TB 9-6625-2368-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DYNATORQ TORQUE CELL SYSTEM, MODEL DYNETICS TCS-1000

Headquarters, Department of the Army, Washington, DC
28 November 2006

Distribution Statement A: Approved for public release; distribution is unlimited.

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, US Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our FAX number is: DSN 788-6546 or Commercial 256-842-6546. Our e-mail address is: 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual. For the World Wide Web, use: https://amcom2028.redstone.army.mil.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Dynatorq Torque Cell System, Model Dynetics TCS-1000. The manufacturer's manual was used as the prime data source in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. None.

b. Time and Technique. The time required for this calibration is approximately 10 hours, using the physical technique.

2. Forms, Records, and Reports

a. Forms, records and reports required for calibration personnel at all levels are prescribed by TB 750-25.

b. Adjustments to be reported are designated (R) at the end of the sentence in which they appear. When adjustments are in tables, the (R) follows the designated adjustment. Report only those adjustments made and designated with (R).

3. Calibration Description. TI parameters and performance specifications which pertain to this calibration are listed in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Torque cell system	Range: 1 to 1000 ft-lb Accuracy: ± 0.5% of reading from 20% to FS

SECTION II
EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment to be used in this calibration procedure. This equipment is issued with Secondary Transfer Calibration Standards AN/GSM-705. Alternate items may be used by the calibrating activity. The items selected must be verified to perform satisfactorily prior to use and must bear evidence of current calibration. The equipment must meet or exceed the minimum use specifications listed in table 2. The accuracies listed in table 2 provide a four-to-one ratio between the standard and TI. Where the four-to-one ratio cannot be met, the actual accuracy of the equipment selected is shown in parenthesis.

5. Accessories Required. The accessories required for this calibration are common usage accessories, issued as indicated in paragraph **4** above, and are not listed in this calibration procedure.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
CALIBRATION ARM 6”	Accuracy:[1]	Avans’ Machine & Tool, Model 13613520
CALIBRATION ARM 48”	Accuracy:[1]	Avans’ Machine & Tool, Model 13613522
HANGER ASSEMBLY	Range: 2 lb Accuracy:[1]	Henry Troemner LLC DBA Hengar CO, Model 9482T
HANGER ASSEMBLY	Range: 5 lb Accuracy:[1]	AMCOM, Model 7916812
JACK SET	Range: 0 – 500 lb	(13613500)
MULTIMETER	Range: 0 to 1000 V Accuracy: (± (ppm of reading + ppm of range) Range: 100 mV	Agilent, Model 3458A
TIME/FREQUENCY WORKSTATION	Capability: latitude/longitude m/s^2	Datum, Model ET6000-75 (13589305)
WEIGHT SET	Range: 0-250 lb Accuracy:[1]	AMCOM, Model 7913046

[1]Combined accuracy of weight set and weight balance and gravity 0.125% (0.13%).

SECTION III
CALIBRATION PROCESS

6. Preliminary Instructions

a. The instructions outlined in paragraphs **6** and **7** are preparatory to the calibration process. Personnel should become familiar with the entire bulletin before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name as listed in table 2.

c. Unless otherwise specified, verify the result of each test and, whenever the test requirement is not met, take corrective action before continuing with the calibration. Adjustments required to calibrate the TI are included in this procedure. Additional maintenance information is contained in the manufacturer’s manual for this TI.

d. Unless otherwise specified, all controls and control settings refer to the TI.

7. Equipment Setup

a. Verify that TI is clean and free from defects that would impair operation.

b. Insure that equipment has been allowed to stabilize at ambient temperature.

c. Position mounting plate on a stable and rigid work surface and secure with bolts.

d. Connect equipment as illustrated in figure 1.

e. Select load cell to be tested and install into the horizontal calibration fixture as illustrated in figure 1.

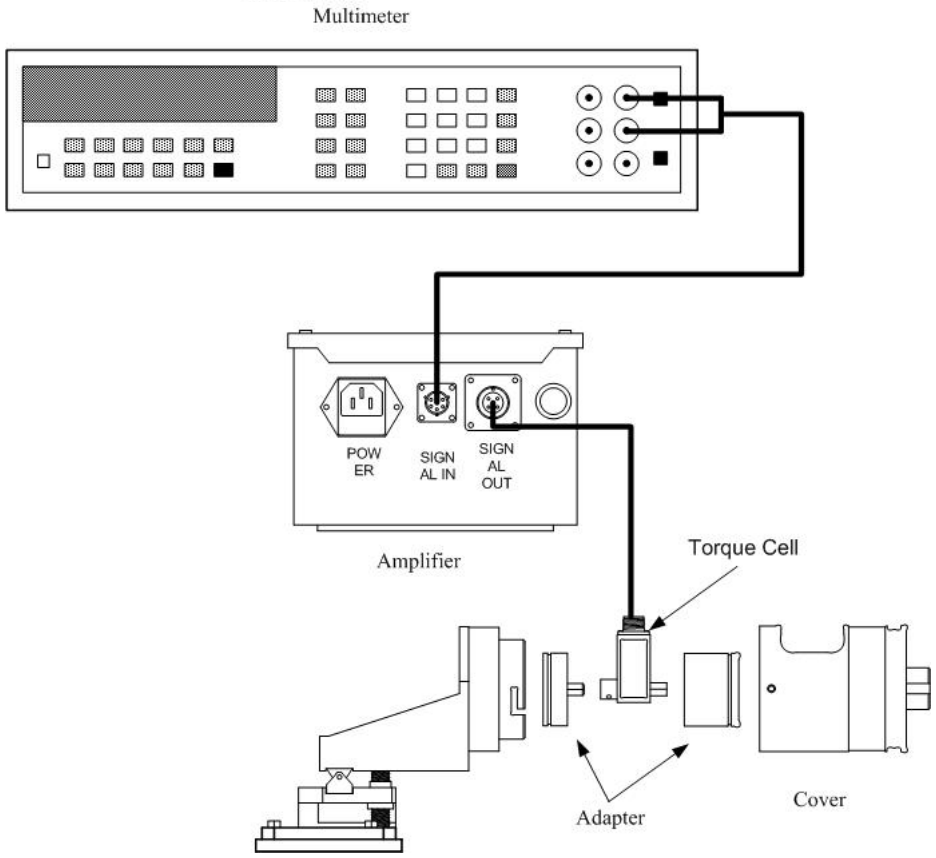

Figure 1. Electrical connection configuration.

NOTE

All text indicated in bold print within the test indicate controls on the instrument controller display.

f. From the **Start** menu select **All Programs\Torque Calibrator\System Calibration**.

g. Select the **Gravity** tab then highlight the radio **Gravity Computation** button. Enter latitude and longitude in m/s^2 and elevation in meters attained from the time/frequency workstation then select the **Compute Gravity** button.

h. Load coefficients from amplifier removed from AN/GSM 421. From the menu tabs select **Coefficient Storage** and load coefficients from the amplifier.

NOTE

The amplifier box with cables must be removed from the AN/GSM 421 Torque System.

NOTE

See Appendix A for entire list of TI components.

8. Torque Cell Accuracy

a. Performance Check

NOTE

The first time calibration is performed on torque cells complete **b** below. Torque cells cannot be verified without coefficients loaded from a previous calibration.

(1) Select the load cell to be calibrated and install into the horizontal calibration fixture as illustrated in figure 1.

(2) Attach appropriate calibrator arm for load cell being calibrated. Calibration arm 6" for 5, 20, and 100 lb load cells and 48" for the 500 and 1000 lb load cells.

NOTE

A gap must be present between the calibrator arm and the torque cell fixture housing to assure no drag exists between the calibrator arm and the fixture assembly.

NOTE

When the direction of torque is changed (CW or CCW), TI must be exercised at 100 percent three times prior to completing performance check.

(3) Select the **Verification** tab then the appropriate radio buttons for **Torque Cell**, **Arm Length**, and **Direction** of cell being calibrated.

WARNING

Heavy weights are used during the performance of this calibration. Injures may result if personnel fail to observe safety precautions. Use extreme care in handling weights to minimize damage to personnel and equipment. Fully support the weight with the jack until ready to apply.

WARNING

Extreme care must be taken when loading and unloading weights on the weight balance to prevent damage to load cells.

(4) In a CW direction exercise the torque cell to 100 percent three times using the calibration arm, hanger and weights.

(5) Insure no tension or weight is applied to arm calibrator.

(6) Calibrate zero load by selecting the **ZERO** button.

(7) Select the **30%** radio button in the **Applied Mass** section of the **Verification** tab display.

NOTE

Assure weights are placed on hanger in an alternated slot alignment to prevent weights from falling off hanger assembly.

(8) Apply total weight indicated at the bottom of the **Applied Mass** section to the calibration arm.

(9) Level arm by adjusting the three screws located in the fixture housing, illustrated in figure 2.

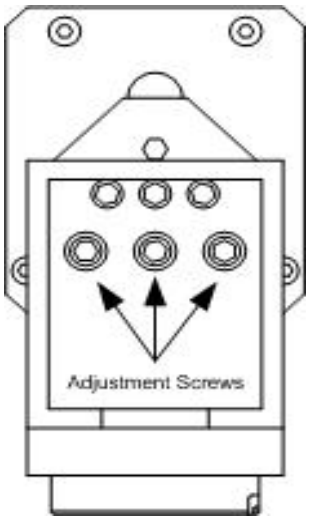

Figure 2. Fixture.

(10) Steady mass making sure that no oscillation can be observed in the level bubble.

(11) Select the **Record Verification Point** button. If the **Analysis Section**, **Error (% Meas)** on the **Verification** tab does not indicate within ± 0.5% perform **b** below for each load cell that fails.

(12) Repeat technique of (7) through (11) above at two additional values (example 50% and 70%) load.

(13) Repeat technique (3) through (12) above in a CCW direction.

(14) Repeat technique (1) through (13) above for remaining torque cells.

b. Adjustments

(1) Select the load cell to be calibrated and install into the horizontal calibration fixture as illustrated in figure 1.

(2) Attach appropriate calibrator arm for load cell being calibrated. Calibration arm 6” for 5, 20, and 100 lb load cells and 48” for the 500 and 1000 lb load cells.

NOTE

A gap must be present between the calibrator arm and the torque cell fixture housing to assure no drag exists between the calibrator arm and the fixture assembly.

NOTE

When the direction of torque is changed (CW or CCW), TI must be exercised at 100 percent three times prior to completing performance check.

(3) Select the **Calibration** tab then the appropriate radio buttons for **Torque Cell**, **Arm Length**, and **Direction** of cell being calibrated.

WARNING

Extreme care must be taken when loading and unloading weights on the weight balance to prevent damage to load cells.

(4) In a CW direction load the torque cell to 100 percent three times using the calibration arm, hanger and weights.

(5) Insure no tension or weight is applied to arm calibrator.

(6) Calibrate zero load by selecting the **ZERO** button.

(7) Select the **20%** radio button in the **Applied Mass** section of the **Calibration** tab display.

NOTE

Assure weights are placed on hanger in an alternated slot alignment to prevent weights from falling off hanger assembly.

(8) Level arm by adjusting the three screws located in the fixture housing, illustrated in figure 2.

(9) Steady mass making sure that no oscillation can be observed in the level bubble.

(10) Select the **Record Calibration Point** button.

(11) Repeat technique of (7) through (10) above for the 60 percent and 100 percent applied mass load to calibration arm.

NOTE

Assure weights are placed on hanger in an alternated slot alignment to prevent weights from falling off hanger assembly.

(12) Select the **Compute Calibration Curve** button.

(13) Repeat technique of (3) through (12) above in the CCW direction.

(14) Repeat techniques (1) through (13) above for remaining torque cells.

(15) Repeat **8 a** above.

9. Final Procedure

a. If new calibration curve was computed in **8 b** above perform 1 and 2 below.

(1) Select the **Coefficient Storage** tab.

(2) Select the **Store to Amplifier** radio button.

b. Deenergize and disconnect all equipment.

c. Annotate and affix DA label/form in accordance with TB 750-25.

APPENDIX A

TI components list:

Nomenclature	Model	MFG	Capacity
Socket Torque Sensor	2133-124-5	Lebow Products	5 lb ft
Socket Torque Sensor	2133-124-20	Lebow Products	20 lb ft
Socket Torque Sensor	2133-125-100	Lebow Products	100 lb ft
Socket Torque Sensor	2133-126-500	Lebow Products	500 lb ft
Socket Torque Sensor	2133-127-1K	Lebow Products	1,000 lb ft
Adapter	13593274-1	Dynetics	.75 Square Adapter
Adapter	13593274-2	Dynetics	.50 Square Adapter
Adapter	13593274-3	Dynetics	.357 Square Adapter
Adapter	13593274-4	Dynetics	.25 Square Adapter
Cover	NA	Dynetics	NA
Amplifier	NA	Dynetics	NA
1.0 Square Adapter	13593275-1	Dynetics	NA
.75 Square Adapter	13593275-2	Dynetics	NA
.50 Square Adapter	13593275-3	Dynetics	NA
.25 Square Adapter	13593275-4	Dynetics	NA
1.0 Square Adapter	13593276-1	Dynetics	NA
.75 Square Adapter	13593276-2	Dynetics	NA
.50 Square Adapter	13593276-3	Dynetics	NA
.25 Square Adapter	13593276-4	Dynetics	NA

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
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0627503

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 344851, requirements for calibration procedure TB 9-6625-2368-24.

Instructions for Submitting an Electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" whomever@redstone.army.mil
To: <2028@redstone.army.mil

Subject: DA Form 2028

1. **From**: Joe Smith
2. Unit: home
3. **Address**: 4300 Park
4. **City**: Hometown
5. **St**: MO
6. **Zip**: 77777
7. **Date Sent**: 19-OCT –93
8. **Pub no:** 55-2840-229-23
9. **Pub Title**: TM
10. **Publication Date**: 04-JUL-85
11. Change Number: 7
12. Submitter Rank: MSG
13. **Submitter FName**: Joe
14. Submitter MName: T
15. **Submitter LName**: Smith
16. **Submitter Phone**: 123-123-1234
17. **Problem**: 1
18. Page: 2
19. Paragraph: 3
20. Line: 4
21. NSN: 5
22. Reference: 6
23. Figure: 7
24. Table: 8
25. Item: 9
26. Total: 123
27. **Text**

This is the text for the problem below line 27.