TWIN DISC
INCORPORATED

Service Manual

Marine Transmission

Components:
MG-6650SC

Document Number: 1019103

NOTICE

Twin Disc, Incorporated makes no warranty or guaranty of any kind, expressed, implied or otherwise, with regard to the information contained within this manual. Twin Disc, Incorporated has developed this manual through research and testing of the information contained therein. Twin Disc, Incorporated assumes no responsibility for any errors that may appear in this manual and shall not be liable under any circumstances for incidental, consequential or punitive damages in connection with, or arising out of, the use of this manual. The information contained within this manual is subject to change without notice.

Document Number
1019103

April, 2002

Marine Transmission Service Manual

TWIN DISC, INCORPORATED
EXCLUSIVE LIMITED WARRANTY
COMMERCIAL MARINE TRANSMISSION

A. Twin Disc, Incorporated warrants all assembled products and parts, (except component products or parts on which written warranties issued by the respective manufacturers thereof are furnished to the original customer, as to which Twin Disc, Incorporated makes no warranty and assumes no liability) against defective materials or workmanship *for a period of twenty-four (24) months from the date of shipment by Twin Disc, Incorporated to original customer, but not to exceed twelve (12) months of service, whichever occurs first.* **This is the only warranty made by Twin Disc, Incorporated and is in lieu of any and all other warranties, express or implied, including the warranties of merchantability or fitness for a particular purpose and no other warranties are implied or intended to be given by Twin Disc, Incorporated.** The original customer does not rely upon any tests or inspections by Twin Disc, Incorporated or on Twin Disc, Incorporated*s application engineering.

B. **The exclusive remedy provided by Twin Disc, Incorporated whether arising out of warranty within the applicable warranty period as specified, or otherwise (including tort liability), shall at the sole option of Twin Disc, Incorporated be either the repair or replacement of any Twin Disc, Incorporated part or product found by Twin Disc, Incorporated to be defective and the labor to perform that work and to remove and reinstall (or equivalent credit). In this context, labor is defined as the flat rate labor hours established by Twin Disc, Incorporated in the published Twin Disc Flat Rate Schedule, required to remove, disassemble, inspect, repair, reassemble, reinstall and test the Twin Disc, Incorporated product only. Authorized reasonable travel and living expenses will be considered for payment. Under no circumstances, including a failure of the exclusive remedy, shall Twin Disc, Incorporated be liable for economic loss, consequential, incidental or punitive damages.** The above warranty and remedy are subject to the following terms and conditions:

1. Complete parts or products upon request must be returned transportation prepaid and also the claims submitted to Twin Disc, Incorporated within sixty (60) days after completion of the in-warranty repair.

2. The warranty is void if, in the opinion of Twin Disc, Incorporated, the failure of the part or product resulted from abuse, neglect, improper maintenance or accident.

3. The warranty is void if any modifications are made to any product or part without the prior written consent of Twin Disc, Incorporated.

4. The warranty is void unless the product or part is properly transported, stored and cared for from the date of shipment to the date placed in service.

5. The warranty is void unless the product or part is properly installed and maintained within the rated capacity of the product or part with installations properly engineered and in accordance with the practices, methods and instructions approved or provided by Twin Disc, Incorporated.

6. The warranty is void unless all required replacement parts or products are of Twin Disc origin or equal, and otherwise identical with components of the original equipment. Replacement parts or products not of Twin Disc origin are not warranted by Twin Disc, Incorporated.

C. As consideration for this warranty, the original customer and subsequent purchaser agree to indemnify and hold Twin Disc, Incorporated harmless from and against all and any loss, liability, damages or expenses for injury to persons or property, including without limitation, the original customer*s and subsequent purchaser*s employees and property, due to their acts or omissions or the acts or omissions of their agents, and employees in the installation, transportation, maintenance, use and operation of said equipment.

D. Only a Twin Disc, Incorporated authorized factory representative shall have authority to assume any cost or expense in the service, repair or replacement of any part or product within the warranty period, except when such cost or expense is authorized in advance in writing by Twin Disc, Incorporated.

E. Twin Disc, Incorporated reserves the right to improve the product through changes in design or materials without being obligated to incorporate such changes in products of prior manufacture. The original customer and subsequent purchasers will not use any such changes as evidence of insufficiency or inadequacy of prior designs or materials.

F. If failure occurs within the warranty period, and constitutes a breach of warranty, repair or replacement parts will be furnished on a no-charge basis and these parts will be covered by the remainder of the unexpired warranty which remains in effect on the complete unit.

TWIN DISC, INCORPORATED
FLAT RATE HOUR ALLOWANCE

(Hourly Labor Rate Must be Acceptable to Twin Disc, Incorporated.)

COMMERCIAL MARINE TRANSMISSIONS - ALL RATIOS:

MODEL SERIES	R&R	UNIT REBUILD	CLUTCH REPAIR (BOTH PACKS)
MG 502, MG 5010, MG5011, MG5005A MG5015A	10.0	8.0	-
MG 506, MG5061, MG 5050, MG5055A	10.0	11.0	-
MG 507, MG 5081, MG5085, MG5090,	10.0	12.0	-
MG 5091	10.0	12.0	4.0
MG5112,MG5113	10.0	17.0	-
MG 509, MG 5111, MG5114	10.0	17.0	4.0
MG5114A, MG5114RV	10.0	17.0	-
MG 514C, MG514M, MG5141, MG514CHP	10.0	25.0	6.0
MG 516, MG 5161	10.0	28.0	8.0
MG 518-1	10.0	32.0	10.0
MG520-1, MG 5202, MG5203, MG5204 MG5205	10.0	32.0	10.0
MG 530, MG530M, MG5301	12.0	32.0	16.0
MG 540	20.0	62.0	20.0
MG5600	20.0	62.0	20.0
MG6000	10.0	32.0	10.0
MGN80, MGN232, MGN233, MGN272, MGN273, MGN332, MGN334, MGN335, MGN432, MGN433, MGN472, MGN493	10.0	32.0	10.0
MGN650, MGN800,MGN1000,MGN1400, MGN1600	20.0	62.0	40.0
PUMP - ALL MODELS	1.0	-	
VALVE - ALL MODELS:	1.0	.5	

Table of Contents

Introduction

General Information

This publication provides service information for Twin Disc model MG-6650SC marine transmission. Specific engineering details and performance characteristics can be obtained from the Product Service Department of Twin Disc, Incorporated, Racine, Wisconsin, USA..

Operation and maintenance personnel responsible for this equipment should be familiar with this publication and have it at their disposal. A thorough understanding and application of the material in this manual will result in consistent performance from the unit and help reduce downtime.

Safety and General Precautions

General

All personnel servicing this equipment should employ safe operating practices. Twin Disc, Inc. will not be responsible for personal injury resulting from careless use of hand tools, lifting equipment, power tools, or unaccepted maintenance/ working practices.

Important Safety Notice

Proper installation, maintenance, and operation procedures must be followed due to the possible danger to person(s) or property from accidents that may result from the use of machinery. Twin Disc, Inc. will not be responsible for personal injury resulting from careless maintenance and working practices.

Inspect the equipment as required to assure safe operation under current operating conditions. Proper guards and other safety devices that may be specified in the safety codes should be provided. These important safety devices are neither provided by, nor are they the responsibility of Twin Disc, Inc.

⚠ WARNING

Selecting NEUTRAL disengages the transmission clutches but does not prevent propeller shaft rotation. If you require a positive neutral condition (propeller shaft locked), a shaft brake or other shaft-locking device must be used.

⚠ WARNING

To prevent accidental starting of the engine when performing routine transmission maintenance, disconnect the battery cables from the battery and remove the ignition key from the key switch.

⚠ WARNING

Most Twin Disc products have provisions for attaching lifting bolts. The holes provided are always of adequate size and number to safely lift the Twin Disc product. These lifting points must not be used to lift the complete power unit (engine and transmission). Lifting excessive loads from these points could cause failure at the lifting point (or points) and result in damage to the machine or personal injury.

⚠ CAUTION

Select lifting eyebolts to obtain maximum thread engagement with the bolt shoulder fastened tightly against the housing. Bolts should be near but should not contact bottom of bolt hole.

Preventative Maintenance

Frequent reference to the information provided in the Marine Transmission Operator's Manual, document number 1016313, regarding daily operation and limitations of this equipment will assist in obtaining trouble-free operation. Schedules are provided for recommended maintenance of the equipment.

Towing

The MG-6650SC series marine transmission has an integral trailing pump option. The following applies only to units not equipped with the optional integral trailing pump:

⚠ WARNING

Under the conditions described below, the prop shaft must be locked in place to prevent backdriving. Failure to do this can damage the marine transmission due to the lack of component lubrication.

Backdriving of the drive shaft (also called trailing or windmilling) occurs when an engine is shut down and the propeller shaft is being driven by the flow of water across the propeller. This action rotates the components in the marine transmission. During backdriving conditions, the transmission does not receive proper lubrication.

Conditions where backdriving may occur:

- ❑ The vessel is being towed
- ❑ One or more of the engines on a multiple transmission vessel are shut down while under way
- ❑ Sailboat under sail with auxiliary engine is shut down
- ❑ The vessel is tied up or docked in a heavy current

The following solutions are applicable for all MG-6650SC series transmissions if any of the above conditions are present:

- ❑ Lock the propeller shaft to prevent rotation.
- ❑ Install an electrically driven auxiliary oil (lubrication) pump into the transmission lubrication circuit.

Refer to the hydraulic system diagrams for details on auxiliary lube pump specifications for the specific transmission, or contact a Twin Disc Authorized Distributor.

Ordering Parts and Obtaining Services

⚠ WARNING

All replacement parts or products (including hoses and fittings) must be of Twin Disc origin or equal quality, and otherwise identical with the components originally installed on the equipment. Use of any other parts or products will void the warranty and may result in equipment malfunction or an accident causing injury to personnel and/or serious damage to the equipment.

Ordering Service Parts

Renewal parts, service parts kits, optional equipment and product service assistance may be obtained from any authorized Twin Disc distributor or service dealer. Contact Twin Disc, Inc. for a distributor or service dealer near you.

Note: Do not order parts from the part numbers on the cross-sectional diagrams. These numbers may be referenced for part identification only. All part numbers should be verified on the bill of material (BOM) before an order is placed. BOM numbers are stamped on the unit nameplate.

Twin Disc, Inc. having stipulated the bill of material number on the unit's nameplate, absolves itself of any responsibility resulting from any external, internal, or installation changes made in the field without the express written approval of Twin Disc, Inc. All returned parts, new or old, emanating from any of the above stated changes will not be accepted for credit. Any equipment that has been subjected to such changes will not be covered by a Twin Disc warranty.

Source of Service Information

For the latest service information on Twin Disc products, contact any Twin Disc distributor or service dealer. This can be done on the Twin Disc corporate web site found at [http://www.twindisc.com]. Provide your model number, serial number, and bill of material number to obtain information on your unit. If necessary, contact the Product Service Department, Twin Disc, Incorporated, Racine, Wisconsin 53405-3698, USA by e-mail at service@twindisc.com.

Warranty

The equipment for which this manual was written has a limited warranty. For details of the warranty, refer to the warranty statement at the front of this manual. For details of the warranty, contact any Twin Disc Authorized Distributor, service dealer, or the Warranty Administration Department, Twin Disc, Inc., Racine, Wisconsin, U.S.A.

Description and Specifications

General

The suffix on the assembly drawing number designates the revision level of the transmission. Assemblies 1018375 and 1013875A utilize belleville springs as clutch piston return springs. Assemblies 1018375B and 1018375C use coil springs as clutch piston return springs. Service information is provided for both variations with this manual, and the assembly drawing number is identified on the bill of material (BOM).

Nameplate

The nameplate identifies the model, bill of material (BOM) and the serial number of the unit. These numbers are necessary to identify the correct parts for your transmission.

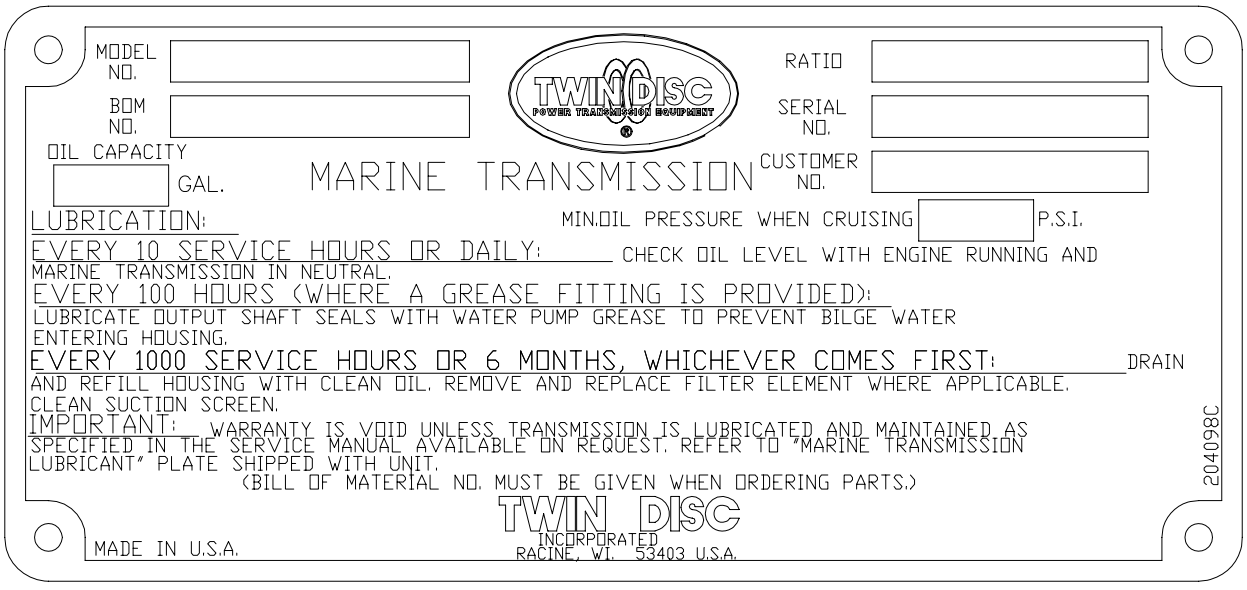


Figure 1. Nameplate for MG-6650SC Marine Transmission

Power Ratings

The MG-6650SC transmission can be operated through either the primary shaft or secondary shaft at its full rated horsepower when driven by a standard right hand rotation engine (counterclockwise flywheel rotation when viewing rear of engine). This series of marine transmission cannot be driven by a left hand rotation engine. Contact an authorized Twin Disc distributor for more information.

Transmission clutches are hydraulically applied using main oil pressure. All bearings, clutches and gears are lubricated and cooled with low-pressure oil.

Always reference the Bill of Materials (BOM) or Specification number when ordering service parts.

Construction Features

Housings

The MG-6650SC series transmission has a one-piece main housing. Front housings in sizes SAE No. 0 and SAE No. 00 sizes are available. A top cover, bearing carrier, and manifold (sealed with gaskets) complete the housing enclosure.

Bearings

The primary and secondary clutch shafts and pinions are supported and located by a combination of straight and tapered roller bearings. Bearing clearances for each clutch shaft and pinion assembly are set by use of a single shim pack at the rear-tapered roller bearing on each shaft. A combination of straight and tapered roller bearings support the output shaft and have bearing clearance adjusted by use of shims in the rear bearing carrier.

Oil Pump and Drive

The oil pump is driven by the secondary clutch shaft.

Lubrication Features

The MG-6650SC series transmission has a lubrication tube located inside the main housing. The tube extends from the front to the rear of the inside of the housing. The lubrication tube has drilled holes in the tube that spray oil on the transfer gears and the primary and secondary pinions. Bearings and clutches on the primary and secondary shafts are lubricated through drilled passages in the shafts. Output shaft bearings are gravity and splash lubricated.

Suction Screen

The marine transmission has a serviceable suction strainer located below the oil pump. The strainer is between the sump and oil pump in the hydraulic circuit. The strainer can be replaced if necessary.

Filter Assembly

A canister-style filter is located between the oil pump outlet and the selector valve in the hydraulic circuit. The replacement element is Twin Disc part number M2725. This should be replaced at 1000 hour or six month intervals, whichever comes first.

Gears

All gears are helical, carburized, hardened and ground for smooth quiet operation. All gears are in constant mesh. The primary and secondary transfer gears and the output gear are mounted on keyless tapers.

Flexible Torsional Input Coupling

The purpose of the torsional coupling is to transmit power from the engine to the marine transmission through a rubber or silicone element that will:

- ❑ Dampen torsional vibrations
- ❑ Change the natural frequencies of a system to move critical frequencies out of the operating speed range
- ❑ Accommodate a certain amount of misalignment
- ❑ Absorb shock and reduce noise
- ❑ Minimize gear “rattle”

Several couplings are available from Twin Disc, and are selected based on the customer supplied engine information. Final coupling selection must be confirmed by the packager based on the torque/rpm ratings and the results of the system torsional vibration analysis (TVA), and on engine rotation. Care must be taken when servicing that replacement couplings are matched to this criteria.

Heat Exchanger

The heat exchanger is designed to maintain the oil in the hydraulic system of the marine transmission at the proper temperature by passing raw or fresh water through the heat exchanger.

HEAT EXCHANGER (H.E.) REQUIREMENTS				
PERMISSIBLE OIL TEMPERATURE INTO HEAT EXCHANGER				
RATIO	OIL VISCOSITY	MAX.	MIN.	
ALL RATIOS	SAE 40	85°C(185°F)	65°C(150°F)	*
ALL RATIOS	SAE 50	93°C(200°F)	80°C(175°F)	
MIN. HEAT TRANSFER CAPACITY (APPLY APPROPRIATE SERVICE FACTOR FOR FRESH AND RAW WATER)	kW(Btu/min) PER ENGINE RTD. kW(hp)			
	CONT. & MED. DUTY	INT., LIGHT, & P.C. DUTY		
	.035 (1.484)	.030 (1.272)		
APPROX. OIL FLOW TO H.E. 5.91 L/min(1.56 gpm) PER 100 ENGINE rpm				
PEAK OIL PRESSURE AT H.E. (PROOF TEST H.E. AT 1.5 X kPa(psi)) 690 kPa(100 psi)				
MAX. ALLOWABLE OIL PRESSURE DROP ACROSS H.E. WITH 66mm²/s (300) SUS OIL AT RATED ENGINE rpm			207 kPa (30 psi)	
MAX. ALLOWABLE WATER PRESSURE DROP ACROSS H.E.			10.3 kPa (1.5 psi)	
WATER FLOW TO H.E. - USE 1.5 TO 3.0 TIMES OIL - L/min (gpm)				
H.E. WATER PRESSURE RATING, MIN., = 1.5 X H.E. INLET WATER kPa(psi)				
DATA H.E. PURCHASER MUST ALSO TELL VENDOR				
STATE IF RAW (OPEN CHANNEL & SEA) OR FRESH (CLOSED ENGINE JACKET * AND/OR KEEL COOLER) WATER WILL COOL H.E.				
STATE MAX. WATER TEMP. INTO H.E. - TYPICAL: RAW WATER 29°C-32°C (85°F-90°F) KEEL COOLER WATER 46°C-60°C (115°F-140°F) ENGINE JACKET WATER * 74°C-85°C (165°F-185°F).				
STATE MIN., ALSO MAX. L/min (gpm) OF WATER FLOW TO H.E.				
H.E. INSTALLATION & SERVICE REQUIREMENTS				
OIL LINES, TRANSMISSION TO H.E. AND RETURN ---- (1) MAX. VELOCITY IN FITTINGS,PIPE,HOSE AND TUBES-7.6m/s (25ft/s) (2) BURST PRESSURE, MIN., = 10 x PEAK OIL PRESSURE AT H.E. (3) HOSE - SAE J517 100R1 MEETING USCG 46CFR 56.60-25(C),135°C (275°F) TEMP. RATING (4) PROTECT LINES FROM MECHANICAL DAMAGE. ZINC ANODES PROTECT H.E. RAW WATER PASSAGES FROM CORROSION. CHECK & REPLACE THEM FREQUENTLY.				

* FOR CLOSED ENGINE JACKET WATER COOLING IT MAY BE IMPOSSIBLE OR IMPRACTICAL TO HAVE HEAT EXCHANGER SUITABLE FOR MAINTAINING 85°C (185°F) MAX. OIL TEMPERATURE.

Figure 2. Heat Exchanger Specification Information

Specifications

Maximum operating speed: 2300 rpm

Maximum oil sump temperature: 85°C (185° F) when using SAE 40 oil
93°C (200°F) when using SAE 50 oil

Oil type and viscosity: See data plate below

Oil capacity: 41.6 liters (11.0 gal)

Approximate Dry weight: 970 kg. (2140 lbs.)

Oil pressure: See Table 1. Oil temperature to be in normal operating range.

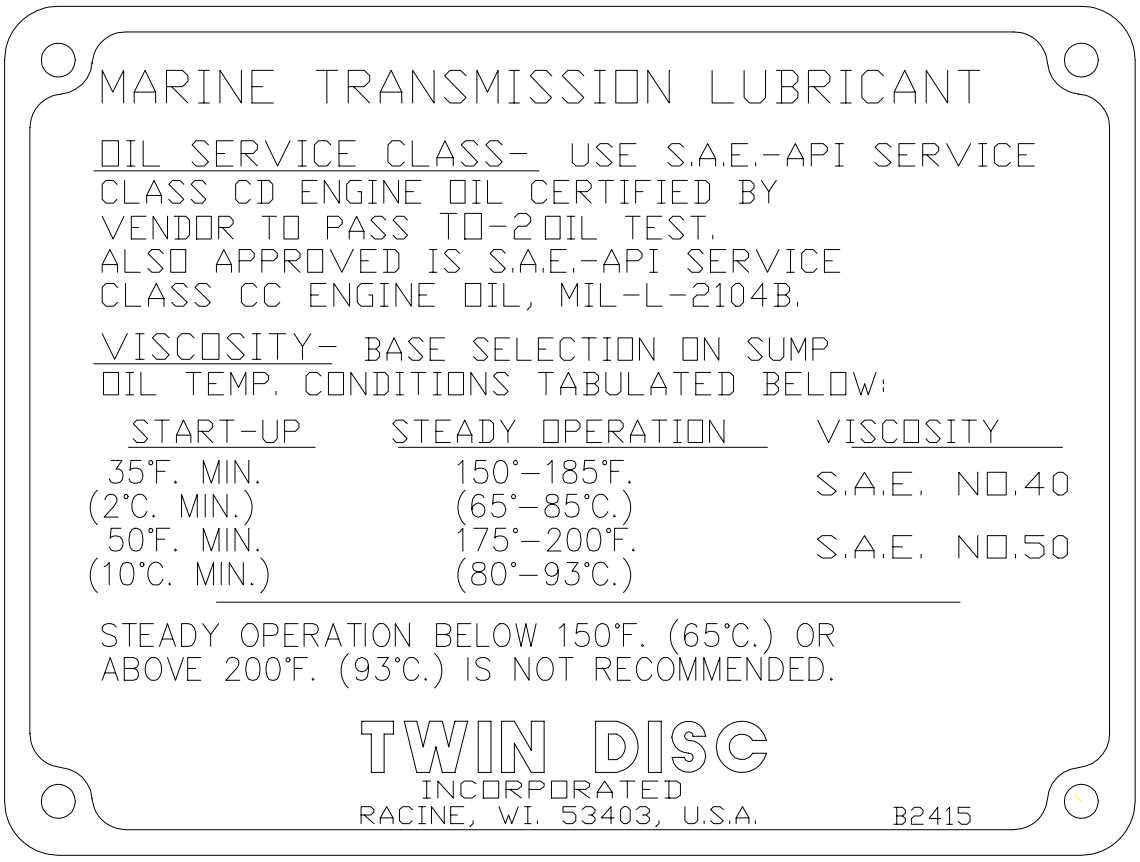


Figure 3. Oil Specification Plate Example

Table 1. Transmission Oil Pressure Specifications

Electrical Valve - 290 psi Springs									
Input Speed	Shift Position	Main Pressure at Valve Inlet		Primary Clutch Min.		Secondary Clutch Min.		Lube	
		kPa	psi	kPa	psi	kPa	psi	kPa	psi
600	Neutral	255-310	37-45	0	0	0	0	20-140	3 - 20
600	Primary	1860-2000	270-290	1860	270	0	0	7- 69	1-10
600	Secondary	1860-2000	270-290	0	0	1860	270	7-69	1-10
1800	Neutral	689-1034	100-150	0	0	0	0	280-450	40-65
1800	Primary	1960-2140	285-310	1960	285	0	0	100-380	15-55
1800	Secondary	1960-2140	285-310	0	0	1960	285	100-380	15-55

Note: It is required that lube pressure with primary clutch engaged must equal lube pressure with secondary clutch engaged within 21 kPa (3 psi).

Optional Equipment

The following optional equipment for use with the model MG-6650SC is available through the nearest authorized Twin Disc distributor.

Optional Trailing Pump

An optional integral trailing pump is available. Twin Disc part number 1018554 is for MG-6650SC assemblies 1018375, 1018375A, and 1018375B. The optional integral trailing pump for MG-6650SC assembly 1018375C is 1020514. An optional 115 vac electric powered remote trailing pump system is also available, Twin Disc part number 1016473. Drawings are included in Engineering Drawings.

Power Take-off

A live power take-off pump mount is available in sizes SAE J744 No. 32-4 and SAE J744 No. 38-4.

A hydraulically clutchable PTO is available in sizes SAE J744 No. 32-4 and SAE J744 No. 38-4.

Metric to NPTF Adapter Kit

Adapter kits are available to convert the oil drain plug opening, the pressure test ports, and the heat exchanger connections from metric to NPTF threads. Kit K1195 is for units with an integral heat exchanger and kit K1254 is for units with a remote heat exchanger.

Torsional Input Coupling

Several models of torsional input couplings are available, including Vulkan VL3411S and Centa CF-R couplings in both SAE #0 and SAE #00 sizes.

Trolling Valve

Two types of trolling valves are available, an electrically actuated trolling valve and a mechanically actuated trolling valve. The electric trolling valve is Twin Disc part number 1017554, and the mechanical trolling valve is Twin Disc part number 1017555.

Companion Flange

The companion flange assembly is Twin Disc part number 1018682.

Table 2. Advance Specifications

Transmission Primary and Secondary Transfer Gears Advance	
Minimum	Maximum
2.67mm (.105 in)	3.71mm (.146 in)
Transmission Output Gear Advance	
Minimum	Maximum
9.45mm (.372 in)	11.00mm (.433 in)
Transmission Output Flange Advance	
Minimum	Maximum
4.85mm (.191 in)	7.04mm (.277 in)

Table 3. Bearing End Play Specifications

Transmission Primary and Secondary Shaft Tapered Roller Bearing Endplay		
Assembly No.	**Minimum**	**Maximum**
1018375, 1018375A	0.13 mm (.005 in)	0.18 mm (.007 in)
1018375B, 1018375C	0.013 mm (.0005 in)	0.063 mm (.0025 in)
Transmission Output Shaft Bearing Endplay		
Ratio	**Minimum**	**Maximum**
1.88:1 and numerically higher	0.05mm (.002 in)	0.15mm (.006 in)
1.51:1 and numerically lower	-0.08mm (-.003 in)	-0.08mm (-.003 in)

Table 4. Front housing and Output Flange Rounout Limits

Feature	Maximum allowable total indicator reading
SAE #0 and SAE #00 front housing face	0.41 mm (.016 in)
SAE #0 and SAE #00 front housing pilot diameter	*0.30 mm (.012 in)
Output flange face near O.D.	0.10 mm (.004 in)
Output flange pilot diameter	0.10 mm (.004 in)

*This note applies to a continous 270 arc if the balance of the pilot is negative in readings; otherwise it means all 360 .

Torque Values for Fasteners

Note: All threads and bearing face to be lubricated with light oil film prior to assembly.

Table 5. U.S. Standard Fine and Coarse Thread Capscrews, Bolts, and Nuts

Thread Diameter	SAE Grade 5		SAE Grade 8	
	lb-ft	Nm	lb-ft	Nm
1/4	6 - 8	8 - 11	10 - 12	14 - 16
5/16	13 - 17	18 - 23	20 - 24	27 - 32
3/8	25 - 29	34 - 39	35 - 41	48 - 55
7/16	37 - 43	51 - 58	55 - 65	75 - 88
1/2	60 - 70	81 - 95	83 - 97	113 - 131
9/16	82 - 98	111 - 132	120 - 140	163 - 190
5/8	120 - 140	163 - 190	165 - 195	224 - 264
3/4	205 - 245	278 - 332	295 - 345	400 - 467
7/8	330 - 390	448 - 528	470 - 550	638 - 745
1	495 - 585	671 - 793	715 - 835	970 - 1132
1 1/8	615 - 735	834 - 997	1015 - 1185	1377 - 1606
1 1/4	850 - 1000	1163 - 1355	1375 - 1625	1865 - 2203

Table 6. Metric Coarse Thread Capscrews, Bolts, and Nuts

Thread Size	Property Class 8.8		Property Class 10.9		Property Class 12.9	
	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm
M6	6.5 - 7.5	9 - 10	9 - 10	12 - 14	10 - 12	14 - 16
M8	16 - 18	21 - 25	23 - 26	31 - 35	25 - 29	34 - 40
M10	32 - 36	43 - 49	44 - 51	60 - 68	51 - 59	70 - 80
M12	55 - 63	74 - 86	77 - 88	104 - 120	89 - 103	121 - 139
M16	132 - 151	179 - 205	189 - 217	256 - 294	219 - 253	298 - 342
M20	257 - 295	348 - 400	364 - 418	493 - 567	429 - 493	581 - 669
M24	445 - 511	603 - 693	626 - 720	848 - 976	737 - 848	1000 - 1150
M30	714 - 820	987 - 1113	1235 - 1421	1674 - 1926	1475 - 1697	2000 - 2301

Table 7. Tapered Pipe Plugs (with thread lubricant)

NPTF Size (in)	Nm (+ or - 5 %)	lb-ft (+ or - 5 %)	Nm (+ or - 5 %)	lf-ft (+ or - 5 %)
1/16-27	11.5	8.5	7.5	5.5
1/8-27	14	10.5	9	6.5
1/4-18	34	25	22	16
3/8-18	37	27	23	17
1/2-14	68	50	41	30
3/4-14	73	54	46	34
1 -11 1/2	108	80	68	50
1 1/4 - 11 1/2	115	85	75	55
1 1/2 - 11 1/2	115	85	75	55

Table 8. Straight Threaded Tube Fittings, Hose Fittings, and O-ring Plugs

Nominal Thread Diameter	Nm + or - 5 %	lb-ft + or - 5 %	Nominal Thread Diameter	Nm + or - 5 %	lb-ft + or - 5 %
5/16	5	3.5	1 5/8	108	80
3/8	11.5	8.5	1 7/8	108	80
7/16	16	12	2 1/2	108	80
1/2	20	15	M10X1.0	12	9
9/16	24	18	M12X1.5	16	12
5/8	24	18	M14X1.5	20	15
11/16	34	25	M16X1.5	24	18
7/8	54	40	M18X1.5	34	25
1 1/16	75	55	M22X1.5	54	40
1 3/16	88	65	M27X2.0	75	55
1 1/4	88	65	M33X2.0	88	65
1 5/16	108	80	M42X2.0	108	80
1 3/8	108	80	M48X2.0	108	80

Clutch Plate Wear Limits

Clutch steel plates:

Maximum cone: 0.20 mm (0.008 inch).

Clutch friction plates:

Maximum cone: 0.25 mm (0.010 inch).

Minimum thickness: 3.48 mm (0.137 inch).

Operation

General

The control valve obtains primary, neutral and secondary positions. When these positions are selected, the control valve directs high-pressure oil through internal passages to operate the clutches. The pressure-rate control piston within the control valve assembly provides a rapid, smooth, oil pressure increase in the hydraulic system during clutch engagement.

Hydraulic System with Electric Control Valve

The oil pump draws oil through the strainer from the oil sump and discharges it through the oil filter. Filtered oil enters the control valve through the inlet port. The incoming oil forces the pressure regulator piston against the springs to open the path to the lubrication circuit. Oil not used for clutch engagement flows past the regulator piston to become lubrication oil. Lubrication oil flows through the heat exchanger to the lubrication oil circuit in the transmission to lubricate and cool the clutches and bearings. There is a lubrication oil pressure relief valve to limit maximum lubrication oil pressure to approximately 690 kPa (100 psi).

In Neutral, the inlet port of both clutches is connected to the atmosphere. Since the area behind the clutch pistons is open to sump, the clutches are disengaged. Oil is distributed through the lubrication system. The area between the pressure regulating piston and the rate-of-rise piston is connected to sump at all times to prevent any leakage oil from affecting the pressure regulation.

The pressure in the rate-of-rise chamber is controlled by a ball that is spring loaded against the orifice plate. The passage behind the ball and spring is connected to the sump (atmosphere) in Neutral and to main pressure when either clutch is engaged. A shuttle ball, connected to both clutch pressure ports, permits pressurizing this passage with oil from the engaged clutch without allowing oil to flow to the disengaged clutch.

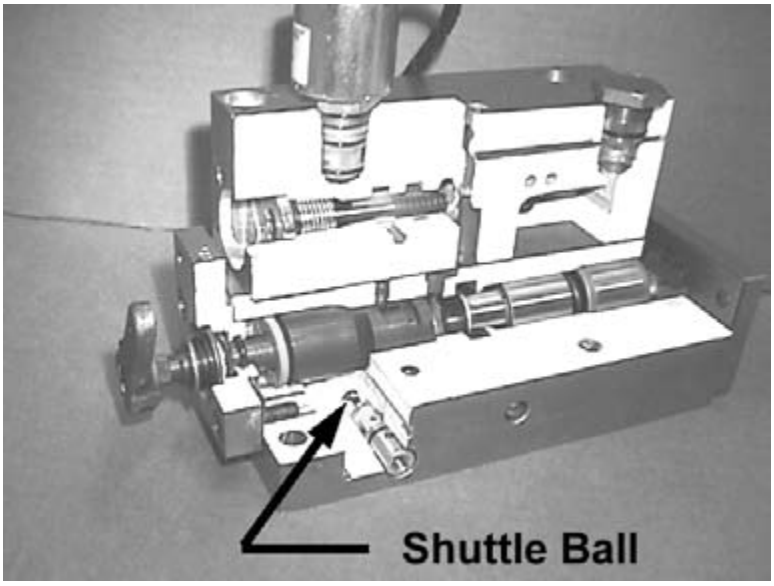


Figure 4. Location of Shuttle Ball

The electric control valve can be used in a manual override mode in the event of an electrical power failure.

When the control valve is energized or shifted to engage either clutch, the valve directs main pressure to engage the selected clutch pack. Oil is also directed to move the rate-of-rise piston, compressing the pressure regulator springs. This progressively increases the clutch engaging pressure causing the clutches to engage at a controlled rate.

The control valve allows only one clutch to be engaged at a time, and the oil from the disengaged clutch is vented to sump (atmospheric pressure). The clutch return springs move the disengaged clutch's piston to the disengaged position minimizing clutch plate drag.

Control Valve Assembly in Neutral

Some of the main pressure oil from the oil inlet chamber flows through a passage to the orifice in the orifice plate. The small flow of oil through this orifice fills and begins to pressurize the rate-of-rise chamber.

Both clutches are connected to sump when the control valve is in Neutral. Since there is no pressure acting on the shuttle ball from either clutch, the passage behind the ball and spring regulator is also connected to sump. This allows the oil pressure in the rate-of-rise chamber to be regulated by the ball and spring, since the overage oil can flow to sump. The oil pressure in the rate-of-rise chamber acting on the rate-of-rise piston causes it to stroke over partially, which compresses the pressure regulating springs additionally. This additional spring compression further resists the movement of the pressure regulating piston, resulting in a force balance between the area at the pressure regulator, the springs, and the area behind the rate-of-rise piston. Neutral main pressure of approximately 40 psi is maintained by relieving excess oil behind the rate-of rise piston through the ball and spring regulator.

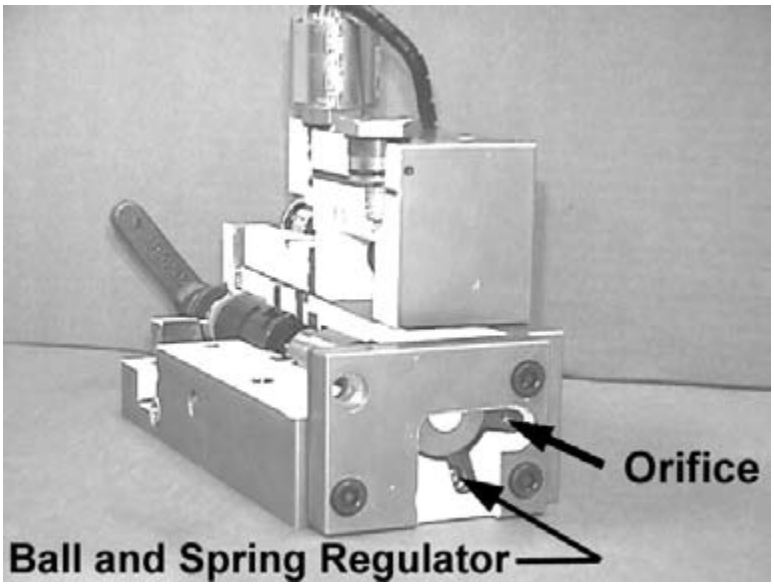


Figure 5. Neutral Regulator and Rate of Rise Orifice

Control Valve Assembly in Primary or Secondary

Pressurized oil is directed to one of the transmission's clutches to engage it. The pressurized oil in the clutch port of the engaged clutch acts on the shuttle ball, sealing off the passage to the opposite clutch. The pressurized oil also forces the ball of the ball and spring regulator against its seat on the orifice plate, stopping the flow of oil from the rate-of-rise chamber to sump. Since oil continues to flow into the rate-of-rise chamber through the orifice, the oil pressure in the rate-of-rise chamber increases. This increased oil pressure forces the rate-of-rise piston to stroke over to its stop in the valve body, compressing the pressure regulating springs even further yet.

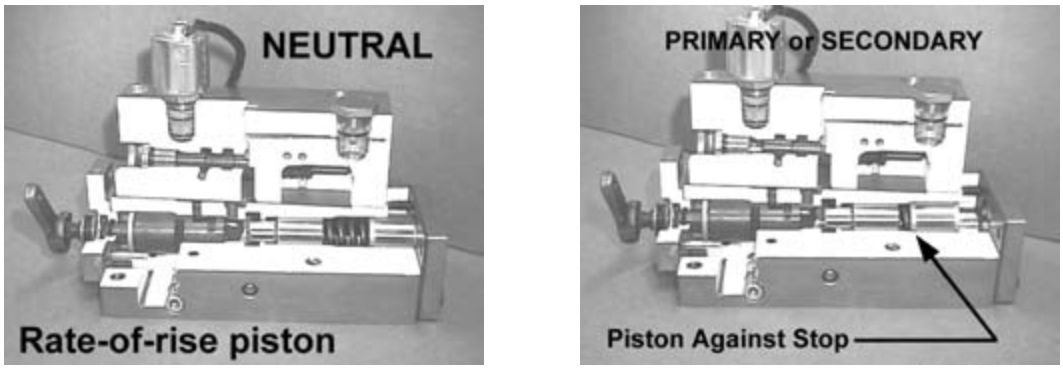


Figure 6. Rate of Rise Piston in Neutral (left) and Rate of Rise Piston with Clutch Engaged (right)

The travel rate of the rate-of-rise piston (and resulting pressure rate-of-rise) is controlled by the orifice size, regulator spring stiffness and the final main pressure after completion of the rate-of-rise cycle. Neutral main pressure controls the start time of the rate-of-rise cycle. When the rate-of-rise piston is against the stop (pressure regulating springs are compressed the most), the main oil pressure reaches approximately 290 psi.

When the control valve is shifted to Neutral, the clutch that was engaged is vented to sump within the valve. As a result, the passage behind the ball and spring regulator is vented to sump and induces a high differential pressure between the rate-of-rise chamber and the passage behind the ball and spring. Since the pressure in the rate-of-rise chamber is much greater than the pressure it is to be regulated at, the ball unseats from the orifice plate, allowing main oil pressure to return to the neutral pressure level rapidly and again be regulated by the ball and spring regulator. The ball returns to the pressure regulating position once the spring force is equal to force induced by the pressure at the rate-of-rise piston.

Electric Operation

The transmission normally operates with the control valve in the electric mode. Two spools, each controlled by a solenoid operated pilot valve, control clutch engagement. When a solenoid is energized, it opens the pilot valve and allows main pressure oil to flow to the end of the spool. The pressure acting on the end of the spool overcomes the return spring at the opposite end, causing the spool to stroke over and connect the clutch passage with main pressure passage.

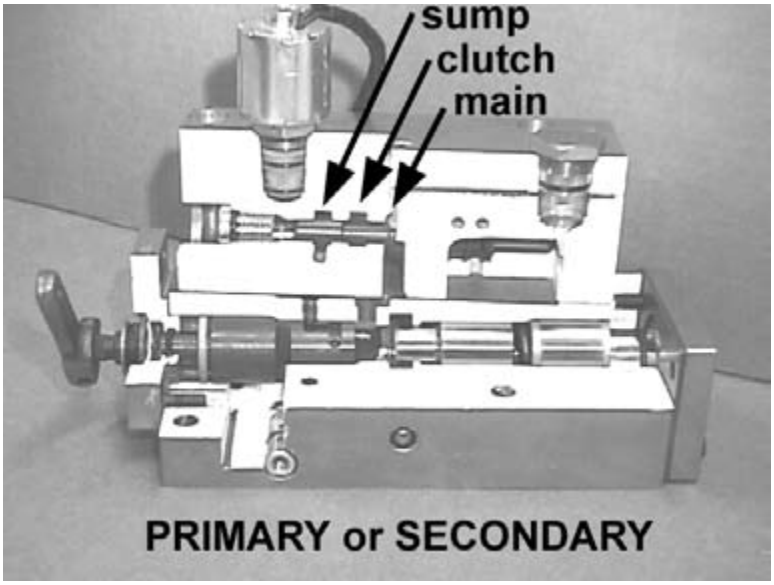


Figure 7. Pilot Spool Passages

Main pressure oil flows from the spools above to the clutch passages of the transmission below via connecting slots in the manual override stem. These connecting slots are aligned with passages in the valve body when the valve is in the electric mode.

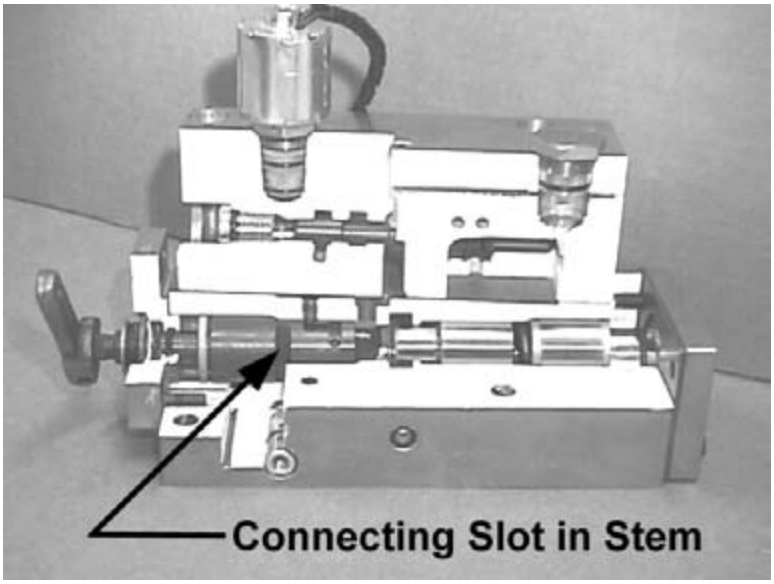


Figure 8. Flow Path in Override Spool

Main pressure from the energized solenoid operated pilot valve also acts on a pin on the return spring side of the opposite spool to ensure the opposite spool is connecting its clutch to sump. The clutch engagement cycle is outlined in the previous section.

Hydraulic Lock Feature (some models)

Some control valve models have a hydraulic lock feature, and are identifiable by a third solenoid operated pilot valve. This feature keeps the engaged clutch pressurized as long as the engine remains running, should electrical power fail or malfunction occur while the clutch is engaged. The hydraulic lock is accomplished by allowing pressurized oil (from the pressurized clutch passage) to flow inside the spool. Oil pressure inside the spool forces the dowel pin against the O-ring plug.

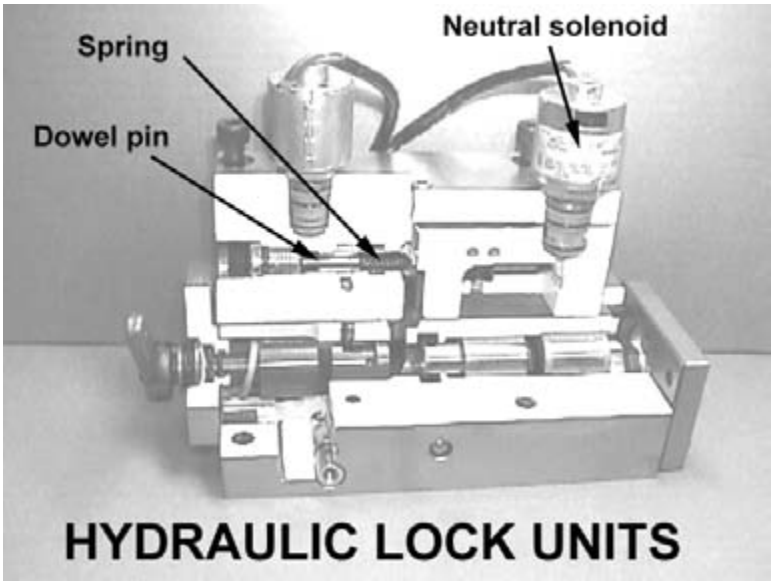


Figure 9. Hydraulic Lock Units

The resulting reaction is a force on the spool that overcomes the spool's return spring force. Should the solenoid become de-energized while the spool has its clutch pressurized, oil pressure will keep the spool in that position. This keeps the transmission in gear as long as the engine is running.

The hydraulic lock is disabled when either the engine is stopped, or the neutral solenoid is energized. When the neutral solenoid is energized, it sends pressurized oil to the dowel pins at the return spring end of each spool.
Since the dowel pin used at the return spring side of the spool is larger in diameter than the dowel pin inside the spool, the hydraulic force acting on the larger pin forces the spool to connect the clutch passage to sump with assistance from the return spring.

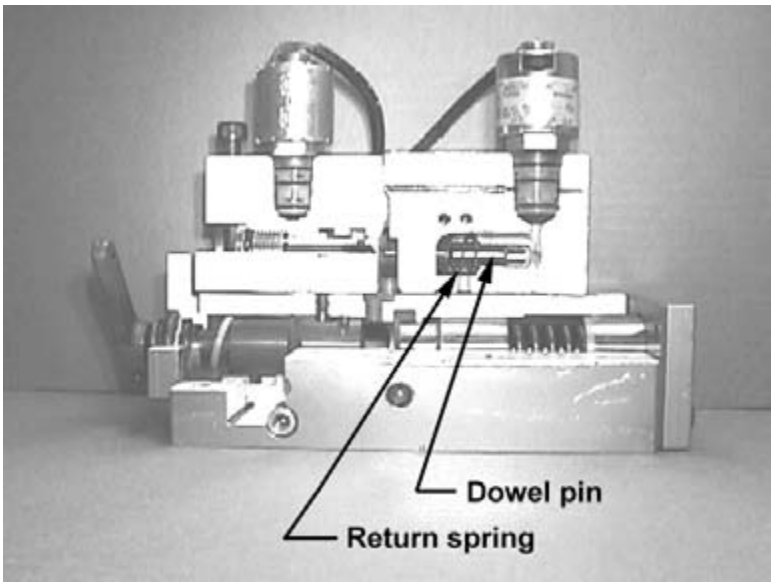


Figure 10. Neutral Solenoid Engaged

Manual Override Operation

The control valve has a manual override feature, which is a lever operated selector. When the manual override lever is rotated counterclockwise and pulled outwards, the upper portion of the valve is disabled because the connecting slots in the manual override stem are no longer aligned with the oil passages in the valve body. Oil pressure from the solenoid operated pilot valve controlled spools cannot reach the clutch pressure passages in the transmission. The main oil pressure regulator, shuttle ball, neutral pressure regulator, and rate-of-rise functions remain exactly the same as when the valve is in the electric mode. In the manual override position, shifting is controlled by rotating the lever on the manual override stem.

In the Neutral position, both clutches are vented to sump by two pockets in the stem.

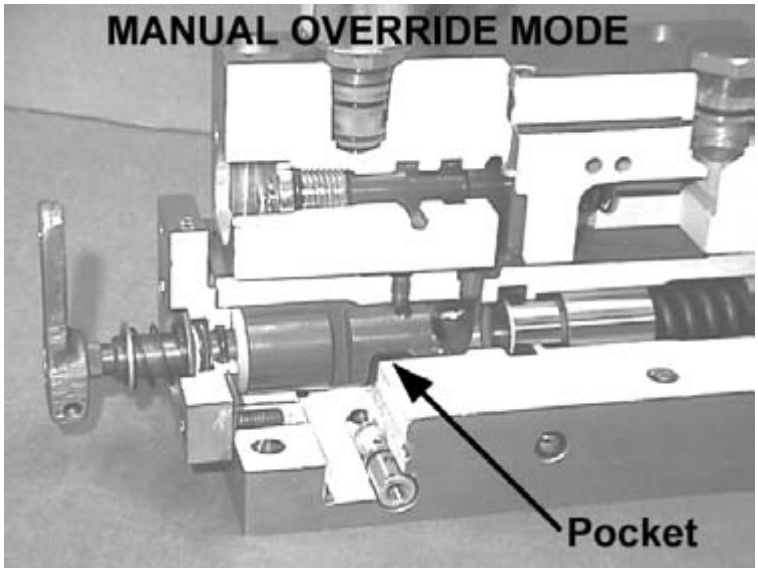


Figure 11. Stem Pocket or Passage

Main pressure oil can flow through the hole in the end of the stem to a narrow slot between the two pockets. This slot does not connect to any other passages when the stem is in the Neutral position.

When the lever and stem are rotated to engage either the primary or secondary clutch, main pressure oil flows through the slot in the stem to the appropriate clutch pressure port. The opposite clutch port passage remains connected to sump by the same pocket in the stem as when the stem was in the Neutral position. When the stem is rotated back to the Neutral position, the main pressure oil slot in the stem is no longer aligned with either clutch port. Both clutches are again vented to sump by the two pockets in the stem.

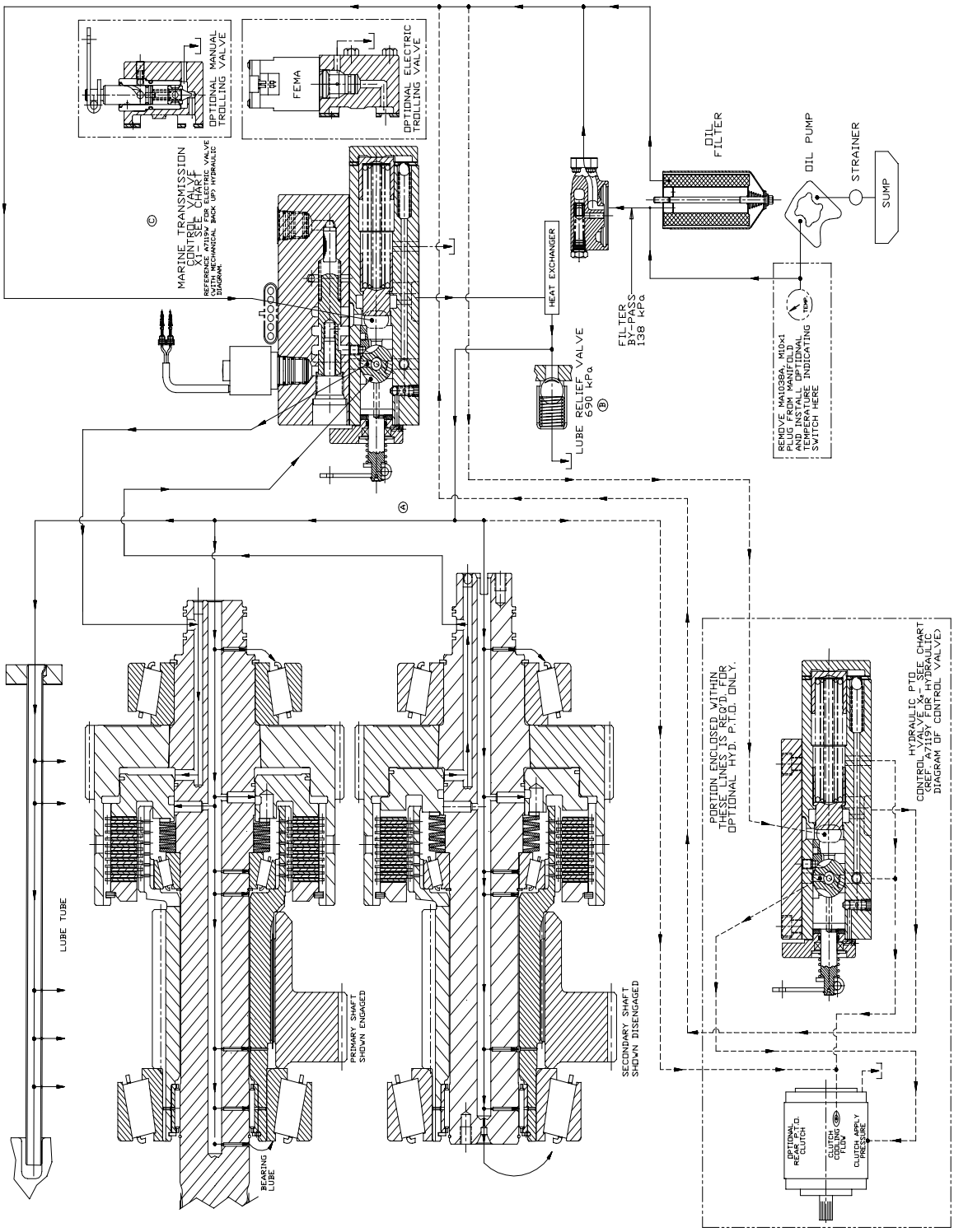


Figure 12. A7119AA Hydraulic Schematic (electric control valve)

Trolling Valve (Optional)

The trolling valve is used to reduce and control propeller speed below that normally attained by operating the engine at low idle. Actuating the trolling function reduces clutch apply pressure to reduce the propeller speed.

1017555 Mechanical Trolling Valve

This trolling valve is a variable orifice that controls the pressure in the rate-of-rise chamber. The pressure in the rate-of-rise chamber determines the rate-of-rise piston position, which ultimately controls the main and clutch pressures for the transmission.

When the trolling valve lever is in the detent (non-trolling) position, the orifice in the trolling valve is closed. Oil cannot exit from the rate-of-rise chamber through the trolling valve's orifice, and the rate-of-rise chamber is fully pressurized (the ball and spring regulator is blocked when either clutch is engaged). This full pressure causes the rate-of-rise piston to remain against its stop in the valve body bore, and main oil pressure is not reduced.

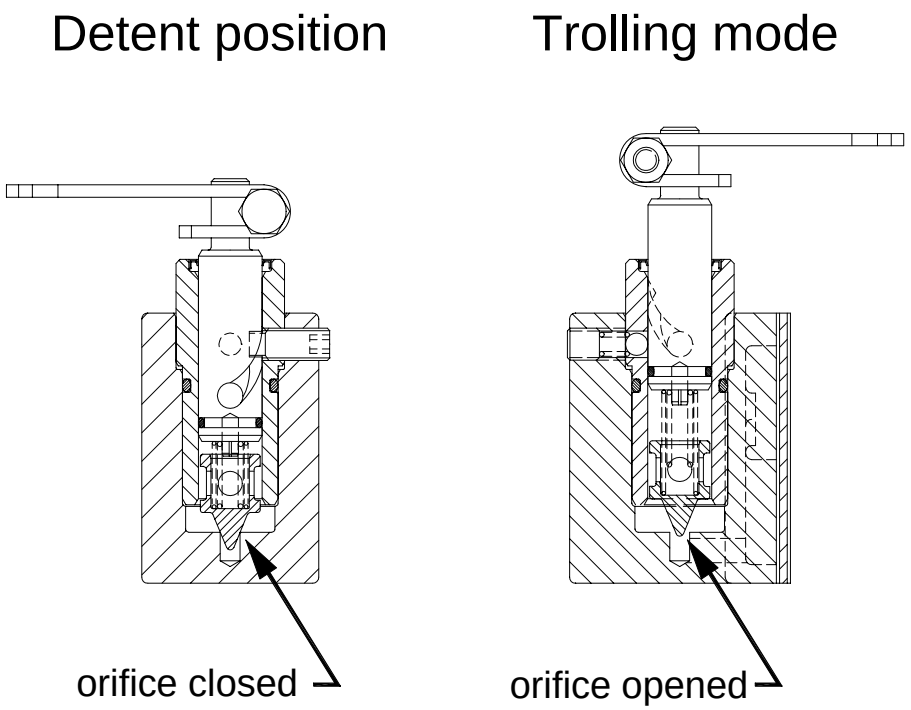


Figure 13. Mechanical Trolling Valve

Rotating the trolling valve lever into the trolling mode opens the variable orifice, allowing some of the oil to escape from the rate-of-rise chamber to sump. This reduces the oil pressure in the rate-of-rise chamber. Since oil is always flowing into the rate-of-rise chamber through the orifice in the orifice plate, the pressure in the rate-of-rise chamber is controlled by how much oil is allowed to exit through the trolling valve's variable orifice. The trolling valve lever position determines the pressure in the rate-of-rise chamber, which determines main oil pressure. Main oil pressure is always the same as the oil pressure in the engaged clutch with this type of trolling valve.

1017554 Electric Trolling Valve

This trolling valve is a variable orifice that controls the pressure in the rate-of-rise chamber. The pressure in the rate-of-rise chamber determines the rate-of-rise piston position, which ultimately controls the main and clutch pressures for the transmission. The only difference between the electric trolling valve and the previously described mechanical trolling valve is that the electric trolling valve's orifice size is controlled by electrical current instead of a lever.

When the trolling valve is in the cruise (non-trolling) mode, the orifice in the trolling valve is closed. Oil cannot exit from the rate-of-rise chamber through the trolling valve's orifice, and the rate-of-rise chamber is fully pressurized (the ball and spring regulator is blocked when either clutch is engaged). This full pressure causes the rate-of-rise piston to remain against its stop in the valve body bore, and main oil pressure is not reduced.

The trolling valve is actuated by sending a controlled amount of current through the valve's coil. As the current is increased, the orifice progressively opens, allowing oil pressure from the rate-of-rise chamber to escape to sump. Since oil is always flowing into the rate-of-rise chamber through the orifice in the orifice plate, the pressure in the rate-of-rise chamber is controlled by how much oil is allowed to exit through the trolling valve's variable orifice. Since the oil pressure in the rate-of-rise chamber is reduced, clutch pressure is reduced which allows the clutch plates to slip. The amount of clutch slip is controlled by the current flow (amps) through the valve's coil. Decreasing the current through the valve's coil will increase clutch pressure and therefore reduce clutch slip. Main oil pressure is always the same as the oil pressure in the engaged clutch with this type of trolling valve. The 1017170 valve contains no user serviceable parts, and is available only as an assembly.

Power Take-off (Optional)

There is a separate manual (part number 1020075) which describes the operation, installation, troubleshooting, and service of the optional Power Take-off (PTO) for this marine transmission.

Live Power Take-off

The live PTO drives accessories using engine horsepower. Since the live PTO connects the accessory to the primary shaft of the transmission via a direct coupling, the accessory is driven when the engine is running.

Hydraulic Clutched Power Take-off

The hydraulic clutched PTO also allows accessories to be driven using engine horsepower. Since the PTO is attached to the primary shaft of the transmission, the accessories can be driven any time the engine is running. The PTO is engaged by the PTO control valve, which is very similar to the valve used to control the transmission clutches.

The hydraulic clutched PTO operates with an engaged clutch pressure greater than that of the transmission's primary and secondary clutches. For this reason, the PTO control valve (pressure increasing valve) is in the transmission's hydraulic circuit before the control valve's inlet and pressure regulator. Pressurized oil from the filter is directed to the PTO control valve, with the overage oil flowing to the transmission's control valve.

Trailing Pump (Optional)

The trailing pump is used to supply oil flow to the transmission lubrication circuit when the transmission is in a backdriving condition. Backdriving (sometimes referred to “windmilling”) occurs when the engine is shut down and the transmission output shaft is being driven by water flow across the propeller.

The integral trailing pump option can be added to any MG-6650SC transmission. The trailing pump is driven by a gear connected to the output shaft of the transmission. The trailing pump pulls oil through a dedicated suction strainer. The oil is then discharged through a check valve and into the transmission’s lubrication oil circuit.

The remote trailing pump option is driven by an electric motor. This trailing pump pulls oil through its suction strainer and discharges it through a filter to a check valve. The oil then flows through an oil-to-air heat exchanger and into the transmission’s lubrication circuit via one of the lubrication oil pressure test ports.

Power Flow

Input power to the transmission is through a torsional coupling mounted on the engine flywheel. The coupling is splined to the forward end of the primary (forward clutch) shaft causing the primary shaft to rotate in engine direction during engine operation. Power is transmitted to the secondary shaft by means of the transfer gear teeth on the outer diameter of the primary clutch housing. These teeth are in constant mesh with gear teeth on the of the secondary clutch housing causing the secondary shaft to rotate in anti-engine direction. The primary and secondary pinions on their respective shafts are in constant mesh with the output gear, which is connected to the output shaft through a keyless tapered joint.

Application of the primary clutch locks the primary pinion to the primary shaft causing the pinion to turn in the shaft direction and causing the output shaft to rotate in anti-engine direction. Application of the secondary clutch locks the secondary pinion to the secondary shaft causing the pinion to turn in the shaft direction and causing the output shaft to rotate in engine direction.

Neutral

When in neutral the primary and secondary shafts, transfer gears and clutch friction plates rotate at engine speed.

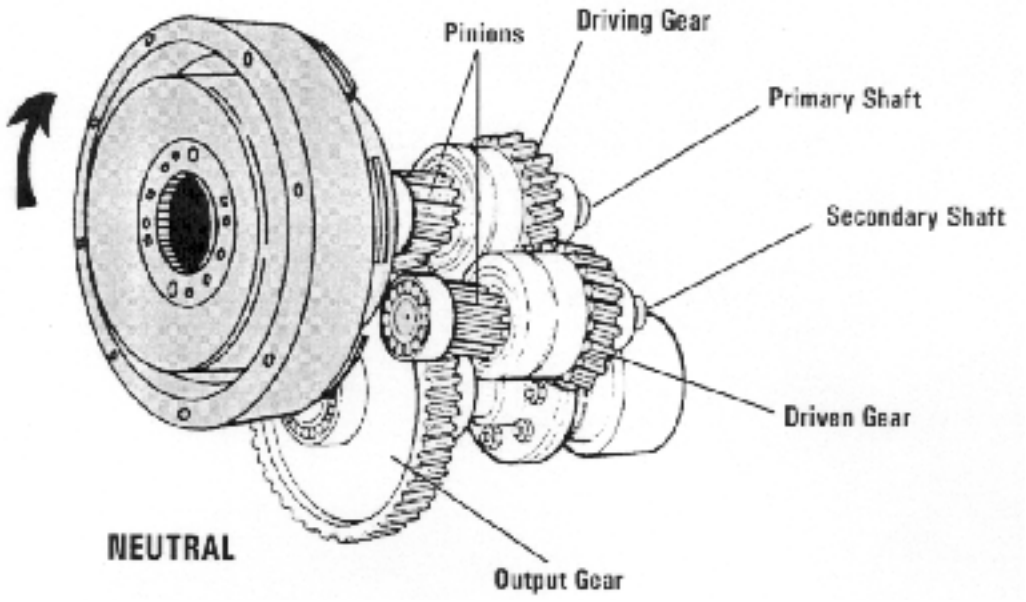


Figure 14. MG-6650SC Power Flow in Neutral

Primary

When the primary position is selected, hydraulic pressure is applied to the primary clutch piston clamping the friction and steel clutch plates together. The primary input pinion will then rotate at engine speed and direction because the steel plates are spline-connected through the clutch hub assembly to the pinion. Because the primary input pinion is in mesh with the output gear, the output gear and shaft will rotate in anti-engine direction. The secondary input pinion will be backdriven (engine direction) when the unit is in the primary position.

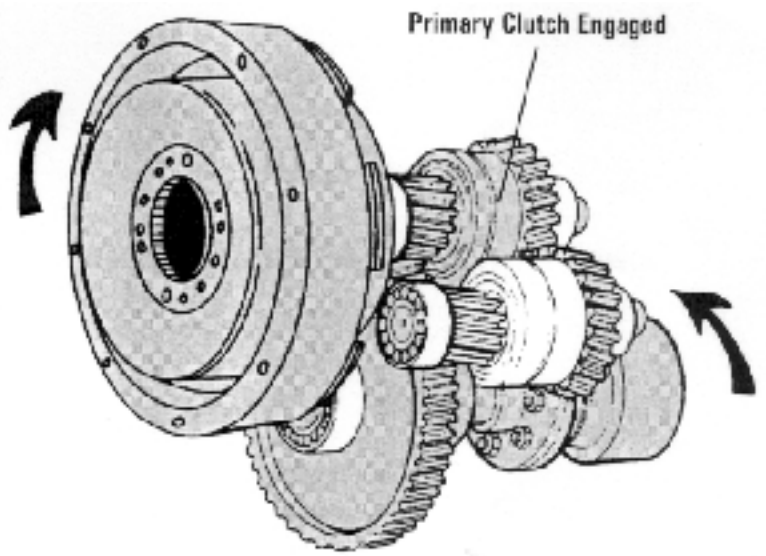


Figure 15. MG-6650SC Power Flow with Primary Clutch Engaged

Secondary

In secondary, the same parts are turning that were turning in neutral. When the secondary position is selected, hydraulic pressure is applied to the secondary clutch piston clamping the friction and steel plates together. The secondary input pinion will then rotate at engine speed and anti-engine direction, because the steel clutch plates are spline connected through the clutch hub assembly to the input pinion. Because the secondary input pinion is in mesh with the output gear, the output gear and shaft will rotate in engine direction. The primary input pinion will be backdriven (anti-engine direction) when the unit is in the secondary position.

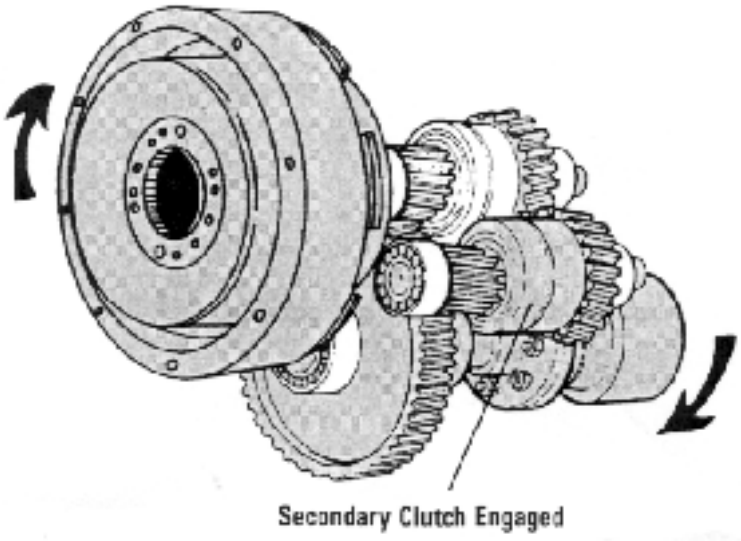


Figure 16. MG-6650SC Power Flow with Secondary Clutch Engaged

Preventative Maintenance

Lubrication

Grease the oil seals on the output end of the output shaft through the grease fitting with water pump (lithium soap-based NLGI No. 2) grease. Apply grease every 100 hours or when the boat is docked.

No other lubrication is required beyond the daily oil check.

Oil System

Oil Level

The oil level should be checked daily or every 10 hours. Check oil level before starting the engine to confirm that the transmission has oil in it. With the engine running at low idle and the transmission in Neutral, check the oil again. The oil level should be near the “low” oil level mark. Transmission oil temperature should be in the normal operating range prior to finalizing the oil level between the low and full marks on the oil level gauge.

Oil and Filter Change Interval

With a new transmission, change the oil and filter element within the first 50 hours of operation. Change oil and filter element after each 1000 hours thereafter or more often if conditions warrant.

For a rebuilt transmission, check the filter element after eight hours of operation. If the filter is clean, install a new filter element and then change the oil and filter element after 1000 hours of service. If the filter is dirty, change the element and operate for another eight hours. Check the filter again. Continue this cycle until the filter is clean and then change the oil and filter after 1000 hours of service or more often if conditions warrant.

Draining

Drain the transmission by removing the O-ring plug at the rear side at the bottom.

Oil Suction Strainer

Remove and clean the pump suction strainer at every oil change or sooner if necessary. The suction strainer is located in the manifold below the pump. See Engineering Drawings for suction strainer location.

Type Oil Recommended

See Description and Specifications.

Filling

1. Remove the filler breather in the top cover of the transmission.

2. Fill the transmission's sump with 41.6 liters (11.0 U.S. gal.) of the proper weight and type oil. See Description and Specifications for oil recommendations.

3. Start the engine and let it idle with transmission in neutral until oil is circulated throughout the hydraulic system. Add oil if necessary to bring the oil level up to the "low" mark with the engine at low idle.

4. With the oil at operating temperature, transmission in neutral, and the engine running at low idle, check the oil level with the oil gauge. Add or remove oil if necessary to bring the oil level to "FULL" mark on the oil gauge.

5. Allow the oil temperature to cool to normal cold oil conditions (perhaps overnight). Check the oil level while cold at low idle engine speed while in neutral. Make note of the oil level in the cold conditions for future reference, as it corresponds to the correct oil level at operating temperature.

Torsional Coupling

Do not obstruct the flywheel housing vents preventing the free flow of air for cooling the coupling. The ambient temperature of the air around the coupling should be between -6˚C (22˚F) and 80˚C (176˚F). Assure baffles are installed properly so hot air is ported out of the housing.

Visually inspect the element after the first 100 hours of operation and every 2000 hours thereafter, or every six months, whichever comes first. Torsional vibration, misalignment, degradation by contaminants (oil), heat, ultraviolet radiation, and excessive system torque can cause cracks or other signs of distress to appear on the surface of the rubber. The above-described items affect the life of the coupling element.

When inspecting the flexible coupling, look for evidence or conditions identified in the following steps:

- ❑ Cracks in the surface of the rubber. May be caused by torsional vibrations, excessive misalignment or exposure to contaminants (heat, petroleum products, chemicals, ozone, ultraviolet radiation, etc.) excessive system torques.
- ❑ Separation of rubber from flex plate on coupling plate or deterioration of the rubber-to-metal bond. See above.
- ❑ Deterioration of the rubber element, as evidenced by sponginess or by black carbon-like dust on rubber surface. May be caused by contaminants or excessive heat, either external or internal to the coupling.
- ❑ Cracked, bent or otherwise damaged flex plate or coupling plate.
- ❑ Bolt holes in flex plate or coupling plate elongated oval shaped, not round. This could be caused by improperly assembled parts, loose parts, vibration or improperly torqued parts.
- ❑ Bolts/nuts—bent, worn or stripped threads.

Inspect the hub, looking for the following:

- ❑ Damaged or worn splines
- ❑ Cracked parts
- ❑ Oil seal surface for wear or damage

Replace any defective parts including defective fasteners that are found.

Heat Exchanger Check

Heat exchangers furnished by Twin Disc to be used for salt water applications have zinc rods installed at the inlet and outlet heads. These rods must be checked every 90 days. If over 50% of the rod is disintegrated, it should be replaced to provide effective protection.

Excessive corrosion of the zinc rod indicates electrolytic action. A careful inspection should be made to determine if this action is caused by a short circuit or external grounded electric current. If these conditions do not exist, it is evident that the corrosion is due to local electrolysis. If rods are corroded with foreign materials, they should be cleaned with a wire brush.

In-boat Repair

Certain transmission maintenance/repair procedures can be accomplished in the boat provided sufficient space exists to work. These procedures are:

- ❑ Removing and installing the oil pump
- ❑ Changing the filter
- ❑ Removing, cleaning and installing the suction strainer
- ❑ Removing and installing the control valve
- ❑ Removing and installing the manifold or top cover, bearing carrier and lube tube
- ❑ Removing and installing the primary and secondary shaft assemblies

Note: See special tools section for lifting bracket to aid in shaft removal or installation.

- ❑ Changing primary and secondary clutch plates

Note: Further disassembly/reassembly of the clutch shafts will require use of tools and equipment normally not available on board the vessel.

Overhaul Interval

A complete overhaul of the unit should be made at the same time that the engine is overhauled.

Periodic Visual Inspection

- ❑ Check the mountings for tightness or damage such as cracks. Tighten loose mountings and replace damaged parts.
- ❑ Check pressure and temperature gauge where applicable.
- ❑ Inspect the oil lines and heat exchanger for leaky connections, cracks, or other damage. Replace damaged lines.
- ❑ Periodically, inspect the drive line and the input and output shaft oil seals for leakage. Replace parts as required.

Troubleshooting

Troubleshooting Chart

The following chart is intended as a guide for determining the cause of problems that could be encountered and the corrective actions for those difficulties.

The transmission is one part of a complete power package. Problems in the input power system or the output power delivery components can cause problems to develop in the transmission. It is therefore important that the entire power package be considered when problems are encountered.

The troubleshooting chart begins on the following page.

Table 9. Troubleshooting Chart

Symptom	Cause		Remedy	
1. Low main oil pressure	1-1	Partially clogged oil strainer	1-1	Remove and clean oil strainer.
	1-2	Stuck pressure regulation piston.	1-2	Disassemble the valve and clean the piston.
	1-3	Broken piston rings on clutch shaft(s).	1-3	Remove the collector and inspect piston rings.
	1-4	Damaged or worn oil pump assembly.	1-4	Replace damaged or worn oil pump assembly (pump is not serviceable)
	1-5	Incorrect linkage adjustment to control valve assembly.	1-5	Adjust linkage so that control valve stem is indexed properly by detent.
	1-6	Clogged or plugged orifice in orifice plate of control valve assembly.	1-6	Remove orifice plate cover. Clean parts.
	1-7	Shimming required between regulator springs and rate-of-rise piston.	1-7	Shim as required.
	1-8	Engine idle speed too low.	1-8	Raise engine speed.
2. No oil pressure, or erratic low pressure at control valve tap.	2-1	Oil pump suction strainer plugged.	2-1	Remove and clean strainer.
	2-2	Oil level low.	2-2	Check oil level and correct.
	2-3	Air leak on suction side of pump.	2-3	Correct cause of air leak.
	2-4	Pump drive on reverse clutch shaft broken.	2-4	Disassemble and repair as required.
	2-5	Regulating valve stuck in open position	2-6	Remove, disassemble, clean and repair the regulating valve.
	2-6	Oil pump defective	2-7	Replace oil pump.
	2-7	Leaking heat exchanger has caused oil to be lost over board.	2-7	Replace heat exchanger

Table. 9. Troubleshooting Chart (continued)

Symptom	Cause		Remedy	
3. High main oil pressure.	3-1	Regulating valve stuck.	3-1	Remove and clean regulating valve.
	3-2	Improperly shimmed.	3-2	Shim as required.
	3-3	Lube relief valve malfunction.	3-3	Inspect, repair or replace parts as necessary.
4. High temperature.	4-1	Improper oil level.	4-1	Check and fill (or drain) with proper oil to the correct level.
	4-2	Faulty heat exchanger	4-2	Inspect, repair, or replace heat exchanger.
	4-3	Clutches slipping	4-3	Check clutch apply oil pressure. If pressure is normal, remove, disassemble, and repair slipping clutch.
	4-4	Bearing failure.	4-4	Overhaul marine transmission.
	4-5	Air leak on suction side of pump.	4-5	Inspect and correct cause of suction leak.
	4-6	Control valve malfunction	4-6	Inspect, repair, or replace control valve.
5. Excessive Noise	5-1	Bearing failure.	5-1	Overhaul marine transmission.
	5-2	Worn or damaged input coupling.	5-2	Remove marine transmission. Replace a worn or damaged coupling.
	5-3	Excessive torsional vibration.	5-3	Select proper torsional coupling.
	5-4	Worn or damaged gears.	5-4	Overhaul marine transmission.
	5-5	Improper alignment.	5-5	Check alignment of engine and transmission output flange to propeller shaft. Correct as necessary.
	5-6	Damaged propeller.	5-6	Repair propeller.
	5-7	Misfiring engine.	5-7	Repair engine.

Table. 9. Troubleshooting Chart (continued)

Symptom	Cause		Remedy	
6. No neutral.	6-1	Clutch plates warped.	6-1	Remove clutch plates. Overhaul unit.
	6-2	Control valve incorrectly indexed.	6-2	Check and adjust control linkage.
	6-3	Solenoid malfunction (units equipped with electric selector valve)	6-3	Replace defective solenoid.
	6-4	Hydraulic lock piston stuck (units equipped with electric selector valve and hydraulic lock).	6-4	Inspect, repair, or replace hydraulic lock spool.
7. Harsh engagement.	7-1	Regulating piston or rate-of-rise piston stuck.	7-1	Disassemble control valve. Clean parts. Replace parts if necessary.
	7-2	Orifice plate ball in control valve not seating properly.	7-2	Remove orifice plate cover. Clean parts. Replace parts if necessary.
	7-3	Blown gasket on either side of orifice plate.	7-3	Replace gasket.
8. Low lube oil pressure.	8-1	Pump flow output too low.	8-1	Replace pump.
	8-1	Pump suction strainer plugged.	8-2	Remove, clean, inspect, and install the suction screen.
	8-3	Air leak on suction side of pump.	8-3	Inspect and correct cause of suction leaks.
	8-4	Lube relief valve malfunction.	8-4	Remove and clean or replace parts as necessary.
	8-5	Broken piston rings.	8-5	Replace damaged piston rings.
9. Oil spilling out of breather.	9-1	Oil level too high.	9-1	Adjust oil level.
	9-2	Wrong type of oil.	9-2	Draw and refill with recommended oil.

Disassembly

The following procedure is for complete disassembly of the unit. Prior to this procedure, the transmission should be removed from the boat. Qualified personnel should do the work in a fully equipped facility.

The physical size and weight of many of the parts for this transmission assembly are such that adequate lifting devices and procedures are necessary for safety considerations. This requires that the transmission assembly be adequately supported and properly positioned as identified in the following paragraphs.

Note: The MG-6650SC requires the use of a SKF THAP 300 Oil Injection Kit, as seen in Special Tools, or similar device to service the output flange and output gear.

Use the following reference: The input side of the transmission is the front and the output side is the rear. Left and right sides are determined by facing the output side of the transmission from the rear.

Prepare Transmission for Disassembly

Note: During service of this unit, all O-rings, gaskets and seals must be replaced. It is good practice to keep the old O-rings, gaskets and seals with the appropriate components being disassembled for future reference during the inspection and assembly process (to make sure you do not forget the quantity, size, etc.).

Drain the oil from the transmission sump by removing the hex plug from the bottom of the rear side of the housing. Drain the water from the heat exchanger by removing the O-ring plug from the bottom of the heat exchanger housing (units with integral heat exchanger only).

Remove Transmission External Components and Sub-Assemblies

Note: The following steps of disassembly can be accomplished with transmission standing upright.

1. Remove the torsional coupling and hub from the primary shaft spline (if not previously removed). The coupling hub is a slip-fit on the spline. Note the position of the internal retaining ring inside the hub - it must be reinstalled in that position at reassembly.

2. Remove the front housing from the main housing.

3. Remove the oil level gauge and tube assembly from the top cover. Remove the top cover and gasket.

4. Remove the oil pump and gasket. Remove the pump spacer plate and pump drive adapter (some models).

5. Remove the heat exchanger housing, heat exchanger element, and stiffener plate. Check the condition of the anode inside the heat exchanger housing (units with integral raw water heat exchanger only).

6. Remove the oil filter canister housing, element, and filter head. Remove the filter bypass valve parts from the filter head.

7. Remove the control valve and set it aside for later disassembly.

8. Remove capscrew securing clamp plate for suction strainer cover. Remove clamp plate, suction strainer cover with O-ring, and suction strainer.

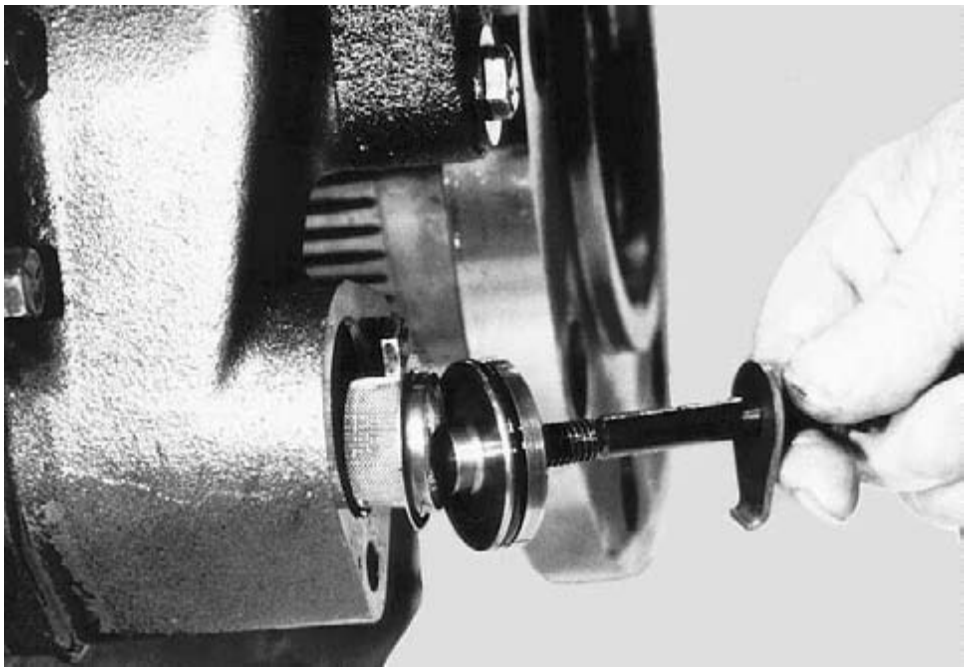


Figure 17. Removing Suction Strainer

Note: It is necessary to block and support the transmission with the output side facing up. Use caution to avoid damaging the taper on the primary shaft.

Remove Output Flange

1. Loosen each of the output flange retaining washer capscrews approximately six revolutions, resulting in a 9 mm (0.35 inch) gap below each of the screw head. The capscrews and washer will be used to restrain the output flange when it separates from the output shaft.

⚠ WARNING

Always use retainer bolts or a safety strap to hold parts being separated with oil pressure. Oil pressure applied between the two parts for disassembly can reach 300Mpa (43500psi). The use of proper safety equipment is mandatory when working with high pressure hydraulic tools. The parts may separate with extreme force.

2. Install the oil injector into the output flange at the O-ring plug location. Note that the threads are 1/4-19 BSP.

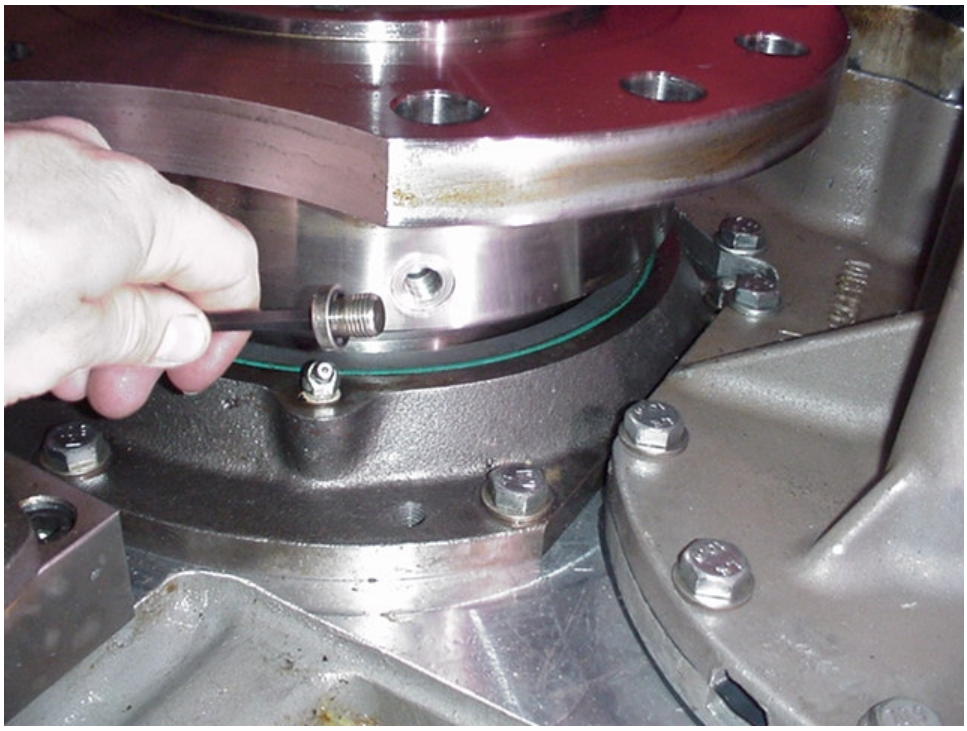


Figure 18. Output Flange Oil Injection Plug Location

3. Inject oil with a viscosity of 900 mm^2/S (900 cSt) at room temperature into the flange hub until the flange separates from the output shaft. Remove the oil injection equipment. Remove the capscrews, washer, shims, and output flange.

   Note: Use caution to prevent damaging the taper of the output flange or shaft as the torque capacity can be reduced.

4. Remove the output seal carrier.

5. Press the oil seals out of the seal carrier and remove the O-ring from the seal carrier.

6. Remove the output bearing cup and adjustment shims from the seal carrier.

Remove and Disassemble Manifold and Bearing Carrier

1. Remove the primary shaft end cover plate and O-ring.

2. Remove manifold attaching screws. Install two of the removed screws into the threaded pusher screw holes of the manifold (near the dowel pins). Tighten the screws alternately and evenly to push the manifold off of the bearing carrier and dowel pins. Remove the manifold and gasket.

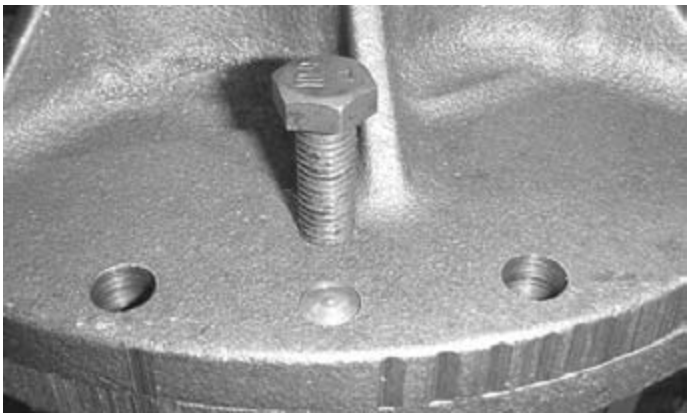


Figure 19. Pusher Screws Installed in Manifold

3. Remove the bushings from the bores of the manifold only if replacement is necessary.

4. Remove the shims and bearing spacers from the bearing bores of the bearing carrier. Mark the shims and spacers for location identification.

5. Remove the lubrication tube from the bearing carrier.

Figure 20. Lube Tube in Bearing Carrier

6. Install two of the removed screws into the threaded pusher screw holes of the bearing carrier (near the dowel pins). Tighten the screws alternately and evenly to push the bearing carrier off of the housing and dowel pins. Remove the bearing carrier and prevent the bearing cups from falling out of the bores.

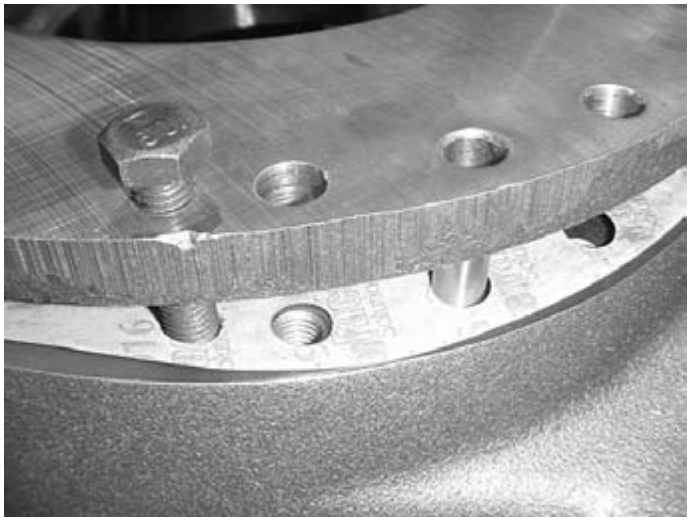


Figure 21. Pusher Screw Installed in Bearing Carrier

7. Remove the bearing cups from the bearing carrier. Mark the bearing cups for location identification.

8. Remove the lubrication oil pressure relief valve from the bearing carrier.

Figure 22. Lubrication Oil Pressure Relief Valve

Remove Primary and Secondary Clutch Shaft Assemblies

1. Lift out primary and secondary shafts. (Disassembly of the primary and secondary shafts are covered later in this section.) Use caution with the front pinion bearing cones. They are loose on the pinion diameter, and should remain in the housing. On some ratios, the diameter of the output gear will allow the bearing to come out with the shaft, and it could easily fall off causing damage. Set the shafts aside for further disassembly.

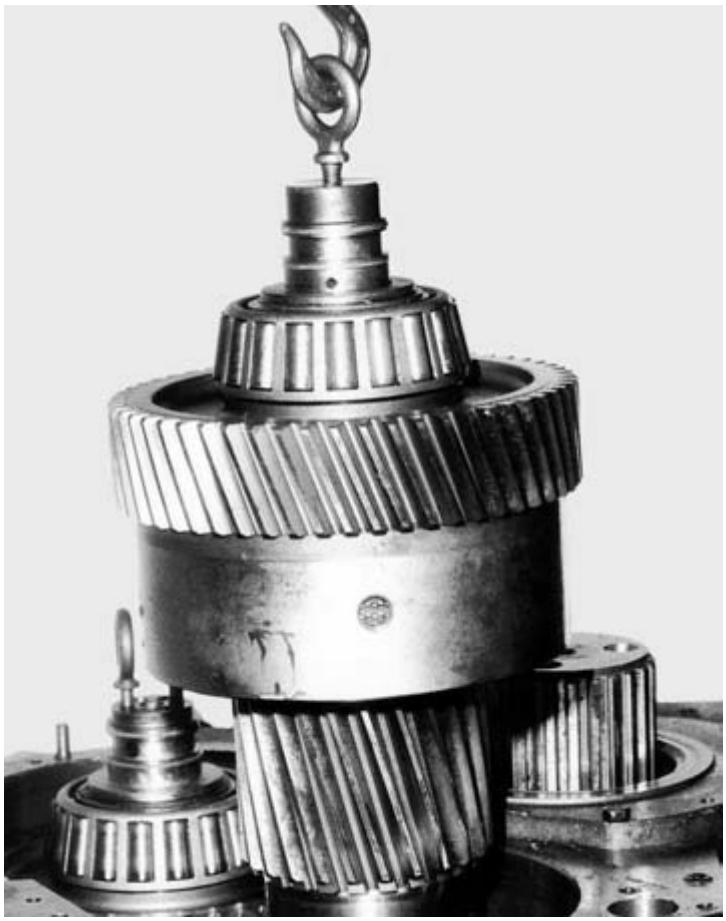


Figure 23. Lifting Out Primary or Secondary Clutch Shaft Assembly

2. Remove front pinion tapered roller bearing cones that were pulled off by output gear as primary and secondary shafts were removed.

   Note: Tapered roller bearing cups of front bearings on the primary and secondary shafts are an interference fit in the housing. Removal of these bearing cups should not be attempted unless replacement of the bearing is necessary.

Remove Output Gear and Shaft

1. Remove the four screws and sealing washers that retain the output gear pan. Rotate the gear pan around the output gear and remove it from the transmission housing.

2. Use a hoist to lift output shaft and gear assembly until gear contacts housing. Place blocks under gear to support the gear and shaft assembly in position.

Figure 24. Supported Gear and Shaft Assembly

3. Connect oil injection equipment to the 1/4 - 19 BSP threaded port on the rear end of the output shaft.

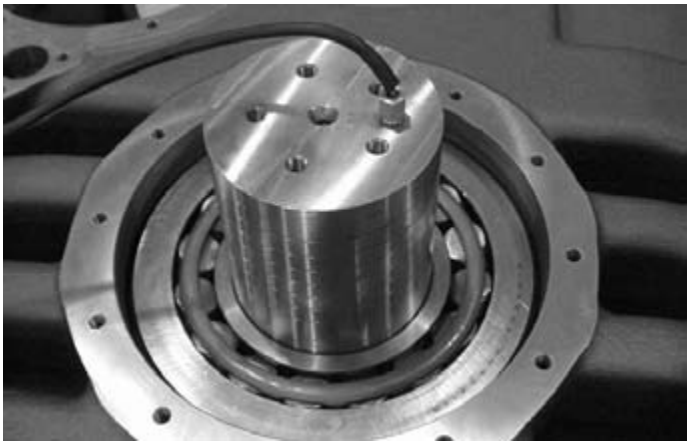


Figure 25. Oil Injection Equipment Connected to Output Shaft

4. Install eyebolts into the end of the output shaft and into the main housing mounting pads.

5. Thread a heavy strap through the eyebolts in the output shaft and the strap to the eyebolts in the main housing. The strap will restrain the output shaft during disassembly.

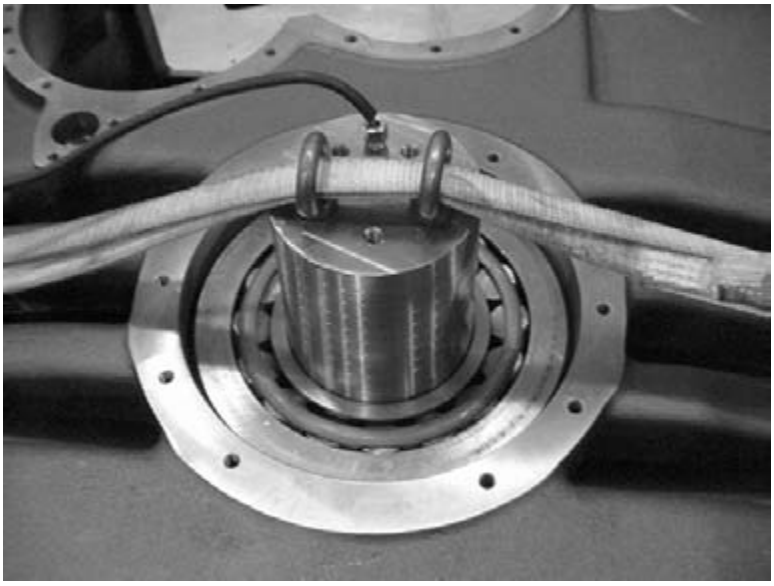


Figure 26. Heavy Strap Restraining Output Shaft

⚠ WARNING

Always use retainer bolts or a safety strap to hold parts being separated with oil pressure. Oil pressure applied between the two parts for disassembly can reach 300Mpa (43500psi). The use of proper safety equipment is mandatory when working with high pressure hydraulic tools. The parts may separate with extreme force.

6. Inject oil with a viscosity of 900 mm^2/S (900 cSt) at room temperature (dismounting fluid) into the output shaft until the shaft and gear separate.

   Note: Use caution to prevent damaging the taper of the output gear or shaft as the torque capacity can be reduced.

7. Lift the output shaft out of the transmission using tool T-18050-714. Remove the inner race of the front output shaft bearing and tapered roller bearing cones from the output shaft only if replacement is required.

8. Remove output gear assembly from transmission housing. Tool T-21528 can be used to ease removal of gear from housing.

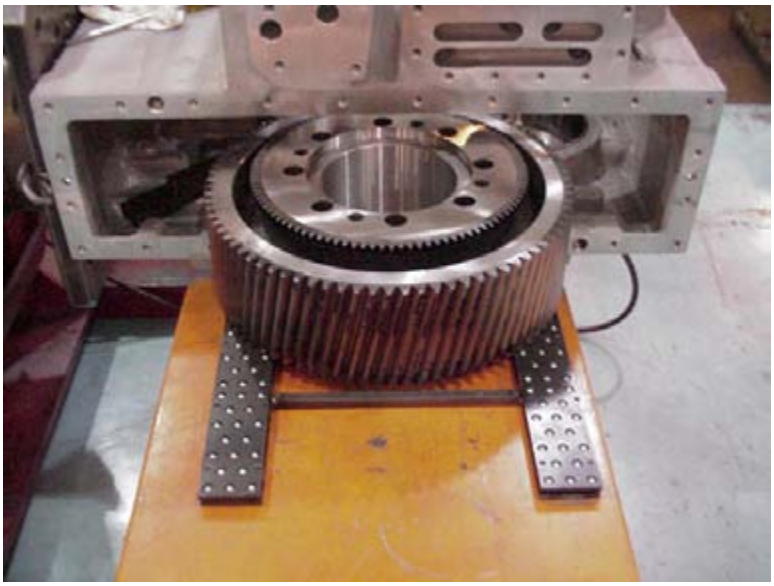


Figure 27. Removing Output Gear Assembly

9. Remove the trailing pump drive gear from the output gear.

10. Tapered roller bearing cups for front bearings on primary pinion, secondary pinion, and output shaft are an interference fit in their respective bearing bores of the transmission housing. Remove these parts only if replacement is required. To remove these bearing cups, weld a light bead around the I.D. of the bearing cup with an electric welder. This will shrink the cup and facilitate removal. Bearings removed in this manner must be replaced.

11. Remove input oil seal. Remove input oil seal protector plug only if replacement is necessary.

Disassembly of Trailing Pump Drive Components

1. From inside the transmission, remove the retaining ring from the gear end of the trailing pump shaft.

Figure 28. Removing External Retaining Ring

2. Remove the trailing pump driven gear and key from the trailing pump shaft.

3. Remove the trailing pump (or trailing pump cover, if equipped) and gasket from the transmission housing.

4. Remove the internal retaining ring from the bore of the transmission housing.

Figure 29. Removing Internal Retaining Ring

5. Remove the trailing pump shaft assembly.

Figure 30. Removing Shaft Assembly

6. Press the bearings off of the trailing pump shaft only if replacement of parts is necessary.

Disassembly of Primary and Secondary Clutch Shafts

Assemblies 1018375, and 1018375A

Note: The following procedures apply to assemblies 1018375, and 1018375A which use belleville clutch release springs. If the transmission has coil spring clutch release springs, proceed directly to page 81.

1. Remove two piston rings from rear end of shaft.

Figure 31. Removing Piston Rings From Shaft

2. If rear bearing must be removed, remove bearing retaining ring from rear end of shaft. Remove the bearing as follows:

   Note: Do not remove rear bearing unless bearing must be replaced. Bearing is an interference fit with shaft and will be destroyed during removal.

   a. Remove the external retaining ring from the shaft.

   b. With a hammer and chisel, cut cage off bearing to remove bearing cage and rollers.

   c. Use a split-type bearing puller (cheese cutter) to grip flange at small end of tapered inner race.

   d. With a hydraulic jack, pull on bearing inner race while pushing on rear end of shaft to remove bearing inner race from shaft.

3. Set shaft upright with input end up.

4. Remove and disassemble pinion(s).

   a. Remove round retaining ring from input end of shaft and remove pinion from shaft.

Figure 32. Removing Round Retaining Ring from Input End of Shaft

b. Remove internal retaining ring from input end of pinion and remove straight roller bearing.

Note: The straight roller bearing in the bore of the input end of the pinion is an interference fit, and will likely be destroyed during removal. Remove the straight roller bearing with the use of a puller behind the roller ends.

c. Remove tapered roller bearing cup from bore at rear of pinion if bearing requires replacement. This bearing cup is an interference fit in the pinion bore. To remove, use an electric welder to weld a light bead around the I.D. of the bearing race. This will shrink the bearing cup to facilitate removal. Bearings removed with this method must be replaced.

5. Remove internal retaining ring at front of clutch housing and remove clutch backing plate.

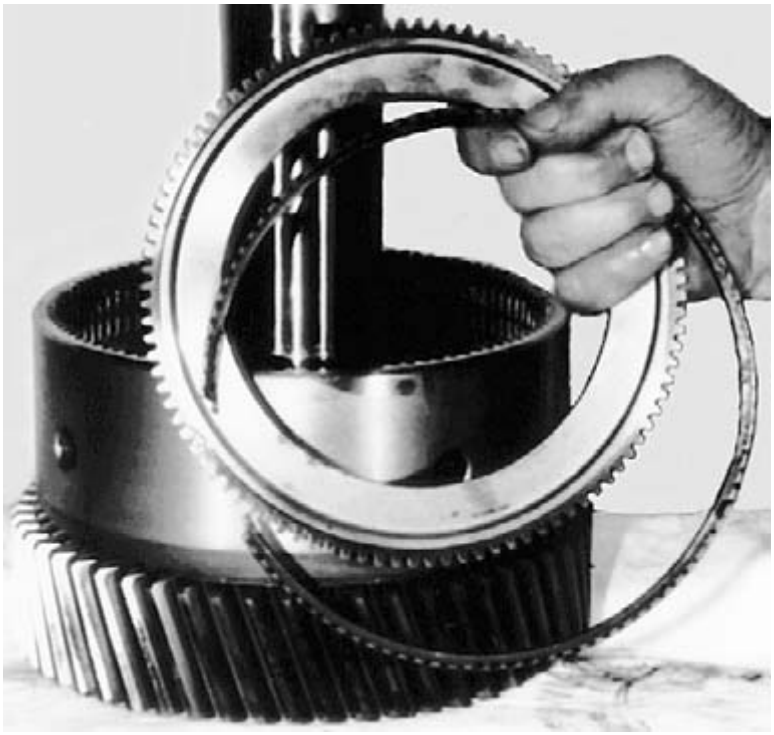


Figure 33. Clutch Backing Plate and Retaining Ring Removed

Note: Some models use a spiral internal retaining ring at the clutch backplate and a clutch piston without external splines.

6. Remove clutch plates (9 steel, 10 friction), maintaining the respective order for inspection purposes.

7. Use tool T-18050-704 to compress the belleville springs, and remove the external retaining ring.

Figure 34. Close-up of External Retaining Ring

8. Remove tapered roller bearing cone from shaft (bearing supports rear of pinion). This bearing is a slip fit and should remove easily.

9. Remove belleville clutch release springs and spring retainer.

10. Remove the clutch piston by applying air to the hydraulic pressure port (between the seal ring grooves) to force the piston from the bore. Use caution to avoid damaging the piston.

11. Remove clutch piston outer multi-piece seal ring from groove in piston.

12. Remove clutch piston inner seal ring from groove in shaft.

13. Remove the orifice plug from the front end of the secondary shaft (some models).

14. Proceed to page 85.

Assemblies 1018375B and 1018375C

Note: The following procedures apply to assemblies 1018375B and 1018375C which use coil spring clutch release springs. If the transmission has belleville spring clutch release springs, refer back to page 77.

1. Remove two piston rings from rear end of shaft.

Figure 35. Removing Piston Rings From Shaft

2. If rear bearing must be removed, remove bearing retaining ring from rear end of shaft. Remove the bearing as follows:

   Note: Do not remove rear bearing unless bearing must be replaced. Bearing is an interference fit with shaft and will be destroyed during removal.

   a. Remove the external retaining ring from the shaft.

   b. With a hammer and chisel, cut cage off bearing to remove bearing cage and rollers.

   c. Use a split-type bearing puller (cheese cutter) to grip flange at small end of tapered inner race.

   d. With a hydraulic jack, pull on bearing inner race while pushing on rear end of shaft to remove bearing inner race from shaft.

3. Set shaft upright with input end up.

4. Remove and disassemble pinion(s).

   a. Remove round retaining ring from input end of shaft and remove pinion from shaft.

Figure 36. Removing Round Retaining Ring from Input End of Shaft

   b. Remove internal retaining ring from input end of pinion and remove straight roller bearing.

   Note: The straight roller bearing in the bore of the input end of the pinion is an interference fit, and will likely be destroyed during removal. Remove the straight roller bearing with the use of a puller behind the roller ends.

   c. Remove tapered roller bearing outer race from bore at rear of pinion if bearing requires replacement. This bearing race is an interference fit in the pinion bore. To remove, use an electric welder to weld a light bead around the I.D. of the bearing race. This will shrink the bearing cup to facilitate removal. Bearings removed with this method must be replaced.

5. Remove internal retaining ring at front of clutch housing and remove clutch backing plate.

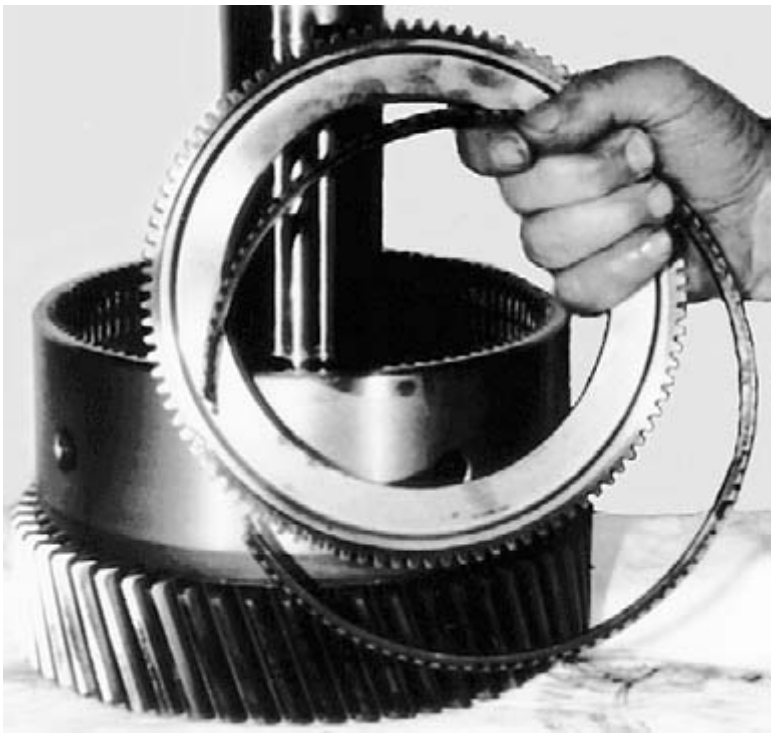


Figure 37. Clutch Backing Plate and Retaining Ring Removed

Note: Some models use a spiral internal retaining ring at the clutch backplate and a clutch piston without external splines.

6. Remove clutch plates (9 steel, 10 friction), maintaining the respective order for inspection purposes.

7. Remove tapered roller bearing cone from shaft. (Bearing supports rear of pinion.) This bearing is a slip fit and should remove easily.

8. Remove clutch apply piston.

   a. Place clutch in a press, input side up. Use special tool T-19330 to compress clutch release springs and expose round retaining ring.

Figure 38. Removing Spring Retainer Retaining Ring

   b. Remove retaining ring. Slowly release pressure on press and remove shaft from press. Remove special tool T-19330 and spring retainer. Remove clutch release springs form pockets in face of piston.

c. Remove the clutch piston by applying air to the hydraulic pressure port (between the seal ring grooves) to force the piston from the bore. Use caution to avoid damaging the piston.

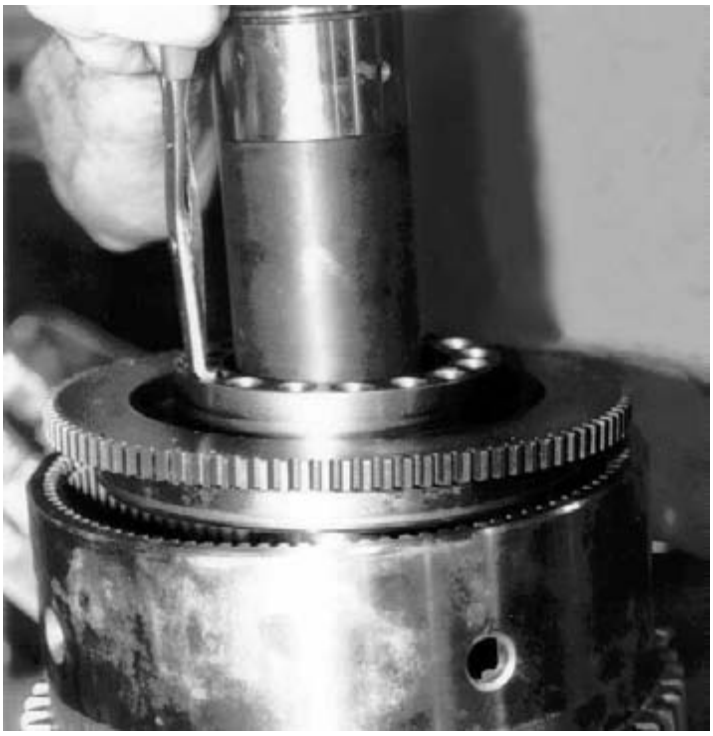


Figure 39. Removing Clutch Piston

d. Remove piston ring from ring groove in shaft (seals I.D. of clutch piston) and multi-piece piston ring from ring groove in O.D. of clutch piston.

Note: Do not separate clutch housing/transfer gear from the secondary shaft unless the shaft or the clutch housing must be replaced and the mating part remains serviceable. Use the following procedure to separate the housing/transfer gear from the primary or secondary shaft.

9. To remove clutch housing, place shaft and clutch housing on a press, front end of shaft down. Place a sleeve over input front end of shaft with an I.D. only slightly larger than the O.D. of the shaft taper large end [101.6mm (4.00 in.)]. Rest one end of sleeve on a heavy wood block while the other end supports the inner face of the clutch housing. Apply press force to rear end of shaft to separate shaft from clutch housing. The shaft must be protected and restrained to prevent damage as the tapered joint separates.

Disassembly of Selector Valve - Electric Valve

⚠ CAUTION

Steel ball is under pressure from the spring. Care must be taken when removing the cover and orifice plate to prevent loss of steel ball.

1. Loosen and remove four of M8 x 25 socket head capscrews, and remove orifice plate cover and gasket.

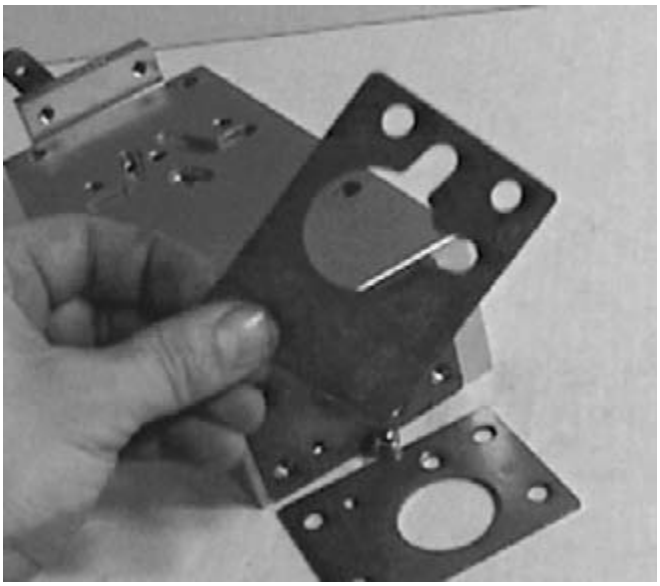


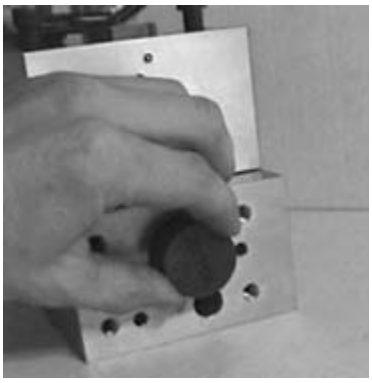
Figure 40. Removing Orifice Plate Cover Gasket

2. Remove orifice plate.

3. Remove steel ball and neutral pressure regulating spring.

4. Remove orifice plate gasket.

5. Remove rate-of-rise piston. Note that shims are located between the piston and springs.



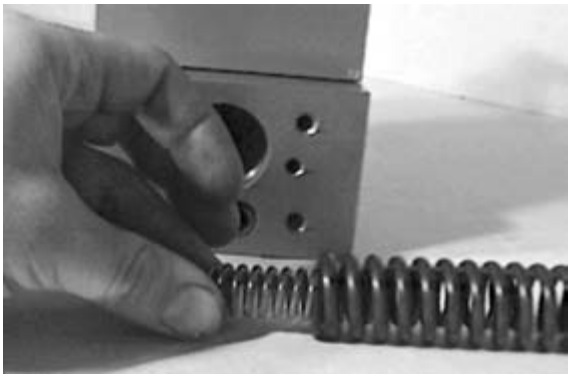


Figure 41. Rate of Rise Piston (left) and Regulator Springs (right)

6. Remove pressure regulating springs.

7. Remove pressure regulating piston with an external retaining ring pliers.

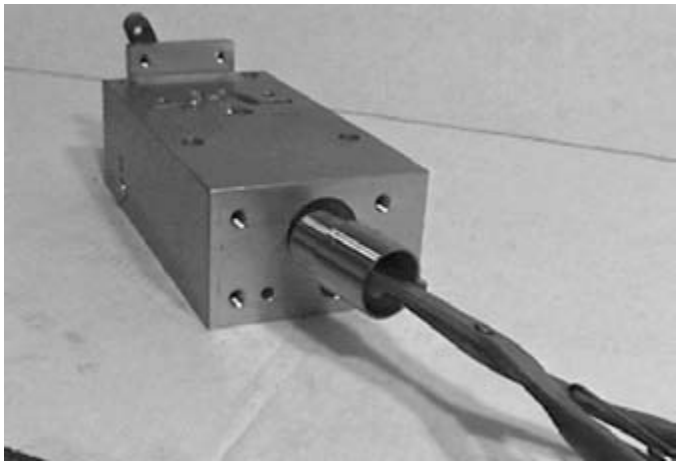


Figure 42. Removing Regulating Piston with Pliers

8. Remove external retaining ring from the lever end of the stem.

9. Loosen the clamping nut and remove the control lever from the stem. It may be necessary to splay the lever to be able to remove it. DO NOT apply any impact force to the lever, as the stem or dog-point setscrew might get damaged.

10. Remove the washer and spring from the stem.

11. Remove four of M8 x 25 socket head capscrews.

12. Remove the cover assembly with gasket from the valve body.

13. Remove the O-ring and oil seal from the cover assembly.

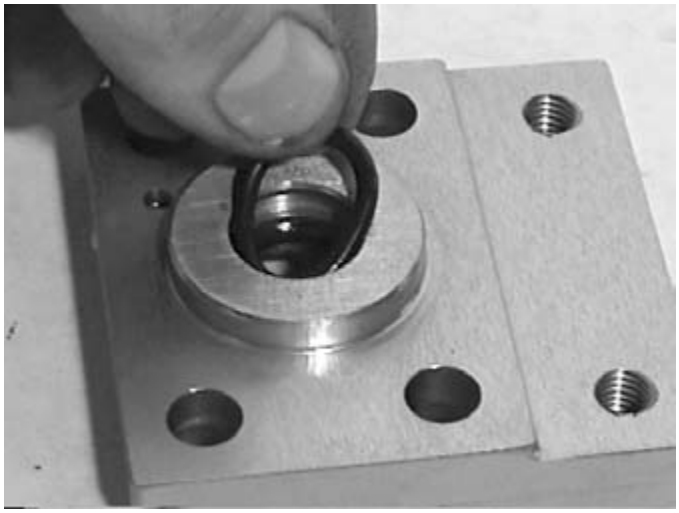


Figure 43. Removing O-ring from Cover

14. Remove the two electrical switches from the sides of the valve body and the two steel balls from each of the switch bores in the valve body (some models).

15. Remove the detent setscrew, spring, and steel ball from the valve body.

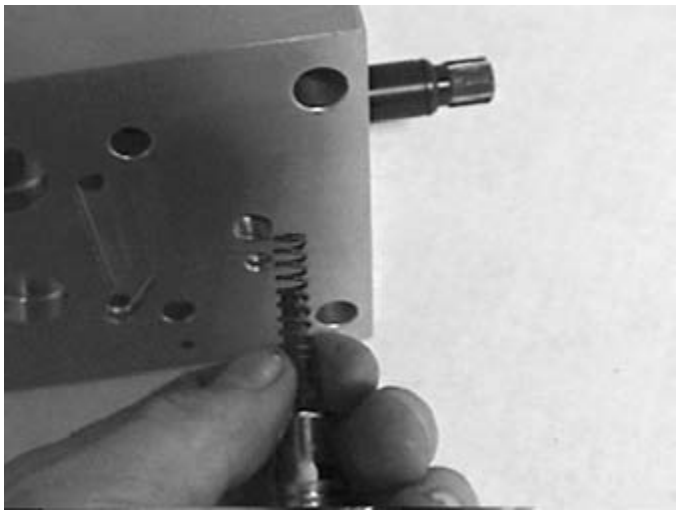


Figure 44. Removing Detent Setscrew and Spring

16. Remove the dog-point setscrew. Note that the setscrew is retained with MA908 threadlocker.

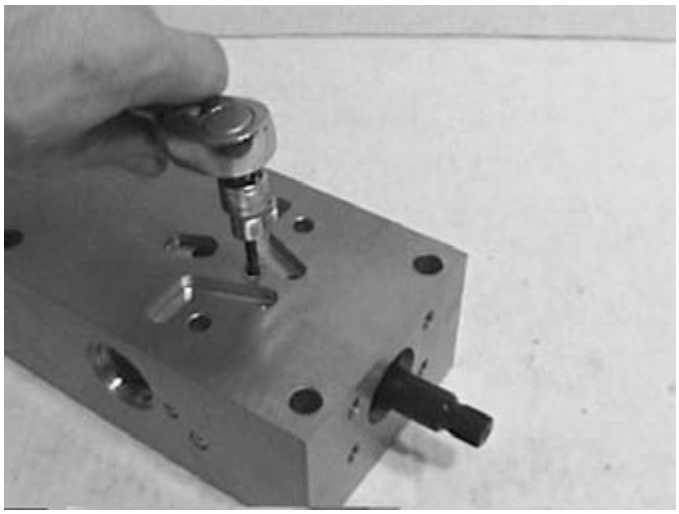


Figure 45. Removing Dogpoint Setscrew

17. Remove the stem from the valve body partially.

18. Remove the thrust washer from the stem.

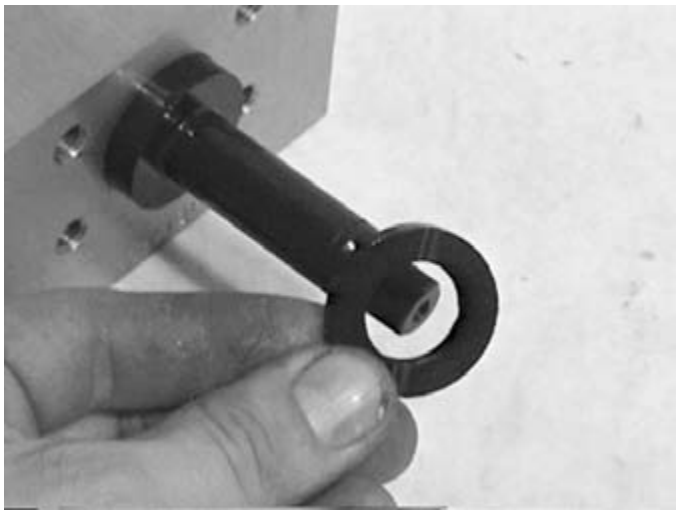


Figure 46. Removing Thrustwasher

19. Remove the stem from the valve body.

20. Remove the roll pin (retains the shuttle ball seat) with a needle-nose pliers.

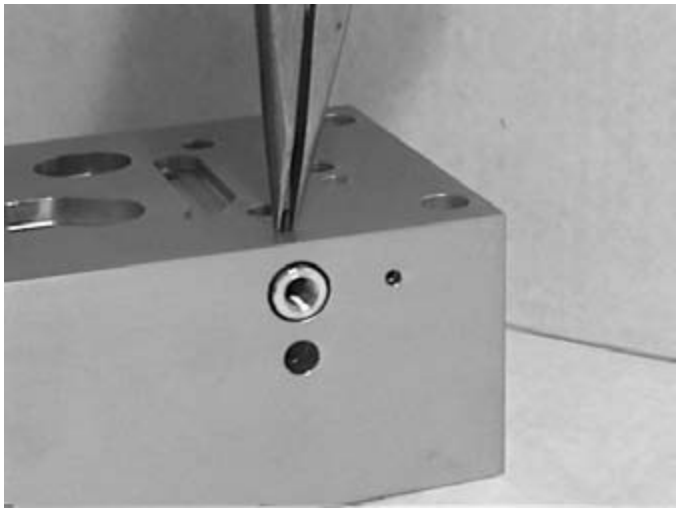


Figure 47. Removing Roll Pin Retaining Shuttle Seat

21. Thread a M8x1.25 screw (one of the cover screws works well) into the seat and remove it from the valve body.

22. Remove the shuttle ball from the valve body.

Disassembly of Upper Valve Body Half (electric section)

1. Remove the Weatherpak connector from the valve body by sliding it in the direction of the opening in the shroud.

2. Mark the wires with the location letters that are on the Weatherpak connector. Open the end of the Weatherpak connector to allow removal of the pins and wires.

3. Remove the pins (for the wires of all but one solenoid) from the Weatherpak connector using the extraction tool. Tool is Packard Electric P/N 12014012.

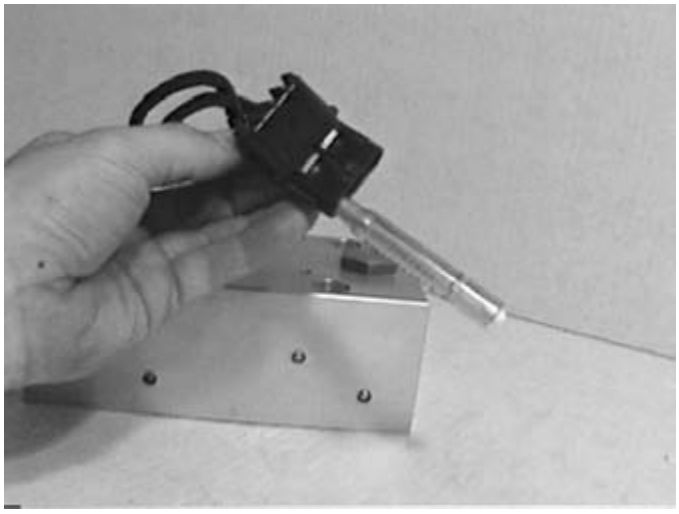


Figure 48. Removing Wires using Extraction Tool

4. Mark the two solenoids for location identification and remove them.

5. Remove the third (Neutral) solenoid (units with hydraulic lock) or plug (units without hydraulic lock).

6. Remove the filter screen from the valve body.

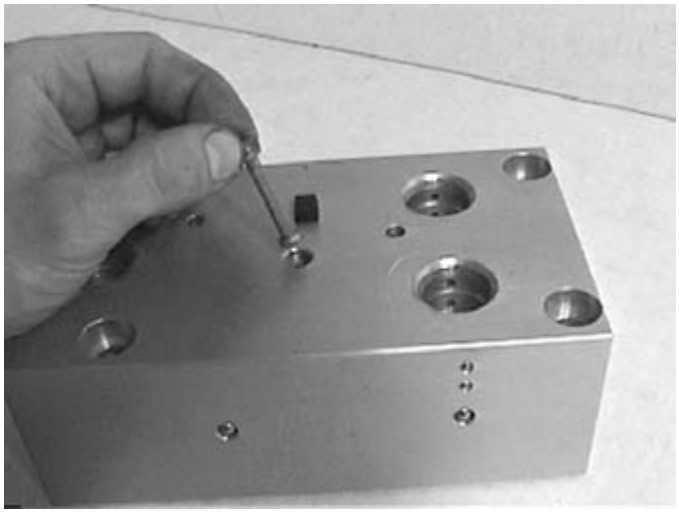


Figure 49. Removing Filter Screen

7. Remove the two socket head O-ring plugs from the bores in the end of the valve body.

8. Remove the two spools from the valve body.

9. Remove one dowel pin and spring from each of the spools (hydraulic lock units only).

10. Remove the spool return spring and dowel pin from the bottom of each of the spool bores in the valve body.

1017555 Trolling Valve (Optional Equipment)

1. Remove the trolling valve attaching screws.

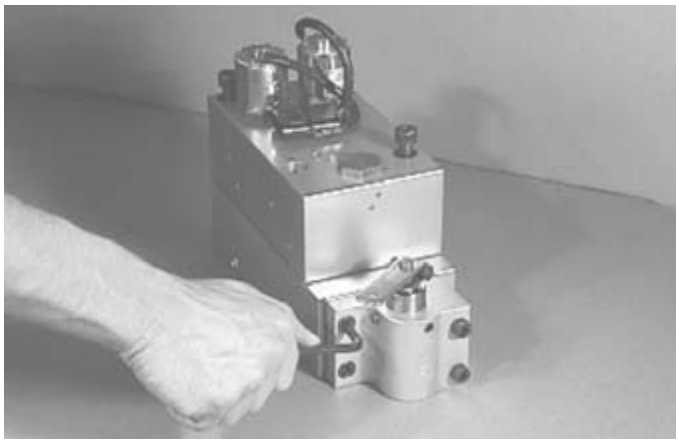


Figure 50. Removing Trolling Valve Attaching Screws

⚠ CAUTION

Steel ball is under pressure from the spring. Care must be taken when removing the trolling valve and orifice plate to prevent loss of steel ball.

2. Remove the trolling valve from control valve.

3. Remove the gaskets, orifice plate, and steel ball from control valve.

4. Remove the screw and nut clamping the lever to the stem.

5. Remove the lever from the stem. It may be necessary to splay the lever to be able to remove it. **DO NOT** apply any impact force to the lever, as the stem or dog-point setscrew might get damaged.

6. Remove the detent setscrew, spring, and detent ball.

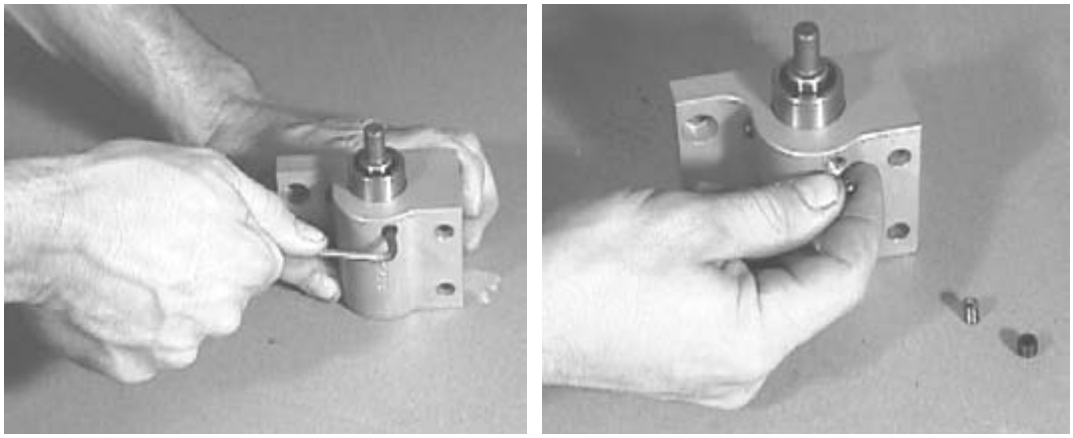


Figure 51. Removing Detent Setscrew (left) and Detent Spring and Ball (right)

7. Remove the dog-point setscrew from the valve body.

Figure 52. Removing Dogpoint Setscrew

8. Slide the stem and adapter out of the valve body together as one piece. Push the stem out of the adapter such that the spring end of the stem exits the adapter first. Note that the inner spring will come out with the stem.

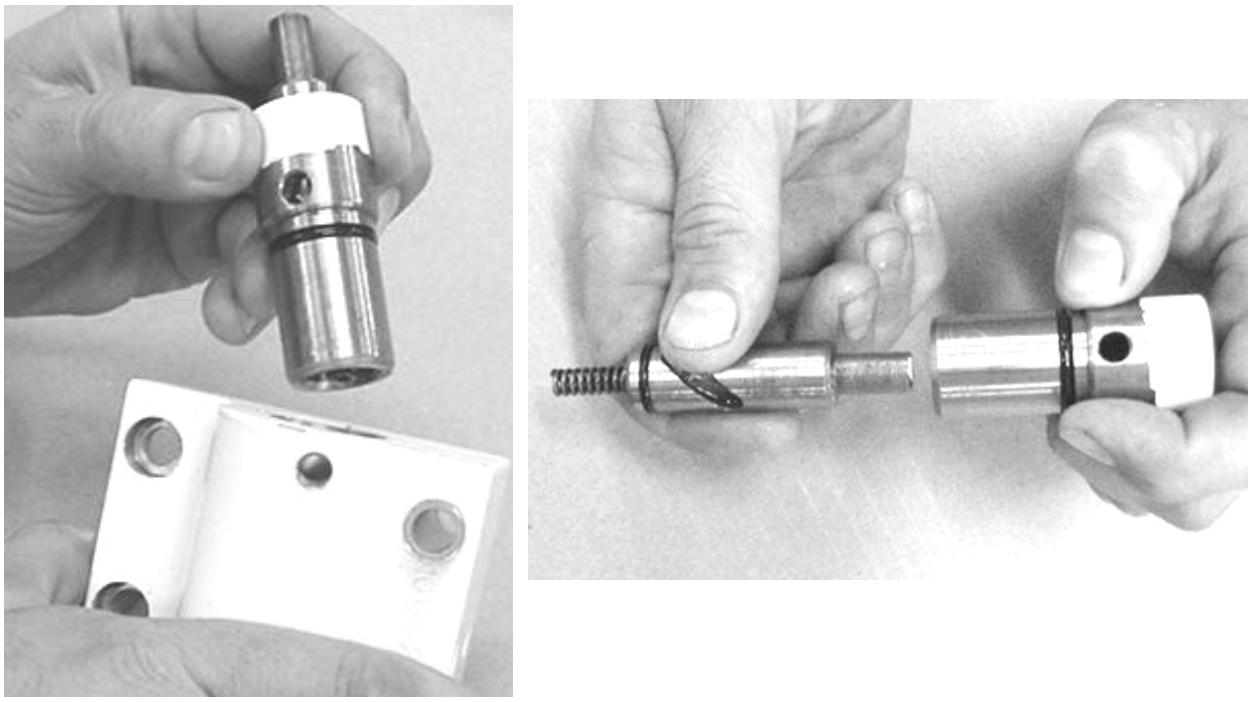


Figure 53. Removing Stem and Adapter from Valve Body (left) and Removing Stem from Adapter (right)

9. Remove the O-ring from the groove in the end of the stem.

Figure 54. Removing O-ring from Stem

10. Remove the inner spring and roll pin from the stem only if replacement of parts is necessary.

11. Remove the washer from the bore of the valve body (some models). Note: the washer may have been removed with the stem.

12. Remove the (outer) spring and piston from the bore of the valve body. Note that there may be washer(s) in the bore of the piston (some models).

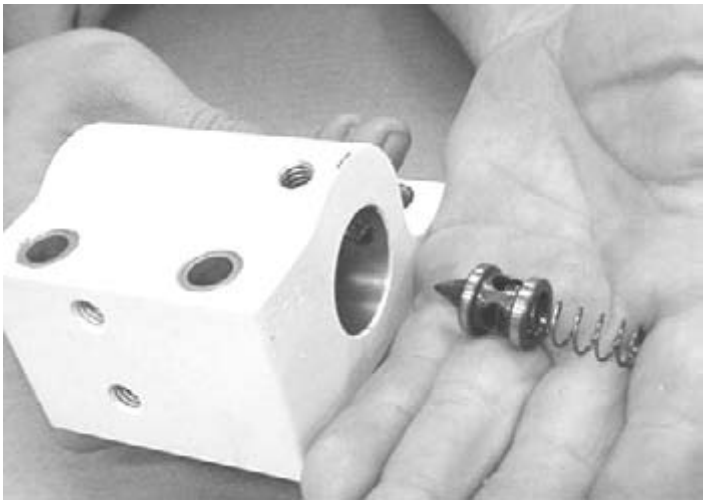


Figure 55. Removing Spring and Piston from Valve Body

13. Remove the O-ring from the groove and the oil seal from the end of the adapter.

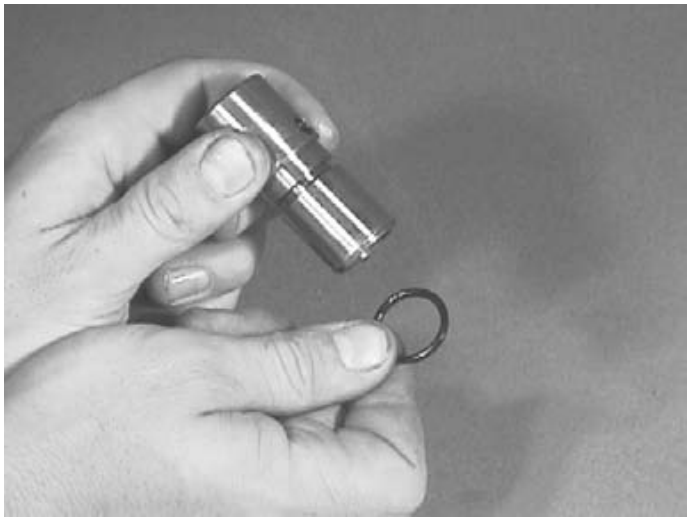


Figure 56. Removing O-ring from Adapter

Cleaning and Inspection

Cleaning

Note: Replace all oil seals, gaskets, O-rings piston rings, seal rings, snap rings, etc., as a part of any maintenance or overhaul procedure. Replace shims that are damaged or destroyed in disassembly.

- ❑ Clean all parts using EPA/OSHA approved solvents or by steam cleaning. Parts must be dried and oiled immediately to prevent corrosion.
- ❑ Examine all parts carefully for grit, dirt and abrasives and reclean them if necessary.
- ❑ Clean all oil passages by working a piece of wire back and forth through the passages and then flushing them with cleaning solvent.
- ❑ Use clean solvent to flush oil pumps, valves, etc.
- ❑ Flush all hoses, tubing, coolers etc., particularly if the unit is being disassembled because of an internal failure.
- ❑ De-burr the housing and bearing carrier with a stone or file in the vicinity of all pusher screw locations.

Cleaning Bearings

Do not remove grease in which new bearings are packed. Thoroughly wash bearings that have been in service. Soak bearings in solvent if they are particularly dirty or filled with hardened grease.

⚠ CAUTION

Never dry bearings with compressed air. Do not spin unlubricated bearings. Oil bearings with SAE 10 engine oil immediately after cleaning. Oil bearings before inspection.

Preventing Dirt from Entering into Bearings

Dirt and grit in bearings are often responsible for bearing failure; consequently, it is important to keep bearings clean. Do not remove grease from new bearings. Keep the wrapper on new bearings until they are installed. Do not expose clean bearings if they are not to be assembled at once. Wrap them with a clean lint-free cloth or paper to keep out dust.

Previously Sealed Joints

- ❑ For previously sealed joints, scrape surfaces to remove old gasket material or silicone.
- ❑ Clean surfaces with solvent to remove oil and grease residue.
- ❑ Test for clean surfaces by applying a few drops of cool water to the surfaces. Parts are sufficiently clean if water covers the surface in a film. If the water puddles or forms beads, use fresh solvent and reclean.

Inspection

Housings, Cast Parts, and Machined Surfaces

- ❑ Replace cast parts or housings that are cracked.
- ❑ Inspect bores for wear, grooves, scratches and dirt. Remove burrs and scratches with crocus cloth or soft stone. Replace deeply grooved or scratched parts. Do not remove excess material by sanding. This will cause loss of press of bearings or races.
- ❑ Inspect oil passages for obstructions. If you find an obstruction, remove it with compressed air or work a wire back and forth through the passage and flush it with solvent.
- ❑ Inspect machined surfaces for burrs, scratches, nicks and foreign matter. If you cannot remove the defect with crocus cloth or a soft stone, replace the part.
- ❑ Inspect ground tapers for burrs or nicks. If you cannot remove the defect with a soft stone, replace the part.
- ❑ Inspect ground tapers for scratches, galling or scoring damage. If any of these the defects, replace the part.
- ❑ Inspect threaded openings for damaged threads. Chase damaged threads with a tap of the correct size.
- ❑ Inspect studs for damaged threads and looseness. Replace defective studs.
- ❑ Inspect dowel pins for wear or damage. Replace defective dowels. This applies where a matched set of parts is not involved.
- ❑ Inspect dowel pin holes for wear due to movement between mating parts. If a dowel pin hole is worn, re-bore and sleeve the hole when possible. Otherwise, replace the parts. This applies where a matched set of parts is not involved.

Valve Seats

Inspect valve seats for burrs, nicks and scratches. If you cannot remove these defects with a crocus cloth, replace the part. Check to see that the valve is seating properly after reworking the valve seat.

Bearings

- ❑ Inspect bearings for roughness of rotation. Replace the bearing if the rotation is rough.
- ❑ Inspect bearings for corrosion, and for indication of wear of balls or rollers. Inspect for scored, scratched, cracked, pitted or chipped races. If you find one of these defects, replace the bearing.
- ❑ Inspect bearing bores and shafts for grooved, burred, or galled conditions that would indicate the bearing has been turning in its housing or on its shaft. If you cannot repair the damage with a crocus cloth, replace the part.

Bushings and Sleeves

Inspect bushings for size and out-of-roundness. Inspect for scores, burrs, sharp edges, and evidence of overheating. Remove scores with a crocus cloth. If the bushing is out-of-round, deeply scored, or excessively worn, replace it.

Thrust Washers and Spacers

Inspect thrust washers for distortion, scores, burrs and wear. Rework or replace any defective thrust washers or spacers.

Gears

- ❑ Inspect gears for scuffed, nicked, burred or broken teeth. If you cannot remove the defect with a soft stone, replace the gear.
- ❑ Inspect gear teeth for wear that may have destroyed the original tooth shape. If you find this condition, replace the gear.
- ❑ Inspect thrust faces of gears for scores, scratches and burrs. If you cannot remove these defects with a soft stone, replace the gear.

Splined Parts

Inspect splined parts for stripped, twisted, chipped or burred splines. Remove burrs with a soft stone. Replace the part if other defects are found.

Springs

Inspect springs for broken or distorted coils. Replace the spring if either of these defects is found.

Flexible Hoses

Inspect all flexible hoses for cracks and sponginess. Replace damaged hoses.

Clutch Plates

Inspect clutch plates for signs of overheating, pitting, or excessive wear of the friction and splined surfaces. Replace the clutch plates if one of these defects is found. Refer to wear limits in Description and Specifications.

Assembly

The MG-6650SC requires the use of a SKF THAP 300 Oil Injection Kit (See Special Tools) or similar device to install the output gear and output flange onto the output shaft.

Unless otherwise specified, all torque values listed are for capscrews that have been lubricated on the threads and contact surfaces.

The following discussion contains frequent reference to the transmissions parts and components. Refer to Engineering Drawings.

Prior to Assembly

Use the following reference: The input side of the transmission is the front and the output side is the rear. Left and right sides are determined by facing the output side of the transmission from the rear.

Identify and place the following bearing components in an oven at 120˚C (250˚F) for 30 minutes: output shaft tapered roller bearing cones, output shaft front bearing inner race, and the rear bearing cones for both clutch shafts.

Submerge all new friction clutch plates in transmission oil for a minimum of one hour prior to installation.

Identify and place the following bearing components in a deep freeze -51˚C (-60˚F) for at least two hours prior to assembly: output shaft front bearing, output shaft center tapered roller bearing cup, all pinion bearing cups, and both pinion inner needle roller bearings.

Preliminary Assembly

1. Lay the transmission on blocking with the rear side up.

2. Install the seal protector into input shaft front bearing area using tool T-18050-712.

Figure 57. Seal Protector Installation

3. Install the chilled cups for the primary and secondary front tapered roller bearings into their respective bores in the front inner face of the housing. Use driver T-18050-711 to press/drive cups to the bottom of the bore. It is important to maintain downward force as temperatures equalize to ensure that cup is at bottom of bore.

Figure 58. Front Pinion Bearing Cup Installation

4. Measure and record the distance from the machined surface of the housing to the bottom of the front output bearing bore (dimension “A”). Measure and record the width of the bearing (dimension “B”).

5. Install chilled front output roller bearing into housing bore. Use driver T-18050-711 to start bearing in its bore.

6. Place T-21566-2 over the bearing. Place a suitably sized puller (or T-18050-771) inside the housing to push on the steel plate. Tighten puller rod to standard torque limit for thread size of puller rod or 275 Nm (200 ft-lb), whichever is less. Maintain this torque until bearing and housing temperatures equalize (approx. 10 minutes).

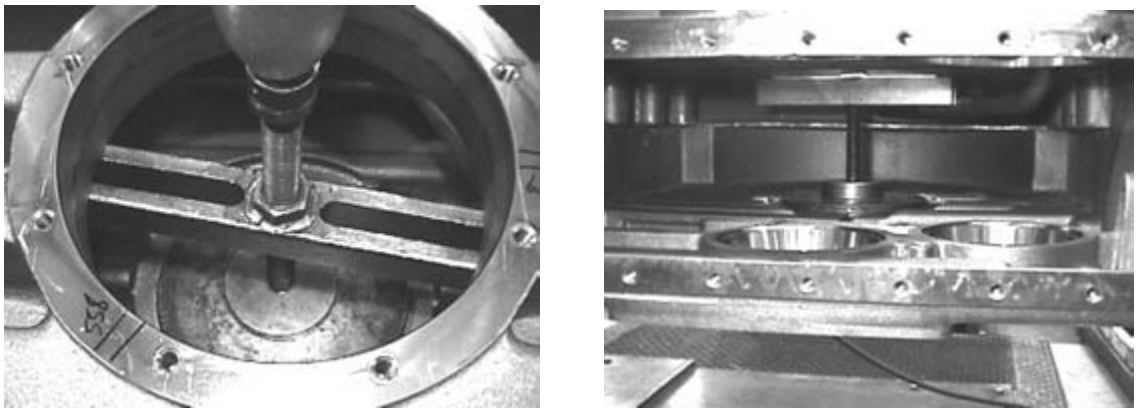


Figure 59. Installing Output Shaft Front Bearing

7. Remove tools. Measure and record the distance from the machined surface of the housing to the top of the bearing cup (dimension “C”). Dimension “C” must equal dimension “A” minus dimension “B” within 0.025 mm (0.001 in.).

8. Install the heated output shaft front bearing inner race onto the output shaft. Before the race cools, rotate race on shaft to ensure it is fully seated against shaft shoulder.

Installation of Trailing Pump Shaft and Driven Gear

1. Press the bearings onto the trailing pump shaft by pushing on the inner race of the bearing. Use a driver with an inside diameter only slightly larger than the shaft diameter to push bearings on until they are stopped by the shaft shoulder.

Figure 60. Installing Trailing Pump Shaft Bearings

2. Install the trailing pump shaft and bearings into the transmission housing using a soft hammer if necessary.

Figure 61. Installing Trailing Pump Shaft

3. Install internal retaining ring into housing over bearing.

Figure 62. Installing Internal Retaining Ring

4. Install key and trailing pump driven gear onto trailing pump shaft.

5. Install external retaining ring onto trailing pump shaft to retain driven gear.

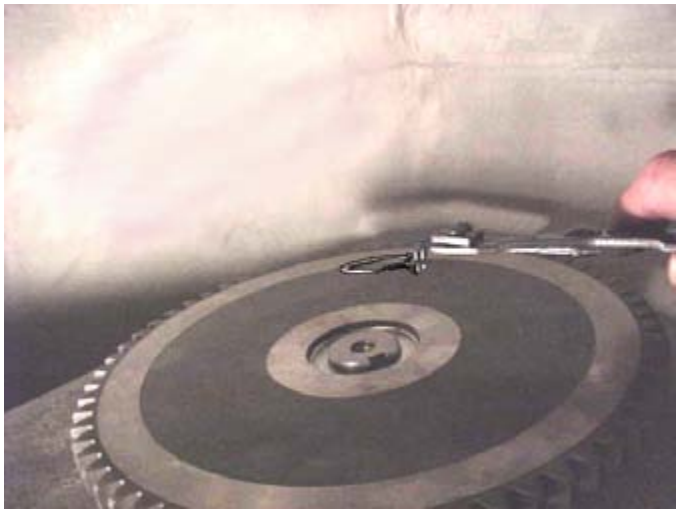


Figure 63. Installing External Retaining Ring

Installation of Output Shaft and Gear

1. Install trailing pump drive gear onto output gear using guide studs to help align the screw holes. Apply MA908 threadlocker to the threads of the four sockethead capscrews and torque them to 75 Nm (55 ft-lb).

2. Clean tapered surface of output shaft and tapered bore of output gear. Use OSHA approved cleaning solvent to remove all traces of dirt, grease, oil, etc. Do not touch cleaned surfaces. Loctite® 7070 cleaner is recommended.

⚠ CAUTION

Tapered surface of shaft and matching tapered bore of gear must be completely free of grease, oil, dirt or solvent residue. Failure to properly clean mating parts could prevent proper advance measurement of gear on shaft and adversely effect torque carrying capacity of the assembled joint. Both parts must be at the same temperature.

3. Place output gear into transmission housing, using special tool T-21528 to ease positioning of gear into correct location. Visually center the gear on the output shaft bore.

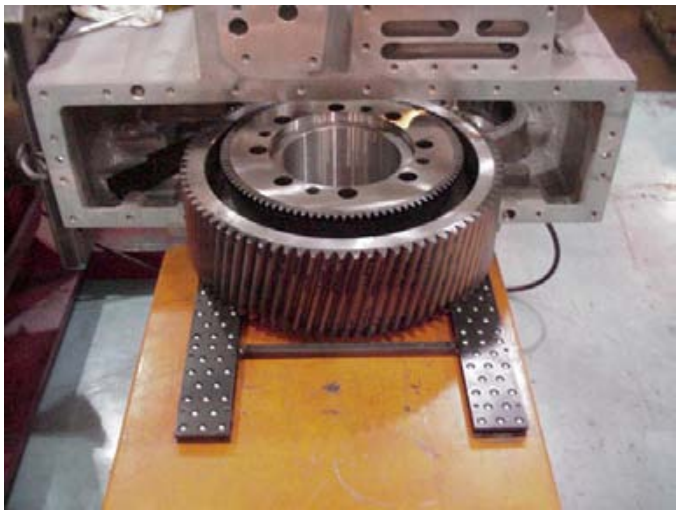


Figure 64. Placing Output Gear into Housing with T-21528

4. Install the output shaft assembly into the output gear in the transmission housing using T-18050-714. Use caution to prevent damaging the taper of the gear or shaft. Align the shaft and gear such that the oil injection hole of the shaft is centered between two of the gear's threaded puller holes. Seat shaft onto the taper of the gear using only the weight of the shaft.

5. Use gauge blocks and a feeler gauge to measure between the output gear and shaft shoulder. This is the potential advance, and it must be 9.45 mm to 11.00 mm (0.372 in. to 0.433 in.).

Figure 65. Measuring Output Gear Advance

Note: Should the calculated advance fall outside the range given above, check to assure that all measurements and calculations are correct. If no errors are found and the expected advance is out of tolerance, it will be necessary to change parts. Contact the Product Service Department at Twin Disc, Incorporated for assistance.

6. Connect the oil injector to the output shaft.

7. Install tool T-20023-3 onto output shaft and gear.

8. Inject oil with a viscosity of 300 mm^2/S (300cSt) at room temperature (mounting fluid) into the shaft until it leaks out of both ends of the mating surfaces.

9. Advance gear to shaft shoulder stop with the portable press.

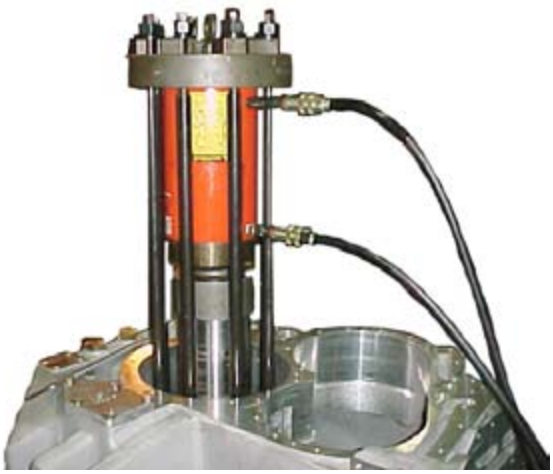


Figure 66. Advancing Output Gear

10. Release injection oil pressure between the mating surfaces and wait five minutes before lowering the press force and removing the assembly tool.

11. Remove the assembly tools from the output shaft and gear.

12. Confirm that the output gear has been advanced completely such that there is no gap between the shaft shoulder and the gear hub.

Installation of Output Shaft Bearings

1. Install the chilled output shaft front tapered roller bearing cup into the output bore of the transmission housing. Seat bearing with tool T-21566-3.

Figure 67. Output Bearing Cup Installed

2. Install the two heated rear output shaft tapered roller bearing cones. Install the large bearing first with the large O.D. of bearing to the rear. Install the small bearing second with the small O.D. of bearing to the rear. Press/drive bearing cones to shaft shoulder using special tool T-21506.

Figure 68. Output Bearing Tool T-21506

3. Install the pinion front bearing cones for primary and secondary shafts onto bearing cups previously installed in transmission housing. Lift the output shaft and gear with T-18050-714 if necessary.

Output Shaft Tapered Roller Bearing Adjustment

1. Establish a trial shim pack having a thickness of approximately 1.20 mm (0.047 in.).

2. Install the shim pack into seal carrier followed by the rear tapered roller bearing cup.

3. Install the seal carrier (with shims and bearing cup but without output seals or O-ring) onto the transmission and torque the screws to 80 Nm (59 ft-lb).

4. Rotate output shaft at least three revolutions to seat bearing rollers of front output tapered roller bearing.

5. Install dial indicator onto the housing with finger resting on rear of output shaft or on lifting fixtures. Zero the dial indicator and mark the spot where the reading was taken.

6. Using a hoist and tool T-18050-714, exert 2225 N to 4000 N (500 lbs to 900 lbs) of lifting force onto the shaft. Minimum of 2224 N (500 lbs) lifting force is required to overcome weight of gear and shaft and still exert a minimum of 1334 N (300 lbs) lifting force on bearing. Rotate shaft several revolutions with lifting force applied. Stop rotation with dial indicator finger on mark previously made, continuing to hold lifting force. Read shaft endplay on dial indicator.

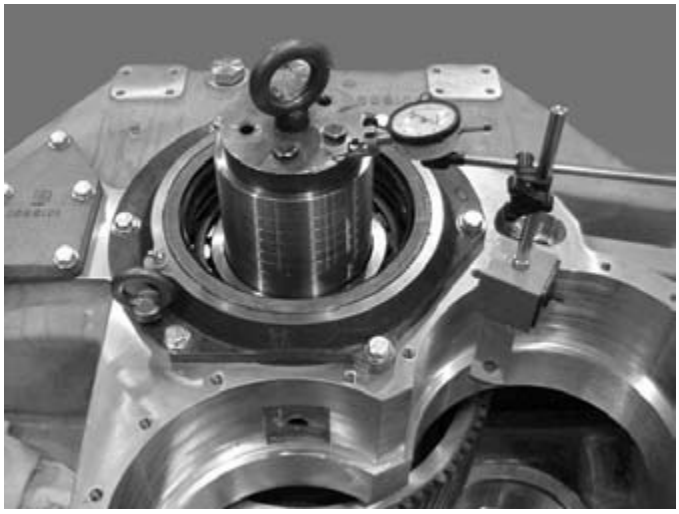


Figure 69. Measuring Output Shaft Endplay

7. Add or remove shims as necessary to achieve the correct bearing adjustment. Arrange the shims such that the thinnest shims are in the center of the shim pack, and the thickest shim is against the bearing cup. On units with 1.51:1 and numerically lower gear ratios, the output bearings are to have 0.08 mm (0.003 in.) of preload. On units with 1.88:1 and numerically higher ratios (i.e. 1.88:1, 2.03:1, 2.47:1, 2.93:1, 3.21:1), the output bearings are to have 0.05 to 0.15 mm (0.002 to 0.006 inch) of clearance.

8. Remove dial indicator. Remove output seal carrier, using caution to prevent loss of tapered roller bearing cup and shims.

9. Install O-ring in groove in O.D. of output seal carrier.

Figure 70. O-ring Installed onto Output Seal Carrier

10. Install oil seals into output seal carrier using driver T-18050-713 per the following description:

    A. Install forward seal with spring-loaded lip toward the inside of the transmission. Start inner seal with flanged side of driver T-18050-713 facing down, and complete its installation with tool inverted as shown below in Figure 68.

    B. Install rear seal with spring-loaded lip of seal toward rear of the transmission. Install flush with outer face of seal carrier with driver T-18050-713.

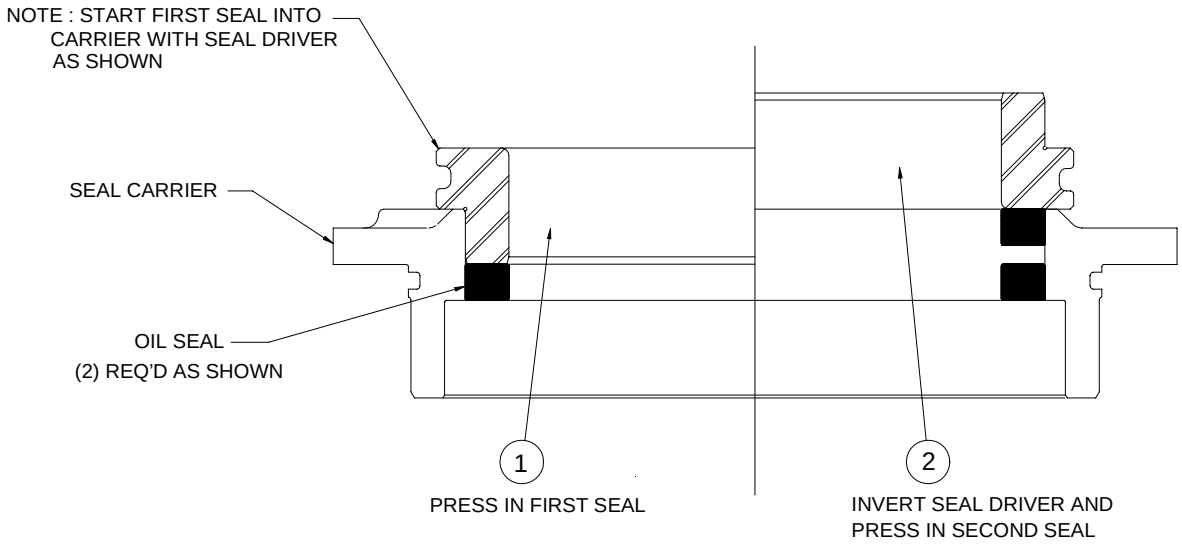


Figure 71. Output Seal Driver T-18050-713

11. Pack area between the seals with NLGI No.2 grease (example Mobilux® EP2).

Figure 72. Packing Cavity Between Output Seals With Grease

12. Install grease fitting if not previously installed.

13. Install assembled output seal carrier onto housing. Use caution to avoid damaging the O-ring. Install attaching screws and washers and torque to 80 Nm (59 ft-lb).

14. Confirm output shaft endplay is within specification. Remove T-18050-714 from output shaft.

Assembly and Installation of Gear Pan

1. Assemble four caged nuts into the square openings of the gear pan if not already present. The nuts must be placed onto the pan side of the plate, and the threads should be free of oil or grease.

2. Place the gear pan into the top cover opening of the transmission housing. Rotate the pan around the output gear on the side opposite the trailing pump shaft. Position the pan so the caged nuts are aligned with the four screw holes in the front of the transmission housing.

Figure 73. Installing Output Gear Pan

3. Place a new sealing washer on each of the four hex head capscrews. Lubricate the sealing washers. Apply MA908 threadlocker to the threads of the screws, and install them through the housing and into the gear pan. Torque the screws to 18 N-m (13 ft-lb).

Figure 74. Installing Output Gear Pan Screws

Assembly and Installation of Primary and Secondary Shafts

Installation of Transfer Gear, Rear Bearing and Clutch Piston

1. Assembly of transfer gear to secondary shaft.

   A. Clean taper on secondary shaft and tapered bore in transfer gear using OSHA approved cleaner. Do not touch cleaned surfaces. Loctite® 7070 cleaner is recommended.

   B. Determine if secondary shaft and transfer gear can be advanced properly:

      a. Hold secondary shaft in a vertical position standing on its front end.

      b. Use a depth micrometer and measure distance from the rear end of the shaft to the shaft shoulder at small end of taper. Record this distance as dimension “A”.

      c. Install secondary transfer gear on secondary shaft taper, small diameter of tapered bore up. Seat gear on shaft taper with 445 N to 890 N (100 lbs to 200 lbs) of force.

      d. Use a depth micrometer and measure distance from rear end of shaft to machined face of transfer gear at small diameter of tapered bore. Record this distance as dimension “B”.

      e. Calculate expected advance: Expected advance = A - B. Calculated advance must be 2.67 mm to 3.71 mm (0.105 in. to 0.146 in.). If calculated advance is not within the range, recheck all measurements and calculations for errors. If no errors are found, contact the Product Service Department at Twin Disc, Incorporated for information.

   C. Set secondary transfer gear on fixture T-18050-723 with large diameter of tapered bore up. Move fixture and transfer gear to a press with at least 667 kN (75 tons) capacity.

   D. Install secondary shaft front end up, into tapered bore of transfer gear. Seat shaft in tapered bore of gear by applying 445 N to 890 N (100 lbs to 200 lbs) downward force on shaft.

E. Center fixture, gear and shaft under ram of press and apply approximately 391 kN to 543 kN (44 tons to 61 tons) of force on front end of secondary shaft. Release pressure and turn fixture, shaft and gear 180°. Reapply pressure to complete advance.

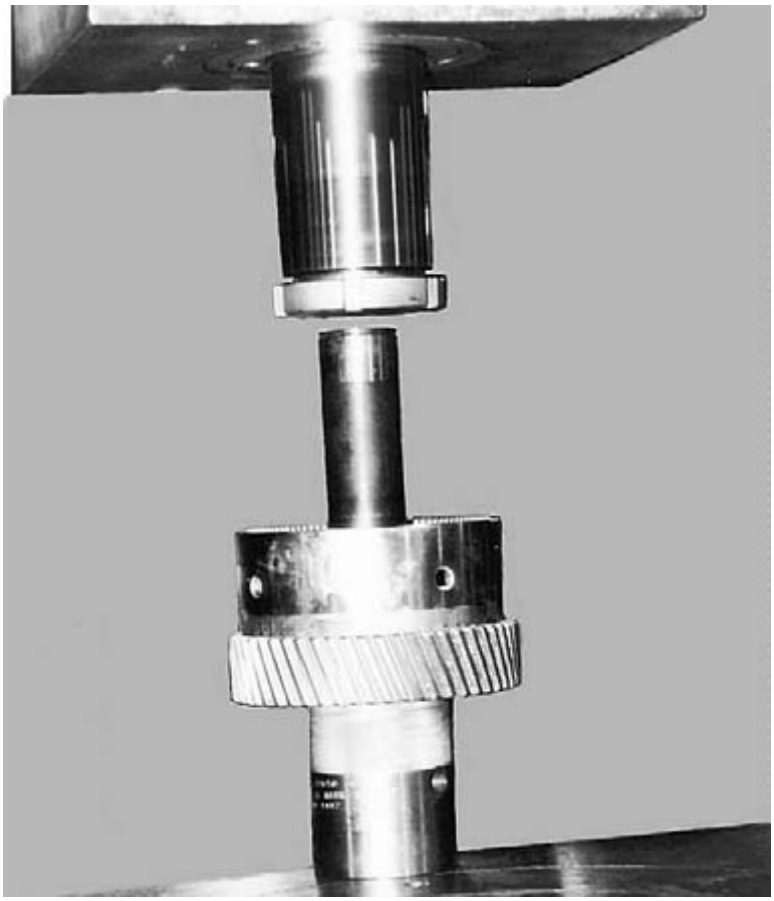


Figure 75. Pressing Clutch Shaft Into Transfer Gear

F. Using a depth micrometer, measure distance from rear end of shaft to face of transfer gear. Record as dimension “C”. Transfer gear face should be within 0.05 mm (.002 in.) of the shaft shoulder at the small diameter end of the taper.

Note: Actual advance (C-B) must be 2.67 mm to 3.71 mm (0.105 in. to 0.146 in.) for both the primary and secondary shaft transfer gears. If transfer gear has not been advanced as specified above, contact the Product Service Department at Twin Disc, Incorporated for information.

2. Install heated tapered roller bearing cone onto shaft against clutch housing. Install bearing with large O.D. toward transfer gear. Use driver T-18050-723 and hydraulic press to ensure bearing is fully seated against transfer gear.

3. Install the external retaining ring onto the shaft with the tapered edge side away from the bearing.

4. Install clutch piston inner seal ring into groove in secondary shaft. Apply a coat of assembly grease or oil to seal ring.

5. Install multi-piece seal ring in groove in O.D. of clutch apply piston as follows:

   A. Install the expander into the piston seal ring groove.

   B. Install the first seal ring section into the groove over the expander ring.

   C. Install the second seal ring section into the groove over the expander ring with the ends rotated 180° from the ends of the first seal ring.

   D. Install the third seal ring section into the groove over the expander ring with the ends rotated 90° from the ends of the first seal ring.

   E. Install the fourth seal ring section into the groove over the expander ring with the ends rotated 270° from the ends of the first seal ring.

   F. Apply a coat of assembly grease or oil to the seal ring.

7. Install clutch apply piston into piston bore in transfer gear.

Figure 76. Installing Clutch Piston

Note: Some models use a clutch piston without external splines. Refer to unit BOM for parts usage.

8. Install the orifice plug into the front end of the secondary shaft (some models). Use MA908 (Loctite® 242) on the threads and torque the plug to 68 Nm (50 ft-lb).

Assembly of Clutch - Assemblies 1018375 and 1018375A

Note: The following procedures apply to assemblies 1018375 and 1018375A which use belleville clutch release springs. The shaft endplay is established before the belleville springs and clutch plates are installed. An alternate procedure is also listed to establish correct bearing settings while the transmission is installed. If the transmission has coil spring clutch release springs, proceed directly to page 136.

Establishment of Correct Bearing Clearance

1. Install the pinion rear tapered roller bearing cone onto the shaft without the belleville springs.

2. Assembly of pinion.

   A. Use special tool T-18050-708 to install chilled tapered roller bearing cup into rear of pinion for secondary shaft. Bearing cup is installed with small I.D. of taper toward the front and seated against shoulder of bore in clutch hub of pinion.

Figure 77. Installing Tapered Roller Bearing Cup Into Pinion

B. Using tool T-18050-705, install chilled needle roller bearing into bore at front of pinion with the radiused edge of the outer race entering the pinion first.

Figure 78. Needle Roller Bearing Installed

C. Install internal retaining ring into groove in pinion bore.

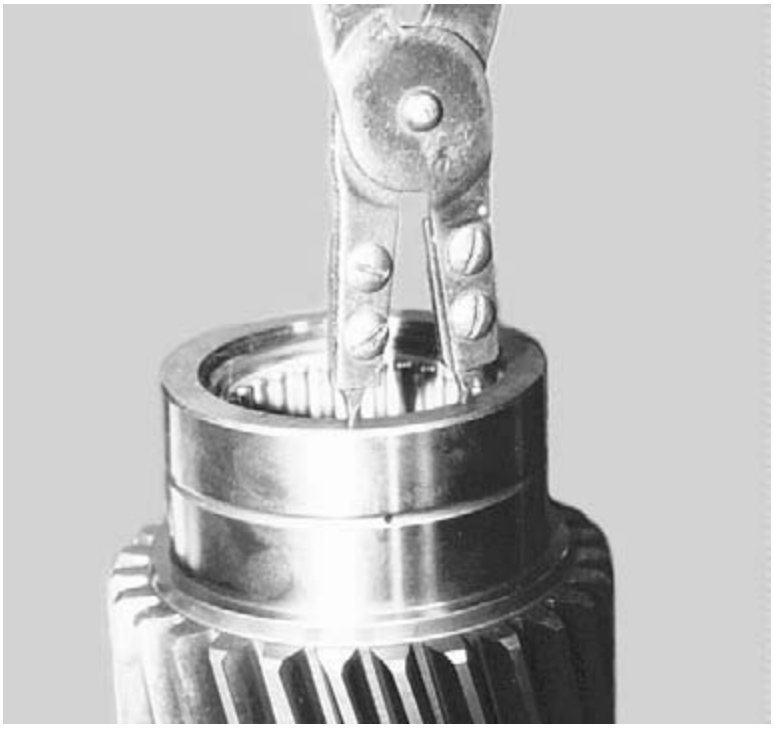


Figure 79. Installing Internal Retaining Ring Into Pinion

E. Install pinion on secondary shaft (without clutch plates).

F. Install external retaining ring to retain pinion on shaft.

Figure 80. Installing External Retaining Ring Onto Clutch Shaft

3. Assemble primary shaft. Repeat previous procedure steps, as assembly procedure for primary shaft is exactly the same as for the secondary shaft.

4. Install clutch shaft assemblies into transmission housing. Use caution to prevent damaging the shafts, gears, and bearings. Use tool T-18050-715 for lifting the primary and secondary shafts.

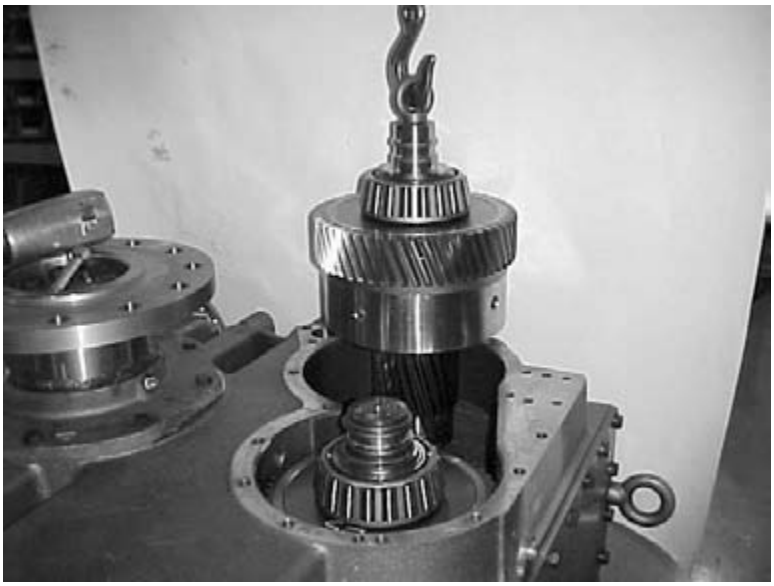


Figure 81. Installing Clutch Shaft Assembly

5. Install bearing carrier gasket over dowels onto rear face of housing.

6. Install two alignment studs into face of transmission housing. Install bearing carrier over studs and onto dowels in housing face. Use a soft hammer (near the dowels) to seat carrier against gasket and over dowels. Be sure bearing carrier is fully seated.

7. Install cups for rear tapered roller bearings on primary and secondary shafts into bores in bearing carrier. Tap cups down gently with soft hammer or brass drift to seat against bearing cones on shafts.

8. Install manifold gasket over alignment studs and against bearing carrier.

9. Install the bearing spacers over the bearing cups.

10. Rotate the shafts at lease three revolutions to seat the bearing rollers while pressing down on both bearing spacers.

11. Push tapered roller bearing cups, with bearing spacers, firmly against roller bearing cones on rear of primary and secondary shafts. Use a depth micrometer to measure from top of manifold gasket down to shim retainers. Measured distance is shaft endplay. Use necessary shims to develop a shim pack for each shaft to reduce shaft endplay to 0.13 mm to 0.18 mm (0.005 in. to 0.007 in.).

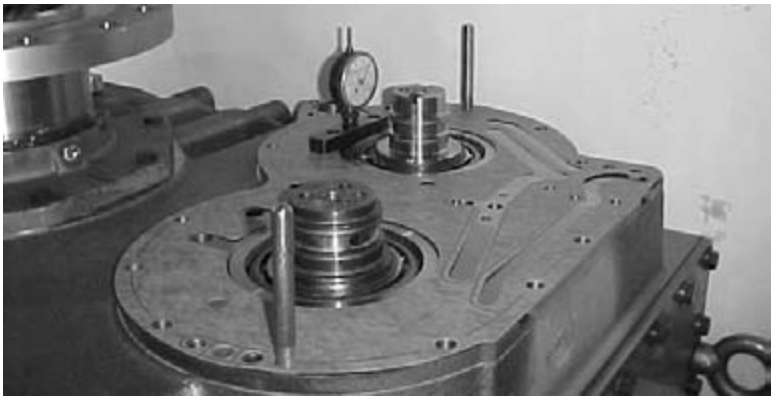


Figure 82. Measuring to Determine Shim Pack Thickness

12. Remove one shim retainer and install the shim pack for that shaft directly over the bearing cup. The thinnest of the shims should be in the center of the pack, and the thickest shim should be against the bearing cup. Repeat this process for the other shaft.

13. Install the manifold (without shaft seal rings) over the bearing carrier and gasket. Use a soft hammer (near the dowels) to seat manifold against gasket and over dowels.

14. Install the manifold attaching screws and torque to 80 Nm (59 ft-lb).

15. Confirm shaft endplay.

    A. With a felt-tip pen, make a mark across the rear end of the secondary shaft. Install a dial indicator on a machined surface on the manifold with the probe resting on the mark made on the secondary shaft.

Figure 83. Confirming Secondary Shaft Bearing Adjustment

    B. Install an eyebolt into the end of the shaft and exert 890 N (200 lbs) downward force while rotating the shaft several revolutions in each direction. Stop so that the dial indicator probe is resting on the mark.

    C. Zero the dial indicator.

    D. Remove downward pressure and exert 1334 N to 1557 N (300 lbs to 350 lbs) lifting force on the shaft. Rotate the shaft several revolutions in each direction stopping with the dial indicator probe resting on the mark.

    E. Dial indicator reading is secondary shaft endplay. Endplay should be between 0.13 mm to 0.18 mm (0.005 in. to 0.007 in.). Add or remove shims as necessary to achieve correct endplay. Use dial indicator and above procedure to confirm that desired endplay has been attained.

    F. Confirm endplay for primary shaft by repeating previous steps on primary shaft.

16. Remove the indicator and manifold. Remove the shims and bearing spacers, keeping track of which shaft they correspond to. Remove the bearing carrier, bearing cups (marking them for location identification), and clutch shafts.

Assemble Primary and Secondary Clutch Shafts

Note: Assembly procedure is exactly the same for each clutch shaft, therefore only one shaft is described.

1. Remove external retaining ring and pinion from clutch shaft.

2. Remove the pinion rear bearing from inside clutch housing.

3. Install spring retainer onto clutch piston.

4. Install the belleville clutch release springs over the spring retainer in an alternating fashion. The first belleville spring must contact the spring retainer at the outside diameter. The second belleville spring must contact the first belleville spring at the inside diameter. Install the remaining springs, alternating each spring's orientation.

Figure 84. Correct Spring Stacking (left) and Installation (right)

5. Install the pinion rear tapered roller bearing cone onto the shaft.

6. Install the external retaining ring over the bearing. Use T-18050-704 to compress the springs and expose the retaining ring groove.

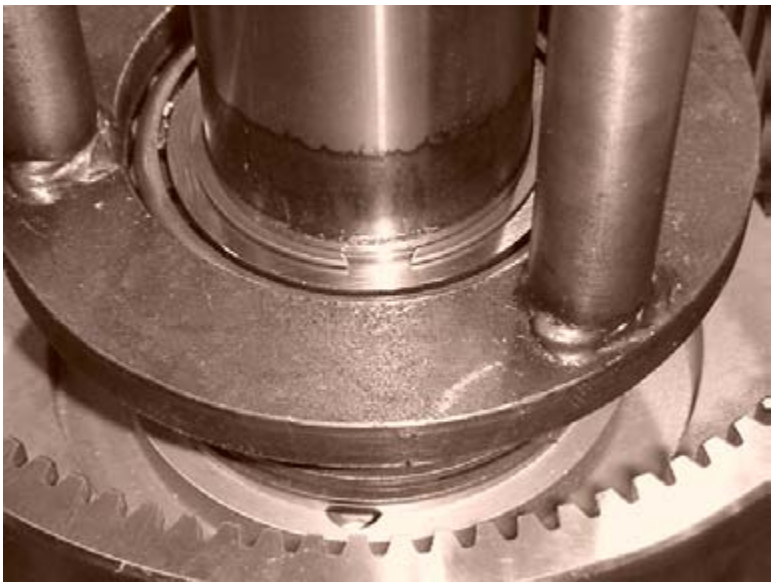


Figure 85. External Retaining Ring Installed

7. Beginning with a friction plate, alternately install 10 friction plates and 9 steel plates into clutch housing (transfer gear) against clutch apply piston.

8. Install clutch backplate and internal retaining ring.

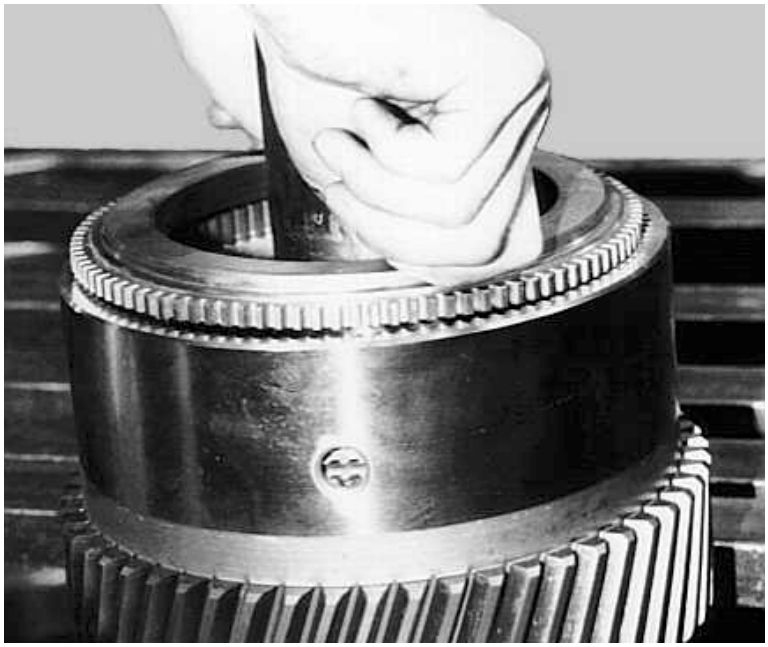


Figure 86. Installing Clutch Backplate

Note: Some models use a clutch backplate without external splines and a spiral internal retaining ring. Refer to unit BOM for parts usage.

9. Align plates in clutch pack and install pinion on clutch shaft so that external teeth on clutch hub mesh with internal teeth of steel plates in clutch pack. Assure that clutch hub is in mesh with all clutch plates.

10. Install external retaining ring to retain pinion on shaft.

Figure 87. Installing External Retaining Ring Onto Clutch Shaft

Installation of Clutch Shafts, Bearing Carrier, and Manifold

1. Install the clutch shaft assemblies into the transmission.

2. Install bearing carrier gasket over dowels onto rear face of housing.

3. Assemble lube relief valve spring and lube relief valve steel ball into lube relief valve housing. Attach assembled lube relief valve to inner face of bearing carrier with the screws and washers. Torque the screws to 23 Nm (17 ft-lb).

Figure 88. Lubrication Oil Pressure Relief Valve Installed

4. Install two alignment studs into face of transmission housing. Install bearing carrier over studs and onto dowels in housing face. Use a soft hammer (near the dowels) to seat carrier against gasket and over dowels. Be sure bearing carrier is fully seated.

5. Install cups for rear tapered roller bearings on primary and secondary shafts into the same bores in bearing carrier as previously installed. Tap cups down gently with soft hammer or brass drift to seat against bearing cones on shafts.

6. Install lube tube through “keyed” hole in bearing carrier and into machined pocket in front inner face of housing. Rotate tube so elongated “key” of tube fits into corresponding “key” in bearing carrier. Properly installed lube tube will be flush with rear face of bearing carrier.

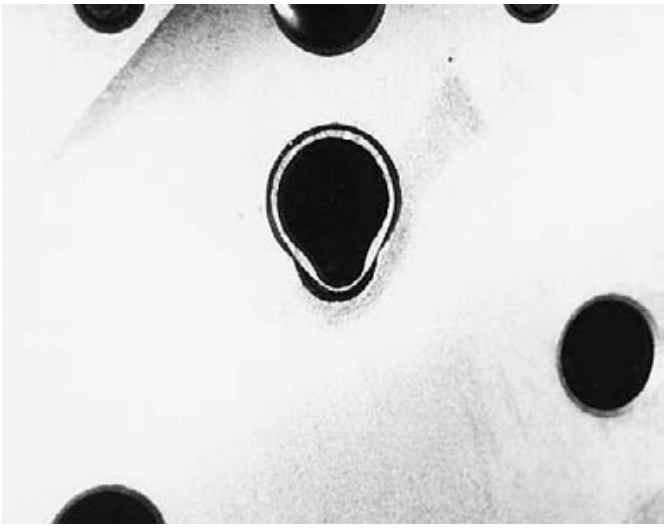


Figure 89. Key Orientation of Installed Lube Tube

7. Install manifold gasket over alignment studs and against bearing carrier.

8. Install the previously established shim packs into the respective bearing bores over the bearing cups.

9. Install the bearing spacers into the same bores as previously installed and over the shim packs.

10. Install the shaft seal rings into the grooves of the clutch shafts.

11. Apply a coat of assembly grease or oil to the seal rings of both clutch shafts. Center the seal rings in the shaft grooves to prevent seal ring damage during manifold installation.

12. Install manifold over alignment studs and dowels. Use a soft hammer (near the dowels) to seat manifold against gasket and over dowels. Install manifold attaching screws and torque to 80 Nm (59 ft-lb).

13. Install new O-rings onto the M18 O-ring plugs used for the clutch and lube pressure test ports. Lubricate the O-ring and threads and install the plugs, torquing them to 34 Nm (25 ft-lb).

14. Proceed to page 147.

Alternate In-boat Procedure for 1018375 and 1018375A Assemblies

It is possible to assemble the transmission and then establish the primary and secondary shaft bearing clearance. This procedure requires the use of a fixture that will apply 3115 N (700 lb) force to the clutch shaft to compress the belleville springs. Once the belleville springs are compressed, the shaft endplay can be measured by releasing the press force from the fixture.

Figure 90. Fixture Used to Establish Secondary Shaft Bearing Clearance

To perform this procedure, the clutch shafts are completely assembled and then installed into the transmission. The bearing carrier is then assembled and installed over its gasket on the transmission. The bearing cups are installed and 3115 N (700 lb) of force is applied (from the fixture) to the bearing cups while rotating the shafts three revolutions to seat the bearing rollers. The distance is measured from the manifold surface down to the bearing cup and the manifold gasket thickness added to that measurement. A shim pack is used with the bearing spacer so that the overall thickness is 0.013mm (0.005 in.) thinner than the sum of the previous two measurements. The thinnest of the shims should be in the center of the pack, and the thickest shim should be against the bearing cup. The shim packs are installed against the bearing cups followed by the bearing spacers. The manifold gasket and seal rings are installed next and assembly grease is used to hold the seal rings centered within their grooves. The manifold is installed and the screws torqued to 80 Nm (59 ft-lb). At this point, proceed to page 147.

Assembly of Clutch - Assemblies 1018375B and 1018375C

Note: The following procedures apply to assemblies 1018375B and 1018375C which use coil spring clutch release springs. If the transmission has belleville clutch release springs, refer back to page 123.

1. Installation of clutch return springs.

   A. Install 16 clutch return spring into pockets in face of clutch apply piston.

   B. Install spring retainer over springs with groove toward springs. Working through holes in retainer, use a small punch or probe to assure that all springs are in pockets in face of piston and that springs are aligned correctly (stand straight up).

Figure 91. Return Springs and Spring Retainer Ready for Installation

C. Install external retaining ring over shaft to rest against spring retainer. Move shaft assembly to press and install tool T-19330. Press down tool T-19330 to compress springs and expose retaining ring groove of shaft. Keep force on springs and install retaining ring into exposed groove of shaft.

Figure 92. Installing Spring Retainer Retaining Ring

D. Slowly release force on springs assuring that spring retainer counterbore covers retaining ring and prevents retaining ring from coming out of the groove. Remove tool T-19330.

2. Install the pinion rear tapered roller bearing cone onto the shaft.

   Note: This bearing is a slip fit and will not require special tools for installation.

3. Beginning with a friction plate, alternately install 10 friction plates and 9 steel plates into clutch housing (transfer gear) against clutch apply piston.

4. Install clutch backplate and internal retaining ring.

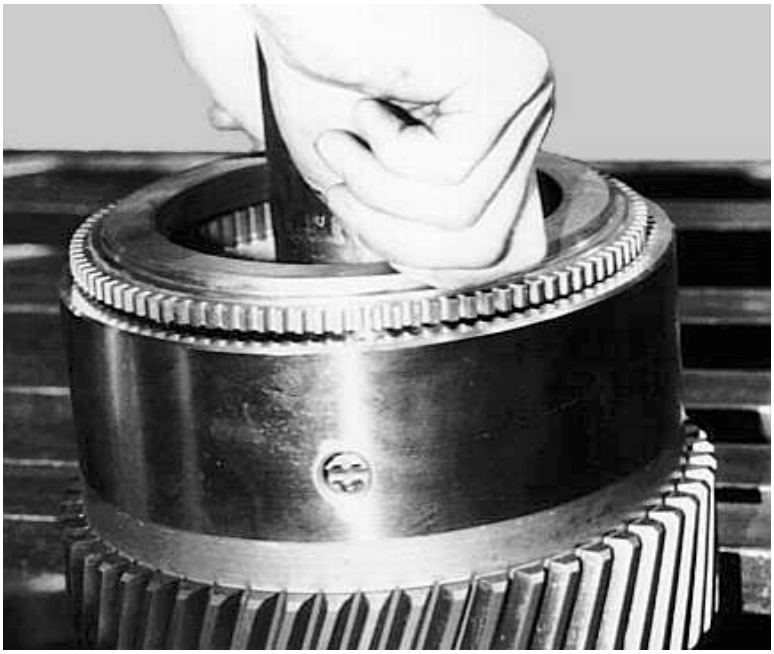


Figure 93. Installing Clutch Backplate

Note: Some models use a clutch backplate without external splines and a spiral internal retaining ring. Refer to unit BOM for parts usage.

5. Assembly of pinion.

   A. Use special tool T-18050-708 to install chilled tapered roller bearing cup into rear of pinion for secondary shaft. Bearing cup is installed with small I.D. of taper toward the front and seated against shoulder of bore in clutch hub of pinion.

Figure 94. Installing Tapered Roller Bearing Cup Into Pinion

   B. Using tool T-18050-705, install chilled needle roller bearing into bore at front of pinion with the radiused edge of the outer race entering the pinion first.

Figure 95. Needle Roller Bearing Installed

C. Install internal retaining ring into groove in pinion bore.

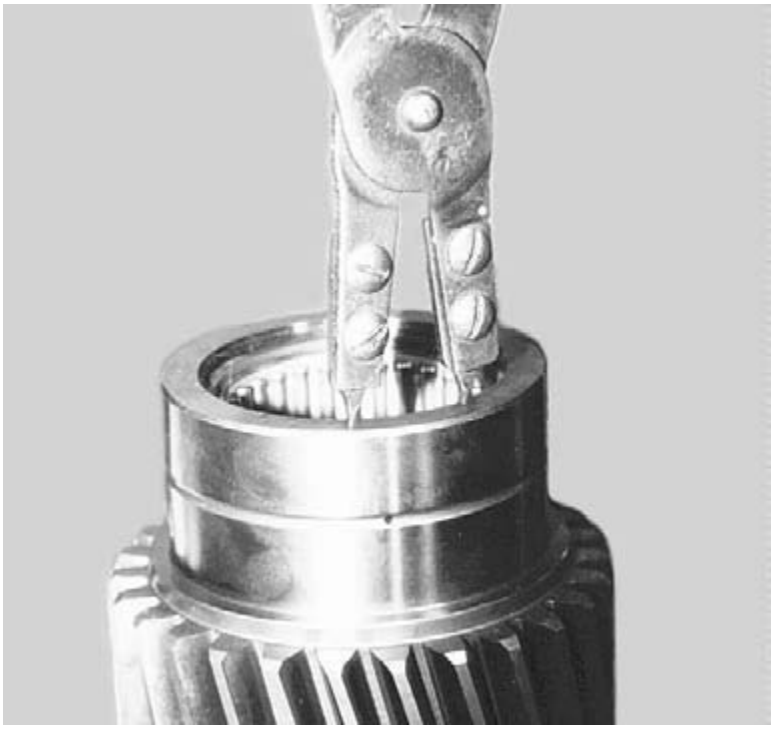


Figure 96. Installing Internal Retaining Ring Into Pinion

D. Align plates in clutch pack and install pinion on secondary shaft so that external teeth on clutch hub mesh with internal teeth of steel plates in clutch pack. Assure that clutch hub is in mesh with all clutch plates.

E. Install external retaining ring to retain pinion on shaft.

Figure 97. Installing External Retaining Ring Onto Clutch Shaft

6. Assemble primary shaft. Repeat previous procedure steps, as assembly procedure for primary shaft is exactly the same as for the secondary shaft.

Installation of Clutch Shafts, Bearing Carrier, and Manifold

1. Install clutch shaft assemblies into transmission housing. Use caution to prevent damaging the shafts, gears, and bearings. Use tool T-18050-715 for lifting the primary and secondary shafts.

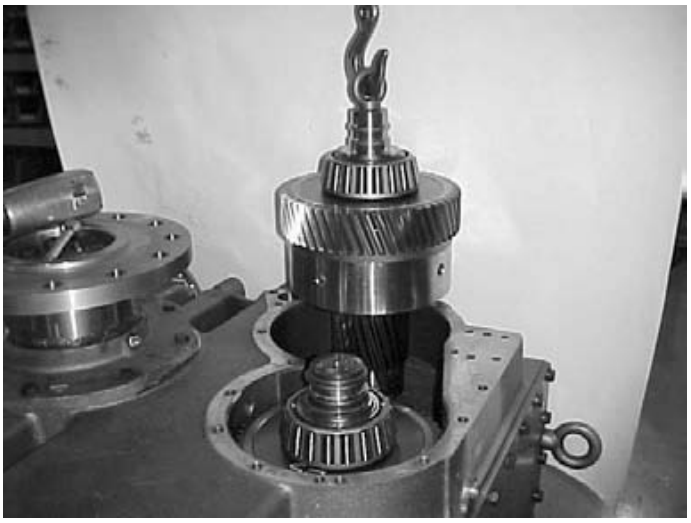


Figure 98. Installing Clutch Shaft Assembly

2. Install bearing carrier gasket over dowels onto rear face of housing.

3. Assemble lube relief valve spring and lube relief valve steel ball into lube relief valve housing. Attach assembled lube relief valve to inner face of bearing carrier with the screws and washers. Torque the screws to 23 Nm (17 ft-lb).

Figure 99. Lubrication Oil Pressure Relief Valve Installed

4. Install two alignment studs into face of transmission housing. Install bearing carrier over studs and onto dowels in housing face. Use a soft hammer (near the dowels) to seat carrier against gasket and over dowels.

5. Install lube tube through “keyed” hole in bearing carrier and into machined pocket in front inner face of housing. Rotate tube so elongated “key” of tube fits into corresponding “key” in bearing carrier. Properly installed lube tube will be flush with rear face of bearing carrier.

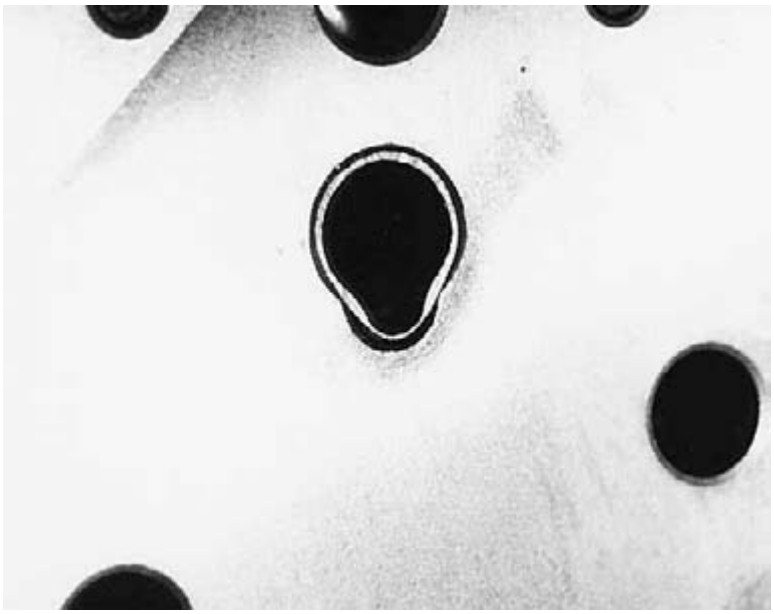


Figure 100. Key Orientation of Installed Lube Tube

6. Install cups for rear tapered roller bearings on primary and secondary shafts into bores in bearing carrier. Tap cups down gently with soft hammer or brass drift to seat against bearing cones on shafts.

7. Install manifold gasket over alignment studs and against bearing carrier.

8. Install the bearing spacers over the bearing cups.

9. Rotate the shafts at lease three revolutions to seat the bearing rollers while pressing down on both bearing spacers.

10. Push tapered roller bearing cups, with bearing spacers, firmly against roller bearing cones on rear of primary and secondary shafts. Use a depth micrometer to measure from top of manifold gasket down to shim retainers. Measured distance is shaft endplay. Use necessary shims to develop a shim pack for each shaft to reduce shaft endplay to 0.013 mm to 0.063 mm (0.0005 in. to 0.0025 in.).

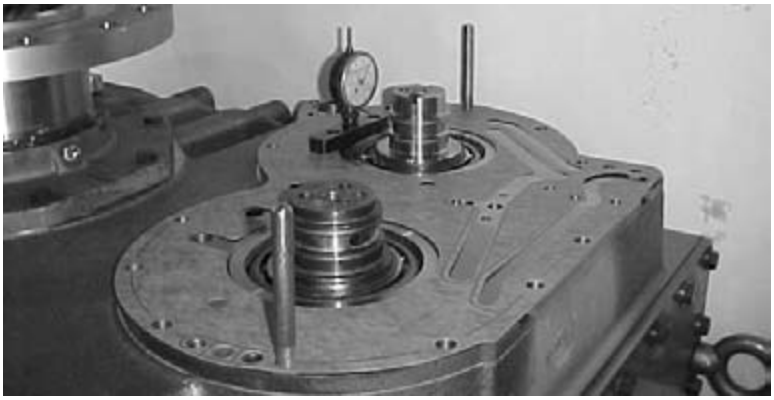


Figure 101. Measuring to Determine Shim Pack Thickness

11. Remove one shim retainer and install the shim pack for that shaft directly over the bearing cup. The thinnest of the shims should be in the center of the pack, and the thickest shim should be against the bearing cup. Repeat this process for the other shaft.

12. Install the shaft seal rings into the grooves of the clutch shafts.

13. Apply a coat of assembly grease or oil to the seal rings of both clutch shafts. Center the seal rings in the shaft grooves to prevent seal ring damage during manifold installation.

14. Install the manifold over the bearing carrier and gasket. Use a soft hammer (near the dowels) to seat manifold against gasket and over dowels.

15. Install the manifold attaching screws and torque to 80 Nm (59 ft-lb).

16. Confirm shaft endplay.

Note: Some early production manifolds will not allow the secondary shaft endplay to be confirmed, as the opening at the oil pump blocks the threaded hole(s) in the shaft end. Such transmissions require a modified manifold (enlarged opening) to be used as a tool to confirm correct secondary shaft endplay.

A. With a felt-tip pen, make a mark across the rear end of the secondary shaft. Install a dial indicator on a machined surface on the manifold with the probe resting on the mark made on the secondary shaft.

Figure 102. Confirming Secondary Shaft Bearing Adjustment

B. Install an eyebolt into the end of the shaft and exert 890 N (200 lbs) downward force while rotating the shaft several revolutions in each direction. Stop so that the dial indicator probe is resting on the mark.

C. Zero the dial indicator.

D. Remove downward pressure and exert 1334 N to 1557 N (300 lbs to 350 lbs) lifting force on the shaft. Rotate the shaft several revolutions in each direction stopping with the dial indicator probe resting on the mark.

E. Dial indicator reading is secondary shaft endplay. Endplay should be between 0.013 mm to 0.063 mm (0.0005 in. to 0.0025 in.). Add or remove shims as necessary to achieve correct endplay. Use dial indicator and above procedure to confirm that desired endplay has been attained.

F. Confirm endplay for primary shaft by repeating previous steps on primary shaft.

17. Install new O-rings onto the M18 O-ring plugs used for the clutch and lube pressure test ports. Lubricate the O-ring and threads and install the plugs, torquing them to 34 Nm (25 ft-lb).

Installation of Exterior Components

1. Install suction strainer into bore in manifold.

Figure 103. Installing Suction Strainer

2. Install O-ring into groove in suction screen cover. Apply assembly grease or oil to the O-ring.

3. Install suction screen cover and secure with clamp plate and screw. Torque attaching screw to 80 Nm (59 ft-lb).

4. Install O-ring into groove in face of manifold at primary shaft. Install cover onto manifold at primary shaft. Install attaching screws and torque to 80 Nm (59 ft-lb).

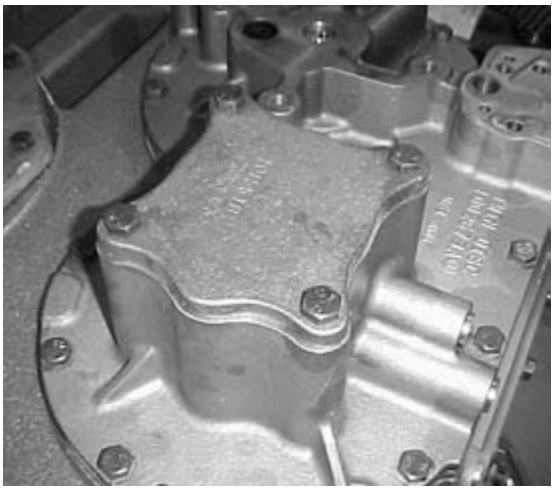


Figure 104. O-ring Installed (left) and Cover Installed (right)

5. Install oil pump drive adapter onto the secondary shaft (some models). Apply MA908 threadlocker to the cleaned threads of the screws and torque them to 130 Nm (96 ft-lb). Install the pump spacer pilot onto the manifold.

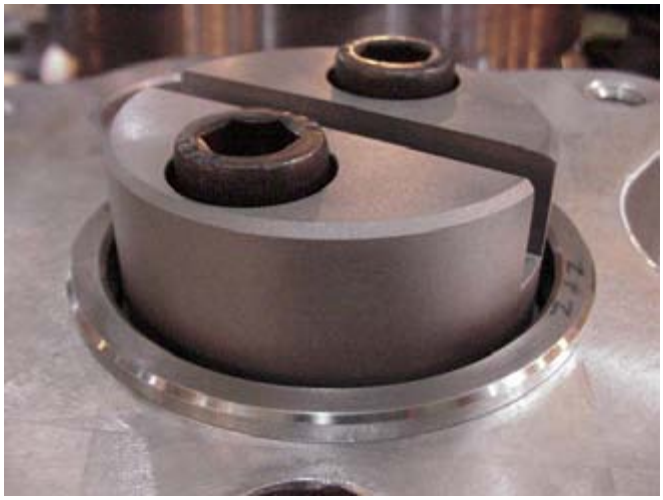


Figure 105. Pump Drive Adapter and Spacer Pilot Installed

6. Install the pump spacer and its gasket onto the manifold.

7. Install the oil pump gasket and oil pump onto the pump spacer. Mesh drive tang on pump shaft with drive slot in secondary shaft or drive adapter. Install attaching screws and torque to 80 Nm (59 ft-lb).

8. Assemble oil filter differential bypass valve parts into oil filter head and torque the O-ring plug to 108 Nm (80 ft-lb). Install the oil filter head onto transmission and torque the attaching screws to 80 Nm (59 ft-lb). Install O-ring, filter element, and filter housing onto filter head and torque the bolt to 81 Nm (60 ft-lb) with its threads and washer oiled.

9. Install the trailing pump cover (if not equipped with optional trailing pump). Install the five attaching screws and washers and torque them to 80 Nm (59 ft-lb).

10. If the transmission is equipped with an optional trailing pump, install the trailing pump, tube, and associated fittings. If the trailing pump is the earlier gerotor style pump (see illustrations section of this manual for identification), torque the five attaching screws in an alternating pattern to 62 Nm (46 ft-lb). Torque the four screws of the later crescent style pump to 37 Nm (27 ft-lb). Install the trailing pump suction strainer and cover with its O-ring. Tighten tubing fittings to 41 Nm (30 ft-lb) and the elbow fitting jam nuts to 47 Nm (35 ft-lb).

Installation of Output Flange

1. Clean tapered surface of output shaft and tapered bore of output flange. Use OSHA approved cleaning solvent to remove all traces of dirt, grease, oil, etc. Do not touch cleaned surfaces. Loctite® 7070 cleaner is recommended.

⚠ CAUTION

Tapered surface of shaft and matching tapered bore of flange must be completely free of grease, oil, dirt or solvent residue. Failure to properly clean mating parts could prevent proper advance measurement of flange on shaft and adversely effect torque carrying capacity of the assembled joint. Both parts must be at the same temperature.

2. Measure the length of the tapered bore of the output flange using a depth micrometer. The flange must be placed on a flat surface, and the length being measured is to the inner shoulder of output flange. Record this distance as dimension “A”.

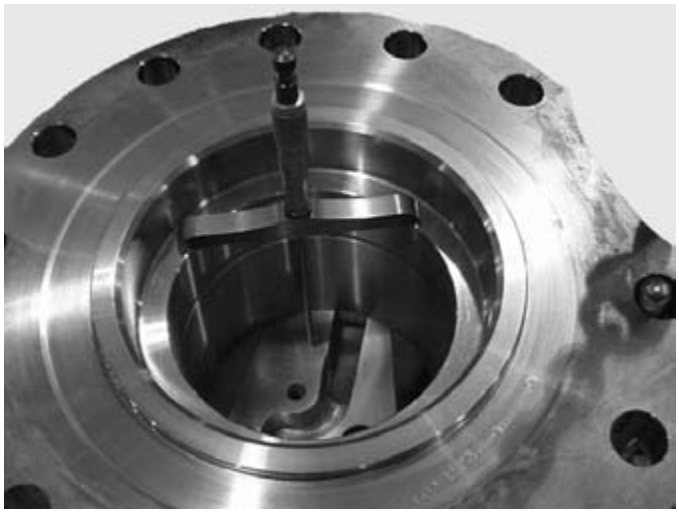


Figure 106. Measuring Output Flange Bore Length

3. With a depth micrometer, measure the output shaft height. This is the distance from the end of the output shaft down to the rear tapered roller bearing cone. Record this distance as dimension “B”.

Figure 107. Measuring From Output Shaft Height

4. Seat flange onto the taper of the shaft using only the weight of the flange.

5. With a depth micrometer, measure distance from inner shoulder of output flange to end of output shaft. Record this distance as dimension “C”.

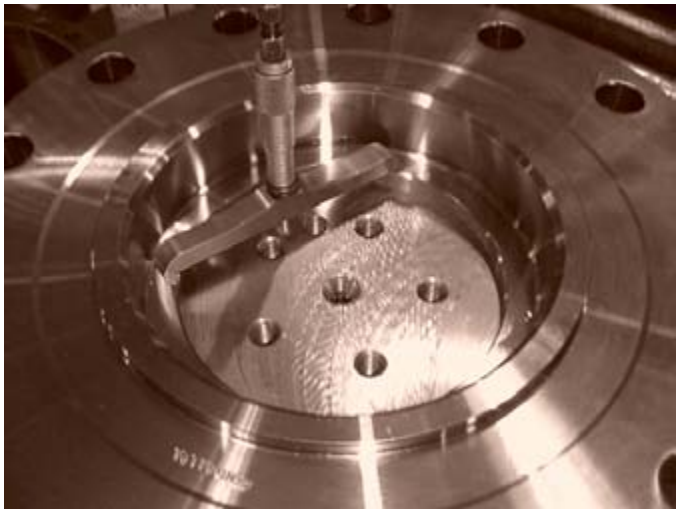


Figure 108. Measuring Output Step Height

6. Calculate the output flange advance, which is dimension “B” plus dimension “C” minus dimension “A”. This is advance must be 4.85 mm to 7.04 mm (0.191 in. to 0.277 in.).

   Note: Should the calculated advance fall outside the range given above, check to assure that all measurements and calculations are correct. If no errors are found and the expected advance is out of tolerance, it will be necessary to change parts. Contact the Product Service Department at Twin Disc, Incorporated for assistance.

7. Connect the oil injector to the output flange.

8. Install tool T-21433 onto the output shaft to advance the flange onto the shaft.

9. Inject oil with a viscosity of 300 mm^2/S (300cSt) at room temperature (mounting fluid) into the shaft until it leaks out of both ends of the mating surfaces.

10. Advance flange onto shaft with the portable press.

Figure 109. Advancing Output Flange Onto Output Shaft

11. Release injection oil pressure between the mating surfaces and wait five minutes. Remove T-21433 from the transmission.

    Note: It is possible to advance the flange using the retainer washer and its five retaining screws. The screws must be tightened evenly in small increments and in an alternating star pattern to advance the flange squarely onto the shaft. New screws must be installed if the old screws were over-torqued during the advancing process.

12. Measure the distance from the output flange shoulder to the end of the output shaft. Record this as dimension “D”. Dimension “D must be the same as dimension “B” minus dimension ”A” within 0.05 mm (0.002 inch).

13. Create a shim pack that is 0.05 mm to 0.15 mm (0.002 to 0.006 inch) less than dimension “D”. Install the shim pack and retainer washer onto the output shaft. Install the screws and torque them to 112 Nm (83 ft-lb).

Figure 110. Installing Output Flange Retainer Washer and Shims

14. Attach dial indicator to housing with probe resting on face of output flange. Locate indicator probe as close to O.D. of flange as possible. Check flange face runout by rotating flange. Total indicated runout must not exceed 0.10 mm (0.004 in.).

15. Attach dial indicator to housing with probe resting on O.D. of output flange pilot. Check pilot runout by rotating output flange. Total indicated runout must not exceed 0.10 mm (0.004 in.).

    Note: Should total dial indicator runout exceed 0.10 mm (0.004 in.) the flange must be removed and reinstalled on the shaft taper.

16. Install the O-ring plug into the oil injection port of the output flange and torque to 16 Nm (12 ft-lb).

Installation of Top Cover Assembly, Heat Exchanger, and Oil Gauge

1. Turn transmission over and block securely in upright position.

2. Attach oil baffle to top cover (if removed). Install the sealing washers onto the screws, apply MA908 threadlocker to the screw threads and grease to the sealing washers, and torque the screws to 18 Nm (13 ft-lb). Install top cover assembly with its gasket. Install attaching screws and torque to 80 Nm (59 ft-lb). Install the two lifting eyebolts.

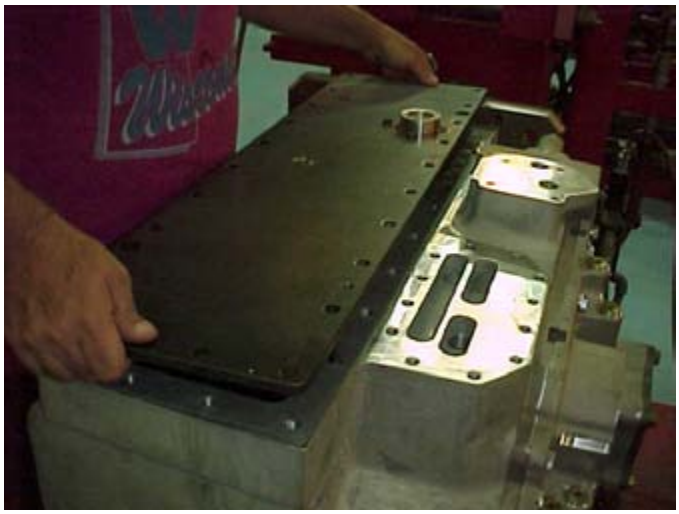


Figure 111. Installing Top Cover

3. Install breather-filler cap.

4. Install oil gauge tube assembly and oil level gauge. Be sure the oil gauge tube did not enter the gear pan.

5. Install PTO valve cover plate onto the top of the transmission housing and torque the screws to 80 Nm (59 ft-lb).

6. Install the heat exchanger. The use of M12x1.75 guide studs will ease the installation of the heat exchanger.

Units with Remote Heat Exchanger:

Install the adapter plate and gasket. Torque the attaching sockethead capscrews to 80 Nm (59 ft-lb). Install protective plugs to prevent the entrance of contaminants into the transmission's lubrication oil circuit.

Units with Integral Fresh Water Heat Exchanger:

Install the adapter plate and gasket. Torque the attaching sockethead capscrews to 80 Nm (59 ft-lb). Install heat exchanger element and gasket over adapter plate. Install heat exchanger cover and gasket and torque the attaching screws to 112 Nm (83 ft-lb). Install protective plugs into cover to prevent the entrance of contaminants into the transmission's water circuit. Install the M10x1 O-ring water drain plug and torque to 12 Nm (9 ft-lb).

Units with Integral Raw Water Heat Exchanger:

Install stiffener plate and gasket. Install two O-rings into counterbores of stiffener plate. Install heat exchanger element and cover gasket over adapter plate and O-rings. Install anode into cover with gasket, screw and sealing washer, torquing screw to 18 Nm (13 ft-lb). Fill the remaining threads in the anode below the screw with RTV silicone sealer. Be sure sealer has proper curing time before exposing it to water. Install heat exchanger cover and torque the attaching screws to 80 Nm (59 ft-lb). Install protective plugs into cover to prevent the entrance of contaminants into the transmission's water circuit. Install the M10x1 O-ring water drain plug and torque to 12 Nm (9 ft-lb).

Installation of Input Oil Seal, Front Housing and Input Coupling

1. Apply a thin coat of M2828 anaerobic sealer to the OD of the oil seal and also to the housing input oil seal bore. Install the input oil seal with the driver of tool T-18050-706 (detail #2). Be sure to use the seal sleeve (detail #1) to protect the input oil seal from being damaged by the primary shaft. Remove any excess M2828 sealant from the seal.

Figure 112. Installing Input Oil Seal

2. If the expansion plug has been removed from the output shaft bore of the housing, apply a thin coat of M2828 anaerobic sealer to the OD of the new expansion plug and also to the housing bore. Drive the plug in until the flange is flush with the machined surface of the housing.

3. Install the front housing onto the transmission. Torque the attaching screws to 80 Nm (59 ft-lb).

4. Check front housing runout.

   A. Mount a dial indicator on the input shaft with the probe on the front housing machined face. Rotate the input shaft and note the total indicator runout. The face runout must not exceed 0.41 mm (0.016 in) for both SAE #0 and #00 housings.

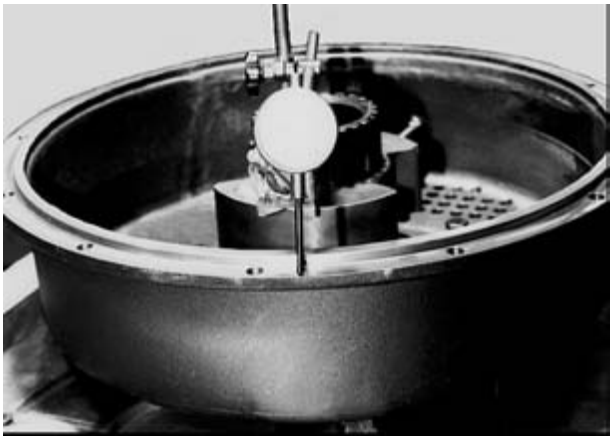


Figure 113. Measuring Front Housing Face Runout

   B. Move the dial indicator's probe so it measures the O.D. of the front housing pilot diameter. Rotate the input shaft and note the total indicator runout. The pilot runout must not exceed 0.30 mm (0.012 in) for both SAE #0 and #00 housings. Should total indicator runout exceed the allowable limits, contact the Product Service Department of Twin Disc, Inc. for information and recommendations.

5. On units using Vulkan® or Centa® input couplings, the input shaft splines are a slip fit. If the transmission is to be shipped with the input coupling installed, it must be attached to prevent it from sliding off and causing damage. Be sure the internal retaining ring is installed into the correct groove of the input hub on units using a Vulkan® input coupling (refer to transmission assembly drawing). The torque specification for the M20 screws that attach the coupling element to the coupling hub is 530 N-m (391 ft-lb) with lubricated threads.

6. On remote mounted units or units using a Geislinger input coupling, install the input hub. The spline fit with this hub is a tight fit, therefore it is recommended to heat the coupling to 66° C (150° F) to ease installation. The use of silicone spray lubricant on the shaft is also recommended.

Assembly and Installation of Control Valve

Assembly of Electrical Control Valve (upperbody half)

1. Install one dowel pin (large diameter) into each of the two bores of the valve body.

2. Install one spring into each of the two bores of the valve body.

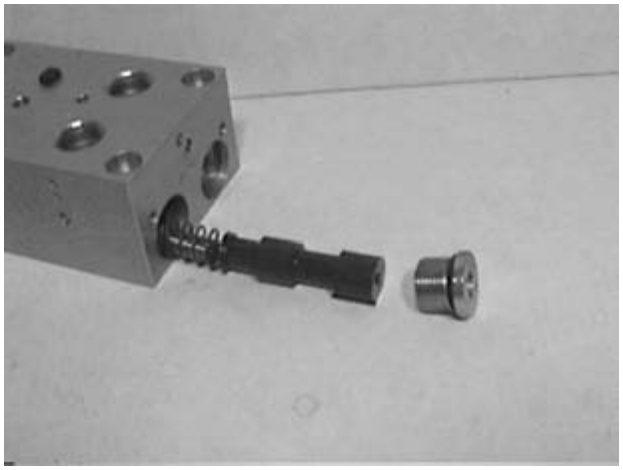


Figure 114. Dowel, Return Spring, Spool, and Plug

3. Install one spool into each of the two bores of the valve body.

4. On units equipped with the hydraulic lock feature, install one spring followed by one pin (small diameter) into each of the spools.

5. Install the two O-ring plugs into the valve body and tighten to 75 Nm (55 lb-ft.)

6. Apply lubricant (such as Dow Corning 200® 30,000cSt fluid) to the O-rings of the solenoids and plug (plug used on units without hydraulic lock). Install solenoids (and plug, if equipped) into the valve body and torque them to 34 Nm (25 lb-ft.).

7. Insert the wires (pins) into the Weatherpak connector according to the location markings made at disassembly. Close the end of the Weatherpak connector to lock the wires in position.

8. Install the Weatherpak connector onto its retaining clip on the top of the valve body.

Assembly of Electrical Control Valve (lower body half)

1. Install the steel shuttle ball into its bore in the valve body.

2. Install the O-ring onto the shuttle ball seat.

3. Apply lubricant such as Dow Corning 200® 30,000cSt fluid to the O-ring, and install the seat into the valve body. Be sure to align the roll pin holes in the seat with the holes in the valve body. One of the valve's M8x1.25 cover screws threaded into the seat can be used to adjust the seat location in the valve body.

4. Install the roll pin to retain the shuttle ball seat. Drive the roll pin in until it is flush with the gasket surface of the valve body.

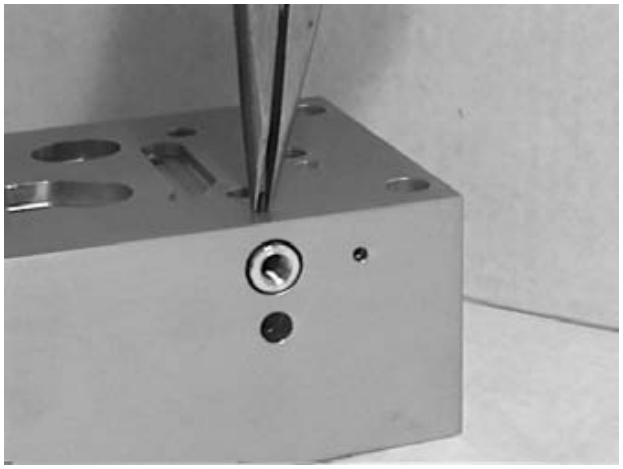


Figure 115. Installing Shuttle Ball Seat Roll Pin

5. Install the stem into the valve body, aligning the slot in the stem with the threaded hole in the valve body for the dog-point setscrew. Be sure the slot in the stem is aligned with the setscrew hole in the valve body to prevent damage to the stem and valve body.

6. Apply MA908 threadlocker to the threads of the dog-point setscrew and install. Tighten the dog-point setscrew until snug, then back off 1/2 turn.

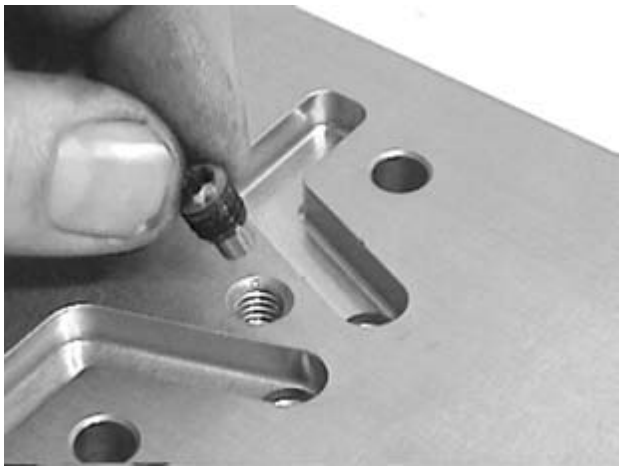


Figure 116. Installing Dogpoint Setscrew

7. Install the steel detent ball into the valve body.

8. Install the detent spring over the detent ball.

9. Apply MA908 threadlocker to the threads of the hollow setscrew and install into the threaded hole. A stepped Allen wrench, or one wrapped with tape will ease the installation of the hollow setscrew. Tighten the setscrew until it is flush with the gasket surface of the valve body. Check the stem rotation and detent action.

Figure 117. Installing Detent Ball Setscrew

10. Install the thrust bearing and races (thrust washer on earlier units) over the end of the stem.

11. Press the oil seal into the cover assembly until flush with the adjacent cover surface.

12. Install the O-ring into the counterbore in the cover assembly.

13. Apply grease to the stem, O-ring, and oil seal lip.

14. Install cover assembly and gasket onto valve body. Be sure to align the oil drain hole in the gasket with the hole in the valve body.

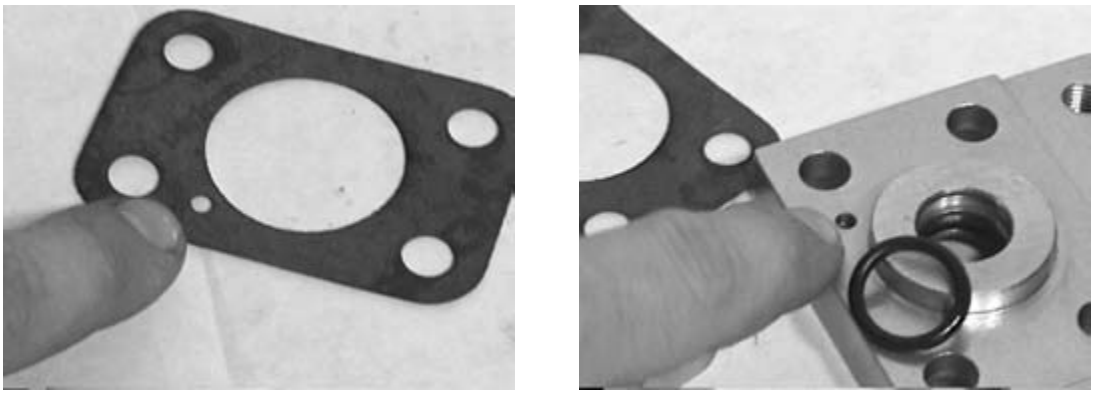


Figure 118. Holes in Gasket and Cover Must be Aligned

15. Install cover capscrews and torque to 23 Nm (17 lb-ft).

16. Install washer over stem and against oil seal.

17. Install spring over stem against washer.

18. Install lever onto the stem. It may be necessary to splay the lever to be able to install it. DO NOT apply any impact force to the lever, as the stem or dog-point setscrew may be damaged. Torque the lever's attaching screw to 9.5 Nm (7 lb-ft).

19. Install external retaining ring onto stem.

20. Install the steel balls and electrical switches into the bores in the sides of the valve body (if equipped). Note that the small diameter ball is inboard of the large diameter ball at each switch location.

21. Install the pressure regulating piston into valve body with spring pocket out.

22. Install pressure regulating springs into valve body and into piston spring pocket.

23. Install the shims that were removed into the bore of the rate-of-rise piston. Install the rate-of-rise piston over the springs and into valve body.

24. Install neutral pressure regulating spring into the pocket of valve body.

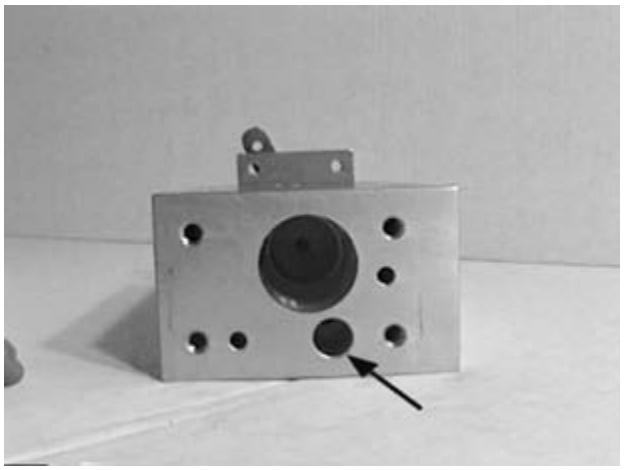


Figure 119. Neutral Pressure Regulating Spring Location

25. Install the orifice protection screen into the valve body.

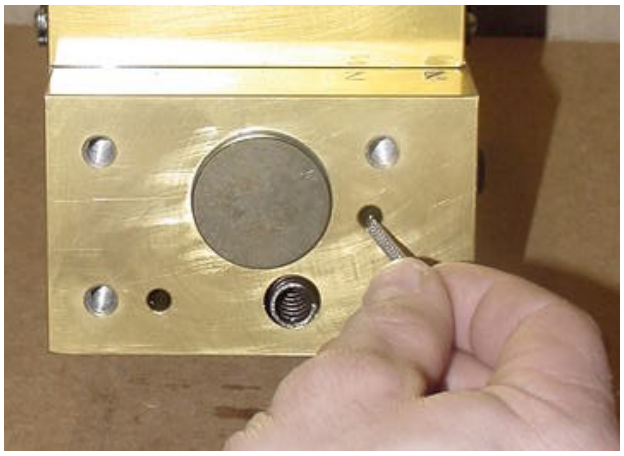


Figure 120. Installing Screen

26. Install orifice plate gasket onto valve body.

27. Install orifice plate and steel ball (against spring) onto valve body.

28. Install orifice plate cover and gasket onto valve body. Install cover capscrews and torque to 23 Nm (17 lb-ft).

29. Install gasket over lower valve body half.

30. Set upper valve body half over lower valve body half. Insert the valve attaching screws through valve body halves to keep parts in alignment until installation onto the transmission. When installing the valve onto the transmission, torque the screws to 54 Nm (40 lb-ft.).

Assembly of Trolling Valve (optional equipment)

1. Press a new oil seal into the counterbore in the end of the adapter. Install a new O-ring into the groove of the adapter.

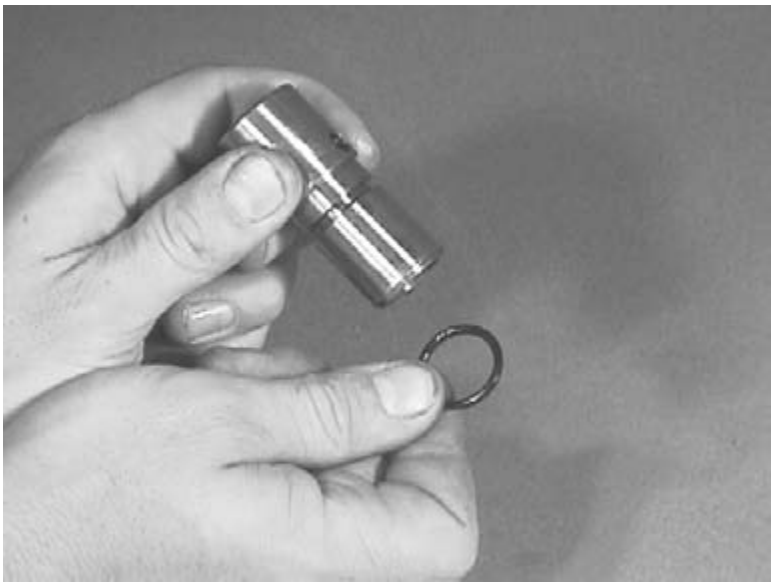


Figure 121. Installing O-ring onto Adapter

2. Install a new O-ring into the groove of the stem.

3. Install the roll pin into the end of the stem (if removed).

4. Install the inner spring onto the roll pin in the stem end with a counterclockwise twisting motion. The spring is to be installed onto the roll pin such that the first coil contacts the end of the stem.

5. Apply assembly grease to the stem, from the O-ring to the reduced diameter end. Install the stem into the adapter, with the reduced diameter end entering the adapter first. Adjust the position of the stem if necessary to bring the helical slot into alignment with the dog-point setscrew hole.

6. Install the large diameter washer (used on some models) inside the bore of the adapter and over the inner spring until it lays flat on the end of the stem.

7. Install the small washer (used on some models) inside the piston. The washer must lie flat at the bottom of the bore in the piston.

8. Apply assembly grease to the adapter (where it contacts the trolling valve body) and install the adapter into the valve body. Be sure to align the setscrew holes in the adapter with those in the valve body.

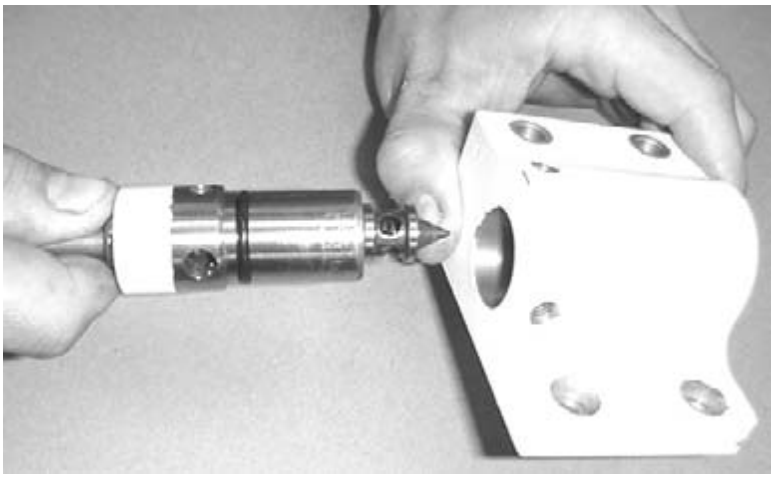


Figure 122. Installing Trolling Valve Parts Into Trolling Valve Body

9. Apply MA908 threadlocker to the threads of the dog-point setscrew and install. Tighten the dog-point setscrew until snug, then back off 1/2 turn. The end of the setscrew should protrude approximately 3mm from the valve body when the dog point of the setscrew is fully engaged in the helical slot.

Figure 123. Installing Dogpoint Setscrew

10. Check the action of the stem in the trolling valve. If the stem does not rotate 90° smoothly, loosen the dog-point setscrew 1/8 turn and recheck the action of the stem.

11. Install the detent ball and spring into the remaining hole in the valve body. Apply MA908 threadlocker to the threads of the detent setscrew and install until flush with the valve body.

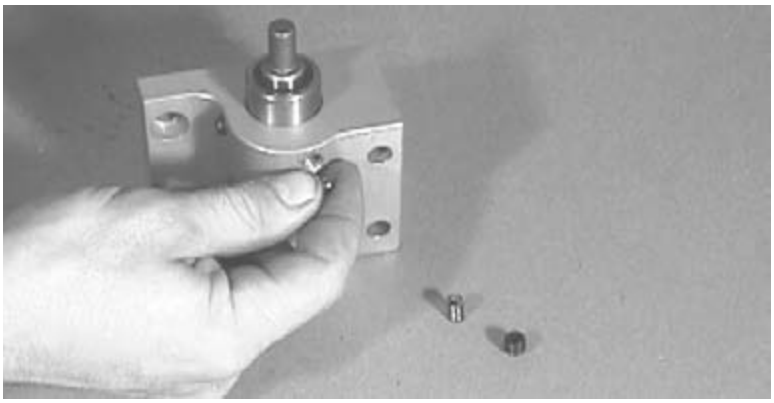


Figure 124. Installing Detent Ball, Spring, and Setscrew

12. Check the torque required to overcome the detent. The torque should be 1.1-1.7 Nm (10-15 in-lb). Adjust the detent setscrew if necessary to achieve the proper torque to rotate the lever out of the detent position.

13. Install the lever onto the stem. It may be necessary to splay the lever to be able to install it. **DO NOT** apply any impact force to the lever, as the stem or dog-point setscrew might get damaged.

14. Rotate the lever (if necessary) on the stem to the position shown on the valve installation drawing (see Engineering Drawing Section of this manual). Install the screw and nut to clamp the lever to the stem. Tighten the screw and nut to 9.5 Nm (7 ft-lb).

15. Install the neutral pressure regulating spring into the bore of the control valve (if removed).

16. Install the steel ball onto the neutral pressure regulating spring.

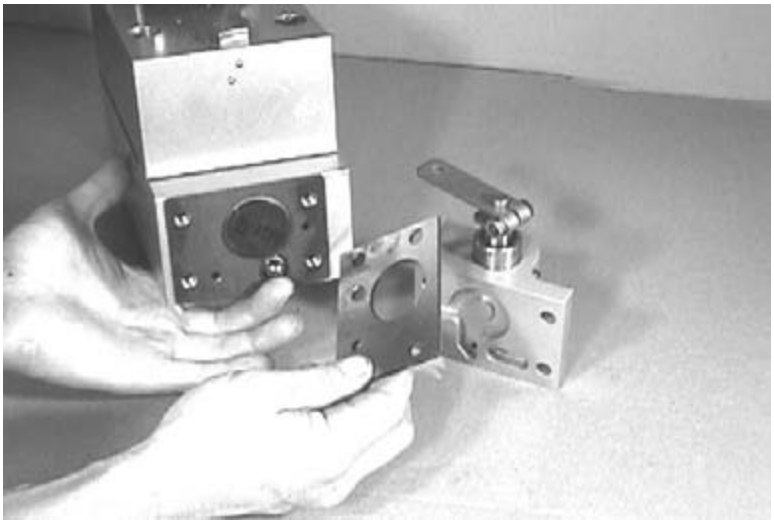
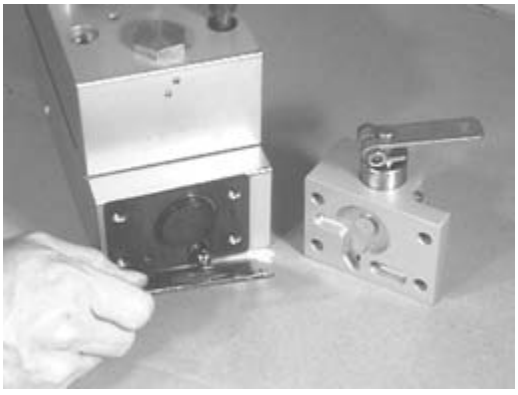


Figure 125. Installing Neutral Pressure Regulating Spring and Ball

17. Install the orifice plate gasket, orifice plate, trolling valve gasket, and trolling valve onto the control valve. Install the attaching screws and torque them to 23 Nm (17ft-lb).



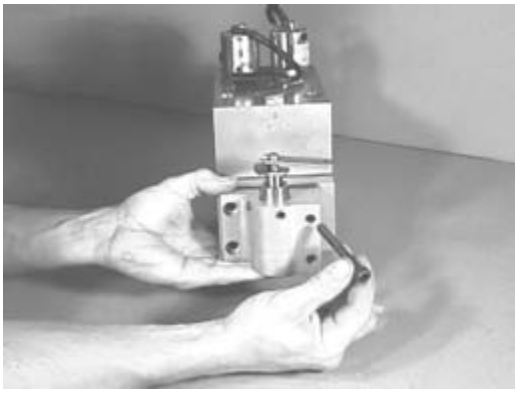


Figure 126. Installing Orifice Plate (left) and Trolling Valve Onto Valve Body (right)

Installation of Electric Control Valve

1. Install control valve ditch plate and gasket. Torque the ditch plate attaching capscrews to 80 Nm (59 ft-lb).

2. Install control valve and gasket. Torque the valve attaching capscrews to 54 Nm (40 ft-lb).

Installation

Prior to Installation

⚠ CAUTION

Most Twin Disc products mount directly onto the flywheel of the engine, or are attached to the flywheel through external shafting or adapters. Flywheel-to-driven component interference is possible due to mismatch of components or other reasons. Therefore, engine crankshaft endplay as well as flywheel alignment checks must be made before the driven component is installed.

After installation of the driven component, the crankshaft endplay should be measured again. The endplay at the second measurement should be the same as the first. A difference in these two endplay measurements could be an indication of interference. Consequently, the driven component should be removed and the source of interference found and corrected.

Twin Disc will not be responsible for system damage caused by engine to Twin Disc component interference regardless of the cause of interference. This engine crankshaft endplay check is considered mandatory.

The transmission housing flange and pilot, the engine flywheel and the flywheel housing must be checked for trueness. Clean the engine flywheel and flywheel housing mounting surfaces thoroughly before any measurements are made.

Note: To isolate engine vibration and prevent transferring it to the hull through the propeller shaft, the distance from the marine gear output flange to a fixed stuffing box or the first fixed bearing must be a minimum of 20 times the shaft diameter. If the distance is less than this, a flexible coupling may be necessary to isolate the engine vibration.

Alignment (also reference SAE J-1033 and J-617)

1. Bolt a thousandths increment dial indicator or gauge to the engine flywheel so that the indicator is perpendicular to the face of the engine flywheel housing, and the indicator stem is riding on the face of the flange.

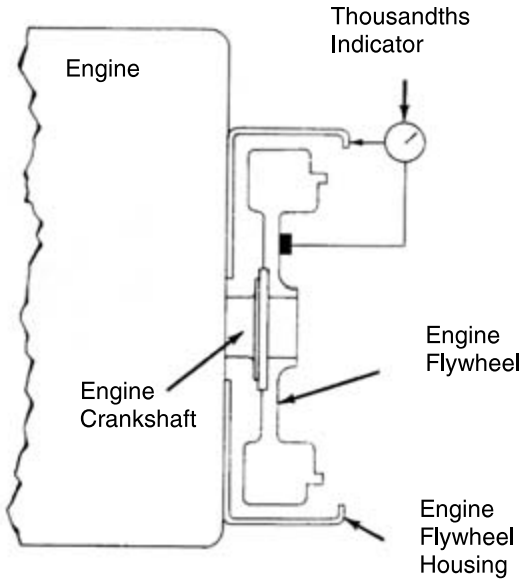


Figure 127. Checking Flywheel Housing Flange for Deviations

2. Rotate the engine flywheel, always keeping a thrust in the same direction, and note the face deviation of the engine flywheel-housing flange. The face deviation must not exceed the figures given in Table 10.

Table 10. Total Indicator Readings for Engine Flywheel Housing Flange

SAE Housing Number	Face Deviations and Bore Eccentricity mm (in)
00	0.48 (0.019)
0	0.41 (0.016)
1/2	0.36 (0.014)
1	0.30 (0.012)
2	0.28 (0.011)
3	0.25 (0.010)
4	0.23 (0.009)
5	0.20 (0.008)
6	0.18 (0.007)

3. With the indicator mounted as in the previous paragraph, adjust the indicator stem so that it will ride on the bore of the engine flywheel housing.

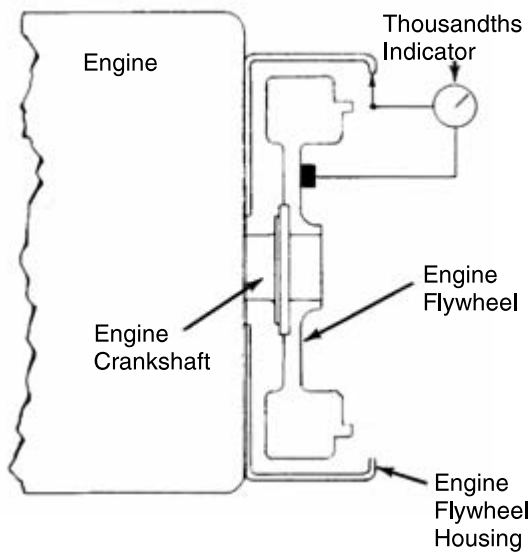


Figure 128. Checking Flywheel Housing Bore Eccentricity

4. Rotate the engine flywheel and note the bore eccentricity of the engine flywheel-housing bore. See the previous Table for allowable tolerances.

5. Bolt a thousandths dial indicator or gauge to the engine flywheel housing so that the indicator is perpendicular to the engine flywheel, and the indicator tip is riding on the inner face of the flywheel. Rotate the flywheel. The variation of the face runout of the surface to which the driving ring is bolted should not exceed 0.013 mm (0.0005 in) per inch of diameter.

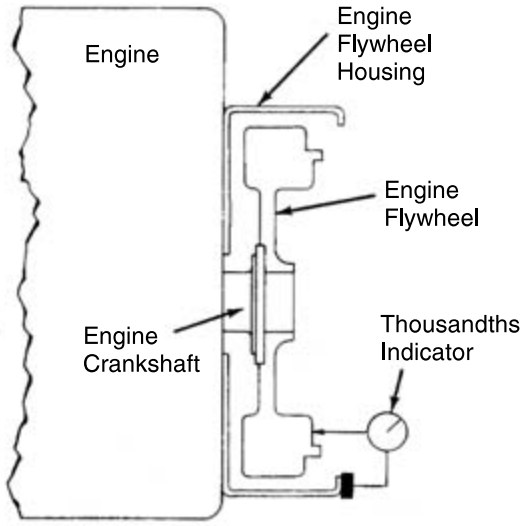


Figure 129. Checking the Flywheel Face Runout

6. With the indicator mounted as in the paragraph above, adjust the indicator tip so that it will ride on the driving ring pilot bore of the engine flywheel. Rotate the flywheel. The driving ring pilot bore eccentricity of the engine flywheel should not exceed 0.13 mm (0.005 in) maximum total indicator reading. Thrust on the flywheel should be in one direction at all times to obtain a correct reading.

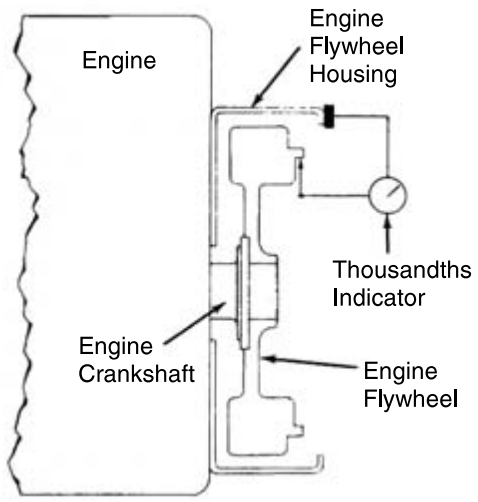


Figure 130. Checking the Flywheel Pilot Ring Bore Eccentricity

Installation

Alignment

Proper alignment of an engine and marine unit is critical, both during the initial installation and at frequent intervals during the life of the boat. It is rather common for a boat to change its form with various loads and with age. Engine and shaft alignment can also change on a boat due to varying loads and the boat's age. The following steps may be taken to secure proper marine transmission alignment.

When reinstalling a marine gear after a repair, or when installing a new marine gear to an engine already mounted in the bed rails, the flywheel housing should be checked for deflection using the following procedure:

Install the mounting brackets on the side mounting pads of the marine gear. Install the driving ring on the engine flywheel. Bolt an indicator to the engine block and set the indicator stem on the engine flywheel housing

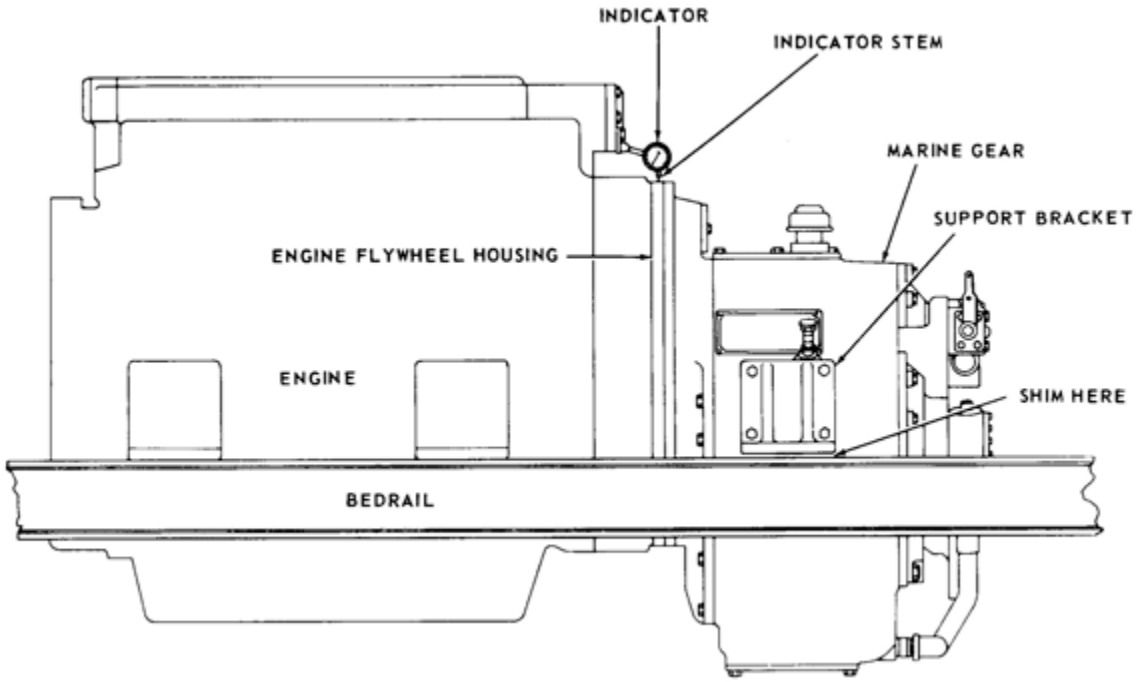


Figure 131. Marine Gear Alignment

Set the indicator gauge at zero (0). Lift the marine gear with a hoist, or other suitable means, and place the unit in position against the engine flywheel housing. Secure the flange of the marine gear main housing to the engine flywheel housing. Use a feeler gauge between each mounting bracket and engine bed rail. Add shims between the brackets and bed rails to equal the feeler gauge readings. Carefully release the lifting force on the marine gear while observing the indicator. The indicator gauge must remain steady at the zero mark. Torque the bed bolts to the proper rating. If the reading moves from zero, lift the marine gear and insert additional shims. Continue this procedure until the marine gear is completely at rest on the bed rails and the gauge maintains a steady zero reading. After obtaining the correct zero reading, indicating no distortion of the engine flywheel housing, secure the mounting brackets to the engine bed rails. Before securing the mounting brackets to the engine bed rails, the propeller shaft should be checked for alignment.

Note: The transmission output flange and companion flange bolts must be torqued to the proper value as identified in Description and Specifications.

Engine and Marine Transmission Alignment

⚠ CAUTION

When mounting the engine and transmission in the boat, all of the mounting pads on both the engine and transmission must be used. Failure to do so may result in damage to the transmission or the engine flywheel housing.

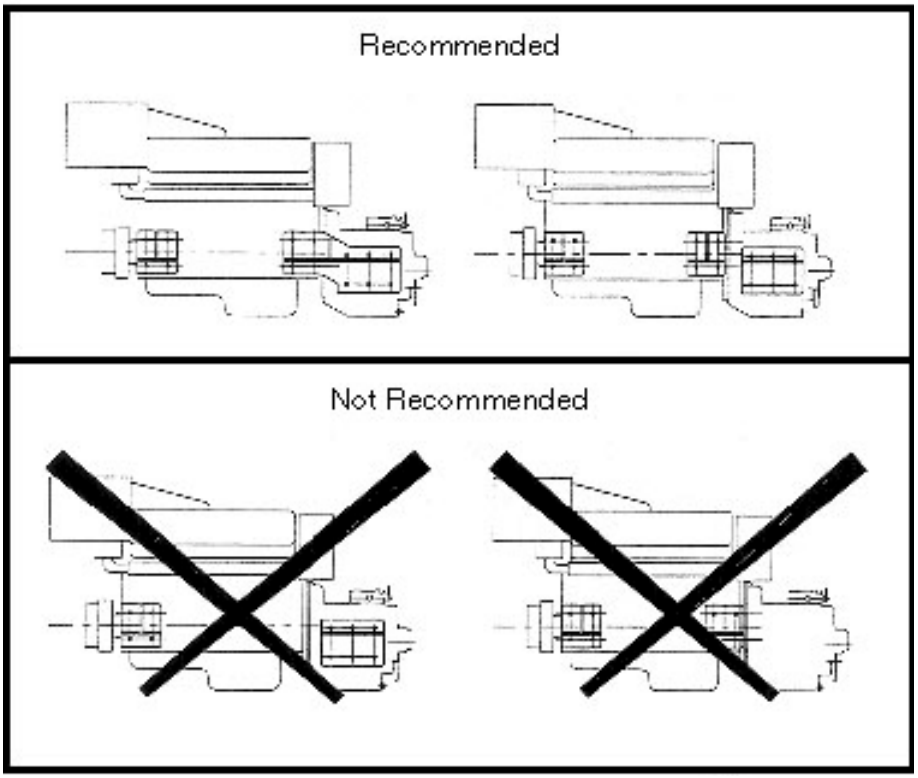


Figure 132. Transmission Mounting Configurations

When mounting the engine and transmission in the boat, all of the mounting pads on both the engine and the transmission must be used. Failure to do so may result in damage to the transmission.

It is important to align the engine and transmission only when the boat is afloat, and NOT in dry-dock. During this alignment period, it is also advisable to fill the fuel tanks and load the boat in the typical manner that it is to be used. Some boats are built with flexibility and may change shape as the loading varies.

When a heavy boat is dry-docked, it naturally undergoes some bending. Therefore, it is always good practice to unbolt the marine transmission coupling to prevent bending of the shaft.

With the engine and transmission in position on the engine bed, arrangements must be made to have a controlled lifting or lowering of each of the four corners of the engine. If threaded holes are provided in each of the engine mounts, jacking screws can be used in them. The engine can be raised by screwing down, or lowered by backing off on the jacking screws to obtain the desired adjustment.

Steel plates must be inserted under the jacking screws so that the bolts will not damage the engine bed. Lifting can also be accomplished by the use of chain hoists or properly placed jacks. Adjustable shims also are available and can simplify the alignment process, particularly for future realignment.

It may also be necessary to move the engine and transmission to one side or the other on the engine bed to obtain horizontal alignment. This can be done with a jack placed horizontally between the engine and the foundation. At the same time, a straight edge is laid across the edges of the flanges at the top and side to check the parallel alignment of the coupling edges.

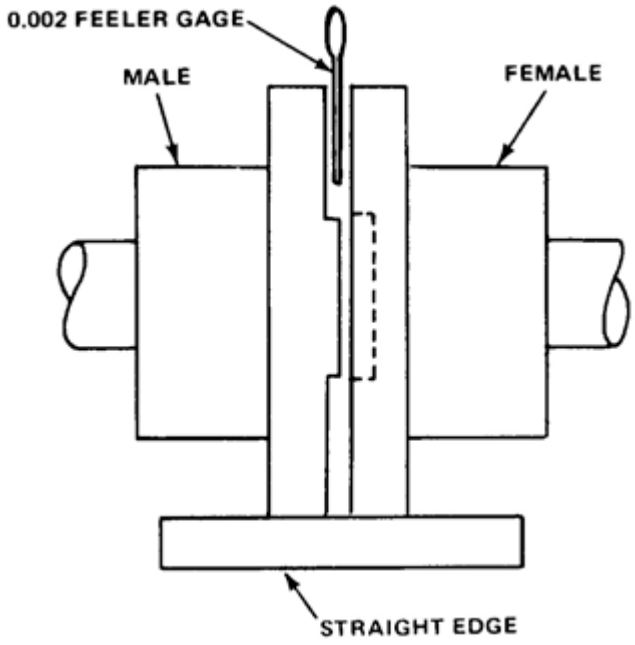


Figure 133. Checking Parallel Alignment of the Coupling

As the engine and marine transmission come into their aligned position, it will be possible to mate the output flange and propeller coupling, and prepare for bolting together. Care should be taken not to burr or mar this connection because the fit is very critical. Place a 0.05 mm (0.002 in) feeler gauge between the flanges of the coupling. Move (slide) the feeler gauge completely around the coupling. Rotate the marine transmission flange coupling in 90 degree increments, and move the feeler gauge around the flange in each successive position. The feeler gauge will fit snugly, with the same tension, all around the flange coupling in all four positions if the alignment is correct.

If the alignment varies during rotation, additional alignment is necessary, or the marine transmission and shaft couplings should be checked for proper face runout. Runout must not exceed 0.10 mm (0.004 in). Excessive face runout on the marine transmission output flange can usually be corrected by repositioning the coupling on its spline or taper. Excessive shaft coupling runout is usually due to inaccuracy of the taper fit or key to keyway interference. The optimum relative mating location will be where the measured runout dimensions of the transmission flange and the shaft coupling flange compliment each other to result in the least relative out of true parallel measurement.

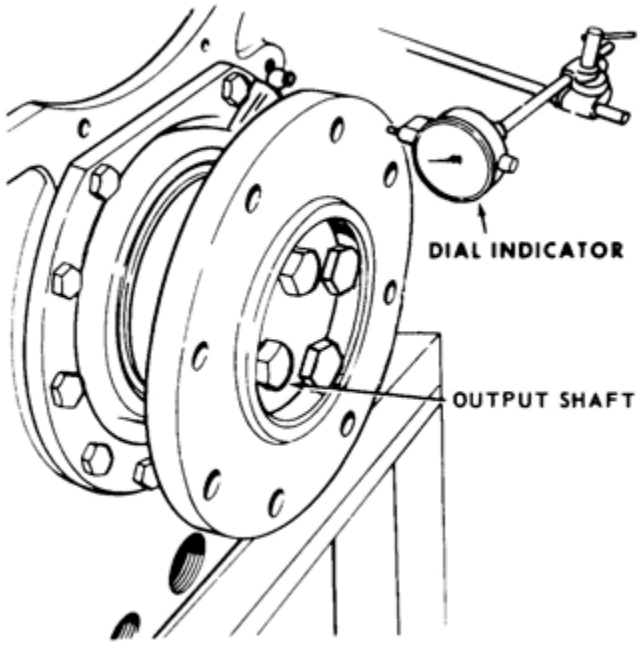


Figure 134. Checking Output Flange Face Runout

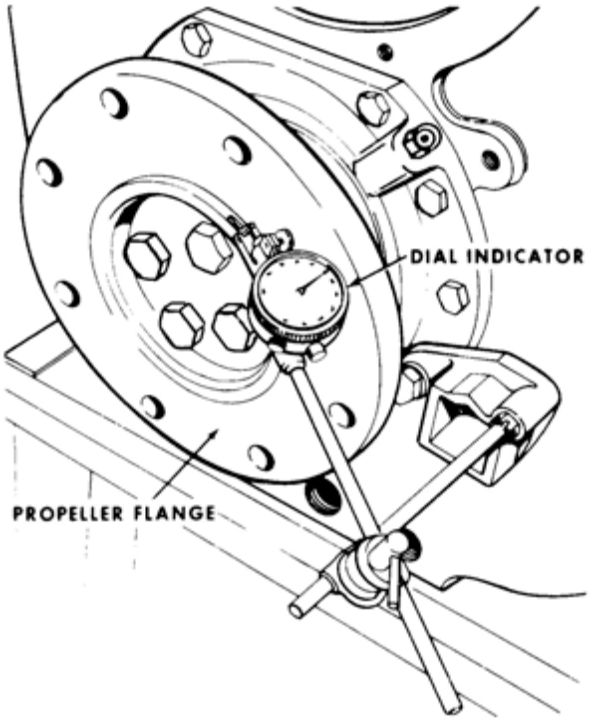


Figure 135. Checking Output Flange Pilot Eccentricity

Some boats are not structurally rigid and some carry their load in such a way that they will “hog” or go out of normal shape with every loading and unloading. Where this condition exists, it important to apply common sense alignment techniques to minimize the potential damage to any of the components.

During the process of securing final alignment, it may be necessary to shift the engine many times. When the final alignment is accomplished, mark and drill the holes for the lag studs or locating dowel pins. Then with final alignment secured, make up the necessary poured, steel, or hardwood shims, and fasten the engine and transmission in place. Then recheck the alignment, and if satisfactory, bolt the coupling together.

There are many types of flexible couplings in the market today that solve a variety of problems:

- ❑ Couplings to reduce noise and vibration.
- ❑ Couplings to allow a permanent angular misalignment.
- ❑ Couplings that allow engines to be flexibly mounted and take out the momentary misalignment.

In some cases, the proper alignment of these couplings requires an accuracy equal to that of rigid couplings. Always use the alignment procedures recommended by the coupling manufacturer.

Torsional Input Couplings Installation - For Models Provided by Twin Disc

⚠ CAUTION

Be sure the internal retaining ring is properly installed inside the torsional input coupling hub. See Engineering Drawings section of this manual for correct ring location.

The following pages include the Assembly Instructions for CENTAFLEX - R on Flange Mounted Gears taken directly from CENTA document 26-01/02.

CENTAFLEX®-R

Assembly instructions on flange mounted gears

CAUTION- Before you start the coupling assembly

Check there is axial play in each direction of the engine crankshaft to ensure the engine thrust bearings are not loaded. Record the result.

Assembly Method

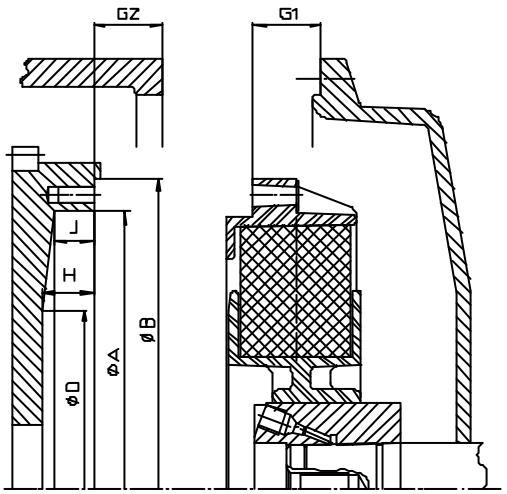
Mount the gear half of the coupling to the gearbox input shaft as the design dictates. Insert the rubber rollers into each of the sockets of the gearbox hub. Usually, the rubber rollers of the smaller sizes are held by an adhesive pad, but on the large sizes a plastic assembly strap is used (if these are not available, or the coupling is being reassembled), temporarily hold the rollers in place using string or tape secured with a slip knot, ensuring the end is placed to the gearbox side.
Trial fit the assembly by offering up the coupling flange (outer part or flywheel half) to the gear half and push the two halves together. Should the resistance be too high; use a lubricant such as soft soap, silicone grease or similar (mineral oil can be used sparingly as a non-preferred lubricant). Should the rollers be held with tape or string, once the outer part is started, remove it. Push the coupling flange (outer part) fully home to the aligned position. **Rotate the complete assembly a few times to ensure that there is no interference. If there is, the source must be identified and eliminated before you proceed.**

Check the axial length (dimension G1 in sketch 1) between the gearbox mounting flange and coupling flange (do this in several places and take the average result). Measure engine flywheel / flywheel housing mounting dimension (Dimension G2 in sketch 1). G1 should be less than or equal to G2. (G1≤ G2). The CENTAFLEX CF-R has a generous ± 2 mm to compensate for this difference.

SKETCH 1 - ENSURE CORRECT AXIAL ALIGNMENT

SAE J620c	Dia A		Dia B		Dia D		nom. Length G		Length J		Length H	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
11.5	12.38	314.5	13.875	352.4	8.00	203.2	1.56	39.6	0.88	22.4	1.12	28.5
14	16.12	409.5	18.375	466.7	8.75	222.25	1.00	25.4	0.88	22.4	1.12	28.5
18	19.62	498.35	22.5	571.5	0	0	0.62	15.7	1.25	31.75	1,25	31.75
21	23.00	584.2	26.50	673.1	0	0	0	0	1.25	31.75	1.25	31.75

The CENTAFLEX Series R coupling series is designed according to the dimension tables in SAE J620c (Flywheels) and SAE J617a (Housings). There are several engines on the market which do not conform fully with the SAE specifications (CAT, MWM, VOLVO, YANMAR etc). Engineers at CENTA will assist in the correct selection (from both torque rating and dimensional requirements) based on information they have but it remains the responsibility of the assembler to ensure the CENTAFLEX coupling offered is dimensionally suitable for the application. CENTA cannot accept any liability for any incompatibility of fit or consequence thereof.



Remove the coupling flange (outer part) and bolt it to the engine flywheel. Torque tighten using the engine manufacturers recommendation, but in the absence of it, the table below gives general guidelines.

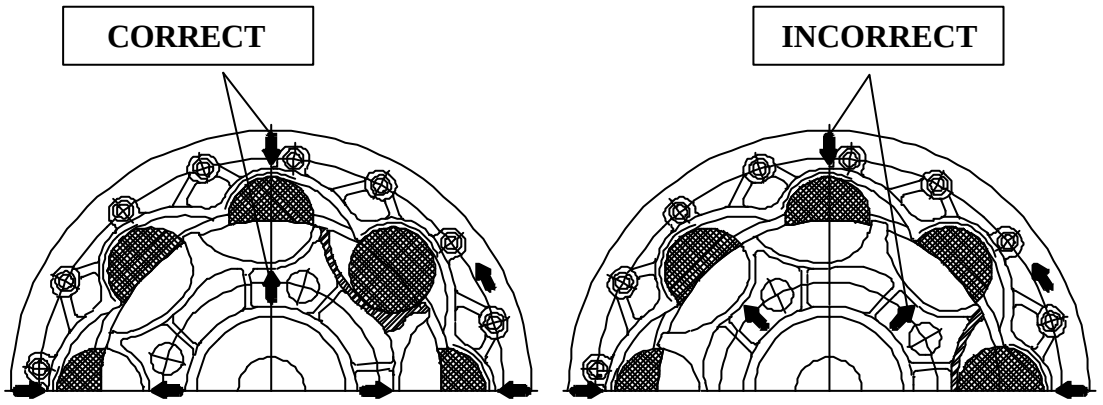
Coupling Flange to Engine Flywheel Bolts.

These bolts are not supplied with the CENTAFLEX - R Coupling, but where no instructions are available from the engine supplier, the following can be used as a guide.

SAE J620c May93		Bolt	Grade	Tightening Torque - a	
				Nm	in.lb
290	11½	M10	DIN 8.8	46	407
		SAE 3/8 – 16	SAE 8*	42	372
355	14	M12	DIN 8.8	79	699
		SAE ½ - 13	SAE 8*	102	903
460	18	M16	DIN 8.8	195	1726
		SAE 5/8 – 11	SAE 8 *	203	1797
530	21	M16	DIN 8.8	195	1726
		SAE 5/8 – 11	SAE 8 *	203	1797

* "Best Commercial"
♦ Based on lightly oiled bolts.
Tolerance ± 5%
♠ Anaerobic adhesives (eg Loctite - can be used)

As necessary, refit the rubber rollers to the coupling hub using advice as given above.
Complete the engine/gearbox connection by engaging both halves of the coupling again ensuring the ***arrows cast into both flange and hub are aligned*** (see sketch 2)



SKETCH 2 - ENSURE CORRECT ASSEMBLY ALIGNMENT WITH THE ARROWS.

Bolt the gearbox mounting flange to the engine flywheel housing using the gearbox manufacturers/ engine manufacturers instruction.

MANDATORY! Caution - Before you start the engine

Check there is axial play in each direction of the engine crankshaft to ensure the engine thrust bearings are not loaded. Check it is the same as before the coupling was fitted.

Propeller Shaft

Before any attempt to align the engine and gearbox to the propeller shaft, proper alignment of the propeller shaft must be determined. This includes alignment of the propeller shaft through all struts and intermediate bearings. Failure to properly align the propeller shaft may result in premature wear on bearings, vibrations, or possible damage to other components.

If the length of the shaft from the last support bearing to the gearbox is excessive or a flexible stuffing box is used, the shaft must be centered prior to engine and gearbox to propeller shaft alignment.

Transmission Controls

⚠ CAUTION

Transmission controls must be checked for proper function and alignment after any transmission selector valve is properly indexed in relation to the operator's control lever. Failure to do so could cause control system malfunction, resulting in personal injury and or damage to equipment and property.

See specific marine transmission installation drawings for detail and dimensional information needed for the proper installation of control linkages, power engaging devices, or electrical connections.

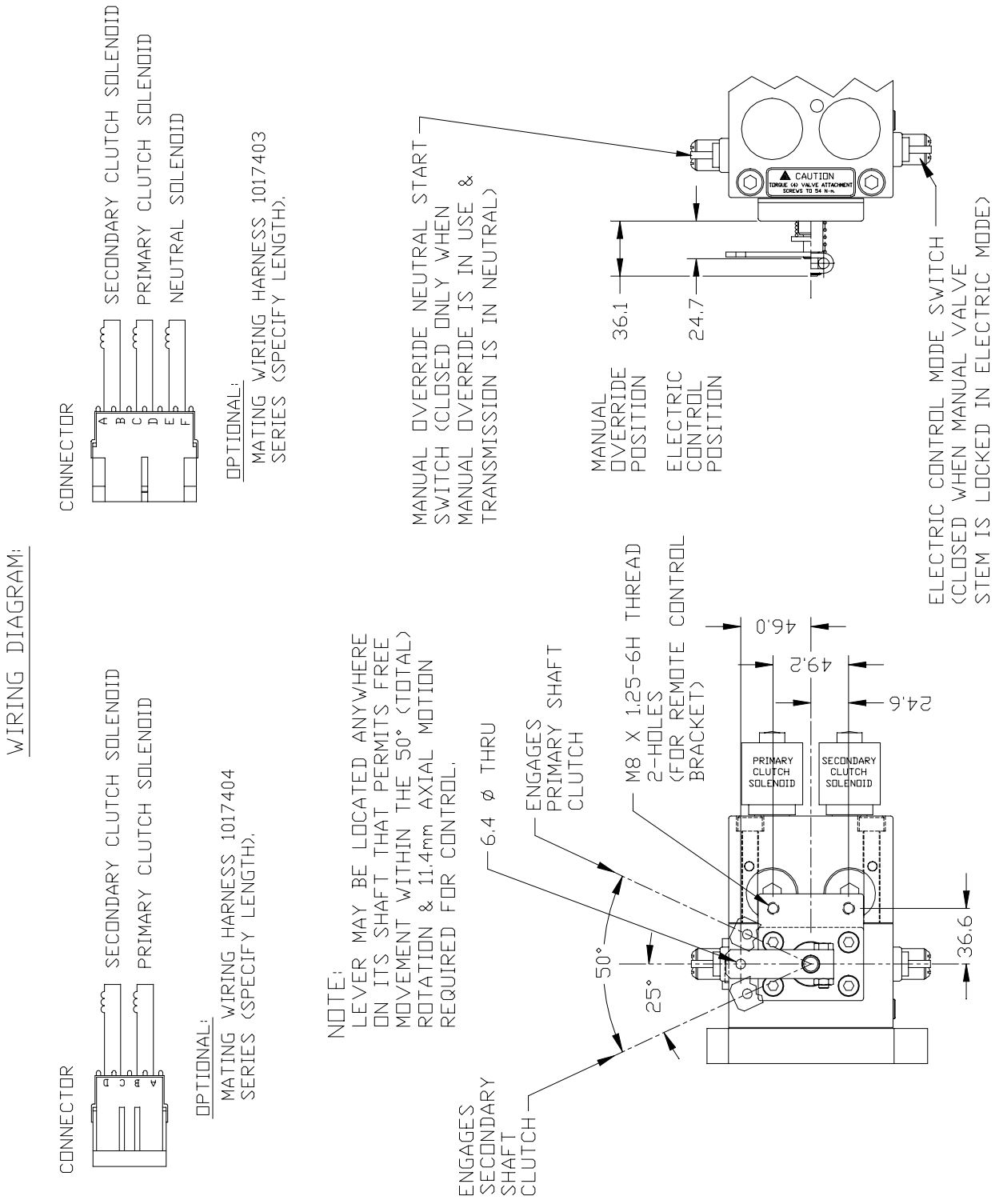


Figure 140. Electric Control Valve Installation Specifications

Mechanical Controls

Movement of the operator's selector lever to the forward, neutral or reverse position must result in the transmission control valve selector being positioned in the forward, neutral or reverse detent location. Cables and linkages must be supported properly and not have any excessive slack that will allow relative movement between the operators selector lever and the transmission control valve selector lever.

Power Controls

Selector valve positioning devices must be installed so that full travel of the actuating cylinder places the transmission selector valve in the detent position for forward or reverse, as selected, without exerting pressure on the rotational stop on the selector valve stem. Selecting neutral must place the selector valve in the neutral detent position. Improper installation of power engaging devices could cause failure of the selector valve stop permitting improper positioning of the selector valve and resulting in control malfunction.

Electrical Controls

All electrical wires and connectors must be adequately supported to prevent rubbing, chafing, or distress from relative movement. All electrical connections must be tight and free from any corrosion.

Final Checks

Be sure the transmission is filled with oil before starting. See Description and Specifications and Preventative Maintenance for proper oil and filling procedure.

Special Tools

List of Special Tools

The following pages include the special tool drawings that are specific to this model. The special tool drawings included are listed below and continued on the following page.

❑	SKF THAP300	Pump Set and Fluids
❑	T-18050-704	Spring Retainer Compressor (bellville spring units)
❑	T-18050-705	Bearing driver for pinion needle roller bearings
❑	T-18050-706	Input seal driver and protection sleeve
❑	T-18050-708	Bearing cup driver
❑	T-18050-711	Bearing cone driver (primary and secondary shafts)
❑	T-18050-712	Seal protector plug driver
❑	T-18050-713	Output seal driver
❑	T-18050-714	Shaft lifting fixture (output shaft)
❑	T-18050-715	Shaft lifting fixture (primary and secondary shafts)
❑	T-18050-723	Bearing cone and transfer gear driver (primary and secondary shafts)
❑	T-18050-771	Front output bearing cup driver
❑	T-19330	Spring retainer compressor (coil spring units)
❑	T-20023-3	Output gear installing fixture (sheet 1 of 3)
❑	T-20023-3	Output gear installing fixture (sheet 2 of 3)
❑	T-20023-3	Output gear installing fixture (sheet 3 of 3)

- ❑ T-21433 Output flange installing fixture (sheet 1 of 3)
- ❑ T-21433 Output flange installing fixture (sheet 2 of 3)
- ❑ T-21433 Output flange installing fixture (sheet 3 of 3)
- ❑ T-21506 Output shaft bearing driver (sheet 1 of 2 only)
- ❑ T-21528 Gear assembly rail
- ❑ T-21566-2 Output bearing driver
- ❑ T-21566-3 Output bearing cup driver
- ❑ T-506000 Lifting bracket for clutch removal in boat
- ❑ SPX Power Team RD1006 100 ton x 6.375 inch stroke double acting ram (no drawing)
- ❑ SPX Power Team PE554T electric over hydraulic pump (no drawing)
- ❑ Two SPX #9764 hoses (no drawing)
- ❑ Two SPX #9795 couplers (no drawing)

Recommended Pump Set and Fluids

Twin Disc recommends the following products for use in the assembly and removal of tapered shafts using the oil injection method:

THAP 300 Air-Driven Pump Set

This set consists of the air-driven pump with accessories, such as an adapter block, pressure gauge, high pressure pipe, or pressure hose with quick connection couplings and connection nipples. The set includes one of each: air-driven pump [THAP 300], adapter block [226402], pressure gauge [1077589] and high pressure pipe (2m/6.5 ft.) [227957A].

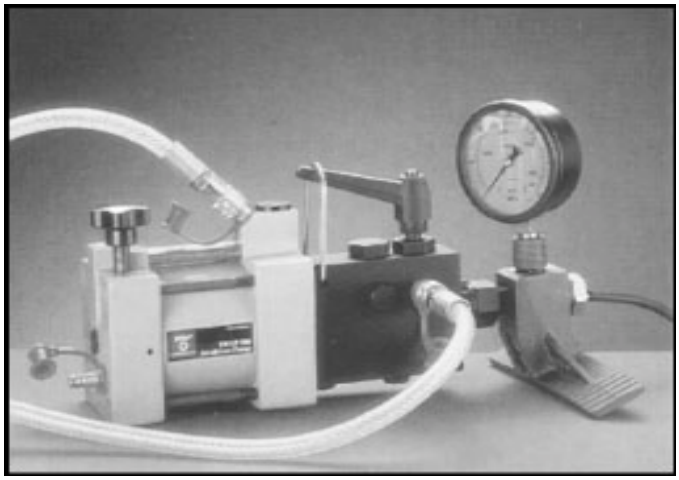


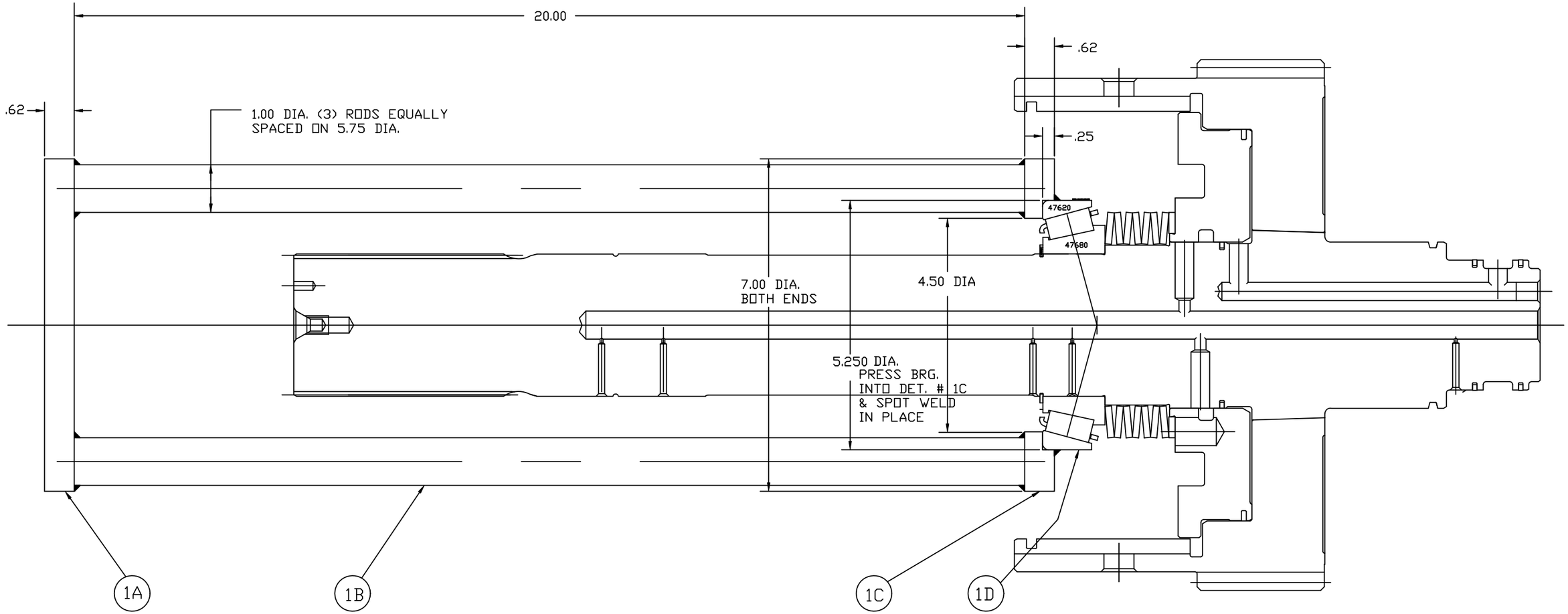
Figure 141. THAP 300 Air-driven Pump Set

Mounting Fluid LHMF 300 and Dismounting Fluid LHDF 900

SKF LHMF 300 and LHDF 900 are recommended when using SKF hydraulic equipment like hydraulic pumps, HMV nuts, oil injection equipment, etc. The fluids contain anticorrosives and are non-aggressive to seal material like nitrile rubber, Buna N (Perbunan), chrome, leather, PTFE, etc. SKF LHMF 300 and LHDF 900 are available in 5 liter (5.3 qt.) cans. Designation: LHMF 300/5 and LHDF 900/6.

Figure 142. SKF LHMF 300 and LHDF 900

Note: Order Through Your Local Authorized SKF Distributor



1

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
1D	1	STK.	BEARING CUP USE	BRG. CUP MA 590 B
1C	1	T.S.	BASE	7.25 DIA. x .62 THK.
1B	3		ROD	1.00 DIA. x 20.50
1A	1	T.S.	CAP	7.25 DIA. x .62 THK.
1	1		WELDMENT	

Date: | By: JPL | F.P.N.: | Scale: FULL

NAME: SPRING HOLD-DOWN RETAINER

FOR: MG 5301 | SHEET 2 OF 2

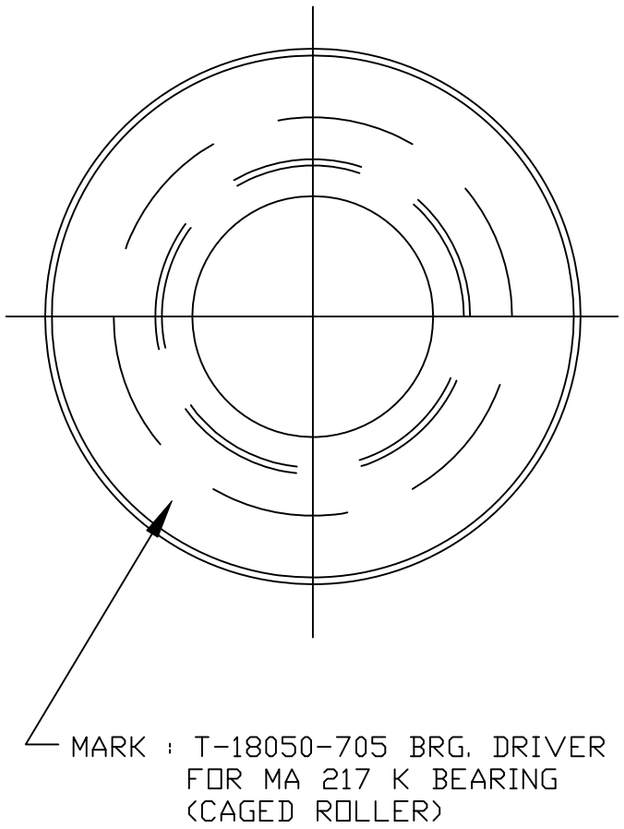
TWIN DISC INC. RACINE, WIS. | T-18050-704

CHANGE	DESCRIPTION	DATE	BY

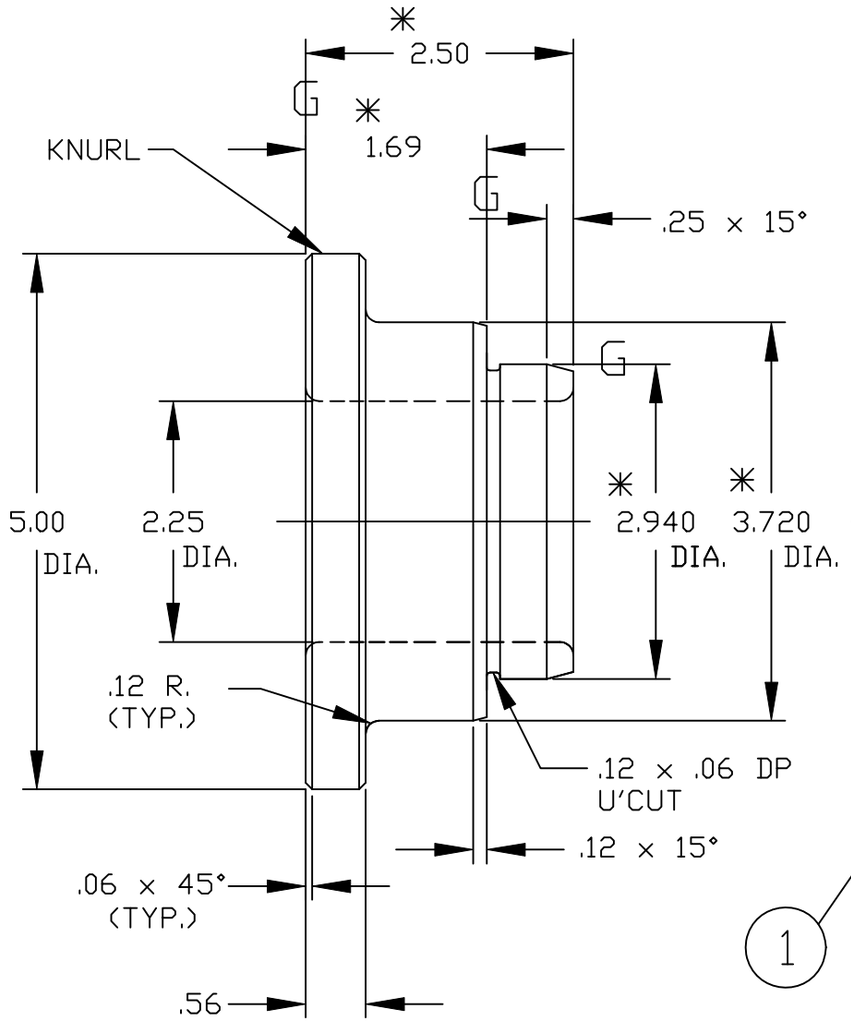
STAMP TOOL NO: T-18050-704
PART NO: MG 5301
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.005 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

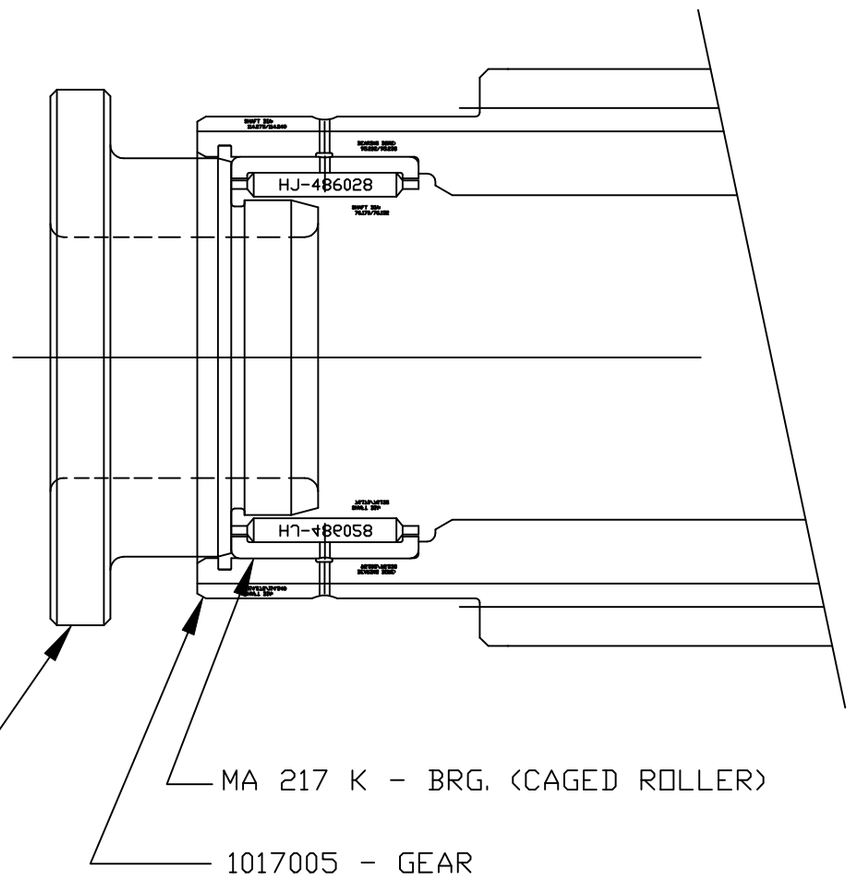
CAD FILE : T-18050-704.dwg

NOTE : UNLESS OTHERWISE SPECIFIED, BREAK ALL SHARP CORNERS



MARK : T-18050-705 BRG. DRIVER
FOR MA 217 K BEARING
(CAGED ROLLER)





(1) BEARING DRIVER (1) REQ'D.
MAT. : M.S. (CARB. HDN.)

✳

NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

NOTE : GROUND SURFACES MUST BE PARALLEL
WITHIN .0005 OF EACH OTHER

(C & H)

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
1	1	M.S.	BEARING DRIVER 5.12 DIA. x 2.75 THK.	

Date: 11-16-96 | By: JPL | F.P.N.: | Scale: FULL

NAME BEARING DRIVER (CAGED ROLLER)

FOR MG 4406
MA 217 K - BRG.

SHEET 1 OF 1

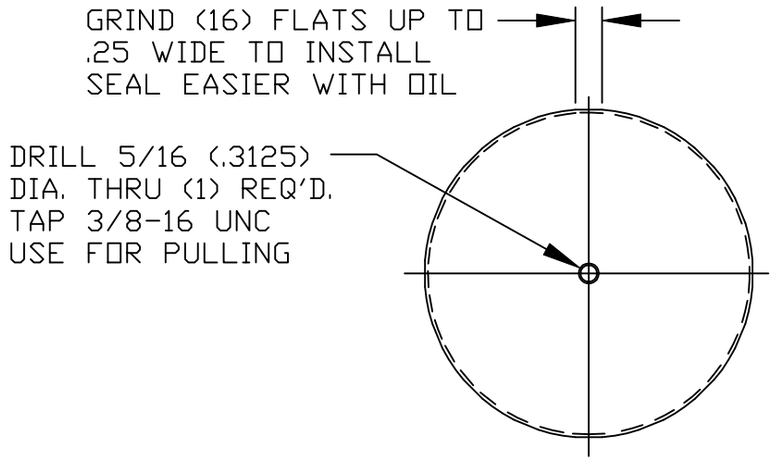
T-18050-705

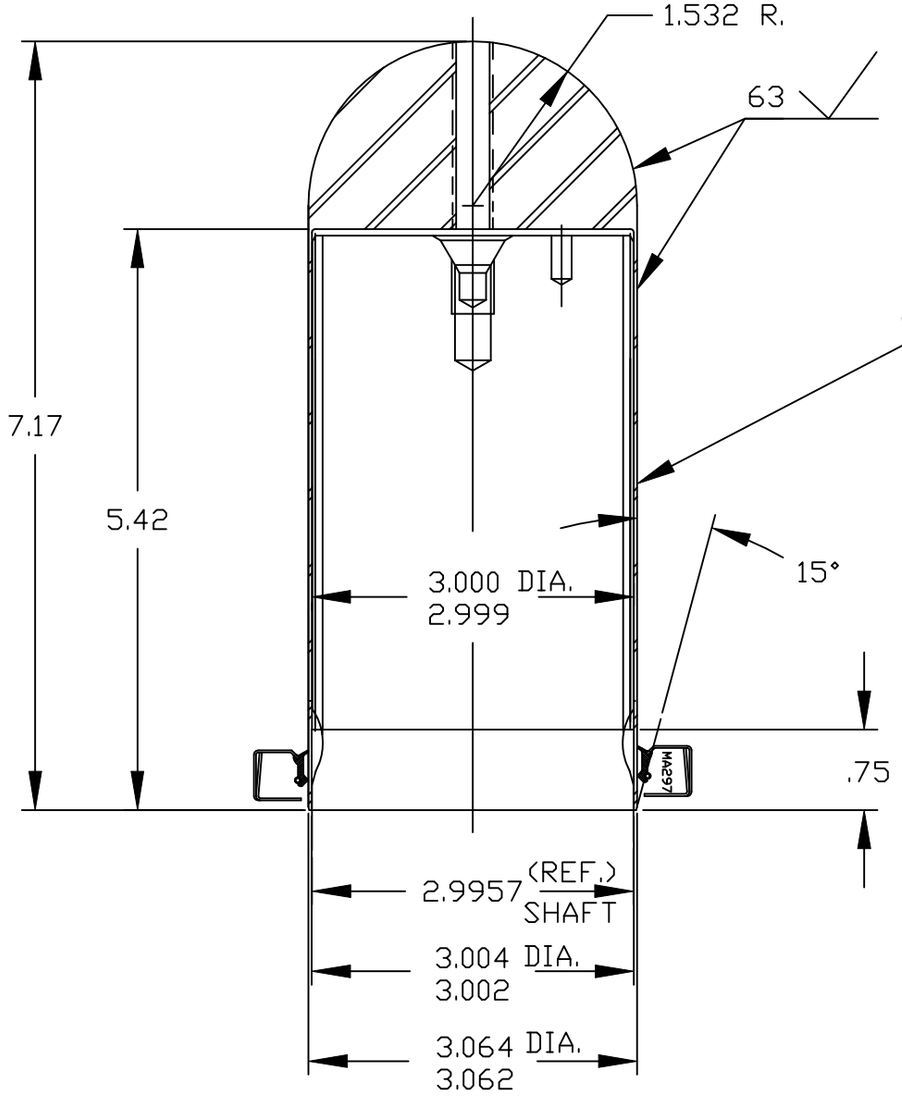
TWIN DISC INC. RACINE, WIS.

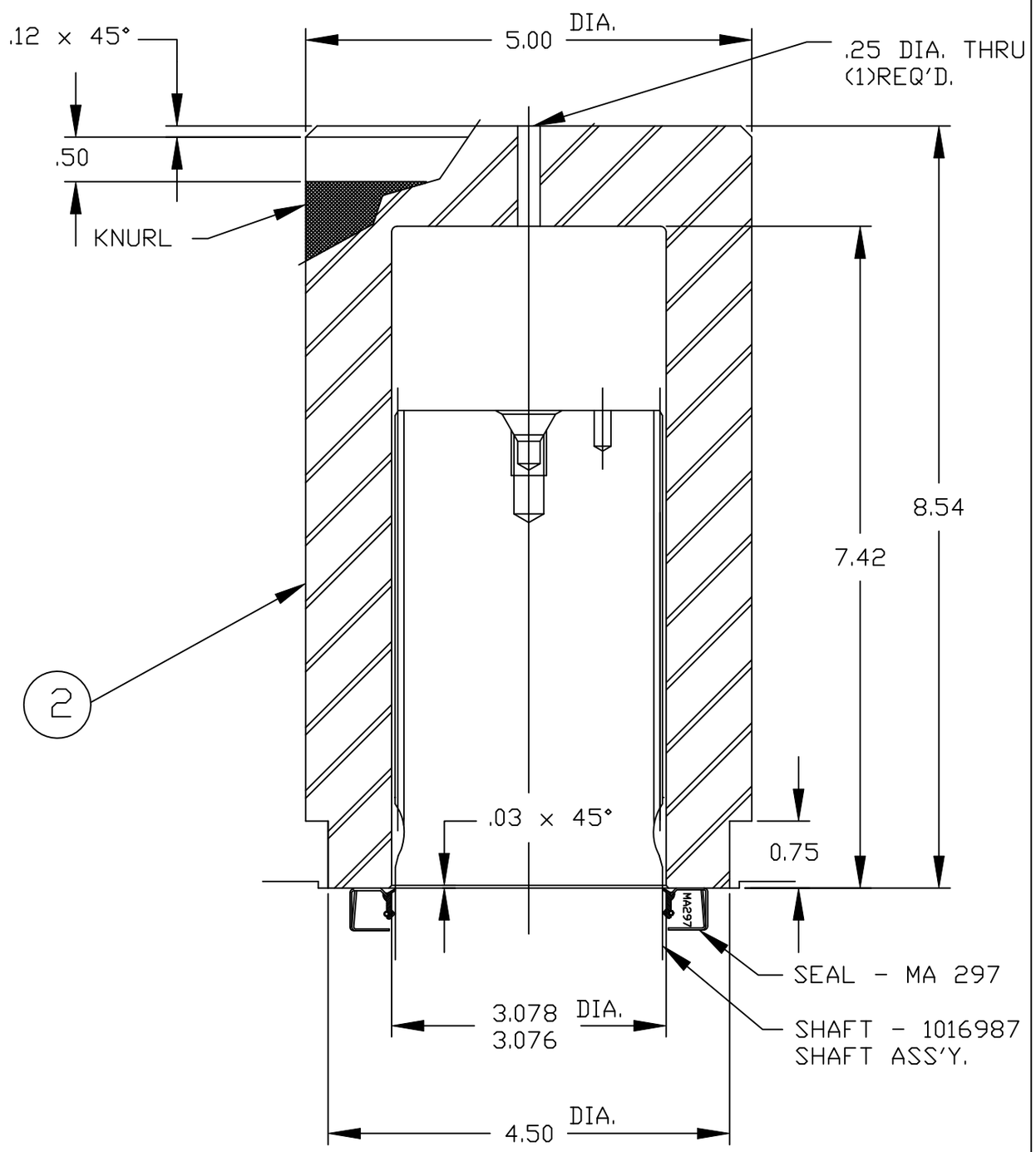
CHANGE	DESCRIPTION	DATE	BY

STAMP TOOL NO. T-18050-705
PART NO. MG 4406
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : T-18050-705.dwg







DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
2	1	T.S.	SLEEVE	3.25 DIA. x 7.50 LG.
1	1	NYL.	DRIVER	5.00 DIA. x 9.00 LG.

Date: 11-18-96 By: JPL F.P.N.: Scale: FULL

NAME SEAL DRIVER & SLEEVE

FOR MG 4406
MA 297 SEAL

SHEET 1 OF 1

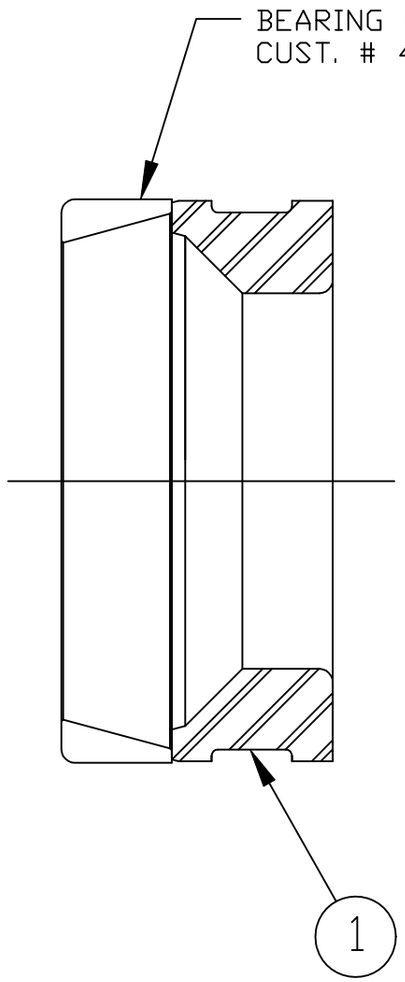
T-18050-706

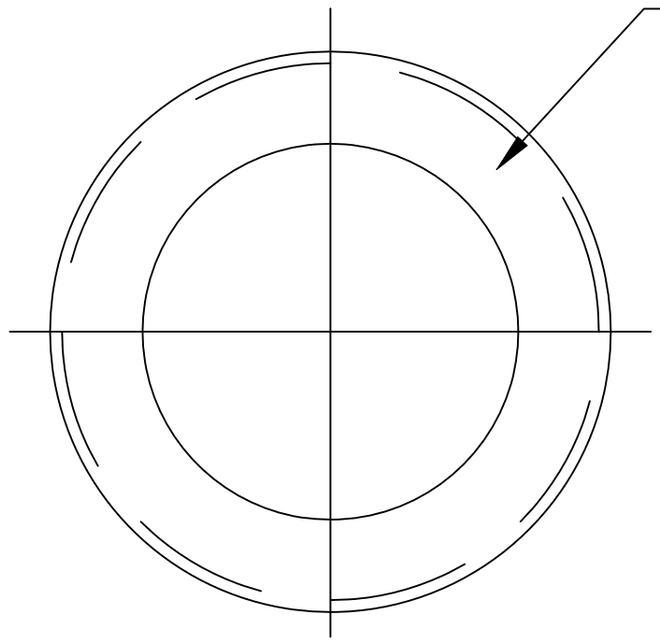
TWIN DISC INC. RACINE, WIS.

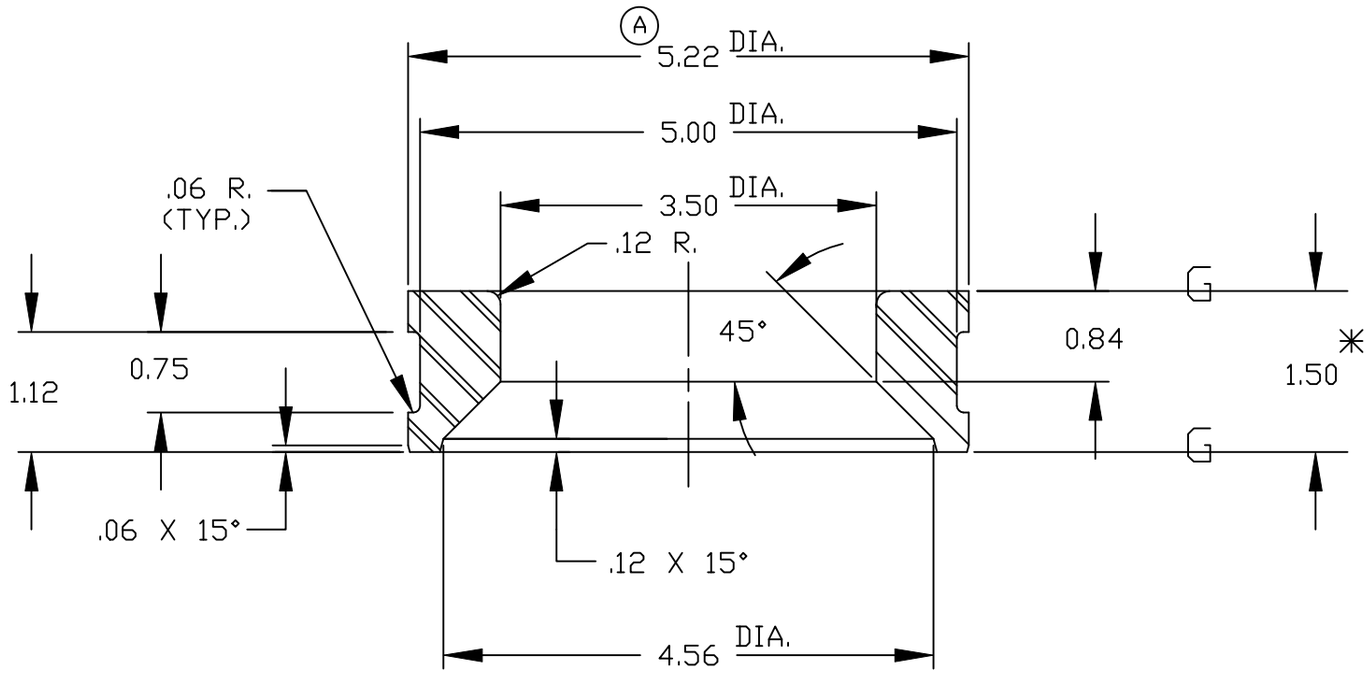
CHANGE	DESCRIPTION	DATE	BY

STAMP TOOL NO: T-18050-706
PART NO: MG 4406
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : T-18050-706.dwg







1 BEARING DRIVER (1) REQ'D.
MAT. : M.S. (C x H)

✳

NOTE : GROUND SURFACES MUST BE PARALLEL WITHIN .0005 OF EACH OTHER

NOTE : UNLESS OTHERWISE SPECIFIED, BREAK ALL SHARP CORNERS

STAMP TOOL NO: T-18050-708
PART NO: MG 4406
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : T-18050-708.dwg

CHANGE	DESCRIPTION	DATE	BY
A	WAS 5.50	9-30-97	JPL

(C x H)

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
1	1	M.S.	BEARING DRIVER	5.25 DIA. x 1.62 THK.

Date: 11-20-96 | By: JPL | F.P.N.: | Scale: FULL

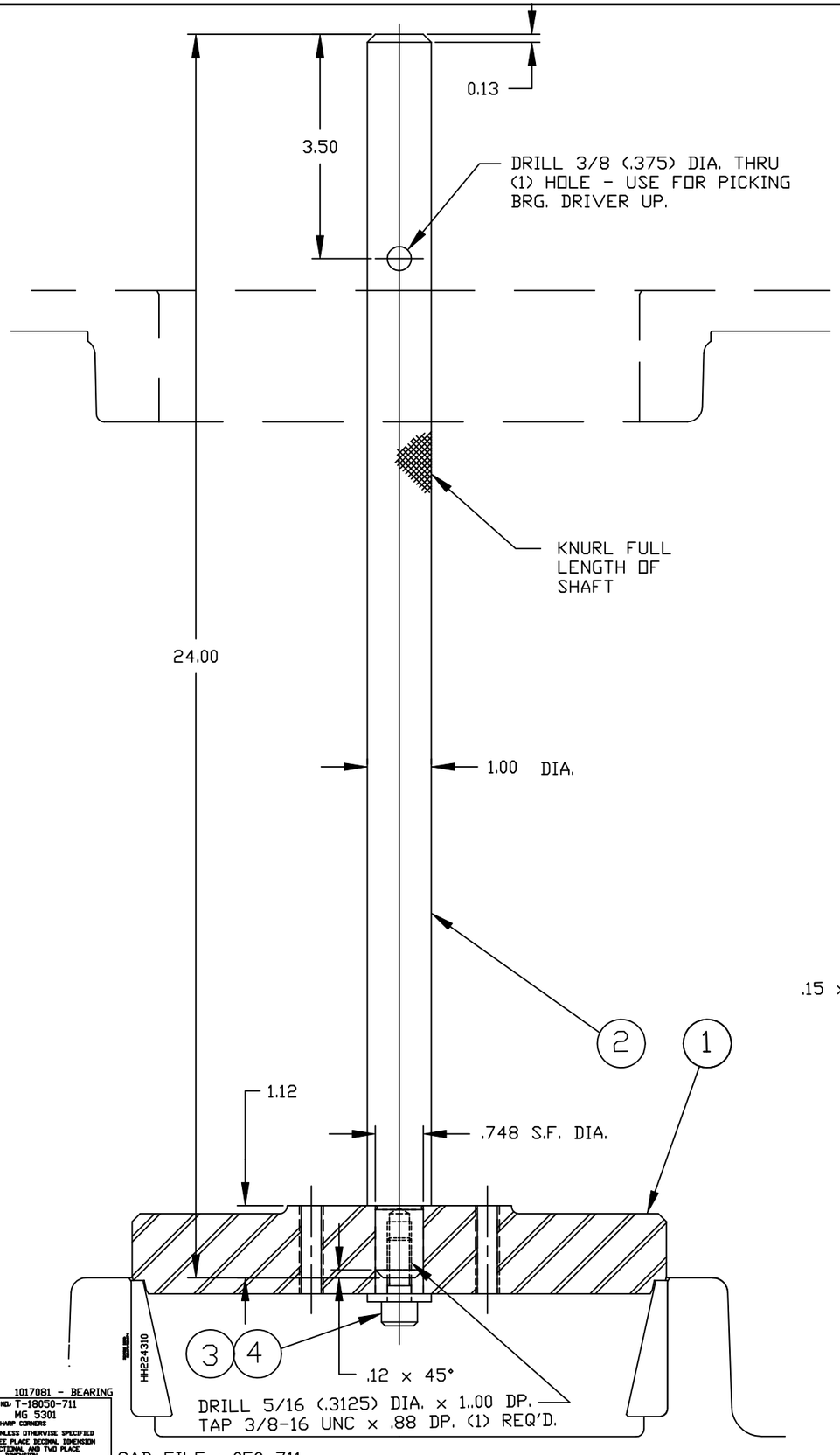
NAME BEARING DRIVER FOR CONE

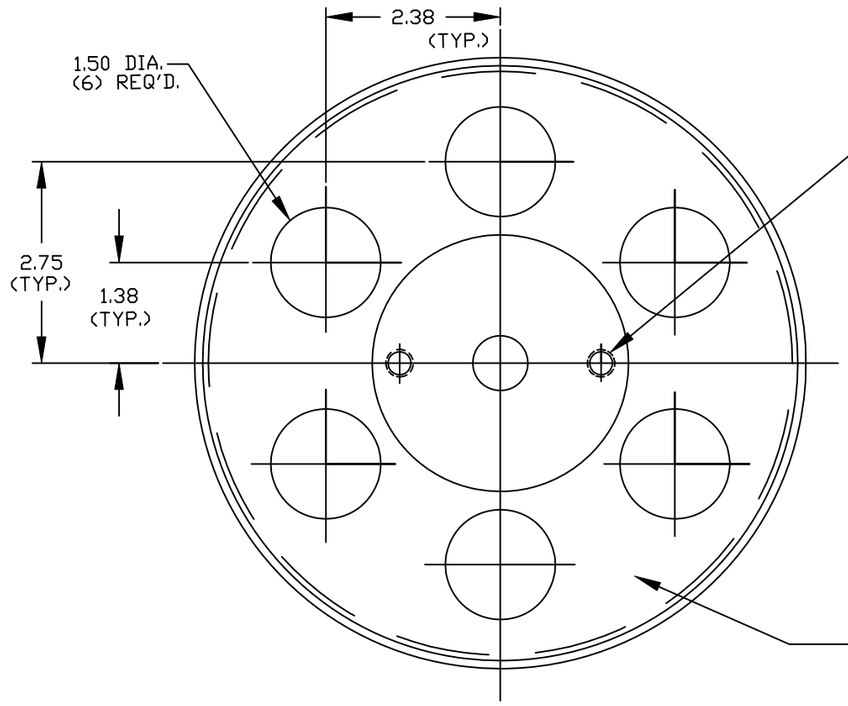
MG 4406 1017005 - PINION
HH224346 - BRG. CONE

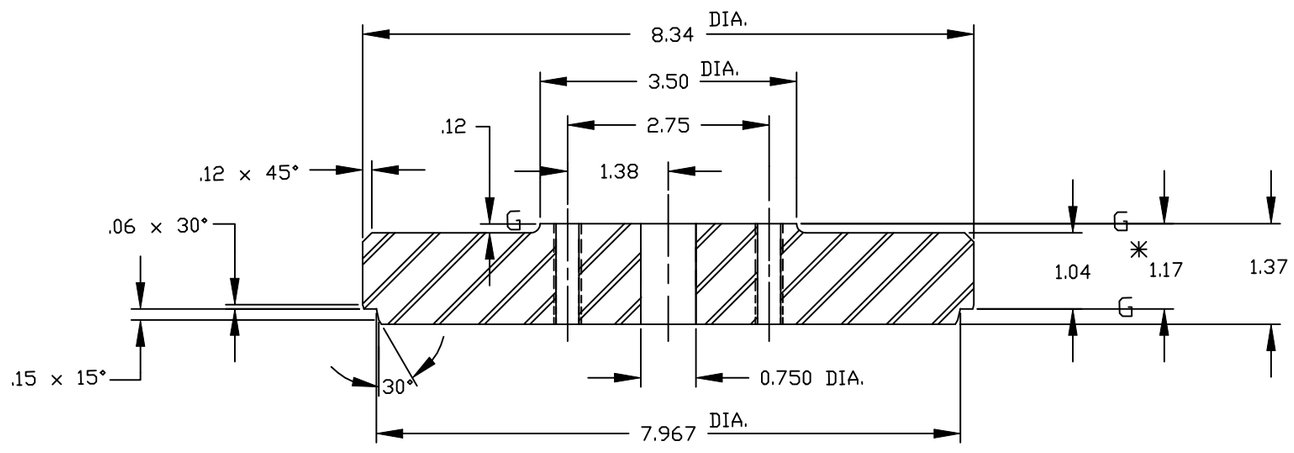
SHEET 1 OF 1

T-18050-708

TWIN DISC INC. RACINE, WIS.







(1) BEARING DRIVER (1) REQ'D.
MAT. : (CARB. & HDN.)

* NOTE : GROUND SURFACES MUST BE PARALLEL WITHIN .0005 OF EACH OTHER

NOTE : UNLESS OTHERWISE SPECIFIED, BREAK ALL SHARP CORNERS

CANCELLED (CARB. & HDN.)
9-24-97

CHANGE	DESCRIPTION	DATE	BY

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
4	1	PUR.	JERGENS' WASHER # 32004	
3	1	STK.	SOC. HD. CAP SCREW	3/8-16 x 1.0 LG.
2	1	ROD	HANDLE	1.00 DIA. x 24.25 LG.
1	1	M.S.	BEARING DRIVER	8.75 DIA. x 1.38 THK.

Date: 12-3-96 By: JPL F.P.N.: Scale: FULL

NAME BEARING DRIVER FOR CUP

FOR MG 5301
1017081 - BRG.

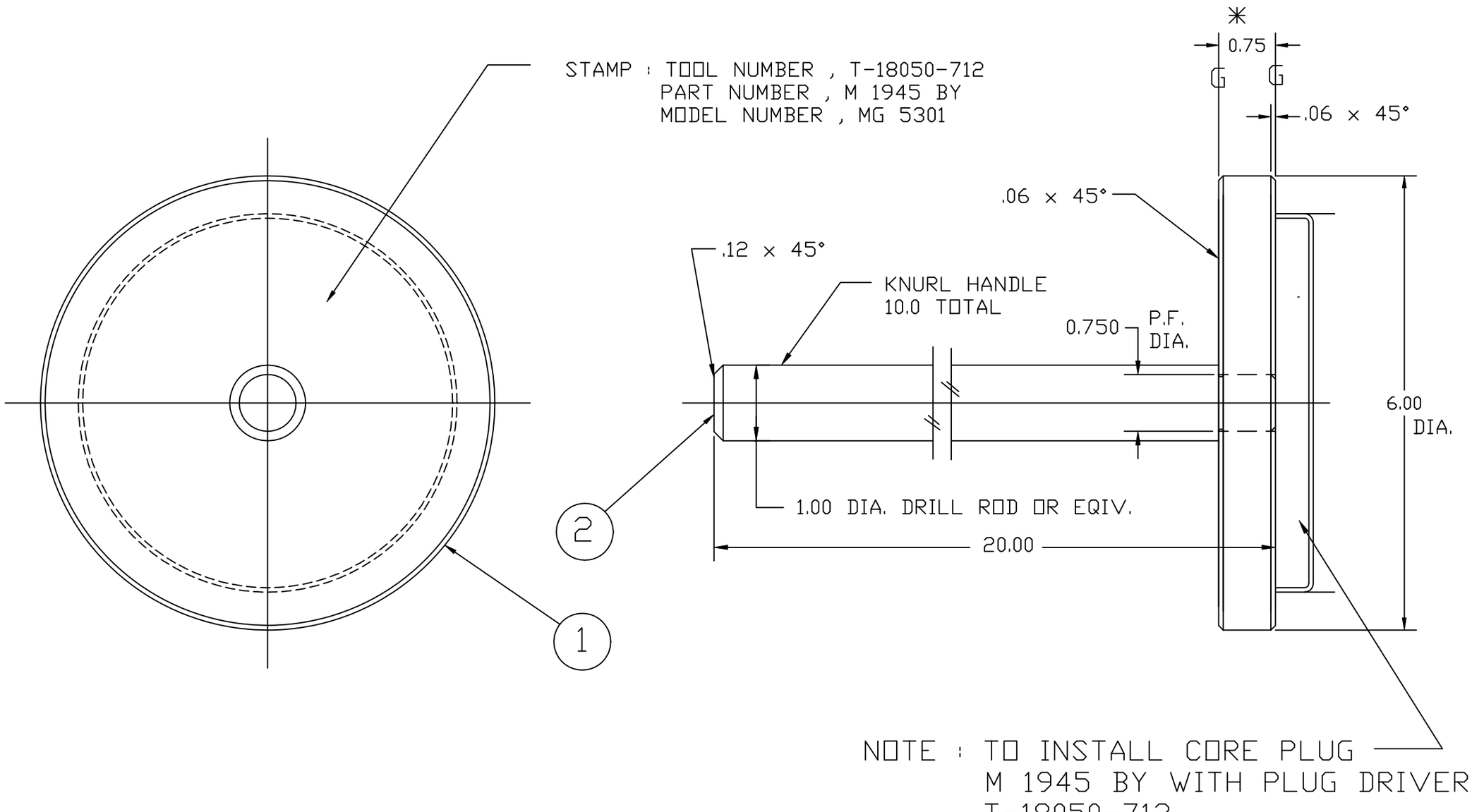
SHEET 1 OF 1

T-18050-711

TWIN DISC INC. RACINE, WIS.

1017081 - BEARING
STAMP TOOL NO: T-18050-711
PART NO: MG 5301
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 050-711



NOTE : TO INSTALL CORE PLUG
M 1945 BY WITH PLUG DRIVER
T-18050-712

*

NOTE : GROUND SURFACES MUST BE PARALLEL
WITHIN .005 OF EACH OTHER

NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
2	1	ROD	HANDLE	1.00 DIA. x 20.25 LG.
1	1	M.S.	PLATE (CARB. & HDN.)	6.25 DIA. x .75 THK.

Date: 12-3-96 | By: JPL | F.P.N.: | Scale: FULL

NAME PLUG DRIVER

FOR MG 5301 CORE PLUG - M 1945BY

SHEET 1 OF 1

TWIN DISC INC. RACINE, WIS.

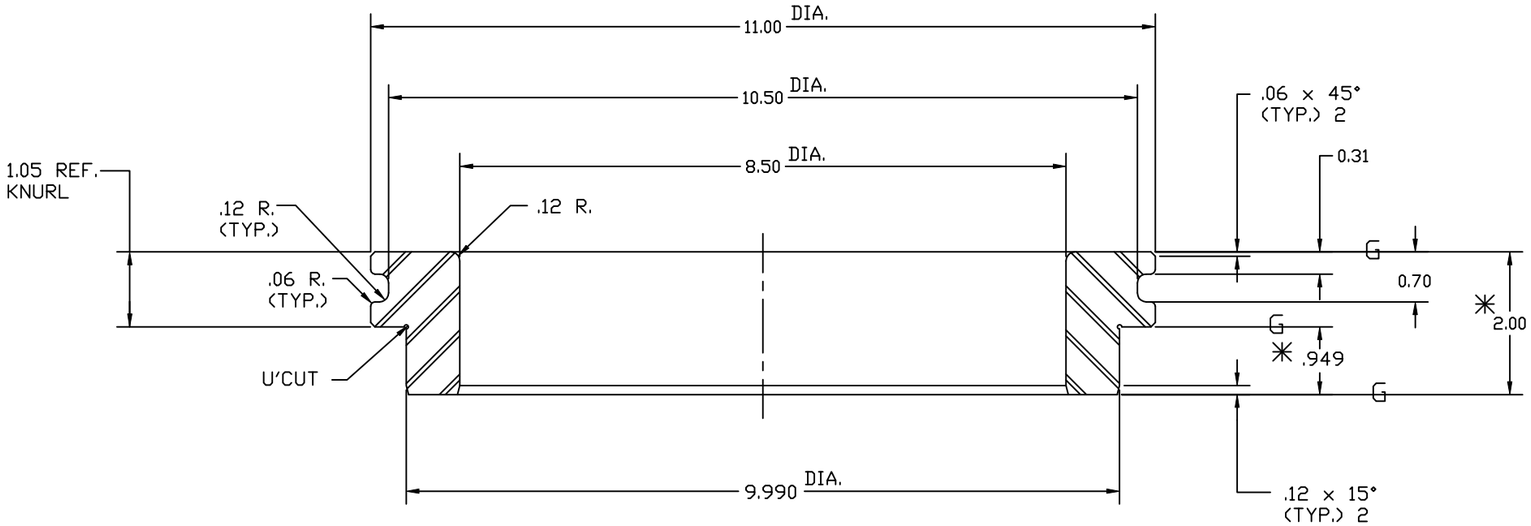
T-18050-712

CHANGE	DESCRIPTION	DATE	BY

CORE PLUG - M 1945 BY

STAMP TOOL NO: T-18050-712
PART NO: MG 5301
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : T-18050-712.dwg

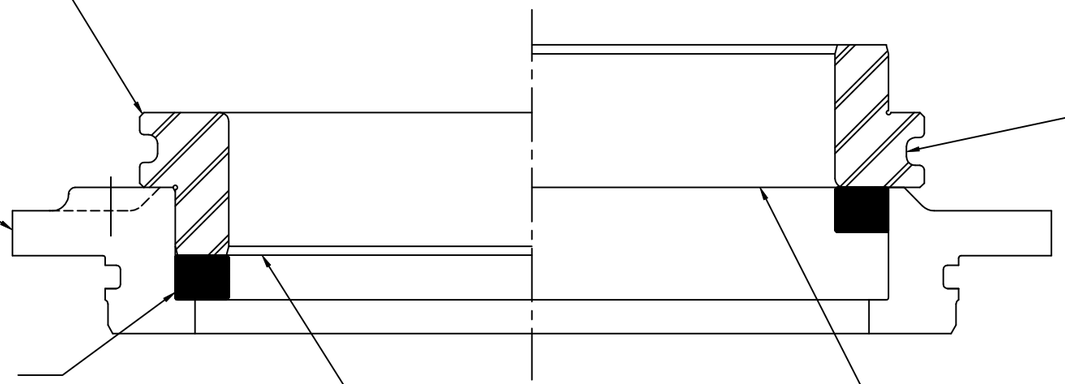


1 SEAL DRIVER (1) REQ'D.
(DOUBLE DUTY DRIVER)
MAT. : M.S. (CARB. & HDN.)

NOTE : PRESS SEAL INTO CARRIER WITH SEAL DRIVER FLANGE DOWN. INSERT THIS SEAL FIRST AS SHOWN

1017019 - CARRIER

1017085 - OIL SEAL (2) REQUIRED AS SHOWN



STAMP : TOOL NUMBER - T-18050-713
CARRIER NUMBER - 107019
SEAL NUMBER - 1017085
MODEL NUMBER - MG 5301

1 FLANGE DOWN PRESS IN FIRST SEAL

1 FLANGE UP PRESS IN SECOND SEAL

NOTE : UNLESS OTHERWISE SPECIFIED, BREAK ALL SHARP CORNERS

✳ NOTE : GROUND SURFACES MUST BE PARALLEL WITHIN .005 OF EACH OTHER

1017085 - OIL SEAL
1017019 - CARRIER

STAMP TOOL NO: T-18050-713
PART NO: MG 5301
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 050-713

(CARB. & HDN.)

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
1	1	M.S.	DRIVER	11.25 DIA. x 1.50 WALL x 2.12 THK.

Date: 12-4-96 By: JPL F.P.N.: Scale: FULL

NAME SEAL DRIVER

FOR MG 5301

SHEET 1 OF

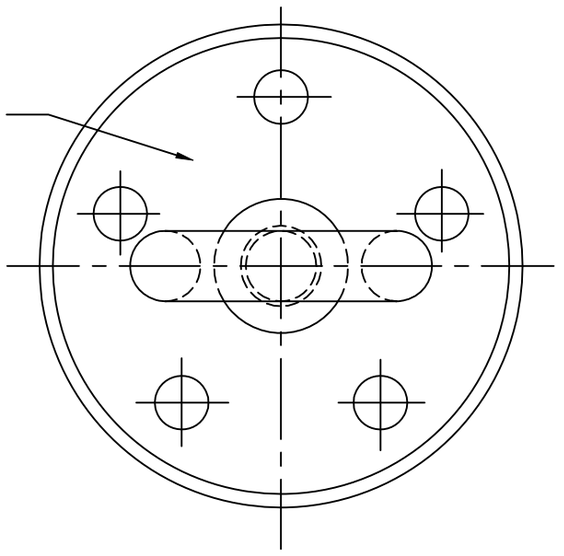
TWIN DISC INC. RACINE, WIS.

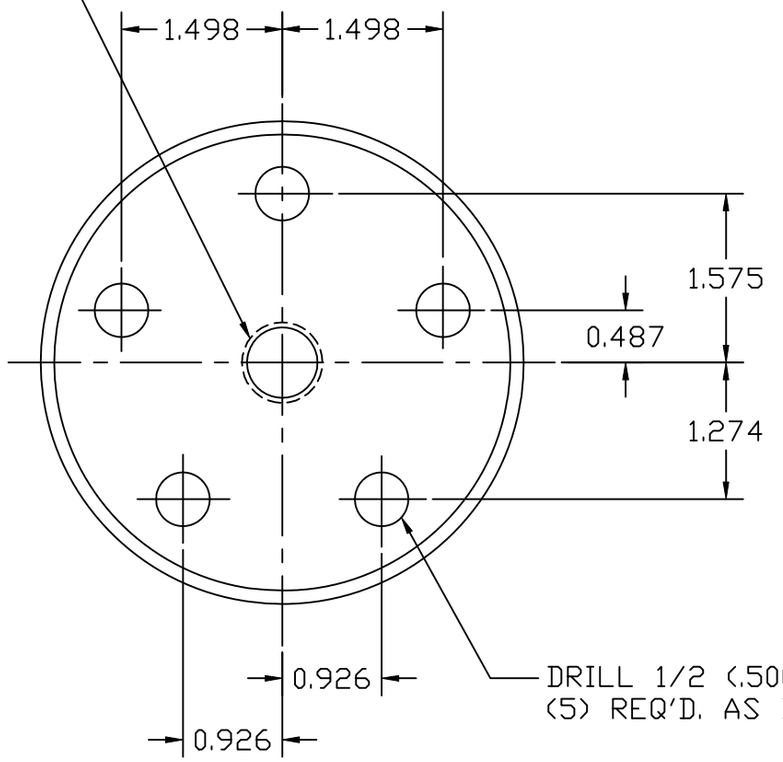
T-18050-713

CHANGE	DESCRIPTION	DATE	BY

DRILL 21/32 (.6563) DIA. THRU
TAP 3/4-10 UNC (1) REQ'D.

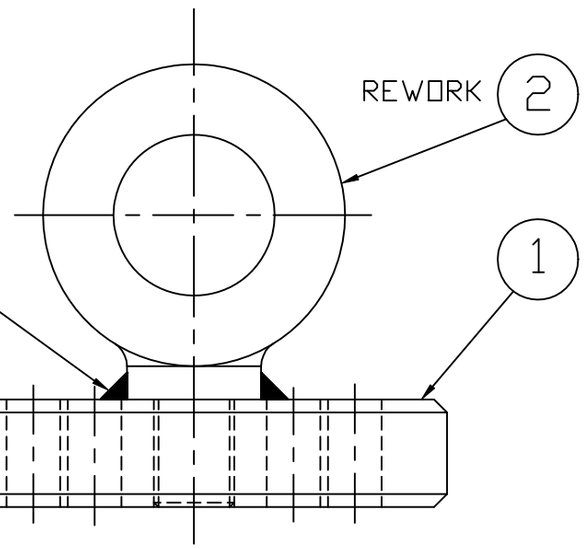
STAMP : TOOL NUMBER - T-1805-714
SHAFT NUMBER - 1017000
MODEL NUMBER - MG 5301

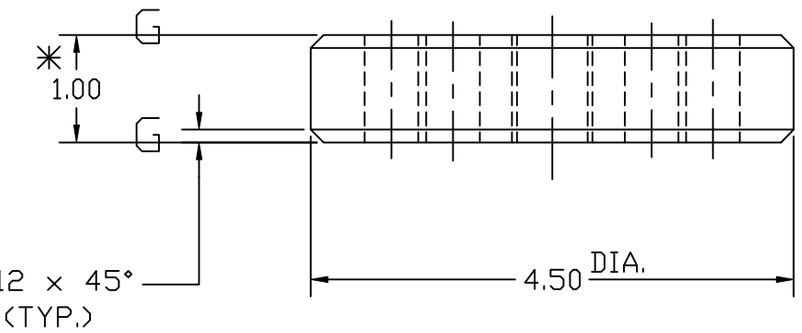




DRILL 1/2 (.500) DIA. THRU
(5) REQ'D. AS DIMENSIONED

NOTE : SPOT-WELD & LOCATE
SHLD'ER. EYE BOLT
AS SHOWN





NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

✳
NOTE : GROUND SURFACES MUST BE PARALLEL
WITHIN .005 OF EACH OTHER

1 PICK-UP PLATE (1) REQ'D.
MAT. : M.S. (CARB. & HDN.)

REWORK JERGENS' # 18506 OR EQUIV.
(CARB. & HDN.)

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
2	1	PUR.	JERGENS' SHD'ER. EYE BOLT	3/4-10 UNC
1	1	M.S.	PICK-UP PLATE	4.75 DIA. x 1.00 THK.

Date: 12-5-96 | By: JPL | F.P.N.: | Scale: FULL

NAME SHAFT PICK-UP FIXTURE

FOR MG 5301
1017000 - SHAFT

SHEET 1 OF 1

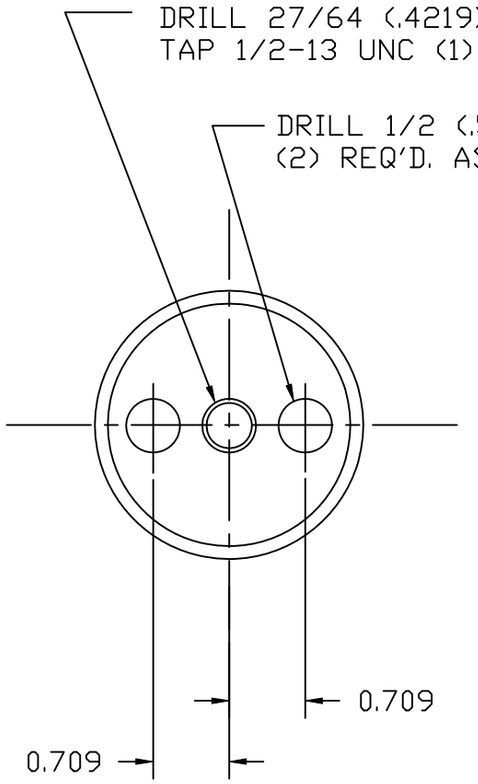
T-18050-714

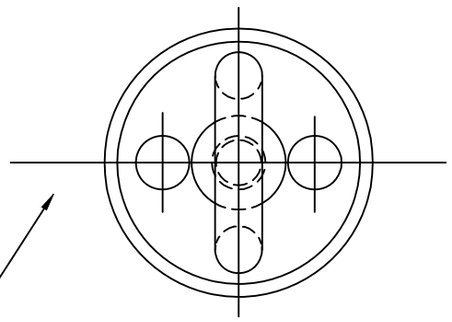
TWIN DISC INC. RACINE, WIS.

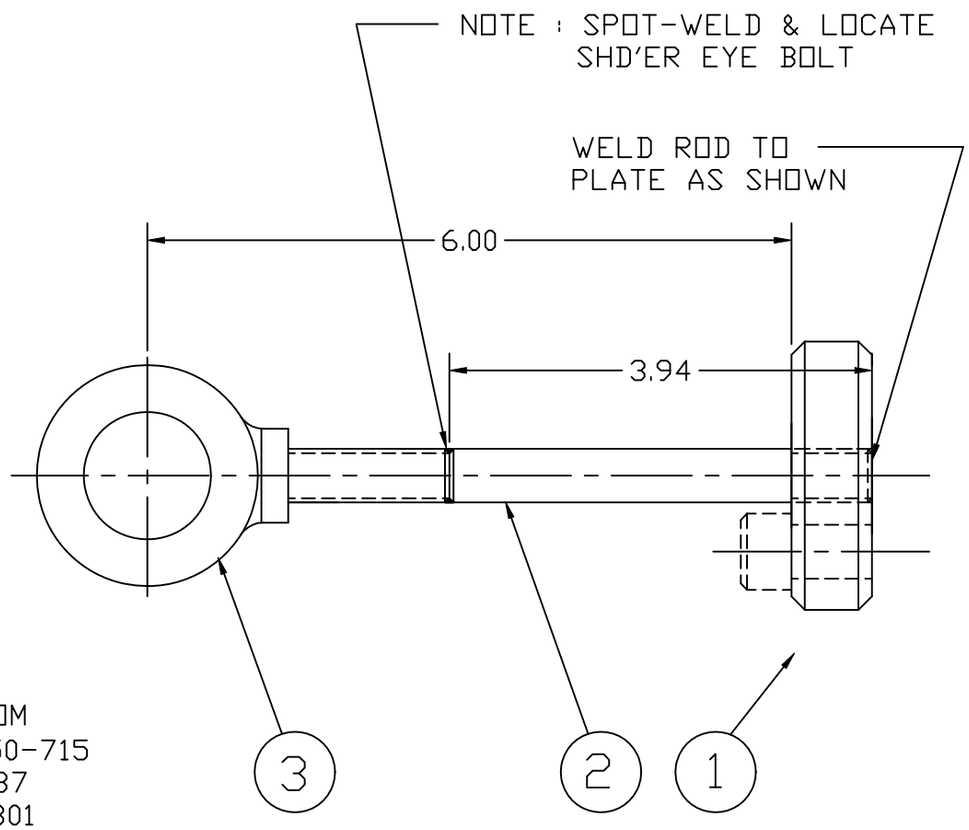
CHANGE	DESCRIPTION	DATE	BY

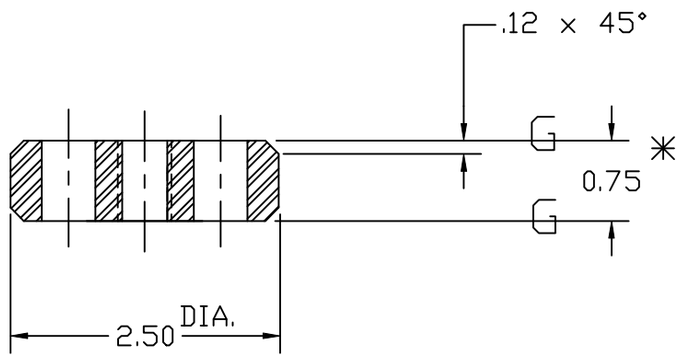
STAMP TOOL NO: T-18050-714
PART NO: MG 5301
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 050-714









(1) CLUTCH PICK-UP PLATE (1) REQ'D.
MAT. : M.S. (CARB. & HDN.)

NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

✳

NOTE : GROUND SURFACES MUST BEPARALLEL
WITHIN .005 OF EACH OTHER

JERGENS' # 18504 OR EQUIV.

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
3	1	PUR.	SHLD'ER EYE BOLT	1/2-13 UNC
2	1	D.R.	EXTENSION	.50 DIA. x 4.25 LG.
1	1	M.S.	PICK-UP PLATE	3.62 DIA. x .88 THK.

Date: 12-5-96 | By: JPL | F.P.N.: | Scale: FULL

NAME CLUTCH PICK-UP FIXTURE

FOR MG-5301
1016987 - SHAFT

SHEET 1 OF 1

T-18050-715

TWIN DISC INC. RACINE, WIS.

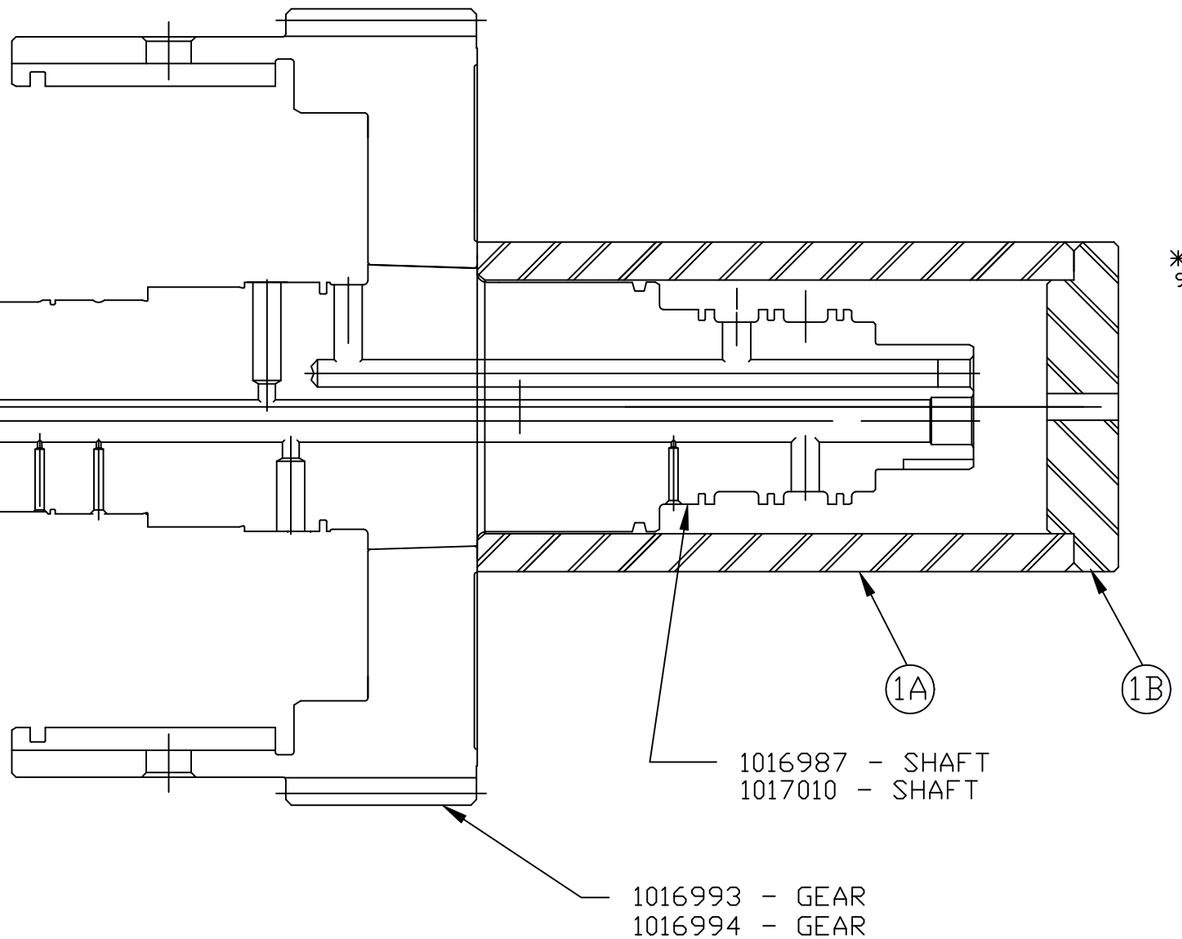
CHANGE	DESCRIPTION	DATE	BY
A	OD 3.5" MOD TO 2.5" DET1	6NOV01	RMTR

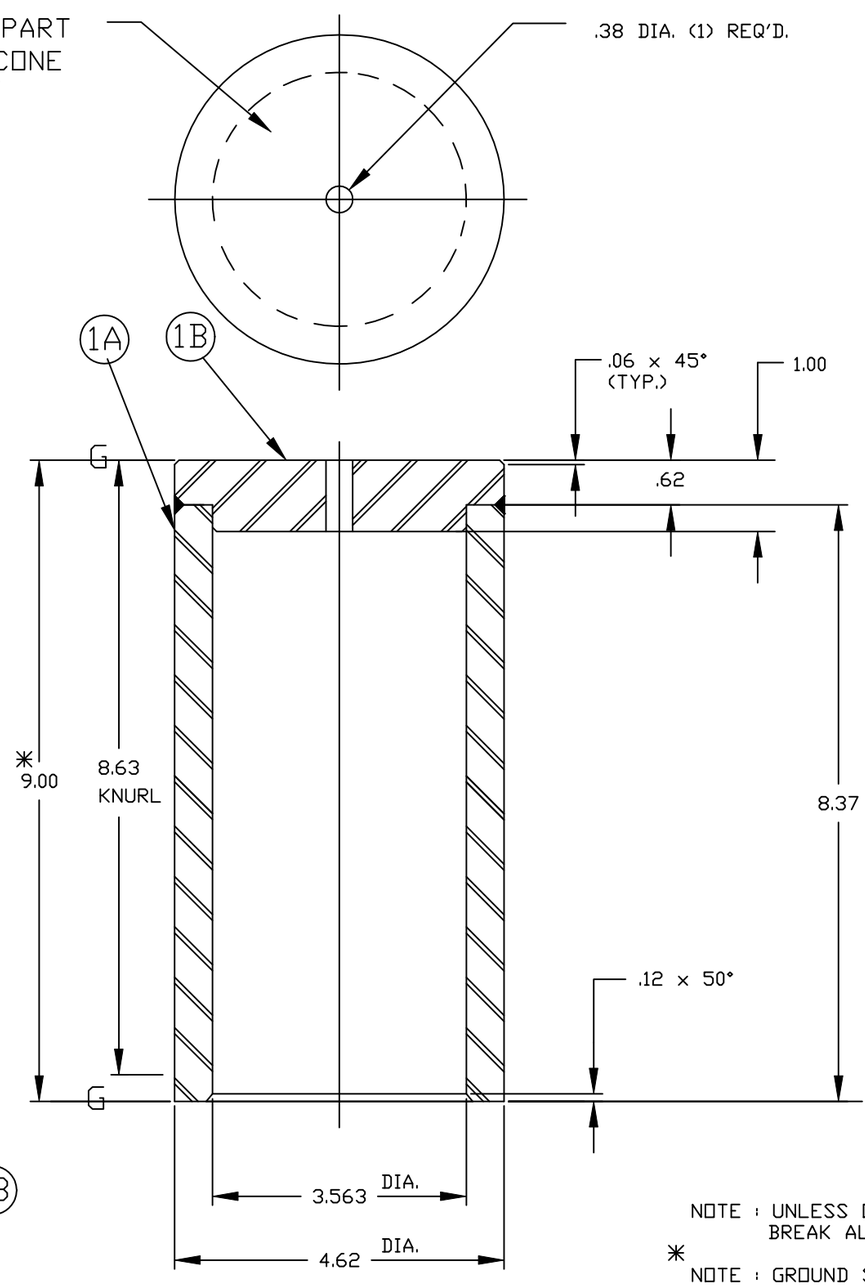
1016987 - CLUTCH SHAFT

STAMP TOOL NO: T-18050-715
PART NO: MG 5301
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : T-18050-715.dwg

MARK : T-18050-723 FOR PART
MA 628 BEARING CONE
TO SHAFT 1016987





NOTE : UNLESS OTHERWISE SPECIFIED, BREAK ALL SHARP CORNERS

✳ NOTE : GROUND SURFACES MUST BE PARALLEL WITHIN .0005 OF EACH OTHER

(1) WELDMENT (1) REQ'D. SEE DETS. FOR MAT. & HEAT TREAT

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
(CARB. & HDN.)	1B	1	M.S.	CAP 4.75 DIA. x 1.00 THK.
(CARB. & HDN.)	1A	1	STEEL TUBE	BODY 4.75 O.D. x .62 WALL x 8.50 LG.
	1	1		WELDMENT

Date: 2-15-97 By: JPL F.P.N.: Scale: FULL

NAME BEARING CONE DRIVER

FOR MG 5301 1016993 1016987,1017010,1016994

SHEET 1 OF 1

TWIN DISC INC. RACINE, WIS.

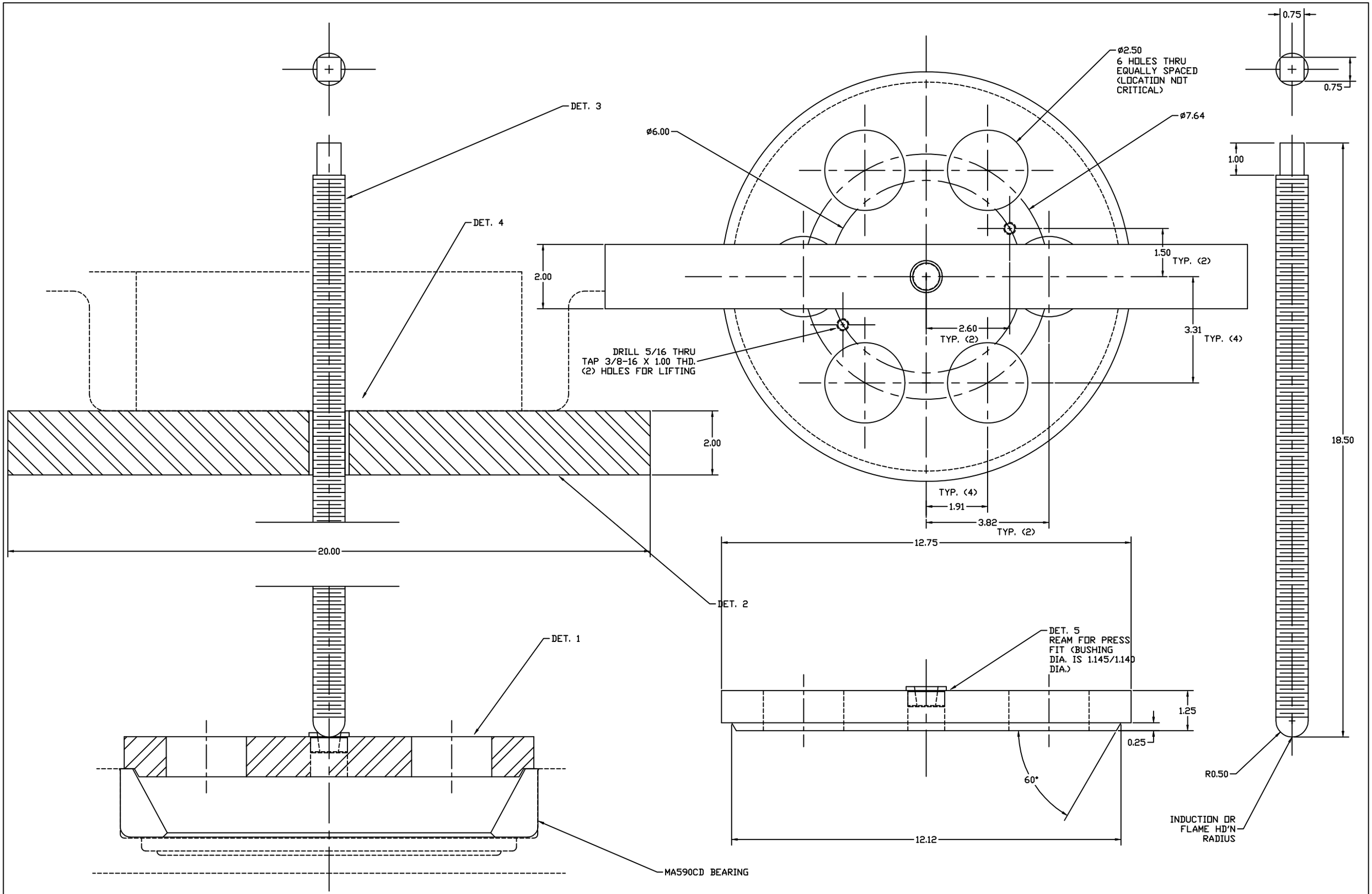
T-18050-723

CHANGE	DESCRIPTION	DATE	BY
	WAS T-18050-719		

1016987 - SHAFT

STAMP TOOL NO: T-18050-723
PART NO: MG 5301
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.XX IN THREE PLACE DECIMAL DIMENSION
.XX IN FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 IN ANGULAR DIMENSION

CAD FILE : 050-723



5	1	PUR.	TECO #54973 TAPER INDEX BUSHING
4	1	PUR.	1-8 STEEL THREADED INSERT
3	1	PUR.	1-8 DRILL ROD X 18-3/4 LGTH
2	1	ALUM.	BLOCK 2 X 2 X 20
1	1	ALUM.	BASE 13 DIA. X 1-1/2

DET.	REQ	MAT.	DESCRIPTION	STOCK SIZE

Date: 8/30/99 | By: GDL | F.P.N.: | Scale: FULL

NAME: BEARING DRIVER FOR CUP

FOR: MG-5301

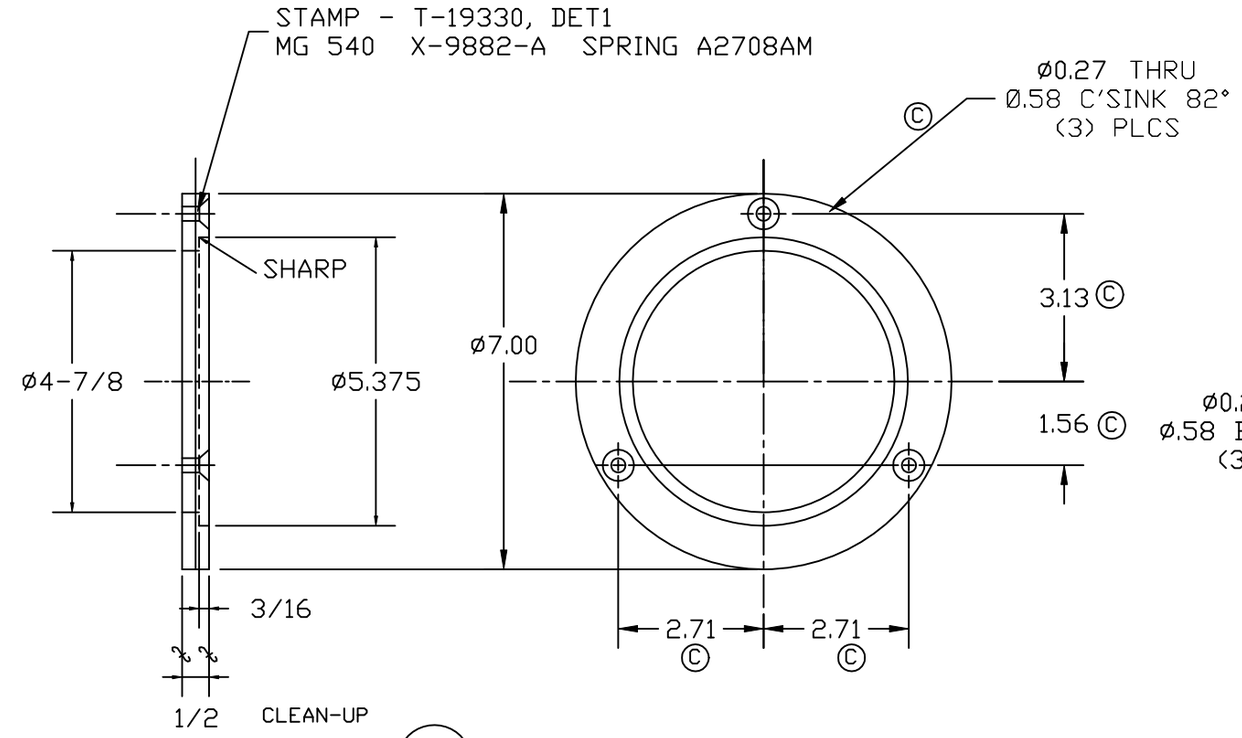
SHEET 1 OF 1

T-18050-771

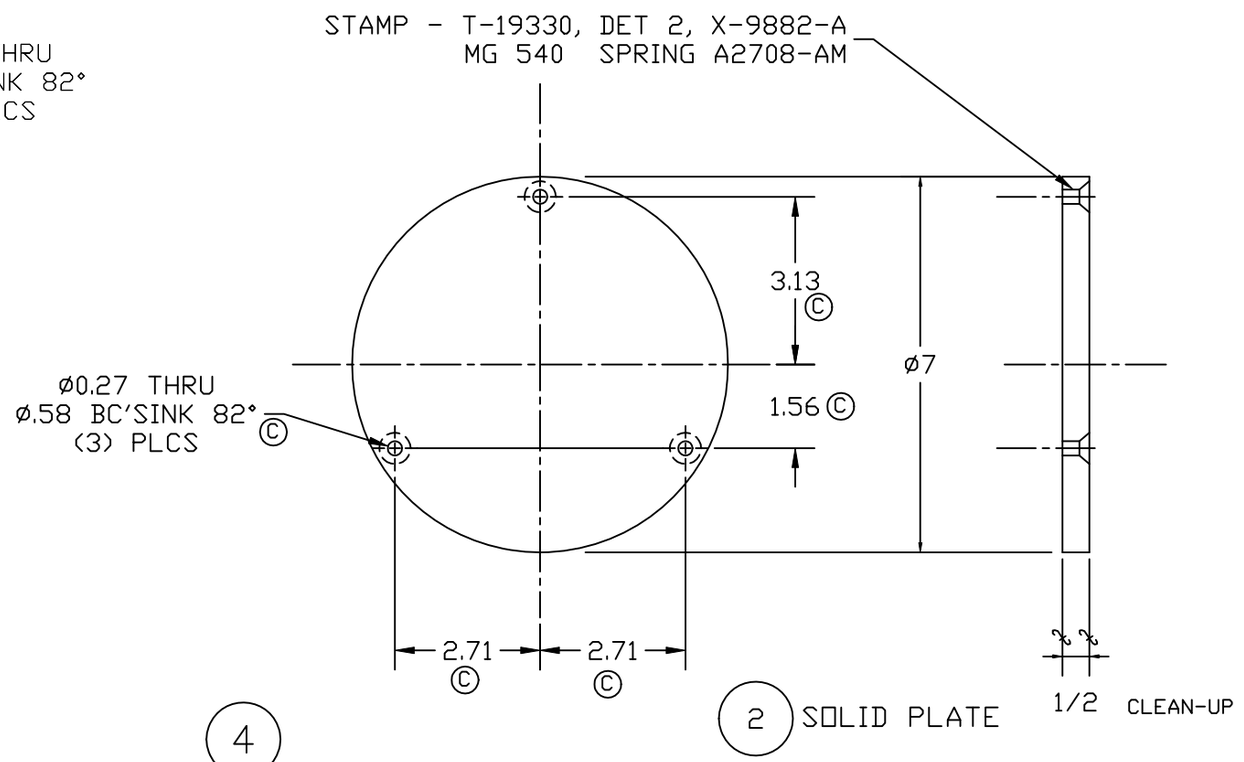
TWIN DISC INC. RACINE, WIS.

REV	DESCRIPTION	DATE	BY
A	TO CHECK FROM -762 DUE TO ANOTHER SAMEB	4-4-01	THV

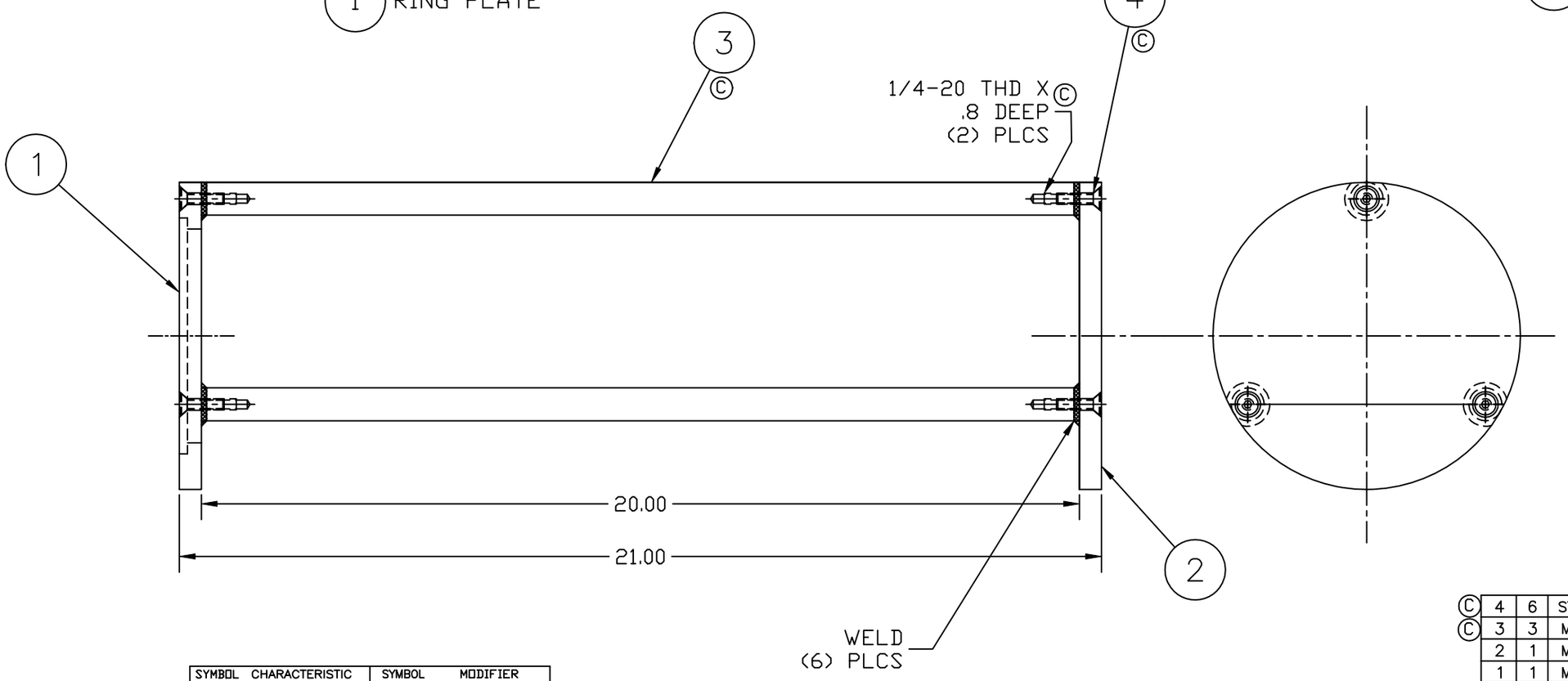
STAMP TOOL NO:
PART NO:
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.XX IN THREE PLACE DECIMAL DIMENSION
.XX IN FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 IN ANGULAR DIMENSION



1 RING PLATE



2 SOLID PLATE



Ⓒ					
Ⓒ 4	6	STK	FLAT HD SCR	1/4-20 THD X 1.0	
Ⓒ 3	3	MS	SUPPORT BARS	ø3/4 X 20.1	
2	1	MS	SOLID END PLATE	ø7.5 X .5	
1	1	MS	RING PLATE	ø7.5 X .5	

Date: 10-20-80 | By: W.SCHEEL | F.P.N.: | Scale: HALF

NAME SPRING DE-COMPRESSER

FOR X9882-A (A2708AM SPRING)

SHEET 1 OF 1

TWIN DISC INC. RACINE, WIS.

T-19330

STAMP TOOL NO.: T-17710-38
PART NO.: 1016309
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
±.0002 ON FOUR PLACE DECIMAL DIMENSION
±.001 ON THREE PLACE DECIMAL DIMENSION
±.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

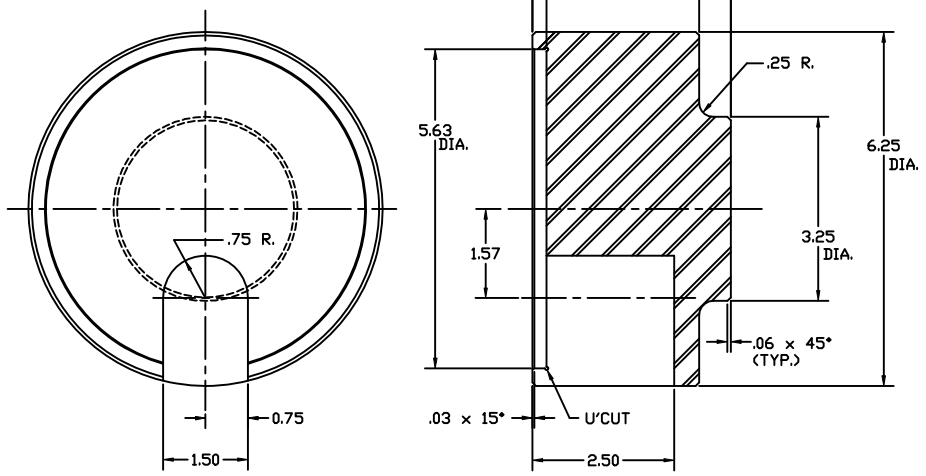
SYMBOL	CHARACTERISTIC
▱	FLATNESS
//	PARALLELISM
⊥	PERPENDICULARITY
◎	CONCENTRICITY
↗	CIRCULAR RUNOUT
↗↗	TOTAL RUNOUT
⌖	POSITION

SYMBOL	MODIFIER
Ⓜ	MMC (MAX. MATERIAL CONDITION)
Ⓢ	RFS (REGARDLESS OF FEATURE SIZE)

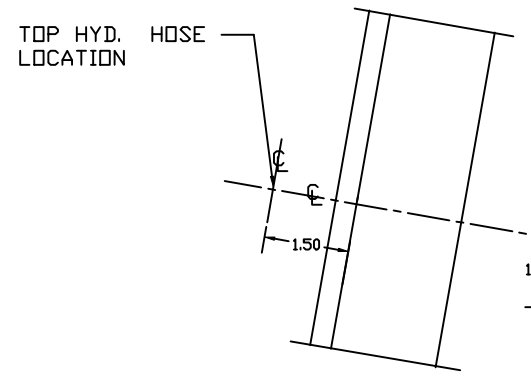
SYMBOL	NAME
-A-	DATUM FEATURE
ø	DIAMETER

AUTOCAD FILE ~ T-19330

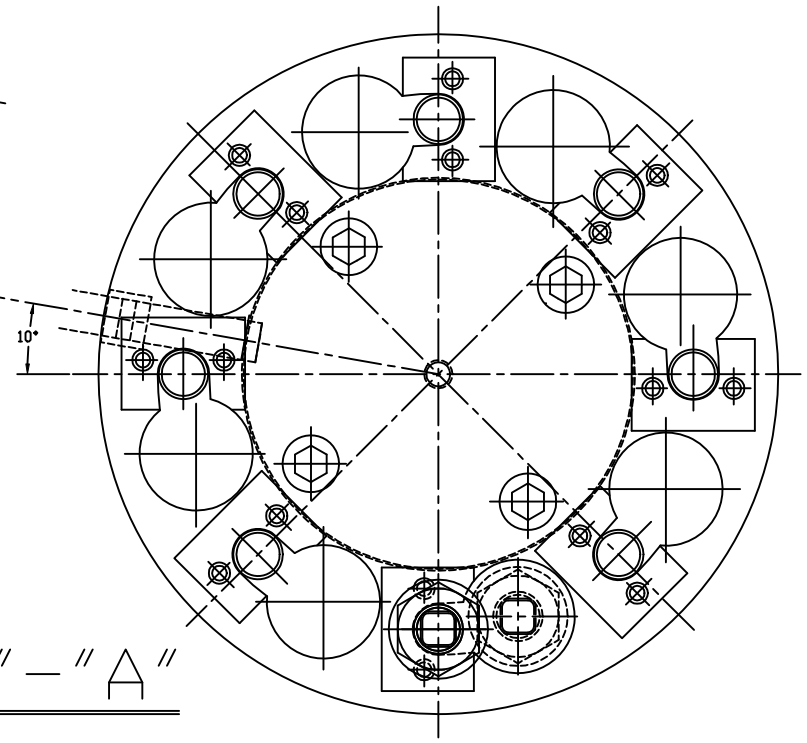
REV	DESCRIPTION	DATE	BY
C	UPDATED PRINT/TOOL (ADD #3 & #4)	4-16-01	TMV
B	CAD DRAWING	3-20-01	RTR
A	5.375 X DIA WAS 5.25	12-6-00	WLR



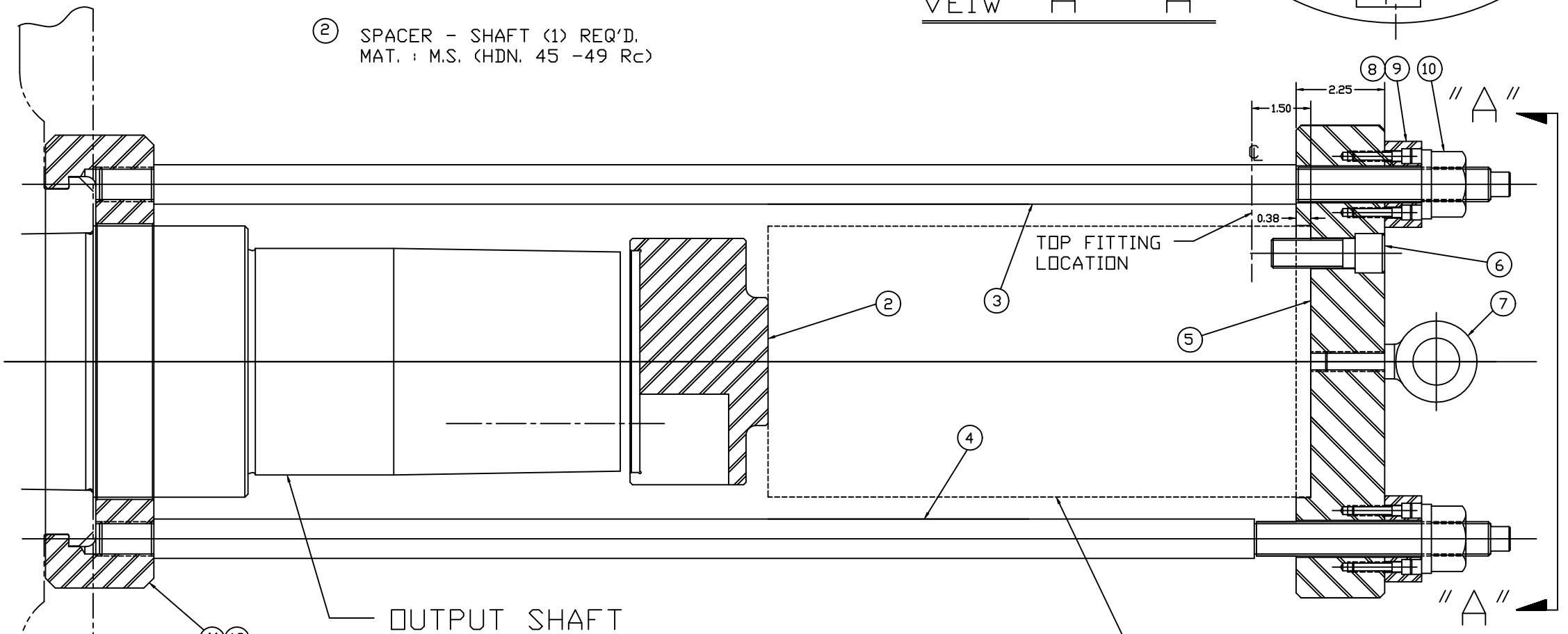
② SPACER - SHAFT (1) REQ'D.
MAT. : M.S. (HDN. 45 -49 Rc)



PARTIAL VEIW



VEIW "A" - "A"



POWER TEAM DOUBLE ACTING RAM
100 TONS (6.625" STROKE)
MODEL # RD 1006 - 13.782 LONG

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
14	4	4140	ROD SEE SHT. # 2	
13	4	4140	ROD SEE SHT. # 2	
12	2	STK.	SOC. HD. CAP SCREW 3/8-16 x 2.50	
11	1	4140	COLLAR SEE SHT. # 2	
10	8	PUR.	JERGEN'S FLG. NUT # 19909 7/8-9 UNC	
9	16	STK.	SOC. HD. CAP SCREW 1/4-20 x 1.25 LG.	
8	8	4140	SPACER SEE SHT. # 2	
7	1	PUR.	JERGEN'S SHLDR. EYE-BOLT # 18504	
6	4	STK.	SOC. HD. CAP SCREW 3/4-10 x 2.00 LG.	
5		M.S.	TOP PLATE SEE SHT. # 2	
4	4	4140	ROD SEE SHT. # 2	
3	4	4140	ROD SEE SHT. # 2	
2	1	M.S.	SPACER - SHAFT CHDN. 45-49 Rc>6.50x4.00 THK.	
1	1	PUR.	POWER TEAM RAM # RD 1006	

Ⓐ RODS FOR MG 6650 SC

RODS FOR MG 5301 DC

Date: 9-27-96 By: JPL F.P.N.: Scale: FULL

NAME: OUTPUT GEAR TO SHAFT PULLER

FOR: MG 5301

SHEET 1 OF 3

T-20023-3

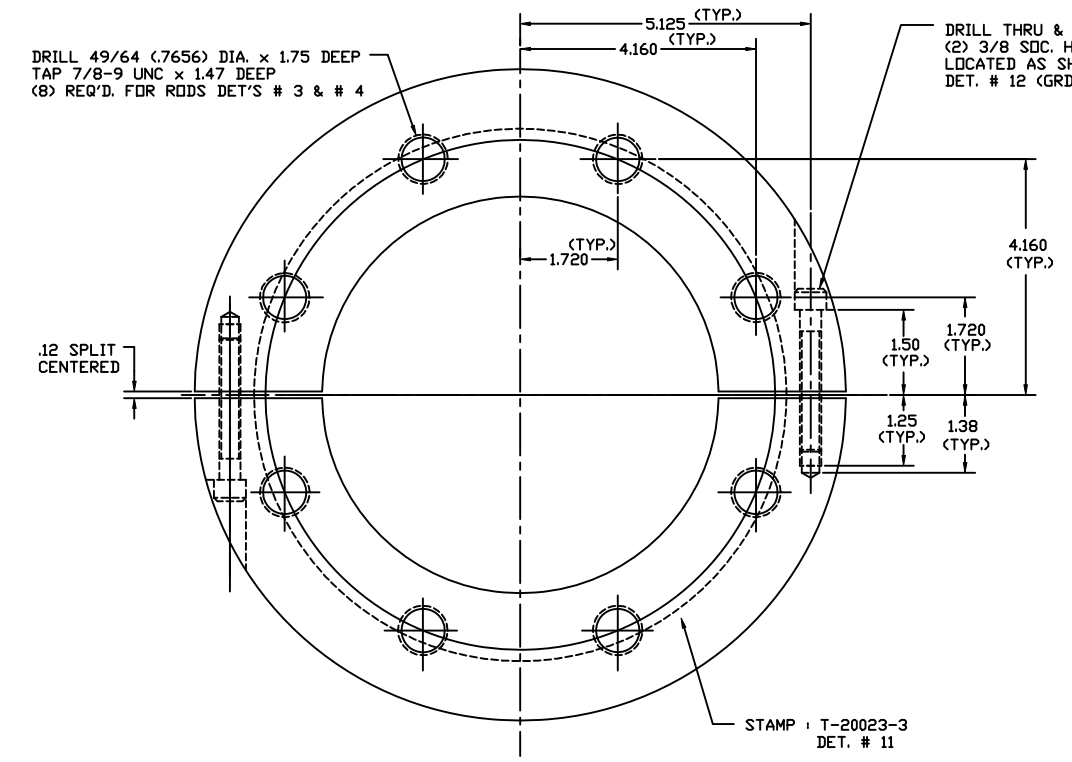
TWIN DISC INC. RACINE, WIS.

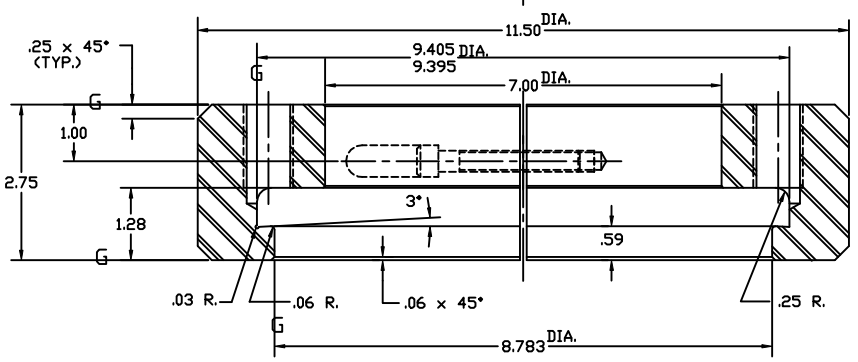
CHANGE	DESCRIPTION	DATE	BY
A	MG 6650 & DETS #13 & 14 ADDED	7-7-98	JPL

STAMP TOOL NO: T-20023-3
PART NO: MG 4406
REMOVE ALL STAMP DETAILS
TOLERANCE UNLESS OTHERWISE SPECIFIED ARE ON THREE PLACE DECIMAL DIMENSION ARE ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

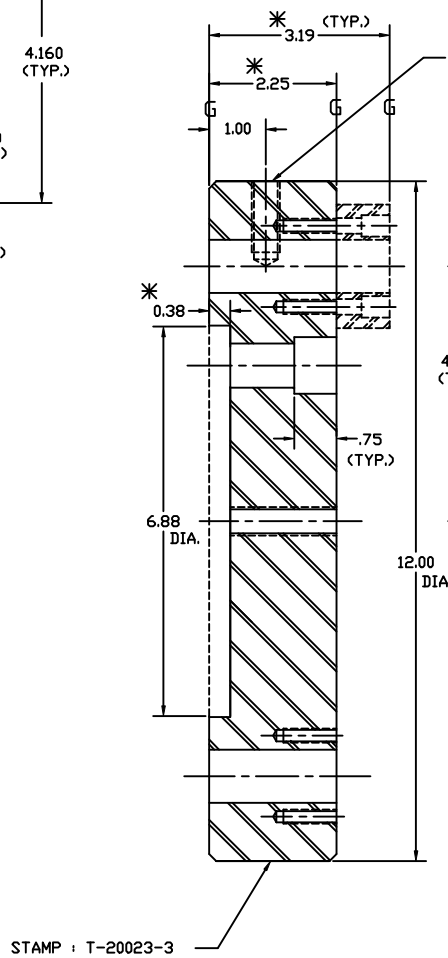
NOTE : REF. THIS DRWG. FROM T-20023 FIRST USED ON MG-516

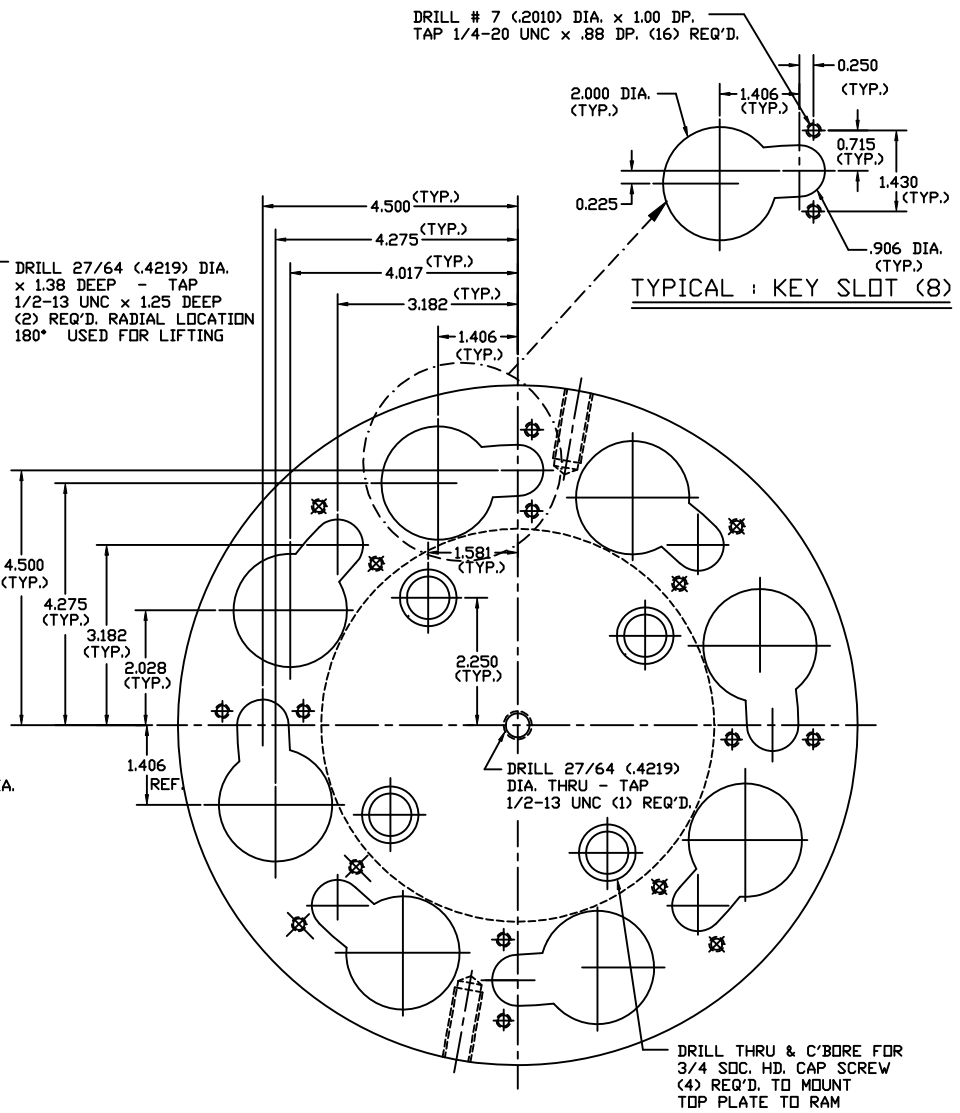
CAD FILE : T20023-3



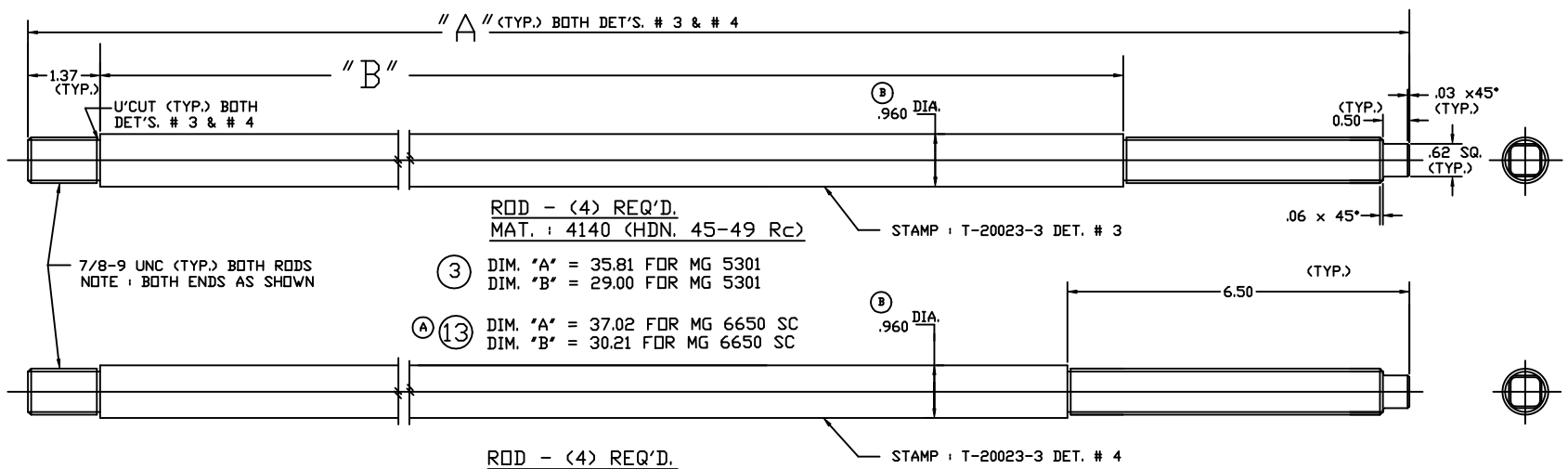


(11) COLLAR - (1) REQ'D.
MAT. : 4140 (HDN. 45-49 Rc)





(8) TOP PLATE - (1) REQ'D.
MAT. : M.S. (HDN. 45-49 Rc)



ROD - (4) REQ'D.
MAT. : 4140 (HDN. 45-49 Rc)

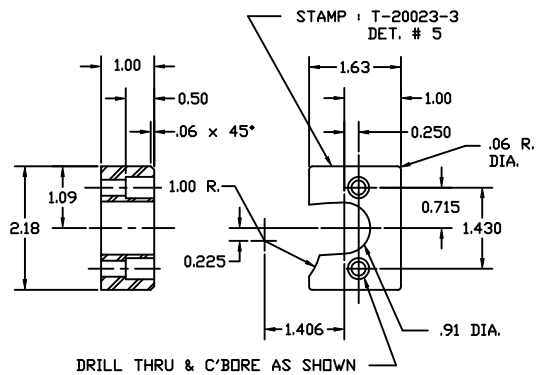
(3) DIM. "A" = 35.81 FOR MG 5301
DIM. "B" = 29.00 FOR MG 5301

(A)(13) DIM. "A" = 37.02 FOR MG 6650 SC
DIM. "B" = 30.21 FOR MG 6650 SC

ROD - (4) REQ'D.
MAT. : 4140 (HDN. 45-49 Rc)

(4) DIM. "A" = 35.81 FOR MG 5301

(A)(14) DIM. "A" = 37.02 FOR MG 6650 SC



(5) SPACER - (8) REQ'D.
MAT. : 4140 (HDN. 52 - 59 Rc)

(A) RODS FOR MG 6650 SC	14	4	4140	ROD (HDN. 45-49 Rc) 1.00	DIA. x 37.25 LG.
	13	4	4140	ROD (HDN. 45-49 Rc) 1.00	DIA. x 37.25 LG.
	12	2	STK.	SOC. HD. CAP SCREW	3/8-16 x 2.50
	11	1	4140	COLLAR (HDN. 45-49 Rc) 12.00	DIA. x 3.25 THK.
	8	8	4140	SPACER (HDN. 52-59 Rc)	1.12x1.75x2.25
	5	1	M.S.	TOP PLATE (HDN. 45-49 Rc)	12.25 D. x 2.75D
RODS FOR MG 5301 DC	4	4	4140	ROD (HDN. 45-49 Rc) 1.00	DIA. x 36.00 LG.
	3	4	4140	ROD (HDN. 45-49 Rc) 1.00	DIA. x 36.00 LG.
	DET.	REQ'I	MAT.	DESCRIPTION	STOCK SIZE

Date 9-27-98 By: JPL F.P.N.: Scale: FULL

NAME: OUTPUT GEAR TO SHAFT PULLER

FOR: MG 5301 & MG 6650 — TWIN DISC INC. RACINE, WIS.

SHEET 2 OF 3

T-20023-3

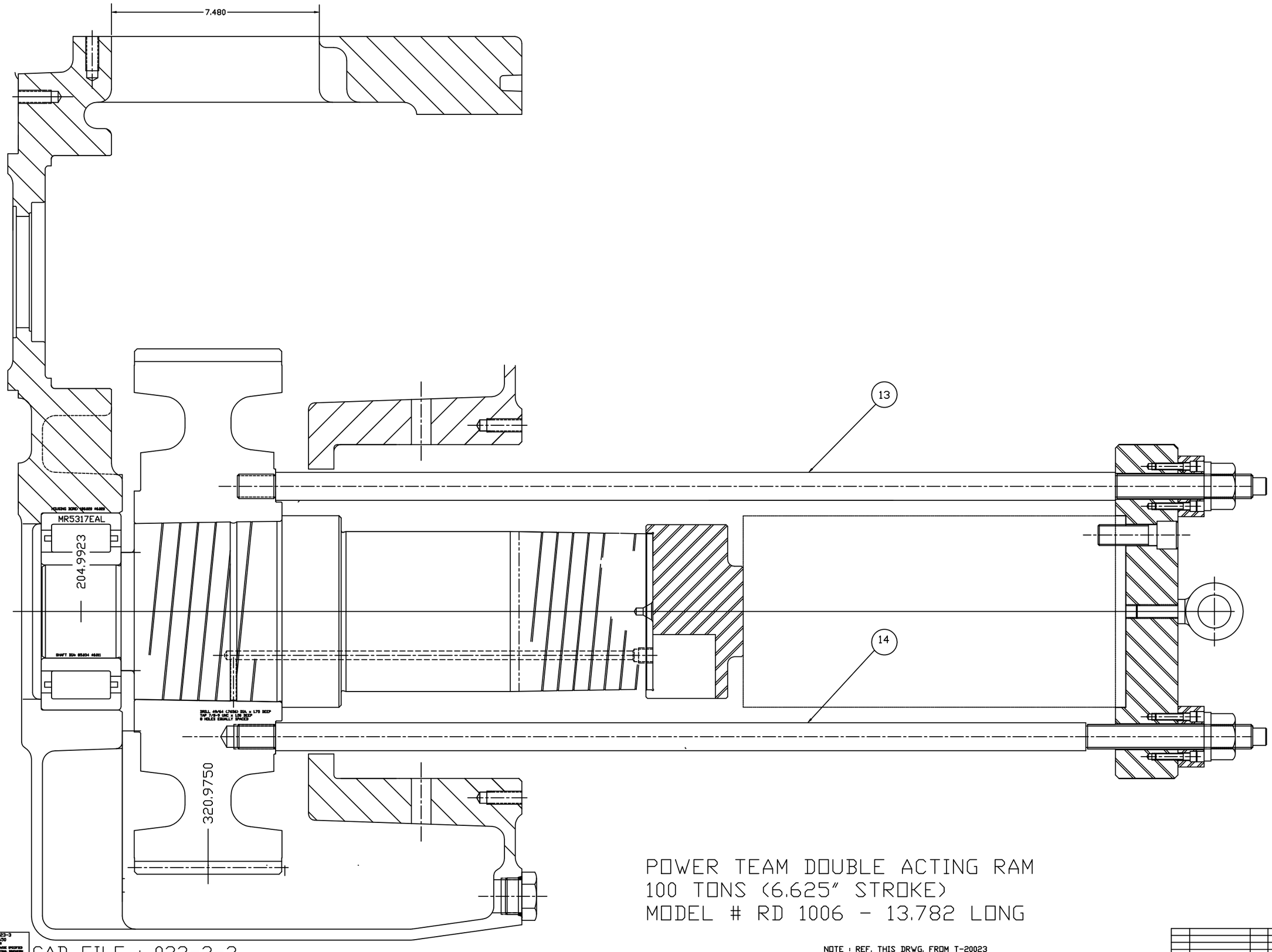
CHANGE	DESCRIPTION	DATE	BY
B	DIM. .960 DIA. WAS 1.00 DIA.	7-31-98	JPL
A	MG 6650 SC & DET.#13 & #14 ADDED	7-6-98	JPL

STAMP TOOL NO: T-20023-3
PART NO: MG 4406
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
ARE AS THREE PLACE DECIMAL DIMENSIONS
ARE IN CONSTANT, AND TWO PLACE
DECIMAL DIMENSION
1/4 DIA ANGULAR DIMENSION

AUTOCAD FILE : T20023-3A

✳ NOTE : GROUND SURFACES MUST BE PARALLEL WITHIN .0005 OF EACH OTHER.

NOTE : UNLESS OTHERWISE SPECIFIED, BREAK ALL SHARP CORNERS.



POWER TEAM DOUBLE ACTING RAM
100 TONS (6.625" STROKE)
MODEL # RD 1006 - 13.782 LONG

14	4	4140	ROD	SEE SHT. # 2	
13	4	4140	ROD	SEE SHT. # 2	
DET/REQ'D	MAT.		DESCRIPTION		STOCK SIZE

Date: 7-6-98 By: JPL F.P.M. Scale: FULL

NAME: OUTPUT GEAR TO SHAFT PULLER

FOR: MG 6650 SC

SHEET 3 OF 3

T-20023-3

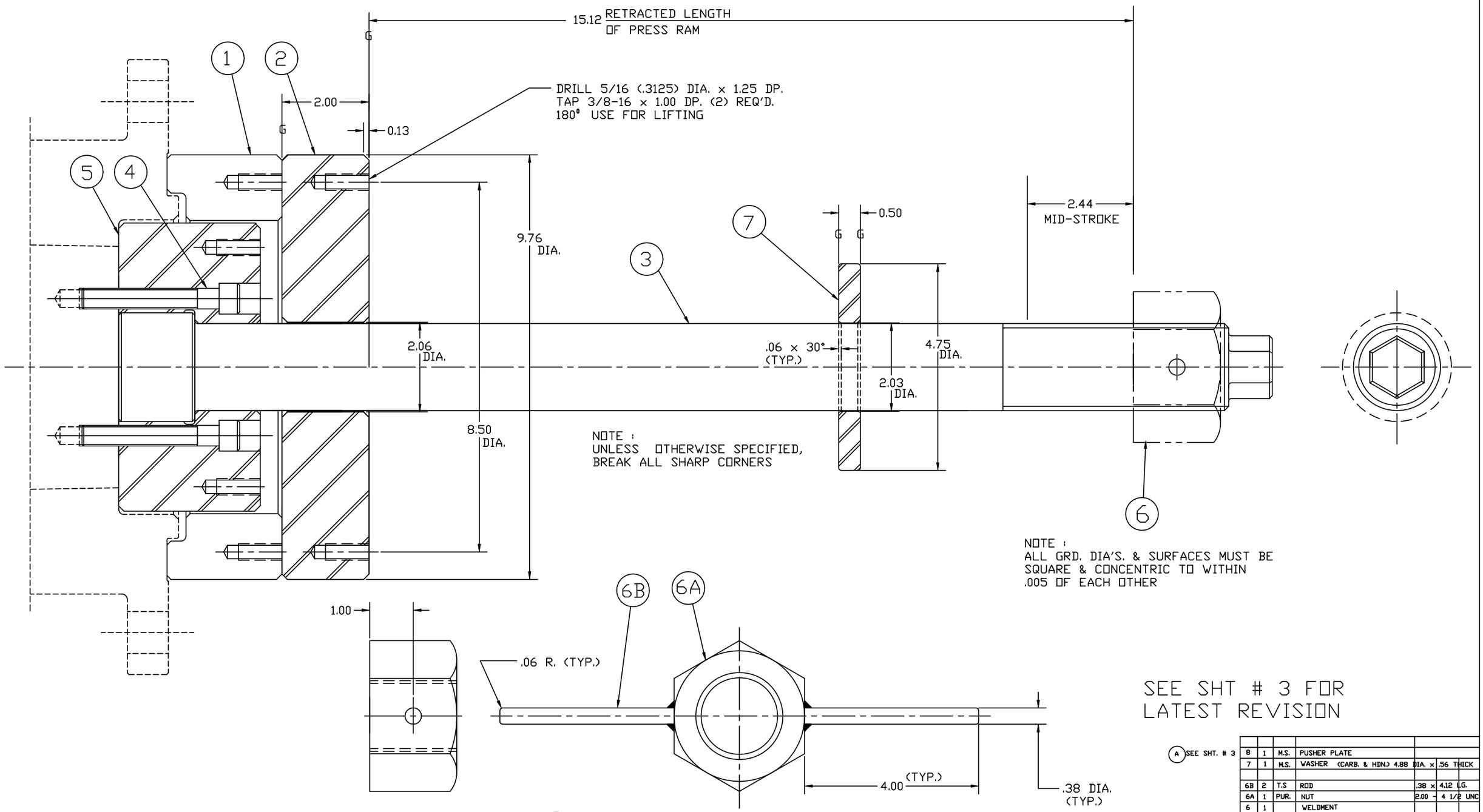
TWIN DISC INC. RACINE, WIS.

CHANGE	DESCRIPTION	DATE	BY

T-20023-3
MG 6650
REMOVE ALL BURRS CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.XX ON THREE PLACE DECIMAL DIMENSIONS
.XXX ON FUNCTIONAL AND TWO PLACE DECIMAL DIMENSIONS
1/4 ON ANGULAR DIMENSIONS

CAD FILE : 023-3-3

NOTE : REF. THIS DRWG. FROM T-20023
FIRST USED ON MG-516



6 NUT WELDMENT

NUT WITH HANDLES

THREAD SIZE : 2 - 4 1/2 UNC GRADE 8

A 194 GRADE 2H - HEAVY HEX - FULL NUT

SEE SHT # 3 FOR LATEST REVISION

	DET. REQ.	MAT.	DESCRIPTION	STOCK SIZE
A SEE SHT. # 3	8	1	M.S.	PUSHER PLATE	
	7	1	M.S.	WASHER (CARB. & HDN.) 4.88 DIA. x .56 THICK
	6B	2	T.S	ROD	.38 x 4.12 LG.
	6A	1	PUR.	NUT	2.00 - 4 1/2 UNC
	6	1		WELDMENT
A SEE SHT. # 3	5	1	M.S.	PULLER BASE
	4	5	STK.	SOC. HD. CAP SCREW M12 x 1.75 x 80 MM LG.
SEE SHT.#2	3	1	4340H	PULLER ROD
~~SEE SHT.#2~~	~~2~~	~~1~~	~~M.S.~~	~~PLATE - RAM BASE 10.00 DIA. x 2.25 THK.~~
~~SEE SHT.#2~~	~~1~~	~~1~~	~~M.S.~~	~~PUSHER PLATE~~

Date: 10-4-96 By: JPL F.P.N.: Scale: FULL

NAME OUTPUT FLANGE FIXTURE (A)

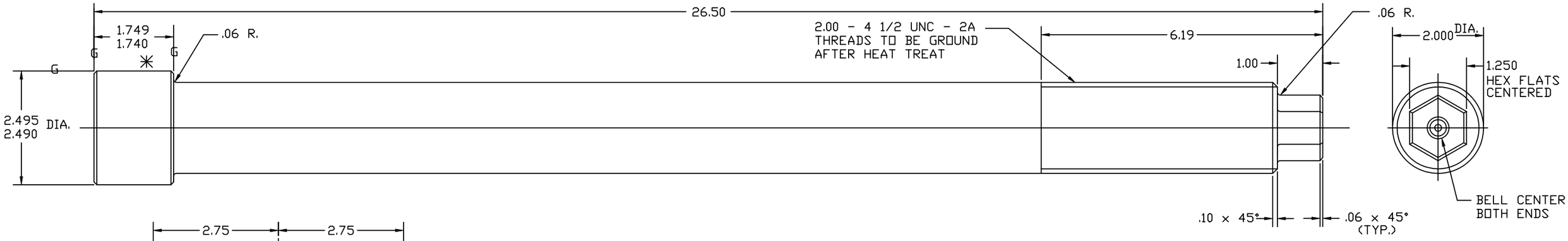
FOR MG 5301 SHEET 1 OF 3

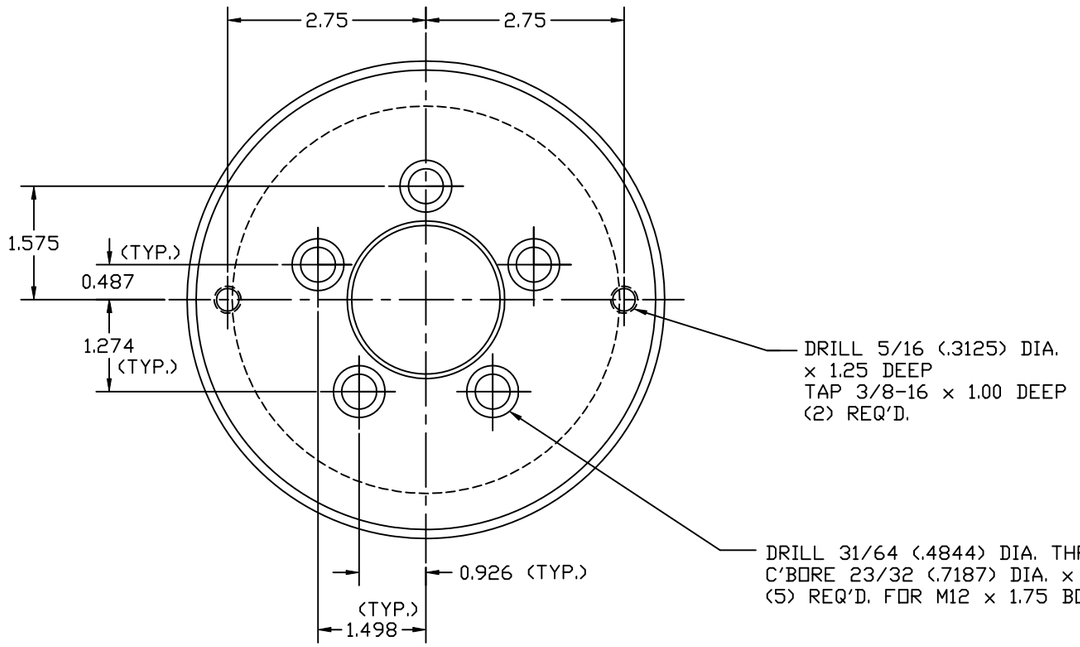
TWIN DISC INC. RACINE, WIS. T-21433

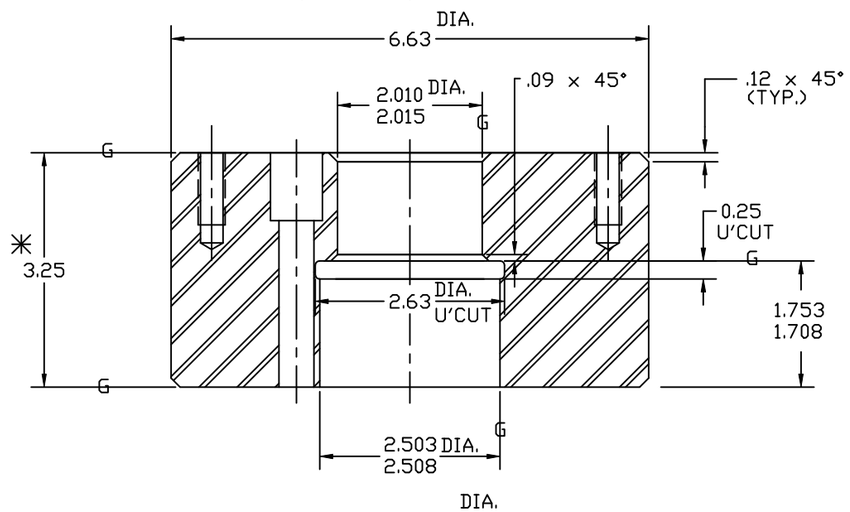
CHANGE	DESCRIPTION	DATE	BY
A	DET. # 8 REPACES DET. # 1 & # 2 DET. # 5 REWORKED SHT. # 3 ADDED	2-21-97	JPL

1016523 HSG.
1017000 SHAFT
PART NO.: 1017009 FLANGE
STAMP TOOL NO.: T-21433
PART NO.: MG 4406
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.XX IN THREE PLACE DECIMAL DIMENSION
.010 IN FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 21433







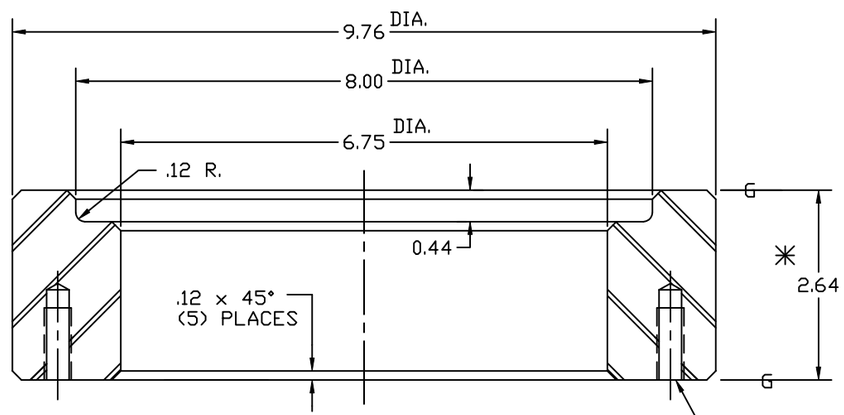
1016523 - HSG.
1017000 - SHAFT -OUTPUT
1017009 - FLANGE

PART NO: T-21433
STAMP TOOL NO:
PART NO:
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.XX IN THREE PLACE DECIMAL DIMENSION
.X0 IN FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4° IN ANGULAR DIMENSION

(5) PULLER BASE (1) REQ'D.
MAT. : M.S. (HDN. 45-49 Rc)

CAD FILE : 21433-1

③ PULLER ROD (1) REQ'D.
MAT. : SAE # 4340 H (AIRCRAFT QUILITY)
HEAT TREATMENT :
HARDEN & TEMPER TO Rc 44 - 48
CHECK HARDNESS ON 2.000 DIA. ONLY,
DO NOT TOUCH THREADS
INSPECTION : CHECK ALL SURFACES WITH MAGNIFLO EQUIPMENT



(1) PUSHER PLATE (1) REQ'D.
MAT. : M.S. (HDN. 45-49 Rc)

NOTE :
UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

✳ NOTE :
ALL GRD. DIA'S. & SURFACES MUST BE SQUARE & CONCENTRIC TO WITHIN .005 OF EACH OTHER

Ⓐ (HDN. 45-49 Rc)
SEE DET. # 5 REV'D. ON SHT. # 3

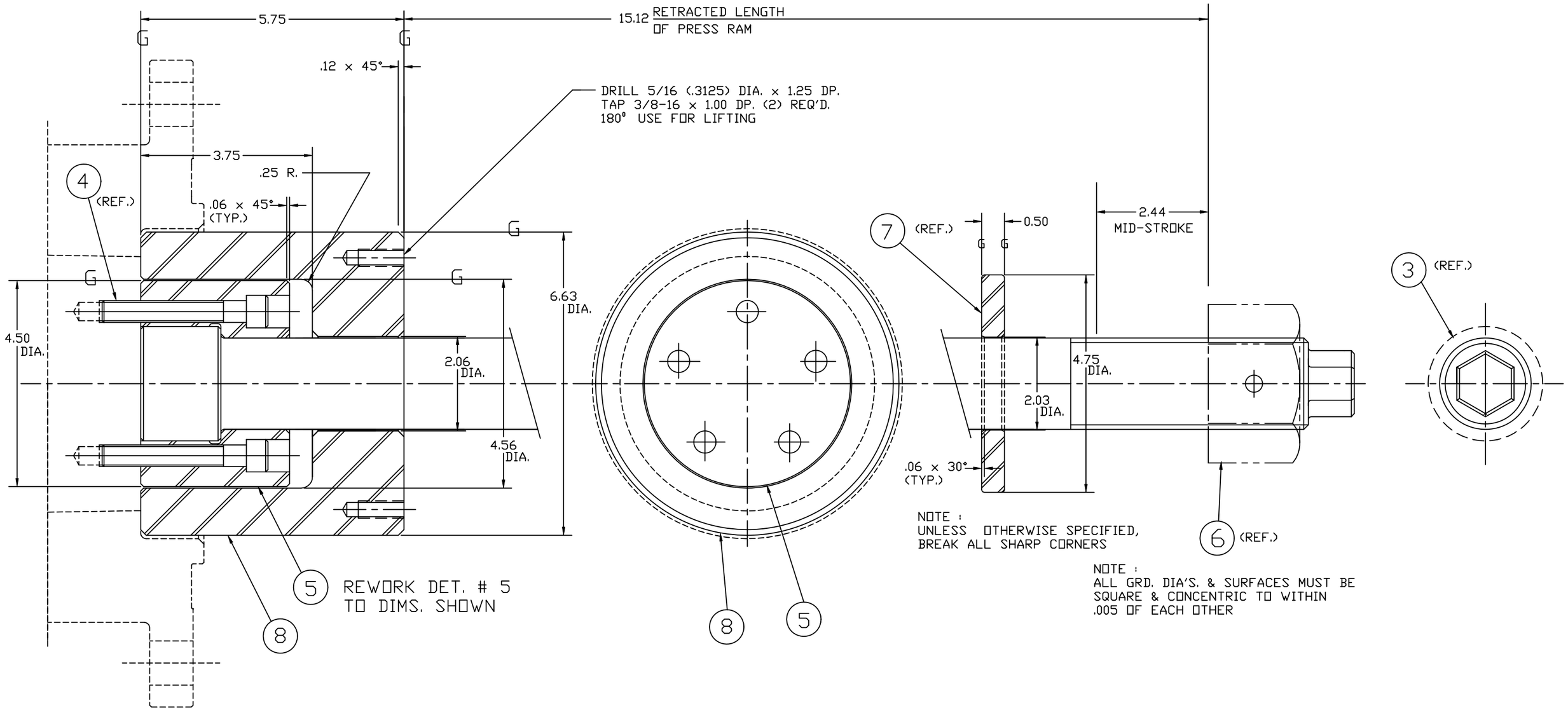
DET.# 1 NOT USED
Ⓐ (HDN. 45-49 Rc)

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
5	1	M.S.	PULLER BASE	6.75 DIA. x 3.38 THK.
3	1	4340H	PULLER ROD	2.62 DIA. x 27.00 LG.
1	1	M.S.	PUSHER PLATE	10.00 DIA. x 2.88 THK.

Date: 10-12-96 By: JPL F.P.N.: Scale: FULL

NAME: OUTPUT FLANGE FIXTURE Ⓐ
FOR MG 5301
SHEET 2 OF 3
T-21433
TWIN DISC INC. RACINE, WIS.

CHANGE	DESCRIPTION	DATE	BY
A	DET. # 8 ADDED DET. # 5 REV'D. SHT.. #3 ADDED	2-21-97	JPL



NOTE :
UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

NOTE :
ALL GRD. DIA'S. & SURFACES MUST BE
SQUARE & CONCENTRIC TO WITHIN
.005 OF EACH OTHER

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
8	1	M.S.	PUSHER PLATE (HDN. 45-49 Rc)	6.75 DIA. x 6.00 LG.
5	1	M.S.	PULLER BASE REWORKED TO THIS DRWG. SEE SHT.#2	
4	5	STK.	SOC. HD. CAP SCREW	M12 x 1.75 x 80 MM LG.
3	1	4340H	PULLER ROD SEE SHT.#2	

Date: 2-21-97 By: JPL F.P.N.: Scale: FULL

NAME OUTPUT FLANGE FIXTURE

FOR MG 5301 SHEET 3 OF 3

TWIN DISC INC. RACINE, WIS. T-21433

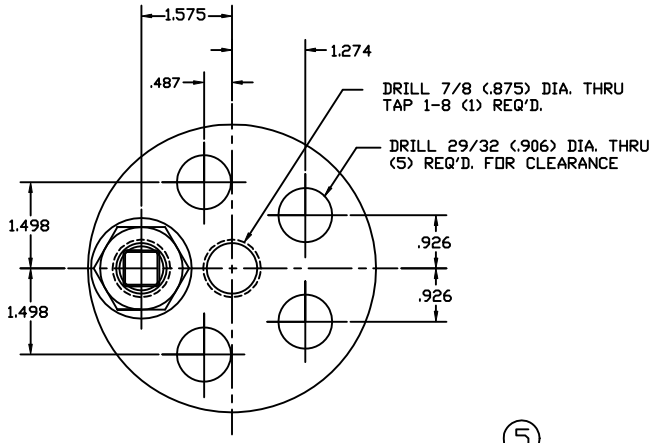
CHANGE	DESCRIPTION	DATE	BY
A	& DET. # 8 ADDED DET. # 5 REV'D. SHT. # 3 ADDED &	2-21-97	JPL

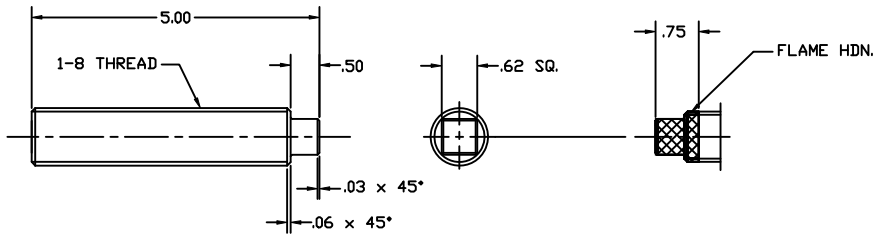
PART NO: 1016523 HSG.
1017000 SHAFT
1017009 FLANGE

STAMP TOOL NO.: T-21433
PART NO: MG 4406

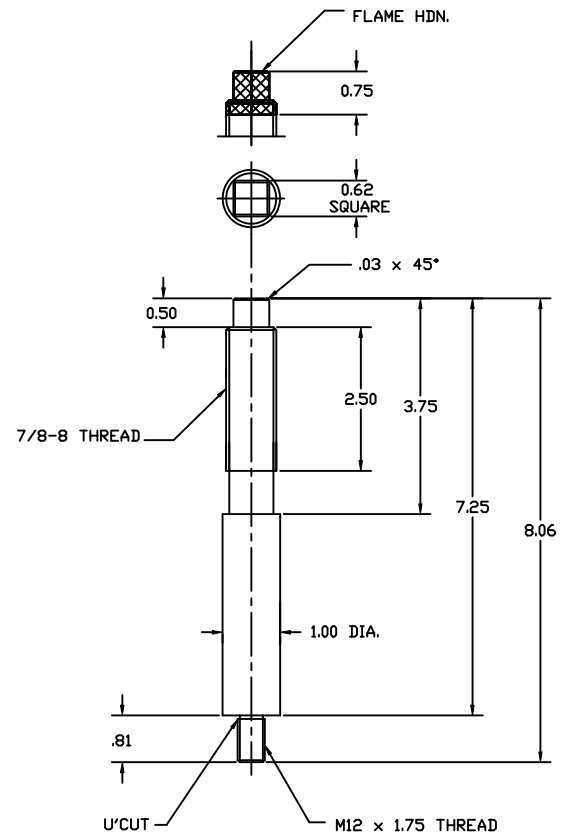
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.005 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

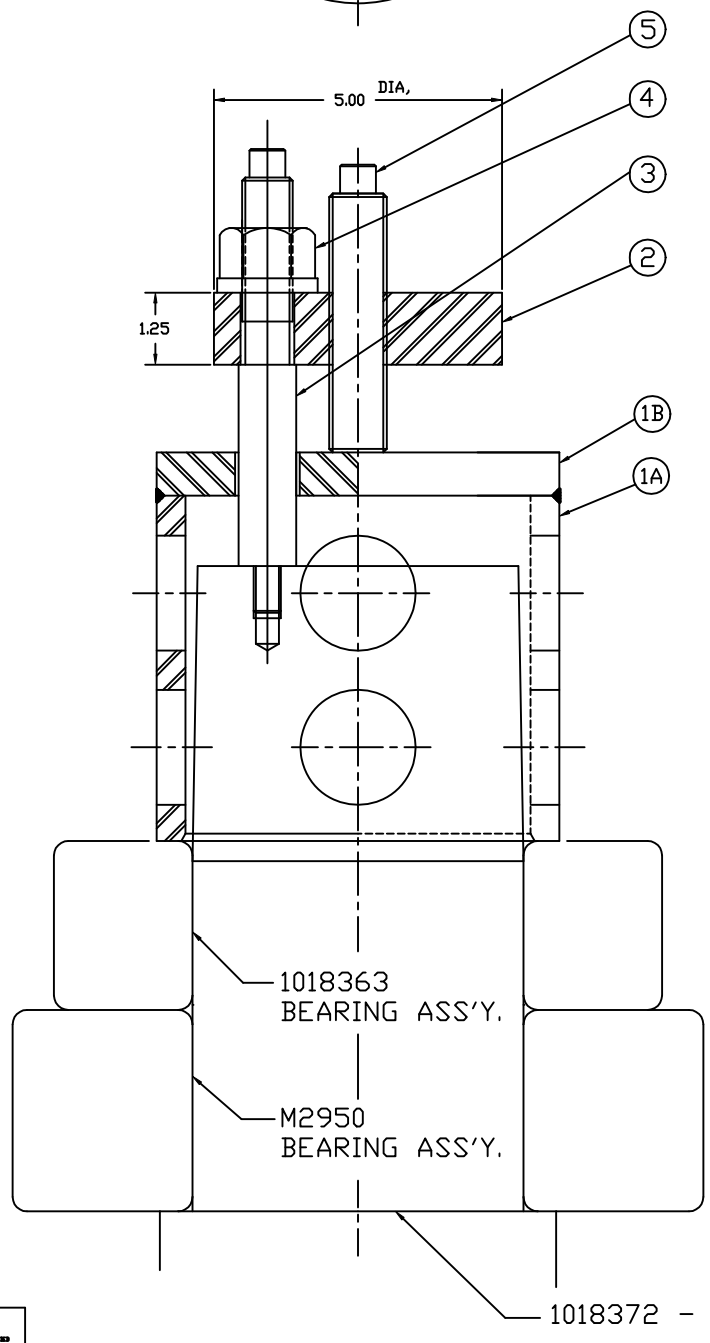
CAD FILE : 21433

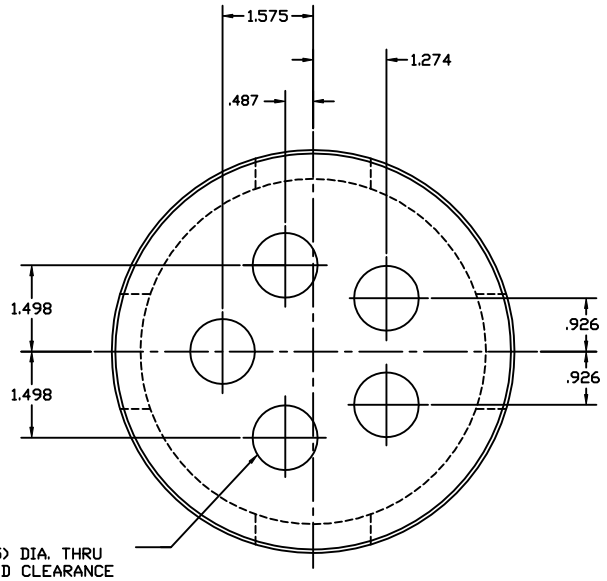


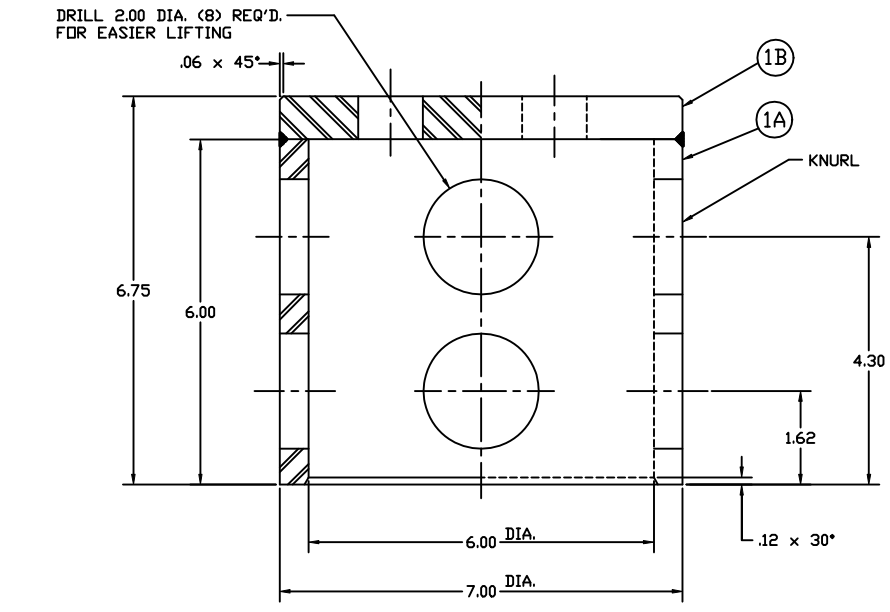


⑤ THREADED ROD (1) REQ'D.
MAT. : DRILL ROD OR THREADED STOCK
FLAME HDN. AS SHOWN









① WELDMENT ASS'Y. - (1) REQ'D.
WELD, NORMALIZE & HARDEN

③ ROD (5) REQ'D.
MAT. : FIRM-X
FLAME HDN. AS SHOWN

NOTE : GROUND SURFACES MUST BE PARALLEL WITHIN .0005 OF EACH OTHER
NOTE : UNLESS OTHERWISE SPECIFIED, BREAK ALL SHARP CORNERS

DET.	REQ'D	MAT.	DESCRIPTION	STOCK SIZE
5	1	STK.	THREADED ROD	1-8 THREAD x 5.25 LG.
4	5	STK.	FLANGE NUT	7/8-8 THREAD
3	5	FIRM-X	ROD	1.00 DIA. x 8.25 LG.
2	1	M.S.	TOP PLATE	5.00 DIA. x 1.25 THK.
1B	1	M.S.	TOP PLATE	7.00 DIA. x .75 THK.
1A	1	TUB.	TUBE - DRIVER	7.00 O.D. x .5 WALL x 6.25 LG.
1	1		WELDMENT ASS'Y.	

(C x HD)

Date 10-22-98 By JPL F.P.N. Scale FULL

NAME BEARING DRIVER - CONE

FOR 1018372 SHAFT
MG 6650 SC

SHEET 1 OF 2

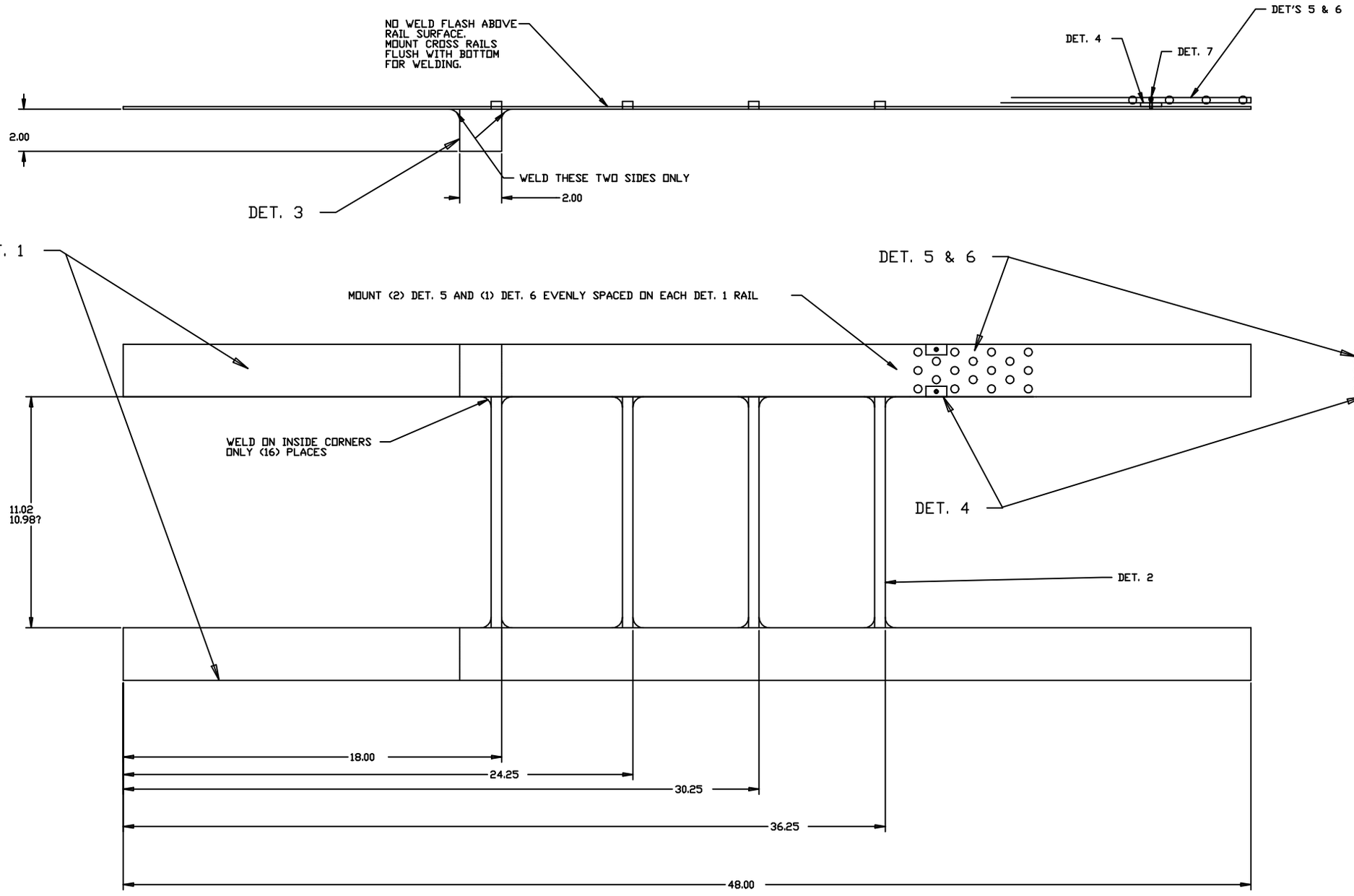
T-21506

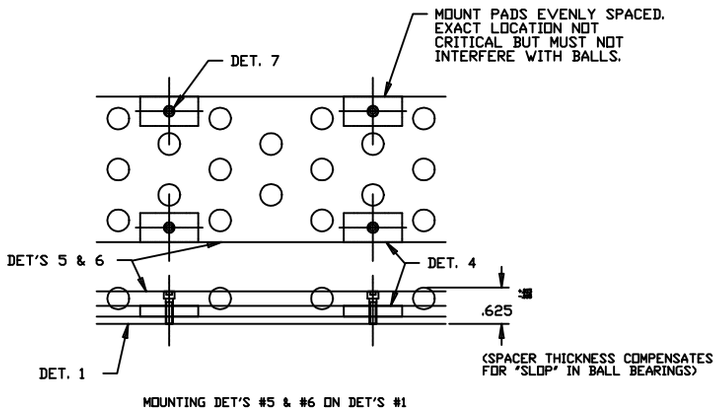
TWIN DISC INC. RACINE, WIS.

CHANGE	DESCRIPTION	DATE	BY

STAMP TOOL NO: T-21506
PART NO: MG 6650 SC
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
ARE ON THREE PLACE DECIMAL DIMENSION
ARE ON FRACTIONAL ADD TWO PLACE
DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 21506





MOUNTING DET'S #5 & #6 ON DET'S #1

7	30	PUR.	#5 S.H.C.S. X 1/2 THD. LGTH.
6	2	PUR.	12 X 2-1/2 BALL BEARING PARALLEL
5	4	PUR.	18 X 2-1/2 BALL BEARING PARALLEL
4	30	1020	SPACER PAD 7/32 X 1 X 1/2
3	2	1020	STOP PLATE 2 X 2 X 2-1/2
2	4	1020	CROSS BRACE 11-1/2 X 1/2 X 1/2
1	2	1020	MAIN RAIL 48 x 2-1/2 x 1/8
DET.	REQ	MAT.	DESCRIPTION STOCK SIZE

Dated 2/16/98 | By: GDL | F.P.N.: | Scale: 1/2

NAME: GEAR ASSY. RAIL

FOR: 1018375

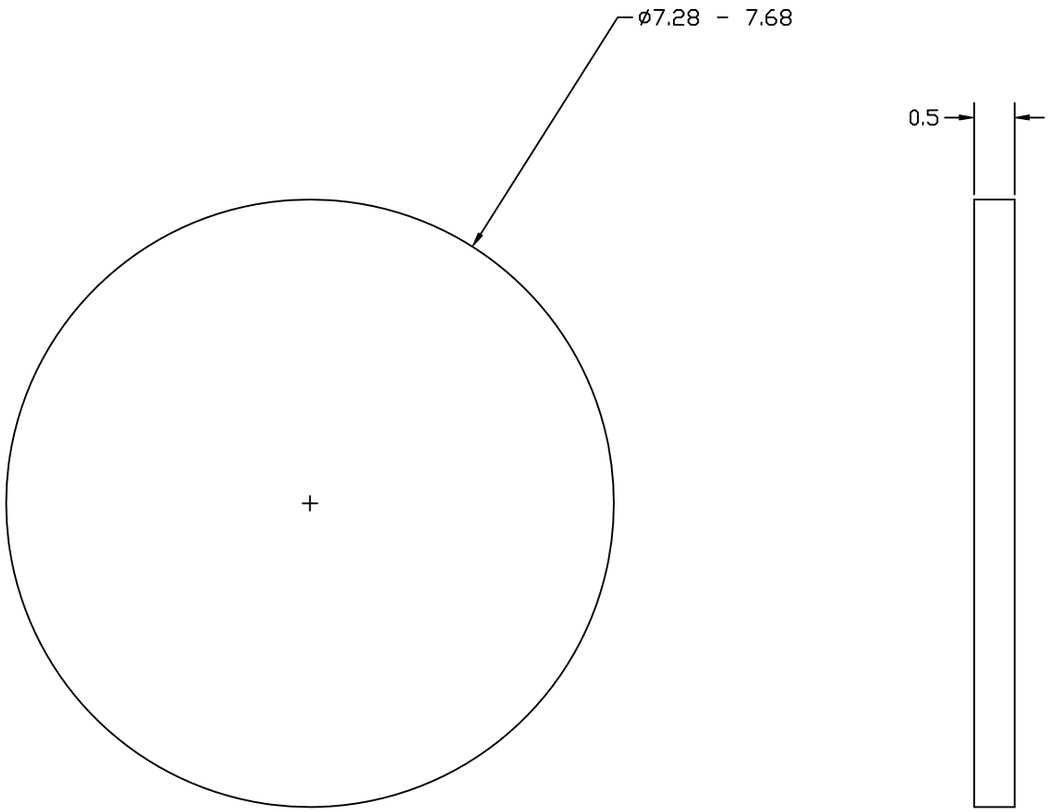
SHEET 1 OF 1

T-21528

TVIN DISC INC. RACINE, WIS.

CHANGE	DESCRIPTION	DATE	BY

STRIP TOOL NO:
PART NO:
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS DIMENSIONS SPECIFIED
.XX IN THREE PLACE DECIMAL DIMENSION
.XXX IN FUNCTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 IN ANGULAR DIMENSION



NOTE:

1) STAMP TOOL NUMBER ON TOOL

2) USE WITH T-18050-772 OR SIMILAR TOOL

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
	1		7.5 DIA X 0.5 STEEL	

Date: 11/08/01 | By: RTR | F.P.N.: | Scale: FULL

NAME: BEARING DRIVER

FOR: MG6650/MG6848/MG6690

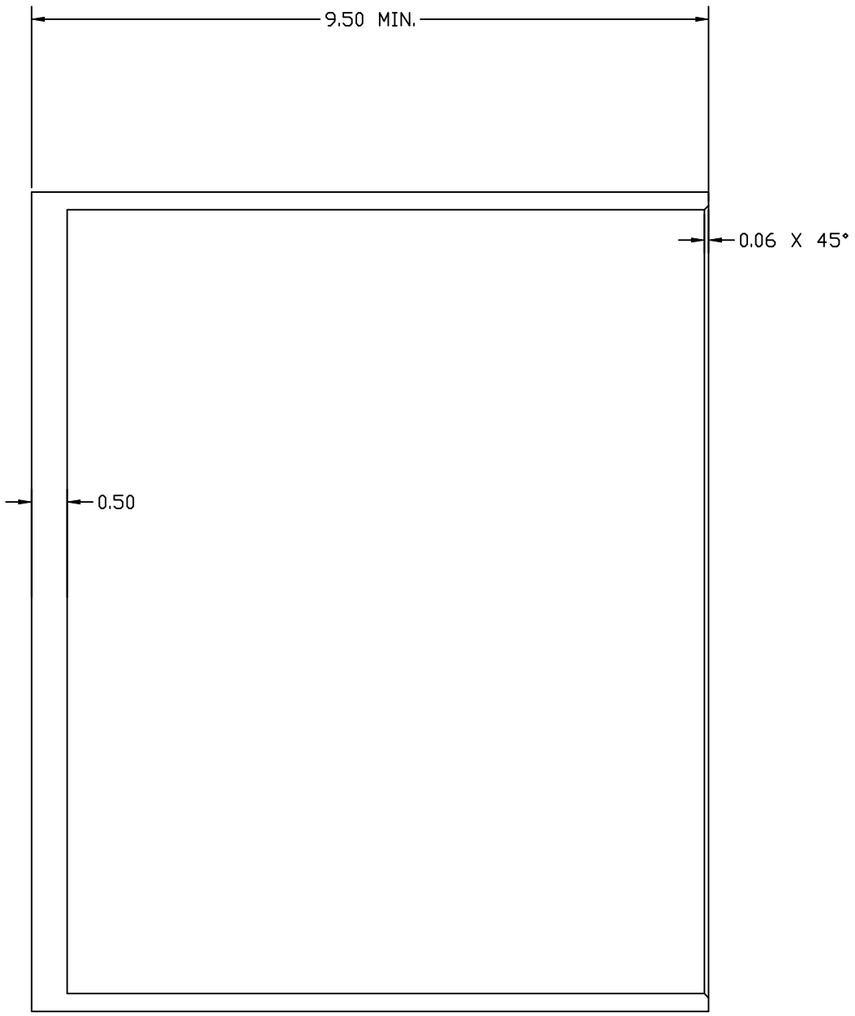
TWIN DISC INC. RACINE, WIS.

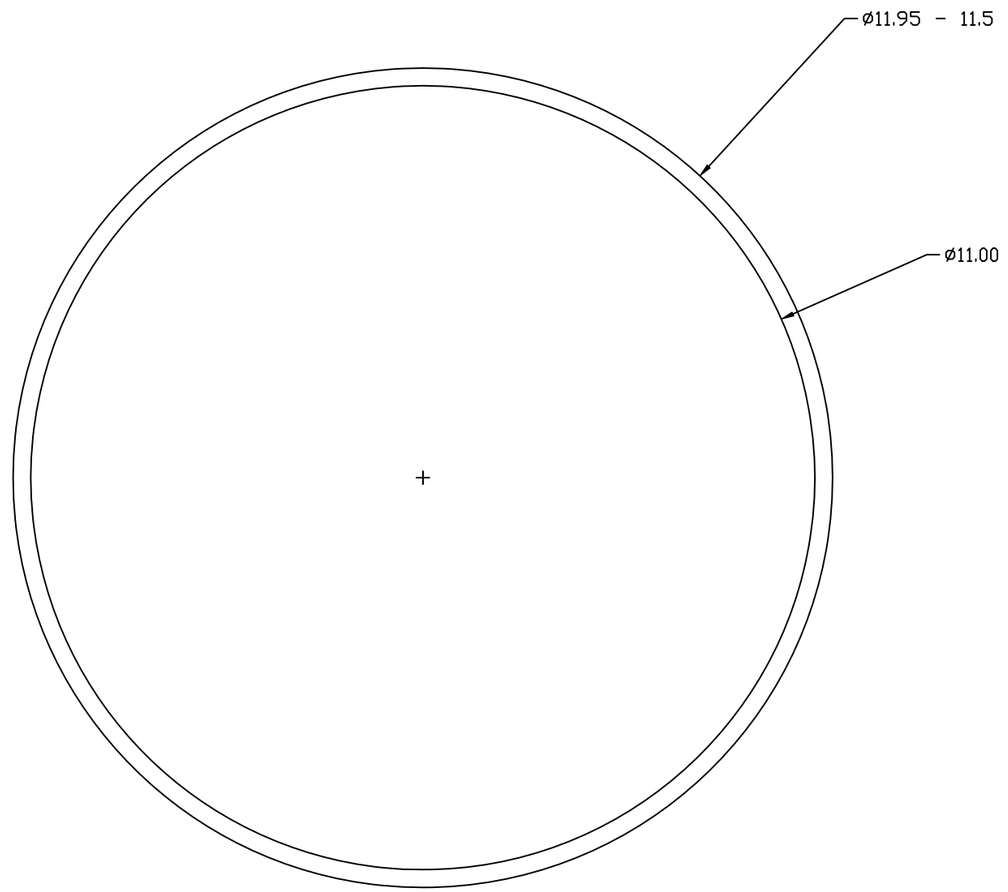
SHEET 1 OF 1

T-21566-2

CHANGE	DESCRIPTION	DATE	BY

STAMP TOOL NO: T-21566-2
PART NO.:
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION





STAMP TOOL NO.:
PART NO.:
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CHANGE	DESCRIPTION	DATE	BY

DET. REQ.	MAT.	DESCRIPTION	STOCK SIZE
1	STEEL	XXXXX	12.00 OD X 9.5

Date: 11/08/01 | By: RTR | F.P.N.: | Scale: FULL

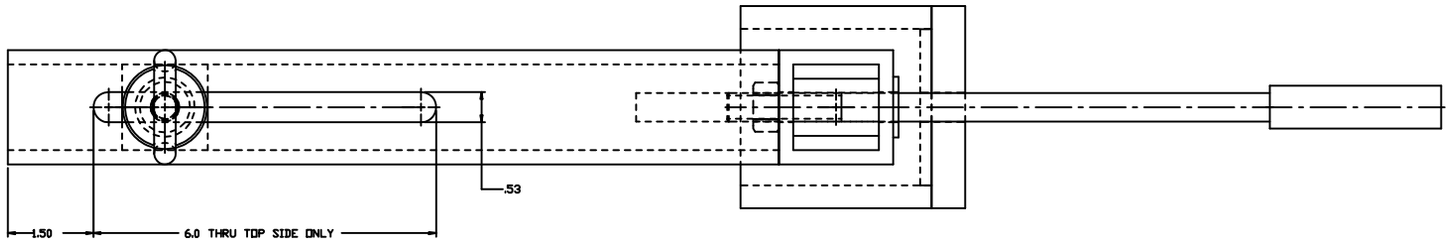
NAME: BEARING DRIVER

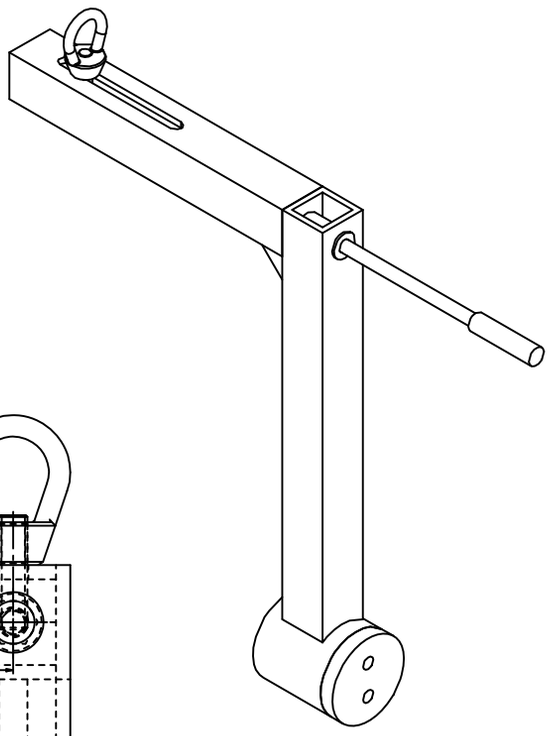
FOR: MG6650/MG6848/MG6690

SHEET 1 OF 1

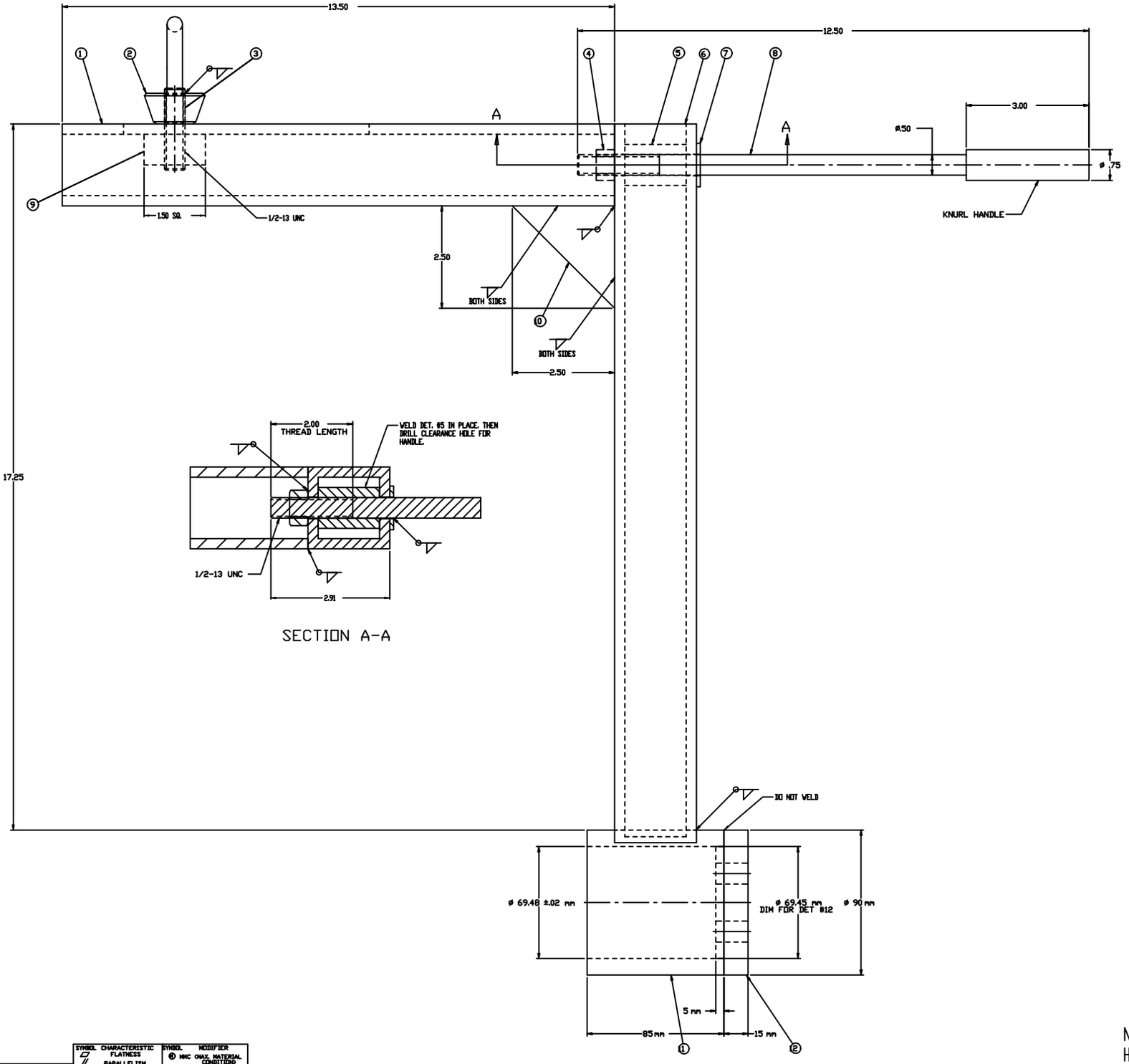
TWIN DISC INC. RACINE, WIS.

T-21566-3

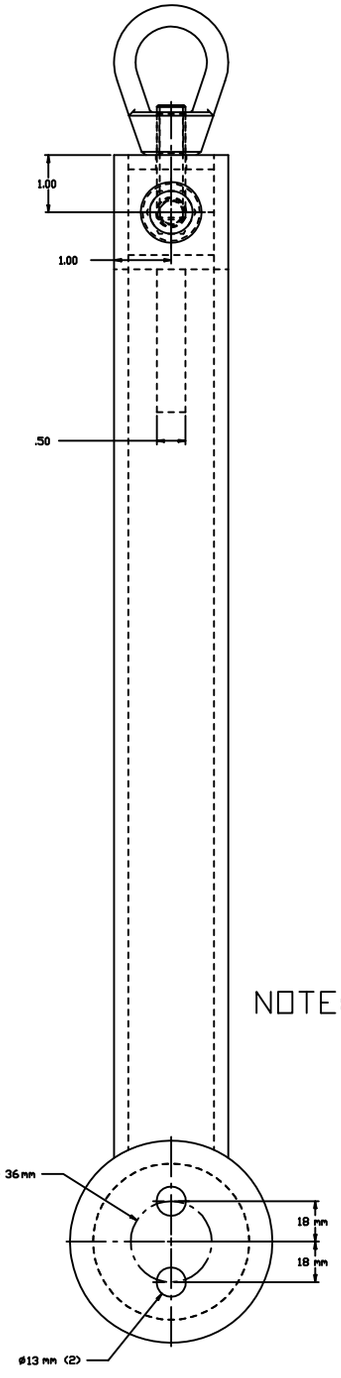




1:2



SECTION A-A



NOTE: LIFTING CAPACITY
@ 325 POUNDS

NOTE:
HOLD DRILLED, C'BORED AND/OR
TAPPED HOLES TO ±.005

DET.	REQ.	DESCRIPTION	MATERIAL
1	1	2.00 SQ X .25 WALL X 13.50	TUBE
2	1	EYE NUT, # 3019718	McMASTER-CARR
3	1	1/2-13 X 2.00 THREADED ROD	
4	1	1/2-13 NUT	
5	1	1.00 O.D. X .51 I.D. X 1.50	CRS
6	1	2.00 SQ X .25 WALL X 17.56	TUBE
7	1	1/2" I.D. HEAVY WASHER	
8	1	.75 DIA X 12.50	CRS
9	1	1.50 SQ X .75	CRS
10	1	2.50 X 2.50 X .50	CRS
11	1	90MM DIA X 85MM	CRS
12	1	90MM DIA X 20MM	CRS

Date: 10/17/00 By: MDS F.P.N.: Scale: 1/1

NAME P & S SHAFT LIFTING DEVICE TO DO IN-BOAT CLUTCH REPAIR

FDR

SHEET 1 OF 1

T-506000

TWIN DISC INC. RACINE, WIS.

REV	DESCRIPTION	DATE	BY

SYMBOL	CHARACTERISTIC
⏥	FLATNESS
//	PARALLELISM
⊥	PERPENDICULARITY
◎	CONCENTRICITY
↗	CIRCULAR RUNOUT
⌰	TOTAL RUNOUT
⌖	POSITION

SYMBOL	MODIFIER
Ⓜ	MMC (MAX. MATERIAL CONDITION)
Ⓢ	RFS (REGARDLESS OF FEATURE SIZE)

SYMBOL	NAME
-A-	DATUM FEATURE
⌀	DIAMETER

AUTOCAD FILE ~T-506000.DWG

Notes

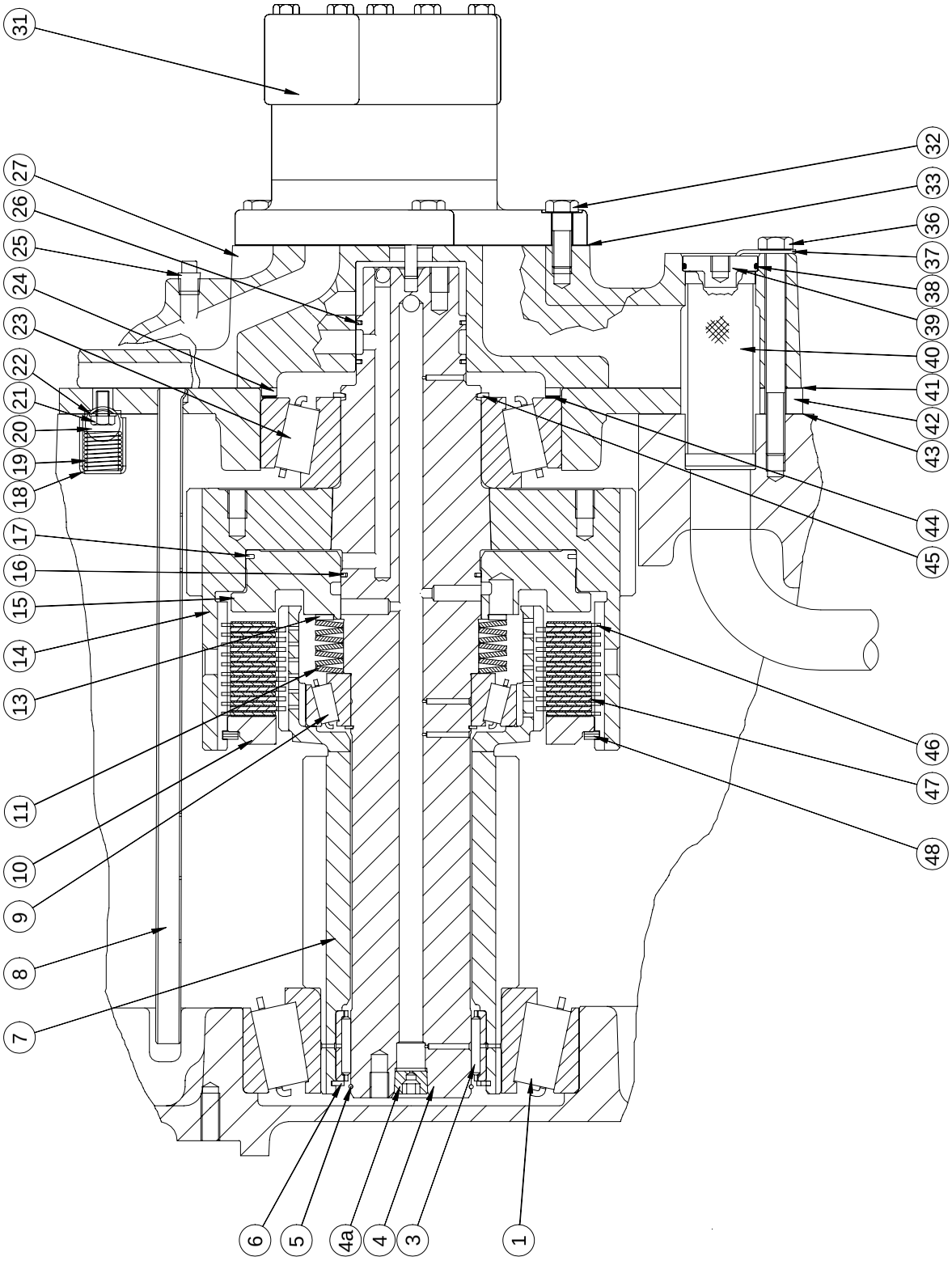
Illustrations

List of Illustrations

The following pages include illustrations that are specific to this model. The illustrations included are listed below.

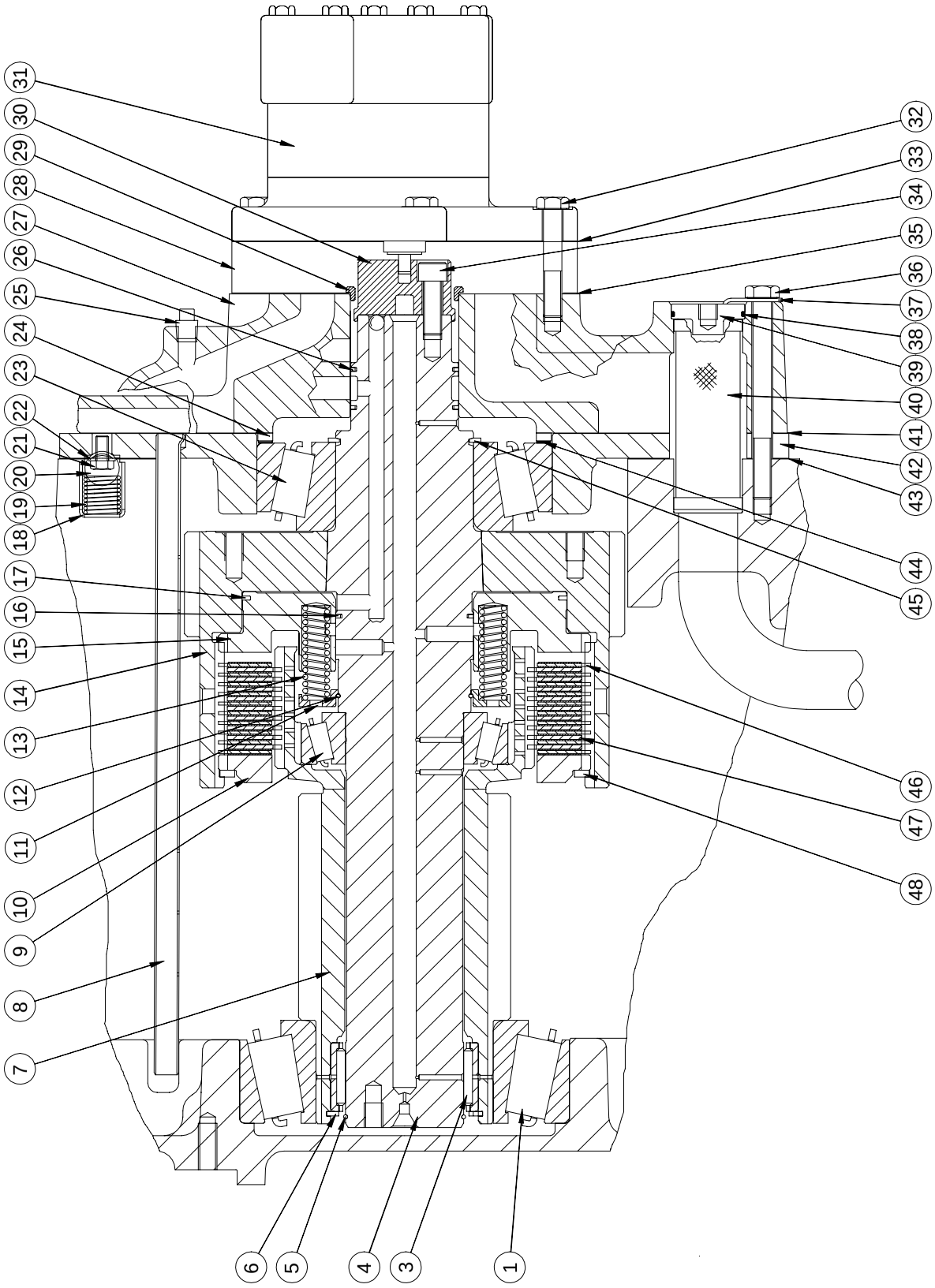
Note: Any part numbers listed in the following illustrations are for reference only. Please refer to your bill of material for part numbers specific to your model.

Clutch Group - Assemblies 1018375 and 1018375A



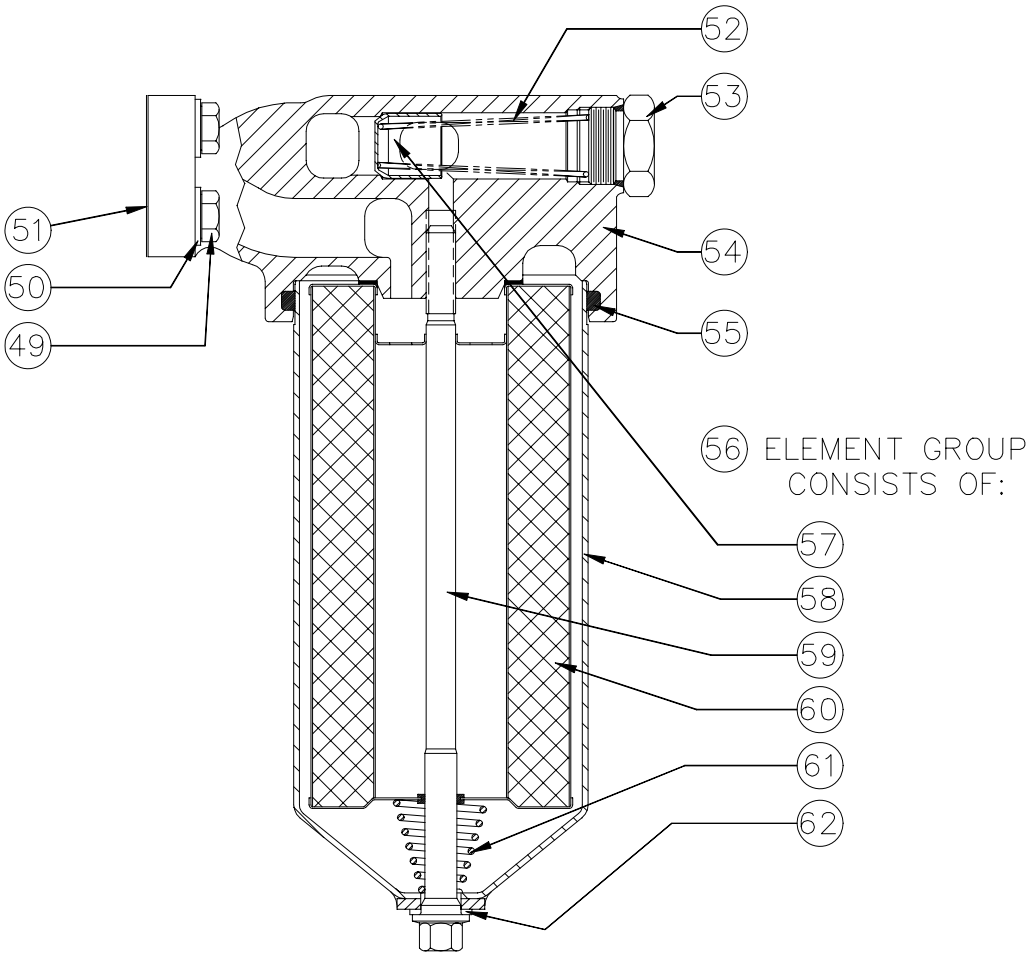
Item	Qty.	Description
1	2	Bearing, tapered roller (primary & secondary shaft front bearing)
3	2	Bearing, needle roller
4	1	Shaft assembly, secondary
4a	1	Plug, orifice (some models)
5	2	Ring, external retaining (primary & secondary shaft @ needle bearing)
6	2	Ring, internal retaining (pinion @ needle bearing)
7	2	Pinion assembly, (primary & secondary)
8	1	Tube, lube
9	2	Bearing, tapered roller (primary & secondary pinion rear bearing)
10	2	Backplate, clutch
11	14	Spring, belleville (clutch release)
13	2	Retainer, spring
14	1	Gear, transfer (secondary shaft, LH helix)
15	2	Piston, clutch
16	2	Ring, piston (clutch piston inner)
17	2	Ring assembly, piston (clutch piston outer)
18	1	Housing (lube relief valve)
19	1	Spring, compression (lube relief valve)
20	1	Ball, steel (lube relief valve)
21	2	Screw, hex head (lube relief valve)
22	2	Washer (lube relief valve)
23	2	Bearing, tapered roller (primary & secondary shaft rear bearing)
24	2	Spacer, bearing
25	1	Plug, pipe (temperature sensor port)
26	4	Ring, piston (primary and secondary shaft)
27	1	Manifold
31	1	Pump, oil
32	4	Screw, hex head cap (oil pump)
33	1	Gasket, oil pump
36	2	Screw, hex head cap (suction strainer cover)
37	1	Plate, clamp (suction strainer cover)
38	1	O-ring (suction strainer cover)
39	1	Cover, suction strainer
40	1	Strainer, suction
41	1	Gasket, manifold
42	1	Carrier, bearing
43	1	Gasket, bearing carrier
44	AR	Shim, bearing (.005 , .007 , .020) (primary & secondary shaft bearing adjustment)
45	2	Ring, external retaining (primary & secondary shaft @ rear bearing)
46	20	Plate, clutch friction
47	18	Plate, clutch steel
48	2	Ring, internal retaining (clutch backplate)

Clutch Group - Assemblies 1018375B, 1018375C



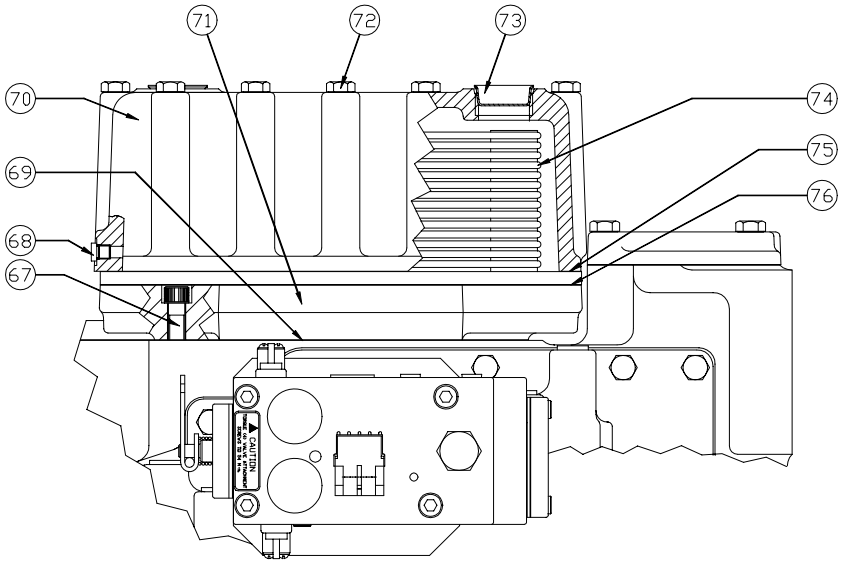
Item	Qty.	Description
1	2	Bearing, tapered roller (primary & secondary shaft front bearing)
3	2	Bearing, needle roller
4	1	Shaft assembly, secondary
5	2	Ring, external retaining (primary & secondary shaft @ needle bearing)
6	2	Ring, internal retaining (pinion @ needle bearing)
7	2	Pinion assembly, (primary & secondary)
8	1	Tube, lube
9	2	Bearing, tapered roller (primary & secondary pinion rear bearing)
10	2	Backplate, clutch
11	2	Retainer, spring (primary & secondary shaft)
12	2	Ring, external retaining (primary & secondary shaft @ spring retainer)
13	32	Spring, compression (clutch release)
14	1	Gear, transfer (secondary shaft, LH helix)
15	2	Piston, clutch
16	2	Ring, piston (clutch piston inner)
17	2	Ring assembly, piston (clutch piston outer)
18	1	Housing (lube relief valve)
19	1	Spring, compression (lube relief valve)
20	1	Ball, steel (lube relief valve)
21	2	Screw, hex head (lube relief valve)
22	2	Washer (lube relief valve)
23	2	Bearing, tapered roller (primary & secondary shaft rear bearing)
24	2	Spacer, bearing
25	1	Plug, pipe (temperature sensor port)
26	4	Ring, piston (primary and secondary shaft)
27	1	Manifold
28	1	Spacer, oil pump
29	1	Pilot, spacer
30	1	Adapter, pump drive
31	1	Pump, oil
32	4	Screw, hex head cap (oil pump)
33	1	Gasket, oil pump
34	2	Screw, socket head cap (pump drive adapter)
35	1	Gasket, oil pump spacer
36	2	Screw, hex head cap (suction strainer cover)
37	1	Plate, clamp (suction strainer cover)
38	1	O-ring (suction strainer cover)
39	1	Cover, suction strainer
40	1	Strainer, suction
41	1	Gasket, manifold
42	1	Carrier, bearing
43	1	Gasket, bearing carrier
44	AR	Shim, bearing (.005 , .007 , .020) (primary & secondary shaft bearing adjustment)
45	2	Ring, external retaining (primary & secondary shaft @ rear bearing)
46	20	Plate, clutch friction
47	18	Plate, clutch steel
48	2	Ring, internal retaining (clutch backplate)

Oil Filter

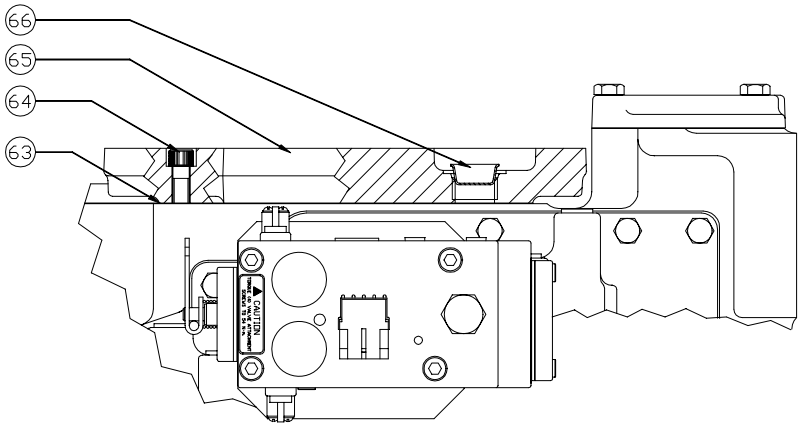


Item	Qty.	Description
49	4	Screw, hex head cap
50	4	Washer, flat
51	1	Gasket (filter head mounting)
52	1	Spring, compression (filter differential pressure bypass)
53	1	Plug assembly (includes O-ring)
54	1	Filter head
55	1	O-ring (filter body to filter head)
56	1	Element group (consists of items 57 through 62)
57	1	Poppet
58	1	Body
59	1	Bolt
60	1	Element
61	1	Spring, compression
62	1	Washer, sealing

Optional Heat Exchangers



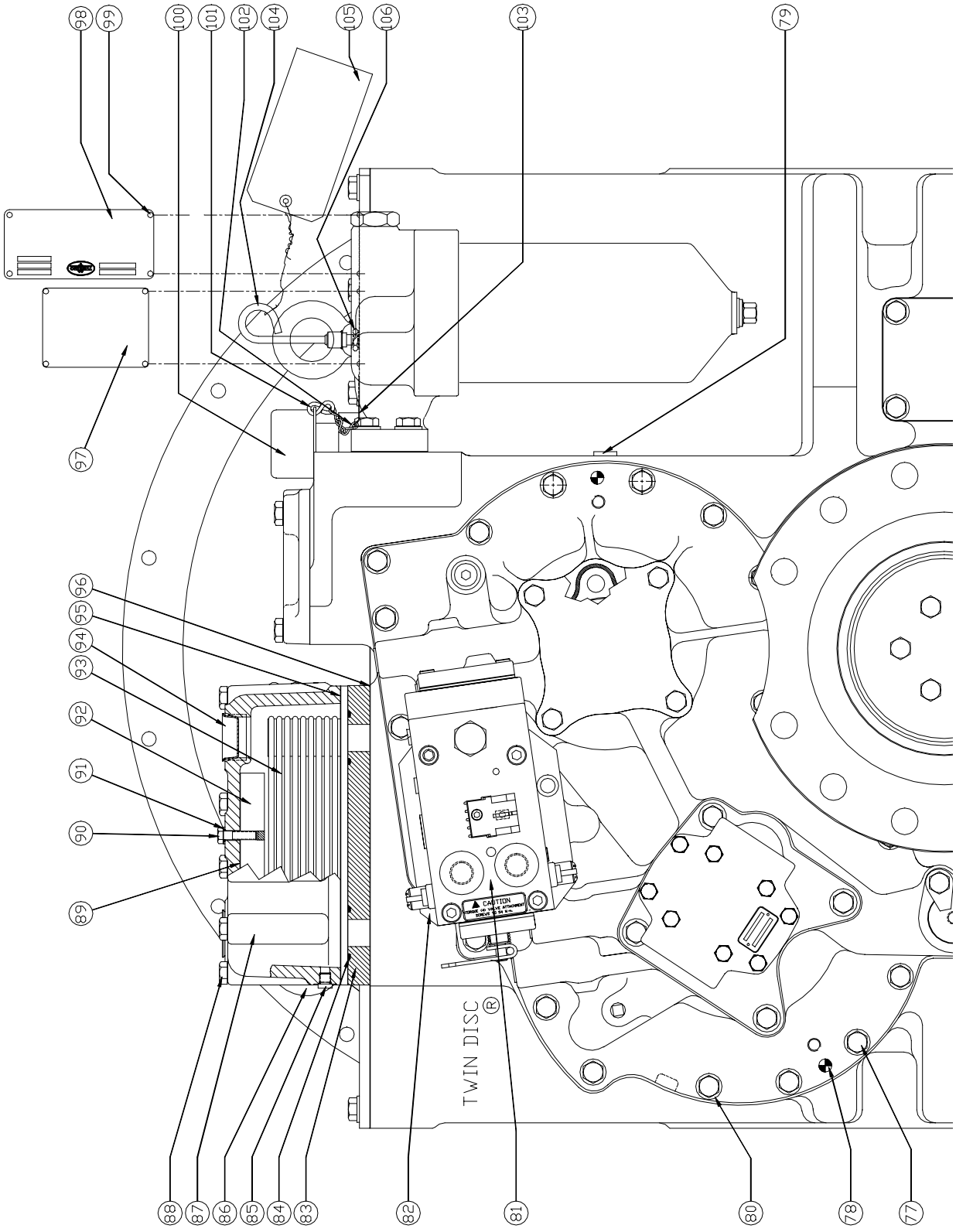
OPTIONAL FRESH WATER HEAT EXCHANGER



OPTIONAL DITCH PLATE FOR CUSTOMER SUPPLIED HEAT EXCHANGER

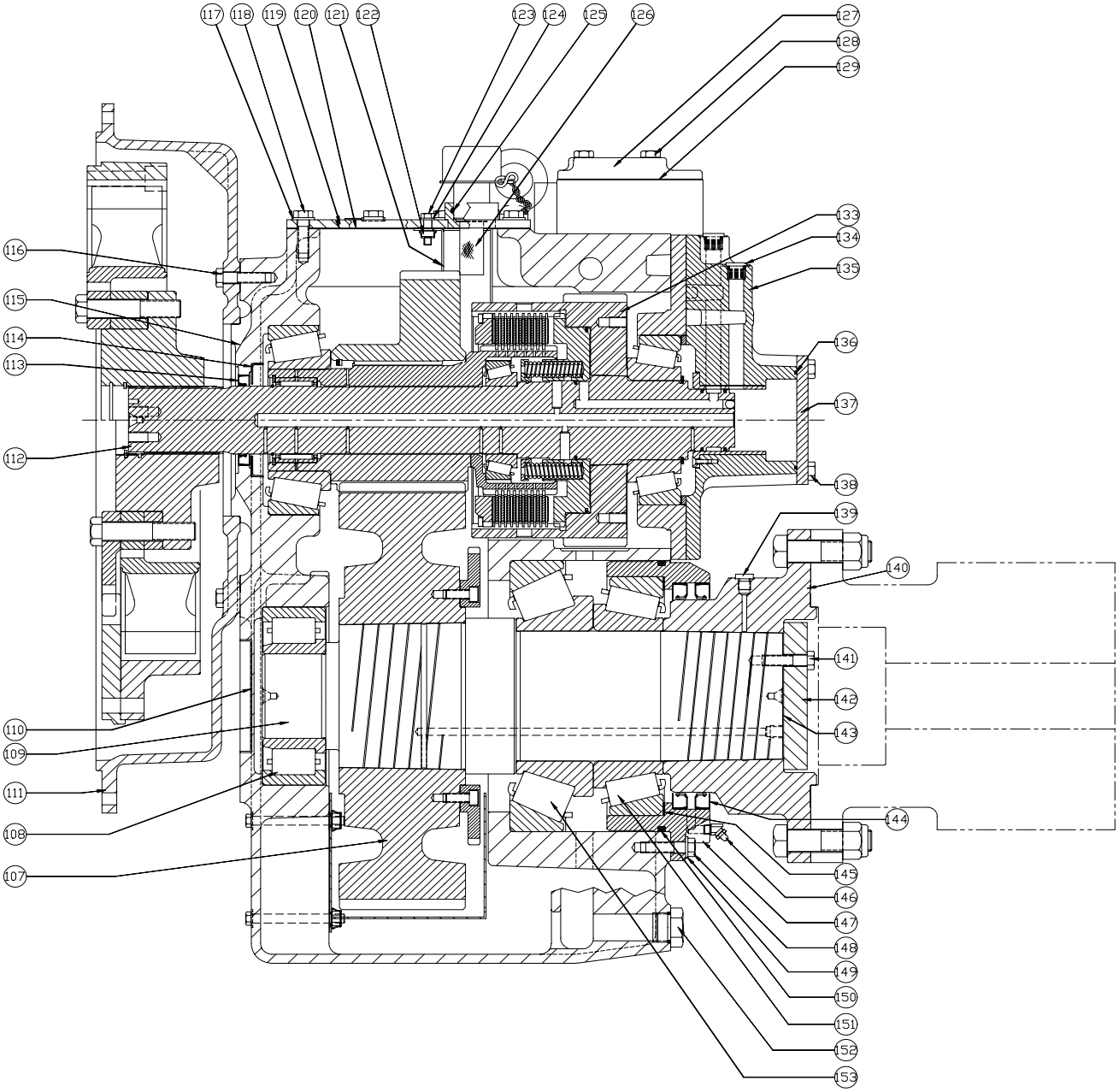
Item	Qty.	Description
63	1	Gasket (adapter plate mounting)
64	12	Screw, socket head cap
65	1	Plate, adapter
66	2	Closure (oil ports)
67	12	Screw, socket head cap
68	1	Plug, O-ring (water drain)
69	1	Gasket (adapter plate mounting)
70	1	Housing, heat exchanger
71	1	Plate, adapter
72	14	Screw, hex head cap
73	2	Closure (water ports)
74	1	Exchanger (heat exchanger element)
75	1	Gasket (heat exchanger housing)
76	1	Gasket (heat exchanger element)

Transmission Rear View



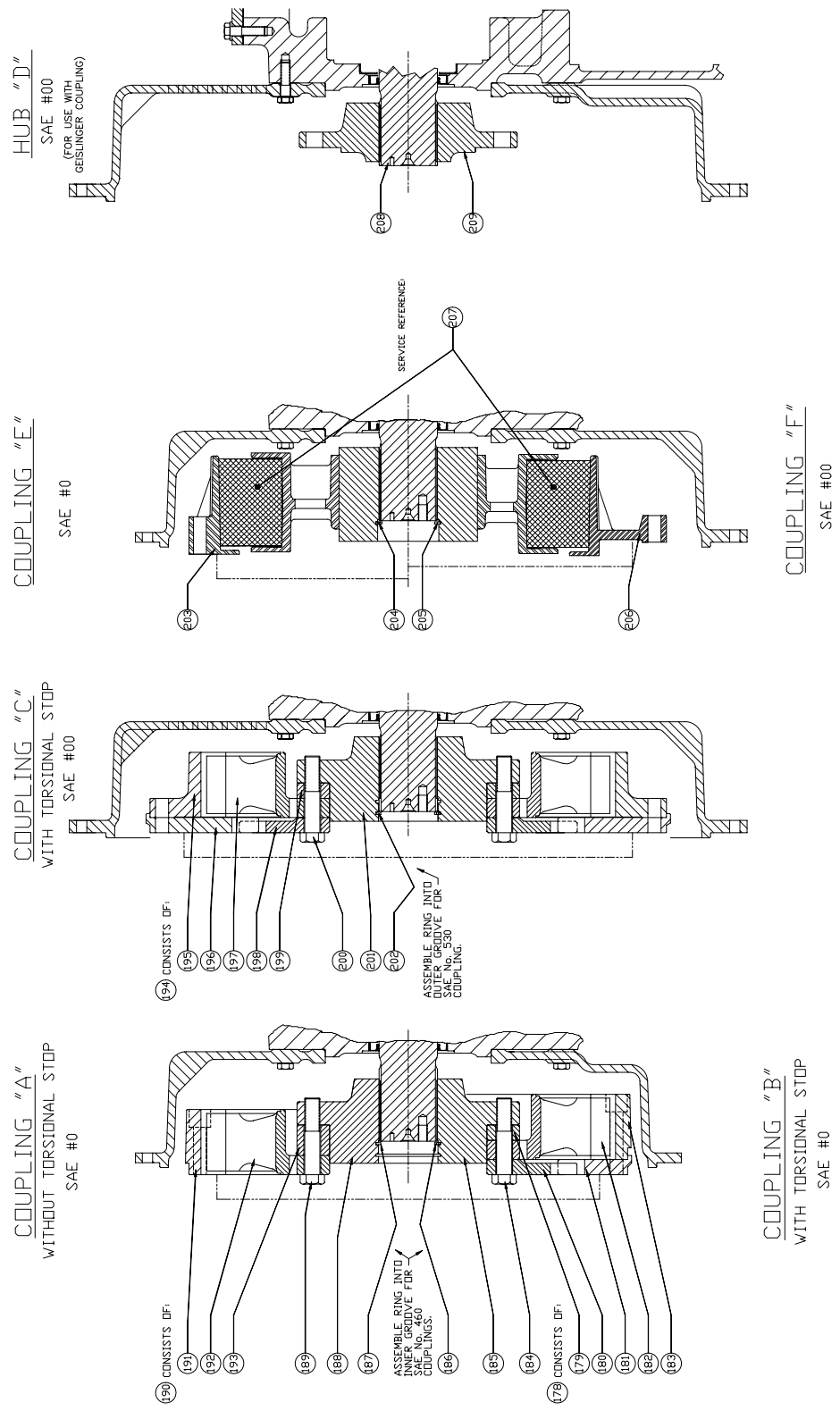
Item	Qty.	Description	Item	Qty.	Description
77	18	Capscrew, hex head (manifold)	92	1	Anode, heat exchanger
78	2	Pin, dowel (manifold & bearing carrier)	93	1	Housing (lube relief valve)
79	1	Plug, O-ring (M16x1.5 speed ports)	94	1	Heat exchanger, raw water
80	19	Washer, flat	95	1	Gasket, heat exchanger housing
81	1	Control valve assembly	96	1	Gasket, stiffener plate
82	1	Adapter plate, gaskets and screws (electric control valve models only)	97	1	Plate, instruction (lube)
			98	1	Plate, instruction (identification)
83	1	Plate, stiffener	99	8	Screw, drive (instruction plate)
84	2	O-ring	100	1	Breather
85	1	Plug, O-ring (raw water drain)	101	1	S -link
86	2	Eyebolt, lifting	102	1	Chain
87	1	Housing, raw water heat exchanger	103	1	Clip
88	12	Capscrew, hex head (heat exchanger)	104	1	Gauge, oil level
89	1	Gasket, anode	105	1	Tag, oil gauge
90	1	Capscrew, hex head (anode)	106	1	Tube assembly, oil level gauge
91	1	Washer, sealing			

Transmission Section View



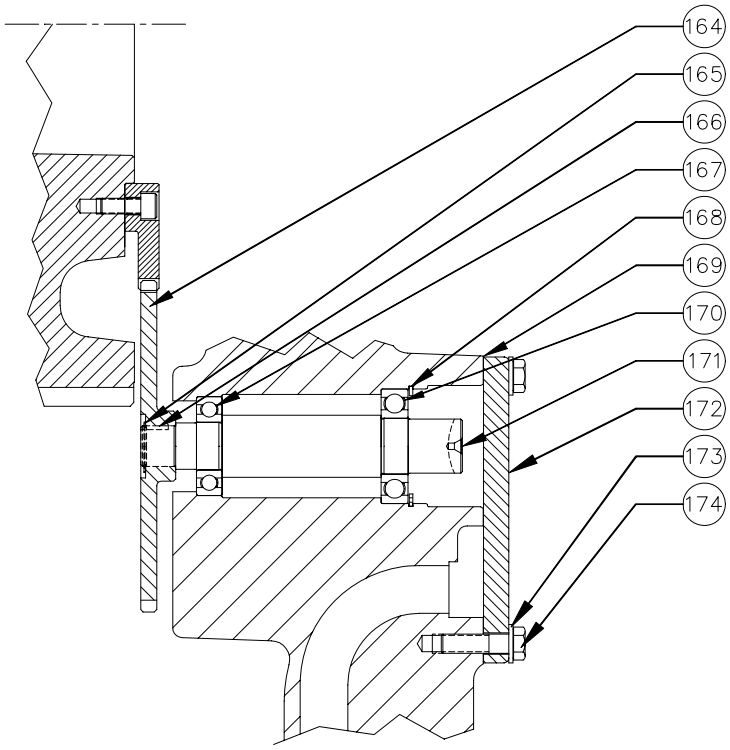
Item	Qty.	Description	Item	Qty.	Description
107	1	Gear, output	133	1	Gear, transfer (primary shaft, RH helix)
108	1	Bearing, roller (output shaft front)	134	4	Plug, O-ring (M18x1.5 pressure test ports)
109	1	Shaft, output			
110	1	Plug, expansion	135	1	Manifold
111	1	Housing, front	136	1	O-ring (primary shaft end cover)
112	1	Shaft assembly, primary	137	1	Cover, primary shaft end
113	1	Seal, input oil	138	4	Screw, hex head cap (primary shaft end cover)
114	1	Plug, seal protector			
115	1	Housing assembly	139	1	Plug, O-ring (flange removal oil injection port)
116	19	Screw, hex head cap (SAE 0 front housing)			
	21	Screw, hex head cap (SAE 00 front housing)	140	1	Flange, output
117	24	Washer, flat	141	5	Screw, hex head cap (output flange)
118	24	Screw, hex head cap (top cover)	142	1	Washer, retaining (output flange)
119	1	Cover assembly, top	143	AR	Shim, retaining washer (0.005", 0.007", 0.020")
120	1	Gasket, top cover			
121	1	Baffle assembly	144	2	Seal, output oil
122	3	Nut, caged	145	AR	Shim, bearing (0.005", 0.007', 0.020")
123	3	Screw, hex head cap (baffle)	146	1	Fitting, grease
124	3	Washer, sealing	147	1	Carrier, output oil seal
125	1	O-ring (breather cap)	148	6	Screw, hex head cap (output seal carrier)
126	1	Screen, oil filler	149	6	Washer, flat
127	1	Plate, cover (PTO valve location)	150	1	O-ring (output seal carrier)
128	4	Screw, hex head cap (PTO valve cover)	151	1	Bearing, tapered roller (output shaft rear)
129	1	Gasket, PTO valve cover	152	1	Plug, O-ring (M33x2 oil drain)
			153	1	Bearing, tapered roller

Torsional Input Coupling



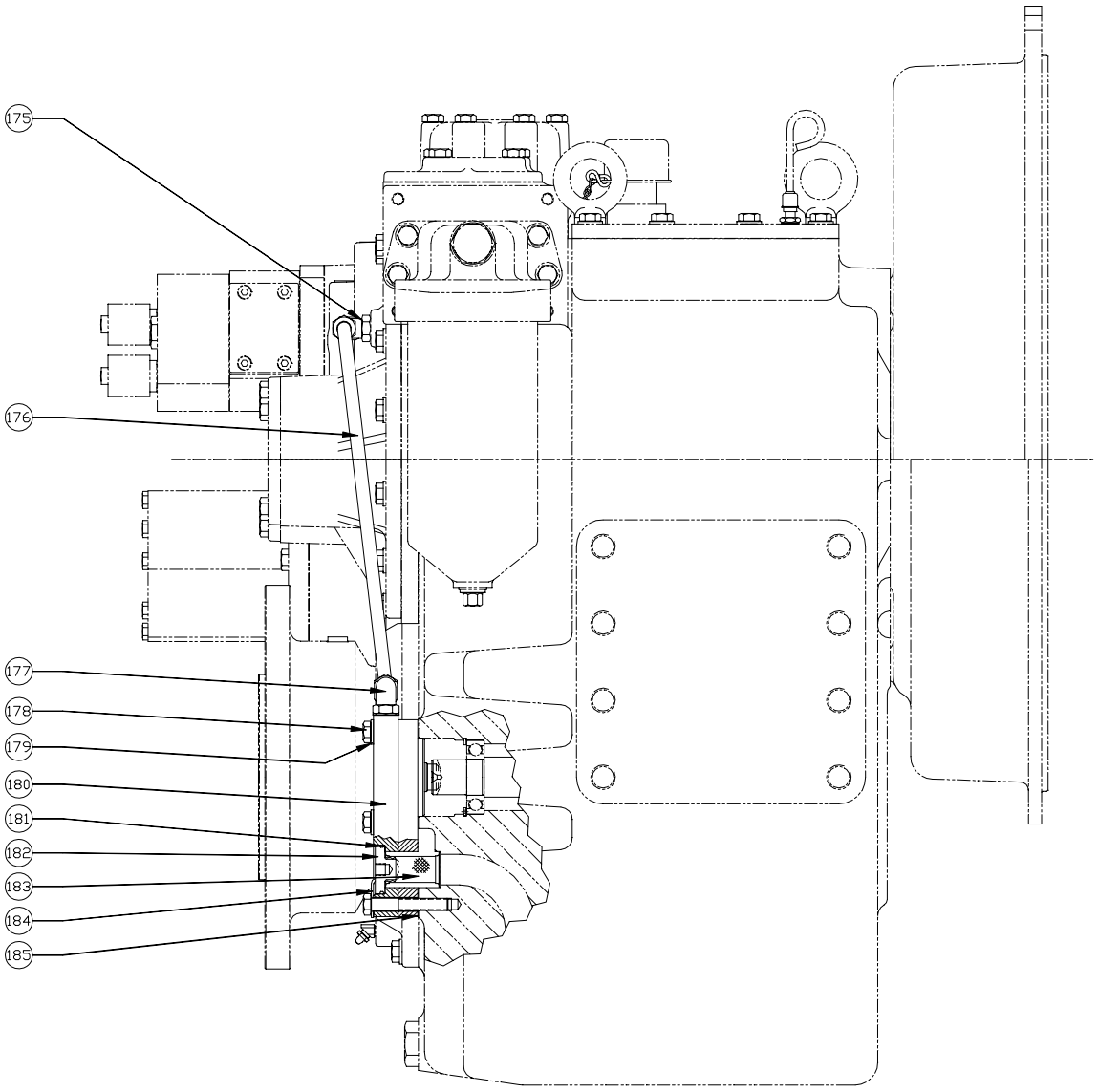
Item	Qty.	Description
178	1	Coupling assembly, SAE #0 w/ torsional stop (consists of items 179 through 183)
179	1	Ring, spacer
180	1	Plate, inner fail safe
181	1	Plate, outer fail safe
182	1	Element, coupling
183	1	Ring, drive
184	16	Screw, hex head cap (coupling hub)
185	1	Hub, coupling
186	1	Ring, internal retaining
187	1	Ring, internal retaining
188	1	Hub, coupling
189	16	Screw, hex head cap (coupling hub)
190	1	Coupling assembly, SAE #0 w/out torsional stop (consists of items 191 through 193)
191	1	Ring, drive
192	1	Element, coupling
193	1	Ring, spacer
194	1	Coupling assembly, SAE #00 w/ torsional stop (consists of items 195 through 199)
195	1	Ring, drive
196	1	Plate, outer fail safe
197	1	Element, coupling
198	1	Plate, inner fail safe
199	1	Ring, spacer
200	16	Screw, hex head cap (coupling hub)
201	1	Hub, coupling
202	1	Ring, internal retaining
203	1	Coupling assembly, SAE #0
204	1	Ring, internal retaining
205	1	Ring, internal retaining
206	1	Coupling assembly, SAE #00
207	1	Element (to service item 203 or 206)
208	1	Shaft assembly, primary clutch (for use with Geislinger coupling hub)
209	1	Hub, coupling

Trailing Pump Shaft Group



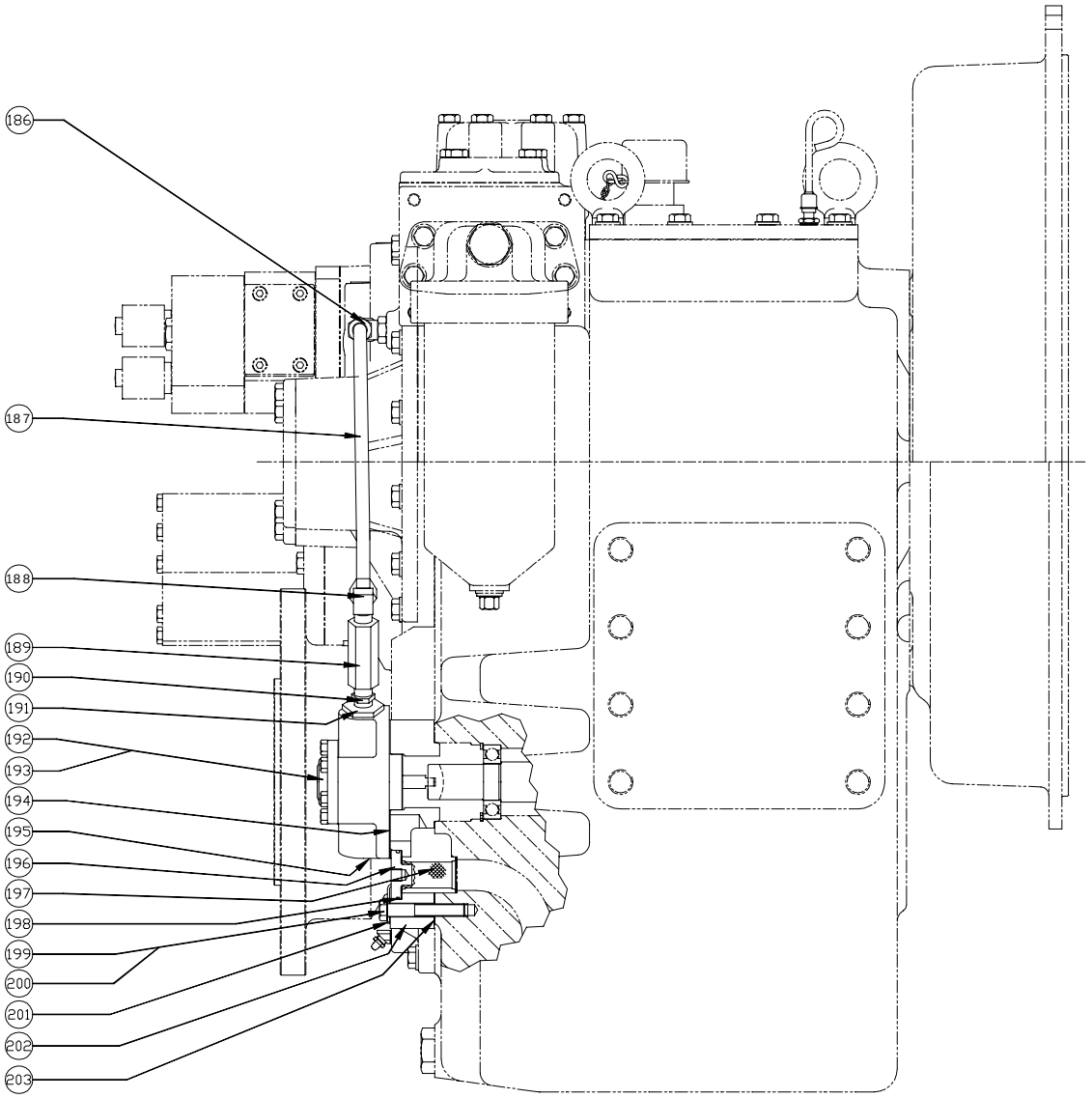
Item	Qty.	Description
164	1	Gear, trailing pump driven
165	1	Ring, external retaining
166	1	Key
167	1	Bearing, ball
168	1	Ring, internal retaining
169	1	Gasket, cover plate
170	1	Bearing, ball
171	1	Shaft, trailing pump drive
172	1	Plate, cover
173	5	Washer, flat
173	5	Screw, hex head cap (cover plate)

Trailing Pump - Gerotor Style (optional equipment)



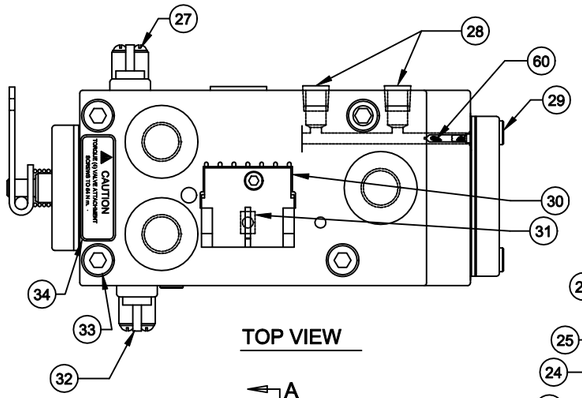
Item	Qty.	Description
175	1	Fitting, elbow adapter
176	1	Tube, lubrication
177	1	Fitting, elbow adapter
178	5	Screw, hex head cap (trailing pump)
179	4	Washer, flat
180	1	Pump, trailing
181	1	O-ring, suction strainer cover
182	1	Cover, suction strainer
183	1	Strainer, suction
184	1	Plate, clamp (suction strainer cover)
185	1	Gasket, trailing pump

Trailing Pump - Crescent Style (optional equipment)

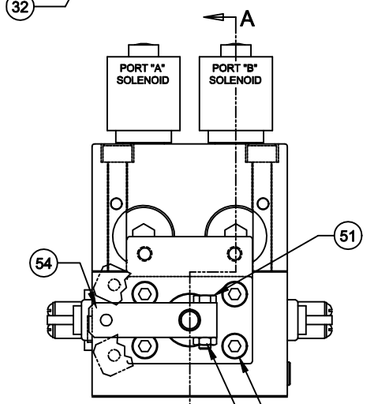


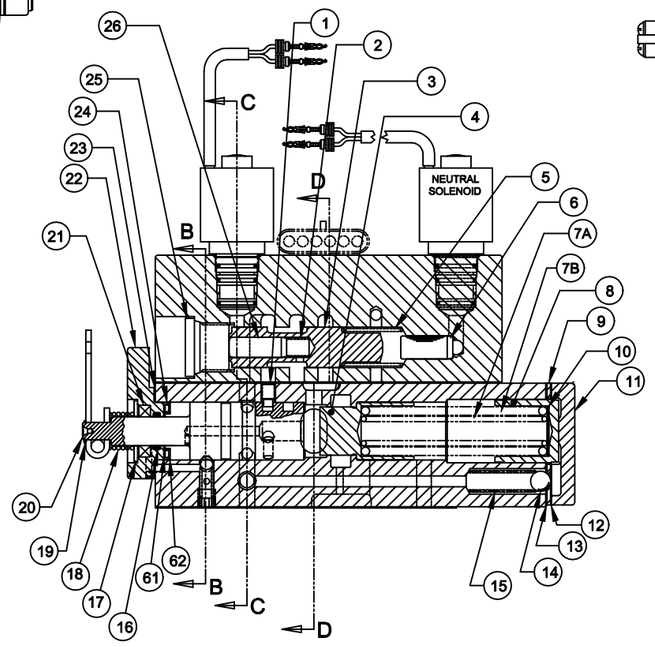
Item	Qty.	Description
186	1	Fitting, elbow adapter
187	1	Tube, lubrication
188	1	Fitting, elbow adapter
189	1	Check valve
190	1	Nipple, pipe
191	1	Fitting, reducer bushing
192	1	Pump, trailing
193	4	Screw, hex head cap (trailing pump to adapter)
194	1	Gasket, trailing pump
195	1	Pipe plug, trailing pump
196	1	Cover, suction strainer
197	1	Strainer, suction
198	1	O-ring, suction strainer cover
199	1	Screw, hex head cap (adapter)
200	4	Screw, socket head cap (adapter)
201	1	Plate, clamp (suction strainer cover)
202	1	Adapter
203	1	Gasket, adapter

CONTROL VALVE GROUP

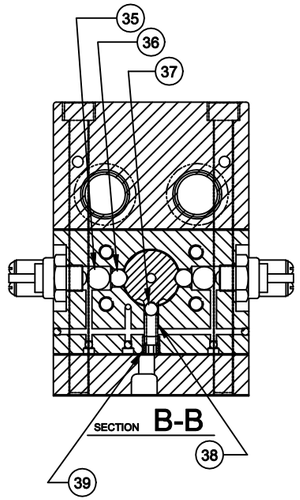


TOP VIEW

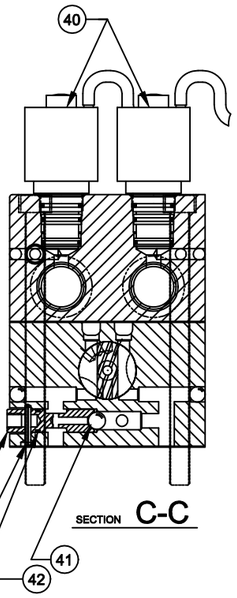




SECTION A-A

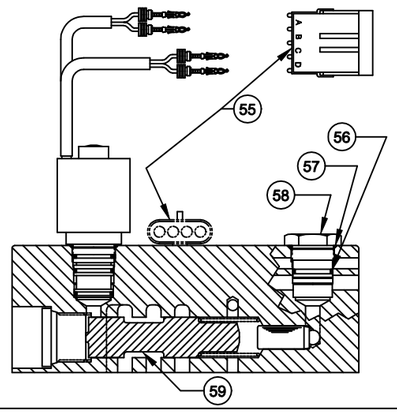


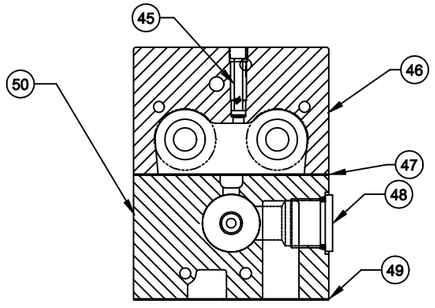
SECTION B-B



SECTION C-C

PARTS FOR UNITS WITHOUT NEUTRAL SOLENOID AND HYDRAULIC LOCK (OPTIONAL CONDITION)

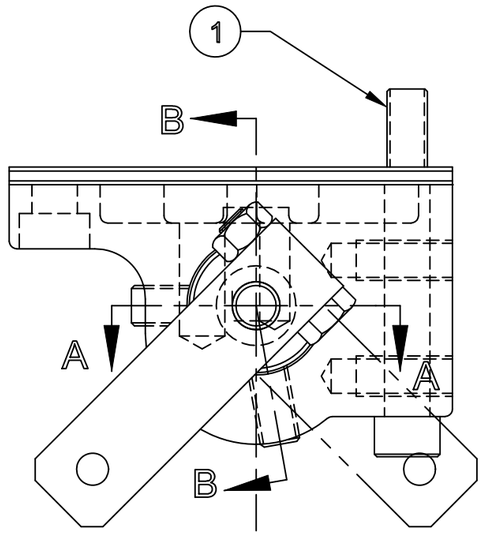


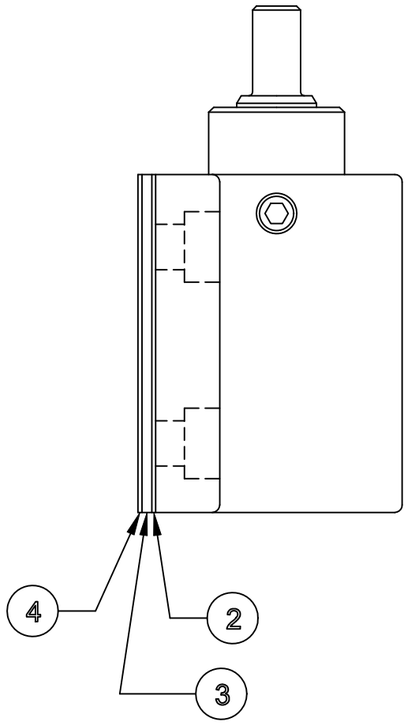


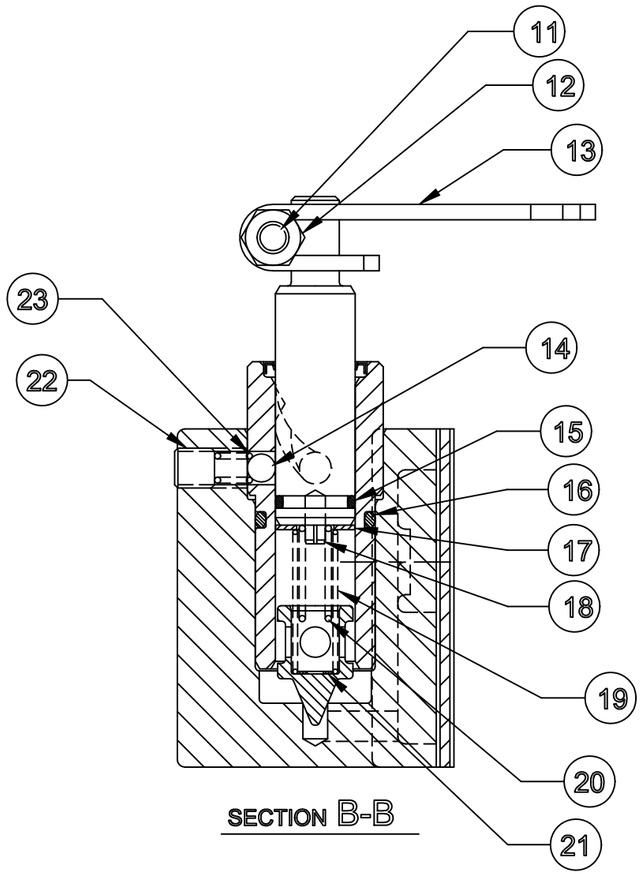
SECTION D-D

ITEM	NAME	Q'TY	REMARKS
1	SETSCREW	1	DOG POINT
2	SPRING	2	UNITS WITH HYD. LOCK
3	SPOOL	2	UNITS WITH HYD. LOCK
4	PISTON	1	
5	SPRING	2	
6	PIN	2	
7a	SPRING	1	INNER (PRESS. REGULATING)
7b	SPRING	1	OUTER (PRESS. REGULATING)
8	PISTON	1	
9	PLATE, ORIFICE	1	
10	SHIM	AS REQ'D	
11	COVER	1	
12	GASKET	1	COVER
13	GASKET	1	ORIFICE PLATE
14	BALL	1	
15	SPRING	1	NEUTRAL PRESS. REGULATING
16	"O" RING	1	
17	WASHER	1	
18	SPRING	1	
19	RING, SNAP	1	
20	STEM	1	
21	SEAL	1	
22	COVER	1	
23	GASKET	1	
24	THRUST BEARING	1	THRUST WASHER ON EARLIER UNITS
25	PLUG ASSEMBLY	2	
26	PIN	2	UNITS WITH HYD. LOCK
27	SWITCH	1	MANUAL OVERRIDE NEUTRAL START
28	PLUG	2	MAIN PRESSURE PORTS
29	SCREW	4	SOCKET HEAD
30	CONNECTOR, SHROUD	1	UNITS WITH HYD. LOCK
31	CLIP, CONNECTOR	1	
32	SWITCH	1	ELECTRIC CONTROL MODE
33	SCREW	4	SOCKET HEAD
34	PLATE	1	CAUTION
35	BALL	2	LARGE DIA.
36	BALL	2	SMALL DIA.
37	BALL	1	
38	SPRING	1	DETENT
39	SETSCREW	1	
40	SOLENOID	2	3 REQ'D. FOR UNITS WITH HYD. LOCK
41	BALL	1	SHUTTLE
42	"O"RING	1	
43	PIN	1	
44	SEAT	1	
45	SCREEN	1	
46	VALVE BODY	1	
47	GASKET	1	VALVE BODY HALF
48	PLUG ASSEMBLY	1	SOME MODELS
49	GASKET	1	
50	VALVE BODY	1	
51	SCREW	1	HEX. HEAD
52	SCREW	4	SOCKET HEAD
53	NUT	1	
54	LEVER	1	
55	CONNECTOR, SHROUD	1	UNITS WITHOUT HYD. LOCK
56	"O" RING	1	UNITS WITHOUT HYD. LOCK
57	"O" RING	1	UNITS WITHOUT HYD. LOCK
58	PLUG	1	UNITS WITHOUT HYD. LOCK
59	SPOOL	2	UNITS WITHOUT HYD. LOCK
60	SCREEN	1	ROR ORIFICE PROTECTION
61	THRUST RACE	1	COVER SIDE - UNITS WITH THRUST BEARING
62	THRUST RACE	1	STEM SIDE - UNITS WITH THRUST BEARING

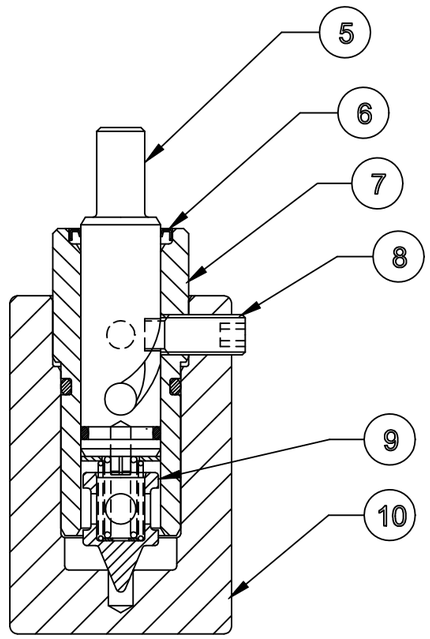
Notes







SECTION B-B



SECTION A-A

TROLLING VALVE GROUP

ITEM	N A M E	Q'TY	REMARKS
1	SCREW	2	SOCKET HEAD
2	GASKET	1	BODY
3	PLATE, ORIFICE	1	
4	GASKET	1	PLATE
5	STEM	1	
6	SEAL	1	
7	ADAPTER	1	
8	SETSCREW	1	DOG POINT
9	PISTON	1	
10	VALVE BODY	1	
11	SCREW	1	HEX. HEAD
12	NUT	1	
13	LEVER	1	
14	BALL	1	
15	"O" RING	1	
16	"O" RING	1	
17	WASHER	1	SOME MODELS
18	PIN	1	
19	SPRING	1	OUTER
20	SPRING	1	INNER
21	WASHER	1	SOME MODELS
22	SETSCREW	1	
23	SPRING	1	DETENT

Notes

Engineering Drawings

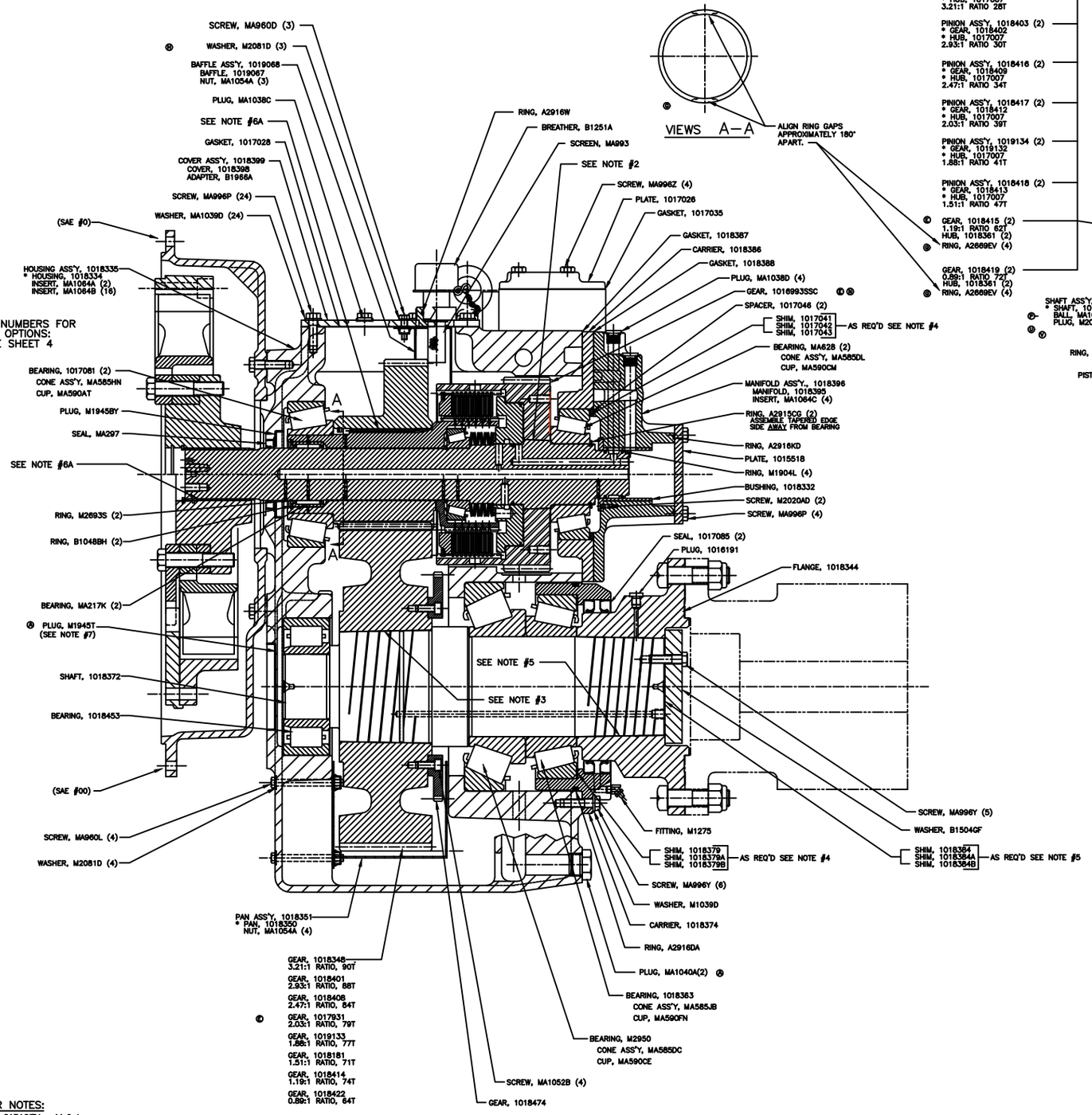
List of Engineering Drawings

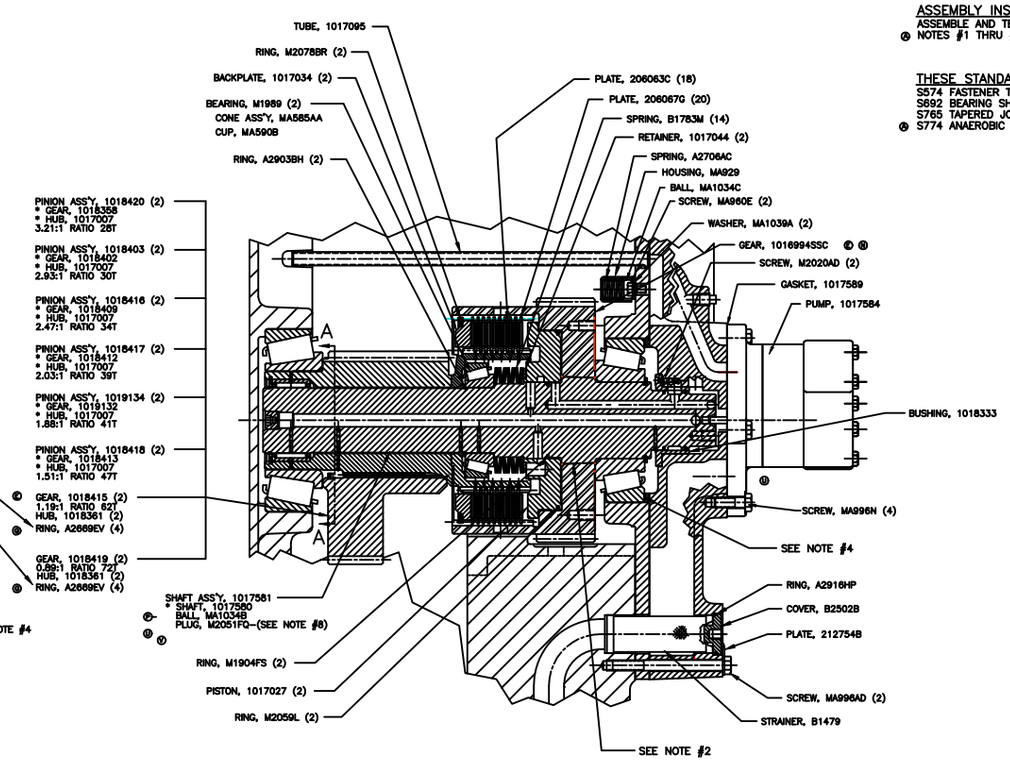
The following pages include the engineering drawings that are specific to this model. The engineering drawings included are listed below and continue on the following page.

Note: Any part numbers listed in the following engineering drawings are for reference only. Please refer to your bill of material for part numbers specific to your model.

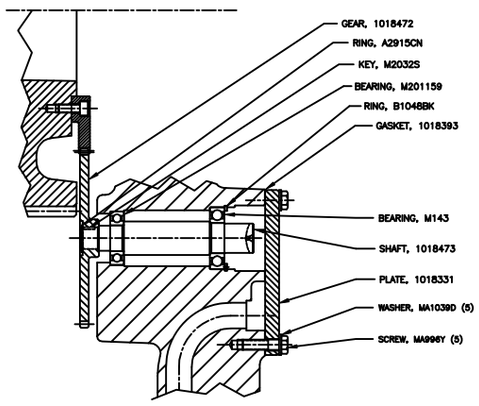
- ❑ 1018375 (sheet 1 of 4) Marine transmission
- ❑ 1018375 (sheet 2 of 4) Marine transmission
- ❑ 1018375 (sheet 3 of 4) Marine transmission
- ❑ 1018375 (sheet 4 of 4) Marine transmission
- ❑ 1018375A (sheet 1 of 1) Marine transmission
- ❑ 1018375B&C (sheet 1 of 4) Marine transmission
- ❑ 1018375B&C (sheet 2 of 4) Marine transmission
- ❑ 1018375B&C (sheet 3 of 4) Marine transmission
- ❑ 1018375B&C (sheet 4 of 4) Marine transmission
- ❑ A7119AA Hydraulic diagram
- ❑ 1018084 Control valve assembly (without trolling valve)
- ❑ 1018085 Control valve assembly (with trolling valve)
- ❑ 1017555 Valve assembly, mechanical trolling
- ❑ 1017554 Valve assembly, electric trolling
- ❑ 1018554 Integral trailing pump option

- ❑ 1016473 Remote trailing pump assembly
- ❑ 1020514 Trailing pump assembly





SECONDARY SHAFT



SECTION B–B
(SEE SHEET 2)

ASSEMBLY INSTRUCTIONS:
ASSEMBLE AND TEST PER S570AJ.
NOTES #1 THRU #8 ARE IN S570AJ.

THESE STANDARDS APPLY:
S574 FASTENER TORQUE REQUIREMENTS
S692 BEARING SHIMMING
S765 TAPERED JOINT ASSEMBLY
S774 ANAEROBIC SEALANT APPLICATION

CUSTOMER NOTES:

a.) OIL CAPACITY : 41.6 L
b.) THIS UNIT CAN NOT BE USED WITH A LEFT HAND ENGINE.
c.) OPTIONAL EQUIPMENT:
- COMPANION FLANGE ASSEMBLY: 1018682
- MANUAL TROLLING VALVE KIT: 1017555
- ELECTRIC TROLLING VALVE KIT: 1017554
- ELECTRIC VALVE WITH MECHANICAL BACKUP (12 VDC): 1018084Y
- LIVE PTO: 1017177A (AUXILIARY PUMP DRIVE)
- HYDRAULIC CLUTCHED P.T.O. : 1017820C
- FLEXIBLE COUPLING INPUTS–SEE SHEET 5.
- KIT BOM # K1195 (METRIC TO NPTF ADAPTER KIT, INTEGRAL HEAT EXCHANGER)
- KIT BOM # K1254 (METRIC TO NPTF ADAPTER KIT, REMOTE HEAT EXCHANGER)
- FRESH WATER OIL COOLER – SEE SHEET 2
- DITCH PLATE FOR CUSTOMER SUPPLIED OIL COOLER – SEE SHEET 2
- MOUNTED TRAILING PUMP KIT: 1018554.
- REMOTE TRAILING PUMP: 1016473
- OIL TEMPERATURE INDICATING SWITCH: B3424, FOR INSTALLATION LOCATION SEE HYDRAULIC DIAGRAM AND SHEET 3.

* NOT SERVICEABLE SEPERATELY.
▲ REMOVE BEFORE OPERATING, 2 PLACES, CLOSURES.

GEAR RATIOS:
3.21:1
2.93:1
2.47:1
2.03:1
1.88:1
1.51:1
1.19:1
0.89:1

CONSULT SALES DEPT. APPLICATION ENGINEERS FOR OTHER LIMITING CONDITIONS.

OBSOLETE FOR PRODUCTION, REPLACED BY 1018375B FOR SERVICE.

2	F	C–4	29266	4–9–99	1&2	M	---	29876	3–3–00	4	T	---	30354	9–27–00									
1	E	C–4 E1–E–2	29049	1–20–99	1	L	B–1	29805	12–22–99	4	S	---	30304	8–31–00									
2	D	B–4	29042	1–11–99	1	K	E–1	29712	11–4–99	2	R	---	30169	6–15–00									
1	C	E1	29035	12–18–98	1&3	J	---	29639	10–13–99	4	Q	B–3	29923	4–10–00	1	W	A–2	30418	11–2–00				
1,2,3	B		28834	10–6–98	1&2	H	---	29447	7–15–99	1	P	B–6	29995	4–3–00	1	V	C–4	30402	11–1–00				
	A		28813	9–22–98	1&2	G	C–3 C–5	29349	5–14–99	1	N	C–3 A–5	29974	3–16–00	1	U	B–4	30353	10–5–00				
SHT.NO.	REV	ZONE	CH. NO.	DATE	SHT.NO.	REV	ZONE	CH. NO.	DATE	SHT.NO.	REV	ZONE	CH. NO.	DATE	SHT.NO.	REV	ZONE	CH. NO.	DATE				

MATERIAL	
HEAT TREAT	
SURFACE TREATMENT	
WEIGHT	970 kg
FIRST USE	
ASSY.	
MODEL	
NAME	MG–6650SC MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X. ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE	8–19–98
SCALE	.375=1.00
DRN.	RM
CHK.	ALC
APPD.	DAS

TWIN DISC INCORPORATED
RACINE, WI 53403 – USA

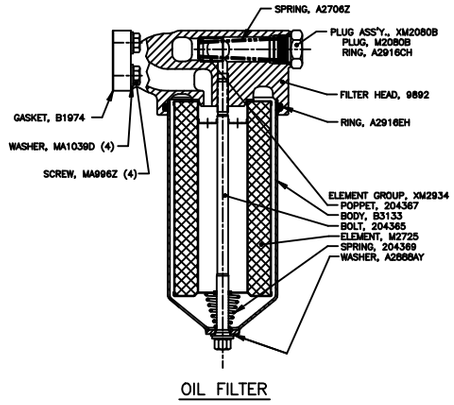
1018375

SHEET 1 OF 4 REV W

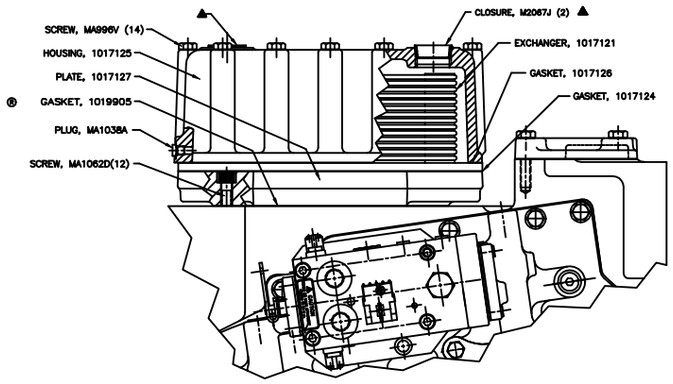
SHEET 1 OF 4	CROSS SECTION AND PART NUMBERS
SHEET 2 OF 4	CROSS SECTION AND PART NUMBERS
SHEET 3 OF 4	INSTALLATION DRAWING
SHEET 4 OF 4	FLEXIBLE COUPLING INPUTS
B3504AU	MASS ELASTIC SYSTEM
B3649M	HEAT EXCHANGER REQUIREMENTS
A7119AA	HYDRAULIC DIAGRAM

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

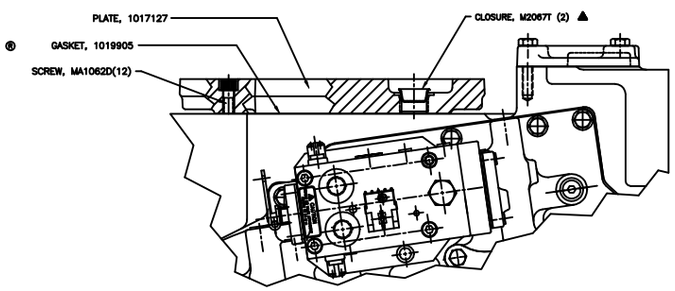
6 5 4 3 2 1
E D C B A



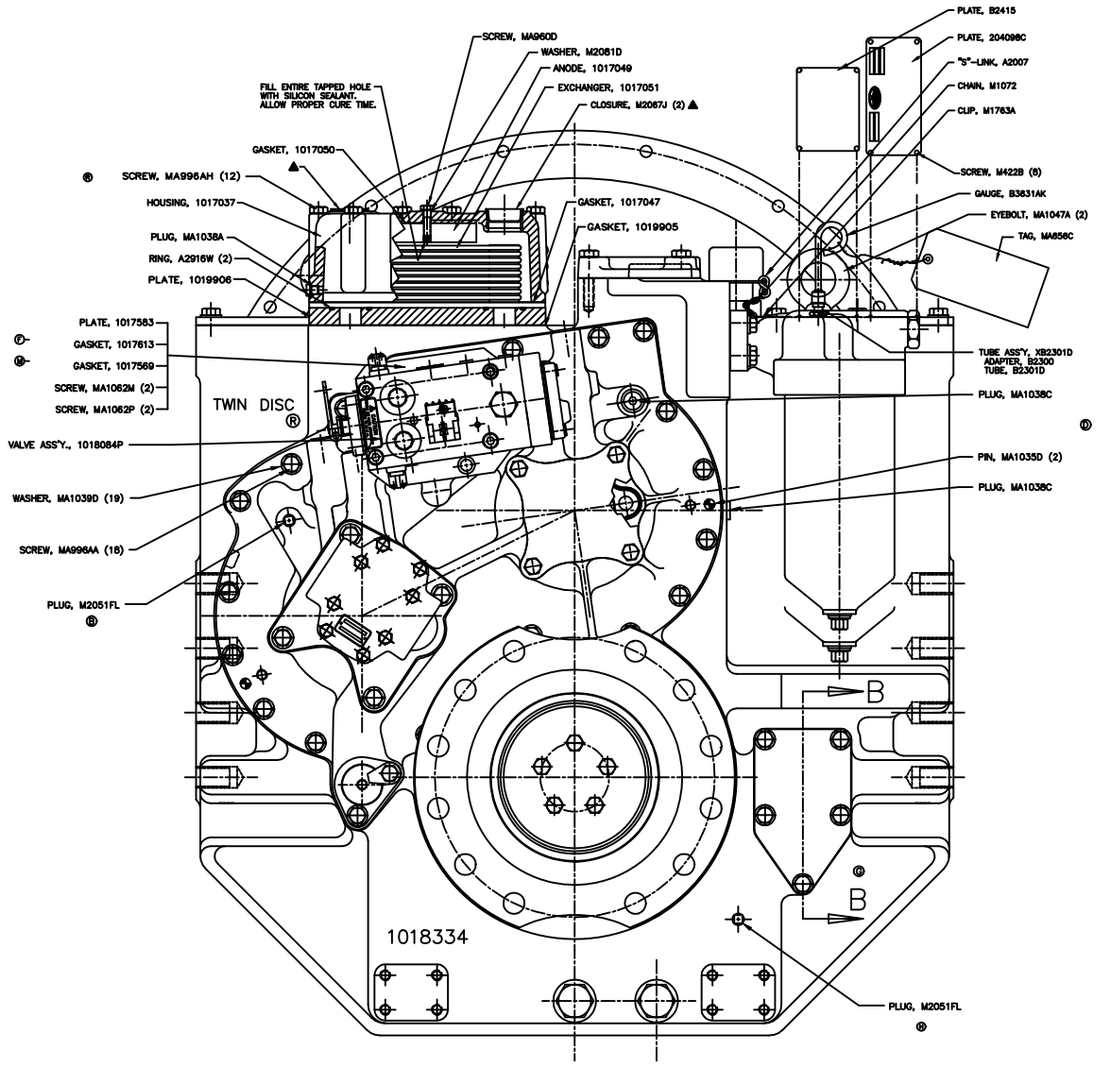
OIL FILTER



OPTIONAL FRESH WATER HEAT EXCHANGER



OPTIONAL DITCH PLATE FOR CUSTOMER SUPPLIED HEAT EXCHANGER



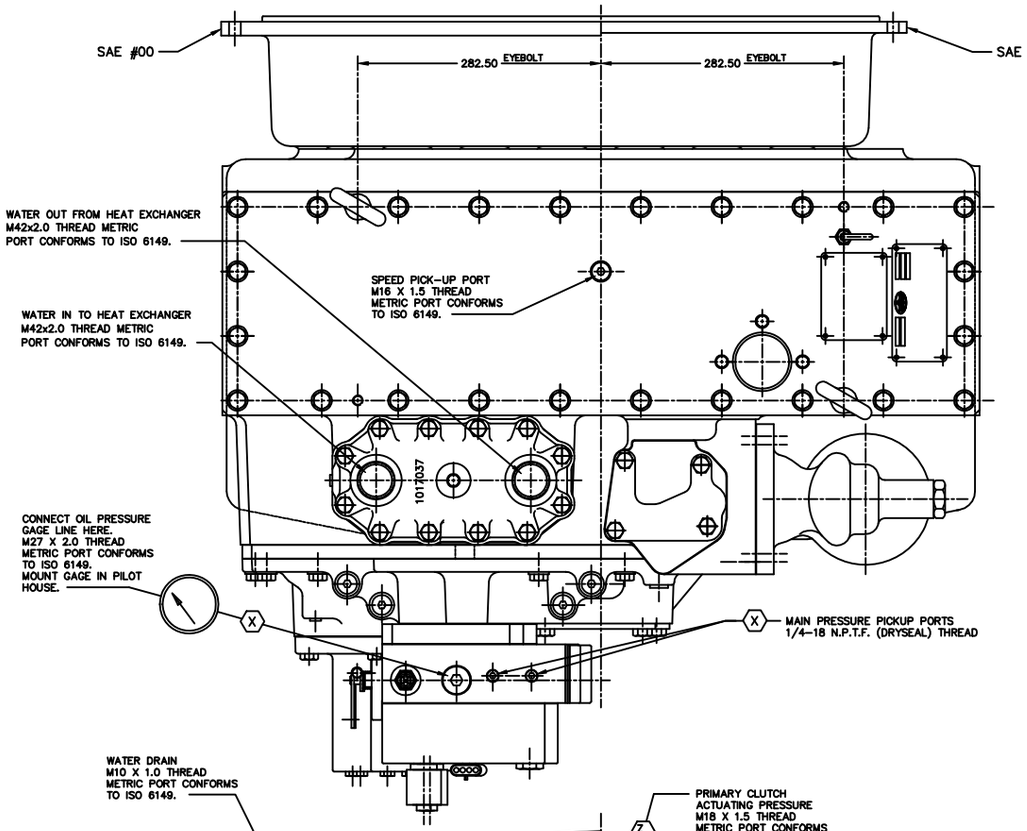
OBSOLETE FOR PRODUCTION, REPLACED BY 1018375B FOR SERVICE. Ⓦ

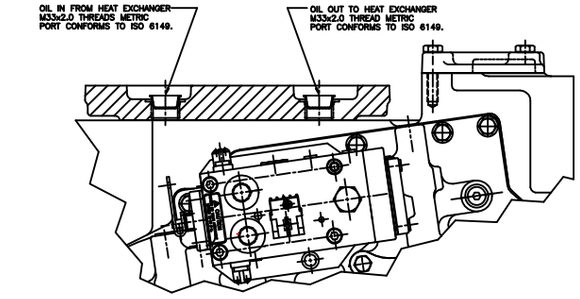
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg / lb
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ASME Y14.5M 1982
FIRST USE
ASSY.
MODEL
NAME MG–6650SC MARINE TRANSMISSION
DATE 8–19–98
SCALE .375=1.00
DRN. RM
CHK. ALC
APPD. DAS
TWIN DISC INCORPORATED RACINE, WI 53403 – USA
1018375
SHEET 2 OF 4 REV W

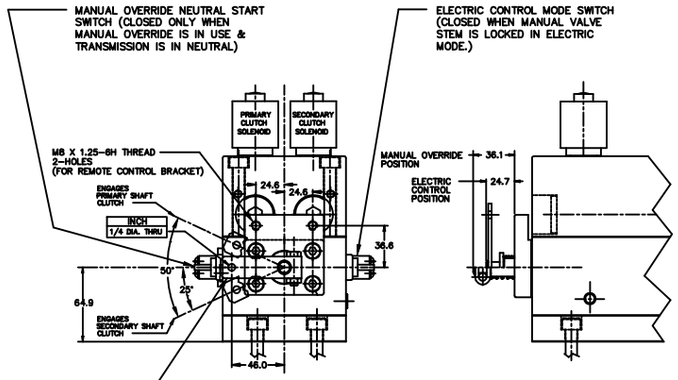
E D C B A

6 5 4 3 2 1



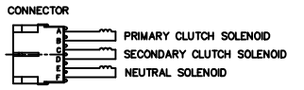


OPTIONAL DITCH PLATE FOR CUSTOMER SUPPLIED HEAT EXCHANGER

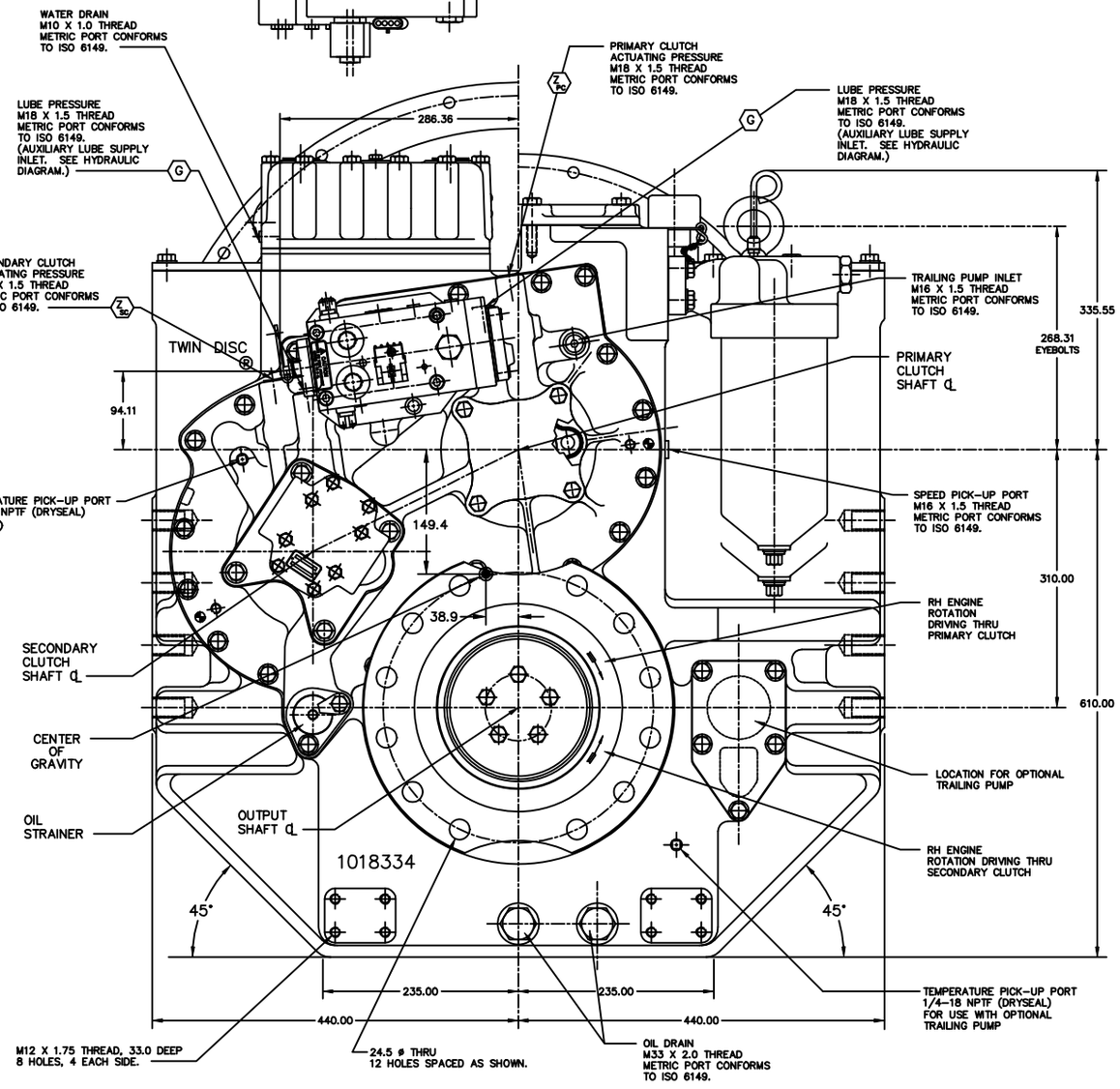


DETAIL OF SELECTOR VALVE

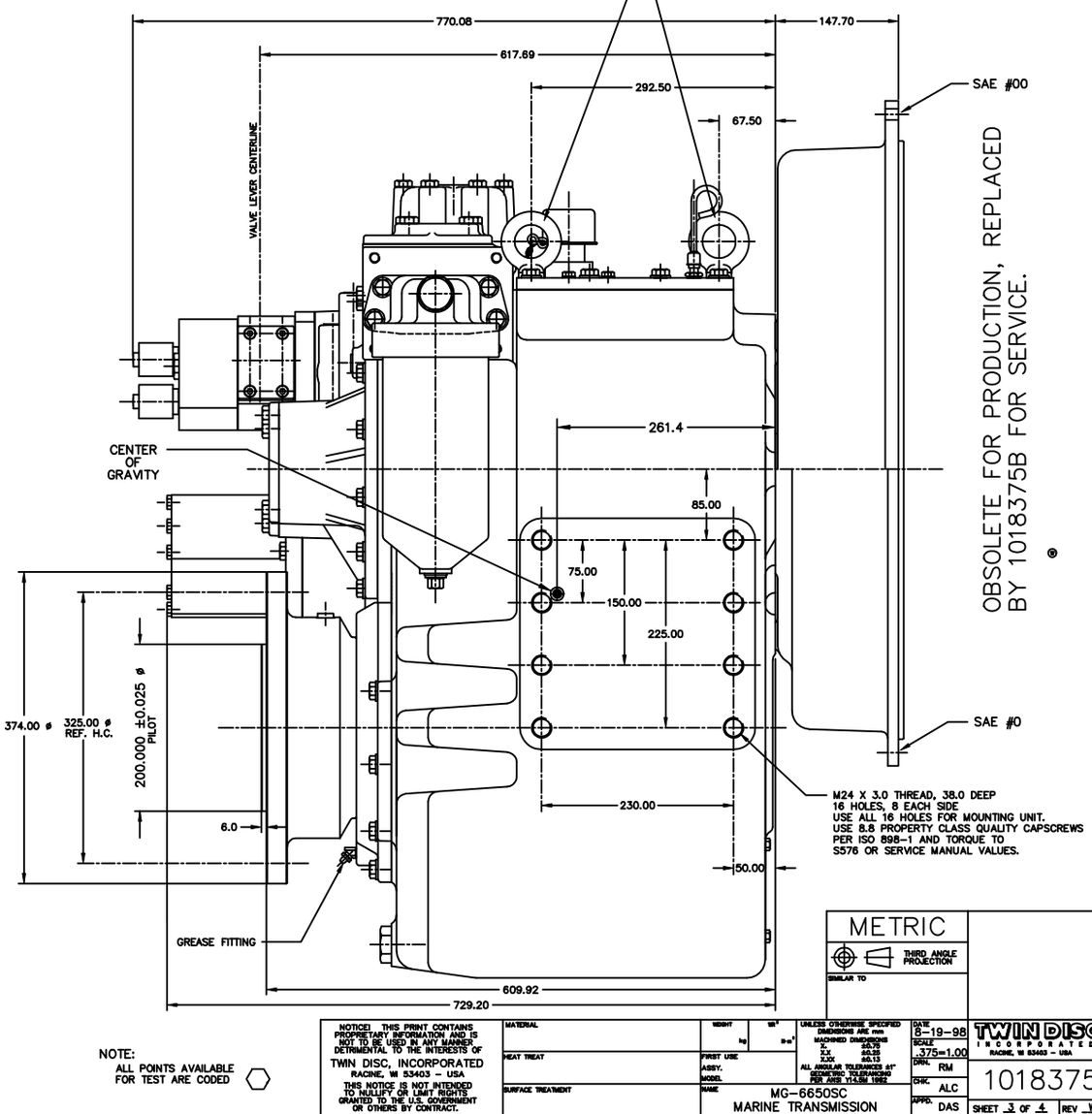
WIRING DIAGRAM:



OPTIONAL:
MATING WIRING HARNESS 1017403 SERIES (SPECIFY LENGTH).



EYEBOLTS (2) FOR LIFTING MARINE TRANSMISSION EQUALIZE LOAD ON BOTH EYEBOLTS TO LIFT MARINE TRANSMISSION ONLY.



OBSOLETE FOR PRODUCTION, REPLACED BY 1018375B FOR SERVICE.

NOTE:
ALL POINTS AVAILABLE FOR TEST ARE CODED ⬡

M24 X 3.0 THREAD, 38.0 DEEP
16 HOLES, 8 EACH SIDE
USE ALL 16 HOLES FOR MOUNTING UNIT.
USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S576 OR SERVICE MANUAL VALUES.

MATERIAL	
WEIGHT	kg / lbs
HEAT TREAT	
FIRST USE	
ASSY.	
MODEL	
NAME	MG-6650SC MARINE TRANSMISSION
SURFACE TREATMENT	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE	6-19-98
SCALE	.375=1.00
DRN.	RM
CHK.	ALC
APPD.	DAS

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

TWIN DISC INCORPORATED RACINE, WI 53403 – USA

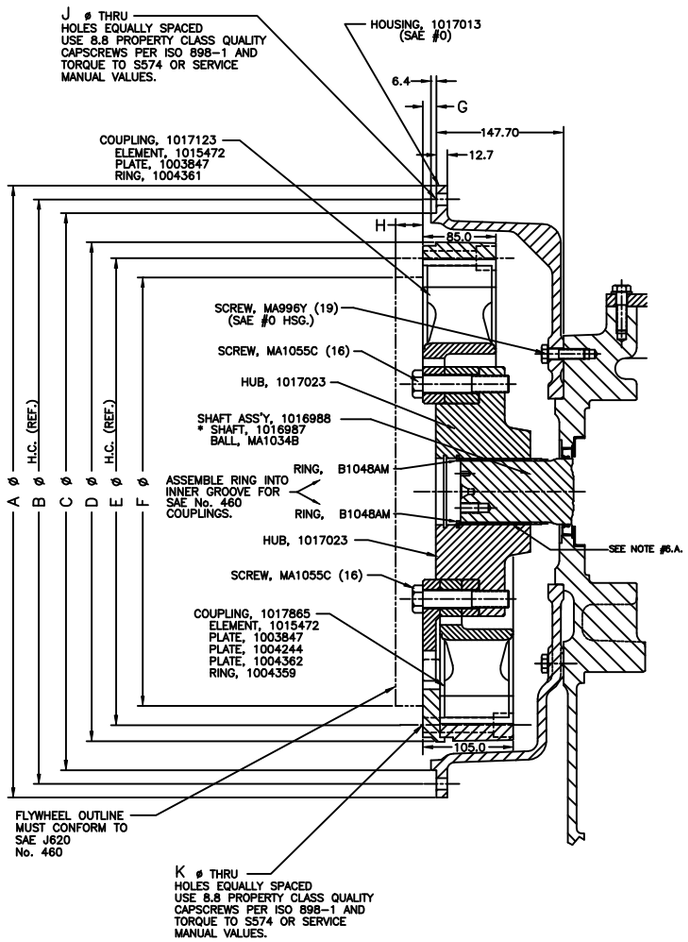
1018375

SHEET 3 OF 4 | REV W

E D C B A

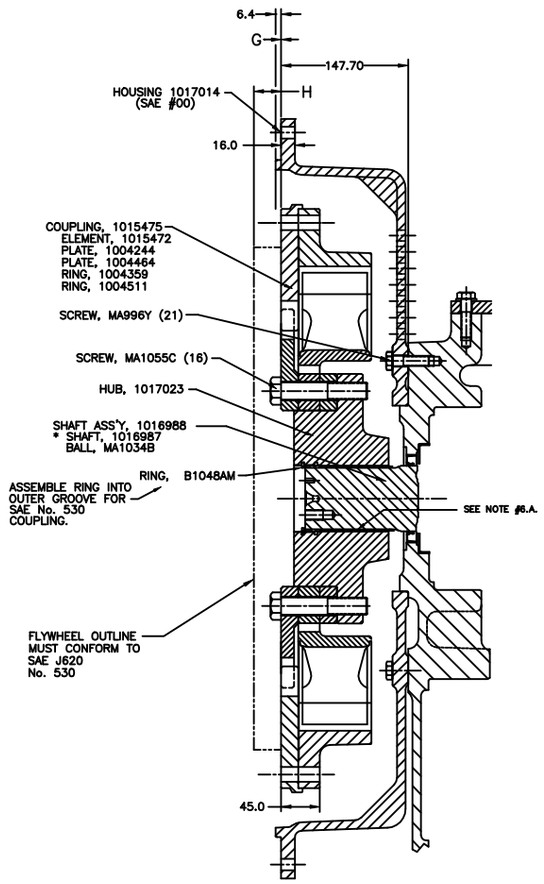
6 5 4 3 2 1

COUPLING "A"
WITHOUT TORSIONAL STOP

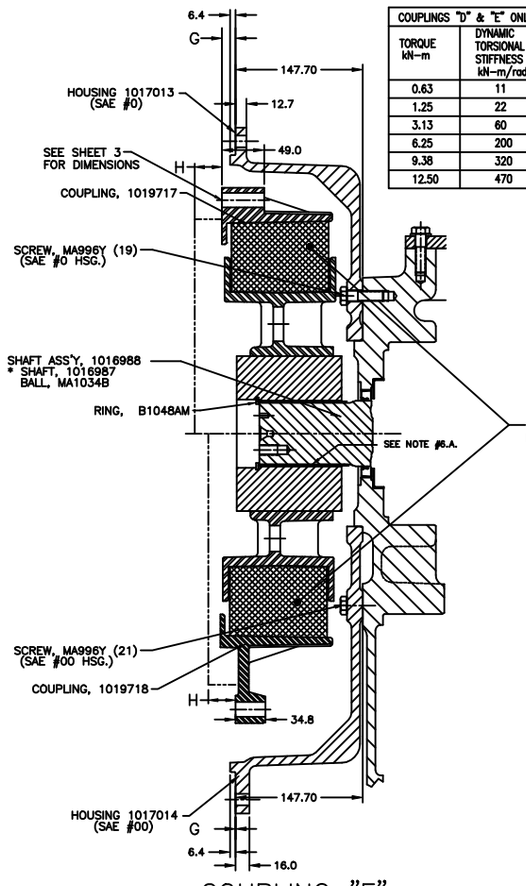


COUPLING "B"
WITH TORSIONAL STOP

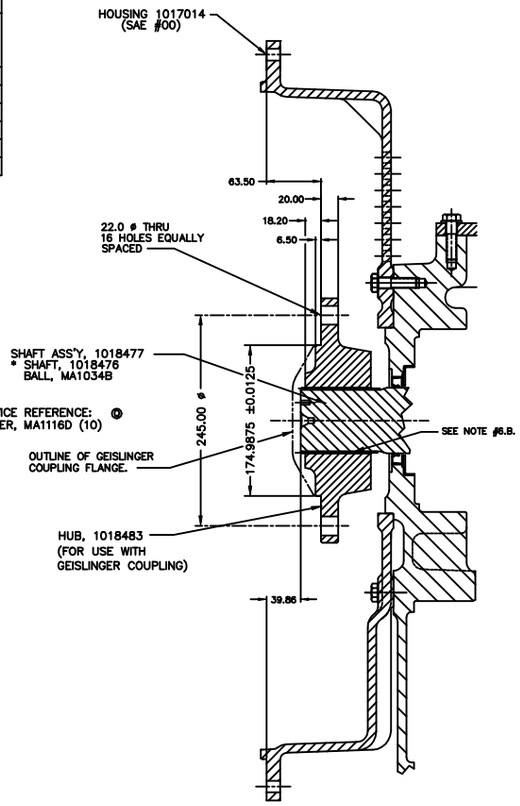
COUPLING "C"
WITH TORSIONAL STOP



COUPLING "E"



COUPLINGS "D" & "E" ONLY	
TORQUE kN-m	DYNAMIC TORSIONAL STIFFNESS kN-m/rad
0.63	11
1.25	22
3.13	60
6.25	200
9.38	320
12.50	470



HUB "D"

COUPLING "F"

COUPLING	SAE J620 FLYWHEEL SIZE	COUPLING NO.	MAX. COUPLING rpm *	NOMINAL TORQUE kN-m	DYNAMIC TORSIONAL STIFFNESS	COUPLING WR² kg-m²	
						OUTER PARTS	INNER PARTS
E	NO. 460	CF-R-510-018 -60161-HR	2800	12.50	PER CHART	0.94	0.589
F	NO. 530	CF-R-510-021 -60164-HR	2500	12.50	PER CHART	1.06	0.589

©

OBSOLETE FOR PRODUCTION, REPLACED BY 1018375B FOR SERVICE. ®

SAE No.	SAE J620 MARINE TRANSMISSION FLYWHEEL No.	A	B	C ±0.065	D ±0.035	E	F	G	H	J	K
0	460	711.0	679.45	647.635	571.5	542.9	498.3	15.7	31.8	16 OF 13.5	12 OF 17.0
00	530	883.0	850.90	787.335	673.1	641.4	584.2	0.0	31.8	16 OF 13.5	12 OF 17.0

* SEE SHEET 1 FOR MAXIMUM TRANSMISSION r.p.m.

THE WR² OF INNER PARTS INCLUDES HUB AND 1/4 SHAFT C_2.

FOR OTHER TRANSMISSION MASS ELASTIC DATA, REFER TO B3504AU.

FOR OTHER TRANSMISSION INSTALLATION DIMENSIONS, REFER TO 1018375, SHEET 3 .

COUPLING	COUPLING SIZE NO.	MAX. COUPLING R.P.M. (REF.)*	NOMINAL TORQUE (T_{TQN})	DYNAMIC TORSIONAL STIFFNESS	DYNAMIC TORSIONAL STIFFNESS (DYNAMIC TORSIONAL STIFFNESS TOLERANCE= $^{-20\%}_{+10\%}$)					WR²	
					0.10 T_{TQN}	0.25 T_{TQN}	0.50 T_{TQN}	0.75 T_{TQN}	1.00 T_{TQN}	OUTER PARTS	INNER PARTS
A	VL3411S	2400	8.00 kN·m (70.85x10³ lbf·in)		26.0 kNm/rad (.230 x 10⁶ lbf·in/rad)	31.0 kNm/rad (.274 x 10⁶ lbf·in/rad)	40.0 kNm/rad (.354 x 10⁶ lbf·in/rad)	59.0 kNm/rad (.522 x 10⁶ lbf·in/rad)	100.0 kNm/rad (.885 x 10⁶ lbf·in/rad)	1.08 kg·m² (3690 lb·in²)	0.78 kg·m² (2660 lb·in²)
B	VL3411S	2400	8.00 kN·m (70.85x10³ lbf·in)		26.0 kNm/rad (.230 x 10⁶ lbf·in/rad)	31.0 kNm/rad (.274 x 10⁶ lbf·in/rad)	40.0 kNm/rad (.354 x 10⁶ lbf·in/rad)	59.0 kNm/rad (.522 x 10⁶ lbf·in/rad)	100.0 kNm/rad (.885 x 10⁶ lbf·in/rad)	2.56 kg·m² (8750 lb·in²)	1.04 kg·m² (3545 lb·in²)
C	VL3411S	2400	8.00 kN·m (70.85x10³ lbf·in)		26.0 kNm/rad (.230 x 10⁶ lbf·in/rad)	31.0 kNm/rad (.274 x 10⁶ lbf·in/rad)	40.0 kNm/rad (.354 x 10⁶ lbf·in/rad)	59.0 kNm/rad (.522 x 10⁶ lbf·in/rad)	100.0 kNm/rad (.885 x 10⁶ lbf·in/rad)	4.82 kg·m² (16470 lb·in²)	1.12 kg·m² (3820 lb·in²)
HUB "D" (FOR GEISLINGER COUPLING)											0.11 kg·m² (392 lb·in²)

Ⓓ

MATERIAL	
HEAT TREAT	
SURFACE TREATMENT	
WEIGHT kg	WR² lb-in²
FIRST USE	
ASSY.	
MODEL	
NAME	MC-6650SC MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

DATE	8-19-98
SCALE	.375=1.00
DRN.	RM
CHK.	ALC
APPD.	DAS

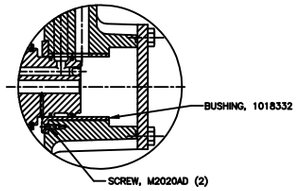
TWIN DISC INCORPORATED RACINE, WI 53403 – USA

1018375

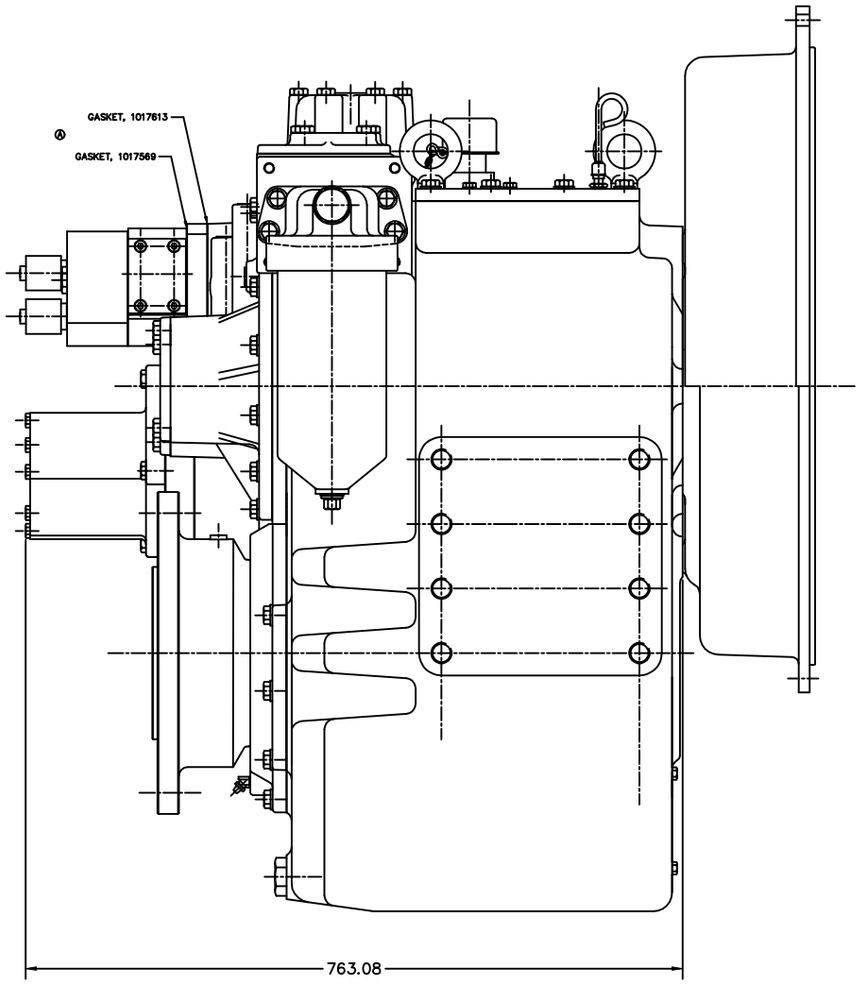
SHEET 4 OF 4 REV W

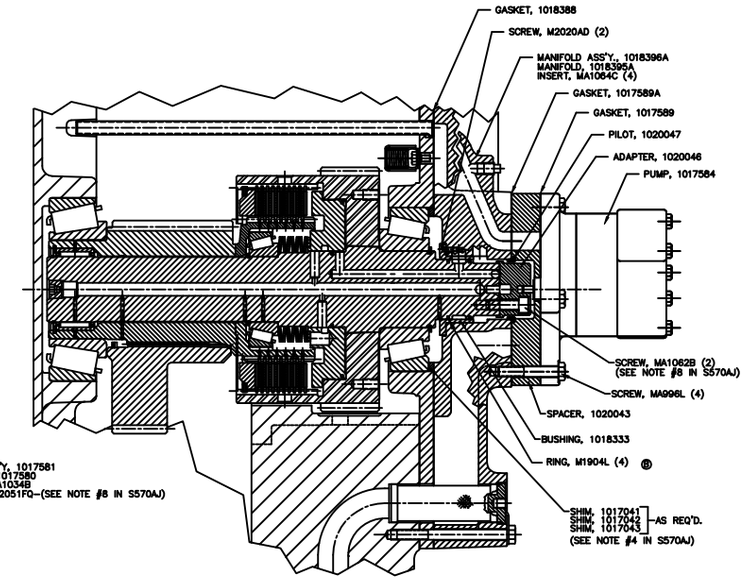
E D C B A

THESE STANDARDS APPLY:
S574 FASTENER TORQUE REQUIREMENTS
S692 BEARING SHIMMING
S765 TAPERED JOINT ASSEMBLY
S774 ANAEROBIC SEALANT APPLICATION



PRIMARY SHAFT





SECONDARY SHAFT

SEE 1018375 SHEETS 1–4
FOR ALL OTHER INFORMATION.

Ⓑ CONSULT SALES DEPT. APPLICATION
ENGINEERS FOR NEW BILL OF MATERIAL
FOR MARINE TRANSMISSION NAMEPLATE.

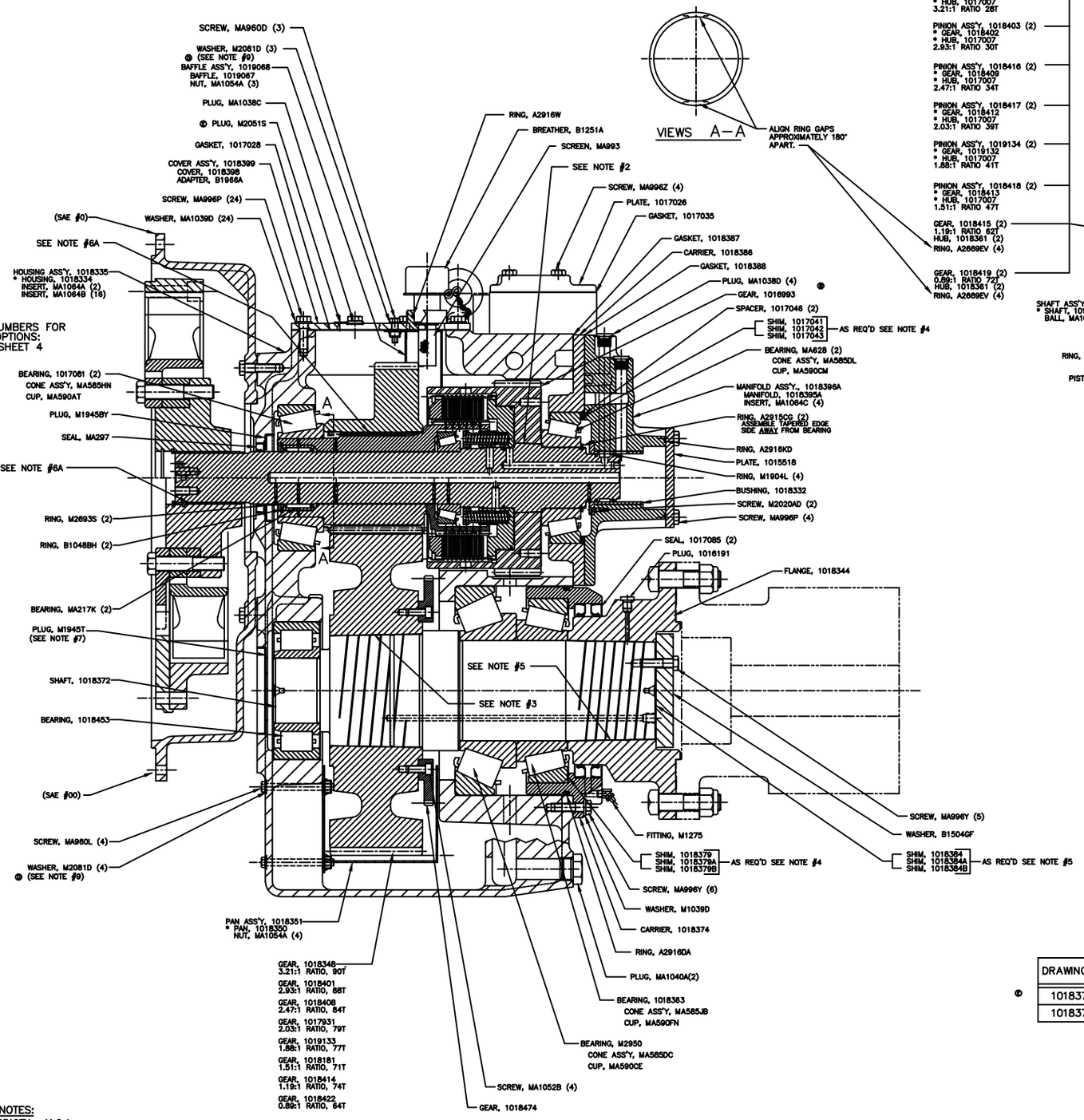
KIT BOM K1314

CONSULT SALES DEPT. APPLICATION
ENGINEERS FOR OTHER LIMITING
CONDITIONS.

SHT.NO.	REV	ZONE	CH. NO.	DATE
	B	---	30497	12-6-00
	A	E5	30430	11-3-00

MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT 970 kg
FIRST USE
ASSY.
MODEL
NAME MG-6650SC MARINE TRANSMISSION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.76
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO
DATE 10-30-00
SCALE .375=1.00
DRN. D. MEYERS
CHK. ALC
APPD. GAM
TWIN DISC INCORPORATED RACINE, WI 53403 -- USA
1018375A
SHEET 1 OF 1 REV B

E D C B A
6 5 4 3 2 1



ASSEMBLY INSTRUCTIONS:
ASSEMBLE AND TEST PER S570AJ.
NOTES #1 THRU #9 ARE IN S570AJ.

THESE STANDARDS APPLY:
S574 FASTENER TORQUE REQUIREMENTS
S692 BEARING SHIMMING
S765 TAPERED JOINT ASSEMBLY
S774 ANAEROBIC SEALANT APPLICATION

DRAWING No.	BOM No.	TRAILING PUMP SHAFT	MTD. TRAILING PUMP KIT	PUMP KIT BOM	
1018375B	T597	1018473	1018554	40907	← REPLACED BY 1018375C
1018375C	T607	1020511	1020514	41906	

CUSTOMER NOTES:

a.) OIL CAPACITY : 41.6 L

b.) THIS UNIT CAN NOT BE USED WITH A LEFT HAND ENGINE.

c.) OPTIONAL EQUIPMENT:
COMPANION FLANGE ASSEMBLY: 1018682
MANUAL TROLLING VALVE KIT: 1017555
ELECTRIC TROLLING VALVE KIT: 1017554
ELECTRIC VALVE WITH MECHANICAL BACKUP (12 VDC): 1018084Y
LIVE PTO: 1017177A (AUXILIARY PUMP DRIVE)
HYDRAULIC CLUTCHED P.T.O. : 1017820C
FLEXIBLE COUPLING INPUTS–SEE SHEET 4.
KIT BOM # K1195 (METRIC TO NPTF ADAPTER KIT, INTEGRAL HEAT EXCHANGER)
KIT BOM # K1254 (METRIC TO NPTF ADAPTER KIT, REMOTE HEAT EXCHANGER)
FRESH WATER OIL COOLER – SEE SHEET 2
DITCH PLATE FOR CUSTOMER SUPPLIED OIL COOLER – SEE SHEET 2
REMOTE TRAILING PUMP: 1016473
OIL TEMPERATURE INDICATING SWITCH: B3424, FOR INSTALLATION LOCATION SEE HYDRAULIC DIAGRAM AND SHEET 3.

* NOT SERVICEABLE SEPERATELY.

▲ REMOVE BEFORE OPERATING, 2 PLACES, CLOSURES.

GEAR RATIOS:
3.21:1
2.93:1
2.47:1
2.03:1
1.88:1
1.51:1
1.19:1
0.89:1

CONSULT SALES DEPT. APPLICATION ENGINEERS FOR OTHER LIMITING CONDITIONS.

SHT./NO.	REV	ZONE	CH. NO.	DATE
1	E	B6	ECN10582	1–4–02
1	D		ECN10323	8–2–01
1	C	B6	ECN10257	6–20–01
1	B	C5	ECN10099	4–20–01
3	A	C5	30530	1–16–01

MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT 970 kg
FIRST USE
ASSY.
MODEL
NAME MG–6650SC MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 10–31–00
SCALE .375=1.00
DRN. D. MEYERS
CHK. ALC
APPD. GAM

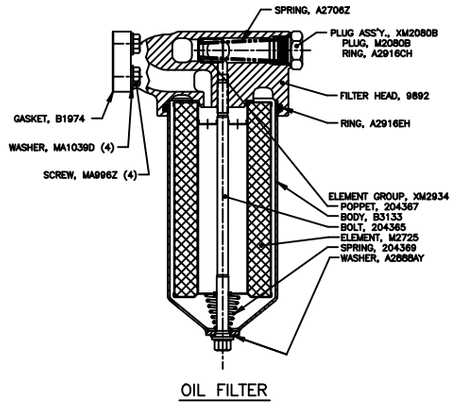
TWIN DISC INCORPORATED RACINE, WI 53403 – USA

1018375B
1018375C

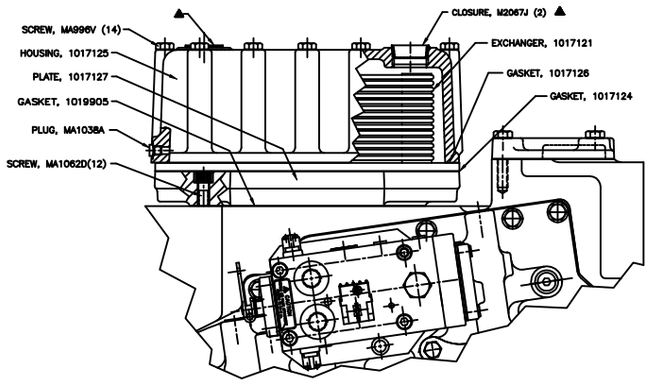
SHEET 1 OF 4 REV E

SHEET 1 OF 4	CROSS SECTION AND PART NUMBERS
SHEET 2 OF 4	CROSS SECTION AND PART NUMBERS
SHEET 3 OF 4	INSTALLATION DRAWING
SHEET 4 OF 4	FLEXIBLE COUPLING INPUTS
B3504AU	MASS ELASTIC SYSTEM
B3649M	HEAT EXCHANGER REQUIREMENTS
A7119AA	HYDRAULIC DIAGRAM

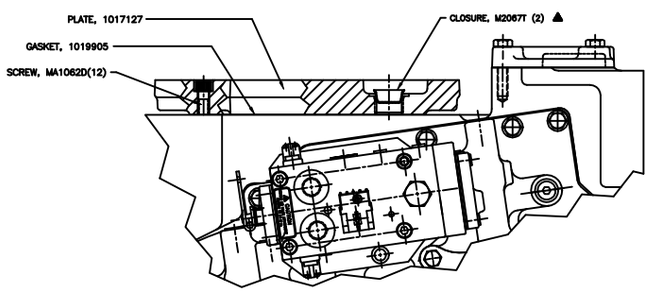
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO



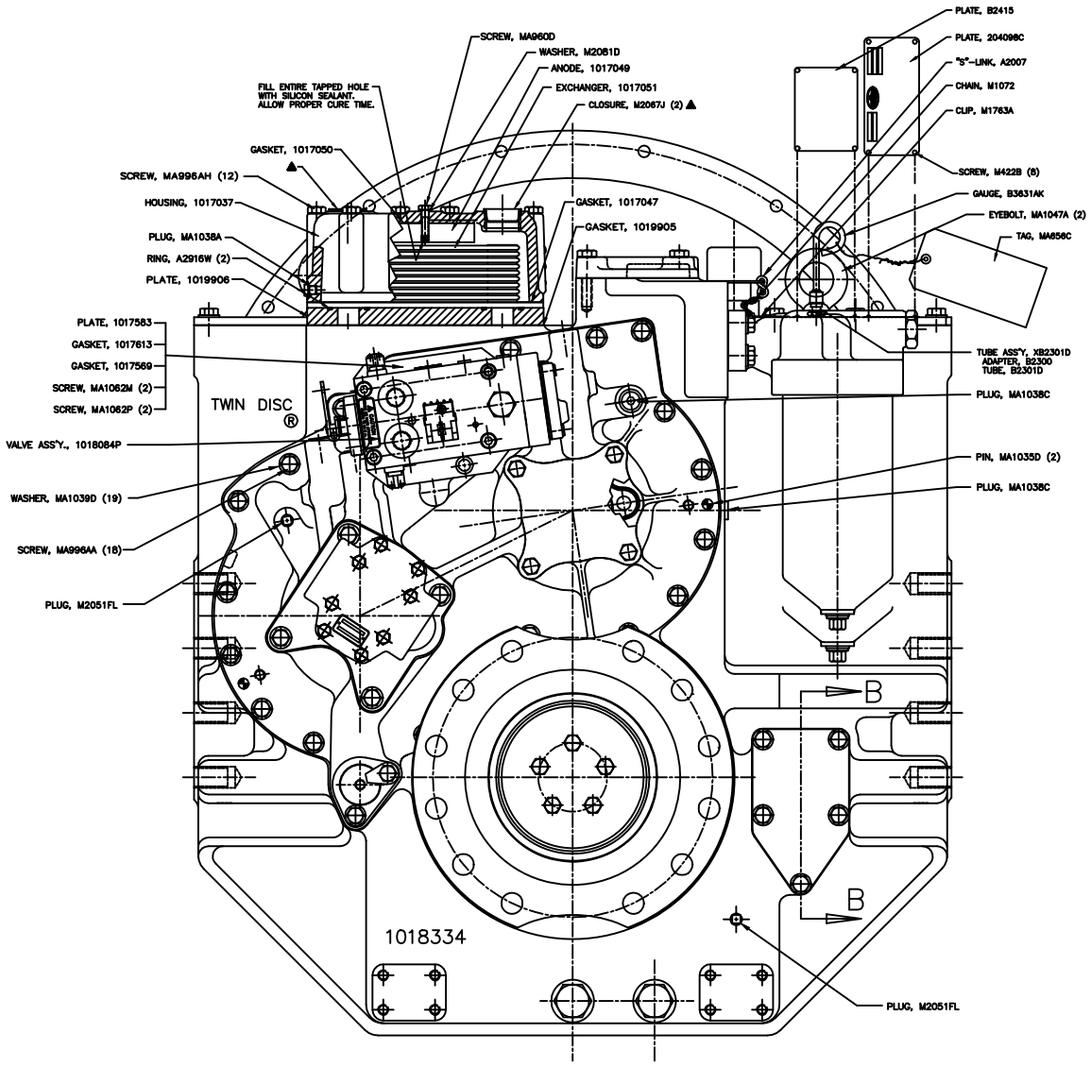
OIL FILTER



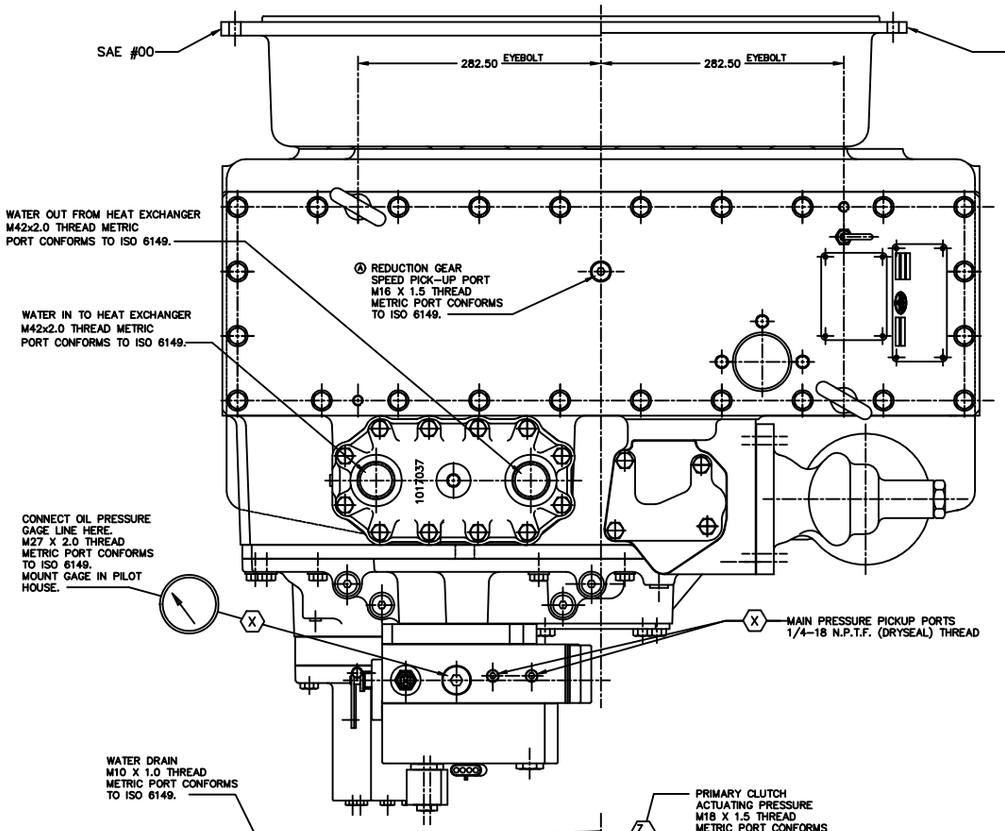
OPTIONAL FRESH WATER HEAT EXCHANGER

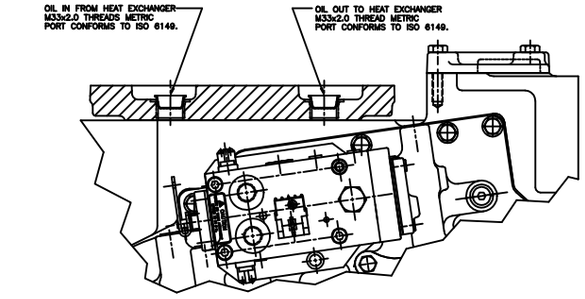


OPTIONAL DITCH PLATE FOR CUSTOMER SUPPLIED HEAT EXCHANGER

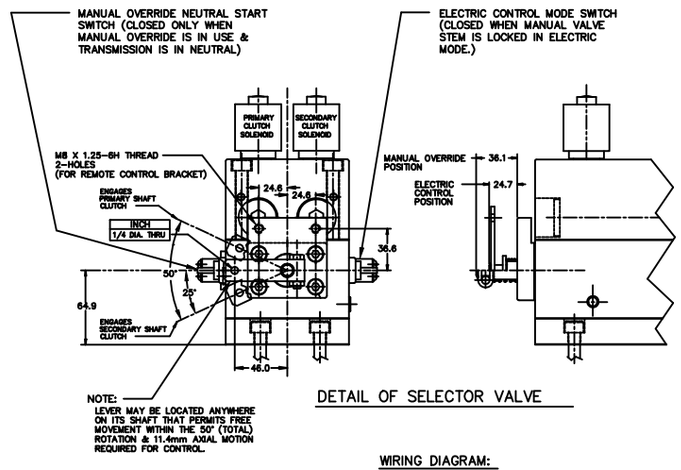


NOTICE! THIS PRINT CONTAINS PROPRIETARY INFORMATION AND IS NOT TO BE USED IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF TWIN DISC, INCORPORATED RACINE, WI 53403 – USA. THIS NOTICE IS NOT INTENDED TO NULLIFY OR LIMIT RIGHTS GRANTED TO THE U.S. GOVERNMENT OR OTHERS BY CONTRACT.	MATERIAL	WEIGHT kg / m³ / lb-in³	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm. MACHINED DIMENSIONS X ±0.76, XX ±0.25, XXX ±0.13. ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982	DATE 10-31-00	METRIC THIRD ANGLE PROJECTION SIMILAR TO	TWIN DISC INCORPORATED RACINE, WI 53403 – USA
	HEAT TREAT	FIRST USE		SCALE .375=1.00		
		ASSY.		DRN. D. MEYERS		1018375B
	SURFACE TREATMENT	MODEL MG-6650SC MARINE TRANSMISSION		CHK. ALC		1018375C
		SIZE		APPD. GAM		SHEET 2 OF 4 REV E





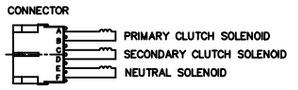
OPTIONAL DITCH PLATE FOR CUSTOMER SUPPLIED HEAT EXCHANGER



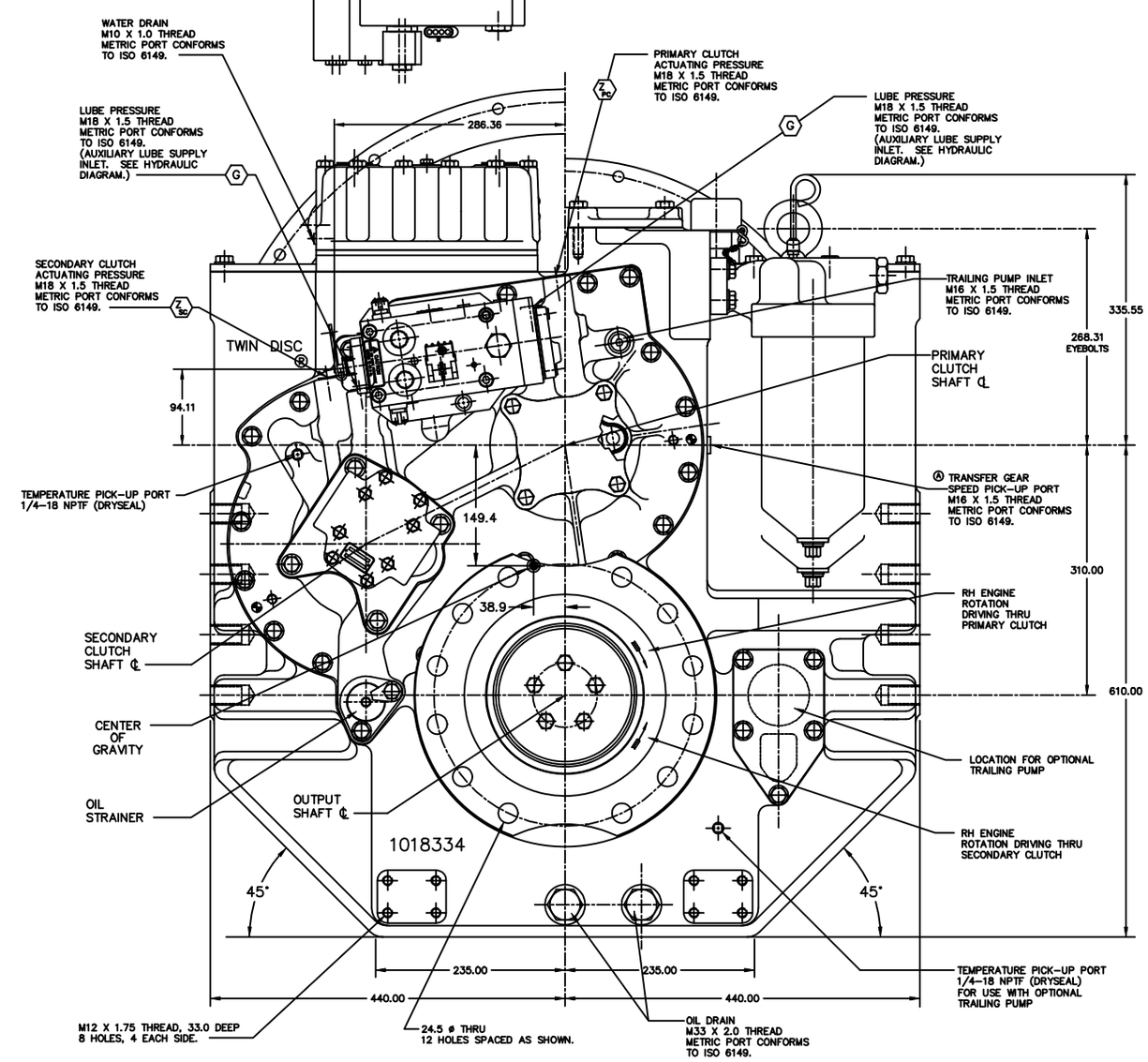
DETAIL OF SELECTOR VALVE

Ⓐ RATIO	DISTANCE FROM SPEED PICKUP PORT SURFACE TO GEAR O.D.	
	REDUCTION GEAR	TRANSFER GEAR
3.21:1	145.04	34.54
2.93:1	139.93	34.54
2.47:1	129.69	34.54
2.03:1	117.03	34.54
1.88:1	111.88	34.54
1.51:1	96.40	34.54
1.19:1	79.79	34.54
0.89:1	57.42	34.54

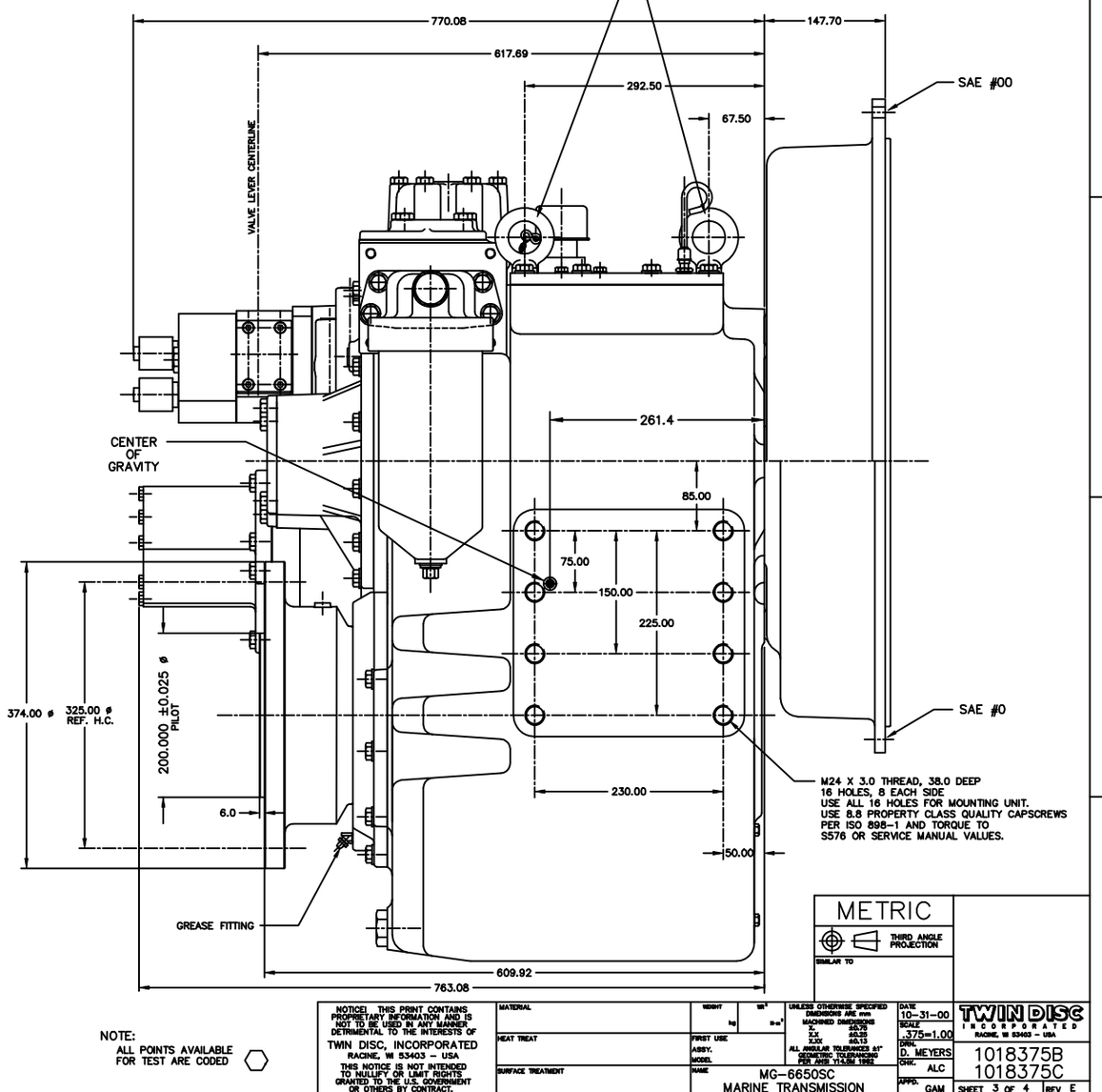
WIRING DIAGRAM:



OPTIONAL:
MATING WIRING HARNESS 1017403 SERIES (SPECIFY LENGTH).



EYEBOLTS (2) FOR LIFTING MARINE TRANSMISSION EQUALIZE LOAD ON BOTH EYEBOLTS TO LIFT MARINE TRANSMISSION ONLY.

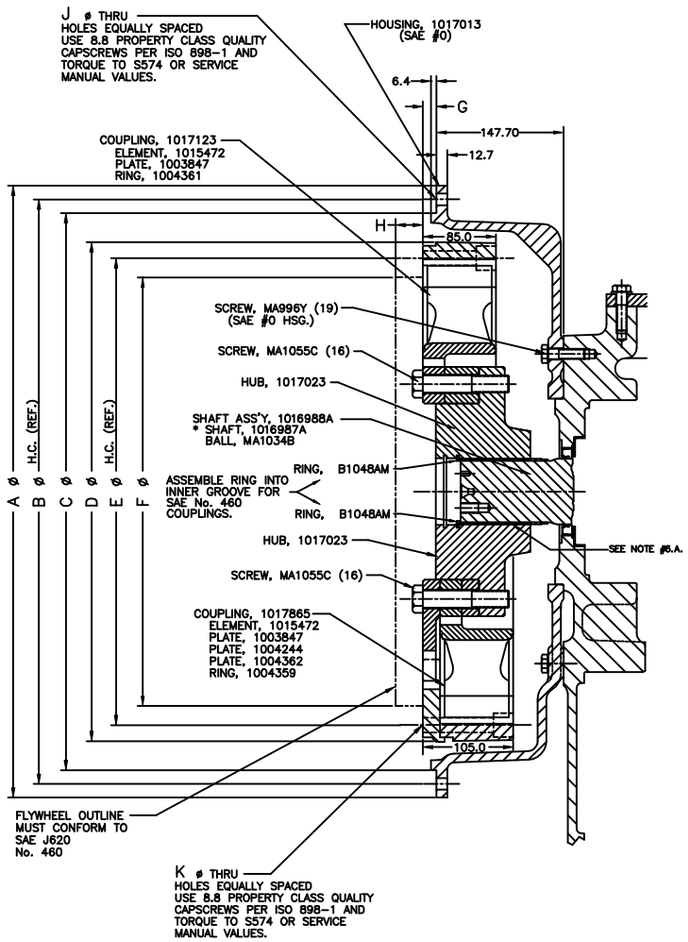


NOTE:
ALL POINTS AVAILABLE FOR TEST ARE CODED ⬡

MATERIAL	
HEAT TREAT	
SURFACE TREATMENT	
WEIGHT	kg / lb
FIRST USE	
ASSY.	
MODEL	
NAME	MG-6650SC MARINE TRANSMISSION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm	MACHINED DIMENSIONS .x ±0.75 .xx ±0.25 .xxx ±0.13 ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982
DATE	10-31-00
SCALE	.375=1.00
DRN.	D. MEYERS
CHK.	ALC
APPD.	GAM
	TWIN DISC INCORPORATED RACINE, WI 53403 – USA
	1018375B 1018375C
	SHEET 3 OF 4 REV E

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

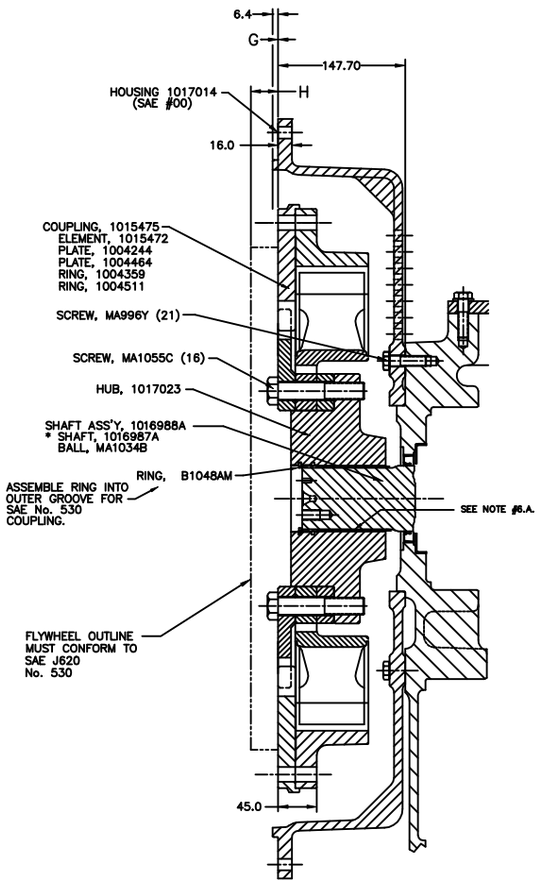
COUPLING "A"
WITHOUT TORSIONAL STOP



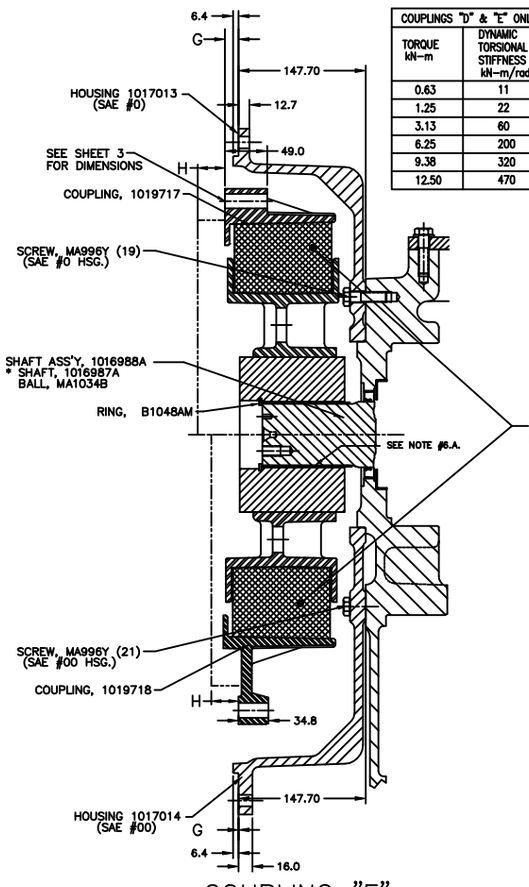
COUPLING "B"
WITH TORSIONAL STOP

SAE No.	SAE J620 MARINE TRANSMISSION FLYWHEEL No.	A	B	C ±0.065	D ±0.035	E	F	G	H	J	K
0	460	711.0	679.45	647.635	571.5	542.9	498.3	15.7	31.8	16 OF 13.5	12 OF 17.0
00	530	883.0	850.90	787.335	673.1	641.4	584.2	0.0	31.8	16 OF 13.5	12 OF 17.0

COUPLING "C"
WITH TORSIONAL STOP

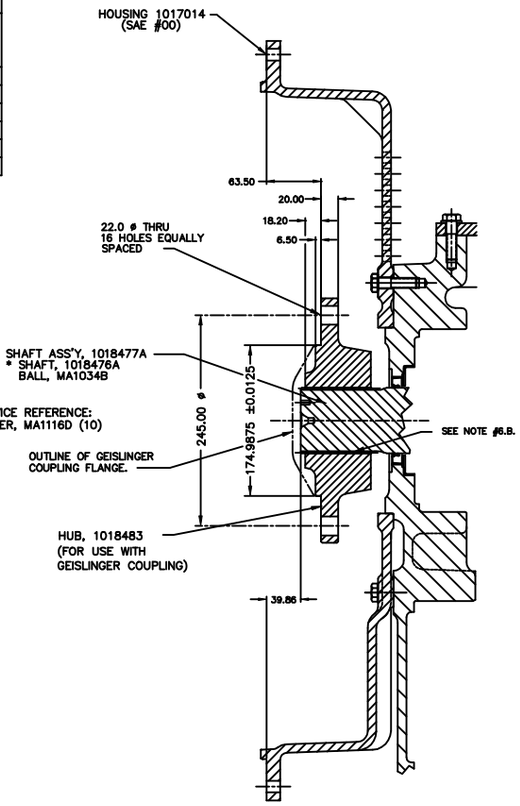


COUPLING "E"



COUPLINGS "D" & "E" ONLY	
TORQUE kN-m	DYNAMIC TORSIONAL STIFFNESS kN-m/rad
0.63	11
1.25	22
3.13	60
6.25	200
9.38	320
12.50	470

HUB "D"



COUPLING	SAE J620 FLYWHEEL SIZE	COUPLING NO.	MAX. COUPLING rpm *	NOMINAL TORQUE kN-m	DYNAMIC TORSIONAL STIFFNESS	COUPLING WR^2 kg-m²	
						OUTER PARTS	INNER PARTS
E	NO. 460	CF-R-510-018 -60161-HR	2800	12.50	PER CHART	0.94	0.589
F	NO. 530	CF-R-510-021 -60164-HR	2500	12.50	PER CHART	1.06	0.589

* SEE SHEET 1 FOR MAXIMUM TRANSMISSION r.p.m.

THE WR^2 OF INNER PARTS INCLUDES HUB AND 1/4 SHAFT C_2.

FOR OTHER TRANSMISSION MASS ELASTIC DATA, REFER TO B3504AU.

FOR OTHER TRANSMISSION INSTALLATION DIMENSIONS, REFER TO 1018375B, SHEET 3 .

COUPLING	COUPLING SIZE NO.	MAX. COUPLING R.P.M. (REF.)*	NOMINAL TORQUE (T_{TOR})	DYNAMIC TORSIONAL STIFFNESS	DYNAMIC TORSIONAL STIFFNESS (DYNAMIC TORSIONAL STIFFNESS TOLERANCE= $^{-20\%}_{+10\%}$)					WR^2	
					0.10 T_{TOR}	0.25 T_{TOR}	0.50 T_{TOR}	0.75 T_{TOR}	1.00 T_{TOR}	OUTER PARTS	INNER PARTS
A	VL3411S	2400	8.00 kN·m (70.85×10^3 lbf·in)		26.0 kNm/rad ($.230 \times 10^6$ lbf·in/rad)	31.0 kNm/rad ($.274 \times 10^6$ lbf·in/rad)	40.0 kNm/rad ($.354 \times 10^6$ lbf·in/rad)	59.0 kNm/rad ($.522 \times 10^6$ lbf·in/rad)	100.0 kNm/rad ($.885 \times 10^6$ lbf·in/rad)	1.08 kg·m² (3690 lb·in²)	0.78 kg·m² (2660 lb·in²)
B	VL3411S	2400	8.00 kN·m (70.85×10^3 lbf·in)		26.0 kNm/rad ($.230 \times 10^6$ lbf·in/rad)	31.0 kNm/rad ($.274 \times 10^6$ lbf·in/rad)	40.0 kNm/rad ($.354 \times 10^6$ lbf·in/rad)	59.0 kNm/rad ($.522 \times 10^6$ lbf·in/rad)	100.0 kNm/rad ($.885 \times 10^6$ lbf·in/rad)	2.56 kg·m² (8750 lb·in²)	1.04 kg·m² (3545 lb·in²)
C	VL3411S	2400	8.00 kN·m (70.85×10^3 lbf·in)		26.0 kNm/rad ($.230 \times 10^6$ lbf·in/rad)	31.0 kNm/rad ($.274 \times 10^6$ lbf·in/rad)	40.0 kNm/rad ($.354 \times 10^6$ lbf·in/rad)	59.0 kNm/rad ($.522 \times 10^6$ lbf·in/rad)	100.0 kNm/rad ($.885 \times 10^6$ lbf·in/rad)	4.82 kg·m² (16470 lb·in²)	1.12 kg·m² (3820 lb·in²)
HUB "D" (FOR GEISLINGER COUPLING)											0.11 kg·m² (392 lb·in²)

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

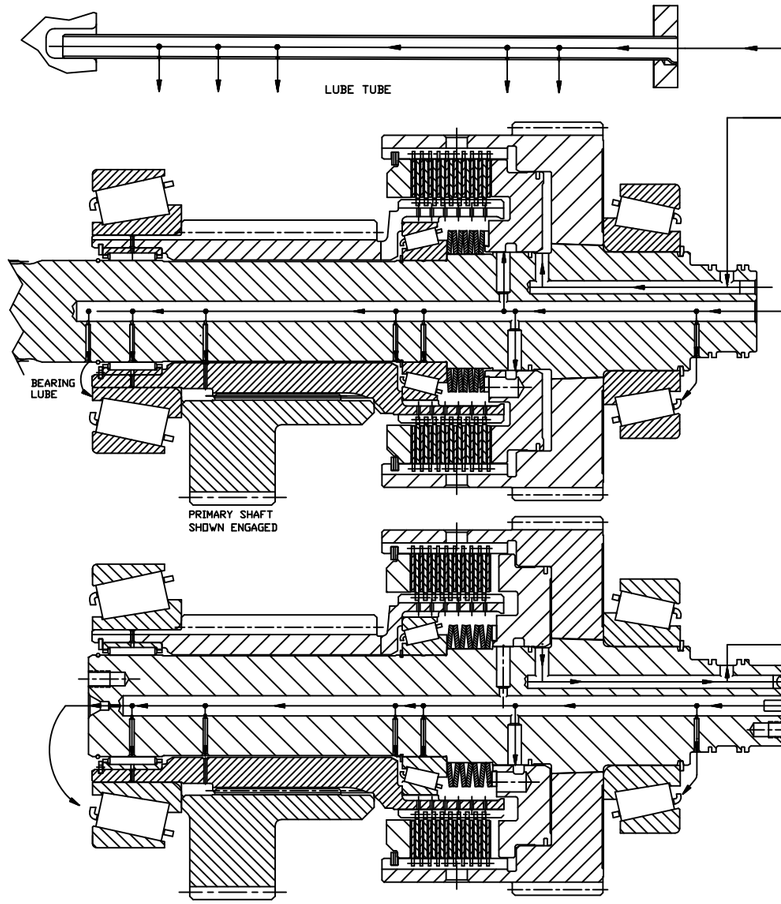
MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
WR^2 kg-m²
FIRST USE
ASSY.
MODEL
NAME MC-6650SC MARINE TRANSMISSION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

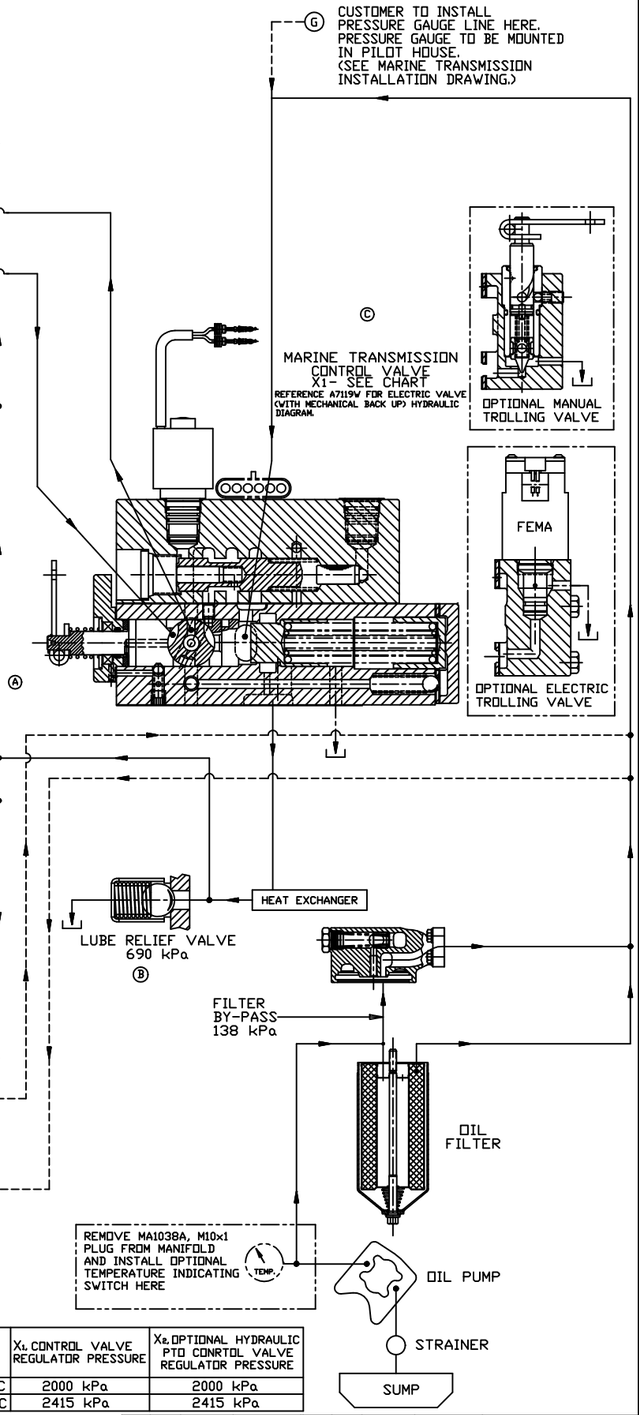
DATE	10-31-00
SCALE	.375=1.00
DRN.	D. MEYERS
CHK.	ALC
APPD.	GAM
SHEET	4 OF 4
REV	E

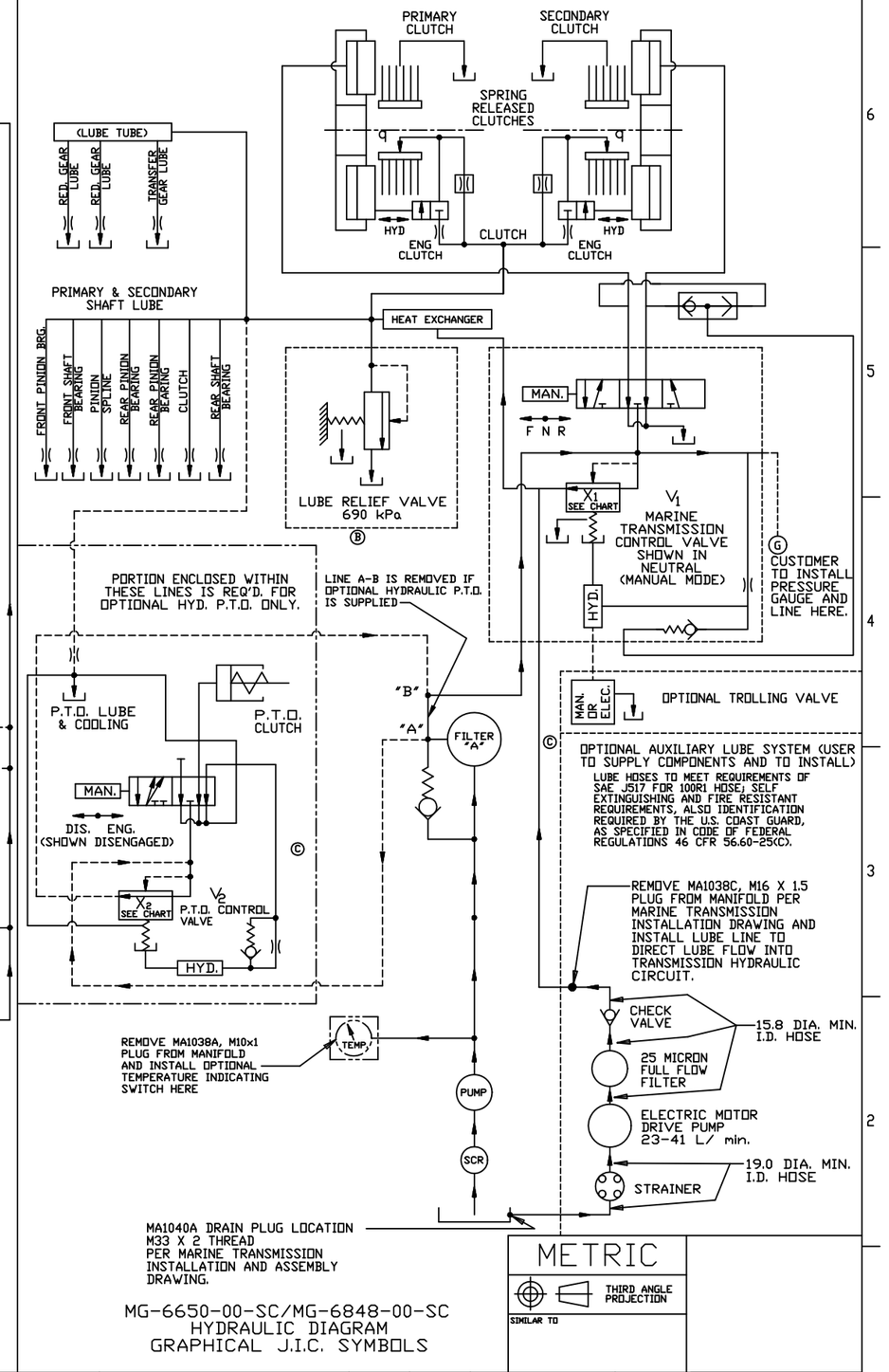
TWIN DISC INCORPORATED RACINE, WI 53403 – USA

1018375B
1018375C

E D C B A
6 5 4 3 2 1







MARINE TRANSMISSION	X_1 CONTROL VALVE REGULATOR PRESSURE	X_2 OPTIONAL HYDRAULIC PTO CONRTOL VALVE REGULATOR PRESSURE
MG-6650-00-SC	2000 kPa	2000 kPa
MG-6848-00-SC	2415 kPa	2415 kPa

MG-6650-00-SC/MG-6848-00-SC
HYDRAULIC DIAGRAM
PICTORIAL

REV	ZONE	CH. NO.	DATE
C		29489	8-10-99
B	D-3	29090	1-25-99
A	D-3	28871	10-13-98

MG-6650-00-SC/MG-6848-00-SC
HYDRAULIC DIAGRAM
GRAPHICAL J.I.C. SYMBOLS

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

MATERIAL	
HEAT TREAT	
SURFACE TREATMENT	
WEIGHT kg	WR² N m²
FIRST USE	
ASSY. 1018375	
MODEL MG-6650-00-SC	
NAME	DIAGRAM, HYDRAULIC

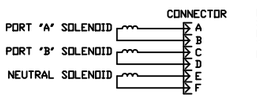
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE	8-5-98
SCALE	NONE
DRN.	LJM
CHK.	DAS
APPD.	DAS
SHEET 1 OF 1	REV C

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA
A7119AA

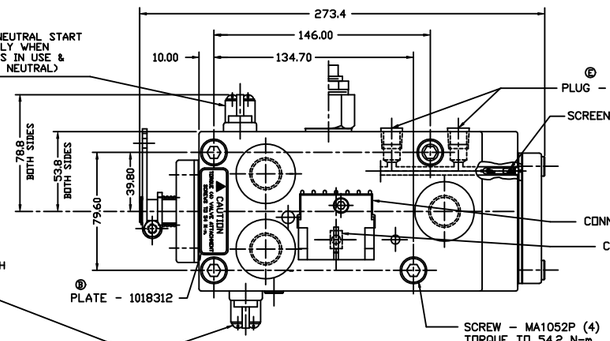
F E D C B
6 5 4 3 2 1

WIRING DIAGRAM:



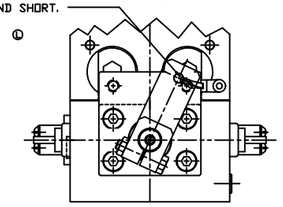
MANUAL OVERRIDE NEUTRAL START SWITCH (CLOSED ONLY WHEN MANUAL OVERRIDE IS IN USE & TRANSMISSION IS IN NEUTRAL) MAX. I = 20 A.

OPTIONAL:
MATING WIRING HARNESS 1017403 SERIES (SPECIFY LENGTH).

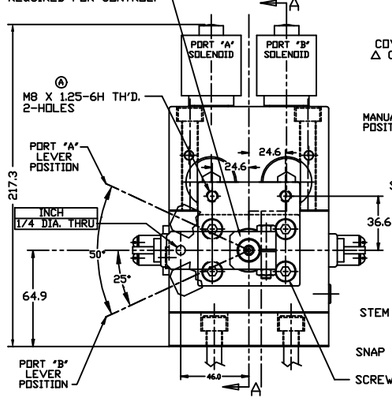


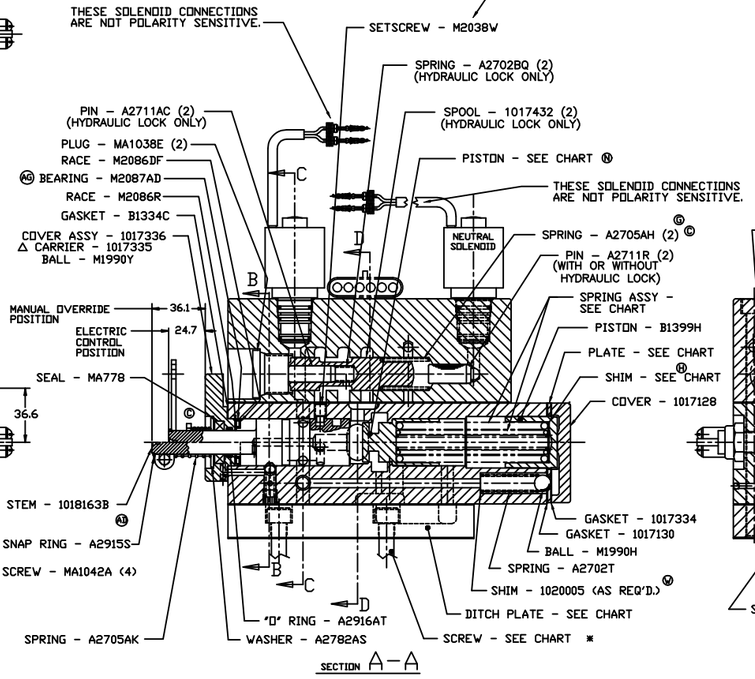
TOP VIEW

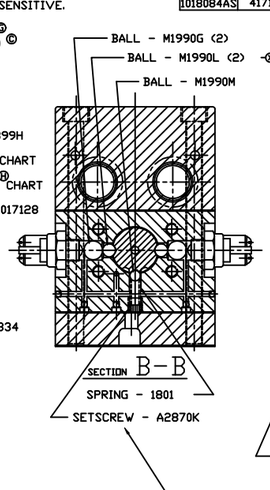
NOTE:
SECURE LEVER IN THE DEPRESSED 'ELECTRIC CONTROL MODE' POSITION BY LOOPING PLASTIC STRAP THRU 1/4" HOLE IN LEVER & M8 THREADED HOLE BEHIND - PULL TIGHT, TRIM END SHORT.



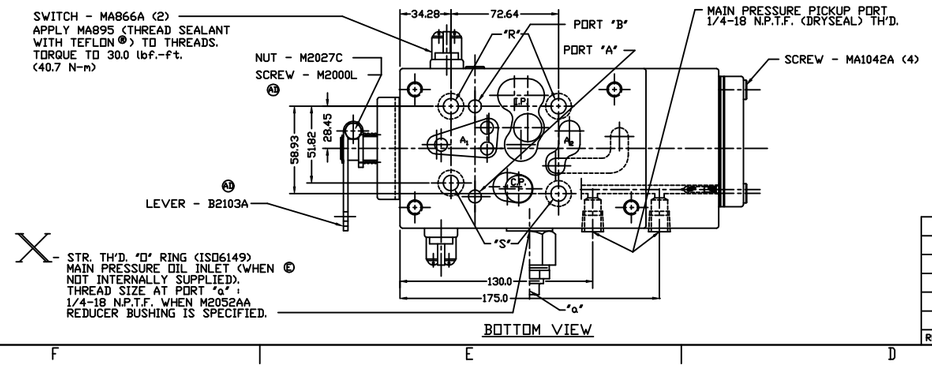
NOTE:
LEVER MAY BE LOCATED ANYWHERE ON ITS SHAFT THAT PERMITS FREE MOVEMENT WITHIN THE 50° (TOTAL) ROTATION & 11.4mm AXIAL MOTION REQUIRED FOR CONTROL.







NOTE:
INSTALL USING MA908 (LOCTITE #242) TOP OF SCREW MUST BE FLUSH WITH SURFACE.



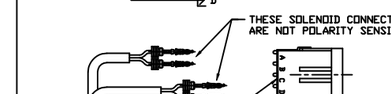
X - STR. TH'D. "O" RING (ISO6149) MAIN PRESSURE OIL INLET (WHEN NOT INTERNALLY SUPPLIED). THREAD SIZE AT PORT "a": 1/4-18 N.P.T.F. WHEN M2052AA REDUCER BUSHING IS SPECIFIED.

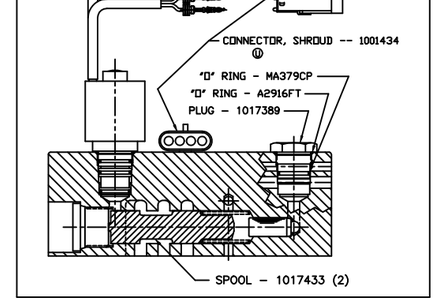
VALVE ASS'Y No.	BOM No.	DITCH PLATE No.	DITCH PLATE GASKET	TRANSMISSION GASKET	PISTON	HYD-RAULIC LOCK†	SOLENOID QTY.	SOLENOID No.	VOLTAGE	VALVE SPRINGS SPRING ASS'Y	VALVE SPRINGS CONSISTS OF: OUTER	VALVE SPRINGS CONSISTS OF: INNER	CLUTCH kPa (PSI) NOM.	ORIFICE PLATE No.	X	SHIMS PART NO.	SHIMS APPX. QTY.	MOUNTING SCREWS "R"	MOUNTING SCREWS QTY.	MOUNTING SCREWS "S"	MOUNTING SCREWS QTY.	FIRST USE	DATE AND APPR.
1018084	40750	1017133	1017134	B1337F	1018688	YES	3	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E×M27 X 2.0-6H	B2451B		MA1052A	2	MA1052A	2	MG-5202DC	3-17-98 DAS/BJE
1018084A	40751	------	1017383	------	1017179	NO	2	XM2759FM	24 VDC	-------	A2707BD	A2704BU	2415 (350)	1017129A	MA1038E×M27 X 2.0-6H	B2451B		------		------		MG-6619RV	3-17-98 DAS/BJE
1018084B	40752	1017133	1017134	B1337F	1017179	NO	2	XM2759FM	24 VDC	-------	A2707AD		1585 (230)	1017129A	MA1038E×M27 X 2.0-6H M2051L M2052AA MA1053G	B2451B		M2089F	2	M2089AG	2	DD-514V	3-17-98 DAS/BJE
1018084C	40753	1017133	1017134	B1337F	1017179	NO	2	XM2759FM	24 VDC	XA2707BZ	A2707BW	A2703BA	1380 (200)	1017129	MA1038E×M27 X 2.0-6H M2051L M2052AA MA1053G	B2451B		M2089Y	1	M2089F	3	DD-516V	3-17-98 DAS/BJE
1018084D	40754	1017133	1017134	B1337F	1017179	NO	2	XM2759FL	12 VDC	-------	A2707AD		1585 (230)	1017129A	MA1038E×M27 X 2.0-6H M2051L M2052AA MA1053G	B2451B		M2089F	2	M2089AG	2	DD-514V	3-17-98 DAS/BJE
1018084E	40755	1017133	1017134	B1337F	1017179	NO	2	XM2759FL	12 VDC	XA2707BZ	A2707BW	A2703BA	1380 (200)	1017129	MA1038E×M27 X 2.0-6H M2051L M2052AA MA1053G	B2451B		M2089Y	1	M2089F	3	DD-516V	3-17-98 DAS/BJE
1018084F	40756	1017133A	1017134	B1337F	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E×M27 X 2.0-6H	B2451B		M2089F	2	M2089F	2	MG-5111	3-17-98 DAS/BJE
1018084G	40757	1017133A	1017134	B1337F	1018688	NO	2	XM2759FL	12 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E×M27 X 2.0-6H	B2451B		M2089F	2	M2089F	2	MG-5111	3-17-98 DAS/BJE
1018084H	40758	1017583	1017569	1017613	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	2000 (290)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	0	MA1062B	2	MA1062G	2	MG-5600	3-17-98 DAS/BJE
1018084J	40761	1017583	1017569	1017613	1018688	NO	2	XM2759FL	12 VDC	XA2707Z	A2707Z	A2703T	2000 (290)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	0	MA1062B	2	MA1062G	2	MG-5600	3-17-98 DAS/BJE
1018084K	40762	1017133A	1017134	B1337F	1017179	NO	2	XM2759FM	24 VDC	-------	A2707AD		1585 (230)	1017129A	MA1038E×M27 X 2.0-6H	B2451B		MA1052B	2	MA1052B	2	MG-5114	3-17-98 DAS/BJE
1018084L	40763	1017133A	1017134	B1337F	1017179	NO	2	XM2759FL	12 VDC	-------	A2707AD		1585 (230)	1017129A	MA1038E×M27 X 2.0-6H	B2451B		MA1052B	2	MA1052B	2	MG-5114	3-17-98 DAS/BJE
1018084M	40764	-------	-------	-------	1018688	NO	2	XM2759FM	24 VDC	-------	A2702BC A2707AX	A2704BU	2415 (350)	1017129A	MA1038E×M27 X 2.0-6H	B2451B		------		------		MG-5984 61242	3-17-98 DAS/BJE
1018084N	40775	1017583	1017569	1017613	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	2000 (290)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	0	MA1062B	2	MA1062J	2	MG-5600DR	3-17-98 DAS
1018084P	40817	-------	-------	-------	1018688	NO	2	XM2759FM	24 VDC	XA2707AD	A2707AD	A2703AB	2000 (290)	1017129B	MA1038E×M27 X 2.0-6H	B2451B		------		------		MG-6550SC	7-23-98 DAS/AZ
1018084Q	40842	1017133	1017134	B1337F	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E×M27 X 2.0-6H	B2451B		MA1052K	2	MA1052K	2	MG-5202SC	8-5-98 DAS/DM
1018084R	40935	-------	1017383	-------	1017179	YES	3	XM2759FM	24 VDC	-------	A2707BD	A2704BU	2415 (350)	1017129B	MA1038E×M27 X 2.0-6H	B2451B		------		------		MG-6557	10-9-98 JHB/DAS
1018084S	40954	1018584	1018594	B3117A	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E×M27 X 2.0-6H	B2451B		M1732AH	2	M1732AH	2	MG-540	11-6-98 DAS/BJE
1018084T	40955	-------	1017383	-------	1017179	NO	2	XM2759FM	24 VDC	-------	A2702BC A2707BD	A2704BU	2655 (385)	1017129A	MA1038E×M27 X 2.0-6H	B2451B		------		------		MG-6449	11-6-98 DAS/BJE
1018084U	40956	-------	1017383	-------	1017179	NO	2	XM2759FM	24 VDC	-------	A2702BC A2707AX	A2704BU	2550 (370)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	7	------		------		MG-6557	11-6-98 DAS/BJE
1018084V	40957	-------	1017383	-------	1017179	NO	2	XM2759FM	24 VDC	-------	A2702BC A2707AX	A2704BU	2450 (355)	1017129A	MA1038E×M27 X 2.0-6H	B2451B	5	------		------		MG-6600 MG-6619	11-6-98 DAS/BJE
1018084W	40958	1017133	1017134	B1337F	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	MA1052A	2	MA1052A	2	MG-5202DC	11-18-98 WR/WTV
1018084X	40964	1017133A	1017134	B1337F	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	M2089AR	2	M2089AR	2	MG-5141	11-24-98 RM/WTV
1018084Y	41028	-------	-------	-------	1018688	NO	2	XM2759FL	12 VDC	XA2707AD	A2707AD	A2703AB	2000 (290)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-6550SC	12-2-98 ILW/DAS
1018084Z	41045	-------	1017134	-------	1018688	NO	2	XM2759FM	24 VDC	XA2707AD	A2707AD	A2703AB	2000 (290)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-5205DC	2-18-99 JS/BJE
1018084AA		1017583	1017569	1017613	1018688	NO	2	XM2759FL	12 VDC	XA2707Z	A2707Z	A2703T	2000 (290)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	0	MA1062B	2	MA1062J	2	MG-5600DR	
1018084AB	41093	1017133	1017134	B1337F	1018688	NO	2	XM2759FL	12 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	MA1052A	2	MA1052A	2	MG-5202DC	5-26-99 JS/WTV
1018084AC	40967	-------	1017383	-------	1017179	YES	3	XM2759FM	24 VDC	-------	A2702BC A2707BD	A2704BU	2655 (385)	1017129A	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-6449-RV	7-9-99 JS/DAS
1018084AD	41114	-------	-------	-------	1018688	NO	2	XM2759FL	12 VDC	-------	A2702BC A2707BD	A2704BU	2415 (350)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-6848SC	8-2-99 ALC/DAS
1018084AE	41115	-------	-------	-------	1018688	NO	2	XM2759FM	24 VDC	-------	A2702BC A2707BD	A2704BU	2415 (350)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-6848SC	8-2-99 ALC/DAS
1018084AF	41118	1017133	1017134	B1337F	1018688	NO	2	XM2759FL	12 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	MA1052K	2	MA1052K	2	MG-5202SC	8-11-99 JS/DAS
1018084AG	41163	-------	1017134	-------	1018688	NO	2	XM2759FL	12 VDC	XA2707AD	A2707AD	A2703AB	2000 (290)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-5205DC	11/19/99 ALC/DAS
1018084AH	41171	-------	-------	-------	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-5170DC	11/19/99 ALC/DAS
1018084AJ	41172	-------	-------	-------	1018688	NO	2	XM2759FL	12 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-5170DC	11/19/99 ALC/DAS
1018084AK	41244	1018584	1018594	B3117A	1018688	NO	2	XM2759FL	12 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	M1732AH	2	M1732AH	2	MG-540	2/11/00 ALC/DAS
1018084AL	41250	-------	-------	-------	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-520-1HP	2/11/00 ALC/DAS
1018084AM	41251	-------	-------	-------	1018688	NO	2	XM2759FL	12 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-520-1HP	2/11/00 ALC/DAS
1018084AN	41196	-------	-------	-------	1017179	NO	2	XM2759FM	24 VDC	-------	A2707AD	A2703BA	1860 (270)	1017129A	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-5141SC	3/21/00 ALC/DAS
1018084AP	41195	-------	-------	-------	1017179	NO	2	XM2759FL	12 VDC	-------	A2707AD	A2703BA	1860 (270)	1017129A	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-5141SC	3/21/00 ALC/DAS
1018084AQ	41337	-------	1017383	-------	1017179	YES	3	XM2759FM	24 VDC	-------	A2702BC A2707AX	A2704BU	2550 (370)	1017129B	MA1038E×M27 X 2.0-6H	B2451B	7	------		------		MG-6557	4/24/00 JJ/ALC
1018084AR	41446	-------	1017383	-------	1017179	YES	3	XM2759FM	24 VDC	-------	A2702BC A2707AX	A2704BU	2450 (355)	1017129A	MA1038E×M27 X 2.0-6H	B2451B	5	------		------		MG-6600 MG-6619	6/21/00 ILW/ALC
1018084AS	41718	-------	-------	-------	1018688	YES	3	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E×M27 X 2.0-6H	B2451B	AS REQ.	------		------		MG-5170DC	4/16/01 JR/ALC

USE AS REQUIRED

PARTS FOR UNITS WITHOUT NEUTRAL SOLENOID AND HYDRAULIC LOCK (OPTIONAL CONDITION)

WIRING DIAGRAM: OPTIONAL:
MATING WIRING HARNESS 1017404 SERIES (SPECIFY LENGTH).





A_1 = ATMOSPHERIC PRESSURE
A_2 = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

(A9) □ OBSOLETE FOR PRODUCTION AND SERVICE

△ NOT SERVICEABLE SEPARATELY

* THESE PARTS ARE TO BE PACKAGED SEPARATELY AND SHIPPED WITH UNIT.

REV	ZONE	CH. NO.	DATE
AG		ECN10415	1-11-02
AF	A-4,-5	ECN10553	12-3-01

MATERIAL: ----------
HEAT TREAT: ----------
SURFACE TREATMENT:
WEIGHT kg / WR² N·m²
FIRST USE: ASSY. 1015207 MODEL MG-5202DC
NAME: VALVE ASS'Y. - CONTROL (WITHOUT TROLLING VALVE)

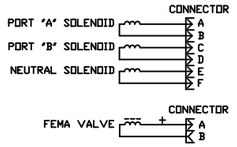
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 3-23-98
SCALE .50 = 1.00
DRN. RM
CHK. RM/BJE
APPD. DAS

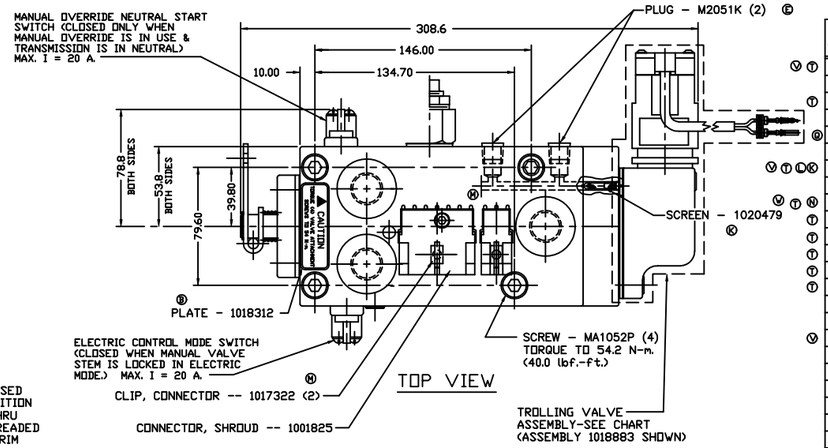
HYDRAULIC DIAGRAM A7119W, SHEET 1 OF 2
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

TWIN DISC INCORPORATED RACINE, WI 53403 - USA
1018084 SERIES
SHEET 1 OF 1 REV AG

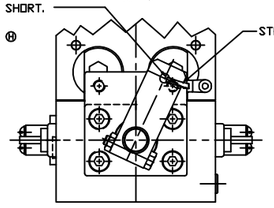
WIRING DIAGRAM:



OPTIONAL:
MATING WIRING HARNESS 1017502 SERIES (SPECIFY LENGTH).

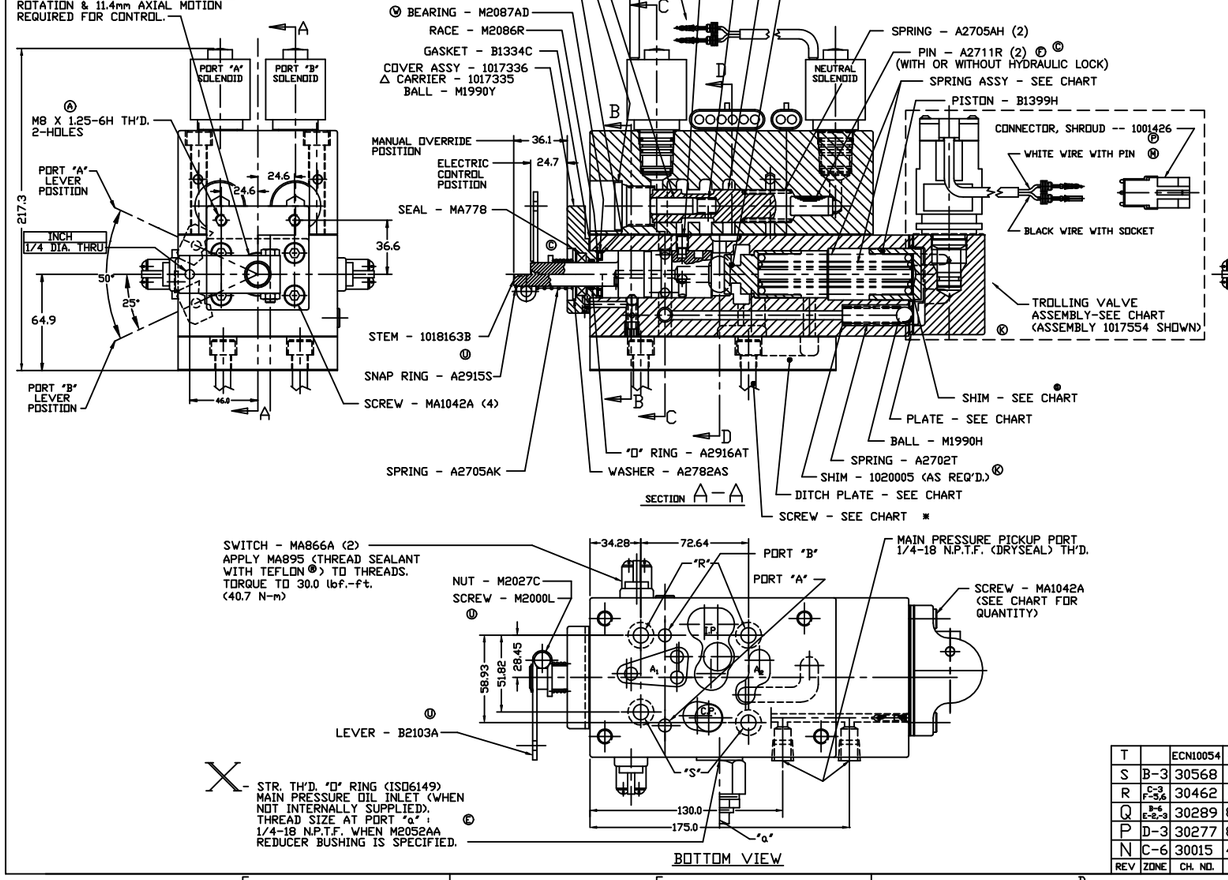


NOTE:
SECURE LEVER IN THE DEPRESSED 'ELECTRIC CONTROL MODE' POSITION BY LOOPING PLASTIC STRAP THRU 1/4" HOLE IN LEVER & M8 THREADED HOLE BEHIND - PULL TIGHT, TRIM END SHORT.

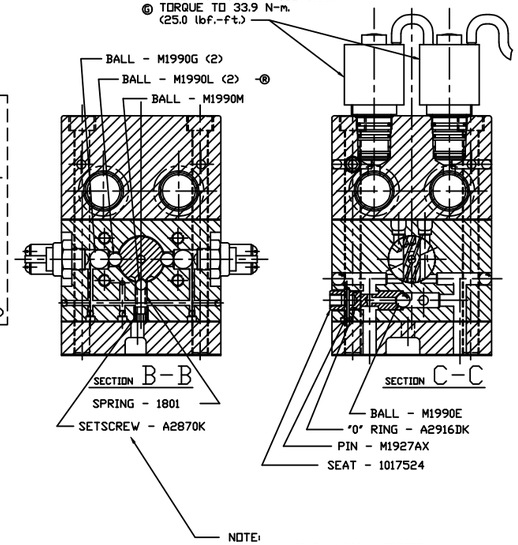


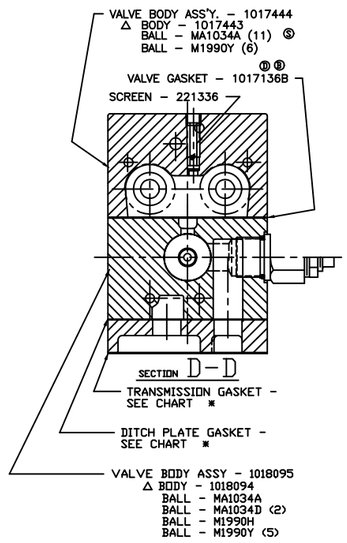
NOTE:
INSTALL USING MA908 (LOCTITE #242). THREAD DOG POINT INTO DETENT GROOVE UNTIL SNUG. BACK-OFF 1/2 TURN.

NOTE:
LEVER MAY BE LOCATED ANYWHERE ON ITS SHAFT THAT PERMITS FREE MOVEMENT WITHIN THE 50° (TOTAL) ROTATION & 11.4mm AXIAL MOTION REQUIRED FOR CONTROL.



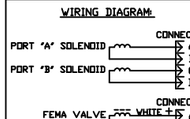
X - STR. TH'D. "O" RING (ISO6149) MAIN PRESSURE OIL INLET (WHEN NOT INTERNALLY SUPPLIED). THREAD SIZE AT PORT "a": 1/4-18 N.P.T.F. WHEN M2052AA REDUCER BUSHING IS SPECIFIED. E



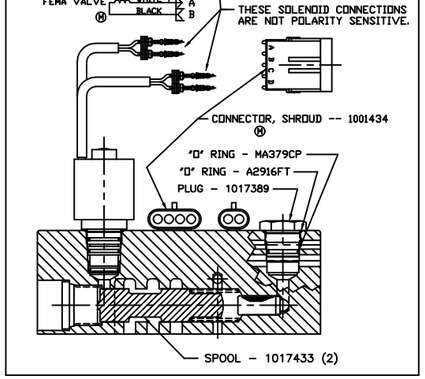


PARTS FOR UNITS WITHOUT NEUTRAL SOLENOID AND HYDRAULIC LOCK (OPTIONAL CONDITION)

WIRING DIAGRAM:



OPTIONAL:
MATING WIRING HARNESS 1017501 SERIES (SPECIFY LENGTH).



VALVE ASS'Y No.	BOM No.	DITCH PLATE No.	DITCH PLATE GASKET	TRANSMISSION GASKET	PISTON	HYD-RAULIC LOCK?	SOLENOID QTY.	SOLENOID No.	VOLTAGE	VALVE SPRINGS SPRING ASS'Y	VALVE SPRINGS CONSISTS OF: OUTER	VALVE SPRINGS CONSISTS OF: INNER	CLUTCH kPa (PSI) NOM.	ORIFICE PLATE No.	TROLLING VALVE ASS'Y △	X	QTY OF MA1042A	SHIMS PART NO.	SHIMS QTY.	MOUNTING SCREWS "R" #	MOUNTING SCREWS QTY.	MOUNTING SCREWS "S" #	MOUNTING SCREWS QTY.	FIRST USE	DATE AND APPR.
V T 1018085	40759	1017133	1017134	B1337F	1018688	YES	3	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	1018883	MA1038E(M27 X 2.0-6H)	2	B2451B		MA1052A	2	MA1052A	2	MG-5202DC	3-17-98 DAS/BJE
1018085A	40760	-------	1017383	-------	1017179	NO	2	XM2759FM	24 VDC	-------	A2707BD	A2704BU	2415 (350)	1017129A	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B		-------		-------		MG-6619RV	3-17-98 DAS/BJE
T 1018085B		1018584	1018594	B3117A	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B		M1732AH	2	M1732AH	2	MG-540	11-6-98 DAS/BJE
1018085C	41079	-------	1017383	-------	1017179	NO	2	XM2759FM	24 VDC	-------	A2707BC A2702BC	A2704BU	2655 (385)	1017129A	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B		------		------		MG-6449	11-6-98 DAS/BJE
G 1018085D	41113	-------	1017383	-------	1017179	NO	2	XM2759FM	24 VDC	-------	A2707AC A2702BC	A2704BU	2550 (370)	1017129B	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	3	------		------		MG-6557	11-6-98 DAS/BJE
1018085E		-------	1017383	-------	1017179	NO	2	XM2759FM	24 VDC	-------	A2707AX A2702BC	A2704BU	2450 (355)	1017129A	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	AS REQ'D.	------		------		MG-6600 MG-6619	11-6-98 DAS/BJE
V T K 1018085F		-------	1017134	-------	1018688	NO	2	XM2759FM	24 VDC	XA2707AD	A2707AD	A2703AB	2000 (290)	1017129B	1018883	MA1038E(M27 X 2.0-6H)	2	B2451B	AS REQ'D.	------		------		MG-5205DC	6-24-99 ALC/DAS
1018085G	41152	-------	-------	-------	1018688	NO	2	XM2759FM	24 VDC	-------	A2707BD A2702BC	A2704BU	2415 (350)	1017129B	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	AS REQ'D.	------		------		MG-6848SC	11/15/99 ALC/DAS
V T N 1018085H	41173	-------	-------	-------	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	1018883	MA1038E(M27 X 2.0-6H)	2	B2451B	AS REQ'D.	------		------		MG-5170DC	11/15/99 ALC/DAS
T 1018085J	41256	-------	-------	-------	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	AS REQ'D.	------		------		MG-520-1HP	12/16/00 ALC/DAS
T 1018085K	41255	-------	-------	-------	1018688	NO	2	XM2759FL	12 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	AS REQ'D.	------		------		MG-520-1HP	12/16/00 ALC/DAS
T 1018085L	41266	1017133A	1017134	B1337F	1017179	NO	2	XM2759FM	24 VDC	-------	A2707AD	-------	1585 (230)	1017129A	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	AS REQ'D.	MA1052B	2	MA1052B	2	MG-5114	2/29/00 ALC/DAS
T 1018085M	41304	-------	-------	-------	1017179	NO	2	XM2759FM	24 VDC	-------	A2707AD	A2703BA	1860 (270)	1017129A	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	AS REQ'D.	------		------		MG-5141SC	3/21/00 ALC/DAS
T 1018085N	41305	-------	-------	-------	1017179	NO	2	XM2759FL	12 VDC	-------	A2707AD	A2703BA	1860 (270)	1017129A	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	AS REQ'D.	------		------		MG-5141SC	3/21/00 ALC/DAS
1018085P	41308	-------	-------	-------	1018688	NO	2	XM2759FM	24 VDC	XA2707AD	A2707AD	A2703AB	2000 (290)	1017129B	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	AS REQ'D.	------		------		MG-6650SC	3/21/00 ALC/DAS
1018085R	41310	-------	-------	-------	1018688	NO	2	XM2759FL	12 VDC	XA2707AD	A2707AD	A2703AB	2000 (290)	1017129B	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	AS REQ'D.	------		------		MG-6650SC	3/21/00 ALC/DAS
V 1018085S	41709	-------	1017134	-------	1018688	NO	2	XM2759FM	24 VDC	XA2707AD	A2707AD	A2703AB	2000 (290)	1017129B	1017554	MA1038E(M27 X 2.0-6H)	4	B2451B	AS REQ'D.	------		------		MG-5204SC	4/6/01 KS/ALC
1018085T	41915	1017133	1017134	B1337F	1018688	NO	2	XM2759FM	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	1018883	MA1038E(M27 X 2.0-6H)	2	B2451B	AS REQ'D.	MA1052A	2	MA1052A	2	MG-5202DC	1-11-02 ALC/GAH
1018085U																									
1018085V																									
1018085W																									
1018085X																									
1018085Y																									
1018085Z																									
1018085AA																									
1018085AB																									
1018085AC																									
1018085AD																									
1018085AE																									
1018085AF																									
1018085AG																									
1018085AH																									
1018085AJ																									
1018085AK																									

K □ THE 1018883 TROLLING VALVE IS REQUIRED TO PROVIDE CLEARANCE FROM THE HYDRAULIC PTO.

△ NOT SERVICEABLE SEPARATELY

* THESE PARTS ARE TO BE PACKAGED SEPARATELY AND SHIPPED WITH UNIT.

A_1 = ATMOSPHERIC PRESSURE
A_2 = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

REV	ZONE	CH. NO.	DATE	REV	ZONE	CH. NO.	DATE
T		ECN10054	4-18-01				
S	B-3	30568	2-06-01				
R	C-3, F-3,6	30462	11-16-00				
Q	B-4, E-2,3	30289	8-30-00	W		ECN10415	1-11-02
P	D-3	30277	8-30-00	V		ECN10465	10-26-01
N	C-6	30015	4-12-00	U	E-2 F-1	ECN10249	6-20-01

MATERIAL: ----------
HEAT TREAT: ----------
SURFACE TREATMENT:
WEIGHT kg: WR² N m²
FIRST USE: ASSY. 1015207 MODEL MG-5202DC
NAME: VALVE ASS'Y. - CONTROL (WITH TROLLING VALVE)

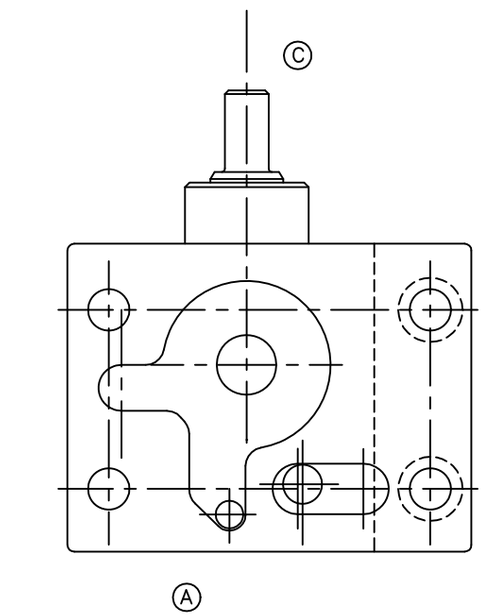
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm MACHINED DIMENSIONS X. ±0.75 X.X ±0.25 X.XX ±0.13
ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

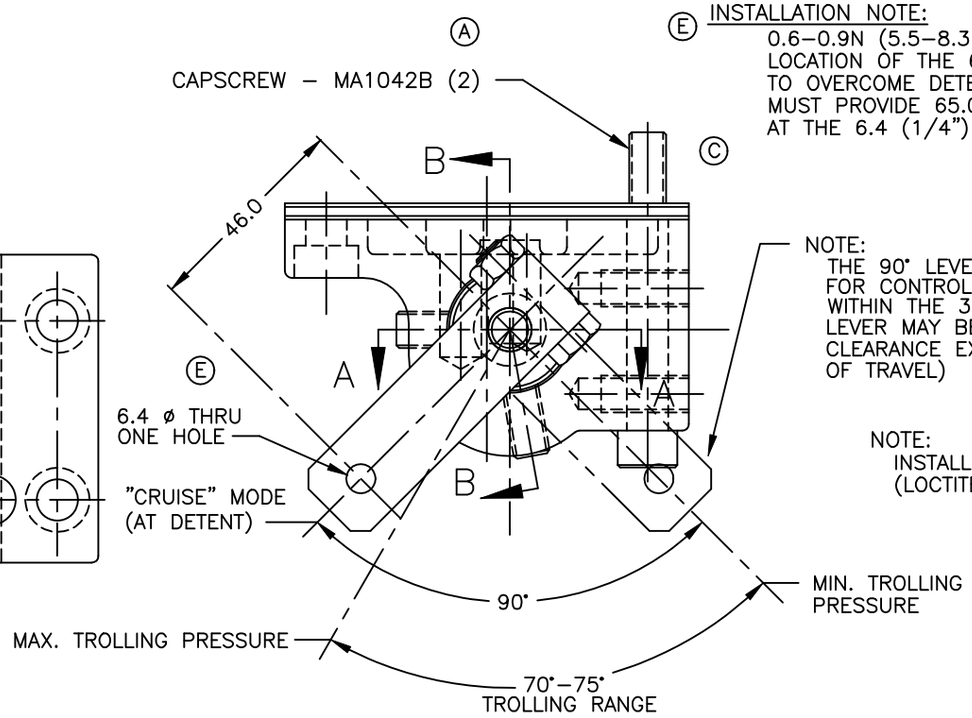
DATE 3-23-98
SCALE .50 = 1.00
DRN. RM
CHK. RM/BJE
APPD. DAS

TWIN DISC INCORPORATED RACINE, WI 53403 - USA
1018085 SERIES
SHEET 1 OF 1 REV W

HYDRAULIC DIAGRAM A7119W, SHEET 1 OF 2
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

F E D C B A
6 5 4 3 2 1

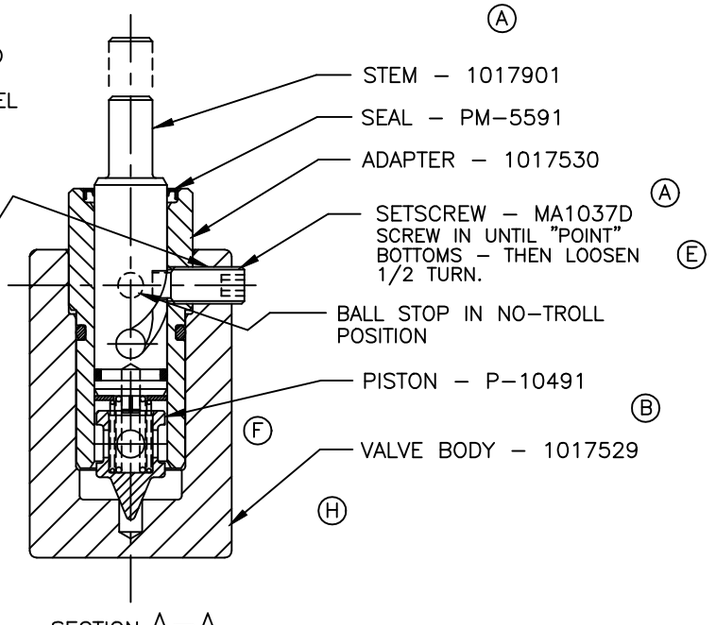




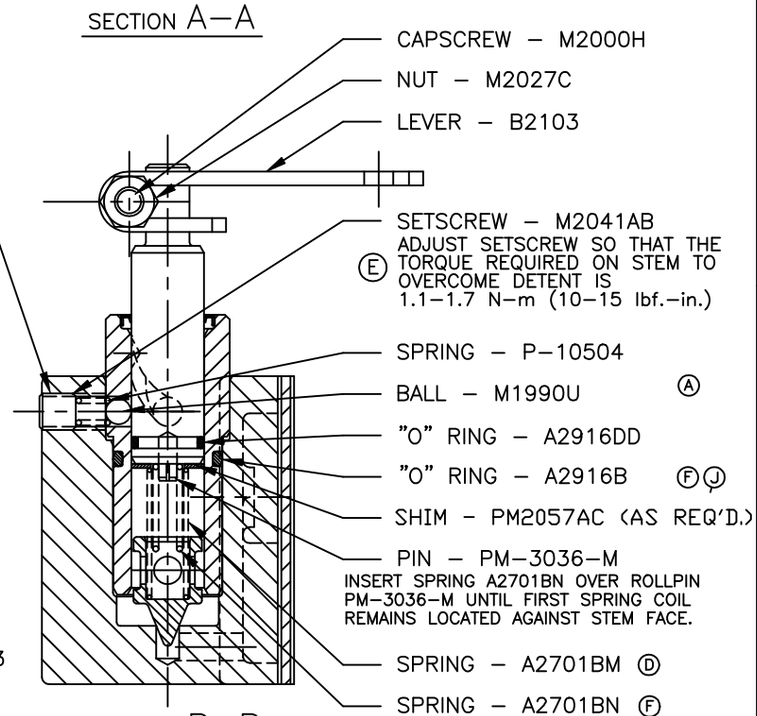
INSTALLATION NOTE:
0.6–0.9N (5.5–8.3 lb.) AT THE 46.0 (1.81") R LOCATION OF THE 6.4 (1/4") DIA. HOLE IS REQUIRED TO OVERCOME DETENT. REMOTE CONTROL ACTUATOR MUST PROVIDE 65.0 mm (2.56") TOTAL LINEAR TRAVEL AT THE 6.4 (1/4") DIA. HOLE LOCATION.

NOTE:
THE 90° LEVER ROTATION REQUIRED FOR CONTROL MAY FALL ANYWHERE WITHIN THE 360° IN WHICH THE LEVER MAY BE CLAMPED. (PROVIDED CLEARANCE EXISTS FOR FULL 90° OF TRAVEL)

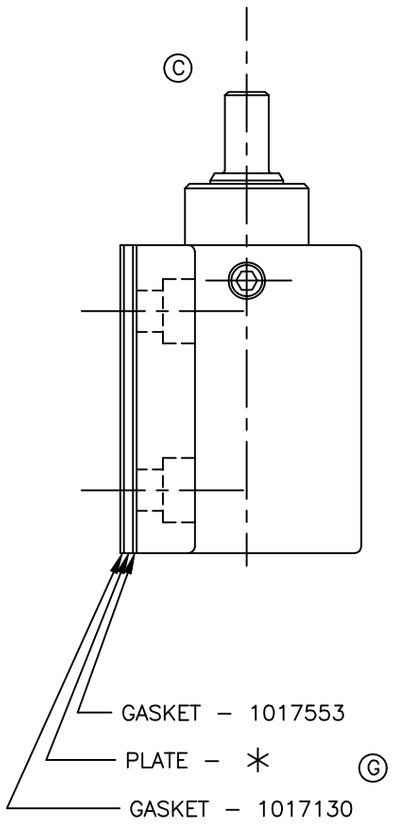
NOTE:
INSTALL USING MA908 (LOCTITE #242).

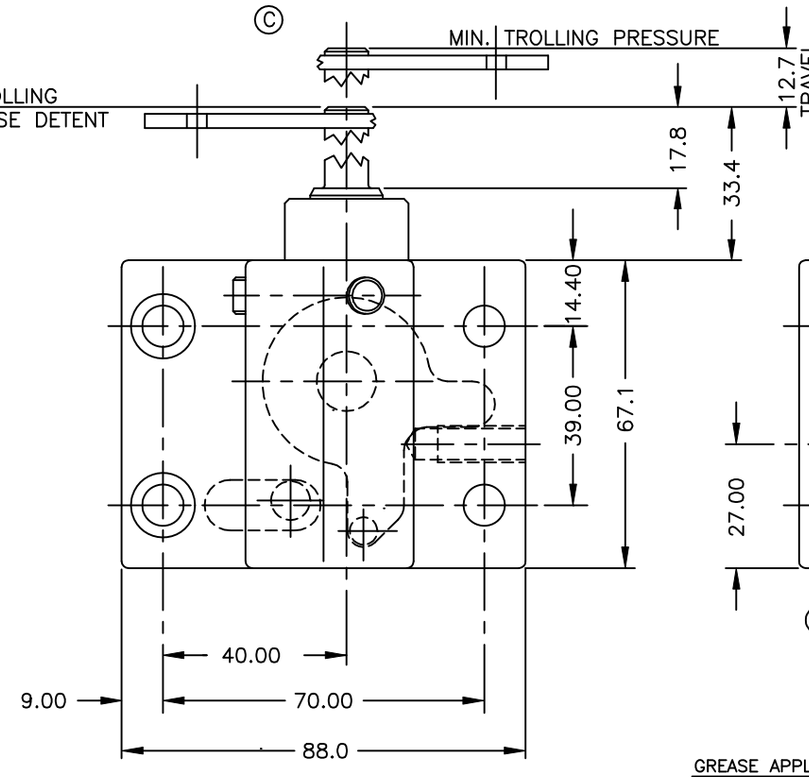


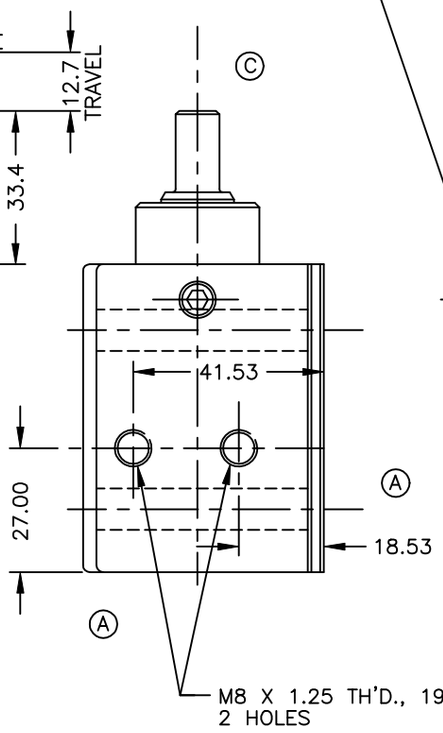
SECTION A–A



SECTION B–B







* PLATE IS NOT INCLUDED IN ASSEMBLY. USE EXISTING PLATE FROM CONTROL VALVE.

BOM NO. 40588

GREASE APPLICATION PROCEEDURE:

BEFORE INSTALLING VALVE STEM INTO BODY APPLY GENERAL PURPOSE GREASE PER S–364, ITEM 6, NO. 1 NLGI CONSISTENCY TO THE VALVE STEM FROM THE "O" RING GROOVE TO NECKED–DOWN DIAMETER AT LEVER END.

REV	ZONE	CH. NO.	DATE
J	A–2	30289	8–30–00
H	A–3	29863	1–31–00
G	C,D −1 A–1	29350	6–24–99
F	A–1,–2 A–3,–4	29117	2–4–99
E	A–3,–4 B–4	29015	12–17–98
D	A–2	28585	6–3–98
C	ALL	28500	4–20–98
B	A–4	28315	1–21–98
A	ALL	28208	11–26–97

MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
WR² N·m²
FIRST USE
ASSY. 1017546
MODEL VARIOUS
NAME VALVE ASS'Y., TROLLING

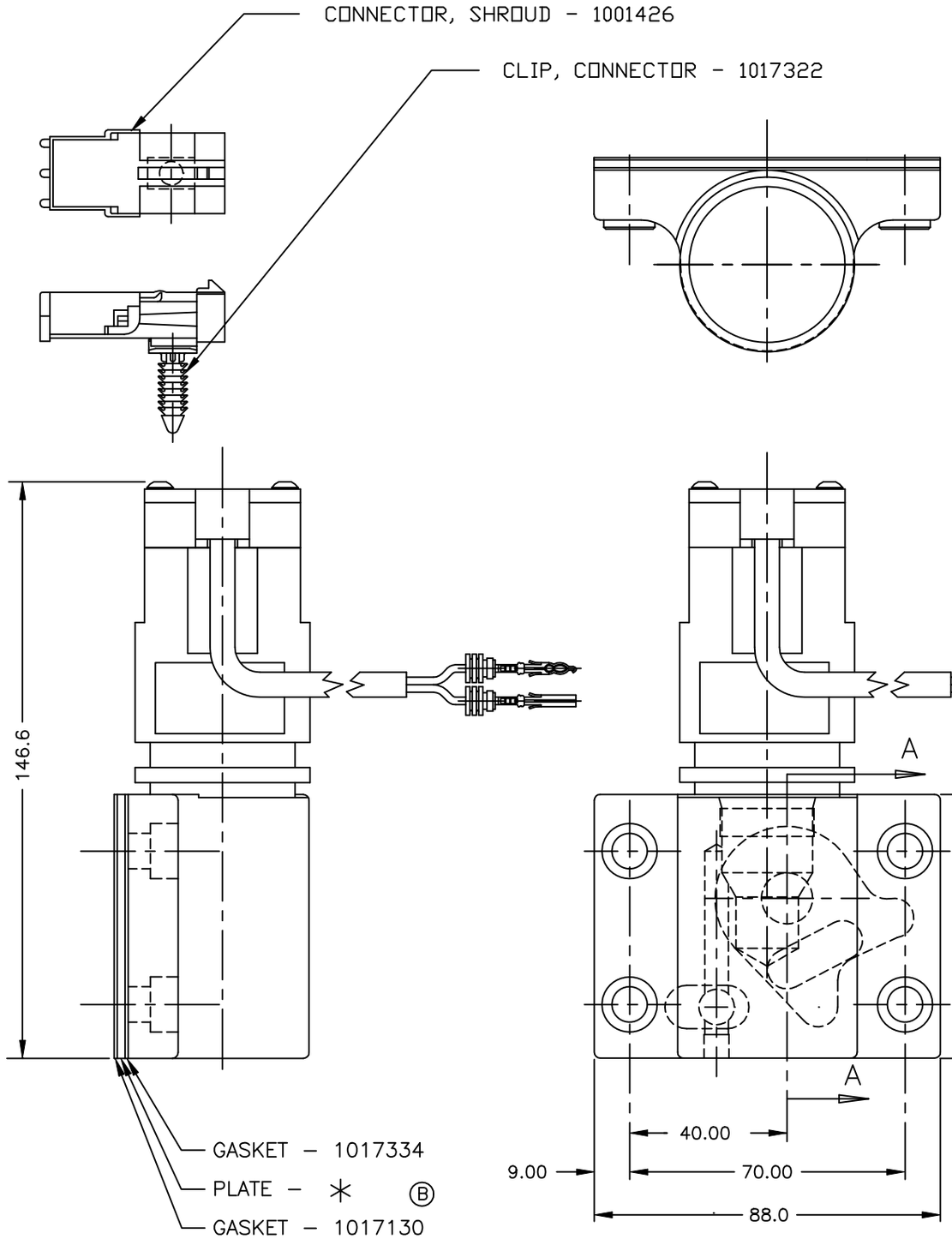
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

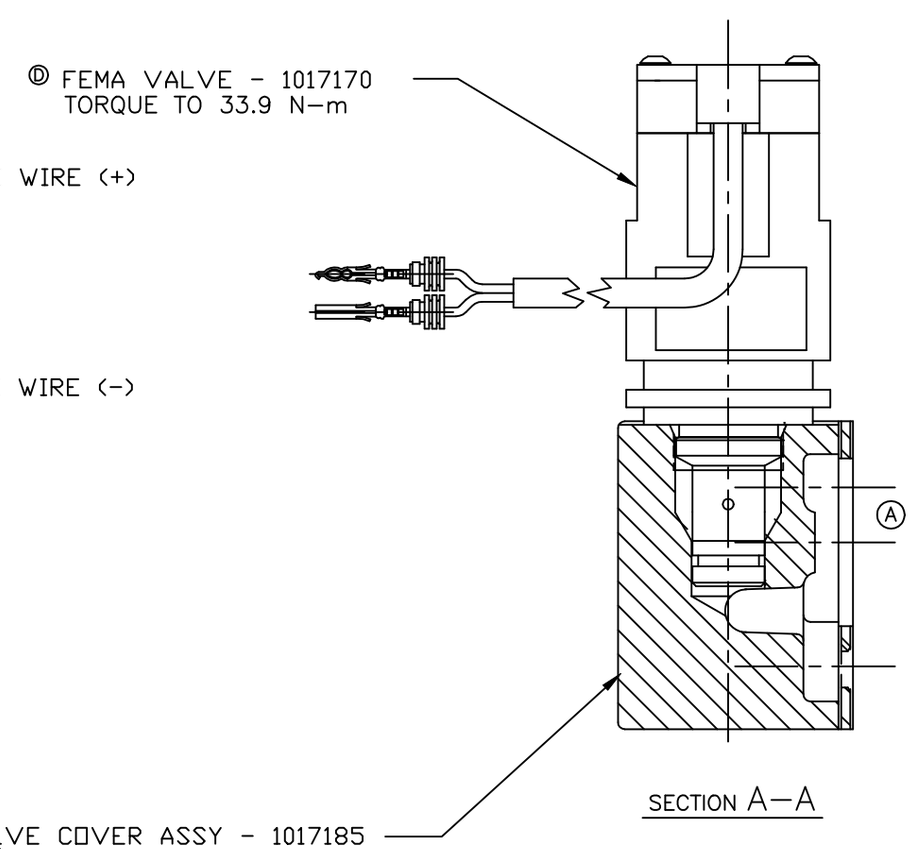
DATE 7–30–97
SCALE 1.0=1.0
DRN. RM
CHK. BE
APPD. BE

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO PX–8671

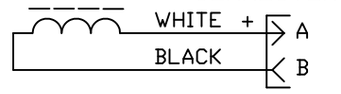
TWIN DISC INCORPORATED RACINE, WI 53403 – USA
1017555
SHEET 1 OF 1 REV J

D C B A





Ⓔ WIRING DIAGRAM



✳ PLATE IS NOT INCLUDED IN ASSEMBLY. USE PLATE FROM CONTROL VALVE.

Ⓑ

△ NOT SERVICEABLE SEPARATELY

BOM NO. 40537

REV	ZONE	CH. NO.	DATE
E	A-4	ECN10580	12-20-01
D	A-3	29641	10-8-99
C	A-1	29503	8-20-99
B	B1 D1	29350	6-24-99
A	A-2	28585	6-3-98

MATERIAL

HEAT TREAT

SURFACE TREATMENT

WEIGHT kg | WR² N·m²

FIRST USE
ASSY. 1015207
MODEL MG-5202DC

NAME
© VALVE ASS'Y., TROLLING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO
PX-8671

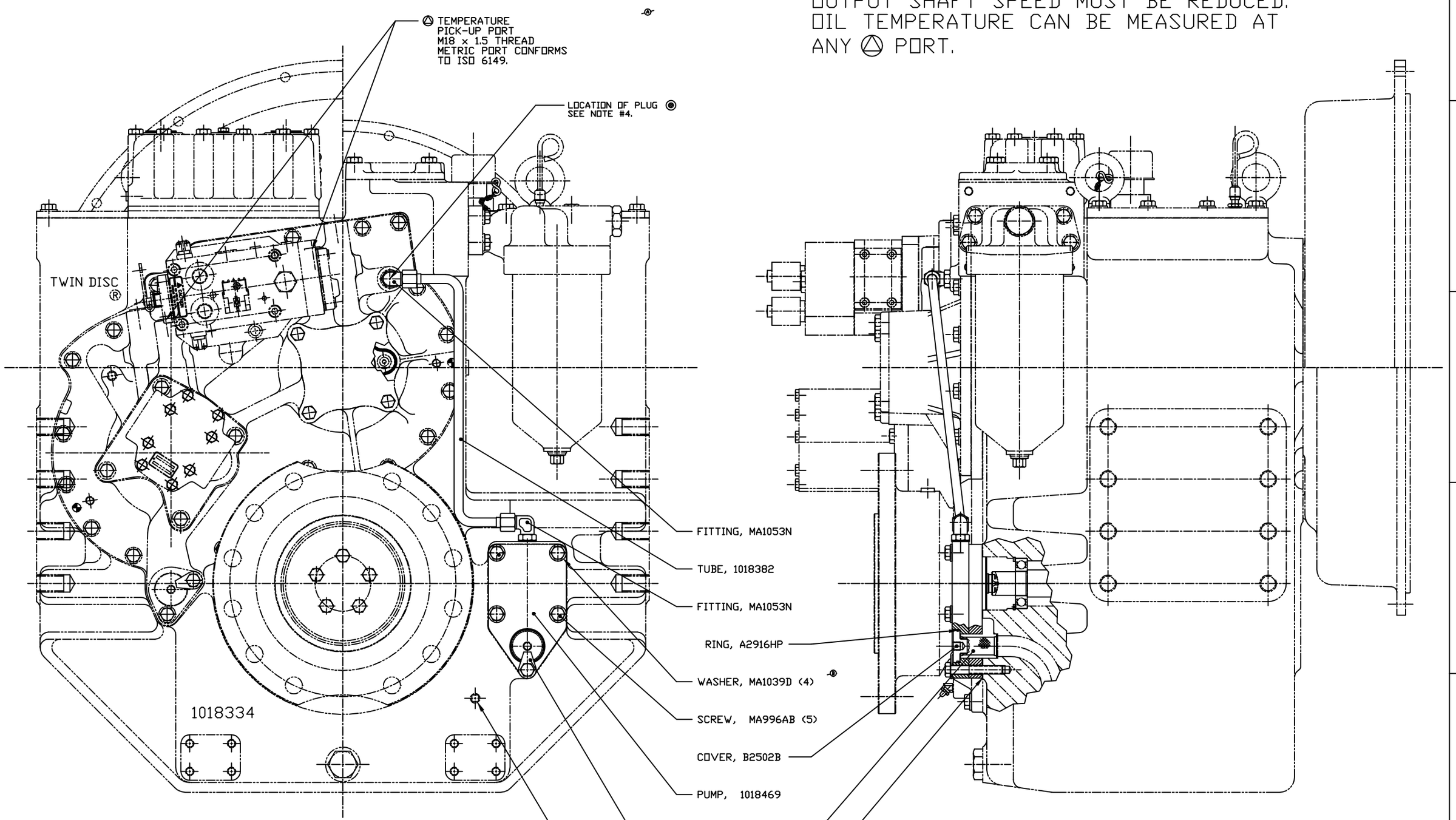
DATE 10-2-97
SCALE 1.0=1.0
DRN. RM
CHK. BJE
APPD. BJE

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

1017554

SHEET 1 OF 1 REV E

CAUTION: IF OIL TEMPERATURE EXCEEDS 100°C, OUTPUT SHAFT SPEED MUST BE REDUCED. OIL TEMPERATURE CAN BE MEASURED AT ANY △ PORT.



BOM NO. 40907

TRAILING PUMP
INSTALLATION INSTRUCTIONS:

1.) REMOVE COVER, GASKET, CAPSCREWS AND WASHERS FROM REAR OF HOUSING.

2.) ASSEMBLE A 90° FITTING ONTO THE PUMP (IN DIRECTION SHOWN).

3.) ALIGN THE TANG OF THE PUMP WITH THE SLOT IN THE PUMP SHAFT IN THE MAIN HOUSING AND ASSEMBLE THE GASKET, PUMP AND FITTING, SCREEN, COVER, AND PLATE ONTO THE REAR OF THE MAIN HOUSING USING THE (5) - M12 x 75.0 LONG CAPSCREWS AND TORQUE TO 62 N·m.

4.) REMOVE PLUG ◉ FROM MANIFOLD AND INSTALL 90° FITTING (IN DIRECTION SHOWN).

5.) ASSEMBLE TUBE TO FITTINGS.

REV	ZONE	CH. NO.	DATE
C	D-1	30554	02-02-01
B	C-3	30503	12-14-00
A	--	29447	7-15-99

MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT Kg / m³
FIRST USE
ASSY.
MODEL
NAME MG-6650-00-SC TRAILING PUMP ASSEMBLY

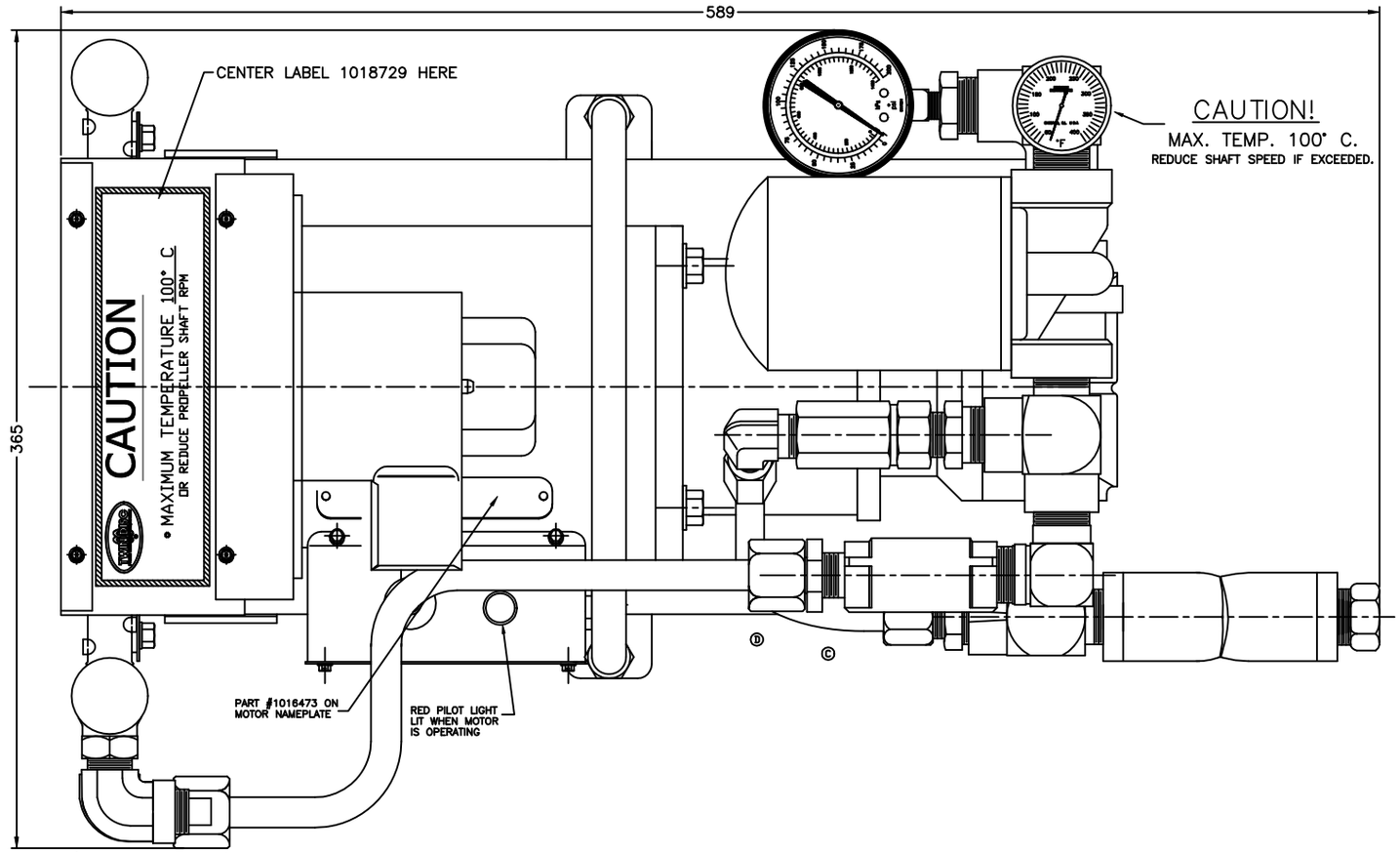
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
XX ±0.25
XXX ±0.13
XXXX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ASME Y14.5M 1994

DATE 9-3-98
SCALE .50=1.00
DRN. AZ
CHK. ALC
APPD. DAS
SHEET 1 OF 1 REV C

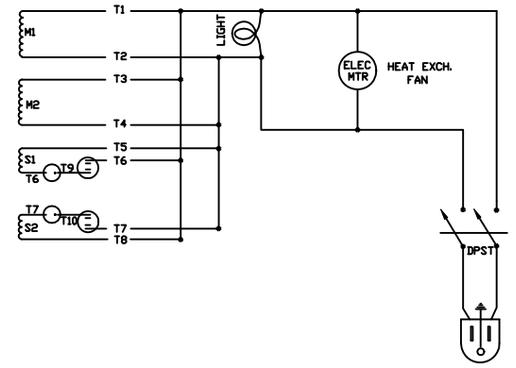
TWIN DISC INCORPORATED RACINE, WI 53403 - USA
1018554

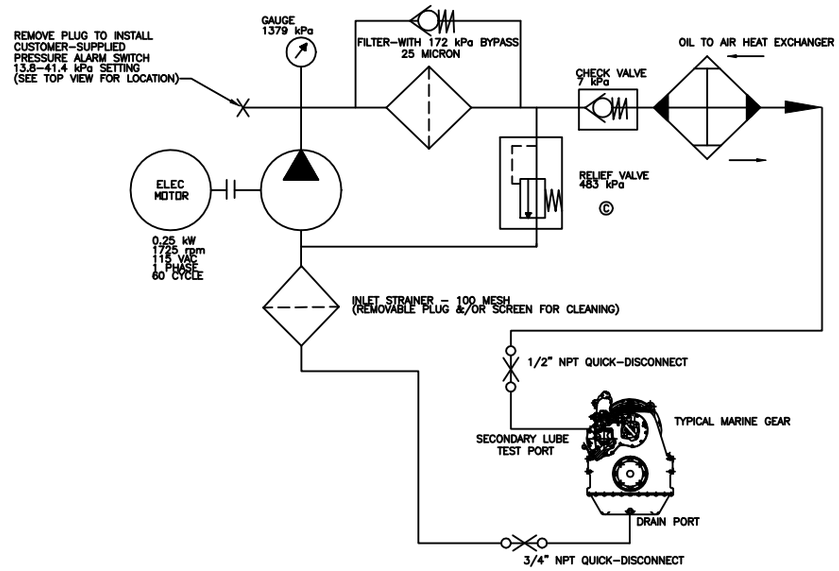
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

E D C B A



SINGLE PHASE, CAPACITOR, TYPE C, THERMALLY PROTECTED, DUAL VOLTAGE, DUAL ROTATION, 8 LEAD





PUMP FLOW RATE IS 11.0 l/min. AT 102° C.

REV	ZONE	CH. NO.	DATE
D	D-5	29860	1-26-00
C	B	29423	7-6-99
B	A-1	29078	1-19-99
A	---	29003	12-4-98

MATERIAL	
HEAT TREAT	
SURFACE TREATMENT	
WEIGHT	27.0 kg
FIRST USE	
ASSY. MODEL	
NAME	PUMP ASSEMBLY (TRAILING)
DATE	4-24-98
SCALE	1:1
DRN.	DMB
CHK.	PJL
APP'D.	DAS

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

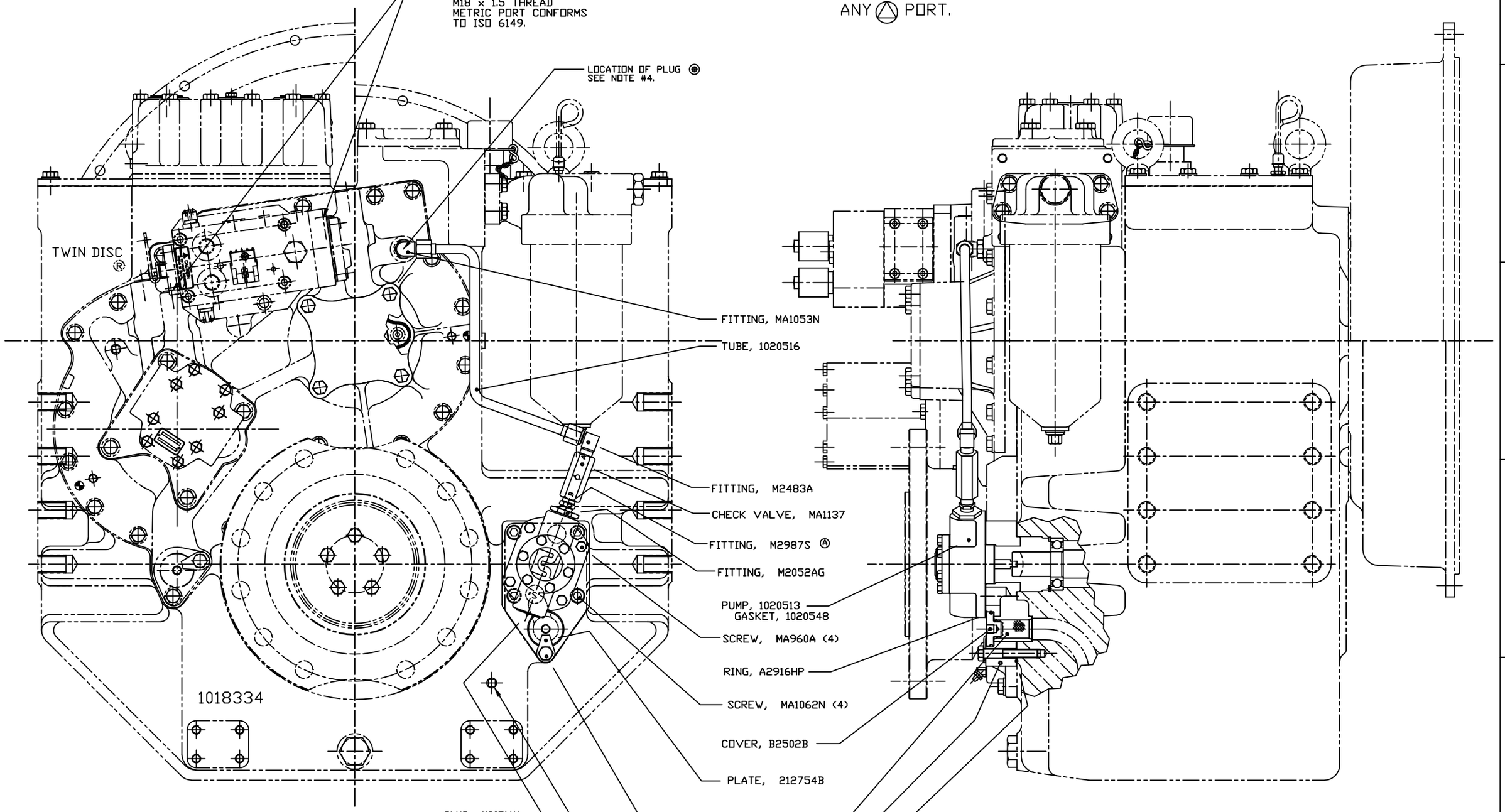
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
MACHINED DIMENSIONS
X.X ±0.75
X.XX ±0.13
X.XXX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1016473

SHEET 1 OF 1 REV D

CAUTION: IF OIL TEMPERATURE EXCEEDS 100°C,
OUTPUT SHAFT SPEED MUST BE REDUCED.
OIL TEMPERATURE CAN BE MEASURED AT
ANY Ⓐ PORT.



TRAILING PUMP

INSTALLATION INSTRUCTIONS:

1.) REMOVE COVER, GASKET, CAPSCREWS AND WASHERS FROM REAR OF HOUSING.

2.) ASSEMBLE ADAPTER WITH GASKET TO PAD ON THE TRANSMISSION AND HAND TIGHTEN THE (4) SOCKET HEAD SCREWS. INSERT STRAINER, COVER WITH "O" RING AND HAND TIGHTEN WITH A HEX BOLT AND LOCK PLATE. CROSS TORQUE ALL FASTENERS TO GRADE 8.8 PER S574.

Ⓐ 3.) INSTALL PUMP GASKET AND ALIGN PUMP TANG TO SHAFT DRIVER AND SECURE WITH (4) HEX HEAD SCREWS. PUMP MUST BE INSTALLED WITH PORT "S" CLOSEST TO TRAILING PUMP STRAINER. CROSS TORQUE FASTENERS TO GRADE 8.8 PER S574. INSTALL CHECK VALVE AS SHOWN (PORT "B" OF CHECK VALVE CLOSEST TO PUMP).

4.) REMOVE PLUG ◉ FROM MANIFOLD AND INSTALL 90° FITTING (IN DIRECTION SHOWN).

5.) ASSEMBLE TUBE TO FITTINGS.

BOM NO. 41906

REV	ZONE	CH. NO.	DATE
A		EC010655	2-8-02

MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT Kg / Wt. lb
FIRST USE
ASSY.
MODEL
NAME MG-6650-00-SC TRAILING PUMP ASSEMBLY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
.X ±0.5
.XX ±0.25
.XXX ±0.13
ALL ANGULAR TOLERANCES ±1°
BEND RADIUS TOLERANCES FOR SHEET METAL ±1mm

DATE 1-31-02
SCALE 50=1.00
DRWN J.R.
CHK. GM
APPD. GAM

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1020514

SHEET 1 OF 1 REV A

E D C B A

Notes

#1019103 04/02

TWIN DISC, INCORPORATED RACINE, WISCONSIN 53403, U.S.A. 262-638-4000/262-638-4482 (FAX) WWW.TWINDISC.COM