

BOMBARDIER SNOWMOBILE

OPERATOR'S MANUAL

R12 R15

[1953]



BOMBARDIER SNOWMOBILE LTD

L'AUTO-NEIGE BOMBARDIER LTEE

VALCOURT, QUE, CANADA

GENERAL INFORMATION

WEIGHT & DIMENSIONS:

	<u>12 passengers</u>	<u>15 passengers</u>
Weight	4,200 lbs	4,300 lbs
Length:	17' 8"	17' 8"
Width:	59"	78"
Road clearance:	13"	13"
Height	78"	78"

PERFORMANCE:

Maximum speed:	45 M.P.H.
Cruising speed:	25-30 M.P.H.
Ground pressure:	Less than 1 lb. per sq. inch.

ENGINE AND POWER TRAIN:

Engine	Chrysler.
Displacement	250.6 cu. in.
Brake Horse power ..	115 H.P. at 3600 R.P.M.
Clutch	Dry, disc type.
Transmission	3 forward 1 reverse.
Propeller shaft	Tubular.
Universal joint	Cross and trunion.
Differential	Hypoid ratio 4.1 to 1.

STEERING:

Type	Pinion and rack.
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TRACK AND SUSPENSION:

Track type:	Rubber belt with steel cross links
Length	22' 6".
Width	17 $\frac{1}{2}$ "
Suspension type	Cross tube and bogie.
Wheels	Drop center type.
Tires	4.50 x 16 4 plies.
Tire pressure	35 lbs p.s.i.
Tread width	12 pass: 42"; 15 pass: 58".

BODY:

Type	All steel construction.
Frame	Toboggan type.

CAPACITIES: (imperial measures)

Fuel tank:	12 pass: 13 gals; 15 pass: 16 gals.
Extra gas tank	Available.
Cooling system	15 qts.
Crankcase	4 qts.
Transmission	1 qt.
Differential	3 qts.

DATA PLATE:

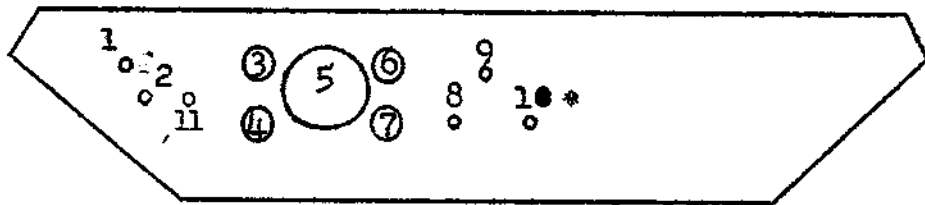
Location: In engine compartment on right hand side,
tacked to the door post.

OPERATING INSTRUCTIONS

SECTION I

INSTRUMENTS AND CONTROLS

INSTRUMENT PANEL



The following gauges and controls are found on the instrument panel:

1. HEAD LIGHT SWITCH
To operate head lights, pull on knob.
2. IGNITION SWITCH
Turn ignition key to the right for "ON" position.
3. AMMETER
This gauge shows the net amount of current flowing through the electrical system.
4. TEMPERATURE GAUGE
Registers the heat condition of the engine. If abnormally high temperature is registered, an immediate check should be made to ascertain the cause of over-heating and bring immediate remedy to prevent damage to the engine.
5. SPEEDOMETER
With the standard 4.1 to 1 differential the speedometer registers double the actual mileage of the snowmobile.
6. OIL PRESSURE GAUGE
Normal pressure, when the engine is running, should be 40 lbs/sq.in. If the pressure should drop suddenly or not register, stop immediately and ascertain the cause of the pressure failure to prevent permanent damage to the engine.

7. FUEL GAUGE
Indicates amount of fuel in fuel tank.
8. WIPER SWITCH
To operate electric wiper, pull on switch knob.
9. DOME LIGHT SWITCH
Pull switch knob to light dome lamp.
10. HEATER SWITCH
Pull knob to operate heater motor.
11. STARTER BUTTOM: push to engage the starter.

CONTROL

1. CLUTCH PEDAL
The clutch pedal is used to disconnect the engine power from the transmission. When the pedal is depressed, the transmission gears can be shifted; releasing the pedal engages the power of the engine. The pedal should have a "free play" of 1 inch before the clutch starts to release to assure positive engagement. Too much free play will prevent the clutch from disengaging completely causing difficult shifting. Not enough free play may cause clutch slippage.
2. BRAKE PEDAL
The brake pedal operates the mechanical brake on the brake drum on the end of the transmission mainshaft. Being entirely in the interior of the vehicle, it is protected from outside interference such as snow or ice.
3. ACCELERATOR PEDAL
This pedal is used to control the speed of the engine.
4. DIMMING SWITCH
This foot-operated switch is used to change the headlights from high beam to low beam and vice versa.
5. GEARSHIFT LEVER
The gearshift lever is situated below the steering wheel and is used to change gears in the transmission with remote gearshift controls.

S E C T I O N II

A OPERATING THE ENGINE

1. STARTING THE ENGINE. Place transmission gearshift lever in neutral position and depress the clutch pedal to relieve the engine of transmission load; turn on the ignition switch and press on the starter button. No hand choke is required as the engine is equipped with an automatic choke. After the engine has started, let it run a few minutes at idle speed so that all the moving parts will be properly lubricated before running the engine under load. Do not race the engine when it is cold as this will cause abnormal wear to the moving parts. Check all instruments for normal reading before driving off.

In extremely cold temperatures the crankcase should be filled with grade 5W engine oil. If power is readily available, an engine block coolant heater can be installed and plugged in for a few hours; this will warm up the engine block and help in starting the engine. Another aid in starting a cold engine is the use of a second battery connected in parallel with the one in the vehicle.

The door at the rear of the snowmobile is for controlling the air which is drawn through the radiator to cool the engine. This door can be opened as required to keep the engine at the correct temperature.

In extremely cold temperature, the vents in the motor compartment doors can be closed with cardboard which will help to keep the engine warm.

2. CARE OF A COLD ENGINE. A cold engine required particular care during the warming-up period. Before driving the vehicle, the engine should be run at idle speed for a few minutes and then, driven slowly until normal temperature has been reached. It must be remembered that in a cold engine, the oil is thicker and does not reach the moving parts as easily as when it is warm. Excessive speed with a cold engine will cause high temperatures to develop too quickly in the bearings and pistons and will damage these parts.

3. "BREAKING IN" NEW ENGINE. The life of a new engine depends to a large extent, on the care it receives for the first 500 to 1,500 miles of operation. A new engine has very close fitting parts; a thin film of lubricant prevents excessive wear of the moving parts. Driving a new engine at high speeds would create an extremely high temperature of the frictional surfaces with the danger of breaking down the oil film between the moving parts and causing permanent damage to the engine. Therefore, it is important not to drive in excess of 35 miles per hour (Speedometer reading) until the vehicle has covered its first 500 miles. During the next 2000 miles, the speed may be gradually increased to complete the "breaking-in" process but no continued high speed should be made until the vehicle has covered 2,500 miles. This mileage is necessary to make sure that all internal engine friction has been minimized and that the bearing surfaces have been burnished to a smooth glazed surface which has much to do with the length of the life of the engine parts.

B OPERATING THE VEHICLE

1. To place the vehicle in motion, second speed can usually be used except when starting on steep hills; due to the small size of the sprocket gears in comparison with the standard wheels, the driving power of the engine is increased considerably; this accounts for being able to drive off in second speed. Low speed is used for unusually hard starting or driving conditions.
2. To cross snow banks, ditches or other road hazards, gear down to have plenty of power in reserve in order to be able to cross the obstacles without stalling; steady movement without the momentary halt necessary for gear change is desirable as once the snowmobile is halted in deep snow, there is the risk of spinning the tracks with the result that the bottom of the vehicle would be jacked up on the snow

If the tracks start spinning, back up to pack the snow and beat tracks; try again with enough speed so that the momentum will carry the vehicle through the obstacle without spinning the tracks.

3. Driving on hard or packed snow does not present any difficulties. However, on deep soft snow, the snowmobile should be driven at a regular moderate speed to prevent stalling and "digging in" the snow.
4. Steering a snowmobile is somewhat different from steering a standard motor vehicle. On snow, steering is positive and is effected without difficulty. The steering mechanism is so arranged that the skis "bank" on turns and in ordinary snow conditions, turns are made quite easily. However, to make a turn on hard surfaces such as ice or cement, approach the turn at a moderately high speed, turn the skis in the required direction and release the accelerator suddenly; by doing so, the compression of the engine will act as a brake, bringing more weight to bear upon the skis; the runner shoes will bear more heavily against the asperities of the surface and will help very much to make the desired turn.
5. Changing from skis to wheels or vice-versa: when a jack is available, this operation is rather simple; jack up the front end of the vehicle until the skis clear the ground. Remove the spindle nut and washer and the bolts at the top of the ski bracket; the ski and bracket will come off as an assembly. Mount the wheel and adjust the bearings properly.

To change from wheels to skis, reverse the foregoing operations.

When a jack is not available, run the front end of the snowmobile on the edge of a square cut snow bank or ditch or on a small ridge so that such an obstacle serve the purpose of a jack to hold the front part of the snowmobile up leaving the skis suspended. The change-over described above can then be made.

MAINTENANCE INSTRUCTIONS.

PREVENTIVE MAINTENANCE:

To obtain maximum efficiency, it is necessary that the snowmobile be inspected every day it is operated, so that defects be discovered and corrected before they result in serious damage or failure. Scheduled maintenance services should be performed at established intervals especially regarding lubrication and cooling. More information in the section "Maintenance Schedule" is given later in this booklet.

SKI AND FRONT SUSPENSION:

The ski assemblies consist of four major parts held together by means of axles and nuts. The runner shoe of the ski is the part that should be inspected from time to time and replaced whenever deemed necessary. If the vehicle is operated on snow covered terrain only, the skis will not require frequent servicing. However, if driven on ice or bare ground, the runner shoe will wear out more rapidly and require replacement.

To replace the runner shoe, jack up the front end of the vehicle and remove the runner shoe nuts and drive out the worn runner shoe, front end first. Install new runner shoe rear end first and by tightening the nut installed at the rear end, the front end will come in position. Install the nut on the front end and tighten. When a runner shoe is replaced it is time to check the conditions of the ski assembly bolts; tighten or replace the bolts if necessary. The ski support bracket is fastened to the ski on adjustable tapered roller bearings.

On the recent models of snowmobiles the ski is interchangeable with a set of wheels for operation on bare ground or muddy roads. Caution should be taken to grease the wheel bearings properly when installing them. (See operating instructions for changing from skis to wheels and vice-versa.) The front suspension spindle and steering arm

assembly is connected to the knuckle arm and spring seat assembly with a king pin and tapered roller bearings. For disassembling the king pin, the nut should be taken off and the king pin driven out. When assembling the king pin, the bearings should be packed with grease.

The knuckle arm and spring seat assembly is mounted to the chassis of the snowmobile on an axle and tapered roller bearings. These bearings are adjustable. To readjust these bearings take off the cotter pin of the knuckle arm axle nut which can be reached from the inside front section of the body and tighten. Shims can be used if proper adjustment cannot be reached. These shims are to be installed between the bearing cone and the side of the frame. When satisfactory adjustment is made install a new cotter pin on the nut. To remove the front spring, the lower rubber bumper should be taken off so that the knuckle arm can reach a lower point; the spring is then pressed up with a steel bar and driven off the seat. For installation, reverse the operation to drive the front spring in position.

TRACK & REAR SUSPENSION:

The Bombardier snowmobile is of the half track type. The rear suspension mechanism consists of eight bogie wheels and pneumatic tires, four on each side, supported by means of individual and independent body spindles with plenty of action to assure maximum mobility. The bogie wheel body spindles are coupled 2 by 2 and linked to a heavy duty bogie spring assuring the best comfort obtainable when travelling over rough Winter conditions. The power is transmitted to the tracks by means of drive sprockets.

TRACK INSTALLATION AND ADJUSTMENT:

The installation of a track on a snowmobile is quite simple when the vehicle is in a shop and when a jack and tools are available. However, the operation becomes more difficult in the field where the minimum of facilities exist. The following instructions give the details for installing the tracks easily:

- A: The adjusting screw nut and tube should be loosened as much as possible leaving only about 4 threads screwed in the adjusting screw.

B: The track is then installed on the sprocket gear first. When a jack is available, jack- up the rear part of the snowmobile until all the wheels are off the ground and install the track on the top of all the wheels and force over the rear wheel to slip it in position.

When no jack is used especially for installation in the field, the track is still installed on the sprocket first. It is then slipped underneath the first, second, third, and fourth wheel. The power of the engine is used to force the track over the rear wheel. If and when the track on which you are not working is the one turning when the power of the engine is applied, that sprocket should be blocked by means of a wooden block inserted between the sprocket and the member of the body. This will transfer the power where you need it. To remove the track, release or dismount completely the adjusting screw nut and tube and pry off the track from the rear wheel.

Each track is adjustable independently by means of an adjusting screw operating the adjuster unit of the rear wheel. To obtain the proper tension, remove the locking wire of the adjusting screw nut and tube and using an open end wrench of 1-5/16" or an adjustable wrench tighten or loosen to obtain the proper tension of the track which is at normal tension when it is possible to raise it by hand two or three inches from the top of the second front wheel. The operator soon discovers that with too much tension it takes more power to operate the vehicle and that this will cause premature wear of the sprocket rubber. If the track is too loose it may fall off under adverse conditions and in sharp turns.

NOTE: The rear wheels are installed with the front end facing outward a bit; they will fall back in the straight ahead position when the tracks are installed and adjusted; the weight and the tension of the tracks bring them back in the correct alignment.

The track belts of all the new units are endless and reinforced with steel cable; they do not vary in length due to stretching or shrinkage, consequently the adjustment will remain good for long periods. So that the tracks remain adjusted when proper tension is reached, lock the adjusting screw nut in position by a locking wire.

BOGIE WHEELS BEARINGS:

The bogie wheel bearings are well protected against dust, sand and ice by a mud excluder and a grease seal. However due to the importance of this item and for good results with the snowmobile we recommend that the adjustment of the bogie wheel bearings be checked often especially when the vehicle is used for heavy duty tasks under the most adverse conditions. To adjust the bearings, rotate the wheel while tightening the spindle nut until the wheel becomes somewhat hard to turn and you are sure the bearings are tight. Back off the adjusting nut one half to one full constellation as necessary to install cotter pin. When the vehicle is jacked up the bearings of the front and the two intermediate wheels of the rear suspension can be adjusted. For the rear wheel it is necessary to remove the track.

BODY SPINDLE - BOGIE SPRING AND LINKAGE:

The body spindles are installed on the rear suspension cross shafts and operate through needle bearings. These parts do not necessitate much attention except for lubrication and inspection at the overhaul. The springs are in a cage and also require no maintenance; excessive shock or impact only may damage them. When operated in slush during a very cold period, ice may build up on the bogie spring and it will then be necessary to break and remove this ice which may impair the performance of vehicle and cause wear of the tire. The bogie spring and link bolts and nuts should be checked from time to time and kept tight.

BOGIE WHEEL TIRES:

On the snowmobile rear suspension, the tires do not wear out evenly, the exterior side wears out more quickly than the interior side and the front tire more quickly than the rear one. To increase their life, the tires should be rotated. The first rotation will be made between the front and rear wheels. Then, when all the tires show an even wear on the exterior side, they should be dismantled from the wheel and changed sides.

The snowmobile bogie wheels are of the drop center type and the tire can be removed easily by following the standard procedure. For tire repairs or replacement it is possible to remove the 3 front wheels of the rear suspension when the vehicle is jacked up; for the rear wheel it is necessary to remove the track.

STEERING MECHANISM:

Toe-in adjustment should be given to the skis of a snowmobile and the front end of the skis should be $\frac{1}{4}$ " closer than the rear when the runners are in the straight ahead position. To obtain the adjustment required it is necessary to uncouple the steering tie rod end assembly from the steering arm, loosen the tie rod clamp bolt and turn the tie rod end one way or the other as required. When the wheels are installed in place of the skis, the toe-in should be $\frac{1}{8}$ ".

ENGINE, FUEL & EXHAUST SYSTEMS:

For engine maintenance see the Chrysler Industrial Engines Maintenance Manual supplied with each unit.

The muffler and exhaust outlet of the snowmobile is on the left side of the unit. The muffler used is of a special construction, strong and sturdy. Due to its location and the fact that when necessary, the warm air of the engine compartment can be circulated through the passenger compartment, the condition of the muffler and exhaust gasket as well as the exhaust outlet bolts should be checked occasionally.

The fuel tank is located at the rear part of the vehicle and the fuel lines are short requiring but the minimum of attention; the possibilities to have defects caused by frost are reduced to a minimum. The choke is of the automatic type and the foot accelerator control linkage is located between the bottom plate of the vehicle and the floor board sheltered from ice and frost. The accelerator linkage is adjusted by turning the swivel of the accelerator rod; this part is located close to the carburetor in the engine compartment.

CLUTCH AND BRAKE:

The clutch control rod is installed in the interior of the vehicle under the floor boards and is protected against damage due to snow or ice adhesion. Adjustment is made by turning the clutch rod adjuster located near the engine. The clutch adjustment should be checked often making sure the pedal has $\frac{5}{8}$ to 1" free travel before the clutch starts to release. Too much travel will prevent the clutch from releasing completely causing difficult shifting. A too tight adjustment will cause clutch slippage.

The brake system used on the snowmobile is mechanical; it acts on the propeller shaft. Being entirely in the interior of the vehicle, it is protected from snow or ice. Adjustments are made by the adjusting nut on the brake rod.

TRANSMISSION & PROPELLER SHAFT.

The transmission used in the Bombardier snowmobile is the standard 3 speeds forward and one reverse. It is operated through a special mechanism consisting of linkage, cross shaft and rods. The system is adjustable by means of a clevis and adjusting nuts and everything is located in the interior of the unit free from ice, mud, etc. Gearshift is effected through a control rod and a selector rod. If shifting is hard, the cause should be found in the adjustment of the rods which are adjustable at the following places: A: steering to cross shaft selector adjusting rod at the lower part of the steering column; B: Cross shaft to transmission selector rod at the cross shaft lever and: C: cross shaft to transmission gearshift control rod at both ends through clevis.

The following procedure is recommended to obtain proper adjustment: A. When transmission is properly engaged in second gear, the selector rod should have a free play of 1/16" of an inch; if this is not obtained, tighten or loosen the adjusting nuts of the selector adjusting rod or the selector rod; B. The adjustment of the control rods is perfect when the transmission is properly engaged in reverse and a clearance of 1/16" of an inch exists between the steering mast jacket and the tube and socket of the gearshift lever. Check this on the upper part of the steering column.

DIFFERENTIAL AND DRIVE SPROCKET:

When used in our snowmobile, the differential is installed up-side down and sheltered from the usual coolant such as water snow and fresh air which ordinarily cool the differential of a standard motor vehicle. For this reason more attention should be given to this part when the vehicle is used for extremely heavy duty tasks. The instructions for lubrication should be followed closely.

The drain plug on the differential cannot be used on account of its location and to drain it, it is necessary to remove the differential carrier and housing assembling bolts located over the differential draining hole. (2 lower bolts)

The instructions concerning the adjustment of the differential carrier parts are not covered in this booklet and are similar to those governing the adjustment of standard automobile differentials of the same make and type. For drive axle bearing adjustment, the same thing applies.

SPROCKET:

On new snowmobiles, the tracks tend to stick to the sprocket and in certain cases, may jump a sprocket tooth. This is due to the new rubber being sticky and to the paint on the cross links which sticks to the rubber.

To prevent this condition on a new vehicle, it is suggested that dry pavement be avoided and that the vehicle be run through wet places whenever possible as water will lubricate the sprocket and prevent the cross links from sticking to the rubber.

As soon as the paint has worn off on the inside of the cross links and the rubber has been seasoned by dirt or water, the condition mentioned above will cease.

No trouble will be encountered if a new vehicle is run on snow or in wet conditions.

ELECTRICAL:

For engine electrical accessories, see Chrysler Industrial Engines Maintenance and Parts Manual supplied with each unit.

The battery supplied as original equipment is a 6 volts 17 plates battery and due to the importance of keeping it in good condition, it should be checked periodically.

To remove the head light sealed beam, -1- take off the housing ring by loosening the bolt and nut located at the bottom of the housing -2- disconnect cable from lamp unit.

To adjust the head light, loosen the mounting bolt nut and turn the head light in the desired direction; when proper adjustment is reached tighten mounting bolt nut.

COOLING SYSTEM:

The cooling system of a snowmobile consists of the standard cooling mechanism used on motor vehicles with the exception that the air is not pushed through the radiator core by the motion of the vehicle. The radiator being installed at the rear of the vehicle the air is drawn in by the fan and cools the water or anti-freeze.

MAINTENANCE SCHEDULE

NOTE

The instructions given below are for normal operation on snow. When operating in mud, maintenance should be done two or even three times more often depending on the conditions.

FRONT SUSPENSION:

Knuckle Arm Bearings: Every 1,000 miles; grease fitting at end of knuckle arm axle. Use pressure gun grease.

King Pin Bearings: Every 1,000 miles; grease fitting on top of king pin. Use pressure gun grease.

Wheel Roller Bearings: Every 1,000 miles; grease fitting on hub cap; insert high quality bearing grease as required.

Ski Support Axle Bearing: Every 1,000 miles; grease fittings on end of axle. Use pressure gun grease.

REAR SUSPENSION:

Bogie Spindle Assembly: Every 500 miles; grease fitting (Part no: A-4132). Use pressure gun grease.

Axle adjuster unit: Every 1,000 miles; grease fitting on end of axle (Part no: 4107). Use pressure gun grease.

Wheel Bearings: Every 1,000 miles; greasfitting on nub cap; insert high quality bearing grease as required.

Bogie Spring Links: Apply grease on the bushings or bolts of the bogie spring links to lengthen the life of these parts.

Adjusting screw Nut and Tube: Insert grease in the nut and tube.

Adjuster Unit to Cross Shaft (Part no: B-4100):
Grease when remounting to prevent rust.

STEERING MECHANISM:

All the steering mechanism parts are easily accessible by removing the cover behind the heater. The following lubrication is recommended:

Bearing steering Shaft: Every 1,000 miles; grease fitting at the lower end of the mast jacket. Use pressure gun grease.

Rack Housing: Every 1,000 miles; grease fitting at the front right hand side. Use pressure gun grease.

Sliding Joints: Once a year at overhaul; apply grease on the sliding joints.

Tie Rod Ends: Every 1,000 miles; grease fitting on tie rod end. Use pressure gun grease.

Steering Rack and Pinion: Grease at overhaul.

TRANSMISSION:

The oil level in the transmission should be checked every 1,000 miles. A high grade fluid gear lubricant of recommended viscosity SAE 80 should be used. This lubricant should be changed one a year at overhaul.

The cross shaft which operates the selector rod should be lubricated every 1,000 miles through the grease fitting. The end brackets should be oiled through the oil holes for this purpose.

All the other joints should be lubricated at the seasonal overhaul.

The propeller shaft used in the snowmobile is a modified passenger vehicle shaft. The splined yoke has a grease fitting for lubrication every 1,000 miles.

DIFFERENTIAL:

The differential used is of the passenger type, ratio 4.1 to 1. The engine being in a reversed position, the differential has to be inverted in order to operate the vehicle. In this inverted position, the oil level has to be higher than when it is in the standard position; therefore the differential should be filled $3/4$ " below the oil plug level.

The lubricant recommended for this differential is SCL extreme pressure hypoid gear lubricant which is specially designed for hypoid gears. Viscosity SAE 80 or 90 should be used according to the temperature.

Check the oil level every 1,000 miles under normal condition, more often if working under adverse conditions. Make sure there are no leaks. Never mix different brands of hypoid lubricants; if the oil level is low, drain off, rinse with cleansing oil (not kerosene) and refill with new lubricant.