CARE AND OPERATION OF TWIN DISC POWER TAKE-OFFS

MODEL
SP-211-HP-x*

Assembly Drawings SP211Pxxx* and X-9681

Manual #1015996

TWIN DISC, INCORPORATED

Administrative Offices – Racine, Wisconsin

* The numbers designated by "x" will vary.

SERVICE INFORMATION

Each series of Maintenance Manuals issued by Twin Disc, Incorporated is reviewed for accuracy at regular intervals. When required, changes are made in the manual to provide the latest information regarding current design and maintenance practices of the product.

In addition, individual product Service Bulletins are issued to provide the field with immediate notice of new service information.

These Service Bulletins are distributed to all the Twin Disc Distributorships throughout the United States and in many foreign countries.

To be sure you have the latest Service Information on your Twin Disc product, contact any Twin Disc Distributor for Service Bulletins, or write to the Service Engineering Department, Twin Disc, Incorporated, Racine, Wisconsin, U.S.A.

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TWIN DISC, INCORPORATED
EXCLUSIVE LIMITED WARRANTY
GENERAL UNITS

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 original shipment by Twin Disc, Incorporated to the 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. 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.

CARE AND OPERATION OF TWIN DISC POWER TAKE-OFF

ADJUSTMENT

CLUTCH – If the clutch does not pull, heats, or operating lever jumps out, the clutch must be adjusted. To adjust the clutch, remove the hand hole plate from the housing and turn the clutch shaft assembly until the adjusting lock pin can be reached. Disengage the adjusting lock pin and turn the adjusting yoke or ring to the right or clockwise, until the operating lever shaft requires 1,930 lbs.-inches of torque to engage, or divide 1,930 by lever length to A obtain pounds pull at end of lever. See pages 19 and 20.

BEARINGS – Ball bearings do not require any adjustment.

The only approved method for the field adjustment of tapered roller bearings in Twin Disc Power-Take-Off Units is by use of a dial indicator to read actual endplay. See pages 12, 13, 14, 15, 16, 17, A and 18.

Adjust tapered roller bearings as follows:

1. Tighten adjusting nut. Roll bearings by rotating shaft to align and seat bearing rollers. Re-check adjusting nut for a tightness which would require 60 lbs.-in. to rotate the shaft in addition to seal drag. This step applies before greasing. Mark notch to use.

2. Back-off bearing retainer the number of notches as shown.

3. Strike output end of shaft with a soft hammer to seat bearing cup (outer race) against bearing retainer. This should give approximately the end play shown.

4. Measure actual end play with a dial indicator. Place PTO in a vertical position with its input end up. Mount an indicator to end of shaft to take exact readings. Use a hoist, or other means, and attach to shaft. Lift the shaft to the end of its free movement. This is done to seat bearing cup. Rotate shaft several times to seat bearing rollers. Set indicator to zero and release shaft. Press on end of shaft and rotate bearings to seat in opposite direction. If indicator shows end play out of limits, shim retainer, or adjust bearing nut to give correct end play.

5. After obtaining correct bearing end play adjustment, lock or secure bearing retainer.

NOTE

It is recommended after a new Power Take-off has been assembled to an engine or the bearings have been adjusted, to rap the shaft on the end to relieve any preloading that may result due to the resistance of the pilot bearing when being pressed into the flywheel.

LUBRICATION

THROWOUT COLLAR – Apply a small amount of lubricant once a day, before starting, through the fitting on the tapered part of the housing. Lubricate the bronze type collar design daily or after every 10 hrs. of operation. Lubricate the ball bearing type (periodic lubricated) every 100 hrs. of operation. Sealed-for-life ball bearing collar needs no further lubrication.

ANTI-FRICTION BEARINGS – Apply a small amount of lubricant to the pilot bearing through hole in the clutch shaft and to shaft bearings through fitting located at the housing hub approximately every 100 hours of operation.

NOTE

When a Power Take-off is being used with a direct drive through a flexible coupling, or any other means, thereby making it impossible to get at the fitting in the end of the shaft, provision should be made for cross drilling fo the shaft and installing a fitting between the housing and the hub of the driven member.

CAUTION

The sealed-for-life pilot bearing should not be lubricated during service, damage to engine crankshaft could result from trapped grease pressure. Clutch shaft, normally, will not be drilled. If drilled, a plug should be installed to prevent inadvertent greasing.

LUBRICANT – Use any high grade, high temperature, lithium base gun lubricant for anti-friction bearings, having operating temperatures of 200° F.

DRIVING PLATE REPLACEMENT – Common symptoms indicating the driving plate is worn out. The adjusting yoke cannot be screwed up any tighter and, in the case of riveted-on friction discs, that the rivet heads are flush with the face of the disc. In the case of moulded driving plates, the entire plate must be replaced. In the case of driving plates with riveted-on friction disc, the latter may be replaced. Wherever split driving plates are used, these may be replaced by unbolting Power Take-off housing from engine in order to permit getting at the clutch. With solid driving plates, it is necessary to further remove the clutch from the Power Take-off shaft.

REPAIR PARTS – In order to properly identify parts when ordering, always refer to unit and specification number stamped on the pad or plate on the top center of the Power Take-off housing flange. See page 11.

INSTALLATION – Avoid excessive wear or scrubbing of parts due to misalignment between the engine and the Power Take-off. If wear is experienced check the following:

1. Excessive loads tend to deflect parts to which Power Take-offs are mounted. To determine deflection under actual operating conditions, a dial indicator may be mounted on a rigid part of the engine, such as the crankcase, or independently on the foundation. Readings taken before the drive is installed, with the engine standing still and when under actual operating conditions, will indicate the extent of such deflection. In no case should the indicated deflection exceed .010 inch at the bearing in the Power Take-off housing.

2. To determine the concentricity of the flywheel housing bore and the alignment of the flywheel housing face, a dial indicator should be used in the manner shown below. All measurements should be taken with the assembled engine mounted on its supports after the flywheel and housing has been thoroughly cleaned. See page 11.

CHECKING FLYWHEEL HOUSING FACE

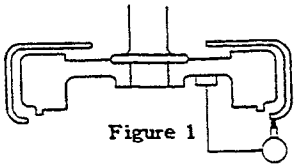


Figure 1

Bolt the indicator to the flywheel so that the indicator is vertical to the housing face and the indicator stem rides on the housing face. (See Fig. 1). Runout should not exceed tolerance listed in table No. 1.

CHECKING FLYWHEEL HOUSING BORE

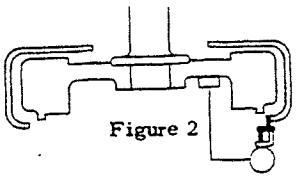


Figure 2

Readjust indicator so that the stem rides on the bore of the flywheel housing. (See Fig. 2). Runout should not exceed tolerances listed in table No. 1 Page 5.

CHECKING DRIVING RING SURFACE OF FLYWHEEL

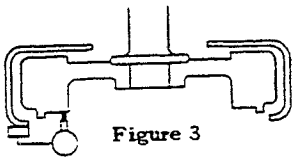


Figure 3

Remove indicator base from flywheel, and bolt indicator to flywheel housing proper, and check flywheel (See Fig. 3).
The variation of the face runout of the surface to which the driving ring or clutch plate is bolted, should not exceed .0005 maximum total indicator reading per inch of diameter.

CHECKING DRIVING RING PILOT BORE OF FLYWHEEL

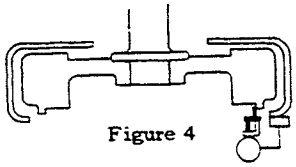


Figure 4

Readjust indicator so that the stem will ride on the driving ring pilot bore. The eccentricity of the driving ring pilot bore should not exceed .005 maximum total indicator reading. Eccentricity between driving ring pilot bore and pilot bearing bore should not exceed .008 total indicator reading.

CHECKING PILOT BEARING BORE OF FLYWHEEL

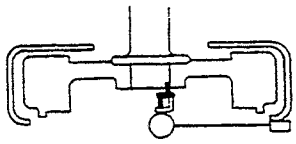


Figure 5

Readjust the indicator so stem rides on the pilot bearing bore cavity. The eccentricity of the pilot bearing bore should not exceed .005 maximum total indicator reading.

DISASSEMBLY AND ASSEMBLY

REMOVAL AND DISASSEMBLY

1. Remove all attached parts from the output end of the clutch shaft (28). Remove the key (29) and the grease fitting (30) from the output end of the clutch shaft.

2. Remove the twelve hex-head cap screws that secure the clutch housing (35). Use two 7/16-14 pusher screws in the tapped holes of the clutch housing flange, and remove the power take-off from the engine.

3. Remove the hex-head cap screws that secure the driving ring or spider (4) to the engine flywheel. Remove the driving ring, or spider.

4. Support the clutch housing with wooden blocks on a work bench with the clutch end of the unit up.

5. Use a standard bearing puller, and remove the pilot bearing (1) from the clutch shaft.

6. Remove the jam nut (20) and lock washer (19) from the hose fitting (18c) located in the clutch housing. Push the fitting and hose inward from the housing.

7. Straighten the bent portion of the hub nut lock washer (3) from the hub nut (2). Remove the hub nut and lock washer from the clutch shaft. Discard the hub nut lock washer.

8. Fit pilot bearing end of the clutch shaft with a protective steel cap. Engage clutch with clutch hand lever and hold lever with significant force in the engaged position direction. Rap the protective cap (shaft) with a smart hammer blow to free the clutch hub taper from the shaft taper. Remove the clutch assembly (5) through (17) from the clutch shaft. The key (27) will partially remove with the clutch assembly. Remove the key (27).

9. Straighten and remove the three cotter pins (12) from the three lever headed pins (14). Remove the three headed pins (14) and six spring washers (13) from the levers and floating plate. Remove the levers, sliding sleeve, and collar groups as an assembly from the adjusting ring and floating plate.

10. Use a screwdriver and depress the adjusting ring lock pin (10). Remove the adjusting ring (11) from the hub-and-back plate. Remove the adjusting ring lock pin (10) and spring (9) from the floating plate (8). Remove the floating plate (8), a driving plate (6), the center plate (7), and another driving plate (6) from the hub-and-back plate (5).

11. Remove the flexible hose assembly (18) from the collar assembly (17). Remove the lubrication fitting (21) from the hose fitting (18c). Remove the hose fittings (18c) and (18b) from the hose (18a).

12. Remove the two hex nuts (17a) and two hex-head cap screws (17d) from the collar. Remove the collar (17b) and two shims (17c) from the sliding sleeve.

13. Straighten and remove the six cotter pins (16a) from the headed pins (16c). Remove the headed pins (16c), six lever links (16b), and three levers (15) from the sliding sleeve (16d).

14. Remove the hex-head cap screw (22) from the clutch housing (35), and remove the lock washer (23) and lock (24) from the clutch housing. Remove the bearing retainer (25) from the housing. Press or carefully tap the clutch shaft (28) with attached bearing cones (26) and (31) from the clutch housing, from rear toward front. The forward bearing cone cup (26) will remove with the shaft and bearing cones. If necessary to remove the rear bearing cup (31), two access holes are provided in the housing through which a straight punch can be inserted. Tap the bearing cup forward, evenly, with the punch until it falls free into the housing. Remove the cup.

15. Press, or with a puller, pull the bearing cones (26) and (31) from the clutch shaft (28). The bearing cones are positioned back-to-back against the shoulder on the shaft. The bearing cones are mounted from opposite ends of the clutch shaft.

16. Remove the headless setscrew (32) from the clutch housing (35) only if the replacement of the parts is necessary.

17. Remove the hex-head cap screw (36) from the hand lever (37), and remove the hand lever (37) from the operating shaft (40).

18. Remove the two hex-head cap screws (42) and lock washers (43) from the throwout yoke (44). Tap the operating shaft through the housing and yoke far enough to expose one of the Woodruff keys (41). Remove this key and continue to tap the operating shaft through until the other key is exposed adjacent to the yoke and remove the key. Continue to tap the operating shaft (40) through the yoke and from the housing.

19. Remove the two round-head cap screws (39) which secure the instruction plate cover (38) to the clutch housing (35) and remove the cover (38) from the clutch housing.

20. Remove the lubrication fittings (34) from the housing only if replacement of the parts is necessary.

21. Remove the lubrication fitting (33) from the housing only if replacement of the parts is necessary.

ASSEMBLY AND INSTALLATION

1. Install the 1/8-inch grease fitting (33) and the two 1/4-inch grease fittings (34) into the clutch housing if removed during disassembly. Set the clutch housing on the bench supported by wood blocks, so the input end faces up.

2. Install the operating shaft (40) halfway into the clutch housing. Slip the throwout yoke (44) onto the operating shaft and push the shaft through the opening on the other side of the clutch housing. Install one 1/4 x 1 Woodruff key (41) in the operating shaft. Slightly move the throwout yoke on the operating shaft and install the other key. Install the two 3/8-16 x 1-1/2 hex-head cap screws (42) and the two 3/8-inch lock washers (43) to secure the throwout yoke to the operating shaft. Tighten the cap screws to 38-42 lbs.-ft. torque.

3. Install the headless setscrew (32) into the clutch housing lubrication passage. Tighten the screw securely.

4. Position the hand lever (37) on the operating shaft (40). Secure the hand lever to the shaft with a hex-head cap screw (36) 1/2-13 x 1-3/4. Tighten the cap screw to 86-95 lbs.-ft. torque.

5. Use an arbor press, and press the clutch shaft (28) into the bearing cones (26) and (31). The shaft must be turned around for the installation of the second bearing cone, as the cones are mounted back-to-back against the shoulder on the clutch shaft.

6. Use a piece of steel tubing 14 inches long slightly smaller in diameter (outside) than the bearing cup (31), and with it press the bearing cup into the bearing bore to bottom.

7. Slide the clutch shaft (28) with attached parts into the clutch housing (35). Install the clutch shaft forward bearing cup (26) into the housing over the clutch shaft and bearing cone. Use the piece of steel tubing and tap or press the bearing cup (26) into position in the bearing bore.

8. Install the bearing retainer (25) and proceed to adjust the bearings by adjusting the shaft end-play as outlined on the front page under "Adjustment". Before taking end play readings, rotate the shaft to seat and align the bearing rollers. After adjustment, install the retainer lock (24), lock washer (23), and cap screw (22) to secure the bearing retainer in the clutch housing.

9. Set the hub-and-back plate (5) on the work bench with the threaded hub facing up. Install a driving clutch plate (6), center plate (7), another driving plate (6), and the floating plate (8) onto the hub-and-back plate.

10. Install the adjusting ring lock pin spring (9) onto the floating plate in the hole provided. Install the adjusting ring lock pin (10) on top of the spring (9). Depress the lock pin with a screwdriver and install the adjusting ring (11) to the threaded hub of the back plate (5). Screw the ring down approximately 1/2 of the distance of the hub thread.

11. Install the six lever links (16b), three levers (15), and six headed pins (16c) to the sliding sleeve. Retain the headed pins with six cotter pins (16a). Spread the ends of the cotter pins so their radius does not exceed 0.390-inches for proper operating clearances.

12. Install the collar halves (17b) and two shims (17c) to the sliding sleeve. Secure the collar with two hex nuts (17a) and two hex-head cap screws (17d) 3/8-24 x 2-1/4. Tighten the cap screw to 38-42 lbs.-ft. torque.

13. Install the levers, sliding sleeve, and collar groups onto the adjusting ring and floating plate as an assembly. Engage the levers with the adjusting ring and locate the levers in their mounting lugs on the floating plate (8).

14. Place six spring washers (13) (one on each side) on the sides of the clutch levers (15), and secure the levers to the lugs of the floating plate with three lever headed pins (14). Retain the headed pins with three cotter pins (12). Spread the ends of the cotter pins.

15. Install the flexible hose fitting (18b) into the collar half (17b). Install the hose (18a) into the fitting (18b). Install the fitting (18c) onto the hose. Install the lubrication fitting (21) into the fitting (18c).

16. Set the clutch assembly (5) through (17) and attached parts over and down about three-fourths of the taper of the clutch shaft. Align the keyways in the shaft and hub-and-back plate. Install key (27). Lower the clutch assembly while engaging the throwout yoke with the trunnions on the collar assembly, also keep tapping the key to keep it flush with the back side of the hub-and-back plate. Route the flexible hose clear of all moving parts and into the hole provided in the housing.

17. Install the lock washer (3) on the clutch shaft against the hub-and-back plate. Be sure the washer tab is indexed in the spot-drilled hole provided in the hub-and-back plate. Install the hub nut (2) onto the clutch shaft. Tighten the nut against the washer (3), using 30 lbs.-ft. torque, to seat the tapers and take up the clearances. Tighten the nut by turning it an additional 120 to 150°. Bend a section of the lock washer (3) against a flat on the hub nut to secure the nut.

18. Push the flexible hose (18) fitting (18c) through the hole provided in the clutch housing. Install lock washer (19) over the fitting and install nut (20) on the fitting to secure it in the housing.

19. Install the pilot bearing (1) on the end of the clutch shaft (28). Press or tap the bearing on its inner race, until it's in a position on the shaft, where the inner race overhangs the shaft by 0.08-inch. (See sketch).

20. Adjust the clutch assembly by the following procedure:

(a) With the clutch disengaged, turn the clutch until the adjusting lock pin (10) can be reached. Depress the lock pin and screw the adjusting ring in a clockwise direction one or two adjusting notches, or until a distinct pressure is required to move the hand lever.

(b) Release the lock pin, and move the adjusting ring to engage the lock pin in the nearest notch of the ring.

(c) Engage and disengage the clutch a number of times to make certain the clutch is functioning properly. If proper engagement has not been accomplished, repeat steps (a) to (c) until proper engagement and disengagement is obtained.

21. Place the instruction plate cover (38) in position on the clutch housing (35) and secure it to the housing with two round-head cap screws (39) 1/4-20 x 1/2. Tighten the cap screws to 11-13 lbs. ft. torque.

22. Position the driving ring, or spider (4) against the engine flywheel and secure with eight hex-head cap screws. Refer to torque chart Page 21 for proper torque of capscrews.

23. Position the clutch housing (35) against the flywheel housing, carefully aligning the pilot bearing (1) with the flywheel pilot and clutch plates (6) with the driving ring or spider. Secure the clutch housing to the flywheel housing with twelve hex-head cap screws. Rap the output end of the clutch shaft with a soft hammer to relieve any preloading on the bearings.

B

24. Install the 1/4-inch grease fitting (30) and key (29) in the output end of the clutch shaft (28). Attach all the parts, previously removed, to the output end of the clutch shaft.

CAUTION

A support plate must be used when side loads are applied to the output shaft.

TABLE No. 1 – FLYWHEEL HOUSING TOLERANCES

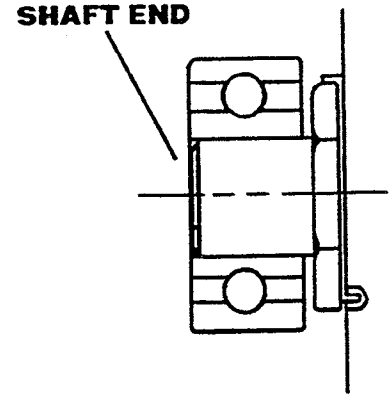
SAE Housing No.	Face Deviations	Bore Eccentricity
00	.019	.019
0	.016	.016
½	.014	.014
1	.012	.012
2	.011	.011
3	.010	.010
4	.009	.009
5	.008	.008
6	.007	.007

All Figures are Total Indicator Readings Tolerances

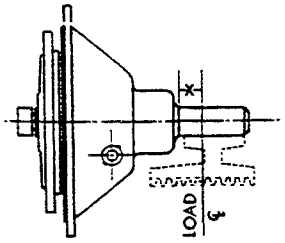
POWER TAKE-OFF CHART

Model No.	Drawing No.	Main Bearing T.D. No.	Recommended End Play	Notches Backed-Off From Tight
SP-211-HP-1	X9681	M2196	0.004-0.007	3¾ - 4¾

PILOT BEARING



ALLOWABLE SIDE-PULL LOADS – FOR STANDARD POWER TAKE OFFS



THE FOLLOWING GENERAL FORMULA SHOULD BE USED FOR DETERMINING THE ACTUAL APPLIED LOAD:

$$L = \frac{126{,}000 \times H.P.}{N \times D} \times F$$

WHERE L=ACTUAL APPLIED LOAD (LBS.)
N=SHAFT SPEED, (REV./MIN.)
D=PITCH DIA. OF SHEAVE, ETC.
* F=LOAD FACTOR

"X" DISTANCE, INCHES (SEE SKETCH)

1.0 FOR CHAIN OR GEAR DRIVE
2.5 FOR ALL V-BELT DRIVES
3.5 FOR FLAT BELT

* NOTE: FOR RECIPROCATING COMPRESSORS AND OTHER SEVERE SHOCK DRIVES, MULTIPLY ABOVE FACTORS BY 2.1

PTO	RPM	1	2	3	4	5	6	7	8	9
SP-211-HP-1 X9681	1000	4540	3395	2710	2255	1930	1690			
	1200	4370	3395	2710	2255	1930	1690			
	1800	3900	3395	2710	2255	1930	1690			
	2400	3550	3330	2710	2255	1930	1690			

Maximum Allowable RPM

	Cast Iron Driving Ring		Steel or Nodular Iron Driving Ring			
Model	Solid Drive Plates	Split Drive Plates	Solid Drive Plates	Split Drive Plates	Cast Iron Drive Plates	Nodular Drive Ring
SP-211-HP-1	2850	2200	3500	3160	6931	6931T

* Maximum RPM should not exceed tabulated speed by more than 8% including governor over run.

STEPS TO BE TAKEN IN SETTING UP AIR ENGAGEMENT ON TWIN DISC POWER TAKE OFFS

1. The cylinder should be located so that the piston travels in the same plane as the arc of the engagement lever.
2. Air cylinder must be of sufficient size to operate the required torque to engage the clutch. It must have some means to make adjustment to the piston stroke.
3. Air pressure must be constant. Low pressures could give only partial engagement which will cause failures to the clutch plates and throwout collar.
4. Piston travel must be within limits established to engage and disengage the clutch. Failure to adhere to this will cause failure and possible breakage of the clutch.
5. The engaging cylinder must unload itself at the engaged and disengaged position.*

*To further qualify this statement, the engaging collar must float free after engagement or disengagement. Short life on the collar and sleeve will result if proper adjustment is not made.

When adjustments are made to the clutch to take up plate wear the power cylinder rod length must be re-adjusted to assure proper stroke length.

TO DETERMINE THE LENGTH OF TRAVEL FOR THE ENGAGING CYLINDER

*Multiply the length of the engaging arm by the figure given in the engaging stroke column. This will give you the length of stroke in inches, required for the force cylinder.

TABLE I

ENGAGING EFFORTS AND TRAVEL

Model No.	Drawing Number	† Torque on Operating Shaft Required to Engage Clutch Lbs.-in.	* Engaging Stroke Travel at One Inch
C106-SP	X8317 - Nos. 4, 6 Hsg.	940	.238
C106-SP	X8317 - No. 5 Hsg.	940	.218
C107-SP	X8317 - Nos. 4, 6 Hsg.	940	.238
C107-SP	X8317 - No. 5 Hsg.	940	.218
C108-HP	X8419-E	1030	.270
C110-HP	X8249 - Nos. 1, 2, 3 Hsg.	1270	.270
C110-HP	X8249 - Nos. 4 Hsg.	1270	.270
SP111-OP	X9818	1540	.325
SP111-HP	X9582	1540	.325
SP211-HP	X9681	1930	.267
SP211-OP	X9894	1930	.267
SP114-P	X9643	3150	.312
SP214-P	X9803	3150	.312
SP314-P	X9585 & A	3150	.313
IBF214-OP	X9745-C & D	3465	.312
B118-P	X7243-A	3540	.352
B218-P	X7189-B	3540	.352
SP318-P	X9671	7370	.350
IBF318-OP	X9918 & A	7370	.375
EH121-P	X9235	9950	.272
EH221-P	X9236	9950	.280
IBF321-OP	X9919	7370	.375
SP321	X9691-A	7370	.352
EH224-P	X9635	10530	.303

*Multiply engaging stroke travel at one inch by length of engaging lever to obtain piston travel.

TO DETERMINE THE ENGAGING FORCE IN POUNDS REQUIRED AT THE ENGAGING CYLINDER

Use the following formula to determine the engaging piston force in lbs.

$$\dagger \ \frac{\text{Torque on operating shaft}}{\text{Lever Length}} = \text{Force in lbs. at piston}$$

Example: C108-HP $\quad \frac{1030 \text{ lbs.-in.}}{10 \text{ in.}} = 103 \text{ lbs.}$

CAUTION NOTES:

1. When using a power engager there is no feel to the adjustment of the clutch.
2. The power engager should be disconnected periodically and required force physically checked with a scale. The use of 66.7% of maximum force for minimum effort to engage is acceptable before re-adjusting.

ASSEMBLY INSTRUCTIONS FOR PILOT ROLLER BEARINGS

Twin Disc has available roller type pilot bearings in several sizes for use with PTO's and single stage torque converters. Many specifications have been written to include this type of bearing. All of the roller pilot bearings available from Twin Disc are the separate race type i.e. the inner race is removable from the outer race roller and seal assembly. Due to this construction axial alignment of the inner and outer races is **most important.** Data is given here in general terms which will assure proper bearing mounting for any unit using this type pilot bearing. In most cases installation drawings are also available for specific units using this bearing.

NOTE

Pilot bearing race to be assembled flush with end of input shaft.

INSTRUCTIONS FOR ASSEMBLY:

1. Press inner race of roller bearing on clutch shaft flush with end of shaft.
2. Place unit on bench with clutch shaft vertical as shown.
3. Measure dimension (a) as shown in Table A.
4. Installation dimension (b) for bearing outer race is determined by subtracting the bearing width shown in Table from dimension (a). (b=a–bearing width).
5. Install bearing outer race and roller assembly into flywheel cavity to dimension (b).

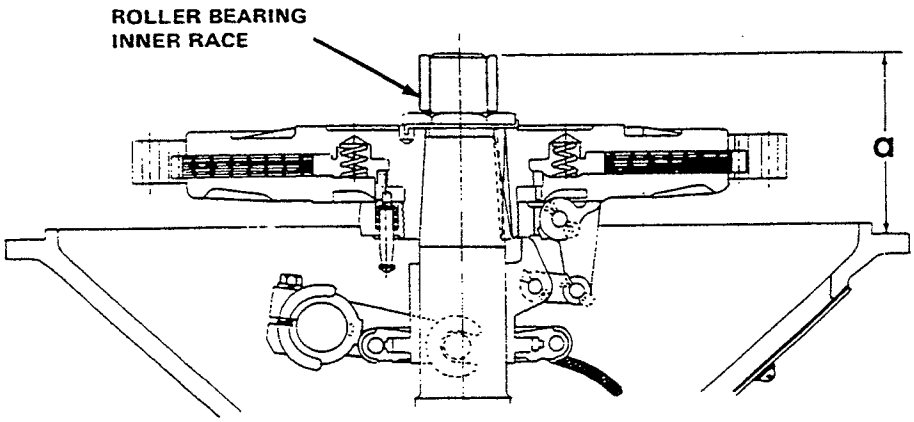


FIGURE A

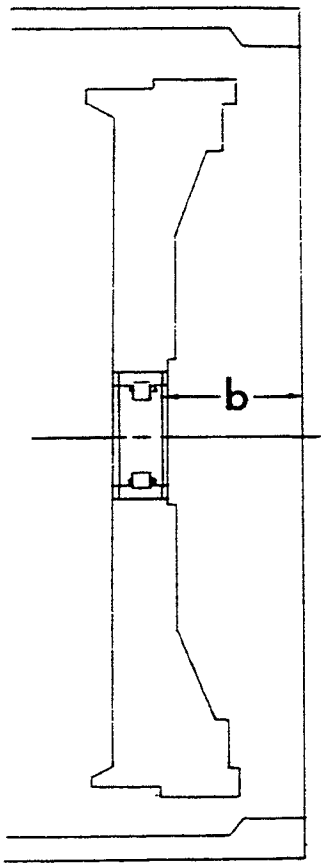
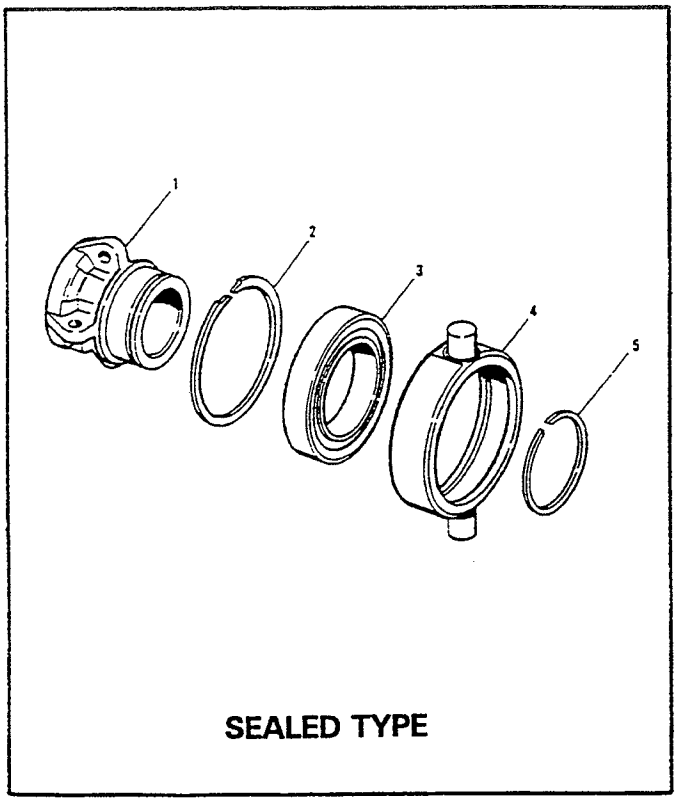


FIGURE B

Figure 6-26. Optional Pilot Bearing.

Roller Brg. Part No.	Brg. O.D.	Recommended Flywheel Bore	Brg. I.D.	Roller Brg. Width Nominal
M2680	3.1506	3.1500	1.1807	1.1850
	3.1501	3.1494	1.1802	
M2467	2.8356	2.8350	1.1806	1.1850
	2.8351	2.8344	1.1802	
M2529	3.1506	3.1500	1.3775	1.3725
	3.1501	3.1494	1.3770	
M2713	3.9384	3.9377	1.7707	1.5600
	3.9378	3.9367	1.7712	

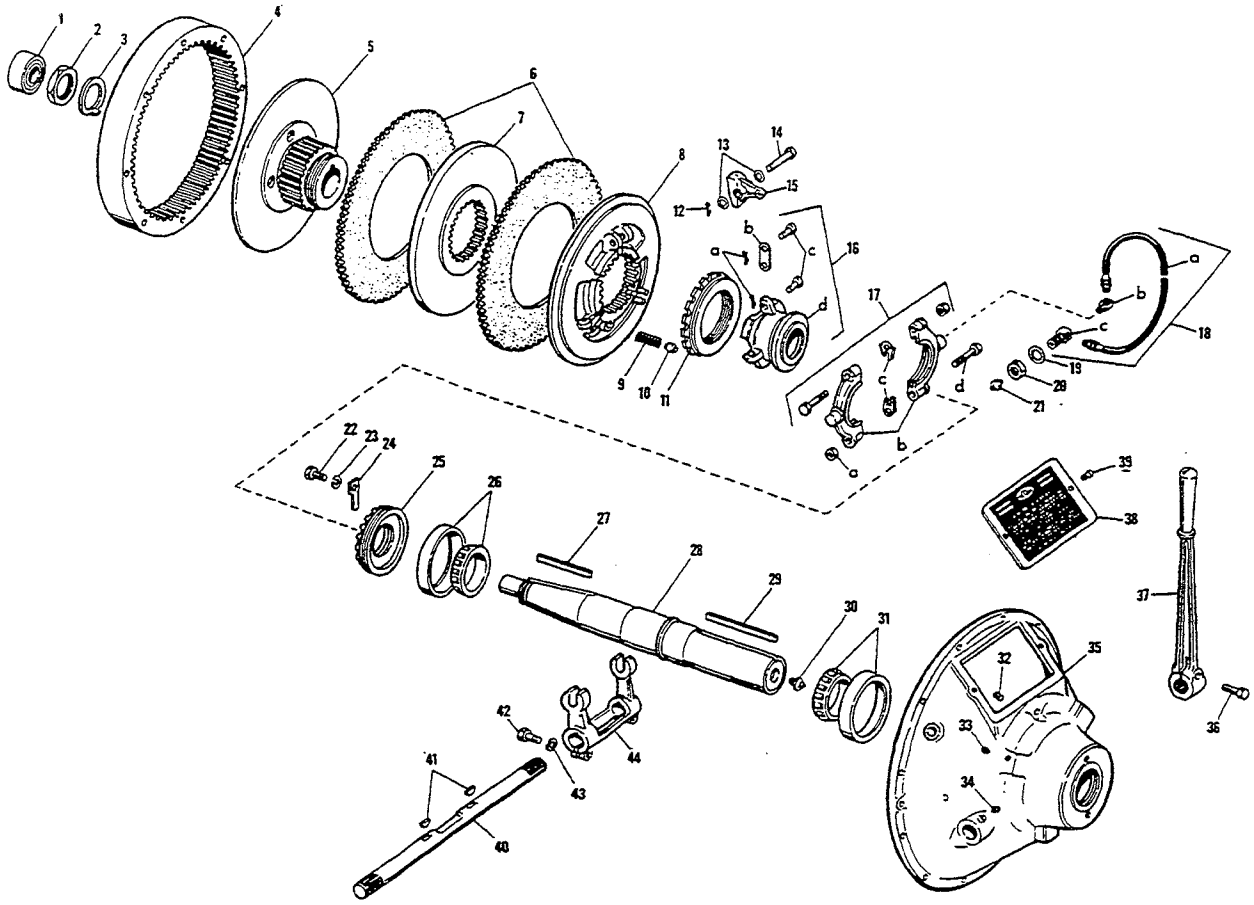


SEALED TYPE

ALTERNATE BALL BEARING THROWOUT COLLAR ASSEMBLY

A ball bearing throwout collar feature is obtainable for this model, PTO. The parts which differ from the standard bronze collar type are: sliding sleeve and throwout collar. New additional parts are; ball bearing (sealed-for-life, or periodic-lubricated) and two snap rings. A lubricating hose, two fittings, a jam nut, washer (shakeproof), and grease fittings go with the periodically lubricated bearing.

Optional sealed-type bearing. During disassembly remove the external snap ring (5), and with a bearing puller remove the collar (4) and bearing (3) from the sleeve (1). Remove the internal snap ring (2), and remove the ball bearing (3) from the collar (4). To assemble, press the ball bearing (3) into the collar (4). Install the internal snap ring (2) into the collar (4) to retain the bearing. Press the collar and ball bearing onto the sleeve (1) using force on the bearing inner race only. Install the external snap ring to retain the bearing and the collar on the sleeve.



Item	Description	Quantity
1	BEARING, pilot	1
2	NUT, hub	1
3	WASHER, lock	1
4	RING, driving (or spider)	1
5	PLATE, hub-and-back	1
6	PLATE, driving	2
7	PLATE, center	1
8	PLATE, floating	1
9	SPRING	1
10	PIN, adjusting lock	1
11	RING, adjusting	1
12	PIN, cotter	3
13	WASHER, spring	6
14	PIN, lever	3
15	LEVER	3
16	SLIDING SLEEVE ASSEMBLY	1
A	PIN, cotter	6
B	LINK, lever	6
C	PIN, lever	6
D	SLEEVE, sliding	1
17	COLLAR ASSEMBLY	1
A	NUT, hex	2
B	COLLAR	1
C	SHIM	2
D	SCREW, cap, hex-head (3/8-24 x 2-1/4)	2
18	HOSE ASSEMBLY	1
A	HOSE, flexible	1
B	FITTING	1
C	FITTING	1
19	WASHER, lock	1
20	NUT, jam	1
21	FITTING	1
22	SCREW, cap, hex-head (1/4-20 x 5/8)	1
23	WASHER, lock	1
24	LOCK, bearing retainer	1
25	RETAINER, bearing	1
26	ROLLER BEARING	1
27	KEY	1
28	SHAFT, clutch	1
29	KEY	1
30	FITTING	1
31	ROLLER BEARING	1
32	SCREW, headless set	1
33	FITTING	1
34	FITTING	2
35	HOUSING No. 2 SAE	1
36	SCREW, cap, hex-head (1/2-13 x 1-3/4)	1
37	LEVER, hand	1
38	PLATE, instruction cover	1
39	SCREW, rd. head (1/4-20 x 1/2)	2
40	SHAFT, operating	1
41	KEY, Woodruff	2
42	SCREW, cap, hex-head (3/8-16 x 1-1/2)	2
43	WASHER, lock	2
44	YOKE, throwout	1

ORDERING PARTS

Renewal parts, parts service kits, and repairs may be obtained from your Authorized Twin Disc Distributor or Service Dealer. You can find him listed under POWER TRANSMISSION EQUIPMENT in the Yellow Pages of most metropolitan telephone directories.

CAUTION

Most Twin Disc products are made to be mounted directly on the flywheel of the engine. It is possible, due to mismatch of components or many other reasons, to have flywheel to driven component interference. As a result, it is necessary that engine crankshaft end play be measured before the driven component is installed.

After installation of the driven component, crankshaft end play should again be measured. The second measurement should be the same as the first end play measurement. If it is not the same, it could be an indication of interference. Consequently, the driven component should be removed, 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 end play check is considered mandatory.

LIFTING BOLT HOLES PROVIDED ON TWIN DISC PRODUCTS

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 should **not** be used to lift the complete power unit. Lifting excessive loads at these points could cause failure at the lift point (or points) and result in damage or personal injury.

FIELD ADJUSTMENT – TAPERED ROLLER BEARINGS (SIDE LOADED PTO APPLICATIONS)

The only approved method for field setting (adjusting) tapered roller bearings in Twin Disc Power Take-off units, is by the use of a dial indicator to read actual end play.

Twin Disc PTO design will have one of two means provided for adjustment of the tapered roller bearings; either a bearing retainer nut (figure 1), or a bearing retainer plate and shim pack (figure 2). See pages 13 and 14.
To reach a starting point for bearing adjustment, assemble PTO clutch shaft, bearings and retainer nut or shim retainer plate into the housing and carrier (if used).

1. Tighten the retainer nut or capscrews on retainer plate until the shaft requires a 60 lbs. in. force to turn.

2. Back off the retainer nut (figure 1) the number of notches shown on page 5. Measure the shim pack space on (figure 2) for selecting shims. Select shims equal to space plus additional shims for endplay specified in table.

3. Dial indicate resulting end play as follows:

a. Set PTO on supporting blocks with the clutch shaft in a vertical position with the input end down.

b. Attach an eyebolt in the 1/4 PTF thread at the output end of the shaft. (Models which do not have this hole will have to be inverted with the input end up, and clearance at the output end below, for dial indicator mounting. An extra hub nut with a loop shaped strap welded to it can be used to apply the pushing and pulling forces required during end play check). See p.14 for tool.

c. Attach a hoist with a thrust bearing equipped swivel hook to the eyebolt or strap.

d. Attach a dial indicator to the housing and locate the stem or plunger, from the indicator, on the outer machined area of the end of the clutch shaft. Mark a spot next to the indicator stem.

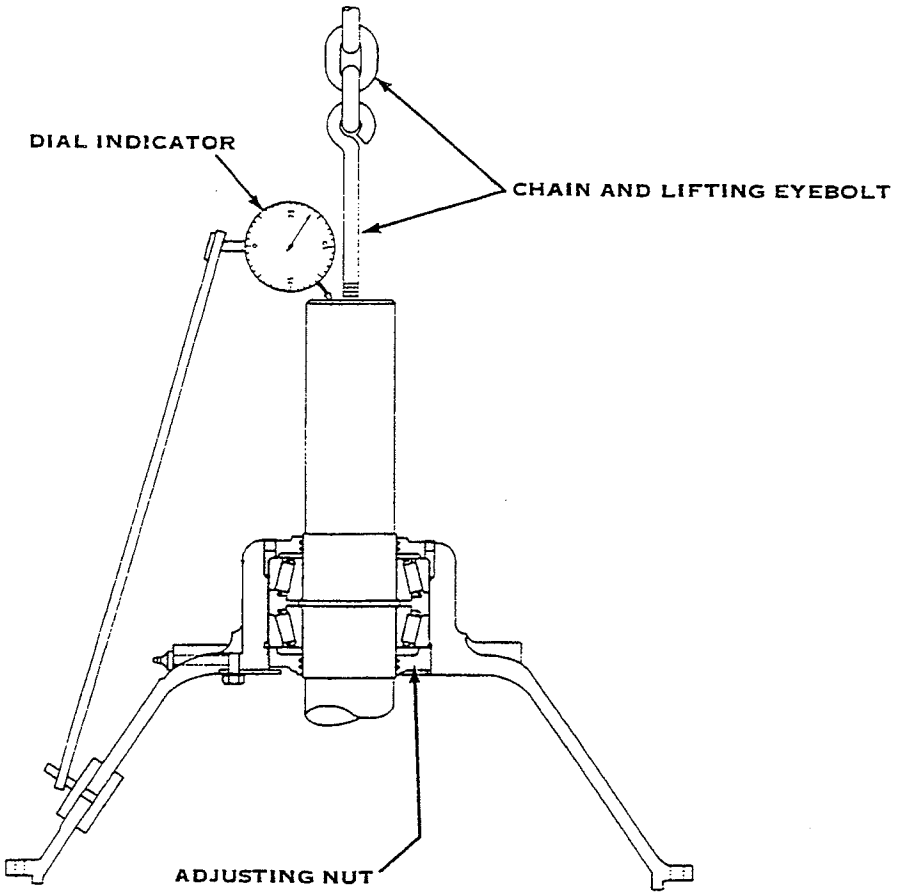
e. Apply a pushing force of two hundred pounds while turning the shaft two complete revolutions in each direction (the weight of the shaft can be counted as part of the two hundred pounds). With the pushing force applied, stop the plunger or stem next to the mark and zero the dial indicator.

f. Apply a pulling force of two hundred pounds (compensate for shaft weight), to the shaft and rotate, with force applied, two complete revolutions in each direction. Stop with force applied and mark next to plunger or stem of the dial indicator. The indicator reads the actual end play.

g. Adjust nut or add or subtract shims as model requires, to obtain the desired end play. Recheck final end play with the dial indicator as described. Lock nut when end play adjustment is satisfactory.

NOTE

The following recommended endplay dimensions pertain to PTO applications where side loading is a factor. For endplay dimensions for PTO's used in in-line drive applications, refer to Service Letter 71-28.


DIAL INDICATOR
CHAIN AND LIFTING EYEBOLT
ADJUSTING NUT

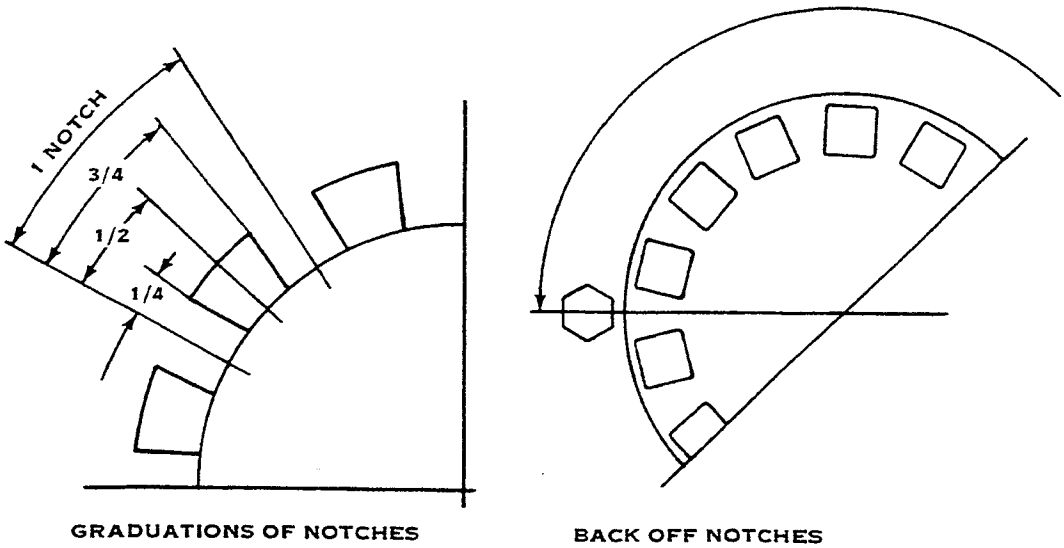
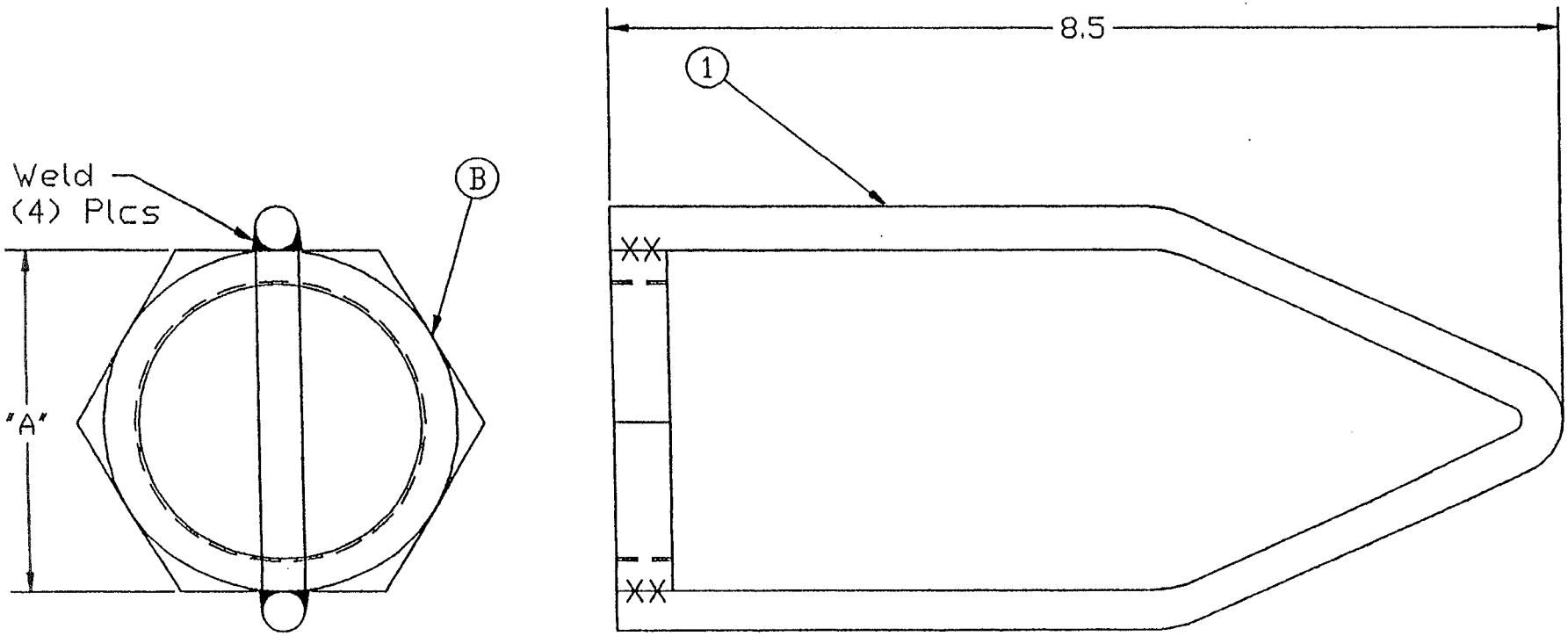

1 NOTCH
3/4
1/2
1/4
GRADUATIONS OF NOTCHES
BACK OFF NOTCHES

Figure 1.

CHANGE	DESCRIPTION	DATE	BY



T.D. Tool No.	"A" Dim.	"B" T.D. Part No.	Thread.	Units
T-21275-1	3.125	1442	2.5-16N	
T-21275-2	2.000	1092	1.375-12NF	
T-21275-3	2.375	B1509B	1.75-16N	

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
1	1	C.R.S.	.38 Dia. 1018 C.R.S. Round Stock	

DATE 10-4-94 BY M. WADE

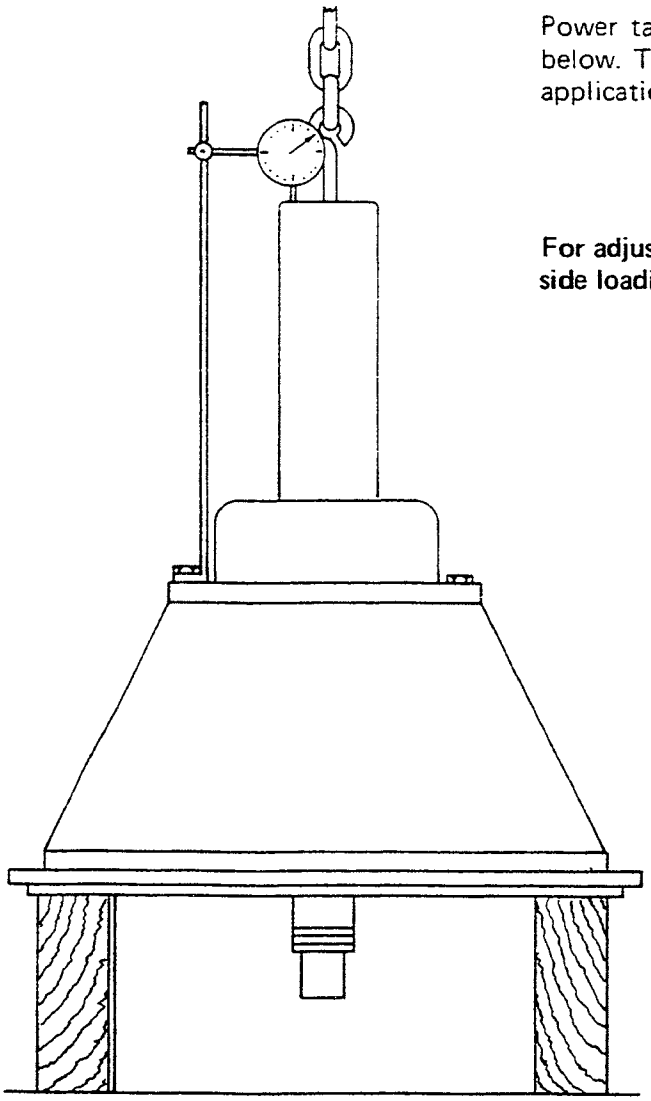
NAME LIFTING BAIL

FOR MISCELLANEOUS PARTS

SHEET OF

T-21275

ADJUSTMENT TAPERED ROLLER BEARINGS HIGH SPEED, "U" JOINT TYPE OR FLEXIBLE COUPLING. IRRIGATION PUMP AND IN LINE DRIVE APPLICATIONS



Field experience with high speed, "U" joint type, in line drive and irrigation pump installations indicates that extra care must be taken when adjusting the power take-off tapered roller bearings.

Power take-off shaft end play should be within the limits tabulated below. The end play shown on this chart is special for the above type applications. The sketch shows the method of checking this end play.

NOTE

For adjustment of tapered roller bearings in PTO applications where side loading is a factor, refer to Service Letter 71-26.

Twin Disc Number	Recommended End Play	Used in Model	Drawing Number
M-1590	.007-.009	C-108	X8419-A
M207	.007-.009	C110HP	X8249
		C111HP	X8249
M-207	.007-.009	SP-111HP	X 9582
M-282	.009-.012	B-114	X8409-A
		SP114P	X9643
M-215	.009-.012	B-118	X7243-A
M-215	.009-.012	B-218-P	X7189-B
M-215	.009-.012	SP314-P	X9585
M-215	.009-.012	SP314-P	X9585-A
M-214	.009-.012	B214-P	X8295-A
M-214	.009-.012	SP214-P	X9803
M2169	.007-.009	SP211HP	X9681
MA-181	.007-.009	SP211OP	X9894-B
M-2780	.009-.012	SP218OP	XA7190
M-2780	.009-.012	SP218OP	XA7190-A
M-2780	.009-.012	IBF214OP	X9745-E
M-2780	.009-.012	IBF214OP	X9745-F
M-2780	.009-.012	IBF314OP	XA7149-A
M-2780	.009-.012	IBF314OP	XA7149-B
M-2962	.013-.016	IBF318OP	X9918
M-2962	.013-.016	IBF321OP	X9919

Procedure for checking clutch shaft end play.

1. Tighten bearing adjusting nut, until output shaft requires 60 in. lbs. to rotate.

2. Back off adjusting nut 2-3 notches. Note: If shims are used refer to appropriate PTO manual for procedure.

3. Strike output end of shaft with soft hammer or block of wood to set bearing cup (outer race) against adjusting nut.

4. Place housing and shaft assembly on firm blocking, output end up (see sketch). See page 15.

5. Install dial indicator as shown in sketch.

6. Mark a spot adjacent to the indicator stem or plunger and apply a two hundred pound force (weight of shaft counts toward 200 lbs. force), while rotating the shaft two complete revolutions in each direction. While applying this force stop with the stem or plunger of the dial indicator next to the spot marked and zero the indicator. Apply a pulling force of two hundred pounds and rotate the shaft two complete revolutions in each direction. With force applied, stop so the stem or plunger of the indicator is next to the mark as before, and read the actual shaft end play on the indicator. The pulling and pushing forces can be applied with an eyebolt as illustrated, or by inverting the PTO and using an extra hub nut with a loop strap welded to it on the input end of the shaft. With the latter design the dial indicator will have to be mounted below the unit on the output end of the shaft.

7. If end play reading obtained in step 6 is below the minimum shown in the table, back off adjusting nut and follow steps 3 through 6 until proper end play is obtained.

8. If end play reading obtained in step 6 is above the maximum shown in the table, tighten the adjusting nut and follow steps 3 through 6 until proper end play is obtained.

*9. When proper end play is obtained, lock adjusting nut and complete assembly of the power take-off.

* This check must be made WITHOUT grease in the bearings.

BE SURE TO PACK BEARINGS AND BEARING CAVITY WITH GREASE BEFORE STARTING UNIT.

ALIGNMENT – "U" JOINT OR IN LINE TYPE INSTALLATION

To realize the longest possible life of the power take off bearings, the best possible alignment must be maintained between the center line of the power take off shaft and the center line of the driven member shaft.

This may be accomplished as follows:

First, and very important, the forks of the drive shaft, between the PTO and the driven member, must lie in the same plane. This will prevent severe vibrations from occurring in the drive shaft.

Second, the center lines of the PTO shaft and driven member input shaft must be offset within the limits recommended by the universal joint manufacturer to prolong the life of the universal joint needle bearings.

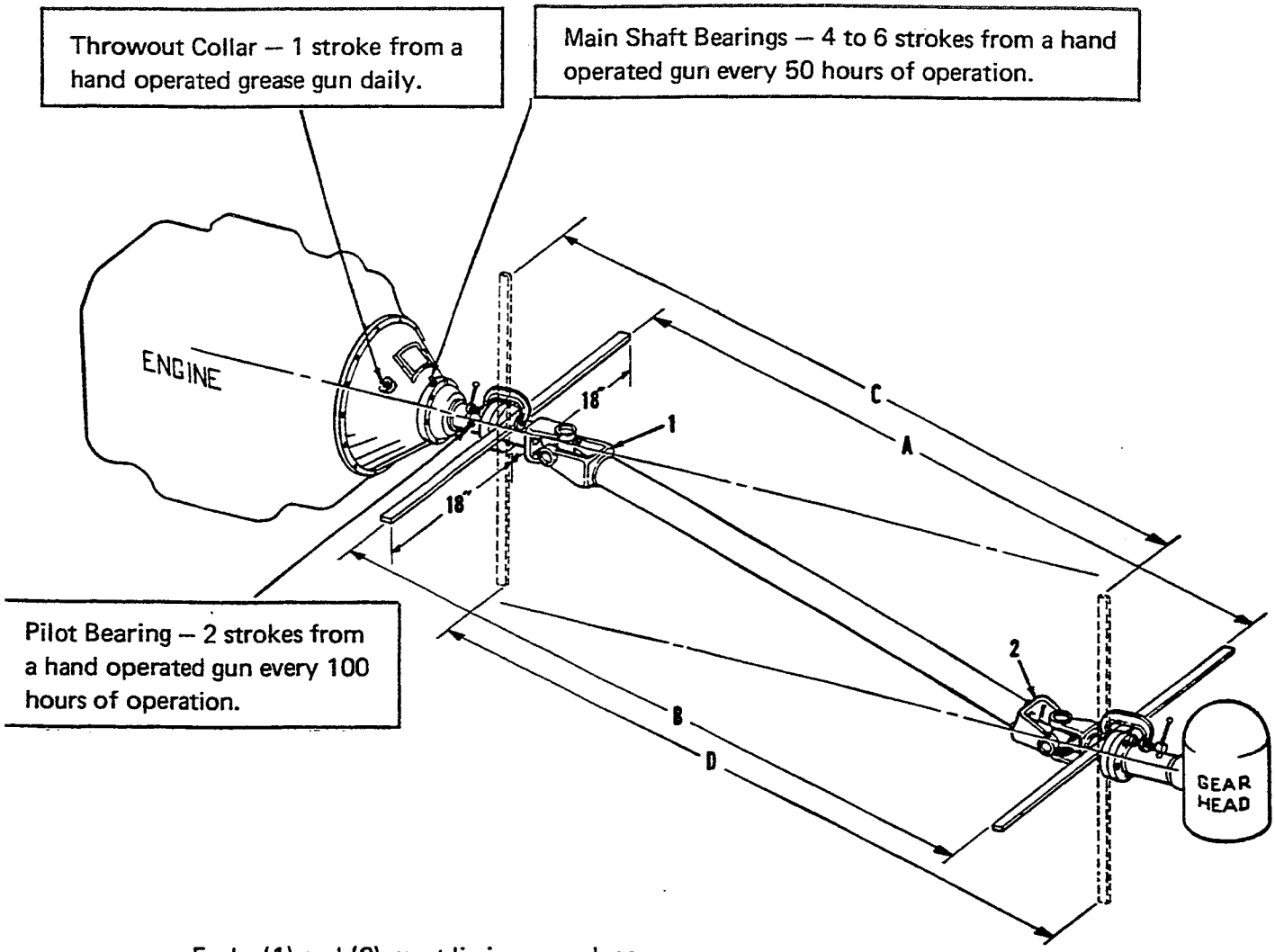
Third, and very important, the center lines of the PTO shaft and driven member input shaft must be parallel. This will further prevent vibrations which cause premature PTO bearing failure.

Proper lubrication of the power take off is also very important for satisfactory performance.

A high grade grease gun lubricant should be used. The grease selected should be recommended for anti-friction bearings and have a minimum melting point of 300° F.

A list of approved lubricants is available upon request.

Refer to sketch on reverse side.



Forks (1) and (2) must lie in same plane.

The centerlines of the power take off shaft and input shaft of the gear head must be parallel. One method of accomplishing this is shown on this sheet. To align engine and gear head by this method two accurate straight edges of at least 36 inches and a tape measure are required.

Place the straight edges horizontally along the face of the PTO and gear head hubs. Measure distances A and B. A and B should be equal within 1/8 inch measured 18 inches out fom the centerlines of the shaft. If a difference in A and B of more than 1/8 inch is found the engine should be moved to bring these distances within 1/8 inch. After A and B have been set the straight edges should be rotated to the vertical position as shown by the dotted lines in the sketch. Distance C should be equal to distance D within 1/8 inch measured 18 inches out from the center of the shaft. If C and D vary more than 1/8 inch measured 18 inches from the shaft center the engine should be moved until the difference is brought within 1/8 inch. After setting C and D, A and B should be rechecked and reset if required. Repeat this procedure until distances A and B and C and D are equal to each other within 1/8 inch measured 18 inches from shaft centers.

After setting as described above the engine should be securely anchored. The PTO shaft centerline and gear head input shaft centerline will now be within 1 degree of parallel.

WARNING

This clutch requires checking of adjustment after installation and prior to operation.

Be sure to remove input power to clutch before adjusting.

CLUTCH ADJUSTMENT OF POWER TAKE-OFFS

NEW POWER TAKE-OFFS SHOULD HAVE CLUTCH ADJUSTMENT CHECKED BEFORE BEING PLACED IN SERVICE. A newly placed in service power take-off should have its clutch adjustment checked again after the first ten (10) hours of operation. New clutch plates have a "wear in" period and the clutch may require several adjustments until the new plates are "worn in".

After wear in, clutch adjustment should be checked regularly. Heavy duty applications (rock crushers, etc.) which have frequent engagements and relatively long periods of clutch slip, will require more frequent re-adjustment than light duty (power shovel master clutch) applications.

In order to determine if clutch adjustment is required, operating shaft torque should be measured.

A method of measuring this is shown in Figure 1. See page 20.

If this force is found to be at or below the "MINIMUM" shown, the clutch should be adjusted until the "MAXIMUM" force for your model is required to engage the clutch.

NOTE: Do Not adjust the clutch too tight. Forces above maximum can cause clutch component failure.

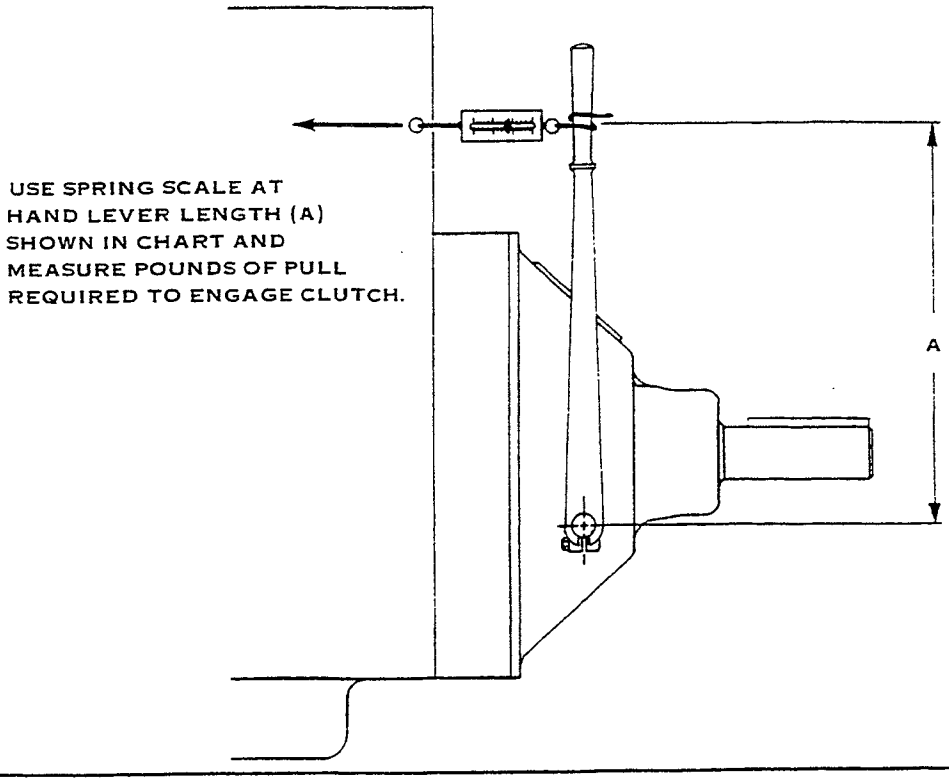


Figure 1.

The chart shows the "MINIMUM" and "MAXIMUM" values for clutch adjustment checking.

CLUTCH MODEL	OPERATING SHAFT TORQUE (POUNDS/FEET) MIN	MAX	HAND LEVER EFFORT (POUNDS) MIN	MAX	HAND LEVER LENGTH (A) (INCHES)
C-106	66	86	58	76	13.6
C-107	66	86	58	76	13.6
C-108	71	94	63	83	13.6
C-110	88	117	78	103	13.6
SP-111	108	142	95	125	13.6
SP-211	134	177	118	156	13.6
SP-114	218	289	123	163	21.3
SP-214	218	289	123	163	21.3
SP-314	218	289	123	163	21.3
IBF-214	218	289	123	163	21.3
IBF-314	218	289	123	163	21.3
*B-118	247	325	139	183	21.3
*B-218	247	325	139	183	21.3
SP-218	514	676	226	297	27.3
SP-318	514	676	226	297	27.3
IBF-318	569	751	172	227	39.7
*EH-121	695	913	210	276	39.7
*EH-221	695	913	210	276	39.7
SP-321	513	675	155	204	39.7
IBF-321	513	675	155	204	39.7
*EH-224	731	966	221	292	39.7

* — These clutch models no longer in production.

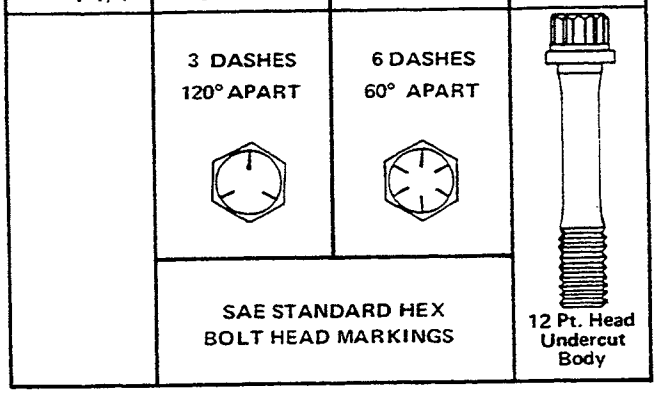
This information applies to power take-offs, reduction gears and pump drive units built by Twin Disc, Incorporated.

TORQUE VALUES - FOR TIGHTENING CAPSCREWS, BOLTS & PIPE PLUGS.

CAPSCREWS, BOLTS & NUTS (1)

TORQUE (LB. FT.) FOR COARSE AND FINE THREADS

NOMINAL THREAD DIAMETER (INCHES)	SAE GRADE 5	SAE GRADE 8 (3)	Screws for Univ. Joint Bearing Caps
	OILED (2)	OILED (2)	OILED (2)
1/4	9-8	13-11	
5/16	17-15	24-21	
3/8	30-27	42-38	
7/16	44-40	62-56	67-60
1/2	68-61	95-86	105-95
9/16	100-90	140-127	
5/8	140-125	195-177	200-180
3/4	240-215	335-305	345-315
7/8	360-325	505-460	535-485
1	545-490	880-792	
1-1/8	690-620	1110-1010	
1-1/4	920-830	1490-1350	



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PIPE PLUGS

RECOMMENDED TORQUE (LB. FT.) *

NPT DIAMETER (INCHES)	IRON, STEEL & BRASS PLUG OR FITTINGS	
	IN CAST IRON OR STEEL	IN ALUMINUM
1/16	6.2-4.5	
1/8	10-7.5	
1/4	20-15	
3/8	25-19	
1/2	47-35	
3/4	59-44	
1	100-80	
1-1/4	130-105	
1-1/2	150-120	

* MUST BE USED WITH COMPOUND, JOHN CRANE INSOLUBLE PLASTIC LEAD SEAL NO. 2 OR EQUIVALENT.

THIS TABLE COVERS TIGHTENING TORQUES FOR LEAK PROOF JOINTS SEALING OIL UP TO 500 PSI AND AIR UP TO 100 PSI AND VACUUM LINES. CAN USE 2/3 OF ABOVE VALUES IF NOT OVER 5 PSI OIL OR 3 PSI AIR IS BEING SEALED. TORQUEING HOT UNITS TENDS TO CAUSE MORE DIFFICULT PLUG REMOVAL.

(1) TORQUE VALUES FOR CAPSCREWS AND BOLTS ALSO APPLY TO USE IN ALUMINUM PROVIDED THE THREAD ENGAGEMENT IS TWICE THE NOMINAL THREAD DIAMETER AND A HARDENED FLAT STEEL WASHER IS USED UNDER THE HEAD. THIS TABLE COVERS TIGHTENING TORQUES FOR THE MAJORITY OF TWIN DISC'S USE OF CAPSCREWS AND BOLTS IN THREADED STEEL, CAST IRON, ALUMINUM AND BRASS PARTS. INDIVIDUAL ASSEMBLY DRAWINGS WILL SHOW SPECIAL REQUIREMENTS.

(2) USE FOR ALL FASTENERS LUBRICATED WITH MOLY-DISULFIDE, WHEN PLATE ZINC OR CADMIUM, OR WHEN DIPPED IN LUBRICATING OIL.

(3) SOCKET HEAD SCREWS AND 12 POINT HEAD SCREWS WITH FULL BODY ARE ALSO GRADE 8.

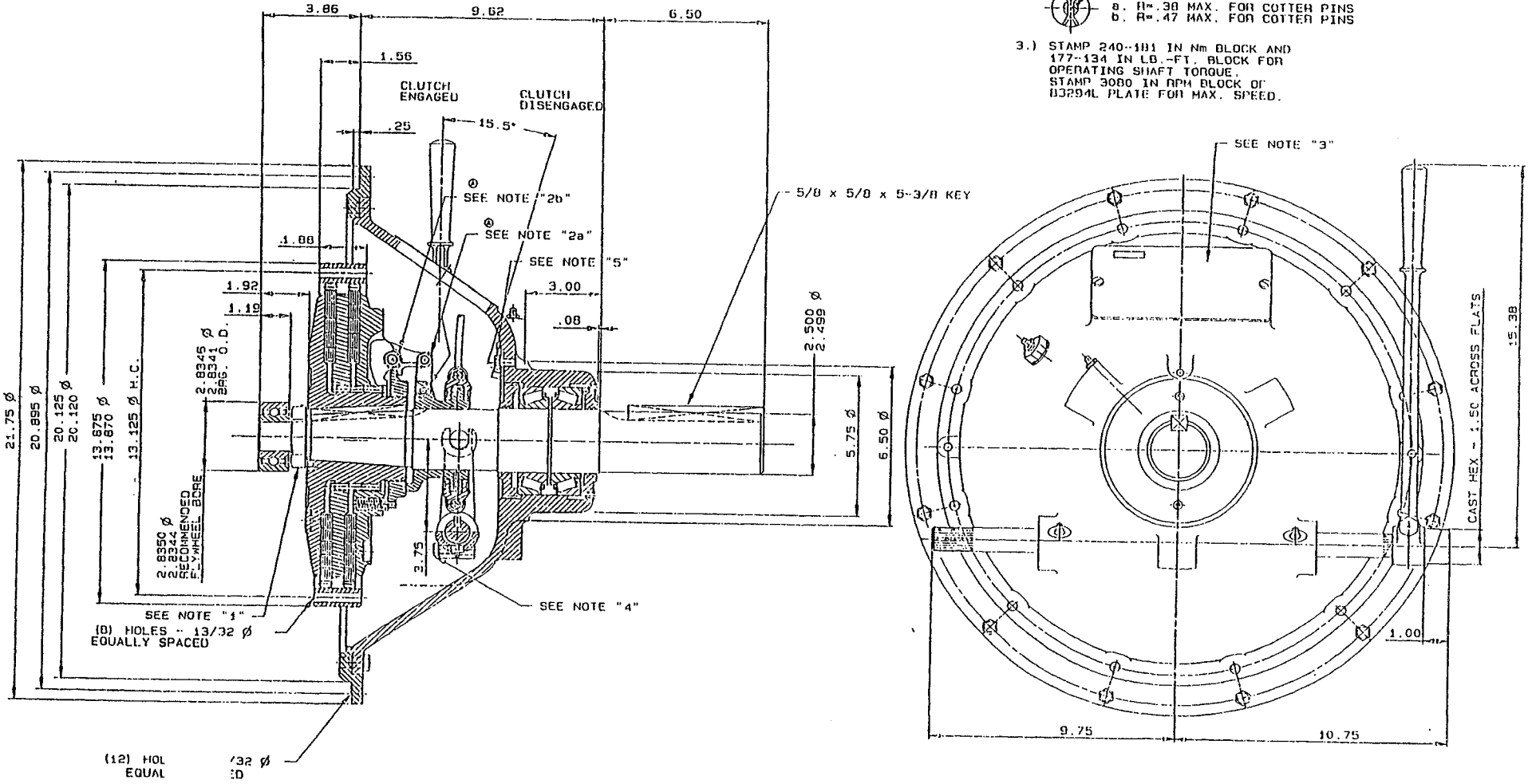
TORQUE VALUES – FOR TIGHTENING BEARING LOCKNUTS

Size	M-2012	M-2281	Torque Lb. Ft. (2)	M-2012	Torque Lb. Ft. (2)	M-2037	Torque Lb. Ft. (2)
03	A		44-40				
04	B		77-70				
05	C	C	88-80				
06	D		110-100				
07	E		165-150			E	240-220
08	F	F	190-170	AF	265-240	F & AA	300-270
09	G	G	220-200	AG(1)	320-290	G	320-290
10	H	H	290-260	AH	410-370	H	420-380
11	J	J	320-290	AJ	440-400	J	440-400
12	K	K	375-340	AK	520-470	K	540-490
13	L		450-410	AL	660-600	L	660-600
14	M	M	510-460	AM	740-670	M	730-660
15	N	AJ	620-560	AN	890-810	N & AN	900-820
16	P	P	680-620	AP	1000-910	P	960-870
17	Q		780-710	AQ	1120-1020	Q	1100-1000
18	R		990-900	AR	1460-1560	R	1430-1300
19	S	S & AH	1180-1070	AS	1720-1560	S	1640-1490
20	T		1360-1240	AT	1960-1780	T	1820-1650
21	U		1410-1280	AU	2020-1840	U	2000-1820
22	V	V	1600-1450	AV	2320-2110	V	2130-1940
24	W		1890-1720	AW	2800-2550	W	2460-2240
26	X	X	2420-2200	AX	3520-3200	X	3040-2760
28	Y		2860-2600	AY	4180-3800	Y	3520-3200
30	Z		3410-3100	AZ	5170-4700	Z	4750-4320

12/75

(1) M-2281-AG Torque Same as M-2012-AG.

(2) Torque values apply to solid shafts.
Torque values may or may not be satisfactory on thin-walled shafts.
Torque values apply to threads lubricated with oil.



ASSEMBLY NOTES:

1.) SEAT HUB USING 30 LB.-FT. TORQUE ON NUT, THEN TIGHTEN NUT BY TURNING AN ADDITIONAL 150 TO 180 DEGREES.

2.) A
a. A=.38 MAX. FOR COTTER PINS
b. A=.47 MAX. FOR COTTER PINS

3.) STAMP 240--181 IN Nm BLOCK AND 177--134 IN LB.-FT. BLOCK FOR OPERATING SHAFT TORQUE. STAMP 3080 IN RPM BLOCK OF 83294L PLATE FOR MAX. SPEED.

4.) TORQUE TO 30 - 36 LB. FT

5.) TORQUE TO 17 - 21 LB. FT

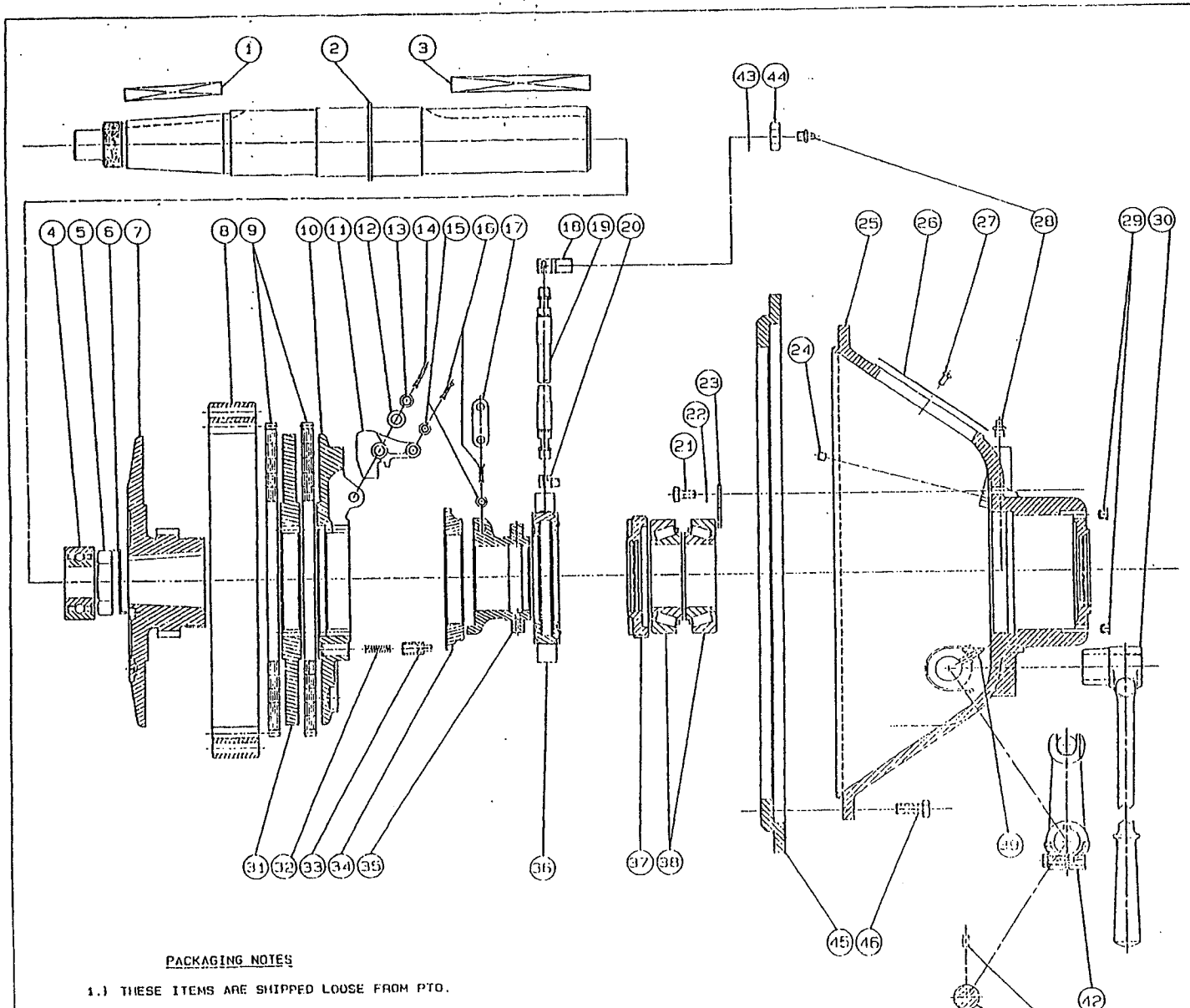
GENERAL NOTES:

a.) REFER TO BILL OF MATERIAL LIST WHEN ORDERING PARTS.
b.) REFER TO CARE & OPERATION MANUAL FOR ADDITIONAL INFO.

TWIN DISC

MATERIAL	HEAT TREAT
SURFACE TREATMENT	METRIC / ENGLISH
DRAWN	CHECKED
NAME	SP211 POWER TAKE-OFF W/MASS COLLAR
DATE	6-16-03
SCALE	.50
SHEET	1 OF 2
DRAWING NO.	SP211P101
REVISION	

					24006	2-2-04



ITEM	PART NO.	-101	NAME	REMARKS
1	M2033X	1	KEY, STRAIGHT SQUARE	
2	A6691AC	1	SHAFT, CLUTCH	
3	M2033BJ	1	KEY, STRAIGHT SQUARE	PKD. NOTE "1"
4	N224A	1	BEARING, PILOT	PKD. NOTE "1"
5	B1509D	1	NUT, HUB	
6	B1511E	1	WASHER	
7	ZA6604A	1	HUB AND BACKPLATE	
8	69317	1	RING, DRIVING	PKD. NOTE "1"
9	A5570L	2	PLATE, FRICTION	
10	A6900H	1	PLATE, FLOATING	
11	B1304	3	LEVER	
12	H2115C	6	WASHER	
13	B1538A	3	PIN, CLEVIS	
14	B1535C	3	COTTER	
15	B1537D	6	PIN, CLEVIS	
16	B1535D	6	COTTER	
17	2617	6	LEVER, LINK	
18	H1283	1	FITTING	
19	H1292B	1	HOSE	
20	H1284	1	FITTING	
21	H2001E	1	SCREW, HEX. HD. (5/16 x 5/8)	
22	H2046L	1	WASHER, LOCK	
23	1216	1	LOCK, BEARING RETAINER	
24	H2041AD	1	SETSCREW	
25	9602	1	HOUSING #2	
26	2015	1	NAMEPLATE	
27	H2023F	2	SCREW, ROUND HD. (1/4 X 1/2)	
28	H268	2	FITTING	
29	H2067L	2	PROTECTOR	
30	X3799E	1	LEVER, HAND	PKG. NOTE "1"
31	A6690	1	PLATE, CENTER	
32	A270100	1	SPRING, COMPRESSION	
33	02340	1	PIN, ADJUSTING LOCK	
34	A4238	1	RING, ADJUSTING	
35	A4422	1	SLEEVE, SLIDING	
36	X117C10	1	SLEEVE, COLLAR	
37	B1430	1	RETAINER, BEARING	
38	H2156	2	BEARING, TAPERED ROLLER	
39	H503	2	FITTING	
40	1144E	1	SHAFT, OPERATING	
41	H20222	2	KEY, WOODRUFF	
42	X3507	1	YOKE, OPERATING	
43	H2046AF	1	WASHER, LOCK	
44	H2027AN	1	NUT, HEX.	
45	6000	1	ADAPTER, HSG. #1	
46	H2002U	12	SCREW, HEX. HD. (3/8 x 1)	
NS	MA1032A	2	WOOD, 2" x 4" x 23"	
NS	MA1032B	3	WOOD, 1" x 6" x 23"	
NS	MA1032C	2	WOOD, 2" x 6" x 18"	
NS	MA1032D	2	WOOD, 2" x 6" x 22"	
NS	MA1033A	1	CARTON	
NS	MA1033D	1	INSERT	
NS	MA1033C	1	PROTECTOR	

NS = DENOTES PART NOT SHOWN ON ASSEMBLY DRAWING

PACKAGING NOTES

1.) THESE ITEMS ARE SHIPPED LOOSE FROM PTO.

TWIN DISC INCORPORATED RACINE, WISCONSIN U.S.A.

MATERIAL | HEAT TREAT | DATE 6-16-93 | SCALE .50 | DRAWN F. CURTIS | CHECKED L.H. SARGE

SURFACE TREATMENT | WEIGHT ROUGH FIN. | FIRST USED ASSY. MODEL

UNLESS OTHERWISE SPECIFIED ALL DECIMAL TOLERANCES ± .010 ALL ANGLE TOLERANCES ± 1°

NAME SP211 POWER TAKE-OFF W/BRASS COLLAR

SP211P101

SHEET 2 OF 2

NOTICE

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