PERFORMANCE THROUGH PRECISION

REVERE GEN-2
Model C-55800-3-50
Technical Manual

INSTRUMENT CALIBRATION PROCEDURE

Aircraft Weighing Kit
A/S 37M-1

June 15, 1973

TABLE OF CONTENTS

ILLUSTRATIONS

TABLES

SECTION I

IDENTIFICATION AND DESCRIPTION

1.1 This procedure describes the calibration of the A/S37M-1 or the Revere Corporation of America C-55800-3-50 Aircraft Weighing Kit.

1.2 The Aircraft Weighing Kit includes the Electronic Weighing Indicator, herein referred to as the TI (Test Instrument), three load cells (Cells 1, 2 and 3), three matching cell cables, a 115 VAC power cable, a 24 VDC power cable, an auxiliary battery cable plug, spherical and ring adapters for the load cells.

1.3 This procedure includes tests of essential performance parameters only. Any malfunction noticed during calibration, whether specifically tested for or not, should be corrected.

Table 1. Calibration Description

TI Characteristics	Performance Specifications
Line Voltage regulation	Equipment designed to operate at 100 to 135 VAC or 22 to 28 VDC.
Load Test	Range per load cell: 0 to 50 K pounds Accuracy: ±.1% of applied load or 10 pounds, whichever is greater
Zero Adjustment	±2000 pounds minimum for each Load Cell.
Cell 1, 2, 3 phase	With cell zeroed, minimum amplitude waveshape must be present for each cell.
Meter Sensitivity, Gain	210 pounds or less, meter from null to given area.
Indicator Balance	With TI Zero control at mid-position, TI meter shall be nulled.
Instrument Span	With full load TI meter shall be nulled.
Zero Crossover	Meter should remain nulled as pounds switch is shifted from 0 to —.

Table 1. Calibration Description (continued)

TI Characteristics	Performance Specifications
Linearity, 20%, 40%, 60% and 80% and Full Scale	Meter should null at each position. ±0.1% of applied load or ±10 pounds
Cell Span	0 to 50,000 pounds ±.1% or 10 pounds

SECTION II

EQUIPMENT REQUIREMENTS

NOTE

Minimum use specifications are the principal parameters required for performance of this calibration, and are included to assist in the selection of alternate equipment, which may be used at the discretion of the calibrating activity. Satisfactory performance of alternate items shall be verified prior to use. All applicable equipment must bear evidence of current calibration.

Table 2. Equipment Requirements

Item	Minimum Use Specifications	Calibration Equipment
2.1 Force Calibrator	Range: 0 to 50,000 pounds Increments:5,000 pounds except 1 point at 2,000 pounds Accuracy: ±.1%	Calibrator Universal Machine Force NSN 4931-00-873-912 Used With: Kit Load Cell BLH 615C NSN 4931-00-917-9815
2.2 Multimeter/Volt-ohmmeter (VOM)	0 to 50 Vdc, ±2% 0 to 150 Vac, ±2% 0 to 10 Mohms	AN/PSM-6B FSN 6625-00-957-4374

[1]The instruments utilized in this procedure were selected from those known to be available at Department of Defense facilities, and the listing by make or model number carries no implication of preference, recommendation, or approval by the Department of Defense for use by other agencies. It is recognized that equivalent equipment produced by other manufacturers may be capable of equally satisfactory performance in the procedure.

Table 2. Equipment Requirements (continued)

Item	Minimum Use Specifications	Calibration Equipment
2.3 Oscilloscope	.008 HZ to 120 KHZ	AN/USM-140A NSN 6625-00-987-6603
2.4 AC Power supply	Range 0 to 150 Vac ±1%	General Radio Type W10 MT3A NSN 4931-000-921-7408
2.5 DC Power Supply	Range: 0 to 36 Vdc ±1% 0 to 10	Hewlett-Packard Model 6455A NSN 6625-00-X55-6798
2.6 Load Cell simulator		Electronic Instrument Service, Model LCS Contractor Recommended
2.7 Resistance Decade Box	Range: 0 to 100K ohm Accuracy: ±1%	Resistance Decade NSN 4931-00-071-5343
2.8 Capacitance Decade Box	Range: 0 to 1 mfd. Accuracy: ±5%	Capacitor Decade MX-4618/U NSN 6625-00-220-9441

SECTION III

PRELIMINARY OPERATION

3.1 Verify that the TI power switch is OFF and connect the 115 VAC power cable to the TI 115 VAC receptacle or the 24 VDC power cable to the TI 24 VDC receptacle.

3.2 With the VOM, verify that the line voltage is between 100 and 135 VAC or 22 and 28 VDC.

3.3 If the 115 VAC power cable is used, no testing is required. If the 24 VDC cable is used set the TI POWER switch to the BATTERY CHECK position and vetify that the TI meter does not indicate in the yellow portion. If it does, reverse the input power polarity. Verify that the point of the TI meter indicates in the green area.

3.4 Connect the TI cell 1, cell 2 and cell 3 cables to their respective TI receptacles.

3.5 Set the TI POWER switch to 115 VAC or 24 VDC and allow a minimum warmup time of 20 minutes for the TI.

NOTE

The TI is calibrated to standard gravity, G-980, 665 cm/sec^2 (32.174 ft/sec^2) which is the gravity level at latitude of 45^o North or South. For other latitudes, a correction factor must be applied. The table of correction factors are listed where they are first used, in the load test.

SECTION IV

CALIBRATION PROCESS

NOTE

Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirements are not met, before proceeding.

NOTE

If TI components have been replaced, or if TI parameters are thought to be out of specification accuracy, proceed to step 4.1. If, however, TI is on scheduled calibration and is thought to be within specification accuracy, proceed to step 4.2. If parameters are not within accuracy limits, return to step 4.1.

4.1 Load Simulated Tests (Coarse)

4.1.1 Cell Phase Tests

4.1.1.1 Verify that the following trimpots are in the approximate positions indicated. If not, adjust as required.

Cell Span: R5, R6, R7	Full Clockwise
Cell Phase: R1, R2, R3	Center
Gain: R51	Center
Balance: R37	Center
Instrument Span: R29	Center
Linearity Adjust: R14, R19, R25, R31	Center
Zero Cross-over: R74	Center

4.1.1.2 Connect equipment as shown in Figure 1, with TI load cell cable 1 connected to the load cell simulator (LCS), and the oscilloscope connected between TP1 and TP4 (case ground) on the TI printed circuit board.

4.1.1.3 Set TI CELL SELECT switch to the CELL 1 position and adjust the oscilloscope for a 4 or 5 cycle waveshape.

4.1.1.4 Verify that there is a TI meter indication of 0 (null) with an oscilloscope minimum amplitude waveshape. If not, adjust TI CELL PHASE control, R1 on the TI circuit board for a minimum waveshape, and adjust the TI CELL 1 ZERO CONTROL simultaneously to keep the TI meter at the 0 indication, as required.

4.1.1.5 Connect the LCS to the TI load cell cable 2 and set the TI CELL SELECT switch to the CELL 2 position.

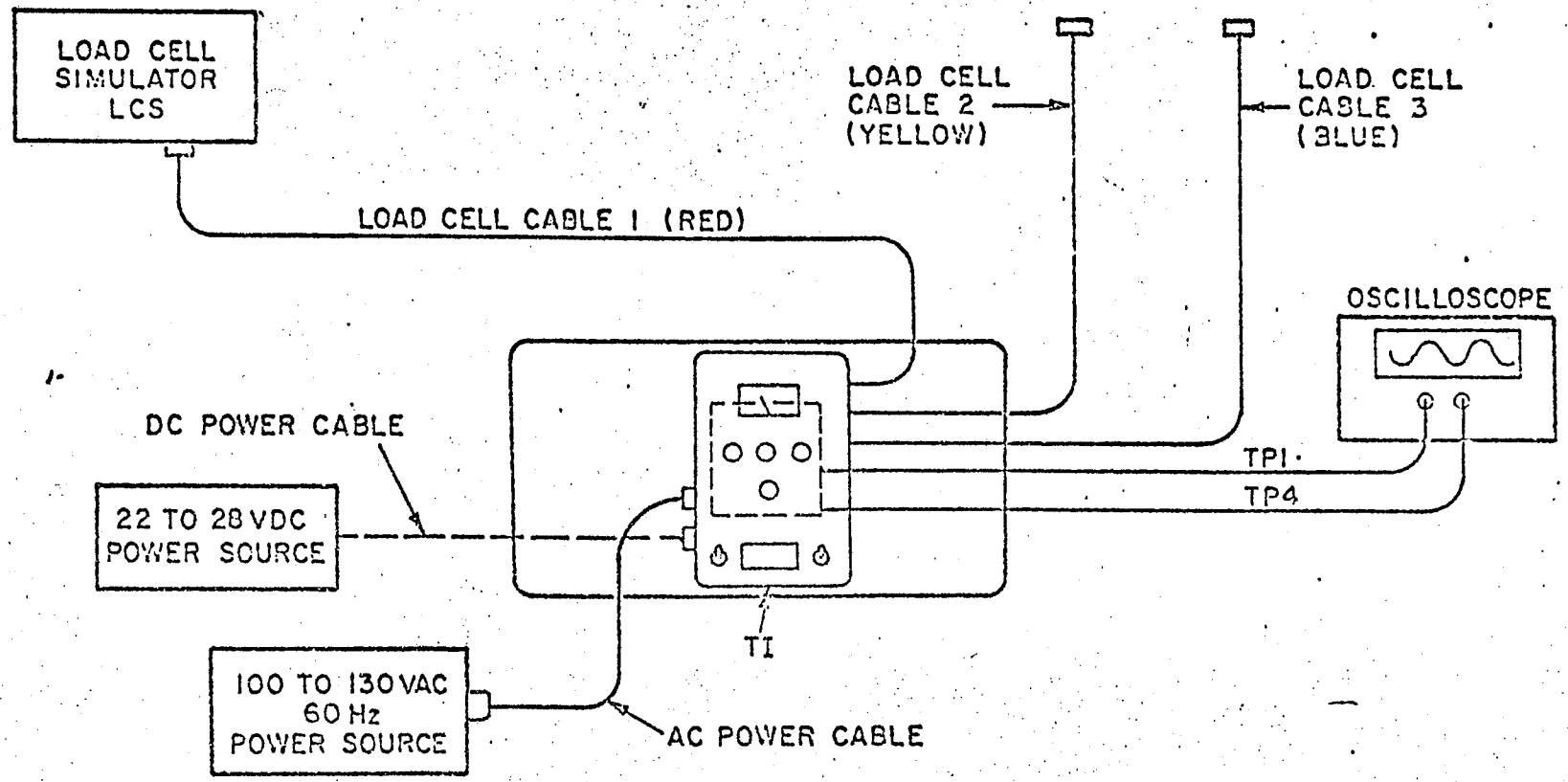

Figure 1. Load Simulated Test Setup

4.1.1.6 Verify that there is a TI meter indicatiion of 0 with an oscilloscope minimum amplitude waveshape. If not, adjust TI CELL 2 PHASE control, R2 on the TI circuit board for a minimum waveshape, and adjust the TI CELL 2 ZERO CONTROL simultaneously to keep the TI meter at the 0 indication, as required.

4.1.1.7 Connect the LCS to the TI load cell cable 3 and set the TI CELL SELECT switch to the CELL 3 position.

4.1.1.8 Verify that there is a TI meter indication of 0 with an oscilloscope minimum amplitude waveshape. If not, adjust TI CELL 3 PHASE control, R3 on the TI circuit board for a minimum waveshape and adjust TI CELL 3 ZERO CONTROL simultaneously to keep the TI meter at the 0 indication, as required.

4.1.2 Gain and Stability Tests

4.1.2.1 Connect the LCS to the TI load cell cable 1 and set the TI CELL SELECT switch to the CELL 1 position.

4.1.2.2 Adjust the LCS to 0, and set the TI POUNDS switch to 0.

4.1.2.3 Verify that the TI meter is nulled (0 position). If not, adjust the TI CELL 1 ZERO CONTROL, for a TI meter null, as required.

4.1.2.4 Set the TI POUNDS switch to 150 pounds.

4.1.2.5 Verify that the TI meter pointer deflects to the start of the green band. If not, adjust the TI GAIN control, R51 on the TI circuit board, for a pointer deflection to the start of the green band, as required.

4.1.2.6 Adjust the LCS to 0, and set the TI POUNDS switch to 0.

4.1.2.7 Verify that the TI meter does not oscillate. If oscillation does occur, C10A on the TI circuit board must be replaced with a capacitor of different value as described in step 4.1.2.8.

NOTE

The need for C10A is determined during initial TI calibration, therefore C10A may not exist in some units.

4.1.2.8 If C10A exists, remove it from circuit board. Connect capacitance decade box in place of C10A. Adjust capacitance decade box between 0 and .1 mfd.

4.1.2.9 Verify that TI meter oscillation does not occur. If it does occur, adjust capacitance decade box until TI meter oscillation stops, as required, and note indicated capacitance.

4.1.2.10 Connect a 50V disc ceramic capacitor, with capacitance value determined in step 4.1.2.9, in place of the capacitance decade box.

4.1.3 Balance Test

4.1.3.1 Connect a jumper between the red and white terminals of the LCS.

4.1.3.2 Adjust the TI CELL 1 ZERO CONTROL to mid position, and set the TI POUNDS switch to 0 pounds.

4.1.3.3 Verify that the TI meter has a nulled indication. If not, adjust the TI BALANCE control R37, on the TI circuit board, for a TI meter null, as required.

4.1.3.4 Remove the jumper from the LCS and adjust the LCS to zero.

4.1.4 Instrument Span Test

4.1.4.1 Set the LCS to a span position of 2.2 MV/V. Set the TI POUNDS switch to the full scale capacity (4-9-9-100), which is equivalent to 50000 pounds.

4.1.4.2 Verify that the TI meter has a null indication. if not, adjust the TI INSTRUMENT SPAN control, R29 on the TI circuit board, for a TI meter null, as required. If TI meter can be nulled by adjusting R29, proceed to step 4.1.4.5. If TI meter cannot be nulled by adjusting R29, proceed to step 4.1.4.3.

4.1.4.3 Set the LCS to a span position of 2.25 MV/V, if TI meter could not be adjusted to a null indication with an LCS span position of 2.2 MV/V.

4.1.4.4 Verify that the TI meter has a null indication. If not, adjust the TI INSTRUMENT SPAN control, R29 on the TI circuit board, for a TI meter null, as required.

4.1.4.5 Set the LCS to a span position of 0 and set the TI POUNDS switch to the 0 position.

4.1.4.6 Verify that the TI meter has a null indication. If not, adjust the TI CELL 1 ZERO CONTROL for a TI meter null indication as required. If it was necessary to adjust the TI CELL 1 ZERO CONTROL, repeat steps 4.1.4.1 through 4.1.4.4, until no further adjustments of the TI INSTRUMENT SPAN control, R29, and the TI CELL 1 ZERO CONTROL are required, when the LCS and TI POUNDS switch are set to their respective positions as indicated.

4.1.5 Zero Cross-Over Test

4.1.5.1 Set the LCS to 0 and set the TI POUNDS switch to 0 (0-0-0-00). Adjust the TI ZELL 1 ZERO CONTROL for a 0 indication on the TI meter.

4.1.5.2 Switch the M.S.D. (most significant digit) of the TI POUNDS switch from 0 to – (minus).

4.1.5.3 Verify that the TI meter indication remains at 0. If not, adjust the TI ZERO CROSSOVER control, R74, on the TI circuit board for a TI meter indication of 0. If it was necessary to adjust R74, repeat steps 4.1.5.1 through 4.1.5.3 until no further adjustments of the TI CELL 1 ZERO CONTROL or the TI ZERO CROSS-OVER are necessary to have a TI meter indication of 0 in both the 0 and -- position of the MSD of the TI POUNDS switch.

4.1.6 Linearity Adjust Test

NOTE

LCS settings in the following test are based on a full scale setting of 2.2 on 2.25 MV/V, as determined in steps 4.1.4.2 or 4.1.4.4.

4.1.6.1 Set the LCS to the .44 or .45 MV/V position (20% of 2.2 or 2.25 MV/V) and set the TI POUNDS switch to 10K (20% of 50K).

4.1.6.2 Verify that the TI meter has a null indication. If not, adjust the TI 20% LINEARITY ADJUST control, R31 on the Ti circuit board, for a TI meter null indication, as required.

4.1.6.3 Set the LCS to the .88 or .90 MV/V position (40% of 2.2 or 2.25 MV/V) and set the TI POUNDS switch to 20K (40% of 50K).

4.1.6.4 Verify that the TI meter has a null indication. If not, adjust the TI 40% LINEARITY ADJUST control, R25 on the TI circuit board, for a TI meter null indication, as required.

4.1.6.5 Set the LCS to the 1.32 or 1.35 MV/V position (60% of 2.2 or 2.25 MV/V) and set the TI POUNDS switch to 30K (60% of 50K).

4.1.6.6 Verify that the TI meter has a null indication. If not, adjust the TI 60% LINEARITY ADJUST control, R19, on the TI circuit board, for a TI meter null indication, as required.

4.1.6.7 Set the LCS to the 1.76 or 1.80 MV/V position (80% of 2.2 or 2.25 MV/V) and the TI POUNDS switch to 40K (80% of 50K).

4.1.6.8 Verify that the TI meter has a null indication. If not, adjust the TI 80% LINEARITY ADJUST control, R14, on the TI circuit board, for a TI meter null indication, as required.

4.1.6.9 Set the LCS to the .44 or .45 MV/V position (20% of 2.2 or 2.25 MV/V) and set the TI POUNDS switch to 10K (1-0-0-00). Verify that the Ti meter has a null indication. If not, repeat steps 4.1.6.2 through 4.1.6.8.

4.1.6.10 Set the LCS to the .44 or .45 MV/V position (20% of 2.2 or 2.25 MV/V) and set the TI POUNDS switch to 10K (20% of 50K), with the MSD set to 0 (0-9-9-100).

4.1.6.11 Verify that the TI meter indication remains at null as the TI POUNDS switch is changed from 1-0-0-00 to 0-9-9-100, both of which indicate 10K pounds. If not, R48 on the TI circuit board must be replaced with a resistor of a different value as described in step 4.1.6.12.

4.1.6.12 Remove R48 from the TI circuit board, and connect a resistance decade box in its place. Adjust the resistance of the decade box, until a value is found which results in a TI meter null indication for TI POUNDS switch settings of 1-0-0-00 and 0-9-9-100 POUNDS. Replace the decade box with a 1/2 watt, carbon composition, ±5% resistor of equivalent value.

4.1.7 Line Voltage Test

4.1.7.1 Connect the TI AC POWER CABLE to an AC power supply.

4.1.7.2 Set the LCS to 0, set the TI POUNDS switch to 0, set the TI CELL SELECTOR switch to the CELL 1 position. Set the TI PWR switch to the 115 VAC position, and adjust the CELL 1 ZERO control for a TI meter null indication.

4.1.7.3 Adjust the AC power supply from 100 VAC through 135 VAC. Verify that the TI meter indication remains nulled.

4.1.7.4 Set the LCS to 1.9 MV/V and set the TI POUNDS switch to value which will null TI meter.

4.1.7.5 Adjust the AC power supply from 100 VAC to 135 VAC. Verify that the TI meter indication remains nulled. Remove the TI AC power cable.

4.1.7.6 Connect the TI DC POWER CABLE to a DC power supply.

4.1.7.7 Set the LCS to 0 and set the TI POUNDS switch to 0.

4.1.7.8 Set the TI PWR switch to the BATTERY CHECK position and verify that the TI meter does not indicate in the yellow area. If it does reverse the input power polarity. Verify that the TI meter pointer is in the green area after reversing the polarity.

4.1.7.9 Set the TI PWR switch to the 24 VDC position and adjust the CELL 1 ZERO control for a TI meter null indication.

4.1.7.10 Adjust the DC power supply from 22 VDC through 28 VDC and verify that the TI meter indication remains nulled.

4.1.7.11 Set the LCS to 1.9 MV/V and set the TI POUNDS switch to value which will null TI meter.

4.1.7.12 Adjust the DC power supply from 22 VDC through 28 VDC and verify that the TI meter indication remains nulled.

4.2 Load Tests (Fine)

4.2.1 Cell Phase Test

4.2.1.1 Connect equipment as shown in Figure 2, with load cells 1, 2, and 3, connected to their respective load cell cables. Connect the oscilloscope between TP1 and TP4 on the Ti circuit board.

4.2.1.2 Set the TI PWR switch to the 115 VAC position and adjust the oscilloscope for a 4 or 5 cycle waveshape. Set the TI CELL SELECTOR switch to the CELL 1 position and make sure there is no load on the load cells.

4.2.1.3 Verify that there is a TI meter null indication. If not adjust the TI CELL 1 ZERO CONTROL for a TI meter null, as required. Verify that there is a minimum amplitude waveshape indication on the oscilloscope. If not, adjust TI CELL 1 PHASE control, R1 on the Ti circuit board, for a minimum amplitude oscilloscope indication, as required.

4.2.1.4 Set the TI CELL SELECTOR switch to the CELL 2 position.

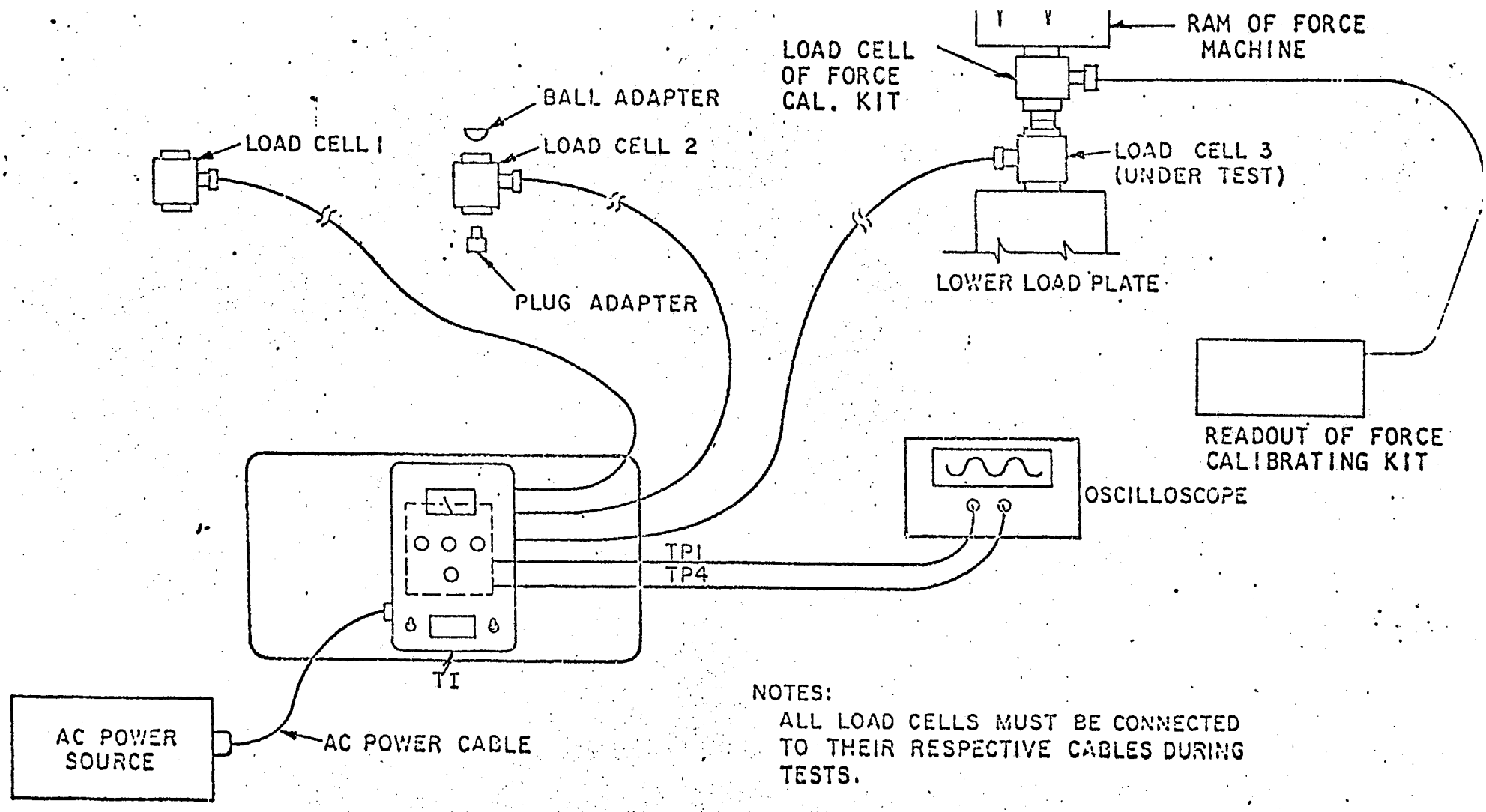

Figure 2. Load Test Setup

4.2.1.5 Verify that there is a TI meter null indication. If not, adjust the TI CELL 2 ZERO CONTRC for a TI meter null, as required. Verify that there is a minimum amplitude waveshape indication on the oscilloscope. If not, adjust the TI CELL 2 PHASE control, R2 on the TI circuit board, for a minimum amplitude oscilloscope indication, as required.

4.2.1.6 Set the TI CELL SELECTOR switch to the CELL 3 position.

4.2.1.7 Verify that there is a TI meter null indication. If not, adjust the TI CELL 3 ZERO CONTRO for a TI meter null, as required. Verify that there is a minimum amplitude waveshape indication on the oscilloscope. If not, adjust the TI CELL 3 PHASE control, R3 on the Ti circuit board, for a minimum amplitude oscilloscope indication, as required.

4.2.2 Cell Span Test

4.2.2.1 Place the TI load cell number 1 in the force calibrator, using ball and plug adapter as shown in Figure 2. Adjust the force calibrator for a load of 50000 pounds. Set the TI CELL SELECTOR switch to the CELL 1 position.

4.2.2.2 Set the TI POUNDS switch to 50K, base on gravity at a latitude of 45°. In order to determin proper setting of TI POUNDS switch, divide 50,000 pounds by the latitude correction factor shown in Table 3, and determine by the location of the TI.

Table 3. Latitude Correction Factors

Latitude	Correction Factor	Latitude	Correction Factor
0	1.0027	50	0.9996
5	1.0026	55	0.9991
10	1.0025	60	0.9987
15	1.0023	65	0.9984
20	1.0021	70	0.9980
25	1.0017	75	0.9978
30	1.0014	80	0.9976
35	1.0010	85	0.9974
40	1.0005	90	0.9974
45	1.0000		

4.2.2.3 Verify that the TI meter has a null indication. If not, adjust TI CELL 1 SPAN control R5 on the circuit board for a TI meter null indication, as required. If it was necessary to adjust R5, remove the force, set the TI POUNDS switch to 0 and repeat steps 4.2.1.3 and 4.2.2.1 through 4.2.2.3 as required for TI meter null indications without making further adjustments.

4.2.3 Linearity Adjust Test

4.2.3.1 Apply a 10K load on cell number 1 with the force calibrator. Set the TI POUND switch to 10,000 pounds.

4.2.3.2 Verify that the TI meter has a null indication. If not, adjust the 20% LINEARITY ADJUST control, R31 on the TI circuit board, for a TI meter null, as required.

4.2.3.3 Apply a 20K load on cell number 1 with the force calibrator. Set the TI POUNDS switch to 20,000 pounds.

4.2.3.4 Verify that the TI meter has a null indication. If not, adjust the 40% LINEARITY ADJUST control, R25 on the TI circuit board, for a TI meter null, as required.

4.2.3.5 Apply a 30K load on cell number 1 with the force calibrator. Set the TI pounds switch to 30,000 pounds.

4.2.3.6 Verify that the TI meter has a null indication. If not, adjust the 60% LINEARITY ADJUST control, R19 on the TI circuit board, for a TI meter null, as required.

4.2.3.7 Apply a 40K load on cell number 1 with the force calibrator. Set the TI POUNDS switch to 40,000 pounds.

4.2.3.8 Verify that the TI meter has a null indication. If not, adjust the 80% LINEARITY ADJUST control, R14 on the TI circuit board, for a TI meter null, as required.

4.2.4 Cell 2 Span Test

4.2.4.1 Place the TI load cell number 2 in the force calibrator, using ball and plug adapters as shown in Figure 2. Set the TI CELL SELECTOR switch to the CELL 2 position.

4.2.4.2 Adjust the force calibrator for no load, and adjust thed TI POUNDS switch for 0 pounds.

4.2.4.3 Verify that there is a TI meter null indication. If not, adjust the TI CELL 2 ZERO CONTROL for a TI meter null indication, as required.

4.2.4.4 Adjust the force calibrator to 50K. Adjust the TI POUNDS switch to 50,000 pounds, divided by the latitude correction factor as determined from Table 3.

4.2.4.5 Verify that there is a TI meter null indication. If not, adjust the TI CELL 2 SPAN control, R6 on the TI circuit board, for a TI meter null indication, as required. Remove the load from the cell.

4.2.5 Cell 3 Span Test

4.2.5.1 Place the TI load cell number 3 in the force calibrator, using ball and plug adapters as shown in figure 2. Set the TI SELECTOR switch to the CELL 3 position.

4.2.5.2 Adjust the force calibrator for no load and adjust the TI POUNDS switch for 0 pounds.

4.2.5.3 Verify that there is a TI meter null indication. If not, adjust the TI CELL 3 ZERO control for a TI meter null, as required.

4.2.5.4 Adjust the force calibrator to 50K. Adjust the TI POUNDS switch to 50,000 pounds divided by the latitude correction factor, as determined from Table 3.

4.2.5.5 Verify that there is a TI meter null indication. If not, adjust the TI CELL 3 SPAN control, R7 on the TI circuit board, for a TI meter null indication, as required. Remove the load from the cell.

4.2.6 Load Test

4.2.6.1 Place cell 1 in the force calibrator with 0 load and switch the TI CELL SELECT switch to the CELL 1 position.

4.2.6.2 Verify that there is a TI meter null indication. If not adjust TI CELL 1 ZERO CONTROL for a TI meter null indication as required.

4.2.6.3 Using the force calibrator, apply a load of 2000 pounds on load cell 1. Adjust the TI POUNDS switch to obtain a TI meter null indication. This is done as follows, with the TI POUNDS switch starting in the 0-0-0-00 position.

a) Adjust the MSD (left thumbwheel) until the TI meter pointer swings across null indication from right to left.
b) Move MSD back one digit so that the TI meter pointer swings back across null from left to right.
c) Repeat procedures a and b with the second thumbwheel.
d) Repeat procedures a and b with the third thumbwheel.
e) Adjust the final thumbwheel switch for an exact TI meter null indication.
f) Read uncorrected weight directly from TI POUNDS switch.
g) Multiply uncorrected weight by the latitude correction factor, determined from Table 2.
h) Record corrected value in CELL 1 corrected readings column of data sheet Table 4.

4.2.6.4 Remove load from cell 1, and wait 3 minutes. Repeat steps 4.2.6.3 a through h.

4.2.6.5 Repeat steps 4.2.6.3 through 4.2.6.4 using the force calibrator for all dead weight loads indicated below, for cell 1 and record in data sheet, 5000, 10,000, 15,000, 20,000, 30,000, 35,000, 40,000, 45,000 and 50,000.

4.2.6.6 Repeat steps 4.2.6.1 through 4.2.6.5, using cell number 2.

4.2.6.7 Repeat steps 4.2.6.1 through 4.2.6.5 using cell number 3.

4.2.6.8 Subtract the applied force calibrator load from the recorded corrected weig recorded in Table 4 and list the error in each cell at each load, and the zero shifts.

4.2.6.9 Verify that the errors do not exceed the required accuracy of $\pm$.1% of the applied load or 10 pounds, whichever is greater.

4.2.6.10 Disconnect all equipment.