INSTRUCTIONS

TORQUE TESTER AND MECHANICAL LOADER

TYPE 1 [SINGLE STATION, SINGLE RANGE] MODEL NUMBERS

500-OI
250-PI
2000-PI
1000-PF
150-MKP
2000-PF
300-MKP
3000-PF
500-MKP

TYPE 1A [SINGLE STATION, DUAL RANGE] MODEL NUMBERS

50-PI/800-OI
200-PF/2400-PI
500-PF/6000-PI

TYPE II [DUAL STATION, DUAL RANGE] MODEL NUMBERS

100/500-OI
250/2000-PI
250/2000-CMKP

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INTRODUCTION AND GENERAL INFORMATION

INTRODUCTION

This manual covers the operation, calibration and maintenance instructions common to mechanical torque testers manufactured by Consolidated Devices, Inc., City of Industry, California (**CDI**). Illustrated parts lists are also included.

CDI testers are beam-bar type torque testers conforming to military specification MIL-26639C and Interim Navy specification XAS-2137.

GENERAL INFORMATION

Torque testers covered by this manual are precision instruments used to measure static torque in both the clockwise and the counter-clockwise directions. Each tester consists of a housing, square drives where torque is applied, precision torque measuring beam(s) and an applied torque indicator.

Each tester includes a set of adapters which connect the square drives of torque wrenches, torque screwdrivers, T-Handles and other static torque tools to the square drives of the tester.

MECHANISM DESIGN

Due to the unique torque tester design, the precision torque beam on all CDI torque testers flexes in one direction only, whether the torque is applied in the clockwise or the counter-clockwise direction. Clockwise torque is applied to the shaft at one end and counter-clockwise torque at the other end. Therefore, tester preloading is not necessary when changing the direction of application of torque and all hysteresis effects on accuracy are eliminated.

STANDARD MODELS

Three types of torque testers are available as standard models.

a. Type I, Single Station, Single Range, Page 4

b. Type IA, Single Station, Dual Range, Page 4

c. Type II, Dual Station, Dual Range, Page 4

There are no basic differences between CDI Testers, except for dimensions and weights, and that Type II Testers have two input shafts: the upper shaft being for the lower range and the lower shaft for higher range.

TYPE I, SINGLE STATION, SINGLE RANGE, FIG. 1

MODEL	RANGE	INCREMENTS	DRIVES	STANDARD# ADAPTERS	MAXIMUM DIMENSION IN	WT LB
500-OI	0-500 oz-in	.5 oz-in	1/4''HEX	1/4,3/8''	20.5x10.8x5.8	14
250-PI	0-250 lb-in	.25 lb-in	1/2'' SQ	1/4,3/8''	20.5x10.8x5.8	18
2000-PI	0-2000 lb-in	2.0 lb-in	1/2'' SQ	3/8,1/2''	20.5x10.8x5.8	18
1000-PF	0-1000 lb-ft	1.0 lb-ft	1'' SQ	1/2,3/4,1''	31.8x11.3x7.8	40
150-MKP	0-150 mkp		1'' SQ	1/2,3/4,1''	31.8x11.3x7.8	40
2000-PF	0-2000 lb-ft	2.0 lb-ft	1'' SQ	3/4,1''	31.8x11.3x7.8	40
300-MKP	0-300 mkp		1'' SQ	3/4,1''	31.8x11.3x7.8	40
3000-PF	0-3000 lb-ft	3.0 lb-ft	1.5'' SQ	3/4,1,1.5''	39.5x13x10.8	98
500-MKP	0-500 mkp		1.5'' SQ	3/4,1,1.5''	39.5x13x10.8	98

TYPE IA, SINGLE STATION, DUAL RANGE, FIG.1

MODEL	RANGE	INCREMENTS	DRIVES	STANDARD ADAPTERS	MAXIMUM DIMENSION, IN	WT LB
50-PI/	0-50 lb-in	.05 lb-in	1/4''HEX	1/4,3/8''	20.5x10.8x5.8	14
800 OI	0-8000 oz-in	1.0 oz-in				
200-PF/	0-200 lb-ft	0.2 lb-ft	1/2''SQ	3/8,1/2''	20.5x10.8x5.8	18
2400-PI	0-2400 lb-in	2.4 lb-in				
500-PF/	0-500 lb-ft	1.0 ft-lb	3/4''SQ	1/2,3/4''	20.5x10.8x6.4	18
6000-PI	0-6000 lb-in	10 lb-in				

TYPE II DUAL STATION, DUAL RANGE, FIG. 2

MODEL	RANGE	INCREMENTS	DRIVES	STANDARD ADAPTERS	MAXIMUM DIMENSION, IN	WT LB
100/	0-100 oz-in	.1 oz-in	1/4''HEX	1/4,3/8''	20.5x10.8x5.8	14
500-OI	0-500 oz-in	.5 oz-in				
250/	0-250 lb-in	.25 lb-in	1/2''SQ	1/4,3/8,	20.5x10.8x5.8	18
2000-PI	0-2000 lb-in	2.0 lb-in		1/2''		
250/	0-250 CMKP	.25 CMKP	1/2''SQ	1/4,3/8,	20.5x10.8x5.8	18
2000-CMKP	0-2000 CMKP	2.0 CMKP		1/2''		

The adapters are female to female socket type - one end is female square of the size listed, the other end fits the tester drive.

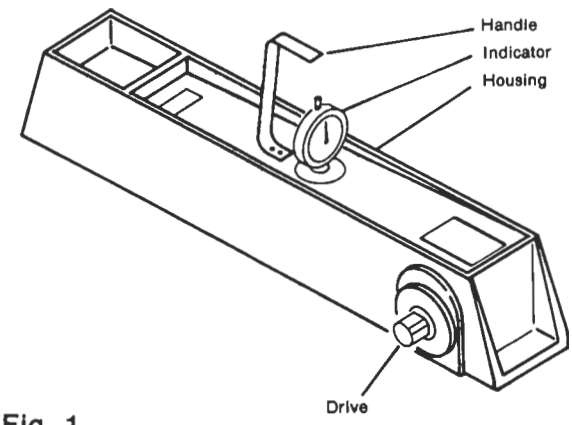


Fig. 1
Single Station, Single Range
Single Station, Dual Range

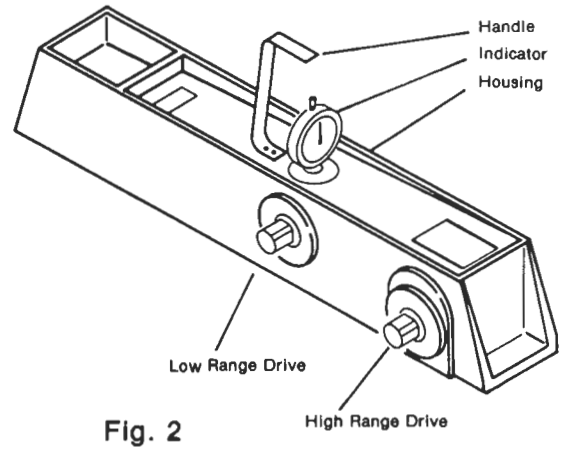


Fig. 2
Dual Station
Dual Range

INTENDED USE

CDI torque testers are used to measure static torque which is applied by torque wrenches, torque screwdrivers, t-handles, and other static torque tools. CDI testers may be used to:

a. Verify the accuracy of any of the dial, free wheeling, click type or light and/or sound indicating torque wrench or screwdriver.

b. Indicate the actual torque for all single setting preset torque wrenches and torque screwdrivers.

c. Calibrate torque wrenches and screwdrivers.

d. Measure other statically applied torques for a wide variety of purposes.

These torque testers are **not** intended for use with impact tools which may, after a short time, damage the bearings, mechanism or applied torque indicator. DO NOT USE TO MEASURE IMPACT TORQUE.

PERFORMANCE CHARACTERISTICS

ACCURACY. The accuracy of all CDI mechanical torque testers is $\pm$ 1% of actual value or one graduation, whichever is greater.

RESOLUTION. The full scale range is divided into 1,000 increments which can be resolved into fifths by the unaided eye. This makes the resolution of the testers 1/5000 of the full scale range.

AMBIENT TEMPERATURE RANGE. CDI mechanical torque testers will operate within the accuracy specified above throughout the temperature range from 32 to 125 degrees Fahrenheit. They will withstand storage in temperatures ranging from -80 to 160 degrees Fahrenheit as specified by MIL-E-4970 (USAF), Para. 4.2.1 ND Para. 4.1.1.

MODE OF OPERATION. Torque may be applied to the tester through manual means or by means of a mechanical loader. A description of the mechanical loader will be found on page 6, SPECIAL TOOLS AND TEST EQUIPMENT.

MECHANICAL LOADER

GENERAL INFORMATION: The CDI mechanical loader is available on special order in three models: the model 500L-1 for use with testers up to 1000 ft. lbs., and the model 500L-2 for use up to 2000 ft. lbs., and the model 500L-3 for use up to 3000 ft. lbs.

INTENDED USE: The loader is used to apply force during testing and/or calibration of torque wrenches. Compared to manual torque application, the mechanical loaders apply even, steady torque resulting in improved accuracy. Loaders may also reduce operator fatigue on repetitive high load applications.

MECHANICAL LOADER SPECIFICATIONS.

NAME:	Mechanical Loader
MODEL NUMBER:	500L-1 (6195) for testers to 1000 ft. lbs. 500L-2 (6196) for testers to 2000 ft. lbs. 500L-3 for testers to 3000 ft. lbs.
STROKE:	12 inches
APPLIED FORCE:	500 lb. maximum
POWER:	110V 60 cycle
NOTE:	The 500L-1,-2, and -3 are essentially the same except for the length of the load arms.

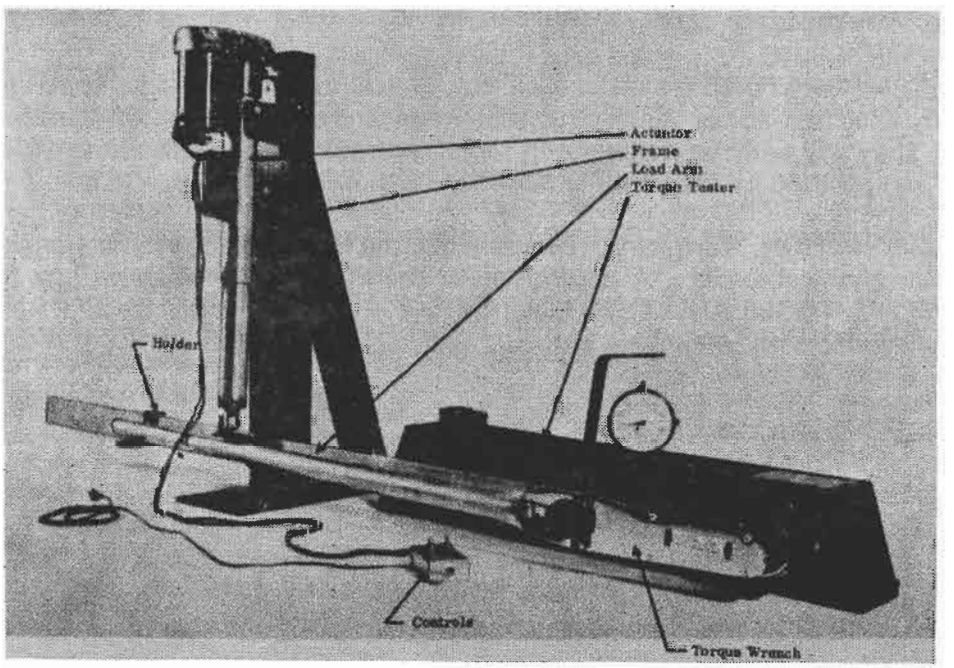


Fig. 3 Mechanical Loader Operational set-up

MECHANICAL LOADER OPERATION

A. Mount the appropriate adapter on the square drive of the torque tester shaft, then mount the load arm (9) on the adapter.
B. Attach a torque wrench to the adapter and hang the holder (Index 10, Pg. 8) on to the load arm to apply force to the wrench at the middle of the handle grip.
C. Move the actuator toward the load arm and attach it to the load arm at an appropriate location as shown on page 6.
D. Plug main power cord into a 110 Volt 60 cycle outlet.
E. Push the switch button on the controls to actuate the loader. The rocker switch changes the direction of load arm movement.
F. Release the switch button just before the desired torque is reached. The loader will hold torque at the release point.
G. Turn the fine adjustment knob (Index 14, Pg. 8) until the desired torque is reached.
H. The actuator has a built-in overload clutch in both directions which insures safe operation. When the actuator is in an overload condition, the motor will spin freely.

FIG. 4 — PARTS LIST FOR MECHANICAL LOADER

Index	Part Number	Description	Units per Assy.	Use On
		(See page 8 for Exploded View)		
1	270-19	Base Assembly	1	All
2#	270-64	Lifting Stirrup	1	"
3	10-129-3	Sckt Hd Shlder Screw, Loader Support	1	"
4	270-5	Loader Support	1	"
5	10-138-2	Hexagon Nut, Loader Support	1	"
6	270-54	Actuator Assembly	1	"
7	270-25	Reduction Sleeve, Load Arm	1	"
8	270-24	Needle Bearing, Load Arm	1	"
9	270-10	Load Arm, 500L-1	1	A
9	270-23	Load Arm 500L-2	1	B
9	270-90	Load Arm, 500L-3	1	C
10	270-18	Holder Assembly	1	All
11	270-69	Retaining Ring	2	"
12	270-38	Load Clamp	1	"
13	270-86	Holding Pin, Load Clamp	1	"
14	270-31	Knob, Fine Adjustment	1	"
15	10-101-29	Socket Setscrew, Knob	1	"
16	10-138-9	Hexagon Nut, Actuator Assembly	1	"
17	10-129-11	Sckt Hd Shldr Screw, Actuator Assembly	1	"

CODE IDENTIFICATION: A refers to loader model 500L-1
B refers to loader model 500L-2
C refers to loader model 500L-3

Item 2 is furnished for the U.S. Navy only

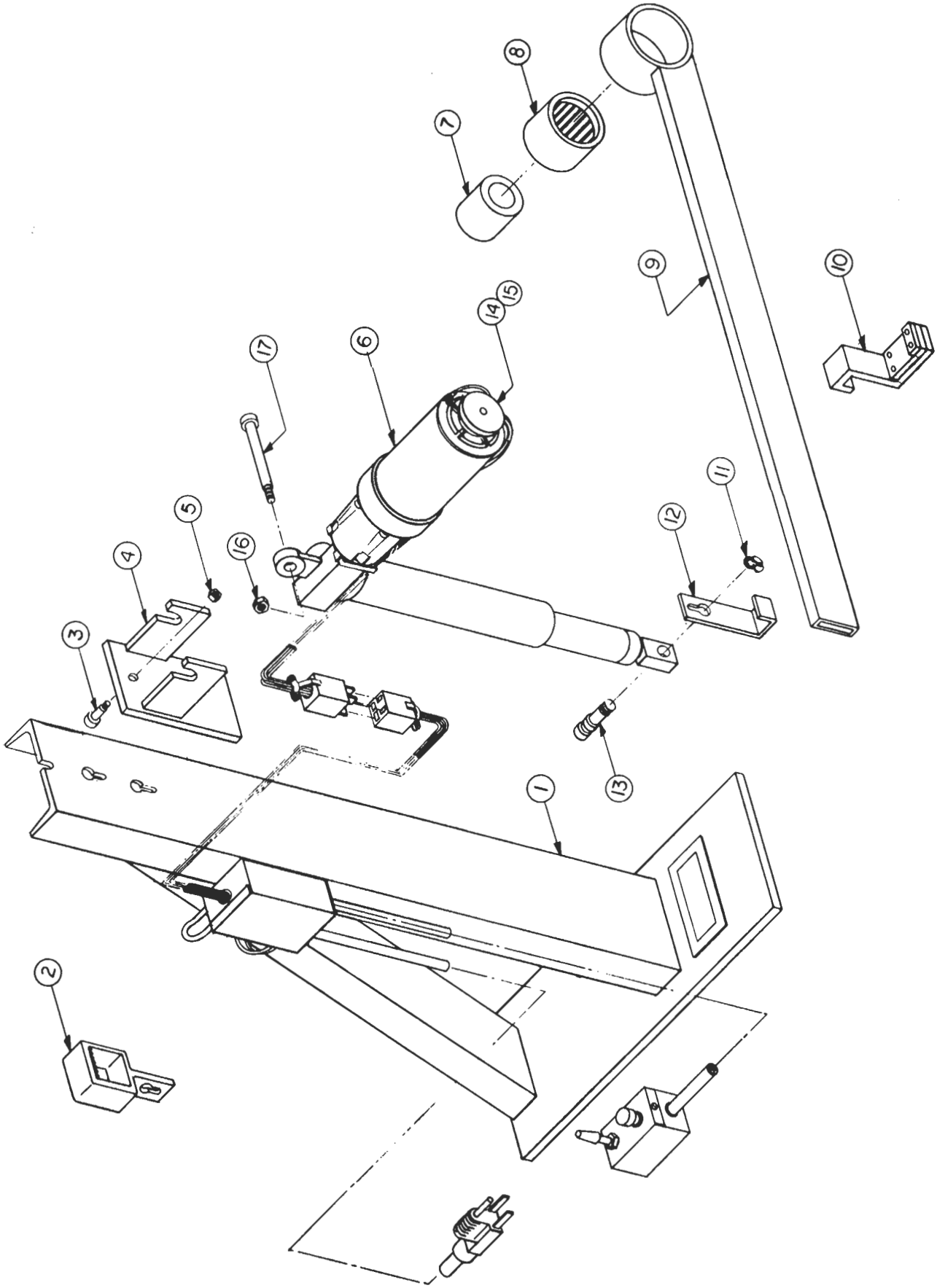


Fig. 5 Mechanical Loader Exploded View
(See Parts List, Page 7)

SPECIAL TOOLS
No Special tools are required to service CDI testers.

TEST EQUIPMENT
Test equipment to calibrate and/or test the calibration of testers consists of a calibration arm or calibration pulley and certified weights. Test equipment is not supplied with the tester unless ordered separately. A detailed description of standard test equipment will be found in the Maintenance instructions on pages 13, 14 & 15.

PREPARATION FOR USE AND SHIPMENT

PREPARATION FOR USE

MOUNTING. Unpack the tester and mount on a table or bench capable of supporting the loads exerted by the particular tester. It is recommended that mounting holes be drilled in the bench and that the tester be securely bolted in place. For temporary mounting, two or more C clamps may be used. However, special care should be exercised in the selection and placement of the clamps to prevent breakage or loosening during tester operation.

SURFACE LEVELING. The mounting surface should be flat but there are no specific leveling requirements since CDI mechanical testers will operate in any plane inclined up to 90 degrees from the horizontal or tilted up to 30 degrees from vertical.

TORQUE INDICATOR. CDI torque testers are shipped with the torque indicator mounted on the tester ready for use. Remove the protective cap from the reset shaft. Using the fingertip, gently press the reset shaft downward until it stops. (Fig. 6 Page 10)

MAJOR ZERO ADJUSTMENT. The major zero adjustment is set at the factory. The revolutions indicator should be in the vicinity of zero and the main pointer should be within 5 graduations from the 12 0'clock (zero) position. If at times corrections are necessary, loosen the upper major zero adjustment nut and turn the lower adjustment nut until the correct setting is reached. Reset the shaft after each change and then tighten the upper nut. (fig. 7 page 10)

FINE ZERO ADJUSTMENT. Push the reset shaft slightly to move the main pointer counter-clockwise from zero and slowly release. If the pointer is not indicating zero, loosen the fine zero adjustment thumb screw and rotate the bezel to line up the zero with the main pointer. Repeat these steps as necessary, then tighten the thumb screw. The fine zero adjustment should be exercised several times a day, particularly if ambient temperature changes. (Page 10)

FINE ZERO ADJUSTMENT FOR OZ-IN TESTERS. Tester model nos. 500-OI & 100/500-OI, have sensitive torque beams so that fine zero adjustment as explained on page 9 is not always possible. A special calibration arm is provided for setting zero. Mount the arm so that it hangs horizontally on the tester square drive. (See Picture Lower Right). Press on the reset shaft to move the main pointer a few graduations counter-clockwise from the 5 oz-in graduation. Release the shaft slowly. If the main pointer is not lined up with the 5 oz-in graduation, loosen the thumb screw and rotate the bezel until lined up. Tighten the thumb screw. Repeat these steps as necessary. Remove the special calibration arm.

SHIPMENT Put the tester into a container (made from wood or sheet metal) capable of supporting the weight of tester, and provided with mounting holes in the bottom. Bolt the tester to the container. Pull the indicator shaft all the way up and put the protective cap on the top of the shaft.

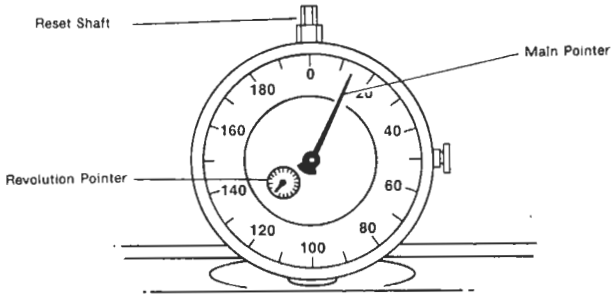


FIG. 6 RESET SHAFT PUSH DOWN

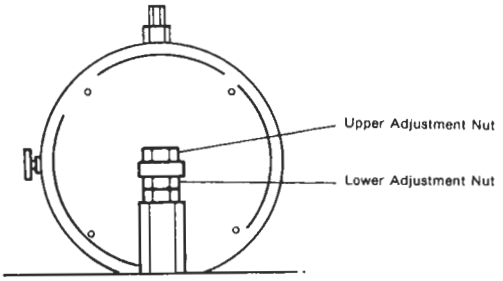


FIG. 7 MAJOR ZERO ADJUSTMENT

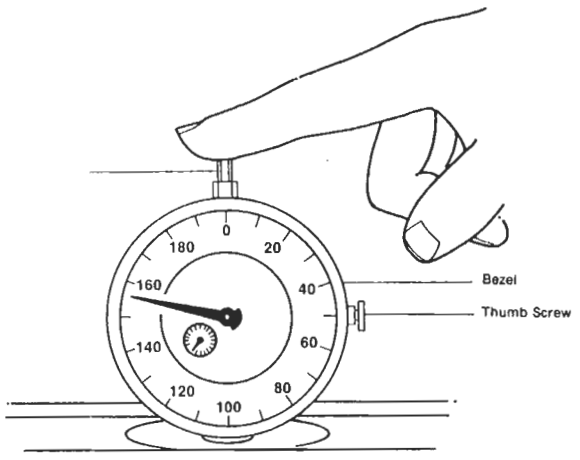


FIG. 8 FINE ZERO ADJUSTMENT

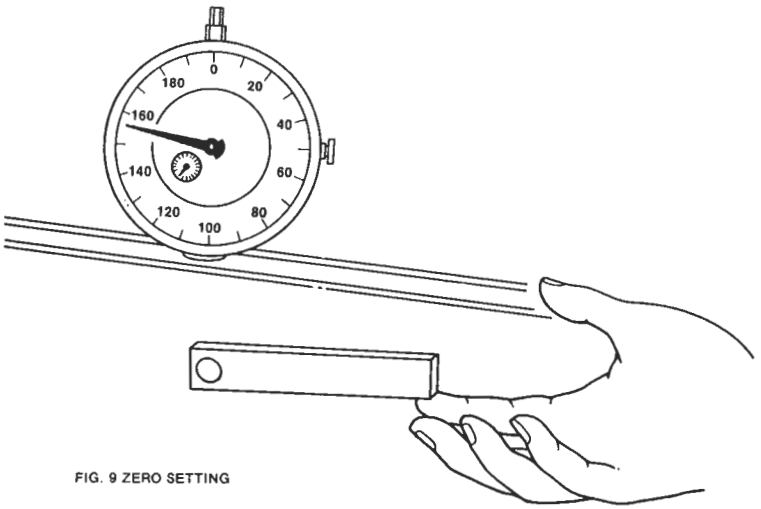


FIG. 9 ZERO SETTING

INDICATOR READING AND OPERATION INSTRUCTIONS

INDICATOR READING

A torque reading is obtained by adding the reading of the main pointer to the reading of the revolution pointer. Dual range testers have color coded scales and the total reading of each scale is obtained as explained below.

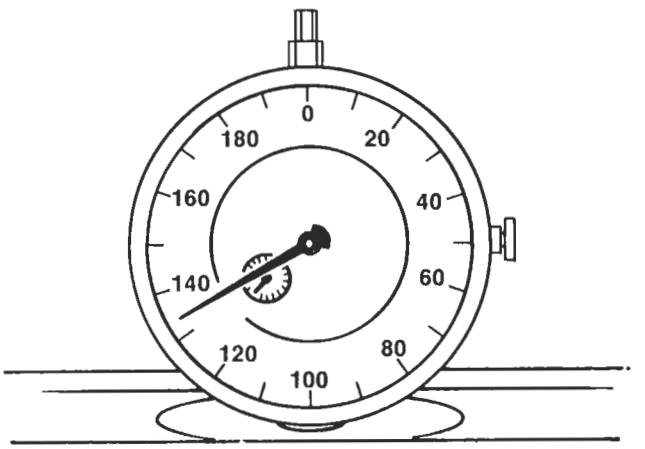


Fig. 10 Single Scale Indicator
Indicator Reading

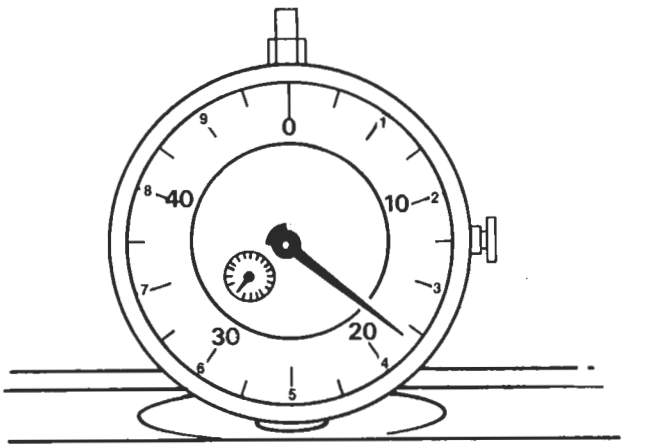


Fig. 11 Dual Scale
Indicator Reading
a) Lower Range, Outer Scale:
b) Higher Range, Inner Scale:

OPERATION

OPERATIONAL SEQUENCE. The following operational sequence should be followed for all CDI testers before calibration or calibration check of any static torque applying devices.

a. Set the pointer to zero as explained on page 9 or 10 under fine zero adjustment.
b. Make sure that the applied torque will not exceed the range of the tester. **Particular caution should be exercised with dual range testers to prevent accidental overload.**
c. Select appropriate adapter and put it on the drive shaft.

TORQUE WRENCH CALIBRATION CHECK

a. MICROMETER ADJUSTABLE (AND PRESET) TORQUE WRENCHES.

1. Select an appropriate adapter matching the square drive of the tool to be calibrated and install it on the square drive of the torque tester

2. Attach the square drive of the torque wrench to the drive adapter on the tester. Normally the wrench is horizontal.

3. Apply force to the handgrip with a smooth action while observing the pointers on the tester torque indicator.

4. As the indicator nears the torque wrench setting, decrease force to slowly approach desired setting. This will minimize the bouncing of the main pointer caused by the "click" or release of the wrench and will improve the accuracy of the reading. Reset the indicator shaft after each reading.

5. If the torque wrench is not in calibration, it should be recalibrated using instructions pertaining to the wrench, and rechecked for accuracy as explained above.

b. DIAL AND BEAM TYPE TORQUE WRENCHES.

1. Select an appropriate adapter matching the square drive of the tool to be calibrated and install it on the square drive of the torque tester.

2. Attach the square drive of the torque wrench to the drive adapter on the tester. Normally the wrench is horizontal.

3. Apply force to the handgrip with a smooth action, while observing the torque wrench scale.

4. Remove force immediately when the wrench shows the desired torque
Repeat step (4) at different values, making thre readings for each test point. The average of the three readings may be taken as the true reading.

5. Reset the indicator shaft after each reading.

6. If a dial type torque wrench is not in calibration it should be recalibrated using instructions pertaining to the wrench, and rechecked for accuracy as explained above.

c. T-HANDLES AND TORQUE SCREWDRIVERS.

1. Select an appropriate adapter matching the square drive of the tool to be calibrated and install it on the square drive of the torque tester.

2. Attach the t-handle or torque screwdriver to the tester and hold the tool with just enough force to balance the weight.

3. Apply torque slowly and uniformly while observing the pointers of the torque indicator on the torque tester.

4. As the indicator nears the torque tool setting, decrease force to slowly approach desired setting. This will minimize any bouncing of the main pointer caused by the release of the tool and will improve the accuracy of reading. Reset the indicator shaft after each reading.

5. If the torque wrench is not in calibration, it should be recalibrated using instructions pertaining to the wrench, and rechecked for accuracy as explained above.

MAINTENANCE INSTRUCTIONS

OPERATIONAL CHECKOUT - CALIBRATION

CALIBRATION INTERVALS. It is recommended that the tester be checked for calibration and recalibrated if necessary at the following intervals:

a. If used under 5 hours per week - Every 6 months.

b. If used 5-25 hours per week - Every 3 months.

c. If used over 25 hours per week - Every month.

d. Calibration checks should also be performed if the tester is dropped, otherwise abused, or if an out-of-calibration condition is suspected.

CALIBRATION EQUIPMENT. The Calibration equipment used to calibrate torque testers should be only primary torque standards. A primary torque standard may consist of:

a. Calibration arm with a radius segment and cable (page 14 Fig. 14)

b. Pulley with cable. (page 14 Fig. 12 or 13)

c. Weights, certified to a minimum Class C accuracy, traceable to N.B.S.

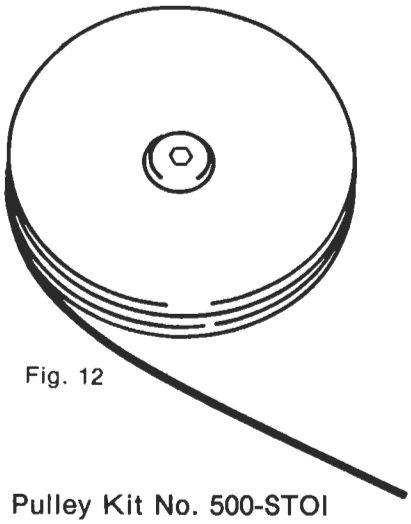


Fig. 12

Fig. 12 Pulley Kit No. 500-STOI
Effective Radius 2.5''
For Testers: 500-OI, 50-PI & 800-OI
and 100/500-OI

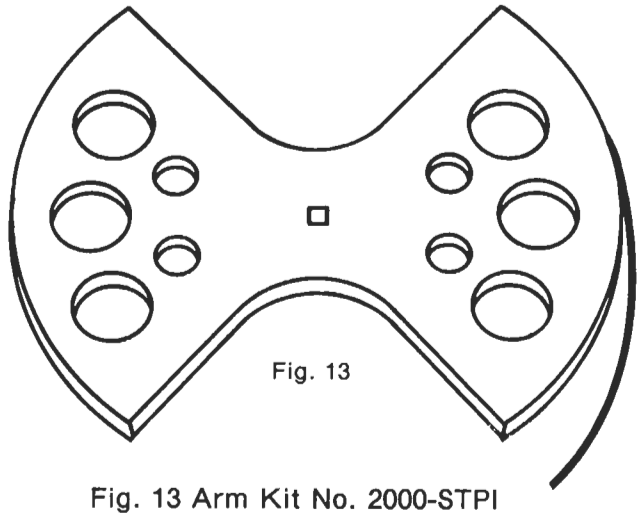


Fig. 13

Fig. 13 Arm Kit No. 2000-STPI
Effective Radius 10''
For Testers: 250-PI, 2000-PI
200-PF & 2400-PI, 250/2000-PI
and 250/2000-CMKP.

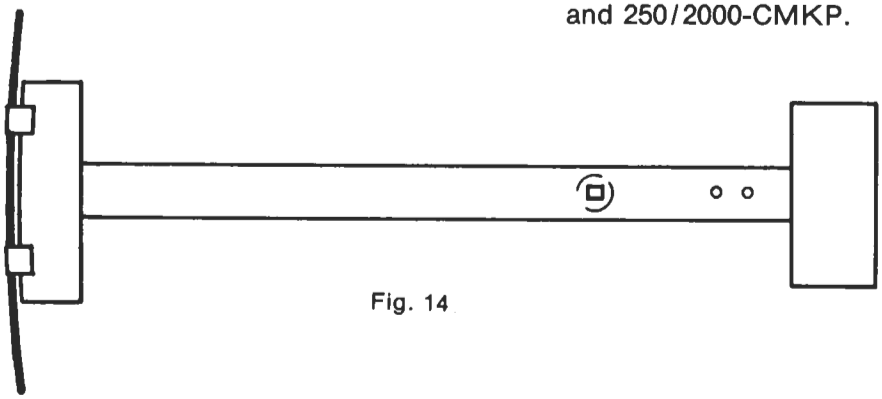


Fig. 14

Fig. 14 Arm Kit No. 1000-STPF (one arm) 63'' Long (40'' Radius) for Testers: 1000-PF and 500-PF & 6000-PI.
Arm Kit No. 2000-STPF (two arms) 63'' Long Each Arm (40'' Radius) for Testers: 2000-PF.
Arm Kit No. 3000-STPF 142'' Long (80'' Radius) for Testers: 3000-PF.
Arm Kits for Metric Testers 150, 300 & 500 MKP UPON REQUEST.

CALIBRATION CHECK PROCEDURE

a. Using Pulley Kit 500-STOI

1. Attach pulley to the drive shaft of oz-in tester, (if dual range tester, attach pulley on the lower shaft first).

2. Hang a weight of 2 ounces on to a nylon cord and rotate the bezel of the torque indicator to align the 5 oz-in graduation on the scale with the main pointer.

3. Using the tip of a finger, lift the weight slowly and depress the indicator shaft until it stops.

4. Release the weight slowly until it is fully borne by the tester. Realign the bezel to zero if necessary.

5. Repeat steps (2) through (4) a few times and average the reading to eliminate any random and/or human errors.

6. Proceed to the next check point(s) in the same manner as above using Tables, page 16, 17 & 18 as appropriate.

7. If the tester's average readings are not within tolerance limits, recalibrate as detailed on page 19 (RECALIBRATION) and run another calibration check as explained above.

8. If calibration is being performed on a dual range tester, attach the pulley to the upper shaft, and repeat the above procedure.

b. Using Calibration Arm Kit

1. Adjust the bezel so that the tester reads zero.

2. Attach the calibration arm and weight holder (if used) to the drive shaft of the tester. If a dual range tester is being checked, attach the arm on the lower shaft first.

3. If necessary, adjust the balance of the arm and weight holder so that the main pointer rests somewhere between the 12 and 3 o'clock positions. (A slight positive torque)

4. Lift the calibration arm with a fingertip slightly and depress the reset shaft until it stops. Release slowly and rotate the indicator bezel clockwise to align zero with the pointer. Repeat this step a few times until the zero is set.

5. Proceed to the first check point and hang the appropriate weight (Tables page 16 thru 18). Allow the weight to settle. Lift the arm with a fingertip slightly and depress the reset shaft. Release the arm slowly until the weight is borne by the tester. Repeat the above procedure few times and average the readings to eliminate human error.

6. Proceed to other test points in the same manner as above using table as appropriate.

7. If the tester's average readings are not within tolerance limits correct the testers calibration as explained on page 19 (RECALIBRATION) and then run a complete calibration check.

8. Attach the calibration arm to the upper shaft if a dual range tester is being checked, and repeat the above procedure.

9. When checking the tester model no. 2000-PF use two calibration arms, kit no. 2000ST-PF, (page 14), one on each end of the drive shaft. Use arm 3000-STPF for a 3000-PF

CALIBRATION TEST POINTS MODEL 100/500 OI

Calibration Test Point in. oz.	Reading 1% Min.	or 1 Grad Max.	Weight to be Used	Effective Radius
100 OI DRIVE				
10	9.9	10.1	4 oz.	2.5 in. (Kit No. 500-STOI)
20	19.8	20.2	8 oz.	
30	29.7	30.3	12 oz.	
40	39.6	90.4	16 oz.	
50	49.5	50.5	20 oz.	
60	59.4	60.6	24 oz.	
70	69.3	70.7	28 oz.	
80	79.2	80.8	32 oz.	
90	89.1	90.9	36 oz.	
100	99.0	101.0	40 oz.	
500 OI DRIVE				
50	49.5	50.5	20.oz.	
100	99.0	101.0	40 oz.	
150	148.5	151.5	60 oz.	
200	198.0	202.0	80 oz.	
250	247.5	252.5	100 oz.	
300	297.0	303.0	120 oz.	
350	346.5	353.5	140 oz.	
400	396.0	404.0	160 oz.	
450	445.5	454.5	180 oz.	
500	495.0	505.0	200 oz.	

CALIBRATION TEST POINTS MODEL 50PI/800 OI

Calibration Test Point in. oz.	Reading 1% Min.	or 1 Grad Max.	Weight to be Used	Effective Radius
50 PI DRIVE				
5	4.95	5.05	32 oz.	2.5 in. (Kit No. 500-STOI)
10	9.90	10.10	64 oz.	
15	14.85	15.15	96 oz.	
20	19.80	20.20	128 oz.	
25	24.75	25.25	160 oz.	
30	29.70	30.30	192 oz.	
35	34.65	34.35	224 oz.	
40	39.60	40.40	256 oz.	
45	44.55	45.45	288 oz.	
50	49.50	50.50	320 oz.	
800 OI DRIVE				
80	79.2	80.8	32 oz.	2.5 in. (Kit No. 500-STOI)
160	158.4	161.6	64 oz.	
240	237.6	242.4	96 oz.	
320	316.8	323.2	128 oz.	
400	396.0	404.0	160 oz.	
480	475.2	484.8	192 oz.	
560	554.4	565.6	224 oz.	
640	633.6	646.4	256 oz.	
720	712.8	727.2	288 oz.	
800	792.0	808.0	320 oz.	

CALIBRATION TEST POINTS MODEL 500-OI

Calibration Test Point in. oz.	Reading 1% Min.	or	1 Grad. Max.	Weight to be Used	Effective Radius
50	49.5		50.5	20 oz.	2.5 in.
100	99.0		101.0	40 oz.	
150	148.5		151.5	60 oz.	(Kit No.
200	198.0		202.0	80 oz.	500 STOI)
250	247.5		252.5	100 oz.	
300	297.0		303.0	120 oz.	
350	346.5		353.5	140 oz.	
400	396.0		404.0	160 oz.	
450	445.5		454.5	180 oz.	
500	495.0		505.0	200 oz.	

CALIBRATION TEST POINTS MODEL 250-PI

Calibration Test Point in. lb.	Reading 1% Min.	or	1 Grad. Max.	Weight to be Used	Effective Radius
25	24.75		25.25	2.5 lbs.	10 in.
50	49.50		50.50	5.0 lbs.	
75	74.25		75.75	7.5 lbs.	(Kit No.
100	99.00		101.00	10.0 lbs.	2000 STPI)
125	123.75		126.25	12.5 lbs.	
150	148.50		151.50	15.0 lbs.	
175	173.25		176.75	17.5 lbs.	
200	198.00		202.00	20.0 lbs.	
225	222.75		227.25	22.5 lbs.	
250	247.50		252.50	25.0 lbs.	

CALIBRATION TEST POINTS MODEL 2000-PI

Calibration Test Point in. lb.	Reading 1% Min.	or	1 Grad. Max.	Weight to be Used	Effective Radius
200	198		202	20 lbs.	10 in.
400	396		404	40 lbs.	
600	594		606	60 lbs.	(Kit No.
800	792		808	80 lbs.	2000 STPI)
1000	990		1010	100 lbs.	
1200	1188		1212	120 lbs.	
1400	1386		1414	140 lbs.	
1600	1584		1616	160 lbs.	
1800	1782		1818	180 lbs.	
2000	1980		2020	200 lbs.	

CALIBRATION TEST POINTS MODEL 1000-PF

Calibration Test Point ft. lb.	Reading 1% Min.	or 1 Grad. Max.	Weight to be Used	Effective Radius
100	99	101	30 lbs.	40 in.
200	198	202	60 lbs.	
300	297	303	90 lbs.	(Kit No.
400	396	404	120 lbs.	1000STPF)
500	495	505	150 lbs.	
600	594	606	180 lbs.	
700	693	707	210 lbs.	
800	792	808	240 lbs.	
900	891	909	270 lbs.	
1000	990	1010	300 lbs.	

CALIBRATION TEST POINTS MODEL 2000-PF

Calibration Test Point ft. lb.	Reading 1% Min.	or 1 Grad. Max.	Weight to be used	Effective Radius
200	198	202	60 lbs.	40 in.
400	396	404	120 lbs.	
600	594	606	180 lbs.	
800	792	808	240 lbs.	Two Arms
1000	990	1010	300 lbs.	(Kit No.
1200	1188	1212	360 lbs.	2000STPF)
1400	1386	1414	420 lbs.	
1600	1584	1616	480 lbs.	
1800	1782	1818	540 lbs.	
2000	1980	2020	600 lbs.	

CALIBRATION TEST POINTS MODEL 3000-PF

Calibration Test Point ft. lb.	Reading 1% Min.	or 1 Grad. Max.	Weight to be used	Effective Radius
300	297	303	45 lbs.	80 in.
600	594	606	90 lbs.	
900	891	909	135 lbs.	(Kit No.
1200	1188	1212	180 lbs.	3000 STPF)
1500	1485	1515	225 lbs.	
1800	1782	1818	270 lbs.	
2100	2079	2121	315 lbs.	
2400	2376	2424	360 lbs	
2700	2673	2727	405 lbs	
3000	2970	3030	450 lbs	

SHORTCUT CALIBRATION CHECK

Occasionally a tester may be used to calibrate one or more torque wrenches which have ranges which are considerably less than the range of tester. Here a complete calibration check is not necessary. The tester should be checked for calibration in accordance with the time intervals given on page 13, but only over the range of use.

If a tester is used to check a torque wrench with torque setting(s) within the range of the tester, a quick calibration check of the tester may be completed as follows:

a. Mount a pulley or calibration arm on the drive shaft of the tester and hang a weight which will exert a torque on the tester less than the torque at which the wrench will be used.

b. Lift the calibration arm with the weight and slightly depress indicator shaft and release the weight slowly until it is borne by the tester.

c. Rotate the indicator bezel to zero the main pointer.

d. Repeat steps b and c until zero is set.

e. Proceed to the first and consecutive test points, as desired by adding appropriate weight and following the calibration check procedure on page 14. Take the average reading to eliminate human and/or random errors.

f. The change of torque equals the added weight (pounds or ounces) multiplied by the effective radius of the pulley or calibration arm (inches or feet).

g. Total torque equals total weight times effective radius.

RECALIBRATION

The testers should be recalibrated if average reading at any of test points is out of tolerances. (See Tables: 16 and 17)

PROCEDURE:

a. Single range tester
   1. Remove bottom cover.

   2. Loosen adjustment screws.

   3. Move the support assembly away from the drive shaft to increase the reading of the tester or toward the drive shaft to lower the reading. A small adjustment is usually sufficient. (Fig. 15 page 20)

   4. Tighten the **Bracket Holding** screws and run a calibration check as explained on pages 13 and 14.

5. Repeat steps 2 to 4 above as necessary, and reinstall the bottom cover.

b. Dual Range Testers

1. Adjust the calibration of the higher range first. (Lower shaft bean). Use the calibration procedure given on page 19.

2. Loosen the adjustment screw and move the adjustment block away from the shaft to increase the torque or toward the shaft to lower the torque. A small adjustment is usually sufficient. (Fig. 16)

3. Tighten the adjustment screw and run a calibration check of both ranges.

4. Repeat steps 2 and 3 if necessary and replace the bottom cover.

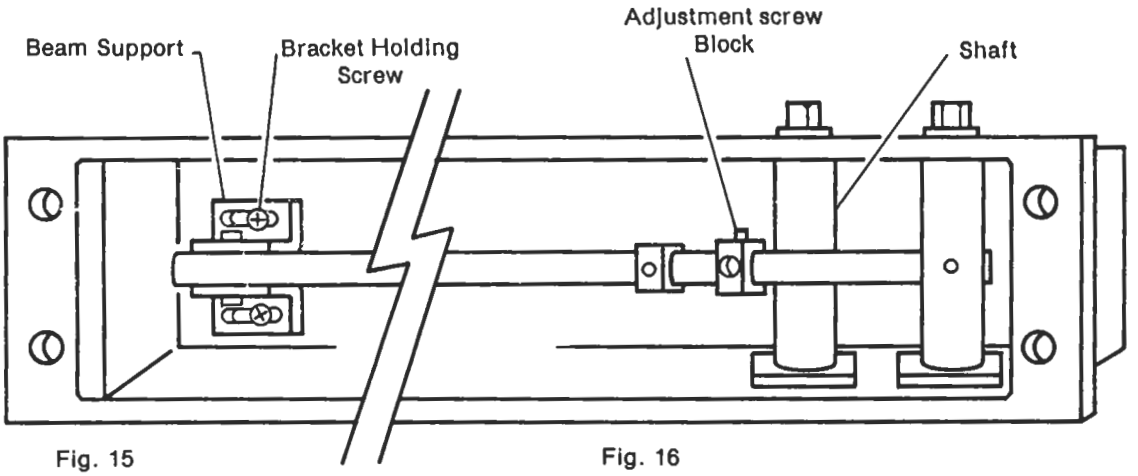


Fig. 15

Fig. 16

Fig. 15 Calibration Adjustment of Single Range Tester or Lower Shaft Dual Range Testers.

Fig. 16 Calibration Adjustment of Upper Shaft of Dual Range Torque Testers.

LUBRICATION

Lubrication is not necessary for the accurate operation of CDI torque testers.

TROUBLESHOOTING

Occasionally an operator may encounter some troubles with a tester such as: non-uniform reading, movement of the zero reading when torque is applied at one end of the shaft and then applied at the other shaft end, etc. TROUBLESHOOTING, page 21, is provided to guide the operator and to help to identify a problem, its probable cause and the way to correct it.

REPAIR AND DISASSEMBLY

Disassembly is not recommended, except as specified under troubleshooting above. If additional repairs are necessary, study the exploded view of the appropriate tester assembly.

TROUBLE	POSSIBLE CAUSE	REMEDY
Readings change radically	a. Main pointer loose	Pull reset shaft all the way out a few times. If the main pointer stops at the same place check for causes (b) or (c). If the main pointer stops at different places, remove the bezel and tighten the pointer.
	b. Contact Point (See Fig. 17 on page 22)	Remove handle and loosen the zero adjustment nut and remove the indicator assembly. Tighten the contact point. Reassemble.
	c. Support Bearing galled or cracked	Remove bottom cover and replace support bearing, in the bearing bracket assembly. Assemble cover.
Indicator pointer stops short.	Overload stop out of adjustment.	a) Single range tester - adjust set screw. b) Dual range tester - remove bottom cover and adjust the screw. When adjusting the overload stop, load the tester to about 10% above the total range, then adjust the stop.
Pointer does not retain the torque.	Memory spring loose. (See Fig. 17, page 22).	Remove indicator and the rear plate on the indicator. Slightly bend the memory spring away from the plate. Be careful not to break the spring.
Reset shaft is hard to push counter-clockwise from zero when doing fine zero adjustment.	Reverse load stop screw lacks clearance.	Remove bottom cover and loosen set screw under the beam at the rear end of the tester. There should be a clearance of .01 to .02 inches between the screw and the beam. (Fig.18 page 24)

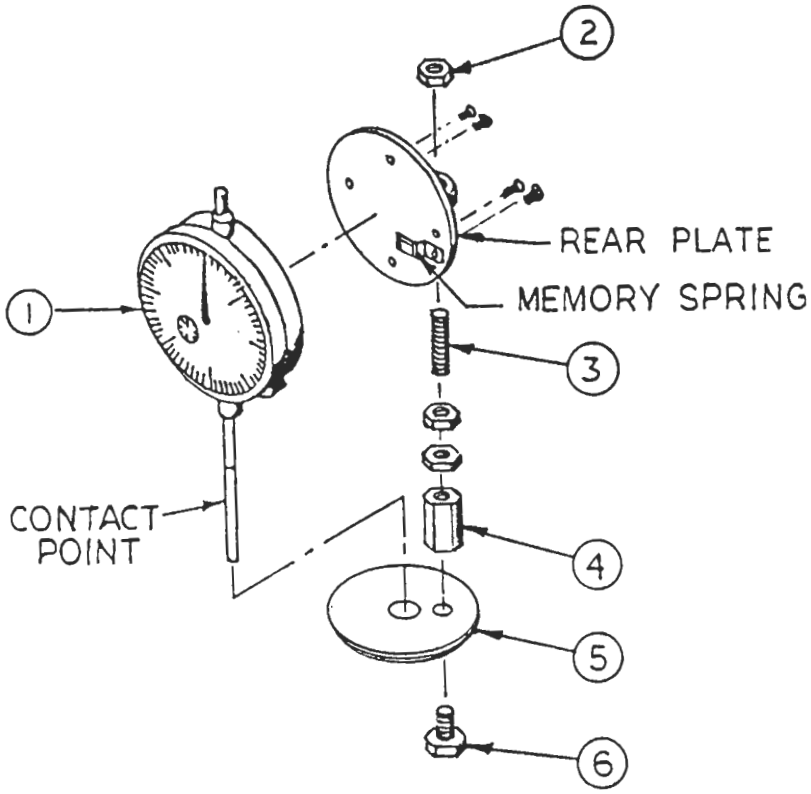


Fig. 17

Index No.	Part Number	Description	Units per Assembly
1	See index no. 33, on p. 24, index no. 28, on p. 27, and index no. 43, on p. 30.	Indicator Assembly	1
2	10-138-2	Nut, Hex.	3
3	10-101-18	Setscrew, Socket	1
4	65-16	Clamp	1
5	235-7	Base	1
6	10-125-2	Hexagon Head Machine Screw	1

Figure 17. Indicator Assembly and Mounting.

FIG. 18; PARTS LIST FOR TESTER MODEL NUMBERS 500-OI, 50-PI/800-OI, 250-PI, 2000-PI, 200-PF/2400-PI, 500-PF/6000-PI.

CODE IDENTIFICATION:

A	500-OI	E	2000-PI
B	50-PI/800-OI	F	200-PF/2400-PI
C	250-PI	G	500-PF/6000-PI

Index No.	Part Number	Description	Units per Assy.	Use on Code
		SEE EXPLODED VIEW DRAWING, PAGE 25		
1	260-48	Housing Assembly	1	A,B
1	65-84	Housing Assembly	1	C,E,F
1	65-85	Housing Assembly	1	G
2	260-9-1	Shaft	1	A
2	260-9-2	Shaft	1	B
2	65-15-2	Shaft	1	C
2	65-15-3	Shaft	1	D
2	65-15-1	Shaft	1	E
2	65-15-4	Shaft	1	F
2	65-73	Shaft	1	G
3	10-101-29	Socket Setscrew, Shaft	1	A,B
3	10-101-19	Socket Setscrew, Shaft	1	C,E,F,G
4-A	65-66	Spacer, Shaft	2	C,E,F
4	10-146-1	Shim, Shaft	A/R	A,B
4	10-146-2	Shim, Shaft	A/R	A,B
4	10-146-3	Shim, Shaft	A/R	C,E,F
4	10-146-4	Shim, Shaft	A/R	C,E,F
4	10-146-5	Shim, Shaft	A/R	G
4	10-146-8	Shim, Shaft	A/R	G
5	260-34-1	Ball Bearing, Shaft	2	A,B
5	10-133-1	Ball Bearing, Shaft	2	C,E,F
5	10-133-18	Ball Bearing, Shaft	2	G
6	260-7	Bearing Retainer, Shaft	2	A,B
6	65-6	Bearing Retainer, Shaft	2	C,E,F
6	65-74	Bearing Retainer, Shaft	2	G
7	10-126-1	Philips Head Machine Screw, Bearing Retainer	6	A,B,C,E,F,G
8	260-12	Beam	1	A
8	260-41	Beam	1	B
8	70-1	Beam	1	C
8	250-1	Beam	1	
8	65-4-1	Beam	1	E
8	65-4-3	Beam	1	F
8	65-71	Beam	1	G
9	10-101-29	Sockt Setscrw, Indicator Block	1	A,B
9	10-101-19	Sockt Setscrw, Indicator Block	1	C
10	260-18-1	Indicator Block	1	A
10	260-18-2	Indicator Block	1	B
10	70-11	Indicator Block	1	C
11	10-131-1	Spring, Beam Support	1	C,E,F,G
12	10-132	Rivet, Beam ¼Sq.	1	C,E,F,G
13	10-125-6	Hex Hd Screw, Overload Stop	1	A,B

Continued on p. 24

Fig. 18 Contin.

Index No.	Part Number	Description	Units per Assy.	Use on Code
		SEE EXPLODED VIEW DRAWING PAGE 25		
14	260-46	Bearing Bracket Assembly	1	A,B
14	65-86	Bearing Bracket Assembly	1	C,E,F
14	65-87	Bearing Bracket Assembly	1	G
15	10-149-2	Washer Flat, Bearing Bracket	2	A,B,C,E,F,G
16	10-110-4	Rd Hd Screw, Bearing Bracket	2	A,B,C,E,F
16	10-125-9	Hex Hd Screw, Bearing Bracket	2	G
17	10-138-3	Hexagon Nut, Beam Stop	1	A,B,C,E,F,G
18	10-101-32	Socket Setscrew, Beam Stop	1	A,B,C,E,F,G
19	65-10	Beam Stop	1	A,B,C,E,F,G
20	10-130-1	Rd Hd Screw, Bottom Cover	2	A,B,C,E,F,G
21	65-35	Bottom Cover	1	A,B,C,E,F,G
22	260-23	Bracket and Screws Calibration Arm Assembly	1	A,B
23	260-22	Calibration Arm Assembly	1	A,B
24	65-34	Adapter Retainer	1	A,B,C,E,F,G
25	10-138-2	Hexagon Nut, Bearing Bracket	2	A,B,C,E,F,G
26	65-47-1	Clip, Adapter Retainer	1	A,B
26	65-47-2	Clip, Adapter Retainer	1	A,B
26	65-47-3	Clip, Adapter Retainer	2	C,E,F
26	65-47-4	Clip, Adapter Retainer	2	G
27	10-128-1	Flt Hd Sckt Scrw, Beam Stop	1	A,B,C,E,F,G
28	65-52	Handle	1	A,B,C,E,F,G
29	10-125-3	Hex Head Machine Scrw, Handle	2	A,B,C,E,F,G
30	10-145	Thumb Screw, Indicator	3	A,B,C,E,F,G
31	10-142	Drive Screw, Indicator	3	A,B,C,E,F,G
32	10-144	Clamp, Indicator	3	A,B,C,E,F,G
33	65-83-3	Indicator Assembly	1	A
33	65-83-4	Indicator Assembly	1	B
33	65-83-5	Indicator Assembly	1	C
33	65-83-7	Indicator Assembly	1	E
33	65-83-9	Indicator Assembly	1	F
33	65-83-10	Indicator Assembly	1	G
34	109-101-19	Sckt Stscrw Overload Stop Lock	1	A,B,C,E,F,G
35	10-101-1	Sckt Stscrw Overload Stop	1	C,E,F,G
36	65-111	Base Assembly, Indicator	1	A,B,C,E,F,G

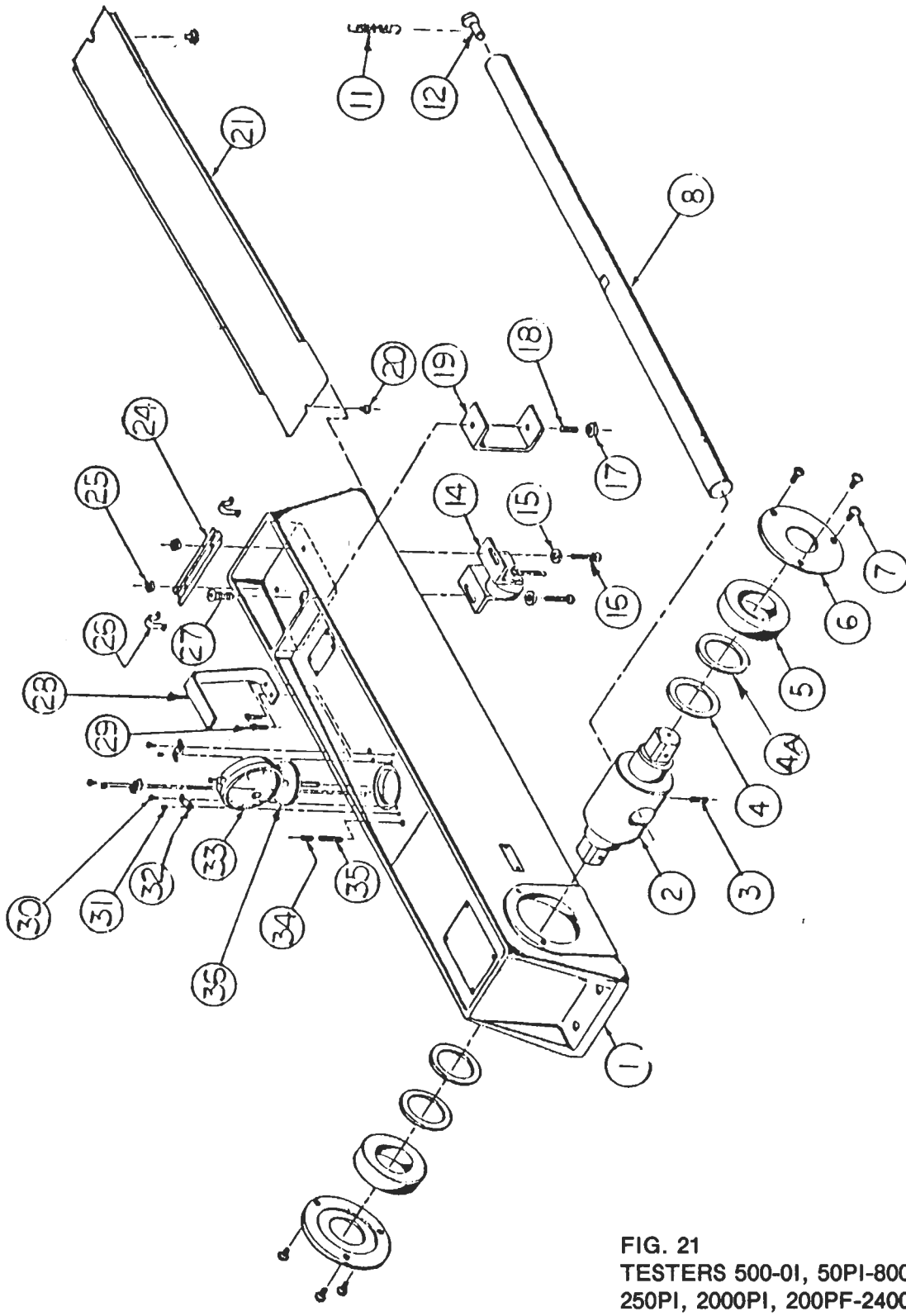


FIG. 21
TESTERS 500-0I, 50PI-800-OI
250PI, 2000PI, 200PF-2400PI
500PF-6000PI

FIG. 19: PARTS LIST FOR TESTER MODEL NUMBERS 1000-PF, 150-MKP, 2000-PF, 300-MKP, 3000-PF, 500-MKP.

CODE IDENTIFICATION: **A 1000-PF** **D 300-MKP** **B 150-MKP** **E 3000-PF** **C 2000-PF** **F 500-MKP**

SEE EXPLODED VIEW DRAWING, PAGE 28

Item No.	Part Number	Description	Units per Assy.	Use on Code
1	75-41	Housing Assembly	1	A,B,C.D
1	340-24	Housing Assembly	1	E,F
2	75-48-1	Shaft	1	A,B
2	75-48-2	Shaft	1	C,D
2	340-9-1	Shaft	1	E,F
3	10-101-6	Socket Setscrew Shaft	1	A,B,C,D,E,F
4	10-101-28	Socket Setscrew, Lock, Shaft	1	A,B,C,D,E,F
5	10-146-6	Shim, Shaft	A/R	A,B,C,D
5	10-146-7	Shim, Shaft	A/R	A,B,C,D
5	10-146-9	Shim, Shaft	A/R	E,F
5	10-146-10	Shim, Shaft	A/R	E,F
6	10-133-3	Ball Bearing, Shaft	2	A,B,C,D
6	10-133-12	Ball Bearing, Shaft	2	E,F
7	75-12	Bearing Retainer, Shaft	2	A,B,C,D
7	340-6	Bearing Retainer, Shaft	2	E,F
8	10-126-3	Pan Hd Scrw Bearing Retainer	8	A,B,C,D,E,F
9	75-11-1	Beam	1	A,B
9	75-11-2	Beam	1	C,D
9	340-20-1	Beam - with 3000 PF	1	E,F
9	340-20-3	Beam - with 500 MKP	1	F
10	75-40	Bearing Bracket Assembly	1	A,B,C,D
10	340-23	Bearing Bracket Assembly	1	E,F
11	10-149-2	Washer, Flat, Bearing Bracket	4	A,B,C,D,E,F
12	10-110-3	Rd Hd Screw, Bearing Bracket	4	A,B,C,D,E,F
13	10-138-4	Hexagon Nut, Beam Stop	1	A,B,C,D,E,F
14	10-101-6	Socket Setscrew, Beam Stop	1	A,B,C,D,E,F
15	10-131-2	Spring, Beam Support	1	A,B,C,D
15	10-131-3	Spring, Beam Support	1	E,F
16	75-14	Beam Stop	1	A,B,C,D
16	340-5	Beam Stop	1	E,F
17	10-149-1	Washer, Flat, Beam Stop	1	C,D
18	10-131-1	Round Hd Self Tap Scrw. Bot Cov	2	A,B,C,D,E,F
19	140-9	Bottom Cover	1	A,B,C,D
19	340-2	Bottom Cover	1	E,F
20	10-138-2	Hexagon Nut, Bearing Bracket	4	A,B,C,D,E,F
21	75-42	Metal Box, Sockets	1	A,B,C,D
21	340-22	Metal Box, Sockets	1	E,F
22	10-128-2	Flat Hd Sckt Cap Scrw, Beam Stp	1	A,B,C,D,E,F

Continued on Page 27.

FIG. 19 Cont.

No.	Number	Description	Units per Assy.	Use on Code
23	10-125-3	Hexagon Hd Machine Scrw Hndle	2	A,B,C,D,E,F
24	65-52	Handle	1	A,B,C,D,E,F
25	10-145	Thumb Screw, Clamp	3	A,B,C,D,E,F
26	10-142	Drive Screw, Clamp	3	A,B,C,D,E,F
27	10-144	Clamp Indicator	3	A,B,C,D,E,F
28	65-83-11	Indicator Assembly	1	A
28	65-83-15	Indicator Assembly	1	B
28	65-83-12	Indicator Assembly	1	C
28	65-83-16	Indicator Assembly	1	D
28	65-83-13	Indicator Assembly	1	E
28	65-83-17	Indicator Assembly	1	F
29	10-101-23	Sckt Stscrw, Lock, Overload Stop	1	A,B,C,D,E,F
30	10-101-30	Socket Setscrew, Overload Stop	1	A,B,C,D,E,F
31	65-111	Base Assembly, Indicator	1	A,B,C,D,E,F

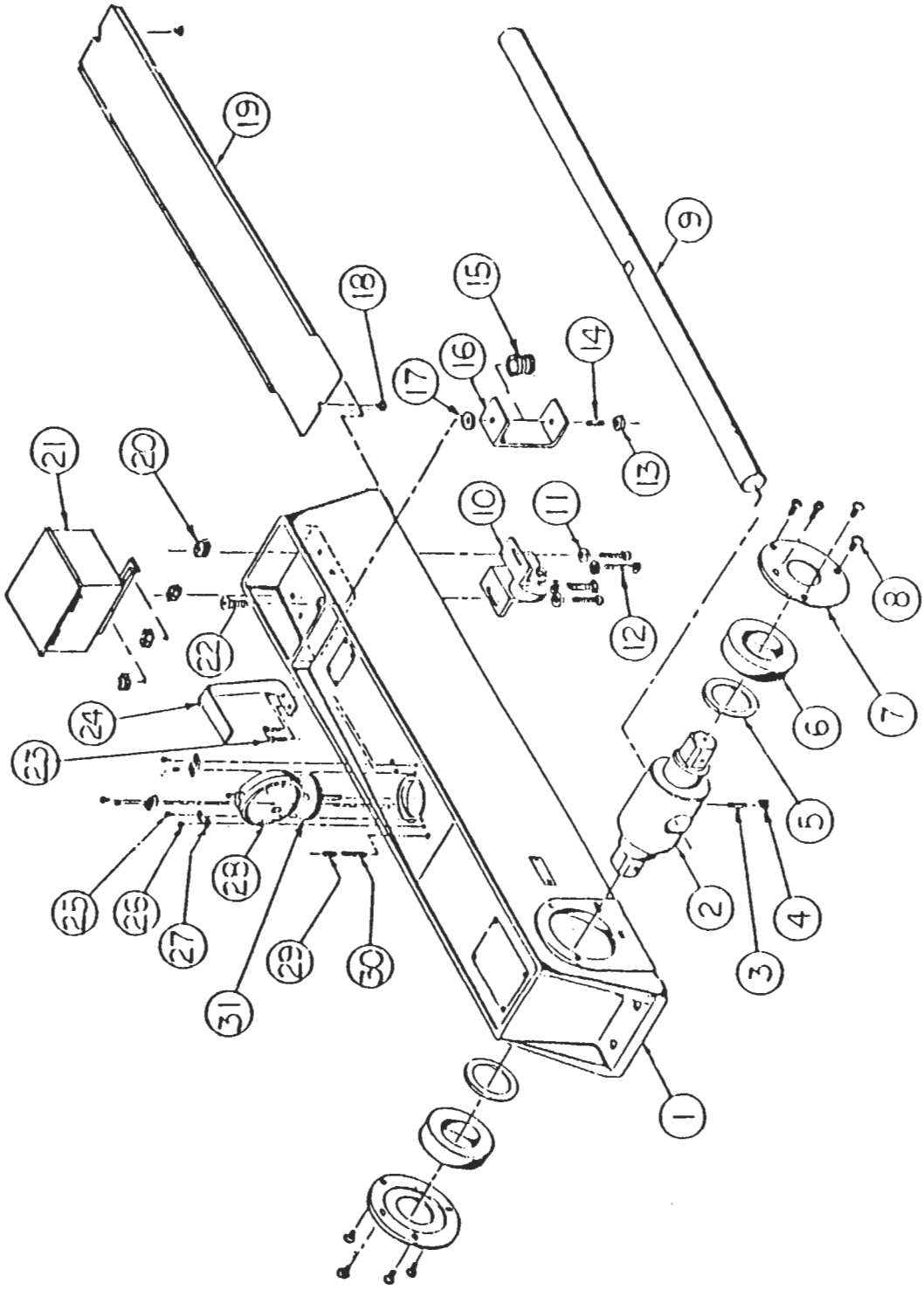


FIG. 22
TESTERS 1000PF, 150MKG
2000PF, 300MKG, 3000PF
500MKG

FIG. 20: PARTS LIST FOR TESTER MODEL NUMBERS 100/500-OI, 250/2000-PI, 250/2000CMKP

CODE IDENTIFICATION:

B 100/500-OI C 250/2000-PI D 250/2000-CMKP

SEE EXPLODED VIEW DRAWING, PAGE 31

Index No.	Part Number	Description	Units per Assy.	Use on Code
1	260-45	Housing Assembly	1	B
1	235-22	Housing Assembly	1	C,D
2	260-11	Shaft, Lower, 100-OI	1	
2	260-9-1	Shaft, Lower,	1	B
2	65-15-1	Shaft, Lower	1	C
2	65-15-5	Shaft, Lower	1	D
3	10-101-29	Socket Setscrew, Shaft, Lower	1	B
3	10-101-19	Socket Setscrew, Shaft, Lower	1	C,D
4	65-66	Spacer, Lower Shaft	2	C,D
4	10-146-1	Shim, Shaft, Lower & Upper	A/R	B
4	10-146-2	Shim, Shaft, Lower & Upper	A/R	B
4	10-146-3	Shim, Shaft, Lower & Upper	A/R	C,D
4	10-146-4	Shim, Shaft, Lower & Upper	A/R	C,D
5	260-34-1	Ball Bearing Shft, Lower & Upper	4	B
5	10-133-1	Ball Bearing Shft, Lower & Upper	4	C,D
6	260-24	Bearing Retainer, Shaft, Lower	2	
6	260-7	Bearing Retainer, Shaft, Upper	2	
6	260-7	Bearing Retainer, Shaft, Upper & Lower	4	B
6	65-6	Bearing Retainer, Shaft Upper & Lower	4	C,D
7	10-126-1	Phillips Head Machine Screw, Bearing Retainer	12	B,C,D
8	260-12	Beam	1	B
8	65-4-1	Beam	1	C
8	65-4-2	Beam	1	D
9	10-132	Revit, Beam	1	C,D
10	10-101-29	Socket Setscrew, Holder Cable Assembly	1	B
10	10-101-19	Socket Setscrew, Holder Cable Assembly	1	C,D
11	10-101-29	Socket Setscrew, Indicator Block	1	B
12	260-18-1	Indicator Block	1	B
13	260-47	Holder Cable Assembly	1	B
13	235-23-1	Holder Cable Assembly	1	C
13	235-23-2	Holder Cable Assembly	1	D
14	10-131-1	Spring, Beam Support	1	C,D
15	260-10	Shaft, Upper	1	B
15	235-6	Shaft, Upper	1	C,D
16	235-15	Bracket, Cable Shaft, Upper	1	C,D
17	10-126-5	Pan Head Machine Screw, Bracket, Cable	2	C,D
18	10-101-29	Socket Setscrew, Bracket Cable	1	C,D
19	10-125-6	Hexagon Head Machine Screw, Overload Stop	1	B,C,D
20	10-138-2	Hexagon Nut, Overload Stop	1	B,C,D
21	65-16	Clamp, Overload Stop	1	B,C,D
22	10-138-2	Hexagon Nut, Cable Bracket Stop	1	B,C,D

235-9 CMB/e 024

No.	Number	Description	Units per Assy.	Use on Code
23	260-46	Bearing Bracket Assembly	1	B
23	65-86	Bearing Bracket Assembly	1	C,D
24	10-149-2	Washer, Flat, Bearing Bracket	2	B,C,D
25	10-110-4	Round Head Machine Screw, Bearing Bracket	2	B,C,D
26	10-138-3	Hexagon Nut, Beam Stop	1	B,C,D
27	10-101-32	Socket Setscrew, Beam Stop	1	B,C,D
28	65-10	Beam Stop	2	B,C,D
29	10-130-1	Round Head Self Tapping Screw, Bottom Cover	2	B,C,D
30	65-35	Bottom Cover	1	B,C,D
31	260-23	Bracket, With Screws, Calibration Arm Assembly	1	B
32	260-22	Calibration Arm Assembly	1	B
33	65-34	Adapter, Retainer	1	B,C,D
34	10-138-2	Hexagon Nut, Bearing Bracket	2	B,C,D
35	65-47-1	Clip, Adapter, Retainer	1	B
35	65-47-2	Clip, Adapter, Retainer	1	B
35	65-47-3	Clip, Adapter, Retainer	3	C,D
36	10-128-1	Flat Head Socket Cap Screw, Beam Stop	1	B,C,D
37	10-125-3	Hexagon Hd Machine Scrw, Hndle	1	B,C,D
38	10-125-2	Hexagon Hd Machine Scrw, Hndle	1	B,C,D
39	65-52	Handle	1	B,C,D
40	10-145	Thumb Screw, Clamp	3	B,C,D
41	10-142	Drive Screw, Clamp	3	B,C,D
42	10-144	Clamp Indicator	3	B,C,D
43	65-83-1	Indicator Assembly 100OI	1	
43	65-83-2	Indicator Assembly,	1	B
43	65-83-6	Indicator Assembly	1	C,D
44	10-101-5	Socket Setscrew, Pulley Stop	1	B
44	10-101-9	Sckt Setscrw, Cable Bracket Stop	1	C,D
45	10-101-35	Socket Setscrew, Cable Holder	1	B
46	260-6	Pulley, Shaft, Upper	1	B
47	10-101-29	Socket Setscrew, Pulley	2	B
48	65-111	Base Assembly, Indicator	1	B,C,D

SOCKET ADAPTORS:

1H1S ..... 1/4 HEX x 1/4 SQ.
1H2S..... 1/4 HEX x 3/8 SQ.
1S1S ..... 1/4 SQ. x 1/4 SQ.
1S2S ..... 1/4 SQ. x 3/8 SQ.
2S2S ..... 3/8 SQ. x 3/8 SQ.
3S2S ..... 1/2 SQ. x 3/8 SQ.
3S3S ..... 1/2 SQ. x 1/2 SQ.
3S4S ..... 1/2 SQ. x 3/4 SQ.
4S4S ..... 3/4 SQ. x 3/4 SQ.
5S3S ..... 1" SQ.x 1/2 SQ.
5S4S ..... 1" SQ.x 3/4 SQ.
5S5S ..... 1" SQ. x 1" SQ.
6S4S ..... 11/4 SQ. x 3/4 SQ.
6S5S ..... 11/4 SQ. x 1" SQ.
6S6S ..... 11/4 SQ. x 11/4 SQ.

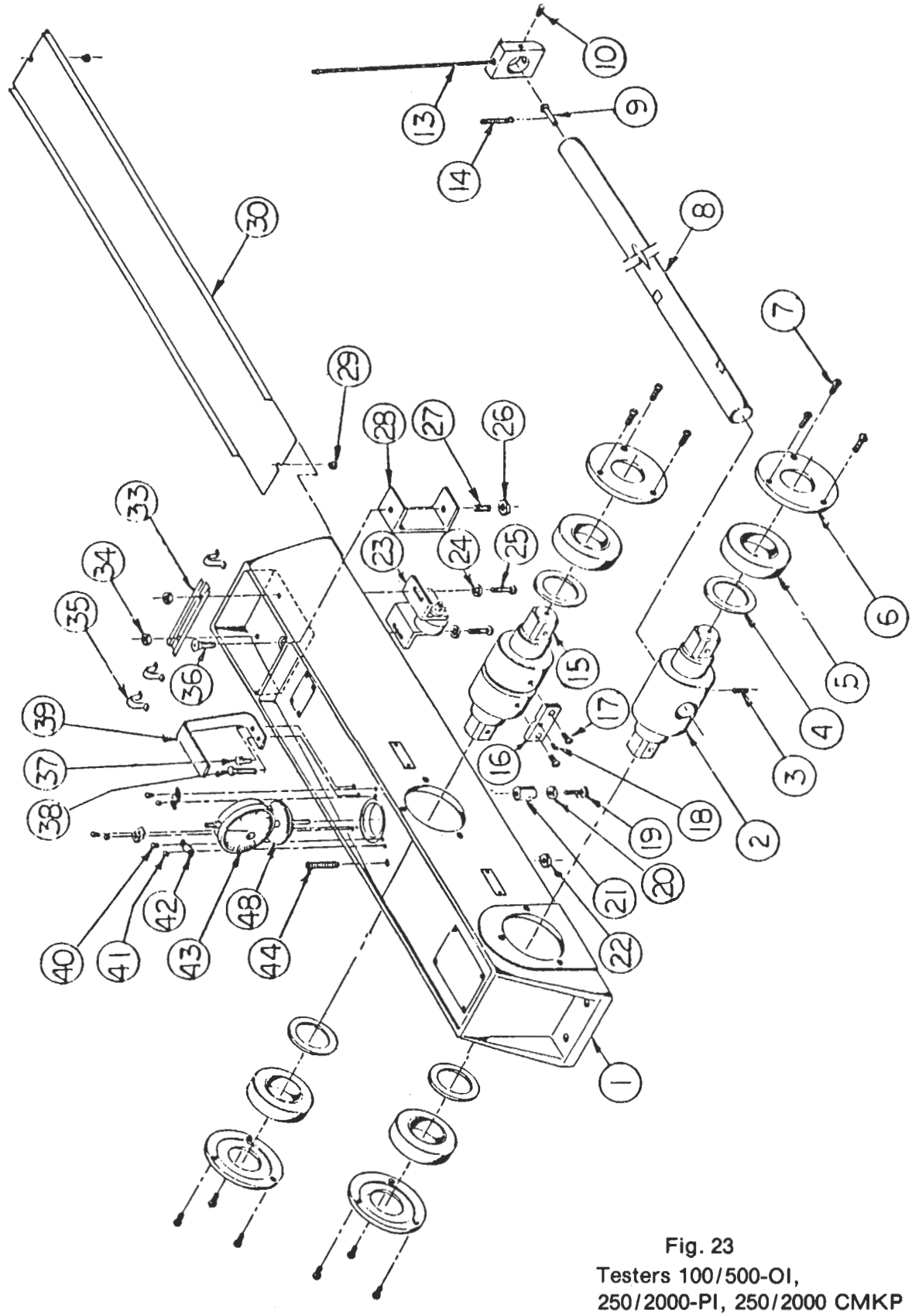
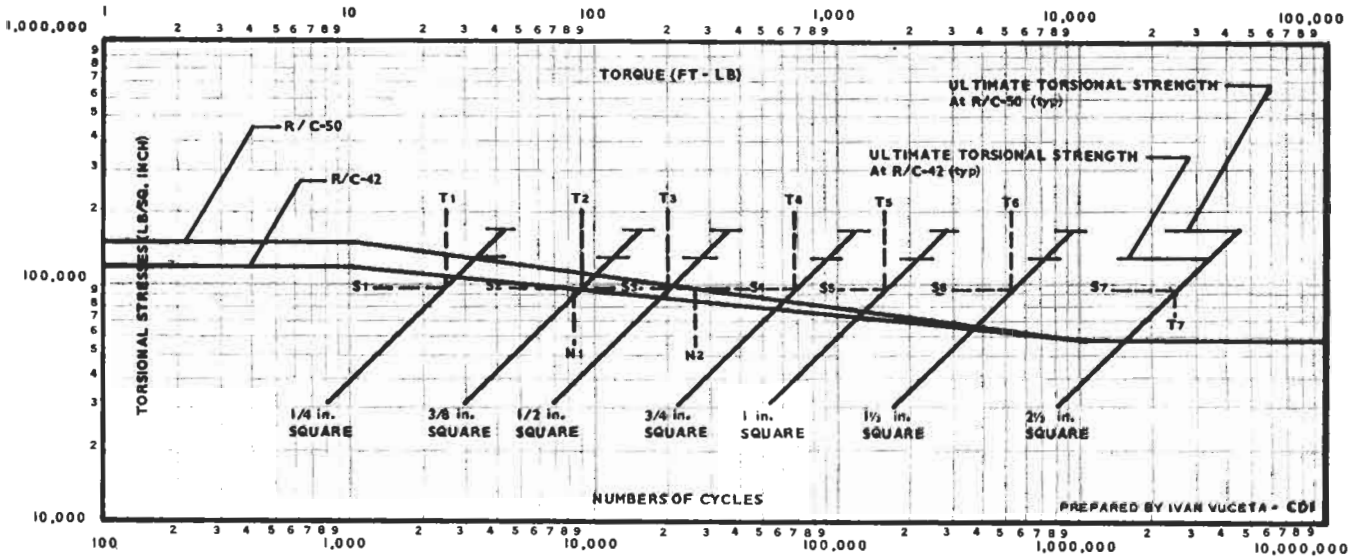


Fig. 23
Testers 100/500-OI,
250/2000-PI, 250/2000 CMKP

TORSIONAL ENDURANCE LIMIT FOR SQUARE DRIVES



Use above graph to find fatigue life (number of cycles) of square drives when loaded in torsion to given torques.

One cycle is defined as two loadings in R.H. (clockwise) direction, or two loadings in L.H. (counterclockwise) direction or one loading in clockwise plus one loading in counterclockwise direction. Thus, 10,000 cycles on graph represent 20,000 loadings (to same torque) in clockwise direction, or 20,000 loadings in counterclockwise direction, or any combination of loadings in clockwise and counterclockwise direction, totaling 20,000 loadings.

SAMPLE PROBLEM No.1
What is the number of cycles at which a ½ inch square drive would fail if loaded to a torque of 200 ft. lbs.?
SOLUTION: From the graph, dotted line T3, represents a torque of 200 ft. lbs. It intersects the ½ inch square line at point S3, which is torsional stress of 93,000 lbs./square inch. Project S3 to the left until it intersects the R/C-42 line at point N1, and to the right until it intersects the R/C-50 line at point N2. Points N1 (8,500 cycles) and N2 (27,000 cycles) are the number of cycles where ½ inch square drive should fail if hardened to R/C-42 or R/C-50 respectively.

SAMPLE PROBLEM No.2
What are the torques at which other square drives should be loaded to fail at same number of cycles as the ½ inch square drive from problem No. 1.?
SOLUTION: Each square drive will in general fail at the same number of cycles if heat treated to same hardness and loaded to same torsional stress. Project S3 further to the left and to the right until it intersects ¼ inch square at T1, 3/8 square at T2, ¾ square at T4, etc. Points T1, T2, T4, T5, T6, T7, are the torques (ft. lbs.) exerted on respective square drives, to cause them to fail at the same number of cycles as ½ inch square. From graph, T1 is 25 ft. lbs., T2 is 90 ft. lbs. T4 is 680 ft. lbs., etc.

CDI manufactures dial wrenches; micrometer adjustable and preset torque wrenches and screwdrivers; beam wrenches; torque testers, torque standards, mechanical loaders; torque multipliers; ratchet adapters and other torque devices. Catalogs available upon request.