

1.0 Purpose

The purpose of this document is to aid in training of new workers in the Plant 1 Facility to understand and comprehend the 2 Bearing Installation of Marathon and Kato Engineering generators.

2.0 Scope

The scope of this document covers the methods and procedures to couple a 2 bearing generator.

3.0 Definitions

N/A

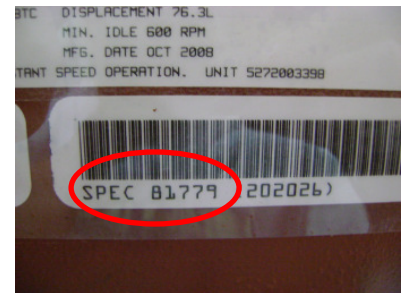
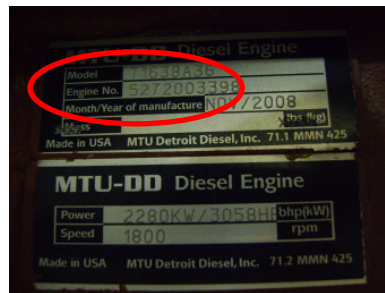
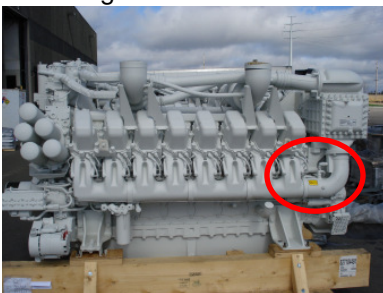
4.0 2 Bearing Procedure

4.1 Generator Types

- 4.1.1 2500kW and below Marathon and Kato Engineering Generators.
- 4.1.2 2800kW and above Marathon and Kato Engineering Generators.

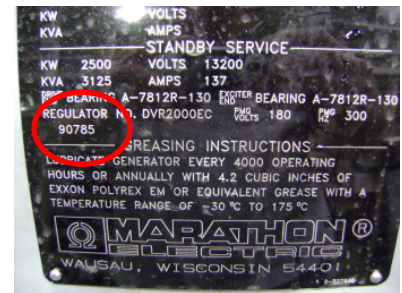
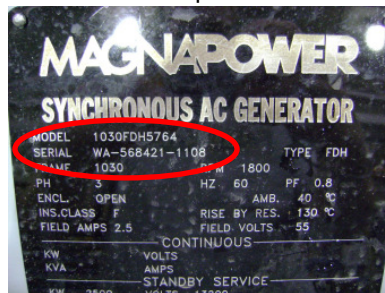
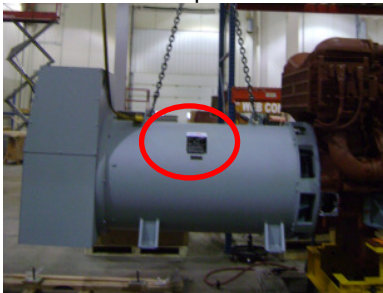
4.2 Job Verification

- 4.2.1 Verify Engine P/N and model number matches Job Traveler.
MTU Engine MTU After Cooler Left Side

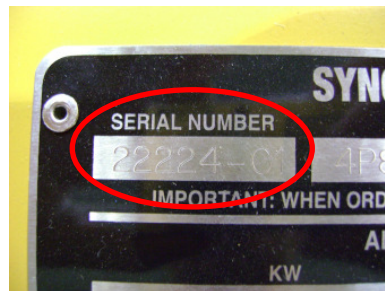


- 4.2.1.1 Record Engine S/N and that day's date.

- 4.2.2 Verify Generator P/N and model number.
Marathon Nameplate Marathon Nameplate



Kato Engineering Nameplate



- 4.2.2.1 Record Generator S/N and that day's date.

- 4.2.3 Verify base component part numbers to job traveler.
 - 4.2.3.1 Main Section with Generator Mounting Feet (4)
 - 4.2.3.2 Left Wing
 - 4.2.3.3 Right Wing

4.3 Base Prep

- 4.3.1 See lifting and rigging instructions for placing base on floor.
 4.3.2 Remove generator feet from main base section and place on base rails.



- 4.3.3 Clean base if heavy soil is present and or road salt.

- 4.3.3.1 If rust is present on the base interior or any of the cross section remove and primer trouble areas.

Bad Spots



Corrected Spots



- 4.3.3.2 Tools Used

- 4.3.3.2.1 Right Angle Die Grinder
 4.3.3.2.2 Soft Scuff Pad
 4.3.3.2.3 Primer
 4.3.3.2.4 3M Pad
 4.3.3.2.5 Degreaser
 4.3.3.2.6 Towels

- 4.3.4 Install lifting brackets in to the designated locations (4). 2 men increase ease of assembly.



- 4.3.4.1 Hand-thread all joints then tighten.

- 4.3.4.2 Hardware Used

- 4.3.4.2.1 1"-8x3" GR5 HCS 13465 (24)
 4.3.4.2.2 1"-8 GR5 FHN 36320 (20)
 4.3.4.2.3 1 Z MED SPLIT 33636 (24)

- 4.3.4.3 Tools Used

- 4.3.4.3.1 3/4" Air Impact
 4.3.4.3.2 1.5" 3/4" Dr Impact Socket
 4.3.4.3.3 1/5" Wrench
 4.3.4.3.4 Small Pry Bar

4.4 Install Oil Drain and Plumbing (See work instructions for components / engine used)

4.4.1 Install P/N 72777 to inside base drain bung.



4.4.2 Tool Used

4.4.2.1 1 5/8" Wrench

4.4.3 Install oil drain hose and plug; lengths will vary based on engine / base combination.



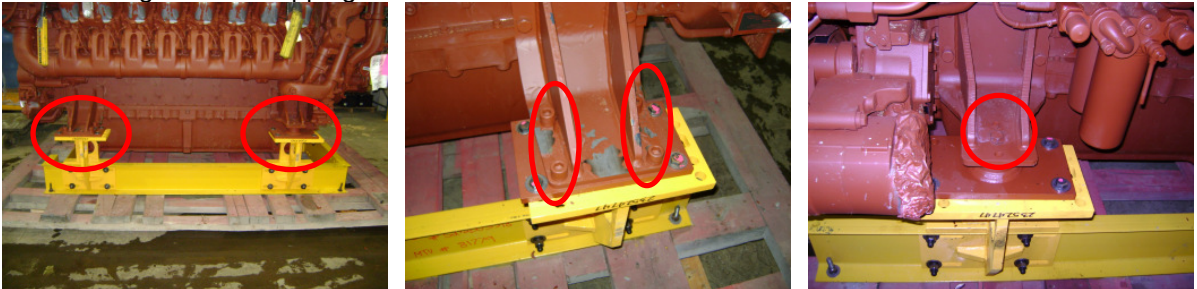
4.4.4 Tools Used

4.4.4.1 15" Adjustable Wrench

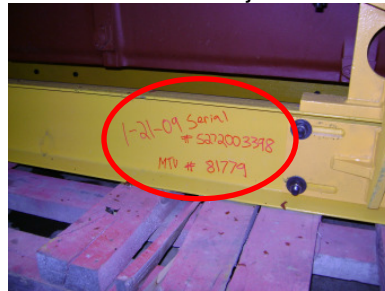
4.5 Engine Prep

4.5.1 See lifting and rigging instructions for engine lifting techniques.

4.5.2 Remove engine from shipping skid.



4.5.2.1 Match S/N & P/N to job traveler and write on yellow shipping bracket along with date.



4.5.2.2 Tools Used

4.5.2.2.1 17mm Allen Socket

4.5.2.2.2 1 1/16" Socket

4.5.2.2.3 15/16" Socket

4.5.2.2.4 15/16" Wrench

4.5.2.2.5 1/2" Air Impact

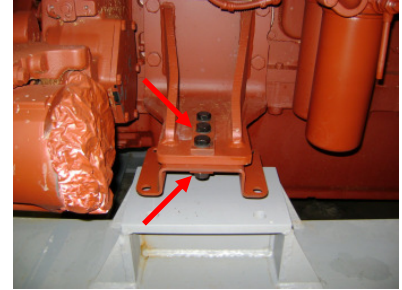
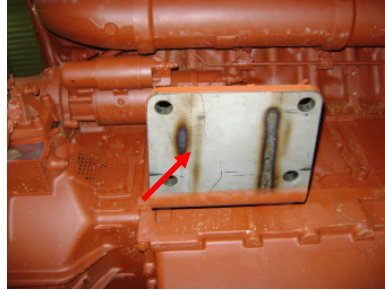
- 4.5.2.3 Place all hardware in return crate or box



- 4.5.2.4 Discard mounting plates

- 4.5.3 Install mounting vibration bracket (5242370641) and plate (5242370235) to front engine feet.

- 4.5.3.1 Wipe the bottom of all engine feet off first to remove dirt and debris.



- 4.5.3.2 Hardware Used

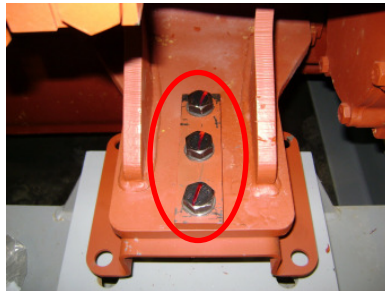
- 4.5.3.2.1 Bolt (6) (000931016126)

- 4.5.3.2.2 Flat Washer (12) (200433017000)

- 4.5.3.2.3 Nut (6) (000934016006)

- 4.5.4 Hand Thread hardware first.

- 4.5.4.1 Tighten then torque to **230 lbs/ft**, mark after torque is applied with appropriate paint marker color.



- 4.5.5 Tools Used

- 4.5.5.1 24mm Socket

- 4.5.5.2 1/2" Air Impact

- 4.5.5.3 1/2" Ratchet

- 4.5.5.4 Torque Wrench

4.6 Mount Engine to Base

- 4.6.1 See lifting and rigging instructions.

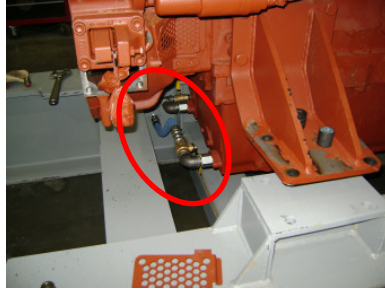
- 4.6.2 Position engine so feet match up to the base mounting locations and lower to base so front feet touch first.

- 4.6.3 Install sub assembly engine side plumbing (engine must be tipped forward and blocked under rear feet).

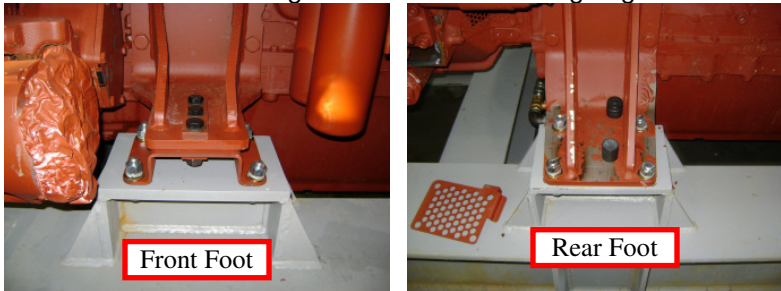


- 4.6.4 Remove right side oil pan plug and discard.

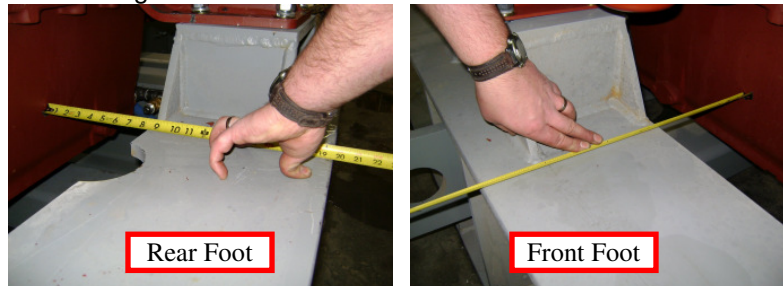
- 4.6.5 Apply o-ring lube to P/N 72142, install to pan.
- 4.6.6 Install sub assembly to adapter P/N 72142.
- 4.6.7 Tools used
- 4.6.7.1 7/8" Wrench
 - 4.6.7.2 1 5/8" Wrench
 - 4.6.7.3 12" Pipe Wrench
 - 4.6.7.4 Loctite 592
 - 4.6.7.5 15" Adjustable
- 4.6.8 Install oil hose to engine plumbing.
- 4.6.8.1 Block the rear feet to support the engine as it is tilted forward so no oil spills out onto the floor.



- 4.6.8.2 Tools Used
- 4.6.8.2.1 15" Adjustable Wrench
- 4.6.9 Lower engine so feet mounting holes match up to the base feet mounting holes.
- 4.6.10 Hand thread all mounting locations before setting engine on base.



- 4.6.10.1 Hardware used Front
- 4.6.10.1.1 13313 HCS 5/8"-11 x 2.5" GR 5 Z (8)
 - 4.6.10.1.2 33819 5/8" SAE Z Thru HD F/W (16)
 - 4.6.10.1.3 33630 5/8" Z Medium Split L/W (8)
 - 4.6.10.1.4 36314 5/8"-11 GR 5 Z FHN (8)
- 4.6.10.2 Hardware used Rear
- 4.6.10.2.1 13365 HCS 3/4"-10 x 3" GR 5 Z (8)
 - 4.6.10.2.2 33820 3/4" SAE Z Thru HD F/W (16)
 - 4.6.10.2.3 33632 3/4" Z Medium Split F/W (8)
 - 4.6.10.2.4 36316 3/4"-10 GR 5 FHN (8)
- 4.6.11 Center engine left to right.
- 4.6.11.1 Use a tape measure on the inside of each foot; left side front and rear must match up and same for right side.



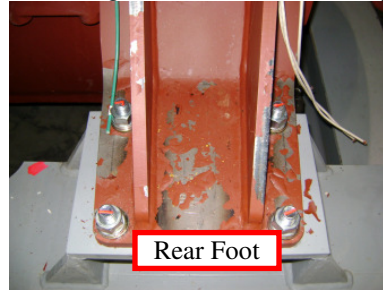
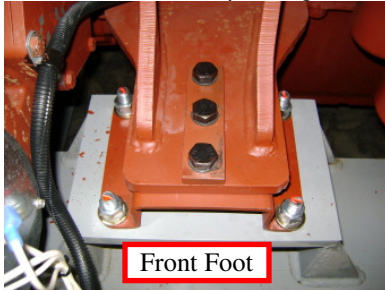
- 4.6.11.2 All 4 points do not have to be equal as long as the sides, front and rear, match each other.
- 4.6.11.3 EX: Front Left 15" Rear Left 15" Front Right 15.0625" Rear Right 15.0625"

4.6.11.4 Tools Used

4.6.11.4.1 Tape Measure

4.6.11.4.2 Power Pusher

4.6.12 Once centered torque engine feet mounting bolts and mark with appropriate paint marker color.

4.6.12.1 Front **135 lb/ft**

4.6.12.2 Tools Used

4.6.12.2.1 15/16" Socket

4.6.12.2.2 1/2" Torque Wrench

4.6.12.2.3 1/2" Air Impact

4.6.12.2.4 15/16" Wrench

4.6.12.3 Rear **240 lb/ft**

4.6.12.4 Tools Used

4.6.12.4.1 1 1/8" Socket

4.6.12.4.2 1 1/8" Wrench

4.6.12.4.3 1/2" Air Impact

4.6.12.4.4 1/2" Torque Wrench

4.7 Check Engine Endplay; Before Coupling

4.7.1 Mounting dial indicator to bell housing face and position so the plunger is reading off the flywheel axial face.

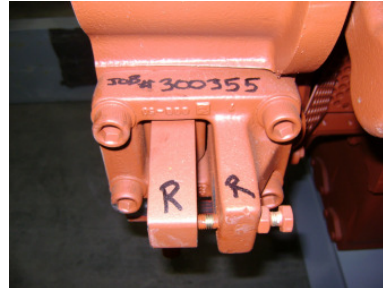


4.7.2 Tools Used

4.7.2.1 Dial Indicator

4.7.2.2 Large Crowbar or Pry Bar

4.7.3 Remove both shipping locks.

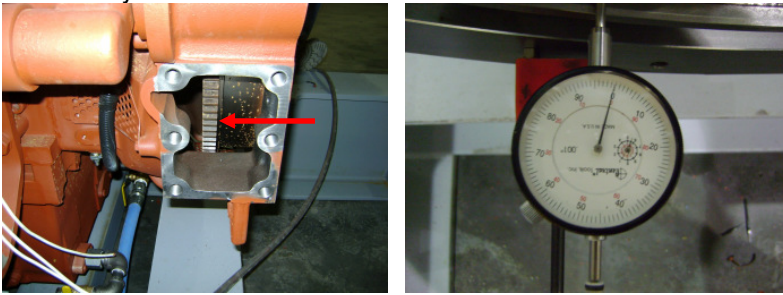
4.7.3.1 Mark locks with **FULL Job Traveler** number and **Side** they were taken from. Place in Final tub marked with equivalent **Job Traveler** number. **HARDWARE** must go with the locks.

4.7.3.2 Tools Used

4.7.3.2.1 14mm Allen Socket

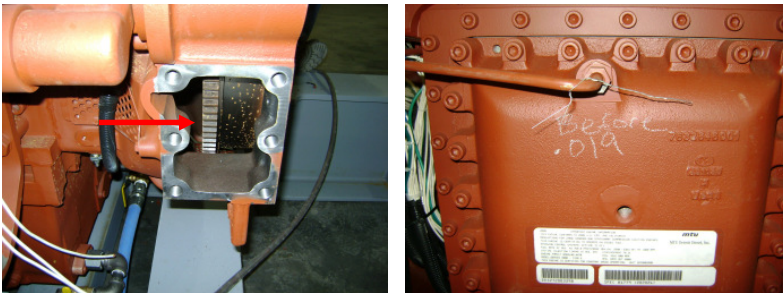
4.7.3.2.2 Impact

- 4.7.4 Shift the flywheel forward and reset the dial indicator to 0.



- 4.7.5 Shift the flywheel to the rear and check the dial indicator for movement, if within tolerance write down on after cooler with pencil and mark on assembler checklist.

4.7.5.1 Tolerance **0.008" – 0.024"**



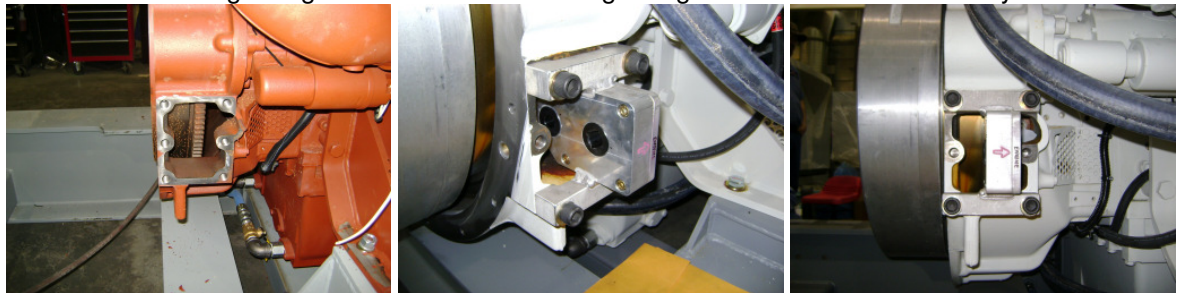
4.7.5.2 Tools Used

4.7.5.2.1 4' or Longer Pry Bar

4.7.5.2.2 Dial Indicator

- 4.7.6 Install engine gearing tool.

4.7.6.1 Install gearing tool and make sure the gearing tool teeth mesh with the flywheel teeth.



4.7.6.2 Tools Used

4.7.6.2.1 Gearing Tool

4.7.6.2.2 1" Ratchet to operate gearing tool

4.7.6.2.3 14mm Allen Socket

4.7.6.2.4 3/8" Ratchet

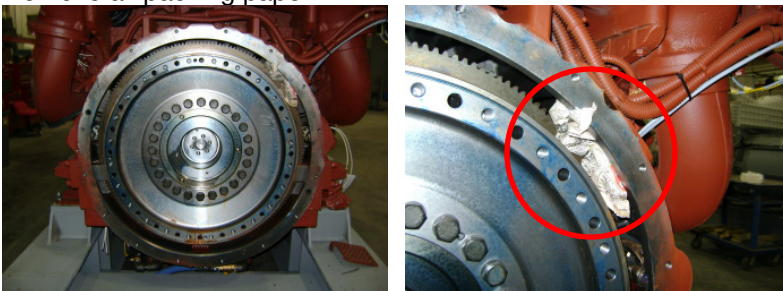
4.7.6.3 Hardware Used

4.7.6.3.1 Supplied with gearing tool.

4.8 Clean Engine Bell Housing & Flywheel

4.8.1 Cover floor with gray oil rags to catch extra degreaser and residue.

4.8.2 Remove all packing paper.

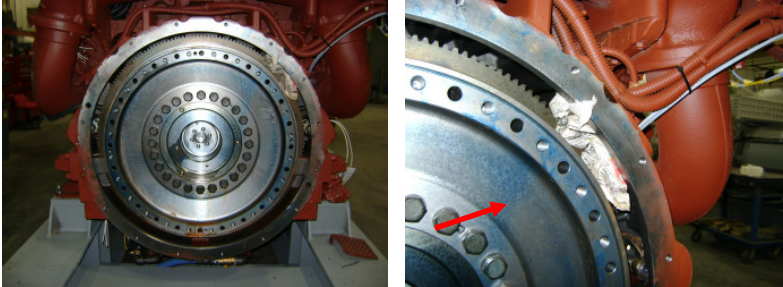


- 4.8.3 Remove rust and excess paint from bell housing with scuff pad or right angle grinder and scuff wheel.



- 4.8.4 Wipe bell housing clean with degreaser and towels.

- 4.8.5 Degrease flywheel and remove wax coating with gasket scraper if present.



- 4.8.6 Clean up floor area after bell housing and flywheel have been cleaned.

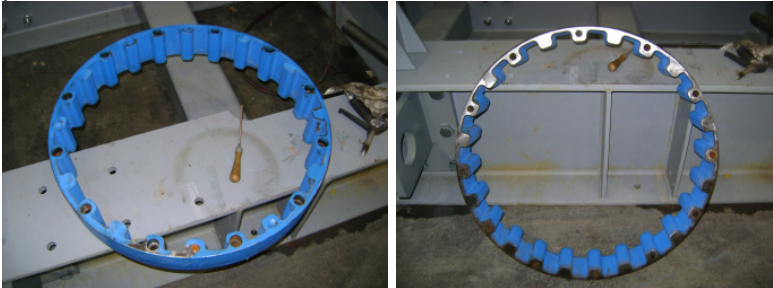
- 4.8.7 Tools Used

- 4.8.7.1 Degreaser
- 4.8.7.2 Citrol II
- 4.8.7.3 Right Angle Grinder
- 4.8.7.4 Scuff Pad
- 4.8.7.5 Towels
- 4.8.7.6 Gray Oil Rags

4.9 Install Outer Ringfeder Gear Ring

- 4.9.1 Match the gear ring to the **Job Traveler** and engine flywheel to ensure proper gear ring is called out.

- 4.9.2 Clean the gear ring through holes and mounting face surface to ensure a flush mount and fit and to prevent corrosion.

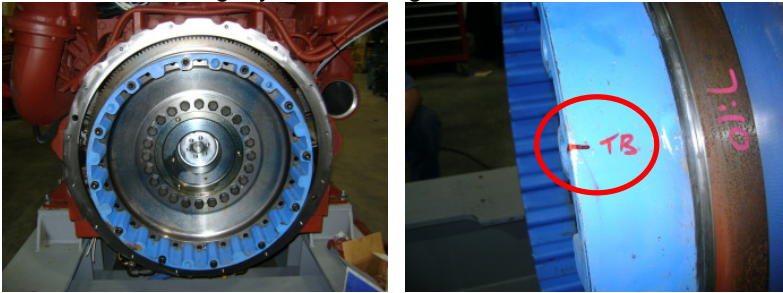


- 4.9.2.1 If installing the "silver" aluminum gear ring drill and tap 2 holes at 8-32 as seen below; make sure to use the mounting plate found in the Alineo case as a guide for the hole locations.



4.9.3 Install outer gear ring and hand thread hardware.

4.9.3.1 Lightly oil mounting hardware.

4.9.4 Torque hardware to flywheel (see **Sec. 4.27** for torque pattern), 50% in the prescribed pattern, then 100% and mark each location with appropriate paint marker color (see **Sec 4.26** for Hardware Used and Torque Values).

4.9.5 Tools Used

- 4.9.5.1 Air Gun
- 4.9.5.2 Scuff Pad for Grinder
- 4.9.5.3 90° Die Grinder
- 4.9.5.4 Torque Wrench
- 4.9.5.5 ½" Air Impact
- 4.9.5.6 14mm Allen Socket

4.10 Generator Prep

4.10.1 See lifting and rigging instructions.

4.10.2 Remove from skid and discard hardware.

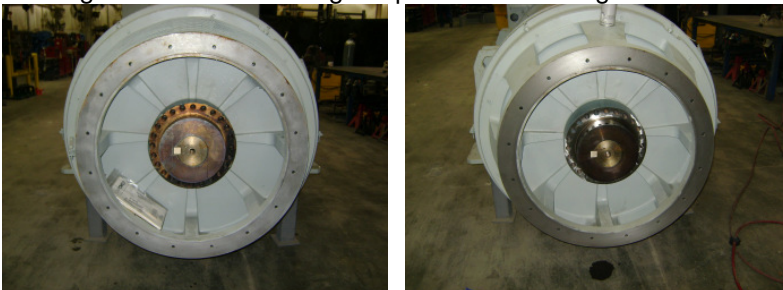
4.10.3 Tools Used

- 4.10.3.1 1 1/8" Socket (**Marathon**)
- 4.10.3.2 ½" Air Impact

4.10.4 Place on generator stands.



4.10.5 Clean generator bell housing adapter and mounting hub.

4.10.5.1 See **Sec. 4.8** for cleaning instructions.

4.10.6 Remove generator screen and save hardware.



4.10.6.1 Tools Used

4.10.6.1.1 3/8" Wrench or Swivel Socket and (*Marathon*)

4.10.6.1.2 10mm Wrench or Socket (*KATO*)

4.10.6.1.3 Impact

4.11 Install Inner Ringfeder Gear Ring

4.11.1 Match the gear ring to the *Job Traveler* and generator hub to ensure proper gear ring is called out.

4.11.2 Clean the gear ring through holes and mounting face surface to ensure a flush mount and fit and to prevent corrosion.



4.11.3 Make sure mounting hub is seated on generator drive shaft and key stock is in place.



4.11.4 Lightly oil mounting hardware.

4.11.5 Mount inner gear ring to generator hub and hand thread hardware. (see **Sec 4.26** for hardware used)



4.11.6 Bar inner gear with chain setup or barring tool is supplied to keep it from rotating during the applied torque to the gear.



4.11.7 Torque hardware to flywheel (see **Sec. 4.27** for torque pattern), 50% in the prescribed pattern, and then 100% and mark each location with appropriate paint marker color. (see **Sec 4.26** for Hardware Used and Torque Values)

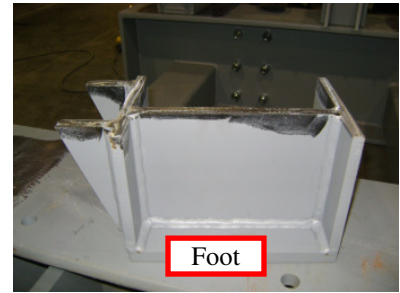
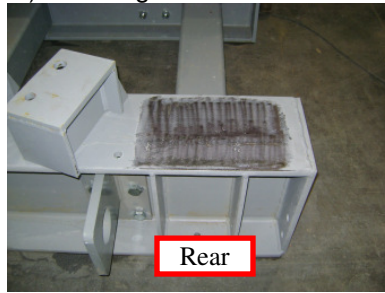
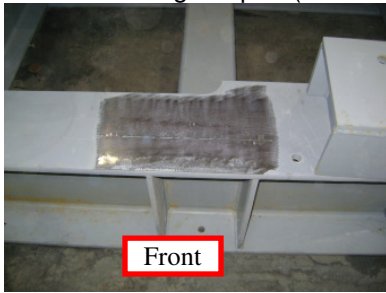
4.11.8 Tools used

4.11.8.1 1" Torque Wrench

4.11.8.2 1" x 3/4" Allen Socket

4.12 Base Prep

- 4.12.1 Using base drawing to locate the approximate location of where the generator feet will be at and grind off paint to prep base rails for weldment.
- 4.12.2 Grind all (4) mounting feet on the sides that will be welded to the base rail tops.
- 4.12.3 Grind a rectangular pad (4 locations) 1-2" longer than each foot and then the entire width of the rail.



4.12.4 Clean all grinding locations.

4.12.5 Tools Used

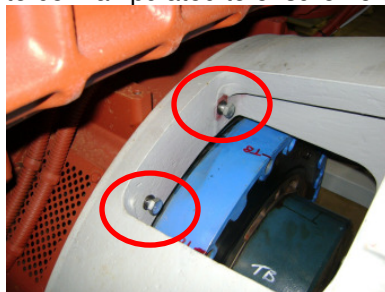
- 4.12.5.1 Face Shield
 4.12.5.2 4.5" Right Angle Grinder
 4.12.5.3 sander pads
 4.12.5.4 degreaser
 4.12.5.5 Towels

4.13 Couple Unit

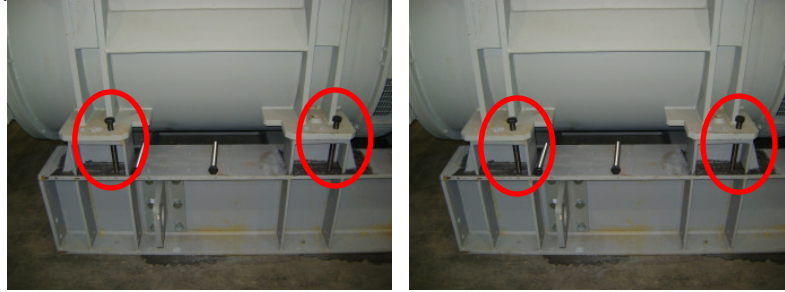
- 4.13.1 Attach generator to engine.
- 4.13.2 See lifting and rigging instructions for proper lifting of the generator.
- 4.13.3 Remove generator stands.
- 4.13.4 Using bubble level to help guide the generator adapter to the engine bell housing.
- 4.13.5 Make sure the Ringfeder gears mate.
- 4.13.6 **Make sure that the Generator Flange is FULLY SEATED to the Engine Bell Housing so that NO SPACES are visible around the entire circumference of the (2) mating surfaces.**



- 4.13.6.1 This will ensure easier alignment process.
- 4.13.7 Hand thread bell housing mounting bolts.
- 4.13.7.1 Make sure all bell housing bolts can be easily hand threaded and the generator through holes are centered on the engine bell housing threaded holes, the generator might need to be manipulated to ensure no cross threading.



- 4.13.7.2 Hardware Used (see **Sec. 4.26**) per generator used.

4.13.8 Install appropriate jacking screws and feet to the generator feet.

4.13.8.1 Check Job Traveler for part number of jacking screw to make sure the appropriate screw is being utilized. (see **Sec. 4.26**)

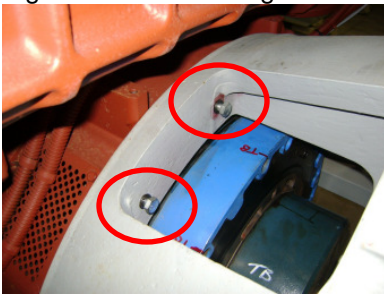
4.13.8.2 Jacking screws can be used to shift generator to make sure all bell housing bolts can be hand threaded.

4.13.8.2.1 Tools Used

4.13.8.2.1.1 1 1/2" Socket (**Marathon**)

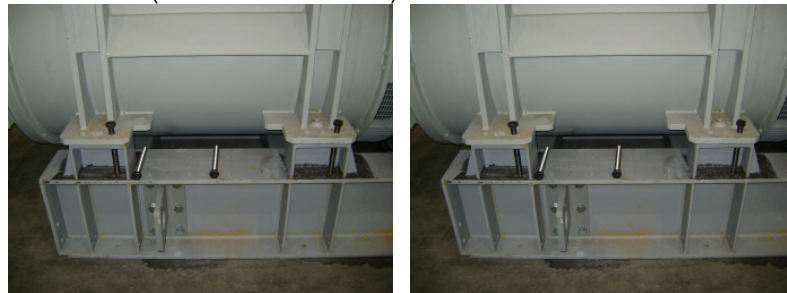
4.13.8.2.1.2 36mm Socket (**KATO**)

4.13.8.2.1.3 3/4" Ratchet

4.13.9 Tighten all bell housing bolts.**4.13.9.1** Tools Used

4.13.9.1.1 19mm Socket / Swivel Socket

4.13.9.1.2 Impact

4.13.10 Snug all jacking screws to remove weight from base rails.**4.13.10.1** Tools Used (see **Sec. 4.13.8.2.1**)**4.14 Engine & Generator Alignment**

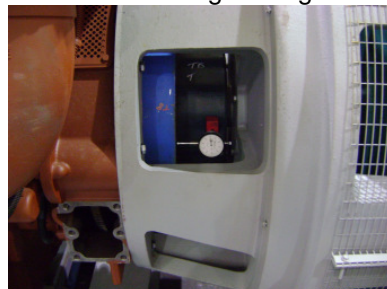
4.14.1 If using dial indicators they must remain in place until alignment is complete.

4.14.2 If using Aligneo setup it must remain in place until alignment is complete. (see **Sec. 4.14.4**)

4.14.3 Dial Indicator Procedure (2500kW and Below 2 Bearing)

4.14.3.1 Mount dial indicators to generator shaft with plungers taking readings off the Ringfeder gear mounted to the flywheel.

4.14.3.2 Mount the standard dial indicator at the left position with the plunger reading the angular face of the outer gear ring.



- 4.14.3.3 Mount the back plunger dial indicator at the top position with the plunger reading the radial face of the outer gear ring.



- 4.14.3.4 Rotate the flywheel to seat the engine and generator; make sure that the angular face dial indicator (**Sec 4.14.3.2**) stops at the top position and zero it.



- 4.14.3.5 Rotate the flywheel 90° and take the first reading from the angular dial indicator (**Sec 4.14.3.2**); record all data on **2 Bearing Coupled Results A-0-0-237-1** form then zero the radial dial indicator (**Sec 4.14.3.3**) at the top position.
- 4.14.3.5.1 Rotate 90° and take the second angular reading and the 1st radial reading. (**Sec 4.14.3.3**)
- 4.14.3.5.2 Rotate 90° and take the third angular reading and the 2nd radial reading.
- 4.14.3.5.3 Rotate 90° and take the last angular reading and the 3rd radial reading.
- 4.14.3.5.4 Rotate 90° and the take the final radial reading.
- 4.14.3.5.5 Dial Indicators should return to **ZERO**.
- 4.14.3.5.6 Dial indicators and or Aligneo should now be in their starting positions.
- 4.14.3.6 If within tolerance (+/- .020" TOTAL in all directions, adding up left to right and up to down) proceed to **Sec. 4.14.3.8**.
- 4.14.3.6.1 EX: Top position Radial indicator zeroed, rotated to the bottom position and has a -0.009" reading, then rotated back to the top position and has a -0.001 reading; unit is with in tolerance because there was only 0.010" of **TOTAL** movement.
- 4.14.3.6.2 EX: Top position Axial indicator is zeroed, rotated to the bottom position and has a 0.021" reading, then rotated back to the top position and has a .000 reading; unit is out of tolerance because there is .021" **TOTAL** movement.
- 4.14.3.7 If not in tolerance see **Sec. 4.15** for realignment.
- 4.14.3.8 Install shim pack.
- 4.14.3.8.1 At all 4 corners start with 0.045" worth of shims. (0.02", 0.01", 0.01" and 0.005")
- 4.14.3.8.1.1 Tape tabs together to hold shim stock in place.



4.14.3.8.1.2 Depending on the gap shim plates maybe needed.

4.14.3.8.1.2.1 See **Job Traveler** for shim plates to use.



4.14.3.8.1.2.2 An extra plate should be used if gap is still significant.

4.14.3.8.2 Flush up shims to outside of generator foot and base foot.



4.14.3.9 Torque mounting bolts to appropriate torque per hardware used. (see **Sec. 4.26**)



4.14.3.9.1 Tools Used

4.14.3.9.1.1 1" Drive Pistol Grip Nutrunner

4.14.3.9.1.2 7/8" Socket (**Marathon**)

4.14.3.9.1.3 1/2" Socket (**Small KATO**)

4.14.3.9.1.4 Torque Wrench

4.14.3.9.1.5 7/8" Wrench (**Marathon**)

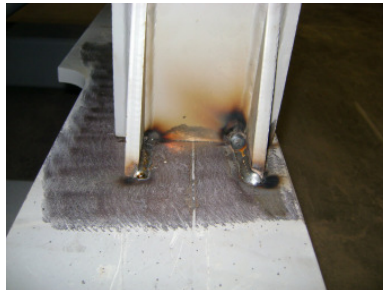
4.14.3.9.1.6 1/2" Wrench (**Small KATO**)

4.14.3.9.1.7 3/4" Air Impact

4.14.3.10 Shim between base and feet to prevent weld sag and soft foot instances if gaps are still present.

4.14.3.11 Relieve jacking screw pressure.

4.14.3.12 Stitch weld all feet to base first.



4.14.3.13 Weld each foot in segments to prevent movement from over heating.

4.14.3.13.1 Front side of each foot.



4.14.3.13.2 Back side of each foot.



4.14.3.13.3 Outside of each foot.



4.14.3.14 Allow welds to cool before rechecking alignment.

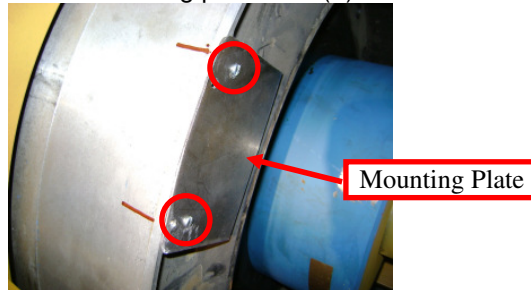
4.14.3.15 After cooling repeat **Sec. 4.14.3.4 - 4.14.3.5.**

4.14.3.15.1 If within tolerance proceed to **Sec. 4.16.**

4.14.3.15.2 If out of tolerance proceed to **Sec. 4.15.**

4.14.4 Aligneo Procedure (2800kW and Up 2 Bearing)

4.14.4.1 Install mounting plate with (2) 8-32 machine screws.

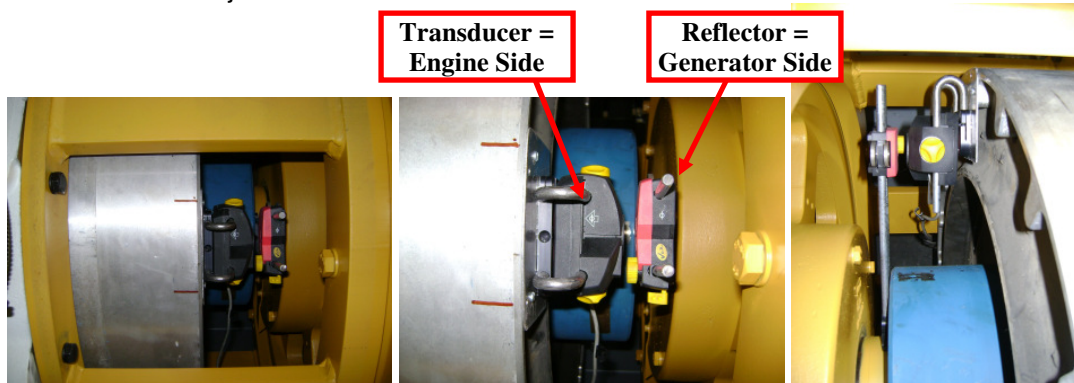


4.14.4.2 Tools Used

4.14.4.2.1 Screwdriver

4.14.4.3 Install Aligneo as seen in the reference pictures below; at the top position on both the engine and generator.

4.14.4.3.1 Try to line up the transducer and reflector as close as possible to minimize adjustment.



4.14.4.4 Attach the cable from the transducer to the Aligneo control unit; notice the matching arrows symbolizing correct cable connection to control unit.



4.14.4.5 Turn Aligneo Control Unit on.



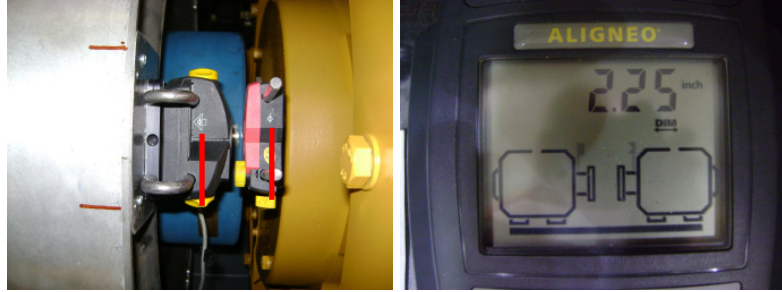
4.14.4.6 In conjunction with the **Ludeca Aligneo Operating Instructions** and **Recording Form (Ludeca Order No. 01-208-01)** begin the alignment procedure.

4.14.4.7 Setup the Aligneo with the required measurements by pressing the **DIM** key to start followed by the **ENT** key to switch between dimensions.



4.14.4.8 Take these measurements and input them into the control unit; **measurements may vary from job to job.**

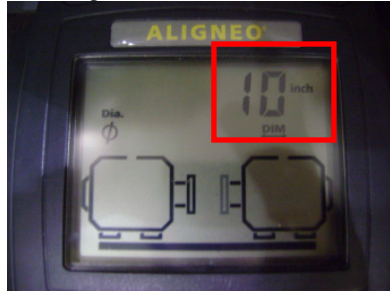
4.14.4.8.1 Laser to Prism



4.14.4.8.2 Laser to Coupling Center is predetermined to be - 3.625", use this value every time.



4.14.4.8.3 Working diameter is defaulted to 10", use this value every time.



4.14.4.8.4 Laser to Front Foot



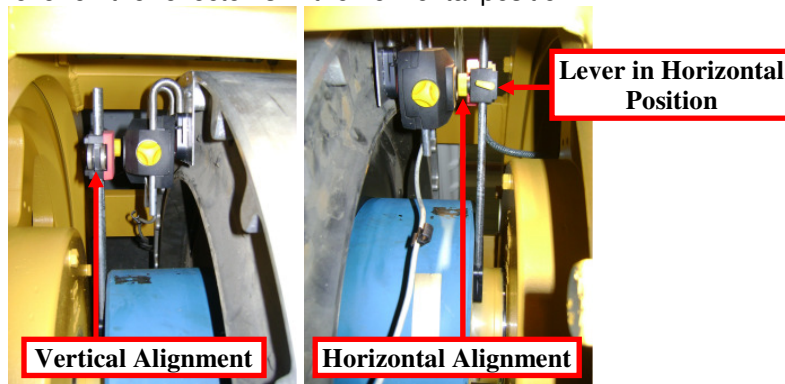
4.14.4.8.5 Front Foot to Back Foot



- 4.14.4.9 Adjust Laser beam so the transducer and reflector are aligned by pressing the **M** key and removing the **"RED"** reflector cap.



- 4.14.4.10 Use the vertical and horizontal adjustments to align laser beam; make sure the yellow lever on the reflector is in the horizontal position.



- 4.14.4.10.1 Both **LEDs** must be **"blinking"** for correct alignment and control unit screen needs to be reading **0, 0** for coordinates.



- 4.14.4.11 Rotate the coupling till **"3 DOTS"** appear on the control unit.



- 4.14.4.12 Press the **Results** key to cycle through the dimensions obtain from the alignment.



- 4.14.4.12.1 Make sure this the **results** symbol appears on the screen before cycle through the

dimensions.



- 4.14.4.13 Using the right arrow key cycle through the measurements and record them on the **2 Bearing Coupled Results** sheet. (**This sheet must stay with the Job Traveler to be archived!**)



- 4.14.4.14 Tools Used

- 4.14.4.14.1 Tape Measure
- 4.14.4.14.2 Aligneo
- 4.14.4.14.3 Gearing Tool
- 4.14.4.14.4 1" Ratchet
- 4.14.4.14.5 Transducer Mounting Plate

- 4.14.4.15 If within tolerance (**Sec. 4.14.3.6**) proceed to **Sec. 4.14.3.8 - 4.14.3.15** and complete.

- 4.14.4.16 If out of tolerance see **Sec 4.14.4.19**.

- 4.14.4.17 After welds have cooled recheck the alignment of the generator and engine and record the data again. See **Sec 4.14.4.9 - 4.14.4.12**

- 4.14.4.18 If within tolerance proceed to **Sec 4.16**.

- 4.14.4.19 Soft Foot correction for out of tolerance generator and engine alignment see **Ludeca Aligneo Operating Instructions Pg. 51**

4.15 Realignment

- 4.15.1 Loosen bell housing bolts.
- 4.15.2 Run down jacking screws till they hit the base.
- 4.15.3 Loosen feet mounting bolts.
- 4.15.4 Make sure dial indicators experience no movement.
- 4.15.5 Consultation of more experienced production workers and engineering may be necessary to determine the corrections that will be needed to each mounting location depending on how the generator is out of alignment on either the radial plane, axial plane or both.
- 4.15.6 Repeat **Sec. 4.14.3.4 - 4.14.3.5** for dial indicator alignment.
- 4.15.7 Repeat **Sec. 4.14.4.9 - 4.14.4.12 & 4.14.4.19** for Aligneo alignment.

4.16 Relieve Jacking Screws & Install Hex Nuts



4.16.1 Tools used

- 4.16.1.1 1 1/2" Socket
- 4.16.1.2 36mm Socket (*KATO*)
- 4.16.1.3 1 1/2" Wrench
- 4.16.1.4 1/2" Air Impact

4.16.2 Hardware Used (see *Sec. 4.26*)

4.17 Install Pusher Brackets

4.17.1 Check the *Job Traveler* for bracket P/Ns and make sure they fit the base mounting locations.

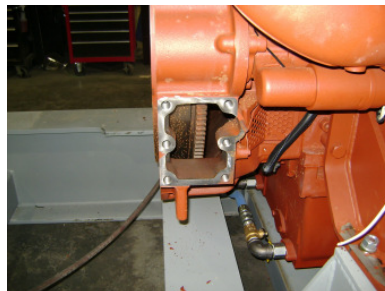
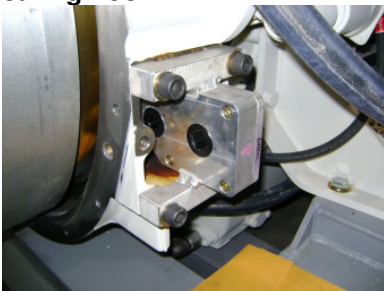


4.17.2 Hardware Used (see *Sec. 4.26*)

4.17.3 Tools Used

- 4.17.3.1 1 1/8" Socket
- 4.17.3.2 1 1/8" Wrench
- 4.17.3.3 1/2" Air Impact
- 4.17.3.4 15/16" Socket (*KATO*)

4.18 Remove Gearing Tool

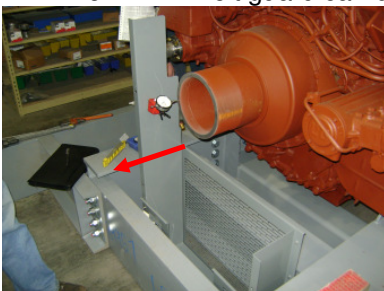


4.18.1 See *Sec. 4.7.6.2* for tools used.

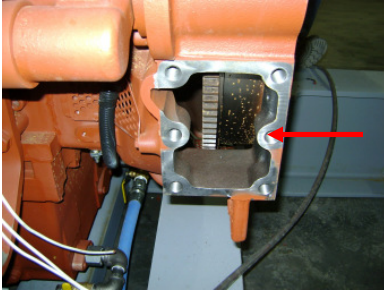
4.19 Check Engine End Play After Coupling

4.19.1 Mount dial indicator so reading is taken from crank damper pulley. (See *Sec. 4.7.5.2* for tools used.)

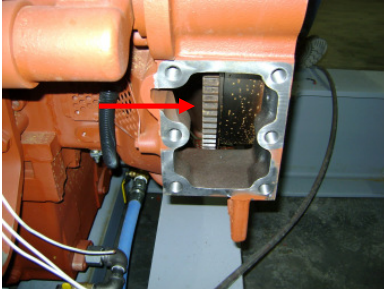
4.19.1.1 Belt guard can be used to mount the dial indicator to.



4.19.2 Shift pulley forward and zero dial indicator.



4.19.3 Shift pulley to the rear using the flywheel through one of the flywheel cover openings at the rear of the engine.

4.19.4 If in tolerance (**Sec. 4.7.5.1**) mark on after cooler below **BEFORE** reading with pencil.

4.20 Install Engine Flywheel Covers (Supplied with engine)



4.20.1 Tools used

4.20.1.1 24mm Socket & Wrench

4.20.1.2 1/2" Impact

4.20.2 Hardware used

4.20.2.1 Supplied hardware that comes with engine

4.21 Torque All Coupling Hardware

4.21.1 Torque generator feet mounting bolts and bell housing bolts to correct rating per hardware used and mark with the appropriate paint marker color. (see **Sec. 4.26** for torque spec)4.21.2 See **Sec. 4.14.3.9.1** and **4.13.9.1** for tools used.

4.22 Remove Dial Indicators if used

4.23 Remove Aligneo if used

4.24 Replace Generator Screen

4.24.1 See **Sec. 4.10.6.1** for tools used.

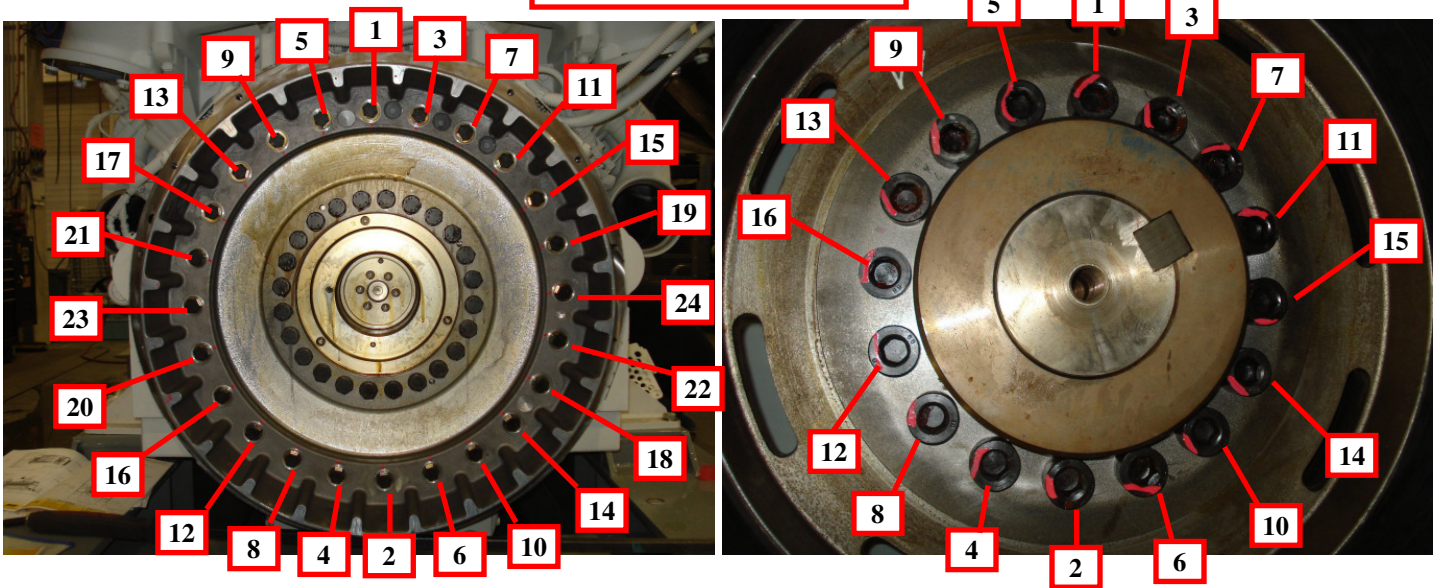
4.25 Make sure the 2 Bearing Recording Form is completely filled out and sign by the Assembler responsible and Line Lead.

4.26 Hardware Used

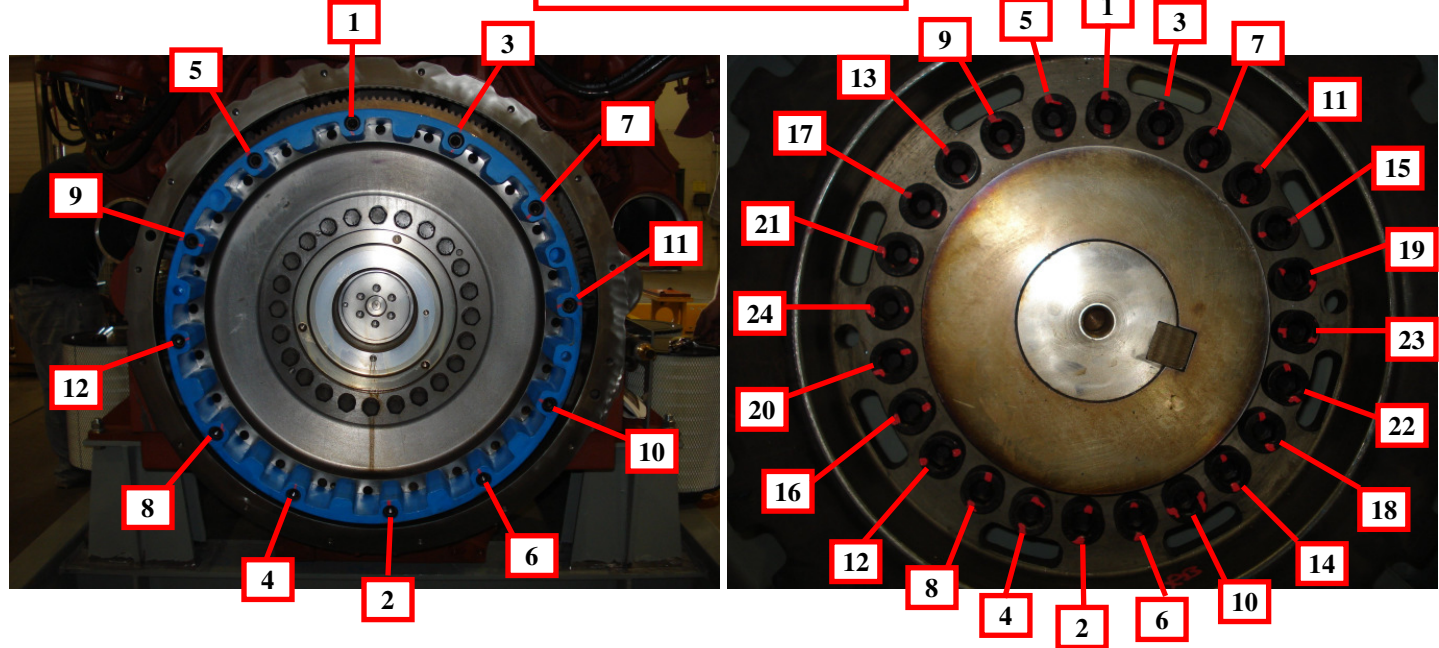
Description	P/N	Description	Hardware P/N MTU OE (Fastenal)	QTY	50% Torque	100% Torque
Ringfeder Outer Gear, 2500kW & Below	86791	SHCS M16-2.0 x 120mm P GR12.9	86815	12	75 lb/ft	150 lb/ft
Ringfeder Inner Gear; 2500kW & Below	86791	Provided by Supplier	N/A	24	262 lb/ft	523 lb/ft
Ringfeder Outer Gear; 2800kW & Above	86901	HCS M16-2.0 x 50mm P GR 10.9	(40758)	12	75 lb/ft	150 lb/ft
		5/8" SAE Z Thru HD F/W	49818 (33819)	12		
Ringfeder Inner Gear; 2800Kw & Above	86901	Provided by Supplier	N/A	24	262 lb/ft	523 lb/ft
Ringfeder Outer Gear, Leroy Somer 2250kW & Below		HCS M16 - 2.0 x 45mm P GR 10.9	(40757)	12	75 lb/ft	150 lb/ft
		5/8" SAE Z Thru HD F/W	49818 (33819)	12		
Ringfeder Inner Gear, Leroy Somer 2250kW & Below		Provided by Supplier	N/A	16	157 lb/ft	314 lb/ft
Marathon 2500kW & Below Bell Housing		M12-1.75 x 65mm 10.9 P HCS	40721	16		70 lb/ft
		M12 P Medium Split L/W	40254	16		
Marathon 2800kW & Above Bell Housing		M12-1.75 x 65mm 10.9 P HCS	40721	16		70 lbs/ft
		M12 P Medium Split L/W	40254	16		
KATO 2500kW & Below Bell HSG				16		70 lbs/ft
		M12 P Medium Split L/W	40254	16		
KATO 2800kW & Above Bell HSG				16		70 lbs/ft
		M12 P Medium Split L/W	40254	16		
Leroy Somer 2250kW & Below Bell HSG		M12-1.75 x 45mm 10.9 P HCS	(40717)	16		70 lbs/ft
		M12 P Medium Split L/W	40254	16		
Jacking Screw Marathon Tall Foot		1"-8 x 10" TPI GR 8 FT	90085	4		
Jam Nut		1.25"-7 GR 5 Z FHN	(36324)	4		
Jacking Screw Marathon Short Foot		1"-8 x 6.5" TPI GR 8 FT	86840	4		
Jam Nut		1.25"-7 GR 5 Z FHN	(36324)	4		
Jacking Screw Leroy Somer		M16 Threaded Rod w/Welded M16 Hex Nut (See Below)	N/A	4		
Jam Nut		M16 CL8 FHN	(40311)	4		
Marathon to Base		HCS 1.25"-7 x 4.5" Z GR 5	(13571)	4		952 lb/ft
KATO 2800kW & Above		1.25"-7 GR 5 Z FHN	(36324)	4		952 lb/ft
Leroy Somer 2250kW & Below		1.25" Z Medium Split L/W	(33640)	4		
		1.25" GR 9 SAE Yellow Z F/W	(33251)	8		
KATO to Base 2500kW & Below		HCS 1"-8 x 4.5" Z GR 5	(13471)	4		579 lb/ft
		1"-8 GR 5 Z FHN	89044 (36320)	4		579 lb/ft
		1" Z Medium Split L/W	47825 (33636)	4		
		1" GR 9 SAE Yellow Z F/W	(33249)	8		
Marathon Pusher Bracket Alignment		HCS 3/4"-10 x 2.5" Z GR 5	13363	8		
		3/4"-10 GR 5 Z FHN	36315	8		
Marathon Pusher Bracket Mounting		HCS 3/4"-10 X 3" Z GR 5	13365	12		
		3/4" SAE Z Thru HD F/W	33820	24		
		3/4" Z Medium Split L/W	33632	12		
		3/4"-10 GR 5 Z FHN	36316	12		
KATO Small Gen. Pusher Bolts		HCS 1"-8 x 3" Z GR 5	13465	4		
KATO Pusher Bracket Alignment		HCS 5/8"-11 x 2.5" Z GR 5	13313	8		
		5/8"-11 GR 5 Z FHN	36314	8		
KATO Pusher Bracket Mounting		HCS 3/4"-10 X 3" Z GR 5	13365	16		
Leroy Somer 2250kW & Below		3/4" SAE Z Thru HD F/W	33820	32		
		3/4" Z Medium Split L/W	33632	16		
		3/4"-10 GR 5 Z FHN	36316	16		
Leroy Somer Pusher Bracket Alignment		HCS 3/4"-10 x 4" Z GR5	(13369)	4		
		3/4"-10 GR 5 Z FHN	(40311)	4		

4.27 Torque Patterns

2800kW & Above Ringfeder



2500kW & Below Ringfeder



Model Change Records

Date: 5/12/2009
 Change: Procedure document created. PCA 100963

Job Traveler: N/A
 By Who: Chris Vermillion Approved: Tony Rolfes

Date: 2-18-2010
 Change: Updated document to reflect Leroy Somer hardware, added After coupling endplay check, updated fastener chart for LS and other grammatical changes.

Job Traveler: N/A
 By Who: Chris Vermillion Approved: Chad Massman

Date: _____
 Change: _____

Job Traveler: _____
 By Who: _____ Approved: _____

Date: _____
 Change: _____

Job Traveler: _____
 By Who: _____ Approved: _____

Date: _____
 Change: _____

Job Traveler: _____
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Job Traveler: _____
 By Who: _____ Approved: _____