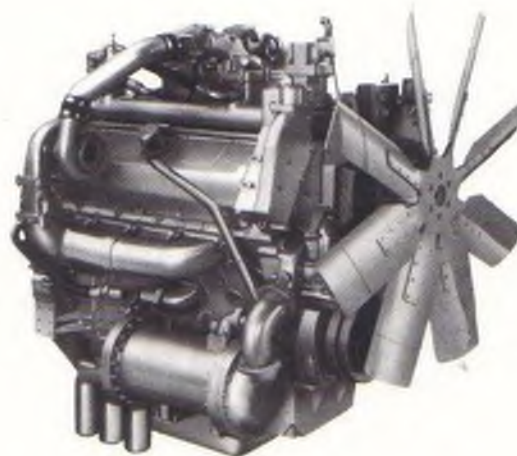


Detroit Diesel Industrial Model

8V-149TI 900 HP 800 HP



Horsepower Rating

Basic Engine	8V-149TI
Injector	190
Rated Gross Power	900 BHP (671 kW) @ 1900 RPM
Peak Torque	2607 lb ft (3535 N-m) @ 1400 RPM
Injector	160
Rated Gross Power	800 BHP (597 kW) @ 1900 RPM
Peak Torque	2350 lb ft (3187 N-m) @ 1200 RPM

(Continuous Rating)

Injector	145
Gross Power	740 BHP (552 kW) @ 1900 RPM
Peak Torque	2157 lb ft (2925 N-m) @ 1400 RPM

Rated Fuel Consumption:

@ 900 BHP369 lbs/bhp-hr (224 g/kW-hr)
	46.7 gals/hr (176.8 L/hr)
@ 800 BHP366 lbs/bhp-hr (223 g/kW-hr)
	41.2 gals/hr (155.9 L/hr)

Rating Explanation

RATED BHP is the power rating for variable speed and load applications where full power is required intermittently.

CONTINUOUS BHP is the power rating for applications operating under a constant load and speed for long periods of time.

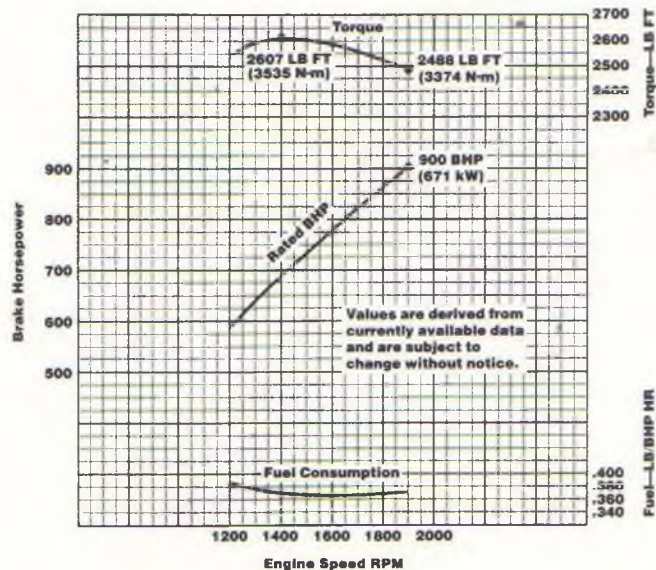
FUEL CONSUMPTION CURVE shows fuel used in pounds per brake horsepower hour.

POWER OUTPUT guaranteed within 5% at standard ambient conditions.

THIS RATING does not include power requirements for accessory and standard equipment. For complete engine specifications for your particular requirements, see your distributor or authorized Detroit Diesel Allison representative.

† Rating conditions of SAE: 77°F (25°C) and 29.31 in Hg (99kPa) Barometer (Dry)

Performance Curve †



General Specifications

Basic Engine	8V-149TI
Model	9083-7311
Number of Cylinders	8
Bore and Stroke	5.75 in × 5.75 in (146 mm × 146 mm)
Displacement	1195 cu in (19.6 liters)
Engine Type	Vee-2 cycle
Compression Ratio	16 to 1
Length	64 in (1625 mm)
Width	64 in (1625 mm)
Height	68 in (1727 mm)
Weight (dry)	6000 lbs (2727 kg)
Engine Coolant Capacity	91 qt (86.1 liters)
Total Engine Oil Capacity	124 qt (117.3 liters)
900 HP @ 1900 RPM:	
Engine Heat Rej.	28,350 BTU/min (499 kW)
Exhaust Temperature	745°F (396°C)
800 HP @ 1900 RPM:	
Engine Heat Rej.	25,200 BTU/min (443 kW)
Exhaust Temperature	710°F (377°C)

Approximate dimensions shown. For complete dimensional information refer to installation drawing 2SA489. For complete coolant specifications, see publication 7SE298. For complete fuel and lubricating oil specifications, see publication 7SE270.

Equipment Specifications

Alternator—24 volt, 65 amp
Blower—With bypass mechanism
Crankcase Pressure Monitor
Engine Oil Cooler—Tube and shell
Fan Bracket and Pulley Assembly Only
Flywheel—SAE #0
Flywheel Housing—SAE #0
Governor—Hydraulic
Intercooler
Oil Pan—Dual sump 15° angularity
Starter—24 volt
Turbocharger—Dual turbochargers, TV8401, 1.23 A/R

Additional options are also available. For a complete list, consult your authorized Detroit Diesel Allison representative.



Detroit Diesel Allison

Division of General Motors

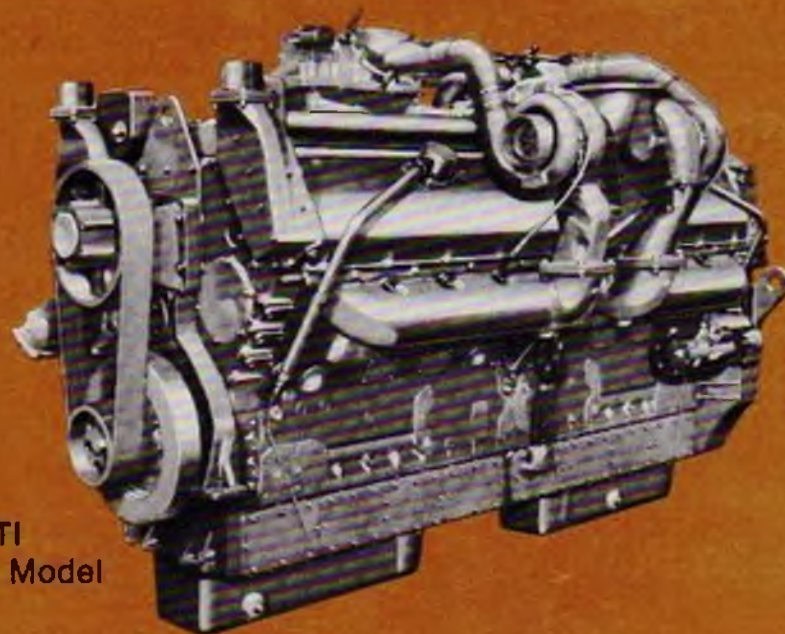
13400 Outer Drive, West, Detroit, Michigan 48239-4001
(313/592-5000)

Detroit Diesel Engines

fan-to-flywheel
models

12V-149TI
1350 hp

16V-149TI
1800 hp



Typical 16V-149TI
Fan-to-Flywheel Model

specifications

Basic Engine	12V-149TI with 195 Injectors	16V-149TI with 195 Injectors
Model	9123-7301	9163-7301
Description	Turbocharged, Intercooled	Turbocharged, Intercooled
Number of Cylinders	12	16
Bore and Stroke	5.75 in x 5.75 in (146 mm x 146 mm)	5.75 in x 5.75 in (146 mm x 146 mm)
Displacement	1792 cu in (29.39 litres)	2389 cu in (39.18 litres)
Rated Power:* SAE: 85°F (29.4°C) and 29.00 in Hg (98.19 kPa) Bar. (Dry)	1350 BHP (1007 kW) @ 1900 RPM	1800 BHP (1343 kW) @ 1900 RPM
Torque:* SAE: 85°F (29.4°C) and 29.00 in Hg (98.19 kPa) Bar. (Dry)	3840 lb ft (5206 N·m) @ 1600 RPM	5120 lb ft (6942 N·m) @ 1600 RPM
Compression Ratio	16 to 1	16 to 1
Approximate Dimensions:		
Length	91 in (2311 mm)	104 in (2642 mm)
Width	64 in (1626 mm)	64 in (1626 mm)
Height	69 in (1753 mm)	66 in (1676 mm)
Net Weight (dry)	9225 lbs (4184 kg)	10,865 lbs (4928 kg)

For complete dimensional information, refer to installation drawing 2SA274 for Model 9123-7301 and 2SA375 for Model 9163-7301

*Preliminary - jacketwater intercooled

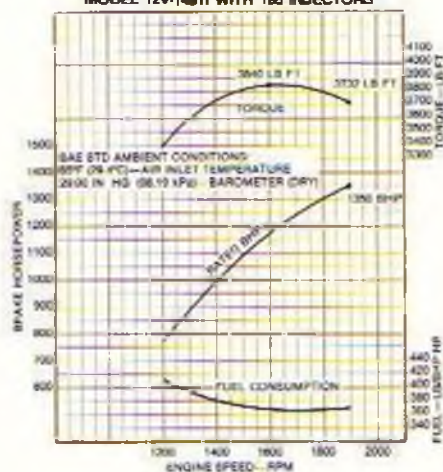
Rating Explanation

RATED BHP is the power rating for variable speed and load applications where full power is required intermittently. Performance may be derated to improve fuel economy and extend engine life.

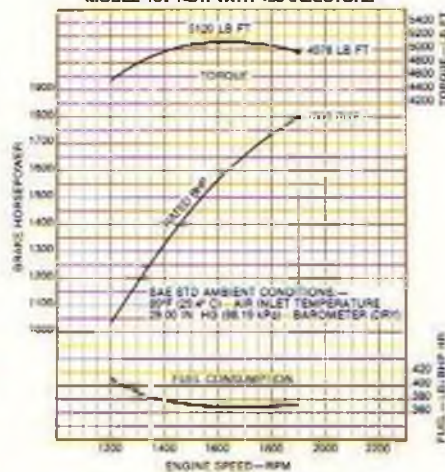
FUEL CONSUMPTION CURVE shows fuel used in pounds per brake horsepower hour.

THESE RATINGS do not include power losses for accessories and standard equipment.

PRELIMINARY ENGINE PERFORMANCE
MODEL 12V-148TI WITH 185 INJECTORS



PRELIMINARY ENGINE PERFORMANCE
MODEL 16V-148TI WITH 185 INJECTORS



standard equipment

Air Inlet Housing

Alternator—24 v, 65 amp

Crankshaft Pulley—Poly-Vee

Engine Mounts—Trunnion mounts

Exhaust Manifold

Fan—52", 8-blade, suction (Model 9123-7301);
Fan bracket and pulley assembly only
(Model 9163-7301)

Flywheel—SAE #0

Flywheel Housing—SAE #0, dual starter pads

Fuel Filters

Governor—Variable speed

Injectors—Cam operated, unit type
needle valve

Intercooler

Lube Oil Cooler

Lube Oil Filters—Full flow, dual can

Oil Pan—Dual sump, for 15°
inclination angle

Starting Motors—Two 24-volt

Turbocharger—Four turbos

Vibration Damper—Thick, heavy, viscous

For a complete listing of standard and optional equipment, consult your authorized Detroit Diesel Allison representative

Specifications subject to change without notice.



Detroit Diesel Allison
Division of General Motors Corporation

13400 West Outer Drive Detroit, Michigan 48228

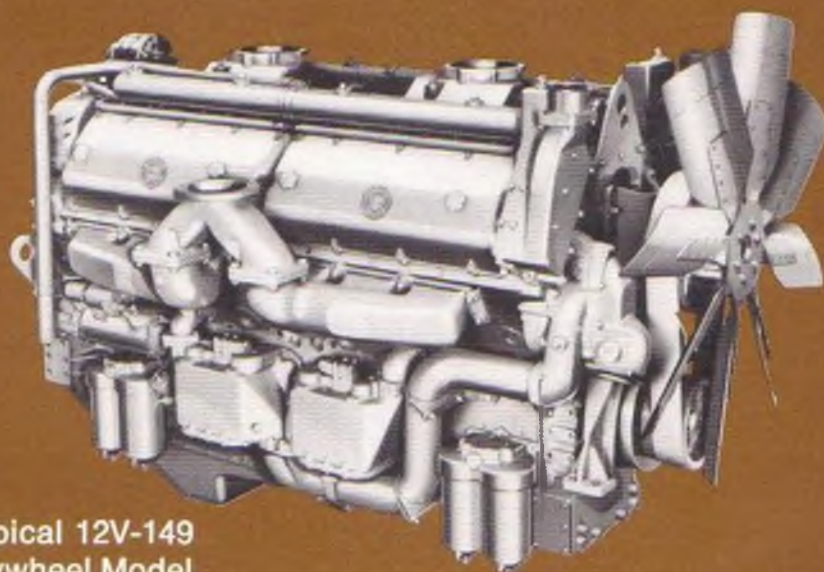
In Canada: Diesel Division, General Motors of Canada Limited, London, Ontario

Detroit Diesel Engines

fan-to-flywheel
models

12V-149
800 hp

12V-149T
1000 hp



Typical 12V-149
Fan-to-Flywheel Model

specifications

Basic Engine	12V-149 130 Injectors	12V-149T 150 Injectors
Model	9123-7000	9123-7300
Engine Type	Two Cycle	Two Cycle
Number of Cylinders	12	12
Bore and Stroke	5.75 in x 5.75 in (146 mm x 146 mm)	5.75 in x 5.75 in (146 mm x 146 mm)
Two Cycle Displacement (Every Downstroke a Powerstroke)	1792 cu in (29.39 litres)	1792 cu in (29.39 litres)
Rated Power: SAE: 85°F (29.4°C) and 29.00 in Hg (98.19 kPa) Bar. (Dry)	800 BHP (597 kW) @ 1900 RPM	1000 BHP (746 kW) @ 1900 RPM
Continuous Power: SAE: 85°F (29.4°C) and 29.00 in Hg (98.19 kPa) Bar. (Dry)	675 BHP (504 kW) @ 1800 RPM	—————
Torque: SAE: 85°F (29.4°C) and 29.00 in Hg (98.19 kPa) Bar. (Dry)	2310 lbs ft (3132 N·m) @ 1500 RPM	2915 lbs ft (3952 N·m) @ 1500 RPM
Compression Ratio	17 to 1	17 to 1
Approximate Dimensions:		
Length	92 in (2337 mm)	91 in (2311 mm)
Width	57 in (1448 mm)	63 in (1600 mm)
Height	67 in (1702 mm)	69 in (1753 mm)
Net Weight (Mass) (dry)	8880 lbs (4028 kg)	9095 lbs (4125 kg)

For complete dimensional information, refer to installation drawing 2SA363 for Model 9123-7000 and 2SA362 for Model 9123-7300.

Rating Explanation

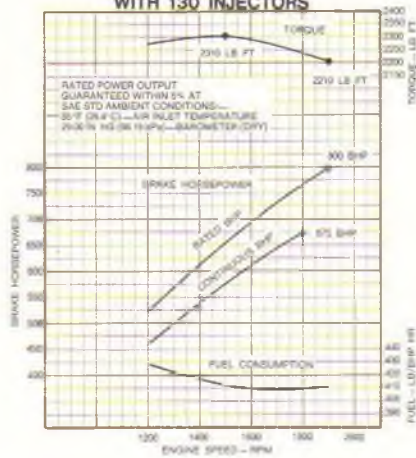
RATED BHP is the power rating for variable speed and load application where full power is required intermittently. Performance may be derated to improve fuel economy and extend engine life.

CONTINUOUS BHP is the power rating for applications operating under a constant load and speed for long periods of time.

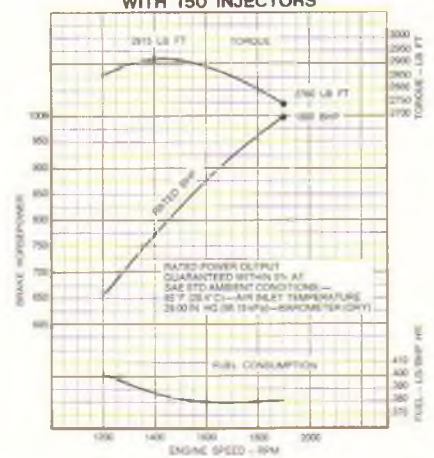
FUEL CONSUMPTION CURVE shows fuel used in pounds per brake horsepower hour.

THESE RATINGS do not include power requirements for accessory and standard equipment.

**BASIC ENGINE PERFORMANCE
MODEL 12V-149
WITH 130 INJECTORS**



**BASIC ENGINE PERFORMANCE
MODEL 12V-149T
WITH 150 INJECTORS**



standard equipment

Air Inlet Housing

Alternator—24 volt, 65 amp

Crankshaft Pulley—Poly-Vee

Engine Mounts—Front trunnion

Exhaust Manifold—Vertical Center Outlet

Fan—48 in (1229 mm), 8 blades, suction, Model 9123-7000 only; 52 in (1331 mm), 8 blades, suction, Model 9123-7300 only

Flywheel—SAE #0

Flywheel Housing—SAE #0, dual starter pads

Fuel Filters

Governor—Variable speed

Injectors—Cam operated, unit type, clean tip

Lube Oil Cooler

Lube Oil Filter—Full flow

Oil Pan—Stamped pan for 15° inclination angle, dual sump

Starting Motor—Two (2) 24 volt

Turbocharger—Model 9123-7300 only

For a complete listing of standard and optional equipment, consult your authorized Detroit Diesel Allison representative.

Specifications subject to change without notice.



Detroit Diesel Allison
Division of General Motors Corporation

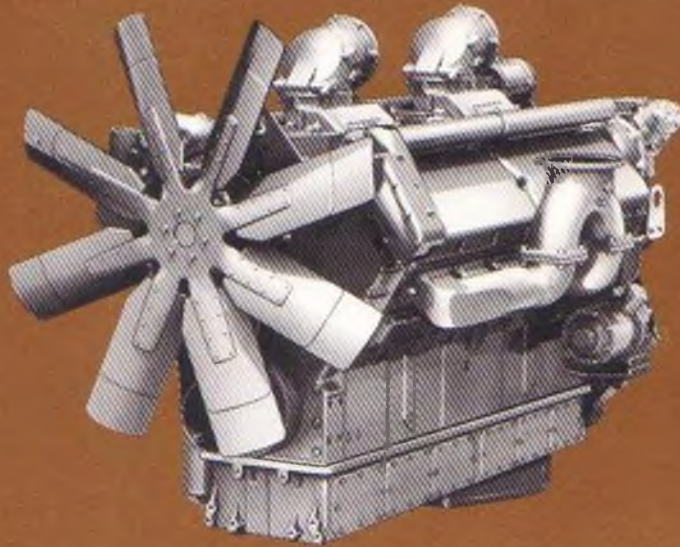
13400 West Outer Drive Detroit, Michigan 48228

In Canada: Diesel Division, General Motors of Canada Limited London Ontario

Detroit Diesel Engines

Industrial Models

12V-149 16V-149
805 hp 1070 hp



Typical 12V-149

specifications

Basic Engine	12V-149 130 Injectors	16V-149 130 Injectors
Model	9123-7000	9163-7000
Description	Naturally Aspirated	Naturally Aspirated
Number of Cylinders	12	16
Bore and Stroke	5.75 in × 5.75 in (146 mm × 146 mm)	5.75 in × 5.75 in (146 mm × 146 mm)
Displacement	1792 cu in (29.39 liters)	2389 cu in (39.18 liters)
Rated Gross Power: SAE: 77°F (25°C) and 29.31 in Hg (99 kPa) Barometer (Dry)	805 BHP (601 kW) @ 1900 RPM	1070 BHP (798 kW) @ 1900 RPM
Continuous Gross Power: SAE: 77°F (25°C) and 29.31 in Hg (99 kPa) Barometer (Dry)	675 BHP (504 kW) @ 1800 RPM	900 BHP (671 kW) @ 1800 RPM
Torque: SAE: 77°F (25°C) and 29.31 in Hg (99 kPa) Barometer (Dry)	2326 lb ft (3154 N•m) @ 1400 RPM	3106 lb ft (4212 N•m) @ 1400 RPM
Compression Ratio	17 to 1	17 to 1
Approximate Dimensions:		
Length	93 in (2362 mm)	110 in (2794 mm)
Width	59 in (1499 mm)	54 in (1372 mm)
Height	61 in (1549 mm)	60 in (1524 mm)
Net Weight (Dry)	8490 lbs (3851 kg)	10,490 lbs (4758 kg)

For complete dimensional information, refer to installation drawing 2SA363 for Model 9123-7000, and 2SA360 for Model 9163-7000.

Rating Explanation

RATED BHP is the power rating for variable speed and load applications where full power is required intermittently.

CONTINUOUS BHP is the power rating for applications operating under a constant load and speed for long periods of time.

FUEL CONSUMPTION CURVE shows fuel used in pounds per brake horsepower hour.

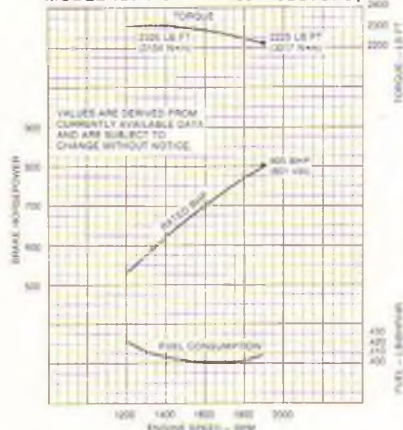
POWER OUTPUT guaranteed within 5% at standard ambient conditions.

THIS RATING does not include power requirements for accessory and standard equipment.

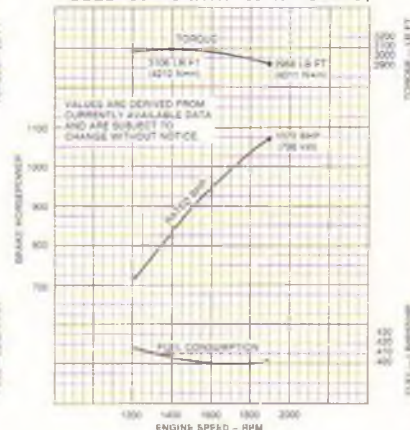
For complete engine specifications for your particular requirements, see your distributor or authorized Detroit Diesel Allison representative.

†Rating conditions of SAE: 77°F (25°C) and 29.31 in Hg (99 kPa) Barometer (Dry)

**BASIC ENGINE PERFORMANCE
MODEL 12V-149 WITH 130 INJECTORS†**



**BASIC ENGINE PERFORMANCE
MODEL 16V-149 WITH 130 INJECTORS†**



standard equipment

Air Box Drain Tubes

Air Inlet Housing

Alternator—24 volt, 65 amp

Crankshaft Pulley—Poly-Vee

Engine Mounts—Front trunnion

Exhaust Manifold

Fan—48 in (1229 mm), 8 blades, right-hand suction, 12V-149; 52 in (1331 mm), 8 blades, right-hand suction, 16V-149

Flywheel—SAE #0

Flywheel Housing—SAE #0

Fuel Filters

Governor—Variable speed

Injectors—Cam operated, unit type, clean tip

Lube Oil Cooler—Plate type

Lube Oil Filters—Full flow, spin on

Oil Pan—Stamped steel, dual sump, for 15° inclination angle

Starting Motor—Two (2) 24 volt

Vibration Damper—Thick, heavy, viscous

For a complete listing of standard and optional equipment, consult your authorized Detroit Diesel Allison representative.

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Detroit Diesel Allison

Division of General Motors

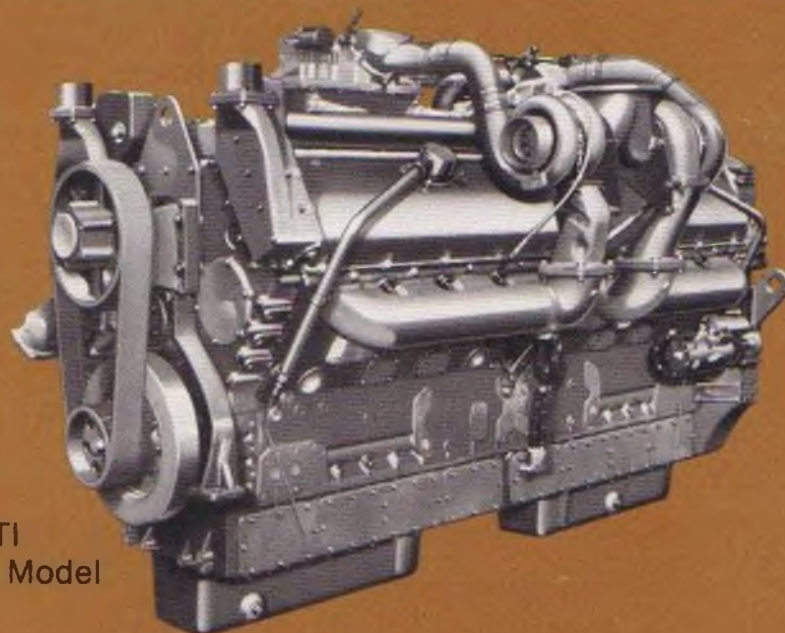
13400 Outer Drive, West, Detroit, Michigan 48239-4001
(313/592-5000)

Detroit Diesel Engines

fan-to-flywheel
models

12V-149TI
1350 hp

16V-149TI
1800 hp



Typical 16V-149TI
Fan-to-Flywheel Model

specifications

Basic Engine	12V-149TI with 195 Injectors	16V-149TI with 195 Injectors
Model	9123-7301	9163-7301
Description	Turbocharged, Intercooled	Turbocharged, Intercooled
Number of Cylinders	12	16
Bore and Stroke	5.75 in x 5.75 in (146 mm x 146 mm)	5.75 in x 5.75 in (146 mm x 146 mm)
Displacement	1792 cu in (29.39 litres)	2389 cu in (39.18 litres)
Rated Power:* SAE: 85°F (29.4°C) and 29.00 in Hg (98.19kPa) Bar. (Dry)	1350 BHP (1007 kW) @ 1900 RPM	1800 BHP (1343 kW) @ 1900 RPM
Torque:* SAE: 85°F (29.4°C) and 29.00 in Hg (98.19 kPa) Bar. (Dry)	3840 lb ft (5206 N·m) @ 1600 RPM	5120 lb ft (6942 N·m) @ 1600 RPM
Compression Ratio	16 to 1	16 to 1
Approximate Dimensions:		
Length	91 in (2311 mm)	104 in (2642 mm)
Width	64 in (1626 mm)	64 in (1626 mm)
Height	69 in (1753 mm)	66 in (1676 mm)
Net Weight (dry)	9225 lbs (4184 kg)	10,865 lbs (4928 kg)

For complete dimensional information, refer to installation drawing 2SA374 for Model 9123-7301 and 2SA375 for Model 9163-7301

*Preliminary - jacketwater intercooled

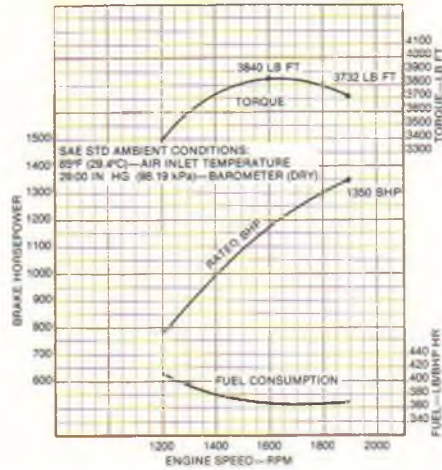
Rating Explanation

RATED BHP is the power rating for variable speed and load applications where full power is required intermittently. Performance may be derated to improve fuel economy and extend engine life.

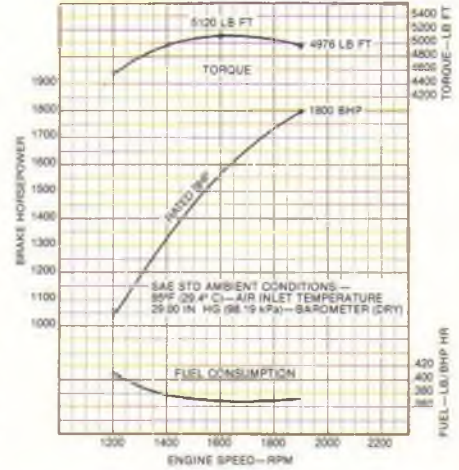
FUEL CONSUMPTION CURVE shows fuel used in pounds per brake horsepower hour.

THESE RATINGS do not include power losses for accessories and standard equipment.

PRELIMINARY ENGINE PERFORMANCE
MODEL 12V-140TI WITH 195 INJECTORS



PRELIMINARY ENGINE PERFORMANCE
MODEL 16V-140TI WITH 195 INJECTORS



standard equipment

Air Inlet Housing

Alternator—24 v, 65 amp

Crankshaft Pulley—Poly-Vee

Engine Mounts—Trunnion mounts

Exhaust Manifold

Fan—52", 8-blade, suction (Model 9123-7301);
Fan bracket and pulley assembly only
(Model 9163-7301)

Flywheel—SAE #0

Flywheel Housing—SAE #0, dual starter pads

Fuel Filters

Governor—Variable speed

Injectors—Cam operated, unit type
needle valve

Intercooler

Lube Oil Cooler

Lube Oil Filters—Full flow, dual can

Oil Pan—Dual sump, for 15°
inclination angle

Starting Motors—Two 24-volt

Turbocharger—Four turbos

Vibration Damper—Thick, heavy, viscous

For a complete listing of standard and optional equipment, consult your authorized Detroit Diesel Allison representative

Specifications subject to change without notice.



Detroit Diesel Allison
Division of General Motors Corporation

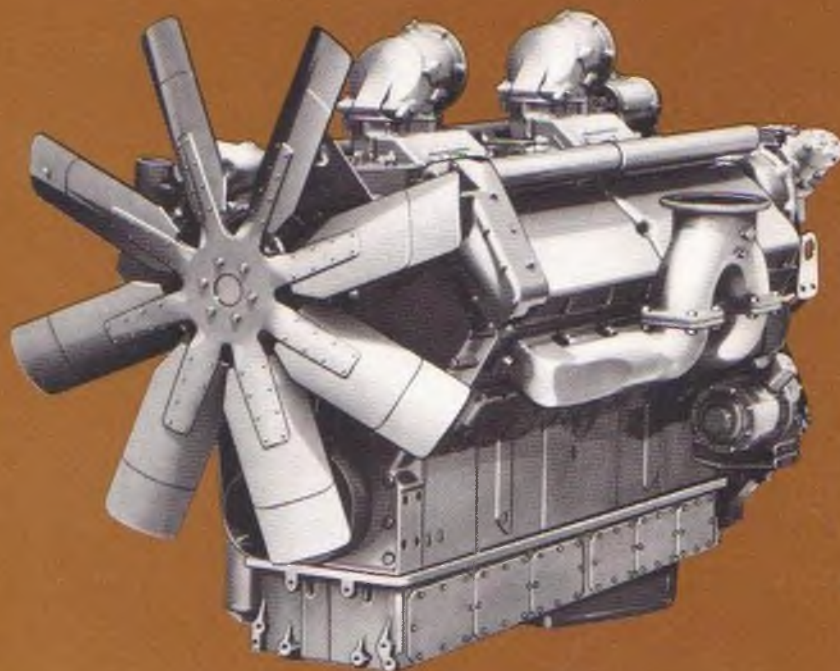
13400 West Outer Drive Detroit, Michigan 48228

In Canada: Diesel Division, General Motors of Canada Limited, London Ontario

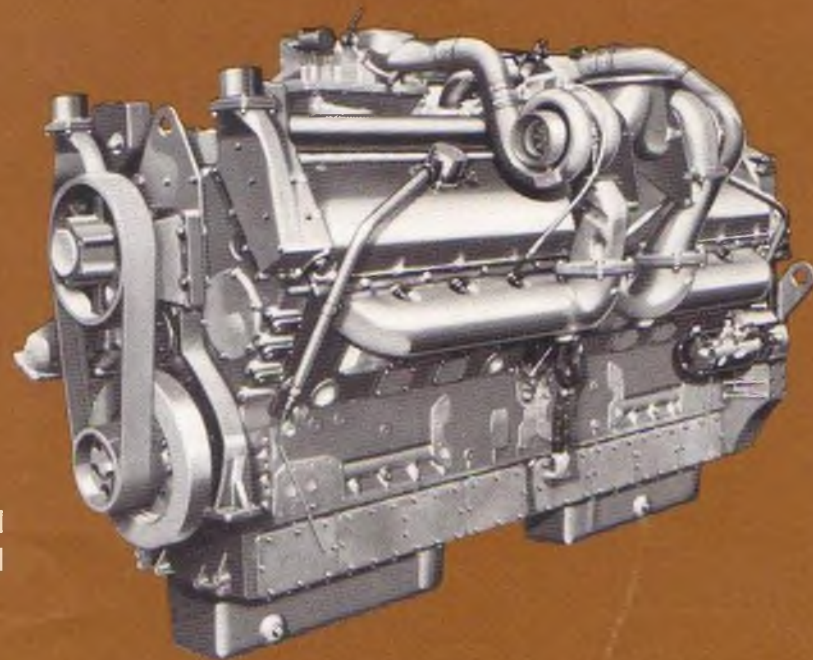
Detroit Diesel Engines

fan-to-flywheel models

12V-149	12V-149T	12V-149TI	12V-149TI	16V-149	16V-149T	16V-149TI	16V-149TI
805 hp	1050 hp	1200 hp	1350 hp	1070 hp	1400 hp	1600 hp	1800 hp



Typical 12V-149
Fan-To-Flywheel Model



Typical 16V-149TI
Fan-To-Flywheel Model

Basic Engine	12V-149 130 Injectors	12V-149T 145 Injectors	12V-149TI 160 Injectors	12V-149TI 190 Injectors
Model	9123-7000	9123-7300	9123-7301	9123-7311
Description	Naturally Aspirated	Turbocharged	Turbocharged Intercooled	Turbocharged Intercooled
Number of Cylinders	12	12	12	12
Bore and Stroke	5.75 in × 5.75 in (146 mm × 146 mm)	5.75 in × 5.75 in (146 mm × 146 mm)	5.75 in × 5.75 in (146 mm × 146 mm)	5.75 in × 5.75 in (146 mm × 146 mm)
Displacement	1792 cu in (29.39 liters)	1792 cu in (29.39 liters)	1792 cu in (29.39 liters)	1792 cu in (29.39 liters)
Rated Gross Power: SAE: 77 °F (25 °C) and 29.31 in Hg (99 kPa) Barometer (Dry)	805 BHP (601 kW) @ 1900 RPM	1050 BHP (783 kW) @ 1900 RPM	1200 BHP (895 kW) @ 1900 RPM	1350 BHP (1007 kW) @ 1900 RPM
Continuous Gross Power: SAE: 77 °F (25 °C) and 29.31 in Hg (99 kPa) Barometer (Dry)	675 BHP (504 kW) @ 1800 RPM	675 BHP (504 kW) @ 1800 RPM	810 BHP (604 kW) @ 1800 RPM	810 BHP (604 kW) @ 1800 RPM
Torque: SAE: 77 °F (25 °C) and 29.31 in Hg (99 kPa) Barometer (Dry)	2326 lb ft (3154 N•m) @ 1400 RPM	3116 lb ft (4225 N•m) @ 1200 RPM	3480 lb ft (4719 N•m) @ 1200 RPM	3909 lb ft (5301 N•m) @ 1400 RPM
Compression Ratio	17 to 1	17 to 1	16 to 1	16 to 1
Approximate Dimensions:				
Length	93 in (2362 mm)	93 in (2362 mm)	93 in (2362 mm)	93 in (2362 mm)
Width	59 in (1499 mm)	62 in (1575 mm)	62 in (1575 mm)	62 in (1575 mm)
Height	61 in (1549 mm)	68 in (1727 mm)	70 in (1778 mm)	70 in (1778 mm)
Net Weight (Dry)	8490 lbs (3851 kg)	9030 lbs (4096 kg)	9110 lbs (4132 kg)	9110 lbs (4132 kg)

For complete dimensional information, refer to installation drawing 2SA363 for Model 9123-7000, 2SA490 for Model 9123-7300, 2SA491 for Model 9123-7301 and 2SA492 for Model 9123-7311.

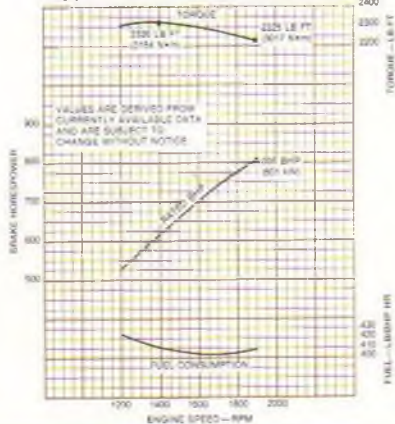
Rating Explanation

RATED BHP is the power rating for variable speed and load applications where full power is required intermittently.

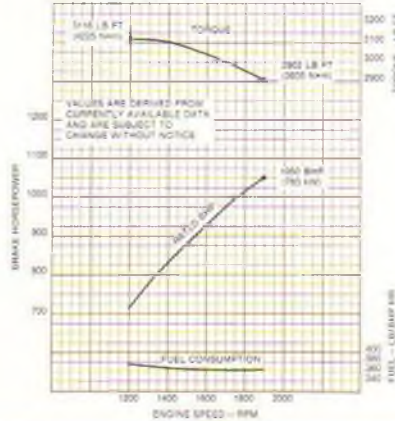
CONTINUOUS BHP is the power rating for applications operating under a constant load and speed for long period of time.

For complete engine specifications for your particular requirements, see your distributor or authorized Detroit Diesel Allison representative.

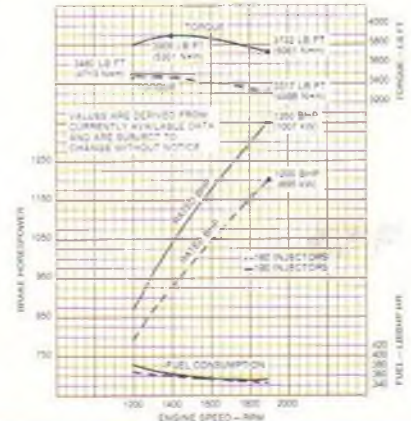
**BASIC ENGINE PERFORMANCE
MODEL 12V-149 WITH 130 INJECTORS†**



**BASIC ENGINE PERFORMANCE
MODEL 12V-149T WITH 145 INJECTORS†**



**BASIC ENGINE PERFORMANCE
MODEL 12V-149TI†**



specifications

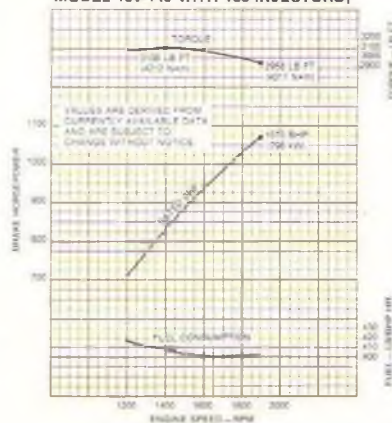
16V-149 130 Injectors	16V-149T 145 Injectors	16V-149TI 160 Injectors	16V-149TI 190 Injectors
9163-7000	9163-7300	9163-7301	9163-7311
Naturally Aspirated	Turbocharged	Turbocharged Intercooled	Turbocharged Intercooled
16	16	16	16
5.75 in × 5.75 in (146 mm × 146 mm)	5.75 in × 5.75 in (146 mm × 146 mm)	5.75 in × 5.75 in (146 mm × 146 mm)	5.75 in × 5.75 in (146 mm × 146 mm)
2389 cu in (39.18 liters)	2389 cu in (39.18 liters)	2389 cu in (39.18 liters)	2389 cu in (39.18 liters)
1070 BHP (798 kW) @ 1900 RPM	1400 BHP (1044 kW) @ 1900 RPM	1600 BHP (1194 kW) @ 1900 RPM	1800 BHP (1343 kW) @ 1900 RPM
900 BHP (671 kW) @ 1800 RPM	900 BHP (671 kW) @ 1800 RPM	1080 BHP (806 kW) @ 1800 RPM	1080 BHP (806 kW) @ 1800 RPM
3106 lb ft (4212 N•m) @ 1400 RPM	4213 lb ft (5713 N•m) @ 1400 RPM	4689 lb ft (6358 N•m) @ 1400 RPM	5290 lb ft (7173 N•m) @ 1400 RPM
17 to 1	17 to 1	16 to 1	16 to 1
110 in (2794 mm) 54 in (1372 mm) 60 in (1524 mm) 10,490 lbs (4758 kg)	106 in (2692 mm) 64 in (1626 mm) 67 in (1702 mm) 10,690 lbs (4849 kg)	106 in (2692 mm) 64 in (1626 mm) 68 in (1727 mm) 11,210 lbs (5085 kg)	106 in (2692 mm) 64 in (1626 mm) 68 in (1727 mm) 11,210 lbs (5085 kg)

†123-7311, 2SA360 for Model 9163-7000. 2SA492 for Model 9163-7300, and 2SA493 for Model 9163-7301 and Model 9163-7311.

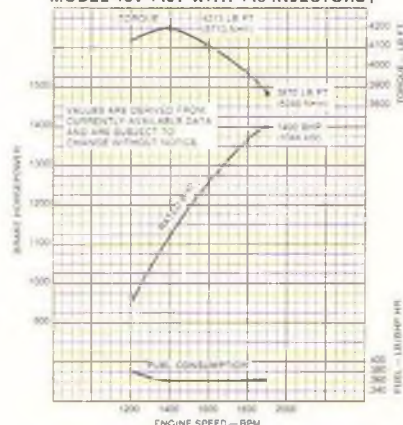
FUEL CONSUMPTION CURVE shows fuel used in pounds per brake horsepower hour. THESE RATINGS do not include power requirements for accessory and standard equipment. †Rating conditions of SAE: 77 °F (25 °C) and 29.31 In Hg (99 kPa) Barometer (Dry)

performance

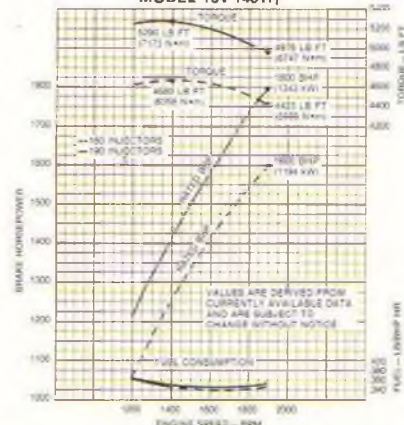
BASIC ENGINE PERFORMANCE
MODEL 16V-149 WITH 130 INJECTORS†



BASIC ENGINE PERFORMANCE
MODEL 16V-149T WITH 145 INJECTORS†



BASIC ENGINE PERFORMANCE
MODEL 16V-149TI†



standard equipment

Air Box Drain Tubes

Air Inlet Housing

Alternator—24 volt, 65 amp

Crankshaft Pulley—Poly-Vee

Engine Mounts—Front trunnion

Exhaust Manifold

Fan—48 in (1229 mm), 8 blades, right-hand suction, 12V-149 only; 52 in (1331 mm), 8 blades, right-hand suction, 12V-149T, 12V-149TI, & 16V-149 only; fan bracket and pulley assembly, 16V-149T & 16V-149TI only

Flywheel—SAE #0

Flywheel Housing—SAE #0

Fuel Filters

Governor—Variable speed

Injectors—Cam operated, unit type, clean tip

Intercooler—12V-149TI & 16V-149TI only

Lube Oil Cooler

Lube Oil Filters—Full flow

Oil Pan—Stamped steel, dual sump, for 15° inclination angle

Starting Motor—Two (2) 24 volt

Turbocharger—12V-149T, 12V-149TI, 16V-149T, & 16V-149TI only

Vibration Damper—Thick, heavy, viscous

For a complete listing of standard and optional equipment, consult your authorized Detroit Diesel Allison representative.

Information and specifications subject to change without notice or obligation.

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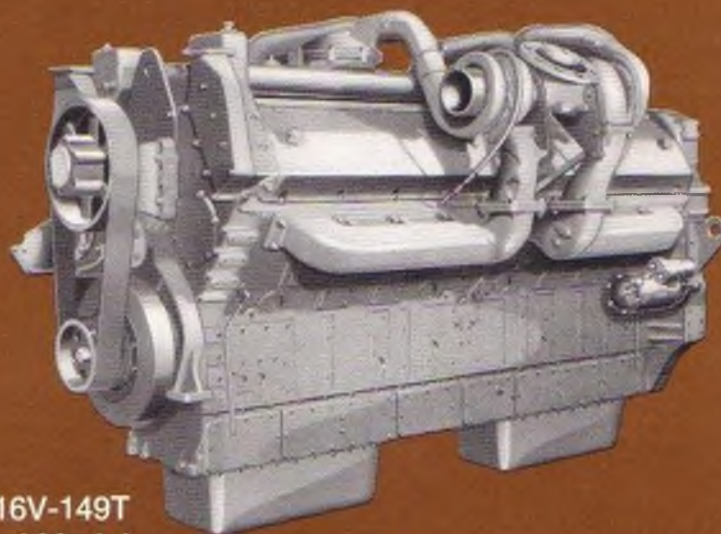
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Bogota, Colombia
Buenos Aires, Argentina
Lima, Peru
Santiago, Chile
Sao Paulo, Brasil

Detroit Diesel Engines

fan-to-flywheel models

16V-149
1060 hp

16V-149T
1325 hp



Typical 16V-149T
Fan-to-Flywheel Model

specifications

Basic Engine	16V-149 130 Injectors	16V-149T 150 Injectors
Model	9163-7000	9163-7300
Description	Naturally Aspirated	Turbocharged
Engine Type	Two Cycle	Two Cycle
Number of Cylinders	16	16
Bore and Stroke	5.75 in x 5.75 in (146 mm x 146 mm)	5.75 in x 5.75 in (146 mm x 146 mm)
Two Cycle Displacement (Every Downstroke a Powerstroke)	2389 cu in (39.18 litres)	2389 cu in (39.18) litres)
Rated Power: SAE: 85°F (29.4°C) and 29.00 in Hg (98.19 kPa) Bar (Dry)	1060 BHP (791 kW) @ 1900 RPM	1325 BHP (988 kW) @ 1900 RPM
Continuous Power: SAE: 85°F (29.4°C) and 29.00 in Hg (98.19 kPa) Bar (Dry)	900 BHP (671 kW) @ 1800 RPM	— —
Torque: SAE: 85°F (29.4°C) and 29.00 in Hg (98.19 kPa) Bar (Dry)	3080 lb ft (4176 N·m) @ 1500 RPM	3880 lb ft (5261 N·m) @ 1400 RPM
Compression Ratio	17 to 1	17 to 1
Approximate Dimensions:		
Length	108 in (2743 mm)	109 in (2769 mm)
Width	54 in (1372 mm)	64 in (1626 mm)
Height	68 in (1727 mm)	72 in (1829 mm)
Net Weight (Mass) (dry)	10540 lbs (4781 kg)	10840 lbs (4917 kg)

For complete dimensional information, refer to installation drawing 2SA360 for Model 9163-7000 and 2SA359 for Model 9163-7300

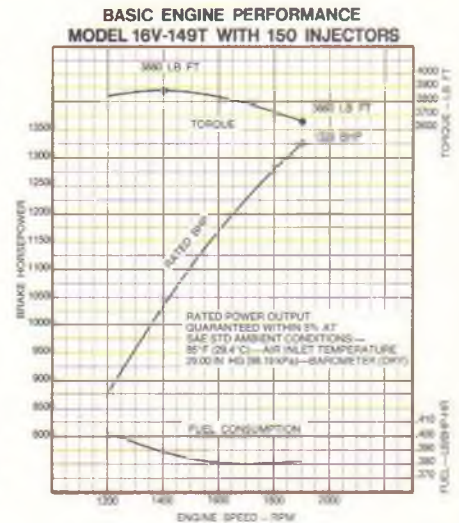
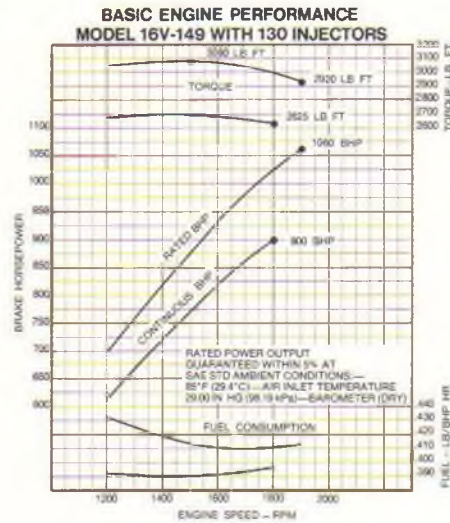
Rating Explanation

RATED BHP is the power rating for variable speed and load application where full power is required intermittently. Performance may be derated to improve fuel economy and extend engine life.

CONTINUOUS BHP is the power rating for applications operating under a constant load and speed for long periods of time.

FUEL CONSUMPTION CURVE shows fuel used in pounds per brake horsepower hour.

THESE RATINGS do not include power requirements for accessory and standard equipment.



standard equipment

Air Inlet Housing

Alternator—24 volt, 65 amp

Crankshaft Pulley—Poly-Vee

Engine Mounts—Front trunnion

Exhaust Manifold

Fan—52 in (1331 mm), 8 blades, suction, Model 9163-7000 only; Fan bracket and pulley assembly, Model 9163-7300 only

Flywheel—SAE #0

Flywheel Housing—SAE #0, dual starter pads

Fuel Filters

Governor—Variable speed

Injectors—Cam operated, unit type, clean tip

Lube Oil Cooler

Lube Oil Filter—Full flow

Oil Pan—Stamped lower pan for 15° inclination angle, dual sump

Starting Motor—Two (2) 24 volt

Turbocharger—Model 9163-7300 only

For a complete listing of standard and optional equipment, consult your authorized Detroit Diesel Allison representative.

Specifications subject to change without notice.



Detroit Diesel Allison
Division of General Motors Corporation

13400 West Outer Drive Detroit, Michigan 48228

In Canada: Diesel Division, General Motors of Canada Limited London Ontario

HYDRAULIC GOVERNOR AND INJECTOR RACK CONTROL ADJUSTMENT

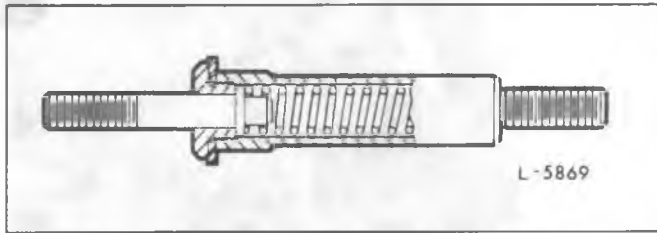


Fig. 1 - Throttle Delay Yield Link Assembly

Adjust the governor and the injector rack control levers after adjusting the exhaust valve clearance and timing the injectors.

Effective with engines built April 1, 1980 a throttle delay yield link assembly (Fig. 1) replaces the vertical link assembly, for those applications where a throttle delay mechanism is used in conjunction with the hydraulic governor (refer to Section 14.14).

Adjust Governor Linkage And Position Injector Rack Control Levers

1. Clean and remove the valve rocker cover from each cylinder bank.
2. Loosen all of the inner and outer injector rack control lever adjusting screws or loosen all of the adjusting screws and locknuts. Be sure all of the control levers are free on the injector control tubes.
3. Disconnect the yield link assembly or vertical link assembly from the governor operating lever (Fig. 2).

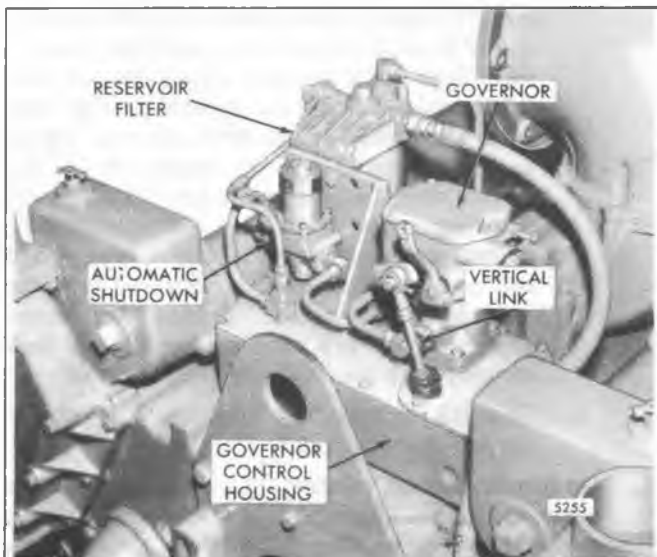


Fig. 2 - Hydraulic Governor Mounting and Linkage (Current with Vertical Link)

Do not remove the lever. On current engines, remove the small cover from the governor control housing and disconnect the yield link or vertical link from the left-bank operating lever (Fig. 3). On former engines, remove the small cover on top of the engine front cover and disconnect the vertical link from the bellcrank lever (Fig. 4).

The letters R and L indicate the injector location in the right or left cylinder bank, as viewed from the rear of the engine. The cylinders are numbered starting at the front of the engine on each cylinder bank. Adjust the No. 1L and No. 1R injector rack control levers first to establish a guide for adjusting the remaining levers.

The injectors incorporate an injector rack stop. The stop limits the travel of the injector rack and has been preset at the factory. *Under no circumstances should the injector stop setting be altered.*

4. On current engines, position the linkage setting gage J 23475-01 as shown in Fig. 5. This will place the left-bank operating lever in the correct *no-fuel* position.

The former gage J 23475 can only be used with current engines that have 120, 130, 140 or 150mm fuel injectors. Gage J 23475-01 can be used on engines equipped with any size fuel injector.

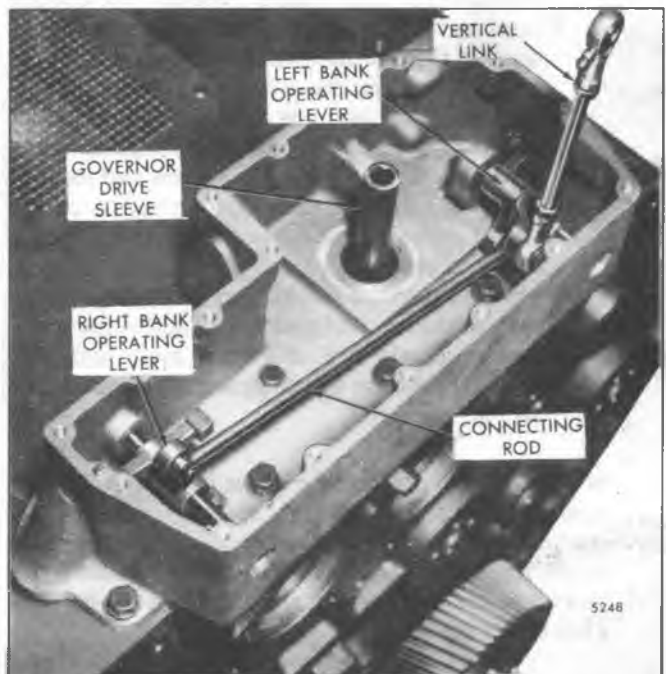


Fig. 3 - Governor Control Housing and Linkage (Current with Vertical Link)



Fig. 4 - Hydraulic Governor Mounting and Linkage (Former with Vertical Link)

At the *no-fuel* position, the distance from the top of the main cover on the governor control housing to the center line of the bolt hole on the arm of the left-bank operating lever (which carries the yield link or vertical link) is 1.80".

Maintain the above dimension and set the No. 1L and No. 1R injector rack control levers, as follows:

- a. With the fuel rod on the right-bank injector control tube removed and the fuel rod on the left-bank injector control tube installed, turn down the outer adjusting screw (two screw assembly) of the No. 1L injector rack control lever until the ball end of the lever is just snug against the injector rack (with the rack in the *no-fuel* position). Turn down the inner adjusting screw until it bottoms lightly on the injector control tube. Then alternately tighten both adjusting screws. On the one screw and locknut assembly, tighten the adjusting screw of the No. 1 injector rack control lever until the rack clevis is observed to roll up or an increase in effort to turn the screwdriver is noted (with the rack in the *no-fuel* position). Tighten the screw approximately 1/8 of a turn more and lock securely with the adjusting screw locknut. Refer to Fig. 6.

NOTICE: Overtightening of the injector rack control lever adjusting screws during installation or adjustment can result in damage to the injector control tube. The recommended torque of the adjusting screws is 24-36 lb-in (3-4 N·m) torque.

- b. Remove the gage and install the right-bank injector control tube fuel rod.

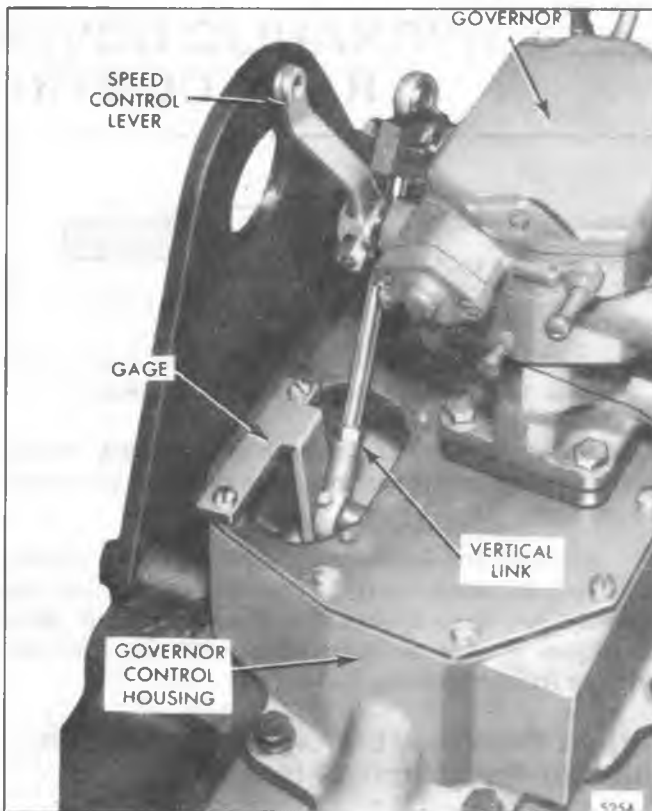


Fig. 5 - Positioning of Current Governor Operating Link with Vertical Link (Gage J 23475-01)

- c. Move the No. 1 left bank injector control lever to the full-fuel position by depressing the arm of the left-bank operating lever (which carries the yield link or vertical link).
- d. Hold this position and turn down the inner adjusting screw (two screw assembly) in the No. 1R injector rack control lever until the ball end of the lever is just snug against the injector rack. Turn down the outer adjusting screw until it bottoms lightly on the injector control tube. Then alternately tighten both adjusting screws to 24-36 lb-in (3-4 N·m) torque. On the one screw and locknut assembly, tighten the adjusting screw of the No. 1R injector rack control lever until the rack clevis is observed to roll up or an increase in effort to turn the screwdriver is noted. Tighten the screw approximately 1/8 of a turn more and lock securely with the adjusting screw locknut.
- e. This will place the No. 1 right-bank injector in the *full-fuel* position.

5. On former engines, position the elongated pin in the bellcrank (the pin which carries the left-bank fuel rod) so that it lines up with the center bolt of the bellcrank from vertical to approximately 1/16" off center toward the right cylinder bank (Fig. 7).

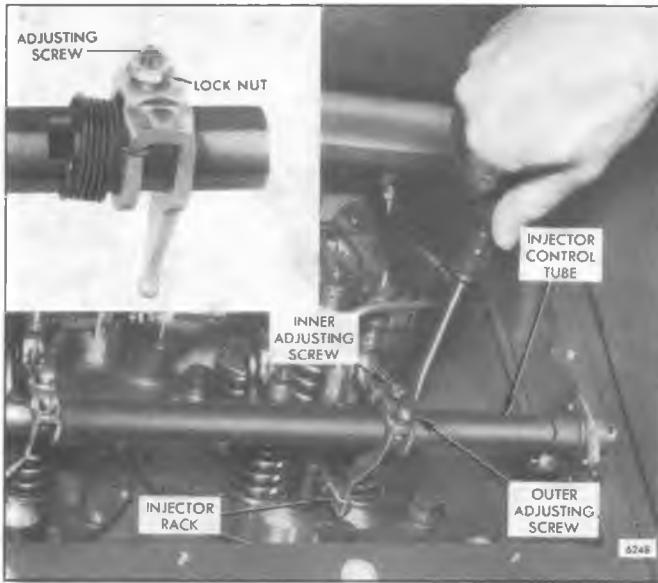


Fig. 6 - Positioning the No. 1 Injector Rack Control Lever

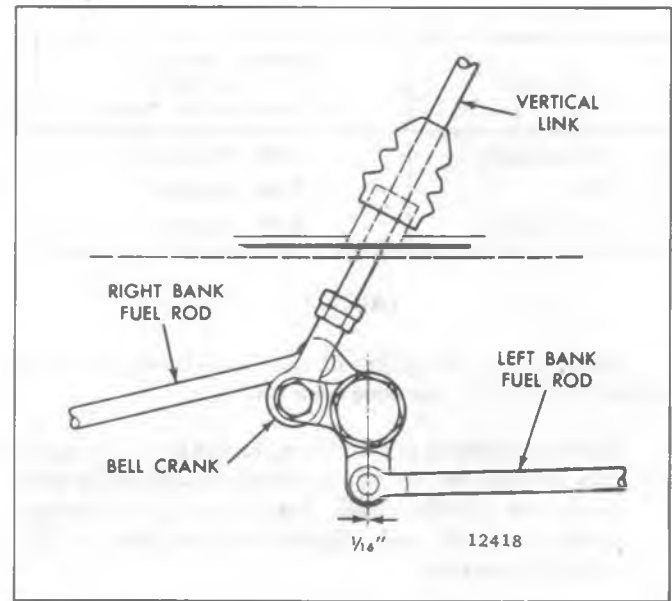
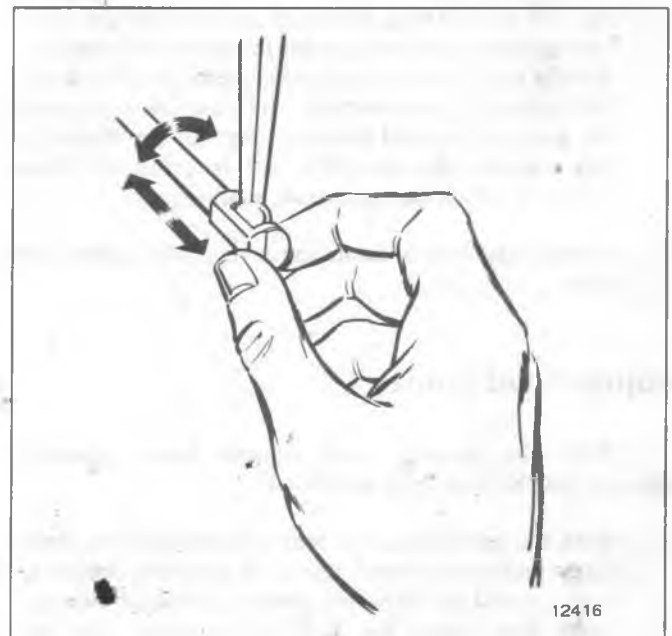


Fig. 7 - Positioning of the Bellcrank (Former Engines)

- a. With the fuel rod on the right-bank injector control tube removed and the fuel rod on the left-bank injector control tube installed, turn down the outer adjusting screw of the No. 1L injector rack control lever until the ball end of the lever is just snug against the injector rack (with the rack in the no-fuel position). Refer to Fig. 5.
- b. Turn down the inner adjusting screw until it bottoms lightly on the injector control tube. Then alternately tighten both adjusting screws. The recommended torque of the adjusting screws is 24-36 lb-in (3-4 N·m) torque.
- c. Install the right-bank fuel rod.
- d. Hold the bellcrank lever in the full-fuel position and turn down the inner adjusting screw in the No. 1R injector rack control lever until the ball end of the lever is just snug against the injector rack.
- e. Turn down the outer adjusting screw until it bottoms lightly on the injector control tube. Then alternately tighten both adjusting screws to 24-36 lb-in (3-4 N·m) torque.

FOR MER ENGINE

(Fig. 8). If the movement is the same for both, the two rack control levers are in adjustment. If the movement is not the same, loosen either the inner or outer adjusting screw (two screw assembly) of the No. 1R rack control lever and adjust the lever until both the No. 1L and No. 1R levers are balanced. On the one screw and locknut assembly, loosen the locknut on the No. 1R rack control lever and turn the adjusting screw clockwise or counterclockwise until both the No. 1L and No. 1R levers are balanced. Tighten the locknut securely.



8 - Checking Injector Rack Movement

Governor	Distance Between Center Lines of End Bearing Bolt Holes
SG (current)	7.00" (Approx.)
PSG	7.44" (Approx.)
SG (former)	8.88" (Approx.)

TABLE 1

Never alter the setting of the No. 1L injector rack control lever after it has once been set.

7. Set the remaining injector rack control levers, using he No. 4R and No. 1L control levers as a guide for each respective cylinder bank. Use a spring of suitable length to hold each injector control tube in the full-fuel position.
8. Remove the governor cover.
9. Adjust the load limit screw to obtain a distance of 2" from the outside face of the boss on the governor subcap to the end of the screw.
10. Position the governor operating lever on the shaft toward the left cylinder bank (on *current* engines) or toward the right cylinder bank (on *former* engines) so that the center of the bolt hole is approximately 5/16" above a horizontal line through the shaft (with the lever in the no-fuel position).
11. Refer to Table 1 and adjust the length of the yield link or vertical link so that the bolt holes of the levers and the rod end bearings are lined up with the governor lever and the injector racks are in the no-fuel position. Always install the throttle delay yield link of a Series 149 hydraulic governor with the yieldable end inside the governor control housing (Fig. 1). Positioned in this manner the yieldable end is protected from abrasives which can accelerate shaft wear.
12. Replace the two bolts in the levers and tighten the bolts.

Adjust Load Limit

With the injector rack control levers properly adjusted, set the load limit as follows:

1. With the governor cover removed and the load limit screw locknut loosened, move the governor operating lever toward the full-fuel position until the injector racks just reach the full-fuel position. Do not overstress the linkage.

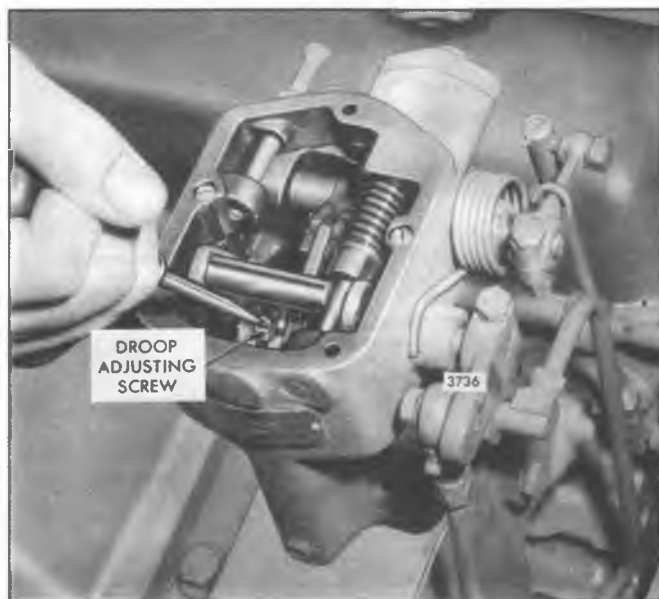


Fig. 9 – Adjusting Speed Droop

2. Turn the load limit adjusting screw inward until the injector racks just loosen on the ball ends of the control levers.
3. Release the governor operating lever and hold the load limit screw while tightening the locknut. Install the governor cover.

Adjust Governor Speed Droop

INTERNAL DROOP ADJUSTMENT

The purpose of adjusting the speed droop is to establish a definite engine speed at no load with a given speed at rated full load. The governor speed droop is set at the factory and further adjustment should be unnecessary.

However, if the governor has been overhauled, the speed droop must be readjusted.

If a full-rated load can be established on the engine, and the fuel rods, injector rack control levers and the load limit have been adjusted, set the speed droop as follows:

1. Start the engine and run it at approximately one-half the rated no-load speed until the lubricating oil temperature stabilizes. When the engine lubricating oil is cold, the governor regulation may be erratic. Regulation will become increasingly stable as the temperature of the oil increases.
2. Stop the engine and remove the governor cover.
3. Loosen the locknut and back off the maximum speed adjusting screw approximately 5/8".

4. Loosen the droop adjusting screw. Move the droop adjusting bracket so that the screw is midway between the ends of the slot in the bracket. Tighten the screw (Fig. 9).
5. With the throttle in the *run* position, adjust the engine speed until the engine is operating at 3% to 5% above the recommended full-load speed. Use an accurate tachometer to determine the engine speed.
6. Apply the full-rated load on the engine and readjust the engine speed to the correct full-load speed.
7. Remove the load and note the engine speed after the speed stabilizes under no load. If the speed droop is correct, the engine speed will be approximately 3% to 5% higher than the full-load speed.
8. If the speed droop is too high, stop the engine, loosen the droop adjusting screw and move the adjusting bracket *in* toward the center of the governor. Tighten the adjusting screw. If the speed droop is too low, move the bracket *out*, away from the center of the governor.

The speed droop in governors which control engines driving generators in parallel must be identical, otherwise the electrical load will not be equally divided.

Adjust the speed droop bracket in each governor to obtain the desired variation between engine no-load and full-load speeds. The recommended speed droop for generator sets operating in parallel is 50 rpm (2-1/2 cycles) for units operating at 1000 or 1200 rpm and 75 rpm (2-1/2 cycles) for units operating at 1500 or 1800 rpm (Table 2).

However, this droop recommendation may be varied to suit the individual application.

EXTERNAL DROOP CONTROL

Some PSG type governors are equipped with an external adjustable droop control. This permits the speed droop to be adjusted without removing the governor cover. With this feature, a unit can be paralleled with another unit that is operating at constant frequency (zero droop). The incoming unit must have its droop bracket set in the maximum position while it is being paralleled and while operating in parallel. When it is desired to stop the unit operating at constant frequency, shift the load to the incoming unit and move the governor droop bracket to zero droop.

Full Load	No-Load
50 cycles 1000 rpm	52.5 cycles 1050 rpm
60 cycles 1200 rpm	62.5 cycles 1250 rpm
50 cycles 1500 rpm	52.5 cycles 1575 rpm
60 cycles 1800 rpm	62.5 cycles 1875 rpm

TABLE 2

Then, adjust the outgoing unit to maximum droop, remove it from the line and stop the engine. The incoming unit will now be carrying the load and operating at constant frequency (zero droop).

Adjust the governor speed droop as follows:

1. Start the engine and run it at approximately one-half of the rated full-load speed until the lubricating oil temperature stabilizes.
2. Remove the load from the engine.
3. Back off the compensation needle valve to release any air that may be trapped in the system. Turn the needle valve in slowly to reduce governor "hunting". The correct needle valve setting will be between 1/8 and 1/2 turn open.
4. Back out the maximum droop setting screw.
5. Loosen the droop adjusting knob and move the slide all the way toward the minimum adjusting screw. Then tighten the knob.
6. Loosen the locknut on the maximum speed adjusting screw and turn the screw out until 5/8" of the threads are exposed.
7. With the engine operating at the recommended full-load speed, apply the full-rated load and recheck the engine speed. If required, readjust the engine to full-load speed.
8. Remove the load and note the engine speed. If the zero droop setting is correct, the engine speed will remain constant. If the engine speed is higher, loosen the droop adjusting knob and set the slider to a reduced droop position.
9. When the desired minimum droop setting is reached, turn the minimum droop setting screw inward until it contacts the droop linkage within the governor. This will be felt by a step-up of resistance while turning the adjusting screw. Lock the adjusting screw in this position.



Fig. 10 – Typical Synchronizing Motor Mounting

10. Loosen the droop adjusting knob and slide the droop bracket in a direction to increase the droop. Perform Steps 7 and 8 to check the droop until the desired maximum speed droop is attained.
11. When the desired maximum droop setting is reached, loosen the locknut and turn the maximum droop setting screw inward until it contacts the droop slider arm. Lock the adjusting screw in this position.

12. Recheck the minimum and maximum droop setting as outlined in Steps 7 and 8 and adjust the adjustment screws, if necessary, until the correct settings are obtained.

Adjust Maximum No-Load Speed

With the speed droop properly adjusted, set the maximum no-load speed as follows:

1. With the engine operating at no load, adjust the speed until the engine is operating at approximately 8% higher than the rated full-load speed.
2. Turn the maximum speed adjusting screw in until the screw contacts the throttle linkage internally, limiting the maximum speed of the engine at 8% above the rated full-load speed (Fig. 10).
3. Hold the screw and tighten the locknut.

Governors With Synchronizing Motor

Some hydraulic governors are equipped with a reversible electric synchronizing motor mounted on the governor cover (Fig. 10).

The adjustments are the same as on a governor without a motor. However, the governor cover and motor assembly must be removed when setting the engine speed droop (except on the PSG type governor equipped with an external droop adjustment). The cover and motor must be reinstalled to check the speed droop.

EXCEPTIONS TO STANDARD BOLT AND NUT TORQUE SPECIFICATIONS

APPLICATION	THREAD	(lb-ft)	(Nm)
Camshaft coupling bolt (early 12V only)	5/16-24	20-24	27-33
Exhaust valve bridge adjusting screw nut	5/16-24	20-25	27-34
Camshaft coupling bolt (early 12V only)	3/8-24	45-50	61-68
Exhaust valve adjusting screw nut	3/8-24	30-35	41-47
Fuel pump drive coupling disc bolt	3/8-24	50-55	68-75
Camshaft coupling bolt (current)	7/16-20	57-61	77-83
*Crankshaft coupling bolts (2-piece crankshaft)	7/16-20	70-80	95-108
Injector fuel pipe nut (large)	7/16-20	18-22	24-30
Injector fuel pipe nut (small)	7/16-24	18-22	24-30
*Block attaching bolts	1/2-13	75-85	102-115
Camshaft bearing cap bolts	1/2-13	90-100	122-136
Fuel pipe connector nut	1/2-13	35-40	47-54
Idler gear hub retaining bolt	1/2-13	80-90	108-122
Rocker arm shaft bolt	1/2-13	90-100	122-136
*Block attaching bolts	1/2-20	85-95	115-129
*Connecting rod-to-piston pin bolt	1/2-20	35-45 + 60°-80°	47-61 + 60°-80°
*Crankshaft coupling bolts (2-piece crankshaft)	1/2-20	100-110	136-150
Exhaust manifold to block stud nuts	1/2-20	50-55	68-75
Bearing cap nut (oil pan removed)	9/16-18	45-55 + 130°-150°	61-75 + 130°-150°
Bearing cap nut (oil pan installed)	9/16-18	125-135	170-183
*Connecting rod cap nut (oil pan installed)	9/16-18	130-140	177-190
• *Connecting rod cap nut (oil pan removed)	9/16-18	45-55 + 130°-150°	61-75 + 130°-150°
*Cylinder head bolt	9/16-18	140-150	190-204
*Block attaching bolts	5/8-11	160-175	217-238
*Flywheel bolt (see Sect. 1.4)	5/8-18		
Vibration damper hub to crankshaft bolt	5/8-18	180-190	244-258
*Block attaching bolts	3/4-10	270-290	366-393
*Main bearing cap bolt	3/4-10	280-290	379-393
Accessory drive pulley nut	3/4-16	120-140	163-190
Crankshaft pulley bolt	1 1/4-7	450-500	610-678
Front PTO hub nut	1 1/4-12	325-350	441-475
Blower drive support nut	1 7/16-16	50-60	68-81
Accessory gear locknuts	2 1/2-18	280-300	379-407
Idler gear locknuts (spanner, standard hex)	2.548-18	280-300	379-407
• Idler gear Locknut (hex w/locking lip)	2.548-18	300-320	407-434
Camshaft gear locknut (spanner, standard hex)	3.137-12	280-300	379-407
• Camshaft gear locknut (hex w/locking lip)	3.137-12	300-320	407-434

*Lubricate threads with International Compound No. 2, or equivalent (refer to Parts Catalog or Microfiche, Section 12.8000A).

ENGINE TIMING

The correct relationship between the crankshaft and the two camshafts must be maintained to properly control fuel injection, the opening and closing of the exhaust valves and engine balance.

The crankshaft timing gears can be mounted in only one position since one attaching bolt hole is offset. Therefore, when the engine is properly timed, the timing marks on the

various gears will match (Figs. 3, 4 and 5). Early engines did not include a dot in the timing marks.

Special care should be exercised when aligning the timing marks of the front gear train idler gears as the difference in thickness of the two gears may give the appearance of misalignment.

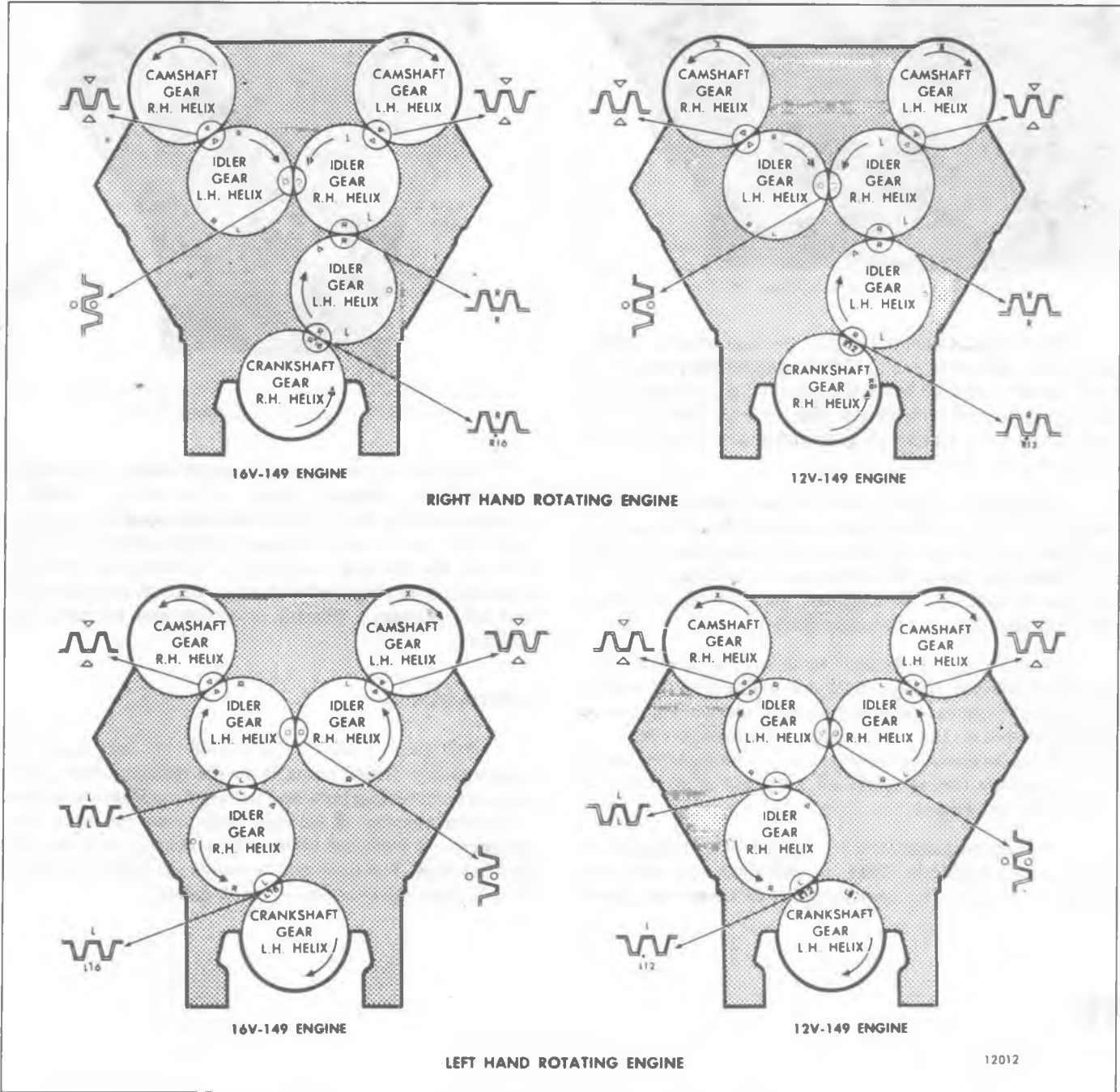
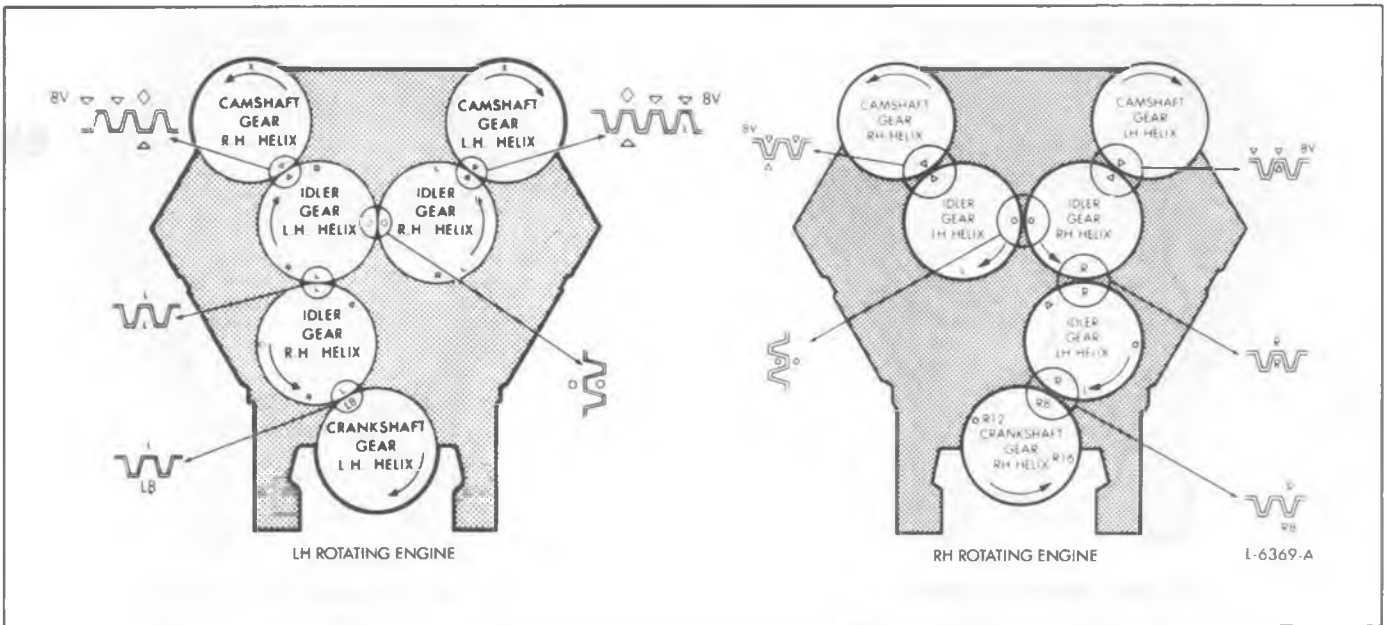


FIG. 3 - Rear Gear Train Timing Marks - 12V And 16V Engines



• Fig. 4 – Rear Gear Train Timing Marks – 8V Engines

An engine which is *out of time* may result in preignition, uneven running and a loss of power.

When an engine is suspected of being out of time due to an improperly assembled gear train, a quick check can be made without having to remove the flywheel and flywheel housing by following the procedure outlined below.

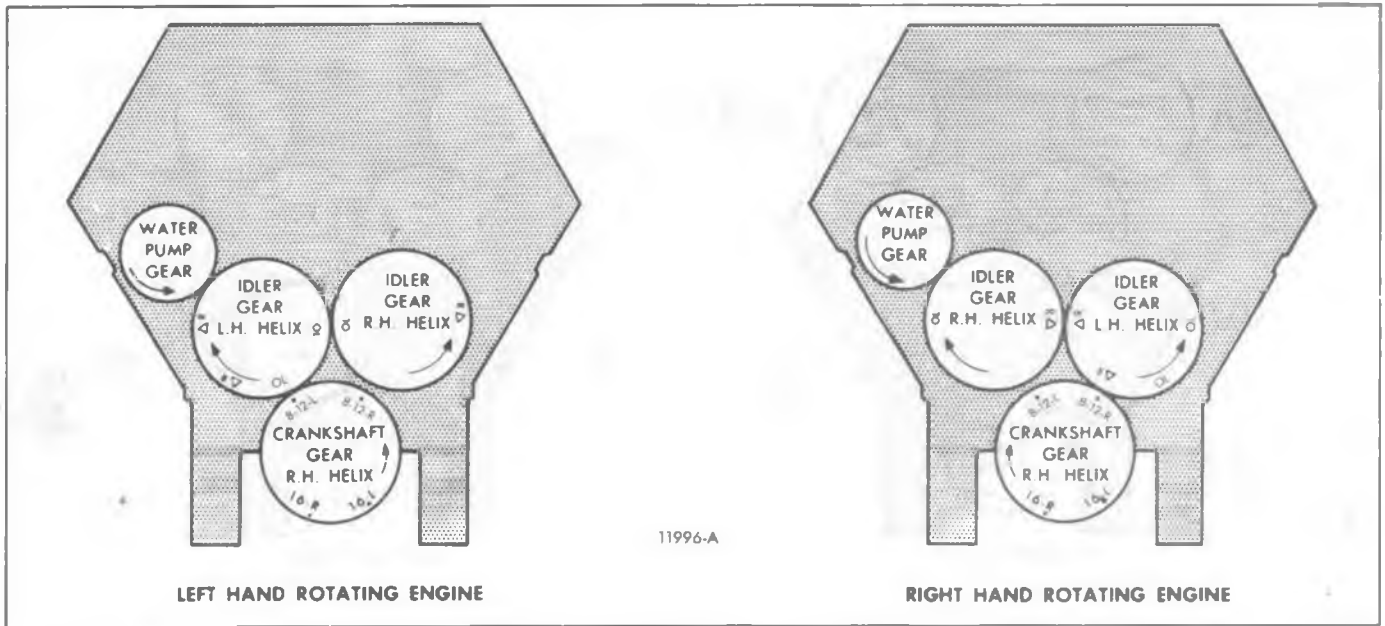
Check Engine Timing

Access to the vibration damper or crankshaft pulley, to mark the top-dead-center position of the selected piston, and to the front end of the crankshaft (or to the flywheel), for turning the crankshaft, is necessary when performing the timing check. Then, proceed as follows:

1. Remove one valve rocker cover. Discard the gasket.
2. Select any cylinder for the timing check.
3. Remove the injector (at the cylinder selected) as outlined in Section 2.1.1.
4. Carefully slide a rod, approximately 12" long, through the injector tube until the end of the rod rests on top of the piston. Place the throttle in the *no-fuel* position. Then, turn the crankshaft slowly in the direction of engine rotation. Stop when the rod reaches the end of its upward travel. Remove the rod and turn the crankshaft, opposite the direction of rotation, between 1/16 and 1/8 of a turn.
5. Select a dial indicator with .001" graduations and a spindle movement of at least one inch. Provide an extension for the indicator spindle. The extension must

be long enough to contact the piston just before it reaches the end of its upward stroke. Also, select suitable mounting attachments for the indicator so it can be mounted over the injector tube in the cylinder head.

6. Mount the indicator over the injector tube. Check to be sure the indicator spindle is free in the injector tube and is free to travel at least one inch.
7. Attach a suitable pointer to the engine front cover. The outer end of the pointer should extend over the top of the crankshaft pulley (or vibration damper).
8. Turn the crankshaft slowly in the direction of engine rotation until the indicator hand just stops moving. Continue turning the crankshaft until the indicator hand starts to move again.
9. Set the dial indicator to zero. Then, turn the crankshaft approximately .075" in the direction of engine rotation. Rotate the crankshaft in the opposite direction to .050" from the zero setting.
10. Scribe a line on the crankshaft pulley (or vibration damper) in line with the end of the pointer.
11. Turn the crankshaft in the opposite direction of engine rotation, through the point where the indicator stops, to approximately .075" from the zero setting. Rotate the crankshaft back in the direction of engine rotation to .050" from the zero setting.
12. Scribe a second line on the vibration damper (or crankshaft pulley) in line with the end of the pointer.



• Fig. 5 – Front Gear Train Timing Marks – 12V and 16V Engines

13. Scribe a third line half way between the first two lines. This is top dead center. If the crankshaft pulley retaining bolt has loosened, tighten it to 450–500 lb–ft (610–678 Nm) torque.
14. Remove the dial indicator and rod from the engine.
15. Install the injector as outlined in Section 2.1.1. Then, adjust the valve clearance (Section 14.1) and time the injector (Section 14.2).
16. Turn the crankshaft, in the direction of engine rotation, until the exhaust valves in the selected cylinder are completely open. Reinstall the dial indicator so the indicator spindle rests on top of the injector follower. Set the indicator dial on zero, then, turn the crankshaft slowly, in the direction of engine rotation, until the center mark on the pulley is in line with the pointer.
17. Note the reading on the dial indicator and compare it with the following:
 1. If the indicator reading is .306" to .326", the engine is in time.
 2. If the indicator reading is .268" to .288", timing is retarded one tooth.
 3. If the indicator reading is .337" to .357", timing is advanced one tooth.
18. After completing the timing check, remove the dial indicator. Also, remove the pointer from the engine front cover.
19. Using a new gasket, reinstall the valve, rocker cover.

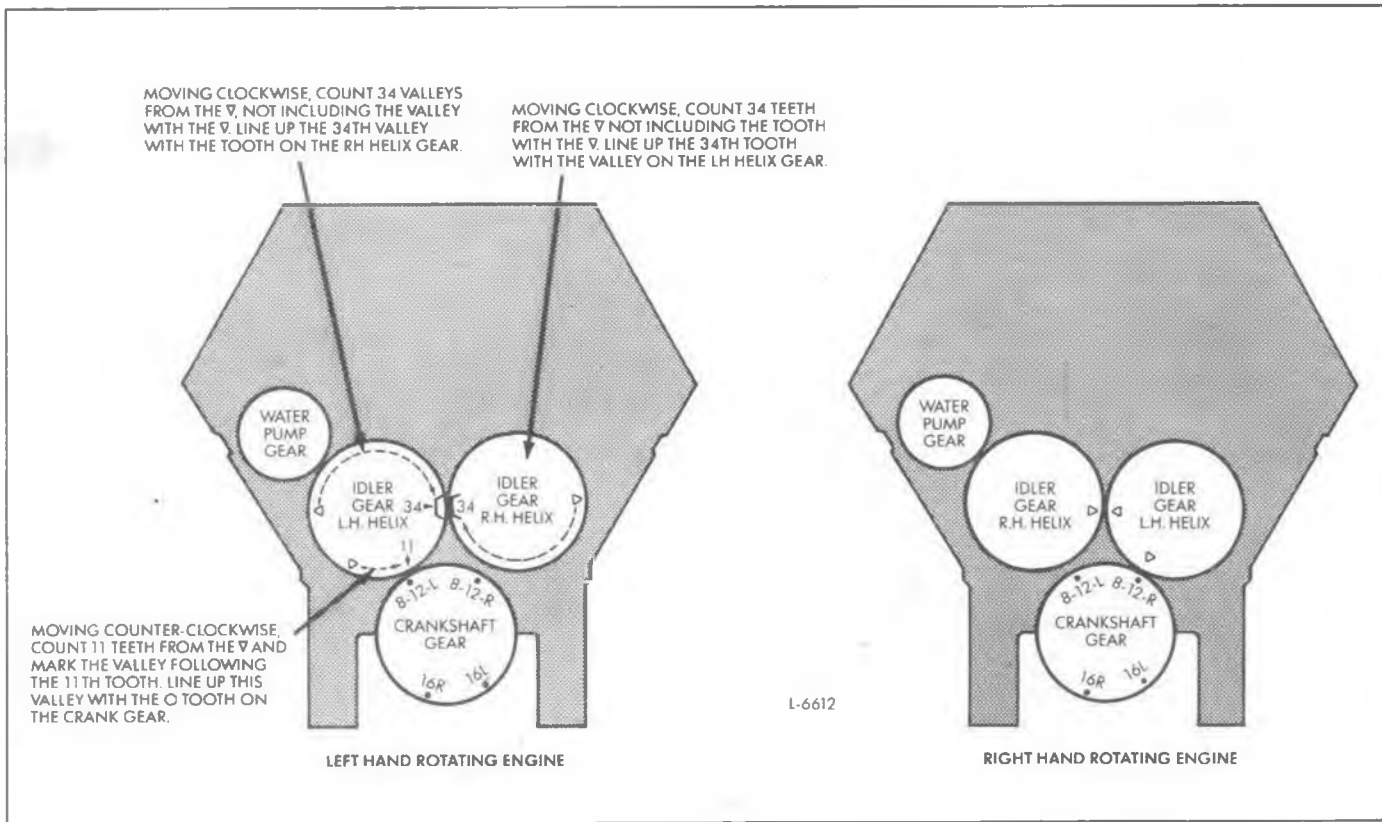


Fig. 6 - Front Gear Train Timing Marks - 8V-149 Engine

GENERAL SPECIFICATIONS

	8V	12V	16V
Type	2 Cycle	2 Cycle	2 Cycle
Number of Cylinders	8	12	16
Bore (inches)	5.75	5.75	5.75
Bore (mm)	146	146	146
Stroke (inches)	5.75	5.75	5.75
Stroke (mm)	146	146	146
Total Displacement – (cubic inches)	1195	1792	2389
Total Displacement – (liters)	19.6	29.39	39.18
Compression Ratio (standard and turbocharged engines)		17:1	17:1
Compression Ratio (intercooled turbocharged engines)*	16:1	16:1	16:1

*Note: Certain high output turbocharged — intercooled engines also have 14:1 and 15:1 compression ratios.

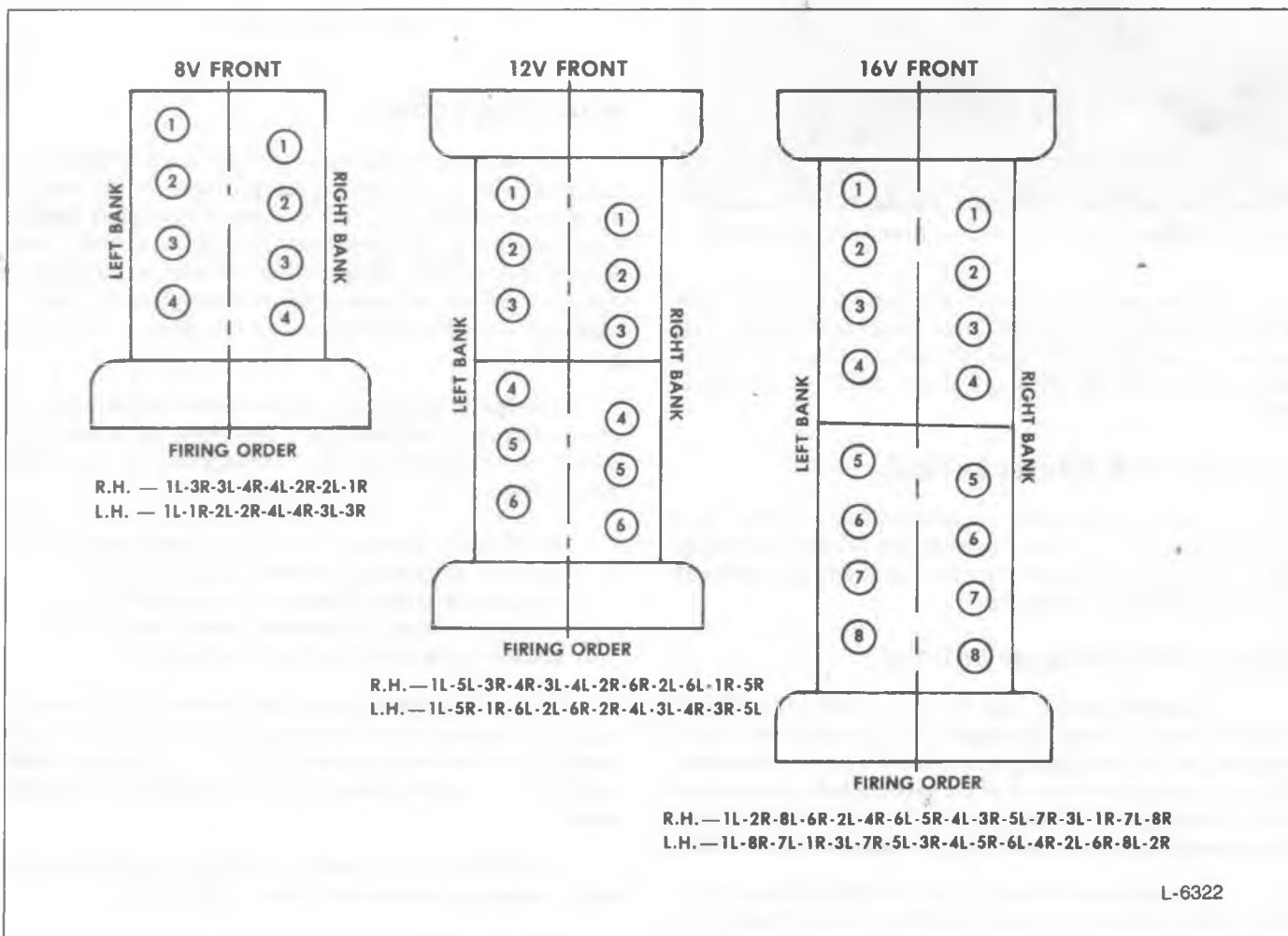


Fig. 3 – Cylinder Designation and Firing Order

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FUEL INJECTOR TIMING

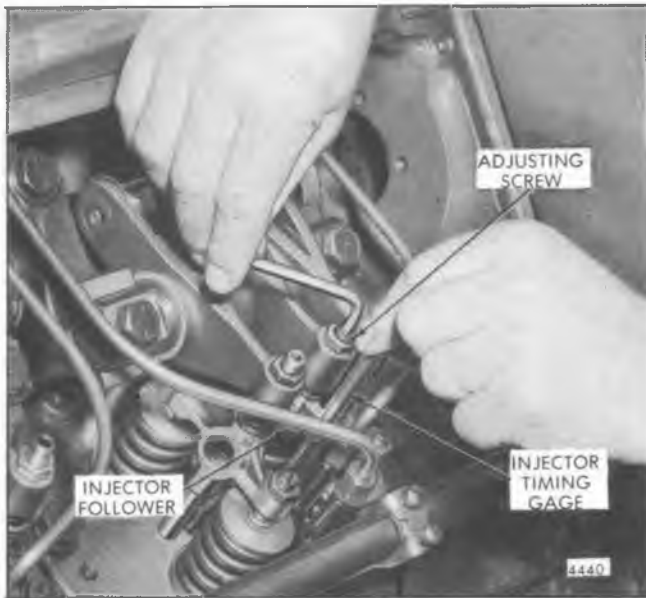


Fig. 1 – Timing Fuel Injector

All of the injectors can be timed in firing order sequence during one full revolution of the crankshaft. Refer to the *General Specifications* at the front of the manual for the firing order.

Time Fuel Injector

After the exhaust valve clearance has been adjusted (Section 14.1), time the fuel injectors as follows:

1. Place the governor speed control lever in the *idle speed* position. If a stop lever is provided, secure it in the *stop* position.
2. Rotate the crankshaft, with the starting motor or with engine barring tool J 22582 (refer to Section 1.2.2), until the exhaust valves are fully depressed on the particular cylinder to be timed.

● **CAUTION:** To reduce the risk of personal injury when barring over or bumping the starter while performing an engine tune-up, personnel should keep their hands and clothing away from the engine as there is a remote possibility the engine could start.

Injector	Timing Gage Dimension	Timing Gage Tool No.	Camshaft Timing
120	2.1750"	J 22412	Std.
130	2.1750"	J 22412	Std.
140	2.1750"	J 22412	Std.
*140	2.2050"	J 24283	Std.
145	2.2050"	J 24283	Std.
150	2.1750"	J 22412	Std.
*150	2.2050"	J 24283	Std.
155	2.2050"	J 24283	Std.
*160	2.2050"	J 24283	Std.
165	2.1750"	J 22412	Std.
*165	2.2050"	J 24283	Std.
170	2.1750"	J 22412	Std.
*170	2.2050"	J 24283	Std.
*180	2.2050"	J 24283	Std.
185	2.2050"	J 24283	Std.
*190	2.2050"	J 24283	Std.
*195	2.1850"	J 29116	Std.
230	2.1750"	J 22412	Std.
240	2.1850"	J 29116	Std.
270	2.1850"	J 29116	Std.
290	2.1750"	J 22412	Std.
315	2.1750"	J 22412	Std.
6810	2.1750"	J 22412	Std.
*7110	2.2050"	J 24283	Std.

*Used on turbocharged-intercooled engines.
 Notice: Do not mix 190 and 7110 injectors in the same engine. L-6627

● TABLE 1 – INJECTOR TIMING

NOTICE: If a wrench is used on the crankshaft bolt at the front of the engine, do not turn the crankshaft in a left-hand direction of rotation because the bolt may be loosened.

3. Place the small end of the injector timing gage (refer to Table 1 for the correct timing gage) in the hole provided in the top of the injector body with the flat of the gage toward the injector follower (Fig. 1).
4. Loosen the injector rocker arm adjusting screw locknut.
5. Turn the adjusting screw to adjust the injector rocker arm until the extended part of the gage will just pass over the top of the injector follower.
6. Hold the adjusting screw and tighten the locknut to 30–35 lb-ft (41–47 N·m) torque. Check the adjustment and, if necessary, readjust the rocker arm.
7. Time the remaining injectors in the same manner as outlined above.
8. If no further engine tune-up is required, install the valve rocker covers, using new gaskets.

SPECIFICATIONS

Specifications, clearances and wear limits are listed below. It should be specifically noted that the clearances apply only when all new parts are used at the point where the various specifications apply. This also applies to references within the text of the manual. The column entitled "Limits" in this Chart lists the amount of wear or increase in clearance which can be tolerated in used engine parts and still ensure

satisfactory performance. It should be emphasized that the figures given as "Limits" must be qualified by the judgement of personnel responsible for installing new parts. These wear limits are, in general, listed only for the parts more frequently replaced in engine overhaul work. For additional information, refer to the text.

TABLE OF SPECIFICATIONS, NEW CLEARANCES AND WEAR LIMITS

These limits also apply to oversize and undersize parts.

ENGINE PARTS (Standard Size, New)	MINIMUM	MAXIMUM	LIMITS
CYLINDER BLOCK			
Block bore:			
Diameter (upper pilot)	6.5220"	6.5240"	6.5260"
Diameter (seal ring lands)	6.5010"	6.5030"	6.5050"
Diameter (water jacket)	6.4000"	6.4020"	6.4040"
Out-of-round		.0015"	
Taper		.0015"	
*Cylinder liner counterbore:			
Diameter	6.9080"	6.9140"	
Depth	.4920"	.4960"	
Main bearing bore:			
Inside diameter	5.1870"	5.1880"	
Camshaft bearing bore:			
Inside diameter (former)	2.1510"	2.1520"	
Inside diameter (current)	2.1505"	2.1525"	
CYLINDER HEAD			
Exhaust valve seat counterbore:			
Diameter	1.8965"	1.8975"	
Depth	.4010"	.4060"	
Exhaust valve seat insert runout		.0020"	.0020"
Exhaust valve:			
Stem diameter	.3722"	.3730"	
Valve head-to-cylinder head	Flush	.017" recess	.032" recess
Exhaust valve guide:			
Height above cylinder head	1.1400"	1.1800"	
Diameter—inside	.3750"	.3760"	
Clearance—valve-to-guide	.0020"	.0038"	.0060"
Exhaust valve bridge guide:			
Height above cylinder head (press fit)	2.3900"	2.4100"	
ROCKER ARMS AND SHAFTS			
Diameter—rocker shaft	1.2295"	1.2300"	
Diameter—inside (rocker arm bushing)	1.2310"	1.2320"	
Clearance—shaft-to-bushing	.0010"	.0025"	.0040"
Clearance—cam roller bushing-to-pin			.0100"

*Prior to engines 12E-1703 and 16E-361.

ENGINE PARTS (Standard Size, New)	MINIMUM	MAXIMUM	LIMITS
CRANKSHAFT			
Journal diameter—main bearing	4.8720"	4.8730"	
Journal diameter—connecting rod bearing	3.8730"	3.8740"	
Journal diameter—outboard bearing	5.9990"	6.0000"	
Journal out-of-round		.00025"	.0010"
Journal taper		.0005"	.0015"
# Runout on journals—total indicator reading:			
12V (mounted on No. 1 and No. 8 journals):			
At No. 2 and No. 7 journals		.0020"	
At No. 3 and No. 6 journals		.0040"	
At No. 4 and No. 5 journals		.0060"	
16V (mounted on No. 1 and No. 10 journals):			
At No. 2 and No. 9 journals		.0020"	
At No. 3 and No. 8 journals		.0040"	
At No. 4 and No. 7 journals		.0060"	
At No. 5 and No. 6 journals		.0080"	
Thrust washer thickness	.1630"	.1660"	
End play (end thrust clearance)	.0040"	.0140"	.0180"
MAIN BEARINGS			
Inside diameter (vertical axis)	4.8760"	4.8782"	
Bearing-to-journal clearance	.0030"	.0062"	.0072"
Bearing thickness (90° from parting line)	.1550"	.1555"	.1544"
OUTBOARD BEARING			
Inside diameter (installed)	6.0033"	6.0087"	
Clearance—bearing-to-journal	.0033"	.0097"	
PISTONS (FLOATING SKIRT)			
Piston:			
Height	6.6610"	6.6710"	
Diameter at top:			
Current	5.7030"	5.7050"	
Former	5.7010"	5.7030"	
Diameter of skirt (3" below top):			
Current (effective with 12E-1463 and 16E-218)	5.7394"	5.7416"	
(2E-673 to 12E-1463 and 16E-16 to 16E-218)	5.7388"	5.7410"	
Former	5.7368"	5.7390"	
Clearance—piston skirt-to-liner:			
Current (effective with 12E-1463 and 16E-218)	.0074"	.0116"	
(2E-673 to 12E-1463 and 16E-16 to 16E-218)	.0080"	.0122"	
Former	.0100"	.0142"	
PISTON CARRIER (FLOATING SKIRT PISTON)			
Height (bottom to thrust platform)	3.6060"	3.6090"	3.6050"
Thrust plate thickness	.0995"	.1010"	.0945"
Clearance—snap ring-to-carrier	.0030"	.0130"	

Runout tolerance given for guidance when regrinding crankshaft. When runout on adjacent journals is in opposite direction, the sum must not exceed .003" total indicator reading. When runout on adjacent journals is in the same direction, the difference must not exceed .003" total indicator reading. When high spots of runout on adjacent journals are at right angles to each other, the sum must not exceed .004" total indicator reading, or .002" on each journal.

ENGINE PARTS (Standard Size, New)	MINIMUM	MAXIMUM	LIMITS
PISTONS (CROSS-HEAD)			
Piston crown:			
Saddle-to-crown distance	2.7205"	2.7275"	
Diameter:			
At top edge	5.7040"	5.7070"	
Below both compression rings	5.7370"	5.7410"	
Above and below seal ring groove	5.4110"	5.4160"	
Above and below Bearing saddle	4.2200"	4.2250"	
Seal ring:			
Gap (in skirt counterbore)	.0020"	.0270"	
Side clearance	.0005"	.0030"	.0040"
Piston skirt:			
+ Diameter	5.7404"	5.7426"	
Clearance—skirt-to-liner (former)	.0064"	.0106"	
Clearance—skirt-to-liner (current)	.0066"	.0109"	
Seal ring bore	5.4400"	5.4450"	
Piston pin bore	2.3909"	2.3919"	
PISTON RINGS			
Compression rings:			
Gap (wide gap rings)	.0550"	.0750"	
Gap (standard rings)	.0450"	.0550"	
Clearance—ring-to-groove:			
No. 1 (top)	.0045"	.0081"	
No. 2	.0105"	.0130"	
No. 3	.0045"	.0070"	
No. 4	.0045"	.0070"	
Oil control rings:			
Gap	.0170"	.0320"	
Clearance—ring-to-groove:			
Upper	.0015"	.0055"	
Upper (turbocharged engine)	.0010"	.0035"	
Lower	.0015"	.0055"	
PISTON PIN			
Diameter	2.3873"	2.3877"	
Slipper bearing (bushing) thickness at center	.0870"	.0880"	.0860"
CONNECTING ROD			
Side clearance (normal) between rods	.0180"	.0260"	
CONNECTING ROD BEARINGS			
Inside diameter	3.8755"	3.8775"	
Bearing-to-journal clearance	.0015"	.0045"	.0055"
Bearing thickness (90° from parting line)	.1550"	.1555"	.1544"

+ Diameter above and below the piston may be 5.7370".

ENGINE PARTS (Standard Size, New)	MINIMUM	MAXIMUM	LIMITS
CYLINDER LINER			
Outside diameter:			
Upper pilot	6.5200"	6.5210"	
Below ports	6.3980"	6.3990"	
Inside diameter	5.7488"	5.7513"	
Clearance—liner pilot—to—block bore	.0010"	.0040"	
Out-of-round (inside diameter)		.0010"	.0020"
Taper (inside diameter)		.0010"	.0020"
*Depth of flange BELOW block	.0390"	.0450"	
GEAR TRAIN			
Gear backlash (between all gears)	.0015"	.0080"	.0100"
Clearance—Crankshaft—to—bushing (in front crankshaft gear)	.0010"	.0030"	
CAMSHAFT			
Journal diameter	1.9940"	1.9945"	
Runout at intermediate journal (when mounted on end journals)		.0020"	
Thrust plate thickness	.3680"	.3720"	
Clearance—thrust plate—to—camshaft thrust shoulder	.0130"	.0220"	.0260"
CAMSHAFT BEARINGS			
Inside diameter (vertical axis)	2.0004"	2.0024"	
Clearance—bearing—to—shaft	.0059"	.0084"	.0100"
FRONT IDLER GEAR			
Inside diameter — bushing	2.6270"	2.6280"	
Outside diameter — idler gear hub	2.6240"	2.6250"	
BLOWER DRIVE GEAR			
Inside diameter—bushing	1.8770"	1.8780"	
Clearance—hub—to—gear bushing	.0010"	.0025"	.0050"
Thrust washer (drive support) thickness	.2350"	.2450"	
Thrust washer (gear) thickness	.1190"	.1210"	
End play (between thrust washers)	.0020"	.0180"	

*Prior to engines 12E-1703 and 16E-361.

EXHAUST VALVE CLEARANCE ADJUSTMENT

The correct exhaust valve clearance at normal engine operating temperature is important for smooth, efficient operation of the engine.

Insufficient valve clearance can result in loss of compression, misfiring cylinders and, eventually, burned valve seats and valve seat inserts. Excessive valve clearance will result in noisy operation, increased valve face wear and valve lock damage.

Whenever a cylinder head is overhauled, the exhaust valves are reconditioned or replaced, or the valve operating mechanism is replaced or disturbed in any way, the valve clearance must first be adjusted to the cold setting to allow for normal expansion of the engine parts during the engine warm-up period. This will ensure a valve setting that is close enough to the specified clearance to prevent damage to the valves when the engine is started.

The exhaust valve bridges must be adjusted and the adjustment screws locked securely at the time the cylinder head is installed on the engine. The necessary adjustment procedure is outlined in Section 1.2.2.

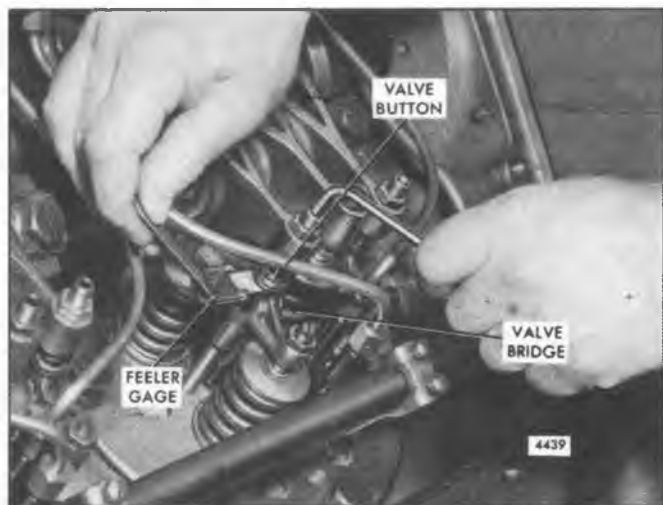


Fig. 1 - Adjusting Valve Clearance

The exhaust valve bridge balance should be checked when a general valve adjustment is performed. After the bridges are balanced, adjust the valve clearance. Do not disturb the exhaust valve bridge adjusting screw.

All of the exhaust valves may be adjusted in firing order sequence during one full revolution of the crankshaft. Refer to the *General Specifications* at the front of the manual for the engine firing order.

Valve Clearance Adjustment (Cold Engine)

1. Remove the loose dirt from the valve rocker covers and remove the covers. Discard the gaskets. Cover all drain

cavities in the cylinder block to prevent foreign material from entering.

2. Place the governor speed control lever in the *idle* position. If a stop lever is provided, secure it in the *stop* position.
3. Rotate the crankshaft, by using either barring tool J 22582 or the starting motor, until the injector follower is fully depressed on the particular cylinder to be adjusted. If a wrench is used on the crankshaft bolt at the front of the engine, do not turn the crankshaft in a left-hand direction of rotation or the bolt may loosen.

CAUTION: To reduce the risk of personal injury when barring over or "bumping" the starter while performing an engine tune-up, personnel should keep their hands and clothing away from the engine as there is a remote possibility the engine could start.

4. Loosen the exhaust valve adjusting screw locknut on the rocker arm.
5. Place a .016" feeler gage (J 9708-01) between the end of the valve button and the pallet of the valve bridge (Fig. 1). Adjust the valve adjusting screw to obtain a smooth pull on the feeler gage.
6. Remove the feeler gage and tighten the locknut to 30-35 lb-ft (41-47 N·m) torque.
7. Recheck the clearance and adjust, if necessary.
8. Adjust and check the remaining exhaust valves in the same manner as above.

Valve Clearance Adjustment (Hot Engine)

Maintaining normal engine operating temperature is particularly important when making the final exhaust valve clearance adjustment. If the engine is allowed to cool before setting any of the valves, the clearance when running at full load may become insufficient.

1. With the engine at normal operating temperature (see Section 13.2), recheck the exhaust valve clearance with feeler gage J 9708-01. At this time, if the valve clearance is correct, a .012" feeler gage will pass freely between the valve button and the valve bridge.
2. After the exhaust valve clearance has been adjusted, check the fuel injector timing (Section 14.2).















