INTERNATIONAL®

Medium

1000
4000

Operator's Manual

- Do Not Remove This Manual From Vehicle
- Study Manual Carefully Before Operating Vehicle
- Pay Close Attention to All Notes & Cautions
- Carefully Read and Fully Follow All Warnings
- If You Sell The Vehicle Give The Manual To The New Owner

CONTENTS

Vehicle Inspection Guide

To be sure your vehicle is ready to operate, conduct a pre-trip inspection at the beginning of each work period. Follow the steps below and check them off to assure a proper vehicle inspection procedure. The pages in this section may be reproduced locally and used on a regular basis.

1. *Engine Compartment – with the engine stopped, check the following:*

_____ **Oil Level** – Use dip stick to verify that the oil level is between the full and refill mark.

_____ **Coolant Level** – Look at sight glass of reservoir, or remove the radiator cap to see the level. Adequate level will show in sight glass or be visible in the radiator when the cap is removed. ***Do Not Remove Radiator Cap Until Radiator Has Cooled.*** See *Cooling System* in Section B.

_____ **Power Steering Fluid** – Use the dip stick to verify that the fluid level is between the full and refill mark.

_____ **Water Pump** – With engine off, touch or press belt to test that it is snug. Check for frays, cracks, loose fibers, or visible signs of wear. If it deflects more than $^1/_2$ to $^3/_4$ of an inch, slippage is probably excessive.

_____ **Alternator** – Check belts the same as for Water Pump.

_____ **Air Compressor** – Check belts (if so equipped) the same as for Water Pump.

_____ **Freon Compressor** – Check belts (if so equipped) the same as for Water Pump.

_____ **Any Leaks** – Check for signs of fluid puddles, or dripping fluids on the ground under the engine, or the underside of the engine.

2. *Engine Start*

_____ **Safety/Emergency Equipment** – Prior to entering cab, verify that vehicle is equipped with electrical fuses (if used); 3 red reflective triangles; and a properly charged and rated fire extinguisher, and wheel chocks. When entering cab, verify that grab handles and steps are tight and clean; use extreme caution and maintain 3 point contact at all times.

_____ **Clutch/Gearshift** – Depress clutch (if manual transmission) and verify transmission is in neutral before turning on starter; keep depressed until engine reaches idling speed.

_____ **Oil Pressure Builds** – Check to see that oil pressure is building to normal. Engine oil temperature gauge should begin a gradual rise to normal operating range.

_____ **Air Buzzer Sounds** –If the air pressure is low, the low air pressure warning should sound immediately after the engine starts but before the air compressor has built up pressure. Let the air pressure build to governed cut-out pressure, which should occur between 100-125 psi. The low air pressure warning should stop when the air pressure gets to 60 psi or more.

_____ **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.

_____ **Ammeter/Voltmeter** – Check that the gauge shows alternator or generator is charging.

_____ **Steering Play** – Check for excessive looseness in the steering linkages; it should have less than 10 degrees free play (approximately 2 inches at rim of 20 inch steering wheel).

_____ **Horn(s)** – Check to see that horn works.

_____ **Mirrors, Windshield** – check mirrors for proper adjustment; check for cracks or loose fittings. Make sure the mirrors are clean.Check the windshield for cracks, dirt, illegal stickers or other obstructions to view.

_____ **Wipers** – Check for worn rubber on blades; blades secure on wiper arm; and that wipers work.

_____ **Lighting Indicators** – Check to see that indicators illuminate when corresponding lights are turned on.

_____ **Heater/Defroster** – Check to be sure heater/defroster is working.

_____ **Air Brake Check** – Check the air brakes in the following manner:

1. Chock wheels if necessary. Push in parking brake and TPV knobs.
2. Check the air compressor or governor cut-out pressure (approximately 120 PSI).
3. Shut off engine and TURN KEY BACK ON.
4. Without brake pedal applied, note air pressure drop for one minute. It should be less than 2 PSI for single vehicles, 3 PSI for combinations.
5. Depress and hold brake pedal and make sure there is no more than a 4 PSI per minute leak.
6. Step on and off brake pedal and check for warning light and buzzer to come on at about 60 PSI.
7. Step on and off brake pedal and check to make sure the tractor protection and parking brake knobs pop out between 20 to 45 psi (138 to 310 kPa).
8. Restart engine, shift into a low gear, and gently pull against brakes to make sure they will hold.

_____ **Hydraulic Brake Check** – Pump the brake pedal three times. Then apply firm pressure to the pedal and hold for five seconds. The pedal should not move. If it does, there may be a leak or other problem. Do not drive vehicle until problem is fixed.

_____ **Parking Brake** – Check that parking brake will hold vehicle by gently trying to pull forward with parking brake on.

3. *Front of Vehicle*

_____ **Lights** – Check to see that all lights illuminate and are clean. Make sure headlights function on both high and low beams. Check to see that reflectors are clean and unbroken and of proper color (red on rear, amber elsewhere). Make sure that running lights are also clean and unbroken. Rear running lights must be checked separately from signal, flasher and brake lights.

_____ **Steering Gear** – Look for missing or loose nuts, bolts, cotter keys, etc. power steering fluid leaks; damage to power steering hose.

_____ **Steering Linkage** – Check to see that connecting links, arms, rods are not worn or cracked; joints, sockets and boot seals are not worn or loose; that there are no loose or missing cotter keys, nuts or bolts.

4. *Front Suspension*

_____ **Spring** – Look for missing, broken or shifted leaves, or ones that are in contact or nearly in contact with tires, rim, brake drum, frame or body.

_____ **Spring Mount** – Check for cracked or broken spring hangers; broken, missing or worn bolts; missing or damaged bushings; broken, loose or missing axle mounting U-bolts and nuts.

_____ **Shock Absorber** – Check for cracks or leaks, or missing and broken mounting bolts and bushings.

5. *Front Brake*

_____ **Hoses** – Check for cracked, worn or frayed hoses; and for secure couplings.

_____ **Chamber** – Check to see that the brake chambers are not cracked or dented and that they are securely mounted.

_____ **Slack Adjuster** – Check for broken, loose or missing parts; angle between push rod and adjuster arm should be approximately 90 degrees when brakes are applied. When pulled by hand, push rod should not move more than approximately 1 inch.

_____ **Drum** – Check to see there are no cracks, dents or holes; no loose or missing bolts. Check to see that brake linings (where visible) are not worn dangerously thin or contaminated by lubricant.

6. *Front Wheel*

_____ **Tires** – Check tread depth and tire inflation and note if tread is evenly worn. Look for cuts, or other damage to the tread walls. See if valve caps and stem are missing, broken or damaged. Make sure retread is not separating from tire. Retreads are not allowed on front axles of shool buses, nor are they recommended on front axles of trucks. NOTE: Minimum tread depth is 4/32 inch on front tires, and 2/32 inch on other tires.

_____ **Rims** – Check for damaged or bent rims. Rims should not have welding repairs and no rust trails that indicate it is loose on the wheel.

_____ **Lug Nuts** – Check to see that all lug nuts are present and not loose (look for rust trails around nuts). There should be no cracks radiating from lug bolt holes nor distortion of the bolt holes.

_____ **Hub Oil Seal** – Check wheel hub oil seal for leaks, and, if sight glass is present, that oil level is adequate.

_____ **Oil Lubricated Front Wheel Bearings** – If hubcap has a transparent window, check lube for proper level. If hubcap does not have a transparent window, remove rubber fill plug and check for proper level.

7. *Driver/Fuel Area*

_____ **Door, Mirror** – Check for proper adjustment. Check for cracks or loose fittings. Make sure visibility is not impaired due to dirty mirrors.

_____ **Fuel Tank** – Check to see that tank is secure; that caps are secure. Make sure there is no damage to the tank.

_____ **Leaks** – Check for any fuel leaks from tanks.

8. *Under Vehicle - Rear of Tractor*

_____ **Drive Shaft** – Check to see that shaft is not bent or cracked. Shaft couplings should be secure.

_____ **Exhaust System** – Check to see that outside visible parts are securely mounted. Check to see there are no cracks, holes or severe dents.

_____ **Frame** – Check for cracks or bends in longitudinal frame members. Make sure there are no loose, cracked, bent, broken or missing cross members.

9. *Tractor Only*

_____ **Air/Electric Lines** – Check to see that air hoses are not cut, cracked, chafed or worn (steel braid should not show through). Listen for audible air leaks. Make sure air and electrical lines are not tangled, crimped or pinched or being dragged against tractor parts. Electrical line insulation should not be cut cracked, chafed or worn. None of the air or electrical lines should be spliced or taped.

_____ **Deck Plate** – Check to see if deck plate is solid, securely bolted to tractor frame and is clean and clear of loose objects.

_____ **Lights, Reflectors** – Check to see that reflectors are clean. Make sure none are missing or broken. Check for proper color – red on rear, amber elsewhere. Rear running lights should be clean, not broken and proper color. Rear running lights must be checked separately from signal, flasher and brake lights.

Coupling System

_____ **Mounting Bolts** – Look for loose or missing mounting brackets, clamps, bolts or nuts. Both fifth wheel and slide mounting should be solidly attached.

_____ **Platform** – Check for cracks or breaks in the platform structure.

_____ **Safety Latch** – Check to see if safety latch is engaged.

_____ **Release Arm** – Check to see if release arm is in the engaged position and that any safety latch is in place.

_____ **Kingpin/Apron** – Check to see that kingpin is not bent. Make sure that apron lies flat on fifth wheel skid plate, and that visible part of apron is not bent, cracked or broken.

Sliding 5th Wheel

_____ **Locking Pins** – Check for loose or missing pins in the slide mechanism of sliding fifth wheels. If air powered, check for air leaks. Make sure that fifth wheel is not so far forward that tractor frame will strike landing gear during turns.

10. *Tractor Only – Springs*

_____ **Springs** – Check for broken leaves, leaves that have shifted and are in, or nearly in, contact with the tires, rim, brake drum, frame or body. Check for missing or broken leaves in the leaf spring. For coil spring, check for broken or distorted spring.

_____ **Spring Mounts** – Check for cracked or broken spring hangers; broken, missing or loose bolts; missing or damaged bushings; broken, loose or missing axle mounting parts.

_____ **Torsion, Shocks** – Check to see that torsion bar assembly or torque arm is not cracked, broken or missing. Check shock absorber for cracks or leaks. There should be no missing or broken mounting bolts or worn bushings.

11. *Rear Wheels*

_____ **Tires** – (Same procedure as *6. Front Wheel*)

_____ **Spacers** – Check to see that dual wheels are evenly separated, and that tires are not touching one another.

_____ **Lights, Reflectors** – Check to see that reflectors are clean. Make sure none are missing or broken. Check for proper color – red on rear, amber elsewhere. Rear running lights should be clean, not broken and proper color. Rear running lights must be checked separately from signal, flasher and brake lights.

_____ **Rims** – Check for damaged or bent rims. Rims should not have welding repairs and no rust trails that indicate it is loose on the wheel.

_____ **Lug Nuts** – Check to see that all lug nuts are present and not loose (look for rust trails around nuts). There should be no cracks radiating from lug bolt holes nor distortion of the bolt holes.

12. *Rear of Vehicle*

_____ **Signal/Brake Lights** – Check to see that both brake lights come on when brakes are applied. Make sure each signal light flashes; and check that four-way flashers work.

13. *Trailer*

_____ **If you** are operating a tractor w/trailer attached, an inspection of the trailer similar to that of the tractor should be done. Such an inspection should follow trailer manufacturer recommendations and should include at a minimum: general condition, landing gear, doors, sides, lights, reflectors, suspension, brakes, tires and wheels.

Section A: To The Owner

To The Owner

CAUTIONS AND WARNINGS

Throughout this manual you will find Cautions and Warnings:

CAUTION

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

⚠ WARNING

Warnings will advise you of the proper care to be taken, not only to avoid damage to your vehicle or property, but to help prevent situations and occurrences which could cause serious personal injury and possibly death.

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.

Navistar believes that every customer is entitled to the best service, both from the product itself and from the firm who sells and services that product.

If, for any reason, 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 International Sales Region Office or the Customer Relations Manager.**

Addresses of Region Sales Offices and the Customer Relations Manager are found on the first page of this manual. Should you desire to contact any of these offices, it is important to include the following information in your communication.

1. Name under which new vehicle was purchased, address and telephone number of purchaser
2. Vehicle model, year, vehicle identification number, component code and serial numbers
3. Vehicle delivery date and present mileage
4. Location where purchased
5. Details of the problem

We sincerely appreciate your purchase of an International® vehicle. Remember, you are entitled to and shall receive every consideration and complete service involving your vehicle. Thank you for favoring us with your business!

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 alphabetical letters. These codes are listed on the Vehicle Line Setting Ticket which is sometimes known as the vehicle specification card or code sheet.

LINE SETTING TICKET

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

One copy of the line setting 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 Setting Ticket To Vehicle After Obtaining Parts.

VEHICLE STORAGE INSTRUCTIONS

When a vehicle is not used for an extended period of time, certain precautions must be taken to prevent deterioration of some components. Contact your dealer for advice on vehicle storage, as well as proper procedures to follow when you return the vehicle to service.

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. 20402

Navistar International Transportation Corp. 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, cause 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: A. Air Intake System: Removal of air cleaner, intake silencer or piping. B. Acoustical Shielding (Body): Removal of wheel well splash shields, cab shields or acoustical (underhood) insulation. C. Cooling System: 1. Removal or rendering inoperative the fan clutch. 2. Removal of fan shrouds. D. Engine and Driveline System: 1. Removal or rendering engine speed governor inoperative so as to allow engine speed to exceed manufacturer specifications. 2. Removal of engine block shield, oil sump shield or transmission enclosures. E. Exhaust System: Removal or rendering inoperative exhaust system components including muffler, resonator or tailpipe.

EMISSION CONTROL SYSTEMS

NOTE: Federal and California Emission system warranties are found in your Engine Operator's Manual.

SAFETY CHECKS AND PRECAUTIONS

Every effort has been made to assure that your new vehicle has been engineered and manufactured to provide continued trouble-free service. Materials selected to manufacture the many parts which make up the vehicle undergo exhaustive testing and research to make certain that acceptable, safe service life is realized.

There is, however, an area in which the vehicle owner plays an important part and which determines in a large measure the extent of continued, trouble-free service to be realized from the owner's investment in the vehicle. This has to do with the owner's responsibility in seeing that the vehicle receives proper care by following the periodic lubricating procedures and arranging the regular inspection intervals to assure that parts that normally wear out are replaced or repaired. In addition, ask your International® dealer to make an inspection of your vehicle at least once a year.

A good, general vehicle check by an experienced serviceman will give you assurance that your vehicle is still in a safe condition.

The lubrication intervals present a good opportunity to inspect the vehicle, and we suggest the following points be checked at these intervals.

NOTE: Refer to the *Vehicle Inspection Guide* at the front of this manual for a recommended daily inspection routine.

ACCELERATOR

Check to assure that accelerator system is smooth, does not bind, and returns engine to idle properly.

AXLE - FRONT

Maintaining proper front axle alignment specifications is of great importance and should only be performed by a qualified mechanic. Check to assure that axle mounting U–bolt nuts, attaching or mounting bolts and nuts are securely tightened. Regularly check front axle for damaged, binding or worn parts, and adequate lubrication.

AXLE - REAR

Check to assure that axle mounting U–bolt nuts, attaching or mounting bolts and nuts are securely tightened. Regularly check rear axle for damaged, binding or worn parts.

BRAKE SYSTEM

Brake Lining Adjustment – Always maintain proper lining adjustment.

Brake Lining Inspection – Inspect brake linings for wear. Refer to MAINTENANCE, BRAKES, Air or Hydraulic for inspection interval.

Parking Brake Adjustment – Always maintain proper parking brake lever adjustment.

Where vehicles are used in severe service or in considerable stop–and–go service, more frequent inspections should be scheduled.

On a periodic basis or at least once a year inspect entire brake system for:

1. Brake controls (Refer to RUBBER PARTS, in this section).
2. Condition of drums, brake chambers, slack adjusters, discs and calipers.
3. Air leaks, hydraulic fluid leaks.
4. Hose or pipe damage.
5. Operation of service and parking brakes.

CAB

Defrosters – Operate defroster controls to determine if sufficient air is being directed against windshield.

Door Latches – Check latches for positive closing, latching and locking.

Glass – Check for cracked, broken, scratched or dirty glass including rear view mirrors.

Mirrors – Check to be certain all mirrors are clean, properly adjusted and in good condition.

Seats – Be sure manually operated seats are firmly engaged to avoid forward or rearward movement when starting or stopping.

Seat Belts – Check the entire seat belt assembly for wear and proper operation. Make certain anchor mountings are tight.

Steps and Grabhandles – Check to make sure all steps and grabhandles are tight and undamaged.

Upper Sleeper Bunks – Check latch for positive latching and locking.

In addition to the above, check condition of cab mounting brackets, sheet metal, rubber mountings and safety prop when equipped.

CLUTCH

Maintain specified clutch pedal adjustment. Regularly inspect clutch control linkage for tightness. Refer to MAINTENANCE, CLUTCH for more detail.

COOLING

WARNING

Exercise great caution when working on vehicles equipped with an automatic fan clutch. The fan starts in motion only after engine coolant reaches a predetermined temperature or the freon pressure (if equipped with air conditioning) reaches a predetermined setting. The fan will start in motion at these points with no advance warning. To avoid injury to yourself or damage to the vehicle never reach or permit objects to protrude into the fan blade radius while the engine is running.

ELECTRICAL

Horn – Occasionally blow the horn (air or electric) to check for satisfactory operation.

Instruments – Check operation of all instruments and gauges.

Lights – Be sure lights, regardless of type or where they are located, will illuminate at all times.

Wiring – Replace loose, weathered, cracked or broken wires to safeguard against breakdown on the road or possible shorts.

Batteries – Check charge level. Batteries should be kept at full charge.

EXHAUST SYSTEM

Inspect heat shields for proper installation or location. Maintain exhaust system (mufflers, pipes, tail pipes, joints) integrity to assure no exhaust fumes can enter cab area.

WARNING

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 that could result in property damage or severe personal injury.

FRAME

Because International® chassis are manufactured with frame rails of either cold rolled steel, heat–treated steel or aluminum alloy, each must be handled in a specific manner to assure maximum service life.

Specific instructions are published, concerning proper repair of frame rails and can be obtained from your nearest International dealer.

FUEL SYSTEM

Frequently check throttle linkage for proper operation. Inspect for leaks and general condition of fuel tanks, fuel lines, clips and routing.

PROPELLER SHAFT

At the regular lubrication interval, check universal joints for wear. Should propeller shaft vibrations occur, stop the vehicle immediately to avoid possible hazardous consequences or damage to other components.

RUBBER PARTS

Rubber parts are subject to deterioration. Brake components should be considered for periodic replacement once each year based upon the severity and length of service. Usually careful inspection by experienced mechanics will disclose the need for attention.

SPRINGS

Maintain specified torque on spring U–bolt nuts. Periodically check condition of spring leaves for evidence of fatigue, bending or breakage.

CAUTION

Never apply grease to spring pads.

STEERING

Be alert to any change (feel) in steering when driving. This change or feel would include increased steering efforts, unusual sounds when turning, excessive wheel play or pulling to either side.

Check tie rod and drag link end clamp bolts. They must be tight. Ask a service technician to examine the steering mechanism. Minor adjustments could head off further problems.

Check power steering system for leaks or hose chafing. Repair at once. Maintain proper steering gear and power steering pump lubricant levels. Regularly inspect all steering linkage, particularly for body or chassis clearance.

SUSPENSIONS

Check condition of suspension mounting brackets or bushings. Suspension alignment must be maintained at all times.

⚠ WARNING

Do not operate vehicle if any of the above conditions are evident. Loss of steering or suspension could result in personal injury if these conditions are not corrected.

TOW HOOKS

Front and rear tow hooks should be inspected for damage or a loose mounting. This is of great importance, particularly on vehicles used in operations where the tow hooks are frequently required.

TRANSMISSION

Check fluid level and shift linkage for proper operation.

⚠ WARNING

If vehicle is equipped with an automatic transmission, have a qualified technician occasionally check operation of transmission neutral start switch. If unit starts in gear the vehicle may inadvertently move resulting in collision and personal injury.

WHEELS

Check condition and maintain recommended torque on wheel and rim mounting bolts and nuts. Check condition of tires for abnormal wear patterns, and proper inflation pressures. Cut or broken tire casing must be repaired.

⚠ WARNING

To avoid personal injury and property damage if a wheel 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.

Wheel bearings must be properly packed and adjusted at regular intervals.

REPORTING SAFETY DEFECTS

U.S. REGISTERED VEHICLES

If you believe that your vehicle has a defect which 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 International Transportation Corp.

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, your dealer, or Navistar International Transportation Corp.

To contact NHTSA, you may either call the Auto Safety Hotline toll–free at 1–800–424–9393 (or 366–0123 in Washington, D.C. area) or write to: NHTSA, U.S. Department of Transportation, Washington, D.C. 20590. You can also obtain other information about motor vehicle safety from the Hotline.

CANADIAN REGISTERED VEHICLES

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

To contact Navistar International Corporation Canada, you may either call 416–528–7700 or write to: Navistar International Corporation Canada, 120 King Street West, PO Box 2020, Hamilton, Ontario L8N 3S5.

To contact Transport Canada, write to: Transport Canada, Motor Vehicle Defect Investigation, PO Box 8880, Ottawa, Ontario K1G 3J2.

NAVISTAR CUSTOMER SECURITY GUIDE

Navistar has prepared this guide to help you protect your truck/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. While no system or device is 100% effective, our intention is to provide some tips that you or your drivers can use to reduce the risk of theft.

- Etch your Vehicle Identification Number on one of your side windows. Contact your International®dealer for information.
- Drop a business card with your name on it between the glass and door frame. This can aid in identifying the truck when it's recovered.
- Keep a copy of the lineset ticket in a location other than your truck for reporting purposes and a copy of the V.I.N. 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.
- Whenever possible, park your truck in well lit areas where it can be seen.
- Lock all doors when unattended.
- Steering locks that slide into the steering shaft u–joint are easy to use and provide a very high level of affordable theft protection.
- High quality wheel locks can help prevent tire and wheel theft.
- Trailers can be protected by using fifth wheel and trailer locks.
- Install a hidden ignition cutoff switch or fuel cutoff switch.
- Report a theft as soon as it's 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 C.B. radio or remove it when you will be away from your truck.
- Do not discuss where your rig is located when you are not on the road.
- Do not share information about your specific destination, or the load you are hauling.
- Exercise caution and good judgement when asked numerous questions by people you do not know concerning your business activities.

The following information block can assist you in reporting a theft when completely filled out.

VIN:

Model/Year:

Engine Serial Number:

License Number:

Insurance Co.:

Policy Number:

Phone Number:

Other:

Put a copy of this information in your wallet.

Section B: Operation

Operation

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 and steering systems, can adversely affect the quality and reliability of your vehicle. Such modifications must be avoided.

WARNING

This vehicle has many parts dimensioned in the metric system as well as the English system. Some fasteners are metric and are very close in dimension to well-known English fasteners in the inch system. Mismatched or incorrect fasteners can result in damage to the vehicle or possibly personal injury.

VEHICLE ENTRY AND EXIT

WARNING

Do not use side mounted fairing (wind deflector) brackets and braces as steps or grab handles. They are not intended for that purpose; they could fail and serious personal injury could result.

WARNING

Certain steps may be of a folding or pivoting design. Be certain that such steps are firmly engaged in the weight bearing position before placing full weight on the step.

WARNING

Failure to exercise due care when entering and exiting vehicles can result in personal injury. Entry and exit should be made slowly, deliberately and carefully.

WARNING

A three–point stance should be used (three out of four extremities should be in contact with the vehicle at all times). Face inward toward steps and handholds 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.

WARNING

Do not step or climb upon any vehicle surface unless it is slip resistant and handholds are provided.

OCCUPANT RESTRAINT SYSTEM

WARNING

Always use occupant restraint system when vehicle is being operated. Any location in the vehicle not equipped with a seat belt, bunk restraint belts or sleeper berth restraint webbing is not intended to be occupied when the vehicle is being operated. Failure to properly use an occupant restraint system may result in serious personal injury or death in the event of a vehicle accident .

Two types of sleeper berth occupant restraint systems are available with sleeper berths supplied by Navistar. If an upper bunk of a 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:

- **Two Sets of Adjustable Belts**
  To use the two–belt system, the bunk occupant should place one belt set across the lower body (positioned above the occupant's knees but below the hips), and the other belt set should be positioned across the upper body (above the hips but below the shoulders). Slack must be removed from each belt set after connecting the buckle by pulling the loose end of each belt set to fit the connected belt set snugly across the occupant's body.
- **Belt Webbing Closure System (Optional)**
  To use the webbing closure system, the occupant must close the buckle in the middle of the webbing system after entering the sleeper berth area. After the buckle is closed, the webbing closure must be tightened snugly by pulling on the loose end of the belt at the buckle.

SEAT ADJUSTMENT

WARNING

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

Operating this vehicle over rough roads or surfaces can result in personal injury. Use caution and reduce speed. Properly adjusted seats and seating systems may not compensate completely for severe road conditions.

BENCH OR BUCKET TYPE SEAT WITH SINGLE LEVER ADJUSTMENT

These seats have fore and aft adjustment only. Adjust while sitting in seat. Push seat adjustment lever to release mechanism and move seat to desired position. Be sure seats are firmly engaged to avoid forward or rearward movement when vehicle is started or stopped.

SUSPENSION TYPE SEATS

The vehicle may be equipped with a suspension type seat. For suspension type seat adjustment refer to the booklet or decal attached to seat frame as supplied by the seat manufacturer.

SEAT BELTS

WARNING

Failure to properly inspect and maintain seat belts can cause serious personal injury or death.

WARNING

It is critical that any time a vehicle is involved in an accident, the entire seat belt system must be replaced in the vehicle.

WARNING

The seat belt in a commercial truck application should be considered to have a finite life and must be replaced as needed throughout the life of the vehicle. Belt must be inspected for needed maintenance every 20,000 miles or more often if exposed to severe environmental or vocational conditions.

WARNING

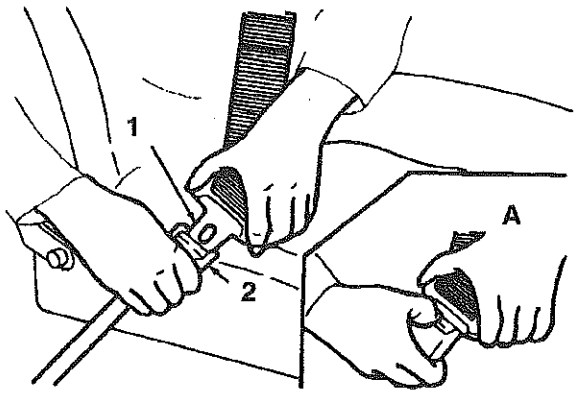
If replacement of any part of the seat belt is required, the entire belt must be replaced, both retractor and buckle side.

WARNING

Any seat belt severely strained in an accident should be replaced immediately. All belts should be replaced at least every five years.

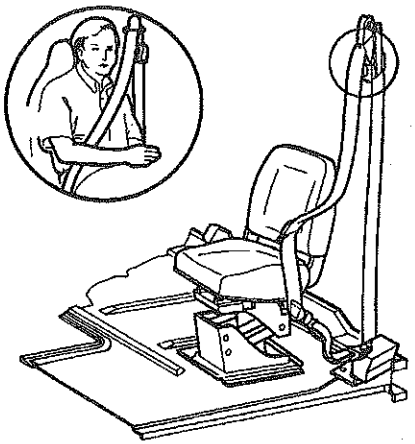
Seat belts should be worn at all times the vehicle is in motion to avoid personal injury. Before fastening a front seat belt, always adjust the driver's seat to the position in which you will drive. Lap and shoulder (three-point) seat belts with retractor are standard for driver and door-side passenger. An adjustable belt that does not retract is provided for the center passenger with full and two-man bench seats.

ADJUSTABLE LAP AND SHOULDER (THREE–POINT) BELTS



6. Belt Tongue
7. Buckle

A Press to Unfasten



To fasten the belt, bring belt across hips and chest and insert tongue into buckle. The web is free to slide through tongue, allowing the belt tension to equalize across hips and chest. The retractor is a locking type which allows webbing to come out to adjust for body movement.

The webbing will return to the retractor as the body returns to its original position. The retractor will retain moderate tension across the body in its operator mode.

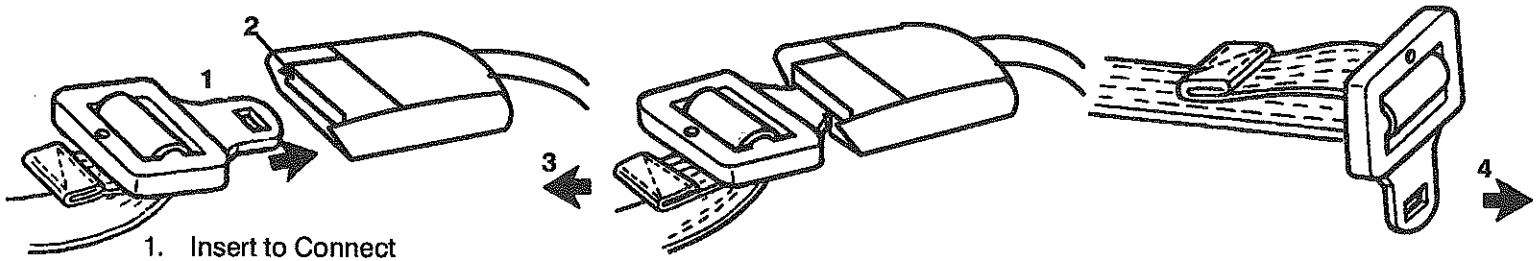
To release, push the button release latch on the buckle. Give the belt a tug to insure it will retract.

KOMFORT–CLIP ADJUSTMENT

The Komfort-clip is located over the shoulder under the wall-mounted O-ring. The clip can be engaged by pulling on webbing of belt's shoulder strap, permitting only enough slack in the shoulder belt to allow slight pressure on shoulder and chest **(maximum amount of slack should not exceed 1 inch when measured from chest to belt)**. While holding this slack lift lever/top of Komfort latch mechanism upward, clamping webbing in place. Belt tension will be removed across the chest. If you try to lean forward, the clip will hold unless a moderate force is applied causing the clip to disengage. At this point the Komfort–clip would have to be reset as mentioned above. ONLY ENGAGE THE KOMFORT–CLIP WHILE THE TRUCK IS AT REST.

NON–RETRACTING ADJUSTABLE SEAT BELTS FOR CENTER PASSENGER – BENCH SEAT

To Adjust: Tip the buckle end downward and pull the buckle until the ends can be joined. Insert tongue into open end of buckle and snap together. Shorten the belt after it is connected by pulling on the loose end until the belt is snug and comfortable (see illustrations).



1. Insert to Connect
2. Push Button to Release
8. Pull to Shorten with Belt Connected
9. Pull to Lengthen with Buckle in Vertical Position

To Release: Push in the button release latch to release the seat belt (see illustration).

CARE OF SEAT BELTS

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

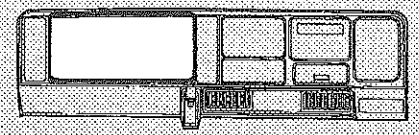
WARNING

Do not bleach or re-dye color webbing. Bleaching or re-dying may cause a severe loss of belt strength. This loss of strength could allow the seat belt to break under stress, thus resulting in personal injury.

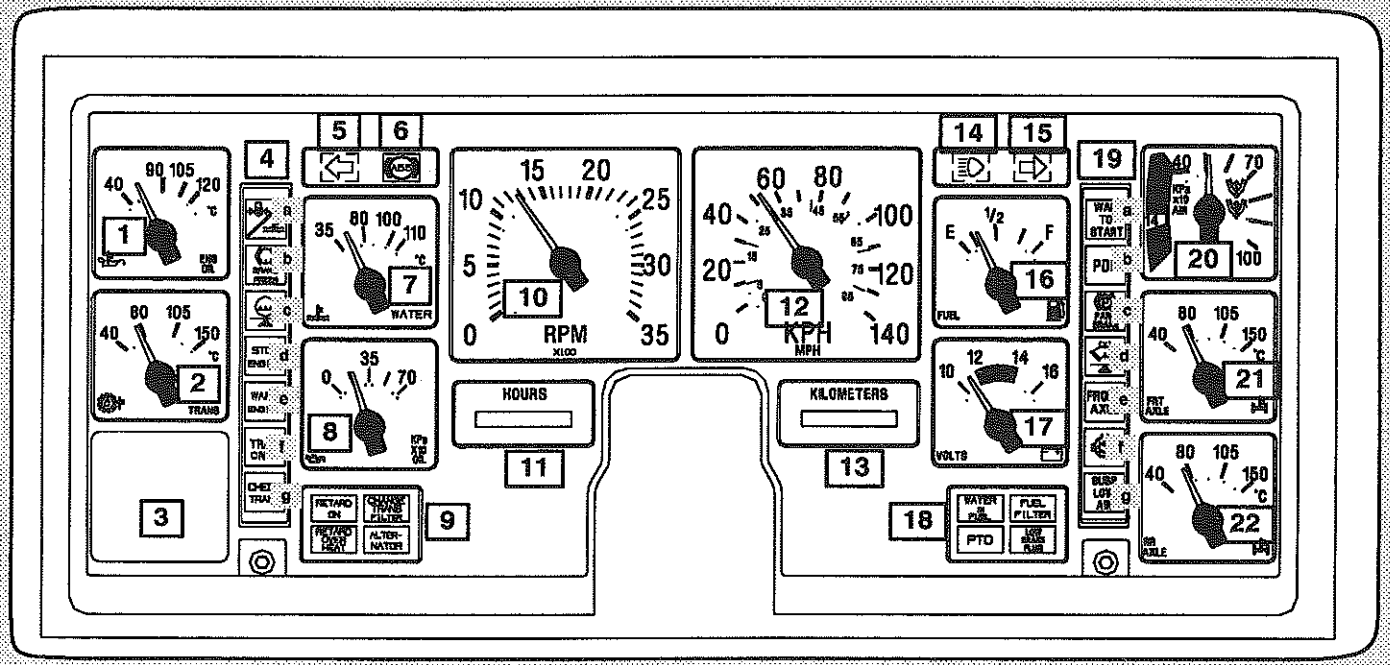
The entire seat belt assembly should be inspected periodically for corrosion, wear, fraying or weak spots. The retractor, latch and buckle should be checked for proper function, and all seat belt mounting bolts should be tight at all times.

INSTRUMENT PANEL AND CONTROLS

1000 /4000 SERIES



1000/4000 SERIES INSTRUMENTATION

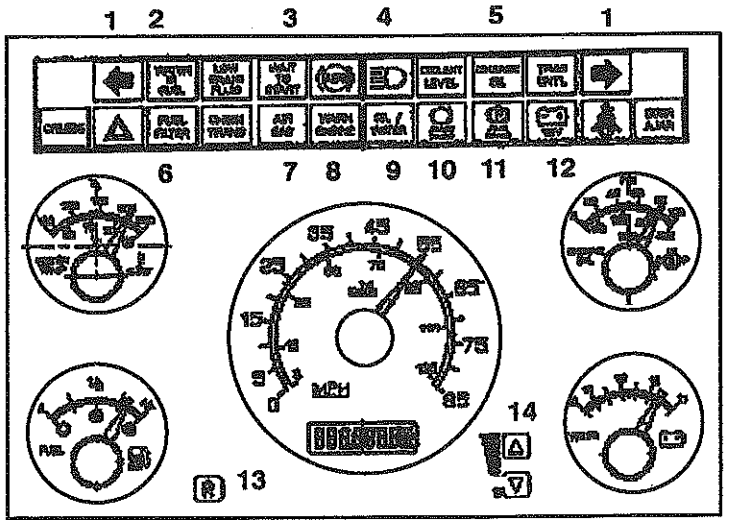


1. Engine Oil Temperature Gauge (Optional)
2. Transmission Oil Temperature Gauge (Optional)
3. Exhaust Temperature Gauge or Ammeter (Optional)
4. Warning Lights:
   a) Oil/Water
   b) Brake Pressure
   c) Coolant Level
   d) Stop Engine–red light/Change Oil–amber light
   e) Engine Warning
   f) Traction Control
   g) Check Trans
5. Left Turn Indicator
6. Antilock Brake Warning Light
7. Water Temperature Gauge
8. Oil Pressure Gauge
9. Warning Lights:
   a Retard On
   b) Change Transmission Filter
   c) Retard Overheat
   d) Alternator
10. Tachometer
11. Hourmeter (Optional)
12. Speedometer
13. Odometer
14. High Beam Indicator
15. Right Turn Indicator
16. Fuel Gauge
17. Voltmeter
18. Warning Lights:
    a) Water in Fuel
    b) Fuel Filter
    c) PTO
    d) Low Brake Fluid
19. Warning Lights:
    a Wait to Start
    b) PDL (not Bus)
    c) Parking Brake
    d) Windshield Washer Fluid
    e) Front Axle (not Bus)
    f) Diff Lock Engaged
    g) Suspension Low Air
20. Dual Air Pressure Gauge
21. Forward Rear Axle Temperature Gauge (Optional – not Bus)
22. Rear Rear Axle Temperature Gauge (Optional – not Bus)

INSTRUMENT PANEL AND CONTROLS

1652 SC SERIES

1652 SC SERIES
INSTRUMENTATION

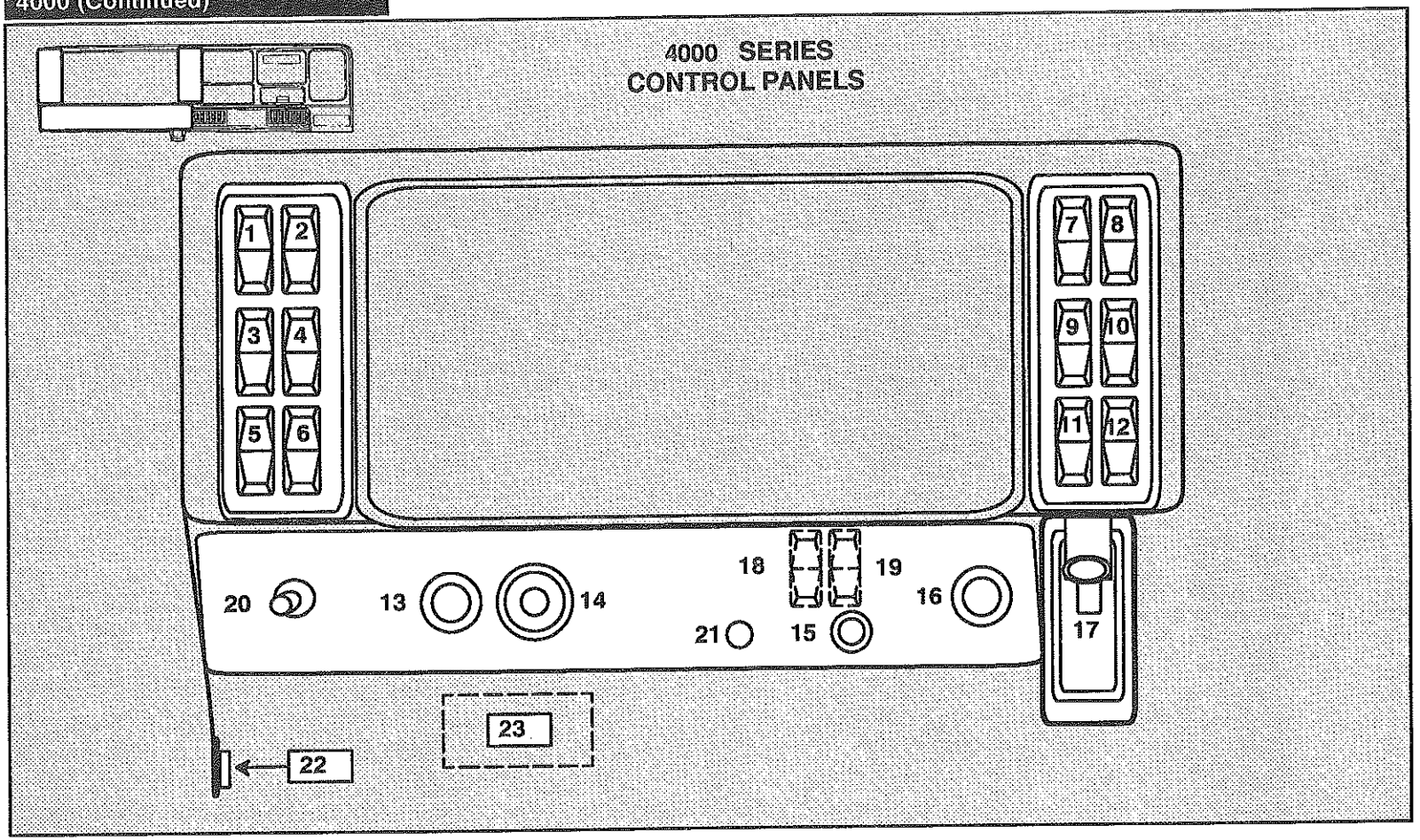


1. Turn Signal Indicator
2. Water In Fuel
3. Wait To Start
4. Headlight Hi–Beam
5. Change Oil
6. Fuel Filter
7. Susp Low Air
8. Warn Engine
9. Oil Water
10. Brake Press
11. Park Brake
12. Low Batt
13. Toggle Sw (mi/hrs)
14. Panel Light Dimmer

NOTE: **All of the active warning lights for this cluster are noted above.**

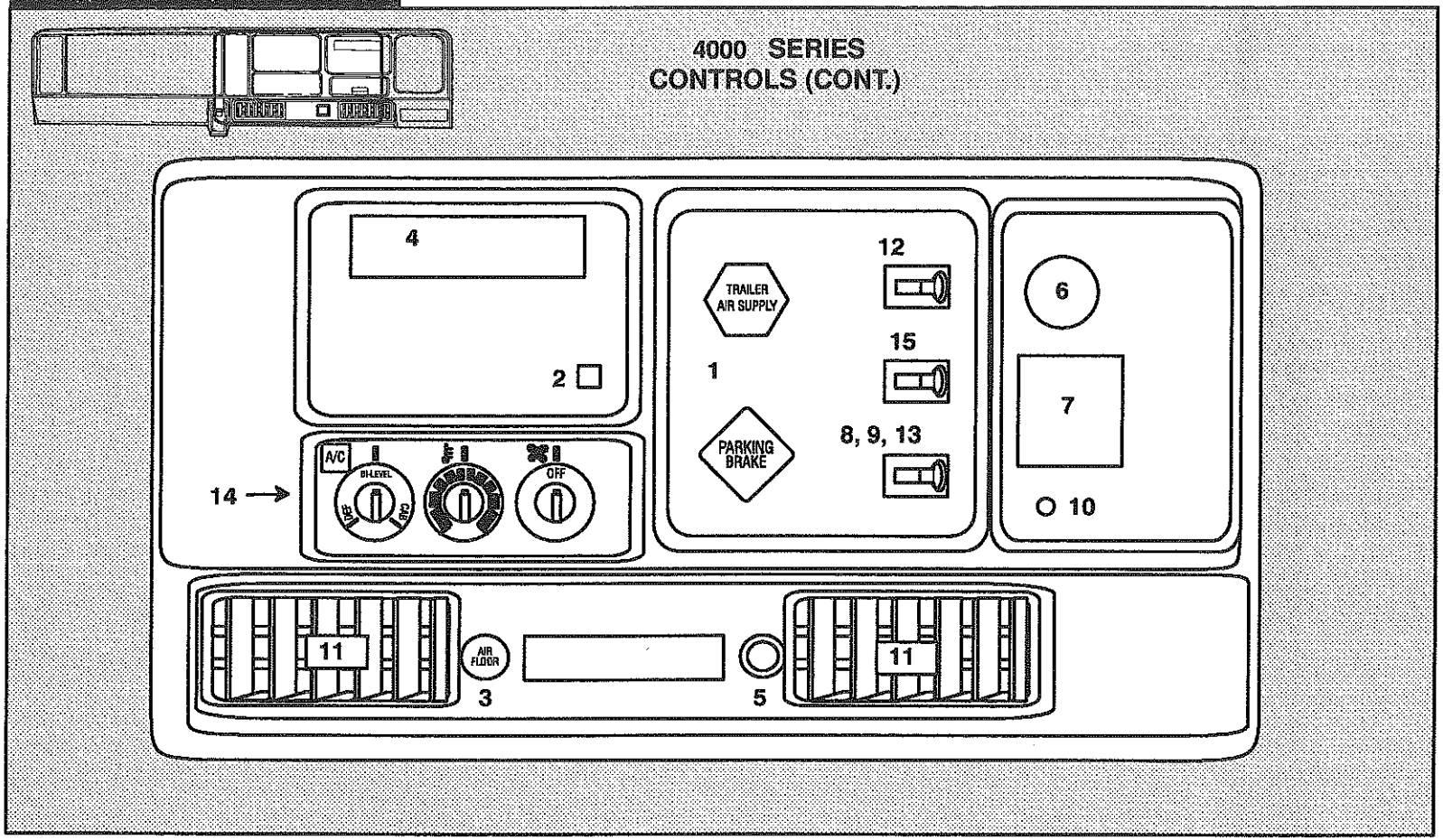
INSTRUMENT PANEL (CONTINUNED)

4000 (Continued)



1 Right Power Mirror
2 Heated Mirror
3 Cruise On/Off
4 Fuel–Tach On/Off/Reset or Cruise/Set/Resume
5 Engine Brake On/Off
6 Engine Brake Selector
7 Not Used
8 Not used
9 Headlight Switch
10 Panel Lights Switch
11 Fog Light Switch
12 Marker Interrupt Switch
13 Engine/Start
14 Key Switch (Start)
15 Engine Shutdown Switch
16 Hand Throttle
17 Automatic Transmission Selector
18 Starter Button (When Equipped)
19 Diagnostic push button switch for International engines
20 Data Link Connector (6–way Deutsch)
21 Fuse Panel

4000 (Continued)



1 Brake Controls (Push–Pull)
2 Antilock Brake System (ABS) Warning Light
3 Floor Air/Heat (A/C Only)
4 Radio
5 Cigar Lighter
6 Air Restriction Gauge
7 Caution Note
8 Front Axle Lock–Out
9 Differential Lock–Out
10 CB Power Connection
11 Lower A/C Outlet
12 Power Divider Lock–Out
13 5th Wheel Control
14 Heater A/C Unit
15 Air Suspension

Note: Standard Headlight Dimmer Switch on Turn Signal Control

AXLES

AXLE OPERATING TEMPERATURE

Normally, axle operating temperature will not exceed more than 100°F (38°C) above ambient temperature. However, intermittent operation (5% of time) at higher temperatures under extreme loads (long pulls) will not harm the axle. Operating temperatures above 230°F (110°C) significantly increase the rate of lubricant oxidation and shorten the effective life of the lubricant, making more frequent changes necessary. EP lubricants should not be run consistently at temperatures above 230°F (110°C).

FRONT AXLE (4x4, 6x6)

With different configurations of transfer cases and types of controls, such as manually operated or air operated, it is important that the front axle control instructions provided on the vehicle be followed. Most vehicles have a front axle indicator light to alert the driver that the front axle is engaged.

⚠ WARNING

To avoid personal injury, property damage or death, pay strict attention to the following:

Should it be necessary to operate the rear wheels (with engine power) with the vehicle stationary and the rear wheels raised from the ground, first disengage the front axle; otherwise the driving front axle will pull the vehicle off its support.

Parking brakes should be applied when the transmission and the transfer case have been left in the neutral position with the engine running or not running.

IMPORTANT: Do not keep the front axle engaged when operating on dry, hard surfaced roads except where It is absolutely necessary to operate with the transfer case in low range. Operating on hard, dry surfaces with both the front and rear axle engaged creates a build–up of torque between the axles resulting in excessive tire wear and strain on the entire drive unit.

When necessary to operate with the transfer case in low range, the front axle drive must be engaged to avoid excessive torque load on the rear axle.

CAUTION

Use extreme caution when backing up on a steep grade. Weight transfer to the front will reduce traction on the rear axle while increasing the load demands on the front axle. This can make the front drive components subject to overloading and damage.

Front Axle Disengagement (4x4, 6x6)

The torque build–up between the front and rear axles sometimes makes it difficult to disengage the front axle while the vehicle is in motion. To disengage the front axle with the vehicle in motion, slack off abruptly on the accelerator and/or release the clutch while pressure is applied to the front axle control. In some instances it may be necessary to stop the vehicle and move it slightly in the reverse direction to complete disengagement of the front axle.

Front Axle Engagement

Locking Hubs in Lock Position or Axles without Locking Hubs

The front axle can be engaged with the vehicle in motion by pushing the front axle control to the IN position. It is not necessary to stop the vehicle or to disengage the clutch when engaging the front axle. It is recommended that the accelerator be released while engaging the front axle to release torque on the drivetrain.

Locking Hubs in Free Position

Vehicle must be stopped to engage the front axle. If difficulty is encountered in engaging the front axle when the vehicle is not in motion, it means the splines on the engaging clutch are not matched. Using forcing action or kicking the control will not make it engage but may damage the control linkage. Shift the transmission into low gear and roll the vehicle forward, keeping pressure on the control. When the splines are matched, they will engage.

With an automatic transmission, it may be necessary to use a special procedure to shift out of neutral position in the transfer case. The input shaft to the transfer case must be stopped either by shifting between forward and reverse or by stopping the engine. Keep pressure on the transfer case lever as the input shaft approaches zero speed. Stopping the engine will assure that the transfer case is not damaged.

FRONT WHEEL LOCKING HUBS (4X4, 6X6)

Locking hubs control the engagement of the front wheels with the front drive axle. When the hubs are engaged, full power is transmitted to both wheels. Disengagement with front axle not driving allows the front wheels to *free wheel*, and the axle shaft and differential gears to remain idle, saving unnecessary wear.

IMPORTANT: For the first 200 miles (320 kilometers) operate your new vehicle with locking hubs in LOCK position to assist in initial break–in of the driving axle.

IMPORTANT: Be sure that both hubs are in either FREE position (turn counterclockwise to FREE) or LOCK position (turn clockwise to LOCK). Arrow in center of controls must always point directly to one of the dots on the rim of the hub. You can feel the control "seat" itself when it is properly set. If arrow does not point to one of the dots, it will not seat. Both hubs must always be set the same!

Use fingers only to turn controls. If controls do not turn freely with your fingers, move vehicle slightly either way in two-wheel drive, standard gear range, and try again. Do not force controls with tools.

When to use FREE or LOCK position: Use FREE for all driving that does not require four–wheel drive power and traction. Use LOCK whenever four–wheel drive is used.

To avoid excessive torque loads on the rear axle, do not drive vehicle in low range of transfer case with locking hubs set in FREE position.

TWO SPEED REAR AXLE

The two–speed rear axle switch permits selection of either the high or low axle ratio.

Axle Shift Only

TO DOWN SHIFT: Select lower ratio position, release and depress accelerator pedal as quickly as possible, or while holding the accelerator down, disengage and re-engage clutch as quickly as possible.

NOTE – Clutch method recommended for slower speeds.

TO UPSHIFT: Keep accelerator down, select a faster ratio position, release accelerator pedal and pause until axle shifts.

NOTE – De-clutch for smoother axle upshifts at slow speed.

Split Shifting

Combined Axle and transmission shift.

TO DOWNSHIFT: The axle to a slower ratio and upshift or downshift the transmission, shift the transmission and just before clutch is re–engaged. Move the control switch to a slower ratio position.

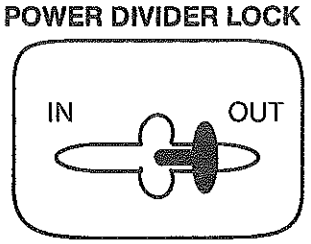
TO UPSHIFT: The axle and downshift or upshift the transmission, move the control switch to a faster ratio position and make the transmission shift in the usual manner.

NOTE: In all axle up-shifts, move the control switch to position first. When split shifting to a slower axle ratio, do not move the control switch until just before engaging the clutch.

⚠ WARNING

Never attempt to shift a two–speed axle when descending a hill as it could cause a loss of vehicle control and result in personal injury.

TANDEM AXLE POWER DIVIDER (INTER-AXLE DIFFERENTIAL) LOCK CONTROL



Tandem axle power dividers or interaxle differentials in the forward rear axle are controlled by the above, dash mounted power divider lock switch.

Under normal highway conditions (good traction) the power divider lock switch should be in the OUT position which allows differential action between the forward, rear axle and the rear, rear axle preventing inter axle differential wear due to unequally worn or mismatched tires, etc.

The power divider lock switch should be in the IN position, which prevents interaxle differential action, when backing under a trailer with a tractor, starting on a slippery surface (poor traction), operating off highway in mud, etc. (poor traction), or when traveling on slippery highways (poor traction). Failure to lock the power divider IN under these conditions may result in power divider differential spin-out failures and costly repairs. If you encounter wheel spin conditions you power divider lock should be IN.

CAUTION

Switch the power divider lock to *in* only when stopped or moving at low speed. Never try to go to the *in* position while your wheels are spinning as this may result in shock damage to the power divider components and costly repairs.

When encountering slippery highway conditions (poor traction) the power divider lock can be moved to IN at a low, even speed and momentarily letting off the accelerator will engage the differential lock. A warning light on the instrument panel indicates when the inter axle differential is locked.

When highway conditions improve (good traction) the power divider lock can be moved to OUT at a low, even speed and letting up on the accelerator momentarily will unlock the inter axle differential.

CAUTION

Do not operate with the power divider lock in the *in* position on dry pavement (good traction) continuously. This will result in excessive tire wear and premature axle wear.

CAUTION

Never move the power divider lock to the *in* position when your wheels are spinning.

CAUTION

Never shift a two–speed tandem axle from one range to another with the power divider lock switch to the *in* position. This may cause shock damage to the inter axle differential and result in costly repairs.

REAR AXLES (WITH LOCKING OR LIMITED SLIP DIFFERENTIALS)

WARNING

To avoid personal injury or property damage, 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, possibly resulting in personal injury.

As with any vehicle, care should be taken to avoid 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 on the crowned surface of a road or in a turn, and possibly result in loss of vehicle control and personal injury.

Traction Equalizer

Some Rockwell drive axles are equipped with a traction equalizer. It will maintain an appreciable amount of wheel end traction in all operating conditions while still allowing the vehicle to negotiate turns smoothly. This is accomplished with the ability of the traction equalizer to slip above a certain torque value, and remain rigid below this torque value.

CAUTION

Tire sizes on both rear wheels should be the same on axles equipped with a traction equalizer. If not, excessive wear may occur to the traction equalizer.

NoSPIN Detroit Locker Positive Locking Differential

The following is a brief summary of operational guidelines for Detroit Locker positive locking differentials. It is mandatory that the owner/operator refer to the separate NoSPIN owner's manual provided with the vehicle for additional instructions, warnings, and required operational tests.

The NoSPIN differential is designed to deliver 100 percent of the available power to either or both drive wheels, yet UNLOCK as required to allow wheel speed differentiation, automatically.

The performance of a vehicle equipped with a NoSPIN differential is somewhat different from that of a vehicle equipped with a conventional differential.

For example: when turning a corner, the sound of gear disengagement and re–engagement may be audible, and the transfer of driving torque from both wheels to one wheel may be noticeable.

When going from drive (acceleration) to coast (deceleration) in a turn, a *metallic* sound may be heard as torque flow is reversed (inside wheel engaged during acceleration; outside wheel engaged during deceleration).

These characteristics are a result of necessary backlash designed into the NoSPIN differential, which is of a fixed amount (one to two inches of rotation at the tire tread).

Anything that improperly causes a difference in individual wheel speeds, such as mismatched tire diameters due to differences in tire wear or tire pressure, or unbalanced loading of the vehicle, or vehicle operated on a side slope, can cause the NoSPIN differential to deliver power to only one side of the vehicle, which may affect directional stability. Always maintain matched tire sizes and pressures and balanced loads and avoid operation on side slopes.

⚠ WARNING

To prevent the vehicle from moving when servicing wheels, tires, or brakes, turn the engine off and raise all driving wheels of locker differential equipped axle. Axles equipped with NoSpin Detroit locker differentials deliver power to both wheels even when only one wheel is on the ground. Failure to observe this warning could cause the vehicle to move unexpectedly resulting in possible property damage and personal injury.

Driver Controlled Differential Lock

Some Rockwell/Eaton drive axles have a driver controlled differential lock. The air actuated traction device that can be manually shifted from the vehicle cab. By actuating a switch, mounted on the instrument panel, the driver can lock or unlock the differential when the vehicle is moving or stopped. IMPORTANT, when the differential is fully locked the vehicle will have a slight "understeer" condition. This will increase the turning radius of the vehicle.

The driver must limit the use of the differential lock to low vehicle speeds, under 25 MPH. Also, the differential must not be locked when the vehicle is traveling down steep grades and traction is minimal.

It is mandatory that the Owner/Operator refer to the separate driver controlled main differential lock owners manual provided with the vehicle for additional instructions, warnings and required operational tests.

AXLE AND SUSPENSION CONVERSIONS

Navistar International Transportation Corp. does not recommend or approve; however, it is aware that on occasion aftermarket add–on axles and suspensions are installed by others on International truck chassis which allow operator control for weight transfer from other axles (i.e. air lift axles).

⚠ WARNING

When operating a loaded vehicle, the driver must keep all adjustable axles on the ground at all times, supporting their share of the load. Failure to do so can overload other axles, tires, wheels, springs, steering, brakes and frames, resulting in early component failure, loss of vehicle control and possible property damage and personal injury.

BRAKES

⚠ WARNING

Failure to maintain brakes in proper condition and adjustment could cause reduced braking ability and result in possible property damage and personal injury.

DOWNHILL OPERATION

Always descend hills with extreme care, relying on the braking effect of the engine to control vehicle speed. Heed warning signs posted for any grade. Before starting a descent (if a pull off area is available), stop and check the brakes for condition and adjustment.

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.

Operating engine with closed throttle and transmission/rear axle in reduced gear is the method that should be used to control downhill speed. If the gear selection will not hold the desired speed without overuse of the brakes, an improper gear selection was made.

Make a full stop. Let the brakes cool, then continue down grade in a lower gear range.

⚠ WARNING

DO NOT ATTEMPT to gear down if the engine has reached maximum speed (RPM) in any gear range since it will be impossible to shift into a lower gear and could result in possible vehicle runaway, property damage, personal injury or death.

The common rule to follow in using the engine and transmission/rear axle to control vehicle speed is to select the same gear going down the hill that 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. When descending long grades requiring use of the brakes, snub applications (five to ten 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

All air brake equipped vehicles to which this manual applies have 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. In the event air pressure loss occurs in one system, the remaining system continues to provide braking action.

Even though there will be enough braking capability for emergency stopping, the vehicle must not be operated when a failure is indicated, as there is no means of replenishing air pressure.

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.

Some vehicles are equipped with color-coded air brake lines. The color coding is as follows:

GREEN – Primary Supply and Delivery System
ORANGE – Secondary Supply and Delivery System
YELLOW – Spring Brake System
RED – Trailer Emergency
GRAY – Power Divider Lockout
BLUE – Tractor Protection Valve Service
BLACK – Other Systems

Air Gauge, Low Air Pressure Buzzer and Indicator Light

Should air pressure in either section of the split air brake system be reduced to 70 ± 6 psi (483 ± 41 kPa) the warning buzzer will sound and a red light 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 buzzer and red light will automatically shut off when the air pressure in both systems is sufficient (approximately 70 psi [483 kPa]) to operate the vehicle.

Should the red light and buzzer not shut off soon after start–up, the air pressure gauge/gauges should also indicate at least one section of the split system has low air pressure.

If the red light, buzzer and gauge indicate a loss of pressure while driving, the vehicle still has a portion of the braking capability, in that either one–half of the split system or the spring brake system braking capability is retained. However, the distance required to stop the vehicle will be increased.

WARNING

To avoid loss of vehicle control resulting in possible property damage and personal injury never operate the vehicle when insufficient air pressure (less than 70 psi [483 kPA]) is indicated for either system since 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.

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.

Parking Brake

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.

WARNING

Under no circumstances should the spring section of the spring and service chamber assembly be disassembled. Disassembly will release a powerful spring. This may result in severe personal injury or death.

The purposes of this brake are to hold the vehicle in a parked position and to assist in bringing it to an emergency stop. The parking brake should not be used to brake the vehicle during normal driving.

To apply the parking brake, pull out control. To release the parking brake, push in on control.

On single unit trucks and tractors with independent parking and trailer controls: if air pressure is reduced to approximately 20 to 45 psi (138 to 310 kPa) in both the primary and secondary systems, the parking brakes will automatically apply.

On tractors with the modular control system: if air pressure is reduced to approximately 20 to 45 psi (138 to 310 kPa) in both the primary and secondary systems, the parking brake control will automatically apply. For the exact air pressure set–points, refer to the Service Manual.

It should be noted that upon loss of air pressure partial spring brake application will occur prior to automatic application of the control valve.

To release, recharge system to 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).

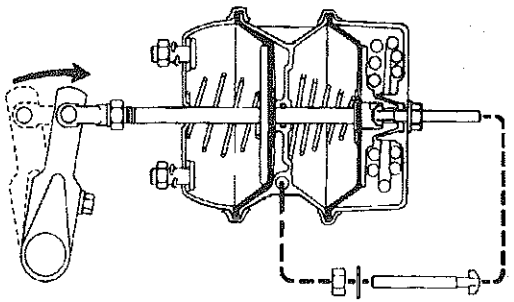
WARNING

To avoid loss of vehicle control resulting in possible property damage and personal injury, when manually releasing the spring brakes, be sure to block the wheels so that vehicle cannot move when the brakes are released.

For towing, make sure the disabled vehicle is securely connected to tow vehicle and tow vehicle parking brakes are applied before releasing the disabled vehicle's parking brakes.

Release After Emergency Application

Mechanical Release



In the event 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 Never Seeze 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.

Reservoir Moisture Draining

Moisture taken in with the air through the compressor inlet valves collects in the reservoirs and necessitates draining each reservoir daily in cold weather and once a week in warm weather by opening the drain cock located either on the bottom of the tank or in the end of the tank. If in the end of the tank, there must be some air pressure in the system to assure 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.

Air Dryer

The function of the air dryer is to collect and remove moisture and contaminants before air reaches the first reservoir, thus providing moisture free air for the air brake system. Daily draining of the air system reservoirs is no longer necessary. (See Maintenance Section.)

The air dryer is installed in the discharge line between the air compressor and supply reservoir. The air dryer can be a unit with desiccant cartridge and a paper oil filter which is serviced as an assembly. An air dryer can also be an aftercooler in which the hot compressed air enters the expansion chamber; the sudden drop in pressure cools the air. The heat is carried away through the external fins which are an integral part of body. As the air cools in the expansion chamber both water and oil vapors are condensed out. This condensation collects on the walls of the expansion chamber and runs down into the collection area where it is automatically discharged.

Trailer Brake Hand Control

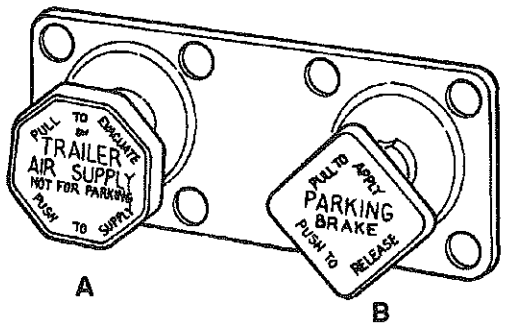
The trailer brake hand control is used to apply the TRAILER service brakes, independently of the TRACTOR service brakes.

WARNING

The hand control should never be used to apply the brakes when the tractor and trailer are parked unattended, since air may leak from the system, and the vehicle could possibly move, resulting in possible property damage, personal injury or death.

Trailer Air Supply and Parking Brake Controls Modular Controls

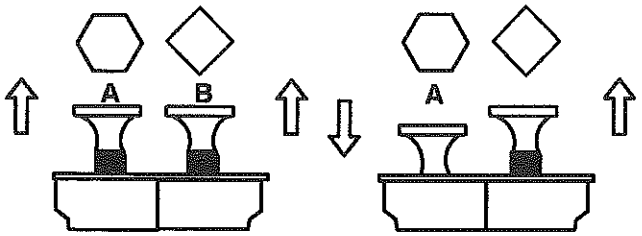
The TRAILER AIR SUPPLY valve A (red control) delivers air to the trailer supply and will automatically pop out, shutting off the trailer supply if pressure decreases to approximately 35 psi (248.5 kPa). For exact air pressure set–points, refer to the Service Manual.



A B

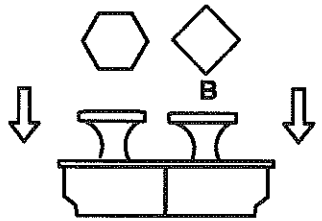
The PARKING BRAKE valve **B** (yellow control) controls the spring brakes on the tractor and when pulled out simultaneously causes the trailer supply valve to pop out, thus applying both tractor and trailer parking brakes. The trailer brakes may be independently released by pushing only the TRAILER AIR SUPPLY valve (red control) in.

Initial Charge

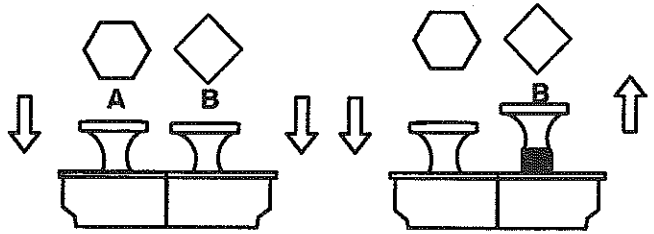


With air system completely discharged, both controls **A** and **B** will be out. When air system pressure reaches 65 psi (448 kPA) the TRAILER AIR SUPPLY (red control) A may be pushed In and should stay in charging the trailer air system and releasing the trailer brakes.

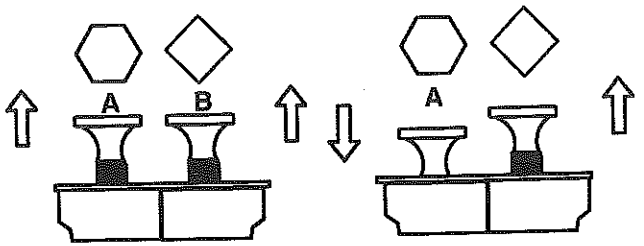
The PARKING BRAKE (yellow control) **B** may now be pushed In and supply air to the tractor spring brakes, releasing them.



System Park



With both controls pushed In (normal driving position), the parking brakes on both tractor and trailer are applied by pulling the parking control **B** (yellow) out, exhausting air from the tractor spring brakes and simultaneously causing the trailer supply valve (red control) to pop Out, applying the trailer brakes.

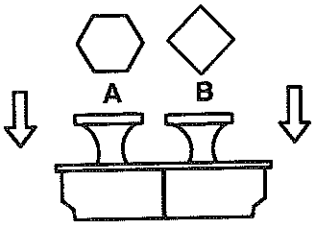


Trailer Charge

If both controls are Out (both tractor and trailer brakes applied), and it is desired to recharge the trailer while leaving the tractor spring brakes applied, the red control A may be pushed in to re-pressurize the trailer supply line. This mode may also be used to park a combination vehicle with tractor spring brakes.

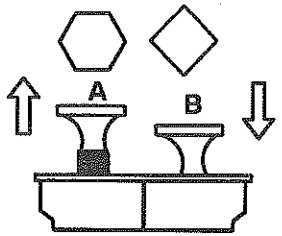
Automatic Application

If, with both controls In (normal operating position), the brake system air pressure is reduced to approximately 35 psi (248.5 kPa) the red control A will pop out, applying the emergency or parking brakes on the trailer. If the red control A is manually held In and the pressure is further reduced to approximately 30 psi (207 kPa) a tripper piston within the valve will move, exhausting the trailer air supply, thus applying the trailer brakes. Further reduction of pressure while holding in red knob will cause yellow knob to pop at 25 psi. For exact air pressure set points refer to the Service Manual.



Normal Run Position

With both controls pushed In, air is then supplied to both trailer and tractor spring brakes and all brakes are released.



Actuation of Trailer Park (Emergency) or Tractor Bobtail Position

To actuate the trailer brakes only, the red control A is pulled Out, exhausting the trailer air supply. The trailer brakes are now applied whether emergency or spring brakes are used on the trailer.

This mode is also used when the tractor is used during bobtail operation.

ANTILOCK BRAKE SYSTEM (ABS)

The Antilock Brake System is a mandated feature added to the standard air brake system. It electronically monitors vehicle wheel speed at all times, and only engages when wheel lock is imminent. The standard air brake system controls normal braking use.

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 overbrake 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 7 miles per hour. The ABS system cannot provide any better braking and steering capability than the available road traction will permit. In other words, if the road is slippery it will take longer to stop than on dry, high traction roadway. Steering manueverability will be similarly limited. The driver must reduce vehicle speed on slippery surfaces to assure that he has sufficient time and distance to properly control the vehicle.

The wheel hubs carry exciter rings used by the ABS axle mounted sensors to transmit wheel speed information to an electronic control unit located on the chassis frame. The control unit monitors and compares all wheel speed inputs to determine if any wheel(s) have locked. If wheel lockup is about to occur, the control unit commands the appropriate modulator valve to adjust air pressure delivery to prevent wheel lockup.

Bendix ABS Checkout: A yellow warning light on the instrument panel indicates the antilock system status. The light comes on and goes through an ABS self checkout sequence each time the ignition is turned on. The system is working normally when:

- Ignition turned on, lamp 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 Front
2. Left Front
3. Right Rear
4. Left Rear

The antilock system is faulty if the warning light 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 retarding devices are in operation, the ABS will interrupt and disable the retarder until the lockup situation has stopped.

NOTE: If an antilock fault develops, standard air brake system operation is maintained. The brake system is still operational, but the antilock system will not operate to prevent wheel lockup if the driver over applies the brakes for existing conditions.

If the ABS warning light on the instrument panel is lit, consult your nearest International® service center for further assistance in maintaining and repairing your ABS system.

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 and 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.

If only your trailer has ABS . . .

Use your rig's brakes as necessary to maintain control and keep your combination in it's lane. Trailer ABS will not prevent jackknife but will help prevent trailer swing out.

If wheel spin occurs at speeds above 25 mph, the dash indicator lamp blinks, and, using its link to the engine control module, the ATC reduces engine RPM to a level suitable for the available traction. The brakes are not applied, even slightly, at any speed above 25 mph.

Both Antilock and Traction Control are features added to the basic air brake system and the loss of either or both should in no way affect the basic 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 Traction lamp flashes and then goes out, the ATC system should not be noticed until it's needed. Routine operation of the brakes and accelerator are unchanged.

AIR SUSPENSION (CONNECT AND DISCONNECT TRAILER)

The Air Suspension has a dump valve system option (Code 14899) that permits exhausting air in the suspension system when disconnecting the trailer. Refer to Tractor Trailer Connections, Connect and Disconnect Trailer with Air Suspension within this section.

HYDRAULIC BRAKES

Disc type brakes with split system piping are used on all hydraulic brake equipped chassis.

A Hydro–Max Booster is the hydraulic assist system that is powered by a hydraulic pump (power steering). The system also has a back–up power assist in the event of a malfunction in the hydraulic power pump system or loss of engine power. This back–up pump is electrically powered.

⚠ WARNING

Hydraulic brake systems are power assisted. Braking capabilities will be greatly reduced without engine assist. Do not move vehicle with dead engine, as reduced braking capability may result in property damage, personal injury or death.

The electric power back–up pump has been designed to cycle whenever the engine is not operating and the key switch is in either the ON or START position.

Test daily by listening for the electric motor operation while applying the brakes with key switch in OFF position or when the key switch is in the ON or START positions and the engine is not operating.

⚠ WARNING

Do not drive if the electrical backup pump does not cycle. To drive vehicle without a properly operating pump could result in loss of braking ability if the power steering pump drive belt fails or engine power is lost. Loss of brakes could cause an accident and result in property damage, personal injury or death.

The master cylinder with Hydro–Max Booster is of the split hydraulic system design. It has a two compartment reservoir. The master cylinder is mounted on the power booster.

NOTE: Servicing the Hydro–Max Booster (such as bleeding the system) requires that the electric motor be disconnected. Be sure that the electric motor is re-connected upon completion of repairs.

Split System Features

On a vehicle with a split brake system, the operator is assured of reasonable brake control should one of the two sections of the system fail. In making application with one system failed, the vehicle operator must utilize a longer brake pedal stroke to actuate the remaining brake system. Brake control of the vehicle will occur somewhere between the mid–position of pedal travel and as the pedal approaches the toeboard. Also, an increase in pedal effort is required as the remaining section of the system picks up the vehicle load normally controlled when both systems are functioning.

⚠ WARNING

Stopping distance may increase under the failed condition since only one section of the split system is operating. Stopping ability will be reduced with one section of the split system failed. If speed is not reduced and allowances made for possible increase in stopping distances, this could result in loss of vehicle control , personal injury or death.

The hydraulic brakes are self–adjusting. The brake caliper maintains proper clearance between the brake pad lining and the disc face during the service life of the lining.

It should be noted, however, that the automatic adjustment feature does not eliminate the need for periodic inspection of the brake system (calipers, master cylinder, lines and hoses) or the replacement of worn or damaged parts.

This inspection should only be performed by qualified service personnel and must be in accordance with instructions provided by Navistar International Transportation Corp.

Fluid Precautions

The Hydro–Max brake system consists of two completely separate hydraulic systems operating with two different and incompatible fluids: power steering fluid and hydraulic brake fluid. Failure to observe precautions preventing the contamination of either system with fluid from the other will result in the swelling and deterioration of rubber parts leading to reduced brake performance and eventual failure.

To avoid fluid contamination, the following should be observed:

1. Use only fluids specified (or equivalent), and properly identified.
2. Add fluids only to the following locations:
   a. Power steering fluid to the power steering pump reservoir.
   b. Brake fluid to the brake master cylinder.

Hydro–Max Warning Light and Buzzer

Vehicles are equipped with a warning system that includes a warning buzzer in addition to the indicator light standard on all vehicles.

When the ignition switch is turned to ON position with engine off, the BRAKE PRESS light should illuminate and buzzer should sound indicating that the indicators are functioning. The electric power back–up pump should operate until engine starts. After the engine has started, the BRAKE PRESS light and buzzer should go off, indicating that the hydraulic brake system is functioning properly. Continued illumination of the BRAKE PRESS indicator and buzzer could be caused by either a loss of power booster assist or a faulty condition in one side of the split hydraulic system.

Should the BRAKE PRESS light and buzzer come on during vehicle operation when the brakes are not applied, the problem is in the booster system. If the light and buzzer should come on during brake application, the problem could be either in one of the split hydraulic systems, or booster system.

If the BRAKE PRESS light and buzzer actuate while driving, the vehicle should be operated only with extreme caution and taken to a repair facility for service due to reduced braking capability.

Even if a failure should occur in both the primary and back–up boosters, the master cylinder alone will provide a very limited means of stopping the vehicle.

If a failure is experienced in one side of the split hydraulic system, the vehicle will still have the remaining portion of the split system to stop the vehicle; however, the braking capabilities will be reduced. The brake system must be repaired immediately.

Pedal Adjustment

Adjustment of brake pedal free travel should not be necessary. In the event adjustment is necessary, it is extremely important that the work be properly performed. Allow only qualified technicians to perform this operation.

Parking Brake Indicator Light

The PARK BRAKE indicator is operated in conjunction with the parking brake. During engine cranking period the PARK BRAKE indicator should illuminate. This light will go out after engine is started providing the parking brake is not applied. If

parking brake is applied, this light will remain on after engine has started. If light does not illuminate during cranking period the light bulb may be defective.

Driveline Parking Brake (All Models with Hydraulic Brakes)

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. It may be used to assist in making an emergency stop.

The parking brake lever, also known as the Orscheln Lever, is an over-center locking type. The lever has an adjustment knob on the end which the operator can turn to the desired position for more or less brake application.

To apply the parking brake, depress the brake pedal, then pull on the parking brake lever. When properly adjusted, the lever should pull with increasing resistance until it snaps distinctly over center to the fully applied position with a distinct click. To release the parking brake, depress the brake pedal and push the parking brake lever all the way down.

If the parking brake does not hold the vehicle securely when applied, depress the brake pedal and release the parking brake. With the parking brake released, turn the adjustment knob clockwise as viewed from the end of the lever to increase the application force. Turning the knob clockwise tightens the brake and increases the effort needed to move the lever over center.

CAUTION

The parking brake hand lever should not be allowed to snap to the release position. The operator must maintain a grip on the lever during release of the parking brake. Also, should the parking brake hand lever not travel to the full release position when it is released, do not force it. This condition indicates that there is an obstruction at the brake end or a restriction within the cable housing itself such as corrosion, ice, snow or cable damage which is preventing full release of the parking brake shoes. The ability of the cable to move freely in the cable housing must be restored to prevent cable damage.

WARNING

Either the rapid release or the forced release of the parking brake hand lever can cause the cable to kink at the connection to the hand lever and result in early cable failure. A damaged cable could result in cable failure and vehicle roll-away that could cause vehicle damage, property damage, and/or severe personal injury.

If the parking brake cannot be adjusted tight enough to hold the vehicle, a linkage adjustment between the hand lever and brake assembly must be performed by a skilled mechanic.

Air Operated Parking Brake (Code 04GAC) or Hydraulic Operated Parking Brake (Code 04GAG)

WARNING

Before starting the engine, the parking brake control knob must be in the applied (PULLED) position to prevent movement of the vehicle.

The brake is applied by manually pulling the parking brake control knob. The purpose of the parking brake is to hold the vehicle in the parked position. It should NOT be used to brake the vehicle during normal driving. It may be used to assist in making an emergency stop.

The air operated parking brake (Code 04GAC) is equipped with an air gauge and warning buzzer. When pressure in the parking brake air reservoir has been reduced to about 70 psi (483 kPA), the buzzer will activate.

To release the parking brake, have the engine running and your foot on the service brake pedal, then push in the control knob. DO NOT drive away until system pressure has reached 70 psi (483 kPA).

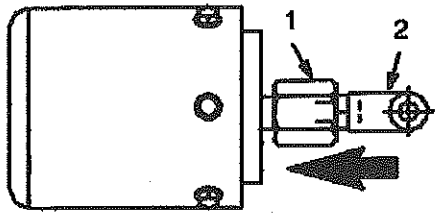
A loss of pressure in the control circuit will prevent normal operation of the parking brake. If air system pressure falls below 70 psi, pull off the roadway, apply the brake and correct the low pressure condition.

To release the parking brake, recharge the system to 70 psi (483 kPA). If the system cannot be recharged and the vehicle must be moved, the brake chamber must be manually released (caged) by turning the adjusting nut on the push rod clockwise until it's bottomed on the chamber (Figure 1).

WARNING

When manually releasing the chamber assembly, be sure to block the wheels so that the vehicle cannot move when the brakes are released. This will prevent vehicle movement which could result in property damage and personal injury.

Brake Chamber



1.Jam Nut
2.Clevis

Turn Jam Nut In This Direction To Release Parking Brake For Emergency Service

Figure 1

For towing, make sure the disabled vehicle is securely connected to tow vehicle and tow vehicle parking brakes are applied.

WARNING

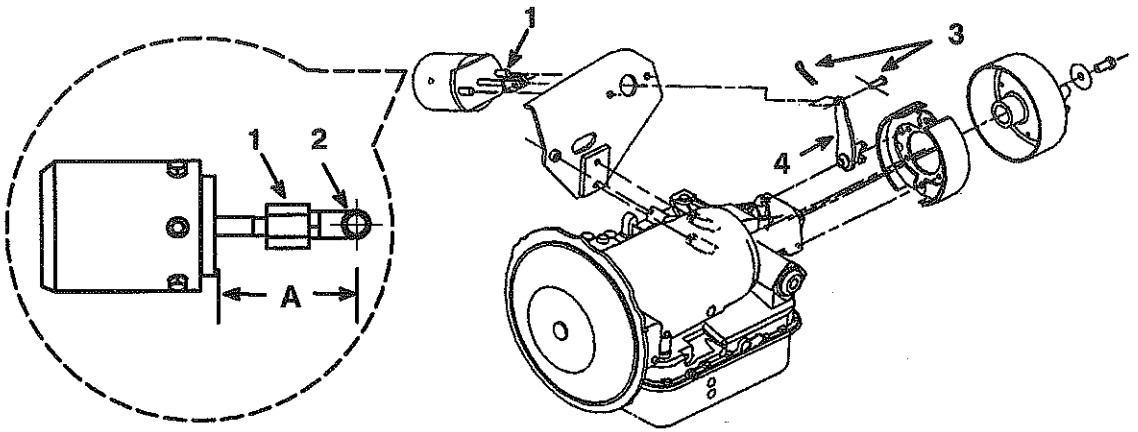
Under no circumstances should the spring section of the chamber assembly be disassembled. Disassembly will release a powerful spring that may cause severe personal injury or death.

Reservoir Moisture Draining Moisture taken in with the air through the air compressor inlet valves collects in the reservoir and necessitates draining daily in cold weather and once a week in warm weather. To drain, open the drain cock located either on the bottom or the end of the reservoir. If in the end of the reservoir, there must be some air pressure in the system to assure proper drainage. Be sure to close the drain cock after all moisture has been expelled.

Instructions For Adjusting THE AIR OPERATED PARKING BRAKE

Refer to Figure 2 for all item numbers.

1. Block wheels.
2. Push in on the Parking Brake Valve to release the parking brake.
3. With air pressure applied (brake released) and the brake chamber rod fully extended, measure from the center line of the clevis pin to the brake chamber. If the parking brake is properly adjusted, this measurement (Item 'A", Figure 2) will be 5–1/2 inches.
4. If the rod length needs adjusting, loosen the large jam nut (Item 1).
5. Remove the cotter and clevis pins (Item 3). Remove the clevis from the cam and lever assembly (Item 4).
6. Lengthen or shorten dimension "A", Figure 2, by turning the clevis. Be sure the brake chamber rod is fully extended while measuring its length.
7. When the adjusted dimension is 5–1/2 inches, reinstall the clevis (Item 2) on the cam and lever assembly (Item 4) and secure with the clevis and cotter pins (Item 3).
8. Tighten the large jam nut (Item 1) against the clevis (Item 2).
9. Check dimension "A", Figure 2; readjust if necessary.



A. 5−1/2 Inches, With Air Pressure Applied, Rod Extended

1.Jam Nut
2.CLEVIS
3.CLEVIS AND COTTER PINS
4.CAM AND LEVER ASSEMBLY

Figure 2 − Hydraulic Operated Parking Brake (Code 04GAG)

An additional option available only with Code 04GAC air-operated driveline parking brake, is a "Park Brake" Transmission Shift Control, Code 813AAL. Placing the shift control in the "P–B" position while the ignition key is on places the transmission in Neutral, actuates the dash-mounted control valve and sets the parking brake. This is similar to conventional automobile practice with the exception that the transmission is in Neutral rather than being equipped with a parking pawl. To properly release the parking brake, with the engine running, place your foot on the brake pedal, move the shift control into a drive gear, and push the dash-mounted knob to release the brake. The dash-mounted valve can be used independently of the shift control to apply and release the parking brake.

BRAKE BURNISHING (DRIVELINE TYPE W/ORSCHELN LEVER)

The following burnishing procedure is recommended to be performed on new vehicles or whenever the parking brake lining and/or drum is replaced. Consult your dealer if you do not understand the following procedure.

The Procedure:

1. The vehicle must be loaded near rated GVW.
2. With the parking brake released, turn the handle knob of the Orscheln lever until force is obtained to apply the brake (over center position of lever) which will result in the vehicle making a somewhat lighter than normal stop (3–5 feet per second) without wheel lock-up.
3. Make ten (10) stops from 16 km/h (10 mph) on a dry hard surface road using only the parking brake to stop the vehicle.
4. After each stop, release the parking brake and drive the vehicle at 32 km/h (20 mph) for 4 km (2.5 mi.) to cool the brake.
5. Readjust parking brake linkage (between hand lever and brake assembly) and hand lever knob to suit your operational requirement considering load and road grades you are operating over.

CAB

CARGO AREA OCCUPANCY

⚠ WARNING

To avoid possible injury or death do not ride in the cargo area. Ride only in designated seating positions or sleeper berth with seat belts fastened and properly adjusted. Never ride on the outside of a vehicle.

CLUTCH AND TRANSMISSION

CLUTCH

Vehicles with manual transmissions have a clutch pedal which 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. **EXCESS FRICTION HEAT IS A CLUTCH'S WORST ENEMY!** Almost every early failure of a clutch can be traced to excess 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.

Engaging the Clutch

Always start In the proper gear. Obviously, 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 clutch slippage, too much 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 you release the clutch pedal and the clutch begins to engage, the engine speed will drop slightly. When this happens, increase the engine speed and fully engage the clutch. **Increasing the engine speed before you fully engage the clutch could damage the clutch and drive train.**

Do not shift until vehicle has reached proper speed. Upshifting before the vehicle has reached the right speed is almost as bad as starting off in too high a gear. When the difference between the vehicle speed and the engine speed is too great, the clutch is forced to slip. The result is extra heat and wear.

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.

Never engage the clutch while coasting. Re-engaging a clutch after coasting causes tremendous shock to the clutch and the whole drive train. 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 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's and riding or feathering clutch pedal since the vehicle will experience erratic engagement.
4. Erratic engagement can cause engine stalling and potential serious damage to your vehicle's drive train components (i.e., clutch, transmission, driveshaft(s), rear axle).

Clutch Brake (Vehicles with Non-Synchronized Transmission)

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 running at idle speed. Clutch brake application occurs in the last 1 inch (25mm) of pedal travel.

When using the clutch brake, fully depress the clutch pedal and shift the transmission into either first or reverse gear. If tooth–butting occurs between the clutching teeth, re–engage the clutch while applying light pressure to the shift lever. This will provide for a smooth shift into either first or reverse gear.

IMPORTANT: 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 1 inch (25mm) of pedal travel.

Double Clutch Procedures, Non-Synchronized

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 output 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 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 becomes necessary.

To avoid needless delay and expense, allow only competent and experienced mechanics to perform these operations.

TRANSMISSION

NOTE: For Allison Mechanical Automatic Transmissions (AT and MT models) refer to separate Allison Transmission Operator's Manual.

WARNING

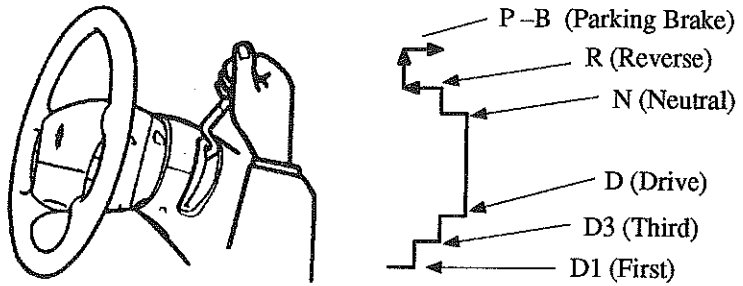
To avoid sudden, unexpected vehicle movement and possible personal injury or death:

- **Always fully set the parking brake. Do not use gearshift lever instead of parking brake – unless your vehicle is equipped with a column-mounted gearshift and park position.**
- **Turn off engine when you leave vehicle. Never leave vehicle unattended with engine running.**

Using a Column-Mounted Gearshift

NOTE: This feature pertains only to the Allison AT transmission with gearshift actuated parking brake and brake interlock.

If your gearshift is on the column, you can use any of the following positions.



To move the gearshift out of P (park), the ignition must be turned to ON position. The brake-shift interlock feature prevents shifting of the transmission out of the P (park) position without the brake pedal being depressed. To operate:

- Start the engine.

- Depress and hold the brake pedal. Do not have pressure on the gearshift lever when depressing the brake.
- Move the gearshift lever out of P (park).

⚠ WARNING

Hold the brake pedal down while you move the gearshift from position to position. If you do not hold the brake pedal down, your vehicle may move unexpectedly and cause property damage, personal injury or death.

Allison MD (Medium Duty) Electronic World Transmission (WT)

When the vehicle is started, Navistar installations for WT transmissions always start in the *Performance* mode. Pressing the *Mode* button on the shift tower will switch the transmission to *Economy* mode and illuminate *Mode ON* in the shift tower display. Economy mode provides operation at a lower engine RPM while maintaining adequate performance.

If the engine speed is above idle when a gear is selected with the shift tower, the vehicle will **not** launch. To move the vehicle, the shift tower must be moved to re-select a gear after the engine comes down to idle.

For further information on the Allison WT-MD, refer to the separate Allison WT-MD Operator's Manual.

Shifting with Synchronized Transmission

With the clutch released (pedal depressed) use second speed gear synchronizer to stop clutch disc rotation. This will allow smooth engagement of first or reverse gear selection. In order to complete gear engagement, it may be necessary to apply light pressure to the shift lever during initial engagement of the clutch. It takes one to two seconds to match gear speeds. Steady pressure on shift lever will help the synchronizer perform its job quicker. If the shift lever is forced into gear it is possible to override a blocker and defeat the purpose of the synchronizer, causing gear clash.

Shifting with Non-Synchronized Transmission

Refer to Clutch Brake (vehicles with non-synchronized transmission) and Double Clutch Procedures in this section.

Main and Auxiliary Controls

Main transmission, auxiliary transmission, transfer case, and power take off control shift patterns can be found in the following locations: A placard or decal on driver's visor door, on the instrument panel or on the shift control itself. In certain cases, the shift pattern will be contained in a manual for the specific component which was supplied with the vehicle.

The main transmission control is used to select the various gear ratios or speeds provided within the transmission.

The auxiliary transmission, used in conjunction with the main transmission, provides additional gear ratios. The auxiliary transmission (in addition to the main transmission) must be placed in one of the driving positions before power can be transferred to the rear wheels.

Selection of the UD (underdrive) gear in the auxiliary transmission gives a greater gear reduction than provided by the main transmission and can be used with any of the main transmission ratios. This ratio is generally used where the vehicle is under heavy load and additional torque is required. The auxiliary transmission should always be in UD (underdrive) when starting with a load.

Selection of the D (direct drive) gear does not change the gear ratio provided by the main transmission but is used where the gear ratios in the main transmission are adequate to handle the vehicle operation.

Selection of the OD (overdrive) gear in the auxiliary transmission permits increased road speeds in the various transmission ratios.

A loaded vehicle should not be operated with the auxiliary transmission in OD (overdrive) with the main transmission in either of the two lowest speed gears. Doing so could cause damage to either the transmission or propeller shaft.

CAUTION

When auxiliary transmissions are used in combination with automatic transmissions, a loaded vehicle should not be started with the auxiliary in the OD (overdrive) position. Other auxiliary transmission ratio selections must be made only when vehicle is not in motion.

WARNING

Before backing up, check to see that area behind vehicle is clear of people, animals and objects. Use a spotter whenever possible and always keep that person in sight. Failure to do so may result in property damage, personal injury, or death . If so desired, backup alarms are available through your International dealer. However, they are never a substitute for the above procedures.

TRANSFER CASE

This control ENGAGES or DISENGAGES the front axle and selects the HIGH or LOW speed range of the transfer case.

Shifting

The transfer case transmits power to the front driving axle for operation over rough terrain, steep grades or slippery surfaces (i.e., mud, gravel, snow) where improved traction is required.

Low gear of the transfer case (if so equipped) should be engaged only when the vehicle is stopped or moving forward slowly. Low gear is intended for off–highway use only, where additional gear reduction is occasionally required to pull heavy loads.

IMPORTANT: The vehicle must not be operated on dry, flat, hard surface roads with the transfer case in low gear. Operating under these conditions may damage the power train.

Downhill Operation

For precautions to be observed when operating vehicle on downgrades, refer to the Brake Section of this manual.

POWER TAKE OFF CONTROL

If your vehicle is equipped with a power take off (PTO), refer to the PTO equipment manufacturer's instructions.

If vehicle is equipped with an Allison Automatic Transmission, refer to separate Allison Transmission Operator's Manual.

AUTOMATIC TRANSMISSION OPERATING TEMPERATURE

The transmission should not be operated consistently at temperatures above 250°F (120°C). However, intermittent operation at temperatures up to 250°F (120°C) will not harm transmissions based on recommended lubricant change interval. Operating temperatures above 250°F (120°C) increase the rate of lubricant oxidation and shorten the effective life of the lubricant. When the transmission is operated intermittently above 250°F (120°C), snynthetic CD50 lube provides the best oxidation resistance followed by SAE 50 heavy duty engine oil. EP lubricants should not be run above 230°F (110°C) consistently. When the average operating temperature is at 250°F (120°C), the transmission will require more frequent oil changes or an auxiliary oil cooler.

CRUISE CONTROL

The cruise control systems for all electronic engines function in a very similar manner. The biggest difference is the minimum and maximum cruise control speeds which will vary from vehicle to vehicle.

⚠ WARNING

Do not use the cruise control system when driving conditions do not permit maintaining a constant speed, such as heavy traffic, or on roads that are winding, icy, snow covered, slippery, or with a loose driving surface. This may result in loss of vehicle control, and personal injury or death. Never attempt to use hand throttle as a cruise control.

CRUISE CONTROL SYSTEMS FOR INTERNATIONAL ENGINES

The electronic engine speed controls are activated by use of the rocker switches located in the cab dash.

These switches are used to control engine speed. The variable type controls bring the engine up to a desired speed and hold it there. The Pre-Set type, when activated, automatically advance the engine speed to a pre-set speed and hold it there.

The rocker type switches are used to operate these electronic features: cruise control, hand throttle, stationary pre-set speed control, stationary variable speed control, and mobile variable speed control.

Basic Functions of Rocker Switches

The left ON/OFF switch turns the control feature on or off. Engine speed does not change when you press on the ON side. All this switch does is turn the feature on. The ON/OFF switch has different labels, depending on which feature was ordered. However, they all perform the same function: to turn on the basic feature. The three available options are:

- Cruise – used when only cruise control is ordered;
- Throttle – used when only hand throttle or an engine speed control are ordered;
- Cruise/Throttle – used when cruise control and either hand throttle or an engine speed control are ordered.

The right switch (SET/COAST – RESUME/ACCEL) actually sets and controls the engine speed. But if the left switch has not been activated, nothing will happen when pushing on this right switch. This switch has the same label in all applications.

Operation Procedures

The following steps will activate and enable each of the five engine speed control features.

Cruise Control (12VVN) – operates like an automotive cruise control:

1. Press the ON (lower) position on the "ON/OFF" left rocker switch.
2. Bring the vehicle to the desired operating speed, and then push the "SET/COAST" position on the right rocker switch.
3. Once in the cruise mode the right switch can be used to increase or decrease vehicle speed by pushing and holding the "RESUME/ACCEL" to increase or the "SET/COAST" to decrease speed.
4. A slight tap on the brake or clutch pedal will deactivate the cruise but holds the selected speed in memory. To return to this speed, just press the "RESUME/ACCEL" position on the right switch.
5. When the left switch is pressed on the OFF position, or if the vehicle is shut off, the previous speed setting is canceled.

Hand Throttle (12UGN)

1. Press the ON (lower) position on the "ON/OFF" left rocker switch.
2. Press the "SET/COAST" position on the right switch.

3. Press and hold on the "RESUME/ACCEL" position on the right switch until the speed desired is obtained. Or, you can repeatedly press this position and increase the speed in small increments.
4. To change from this initial setting, use the right switch to lower or raise the engine speed, as you would in the cruise control mode. SET/COAST reduces engine speed and RESUME/ACCEL increases engine speed..
5. Press the OFF switch to turn the throttle off and return engine to idle.

Stationary Variable Speed Control (12VVT)

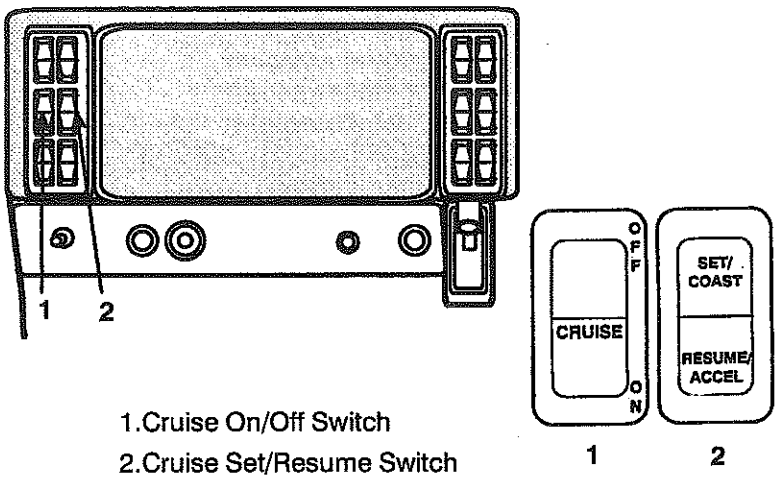
This feature is ordered to provide variable engine speed control primarily for operation of PTO powered equipment. It operates the same as the hand throttle discussed above.

Stationary Pre-Set Speed Control (12VVS)

1. Press the ON (lower) position on the "ON/OFF" left rocker switch.
2. Press the SET/COAST or RESUME/ACCEL right hand switch position for the pre-set speed desired. When ordered, this feature can provide two different predetermined speeds, which are selected with the SET/COAST or RESUME/ACCEL positions. You need to know which position to use for your specific operation.
3. To go from the first selected speed to the second speed, you need to be aware that when you press on this other position, the engine will initially return to idle. You must push it a second time to go to the second speed. This is done to protect equipment from being inadvertently operated at the wrong speed.

Mobile Variable Speed Control (12VVU)

Operates the same as cruise control, accept the engine speed is accurately controlled instead of vehicle speed. The truck could be operated in one of several gears but the truck is limited to 20 MPH, or any pre-set lower speed down to 3 MPH.



1.Cruise On/Off Switch
2.Cruise Set/Resume Switch

Cruise Control Switches – Dash Mounted
Models – 4000

NAVISTAR INTERNATIONAL ELECTRONICALLY CONTROLLED ENGINES

The Navistar engine is an electronically controlled diesel engine. The engine Electronic Control Module (ECM) controls the injection process and other engine functions. Some of the other systems controlled by the ECM include:

1. Cruise Control
2. Self Diagnostics
3. Engine Protection System
4. Engine Starting Options

Since many of the features are owner selectable and electronically programmable, some of the operating parameters will vary from vehicle to vehicle. Each vehicle will include an Engine Operation Manual.

Cruise Control

For information on the cruise control refer to the Cruise Control section of this manual.

Self Diagnostics

All Navistar engines have a Yellow engine warning light located on the instrument cluster. When the key switch is turned ON, the Yellow Engine Warning Light comes ON and stays ON, while the ECM runs normal startup tests, then the light turns OFF.

If the Yellow Light stays ON or comes ON while operating the vehicle, it is an indication that the vehicle needs service. Take the vehicle to a service center as soon as possible as some optional features and or engine power may be lost while the light is ON.

A diagnostic check may be performed using the Engine Diagnostics switch. With the KEY ON ENGINE OFF (KOEO), depress the Self Test Input (STI) switch located on the instrument panel. This will cause the ECM to run the KOEO standard tests. Any active system faults detected, will be "flashed" using the Yellow Engine Warning Light. If no faults are detected, code "111" will be flashed. Flash codes are three digit numbers. An explanation of the fault codes is contained in the Navistar Troubleshooting and Maintenance Manuals.

To retrieve flash codes, use the following procedure:

1. The procedure is performed in the key ON engine OFF (KOEO) mode.
2. Turn the key to the IGN (not start) position allow the ECM to perform it's normal startup test. If an active code is detected the Yellow warning light will stay on.
3. Depress and release the STI switch to begin the diagnostic read out procedure:
   A. Before the first code is sent the red Oil/Water lamp will flash once.
   B. • If **no codes** are present, the Yellow engine warning light will flash code 111
   Flash – pause – Flash – pause – Flash

   • If an **active code** is present, the code will be flashed through the Yellow light. If more than one active code is present, then the Red light will flash once before each new code and the Yellow light will flash the next code. It will continue in this manner until all active codes are flashed.

   C. • Two flashes of the red Oil/Water lamp separate the last active code from the first inactive code. If **no codes** are present, the Yellow engine warning light will flash code 111
   Flash – pause – Flash – pause – Flash

- If an **active code** is present, the code will be flashed through the Yellow light. If more than one active code is present, then the Red light will flash once before each new code and the Yellow light will flash the next code. It will continue in this manner until all active codes are flashed.

D. **When all the active and inactive codes have been flashed**, the Red Oil Water Warning Light will flash three times to indicate the end of the process. To interrupt and end the process early, just turn the key OFF.

Engine Warning/Protection System (EWPS)

The engine provides four distinct levels of protection:

- Standard Engine Monitoring
- Optional Engine Warning System 3–Way (08WCB)
- Optional Engine Protection System (08WNG)
- Optional Engine Warning System – 2 Way (08WDH)

Standard Engine Monitoring

The ECM monitors engine operating conditions for excessive *engine speed* and *coolant temperature*. If these conditions occur, a fault code will be set, but the Yellow Engine Warning Light or the Red Oil Water Warning Light are not turned on. Standard instrumentation includes an oil pressure and engine coolant temperature gauge.

Optional Engine Warning System – 3-Way (08WCB)

The optional 3–way warning system monitors engine oil pressure, coolant temperature and coolant level. If engine oil pressure, engine coolant temperature or engine coolant level conditions exceed the *preset warning limits*, the appropriate fault codes are set and the Red Engine Warning Light is turned ON. This system includes standard monitoring.

NOTE: If the Oil/Water Warning Light comes ON, bring the vehicle to a safe stop and shut the engine off.

Optional Engine Protection System – 3-Way (08WNG)

This system includes the optional 3–way engine warning system. In addition, if engine oil pressure, engine coolant temperature or engine coolant level conditions exceed the warning limits, the appropriate fault codes are set and the Red Engine Warning Light is turned ON. If the engine oil pressure, engine coolant temperature or engine coolant level conditions exceed the *preset critical limit* the engine is shutdown. After an automatic shutdown, the engine can be restarted and will operate in a derated mode for an additional 30 seconds if the conditions causing the shutdown are still present.

Optional Engine Warning System – 2 Way (08WDH)

The optional 2-way system monitors engine oil pressure and coolant temperature.

NOTE: If the Oil/Water Warning Light comes ON, bring the vehicle to a safe stop and shut the engine off before shutdown occurs.

WARNING

In the event engine shutdown occurs, make certain that vehicle is safely off of roadway and problem is remedied prior to proceeding back on roadway. Failure to remove vehicle from roadway could result in an accident, serious injury or death.

Engine Starting Features

WARNING

To avoid accidental movement and possible property damage and personal injury, never start the engine unless you're sure the transmission has been placed in neutral.

With an automatic transmission, the transmission must be neutral, before the starter can be engaged.

With manual transmissions there is an *optional customer selectable feature* requiring the clutch pedal to be depressed, before the starter can be engaged while the standard mode does not require the clutch pedal to be depressed to start the vehicle. It is recommended that the clutch always be depressed and the transmission placed in neutral before attempting to start the engine.

DOOR CONTROL AND LOCK

TO LOCK/UNLOCK FROM INSIDE

To lock doors, push door lock control downward. To unlock doors, pull control upward.

TO LOCK/UNLOCK FROM OUTSIDE

To lock doors, turn key clockwise and remove. To unlock, turn key counterclockwise and remove.

⚠ WARNING

To help reduce the risk of personal injury in the event of an accident, keep doors locked when vehicle is in motion and be sure all occupants are using seat belts.

Along with using the seat belts properly, locking the doors helps prevent people from being thrown from the vehicle. It also helps prevent unintended opening of the doors and helps keep out intruders.

TO OPEN FROM INSIDE/OUTSIDE

4000 : To open door from inside, pull upward on handle. To open door from outside, insert fingertip into door control recess and pull handle outward.

DOOR WINDOW REGULATOR

To lower door glass (left door), turn window regulator handle clockwise. To raise glass, turn handle counterclockwise. Reverse this procedure for opposite door.

POWER WINDOWS (OPTIONAL)

4000 Series trucks may have optional electrically operated driver and passenger windows. Controls for these window lifts are mounted in the instrument panel.

ELECTRICAL

ACCESSORY FEED CONNECTIONS

When connecting owner–installed electrical accessories to the vehicle's electrical system, use only the connection terminals provided for this purpose.

DO NOT break or cut into existing vehicle circuits to connect accessories.

For locations of accessory feed connectors, refer to the ELECTRICAL CIRCUIT DIAGRAM MANUAL.

ALTERNATOR

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

IMPORTANT: Before connecting a fast charger, booster battery or installing a new battery, make sure that the ground polarities of the fast charger, booster battery or alternator (when installing a battery) are matched to the ground polarity of the vehicle battery. Improper usage of fast charger, hook–up of booster battery or installing battery can cause damage to the electrical system or to the alternator. Do not attempt to polarize the alternator.

AMMETER

The ammeter indicates the rate of charge of electric current supplied by the alternator to the battery, or the rate of discharge from the battery. At low engine speeds the ammeter indicator may show a negative or discharge reading. When the battery is fully charged, a very slight charge is indicated during normal vehicle operation.

BATTERY

WARNING

To prevent severe injury to the eyes, face, limbs and body, it is imperative that lighted tobacco, flames or sparks be kept away from the vent openings of the battery. The gas mixture in the battery cells, which escapes through the vents, could ignite and/or cause an explosion. This is particularly true when jumper cables are being used.

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

Whenever disconnecting battery terminals, always disconnect ground terminal first. When reconnecting, always connect ground terminal last.

Always wear eye protection when working around batteries. Do not attempt to jump start a vehicle having a frozen battery, because the battery may rupture or explode. If a frozen battery is suspected, examine all fill vents on the battery. If ice can be seen, do not attempt to start with jumper cables as long as the battery remains frozen. Thaw out battery and recharge.

Do Not Check Battery Condition By Shorting (Flashing) Across Terminals.

Failure to observe these instructions could result in personal injury and/or damage to the vehicle.

The solution in each cell should be to the indicator level. When the solution is below this level, add distilled water, using a clean syringe. Acid or electrolyte should never be added except by persons skilled in working with these materials. Some maintenance-free batteries do not have removable caps for adding distilled water.

Never add special dopes, solutions or powders to batteries.

Battery cable terminals must be clean and tight. Use hot water and common baking soda for removing terminal corrosion and for cleaning the top of the battery. Brighten the contact surface with steel wool, apply a light coat of lubricant sealing grease such as Fleetrite® 472141–C1 or equivalent and reassemble. Be sure the terminals are clamped tightly and that the battery is clamped securely in the battery box.

When working around the terminals and battery, use extra care to avoid shorting. A good practice is to insulate pliers and screwdrivers. **Do Not Check Battery Condition By Shorting (Flashing) Across Terminals.**

VOLTMETER

The voltmeter gauge indicates the condition of the battery.

The gauge is divided into colored sections.

With ignition switch ON (before starting engine) the gauge will show the condition of the battery.

GREEN – A well charged battery.

ORANGE (RED) – Very low battery charge.

With the engine running at operating speeds the gauge will show the condition of the generating system.

GREEN generating system working properly.

ORANGE (RED) – voltage output too low or too high.

Constant reading in either RED area indicates the need for a complete check of the battery and generating system.

CIRCUIT BREAKERS, FUSES AND FUSIBLE LINKS

Electrical circuits are protected either by circuit breakers, fuses or fusible links. For the size and location of circuit breakers, fuses and fusible links, please refer to Section F 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 splicing in 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. Automatic reset breakers (Type I) will reset automatically; they should only be used in the headlight and wiper motor circuits. Type II circuit breakers will reset if the short is removed from the circuit.

WARNING

Wire gauge is designed to meet fuse/circuit breaker rating. Do not increase size of fuse or circuit breaker or change type of breaker supplied with your truck. To do so could cause wiring to overheat and possibly burn, resulting in a fire which could cause personal injury or death.

1000, 4000

The various electrical units are protected by either fuses or circuit breakers located under the instrument panel to the left of the driver.

HORN

Some areas have local Noise Control Laws regulating horn use. If your vehicle has both an electric and an air horn system, use the electric horn within city limits and the air horn outside city limits.

The electric horn control (city horn) is normally located in the steering wheel. Push horn button down to operate.

The air horn control (country horn) is normally located forward of the left door opening above the driver's head. Pull control down to operate.

HOUR METER

The hour meter records the number of hours that the engine has operated. Never leave starting switch in the Run position while the engine is not operating. For 1000, 4000 Series it is mounted in the tachometer head, and will not operate unless the engine is running.

In certain types of operations such as stationary use of engine during Power Take Off use or short hauls involving extensive use of reverse gear, the odometer reading is not an accurate guide for engine or chassis lubrication intervals. The hour meter reading can be used as a guide in determining lubrication and maintenance intervals.

LIGHTING SWITCHES

NOTE: ***Vehicles Equipped with Fog Lights:*** **the electrical circuit is designed so that the fog lights will operate with the headlights on low beam mode.**

4000

When the upper half of the lighting switch is pressed, the parking, marker and tail lights are on. When the lower half of the lighting switch is pressed, the head lights, marker lights and tail lights are on. To light the instrument panel, slide the PANEL LIGHT switch up; a built–in rheostat controls the intensity of the panel light from DIM to BRIGHT. To turn the cab interior light on, slide the lighting switch control mounted on the light housing to the desired position.

Standard headlight dimmer switch, located on the turn signal switch is activated by lifting.

OIL PRESSURE WARNING LIGHT, HIGH WATER TEMPERATURE WARNING LIGHT

With the ignition switch turned ON the light will glow while the basic 6 gauges are cycled through one complete sweep. If light fails to go OUT after starting engine, stop engine and determine cause of low oil pressure and/or excessive water temperature.

PYROMETER

The pyrometer indicates the temperature of the exhaust gases. Variations in engine load can cause exhaust temperatures to vary. If the pyrometer reading shows that exhaust temperature exceeds 1200°F (649°C), throttle less fuel to the engine until the exhaust temperature is reduced. Downshift to a lower gear if the engine is in an overloaded condition.

NOTE: The pyrometer is set to ambient temperature. With the engine cold, the pyrometer reading should indicate approximately the outside temperature. Do not attempt to adjust the pyrometer to 0 (zero) degrees.

SPEEDOMETER AND ODOMETER

The speedometer indicates the vehicle speed in miles or kilometers per hour. The odometer records the total numbers of miles/kilometers traveled. The speedometer will go through a self-check (full sweep) on every power-up.

LOW FUEL WARNING LIGHT

The low fuel warning light will come on during the diagnostic sweep of the basic 6 gauges. Warning light will go off when fuel level is greater than $^1/_8$ th tank.

TACHOMETER

The tachometer indicates engine RPM. The engine can be operated between rated speed and high idle without damage but should not be allowed to overspeed (such as when going downhill). Refer to Engine Segment of this Section for vehicle operation engine speeds.

DATA LINK DRIVEN INSTRUMENT CLUSTER – 1000 THROUGH 8000

The speedometer, tachometer, voltage oil pressure and water temperature gauges will go through one full sweep on every power–up before returning to indicating a gauge parameter. This tells the driver that all eletronice, electronic gauges and odometer are functioning properly. Gauges that are erratic or do not sweep properly should be serviced.

Electronic Fuel Control – International Engines

The DT466E and International 530E are electronically governed over all operating ranges. Some standard features:

- Engine Warm–Up Control – (ECM) adjusts injector operation as required.
- Cold Ambient Protection (CAP) – to aid engine warm up and maintain engine temperature.
- Change Oil Light – lights when oil change is required.

Some Optional Features:

- Cruise Control – provides vehicle speed control.

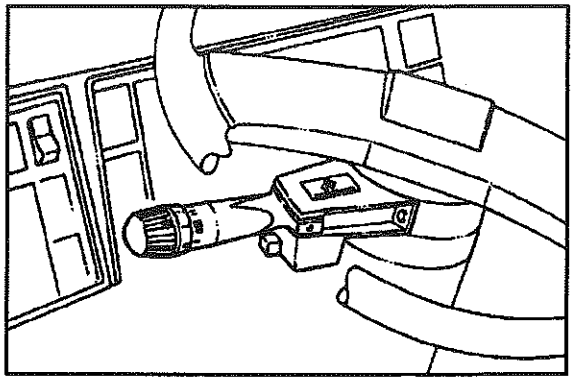
- Engine Warning System – This system illuminates the red "Stop Engine" lamp and actuates a buzzer when warning thresholds for coolant temperature, engine coolant level and/or low engine oil pressure are exceeded.
- Engine Shutdown System – This system shuts down the engine after 30 seconds of operation 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.
- Exhaust Back Pressure Engine Warm–Up System ((T–444E only)

TURN SIGNAL SWITCH

The turn signal switch is mounted on the left side of the steering column below the steering wheel. Green directional indicator lights are located on the instrument panel.

IMPORTANT: The turn signal system on some models is not self canceling. After a turn is completed, the driver must manually shut the system off by returning the switch to the OFF position.

Multi–Function Turn Signal Switch



4000Switch

This switch provides the following functions:

- **Signaling For A Turn** – When signaling your intention to make a turn, move the turn signal lever up or down to the "full turn" position which is past the point of resistance. On some models the switch will automatically cancel if the steering wheel is turned a large enough degree. On other models switch is not automatic cancel and will require manual cancel. (**Note**: on bus models automatic cancel is standard.) .
- **Push On/Push Off Hazard Switch** – Located just below the turn signal stalk.
- **Stop Override Hazard** – When hazard lights are activated and the brake pedal is depressed, all hazard/turn signal lights on the front, side and rear of the truck along with the side and rear trailer lights, will burn steadily until the brake is released.
- **Lift-to-Dim** – When the turn signal stalk is lifted past the "click" position, lights will switch to Hi-Beam position. When lifted again they will revert to Lo-Beam.
- **Headlight Flash-to-Pass** – When the turn signal lever is lifted with the headlights off, the Hi-Beam lights will come on and stay on as long as the lever is held in the up position. When the headlights are

on, the Hi-Beam lights can be made to flash if the lever is not lifted past the "click" or dimmer position.

- **Windshield Wipe** – Rotating the knob will control wiper speed (hi–low). Depressing the knob will start the wash feature and activate the wipers.
- **Lane Change** – Some switches include a "lane change" feature which allows the operator to signal their 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.

TRAFFIC HAZARD WARNING LIGHT SWITCH

Standard On All Models

The traffic hazard warning flasher system will operate with the key switch in the ON or OFF position. Use the warning system any time your vehicle becomes a traffic hazard, day or night.

The push on/push off traffic hazard warning switch is located just below the turn signal stalk.

GLOW PLUG WAIT LIGHT (T-444E DIESEL ENGINE)

The T444E diesel engine utilizes an electric glow plug system to aid starting the engine. This system preheats the combustion chamber to aid ignition of the fuel.

The system consists of eight glow plugs (one for each cylinder) and a WAIT light on the instrument panel. Refer to this section for instrument panel illustrations.

The system is activated when the key switch is in the ON position. Battery current energizes the glow plugs. Current to the glow plugs and the WAIT lamp will shut off when the glow plugs are hot enough. This takes from four to ten seconds after the key is first turned on. When the WAIT lamp goes off, the engine is ready to start.

The glow plugs will not activate unless the coolant temperature drops below normal operating temperature.

CAUTION

Do not jump start vehicle with auxiliary source of more than 12 volts.

Do not bypass or alter glow plug circuits in any way. Failure to comply will destroy glow plugs and can lead to severe engine damage.

Refer to T444E Engine Operator's Manual for additional information.

COOLANT TEMPERATURE WARNING LIGHT

This light will illuminate in the event the coolant is above normal operating temperature. It is to make the operator aware that the cooling system temperature gauge should be monitored.

Selecting the next lower transmission gear range may help drop the temperature. If the temperature drops the light may not immediately correspond to the temperature gauge. There may be a 10°– 15°F (6°– 8°C) drop on the temperature gauge before the temperature warning light goes off.

WARNING LIGHTS

All of the warning lights have power applied when the ignition key is turned ON.

The coolant level warning light circuit ground is controlled by the coolant level control module. The coolant level control module monitors the coolant level ground probe. The probe provides a ground path for the control module using the radiator coolant as a conductor. If the coolant level drops below the ends of the probe, the ground path is opened. The control module senses the opening of the circuit. An electronic switch in the module closes and provides a ground path to turn ON the coolant level warning light. Also, the warning light will come ON to check the bulb when the key switch is turned from the OFF position to the ON or RUN position.

The engine coolant temperature warning light switch is a normally-open switch that closes to ground when the engine coolant temperature rises above 210°F (99°C).

The pressure warning switch on an air–braked vehicle is a normally-closed switch that opens when the pressure in the system rises above 60 psi. When the engine is first started, this light will come ON and remain ON until the air pressure rises above 60 psi.

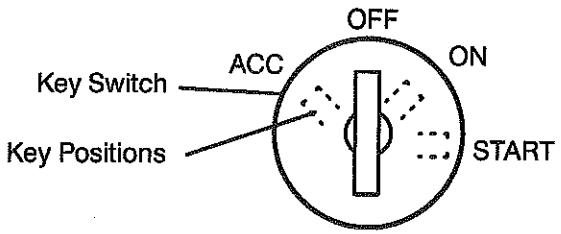
The engine oil pressure warning switch is also a normally-closed switch. This switch opens when engine oil pressure exceeds 4 psi.

STARTING SWITCHES (Also Refer To STARTING DIESEL ENGINES)

Key Switch with START Position

Set parking brake, place transmission control in the neutral position and depress clutch pedal. With ignition key in switch, rotate switch clockwise to the first position, marked ON. Continued clockwise rotation of the key will activate the cranking system causing the engine to turn over. As soon as the engine starts release key and the switch will return to the ON position. Engine will continue to run with key in ON position. To stop the engine rotate the key counterclockwise to the vertical position, marked OFF, and remove key from switch. There is also an ACC (Accessory) position on the switch, allowing use of accessories during periods when engine operation is not desired. With ignition key in switch, rotate key counterclockwise from the OFF position. Switch will stop at the ACC position. To terminate accessory operation rotate key clockwise to the OFF position and remove key.

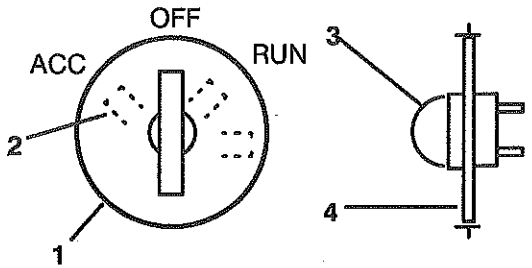
Key Switch with START Position



NOTE: Pushbutton start is an optional feature on some models.

To engage cranking motor for engine operation:

Set parking brake, place transmission control in neutral position and **depress clutch pedal.** Insert key into switch, rotate switch clockwise to the RUN position and depress start pushbutton located on instrument panel. When engine starts, release start pushbutton. Engine will continue to run with switch in the RUN position. To stop the engine, rotate the switch counterclockwise to the vertical position, marked OFF, and remove key from switch. Some engines have separate manual shut–off valves.



Key Switch with Push Button Start

1.Key Switch
2.Key Positions
3.Starter Push Button
4.Instrument Panel

There is also an ACC (Accessory) position on the switch, allowing use of accessories during periods when engine operation is not desired. With key in switch, rotate key counterclockwise from the OFF position. Switch will stop at the ACC position. To terminate accessory operation rotate key clockwise to the OFF position and remove key.

ENGINE

OPERATION OF ENGINE IN FUEL RICH ATMOSPHERE

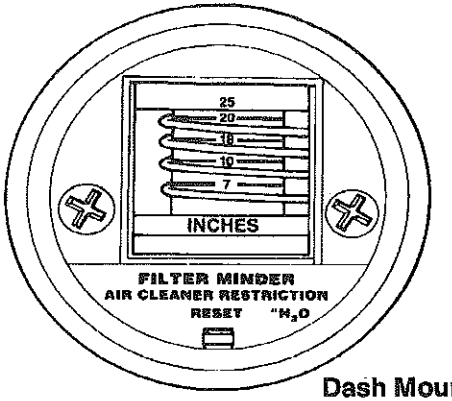
⚠ WARNING

Operation of diesel engines in locations where potentially fuel rich atmospheres can exist may result in situations that will cause engine speed to increase uncontrollably as a a result of the engine being fueled by fuel rich air being drawn into the engine air intake. If this situation should occur, serious mechanical damage to the engine, fire or serious personal injury could result. Turning the ignition key off or activating the engine fuel stop will not slow or stop the engine under these conditions. Before operating diesel engines in such environments, be sure that: (1) adequate means of completely stopping the air intake to the engine is available and, (2) the driver remains in the vehicle operator's position whenever the engine is running.

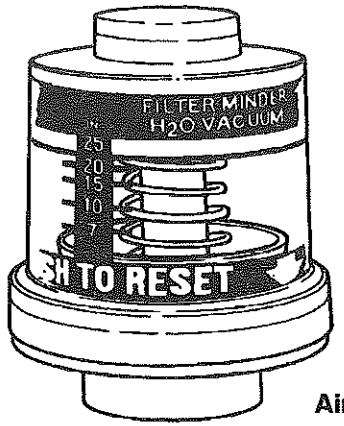
AIR RESTRICTION GAUGE

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 will be mounted either on the air cleaner or instrument panel (dash mounted).



Dash Mounted

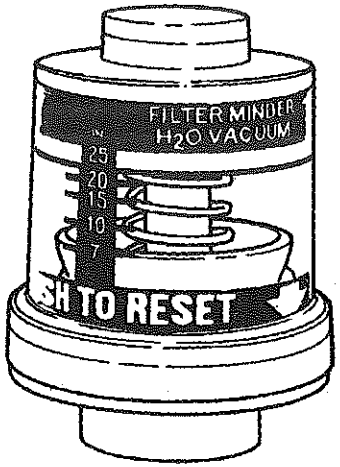


Air Cleaner Mounted

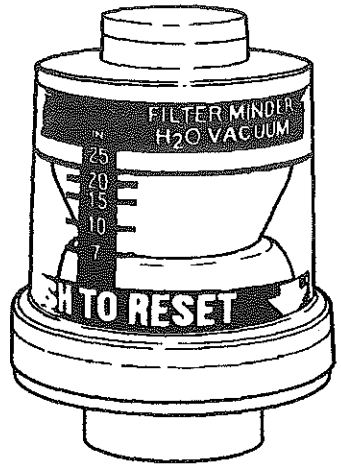
Both gauges have a push type reset button. The reset on the dash panel mounted gauge is in face of the gauge. The reset on air cleaner mounted gauge is on bottom of gauge.

It is recommended that the operator NOT reset gauge until it has been determined if air cleaner service is required.

NOTE: It is not necessary that the engine be shut down when the yellow indicator in gauge reaches the maximum restriction (red) but indicates air cleaner service is required (refer to Troubleshooting).



Normal Clean Filter (3–15 inches) (Varies With Each System)



Filter Life Used Up. Refer to Engine Air Restriction Limit Chart. Continued Operation May Damage Engine.

IMPORTANT: DO NOT open air cleaner, disturb seals or element until gauge registers maximum restriction (refer to Engine Air Restriction Limit Chart). Replacement of air cleaner element is not to be judged by appearance. Air cleaner element may look dirty but still be in satisfactory condition.

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 below the window so the air restriction gauge can be reused.

IMPORTANT: 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.

TROUBLESHOOTING

No Restriction Reading	
POSSIBLE CAUSES	HOW TO CHECK
Plugged fitting or vacuum line.	Apply vacuum to gauge until locked up at red zone. Re-connect line and *hold in* 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. Re-connect gauge and close end of line air tight. *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 air tight.
Engine air flow too low to generate a restriction reading.	Turbocharged engines must be at full load to pull full engine air flow. (N.A. engines at full RPM)
Air cleaner element split open.	Visually inspect element.

High Restriction Reading	
POSSIBLE CAUSES	EXPLANATION
Plugged or poorly cleaned elements.	Ultra fine particles are difficult to remove and cleaning may not sufficiently lower restriction.
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 and it disappears after drying out. COLD AIR MAY BE SO DENSE THAT HIGH RESTRICTION MAY NOT REDUCE ENGINE POWER BEFORE ELEMENTS ARE DAMAGED FROM HIGH VACUUM. If gauge is locked up at red zone check elements for damage.

DIESEL ENGINES

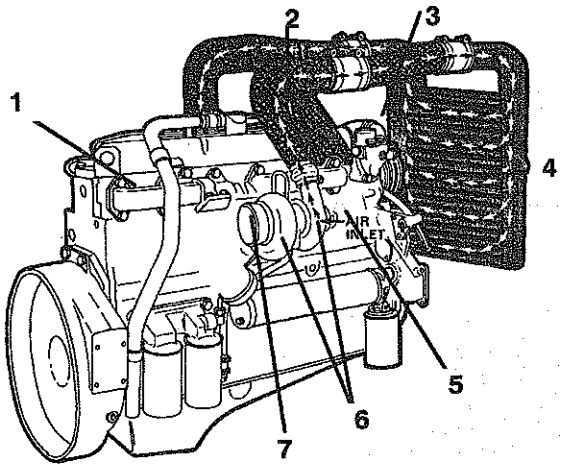
NOTE: For information pertaining to fuel and requirements refer to individual engine owner's manual provided with the vehicle.

The text herein applies to International® engines only.

Refer to Fueling Precautions listed in this section of manual.

CHARGE AIR COOLER

All International engines are 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.



Typical Charge Air Cooler System

1. Exhaust Manifold
2. Charge Air Cooler to Intake Manifold Pipe (Cold Side)
3. Turbocharger to Charge Air Cooler (Hot Side)
4. Charge Air Cooler
5. Air Intake
6. Turbocharger
7. Exhaust

ENGINE PERFORMANCE PROBLEMS

- Lower fuel viscosity could reduce engine power and fuel economy, and increases the possibility of excessive fuel system wear or failure.
- Lower cetane number could cause hard starting and slower warm–up, and could increase engine noise and exhaust emissions.

CAUTION

Excessive cetane number reduction can lead to engine damage or failure.

WARNING

Under no circumstances should gasoline, gasohol and/or alcohol be blended with diesel fuel. This practice creates an extreme fire hazard and under certain conditions an explosive hazard which could result in serious injury or death.

WARNING

Exhaust gases from engines contain hazardous compounds. Do not operate engines in enclosed areas without abundant ventilation (garage doors & windows wide open). Maintain exhaust system in good operating condition. Breathing excessive amounts of exhaust gases can cause severe personal injury or death.

EMERGENCY STARTING

⚠ WARNING

The following procedures must be performed exactly as outlined. Otherwise injury to the face, eyes, body, limbs and respiratory system could result from fire or acid due to battery explosion. Property damage could also result.

1. To prevent shorting of the electrical system, remove metal rings or watches and do not allow metal tools to contact positive terminal of battery.
2. Place transmission in Neutral and set parking brake in both vehicles.
3. Shut off lights, heater, air conditioner and any other electrical loads in both vehicles.
4. Eye protection should be worn if available. If not available, shield eyes when near either battery.
5. Vehicle bodies or bumpers must not be in contact.
6. Connect one end of the first jumper cable to positive (+) terminal of the dead battery or (+) terminal of jump start stud and then the other end to the positive (+) terminal of the booster battery.

CAUTION

To avoid damage to vehicle electronic components, voltage supplied to a vehicle's electrical system must never exceed 16.0 volts. This voltage must not be exceeded when the ignition switch is in the OFF, ACC or IGN position, or during engine cranking. The most reliable means for jump starting a vehicle is to use batteries connected so as to provide 12 volts. Never use an electric welder.

7. Connect one end of the second jumper cable to negative (–) terminal of the booster battery, and the other end to chassis frame. Do not attach the other end to the negative (–) battery terminal, because a spark could occur and cause explosion of gases normally present around the battery.
8. Reverse above procedure when removing the jumper cables.

WARNING

All vehicles have blind spots. To avoid possible severe injury or property damage, never move your vehicle to the side or rear or change lanes without being sure your way is clear on both sides and to your rear.

When approaching a hill, depress accelerator smoothly to start the upgrade at full power, then shift down as needed to maintain vehicle speed.

Prevent over–speeding 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 not in excess of the Maximum Governed Speed or High–Idle RPM (no load).

WARNING

Operating an engine beyond the maximum governed speed can cause vehicle damage and personal injury.

Engine Brake, Exhaust Brake or Retarder

WARNING

Do not use the vehicle retarder, engine or exhaust brake on slippery road surfaces. Doing so could cause wheel slippage, loss of vehicle control, resulting in an accident causing property damage, personal injury or death. Use same transmission gear you would normally use in these conditions.

Cold Weather Operation

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

1. Make certain that battery is of sufficient size and is in fully charged condition. Check that all other electrical equipment is in optimum condition.
2. Use permanent type anti–freeze solution to protect against damage by freezing.
3. At the end of each daily operation, drain water from water separator. Fill fuel tank at end of daily operation to prevent condensation.
4. Be sure to use proper cold weather lubricating oil, and be sure crankcase is at proper level.
5. At temperatures of – 4 °F (–20 °C) and below, it is recommended that you use a crankcase mounted coolant heater to improve cold starting.
6. 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.

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 build–up of heavy deposits of carbon and varnish 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.**
- **Use a minimum 45 Cetane diesel fuel or utilize Cetane index improvers from a reputable manufacturer.**
- **Maintain a minimum of 1250 rpm idle by use of the hand throttle. Always make sure that parking brake is applied and transmission is in neutral before applying hand throttle.**
- **Maintain engine cooling system.**
- **For School Buses: shut off rear heater fans until bus is being driven.**

- **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.**
- **Consider use of engine block heaters, approved winterfronts and/or radiator shutters where conditions warrant.**

Winter Front Usage

Unless extremely cold conditions exist, the use of winter fronts or other air restrictive devices mounted in front of the radiator is not recommended on vehicles equipped with chassis mounted charge air coolers. Air flow restriction can cause high exhaust temperatures, power loss, excessive fan usage, and a reduction in fuel economy. If you insist on using a winter front, the device should have a **permanent** opening directly in line with the fan hub. The opening's minimum dimension must be at least 120 sq.in.

Hot Weather Operation

1. Make sure that battery has proper amount of electrolyte.
2. Keep cooling system filled with clean permanent anti–freeze solution to protect against damage by overheating.
3. Fill fuel tank at end of daily operation to prevent condensation in tank.
4. Keep external surface of engine, radiator and accessories clean to avoid dirt build–up.

Above normal coolant temperature could be experienced while driving in a transmission gear ratio which would lug the engine. To correct the problem, engine speed should be increased by down shifting into the next lower gear to increase engine RPM's which will increase coolant flow through the radiator.

STARTING A TURBOCHARGED VEHICLE ON A GRADE

Under normal circumstances, when a driver is starting a load on a grade with a naturally aspirated diesel engine, the engine RPM starts to fall slightly when the clutch is engaged, but very quickly recovers as the vehicle begins moving.

The turbocharged diesel engines have a somewhat different feeling. Once the clutch is engaged, the RPM falls off significantly. This is due to the emission control device on the turbocharged engine which controls the fuel input during first gear acceleration. When engine RPM first falls off, do not disengage the clutch and try to increase engine RPM. Doing so may damage driveline components. After the initial drop in speed, the engine will recover and accelerate in a normal manner.

The Proper Procedure Should Be:

Set the spring brakes or hand brake, if equipped, bring the RPM up slightly and begin to engage the clutch while, at the same time, releasing the spring brakes.

As the RPM begins to fall off, DO NOT disengage the clutch. The RPM will quickly come back and the vehicle will move steadily up the grade.

SHUT-DOWN

Idle the engine for three to five minutes before shutting down. This few minutes idling allows the lubricating oil and water to carry heat away from the iron masses.

The larger the engine, the greater the need for this idling period and of course, the length of the idling period should somewhat follow the size of the engine in order to avoid seals or like features of an engine being damaged by rising heat.

With Engine Stop Control

To stop the engine turn the starting switch to OFF position and pull out an engine fuel shut–off control (if equipped) until engine stops. Leave control pulled out until ready to restart engine. Leaving control out will prevent engine from starting if vehicle should roll.

SHUT-DOWN WARNING LIGHT OR BUZZER

Vehicles may be equipped with an automatic shutdown system which stops the engine in the event of high coolant temperature or low engine oil pressure. A warning light on the instrument panel along with a buzzer or bell will indicate high coolant temperature or low oil pressure. If the temperature and/or pressure continues to change beyond the warning point to a predetermined level, the engine will automatically shut down. Vehicles are equipped with an override feature which will allow the engine to be restarted so that the vehicle can be moved. The engine should be run no longer than absolutely necessary. A decal located in front of the operator provides instructions on how the override should be operated.

WARNING

In the event that a shutdown occurs, make certain that vehicle is safely off of roadway and problem is remedied prior to proceeding back on roadway. Failure to temove vehicle from roadway could result in an accident, causing serious injury or death.

PARKING

WARNING

When parking your vehicle, do not leave transmission in gear; if vehicle rolls, engine could start by heat of compression. Always use parking brake. When parking on a grade, block wheels and turn front wheels to one side or the other. Failure to follow these procedures could result in an unattended vehicle moving, and possibly cause personal injury or property damage.

COOLING SYSTEM

WARNING

To avoid personal injury use only the following procedure to remove the pressure type cap from the radiator or expansion tank. Always allow the engine to cool first. Wrap a thick, heavy cloth around the cap. Push down, loosen cap slowly to its first notch position; then pause a moment. This will avoid possible scalding by hot water or steam. Continue to turn cap to the left and remove.

CAUTION

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.

WARNING

To avoid property damage and/or personal injury do not operate the engine with a fan which has been bent, mutilated, modified or in any way damaged. Do not operate the engine if the radiator cooling fan makes physical contact or strikes against anything while in operation.

Anti–Freeze

The cooling system of your new vehicle is filled at the factory with International permanent type anti–freeze. International or Fleetrite permanent type anti–freeze may be added undiluted if protection below –20°F (–29°C) is required. Never use a concentration of anti–freeze greater than 68%. Refer to the segment on anti–freeze in the cooling system portion of the maintenance section of this manual.

Use anti–freeze meeting industry recommended standard containing not more than 0.1% silicate content. International and Fleetrite anti–freeze meets this requirement.

NOTE: Refer to Over concentration of Anti–freeze and/or Supplemental Coolant Additives in Maintenance, Cooling System.

Radiator Shutters

An internal combustion engine operated at a constant predetermined temperature has less wear and greater efficiency. To assist in maintaining this constant temperature, optional shutters limit air flow through the radiator core. Shutter blades are opened and closed automatically by a thermostatic modulated control. Generally, shutters are not needed unless ambient temperatures are extremely cold.

ENGINE OIL

Keep oil level as near the high level mark as possible. Never operate an engine with oil level below low level mark.

When checking the oil level, the dipstick must be withdrawn and wiped clean, then inserted all the way and again withdrawn for a true reading.

Never check the oil level with engine running or immediately after engine shutdown as an inaccurate reading will be obtained. Most engines require a 15 to 20 minute waiting period. The T444E engine requires a 20 to 30 minute shutdown prior to an oil level check.

Use only recommended viscosity engine oil. Refer to the Engine Owner's Manual for engine oil specifications.

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 change periods are performed at **recommended intervals.**

FUEL

Hazards of Diesel Fuel/Gasoline Blends:

Navistar International Transportation Corp. does not recommend the blending of gasoline, and/or alcohol with diesel fuel due to the hazards of fire/explosion and the detrimental effects on engine performance.

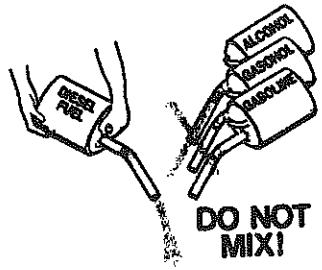
⚠ WARNING

Under no circumstances should gasoline, gasohol and/or alcohol be blended with diesel fuel. This practice creates an extreme fire hazard and under certain conditions an explosive hazard which could result in serious injury or death.

As little as two percent 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.

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. The Navistar International Transportation Corp. does not recommend the use of any supplementary fuel or lubricant additives. 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 PRECAUTIONS

According to the Federal Motor Carrier Safety Regulations, no driver or any employee of a motor carrier shall:

1. Fuel a motor vehicle with the engine running, except when it is necessary to run the engine to fuel the vehicle.
2. Smoke or expose any open flame in the vicinity of a vehicle being fueled.
3. Fuel a motor vehicle unless the nozzle of the fuel hose is continuously in contact with the intake pipe of the fuel tank.
4. Permit, insofar as practicable, any other person to engage in such activities as would be likely to result in fire or explosion.

Reserve Fuel

No supply of fuel for the propulsion of said motor vehicle or for the operation of accessories shall be carried on any motor vehicle except in a properly mounted fuel tank or tanks.

GROSS WEIGHT (AXLE - VEHICLE)

WARNING

Your International truck has gross axle weight, gross vehicle weight and gross combination weight ratings. Do not exceed these ratings. Exceeding these ratings by overloading can cause component failure resulting in property damage, personal injury or death.

HEATING, DEFROSTING, VENTILATION, AIR CONDITIONING

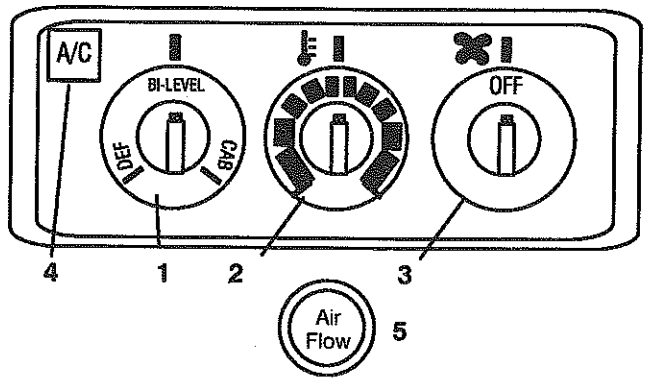
WARNING

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 result in an accident, causing property damage, personal injury or death. To improve defroster efficiency, remove ice and/or snow by hand from the windshield and windows.

CAUTION

To clear system of humid air, operate blowers for 30 seconds at high speed before moving the air outlets lever to the DEF position. This will prevent fogging of the glass, which can occur if humid air is blown onto a cool windshield.

4000



1.Air Selector Knob
2.Temperature Control Knob
3.Fan Speed Control Knob
4.Air Conditioning Button
5.Air Flow Knob

Heating

For proper cold weather operation the heat should be directed toward the floor level. Therefore, close all instrument panel outlets and fully open driver floor dump. The driver floor dump is cable operated from a push–pull control on the instrument panel located above the ashtray. Pushing the FLOOR AIR knob in will open the floor dump.

Adjust the temperature HEATER (heat) knob as required to give the desired degree of heat. The full counterclockwise (red) position provides the maximum heat. Move the AIR OUTLET knob to whichever position provides the desired air flow distribution between heat and defrost. For the maximum air flow, move the fan switch to the HI position. The heater will also operate with the fan OFF due to the ram air produced by vehicle motion.

Defrosting

To obtain maximum defrosting, place the AIR OUTLET knob on DEF and adjust the HEATER knob for the desired degree of heat. Adjust the fan speed to provide the desired air flow.

Fresh Air Ventilation

Fresh air enters the cab through the heater system. Adjust the temperature control knob as required to give the desired degree of ventilation. The full clockwise (blue) position provides maximum ventilation. Move the AIR OUTLET knob to whichever position provides the desired air flow distribution.

The fan may be used to increase the quantity of air entering the cab during ventilation. Adjust fan speed and air outlets.

IMPORTANT: Units equipped with heater-only will have three ventilation registers on the instrument panel: one on the left and two in the center. There is no right side ventilation register because air flow is not available at that location in the ventilation mode.

Air Conditioning

To properly air condition your cab in warm weather close the driver floor dump by pulling the FLOOR AIR knob out. Close all windows. Push the A/C button in and set the temperature knob to COLD. For maximum cooling move the FAN switch to the HI position. (The fan must be on for A/C operation.) Place the AIR OUTLET knob on the CAB position, then adjust the instrument panel outlets as desired.

The volume of air coming from the upper left dash outlet is normally less than the volume delivered by the other dash outlets. To assure maximum air flow from the upper left outlet be certain the FLOOR AIR knob is pulled all the way out.

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 overheated air inside by driving with windows down and the air conditioner ON for one or two city blocks.

Keep radiator area free of bugs, leaves, etc. 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. This water is condensed moisture removed from the air inside the vehicle.

IMPORTANT: The air conditioning system incorporates a low pressure switch which disengages the compressor clutch if evaporator outlet pressure falls below a certain set point. To restart the air conditioning system after an automatic shutdown has occurred, the operator must do one of the following:

1. Place A/C button in OFF position and thenback ON. Fan knob MUST NOT be in the OFF position.
2. Place fan knob in OFF position and then back to the desired speed setting. A/C system must be on (A/C button in the ON position).

If system continues to shut down automatically, have the system checked.

Dehumidification

The heater–defroster systems can be operated simultaneously with the air conditioner during mild weather and high humidity conditions to dehumidify moist air. Push in the A/C button, place the fan switch on HI and move the HEATER knob towards HOT until a comfortable temperature is maintained. The air conditioner will remove the humidity while the heater keeps the cab comfortable.

HOOD

TILT HOOD

WARNING

Never put any part of your body beneath a raised hood unless the hood is settled into its fully raised position.

Raising the Hood

3. Release latches on both sides of cowl.
4. Grasp hood assist handle/hood ornament. Pull hood forward over center and allow to settle into raised position.
5. Make certain that hood restraining cables are engaged before realeasing hood.

Lowering the Hood

1. Grasp hood assist handle/hood ornament. Push hood backward over center and allow to settle into lowered position.
2. Engage latches at both sides of cowl.

SMOKING

⚠ WARNING

Always use the ashtray(s) provided for disposing of cigar, cigarette, or pipe ashes and tobacco. If the sleeper bunk is not equipped with an ashtray, do not smoke in this area.

In addition to the risk of burn injuries or the possibility of even greater hazard associated with smoking in the cab or sleeper bunk, smoke or toxic gases emitted from a fire may promote confusion and disorientation, which could result in an accident, serious injury or death.

STEERING

Be alert to any change (feel) in steering when driving. This change or feel would include increased steering efforts, 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.

ADJUSTABLE STEERING COLUMN

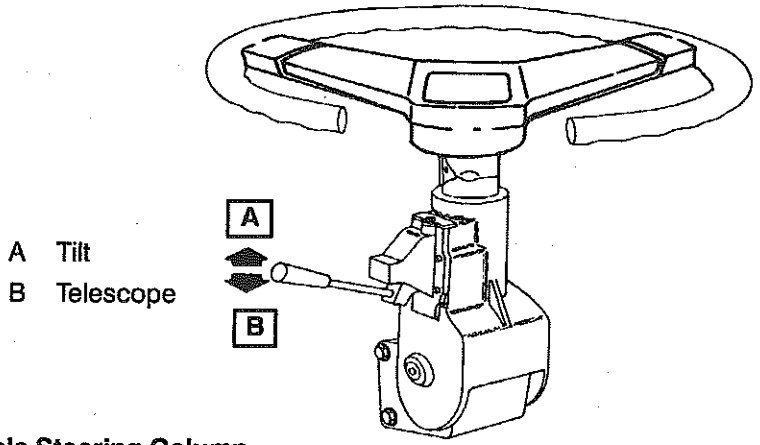
4000

Tilt

The steering column assembly has seven positions allowing adjustment toward or away from the driver in 7 degree increments through a 42 degree range. The tilt/telescoping lever is located on the left side of the column. To tilt the column, push the lever down and move the steering wheel to the desired position. Release the lever to lock the column in position.

Telescope

The column will telescope in 7 positions for a maximum increase of $2\text{–}^1/_4$ inches. To adjust the position of the steering wheel up or down, pull the lever up. Raise or lower the steering wheel to the desired position and release the lever to lock the column. Refer to illustration.



A Tilt
B Telescope

4000 Adjustable Steering Column

TOWING INSTRUCTIONS

Before moving the towed vehicle, check for adequate road clearance of vehicle components. Navistar 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 reset by recharging the air system with at least 64 lbs. (441 kPa) of air. If brake system will not retain air pressure, then the spring brakes must be released manually. SEE PARKING BRAKES

⚠ WARNING

To avoid personal injury or property damage when manually releasing the spring brakes, be sure to block the wheels so that vehicle cannot move when the brakes are released.

For towing, make sure the vehicle is securely connected to tow vehicle and tow vehicle parking brakes are applied before releasing the disabled vehicle's spring brakes.

TOWING VEHICLE WITH FRONT WHEELS SUSPENDED

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.

To avoid transmission damage, vehicles should not be towed even short distances without suspending rear wheels or removing the axle shafts or propeller shaft.

In the event the chassis is equipped with tandem axle 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 rear axle to contact road surface. Axle shafts must be removed from rear 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 avoid possible damage of brake lines, hoses or other components.

TOWING VEHICLES WITH DRIVER CONTROLLED DIFFERENTIAL LOCK

Removing Axle Shafts Before Towing

CAUTION

If the vehicle must be towed to a service facility with the drive axle wheels on the ground, it is necessary to remove the axle shafts before the vehicle is towed.

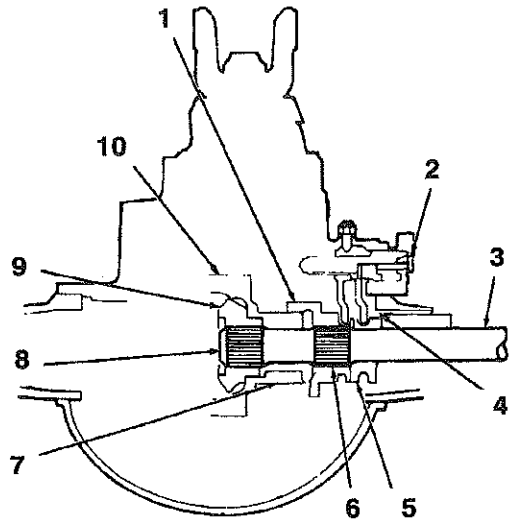
1. Shift main differential to the unlocked (disengaged) position. Differential lock light in the cab will go out.
2. Disconnect driveline universal joint from pinion input yoke or flange on carrier.
3. Remove capscrews and washers or stud nuts and washers from flanges of both axle shafts.
4. Loosen tapered dowels in flanges of both axle shafts by holding a 1–1/2 inch diameter brass drift or hammer against axle shaft center and hitting it with a five to six pound hammer.

CAUTION

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.

5. Remove tapered dowels and both axle shafts from axle assembly.
6. Assemble a cover over openings of both wheelends to prevent loss of lubricant and keep dirt from the wheel bearing cavities

NOTE: Right–hand axle shaft 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 Collar in Locked Position
2.Actuator Assembly and Shift Fork
3.Shaft, Axle
4.Interference Between Shift Collar and Housing
5.Shift Collar in Unlocked Position
6.Outer Splines – Axle Shaft to Collar
7.Shift Collar and Differential Case Splines
8.Inner Splines – Axle Shaft to Side Gear
9.Gear, Side
10.Differential (Plain) Case Half

Installing Axle Shafts

1. Remove covers from wheel ends.
2. Shift differential lock to the unlocked (disengaged)position.
3. Install right–hand and left–hand axle shafts:
   A. Place gaskets on both axle shafts.
   B. Push right–hand axle shaft and gasket into wheel end and housing until shaft stops against differential shift collar.
   C. Push down and in on axle shaft flange and rotate shaft until splines of shaft and shift collar are engaged.
   D. Push axle shaft further into housing until shaft stops against differential side gear.
   E. Push down on axle shaft flange and rotate shaft until splines of shaft and side gear are engaged.
   F. Push axle shaft completely into housing until axle shaft flange and gasket are flush against wheel hub.

G. Install left–hand axle shaft and gasket into wheel end.

H. Install capscrews and washers that hold axle shafts to wheel hub. Tighten to correct torque value. Refer to the appropriate Service Manual Section.

4. If wheel hubs have studs, install tapered dowels at each stud and into flange of axle shaft. Use a punch or drift and hammer if needed.

5. Install nuts and washers on studs. Tighten nuts to correct torque value. Refer to the appropriate Service Manual Section.

TOWING VEHICLE WITH REAR WHEELS SUSPENDED

Whenever possible, it is preferable to tow a disabled vehicle from the rear by raising the rear of the chassis.

When towing a vehicle with rear of the chassis suspended the front wheels must be locked in the straight ahead position.

Vehicles with manual shift transmissions must have at least one (1) pint of transmission lubricant drained from the case. This will prevent transmission lubricant from entering the clutch housing and lubricant saturating the clutch discs. Make sure that the transmission lubricant is replaced before the vehicle is returned to service.

CAUTION

To avoid damage to cab roof or air deflector when towing the vehicle backwards (rear wheels suspended) the air deflector must be removed.

TRACTOR-TRAILER CONNECTIONS

WARNING

To avoid personal injury use extreme caution when making brake and light connections. Inclement weather and accumulated road contamination deposits on handholds and stepping surfaces require extra care to avoid slips and falls. Provide adequate lighting of working area.

Do not climb on the back of a tractor unless it has been provided with a deck plate and hand-holds. Use a three point stance when climbing up and down from a deck plate. Do not jump from vehicle. Whenever possible make all connections while standing on the ground.

CONNECT AND DISCONNECT TRAILER WITH AIR SUSPENSION

The Air Suspension has a dump valve system option (Code 14899) that permits exhausting air in the suspension system when connecting or disconnecting the trailer.

The system is controlled by a lever–operated two–way control valve (flipper-type) air on or off valve. The control is usually located on the instrument panel.

With the control in the *exhaust* mode (left), the air supply to the air suspension system is exhausted to atmosphere. With the control in the *fill* position (right), air is supplied to the air suspension system and the air suspension system will regain height.

When connecting to a trailer, move the air control lever to the left and air will exhaust from suspension system lowering the tractor permitting backing under the trailer without undue loading of suspension system. After making the connection to trailer return the air control valve lever to the right (OFF) position, then raise landing gear. When disconnecting, the air control valve lever is moved to the left (ON) position after the landing gear is lowered. The brake hoses and light connectors are disconnected as well as pulling release lever on the fifth wheel.

The ON–OFF control valve must be returned to the left (OFF) position before operating with a trailer or operating the bobtail mode.

FIFTH WHEEL OPERATION

WARNING

Failure to follow the fifth wheel manufacturer's instructions for hooking and unhooking as well as sliding the fifth wheel could result in an accident, personal injuryor death.

Hook–Up

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 brakes are locked. 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. Hook brake hoses and light cord. Refer to Tractor Trailer Connections adhering to the WARNING and using the three point stance while connecting and disconnecting trailer.
7. Inspect fifth–wheel jaws to be sure they have closed on trailer king pin 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 brakes, either with the hand valve or tractor protection valve. Pull against trailer for an additional check of hook–up. Do not pull hard enough to damage or strain the equipment.
10. Set parking brakes and fully raise landing gear. Refer to Brakes Segment of the Operation Section for Operation of Parking Brakes and Trailer Brakes.
11. Check operation of all trailer lights and correct faulty operational lights.

Un–Hook

1. Try to keep tractor and trailer in straight line.
2. Apply parking brakes.
3. Lower trailer landing gear, making sure it is on solid, level ground. The weight of trailer is to 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.

SLIDING FIFTH WHEEL

WARNING

When using an assistant to re-position 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 avoid possible personal injury. The driver must not begin to move the vehicle until the assistant is clear.

CAUTION

Read and follow the instructions provided by the fifth wheel manufacturer.

The basic precautions for heavy lifting are applicable to releasing fifth wheel and when moving sliding fifth wheel.

1. Be sure of your grip on release lever. Don't jerk the lever and be sure to wear gloves.
2. It may be necessary to *rock* the vehicle to release the fifth wheel or locking mechanism of sliding fifth wheel.

NOTE: Substantial changes in fifth wheel settings will affect load distribution between tandem axles with four spring suspensions. By design, tandem axles will be balanced within 500 lbs. (227 Kg) with the fifth wheel set 12 in. (305 mm) ahead of center. Severe unbalanced condition can affect inter-axle shaft U-joint working angles and adversely affect the service life of the U-joints. Refer to the Service Manual, Springs, Suspension Alignment Section, Load Equalization.

WINDSHIELD WIPER CONTROL

4000

The electric wiper has two speeds, high and low which can be operated by the turn signal switch lever of the multi-function turn signal switch. Optional intermittent control allows continuous wiper speed adjustment by sliding switch up or down.

WINDSHIELD WASHERS

To operate the windshield washers, press the button to spray solution on the windshield. Wipers will start wiping and continue for two cycles. The windshield washers on 4000 with the electric wiper are operated by the turn signal switch lever.

⚠ WARNING

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 anti-freeze in the windshield washer reservoir. Radiator coolant in the washer reservoir can severely affect visibility when sprayed on the windshield.

Keep the fluid reservoir filled with Fleetrite Windshield Washer Solvent or an equivalent.

Section C: Maintenance

Maintenance

PREFACE

As with any machine, 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 carrying out some service, have the service done by a skilled professional mechanic.

SERVICING GUIDELINES

When servicing your vehicle always:

1. Turn off the ignition switch unless the procedure calls for a running engine.
2. Set the parking brake or chock the wheels.
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 unless proper precautions are taken to avoid inhaling brake dust.
8. Do not wear loose clothing, hanging jewelry, watches or rings.
9. Avoid contact with hot metal parts; allow hot components to cool before working on them.

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

Quality International service parts are available through your Navistar dealer. If International service parts are not used, the owner must assure himself that the parts used are equivalent to International service parts.

WARNING

The use of inferior parts can adversely affect the quality and reliability of your vehicle, possibly resulting in property damage accidents, personal injury or death.

CAUTION

To avoid damage to vehicle electronic components, disconnect both the positive (+) and negative (–) battery cables prior to electric welding. Attach the welder ground cable as close as possible to the part being welded. If it is necessary to weld close to an electric component, it is recommended that the electronic component be temporarily removed.

Follow the periodic lubrication procedures and regular inspection intervals outlined in this guide. Have your International dealer or service center inspect your vehicle at least once a year. Remember that regular maintenance and replacement of worn parts will usually prevent serious problems from developing later.

WARNING

Making modifications to various parts, components and systems of the vehicle, such as brake and steering systems, can adversely affect the quality and reliability of your vehicle, possibly resulting in accidents, personal injury or death. Such modifications must be avoided.

The lubrication intervals present a good opportunity to inspect the vehicle. We suggest that the various points listed herein be checked at the lubrication or other recommended intervals.

WARNING

Failure to properly perform maintenance and servicing procedures could result in damage to the vehicle and could cause personal injury or death. If the owner/operator of the vehicle is a skilled technician and intends to perform the vehicle maintenance and servicing, he is strongly urged to purchase and follow a service manual. An order form is included at the back of this manual.

WARNING

To avoid personal injury, 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. Improper or incomplete service can also affect the vehicle which may in turn result in damage to the truck or its equipment , personal injury or death. If you have any questions pertaining to the service, have the work done by a skilled technician.

AIR CONDITIONING SERVICE CHECKS

Have your air conditioner serviced each Spring to add refrigerant if needed and check compressor oil level and belt tension. Belt tension should be checked about three times a year.

When air conditioner is being used daily, remove air filter once each season and check for dirt, lint, etc. Replace if necessary. Vehicles operating in unusually dusty conditions may require inspecting and replacing the air filter more often.

AXLE - FRONT

FRONT AXLE – GENERAL

Maintaining front axle alignment to specifications is very important and should only be performed by a qualified mechanic. Toe-in adjustment is particularly important with radial tires.

Check to assure that axle mounting U-bolt nuts, attaching or mounting bolts and nuts are securely tightened.

Regularly check front axle for damaged, binding or worn parts, and adequate lubrication.

At regular intervals, or during other scheduled maintenance, (tire rotation/service, wheel bearing service, alignment, etc.), the kingpins should be checked for excessive wear. Refer to Service Manual for proper procedure.

TOE - IN SETTING

General - Inspection

Inspecting steer axle tires in the first 3,000 to 10,000 service miles 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. In P&D type service, which includes school buses, left to right steer tire tread life differentials of up to 40 percent can be observed depending on routes and other variables.

Follow the tire manufacturer's recommended cold inflation pressure for the tire size, type, load range (ply rating) and steer axle loading typical for their operation (each steer axle tire will equal 1/2 steer axle loading).

Special applications may warrant a setting based on past experience with the type of tire operating loads and conditions. Radial tires are more sensitive to toe-in setting than bias ply tires. While not insensitive to vehicle alignment, fine tuning school bus alignment to line-haul truck standards will not drastically improve tire tread life.

It is essential that correct toe-in and tire pressure be maintained for optimum tire wear.

AXLE - REAR

Check to assure that axle mounting U-bolt nuts, attaching or mounting bolts and nuts are securely tightened. Refer to Springs, U-bolt Nut Torque Chart. Regularly check rear axle for damaged, binding or worn parts.

NoSpin Detroit Locker Positive Locking Differential

Vehicles which have NoSpin Detroit Locker Positive Locking differential have the operators manual supplied with the vehicle. Refer to this manual for maintenance checks.

BRAKES

All new International vehicles use non-asbestos brake linings. However, exposure to excessive amounts of brake material dust (whether asbestos or non-asbestos, fiberglass, mineral wool, aramid, ceramic or carbon) may be a potentially serious health hazard.

⚠ WARNING

Avoid breathing brake lining fiber dust as it may be extremely hazardous to your health. Always use a respirator during brake maintenance. Follow precautions listed below.

Persons who handle brake linings should follow the following precautions:

1. Always wear a respirator approved by NIOSH or MSHA during all brake service procedures. Wear the respirator from removal of the wheels through assembly.
2. **NEVER** use compressed air or dry brushing to clean brake parts or assemblies.
3. 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.
4. **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.
5. **Worker clean–up**. 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

Brake Inspection and 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 2,000 mi. (3000 km) to determine if adjustment is necessary. Brake chamber push rods on original equipment chambers now incorporate a stroke indicator to aid adjustment checks – an orange paint marker near the base of the push rod. If the push rod is clean and the brakes require adjustment, the orange marker can be seen protruding from the chamber when the brakes are applied.

Slack adjusters should also be checked to ensure proper operation of the adjuster mechanism at the 6 month/ 24,000 mi. (38000 km) interval. Push rod travel should be kept at a minimum without brakes dragging.

Inspect brake lining every 12,000 mi. (19000 km) or every 12 months, whichever occurs first. Inspect more often during periods of severe service operation or considerable stop-and-go operation. When brake lining or blocks are worn to within 1/16 in. (1 .6mm) of rivets, brake lining must be replaced.

This inspection or adjustment should only be performed by qualified service personnel and must be in accordance with instructions provided by International Service Manual.

Do not back off or disconnect front brakes so that they are less effective, letting the rear brakes do all the stopping of the vehicle. Do not overlook the brakes on the trailer either. Brake condition on trailer is just as important as tractor. Proper brake balance on trucks and tractor trailers is essential for good braking.

Once a year, the entire brake system must be inspected.

1. Rubber may deteriorate wherever it is used. Rubber brake components should be inspected by a competent mechanic and replaced as necessary. Replacement intervals will vary according to the severity and length of service.
2. Condition of drums, brake chambers and slack adjusters.
3. Air leaks.
4. Hose or pipes for rust, damage, deterioration.
5. Operation of service and parking brake.

Some parts, such as air brake chamber diaphragm, air compressor and air cleaner should be inspected periodically and replaced if considered unserviceable. See Lubrication & Maintenance Guide intervals in Section D.

Air Dryer

Performance of dessicant or after cooler type air dryers is dependent on climatic conditions in which the vehicle is operating. Maintenance schedules must be established for each specific operation.

The use of an air dryer on a vehicle does not eliminate the need to periodically drain the air reservoirs.

Dessicant Air Dryer

Inspect for moisture in the air system by opening reservoirs, drain cocks or valves and checking for presence of water. The presence of small amounts of water due to condensation is normal and should not be considered as an indication that the dryer is not performing properly.

The dessicant cartridge should be replaced or rebuilt when it has been determined that the dessicant is contaminated and does not have adequate water absorption capacity. The dessicant change interval may vary; it is generally recommended that the dessicant be replaced every 12 months (yearly). If experience has shown that extended or shortened life has resulted for a particular installation, then the yearly interval can be increased or reduced accordingly.

Heat Exchanger or Aftercooler Type Air Dryer

Periodic or scheduled maintenance is not required. However, for trouble free operation, the following items should be checked.

1. Steam clean cooling fins to remove accumulated road grime.
2. Check to be sure cooling fins have not been painted.
3. Check air lines to be sure they have not become kinked, cracked, broken or chafed.
4. Perform the Service Checks. (Your International dealer can perform these Service Checks.)

HYDRAULIC BRAKES

Brake Inspection and Adjustment

A regular schedule for periodic cleaning, lubrication, 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.

Inspect brake lining every 12,000 mi. (19 000 km) or every 12 months, whichever occurs first. During severe service operations or prolonged periods of stop-and-go operation, the brakes should be inspected more frequently. Establish inspection intervals that provide for lining replacement before damage to the disc occurs. Excessive lining wear may expose the steel backing plate to the disc causing scoring of the disc faces.

This inspection or adjustment should only be performed by qualified service personnel and must be in accordance with instructions provided by International Service Manual.

⚠ WARNING

Hydraulic brake systems are power assisted. Braking capabilities will be greatly reduced without engine assist. Do not move vehicle with dead engine as reduced braking capability may result in an accident, personal injury or death.

Fluid Level

Fluid level should be to bottom edge of ring on each reservoir fill port. Do not fill the master cylinder to the top of reservoir.

NOTE – If the brake fluid requires attention to maintain proper master cylinder level, this is an indication of either severe service operation (pad wear) or fluid system leakage. A more frequent and thorough brake inspection will be required.

Fluid Precautions

The Hydro-Max brake system consists of two completely separate hydraulic systems operating with two different and incompatible fluids: power steering fluid and hydraulic brake fluid. Failure to observe precautions preventing the contamination of either system with fluid from the other will result in the swelling and deterioration of rubber parts leading to reduced brake performance and eventual failure.

To avoid fluid contamination, the following should be observed:

1. Use only fluids specified (or equivalent), and properly identified.
2. Add fluids only to the following locations:

a. Power steering fluid to the power steering pump reservoir.
b. Brake fluid to the brake master cylinder.

Brake Lines, Hoses and Fittings

Inspect every 4,000 mi. (6,000 km).

1. Check lines for kinks, dents, corrosion or rupture.
2. Check hoses for abrasion, kinks, soft spots, or rupture, collapse, cracks, twists or loose frame supports. When replacing a hose, be sure there is adequate clearance to the hose to avoid abrasion of new hose.
3. Examine all connections for leaks.
4. Repair or replace brake line tubes, hoses or fittings as required.

DRIVELINE PARKING BRAKE INSPECTION, ADJUSTMENT AND LUBRICATION

Use the following procedure to check parking brake cable at each service interval.

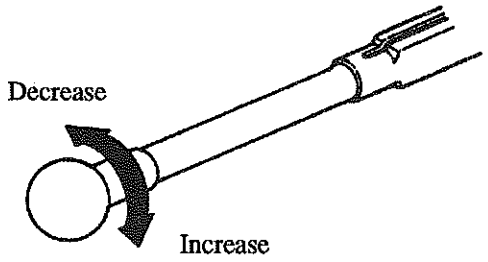


Figure 1 – Adjust Parking Brake Lever

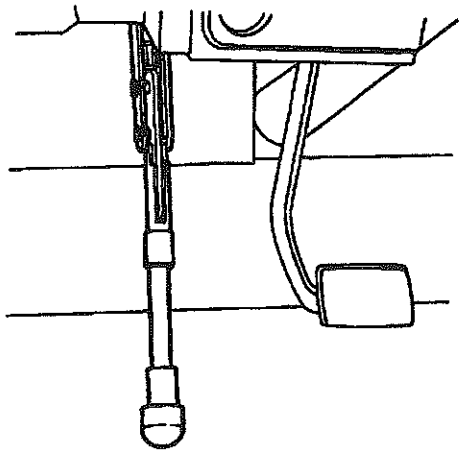


Figure 2 – Apply Parking Brake

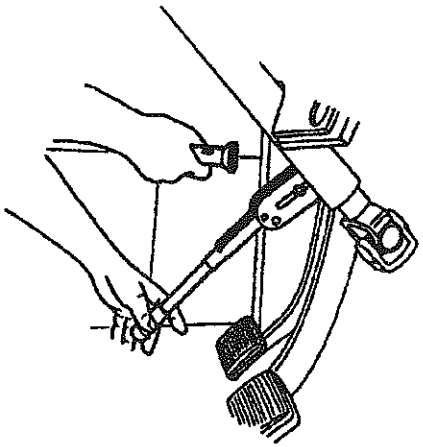


Figure 3 – Visually Inspect

1. Adjust the parking brake lever by turning the knob to achieve a moderate application force (approximately 30–40 pounds) to apply the parking brake.

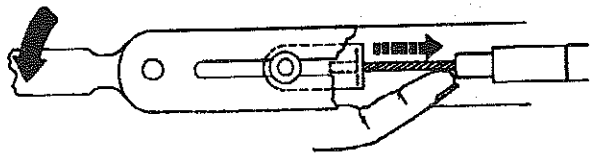
NOTE: This force range is for the checking procedure only. See #7 for final adjustment procedures.

2. Apply the parking brake (Figure 2).

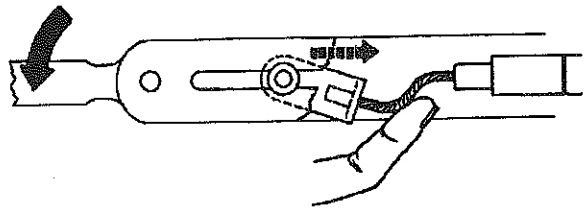
NOTE: In a truck chassis, the lever is mounted to the floor to the right of the driver.

3. Visually inspect the exposed cable core by shining a flashlight beam between the lever side plates (Figure 3). Look for:
   A. Worn, broken or frayed strands of the cable core wire.
   B. Kinked or bent cable core.
   C. Loose or "bunched" plastic cable core sheathing.
4. Place a finger of the left hand between the lever side plates to rest on the cable core at the cable housing end fitting (Figure 4). Slowly release the parking brake lever with the right hand while feeling movement of the core as it enters the cable housing. Movement should be smooth and continuous without restrictions or jerkiness. The core should feel like a rod without kinks or bends.

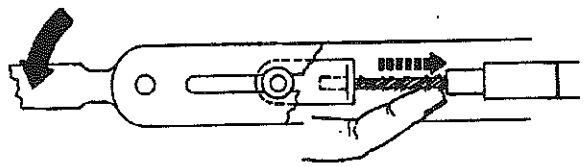
Figure 4 – Feel Movement of Brake Cable



A. Slowly Release the Parking Brake Handle



B. Feel for Kinks or Bending in Cable



C. Feel for Worn or Broken Strands

WARNING

Use caution while checking cable. Broken strands may cause injury.

5. Replace the cable assembly if there is any evidence of kinking or bending, if worn or broken strands are detected, or if cable movement is restricted by disruption of the core sheathing (Figure 4).
6. For both truck and bus, the entire cable routing should be inspected and the cable should be replaced if there is evidence of damage to cable housing (exterior of cable assembly) or if kinks, broken strands or corrosion exists at the brake end of the cable.

NOTE: Damage can be in the form of cracks, cuts, abrasions, separation, swelling, bubbles, burns, melts, sharp bends, kinks, tears and cable boots or seals damaged or missing.

7. Readjust the parking brake lever as follows:
   The parking brake lever, also known as the Orscheln Lever, is an over–center locking type. The lever has an adjustment knob on the end which the operator can turn to the desired position.

   To apply the parking brake, depress the brake pedal, then pull on the parking brake lever. When properly adjusted, the lever should pull with increasing resistance until it snaps distinctly over center to the fully applied position. To release the parking brake, depress the brake pedal and push the parking brake lever all the way down. On flatback chassis/cowl the motion may be opposite.

   If the parking brake does not hold the vehicle securely when applied, depress the brake pedal and release the parking brake. With the parking brake released, turn the adjustment knob clockwise (as viewed from the end of the lever) to increase the application force. Turning the knob clockwise tightens the brake and increases the effort needed to move the lever over center.

   If the parking brake cannot be adjusted enough to hold the vehicle, a linkage adjustment, between the cable housing lower end fitting at the transmission and the brake assembly, must be performed.
8. Lubricate the pivot points and sliding contact areas of the Orscheln Lever, i.e. the pivot pin in the adjuster tube, the adjustment screw, the lever pivot pin, the link pin, slider block and slider slot.

WARNING

Use wheel chocks and exercise caution when inspecting under the vehicle. A vehicle rollaway could result in property damage, personal injury or death.

WARNING

Either the rapid release or the forced release of the parking brake hand lever can cause the cable to kink at the connection to the hand lever and result in early cable failure. A damaged cable could result in cable failure and vehicle roll-away that could cause property damage, personal injury or death.

CAUTION

The parking brake hand lever should not be allowed to snap to the release position. The operator must maintain a grip on the lever during release of the parking brake. Also, should the parking brake hand lever not travel to the full release position when it is released, do not force it. This condition indicates that there is an obstruction at the brake end or a restricition within the cable housing itself such as corrosion, ice, snow or cable damage which is preventing full release of the parking brake shoes. The ability of the cable to move freely in the cable housing must be restored to prevent cable damage.

CAB

Defrosters: Operate defroster controls to determine if sufficient air is being directed against windshield.

Door Latches: Check latches for positive closing, latching and locking.

Glass: Check for cracked, broken, scratched or dirty glass including rear view mirrors.

Grabhandles: Check to make sure all grabhandles are tight and not cracked or broken. If handles are loose, re-torque the $^{5}/_{16}$ in. stainless steel mounting bolts to 15–20 ft. lbs.

Seat Belts: Check entire seat belt assembly for wear and proper operation. Make certain anchor mountings are tight. Seat belts are to be worn at all times.

Steps: Check to make sure that all steps are tight and not cracked, broken, or worn to a point that the non-slip surface is ineffective.

Cab Mounting: Check condition of cab mounting brackets, tilt cab latches, sheet metal, rubber mountings and safety prop when equipped.

CARE OF VEHICLE

WASHING

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 or wipe off dirt when the surface is dry as this will scratch the paint.

Always make certain that steps and grabhandles are clean and free of road grime, grease and ice.

CAUTION

To prevent damage to the Consolidated Engine Controller box (CEC) it should never be spray–washed directly.

WAXING OR POLISHING VEHICLES

Prior to using any wax or polish, the vehicle must be thoroughly washed.

BRIGHT METAL CARE

To preserve the bright look of your vehicle's anodized aluminum trim (grilles, bumpers, etc.) 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 acid or more alkaline will attack the anodic coating.

If you are having difficulty with your washing compound, contact your local supplier for the acidity/alkalinity (pH) specification.

A non–abrasive 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. Wipe dry. If commercial cleaners are used, follow instructions supplied with cleaner.

PLASTIC BUMPER AND SIDE-SKIRT PROTECTION

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

Two types of clutches are used on these vehicles. They are the push and pull types, with the adjustment being different for each type.

Each time the vehicle chassis is lubricated, check clutch free pedal. If free pedal is less than the specified dimensions in the chart, the clutch linkage must be adjusted on **push type clutches** to be assured that the clutch is fully engaged.

Pull type clutches are adjusted internally for wear. Your International dealer should be contacted for the proper adjustment procedure.

IMPORTANT: Improper adjustment of pull type clutches may cause improper clutch operation and may void the clutch warranty.

Vehicle Model	Pedal Free Travel
,4000	1 1/4 inch (32mm)

NOTE: Proper free pedal adjustment will provide adequate clearance between the release yoke fingers and the release bearing.

New International 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) may be a potentially serious health hazard.

Avoid breathing clutch lining fiber dust as it may be hazardous to your health. Always wear a respirator when doing clutch lining maintenance.

Persons who handle clutch linings should follow the same precautions as outlined above for the brake linings.

ELECTRICAL

Periodically inspect electrical connectors on the outside of the cab, on the engine and frame for corrosion and tightness. Exposed terminals such as water temperature, oil pressure, fuel sender, cranking motor and feed through studs should be cleaned and re–coated with a lubricant sealing grease such as Fleetrite® 472141–C1 or equivalent. This should include ground cable connections for batteries, engine and cab as well as jump start stud.

Inspect exposed cables for fraying or signs of abrasion.

ACCESSORY FEED CONNECTIONS

Vehicle electrical systems are complex and often include electronic components such as engine and transmission controls, instrument panels, anti-lock brakes, etc. 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 Navistar (see order form in back of this manual) to assure that any additional body lights and accessories are connected to circuits that are both appropriate and not overloaded. No modifications should be made to any vehicle control system without first contacting your Navistar dealer.

ENGINE

NOTE: Information in this Section pertains to International engines only. For *complete* operation and maintenance information pertaining to your International Engine refer to the International Engine Owner's Manual provided with the vehicle. Information pertaining to engines not manufactured by Navistar International Transportation Corp. will be found in separate manuals provided with the vehicle.

GENERAL

For effective emission control and low operating cost, it is important that maintenance operations listed on the following pages be performed at the specified periods or mileage intervals indicated (kilometers, miles, hours or months, whichever occurs first).

Service intervals are based upon average operating conditions. Where dusty, frequent start and stop or heavily laden operations are encountered, more frequent servicing will be required.

As the vehicle (engine) owner, you are responsible for the performance of all scheduled maintenance. The required maintenance operations may be performed by the owner at a service establishment of the owner's choosing. Any replacement

parts used for required maintenance services or repairs should be genuine International service parts or equivalent in quality and performance to genuine International service parts. Use of inferior replacement parts hinders operations 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).

CATALYTIC CONVERTER

If your diesel engine is equipped with a catalytic converter, it is important to review the maintenance schedule in the Engine Owner's Manual to insure proper functioning of the catalytic converter. Also, take precautions not to damage the catalytic converter when servicing your engine or storing your vehicle.

CAUTION

If your vehicle is equipped with a Catalytic Converter / Muffler Do Not blend waste oil with diesel fuel. Operate only on low sulfur diesel fuel with cetane value of 45 or higher.

CAUTION

If your vehicle is equipped with a vertical exhaust pipe, it is very important to have and maintain a rain cap on the exhaust pipe to prevent water from entering the exhaust system and catalytic converter. Any water entering the catalytic converter may damage the catalyst and affect the function of the converter.

AIR INDUCTION SYSTEM

Once each year perform a complete inspection of the air induction system. The inspection is to consist of disassembling the joints of each aluminum component and inspecting for salt build–up, presence of chlorine that can cause aluminum particles to flake off and enter the engine combustion chambers.

If evidence of corrosion is found (usually appears at the pipe connections) use a wire brush to clean the inside of the pipes and inside the rubber hoses.

If the intake pipes are pitted at the joint ends, use Loctite, Make-a-Gasket No. 2, or "Superflex™" RTV Silicone to seal the joints. Be certain that no excess material is on the inside of the pipe that can be pulled into the engine. If the service condition of the pipes, hoses or clamps is questionable, replace the defective part or parts.

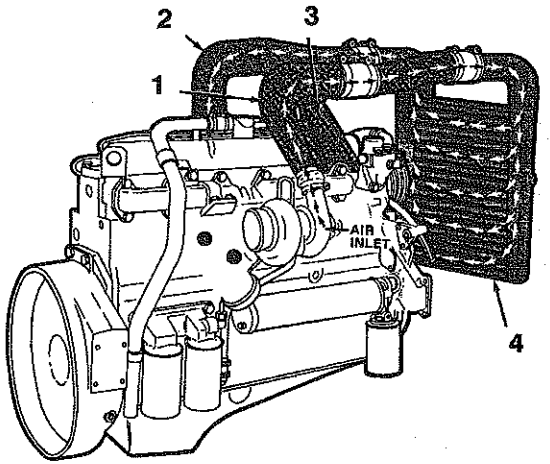
⚠ WARNING

To avoid personal injury 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. Order protective shield J–26554 for Navistar engines from your local Navistar Dealer.

CHASSIS MOUNTED CHARGE AIR COOLER

Inspect Charge Air Cooler Daily

1. With the engine off, visually inspect the charge air cooler core assembly for debris and clogging of external fins.
2. Prior to engine operation, remove any debris blocking the core.



Charge Air System (Air-To-Air)

1.Turbo to Intercooler Pipe
2.Intercooler to Intake Manifold Pipe
3.Mounting Bracket
4.Chassis Mounted Charge Air Cooler Core

Inspect Air Intake Piping (8,000 miles, 12 900 km, 200 hours or 4 months)

1. Check for accumulation of salt deposits. If present disassemble and clean the complete air intake piping system. If the intake piping is pitted use Loctite Make-A-Gasket No. 2 to seal joints against leakage.
2. Check for loose hoses and clamps.
3. Check for ruptured hoses.
4. Check air cleaner housing for cracks.

COOLING SYSTEM

Inspect Coolant Level Daily – refer to the Engine Owner's Manual provided with the vehicle.

NOTE: Deaeration tank requires air space for expansion volume. Correct level is approximately two inches below the fill cap.

⚠ WARNING

To avoid severe personal injury use only the following procedure to remove the pressure type cap from the radiator or expansion tank. Always allow the engine to cool first. Wrap a thick, heavy cloth around the cap. Push down, loosen cap slowly to its first notch position; then pause a moment. This will avoid possible scalding by hot water or steam. Continue to turn cap to the left and remove only after pressure in radiator is fully released.

CAUTION

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.

Filling Instructions

To function properly, the system must be completely filled with coolant and all air must be expelled. To accomplish this, the following precautions should be observed during the filling operation:

1. Pressure filling is not recommended. Fill rate must not exceed five gallons per minute.
2. Because the radiator fills slowly, it is important to top off the system after a two minute wait following the initial fill.

3. With the system filled, operate the engine until coolant reaches normal operating temperature. Let engine completely cool. Recheck coolant level and top off as needed.

Coolant Concentrations – Supplemental Coolant Additives (SCA's)

SCA levels must be maintained by regular coolant filter changes and/or liquid SCA additions to properly maintain the SCA level. Coolant should be tested a minimum of twice a year. The SCA concentration level should be checked at every engine maintenance interval. Low levels of SCA's will result in engine cylinder or cylinder wall cavitation erosion. DCA4 is the Supplemental Coolant Additive used by Navistar. Nalcool/Pencool is another SCA that is completely compatible with DCA4. **Refer to the Engine Operator's Manual supplied with the vehicle for specific servicing information on SCA's.**

Anti–Freeze

For cooling system capacities, see Lubrication Section of this manual. For anti-freeze coolant part numbers and other anti-freeze information refer to the Engine Owner's Manual.

Use of Propylene Glycol

Propylene Glycol (P.G.) antifreeze has been approved by Navistar as an alternative for ethylene glycol (E.G.) antifreeze when used in cooling systems for International engines. **Do Not add propylene glycol (P.G.) antifreeze to any diesel engine cooling system containing ethylene glycol (E.G.) antifreeze or vice versa.**

Fan Clutch

FRAME AND TOW HOOKS

International chassis are manufactured with frame rails of either mild carbon steel, or HSLA steel and each must be handled in a specific manner to assure maximum service life. Before attempting frame repair or modification, consult the service manual or your International Truck dealer.

When accessory mounting brackets are being added to aluminum framesor when dissimilar metals are joined, it is very important that a commercial rust-proofing agent be applied to guard against inter-granular corrosion. A commercial rust–proofing agent meeting MIL–C–0083933A specification, such as Ziebart rust–proofing or equivalent must be used. The coating should be painted on the surface of the aluminum frame and on the surface of the steel accessory bracket where the two are in contact. Steel bolts passing through the aluminum frame and washers in contact with the frame should also be coated.

Specific instructions are published concerning proper repair of frame rails. See your nearest International dealer.

Front and rear tow hooks should be inspected for damage or a loose mounting. This is of great importance, particularly on vehicles where the tow hooks are used frequently.

FUEL AND LUBRICANT ADDITIVES

Refer to Fuel and Lubricant Additives segment in the Operation section of this manual.

FUEL SYSTEM

Frequently check accelerator for proper operation.

Inspect condition of fuel tanks, fuel lines, clips and routing.

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. Depending upon the vehicle configuration, it may incorporate all or some of the following.

Air Intake System:

A. Air Intake Silencer – a metal ring or canister mounted between the air cleaner and the engine air intake – should be checked for proper installation.

B. Air Cleaner if remote mounted to dash panel, should be inspected and its location should not be altered. Do not alter inlet and outlet piping.

Body:

A. Wheel Well – splash shields, cab shields and under–hood insulation should be inspected for deterioration, dislocation and orientation.

Cooling System:

A. Check fan for damage to blades; replace if damaged with manufacturer recommended parts. Inspect for fan to shroud interference, and any damage to shroud such as cracks, holes and buckling of metal.

B. Fan ratio should not be changed and fan spacer dimensions and position should not be altered.

C. Inspect for proper operation of fan clutch making sure that the fan is disengaged when cooling of engine is not required.

D. Check for proper operation of radiator shutters, if provided. Shutters should be open during normal operating temperatures.

Engine and Driveline System:

A. Engine sump cover – inspect for cracks, holes and visible signs of deterioration. Sump cover should be mechanically isolated to be effective. Check for grounding. Maintain exact location of sump cover and check sealing at edges.

B. Transmission enclosure – inspect for cracks, holes and tears. Clean any deposits such as oil, dirt and stones.

C. Throttle delay devices should be checked and, if necessary, adjust as per manufacturers' recommendations.

D. Engine valve covers and block covers are made to damp out engine mechanical noise and, if needed to be replaced, should be replaced with recommended parts. Check for mechanical isolations.

Exhaust System:

Inspect for leaks at various joint connections and tighten clamps. Make visual inspection for cracks or holes in muffler and tail pipe. Always replace with manufacturer recommended parts. Tail pipe elbow or offset tail pipe orientation must not be changed from standard position as originally received.

To avoid abnormal changes in vehicle sound level, it is necessary for the owner to perform inspections and necessary maintenance at the intervals shown in the following maintenance schedules, and record on the inspection verification forms provided.

NOISE EMISSIONS - EXTERIOR (CONTINUED)

MAINTENANCE INTERVALS

Kilometers, Mileage, or Operation Hours, Whichever Occurs First (Kilometers and Mileage in Thousands)

MAINTENANCE INSPECTIONS	KM	6	13	19	38	58	77	96
	MILES	4	8	12	24	36	48	60
	MOS.	5	10	15	30	45	60	75
	HOURS	125	250	375	750	1125	1500	1875
AIR INTAKE SYSTEM:								
Silencer						X		X
Piping						X		X
Clamps						X		X
BODY:								
Splash Shields				X	X	X	X	X
Cab Shields				X	X	X	X	X
Under Hood Insulation				X	X	X	X	X
COOLING SYSTEM:								
Fan Damage			X		X	X	X	X
Fan Clutch Operation		X		X	X	X	X	X
Shroud Damage		X		X	X	X	X	X
Shroud Interference		X		X	X	X	X	X
Shutter Operation		X		X	X	X	X	X
ENGINE AND DRIVELINE:								
Oil Sump Cover		X			X		X	
Valve Covers			X			X		X
Block Covers			X			X		X
Throttle Delays		X			X		X	
Governor			X			X		X
Manifold Condition		X			X		X	
Manifold Gaskets		X			X		X	
Transmission Enclosure		X			X	X	X	X
EXHAUST SYSTEM:								
Exhaust Flange Bolts		X			X		X	
Exhaust Flange Gaskets		X			X		X	
Exhaust Pipe Condition		X			X		X	
Muffler Condition						X		
Resonator Condition		X				X		
Tail pipe Condition		X				X		
Tail pipe Orientation		X			X		X	
Flex-pipe Condition		X				X		
Clamps			X			X		X

VERIFICATION OF INSPECTION – NOISE EMISSIONS

Chassis Model _____ Vehicle Identification No. _____

First Inspection

Miles _____ Km _____ Hours _____ Months _____

Performed by:	_____	_____	_____	_____	_____
	Service Manager	Dealer	Date	City	State
Approved by:	_____	_____	_____	_____	_____
	Owner	Dealer	Date	City	State

Second Inspection

Miles _____ Km _____ Hours _____ Months _____

Performed by:	_____	_____	_____	_____	_____
	Service Manager	Dealer	Date	City	State
Approved by:	_____	_____	_____	_____	_____
	Owner	Dealer	Date	City	State

Third Inspection

Miles _____ Km _____ Hours _____ Months _____

Performed by:	_____	_____	_____	_____	_____
	Service Manager	Dealer	Date	City	State
Approved by:	_____	_____	_____	_____	_____
	Owner	Dealer	Date	City	State

PROPELLER SHAFT

At the regular lubrication interval, check universal joints for any evidence of wear or looseness. Should propeller shaft vibrations occur, stop the vehicle immediately to avoid possible hazardous consequences or damage to other components.

CAUTION

Do not adjust air suspension height to any setting other than the specified setting. Altering the height setting will change the driveline angle and can cause serious damage.

SPRINGS

Periodically check condition of spring leaves for evidence of fatigue, bending or breakage.

Check condition of suspension mounting brackets and bushings.

Check that torque rod mounting fasteners are tight.

Suspension alignment must be maintained at all times.

Check U–Bolts as follows:

1. After the chassis has been operating under load for 1000 miles (1 600 km) or six months, whichever comes first, the U–Bolt nuts must be torqued.
2. The U–Bolt nuts thereafter must then be re-torqued every 36,000 miles (57 936 km).
3. The U–Bolt and nut threads and seats should be cleaned and lubricated to assure a "like new" condition when re–torquing.

U–Bolt Nut Chart		
U–Bolt Diameter (Nominal)	Torque N–m	Ft–lbs
5/8" Flanged Lock Nut	176–217	130–160
3/4" Flanged Lock Nut	271–325	200–240
3/4" Flanged Nut [1]	350–380	260–300
7/8" Hex Head w/Washer	305–373	225–275
7/8" Hex Head [2] w/Washer	350–380	260–300
1" Hex Head w/Washer	441–543	325–400

[1] On International® Four Spring and Air Suspensions

[2] On 4 x 2 Rear Suspensions

SUPPORTING VEHICLE FOR SERVICE

1. Set parking brake and/or block wheels to prevent vehicle from moving.
2. Select jack (floor jack preferred) with a rated capacity sufficient to lift and hold up the vehicle.
3. Raise vehicle with jack applied to axle(s). (DO NOT use bumper as a lifting point.)
4. 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.

WARNING

Do not use a jack when working under a vehicle. It may give way, causing the vehicle to fall and injure you. Always use floor stands to support the vehicle.

STEERING

GENERAL

Ask your service mechanic to examine the steering mechanism. Minor adjustments could head off further problems.

Check tie rod, drag link end clamp bolts and ball joints. They must be tight.

Check for installation and spread of cotter pins and tightness of nuts at both ends of tie rod and drag link.

Check that pitman arms (steering arm at steering gear) mounting are tight and locked. Check system for leaks or hose chafing. Repair at once.

Maintain proper steering gear and power steering pump lubricant levels.

Regularly inspect steering column joint bolts and steering linkage, particularly for body–to–chassis clearance.

IMPORTANT: Have any steering problems corrected at once by a qualified mechanic.

WARNING

Failure to maintain the steering system in proper condition can cause reduced steering ability resulting in property damage, personal injury or death.

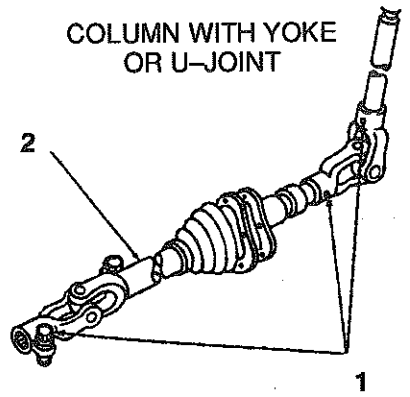
TIGHTENING STEERING COLUMN JOINT BOLTS

As a good maintenance practice, it is recommended that steering column joint bolts be checked for tightness every 50,000 miles (80 000 km) or annually, whichever occurs first. Tighten bolts to torque specified in table below. DO NOT OVER-TIGHTEN.

Steering Column Clamp or Yoke Bolt

1.Yoke Bolt

2.Some Vehicles Also Have a Bolt on This End



Bolt Location	Specified Torque
3/8–24 (Shell Coupling)	30–35Ft–lbs (41–47N–m)
3/8–24 (Yoke or U–joint)	30–40Ft–lbs (41–54N–m)
7/16–20	70–75Ft–lbs (95–102N–m)

VEHICLES WITH POWER STEERING

Whenever the hydraulic (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 shimmy complaints and/or steering wheel oscillation when striking a bump.

Consult your International dealer who is aware of the proper procedures for filling and bleeding the system.

TIRES

GENERAL

Check condition of tires for abnormal wear patterns, and proper inflation pressures. Cut or broken tire casing must be repaired.

Tires should be inspected for the following conditions. If any are found, 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 indicated 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.

Inspecting steer axle tires in the first 3,000 to 10,000 service miles 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. Rapid outside shoulder wear on one tire and rapid inside shoulder wear on the other tire indicates a tandem that is out of alignment.

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).

WARNING

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. Failure to adhere to these warnings could result in tire malfunction, damage to your vehicle, personal injury, and possibly death.

Proper tire inflation, toe–in adjustment, loads, and road speeds are important factors governing tire mileage, steering ease and maneuverability.

INFLATION

Proper inflation pressure is the most important maintenance practice to insure 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.

Checking Inflation

Always check inflation pressure when tires are cold. Never bleed air from *hot* tires to relieve normal pressure build–up. Normal increases in pressure due to service conditions will be 10 to 15 psi, which is allowable in truck tires.

It is particularly important to keep moisture from the inside of tires and it is strongly recommend proper selection of air compressor equipment, proper air line routing, and the use of air dryers to avoid moisture in the high pressure air used for tire inflation and make–up air.

Under Inflation

Over–the–road truck tires should not be permitted to become underinflated. Increased flexing due to underinflation causes heat build–up within the tire components. This leads to reduced strength, breakdown of the rubber compounds, and possible separation of the tire components (i.e. 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 mileage, and uneven wear due to increased tread movement. To determine proper inflation refer to the tire inflation charts at the end of this section.

LOADS

Loading tires beyond their rated capacity decreases tire life, requiring more frequent replacement of tires. Severe overloading creates an unsafe condition which may result in tire failure with sudden air loss.

MATCHING

Dual Tires

Dual tires should be matched using tires of equivalent size. Tires which differ more than 1/4" (6mm) in diameter or 3/4" (19mm) in circumference should not be mounted on the same dual wheel assembly.

Tandem Drive Axles

When mounting tires on tandem drive axles follow the same instructions as specified for dual tires. However, never install the four largest tires on one driving axle and the four smallest on the other. This method of tire mounting will cause high axle lubricant temperatures which may lead to premature axle failures.

Front Wheel Drive, 4x4, 6x6 replacement tires must have same rolling radius as original equipment tires in order to avoid damage to the drive train components. Refer to line setting ticket for original equipment tire size.

MIXING

Radial and Bias Ply Tires

It is recommended that for best overall performance that only bias or only radial tires be used on a vehicle. However, different heavy truck tires may be used under the following conditions:

- Bias or radial tires may be used on either axle of two–axle vehicles if the vehicle has dual rear wheels, or is equipped with wide base single tires.
- Either bias or radial tires may be used on the steering axle of vehicles with three more axles.
- Never mix different tire sizes or constructions on the same axle.

- Never mix bias and radial tires in a tandem drive axle combination.

ROTATION

Rotation Is Always Advisable:

1. If front (steering) axle tires become irregularly worn, move to rear or trailerposition.
2. In a dual assembly, if one tire wears much faster than its mate, reverse position of tires.
3. On the drive axle, if heel and toe wear or alternate lug wear occurs, rotating the tires from one end of the axle to the other end of the axle may help even out this wear.

Rotation May Be Advisable:

1. If tires are highway type tread design:

   Front (Steering) Axle – Tires must be removed when tread is worn to 4/32 inch (3mm) or less. Retread or rotate worn tires to drive or trailer position. Retreaded tires are not to be used on steering axles.

2. *Rear and Trailer Axles* – Tires must be removed when tread is worn to 2/32 inch (2mm).
3. If rib tire is used on front axle and lug or off–road type on rear axle positions:

   Front (Steering Axle) – Install new tires at front wheels when tread is worn to 4/32 inch (3mm) or less. These tires can be moved to trailer positions.

   Rear and Trailer Axles – Tires must be removed when the tread is worn to 2/32 inch (2mm) or less. Tires identified with the word "re-groovable" molded on the sidewall can be re-grooved. A minimum of 3/32 of under-tread 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, bounce and shimmy. Wheels should be replaced if damaged or out-of-round. Out-of-round tires can usually be *trued* by a tire checker. The tire and wheel assembly should then be dynamically balanced.

WEAR

Radial tires can exhibit three types of normal wear patterns: 1 Even, 2 Erosion, 3 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 and can be found in both bias or radial tires. 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 required. If erosion gets to be 1/16 inch (2mm) 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. Over-inflation is not effective in correcting this effect.

Check How Your Tires Are Wearing

If the tires on your vehicle show signs of irregular wear, the vehicle may be out of alignment. This condition not only shortens tire life, but will adversely affect the handling of your vehicle, which is dangerous. If irregular wear is present, check the front steering axle alignment and parrallelism of the rear tandem axles.

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. Some of the more effective tire rotation programs are:

- Steer tires that have developed some type of irregular wear pattern can be rotated to a trailer position to be run out to cap stage or, if rib tires are being used on all wheel positions, they can be placed on drive axles. Applying steer tires to a drive position will often "clean" them and they can be moved back to the steer axle.
- Another rotation possibility for fleets with rib tires in all wheel positions is to break in the new "steer" tires in the drive 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 lug wear pattern has developed.

Irregular wear can be minimized by:

1. Using the right inflation pressure for the load being carried.
2. Maintaining the front wheel alignment – *especially toe-in* – to specifications.
3. Keeping tandem rear axles parallel to each other.

USE OF TIRE CHAINS

If your vehicle is equipped with radial tires, *only use tire chains designed for use with radial tires.* Radial tire chains normally have shorter cross chains than older designs and allow the position of the side chains to be higher on the tire sidewall. This is out of the high–flex sidewall area of a radial tire and results in less susceptibility to sidewall damage.

Be sure to use the proper chain size for the tire that on which it is being attached. Tighten chains when they are first applied then, after a short run–in period, re–adjust to ensure a continued snug fit on radial tires. Serious sidewall damage may result from loose chains.

Check for adequate dual spacing, especially if using single tire chains on each tire of a dual assembly.

Refer to chain manufacturer's recommended dual spacing for chains being used. Always remove chains as soon as they are no longer needed.

CAUTION

THE TIRE LOADS AND INFLATIONS SHOWN IN THE FOLLOWING TABLES ARE FOR MAXIMUM SPEEDS OF 65 MPH. SUSTAINED SPEEDS IN EXCESS OF 65 MPH WILL REQUIRE INCREASING PRESSURE AND MAY REQUIRE ADJUSTING LOADS AS SHOWN IN THE TABLE BELOW.

LOAD LIMITS AT HIGHER SPEEDS FOR BIAS AND RADIAL TRUCK AND BUS TIRES USED ON IMPROVED SURFACES

The service load and minimum (cold) pressure must comply with the following limitations unless a speed restriction is indicated on the tire:

INFLATION PRESSURE INCREASE			% INCREASE (+) OR DECREASE (–) IN LOADS	
SPEED RANGE (MPH)	BIAS PLY TIRES	RADIAL PLY TIRES	CONVENTIONAL TIRES	WIDE BASE AND METRIC TIRES
71 thru 75	+ 10 psi	+ 5 psi	– 12%	– 12%
66 thru 70	+ 10 psi	+ 5 psi	– 4%	– 4%
51 thru 65	No Increase	No Increase	None	None

The inflations shown in the following tables are minimum cold pressures for the various loads listed. Higher pressures should be used as follows:

A. When required by the above speed/load table.
B. When higher pressures are desirable to obtain improved operating performance.

The combined increases of A and B should not exceed **20 psi** above the inflation specified for the maximum load of the tire.

THE MAXIMUM LOAD AND INFLATION CAPACITY OF THE RIM MUST NOT BE EXCEEDED.

NOTES:

1. The total load on individual tires must not exceed the maximum tire load limit as indicated by the bold face type in the table. Minimum recommended cold inflation pressure for various loads must conform to the load table.
2. Improved Surface – An improved surface is one which is relatively smooth and intended to handle any vehicle manufactured primarily for use on public streets, roads and highways.
3. Important – The load and cold inflation pressure imposed on the rim and/or wheel must not exceed the rim and/or wheel manufacturer's recommendations even though the tire may be approved for a higher load or inflation. Rims and wheels may be identified (stamped) with a maximum load and maximum cold inflation rating. For rims and wheels not so identified, consult the rim or wheel manufacturer to determine rim and wheel capacities for the intended service.

BIAS TIRE LOAD AND INFLATION CHART (GOODYEAR)
(For TRUCKS AND TRAILERS in Normal Highway Service)
65 Miles Per Hour Maximum Speed Except Where Noted

Tire Size Designations			Tire Load Limits at Various Cold Inflation Pressures (PSI)												
Tube	Tubeless		55	60	65	70	75	80	85	90	95	100	105	110	115
	8-19.5	D	2230	2350	2460D	2570	2680	2780E	2880	2980	3070F				
		S	2270	2410	2540	2680	2800D	2930	3060	3170E	3280	3400	3500F		
7.50-20	8-22.5	D	2490	2620	2750D	2870	2990	3100E	3210	3320	3430F	3540	3640G		
		S	2530	2680	2840	2990	3140D	3270	3410	3530E	3660	3780	3910F	4040	4150G
8.25-20	9-22.5	D	2960	3120	3270	3410	3550E	3690	3820	3950F	4070	4200	4320G		
		S	3010	3190	3370	3560	3730	3890	4050E	4210	4350	4500F	4640	4790	4920G
9.00-20	10-22.5	D	3510D	3690	3870	4040E	4200	4360	4520F	4670	4820	4970G			
		S	3560	3770	4000	4210	4410	4610E	4790	4970	5150F	5320	5490	5670G	
10.00-20	11-22.5	D			4380	4580	4760F	4950	5120	5300G	5470	5630	5800H		
		S			4530	4770	4990	5220	5430F	5640	5840	6040G	6240	6430	6610H
10.00-22	11-24.5	D			4660	4870	5070F	5260	5450	5640G	5820	6000	6170H		
		S			4820	5070	5310	5550	5780F	6000	6210	6430G	6630	6840	7030H
11.00-20	12-22.5	D			4780	4990	5190F	5390	5590	5780G	5960	6150	6320H		
		S			4940	5200	5450	5690	5920F	6140	6370	6590G	6790	7010	7200H
11.00-22	12-24.5	D			5080	5300	5520F	5730	5940	6140G	6330	6530	6720H		
		S			5240	5520	5790	6040	6290F	6530	6770	7000G	7220	7440	7660H

[1] Max speed 50 MPH Bias Ply

Letters listed with loads are the maximum load for load range of tire. Do not exceed rim loads and/or inflation limits. For applicable load limits for other than normal highway service, for other size designations and for size designations with suffixes such as MI (mining and logging) consult tire manufacturer.
D= Dual Tire Usage S= Single Tire Usage

⚠ WARNING

WARNING — To prevent bodily harm , always follow these instructions when mounting radial tires on wheels.

1. **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.**
2. **If a tube is to be used, make sure special radial tire tubes are used because of the increased flexing of the side walls on radial tires.**
3. **Never use soap when mounting radial tires. A lubricant approved by the tire manufacturer can be used as an aid for mounting tires.**
4. **Always inflate tires in a protective cage.**

LOW PROFILE RADIAL TIRE LOAD AND INFLATION CHART (GOODYEAR) (FOR TRUCKS & TRAILERS IN NORMAL HIGHWAY SERVICE) 65 MPH MAXIMUM HIGHWAY SPEED

Tire Size Highway		TIRE LOAD LIMITS (LBS.) AT VARIOUS COLD INFLATION PRESSURES (PSI)										
		70	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**
8R19.5	D	2460	2570	**2700(D)**	2780	2880	**3000(E)**	3070	3160	**3375(F)**		
	S	2540	2680	**2800(D)**	2930	3060	**3170(E)**	3280	3400	**3500(F)**		
8.25R20 or 9R22.5	D	3270	3410	**3550(E)**	3690	3820	**3950(F)**	4070	4200	**4320(G)**		
	S	3370	3560	3730	3890	**4050(E)**	4210	4350	**4500(F)**	4640	4790	**4920(G)**
9.00R20 or 10R22.5	D	3870	4040	4200	**4375(E)**	4520	4670	**4875(F)**	4970	5110	**5250(G)**	
	S	4000	4210	4410	**4610(E)**	4790	4970	**5150(F)**	5320	5490	**5680(G)**	

Note: Letters in parentheses denote Load Range for which loads (shown in bold faace) are maximum. Dual (D), Single (S).

Tire Size Highway		TIRE LOAD LIMITS (LBS.) AT VARIOUS COLD INFLATION PRESSURES (PSI)										
		70	75	80	85	90	95	100	105	110	115	120
BS/F 9.00R20 or 10R22.50	D S	3870 4000	4040 4210	4200 4410	**4360** **4610**	4520(F) 4790	4670 4970	**4820** **5150(F)**	4970(G) 5320	5490	**5670(G)**	
10.00R20 or 11R22.5	D S	4380 4530	4580 4770	**4760(F)** 4990	4950 5220	5120 **5430(F)**	5300 5640	5470 5840	**5750(G)** **6175(G)**	**5800H** 6240	6430	**6610(H)**
Note: Letters in parentheses denote Load Range for which loads (shown in bold faace) are maximum. Dual (D), Single (S).												

RADIAL TIRE LOAD AND INFLATION CHART (GOODYEAR) (FOR TRUCKS & TRAILERS IN NORMAL HIGHWAY SERVICE) 65 MPH MAXIMUM HIGHWAY SPEED EXCEPT WHERE NOTED

Tire Size Highway		TIRE LOAD LIMITS (LBS.) AT VARIOUS COLD INFLATION PRESSURES (PSI)										
		70	75	80	85	90	95	100	105	110	115	120
10.00R22 or 11R24.5	D S	4660 4820	4870 5070	**5070(F)** 5310	5260 5550	5450 **5780(F)**	5640 6000	5820 6210	**6000(G)** **6430(G)**	**6170(H)** 6630	6840	**7030(H)**
11.00R20 or 12R22.5	D S			**5190(F)** 5450	5390 5690	5590 **5920(F)**	**5780(G)** 6140	5960 6370	6150 **6590(G)**	6320 6790	6500 7010	**6750(H)** **7390(H)**
11.00R22 or 12R24.5	D S			**5520(F)** 5790	5730 6040	5940 **6290(F)**	**5780(G)** 6140	5960 6370	6150 **6590(G)**	6320 6790	6500 7010	**6750(H)** **7390(H)**
12.00R20	D S			5910 6200	6140 6480	6360 6740	6580 7010	6790 7250	7000 7500	**7200(J)** 7740	7980	**8210(J)**
11.00R24	D			**5860(F)** 6140	6090 6420	6310 **6680(F)**	**6520(G)** 6940	6730 7190	6930 **7430(G)**	**7130(H)** 7670	7900	**8130(H)**
Note: Letters in parentheses denote Load Range for which loads (shown in bold face) are maximum. Dual (D), Single (S).												

Tire Size Highway		TIRE LOAD LIMITS (LBS.) AT VARIOUS COLD INFLATION PRESSURES (PSI)										
		70	75	80	85	90	95	100	105	110	115	120
12.00R24	D S			6650 6980	**6910(G)** 7280	7160 7580	7410 **7880(G)**	**7640(H)** 8160	7870 8450	**8100(J)** **8710(H)**	8970	**9230(J)**
14.00R20.21	D S			8120 8510	8430 8890	**8740(J)** 9260	9030 9610	9320 **9960(J)**	**9610(L)** 10300	10620	**10960**	
Note: Letters in parentheses denote Load Range for which loads (shown in bold face) are maximum. Dual (D), Single (S).												

Tire Size Designations		TIRE LOAD LIMITS (POUNDS) AT VARIOUS COLD INFLATION PRESSURES (PSI) (GOODYEAR)								
Tubeless Tires Mounted on 15° Drop Center Rims		80	85	90	95	100	105	110	115	120
385/65R22.5	S	7040	7350	7650	7950	8230	8510	8790	9050	**9370(J)**
425/65R22.5	S	8370	8740	9100	9450	9790	10100	**10500(J)**		
445/65R22.5	S	9120	9540	9930	10300	10700	11000	11400	11700	**12300(L)**
225/70R19.5	D S	**3000E** **3195E**	3115 3315	3245 3450	**3415F** **3640F**	3490 3715	3615 3845	**3750G** **3970G**		
245/70R19.5	D S	3655 3890	**3875F** **4080F**	3940 4190	4075 4335	**4375G** **4545G**	4500 4620	**4625H** **4805H**		
265/70R19.5	D S	3750 3970	3930 4180	4095 4355	4300 4540	4405 4685	**4560(G)** **4850(G)**	4805(G) 5070(G)		
255/70R22.5	D S	3970 4190	4110 4370	4275 4550	4410 4675	4455 4895	4610 5065	**4675G** **5205G**	**5070H** **5510H**	
245/75R22.5	D S	3640 3860	3740 3980	3890 4140	4080 4300	4190 4455	4335 4610	**4410G** **4675G**		
Note: Letters in parentheses denote Load Range for which loads (shown in bold face) are maximum. Dual (D), Single (S).										

Tire Size Designations		TIRE LOAD LIMITS (POUNDS) AT VARIOUS COLD INFLATION PRESSURES (PSI) (GOODYEAR)								
Tubeless Tires Mounted on 15° Drop Center Rims		**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**
265/75R22.5	D S	4205 4255	4370 4440	4525 4620	4685 4800	**4805(G)** 4975	5150	**5205(G)**		
295/75R22.5	D S	4885 4945	**5070(F)** 5155	5260 5370	5440 **5510(F)**	**5675(G)** 5780	5800 5980	**6005(H)** **6175(G)**	6370	**6610(H)**
295/80R22.5	D S	4945 5530	5190 5805	5435 6075	5675 6345	5910 6610	6145 6870	6380 7130	**6610(H)** **7390(H)**	
285/75R24.5	D S	4930 4990	**5205(F)** 5210	5310 5420	5495 **5675(F)**	**5675(G)** 5835	5860 6040	**6175(H)** **6175(G)**	6440	**6780(H)**
315/80R22.5	D S		5840 6415	6070 6670	6395 6940	6540 7190	6770 7440	6940 7610	7210 7920	**7610(J)** **8270(J)**
315/80R22.5 55mph Max. Spd.	D S				6425 7460	6690 7770	6955 8080	7220 8380	7480 8690	**7750(L)** **9000(L)**
14/80R20	S				7540	7860	8170	8480	8790	**9090(J)**
Note: Letters in parentheses denote Load Range for which loads (shown in bold face) are maximum. Dual (D), Single (S).										

BIAS TIRE LOAD AND INFLATION CHART (BRIDGESTONE)
(For TRUCKS AND TRAILERS in Normal Highway Service)
65 Miles Per Hour Maximum Speed Except Where Noted

Tire Size Designations			Tire Load Limits at Various Cold Inflation Pressures (PSI)												
Tube	**Tubeless**		**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**
	8-19.5	D S	2230 2270	2350 2410	2460D 2540	2570 2680	2680 2800D	2780E 2930	2880 3060	2980 3170E	3070F 3280	3400	3500F		
7.50-20	8-22.5	D S	2490 2530	2620 2680	2750D 2840	2870 2990	2990 3140D	3100E 3270	3210 3410	3320 3530E	3430F 3660	3540 3780	3640G 3910F	4040	4150G
8.25-20	9-22.5	D S	2960 3010	3120 3190	3270 3370	3410 3560	3550E 3730	3690 3890	3820 4050E	3950F 4210	4070 4350	4200 4500F	4320G 4640	4790	4920G

Tire Size Designations			Tire Load Limits at Various Cold Inflation Pressures (PSI)											
Tube	Tubeless		55	60	65	70	75	80	85	90	95	100	105	110	115
9.00-20	10-22.5	D S	3510D 3560	3690 3770	3870 4000	4040E 4210	4200 4410	4360 4610E	4520F 4790	4670 4970	4820 5150F	4970G 5320	5490	5670G	
10.00-20	11-22.5	D S			4380 4530	4580 4770	4760F 4990	4950 5220	5120 5430F	5300G 5640	5470 5840	5630 6040G	5800H 6240	6430	6610H
10.00-22	11-24.5	D S			4660 4820	4870 5070	5070F 5310	5260 5550	5450 5780F	5640G 6000	5820 6210	6000 6430G	6170H 6630	6840	7030H
11.00-20	12-22.5	D S			4780 4940	4990 5200	5190F 5450	5390 5690	5590 5920F	5780G 6140	5960 6370	6150 6590G	6320H 6790	7010	7200H
11.00-22	12-24.5	D S			5080 5240	5300 5520	5520F 5790	5730 6040	5940 6290F	6140G 6530	6330 6770	6530 7000G	6720H 7220	7440	7660H

[1] Max speed 50 MPH Bias Ply
Letters listed with loads are the maximum load for load range of tire. Do not exceed rim loads and/or inflation limits. For applicable load limits for other than normal highway service, for other size designations and for size designations with suffixes such as MI (mining and logging) consult tire manufacturer.
D= Dual Tire Usage S= Single Tire Usage

LOW PROFILE RADIAL TIRE LOAD AND INFLATION CHART (BRIDGESTONE) (FOR TRUCKS & TRAILERS IN NORMAL HIGHWAY SERVICE) 65 MPH MAXIMUM HIGHWAY SPEED

Tire Size Highway		TIRE LOAD LIMITS (LBS.) AT VARIOUS COLD INFLATION PRESSURES (PSI)										
		70	75	80	85	90	95	100	105	110	115	120
8R19.5	D S	2460(D) 2540	2570 2680	**2680(D)** **2800(D)**	2780(E) 2930	2880 3060	**2980(E)** **3170(E)**	3070(F) 3280	3400	**3500(F)**		
8.25R20 or 9R22.5	D S	3270 3370	3410 3560	**3550(E)** 3730	3690 3890	3820 **4050(E)**	**3950(F)** 4210	4070 4350	4200 **4500(F)**	**4320(G)** 4640	4790	**4920(G)**
9.00R20 or 10R22.5	D S	3870 4000	4040(E) 4210	4200 4410	**4360** **4610(E)**	4520(F) 4790	4670 4970	**4820** **5150(F)**	4970(G) 5320	5490	**5670(G)**	
Note: Letters in parentheses denote Load Range for which loads (shown in bold faace) are maximum. Dual (D), Single (S).												

Tire Size Highway		TIRE LOAD LIMITS (LBS.) AT VARIOUS COLD INFLATION PRESSURES (PSI)										
		70	75	80	85	90	95	100	105	110	115	120
BS/F 9.00R20 or 10R22.5	D S	3870 4000	4040 4210	4200 4410	**4360** **4610**	4520(F) 4790	4670 4970	**4820** **5150(F)**	4970(G) 5320	5490	**5670(G)**	
10.00R20 or 11R22.5	D S	4380 4530	4580 4770	**4760(F)** 4990	4950 5220	5120 **5430(F)**	5300(G) 5640	5470 5840	**5630** **6040(G)**	**5800H** 6240	6430	**6610(H)**
Note: Letters in parentheses denote Load Range for which loads (shown in bold faace) are maximum. Dual (D), Single (S).												

RADIAL TIRE LOAD AND INFLATION CHART (BRIDGESTONE) (FOR TRUCKS & TRAILERS IN NORMAL HIGHWAY SERVICE) 65 MPH MAXIMUM HIGHWAY SPEED EXCEPT WHERE NOTED

Tire Size Highway		TIRE LOAD LIMITS (LBS.) AT VARIOUS COLD INFLATION PRESSURES (PSI)										
		70	75	80	85	90	95	100	105	110	115	120
10.00R22 or 11R24.5	D S	4660 4820	4870 5070	**5070(F)** 5310	5260 5550	5450 **5780(F)**	5640(G) 6000	5820 6210	**6000** **6430(G)**	**6170(H)** 6630	6840	**7030(H)**
11.00R20 or 12R22.5	D S			**5190(F)** 5450	5390 5690	5590 **5920)F)**	**5780(G)** 6140	5960 6370	6150 **6590(G)**	6320(H) 6790	7010	**7200(H)**
11.00R22 or 12R24.5	D S			**5520(F)** 5790	5730 6040	5940 **6290(F)**	**6140(G)** 6530	6330 6770	6530 **7000(G)**	6720(H) 7220	7440	**7660(H)**
12.00R20	D S			5910 6200	6140(G) 6480	6360 6740	6580 7000(G)	6790(H) 7250	7000 7500	**7200(J)** 7740(H)	7980	**8210(J)**
11.00R24	D			**5860(F)** 6140	6090 6420	6310 **6680(F)**	**6520(G)** 6940	6730 7190	6930 **7430(G)**	**7130(H)** 7670	7900	**8130(H)**
Note: Letters in parentheses denote Load Range for which loads (shown in bold face) are maximum. Dual (D), Single (S).												

Tire Size Highway		TIRE LOAD LIMITS (LBS.) AT VARIOUS COLD INFLATION PRESSURES (PSI)										
		70	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**
12.00R24	D			6650	**6910(G)**	7160	7410	**7640(H)**	7870	**8100(J)**		
	S			6980	7280	7580	**7880(G)**	8160	8450	**8710(H)**	8970	**9230(J)**
14.00R20.21	D			8120	8430	**8740(J)**	9030	9320	**9610(L)**			
	S			8510	8890(H)	9260	9610	**9960(J)**	10300	10620	**10960L**	
Note: Letters in parentheses denote Load Range for which loads (shown in bold face) are maximum. Dual (D), Single (S).												

Tire Size Designations		TIRE LOAD LIMITS (POUNDS) AT VARIOUS COLD INFLATION PRESSURES (PSI) (BRIDGESTONE)										
Tubeless Tires Mounted on 15° Drop Center Rims		**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**	**125**	**130**
385/65R22.5	S	7040	7350	7650	7950	8230	8510	8790	9050	**9370J**		
425/65R22.5	S	8370	8740	9100	9450	9790	10100	**10500J**	10900	11350L		
445/65R22.5	S	9120	9540	9930	10300	10700	11000	11400	11700	**12300L**		
225/70R19.5	D	**3000E**	3115	3245	**3415F**	3490	3615	**3750G**				
	S	**3195E**	3315	3450	**3640F**	3715	3845	**3970G**				
245/70R19.5	D	3415	**3515**	3655	3680F	**3940**	4075	**4300G**	4345	4540(H)		
	S	3640	**3740**	3890	4080F	**4190**	4335	**4540G**	4620	4805(H)		
265/70R19.5	D	3750	3930	4095	4300	4405	**4415**	4675(G)				
	S	3970	4180	4355	4540	4685	**4850**	5070(G)				
255/70R22.5	D	3970	4110	4275	4410	4455	4610	**4675G**	**4915**	5070(H)		
	S	4190	4370	4550	4675	4895	5065	**5205G**	**5400**	5510(H)		
245/75R22.5	D	3765	3915	4055	4195	4300(G)						
	S	3810	3975	4140	4300	4455	4610	**4675G**				
265/75R22.5	D	4205	4370	4525	4685	**4805G**						
	S	4255	4440	4620	4800	4975	5150	**5205G**				

Tire Size Designations		TIRE LOAD LIMITS (POUNDS) AT VARIOUS COLD INFLATION PRESSURES (PSI) (BRIDGESTONE)										
Tubeless Tires Mounted on 15° Drop Center Rims		**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**	**125**	**130**
295/75R22.5	D	4885	**5070(F)**	5260	5440	**5675G**	5795	**6005H**				
	S	4945	5155	5370	**5510(F)**	5780	5980	**6175G**	6370	**6610H**		
295/80R22.5	D	4810	5080	5340	5600	5860	6130	6390	**6780H**			
	S	5350	5640	5930	6220	6510	6810	7100	**7390H**			
285/75R24.5	D	4930	**5205(F)**	5310	5495	**5675G**						
	S	4990	5210	5420	**5675(F)**	5835	6040	**6175G**				
315/80R22.5	D		**5840**	6070	6395G	**6540**	6770	**6940H**	7210	**7610J**	8010	8255L
	S		6415	6670	**6940G**	7190	7440	**7610**	7920	**8270J**	8635	9000L

RADIAL TIRE LOAD AND INFLATION CHART (MICHELIN ONLY)
(For TRUCKS AND TRAILERS in Normal Highway Service)

Tire Size Designations			Tire Load Limits at Various Cold Inflation Pressures (PSI)														
Tube	Tubeless		55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130
	8R 19.5	D S	2288 2355	2443 2518	2598 2683	2700 2800	2869 2975	3050 3170	3206 3325	3375F 3500F								
8.25 R20	9R 22.5	D S	2610 2860	2840 3090	3114 3318	3261 3503	3474 3700	3671 3913	3830 4050	4050 4308	4300F 4540F							
9.00 R20	10 R22.5	D S					3914 4255	4131 4490	4349 4725	4566 4963	4740F 5150F	4995 5600	5080G 5680G					
10.00 R20		D S				3992 4435	4224 4692	4455 4950	4692 5215	4922 5470	5180 5755	5440G 6040G	5620 6245	5782 6427	5950H 6610H			
11.00R20		D S				4145 4680	4390 4958	4635 5235	4880 5513	5130 5705	5361 6055	5575 6295	**6000 G 6590 G**	6055 6835	**6360H 7200H**			
11.00 R22	12 R22.5	D S				4145 4680	3990 4957	4635 5235	4880 5512	5130 5705	5361 6055	5575 6295	6000G 6590	6180 6895	6360H 7200H			
12.00 R20		D S					4629 5197	4815 5512	5181 5827	5435 6117	5725 6447	5966 6725	6255 7055	6500 7330	6755 7605	7160J 8270J		
14.00 R20		D S							8077 8832	8473 9287	8887 9782	9232 10197	9645 10692	9900 M 11000 M				
10.00 R22	11R 24.5	D S				4285 4705	4534 4960	4740 5235	4976 5512	5200F 5780F	5495 6105	5790G 6430G	5970 6630	6150 6830	6330H 7030H			
11.00 R22		D S				4480 4975	4750 5285	5130 5700	5505 6115	5690 6320	5970 6630	6200 6890	6435 7150	6715 7460	6900H 7660H			
11.00 R24		D S					5630 5860	5860 6140	6090 6420	6310 6680	6520 6940	6730 7190	6930 7430	**7130 H** 7670	7900	**8130 H**		

Letters listed with weight are the maximum load for load range of tire. Do not exceed rim load and/or Inflation Limits. For applicable load limits for other than normal highway service, for other size designations consult the Michelin dealer. D= Dual Tire Usage. S= Single Tire Usage

Tire Size Designations		Tire Load Limits at Various Cold Inflation Pressures (PSI)															
Tube Tubeless		55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130
12.00 R24	D S					6390 6660	8650 6980	6910 7280	7160 7580	7410 7880	7640 8160	7870 8450	**8100J** 8710	8970	**9230J**		
11R22.5	D S				3993 4435	4224 4693	4455 4950	4693 5215	4923 5470	5180 5755	5675G 6175G	5778 6245	5880 6428	5950H 6610H			
12R22.5	D S				4210 4705	4465 4990	4740 5280	5008 5570	5283 5870	5548 6155	5805 6455	6055 6740	6305 7030	6610H 7390H			
12R24.5	D S				5080 5240	5300 5520	5520 5790	5730 6040	5940 6290	6140 6530	6330 6770	6530 7000	6720 H 7220	7440	7660 H		
225/70R 19.5	D S	2380 2475	2560 2650	2755 2835	2920 3040	3085 3220	3250 3405	**3415F** **3640F**									
245/70R 19.5	D S	2530 2640	2723 2870	2910 3075	3160 3250	3340 3455	3520 3660	3700 3865	**3860F** **4080F**	4063 4275	**4375** **G** **4545** **G**						
235/80R 22.5	D S				3594 3815	3814 4035	4035 4278	4278 4543	**4410** **G** **4675** **G**								
255/70R 22.5	D S			3135 3385	3329 3598	3521 3810	3713 4023	3905 4235	4096 4448	4280 4635	4420 4805	4540 5000	4851 5273	**5070** **H** **5510** **H**			
255/80R 22.5	D S				3695 4000	3910 4235	4135 4465	4355 4710	4575 4960	**4810** **G** **5205** **G**							
275/80R 22.5	D S				4113 4560	4350 4825	4588 5090	4833 5365	5070 5625	5335 5920	**5675** **G** **6175** **G**	5778 6345	5883 6615	**6175** **H** **6940** **H**			

Letters listed with weight are the maximum load for load range of tire. Do not exceed rim load and/or Inflation Limits. For applicable load limits for other than normal highway service, for other size designations consult the Michelin dealer. D= Dual Tire Usage. S= Single Tire Usage

Tire Size Designations		Tire Load Limits at Various Cold Inflation Pressures (PSI)															
Tube Tubeless		55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130
315/80R 22.5 55 mph Max Speed	D S								5865 6675	6145 6995	6463 7310	6708 7630	7050 7950	**7385J** **8270J**	7560 8485	7893 8750	**8255L** **9000L**
385/65R 22.5	D S					6310	6640	6940	7280	7580	7890	8220	8530	9000	9150	**9370J**	
425/65R 22.5	D S					7580	8000	8400	8840	9220	9590	10000	10500	10740	11110	**11400 L**	
445/65R 22.5	D S					8200	8710	9130	9570	9990	10410	10970	11240	11660	12060	**12300 L**	
365/80R 20	D S						6415	6740	7080	7440	7810	8120	8465	8850	9233	9618	**10000 L**
275/80R 24.5	D S				4113 4560	4350 4825	4588 5090	4833 5365	5070 5625	5335 5920	**5675 G** **6175 G**						

Letters listed with weight are the maximum load for load range of tire. Do not exceed rim load and/or Inflation Limits. For applicable load limits for other than normal highway service, for other size designations consult the Michelin dealer. D= Dual Tire Usage. S= Single Tire Usage

TIRE AND RIM COMBINATIONS

Tires Designed for Normal Highway Service

Tube Type		Tubeless	
Tire Size	Rim Width	Tire Size	Rim Width
		8–19.5	6.00, 6.75
8.25–20	6.50, 7.00		
9.00–20	7.00, 7.50	9–22.5	6.75, 7.50
10.00–20	7.50, 8.00	10–22.5	6.75, 7.50
10.00–22	7.50, 8.00	11–22.5	7.50, 8.25
11.00–20	7.50, 8.00	11–24.5	7.50, 8.25
11.00–22	7.50, 8.00, 8.50	12–22.5	8.25, 9.00
11.00–24	7.50, 8.00, 8.50	12–24.5	8.25, 9.00
12.00–20	8.50, 9.00	15–22.5	11.75, 12.25
14.00–20	10.00	16.5–22.5	12.25, 13.00
14.00–24	10.00	18–22.5	13.00, 14.00
14/80R20	10.00	225/70R19.5	6.00, 6.75
365/80R20	10.00	235/80R22.5	6.75, 7.50
		245/70R19.5	6.75, 7.50
		255/70R22.5	7.50, 8.25
		265/70R19.5	6.75, 7.50, 8.25
		275/80R22.5	7.50, 8.25
		285/75R24.5	8.25
		295/75R22.5	7.50, 8.25
		315/80R22.5	9.00
		385/65R22.5	11.75, 12.25

Tube Type		Tubeless	
Tire Size	Rim Width	Tire Size	Rim Width
		425/65R22.5	12.25, 13.00
		445/65R22.5	13.00, 14.00

CAUTION

Always use approved tire and rim combinations for diameters and contours. After mounting dual tires, insure tires do not contact each other under a loaded condition.

Not applicable for ML (Mining and Logging) tires.

CONVERSION OF PLY RATING TO LOAD RANGE DESIGNATION.

Load Range	Replaces Ply Rating
D	8
E	10
F	12
G	14
H	16
J	18
L	20
M	22
N	24

WARNING

Do not mount tube type tires on tubeless wheels or tubeless tires on tube type wheels. To do so could result in property damage, personal injury or death.

TRANSMISSION

Check fluid level and shift linkage for proper operation.

IMPORTANT: If vehicle is equipped with an automatic transmission, have a qualified mechanic occasionally check operation of transmission neutral safety switch.

WHEELS

GENERAL

Wheel bearings should be inspected, lubricated and adjusted at regular intervals. This is especially important if operating in deep sand, mud, or water. Refer to lubrication section of this manual.

OIL LUBRICATED FRONT WHEEL BEARINGS

During normal vehicle duty cycle, the lube and air inside the hub/wheel cavity expands and if not vented, causes pressure build-up that could cause accelerated seal wear.

Currently there are two popular venting methods (a slit or small hole in the rubber check vent or window) used on International trucks to prevent pressure build-up.

As the air and oil expand, it is normal for a mist of oil to be present on the outside of the hubcap around the slit or hole. Over a period of 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, further investigation should be conducted. See Service Manual for procedure.

Normal Maintenance

As previously noted, over a period of time, if not routinely cleaned, a slight film of oil can collect dirt around the rubber fill plug and face which could be perceived as a leak. Furthermore, routine cleaning ensures that the lube level can be easily observed through the clear window as intended. In a case where the window is clean on the outside but discolored on the inside from the lubricant used, its lube level may be checked by inserting a finger through the rubber check vent hole.

The specified lube level for International clear window type hubcaps is from the minimum line to + $^{5}/_{16}$" above the minimum line.

If the lube level should suddenly drop dramatically below the minimum level, see the Service Manual for diagnostic procedure.

INSTALLATION, TIGHTENING AND ALIGNMENT

When installing wheels, be certain that the threads on studs and nuts are clean to permit correct torquing of nuts. The mounting surfaces of rims, wheels, spacer rings and clamps must be free of dirt, rust, lubricants or damage.

Use a wire brush to clean mounting contact surfaces. Do not use lubricant on threads. Refer to Dry Threads – No Lubrication note following the Torque Chart.

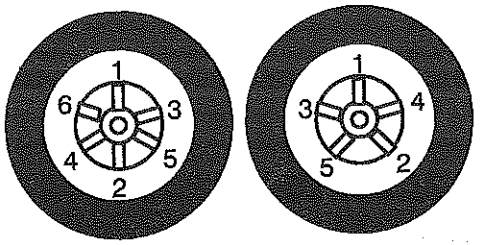
After rim or wheel has been properly tightened, it should be checked for alignment. Rotate the wheel with a piece of chalk attached to a steady, firm surface and placed to just barely clear outside surface of tire bead seat. This procedure will point out the high spot. Keep in mind, however, that a high spot does not necessarily mean that lug nuts have been unevenly tightened. This condition or misalignment could be caused by a bent wheel.

Checking the alignment of the wheel/rim installation is more important on cast spoke rims since the rims can be drawn out of alignment when improperly tightened. Use the following installation procedures.

Cast Spoke Wheels

1. Slide inner rear or front tire and rim assembly over the cast spoke wheel and push it back into position against tapered mounting surface. Be sure valve stem faces out and is centered between two spokes.
2. Slide spacer ring over rear wheel. Check spacer ring for concentricity by rotating spacer ring around cast spoke wheel.
3. Slide the outside rear tire and rim assembly on the wheel, making sure the valve stem faces inboard and is located in same relative position as inner valve stem.
4. Assemble all rim clamps and nuts. Turn nuts on studs until each nut is flush with end of stud.

5. Turn top nut 1 until it is snug.
6. Rotate wheel and rim until nut 2 is at top position and turn nut until snug.
7. Rotate wheel and rim until nut 3 is at top position and turn nut until snug.
8. Rotate wheel and rim until nuts 4, 5 and 6 are respectively at top and turn these nuts until snug.

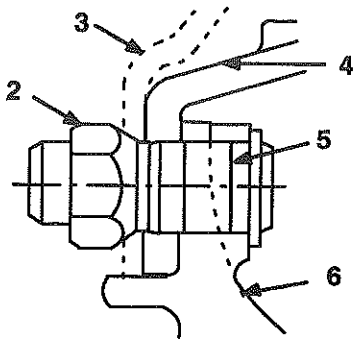


Cast Spoke Wheel Tightening Sequence

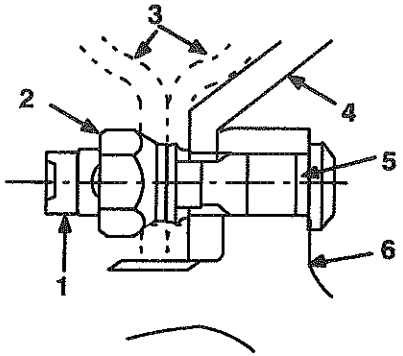
9. Repeat the sequence of tightening the nuts to torque value listed in Torque Chart.
10. After operating the vehicle approximately 50 miles (80 km) check the stud nuts for tightness in same sequence shown. Once each week inspect and re-tighten wheel stud nuts.

Since the entire weight of tire and rim assembly is on top spoke, the foregoing procedure (criss–cross sequence) will assure even application of force at all points on the rim, keeping the rim in proper alignment.

Disc Wheels with Ball Seat Nuts (Stud Piloted)



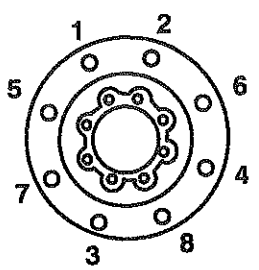
FRONT WHEEL MOUNTING
OF BALL SEAT NUTS



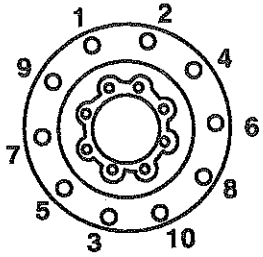
REAR WHEEL MOUNTING
OF BALL SEAT NUTS

1. Inner Wheel Nut ($1-1/8$ inch O.D.)
2. Outer Wheel Nut
3. Wheel(s)
4. Brake Drum
5. Wheel Stud ($3/4$ and $1-1/8$ inch Front) (3/4 inch Rear)
6. Wheel Hub

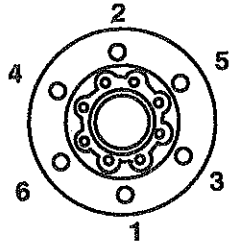
1. Slide inner rear or front tire and wheel in position over studs and push back as far as possible. Use care to avoid damage to threads on studs.
2. Install the outer wheel nut on front wheels and inner wheel nut on rear dual wheels. Run nuts on studs until the nuts start to contact the wheel. Rotate wheel a half turn to allow parts to seat naturally.
3. Draw up stud nuts, alternately following the sequence (criss–cross pattern) illustrated. Do not fully tighten the nuts at this time. This procedure will allow a uniform seating of nuts and insure the even face–to–face contact of wheel and hub.
4. Continue tightening the nuts to the torque specifications in the Torque Chart using the same alternating (crisscross) sequence shown.
5. Install the outer rear wheel and repeat the preceding method. Be sure that both inner and outer tire valve stems are accessible.
6. After operating the vehicle approximately 50 miles (80 km) check the stud nuts for tightness. Some natural seating of parts may be encountered and the torque on nuts will drop. Re-tighten all nuts to specified torque.



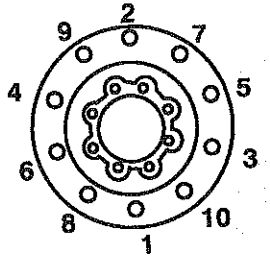
Flange Nut Mount 8 Stud



Flange Nut Mount 10 Stud



Ball Seat Mounting 6 Stud



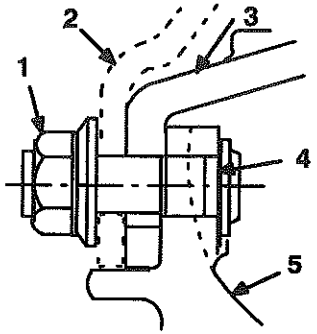
Ball Seat Mounting 10 Stud

To check and tighten the inner wheel to proper torque, first loosen the outer wheel nuts several turns. Then tighten the inner nuts and re-tighten the outer nuts.

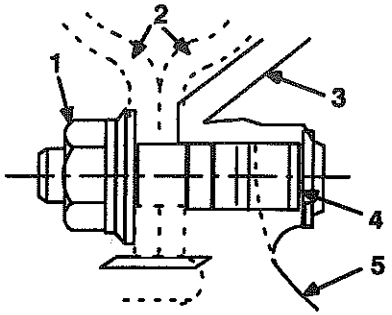
To prevent losing the seating of the outer wheel when checking the inner wheel torque, first loosen alternate outer nuts. Then tighten the inner nuts and re-tighten the outer nuts. Then loosen the remaining outer nuts, tighten the inner nuts and re-tighten the outer nuts.

Once each week inspect and re-tighten wheel stud nuts.

Disc Wheels with Flange Nuts (Hub Piloted)



FRONT WHEEL MOUNTING
OF FLANGE NUT SYSTEM



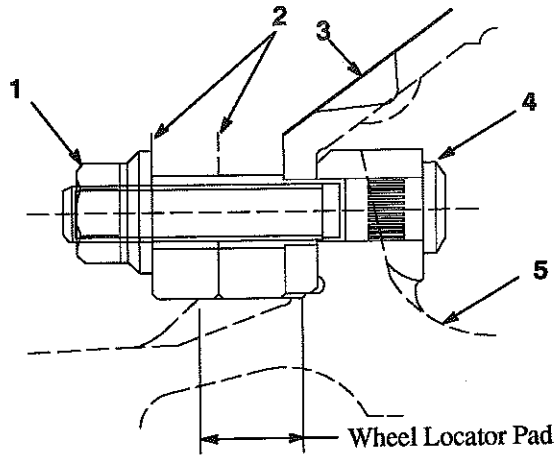
REAR WHEEL MOUNTING
OF FLANGE NUT SYSTEM

1. Flange Nut
2. Wheel(s)
3. Brake Drum
4. Wheel Stud (22mm)
5. Wheel Hub

1. Slide inner rear or front tire and wheel in position over studs and push back as far as possible. Use care so that the threads on studs are not damaged.
2. Position outer rear tire and wheel in place over the studs and push back as far as possible. Again, use care so that the threads on studs are not damaged.
3. Run the nuts on the studs until nuts contact the wheel or wheels. Rotate wheel assembly a half turn to permit parts to seat.
4. Draw up nuts alternately following the (crisscross) sequence illustrated. Do not fully tighten nuts at this time. This will allow uniform seating of nuts and assure even face to face contact of wheel and hub.
5. Continue tightening the nuts to torque specifications in the Torque Chart using the same alternating sequence shown.
6. After operating the vehicle approximately 50 miles (80 km) check the stud nuts for tightness. Some natural seating of parts may be encountered and the torque on nuts will drop. Re-tighten all nuts to specified torque.

Once each week inspect and re-tighten wheel stud nuts.

Aluminum Rear Disc Wheels with Flange Nuts (Hub Piloted)



1. Flange Nut
2. Wheel(s)
3. Brake Drum
4. Wheel Stud (22mm)
5. Wheel Hub

Prior to re-installing rear aluminum hub-piloted wheels, clean each wheel locator pad on the hub from all dirt, rust and foreign material.

Apply a light coat of chassis grease, never seize or disc brake corrosion control grease.

WARNING

Failure to follow these instructions could result in property damage, personal injury or death:

Always loosen rim clamps before complete removal of nut from stud (cast spoke wheels). With loosened nuts on stud, strike clamps with a heavy hammer and be sure each clamp is loose.

Always deflate tires completely before removing locks or side rings.

Always inflate tires in a safety cage.

Always use a clip–on air chuck with remote control valve to inflate tires.

Never strike cast spokes of wheel assembly when loosening rim clamps.

Never mix rim side rings or lock rings of different types or sizes.

Never use cracked, bent or badly rusted parts.

Never re-inflate flat tires on vehicle. Use the spare.

Never add air until each side or lock ring is fully seated.

Never hammer side or lock ring on a partially or fully inflated tire.

WARNING

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 an International® valve stem retainer or a tire manufacturer's stem forming tool are the only acceptable methods of obtaining clearance when necessary.

PROPER TORQUE

It is important to tighten and maintain wheel and rim mounting nuts to the proper torque. Loose nuts or over-tightened nuts can lead to premature wear and possible failure of the wheel, rim and/or mounting hardware.

CHANGING WHEEL TYPES

WARNING

Use only the same type and style wheels and mounting hardware to replace original parts. Failure to do so may result in an assembly which looks fine, but does not fit together properly. This could possibly cause wheel or fastener failures which may result in property damage, personal injury or death.

Do not attempt to mix stud piloted wheels or fasteners with hub piloted wheels or fasteners.

Do not mix foreign (not made in North America) parts with domestic (Made in North America) parts. Many foreign wheel components are similar but not exactly the same as North American made.

Do not change from aluminum wheels to steel wheels or vice–versa without changing the mounting hardware where required or, in some cases with flange nut mounting systems, changing the hub and stud assembly.

Consult your International dealer or wheel/rim distributor before attempting any wheel or fastener changes.

TORQUE CHART

DISC WHEELS			
Size	**Nut Mounting**	**Torque** N–m	Ft-Lbs
22 mm	Flange		
	Motor Wheel – 37.5mm Across Flats	610–678	450–500
	International/Budd – 33mm Across Flats	610–678	450–500
$^{3}/_{4}$"	Standard Square Cap: $^{13}/_{16}$" Across Flats	610–678	450–500
	Standard Hex Cap: $1^{1}/_{2}$" Across Flats	610–678	450–500
$1\ ^{1}/_{8}$"	Standard Hex Cap: $1\ ^{1}/_{2}$" Across Flats	882–949	450–500
$^{15}/_{16}$"	HeavyDuty Square Cap: $^{15}/_{16}$" Across Flats	1017–1221	750–900
$1\ ^{5}/_{16}$"	HeavyDuty Cap: $1\ ^{3}/_{4}$" Across Flats	1017–1221	750–900
CAST WHEELS			
$^{3}/_{4}$"	Hex Rim Clamp Nut: $1\ ^{1}/_{4}$" Across Flats	271–325	200–240

NOTE: Do not use lubrication on dry threads. Where excessive corrosion exists, a light coat of lubricant on first three threads of stud on bolt is permitted. Keep lubricant away from:

- **hex nut and rim clamp contact surfaces;**
- **cap nut ball face and ball seat on disc wheel;**
- **flange nut washer surface and flat on disc wheel.**

Section D: Lubrication

Lubrication

GENERAL INSTRUCTIONS

New vehicles are lubricated at the factory and before they are delivered. After the vehicle is placed in operation, regular lubrication intervals, as outlined, should be followed. Thorough lubrication at the specified intervals will improve the Low Cost of Ownership (LCO) and will reduce overall operating expense.

The interval between lubrication periods and oil changes depends entirely upon operating conditions, loads carried, speeds and road and weather conditions. Where operating conditions are extremely severe, such as in deep water, mud, or unusually dusty conditions, the vehicle may require lubrication after every twenty–four hours of operation.

Only lubricants of superior quality, having proper body or viscosity, should be used. The use of inferior products will reduce the service life of the vehicle or result in failure of its components. Navistar recommends the use of regular Fleetrite® oil and lubricants available through your International® dealer.

The lubrication specifications refer only to the viscosity (SAE) and type to be applied. The viscosity numbers have been adopted by the Society of Automotive Engineers to classify lubricants according to viscosity and do not cover any other properties.

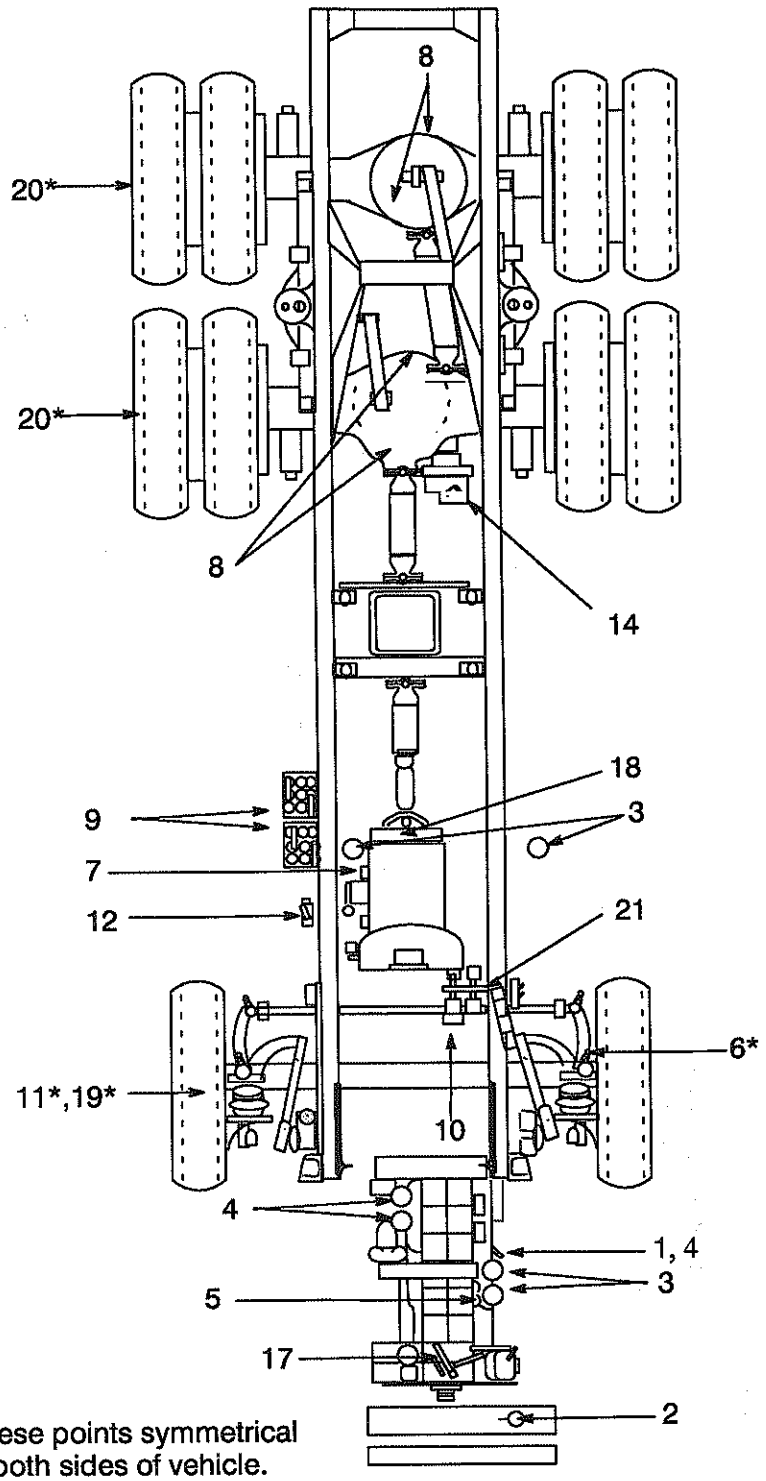
Unless otherwise specified, never add lubricant unless it is the same grade as that which is already in use. If the grade is unknown or is not available, drain, flush and refill with new lubricant.

The lubrication intervals specified should be performed at whatever interval occurs first, whether it is months, miles, hours or kilometers.

ENGINE OIL SPECIFICATIONS

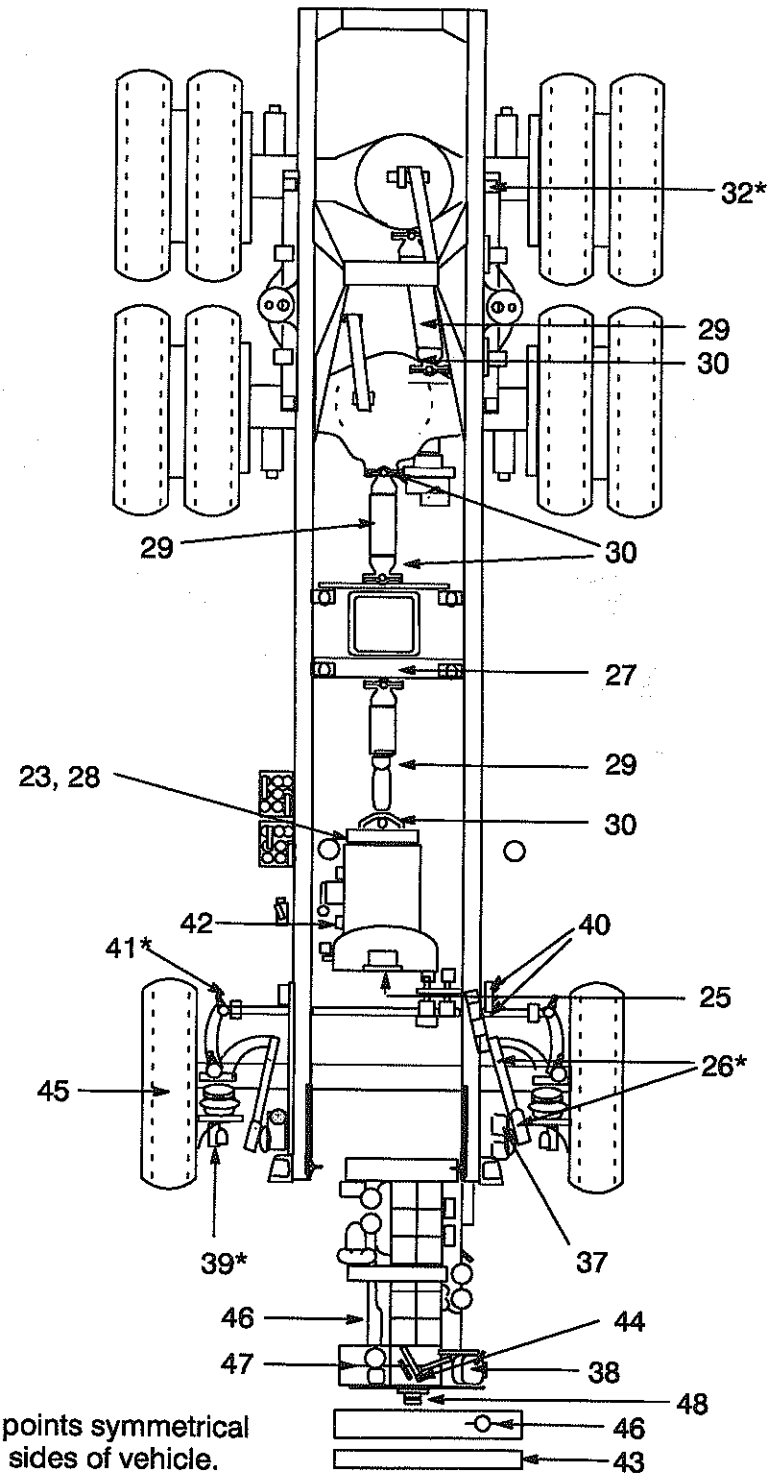
For engine oil specifications, and oil and filter change intervals, refer to the Engine Owner's Manual provided with the vehicle.

LUBRICATION DIAGRAM (KEY NOS. 1–21)



*These points symmetrical on both sides of vehicle.

LUBRICATION DIAGRAM (KEY NOS. 22–48)



*These points symmetrical on both sides of vehicle.

LUBRICATION MAINTENANCE CHART

Key No.	Description	Operation	Use or Remarks [1]
		Interval: Daily Inspection	
NI	Air Cleaner Restricition Indicator		B
1	Engine Crankcase Level Change Interval		A
2	Coolant Level	Check and Correct on each Fuel Stop	Refer to Cooling System in the Maintenance Section
NI	Low Oil Pressure Alarm	Correct As Necessary	Refer to Engine Oil Specifications
NI	External Leakage		
3	Fuel/Water Separator	Drain and Replace Element as Necessary	
5	Accelerator Pedal	Check for Smooth Operation and Returnability	If equipped with mechanical linkage, verify that both throttle return springs are functional.
7	Allison Automatic Transmission Oil and Filters	Check Level and Correct as Required	L Refer to Separate Allison Transmission Operator's Manual
		Interval: As Required	
NI	Air Cleaner (Engine)	Replace	B
3	Fuel Filters		Refer to Engine Maintenance Charts flound in this Manual or Separate Engine Supplements
4	Engine Oil and Filters		
5	Throttle Linkage	Lubricate	Light Engine Oil
6	Trunnion Bearing and Axle Shaft U-Joint Dana Axles		N
7	Allison Automatic Transmission Oil and Filters	Replace	L Refer to Separate Allison Transmission Operator's Manual
10	Brake Pedal Linkage Clevis & Pins	Lubricate	Mobil SHC32 Lubricant or Equivalent

The Key Number refers to call out number on the Lubrication Diagram, pages 2 – 3. NI = Not Illustrated

[1] = Letters will indicate additional requirements of Special Instructions following the Lubrication Charts.

Key No.	Description	Operation	Use or Remarks [1]
	Interval: As Required		
NI	Speedometer, Tachometer Cable		Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi–purpose Lithium Grease (Electronic Speedometer or Tachometer Not Required)
NI	Speedometer, Tachometer Head		Light Weight Oil (Not Required w/Electronic Speedometer or Tachometer)
NI	Door Window Regulators		Lubriplate 105 Grease or Equivalent
NI	Seat Adjuster Slides		Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi–purpose Lithium Grease
NI	Manifold Heat Control Valve		Penetrating Oil
	Interval: Every 1,000 Miles or 1600 Kilometers		
6	Steering Knuckles and U-Joints–FABCO Axles	Lubricate	[N]
	Interval: Every 5,000 Miles or 8100 Kilometers		
7	AllisonMD , AT, MT Transmission Oil and Filters	Change Initial Fill Lubricant	[L] Refer to Separate Allison Transmission Operator's Manual
8	Differential Rockwell	Change Initial Fill Lubricant	[D] Not to Exceed 3,000 miles or 5000 kilometers
	Interval: Every 6,000 Miles or 9500 Kilometers or Monthly		
7	Fuller Transmission Main & Auxiliary	Change Initial Fill	[J] Mileage Interval Only
7	Transmissions Manual, Automatic	Check Level & Correct as Required	[J] [K] [L]
8	Differential (Front or Rear Axles) Eaton	Change Initial Fill	[C] Mileage Interval Only
8	Differential (Front or Rear Axles)	Check Level and Correct as Required	[C]
9	Battery (With Caps)	Check Water Level	Distilled Water
9	Battery Posts	Clean	Grease After Cleaning

The Key Number refers to call out number on the Lubrication Diagram, pages 2 – 3. NI = Not Illustrated
[1] = Letters will indicate additional requirements of Special Instructions following the Lubrication Charts.

Key No.	Description	Operation	Use or Remarks [1]
Interval: Every 6,000 Miles or 9500 Kilometers or Monthly			
10	Brake Master Cylinder	Check Level and Correct as Required	Super Heavy Duty "DOT 3" Brake Fluid
11	Wheel Bearing (Synthetic Grease) Front		Mobil SHC007 Synthetic Grease
17	Power Steering Pump	Check Level and Correct as required	[F]
	Hydraulic Brake Booster Pump (w/o P.S.)		
18	Transfer Case		[H]
19	Wheel Bearings (Oil) Front		[C] or SAE 50 Engine Oil or SAE 50 Synthetic Transmission Oil
21	Clutch Pedal Linkage	Lubricate	
23	Parking Brake Lever & Cable		Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi–purpose Lithium Grease
24	Clutch Relay and Release Fork Shaft		
25	Clutch Release Sleeve, Bearing, Fork		Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi-purpose Lithium Grease
NI	Door Check, Hinges, Latches, Strikers, 2000, 4000 & 8000		
NI	Hood Linkage		
NI	Hood Tilt Linkage		
27	Prop Shaft Center Bearing		
28	Parking Brake Relay Lever		
29	Prop Shaft Slip Joint		
30	Prop Shaft U-Joint City or On/Off Highway		

The Key Number refers to call out number on the Lubrication Diagram, pages 2 – 3. NI = Not Illustrated

[1] = Letters will indicate additional requirements of Special Instructions following the Lubrication Charts.

Key No.	Description	Operation	Use or Remarks [1]
Interval: Every 6,000 Miles or 9500 Kilometers or Monthly			
31	Power Take Off Shift Control		
35	Transfer Case Shift Linkage		
NI	Transmission Control Rods		
Interval: Every 8,000 Miles, 13900 Kilometers			
1	International Engines with Extend-a-Filter	Change Engine Oil and Filter	[A] Fleetrite® SG/CF–4 15W–40
2	Charge Air Cooler	Check intake air system and charge air cooler for wear points and damage to piping, or loose connections	See Maintenance Section C, Charge Air Cooler
Interval: Every 12,000 Miles, 19000 Kilometers			
6	Steering Knuckles & Bearings, Steering U–Joints	Lubricate Tie Rod & Drag Link Ends	[N] Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi–purpose Lithium Grease
30	Propshaft U-Joint On Highway (Non Line Haul	Lubricate	Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi-purpose Lithium Grease Lubricated with low pressure to flush out any contaminants which may have passed the seals
39	Brake Camshafts and Automatic & Manual Slack Adjusters	Lubricate	Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi–purpose Lithium Grease
Interval: Every 24,000 Miles, 38000 Kilometers or Monthly			
43	Radiator Shutters	Lubricate	Automatic control radiator shutters vane bearings are to be coated with light duty or penetrating oil. Vehicles which have been in storage or out of service for any length of time are to have bearings lubricated prior to going back into service.

The Key Number refers to call out number on the Lubrication Diagram, pages 2 – 3. NI = Not Illustrated

[1] = Letters will indicate additional requirements of Special Instructions following the Lubrication Charts.

Key No.	Description	Operation	Use or Remarks [1]
Interval: Every 24,000 Miles, 38000 Kilometers or Monthly			
30	Propshaft U-Joint (On Highway Linehaul Only)		Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi–purpose Lithium Grease
Interval: Every 24,000 Miles, 38000 Kilometers or 900 Hours or Annually			
46	Cooling System Filter	Change Filter Conditioner for International Engines with Coolant Filter	Refer to Cooling System in Maintenance Section of this Manual for International Navistar Engines. For Caterpillar, Cummins and Detroit Diesel Engines, refer to separate engine supplements.
Interval: Every 24,000 Miles, 38000 Kilometers or 5 Months			
NI	Brake Pedal to Brake Valve Linkage	Lubricate	Light Weight Engine Oil

The Key Number refers to call out number on the Lubrication Diagram, pages 2 – 3. NI = Not Illustrated

[1] = Letters will indicate additional requirements of Special Instructions following the Lubrication Charts.

Key No.	Description	Operation	Use or Remarks [1]
	Interval: Every 25,000 Miles, 39600 Kilometers		
6	Steering Knuckles Non-Drive Axles with Sealed Kingpins All Dana, Rockwell, Eaton	Lubricate	Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi–purpose Lithium Grease Distribution of grease thru kingpin bushing pockets may be enhanced by lifting weight off front wheels during lubrication process.
7	AllisonMD , AT, MT Transmission Oil and Filters	Change & Replace	[L] Refer to Separate Allison Transmission Operator's Manual
40	Steering Column U-Joints, Slip Joint		
41	Tie Rod Ends		
	Interval: Every 30,000 Miles, 48000 Kilometers or Annual		
45	Front Wheel Bearings (Mineral Grease)	Re-pack	Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi–purpose Lithium Grease
	Interval: Every 50,000 Miles, 80000 Kilometers or 6 Months		
37	Ross TAS Power Steering	Change Lubricant & Filter in Reservoir	[F]
	Interval: Every 50,000 Miles, 80000 Kilometers		
6	Steering Knuckle Rockwell Non-Drive Axle with Sealed Front Axles	Lubricate	[G] Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi–purpose Lithium Grease
	Interval: Every 72,000 Miles, 116000 Kilometers or 2700 Hours or Annually		
46	Cooling System T444E Engine	Service Cooling System	Refer to Cooling System in Maintenance Section of this Manual.

The Key Number refers to call out number on the Lubrication Diagram, pages 2 – 3. NI = Not Illustrated

[1] = Letters will indicate additional requirements of Special Instructions following the Lubrication Charts.

Key No.	Description	Operation	Use or Remarks [1]
Interval: Every 100,000 Miles, 160000 Kilometers or Annually			
8	Differential	Change Lubricant	[C] [D] After Initial Change, Change Every 100,000 Miles (160000 km) for Service on Class A or Better Roads. Change More Often on Lower Class and Off–Road Service. No initial drain required on Dana axles.
11.	Wheel Bearings (Synthetic Grease) Front		Mobil SHC007 Synthetic Grease
19	Wheel Bearings (Oil) Front		[C] or SAE 50 Engine Oil or SAE 50 Synthetic Transmission Oil
44	Power Steering Applications	Change Lubricant Change Filter in Reservoir	[F]
NI	Door Lock Cylinders	Lubricate	Lock Oil
Interval: Every 240,000 Miles, 385000 Kilometers or 2 Years			
2	Charge Air Cooler	Check for cracked tubes or header	
Interval: Every 250,000 Miles, 402300 Kilometers			
8	Transmission (Fuller, Spicer and Rockwell) Main & Aux. (No Monthly Interval)	Change Lubricant with Synthetic Oil Change Filter if Equipped	[J] [K] After Initial Fill Lubricant Change with Synthetic Oil
8	Differential (Front or Rear) Eaton, Dana and Rockwell	Change Lubricant with Synthetic Oil	[C] After Initial Fill Lubricant Change With Synthetic Oil
Interval: Every 350,000 Miles or 560000 Kilometers			
48	Horton Fan Clutch	Replace Bearings and Seals	Refer to Service Manual
Interval: Overhaul			
47	Alternator	Lubricate	Cam and Ball Bearing Lubricant (Delco-Remy #1948791)
14	Two Speed Axle (Electronic)	Lubricate	[O] Lube at Overhaul or Motor Replacement

The Key Number refers to call out number on the Lubrication Diagram, pages 2 – 3. NI = Not Illustrated

[1] = Letters will indicate additional requirements of Special Instructions following the Lubrication Charts.

Key No.	Description	Operation	Use or Remarks [1]
		Interval: Overhaul	
NI	Brake Caliper & Anchor Plate Slide Pins	Lubricate	AEROSHELL #5 NAV P/N 991953C1
NI	Brake Shoe Anchor Pins		Fleetrite EP2 Moly Grease or Equivalent NLGI #2 Multi–purpose Lithium Grease

The Key Number refers to call out number on the Lubrication Diagram, pages 2 – 3. NI = Not Illustrated

[1] = Letters will indicate additional requirements of Special Instructions following the Lubrication Charts.

SPECIAL INSTRUCTIONS

A. For Engine Oil Specifications refer to Engine Owner's Manual provided with vehicle.

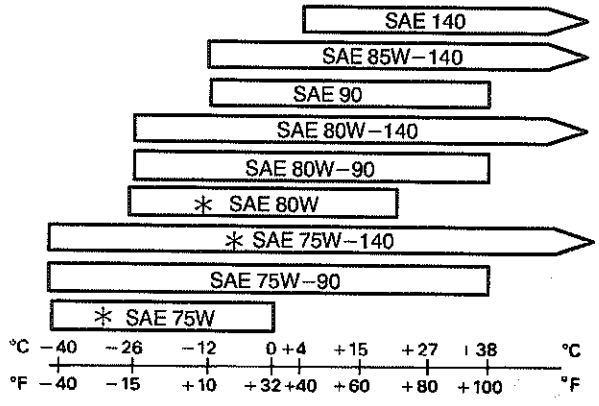
Recommended Engine Oil and Oil Filter Service Intervals will be located in the Engine Owner's Manual furnished with vehicle.

B. **Diesel Engines**; When air restriction reading (in inches of water vacuum) reaches the level shown in the table, clean or replace engine air cleaner. Refer to Air Restriction Gauge Instructions in this manual. Also refer to Engine Owner's Manual.

Due to the many variables associated with element washing, only new air cleaner elements should be used to replace elements that have become restricted beyond the maximum recommended restriction level. These elements are not to be cleaned. Replacement of elements is not to be judged on appearance, but by the air restriction.

Engine
International, Cummins (All), Caterpillar and Detroit Series 60
Maximum Inches of Water Vacuum
25 in. or (6.25 kPa)†
12.5 in. or (3.13 kPa)‡
† At Full Load, Rated Speed
‡ At High Idle, No Load

C. Multipurpose EP gear lubricant of API GL 5 quality meeting MIL–L–2105 D specifications including synthetic lubricants. For abnormally high temperatures, severe service (hot climate prolonged periods), use SAE 140. Refer to table. (Note special Dana–Spicer axle lubricant viscosities).



* DANA – SPICER AXLES ONLY

D. **Rockwell** front or rear axle lubricant change after initial fill lubricant change is as follows:

Vehicles operated less than 60,000 miles or 97 000 kilometers – change lubricant twice a year.

Vehicles operated more than 60,000 miles or 97 000 kilometers change lubricant every 25,000 to 30,000 miles or every 40 000 to 48 000 kilometers.

Refer to Note C for lubricant.

Rear Axle Lubricant Type	Ambient Temperature	Viscosity
Rockwell 0–76–A Hypoid Gear Oil	Above 10°F (–12°C)	GL-5, SAE 85W/140
Rockwell 0–76–B Hypoid Gear Oil	Above –15°F (–26.1°C)	GL-5, SAE 85W/140
Rockwell 0–76–D Hypoid Gear Oil	Above –15°F (–26.1°C)	GL-5, SAE 80W/90
Rockwell 0–76–E Hypoid Gear Oil	Above –40°F (–40°C)	GL-5, SAE 75W/90
Rockwell 0–76–J Hypoid Gear Oil	Above –40°F (–40°C)	GL-5, SAE 75W (Max. outside temp. 35°F (1.6°C))
Rockwell 0–76–L Hypoid Gear Oil	Above –40°F (–40°C)	GL-5, SAE 75W/140

There is no upper limit on these outside temperatures, but the axle sump must never exceed 250°F (121°C).

F. **Sheppard and Ross Gears:** Use Fleetrite Power Steering Fluid (Can No. 990625–C2) for all 1000 thru 8000, 9600 & 9700 Series. Use SAE 15–40 engine oil for 5000, 9100, 9200, 9300 & 9400 Series.

NOTE: For Ross TAS Series gears, the output shaft seal needs to be greased twice a year, (before and after winter), using NLGI grade 2 or 3 multi–purpose EP chassis lube. Do not use an automatic or power grease gun.

NOTE: Consult your International dealer for special Bleeding Instructions. He is aware of special procedures concerning certain installations.

G. **Lubrication Procedures:** **1.** Rockwell King Pins with Sealed Front Axles (02ARA) – Lubricate with vehicle on ground **2.** All Dana Axles and Rockwell Axles with Easy Steer™ Front Axles (02227, 02231, 02232, 02233, 02238, 02239)With chassis load on axle, force grease through thrust bearings. Then with axle lifted clear of floor, force grease between king pin and bushing surfaces. Use Fleetrite EP2 Moly Grease.

H. Use GL-1 straight mineral oil (rust and oxidation inhibited) SAE 90 for temperatures 0°F (–18°C) and up. Use SAE 80 for temperatures below 0°F (– 18°C).

Special Recommendations: Where temperature is consistently below 0°F (–18°C) and where parked vehicles are exposed to unusual cold for long periods, use SAE 75. Where temperatures are consistently above 90°F (32°C) or unusually hot, use SAE 140 straight mineral oil.

J. Fuller & Rockwell Transmissions

Lubricant Type	Ambient Temperature	Viscosity
Eaton®, Roadranger® Synthetic CD–50 Transmission Fluid	All	CD SAE 50
Engine Oil API–SF, SG or API–CD CE (MIL–L–2104D or E or MIL–L–46152 D or E	Above 10°F (–12°C) Below 10°F (–12°C)	SAE 50 SAE 40
Mineral Gear Oil API–GL-1 (Rust & Oxidation Inhibited)	Above 10°F (–12°C) Below 10°F (–12°C)	SAE 90 SAE 80W

Do not use oil additives or friction modifiers.

Mild EP gear oil or multi–purpose gear oil are not recommended when lubricant operating temperatures are above 230°F (100°C).

Synthetic CD50 should be used when lubrication operating temperatures frequently exceed 250°F (120°C). Intermittent transmission oil temperatures to 300°F (149°C) will not harm the transmission.

K. Spicer/International Transmissions

Synchronized Transmissions

Lubricant Type	Ambient Temperature	Viscosity
Synthetic Engine Oil Meeting MIL–L–2104D or MIL–L–46152B, API–SF or API–CD	All	CD SAE 50
Engine Oil API–SF or API–CD (MIL–L–2104D or MIL–L–46152B) (MIL–L–2104 B&C, or 46152 are also acceptable	Above 0°F (–18°C) Below 0°F (–18°C)	SAE 40 SAE 30
Mineral Gear Oil API–GL–1 Rust & Oxidation Inhibited	Above 0°F (–18°C) Below 0°F (–18°C)	SAE 90 SAE 80W

Do not use extreme pressure additives, such as found in multi–purpose or rear axle type lubricants. These additives are not required in Spicer Transmissions, and may in some cases create transmission problems. Multi–purpose oils, as a group, have relatively poor oxidation stability, a high rate of sludge formation and a greater tendency to react on or corrode the bronze parts in Spicer Synchronized Transmissions.

Non–Synchronized Transmissions

Lubricant Type	Ambient Temperature	Viscosity
Synthetic Engine Oil Meeting MIL–L–2104D or MIL–L–46152B, API–SF or API–CD	All	CD SAE 50
Heavy Duty Engine Oil Meeting MIL–L–2104D or MIL–L–46152B, API–SF or API–CD. MIL–L–2104B & C, or 46152–BARG also acceptable	Above 0°F (–18°C) Below 0°F (–18°C)	SAE 50 SAE 40
Straight Mineral Gear Oil R&O Type API–GL–1 * Mild EP Gear Oil MIL–L–2105 or API–GL–4	Above 0°F (–18°C) Below 0°F (–18°C)	SAE 90 SAE 80
* Synthetic Gear Oil Meeting MIL–L–2105C or API–GL–5	All	EP SAE 75W90

* EP Gear Oils are not recommended when lubricant operating temperatures are above 230°F (110°C).

L.	Allison Automatic Models	Type Fluid
	For Models MD – MT – HT	Dexron IIE, Dexron III or Type C4

Use type C-4 SAE 30 in all applications where ambient temperature is consistently above 86°F (30°C).

Some Dexron IIE and Dexron III fluids are also qualified as type C-4 oils and may be used in off–highway applications. However, a fluid which is not a qualified type C-4 oil must never be used in off–highway applications. Consult your local Allison dealer or distributor to determine if a Dexron IIE or Dexron III fluid is also a qualified type C-4 oil.

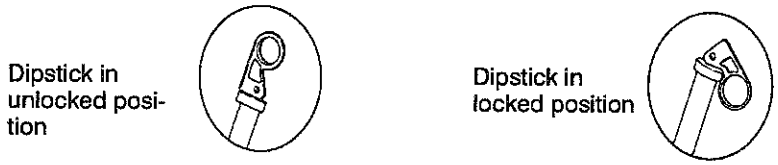
Refer to separate Allison Transmission Operator's Manual for more lubrication details.

Oil Check Procedure

WARNING: When checking the oil level, be sure that the parking brake and/or emergency brakes are set and properly engaged, and the wheels are chocked.

Unexpected and possibly sudden vehicle movement may occur if these precautions are not taken.

Always clean around the end of the fill tube before removing the dipstick. Dirt or foreign matter must not be permitted to enter the oil system. It can cause valves to stick, cause undue wear of transmission parts, or clog passages. Check the oil level by one of the following procedures and report any abnormal oil level to your maintenance personnel.



NOTE: Transmissions equipped with a transfer gear housing (drop box) contain two separate oil systems; the transmission system and the drop box system. Each system uses a different type of oil and must be checked independently.

Check for abnormal oil level, milky appearance or any trace of coolant in the oil.

L. (Continued)

COLD CHECK

NOTE: A cold oil check may be made when the sump temperature is 60–120°F (15–49°C).

- Run the engine for at least 1 minute to clear the oil system of air.
- With the engine running at idle, wipe the dipstick clean and check the oil level. Any level within the COLD RUN (60°– 120°F) band is satisfactory for operating the vehicle. If the level is not within the COLD RUN (60°– 120°F) band, add or drain oil as necessary to bring the level to the middle of the COLD RUN (60°– 120°F) band.

HOT CHECK

NOTE: If the transmission has reached normal operating temperature is 160–200°F (71–93°C), hot check must be made. The oil level rises as temperature increases.

- Park the vehicle on a level spot, shift to (N) neutral and apply the parking brake. Let the engine run at idle speed.
- Wipe the dipstick clean and check the oil level. The safe operating level is any level within the HOT RUN band on the dipstick.
- If not within this range, add or drain oil as necessary to bring the level to the middle of the HOT RUN band. (If dipstick has only hot overfull mark, perform cold check at first opportunity.)

N. 02064 (Dana) and Front Driving Axles only – Lubricate with FIeetrite EP2 Moly Grease. Lube axle shaft U–Joint whenever axle shafts are removed. Lube trunnion bearings when bearing caps are removed for service. No periodic lubrication is required.

02191, 02194, 02195, 02196 and 02ERA (Rockwell) Front Driving Axles Lubricate with Fleetrite EP2 Moly Grease. Lube wheel bearings, steering knuckle bearings, steering U-Joints and outer drive shaft seals. To lubricate U- Joints raise wheel off ground and rotate wheel so that grease fitting appears in lube access hole.

02083 & 02EYB (FABCO) Front Drive Axles Lubricate with Fleetrite EP2 Moly Grease. Lube steering knuckle bearings & steering U-Joints.

O. Use RHEOLUBE 362 or equivalent. RHEOLUBE 362 is available from Eaton Corporation under part number 113741. RHEOLUBE 362 is manufactured by NYE Specialists Lubricants, New Bedford, Mass.

Section E: Unit Refill Capacities

Unit Refill Capacities

ABBREVIATIONS

Volume
cm^3 = cubic centimeters

Pressure
kPA = kilopascal

Power
kw = kilowatts

Temperature
C = Celsius

Velocity
km/h = kilometers per hour

Length
m = meter
mm = millimeter
cm = centimeter
km = kilometer

Torque
N•m = Newton meter

Mass
g = gram
kg = kilogram
gpl = grams per liter
gpg = grams per gallon

REFILL TIP

When refilling axle or transmission housing, the lubricant must be level with opening.

AXLE – FRONT

Code	Liters	Pints
02064	8.42	17.75

AXLE – REAR

CODE	FORWARD		REAR		NOTES
	LITERS	PINTS	LITERS	PINTS	
14029	11	24			
14036	18	37			
14040	22	47			
14044	18	37			
14047	18	37			3
14051	19	40			
14052	22	47			
14057	20	42			
14088	18	38			
14130	12	25			
14131	17	35			
14132	17	35			
14133	16	33			
14309	18	37	16	34	2
14472	16	34	11	23	1, 3
14ADB	16	34			

CODE	FORWARD		REAR		NOTES
	LITERS	PINTS	LITERS	PINTS	
14ADC	16	34			
14ADD	15	32			
14ADE	11	24			
14ADK	16	34			
14ADL	16	34			
14ADM	16	34			
14ADN	12	25			
14ADP	12	25			
14ADR	23	49			
14ADU	23	49			
14ADV	16	34			
14ADW	18	37			
14ADY	16	34			
14ADZ	20	42			
14AEG	23	48			
14AEL	23	48			
14AEP	22	46			
14AET	13	28			
14AEU	18	38			
14AEW	13	28			
14AEX	19	40			

CODE	FORWARD		REAR		NOTES
	LITERS	PINTS	LITERS	PINTS	
14AEY	13	28			
14AEZ	19	40			
14AGA	13	28			
14AGB	19	40			
14AGC	20	43			
14ARA	15	32			
14ARB	19	40			
14ARC	22	47			
14ARD	22	47			
14ARG	15	32			
14ARH	16	33			
14CDA	12	25			
14CDB	17	35			
14CDD	12	25			
14CEJ	19	41			
14CEK	19	41			
14EED	17	36			
14EEH	19	41			
14GDA	14	30	23	49	1
14GRU	14	29	12	25	
14GRV	27	56	28	58	

CODE	FORWARD		REAR		NOTES
	LITERS	PINTS	LITERS	PINTS	
14GRW	14	29	12	25	
14GSA	21	44	19	41	
14GSB	15	31	13	27	
14GSC	29	61	18	38	
14GSE	27	56	17	36	
14GSG	14	30	12	26	
14GSH	27	56	17	36	
14GST	27	57	28	59	
14GSU	21	44	19	41	
14GSX	14	30	12	26	
14GTD	18	37			

NOTES

1. Add 2 pints (0.946 liter) of forward rear axle differential capacity total to inter–axle differential.
2. Add an additional 2 pints (0.946 liter) of gear lubricant to inter–axle differential forward rear axle.
3. Add 1 pint (0.47 liter) of this total at pinion cageplug on single or tandem rear axles.
4. Fill forward rear and rear axle through fill hole located on side of carrier housing.

*Note: When refilling axle assembly, lubricant must be level with opening

COOLING SYSTEM

4000, Series Cooling System Capacity		
Engine	**Liters**	**Quarts**
T 444E	27	28.5
DT-466, INTL 530	35	37

NOTE: Capacities listed are approximate. See Section C, Maintenance, for Cooling refill instructions.

CRANKCASE AND OIL FILTERS

For specific crankcase capacities refer to separate Engine Owner's Manual provided with vehicle.

MANUAL STEERING GEAR

Code	kg	lbs	oz
05109	.454	1	0
05MRA	.454	1	0

POWER STEERING GEAR

Fill power steering pump reservoir to indicator level.

TRANSMISSION (MAIN)

CODE	VENDOR	TRANSMISSION MODEL	LITERS	PINTS	NOTES(1)
13367	FULLER	RT-8609	6.6	14	
13434	ALLISON	MT–653DR	10	21.1	(2), (3), (4)*
13438	FULLER	RTX/RTXF-11708LL	12.8	27	
13465	ALLISON	MT–653DR	10	21.1	(2), (3), (4)*
13AAC	ALLISON	AT–545 N/PTO GR & TC290	14.7	31.1	(2), (3), (4)*
13AAD	ALLISON	AT–545 N/PTO GR & TC290	14.7	31.1	(2), (3), (4)*
13AAM	ALLISON	AT-542	7.9	16.8	
13ABE	ALLISON	MD–3060 5 SPEED	14.8	31.2	(3), (4)
13ABG	ALLISON	MD–3060 4 SPEED	14.8	31.2	(3), (4)
13ABH	ALLISON	MD–3560P W/PTO PROV	14.8	31.2	(3), (4)
13ABJ	ALLISON	MD–3560P W/PTO PROV	14.8	31.2	(3), (4)
13ABK	ALLISON	MD–3560P W/PTO PROV	14.8	31.2	(3), (4)
13ABR	ALLISON	MD–3066P W/PTO PROV	14.8	31.2	(3), (4)
13ACA	ALLISON	HD–4060P	29.8	63	(3), (4)
13ACB	ALLISON	HD–4060P	29.8	63	(3), (4)
13ACC	ALLISON	HD–4060P	29.8	63	(3), (4)
13ACD	ALLISON	HD–4560P	29.8	63	(3), (4)
13ACE	ALLISON	HD–4560P	29.8	63	(3), (4)
13ACG	ALLISON	HD–4560P	29.8	63	(3), (4)
13ACJ	ALLISON	HD–4060PR	30.8	65	(3), (4)
13ACK	ALLISON	HD–4060PR	30.8	65	(3), (4)

CODE	VENDOR	TRANSMISSION MODEL	LITERS	PINTS	NOTES(1)
13ACM	ALLISON	HD–4560PR	30.8	65	(3), (4)
13ACN	ALLISON	HD–4560PR	30.8	65	(3), (4)
13DBA	SPICER	ES43–5D	5.2	11	
13DBB	SPICER	ES43–5A	5.2	11	
13DBC	SPICER	ES53–5D	5.2	11	
13DBD	SPICER	ES53–5A	5.2	11	
13DBG	SPICER	PS110–7B	22.2	47	
13DBH	SPICER	PS145–7A	22.2	47	
13DBJ	SPICER	PS110–7A	22.2	47	
13DBT	SPICER	ES62-5A	7.6	16	
13DBU	SPICER	ES62-5D	7.6	16	
13DBV	SPICER	ES67-5A	7.6	16	
13DBW	SPICER	ES67-5D	7.6	16	
13DBX	SPICER	ES70-5A	8.0	17	
13DBY	SPICER	ES70-5D	8.0	17	
13GCY	FULLER	RTX/RTXF–11710C	12.3	26	
13GCZ	FULLER	RTX/RTXF–12710C	12.3	26	
13GDA	FULLER	RTX/RTXF–13710C	12.3	26	
13GDB	FULLER	RTX.RTXF–14710C	12.8	27	
13GDP	FULLER	RT/RTF-6609A	6.6	14	
13GDS	FULLER	RTLO/RTLOF-16610B	12.8	27	

CODE	VENDOR	TRANSMISSION MODEL	LITERS	PINTS	NOTES(1)
13MAG	INTERNATIONAL	ES52-7A	9.9	21	
13MAH	INTERNATIONAL	ESO65-7	9.9	21	

TRANSMISSION (AUXILLARY)

CODE	VENDOR	MODEL	LITERS	PINTS	NOTES(1)
13552	SPICER	AMO610–4	5.7	12	
13601	FULLER	2–A–92	5.7	12	
13607	FULLER	AT–1202	5.2	11	

*** All oil level checks must be performed with the engine at idle, transmission in neutral. A HOT–CHECK must be performed with operating temperatures stabilized between 160–200° F. Some dipsticks have provide a cold range indicator mark to assure that the oil level is sufficent to operate the vehicle to perform a HOT–CHECK. Refer to separate Allison Transmission Operator's Manual for additional information.**

NOTE	DESCRIPTION
(1)	Capacity is approximate and can vary depending on engine angle in chassis.
(2)	Some dipsticks for Allison Transmissions have a 72° Full Mark instead of Cold Run Range
(3)	After Oil is Circulated, ADD OIL AS NEEDED TO BRING LEVEL TO COLD RUN RANGE
(4)	Capacity is approximate and can vary with different cooling systems.
(5)	Automatic Transmission with Transfer Case. 1st No. is transmission capacity and 2nd No. is Transfer Case capacity.
(6)	Two Case Transmission—1st No. is capacity of fwd. unit and 2nd is the rear unit capacity.

Note: When refilling transmission assembly, lubricant must be level with opening

TRANSFER CASE

CODE	LITERS	PINTS	NOTES
13TJA	6.6	14	
13TJC	9.5	20	

(1) CAPACITY IS APPROXIMATE AND CAN VARY DEPENDING UPON INCLINATION.

AIR CONDITIONER REFRIGERANT

MODEL	KG	LB	OZ
1000/4000	2.04	3	8

Section F: Fuse & Bulb Charts

Fuse & Bulb Charts

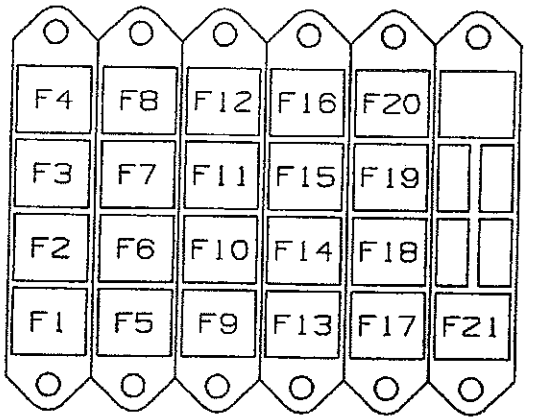
LAMP BULB CHART – 1000

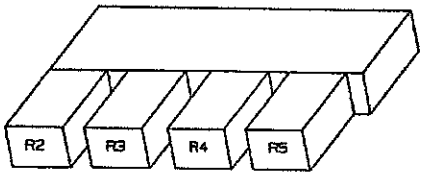
Bulb Application	Watts or Candlepower	Trade Number
Control Identification	0.5 Candlepower	21620
Fog Light	55 Watts	VH550

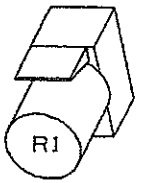
1000 FUSE BLOCK AND CIRCUIT BREAKER CHART – CAB

FUSE	AMP.	DESCRIPTION
F1	20 AMP	HEAD LIGHTS
F2	20 AMP	PARK LIGHTS
F3	20 AMP	TURN SWITCH
F4	20 AMP	STOP LIGHTS
F5	10 AMP	CARGO LIGHTS
F6	10 AMP	ECM/DIAGNOSTIC
F7	10 AMP	DAYTIME RUNNING LIGHTS
F8	25 AMP	BLOWER MOTOR
F9	10 AMP	CRANKING
F10	10 AMP	IDLE SWITCH
F11	10 AMP	BODY BUILDER
F12	5 AMP *	ENGINE CONTROL
F13	10 AMP	INSTRUMENTS
F14	10 AMP	BODY BUILDER
F15	10 AMP	BACK–UP LIGHTS
F16	10 AMP	FUEL FILTER
F17	10 AMP	DAYTIME RUNNING LIGHTS
F18	10 AMP #	WINDSHIELD WIPER
F19	10 AMP #	WINDSHIELD WIPER
F20	10 AMP	BODY BUILDER
F21	10 AMP	BRAKE SWITCH

= Type 1 Ckt. Brkr. Only; * = Fuse Only

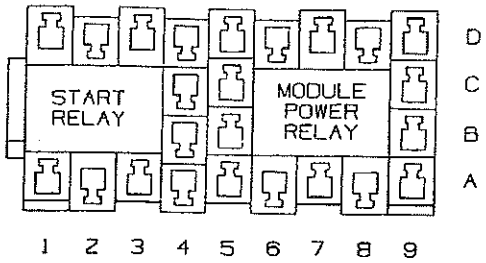






RELAY	DESCRIPTION
R1	Turn Signal Flasher
R2	Dimmer Relay
R3	Blower Motor Relay
R4	Crank Relay
R5	Ignition Relay

1000 FUSE BLOCK AND CIRCUIT BREAKER – COWL



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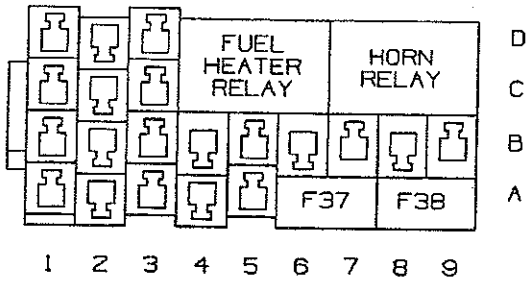

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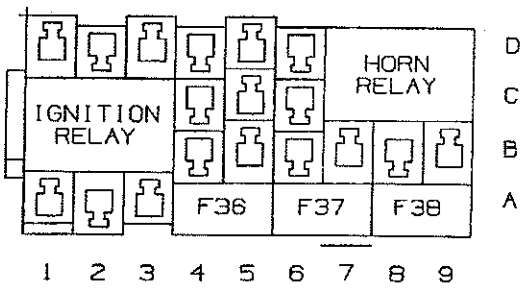
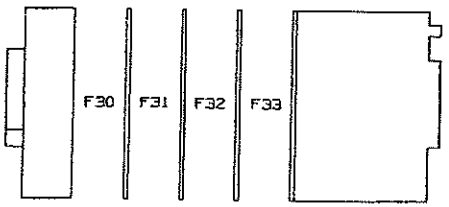




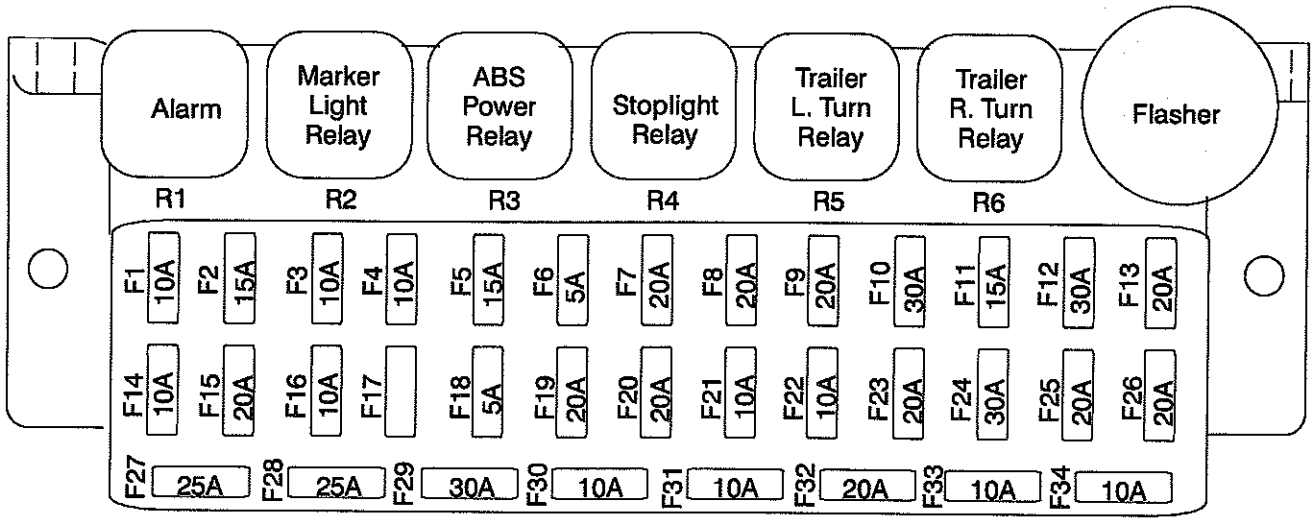
Fuse	Amp.	Description
F30	50	START RELAY
F31	50	KEYSW/IGNITION
F32	50	DRL/HEATER
F33	50	LIGHTING/ MODULE POWER RELAY/DIA CONN
F36	20	IGNITION RELAY
F37	20	WIF/FUEL– WATER SEPARATOR
F38	20	HORN

LAMP BULB CHART – 4000

Bulb Application	Watts or Candlepower	Trade Number
Switch Cluster		1661283C92
Heater A/C Controls		1661283C92
Air Brake Warning Light	.5 Candlepower	37
Back-up Light	32 Candlepower	1156
Clearance and Identification	3 Candlepower	168
Courtesy Light	2 Candlepower	57
Dome Light	12 Candlepower	561
Engine Overspeed Warning Light	.5 Candlepower	37
Map Light	12 Candlepower	561
Foglights	55 Watts	50340
Work Light	35 Watts	4411
Headlights Rectangular		
Incandescent Bulb		
High Beam	65 Watts	6053
Low Beam	55 Watts	6053
Halogen Bulb		
High Beam	65 Watts	H5054
Low Beam	42 Watts	H5054

Bulb Application	Watts or Candlepower	Trade Number
Instrument Cluster		
Illumination	1.0 Candlepower	936
Indicator	.5 Candlepower	37
Warning	.5 Candlepower	37
Stop, Tail, Turn License	32/3	1157
Turn Signal (Fender Pedestal)	32/2	3157
Turn Signal and Marker Light	32/2	3157
Power Distribution Panel	6	89

FUSE/CIRCUIT BREAKER CHART – 4000



LOCATION	DESCRIPTION
F1	IGN - Back-up/Alarm
F2	IGN - Automatic Transmission, Ether Start
F3	IGN - Hydraulic Brakes
F4	IGN - Electronic Engine Control
F5	IGN - ECM Poser Relay, Glow Plugs, Ipr Valve, Coolant Level Warning
F6	IGN - Instrument Cluster Feed, Fuel WIF & Filter Lt., Remote PTO – (Use 5A Fuse Only)
F7	BAT - Horn/Dome/Fuse Panel Light
F8	BAT - Cab Clearance, Marker & Tail Lights
F9	BAT - Stop Lights
F10	BAT - Owner/Operator Connections or Spare
F11	BAT - Diagnostics
F12	BAT - Heater Motor-High Speed
F13	BAT - Electric Window
F14	ACC - Air Dryer/Two Speed Axle/Sleeper/Transfer Case
F15	ACC - Owner/Operator Connection
F16	ACC - Radio AM-FM and C.B.
F17	Not Used
F18	ACC - Windshield Wiper and Washer (Auto Reset Circuit Breaker– Type I)
F19	ACC - Heater Motor – Low or Medium, Heated Mirror
F20	BAT - Turn Signal and Hazard Lights Feed
F21	BAT - Cargo Light/CB
F22	BAT - Radio/Work Light
F23	BAT - Cigar Lighter

LOCATION	DESCRIPTION
F24	BAT - Clearance and Marker Lights/Tail Lights/Panel Lights
F25	BAT - Fog Lights
F26	BAT - Headlights/Fog Light Relay (Auto Reset Circuit Breaker– Type I)
F27	BAT - Trailer Left Turn Relay
F28	BAT - Trailer Right Turn Relay
F29	BAT - Trailer Stop Lights
F30	IGN - Air Suspension Warning Light
F31	BAT - Daytime Running Lights
F32	BAT - Fuel Filter Heater, Eng Fan
F33	BAT - Hydraulic Brake Warning Module
F34	BAT - Heater and Power Mirrors

FUSE COLORS

5 AMP .. Tan
10 AMP . Red
15 AMP . Light Blue
20 AMP . Yellow
25 AMP . Clear
30 AMP . Light Green

CAUTION : Always replace fuse/breakers with the same amperage rating and type listed on the chart.

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V

W

Navistar International
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