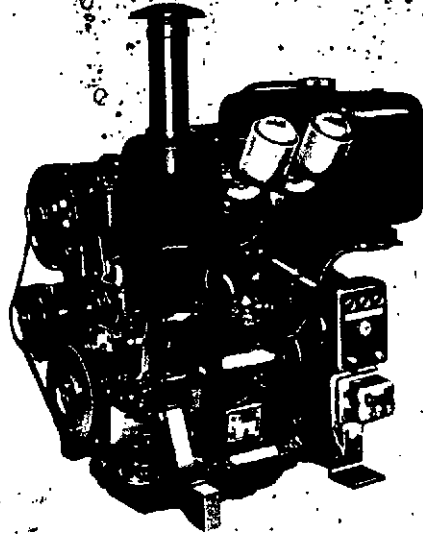
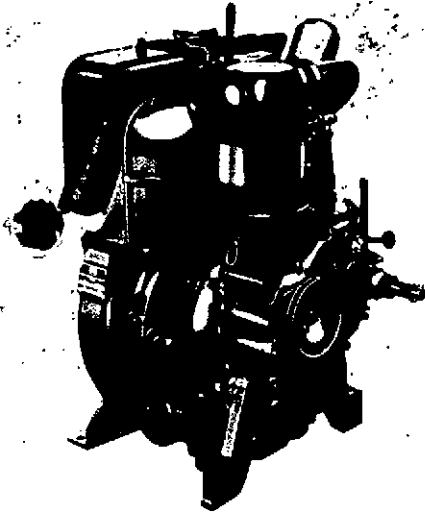




MAINTENANCE  
&  
OPERATING INSTRUCTIONS

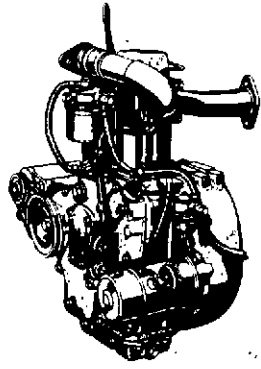
D 302 - 1

D 302 - 2

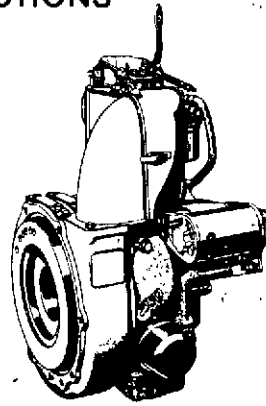


# OPERATING INSTRUCTIONS

MURPHY DIESEL

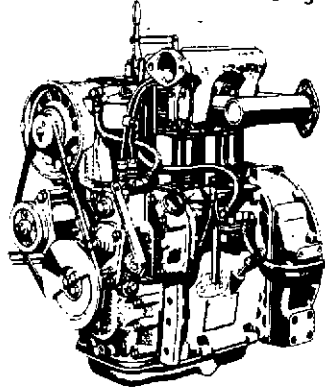


Engine front

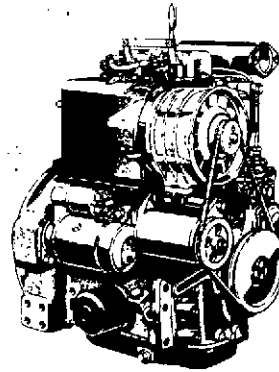


Back view

Single-cylinder engine



Front



Back view

Two-cylinder engine



**MURPHY DIESEL CO.**  
**5317 W. Burnham St.**  
**Milwaukee, Wisconsin 53219**

## Introduction

Please read this manual carefully and closely follow the operating and maintenance instructions before you start your engine for the first time.

Always use lubricants of approved brand which comply with our specification.

To prevent failures of the injection system, make sure that only clean fuel is used. Remember that the life of your engine depends on a careful and regular service.

For service, parts, or warranty information contact nearest Murphy Diesel distributor or the factory.

Murphy Diesel Co.  
5317 West Burnham St.  
Milwaukee, Wisconsin 53219  
414-645-2255

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# 1. TECHNICAL DATA

## 1.1 Construction and operation data

Type .....	D 302-1	D 302-2
Operating cycle .....	four stroke	four stroke
Combustion system .....	direct injection	direct injection
Lubrication .....	force feed	force feed
Cooling system .....	air cooling by flywheel blower	air cooling by axial blower
Number of cylinders .....	1	2
Bore .....	95 mm	95
Stroke .....	105 mm	105
Displacement .....	0,744 ltrs.	1,488
Output rating DIN 700 20 ..	h.p. see name plate	see name plate
Torque with vehicle rating ..	mcp see name plate	see name plate
Fuel consumption .....	g/HPH	
Lube oil consumption .....	g/HPH 1,5	1,5
Oil capacity of crankcase ...	ltrs. 2,6/1,6	4,5/2,75* (upper and lower mark)
Valve clearance, cold engine .....	mm 0,2	0,2
Min. oil pressure at rated speed .....	kp/cm <sup>2</sup> 2	2
Oil pressure warning indicator adjusted to .....	kp/cm <sup>2</sup> 0,5 - 0,8	
Min. oil pressure at low idling speed .....	kp/cm <sup>2</sup> 0,5	

\*) Supplementary quantity at first filling and at oil change is one liter.

## 1.2 Torque data for essential nuts and bolts in mcp 1st step 2nd st. Definitive tight.

1	Connecting rod bolt	19	M12x1,5	3	5	7,5-8
2	Bolt for counterweight	22	M14	3	8	14-15
3	Bearing cover fastening bolt, two-cyl. eng.	22	M14	3	8	13-14
4	Bolt for V-belt pulley, two-cyl. eng.	19	M12			12-13
5	Flywheel bolt, two-cyl.eng.	19	M12x1,5	3	8	12-12,5
5a	Flywheel bolt, single-cyl. eng.	19	M12	3	8	12-12,5
6	Tie rod (root thread), single-cyl.	M14	M14	2		3-4
7	Cylinder head nut	22	M14	2	4	5-5,5*)
8	Oil pump fastening bolt		M8			2-2,5
9	Fastening screw for injection valve	13	M8			1-1,5
10	Pressure pipe joint union to injec- tion pump	17	M12x1,5	2		4-5
11	Nut or crank handle for camshaft		M24x2	6	12	20-21
12	Nut for generator		M12x1,5			3,5-5
13	Oil sump fastening bolt	13	M8			2-2,5
14	Bolt for housing flange, two-cyl.eng.	17	M10	2	4	6-6,5

\*) with Molykote

15	Rocker arm bracket fastening	17	M10	2	3,5-4
16	Crankshaft gear wheel, single-cyl.		M12		3-4
17	Bolt for balance weight, single-cyl.		M14		5-6
18	Bearing plate fastening bolt, single-cyl. eng.		M8		2-2,5
	Bolt for crankshaft V-belt pulley		M12x1,5		12-12,5

### 1.3 Injection system

		D 302-1	D 302-2
Injection pump	CAV	CPF 1 R 75 C	CPF 2 R 75 CS
Fuel feed pump	Arranz		
Speed governor	MWM	centrifugal	centrifugal type
Injector		multi-hole nozzle	
Fuel filter	ltrs.		
Injection pressure	kp/cm <sup>2</sup>	180 + 5	
Timing before	T,D,C.		

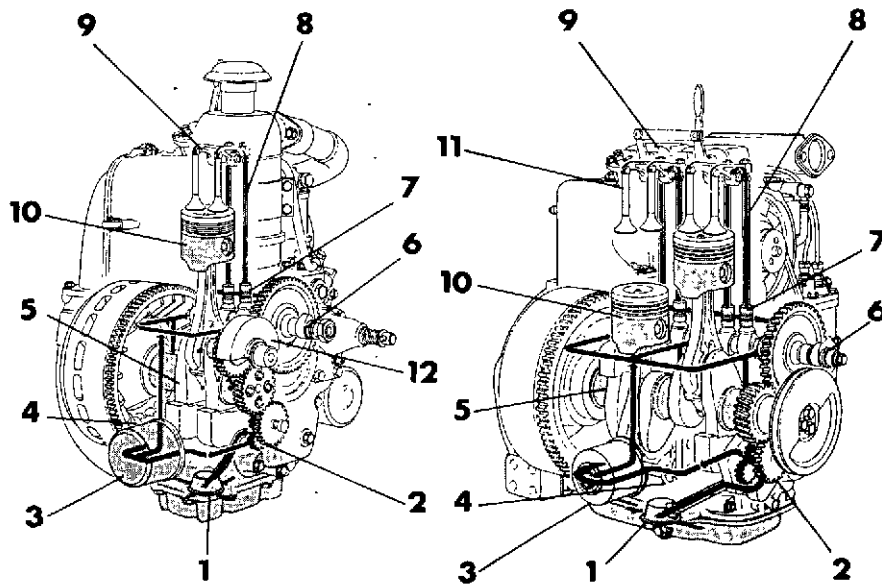
### 1.4 Electric equipment

Starter motor 12V	Bosch or Delco
Generator 12V	Bosch, Femsa or Motorola alternator
Normal Battery	Ah
Thin plate battery	Ah

## 1.5 Lubrication system

Dependent on the lubricating point, force fed or splash lubrication is provided for the moving parts of the engine. The lubricating oil pump aspirates the oil from the deepest point of the oil sump and delivers it through a micro superfine filter to the following bearings:

Main and connecting rod bearings, mushroom type tappets, rocker arm and camshaft bearing and balance weight working in opposite direction. The cylinder liners and pistons are splash-lubricated by the oil issuing from the connecting rod bearings.



### Single-cylinder engine

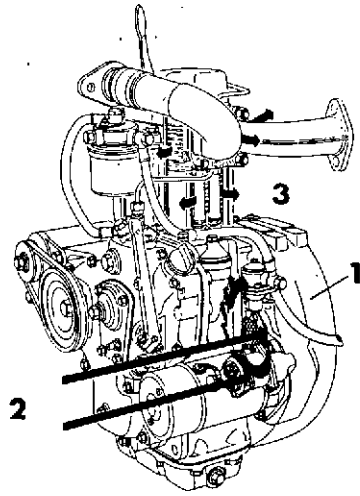
- 1 Suction funnel
- 2 Oil pump
- 3 Oil filter
- 4 Safety valve
- 5 Crankshaft
- 6 Camshaft

### Two-cylinder engine

- 7 Mushroom tappet
- 8 Pushrods
- 9 Rocker arms
- 10 Piston
- 11 Valve cone
- 12 Balance weight working in opposite direction

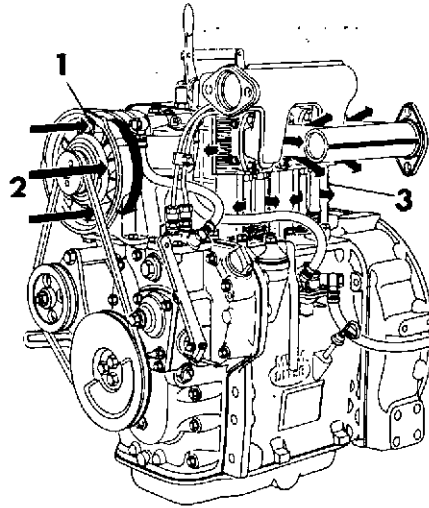
## 1.6 Cooling system

Cylinder heads and cylinders are cooled by air which is supplied from a flywheel blower for the single-cylinder engine and from an axial blower for the two-cylinder engine.



**Single-cyl. engine**

- 1 Flywheel blower
- 2 Cooling air intake
- 3 Cooling air discharge



**Two-cyl. engine**

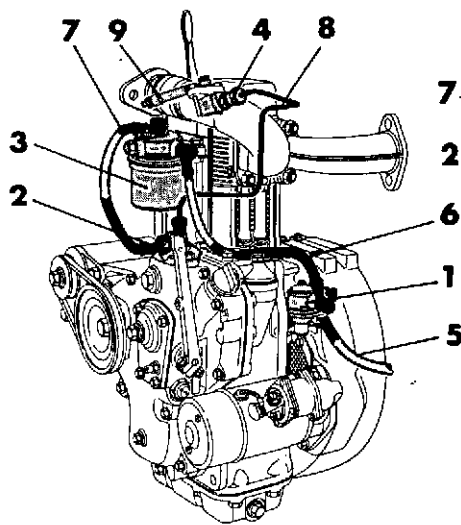
- 1 Axial blower
- 2 Cooling air intake
- 3 Cooling air discharge

## 1.7 Fuel System

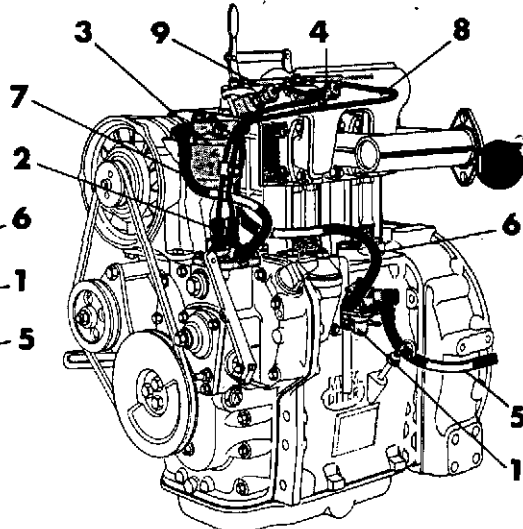
The fuel is picked up from the tank by a fuel feed pump and delivered to the fuel filter.

From the fuel filter the fuel passes into the suction compartment of the injection pump which delivers it high-pressurized to the injection valves.

Leak-off fuel from the injection valves is returned to the tank.



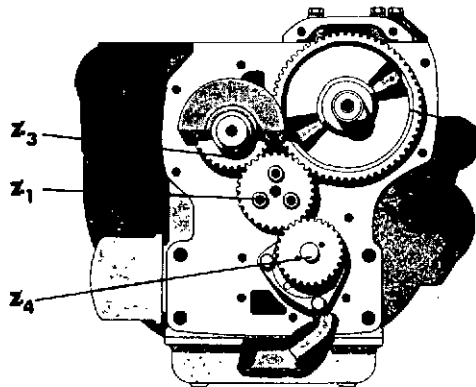
- 1 Fuel feed pump (Solex)
- 2 Injection pump
- 3 Fuel filter
- 4 Injection valve
- 5 Fuel suction pipe towards feed pump



- 6 Fuel pipe from feed pump to fuel filter
- 7 Fuel pipe from filter to injection pump
- 8 Fuel delivery pipes
- 9 Fuel spill pipe to tank

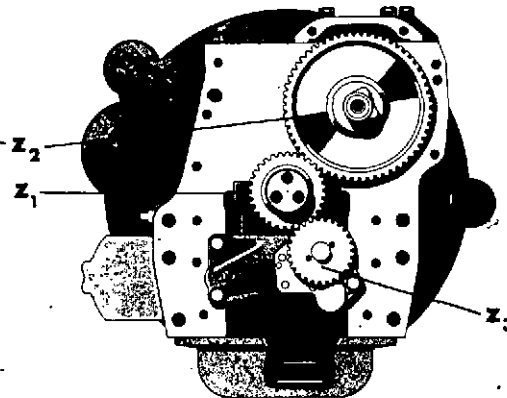
**1.8 Schematic of wheel gearing**

**Single-cyl. engine**



- Z1 = 32 teeth; spurwheel to crankshaft
- Z2 = 64 teeth; spurwheel to camshaft
- Z3 = 32 teeth; spurwheel to balance weight working in opposite direction
- Z4 = 28 teeth; spurwheel to oil pump

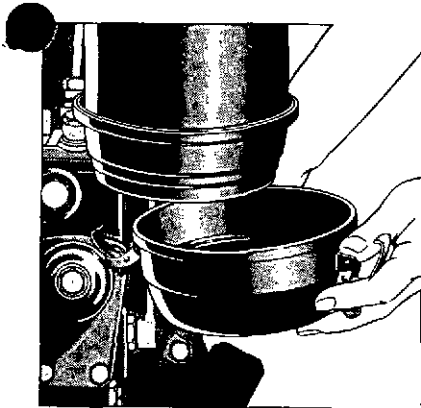
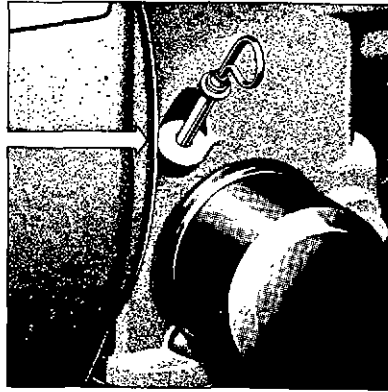
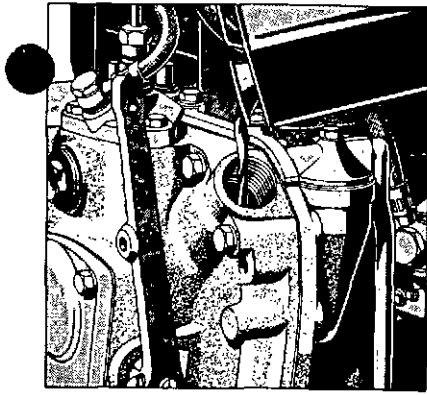
**Two-cyl. engine**



- Z1 = 32 teeth; spurwheel to crankshaft
- Z2 = 64 teeth; spurwheel to camshaft
- Z3 = 28 teeth; spurwheel to oil pump

Balancer gear (2) chamfered teeth align with "1" or the crank gear. "0" on crank gear aligns with "00" on the cam gear.

## 2. Preparations for the first start-up



### 2.1 Lube oil filling

- a) Engine. Unscrew oil filler plug and fill with API classified "CC" or "CD" oil having the following properties and viscosity, when outside temperature is:
- |                     |          |
|---------------------|----------|
| over 30° C          | SAE 30   |
| from 0° C to 30° C  | SAE 20   |
| from 0° C to -20° C | SAE 10   |
| -30° C              | SAE 5W20 |

To prevent damage by the use of lubricants of inferior quality, it is recommended to use only quality brands and to keep the one originally chosen.

Unsuitable oil or delayed oil change cause trouble and high repair cost.

The oil level should reach the upper gauge mark while engine is in horizontal position.

#### **WARNING!**

Too high an oil level causes high oil consumption and carbonizing of the engine.

Too low a level means damage to the engine.

- b) Oil bath air cleaner. Take oil bowl away and fill with the same type of clean oil, as specified in para 2.1a, up to the lower normal mark.

## 2.2 Fuel filling

Use only clean fuel. Impurities in the fuel cause heavy wear to injection pump and nozzles.

## 2.3 Venting the fuel system

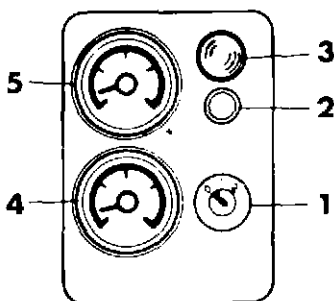
see para 5.1

## 3. Starting the engine

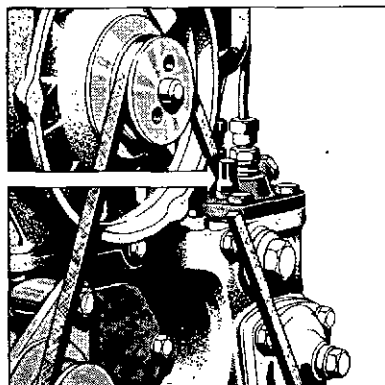
### 3.1 Before starting check:

Fuel level in tank. Oil level in oil sump. Oil level should be between upper and lower gauge mark.

Oil level in air cleaner.



- 1 Ignition switch
- 2 Starter button
- 3 Charging indicator bulb
- 4 Thermometer
- 5 Oil pressure gauge



### 3.2 Starting by Bosch starter motor

- a) Put ignition key (1) into switch box (charging indicator bulb (3) flashes).
- b) Set speed adjusting lever (accelerator) at full speed.
- c) Push starter button to crank the starter motor. When engine begins starting, release starting button.
- d) Do not operate the starter motor longer than 20 secs nor push the starter button when starter motor and engine are still rotating. To spare the battery, leave intervals of 30 to 60 secs between two attempts.

Panels will vary from illustration.

### 3.2.1 Starting by hand

- a) Move speed adjusting lever to highest speed.
- b) Push start button on injection pump and release it (see arrow). Due to that, the injection timing is set back by about  $11^\circ$  crank angle and the starting crank cannot jump back in starting. Simultaneously the quantity injected of the pump is increased which facilitates starting.
- c) Introduce the starting crank in the crank guide. Crank the crankshaft beyond compression and at the same time, release the decompression lever until ignition sets in. Then put the speed adjusting lever at medium speed.  
If no ignitions occur, repeat the steps required for starting.

### 3.3 Starting from cold

At a temperature around the freezing point use winter oil SAE 10 resp. 5 W 20 at temperatures below  $-20^{\circ}$ . Use arctic fuel.

#### Note!

Low temperature reduces battery performance. During heavy frost dismantle the battery and store it in a heated room overnight.

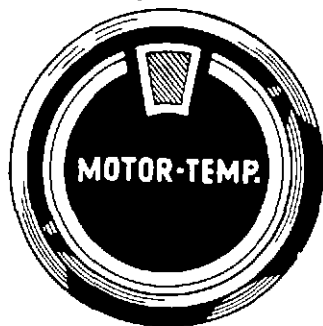
### 3.4 After start

When the engine has started, the oil pressure gauge should immediately indicate a pressure of about  $4,0 \text{ kg/cm}^2$ . At low idling speed and with warm engine oil pressure must not drop below  $0,5 \text{ kg/cm}^2$ , otherwise warning lamp flashes.

### 3.5 Observations during operation

When the engine is running under load, watch the oil pressure gauge as well as the remote thermometer (is supplied upon request). The field in the window is green-coloured as long as the engine is not overheated. Green and red appears when temperature rises excessively.

Red or green field



Temperature of engine

In case the field is red, stop the engine and trace the cause of overheating. If the remote thermometer is provided with a horn, the sound of the horn means a last warning to stop the engine immediately. The exhaust should always be clear otherwise the engine has overload or other problems.

**Note!** When oil pressure drops, or an alarm is given, stop the engine immediately and determine the cause.

### 3.6 Stopping the engine

Remove load from engine and run it at idling speed for a while to allow it to cool down. Move the speed control lever towards "stop", until the engine comes to a complete stop. Withdraw key from ignition switch.

## 4. Routine maintenance

In the following there is a summary of all maintenance work to be carried out periodically.

#### Daily or every 10 hours of operation

check oil level in oilpan, when the engine is in horizontal position.

#### After 30 hours of operation

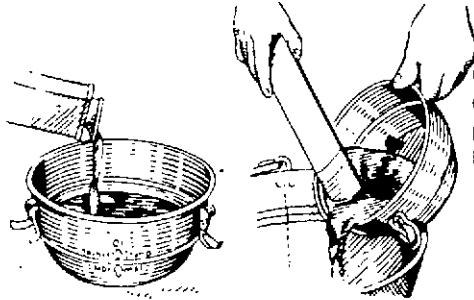
First oil change is due for a new or an overhauled engine.

### After every 100 to 125 hours of operation

carry out oil change regularly. Remove drain plugs from the oilpan and drain the used oil, while the engine is still hot.

Screw plug into oilpan.

Fill the crankcase with lubricating oil up to the upper dipstick mark.



Clean oil bath air filter with solvent and fill container with new engine lube oil (see para 2.1a) up to the lower normal mark. Reassemble oil container and filter (with clamps).

### Check the battery

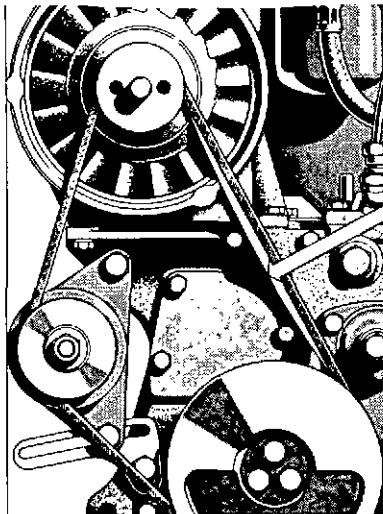
(every four weeks at the latest)

The battery should be clean and dry outside. The acid level should be appr. 10-15 mm above the upper edge of the plate. In a properly maintained battery the density of acid reveals its state of charge. At an acid temperature of 20° C density should be:

1,285 battery charged                      1,23 - 1,21 half charged                      1,14-1,11 run-down.

Wash terminals in hot soda solution. Take care that no soda lye penetrates into the battery. Rinse with cold water and lubricate terminals with acid protection grease.

### Check tightness of fuel pipes



### After every 250 hours of operation

Check V-belt tension of generator and cooling air blower (applies only to two-cyl. engines). Under moderate thumb pressure the V-belt must yield appr. 2 cm.

The generator V-belt can be tightened by tilting the generator. Slacken the hexagonal bolts from the bracket and pull the generator outward. Then tighten bolts again.

Check the clearance of inlet and exhaust valves. In cold engine it should be 0,2 mm. (See para 5.6).

### After every 500 hours of operation

Decrease of output may be caused by lack of fuel supply. When in spite of high speed and of disengaged delivery pipe from injection valve no fuel issues, that is surely a symptom of lacking fuel.

A renewal of the filter depends on the amount

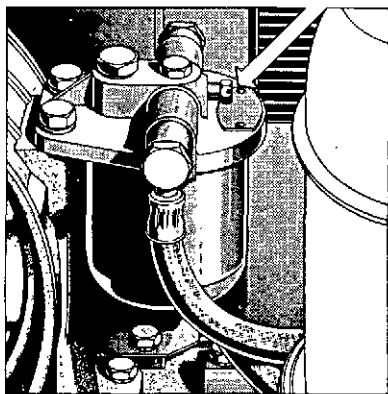
of dirt in the fuel, therefore no fixed order for changing can be indicated. Check all nuts and bolts of engine mounts. If necessary, retighten. After every 2000 hours of operation - check injection pressure, consult your distributor.

## 5. Guide to maintenance eventually necessary

### 5.1 Venting the fuel system

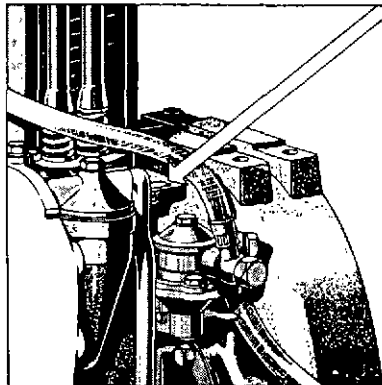
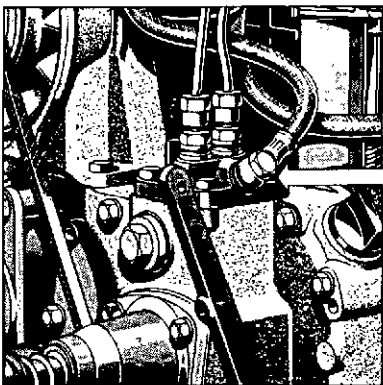
Venting is required:

- a) before first start up of engine
- b) after a long standstill
- c) when pump or suction and pressure pipes have been disconnected or dismantled
- d) whenever air seems to be in the pipes or in the suction chamber
- e) when the fuel filter has been replaced



### 5.2 Venting the fuel filter

Loosen the vent plug on the fuel filter and actuate the priming lever of the fuel feed pump until fuel flows bubble-free from the vent screw. Tighten vent plug again.



### 5.3 Venting the injection pump and piping

Loosen the suction line on the injection pump and actuate the priming lever of the fuel feed pump until fuel blows bubble-free from the suction connection. Venting of injection pipes and nozzles is not necessary at an emptied tank but only when the pipes have been removed and thus completely emptied.

To fill the pipes, crank the engine with starter motor or by hand.

### 5.4 Fuel filter

All D 302 engine shipped from the Milwaukee factory have spin on replacement filters.

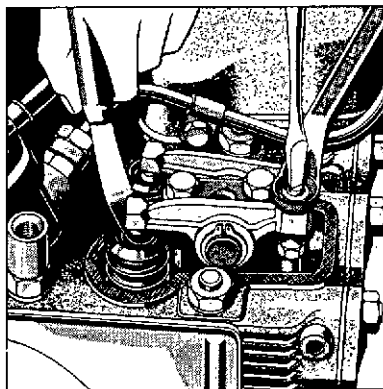
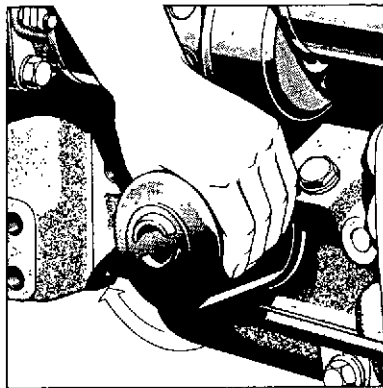
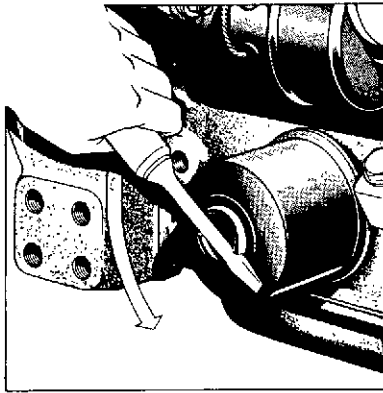
### 5.5 Maintaining the oil filter

**Note!** The renewal of the disposable filter is required every 250 hours of operation that is after every second oil change.

Unscrew the filter by turning in anti-clockwise direction and discard element.

Using your finger lightly oil the joint on the bottom of the new disposable filter before tightening.

Screw-in the new disposable filter by hand until joint is adjacent and then tighten filter by half a revolution. Do not use any tool. Start the engine and check filter for tightness. Top up with engine lubricating oil to the upper dipstick mark.



### 5.6 Adjustment of valve clearance

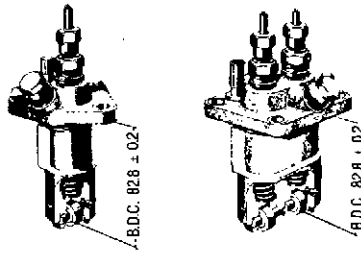
In cold engine the valve clearance must be 0,2 mm. Upon each mounting of cylinder head, valves, rocker arm bracket or camshaft the clearance is to be re-adjusted. To do so, put a feeler gauge of 0,2 mm in thickness between valve stem and rocker arm, while valve is closed.

It is useful to adjust the valve clearance at the end of the compression stroke when the two valves are closed.

## 5.7 Timing the commencement of delivery

The commencement of delivery is set in the works and serves as a basis for the adjustment of the pump on the engine. Commencement of delivery is ascertained as follows:

Measure value of adjustment for the B.D.C. of the roller tappet



Commencement of delivery in crank angle degrees

$n = 1,000-3,000 \text{ r.p.m.} = 23-25^\circ \text{ bef. T.D.C.}$

Commencement of delivery crank angle deg.	Pre-stroke mm	Piston travel mm bef. T.D.C.
23	2,6	6,22
24	2,5	5,74
25	2,4	5,25

A change of the timing is effected by altering the pre-stroke of the injection pump, when shims are put under the pump flange.

### 5.7.1 Adjustment of governor

See D 302 repair manual 42-103.

- a) Move the piston on the T.D.C. of compression stroke. Inlet and exhaust valves are shut now, the pushrods can be turned easily. Check whether the injection pump is connected with the fuel tank.
- b) Find out the commencement of delivery according to the overflow method. To do so, remove the delivery valve with spring from the pump element. Screw the empty delivery valve holder on again. Fasten the overflow tube to the delivery valve holder. Turn the flywheel rearward by one 1/4 revolution, until fuel flows bubble-free from the overflow tube. Then turn the flywheel forward, until fuel ceases to flow. At the same time the pump plunger, in its upward motion, closes the inlet bore of the suction compartment and the injection pump stands on "commencement of delivery". The commencement of delivery can be altered by adding or removing shims under the injection pump flange. (Pre-stroke is changed).

### **5.8 Torque instructions for cylinder head fastening nuts**

In order to meet the settling of the cylinder head gasket, slacken the nuts fastening the cylinder head by one 1/4 revolution every time when a new gasket has been fitted and when the test run is over. Then coat nut support, thread nuts and stud bolts with Molykote, apply the nuts by hand and retighten them to 5-5,5 mkp.

### **5.9 Fitting the fuel pressure pipes**

Fuel pressure pipes are supplied ready for installation. When fitting a new pipe make sure that it is free of stress being in the proper position. When the stuffing cone does not fit free of stress, it risks to break. For a check loosen the cap nut again after tightening. If it rests on its seat without moving, the line is laid free of stress.

## 6. Trouble-shooting

Symptom	Possible cause	Action
A Engine does not start.	1. No key in the switch.	Put key in properly.
	2. Battery run-down or cold. Current supply interrupted.	Check battery and cable conditions, heat battery up.
	3. Failure of starter motor.	Have starter repaired by Bosch service.
	4. No fuel supply.	Open fuel cock, vent injection pump, refill with fuel.
	5. Starting fuel admission insufficient.	Check whether control rod is free.
	6. Nozzle does not work.	Take out and check.
	7. Insufficient compression (Engine can be turned easily over dead centre).	Grind-in inlet and exhaust valves, check fit of nozzle holder.
	8. Piston rings seize.	Clean or renew.
	9. Valve clearance too small.	Adjust correctly.
	10. Air filter clogged.	Clean it.
	11. Wrong lube oil.	See specification in para 2.1.
B Engine stops.	Fuel line choked or tank empty.	Clean filter and line, fill up tank, vent pump.
C Insufficient output	1. Injection pump or nozzle leaks.	Check injection pump or nozzle.
	2. Inlet and exhaust valves leaky.	Grind valves.
D Engine fires irregularly.	1. Fuel pipes not tight.	Tighten.
	2. Air in injection system.	Vent system.
	3. Fuel filter clogged.	Replace filter.
	4. Cylinder head not tight.	Tighten (and check fit of nozzle holder).

Symptom	Possible cause	Action
E Engine smokes blue or black.	1. Lube oil level too high.	Adjust to dipstick mark.
	2. Engine out of time.	Adjust timing.
	3. Low compression.	Check valve clearance, grind-in valves. Retorque nozzle holder fastening bolts.
	4. Nozzle does not atomize.	Clean or renew.
	5. Injection quantity excessive.	Have quantity readjusted in service shop.
F Low oil pressure	1. Low oil level.	Adjust to upper dipstick mark.
	2. Crankshaft or big end bearings worn.	Replace bearings.
	3. Lube oil filter clogged.	Replace filter
	4. Failure of pressure gauge.	Check gauge, renew oil.
G Engine overspeeds	Control rod of injection pump stuck.	Ease movement of control rod.
	1. Cooling fins on cylinder and cylinder heads clogged.	Clean fins.
H Engine overheats	2. V-belt relaxed or torn.	Tighten or renew.
	3. Failure of injection nozzle.	Recondition or renew.
	4. Fuel quantity set too high.	Have quantity adjusted correctly.
	5. Wrong timing.	Have commencement of delivery adjusted correctly.
	1. Injection nozzle seizes.	Run engine once more from idling to full load. If knocking occurs often, clean fuel system.
I Engine knocks suddenly.	2. Big end bearings worn.	Renew bearings.
	3. Inlet or exhaust valve seizes.	Lubricate with some drops of lube-oil-petroleum mixture.

## 7. Running material and preservation

### 7.1 Diesel fuel

Normally the engine works with diesel fuel, but all other fuels appropriate for diesel engines may be used if in conformity with the below given specifications (DIN 51 601).

Requirement			Tested acc. to
Max content of water	vol. %	0,1	DIN 51777
Density at 15° C	g/ml	0,820 - 0,860	DIN 51757
Boiling point at 360° C	vol. %	90	DIN 51752
Viscosity at 20° C	c/St	1,8 - 10 1,1-1,85° E	DIN 51550
Flash point according to Abel-Pensky min.	° C	55	DIN 51755
Possibility of filtering	° C	in summer down to "0" in winter to -12°	DIN 51770
Max sulphur content	weight %	1,0	DIN 51768
Carbon residue acc. to Conradson max.	weight %	0,5	DIN 51551
Reaction to zinc: Max loss in weight	mg	4	DIN 51779
Ignition quality (cetane number) min.	CaZ	40	DIN 51773
Percentage of ashes max.	weight %	0,02	DIN 51575

Net calorific value appr. 10.000 kcal.

Beginning paraffin separation (BPA) by 5 at least below the lowest room resp. outside temperature.

The fuel should not contain solid, insoluble impurities and must be free of mineral acids and alkalis.

## 7.2 Preservation of stored engines

If no particular instructions are given for long storage preservation, our engines are preserved for a three months' period under normal conditions.

If an engine thus preserved should not yet be put into operation after that time, another preservation is necessary. Proceed in the following way:

1. Fill with anti-corrosion oil of SAE 10 grade up to the lower dipstick mark.
2. Drain the fuel system by slackening the hollow screws from the fuel injection pump or from the fuel filter. Fill the whole system with rust-preventing anti-corrosion oil of grade SAE 10 through the fuel filters (take inserts out) or through the daily tank.
3. Crank the engine several times by hand. Vent cylinders (f.i. by releasing the injection valve) and put control rod in full load position.
4. Take cylinder head covers off, wipe out and spray with inhibitory oil: Spray valve springs.
5. Spray with inhibiting oil all shining parts, especially of injection pump and control system.

If batteries are available, the engines equipped with electric starter motor can also be cranked by the motor instead of the procedure as described under article 3.

**Note!** Before starting the engine, check freedom of control rod movement.

Repeat same preservation procedure every three months.

Before using the engine, drain the anti-corrosion oil from engine and fuel system. If engine is out of operation for more than one year, change the anti-corrosion oil.

## 7.3 Air filter

Dusty intake air causes premature wear to the engine. We therefore recommend to maintain the air filters properly and keep them clean. Periods of cleaning or a change of the oil bath is to be carried out vary from 10 to 125 hours of operation, dependent on the dust conditions of outside air. Check and change the oil bath only after the engine has been stationary for one and a half to two hours or the following day before starting it up. When the oil bath is full of sludge or has fallen below the lower mark, clean the oil container with diesel fuel and refill with engine lube oil up to the mark.

**Note!** Strictly no cleaning with petrol, etheral compounds or equivalent inflammable liquids because of danger of inflammation or explosion.

## 8. Maintenance schedule

Time-table for performing the echelon preventive maintenance services "E1" to "E3" on Murphy diesel engines

Hours of operation:

125 250 375 500 625 750 875 1000 1125 1250 1375 1500 1625 1750 1875 2000

Echelon:

E1 E2 E1 E2 E1 E2 E1 E2 E1 E2 E1 E2 E1 E2 E1 E3

This schedule will be passed through once after 2000 hours of operation.

Work to be carried out once after	60	130	hours of op.		8-10 hours	Routine servicing at:			Refer to chapter involved:
						E1	E2	E3	
					x				3
				Check fuel level	x				4
				Check oil level in oilpan	x				4
	x			Change of oil (with warm engine)		x	x	x	4
				First oil change after 30 hours					
				Second oil change after 60 hours					
				Renew filter					
				After 60 hours for the first time,			x	x	5.5
	x			Clean air filter (earlier under dusty conditions)		x	x	x	4.7
				Check tight fit of all screws and nuts especially suction, exhaust and oilpan fixing screws		x	x	x	
	x	x		Check V-belt tension.			x	x	4
				Check whether fuel, and oil lines are tight -		x	x	x	
				Check battery		x	x	x	4
				Check battery and cable connections for tight fit			x	x	4
				Check valve clearance (cold eng, 0,2 mm)			x	x	5.6
				Check fuel filter;					
				Renew filter element			x	x	4
				Clear fuel tank from water				x	
				Check free movement of articulations of speed adjustment and engine stopping mechanism and lubricate			x	x	
				Check carbon brushes on starter motor and generator				x	
				Grease toothed flywheel ring				x	
				Check injection nozzles (injection pressure should be 180 kp/cm <sup>2</sup> )				x	4
				Measure compression pressure				x	
				Check running of cooling air blower ball bearings (two-cyl. eng.)				x	4
				Check running of idler ball bearings				x	
				Clean cooling fins and blower guide blades				x	
				Lubricate outer bearing (after every third echelon of maintenance)					
				Clean vent filter				x	
				Examine supervisory system				x	

When the engine is out of operation for long, it is required every two weeks to make a test run until the working temperature is reached.

If an engine does not come to 125 hours of operation within half a year, it is imperative to change the oil.

Parts Book 42-109 and shop manual 42-108 are available at your Murphy Diesel Distributor

Part numbers:

**Lube Oil Filter —**

6.0541.18.8.000.1

Or 438-13 for engines D302-1 and D302-2

**Fuel Oil Filter —**

6.0541.18.8.000.6 (Specify Short)

**"V" Belts —**

302-1 with Generator MD 434-17

Or 6.0345.02.0.0675

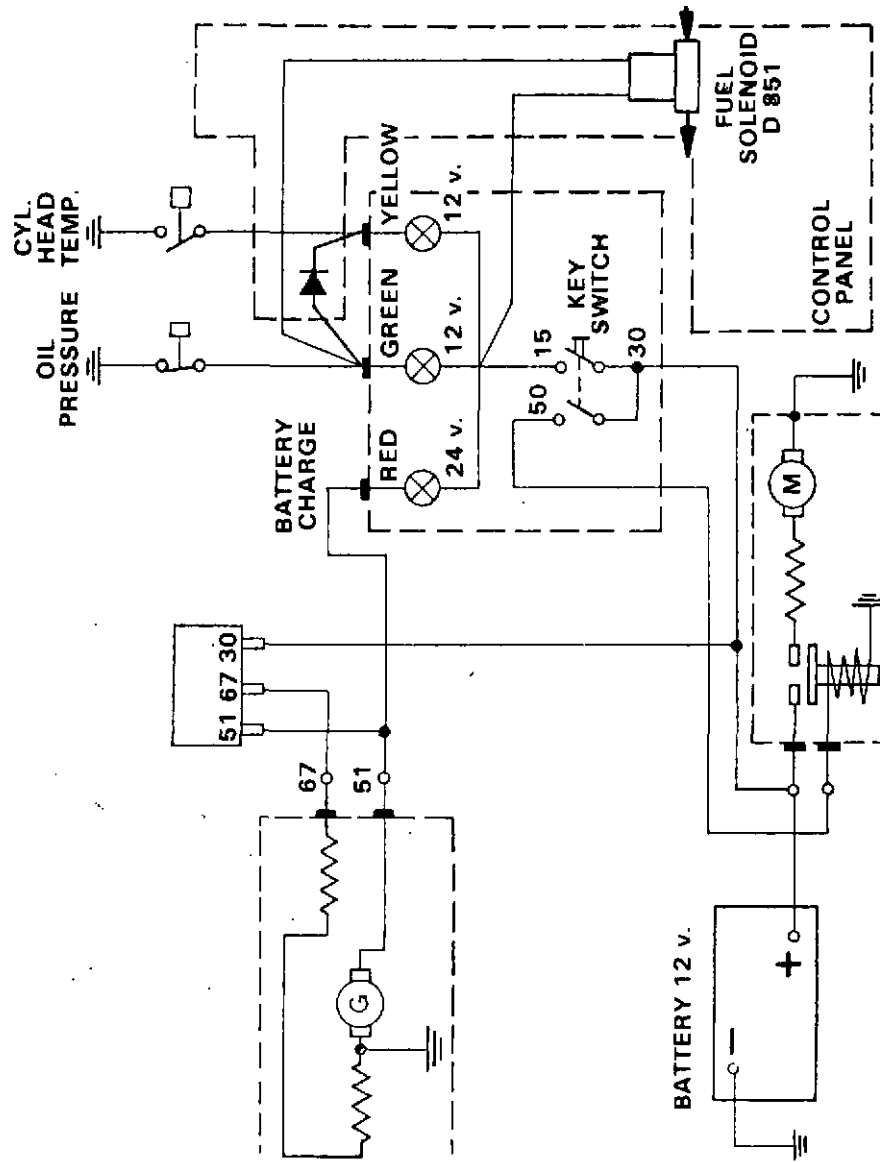
302-2 with Generator MD 434-18

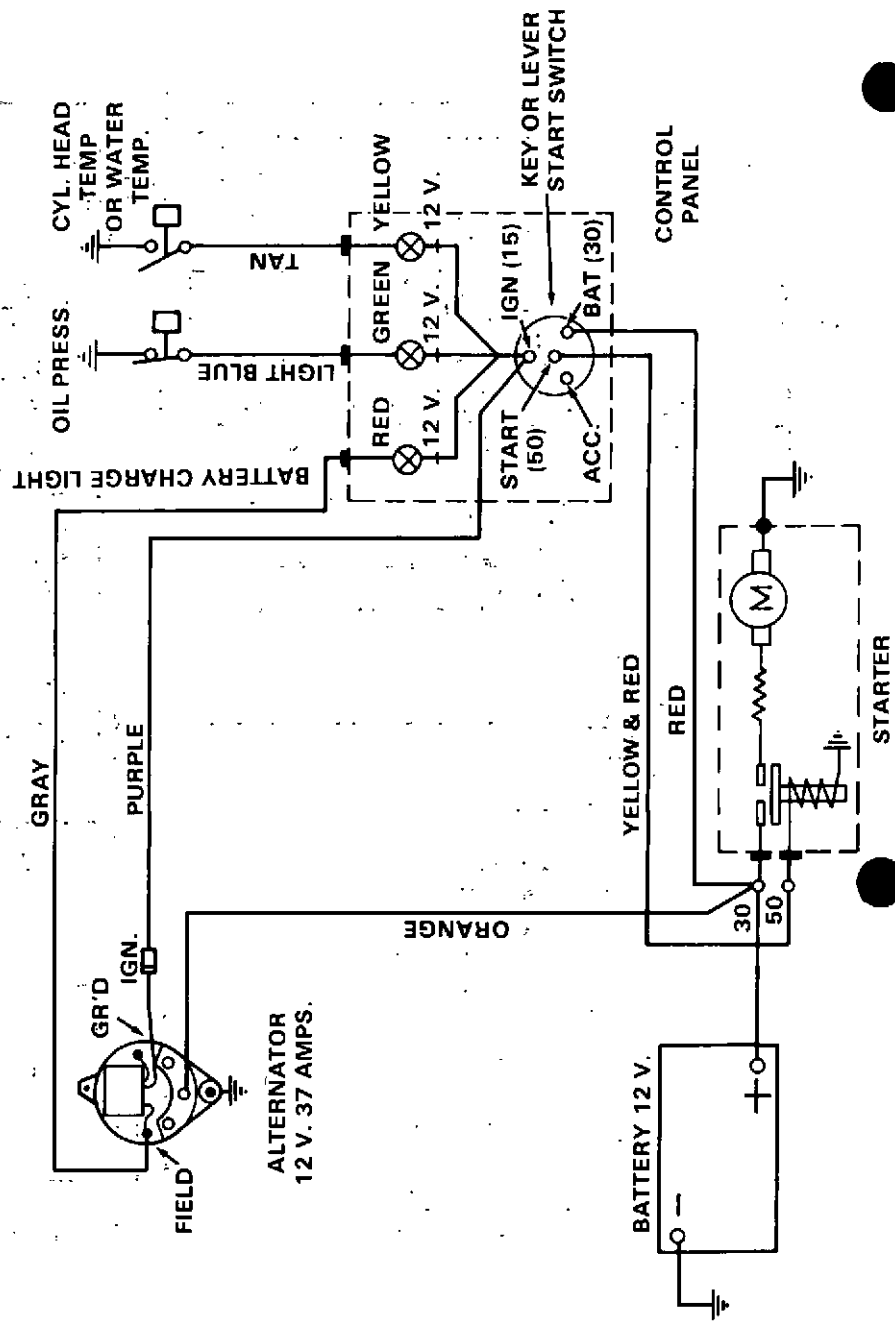
Or 6.0345.02.0.1075

302-2 with Motorola Alternator MD 434-16

Or 6.0345.02.0.1100

When ordering parts be sure to give engine model, serial number and specification number.





# WIRING DIAGRAM WITH ALTERNATOR, SEMI AUTOMATIC PANEL

