

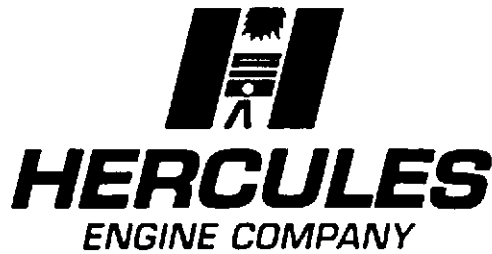
Operator's Guide

REC'D JAN 12 1954

Spark Ignited

Industrial Engines

090204



Engine Specialists Since 1915

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INTRODUCTION

This guide will acquaint you with Hercules' Gasoline, LPG or Natural Gas engine. It provides recommendations on engine care and operating procedures.

This guide should be considered a permanent part of the engine and remain with the engine, if sold, to provide the next owner with the engine operating and maintenance information.

All information and illustrations presented herein are based upon the latest information available at the time of printing. Hercules Engine Company reserves the right to make changes at any time without notice.

HOW TO USE THIS GUIDE

This guide was written especially for you. We trust you will use it to get to know your Hercules engine.

We urge you to read this guide from cover to cover. This will enable you to become familiar with your engine's various features, maintenance and service requirements to keep your engine in excellent operating condition.

ENGINE IDENTIFICATION PLATE

An Engine Identification Plate is affixed to the right hand side of the engine block. Code numbers on this plate identify certain important manufacturing specifications applicable to your particular engine including the serial number. Use the Engine Serial Number when seeking information or ordering replacement parts for this engine. For a handy reference, record the information from your engine.

PARTS AND SERVICE

Replacement parts can be obtained through your authorized local Hercules Engine Distributors and Dealers. They can be found in the Yellow Pages under "Engines".

SERVICE LITERATURE

A maintenance manual, parts catalog and installation manual can be obtained from your Hercules Distributor or Dealer. These publications will provide the necessary service, overhaul and replacement part information for your Hercules engine.

INSTRUMENTS:

Oil Pressure Gauge (If Equipped)

The oil pressure gauge registers the lubricating system pressure in pounds per square inch and should be frequently checked to ensure that the system is functioning correctly. Normally, the pressure registered by the gauge should remain constant for a given engine speed (see NORMAL STARTING, Pages 5-6).

Should the pressure fluctuate or drop, stop the engine and find the cause. Do not operate the engine at lower than normal oil pressure (8 PSI).

Ammeter (If Equipped)

This instrument registers the charging current which is being passed to the battery by the alternator. It also registers a discharge equivalent to the amount of current being used by the electrical equipment when the alternator is not charging.

Temperature Gauge (If Equipped)

The temperature gauge registers the coolant temperature and will indicate overheating which may arise from a low coolant level, clogged radiator, loose belt, faulty thermostat or electric fan.

By operating the engine at the correct temperature, maximum power, longer life and better fuel economy will be ensured.

SAVE YOUR BATTERIES

One 12 volt battery will crank the engine against compression five or six periods of fifteen seconds each with a recuperation or rest of one minute between each period of cranking.

If a battery replacement is necessary, use one with a rating as high as the one furnished with new equipment. Make sure all battery connections are clean and tight.

OPERATION

**NOTE: ENGINE OPERATION BELOW 1200 RPM
REQUIRES FACTORY AUTHORIZATION.**

This section covers those items which are of particular interest to the operator and does not necessarily cover such work as might be required of the maintenance person. Each operator should thoroughly acquaint himself with the various subjects covered in this book.

PRECAUTIONS: READ BEFORE STARTING THE ENGINE

Know how to stop the engine before attempting to start. The following precautions, if followed, will help eliminate many operating difficulties and insure satisfactory service and engine life.

1. Do not start the engine until the lubricating oil, water and fuel levels have been checked and brought up to the FULL mark (see COOLANT MIXTURE, Page 4).
2. Before attempting to start in cold weather, read "COLD WEATHER STARTING", Page 6.
3. Never run the starting motor longer than 15 seconds without a rest period of at least one (1) minute, to allow starter to cool down.
4. REMEMBER: Dirt, grit, water, lint or any foreign matter is detrimental and it is your duty to see that they do not get into the engine. Keep all filters clean and serviced regularly.

5. Fuel - keep it clean; use only clean containers.

6. Lubricating oil recommendations are based upon engine design, type of service and ambient air temperature. High quality oils, combined with necessary oil and filter changes, are required to assure maximum operating cost. Hercules Engine Company does not recommend oil by brand name. A listing of lubricant producers and their product descriptions is available in the "EMA Lubricating Oils Data Book", which can be obtained from: EMA, 111 East Wacker Drive, Chicago, IL 60601.

COOLANT MIXTURE

The coolant mixture required is a 50/50 mix of ethylene glycol based permanent anti-freeze and water with a hardness of less than 10 grains per gallon.

RECOMMENDED LUBRICATING OIL SPECIFICATIONS

Use a single viscosity, low ash oil with API Classification as shown below. Select viscosity grade according to ambient temperature.

AMBIENT AIR TEMP.	VISCOSITY GRADE
-10° to 30° F	10W
10° to 50° F	20W
40° F and up	30W

NOTE: Multigrade oils (SE or CC) are acceptable for gasoline, natural gas* and LPG engines.

API CLASSIFICATION

Gasoline, natural gas*, LPG (MIL-L-46152) SE or CC

*Natural gas fueled engines require oils formulated with additives specifically for gas engine operating conditions. These oils should have typical characteristics as shown below.

Sulfated ash, % weight 0.4 or less
TBN 6 or higher
Others Per API CC

7. Oil level -- maintain the level at the "FULL" mark on the dipstick; however, do not overfill. Never allow the engine to run without oil pressure showing on the gauge.

8. Do not put cold water in an overheated engine or serious damage may result. Add water slowly in radiator with engine operating at a slow idle. At a temperature of 32° F or below, use anti-freeze solution (see COOLANT MIXTURE, page 4).

9. Never allow the batteries to run low or dry of water. In cold weather, do not fill the batteries with water when shutting down as this makes them more likely to freeze. Add water to battery after starting engines for day's run.

10. Do not use the engine as a brake in intermediate or low gear unless the vehicle speed is held to that used in the same gears on the level, or serious damage may result from engine overspeeding.

11. Do not attempt major repairs or adjustments to the engine; rather, take it to the nearest authorized Hercules distributor.

12. Keep the fan belts at proper tension. Loose belts allow slippage and wear rapidly. Overtightening can damage the alternator and water pump bearings.

13. Do not permit oil, water or fuel leaks to go uncorrected.

14. Do not allow the air cleaner to become clogged or to operate with loose connections. Keep clean and properly serviced.

STARTING ENGINE

W A R N I N G !

**NEVER OPERATE AN ENGINE IN A CLOSED BUILDING UNLESS
ENGINE EXHAUST SYSTEM HAS BEEN VENTED OUTSIDE**

NORMAL STARTING

If the engine has been operated recently, start as follows:

1. Check the fuel supply in the tank, oil level in the pan and cooling solution level in the radiator.
2. Place transmission, if equipped, in the "neutral" position.
3. Open throttle to 1/5 of full position if manually controlled. Never attempt to start with throttle wide open. When throttle is automatically controlled, no pre-setting is necessary.
4. Turn the ignition switch to "on". Crank the engine with the choke completely closed for a couple of turns or until the engine fires and then open the choke part way to prevent flooding. Open choke fully as engine warms. With automatic choke equipment, no manual choke action is required.
5. After the engine starts, if throttle is manually controlled, reduce speed to fast idle and observe all gauges for proper functioning. Particular attention should be given to the oil pressure gauge and if a minimum of 5 PSI pressure does not show in a few seconds, shut engine down and determine the trouble. At normal operating temperatures, oil pressure should be between 30 and 60 PSI at full speed.
6. Allow the engine to run for several minutes at fast idle or light load, if possible, before applying the load. Never attempt to pull loads beyond the power of the engine. (Intake manifold vacuum should not be below 5" Hg.)

COLD WEATHER STARTING - BELOW 20° F

Assuming the ignition and carburetor setting are correct, and proper fuel is being used, starting in cold weather is not difficult if the following suggestions are followed:

1. Open throttle to 1/5 total opening.
2. Close the carburetor choke and crank the engine several revolutions with the ignition switch "off" if the engine is hand choked.
3. *With the ignition switch "on" and the choke closed, start as described in paragraph four (4) under NORMAL STARTING.*

CAUTION!

DO NOT RUN THE ENGINE UP TO GOVERNED SPEED OR MUCH OVER 800 TO 1000 RPM UNTIL THE OIL HAS BECOME WARM ENOUGH TO CIRCULATE AND THE WATER OR COOLING SOLUTION HAS BECOME WARM ENOUGH TO TAKE THE CHILL OFF THE CYLINDER BLOCK

STOPPING THE ENGINE

1. Before stopping, always allow the engine to return to idle for at least one minute to permit engine temperatures to equalize.
2. When an anti-freeze is used, it should be a solution that will not freeze at ambient temperatures (see COOLANT MIXTURE, page 4).

TURBOCHARGER (If Equipped)

The turbocharger is a self-contained unit composed of a turbine wheel and a compressor mounted on a common shaft with the necessary surrounding castings. The exhaust gas from the engine is forced into the turbine side of the turbocharger, where the energy of the gas is used to drive the turbine. The compressor mounted on the opposite end of the shaft forces air under pressure into the intake system. By providing a greater amount of fresh air, power output from the turbocharger engine is increased. The action of the turbocharger is entirely automatic and requires no control. The speed and output of the turbocharger will vary automatically with variations of engine load or speed, or both.

CAUTION!

DO NOT OPERATE THE TURBOCHARGER IF A LEAK EXISTS IN THE DUCTING OR IF THE AIR CLEANER IS NOT FILTERING EFFICIENTLY. DUST LEAKING INTO THE AIR DUCTING CAN DAMAGE THE TURBOCHARGER OR THE ENGINE

The exhaust system of a turbocharger engine installation is very carefully designed to eliminate restriction of the free flow of exhaust gases from the turbocharger. The turbocharger exhaust outlet pipe flange is shipped with the engine. The flange is sized to accept the recommended size outlet pipe. No reduction in this pipe size is permissible.

NOTE: Back pressure in the exhaust system, measured near the turbocharger discharge, should not exceed 2.0" Hg. or 25" water column. An increase in exhaust back pressure will result in a corresponding decrease in engine power output.

Turbocharger repairs should be made only by authorized service centers.

CAUTION!

AT ALL TIMES, BEFORE SHUT DOWN, THE ENGINE MUST BE ALLOWED TO IDLE FOR ONE MINUTE TO PREVENT DAMAGE TO THE TURBOCHARGER UNIT

1. Inspect the mounting and connections of the turbocharger to be certain they are secure and that there is no lubricant leakage or duct leakage.
2. The turbocharger does not make a whining noise when functioning normally. Unusual turbocharger noise may indicate internal turbocharger problems. Return to dealer for such problems.
3. Inspect and service the engine air cleaner (refer to SUGGESTED PREVENTATIVE MAINTENANCE SCHEDULE, Pages 9-10).

STORAGE OF ENGINES FOR LONG PERIODS AND RUST PREVENTATIVE TREATMENT

If the engine is to be stored for an extended period, special preparations should be made to prevent rust from forming on the wearing surfaces or in the fuel system.

Thorough "Rustproofing Preparation Instructions" may be obtained from the authorized service dealers.

NOTE: If the engine can be started and run each week for a period of one half hour or more, rust treatment may not be required; however, it is recommended that a No-Rust type oil be used during these periods or until the equipment is put back into regular service.

RUST PREVENTATIVE OILS

Shell Ensis Mill-L-21260 Code 66200 - SAE #10W
Code 66202 - SAE #30

SERVICE AND MAINTENANCE

This section covers a brief description of various parts of the engine with instructions covering their service and maintenance requirements under normal operating conditions.

SUGGESTED PREVENTATIVE MAINTENANCE SCHEDULE

A: DAILY SERVICES

1. Check air cleaner and all inlet connections. Clean or change filter as required.
2. Check that the oil level is at the FULL mark on the dipstick.
3. Check coolant level and condition of the solution in radiator. Also keep the external parts of the radiator clean and free dirt, leaves, etc.
4. Check the fuel supply in the tank. To avoid water condensation, fill the tanks at the end of the day's run.
5. Check battery solution level. Never allow it to run low.
6. Check all gauges to be sure they are functioning properly.
7. Check general condition of unit. Tighten, repair or replace parts when necessary.

B: 125 HOURS OR 3000 MILES IN ADDITION TO DAILY SERVICES

1. Change crankcase oil and filter element.

2. Clean crankcase breather system.
3. Tighten accessory drive belts to avoid slippage.
4. Lubricate accessory items as needed.
5. Check valve clearance for proper of .015.

**C: 500 HOURS OR 12,000 MILES IN ADDITION
TO "B" SERVICES**

MAJOR ENGINE TUNE-UP:

1. Replace spark plugs.
2. Inspect distributor cap for cracks.
3. Check distributor air gap.
4. Check tappets for setting of .015 (cold).
5. Check carburetor adjustments.
6. Compression test on all cylinders.
7. Check linkage adjustments.
8. Check manifold vacuums.
9. Change air filters.
10. Change fuel filters.
11. Check all electrical connections.
12. Check timing (see chart).
13. Replace PVC valve.

LUBRICATION AND PREVENTATIVE MAINTENANCE SCHEDULE

OPERATION	TIME INTERVAL					REMARKS
	Hours	8	50	125	500	
	Miles	Daily	1500	3000	12,000	
LUBRICATION SYSTEM:						
Engine Oil		■		■	■	Include in tune-up.
Oil Filter				■		Replace at every oil change.
COOLING SYSTEM:						
Coolant		■			■	Check complete system.
Radiator			■			
Water Pump						Inspect at overhaul.
Hoses					■	
FUEL SYSTEM:						
Fuel Filters				■		Include in tune-up.
PCV Valve					■	Replace.
Fuel Tank		■			■	
AIR SYSTEM:						
Air Cleaner		■	■		■	Include in tune-up.
Crankcase Breather			■			Clean breather cap at every oil change. Include in tune-up.
ELECTRIC SYSTEM:						
Starting Motor					■	Service per mfg.'s instructions.
Alternator					■	Service per mfg.'s instructions.
Battery			■		■	
MISC. ACCESSORIES						
						Lubricate and service per mfg.'s instructions.
GENERAL CONDITION						
		■				
DRIVE BELTS			■			Tighten new belts after 8 hours of operation.
ENGINE TUNE-UP					■	As required by engine performance due to environmental condition.

■ Indicates that service or inspection is required.

ENGINE TIMING CHART SPARK IGNITED

ENGINES TIMED AT 1800 RPM

When using the charts below for correct timing to type of fuel used, set the engine speed at 1800 RPM. Using a timing light, align the degree mark with the center of the timing hole in the bellhousing or pointer located on the front gear housing with the appropriate mark on the front pulley. Degrees shown are before top dead center of #1 piston, compression stroke.

2300 SERIES

FUEL	COMP. RATIO	PART #	VENDOR	TIMING	RPM	PLUG GAP	ROTOR GAP	DWELL ANGLE
Gasoline	7.5 : 1	40-2500616	Prestolite	22°	1800	.030"	.008"	26° - 36°
L.P.G.	7.5 : 1	40-2500616	Prestolite	22°	1800	.030"	.008"	26° - 36°
L.P.G.	10 : 1	40-2500616	Prestolite	16°	1800	.030"	.008"	26° - 36°
Natural Gas	7.5 : 1	40-2500616	Prestolite	28°	1800	.030"	.008"	26° - 36°
Natural Gas	10 : 1	40-2500616	Prestolite	22°	1800	.030"	.008"	26° - 36°

3400 SERIES

FUEL	COMP. RATIO	PART #	VENDOR	TIMING	RPM	PLUG GAP	ROTOR GAP	DWELL ANGLE
Gasoline	7.5 : 1	40-2500617	Prestolite	22°	1800	.030"	.008"	26° - 36°
L.P.G.	7.5 : 1	40-2500617	Prestolite	22°	1800	.030"	.008"	26° - 36°
L.P.G.	10 : 1	40-2500617	Prestolite	16°	1800	.030"	.008"	26° - 36°
Natural Gas	7.5 : 1	40-2500617	Prestolite	18°	1800	.030"	.008"	26° - 36°
Natural Gas	10 : 1	40-2500617	Prestolite	22°	1800	.030"	.008"	26° - 36°

GTA5.6

FUEL	COMP. RATIO	PART #	VENDOR	TIMING	RPM	PLUG GAP	ROTOR GAP	DWELL ANGLE
Natural Gas	10 : 1	40-2500617	Prestolite	16°	1800	.015"	.008"	26° - 36°

3400 SERIES TURBOCHARGED

FUEL	COMP. RATIO	PART #	VENDOR	TIMING	RPM	PLUG GAP	ROTOR GAP	DWELL ANGLE
Natural Gas	10 : 1	40-2500617	Prestolite	22°	1800	.030"	.008"	26° - 36°

4800 SERIES

FUEL	COMP. RATIO	PART #	VENDOR	TIMING	RPM	PLUG GAP
L.P.G.	10 : 1	40-2505206	Altronic	12°	1800	.018"

G1600 ENGINE TIMING CHART

Set engine at 8000 RPM with a timing light. Align the second timing mark that appears on the crankshaft pulley with the pointer on the gear cover.

At 1800 RPM, repeat above procedure except align the pointer with the first mark.

FUEL	COMP. RATIO	H. E. C. PART #	VENDOR PART #	TIMING	RPM	SPARK PLUG GAP	ROTOR GAP	POINT GAP	DWELL ANGLE
Gasoline	7.5 : 1	40-2500613	Prestolite IDU-4407	6° BTDC	800	.030	.008		26° - 36°
L.P.G.	7.5 : 1	40-2500613	Prestolite IDU-4407	6° BTDC	800	.030	.008		26° - 36°
Natural Gas	7.5 : 1	40-2500613	Prestolite IDU-4407	6° BTDC	800	.030	.008		26° - 36°
Gasoline	7.5 : 1	42-2500611	Prestolite IDU-4009	6° BTDC 18° BTDC	800 1300	.030 .030	.008 .008		26° - 36° 26° - 36°
Gasoline	8.0 : 1	42-2500611	Prestolite ODM-4009	6° BTDC 18° BTDC	800 1300	.030 .030	.008 .008		26° - 36° 26° - 36°
Natural Gas	10.0 : 1	40-2500613	Prestolite IDU-4407	30° BTDC	1800	.030	.008		26° - 36°
L.P.G.	10.0 : 1	40-2500613	Prestolite IDU-4407	24° BTDC	1800	.030	.008		26° - 36°
L.P.G.	7.5 : 1	40-2505905	Unit Tech 48757-22 MROOEA	40° BTDC	3600	.030		.017 - .019	53° - 62°
L.P.G.	7.5 : 1	40-2505905	Unit Tech 48757-22 MROOEA	40° BTDC	3000	.030		.017 - .019	53° - 62°
Natural Gas	7.5 : 1	40-2505905	Unit Tech 48757-22 MROOEA	48° BTDC	3600	.030		.017 - .019	53° - 62°
Natural Gas	7.5 : 1	402505905	Unit Tech 38757-22 MROOEA	48° BTDC	3000	.030		.017 - .019	53° - 62°

MCD MAGNETO TIMING

The American Bosch MCD Magneto Ignition, which does not have a speed or load advance, is timed at 18° BTDC.

STATIC TIMING PROCEDURE FOR ALTRONIC V IGNITION

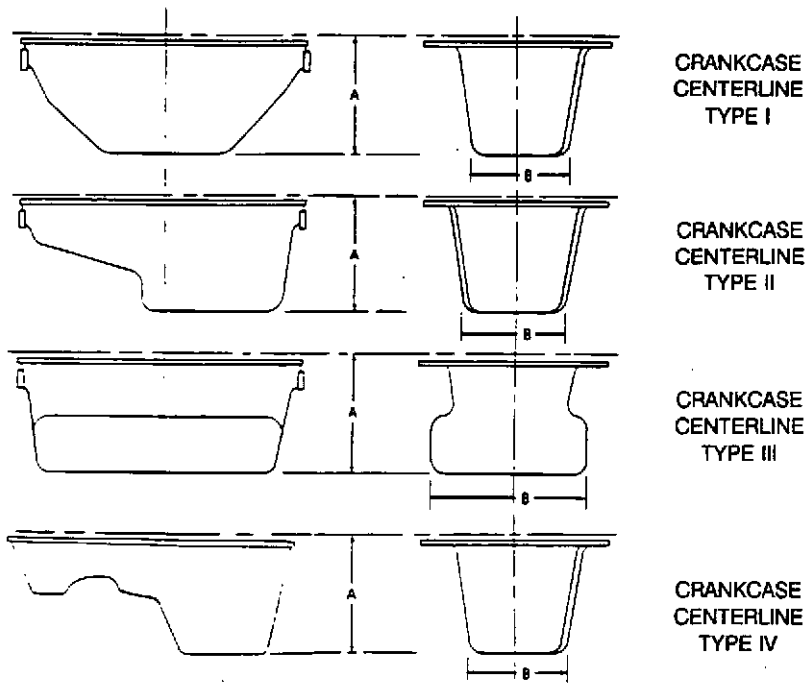
1. Set the engine so that #1 cylinder is at the ignition firing point.
2. Determine the rotation of the Altronic V unit (looking at the drive end of the Altronic unit). The Altronic V unit can be used for either CCW or CW rotation. Normally, all Hercules engines are equipped with the Altronic V rotating in the CW rotation.
3. *Locate the timing mark on the housing for the proper rotation. Rotate the drive coupling until the red mark on the shaft lines up with the proper mark on the housing. The following drawing shows the standard SAE CCW and CW configurations.*
4. Mount unit to engine keeping the two red lines together as close as possible. If the lines cannot be made to meet by rotating the entire unit, remove the four screws which fasten the back cover assembly to the unit. The entire back cover assembly should then be pulled away from the unit, keeping the internal plug connected. Rotate the large gear until the two marks described above line up. With the plastic cover removed, use one finger on the timing decal to maintain the distributor shaft in the correct position (proper red marks lined up) and reinstall the cover to the unit, engaging the gears. Securely tighten the four fastening screws. Final timing should be checked using a timing light with the engine at operating speed.

TROUBLESHOOTING

NOTE: Numbers in each column indicate sequence in which problem should be checked. CAUSE	PROBLEM												
	Engine will not start	Engine stops	Hard starting	Erratic engine performance	Black exhaust smoke	Blue exhaust smoke	White exhaust smoke	Low power	Engine over-heating	Engine over-cooling	Engine knocking	Bearing failures	Low oil pressure
Air cleaner dirty Air inlet restricted	11		3	1 2	1 2			1 2					
Exhaust system restricted		6		13				13	10				
Battery weak or discharged Battery cables worn or loose connection	5 4		1 2										
Low cylinder compression Foreign matter on pistons Worn or scored pistons, rings, etc.			10 15	11 17 18		5 7		11 16 17			7 8		11
Valves leaking or sticking Worn valve guides Valves incorrectly adjusted	14 13		14 13	16 15				15 14			6 5		
Luboil level too low Luboil level too high Luboil contaminated Wrong type of luboil			18			1 3		3			1	1 4 3	1 3 2
Oil pump inlet screen plugged Pressure regulator not functioning Rocker arm shaft upside down Oil heater plug missing or loose Bearing failed - main - rod - cam												6 7 5 10 9	8 9 12 12 8
Excessive angle operation Excessive thrust pressure on shafts	16	12	17			2						2 9	5 10
Fuel tank empty Fuel tank valve closed Fuel tank valve plugged Fuel pump worn or inoperative Fuel contamination Fuel incorrect for conditions Fuel filter dirty or plugged	2 3 12 6 7 8	1 2 10 8 8 9		6 10 5 6 7 9			4	10 4 5			2		
Ignition switch in OFF position Defective dist. module, coil or spark plug Ignition timing incorrect	1 9 10		7 9 8		4			8 7		7		3	
Throttle linkage adj. incorrect or sticking Carburetor choke closed Carburetor malfunction Air leak in intake system			4 11	12 11 4	4 5			9 6 12		11			
Fan belt loose or slipping Radiator fins or tubes dirty or restricted Water system piped incorrectly Low coolant level Coolant in cylinders Inoperative thermostat Thermostat missing Internal coolant leak Wrong or defective radiator cap													
Engine overload Engine overspeeded					3								6 7

CRANKCASE OIL CAPACITIES

ENGINE TYPE & MODEL	OIL PAN TYPE	OIL PAN DIMENSIONS (In.)		CRANKCASE CAP. (Qts.) Not including oil filters
		A:	B:	
4 Cylinder: G2000, G2300	I	9	7-1/2	5-1/2
	III	10-7/8	12-1/4	8
G1600	II	7-3/8	8-1/8	6
6 Cylinder: G3000, G3400	I	10	7-3/16	7
	I	9	7-7/16	6
	I	12	8-7/16	8
	II	11	7-5/8	8
	III	12	11-7/8	7
GTA5.6				8+2 for oil cooler oil filter & lines
G4800	IV	15	9-3/4	18



HERCULES ENGINE COMPANY

LIMITED WARRANTY - INDUSTRIAL ENGINE

Hercules Engine Company warrants each new Engine or component thereof, sold by it to the original owner/user as follows:

For eighteen (18) months from date of shipment from the factory, or for twelve (12) months of service, or for 2,000 hours of service, whichever shall first occur, (or for such other period of time as may be agreed upon in writing by Hercules Engine Company in respect to the application in which the Engine is used) that said Engine and component shall be free from defects in material and workmanship.

For any Engine or component which is, or becomes defective within the period set forth above, Hercules Engine Company shall furnish to the original owner/user, without charge, Parts to replace those Parts which upon inspection are determined by Hercules Engine Company to have been defective in material or workmanship.

This warranty does not obligate Hercules Engine Company for the cost of labor or transportation charges in connection with the replacement of defective Parts or repair of the Engine.

The foregoing warranty does not apply to normal maintenance services or adjustment or to an Engine upon which repairs or alterations have been made unless the repairs or alterations were authorized in writing by Hercules Engine Company.

Hercules Engine Company makes no warranty in respect to trade accessories. trade accessories are subject to the warranties of their respective manufacturers.

Other than set forth above, **SELLER MAKES NO WARRANTY OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED; AND ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OTHER THAN AS CONTAINED HEREIN AND HEREBY LIMITED AS TO DURATION IS HEREBY DISCLAIMED.**

Owner is responsible for communication expense, meals, lodging and incidental costs incurred by owner or employees of owner as a result of a warrantable failure.

Owner is also responsible for any loss of productivity, all business costs and losses resulting from warrantable failure.

THIS WARRANTY SUPERCEDES ANY PREVIOUS WARRANTIES AND TAKES EFFECT JUNE 6, 1988.



HERCULES
ENGINE COMPANY

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