

**800/1000
Crawler**

Service Manual

9-72062



**800 CRAWLER, S/N 7081201 AND AFTER
1000 CRAWLER, BEFORE S/N 7103000**

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GENERAL SPECIFICATIONS

GROUP I

SECTION A - MODEL 800 SPECIFICATIONS

CAPACITIES (U.S.)

Fuel tank	40 Gallons
Cooling	7-1/2 Gallons
Transmission and Torque Converter	11-1/2 Gallons
Final Drive (Each)	8 Quarts
Crankcase	Dry Engine (new filter element) - 9 Quarts
	Wet Engine (old filter element) - 7 Quarts
Air Cleaner	1 Quart
Hydraulic Brake System	1-1/2 Pint
Hydraulic System - Terraload'r	24 Gallons
Hydraulic System - Terradozer	22 Gallons

TRACTOR

Engine, Continental Diesel	HD-277
HP (Gross)	80
HP (Net)	70
Electrical System	24 Volts
Cooling Fan Diameter	20 In.
Ratio - Engine To Fan	1.4
Radiator: No. Tubes	5
No. Fins Per Inch	7
Torque Converter: Make	LONG
Type	SINGLE STAGE
Diameter	13 In.
Stall Speed	1550-1650
Stall Torque	
Ratio	1.92
Transmission: Model	593
Type	HYDRAULIC
No. Speeds Forward	4
No. Speeds Reverse	4
Battery: Type	GROUP 2E
Number	4
Capacity - 20 Hour Rate	130 Amp. Hrs.
Generator: Make	Delco-Remy
Capacity	10 Amp.

DIMENSIONS AND WEIGHTS

	Wide Gauge (Loaders)	Narrow Gauge (Dozers)
Length, Overall Without Drawbar	114-11/16 In.	
Height	71-1/2 In.	
Gauge	60 In.	54 In.
Width, Overall	75 In.	69 In.
Ground Clearance Without Drawbar	16-3/16 In.	
Ground Clearance Under Drawbar	10-15/16 In.	
Drawbar Height	14-1/16 In.	
Drawbar Movement, Lateral	16 In.	
Track Shoe Width, Standard	15 In.	
Track Shoe Width, Maximum	24 In.	20 In.
Number Track Links Per Side	37	
Length Of Track On Ground	73 In.	
Track Pitch	6-1/4 In.	
Sprocket Teeth	27	
Ground Contact Area	2190 Sq. In.	
Height Of Grouser	2-1/16 In.	
Track Pin Diameter	1-1/4 In.	
Track Bushing Diameter	1-7/8 In.	
Track Bolt Diameter	1/2 In.	
Track Rollers, No. Per Side	5	
Track Roller Diameter	7-1/4 In.	
Support Rollers, No Per Side	1 (2 Optional)	
Ground Pressure	5.3 PSI	5.1 PSI
Weight (Standard Basic) Shipping	11,680 Lbs	11,200 Lbs.

ENGINE

Continental Model HD-277 Diesel

Number of Cylinders	4
Bore	4 In.
Stroke	5-1/2 In.
Governed RPM (Full Load)	2250
Injection System	Roosa-Master
Firing Order	1, 3, 4, 2
Valve Tappet Clearance	.014 Intake (hot)
Valve Tappet Clearance	.014 Exhaust (hot)

PERFORMANCE DATA

		<u>1 ST</u>	<u>2 ND</u>	<u>3 RD</u>	<u>4 TH</u>
Speeds:	Forward	1.6	2.9	3.3	5.9
	Reverse	1.9	3.5	4.0	7.2

Steering:	Geared Turn - 7 Foot Radius (Measured From Center Of Inside Track)	
	Pivot Turn	
	Counter-Rotation	
Gradeability:	Fore And Aft	38°
	Sideways	32°
Drawbar Pull:	1ST	20,700
	2ND	11,750
	3RD	10,000
	4RD	5,660

SECTION B - 800 LOADER SPECIFICATIONS

REAR HINGE LOADER

Bucket Capacity	1.5 Cu. Yd.
Digging Depth Below Ground	8-3/4"@8-1/2°
Grading Angle	115°
Bucket Rollback-At Ground Level	40°
At Carry	39-1/2°
At Maximum Lift	55°
Overall Height At Maximum Lift (Clearance Required To Dump Bucket)	162-3/8 In.
Dump Clearance	98-5/8 In.
Dump Reach At Maximum Lift	35-1/16"@45°
At 7 Foot Dump	45-1/4 In.
Lifting Time From Ground Level To Max. Lift	7 Sec.
Dumping Time	2.4 Sec.
Lowering Time	5.0 Sec.
Width of Bucket	81 In.
Tractor Width	75 In.
Overall Height	94 In.
Overall Length	185-5/16 In.
Weight With Counterweight	20,970 Lbs.
Lift Capacity At Ground	17,440 Lbs.
Fully Raised	8,150 Lbs.
Dump Cylinder Size	4"x 23-1/4"
Lift Cylinder Size	5"x 29-1/2"
Pump Capacity At Rated RPM	41 Gal./Min.
Cutting Edge Of Bucket: Width	6 In.
Thickness	3/4 In.

SECTION C - DOZER SPECIFICATIONS

TILT - CROWN DOZER

Moldboard Width	96 In.
Moldboard Height	31-1/2 In.
Lift Above Ground	33 In.
Drop Below Ground	13 In.
Hydraulic Lift Cylinders	3-1/2" x 31-1/2"
Hydraulic Tilt Cylinders	3-1/2" x 2-1/8"
Lift Speed	13 In./Sec.
Pump Capacity	31 Gal./Min.
Moldboard Crown Adjustment	14 In.
Moldboard Pitch Adjustment	10°
Overall Length	157-1/2 In.
Weight	14,450 Lbs.

ANGLE DOZER

Moldboard Width	112 In.
Moldboard Height	31-1/2 In.
Lift Above Ground	30 In.
Drop Below Ground	13-1/2 In.
Hydraulic Lift Cylinders	3-1/2" x 31-1/2"
Hydraulic Angle Cylinders	3" x 33-1/4"
Pump Capacity	31 Gal./Min.
Lift Speed	12 In./Sec.
Moldboard Angle Adjustment	21°
Moldboard Crown Adjustment	12 In.
Overall Length	158 In.
Total Weight	15,000 Lbs.

SECTION D - MODEL 1000 SPECIFICATIONS

CAPACITIES (U.S.)

Fuel Tank	45 Gal.
Cooling	8-1/2 Gal.
Transmission and Torque Converter	11-1/2 Gal.
Final Drive (Each Side)	8 Qts.
Crankcase	11 Qts.
	with filter
	12 Qts.
Air Cleaner	1 Qt.
Hydraulic Brake System	1-1/2 Pt.
Hydraulic System - Terraload'r	24 Gal.
Hydraulic System - Terradozer	22 Gal.

TRACTOR

Engine, Continental Diesel	JD-382
HP (Gross)	100
HP (Net)	87
Electrical System	24 Volts
Cooling Fan Diameter	22 In.
Ratio - Engine to Fan	1.3
Radiator: No. Tubes	6
No. Fins Per Inch	7
Torque Converter: Make	LONG
Type	SINGLE STAGE
Diameter	13 In.
Stall Speed	1400-1500
Stall Torque Ratio	1.72
Transmission: Model	593
Type	Hydraulic
No. Speeds Forward	4
No. Speeds Reverse	4
Battery: Type	Group 2E
Number	4
Capacity - 20 Hour Rate	130 Amp. Hrs.
Generator: Make	Delco-Remy
Capacity	10 Amp.

DIMENSIONS AND WEIGHTS

	Long Track (Loaders)	Standard Track (Dozers)
Length, Overall Without Drawbar	114-15/16 In.	
Height	72 - 5/8 In.	
Gauge	60	
Width, Overall.	76 In.	
Ground Clearance Without Drawbar	16 - 3/16 In.	
Ground Clearance Under Drawbar	10 - 15/16 In.	
Drawbar Height	14 - 1/16 In.	
Drawbar Movement, Lateral	16 In.	
Track Shoe Width, Standard	16 In.	
Track Shoe Width, Maximum	24 In.	
Number of Track Links Per Side . . . 39		37
Length of Track on Ground 79 In.		73 In.
Track Pitch	6 - 1/4 In.	
Sprocket Teeth	27	
Ground Contact Area 2528 Sq. In.		2336 Sq. In.
Height Of Grouser	2 - 1/16 In.	
Track Pin Diameter	1 - 1/4 In.	
Track Bushing Diameter	1 - 7/8 In.	
Track Bolt Diameter	1/2 In.	
Track Roller Diameter	7 - 1/4 In.	

	Long Track (Loaders)	Standard Track (Dozers)
Number of Track Rollers Per Side	6	5
Number of Support Rollers Per Side	2	1 (2 Optional)
Ground Pressure	5.3 PSI	5.6 PSI
Standard Basic Shipping Weight	13, 290 Lbs	13,090 Lbs.

ENGINE

Continental Model JD-382

Number of Cylinders	4
Bore	4-1/2 In.
Stroke	.6 In.
Governed RPM. (Full Load)	2000
Injection System	Roosa - Master
Firing Order	1, 3, 4, 2
Valve Tappet Clearance	.014 Intake (Hot)
Valve Tappet Clearance	.014 Exhaust (Hot)

PERFORMANCE DATA

	IST	2ND	3RD	4TH
Speeds: Forward	1.6	2.9	3.3	5.9
Reverse	1.9	3.5	4.0	7.2

Steering: Power Turn - 7 Foot Radius
Pivot Turn
Counter-Rotation

Gradeability: Fore and Aft	38°
Sideways	32°

Drawbar Pull:	IST	25,400 Lbs.
	2ND	14,400 Lbs.
	3RD	12,290 Lbs.
	4TH	6,770 Lbs.

SECTION E - 1000 LOADER SPECIFICATIONS

REAR HINGE LOADER

Bucket Capacity	2 Cu. Yd.
Digging Depth Below Ground	9-11/16" @ 8 1/2°
Grading Angle	112-1/2°
Bucket Rollback - At Ground Level	40°
At Carry	42-1/2°
At Maximum Lift	54°

Overall Height At Maximum Lift (Clearance	
Required to Dump Bucket)	174-1/8 In.
Dump Clearance	100-3/4 In.
Dump Reach At Maximum Lift	44-3/8" @ 45°
At 7 Foot Dump	42" @ 60°
Lifting Time From Ground to Maximum Lift	6.6 Sec.
Dumping Time	2.7 Sec.
Lowering Time	3.1 Sec.
Width of Bucket	81 In.
Width of Tractor	76 In.
Overall Height	94 In.
Overall Length	197 In.
Weight With Counterweight	23, 170 Lbs.
Lift Capacity At Ground	18,700 Lbs.
Fully Raised	9,300 Lbs.
Dump Cylinder Size	5" x 22-3/16"
Lift Cylinder Size	5-1/2" x 30"
Pump Capacity At Rated RPM	56 Gal./Min.
Cutting Edge of Bucket: Width	6 In.
Thickness	3/4 In.

SECTION F - MODEL 1000 DOZER SPECIFICATIONS

TILT-CROWN DOZER

Moldboard Width	104 In.
Moldboard Height	31-1/2 In.
Lift Above Ground	33 In.
Drop Below Ground	13 In.
Hydraulic Lift Cylinders	3-1/2" x 31-1/2"
Hydraulic Tilt Cylinders	3-1/2" x 2-1/8"
Lift Speed	14 In./Sec.
Pump Capacity	31 Gal./Min.
Moldboard Crown Adjustment	14 In.
Moldboard Pitch Adjustment	10°
Weight	16, 450 Lbs.

ANGLE DOZER

Moldboard Width	120 In.
Moldboard Height	31-1/2 In.
Lift Above Ground	31-1/2 In.
Drop Below Ground	13-1/2 In.
Hydraulic Lift Cylinders	3-1/2" x 31-1/2"
Hydraulic Angle Cylinders	3" x 33-1/4"
Pump Capacity	31 Gal./Min.
Lift Speed	14 In./Sec.

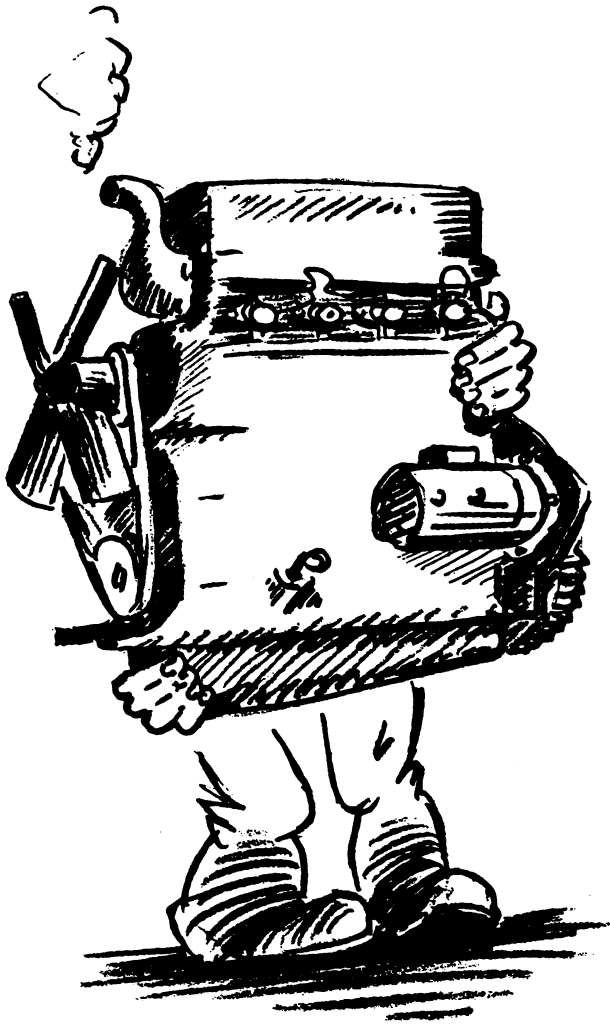
Moldboard Angle Adjustment	20°
Moldboard Crown Adjustment	12 In.
Overall Length	160 In.
Total Weight	17,025 Lbs.

SECTION G - RIPPER SPECIFICATIONS

Tooth Clearance Above Ground	15-3/4 In.
Digging Depth Below Ground	16-3/4 In.
Hydraulic Cylinder (l)(Double Acting)	4" x 13"
Number Of Teeth (Standard)	3
Spacing Of Teeth (Standard)	32" Centers
Tooth Shank Thickness	1-1/2 In .
Distance From Center Line Of Sprocket To	
Back Of Tooth (Raised) (Approx.)	52-13/16 In.
Weight Of Ripper	1480 Lbs.
Ballast Weights Available	2
Weight Of Ballast.	860 Lbs. Ea.

ENGINE

II



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DIESEL ENGINES

GROUP II

SECTION A - GENERAL INFORMATION AND SPECIFICATIONS

ENGINE SPECIFICATIONS

	<u>Model 800</u>	<u>Model 1000</u>
Continental Diesel	HD 277	JD 382
Number of Cylinders	4	4
Bore	4"	4-1/2"
Stroke	5-1/2"	6
Displacement in Cubic Inches	277	382
Compression Ratio	15.0:1	15.0:1
Injection System	Roosa Master	Roosa Master
Firing Order	1-3-4-2	1-3-4-2

ELEMENTARY PRINCIPLES OF DIESEL ENGINES

In order to dispel any mystery there may be with regard to the diesel engine and how it operates, compare the diesel engine with its gasoline counterpart.

Mechanically, the two are alike. Both have pistons moving up and down in cylinders with connecting rods attached to a crankshaft. Both convert the reciprocating motion of the pistons into a rotary motion. Both have valves in the cylinder heads operated by a camshaft and push rods. An intake valve admits air into the cylinder, and an exhaust valve permits the disposition of the burned gases. The camshaft is driven through a train of timing gears so that the opening and closing of the exhaust and intake valves are properly timed with the stroke of the piston and crankshaft.

The engines are so much alike in exterior appearance that the only way most people are able to distinguish between them is to look for the carburetor and the distributor on the gasoline engine or the injection pump on the diesel.

Both operate on mixtures of liquid fuel and air inside the combustion chambers. The ignition of these mixtures under pressure, and the subsequent expansion furnishes the power to drive the piston downward on its power stroke. The one big difference between the two types of engine lies in the way the fuel is handled and combustion brought about.

In a gasoline engine desired proportions of fuel and air are mixed in the carburetor before entering the cylinder through the intake valve. In a diesel engine, air is drawn into the cylinder through the intake valve and is compressed. At the proper time a measured quantity of fuel is injected into this air thus forming a combustible mixture which is self-ignited by the high temperature of the compressed air.

In a gasoline engine the suction or downward stroke of the piston draws in a combustible mixture of air and gasoline which is compressed in the upward stroke and ignited by an electric spark, whereupon the expansion of this compressed mixture forces the piston down on the power stroke.

In the diesel engine, the piston on the down stroke draws in clean, pure air, which is compressed on the upward stroke. At the proper instant, fuel is injected into this compressed air which then ignites from the heat of compression, causing the expansion of the mixture and forcing the piston down on the power stroke. The compression ratio of diesel engines is twice that of gasoline engines, and it is the heat generated by the comparatively rapid compression of the air which ignites the fuel as it is sprayed in under high pressure.

It is a well known fact that the tendency in gasoline engines design is to increase compression ratios in order to obtain more power and greater efficiency out of the engine without increasing the bore and stroke. Compression ratios are however limited by the octane number of fuels available and the desire to keep combustion chamber temperatures down to prevent pre-ignition. A diesel engine is not controlled by these conditions, consequently, compression ratios in the neighborhood of 15 to 1 can be used with entire satisfaction since there is no possibility of the air in this engine igniting until injection of the fuel provides a combustible mixture. This high compression in a diesel causes the temperature of the air to rise under compression to approximately 900° Fahrenheit, far above the ignition point of the fuel, thus igniting the mixture.

To summarize, both engines are heat engines of the internal combustion type, the power in each case being developed from the expansion of the mixture of air and fuel after ignition occurs. Since the expansion is directly related to the compression, the diesel is able to deliver a greater amount of work using a given quantity of fuel. This is basically the reason for its superior efficiency, which results in its saving in fuel cost.

THE DIESEL CYCLE

Intake

Air only is drawn into the cylinder through the open intake valve by the suction created by the Downward moving piston. Figure 1.

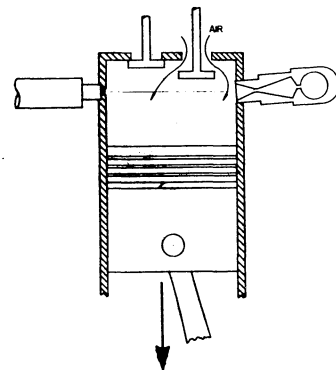


Figure 1

Compression

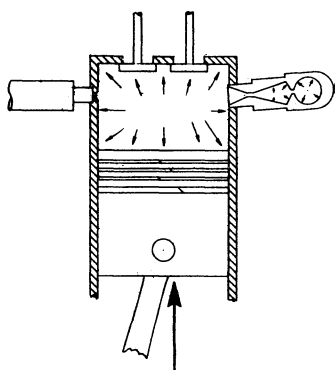


Figure 2

The intake valve is now closed and the air in the cylinder is highly compressed by the Upward Moving piston. This high compression of the air raises the temperature to between 900° and 1000° F. Figure 2.

Injection and Combustion

At a definite point, shortly before the piston reaches the top of its stroke, fuel is injected into the cylinder by the spray nozzle. The fuel is ignited by the heat of the highly compressed air. Figure 3.

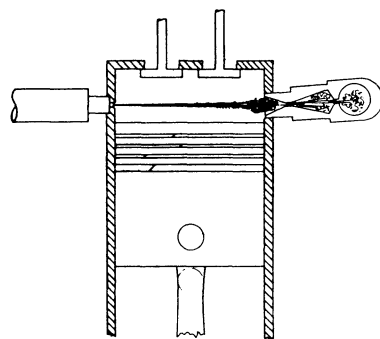


Figure 3

Power

The expansion of the gases resulting from the burning of the fuel exerts pressure on top of the piston, driving it Downward. Figure 4.

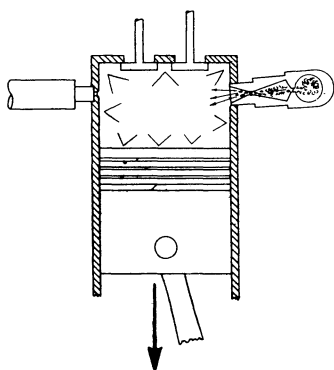


Figure 4

Exhaust

As the piston passes the bottom of its stroke the exhaust valve opens and the burnt gases are expelled by the now Upward moving piston. The intake valve opens about the time the piston reaches the top of its stroke, and a similar sequence of events, often referred to as the cycle, repeats itself. Figure 5.

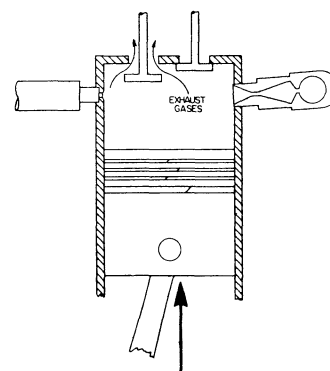


Figure 5

Compression

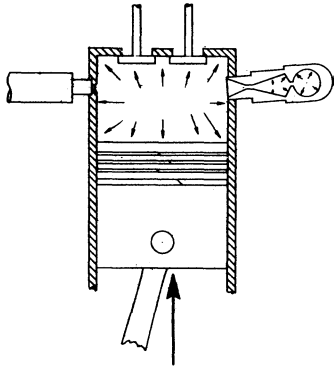


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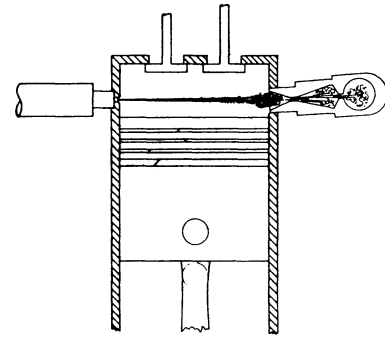


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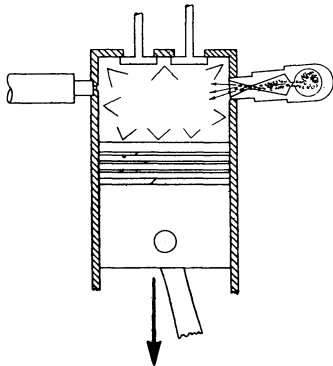


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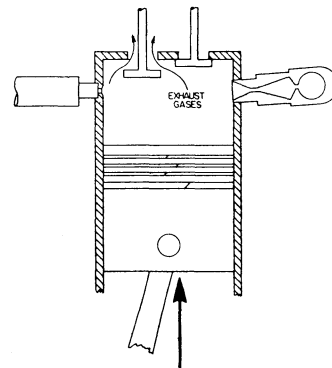


Figure 5

Distillation Recovery	Lower % recovery indicates heavy oil fractions to cause smoke and poor combustion.	98%
Total Sulphur	Sulphurous acids corrode and increase engine wear.	.5% Maximum
Corrosion(Copper)3 hours @ 212° F.	Discoloration or pitting on polished copper strip shows same effect on engine parts.	Pass Test
Pour Point	Fuel Oil must be in fluid state to prevent clogging due to congealing wax.	10° F. below lowest anticipated operating temperature.
Warning: Grade # 2 Diesel Fuel Oil should not be confused with # 2 Furnace Oil, which has no definite limits on ash content, sulphur content, and Cetane Value.		

HANDLING AND STORAGE

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

A storage tank should be constructed for fuel oil with 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 pump. Double filtering is preferable, and the filter equipment should be maintained as recommended by the manufacturer.

The open ends of the dispenser funnels, measures, and containers should be covered, when not in use, to prevent the entrance of dirt or moisture, and they should be kept scrupulously clean at all times.

FUEL SYSTEM PRECAUTIONS

1. Fill the fuel tank at the end of each day to keep condensation to a minimum. When emptying the drum of fuel oil, agitate it as little as possible, and leave about 1" of fuel, which may contain sediment or water, in the bottom of the drum.
2. Shut off fuel supply valve at fuel tank when disconnecting lines -- to save needless waste of fuel.

3. Drain first stage fuel filter daily. This will also prevent ice damage to the filtering element where freezing temperatures are encountered.
4. DO NOT USE WASTE OR LINTY RAGS AROUND FUEL CONTAINERS OR FUEL INJECTION EQUIPMENT.
5. Use of clean fuel and daily care of the first-stage filter will prolong the life of the final-stage filter. For further details see Section on Fuel Injection.

FUEL PIPING ARRANGEMENTS

The fuel supply arrangement is with the fuel tank mounted higher than the injection pump and filters. This provides gravity feed to the filters and pump.

The fuel supply lines should be 3/8" copper tubing minimum under 10 feet and 1/2" copper tubing for lines over 10 feet. The return lines should be 5/16" minimum tubing. Return lines must also be piped to the tank and never back to the inlet, as its fuel flow cools, lubricates, and purges air from the tank.

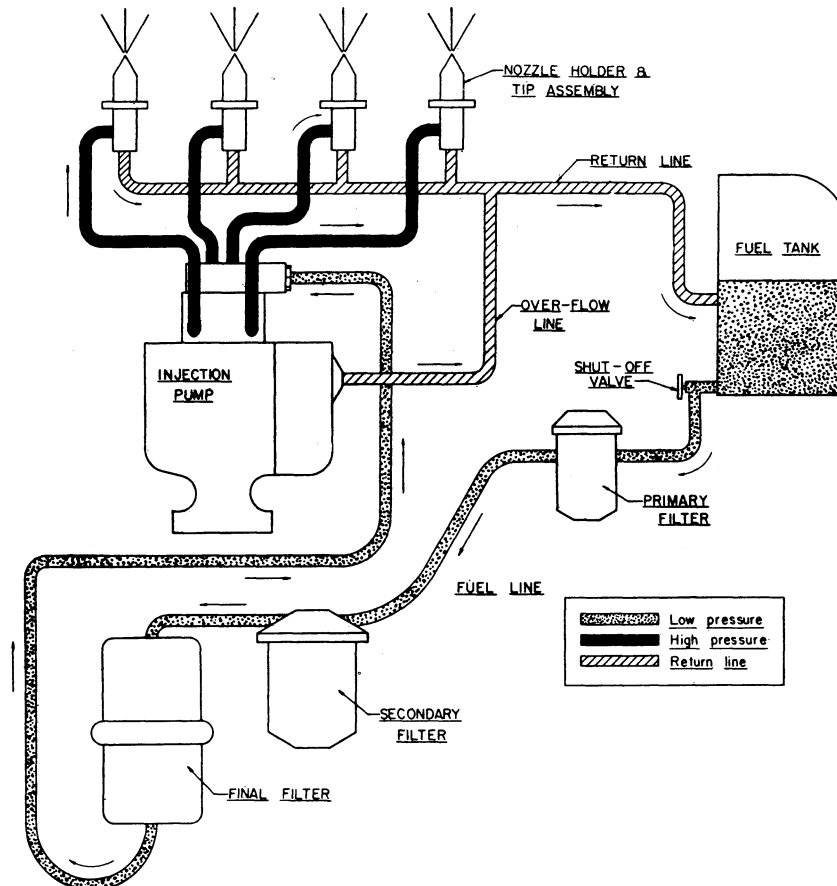


Figure 6 - Schematic of Fuel Filtering System

DIRT IS THE WORST ENEMY OF A DIESEL ENGINE

Eliminate possible damage to diesel engines by preventing the entry of dirt:

1. Use clean fuel, keeping all funnels and measures in dustproof cases.
2. Keep fuel system clean while servicing. Cap lines that must be broken, and wipe clean all openings before closing.
3. Clean and refill oil bath air cleaner at regular intervals.
4. Replace oil filter at every oil change.
5. Hose nozzles, filler flanges, and caps must be thoroughly cleaned before using.
6. Avoid using linty or dirty rags when working on diesel engines.
7. Keep outside of engine clean for maximum cooling.

Dirt and water in the fuel cause scored and sticking plungers in the injection pump and may cause serious damage.

KEEP DIESEL FUEL CLEAN!

LUBRICATION RECOMMENDATIONS

Diesel engines operate with much higher pressures in the combustion chambers than their gasoline counterparts. Diesel fuels have much higher end points, that is, heavier ends of fuel which do not vaporize readily and burn completely. This results in a tendency to form deposits in the combustion area as well as in the ring grooves which could cause clogging of energy cells, rings sticking in the grooves and poor performance in general with resultant rapid wear and increased maintenance expense.

To counteract these conditions, the choice of fuels and lubricating oils must be made according to the specifications.

Oil used in the lubrication system must have certain qualities to provide a satisfactory oil film on friction surfaces to minimize wear, to protect bearings from corrosion, and to keep engines free from harmful deposits.

Lubricating oils for diesel engines are compounded with additives to provide this protection. They are better able to resist oxidation resulting from the higher operating pressures found in the diesel and at the same time, hold combustion by-products in suspension until removed when the oil is drained. Diesel en-

gines are generally used in heavy duty operation. The American Petroleum Institute has classified oils for three types of service: General Service-DG, Moderate Service-DM, and Severe Service-DS, depending on the type of operation.

For Service DG (Diesel General)

As the name indicates, this DG oil is for use in General or Ordinary service where diesel fuel oil with less than .4% sulphur is used with normal engine operation and maintenance.

For Service DM (Diesel Moderate)

This oil is to be used in diesel engines operating under severe conditions, or using fuel which tends to promote deposits, but where design characteristics or operating conditions make the engine either less sensitive to fuel effects or more sensitive to residues from the lubricating oil.

For Service DS (Diesel Severe)

This oil is to be used when the diesel fuel oil has over .4% sulphur content coupled with severe operating conditions under heavy loads and high temperature conditions, or very light or intermittent operation at low temperatures.

While oils in this category are, by no means, a safeguard against failure to follow proper maintenance procedures, they are absolutely necessary when operating conditions approach those outlined in the preceding paragraph. We recommend using motor oils meeting DS specifications.

OPERATING CONDITIONS

<u>TEMPERATURE</u>	<u>SEVERE</u>	<u>S.A.E. NUMBER</u>
0° or Below	Service DS	5W-20
0° to 35° F.	Service DS	10W-30
35° to 100 F.	Service DS	40
100 or Over	Service DG	50

As in other internal combustion engines, oils must be selected as to S.A.E. number grades in accordance with the atmospheric temperature where the engine is to be operated.

Except for the break-in period, designated elsewhere in this manual as the first 50 hours, select the grade of oil as shown in the preceding chart.

Continental Diesel Engines have full pressure lubrication through drilled passages in the cylinder block and crank shaft to all main and connecting rod bearings as well as to the timing gears and overhead valve rocker arms, the over flow from which lubricates the tappets. The oil pressure is automatically regulated by a spring loaded relief valve.

OIL FILTER

A full flow type oil filter is provided to remove dirt and foreign elements from the oil. The removal of grit, sludge and foreign particles causes filter elements to clog and become ineffective unless they are replaced at regular intervals.

Oil filter elements or cartridges should be replaced at every oil change or approximately every 50 hours operation.

OIL CHANGE FREQUENCY

Engine oil does not "wearout". However, heavy-duty detergents in diesel engines become contaminated from by-products of combustion, dirt, water, and unburned fuel entering the crankcase and the detergents holding the carbon particles in suspension in the crankcase.

In normal industrial operation engines should have the oil and the oil filter element changed after every 50 hours of operation. The oil should be drained when the engine is at normal operating temperature.

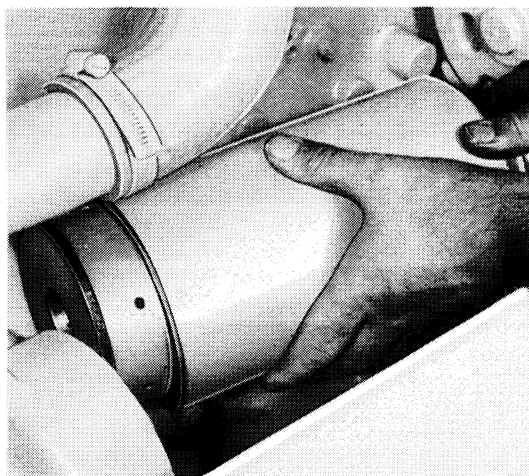


Figure 7 - Oil Filter

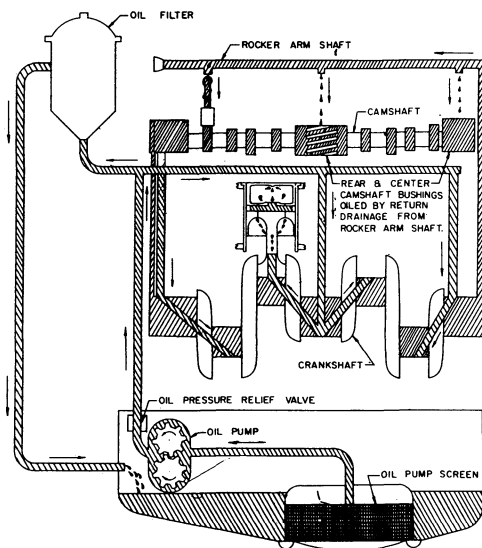


Figure 8 - Lubrication Diagram

(The camshaft has been moved up in order to simplify the schematic drawing.)

OIL PUMP

The oil pump is mounted on the rear of the Lanchester Balancer. It is a gear type pump driven by the timing gear on the crankshaft.

The normal oil pressure is 30 to 40 lbs. At idling speed it should not fall below 7 lbs. If the pressure fluctuates or falls below these limits, STOP THE ENGINE IMMEDIATELY, and find the cause to the trouble. Refer to engine overhaul for repairing.

AIR CLEANER

Diesel engines, when operating, consume several thousand cubic feet of air per hour. Since dusty air is full of abrasive matter, the engine would soon wear excessively if it was not protected by the air cleaner collecting dust in an oil cup.

Air cleaners are not 100% efficient, and their efficiency is DECREASED by the lack of proper servicing.

Proper servicing means cleaning thoroughly, refilling with new oil, and maintaining air tight connections between the air cleaner and the intake manifold so that all air entering the engine is filtered.

The number of hours an engine may be permitted to run before the air cleaner is serviced depends entirely on operating conditions, and no definite interval can be established. In extremely dusty operations this might be once or twice a day, while in dust free areas the air cleaner should be serviced when changing the oil.

Dirt and foreign particles, removed from the air, settle to the bottom of the air cleaner oil sump. This deposit must not be permitted to build up to any quantity. The speed at which this builds up indicates how often the air cleaner should be serviced.

IT REQUIRES ONLY A COMPARATIVELY SMALL QUANTITY OF ABRASIVE DUST TO WEAR OUT AN ENGINE. A planned air cleaner servicing program will increase the life of the engine.

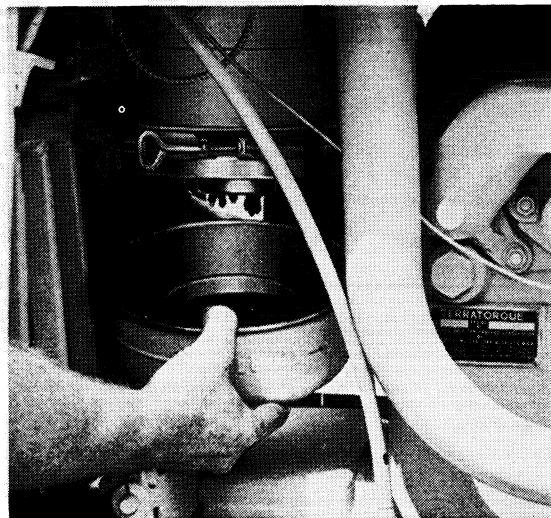


Figure 9 - Air Cleaner

SECTION C - ENGINE COOLING

The function of the cooling system is to prevent temperatures, some as high as 3500° F. in the combustion chamber, from damaging the engine.

Maintaining the cooling system efficiency is important, as engine temperatures must be maintained within a specific satisfactory range for efficient operation. Yet overheating must not take place, in order to prevent damage to valves, pistons, and bearings.

Continental Diesel Engines operate most efficiently with water temperatures of 165° - 185° F. A thermostat and by-pass system is used to control these temperatures. The normal operating temperature when a pressurized cooling system is used is 175° - 210° F. The thermostat valve remains closed and only allows the water to recirculate within the engine itself until normal operating temperatures are reached. This provides for both rapid and even temperature increase of all engine parts during the warm up period. When the desired temperature is reached, the thermostat valve opens and allows the water to circulate through both engine and radiator.

The cooling water is circulated by a water pump located at the front of the engine block. The radiator cooled water enters the pump at the lower or suction opening and is directed through integral distribution passages cast in the cylinder head to areas in and around the valve seats and combustion chambers. This method provides the coolest water at the parts in the engine subjected to the highest temperatures.

The cylinder walls, in turn, are cooled by convection currents only, which keep the cylinder barrels at a more uniform temperature, thereby greatly reducing crankcase oil dilution and sludge formation.

Upon leaving the cylinder head, water enters the thermostat housing through a by-pass type thermostat, which controls the opening to the radiator.

RADIATOR

The radiator consists of tubes through which the cooling water is circulated. In standard radiator design fins are connected to the tubes to give an extended surface through which heat can be dissipated. It is important that these tubes be kept clean on the inside and the fins free of dirt on the outside so that maximum heat transfer can take place in the radiator.

Keep the cooling surfaces of the core free of dirt and other foreign particles.

Each 250 hours of operation the radiator and cooling system is to be well cleaned and flushed with clean water.

Wherever possible, use only soft clean water in the cooling system. Hard water will cause scale to form in the radiator and the engine water jackets and cause poor heat transfer. Where the use of hard water cannot be avoided, use an approved anti-rust and water pump lubricant.

CLEANING THE COOLING SYSTEM

Deposits of sludge, scale, and rust on the cooling surfaces prevent normal heat transfer and in time render the cooling system ineffective. The appearance of rust in the radiator or coolant is a warning that the corrosion inhibitor has lost its effectiveness, and the radiator is to be cleaned before adding fresh coolant.

Use dependable cleaning compounds. Follow the procedure recommended by the supplier. This is of prime importance because different cleaners vary in concentration and chemical composition. After cleaning and flushing, fill the system with an approved anti-freeze compound containing a rust and corrosion inhibitor or water with a corrosion inhibitor.

RADIATOR PRESSURE CAP

The practice of operating the cooling system under pressure is used because of the reduction in evaporation losses, because of the increase in engine operating temperatures possible without overflow loss from boiling, and because of a desire to increase the radiator cooling capacity. This is possible because the increased pressure within the system raises the boiling point of the coolant.

The Case Model 800 and 1000 Crawlers use 7 pound pressure caps, which have spring loaded valves that close the outlet to the overflow pipe of the radiator and thus seal the system until 7 pounds of pressure is built up. To prevent the collapse of hoses which have no internal support, a second valve in the radiator cap opens under vacuum when the system cools.

The boiling point of the cooling water at 7 pounds of pressure is 232°F at sea level. When a pressure cap is used, an air tight cooling system is necessary, and particular attention must be paid to insure tight connections.

ENGINE OIL COOLER

The Models 800 and 1000 employ heat exchangers to cool the engine lubricating oil. Figure 10. Located on the right side of the engine block, the cooler is designed so that oil passes through tubing surrounded by the coolant. The oil is cooled and thus helps to reduce engine heat.

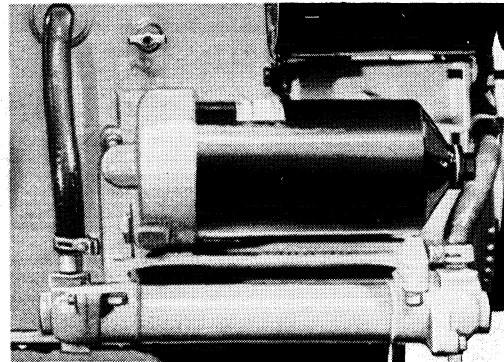


Figure 10 - Engine Oil Cooler

SECTION D - COLD WEATHER STARTING AND MAINTENANCE

COLD WEATHER STARTING - Below 32°

The requirements for satisfactory cold weather operation of diesel engines differ somewhat from those of gasoline engines. This is brought about, to a large extent by a difference in methods of ignition.



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The diesel engine depends on the heat from the air compressed in the combustion chamber to ignite the fuel when it is injected into this air. It requires a temperature of approximately 900° F. in the combustion chamber to institute this combustion process.

With engines standing out in temperatures below freezing, difficulty may be expected in raising the temperature of the air in the combustion chamber to the point where it will ignite fuel, even though compression pressures do meet the required minimum of 325 pounds per square inch, and the starter will turn the engine over at a desirable minimum of 150 RPM.

ETHER BOMB STARTING

An ether spray bomb is provided with the 800 and 1000 Crawlers to insure cold weather starts. The bomb is used as follows:

1. Make sure both track speed controls are in neutral position.
2. Open shut-off cock in the fuel line beneath tank.
3. Using the ether spray bomb, direct spray into screen mesh of air cleaner cap. At the same time crank the engine with the starter. Repeat until engine has fired. Figure 11.
4. Under extremely windy conditions, it is advisable to remove the air cleaner cap and spray directly into the opening. Be careful, however not to saturate air with ether.

CAUTION

Use every precaution against igniting or excessively inhaling ether fumes.

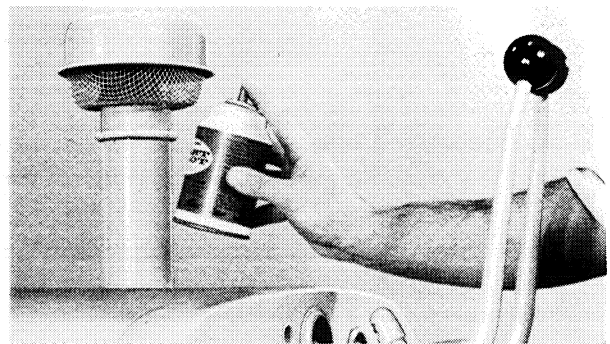


Figure 11 - Ether Spray Bomb

MAINTENANCE OF EQUIPMENT DURING COLD WEATHER

Certain maintenance operations must be checked more carefully in cold weather, than during summer operation. For instance, the thermostat and water temperature control must be maintained so that the engine is warmed up as quickly as possible to 185° F. and remains at this minimum or above during operation.

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