

REPAIR OF VERTICAL DRIVE SHAFTS

1. GENERAL

- 1.01 This section covers the procedures for repairing vertical drive shafts that have broken or cut through in service.
- 1.02 The application of these procedures is intended to shorten the length of time a frame is out of service as a result of a broken or cut through vertical drive shaft.
- 1.03 After a shaft has been repaired, check the location of all sequence switch driving discs as covered in Section 030-801-701 and the alignment of all shaft bearings as covered in Section 159-735-701.
- 1.04 Before stopping a drive to repair a shaft, make busy the affected circuits in the approved manner and then stop the drive motor.

2. TOOLS AND MATERIALS

<u>Code or Spec.No.</u>	<u>Description</u>
<u>Tools</u>	
240	Scriber
KS-6098	Bristo Set Screw Wrench
R-1051	6" Pillar File
R-1640	Center Punch
R-1952	Tap Wrench
R-2485	5/32" Allen Socket Screw Wrench
R-2958	5/64" Allen Socket Screw Wrench
R-80238	Shaft Straightening Fixture
-	Hand Drill
-	No. 29 Commercial Twist Drill
-	No. 42 Commercial Twist Drill
-	Hacksaw
-	4 Oz. Riveting Hammer
-	Combination Pliers
-	4" Regular Screwdriver
-	8-32 Tap

Code or
Spec.No.

Description

Material

D-98063	Cloth
*(2 reqd.)	8-32 Steel Hex. Socket Cup point Set Screw 1/2" Long.
* -	Seamless Brass Tubing (Commercial) 2" Long x 1/2" Outside Diameter x 1/16" Wall Thickness

*May be obtained locally.

3. PREPARATION

3.01 Preparation of Tubing: Clamp the 2" length of tubing firmly in a horizontal position, in a vise. Take care in doing this not to distort the tubing. Mark a spot equidistant from the ends and crosswise at the center of the tubing. To do this, hold the R-1640 center punch vertically at the spot and tap it lightly with the hammer. Then using the hand drill and the No. 42 drill, drill a hole vertically through the top and bottom walls of the tubing. Loosen the vise, rotate the tubing 90°, and clamp it firmly in this position. Using the hacksaw, cut a longitudinal slot through the top wall of the tubing, along a line midway between the two drilled holes. Remove burrs from the drilled holes, slot and ends of the tubing with the R-1051 file.

3.02 Preparation of Vertical Drive Shaft: Where interrupter gears are mounted on the shaft above the break, loosen the interrupter mounting screws using the 4" regular screwdriver. Move the interrupter as far as possible to the right. If the interrupter cannot be moved far enough to the right to disengage the gear on the drive shaft, loosen the gear mounting screw with the screwdriver or the R-2485 wrench and shift the gear upward. Using the screwdriver or KS-6098 wrench loosen the mounting screws of all sequence switch driving discs on the shaft above the break. Where Schatz type bearings are mounted on the shaft above the break, it may be advisable to replace the shaft, as covered in Section 159-735-801. Where other ball bearing type bearings are used, remove the bearing caps from the bearings mounted above the break. To do this, remove the bearing cap mounting screws using the screwdriver. Remove the cap and the metal and felt washers.

4. METHOD

4.01 Position the upper portion of the broken drive shaft so that the edges of the upper and lower portions of the shaft match at the break. Then, with the No. 240 scriber, scribe a vertical line across the break at the front of the shaft. This will facilitate lining up the parts later.

4.02 Raise the upper portion of the shaft sufficiently to permit inserting the prepared tubing into the lower portion of the shaft. Then while compressing the tubing with the combination pliers, insert it into the lower portion of the shaft, so that the slot in the tubing lines up with the scribed line on the shaft. Insert the long leg of the R-2958 wrench into the holes in the tubing. If the slot in the tubing is not aligned with the lines scribed on the shaft, rotate the tubing as required with the wrench. Push the tubing into the shaft as far as permitted by the R-2958 wrench. If the tubing is a loose fit in the shaft, remove it. Using the blade of the 4" regular screwdriver as a wedge, widen the slot in the tubing as required to provide a tight fit. Reinsert the tubing as described above.

4.03 Position the upper portion of the shaft over the tubing so the scribed line on the shaft lines up with the slot in the tubing. Slide the shaft down over the tubing until it contacts the R-2958 wrench. Check that the scribed lines on the upper and lower portions of the shaft and the slot in the tubing are in vertical alignment.

4.04 After the two portions of the shaft have been aligned, remove the R-2958 wrench. Push the upper portion of the shaft down, taking care that the two portions are matched at the break.

4.05 Rotate the shaft approximately 90 degrees by turning the motor coupling at the motor. Check that the upper and lower portion of the shaft are still matched at the break with the scribed lines in alignment.

4.06 Before proceeding to drill and tap the shaft, protect the adjacent apparatus with a D-98063 cloth so as to prevent the resulting debris being deposited on the apparatus.

4.07 While drilling and tapping, prevent bowing of the shaft by means of a block of wood of suitable size wedged between the shaft and frame.

4.08 Using the R-1640 center punch and tapping it lightly with the hammer, mark a spot on the front of the lower portion of the shaft about 1/2" below the break. Then with the No. 29 drill mounted in the hand drill, drill a hole horizontally through the nearer wall of both the shaft and the tubing. Do not drill through the rear wall.

4.09 Tap the hole with the 8-32 tap. Dress down any rough or burred edges with the R-1051 file. Place a 1/2" long socket cup point set screw in the tapped hole and tighten the screw securely with the R-2958 wrench.

4.10 Rotate the shaft 180 degrees as described in 4.05. Check that the upper and lower portions of the shaft are still matched at the break with the scribed lines in alignment. As described in 4.08 and 4.09, drill and tap another hole in the shaft about 1/2" above the break. Place a set screw in this hole and tighten it securely with the R-2958 wrench.

4.11 The set screws should be flush or slightly underflush with respect to the surface of the shaft. If necessary, file the top of the set screw sufficiently with the R-1051 file to permit the discs or bearings to pass over it.

4.12 Remount the parts that were removed and relocate the driving discs and interrupter gears as covered in the sections covering the apparatus. Also check the eccentricity of shaft, and if necessary, straighten the shaft using the R-80238 tool as covered in Section 159-735-701. Start the drive motor in the approved manner and restore all made busy circuits to normal.