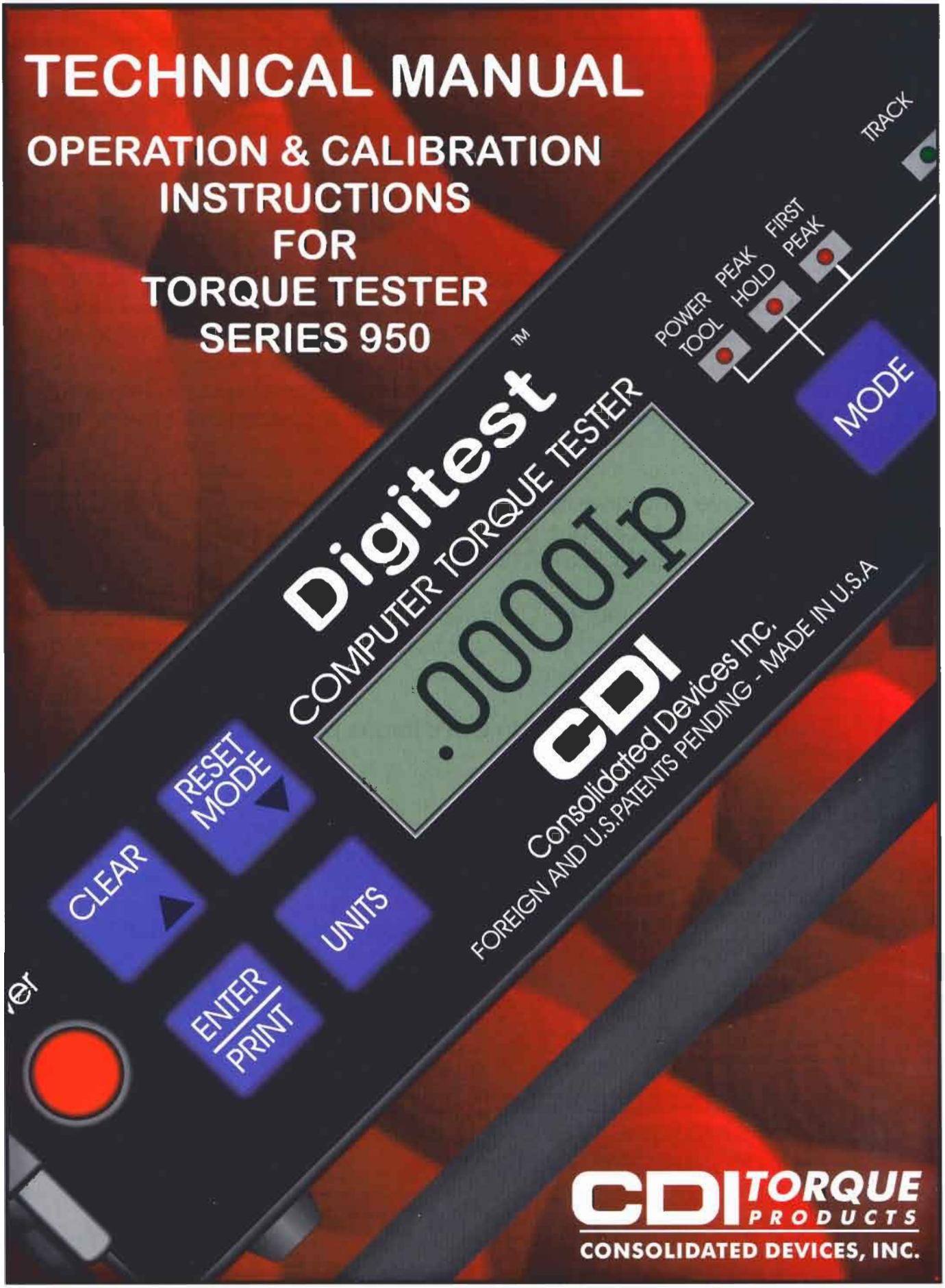
TECHNICAL MANUAL

OPERATION & CALIBRATION INSTRUCTIONS FOR TORQUE TESTER SERIES 950



CDI TORQUE PRODUCTS

CONSOLIDATED DEVICES, INC.

DIGITEST OPERATING INSTRUCTION INTRODUCTION

Congratulation on the purchase of one of the most versatile, accurate and user friendly electronic torque testers manufactured today. Digitest is used in the most sophisticated metrology / calibration labs throughout the world and will provide years of trouble free service with minimal maintenance. Please take a few moments to familiarize yourself with the functions, features and specifications of your new tester.

If you have any questions regarding the operations or functions of Digitest, please call our Sales or Customer Service department for assistance at (800) 525-6319.

A complete catalog of Consolidated Devices' torque products is available with a fax or phone call from you or by a written request on your company's letterhead.

Thank you for your interest in CDI's torque products.

Sincerely,

Consolidated Devices Inc.

CONSOLIDATED DEVICES, INC.
19220 SAN JOSE AVE.
CITY OF INDUSTRY, CALIF. 91748
PHONE (800) 525-6319
FAX (626) 965-2410

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FRONT PANEL

REAR PANEL

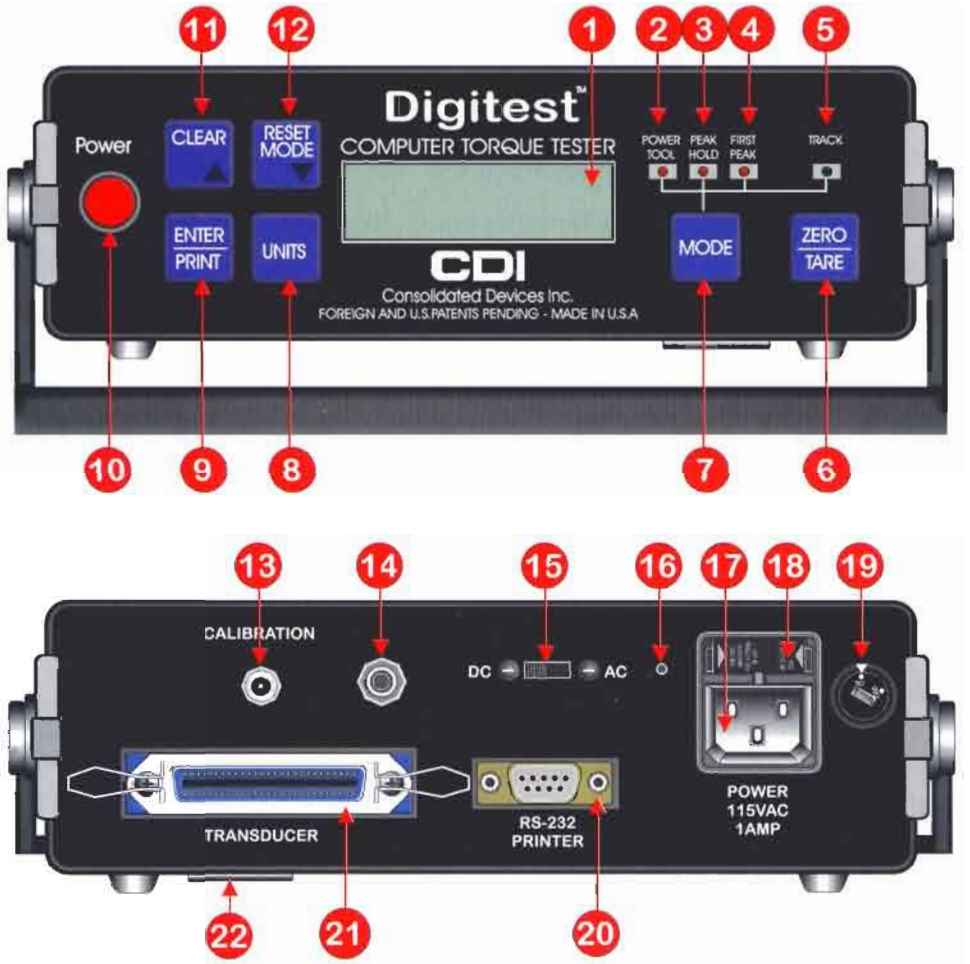


FIG.1.0

PHYSICAL FEATURES OF 950-DT DIGITEST

1. SUPER TWIST LCD
2. POWER TOOL MODE INDICATOR
3. PEAK HOLD MODE INDICATOR
4. FIRST PEAK MODE INDICATOR
5. TRACK MODE INDICATOR
6. ZERO / TARE BUTTON
7. MODE BUTTON
8. TORQUE UNITS BUTTON
9. ENTER / PRINT BUTTON
10. POWER ON / OFF BUTTON
11. CLEAR BUTTON
12. RESET MODE BUTTON
13. CALIBRATION BUTTON
14. FOOT PEDAL JACK – OPTIONAL
15. AC / DC SELECTOR SWITCH
16. AUDIO INDICATOR
17. POWER SUPPLY – MALE RECEPTACLE
18. 1 AMP FUSE BOX
19. 110 / 220 VOLT SELECTOR SWITCH
20. RS-232 – 9 PIN INTERFACE RECEPTACLE
21. TRANSDUCER – 36 PIN RECEPTACLE
22. 2 – 9 VOLT BATTERY CASES

DIGITEST FEATURES

FIG. 1.1

DIGITEST PROUDLY FEATURES THE FOLLOWING :

- ACCURACY BETTER THAN +/- .25% OF INDICATED VALUE (10-100% OF TRANSDUCER RANGE)
- FULL EASY TO READ ALPHANUMERIC DISPLAY
- AUTOMATIC RECOGNITION OF UP TO 15 DIFFERENT TRANSDUCERS
- RS-232 PORT STANDARD
- EASY SELECTION OF 7 DIFFERENT TORQUE UNITS
- SEALED CHEMICAL RESISTANT MEMBRANE KEYPAD
- QUICK AND EASY CALIBRATION FROM FRONT KEYPAD
- DURABLE HIGH IMPACT CASE WITH REINFORCED BAIL HANDLE
- COMPLETE DIGITAL MICROPROCESSOR BASED CIRCUITRY
- SUPER FAST POWER TOOL MODE
- PEAK MODE IN CLOCKWISE AND COUNTER-CLOCKWISE DIRECTIONS
- FIRST PEAK FOR "CLICK" AND CLUTCH TYPE TOOLS
- TRACK MODE
- SUPER TWIST LCD-VIEW AT ANY ANGLE
- EASY CALIBRATION MODE-INSTRUCTIONS VIA ALPHANUMERIC DISPLAY
- BAIL HANDLE AND TWO 9 VOLT BATTERIES MAKES DIGITEST PORTABLE
- DC POWER FOR PORTABILITY
- LIGHTWEIGHT — ONLY 3.5 LBS.
- ACCEPTS ANY LOAD CELL OUTPUT AT 2 OR 3 MV/V
- AC POWER FOR STANDARD 110 OR 220 VOLT

DIGITEST OPERATING INSTRUCTIONS

MODEL 950-DT

All Digitest calibrators with calibrated transducers supplied by CDI are certified accurate to: +/- .25% of indicated value from 10-100% of transducer range.

TESTER SET UP PROCEDURE:

A. The shipping container(s) should contain the following items:

1) **Digitest Electronic Torque Calibrator**
2) **A.C. power cord**
3) **Transducer(s) ordered with Digitest**
4) **Appropriate female to female socket adapter(s) depending on tranducers supplied**
5) **Digitest Operating Instructions**
6) **Certificate of Accuracy traceable to N.I.S.T. (National Institute of Standards Technology) for all transducers supplied with Digitest**

B. Remove Digitest from the container and place the calibrator on a bench or table. There is a swivel handle attached to the calibrator that allows for Digitest to be positioned in twelve (12) different viewing angles. Grasp the sides of the handles next to the calibrator and pull both simultaneously away from the case. The bail will swing freely in a 360 degree arc. Select one of the twelve positions most convenient for viewing.

C. Plug in the A.C. power cord to the back of the calibrator (receptacle labeled power-1amp) and the other end to the wall outlet. There is a choice of power sources on Digitest. On the back of the calibrator is a slide switch to select A.C. or D.C. It is recommended that A.C. be used whenever possible. D.C. is supplied as a means of portable calibration on the assembly line or to remote locations where A.C. is not available. Please note that there is also a selectable option of A.C. power; either 110 or 220 volts located on the back of the calibrator (labeled voltage selector). Be sure the calibrator is selected for the proper voltage for your facility.

D. Connect the transducer cable (either part numbers 950-50 for single transducers, 950-51 for the 4 in 1 transducer system or 950-84 for the 20 and 160 in. oz. transducers) to Digitest on the back of the calibrator. Plug the other end into the active transducer.

PLEASE NOTE: Properly mounting CDI's transducers for use will be covered in another section of this manual. See pages 14 and 15.

DIGITEST IS READY TO BE TURNED "ON"!!

FRONT PANEL OF DIGITEST

FUNCTIONS:

Power Button

Push "on" the red power button to activate Digitest. The alphanumeric display will flash a series of indicators eventually settling on the LCD showing all zeros.

The display sequence shown is: (example)

Torque Tester - - - - - - - - - - - - - indicates circuit is active - starting "wake-up" cycle
Ver. 7.00 - - - - - - - - - - - - - - - - indicates current version of torque program within Digitest
Single (or Multiple) - - - - - - - - - indicates whether a single or multiple transducer system is attached
 # ?? - - - - - - - - - - - - - - - - - - - indicates the transducer number that is recognized by Digitest's automatic coding system. Note: see coding chart below with corresponding numbers for the full range of transducers CDI offers
.0000 IP - - - - - - - - - - - - - - - - - Digitest is ready for use

NOTE: When plugged in, the multiple transducer system (CDI's part #TTPM-41), will indicate the active transducer (of the four) by lighting a red LED next to this transducer.

Codes for transducers calibrated to Digitest:

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

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

Mode Button

There are four operational torque modes for Digitest:

1) **Track – Used mainly for calibration of the torque tester. The display "tracks" the number up when a force is applied to a transducer. At the moment the force is released, the displayed number "tracks" down. Digitest will not "hold" any torque value on the display while in this mode.**
2) **First Peak – Used mainly for micrometer (click) type torque wrenches and screwdrivers. Digitest electronically captures and holds the torque value at the moment of the "camming over" or "click" of the wrench. It will not recognize or record any torque value applied after the "click" of the wrench.**
3) **Peak Hold – Used mainly for dial or beam type torque wrenches. As the force is applied, Digitest's LCD will "hold" the highest torque value applied.**
4) **Power Tool – Used primarily with non-impact type of air or electric power tools. Digitest will capture the peak torque of most types of rotary torque tools. A joint simulator is recommended for simulating rotational "run-down" conditions as well as joint rate conditions (hard, medium or soft). See page 17 for a listing of joint rate simulators available.**

Zero/Tare Button

This button is a means for zeroing or balancing the torque system prior to use. This is used to zero the display or zero-out a transducer even when there might be a slight load on the transducer. Prior to calibration, pressing the Zero/Tare button gives Digitest a reference "starting point."

Units Button

To change the display to different torque units, press the blue "Units" button. Digitest will automatically convert any displayed torque value into any of seven basic torque engineering units: FT. LB., IN. LB., IN. OZ., NM, dNM, MKG and cmKG. You may change these torque units at any time before, during or after values are displayed. Note:When first turning Digitest "on," it will default to the torque engineering units set at factory or the last programmed into the display.

TO CHANGE "BOOT-UP" TORQUE ENGINEERING UNITS:

A. Power up Digitest.
B. Press the "units" button until the desired torque unit is displayed.
C. Press and hold the "mode" button in for approximately 3 seconds until the word "select" is displayed.
D. Press the "clear" button until the words "units save" appears.
E. With one hand, press and hold in the black "calibration" button on the back panel. Simultaneously, press and hold the "enter/print" button on the front panel. The display should read "saving" and then "done."
F. Turn Digitest off then back on. Digitest will now "wake up" in the torque engineering units you have selected and will remain in these units until changed by repeating the above procedure.

Enter/Print Button

There are three functions of this key:

1) This is the "send" button for transferring any displayed torque value on the LCD via the RS232 port to a printer, computer or datalogger.
2) This is also the button used to enter key calibration data into the microprocessor during the calibration cycle. See "calibration instructions" later in this manual.
3) Used to change boot-up torque engineering units described above.

Clear Button

When the reset mode is in "manual clear," pressing this button clears the display and returns the LCD to all zeros.

Reset Mode Button

Used to select one of the three operating modes for clearing the display. Pressing this button repeatedly allows for the operator to select any one of the following "clearing" modes.

1) Manual Clear – Digitest will hold the displayed torque until the "clear" blue button is pressed.
2) 1.0 Second Clear – The displayed torque is held on the LCD for approximately one second, then the display automatically clears to all zeros--ready for next cycle.
3) Auto Clear – The displayed torque remains on the LCD until the next torque reading is taken. When the next torque reading is taken, Digitest erases or "clears" the previous reading and begins to show the current torque being applied. Excellent for "cycling" wrenches.

BACK PANEL OF DIGITEST

FUNCTIONS:

Transducer Plug

A 36 pin female plug allows the active transducer cable to be plugged into Digitest. If previously calibrated to Digitest, the transducer may immediately be used.

RS 232/Interface Port

This 9 pin male port is supplied to allow downloading the displayed torque value, in the RS 232 format, for further processing to a printer, computer or data logger. See page 27 for proper cabling. Digitest's RS 232 Protocol is: 1 stop bit, 8 data bit, 1200 baud and no parity.

Voltage Selector Switch

This switch allows the selection of either 110 or 220 volt power supply. Please select the proper voltage supplied to the Digitest unit.

Power Supply Plug

CDI supplies a power cable that connects Digitest to a 110 or 220 volt supply. A 250/1A fuse is also supplied for electrical protection of your Digitest unit and is located in a plastic case just above the power cord female receptacle plug. Also, in the same case, is an extra 250/1A fuse furnished for your convenience. To check or replace this fuse, squeeze the thin "ears" on each side of the fuse case and pull outward. When replacing, push the holder in and the plastic tabs will snap back into place. Digitest A.C. power cord part number: 2000-114.

AC/DC Selector Switch

A slide selector switch allows for choosing A.C. or D.C. power usage for Digitest. Important: Please be careful to select the proper power supply to Digitest as it has a direct affect on proper functioning.

Calibration Button

This button is used during the calibration sequence. Please refer to the calibration procedure later in this manual for proper use. Do not use this button unless you are calibrating a transducer... or when changing the "boot-up" torque units, the calibration button must be pressed simultaneously with the Enter/Print button. Please refer to the section on "units button" on page 7.

Foot Pedal Jack

This optional accessory Jack allows the opportunity of the displayed torque value to be transmitted via the RS 232 port. Depressing this optional foot pedal, CDI part number 950-79, transfers this value to the peripheral attached to Digitest.

Audio Buzzer

As a safety signaling device for possible over loading of CDI's transducers, an audible tone is sounded when Digitest senses approximately 110% (or above) of applied torque to full scale of transducer's range. Upon hearing this loud tone, release the force on the transducer being tested immediately.

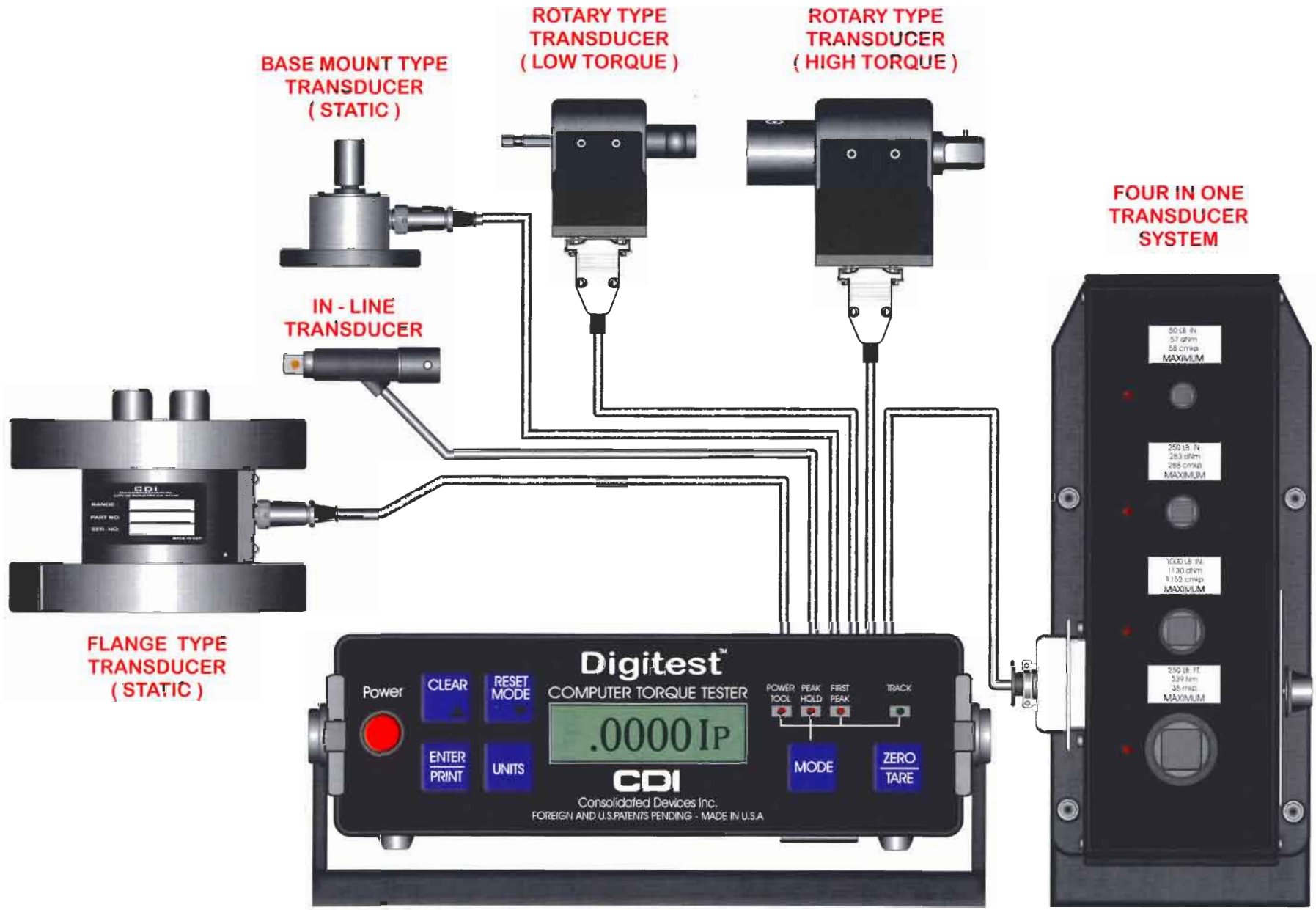


FIG.1.7 **DIGITEST CONNECTIONS TO STANDARD TRANSDUCERS**

CDI'S MASTER TRANSDUCER CHART–WITH ACCESSORIES

DIGITEST 950-DT PLUS	CDI PART # TRANSDUCER	SQ. DRIVE	TORQUE RANGE IN.OZ.	TORQUE RANGE IN.LB.	TORQUE RANGE FT.LB.	STYLE/ APPEARANCE	CABLE	MOUNTING BRACKETS	FLANGE ADAPTERS	SOCKET ADAPTERS SUPPLIED
SINGLE TRANSDUCERS	1001-O-TTP	1/4"	10-100			Base Mount Style A	950-50	TB-342/1	N/A	1S1S = 1/4" x 1/4"
	2001-O-TTP	1/4"	20-200							1S1S = 1/4" x 1/4"
	4001-O-TTP	1/4"	40-400							1S1S = 1/4" x 1/4"
	501-I-TTP	1/4"		5-50						1S1S = 1/4" x 1/4"
	1001-I-TTP	1/4"		10-100						1S1S = 1/4" x 1/4"
	2502-I-TTP	3/8"		25-250						2S2S = 3/8" x 3/8"
	4002-I-TTP	3/8"		40-400						2S2S = 3/8" x 3/8"
	7502-I-TTP	3/8"		75-750						2S2S = 3/8" x 3/8"
	10002-I-TTP	3/8"		100-1000						2S2S = 3/8" x 3/8"
	1253-F-TTP	1/2"			12.5-125	Base Mount Style B		TB-342/2		3S3S = 1/2" x 1/2"
	2503-F-TTP	1/2"			25-250					3S3S = 1/2" x 1/2"
	6004-F-TTP	3/4"			60-600					4S4S = 3/4" x 3/4"
						Flange Mount		2000-150-01	2000-219-3 3/4" Fem. sq.dr. 2000-219-2 1" Fem. sq.dr.	N/A
	1000-F-TTP				100-1000					
	2000-F-TTP				200-2000					
MULTIPLE TRANSDUCERS	TTPM-41 (4 IN 1)	1/4"		5-50			950-51	TBM-343	N/A	1S1S = 1/4" x 1/4"
		3/8"		25-250						2S2S = 3/8" x 3/8"
		3/8"		100-1000						2S2S = 3/8" x 3/8"
		1/2"			25-250					3S3S = 1/2" x 1/2"

TRANSDUCER SPECIFICATIONS

2-3 MV/V OUTPUT
350 OHM WHEATSTONE BRIDGE
10 VOLTS EXCITATION
USEABLE TEMPERATURE RANGE 72 ^{0}F + / - 20 ^{0}F
OVERLOAD PROTECTION 120%

OPTIONAL ADAPTERS (FEMALE TO FEMALE) AVAILABLE:

CDI PART#	OPENING X OPENING	CDI PART#	OPENING X OPENING
260-27	1/4" hex x 1/4" sq.	65-78-1	1/2" sq. x 3/4" sq.
260-28	1/4" hex x 3/8" sq.	65-78-2	3/4" sq. x 3/4" sq.
342-40	1/4" sq. x 1/4" sq.	75-25-2	1" sq. x 1/2" sq.
342-41-1	1/4" sq. x 3/8" sq.	75-25-1	1" sq. x 3/4" sq.
342-41-2	3/8" sq. x 3/8" sq.	75-20	1" sq. x 1" sq.
65-26-1	1/2" sq. x 1/4" sq.	340-16-1	1 1/2"sq. x 3/4" sq.
65-26-2	1/2" sq. x 3/8" sq.	340-16-2	1 1/2"sq. x 1" sq.
65-26-3	1/2" sq. x 1/2" sq.	340-11	1 1/2"sq. x 1 1/2" sq.

TRANSDUCERS USED WITH DIGITEST

A variety of different styles of transducers can be calibrated to Digitest: Static, Rotary and In-line types. CDI offers a wide range of all three styles.

Static transducers offered as standard:

Single Transducers:

	CDI Part #	Torque Range
	1001-O-TTP	10-100 In. oz.
	2001-O-TTP	20-200 In. oz.
	4001-O-TTP	40-400 In. oz.
	501-I-TTP	5-50 In. lbs.
	1001-I-TTP	10-100 In. lbs.
Style A	2502-I-TTP	25-250 In. lbs.
	4002-I-TTP	40-400 In. lbs.
	7502-I-TTP	75-750 In. lbs.
	10002-I-TTP	100-1000 In. lbs.
	1253-F-TTP	12.5-125 Ft.lbs
Style B	2503-F-TTO	25-250 Ft. lbs.
	6004-F-TTP	60-600 Ft. lbs.
Flange	1000-F-TTP	100-1000 Ft. lbs.
Style	2000-F-TTP	200-2000 Ft. lbs.

BASE MOUNT STYLE B
(2503-F-TTP)

BASE MOUNT STYLE A
(2502-I-TTP)

FLANGE MOUNT
(1000-F-TTP)

FIG. 2.2

Multiple Transducers (4 in 1):

CDI Part #	Torque Range
TTPM-41	5-50 In. lbs.
	25-250 In. lbs.
	100-1000 In. lbs.
	25-250 Ft. lbs.

NOTE: *The two mounting pins on the base mount styles (A & B) are offset slightly from 180°. These match an identical offset on CDI's mounting brackets. Thus, the orientation is exactly the same as when the transducer was calibrated at the factory.*

MOUNTING BRACKETS (SEE PICTURES – PAGE 10)

Single Static Transducers:

CDI Part #	Torque Range
TB-342/1	up to 1000 In. lb. transducers
TB-342/2	20,160 In. oz. and 125-600 Ft. lb. transducers
2000-150-01	1000-2000 Ft. lb. transducers

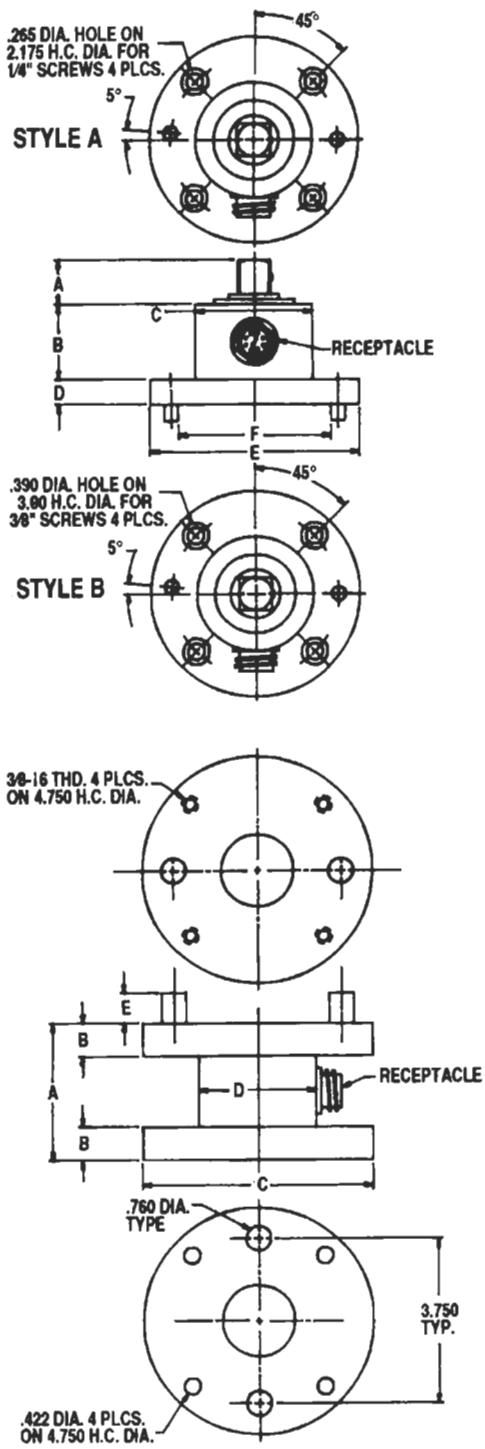
Multiple Transducer System

TBM 343	4 in 1 system (5 In. lbs. to 250 Ft. lbs.)

NOTE: If "not cal" is displayed, then Digitest's microprocessor has no calibration data in memory. If this is the first time Digitest is being calibrated with this transducer, the "not cal" will also be displayed.
NOTE: If "no cell" is displayed, check to see if a transducer is connected or if the cable connection is correct and secure.

BASE AND FLANGE – TYPE TRANSDUCER DIMENSIONS

SEE MASTER TRANSDUCER CHART FOR TORQUE RANGES (PAGE 10)



FLANGE SYTLE

DIGITEST BASE MOUNTED TRANSDUCERS

PART NUMBER	A	B	C	D	E	F
1001-O-TTP*	0.44	1.50	1.75	0.35	2.75	2.175
2001-O-TTP*	0.44	1.50	1.75	0.35	2.75	2.175
4001-O-TTP*	0.44	1.50	1.75	0.35	2.75	2.175
501-I-TTP*	0.44	1.50	1.75	0.35	2.75	2.175
1001-I-TTP*	0.44	1.50	1.75	0.35	2.75	2.175
2502-I-TTP*	0.57	1.50	1.75	0.35	2.75	2.175
4002-I-TTP*	0.57	1.50	1.75	0.35	2.75	2.175
7502-I-TTP*	0.57	1.50	1.75	0.35	2.75	2.175
10002-I-TTP*	0.57	1.50	1.75	0.35	2.75	2.175
1253-F-TTP**	0.75	1.50	2.25	0.49	4.00	3.00
2503-F-TTP**	0.75	1.50	2.25	0.49	4.00	3.00
6004-F-TTP**	0.75	1.50	2.25	0.49	4.00	3.00

* Style A
** Style B

DIGITEST FLANGE MOUNTED TRANSDUCERS

PART NUMBER	A	B	C	D	E
1000-F-TTP	3.50	0.88	5.50	2.90	0.62
2000-F-TTP	3.50	0.88	5.50	2.90	0.62

Square Drive Flange adapters (3/4" and 1") are available.
See page 10 for current information.

CDI 4 IN 1 TRANSDUCER SYSTEM
(PART # TTPM-41)

FIG.1.9 TORQUE RANGE FROM 5 IN-LBS TO 250 FT-LBS

ROTARY AND IN-LINE TRANSDUCERS -- please contact factory for current model numbers and respective torque ranges.

FIG.1.3

ROTARY TRANSDUCER

CABLE FROM DIGITEST TO
ROTARY TRANSDUCER
(950-82)

IN-LINE TRANSDUCER

CABLE FROM DIGITEST TO
IN-LINE TRANSDUCER
(950-81)

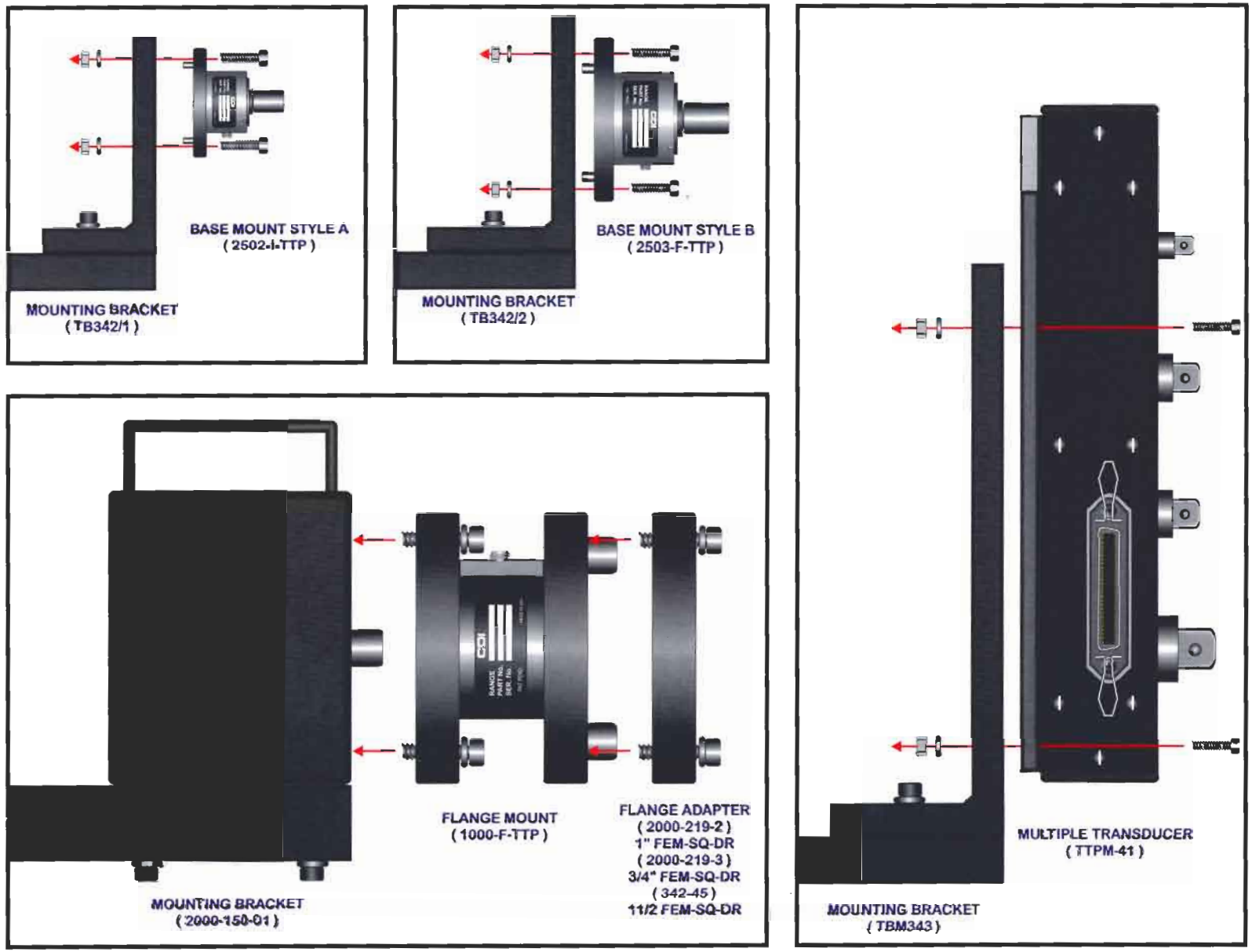


FIG. 1.8 **MOUNTING BRACKETS WITH VARIOUS CDI TRANSDUCERS**

NOTICE:

TRANSDUCERS IN USE WITH DIGITEST

Let's discuss a few points on transducers and their use with Digitest.

1. **Transducers can be mounted and used in either a horizontal or vertical position.**
2. **Transducers can be bolted directly to any secure flat surface or used with any CDI bench bracket listed on page 11 of this manual. Please allow adequate working room for the torque tools being checked or calibrated. If mounting to a work bench, roller cabinet, etc., consider the amount of torque being applied and the weight/support needed to counter-balance this applied torque.**
3. **Any of 15 different transducers offered by CDI can be added to Digitest as long as they have been calibrated to this unit. Each Digitest has a memory that will accept calibration data of up to 15 different transducers. Digitest automatically senses which transducer is attached by a unique coding system built into each transducer.**
4. **Allow approximately 30 minutes after a "cold" turn-on for the electronics of Digitest and the attached transducer to stabilize.**
5. **You are encouraged to "zero tare" Digitest as often as you like when there is a "no load" condition on transducers. It is recommended that Digitest be zeroed prior to taking <u>any</u> new torque readings, changing directions of applied torque, using of the upper range then immediately using the lower range or when calibrating (see calibration section of this manual).**

NOTE:

Transducers are sensitive measuring instruments. "Over-Torquing" past the usable range of the transducer may result in permanent damage to the transducer. Always load the transducer slowly and <u>do not exceed the usable range in any application.</u>

Prior to using Digitest and any attached transducer, the transducer must be exercised to the maximum range being used three times prior to taking torque readings. To accomplish this, take the torque instrument being tested, apply the highest torque value of the range of the transducer or instrument three times on the transducer. Remove the tool from the transducer allowing the tool and the transducer to return to a "no-load" position. Press the "zero/tare" blue button on the front panel. You are now ready to calibrate.

When the direction (clockwise or counter-clockwise) is changed, the transducer must be exercised three times in the new direction of use, as explained above, before taking readings.

IMPORTANT NOTICES

WARNING!!

Do not use any type of impact power or "pulse type" tool on static transducers. Stall and clutch types of air and electric assembly tools can be used as long as the maximum range of the transducer is not exceeded. A transducer damaged due to application of an impact tool will not be covered under warranty. See page 17 for a diagram of a transducer used in conjunction with a joint rate simulator and its appropriate driving bit.

NOTE / CAUTION

When applying torque to any of CDI's transducers, if the maximum range of the transducer (plus a percentage) is exceeded, a buzzer is sounded indicating there is an "over-torque" condition. Immediately remove the force on the torque tool being tested. If the over-range is severe, there could be possible damage to the transducer.

WARRANTY

Digitest and all transducers are warranted against defects in material and workmanship for a period of one year from the date of purchase. CDI, or our authorized representative will, at our option, repair or replace any defective calibrator, cable or transducer manufactured by CDI. Any defective product must be returned to CDI or our authorized repair station prepaid for warranty consideration.

The foregoing obligation is CDI's sole liability and the purchaser's sole remedy under this warranty. There are no other warranties expressed or implied, including those of marketability or fitness for purpose. Under no circumstances shall CDI be liable for any special, incidental or consequential damages.

This warranty does not apply if the Digitest or any related transducers, cables or accessories have been altered, damaged, abused or improperly maintained. This warranty gives you specific legal rights and you may have other rights which vary from state to state.

USE OF POWER TOOLS

Air and electric power tools can be used with Digitest and CDI's transducers. It is highly recommended that these types of tools be operated and/or tested with a joint simulator.
The primary purpose of a simulator is to allow the power tool to turn or come up to a full speed condition (which does not take long). The secondary reason for joint simulation is, in fact, to simulate a make-up or type of a particular joint stack-up (soft, medium, hard). In other words, a joint simulator tries to establish a relationship in the testing or torque setting of a power tool with the type of joint this tool is to actually be used.

Below is a typical "stack-up" of transducer, joint simulator and the adapter mated to the power tool.

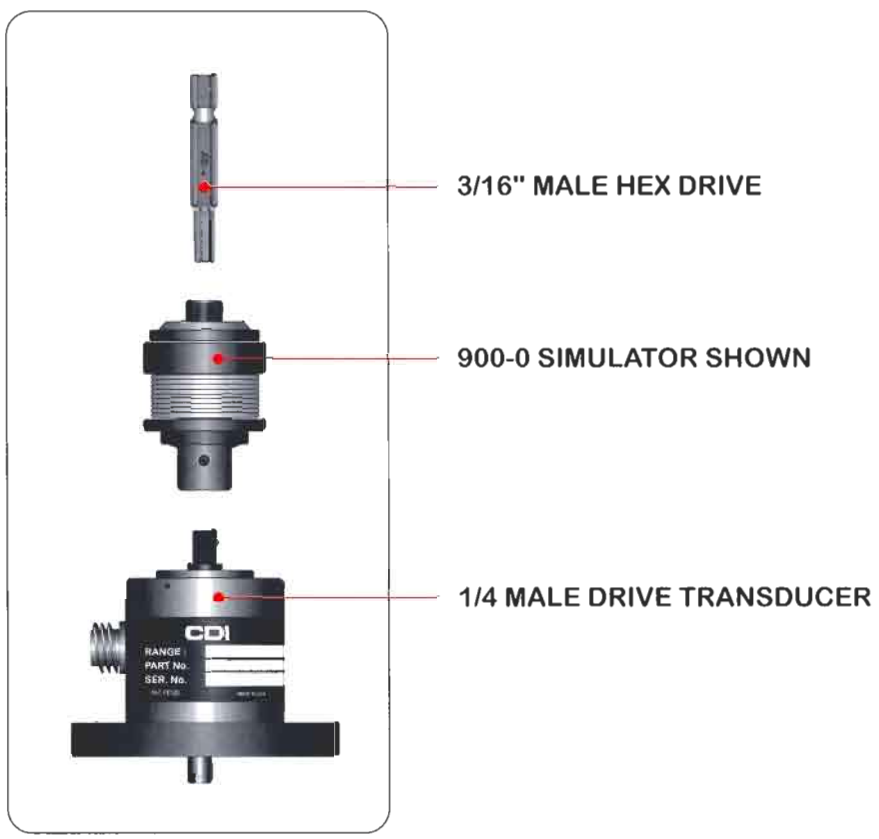


FIG. 1.4

CDI OFFERS SEVERAL RANGES OF JOINT SIMULATORS :

CDI PART #	TORQUE CAPACITY	SIMULATOR'S FEMALE DRIVE SIZE	SIMULATOR'S SCREW MALE HEX DRIVE
900-0	50 IN-LBS.	1/4"	3/16"
900-2-0	400 IN-LBS.	3/8"	3/8"
900-3-0	1000 IN-LBS.	3/8"	1/2"

BATTERY REPLACEMENT

There is a dual 9 volt alkaline DC battery pack located on the bottom case of Digitest. Follow the instructions on the molded battery case to remove, check or replace either of these batteries. When replacing batteries, it is recommended to change both at the same time.

NOTE : It is recommended to use Digitest on A.C. power whenever possible. This conserves the D.C. battery life. Use D.C. power for portability or when A.C. power is not available.

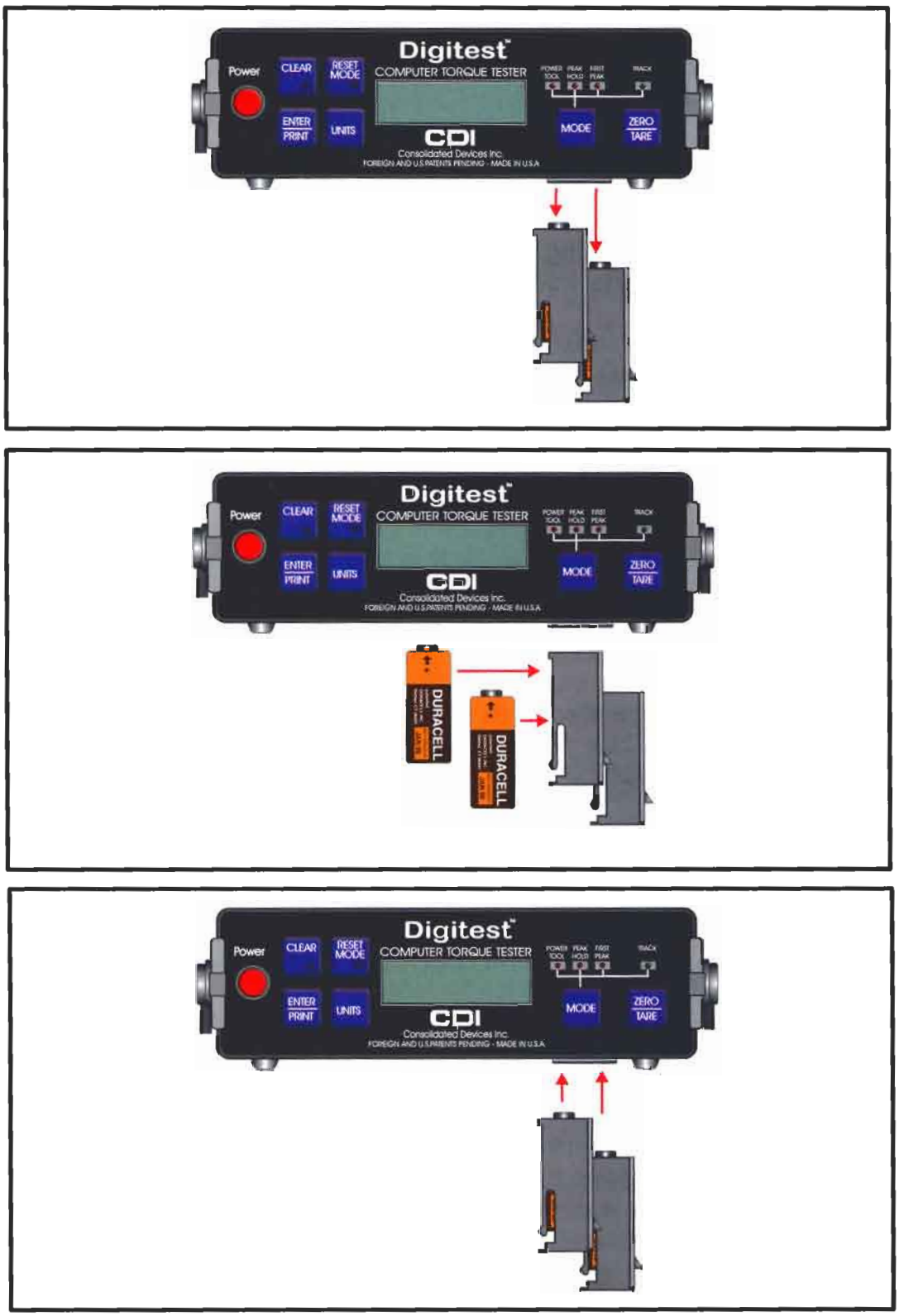


FIG.1.2

DIGITEST 950-DT
CALIBRATION PROCEDURE

ACCURACY: +/- .25% of indicated value from 10-100% of transducer's full range.

1. **Make sure all power and transducer cable connections are securely fastened.**

2. **Always use AC power when calibrating Digitest. Slide the AC/DC switch on the back panel to the AC position.**

3. **When attaching the transducers 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.**

4. **Press the "power" button on Digitest's front panel. The Digitest display will read "Torque Tester Ver. xxx." Then the display shows "single" or "multiple" depending on which transducer is connected to Digitest. Next, "#x" appears (where x is the transducer number that is recognized by Digitest's automatic coding system. Please refer to the chart on CDI's transducer codes on page 6. The final display on the LCD will be ".0000" 1P.**
   NOTE: If "not cal" is displayed, then Digitest's microprocessor has no calibration data in memory. If this is the first time Digitest is being calibrated with this transducer, the "not cal" may also be displayed.
   NOTE: If "no cell" is displayed, check to see if a transducer is connected or if the cable connection is correct and secure.

5. **The display will show zeros and also indicate the torque unit of measure. Most Digitest units "wake-up" in In. Lbs. from the factory. If you are calibrating in units other than In. Lbs., simply press the blue "unit" button on the front panel to the desired torque units.**

6. **Now you are ready to start the calibration procedure. Please refer to the calibration chart on pages 23-26 for the necessary arms, trays and weights needed to calibrate each torque cell. Attach the selected calibration "arm" and adapters, if necessary, and hang the appropriate weight hanger or tray to this arm.**

7. **Select the proper weights, again referring to the calibration chart, to allow calibration of the transducer at the desired points—up to five points from 10-110% of range of the transducer (usually 10, 40, 80, 100 & 110% of range).**

8. **Starting in the counter clockwise direction, load the transducer to 100% of its maximum range. Maintain this load for at least 10 seconds. Remove the weight(s), tray or holder, maintaining this "no load" for 60 seconds. Repeat this procedure two more times. Remove all weights and weight trays. Keep the calibration wheel or arm attached to transducer.**

9. Press the "zero/tare" blue button to "tare-out" any residual load on the transducer. The display should show the transducer number and then four zeros.

10. Digitest has a background menu that is used to change parameters such as the units and calibration data, etc. Enter this mode by pressing and holding the blue "mode" button on the front panel for approximately three seconds or until the display reads "select." You are ready to enter into the calibration menu.

11. Press the blue "clear" or "reset mode" button. Scroll through the menu until the display reads "cal – – –." By pressing the "enter" button, the display will read "calibrating" then "– 1 –." This means Digitest is waiting for the first calibration point in the left (–) hand direction.

12. Load the transducer with the proper hanger and weights selected from the calibration chart to achieve the desired first calibration torque value (this is normally 10% of transducer full scale). Allow a few seconds for the weights to stabilize or stop swinging. The display will show the current reading at that given point. Use the "clear" or "reset mode" buttons to scroll the numbers up or down on the display to read the anticipated torque applied through the weights. Get the number as close as possible to the 10% number. NOTE: Please make sure you are in the proper units of measure. Once the displayed torque matches the applied torque, press the "enter/print" button allowing the displayed torque to be put into Digitest's memory. The display will now read "– 2 –."

13. Digitest is now waiting for the second calibration point. Leave the previous weights on the hanger and add the weights necessary to reach the next calibration point listed on the calibration chart. Again, adjust the display reading by pressing the "clear" and/or "reset mode" buttons until the displayed torque matches, as close as possible, the applied torque. When ready, press the "enter/print" button to place this second value into Digitest's memory.

14. Proceed with this sequence until all five points are entered for the counter-clockwise direction. Upon entering the final counter-clockwise calibration point, Digitest will display "cal done."
NOTE: Some operators will want to "save" the first calibration side (counter-clockwise) values before starting step 15. See step 18 for procedure.
Again press and hold the blue "mode" button for approximately three seconds. You are now ready to calibrate the clockwise (+) direction. Remove the weights, arms and wheels, and place these in the clockwise direction of use.

15. Scroll through the menu using the "clear" or "reset mode" buttons until "cal + + +" is displayed. Now repeat the above procedure in the right hand (clockwise) direction. It is important to remember to pre-load the transducer to the maximum range of the transducer for at least 10 seconds, remove the weights and hanger, waiting 60 seconds before starting the right hand or clockwise calibration procedure. Repeat this procedure two more times. Press the "zero tare" button.

16. Repeat steps 11-15 above for the clockwise (+) direction.

17. IMPORTANT: After "cal done" is displayed (immediately after the fifth calibration point is completed in the clockwise position), completing the calibration procedure for both the clockwise and counter-clockwise directions, you must "save" the data prior to turning Digitest "off." If you fail to save the new calibration data before turning Digitest "off," <u>all</u> values just taken will be lost. Digitest will retain the "old" calibration values.

18. To save the just acquired torque data use the following steps:
    a) Press and hold the "mode" button until the display reads "select."
    b) Press the "clear" button until the display reads "data save".
    c) With one hand, press the black calibration button on the back panel. Holding this button "in" press the "enter/print" button on the front panel.
    d) The display will read "saving" and then "done." Release both buttons.

YOUR DIGITEST IS NOW CALIBRATED!!!

If an "error" message appears, try re-entering all calibration data again using the above procedures.

NOTE:

Only certified weights and certified arms should be used for torque calibration. They may be purchased from CDI or any distributor of weights and measures. These calibration standards should be handled with care.

If there are questions on calibrating your Digitest, please call our customer service department for assistance.

Refer to the four page calibration chart on page 23 to 26 for the suggested weights, calibration arms or wheel and weight trays to calibrate all CDI manufactured transducers.

In addition, there are adapters that might be helpful in adapting the calibration arms to transducers or reducing square drives to a better operating dimension. Some adapters are:

CDI Part #	Description
2000-221-0	1-1/4" adapter for using the 40" arm on the flange-type transducer
2000-154-8	1-1/4" adapter for using the 40" arm on the 600 ft. base mount type transducer (1-1/4" x 3/4")
2000-226-2	1" x 3/4" reducer adapter/bushing
2000-226-3	3/4" x 1/2" reducer adapter/bushing
2000-152-3	1/2" x 3/8" adapter for using the 10" butterfly and a 3/8" drive transducer

See page 27 for additional calibration equipment.

DIGITEST AND MECHANICAL LOADER
CALIBRATING A MICROMETER " CLICK " WRENCH

TRANSDUCER WITH ADAPTER CUP

(See bottom of page for adapter/hardware information)

FIG.1.6

PLEASE NOTE :

ANY CDI TRANSDUCER USED WITH CDI'S MECHANICAL LOADERS (250L-1 OR 2000-600-02) WILL NEED ADAPTERS MOUNTED TO THE BOTTOM OF EACH TRANSDUCER AS SHOWN ABOVE. THE ADAPTER ALLOWS FOR THE MECHANICAL MATING OF TRANSDUCER TO LOADER.

TRANSDUCER TO LOADER MOUNTING ADAPTERS AND THEIR APPROPRIATE HARDWARE

TO BE USED WITH CDI MECHANICAL LOADERS

CDI# 250 L-1	**–**	**250 ft. lb. Capacity**
CDI# 2000-600-02	**–**	**2000 ft. lb. Capacity**

	CDI Transducer Part #	Adapter Part #	Screws needed/ Part #
All Base Mount Transducers	**1001-O-TTP THRU 10002-I-TTP**	**2000-225-5**	**(4) 10-168-19**
	6004-F-TTP 1253-F-TTP 2503-F-TTP	**2000-225-4**	**(4) 10-168-24**
All Flange Mount Transducers	**1000-F-TTP 2000-F-TTP**	**2000-225-3**	**(4) 2000-91-1**

CALIBRATION CHART

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)
								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.	2.5"					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	
									1		1										4.5	11.25	
		16.25							1	1	1										6.5	16.25	
		20									2										8	20	
		22						1	1		2										8.8		
16-160 IN. OZ.	1601-0-TTP	16 IN. OZ.	2.5"	1								1									.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	
													1		2						2.5	100	
		128											1	1	2						3	120	
		160											1	1	3						4	160	
		180											1		4						4.5		
10-100 IN. OZ.	1001-0-ETT	10 IN. OZ.	2.5"	1																	.25 LB.	10 IN. OZ.	1/4 LB.–1 1/2 LB.–2 1 LB.–2
		40											1	1							1.0	40	
		50													1						1.25	50	
		80											1	1	1						2.0	80	
		100											1		2						2.5	100	
		110												1	2						2.75	110	
20-200 IN. OZ.	2001-0-TTP	20 IN. OZ.	2.5"		1																.5 LB.	20 IN. OZ.	1/2 LB.–1 1 LB.–1 2 LB.–2
		80												1	1						2	80	
														1		1					3	120	
		160												1	1	1					4	160	
		200												1		2					5	200	
		220													1	2					5.5		
40-400 IN. OZ.	4001-0-TTP & 251-I-ETT	40 IN. OZ.	5"		1																.5 LB.	40 IN. OZ.	1/2 LB.–1 1 LB.–1 2 LB.–2
		160												1	1						2	160	
														1		1					3	240	
		320												1	1	1					4	320	
		400												1		2					5	400	
		440													1	2					5.5		
5-50 IN. LB.	501-I-TTP & 501-I-ETT & TTPM-41	5 IN. LB.	5"		1									1							1 LB.	5 IN. LB.	1/2 LB.–1 1 LB.–1 2 LB.–2 5 LB.–1
		20												1	1	1					4	20	
														1	1	2					6	30	
		40												1		1	1				8	40	
		50												1		2	1				10	50	
		55												1	1	2	1				11		

CALIBRATION CHART

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)
								OZ.				LB.											
				1/4	1/2	15	50	.3	.5	2	4	1/8	1/4	1/2	1	2	5	10	20	50			
10-100 IN. LB.	1001-I-TTP	10 IN. LB.	5"		1									1	1						2 LB.	10 IN. LB.	1/2 LB.–1 1 LB.–1 2 LB.–3 5 LB.–3
		40												1		1	1				8	40	
														1	1		2				12	60	
		80												1			3				16	80	
		100												1		2	3				20	100	
		110												1		3	3				22		
20-200 IN. LB.	2002-I-TTP	20 IN. LB.	10"		1									1	1						2 LB.	20 IN. LB.	1/2 LB.–1 1 LB.–1 2 LB.–3 5 LB.–3
		80												1		1	1				8	80	
														1	1		2				12	120	
		160												1			3				16	160	
		200												1		2	3				20	200	
		220												1		3	3				22		
25-250 IN. LB.	TTPM-41 & 2502-I-ETT	25 IN. LB.	10"		1											1					2.5 LB.	25 IN. LB.	1/2 LB.–1 1 LB.–1 2 LB.–3 5 LB.–4
		100												1		2	1				10	100	
														1		2	2				15	150	
		200												1		2	3				20	200	
		250												1		2	4				25	250	
		275													1	3	4				27.5		
37.5-375 IN. LB.	3752-I-TTP (AIR FORCE)	37.5 IN. LB.	10"		1								1		1	1					3.75 LB.	37.5 IN. LB.	1/4 LB.–1 1/2 LB.–1 1 LB.–1 2 LB.–2 5 LB.–7
		150												1		2	2				15	150	
																1	4				22.5	225	
		300												1		2	5				30	300	
		375														1	7				37.5	375	
		410												1	1	2	7				41		
40-400 IN. LB.	4002-I-TTP	40 IN. LB.	10"		1									1	1	1					4 LB.	40 IN. LB.	1/2 LB.–1 1 LB.–1 2 LB.–2 5 LB.–8
		80												1			3				16	160	
														1	1	1	4				24	240	
		160												1	1		6				32	320	
		400												1		2	7				40	400	
		440												1	1	1	8				44		

CALIBRATION CHART

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)
								OZ.				LB.											
				1/4	1/2	15	50	.3	.5	2	4	1/8	1/4	1/2	1	2	5	10	20	50			
70-750 IN. LB.	7502-I-TTP	75 IN. LB.	10"		1											1	1				7.5 LB.	75 IN. LB.	1/2 LB.–1 2 LB.–1 5 LB.–1 10 LB.–2 20 LB.–2
		300				1											1	1			30	300	
																		1	1		45	450	
		600															1		2		60	600	
		750																2	2		75	750	
		825												1		1	1	2	2		82.5		
100-1000 IN. LB.	10002-I-TTP & TTMP-41 & 10002-I-ETT	100 IN. LB.	10"		1									1		2	1				10 LB.	100 IN. LB.	1/2 LB.–1 2 LB.–2 5 LB.–1 10 LB.–3 20 LB.–3
		400				1											1	2			40	400	
																	1	2	1		60	600	
		800															1	2	2		80	800	
		1000															1	2	3		100	1000	
		1100															1	3	3		110		
12.5 FT. LB.	1253-F-TTP	12.5 FT. LB.	10"																		15 LB.	12.5 FT. LB.	5 LB.–1 10 LB.–1 20 LB.–3 50 LB.–2
		50				1											1		2		60	50	
																	1	1	3		90	75	
		100															1			2	120	100	
		125															1	1	1	2	150	125	
		137.5																1	2	2	165		
25-250 FT. LB.	2503-F-TTP & TTMP-41 & 2503-F-ETT	25 FT. LB.	10"														1	1			30 LB.	25 FT. LB.	5 LB.–1 10 LB.–1 20 LB.–5 50 LB.–4
		100				1											1			2	120	100	
																	1		3	2	180	150	
		200															1		1	4	240	200	
		250															1		4	4	300	250	
		275															1	1	5	4	330		
50-500 FT. LB.	5004-F-TTP & 500-F-TTP	50 FT. LB.	40"																		15 LB.	50 FT. LB.	5 LB.–1 10 LB.–1 20 LB.–3 50 LB.–2
		200				1											1		2		60	200	
																	1	1	3		90	300	
		400															1			2	120	400	
		500															1	1	1	2	150	500	
		550																1	2	2	165		

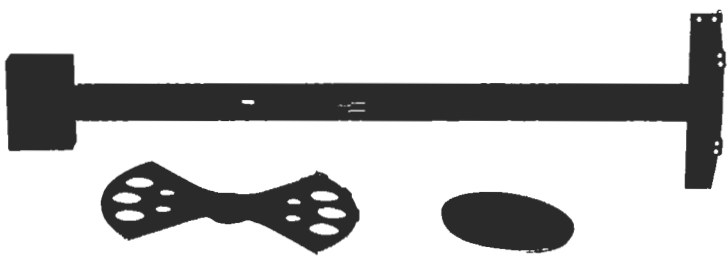
CALIBRATION CHART

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)
								OZ.				LB.											
				1/4	1/2	15	50	.3	.5	2	4	1/8	1/4	1/2	1	2	5	10	20	50			
60-600 FT. LB.	6004-F-TTP	60 FT. LB.	40"			1									1	1					18 LB.	60 FT. LB.	1 LB.–1 2 LB.–2 5 LB.–1 10 LB.–1 20 LB.–4 50 LB.–2
		240														1	1	1	2		72	240	
															1	1		1	4		108	360	
		480														2	1		1	2	144	480	
		600															1		3	2	180	600	
		660													1	1			4	2	198		
100-1000 FT. LB.	1000-F-TTP	100 FT. LB.	40"			1											1	1			30 LB.	100 FT. LB.	5 LB.–1 10 LB.–3 20 LB.–4 50 LB.–4
		400															1			2	120	400	
																	1	2	2	2	180	600	
		800															1	2		4	240	800	
		1000															1		4	4	300	1000	
		1100															1	3	4	4	330		
200-2000 FT. LB.	2000-F-TTP	200 FT. LB.	40"				1											1			60 LB.	200 FT. LB.	10 LB.–1 20 LB.–6 50 LB.–10
		800																1	4	2	240	800	
																		1	5	4	360	1200	
		1600																3	5	6	480	1600	
		2000																	5	9	600	2000	
		2200																1	5	10	660		

ELECTRONIC CALIBRATION EQUIPMENT

The following calibration equipment can be used to calibrate any of CDI's transducers listed on page 10. All weights are NIST (NBS) traceable. Arms are certified to manufacturers standards. Weight trays are certified as to weight.

342-50-0	2-1/2" Calibration Wheel 1/4" sq. dr (not shown)
2000-151-0	5" Calibration Wheel 1/4" sq. dr.
2000-152-0	10" Calibration Butterfly 1/2" sq. dr.
2000-154-0	40" Calibration Arm 1-1/4" sq. dr. w/ 1-1/4" to 3/4" adapter sleeve
2000-221-0	1-1/4" Adapter for using the 40" arm on the flange-type transducers (not shown)
2000-154-8	1-1/4" x 3/4 Adapter for using the 40" arm on the 600 ft. lb. base mount type transducer (not shown)
2000-152-3	1/2"M x 3/8"F Adapter for adapting the 10" butterfly to the 3/8" drive transducers (not shown)
2000-226-2	1" x 3/4" Adapter/Reducer
2000-226-3	3/4" x 1/2" Adapter/Reducer



CALIBRATION / WHEELS

WEIGHT HOLDERS / TRAYS

PART NUMBER	DESCRIPTION
2000-301	8 oz. Hanger

PART NUMBER	DESCRIPTION
2000-302	15 lb. Tray
2000-303	50 lb. Tray

A POPULAR TORQUE CALIBRATION SYSTEM FOR CALIBRATION / METROLOGY LABS

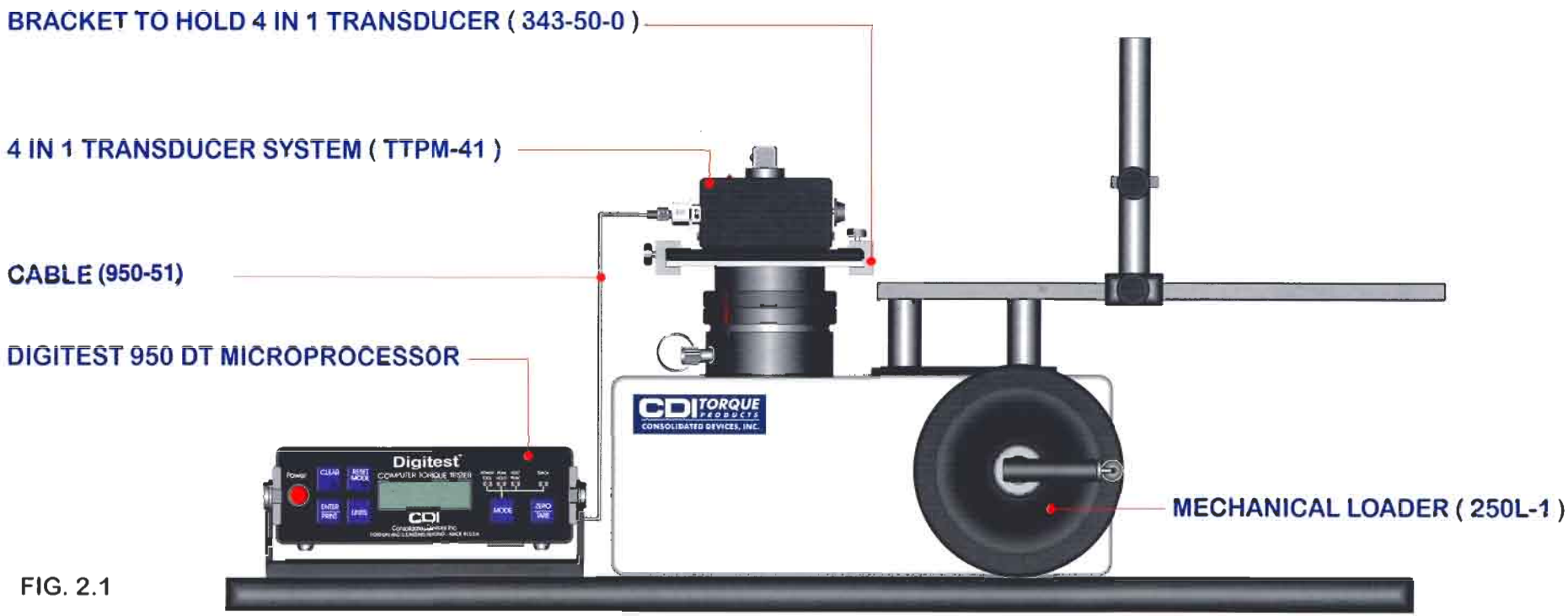
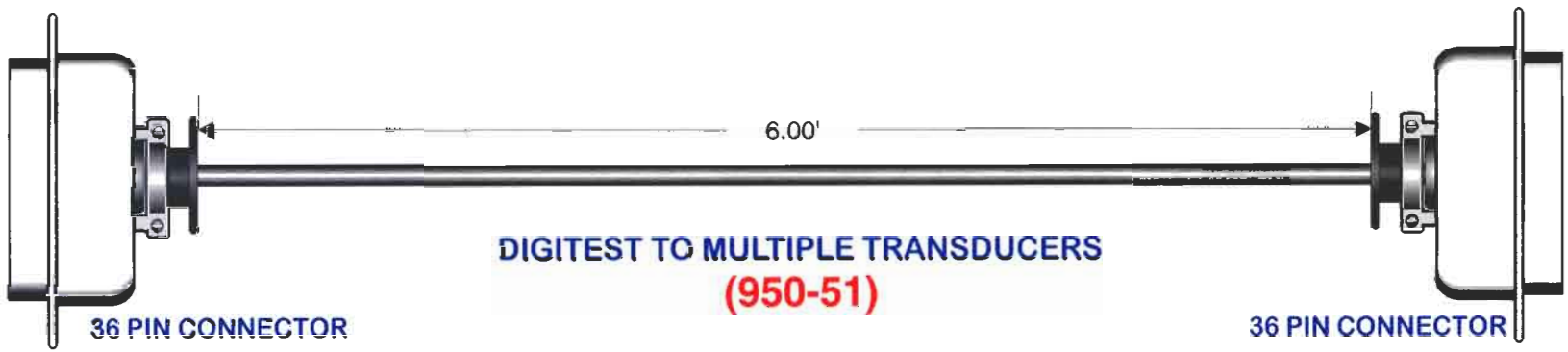
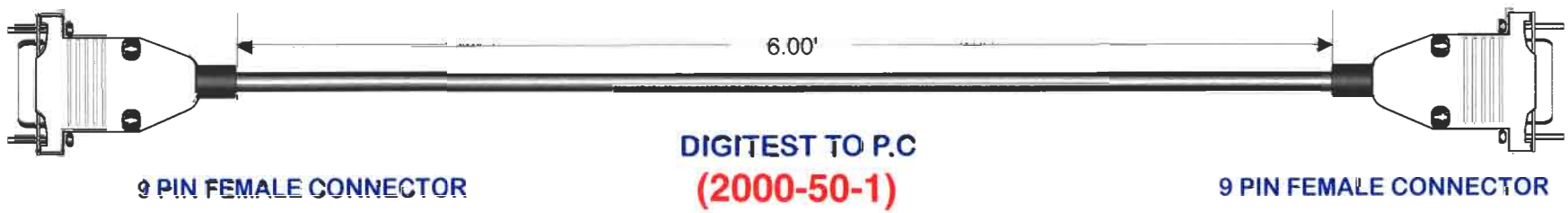


FIG. 2.1

INTERFACE CABLES FOR DIGITEST





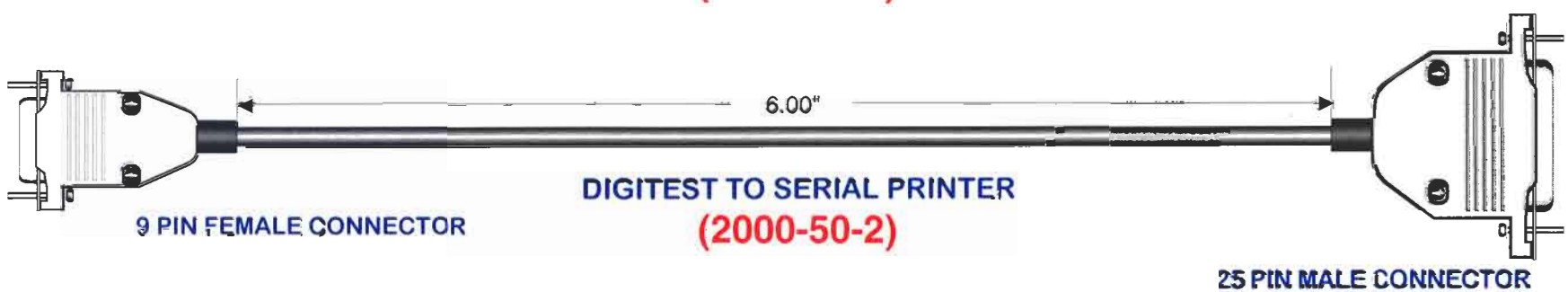


FIG 2.0

CDI CONSOLIDATED DEVICES INC.
19220 SAN JOSE AVE.
CITY OF INDUSTRY, CA 91748
(818) 965-0668

CERTIFICATE OF ACCURACY AFTER CALIBRATION

THIS CERTIFIES THAT THE ELECTRONIC TESTER WAS CALIBRATED WITH WEIGHTS AND MEASURES TRACEABLE TO AND COMPLYING WITH NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) SPECIFICATIONS.

TRANSDUCER MODEL NUMBER: 201-O-TTP	**SERIAL NUMBER:** 0000	**RANGE:** 20 TO 200 IN. OZ.
TESTER MODEL NUMBER: DT-950	**SERIAL NUMBER:** 0000	**CERTIFIED ACCURACY:** .25% FROM 10% TO FULL SCALE
CALIBRATED BY:	**INSPECTED BY:**	**DATE:**

ACCURACY DATA

TEST POINTS			CALIBRATION DATA	
NOMINAL	MINIMUM	MAXIMUM	CLOCKWISE	COUNTERCLOCKWISE
20	19.95	20.05		
80	79.80	80.20		
120	119.70	120.30		
160	159.60	160.40		
200	199.50	200.50		

STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) THROUGH TEST NUMBER MMAP 822/LA.

PLEASE CONSIDER THESE OTHER QUALITY TORQUE PRODUCTS MANUFACTURED BY CONSOLIDATED DEVICES, INC.

ELECTRONIC TORQUE FORCE CALIBRATOR TFC 2000

ELECTRONIC TORQUE CALIBRATOR—DIGITEST

ELECTRONIC TORQUE TESTER—ETT

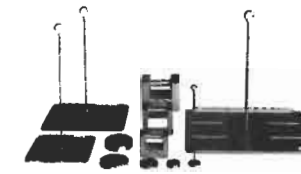
TRANSDUCERS

PROGRAMMABLE ELECTRONIC TORQUE WRENCH—PET

COMPUTORQ -II

MECHANICAL TORQUE LOADERS

CALIBRATION EQUIPMENT



TORQUE MULTIPLIERS

DIAL WRENCHES

MICROMETER WRENCHES

PRE-SET WRENCHES

SCREWDRIVERS

TORKYS

BEAM TORQUE WRENCHES

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