



Data, Ratings &
Clearances
For
White Superior
Engines

DATA, RATINGS AND CLEARANCES

Type Designated	6G-510
Cycle	4 STROKE
Bore and Stroke	8½ X 9
BMEP	REG-95 SUP-103
Displacement - 6 Cylinder	3060
Displacement - Cylinder	
Type of Cylinder Arrangement	INLINE-VERTICAL
Number of Cylinders	6
Brake Horsepower - (Sea Level Rating Without Fan and Radiator) - 6 Cylinder	REG-330 SUP-360
Revolutions Per Minute	900
Minimum Idle Speed	450
Operating Speed Range	450-900
Compression Ratio	*
Firing Order (Numbered from Front of Engine):	
6 Cylinder	1-4-2-6-3-5
Cylinder	
Crankshaft Rotation - Facing Flywheel	CCW
Engine Weight - Dry (Approx.) - 6 Cylinder	10,130 LBS.
Engine Weight - Dry (Approx.) - Cylinder	

RECOMMENDED OPERATING DATA

Bare Engine Water Capacity (Jacket Water) - 6 Cylinder	30 GALLONS
Bare Engine Water Capacity (Jacket Water) - Cylinder	
Lubricating Oil Capacity - 6 Cylinder	30 GALLONS
Lubricating Oil Capacity - Cylinder	
Starting Air Pressure	150 PSIG
Engine Air Flow Requirement - 6 Cylinder	726 CFM
Engine Air Flow Requirement - Cylinder	
Air Intake Pressure Drop - Max.	7½ IN H2O
Exhaust Flow - 6 Cylinder	58 LBS MIN
Exhaust Flow - Cylinder	
Exhaust Backpressure - Max.	15 IN H2O
Lube Oil Flow Thru Filter	35 GPM
Jacket Water Pump Flow - 6 Cylinder	160 GPM
Jacket Water Pump Flow - Cylinder	
Intercooler Water Pump Flow - Cylinder	---
Intercooler Water Pump Flow - Cylinder	

Pressures at Full Load and Speed:

Lubricating Oil Pressure in Header	40 PSI
Fuel Gas Pressure	4-8 OZ

* COMPRESSION RATIOS AVAILABLE: 8¼ : 1
 9½ : 1

Temperatures at Full Load and Speed:

Normal Lubricating Oil Temperature - IN . . . . .	.150-180°F
Maximum Lubricating Oil Temperature - OUT . . . . .	.210°F
Normal Water Operating Temperature . . . . .	.170-185°F
Maximum Water Operating Temperature . . . . .	.200°F
Air Manifold Temperature	----
Exhaust Gas Temperature at Turbocharger Turbine Inlet Cylinder (TCU) Turbo	----
Exhaust Gas Temperature at Turbocharger Turbine Inlet Cylinder (C-B) Turbo	----

Torque Limits

Cylinder Head Stud Nuts	250 FT LBS
Cylinder Block to Bed Stud Nuts - Inside	----
Main Bearing Stud Nuts	300 FT LBS
Connecting Rod Bolt Nuts	125 FT LBS
Flywheel to Crankshaft Bolts	350 FT LBS
Counterweight Stud Nuts	----
Camshaft Bearing Capscrews	----
Spark Plug - 18 mm Thread - (W/O Torque Wrench 1/4 Turn)	

NOTE: Torque figures are for threads lubricated with engine oil or similar petroleum base lubricants. DO NOT use any compounds containing molybdenum disulfide as a thread lubricant.

IGNITION AND VALVE TIMING IN CRANKSHAFT DEGREES

Inlet Opens	18° ATDC
Exhaust Closes	5° BTDC

(Check above angles, for camshaft timing purposes only, with .125" valve lash. Check valve events at point where lash is just taken up (pushrod will not turn).

Timings for Engine Speed ----

Suggested Engine Alarm and Shutdown Settings (Where Applicable)

Low Jacket Water Pressure - Alarm	
Low Jacket Water Pressure - Shutdown	
High Jacket Water Temperature (From Engine) - Alarm . .	
High Jacket Water Temperature (From Engine) - Shutdown .	195° F
Low Intercooler Water Pressure - Shutdown	
High Intercooler Water Temperature (From Intercooler) .	
Low Lube Oil Pressure - Alarm	
Low Lube Oil Pressure - Shutdown	18 PSI
High Lube Oil Temperature - Alarm	
High Lube Oil Temperature - Shutdown	
Low Turbocharger Lube Oil Pressure - Shutdown	
Engine Overspeed Governor - Shutdown	

STANDARD SIZES, CLEARANCES AND WEAR LIMITS

ITEM

Gas Admission Valve	---	
Inlet Valve Tappet . . . . .	.018"	
Exhaust Valve Tappet . . . . .	.030"	
Spark Plug Gap . . . . .	.023"-.028"	
Cylinder Liner Bore	8.500"-8.501"	
Top Ring Travel Area (Any Point)		8.520"
Bottom of Liner		8.507"
Piston Skirt Dia. (Bottom)	8.484"-8.485"	8.479"
Piston Clearance (Skirt Bottom) . . . . .	.015"-.017"	.022"
Piston Compression Ring (Gap #1) . . . . .	.035"-.055"	.190"
Gap (#2 - 3 - 4) . . . . .	.035"-.055"	
Piston Compression Ring #1		
Ring Width . . . . .	.248"-.249"	
Ring Groove Width . . . . .	.251"-.252"	.257"
Ring Side Clearance . . . . .	.002"-.004"	.010"
Piston Compression Ring #2, 3 and 4		
Ring Width . . . . .	.248"-.249"	
Ring Groove Width . . . . .	.251"-.252"	.257"
Ring Side Clearance . . . . .	.002"-.004"	.010"
Piston Oil Ring Gap . . . . .	.035"-.055"	
Piston Oil Ring Width . . . . .	.248"-.249"	
Piston Oil Ring Groove Width . . . . .	.251"-.252"	
Ring Side Clearance #5 and 6 . . . . .	.002"-.004"	.010"
Piston Pin Diameter	2.2505"-2.2508"	2.249"
Piston Bore for Pin	2.2499"-2.2504"	2.2515"
Piston Pin Clearance in Piston . . . . .	.0001"-.0018"	INTERFERENCE
Connecting Rod Bushing Bore	2.253"-2.2535"	2.2545"
Piston Pin Clearance in Rod . . . . .	.0022"-.0030"	.004"
Connecting Rod Eye Side	3.238"-3.240"	
Clearance in Piston . . . . .	.010"-.016"	.025"
Connecting Rod Big End Bearing Bore	4.7528"-4.7552"	
(Torqued, to 125 ft. lb.)		
Bearing Shell Wall Thickness . . . . .	.1794"-.1801"	
Crankpin Diameter	4.749"-4.750"	
Crankpin Bearing Clearance . . . . .	.0028"-.0062"	

ITEM

Main Bearing Bore (Torqued to 300 ft. lb.)	5.003"-5.005"	
Bearing Shell Wall Thickness . . . . .	.248"-.2485"	
Main Journal Diameter	4.999"-5.000"	
Main Bearing Clearance . . . . .	.003"-.006"	
Crank Thrust Bearing Width	5.365"-5.367"	5.360"
Crank Thrust Shoulder Span	5.375"-5.377"	5.387"
Crankshaft End Play . . . . .	.008"-.012"	.020"
Camshaft Bearing Bushing Bore Center and Ends	2.814"-2.815"	
Camshaft Diameter	2.809"-2.810"	
Camshaft Bearing Clearance . . . . .	.004"-.006"	.010"
Camshaft End Play . . . . .	.003"-.007"	.015"
Valve Rocker Arm Bore (Bushing in Place)	1.3761"-1.3791"	
Rocker Shaft Diameter	1.3745"-1.3750"	
Clearance . . . . .	.0011"-.0046"	
Valve Rocker Arm Side Clearance - Adjustable: - - Set . . . . .	.005"-.007"	
Valve Stem Diameter . . . . .	.682"-.683"	
Valve Guide Bushing Bore . . . . .	.6875"-.6885"	
Clearance . . . . .	.0045"-.0065"	
Lubricating Oil Pump/Crankshaft Gear Backlash		
Lubricating Oil Pump Internal Gear Backlash . . . . .	.012"-.015"	.020"
Lubricating Oil Pump Gear End Play . . . . .	.0056"-.0134"	.017"
Lubricating Oil Pump - Radial Clearance Between Gear Teeth and Housing Bore . . . . .	.004"-.005"	.010"
Lubricating Oil Pump Shaft Diameter	1.2490"-1.2495"	
Lubricating Oil Pump Bushing Bore	1.253"-1.254"	
Clearance . . . . .	.0035"-.0050"	.008"

DATA, RATINGS AND CLEARANCES

Type Designated	6/8 G-825
Cycle	4-Stroke
Bore and Stroke	10" X 10-1/2"
Type of Cylinder Arrangement	In Line Vertical
Number of Cylinders	6
Brake Horsepower - (Sea Level Rating Without Fan and Radiator)	650
Revolutions Per Minute	1000
Compression Ratio	9.94:1
Firing Order (Numbered from Front of Engine):	
6 Cylinder	1-4-2-6-3-5
8 Cylinder	1-3-7-4-8-6-2-5
Crankshaft Rotation - Facing Flywheel	Counter-clockwise

RECOMMENDED OPERATING DATA

Bare Engine Water Capacity (Jacket Water) - 6 Cylinder . .	48 Gallons
Bare Engine Water Capacity (Jacket Water) - 8 Cylinder . .	62 Gallons
Lubricating Oil Capacity - 6 Cylinder	65 Gallons
Lubricating Oil Capacity - 8 Cylinder	80 Gallons

<u>Pressures at Full Load and Speed:</u>	<u>Lbs. per Sq. In.</u>
Lubricating Oil Pressure in Header	35
Starting Air Pressure	200-250
Gas Pressure to Engine Fisher Regulator	5-10 psig

<u>Temperatures at Full Load and Speed:</u>	<u>°F</u>
Normal Lubricating Oil Temperature - IN	150-180
Maximum Lubricating Oil Temperature - OUT	210
Normal Water Operating Temperature	165-180
Maximum Water Operating Temperature	200
Minimum Idle Speed	450 RPM
Operating Speed Range	**

<u>Torque Limits</u>	<u>Foot Pounds</u>
Cylinder Head Stud Nuts	450
Cylinder Block to Bed Stud Nuts - Inside	165-175
Main Bearing Stud Nuts	250-275
Connecting Rod Bolt Nuts	340-360
Flywheel to Crankshaft Bolts	640-660
Counterweight Stud Nuts	500-525

NOTE: Torque figures are for threads lubricated with engine oil or similar petroleum base lubricants. DO NOT use any compounds containing molybdenum disulfide as a thread lubricant.

*See Compressor Section for Operating Speed Range of Unit

IGNITION AND VALVE TIMING IN CRANKSHAFT DEGREES

Inlet Opens	14° ATC
Exhaust Closes	2° ATC
(Check above angles, for camshaft timing purposes only, with .125" valve lash. Check valve events at point where lash is just taken up (pushrod will not turn).	
Starting Air Valve Opens*	0° TDC
Starting Air Valve Closes*	55° BBDC

*Does not apply when Air/Gas starting motor is used. The following ignition timings are recommended due to various characteristics of fuel gas:

<u>Timings for Engine Speed</u>		Approximate BTU/cu. ft.
700 RPM	900 RPM	
30°	35° BTC for dry natural gas	1000-1100
25°	30° BTC for slightly "wet" natural gas	1100-1200
20°	25° BTC for very "wet" natural gas	1200-1400

NOTE: + 2° tolerance allowed on inlet and exhaust valve timing. Spark timing must be accurate.

Engine Alarm and Shutdown Settings

Water Temperature - Shutdown	-----
Lube Oil Pressure - Shutdown	-----
Engine Overspeed - Shutdown	1100 RPM
High Lube Oil Temperature - Shutdown	205° F.

STANDARD SIZES, CLEARANCES AND WEAR LIMITS

<u>ITEM</u>	<u>STANDARD DIMENSION</u>	<u>MAX. (OR MIN.) ALLOWABLE WOR SIZE OR CLEAR</u>
Gas Admission Valve (turbocharged engine only) . . . . .	.013"	
Inlet Valve Tappet . . . . .	.018"	
Exhaust Valve Tappet . . . . .	.030"	
Spark Plug Gap . . . . .	.015"	.018"
Cylinder Liner Bore	10.000"	10.002"
Top Ring Travel Area (Any Point)		10.020"
Bottom of Liner		10.007"
Piston Skirt Dia. (Bottom)	9.991"	9.990"
Piston Clearance (Skirt Bottom) . . . . .	.009"	.012"
.015"		
Piston Compression Ring (Gap #1) . . . . .	.030"	.060"
Gap (#2 - 3 - 4) . . . . .	.040"	.060"
Piston Compression Ring #1		
Ring Width . . . . .	.1880"	.1865"
Ring Groove Width . . . . .	.193"	.194"
Ring Side Clearance . . . . .	.0050"	.0075"
.015"		
Piston Compression Ring #2, 3 and 4		
Ring Width . . . . .	.1880"	.1865"
Ring Groove Width . . . . .	.191"	.192"
Ring Side Clearance . . . . .	.0030"	.0055"
.015"		
Piston Oil Ring Gap . . . . .	.035"	.050"
Piston Oil Ring Width . . . . .	.3100"	.3115"
Piston Oil Ring Groove Width . . . . .	.313"	.314"
Ring Side Clearance #5 and 6 . . . . .	.0040"	.0015"
.008"		
Piston Pin Diameter	3.4985"	3.4975"
Piston Bore for Pin	3.501"	3.500"
Piston Pin Clearance in Piston . . . . .	.0015"	.0035"
.005"		
Connecting Rod Bushing Bore	3.5020"	3.5015"
Piston Pin Clearance in Rod . . . . .	.0030"	.0040"
.005"		
Connecting Rod Eye Side		
Clearance in Piston . . . . .	.020"	.035"
.045"		
Connecting Rod Big End Bearing Bore		
(Torqued, to 340-360 ft. lb.)	5.7538"	5.7564"
Bearing Shell Wall Thickness1856"	.1848"
Crankpin Diameter	5.751"	5.749"
Crankpin Bearing Clearance0028"	.0074"
.010"		

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5.745"

<u>ITEM</u>	<u>STANDARD DIMENSION</u>		<u>MAX. (OR MIN.) ALLOWABLE WORN SIZE OR CLEARANCE</u>
Main Bearing Bore (Torqued to 250-275 ft. lb.)	6.0074"	6.0050"	
Bearing Shell Wall Thickness . . . . .	.3100"	.3093"	Surface Inspect
Main Journal Diameter	6.001"	5.999"	5.995"
Main Bearing Clearance . . . . .	.0040"	.0084"	.012"
Crank Thrust Bearing Width	4.122"	4.120"	4.115"
Crank Thrust Shoulder Span	4.130"	4.127"	4.140"
Crankshaft End Play . . . . .	.005"	.010"	.020"
Camshaft Bearing Bushing Bore Center and Ends	2.128"	2.127"	
Camshaft Diameter	2.124"	2.123"	
Camshaft Bearing Clearance . . . . .	.003"	.005"	.010"
Camshaft End Play . . . . .	.003"	.010"	.015"
Valve Rocker Arm Bore (Bushing in Place)	1.5036"	1.5006"	
Rocker Shaft Diameter	1.4995"	1.4990"	
Clearance . . . . .	.0011"	.0046"	.010"
Valve Rocker Arm Side Clearance - Adjustable: - - Set . . . . .	.005"	.010"	
Valve Stem Diameter . . . . .	.871"	.870"	
Valve Guide Bushing Bore . . . . .	.873"	.874"	
Clearance . . . . .	.002"	.004"	.006"
Lubricating Oil Pump Internal Gear Backlash	.012"	.015"	.020"
Lubricating Oil Pump Gear End Play . . . . .	.0056"	.0134"	.017"
Lubricating Oil Pump - Radial Clearance Between Gear Teeth and Housing Bore . . . . .	.004"	.005"	.010"
Lubricating Oil Pump Shaft Diameter	1.3750"	1.3745"	
Lubricating Oil Pump Bushing Bore	1.3770"	1.3780"	
Clearance . . . . .	.0020"	.0035"	.008"

DATA, RATINGS AND CLEARANCES

Type Designated	6/8 GT-825
Cycle	4-Stroke
Bore and Stroke	10" X 10-1/2"
Type of Cylinder Arrangement	In Line Vertical
Number of Cylinders	6/8
Brake Horsepower - (Sea Level Rating Without Fan and Radiator)	1069
Revolutions Per Minute	875
Compression Ratio	9.94:1
Firing Order (Numbered from Front of Engine):	
6 Cylinder	1-4-2-6-3-5
8 Cylinder	1-3-7-4-8-6-2-5
Crankshaft Rotation - Facing Flywheel	Counter-clockwise

RECOMMENDED OPERATING DATA

Bare Engine Water Capacity (Jacket Water) - 6 Cylinder . .	54 Gallons
Bare Engine Water Capacity (Jacket Water) - 8 Cylinder . .	70 Gallons
Lubricating Oil Capacity - 6 Cylinder	65 Gallons
Lubricating Oil Capacity - 8 Cylinder	80 Gallons

<u>Pressures at Full Load and Speed:</u>	<u>Lbs. per Sq. In.</u>
Lubricating Oil Pressure in Header	25, not less than 2
Starting Air Pressure	200-250

<u>Temperatures at Full Load and Speed:</u>	<u>°F</u>
Normal Lubricating Oil Temperature - IN	150-180
Maximum Lubricating Oil Temperature - OUT	210
Normal Water Operating Temperature	165-180
Maximum Water Operating Temperature	200
Minimum Idle Speed	500 RPM
Operating Speed Range	*

<u>Torque Limits</u>	<u>Foot Pounds</u>
Cylinder Head Stud Nuts	450
Cylinder Block to Bed Stud Nuts - Inside	165-175
Main Bearing Stud Nuts	250-275
Connecting Rod Bolt Nuts	285-310
Flywheel to Crankshaft Bolts	640-660
Counterweight Stud Nuts	500-525

NOTE: Torque figures are for threads lubricated with engine oil or similar petroleum base lubricants. DO NOT use any compounds containing molybdenum disulfide as a thread lubricant.

*See Compressor Section for Operating Speed Range of Unit.

IGNITION AND VALVE TIMING IN CRANKSHAFT DEGREES

Inlet Opens	40° BTC
Exhaust Closes	61° ATC
(Check above angles, for camshaft timing purposes only, with .125" valve lash. Check valve events at point where lash is just taken up (pushrod will not turn).	
Starting Air Valve Opens*	TDC
Starting Air Valve Closes*	BBDC

*Does not apply when Air/Gas starting motor is used. The following ignition timings are recommended due to various characteristics of fuel gas:

<u>Timings for Engine Speed</u>		Approximate BTU/cu. ft.
700 RPM	900 RPM	
35°	40° BTC for dry natural gas	1000-1100
30°	35° BTC for slightly "wet" natural gas	1100-1200
25°	30° BTC for very "wet" natural gas	1200-1400

NOTE: + 2° tolerance allowed on inlet and exhaust valve timing. Spark timing must be accurate.

Engine Alarm and Shutdown Settings

Water Temperature - Shutdown	-----
Lube Oil Pressure - Shutdown	-----
Engine Overspeed - Shutdown	990 RPM

STANDARD SIZES, CLEARANCES AND WEAR LIMITS

<u>ITEM</u>	<u>STANDARD DIMENSION</u>		<u>MAX. (OR MIN. ALLOWABLE WOF SIZE OR CLEAR</u>
Gas Admission Valve (turbocharged engine only) .	.013"		
Inlet Valve Tappet . . . . .	.018"		
Exhaust Valve Tappet . . . . .	.030"		
Spark Plug Gap . . . . .	.015"	.018"	
Cylinder Liner Bore	10.000"	10.002"	
Top Ring Travel Area (Any Point)			10.020"
Bottom of Liner			10.007"
Piston Skirt Dia. (Bottom)	9.991"	9.990"	9.985"
Piston Clearance (Skirt Bottom) . . . . .	.009"	.012"	.915"
Piston Compression Ring (Gap #1) . . . . .	.050"	.070"	.190"
Gap (#2 - 3 - 4) . . . . .	.040"	.060"	.190"
Piston Compression Ring #1			
Ring Width . . . . .	.1875"	.1865"	
Ring Groove Width . . . . .	.193"	.194"	.199"
Ring Side Clearance . . . . .	.0055"	.0075"	.015"
Piston Compression Ring #2, 3 and 4			
Ring Width . . . . .	.1875"	.1865"	
Ring Groove Width . . . . .	.191"	.192"	.197"
Ring Side Clearance . . . . .	.0035"	.0055"	.015"
Piston Oil Ring Gap . . . . .	.040"	.060"	.090"
Piston Oil Ring Width . . . . .	.310"	.311"	
Piston Oil Ring Groove Width . . . . .	.3145"	.3155"	.318"
Ring Side Clearance #5 and 6 . . . . .	.0035"	.0055"	.008"
Piston Pin Diameter	3.4985"	3.4980"	3.496"
Piston Bore for Pin	3.501"	3.500"	3.503"
Piston Pin Clearance in Piston . . . . .	.0015"	.0030"	.005"
Connecting Rod Bushing Bore	3.5020"	3.5015"	3.503"
Piston Pin Clearance in Rod . . . . .	.0030"	.0040"	.005"
Connecting Rod Eye Side			
Clearance in Piston . . . . .	.020"	.035"	.045"
Connecting Rod Big End Bearing Bore			
(Torqued, to 340-360 ft. lb.)	5.7538"	5.7558"	
Bearing Shell Wall Thickness . . . . .	.1856"	.1849"	Sur. Insi
Crankpin Diameter	5.751"	5.749"	5.745"
Crankpin Bearing Clearance . . . . .	.0028"	.0068"	.010"

<u>ITEM</u>	<u>STANDARD DIMENSION</u>		<u>MAX. (OR MIN.) ALLOWABLE WORN SIZE OR CLEARANCE</u>
Main Bearing Bore (Torqued to 250-275 ft. lb.)	6.0074"	6.0050"	
Bearing Shell Wall Thickness . . . . .	.3100"	.3093"	Surface Inspect
Main Journal Diameter	6.001"	5.999"	5.995"
Main Bearing Clearance . . . . .	.0040"	.0084"	.012"
Crank Thrust Bearing Width	4.122"	4.120"	4.115"
Crank Thrust Shoulder Span	4.130"	4.127"	4.140"
Crankshaft End Play . . . . .	.005"	.010"	.020"
Camshaft Bearing Bushing Bore Center and Ends	2.128"	2.127"	
Camshaft Diameter	2.124"	2.123"	
Camshaft Bearing Clearance . . . . .	.003"	.005"	.010"
Camshaft End Play . . . . .	.003"	.010"	.015"
Valve Rocker Arm Bore (Bushing in Place)	1.5036"	1.5006"	
Rocker Shaft Diameter	1.4995"	1.4990"	
Clearance . . . . .	.0011"	.0046"	.010"
Valve Rocker Arm Side Clearance - Adjustable: - - Set . . . . .	.005"	.010"	
Valve Stem Diameter . . . . .	.871"	.870"	
Valve Guide Bushing Bore . . . . .	.873"	.874"	
Clearance . . . . .	.002"	.004"	.006"
Lubricating Oil Pump Internal Gear Backlash	.012"	.015"	.020"
Lubricating Oil Pump Gear End Play . . . . .	.0056"	.0134"	.017"
Lubricating Oil Pump - Radial Clearance Between Gear Teeth and Housing Bore . . . . .	.004"	.005"	.010"
Lubricating Oil Pump Shaft Diameter	1.3750"	1.3745"	
Lubricating Oil Pump Bushing Bore	1.3770"	1.3780"	
Clearance . . . . .	.0020"	.0035"	.008"

DATA, RATINGS AND CLEARANCES

Type Designated	6/8 GTL
Cycle	4-Stroke
Bore and Stroke	10" X 10-1/2"
Type of Cylinder Arrangement	In Line Vertical
Number of Cylinders	6/8
Brake Horsepower - (Sea Level Rating Without Fan and Radiator)	1100
Revolutions Per Minute	900
Compression Ratio	8.75:1
Firing Order (Numbered from Front of Engine):	
6 Cylinder	1-4-2-6-3-5
8 Cylinder	1-3-7-4-8-6-2-5
Crankshaft Rotation - Facing Flywheel	Counter-clockwise

RECOMMENDED OPERATING DATA

Bare Engine Water Capacity (Jacket Water) - 6 Cylinder . .	54 Gallons
Bare Engine Water Capacity (Jacket Water) - 8 Cylinder . .	70 Gallons
Lubricating Oil Capacity - 6 Cylinder	65 Gallons
Lubricating Oil Capacity - 8 Cylinder	80 Gallons

<u>Pressures at Full Load and Speed:</u>	<u>Lbs. per Sq. In.</u>
Lubricating Oil Pressure in Header	35

<u>Temperatures at Full Load and Speed:</u>	<u>°F</u>
Normal Lubricating Oil Temperature - IN	150-180
Maximum Lubricating Oil Temperature - OUT	210
Normal Water Operating Temperature	165-180
Maximum Water Operating Temperature	200
Minimum Idle Speed	500 RPM
Operating Speed Range	600-900 RPM

<u>Torque Limits</u>	<u>Foot Pounds</u>
Cylinder Head Stud Nuts	380
Cylinder Block to Bed Stud Nuts - Inside	165-175
Main Bearing Stud Nuts	250-275
Connecting Rod Bolt Nuts	340-360
Flywheel to Crankshaft Bolts	640-660
Counterweight Stud Nuts	500-525

NOTE: Torque figures are for threads lubricated with engine oil or similar petroleum base lubricants. DO NOT use any compounds containing molybdenum disulfide as a thread lubricant.

IGNITION AND VALVE TIMING IN CRANKSHAFT DEGREES

Inlet Opens	52°	BTDC
Exhaust Closes	21°	ATDC
(Check above angles, for camshaft timing purposes only, with .125" valve lash. Check valve events at point where lash is just taken up (pushrod will not turn).		
Starting Air Valve Opens*		TDC
Starting Air Valve Closes*		BBC

*Does not apply when Air/Gas starting motor is used. The following ignition timings are recommended due to various characteristics of fuel gas:

<u>Timings for Engine Speed</u>		Approximate BTU/cu. ft.
700 RPM	900 RPM	
35°	40° BTC for dry natural gas	1000-1100
30°	35° BTC for slightly "wet" natural gas	1100-1200
25°	30° BTC for very "wet" natural gas	1200-1400

NOTE: + 2° tolerance allowed on inlet and exhaust valve timing. Spark timing must be accurate.

Engine Alarm and Shutdown Settings

Water Temperature - Shutdown	-----
Lube Oil Pressure - Shutdown	-----
Engine Overspeed - Shutdown	990 RPM

STANDARD SIZES, CLEARANCES AND WEAR LIMITS

<u>ITEM</u>	<u>STANDARD DIMENSION</u>	<u>MAX. (OR MIN. ALLOWABLE WOR SIZE OR CLEAR</u>
Gas Admission Valve (turbocharged engine only) . . . . .	.015"	
Inlet Valve Tappet . . . . .	.018"	
Exhaust Valve Tappet . . . . .	.030"	
Spark Plug Gap . . . . .	.023"	.028"
Cylinder Liner Bore	10.000"	10.002"
Top Ring Travel Area (Any Point)		10.020"
Bottom of Liner		10.007"
Piston Skirt Dia. (Bottom)	9.991"	9.990"
Piston Clearance (Skirt Bottom) . . . . .	.009"	.012"
.015"		
Piston Compression Ring (Gap #1) . . . . .	.050"	.070"
Gap (#2 - 3 - 4) . . . . .	.040"	.060"
.190"		
Piston Compression Ring #1		
Ring Width . . . . .	.1875"	.1865"
Ring Groove Width . . . . .	.193"	.194"
Ring Side Clearance . . . . .	.0055"	.0075"
.015"		
Piston Compression Ring #2, 3 and 4		
Ring Width . . . . .	.1875"	.1865"
Ring Groove Width . . . . .	.191"	.192"
Ring Side Clearance . . . . .	.0035"	.0055"
.015"		
Piston Oil Ring Gap . . . . .	.040"	.060"
.090"		
Piston Oil Ring Width . . . . .	.310"	.311"
Piston Oil Ring Groove Width . . . . .	.3145"	.3155"
Ring Side Clearance #5 and 6 . . . . .	.0035"	.0055"
.008"		
Piston Pin Diameter	3.4985"	3.4980"
3.496"		
Piston Bore for Pin	3.501"	3.500"
3.503"		
Piston Pin Clearance in Piston . . . . .	.0015"	.0030"
.005"		
Connecting Rod Bushing Bore	3.5020"	3.5015"
3.503"		
Piston Pin Clearance in Rod . . . . .	.0030"	.0040"
.005"		
Connecting Rod Eye Side		
Clearance in Piston . . . . .	.020"	.035"
.045"		
Connecting Rod Big End Bearing Bore		
(Torqued, to 340-360 ft. lb.)	5.7538"	5.7558"
Bearing Shell Wall Thickness . . . . .	.1856"	.1849"
Sur. Inset		
Crankpin Diameter	5.751"	5.749"
5.745"		
Crankpin Bearing Clearance . . . . .	.0028"	.0068"
.010"		

<u>ITEM</u>	<u>STANDARD DIMENSION</u>		<u>MAX. (OR MIN.) ALLOWABLE WORN SIZE OR CLEARANCE</u>
Main Bearing Bore (Torqued to 250-275 ft. lb.)	6.0074"	6.0050"	
Bearing Shell Wall Thickness . . . . .	.3100"	.3093"	Surface Inspect
Main Journal Diameter	6.001"	5.999"	5.995"
Main Bearing Clearance . . . . .	.0040"	.0084"	.012"
Crank Thrust Bearing Width	4.122"	4.120"	4.115"
Crank Thrust Shoulder Span	4.130"	4.127"	4.140"
Crankshaft End Play . . . . .	.005"	.010"	.020"
Camshaft Bearing Bushing Bore Center and Ends	2.128"	2.127"	
Camshaft Diameter	2.124"	2.123"	
Camshaft Bearing Clearance . . . . .	.003"	.005"	.010"
Camshaft End Play . . . . .	.003"	.010"	.015"
Valve Rocker Arm Bore (Bushing in Place)	1.5036"	1.5006"	
Rocker Shaft Diameter	1.4995"	1.4990"	
Clearance . . . . .	.0011"	.0046"	.010"
Valve Rocker Arm Side Clearance - Adjustable: - - Set . . . . .	.005"	.010"	
Valve Stem Diameter . . . . .	.871"	.870"	
Valve Guide Bushing Bore . . . . .	.873"	.874"	
Clearance . . . . .	.002"	.004"	
Lubricating Oil Pump Internal Gear Backlash	.012"	.015"	.020"
Lubricating Oil Pump Gear End Play . . . . .	.0056"	.0134"	.017"
Lubricating Oil Pump - Radial Clearance Between Gear Teeth and Housing Bore . . . . .	.004"	.005"	.010"
Lubricating Oil Pump Shaft Diameter	1.3750"	1.3745"	
Lubricating Oil Pump Bushing Bore	1.3770"	1.3780"	
Clearance . . . . .	.0020"	.0035"	.008"

DATA, RATINGS AND CLEARANCES

Type Designated	6/8 GTLA
Cycle	4-Stroke
Bore and Stroke	10" X 10-1/2"
Type of Cylinder Arrangement	In Line Vertical
Number of Cylinders	8
Brake Horsepower - (Sea Level Rating Without Fan and Radiator)	1050
Revolutions Per Minute	900
Compression Ratio	8.75:1
Firing Order (Numbered from Front of Engine):	
6 Cylinder	1-4-2-6-3-5
8 Cylinder	1-3-7-4-8-6-2-5
Crankshaft Rotation - Facing Flywheel	Counter-clockwise

RECOMMENDED OPERATING DATA

Bare Engine Water Capacity (Jacket Water) - 6 Cylinder . .	54 Gallons
Bare Engine Water Capacity (Jacket Water) - 8 Cylinder . .	70 Gallons
Lubricating Oil Capacity - 6 Cylinder	65 Gallons
Lubricating Oil Capacity - 8 Cylinder	80 Gallons

<u>Pressures at Full Load and Speed:</u>	<u>Lbs. per Sq. In.</u>
Lubricating Oil Pressure in Header	35
Starting Air Pressure	200-250
<u>Temperatures at Full Load and Speed:</u>	<u>°F</u>
Normal Lubricating Oil Temperature - IN	150-180
Maximum Lubricating Oil Temperature - OUT	210
Normal Water Operating Temperature	165-180
Maximum Water Operating Temperature	200
Air Manifold Temperature	128-132
Minimum Idle Speed	500 RPM
Operating Speed Range	500-900 RPM

<u>Torque Limits</u>	<u>Foot Pounds</u>
Cylinder Head Stud Nuts	380
Cylinder Block to Bed Stud Nuts - Inside	165-175
Main Bearing Stud Nuts	250-275
Connecting Rod Bolt Nuts	340-360
Flywheel to Crankshaft Bolts	640-660
Counterweight Stud Nuts	500-525

NOTE: Torque figures are for threads lubricated with engine oil or similar petroleum base lubricants. DO NOT use any compounds containing molybdenum disulfide as a thread lubricant.

IGNITION AND VALVE TIMING IN CRANKSHAFT DEGREES

Inlet Opens	60° BTDC
Exhaust Closes	34° ATDC
(Check above angles, for camshaft timing purposes only, with .125" valve lash. Check valve events at point where lash is just taken up (pushrod will not turn).	
Starting Air Valve Opens*	TDC
Starting Air Valve Closes*	BBC

*Does not apply when Air/Gas starting motor is used.

The following ignition timings are recommended due to various characteristics of fuel gas:

Timings for Engine Speed See Air Fuel Ratio Curve for Ignition Timing

Approximate
BTU/cu. ft.

700 RPM	900 RPM	
.	BTC for dry natural gas	1000-1100
.	BTC for slightly "wet" natural gas	1100-1200
.	BTC for very "wet" natural gas	1200-1400

NOTE: + 2° tolerance allowed on inlet and exhaust valve timing. Spark timing must be accurate.

Engine Alarm and Shutdown Settings

Water Temperature - Shutdown	-----
Lube Oil Pressure - Shutdown	-----
Engine Overspeed - Shutdown	990 RPM

STANDARD SIZES, CLEARANCES AND WEAR LIMITS

<u>ITEM</u>	<u>STANDARD DIMENSION</u>		<u>MAX. (OR MIN. ALLOWABLE WOF SIZE OR CLEARANCE)</u>
Gas Admission Valve (turbocharged engine only)	.013"		
Inlet Valve Tappet	.018"		
Exhaust Valve Tappet	.030"		
Spark Plug Gap	.023"	.028"	
Cylinder Liner Bore	10.000"	10.002"	
Top Ring Travel Area (Any Point)			10.020"
Bottom of Liner			10.007"
Piston Skirt Dia. (Bottom)	9.991"	9.990"	9.985"
Piston Clearance (Skirt Bottom)	.009"	.012"	.015"
Piston Compression Ring (Gap #1)	.050"	.060"	.190"
Gap (#2 - 3 - 4)	.040"	.060"	.190"
Piston Compression Ring #1			
Ring Width	.1875"	.1865"	
Ring Groove Width	.193"	.194"	.199"
Ring Side Clearance	.0055"	.0075"	.015"
Piston Compression Ring #2, 3 and 4			
Ring Width	.1875"	.1865"	
Ring Groove Width	.191"	.192"	.197"
Ring Side Clearance	.0035"	.0055"	.015"
Piston Oil Ring Gap	.035"	.050"	.090"
Piston Oil Ring Width	.310"	.311"	
Piston Oil Ring Groove Width	.3145"	.3155"	.318"
Ring Side Clearance #5 and 6	.0035"	.0055"	.008"
Piston Pin Diameter	3.4985"	3.4980"	3.496"
Piston Bore for Pin	3.501"	3.500"	3.503"
Piston Pin Clearance in Piston	.0015"	.0030"	.005"
Connecting Rod Bushing Bore	3.5020"	3.5015"	3.503"
Piston Pin Clearance in Rod	.0030"	.0040"	.005"
Connecting Rod Eye Side			
Clearance in Piston	.020"	.035"	.045"
Connecting Rod Big End Bearing Bore (Torqued, to 340-360 ft. lb.)	5.7538"	5.7558"	
Bearing Shell Wall Thickness	.1856"	.1849"	Sur. Insi
Crankpin Diameter	5.751"	5.749"	5.745"
Crankpin Bearing Clearance	.0028"	.0068"	.010"

<u>ITEM</u>	<u>STANDARD DIMENSION</u>		<u>MAX. (OR MIN.) ALLOWABLE WORN SIZE OR CLEARANCE</u>
Main Bearing Bore (Torqued to 250-275 ft. lb.)	6.0074"	6.0050"	
Bearing Shell Wall Thickness . . . . .	.3100"	.3093"	Surface Inspect
Main Journal Diameter	6.001"	5.999"	5.995"
Main Bearing Clearance . . . . .	.0040"	.0084"	.012"
Crank Thrust Bearing Width	4.122"	4.120"	4.115"
Crank Thrust Shoulder Span	4.130"	4.127"	4.140"
Crankshaft End Play . . . . .	.005"	.010"	.020"
Camshaft Bearing Bushing Bore Center and Ends	2.128"	2.127"	
Camshaft Diameter	2.124"	2.123"	
Camshaft Bearing Clearance . . . . .	.003"	.005"	.010"
Camshaft End Play . . . . .	.003"	.010"	.015"
Valve Rocker Arm Bore (Bushing in Place)	1.5036"	1.5006"	
Rocker Shaft Diameter	1.4995"	1.4990"	
Clearance . . . . .	.0011"	.0046"	.010"
Valve Rocker Arm Side Clearance - Adjustable: - - Set . . . . .	.005"	.010"	
Valve Stem Diameter . . . . .	.871"	.870"	
Valve Guide Bushing Bore . . . . .	.874"	.875"	
Clearance . . . . .	.002"	.004"	.006"
Lubricating Oil Pump Internal Gear Backlash	.012"	.015"	.020"
Lubricating Oil Pump Gear End Play . . . . .	.0056"	.0134"	.017"
Lubricating Oil Pump - Radial Clearance Between Gear Teeth and Housing Bore . . . . .	.004"	.005"	.010"
Lubricating Oil Pump Shaft Diameter	1.3750"	1.3745"	
Lubricating Oil Pump Bushing Bore	1.3770"	1.3780"	
Clearance . . . . .	.0020"	.0035"	.008"

DATA, RATINGS AND CLEARANCES

Type Designated	GTLB
Cycle	4-Stroke
Bore and Stroke	10" X 10-1/2"
BMEP	146.7 PSI
Displacement - 6 Cylinder	4948 Cu. In.
Displacement - 8 Cylinder	6597 Cu. In.
Type of Cylinder Arrangement	In-Line Vertical
Number of Cylinders	6 or 8
Brake Horsepower - (Sea Level Rating Without Fan and Radiator) - 6 Cylinder	825
8 Cylinder	1100
Revolutions Per Minute	900
Minimum Idle Speed	600 RPM
Operating Speed Range	600-900 RPM
Compression Ratio	8.20:1
Firing Order (Numbered from Front of Engine):	
6 Cylinder	1-4-2-6-3-5
8 Cylinder	1-3-7-4-8-6-2-5
Crankshaft Rotation - Facing Flywheel	Counter-Clockwise
Engine Weight - Dry (Approx.) - 6 Cylinder	20000 Lbs.
Engine Weight - Dry (Approx.) - 8 Cylinder	24500 Lbs.

RECOMMENDED OPERATING DATA

Bare Engine Water Capacity (Jacket Water) - 6 Cylinder	32 Gallons
Bare Engine Water Capacity (Jacket Water) - 8 Cylinder	56 Gallons
Lubricating Oil Capacity - 6 Cylinder	65 Gallons
Lubricating Oil Capacity - 8 Cylinder	80 Gallons
Starting Air Pressure	150 PSIG Max.
Engine Air Flow Requirement - 6 Cylinder	2045 SCFM
Engine Air Flow Requirement - 8 Cylinder	2500 SCFM
Air Intake Pressure Drop - Max.	10 In. H2O
Exhaust Flow - 6 Cylinder	151 Lbs./Min.
Exhaust Flow - 8 Cylinder	196 Lbs./Min.
Exhaust Backpressure - Max.	10 In. H2O
Lube Oil Flow Thru Filter	50 GPM
Jacket Water Pump Flow - 6 Cylinder	275 GPM
Jacket Water Pump Flow - 8 Cylinder	340 GPM
Intercooler Water Pump Flow - 6 Cylinder	100 GPM
Intercooler Water Pump Flow - 8 Cylinder	130 GPM

Pressures at Full Load and Speed:

Lubricating Oil Pressure in Header	35 PSIG
Fuel Gas Pressure	35-40 PSIG

Temperatures at Full Load and Speed:

Normal Lubricating Oil Temperature - IN	150-180 of
---	---------------

Maximum Lubricating Oil Temperature - OUT	200
Normal Water Operating Temperature	165-180
Maximum Water Operating Temperature	200
Air Manifold Temperature	128-132
Exhaust Gas Temperature at Turbocharger Turbine Inlet	
6 Cylinder (TCU) Turbo	1170-1220
Exhaust Gas Temperature at Turbocharger Turbine Inlet	
8 Cylinder (C-B) Turbo	1150-1210

Torque Limits

Cylinder Head Stud Nuts	380
Cylinder Block to Bed Stud Nuts - Inside	165-175
Main Bearing Stud Nuts	250-275
Connecting Rod Bolt Nuts	340-360
Flywheel to Crankshaft Bolts	640-660
Counterweight Stud Nuts	500-525
Camshaft Bearing Capscrews	45-50
Spark Plug - 18 mm Thread - (W/O Torque Wrench 1/4 Turn)	32-38

NOTE: Torque figures are for threads lubricated with engine oil or similar petroleum base lubricants. DO NOT use any compounds containing molybdenum disulfide as a thread lubricant.

IGNITION AND VALVE TIMING IN CRANKSHAFT DEGREES

Inlet Opens	°60	BTC
Exhaust Closes	°34	ATC

(Check above angles, for camshaft timing purposes only, with .125" valve lash. Check valve events at point where lash is just taken up (pushrod will not turn).

Timings for Engine Speed See Air/Fuel Ratio Curve

suggested Engine Alarm and Shutdown Settings (Where Applicable)

Low Jacket Water Pressure - Alarm	10 PSIG
Low Jacket Water Pressure - Shutdown	7 PSIG
High Jacket Water Temperature (From Engine) - Alarm	185°F.
High Jacket Water Temperature (From Engine) - Shutdown	195°F.
Low Intercooler Water Pressure - Shutdown	5 PSIG
High Intercooler Water Temperature (From Intercooler)	140°F.
Low Lube Oil Pressure - Alarm	23 PSIG
Low Lube Oil Pressure - Shutdown	18 PSIG
High Lube Oil Temperature - Alarm	195°F.
High Lube Oil Temperature - Shutdown	205°F.
Low Turbocharger Lube Oil Pressure - Shutdown	18 PSIG
Engine Overspeed Governor - Shutdown	990 RPM

STANDARD SIZES, CLEARANCES AND WEAR LIMITS

<u>ITEM</u>	<u>STANDARD DIMENSION</u>		<u>MAX. (OR MIN.) ALLOWABLE WORN SIZE OR CLEARANCE</u>
Gas Admission Valve . . . . .	.013"		
Inlet Valve Tappet . . . . .	.021"		
Exhaust Valve Tappet . . . . .	.030"		
Spark Plug Gap . . . . .	.018"		
Cylinder Liner Bore	10.000"	10.002"	
Top Ring Travel Area (Any Point)			10.020"
Bottom of Liner			10.007"
Piston Skirt Dia. (Bottom)	9.991"	9.990"	9.985"
Piston Clearance (Skirt Bottom) . . . . .	.009"	.012"	.015"
Piston Compression Ring (Gap #1) . . . . .	.050"	.060"	.190"
Gap (#2 - 3 - 4) . . . . .	.040"	.060"	.190"
Piston Compression Ring #1			
Ring Width . . . . .	.1880"	.1865"	
Ring Groove Width . . . . .	.193"	.194"	.199"
Ring Side Clearance . . . . .	.0050"	.0075"	.015"
Piston Compression Ring #2, 3 and 4			
Ring Width . . . . .	.1880"	.1865"	
Ring Groove Width . . . . .	.191"	.192"	
Ring Side Clearance . . . . .	.0030"	.0055"	.015"
Piston Oil Ring Gap . . . . .	.035"	.050"	.090"
Piston Oil Ring Width . . . . .	.310"	.3115"	
Piston Oil Ring Groove Width . . . . .	.313"	.314"	.318"
Ring Side Clearance #5 and 6 . . . . .	.0015"	.0040"	.008"
Piston Pin Diameter	3.4985"	3.4975"	3.496"
Piston Bore for Pin	3.501"	3.500"	3.503"
Piston Pin Clearance in Piston . . . . .	.0015"	.0035"	.005"
Connecting Rod Bushing Bore	3.5020"	3.5015"	3.503"
Piston Pin Clearance in Rod . . . . .	.0030"	.0045"	.005"
Connecting Rod Eye Side			
Clearance in Piston . . . . .	.020"	.035"	.045"
Connecting Rod Big End Bearing Bore			
(Torqued, to 340-360 ft. lb.) . . . . .	.7538		
.	5.7358"	5.7564"	
Bearing Shell Wall Thickness . . . . .	.1856"	.1848"	Surface Inspect
Crankpin Diameter	5.751"	5.749"	5.745"
Crankpin Bearing Clearance . . . . .	.0028"	.0074"	.010"

<u>ITEM</u>	<u>STANDARD DIMENSION</u>		<u>MAX. (OR MIN.) ALLOWABLE WORN SIZE OR CLEARANC</u>
Main Bearing Bore (Torqued to 250-275 ft. lb.)	6.0040"	6.0066"	
Bearing Shell Wall Thickness . . . . .	.3105"	.3097"	Surface Inspec
Main Journal Diameter	6.001"	5.999"	5.995"
Main Bearing Clearance . . . . .	.0030"	.0076"	
Crank Thrust Bearing Width	4.122"	4.120"	4.115"
Crank Thrust Shoulder Span	4.130"	4.127"	4.140"
Crankshaft End Play . . . . .	.005"	.010"	.020"
Camshaft Bearing Bushing Bore Center and Ends	2.253"	2.252"	
Camshaft Diameter	2.2495"	2.2485"	
Camshaft Bearing Clearance . . . . .	.003"	.005"	.010"
Camshaft End Play . . . . .	.003"	.010"	.015"
Valve Rocker Arm Bore (Bushing in Place)	1.5036"	1.5006"	
Rocker Shaft Diameter	1.4995"	1.4990"	
Clearance . . . . .	.0011"	.0046"	.010"
Valve Rocker Arm Side Clearance - Adjustable: - - Set . . . . .	.005"	.010"	
Valve Stem Diameter . . . . .	.871"	.870"	
Valve Guide Bushing Bore . . . . .	.874"	.875"	
Clearance . . . . .	.002"	.004"	
Lubricating Oil Pump/Crankshaft Gear Backlash . . . . .	.005"	.008"	
Lubricating Oil Pump Internal Gear Backlash	.012"	.015"	.020"
Lubricating Oil Pump Gear End Play . . . . .	.0056"	.0134"	.017"
Lubricating Oil Pump - Radial Clearance Between Gear Teeth and Housing Bore . . . . .	.004"	.005"	.010"
Lubricating Oil Pump Shaft Diameter	1.3750"	1.3745"	
Lubricating Oil Pump Bushing Bore	1.3770"	1.3780"	
Clearance . . . . .	.0020"	.0035"	.008"

SPECIFIC ENGINE DATA - MODEL 8SGTB

Type Designation	SGTB
Cycle	4-Stroke
Bore and Stroke	10" x 10-1/2"
BMEP	
Displacement	6597 Cu. In.
Type of Cylinder Arrangement	In-Line Vertical
Number of Cylinders	8
Brake Horsepower - (Sea Level Rating Without Fan and Radiator)	1350
Revolutions Per Minute	900
Minimum Idle Speed	600 RPM
Operating Speed Range	600-900
Compression Ratio	8.20:1
Firing Order (Numbered from Front of Engine):	1-3-7-4-8-6-2-5
Crankshaft Rotation - Facing Flywheel	Counter-Clockwise
Engine Weight - Dry (Approx.)	34,500
Bare Engine Water Capacity (Jacket Water)	70 Gallons
Lubricating Oil Capacity	122 Gallons
Starting Air Pressure	150 PSIG Max.
Engine Air Flow Requirement	
Air Intake Pressure Drop - Max.	10 In. H ₂ O
Exhaust Flow	
Exhaust Backpressure - Max.	10 In. H ₂ O
Lube Oil Flow Thru Filter	60 GPM
Jacket Water Pump Flow	
Intercooler Water Pump Flow	

OPERATING PRESSURES AND TEMPERATURES:

Lubricator Oil Pressure in Header	35-45 PSIG
Fuel Gas Pressure	35-40 PSIG
Normal Lubricating Oil Temperature - IN	150-180 °F
Maximum Lubricating Oil Temperature - OUT	200 °F
Normal Water Operating Temperature	165-180 °F
Maximum Water Operating Temperature	200 °F
Intercooler Water Temperature Into Engine - Maximum IN	120 °F

TIGHTENING TORQUES

(NOTE: Torque figures are for threads lubricated with engine oil or similar petroleum base lubricants. DO NOT use any compounds containing molybdenum disulfide as a thread lubricant.)

	<u>Foot Pounds</u>
Main Bearing Cap Bolts	350-375
Block to Bed Stud Nuts	170
Block to Bed Bolts	125
Camshaft Sprocket Clamp Ring Capscrews	65-75
Connecting Rod Bolt Nuts	280-300
Cylinder Head Stud Nuts	380
Rocker Arm Bracket Capscrews	90
Cam Bearing Cap Capscrews	55

TIGHTENING TORQUES (CONT.)

Flywheel Capscrews	720-780
Cam Follower Bracket Capscrews	55
Crankshaft Sprocket Assembly Bolt Nut	85-95
Vibration Damper Capscrews	85-95
Gear Drive to Crankshaft	55
End Covers Capscrews	55
Spark Plug - 18mm - (w/o Torque Wrench 1/4 Turn)	40 (Dry Threads)
Prechamber Assembly	
Prechamber Cap	85
Nozzle Retainer	70
Swivel Nut	Finger Tight Plus 1/3 Turn

VALVE CLEARANCES

<u>VALVE</u>	<u>CLEARANCE (COLD)</u>
Exhaust	.030
Intake	.021
Gas Admission	.013

CAMSHAFT TIMING IN CRANKSHAFT DEGREES

<u>CAM</u>	<u>CLEARANCE</u>	<u>OPENS (+ 2°)</u>	<u>CLOSES (+ 2°)</u>
Exhaust	.125	34 B.B.C.	38 A.T.C.
Intake	.125	41 B.T.C.	1 A.B.C.
Gas Admission	.013	22 A.T.C.	43 B.B.C.

NOTE: The .125" lash for intake and exhaust cams is for camshaft timing purposes only. Check valve events at point where lash is just taken up.

IGNITION TIMING

<u>RPM</u>	<u>TIMING °BTDC</u>
600	8
750	13
900	18
1000	21

ALARMS AND SHUTDOWN SETTING

Water Temperature - Alarm	
Water Temperature - Shutdown	
Lube Oil Pressure - Alarm	
Lube Oil Pressure - Shutdown	
Overspeed Shutdown	990 RPM

STANDARD SIZES, CLEARANCES AND WEAR LIMITS

Item	Standard Dimension	Max. (or Min.) Allowable Worn Size or Clearance
Cylinder Liner Bore -----	10.000" - 10.002"	
Top Ring Travel Area (Any Point) -----		10.020"
Bottom of Liner -----		10.007"
Piston Skirt Diameter (Bottom) -----	9.991" - 9.990"	9.985"
Piston Clearance (Skirt Bottom) -----	.009" - .012"	.015"
Piston Compression Ring Gap (#1) -----	.050" - .060"	.190"
Piston Compression Ring Gap (#2 - 3 - 4) -----	.040" - .060"	.190"
Piston Compression Ring Width (#1) -----	.1865" - .1880"	
Piston Compression Ring Groove Width (#1) -----	.193" - .194"	.199"
Ring Side Clearance (#1) ----	.0050" - .0075"	.015"
Piston Compression Ring Width (#2 - 3 - 4) -----	.1865" - .1880"	
Piston Compression Ring Groove Width (#2 - 3 - 4) ---	.191" - .192"	.197"
Ring Side Clearance (#2-3-4)	.0030" - .0055"	.015"
Piston Oil Ring Gap (#5 - 6) ---	.035" - .050"	.090"
Piston Oil Ring Width -----	.3100" - .3115"	
Piston Oil Ring Groove Width ---	.313" - .314"	.318"
Ring Side Clearance (#5 - 6)-	.0015" - .0040"	.008"
Piston Pin Diameter -----	3.4985" - 3.4975"	3.496"
Piston Bore for Pin -----	3.501" - 3.500"	3.503"
Piston Pin Clearance in Piston -----	.0015" - .0035"	.005"
Connecting Rod Bushing Bore ----	3.5020" - 3.5015"	3.503"
Piston Pin Clearance in Rod ----	.0030" - .0045"	.005"
Connecting Rod Big End Bearing Bore -----	6.3790" - 6.3824"	
Bearing Shell Wall Thickness ---	.2045" - .2033"	Surface Inspection
Crankpin Diameter -----	6.376" - 6.374"	6.370"
Crankpin Bearing Clearance -----	.0030" - .0084"	.012"
Crankpin Length -----	3.490" - 3.510"	
Width of Rod -----	3.000" - 2.995"	
Side Clearance of Rod -----	.490" - .515"	

ITEM	STANDARD DIMENSION	MAX. (or MIN.) ALLOWABLE WORN SIZE/CLEARANCE
Main Bearing Bore -----	8.0050" - 8.0084"	
Main Bearing Shell		
Wall Thickness -----	.2650" - .2638"	
Main Journal Diameter -----	8.001" - 7.999"	7.995"
Main Bearing Clearance -----	.0040" - .0094"	.013"
Crank Thrust Bearing Width ----	5.496" - 5.493"	5.488"
Crank Thrust Shoulder Span ----	5.506" - 5.508"	5.516"
Crankshaft End Play -----	.010" - .015"	.025"
Camshaft Bearing Bushing Bore -	2.7530" - 2.7546"	
Camshaft Diameter -----	2.750" - 2.749"	
Camshaft Bearing Clearance --	.0030" - .0056"	.010"
Camshaft End Play		
Adjustable - Set -----	.005" - .008"	
Valve Rocker Arm Bore		
(Bushing in Place) -----	1.7496" - 1.7526"	
Rocker Shaft Diameter -----	1.7485" - 1.7480"	
Clearance -----	.0011" - .0046"	.010"
Valve Rocker Arm Side Clearance		
Adjustable - Set -----	.005" - .007"	
Valve Stem Diameter -----	.871" - .870"	
Valve Guide Bushing Bore -----	.874" - .875"	
Clearance -----	.002" - .004"	.006"
Gas Admission Valve -----	.4975" - .4965"	
Gas Admission Valve Body -----	.500" - .501"	
Clearance -----	.0025" - .0045"	.006"
Lubricating Oil Pump		
Internal Gear Backlash -----	.011" - .015"	.020"
Lubricating Oil Pump		
Gear End Play (032-211-L) ---	.016" - .022"	.026"
Lubricating Oil Pump		
Radial Clearance Between Gear Teeth and Housing Bore -----	.012" - .013"	.015"
Lubricating Oil Pump		
Shaft Diameter -----	1.7500" - 1.7495"	
Lubricating Oil Pump -----		
Bushing Bore -----	1.753" - 1.754"	
Clearance -----	.0030" - .0045"	.008"

Item	Standard Dimension	Max. (Or Min.) Allowable Worn Size or Clearance
Front End Gear Drive Backlash		
Lubricating Oil Pump -----	.011" - .015"	.020"
Jacket Water Pump -----	.011" - .015"	.020"
Intercooler Water Pump -----	.011" - .015"	.020"
Governor/Alternator		
Drive Gear Backlash -----	.003" - .005"	.010"
Spark Plug Gap -----	.018"	

DATA, RATINGS AND CLEARANCES

Type Designated	12/16G-825
Cycle	4 STROKE
Bore and Stroke	10" x 10½"
BMEP	107 PSI
Displacement -12 Cylinder	9896 CU. IN.
Displacement -16 Cylinder	13,195 CU. IN.
Type of Cylinder Arrangement	VEE
Number of Cylinders	12/16
Brake Horsepower - (Sea Level Rating Without Fan and Radiator)	
-12 Cylinder	1200
16 Cylinder	1600
Revolutions Per Minute	900
Minimum Idle Speed	450
Operating Speed Range	
Compression Ratio	*
Firing Order (Numbered from Front of Engine):	
12 Cylinder	1R-1L-4R-4L-2R-2L-6R-6L-3R-3L-5R-5L
16 Cylinder	1R-1L-3R-3L-2R-2L-5R-5L-8R-8L-6R-6L-7R-7L-4R-4L
Crankshaft Rotation - Facing Flywheel	CCW
Engine Weight - Dry (Approx.) -12 Cylinder	42,000
Engine Weight - Dry (Approx.) -16 Cylinder	51,000

RECOMMENDED OPERATING DATA

Bare Engine Water Capacity (Jacket Water) -12 Cylinder	140 GALLONS
Bare Engine Water Capacity (Jacket Water) -16 Cylinder	180 GALLONS
Lubricating Oil Capacity -12 Cylinder	165 GALLONS
Lubricating Oil Capacity -16 Cylinder	220 GALLONS
Starting Air Pressure	150 PSIG
Engine Air Flow Requirement -12 Cylinder	2156 CFM
Engine Air Flow Requirement -16 Cylinder	2860 CFM
Air Intake Pressure Drop - Max.	7½ IN H2O
Exhaust Flow -12 Cylinder	174 LBS. MIN.
Exhaust Flow -16 Cylinder	232 LBS. MIN.
Exhaust Backpressure - Max.	15 IN. H2O
Lube Oil Flow Thru Filter	150 GPM
Jacket Water Pump Flow -12 Cylinder	600 GPM
Jacket Water Pump Flow -16 Cylinder	750 GPM
Intercooler Water Pump Flow -12 Cylinder	
Intercooler Water Pump Flow -16 Cylinder	

Pressures at Full Load and Speed:

Lubricating Oil Pressure in Header	34-45 PSI
Fuel Gas Pressure	5 PSIG

Temperatures at Full Load and Speed:

Normal Lubricating Oil Temperature - IN	150-180°F
Maximum Lubricating Oil Temperature - OUT	210°F
Normal Water Operating Temperature	170-180°F
Maximum Water Operating Temperature	195°F
Air Manifold Temperature	
Exhaust Gas Temperature at Turbocharger Turbine Inlet Cylinder (TCU) Turbo	
Exhaust Gas Temperature at Turbocharger Turbine Inlet Cylinder (C-B) Turbo	

Torque Limits

Cylinder Head Stud Nuts	380 FT LBS
Cylinder Block to Bed Stud Nuts - Inside	275-300
Main Bearing Stud Nuts	325-350
Connecting Rod Bolt Nuts	340-360
Flywheel to Crankshaft Bolts	720-780
Counterweight Stud Nuts	
Camshaft Bearing Capscrews	45-51
Spark Plug - 18 mm Thread - (W/O Torque Wrench 1/4 Turn)	

NOTE: Torque figures are for threads lubricated with engine oil or similar petroleum base lubricants. DO NOT use any compounds containing molybdenum disulfide as a thread lubricant.

IGNITION AND VALVE TIMING IN CRANKSHAFT DEGREES

Inlet Opens	12° ATDC
Exhaust Closes	13½° ATDC
(Check above angles, for camshaft timing purposes only, with .125" valve lash. Check valve events at point where lash is just taken up (pushrod will not turn).	

Timings for Engine Speed 35° BTDC

Suggested Engine Alarm and Shutdown Settings (Where Applicable)

Low Jacket Water Pressure - Alarm	
Low Jacket Water Pressure - Shutdown	
High Jacket Water Temperature (From Engine) - Alarm	
High Jacket Water Temperature (From Engine) - Shutdown	195°F
Low Intercooler Water Pressure - Shutdown	
High Intercooler Water Temperature (From Intercooler)	
Low Lube Oil Pressure - Alarm	
Low Lube Oil Pressure - Shutdown	18 PSI
High Lube Oil Temperature - Alarm	
High Lube Oil Temperature - Shutdown	205°F
Low Turbocharger Lube Oil Pressure - Shutdown	
Engine Overspeed Governor - Shutdown	

STANDARD SIZES, CLEARANCES AND WEAR LIMITS

ITEM

Gas Admission Valve		
Inlet Valve Tappet	WARM-.018"	HOT-.026"
Exhaust Valve Tappet	WARM-.030"	HOT-.010"
Spark Plug Gap . . . . .	.023"-.028"	
Cylinder Liner Bore	10.000"-10.002"	
Top Ring Travel Area (Any Point)	10.020" MAX	
Bottom of Liner	10.007" MAX	
Piston Skirt Dia. (Bottom)	9.990"-9.991"	
Piston Clearance (Skirt Bottom) . . . . .	.009"-.012"	
Piston Compression Ring (Gap #1) . . . . .	.030"-.045"	
Gap (#2 - 3 - 4) . . . . .	.040"-.060"	
Piston Compression Ring #1		
Ring Width . . . . .	.1865"-.1880"	
Ring Groove Width . . . . .	.193"-.194"	
Ring Side Clearance . . . . .	.005"-.0075"	
Piston Compression Ring #2, 3 and 4		
Ring Width . . . . .	.1865"-.1880"	
Ring Groove Width . . . . .	.191"-.192"	
Ring Side Clearance . . . . .	.003"-.0055"	
Piston Oil Ring Gap . . . . .	.035"-.050"	
Piston Oil Ring Width . . . . .	.3100"-.3115"	
Piston Oil Ring Groove Width . . . . .	.313"-.314"	
Ring Side Clearance #5 and 6 . . . . .	.0015"-.0040"	
Piston Pin Diameter	3.4975"-3.4985"	
Piston Bore for Pin	3.500"-3.501"	
Piston Pin Clearance in Piston . . . . .	.0015"-.0035"	
Connecting Rod Bushing Bore	3.5015"-3.502"	
Piston Pin Clearance in Rod . . . . .	.003"-.004"	
Connecting Rod Eye Side		
Clearance in Piston . . . . .	.020"-.035"	
Connecting Rod Big End Bearing Bore	6.3790"-6.3824"	
(Torqued, to ft. lb.)		
Bearing Shell Wall Thickness . . . . .	.2033"-.2045"	
Crankpin Diameter	6.374"-6.376"	
Crankpin Bearing Clearance . . . . .	.0030"-.0084"	

<u>ITEM</u>	<u>STANDARD DIMENSION</u>	<u>MAX. (OR MIN.) ALLOWABLE WORN</u>
Main Bearing Bore (Torqued to ft. lb.)	8.0050"-8.0084"	
Bearing Shell Wall Thickness . . . . .	.2650"±.2638"	
Main Journal Diameter	8.001"-7.999"	7.995"
Main Bearing Clearance . . . . .	.0040"- .0094"	.013"
Crank Thrust Bearing Width	5.496"-5.493"	5.488"
Crank Thrust Shoulder Span	5.506"-5.508"	5.516"
Crankshaft End Play . . . . .	.010"- .015"	.025"
Camshaft Bearing Bushing Bore Center and Ends	2.7530"-2.7546"	
Camshaft Diameter	2.750"-2.749"	
Camshaft Bearing Clearance . . . . .	.0030"- .0056"	.010"
Camshaft End Play . . . . .	.005"- .008"	
Valve Rocker Arm Bore (Bushing in Place)	1.7496"-1.7526"	
Rocker Shaft Diameter	1.7485"-1.7480"	
Clearance . . . . .	.0011"- .0046"	.010"
Valve Rocker Arm Side Clearance - Adjustable: - - Set . . . . .	.005"- .007"	
Valve Stem Diameter . . . . .	.871"- .870"	
Valve Guide Bushing Bore . . . . .	.874"- .875"	
Clearance . . . . .	.002"- .004"	.006"
Lubricating Oil Pump/Crankshaft Gear Backlash		
Lubricating Oil Pump Internal Gear Backlash . . . . .	.007"- .010"	.015"
Lubricating Oil Pump Gear End Play . . . . .	.0036"- .0144"	.017"
HERRING BONE GEARS . . . . .	.016"- .022"	
SPUR (STRAIGHT) GEARS . . . . .	.025"- .034"	
Lubricating Oil Pump - Radial Clearance Between Gear Teeth and Housing Bore . . . . .	.012"- .013"	.015"
Lubricating Oil Pump Shaft Diameter	1.7500"-1.7495"	
Lubricating Oil Pump Bushing Bore	1.753"-1.754"	
Clearance . . . . .	.0030"- .0045"	.008"

2. STANDARD ENGINE DATA

Model	12GTL	12SGT	16GTL	16SGT
Brake Horsepower (BHP) at 900 RPM	1650	2000	2200	2650
Minimum Idle Speed - RPM				600
Operating Speed - RPM				600-900
Bore x Stroke	10" x 10-1/2"			

FIRING ORDER - Counter-Clockwise Rotation

12 Cylinder -

1R-1L - 4R-4L - 2R-2L - 6R-6L - 3R-3L - 5R-5L

16 Cylinder -

1R-1L - 3R-3L - 2R-2L - 5R-5L - 8R-8L - 6R-6L - 7R-7L - 4R-4L

NOTE: Right and Left Cylinder Banks and Direction of Rotation are determined by viewing the engine from the Flywheel End.

CAPACITIES

	<u>GALLONS</u>	
	<u>12 Cyl.</u>	<u>16 Cyl.</u>
Lubricating Oil Sump - (Including Cooler)	165	220
Water in Engine	140	180

3. OPERATING PRESSURES AND TEMPERATURES

Lube Oil Pressure - Normal	35-40 PSI
Lube Oil Temperature - Normal IN	140-150 F
Lube Oil Temperature - Normal OUT	165-175 F
Jacket Water Temperature - Normal OUT	170-180 F **
Intercooler Water Temperature - Normal IN	120 F

4. SET-UP TORQUES FOR STUDS AND BOLTS

NOTE: Torque figures are for threads lubricated with engine oil or similar petroleum base lubricants - DO NOT USE ANY COMPOUNDS CONTAINING MOLYBDENUM DISULFIDE AS A THREAD LUBRICANT.

	<u>FOOT POUNDS</u>
Main Bearing Cap Bolts	350-375
Block to Bed Stud Nuts	275-300
Camshaft Sprocket Clamp Ring Capscrews	65-75
Connecting Rod Bolt Nuts	280-300
Cylinder Head Stud Nuts	380(HOT)
Rocker Arm Bracket Capscrews	125
Camshaft Bearing Cap Capscrews	45-51
Flywheel Capscrews	720-780
Cam Follower Bracket Capscrews	45-51
Crankshaft Sprocket Assembly Bolt Nuts	85-95
Vibration Damper Capscrews	300-325
End Cover Capscrews	65-75
Spark Plug - 18mm (w/o Torque Wrench 1/4 Turn)	32-38

SECTION A

8. STANDARD SIZES, CLEARANCES, AND WEAR LIMITS

	STANDARD DIMENSION (Inches)		MAX. (OR MIN.) ALLOWABLE WORN SIZE OR CLEARANCE (Inches)
Cylinder Liner Bore	10.000	10.002	
Top Ring Travel Area (Any Point)			10.020
Bottom of Liner			10.007
Piston Skirt Diameter (Bottom)	9.991	9.990	9.985
Piston Clearance (Skirt Bottom) .....	.009	.012	.015
Piston Compression Ring #1			
Gap .....	.050	.060	.190
Ring Width .....	.1880	.1865	
Ring Groove Width .....	.193	.194	.199
Ring Side Clearance .....	.0050	.0075	.015
Piston Compression Rings #2, #3, and #4			
Gap .....	.040	.060	.190
Ring Width .....	.1880	.1865	
Ring Groove Width .....	.191	.192	.197
Ring Side Clearance .....	.0030	.0055	.015
Piston Oil Ring			
Gap .....	.035	.050	.090
Ring Width .....	.310	.3115	
Ring Groove Width .....	.313	.314	.318
Ring Side Clearance #5 and #6 .....	.0015	.0040	.008
Piston Pin Diameter	3.4985	3.4975	3.496
Piston Bore for Pin	3.501	3.500	3.503
Piston Pin Clearance in Piston .....	.0015	.0035	.005
Connecting Rod Bushing Bore	3.5020	3.5015	3.503
Piston Pin Clearance in Rod .....	.0030	.0045	.005
Connecting Rod Eye			
Side Clearance in Piston .....	.020	.035	.045
Connecting Rod Big End Bearing Bore ...	6.3790	6.3824	
Bearing Shell Wall Thickness .....	.2045	.2033	Surface Inspection
Crankpin Diameter	6.376	6.374	6.370
Crankpin Bearing Clearance .....	.0030	.0084	.012
Crankpin Length	6.248	6.253	
Width of Two Rods	6.000	5.992	
Side Clearance of Rods .....	.248	.261	

SECTION A

	STANDARD DIMENSION (Inches)		MAX. (OR MIN.) ALLOWABLE WORN SIZE OR CLEARANCE (Inches)
Main Bearing Bore	8.0050	8.0084	
Main Bearing Shell Wall Thickness .....	.2650	.2638	Surface Inspection
Main Journal Diameter	8.001	7.999	7.995
Main Bearing Clearance .....	.0040	.0094	.013
Crank Thrust Bearing Width	5.496	5.493	5.488
Crank Thrust Shoulder Span	5.506	5.508	5.516
Crankshaft End Play .....	.010	.015	.025
Camshaft Bearing Bushing Bore	2.753	2.7546	
Camshaft Diameter	2.750	2.749	
Camshaft Bearing Clearance .....	.003	.0056	.010
Camshaft End Play .....	.005	.008	
Camshaft/Governor Drive Gear Lash .....	.004	.008	
Valve Rocker Arm Bore (Bushing in Place)	1.5036	1.5006	
Rocker Shaft Diameter	1.4995	1.4990	
Shaft to Bushing Clearance .....	.0011	.0046	.010
Side Clearance .....	.005	.010	
Valve Stem Diameter .....	.871	.870	
Valve Guide Bushing Bore .....	.874	.875	
Stem to Bushing Clearance .....	.002	.004	.006
Gas Admission Valve Stem Diameter.....	.4975	.4965	
Gas Admission Valve Bushing Bore.....	.500	.501	
Clearance .....	.0025	.0045	.006
Lubricating Oil Pump/Crankshaft Gear Backlash .....	.005	.008	
Lubricating Oil Pump Internal Gear Backlash .....	.011	.015	.020
Lubricating Oil Pump Gear End Play (002-914 Pump) .....	.016	.022	.026
End Play (033-639 Pump) .....	.025	.034	.037
Lubricating Oil Pump - Radial Clearance Between Gear Teeth and Housing Bore .....	.012	.013	.015
Lubricating Oil Pump Shaft Diameter ...	1.750	1.7495	
Lubricating Oil Pump Bushing Bore	1.753	1.754	
Clearance .....	.0030	.0045	.008

2. STANDARD ENGINE DATA

Model	12GTLB	12SGTB	16GTLB	16SGTB
Brake Horsepower (BHP) at 900 RPM	1650	2000	2200	2650
Minimum Idle Speed - RPM	600			
Operating Speed - RPM	600-900			
Bore x Stroke	10" x 10-1/2"			

FIRING ORDER - Counter-Clockwise Rotation

12 Cylinder -

1R-1L - 4R-4L - 2R-2L - 6R-6L - 3R-3L - 5R-5L

16 Cylinder -

1R-1L - 3R-3L - 2R-2L - 5R-5L - 8R-8L - 6R-6L - 7R-7L - 4R-4L

NOTE: Right and Left Cylinder Banks and Direction of Rotation are determined by viewing the engine from the Flywheel End.

CAPACITIES

	<u>GALLONS</u>	
	<u>12 Cyl.</u>	<u>16 Cyl.</u>
Lubricating Oil Sump - (Including Cooler)	165	220
Water in Engine	140	180

3. OPERATING PRESSURES AND TEMPERATURES

Lube Oil Pressure - Normal	35-40	PSI
Lube Oil Temperature - Normal IN	140-150	F
Lube Oil Temperature - Normal OUT	165-175	F
Jacket Water Temperature - Normal OUT	170-180	F **
Intercooler Water Temperature - Normal IN	120	F

4. SET-UP TORQUES FOR STUDS AND BOLTS

NOTE: Torque figures are for threads lubricated with engine oil or similar petroleum base lubricants - DO NOT USE ANY COMPOUNDS CONTAINING MOLYBDENUM DISULFIDE AS A THREAD LUBRICANT.

	<u>FOOT POUNDS</u>
Main Bearing Cap Bolts	350-375
Block to Bed Stud Nuts	275-300
Camshaft Sprocket Clamp Ring Capscrews	65-75
Connecting Rod Bolt Nuts	280-300
Cylinder Head Stud Nuts	380(HOT)
Rocker Arm Bracket Capscrews	125
Camshaft Bearing Cap Capscrews	45-51
Flywheel Capscrews	720-780
Cam Follower Bracket Capscrews	45-51
Crankshaft Sprocket Assembly Bolt Nuts	85-95
Vibration Damper Capscrews	300-325
End Cover Capscrews	65-75
Spark Plug - 18mm (w/o Torque Wrench 1/4 Turn)	32-38

SECTION A

8. STANDARD SIZES, CLEARANCES, AND WEAR LIMITS

	STANDARD DIMENSION (Inches)		MAX. (OR MIN.) ALLOWABLE WORN SIZE OR CLEARANCE (Inches)
Cylinder Liner Bore	10.000	10.002	
Top Ring Travel Area (Any Point)			10.020
Bottom of Liner			10.007
Piston Skirt Diameter (Bottom)	9.991	9.990	9.985
Piston Clearance (Skirt Bottom) .....	.009	.012	.015
Piston Compression Ring #1			
Gap .....	.050	.060	.190
Ring Width .....	.1880	.1865	
Ring Groove Width .....	.193	.194	.199
Ring Side Clearance .....	.0050	.0075	.015
Piston Compression Rings #2, #3, and #4			
Gap .....	.040	.060	.190
Ring Width .....	.1880	.1865	
Ring Groove Width .....	.191	.192	.197
Ring Side Clearance .....	.0030	.0055	.015
Piston Oil Ring			
Gap .....	.035	.050	.090
Ring Width .....	.310	.3115	
Ring Groove Width .....	.313	.314	.318
Ring Side Clearance #5 and #6 .....	.0015	.0040	.008
Piston Pin Diameter	3.4985	3.4975	3.496
Piston Bore for Pin	3.501	3.500	3.503
Piston Pin Clearance in Piston .....	.0015	.0035	.005
Connecting Rod Bushing Bore	3.5020	3.5015	3.503
Piston Pin Clearance in Rod .....	.0030	.0045	.005
Connecting Rod Eye			
Side Clearance in Piston .....	.020	.035	.045
Connecting Rod Big End Bearing Bore ...	6.3790	6.3824	
Bearing Shell Wall Thickness .....	.2045	.2033	Surface Inspection
Crankpin Diameter	6.376	6.374	6.370
Crankpin Bearing Clearance .....	.0030	.0084	.012
Crankpin Length	6.248	6.253	
Width of Two Rods	6.000	5.992	
Side Clearance of Rods .....	.248	.261	

SECTION A

	STANDARD DIMENSION (Inches)		MAX. (OR MIN.) ALLOWABLE WORN SIZE OR CLEARANCE (Inches)
Main Bearing Bore	8.0050	8.0084	
Main Bearing Shell Wall Thickness .....	.2650	.2638	Surface Inspection
Main Journal Diameter	8.001	7.999	..... 7.995
Main Bearing Clearance .....	.0040	.0094	..... .013
Crank Thrust Bearing Width	5.496	5.493	..... 5.488
Crank Thrust Shoulder Span	5.506	5.508	..... 5.516
Crankshaft End Play .....	.010	.015	..... .025
Camshaft Bearing Bushing Bore	2.753	2.7546	
Camshaft Diameter	2.750	2.749	
Camshaft Bearing Clearance .....	.003	.0056	..... .010
Camshaft End Play .....	.005	.008	
Camshaft/Governor Drive Gear Lash .....	.004	.008	
Valve Rocker Arm Bore (Bushing in Place)	1.5036	1.5006	
Rocker Shaft Diameter	1.4995	1.4990	
Shaft to Bushing Clearance .....	.0011	.0046	..... .010
Side Clearance .....	.005	.010	
Valve Stem Diameter .....	.871	.870	
Valve Guide Bushing Bore .....	.874	.875	
Stem to Bushing Clearance .....	.002	.004	..... .006
Gas Admission Valve Stem Diameter.....	.4975	.4965	
Gas Admission Valve Bushing Bore.....	.500	.501	
Clearance .....	.0025	.0045	..... .006
Lubricating Oil Pump/Crankshaft Gear Backlash .....	.005	.008	
Lubricating Oil Pump Internal Gear Backlash .....	.011	.015	..... .020
Lubricating Oil Pump Gear End Play (002-914 Pump) .....	.016	.022	..... .026
End Play (033-639 Pump) .....	.025	.034	..... .037
Lubricating Oil Pump - Radial Clearance Between Gear Teeth and Housing Bore .....	.012	.013	..... .015
Lubricating Oil Pump Shaft Diameter ...	1.750	1.7495	
Lubricating Oil Pump Bushing Bore	1.753	1.754	
Clearance .....	.0030	.0045	..... .008

GENERAL COMPRESSOR DATAA. FOREWORD

The Superior Compressor is of compact design and has been efficiently engineered for reliable, continuous, heavy duty and long life with trouble-free operation. These ruggedly constructed, balanced-opposed type compressor units are built to the same high precision, high quality, field proven standards as the Superior engines. Ready accessibility of all wearing parts mean simplified maintenance and dependable service. The balanced-opposed design, with two crankthrows separated by a crank cheek, has become the modern standard for reciprocating compressors.

Main and connecting rod bearings are of thin wall, steel backed, split, precision design. The crankshaft can be removed through the top of the base without disturbing the cylinders. An extension of the crankshaft at the auxiliary end can be used to drive additional accessories. The lube oil pump and the force feed lubricator are gear driven and mounted on the auxiliary end cover. Either may be removed independently.

Lube oil is drawn from the sump through a screen type strainer which protects the lube oil pump. An oversize, full-flow lube oil filter, with built-in bypass, protects all frame running parts.

All cylinders fit interchangeably on the standard crosshead guide. Attention has been given to the cooling of all cylinder designs.

Clearance pocket plugs are provided in the head end of all cylinders. Clearance plugs are interchangeable with clearance bottle fittings.

The purpose of this manual is to acquaint the compressor operating and maintenance personnel with the design and construction of the unit. If the functions of the various parts are known and understood, proper maintenance at the proper time is made somewhat easier. Further, in the parts list section, the complete compressor unit is divided into assembly drawings so that service parts are readily identifiable for ease of ordering.

A nameplate on the frame gives the Compressor Model, Frame Serial Number, Stroke and Speed. Each cylinder has a nameplate which gives the Compressor Cylinder Diameter, Cylinder Class, Stroke, Compressor Cylinder Serial Number and the Maximum Working Pressure (M. W. P.).

SECTION 1

B. RECOMMENDED CLEARANCES

(Note: All Clearances in Inches)

	Standard Clearance
Crankshaft Thrust -----	.011 - .022
Crankshaft Horizontal (Bearing) -----	.004 - .0084
Connecting Rod Thrust -----	.014 - .027
Connecting Rod Bearing -----	.004 - .0084
Crosshead Pin to Bushing -----	.003 - .006
Crosshead to Guide -----	.010 - .015
Gear Backlash - Auxiliary End -----	.004 - .006
Lube Oil Pump Shaft to Bushing -----	.0015 - .0045
Force Feed Lubricator Drive Shaft to Bushing ---	.001 - .003
End Play - Lube Oil Pump - W62 -----	.004 - .007
W64/W66/W68 -----	.005 - .008
End Play - Force Feed Lubricator Drive Shaft ---	.0005 - .0025

Piston End Clearance -

2/3 on Head End -----	Approx.	.080 HE
1/3 on Crank End -----	Approx.	.040 CE

SECTION 1

C. RECOMMENDED TORQUES

(NOTE: All Torque Figures for lubricated threads.)

	<u>FOOT POUNDS</u>
Connecting Rod Nut - 1-14 NS	250 - 260
Main Bearing Cap Nut - 7/8-14	180 - 200
Base Spacer Bolt - 1-1/8 - 12 NF	380 - 410
Crosshead Pin Thru Bolt Nut - 3/4 - 16 NF	** 65 - 75
Allen Screws for Rod Packing - 5/8 - 11 NC	60 - 65
Crosshead Shoe - Flat Head Screw - 1/2 - 20 NF	25 - 30
Piston to Piston Rod Nut - 1-1/2 - 12 NF	700 - 750
Piston to Piston Rod Nut - 2 - 12 NF	1760 - 2150
Balance Nut Torque - 2-1/4 - 8 UN	1500 - 2000
All Nuts - 3/4 - 16 NF	105 - 115
All Nuts - 7/8 - 14 NF	170 - 190
All Nuts - 1 - 14 NF	260 - 290
All Nuts - 1-1/8 - 12 NF	*370 - 410
All Nuts - 1-1/4 - 12 NF	*520 - 570
All Nuts - 1-3/8 - 12 NF	700 - 770
All Nuts - 1-1/2 - 12 NF	930 - 1030
2500# Steel Cylinder - 1-3/4 Jackscrew	850 - 900

Valve Center Bolts:

<u>Valve Size</u>	<u>Center Bolt Torque Ft. Lbs.</u>
2.375	3-5
3.25	3-5
4.00 (Slotted Seat)	13-15
4.00 (Drilled Seat)	29-32
5.25	13-15
5.75	18-20
7.00	18-20
8.00	18-20
9.125	18-20

*NOTE:

*Torque Valve Cap Nuts on 3-3/4" and Smaller Diameter Cylinders or Cylinders with Working Pressure of 4000 PSI or Greater to 300 Ft. Lbs.

**Each crosshead pin to be checked two hours after first being placed in service, retorquing bolt nut to 105-115 Ft. Lb.

This procedure to again be followed at the end of one week's service, at which time each pin should be in a stable and permanent position.

GENERAL COMPRESSOR DATAA. FOREWORD

The White Compressor is of compact design and has been effeciently engineered for reliable, continuous, heavy duty and long life with trouble-free operation. These ruggedly constructed, balanced-opposed type compressor units are built to the same high precision, high quality, field proven standards as the White-Superior engines. Ready accessibility of all wearing parts mean simplified maintenance and dependable service. The balanced-opposed design, with two crankthrows separated by a crank cheek, has become the modern standard for reciprocating compressors.

Main and connecting rod bearings are of thin wall, steel backed, split, precision design. The crankshaft can be removed through the top of the base without disturbing the cylinders. An extension of the crankshaft at the auxiliary end can be used to drive additional accessories. The lube oil pump and the force feed lubricator are gear driven and mounted on the auxiliary end cover. Either may be removed independently.

Lube oil is drawn from the sump through a screen type strainer which protects the lube oil pump. An oversize, full-flow lube oil filter, with built-in bypass, protects all frame running parts.

All cylinders fit interchangeably on the standard crosshead guide. Attention has been given to the cooling of all cylinder designs.

Clearance pocket plugs are provided in the head end of all cylinders. Clearance plugs are interchangeable with clearance bottle fittings.

The purpose of this manual is to acquaint the compressor operating and maintenance personnel with the design and construction of the unit. If the functions of the various parts are known and understood, proper maintenance at the proper time is made somewhat easier. Further, in the parts list section, the complete compressor unit is divided into assembly drawings so that service parts are readily identifiable for ease of ordering.

A nameplate on the frame gives the Compressor Model, Frame Serial Number, Stroke and Speed. Each cylinder has a nameplate which gives the Compressor Cylinder Diameter, Cylinder Class, Stroke, Compressor Cylinder Serial Number and the Maximum Working Pressure (M. W. P.).

SECTION 1

MWB COMPRESSOR

B. RECOMMENDED CLEARANCES

(Note: All Clearances in Inches)

	Standard Clearance
Crankshaft Thrust -----	.006 - .015
Crankshaft Horizontal (Bearing) -----	.004 - .0084
Connecting Rod Thrust -----	.008 - .012
Connecting Rod Bearing -----	.004 - .0084
Crosshead Pin to Bushing -----	.005 - .006
Crosshead to Guide -----	.010 - .015
Gear Backlash - Auxiliary End -----	.006 Min.
Lube Oil Pump Shaft to Bushing -----	.0015 - .0045
Force Feed Lubricator Drive Shaft to Bushing ---	.001 - .0035
End Play - Lube Oil Pump -----	.002 - .003
End Play - Force Feed Lubricator Drive Shaft ---	.002 - .010
Piston to Cylinder - Minimum Clearance Per Inch of Bore Diameter	
C.I. Piston (over 5" Dia.) -----	.0015
C.I. Piston (5" Dia. and under) -----	.002
Aluminum Piston -----	.0025
Aluminum Piston (With Rider Ring) ---	.007
Piston End Clearance -	
2/3 on Head End ----- Approx.	.080 HE
1/3 on Crank End ----- Approx.	.040 CE

C. RECOMMENDED TORQUES

(Note: All torque figures for lubricated threads)

	Foot Pounds
Connecting Rod Nut - 1-14 NS -----	250-260
Main Bearing Cap Nut - 7/8-14 -----	180-200
Base Spacer Bolt - 1-1/8 - 12 NF -----	380-410
Crosshead Pin Thru Bolt Nut - 3/4 - 16 NF -----	65-75
Allen Screws For Rod Packing - 5/8 - 11 NC -----	60-65
Crosshead Shoe - Flat Head Screw - 1/2 - 20 NF --	25-30
Piston to Piston Rod Nut - 1-1/2 - 12 NF -----	700-750
Piston to Piston Rod Nut - 2 - 12 NF -----	1025-1100
All Nuts - 3/4 - 16 NF -----	105-115
All Nuts - 7/8 - 14 NF -----	170-190
All Nuts - 1 - 14 NF -----	260-290
All Nuts - 1-1/8 - 12 NF -----	370-410
All Nuts - 1-1/4 - 12 NF -----	* 520-570
All Nuts - 1-3/8 - 12 NF -----	700-770
All Nuts - 1-1/2 - 12 NF -----	930-1030
2500# Steel Cylinder - 1-3/4 Jackscrew -----	850-900

* NOTE:

Torque Valve Cap Nuts on W6AS, W6BRS, and W6BS cylinders, using rectangular gasket, to 300 foot pounds.

THOMAS FLEXIBLE COUPLING

Coupling Size	Bolt Size	Thds. /In.	"T" Torque (Ft. Lbs.)	Dimension "D" Ref. Sec. 4, Fig. 4-3
500	3/4	16	265	8-3/4
550	7/8	14	350	9-7/8
600	1.0	14	490	10-7/8
700	1-1/8	12	635	12-7/16
750	1-1/4	12	835	13-1/2
800	1-3/8	12	1085	14-3/4
850	1-1/2	12	1425	15-3/4

SECTION 1

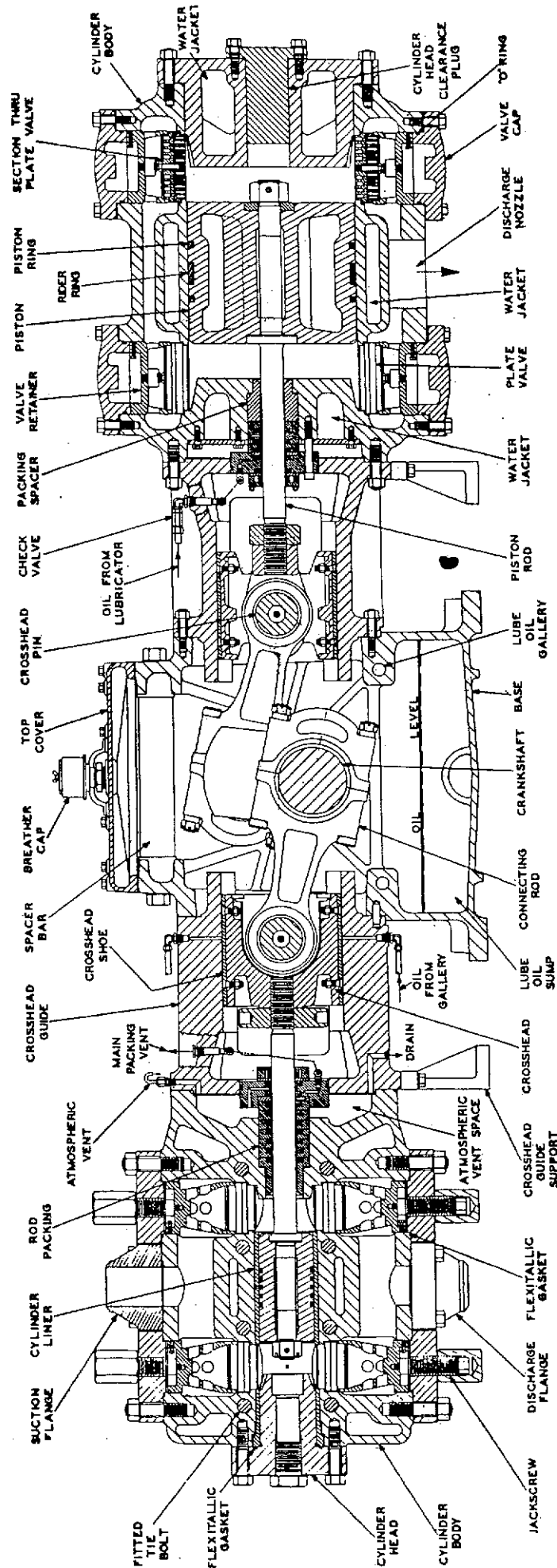
MWB COMPRESSOR

NOTE: Coupling bolts are tightened at the factory for shipping purposes only. When installing coupling, the above tightening torques apply to bolts and locknuts as they are received from the factory. If any additional lubricant is used or if threads are wiped dry, tightening torques must be modified.

BOLT HEAD SHOULD BE HELD AND LOCKNUT ONLY TURNED WHEN TIGHTENING COUPLING BOLTS.

D. CRANKSHAFT ROTATION

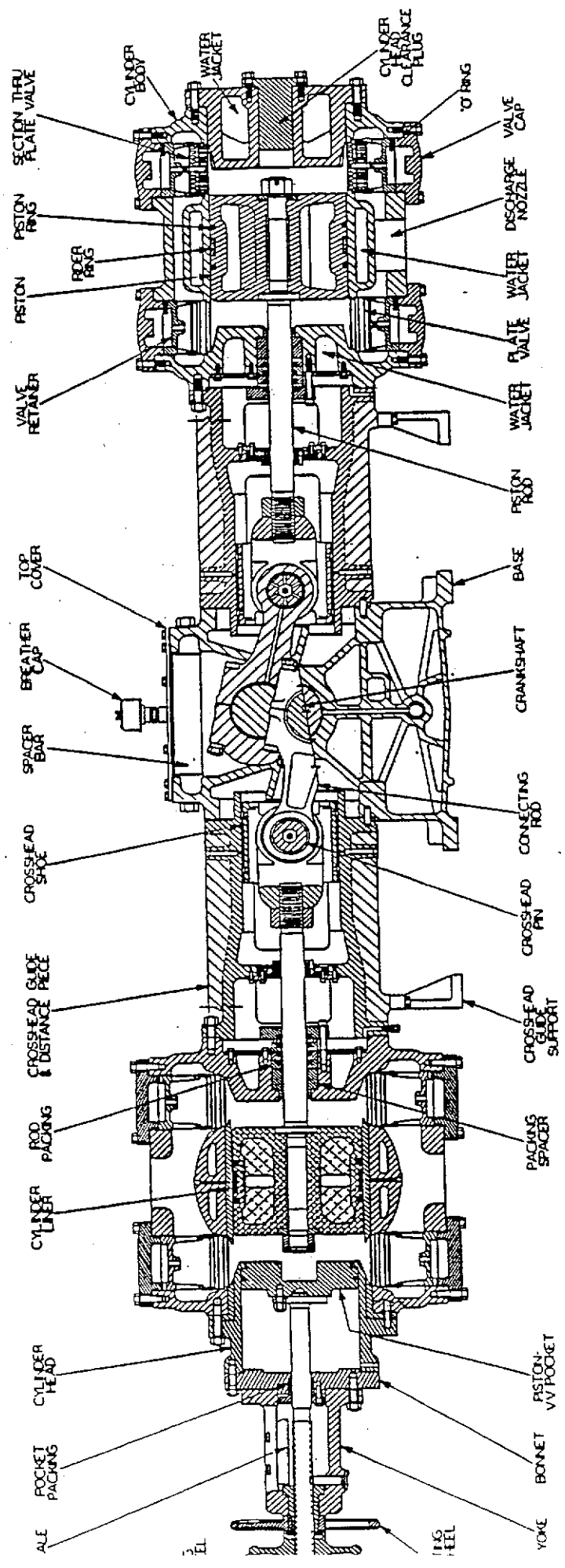
FACING DRIVE END - CLOCKWISE



TYPICAL LOW PRESSURE CYLINDER

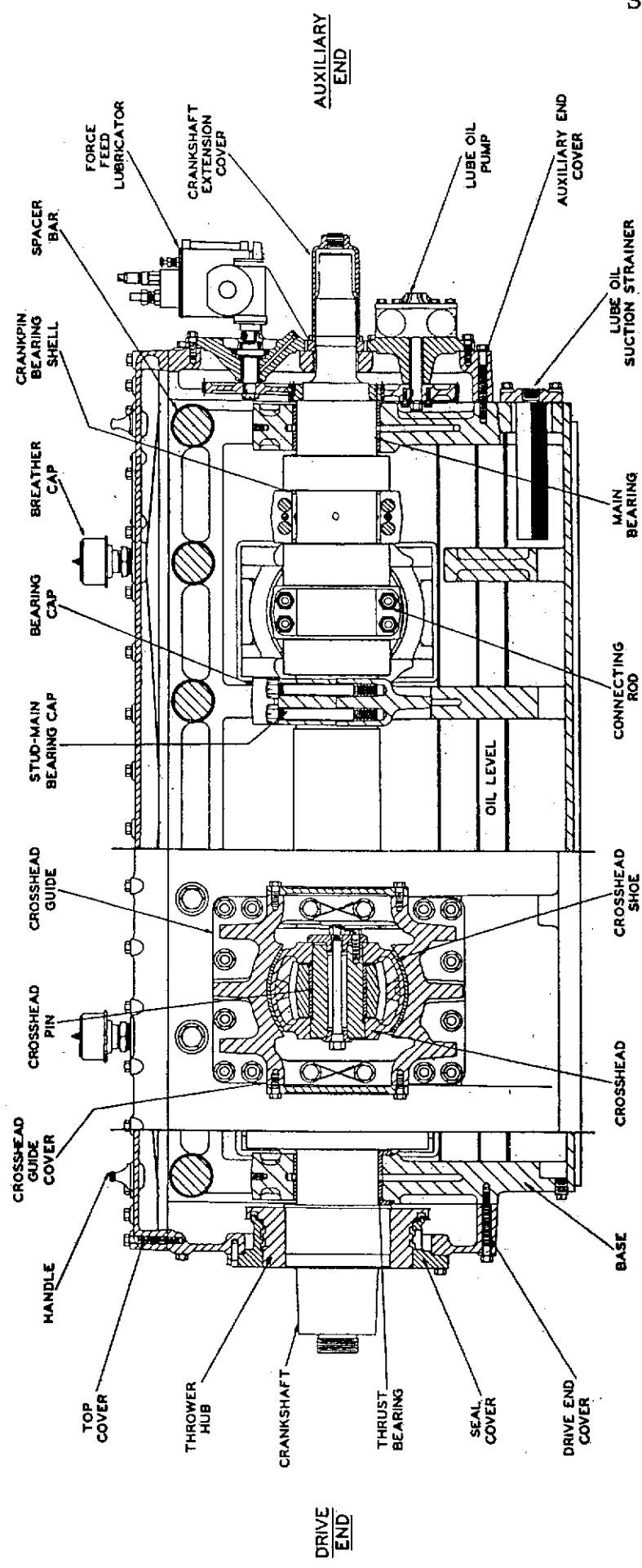
TRANSVERSE CROSS SECTION
WHITE COMPRESSOR

TYPICAL HIGH PRESSURE CYLINDER



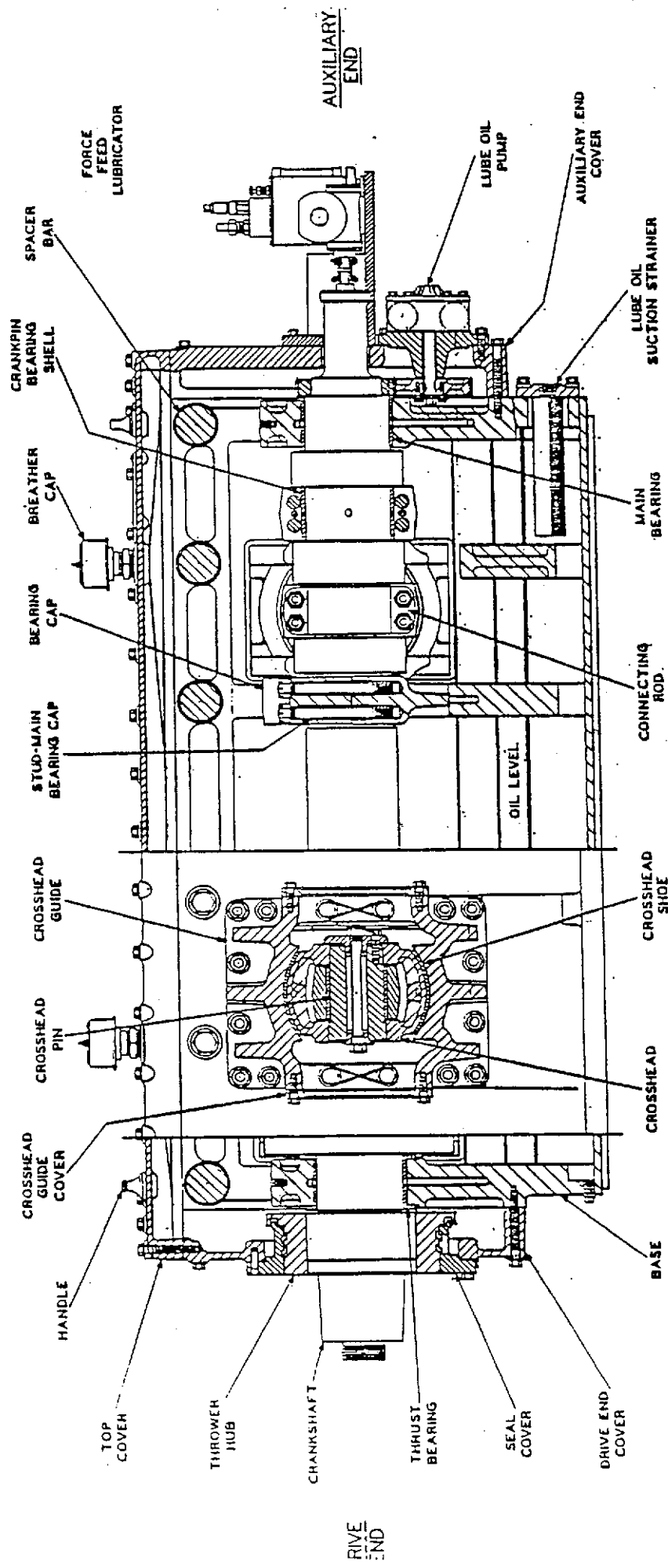
TYPICAL
LOW PRESSURE CYLINDER

TRANSVERSE CROSS SECTION



LONGITUDINAL CROSS SECTION
WHITE COMPRESSOR

PLATE NO.
PJ-2059



LONGITUDINAL CROSS SECTION
COMPRESSOR

MODEL: W-74 COMPRESSOR

RECOMMENDED CLEARANCES

(Note: All Clearances in Inches)

Standard Clearances

Crankshaft Thrust -----	0.010 -	0.015
Crankshaft Horizontal (Bearing) -----	0.004 -	0.0094
Connecting Rod Thrust -----	0.014 -	0.027
Connecting Rod Bearing -----	0.004 -	0.0094
Crosshead Pin to Bushing -----	0.003 -	0.006
Crosshead to Guide -----	0.010 -	0.015
Force Feed Lubricator Drive Gear Backlash -----	0.014 -	0.016
Force Feed Lubricator Drive Shaft to Bushing -----	0.001 -	0.0035
End Play - Force Feed Lubricator Drive Shaft -----	0.0005 -	0.0025
Lubricating Oil Pump Drive Gear Backlash -----	0.010 -	0.014
Lubricating Oil Pump Internal Gear Backlash -----	0.012 -	0.015
Lubricating Oil Pump Gear End Play -----	0.0056 -	0.0134
W72 (939-880) -----	0.012 -	0.016
W74 (004-290) -----	0.012 -	0.016
W76 (939-383) -----	0.016 -	0.022
Lubricating Oil Pump - Radial Clearance Between Gear Teeth and Housing Bore -----	0.004 -	0.005
Lubricating Oil Pump Shaft Diameter		
W72 & W74 -----	1.3750 -	1.3745
W76 -----	1.7500 -	1.7495
Lubricating Oil Pump Bushing Bore		
W72 & W74 -----	1.3770 -	1.3780
W76 -----	1.753 -	1.754
Clearance Between Shaft & Bushing		
W72 & W74 -----	0.0020 -	0.0035
W76 -----	0.0030 -	0.0045
Piston End Clearance -		
2/3 on Head End -----	Approx.	.080 HE
1/3 on Crank End -----	Approx.	.040 CE

C. RECOMMENDED TORQUES

(NOTE: All torque figures for lubricated threads)

<u>DESCRIPTION</u>	<u>SIZE</u>	<u>TORQUE FOOT POUNDS</u>
Connecting Rod	1-1/8 - 12	430 - 460
Main Bearing Cap Nut	1-1/8 - 12	430 - 460
Base Spacer Bolt	1-1/4 - 12	640 - 700
Crosshead Pin Thru Bolt Nut	3/4 - 16	**105 - 115
Socket Head Capscrews	5/8 - 11	60 - 70
Crosshead Shoe Flathead	1/2 - 20	35 - 45
Balance Nut Torque	2-1/2 - 8	2300 - 2800
Balance Nut Torque	2-1/2 - 10	2650 - 3250
Piston to Piston Rod Nut	2 - 8	1180 - 1265
All Nuts	1/4	4 - 6
All Nuts	3/8	12 - 18
All Nuts	1/2	35 - 45
All Nuts	5/8	60 - 70
All Nuts	3/4	120 - 140
All Nuts	7/8	200 - 220
All Nuts	1	260 - 290
All Nuts	1-1/8	370 - 410
All Nuts	1-1/4	520 - 570
All Nuts	1-3/8	700 - 770
All Nuts	1-1/2	930 - 1030
2500 Lb. Steel Cylinder - 1-3/4" Jackscrew		850 - 900
JACK SCREW LOCK NUT		200 - 250

NOTE: All capscrews and nuts should be S.A.E. Grade 5 Quality.

Valve Center Bolts:

<u>Valve Size</u>	<u>Center Bolt Torque Ft. Lbs.</u>
2.375	3-5
3.25	3-5
4.00 (Slotted Seat)	13-15
4.00 (Drilled Seat)	29-32
5.25	13-15
5.75	18-20
7.00	18-20
8.00	18-20
9.125	18-20

*NOTE:

*Torque valve cap nuts on 3-3/4" and smaller diameter cylinders or cylinders with working pressure of 4000 PSI or greater to 300 Ft. Lbs.

**Each crosshead pin to be checked two hours after first being placed in service, retorquing bolt nut to 105-115 Ft. Lb.

This procedure to again be followed at the end of one week's service, at which time each pin should be in a stable and permanent position.

SECTION 1

THOMAS FLEXIBLE COUPLING

Coupling Size	Bolt Size	Thds./In.	"T" Torque (Ft. Lbs.)	Dimension "D" Ref. Sec. 4, Fig. 4-3
500	3/4	16	265	8-3/4
550	7/8	14	350	9-7/8
600	1.0	14	490	10-7/8
700	1-1/8	12	635	12-7/16
750	1-1/4	12	835	13-1/2
800	1-3/8	12	1085	14-3/4
850	1-1/2	12	1425	15-3/4

NOTE: Coupling bolts are tightened at the factory for shipping purposes only. When installing coupling, the above tightening torques apply to bolts and locknuts as they are received from the factory. If any additional lubricant is used or if threads are wiped dry, tightening torques must be modified.

BOLT HEAD SHOULD BE HELD AND LOCKNUT ONLY TURNED WHEN TIGHTENING COUPLING BOLTS.

D. CRANKSHAFT ROTATION

FACING DRIVE END - CLOCKWISE

BALANCING CES/SUPERIOR COMPRESSORS

CES/SUPERIOR manufactures balanced-opposed reciprocating compressors having 1 to 8 cylinders. The cylinders range in size from 2-7/8" to 26-1/2" diameter and may be mounted on the frames in many combinations.

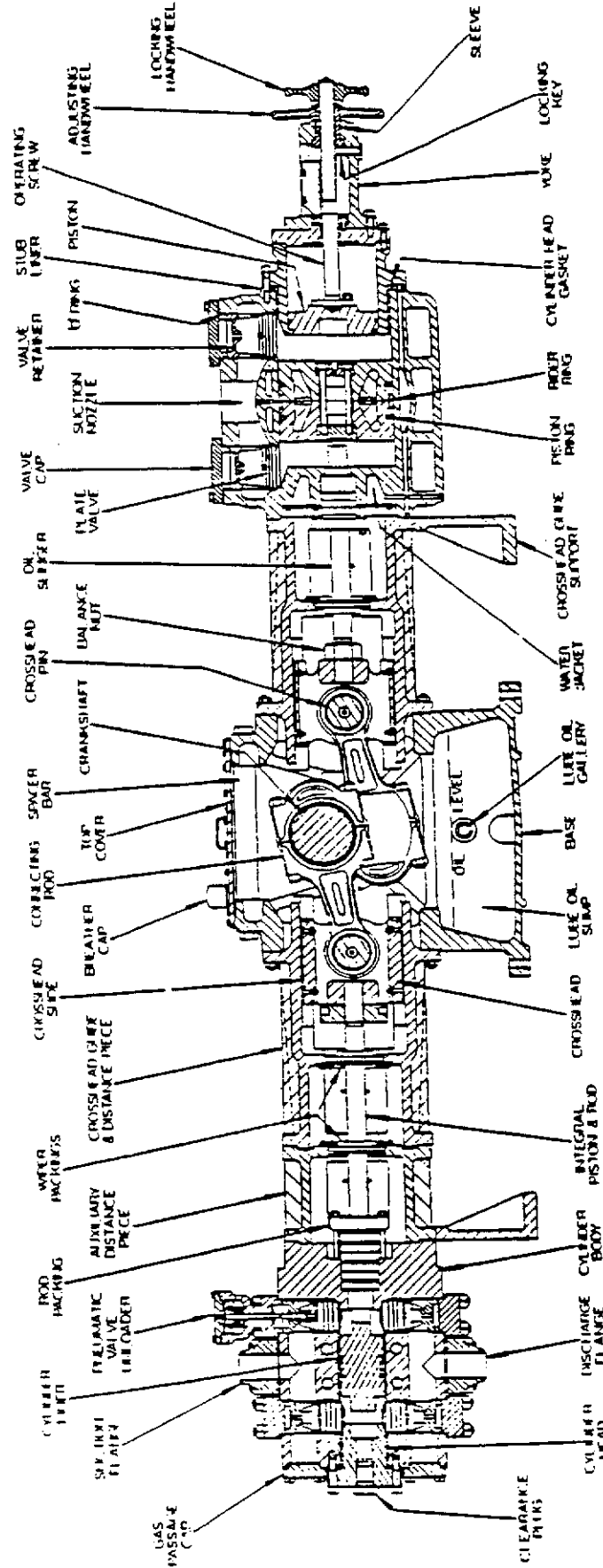
Since it is our goal to produce a balanced opposed compressor, we must attempt to make the reciprocating weights on each pair of opposing throws approximately the same. This is quite a task, in view of the large number of cylinder sizes and throw location combinations that are possible, and because each piston and rod assembly (piston, rings, piston rod and piston nut) has a certain combined weight which will probably be different from the weight of the piston assembly that it will oppose.

Balancing of the unit is accomplished by using both an appropriate weight crosshead assembly and a piston rod jam nut (balance nut) to obtain a maximum weight difference of 2 pounds on the opposing throws. The crosshead assembly consists of a pair of shoes, the bolts and nuts to attach the shoes, and the crosshead. There are several different weight crossheads available. Also available are balance nuts which weigh from 5 to 40 lbs., in 5 lb. increments (standard), along with 50 lb., 58 lb., and 67 lb balance nuts (special). (Consult Superior Engineering for details concerning the use of the special weight nuts.) In addition to the above mentioned balance parts, the connecting rod weight is also involved in the balance. Connecting rods vary in weight and, when the units are assembled at the factory, care is taken to select the connecting rods so that the weight variation for opposing throws does not exceed 1 lb.

Every effort should be made to achieve as near equal balance between opposite throws as possible. REMEMBER: WE PERMIT A MAXIMUM ALLOWABLE VARIATION OF TWO POUNDS ON THE RECIPROCATING WEIGHTS AND ONE POUND ON THE CONNECTING ROD WEIGHTS FOR EACH PAIR OF OPPOSING THROWS. This does not apply to adjacent throw pairs, which sometimes vary by 100 lbs. or more, and will not cause problems.

The estimated balance for the original assembly of a compressor is recorded on the Compressor Torsional and Balance Data Sheet. A copy of the data sheet for this compressor is included in the Instruction Manual, and should be referred to in the event a change which would affect the balance is contemplated. The actual weight of parts can vary from the estimated weights. Also, when replacing crossheads, connecting rods, pistons, or changing piston ring material, the new parts should be weighed in order to reaffirm the actual unit balance. CAUTION: FAILURE TO VERIFY AND CORRECT UNIT BALANCE CAN RESULT IN EXCESS MECHANICAL VIBRATION, CAUSING FRAME CRACKING, PIPING VIBRATION, FOUNDATION CRACKING, ETC.

REV. 9/93



TYPICAL
LOW PRESSURE
CYLINDER

TRANSVERSE CROSS SECTION
W7 COMPRESSOR

TYPICAL
HIGH PRESSURE
CYLINDER

Section 7

Maintenance

General

The diligent observation of the inspection and maintenance procedure, given in this section, will go a long way toward insuring satisfactory operation of the compressor. Ajax-Superior recommends planned periodic inspections of equipment. Regardless of the gas compressors, malfunctions can occur. Faithful preventative maintenance and the use of Genuine Superior Parts will help prevent costly down time, repairs, and replacement costs. Planned shutdowns for doing preventative maintenance will result in minimum maintenance costs and maximum mechanical efficiency of your equipment. Good preventative maintenance practice includes a periodic check of critical bolt torques, such as compressor main and connecting rod bolts and drive coupling bolts.

The following paragraphs contain valuable precautions, tolerance limits, and recommended torque values.

Precautions

Follow the precautions listed below when any maintenance is performed. Damage to the equipment, personal injury or death may result if these precautions are not followed.

- a. Block the flywheel to prevent rotation of the compressor and driver.
- b. Remove all gas by unloading, venting, and then "blinding" the compressor. Blinding means to shut off all block valves so there can be no process gas flow to the compressor.
- c. Eliminate all internal pressures by removing cylinder indicator plugs or vent through indicator cocks, if provided.
- d. Prevent clogged oil lines or filters by using only lint free cloths.
- e. Insure all tools and work areas are clean and free of oil, water, dirt, dust or grit.
- f. Never file, grind or scrape any lubricated parts (i.e. bearing shells or saddles).
- g. Never distort or mark the piston rod with any tool or device. Rods that are bent or have burrs will damage the packing or prevent it from sealing. In severe cases, the rod could break.

SUPERIOR

- h. Never torque or tighten any nut, cap screw or stud if threads or mating threads are covered with paint or other materials that are not specified by Ajax-Superior for use on threads.
- i. It is recommended that genuine Superior parts replace any components which are changed.
- j. Do not refinish worn valve plates.
- k. When reassembling parts during maintenance, replace all worn or damaged gaskets and seals.
- l. Always install new cotter pins or lockwire.
- m. Check and clean all lubricating oil passages when the unit is down for repair or normal maintenance.
- n. After a long period of shutdown or a major overhaul, frequently check the unit during the first 300 hours of operation.
- o. After completing maintenance, remove any locking or blocking devices before attempting to rotate the equipment.

Warning

When work is being done on the compressor, the driving unit must be blocked in such a way that the compressor cannot turn over. Block valves must be closed on the suction and discharge lines. Air or gas must be bled off from the cylinders. Precaution must be taken to prevent the opening of any valve which would release pressure against a piston, causing it to rotate the unit at a critical moment.

Acceptable Tolerance Values

Table 7-1 shows tolerance values for some critical components. When a part is first installed, the tolerance should be within the range shown under "First Installed". If not, the part is defective or has been incorrectly installed. During inspections, tolerances found exceeding the "Maximum Limit" values indicate worn parts that should be replaced.

Table 7-1 Acceptable Tolerances

Assemblies	Limits inch (mm)
Crankshaft - Main Bearing (MH6 & WH6)	.004 - .0084 (.102 - .2133)
Connecting Rod Bearing (WH6)	.004 - .0084 (.102 - .2133)

Table 7-1 Acceptable Tolerances

Connecting Rod Bearing (MH6)	.004 - .0096
Crosshead Pin to Connecting Rod Bushing (WH6)	.003 - .0045 (.076 - .1143)
Crosshead Pin to Connecting Rod Bushing (MH6)	.003 - .004
Crankshaft End Play - Thrust Bearing WH6 & MH6	.011 - .022 (.028 - .056)
Crosshead Pin to Crosshead (WH6)	.0015 - .0035 (.0381 - .0889)
Crosshead Pin to Crosshead (MH6)	.0015 - .003
Crankshaft Web Deflection (MH6 & WH6)	.000 - .001 (.000 - .025)
Connecting Rod Thrust (WH6)	.014 - .027 (.035 - .068)
Connecting Rod Thrust (MH6)	.017 - .029
Gear Backlash -Aux End Lube Oil Pump (WH6)	.004 - .006 (.000 - .025)
Gear Backlash -Aux End Lube Oil Pump (MH6)	.003 - .007
Crosshead To Guide (WH6)	.007 - .020 (.178 - .508)
Crosshead To Guide (MH6)	.014 - .022
Lube Oil Pump Drive Gear Backlash (WH6 & MH6)	.006 - .010 (.152 - .254)

Torque Recommendations

To insure satisfactory compressor performance and to minimize costly failures, it is extremely important to tighten all nuts and bolts to the recommended torque values specified in Table 7-2. Additional information is given in Service Bulletins 168 and 175. Follow the following general recommendations.

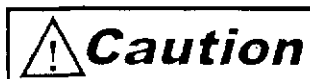
Torque wrenches should not be used to "Break Loose" fasteners. Use an appropriate wrench or breaker bar.

Hand position is critical. Only pull from the hand hold to assure accuracy.

The torque wrench supplied with Superior equipment is a heavy-duty, adjustable "click-type" wrench. It will only torque in the clockwise direction.

Occasionally clean and lubricate the ratcheting head with light oil, NOT GREASE.

Periodic Calibration is essential to ensure accuracy.



When tightening nuts and bolts on compressor valve caps, bottles, and flanges care must be taken to exercised to avoid excessive tightening. Over-tightening can result in unnecessary stress in the cylinder body and, in the case of valve caps, can result in valve seat distortion.

Critical Bolt Torques

It is critical that the following preventative maintenance schedule be followed to prevent major damage to your compressor. Check all critical bolt torques on major engine components as follows:

One month after unit is placed in service.

Six months after unit is placed in service.

Every twelve months thereafter.

Repeat this schedule when the compressor is rebuilt, overhauled, or has major repairs.

All torque values shown in Table 7-2 are based on threads which are clean, free of burrs, paint, etc. and lubricated with engine oil or similar petroleum base lubricants. Unless specified, DO NOT USE any compounds containing Molybdenum Disulfide as a thread lubricant. Due to its high lubricity, excessive stresses will result if used with the torque values given in Table 7-2.

Table 7-2 Recommended Torques

Fastener (S.A.E. Grade 5 or Better)	Size	Torque Ft-Lb (N-m)
Specific Torque Values		
Main Bearing Cap (MH6 & WH6)	3/4 - 10 UNC	185-200 (251-271)
Connecting Rod Cap		
MH6	1" - 8 UNJ	430 - 450 (583 - 610)
WH6	1" - 8 UNJ	480 - 520
Spacer Bar (MH6 & WH6)	1 1/8" - 7 UNC	380 - 400 (515 - 542)
Crosshead Guide to Frame (MH6 & WH6)	7/8" - 9 UNC	200 - 220 (271 - 298)
Cylinder to Crosshead Guide (MH6 & WH6)	7/8" - 9 UNC	200 - 220 (271 - 298)
Shoe to Crosshead		
MH6	1/2" - 20 UNF	30 - 35
WH6	3/8" - 16 UNC	18 - 22 (24 - 30)
Balance Nut		
MH6	2 1/4" - 10 UNS	1900-2300 (2575- 3100)
WH6	2 1/2" - 10 UNS	2650-3250 (3593-4406)
Piston to Piston Rod		

Table 7-2 Recommended Torques

MH6 AND WH6	2" - 8 UN (for through rod)	1500 - 1600 (2034 - 2169)
	7/8" - 9 UNC	200 - 220 (271 -298)
General Torque Values		
All Fasteners		
	1/4"	4 - 6 (5 - 8)
	3/8"	12-18 (16-24)
	1/2"	35-45 (47-61)
	5/8"	60-70 (81-95)
	3/4"	120-140 (163-190)
	7/8"	200-220 (271-298)
	1"	260-290 (353-393)
	1-1/8"	370-410 (502-556)
	1-1/4"	520-570 (705-773)
	1-3/8"	700-770 (949-1044)
	1-1/2"	930-1030 (1261-1396)
Special Torque Values		
Cylinder Number	Cylinder Diameter	Valve Cap Nut Torque (Ft/lbs)
615	6.00"	370
616	6.25"	370
617	6.75"	370
618	5.75"	300
619	6.25"	300
620	6.75"	300
621	7.25"	300

Component Maintenance

Base (Crankcase)

The base is made of high strength alloy iron and is heavily ribbed and reinforced for maximum rigidity. Large spacer bars provide further stability and ease reassembly. The top and end covers are individually removable to provide easy access to moving parts. Our open-top design allows the crankshaft to be easily removed. An oil sump is provided in the lower portion of the base. The line-bored main bearing supports have caps which are match-marked and numbered and must be assembled accordingly.

Crankshaft, Thrust And Main Bearings

The complete crankshaft assembly includes the drive end oil slinger and the auxiliary end drive gear. Both of these are shrunk onto the crankshaft, eliminating the need for keyways and keys. The crankshaft is drilled to carry lubrication from the main bearings to the connecting rod bearings.

The thrust bearing is a "half washer" type. It fits into a groove machined in the main bearing saddle and is held captive by the crankshaft, the main bearing saddle and the main bearing cap.

The upper and lower main bearing shells are interchangeable. After the compressor has been run, it is preferable that the shells be placed back in their original position. Therefore, upon removal of the bearing shells, they should be so marked.



Only use a pencil for marking on the parting line faces or in the groove of the bearing shells.

After removing the main bearing cap and the upper bearing shell, the lower bearing shell can be rolled out from underneath the crankshaft with the help of the main bearing removal tool. This is done by inserting the neck of the tool into the oil passage in the crankshaft journal. When the compressor is barred over, the tool will push the bearing shell out from underneath the journal and around to the top where it can be removed. A new bearing shell can be installed using the same procedure.

Carefully clean the crankshaft, bearing shells and saddles before attempting to replace the bearing shells. Under no circumstances should any filing, scraping, or other fitting be done on either bearing shells or saddles. The bearing cap nuts should be tightened uniformly (using a crisscross pattern) to the proper torque given in Table 7-2.

The main bearing clearance (tolerance value) can be checked by using a dial indicator and a hydraulic jack. Proceed as follows:

Several safety devices may be employed on compressor units. The most common ones and their recommended set points are listed in Table 7-3. Questions regarding these and other devices and their set points may be referred to the Energy Services Group Aftermarket office.

Table 7-3 Recommended Alarm Setpoint

Alarm/Shutdown	Normal Condition	Alarm Point	Shutdown Point
Oil Pressure	45-55 psig	25	20
Oil Temperature	160-180 F (Out)	185°F Out	190°F Out
Vibration	Nominal	1/4-3/8 turn from normal condition	3/8 - 1/2 turn from normal condition
Gas Temperature	Suction (TS) or Discharge (TD)	20°F above TS or TD	25°F above TS or TD
Water Temperature	T _{in} or T _{out}	20° F above T _{out} or T _{in}	25° F above T _{out} or T _{in}
Gas Pressure	Suction (PS) or Discharge (PD)	5% below PS 5% above PD	10% below PS 10% above PD

Recommended Maintenance Schedule

Adhering to Table 7-4 Recommended Maintenance Schedule will result in less equipment down time and less operating costs.

Table 7-4

System	Daily	Weekly	Monthly	Semi-Annually	Annually or as Needed
CONTROLS					
Perform safety shutdown system tests.				✓	
Note and record panel gauge readings.	✓				
Check calibration of all thermometers and pressure gauges.				✓	
LUBRICATION SYSTEM					
Check oil levels, oil level regulator, and oil sight level.	✓				
Check lubricator line connections for leakage.	✓				

piston ring material, the new parts should be weighted in order to reaffirm the actual unit balance.

Warning

Failure to verify and correct compressor balance can result in excessive mechanical vibration, frame cracking, piping vibration, foundation cracking and other damage to the compressor. It also creates a potentially UNSAFE operating condition for the operator.

Compressor System Vibration

Due to the nature of the horizontal compressor design, the reciprocating weights generate some vibrational forces. Proper balance of reciprocating weights on opposing throws will minimize this effect.

Compressor systems including skids, bottles, piping, valves and other components are subject to vibration. The design goal is to have a system free of vibrations in the normal operating speed range.

Operators and maintenance personnel should be alert for excessive system vibrations that can cause damage to equipment. Normally, clamping or adding additional support to a vibrating component will raise its natural frequency and eliminate the vibration problem.

Compressor cylinder mounting can be stiffened, if necessary, by attaching additional supports directly to the cylinder from the skid or foundation. Most cylinders now have a machined boss with drilled and tapped holes for attaching an outboard cylinder vibration suppression device. This is the preferred method of attachment.

Compressor Specifications

Table 2-1 Compressor Specifications*

Specification	Type Of Unit	
	MH6	WH6
Number of Throws	2-6	2-6
Stroke Inches (mm)	6 (152.4)	6 (152.4)
Speed Range - RPM	600-1200	600-1200
Horsepower Per Throw @ 1200 RPM-hp (kw)	900 (671)	900 (671)
Rod Load-kips (kg)	38 (17,237)	50 (22,680)
Rod Diameter - inches (mm)	2.25 (57.15)	2.5 (63.5)
Connecting Rod Length Center to Center - inches (mm)	14.5 (368.3)	15.0 (381.0)

Table 2-1 Compressor Specifications*

Crosshead Guide Bore Diameter - inches (mm)	10.5 (266.7)	12.75 (323.85)
Crosshead Pin Diameter - inches (mm)	4.0 (101.6)	4.75 (120.65)
Crosshead Shoe - Oiling Method	External	Internal
Lube Oil Filter Differential Pressure - Normal	< 5 psi	--
Lube Oil Filter Differential Pressure - Alarm Point	15 psi	--
Lube Oil Filter Differential Pressure - Shutdown	25 psi	--
Maximum Limit for Reciprocating Weights	397 lbs	397 lbs
* Subject to change without notice.		



February 3, 1996

Distributors, Agents & Representatives
EnDyn Domestic Salesman

SUBJ: Installation Data Sheets
Engine & Compressors
Individual New Parts & Assemblies
With Two (2) Year Warranty

Attached is our renewed attempt to encourage customers to complete and get **EnDyn** approval on installation data sheets for subject. The attached:

1. Outlines the parts covered in a simplified listing,
2. Clarifies our warranty,
3. Sets our internal policy to make sure the customer gets the IDS sheets with the parts and assemblies and,
4. Modifies the IDS sheets so we can get only the basic data we require.

Our goal has not changed. It's simply to try to make sure **PowerParts**[®] are properly installed and that they operate in the intended environment (for all mutual benefits).

We encourage each of you to communicate the above and ensure attached gets to each of your customers. Starting July 1, 1996 the first thing that's required prior to a return goods for/or warranty consideration is an applicable **EnDyn** approved IDS sheet on the part or assembly.

We solicit your help toward our renewed effort on subject.

Cordially,

Kevin Downes /ck

Kevin Downes

cc: Jim Stewart Jay Downes Jeff Terrell Robert del Alamo
Tracy Little Mike Cochran Lane Brooks Buzz Sawyers

300 West First
Alice, Texas 78332 USA
512.668.8311
800.723.6396
fax 512.668.3906
www.endyn.com



EnDyn
300 West First
Alice, TX 78332

DATE: _____
Fax No. 512-668-3906

SUBJ: 2 Year Warranty
Contingent Upon IDS Sheet
Completion, Return
And EnDyn Approval By:

ATTN: Quality Control Manager

Attached for your approval are the following IDS forms associated with the above referenced order.

IDS _____	IDS _____
IDS _____	IDS _____
IDS _____	IDS _____
IDS _____	IDS _____

If you have questions concerning the attached please feel free to contact me direct.

_____	CUSTOMER NAME:	_____
PRINT NAME	CUSTOMER ORDER NO.:	_____
_____	EnDyn INVOICE NO.:	_____
TELEPHONE NO.	(IF APPLICABLE)	_____
	DATE PARTS RECEIVED:	_____

300 West First
Alice, Texas 78332 USA
512.668.8311
800.723.6396
fax 512.668.3906
www.endyn.com

WARRANTY

Seller warrants indicated new goods of it's manufacture with approved (by Endyn, at 300 W. First, Alice, TX 78332) installation data sheets for two years from date of delivery against defects in material or workmanship. Note that warranties of goods made of other manufacture are assigned to Purchaser by delivery. Seller's obligation is one of the following options, viz.:

1. Replacement of goods with then in effect design,
2. Repair of goods returned (all freight by purchaser), or
3. Refund purchase price.

Seller shall have no obligation if goods become defective as a result of Purchaser's improper installation, maintenance or operation which is not in compliance with industry standard procedures and specifications and which is not within the performance range of the specific product. If Seller's option is unacceptable to Purchaser, Purchaser is obligated to choose the remaining above option which is fair to both the Seller and Purchaser. Except as stated in this agreement there are no promises, implied warranties, or oral agreements.

POLICY

Endyn will attach an envelope with the appropriate IDS sheet(s) directly to each major (bedplate, frame, crankshaft, connecting rod, camshaft/layshaft assembly, and cylinder body) part and assembly after our internal Q/C inspection acceptance. Endyn will include the appropriate IDS sheet(s) in a packing slip envelope on one box or crate with other (bearings, connecting rod bushings, cam follower assemblies, liners, power pistons, ring sets, compressor pistons, compressor rods, distance pieces and crossheads) parts and assemblies on a batch basis (if only (1) bearing is shipped the box must have an IDS sheet).

For parts and assemblies not shipped direct, the Distributor-Agent-Representative will be responsible for making sure the customers receive the appropriate IDS sheet(s) for both major and other items.

REV. 0

5-3-96

REV. 1

SUBJ: Engine & Compressor
Individual New Parts & Assemblies
With Two (2) Year Warranty

**INSTALLATION
DATA SHEET (IDS)
REQUIRED
(IDS 14.00)**

PARTS & ASSEMBLIES

1. ENGINE & COMPRESSOR

A. Bedplate and/or Frame	0,1,2 & 3
B. Crankshaft	0,1,2 & 3
C. Connecting Rod	3A & 4
D. Bearing	0,1,2 & 3
E. Bushing (Connecting Rod)	4A & 4B
F. Gears, Sprockets and/or Sheaves	N/A
G. Piston/Crosshead Pin	4A & 4B
H. Lube Oil Manifold	N/A
I. Compressor/Reed Valve (Excluding Plates, Springs & Reeds)	N/A
J. Cover & End Plates	N/A
K. Oil & Water Pumps	N/A

2. ENGINE

A. Cylinder Block	N/A
B. Camshaft, Lobe and/or Layshaft (Requires Replacement of Followers)	N/A ---
C. Cam Follower	N/A
D. Piston Pins	4A & 4B
E. Liner	5-(Page 1 of 2)
F. Piston	5 (Page 1 of 2)
G. Rings	5
H. Cylinder Head (Excludes Valves, Seats & Guides)	N/A ---
I. Rocker Arm & Push Rod	N/A
J. Gas, Intake & Exhaust Manifolds	N/A
K. Gas Metering Valve	N/A
L. Thermostat Housing	N/A
M. Air Butterfly	N/A
N. Flywheel	N/A

3. COMPRESSOR

A. Cylinder Body	N/A
B. Liner	6
C. Variable Volume Pocket (Excluding Rings & Packing)	N/A ---
D. Piston & Rod	6
E. Distance Piece	7
F. Crosshead	7
G. Crosshead Shoes	7

**ENGINE-COMPRESSOR
START-UP SHEET**

Shop Order No: _____ Engine /Compressor Serial No: _____
 Customer: _____ Engine /Compressor Model: _____
 Date: _____ Location: _____

GENERAL	TEST NUMBER				
	DATE (MO./DAY/YR.)				
	TIME OF DAY (AM/PM)				
	TEST DURATION (HRS)				
	AMBIENT TEMP. (°F)				
	ENGINE RPM				

AIR TURBO	AIR BUTERFLY/WASTE GATE POSITION (%OPEN)				
	AIR MANIFOLD PRESS./VAC (PSIG/IN.HG)				
	AIR MANIFOLD TEMP. (°F)				
	AUX. INTERCOOLER WATER TEMP-OUT (°F)				

FUEL GAS	HEATING VALUE (BTU/SCF)				
	SUPPLY FUEL TEMP. (°F)				
	FUEL MANIFOLD PRESS. (PSIG)				

LUBE OIL	OIL HEADER PRESS - ENG/COMP. (PSIG)				
	OIL TEMP. - IN - ENG/COMP. (°F)				
	OIL TEMP. - OUT - ENG/COMP. (°F)				
	FILTER OIL PRESS. - IN - ENG./COMP. (PSIG)				
	FILTER OIL PRESS. - OUT - ENG./COMP. (PSIG)				



**ENGINE – COMPRESSOR
START – UP SHEET**

J. WATER	TEST NUMBER				
	WATER TEMP. – IN – ENG./COMP.	(°F)			
	WATER TEMP. – OUT – ENG./COMP.	(°F)			
	EXPANSION TANK	(% FULL)			

EXHAUST	EXHAUST TEMP. #1R/1L	(°F)			
	EXHAUST TEMP. #2R/2L	(°F)			
	EXHAUST TEMP. #3R/3L	(°F)			
	EXHAUST TEMP. #4R/4L	(°F)			
	EXHAUST TEMP. #5R/5L	(°F)			
	EXHAUST TEMP. #6R/6L	(°F)			
	EXHAUST TEMP. #7R/7L	(°F)			
	EXHAUST TEMP. #8R/8L	(°F)			

MISC.	IGNITION TIMING	°BTU			
	CRANKCASE VACUUM	(IN. H ₂ O)			
	LUBRICATOR FLOW(CYL DROPS/MIN.)				
	BELT TENSIONS CHECKED	(YES/NO)			
	CLEAN COMP. GAS PIPING	(YES/NO)			
	PKG. GLAND/VLV CAP LEAK CHECK	(YES/NO)			
	ALL SAFETY SHUT DOWNS CHECKED	(YES/NO)			
	PRE-LUBE ENG/COMP.	(YES/NO)			
POST LUBE ENGINE	(YES/NO)				

COMPRESSOR	SUCTION PRESS.	(PSIG)			
	1 ST /2 ND INTER PRESS.	(PSIG)			
	1 ST /2 ND INTER TEMP.	(°F)			
	3 RD /4 TH INTER PRESS.	(PSIG)			
	3 RD /4 TH INTER TEMP.	(°F)			
	DISCHARGE PRESS.	(PSIG)			
	DISCHARGE TEMP.	(°F)			

OTHER					

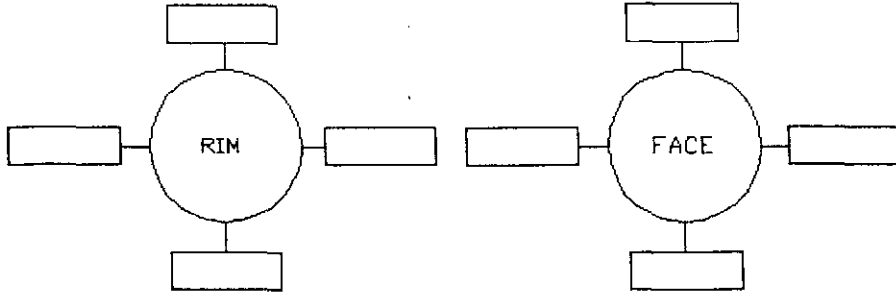
SIGNED _____ DATE _____

ALIGNMENT SHEET

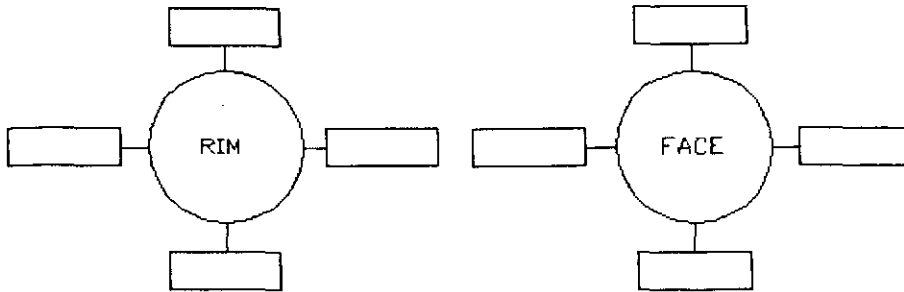
Top Order No: _____ Engine /Compressor Serial No: _____
 Customer: _____ Engine /Compressor Model: _____
 Date: _____ Location: _____

- READINGS TAKEN FROM ENGINE TO COMPRESSOR.
 READINGS TAKEN FROM COMPRESSOR TO ENGINE.

Reading #1
 Conditions: _____



Reading #2
 Conditions: _____



Engine Thrust: _____
 Compressor Thrust: _____

Soft Foot			
1L		1R	
2L		2R	
3L		3R	
4L		4R	
5L		5R	
6L		6R	
7L		7R	
8L		8R	
9L		9R	

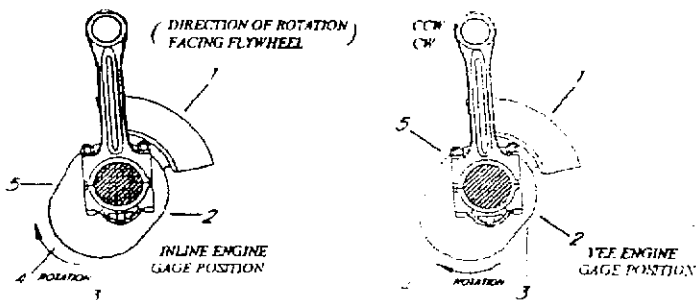
Remarks:

Signed: _____ Date: _____

CRANKSHAFT WEBB DEFLECTION SHEET



hop Order No: _____ Engine /Compressor Serial No: _____
 Customer: _____ Engine /Compressor Model: _____
 Date: _____ Location: _____



Reading #1

Conditions: _____

POS.	1	2	3	4	5	6	7	8
1								
2								
3								
4								
5								

Reading #2

Conditions: _____

POS.	1	2	3	4	5	6	7	8
1								
2								
3								
4								
5								

Reading #3

Conditions: _____

POS.	1	2	3	4	5	6	7	8
1								
2								
3								
4								
5								

Reading #4

Conditions: _____

POS.	1	2	3	4	5	6	7	8
1								
2								
3								
4								
5								

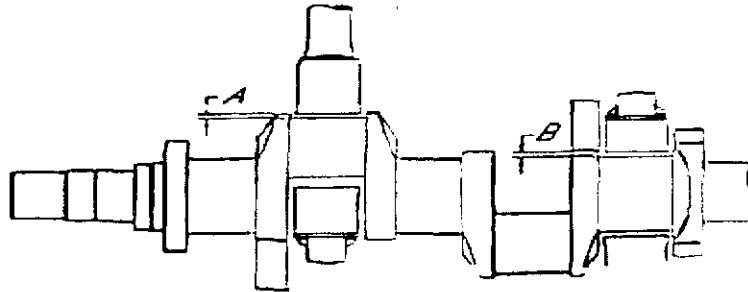
Remarks:

Signed: _____ Date: _____

CRANKSHAFT MAIN & ROD BEARING INSTALLED CLEARANCES

CUSTOMER: _____
 OMS S.O. #: _____
 EQUIP. DESCPT.: _____

EQUIP. MAKE : _____
 EQUIP. MODEL : _____
 EQUIP. S/N : _____



MAIN BEARING CLEARANCES	
No.	B
1	
2	
3	
4	
5	
6	
7	
8	
9	

ROD BEARING CLEARANCES			
No.	A	No.	A
1L		1R	
2L		2R	
3L		3R	
4L		4R	
5L		5R	
6L		6R	
7L		7R	
8L		8R	

RECORDED CRANKSHAFT END-PLAY (thrust) _____ to _____

SPEC./crankshaft end-play (thrust) = _____ to _____

SPEC./main cap bolt torque (ft.lbs) = _____ to _____

SPEC./main bearing clearance = _____ to _____

SPEC./rod bolt torque (ft.lbs) = _____ to _____

SPEC./rod bearing clearance = _____ to _____

REMARKS:

DATE: _____

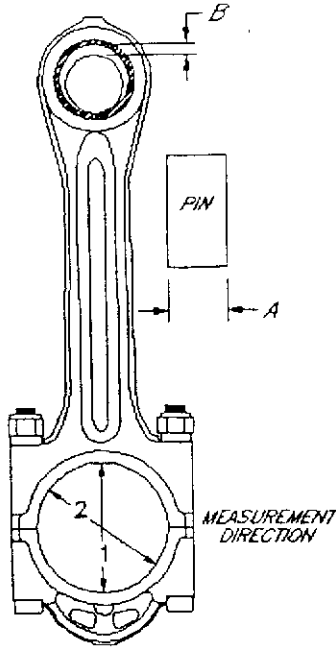
INSPECTOR: _____

CONNECTING ROD SHEET



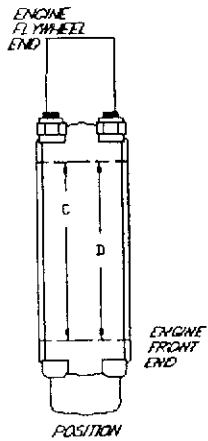
ENGINE /COMPRESSOR SERIAL NO. _____
 ENGINE/COMPRESSOR MODEL _____
 CONNECTING ROD PART NO. _____

CUSTOMER _____
 LOCATION _____
 SHOP ORDER _____



PISTON PIN O.D. (A)		PIN BUSH CLEARANCE (B)	
CYL. NO.	MIN. _____ MAX. _____	CYL. NO.	MIN. _____ MAX. _____
1R/1L		1	
2R/2L		2	
3R/3L		3	
4R/4L		4	
5R/5L		5	
6R/6L		6	
7R/7L		7	
8R/8L		8	

CONN ROD BORE DIMENSION (NO BEARING)



CYL. NO.	FLYWHEEL END (C)		FRONT ENGINE END (D)		CYL. NO.	FLYWHEEL END (C)		FRONT ENGINE END (D)	
	1	2	1	2		1	2	1	2
1R					1L				
2R					2L				
3R					3L				
4R					4L				
5R					5L				
6R					6L				
7R					7L				
8R					8L				

NEEDED FOR ALL RODS EXCEPT NEW ENDYN

SIGNED: _____ DATE: _____

ENGINE CYLINDER SHEET

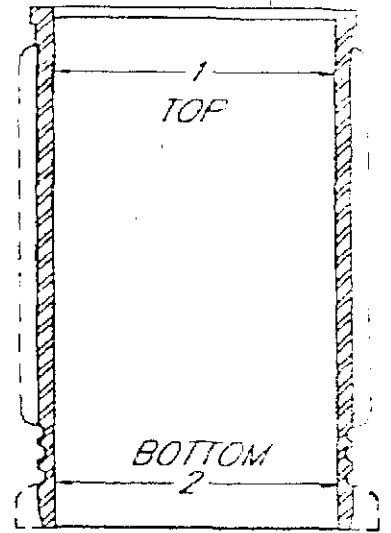
ENGINE/COMPRESSOR SERIAL No. _____
 ENGINE/COMPRESSOR MODEL _____
 SHOP ORDER _____

CUSTOMER _____
 LOCATION _____
 BY _____
 DATE _____

CYLINDER LINER I.D.
(INSTALLED)

(A)		(B)	
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	

LINER PT. No. _____

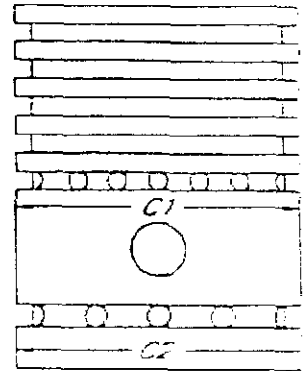


LINER (INSTALLED)

PISTON O.D.

(A) PERPENDICULAR TO PIN		(B) PARALLEL TO PIN	
C1		C1	
C2		C2	
C3		C3	
C4		C4	
C5		C5	
C6		C6	
C7		C7	
C8		C8	

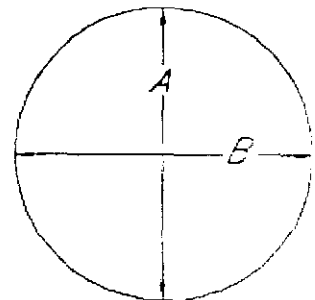
PISTON PT. No. _____



PISTON

PISTON TO LINER
CLEARANCE

(A)		(B)	
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	

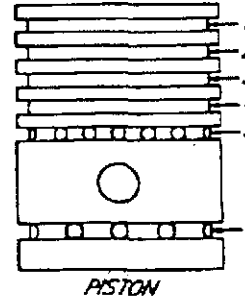
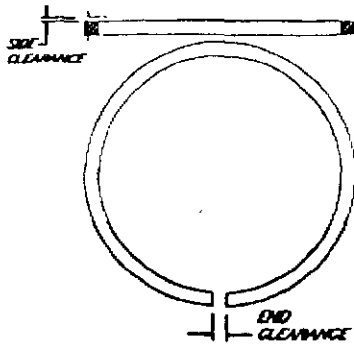


DIRECTION

ENGINE CYLINDER SHEET

ENGINE/COMPRESSOR SERIAL No. _____
 ENGINE/COMPRESSOR MODEL _____
 SHOP ORDER _____

CUSTOMER _____
 LOCATION _____
 BY _____
 DATE _____



RING CLEARANCE RING KIT PART No. _____												
PWR CYL	SIDE CLEARANCE						END CLEARANCE					
	1	2	3	4	5	6	1	2	3	4	5	6
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												

REMARKS:

SIGNED _____ DATE _____

COMPRESSOR CYLINDER SHEET



CYLINDER CLASS NO. _____
 CYLINDER SERIAL NO. _____
 BORE: _____

CUSTOMER _____
 LOCATION _____
 SHOP ORDER _____

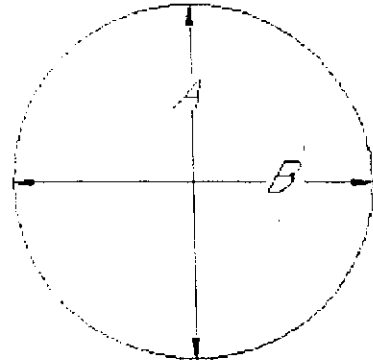
F=FRONT
 C=CENTER
 R=REAR

LINER BORE: (A)

F	_____
C	_____
R	_____

(B)

F	_____
C	_____
R	_____



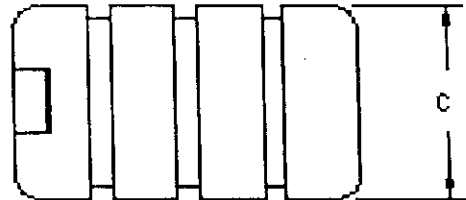
LINER PT. NO. _____

PISTON DIA.: (C)

F	_____
C	_____
R	_____

90° FROM C

F	_____
C	_____
R	_____



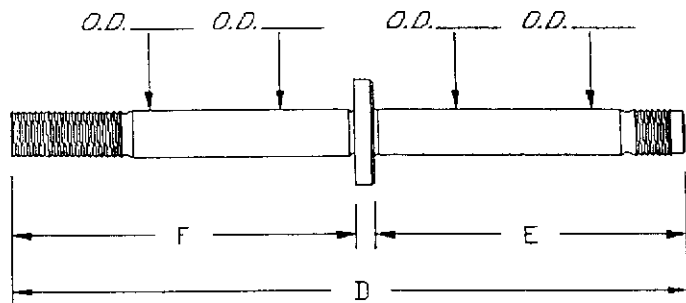
PISTON PART NO. _____
 PISTON TO LINER CLEARANCE _____

IDS 14.006A

PISTON ROD:

D	_____
E	_____
F	_____

ROD RUN-OUT _____ (VERTICAL)
 ROD PART NO. _____
 ROD RUN-OUT _____ (HORIZONTAL)
 SURFACE FINISH _____



IDS 14.006B

SIGNED: _____ DATE: _____

IDS 14.006 REV. 2

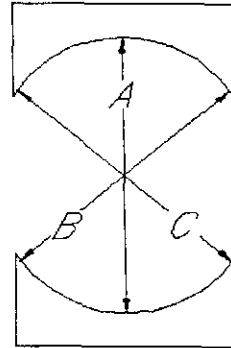
X-HEAD GUIDE SHEET



COMPRESSOR SERIAL NO. _____ CUSTOMER _____
 COMPRESSOR MODEL _____ LOCATION _____
 SHOP ORDER _____

FRONT=END AWAY FROM FRAME
 REAR=END NEXT TO FRAME

NO.		A	B	C
	FRONT			
	REAR			
	FRONT			
	REAR			
	FRONT			
	REAR			
	FRONT			
	REAR			
	FRONT			
	REAR			
	FRONT			
	REAR			

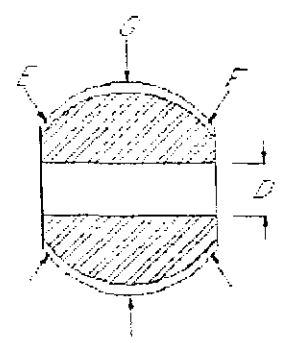


GUIDE PT. NO. _____

MIN.: _____
 MAX.: _____

IDS 14.007A

NO.		D	E	F	G
	FRONT				
	REAR				
	FRONT				
	REAR				
	FRONT				
	REAR				
	FRONT				
	REAR				
	FRONT				
	REAR				
	FRONT				
	REAR				



X-HEAD PT. NO. _____
 WISHOES INSTALLED

MIN.: _____
 MAX.: _____

IDS 14.007B

REMARKS:

SIGNED _____ DATE _____

CRANKSHAFT PIN & JOURNAL CHART

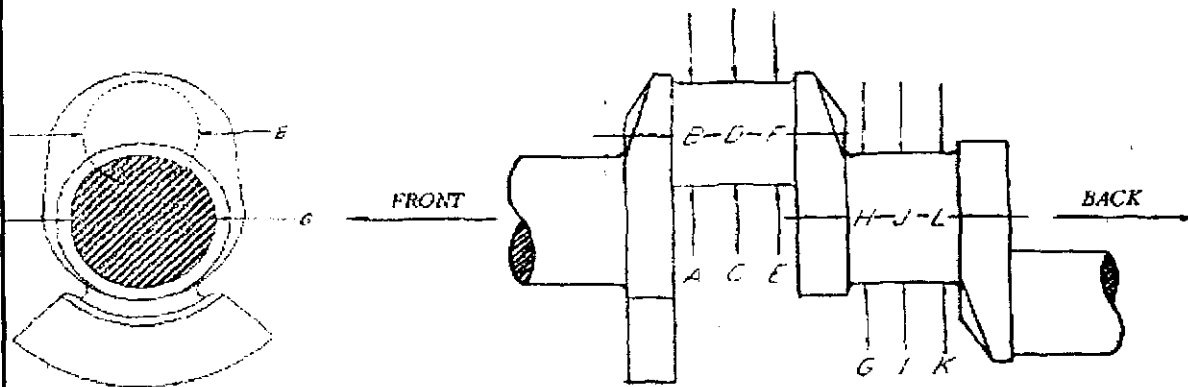
COMPRESSOR SERIAL NO. _____

CUSTOMER _____

COMPRESSOR MODEL NO. _____

LOCATION _____

SHOP ORDER _____



BRG. OR THROW	CRANK PIN DIAMETER						MAIN JOURNAL DIAMETER					
	A	B	C	D	E	F	G	H	I	J	K	L
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

REMARKS:

CRANKSHAFT TEMP. _____

DATE: _____

SIGNED: _____

IDS 14.008 REV.1

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