UNIT ALIGNMENT AND TOOTH CONTACT CHECK

CAUTION

Consult applicable local and national safety codes for proper guarding of rotating members.

Lock out power source and remove all external loads from unit before servicing unit or accessories.

1. Prepare foundation for installation, providing a suitable flat surface for the gear unit mounting flanges. Note: Surface finish required depends upon type of chock used.
2. Place unit on foundation in approximate position, using jackscrews in mounting flange or temporary shim packs at "A" and "B," and a shim pack at "X," for initial support. See Figure 1.
3. Shift unit as required to obtain specified fore and aft and athwartship position and horizontal angular alignment with propeller shaft, using feelers and indicator.
4. Adjust jackscrews at "C" and "D" to contact foundation or measure gap between unit mounting flange and ship foundation at "C" and "D" and install equal fitting shim packs. Remove shim pack at "X".
5. To achieve engine manufacturer's specified offset and angular alignment constants with propeller shaft, make the required adjustments by measured (feeler or micrometer) increments at the four corners. To change elevation adjust jackscrews or shim packs at the four corners "A-B-C-D." The adjustment must be EQUAL at the four corners.

   For vertical angular alignment, adjust in EQUAL amounts at either the two forward corners, "A-C," or the two aft corners "B-D."
6. To prepare for tooth contact check:
   A. Secure unit to foundation with clamps or temporary bolts at the four corners "A-B-C-D."
   B. Brush Prussian Blue, "Dykem" paste, or equivalent on several teeth of main ahead pinion in an axial band. Then rotate pinion until coated teeth engage gear teeth.

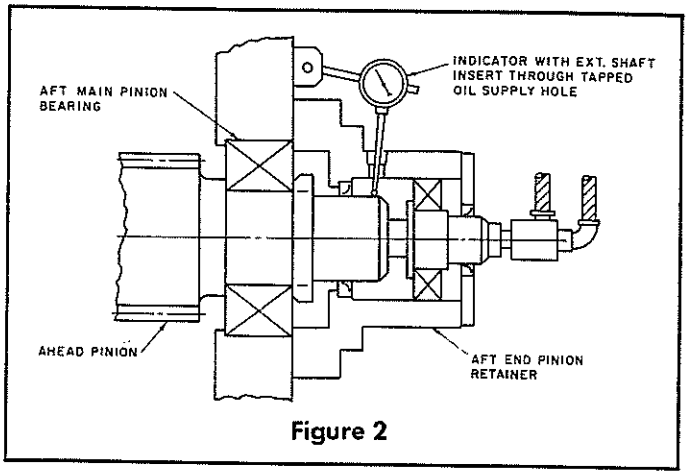

Figure 2

   C. Remove oil line for slip systems or pipe plug for non slip systems from aft end pinion retainer. Mount indicator with extension shaft positioned on top of aft end of pinion shaft. See Figure 2.
   D. With sling on forward clutch or spacer (with forward clutch inflated), carefully raise forward end of pinion just sufficiently to determine and ensure that aft end of pinion is seated in the bottom of its bearing as shown by the indicator. Note that the weight of the clutch assembly on the forward end of the pinion may tip the assembly in bearing clearances, resulting in false tooth contact impression if procedure is not followed carefully. IMPORTANT: Lift forward end only until indicator hand reaches maximum (minus) reading.

   ALTERNATE METHOD: Use feeler gauge to check roller clearance on forward main pinion bearing.
7. Bar pinion back and forth circumferentially to rap pinion teeth sharply against both flanks of gear teeth.
8. Roll blued teeth out of mesh and check contact pattern as indicated by diagonal transfer marks on gear teeth or impression in bluing on pinion teeth. Pattern should show contact 90-100% across the face (heavier aft for inboard turning gears, and even to slightly heavier forward for outboard turning gears) on the ahead driving tooth flanks.

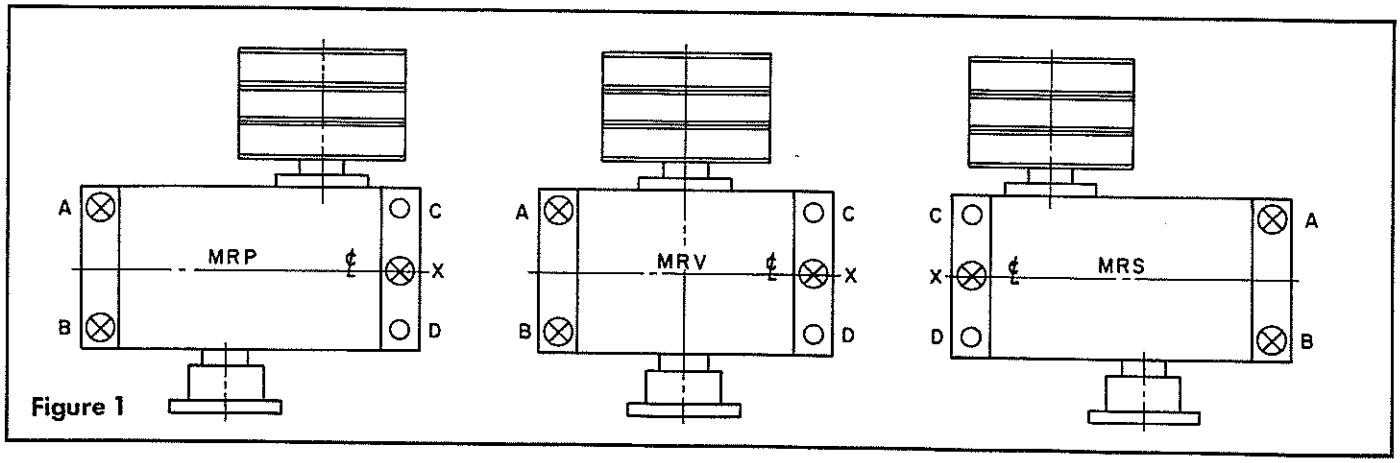

Figure 1

9. If necessary to improve contact:
   A. On horizontal offset units – adjust shims as required at two forward corners "A-C" opposite to each other in direction, with the "C" adjustment twice the "A" in amount. Repeat Steps 6 through 8. Recheck shaft alignment and repeat Step 5 if necessary.
   B. On vertical offset units – adjust shims as required at two forward corners "A-C" opposite to each other in direction, and in equal amounts. Repeat Steps 6 thru 8. Recheck shaft alignment and repeat Step 5 if necessary.
   C. In cases where the gear housing is relatively stiffer than the foundation structure, flexing of the foundation as indicated by minor change in the contact pattern, regardless of amount of shimming, may hinder suitable gear case adjustment for proper contact. This condition can be relieved by loosening the cover and main housing split bolts and capscrews while shimming; and retightening after final contact has been achieved.
10. After contact and alignment has been established, substitute properly fitted chocks for the shim packs or pour plastic chock material per manufacturer's instructions, taking precautions that the setting and alignment to propeller shaft is not changed or lost in the process. Fit chocks at remaining foundation bolt locations.

    It is strongly recommended that fitting of final key chocks at the four corners be deferred until shaft alignment and tooth contact have both been checked and that intermediate chocks be fitted only after the corner key chocks. This will avoid unnecessary refitting of chocks and possible difficulties in carrying out the shaft and gear alignment procedures.
11. Drill and ream for fitted foundation bolts. Insert bolts and tighten nuts securely by slugging or driving to shipyard's torque requirements.
12. Ream, fit and tighten low speed coupling bolts to propeller shaft flange to shipyard's torque requirements.
13. Align engine to gear per instructions given on the following pages.

ENGINE TO GEAR ALIGNMENT FOR PILOT BEARING MOUNTED CLUTCH

1. After gear is in place with gear tooth contact checks made per Falk instructions and propeller shaft alignment to gear is satisfactory with chocks, shims and gear foundation bolts made up tight, proceed with engine-to-gear alignment. See Figure 3.
2. Place temporary support under aft clutch to approximate concentricity with drum and, with clutches deflated, move clutch assembly aft sufficiently to provide clearance for installation of coupling disc and tube assembly.
3. Mount the coupling disc and tube assembly to engine, using a sling from engine or temporary blocking for support of aft end of tube, so as to avoid excessive distortion of disc when bolting to flywheel.
4. Move engine into fore and aft position as shown on engine manufacturer's installation drawings, ensuring necessary clearance for future clutch removal and proper centering of clutches on drums.
5. Make a preliminary alignment by moving engine horizontally and vertically such that the coupling tube flange and clutch spacer joint can be bolted up without forcing or straining parts. Move the clutch assembly forward to engage the rabbet fit and tighten bolts between tube and clutch spacer. Center clutches on drums at this time.
6. Mount a dial indicator on the gear case to run on the exposed flange face of the clutch and check the face runout. Total indicator reading should not exceed .020" for the 26", 30" and 35" clutches, and .025" for the 40" and 48" clutches. If this value is exceeded, remove and disassemble glands and spacer to check for burrs, chips or other foreign matter which might interfere with proper assembly and concentric running of these elements. Check to make certain that clutch assembly is airtight after reassembling.

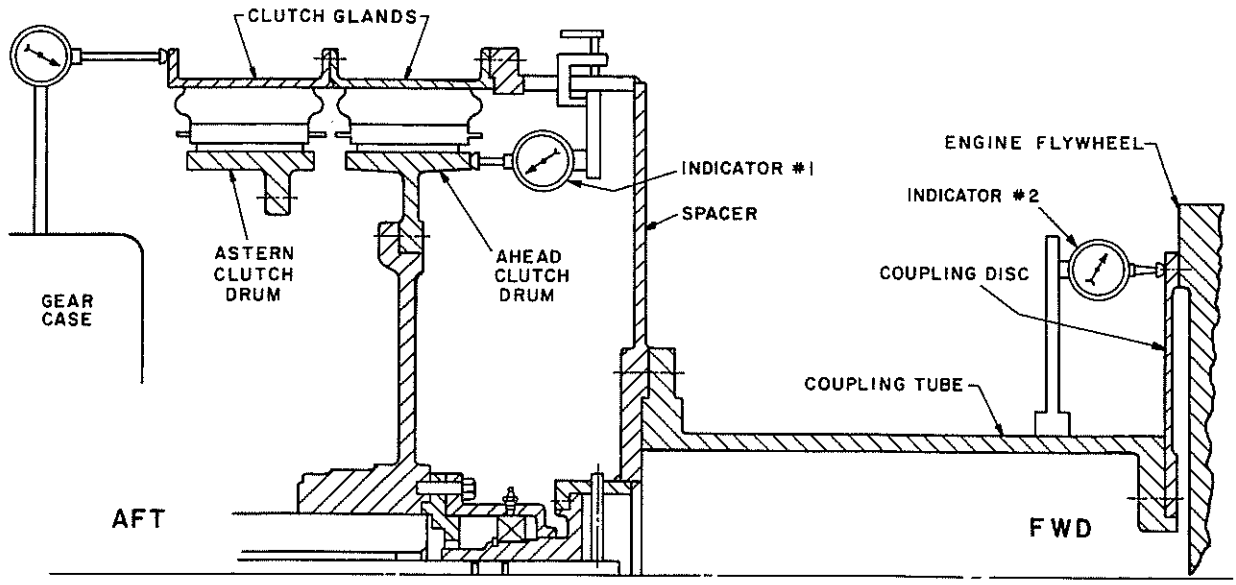

Figure 3 POSITION OF DIAL INDICATORS FOR ALIGNING REDUCTION GEAR UNIT TO DIESEL ENGINE — PILOT BEARING MOUNTED CLUTCH —

NOTE: Any time the clutch spacer is unbolted or removed, the coupling tube must be supported to prevent damage to the coupling disc.

7. Mount dial indicators on 34" bolt circle of engine coupling disc and on ahead clutch drum face as shown in Figure 3. Set both indicators to zero on top starting position.
8. With clutches deflated, rotate clutch gland and ahead clutch drum together taking readings every 90°. Make a full revolution of engine before taking readings to center elements in bearings. Adjust the aft engine mounts to obtain readings per table (TIR#1) at the ahead clutch drum, bottom open and sides equal within .005". Adjust the forward engine mounts to obtain readings per table (TIR#2) at the engine flywheel, bottom closed and sides equal within .005".

ENGINE TO GEAR ALIGNMENT TABLE— NEW INSTALLATIONS* (Figure 3)

MR UNIT SIZE	1226 1230 1626 1630 2430	1235 1635 2435 2440	3035 3040 3540	3048 3548 4048 4548
TIR #1 ▲	-.015"	-.019"	-.025"	-.030"
	± .002" open at bottom			
TIR #2 ▲	.012"	.012"	.014"	.014"
	± .002" closed at bottom			

* For later field inspections, consult with Falk Service Department.
▲ Top reading is zero. Side reading within .005".

9. Repeat Step 8 as necessary to obtain both required readings. Make full revolution of engine before taking readings each time an adjustment is made in the engine mounting. Secure engine per engine builder's instructions. Make final indicator sweep and record data.

ENGINE TO GEAR ALIGNMENT FOR STUB SHAFT SUPPORTED OR ENGINE MOUNTED CLUTCH

1. After gear is in place and bolted down, and jackshaft and engine are in position in accordance with the engine manufacturer's instructions, move the engine into position until the ahead clutch drum and engine drive disc are the correct distance apart per engine manufacturer's requirements. See Figure 4.
2. Fasten a light-weight rigid alignment fixture to engine drive disc so that the fixture will bridge the space normally occupied by the clutch spacer and ahead clutch. Fasten two (2) dial indicators to the fixture, one to run on the edge of the reverse clutch drum, and the other on the O.D. of this drum as shown in Figure 4 below. The alignment fixture should be secured to the drive disc so that the indicator mounting is at the top with the engine set or adjusted to the manufacturer's recommendation.
3. Assemble clutch glands and spacer to driving disc. Mount a dial indicator on some fixed point on the gear case so that it will run on the flange face of the clutch. See Figure 5. Rotate the clutch glands and check the face runout of clutch assembly. The maximum total indicator reading should not exceed .020" for the 26", 30" and 35" clutches, and .025" for the 40" and 48" clutches. If this dimension is exceeded, remove and disassemble glands, spacer,

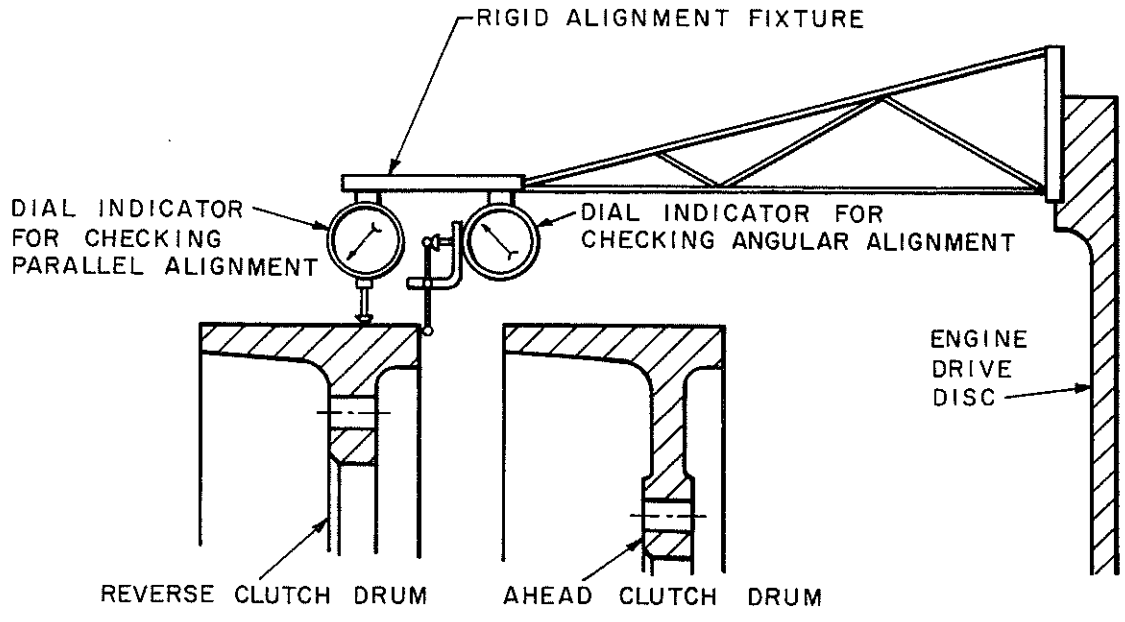

Figure 4 POSITION OF DIAL INDICATORS FOR ALIGNING REDUCTION GEAR UNIT TO DIESEL ENGINE — ENGINE OR STUB SHAFT MOUNTED CLUTCH —

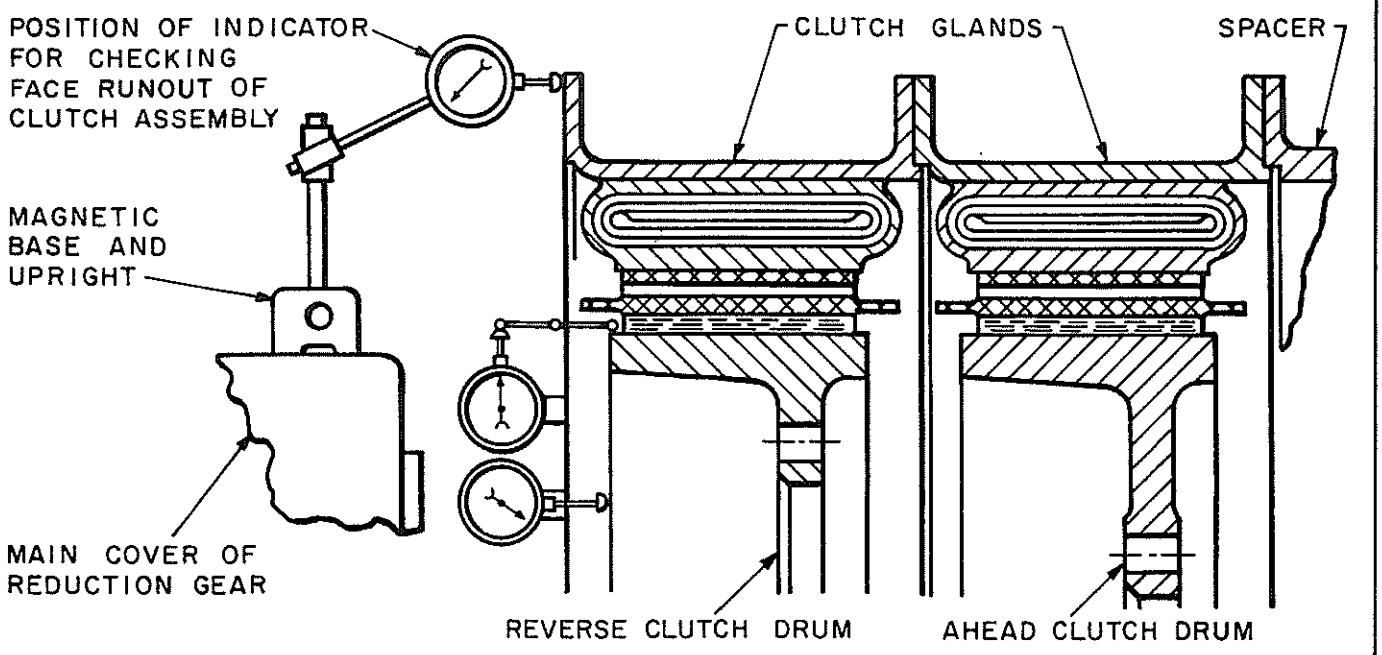

Figure 5

and disc, and check for burrs, chips or other foreign matter which might prevent proper assembly and concentric running of these members. Check to make certain that clutch assembly is air tight after reassembly.

4. Clamp a dial indicator on the reversing clutch gland so that it will contact the outside diameter of the reversing clutch drum. Set engine to manufacturer's recommendation for engine to gear alignment. Position dial indicator at the top of gland. This indicator will show runout between the clutch drum and gland.
5. Clamp a second indicator to the reversing clutch gland flange adjacent to the first indicator so that it contacts the after edge of the reversing clutch drum. This indicator will show the angular alignment between the gland and the drum.
6. Position the engine and jackshaft until the maximum run-out on each indicator is less than .005" when the gear and drive disc are turned together. Be sure that the engine and gear thrusts remain in the same relative position while taking these indicator readings.
7. Secure engine and jackshaft per engine builder's instructions. Repeat Step No. 6.
8. Inflate forward and reverse clutches independently to check for engine crankshaft deflections per engine manufacturer's specification.

Do not weld the gear housing without prior approval from The Falk Corporation. The fabricated housing is stress relieved prior to machining and indiscriminate welding of brackets, channels or repair welding can result in housing distortion. When welding on or near the gear case, exercise care to prevent magnetization of the housing or rotating elements.