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OCALE OPERATIONS

PROCEDURE NO. CPOO612

ISSUE DATE 09-09-97

PAGE 1 OF 7

REV. DATE NEW

CDI 950 TORQUE TESTER

ORIGINATOR _____ APPROVED _____

APPROVED _____ APPROVED _____

APPROVED _____ APPROVED _____

1. CALIBRATION DESCRIPTION:

TEST INSTRUMENT CHARACTERISTICS	PERFORMANCE SPECIFICATIONS
¹ INDICATED FORCE	± 0.5% 10 -100 % OF TRANSDUCER FULL RANGE

¹ Force tolerance as a percentage is calculated by RSS method using length and weight in terms of a percentage. (i. e. If L= Length tolerance as a

percentage, W = Weight as a percentage, and F = Force as a percentage, then $F = \sqrt{(L^2 + W^2)}$

2. EQUIPMENT REQUIRED:

INSTRUMENT	MINIMUM USE SPECIFICATIONS	CALIBRATION EQUIPMENT
WEIGHTS	2 OZ. TO 100 LBS. ± .075% OF WEIGHT	Class F WEIGHTS
TORQUE CAL WHEEL (ARM)	± 0.1% OF LENGTH	TYPICALLY 1", 2.5", 10", 40"

NOTE:

The equipment requirements listed above are recommendations only. Substitute items may be used providing the substitute item possesses accuracy equal to or greater than the minimum use specifications for the function or range required for the calibration. The accuracy of substitute equipment will not be assumed. It will be verified before using an item as a substitute.

3. PRELIMINARY OPERATIONS

- 3.1 Read entire procedure before beginning calibration.
- 3.2 All standards used to perform this calibration will have a valid calibration certificate.
- 3.3 Be aware of any environmental influences in the calibration. Strong air drafts, vibration, temperature, etc. must be considered before proceeding.

4. CALIBRATION PROCESS:

- 4.1 Make sure all power and transducer cable connections are securely fastened.
- 4.2 Always use AC power when calibrating the CDI 950 (TI). Slide the AC/DC switch on the back panel to the AC position.
- 4.3 When attaching the transducer to your test stand or mounting bracket, make sure both mating surfaces are free of any material that would interfere with a flush fit. The bolts securing the transducer to the mounting surface must not be tightened as to warp the mating surfaces. Warping due to over tightening or foreign materials left on mating surfaces can cause false readings. The transducers must be mounted with the correct vertical orientation (plumb and rotated to give least indication when shear-loaded.)
- 4.4 Press the "power" button on the TI's front panel. The TI display will read "Torque Tester Ver. XXX". Then the display shows "single" or "multiple" depending on which transducer is connected to TI. Next, "#X" appears (where X is the transducer number that is recognized by the TI's automatic coding system. Please refer to the chart in Figure 1 for the transducer codes. The final display on the LCD will be ".0000"IP.

Codes for transducer calibrated to CDI 950

01 - Open (Designed space for the 201-0-TTP or 1601-0-TTP)	
02 - 2001-O-TTP	09 - 10002-I-TTP
03 - 4001-O-TTP	10 - 1253-F-TTP
04 - 501-I-TTP	11 - 2503-F-TTP
05 - 1001-I-TTP	12 - 6004-F-TTP
06 - 2502-I-TTP	13 - 1000-F-TTP
07 - 4002-I-TTP	14 - 2000-F-TTP
08 - 7502-I-TTP	15 - OPEN

CDI's TTPM-41 four - in - one transducer system will use codes #5, 6, 8, and 11 when plugged in to the CDI 950. These codes cannot be used for additional single transducers if your unit is already calibrated to a 4 in 1 unit.

Figure 1

- 4.5 The display will show zeros and also indicate the torque unit of measure. Select the desired torque unit of measure by simply pressing the blue "unit" button on the front panel.
- 4.6 Refer to the calibration chart in Appendix A for suggested arms, trays and weights needed to calibrate each torque cell. Attach the selected calibration "arm" and adapters and if necessary, hang the weight hanger or tray to this arm. Use a preload of approximately 1% of full scale in the direction you are calibrating, even if counter weights are required to achieve the preload. This 1% of full scale preload will be the zero tare point.
- 4.7 Select the proper weights, Again referring to the calibration chart, to allow calibration of the transducer at the desired points -- up to four points from 10 - 100% of range of the transducer (usually 10, 40, 80, and 100% of range).
- 4.8 Starting in the clockwise direction, load the transducer to 100% of it's maximum range. Maintain this load for at least 10 seconds. Remove the weight(s), tray or holder, maintaining this 1% full scale preload for 60 seconds. Repeat this step two more times.
- 4.9 Press the "zero/tare" blue button to "tare-out" any load on the transducer. The display should show the transducer number and then four zeros.
- 4.10 Load the transducer with the proper weight (refer to the calibration chart for suggested weights) to achieve the desired calibration torque (this is normally 10% of transducer full scale). Allow a few seconds for the weights to stabilize or stop swinging. NOTE: Please make sure you are in the proper units of measure. Verify display indicates the force applied $\pm 0.5\%$ of reading. If adjustments are required, refer to the Manufacturer's Manual.
- 4.11 The TI is now ready for the second calibration point. Add the weights necessary to reach the next calibration point listed on the calibration chart. Verify display indicates the force applied $\pm 0.5\%$ of reading
- 4.12 Proceed with this sequence until all four points are verified for the clockwise direction.
- 4.13 Repeat steps 4.6 thru 4.12 in the left hand (counter-clockwise) direction. It is important to remember to preload the transducer to 1% F. S. for the zero tare point and exercise to the maximum settings for at least 10 seconds, remove the weights and hanger, waiting 60 seconds before starting the left hand calibration verification. Repeat this step two more times..
- 4.14 Repeat the calibration process for all transducers.
- 4.15 Calibration complete.

CALIBRATION CHART

PAGE 1 of 4

RANGE	TRANSDUCER RANGE	SUGGESTED CALIBRATION POINT	ARM TYPE & LENGTH	HANGER WEIGHT & TYPE																TOTAL WEIGHT	CALIBRATION CHECK POINTS	TOTAL # OF WEIGHTS (PCS.)
				WEIGHT, TYPE & NUMBER OF WEIGHTS																		
								oz				lb										
1/4	1/2	15	50	.3	.5	2	4	1/8	1/4	1/2	1	2	5	10	20	50						
2-20 IN.OZ.	201-0-TTP	2 IN.OZ.						1	1									.8 OZ.	2 IN.OZ.	3 OZ.-1 5 OZ.-1 2 OZ.-1 4 OZ.-2		
		6.25					1	1										2.5	6.25			
		16.25					1	1	1										4.5		11.25	
		20					1	1	1	2									6.5		16.25	
		22					1	1	2	2									8		20	
16-160 IN.OZ.	1601-0-TTP	16 IN.OZ.																.375 LB.	15 IN.OZ.	1/8 LB.-1 1/4 LB.-1 1/2 LB.-1 1 LB.-4		
		64									1	1						1.5	60			
		128			1								2						2.5		100	
		160									1	1	2						3		120	
		180									1	1	3	4					4		160	
20-200 IN.OZ.	2001-0-TTP	20 IN.OZ.																.5 LB.	20 IN.OZ.	1/2 LB.-1 1 LB.-1 2 LB.-2		
		80											1	1				2	80			
		160			1								1	1					3		120	
		200										1	1	2					4		160	
		220										1	2	2					5		200	
40-400 IN.OZ.	4001-0-TTP & 251 I-ETT	40 IN.OZ.																.5 LB.	40 IN. L.	1/2 LB.-1 1 LB.-1 2 LB.-2		
		160											1	1				2	160			
		320			1								1	1					3		240	
		400										1	1	2					4		320	
		440										1	2	2					5		400	
5-50 IN.LB.	501 I-TTP & 501 I-ETT TTPM-41	5 IN.LB.																1 LB.	5 IN.LB.	1/2 LB.-1 1 LB.-1 2 LB.-2 5 LB. 1		
		20											1	1	1			4	20			
		40			1								1	1	2				6		30	
		50										1	1	2	1				8		40	
		55										1	1	2	1				10		50	

CALIBRATION CHART

PAGE 2 of 4

CALIBRATION CHART																				PAGE 2 of 4		
RANGE	TRANSDUCER RANGE	SUGGESTED CALIBRATION POINT	ARM TYPE & LENGTH	HANGER WEIGHT & TYPE WEIGHT, TYPE & NUMBER OF WEIGHTS														TOTAL WEIGHT	CALIBRATION CHECK POINTS	TOTAL # OF WEIGHTS (PCS.)		
10-100 IN.LB.	1001 I-TTP	10 IN.LB.		1/4	1/2	15	50	.3	.5	2	4	1/8	1/4	1/2	1	2	5	10	20	50	2 LB. 10 IN.LB.	1/2 LB.-1
		40													1	1	1				8 40	1 LB.-1
		80			1										1	1	2				12 60	2 LB.-3
		100													1	2	3				16 80	5 LB.-3
		110													1	3	3				20 100	
20-200 IN.LB.	2002 I-TTP	20 IN.LB.													1	1					2 LB. 20 IN.LB.	1/2 LB.-1
		80													1	1	1				8 80	1 LB.-1
		160			1										1	1	2				12 120	2 LB.-3
		200													1	2	3				16 160	5 LB.-3
		220													1	3	3				20 200	
25-250 IN.LB.	TTPM-41 & 2502 ETT	25 IN.LB.														1					25 9 25 IN.LB.	1/2 LB.-1
		100													1	2	1				10 100	1 LB.-1
		200			1										1	2	2				15 150	2 LB.-3
		250													1	2	3				20 200	5 LB.-4
		275														1	3	4				27.5
37.5-375 IN.LB.	3752 I-TTP (AIR FORCE)	37.5 IN.LB.													1	1					37.5 LB. 37.5 IN.LB.	1/4 LB.-1
		150													1	2	2				15 150	1/2 LB.-1
		300			1										1	2	4				22.5 225	1 LB.-1
		375													1	2	5				30 300	2 LB.-2
		410													1	1	7				37.5 375	5 LB.-7
40-400 IN.LB.	4002 I-TTP	40 IN.LB.													1	1					4 LB. 40 IN.LB.	1/2 LB.-1
		80													1	1	3				16 160	1 LB.-1
		160			1										1	1	4				24 240	2 LB.-2
		400													1	1	6				32 320	5 LB.-8
		440													1	1	8				40 400	

CALIBRATION CHART

PAGE 3 of 4

RANGE		SUGGESTED CALIBRATION POINT	ARM TYPE & LENGTH	HANGER WEIGHT & TYPE WEIGHT, TYPE & NUMBER OF WEIGHTS																TOTAL WEIGHT	CALIBRATION CHECK POINTS	TOTAL # OF WEIGHTS (PCS)
TRANSDUCER RANGE	1/4			1/2	15	50	.3	.5	2	4	1/8	1/4	1/2	LB		20	50					
														1	2			5	10			
70-750 IN.LB.	7502 I-TTP	75 IN.LB.		1										1	1			7.5 LB.	7.5 IN.LB.	1/2 LB.-1		
		300													1	1		30	300	2 LB.-1		
		600			1											1	1		45	450	5 LB.-1	
		750													1	2	2		60	600	10 LB.-2	
		825											1	1	1	2	2		75	750	20 LB.-2	
10-1000 IN.LB.	10002 I-TTP & TTMP-41	100 IN.LB.		1									1	2	1			10 LB.	100 IN.LB.	1/2 LB.-1		
		400													1	2		40	400	2 LB.-2		
		800			1										1	2	1		60	600	5 LB.-1	
		1000													1	2	2		80	800	10 LB.-3	
		1100													1	2	3		100	1000	20 LB.-3	
12.5 FT.LB.	1253 F-TTP	12.5 FT.LB.																15 LB.	12.5 FT.LB.	5 LB.-1		
		50													1	1	2		60	50	10 LB.-1	
		100			1										1	1	3		90	75	20 LB.-3	
		125													1	1	2		120	100	50 LB.-2	
		137.5													1	1	2		150	125		
25-250 FT.LB.	2503 F-TTP & TTMP-41	25 FT.LB.													1	1	2		30 LB.	25 FT.LB.	5 LB.-1	
		100													1		2		120	100	10 LB.-1	
		200			1										1		3		180	150	20 LB.-5	
		250													1	1	4		240	200	50 LB.-1	
		275													1	1	4		300	250	50 LB.-4	
50-500 FT.LB.	5004 F-TTP & 500 F-TTP	50 FT.LB.																15 LB.	50 FT.LB.	5 LB.-1		
		200													1		2		60	200	10 LB.-1	
		400			1										1	1	3		90	300	20 LB.-3	
		500													1	1	2		120	400		
		550													1	1	2		150	500	50 LB.-2	

