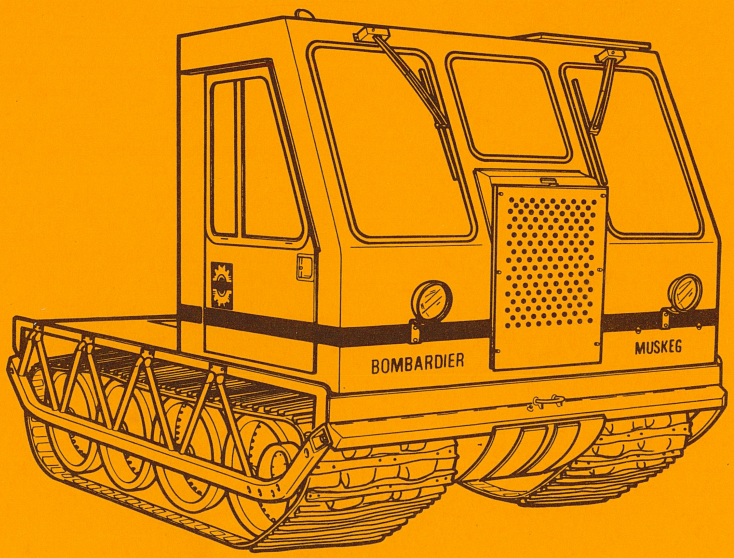
Guide du conducteur
BOMBARDIER
Operator's Guide
MUSKEG *
CARRIER DIESEL



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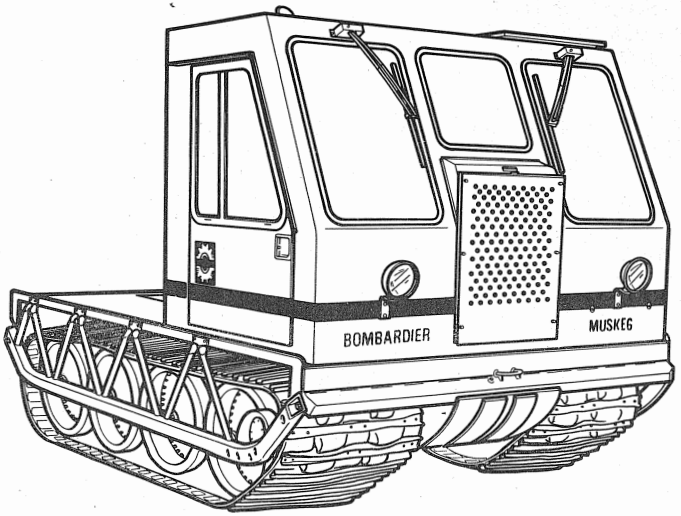
Operator's Guide

MUSKEG *
CARRIER DIESEL



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FOREWORD

The operator's guide 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 guide 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.

- 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.

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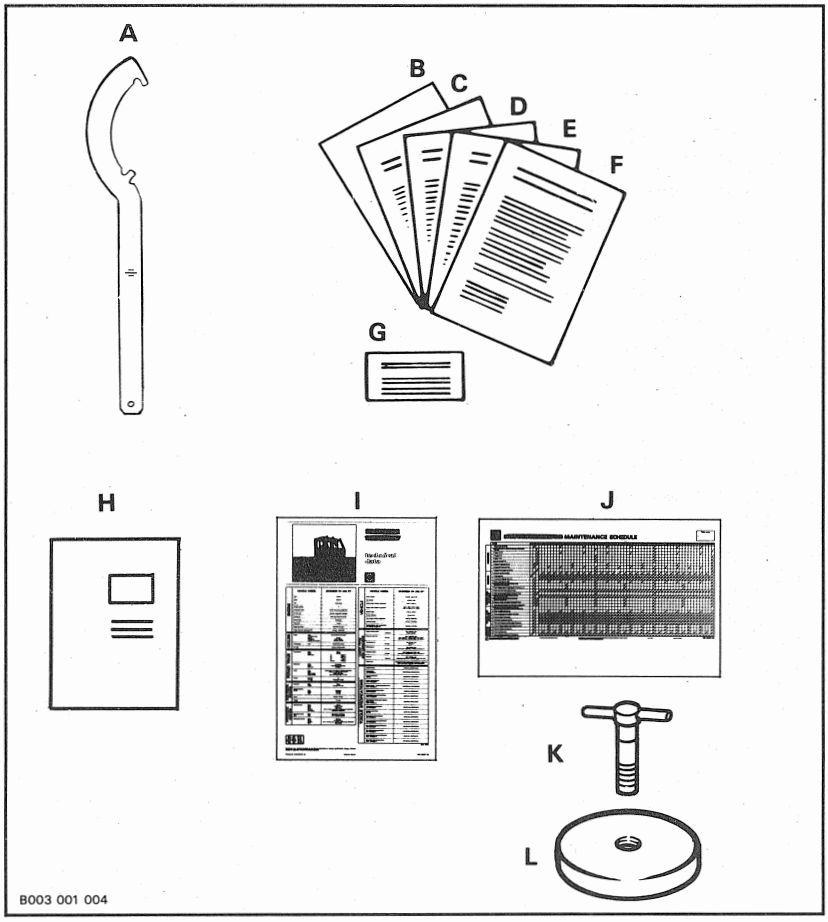
TOOLS AND LITERATURE

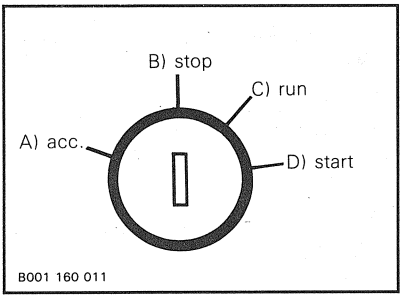
As standard equipment, each new vehicle is supplied with a basic tool kit and literature.



A) Bearing adjuster tool
B) Safe Driving Guide
C) Operator's Guide
D) Bombardier Parts Catalog
E) Bombardier Warranty Card
F) Engine Owner's Manual
G) Engine Warranty Card
H) Engine Directory
I) Technical Data
J) Maintenance
K) Drain Plug Screw
L) Drain Plug

1) Starting Switch

Four-Way Switch



A) ACCESSORIES position

Supplies the main lighting system.

B) STOP position

Stops the engine and cuts-off power supply to vehicle.

C) RUN position

Supplies the whole vehicle and the engine keeps on running at this position.

D) START position

When the engine must be started, turn the key two steps from the STOP position and maintain this position. Once the engine has started, bring back the key immediately to RUN position.

▼ CAUTION : Never hold the key in START position once the engine is running because the starter could be damaged.

▼ CAUTION : Do not operate the starter for more than 15 seconds at a time to avoid overheating it.

2) Starting Aid Switch

▼ CAUTION : Starting aid should be used only when the ambient temperature is 0°C (32°F) or less and engine is cold.

The procedure is the same as under normal temperature, except that key must be turned to RUN position, push the starting aid switch for 20 seconds before starting engine.

If engine does not start after 15 seconds, return key to RUN position, push starting aid switch for 10 seconds and try again.

▼ CAUTION : If engine does not start after three attempts, consult a mechanic.

3) Fuel Level Indicator

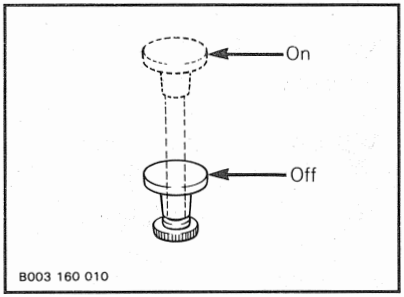
Indicates the fuel level contained in the tank.

4) Parking Brake Indicator Light

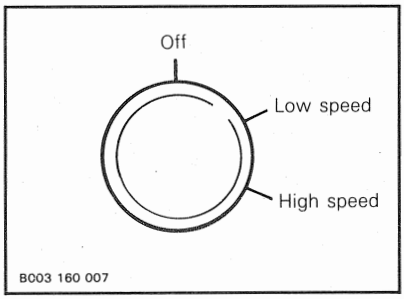
Lights when the parking brake is activated.

▼ CAUTION : Do not attempt to set the vehicle in motion while the parking brake is applied.

8) Back-Up Light Switch

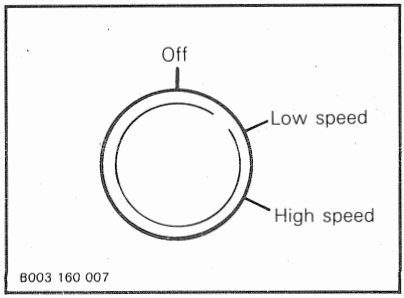


9) Left Wiper Control Knob



Controls the left wiper speed.

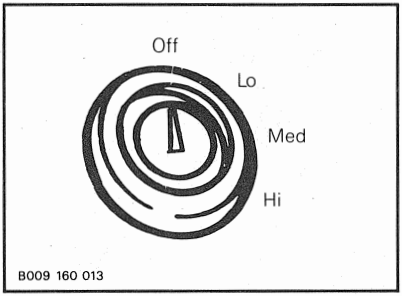
10) Right Wiper Control Knob



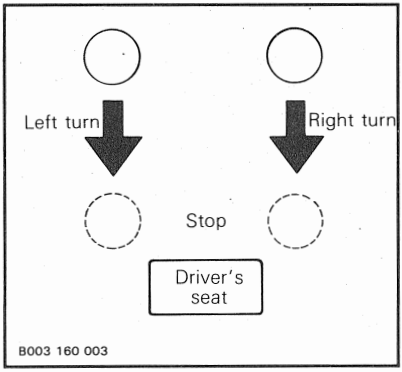
Controls the right wiper speed.

11) Heater Fan Control Knob

Controls 3-speed heater fan motor.



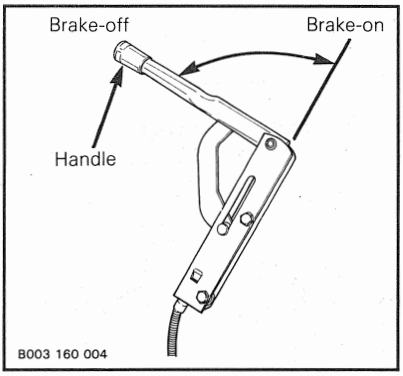
12) Power Steering Levers



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

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

18) Parking Brake



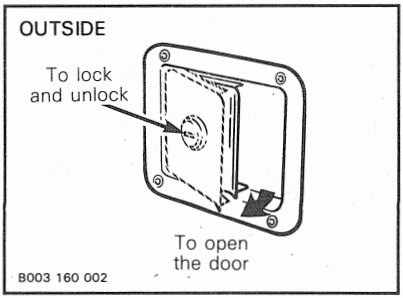
This brake works with a disc. Brake tension can be adjusted by turning the handle in one direction or the other. Turn clockwise to increase tension and counterclockwise to reduce it.

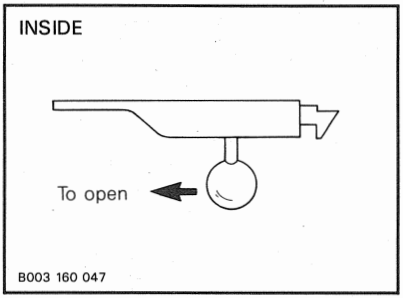
WARNING : Always apply the parking brake when leaving the vehicle.

19) Throttle Pedal

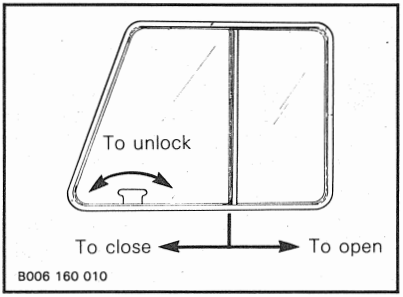
The engine speed increases as a function of the pressure applied on the throttle pedal. Once the pedal is released, the engine automatically returns to idle speed.

20) Door Handles



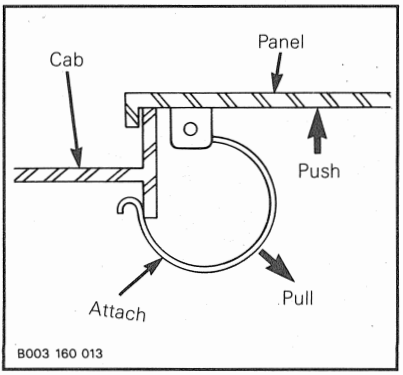


21) Side Windows



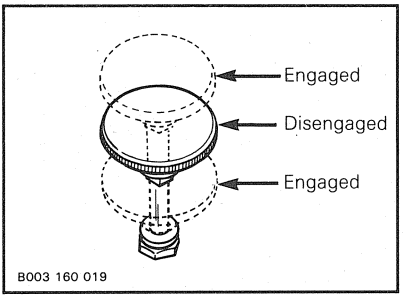
22) Emergency Exit

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

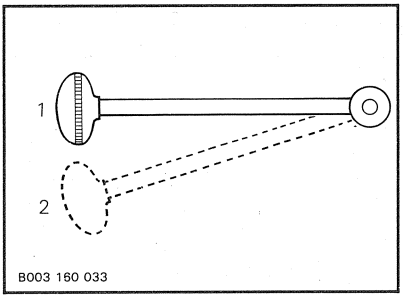


To open, pull on both retaining locks and push the panel.

27) Power Take-Off Control (if applicable)



28) Transfer Case Control Lever (if applicable)

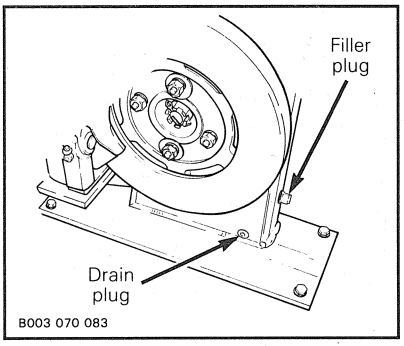


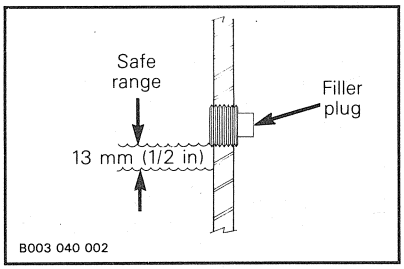
1) At this position, power is transmitted from the transmission to the differential.

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 bee selected.

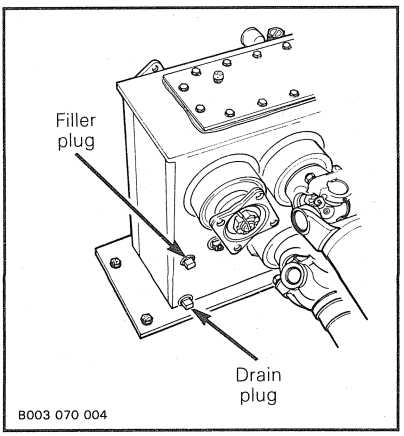
Speed Reducer Oil Level (if applicable)

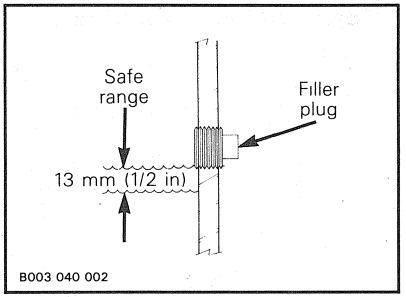




The oil level should always be within the safe range.

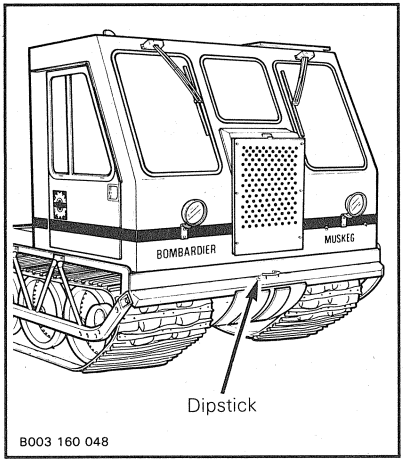
Transfer Case Oil Level (if applicable)

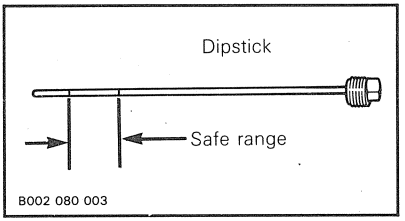




The oil level should always be within the safe range.

Differential Oil Level





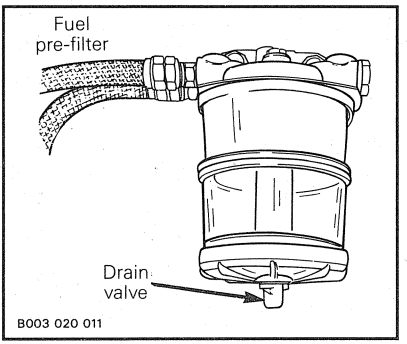
The oil level should always be within the SAFE RANGE of the dipstick.

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, because engine overheating will occur.

Fuel Pre-Filter

To gain access, raise the engine hood.

The pre-filter is located beside the fuel supply pump.



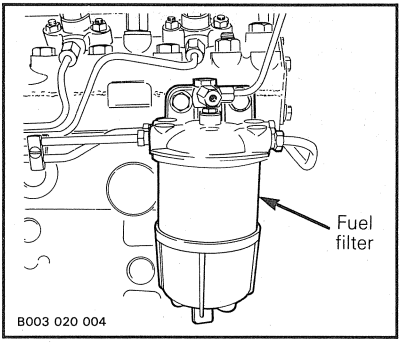
To drain the water accumulated in the pre-filter, open the drain valve slowly and let the water come out. When fuel starts flowing, close the drain valve.

CAUTION : It is important to drain the water contained in the fuel pre-filter at the end of each work shift.

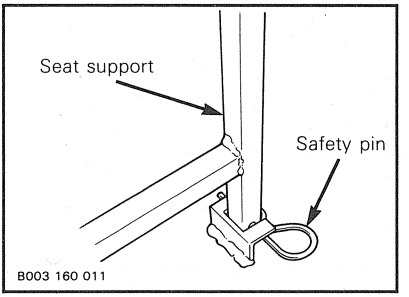
CAUTION : Drain the water in a container.

Fuel Filter

The fuel filter is located under the engine hood.



Batterie



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

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

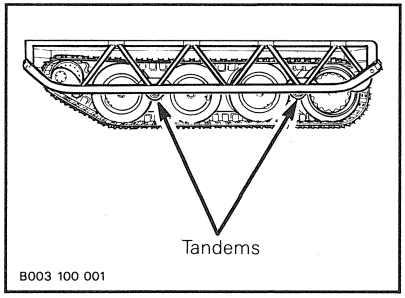
Check electrolyte level in each element. Add distilled water if necessary.

CAUTION : Do not fill excessively.

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

Suspension

Check tandem, wheel and tire condition.



Clutch

Using a grease gun, apply grease sparingly on clutch release bearing sleeve and release shaft.

Transmission Shafts

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

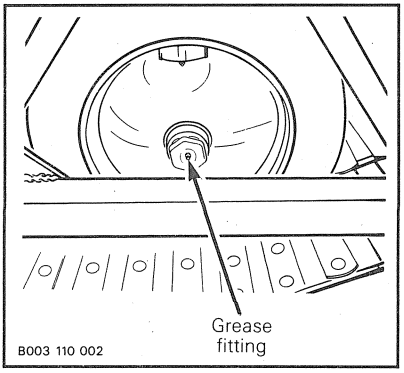
Tire Air Pressure (pneumatic)

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

Wheel and Sprocket Bearings Lubrication

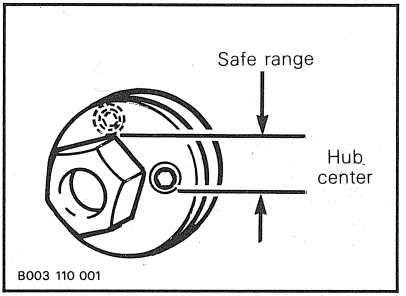
Wheels with Standard Seals :

Using a grease gun, inject grease through the grease fitting.

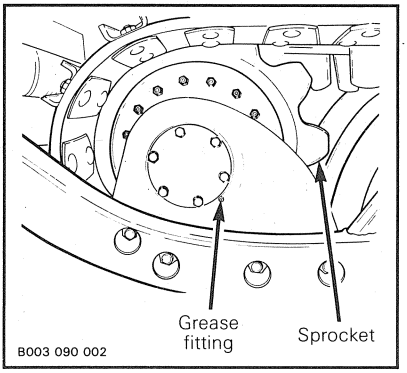


Wheels with mechanical seals :

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



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



Lighting System

Check for 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.

Pre-operation inspection check list	
Before starting the engine	
Engine oil level	
Transmission oil level	
(Speed reducer or transfer case) oil level	
Differential oil level	
Master cylinder oil level	
Power steering oil level	
Coolant level	
Fuel pre-filter	
Fuel filter	
Batteries	
Fan and alternator V-belt	
Tracks	
Sprockets	
Suspension	
Clutch	
Transmission shaft	
Tire air pressure (pneumatic)	
Wheel and sprocket bearings lubrication	
Steering levers	
Lighting system	
Wiper	
Once the engine is started	
Instrument panel	
Emergency and parking brake	
Oil, fuel, coolant and exhaust leak	
Engine idle speed and max. R.P.M.	
Hose and piping	
Heater	

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

DRIVING INSTRUCTIONS

Setting the Vehicle in Motion

Start the engine.

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

Apply pressure on the brake pedal and release the parking brake. Press on the clutch pedal and select either first gear or 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 or 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.

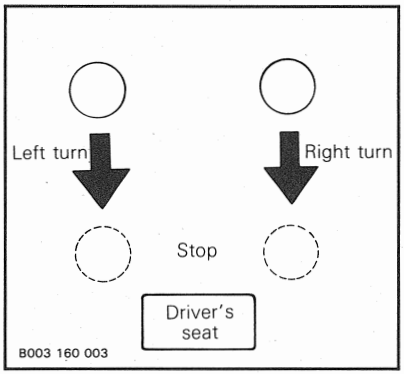
Gear Shifting

The Muskeg vehicle uses a 5-gear 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



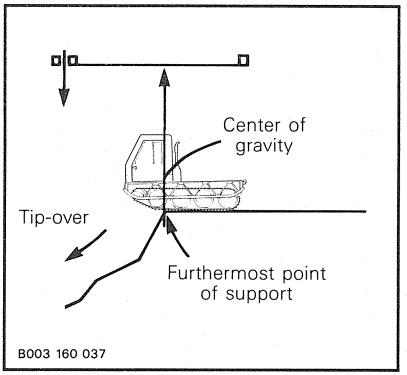
Steering is effected by means of the steering levers, through the planetary-type controlled differential. Pulling on one lever applies the brake on one drum of the differential. This slows down the axle gear of that side and increases proportionately the speed of the axle gear on the other side. One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

◯ NOTE : The steering levers should be pulled sharply.

When braking, depress the clutch and the brake pedal, or depress the clutch pedal and 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.



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.*

TRANSMISSION

Hard to shift	1- Improper adjustment of release lever 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 bearings 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

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

SPEED REDUCER, TRANSFER CASE

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

Maintenance Schedule

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

Item	Every 10 hrs or daily	Every 50 hours	Every 100 hours	Every 200 hours	Every 500 hours	Every 1000 hours
Engine oil and filter	C			R		
Transmission oil			C		R	
Speed reducer or transfer case oil	C			R		
Differential oil	C			R		
Coolant	C					R
Hydraulic oil (power steering)	C					
Wheels bearings (oil)		C			R	
Fuel filter					R	
Air filter		C	R (if required)		R	
V-belt		C				R
Fuel pre-filter	C					
Tandems	C				I	
Batteries		C				
Master cylinders	C					
Sprockets	C		I			
Tires	C	I				
Tracks	C	I				
Brake bands		I				
Universal joints			L			
All linkages			L			
Wheel bearings (grease)	L					
Clutch release bearing sleeve and release shaft				L (sparingly)		
Sprocket hub outer bearings	L					

Removal of a Tire

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

— Raise the vehcile.

— Release track tension by bleeding the hydraulic track tensioner.

— Spread and hold apart two sides of the track by means of a 75 cm (30 in) lever.

— Remove the hub cap, cotter pin and spindle nut, and then pull the wheel out.

NOTE : When removing a rear wheel, the track must be uncoupled and pulled away from the rear wheels.

Installation of a Tire

To install a tire, reverse the removal procedure.

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.

POWER TRAIN

Transmission :	
- Make	Spicer
- Type	Manual, 5 speed
- Model	ES 42-5A
- Ratios	1st - 7.22 to 1
	2nd - 3.88 to 1
	3rd - 2.21 to 1
	4th - 1.42 to 1
	5th - 1.00 to 1
	Reverse - 7.22 to 1
Clutch	Dry, single disc 31 cm (12'') dia.
Speed reducer (if applicable) :	
- Make	Bombardier
- Ratio	1.56 @ 1
Transfer case (if applicable) :	
- Make	Bombardier
- Ratio	1.58 @ 1
Differential :	
- Make	Bombardier
- Type	Planetary controlled
- Ratio	3.9 @ 1
Gear ratio of final drive	1.68 @ 1
Sprocket	11 teeth (rubber and fabric)
Wheels/tires :	
- Quantity	16
- Tire type	12 pneumatic or solid tires and 4 solid ones (rear)
- Dimensions	11.43 cm x 40.64 cm (4.50'' x 16'')
- No. of plies (pneumatic)	6
Track width	71 cm (28'') (for one track)
Cross links :	
- Type	Heat treated alloy steel
- Quantity	68 (for one track)

HYDRAULIC SYSTEM (POWER STEERING)

Hydraulic pump :	
- Make	Vickers
- Model	V10F-1P2P-12A-4D
- Type	Vane type
- Capacity	15 L (3.3 imp. gal., 4 U.S. gal.)/min at 1200 R.P.M.
- Oil pressure	1000 PSI
- Drive	Gear driven
Directional control valve :	
- Make	Bombardier
- Type	2 spools actuated
Cylinders	Mico

LIQUID TYPES AND CAPACITIES	
Engine cooling system :	25 L (5.5 imp. gal, 6.6 U.S. gal)
- Antifreeze	Ethylene glycol
Fuel tank :	94 L (21 imp. gal, 25 U.S. gal)
- Fuel type	A.S.T.M. / D.975-66T Grade 1D or 2D
Engine oil (with filter) :	10.2 L (9 Imp. quarts, 10.8 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, API service CC / SE / SF)
Transmission oil :	5.7 (5 imp. quarts, 6 U.S. quarts)
- Oil type	SAE 80W-140 type E.P. above -25°C (-13°F) and SAE 75 W type E.P. below -25°C (-13°F), API GL-5, MIL-L-2105 C
Speed reducer oil (if applicable) :	1.4 L (1.3 imp. quarts, 1.5 U.S. quarts)
- Oil type	SAE 80W-140 type E.P. above -25°C (-13°F) and SAE 75 W type E.P. below -25°C (-13°F), API GL-5, MIL-L-2105 C
Transfer case oil (if applicable) :	4.2 L (3.7 imp. quarts, 4.4 U.S. quarts)
- Oil type	SAE 80W-140 type E.P. above -25°C (-13°F) and SAE 75W type E.P. below -25°C (-13°F), API GL-5, MIL-L-2105 C
Differential oil :	27.3 L (6 imp. gal, 7.1 U.S. gal)
- Oil type	Dexron, Dexron II or Ford type F (M2C 33F)
Power steering tank :	5.5 L (4.8 imp. quarts, 5.8 U.S. quarts)
- Oil type	Dexron, Dexron II or Ford type F (M2C 33F)
Hydraulic declutching mechanism :	600 mL (21 imp. fl.oz., 20 U.S. fl.oz.)
- Oil type	Brake fluid - SAE 70R3
Hydraulic brake :	600 mL (21 imp. fl.oz., 20 U.S. fl.oz.)
- Oil type	Brake fluid - SAE 70R3
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 high quality grease resistant to water and which will remains 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 3/8''-24 gr.8	Outer retaining bolts (16) : 34 N•m (25 lbf•ft) Inner retaining bolts (4) : 48-45 N•m (35-40 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 45-57 N•m (33-42 lbf•ft)
Engine support (rear) / engine	1/2''-20 73-92 N•m (54-68 lbf•ft)
Rubber mount-engine / frame	3/8''-24 38-48 N•m (28-35 lbf•ft)
Engine fan bolts	5/16''-24 gr.5 20-27 N•m (15-20 lbf•ft)

BRAKES	
Service brake type	Drum (on transmission output)
Emergency / parking	- Disc (on drive line)

Bombardier Inc. reserves the right to make changes in design and specifications and / or to make additions to, or improvements in its product without imposing any obligation upon itself to install them on its products previously manufactured.

SI* METRIC INFORMATION GUIDE

BASE UNITS

DESCRIPTION	UNIT	SYMBOL
length	meter	m
mass	kilogram	kg
force	Newton	N
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	0.01
milli	m	one thousandth	0.001
micro	μ	one millionth	0.000 001

CONVERSION FACTORS

TO CONVERT	TO †	MULTIPLY BY
in	mm	25.4
in	cm	2.54
in^2	cm^2	6.45
in^3	cm^3	16.39
ft	m	0.3
oz	g	28.35
lb	kg	0.45
lbf	N	4.4
lbf•**in**	N•m	0.11
lbf•ft	N•m	1.36
lbf•ft	lbf•**in**	12
PSI	kPa	6.89
imp. oz	U.S. oz	0.96
imp. oz	mL	28.41
imp. gal	U.S. gal	1.2
imp. gal	L	4.55
U.S. oz	mL	29.57
U.S. gal	L	3.79
M.P.H.	km/h	1.61
Fahrenheit	Celsius	(°F − 32) ÷ 1.8
Celsius	Fahrenheit	(°C × 1.8) + 32

*The international system of units abbreviates SI in all languages.

†To obtain the inverse sequence, divide by the given factor. To convert "mm" to "in", divide by 25.4.

NOTES

CHANGE OF ADDRESS OR 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