maximum fuel economy by eliminating pumping energy loss during the unloaded cycle.

As the compressor reaches approximately 130 psi (896 kPa), the air governor will, through various methods, stop the air compressor from pumping pressurized air to the air system. When the air pressure reaches approximately 110 psi (758 kPa), the governor signals the air compressor to resume pumping pressurized air to the air system. During normal engine operation, this cycle will be evident by the fluctuation of the primary air tank pressure gauge.

### *Engine Oil*

Keep oil level between the ADD and FULL marks. Never operate an engine with oil level below the ADD mark.

To obtain an accurate engine oil level reading, the vehicle must be parked on a level surface with the engine off for at least 15 minutes before checking the oil level. This will ensure the oil is level in the oil pan and the circulated oil has had a chance to return to the pan. It is not necessary for the oil to be hot to obtain an accurate reading.

When checking the oil level, the dipstick must be withdrawn and wiped clean, then inserted all the way and again withdrawn for a true check.

Use only recommended viscosity engine oil. Refer to the Engine Operation and Maintenance Manual for engine oil specifications and proper oil choice.

The lubricating oil in a diesel engine becomes dark in color after short periods of engine operation. This discoloration is not harmful to engine parts as long as the oil and oil filter element changes are performed at recommended intervals.

### *Engine Performance Problems*

- Low engine power can be the result of a plugged fuel filter. Fuel filters can plug prematurely due to the use of fuel that is contaminated with a high amount of sediment, microbial growth, or water. Fuel that has been stored for longer periods of time may also reduce engine performance.
- Failure to maintain the vehicle as required in the Maintenance Instructions and Maintenance Intervals and Specifications sections of this manual, as well as any separately available Engine Operation and Maintenance Manual, can cause engine performance problems.

Too low of a cetane number could cause hard starting and slower warm-up and could increase engine noise and exhaust emissions.

## Fuel

### *Ultra Low Sulfur Diesel Fuel Requirements*

Ultra Low Sulfur Diesel (ULSD) fuel is required for all on-highway diesel engines used with advanced aftertreatment systems (Diesel Particulate Filters – DPF). For complete details on fuel requirements, see the Engine Operation and Maintenance Manual supplied with the vehicle.

### *Unacceptable Fuel Blends*

Biodiesel blends having more than 5% pure biodiesel are not within ASTM D975 diesel specifications.

To determine acceptable biodiesel and biodiesel blends, refer to the Engine Operator and Maintenance Manual for the applicable engine.

### *Hazards of Diesel Fuel / Gasoline Blends*



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, never add gasoline, gasohol and / or alcohol to diesel fuel. This mixture creates an extreme fire and explosion hazard.**

Blending of gasoline and / or alcohol with diesel fuel is not recommended due to the hazards of fire / explosion and the detrimental effects on engine performance.

As little as 2% volume gasoline mixed with diesel fuel will create a flammable / explosive mixture in the fuel tank vapor space, which will pose an extreme fire / explosion hazard during refueling or engine operation.

### *Additional Unsafe Practices*



#### **CAUTION**

**To prevent engine damage, do not mix propane with diesel fuel. Warranty claims will not be honored against engines that have used propane.**



#### **CAUTION**

**To prevent engine damage, do not mix engine oil with diesel fuel. Warranty claims will not be honored against engines that have used fuel mixed with oil.**

### *Fuel and Lubricant Additives*

International® trucks are designed and built to operate satisfactorily on fuels and lubricants of good quality marketed by the petroleum industry. Use of any supplementary fuel or lubricant additives is not recommended. Malfunctions attributed to the use of such additives or failure to follow recommended fuel or lubricant recommendations may not be covered by any applicable warranty.

### *Fueling Procedures*

**NOTE: If your vehicle is equipped with dual fuel tanks, be sure to read and understand the following information before refueling the vehicle.**

Dual tank systems are equipped with dual draw and dual return fuel line systems to equalize the fuel temperature and level between the dual tanks.

When refueling, be sure that both tanks are filled completely, as both tanks cannot be filled from one side.

### *Fueling Precautions*

**Federal Motor Carrier Safety Regulations require the driver or any employee of a motor carrier to observe the following requirements:**



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, do not overfill the fuel tank. An overfilled tank may leak, causing fuel spray and fire. The advertised capacity of the fuel tank is the sum of the indicated capacity on the fuel gauge and the reserve fuel in the tank, after the gauge indicates empty.**





### **WARNING**

**To prevent personal injury and / or death, or damage to property, observe to following:**

- **Do not fuel a motor vehicle with the engine running, except when it is necessary to run the engine to fuel the vehicle.**
- **Do not smoke or expose any open flame in the vicinity of a vehicle being fueled.**
- **Do not fuel a motor vehicle unless the nozzle of the fuel hose is continuously in contact with the intake pipe of the fuel tank.**
- **Do not permit any other person to engage in such activities as would be likely to result in fire or explosion.**

### *Reserve Fuel*

No extra supply of fuel for the propulsion of the vehicle or for the operation of accessories shall be carried on any motor vehicle, except in a properly mounted fuel tank or tanks.

### **Transmission**

#### *Transmission Fluid*

Transmission fluid cools, lubricates, and transfers hydraulic power. Proper fluid level and condition is critical to operation of the vehicle. If the fluid is low, the torque converter and clutches

starve for fluid and the transmission overheats. If the fluid level is too high, the fluid may aerate, which may potentially cause the transmission to overheat.

Periodic transmission fluid checks are recommended by every transmission manufacturer. Refer to the Transmission Operator Manual for additional information and proper procedures.

**NOTE: All transmission manufacturers have guidelines for transmission fluid and filter change intervals. Driving conditions, severity of duty cycle, and other factors impact the service cycle for fluid and filter change intervals. Some manufacturers recommend fluid analysis to determine service requirements. Refer to the Transmission Operator Manual for more information and proper service procedures.**

#### *Transmission Fluid Temperature*



### **CAUTION**

**To prevent property damage, observe the following: Transmission malfunction or damage may occur if the transmission is operated with fluid temperature either above or below the fluid temperature specification limits. Continued operation when transmission fluid is out of temperature specification may constitute contributory negligence and resultant damage may not be regarded as a warrantable condition.**

### **Cold Weather**

On certain automatic and automated manual transmissions, if the transmission fluid temperature is below a certain preset range, the Transmission Control Module (TCM) may limit transmission operation until the sump temperature rises to allow the transmission to perform a normal shift schedule. Certain transmission may have a preheating requirement to raise transmission temperature to a point which the transmission may be safely operated. Refer to the Transmission Operator Manual that came with the truck at initial purchase for proper procedures and temperature ranges.

### **High Fluid Temperature**

If the transmission gauges indicate transmission overheating during normal operation, stop the engine and verify that the transmission fluid level is correct and that the engine temperatures are within normal limits. If the high transmission or engine temperatures persist, stop the engine and contact your nearest International Dealer for further assistance.

### **Manual Transmissions**

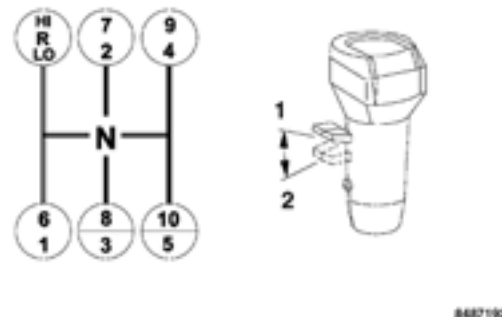
Vehicles with a manual transmission have a clutch pedal that is used to engage or disengage the clutch, connecting or disconnecting the engine from the transmission and rear wheels. With the clutch pedal released (extended), the clutch is engaged, driving the transmission and rear wheels. Depressing the clutch pedal releases the clutch, permitting transmission gear changes.

Clutches will last many thousands of miles if properly used and maintained. Almost every early clutch failure can be traced to excessive friction heat. Do not ride or slip the clutch.

Once a clutch is fully engaged, there is no heat generated and little or no wear. However, during the brief period when the clutch is picking up the load, considerable heat is generated. By riding or slipping the clutch, the period of partial engagement is lengthened, causing unnecessary heat and wear and reduced clutch life.

The International® LT® and RH™ Series has many transmission options available. Refer to the Transmission Operator Manual for information on the transmission available in your truck.

### **Shift Lever**



1. High range
2. Low range

**10-Speed Manual Transmission (standard):** The gear shift lever mechanically engages and disengages five forward gears and one reverse gear in the transmission front section. The range lever on the Roadranger Valve allows the operator to control an air shifted auxiliary section to provide a LO range and HI range.

The five forward gear shift positions selected in LO range are used again in HI range to provide the 10 progressive forward gear ratios. Once the highest shift lever position (5th gear) is obtained in LO range, the operator preselects the range shift lever for HI range. The range shift occurs automatically as the shift lever is moved from 5th gear position to the 6th gear position.

1. When operating off-highway, or under adverse conditions, always use the lowest gear when starting to move the vehicle.
2. For all normal conditions, use the highest gear that is still low enough to start the vehicle moving with engine idling, and without slipping the clutch excessively.
3. Use the clutch brake to stop gear rotation when shifting into low (or 1st) or reverse when the vehicle is stationary. The clutch brake is actuated by depressing the clutch pedal all the way to the floor.
4. Do not make range shifts with the vehicle moving in reverse gear.
5. Never attempt to move the range preselection lever with the gear shift lever in Neutral while the vehicle is moving. Preselection with the range preselection lever must be

made prior to moving the shift lever out of gear into Neutral.

6. Do not shift from high range to low range at high vehicle speeds.
7. Double clutch between all upshifts and downshifts.
8. After your shifting ability improves, you may want to skip some of the ratios. This may be done only when operating conditions permit, depending on the load, grade, and road speed. Transmissions with a greater number of speeds are optionally available. They may include the use of a splitter selector switch in addition to the range selector switch.

### *Engaging the Clutch*

- **Always start in the proper gear.** An empty vehicle can be started in a higher gear than a fully loaded one. But starting in a gear too high for the load can cause too much clutch slippage, generating excessive heat and unnecessary wear. A gear that will start the vehicle moving with the engine at idle speed is usually correct. If the engine must be revved up to prevent stalling, the gear selection is too high. As the clutch pedal is released and the clutch begins to engage, the engine speed will drop slightly. When this happens, fully engage the clutch and increase the engine speed. Increasing the engine speed before fully engaging the clutch can damage the clutch and drivetrain.
- **Do not upshift until the engine has reached proper speed.** Upshifting before the vehicle has reached the right speed will lug the engine.

- **When approaching a hill**, depress accelerator smoothly to start the upgrade at full power, then downshift as needed to maintain vehicle speed.
- **Never hold a vehicle on a hill with the clutch.** To hold on a hill with the clutch requires that the clutch be purposely slipped. By doing this enough heat can be generated to burn up the clutch.
- **Never coast with the clutch disengaged.** This can cause clutch failure by the very high rpm encountered when coasting in gear with the clutch released. In this situation, the rear wheels are driving the disc through the multiplication of the rear axle and transmission ratios. This can result in over 10,000 rpm, which is beyond the burst strength of the facing material. Something as simple as coasting down an unloading ramp can burst a driven disc.

Reengaging a clutch after coasting causes tremendous shock to the clutch and the whole drivetrain. It can result in internal engine damage and / or clutch and flywheel failure. Always report unusual clutch operation promptly. Proper maintenance, performed on time, will greatly extend the life of the clutch. The driver should report any change in free pedal (free travel) slippage or any strange feel to the clutch operation.

### **Helpful Hints to Operate Vehicles with Ceramic Clutch Facings**

1. Driver must start vehicle in first (low) gear.
2. While operating a ceramic clutch the driver has to engage the clutch before giving the engine any fuel (at idle).
3. The driver should not try to slip the ceramic clutch by raising engine rpm and riding or feathering clutch pedal since the vehicle will experience erratic engagement.

Erratic engagement can cause engine stalling and potential serious damage to your vehicle's drivetrain components (such as clutch, transmission, driveshaft(s), and rear axle).

### *Hydraulic Clutch Actuation System*

Clutch brake engagement occurs in the last 2 inches (50 mm) of pedal travel after initial clutch setup adjustment. Clutch wear will move the pedal position at clutch brake engagement toward the physical limit of travel. The hydraulic clutch system must have proper fluid bleeding before operating, usually performed at the factory, or at field servicing. Hydraulic clutch fluid should be drained and refilled every 2 years of service or after 200,000 miles (322,000 km) service interval.



### CAUTION

**To prevent vehicle and / or engine component damage, clutch pedal must engage clutch brake before the physical limit of pedal travel. When the clutch pedal position at clutch brake engagement is less than 0.5 inch (12.7 mm) from the physical travel limit, manual clutch adjustment is required for all Eaton® Easy Pedal® (EP) clutches.**

If non-self-adjusting clutches are used in this application, it is important that clutch adjustments be maintained. Adjustment intervals should be every 20,000 miles (32,000 km). When utilizing an Eaton® EP clutch with a hydraulic clutch actuator, the cab clutch pedal cannot be used to indicate when clutch adjustment is required. Drivers may not notice the need for clutch adjustment and continue to drive in such condition. Lack of adjustment will eventually lead to yoke interference with the clutch cover causing extensive clutch and / or transmission damage.

When using the clutch brake, fully depress the clutch pedal and shift the transmission into either first or reverse gear. If the transmission does not go into first gear or reverse, toothbutting may be occurring. Slowly release the clutch pedal while applying light pressure on the shift lever until the transmission goes into gear. This will provide for a smooth shift into either a forward or reverse gear.

**NOTE: After engagement of first gear, DO NOT use the clutch brake for upshifting and downshifting. To do so will shorten the service life of the clutch brake, and gear selection shift efforts may be increased. Clutch brake application occurs in the last 2 inches (50 mm) of pedal travel.**

### *Double Clutch Procedures*

In order to properly upshift or downshift, be sure to do the following:

- Depress the clutch pedal to disengage the clutch.
- Shift the transmission into Neutral.
- Release the clutch pedal.
  - If upshifting, wait until the engine speed matches the transmission speed of the gear you desire to shift into.
  - If downshifting, accelerate the engine until the engine speed matches the input speed of the gear you desire to shift into.
- Depress the clutch pedal immediately and shift into the desired gear.
- Release the clutch pedal to engage the clutch.

### *Clutch Brake*

**NOTE: After engagement of first gear DO NOT use the clutch brake for upshifting and downshifting. To do so will shorten the service life of the clutch brake, and gear selection shift efforts may be increased.**

A clutch brake is used to stop transmission input shaft rotation so that the initial first or reverse gear selection can be accomplished when the vehicle is at a standstill and the engine is running at idle speed.

When using the clutch brake, fully depress the clutch pedal and shift the transmission into either first or reverse gear. If the transmission does not go into first gear or reverse, tooth butting may be occurring. Slowly release the clutch pedal while applying light pressure on the shift lever until the transmission goes into gear. This will provide for a smooth shift into either first or reverse gear.

Service is required when the clutch brake cannot be engaged, shifting into gear is extremely tough, or grinding gears when shifting from a stop. Service is also required if the clutch pedal becomes spongy or there is a sudden change in clutch freeplay travel.

### *Clutch Precautions*

Maintain specified clutch adjustment. Regularly inspect clutch control linkage for tightness.

When adjustment of the clutch is necessary, it is extremely important that the work be properly performed; otherwise, early failure of the clutch will result and a costly clutch overhaul will be necessary.

To avoid needless delay and expense, allow only competent and experienced mechanics to perform these operations.

### *Eaton® UltraShift+® Transmissions (If Equipped)*

The optional Eaton® UltraShift+® transmission is an automatic transmission that can automatically select and engage the proper transmission gears. Vehicles equipped with this transmission do not have a clutch pedal. For operating instructions refer to the Transmission Operation and Maintenance Manual.

### *Eaton® Endurant™ Transmission*

The optional Eaton® Endurant™ transmission is an automated transmission that can automatically select and engage the proper transmission gear. This transmission also has the option to allow the operator to manually select the transmission gear, see the stalk shifter information in the **Controls and Features** section of this manual for more information on manual mode operation. Vehicles with this transmission do not have a clutch pedal. For operating instructions, refer to the Transmission Operator Manual.

### *Allison Transmissions*

The optional Allison transmission is an automated transmission that can automatically select and engage the proper transmission gears. Vehicles equipped with this transmission do not have a clutch pedal. For operating instructions, refer to the Allison Transmission Operator Manual.

### *International® T14 Transmissions*

The optional International® T14 transmission is an automated transmission that automatically selects and engages the proper transmission gears. Vehicles equipped with this transmission do not have a clutch pedal. For operating instructions, refer to the International® T14 Transmission Operation and Maintenance Manual.

### **Transmission Features (If Equipped)**

#### *Hill Start Aid / Hill Brake (If Equipped)*

Some transmissions are equipped with an optional hill brake. These devices are activated when the vehicle comes to a complete stop on a gradient sufficient for the transmission grade sensor to initiate. When stopped on an incline, use of this optional feature can help the operator begin controlled forward movement without rolling backward. Refer to transmission equipment manufacturer for specific instructions and safety precautions for proper use.

#### *Creep Mode*

Certain Eaton® transmissions come with a creep mode. The creep mode can be used during low speeds for maneuverability. For more information on the creep mode, refer to the appropriate Transmission Operator Manual.

#### *Power Take-Off Control*

If your vehicle is equipped with a Power Take-Off (PTO), refer to the PTO equipment manufacturer's instructions.

### *Coast Mode and Neutral Coast Mode (If Equipped)*

Some transmissions are equipped with an optional Coast mode and / or Neutral Coast Mode. The Coast Mode may keep the transmission from downshifting into lower gears while coming to a stop on level terrain, the transmission will re-select a gear when the throttle is reapplied. The Neutral Coast Mode will allow the transmission to disengage the driveline gear on slight down grades when engine power is not required while the cruise control is ON. For more information on Coast Mode and / or Neutral Coast Mode, refer to the Transmission Operator Manual.

### *Eaton Over-speed Protection*

Eaton Over-Speed Protection will automatically upshift to prevent engine over-speed while in drive, manual or low gear settings. For more information, refer to the Transmission Operator Manual.

### *International® T14 Drive Modes*

The number of programmed drive modes that come with a vehicle can vary, depending on the features that were ordered. The vehicle may also be equipped with the Drive Mode switch.



The switch can be toggled between the following drive modes:

- **Economy:** Favors fuel economy over performance.
- **Performance:** Offers a balance of fuel economy and performance.
- **Performance Plus ()+:** Relies solely on performance.
- **Off-Road:** Relies almost solely on performance.

The type of road conditions and vehicle application helps to determine the preferable drive mode.

For more information on Drives Modes, see the International® T14 Operation and Maintenance Manual.

## Rear Axles

### *Locking or Limited Slip Differentials*



#### **WARNING**

To prevent personal injury and / or death, or damage to property, pay strict attention to the following:

**If your vehicle is equipped with any type of locking or limited slip differential, power will be transmitted to the opposite wheel should one of the wheels slip. Both wheels must be raised free of the ground should it be necessary to operate one wheel with the vehicle stationary; otherwise, the wheel that is not raised will pull the vehicle off its support.**



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, pay strict attention to the following:**

**Care should be taken to prevent sudden accelerations when both drive wheels are on a slippery surface. This could cause both drive wheels to spin and allow the vehicle to slide sideways, resulting in loss of vehicle control.**

### *Tandem Axle Power Divider Lock (PDL) Control*



#### **CAUTION**

**To prevent property damage, do not operate the vehicle with the PDL engaged on dry pavement (good traction) continuously. This will result in excessive tire wear and premature axle wear. Never engage the PDL when the wheels are spinning.**

The PDL should be engaged, which prevents inter-axle differential action, when backing under a trailer with a tractor, or when there is poor traction, such as when starting on a slippery surface, operating off highway in mud, or traveling on slippery highways. Failure to lock the power divider under these conditions may result in power divider failures and costly repairs. If you encounter wheel spin conditions, the PDL switch should be moved to the LOCK position.





### CAUTION

**To prevent vehicle and / or component damage, engage the PDL only when stopped or moving at low speed. Never try to engage the PDL while the wheels are spinning as this may result in shock damage to the power divider components.**

When encountering slippery highway conditions (poor traction), the PDL can be engaged at a low, even speed. Momentarily letting off the accelerator will engage the differential lock. A warning indicator on the instrument panel indicates when the inter-axle differential is locked.

When highway conditions improve (good traction), the PDL should be disengaged, again at a low, even speed. Letting up on the accelerator momentarily will unlock the inter-axle differential.

Tandem axle power dividers or inter-axle differentials in the forward rear axle are controlled by the instrument panel mounted Power Divider Lock (PDL LOCK) switch.

The switch indicator will turn on when the PDL is engaged (locked). The vehicle may be electronically programmed to provide an alarm when a speed is reached where it is not appropriate to have the power divider locked. In this event, an alarm will sound (5 beeps) and the switch indicator will flash slowly (once per second). A fast flashing (twice per second) switch indicator signifies a problem in the PDL system.



Under normal highway conditions (good traction), the PDL should be disengaged, which allows differential action between the forward rear axle and the back rear axle, preventing inter-axle differential wear due to such things as unequally worn or mismatched tires.

### *Driver-Controlled Differential Lock*

The Differential Lock feature locks together the axle's left and right axle shafts for improved traction on reduced traction surfaces.

Some vehicles are equipped with this optional driver-controlled differential lock feature (DIFF LOCK). The air actuated traction device can be manually shifted from the vehicle cab. By actuating a switch, mounted on the instrument panel, the driver can lock or unlock the rear axle differential(s) when the vehicle is moving or stopped.



Other vehicles with tandem rear axles (6 x 4) are equipped with two optional driver-controlled differential lock features (DIFF LOCK 1 and DIFF LOCK 2). The air actuated traction devices can be manually shifted from the vehicle cab. By actuating the switches, mounted on the instrument panel, the driver can independently



lock or unlock the forward-rear and / or rear-rear axle differentials when the vehicle is moving or stopped.

When the differential is fully locked, the vehicle will have a slight under-steer condition. This will increase the turning radius of the vehicle.

On vehicles with multiple drive axles, the differential lock can be used in conjunction with the Power Divider Lock (PDL) to achieve maximum available traction in adverse road surface conditions.

To limit stress on the axle and tires during vehicle turning maneuvers and improve stability, the use of the differential lock must be limited to low vehicle speeds, under 25 mph (40 km/h). Also, to maintain vehicle stability, the differential must not be locked when the vehicle is traveling down steep grades and traction is minimal. DIFF LOCK will automatically disengage when vehicle speeds exceed approximately 25 mph (40 km/h).

Do not engage the locking differential when the tires are spinning.

The vehicle may need to be decelerated or turned once or twice for the differential lock to fully disengage.

### Rear Suspension

#### *Rear Air Ride Suspension*



#### **CAUTION**

**To prevent ride degradation and suspension damage, the vehicle must not be operated on the road without air in the suspension air bags.**

Rear Air Ride Suspensions automatically adjust to different loads to maintain constant frame height. The system maintains vehicle ride quality and driver comfort.

#### *Rear Air Suspension Air Dump*

This feature also allows the rear of the vehicle to lower several inches for trailer attachment / detachment.

The system is controlled by the two-position SUSP DUMP switch with an indicator light in the SUSP DUMP position. This switch controls solenoids, which direct air to the suspension dump and height valve.



When the SUSP DUMP switch is in the SUSP DUMP position and the vehicle speed is below 5 mph (8 km/h), air supplied to the rear air suspension is released, lowering the frame for loading.

Placing the switch in the truck icon position causes air to fill or remain in the air suspension for proper operating ride height.

The SUSP DUMP switch will operate the IROS system only if the ignition switch is in either ACC or ON position and the air tanks have sufficient pressure to fill the suspension. When the ignition switch is turned OFF, power to the solenoid will be removed; therefore, the suspension will remain in the state last set by the SUSP / DUMP switch.

**NOTE: The suspension will dump when the ignition switch is in either the ACC or ON position, but will fill only when the ignition switch is in the ON position.**

**NOTE:** The SUSP DUMP switch functions will be inhibited by either a Traction Control or ABS event. In either event for either inflation or deflation operation, the ASD switch will have to be manually recycled after the event has passed in order to complete the operation.

**NOTE:** The electrical system will automatically switch from deflate to inflate if the vehicle speed exceeds 5 mph (8 km/h). Once this occurs, the only means to deflate the suspension will be to slow the vehicle to 5 mph (8 km/h) and recycle the SUSP DUMP switch to the DUMP position.

### *Air Suspension System Faults*

- The electronic gauge cluster will issue an audible 10-beep alarm whenever the driver pushes the DUMP position of the SUSP DUMP switch and the vehicle exceeds 5 mph (8 km/h).
- The SUSP DUMP switch indicator will blink rapidly in the event of a system component failure or a bad system signal status, when the SUSP DUMP switch is in the DUMP position.
- The SUSP DUMP switch indicator will blink slowly in the event of an ESC command fault, regardless of the position of the SUSP DUMP switch.

## Exhaust Aftertreatment

### Selective Catalytic Reduction System

#### *Introduction*

Selective Catalytic Reduction (SCR) is the aftertreatment technology that treats exhaust gas downstream of the engine. It uses a urea-based Diesel Exhaust Fluid (DEF) and a catalyst to significantly reduce nitrogen oxide (NOx) emissions.

#### *Diesel Exhaust Fluid*

Diesel Exhaust Fluid (DEF) is nontoxic, nonflammable, and biodegradable. It is a carefully blended aqueous urea solution of 32.5% high-purity urea and 67.5% deionized water.

If stored between 10° and 90°F (-12° and 32°C), DEF has shelf life of 12 months minimum. For best shelf life, DEF containers should be stored in a controlled environment out of direct sunlight.

The amount of DEF consumption depends on engine speed, load, and altitude; therefore, it differs from vehicle to vehicle.



#### **CAUTION**

**To prevent property damage, Navistar, Inc. requires the use of Diesel Exhaust Fluid (DEF) that meets or exceeds ISO-22241-1. There is no acceptable substitute.**

Navistar recommends using Fleetrite® brand Diesel Exhaust Fluid.

### DEF Tank

The DEF tank is located on the driver-side of the vehicle, forward of the fuel tank and behind the battery box. For reference, see section **Model Description > Exterior Components**.

The filler neck inlet on a DEF tank has a BLUE cap and has a smaller diameter (19 mm) than that of a filler neck on the diesel fuel tank.

The SCR system is designed to operate normally also under freezing conditions while containing DEF. Though DEF freezes at approximately 10°F (-12°C), no operator interaction is necessary when operating in cold temperatures.

Under cold or very dry conditions, water vapor can be seen coming from the vehicle tailpipe. This is normal system operation. The water vapor will disappear within a few minutes of normal vehicle operation.

After the key is turned OFF on a vehicle with SCR system, a pumping sound may be heard from underneath the vehicle. The sound is made by the aftertreatment DEF dosing unit while it purges any unused DEF from the system and returns it to the DEF tank. This is normal system operation. It takes about 60 seconds to complete.



### CAUTION

**To prevent vehicle / property damage, after turning the key OFF on a vehicle with Selective Catalyst Reduction (SCR) system, do not disconnect the vehicle batteries while you can hear a pumping sound from underneath the vehicle. The sound may last for about 60 seconds.**

### Low DEF Level







### WARNING

**To prevent personal injury and / or death, or damage to property, maintain the adequate Diesel Exhaust Fluid (DEF) level to avoid a loss of engine power and vehicle speed.**






On the instrument panel, you can monitor the fluid level using the DEF Level Gauge. You will see additional warnings if the DEF is too low. If DEF level decreases to 2.5% or lower, the engine performance will start to be derated by at least 25%; if the DEF level remains 0% for an extended time, the vehicle speed will be limited to 5 mph (8 km/h). Refill the DEF tank with approved DEF at any point, and the vehicle will resume normal operation.

See the following table for a detailed explanation of indicators about low DEF level.




### Indicators about Low DEF Level (For Vehicles Equipped with Cummins® X15 Engines)

Level	Indication	Audible Alarm	LCD Text Message	Vehicle Conditions / Operation
1	 (Solid)	1 beep	Scrolls between SEE VISOR FOR INFO and DEF LOW REFILL SOON.	Initial Warning – normal engine operation. DEF level is 10% or lower.
2	 (Flashing)	1 beep	Scrolls between SEE VISOR FOR INFO and DEF LOW REFILL SOON.	Initial Warning – normal engine operation. DEF level is 5% or lower.
3	 (Flashing)  (Solid)	1 beep	Scrolls between SEE VISOR FOR INFO, DEF LOW ENGINE DERATED 25%, and WARN ENGINE.	Engine performance is <b>LIMITED</b> . DEF level is 2.5% or lower.




Indicators about Low DEF Level (For Vehicles Equipped with Cummins® X15 Engines) (cont.)

Level	Indication	Audible Alarm	LCD Text Message	Vehicle Conditions / Operation
4	 (Flashing)  (Solid)	1 beep	Scrolls between SEE VISOR FOR INFO, DEF LOW ENG DERATED 40%, and WARN ENGINE.	Engine performance is <b>LIMITED</b> . DEF level is 0%.
5	 (Flashing)  (Solid)  (Solid)	1 beep	Scrolls between SEE VISOR FOR INFO, DEF LOW ENG DERATED 5 MPH, WARN ENGINE, and STOP ENGINE.	Vehicle speed is limited to 5 mph (8 km/h).

### Indicators about Low DEF Level (For Vehicles Equipped with International® A26 Engines)

Level	Indication	Audible Alarm	LCD Text Message	Vehicle Conditions / Operation
1	 (Solid)	1 beep	DEF LOW REFILL SOON.	Initial Warning – normal engine operation. DEF level is 2.5% or lower.
2	 (Solid)	1 beep	DEF LOW ENGINE DERATED 25%.	Engine Performance is progressively derated by up to 25%
3	 (Solid)	5 short beeps	DEF LOW ENGINE DERATED 40%.	Engine performance is progressively derated by up to 40%. DEF level is 0%.

Indicators about Low DEF Level (For Vehicles Equipped with International® A26 Engines) (cont.)

Level	Indication	Audible Alarm	LCD Text Message	Vehicle Conditions / Operation
4	 (Flashing)  (Solid)  (Solid)	Repetitive short beep	DEF LOW ENGINE DERATED 5 MPH.	Vehicle speed is limited to 5 mph. (8 km/h)

DEF Contamination or SCR System Fault



**WARNING**






To prevent personal injury and / or death, or damage to property, seek service immediately if DEF contamination or SCR system fault is detected. Failure to resolve the problems may result in a loss of engine power and vehicle speed, and may cause an accident.

If incorrect liquid is in the DEF tank or if some other fault is detected within the SCR system, the Amber Warning Lamp or Malfunction Indicator Lamp will illuminate. If no action is taken in the initial warning stages, engine performance will be derated by at least 25%, and eventually vehicle speed may be limited to 5 mph (8 km/h).







See the following tables for detailed explanation of DEF or SCR system indicators.






### Indicators about DEF Quality Problem (For Vehicles Equipped with Cummins® X15 Engines)

Level	Indication	Audible Alarm	LCD Text Message	Vehicle Conditions / Operation
1	 000409011	1 beep	Scrolls between DEF QUALITY SERVICE SOON and WARN ENGINE.	Initial Warning – fault code has been set.
2	 000409011	1 beep	Scrolls between DEF QUALITY DERATED 25% and WARN ENGINE.	Engine performance is derated by at least 25%.
3	 000409011	1 beep	Scrolls between DEF QUALITY DERATED 40% and WARN ENGINE.	Engine performance is progressively derated by up to 40%.
4	 000409011  000409038	1 beep	Scrolls between DEF QUALITY DERATED 5 MPH, WARN ENGINE, and STOP ENGINE.	Engine performance is derated by 40%. Vehicle speed is limited to 5 mph (8 km/h).







**Indicators about DEF Quality Problem (For Vehicles Equipped with International® A26 Engines)**

Level	Indication	Audible Alarm	LCD Text Message	Vehicle Conditions / Operation
1	 (Solid)  (Solid)	3 beeps	DEF QUALITY SERVICE SOON.	Initial Warning – fault code has been set.
2	 (Solid)  (Solid)	1 time short beep	DEF QUALITY ENGINE DERATED 25%.	Engine performance is progressively derated by at least 25%.
3	 (Flashing)  (Solid)	5 short beeps	DEF QUALITY ENGINE DERATED 40%.	Engine performance is derated by up to 40%.




Indicators about DEF Quality Problem (For Vehicles Equipped with International® A26 Engines) (cont.)

Level	Indication	Audible Alarm	LCD Text Message	Vehicle Conditions / Operation
4	 0000036013 (Flashing)  0000054465 (Solid)  0000486038 (Solid)	Repetitive short beeps	DEF QUALITY ENGINE DERATED 5 MPH.	Engine performance is derated. Vehicle speed is limited to 5 mph (8 km/h).





**Warnings of SCR System Fault (For Vehicles Equipped with Cummins® X15 Engines)**

Level	Indication	Audible Alarm	Vehicle Conditions / Operation
1	 <small>000408011</small> or  <small>000408029</small>	1 beep	Initial Warning – fault code has been set.
2	 <small>000408011</small> or  <small>000408029</small>	1 beep	Engine performance is derated by at least 25%.
3	 <small>000408011</small> or  <small>000408029</small>	1 beep	Engine performance is progressively derated by up to 40%.








Warnings of SCR System Fault (For Vehicles Equipped with Cummins® X15 Engines) (cont.)

Level	Indication	Audible Alarm	Vehicle Conditions / Operation
4	<div> <small>0000402011</small></div> <div>or</div> <div> <small>0010409025</small></div> <div>and</div> <div> <small>0010409028</small></div>	1 beep	Engine performance is derated by 40%. Vehicle speed is limited to 5 mph (8 km/h).

**Warnings of SCR System Fault (For Vehicles Equipped with International® A26 Engines)**

Level	Indication	Audible Alarm	Vehicle Conditions / Operation
1	 (Solid)  (Solid)	1 beep	Initial Warning – fault code has been set.
2	 (Solid)  (Solid)	1 beep	Engine performance is derated by at least 25%.

## Warnings of SCR System Fault (For Vehicles Equipped with International® A26 Engines) (cont.)

Level	Indication	Audible Alarm	Vehicle Conditions / Operation
3	 (Flashing)  <small>0000436013</small> (Solid)  <small>0000054465</small> (Solid)	1 beep	Engine performance is progressively derated by up to 40%.
4	 (Flashing)  <small>0000436013</small> (Solid)  <small>0000054465</small> (Solid)  <small>0000436038</small> (Solid)	1 beep	Engine performance is derated by 40%. Vehicle speed is limited to 5 mph (8 km/h).

## Exhaust Diesel Particulate Filter Regeneration

This vehicle is equipped with a Diesel Particulate Filter (DPF) to meet current emissions requirements. The DPF traps exhaust particulate matter generated by normal engine usage. Periodically, the engine control system will perform a cleaning of the filter, known as normal regeneration. This process is transparent to the operator and occurs during normal vehicle operation.

In some cases the engine control system is unable to manage soot levels in the DPF through normal regeneration. When this occurs the DPF indicator will illuminate solid YELLOW on the electronic gauge cluster advising that action must be taken. At this time the vehicle should then be driven at highway speeds, or pulled over to perform a parked regeneration (See **Parked Regeneration Procedure**).

If no action is taken during the previous warning stage, the DPF indicator will begin to flash indicating that the filter is full. The vehicle should then be pulled safely off the roadway and a parked regeneration should be performed.

If the vehicle is driven beyond the initial two warning stages, a loss of engine performance (derate) will occur. Ignoring the need for a parked regeneration, when required, can result in a warning for excessive exhaust temperatures, and a requirement to shut the engine off and not restart it until the DPF has been serviced by a technician. It is important to perform a parked regeneration when required. Failure to do so could be mission disabling and result in the vehicle being towed.

See the following information for a detailed explanation of DPF indicators and the corresponding procedures that must be followed.



### WARNING

**To prevent personal injury and / or death, or damage to property, do not perform a Parked Regeneration when Diesel Particulate Filter (DPF) indicator is ON as this will cause the engine to lose power and eventually shut down.**

**When performing parked regeneration, make certain vehicle is safely off of the roadway and exhaust pipe is away from people or any flammable materials or structures.**

**Failure to follow these instructions may result in a loss of engine power and vehicle speed, increased exhaust temperatures, and an accident or fire.**

There will be three levels of indication that the vehicle's exhaust filter is accumulating soot and needs to be cleaned, each with an increasing urgency for action.







**NOTE: A Level 1 indication may disappear or a Level 2 may revert to a Level 1, if the vehicle is driven on highway at highway speeds for an extended period. This process of auto regeneration of the exhaust filter is activated when the engine load is increased as a result of highway driving at highway speeds. If the DPF indicator does not reduce in level or disappear, a Parked Regeneration must be performed.**



## Operation

**NOTE:** The following table is a typical representation of DPF emissions procedures.

**Diesel Particulate Filter (DPF) Regeneration**

Level	Indication	Audible Alarm	LCD Text Message	Vehicle Conditions / Operation	Action Required
1	 (Solid)	None	PARK REGEN NEEDED	Exhaust filter regeneration recommended.	Drive on highway at highway speeds or start Parked Regeneration to prevent loss of power.
2	 (Flashing)	None	PARK REGEN NEEDED	Exhaust filter is full. Parked regeneration required.	Pull vehicle safely off roadway and start Parked Regeneration to prevent loss of engine power.
3	 (Flashing)  0000054465 (Solid)	5 short beeps	PARK REGEN NEEDED	Exhaust filter is full. Engine performance is derated by 40%. Parked regeneration required.	 <b>WARNING</b>  <b>To prevent personal injury and / or death, or damage to property, pull vehicle safely off roadway and start Parked Regeneration to prevent engine stopping.</b>
4	 0000054466 (Solid)	Repetitive beep	DPF FULL ASH SERVICE REQUIRED	Exhaust filter is full. Engine performance is derated by up to 70%. Parked regeneration required.	

## Diesel Particulate Filter (DPF) Regeneration (cont.)



Exhaust System Temperature is HOT

**WARNING**

To prevent personal injury and / or death, or damage to property, when stationary, keep away from people and flammable materials, vapors, or structures. Exhaust components are operating under normal conditions and exhaust gases are at extremely high temperatures.



or



0000054466

A serious problem has occurred. Engine may **SHUT DOWN** soon. Pull vehicle safely of roadway, turn on flashers, set parking brake, place warning devices, and **STOP ENGINE**. Seek service immediately.

### *Parked Regeneration Procedure*

Perform the following steps to initiate Parked Regeneration (cleaning) of the exhaust filter:

1. Park the vehicle safely off the roadway and away from flammable materials.
2. Before initiating parked regeneration (using the ON / PARKD REGEN switch), the following conditions must be in place:
  - a. Parking brake must be set.
  - b. DPF indicator illuminated (solid or flashing).
  - c. Transmission must be in Neutral (N) or Park (P), if available.
  - d. Accelerator, foot brake, and clutch (if present) pedals must not be depressed.
  - e. Engine temperature must be at a sufficient level to allow regeneration.

With some engines, this may be as high as 170°F (77°C).

**NOTE:** The engine coolant temperature must be above 170°F (77°C) before the parked regeneration procedure can be performed. If the engine coolant temperature is too low, the parked regeneration procedure will not activate.

3. Press the ON position of the ON / PARKED REGEN switch to initiate the regeneration cycle.

The engine speed will automatically ramp up to a preset rpm, PARKED REGEN ACTIVE will be displayed in the information display, and the switch indicator will illuminate when the cycle is started. If the indicator is blinking, check to be sure that all conditions in Step 2 have been met. Once started, the regeneration cycle will last approximately 60 minutes.

**NOTE: If any of the above conditions are altered during the Parked Regeneration process, regeneration will be halted and must be restarted.**

4. When the regeneration cycle is complete, the switch indicator will go off, the engine rpm will return to normal idle, and all exhaust filter warning indicators will be off. The vehicle may now be driven normally.



**NOTE: In the event of an emergency where the vehicle must be moved after beginning Parked Regeneration, press PARKED REGEN position of the ON / PARKED REGEN switch to cancel Parked Regeneration.**

### Regeneration Inhibit Switch

The optional Regeneration Inhibit switch is used to prevent the normal regeneration or parked regeneration processes.



**NOTE:** There are two versions of the regeneration inhibit switch: the two-position and the three-position switch. Therefore, it is necessary to verify which version is installed in this vehicle. Both versions have the same switch labels.

#### *Two-Position Regeneration Inhibit Switch*

With the optional two-position switch, pressing the ON position of the ON / INHIBIT REGEN switch will inhibit both normal and parked regeneration. Regeneration will be inhibited (latched) when in this position and the switch indicator is turned on.

#### *Three-Position Regeneration Inhibit Switch*

The optional three-position switch is a center stable momentary switch. Pressing the ON position inhibits normal regeneration while the engine is running and is reset when the ignition switch is turned off. The Inhibit function is canceled when the lower position is pressed, or parked regeneration is initiated (PARKED REGEN switch is turned to the ON position).

The switch indicator will be turned on whenever regeneration inhibit is enabled.

## Brakes

### General Information



To prevent personal injury and / or death, or damage to property, always check and maintain brakes in proper condition and adjustment. Out-of-adjustment brakes could cause reduced braking ability.

### Downhill Operation



To prevent personal injury and / or death, or damage to property, do not attempt to gear down if the engine is at or near maximum speed (rpm). Under these conditions it will be impossible to shift into a lower gear and could result in possible vehicle runaway.

Always descend hills with extreme care, relying primarily on the engine braking effect to control vehicle speed. Heed warning signs posted for any grade. Stop and check brakes for condition and adjustment at available pull-off areas before starting a descent.

### Observe the following precautions:

- Never coast downhill. Service brakes alone should not be used to control speed on major downgrades. Brakes will fade from overuse.
- Downhill speed is controlled by removing one's foot from the accelerator pedal (engine running with closed throttle) and putting the transmission / rear axle in reduced gear. If the transmission / rear axle is in a gear that results in more than the appropriate speed, a proper downshift should be made to avoid overuse of the brakes. If the proper gear selection was not made and the brakes were overused, then stop the vehicle and wait for the brakes to cool. After the brakes have cooled, continue down grade in a lower gear range.
- The common rule to follow in using the engine and transmission / rear axle to control vehicle speed is to select a lower gear going down the hill than would be required to ascend the hill. There are some exceptions, such as going down a short hill with good visibility and no hazards.
- The service brakes should be used to supplement available vehicle retardation methods. When descending long grades requiring use of the brakes, short applications (3 - 5 seconds duration) should be made rather than long, continuous applications. This minimizes temperature rise, brake fade, and air consumption of air brake system.

### Air Brakes

#### *General Information*



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, if part of the brake system fails, reduce speed and employ safe driving practices as stopping distance may increase under the failed condition or if only one section of the brake system is operating. Have brake system repaired immediately. Loss of braking capability could cause an accident.**

The truck types covered in this manual are equipped with a split brake system.

The purpose of this split system is to provide a means of stopping the vehicle should a failure occur in either the primary or secondary brake system. If air pressure loss occurs in one system, the remaining system continues to provide braking action.

When a failure is detected the air dryer is provided with a limp home feature to allow the vehicle to be driven to a service center.

If vehicle has been parked for an extended period in cold weather, always check to be sure all wheels are rolling free (brakes are not frozen) when starting out. Always clean accumulated ice and snow from brake linkage.

### *Air Gauge, Low Air Pressure Beeper, and Warning Indicator*



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, never operate the vehicle when insufficient air pressure (less than 60 psi [414 kPa]) is indicated for either the primary or secondary air system. The volume of air required to stop the vehicle may be greater than that available. Have the brake system checked and repaired before returning the vehicle to service.**

Should air pressure in either section of the split air brake system be reduced to 60 - 76 psi (414 - 524 kPa) the warning beeper will sound and the RED BRAKE PRESSURE warning indicator on the instrument panel will glow. Also, the air gauge / gauges will indicate low air pressure in at least one of the independent systems. The warning beeper and RED indicator will automatically shut off when the air pressure in both systems is sufficient (approximately 55 - 76 psi [379 - 524 kPa]) to operate the vehicle.

Should the RED indicator and beeper not shut off soon after startup, the air pressure gauge / gauges should also indicate at least one section of the split system has low air pressure.

If the RED indicator, beeper, and gauge indicate a loss of pressure while driving, the vehicle still has a portion of the braking capability, because one-half of the split system braking capability is retained. However, the distance required to stop the vehicle will be increased.

#### *Reservoir Moisture Draining*

The Bendix® AD-HF® air dryer automatically drains the wet tank. Daily draining is not required.

Moisture taken in with the air through the compressor inlet valves collects in the reservoirs and necessitates draining each reservoir periodically. This is done by opening the drain cocks located at the end of all tanks (optional pull-cable operated drain valves may be present). If the drain cock is opened in the end of the tank, there must be some air pressure in the system to ensure proper drainage. Be sure to close the drain cocks after all moisture has been expelled.

On vehicles so equipped, the reservoir automatic drain valve ejects moisture and contaminants from the reservoir in which it is connected. It operates automatically and requires no manual assistance or control lines from other sources. The reservoir should be drained and the valve should be examined periodically to ensure that the drain passage is not obstructed.

## Operation

---

### *Brake Application*

Rapid successive brake applications and release, sometimes referred to as fanning or pumping the pedal, should be avoided. This is an inefficient way of slowing or stopping a vehicle and inefficient use of air pressure. It also defeats the proper operation of the ABS.

### Parking Brake



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, under no circumstances should the spring brake section of the spring and service brake chamber be disassembled. Disassembly will release a powerful spring.**

All vehicles with air brakes are equipped with spring brake chambers for parking. The parking system is operated manually by a single valve, which in the case of a tractor also controls the parking system on the trailer.

The purpose of this brake is to hold the vehicle in a parked position. The parking brake should not be used to brake the vehicle during normal driving.

To apply the parking brake, pull out control knob. To release the parking brake, push in the control knob.

It should be noted that upon loss of air pressure in both primary and secondary systems, partial spring brake application will occur prior to full automatic application of the parking brake control valve at 20 - 45 psi (138 - 310 kPa).

To release the parking brake after a low-pressure occurrence, recharge system to at least 70 psi (483 kPa) and push in the parking brake control. If the system cannot be recharged and the vehicle must be moved, the spring brake must be manually released (caged).



#### **WARNING**

**To prevent personal injury and / or death, or damage to property:**

- **Always install wheel chocks when manually releasing the parking brake, or the vehicle can roll.**
- **For towing, make sure the vehicle is securely connected to tow vehicle and tow vehicle parking brake is applied before releasing the disabled vehicle's parking brake.**
- **To ensure release of parking brake, always cage the spring in the brake chamber.**
- **Under no circumstances should the spring brake chamber be disassembled for the purpose of releasing the parking brake.**

If it is necessary to move the vehicle after an emergency application (before air pressure can be restored), the parking spring can be compressed mechanically to release the brake. A release stud spring caging tool is furnished with the brake chamber assembly. The release stud engages in the spring pressure plate and its nut is tightened to compress, cage the spring, and release the brake.

Remove release stud assembly from carrying pocket.

Apply a light coat of antiseize to the threads of the release stud to avoid any unnecessary wear of the threads. Remove the access plug from the end of the spring chamber. Insert the release stud through the opening in the chamber and into the spring pressure plate.

Turn the release stud one-quarter turn to engage the tangs on the release stud into the slot in the pressure plate. Install the nut on the release stud. Be sure tang on release stud stays engaged with slot on pressure plate while installing the nut. Tighten the nut with a wrench to compress the spring.

#### *Parking Brake Reset*

Charge spring brake chambers with air pressure. Loosen nut and remove the release stud and nut from the spring housing and reinstall the access plug in the chamber opening. Reinstall the release stud and nut in the carrying pocket on the brake chamber housing.

#### *Parking Brake Alarm*

If the parking brake alarm sounds **(horn continuously blows when driver's door is opened)**, press the service brake pedal. Then, after turning the ignition switch to the ON or ACC position, make sure that the parking brake is set.

#### **Bendix® Intellipark™**



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, the driver is responsible for the safe operation of the vehicle at all times. Vehicle safety technology, such as Intellipark™, CANNOT REPLACE a skilled, responsible, and alert driver who exercises safe operating practices.**

**NOTE:** For full details regarding the operation of Intellipark™, see the Bendix® Intellipark™ user documentation shipped with the vehicle.

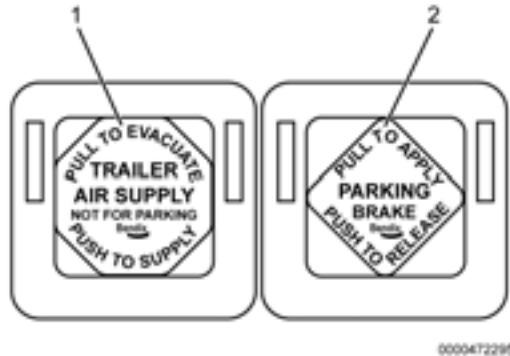
#### *Applying and Releasing the Parking Brake*



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, the driver should engage the parking brake as normal before exiting the cab. Intellipark™ does not relieve the driver of exercising safe operating practices.**





1. Trailer air supply rocker switch
2. Parking brake rocker switch

Always ensure that the parking brake is engaged when exiting the vehicle. The purpose of this brake is to hold the vehicle in a parked position. Do not use the parking brake to slow or stop the vehicle during normal driving.

To engage the parking brake:

- Pull and release PARKING BRAKE rocker switch.

To release the parking brake:

- Turn ignition to KEY ON.
- Ensure all cab doors are closed.
- Press service brake pedal.
- Push and release PARKING BRAKE rocker switch.

- Push and release TRAILER AIR SUPPLY rocker switch (if vehicle is connected to a trailer).

### *Rollaway Prevention*



### **WARNING**

**To prevent personal injury and / or death, or damage to property, the driver is responsible for the safe operation of the vehicle at all times. The operator must NEVER rely upon Intellipark™ to stop the vehicle.**




The Intellipark™ rollaway prevention feature is designed to prevent the vehicle from rolling unintentionally. The system monitors driver actions and if the vehicle is moving at slow speeds for a period of time (approximately 30 seconds) without the driver pressing the accelerator pedal or brake pedal, Intellipark™ will automatically engage the parking brake. A message will appear in the gauge cluster alerting the driver before Intellipark™ engages the brake. To prevent Intellipark™ from engaging the parking brake, the driver can press the accelerator pedal or brake pedal.

The system monitors driver actions and if the vehicle is moving at slow speeds without the driver pressing the accelerator pedal or brake pedal, Intellipark™ will automatically engage the parking brake immediately if any cab door is opened.

When the vehicle is stationary, Intellipark™ monitors driver actions and engages the parking brake if the driver does not apply the parking brake when turning off the vehicle.

## Intellipark™ LED Operation

The Intellipark™ LEDs let the operator know when the tractor and / or trailer brakes are engaged or disengaged.

Startup Check, LEDS illuminate for 3 Seconds	
Trailer Parking Brakes Engaged Tractor Parking Brakes Engaged	
Trailer Parking Brakes Engaged Tractor Parking Brakes Disengaged	

Trailer Parking Brakes Disengaged  
Tractor Parking Brakes Engaged



Trailer Parking Brakes Disengaged  
Tractor Parking Brakes Disengaged  
The LEDs will also turn off when the parking brakes are engaged with the ignition in the Key OFF position.



## WARNING

To prevent personal injury and / or death, or damage to property, the operator should **NOT DRIVE THE VEHICLE** when any combination of Intellipark™ LEDS are blinking. A blinking LED indicates that Intellipark™ has faulted and the vehicle may not have parking brakes available when needed.



### WARNING

To prevent personal injury and / or death, or damage to property, when any combination of Intellipark™ LEDS are blinking **HAVE THE SYSTEM SERVICED** as soon as possible. A blinking LED indicates that Intellipark™ has faulted and the vehicle may not have parking brakes available when needed.

Blinking LEDS indicate that Intellipark™ has faulted. DO NOT DRIVE the vehicle. Service vehicle as soon as possible.	
If the LEDS appear as shown, Intellipark™ has faulted, DO NOT DRIVE the vehicle. Service vehicle as soon as possible	

### *Parking the Vehicle When Parking Brake Cannot be Applied*

If a fault occurs (blinking LED) when driving the vehicle (tractor and trailer) on the roadway, park the vehicle as soon as safely possible.

To park the vehicle:

- Stop the vehicle on a level surface.
- Apply parking brake using PARKING BRAKE rocker switch.

If the parking brake is applied successfully, have the vehicle serviced as soon as possible.

If the parking brake fails to apply after performing the steps above:

- Turn the ignition to the Key ON, Engine OFF position.
- Roll down driver-side window to hear air being expelled when parking the brakes.
- Lift up and release the TRAILER AIR SUPPLY rocker switch. Listen for the sound of air being expelled.
- Lift up and release the PARKING BRAKE rocker switch. Listen for the sound of air being expelled.

If the parking brake does not apply:

- Repeatedly apply the service brakes to evacuate the entire air supply. This action will apply the parking brake.
- Install wheel chocks.
- Turn the ignition to the Key OFF, Engine OFF position.

### *Operating the Vehicle Using Parking Brake Interlock Override Mode*

When the operation of the vehicle has been compromised, use the parking brake interlock override mode so that the vehicle can be driven to a service location for repair.

To activate parking brake interlock override mode:

- Turn the ignition to the Key ON position.
- Press and release the PARKING BRAKE rocker switch three times in rapid succession.
- Press PARKING BRAKE rocker switch for several seconds and release.

Once the interlock override mode is activated, the left-side LED on the switch will begin to double blink.

The interlock override mode will deactivate once the vehicle is parked.

### *Bobtail Operation*

**NOTE: If Intellipark™ does not detect a trailer, bobtail mode may be automatically engaged. A cluster message will be displayed indicating that bobtail mode has been activated.**

When operating the vehicle without a trailer, the Intellipark™ trailer LEDs will be constantly illuminated. The trailer LED can be turned off by doing the following:

- Lift up the TRAILER AIR SUPPLY rocker switch for three or more seconds.

Do any of the following to exit the bobtail mode:

- Lift up and release the PARKING BRAKE rocker switch.

Or,

- Press down and release OR or lift up and release the TRAILER AIR SUPPLY rocker switch.

### *Air Trailer Brake Release*

When the driver forgets to supply air to the trailer, Intellipark™ may automatically detect the trailer and then supply it with air.

### **Air Dryer**

The function of the air dryer is to collect and remove moisture and contaminants before the compressed air reaches the air reservoirs. This protects the air system components from malfunctioning including blockage, corrosion, and freezing. For air tank draining requirements, refer to the Maintenance Instructions section as well as local regulations.

The air dryer is installed in the discharge line between the air compressor and the air system reservoirs. The air dryer includes a replaceable desiccant cartridge and oil blocking filter that is periodically serviced. It also may include a heater to prevent the discharge valve from freezing in cold weather.

### Trailer Brake Hand Control



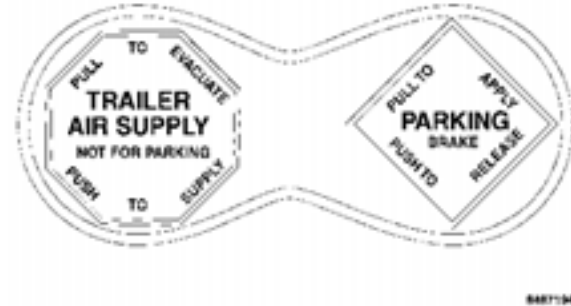
#### WARNING

To prevent personal injury and / or death, or damage to property, the hand control valve should never be used to apply the trailer brake when the tractor and trailer are parked. Air pressure may leak from the system, and the vehicle could roll away.

The trailer brake hand control is used to apply the trailer service brakes, independently of the tractor service brakes. The trailer brake hand control operates a valve that provides gradual control of air pressure applied to the trailer service brakes. The trailer service brake can be fully or partially applied, but when in a partial position, can be overridden by pressing fully on the brake pedal.

To apply the trailer service brakes utilizing the hand control, move the lever clockwise (down). The further the handle is moved clockwise, the greater the air pressure applied to the trailer brakes. The trailer hand brake handle will remain in place with the desired brake pressure applied until the handle is manually moved. To release the trailer brake, move handle counterclockwise (up) until trailer moves freely.

### Trailer Air Supply and Parking Brake Modular Controls



- TRAILER AIR SUPPLY (RED octagonal knob)
- PARKING BRAKE (YELLOW diamond knob)

The PARKING BRAKE valve knob (YELLOW) should be pushed in first, after sufficient air pressure is built up (apply foot brake to prevent vehicle from rolling). The TRAILER AIR SUPPLY valve knob may then be pushed in.

The TRAILER AIR SUPPLY valve knob (RED) and PARKING BRAKE valve knob will automatically pop out if the system pressure (both front and rear circuits) drops to 20 - 40 psi (138 - 276 kPa). The tractor protection valve will then close, the tractor spring brakes will apply, and the trailer emergency system will be activated.

On vehicles equipped with the standard two-valve system, the operation of one valve together with the other permits the operator to select the desired functions described below:

RED Valve (Trailer Air Supply)	YELLOW Valve (Parking Brake)	Function (Mode)
Out	Out	System Park
In	Out	Trailer Charge
In	In	Normal Running
Out	In	Bobtail / Sliding Fifth Wheel Adjustment / Sliding Trailer Tandems Adjustment

The PARKING BRAKE valve (YELLOW knob) controls the spring brakes on the tractor and when pulled out simultaneously causes the trailer supply valve to pop out, thus applying both tractor and trailer parking brakes. The trailer brake may be independently released by pushing only the TRAILER AIR SUPPLY valve (RED control) in.

The TRAILER AIR SUPPLY valve (RED valve) delivers air to the trailer supply and will automatically pop out, shutting off the trailer supply if pressure is decreased to approximately 35 psi (241 kPa). For exact air pressure set points, refer to the Service Manual.

**NOTE: When attempting to readjust / slide the position of the tractor fifth wheel or the trailer's tandem axles with the tractor and trailer fully connected, leave the tractor's PARKING BRAKE pushed in and pull the TRAILER AIR SUPPLY out. This will apply the trailer's parking brake and keep it stationary while the tractor is moved forward or backward.**

## Parking Brake Indicator



### WARNING

**To prevent personal injury and / or death, or damage to property, avoid driving with the parking brake applied, which can lead to excessive heat buildup and possible fire.**

The Parking Brake indicator is operated in conjunction with the parking brake. With the ignition switch on and the parking brake set, the PARK indicator will illuminate. If the indicator does not illuminate with the parking brake set, the indicator may be inoperative.

### Bobtail Proportioning System

Bobtail proportioning is available with tractor air brake systems (for export only with Code 04092) with or without ABS or ABS / Traction Control Systems. The proportioning valve senses when trailer brakes are not connected to the vehicle air brake system, and automatically adjusts rear braking power when operating in the bobtail mode, then returns full braking power when a trailer is attached. When operating in the bobtail mode, bobtail proportioning provides more braking control and shorter stopping distances, particularly on wet and slippery road surfaces.

It should be noted that there is a noticeably different brake pedal feel on tractors with this feature while operating in the bobtail mode. Higher brake pedal efforts will be experienced by the driver than when in a brake system without bobtail proportioning.

### Antilock Brake System (ABS)

#### *General Information*



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, employ safe driving practices and assume no additional driving risks when operating a vehicle equipped with Antilock Brake System(s) (ABS). ABS are designed to enhance overall vehicle safety when a vehicle is driven within its safe operating limits. ABS cannot compensate for a vehicle that is being driven beyond the physical limits of control.**



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, do not rely on the ABS to interrupt vehicle engine brake on slippery road surfaces. Turn these devices off during hazardous driving conditions. Failure to follow this warning may cause wheel slippage and / or loss of vehicle control.**

The ABS is a mandated feature added to the standard air brake system. It electronically monitors vehicle wheel speed at all times, and engages only when wheel lock is imminent. The standard air brake system controls normal braking when the ABS is not engaged.

#### *ABS Operation*



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, if the ABS warning indicator comes on, have the ABS repaired immediately as stopping distances may increase under certain braking conditions. Take every precaution to prevent wheel lockup, which could result in loss of vehicle control.**

ABS requires no changes in driving practices. For the best stopping performance with or without ABS, modulate – do not pump – the brake pedal until the vehicle slows to desired speed or stops. Be aware that ABS on a towing vehicle does not control brakes on towed vehicles. Towed vehicles may

or may not have ABS. ABS will prevent lockup of controlled wheels if you over-brake for existing road conditions. Optimum vehicle control for existing road conditions will be provided as a result of the ABS preventing wheel lockup at speeds above approximately 4 mph (6 km/h). The ABS cannot provide any better braking and steering capability than the available road traction will permit. If the road is slippery it will take longer to stop than on a dry road. Steering maneuverability will be similarly limited. Vehicle speed must be reduced to compensate for the extended time and distance required to stop or slow the vehicle on slippery roads.

The wheel hubs carry exciter rings used by axle-mounted sensors to transmit wheel speed information to the ABS electronic control unit located inside the cab. The control unit monitors and compares all wheel speed inputs to determine if any wheel(s) are about to lock. If wheel lockup is about to occur, the control unit commands the appropriate modulator valve to adjust air pressure delivery to prevent wheel lockup.

#### *ABS Self Check*

**Bendix® ABS Checkout:** A YELLOW warning indicator on the instrument panel indicates the antilock system status. The indicator comes on and the system goes through an ABS self-checkout sequence each time the ignition is turned on. The system is working normally when ignition is turned on, indicator comes on, then flashes twice and remains on for several seconds before going out.

During the self-checkout, the modulator valves will cycle around the vehicle twice in the following pattern:

1. Right-side front

2. Left-side front
3. Right-side rear
4. Left-side rear

A fault has been detected in the ABS if the warning indicator does not come on with ignition, does not flash, fails to go off, or comes on again at any other time.

If over-braking causes wheel lockup on the rear drive axles while engine braking devices are in operation, the ABS will interrupt and disable the engine brake until the lockup situation has stopped.

If the ABS warning indicator on the instrument panel is lit, consult your nearest International Truck service center for further assistance in maintaining and repairing your ABS.

#### *Antilock Driving Tips*

**Brake just the way you always have.** Apply brakes as normal to stop in time. The ABS monitors the brake application electronically and automatically controls the brakes, much faster than a driver could do by pumping the brake pedal.

**Always remember that you are the most important factor to safe operation of your vehicle.** Steer clear of traffic, pedestrians, animals, or other obstacles while you are in an emergency braking situation. The antilock tractor and truck brake system will allow you to steer the vehicle during braking while it comes to a full stop. ABS is not an excuse to take unnecessary risks. Always drive carefully and stay a safe distance away from the vehicle in front of you.



**When driving with a single trailer, doubles, or triples:** Brake as necessary, watch your trailer(s) through your mirrors, and correct steering as necessary to keep in straight lines.

**If only your tractor has ABS:** Use your tractor's ABS brakes. Steer clear of obstacles and watch the trailer through your mirrors to make sure it follows your tractor properly. Tractor ABS will help prevent tractor jackknife but will not prevent trailer swing out.

### Automatic Traction Control (ATC) System

#### General Information

The Automatic Traction Control (ATC) feature is an available option on some models. Automatic Traction Control is an integrated addition to the ABS. This system utilizes input from the individual wheel sensors to determine if drive axle wheel slip is occurring during vehicle acceleration. If drive axle wheel slippage is occurring, the controller relay initiates action to reduce engine power and / or to selectively apply rear brakes to transfer power from the slipping wheel to the opposite wheel. This enables the vehicle to gain momentum and move torque to road surfaces providing more traction. The system instantly blinks an indicator to advise the driver that wheel spin is occurring.

If wheel spin occurs at speeds above 25 mph (40 km/h), the indicator blinks and, using its link to the engine control module, the ATC reduces engine torque to a level suitable for the

available traction. The brakes are not applied, even slightly, at any speed above 25 mph (40 km/h).

Both the ABS and ATC are features added to the basic air brake system, and the loss of either or both should in no way affect the basic brake system. ABS and ATC require no changes in driving style and it is best not to change your usual, careful driving habits. Other than during initial start-up, when the TRAC CTRL indicator flashes and then goes out, the ATC system should not be noticed until it's needed. Routine operation of the brakes and accelerator is unchanged.

#### ATC System Check

At ignition turn ON, the TRAC CTRL indicator will illuminate steadily for 2.5 seconds and then turn OFF. If not, the system is defective or inoperative.

#### ATC OFF ROAD or MUD / SNOW Switch

The optional ATC system comes equipped with one of two switches that perform the same functions of enabling and disabling the ATC system.

**NOTE: Be sure to turn off the ATC ROAD or MUD / SNOW switch when you return to a firm surface.**



The function of this switch is to allow greater engine power and more wheel spin. When operating on soft road surfaces, place the OFF ROAD or MUD / SNOW switch in the ENABLE position. The switch indicator will flash slowly to indicate that this function has been selected, and it will flash rapidly whenever ATC is operating to control excessive wheel spin.



### Stability Control Systems – Bendix® RSP / WABCO® RSC / Bendix® ESP



#### WARNING

To prevent personal injury and / or death, or damage to property, be aware that vehicles equipped with stability control have reduced effectiveness when pulling double or triple trailers. ESP is designed and optimized for trucks and for tractors that tow single trailers. Extremely careful driving is required when towing double or triple trailers. Excessive speed and aggressive maneuvers should be avoided.



#### WARNING

To prevent personal injury and / or death, or damage to property, employ safe driving practices and assume no additional driving risks when operating a vehicle equipped with a stability control system. Stability control systems are designed to enhance overall vehicle stability by automatically reducing vehicle speed under certain conditions.



#### CAUTION

**To prevent property damage, modification to vehicles equipped with stability control systems require prior approval through Navistar or the stability control system manufacturer. Unapproved modifications may result in diminished stability control performance.**

The optional stability control system provides the core ABS function as well as ATC and Roll Stability functions.

**Core ABS Functions:** The core ABS reduces wheel lock-up to help drivers maintain steering control while braking. Antilock Braking Systems (ABS) use wheel speed sensors, ABS pressure modulator valves, and an Electronic Control Unit (ECU) to control either four or six wheels of a vehicle. ECUs optimize slip between the tire and the road surface by monitoring individual wheel turning motion during braking.

**Roll Stability Functions:** The control system (RSP or RSC) helps to mitigate rollovers through advanced sensing, engine torque control, and automatic application of the vehicle brakes. RSP is an all-axle ABS solution that helps reduce vehicle speed by applying all vehicle brakes as needed, reducing the tendency to roll over. RSC is a rear-axle ABS solution that helps reduce vehicle speed by applying rear vehicle brakes as needed, reducing the tendency to roll over.

RSP or RSC focuses on reducing the vehicle's speed below the critical roll threshold during direction-changing maneuvers (such as at exit ramps), lane changing, cornering, or obstacle avoidance. It is most effective on dry, high-friction surfaces.

**Advanced Stability Functions (ESP):** This function enhances stability by sensing actual vehicle dynamics. ESP-equipped vehicles add yaw control to the basic roll stability feature.

**Vehicle Stability Control Speed Reduction:** In the case of a potential roll event, the stability system will remove the throttle and quickly apply brake pressure to slow the vehicle combination below the threshold.

**Steering Angle Sensor (ESP only):** This sensor enables the advanced stability system to capture the driver's steering input and intervene if a yaw correction is needed. The sensor also provides the earliest indication of an increase in lateral acceleration that might cause a potential roll event. A steering angle sensor provides a greater stability margin than a vehicle that is not equipped with this sensor.

**Brake Demand Sensors:** The stability control system (RSP and ESP) was designed to supplement the driver's actions. By directly measuring driver brake demand, the system can transition seamlessly between driver-intended and system-intended braking pressure. For example, if in a certain maneuver, the system calculates 40 psi (276 kPa) is needed and the driver is only applying 20 psi (138 kPa), the system compensates automatically to deliver the needed 40 psi (276 kPa). If, however, during the same maneuver, the driver steps on the brake pedal quickly to apply a higher (above 40 psi [276 kPa]) braking level, the driver's braking input overrides the temporary change made by the system.

**ABS / Stability System Interaction:** With the ABS based stability control system, the ABS is given priority at the wheel

ends to manage wheel slip for optimal braking. The ABS functions similarly whether the stability system or the driver applies the brakes.

**To maximize the effectiveness of ESP:**

- Ensure loads are properly secured at all times.
- Exercise excessive caution by avoiding sharp turns, sudden steering inputs, or abrupt lane changes at high speeds.

**ESP effectiveness may be reduced greatly if:**

- The load shifts due to improper retention, accident damage, or the mobile nature of some loads.
- The vehicle has an unusually high or off-set center of gravity.
- One side of the vehicle drops off the pavement and the drop is too large to be counteracted by a reduction in speed.
- The vehicle is used to haul double or triple trailer combinations.
- Very rapid steering inputs are used at high speeds.
- There are mechanical problems with suspension leveling of the tractor or trailer resulting in uneven loads.
- Gusty winds are strong enough to cause significant side forces on a vehicle.

## Towing Instructions



### WARNING

To prevent personal injury and / or death, or damage to property, always use both tow hooks to prevent possible overloading and breaking of individual hooks. This vehicle may be equipped with (optional) dual tow hooks for recovery purposes only.



### WARNING

To prevent personal injury and / or death, or damage to property, observe the following warning:

- Always install wheel chocks when manually releasing the parking brake, or the vehicle can roll.
- For towing, make sure the vehicle is securely connected to tow vehicle and tow vehicle parking brake are applied before releasing the disabled vehicle's parking brake.
- To ensure release of parking brake, always cage the spring in the brake chamber.
- Under no circumstances should the spring brake chamber be disassembled for the purpose of releasing the parking brake.



### CAUTION

To prevent property damage, observe the following: Due to many variables that exist in towing, positioning, and lifting, towing is the sole responsibility of the towing operator.

Refer to the differential and transmission equipment manufacturer for specific instructions on towing your vehicle. Further information can be located in the component owner manual that came with this truck on delivery for original sale.

Damage caused by improper towing procedures is not a warrantable failure.

Remove tow hooks from their installed position in the front of the vehicle before operating the vehicle. Failure to do so could result in the tow hooks becoming unintentionally detached from the vehicle.

**NOTE:** Important factors to keep in mind when using tow hooks:

- Use both tow hooks when retrieving vehicle.
- Use a slow steady pull; do not jerk on hooks.
- Tow hooks are not designed for towing, only for retrieval.

**NOTE:** The tow hooks must be removed to operate the optional tilt-away bumper.

## Operation

---

Before moving the towed vehicle, check for adequate road clearance of vehicle components. Navistar, Inc. recommends unloading the towed vehicle prior to towing to reduce any abnormal loads to the vehicle components resulting from the towing procedures. Before towing, be sure to fully release the parking brake. The spring-actuated type parking brake can be released by recharging the air system with at least 64 psi (441 kPa) of air. If brake system will not retain air pressure, then the spring brakes must be held in the released position (caged) manually. See **Parking Brake** section.

### Tow Hooks (If Equipped)

Two removable front tow hooks are optional on International® LT® and RH™ Series models. The tow hooks are inserted directly into the front suspension bracket when in use, and can be conveniently stored in the cab when not in use. Tow hooks provide a convenient attachment point from which to recover the vehicle in emergency situations.

**NOTE: The optional tow hooks are stored in a bracket attached to the rear side of the seat bases on day cab models and in a plastic case under the bunk on sleeper models.**

**NOTE: Do not leave tow hooks in receivers when not in use.**



1. Front bumper
2. Receiver portion of front suspension bracket
3. Tow hook (2) (Optional)

Insert the tow hooks through the front bumper and into the receivers (tow hooks must have the point of hooks vertical while inserting into receiver). Push on each tow hook and rotate outward 90° to secure the hooks in the locked position. The point of each tow hook is pointed outboard on the truck to prevent damage to the bumper during towing.

### **Towing Vehicle With Front Wheels Suspended**



#### **CAUTION**

To prevent transmission damage, vehicles should not be towed even short distances without suspending rear wheels or removing the axle shafts or propeller shaft.

If the chassis is equipped with tandem axles and the vehicle is to be towed from the front, the forward rear axle may be raised to clear the road surface and secured to the frame by chains or U-bolts, allowing only rear axle to contact road surface. Axle shafts must be removed from rear axle assembly. The wheel hub ends must be covered to prevent loss of axle lubricant and entrance of contaminants. Use extreme care in securing the chains or U-bolts to prevent possible damage of brake lines, hoses, or other components.

When it is necessary to tow a vehicle with the front wheels suspended, extra precautions must be taken to avoid transmission or differential damage. Proceed as follows.

Remove axle shafts from axle assembly to prevent the wheels from driving the differential and the transmission. The wheel hub ends must be covered to prevent loss of axle lubricant and entrance of contaminants. If axle shafts are not removed, removal of propeller shafts at rear axle will be required.

### **Towing Vehicles With Driver-Controlled Differential Lock**

#### *Removing Axle Shafts Before Towing*



#### **CAUTION**

To prevent differential and / or transmission damage, remove drive axles on vehicles that must be towed to a service facility with the drive axle wheels on the ground.



#### **CAUTION**

To prevent property damage, do not use a chisel or wedge to loosen axle shafts and dowels. The chisel or wedge can damage hub, axle shafts, and oil seals if used.

**NOTE:** On vehicles equipped with a driver-controlled differential lock, before air pressure is lost the differential lock must be manually caged prior to removing the axle shaft. Failure to do so may make reinstallation of the axle shaft extremely difficult and time consuming.

**NOTE:** One of the axle shafts has two sets of splines – one set to engage with differential side gear and one set to engage with shift collar for the differential lock. It may be necessary to rotate shaft slightly to align side gear spline teeth with clutch collar teeth in order to remove axle shaft.

1. Shift main differential to the locked (engaged) position.

## Operation

---

Applicable RR DIFF or FR DIFF ENGAGE indicator must be illuminated in electronic gauge cluster to validate DIFF LOCK is FULLY engaged and axle shaft can be removed. Failure to fully engage axle DIFF LOCK will allow DIFF LOCK shift collar to fall slightly and block, or temporarily resist, axle shaft reinsertion.

2. Remove cap screws and washers or stud nuts and washers from flanges of both axle shafts.
3. Loosen tapered dowels in flanges of both axle shafts by holding a 1 1/2-inch (38 mm) diameter brass drift or

hammer against axle shaft center and hitting it with a 5 - 6 pound hammer.

4. Remove tapered dowels and both axle shafts from axle assembly.
5. Assemble a cover over openings of both wheel ends to prevent loss of lubricant and keep dirt from the wheel bearing cavities.

### *Installing Axle Shafts*

1. Remove covers from wheel ends.
2. Shift differential lock to the locked (engaged) position.

Applicable RR DIFF or FR DIFF ENGAGE indicator must be illuminated in the electronic gauge cluster to validate DIFF LOCK is FULLY engaged and axle shaft can be removed. Failure to fully engage axle DIFF LOCK will allow DIFF LOCK shift collar to fall slightly and block, or temporarily resist, axle shaft reinsertion.

3. Install right-side and left-side axle shafts as follows:
  - a. Place gaskets on wheel hub studs.
  - b. Push right-side axle shaft into wheel end and housing until shaft stops against differential shift collar.
  - c. Push axle shaft further into housing until shaft stops against differential side gear.
  - d. Push down on axle shaft flange and rotate shaft until splines of shaft and side gear are engaged.
  - e. Push axle shaft completely into housing until axle shaft flange and gasket are flush against wheel hub.
  - f. Install left-side axle shaft and gasket into wheel end.
4. If tapered dowels are required, install them at each stud and into flange of axle shaft. Use a punch or drift and hammer if needed.

5. Install fasteners and tighten to correct torque value. Refer to the appropriate Service Manual section.

### **Reverse Towing Vehicle With Rear Wheels Suspended**



#### **CAUTION**

**To prevent damage to property, when reverse towing the vehicle (rear wheels suspended), always remove cab side extenders and rear tractor aero kits and limit vehicle speed to a 50 mph (80 km/h) maximum towing speed.**

Whenever possible, it is preferable to tow a disabled vehicle from the front by raising the front of the chassis by the front axle.

Whenever it is necessary to tow a vehicle with the rear of the chassis suspended, the front wheels must be locked in the straight ahead position.

Aero-enhanced vehicles being reverse towed with the rear wheels suspended must have the rear tractor aero kits and cab side extenders removed. Vehicle towing speed must be limited to 50 mph (80 km/h).



## Operation

---

See the following images for typical air fairing and cab side extender locations.



0000454503

1. Air fairing
2. Cab side extender



0000458043

1. Air fairing
2. Cab side extender



1. Air fairing
2. Cab side extender

## Tractor-Trailer Connections

### WARNING

To prevent personal injury and / or death, or damage to property, whenever possible, make trailer connections while standing on the ground. Provide adequate lighting of working areas. Inclement weather and accumulated road contamination deposits on handholds and stepping surfaces require extra care to prevent slips and falls.

### WARNING

To prevent personal injury and / or death, or damage to property, do not climb on the back of a tractor unless it has been provided with a deck plate and handholds. Use a three-point stance when climbing up and down from a deck plate. Do not jump from vehicle.

## Connecting / Disconnecting a Trailer to a Vehicle with Air Suspension

The air suspension has a dump valve system option (Code 14899) that permits exhausting air from the suspension system, thus lowering the frame when connecting, disconnecting, or loading the trailer. The vehicle speed must be below 5 mph (8 km/h) before the switch will operate the valve.

## Operation

---

When connecting to a trailer, switch the SUSP / DUMP switch, located on the instrument panel, to the DUMP position, and air will exhaust from the suspension system lowering the tractor. This will permit backing under the trailer without undue loading of suspension system. After making the connection to the trailer, return the switch to the SUSP position, then raise landing gear.

When disconnecting the trailer, lower the landing gear, disconnect the brake hoses and rear light connectors from the trailer, and pull the release lever on the fifth wheel. Slowly pull the tractor forward just far enough to release the kingpin from the fifth wheel and stop. Switch the SUSP / DUMP switch to the DUMP position and pull the tractor away from the trailer.

The SUSP / DUMP switch must be returned to the down SUSP position before operating with a trailer or operating in the bobtail mode.

### Fifth Wheel Operation



#### WARNING

**To prevent personal injury and / or death, or damage to property, always follow the fifth wheel manufacturer's instructions for hooking and unhooking as well as sliding the fifth wheel.**



#### WARNING

**To prevent personal injury and / or death, or damage to property, when using an assistant to reposition a sliding fifth wheel, the driver must be ready to stop as soon as the fifth wheel moves to the desired position. The assistant must keep feet, hands and body clear of the vehicle's tires and other moving parts to prevent personal injury or death. The driver must not begin to move the vehicle until the assistant is clear and signals the driver to move the vehicle.**

#### *Fifth Wheel Slide Switch (If Equipped)*

An optional fifth wheel slide switch may be present. This switch allows the operator to electronically unlock the fifth wheel to allow it to be moved forward or backward and relock it once the desired position is attained.

To unlock the fifth wheel, press in the top portion of the switch. The switch indicator will illuminate steadily when the fifth wheel is unlocked.



**NOTE:** The fifth wheel cannot be unlocked above a preset speed (normally 2 mph [3 km/h]). Attempting to unlock the fifth wheel at any higher speed will cause the switch indicator to flash slowly (once per second). The fifth wheel lock automatically engages if it has been unlocked and the vehicle speed exceeds the preset value.

To lock the fifth wheel once the desired position is reached, press the lower portion of the switch. The switch indicator will turn off when the fifth wheel is locked.

**NOTE: A fast flashing (twice per second) switch indicator signifies a problem in the fifth wheel lock system.**

### *Hookup*

1. Fifth wheel jaws must be opened fully.
2. Tilt fifth wheel back to prevent body damage when tractor is backed under trailer.
3. Block trailer wheels and be sure trailer spring brakes are adjusted and applied. Never chase a trailer.
4. Make sure brake hoses and light cords are clear of the fifth wheel.
5. Back tractor squarely under trailer, engaging fifth wheel jaws on trailer kingpin. Always back slowly, making sure trailer is neither too high nor too low. Avoid backing under trailer from an angle.
6. Connect service and parking brake hoses and trailer light connector. Refer to the Warning located in the **Tractor-Trailer Connections** information. Use a three-point stance when connecting and disconnecting trailer.
7. Inspect fifth wheel jaws to be sure they have closed on trailer kingpin and the trailer plate is resting securely on the fifth wheel.

8. Be sure the coupler release lever is in the locked position.
9. Charge trailer brake system. Set trailer brake, either with the hand valve or tractor protection valve. Pull against trailer for an additional check of hookup. Do not pull hard enough to damage or strain the equipment.
10. Set tractor parking brakes and fully raise trailer landing gear. Refer to **Brakes** segment of this section for Operation of Parking Brakes and Trailer Brake.
11. Check operation of all trailer lights and correct faulty lights.

### *Un-Hook*

1. Try to keep tractor and trailer in straight line.
2. Apply tractor and trailer parking brakes.
3. Lower trailer landing gear, making sure it is on solid, level ground. The weight of trailer must be on landing gear.
4. Block trailer wheels.
5. Disconnect brake hoses and light cords. Be sure hoses and cords are clear.
6. Pull coupler release lever to disengage fifth wheel jaws.
7. Release tractor parking brakes.
8. Pull out from trailer slowly, allowing landing gear to take load gradually.

### *Fifth Wheel Jaw Unlock Control*

Your vehicle may be equipped with an optional Fifth Wheel Jaw Unlock feature. A guarded switch mounted in the cab allows the operator to unlock the fifth wheel jaw from inside the vehicle. There are two available versions for the system: with monitoring or without monitoring. The version with monitoring capabilities includes additional indicators to show the driver fifth wheel jaw status.



**NOTE: Fifth Wheel Jaw Unlock is operational only when vehicle is stationary, parking brake is set, and ignition switch is in the ON position.**

**NOTE: Outside (roadside), mechanical jaw release mechanism is still operable regardless of in-cab control.**

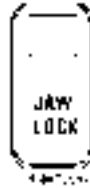
To unlock the fifth wheel jaw, perform the following:

- Depress and **hold** the UNLOCK 5TH JAW switch.
  - If the switch is only pressed **momentarily**, jaw unlock **will not occur**.
  - A continuous tone alarm will sound while the jaw is unlocking.
  - The continuous tone will then change to a repetitive beep indicating jaw unlocking is complete.
  - The RED indicator in the switch will turn on when jaw unlocking is complete.
- Release the UNLOCK 5TH JAW switch and release the parking brake to silence the alarm.
  - The RED indicator will then turn off.
    - If the RED indicator flashes fast, this indicates a fifth wheel control system error or failure.
    - If the RED indicator flashes slowly, this indicates an interlock problem such as a parking brake not set.

**NOTE: If the continuous tone alarm shuts off before the repetitive beep is heard, jaw unlocking was incomplete.**

### *Fifth Wheel Jaw Monitoring*

The optional fifth wheel jaw monitoring feature is an electronic jaw lock indicator system with two indicators to show fifth wheel jaw status to the driver.



One indicator, JAW LOCK, illuminates GREEN when the trailer is fully locked onto the fifth wheel. The other indicator, JAW UNLOCK, illuminates RED when the trailer is not fully locked onto the fifth wheel. If neither indicator is illuminated, this indicates the jaw is unlocked and the tractor is not connected to a trailer and is in bobtail mode. If the JAW UNLOCK indicator is flashing, this indicates the jaw is locked and the trailer is not connected to the fifth wheel. If both indicators are flashing, this indicates a system error or failure. Both indicators will illuminate briefly when the key is turned to the ON position as a check of function.



## SECTION 7 — MAINTENANCE INSTRUCTIONS

### Introduction



#### WARNING

To prevent personal injury and / or death, or damage to property, if the owner / operator of the vehicle is a skilled technician and intends to perform the vehicle maintenance and servicing, they are strongly urged to purchase and follow the appropriate International® service manuals or OnCommand® Service Information USB. Ordering information is included at the back of this manual.

Your vehicle has been engineered and manufactured to provide economical service. However, it is the owner's responsibility to see that the vehicle receives proper care and maintenance to ensure high performance.

Quality International® service parts are available through your International Truck dealer. If International service parts are not used, the owner must make sure that the parts used are equivalent to International service parts.

As with any vehicle, care should be taken to avoid being injured when performing maintenance or repairs or making any checks. Improper or incomplete service could result in the vehicle not working properly, which in turn, may result in personal injury or damage to the vehicle or its equipment. If you have any question

about performing some service, consult your International Truck dealer or have the service done by a skilled technician.

### Maintenance Guidelines



#### WARNING

To prevent personal injury and / or death, or damage to property, perform proper and timely maintenance and service to your vehicle.



#### WARNING

To prevent personal injury and / or death, or damage to property, do not make modifications to any part, component, or system of the vehicle, as that can adversely affect the quality and reliability of your vehicle.



#### WARNING

To prevent personal injury and / or death, or damage to property, use only genuine International® Truck service parts. The use of inferior parts can adversely affect the quality and reliability of your vehicle.



### WARNING

To prevent personal injury and / or death, or damage to property, take care when performing any maintenance or making any check or repair. Some of the materials in this vehicle may also be hazardous if used, serviced, or handled improperly. If you have any questions pertaining to the service, have the work done by a skilled technician.



### WARNING

To prevent personal injury and / or death, or damage to property, when servicing the vehicle, park on a flat level surface, set the parking brake, turn off the engine, and install wheel chocks.



### WARNING

To prevent personal injury and / or death, or damage to property, always disconnect the ground battery terminal first, then the positive cable. When reconnecting the battery cables, connect the positive cables first, and then reconnect the negative cables. Failure to follow this warning may result in a direct battery short, which is a fire or explosion hazard.



### CAUTION

To prevent damage to electrical components during electric welding operations, follow these cautions: Prior to electric welding, disconnect any negative and positive battery cables that connect the batteries to the vehicle. Be sure the detached connectors are not touching the vehicle. If welding close to an electronic component, temporarily remove that component. Attach the welder ground cable as close as possible to the part being welded.

#### When servicing your vehicle, always:

1. Turn OFF the ignition switch, unless the procedure calls for a running engine.
2. Set the parking brake and install wheel chocks.
3. Use support stands, not a jack, whenever you must be under a raised vehicle.
4. Do not smoke.
5. Wear safety glasses for eye protection.
6. Operate engine only in a well ventilated area.
7. Do not work on brakes or clutch unless proper precautions are taken to avoid inhaling friction material dust.



8. Do not wear loose clothing, hanging jewelry, watches, or rings. Tie up long hair and avoid rotating machinery.
9. Avoid contact with hot metal parts; allow hot components to cool before working on them.
10. Correct any problems that were revealed during inspection prior to operating the vehicle.

### Supporting Your Vehicle for Service



#### **WARNING**

**To prevent personal injury and / or death, or damage to property, always use floor stands to support the vehicle before working under it. Using only a jack could allow the vehicle to fall.**

When performing service repairs on a vehicle, first:

1. Park vehicle on level concrete floor.
2. Set parking brake and / or install wheel chocks to prevent vehicle from moving.
3. Select jack with a rated capacity sufficient to lift the vehicle.
4. Raise vehicle with jack applied to axle. (**Do not** use bumper as a lifting point.)
5. Support vehicle with floor stands under axle(s).

If axle or suspension components are to be serviced, support vehicle with floor stands under frame side members, preferably between the axles.

### Chassis Lubrication

New vehicles are lubricated at the factory. After the vehicle is placed in operation, regular lubrication and maintenance intervals, based on the type of service and road conditions, should be established. The loads carried, speed, road and weather conditions all contribute to the frequency of lubrication intervals. Thorough lubrication and maintenance at the specified intervals will ensure Outstanding Life Cycle Value and will reduce overall operating expense.

In some types of operation, and where operating conditions are extremely severe (such as in deep water, mud, or unusually dusty conditions), the vehicle may require relubrication after every 24 hours of operation.

Only lubricants of superior quality, such as Fleetrite® lubricants, should be used. The use of inferior products will reduce the service life of the vehicle or result in failure of its components. Navistar, Inc. recommends the use of Fleetrite® lubricants and OEM original equipment parts.

The lubrication intervals specified should be performed at whatever interval occurs first, whether it is miles (kilometers), hours, or months.

These intervals are provided in **SECTION 8 — Maintenance Intervals and Specifications**

### Air Conditioning Service Checks



#### CAUTION

To prevent component damage, avoid leaving excess dirt and debris in the filter housing when removing and / or replacing any HVAC filters, excess dirt and debris can cause damage to the HVAC system.

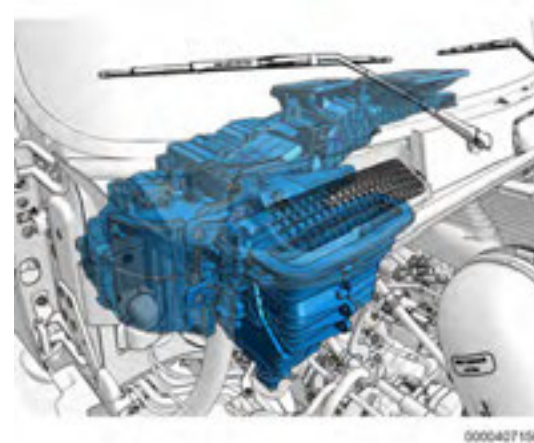
Have your air conditioning system serviced each spring. The refrigerant charge, cleanliness of condenser core, cab filter, and belt condition are essential to air conditioning performance.

Remove the fresh air filter once each season and check for things like dirt and lint. Replace if necessary. Vehicles operating in unusually dusty conditions may require inspecting and replacing the air filter(s) more often.

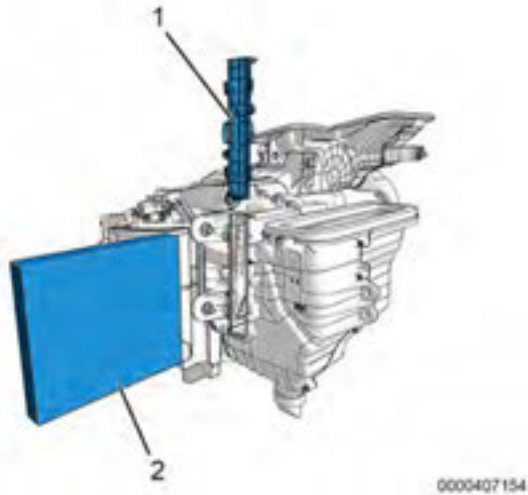
Correct airflow may be restored by either replacing the filter(s), which can be done without tools, or by cleaning the filters.

### HVAC Filters

**NOTE:** There is only one possible cab fresh air HVAC filter configuration: side access to the fresh air HVAC filter housing.



### Side Access HVAC Filter



1. Filter access door
2. Air filter

### Cab Fresh Air HVAC Filter Replacement – Side Access

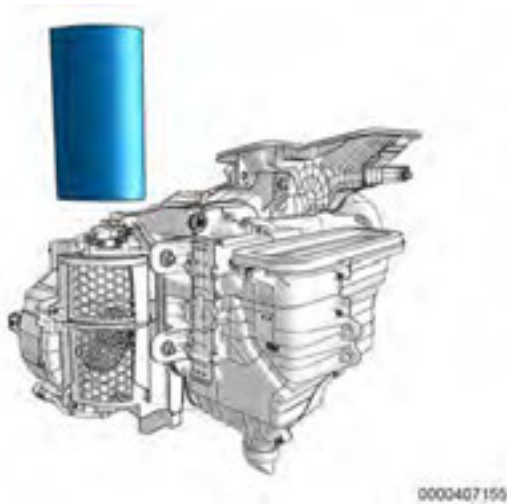
1. Unlatch and remove filter access door.
2. Remove filter by pulling filter out of air intake housing.
3. Install new filter by sliding filter into air intake housing.
4. Install filter access door and latch in place.

## Maintenance Instructions

---

### Recirculation Filter

The recirculation filter is mounted on the right-side of the HVAC unit, which is located in-cab under the right-side instrument panel.

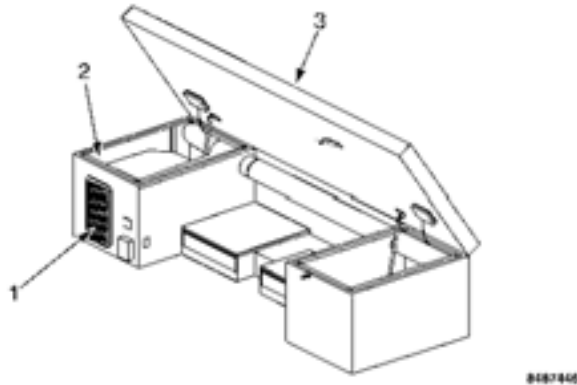


### Cab Recirculation HVAC Filter Replacement

There are two ways to replace this filter, pulling the filter up and out of the housing or, pulling the filter down and out.

1. In order to pull the filter up and out of the filter housing, gain access through the Power Distribution Module (PDM) located on the passenger-side underneath the instrument panel.
2. To pull the filter down and out of the filter housing, gain access from the passenger-side foot well; this requires removal of the passenger-side trim panel.

### Sleeper HVAC Filter



1. Air intake
2. Filter
3. Lower bunk platform

### Sleeper HVAC Filter Replacement

1. Raise lower bunk platform.
2. To avoid damaging the filter, carefully grasp the end of the filter and pull it up and out.
3. Slide a new (or cleaned) filter fully into the slot by pressing down on the outer two edges of the filter's top surface.
4. Close lower bunk platform.

### Axles

#### Front Axle

##### *Inspection and Lubrication*

Check to make sure that the front axle mounting U-bolts, attaching or mounting bolts, and nuts are securely tightened. Loose or misaligned front axles will affect vehicle alignment, front tire wear, and handling.

Refer to the **Maintenance Intervals and Specifications** section for retorque specifications.

Observe the following when checking the front axle for damaged, binding, or worn parts, and adequate lubrication:

- Kingpin wear inspection requires that no weight is on the tires.
- Kingpin and kingpin bushing lubrication requires that the vehicle weight is off tires and the front wheels be turned fully to the left or right prior to installing grease distribution.
- Kingpin thrust bushing lubrication requires that the vehicle weight is resting on the tires.
- Power grease guns may be used; however, a hand-pumped grease gun is recommended for optimal grease distribution within each component joint.
- Inspect, lubricate and adjust the wheel bearings at regular intervals. Refer to **SECTION 8 — Maintenance Intervals and Specifications** for the correct intervals, lubricants, and torques.

## Maintenance Instructions

---

### *Normal Maintenance*

During operation, the air and oil inside the hub / wheel cavity expands. It is normal for a mist of oil to be present on the outside of the hubcap around the vent slit or hole. Over time, if not wiped off, this film may collect dust and appear unsightly. If the entire face and end of the hubcap become wet with oil, investigate the cause. Refer to the Service Manual for repair procedures.

Routinely clean the hubcap to ensure that the lubricant level can be easily observed through the clear window as intended. In situations where the window is clean on the outside but discolored on the inside, check the lubricant level by removing the rubber fill / vent plug and insert a finger into the hole.

The specified lubricant level for International® clear window type hubcaps is from the minimum line to 5/16 inch (0.8 cm) above the minimum line.

If the lubricant level suddenly drops dramatically below the minimum level, see the Service Manual for diagnostic procedure.

### *Alignment*

Maintaining front axle alignment is very important to achieving maximum tire life and vehicle control. Inspecting steer axle tires in the first 3,000 miles (4,828 km) to 10,000 miles (16,094 km) will generally show if tires are wearing normally.

- Rapid outside shoulder wear on both tires indicates too much toe-in.
- Rapid inside shoulder wear on both tires indicates too much toe-out.
- Excessive wear on the inside or outside of one steer tire but not the other can indicate a toe-in or toe-out condition coupled with a misaligned front or rear axle.
- Pulling to the right or left can indicate misalignment of the front or rear axle, unequal tire pressures, or a damaged / mismatched tire.

Refer to the **Tires** subsection for additional related information.

### **Rear Axle**

#### *Inspection and Lubrication*

Check to make sure that the rear axle mounting U-bolts, attaching or mounting bolts and nuts are securely tightened. Loose or misaligned rear axles will affect vehicle alignment, tire wear, and handling. Refer to **SECTION 8 — Maintenance Intervals and Specifications** for torque specifications.

Check the rear axle oil level. Proper oil level minimizes gear wear, heat, and damage to the wheel bearings and seals. The oil level should be at the lower edge of the level inspection hole when the vehicle is on level ground. Add oil as necessary.

Refer to **SECTION 8 — Maintenance Intervals and Specifications** for additional information.

### Locking Differential

Vehicles that have a locking differential have the appropriate operation and maintenance manual supplied with the vehicle. Refer to this manual for maintenance checks.

### Brakes

#### General Information



#### WARNING

**To prevent personal injury and / or death, or damage to property, avoid breathing brake lining fiber dust. Always use a respirator while performing brake maintenance. Follow precautions listed below.**



#### WARNING

**To prevent personal injury and / or death, or damage to property, always check and maintain brakes in proper condition and adjustment. Out-of-adjustment brakes could cause reduced braking ability.**

All new International® vehicles use non-asbestos brake linings. However, exposure to excessive amounts of brake material dust may be a potentially serious health hazard.

Follow these precautions:

- Always wear a respirator approved by National Institute of Occupational Studies of Health (NIOSH) or Mine Safety and Appliance (MSA) during all brake service procedures. Wear the respirator from removal of the wheels through assembly.
- **Never** use compressed air or dry brushing to clean brake parts or assemblies.
- Clean brake parts and assemblies in the open air. During disassembly, carefully place all parts on the floor to avoid getting dust into the air. Use an industrial vacuum cleaner with a HEPA filter system to clean dust from the brake drums, backing plates, and other brake parts. After using the vacuum, remove any remaining dust with a rag soaked in water and wrung until nearly dry.
- **Never** use compressed air or dry sweeping to clean the work area. Use an industrial vacuum cleaner with a HEPA filter system and rags soaked in water and wrung until nearly dry. Dispose of used rags with care to avoid getting dust into the air. Use an approved respirator when emptying vacuum cleaners and handling used rags.
- **Worker cleanup.** Wash your hands before eating, drinking, or smoking. Vacuum your work clothes after use and then launder them separately, without shaking them, to prevent fiber dust from getting into the air.

### Air Brakes

#### *Inspection and Adjustment*



#### **WARNING**

To prevent personal injury and / or death, or damage to property, always install wheel chocks when manually releasing the spring brakes, or the vehicle could roll.



#### **WARNING**

To prevent personal injury and / or death, or damage to property, under no circumstances should the spring brake section of the spring and brake chamber be disassembled. Disassembly will release a powerful spring.



#### **WARNING**

To prevent personal injury and / or death, or damage to property, if a manual adjustment must be made (although this should not be a common practice), a service appointment and full foundation brake, ASA, and other brake system component inspection must be conducted as soon as possible to ensure the integrity of the overall brake system prior to returning the vehicle to service. Brake Automatic Slack Adjusters (ASAs) should not need to be manually adjusted in service. ASAs should not routinely have to be adjusted to correct excessive push rod stroke. Excessive stroke indicates that a problem exists with the foundation brake, ASA, brake actuator, other brake system components, or their installation or adjustment.

A regular schedule for periodic cleaning, lubrication, adjustment and inspection should be established, based on the type of vehicle operation. It is difficult to predetermine an exact maintenance interval (time or mileage), since vehicles will be used in a wide variety of applications and conditions. If you are uncertain of the proper schedule and procedures for your vehicle, contact your International dealer.



Periodic checking of push rod travel or brake adjustment is essential for good braking. Push rod travel should be checked every service interval to determine if adjustment is necessary. Brake chamber push rods on original equipment chambers now incorporate an overstroke indicator (an orange paint marker near the base of the push rod) to aid adjustment checks. If the push rod is clean and the orange marker can be seen protruding from the chamber when the brakes are applied, the brakes require adjustment.

Slack adjusters should also be checked to ensure proper operation of the adjuster mechanism at every interval. Push rod travel should be less than the maximum allowed stroke without brakes dragging.

Inspect brake linings every maintenance interval. When brake shoes (or pads) are worn to within 1/16 inch (1.6 mm) of rivets (or backing plates), as indicated by a line or other feature on the edge of most brake shoes (or pads), brake shoes (or pads) must be replaced.

This inspection or adjustment should only be performed by qualified service personnel and must be in accordance with instructions provided by the Service Manual.

**NOTE: Do not overlook the brakes on the trailer either. Brake condition on a trailer is just as important as the tractor. Proper brake balance on trucks and tractor trailers is essential for good braking.**

At least once a year, the entire brake system must be inspected by a trained mechanic. Deteriorated components or components worn outside of specifications must be replaced. Check:

1. Rubber components for condition, cracks, tears, wear, and missing components.
2. Condition of drums, brake chambers, and slack adjusters for wear, corrosion, maladjustment, cracks, and missing components.
3. For air leaks. **No air leakage is permissible.** Also, check for air leaks with parking brake disengaged and wheels blocked.
4. Hose or pipes for rust, damage, deterioration.
5. Proper operation of service, parking, and trailer brake controls.
6. The condition and full insertion of the ABS wheel speed sensors, wiring, and connectors.
7. Proper ABS wheel speed sensor-to-exciter teeth gap.

### Air Dryer

#### *General Information*

**NOTE: The use of an air dryer does not eliminate the need to periodically drain the air tanks.**

The air dryer removes humidity (water), air compressor oil, and dirt from the incoming compressed air, thus protecting the air system against deterioration and restriction.

The air dryer is installed between the air compressor discharge line and the air tanks. The air dryer has a desiccant cartridge and a filter, which is serviced as an assembly. Moisture from the air collects on the desiccant and is automatically discharged.

Life and performance of the air dryer depends on usage, air humidity levels, environmental temperatures, air compressor oil control, and desiccant quantity. Regularly check the desiccant, purge valve, and air dryer heater performance.

### *Desiccant Filter*

Open reservoir drain valves and check for presence of water. Small amounts of water due to condensation are normal. If the wet, primary, or secondary tanks are collecting an abnormally high amount of water between regular air tank drain intervals, replace the air dryer desiccant.

The air dryer desiccant replacement interval may vary; it is generally recommended that the desiccant be replaced every 12 months for small air dryers, like the Bendix® AD-IP®, or every 24 months for large air dryers, like the Bendix® AD-9® or Bendix® AD-HF®. If experience has shown that extended or shortened life has resulted for a particular installation, then the interval should be increased or reduced accordingly.

### *Purge Valve*

Check that the purge valve opens and expels moisture when the air governor shuts off the air compressor. Air should escape rapidly and then quickly stop. If the purge valve does not open or you can hear a slight audible air leakage past the valve for longer than 30 seconds, the valve may be sticking and should

be rebuilt. Purge valves may also stick if the air dryer heater has failed and ice is clogging the valve.

### *Heater*

Check that the air dryer heater activates at temperatures below freezing. With the vehicle in a cold environment and before the engine is started, turn on the ignition and touch the air dryer housing. It should be warmer than other metallic items on the vehicle. If some warmth cannot be felt, it may indicate that the heater element or the wiring powering it should be serviced.

### **Air Reservoir / Tanks Moisture Draining**

Moisture taken in with the air through the compressor inlet valves collects in the air tanks. The wet tank is the first tank to receive air from the air dryer and therefore collects most of the remaining moisture that was not removed by the air dryer. Drain the wet tank reservoir every day at the end of the trip. Drain the primary and secondary tanks periodically. Periodically, manually drain each reservoir by opening the drain cock located either on the bottom of the tank or in the end of the tank.

Make sure the drain passage is not plugged. For ease of draining, some or all air tank drain valves may be equipped with optional pull cords. There must be some air pressure in the system to ensure proper drainage. Close the drain cocks after all moisture has been expelled.

Drain the wet tank daily at the end of each trip to purge collected water and prevent ice formation inside the tank when the vehicle is shut off in cold weather. If you are unsure which tank is the wet tank, drain all tanks daily.

On vehicles equipped with automatic drain valve(s), moisture and contaminants are automatically removed from the reservoir to which it is connected. It operates automatically during each compression cycle and requires no manual assistance or control lines from other sources.

The Bendix® AD-HF® air dryer has an integral wet / purge tank that automatically purges itself and the desiccant of collected water at the end of each compressor cycle.

### **ABS Connections and Sensors**

Periodically, push together the ABS wiring connections to ensure they are fully seated. Press the wheel speed sensors into their mounting collars to ensure they are fully seated.

## **Cab**

### **Care of Vehicle**

#### *Washing and Waxing*

Frequent and regular washing will lengthen the life of your new vehicle's painted finish and bright metal trim.

Wash your vehicle often with warm or cold water to remove dirt and preserve the original luster of the paint. Never wash the vehicle in the direct rays of the hot sun or when the sheet metal is hot to the touch, as this may cause streaks on the finish. Do not use hot water or strong soaps or detergents, as this may etch the paint or exposed metal / bright surfaces. Do not wipe off dirt when the surface is dry, as this will scratch the paint or exposed metal / bright surfaces.

Always make sure that steps and grab handles are clean and free of road grime, grease, ice, and other debris.

Prior to using any wax or polish, the vehicle must be thoroughly washed to avoid scratching the finish.

#### *Bright Metal Care*

To preserve the bright look of your vehicle's trim (such as grilles and bumpers), use only mild detergents and lukewarm water for cleaning. Damage to these parts can occur if cleaning solutions having excessive acidity or alkalinity (pH) are used. Also, the higher the solution temperature ranges, the more caustic the cleaner's chemical compounds become. However, if high-pressure washing equipment and washing compounds are used, satisfactory results can be achieved, if the solution has a pH value between 4 and 8 and the temperature does not exceed 160°F (71°C). Solutions that are more acidic or more alkaline will attack the metallic coating.

If you are having difficulty with your washing compound, contact your local supplier for the acidity / alkalinity (pH) specification.

A nonabrasive chrome cleaner may be used sparingly to clean the bright metal. Do not use steel wool. Use of automobile wax or polish on bright metal usually will restore the original brightness.

#### *Upholstery Care*

Use a whisk broom and vacuum cleaner to remove loose dust and dirt from upholstery and floor. Vinyl and woven plastic upholstery can be washed with warm water and mild soap.

## Maintenance Instructions

---

Remove soap residue and wipe dry. If commercial cleaners are used, follow instructions supplied with cleaner.

### *Exposed Rubber and Unpainted Plastic Parts*

To better protect plastic surfaces from fading, use Meguiar's #40 vinyl and rubber cleaner / conditioner. Spread evenly with sponge or towel and allow to penetrate. Buff off excess product with clean cloth.

## Clutch

### Pedal Free Travel

All International® LT® and RH™ Series vehicles are equipped with pull type clutches. If a non-self-adjusting clutch (clutches other than the Eaton® Solo series) was selected, free pedal must be checked each time the vehicle chassis is lubricated. If free pedal is less than 1/2 inch (13 mm), the clutch must be adjusted. Contact your International Truck dealer for proper clutch adjustment procedures. After proper clutch adjustment, clutch free pedal should be between 1.25 and 1.75 inch (32 mm and 44 mm) and the release bearing should contact the clutch brake with 1/2 - 1 inch (13 - 25 mm) of clutch pedal travel remaining. Free pedal and clutch brake should be adjusted by lengthening (increases free pedal and decreases clutch brake squeeze) or shortening (decreases free pedal and increases clutch brake squeeze) the horizontal rod if outside of this specification. Contact your International® Truck dealer for proper linkage adjustment procedures.

**NOTE: Proper clutch and linkage adjustment will provide adequate clearance between the release yoke fingers and the release bearing as well as between the release bearing and the clutch brake for proper operation. Improper adjustment may cause improper clutch operation, reduce clutch life, and may void the clutch warranty.**

Clutch cross-shafts and throw-out bearings must be lubricated each time the vehicle chassis is lubricated to ensure smooth clutch activation and long life.

All new International® LT® and RH™ Series vehicles use non-asbestos clutch linings. However, exposure to excessive amounts of clutch material dust (whether asbestos or non-asbestos, fiberglass, mineral wool, aramid, ceramic or carbon) is a potentially serious health hazard.



### **WARNING**

**To prevent personal injury and / or death, or damage to property, do not breathe clutch lining fiber dust. Always wear a respirator when doing clutch lining maintenance.**

Persons who handle clutch linings should follow the same precautions as outlined for handling brake linings.

### Hydraulic Clutch

Your vehicle is equipped with a hydraulic clutch actuation system. The reservoir is located just below the cowl, left of center on the firewall.



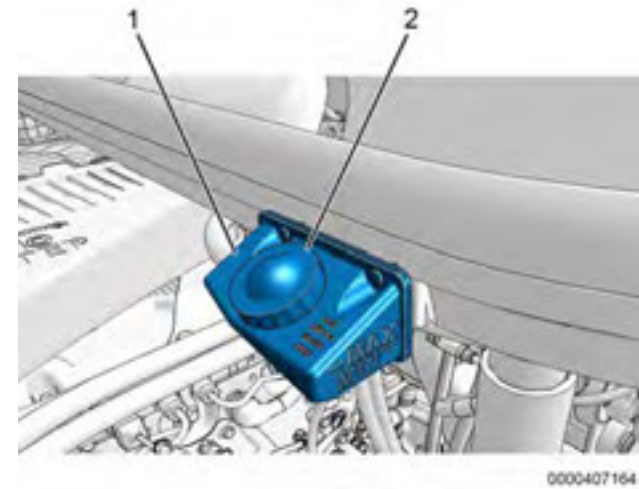
#### CAUTION

To prevent vehicle and / or engine component damage, use only approved hydraulic clutch fluid (DOT 3 or DOT 4 brake fluid) in the clutch hydraulic system. Do not mix different types of brake fluid. The wrong fluid will damage the rubber parts of the system, causing loss of clutch function.



#### CAUTION

To prevent vehicle and / or engine component damage, do not allow the fluid level in the reservoir to go below the MIN line. If too much air enters, the hydraulic system will not operate correctly, and the clutch could be damaged.



1. Reservoir
2. Cap

If the fluid level is below the MIN line, remove cap and fill the reservoir with DOT 3 or DOT 4 brake fluid until the level reaches the MAX line.

### Electrical

#### Batteries

Battery life and performance varies greatly depending on duty cycle. Conditions such as short runs between starts, low ambient operating temperatures, using battery current without the engine running, and vibration will reduce battery life. Battery life is also affected by the condition of interrelated components, such as alternators, battery cables, connections, engine startability, and starter. To maximize battery life, it is important to keep electrical components, battery boxes, and the engine in top condition and to minimize or eliminate electrical loads when the engine is not running.

Battery life can be extended by keeping the batteries fully charged at all times. Periodically charging the batteries with a battery charger may be able to charge the batteries more completely than the vehicle's alternator in certain severe applications. Use a battery charger (float charger) that automatically reduces amperage or shuts off when the batteries are fully charged. Use of a Midtronics 55-Amp Power Supply / Smart (Battery) Charger, Model Number PCX550, Part Number PSC550CCKIT (or equivalent), available through your International dealer, is recommended.

Cold batteries resist charging. Battery performance can be improved by regularly or even periodically storing vehicles and charging batteries with an automatic float charger for 8 - 24 hours in a warm garage during the cold winter months.



#### CAUTION

**To prevent property damage, do not allow batteries to become heavily discharged and exposed to subfreezing weather; such conditions will cause them to freeze and become damaged.**

Your vehicle utilizes maintenance-free batteries, which will not require the periodic addition of water. Wipe the tops of the batteries clean to avoid a slow current flow through the dirt, resulting in a loss of charge. Be sure the terminals are clamped tightly and that the battery is clamped securely in the battery box.

For best results:

- Do not mix and match battery models / manufacturers in the same battery pack.
- Do not use batteries with differing CCA ratings in the same battery pack.
- Do not use batteries with more than one year difference in the installed age of batteries in the same battery pack.

### Battery Cables



#### CAUTION

To prevent property damage, when working around the terminals and battery, use extra care to prevent shorting. A good practice is to insulate pliers and screwdrivers. Do not check battery condition by shorting (flashing) across terminals.

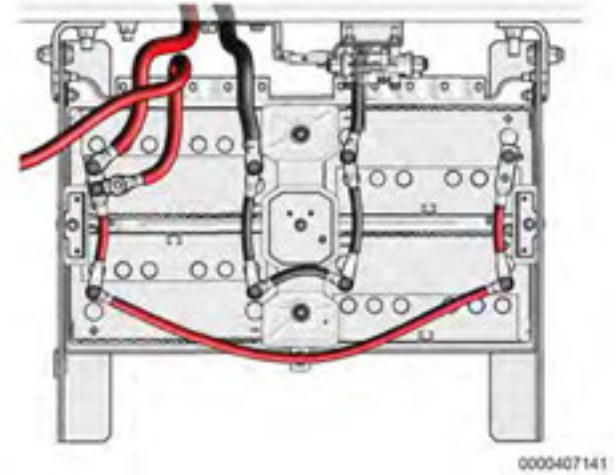
Battery cable terminals must be clean and tight. Use a mixture of hot water and common baking soda for removing terminal corrosion and for cleaning the top of the battery. Brighten the contact surfaces with steel wool, apply a light coat of lubricant sealing grease, such as Fleetrite® 2519646C1 or equivalent or a spray protectant, and reassemble. Be sure the terminals are clamped tightly.

### Auto Start / Stop System Battery Cables: LT® Vehicles Only



#### CAUTION

To prevent property damage, if equipped with the auto start / stop feature, the batteries must be hooked up exactly as shown in the illustration below.



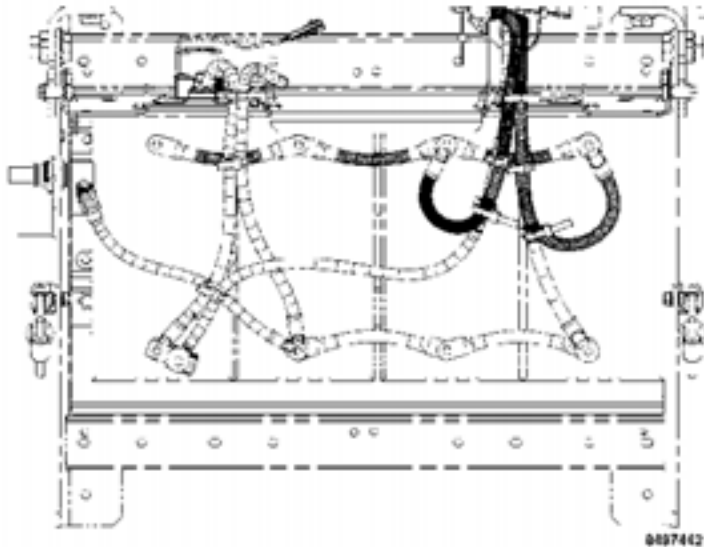
When equipped with the auto start / stop feature, the battery cables require a specific configuration for hooking up the battery.

### Auto Start / Stop System Battery Cables: International® RH™ Vehicles Only



#### CAUTION

To prevent property damage, if equipped with the auto start / stop feature, the batteries must be hooked up exactly as shown in the illustration below.



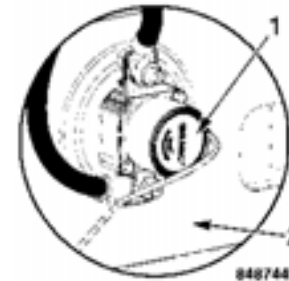
When equipped with the auto start / stop feature, the battery cables require a specific configuration for hooking up the battery.

### High Current Relay



#### CAUTION

To prevent property damage, when servicing the isolation battery, be sure that all cables are connected correctly to prevent damage to the high current relay and other electrical components.



1. High Current Relay
2. Battery Box (Back)

The main vehicle's battery box is equipped with a high current relay to isolate one battery during the auto start / stop crank operation and to stabilize power to electrical system controllers.



### **Electrical Charging and Starting System Test**

At every Preventive Maintenance (PM), fully charge the batteries using an automatic float charger. Then, have a qualified technician perform an electrical system test using an International® Electronic System Tester (Midtronics inTELLECT EXP HD Expandable Electrical Diagnostics Platform available through your local International dealer) to catch electrical system problems before they cause further damage to the batteries, to prevent a stranded vehicle. The test will check for alternator amperage output, starter current draw, and battery amperage capacity. This type of testing will detect weaknesses that may not yet be apparent during normal daily operations.

### **Terminal Inspection-Cleaning-Corrosion Protection**

Periodically inspect electrical connectors on the engine, battery, and frame for corrosion and tightness. Inspect exposed cables for fraying or signs of abrasion. Exposed terminals, such as cranking motor, alternator, and feed-through studs should be cleaned and recoated with a dielectric grease, or equivalent paste or spray protectant. The inspection / cleaning / corrosion protection should include feed-through connections, power and ground cable connections for batteries, engines, and the starter stud.

Connectors that are more subject to corrosion may be disassembled and sprayed internally with a light coating of dielectric grease. Use grease sparingly, as too much grease will not allow air to escape from the connection and this compressed air will push out the seals in the electrical connectors.

### **Accessory Feed Connections**



**To prevent personal injury and / or death, or damage to property, do not increase size of fuse or circuit breaker or change type of breaker supplied with your truck, as this could cause wiring to overheat and possibly burn. Electrical circuits are designed with a particular wire gauge to meet the fuse and circuit breaker current rating.**

Vehicle electrical systems are complex and often include electronic components, such as engine and transmission controls, instrument panels, and antilock brakes. While most systems still operate on battery voltage (12 volts), some systems can be as high as 90 volts or as low as 5 volts. Refer to the Electrical Circuit Diagram manuals, available from your International dealer, to ensure that any body lights and accessories are connected to circuits that are both appropriate and not overloaded. No modification should be made to any vehicle control system without first contacting your International dealer.

### **Fuses and Relays**

Fuses and relays are located inside the cab within the fuse panel cover. Refer to the schematic located on the fuse panel cover in the cab, the schematic on the fuse cover in the luggage compartment, or the **Fuse Panel Schematic** located in **SECTION 8 — Maintenance Intervals and Specifications** of this manual for fuse or relay replacement.

### Engine

#### General Information

**NOTE:** For complete operation and maintenance information pertaining to your engine, refer to the Engine Operation and Maintenance Manual provided with the vehicle.

For effective emission control and low operating cost, it is important that maintenance operations be performed at the specified periods or mileage intervals indicated in the **Engine Operation and Maintenance Manual**.

Service intervals are based on average operating conditions. In certain environments and locations, more frequent servicing will be required.

The required maintenance operations may be performed at a service establishment. Any replacement parts used for required maintenance services or repairs should be genuine OEM service parts. Use of inferior replacement parts hinders operation of engine and emission controls and can reduce engine life and / or jeopardize the warranty.

Receipts covering the performance of regular maintenance should be retained in the event questions arise concerning

maintenance. The receipts should be transferred to each subsequent owner of the engine (vehicle).

#### Engine Fluids and Contaminated Material



**GOVERNMENT REGULATION:** Engine fluids (oil, fuel, and coolant) may be a hazard to human health and the environment. Handle all fluids and other contaminated materials (such as filters or rags) in accordance with applicable regulations. Recycle or dispose of engine fluids, filters, and other contaminated materials according to applicable regulations.

#### Scheduled Maintenance

For information regarding routine scheduled maintenance such as replacement of oil, filters, coolant, belts, belt tensioners, and inspection and adjustment of items such as valve lash, refer to the Engine Operation and Maintenance Manual supplied with the vehicle.

### Air Induction System



#### WARNING

**To prevent personal injury and / or death, or damage to property, when performing maintenance and repairs to any turbocharged engine with engine air inlet piping disconnected, a turbocharger compressor air inlet protective shield should be installed over the turbocharger air inlet.**

Once each year perform a complete inspection of the air induction system. In areas where road salt is used, the inspection consists of disassembling the joints of each metal component and inspecting for salt buildup that can cause particles to flake off and enter the engine combustion chambers.

If evidence of corrosion is found (usually appearing at the pipe connections), use a wire brush to clean the inside of the pipes and inside of the rubber hoses.

Be certain that no excess material that can be pulled into the engine is on the inside of the pipe. If the service condition of the pipes, hoses, or clamps is questionable, replace those parts.

- Check for loose hoses and clamps.
- Check for ruptured, bulging, or collapsed hoses.
- Check air cleaner housing for cracks.

### Air Restriction Gauge

The air restriction gauge indicates how much engine air cleaner filter capacity has been used and how much filter capacity remains. It measures maximum restriction of the filter element when the engine is operated at full load and locks at that point. This feature gives the operator the capability of reading maximum restriction with the engine shut down.

The gauge is mounted on the forward side of the air cleaner housing, or as an optional pop-up message on the instrument cluster.

It is recommended that the operator not reset the gauge until it has been determined if air cleaner service is required.



## Maintenance Instructions

---

The initial restriction with a new air filter element will vary with air cleaner design and installation.

After servicing the filter element, reset the YELLOW indicator by pushing the reset button and releasing it. The YELLOW indicator will drop to near the bottom of or below the window so the air restriction gauge can be reused.

**NOTE: After starting engine, indicator may be seen in lower part of window. This is normal and should not be mistaken as a signal for element service.**

### Air Cleaner Element Service: LT® Vehicles Only

This vehicle comes with a selection of the following air cleaner options:

- Single element: Available for normal environments.
- Dual element: Available for excessively dusty environments that may require frequent service intervals.

The single element air cleaner accommodates a single air element (air filter). The dual element air cleaner accommodates two elements (air filters): a primary element and a secondary element. The secondary element is contained within the primary element. The secondary element prevents contaminants from entering the engine air intake system during service of the primary element, or when the primary element is damaged.

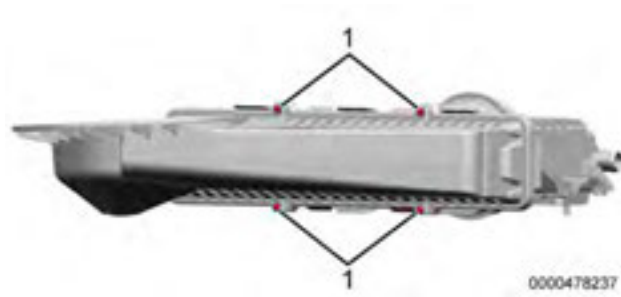
**NOTE: DO NOT CHANGE the vehicle's air cleaner element configuration. It must remain configured as installed in the factory.**

**NOTE: For dual element applications, ALWAYS use a primary element. NEVER run the engine without the primary element.**



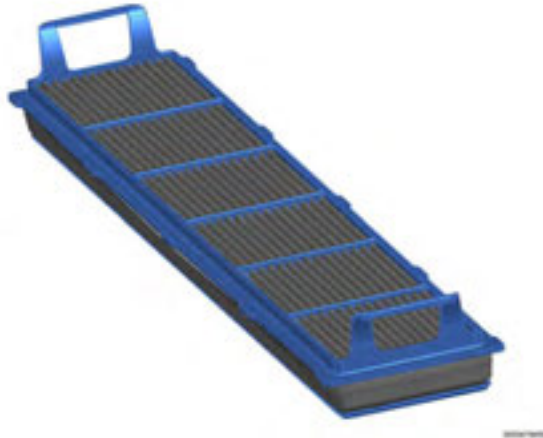
### Single Element Air Cleaner Option

1. Filter element housing
2. Filter element
3. Air cleaner cover



### Air Cleaner Cover – Side View

1. Bolt (4)



### Secondary Element – Dual Element Air Cleaner Option



#### CAUTION

To prevent damage to engine components, be careful not to bump the air filter element while it is in the housing; this can raise a cloud of dust that can enter the clean side of the piping to the turbocharger.



#### CAUTION

To prevent damage to the optional dual element air cleaner, it is strongly recommended that a P-80® water-based lubricant be applied to the seal of the air filter's **SECONDARY ELEMENT**.

1. Locate and remove four bolts from filter element housing. Set aside bolts for reuse.
2. Remove air cleaner cover from filter element housing.
3. Remove the filter element(s) carefully and slowly, then discard the old element(s).
4. Wipe the inside of the filter element housing with a clean, damp cloth. Be sure to clean the gasket sealing surface. Be sure to wipe out any dust that has fallen into the port to the turbocharger. **DO NOT** use compressed air for this cleaning.
5. Visually inspect the filter element housing for damage or distortion, which could allow unfiltered air to enter the engine.

## Maintenance Instructions

---

6. Inspect the new air filter element for a damaged or nonresilient rubber gasket. Inspect the air filter element body for dents or excessive pleat bunching. If any of the mentioned conditions exist, obtain and install a new air filter element from your International® dealer.
7. Carefully install the new air filter element into the filter element housing.
8. Using four bolts, install air cleaner cover onto filter element housing. Using torque wrench, tighten bolts to 30 lb-in (3.4 N·m).
9. When servicing is completed, reset air restriction gauge by pushing and holding the reset button and releasing it.

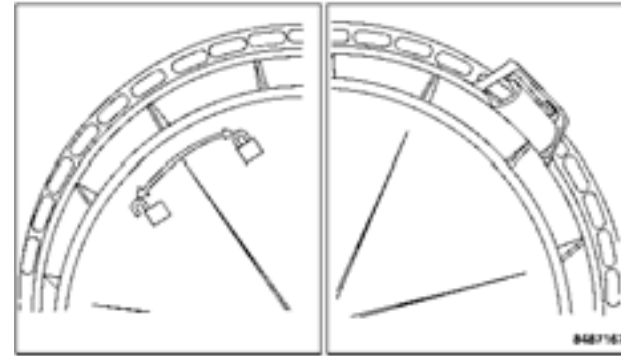
The YELLOW indicator will drop below the window. The air restriction gauge is now ready for the next operating cycle.

**NOTE: After starting engine, the indicator may be seen in the lower part of the window. This is normal and should not be mistaken as a signal for element service.**

### Air Cleaner Element Service: International® RH™ Vehicles Only

This vehicle comes with a selection of two air cleaner options. The first option is a single element. The second option is a dual element air cleaner that is available for applications in excessively dusty environments that may require more frequent service intervals. The secondary element is inside the primary element and prevents contaminants from entering the engine air intake system during service of the primary element, or in cases where the primary element becomes damaged. Both options are serviced in a similar manner.

**NOTE: Do not change the air cleaner element configuration from the factory-installed configuration. If equipped with a single element or dual element, that configuration must stay with the vehicle. Failure to comply may affect engine performance.**

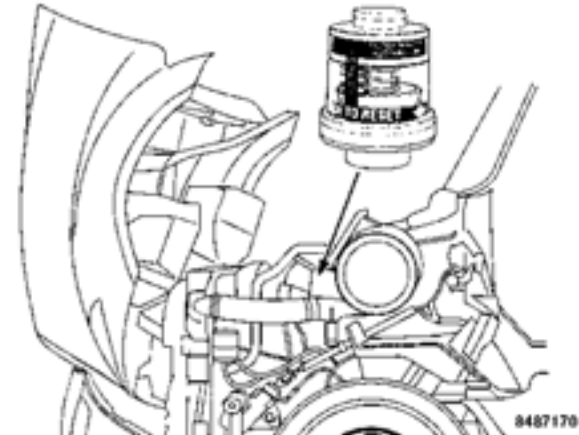


**NOTE: Be careful not to bump the air filter element while it is in the housing; this can raise a cloud of dust that can enter the clean side of the piping to the turbocharger.**

1. Lift and hold the locking tab (located at the 2 o'clock position). Rotate the cover counterclockwise (in direction of unlock symbol on cover) to release cover tabs, and pull to remove the cover. Remove the filter element(s) carefully and slowly, then discard the old element(s).

2. Wipe the inside of the air cleaner housing with a clean, damp cloth. Be sure to clean the gasket sealing surface. Be sure to wipe out any dust that has fallen into the port to the turbocharger. DO NOT use compressed air for this cleaning.
3. Visually inspect the air cleaner housing for damage or distortion, which could allow unfiltered air to enter the engine. Inspect to be sure that the rubber dust unloader valve at bottom of housing is in place, free of debris, and not cracked.
4. Inspect the new air filter element for a damaged or nonresilient rubber gasket. Inspect the air filter element body for dents or excessive pleat bunching. If any of the mentioned conditions exist, obtain and install an alternate new air filter element from your International dealer.
5. Carefully install the new air filter element into the air cleaner housing.
6. With the air cleaner cover latch at the 1 o'clock position, align cover tabs with corresponding slots. Push the cover into the slots. Rotate the cover clockwise (in direction of lock on cover) until the locking tab snaps into its locked position.

7. When servicing is completed, reset air restriction gauge by pushing and holding the reset button and releasing it. The YELLOW indicator will drop below the window. The air restriction gauge is now ready for the next operating cycle.



**NOTE:** After starting engine, the indicator may be seen in the lower part of the window. This is normal and should not be mistaken as a signal for element service.

## Maintenance Instructions

---

### Troubleshooting

#### No Restriction Reading

Possible Causes	How To Check
Plugged fitting or vacuum line	Remove the gauge and apply a vacuum until it is locked up at the RED zone. Reinsert the gauge and hold in the reset button. Indicator will fully return unless line or fitting is plugged. A slow return is normal due to safety filter in fitting.
Leak in vacuum line	Apply vacuum to gauge until locked up at red zone. Reconnect gauge and close end of line airtight. Hold in reset button. Indicator will drop slightly and then not move unless vacuum line has a leak.
Leak in gauge	Repeat above except close gauge connection airtight.
Engine airflow too low to generate a restriction reading	Turbocharged engines must be full load to pull full engine airflow.
Air cleaner element split open	Visually inspect element.

#### High Restriction Reading

Possible Causes	Explanation
Plugged outer element	Particles in outer filter media restrict airflow. Replace outer element.
Plugged inner element (if equipped)	Replace inner element.
Plugged inlet screens or ducts	Check system upstream from restriction; tap for debris, damage, or improper installation.
Heavy snow or rain	Temporary high restriction can occur during a rain or snow storm; it disappears after drying out. If gauge is locked up at red zone, check elements for damage. Reset gauge. Reuse element and recheck gauge reading.



### Charge Air Cooler and Radiator Core Inspection and Cleaning

#### *Inspection and Cleaning*

With the engine off, visually inspect the charge air cooler core and radiator core assembly for debris and clogging of external fins. Prior to engine operation, remove any debris blocking the core.

The cores may be cleaned by externally backflushing them with compressed air and / or water. Use high-pressure air or water Thexton radiator cleaning wand with 90-degree tip, P/N 4106-NAV, available from your International dealer, for best results.

**NOTE: A visual inspection of the area between the condenser and radiator should also be done at this time. Remove debris as necessary.**

### Cooling System

#### *Coolant Level Check*

For vehicles with International® A26 engines, the cooling system is filled at the factory with Fleetrite® Extended Life NOAT (RED) Coolant.

For vehicles with Cummins® X15 engines, the cooling system is filled at the factory with Fleetrite® Extended Life NOAT (RED) Coolant

Navistar recommends using only approved coolant with the LT® and RH™ Series cooling packages, and it will not warrant cooling systems that have not utilized the recommended coolant.

The label on the deaeration tank provides additional coolant / antifreeze information.



**To prevent personal injury and / or death, or damage to property, use the following procedure to remove the pressure cap from the radiator or expansion tank and prevent contact with hot coolant or steam. Allow the engine to cool first. Wrap a thick, heavy cloth around the cap. Unscrew the cap slowly to allow pressure to release from under the cap. After the pressure has been released, the pressure cap may be removed.**



**To prevent personal injury and / or death, or damage to property, do not exceed the pressure rating on the deaeration tank cap. Ensure that the pressure rating of the deaeration tank cap matches that listed on the side of the tank, or the tank may burst.**



### CAUTION

To prevent property damage, if the coolant should get extremely low and the engine very hot, let the engine cool for approximately 15 minutes before adding coolant; then, with the engine running, add coolant slowly. Adding cold coolant to a hot engine may crack the cylinder head or crankcase. Never use water alone.

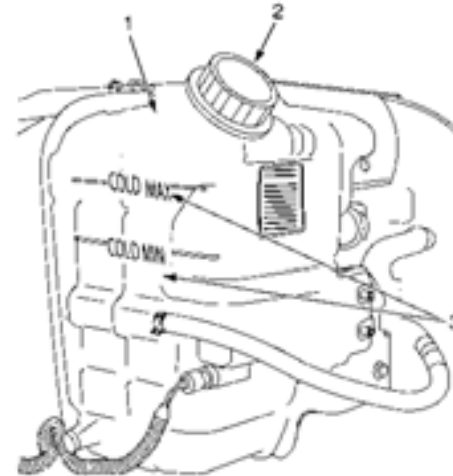
#### *Top-Off Coolant Fill Method*

This is a traditional gravity-fill-only method that involves pouring or pumping the coolant into the deaeration tank of the cooling system and using a combination of gravity and engine operation to purge the system of air. This method includes the disadvantage of a requirement to temporarily disconnect the EGR wiring harness to protect the EGR from heat damage prior to being completely deaerated (freed of trapped air). This process may generate a fault code that might require further investigation by an authorized International dealer.

Ensure that coolant level is maintained between the COLD MIN and COLD MAX lines on the deaeration tank when engine is cold.

#### *Top-Off Instructions for International® A26 Engines*

For vehicles with International® A26 engines, see the following instructions on topping off the cooling system.



8407430

#### **Typical International® A26 Cooling System Deaeration Tank**

1. Deaeration tank
2. Vented fill cap
3. COLD MIN and COLD MAX lines

**NOTE: Vented fill cap may differ slightly in location on tank between engine sizes.**

If the cooling system is low and needs to be topped off, ensure that the correct coolant and coolant mixture are used. The cooling system should be filled with a premixed coolant or a 50/50 mixture of coolant concentrate and water.



### CAUTION

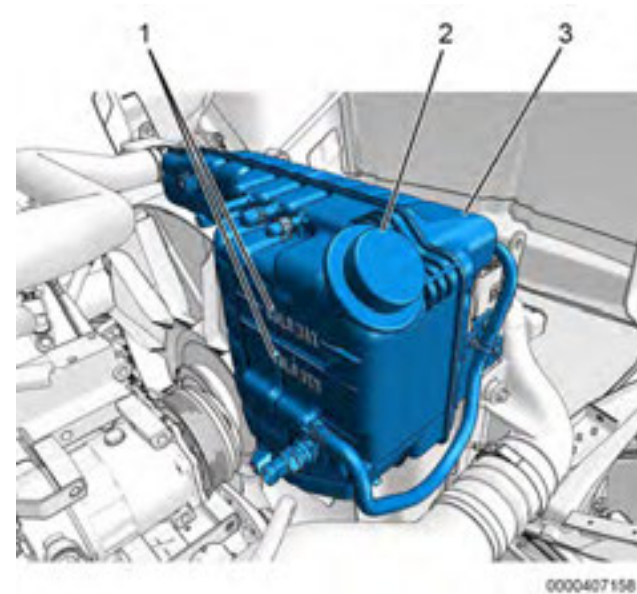
To prevent component damage, because hot coolant expands, do not overfill the cooling system when topping off the deaeration tank. Only fill to the MAX fill line.

For the top-off procedure please perform the following instructions:

1. Allow engine to cool.
2. Locate the deaeration tank.
3. Remove vented fill cap.
4. Using the correct mixture, carefully pour coolant into the deaeration tank until coolant reaches the COLD MAX line. **Do not exceed the MAX line.**
5. Install the vented fill cap.

*Top-Off Instructions for Cummins® X15 Engines*

**For vehicles with Cummins® X15 engines, see the following instructions on topping off the cooling system.**



**Typical X15 Deaeration Tank**

1. COLD MIN and COLD MAX lines
2. Vented fill cap
3. Deaeration tank

## Maintenance Instructions

---

If the cooling system is low and needs to be topped off, ensure that the correct coolant and coolant mixture are used. The cooling system should be filled with a premixed coolant or a 50/50 mixture of coolant concentrate and water.



### CAUTION

**To prevent component damage, because hot coolant expands, do not overfill the cooling system when topping off the deaeration tank. Only fill to the MAX fill line.**

For the top-off procedure please perform the following instructions:

1. Allow engine to cool.
2. Locate the deaeration tank.
3. Remove vented fill cap.
4. Using the correct mixture, carefully pour coolant into the deaeration tank until coolant reaches the COLD MAX line.  
**Do not exceed the MAX line.**
5. Install the vented fill cap.

#### *Coolant and Optional Coolant Filter*

For vehicles equipped with International® A26 engines, the cooling system is filled at the factory with Fleetrite® NOAT ELC (RED).

For vehicles equipped with Cummins® X15 engine, the cooling system is filled at the factory with Fleetrite® NOAT ELC (RED).

Navistar, Inc. recommends using only the approved coolant with the cooling packages and will not warrant these cooling systems that have not utilized the recommended coolant.

The label on the deaeration tank provides additional coolant / antifreeze information. Consult the Engine Operation and Maintenance Manual for coolant service life details.

Some engines are ordered with an optional coolant filter that should be replaced periodically.

ELC equipped vehicles use only water filters **without** Supplemental Coolant Additives (SCAs) as SCAs are not necessary with extended life coolant. Navistar recommends ELC due to its ease of maintenance and lower long-term cost of operation.

#### *Coolant Concentration Freeze Point*

Cooling systems should be checked twice a year to ensure proper coolant water concentrations. A 50/50 mixture can be easily created in the shop using undiluted coolant and water, and it will provide freeze protection down to -34°F (-36.7°C) if no further dilution is experienced during installation.

Concentrations greater than 67% are not recommended. The use of premixed coolant to make up for coolant loss will ensure the glycol / water concentrations stay in balance.



### CAUTION

To prevent property damage, always use the specified coolant to top-off the cooling systems. Failure to do so may result in the loss of extended life properties. Should top-off occur with conventional coolant(s) exceeding 10% of the total cooling system capacity, drain and refill with the proper coolant. Failure to heed this caution may result in vehicle and / or engine component damage.

#### *Antifreeze*

For cooling system capacities, coolant part numbers, and other information, refer to the Engine Operation and Maintenance Manual.

#### *Fan Clutch*

Inspect for proper operation, secure electrical connections, and air supply as appropriate. See the Service Manual for details.

Start cold engine and view fan to see that it is rotating more slowly than the fan pulley (fan clutch is disengaged). Achieve operating temperature and observe that the fan is engaged.

### Fuel System



**GOVERNMENT REGULATION:** Diesel fuel sold for use in 2007 and later highway vehicles must be limited to a sulfur content of 15 parts per million (ppm).

Frequently inspect condition of fuel tanks and mounting hardware, fuel tank cap and vent, fuel lines, clips and routing. At every Preventive Maintenance (PM) (or daily if necessary) drain water and sediment from the fuel / water separator filter (if equipped). If the vehicle is equipped with an optional Davco® fuel / water separator, inspect the level of the fuel in the see-through globe and replace the fuel / water separator filter element if the fuel level has reached the top of the globe. In all cases, be sure to use the proper fuel / water separator filter element with the correct part number and filter efficiency rating.

#### *Fuel Tank Draining and Cleaning*

Periodically (annually is recommended) drain water and sediment from the fuel tank via the drain plug on the bottom of the fuel tank. Drain and flush sediment from fuel tank at least every 12 months or more frequently if fuel quality or type of fuel dictates.

Since Ultra-Low Sulfur Diesel (ULSD) fuel tends to absorb more water and engines are operating at higher temperatures, microbe growth in the fuel tanks has become more prevalent. Microbe growth results in more contaminants in the fuel and reduces fuel filter life. Since fuel tank draining does not remove all microbes, fuel tank draining alone will not eliminate the problem. For vehicle operators experiencing microbe growth in their fuel, the following is recommended:

1. Drain and clean the fuel tank(s) every 12 months or more often. Clean the tanks with a professional fuel tank cleaning system (available through your dealer), or have your local dealer perform the service for you.
2. Treat your vehicle fuel tanks and bulk tanks regularly with a biocide from a reputable vendor.
3. Purchase fuel only from vendors that pretreat their fuel with biocides.
4. Periodically test the fuel supplied by your fuel vendor for the presence of microbes.

### Crankcase Ventilation Filter

Refer to the **Engine Operation and Maintenance Manual** for the proper replacement interval and instructions.

### Frame

International® chassis are manufactured with frame rails of HSLA steel, and each must be handled in a specific manner to ensure maximum service life. Before attempting frame repair or modification, consult the Service Manual or your International Truck dealer.

### Noise Emissions – Exterior

#### Instructions for Proper Maintenance

In order to comply with federal exterior noise regulations, your vehicle may be equipped with noise emission items that must be properly maintained, used, and repaired. Depending upon the vehicle configuration, it may incorporate all or some of the following:

#### Air Intake System

- **Air Cleaner** – Should be inspected and its location should not be altered. Do not alter inlet and outlet piping.

#### Body

- **Wheel Well** – Splash shields, cab shields, and underhood insulation should be inspected for deterioration, dislocation, and orientation and repaired or replaced as necessary.

### Cooling System

- Check fan for damage to blades. Replace, if damaged, with manufacturer's recommended parts. Inspect for fan-to-shroud interference and any damage to shroud, such as cracks and holes.
- Fan speed ratio should not be changed and fan spacer dimensions and position should not be altered.
- Inspect for proper operation of fan clutch, making sure that the fan is disengaged when cooling of engine is not required.

### Engine Noise Shields / Blankets

- Engine valve covers, oil pans, and block covers are made to damp out engine mechanical noise and, if needed, should be replaced with original equipment parts.

### Exhaust System

- Inspect for leaks at various joint connections and tighten clamps. Make visual inspection for cracks or holes in muffler and tailpipe. Always replace with manufacturer's recommended parts. Tailpipe elbow or offset tailpipe orientation must not be changed from standard position as originally received.
- To prevent abnormal changes in vehicle sound level, it is necessary for the owner to perform inspections and necessary maintenance at the intervals shown in the maintenance schedules, and record them on the maintenance record (page 254) form provided.

## Maintenance Instructions

## Maintenance Record – Noise Control

[illegible]



### DEF Tank Filling



#### CAUTION

To prevent property damage, proper care should be taken when handling, dispensing, or transporting DEF, as it is corrosive to some metals and materials.



#### CAUTION

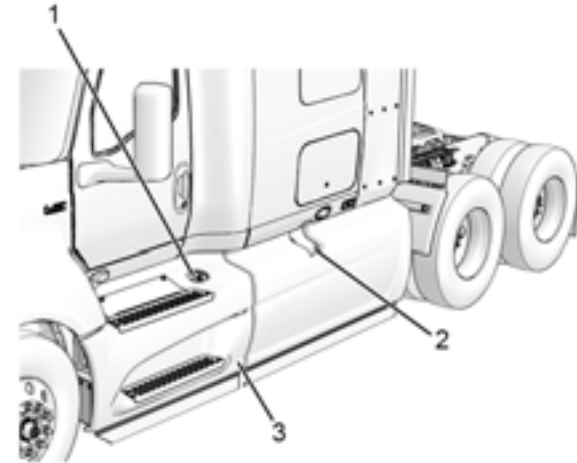
To prevent property damage, **ALWAYS** verify the appropriate fluid is used when filling the DEF tank or the fuel tank, significant damage can occur if incorrect fluid is used.



#### CAUTION

To prevent property damage, **DO NOT OVERFILL** or top off the DEF tank. If the DEF tank is overfilled and freezes, it could crack and leak.

The DEF filler cap on this vehicle is BLUE in order to differentiate it from the fuel filler cap. Use only ISO 22241-1 approved DEF to ensure proper purity and concentration.



0000407150

1. DEF filler cap
2. Fuel filler cap
3. Driver-side skirt

### Diesel Particulate Filter (DPF)

#### Regeneration

Collected soot particles in the Diesel Particulate Filter (DPF) are automatically burned off through normal regeneration (initiated by normal exhaust heat during the normal operation of the vehicle). If conditions for normal regeneration cannot be achieved, it may be necessary to perform a parked regeneration as indicated by the electronic gauge cluster warning indicators. See the Parked Regeneration Procedure in **SECTION 6 — Operation**.

### Cleaning

If on-vehicle regeneration is unsuccessful at removing soot from the DPF, run a second regeneration. If both regeneration attempts are unsuccessful, the DPF may need to be removed from the vehicle and be cleaned with the appropriate machinery and processes.

Ash residue in the DPF comes primarily from fuel and oil additives and will not burn or pass through the DPF. Ash residue accumulates very slowly in the DPF but must eventually be removed to prevent excessive exhaust backpressure. If the DPF needs to have nonregenerable soot or the ash residue removed, please take the vehicle to an International dealer.

### Drive Shafts

At the regular lubrication interval, check universal joints, slip joints, slip joint boot, and carrier bearings for any evidence of wear or looseness. Should drive shaft vibrations occur, stop the vehicle immediately to avoid possible hazardous consequences or damage to other components.

### Suspension (Air and Steel Springs)



#### CAUTION

**To prevent property damage, do not adjust air suspension height to any setting other than the specified setting. Altering the height setting will change the driveline angle and may result in component damage, such as transmission component damage.**

Verify drive axle air suspension height at engine oil change intervals. See the appropriate Service Manual.

**NOTE: Suspension alignment must be maintained at all times.**

**NOTE: Refer to SECTION 8 — Maintenance Intervals and Specifications for proper U-bolt torque values.**

Periodically:

- Check condition of spring leaves for evidence of fatigue, bending, or breakage.
- Check condition of suspension mounting brackets and bushings.
- Check that suspension mounts (such as brackets, bushings, and fasteners) are tight.
- Check that torque rod mounting fasteners are tight.
- Check U-bolts as follows:
  1. After the chassis has been operating under load for 1,000 miles (1,600 km) or six months, whichever comes first, the U-bolt nuts must be retorqued.
  2. Thereafter, the U-bolt nuts must be retorqued every 50,000 miles (80,000 km).

### Front Suspension

The front suspension should be regularly inspected for loose, worn, or broken components. Front suspensions / axles should be checked periodically for proper alignment to promote maximum tire life.

On vehicles equipped with the optional front air suspension, the air suspension components, including air bags, height control valves, air lines, and fittings should be inspected for wear, damage, and audible air leaks.

### Rear Suspension

The rear suspension should be regularly inspected for loose, worn, or broken components. Rear suspensions / axles should be checked periodically for proper alignment to promote maximum tire life. The optional International® Truck Ride Optimized Suspension (IROS) components, including air bags, height control valves, air lines, and fittings should be inspected for wear, damage, and audible air leaks.

### Steering

#### General Information



**To prevent personal injury and / or death, or damage to property, always follow recommended procedures for steering system maintenance. Maintain the steering system in proper condition; otherwise, reduced steering ability could result.**

- Have a technician examine the steering mechanism. Minor adjustments could head off further problems.
- Check tie rod ends, drag link ends, and kingpins. Joints and fasteners must be tight. Articulating joints must be well lubricated.
- Check for installation and spread of cotter pins and tightness of nuts at both ends of tie rod and drag link.
- Maintain proper power steering fluid levels.
- Check that pitman arm (steering arm at steering gear) mounting is tight and locked. Check system for leaks or hose chafing.
- Regularly inspect steering column joint bolts and steering linkage, particularly for body-to-chassis clearance.

**NOTE: Have any steering problems corrected at once by a qualified service technician.**

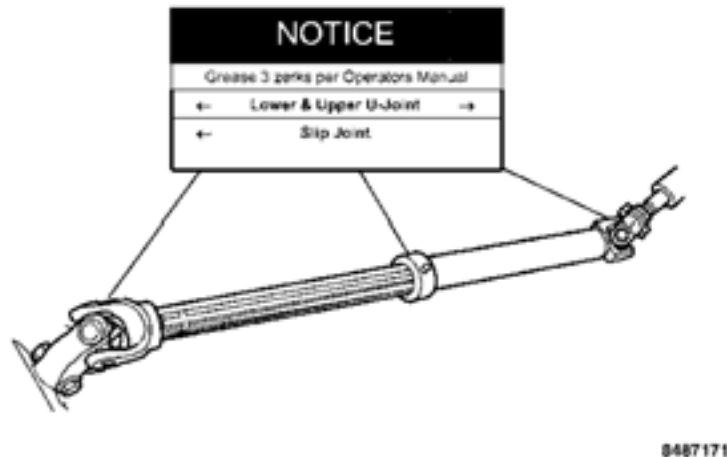
## Maintenance Instructions

---

### Tightening Steering Intermediate Shaft Joint Bolts

As a good maintenance practice, it is recommended that steering intermediate shaft joint bolts be checked for tightness every 120,000 miles (193,000 km) or annually, whichever occurs first.

### Lubrication Points



The steering shaft is lubricated at the three points shown in the illustration above. For the correct maintenance interval, refer to **SECTION 8 — Maintenance Intervals and Specifications**.

### Power Steering

Whenever the power steering system has been drained and refilled for any reason, air must be bled from the system before returning the vehicle to service. Failure to properly bleed the hydraulic system can result in degradation of power system performance.

Consult your International Truck dealer who is aware of the proper procedures for filling and bleeding the system.

The power steering fluid filter is located inside the power steering reservoir. To remove the filter, unscrew the large cap on the power steering reservoir and unscrew the filter. Reverse the procedure to install the new filter.

With time, the large square-cut reservoir cap O-ring seal may shrink slightly. To assist in reinstallation of the cap, the O-ring may need to be stretched. To stretch the O-ring, pull on it while pinching it between your thumb and finger. It must be large enough to stay completely in the shallow groove in the top edge of the reservoir prior to cap installation. Replace cracked or damaged O-rings.

Refer to **SECTION 8 — Maintenance Intervals and Specifications** for the fluid and filter replacement intervals.

## **Tires**

### **Tire Warnings**



#### **WARNING**

To prevent personal injury and / or death, or damage to property, Navistar recommends that you never replace vehicles tires with lower read speed rating. However, in the event you should change / replace vehicle tires with those of a lower road speed rating, it will be necessary for you to take your vehicle to the dealer to have the road speed engine parameter changed to match the new tire rating.



#### **WARNING**

To prevent personal injury and / or death, or damage to property, do not mount tube-type tires on tubeless wheels or tubeless tires on tube-type wheels.



#### **WARNING**

To prevent personal injury and / or death, or damage to property, for field maintenance, only inflate and load tires to the maximum of the least-rated tire on the axle. Due to tire manufacturers re-marking tires to conform to the SI (metric) system, tires marked with old and new loads or inflation pressures could be placed on the same vehicle.



#### **WARNING**

To prevent personal injury and / or death, or damage to property, always maintain your tires in good condition. Frequently check and maintain correct inflation pressures as specified by tire manufacturers. Inspect periodically for abnormal wear patterns and repair / replace cut or broken tire casing. Always use experienced, trained personnel with proper equipment and correct procedures to mount or remove tires and wheels.



### **WARNING**

To prevent personal injury and / or death, or damage to property, always follow these instructions when mounting tires on wheels:

- Only personnel who have had proper training and experience should mount or remove tires from rims or wheels.
- Use only heavy-duty rims or approved rims for radial tires. It may be necessary to contact your wheel and rim distributor to determine if your rims are approved for radial tires.
- If a tube is to be used, make sure special radial tire tubes are used because of the increased flexing of the sidewalls on radial tires.
- Never use antifreeze, silicones, or petroleum-based lubricants when mounting radial tires. Only an approved lubricant should be used as an aid for mounting tires.
- Always inflate tires in a safety cage.



### **WARNING**

To prevent personal injury and / or death, or damage to property:

- Do not mix stud-piloted wheels or fasteners with hub-piloted wheels or fasteners. Mixing wheel types may cause premature wheel failure.
- Do not change from steel wheels or a steel inner and aluminum outer wheel combination to aluminum wheels without changing the mounting hardware since the thicker aluminum wheels require longer studs. In some cases with flange nut mounting systems, changing the hub and stud assembly may be required. Improperly mixing components could cause wheel or fastener failures.
- Do not mix foreign (not made in North America) wheel mounting parts with domestic (made in North America) parts. Many foreign wheel components look similar to, but are not exactly the same as, domestic made components. Mixing components can cause wheel or fastener failures.

### Tire Maintenance

**NOTE:** Maximum tire pressure specifications are located on the vehicle Gross Axle Weight Rating (GAWR) label located on the vehicle B-pillar.

**NOTE:** For vehicles equipped with a Tire Pressure Monitoring System (TPMS), target tire pressure specifications are located on a sticker on the vehicle B-pillar. If other target inflation values are desired, see your International® dealer for more information.

Preserving proper inflation pressure is a very important maintenance practice to ensure safe vehicle operation and long life for the tires.

Failure to maintain correct inflation pressure may result in sudden tire destruction, improper vehicle handling, and may cause rapid and irregular tire wear. Therefore, inflation pressures should be checked daily and always before long-distance trips.

Follow the tire manufacturer's recommended cold inflation pressure for the tire size, type, load range (ply rating), and axle loading typical for your operation. (Each steer axle tire load will equal 1/2 steer axle loading; each drive tire load will be 1/4 the axle loading, if fitted with four tires.)

### *Tire Pressure Monitoring System (TPMS)*



#### **CAUTION**

To prevent property damage, follow specific instructions to avoid breaking tire sensors when mounting and dismounting a tire. If tire work is done by a non-authorized facility, please let them know that a tire pressure monitoring system is installed on the vehicle before they remove a tire from a wheel.

The optional Tire Pressure Monitoring System (TPMS) warns the driver of:

- Low tire pressure
- Extremely low tire pressure
- High tire pressure
- High tire temperature

Air pressure sensors are installed on the inner rim of each wheel. Messages related to the TPMS will be relayed through the cluster display.

## Maintenance Instructions

---

### *Checking Inflation*

Always check inflation pressure when tires are cold. Never bleed air from hot tires to relieve normal pressure buildup. Normal increases in pressure during operation will be 10 - 15 psi (69 - 103 kPa), which is allowable in truck tires. Tires on the same axle should have the same air pressure as the corresponding other tire(s) on that axle. Steer tires should be within a 3 psi (21 kPa) pressure range of each other. All drive tires should be within a 5 psi (34 kPa) pressure range of each other.

### *Underinflation*

Tires should not be allowed to become underinflated. Increased flexing due to underinflation causes heat buildup within the tire components. This leads to reduced strength, breakdown of the rubber compounds, and possible separation of the tire components (such as ply and tread separation and reduced retreadability).

Underinflation is also the primary cause of blowouts. In addition, low inflation causes an increase in rolling resistance. This results in reduced fuel mileage, a loss in tread life, and uneven wear due to increased tread movement. To determine proper inflation, refer to the tire inflation range stated on the tire sidewall and the tire manufacturer's tire load-pressure charts.

### **Inspection**

Check condition of tires for abnormal wear patterns and proper inflation pressures. Cut or broken tire casings must be repaired or replaced.

Tires should be inspected for the following conditions. If any are present, the tire should be removed and repaired, retreaded, or scrapped as the condition indicates.

- Any blister, bump, or raised portion anywhere on the surface of the tire tread or sidewall (other than a bump made by a repair). These indicate the start of internal separation.
- Any cut that reaches to the belt or ply cords or any cut that is large enough to grow in size and depth.
- Any nail or puncturing object.
- If any stone or object is held by a tread groove and is starting to drill into the tread base, remove the object.

Proper tire inflation, toe-in adjustment, loads, and road speeds are important factors governing tire life, steering ease, maneuverability, fuel economy, and ride quality.

**NOTE: Your vehicle is equipped with a factory preset limiting the vehicle's road speed not to exceed that of the tire ratings as installed by the factory. In the event you should change / replace vehicle tires with those of a lower road speed rating, it will be necessary for you to take your vehicle to the dealer to have the read speed engine parameter changed to match the new tire rating.**



### Loads



#### WARNING

To prevent personal injury and / or death, or damage to property, do not load tires beyond their rated capacity as this decreases tire life, requiring more frequent replacement of tires. Overloading creates an unsafe condition that may result in sudden air loss from a tire failure resulting in an accident.

**NOTE:** The load rating of the tires installed on your vehicle at the time of your vehicle's production is at or in excess of the Gross Axle Weight Rating (GAWR) generally found on a label on the B-pillar of your vehicle. When replacing tires, be sure that the replacement tire load rating (listed separately in pounds and kilograms on the tire sidewall for single or dual applications) multiplied by the number of tires on that axle is equal to or higher than the specific listed Steer Axle or Drive Axle GAWR. Failure to do so will adversely affect maximum load-carrying capacity. Tires with the same size specification do not always have the same load specification.

### Dual Tires Matching

Dual tires should be matched using tires of equivalent size. Tires that differ more than 1/4 inch (6 mm) in diameter or 3/4 inch (19 mm) in circumference should not be mounted on the same dual wheel assembly.

### Dual Tires Mixing

**NOTE:** Never mix bias and radial tires on this vehicle.

It is recommended for best overall performance that only radial tires be used on this vehicle.

Never mix different tire sizes or constructions on the same axle.

### Rotation

- Steer tires that have developed some type of irregular wear pattern can be rotated to drive axles if rib tires are being used on all wheel positions. Applying steer tires to a drive position will often wear off the irregularities and they can be moved back to the steer axles or run out to retread stage on the rear axle.
- Another rotation possibility for fleets with rib tires in all wheel positions is to break in the new steer tires in the drive axle positions, then move them to steer axles. This will wear away tread rubber relatively quickly in the early life of a tire when it is most likely to develop an unusual wear pattern.
- Drive axle tires may be placed on the other end of the same axle so that direction of rotation is reversed. This is often helpful if a heel and toe or alternate wheel nut wear pattern has developed.

### *Rotation Is Advisable*

1. If front (steering) axle tires become irregularly worn, move to rear position.

## Maintenance Instructions

---

2. In a dual assembly, reverse the position of the tires if one tire wears much faster than its mate.
3. On the drive axle, if heel and toe wear or alternate wheel nut wear occurs, rotating the tires from one end of the axle to the other end of the axle may help even out this wear.

### *Tire Replacement*

**NOTE: Retread tires are not recommended for use on steering axles of trucks.**

- **Front (Steering) Axle** - Tires must be removed when tread is worn to 4/32 in (3 mm) or less. Retread or rotate worn tires to drive position.
- **Rear Axles** - Tires must be removed when tread is worn to 2/32 in (2 mm).

If rib tire is used on front axle and lug- or off-road-type on rear axle positions:

- **Front (Steering) Axle** - Replace tires at front wheels when tread is worn to 4/32 in (3 mm) or less.
- **Rear Axles** - Tires must be removed when the tread is worn to 2/32 in (2 mm) or less. Tires identified with the word regroovable molded on the sidewall can be regrooved. A minimum of 3/32 in (2.38 mm) of undertread must be left at the bottom of the grooves.

### **Wheel and Tire Balancing**

Out-of-round or out-of-balance wheels or tires can cause vehicle vibration and bounce, and shimmy. Replace damaged or

out-of-round wheels. Out-of-round tires and wheel assemblies can be corrected by rechecking the tire relative to the wheel. The tire and wheel assembly should thereafter be dynamically balanced and reinspected while spinning for an out-of-round condition.

### **Wear**

Radial tires can exhibit three types of normal wear patterns – even, erosion, or chamfer.

**Even Wear** is a sign that the tire is being properly used and maintained.

**Erosion Wear** has also been called rolling wear, channel, or river wear. Erosion wear is found more often at free rolling tires. This is an indication that the tire is being used in a slow wearing operation. What happens is that the belt plies are held very rigid and the tread is not allowed to distort as it passes through the contact area. Wear will only occur at the edge of the tread. No corrective action is required. If erosion gets to be 1/16 inch (2 mm) or more, the tire may be rotated to a drive axle.

**Chamfer or Shoulder Wear**, with tires inflated properly, is a normal tendency of most radial tire designs. If both inside and outside shoulders are wearing evenly around the tire, no further action is required. Overinflation is not effective in correcting this effect.

### *Irregular Wear*

If irregular wear is present, check the tire pressure, wheel balance, shock and suspension component condition, wheel bearing end play and axle alignment.

This condition not only shortens tire life but will adversely affect the handling of your vehicle.

Rotating tires from one wheel position to another is a way often used to even out many types of irregular wear or to avoid it altogether. See **Tires – Rotation** for more information.

### **Irregular wear can be minimized by:**

- Using the right inflation pressure for the load being carried.
- Maintaining proper front wheel alignment – **especially toe-in** – to specifications.
- Maintaining proper tire and wheel balance.
- Maintaining shock absorbers and suspension components.
- Maintaining proper wheel bearing adjustment.
- Maintaining proper tire type for vehicle operation.

### **Use of Tire Chains**

Refer to chain manufacturer's recommendation for correct tire chain usage, installation, and removal.

## **Wheels**

### **Wheel and Wheel Nut Maintenance and Installation**



#### **WARNING**

To prevent personal injury and / or death, or damage to property, always follow these instructions when mounting tires on wheels:

- Only personnel who have had proper training and experience should mount or remove tires from rims or wheels.
- Use only heavy-duty rims or approved rims for radial tires. It may be necessary to contact your wheel and rim distributor to determine if your rims are approved for radial tires.
- If a tube is to be used, make sure special radial tire tubes are used because of the increased flexing of the sidewalls on radial tires.
- Never use antifreeze, silicones, or petroleum based lubricants when mounting radial tires. Only an approved lubricant should be used as an aid for mounting tires.
- Always inflate tires in a safety cage.



### WARNING

To prevent personal injury and / or death, or damage to property:

- Do not mix stud piloted wheels or fasteners with hub piloted wheels or fasteners. Mixing wheel types may cause premature wheel failure.
- Do not mix foreign (not made in North America) wheel mounting parts with domestic (made in North America) parts. Many foreign wheel components look similar to, but are not exactly the same as domestic made components. Mixing components can cause wheel or fastener failures and result in property damage, personal injury, or death.
- Do not change from aluminum wheels to steel wheels, or vice versa, without changing the mounting hardware. In some cases with flange nut mounting systems, changing the hub and stud assembly may be required. Mixing components could cause wheel or fastener failures.



### WARNING

To prevent personal injury and / or death, or damage to property, when installing the tire and rim assembly on disc brake-equipped axles, make sure the tire valve stem clears the brake caliper. The use of either an International® truck valve stem retainer or a tire manufacturer's stem forming tool is the only acceptable method of obtaining clearance when necessary. Failure to obtain proper clearance may result in rapid tire deflation.

#### *Wheel Nut Torque Maintenance*

Tighten and maintain wheel and rim mounting nuts to the proper torque. Loose nuts or overtightened nuts can lead to premature wear and possible failure of the wheel, rim, and / or mounting hardware.

#### *Hub-Piloted Wheel Installation Procedures*



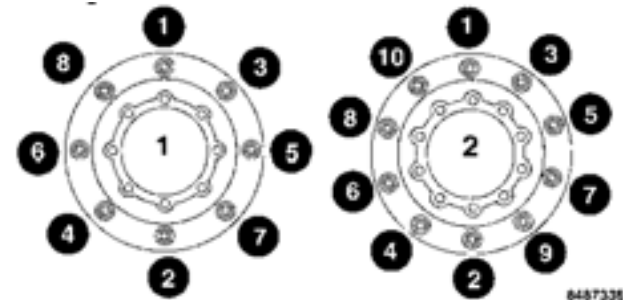
### WARNING

To prevent personal injury and / or death, or damage to property, use only the same type and style wheels and mounting hardware to replace original parts. Failure to do so may result in an assembly that looks fine but does not fit together properly. This could cause wheel or fastener failures.

Out-of-round tires and wheel assemblies can sometimes be corrected by relocking the tire relative to the wheel.

Tightening procedure for disc wheels with flange nuts (hub-piloted):

1. Clean the mating surfaces of the hub, drum, and wheel(s) as well as the wheel studs and wheel nuts with a wire brush prior to assembly.
2. Lubricate the two-piece wheel nuts by putting two drops of oil in the slot between the nut and washer, and spin the washer to spread the oil around the nut-to-washer contact surface.
3. Carefully lubricate the wheel stud threads by wiping them with a freshly oiled cloth. Do not get the oil on any other surfaces or the wheel clamping effectiveness will be reduced.
4. To prevent aluminum wheels from getting stuck on the hub due to corrosion, apply a thin coat of antiseize compound or disc brake corrosion control grease to the hub pilot pads only.
5. Slide the inner wheel (if duals) or steer wheel over the wheel studs and onto the pilot pads of the hub. Care must be taken to avoid damage to the stud threads while positioning the wheel. Ensure that the wheel is resting on the pilot pads and is against the brake drum.
6. Hand-start all wheel nuts to avoid cross threading.
7. Starting with the nut at the 12 o'clock position and using the appropriate star or crisscross pattern (see wheel nuts torque sequence diagram), run the wheel nuts down the wheel studs with an impact wrench until they are snug against the wheel. The purpose of this step is to snug the wheel(s) in the correct position, not to apply the final torque. The tightening of each nut should be stopped immediately when the wheel is contacted, resulting in a wheel nut torque well below the final specified torque.
8. Use a calibrated torque wrench to apply the specified torque to each wheel nut in the sequence specified in the wheel nuts torque sequence diagram above. Refer to **SECTION 8 — Maintenance Intervals and Specifications** for proper torque values.



1. Flange nut mount – 8 stud
2. Flange nut mount – 10 stud

9. All wheels undergo a process called joint settling when placed in service after a wheel installation has been performed. This process results in a reduction in the torque on the wheel nuts. To correct this condition, operate the vehicle normally for approximately 50 miles (80 km), then use a calibrated torque wrench to retorque the wheel nuts to specification using the appropriate pattern shown in the wheel nuts torque sequence diagram.
10. As part of a daily pretrip inspection, look for loose or missing wheel nuts. Also look for rust streaks extending outward from the wheel nuts; this can be an indicator that one or more wheel nuts are loose, even if they cannot be turned by hand. Normal periodic maintenance should also include checking the wheel nut torque with a torque wrench.

### Transmission

**NOTE: Refer to the Original Equipment Transmission Manufacturer for specific service instructions and recommendations, required capacities, and transmission fluids.**

Check lubricant level. With the vehicle on level ground, verify that transmission lubricant level is even with the bottom of the inspection plug in the side of the transmission. Check shifter for proper operation.

- Check operation of transmission Neutral safety switch. Try to start the vehicle in all shift selector positions other than Neutral. The starter should operate **ONLY** when the shift selector is in Neutral.
- Refer to **SECTION 8 — Maintenance Intervals and Specifications** for information on transmission fluids and fluid and filter change intervals.

## SECTION 8 — MAINTENANCE INTERVALS AND SPECIFICATIONS

### Lubrication and Maintenance Intervals

All new vehicles are factory lubricated. Once the vehicle is in operation, regular lubrication and maintenance intervals (based on the type of service and road conditions) must be established and performed. Load weight, vehicle speed, road conditions, and weather conditions all contribute to lubrication frequency. Performing thorough lubrication and maintenance at the specified intervals will ensure an outstanding vehicle life and will reduce overall operating expense.

The LUBRICATION AND MAINTENANCE INTERVAL CHART contains an extensive list of components and systems. Listed items and systems must be regularly inspected, serviced, and / or replaced to maximize vehicle availability and minimize unexpected failures. Recommended synchronized intervals are shown for each item. This chart can serve as a convenient one-stop reference to research most maintenance needs.

Only lubricants of superior quality, such as Fleetrite® lubricants, should be used. The use of inferior products will reduce the service life of the vehicle or result in failure of its components. Navistar, Inc. recommends the use of Fleetrite® lubricants for optimum performance.

### Maintenance Intervals

Maintenance intervals provided in this manual are for normal highway and environmental service conditions.

These intervals may be expressed in miles (kilometers), hours of operation, and / or months of operation. It is important to note

that in high duty cycle types of operation and / or where operating conditions are extremely severe (such as in deep water, mud, or unusually dusty conditions), the vehicle may require lubrication much more frequently than specified in this manual.

**NOTE: The maintainer is advised to refer to the Original Equipment Component Manufacturer for the most up-to-date specific service instructions, required capacities, and lubricating oils.**

**The maintainer may wish to synchronize engine related items with other lubrication / maintenance intervals in order to reduce downtime, even though the recommended intervals in the Engine Operation and Maintenance Manual may be longer.**

The long-haul, short-haul, and severe service intervals are designed to coordinate maintenance activities and to provide the appropriate levels for servicing components. Following the service intervals minimizes the number of times per year that the vehicle must be brought into the shop. In addition to the long-haul, short-haul, and severe service intervals, the Special Service Interval column is provided for items that need infrequent servicing. In most cases, these service intervals represent the recommended maximum intervals. For some components, however, the manufacturer's recommended maintenance intervals may have been shortened to allow synchronization with other maintenance tasks.

## Maintenance Intervals and Specifications

Engine Operation and Maintenance Manual maximum intervals (based on the actual operating conditions specified in that manual) must never be exceeded.

### Lubrication and Maintenance Interval Chart

Vocation	Description
Long-Haul	Vehicles used primarily in over-the-road situations, averaging more the 6.5 mpg
Short-Haul	Vehicles used primarily in local delivery situations, averaging between 5.5 and 6.5 mpg
Severe	Severe service vehicles are those used in vocations such as refuse, mixer, dump truck, logging, heavy equipment hauling, or similar vocations that average up to 30,000 miles / 48,280 km per year) and average the less than 5.5 mpg.

### Lubrication and Maintenance Interval Chart Notes

**NOTE 1:** A hand-pumped grease gun should be used for optimal grease distribution within the component joint.

**NOTE 2:** Certain services are performed at Special Intervals.

**NOTE:** Refer to the Original Equipment Component Manufacturer for the most up-to-date specific service instructions, required capacities, and lubricating oils.

### Lubrication and Maintenance Interval: Truck – LT / RH Series

System	Item	Long-Haul	Short-Haul	Severe	Note / Special Interval
Pre-Trip Inspection	Pre-trip Inspection Items listed in SECTION 3 – INSPECTION GUIDE	Daily	Daily	Daily	If equipped
Axle	Air Suspension – Check Ride Height	Every 60,000 miles (96,560 km)	Every 35,000 miles (56,327 km)		If equipped
	Axle Alignment				Check at tire change
	Axle Breathers – Cleaned and Checked	Every 120,000 miles (193,121 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Axle Shocks – Inspect	Every 60,000 miles (96,560 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	



## Lubrication and Maintenance Interval: Truck – LT / RH Series (cont.)

System	Item	Long-Haul	Short-Haul	Severe	Note / Special Interval
Axle Cont.	Axle Shocks – Replace	Every 300,000 miles (482,803 km)	Every 210,000 miles (337,962 km)	Every 120,000 miles (193,121 km)	
	Axle U-Bolt Torque – Initial	Initial 1,000 miles (1,609 km)	Initial 1,000 miles (1,609 km)	Initial 1,000 miles (1,609 km)	
	Axle U-Bolt Retorque	Every 100,000 miles (160,934 km)	Every 70,000 miles (112,654 km)	Every 40,000 miles (64,373 km)	
	Drag Link Ends – Inspect / Lubricate	Every 100,000 miles (160,934 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Kingpins and Bushings – Inspect / Lubricate	Every 100,000 miles (160,934 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Rear Axle Wheel Ends – Inspect for Leaks, Lube Level and Condition	Every 120,000 miles (193,121 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Rear Axle with Synthetic Oil – Replace	Every 500,000 miles (804,672 km) or 60 months	Every 490,000 miles (788,578 km) or 60 months	Every 500,000 miles (804,672 km) or 60 months	
	Steer Axle Wheel Ends – Inspect for Leaks, Lube Level and Condition	Every 120,000 miles (193,121 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Tie Rod Ends – Inspect –Lubricate	Every 100,000 miles (160,934 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	

## Maintenance Intervals and Specifications

### Lubrication and Maintenance Interval: Truck – LT / RH Series (cont.)

System	Item	Long-Haul	Short-Haul	Severe	Note / Special Interval
Brake – Air	Air Compressor Discharge Line – Inspect for Damage	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Air Dryer Desiccant – Replace	Every 250,000 miles (402,336 km) or 24 Months	Every 245,000 miles (394,289 km) or 24 Months	Every 240,000 (386,242 km) miles or 24 Months	
	Air Dryer Heater & Purge Valve – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Air Primary and Secondary Tanks – Inspect and Drain Water	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Automatic Drain Valve – Check for Leaks and Purge	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Brake Chamber Rod Travel – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Brake S-Cam Bushing and Slack Adjusters – Lubricate	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Governor Cut-in / Cut-out Pressure – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Low Air Pressure Warning Alarm – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Parking Brakes Operation – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Service Brakes Operation – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Shoes – Inspect for Wear and Drag	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	

## Lubrication and Maintenance Interval: Truck – LT / RH Series (cont.)

System	Item	Long-Haul	Short-Haul	Severe	Note / Special Interval
Cab Components	Cab Shocks – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Door Hinges / Latches / Strikers – Lubricate, Inspect Link.	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	Use multipurpose lithium grease or light engine oil. <b>Do not</b> use silicone lubricant.
	Door Lock Cylinders – Lubricate	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
Cooling System	Coolant – Inspect Level	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Coolant Concentration or Freeze Point – Perform Inspection / Adjustment	Every 100,000 miles (160,934 km) or 12 months	Every 70,000 miles (112,654)	Every 80,000 miles (128,747 km)	
	Coolant Filter	Every 200,000 miles (321,868 km)	Every 140,000 miles (225,308 km)	Every 80,000 miles (128,747 km)	If equipped
	Cooling System – Add Coolant Extender	At 600,000 miles (965,606 km), 800,000 miles (1,287,475 km), and 1,000,000 (1,609,344 km) miles	At 600,000 miles (965,606 km)	At 600,000 miles (965,606 km)	Adapter required to Inspect
	Extended Life Coolant – Replace	At 1,200,000 miles (1,931,212 km) or 8 Years	At 1,200,000 miles (1,931,212 km) or 8 Years	At 1,200,000 miles (1,931,212 km) or 8 Years	
	Pressure Relief of Radiator Cap	Every 100,000 miles (160,934 km) or 12 months	Every 70,000 miles (112,654 km)	Every 40,000 miles (64,373 km)	

## Maintenance Intervals and Specifications

### Lubrication and Maintenance Interval: Truck – LT / RH Series (cont.)

System	Item	Long-Haul	Short-Haul	Severe	Note / Special Interval
Drive Shaft	Driveline Lube - SLP250 XL U-Joint – Lubricate	First lube 350,000 miles (563,270 km) miles, and Every 100,000 miles (160,934 km) thereafter	First Lube 350,000 miles (563,270 km) and Every 70,000 miles (112,654 km) thereafter	First Lube 100,000 miles (160,934 km) and Every 20,000 miles (32,187 km) thereafter	if equipped
	Driveline Inspection	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
Electrical	Alternator-Starter-Battery – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Engine Start and Gauge / Warning Indicators – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Instrument Readings Proper – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	

## Lubrication and Maintenance Interval: Truck – LT / RH Series (cont.)

System	Item	Long-Haul	Short-Haul	Severe	Note / Special Interval
Engine	Air Induction System – Inspect for Looseness / Leaks	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Engine Air Filter – Inspect Restriction Gauge Reading; Replace as Needed	Every 100,000 miles (160,934 km) or 12 months	Every 70,000 miles (112,654 km)	Every 40,000 miles (64,373 km)	
	Engine Belts and Belt Tensioner – Inspect	Refer to Engine Operation and Maintenance Manual			
	Engine Oil and Oil Filter(s)				
	Engine Valve Lash Adjustment				
	On-Engine Fuel Filter – Replace				
Exhaust System	Diesel Exhaust Fluid (DEF) Supply Module Filter – Replace				
	DPF Ash Cleaning				
Fifth Wheel	Fifth Wheel – Inspect sensors and Lubricate	Every 50,000 miles (80,467 km)	Every 25,000 miles (40,233 km)	Every 20,000 miles (32,187 km)	Jost (if equipped) every 30,000 miles (48,280 km)
Fuel System	Fuel / Water Separator – Replace Filter – Drain Water / Dirt	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Fuel Tank Mounting Straps – Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	

## Maintenance Intervals and Specifications

### Lubrication and Maintenance Interval: Truck – LT / RH Series (cont.)

System	Item	Long-Haul	Short-Haul	Severe	Note / Special Interval
HVAC	Cabin HVAC Filter – Fresh and Recirculation – Replace or Clean	Every 100,000 miles (160,934 km)	Every 70,000 miles (112,654 km)	Every 40,000 miles (64,373 km)	
	Sleeper HVAC Filter – Replace	Every 100,000 miles (160,934 km)	Every 70,000 miles (112,654 km)	Every 40,000 miles (64,373 km)	
Hydraulic Clutch	Hydraulic Clutch Fluid – Drain and Refill	Every 300,000 miles (482,803 km)	Every 200,000 Mile (321,868 km)	Every 200,000 miles (321,868 km)	
	Release Bearing / Shafts / Fork – Lubricate <b>NOTE: All clutches are equipped with a remote zerk fitting for easy service access.</b>	Every 50,000 miles (80,467 km)	Every 25,000 miles (40,233 km)	Every 25,000 miles (40,233 km)	If equipped
Steering	Power Steering Filter – Replace	Every 500,000 miles (804,672 km)	N/A	N/A	
	Power Steering Fluid – Change	Every 150,000 miles (241,401 km)	Every 105,000 miles (168,981 km)	Every 80,000 miles (128,747 km)	
	Power Steering Fluid – Check Level	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Steering Gear – Lubricate Dust Seal	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Steering Intermediate Shaft U-Joints / Slip Joint – Lubricate	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Steering System – Check Tightness	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	

### Lubrication and Maintenance Interval: Truck – LT / RH Series (cont.)

System	Item	Long-Haul	Short-Haul	Severe	Note / Special Interval
Tires	Tire Pressure, Wheels Wear, Condition and Tread Depth – Check/Inspect	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Wheel Stud Nuts – Retorque	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
Transmission	Neutral Start Switch – Check Function	Every 50,000 miles (80,467 km)	Every 35,000 miles (56,327 km)	Every 20,000 miles (32,187 km)	
	Transmission Filter and Fluid – Replace	Refer to Transmission Operation and Maintenance Manual			
	Transmission Fluid – Check Level				

### Lubrication and Fluids Charts

**NOTE:** Components requiring lubrication and fluid check and fill diagrams are typical representations.

#### Lubrication Notes



#### CAUTION

**To prevent property damage, avoid unapproved lubricants, which can cause premature component failure. Refer to the Lubricants and Sealer Specification table for proper lubricants.**

Wipe clean all dirt and debris from grease fittings before applying grease. If the fitting is not cleaned, dirt can be pushed into the component with the grease. Always fill grease to the point where old grease and contaminants are forced out from the part and only new grease comes out. If a fitting does not accept lubrication due to damage or internal stoppage, replace with a new fitting. Remove excess grease from fittings and other surfaces after applying grease.

Some vehicles may have optional remote mounted grease zerks for the clutch cross-shafts. These fittings reduce service time by providing convenient access to clutch cross-shaft bushing grease zerks. Grease may be applied through two remote mounted grease zerks mounted to the bottom of the transmission bell housing.

#### Fluid Check and Fill Notes



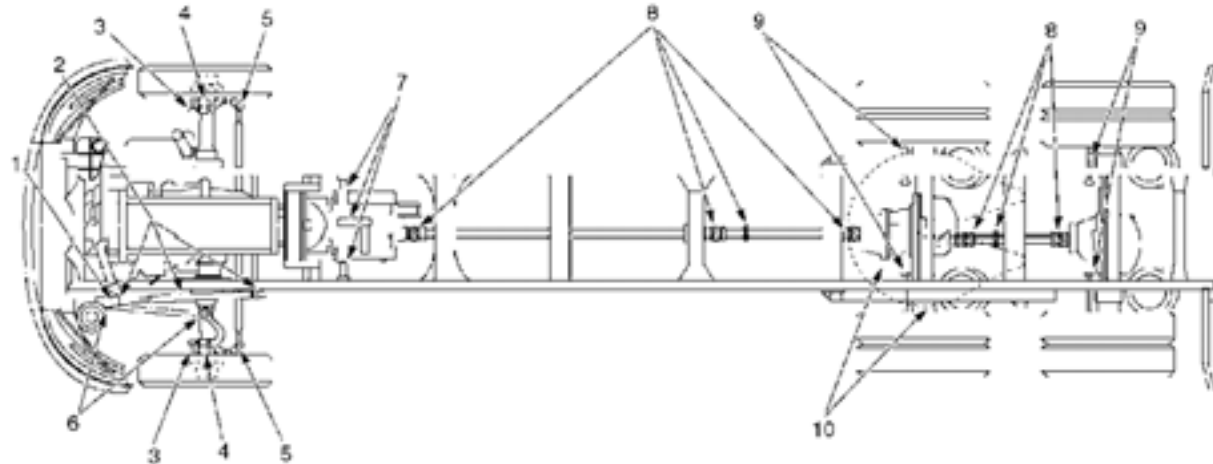
#### CAUTION

**To prevent property damage, use only recommended viscosity engine oil. Refer to the Engine Operation and Maintenance Manual for engine oil specifications.**

- Wait 15 minutes after shutting off the engine before checking the oil level. This gives the oil time to drain back to the oil pan.
- Clean all caps and fill plugs prior to removal to prevent dirt and debris from entering system.
- Filling the power steering fluid above the MAX COLD mark when cold will result in fluid overflow when hot.
- If engine is cold and coolant is above the MIN / ADD line, no additional coolant is needed. Excessive filling when cold can cause tank to overflow when hot.
- When checking the axle hub fluid level, maintain fluid level to fill line on hubcap.
- Check the rear axle(s) vent for blockage. Blockage can cause excessive pressure in the axle and create leaks.



### Components Requiring Lubrication



8487321

1. Steering gear
2. Steering intermediate shaft
3. Front S-cams and slack adjusters
4. Kingpin bushings and thrust bearing

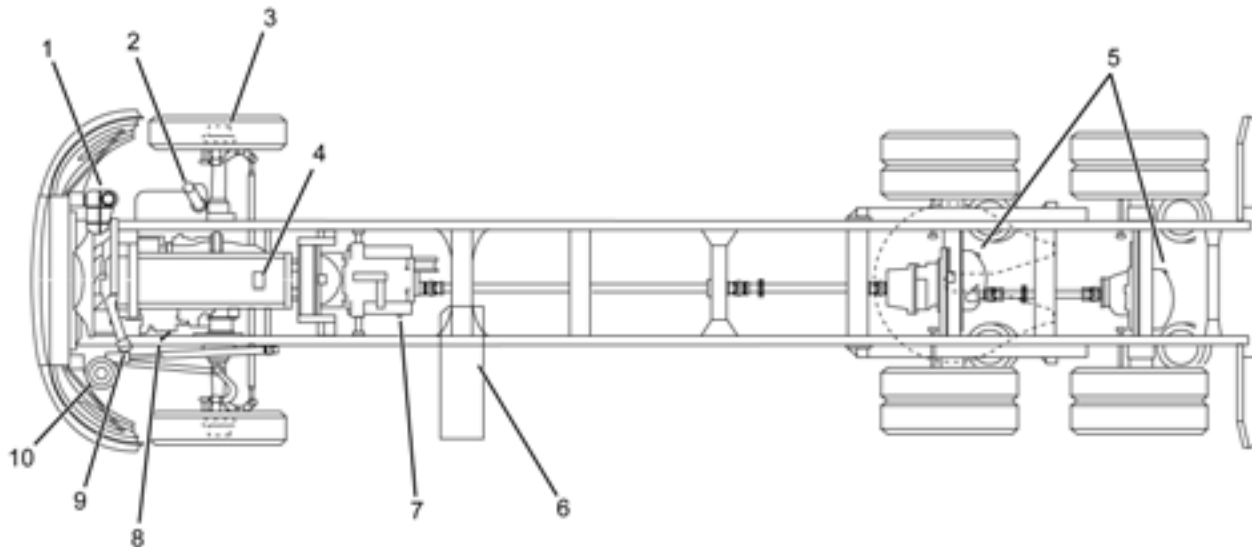
5. Tie rod end
6. Steering drag link end
7. Clutch cross shaft and release bearing
8. Drive shaft U-joint and slip joint

9. Rear S-cams and slack adjuster
10. Fifth wheel pivot point and top plate

## Maintenance Intervals and Specifications

---

### Components Requiring Fluid Check and Fill



0000036010

- |                                   |                                                                                                           |                                             |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------|
| 1. Coolant surge tank             | 5. Drive axle oil fill / level check plug                                                                 | 7. Transmission oil fill / level check plug |
| 2. Windshield washer fluid bottle | 6. Diesel exhaust fluid (DEF) tank (on vehicles equipped with Selective Catalytic Reduction (SCR) system) | 8. Engine oil dipstick                      |
| 3. Front axle oil-filled hub      |                                                                                                           | 9. Engine oil fill tube                     |
| 4. Hydraulic clutch reservoir     |                                                                                                           | 10. Power steering fluid reservoir          |

## Unit Refill Capacities

### Cooling System Refill Capacities

Cooling system refill capacities vary considerably due to differences in engine models and optional equipment (including sleeper heater circuit), in addition to the amount of coolant remaining in the system after draining. Total capacity may range from 12 - 15 gallons (45 - 57 liters).

If system has been drained:

- For vehicles equipped with International® A26 engines, fill with a Fleetrite® Extended Life NOAT ELC (RED) and demineralized or distilled water, or Fleetrite® NOAT ELC 50/50 Premix (RED).
- For vehicles equipped with Cummins® X15 engines, fill with a Fleetrite® Extended Life NOAT ELC (RED) and demineralized or distilled water, or Fleetrite® NOAT ELC 50/50 Premix (RED).

If the system has been flushed with water or cleaner, a significant amount of the rinse water will remain in the system. In this case refilling with a mixture with a higher percentage (60 - 66%) of coolant concentrate is advised in order to achieve a final mixture closer to 50/50. Fill the system and run the vehicle until the thermostat opens. Before adding any fluid, check the coolant concentration and add additional water or concentrated undiluted coolant to adjust the concentration. Run the vehicle and retest for coolant volume level (set to MAX line) and concentration level.

### Diesel Exhaust Fluid Tank

Diesel Exhaust Fluid (DEF) tank refill capacity varies depending on the vehicle models. Its total capacity may range from 16 - 23 gallons (61 - 87 liters).

### Crankcase and Oil Filters

For specific engine crankcase capacities, refer to separate Engine Operation and Maintenance Manual provided with vehicle.

### Hydraulic Clutch System

Description	Liters	Fl oz
Reservoir Capacity	0.25	8.45
System Capacity	0.49	16.6
<b>NOTE: Use only approved DOT 3 or DOT 4 brake fluid.</b>		

### Power Steering Systems

Gear	Power Steering Fluid Volume (pints / liters)
TRW PCF60 Steering Gear	8.4 / 3.9
Sheppard HD94 Steering Gear	8.4 / 3.9

## Maintenance Intervals and Specifications

### Transmission

**NOTE:** A variety of transmissions are available for your vehicle. Refer to the Original Equipment Transmission Manufacturer for the most up-to-date specific service instructions, required capacities, and transmission oils.

### Rear Axle Unit Refill Capacities

4 X 2 SINGLE AXLE			
Description	Feature Code	Pints	Liters
RS-23-160	14051, 14ARB	39.5	18.7
S23-190	14AHE	37	17.5
RS-23-186	14ARX, 14ARY	47.3	22.4

6 X 4 TANDEM AXLE		Forward		Rear	
Description	Code	Pints	Liters	Pints	Liters
RT-40-145, RT-40-145P, RT-40-145A	14GRB, 14GRC, 14GRN, 14GSX, 14GUR, 14HRN	30.2	14.3	25.8	12.2
Dana Spicer AdvanTEK 40 / 40-155D / D40-155S / D40-155DS / D40-155H / D40-155HS	0014GYK, 0014GYL, 0014GYA, 0014GYE, 0014GXX, 14GXY	25.8	12.21	20.10	9.51


6 X 4 TANDEM AXLE		Forward		Rear	
Description	Code	Pints	Liters	Pints	Liters
Dana Spicer AdvanTEK D40-156 / D40-156S / D40-156D / D40-156DS / D40-156H / D40-156HD / D40-156HS / D40-156HD	0014GYB, 0014GYG, 0014GXZ, 0014GYM, 0014GYD, 0014GYJ, 14GYN, 14GYP	25.8	12.21	18.40	8.71
DST41 / RST41, DST40 / RST40	14GJD, 14GJE, 14GJP	31	14.7	36	17
MT-40-143-MA-N, MT-40-144-MA-N	14GVB, 14GVC, 14GWG, 14GWH	30.2	14.3	31.4	14.9
D46-170HP / R46-170H, D46-170P / R46-170, D46-170P / R46-170D, D46-170 / R46-170	14GJH, 14GJL, 14GJM, 14GJR	39	18.5	37	17.5
RT-46-160, RT-46-160P	14GRD, 14GRP, 14GRS, 14HRM	29.1	13.8	34.4	16.3
RT-46-164P	14HRW	38.1	18	33.2	15.7

## Lubricant and Sealer Specifications

**NOTE:** Refer to the Original Equipment Manufacturer for up-to-date specific service instructions, required capacities, and lubricating oils.

Component	Component Vendor / Lubrication Type	Viscosity	Ambient Temperatures
<b>Non-driving Front Axle</b>			
Front axle wheel bearing oil	Mineral Oil	75W: 75W-80: 75W-90: 75W-140: 80W-90: 80W-140: 85W-140:	-40°F to -15°F (-40°C to -26°C) -40°F to 80°F (-40°C to 27°C) -40°F to 100°F (-40°C to 38°C) -40°F and above (-40°C and above) -15°F to 100°F (-26°C to 38°C) -15°F and above (-26°C and above) 10°F and above (-12°C and above)
	Synthetic – Emgard® 2979 Synthetic Lubricant. <b>NOTE: Do not mix conventional (mineral based) lubricants with synthetic lubricants.</b>	40W	All temperatures
Front Axle Tie Rod Ends, Drag Link, Kingpins and Bushings	Eaton®-Dana® axle, Hendrickson Steertek®, International® Multi-Link axle, and Meritor axle: Fleetrite® NLGI #2 Lithium Complex Based Moly grease P/N 991044C2 or equivalent GC/LB NLGI #2 Multi-purpose Lithium Complex grease <b>NOTE: Eaton®-Dana® and Meritor Easy Steer axles: With chassis load on axle, force grease through thrust bearings; then with axle lifted clear of floor, force grease between kingpin and bushing surfaces.</b>		

## Maintenance Intervals and Specifications

Component	Component Vendor / Lubrication Type	Viscosity	Ambient Temperatures
<b>Engine</b>			
Engine Lubricating Oil	See <b>Engine Operation and Maintenance Manual</b>		
<b>Steering System</b>			
<b>Approved (Power Steering Fluids)</b>			
ATF Fluid (Approved for Use in Power Steering System)	Fleetrite® P/N FLTPSDX3Q (MPAPS B-6822 Specification) or Equivalent (Must Meet TES 389 / Dexron III Specification)		-40°F to 92°F (-40°C to 35°C)
Power Steering Fluid	Fleetrite® Power Steering Fluid P/N FLTPSF32 (MPAPS B-6811 Specification)		-24°F to 90°F (-33°C to 32°C)
Engine Oil (Approved for Use in Power Steering System)	Fleetrite® P/N FLTL15W40CK4G (MPAPS B-21 Specification) or Equivalent API CK-4 15W-40 Motor Oil		18°F to 108°F (-10°C to 43°C)
<p><b>NOTE:</b> The power steering system is filled with ATF fluid at the factory.</p> <div style="text-align: center;">  <b>CAUTION</b> </div> <p>To prevent component / system / property damage, <b>ONLY</b> use fluid types listed.</p> <p><b>NOTE:</b> Certain fluid types may be better suited for use in your vehicle, dependent on geographic location and temperature. It is recommended to use the Ambient Temperatures listed above to determine what fluid best fits the application of the user's fleet or vehicle.</p> <p><b>NOTE:</b> The same type of approved power steering fluid that is present in the system must be used when topping off. When switching to another approved power steering fluid type, the power steering system must be drained and flushed prior to refill.</p>			

## Maintenance Intervals and Specifications

Component	Component Vendor / Lubrication Type	Viscosity	Ambient Temperatures
Steering Gear – Lubricant	Fleetrite® NLGI #2 Lithium Complex Based Moly grease P/N 991044C2 or equivalent GC/LB NLGI #2 Multi-purpose Lithium Complex grease		
Steering Intermediate Shaft U-Joints / Slip Joint – Lubricant	Fleetrite® NLGI #2 Lithium Complex Based Moly grease P/N 991044C2 or equivalent GC/LB NLGI #2 Multi-purpose Lithium Complex grease		
<b>Drive Shaft</b>			
U-Joint – Lubricant	Fleetrite® Lithium Complex Based Moly grease P/N 991044C2 or equivalent GC/LB NLGI #2 Multi-purpose Lithium Complex grease		
<b>Clutch</b>			
Release Bearing / Shafts / Fork – Lubricant	Fleetrite® Lithium Complex Based Moly grease P/N 991044C2 or equivalent GC/LB NLGI #2 Multi-purpose Lithium Complex grease		
<b>Cooling System</b>			
Extended Life Coolant	For International® A26 engines: Fleetrite® Extended Life NOAT Coolant For Cummins® X15 engine: Fleetrite® Extended Life NOAT Coolant	See Engine Operation and Maintenance Manual	

## Maintenance Intervals and Specifications

Component	Component Vendor / Lubrication Type	Viscosity	Ambient Temperatures
<b>Transmission</b>			
Transmission Oil	Mineral Gear Oil API-GL-1 (Rust and Oxidation Inhibited) Fleetrite® P/N 991061C1 Heavy Duty Engine Oil API – CJ or CI Gear Oil API – GL-1	SAE 90 – Meritor only SAE 80 – Meritor only SAE 50 SAE 40 SAE 30	Above 10°F (-12°C) Above 10°F (-12°C) Above 10°F (-12°C) Above 10°F (-12°C) Below 10°F (-12°C)
	Synthetic Oil: Emgard® 2979 Synthetic Lubricant	40W	All temperatures
	Synthetic Transmission Oil: meeting Eaton PS-386	SAE 40	All temperatures
<b>NOTE: Refer to the Original Equipment Transmission Manufacturer for specific service instructions and recommendations, required capacities, and transmission fluids.</b>			
<b>Rear Axle</b>			
Rear Drive Axle(s)	Synthetic – Emgard® FE and Emgard® XFE Synthetic Lubricant.	75W-90	All temperatures
<b>Electrical</b>			
Terminals – Lubricant Sealing Grease	Fleetrite® 2519646C1		
Connectors – Dielectric Grease	NYOGEL® 760 G		
<b>Aftertreatment</b>			
Diesel Exhaust Fluid (DEF)	Fleetrite® brand DEF or equivalent, which meets or exceeds ISO-22241-1		



## Torque Specifications

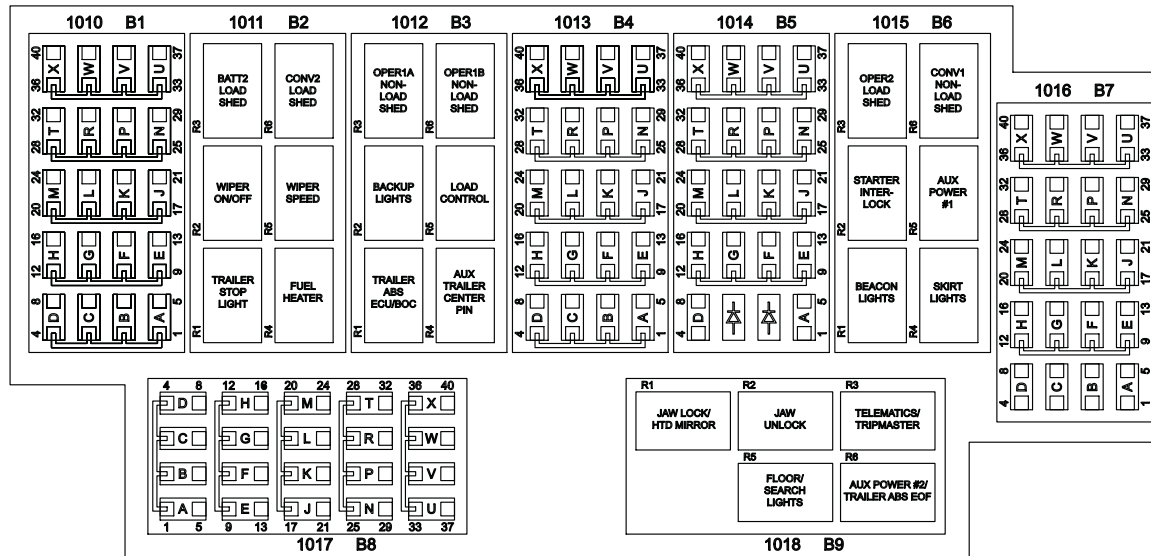
### DISC WHEEL NUT TORQUE CHART

Lug Nut Size	Lug Nut Type	Socket Size	Torque	
			lb-ft	N•m
22 mm	2-piece	33 mm	450 - 500	610 - 678
<b>NOTE:</b> Do not use lubrication on dry threads. Where excessive corrosion exists, a light coat of lubricant on the first three threads of stud is permitted. Keep lubricant away from nut and rim clamp contact surfaces.				

## Fuse Charts

**NOTE:** The contents of this manual will be general and may not reflect the most current vehicle configuration. If the content of this manual does not provide the explanation needed to understand or operate the feature you are using, please contact your local International dealer or refer to International® Service Portal<sup>SM</sup> for the most up to date information.

The following fuse illustrations represent typical fuse panel layouts. The actual vehicle fuse panels will vary depending on the vehicle options. Refer to the chart on rear side of fuse cover.



0000407237

## Maintenance Intervals and Specifications

LOCATION	AMP		STD/OPT	DESCRIPTION
B1-A	NOTE 1	BTRY	STD	INSTRUMENT CLUSTER
B1-B	30	BTRY	STD	TRALER STOP LIGHT
B1-C	15	BTRY	STD	LIGHTING CONTROL MODULE
B1-D	15	BTRY	STD	9-PIN DIAGNOSTIC
B1-E	10	BTRY	OPT	SWITCH PACK
B1-F	30	BTRY	STD	TRALER ABS ECU
B1-G	10	BTRY	STD	ENTERTAINMENT RADIO
B1-H	30	BTRY	STD	CAB HVAC BLOWER MOTOR
B1-J	10	BTRY	OPT	TRANSMISSION SHIFTER
B1-K	5	BTRY	OPT	LANE DEPARTURE SYSTEM
B1-L	5	BTRY	OPT	NEXT GEN CRUISE CONTROL
B1-M	15	BTRY	OPT	SATELLITE COMMUNICATION
B1-N	—	BTRY	—	OPEN
B1-P	15	BTRY	OPT	NO IDLE HEATER
B1-R	NOTE 8	BTRY	OPT	NO IDLE HEATER
B1-T	—	BTRY	—	OPEN
B1-U	NOTE 2	BTRY	STD	TRACTOR ABS ECU
B1-V	NOTE 6	BTRY	OPT	SATELLITE COMMUNICATION
B1-W	30	BTRY	OPT	PASSENGER SIDE WINDOW/DOOR
B1-X	NOTE 5	BTRY	OPT	DRIVER SIDE WINDOW/DOOR/MIRROR

LOCATION	AMP		STD/OPT	DESCRIPTION
B4-A	10	IGN	STD	WINDSHIELD WASHER PUMP
B4-B	—	IGN	—	OPEN
B4-C	10	IGN	STD	TRALER ABS
B4-D	—	IGN	—	OPEN
B4-E	5	IGN	OPT	NEXT GEN CRUISE CONTROL
B4-F	15	IGN	STD	LIGHTING CONTROL MODULE
B4-G	10	IGN	STD	BACK-UP LIGHTS
B4-H	10	IGN	OPT	POWER SEATS
B4-J	5	IGN	STD	TRALER ABS ECU IGN
B4-K	10	IGN	STD	CLUSTER
B4-L	20	IGN	OPT	HEATED MIRRORS
B4-M	—	IGN	—	OPEN
B4-N	—	IGN	—	OPEN
B4-P	—	IGN	—	OPEN
B4-R	10	IGN	OPT	5TH WHEEL MONITOR
B4-T	—	IGN	—	OPEN
B4-U	10	IGN	STD	TRACTOR ABS ECU
B4-V	—	IGN	—	OPEN
B4-W	10	IGN	OPT	COLLISION MITIGATION - SIDE
B4-X	5	IGN	OPT	LANE DEPARTURE SYSTEM

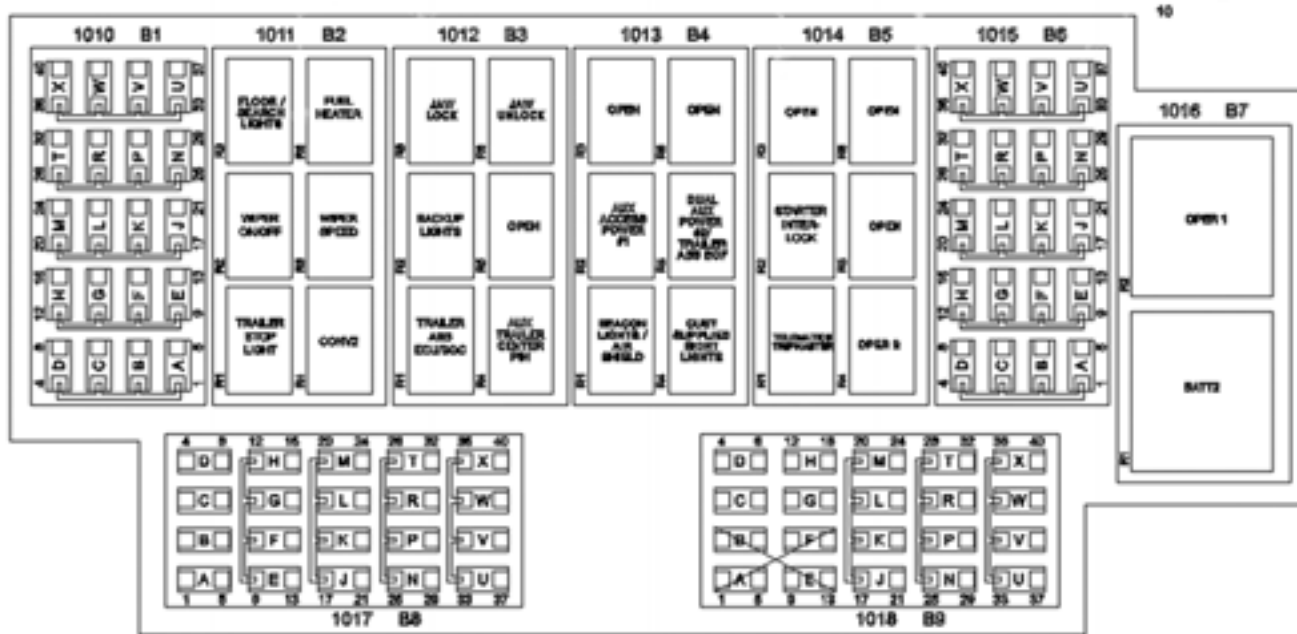
LOCATION	AMP		STD/OPT	DESCRIPTION
B5-A	5	BTRY	STD	TRANSMISSION NEUTRAL SWITCH
B5-B	NA	ACC	OPT	CONVENIENCE GRID DIODE
B5-C	NA	IGN	OPT	OPERATING GRID DIODE
B5-D	5	BTRY	OPT	ELECTRICAL LOAD CONTROL
B5-E	5	IGN	OPT	TRI-PAC
B5-F	—	IGN	—	OPEN
B5-G	5	IGN	OPT	TIRE PRESSURE MONITOR
B5-H	5	IGN	OPT	AUX POWER - USB
B5-J	—	IGN	—	OPEN
B5-K	—	IGN	—	OPEN
B5-L	—	IGN	—	OPEN
B5-M	—	IGN	—	OPEN
B5-N	10	IGN	STD	AIR DRYER
B5-P	10	IGN	OPT	HEATED DRAIN VALVE
B5-R	10	IGN	OPT	COLLISION MITIGATION - FRONT
B5-T	NOTE 7	IGN	OPT	SATELLITE COMMUNICATION
B5-U	10	IGN	OPT	TRANSMISSION
B5-V	10	IGN	STD	CAB HVAC CONTROLLER
B5-W	10	IGN	STD	BODY CONTROLLER
B5-X	5	IGN	STD	ENGINE ECM

LOCATION	AMP		STD/OPT	DESCRIPTION
B7-A	—	—	—	OPEN
B7-B	—	—	—	OPEN
B7-C	5	BTRY	OPT	TRALER TRACS
B7-D	5	IGN	OPT	TRI-PAC
B7-E	—	BTRY	—	OPEN
B7-F	—	BTRY	—	OPEN
B7-G	10	BTRY	OPT	TRALER ABS CENTER PIN
B7-H	5	BTRY	OPT	START RELAY ENABLE PWR
B7-J	10	BTRY	STD	KEYSWITCH
B7-K	30	BTRY	OPT	CUSTOMER ACCESSORY #2
B7-L	30	BTRY	OPT	CUSTOMER ACCESSORY #1
B7-M	5	BTRY	OPT	SINGLE/DUAL AUX SWITCH
B7-N	10	ACC	OPT	ENTERTAINMENT RADIO
B7-P	—	ACC	—	OPEN
B7-R	25	ACC	OPT	AUX TRALER POWER
B7-T	—	ACC	—	OPEN
B7-U	—	ACC	—	OPEN
B7-V	—	ACC	—	OPEN
B7-W	5	ACC	OPT	SLEEPER ACCESSORY RELAY
B7-X	—	ACC	—	OPEN

LOCATION	AMP		STD/OPT	DESCRIPTION
B8-A	30	BTRY	OPT	SLEEPER FUSE PANEL FEED
B8-B	5	BTRY	OPT	DRIVER DISPLAY
B8-C	10	BTRY	STD	CAB DOME/MAP LIGHTS
B8-D	5	BTRY	NOTE 3	FLOOR LIGHT
B8-E	20	BTRY	OPT	FUEL/WATER SEPARATOR
B8-F	—	BTRY	—	OPEN
B8-G	30	BTRY	OPT	SLEEPER FUSE PANEL FEED
B8-H	25	BTRY	OPT	AUX TRALER SOCKET
B8-J	20	BTRY	STD	CIGAR LIGHTER
B8-K	15	BTRY	OPT	AUX POWER SOURCES
B8-L	30	BTRY	OPT	SLEEPER BLOWER NOT NO-IDLE
B8-M	25	BTRY	OPT	BEACON LIGHT
B8-N	—	ACC	—	OPEN
B8-P	—	ACC	—	OPEN
B8-R	15	ACC	OPT	SKIRT LIGHTS
B8-T	10	ACC	OPT	BEACON LIGHT
B8-U	10	ACC	OPT	POWER MIRRORS
B8-V	10	ACC	OPT	CB RADIO
B8-W	NOTE 4	ACC	OPT	DRIVER DISPLAY/GPS
B8-X	10	ACC	OPT	REMOTE ENTERTAINMENT RADIO

0000407238

## Maintenance Intervals and Specifications

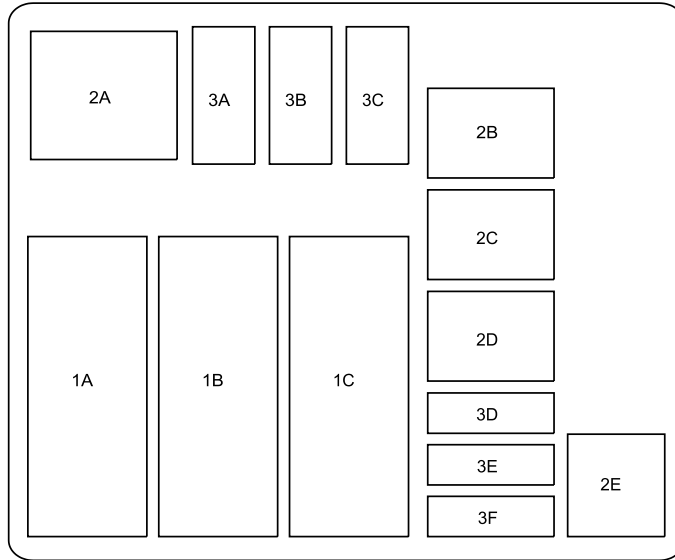


0000450239

LOCATION	AMP	FEED	STD/OPT	DESCRIPTION	LOCATION	AMP	FEED	STD/OPT	DESCRIPTION
B1-A	5	BTRY	OPT	START RELAY ENABLE PWR	B8-A	NOTE 7	IGN	OPT	SATELLITE COMMUNICATION
B1-B	30	BTRY	STD	TRAILER STOP LIGHT	B8-B	10	IGN	STD	WINDSHIELD WASHER PUMP
B1-C	10	BTRY	STD	4-PIN DIAGNOSTIC	B8-C	10	IGN	STD	TRAILER ABS
B1-D	5	BTRY	STD	LIGHTING CONTROL MODULE	B8-D	5	IGN	OPT	DIRECT DRIVE WASH LIGHTS
B1-E	NOTE 1	BTRY	STD	INSTRUMENT CLUSTER	B8-E	5	IGN	OPT	PREDICTIVE CRUISE CONTROL
B1-F	30	BTRY	STD	CAB HVAC BLOWER MOTOR	B8-F	10	IGN	OPT	HEATED SEATS
B1-G	10	BTRY	STD	KEYSWITCH	B8-G	10	IGN	STD	BACKUP LIGHTS
B1-H	5	BTRY	OPT	LANE DEPART/DRIVECAM/MOBILE EYE	B8-H	10	IGN	STD	LIGHTING CONTROL MODULE
B1-J	NOTE 8	BTRY	OPT	TRANSMISSION SHIFTER	B8-J	5	IGN	OPT	TIRE PRESSURE MONITOR
B1-K	30	BTRY	STD	TRAILER ABS ECU	B8-K	20	IGN	OPT	HEATED MIRRORS
B1-L	5	BTRY	OPT	HEAT GEN CRUISE CONTROL	B8-L	10	IGN	STD	INSTRUMENT CLUSTER
B1-M	NOTE 11	BTRY	OPT	SATELLITE COMMUNICATION	B8-M	10	IGN	OPT	TRANSMISSION CONTROL UNIT
B1-N	10	BTRY	STD	ENTERTAINMENT RADIO	B8-N	10	IGN	OPT	COLLISION MITIGATION - FRONT
B1-P	NOTE 5	BTRY	OPT	DRIVER SIDE WINDOW / DOOR	B8-P	10	IGN	OPT	HEATED BRAIN VALVE
B1-R	10	BTRY	STD	SWITCH PACK	B8-R	10	IGN	OPT	FIN WHEEL MONITOR
B1-T	10	BTRY	OPT	RPM/DOC	B8-T	5	IGN	STD	ENGINE ECM
B1-U	NOTE 9	BTRY	OPT	SATELLITE COMMUNICATION	B8-U	10	IGN	STD	TRACTOR ABS ECU
B1-V	30	BTRY	OPT	PASSENGER SIDE WINDOW / DOOR	B8-V	10	IGN	STD	AIR DRYER
B1-W	NOTE 3	BTRY	STD	TRACTOR ABS ECU	B8-W	10	IGN	OPT	COLLISION MITIGATION SIDE
B1-X	5	BTRY	OPT	10MH NEUTRAL SWITCH	B8-X	5	IGN	OPT	LANE DEPART/DRIVECAM

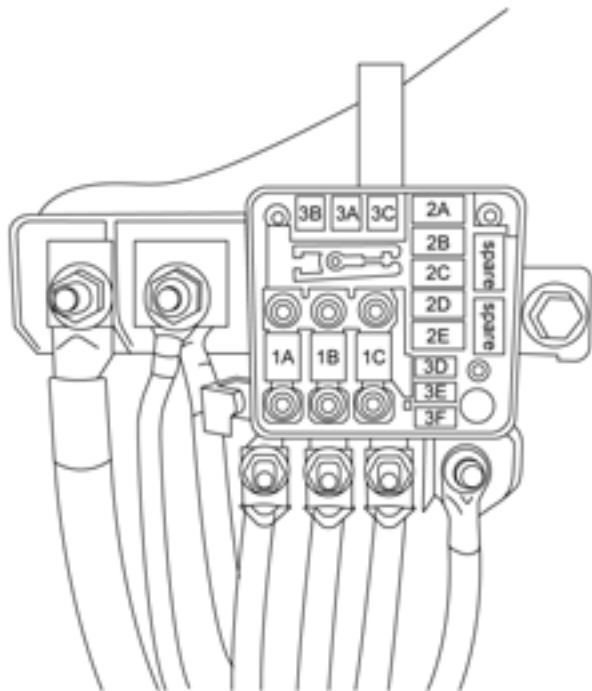
LOCATION	AMP	FEED	STD/OPT	DESCRIPTION	LOCATION	AMP	FEED	STD/OPT	DESCRIPTION
B6-A	5	-	OPT	AUX HEATER	B9-A	-	-	-	NOT FOR USE
B6-B	-	-	-	OPEN	B9-B	-	-	-	NOT FOR USE
B6-C	5	BTRY	OPT	TRAILER TRAC/SAT COMM	B9-C	10	BTRY	OPT	FEEDER DATA TERMINAL
B6-D	-	-	-	OPEN	B9-D	20	BTRY	OPT	AUX HEATER
B6-E	5	BTRY	OPT	DRIVER DISPLAY	B9-E	-	-	-	NOT FOR USE
B6-F	10	BTRY	OPT	AUX POWER SOURCE	B9-F	-	-	-	NOT FOR USE
B6-G	10	BTRY	STD	CAB DOME MAP LIGHTS	B9-G	30	BTRY	OPT	ACC #1 FUDGE
B6-H	5	BTRY	NOTE 3	FLOOR LIGHT	B9-H	30	BTRY	OPT	ACC #2
B6-J	20	BTRY	OPT	FUEL WATER SEPARATOR	B9-J	10	BTRY	OPT	CAB HVAC CONTROLLER
B6-K	30	BTRY	OPT	AUX TRAILER SOCKET	B9-K	5	BTRY	OPT	AUX SWITCH/ROCK
B6-L	20	BTRY	STD	CIGAR LIGHTER	B9-L	10	BTRY	OPT	TRAILER ABS CENTER PSI
B6-M	NOTE 10	BTRY	OPT	BEACON LIGHT/TAIR SHIELD LIGHT	B9-M	NOTE 12	BTRY	OPT	PEOPLEMET DIVING WHEEL
B6-N	-	ACC	-	OPEN	B9-N	5	IGN	OPT	ROLLTEK SEAT
B6-P	10	ACC	OPT	ENTERTAINMENT RADIO	B9-P	5	IGN	OPT	ETRAO LOAD BUS
B6-R	10	ACC	OPT	STURT LIGHT	B9-R	-	IGN	-	OPEN
B6-T	10	ACC	OPT	BEACON LIGHT	B9-T	-	IGN	-	OPEN
B6-U	-	ACC	-	OPEN	B9-U	5	IGN	OPT	DRIVECAM/PEOPLEMET DVR
B6-V	10	ACC	OPT	CB RADIO	B9-V	5	IGN	OPT	AUX POWER USB
B6-W	NOTE 4	ACC	OPT	DRIVER DISPLAY/SPS	B9-W	5	IGN	OPT	TRU-PAC
B6-X	5	ACC	OPT	REMOTE ENTERTAINMENT RADIO	B9-X	10	IGN	OPT	DOUBLE DIN USB





0000037242

Location	Component	Fuse Rating (Amps)
1A	Cold Start Aid (if equipped)	80A
1B	Cab #1	100A
1C	Cab #2	100A
2A	Not in Use	—
2B	Not in Use	—
2C	Eaton® Clutch (if equipped)	40A
2D	Not in Use	—
2E	ECM	30A Or 25A
3A	Not in Use	—
3B	Aftertreatment PDM (if equipped)	30A
3C	Two-Way Radio (if equipped)	20A
3D	TCM (if equipped)	30A
3E	ACM (if equipped)	15A
3F	Engine Timer (if equipped)	5A



0000429416



## Maintenance Intervals and Specifications

Location	Component	Fuse Rating (Amps)
1A	Cold Start Aid (if equipped)	80A
1B	Cab Feed #1 Or Cab Feed (single)	100A Or 150A
1C	Cab Feed #2 (if equipped) Or Sleeper Feed (if equipped)	100A Or 70A
2A	Not in Use	—
2B	Not in Use	—
2C	Eaton® Clutch (if equipped) Or Fuel Heater (if equipped)	40A Or 40A
2D	Not in Use	—
2E	ECM	30A
3A	Not in Use	—
3B	Aftertreatment PDM (if equipped)	30A

Location	Component	Fuse Rating (Amps)
3C	Two-way Radio (if equipped) Or Fuel Pump (if equipped)	20A Or 20A
3D	Eaton® TCM (if equipped) Or Eaton® TCM #1 (if equipped) Or Allison TCM (if equipped)	30A Or 15A Or 10A
3E	ACM (if equipped) Or Eaton® TCM #2 (if equipped) Or DEF Pump / PDM (if equipped)	15A Or 15A Or 15A
3F	Engine Timer (if equipped) Or DEF Pump / PDM (if equipped)	5A Or 10A

## Maintenance Intervals and Specifications

---

### LT® / RH™ Series Light Information

Lamp Description	Bulb P/N
Sleeper Dome Lamp	GE921
Cab Dome Lamp	GE211-2
Accent Lamps	GE211-2
Under Bunk Lamp	GE211-2
Cab Floor Lamp	GEW5W
Sleeper Floor Lamp	GEW5W
Sleeper Reading Lamp	GE912
LED Cab Map Lamp	See Dealer
Door Lamps	GEW5W
Clearance / Marker Lamp (LED)	GE168
Stop / Turn / Tail / Back Up / License Plate Lamps (LED)	International® LT® / RH™ Series: Truck Lite Super 44
Work Light	GE4411
Headlight	Low Beam: GE9006
	High Beam: GE9005
	Side Marker: GE194
	Parking / Turn: GE3357
Side Turn and Marker Lamp assembly	3599250C92
Side Turn Lamp (Incandescent)	GE3156

### Filter List

Filter part numbers and / or specifications may change during the life cycle of this vehicle. Current information on the appropriate chassis and engine filters for your vehicle can be obtained by contacting your local International dealer Parts department. (If you need assistance finding a local International dealer, use the Dealer Locator icon at <http://www.internationaltrucks.com/>.)

## SECTION 9 — CUSTOMER ASSISTANCE

### Service Information

The continued premium performance of this International® chassis can best be ensured through proper servicing. This can be accomplished in several ways.

**International Truck Dealers:** Your local International Truck dealer provides an excellent resource – through their knowledgeable, experienced, and well equipped service staff – to handle all your maintenance, repair, and replacement work.

**Service Publications:** Those persons who are properly trained technicians with the facilities, equipment, tools, safety instructions and know-how to properly and safely service a bus, medium-duty and / or heavy-duty chassis can purchase the appropriate service manual sections applicable to specific vehicle components or areas of this International® vehicle. Engine diagnostic manuals and engine service manuals for all current International® diesel engines are also available to these trained persons for purchase. Information on the purchase of available service publications for this chassis can be found on the <http://www.internationaltrucks.com/> Web site, or by contacting your local International dealer.

These resources are also available via the Internet, by an annual subscription to the **International® Service Portal<sup>SM</sup>**

**website**, or via the **OnCommand® Service Information USB**. For information on the International Service Portal website's content, availability, and fee structure, contact your local International Truck dealer or, in the case of a National Account, your International Fleet Service Manager. The OnCommand Service Information USB contains International® and IC Bus® branded truck, engine, and bus information including service and diagnostic manuals, troubleshooting guides, circuit diagram manuals, and new vehicle processing manuals.

### International Truck Warranty Program

#### **Standard Warranty • Optional Service Contracts • Custom Service Contracts • Performance PM® Service**

The International Truck Warranty Program provides International customers with a better choice when it comes to Standard Warranty and Service Contract Coverage. The **Standard Warranty** is the first tier of the International Truck Warranty Program. It provides the foundation for all extended coverages.

Vehicle Coverage, Towing, Engine and Engine Electronics, Major Component, and Prepackaged System Component protection can be obtained under the International Warranty Program through **Optional Service Contracts**.

Finally, through **Performance PM® Service**, customers can obtain a comprehensive preventive maintenance program designed to ensure consistency in pricing and the level of service received.

### **ADVANTAGES of International® Truck Warranties**

- Extends warranty protection to specified length and component coverage to suit individual needs.
- Honored at over 700 International Truck dealer locations in North America.
- Stabilized and predictable maintenance costs.
- Increased owner confidence and peace of mind.
- Improved resale value on your vehicle – International® Truck Warranties may be transferable for a nominal fee. Contact the Service Contract Center 1-800-336-4500 option 5 for transferability.
- Most coverage is 100% parts and labor with **NO DEDUCTIBLES**.
- Customized warranty programs are offered to suit your needs - your specification - your vocation.
- Navistar, Inc., North America's leader in truck manufacturing, is also North America's leader in warranty value.

- Published Service Contracts for Performance PM® Service, designed to ensure the lowest possible cost of ownership, are also available.
- **Optional Service Contracts** have been prepackaged to fit most common applications.

### **HOW TO OBTAIN International® Truck Warranties**

- **Standard Warranty:** Your new International® vehicle is automatically registered in the International Truck Warranty system at the time of delivery. No further action on your part is required.
- **Optional Service Contracts, Custom Service Contracts, or Performance PM® Service:** These programs are sold exclusively through your International dealer. The vehicle must also have coverage remaining under the Standard Warranty. For extended warranty purchases between 181 and 365 days from DTU and < 100,000 miles (160,000 km), an additional fee will be assessed. If you would like the predictable cost of ownership and peace of mind provided by the International Truck Warranty Program, please contact your International dealer today!

## SECTION 10 — INDEX

### A

ABS Connections and Sensors.....	233
ABS Operation.....	204
ABS Pop-Ups / Alerts Table.....	52
ABS Self Check.....	205
Accent Light Dimmer Switch.....	107
Accent Light Switch.....	107
Accent Lights.....	105
Accessing Driver-Side Cab.....	132
Accessing Passenger-Side Cab.....	133
Accessory Feed Connections.....	239
Active Steering.....	100
Driver Assist Steering Features.....	101
Adding Equipment to the Airbag-Equipped Vehicle.....	137
Additional Unsafe Practices.....	165
Adjustable Belts.....	115
Adjustable Steering Column.....	155
After the Engine Starts.....	150
Air Brakes.....	194, 230
Air Gauge, Low Air Pressure Beeper, and Warning Indicator.....	195
Brake Application.....	196
Inspection and Adjustment.....	230
Reservoir Moisture Draining.....	195
Air Cleaner Element Service: International® RH™ Vehicles Only.....	244
Air Cleaner Element Service: LT® Vehicles Only.....	242
Air Compressor Cycling.....	163
Air Conditioning.....	87
Air Conditioning Mode.....	111
Air Conditioning Service Checks.....	224

### A (CONT.)

<i>Air Conditioning Service Checks (cont.)</i> .....	
HVAC Filters.....	224
Recirculation Filter.....	226
Side Access HVAC Filter.....	225
Sleeper HVAC Filter.....	227
Air Dryer.....	201, 231
Desiccant Filter.....	232
Heater.....	232
Purge Valve.....	232
Air Gauge, Low Air Pressure Beeper, and Warning Indicator.....	195
Air Induction System.....	241
Air Intake System.....	252
Air Reservoir / Tanks Moisture Draining.....	232
Air Restriction Gauge.....	241
Air Suspension System Faults.....	176
Air Trailer Brake Release.....	201
Airbag Readiness Lamp.....	135
Airbag System.....	134
Adding Equipment to the Airbag-Equipped Vehicle.....	137
Airbag Readiness Lamp.....	135
Airbag System Check.....	138
How Does the Airbag Restrain?.....	136
Replacing Airbag System Parts after a Crash.....	138
Servicing the Airbag-Equipped Vehicle.....	137
What Makes the Airbag Inflate?.....	135
What Will You See After the Airbag Inflates?.....	136
When Should the Airbag Inflate?.....	135
Airbag System Check.....	138
Airline Cabinets.....	125

### A (CONT.)

Alignment.....	228
Allison Transmissions.....	171
Alternator.....	155
Antifreeze.....	251
Antilock Brake System (ABS).....	204
ABS Operation.....	204
ABS Self Check.....	205
Antilock Driving Tips.....	205
Antilock Driving Tips.....	205
Applying and Releasing the Parking Brake.....	197
Assistance Guide.....	1
ATC OFF ROAD or MUD / SNOW Switch.....	206
ATC System Check.....	206
Auto Start / Stop Mode.....	109
Auto Start / Stop System.....	107
Auto Start / Stop Mode.....	109
Auto Start / Stop System and HVAC Controls.....	109
Air Conditioning Mode.....	111
Heat Mode and ESPAR Heater.....	110
Vehicles Equipped with ESPAR Heaters.....	110
Vehicles Not Equipped with ESPAR Heaters.....	110
Auto Start / Stop System Battery Cables: International® RH™ Vehicles Only.....	238
Auto Start / Stop System Battery Cables: LT® Vehicles Only .....	237
Automatic Door Lock Function.....	91
Automatic Traction Control (ATC) System.....	206
ATC OFF ROAD or MUD / SNOW Switch.....	206
ATC System Check.....	206
Stability Control Systems – Bendix® RSP / WABCO® RSC / Bendix® ESP.....	207
Auxiliary Gauges.....	73

### A (CONT.)

Available Models.....	13
Axles.....	227
Front Axle.....	227
Alignment.....	228
Inspection and Lubrication.....	227
Normal Maintenance.....	228
Locking Differential.....	229
Rear Axle.....	228
Inspection and Lubrication.....	228

### B

Back View: LT® Series — Long Sleeper.....	20
Base Electronic Gauge Cluster Overview.....	47
Gauges.....	47
Batteries.....	236
Battery Cables.....	237
Battery.....	156
Battery Box (Between Frame Rail).....	41
Battery Cables.....	237
Bendix® Blindspotter 2.0®.....	95
Bendix® Intellipark™.....	197
Air Trailer Brake Release.....	201
Applying and Releasing the Parking Brake.....	197
Bobtail Operation.....	201
Intellipark™ LED Operation.....	199
Operating the Vehicle Using Parking Brake Interlock Override Mode.....	201
Parking the Vehicle When Parking Brake Cannot be Applied.....	200
Rollaway Prevention.....	198
Bendix® Wingman® Advanced™ Collision Warning System....	96

**B (CONT.)**

Bendix® Wingman® Fusion™ System.....	98
Bobtail Operation.....	201
Bobtail Proportioning System.....	204
Body.....	252
Brake Application.....	196
Brakes.....	193, 229
ABS Connections and Sensors.....	233
Air Brakes.....	194, 230
Air Gauge, Low Air Pressure Beeper, and Warning Indicator.....	195
Brake Application.....	196
Inspection and Adjustment.....	230
Reservoir Moisture Draining.....	195
Air Dryer.....	201, 231
Desiccant Filter.....	232
Heater.....	232
Purge Valve.....	232
Air Reservoir / Tanks Moisture Draining.....	232
Antilock Brake System (ABS).....	204
ABS Operation.....	204
ABS Self Check.....	205
Antilock Driving Tips.....	205
Bendix® Intellipark™.....	197
Air Trailer Brake Release.....	201
Applying and Releasing the Parking Brake.....	197
Bobtail Operation.....	201
Intellipark™ LED Operation.....	199
Operating the Vehicle Using Parking Brake Interlock Override Mode.....	201
Parking the Vehicle When Parking Brake Cannot be Applied.....	200
Rollaway Prevention.....	198

**B (CONT.)**

*Brakes (cont.)*

Bobtail Proportioning System.....	204
Downhill Operation.....	193
Parking Brake.....	196
Parking Brake Alarm.....	197
Parking Brake Reset.....	197
Parking Brake Indicator.....	203
Trailer Air Supply and Parking Brake Modular Controls.....	202
Trailer Brake Hand Control.....	202
Bright Metal Care.....	233
Bunk Restraint System.....	115
Adjustable Belts.....	115

**C**

Cab.....	233
Care of Vehicle.....	233
Bright Metal Care.....	233
Exposed Rubber and Unpainted Plastic Parts.....	234
Upholstery Care.....	233
Washing and Waxing.....	233
Cab Access.....	131
Accessing Driver-Side Cab.....	132
Accessing Passenger-Side Cab.....	133
Driver-Side Cab.....	131
Exiting Driver-Side Cab.....	132
Exiting Passenger-Side Cab.....	134
Passenger-Side Cab.....	133
Cab Controls.....	130
Cab Doors and Locks.....	89
Cab Entry and Exit.....	21
Cab Interior Inspection.....	42
Cabinets.....	122



### C (CONT.)

<i>Cabinets (cont.)</i>	
Airline Cabinets.....	125
Dresser Cabinet.....	123
Refrigerator Cabinet.....	122
Tower Wardrobe Cabinet.....	124
Under Bunk Refrigerator.....	122
Cabinets / Storage.....	121
Canadian Registered Vehicles.....	9
Care of Seat Belts.....	142
Care of Vehicle.....	233
Bright Metal Care.....	233
Exposed Rubber and Unpainted Plastic Parts.....	234
Upholstery Care.....	233
Washing and Waxing.....	233
Cautions and Warnings.....	1
Center Dash Panel / Wing Panel.....	72
Auxiliary Gauges.....	73
Climate Control.....	78
Air Conditioning.....	87
Switches.....	74
Charge Air Cooler.....	160
Charge Air Cooler and Radiator Core Inspection and Cleaning.....	247
Inspection and Cleaning.....	247
Chassis Lubrication.....	223
Chassis Skirts.....	23
Extended Chassis Skirts (If Equipped).....	24
Checking Inflation.....	262
Circuit Breakers, Fuses and Fusible Links.....	158
Cleaning.....	256
Climate Control.....	78

### C (CONT.)

<i>Climate Control (cont.)</i>	
Air Conditioning.....	87
Clutch.....	234
Hydraulic Clutch.....	235
Pedal Free Travel.....	234
Clutch Brake.....	171
Clutch Precautions.....	171
Coast Mode and Neutral Coast Mode (If Equipped).....	172
Cold Weather.....	151
Cold Weather Operation.....	152
Cold Weather Starting.....	151
Engine Idle Shutdown Timer (If Equipped).....	153
Engine Idling.....	152
Winter Front Usage.....	153
Cold Weather Operation.....	152
Cold Weather Starting.....	151
Collision Warning Systems.....	95
Bendix® Blindspotter 2.0®.....	95
Bendix® Wingman® Advanced™ Collision Warning System.....	96
Bendix® Wingman® Fusion™ System.....	98
WABCO® OnGuard™ Collision Safety System.....	99
Comfort Clip (If Equipped).....	140
Component Code Numbers.....	2
Line Set Ticket.....	2
Components Covered.....	7
Components Requiring Fluid Check and Fill.....	280
Components Requiring Lubrication.....	279
Connecting / Disconnecting a Trailer to a Vehicle with Air Suspension.....	215
Controller Operation.....	48
Convenience Features.....	126

**C (CONT.)**

<i>Convenience Features (cont.)</i>	
Floor Covering.....	127
Power Inverter.....	126
Power Sockets.....	126
Sleeper Curtain.....	126
Sleeper Fan.....	127
Speakers.....	126
Television Mount.....	126
Coolant and Optional Coolant Filter.....	250
Coolant Concentration Freeze Point.....	250
Coolant Level Check.....	247
Cooling System.....	247
Antifreeze.....	251
Coolant and Optional Coolant Filter.....	250
Coolant Concentration Freeze Point.....	250
Coolant Level Check.....	247
Fan Clutch.....	251
Top-Off Coolant Fill Method.....	248
Top-Off Instructions for Cummins® X15 Engines.....	249
Top-Off Instructions for International® A26 Engines.....	248
Cooling System Refill Capacities.....	281
Courtesy Lights.....	63
Crankcase and Oil Filters.....	281
Crankcase Ventilation Filter.....	252
Creep Mode.....	172
Cruise Control.....	67
Engine Brake.....	69
Gear Selection.....	68
Manual / Automatic Mode.....	68
Stalk Shifter Operation.....	68
Turn Signal Stalk.....	69
Customer Security Guide for International® Trucks.....	10

**D**

Dash Components.....	46
Daytime Running Lights (DRL).....	62
DEF Contamination or SCR System Fault.....	181
DEF Tank.....	177
DEF Tank Filling.....	255
Desiccant Filter.....	232
Diesel Exhaust Fluid.....	176
Diesel Exhaust Fluid (DEF) Storage.....	4
Diesel Exhaust Fluid Tank.....	281
Diesel Particulate Filter (DPF).....	255
Cleaning.....	256
Regeneration.....	255
Diesel Particulate Filter (DPF) Regeneration Table.....	190
Direct Drive Warning Indicators.....	58
Disc Wheel Nut Torque Chart.....	287
Dome Light.....	105
Dome Lighting.....	62
Door and Window Controls.....	89
Door Lock / Unlock.....	89
Automatic Door Lock Function	
Unlocking the Door.....	91
Cab Doors and Locks.....	89
Lock / Unlock from Interior.....	90
Remote Keyless Entry Operation (Optional).....	89
Driver / Passenger Windows.....	91
Manual Operation.....	91
Mirror Controls.....	92
Power Operation.....	92
Vent Window.....	92
Door Lock / Unlock.....	89
Automatic Door Lock Function.....	91
Cab Doors and Locks.....	89

### **D** (CONT.)

<i>Door Lock / Unlock (cont.)</i>	
Lock / Unlock from Interior.....	90
Remote Keyless Entry Operation (Optional).....	89
Double Clutch Procedures.....	170
Downhill Operation.....	193
Dresser Cabinet.....	123
Drive Shafts.....	256
Driver / Passenger Windows.....	91
Manual Operation.....	91
Mirror Controls.....	92
Power Operation.....	92
Vent Window.....	92
Driver Assist Steering Features.....	101
Driver Reward.....	101
Driver-Controlled Differential Lock.....	174
Driver-Side.....	23
Driver-Side Cab.....	131
Dual Tires Matching.....	263
Dual Tires Mixing.....	263

### **E**

Eaton Over-speed Protection.....	172
Eaton® Endurant™ Transmission.....	171
Eaton® UltraShift+® Transmissions (If Equipped).....	171
Electrical.....	155, 236
Accessory Feed Connections.....	239
Alternator.....	155
Auto Start / Stop System Battery Cables: International® RH™ Vehicles Only.....	238
Auto Start / Stop System Battery Cables: LT® Vehicles Only.....	237

### **E** (CONT.)

<i>Electrical (cont.)</i>	
Batteries.....	236
Battery Cables.....	237
Battery.....	156
Circuit Breakers, Fuses and Fusible Links.....	158
Electrical Charging and Starting System Test.....	239
Electrical Load Control and Shedding (ELCS).....	159
Fuses and Relays.....	239
High Current Relay.....	238
Maxwell® Engine Start Module (ESM).....	156
Terminal Inspection-Cleaning-Corrosion Protection.....	239
Electrical Charging and Starting System Test.....	239
Electrical Load Control and Shedding (ELCS).....	159
Electrical System.....	45
Electronic Climate Controller.....	112
Electronic Engine Controller.....	160
Electronic Gauge Cluster Alarms.....	59
Sleeper Temperature General Text and Warning Messages.....	61
Electronic Touchscreen.....	88
Vehicle Information Display.....	88
Emergency Starting.....	150
Emission Control Systems.....	6
HD-OBD Foreword.....	6
Supplemental Federal Emission Control System Warranty...6	
Components Covered.....	7
GHG Emission Control System Warranty Period.....	7
Supplemental Federal Emission Control System Maintenance, Repair, and Replacement.....	8
Engaging the Clutch.....	168
Engine.....	159, 240

**E (CONT.)**

*Engine (cont.)*

Air Cleaner Element Service: International® RH™ Vehicles Only.....	244
Air Cleaner Element Service: LT® Vehicles Only .....	242
Air Compressor Cycling.....	163
Air Induction System.....	241
Air Restriction Gauge.....	241
Charge Air Cooler.....	160
Charge Air Cooler and Radiator Core Inspection and Cleaning.....	247
Inspection and Cleaning.....	247
Cooling System.....	247
Antifreeze.....	251
Coolant and Optional Coolant Filter.....	250
Coolant Concentration Freeze Point.....	250
Coolant Level Check.....	247
Fan Clutch.....	251
Top-Off Coolant Fill Method.....	248
Top-Off Instructions for Cummins® X15 Engines.....	249
Top-Off Instructions for International® A26 Engines....	248
Crankcase Ventilation Filter.....	252
Electronic Engine Controller.....	160
Engine Brake.....	160
Engine Brake With Allison Transmissions.....	161
Engine Brake With Eaton® UltraShift+® Transmission Special Driver Instructions.....	161
Engine Features.....	162
Engine Fluids and Contaminated Material.....	240
Engine Oil.....	163
Engine Performance Problems.....	164
Fuel System.....	251

**E (CONT.)**

*Engine (cont.)*

Fuel Tank Draining and Cleaning.....	251
HD-OBD Overview.....	162
Scheduled Maintenance.....	240
Self Diagnostics.....	163
Stalk Shifter Engine Brake.....	161
Troubleshooting.....	246
Engine Brake.....	69, 160
Engine Brake With Allison Transmissions.....	161
Engine Brake With Eaton® UltraShift+® Transmission Special Driver Instructions.....	161
Engine Features.....	162
Engine Fluids and Contaminated Material.....	240
Engine Idle Shutdown Timer (If Equipped).....	153
Engine Idling.....	152
Engine Noise Shields / Blankets.....	253
Engine Oil.....	163
Engine Performance Problems.....	164
Engine Pop-Ups / Alerts Table.....	50
Engine Serial Number.....	18
Engine Shutdown.....	150
Engine Starting.....	149
Entering the Upper Bunk.....	119
Exhaust Aftertreatment.....	176
Exhaust Diesel Particulate Filter Regeneration.....	189
Parked Regeneration Procedure.....	192
Regeneration Inhibit Switch.....	193
Three-Position Regeneration Inhibit Switch.....	193
Two-Position Regeneration Inhibit Switch.....	193
Selective Catalytic Reduction System.....	176
DEF Contamination or SCR System Fault.....	181

## **E** (CONT.)

<i>Exhaust Aftertreatment (cont.)</i>	
DEF Tank.....	177
Diesel Exhaust Fluid.....	176
Introduction.....	176
Low DEF Level.....	177
Exhaust Diesel Particulate Filter Regeneration.....	189
Diesel Particulate Filter (DPF) Regeneration Table.....	190
Parked Regeneration Procedure.....	192
Regeneration Inhibit Switch.....	193
Three-Position Regeneration Inhibit Switch.....	193
Two-Position Regeneration Inhibit Switch.....	193
Exhaust System.....	253
Exiting Driver-Side Cab.....	132
Exiting Passenger-Side Cab.....	134
Exiting the Upper Bunk.....	120
Exposed Rubber and Unpainted Plastic Parts.....	234
Extended Chassis Skirts (If Equipped).....	24
Exterior Components.....	19
Back View: LT® Series — Long Sleeper.....	20
Front View: LT® Series — Long Sleeper.....	19
Exterior Lights Check.....	26
Exterior Noise Emissions.....	5

## **F**

Fan Clutch.....	251
Feature Codes.....	18
Fifth Wheel and Coupling Area.....	40
Fifth Wheel Jaw Monitoring.....	219
Fifth Wheel Jaw Unlock Control.....	218
Fifth Wheel Operation.....	216
Fifth Wheel Jaw Monitoring.....	219
Fifth Wheel Jaw Unlock Control.....	218

## **F** (CONT.)

<i>Fifth Wheel Operation (cont.)</i>	
Fifth Wheel Slide Switch (If Equipped).....	216
Hookup.....	217
Un-Hook.....	217
Fifth Wheel Slide Switch (If Equipped).....	216
Filter List.....	297
Floor Covering.....	127
Floor Lights.....	105
Frame.....	252
Front Axle.....	227
Alignment.....	228
Inspection and Lubrication.....	227
Normal Maintenance.....	228
Front of Tractor.....	30
Front Suspension.....	257
Front View: LT® Series — Long Sleeper.....	19
Fuel.....	164
Additional Unsafe Practices.....	165
Fuel and Lubricant Additives.....	165
Fueling Precautions.....	165
Fueling Procedures.....	165
Hazards of Diesel Fuel / Gasoline Blends.....	164
Reserve Fuel.....	166
Ultra Low Sulfur Diesel Fuel Requirements.....	164
Unacceptable Fuel Blends.....	164
Fuel and Lubricant Additives.....	165
Fuel System.....	251
Fuel Tank Draining and Cleaning.....	251
Fuel Tank Draining and Cleaning.....	251
Fueling Precautions.....	165
Fueling Procedures.....	165
Fuse Charts.....	288

**F (CONT.)**

<i>Fuse Charts (cont.)</i>	
Filter List.....	297
LT® / RH™ Series Light Information.....	296
Typical Luggage Compartment Fuse Panel Layout.....	292
Typical Under-Hood Power Distribution Module (PDM) Fuse Panel Layout.....	292
Fuses and Relays.....	239

**G**

Gauges.....	47
Gear Selection.....	68
General Information	
Seat Controls and Adjustments.....	143
GHG Emission Control System Warranty Period.....	7

**H**

Hazards of Diesel Fuel / Gasoline Blends.....	164
HD-OBd Foreword.....	6
HD-OBd Overview.....	162
Headlights.....	62
Heat Mode and ESPAR Heater.....	110
Heater.....	232
High Current Relay.....	238
High Restriction Reading Table.....	246
Hill Start Aid / Hill Brake (If Equipped).....	172
Hood.....	21
Lowering the Hood.....	22
Raising the Hood.....	21
Hookup.....	217
Hot Weather Operation.....	153
How Does the Airbag Restrain?.....	136
Hub-Piloted Wheel Installation Procedures.....	266

**H (CONT.)**

HVAC Filters.....	224
Hydraulic Clutch.....	235
Hydraulic Clutch Actuation System.....	169
Hydraulic Clutch System.....	281

**I**

Indicators about DEF Quality Problem (For Vehicles Equipped with Cummins® X15 Engines) Table.....	182
Indicators about DEF Quality Problem (For Vehicles Equipped with International® A26 Engines) Table.....	183
Indicators about Low DEF Level (For Vehicles Equipped with Cummins® X15 Engines) Table.....	178
Indicators about Low DEF Level (For Vehicles Equipped with International® A26 Engines) Table.....	180
Inspection.....	262
Inspection and Adjustment.....	230
Inspection and Cleaning.....	247
Inspection and Lubrication.....	227–228
Installing Axle Shafts.....	213
Instructions for Proper Maintenance.....	252
Intellipark™ LED Operation.....	199
International Truck Warranty Program.....	299
International® T14 Drive Modes.....	172
International® T14 Transmissions.....	172
Introduction.....	176
Electrical System.....	45
Main Features.....	103
Irregular Wear.....	264

**L**

Left-Side Cab Area.....	27
-------------------------	----

### **L (CONT.)**

Left-Side Engine Compartment.....	28
Left-Side Front of Tractor.....	29
Left-Side Rear of Tractor.....	39
Light Control Module.....	61
Courtesy Lights.....	63
Daytime Running Lights (DRL).....	62
Dome Lighting.....	62
Headlights.....	62
Lights On With Wipers.....	62
Panel Lighting.....	62
Parking Lights.....	62
Rocker Switches.....	62
Lighting.....	105
Accent Lights.....	105
Dome Light.....	105
Floor Lights.....	105
Reading Lights.....	105
Lights On With Wipers.....	62
Line Set Ticket.....	2, 18
Loads.....	263
Lock / Unlock from Interior.....	90
Locking Differential.....	229
Locking or Limited Slip Differentials.....	173
Low DEF Level.....	177
Lower Bunk.....	117
Lowering the Hood.....	22
LT® / RH™ Series Light Information.....	296
Lubricant and Sealer Specifications.....	283
Lubrication and Fluids Charts.....	278
Components Requiring Fluid Check and Fill.....	280
Components Requiring Lubrication.....	279

### **L (CONT.)**

Lubrication and Maintenance Interval Chart.....	270
Lubrication and Maintenance Interval Chart Notes.....	270
Lubrication and Maintenance Interval: Truck – LT / RH Series Table.....	270
Lubrication and Maintenance Intervals.....	269
Maintenance Intervals.....	269
Lubrication and Maintenance Interval Chart.....	270
Lubrication and Maintenance Interval Chart Notes.....	270
Lubrication Points.....	258
Luggage Box Access.....	23
Driver-Side.....	23

### **M**

Main Features.....	103
Main Viewer.....	49
Maintenance Guidelines.....	221
Maintenance Intervals.....	269
Lubrication and Maintenance Interval Chart.....	270
Lubrication and Maintenance Interval Chart Notes.....	270
Lubrication and Maintenance Interval: Truck – LT / RH Series Table.....	270
Maintenance Record – Noise Control.....	254
Manual / Automatic Mode.....	68
Manual Climate Controls.....	111
Electronic Climate Controller.....	112
Manual Operation.....	91
Manual Transmissions.....	167
Maxwell® Engine Start Module (ESM).....	156
Menu Items.....	54
Mirror Controls.....	92

**N**

No Restriction Reading Table.....	246
No-Idle Heating.....	113
Noise Emissions – Exterior.....	252
Air Intake System.....	252
Body.....	252
Engine Noise Shields / Blankets.....	253
Exhaust System.....	253
Instructions for Proper Maintenance.....	252
Noise Emissions Warranty.....	5
Normal Maintenance.....	228

**O**

OnCommand® Link (If Equipped).....	94
Operating Instructions.....	154
Electrical.....	155
Alternator.....	155
Battery.....	156
Circuit Breakers, Fuses and Fusible Links.....	158
Electrical Load Control and Shedding (ELCS).....	159
Maxwell® Engine Start Module (ESM).....	156
Engine.....	159
Air Compressor Cycling.....	163
Charge Air Cooler.....	160
Electronic Engine Controller.....	160
Engine Brake.....	160
Engine Brake With Allison Transmissions.....	161
Engine Brake With Eaton® UltraShift+® Transmission Special Driver Instructions.....	161
Engine Features.....	162
Engine Oil.....	163
Engine Performance Problems.....	164

**O (CONT.)**

<i>Operating Instructions (cont.)</i>	
HD-OBD Overview.....	162
Self Diagnostics.....	163
Stalk Shifter Engine Brake.....	161
Fuel.....	164
Additional Unsafe Practices.....	165
Fuel and Lubricant Additives.....	165
Fueling Precautions.....	165
Fueling Procedures.....	165
Hazards of Diesel Fuel / Gasoline Blends.....	164
Reserve Fuel.....	166
Ultra Low Sulfur Diesel Fuel Requirements.....	164
Unacceptable Fuel Blends.....	164
Rear Axles.....	173
Driver-Controlled Differential Lock.....	174
Locking or Limited Slip Differentials.....	173
Tandem Axle Power Divider Lock (PDL) Control.....	173
Rear Suspension.....	175
Air Suspension System Faults.....	176
Rear Air Ride Suspension.....	175
Rear Air Suspension Air Dump.....	175
Steering.....	154
Adjustable Steering Column.....	155
Stationary Steering Column.....	154
Tilt Steering Column (If Equipped).....	155
Transmission.....	166
Allison Transmissions.....	171
Clutch Brake.....	171
Clutch Precautions.....	171
Double Clutch Procedures.....	170
Eaton® Endurant™ Transmission.....	171



### O (CONT.)

#### *Operating Instructions (cont.)*

Eaton® UltraShift+® Transmissions (If Equipped).....	171
Engaging the Clutch	
Shift Lever.....	168
Hydraulic Clutch Actuation System.....	169
International® T14 Transmissions.....	172
Manual Transmissions	
High Fluid Temperature.....	167
Transmission Fluid.....	166
Transmission Fluid Temperature.....	166
Transmission Features (If Equipped).....	172
Coast Mode and Neutral Coast Mode (If Equipped)....	172
Creep Mode.....	172
Eaton Over-speed Protection.....	172
Hill Start Aid / Hill Brake (If Equipped).....	172
International® T14 Drive Modes.....	172
Power Take-Off Control.....	172
Uphill and Downhill Operation.....	154
Operating the Vehicle Using Parking Brake Interlock Override Mode.....	201
Operation.....	139
Operation Safety.....	129
Cab Controls.....	130
Optional Diamond Logic® Electronic Application Solutions....	12
Other Pop-Ups / Alerts Table.....	52
Overhead Console.....	46
Base Electronic Gauge Cluster Overview.....	47
Gauges.....	47
Controller Operation.....	48
Direct Drive Warning Indicators.....	58
Electronic Gauge Cluster Alarms.....	59

### O (CONT.)

#### *Overhead Console (cont.)*

Sleeper Temperature General Text and Warning Messages.....	61
Light Control Module.....	61
Courtesy Lights.....	63
Daytime Running Lights (DRL).....	62
Dome Lighting.....	62
Headlights.....	62
Lights On With Wipers.....	62
Panel Lighting.....	62
Parking Lights.....	62
Rocker Switches.....	62
Overview.....	55
Screen Layout.....	49
Main Viewer.....	49
Menu Items.....	54
Overview.....	49
Pop-ups.....	49
Transmission Information.....	54
Overview.....	49, 55, 93

### P

Panel Lighting.....	62
Parked Regeneration Procedure.....	192
Parking Brake.....	196
Parking Brake Alarm.....	197
Parking Brake Reset.....	197
Parking Brake Alarm.....	197
Parking Brake Indicator.....	203
Parking Brake Reset.....	197
Parking Lights.....	62

**P (CONT.)**

Parking the Vehicle When Parking Brake Cannot be Applied.....	200
Passenger-Side Cab.....	133
Pedal Free Travel.....	234
Pop-ups.....	49
Power Inverter.....	126
Power Operation.....	92
Power Receptacle.....	113
Power Sockets.....	126
Power Steering.....	258
Power Steering Systems.....	281
Power Take-Off Control.....	172
Predictive Cruise Control (PCC) System.....	92
Preface.....	1
Preparation.....	26
Purge Valve.....	232

**R**

Radio Remote Control.....	113
Raising the Hood.....	21
Reading Lights.....	105
Rear Air Ride Suspension.....	175
Rear Air Suspension Air Dump.....	175
Rear Axle.....	228
Inspection and Lubrication.....	228
Rear Axle Unit Refill Capacities.....	282
Rear Axles.....	173
Driver-Controlled Differential Lock.....	174
Locking or Limited Slip Differentials.....	173
Tandem Axle Power Divider Lock (PDL) Control.....	173
Rear of Cab.....	35
Rear of Tractor.....	38

**R (CONT.)**

Rear Suspension.....	175, 257
Air Suspension System Faults.....	176
Rear Air Ride Suspension.....	175
Rear Air Suspension Air Dump.....	175
Recirculation Filter.....	226
Refrigerator Cabinet.....	122
Regeneration.....	255
Regeneration Inhibit Switch.....	193
Remote Keyless Entry Operation (Optional).....	89
Remote Power Inverter Panel.....	113
Removing Axle Shafts Before Towing.....	211
Replacing Airbag System Parts after a Crash.....	138
Reporting Safety Defects.....	9
Canadian Registered Vehicles.....	9
U.S. Registered Vehicles.....	9
Reserve Fuel.....	166
Reservoir Moisture Draining.....	195
Restraint Webbing System (Optional).....	115
Reverse Towing Vehicle With Rear Wheels Suspended.....	213
Right-Side Engine Compartment.....	33
Right-Side Front of Tractor.....	31
Right-Side of Cab.....	34
Right-Side Rear of Tractor.....	37
Right-Side Under Vehicle.....	36
Rocker Switches.....	62
Rollaway Prevention.....	198
RollTek Rollover Protection System.....	144
RollTek Rollover Protection System Operation.....	146
RollTek System Inspection and Service.....	148
RollTek Rollover Protection System Operation.....	146
RollTek System Inspection and Service.....	148

### **R** (CONT.)

RollTek® SRS System Seat Belt Pretensioning Device.....	142
Care of Seat Belts.....	142
Rotation.....	263
Rotation Is Advisable.....	263
Tire Replacement.....	264
Rotation Is Advisable.....	263

### **S**

Safety Recalls, Emission Recalls, and Authorized Field Changes.....	9
Scheduled Maintenance.....	240
Screen Layout.....	49
ABS Pop-Ups / Alerts Table.....	52
Engine Pop-Ups / Alerts Table.....	50
Main Viewer.....	49
Menu Items.....	54
Other Pop-Ups / Alerts Table.....	52
Overview.....	49
Pop-ups.....	49
Transmission Information.....	54
Transmission Pop-Ups / Alerts Table.....	52
Vehicle Pop-Ups / Alerts Table.....	50
Seat Belts.....	138
Comfort Clip (If Equipped).....	140
Operation.....	139
RollTek® SRS System Seat Belt Pretensioning Device....	142
Care of Seat Belts.....	142
Seat Controls and Adjustments.....	143
Seats.....	142
General Information	
Seat Controls and Adjustments.....	143

### **S** (CONT.)

#### *Seats (cont.)*

RollTek Rollover Protection System.....	144
RollTek Rollover Protection System Operation.....	146
RollTek System Inspection and Service	
RollTek Unit Cover Second Warning Label.....	148
Selective Catalytic Reduction System.....	176
DEF Contamination or SCR System Fault.....	181
DEF Tank.....	177
Diesel Exhaust Fluid.....	176
Indicators about DEF Quality Problem (For Vehicles Equipped with Cummins® X15 Engines) Table.....	182
Indicators about DEF Quality Problem (For Vehicles Equipped with International® A26 Engines) Table.....	183
Indicators about Low DEF Level (For Vehicles Equipped with Cummins® X15 Engines) Table.....	178
Indicators about Low DEF Level (For Vehicles Equipped with International® A26 Engines) Table.....	180
Introduction.....	176
Low DEF Level.....	177
Warnings of SCR System Fault (For Vehicles Equipped with Cummins® X15 Engines) Table.....	185
Warnings of SCR System Fault (For Vehicles Equipped with International® A26 Engines) Table.....	187
Self Diagnostics.....	163
Service Information.....	299
Servicing the Airbag-Equipped Vehicle.....	137
Side Access HVAC Filter.....	225
Sleeper Control Panel.....	106
Accent Light Dimmer Switch.....	107
Accent Light Switch.....	107
Auto Start / Stop System.....	107

**S (CONT.)**

<i>Sleeper Control Panel (cont.)</i>	
Auto Start / Stop Mode.....	109
Auto Start / Stop System and HVAC Controls.....	109
Air Conditioning Mode.....	111
Heat Mode and ESPAR Heater.....	110
Vehicles Equipped with ESPAR Heaters.....	110
Vehicles Not Equipped with ESPAR Heaters.....	110
Manual Climate Controls.....	111
Electronic Climate Controller.....	112
No-Idle Heating.....	113
Power Receptacle.....	113
Radio Remote Control.....	113
Remote Power Inverter Panel.....	113
Sleeper Dome / Floor Light Switch.....	107
Sleeper Curtain.....	126
Sleeper Dome / Floor Light Switch.....	107
Sleeper Fan.....	127
Sleeper HVAC Filter.....	227
Sleeper Temperature General Text and Warning Messages..	61
Speakers.....	126
Stability Control Systems – Bendix® RSP / WABCO® RSC /	
Bendix® ESP.....	207
Stalk Shifter Engine Brake.....	161
Stalk Shifter Operation.....	68
Starting Procedures	
After the Engine Starts.....	150
Cold Weather.....	151
Cold Weather Operation.....	152
Cold Weather Starting.....	151
Engine Idle Shutdown Timer (If Equipped).....	153
Engine Idling.....	152
Winter Front Usage.....	153

**S (CONT.)**

<i>Starting Procedures (cont.)</i>	
Emergency Starting.....	150
Engine Shutdown.....	150
Engine Starting.....	149
Hot Weather Operation.....	153
RollTek System SRS Diagnostic Lamp	
RollTek System SRS Diagnostic Lamp	
RollTek System SRS Diagnostic Lamp.....	148
Stationary Steering Column.....	154
Steering.....	154, 257
Adjustable Steering Column.....	155
Lubrication Points.....	258
Power Steering.....	258
Stationary Steering Column.....	154
Tightening Steering Intermediate Shaft Joint Bolts.....	258
Tilt Steering Column (If Equipped).....	155
Steering Column and Switches.....	67
Cruise Control	
Engine Brake.....	69
Gear Selection.....	68
Manual / Automatic Mode.....	68
Stalk Shifter Operation.....	68
Turn Signal Stalk.....	69
Steering Wheel Controls.....	64
Cruise Control.....	67
Supplemental Federal Emission Control System Maintenance,	
Repair, and Replacement.....	8
Supplemental Federal Emission Control System Warranty....	6
Components Covered.....	7
GHG Emission Control System Warranty Period.....	7
Supplemental Federal Emission Control System	
Maintenance, Repair, and Replacement.....	8

### **S** (CONT.)

Supporting Your Vehicle for Service.....	223
Suspension (Air and Steel Springs).....	256
Front Suspension.....	257
Rear Suspension.....	257
Switches.....	74

### **T**

Tampering with Noise Control System Prohibited.....	5
Tandem Axle Power Divider Lock (PDL) Control.....	173
Telematics Module (If Equipped).....	93
Telematics Module Indicators.....	94
Television Mount.....	126
Terminal Inspection-Cleaning-Corrosion Protection.....	239
Three-Position Regeneration Inhibit Switch.....	193
Tightening Steering Intermediate Shaft Joint Bolts.....	258
Tilt Steering Column (If Equipped).....	155
Tire Maintenance.....	261
Checking Inflation.....	262
Tire Pressure Monitoring System (TPMS).....	261
Underinflation.....	262
Tire Pressure Monitoring System (TPMS).....	261
Tire Replacement.....	264
Tire Warnings.....	259
Tires.....	259
Dual Tires Matching.....	263
Dual Tires Mixing.....	263
Inspection.....	262
Loads.....	263
Rotation.....	263
Rotation Is Advisable.....	263
Tire Replacement.....	264

### **T** (CONT.)

#### *Tires (cont.)*

Tire Maintenance.....	261
Checking Inflation.....	262
Tire Pressure Monitoring System (TPMS).....	261
Underinflation.....	262
Tire Warnings.....	259
Use of Tire Chains.....	265
Wear.....	264
Irregular Wear.....	264
Wheel and Tire Balancing.....	264
Top-Off Coolant Fill Method.....	248
Top-Off Instructions for Cummins® X15 Engines.....	249
Top-Off Instructions for International® A26 Engines.....	248
Torque Specifications.....	287
Disc Wheel Nut Torque Chart.....	287
Tow Hooks (If Equipped).....	210
Tower Wardrobe Cabinet.....	124
Towing Instructions.....	209
Reverse Towing Vehicle With Rear Wheels Suspended... ..	213
Tow Hooks (If Equipped).....	210
Towing Vehicle With Front Wheels Suspended.....	211
Towing Vehicles With Driver-Controlled Differential Lock... ..	211
Installing Axle Shafts.....	213
Removing Axle Shafts Before Towing.....	211
Towing Vehicle With Front Wheels Suspended.....	211
Towing Vehicles With Driver-Controlled Differential Lock... ..	211
Installing Axle Shafts.....	213
Removing Axle Shafts Before Towing.....	211
Tractor Inspection.....	26
Battery Box (Between Frame Rail).....	41
Cab Interior Inspection.....	42

**T (CONT.)***Tractor Inspection (cont.)*

Exterior Lights Check.....	26
Fifth Wheel and Coupling Area.....	40
Front of Tractor.....	30
Left-Side Cab Area.....	27
Left-Side Engine Compartment.....	28
Left-Side Front of Tractor.....	29
Left-Side Rear of Tractor.....	39
Preparation.....	26
Rear of Cab.....	35
Rear of Tractor.....	38
Right-Side Engine Compartment.....	33
Right-Side Front of Tractor.....	31
Right-Side of Cab.....	34
Right-Side Rear of Tractor.....	37
Right-Side Under Vehicle.....	36
Tractor-Trailer Connections.....	215
Connecting / Disconnecting a Trailer to a Vehicle with Air Suspension.....	215
Fifth Wheel Operation.....	216
Fifth Wheel Jaw Monitoring.....	219
Fifth Wheel Jaw Unlock Control.....	218
Fifth Wheel Slide Switch (If Equipped).....	216
Hookup.....	217
Un-Hook.....	217
Trailer Air Supply and Parking Brake Modular Controls.....	202
Trailer Brake Hand Control.....	202
Transmission.....	166, 268
Allison Transmissions.....	171
Clutch Brake.....	171
Clutch Precautions.....	171
Double Clutch Procedures.....	170

**T (CONT.)***Transmission (cont.)*

Eaton® Endurant™ Transmission.....	171
Eaton® UltraShift® Transmissions (If Equipped).....	171
Engaging the Clutch.....	168
Hydraulic Clutch Actuation System.....	169
International® T14 Transmissions.....	172
Manual Transmissions.....	167
Transmission Fluid.....	166
Transmission Fluid Temperature.....	166
Transmission Features (If Equipped).....	172
Coast Mode and Neutral Coast Mode (If Equipped).....	172
Creep Mode.....	172
Eaton Over-speed Protection.....	172
Hill Start Aid / Hill Brake (If Equipped).....	172
International® T14 Drive Modes.....	172
Power Take-Off Control.....	172
Transmission Fluid.....	166
Transmission Fluid Temperature.....	166
Transmission Information.....	54
Transmission Pop-Ups / Alerts Table.....	52
Troubleshooting.....	246
High Restriction Reading Table.....	246
No Restriction Reading Table.....	246
Turn Signal Stalk.....	69
Two-Position Regeneration Inhibit Switch.....	193
Typical Luggage Compartment Fuse Panel Layout.....	292
Typical Under-Hood Power Distribution Module (PDM) Fuse Panel Layout.....	292

**U**

U.S. Registered Vehicles.....	9
Ultra Low Sulfur Diesel Fuel Requirements.....	164

### **U** (CONT.)

Un-Hook.....	217
Unacceptable Fuel Blends.....	164
Under Bunk Refrigerator.....	122
Underinflation.....	262
Unit Refill Capacities.....	281
Cooling System Refill Capacities.....	281
Crankcase and Oil Filters.....	281
Diesel Exhaust Fluid Tank.....	281
Hydraulic Clutch System.....	281
Power Steering Systems.....	281
Rear Axle Unit Refill Capacities.....	282
Uphill and Downhill Operation.....	154
Upholstery Care.....	233
Upper Bunk.....	118
Entering the Upper Bunk.....	119
Exiting the Upper Bunk.....	120
Use of Tire Chains.....	265

### **V**

Vehicle Identification.....	18
Engine Serial Number.....	18
Feature Codes.....	18
Line Set Ticket.....	18
Vehicle Identification Number (VIN).....	18
Vehicle Identification Number (VIN).....	18
Vehicle Information Display.....	88
Vehicle Pop-Ups / Alerts Table.....	50
Vehicle Storage Instructions.....	2
Vehicle Telematics.....	93
OnCommand® Link (If Equipped).....	94
Overview.....	93

### **V** (CONT.)

#### *Vehicle Telematics (cont.)*

Telematics Module (If Equipped).....	93
Telematics Module Indicators.....	94
Vehicles Equipped with ESPAR Heaters.....	110
Vehicles Not Equipped with ESPAR Heaters.....	110
Vent Window.....	92

### **W**

WABCO® OnGuard™ Collision Safety System.....	99
Warnings of SCR System Fault (For Vehicles Equipped with Cummins® X15 Engines) Table.....	185
Warnings of SCR System Fault (For Vehicles Equipped with International® A26 Engines) Table.....	187
Washing and Waxing.....	233
Wear.....	264
Irregular Wear.....	264
What Makes the Airbag Inflate?.....	135
What Will You See After the Airbag Inflates?.....	136
Wheel and Tire Balancing.....	264
Wheel and Wheel Nut Maintenance and Installation.....	265
Hub-Piloted Wheel Installation Procedures.....	266
Wheel Nut Torque Maintenance.....	266
Wheel Nut Torque Maintenance.....	266
Wheels.....	265
Wheel and Wheel Nut Maintenance and Installation.....	265
Hub-Piloted Wheel Installation Procedures.....	266
Wheel Nut Torque Maintenance.....	266
When Should the Airbag Inflate?.....	135
Windows.....	114
Winter Front Usage.....	153