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THE ZIS-150 TRUCK

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The Moscow Automobile Plant imeni Stalin has begun the series production of the ZIS-150 truck, a four-wheel machine with rear wheel drive (4 x 2). The ZIS-150 is designed to carry loads up to 4 tons on hard-topped roads, but, over rough terrain, the speed of the truck and the load carried must be reduced.

The truck weighs 3,900 kilograms unloaded. Its maximum length is 6,720 millimeters; width, 2,385 millimeters; height, 2,180 millimeters; wheel base, 4,000 millimeters; front track, 1,700 millimeters; rear track, 1,740 millimeters; front axle clearance, 325 millimeters; and rear axle clearance, 265 millimeters. Minimum turning radius, according to external track of the wheels, is no more than 7.5 meters to the right and no more than 8 meters to the left.

Maximum speed of the truck on the highway is 65 kilometers per hour. Fuel consumption in summer when fully loaded is 30 liters per 100 miles. The truck can travel an average of 420 kilometers before it requires refueling.

The truck has a 90-horsepower, six-cylinder, four-cycle motor which operates on standard gasoline. To reduce wear on basic parts, and to make possible use of lower-grade gasolines, the motor is equipped with an up-draft carburetor, and intake manifold with rectangular cross section (type ZIS-5), and employs comparatively high preheating of the working mixture. The indicated advantages compensate for the relatively low horsepower per liter of displacement of the motor (16.2 horsepower per liter).

The ZIS-150 motor is similar to the ZIS-5 motor in size, points of attachment, and location of units. The cylinder block is reinforced with ribs, and adequate thickness of the cylinder walls (5-7 millimeters) leaves reserve thickness for boring the cylinders during repairs and for installing sleeves.

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The crankshaft is counterweighted, and the hollow crankpins are connected to the main journal by lubricating passages. The crankshaft journals are surface hardened by high-frequency current. The crankshaft and connecting-rod bearings have interchangeable thin-walled babbitt bushings. All bearing caps are centered: connecting rod caps are fixed by ground collars on the connecting rod screws, the crankshaft bearing caps by a raised edge in the block bed. A bearing shim, 0.05-millimeter thick, is placed under each bearing cap at the joints. One of these shims is removed the first time that piston rings are changed, at approximately 15,000 kilometers.

The aluminum-alloy split-skirt pistons have three compression rings and one oil ring. Side-to-side motion of the floating-type piston pins in the piston is prevented by spring locking rings. A channel drilled along the entire length of the connecting rod feeds oil to the piston pin.

Two spiral timing gears are located at the front end of the block. The driving gear is steel and the driven gear is iron. The gap between the valve lifters and the valves is set at 0.20-0.25 millimeter when the motor is warm.

The oil pump, immersed in the oil, is driven from the camshaft. From the pump, the oil passes through two filters. One is in series (all oil passes through it) and is cleaned by hand. The handle of this coarse oil filter should be turned once a day when the truck is in operation. Connected in parallel is a filter-regenerator with a replaceable paper cartridge through which 3-5 percent of the oil circulated by the pump passes. The oil cleaned by this filter runs into the crankcase.

The main oil-supply line is a hole drilled through the entire left side of the block. A reduction valve at the front end of the supply line is set at a pressure of 2.5 kilograms per square centimeter and does not have to be regulated during operation. Excess oil from the reduction valve flows onto the timing gears.

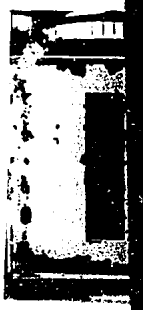
Transverse oil holes are drilled from the main oil line to the main journal supports of the crankshaft, the camshaft support, and the breaker-distributor drive. The oil system holds 8 liters. Avtol 6 is used for winter and Avtol 4 is used for summer lubrication. Motor oil should be changed every 1,500 kilometers.

The motor has a forced circulation, hermetic water-cooling system. A centrifugal water pump forces the water into a distributing pipe which carries it to the hottest points of the motor. A thermostat in the cylinder head regulates water temperature. A by-pass pipe prevents complete stoppage of water circulation by the thermostat (for example, when starting the motor in winter).

The fan is mounted on the end of the water pump shaft with which it has a common drive. The shaft bearings are protected from water penetration by a gland exactly like the one on the GAZ 51 truck. Capacity of the cooling system is 21 liters. The system is drained by two petcocks; one on the cylinder block, the other at the bottom of the radiator.

The new MKZ-14V carburetor used on the ZIS-150 is somewhat different in design from the MKZ-6 carburetor used on the ZIS-5 truck. It has a pneumatic governor which limits the maximum speed of the truck to 65 kilometers per hour. This governor automatically turns off the accelerator when the velocity of the incoming air exceeds a fixed limit. The cone valve in the accelerator pump has been replaced by a ball valve supported by a spring. The economizer is separate and is pneumatically driven.

Idling speed and minimum revolutions per minute of the motor can be adjusted in the field, but adjustment of maximum revolutions per minute on the governor can only be done in specially-equipped workshops.



The motor is equipped with a B-6 diaphragm-type fuel pump with a device for hand pumping and a residue chamber. The gasoline tank holds 150 liters. The gasoline is filtered twice in the fuel system of the ZIS-150 -- by a special filter-settler in the main fuel line, and by the fuel-pump filter. The capacity of the fuel-line filter-settler is large. The filter-settler should be emptied once a month by means of the drain plug on the bottom.

The 12-volt electrical system is of the single wire type with a plus charge and is grounded on the frame. The G-15, 150-watt generator works in conjunction with an RR-15 regulator and a 6ST-100 storage battery. The ST-15 electric starter develops a maximum power or 1.8 horsepower at 1,500 revolutions per minute.

The battery-operated ignition system is made up of the following elements: an R-21 distributor with centrifugal and vacuum regulation of spark advance and an octane corrector, an ignition coil with additional resistance which is shunted during starting, 14-millimeter "Lenkarz" spark plugs (type MA11-14 or MA11-11), and a PVL brand ignition switch and high-voltage wire

The motor should not be run at low idling speeds for long periods because too much oil may collect on the spark plugs, causing the motor to miss.

Correct adjustment of the ignition is important for efficient operation of the motor. To adjust the timing, stop the piston of the first cylinder at the upper dead center at the end of the compression stroke (going by the mark on the flywheel). Remove the distributor cap, check, and, if necessary, readjust the gaps of the breaker contacts. Then loosen the clamping bolt of the distributor plate and place the distributor shaft so that the rotor electrode is opposite the terminal of the first cylinder on the distributor cap. Mount the distributor on the motor so that the vacuum regulator is facing upward. Then set the mark "0" on the scale of the octane corrector opposite the notch on the housing surface and tighten the bolts without tightening the distributor plate clamping bolt.

Having turned on the ignition, turn the distributor housing counterclockwise until a spark appears between the end of the center wire of the ignition coil and the frame. With the housing in this position, tighten the clamping bolt of the distributor plate. Having adjusted the ignition, check to see that the wires are connected to the distributor cap according to the firing order of the cylinders: 1, 5, 3, 6, 2, 4.

Final adjustment of the ignition setting is made on the road by means of the octane corrector.

The transmission of the new truck has several innovations in design. The two-disk dry clutch is different from the one in the ZIS-5 in that the driven disks, which have friction material riveted on, are attached to separate spiders by rivets, instead of being attached to the same spider by bolts.

Adjusting the clutch is very simple. Having released the rod and engaged the clutch, tighten the three adjusting screws until they touch the second driving disk. Then loosen these screws one half to one turn (3-5 clicks of the spring) until the clutch stops pulling in the disengaged position. Connect the rod to the pedal and adjust the play of the pedal to 20-25 millimeters. The clutch sleeve ball bearing is oiled by a wick lubricator which is filled with motor oil once a month through a flanged socket and pipe screwed into the clutch housing.

The two-range, three-way gear-type transmission has five speeds forward and one speed in reverse. Capacity of the transmission housing is 8.5 liters. The lubricant must be changed every 6,000 kilometers. The transmission is lubricated with Avtol 18 in winter and cylinder oil 8 in summer.

The universal joint consists of an open-type shaft with two knuckle joints on needle bearings. The front and rear joints are identical. The bearings are lubricated with thin oil. The rear axle has a two-stage reduction gear with one pair of bevel and one pair of spur gears. The axle shaft is completely unloaded.

When the bearings of the axle-drive bevel pinion wear, it is only necessary to hone down one of the two regulating washers between the bearings. Thin steel gaskets pressed between the face of the main transmission housing and the drive pinion sleeve are used to regulate gear engagement.

Gaskets under the caps of the bearing adjusting sleeves are used to regulate the driven bevel gear and to displace it along its axis for correct engagement.

The differential is the same type as on the ZIS-5. All bearings are preloaded and adjusted at the plant, thus greatly increasing the life of the gears. The capacity of the rear axle housing is 5 liters; the lubricant, which is the same as that used for the transmission, should be changed every 6,000 kilometers.

The front axle beam has an I-shaped cross section. The steering knuckles are yoke type, and the kingpin inclination is not adjustable. The angle of inclination of the kingpin with respect to the wheels is one degree, 30 minutes (with the upper end backward); with respect to the frontal plane, 8 degrees. Camber of the wheels is one degree.

The steering gear permits a maximum turning angle of 43 degrees. The steering mechanism consists of a globoid worm and roller. When wear of the worm and roller occurs, their engagement is regulated by removing gaskets from under the nut of the steering gear case side cover. The capacity of the case is one liter; the lubricant is changed every 6,000 kilometers. Winter lubricant is bright stock oil, and summer lubricant is Avtol 18.

The front and rear suspensions of the truck consist of four semielliptic leaf springs without shock absorbers. The front springs are single; the rear springs are dual and are cushioned. The rear springs transmit shocks and reactive moment from the rear axle. When changing springs and when tightening clips, tighten the front clips first and then tighten the rear clips.

The ZIS-150 has pneumatic brakes, operated by a foot pedal, on all four wheels. There is also a hand brake mounted on the side of the transmission case. A two-cylinder air-cooled compressor mounted on the cylinder head maintains the correct pressure in the brake system. The compressor is pressure lubricated and has a dry housing. A pipe from the main supply line of the motor feeds oil to the face of the compressor crankshaft. Another pipe returns the oil to the motor by way of the rear shield of the timing gear cover. If the compression in the system changes often and shows sharp variations, check the action of the plate valves of the compressor and their seating.

From the compressor, the compressed air goes into a filter. In the lower part of the filter body, there is a drain plug for removing oil and condensed moisture. A pet cock on the filter housing is used for taking off air. The filter outlet leads to a reservoir located on the left frame side member. There is always enough reserve pressure in the reservoir for eight to ten full applications of the brakes when the compressor is not operating.

When the brake pedal is pressed, the brake valve admits compressed air from the reservoir into the brake chambers, which activates the brakes. The brake valve consists of two valves; one is kept closed by the pressure from the reservoir, the other connects the inside of the brake valve to the outside air. When the brake pedal is applied, the second valve closes and the compressed air from the reservoir flows to the brake chambers. When the brake pedal is released, the valve leading

to the reservoir is closed, and the valve connecting the inside of the brake valve to the outside air is opened. This permits the compressed air in the brake chambers to escape to the outside air, and all the brake mechanisms return to their original positions under the action of return springs. Brake chambers on the front and rear wheels consist of stamped housings, diaphragms made of rubber and linen, and covers held on by bolts. When compressed air is introduced into the brake chamber, it straightens out the rubber diaphragm, which in turn activates the push rod connected to the brake lever.

The disk-type hand brake with two mutually unloading shoes is used, as a rule, only when the truck is standing still.

The small amount of operating experience acquired to date has proved the good quality and reliability of the ZIS-150 truck.

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