

Supplement To
OPERATOR'S INSTRUCTION MANUAL
Forms R.I. 9-921 and R. I. 9-922

CASE[®]
"630" SERIES
DIESEL TRACTORS



Est. 1842

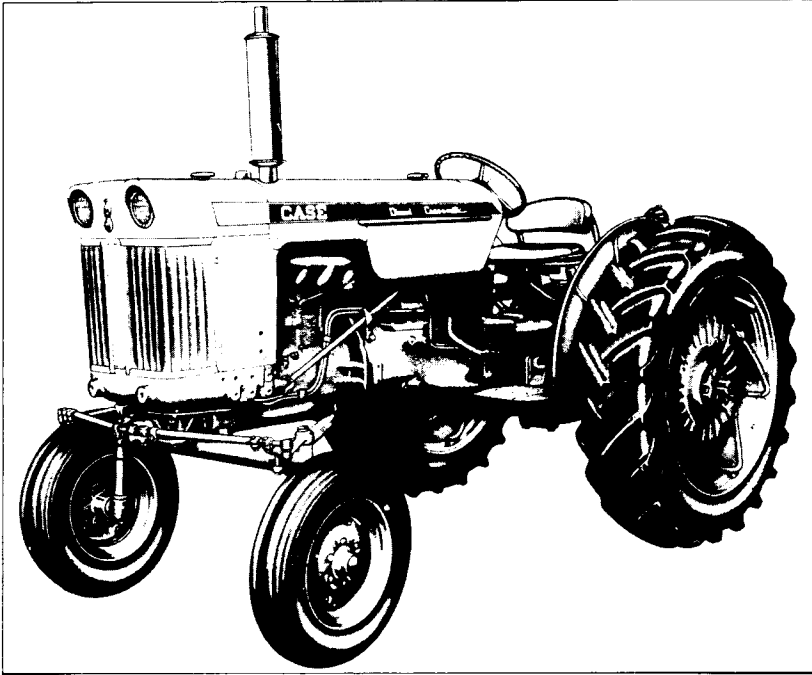
J. I. CASE CO.

RACINE, WIS. U.S.A.

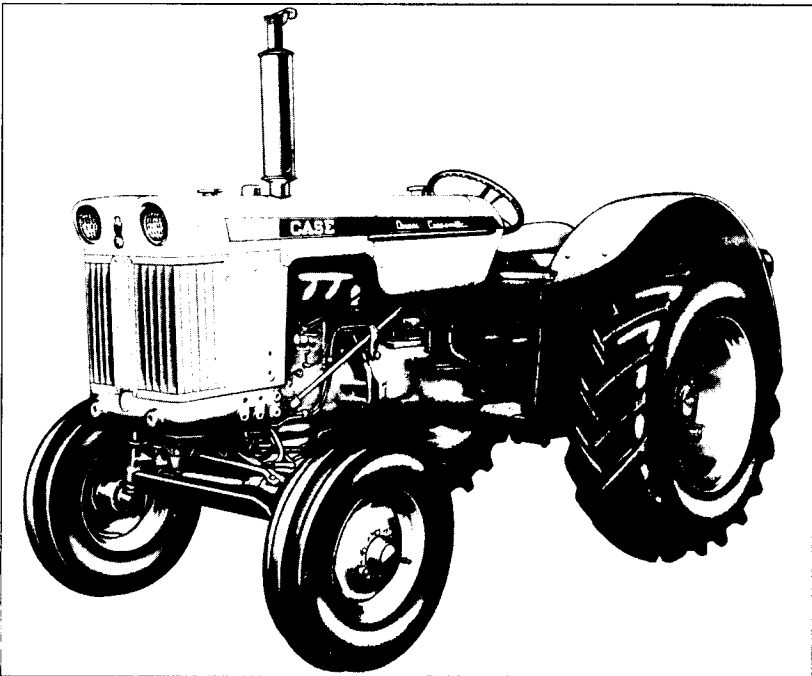
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INTRODUCTION



Model 631C General Purpose Tractor



Model 632C Western Special Tractor

INTRODUCTION

This supplementary manual covers, only, information pertinent to the lubrication, operation and preventive maintenance of the Case "630" Series Diesel tractor engine. Use this supplement along with the Operators Manual Forms 9-921 and 9-922 Case Model 640-641-640C-641C Tractors.

Case "630" Series Tractors are powered by a 188 cu. in. direct injection, full-diesel engine. Here are some of the outstanding features of this engine.

1. High compression - heavy duty construction - five bearing induction hardened counterbalanced crankshaft.
2. Direct injection combustion chamber - fuel is injected directly into the combustion chamber where it is mixed with air moving in a cyclonic manner to give the best fuel efficiency.
3. Multi-purpose fuel filtering system. One unit, (under the fuel tank), filters both dirt and water from fuel. Replaceable cartridge element provides 560 square inches of filtering area.
4. Intake manifold electrical starting aid for easy starting at low temperatures.

CASE "630" SERIES DIESEL TRACTOR DESIGNATIONS

Model 630 - 4 - Wheel Utility (Dry clutch)
Model 630C - 4 - Wheel Utility (Case-O-Matic)
Model 631 - General Purpose (Single, Dual or Adj. Axles) (Dry clutch)
Model 631C - General Purpose (Single, Dual or Adj. Axles) (Case-O-Matic)
Model 632 - Western Special - 4 - Wheel (Dry clutch)
Model 632C - Western Special - 4 - Wheel (Case-O-Matic)
Model 634C - Grove - 4 - Wheel (Case-O-Matic)


NOTE: All above tractor models, use the Case 188 cu. in. Diesel Engine, therefore information in this supplement applies to each one of these tractors. Your tractor serial number plate, located on the right side of the dash panel, (see Fig. 1) will have one of the above model numbers stamped on it.

TRACTOR SERIAL NUMBERS

When ordering parts from your authorized Case Dealer, always specify the Serial Number and Model of your Tractor.

As a means of ready reference fill in the serial numbers along with the model number of your tractor, in the spaces provided here.

MODEL	<input type="text"/>
NO.	<input type="text"/>
J. I. Case Co., Racine, Wis.	



<input type="text"/>
Engine Serial Number

When ordering Tractor Parts, specify the Tractor Model and Serial Number, located on the side of the tractor "dash."

Use the Engine Serial Number, stamped on the right side of the engine block, when ordering Engine Parts.

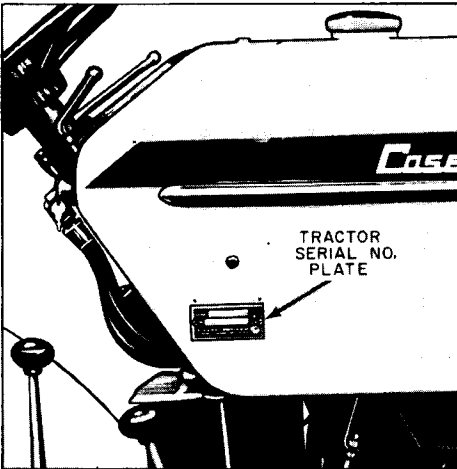


Fig. 1. Tractor Number

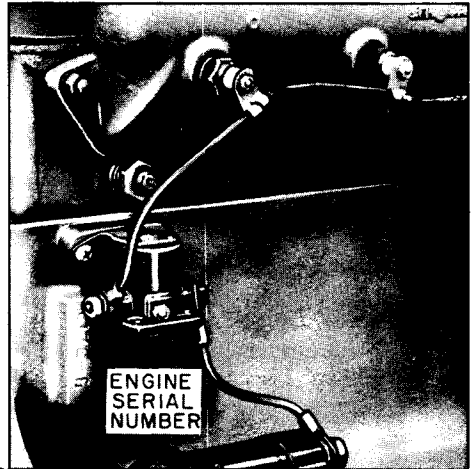


Fig. 2. Engine Number

If you should require additional information or services of a trained mechanic, be sure to see your authorized CASE DEALER.

NOTE: The terms "Right Hand" and "Left Hand" whenever used in this manual apply to the tractor when facing in the direction the tractor will move in forward operation.

GENERAL SPECIFICATIONS

CASE 188 DIESEL ENGINE

GENERAL

Type	Case Open Combustion-4 Cyl.-4-Stroke-Valve in Head
Firing Order	1-3-4-2
Cylinder Bore	3 13/16"; Stroke 4 1/8"
Piston Displacement	188 Cu. In.
Compression Ratio	17.5 to 1
Valve Guides	Cast Replaceable
Valve Clearance014" (Cold)
Cylinder Sleeves	Wet Type-Replaceable
Full Governed Speed (Dry Clutch)	2000 R.P.M.
(Case-O-Matic)	2250 R.P.M.
No Load Speed (Dry Clutch)	2150 R.P.M.
(Case-O-Matic)	2400 R.P.M.
Engine Idle Speed	600 R.P.M.
Governor Type	Flyweight (in injection Pump)
Air Cleaner	Oil Bath Type
Cold Weather Starting Aid (Std.)	Electric Heat Plugs (4)
Fuel	No. 2 Diesel Fuel (See Fuel Spec's)

PISTONS AND RODS

Rings - Compression	2 or 3
Rings - Oil Control	1
Piston Pins	Full Floating
Piston Material	Aluminum Alloy
Connecting Rod Bearings	Steel Backed Inserts
Number of Main Bearings	5
Type Bearings	Steel Backed Inserts

ENGINE LUBRICATING SYSTEM

Oil Pressure	50 to 60 lbs. at 2000 R.P.M.
Type System	Positive Displacement-Gear Type Pump With Floating Intake Screen
Oil Filter	Full-Flow-Replaceable Element

DIESEL FUEL SYSTEM

Fuel Injection Pump	Roosa-Master
Fuel Injectors	(Long Stem Multi-Hole) C.A.V.
Fuel Transfer Pump	Vane Type (Integral Part of Injection Pump)
Governor	Mechanical, Flyweight, (Integral Part of Injection Pump)
Fuel Filter	Roosa-Master (With Replaceable Element) (Includes Moisture Trap)
Fuel Gage	Sending Unit in Tank - Dial on Instrument Panel

COOLING SYSTEM

Type of System Pressurized, Thermostat Controlled
Pump Impeller Type-Sealed Pre-Lubricated Bearing
Radiator . . . Heavy Duty-Tube and Fin Construction. (Heat Exchanger in Base on
Case-O-Matic Models)
Thermostat Starts to Open at 177° F. Fully Open at 202° F.
Radiator Pressure Cap. Open at 4 Lbs.

STARTING AND LIGHTING SYSTEM

Type of System 12 Volt - Positive Ground
Batteries . . . (2) 6 Volt-105 Amp. Hour Batteries connected in series Group I.
Generator 12V-2 Brush With Full Ventilation
Voltage Regulator. 12V - Automatic Type
Starting Motor 12 V With Attached Solenoid Switch
Manifold Heaters (4) 12 Volt - 450 Watt
Headlights. 12 V 35 Watt-Sealed Beam
Rear Light 12 V-Sealed Beam-Combination
Fuse 20 AMP-Light Circuit-Mounted on Dash
Electrical Socket 12 V-for Auxiliary Tail Light on Implements
12 Volt Warning Light (Extra). For use with Electrical Outlet Socket

CAPACITIES

Engine Crankcase. 4 qts.
With Filter Change 5 qts.
Air Cleaner. 2 3/4 Pints
Cooling System 16 1/2 qts.
Fuel Tank 22 gal.

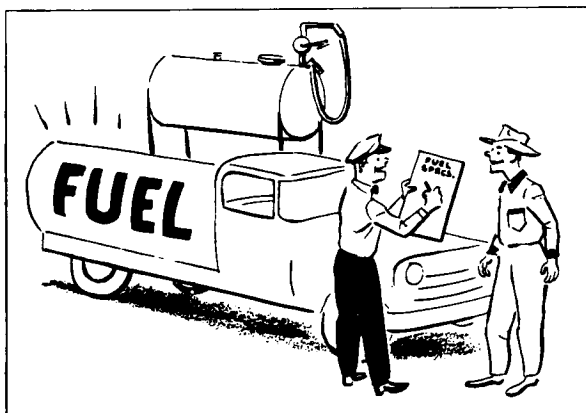
APPROXIMATE WEIGHTS

Model 630 - Utility Tractor 3520 lbs.
Model 631 - Gen. Purp. (Dual Front Wheels) 4195 lbs.
Model 631 - Gen. Purp. (Adj. Front Axle) 4315 lbs.
Model 630C - Utility. 3673 lbs.
Model 631C - Gen. Purp. (Dual Front Wheels). 4348 lbs.
Model 631C - Gen. Purp. (Adj. Front Axle). 4468 lbs.
Model 632C - Western Special 4610 lbs.
Model 632 - Western Special 4580 lbs.
Model 634C - Grove Tractor 4500 lbs.

DIESEL ENGINE FUEL

GENERAL

Many thousands of hours of economical operation have been built into the 188 D Engine of your "630" Series tractor. The quality of fuel that you purchase and the precautions that you observe to see that only clean fuel enters your engine will be a deciding factor in its performance.



To protect the service life that was built into your Case diesel engine, do the following;

1. Purchase fuel only from a reliable dealer who handles a reputable well-known brand and has the facilities to keep it clean during storage and delivery.
2. Use a Number 2 Diesel fuel that meets the requirements listed on the following page.
3. If necessary use a fuel conditioner as discussed on Page 16.
4. Follow the precautions covering fuel handling and storage that are described in this section of the manual.
5. BUY CLEAN FUEL AND KEEP IT CLEAN.

FUEL SPECIFICATIONS FOR A SUITABLE

NUMBER 2 DIESEL FUEL

Case "188D" Diesel Engines are designed to operate most efficiently when using a NUMBER 2 DIESEL FUEL. Most well-known refiners and distributors market a good grade diesel fuel and there should be no difficulty in obtaining it.

ATTENTION!

Do not confuse Number 2 Diesel Fuel with Number 2 Furnace Oil, as this does not always meet the fuel specifications for Diesel Engines.

These are specifications for a suitable Diesel Fuel.

A.P.I. Gravity	32-39
POUR POINT	A Rating 10 Degrees Lower Than the Lowest Expected Temperatures
Volatility	
Initial Boiling Point (Minimum)	320° Fahrenheit
50% Condensed	475°-550° Fahrenheit
Final Boiling Point (Maximum)	675° Fahrenheit
Distillation Recovery (Minimum)	97%
Flash Point	Legal Minimum Limit or Higher
S.U. Viscosity at 100° Fahrenheit	34-39 Seconds
CETANE (Minimum)	45 (45-55 for Winter use)
Diesel Index	43
Water and Sediment (Maximum)05%
Ash (Maximum)02%
TOTAL SULPHUR (Maximum)5%
Conradson Carbon2%
Copper Strip CorrosionPass
Alkali and Mineral Acid	Neutral

The use of Number 1 Diesel Fuel, which is a lighter fuel, may result in a loss of engine power and also increased fuel consumption, due to the fact that it has less heat content and a lower viscosity than Number 2 Diesel Fuel. The life of the injection pump may also be affected because of the lack of lubricant in the Number 1 lighter Diesel Fuel.

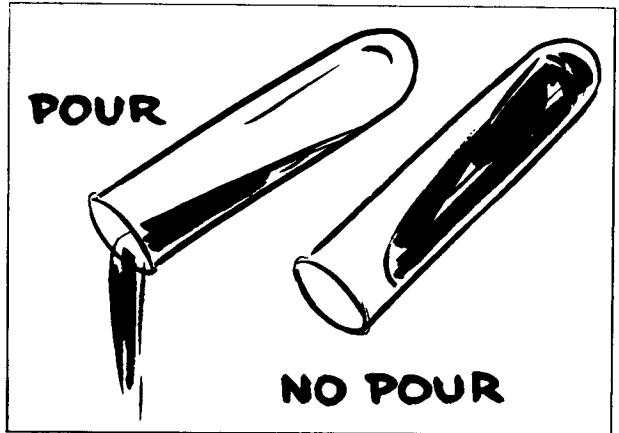
FUEL SPECIFICATION DEFINITIONS

The definitions of the following terms used describing the fuel specifications will be useful for reference when selecting a suitable diesel fuel.

POUR POINT -- is the lowest temperature at which fuel remains fluid and will pour.

Pour Point is especially important for cold weather operation because:

1. If the prevailing air temperatures are lower than the fuel Pour Point, the engine will not start simply because the fuel will not flow through the fuel system.
2. The highly precision injection pump and injector parts receive their lubrication from the diesel fuel. If the fuel is not fluid, serious damage may occur due to lack of lubrication.
3. Use diesel fuel that has a Pour Point rating at least 10° lower than the coldest anticipated temperature. At approximately 10° above the Pour Point, waxes, etc., in the fuel start to congeal and will clog the filters.



CETANE -- is the self-ignition quality of diesel fuel.

NOTE: Do not apply the Cetane rating to diesel engine performance as you would gasoline Octane rating to spark ignition engine performance. High Cetane ratings do not necessarily provide improved diesel engine performance.

A Cetane number of 40 is considered low, while a Cetane number of 60 is considered high.

Your Case Diesel Engine is designed to operate most efficiently with a NUMBER 2 Diesel Fuel having a Cetane Number of 45 to 50. (See page 10. for cold weather recommendations.)

NUMBER 1 Diesel fuel grades with higher Cetane numbers are not recommended because:

1. Premium diesel fuels are higher in price but will not materially increase engine performance and therefore result in higher operating costs.
2. Number 2 Diesel Fuels with a Cetane Number from 45 to 50 are widely distributed and are more readily available.

SULPHUR -- is the percent of corrosive sulphur in the diesel fuel.



A high sulphur content (above 0.5%) in diesel fuel is always undesirable, but it is especially harmful when the tractor must be operated in cold weather, intermittently, or with varying loads where it is difficult to keep the engine up to the recommended operating temperature.

These types of operations result in moisture condensation in the engine which unites with the sulphur to form destructive acids.

High sulphur contents in the fuel will cause:

1. Excessive engine wear.
2. Formation of harmful deposits on valves, rings, pistons and cylinder sleeve wall.
3. Possible corrosive damage to the fuel system.

IMPORTANT: To keep the engine free from harmful deposits and to counteract any destructive acids that may be formed, a "Heavy Duty", additive type crankcase oil must be used.

1. Use a good grade "Heavy Duty" crankcase oil with a Service Designation of "DG" if the sulphur content is 0.5% or less, and if operating conditions are favorable -- no prolonged idling, frequent stops and starts, or cold weather operation. See Page 18.
2. Use a good grade "Heavy Duty" crankcase oil with a Service Designation of "DM" (Series 1) if operating conditions are favorable -- no extreme high or low operating temperatures, no prolonged idling and the sulphur content of the fuel is less than 1%. Page 18.
3. Use a good grade "Extra Heavy Duty" crankcase oil with a Service Designation of "DS" (Series 2 or 3) if the sulphur content is above 0.5% (not exceeding 1%), or where operating conditions are severe. Page 18.

ASH -- is the percentage of harmful non-combustible material in the diesel fuel. A fuel containing a higher maximum Ash content than .01 per cent can damage the extremely close fitting parts in the fuel injection system.

FUEL RECOMMENDATIONS FOR COLD WEATHER OPERATION

If your tractor is to be operated during cold weather, special fuel precautions should be observed as to the POUR POINT, CETANE RATING, and the SULPHUR CONTENT of the diesel fuel.

1. Use diesel fuel that has a Pour Point rating at least 10^o lower than the coldest anticipated temperature. At approximately 10^o above the Pour Point, waxes, etc., in the fuel start to congeal and will clog the filters.
2. The CETANE RATING SHOULD BE AT LEAST 45 to 55 for most efficient cold weather starting.
3. Special precautions must be taken to prevent the entry of water into the fuel system.
 - a. Always refill the tractor fuel at the end of each day's operation to prevent water condensation inside the tank.
 - b. The drain on the filter bowl, Fig. 3, should be opened daily before starting the engine to remove any accumulated water.
 - c. Fuel must be allowed to settle in storage for at least 24 hours before putting it in the tractors fuel tank.
4. A high sulphur content in the fuel is especially injurious to the engine when it is operated intermittently or with the coolant temperature below the recommended 180 degrees. The moisture condensation that forms during cold weather operation combines with the sulphur in the fuel to form corrosive acids which attack the finely machined surfaces.

Use Diesel fuel with a sulphur content of 0.5% or less.

Keep engine temperature up to 180 degrees.

Follow the crankcase oil recommendations on Pages 18 - 19.

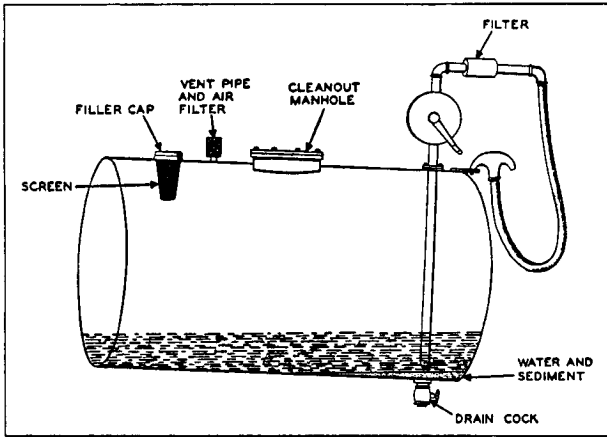
FUEL HANDLING AND STORAGE

The handling of diesel fuel presents a special problem because the specific gravity of this fuel is relatively close to that of water, abrasive rust and dust particles, causing these contaminants to remain in suspension in the fuel for long periods of time. For this reason, diesel fuel must be allowed to settle for at least 24 hours without being disturbed in any way, before it is put into the tractor fuel tank.

Fuel should always be strained or filtered before being put into the storage tank -- it is easier and much cheaper to remove dirt from the fuel BEFORE it finds its way into the engine fuel system.

The storage tank should be constructed of rust-proof steel, with a provision for removal of accumulated sludge and water. This should be done at regular 10 day intervals.

In addition, the fuel should be filtered between the storage tank and the dispensing hose. Double filtering is preferred. The filtering equipment should be maintained as recommended by the manufacturer.



Use a rust proof storage tank similar to that illustration above. This tank should be equipped with a pump, so the diesel fuel can be transferred directly from the storage tank to the tractor fuel tank.

The hose from the pump should be equipped with a nozzle, so the contamination of fuel by the use of dirty buckets or funnels can be eliminated.

Allow the fuel to settle during the night, so that contaminants will be drained off each morning when the sediment bowl is drained before starting the day's work. See Fig. 3.

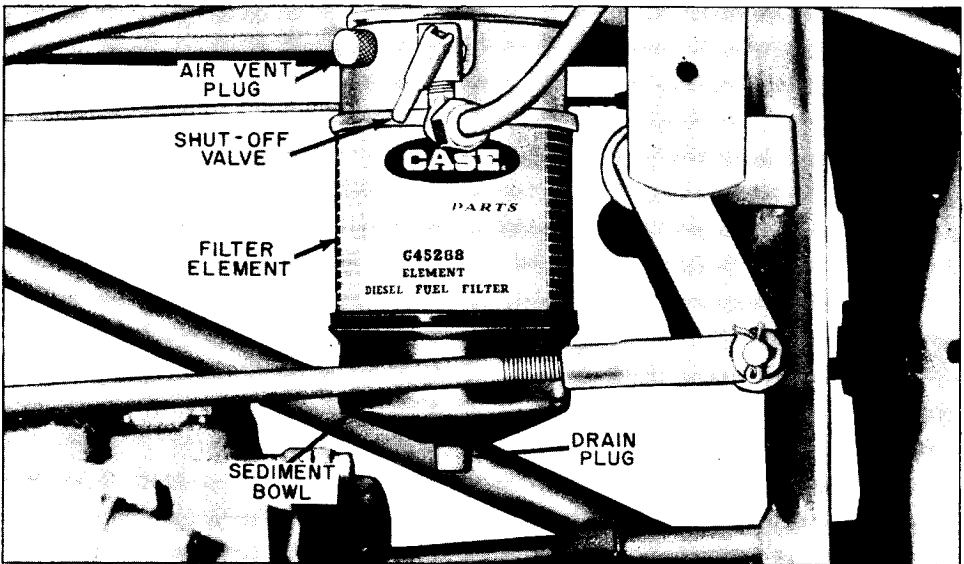
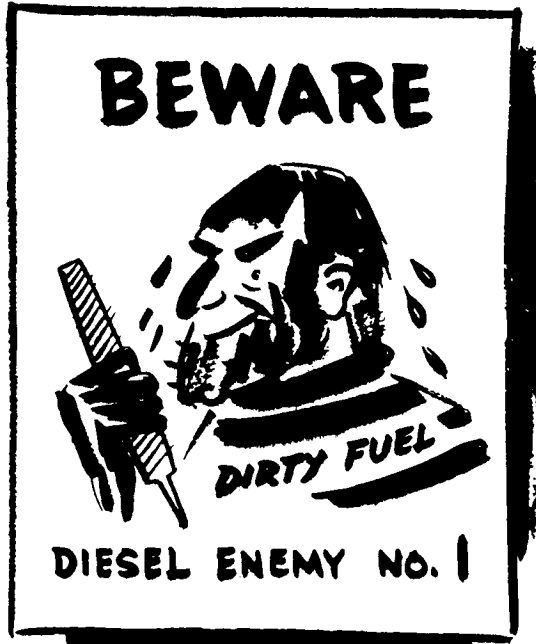


Fig. 3. Draining Fuel Tank Dirt and Moisture

CLEANING FUEL STORAGE TANKS

Drain all of the remaining fuel from the tank. Use a mixture of one part alcohol and one part benzol, or use acetone to dissolve the deposits in the tank. Flush the tank with clean fresh diesel fuel.



The temperature of the fuel during storage affects the formation of gum and varnish. Fuel that is stored in a warm place or where the sun directly strikes the tank will form gum more rapidly than fuel stored in a cool place where the temperature remains constant.

GUM AND VARNISH FORMATION IN FUEL

Most Diesel Fuel is refined by a "cracking" process and has a natural tendency to form gum or varnish when stored. Most major fuel refiners and distributors add a "gum inhibitor" which retards the formation of gum and allows it to be stored for longer periods.

Gum or varnish in diesel fuel plugs the fuel filtering system and interferes with the operation of closely fitted parts in the Fuel Injection System of a diesel engine.

Gum and varnish will result in power loss, misfiring and other symptoms that can easily be mistaken for mechanical difficulty and result in unnecessary expensive servicing of the Injection System, which would provide only temporary relief.

FUEL CONDITIONER

In areas where gum and varnish in the fuel presents a problem, it is recommended that a "Diesel Fuel Conditioner" be used. "Diesel Fuel Conditioners" act as a detergent or solvent and can be used to clean out gum and varnish deposits already in an engine and, when used regularly, will prevent these deposits from forming.

The following "Fuel Conditioner" recommendations are made for the areas troubled with gum and varnish in the fuel:

1. Obtain Case "Diesel Fuel Conditioner" and use it as follows:
 - a. Add it to the fuel in the main storage tank;
 - b. Add a small quantity to the tractor fuel tank daily;
 - c. Use the "Conditioner" periodically or when any symptoms develop in the engine that indicate gum and varnish deposits in the Fuel Injection System.

NOTE: Refer to the instructions furnished with the "Conditioner" as to the amount that should be used.



IMPORTANT

1. Buy Diesel Fuel in quantities that will be used up in 90 days or less.
2. Protect main storage tank with a shelter so the fuel can be kept as cool as possible.
3. When a tractor is to remain idle for a month or longer, follow the Tractor Storage recommendations on Page 37 of this manual.

LUBRICATION

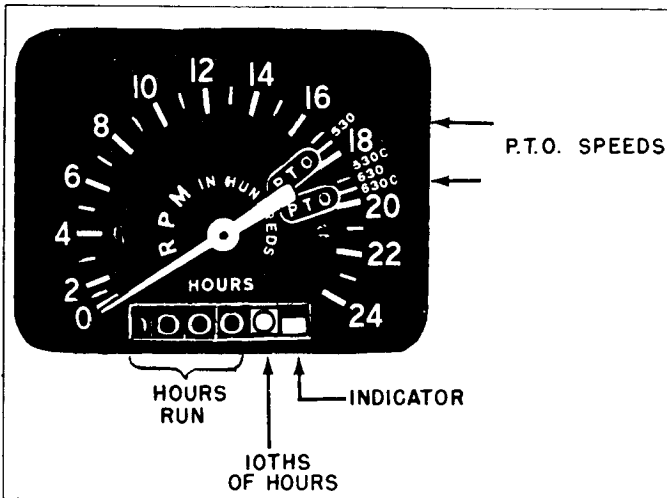


Fig. 4. Tachometer -- Hourmeter Dial

The lubrication of your Case tractor will only require a few minutes of regular daily attention. Wherever possible, automatic lubrication or prepacked bearings have been provided to reduce the time needed for this daily servicing.

Within this "Lubrication" Section all service points are shown, plus types and weights of lubricant to be used and the hourly service intervals.

Hourly service intervals are easy to figure because every "630" Series Case tractor is equipped with an accurate tachometer-hourmeter, Fig. 4. The hourmeter keeps pace with the engine crankshaft and will register average "engine" hours run at a mean speed of 1670 R.P.M. It does not record "clock" hours. All time intervals listed in this manual such as "Preventive Maintenance" and "Lubrication" Sections are based on these hourmeter dial readings.

Use only high grade oils and greases of unvarying specifications. Always buy lubricant from a reliable dealer who handles a reputable well-known product. Use only oils and greases of the specifications recommended in this manual.

IMPORTANT

Give your tractor the benefit of regular thorough LUBRICATION! It is much cheaper to use lubricant when needed, than to replace worn parts when your tractor is needed on the job.

ENGINE LUBRICATION



Selection of Lubricating Oil

It is extremely important that you select and use in your Case "630" Series Tractor a stable, high quality, engine lubricating oil that has the proper body (SAE Viscosity Rating) for the prevailing air temperatures.

ENGINE OIL BODY RECOMMENDATIONS

(SAE Viscosity Rating)

SAE 30 - (DS Series 3 Only) Daytime Air Temperatures above 90° F.
SAE 20-W- (DS Series 3 Only) . . . Daytime Air Temperatures from 90°F. to 32° F.
SAE 10-W- (DS Series 3 Only) . . . Daytime Air Temperatures from 32° F. to 0° F.
SAE 5-W-20 - (DS Series 3 Only) Daytime Air Temperatures below 0° F.

During extremely cold weather it may then be necessary to drain the oil while it is still hot and pre-heat it to approximately 100 degrees Fahrenheit before pouring it back into the crankcase just prior to starting.

Using lubricating oils of the recommended SAE Viscosity Rating assures you that the oil will remain fluid or free flowing within the specified air temperature ranges. The use of either heavier or lighter body oils than recommended may seriously affect engine lubrication and performance. Too light an oil used during warm temperatures may result in high oil consumption and is apt to cause increased engine wear. Using too heavy an oil during cold temperatures will affect starting, and may result in a poor rate of lubricant distribution causing increased wear.

ENGINE LUBRICATING OIL SERVICE DESIGNATIONS

To simplify the selection of a suitable heavy duty engine lubricating oil to meet diesel engine service conditions, the American Petroleum Institute (composed of most major oil companies and refineries) has adopted three service designations for diesel engine use:

1. Service "DG" -- Favorable Diesel Engine Operation
2. Service "DM" -- (Series 1) Moderate to Severe Diesel Engine Operation.
3. Service "DS" (Series 2 and 3) -- Severe Diesel Engine Operation.

These designations will usually be marked on the oil container.

Always use a high quality stable, heavy duty engine lubricating oil, having a service designation of either "DG, DM or DS" -- depending upon your particular diesel engine operating conditions.

SERVICE "DG" -- (Not recommended for Case 630 Series Diesel Tractor Engine)
For favorable diesel engine operation where there are no harmful low or high operating temperatures, no prolonged idling or frequent stops and starts, and where the sulphur content of the fuel is less than 5%.

SERVICE "DM" -- (Not recommended for Case 630 Series Diesel Tractor Engine)
For moderate to severe diesel engine operation where there are no extreme high or low temperatures, no prolonged idling operating conditions and the sulphur content of the fuel is less than 1%.

SERVICE "DS" -- (Series 3 Only) For diesel engine service such as:

1. Low temperature engine operating conditions as a result of: frequent stop and start operations, prolonged idling, operating with a light load (especially during cold weather), tend to produce water in the engine. Water, when combined with sulphur in the fuel or in the crankcase oil itself, will form destructive acids in the engine that cause excessive engine wear, harmful deposits and possible corrosive damage to the engine and fuel system.
2. High temperature engine operating conditions as a result of heavy loads during very hot weather cause excessive engine wear. Lubricating oils that do not have the protective additives to withstand high temperatures may break down under this condition, resulting in excessive oil consumption, harmful deposits and engine wear.
3. Diesel fuel being used that has a sulphur content above .5% but less than 1%. The higher the sulphur content in the diesel fuel, the greater are the chances for acid and deposit formations in the engine. When fuel containing sulphur in excess of .5% must be used, heavy duty "DS" lubricating oil will aid in preventing damage to the engine by tending to neutralize any acid formed and by carrying most of the sludge formations in suspension.

CHECKING CRANKCASE OIL LEVEL

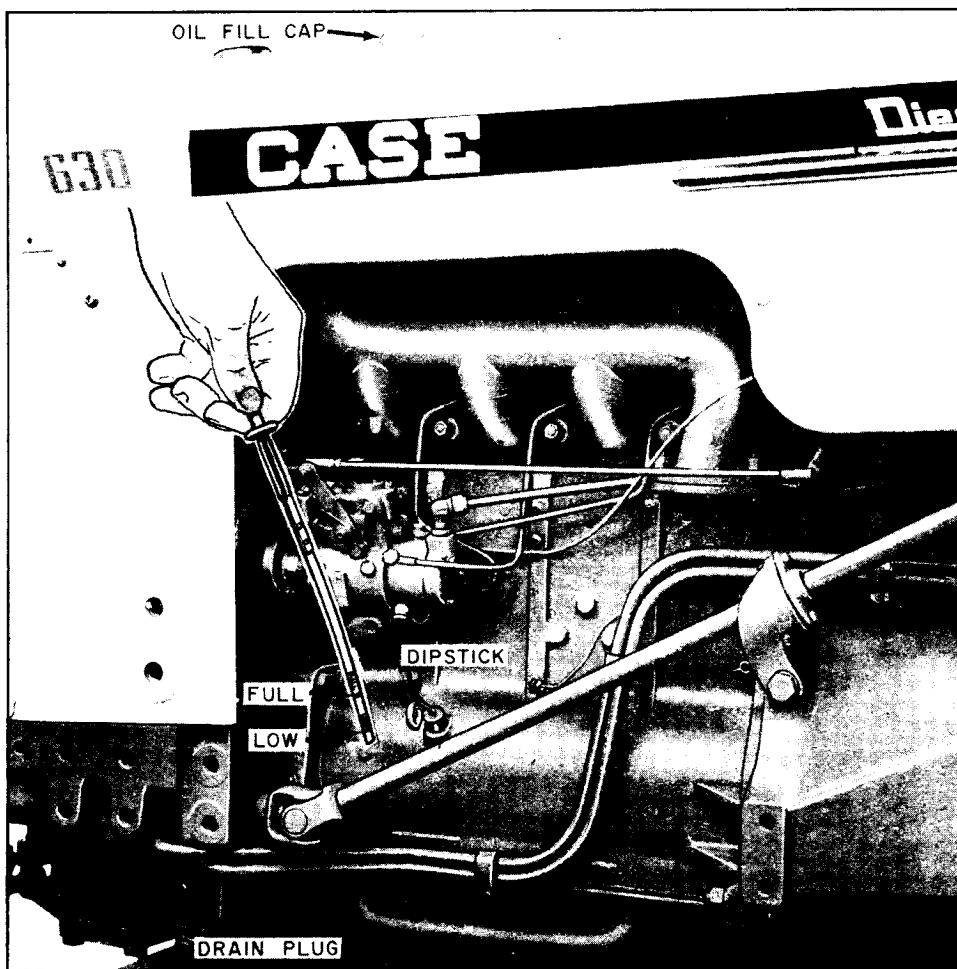


Fig. 5. Crankcase Lubrication Check

Check engine oil level daily before starting the day's work, by means of the bayonet gage rod (dipstick). Fig. 5. The dipstick has "FULL" and "LOW" marks. Add sufficient oil through valve cover fill spout to have oil level just reach the "FULL" mark. Do not overfill the crankcase.

NOTE: When adding oil, allow sufficient time for the oil to run down before checking oil level. Never attempt to check crankcase oil level when the engine is running.

CRANKCASE OIL CHANGE

Crankcase capacity 4 Quarts, (with filter 5 Quarts)

1. Drain special "break-in" oil after first 20 hours of operation. While oil is draining remove oil filter cartridge and install a new cartridge element.
2. Fill crankcase as noted on page 18.
3. Normal conditions change oil every 100 hours of operation.
4. Replace oil filter element every other oil change (or every 200 hours).

If engine service is severe -- frequent starting and stopping, high or low operating temperatures -- the crankcase should be drained more often to prevent the formation of sludge and harmful deposits in the engine.

To drain the crankcase, remove the drain plug while the oil is still hot. Allow oil to drain for several minutes, replace the plug (with gasket in place) and fill crankcase to full mark with new oil.

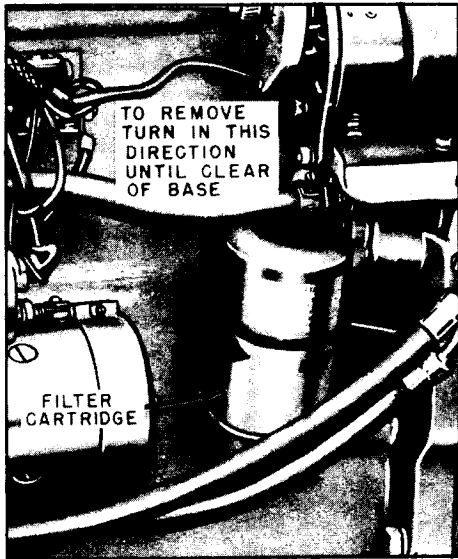


Fig. 6. Oil Filter

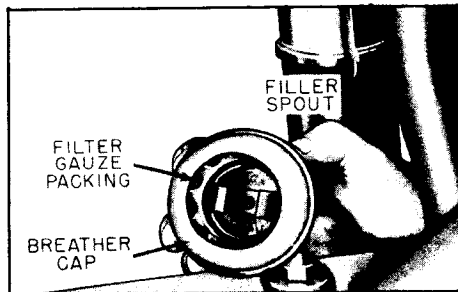


Fig. 7. Crankcase Breather

ENGINE OIL FILTER

Before removing the filter element be sure to clean all traces of dirt from around base joint. Unscrew filter from base. Be sure to use a Genuine CASE element. To install new element apply film of oil to gasket and then hand turn until filter contacts base -- then tighten one half turn (180°). Do not overtighten. Always add one additional quart of oil to engine crankcase every time filter element is changed.



CAUTION: Never attempt to change an oil filter when the engine is running.

CRANKCASE BREATHER

This filler cap serves as a breather for the crankcase. A fine wire mesh, inside the cap, prevents entry of dirt. Wash the breather in tractor fuel, weekly, Dip in oil, allow to drain and replace on filler spout.

AIR CLEANER

Loosen the grille door screws and swing grille screens open to gain access to the air cleaner. The air cleaner oil cup must be removed, cleaned and re-filled exactly to the "level mark" (every 5 to 60 hours depending on operating conditions). Unscrew clamp ring screw to allow oil cup to be removed (straight down). Thoroughly clean oil cup and refill with 2-3/4 pints of the same viscosity oil as used in the crankcase. Install cup in place under cleaner body and secure with thumb screw clamp. Never over-fill the cleaner cup with oil. Fig. 8.

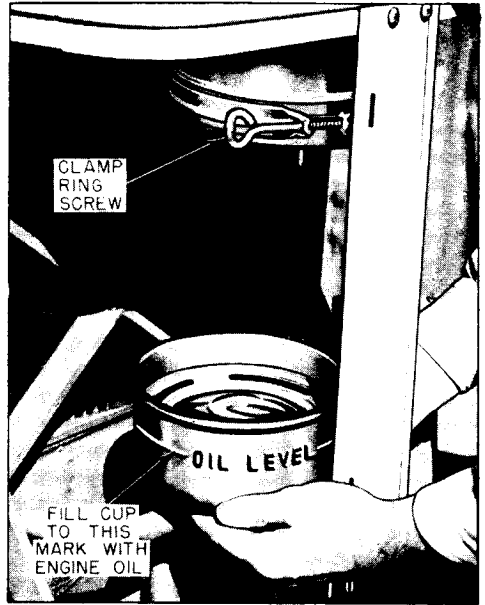


Fig. 8. Servicing Air Cleaner

GENERATOR

Every 100 hours add a few drops of S.A.E. 10W Engine oil to each of the oil cups. Do not over-lubricate especially at the rear bearing, (commutator end).

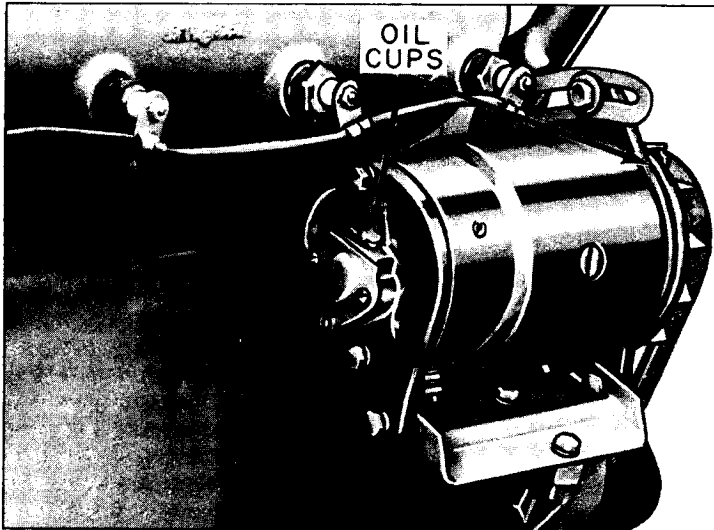


Fig. 9. Oiling Generator Bearings

OPERATING INSTRUCTIONS

PRE-STARTING CHECK LIST

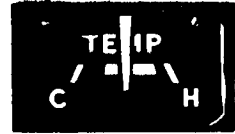
Before starting your new CASE Diesel Tractor for the first time and before each operating period thereafter, check the following:

1. Make sure everyone responsible for the tractor's operation and maintenance understands the importance of clean diesel fuel. See pages 10 to 16.
2. Check crankcase and air cleaner oil levels. Be sure air cleaner cup is filled "exactly" to full mark with oil of proper viscosity.
3. See that radiator is filled with clean soft water or a nationally recognized brand of permanent type anti-freeze.
4. See that fuel tank is filled with clean, water-free diesel fuel that meets requirements listed on page 10. Always wipe fuel tank cap clean before attempting to remove it.
5. Visually inspect fuel system, cooling system and crankcase for leakage. Check fan belt tension. (See page 33).

RUN-IN PROCEDURE

IMPORTANT

Maintain the correct engine operating Temperature, at all times. Always operate the engine at full throttle during run-in period -- do not idle.



1. **LOAD** - For the 1st 50 hours, maintain a normal field load. Do not "baby" the engine, but do not "lug" it. (Engine must not be "lugged" down below its full load governed engine speed).
2. **ENGINE SPEED** - During "run-in" period, always operate the tractor at full governed R.P.M. (throttle wide open). Avoid idling at reduced engine speed.
3. **OPERATING TEMPERATURE** - Maintain temperature as indicated above.

Low operating temperatures contribute to the formation of destructive acids and harmful deposits in the engine.
4. **CRANKCASE OIL**. Drain "run-in" oil after first 20 hours of operation and thereafter refill crankcase with recommended grade of oil. (See page 21).

INSTRUMENTS AND CONTROLS

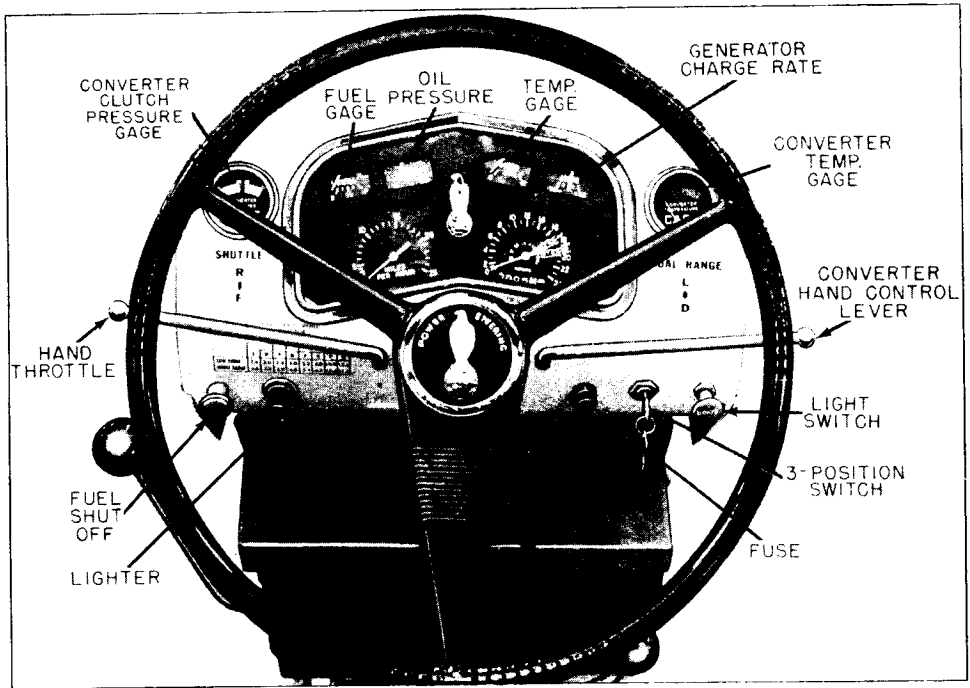


Fig. 10. Diesel Engine Controls and Gages

This is an indirectly lighted instrument panel. Turning on the headlights automatically lights up the instruments. All dials are grouped to provide the operator with instant engine performance data, at a glance.

- HAND THROTTLE - Move down to increased engine speed -- move upward to slow engine R.P.M.'s.
- FUEL SHUT-OFF - Have button pushed "clear in" when starting the engine. Pull button "clear out" to stop engine.
- OIL PRESSURE GAGE - When engine is up to full operating temperature and running at full throttle the gage will indicate 50 to 60 lbs.
- TEMPERATURE GAGE - Indicates proper operating temperature of radiator coolant.

Note: Other gages and controls are exactly the same for all "630" Series tractors.

STARTING THE ENGINE (NORMAL TEMPERATURE)

1. Move hand throttle lever down to 1/2 open position.
2. Turn switch key to the "ON" position, Fig. 12.
3. Move transmission lever forward in the "START" position to engage the starting motor.
4. Immediately after the engine starts, allow shift lever to go back to "NEUTRAL" position and reduce engine speed. **NOTE:** If engine fires and stops, wait for starting motor to stop spinning before attempting to start the engine again. Do not use the starting motor longer than 30 seconds without interruption. Wait at least 2 minutes between starting tries.

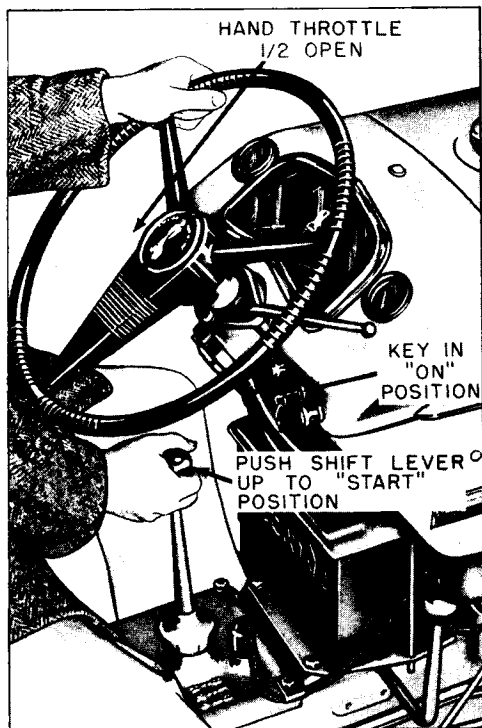


Fig. 11. Starting Procedure

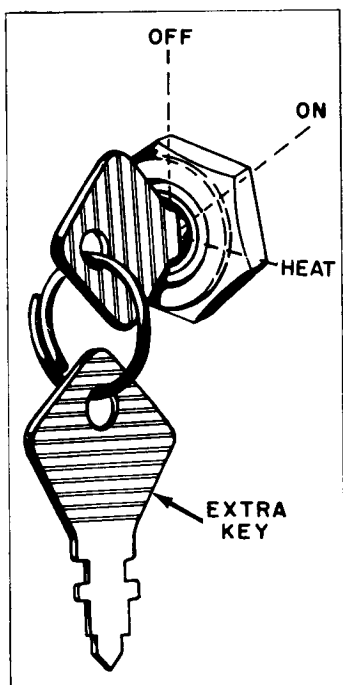


Fig. 12. Switch Key

NOTE: While the engine is being turned over, with the starter, white or black exhaust smoke should be observed at the top of the stack. If no smoke is observed, and the engine will not start, is an indication of no fuel getting to the cylinders. Be sure to allow the engine to warm up completely before operating the tractor under full load.

REMEMBER: The temperature gage will only indicate coolant temperature when the switch key is in the "ON" position.

STOPPING THE ENGINE

An engine that has been working under load should idle several minutes before shutting off so that engine parts can cool evenly. Pull fuel shut-off button, on dash, "out" as far as possible and hold in that position until the engine completely stops rotating.

Be sure to turn Switch Key "Off" after stopping the engine or it will allow Fuel Gage to discharge batteries.

COLD WEATHER STARTING

The 188D engine is equipped with 4 heat plugs, located in the intake manifold. These plugs are activated by turning the switch key to the third or "heat" position. See Fig. 12 and 13.

If the storage batteries of your tractor are fully charged and all cable connections clean and tight -- if the crankcase oil is the proper grade for the temperature encountered, it will not be necessary to use the heat plugs when starting your tractor in temperatures above $+32^{\circ}\text{F}$. Use the following chart to start your diesel engine in temperatures colder than $+32^{\circ}$:

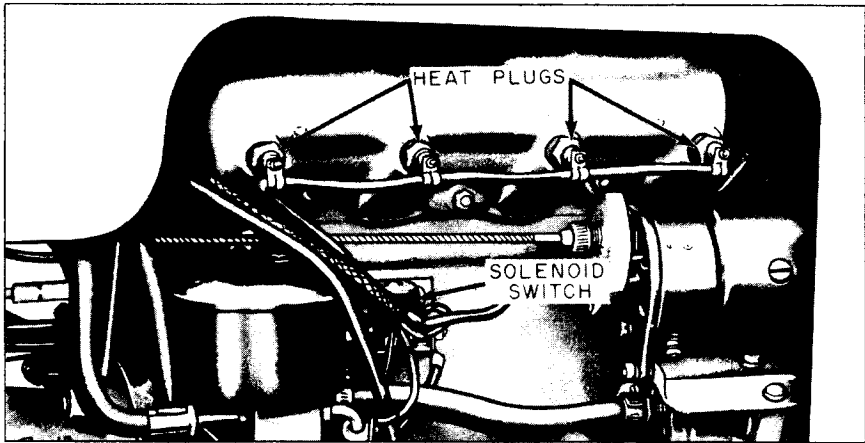
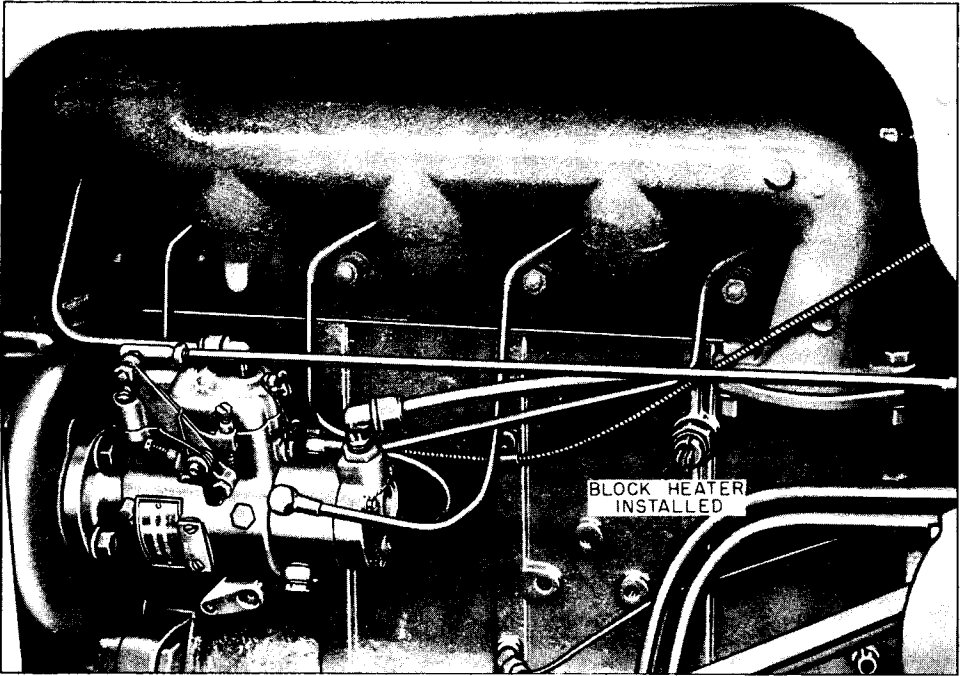


Fig. 13. Intake Manifold Heat Plugs

1. Have throttle in half-open position.
2. $+32^{\circ}\text{F}$. to $+20^{\circ}\text{F}$ Heat for 30 seconds.
Crank for 6 seconds.
Repeat above cycle if necessary.
3. $+20^{\circ}\text{F}$. or Below Heat for 60 seconds.
Crank for 6 seconds.
Repeat above cycle if necessary.

After the engine has started let it run at 1000 to 1200 R.P.M. until it has reached operating temperature.

USING A COOLANT HEATER



Coolant Heater in Place in Block

The engine block has a 1/2" tapped hole, located on the left side, between #3 and #4 cylinder. If desired, a block heater can be installed, by draining the coolant, removing the pipe plug and installing the heater. Replace the coolant and check for leakage around heater. This provides a handy means of keeping the engine warm during extremely cold winter nights and its use will greatly improve engine starting time.

Be sure the block heater you use has a 1/2" pipe thread and the heater does not extend into the block more than 2-3/4".

SERVICE SUGGESTIONS

ENGINE WON'T TURN OVER

PROBABLE CAUSE

1. Dead or weak batteries
2. Poor ground connection
3. Loose or faulty wiring
4. Starting motor defective

REMEDY

1. Recharge or replace batteries
2. Inspect and tighten ground cable
3. Clean and tighten connections
4. Have starter checked

ENGINE TURNS BUT WON'T START

1. No fuel supply to pump
2. Air in fuel lines or system
3. Clogged or dirty filter
4. Cranking speed too slow
5. Water in fuel system
6. Low air temperature
7. Low compression

1. Check fuel system
2. Bleed system
3. Clean or replace filter element
4. Recharge or replace batteries
5. Drain water from sediment bowl
6. Use cold weather electric starting aid
7. See your CASE Dealer

ENGINE RUNS ROUGH OR UNEVEN – (Erratic Performance)

1. Missing on one or more cylinders
2. Too low operating temperatures
3. Engine overspeeds or governor surges
4. Air in fuel lines
5. Clogged air cleaner
6. Engine idles too slowly
7. Poor grade of fuel
8. Control lever sticking
9. Pump improperly timed

1. Have dealer check fuel lines and injector nozzles
2. Check thermostat operation to have minimum 180° F.
3. Call your Authorized Case Dealer
4. Bleed fuel lines of air
5. Clean and service air cleaner, tighten connections
6. Increase to proper idling speed
7. Use No. 2 Diesel fuel that meets proper specifications
8. See your Case Dealer
9. See your Case Dealer

LOSS OF POWER

1. Wrong injection pump timing
2. Air in fuel lines
3. Clogged or dirty filter, see page 32
4. Poor fuel
5. Injection nozzles faulty

1. Have pump timed correctly
2. Check connections for leaks and bleed lines
3. Replace filter element if necessary
4. See fuel recommendations
5. Have nozzles serviced

OVERHEATING

1. Lack of coolant
2. Fan belt slipping
3. Overloading the engine
4. Thermostat sticking or inoperative
5. Injection pump timed wrong
6. Back pressure in exhaust system
1. Check radiator and connection
2. Inspect belt and adjust tension
3. Keep engine speed up, change to reduced transmission speed
4. Remove, clean and check thermostat, replace if faulty
5. Have pump retimed correctly
6. Inspect muffler and exhaust pipe for restriction

EXCESSIVE SMOKE

WHITE SMOKE INDICATES MISS FIRING

1. Low operating temperatures
2. Faulty injector nozzles
3. Poor fuel
4. Poor compression
1. Check condition of thermostat
2. Have nozzles serviced
3. Use fuel that meets proper specifications
4. Have your dealer check cylinder compression

BLUE SMOKE INDICATES HIGH OIL CONSUMPTION

1. Worn or stuck rings
2. Low coolant temperature
1. Have engine serviced
2. Check thermostat action

BLACK SMOKE

1. Excessive fuel consumption
2. Engine overloaded
3. Restricted air supply
4. Low coolant temperature
1. Have injection pump recalibrated to standard
2. Change to lower gear and keep engine R.P.M.'s up
3. Clean and service air cleaner
4. Check thermostat action

POOR COMPRESSION

(UNDER 325 LBS. AT 150 R.P.M.)

1. Valves holding open
2. Leaky cylinder head gasket
3. Burned or sticking valves
4. Broken or weak valve springs
5. Piston rings or sleeves worn
1. Adjust tappet clearance
2. Have engine serviced
3. Have valves serviced
4. Have cylinder head serviced
5. Have engine reconditioned

LOW OIL PRESSURE

1. Low oil level
2. Oil too light -- diluted
3. Pump screen plugged
4. Worn crankshaft or connecting rod bearings
1. Check crankcase with dipstick
2. Change oil and follow seasonal recommendations
3. Have oil pump serviced and cleaned
4. Have engine overhauled

HIGH OIL CONSUMPTION

- | | |
|-------------------------------------|--|
| 1. Oil leaks | 1. Locate leak and repair |
| 2. Too high oil level | 2. Hold oil level to mark on dipstick |
| 3. Incorrect grade of oil | 3. Use recommended SAE number of lubricating oil |
| 4. Piston rings not properly run-in | 4. See engine "break-in" instructions |
| 5. Worn rings, pistons or sleeves | 5. Have engine overhauled |

POOR FUEL ECONOMY

- | | |
|-------------------------------------|---|
| 1. Coolant temperature too low | 1. Maintain at least 180° F. for maximum performance |
| 2. Wrong fuel oil | 2. Use No. 2 Diesel fuel that meets proper specifications |
| 3. Nozzles faulty | 3. Have nozzles checked and serviced |
| 4. Incorrect valve tappet clearance | 4. Adjust valve lash to .014" -- both intake and exhaust |

SUDDEN STOPPING

- | | |
|-----------------------------|--|
| 1. No fuel in tank | 1. Refill tank and bleed fuel lines and system |
| 2. Restriction in fuel flow | 2. Clogged or dirty filter -- check lines for obstruction or break |
| 3. Air in fuel lines | 3. Bleed fuel system |
| 4. Water in fuel lines | 4. Drain lines and filter bowl |

ENGINE KNOCKS (Excessive)

- | | |
|-----------------------------------|---|
| 1. "Lugging" | 1. Reduce load or increase engine RPM |
| 2. Poor quality fuel | 2. Use only fuel that meets recommended standards |
| 3. Injection nozzle sticking | 3. Have nozzles checked and serviced |
| 4. Injection pump timed too early | 4. Have pump timed correctly |

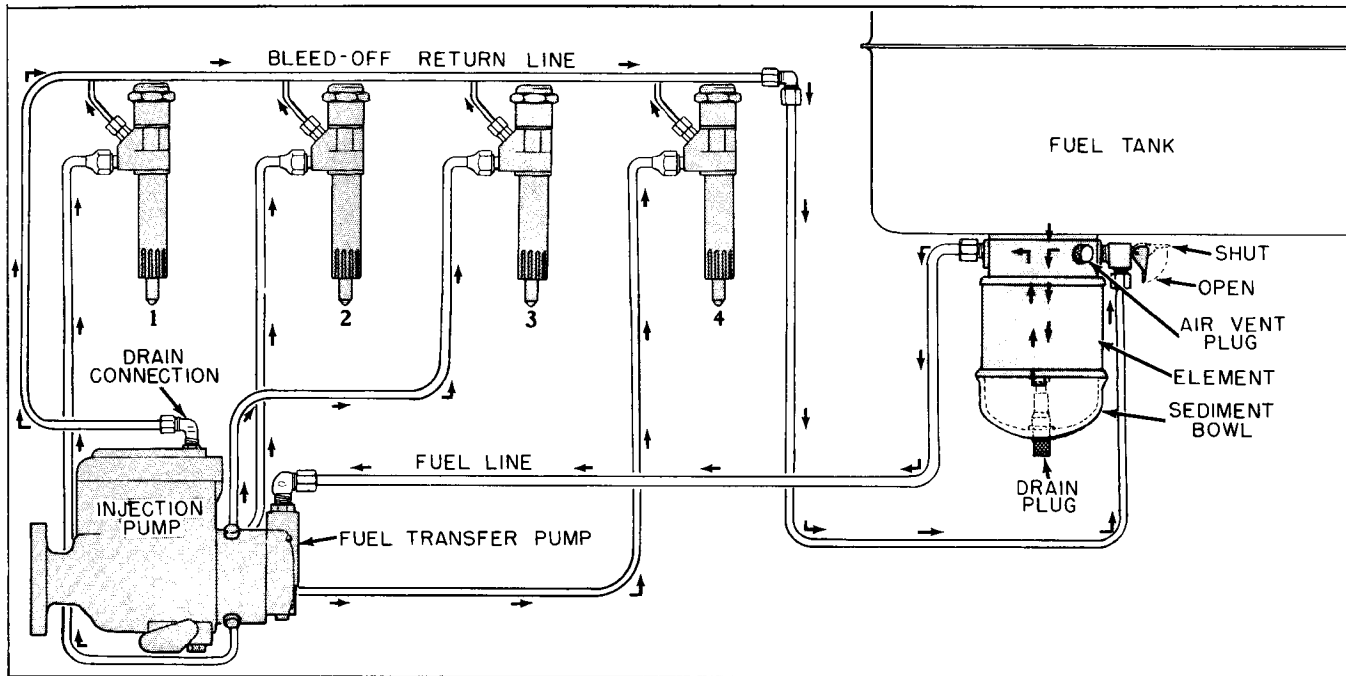


Fig. 14. Fuel System -- Schematic Drawing

The fuel system of your Case "630" Series tractor consists of the following units:

1. A 22 gallon fuel tank containing a fuel gage sending unit.
2. A combination fuel filter and moisture trap attached to the bottom of the fuel tank.
3. Fuel injection pump with built-in governor and transfer pump.
4. Injectors with long-stem nozzles for direct injection into engine combustion chambers.
5. Fuel lines-short and compact installation for simple easy servicing.

COMBINATION FUEL FILTER

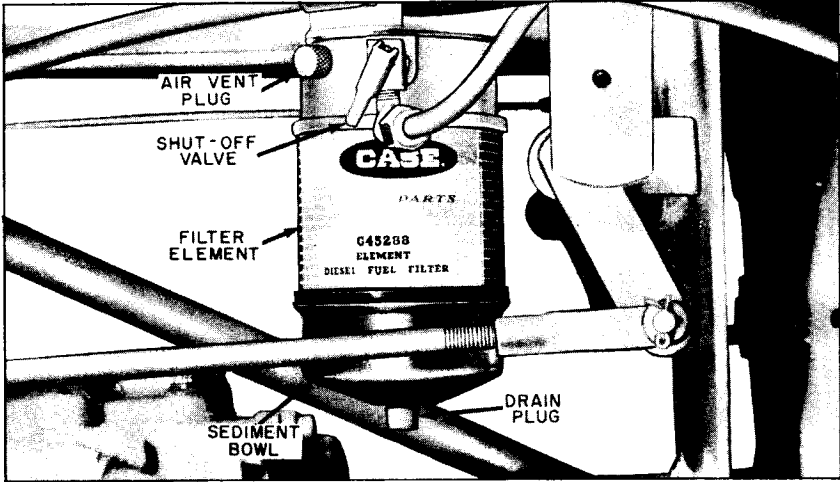


Fig. 15. Filter in Position under Fuel Tank

This filter consists of a filter body and valve secured to the bottom of the fuel tank, a replaceable element (with 2 seals) and a pyrex-type sediment bowl. For daily servicing, loosen the drain plug enough to allow accumulated moisture to escape, then retighten. To replace the filter element, flip the shut-off valve to the closed position and unscrew the sediment bowl by hand. (Do not use a wrench or pliers). Carefully wipe all traces of dirt or grit from lower face of filter body. Clean and inspect glass bowl. If any nicks are noted around rim of bowl, replace with a new bowl. Install a new filter, with gaskets in place under filter body and push filter upward to contact the seat in the filter head. Rotate filter several times to make sure a complete seat has been made, while bowl is being tightened in place by hand. Do not attempt to tighten this assembly by using pliers or a wrench on drain plug. Flip valve to "open" position and wait a few minutes for filter to refill with fuel. Open the air vent plug and allow the air to bleed out. When bubble-free fuel starts to flow, close bleed plug and wipe parts free of diesel fuel.

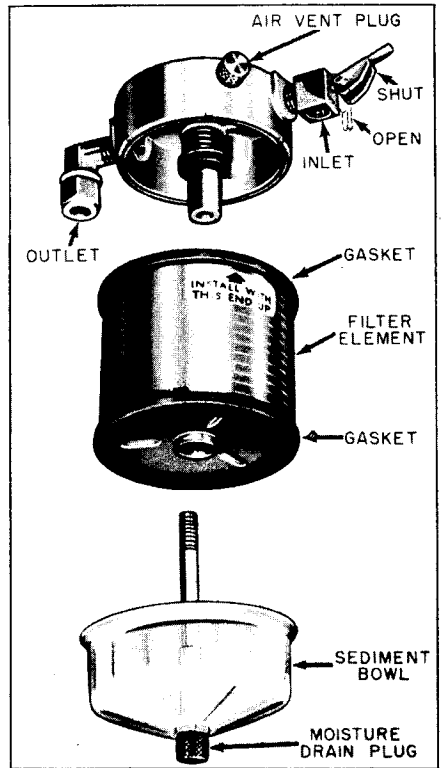


Fig. 16. Filter-Exploded

AIR CLEANER



Fig. 17. Air Cleaner

The air cleaner oil cup must be removed, cleaned and refilled exactly to the "level mark" (5 to 60 hours, depending on dust conditions). Open the tractor grill and unscrew the clamp sufficiently to allow the oil cup to be removed straight down from the air cleaner body. Extract the baffle and clean both baffle and cup in tractor fuel. Refill cup, with 2-3/4 pints of the same viscosity oil as used in crankcase, to "OIL LEVEL" mark on cup. Install cup in place and secure with thumb screw clamp.

Do not overfill the oil cup.

COOLING SYSTEM

Inspect the fan belt periodically. This belt does a triple job. It drives the fan, the water pump and generator. If it is too tight it causes rapid wear of water pump and generator bearings. If it is too loose it will slip, wear out too fast, permit the engine to overheat and allow the battery to run down.

If the belt shows signs of wear, such as frayed edges, knicks or cord separations, replace with a new belt. To tighten the belt, loosen the bolts on the generator mounting bracket, and the capscrew of the adjusting strap. Move the generator "in" or "out" to have the belt adjusted as shown in Fig. 18. A properly adjusted belt can be depressed 3/4" inch with the hand. Be sure all bolts are securely tightened when the belt is adjusted.

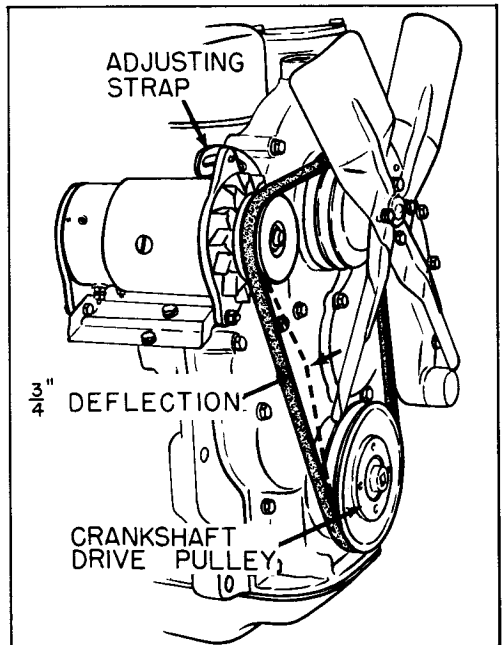


Fig. 18. Fan Belt Tension

CARE OF RADIATOR OPERATING IN ZERO WEATHER

Use a reliable brand of anti-freeze in freezing weather. A permanent type of anti-freeze is required. Your Case "630" Series Tractor is winterized at the factory with ethylene glycol base anti-freeze.

Inspect and replace radiator hose and connections to insure tightness before putting anti-freeze in the radiator. This prevents loss of anti-freeze.



Fig. 19. Radiator and Engine Block Drains

CLEANING COOLING SYSTEM

After draining anti-freeze (see Fig. 19. for location of radiator and engine block drains), the cooling system will need a thorough cleansing.

Drain system: Partially refill with two gallons of fresh water. In an enameled container (do not use aluminum or galvanized iron) boil an equal amount of water. Add as much commercial cleaner as the boiling solution will dissolve.

Pour this in the radiator while solution is still hot. Run the engine as usual for 24 hours, drain, flush thoroughly and refill with clean water. Use of a rust inhibitor is recommended to preserve the interior surfaces of the cooling system.

GENERAL MAINTENANCE OF COOLING SYSTEM

Keep radiator hose clamps tight. Remove any weeds or dirt from the core of radiator to prevent over-heating.

CHECKING THERMOSTAT

Watch the temperature gauge periodically during operation. If the engine doesn't warm up or warms up very slowly, the thermostat may be stuck in an open position and it must be replaced.

If the engine overheats the thermostat may be inoperative and is stuck in a closed position.

Thermostat Replacement

If the tractor is equipped without bolt on type thermostat housing, Figure 20, remove hood, drain the cooling system, loosen the clamps on the upper hose connection and remove upper hose. The thermostat is positioned in the upper hose and is held in place by a sleeve and clamp.

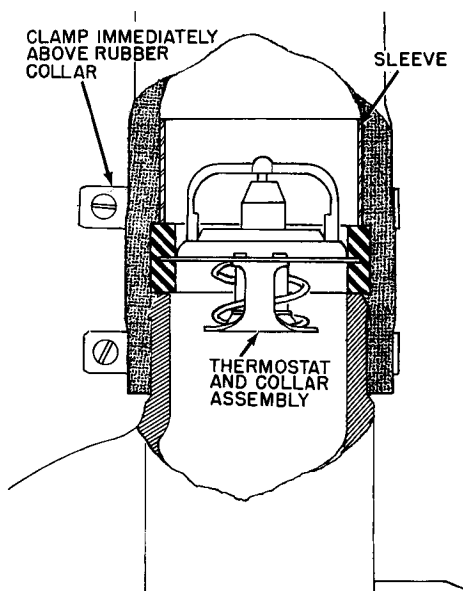


Figure 20

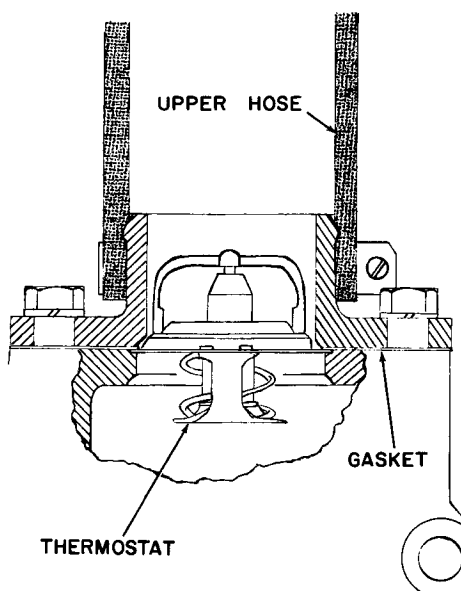


Figure 21

If the tractor is equipped with a bolt on thermostat housing, Figure 21, remove hood, drain the cooling system, loosen the two bolts that hold the housing to the timing gear cover. Loosen the hose clamps on the upper hose and the housing can be removed. The thermostat can be lifted out of the timing gear cover upper water outlet. Install new gasket when the thermostat is reinstalled.

Be sure the new thermostat has the same heat range as the original thermostat. Be sure hose clamps and flange bolts are tight before adding coolant to radiator.

ELECTRICAL SYSTEM

The electrical system is 12 volt - positive ground system. It consists of (2) 105 amp. hour batteries, (connected in series), a 12 volt starting motor, generator and voltage regulator. Lighting equipment is also 12 volt. A 20 amp. fuse is located in a receptacle on the instrument panel.

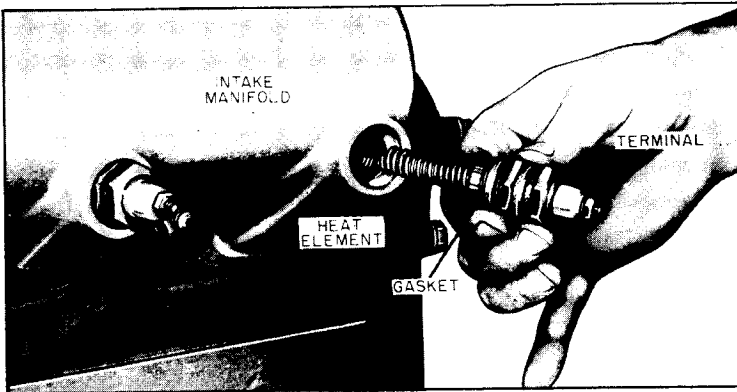


Fig. 22. Manifold Heat Plugs

HEAT PLUGS - These heat plugs are installed in the same manner as a conventional spark plug and draw their current from the batteries. If these plugs need replacing, be sure to use Genuine CASE replacement heat plugs.

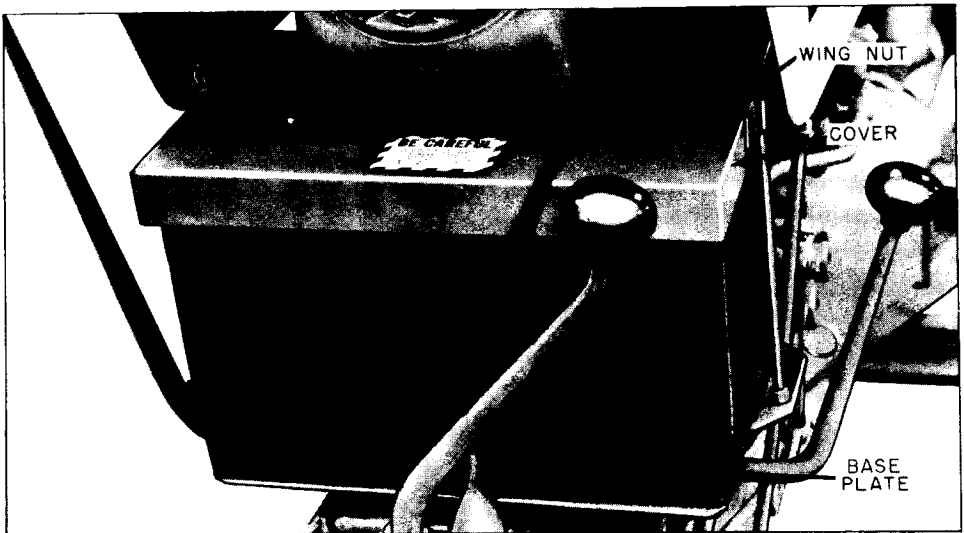


Fig. 23. Storage Batteries in Position

STORAGE BATTERIES - When removing the cover, to service the batteries, be sure not to disturb the insulated boots covering the posts. When cover is replaced be sure wing nuts are drawn down securely enough to prevent batteries from shifting on the base plate.

STORING THE TRACTOR

Whenever the "630" Series Diesel Tractor is to remain idle for an extended period of time or whenever it is to be removed from storage, certain precautions must be observed -- especially as to protecting the fuel system.

To protect the diesel fuel system, the valves and the cylinder sleeve walls, proceed as follows:

1. Clean the tractor thoroughly and completely lubricate it as directed in the Lubrication section of this manual.
2. While the engine is still hot from operation:
 - a. Drain the crankcase and refill it with a good grade of new engine oil.
 - b. Install a new oil filter element.
 - c. Drain, clean, and refill the air cleaner oil cup with clean oil.
3. Drain the diesel fuel tank and pour one or two gallons of Diesel Flushing Oil into the fuel tank.

The following commercial Diesel Flushing Oils -- or the equivalent -- may be used:

Solnus XXX	Sun Oil Co.
VM 1102	Socony Vacuum Oil Co.
Carnea Oil #21	Shell Oil Co.
Alweather Oil	Sinclair Refining Co.
Capella Oil AA	The Texas Co.
Texaco Almag	The Texas Co.
No. 10C	General Electric Co.
Wemco C	Westinghouse Electric Co.
Lonco #71	London Chemical Co.

4. Start and operate the engine until a blue-white smoke appears at the exhaust. This indicates the regular fuel in the filters has been used up and the flushing oil is being burned. Operate the engine for an additional ten minutes before stopping it.
5. While the engine is still hot, drain the coolant from the cooling system, (if system is not protected by anti-freeze). After the system is drained, leave the radiator and engine block drains open and loosen the radiator cap to release pressure on the gasket. Place a warning tag on the radiator cap stating that cooling system has been drained:

6. Remove and store the batteries in a dry and moderately cool place -- especially if freezing temperatures are expected. Take hydrometer readings periodically and record them. When the readings near 1.200, the battery must be recharged.
7. Raise and block up the front end of the tractor. Protect the tires from heat and sun light. It is not necessary to reduce the air pressure in the tires, but be sure to inflate them properly before removing the tractor from the blocking.
8. Be sure the crankcase breather cap is clean and in place, and the weather cap is on the muffler or a covering is over muffler stack.

REMOVING THE TRACTOR FROM STORAGE

A diesel tractor that has been in storage will require careful attention before it is started and placed in operation.

1. Refill the cooling system.
2. Make sure the tires are properly inflated, then take the tractor off the blocking.
3. Make sure the crankcase breather cap is clean.
4. Lubricate the tractor completely to remove dried and dust contaminated grease.
5. Make sure the crankcase, the air cleaner oil cup, the hydraulic housing, and the transmission are filled to the correct level.
6. Replace the fully charged batteries.
7. Drain all of the Diesel Flushing Oil out of the fuel tank and the filter. Refill the tank with clean diesel fuel.
8. Bleed the fuel system as directed on Page 32. Change fuel filter cartridge.
9. Start the engine and let it run at idling speed. It is advisable to remove the valve cover to make sure no valves are sticking and that rocker arm assembly is receiving lubrication.

IMPORTANT!

**DO NOT ACCELERATE THE ENGINE OR RUN IT AT FULL
SPEED IMMEDIATELY AFTER STARTING.**

10. Immediately upon starting the engine, check the oil pressure gage and the ammeter.

NOTE: The flushing oil in the fuel system will cause a blue-white exhaust for a short time. This will not damage the engine.