

TM-10-1207  
CHANGE NO. 3  
DEC. 1, 1941

# **MAINTENANCE MANUAL**

**FOR**

## **WILLYS TRUCK**

**1/4 TON 4x4**

**BUILT FOR  
U. S. GOVERNMENT**

**MODEL MB**

**Contract Number  
W-398-QM-10757**

**U. S. A. Reg. Number  
W-2031575 to W-2047574  
W-2047614 to W-2050213**

**★ ★ ★**

**WILLYS-OVERLAND MOTORS, INC.**

**TOLEDO, OHIO, U. S. A.**

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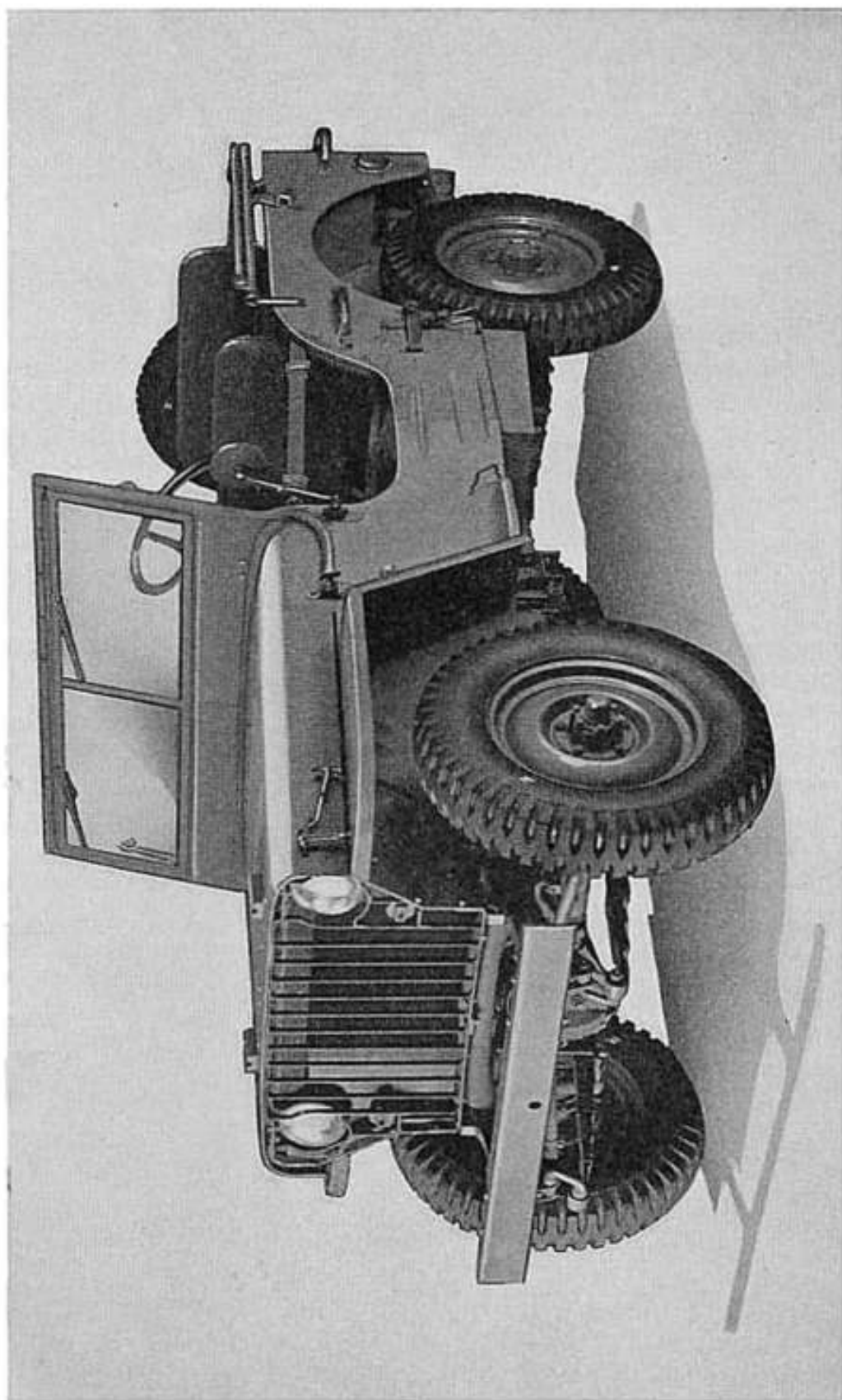
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\* These numbers refer to Parts Group Classifications in Parts List.



WILLYS MODEL "MB" ¼-TON 4 x 4 U. S. GOVERNMENT TRUCK

# WILLYS TRUCK

Model MB-¼ Ton 4 x 4

## GENERAL DATA

### ENGINE

Type.....	Gasoline
Number of Cylinders.....	4
Bore.....	3 1/8"
Stroke.....	4 3/8"
Piston Displacement.....	134.2 cu. in.
Compression Ratio.....	6.48-1
Horsepower—S.A.E.....	15.6
Horsepower { Actual.....	60
{ Revolutions per minute.....	3600
Torque { Maximum Lbs.-Ft.....	103
{ Revolutions per Minute.....	2000
Wheelbase.....	80"
Tread.....	48 1/4"
Overall Width.....	62"
Overall Length.....	132 3/4"
Overall Height—Normal Load	
To top of cowl.....	40"
To top of steering wheel.....	51 1/4"
Top up.....	69 3/4"
Weight—Maximum Pay Load.....	800 lbs.
Maximum Trailed Load.....	1000 lbs.
Shipping (Less water, gasoline and chains).....	2125 lbs.
Road.....	2315 lbs.
Gross.....	3125 lbs.

### CAPACITIES

Fuel Tank (Gals.).....	15
Engine Crankcase—Refill (Qts.).....	5
Cooling System (Qts.).....	11
Transmission (Pts.).....	2
Transfer Case (Pts.).....	3
Front Axle Differential (Pts.).....	2 1/2
Rear Axle Differential (Pts.).....	2 1/2
Oil Bath Air Cleaner (Pts.).....	1
Brake System Brake Fluid (Pts.).....	3/4

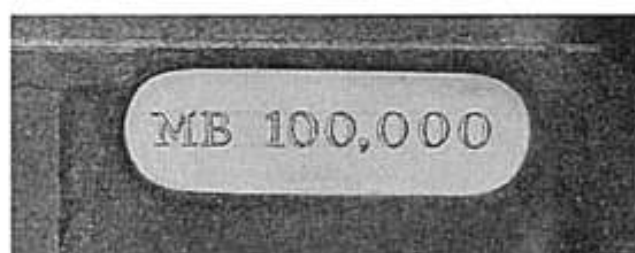
### LAMP BULBS

Head Lamp (Sealed Beam type).....	Mazda 2400
Upper Beam.....	45 Watts
Lower Beam.....	35 Watts
Blackout Fender Lamp Bulb (1).....	3 Cp. SC 63
Left Tail Lamp Bulb (1).....	21-3 Cp.DC 1154
Left Tail Lamp Bulb (1).....	3 Cp. SC 63
Right Tail Lamp Bulbs (2).....	3 Cp. SC 63
Instrument Lamp Bulb (2).....	1.5 Cp. SC 51
Fuse (Thermal Type)—On Light Switch-30 Amperes	

### IDENTIFICATION



Chassis Serial Number located on inside of frame at left front end.



Engine Number located on right side of cylinder block, front upper corner.



## UNLOADING INSTRUCTIONS

Spot freight car along side of the unloading platform. Open freight car door and make visual inspection of vehicles for damage, loose blocking and shortages, due to rough handling or pilferage while vehicles were in transit. If any evidence of carrier's responsibility, the railroad representative should inspect shipment and note it on Bill of Lading.

Vehicles are shipped from one to six in a freight car, therefore, the manner in which the vehicles are anchored in the cars varies. Where shipment does not exceed two vehicles per freight car, the regular 36 foot box car is used. Where three or more vehicles are shipped an "Evans" or "Channel" automobile freight car is used. These freight cars are equipped with upper deck platforms operated by chain falls and have anchor chains in flooring; to operate follow printed instructions on inside wall at controls.

### One or Two Vehicles per Car.

The vehicles are anchored to floor with grooved blocks at front and rear of each wheel and spiked to floor. Spring rebound straps are anchored to front end of front springs and rear end of rear springs and spiked to the floor.

To remove vehicles from car, use a crow bar to pry loose wheel blocks and straps from floor. Remove bolt in spring rebound strap at springs and remove straps.

Roll one vehicle to end of car, then jack or lift the other vehicle so it can be removed through door to platform, then remove second vehicle, and check all items listed in Tool and Accessory list.

### Three Vehicles per Car

Where three vehicles are shipped, the two end vehicles are fastened at front end with car equipment anchor chains. The rear wheels have grooved blocks spiked to the floor. Spring rebound straps at end of rear springs are also spiked to the floor.

The center vehicle is anchored at the ends of front and rear axles with car equipment chains. Spring rebound straps at end of front and rear springs are spiked to the floor.

To remove vehicles first remove all wooden blocks, spring rebound straps and anchor chains from the three vehicles. Run end vehicles to extreme ends of freight car; jack or lift center vehicle so it can be rolled through door to platform. Repeat this operation to remove other two vehicles.

### Four Vehicles per Car

Where four vehicles are shipped, one is decked and three anchored to the floor the same as in three vehicle shipment.

To remove vehicles, first remove anchor chains and wooden blocks from the three vehicles on floor and remove vehicles to platform. Follow instructions printed on inside of freight car at controls in ends of car for lowering Deck platform. Lower platform and remove anchor chains, then remove vehicle.

### Five Vehicles per Car.

Two vehicles are decked and three anchored to flooring in same manner as four to a car.

The removal of vehicles should be in the same sequence as outlined under three and four car shipment.

### Six Vehicles per Car.

Where six vehicles are shipped, two are decked and four are anchored to the floor.

The two end vehicles are fastened at front ends with anchor chains, the rear end of vehicles are anchored with grooved blocks and spring rebound straps spiked to the floor.

The two center vehicles are fastened in the opposite manner, rear ends with anchor chains and front ends with wheel grooved blocks and spring rebound straps spiked to the floor.

To remove vehicles remove wheel blocks, spring rebound straps and anchor chains. Roll end cars and one center car to end of freight car, jack or lift other center vehicle so it can be removed to platform, then remove other three.

Lower one decked vehicle by chain falls, following instructions printed on wall. Then remove second decked vehicle in same manner.

## PRE-OPERATION INSTRUCTIONS

All vehicles are carefully tested and inspected before leaving the factory, however, while in transit and unloading some things may happen which will require attention before putting vehicle into Service. We therefore suggest checking the following items before operating vehicle.

1. Fill radiator and check all connections for water leaks.
2. Check oil in engine, transmission, transfer case, front and rear differential housings.
3. Fill gasoline tank and check fuel system for leaks.

4. Check battery fluid level.
5. Check terminal connections at battery, generator, voltage control, starter, distributor and spark plugs.
6. Check operation of lights and horn.
7. Check brake fluid level in master cylinder and check connections for leaks or damage.
8. Check steering connections and front wheel alignment.
9. Check tire pressure, inflate to 30 lbs.
10. Check hand brake operation.

## DRIVER'S INSTRUCTIONS

*This vehicle should not be driven faster than 40 miles an hour for the first 100 miles nor more than 50 miles an hour from 100 to 500 miles. If the vehicle is operated at excessive speeds while new, the closely fitted parts may possibly become overheated, resulting in serious damage to mechanical units. Never race the Engine while making adjustments or when vehicle is standing idle.*

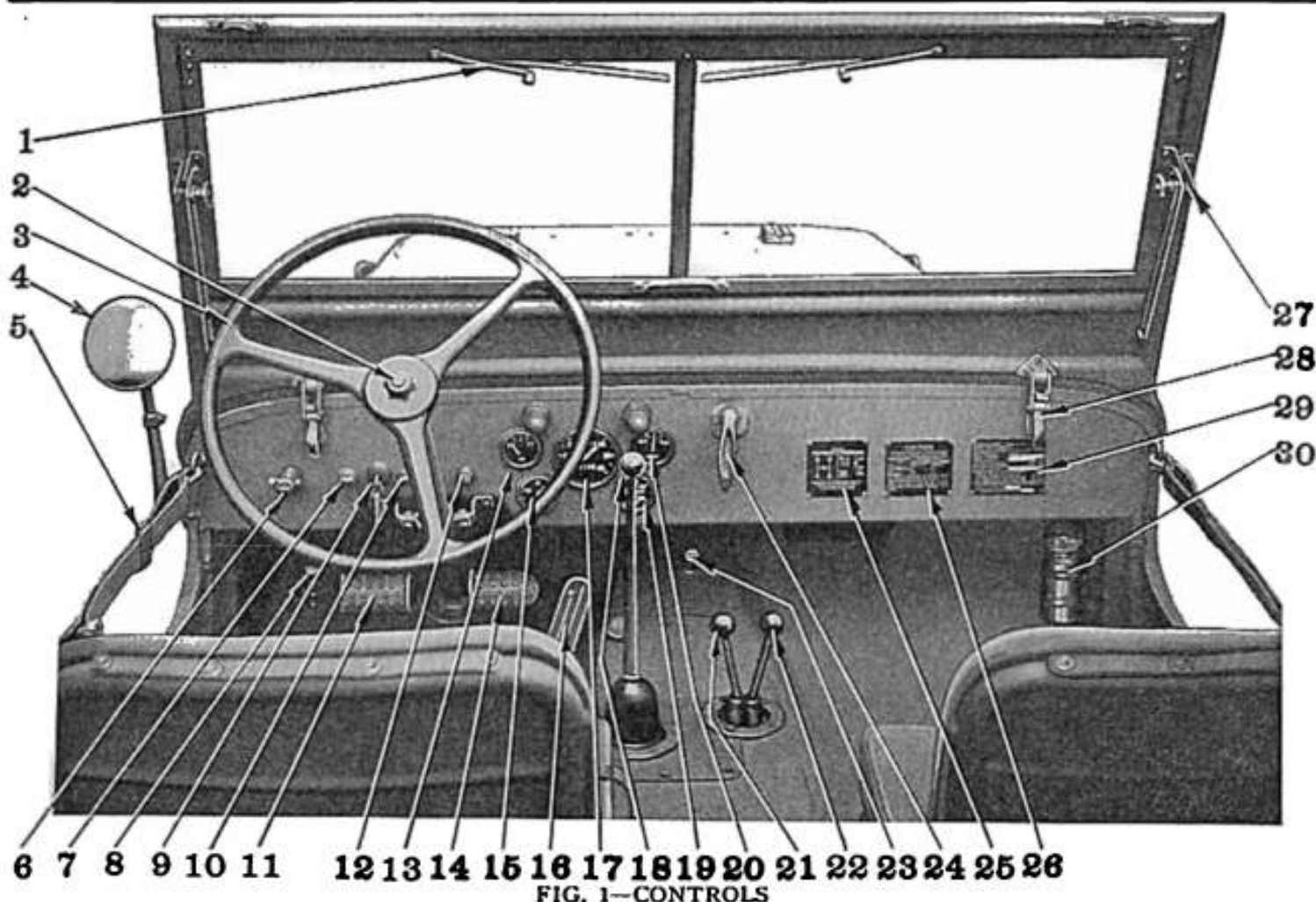


FIG. 1—CONTROLS

It is very important that the driver of this vehicle be thoroughly familiar with the various Controls and their proper use. The most experienced driver should study the Controls because there are a number which are not ordinarily found on standard vehicles.

Illustrations show the controls, instruments and instruction plates; in the following paragraphs we refer to these illustrations by the key numbers so the reader may easily follow the instructions.

### Ignition Switch—No. 9, Fig. 1.

Is operated by a key, turning key to right (clockwise) closes the ignition circuit. Turning key to left (counter clockwise) opens the ignition circuit and shuts off the engine.

### Light Switch—No. 6, Fig. 1

The light switch is the push-pull type with safety lock.

This switch controls the entire lighting system including the instrument panel lights and stop lights.

When the control knob is pulled out to the first position, the blackout lamp circuit is closed—which consists of two fender lamps, stop and tail lamps.

To obtain white lights, push in lockout control button on left of switch and pull out control knob

to second position. This closes entire bright light circuit, which consists of two head lamps—instrument panel lamps, stop and tail lamps.

**CAUTION:** When driving during the day press in lockout control button and pull Control Knob out to the last or Stop Light position to cause regular Stop Light to operate.

### Panel Light Switch—No. 12, Fig. 1.

The Panel Light switch controls the Panel Lights when the main Light Switch is in Service or bright light position, otherwise the Panel Lights do not operate.

### Head Lamp Beam Control Switch—No. 8, Fig. 1

Pressing and releasing the button of the selector foot switch with the left foot alternately changes the headlight beam from high to low.

### Starter Switch—No. 23, Fig. 1

Toe board mounted to the right of the accelerator; pushing button down closes starter circuit and causes starter to crank engine—release the button as soon as the engine starts.

### Hand Throttle—No. 10, Fig. 1.

Pulling control button out opens carburetor throttle valve and increases engine speed.

**Carburetor Choke Control—No. 7, Fig. 1**

Pulling control button out closes choke valve in carburetor to enrich gas mixture for starting the engine when cold, and opens throttle valve slightly for faster idle speed.

**Oil Gauge—No. 15, Fig. 1**

The instrument panel oil gauge indicates oil pressure delivered to camshaft, crankshaft, timing chain and connecting rod bearings when engine is running.

Proper registration should be not below 20 on idle nor more than 80 at speeds above 10 miles per hour.

This gauge does not indicate the amount of oil in crankcase.

**Ammeter—No. 20, Fig. 1**

The ammeter is used to indicate when the generator is charging the battery. It also indicates the amount of current being consumed.

If the ammeter shows discharge at all times, the cause should be immediately investigated and corrected, otherwise the wiring may be damaged and battery discharged.

**Fuel Gauge—No. 13, Fig. 1**

The fuel gauge registers the amount of fuel in the gas tank when ignition switch is turned on. The dial graduations are for—empty, 1/4, 1/2, 3/4, and full.

**Temperature Indicator—No. 19, Fig. 1**

This is a thermal type gauge and registers the temperature of the liquid in the cooling system. The operator should watch this instrument closely.

The normal operating temperature is indicated when hand stands between 160 and 185. The driver should immediately investigate the cause if temperature becomes excessive. Continuous operation of an overheated engine will cause serious damage.

Never fill cooling system with cold water when engine is overheated.

**Speedometer—No. 17, Fig. 1**

The Speedometer indicates the speed at which vehicle is being driven. The Odometer (in upper part of speedometer face) registers the total number of miles the vehicle has been driven.

A trip mileage indicator (in lower part of speedometer face) gives miles covered on any trip. It

can be reset by a knurled control shaft extending through the rear of the speedometer.

**Nomenclature Plate (Name Plate)—Fig. 2**

The nomenclature plate identifies this vehicle and gives the manufacturer's model and serial number, date of delivery, recommended fuel and lubricating oil. Service publication numbers are also given for reference. (When ordering parts be sure to give serial number). See No. 20, Fig. 1.

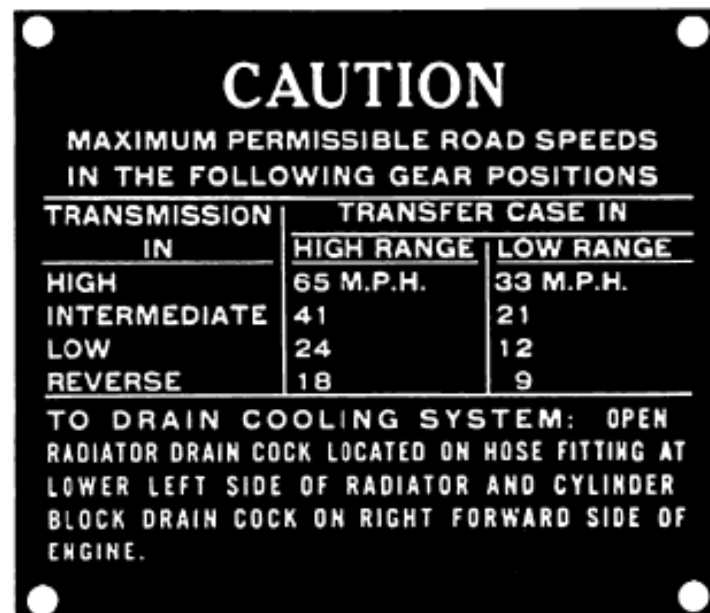


FIG. 3—CAUTION PLATE

**Caution Plate—Fig. 3 & No. 26, No. 1**

Covers maximum permissible road speeds in different gear positions and gives instructions relative to complete draining of the cooling system.

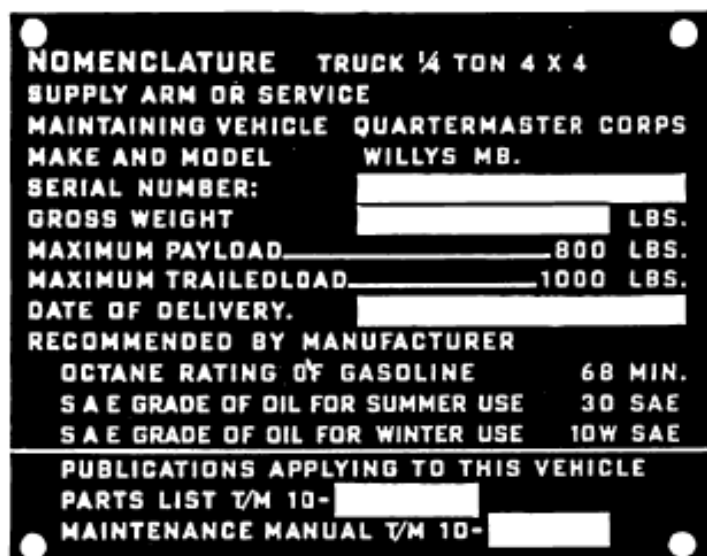


FIG. 2—NAME PLATE

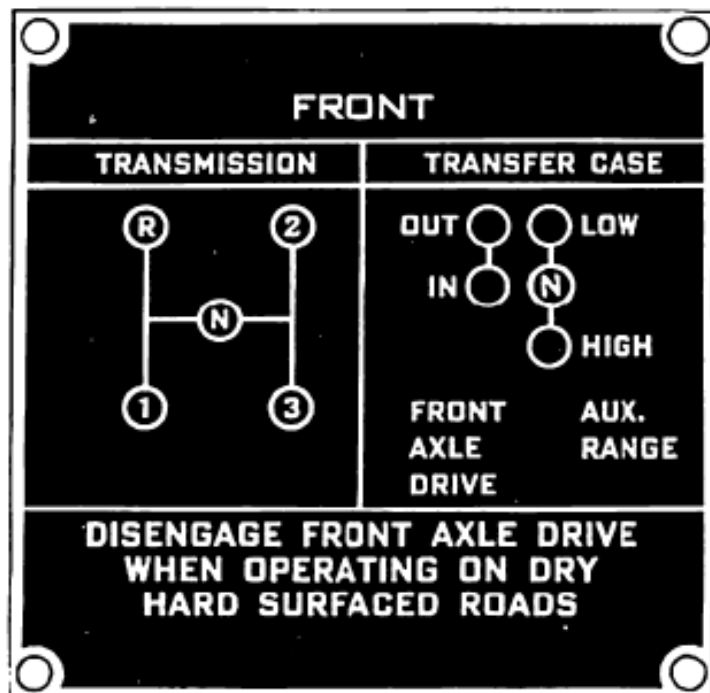


FIG. 4—SHIFT

**Transfer Case Shifting Instructions—Fig. 4**

This diagram gives relative position of shifting levers for front axle drive, low and high gear ratios.

On hard surface and flat roads disengage front axle drive by placing center shift lever, (front axle drive) in forward position. No. 25, Fig. 1.



The right hand lever (third from driver) controls transfer case gear ratio—low or high. No. 22, Fig. 1. The low gear ratio can only be used when front axle drive lever is in the rear position to engage front wheel drive.

Proper position for disengaging axles to use power take-off unit is shown as "N" in Fig. 4.

#### **Clutch Pedal—No. 11, Fig. 1**

The clutch pedal is used to disengage the engine power from transmission when shifting gears. Driving with the foot on pedal will cause excessive wear of clutch facings and release bearing. There should be 3/4" free pedal travel before clutch starts to disengage.

#### **Brake Pedal—No. 14, Fig. 1**

Depressing the pedal applies the hydraulic brakes at all four wheels. Avoid driving with foot on brake pedal, as brakes will be partially applied and cause unnecessary wear of brake linings requiring early adjustment.

#### **Hand Brake Lever—No. 24, Fig. 1**

By pulling out on brake handle the external contracting brake at the transmission on rear propeller shaft is applied mechanically. Whenever vehicle is parked, the lever should be pulled out as far as possible. Before moving vehicle be sure lever is released.

#### **Accelerator—No. 16, Fig. 1**

The accelerator is foot operated and is used to govern the engine speed under ordinary driving conditions.

#### **Gearshift Lever—No. 18, Fig. 1**

This lever is used to shift the gears in the transmission. There are four positions in the movement of the lever in changing the gears in transmission. See diagram for lever location in different gears. Fig. 4.

#### **Horn Button—No. 2, Fig. 1**

Pressing on button closes circuit in horn wiring and causes horn to sound.

#### **Gasoline Tank**

The gasoline tank is located under Drivers seat. To fill tank raise seat cushion and remove filler cap. Capacity 15 gallons.

### **OPERATING INSTRUCTIONS**

Before any trip the following inspections should be made before starting engine.

1. Check the oil level in crankcase, See "Lubrication" Section. Remove oil level indicator located in oil filler pipe on right side of engine, wipe off clean. Insert indicator in filler pipe to full depth. Remove indicator and note position of oil film, if below 1/2 full level add sufficient oil to bring to full mark.
2. Remove radiator filler cap and note water level. Should be up within 1/2" below filler neck. Check all hose connections for leaks also fan belt tension.

3. Check all lights and signal devices. Note condition of tires and see that they are properly inflated to 30 lbs.
4. See that Cap is on front drain hole under fuel tank so as to keep out stones and dirt. If maneuvers in water are necessary put the rear cap on the rear drain hole. The rear cap is part of the equipment furnished.
5. When there is a possibility of water being thrown over the engine by fan action in crossing streams, pull up on the handle of the generator brace, then remove the fan belt. This will stop the fan. As soon as possible the belt should be replaced, then pull out on the generator. The generator will lock in place by spring action of the brace.

### **STARTING OF THE ENGINE**

1. Transmission gearshift lever must be in neutral position. See Fig. 4.
2. Pull out hand throttle about 3/4" to 1".
3. Pull out choke button all the way to obtain proper fuel and air mixture for starting, No. 7, Fig. 1. Choking is not necessary when engine is warm.
4. Insert key in ignition switch and turn to right.
5. Disengage clutch by depressing pedal, holding down till engine starts, No. 11, Fig. 1.
6. Push on starter button No. 23, Fig. 1, to crank engine. Release button when engine starts.
7. Push in on choke button and adjust hand throttle to obtain proper idling speed. When engine is cold, it is advisable to leave choke button pulled out about 1". As engine warms up, push choke button all the way in.

### **STARTING VEHICLE**

(For day time driving, turn on Stop Light; See Light Switch, Page 02-5.)

1. Push clutch pedal down to disengage clutch No. 11, Fig. 1.
2. Shift transfer case (center hand lever) in forward position (front axle disengaged) No. 21, Fig. 1, right hand lever No. 22, Fig. 1 in rear position (high gear ratio).
3. Move transmission shift lever toward driver and back for first speed or forward from driver for reverse. Fig. 4.
4. Release hand brake, No. 24, Fig. 1, increase engine speed with accelerator by gradually pressing down on accelerator treadle No. 16, and slowly release clutch pedal, No. 11, increasing engine speed as load is picked up and vehicle starts to move.
5. As vehicle speed increases, release accelerator pedal and depress clutch pedal, move gearshift lever to neutral then in to second gear. Press on accelerator and release clutch pedal slowly. Repeat these operations until transmission is in high gear. Fig. 4.



## SHIFTING GEARS IN TRANSFER CASE

Instructions for shifting gears in transfer case and engagement of the front axle drive are as follows: No. 21, Fig. 1 and Fig. 4.

1. The transfer case may be operated in either high or low speed range when front axle drive is **ENGAGED**.
2. The transfer case can only be operated in "High" (direct drive) when front axle drive is **DISENGAGED**.
3. To engage front axle drive, depress clutch pedal, release accelerator and move center shift lever to rear position, No. 21, Fig. 1.
4. To disengage front axle drive, release accelerator and shift lever to forward position.
5. Shifting from high to low gear should not be attempted except when the vehicle is being operated at low speeds or at a standstill. The front axle drive must be engaged for this shift.

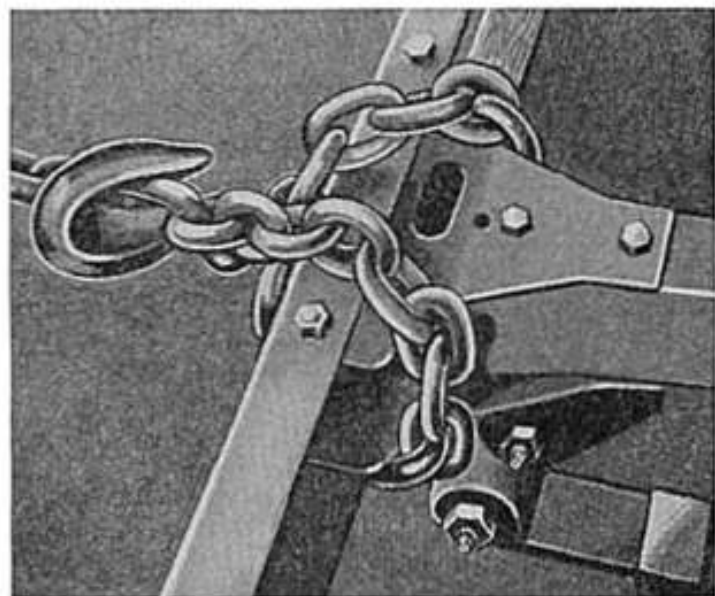


FIG. 5—CHAIN TOW

Release accelerator and depress clutch pedal—move center shift lever to rear position, engaging front wheel drive, No. 21, Fig. 1, then move right hand shift lever, No. 22, to forward position.

6. Shifting from low to high gear may be accomplished at any time, regardless of vehicle speed. Release accelerator and depress clutch pedal—shift right hand lever into rear position.

## SHIFTING TO LOWER SPEED IN TRANSMISSION

The transmission gears should always be shifted to the next lower speed before engine begins to labor or before vehicle speed is reduced appreciably. Shifting to lower speed is accomplished as follows:

1. Depress clutch pedal quickly, increase engine speed and shift to next lower gear, release clutch slowly and accelerate.

It is advisable to use the same transmission gear going down a long hill as would be required to climb the same hill.

## STOPPING THE VEHICLE

1. Remove foot from accelerator pedal and apply brakes by pressing down on brake pedal, No. 14, Fig. 1.
2. When vehicle speed has been reduced to idling engine speed, disengage clutch and move transmission shift lever to neutral position, Fig. 4.
3. When vehicle has come to a complete stop apply hand brake, No. 24, Fig. 1, and release clutch and brake pedals.

## SHIFTING INTO REVERSE

Before attempting to shift into reverse the vehicle must be brought to a complete stop.

1. Push clutch pedal down to disengage clutch.
2. Shift transmission lever to the left and forward toward windshield, Fig. 4.
3. Release clutch pedal slowly and accelerate as load is picked up.

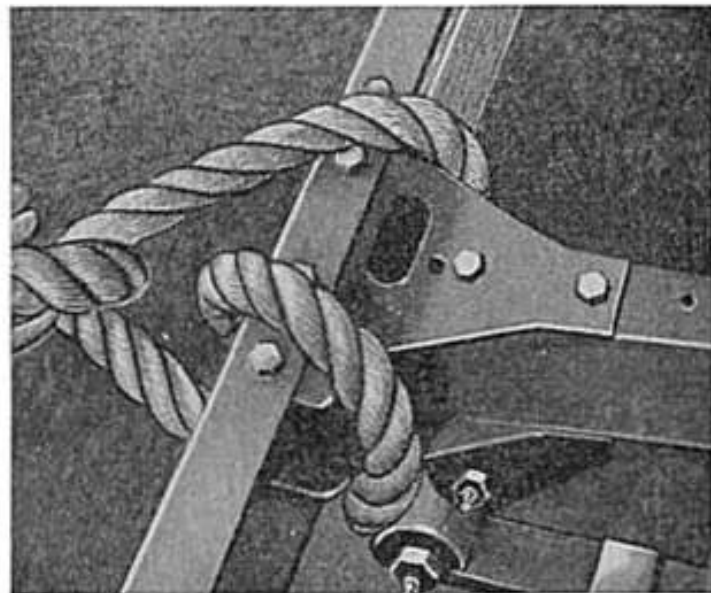


FIG. 6—ROPE TOW

## TOWING VEHICLE

When necessary to tow vehicle the tow chain, rope or cable, should be attached to the front bumper bar and frame side rail gusset, Fig. 5 and 6.

Loop chain or rope over top of bumper and frame gusset bringing it up across face of bumper and back on opposite side of frame, then hook or tie. Do not tow from the middle of the bumper.

## FIRE EXTINGUISHER

The fire extinguisher is mounted on right side cowl panel with spring type clamp. To remove pull outward on clamp release lever, No. 30, Fig. 1.

To operate extinguisher, hold body in one hand and with the other turn handle to left a ¼ turn which releases plunger lock. Use pumping action to force fluid on fire.

Read instructions on fire extinguisher plate.

## GENERAL LUBRICATION

Lubrication of any vehicle is important to prevent damage to moving parts. Because all moving parts are not subjected to the same operating conditions, the lubricants specified are those which most nearly meet the requirements of the parts involved. In some places excessive heat or cold is a problem to overcome, in others it is extreme pressure, water, sand or grit. The type of operating surfaces must also be taken into consideration as parts rotate or oscillate on various types of bearings. Each of the above conditions in construction make necessary the application of the specified lubricant.

Lubricants should be applied regularly to secure maximum useful service from the vehicle. It is of equal importance that not only the proper grade of lubricant be used but that it be applied in accordance with a definite schedule.

The chart in this section should be referred to for instructions on mileage of application, grade and quantity of lubricant required for all parts of the vehicle. A more detailed account of certain phases of lubrication is given in the following paragraphs.

### ENGINE

Lubrication of the engine is accomplished by means of a force-feed continuous circulating system. This is effected by means of a planetary gear type pump located on the left side of the engine, and is driven by a spiral gear on the camshaft.

The oil is drawn into the circulating system through a floating oil intake. The floating intake does not permit water or dirt to circulate, which may have accumulated in the bottom of the oil pan, because the oil is drawn horizontally from the top surface. Oil pressure is maintained under all driving and climatic conditions.

Oil is forced to the crankshaft and camshaft bearings through drilled passages in the cylinder block and then to the connecting rod bearings through drilled passages in the crankshaft. A drilled passage in the crankshaft, from the front bearing to holes in the crankshaft sprocket provides positive lubrication for the timing chain. Direct spray from connecting rod bearings lubricates the cylinder walls, pistons, piston pins and the valve mechanism.

The pressure under which the oil is forced to the bearings is controlled by a pressure regulator or relief valve, located in the cover of the oil pump. The valve is set to relieve at an indicated pressure of 75 lbs. at a car speed of approximately 30 miles per hour, with warm oil, assuring ample lubrication at all speeds. An oil pressure gauge is mounted in the instrument panel, and indicates the pressure being supplied. Failure of the gauge to register may indicate absence of oil, and the engine should be stopped immediately.

If there is plenty of oil in the reservoir, the oiling system should be carefully checked before starting the engine.

The capacity of the oiling system is 5 quarts. Care should be taken to replenish the supply before the oil level indicator, which is combined with the oil filler cap located in the oil filler pipe, shows the oil below the half full mark, No. 6, Fig. 1. Fresh oil should be poured into the reservoir through the filler pipe sufficiently to bring level to full mark.

### WHEN TO CHANGE CRANKCASE OIL

When the vehicle leaves the factory the crankcase is filled to the correct level with oil of the proper viscosity for the "break-in" period. (Decked vehicles in freight cars have engine oil drained and five quarts of oil in cans in freight car for each vehicle.)

At 500 miles and 1500 miles, then every 2500 miles thereafter completely drain the oil by removing the drain plug, indicated by No. 15, Fig. 2, in the lower left side of the oil pan and refill with fresh lubricant, in accordance with specifications.

To insure continuation of best performance and long engine life, it is necessary to change the crankcase oil whenever it becomes diluted or contaminated with harmful foreign materials. Under the adverse driving conditions described in the following paragraphs, it may become necessary to drain the crankcase oil more frequently.

Vehicles operated in extremely dusty country, should have the oil drained both winter and summer, at 1,000 mile intervals or oftener, and extra precaution should also be taken to keep the carburetor airfilter clean and supplied with oil. The frequency of cleaning the Carburetor Oil Bath Air Cleaner depends upon severity of dust conditions and no definite draining periods can be recommended.

Thinning of the oil by unburned fuel leaking by the piston rings and mixing with the oil, is known as crankcase dilution.

Leakage of fuel into the oil pan mostly occurs during the "Warming-Up" period, when the fuel is not thoroughly vaporized and burned. Short runs in cold weather do not permit thorough warming up of the engine and water may accumulate in the crankcase from condensation of moisture produced by the burning of the fuel.

Practically all present-day engine fuels contain a small amount of sulphur which, in the state in which it is found, is harmless; but this sulphur on burning, forms certain gases, a small portion of which is likely to leak past the pistons and rings and reacting with water when present in the crankcase forms sulphurous acid. As long as the gases and the internal walls of the crankcase are hot enough to keep water vapor from condensing no harm will result, but when an engine is run in low temperatures moisture will collect and unite with the gases formed by combustion, thus acid will be formed and is likely to cause serious etching or pitting. This etching, pitting or corrosion manifests itself in excessively rapid wear on piston pins, crankshaft bearings and other parts of the engine.

In view of these conditions it is necessary to drain the crankcase oil at regular intervals. It is always advisable to drain the oil when the engine is warm. The benefit of draining is, to a large extent, lost if the crankcase is drained when the engine is cold because some of the foreign material will remain in the bottom of the oil pan and will not drain out readily with the oil.

At least once a year, preferably in the Spring, the oil pan and floating oil intake should be removed from the engine and thoroughly washed with cleaning solution.