SERVICE

ROTATING SHAFT TORQUE SENSORS

NOTE: An assembly drawing of the torque sensor is enclosed for reference.

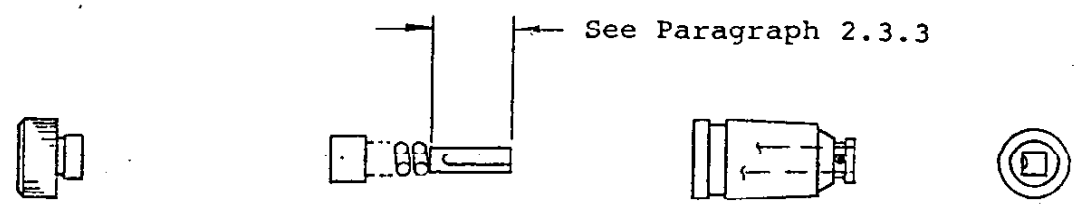
1. GENERAL:

1.1 The Lebow Products Rotating Shaft Torque Sensor has a one-piece shaft with a bonded resistance strain gage bridge. A shaft-mounted slip ring assembly transfers the electrical signal from the bridge wiring to the brushes and the remote instrumentation. The brush carrier is supported over the slip rings by a one-piece housing with bearing bores machined in-line. Because of the simplicity of construction, these sensors may be serviced in the field, provided that the procedures outlined below are carefully followed.

1.2 Factory Service

The sensor may be returned to the factory for service. Turn-around time is subject to current production schedules. Return the sensor in a shipping container equivalent to the original, to the attention of the Service Department. Attach a tag or an envelope to the sensor, listing service required. Address paperwork to the attention of the Service Department. No work will be performed without customer approval of charges and delivery.

2. BRUSH-SPRING ASSEMBLY:



BRUSH CAP

BRUSH-SPRING ASSEMBLY (see chart)

BRUSH HOLDER

PART NO.		SPRING PRESSURE
A-10983-10	Standard	8 psi
A-10983-11		15 psi
A-10983-12	Low Speed Operation	25 psi

FIG. 1

2.1 Brush-Spring Assembly Description

The cartridge type brush-spring assemblies supplied with this transducer are made so that a groove in one side of the brush mates with a dimple in the brush holder. The purpose of this feature is to prevent the brush from falling through the holder when the brush carrier is removed from the housing. Other design features provide for direct electrical connection from the brush-ring interface to the receptacle pin. A brass cup is soldered to the brush spring which in turn is soldered to the brush. When assembled in the holder with the brush cap tightened, the brass cup presses against the holder to complete the circuits.

2.3 Brush-Spring Assembly Service

For torque sensors equipped with manually or air activated brush carrier assembly, see Section 3.2 first.

2.3.1 Remove the Bakelite covered brush cap (right hand thread) with a screwdriver that properly fits the closed slot in the cap.

2.3.2 The brush-spring assembly may now be lifted from the brush holder. If the assembly does not slide freely, a few drips of solvent (Note 1) may be required to wash away the graphite dust deposited at the end of the brush.

2.3.3 The brush-spring assembly must be replaced if the square portion of the silver-graphite brush measures less than 5/16 inches in length (FIG. 1). Useable brushes should be washed with a soft brush and low residue solvent (Note 1).

2.3.4 The brush holder bore should be washed using cotton swabs dipped in solvent. (Slip ring surfaces should also be washed at this time - see Paragraph 5.3.2.)

2.3.5 Replace the brush-spring assembly in the holder so that the groove in the brush is aligned with the dimple in the brush holder.

2.3.6 Replace the brush holder cap. The cap must be tight so that electrical contact is maintained.

3. BRUSH CARRIER ASSEMBLY:

The brush carrier assembly serves to support the brush holders in the correct position with respect to the slip rings. The electrical receptacle and all associated wiring are incorporated into the assembly and are protected with a solvent resistant, washable insulating compound.

3.1 Three interchangeable styles of brush carrier assemblies are available for standard shaft torque sensors.

3.1.1 The fixed brush carrier assembly is used where torque must be monitored continuously.

3.1.2 The manually actuated brush carrier assembly is used to lift the brushes away from the rings to increase brush life where intermittent torque measurements are anticipated.

3.1.3 The air actuated brush carrier assembly is for remote or programmed brush lifting. In the air actuated assembly, air at 40 to 60 psi is applied to the cylinder through a snubber valve, so that the brush carrier is moved slowly into the correct operating position with respect to the slip rings. Actuating air pressure does not affect brush contact pressure unless the air pressure is insufficient to move the brush carrier against the shoulder screw stops. Integral springs in the housing lift the brush carrier when actuating air pressure is removed.

3.1.4 The snubber valve may require occasional cleaning if air supply contains contaminants.

3.2 Brush Carrier Assembly Service

Reference drawings: assembly of manual/air actuated brush carrier assembly.

3.2.1 Remove the socket head cap screw which fastens the "L" shaped reaction bracket to the housing.

3.2.2 Lift the assembly radially outward from the housing so that the brush holders do not mar the soft coin silver slip rings. The slip rings are now accessible for servicing. (See Section 5.)

3.2.3 The insulated undersurface of the brush carrier is also exposed and may be washed with a soft brush and solvent.

3.2.4 Assemble in the reverse order.

4. BEARING AND SHAFT SERVICE:

4.1 Disassembly of rotating shaft torque sensors (except Models 1228, 1240, 1241, 1248 - see Sec. 4.3)

4.1.1 Remove the brush carrier assembly (see Section 3.2) and magnetic pickup, if one has been installed.

4.1.2 Remove the snap ring at either end of the housing. (On those models with two different size bearings, remove the snap ring adjacent to the larger bearing.)

4.1.3 Place the torque sensor in an arbor press and press the sensor shaft assembly from the housing. The arbor press is necessary to provide a mechanical advantage. Do not apply excessive pressing force to the sensor shaft - very little force is required to remove the shaft assembly. The housing must be firmly supported and aligned with the ram so that the shaft does not tilt as it is removed; otherwise, the coin silver slip rings or the sensor shaft itself may be damaged.

NOTE: The sensor shaft must be supported so that it does not drop when the bearings clear the housing. (Bearings are a slip fit in the housing and a press fit on the shaft.)

4.1.4 Wrap the slip ring surfaces with a soft material such as tissue paper and tape for protection during subsequent operations.

4.1.5 Carefully press the bearings from the sensor shaft observing the same precautions as in Paragraph 4.1.3 above.

4.1.6 Proceed with the maintenance for which disassembly was required.

4.1.6.1 If a damaged shaft is replaced and the bearings are still satisfactory, press the bearings onto the new shaft. (Where oil slingers are used, be sure they are in place before the bearings are installed.)

4.1.6.2 Damaged bearings may be replaced by their equivalent as shown in the "Recommended Spare Parts List" in this manual. We cannot recommend that the customer relubricate bearings unless there are facilities approved by the bearing manufacturer available.

4.1.6.3 If damaged or worn slip rings are evident, see Section 5.3 for those operations that may be completed in the field. For conditions beyond the scope of Sec. 5.3, refer to the factory. After slip ring service, replace the bearings as in Paragraph 4.1.6.1 above.

4.2 Assembly of rotating shaft torque sensors (except Models 1228, 1240, 1241, 1248 - see Sec. 4.4)

4.2.1 Place the torque sensor housing in an arbor press. Remove the slip ring assembly protection and press the sensor shaft assembly into the housing until the lower bearing contacts the snap ring. Refer to the assembly drawing for the exact arrangement of the parts.

4.2.2 Install the snap ring. The sensor shaft should spin freely at this stage of assembly. Shaft end play should be two to three thousandths of an inch.

4.2.3 Install the brush carrier assembly. (See Sec. 3.2.) Install the magnetic pickup so that the tip just touches the counter gear, then move back 1/4 turn. Hold the pickup body and tighten the lock nut. Caution: The threads are easily stripped. Rotate the shaft manually to be certain that the magnetic pickup does not touch the gear.

4.3 Disassembly of Models 1228, 1240, 1241, 1248 rotating shaft torque sensors.

4.3.1 Remove all brush spring assemblies. (See Paragraphs 2.3.1 and 2.3.2.)

4.3.2 Remove the socket head cap screws from the end flanges and tap the flanges to separate them from the shaft assembly.

4.3.3 Locate the word "INPUT" stamped on the housing at one end. Place the housing in an arbor press and press the sensor shaft assembly so that it moves from the end of the housing marked "INPUT" toward the unmarked end. The housing must be firmly supported and aligned with the ram so that the shaft does not tilt as it is removed; otherwise, the coin silver slip rings may be damaged. The shaft must be supported so that it does not drop when the bearings clear the housing. The "INPUT" end bearing will remain in the housing.

4.3.4 Wrap the slip ring surfaces with a soft material such as tissue paper and tape for protection during subsequent operations.

4.3.5 Press the bearings from the sensor shaft and from the housing, observing the same precautions as in Paragraph 4.3.3 above.

4.3.6 Proceed with the maintenance for which disassembly was required. (See Paragraph 4.1.6, rotating shaft torque sensor, for service comments.)

4.3.7 Do not install the bearings on the shaft.

4.4 Assembly of Models 1228, 1240, 1241, 1248 rotating shaft torque sensors.

4.4.1 Place the housing in an arbor press and install a bearing at the end marked "INPUT".

4.4.2 Press the other bearing on the shouldered end of the sensor shaft against the slip ring carrier.

4.4.3 Place the housing into the arbor press so that the "INPUT" face is fully supported. Remove the slip ring assembly protection. Install the shaft and bearing by pressing on the outer face of the bearing. (The shaft will pilot in the "INPUT" bearing.)

4.4.4 Install the end flanges, observing the assembly drawing note regarding Loc-tite and cap screw torque. The flanges are match ground to fit. Insure the marks for each end of the sensor Match the marks on the flanges.

4.4.5 Install the brush-spring assemblies. (See Paragraph 2.3.)

5. SLIP RING SERVICE:

5.1 When Should You Clean The Slip Rings?

- After initial 10 hours of run time.
- When they become oily or dirty.
- When they are yellow with tarnish.
- When they have a smooth (polished silver or see yourself shine) type finish.

5.2 Special Precautions

- No contact cleaners or lubricants.
- No silicone sprays
- No oils or greases
- No steel wool

5.3 Cleaning Slip Rings

5.3.1 To gain access to the slip rings, remove the brush carrier assembly. (See Section 3.2.) Models 1228, 1240, 1241, and 1248: remove the pipe plug in the housing and all of the brush spring assemblies. (See Paragraph 2.3.)

5.3.2 Wash the slip ring and insulator surfaces with soft tissue or gauze sponges moistened with solvent. (See Note 1.) Rotate the shaft slowly and repeat this operation until the tissue or sponge shows no soil. (See Paragraph 3.2 for brush carrier assembly service.)

5.3.3 Place the sensor shaft assembly in a lathe and adjust for a maximum run-out of 0.0005 inches (total indicator reading) of the shaft bearing diameters. Models 1228, 1240, 1241, and 1248: the sensor shaft is most easily turned on an arbor prepared for a wringing fit in the shaft bore.

5.3.4 With a sharp tool, turn the rings true, using a fine feed to minimize tool marks. Turn each ring individually removing only enough material to eliminate run-out and dents or scratches. Do not allow the tool to run into the epoxy insulating resin or the cutting edge will be dulled.

5.3.5 After the rings are turned, the resin should be undercut approximately 0.010 inches below the ring surface.

5.3.6 The ring surfaces may be polished lightly with 320 to 400 grit abrasive paper to remove tool marks. Slip ring run-out should not exceed 0.0005 inches (TIR).

NOTE: Do not polish the slip rings while the shaft is assembled in the housing.

5.3.7 Clean the ring and insulator surfaces as in Section 5.3 above and proceed with assembly as in Sections 4.2 or 4.4.

Note 1: The following low residue solvents may be used where noted in the text:

Freon TF

Freon TMC

Test any solvent for activity, since some may cause swelling in certain insulating compounds after a brief exposure. Do not immerse components in any solvent. Instead, use a soft brush, gauze sponge, or tissue paper moistened in the solvent.

APPLICATION NOTE

MODEL 1228, 1241, 1248, 1641, and 1648

This application note details mounting procedures for Lebow Model 1228, 1241, 1248, 1641, and 1648. These procedures must be followed to insure safe operation of these torque sensors.

Because of their short length and flanged ends, these torque sensors lend themselves to applications where short length is mandatory. One typical application is the measurement of engine torque and/or horsepower. The torque sensor is mounted between the engine drive shaft and the dynamometer.

Two installation techniques will be discussed in this application note.

A. Rigid mounting of torque sensor on dynamometer flange:

Refer to Sketch #1.

1. Spacer "A" is required to interface between torque sensor flange and dynamometer flange. Use pilots to insure concentricity.

2. Spacer "B" is required to interface between torque sensor flange and drive shaft "U" joint flange. Use pilots to insure concentricity.

3. Please make the following measurements after spacer "A", torque sensor and spacer "B" are mounted on the dynamometer flange.

   (a) Check the concentricity of "D" diameter as shown in Sketch #1. Concentricity should be within .001 inches.

   (b) Check squareness of the surface "C" as shown in Sketch #1. Squareness should be within .001 inches.

4. Drive shaft should be balanced within 2 in. oz.

B. Mounting of torque sensor within a drive shaft:

Refer to Sketch #2.

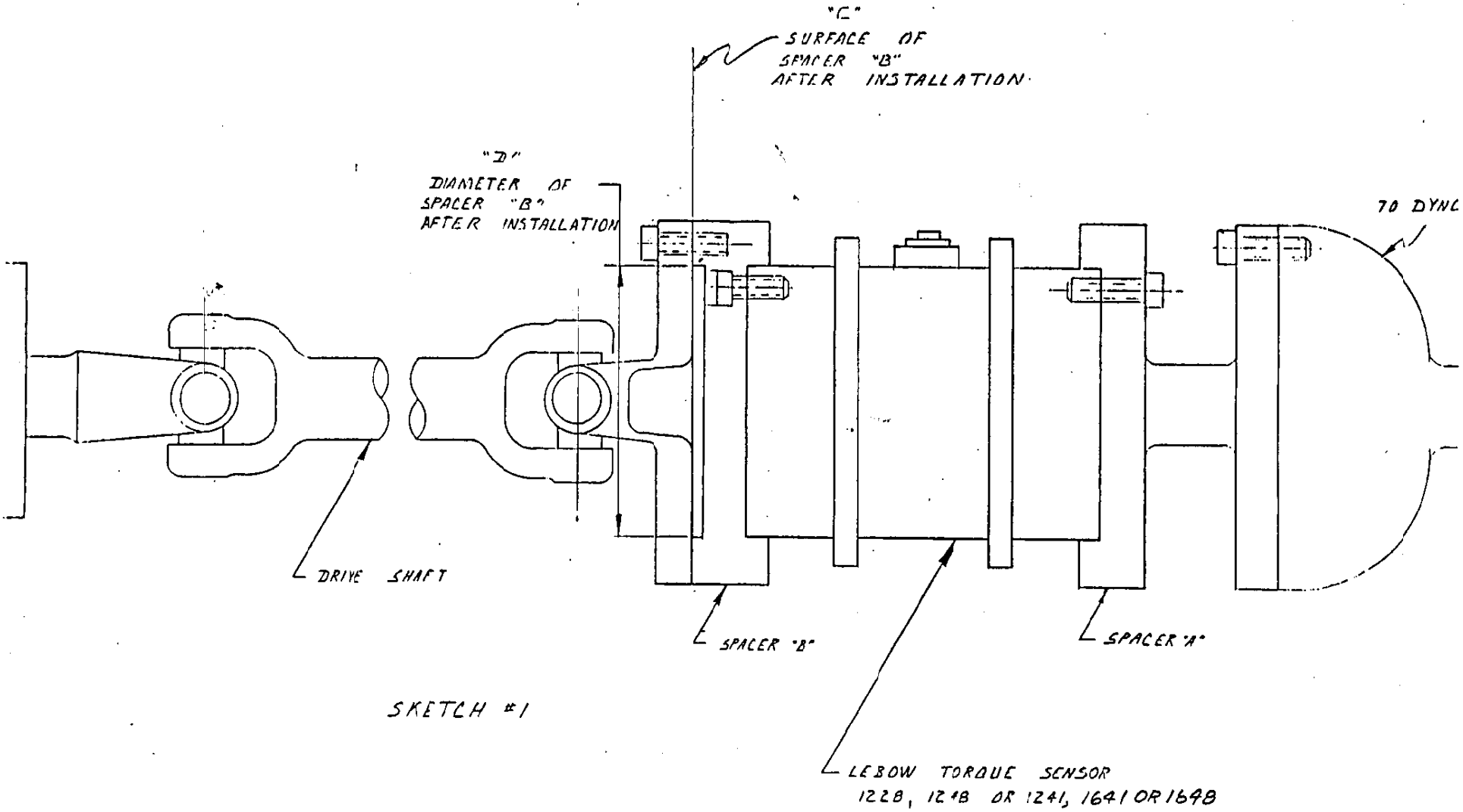
When the drive shaft is to be installed on the vehicle, it is mandatory that the total length be kept unchanged. Drive shaft should be cut to install torque sensor.

1. Cut drive shaft as close as possible to differential "U" joint end.

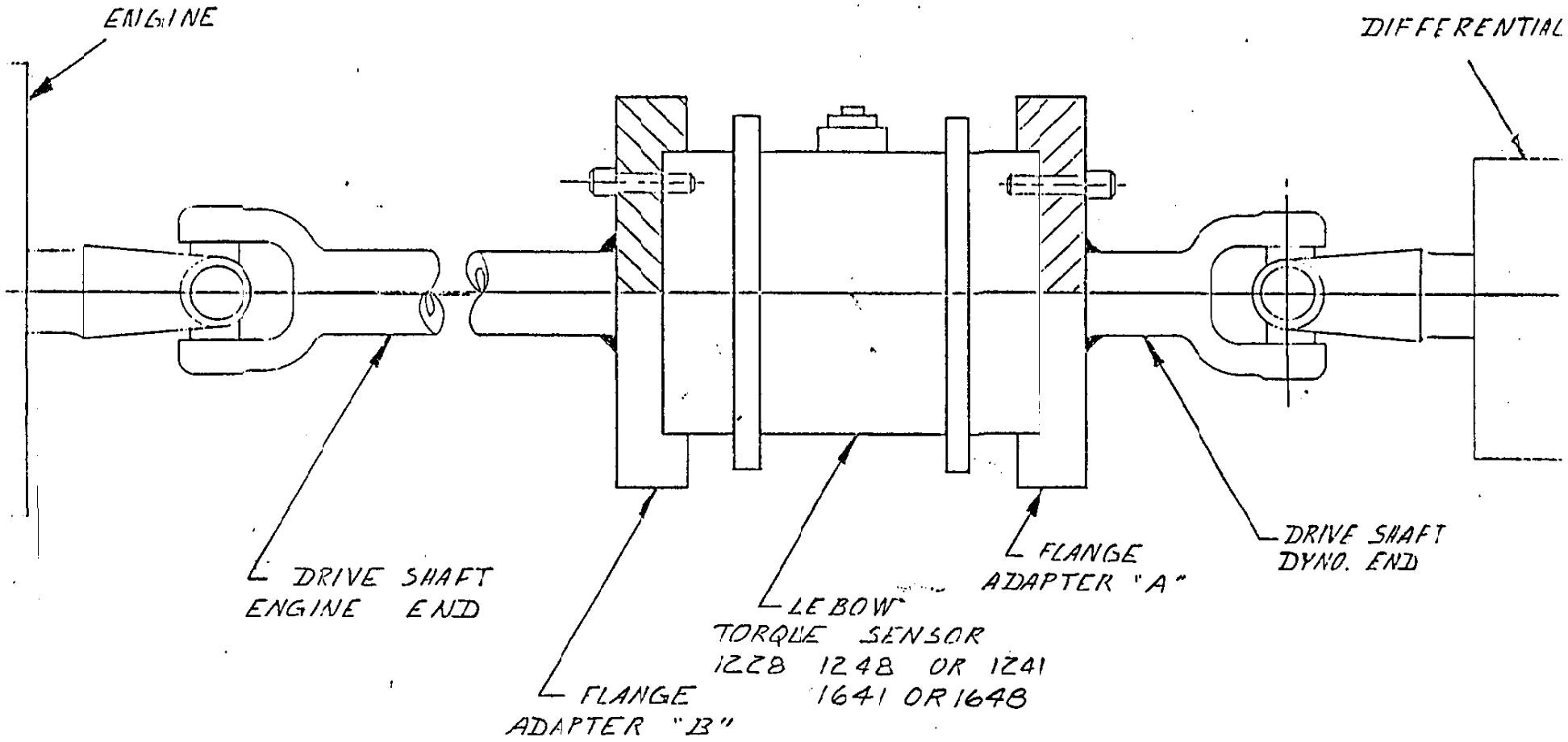
2. Weld flange "A" as shown in Sketch #2. Machine flange "A" after welding for pilot diameter, and square mounting surface. Concentricity and squareness should be held within .005 inches for applications under 1000 rpm and within .002 inches for over 3000 rpm.

3. A short piece will have to be removed from drive shaft to maintain original length after torque sensor is installed. Weld flange "B". Machine flange "B" after welding for pilot diameter and square mounting surface. Concentricity and squareness should be held within .005 inches for applications under 3000 rpm and within .002 inches for over 3000 rpm.

4. Install torque sensor. Balance the whole assembly to within 2 in. oz.


"C"
SURFACE OF
SPACER "B"
AFTER INSTALLATION
"D"
DIAMETER OF
SPACER "B"
AFTER INSTALLATION
TO DYNO
DRIVE SHAFT
SPACER "B"
SPACER "A"
LEBOW TORQUE SENSOR
1228, 1248 OR 1241, 1641 OR 1648

SKETCH #1


ENGINE
DIFFERENTIAL
DRIVE SHAFT
ENGINE END
FLANGE
ADAPTER "B"
LEBOW
TORQUE SENSOR
1228 1248 OR 1241
1641 OR 1648
FLANGE
ADAPTER "A"
DRIVE SHAFT
DYNO. END

SKETCH #2

INSTALLATION NOTES

MODEL 1228 & 1248

Caution must be used in the installation and proper alignment of torque sensors to avoid exceeding the safe bending moments. If exceeded, catastropic failure can result and jeopardize personal safety.

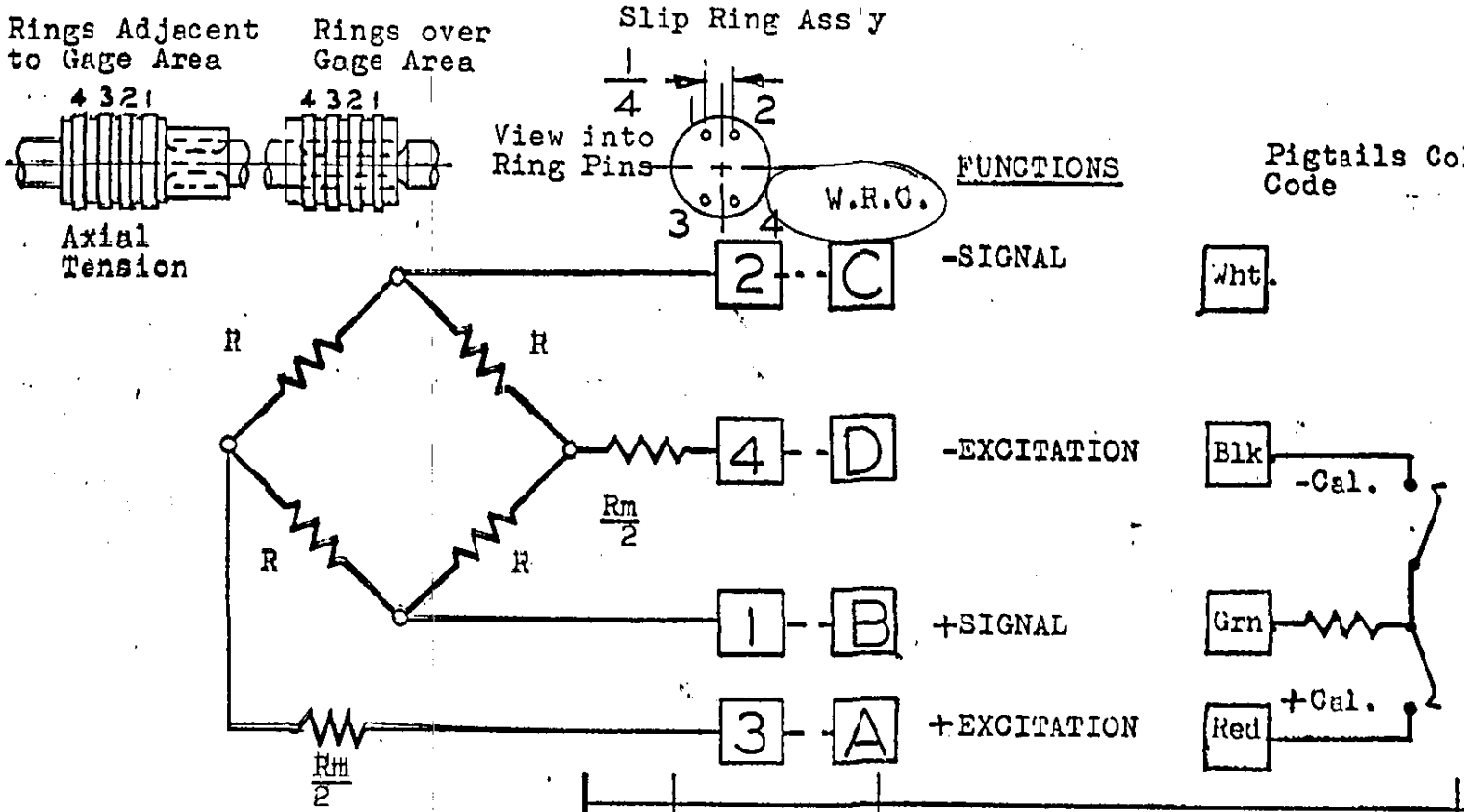
The maximum safe bending moments are listed below.

MODEL	CAPACITY	MAX. SAFE BENDING MOMENT
1228	2000 in. lb.	1000 in. lb.
1228	5000 in. lb.	2500 in. lb.
1228	10,000 in. lb.	5000 in. lb.
1248	20,000 in. lb.	10,000 in. lb.

IF THE ABOVE LIMITS ARE EXCEEDED, SENSOR FAILURE MAY RESULT. INSTALLATIONS MUST BE CAREFULLY CHECKED FOR BALANCE AND RUNOUT TO INSURE SAFE OPERATION.

For application assistance, contact the factory.

W-145



NOTES:
1. R=STRAIN GAGE RESISTANCE
2. Rm =MODULUS & OUTPUT MATCHING RESISTANCE
3. THE WIRING CODE FOR THIS TRANSDUCER IS CIRCLED.
4. TENSION LOADING OR CLOCKWISE TORQUE WILL PRODUCE A POSITIVE OR UPSCALE READING.

DET. No	PART No	DESCRIPTION	REQ'D

WIRING CODES FOR LEBOW TRANSDUCERS

SCALE:	DRAWN BY: DES	REF. DWG:	MAT'L:
DATE: 11-7-75	CHK'D BY: DT	MODEL:	JOB NO.

UNLESS OTHERWISE SPECIFIED:

TOLERANCE ON FRACT'ONS	± 1/64	TOLERANCE ON DRILLED HOLES	+.007 -.000
TWO PLACE DECIMALS	± .010	REMOVE ALL BURRS & SHARP EDGES	
THREE PLACE DECIMALS	± .005	DIMENSION LIMITS HELD AFTER PLATING	
ANGLES ± 0°30'		SURFACE FINISH 125√	

SYM.	REVISION	DATE

LEBOW ASSOCIATES, INC.
TROY, MICHIGAN

DRAWING NO. W-145