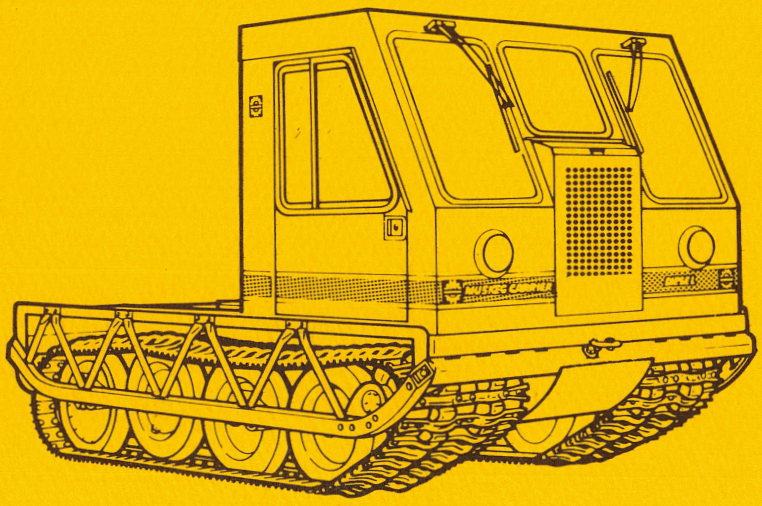
Manuel du conducteur
Operator's manual

MUSKEG*
CARRIER DIESEL



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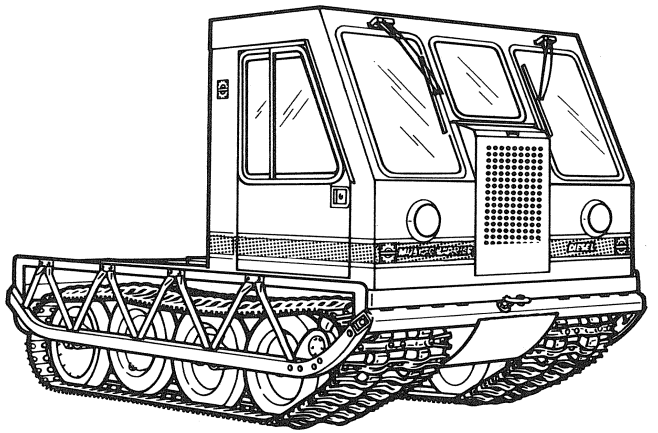
BOMBARDIER

Operator's manual

MUSKEG*

CARRIER DIESEL



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TECHNICAL PUBLICATIONS DEPARTMENT
AFTER SALES SERVICE
BOMBARDIER INC.
VALCOURT, QUEBEC
CANADA, J0E 2L0

FOREWORD

The operator manual has been prepared to acquaint the owner and/or operator(s) of an industrial tracked vehicle with the various controls and instruments, inspections, maintenance and safe driving instructions. Each is indispensable for the proper use of the product, and should be kept with the vehicle at all times.

This manual uses the following symbols.

◆ **WARNING: Identifies an instruction which, if not followed, could cause personal injury.**

▼ **CAUTION: Denotes an instruction which, if not followed, could severely damage vehicle components.**

○ **NOTE:** Indicates supplementary information needed to fully complete an instruction.

Although the mere reading of such information does not eliminate the hazard, your understanding of the information will promote its correct use.

Most specifications are given in both metric and customary units. Where precise accuracy is not required, some conversions are rounded to even numbers for easier use.

SAFETY IN MAINTENANCE

Observe the following precautions:

- The vehicle must be operated only by a qualified operator.
- Visually inspect vehicle before operation.
- Maintain your vehicle in top mechanical condition.
- Do not operate the vehicle and the equipment beyond its rated capacity.
- Do not remove radiator cap when engine is hot.
- Never perform lubrication, adjustments or repairs on a vehicle in operation.
- Fuel is flammable and explosive under certain conditions. Always manipulate in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity, if fuel fumes are noticed while driving, the cause should be determined and corrected without delay.
- Clean and check operation of the lighting equipment.
- Maintain good visibility.
- Throttle mechanism must be checked for free movement before starting the engine.
- The engine can be stopped by pulling the engine stop button.
- Seat and seat belt must be adjusted so the operator may reach the controls easily.
- Correctly secure doors and windows when operating.
- Do not operate vehicle when bystanders are in the vicinity.
- Frequently, check the instrument panel. Do not operate when dials indicate malfunction.
- Never leave the engine running while unattended.

- Operate at moderate speed.
- Avoid abusive operation.
- Check, avoid or remove any obstacle that may cause harm.
- Do not make sharp turns at high speed.
- While hauling equipment, remember to brake or turn slowly. ''Jackknife'' possibilities are always present.
- Drop-offs, must be negotiated slowly and approached from a standstill when possible.
- Bush or snow covered terrain could conceal dangerous obstacles. Proceed slowly and with caution.
- Never attempt ''jumping'' the vehicle over ditches, hill crests or drop-offs. Injury and/or mechanical damage will result.
- Never cross a frozen body of water unless absolutely sure the ice is thick enough to support vehicle weight.
- Unless the vehicle can safely descend as well as ascend a slope, or an alternate descent path is known, do not attempt a climb.
- Small obstacles on steep slopes should always be considered a hazard.
- Avoid stepping on the track to mount vehicle.
- This vehicle is not designed to be driven or operated on black top, or other similar surfaces. On such surfaces abnormal and excessive wear of critical parts is inevitable.
- Many government/private agencies publish instruction booklets pertaining to special off-road operations, including desert driving. Contact the local land governing office for publication lists.
- Only perform procedures as detailed in this manual. Unless otherwise specified, engine should be turned off for all lubrication and maintenance procedures.
- Should removal of a nylon lock nut be required when undergoing repairs/disassembly always replace with a new one. Tighten as specified.

PLEASE READ AND UNDERSTAND ALL WARNINGS AND CAUTIONS IN THIS MANUAL AND ON THE VEHICLE.

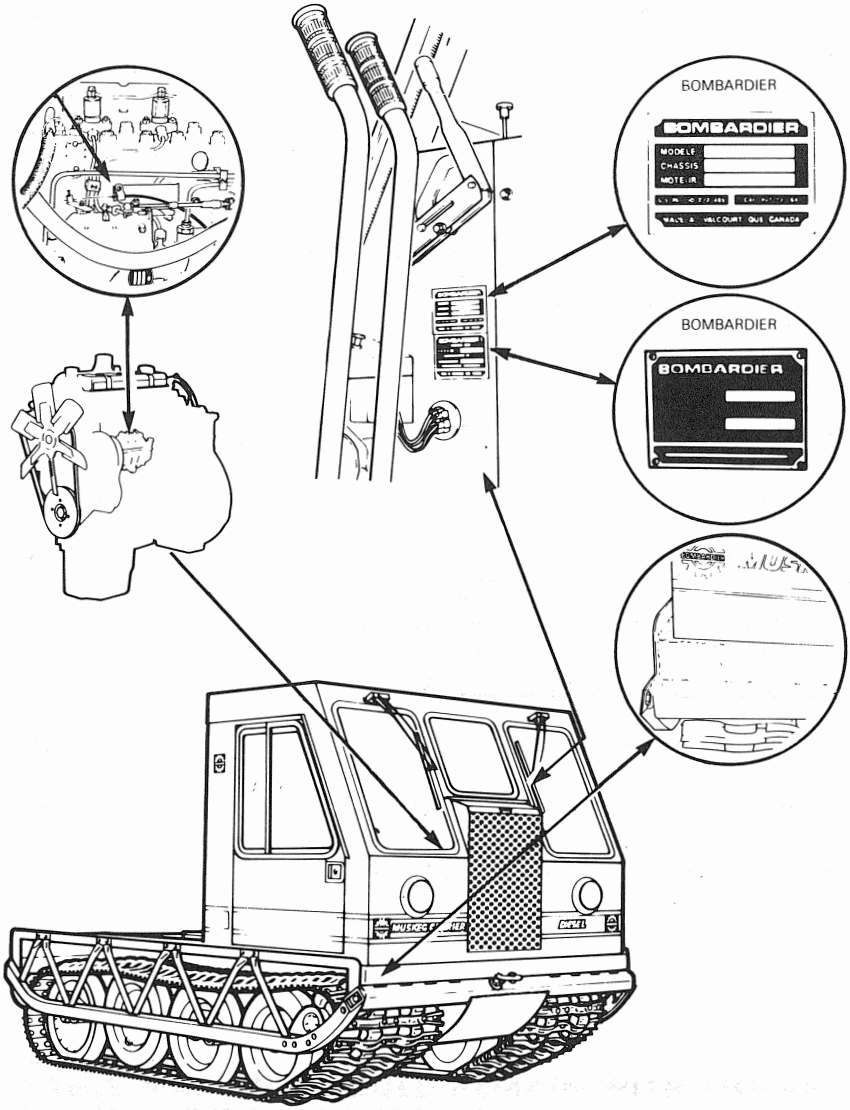
THIS MANUAL SHOULD REMAIN WITH THE VEHICLE AT TIME OF RESALE.

INDEX

HOW TO IDENTIFY YOUR VEHICLE

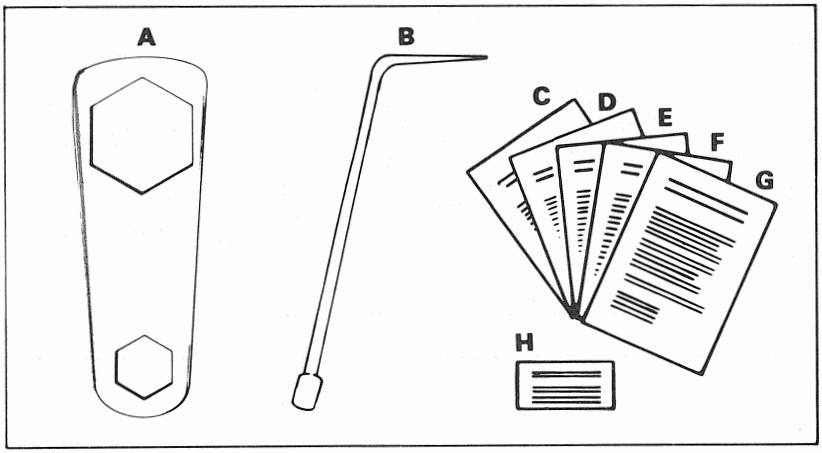
The main components of your vehicle (engine, body) are identified by different serial numbers. It may sometimes become necessary to locate these numbers for warranty purposes or to trace your vehicle in the event of theft.

NOTE: We strongly recommend that you take note of all the serial numbers on your vehicle and supply them to your insurance company. It will surely help in the event a vehicle is stolen.



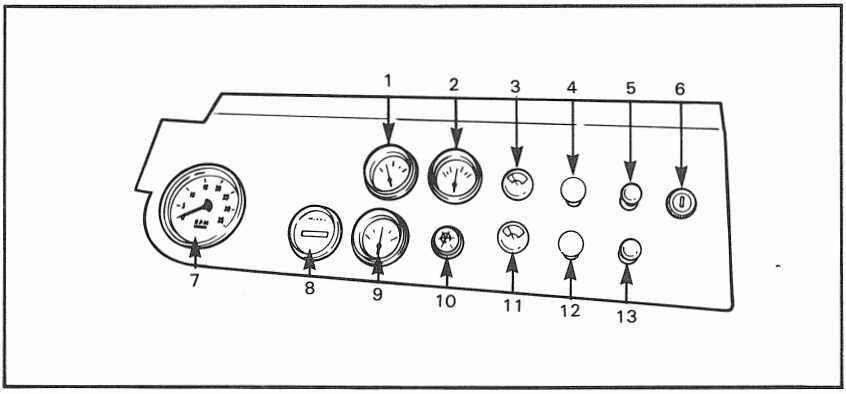
TOOLS & LITERATURE

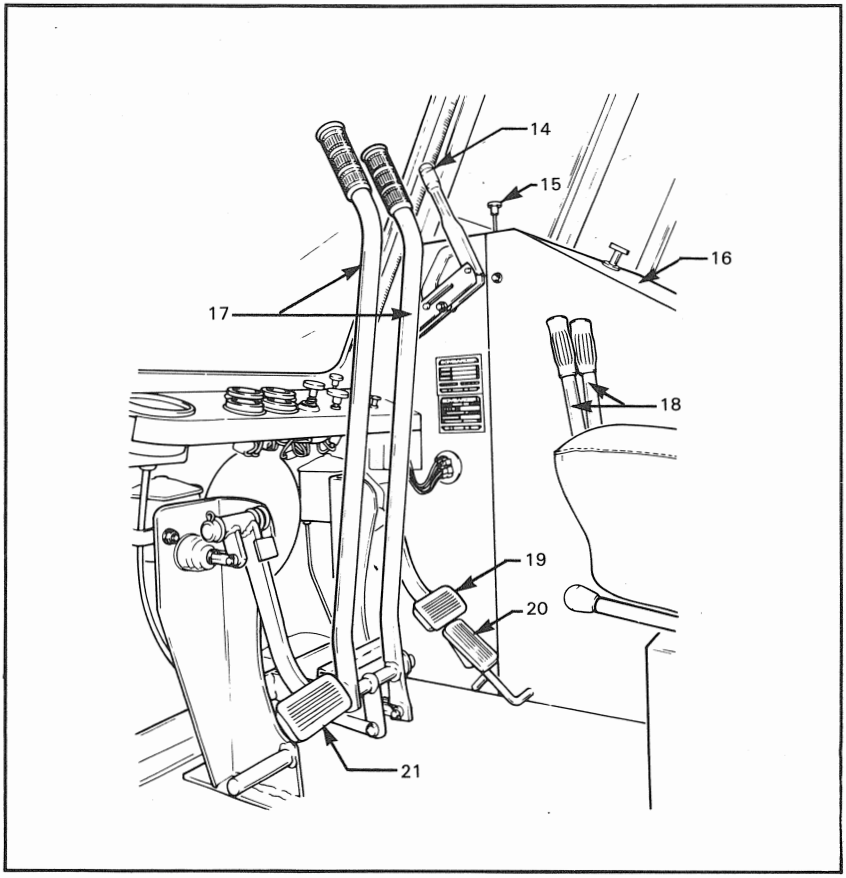
As standard equipment, each new vehicle is supplied with a basic tool kit and literature.

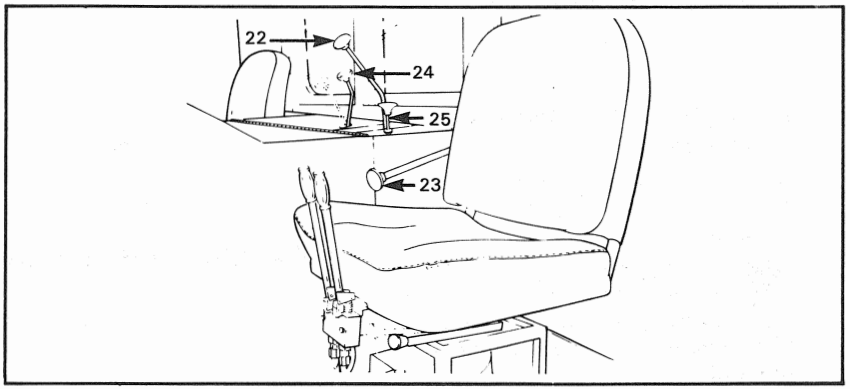


A) Hub cap wrench 38 mm - 68 mm (1 1/2'' - 2 11/16'')
B) Tensioner blender
C) Operator's manual
D) ''Perkins'' owner's manual
E) ''Bombardier'' parts catalog
F) ''Perkins'' parts catalog
G) Safe driving guide
H) ''Bombardier'' warranty card

Controls/instruments







1. Fuel level indicator
2. Coolant temperature gauge
3. Right wiper control knob
4. Front headlamp switch
5. Defroster fan switch
6. Starting switch
7. RPM indicator (if applicable)
8. Hour meter
9. Ammeter
10. Oil pressure indicator light
11. Left wiper control knob
12. Rear light switch
13. Heater fan switch
14. Emergency and parking brake
15. Engine stop knob
16. Engine hood
17. Steering levers
18. Power steering levers (if applicable)
19. Brake pedal
20. Throttle pedal
21. Clutch pedal
22. Gear shift lever
23. Transfer case control lever (if applicable)
24. Integrated power take-off control lever (if applicable)
25. Power take-off control (if applicable)

1) Fuel level indicator

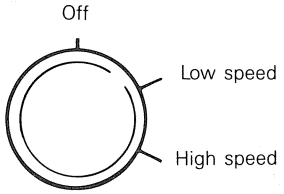
Indicates the fuel level contained in the tank.

2) Coolant temperature gauge

Indicates the engine coolant temperature. The coolant temperature gauge must be checked frequently.

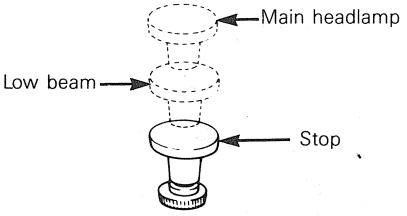
CAUTION: If temperature exceeds 105°C (220°F), let the liquid cool down before operating the vehicle, or stop the engine and consult a mechanic.

3) Right wiper control knob

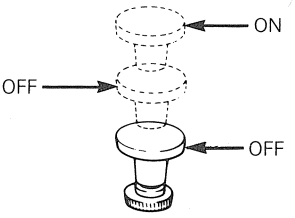


To control right wiper continuous operation and select its speed.

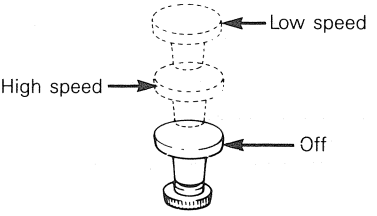
4) Front headlamp switch



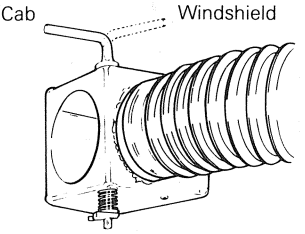
NOTE: Vehicles equipped with a one man cab only have a non-orientable light beam.



5) Defroster fan switch

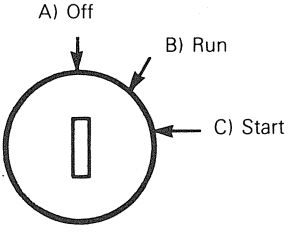


NOTE: On vehicles equipped with a one man cab, a shutter located under the driver's seat can be activated manually to send hot air to the cab and/or windshield.



6) Starting switch

Three-way switch



A) "OFF" position:

Cuts off power supply to vehicle.

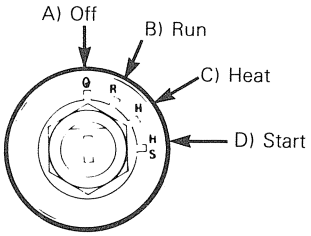
B) "RUN" position:

Supplies power to the whole vehicle.

C) "START" position:

When the engine is to be started, turn the key two (2) steps clockwise from "off" position and hold. Return the key to "run" position immediately when engine has started.

Four-way switch (optional "thermostart")



NOTE: Only vehicles equipped with a starting aid also have a four-way switch.

A) "OFF" position:

Cuts off power supply to vehicle.

B) "RUN" position:
Supplies power to the whole vehicle.

C) "HEAT" position:

Supplies power to a heating device located in the intake manifold of the engine.

While heating, the purpose of this device is to make way for fuel which will be injected and burned in the intake manifold upon starting the engine.

CAUTION: This position should be used only when engine is cold (approx. 0°C (30°F) or lower).

D) "START" position:

When the engine is to be started, turn the key three (3) steps clockwise from "off" position and hold. Return the key to "run" position immediately when engine has started.

CAUTION: Holding key to "start" position when engine has started will damage starter mechanism.

CAUTION: Do not operate the starter for more than fifteen (15) seconds at a time to avoid over heating.

7) R.P.M. indicator (if applicable)

This instrument indicates in R.P.M. the operating speed of the engine.

8) Hour meter

Indicated the total number of engine operating hours. It begins to operate as soon as the engine turns and the starting switch is at "RUN" position.

This instrument can be used as an indication for maintenance of the vehicle as per the maintenance schedule of this manual.

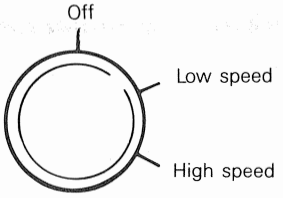
9) Ammeter

Indicates whether current is flowing into or out of the battery. A high charging rate is an indication that the battery is low and in need of a charge. When the battery is near full charge, the ammeter will show a low charging rate.

10) Oil pressure indicator light

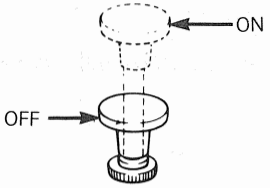
This light will turn on whenever the oil pressure drops below normal. Should it go on during normal driving operations, the engine should be stopped immediately to find the cause of the low oil pressure, and bring remedy as extensive damage may result if the engine is operated with no oil pressure or abnormally low pressure.

11) Left wiper control knob

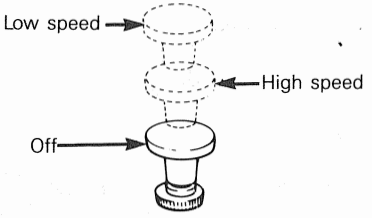


To control left wiper continuous operation and selecting its speed.

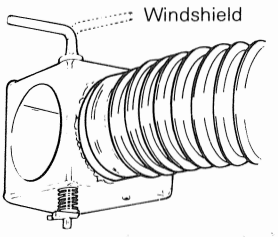
12) Rear light switch



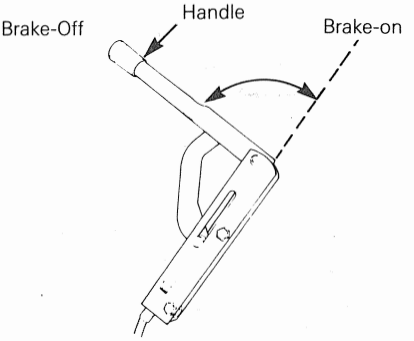
13) Heater fan switch



NOTE: On vehicles equipped with a one man cab, a shutter located under the driver's seat can be activated manually to send hot air to the cab and/or to the windshield.



14) Emergency and parking brake

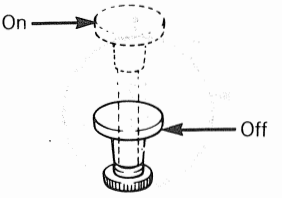


This brake works with a disc on vehicles equipped with a speed reducer, and with a drum on vehicles equipped with a transfer case.

Brake tension can be adjusted by turning the handle in one direction or the other. Turn clockwise to increase tension and counter-clockwise to reduce it.

WARNING: Always apply the parking brake when leaving the vehicle.

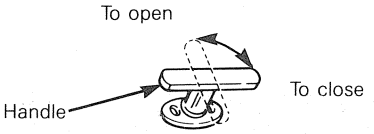
15) Engine stop knob



To stop the engine, pull stop knob to "STOP" position. This cut, off fuel supply to the engine.

NOTE: When starting the engine, push stop knob to "RUN" position.

16) Engine hood

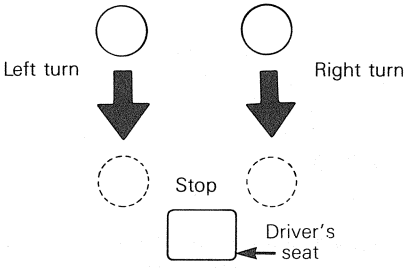


Allows access to the engine and its components.

NOTE: For easy access to the engine, both side panels of the console can also be removed.

17) Steering levers

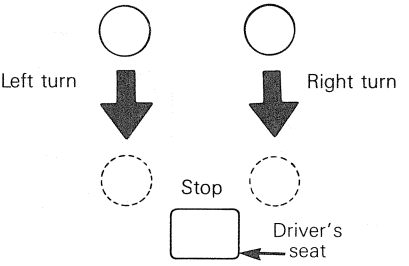
Steering levers allow driving and braking of the vehicle.



To steer the vehicle in a given direction, pull the lever of that corresponding direction.

To brake, simultaneously pull both steering levers.

18) Power steering levers (if applicable)



To steer the vehicle in a given direction, pull the lever corresponding to that direction.

To brake, pull simultaneously both steering levers.

WARNING: Power steering is more positive and provides better response with less effort. For this reason power steering should be used with caution, especially when driving at high speed or on icy surfaces to prevent sudden turns, which could result in side-slippage and loss of control.

19) Brake pedal

Through this pedal, a friction band is being applied hydraulically on the transmission drum.

20) Throttle pedal

The engine speed increases as a function of the pressure applied on the throttle pedal. Once the pedal is released, the engine automatically comes back to idle.

21) Clutch pedal

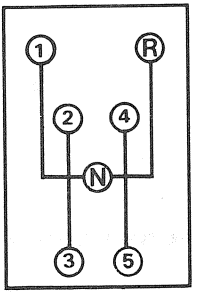
Press on this pedal to cut off engine power to power train.

CAUTION: Always use the clutch pedal when shifting.

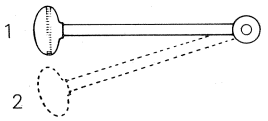
22) Gear shift lever

The Muskeg transmission allows seven (7) positions for the gear shift lever.

1 - Low gear
2, 3, 4 - Intermediate gears
5 - High gear
N - Neutral
R - Reverse



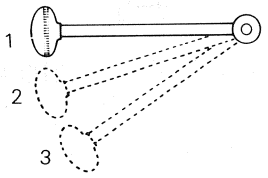
23) Transfer case control lever (if applicable)



1) At this position, power is transmitted from the transmission to the differential.
2) At this position, power cannot be transmitted to the differential. The power take-off of the transfer case is then engaged.

NOTE: The operating speed of the power take-off is controlled by the operating speed of the engine and the gear which has been selected.

Optional transfer case control lever (if applicable)

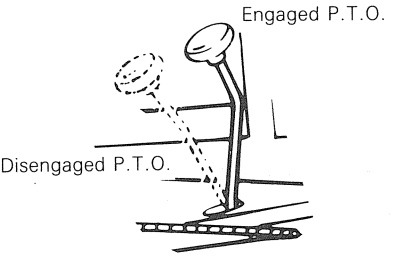


1) Reverse position:

   At this position, the five (5) forward speeds provided through the transmission are becoming reverse speeds. As a result, the reverse speed of the transmission becomes the only forward speed of the vehicle.
2) Neutral position:

   At this position, power cannot be transmitted to the differential.
3) Normal operating position

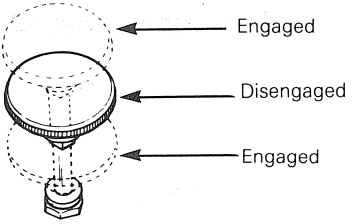
24) Integrated power take-off control lever (if applicable)



NOTE: The operating speed of the power take-off is modified according to the operating speed of the engine and the gear which has been selected.

NOTE: This lever is used only with the optional transfer case.

25) Power take-off control (if applicable)

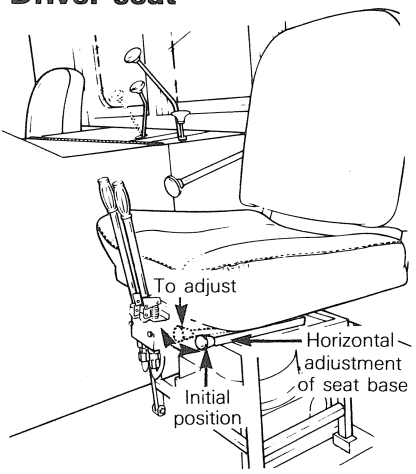


Seat belts

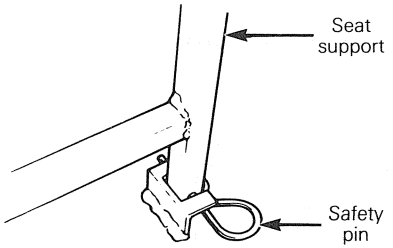
WARNING: The seat belt must be adjusted so the operator may reach controls easily.

WARNING: To help lessen the chance of injury and/or the severity of injury in accidents or sudden stops it is highly recommended that people riding in the vehicle be properly restrained at all times, using the seat belts provided.

Driver seat



WARNING: The seat must be adjusted so the operator may reach controls easily.



Removing the safety pin and tilting the driver's seat towards front gives access to batteries.

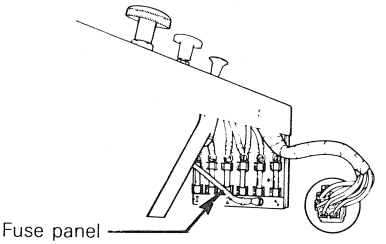
WARNING: Make sure the safety pin has been installed properly before riding the vehicle.

Passenger seat

This seat has no adjustment.

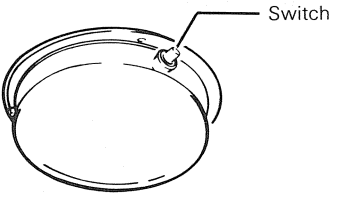
Fuse panel

The fuse panel is located under the instrument panel.



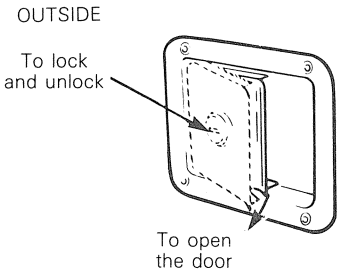
CAUTION: Never replace fuse by a higher rated one or severe electrical system damages will occur.

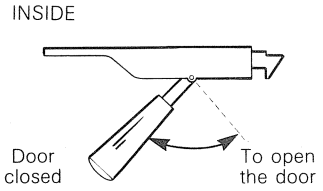
Dome lamp

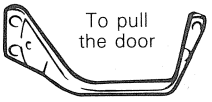


Press switch to turn on dome lamp, press again to turn it off.

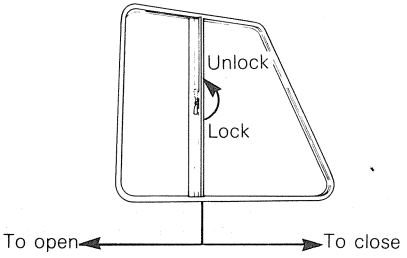
Door handles





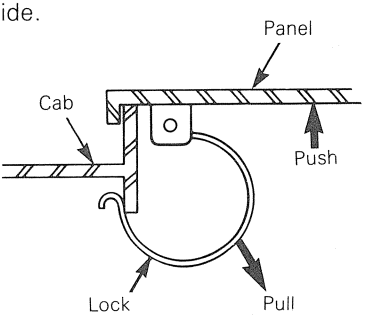


Side windows



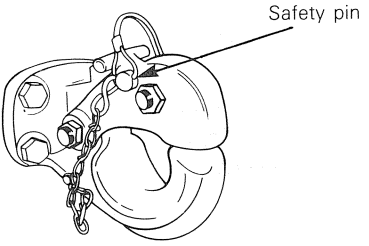
Emergency exit

An emergency exit has been provided on the cab roof, on the driver's side.



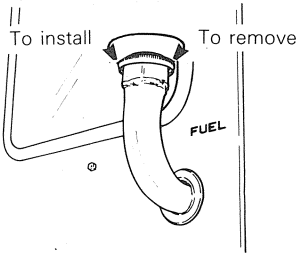
To open, pull on both retaining locks and push the panel.

Hitch



WARNING: When towing, always ensure to lock the hook attachment using the applicable safety pin.

Fuel tank cap



CAUTION: Fill the tank at the end of each day's operation to help prevent moisture from collecting and freezing in the fuel system.

CAUTION: Fuel is flammable and explosive under certain conditions. Always manipulate in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity.

BREAKING-IN

Break-in period

A break-in period is recommended before running the vehicle at full load. Recommended break-in period is twenty-five (25) operating hours. During this time, do not operate the engine at high no load speeds and/or under overload. To facilitate break-in, avoid prolonged periods of engine idling. Frequently check the instrument panel.

If coolant temperature rises above specifications (see controls/instruments section), reduce engine load or stop the engine.

Also if the oil presssure indicator light lights up (see controls/instruments section), stop the engine.

Always find what causes the problem and remedy it before starting the engine.

25-Hour Inspection

As with any precision piece of mechanical equipment, we suggest that after the first twenty-five (25) hours of operation, that the vehicle be checked by a trained mechanic. Remember that it is easier to remedy at this time than to allow the vehicle to operate until a possible failure occurs.

The inspection is at the expense of the vehicle owner.

Care should always be taken to assure that the vehicle is in good mechanical condition before operating it. Regular preventative maintenance and "pre-operation inspection" by each working shift will extend vehicle life and save on costly down-time. Special attention should be given to the following items:

Before starting the engine

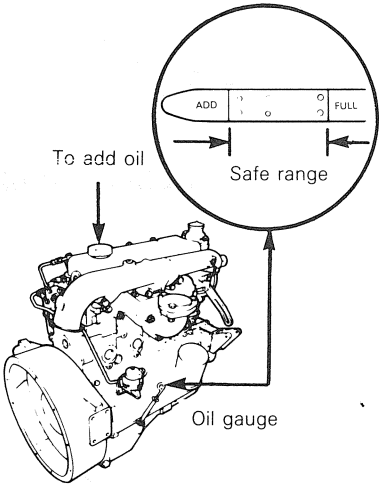
CAUTION: All liquid levels must be checked when the vehicle is on a flat surface.

Engine oil level

To gain access to the gauge, open the engine hood (see "Controls/Instruments" section).

Check the engine oil level when the engine is cold.

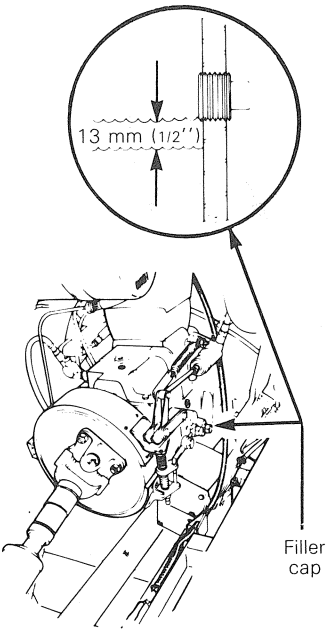
The oil level should be within the safe range.



CAUTION: Using inferior or incorrect oil type will handicap the engine. Use only specified quality lubricants at specified intervals (see "Specifications" section.)

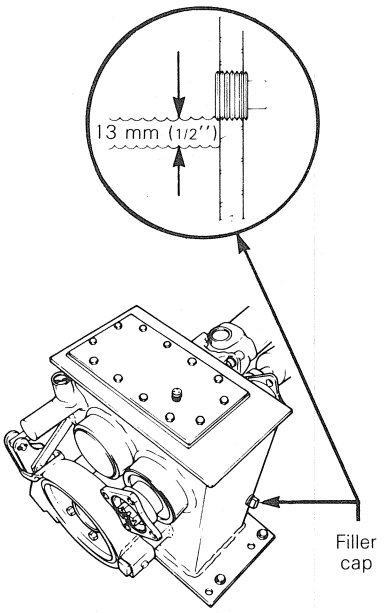
Transmission oil level

At room temperature (21°C-70°F approx.), the oil level must be at least 13 mm (1/2") below the filling hole.



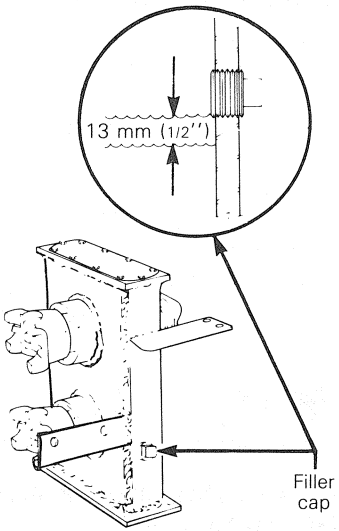
Transfer case oil level (if applicable)

At room temperature (21°C-70°F approx.) the oil level must be at least 13 mm (1/2'') below the filling hole.



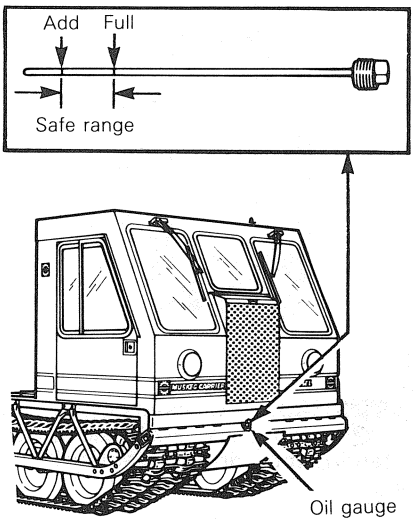
Speed reducer oil level (if applicable)

At room temperature (21°C-70°F approx.) the oil level must be at least 13 mm (1/2'') below the filling hole.



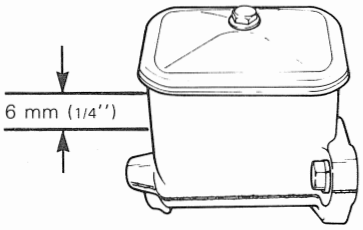
Differential oil level

At room temperature (21°C-70°F approx.) the oil level must be within the safe range of the dipstick.



Master cylinder oil level

The oil level must be at least 6 mm (1/4'') below the tank edge.

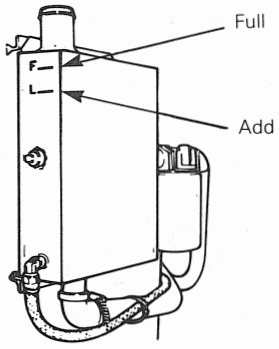


CAUTION: Avoid oil contamination (see ''Hydraulic oil contamination control'' section).

Power steering oil level (If applicable)

The oil tank is located outside the vehicle on the driver's side.

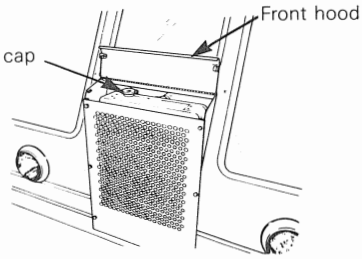
At room temperature (21°C-70°F approx.) the oil level should reach line ''F'' on the tank.



CAUTION: Avoid oil contamination (see ''Hydraulic oil contamination control'' section).

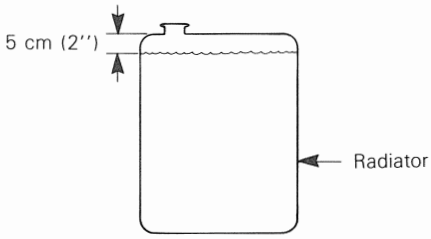
Coolant level

Open the front hood to gain access to the radiator cap.



Always check the coolant level when the engine is cold.

The level must be 5 cm (2'') from the radiator filler neck.



WARNING: If the radiator cap msut be removed when the engine is hot, place a cloth over the cap and open it slowly to release the pressure. Loss of fluid and possibility of severe burns could occur, if this notice is disregarded.

Antifreeze: ethylene glycol.

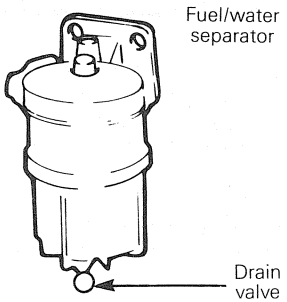
Antifreeze/water mixture: must protect the cooling system from freezing at -40°C (-40°F).

CAUTION: Coolant leakage on radiator, indicates that the cap does not properly pressurize the radiator or a radiator cracked. Ensure to correct the problem(s) before operating the vehicle, since engine overheating will occur.

Fuel/water separator

To gain access, tilt the engine hood (see ''Controls/instruments'' section.

The separator is located beside the fuel supply pump.



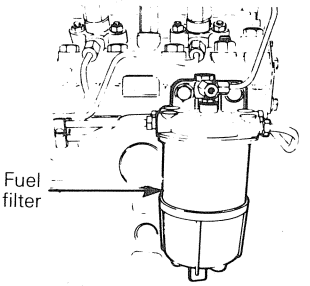
To drain the water accumulated in the separator, open the drain valve slowly and let the water come out. When fuel starts flowing, close the drain valve.

CAUTION: It is important to drain the water contained in the fuel/water separator at the end of each shift.

CAUTION: Drain the water in a container.

Fuel filter

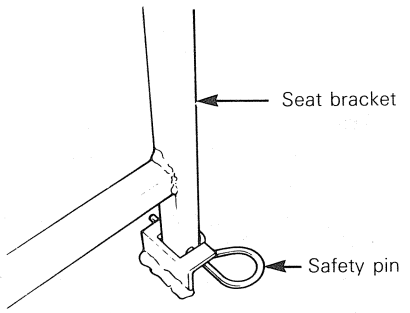
The fuel filter is located under the engine hood (see ''Controls/instruments'' section).



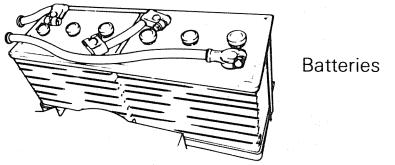
Batteries

Check electrolyte level in each element. Add distilled water if necessary.

CAUTION: Do not fill excessively.



To gain access to the battery housing, remove the safety pin and tilt the driver's seat towards front.



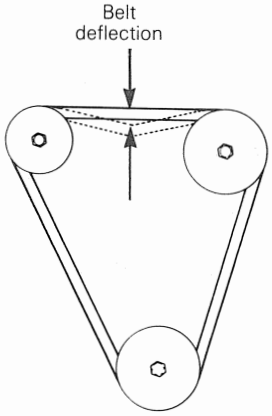
WARNING: Batteries give off explosive fumes. Avoid smoking. Prevent electrolyte from coming into contact with your skin.

WARNING: Before riding the vehicle, make sure the safety pin, has been fixed properly (of the seat).

Fan and alternator "V" belt

To have access to the "V" belt, raise the engine hood.

The belt deflection must be 6.4 mm (1/4") under a force of 11.3 kg (25 lb) applied midway between alternator and fan pulleys.



Tracks

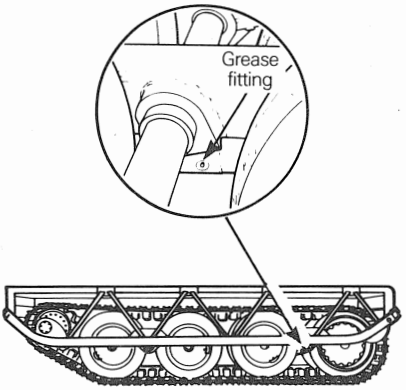
Check for any loose bolt and tighten if necessary.

Recommended torque: 40-47 N•m (30-35 lbf•ft).

Replace any damage crosslink.

Belt tension is correct when the lower part of crosslinks is 19 mm (3/4") above first front wheels and in contact with second ones.

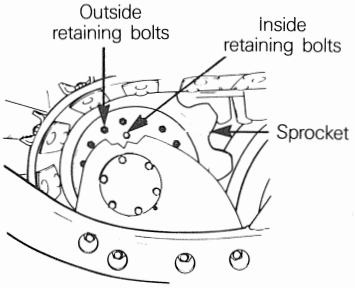
The tracks are adjusted by means of hydraulic track-tensioners located between the two rear wheels. To tighten the tracks, inject grease by means of a grease gun, in the grease fitting of the track-tensioner. To loosen the tracks, bleed the track-tensioner by means of the bleeder tool which releases grease through the grease fitting.



NOTE: For track adjustment, use multi-purpose quality grease which resists tearing and remains fluid under cold temperatures.

Sprockets

Check for worn and/or damaged teeth and if retaining bolts are tight.

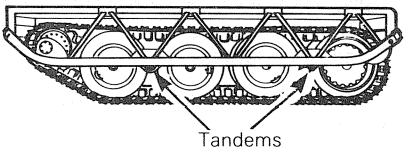


Recommended torques:

Outside retaining bolts (16): 27 N•m (20 lbf•ft)
Inside retaining bolts (4): 47 N•m (35 lbf•ft)

Suspension

Check tandem, wheel and tire condition.



Clutch fork

One grease fitting is located on each side of the bell housing. Lubricate sparingly if the release fork does not operate freely.

Transmission shafts

Using the grease gun, apply grease in the grease fitting.

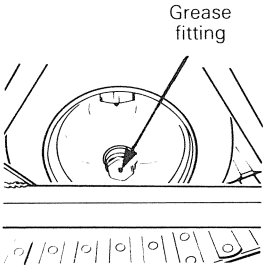
Tire air pressure (pneumatic)

Recommended pressure: 620-690 kPa (90-100 PSI).

Wheel and sprocket bearings lubrication

Wheels with standard seals:

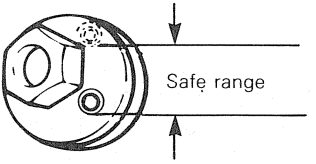
Using the grease gun, apply grease in the grease fitting.

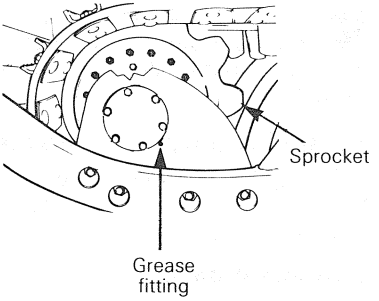


Wheels with mechanical seals:

To check the oil level, remove the cap on the filling hole. The level should be within the safe range.

NOTE: The oil level must always be higher than the hub center.





Steering levers

Steering levers should have a free-play of approximately 7.5 cm - 12.5 cm (3'' - 5'').

NOTE: Apply a few drops of oil on steering lever pivot.

Lighting system

Check good operation of lights.

Wiper

Check wiper operation.

CAUTION: Be sure windshield wipers are free before turning them ''on''. A wiper frozen to the windshield can cause overheating and failure of wiper motor.

CAUTION: Avoid running the wipers when the windshield is dry, or wiper blade and/or arm is damaged.

After the engine is started

NOTE: To start the engine, refer to ''Starting and stopping procedure'' section.

Instrument panel

CAUTION: Frequently check the instrument panel. Do not operate when dials indicate malfunction.

Emergency and parking brake

To check operation, see ''Controls/instruments'' section.

WARNING: Ensure brake functions properly before operating the vehicle.

Oil, fuel, coolant and exhaust leak

CAUTION: Ensure to correct any leakage before operating the vehicle.

Engine idle and max. R.P.M.

Idle: 600 R.P.M. (no load)
Maximum R.P.M.: 2500 R.P.M. (no load)

Hose, pipe

CAUTION: Ensure to correct any leakage, cracks, wear or tear before operating the vehicle.

Heater

See ''Controls/instruments'' section.

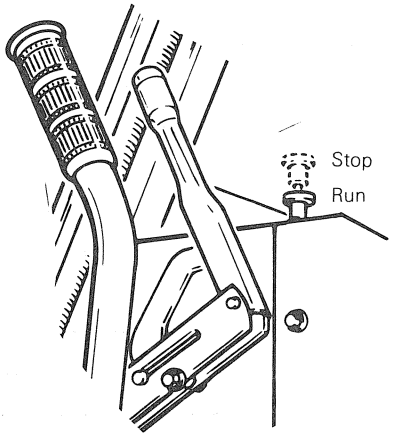
Pre-operation inspection check list	✓
Before starting the engine	
Engine oil level	
Transmission oil level	
(Transfer case or speed reducer) oil level	
Differential oil level	
Master cylinder oil level	
Power steering oil level	
Coolant level	
Water/fuel separator	
Fuel filter	
Batteries	
Fan and alternator ''V'' belts	
Tracks	
Sprockets	
Suspension	
Clutch fork	
Transmission shaft	
Tire air pressure (pneumatic)	
Wheel and sprocket bearings lubrication	
Steering levers	
Lighting system	
Wiper	
After starting the engine	
Instrument panel	
Emergency and parking brake	
Oil, coolant, fuel and exhaust leaks	
Engine idle and max. R.P.M.	
Hose and piping	
Heater	

CAUTION: Any mechanical problem must be corrected before operating the vehicle.

STARTING AND STOPPING PROCEDURE

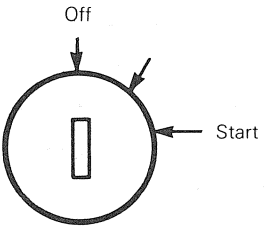
Starting the engine

WARNING: Before starting the engine, make sure that the parking brake is "on" and that the throttle pedal is free.



Make sure that the engine stop button is in "run" position.

Press on the clutch pedal and apply maximum pressure on the throttle pedal.



Turn ignition key to start position.

CAUTION: Return the key to "run" and release throttle pedal immediately after engine has started.

CAUTION: Holding key in "start" position when engine has started will damage starter mechanism.

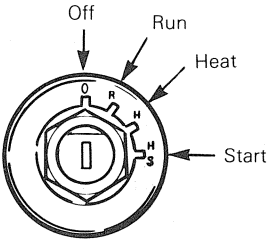
CAUTION: Do not operate the starter for more than fifteen (15) seconds at a time. To do so may overheat the starter. If the engine does not start the first time, wait fifteen (15) seconds before trying again. If it does not start after four (4) attempts, consult a mechanic.

WARNING: All internal combustion engines give off various fumes and gases while running. Do not start or run the engine in a closed or poorly ventilated building where the exhaust gases can accumulate.

NOTE: See pre-operation inspection section, after engine has started.

Starting aid (optional "thermostart")

A starting aid can be used under cold temperatures, when the engine refuses to start using the normal procedure.



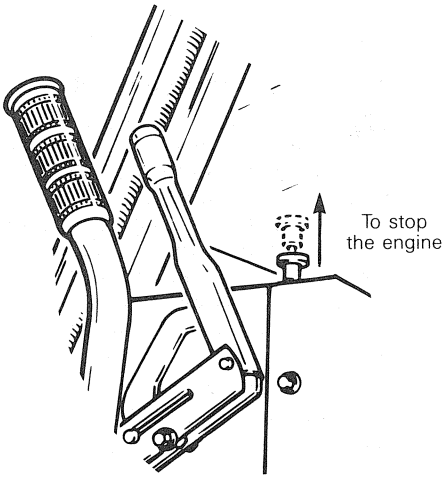
The procedure is basically the same as under normal temperature excepted that the ignition key must be turned to "heat" position during twenty (20) seconds before starting the engine.

If the engine does not start after fifteen (15) seconds, bring back the ignition key to "heat" position during ten (10) seconds and try again.

CAUTION: If engine refuses to start after the third attempt, consult a mechanic.

CAUTION: This starting aid should be used only when the engine is cold (approx. 0°C (30°F) or less).

Stopping the engine



To stop the engine, pull the shut-off knob until the engine stops through lack of fuel supply. Turn ignition key to " OFF " position to prevent battery discharge.

CAUTION: Before shutting off the engine, allow it to run at idle for at least five minutes to allow for gradual and uniform cooling. Engine and lubricant life will be shortened if the engine is not properly cooled before it is shut off.

DRIVING INSTRUCTIONS

Setting the vehicle in motion

CAUTION: Before running the vehicle, allow its engine to reach a minimum temperature of 60°C (140°F).

Start the engine, apply pressure on the brake pedal and release the parking brake. Press on the clutch pedal and select either first gear on reverse. Release gradually the clutch pedal until the friction moment. Release the brake pedal and press on the throttle pedal while gradually freeing the clutch pedal.

CAUTION: It is very important that the vehicle be stopped completely before selecting first gear on reverse since these gears are not synchronized.

CAUTION: Once the vehicle is running, release the clutch pedal completely to prevent any unnecessary slippering of the clutch.

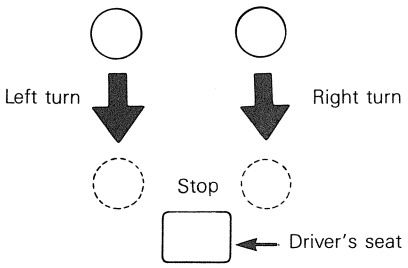
Gear shifting

The Muskeg vehicle uses a 5-ratio manual transmission.

To change from one ratio to the other, press on the clutch pedal and release the throttle pedal. Change gear, release the clutch pedal gradually and press on the throttle pedal.

CAUTION: Always use the clutch pedal during gear shifting.

Driving instructions



Steering is effected by means of the steering levers, through the planetary-type controlled differential. Pulling on one lever applies the brake on one drum of the differential; this slows down the axle gear of that side and increases proportionately the speed of the axle gear on the other side. One track running faster than the other makes the vehicle turn. With this type of differential, there is traction on both tracks, even when turning. Levers should be pulled sharply.

Power-steering (optional)

WARNING: Power steering is more positive and provides better response with less effort. For this reason power steering should be used with caution, especially when driving at high speed or on icy surfaces to prevent sudden turns, which could result in side-slippage and loss of control.

When braking, depress the clutch and the brake pedal, or pull both steering levers simultaneously.

Never brake suddenly, specially when going down hill. Harsh operation at high speed will cause unnecessary jars to the vehicle and could cause loss of control.

WARNING: The emergency brake should be used only in case of emergency when sudden stopping is absolutely necessary.

CAUTION: Release steering levers completely when not in use for steering or braking. "Dragging" the bands will cause differential overheating and unnecessary wear of the bands.

Stopping and parking

When stopping, depress the clutch and the brake pedal, or pull both steering levers simultaneously.

WARNING: Do not park a vehicle on a slope where it could start to roll or slide. Always check the emergency brake system for proper function before operating the vehicle. Never leave a vehicle without setting the parking brake.

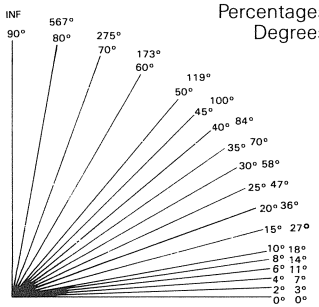
Gradeability

Uphill: 50%
Sidehill: 40%

Slope conversion chart

It is a general trade practice to discuss slope angularity in terms of percentage. The following chart converts percentage of slope into degrees of angle.

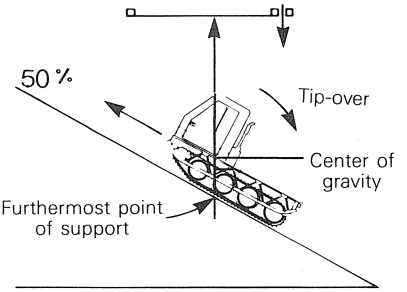
Percentages/Degrees

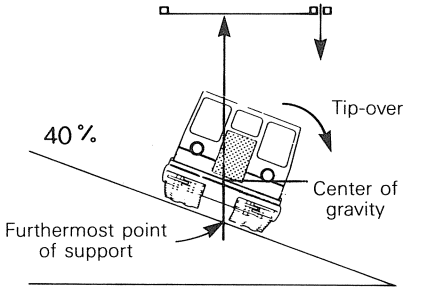


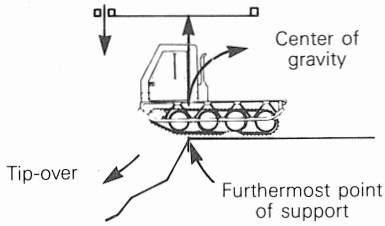
WARNING: These limits are determined with the vehicle stationary on a firm, flat surface and the extent to which they can be approached in practice will depend on the expertise of the operator and his familiarity with the vehicle.

In a tracked vehicle the following can occur when moving uphill or downhill.

When the center of gravity of the vehicle passes beyond an imaginary line drawn vertically upwards from the furthermost point of support of the tracks, the vehicle will tip-over or roll-over.







This can be likened to the action of a seesaw with the vertical line forming the center or pivot of the seesaw. When more weight is placed on one side than on the other the seesaw will move in that direction.

While these limits can be determined with accuracy under ideal conditions, the skill and ability of the operator, the loading of the vehicle and actual terrain conditions, constantly influence and change these limits during operation of the vehicle.

Therefore, one must evaluate every situation carefully and as a separate case. Never assume that the vehicle can traverse a certain piece of terrain, because it has passed there previously, or because another vehicle has passed before it, or because the terrain appears to be within the known performance limits of the vehicle. Moreover, under actual operating conditions, the slope of the terrain is constantly changing and sudden local variations may result in slopes which exceed operational limits, although the overall slope of the terrain is within safe operational limits.

TROUBLE SHOOTING

Engine

See engine manufacturer's manual.

CLUTCH:

Trouble	Probable cause	Suggested remedy
Slipping	1- Faulty adjustment of release lever 2- Weak or broken pressure plate springs 3- Worn or glazed clutch disc facings 4- Oil or grease on disc facings	Adjust linkage Repair Replace Replace
Noisy	1- Faulty adjustment of release lever 2- Oil or grease on disc facings 3- Worn splines on shaft or clutch disc hub 4- Faulty clutch disc 5- Uneven pressure of release lever springs	Adjust Replace Replace Replace Correct or change springs
Grabbing	1- Improper adjustment of release lever 2- Oil or grease on clutch disc facings 3- Worn or glazed disc facings 4- Clutch disc sticking on shaft 5- Worn pressure plate or flywheel 6- Worn or binding clutch release lever	Adjust Replace Replace Check splines and correct Reface or replace Repair or replace
Dragging	1- Faulty adjustment of release lever 2- Dirt or dust accumulation in clutch assembly 3- Worn or broken disc facings 4- Binding clutch disc hub on shaft	Adjust Clean Replace Correct

TRANSMISSION:

Hard to shift	1- Improper adjustment of clutch pedal 2- Wear in gearshift housing	Adjust Replace
Noisy	1- Worn, pitted or chipped gears 2- Worn, pitted or chipped bearings 3- Worn shafts	Replace gears Replace gearings Replace
Slips out of gear	1- Broken rail poppet spring 2- Worn interlock and poppet balls 3- Loose gearshift cover bolts 4- Improper alignment with clutch 5- Too much end play on main shaft 6- Improper adjustment of linkage 7- Worn gears	Replace Replace Tighten Align Correct Adjust Replace
Oil leaks	1- Overfilled 2- Faulty gaskets or oil seals	Correct Replace

TRANSFER CASE, SPEED REDUCER:

Noisy	1- Bearing adjustment 2- Worn, pitted or chipped gears 3- Worn bearings	Adjust Replace Replace
Oil leak	1- Faulty gaskets or seals	Replace

DIFFERENTIAL:

Noisy	1- Scored crown and pinion gears 2- Bearings worn or pitted 3- Improper adjustment of crown and pinion	Replace Replace Adjust
Excessive back lash	1- Worn gears 2- Worn carrier bearings 3- Worn U-joints	Replace Replace Replace
Oil leak	1- Faulty gaskets or seals	Replace

FINAL REDUCTION MECHANISM:

Noisy	1- Worn, pitted or chipped gears 2- Worn bearings	Replace Replace
Oil leak	1- Faulty gaskets or seals	Replace

PROPELLER SHAFT:

Vibration or noise	1- Joints not aligned 2- Bent 3- Out of balance 4- Worn bearings and cross	Align Replace Correct or replace Replace

STEERING:

Does not steer	1- Steering brake bands too loose 2- Faulty differential	Adjust Repair
Steers to one side only	1- Broken axle - inner or outer 2- Broken axle gear 3- Broken steering band	Replace Repair differential Replace
Veers to one side	1- Uneven track tension 2- Broken wheel bearings 3- Low tire pressure on 2 or 3 tires on same side 4- Faulty track belts	Adjust tracks Replace Correct Correct or replace

MAINTENANCE

Maintenance schedule

C - Check
I - Inspect (adjust or correct if necessary)
L - Lubricate
R - Replace

Item	Every 10 hrs or daily	Every 50 hrs or weekly	Every 100 hours	Every 200 hours	Every 500 hours	Every 1000 hours
Engine oil and filter	C		R			
Transmission oil			C		R	
Transfer case or speed reducer	C			R		
Differential oil	C			R		
Wheels with mechanical seals			C		R	
Wheels with standard seals	L					
Sprocket hub outer bearings		L				
U-joints			L			
Coolant	C					R
Hydraulic oil (power steering)		C				R
Fuel filter					R	
Fuel/water separator	C					
Clutch release fork			L (if required)			
Pedals, steering levers and friction band rods			L			
Master cylinders	C					
Battery		C				
Sprockets	C		I			
Tires	C	I				
Tandems	C				I	
Tracks	C	I				
Air filter		C			R	
Brake bands				I		

Minor repairs

Removal of track

1- Jack up the tractor
2- Release the tension of the track by bleeding the track-tensioner.
3- Remove the side beam.
4- Remove the rear suspension silent block collar underneath the frame.
5- Push the complete rear suspension assembly forward and pull it out of the tracks.
6-Pull the track off.

Installation of the track

1- Jack up the tractor.
2- Remove the rear suspension assembly if it is on the tractor.
3- Install the track over the sprockets and the front suspension assembly.
4- Pull the track to the rear.
5- Install the rear suspension assembly inside the track.
6- Pull the track to the rear while the tractor is being lowered to the ground.
7- Pry the rear suspension to the rear until the silent block on the cross-shaft falls in place underneath the frame.

NOTE: The installation of the track can be made easier if 5 or 6 crosslinks are removed from the section of the track installed in front of the sprocket. This will allow the track to be pulled further to the rear, to give the necessary slack, to install the rear suspension.

8- Install the side beam.
9- Install the silent block collar of the rear suspension underneath the frame.
10- Adjust the tracks by means of the hydraulic track-tensioner, by injecting grease in the grease-fitting provided for this purpose.

Removal of drive sprocket assembly

1- Jack up the tractor.
2- Release the track tension by bleeding the track-tensioner.
3- Remove the rear tandem silent block collars.
4- Remove the side beam.
5- Push the rear tandem assembly forward.
6- Pull the track forward to clear the sprockets.
7- Remove the axle end cap, and pull out the drive axle.
8- Remove the 6 cap screws that bolt the seal cover to the final drive case.
9- Pull out the drive sprocket hub assembly.

NOTE: To remove a drive sprocket from the hub, the bearing must be removed by means of a bearing puller. Remove the seals carefully so as not to damage them. Remove the bearing lock on the outside end of the hub before pulling the outside bearing.

To install the drive sprocket hub

Reverse the procedure outlined above. Install the seals carefully so as not to damage the lip. Press the bearing flush with the end of the hub tube.

Removal of suspension

1- Jack up the vehicle.
2- Release the tension of the track by bleeding the track-tensioner.
3- Remove the silent block collars.
4- Remove the side beam.
5- Pull out the tandem assembly.

Installation of suspension

To reinstall the tandem assembly reverse the procedure for its removal. Make sure the tandem is installed correctly. On the front tandem the wheel spindles are at the bottom of the beam. On the rear tandem the track-tensioner is located underneath the beam.

Changing a tire

As the hub is an integral part of the wheel, the complete wheel assembly has to be removed from the wheel spindle.

1- Jack up the tractor.
2- Release the tension of the track by bleeding the track-tensioner.
3- Spread and hold apart two sides of the track by means of a 75 cm (30'') lever.
4- Remove the hub cap, cotter pin and spindle nut, and pull the wheel out.

NOTE: There is enough clearance between the side frame or side beam and wheels to remove the three sets of front wheels without removing the tandems. However, for the rear wheels, the rear tandem has to be removed.

STORAGE

If the vehicle is to remain idle for a prolonged period of time, certain precautions should be taken to protect it from corrosion and the accumulation of rust. The following storage procedure is recommended:

- Clean the vehicle thoroughly.
- Make a thorough inspection and make all the necessary repairs.
- Lubricate all points mentioned in the lubrication schedule.
- Prepare the engine according to the instructions given in the engine manufacturer's manual.
- Check the oil in the differential; if it is closes to a change period, drain and refill with new oil.
- Park the vehicle on pavement if possible or on coarse gravel in a dry place. It would be preferable to lift it off the ground and block it to take the weight off the wheels and tracks.
- Release the tension on both tracks.
- Remove the battery and put it on a trickle charge or check and charge monthly.
- If the vehicle is not under shelter make sure that the drain plug in the bottom of the frame is removed, otherwise water will accumulate in the frame and may find its way into the clutch and the differential.

SPECIFICATIONS

ENGINE	
Make	"Perkins"
Model	4.236
Type	In line Diesel
No. of cylinders	4
Power at R.P.M. (without fan)	58 kW (78 H.P.) @ 2500 R.P.M.
Torque at R.P.M. (without fan)	260 N•m (192 lbf•ft) @ 1300 R.P.M.
Maximum operating R.P.M.	2500 R.P.M. (no load)
Oil filter	Full-flow
Starter	Electrical (12 volts)
Exhaust muffler	"Bombardier"
CARBURATION	
Supply type	Direct injection
Injection pump make	"C.A.V."
Firing order	1-3-4-2
Idle R.P.M.	600 R.P.M. (no load)
COOLING	
Engine:	
- Type	Liquid/radiator/fan cooled
- Antifreeze/water mixture	Must protect the cooling system from freezing at -40°C (-40°F)
Thermostat	
- Opening	79-83°C (175-182°F)
- Complete opening	94°C (202°F)
Radiator cap pressure	96.5 kPa (14 PSI)
Fan:	
- Type	Suction (winter) Blowing (summer)
-Drive	"V" belt driven

POWER TRAIN	
Transmission:	
- Make	"New process gear"
- Model	542-L1
- Type	Manual (5 speeds)
- Gear ratio	1st – 7.24 @ 1 2nd – 4.33 @ 1 3rd – 2.61 @ 1 4th – 1.59 @ 1 5th – 1.00 @ 1 Reverse – 7.22 @ 1
Clutch type	Single dry disc
Transfer case (if applicable):	
- Make	"Bombardier"
- Ratio	1.58 @ 1
Speed reducer (if applicable):	
- Make	"Bombardier"
- Ratio	1.58 @ 1
Differential:	
- Type	Planetary control
- Ratio	3.9 @ 1
Gear ratio of final drive	1.68 @ 1
Sprocket	11 teeth (rubber and fabric)
Wheels:	
- Quantity	16
- Tire type	12 air or solid tires and 4 solid ones (rear)
- Dimensions	11.43 cm x 40.64 cm (4.50" x 16")
- No. of plies	6
Track width	71 cm (28") (for one track)
Cross links:	
- Type	Heat treated alloy steel
- Quantity	68 (for one track)

ELECTRICAL SYSTEM	
Generator:	
- Type	Alternator
- Output	61 amp./12 volts
- Drive	"V" belt driven
Batteries:	
- Type/quantity	Acid (6 volts)/2
- Output	630 amp. (cold starting at -18°C (0°F))
- Reserve capacity	120 min. (for starting at 27°C (80°F))
Voltage	12 volts
Fuse output	15 amp.

VEHICLE	
Frame material	Steel
Cab material	Iron and steel
Overall length	362 cm (142 1/2")
Overall width	224 cm (88")
Overall height	232 cm (91 1/2")
Dry weight	3600 kg (7920 lb)
Ground pressure (o-penetration)	11.1 kPa (1.6 PSI)
Ground clearance	36 cm (14")
Load capacity	3629 kg (8000 lb)
Maximum speed	16 km (10 MPH)
Gradeability:	
- Uphill	50%
- Sidehill	40%

LIQUID TYPES AND CAPACITIES	
Engine cooling system	25 l (5.5 Imp. gal., 6.6 U.S. gal.)
- Coolant type	Ethylene glycol
Fuel tank	104 l (23 Imp. gal., 27 U.S. gal.)
- Fuel type	A.S.T.M./D.975-66T Grade 1D or 2D
Engine oil (with filter)	5.7 l (5 Imp. quarts, 6 U.S. quarts)
- Oil type	SAE 10W40, SAE 20W50, SAE 30 or SAE 40 above 0°C (32°F) and SAE 10W40 or SAE 5W20 below 0°C (32°F), (MIL-L-46152 or MIL-L-2104C, service API CC/SE)
Transmission oil	5.1 L (4.5 Imp. quarts, 5.4 U.S. quarts)
- Oil type	EP 75-80 (MIL-L-2105-B)
Transfer case oil (if applicable)	4.2 l (3.7 Imp. quarts, 4.4 U.S. quarts)
- Oil type	EP 75-80 (MIL-L-2105-B)
Speed reducer oil (if applicable)	1.4 l (1.25 Imp. quarts, 1.5 U.S. quarts)
- Oil type	EP 75-80 (MIL-L-2105-B)
Differential oil	27 l (6 Imp. gal., 7.1 U.S. gal.)
- Oil type	Esso torque fluid no 56 or Dexron
Power steering tank (if applicable)	4.3 l (3.75 Imp. quarts, 4.5 U.S. quarts)
- Oil type	Esso UNIVIS no 42 or BP-HTL 55
Hydraulic drive	600 ml (21 Imp. fl.oz., 20 U.S. fl.oz.)
- Oil type	SAE 70R3 fluid for brakes
Hydraulic declutching mechanism	600 ml (21 Imp. fl.oz., 20 U.S. fl.oz.)
- Oil type	SAE 70R3 fluid for brakes
Hydraulic brake	600 ml (21 Imp. fl.oz., 20 U.S. fl.oz.)
- Oil type	SAE 70R3 fluid for brakes
Wheels with mechanical seals	200 ml (7 Imp. fl.oz., 6.7 U.S. fl.oz.)
- Oil type	Fluid for automatic transmission
Grease type	Multi-purpose good quality grease resisting to water and tearing and remaining fluid under cold temperatures

TORQUE SPECIFICATIONS	
Crosslink/track	1/2"-20 gr.8 40-47 N•m (30-35 lbf•ft)
Sprocket/flange drive axle hub	Outside retaining bolts (16):
3/8"-24 gr. 8	27 N•m (20 lbf•ft)
	Inside retaining bolts (4):
	47 N•m (35 lbf•ft)
Tandem-fixing collar	5/8"-18 gr.8 198-241 N•m (146-178 lbf•ft)
Engine support (front)/engine	7/16"-20 45-56 N•m (33-41 lbf•ft)
Engine support (rear)/engine	1/2"-13 61-76 N•m (45-56 lbf•ft)
Rubber-support/engine support	3/8"-24 38-47 N•m (28-35 lbf•ft)
Fan bolts	5/16"-24 gr.5 20 N•m (15 lbf•ft)

BRAKES	
Brake type	Braking through steering levers, and foot braking through hydraulically applied drum
Emergency brake type	Disc or drum activated hydraulically

NOTE:: Bombardier Inc. reserves the right at any time to discontinue or change specifications, designs, features, models or equipment without incurring obligations.

HYDRAULIC OIL CONTAMINATION CONTROL

Contamination Control

Contaminated fluid leads to leakage and eventual component failure. Hydraulic system contamination is produced by three major sources:

A) Built-in contaminants
B) System-generated contaminants
C) Externally-introduced contaminants.

A) Built-in contaminants include core sand, drawing compounds, metal chips from threaded fittings, paint flakes, pipe scale, rust preventatives, sealants and weld spatter. These are unavoidable, but usually are easily controlled by filter system.

B) System-generated contaminants include carbon and varnish from overheated oil, fiber particles from filters and metal particles scraped off of moving surfaces in pumps, valves and cylinders, as well as particles from elastomeric seals and persistent emulsions. These tend to cause little trouble in conventional hydraulic systems but their small size makes them difficult to remove.

C) Externally-introduced contaminants include airborne metal flakes, dust, bacteria, bearing grease, cutting oil, dirt, lint from rags, and waste, metal chips, water, wax lubricants, the wrong oil and particles which enter when equipment is opened for repair or at oil addition. Prevent their entry into systems and you escape the most numerous and damaging contaminants.

Contamination, regardless of its source, can largely be controlled by these precautions:

Make sure removable reservoir cover fits well, is gasketed and tightly bolted.

Seal all clearance holes to prevent dust suction by reservoir and drain line.

Leakage Reduction

Uncontrolled leakage creates safety hazards, increases cleaning costs and requires more make up oil and the labor to add it. Static joint leakage occurs at tube fittings and connections, pipe threads and joints, and at flexible hose couplings. Other sites include cylinder heads, valve caps, manifold joints, filter and pump. These leaks are caused by unsuitable joints, incomplete joining, faulty pipe and hose layout which is prone to vibration, strain and damage caused by the water hammer effect. Effective control of static joint leakage involves regular inspection and correction of faulty joints. Leakage from moving parts is found at cylinder piston and rod seals, valve stems, and pump or motor shaft seals.

Preventive Maintenance

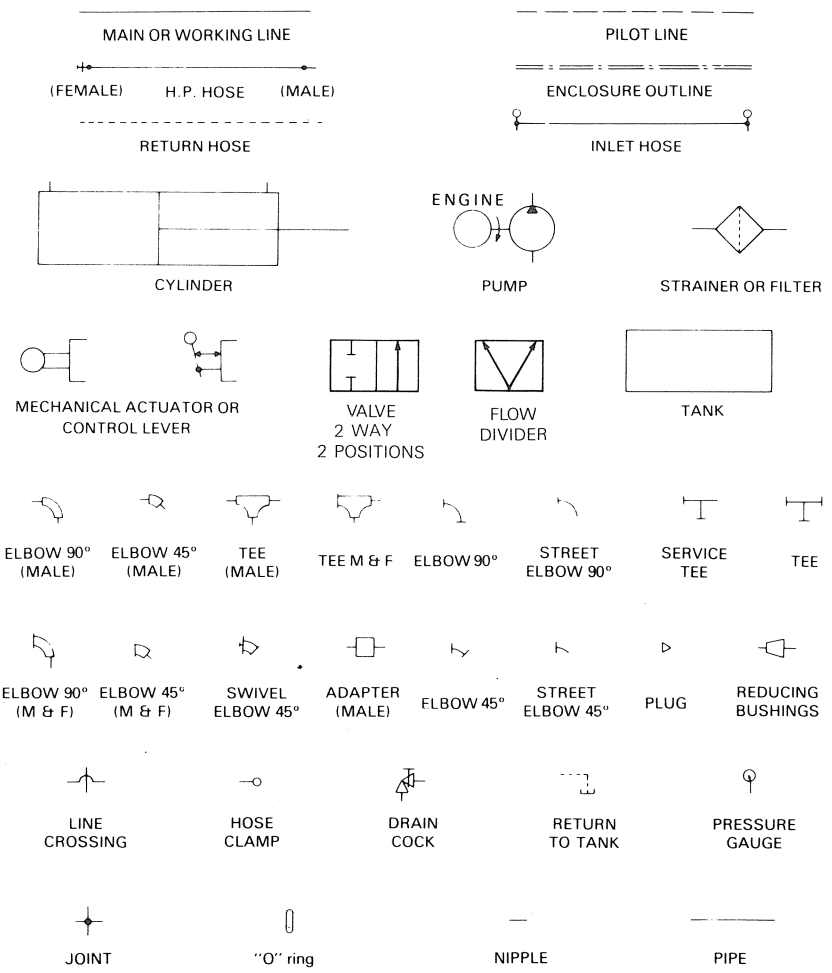
CAUTION: Only maintenance personnel trained on hydraulic equipment should work on it.

Controlling hydraulic system reliability depends on concerned operators and well-trained maintenance personnel. If operators are taught to shut off equipment when a hose or hydraulic line breaks, or leaks, pump and fluid are saved and downtime is reduced.

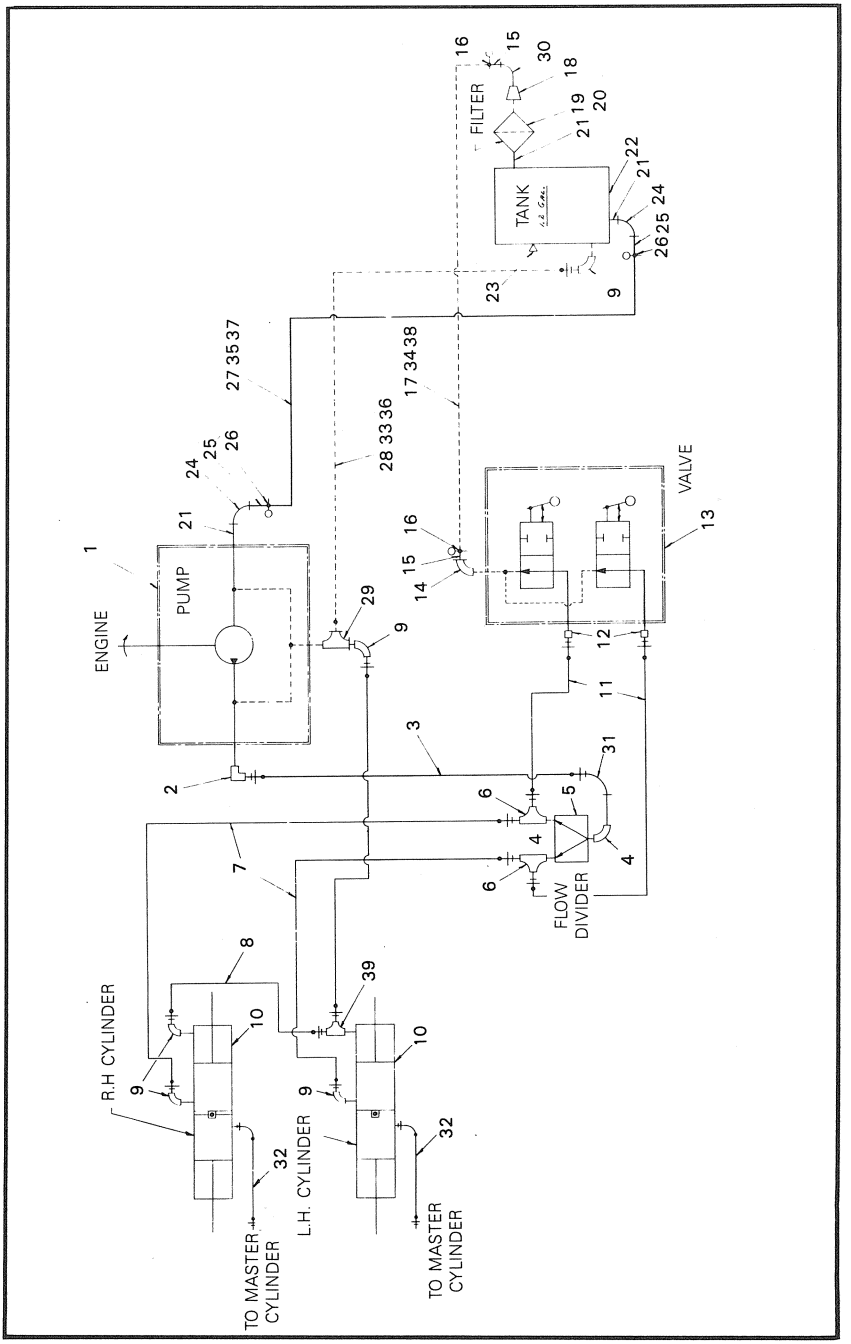
CAUTION: Avoid oil contamination when checking or adding oil.

STEERING HYDRAULIC DIAGRAM

Hydraulic symbols

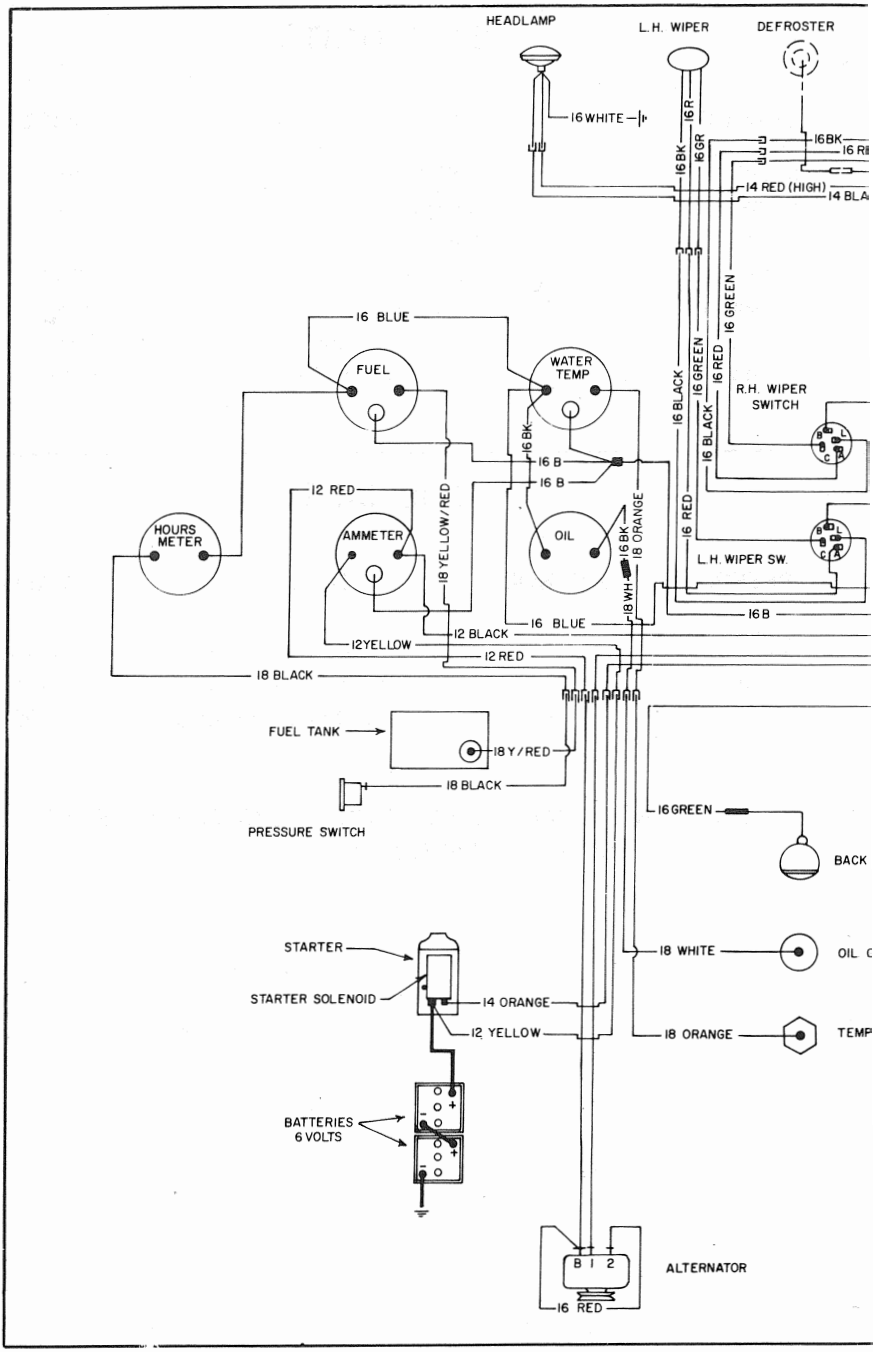


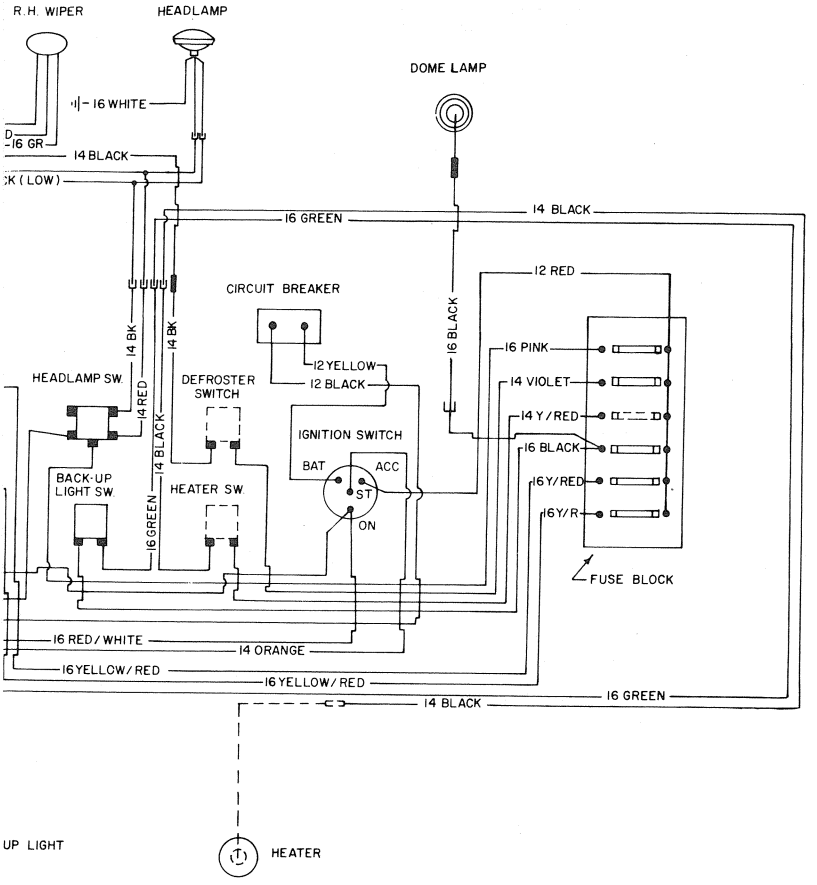
Hydraulic system diagram



NO. REF.	DESCRIPTION	QTÉ PER VEHICLE		
		1 M.C.	2 M.C.	6 M.C.
1	Pump	1	1	1
2	Elbow adaptor	1	1	1
3	H.P. hose (with fittings) (3/8'' dia. x 8'' L.)	1	1	1
4	Elbow 90°	1	1	1
5	Flow divider	1	1	1
6	External fare tee	2	2	2
7	Bulk hose (with fittings) (3/8'' dia. x 16'' L.)	3	3	3
8	Bulk hose (with fittings) (3/8'' dia. x 10 1/2'' L.)	1	1	1
9	Elbow 90°	5	5	5
10	Steering cylinder ass'y	2	2	2
11	Bulk hose (with fittings) (3/8'' dia. x 60'' L.)	2	2	2
12	Male pipe	2	2	2
13	Control valve ass'y	1	1	1
14	Street elbow 90°	1	1	1
15	Valve extension	2	2	2
16	Worm gear hose clamp	2	2	2
17	Paragas hose (5/8'' dia.) (multiple 12'')	-	A.R.	-
18	Reducing bushing	1	1	1
19	Oil filter	1	1	1
20	Oil filter element	1	1	1
21	Close nipple	3	3	3
22	Oil tank	1	1	1
23	Plug	1	1	1
24	Elbow 90°	2	2	2
25	Half nipple	2	2	2
26	Worm gear hose clamp	2	2	2
27	Paragas hose (1'' dia.) (multiple 12'')	1	A.R.	-
28	Overflow hose (with fittings) (3/8'' dia. x 63'' L.)	-	1	-
29	Street tee	1	1	1
30	Street elbow 90°	1	1	1
31	Bent stem adaptor	1	1	1
32	H.P. hose (with fittings) (1/4'' dia. x 20'' L.)	2	2	2
33	Overflow hose (with fittings) (3/8'' dia. x 78'' L.)	1	-	-
34	Paragas hose (5/8'' dia.) multiple 12'')	A.R.	-	-
35	Paragas hose (1'' dia.) (multiple 12'')	A.R.	-	-
36	Overflow hose (with fittings) (3/8'' dia. x 105'' L.)	-	-	1
37	Paragas hose (1'' dia.) (multiple 12'')	-	-	1
38	Paragas hose (5/8'' dia.) (multiple 12'')	-	-	A.R.
39	Male tee	1	1	1

ELECTRIC WIRING DIAGRAM





COLOUR CODE	
BK – BLACK	GN – GREEN
WH – WHITE	GY – GREY
RD – RED	VI – VIOLET
BL – BLUE	OR – ORANGE
YL – YELLOW	BR – BROWN

WARNING: Ensure all terminals are properly crimped on the wires and all connector housings are properly fastened.

SI* METRIC INFORMATION GUIDE

BASE UNITS

DESCRIPTION	UNIT	SYMBOL
length	meter	m
mass	kilogram	kg
liquid	liter	L
temperature	celsius	°C
pressure	kilopascal	kPa
torque	Newton meter	N•m
speed	kilometer per hour	km/h

PREFIXES

PREFIX	SYMBOL	MEANING	VALUE
kilo	k	one thousand	1,000
centi	c	one hundredth of a	0.01
milli	m	one thousandth of a	0.001

*THE INTERNATIONAL SYSTEM OF UNITS (SYSTEME INTERNATIONAL) ABREVIATES "SI" IN ALL LANGUAGES.

CHANGE OF ADDRESS AND OWNERSHIP

Any change in address or ownership should be brought to the attention of the manufacturer by completing and sending out the card supplied below.

NOTICE TO ALL NEW OWNERS: Make sure to receive the warranty registration card from the previous owner, at the time the ownership is transferred. Also enclose a photocopy of this registration card when informing of a change of ownership.

CHANGE OF ADDRESS

VEHICLE IDENTIFICATION NUMBER

OLD ADDRESS:

NAME

NO STREET APT.

CITY STATE/PROVINCE ZIP/POSTAL CODE

NEW ADDRESS:

NAME

NO STREET APT.

CITY STATE/PROVINCE ZIP/POSTAL CODE

CHANGE OF OWNERSHIP

VEHICLE IDENTIFICATION NUMBER

The ownership of this vehicle is transferred

FROM:

NAME

NO STREET APT.

CITY STATE/PROVINCE ZIP/POSTAL CODE

TO:

NAME

NO STREET APT.

CITY STATE/PROVINCE ZIP/POSTAL CODE

BOMBARDIER INC.
ATT.: WARRANTY DEPARTMENT
VALCOURT, QUEBEC
CANADA, J0E 2L0

BOMBARDIER INC.
ATT.: WARRANTY DEPARTMENT
VALCOURT, QUEBEC
CANADA, J0E 2L0