

TB 9-4220-215-35

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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DEPTH GAGES (GENERAL)

Headquarters, Department of the Army, Washington, DC

13 July 1992

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*This bulletin supersedes TB 9-4220-215-35, dated 8 August 1988.

**SECTION 1
IDENTIFICATION AND DESCRIPTION**

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Depth Gages (General). Calibration and Repair Requirements Worksheets, DA Form 3758, and the manufacturers' manuals were used as the prime data sources in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. Model variations are described in appendix.

b. Time and Technique. The time required for this calibration is approximately 2 hours, using the physical technique.

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

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

**SECTION II
EQUIPMENT REQUIREMENTS**

4. Equipment Required. Table 1 identifies the specific equipment to be used in this calibration procedure. This equipment is issued with Secondary Transfer Calibration Standards Set AN/USM-286. 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 1. The accuracies listed in table 1 provide a four-to-one ratio between the standard and the TI.

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 1. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
PNEUMATIC PRESSURE STANDARD	Range: 0 to 210 psi Accuracy: ± 0.06 psi	(MIS-30859)

**SECTION III
CALIBRATION PROCESS FOR
DEPTH GAGES 0-460 FSW AND PRESSURE GAGES -5 TO 30 PSI**

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 1.

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 manufacturers' manuals for this TI.

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

7. Equipment Setup

NOTE

Ensure that pneumatic standard transducers have been zeroed within the last 8 hours.

NOTE

Depth and pressure gages used with diving equipment are exposed to the same oxygen or oxygen mixture as divers breath; therefore, extreme care shall be taken not to contaminate them during calibration. Diving equipment used with oxygen or oxygen mixture shall be cleaned free of flammable material. All equipment utilized in calibration of diving equipment shall be visually inspected to ensure cleanliness and adequacy of strength. No oil, grease, sealing compound, dirt, etc., shall be allowed to enter the depth or pressure gage. Metal parts can be cleaned with a double wash with freon TF. Freon TF has a deteriorating effect on rubber; therefore **do not wash rubber hose** or items containing rubber with freon TF. Rubber hoses can be washed with soap, NSN 7930-00-282-9699, then rinsed with distilled water. Allow all equipment to dry prior to making setup. Pipe thread sealant (teflon tape), NSN 8030-00-889-3534, which is a part of Secondary Transfer Calibration Standards Set AN/GSM-286, can be used to seal potentially leaky connections.

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- a. Connect equipment as shown in figure 1.

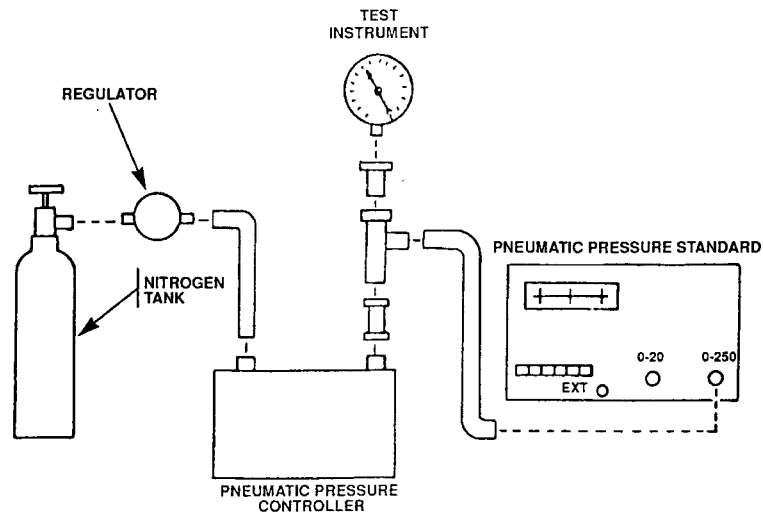


Figure 1. Depth gage - equipment setup.

WARNING

To prevent injury to personnel or damage to equipment, make certain that all components are within the range of the unit to be calibrated and all connections are securely sealed prior to applying pressure to TI. Never attempt to tighten connections with pressure applied.

- b. Position controls on pneumatic pressure standard as indicated in (1) through (7) below:

- (1) Set **POWER** switch to **ON** and allow 1 minute for warm-up.
- (2) Press **SOURCE** pushbutton to **INT**.
- (3) Press **UNITS DISPLAYED** pushbutton to **PSIA**.
- (4) Press **RANGE** pushbutton to **0-250**.
- (5) Press **SENSITIVITY** pushbutton to **HIGH**.
- (6) Press **RESET** pushbutton.
- (7) Press **ZERO** pushbutton.

- c. Adjust regulator fully ccw.

- d. Open nitrogen tank valve and adjust regulator until output gage indicates 210 psi.

- e. Ensure metering and exhaust valves on pneumatic pressure controller are closed.
- f. Open inlet valve on pneumatic pressure controller.
- g. Slowly open shutoff valve on pneumatic pressure controller.

8. Depth Gage 0-460 FSW

a. Performance Check

- (1) Refer to tables 2 through 6 and select appropriate table for TI.
- (2) Operate pneumatic pressure controller for TI indications as listed in appropriate table. The pneumatic pressure standard will indicate within the limits specified.

b. Adjustments. No adjustments can be made.

Table 2. Depth Gage Check 0-230 fsw

Test instrument indications (fsw)	Equivalent pressure (psi) ¹	Pneumatic pressure standard indications (psi)					
		Tolerance ±.25%		Tolerance ±.5%		Tolerance ±1%	
		Min	Max	Min	Max	Min	Max
0	0	-0.256	+0.256	-0.511	+0.511	-1.022	+1.022
20	8.888	8.632	9.144	8.377	9.399	7.866	9.910
40	17.776	17.520	18.032	17.265	18.287	16.754	18.798
60	26.664	26.408	26.920	26.153	27.175	25.642	27.686
80	35.552	35.296	35.808	35.041	36.063	34.530	36.574
100	44.440	44.184	44.696	43.929	44.951	43.418	45.462
120	53.328	53.072	53.584	52.817	52.839	52.306	54.350
140	62.216	61.960	62.472	61.705	62.727	61.194	63.238
160	71.104	70.848	71.360	70.593	71.615	70.082	72.126
180	79.992	79.736	80.248	79.481	80.503	78.970	81.014
200	88.880	88.624	89.136	88.369	89.391	87.858	89.902
220	97.768	97.512	98.024	97.257	98.279	96.746	98.790
230	102.212	101.956	102.468	101.701	102.723	101.190	103.234

¹One fsw equals 0.4444 psi.

Table 3. Depth Gage Check 0-250 fsw

Test instrument indications (fsw)	Equivalent pressure (psi) ¹	Pneumatic pressure standard indications (psi)	
		Tolerance ±1%	
		Min	Max
0	0	-1.111	+1.111
20	8.888	7.777	9.999
40	17.776	16.665	18.887

Table 3. Depth Gage Check 0-250 fsw - Continued

Test instrument indications (fsw)	Equivalent pressure (psi) ¹	Pneumatic pressure standard indications (psi)	
		Tolerance ±1%	
		Min	Max
60	26.664	25.553	27.775
80	35.552	34.441	36.663
100	44.440	43.329	45.551
120	53.328	52.217	54.439
140	62.216	61.105	63.327
160	71.104	69.993	72.215
180	79.992	78.881	81.103
200	88.880	87.769	89.991
220	97.768	96.657	98.879
230	102.212	101.101	103.323
250	111.100	109.989	112.211

¹One fsw equals 0.4444 psi.

Table 4. Depth Gage Check 0-350 fsw

Test instrument indications (fsw)	Equivalent pressure (psi) ¹	Pneumatic pressure standard indications (psi)	
		Tolerance ±1%	
		Min	Max
0	0	-1.555	+1.555
20	8.888	7.733	10.442
40	17.776	16.221	19.331
60	26.664	25.109	28.219
80	35.552	33.997	37.107
100	44.440	42.885	45.995
120	53.328	51.773	54.883
140	62.216	60.661	63.771
160	71.104	69.549	72.659
180	79.992	78.437	81.547
200	88.880	87.325	90.435
220	97.768	96.213	99.323
230	102.212	100.657	103.767
250	111.100	109.545	112.655
280	124.432	122.877	125.987
300	133.320	131.765	134.875
320	142.208	140.653	143.763
350	155.540	153.985	157.095

¹One fsw equals 0.444 psi.

Table 5. Depth Gage Check 0-450 fsw

Test instrument indications (fsw)	Equivalent pressure (psi) ¹	Pneumatic pressure standard indications (psi)	
		Tolerance ±1%	
		Min	Max
0	0	-2.000	+2.000
20	8.888	6.888	10.888
40	17.776	15.776	19.776
60	26.664	24.664	28.664
80	35.552	33.552	37.552
100	44.440	42.440	46.440
120	53.328	51.328	55.328
140	62.216	60.216	64.216
160	71.104	69.104	73.104
180	79.992	77.992	81.992
200	88.880	86.880	90.880
220	97.768	95.768	99.768
230	102.212	100.212	104.212
250	111.100	109.100	113.100
280	124.432	122.432	126.432
300	133.320	313.320	135.320
320	142.208	140.208	144.208
350	155.540	153.540	157.540
380	168.872	166.872	170.872
400	177.760	175.760	179.760
420	186.648	184.648	188.648
450	199.980	197.980	201.980

¹One fsw equals 0.4444 psi.

Table 6. Depth Gage Check 0-460 fsw

Test instrument indications (fsw)	Equivalent pressure (psi) ¹	Pneumatic pressure standard indications (psi)	
		Tolerance ±1%	
		Min	Max
0	0	-2.044	+2.044
20	8.888	6.844	10.932
40	17.776	15.732	19.820
60	26.664	24.620	28.708
80	35.552	33.508	37.596
100	44.440	42.396	46.484
120	53.328	51.284	55.372
140	62.216	60.172	64.260
160	71.104	69.060	73.148
180	79.992	77.948	82.036
200	88.880	86.836	90.924
220	97.768	95.724	99.812

See footnote at end of table.

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Table 6. Depth Gage Check 0-460 fsw - Continued

Test instrument indications (fsw)	Equivalent pressure (psi) ¹	Pneumatic pressure standard indications (psi)	
		Tolerance ±1%	
		Min	Max
230	102.212	100.168	104.256
250	111.100	109.056	113.144
280	124.432	122.388	126.476
300	133.320	131.276	135.364
320	142.208	140.164	144.252
350	155.540	153.496	157.584
380	168.872	166.828	170.916
400	177.760	175.716	179.804
420	186.648	184.604	188.692
450	199.980	197.936	202.024
460	204.424	202.380	206.468

¹One fsw equals 0.4444 psi.

9. Pressure Gage -5 to 30 psi

a. Performance Check. Operate pneumatic pressure controller for TI indication listed in table 7. The pneumatic pressure standard will indicate within the limits specified.

b. Adjustments. No adjustments can be made.

Table 7. Pressure Gage Check -5 to 30 psi

Test instrument indications (psi)	Pneumatic pressure standard indications (psi)			
	±1%		±2%	
	Min	Max	Min	Max
1	.99	1.01	.98	1.02
5	4.95	5.05	4.9	5.1
10	9.9	10.1	9.8	10.2
15	14.8	15.2	14.7	15.3
20	19.8	20.2	19.6	20.4
25	24.7	25.3	24.5	25.5
30	29.7	30.3	29.4	30.6

10. Final Procedure

a. Deenergize and disconnect all equipment.

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

**SECTION IV
CALIBRATION PROCESS FOR
DEPTH GAGES MOUNTED IN RECOMPRESSION CHAMBER**

11. Preliminary Instructions

a. The instructions outlined in paragraphs **11** and **12** 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 1.

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 manufacturers' manuals for this TI.

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

12. Equipment Setup

NOTE

Ensure that pneumatic pressure standard transducers have been zeroed within the last 8 hours.

NOTE

Depth and pressure gages used with diving equipment are exposed to the same oxygen or oxygen mixture as divers breath; therefore, extreme care shall be taken not to contaminate them during calibration. Diving equipment used with oxygen or oxygen mixture shall be cleaned free of flammable material. All equipment utilized in calibration of diving equipment shall be visually inspected to ensure cleanliness and adequacy of strength. No oil, grease, sealing compound, dirt, etc., shall be allowed to enter the depth or pressure gage. Metal parts can be cleaned with a double wash with freon TF. Freon TF has a deteriorating effect on rubber; therefore, **do not wash rubber hose** or items containing rubber with freon TF. Rubber hoses can be washed with soap, NSN 7930-00-282-9699, then rinsed with distilled water. Allow all equipment to dry prior to making setup. Pipe thread sealant (teflon tape), NSN 8030-00-889-3534, which is a part of Secondary Transfer Calibration Standards Set AN/GSM-286, can be used to seal potentially leaky conditions.

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a. Connect equipment as shown in figure 2.

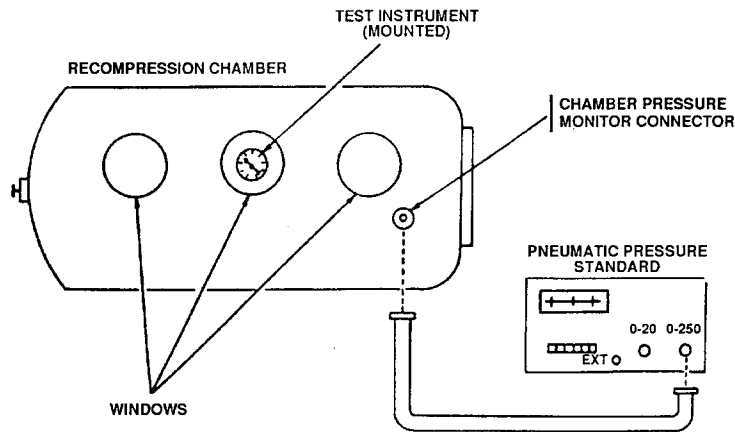


Figure 2. Depth gage (caisson) - equipment setup.

b. Position controls on pneumatic pressure standard as indicated in (1) through (7) below:

- (1) Set **POWER** switch to **ON** and allow 1 minute for warm-up.
- (2) Press **SOURCE** pushbutton to **INT**.
- (3) Press **UNITS DISPLAYED** pushbutton to **PSIA**.
- (4) Press **RANGE** pushbutton to **0-250**.
- (5) Press **SENSITIVITY** pushbutton to **HIGH**.
- (6) Press **RESET** pushbutton.
- (7) Press **ZERO** pushbutton.

13. Depth Gage (Caisson)

NOTE

Recompression chamber is to be operated by shop personnel trained in the operation of diving equipment.

a. Performance Check

- (1) Refer to tables 2 through 6 and select appropriate table for TI.

(2) Operate recompression chamber until TI indications are within tolerances as listed in appropriate table. Pneumatic pressure standard will indicate within limits specified.

b. Adjustments. No adjustments can be made.

14. Final Procedure

a. Deenergize and disconnect all equipment.

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

**APPENDIX
TEST INSTRUMENT IDENTIFICATION**

Range psi/fsw	Manufacturer model (part number)	Accuracy ±(% of FS)	Tolerance ±(psi)	Pressure check tables
-5.5 psi	Dwyer Instruments	1 ¹	.05 ²	7
0-1 psi	Dwyer Instruments	1 ¹	.01 ²	7
0-15 psi	Dwyer Instruments	1 ¹	.15 ²	7
0-30 psi	Wika	2 ¹	.6 ²	7
0-230 fsw	Roylyn 3-D Instruments (25645-23B31)	.25	.256	2
0-230 fsw	Roylyn 3-D Instruments (25545-23B41)	.25	.256	2
0-230 fsw	Roylyn 3-D Instruments (25546-23B31)	.25	.256	2
0-230 fsw	Weskler (G48NH1)	.5	.5110	2
0-230 fsw	Weskler (G-5-81-3)	.5	.5110	2
0-230 fsw	Roylyn 3-D Instruments (25546-23C31)	1	1.022	2
0-230 fsw	Trident Systems	1	1.022	2
0-250 fsw	Diving Systems International (211FTM73W01)	1	1.111	3
0-250 fsw	Roylyn 3-D Instruments (25646-23N21)	1	1.111	3
0-250 fsw	Roylyn 3-D Instruments (25545-23B11)	1	1.111	3
0-250 fsw	Roylyn 3-D Instruments (25545-23B12)	1	1.111	3
0-250 fsw	Roylyn 3-D Instruments (25545-23C41)	1	1.111	3
0-250 fsw	Roylyn 3-D Instruments (25545-23B21)	1	1.111	3
0-250 fsw	Roylyn 3-D Instruments (25546-23B11)	1	1.111	3
0-250 fsw	Roylyn 3-D Instruments (25546-23B21)	1	1.111	3
0-250 fsw	Roylyn 3-D Instruments (25547-23B21)	1	1.111	3
0-250 fsw	Roylyn 3-D Instruments (25544-23B21)	1	1.111	3
0-350 fsw	Roylyn 3-D Instruments (25545-24B21)	1	1.555	4
0-450 fsw	Roylyn 3-D Instruments	1	2	5
0-450 fsw	Unknown ³	1	2	5
0-460 fsw	Robert Shaw	1	2.044	6

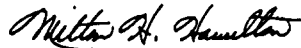
¹±% of reading.

²Zero indication only.

³Owner UIC WDZ1AA, WHKXAA, WHKYAA, WDSNAA, WHO6AA, WHQKTO.

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