*TB 9-6665-286-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR RADIAC SET, AN/PDR-75

Headquarters, Department of the Army, Washington, DC
22 August 2007

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 send in your comments electronically to our E-mail address: 2028@redstone.army.mil or by fax 256-842-6546/DSN 788-6546. For the World Wide Web use: https://amcom2028.redstone.army.mil. Instructions for sending an electronic 2028 can be found at the back of this manual.

*This bulletin supersedes TB 9-6665-286-35, dated 13 March 1995.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Radiac Set AN/PDR-75. TM 11-6665-236-12 and TM 11-6665-236-40 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. None

b. Time and Technique. The time required for this calibration is approximately 2 hours, using the physical and dc and low frequency 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 applications which pertain to this calibration are in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Gamma internal standard	800: ±5 centigray (cGy)
Reader accuracy	Read: ±10 cGy or ±10% whichever is greater Gamma CAL 800: ±10 cGy or ±10% whichever is greater

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 Sets AN/GSM-286, AN/GSM-287, or 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. The following peculiar accessories are also required for this calibration: Power Supply Module, Tektronix Type 500 Series, compatible with Power Supply No. 2, and Maintenance Kit (MK-2512/PDR75) with test report.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
DC POWER SUPPLY NO. 1	Range: 0 to 30 V dc	Elgar, Model DCS40-30EM10 (13589313)
DC POWER SUPPLY NO. 2	Range: 0 to 10 V dc	Tektronix, Type PS503A (MIS-30526/6)
MULTIMETER	Range: -12.008 to +24 V dc Accuracy: ±0.0003 V dc	Hewlett-Packard, Model 3458A (3458A)
OSCILLOSCOPE	Range: 0 to 5V dc Accuracy: ±3%	Agilent, OS-303/G (OS-303/G)

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 TM 11-6665-236-12 and TM 11-6665-236-40 for this TI.

d. When indications specified in paragraphs **8** and **9** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** and **9**. Do not perform power supply check if all other parameters are within tolerance.

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

7. Equipment Setup

WARNING

HIGH VOLTAGE is used or exposed during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions. REDUCE OUTPUT(S) to minimum after each step within the performance check where applicable.

NOTE

The reader and reference dosimeters must be at the same stable temperature during test. Allow reader and reference dosimeters to remain in the same environment for at least 30 minutes prior to testing.

a. Connect equipment as shown in figure 1.

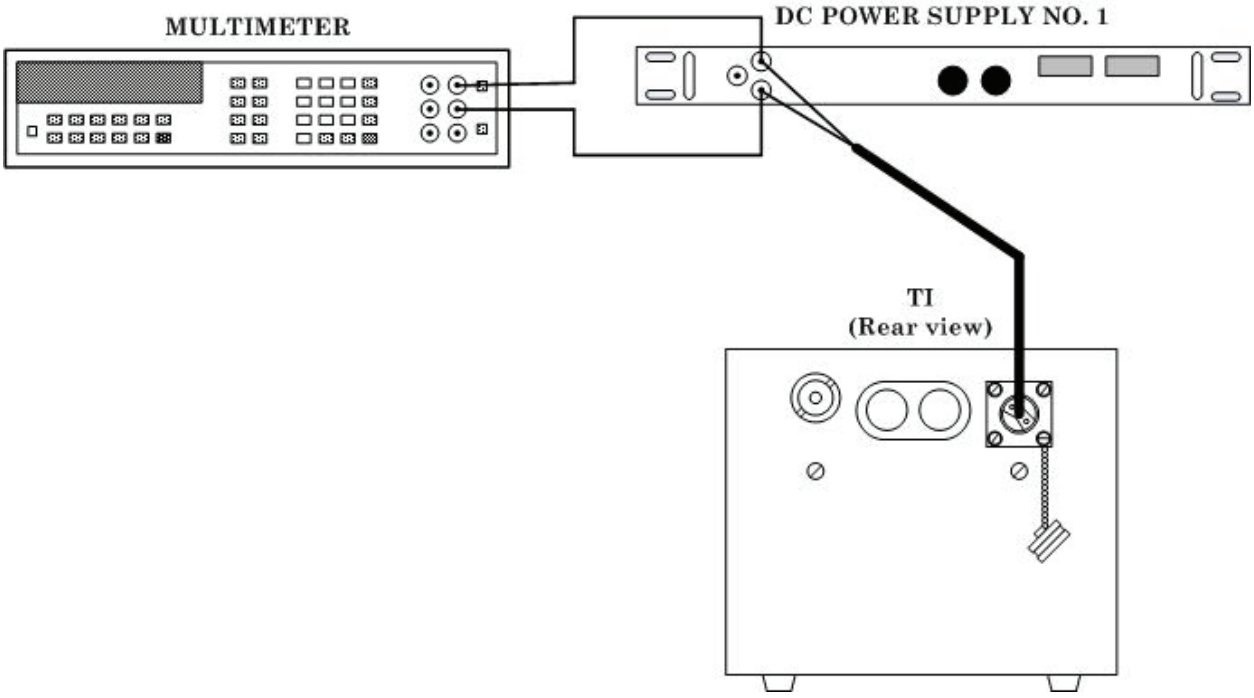

Figure 1. Equipment setup.

b. Adjust power supply No. 1 until multimeter indicates 24 V dc.

c. Position controls as listed in (1) through (3) below:

(1) **DISPLAY** knob to **MAX** (fully cw).
(2) **LAMP** knob to **MIN** (fully ccw).
(3) Selector switch to **SUPPLY**.

d. Press and release **DEPRESS FOR READING** switch. Digital panel meter will read between 200 and 300 and remain lit for 2 to 4 seconds.

e. Loosen transit lock (front panel) one-half turn and raise block.

f. Grasp drawer handle and pull drawer out to its full extent.

g. Lift drawer cover.

h. Adjust **LAMP** control until drawer cover lamp illumination is satisfactory.

NOTE

Ensure that drawer does not contain any dosimeter or other objects on dosimeter LOCATING PLATE (fig. 2).

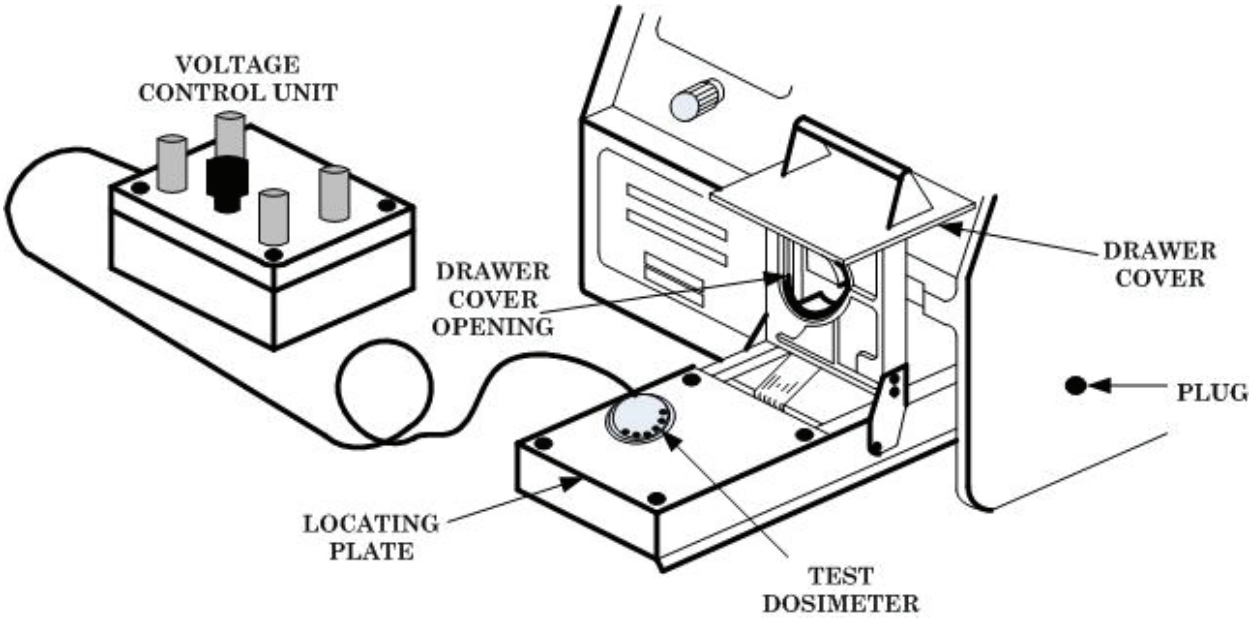

Figure 2. Test dosimeter installation.

i. Lower drawer cover and close drawer.

j. Set selector switch to **NEUTRON CAL 0**.

k. Press and release **DEPRESS FOR READING** switch and, if necessary, adjust **NEUTRON CAL 0** control until digital panel meter indicates 0 ± 1 cGy.

NOTE

Ensure that digital panel meter display is off before pressing **DEPRESS FOR READING** switch or an incorrect reading may result.

l. Set selector switch to **NEUTRON CAL 800**.

m. Press and release **DEPRESS FOR READING** switch and if necessary adjust **NEUTRON CAL 800** control until digital panel meter indicates 800 ± 1 cGy.

n. Repeat **j** through **m** above until **NEUTRON CAL 0** and **800** settings are within tolerance.

8. Gamma Internal Standard

NOTE

Whenever reference dosimeters are used, check humidity indicator on top of dosimeter box. When indicator turns from blue to pink, the disposable desiccant pack is saturated and should be replaced.

a. Note assigned gamma dose for reference dosimeter M2, recorded on chart in maintenance kit lid.

b. Install reference dosimeter M2 into drawer assembly as listed in (1) through (5) below:

(1) Open drawer assembly.

(2) Fit base of M2 onto dosimeter locating plate.

(3) Turn M2 cover ccw to separate it from base.

(4) Set M2 cover aside in a clean place.

(5) Close drawer cover and drawer assembly as far as possible.

c. Set selector switch to **GAMMA CAL 800**.

d. Press and release **DEPRESS FOR READING** switch five times, recording digital panel meter each time.

e. Average the readings recorded in **d** above. If average reading is not within ±10 cGy of the assigned gamma dose for reference dosimeter M2, adjust **GAMMA CAL 800** as close as possible to the assigned gamma dose and repeat **d** above until average reading is within these limits.

f. Remove reference dosimeter M2 from drawer and insert reference dosimeter M1 in drawer.

g. Repeat **7 i** through **n** and **8 a** above for reference dosimeter M1.

h. Set selector switch to **GAMMA CAL 800**.

i. Press and release **DEPRESS FOR READING** switch. If digital panel meter indicates within ± 3 cGy of assigned gamma dose for reference dosimeter M1, proceed to **k** below. If indication is not within specified limits, remove reference dosimeter M1 and repeat **7 i** through **n** above.

j. Reinstall reference dosimeter M1 and repeat **h** and **i** above.

k. Remove reference dosimeter M1 and install reference dosimeter M2. Close drawer assembly.

l. Press and release **DEPRESS FOR READING** switch five times. Record digital panel meter reading each time and then average the readings.

m. Adjust **GAMMA CAL 800** control and repeat **l** above until digital panel meter is as close as possible (within ±5 cGy) to the assigned gamma dose for reference dosimeter.

n. Open drawer assembly fully.

WARNING

Exposure to ultraviolet light is possible when plug is removed from side of reader during gamma internal standard adjustment. Do not look through hole in side of reader while operating **DEPRESS FOR READING** switch. Severe and permanent damage to the eyes may result.

o. Remove PLUG (fig. 2) on right side of TI case, exposing adjusting screw on gamma internal standard.

NOTE

If there is no PLUG on the side, remove the four retaining screws at the corners of TI case. Open case enough to reveal screws on the side. Remove the first screw on top, exposing screw on gamma internal standard.

p. Adjust gamma internal standard, using adjusting screw, while performing **l** above until average reading is between 795 and 805 cGy. Turn screw ccw to increase reading (R).

q. Remove reference dosimeter and close drawer assembly.

r. Install plug removed in **o** above.

9. Reader Accuracy

a. Performance Check

(1) Set selector switch to **NEUTRON CAL 0**.

(2) Press and release **DEPRESS FOR READING** switch. If necessary, adjust **NEUTRON CAL 0** control for 0 ±1 cGy.

(3) Set selector switch to **GAMMA CAL 800**.

NOTE

During the following procedure, ensure that drawer assembly is pulled out of reader as far as it will go. Do not touch or apply any pressure to the drawer assembly during this procedure or inaccurate readings may result.

WARNING

Personal injury may result from failure to close drawer assembly properly. Close drawer assembly by grasping drawer handle firmly with one hand, lowering drawer cover if necessary, and pushing drawer into closed position. The free hand should remain clear of the drawer assembly. Do not touch transit lock with either hand when closing drawer assembly.

(4) Pull drawer out to its full extent.

WARNING

Ultraviolet light may cause severe and permanent damage to the eyes. Operate **DEPRESS FOR READING** switch only when drawer assembly is in full open or full closed position or exposure to ultraviolet light may result.

(5) Press and release **DEPRESS FOR READING** switch 5 times, recording digital panel meter indications each time.

(6) If all recorded readings are not between 790 and 810 cGy, adjust **GAMMA CAL 800** control to 800 ± 1 cGy.

(7) Set selector switch to **READ**.

(8) Connect dc power supply No. 2 to VOLTAGE CONTROL UNIT (fig. 2) (part of maintenance kit) 10 V dc (+) and (-) terminals.

(9) Disconnect multimeter from power supply No. 1 and connect to voltage control unit 10 V dc (+) and (-) terminals.

(10) Adjust dc power supply No. 2 until multimeter indicates between 10 ±1 V dc.

(11) Disconnect multimeter from 10 V dc (+) and (-) terminals and connect to voltage control unit DVM (+) and (-) terminals.

(12) Open drawer assembly and DRAWER COVER (fig. 3).

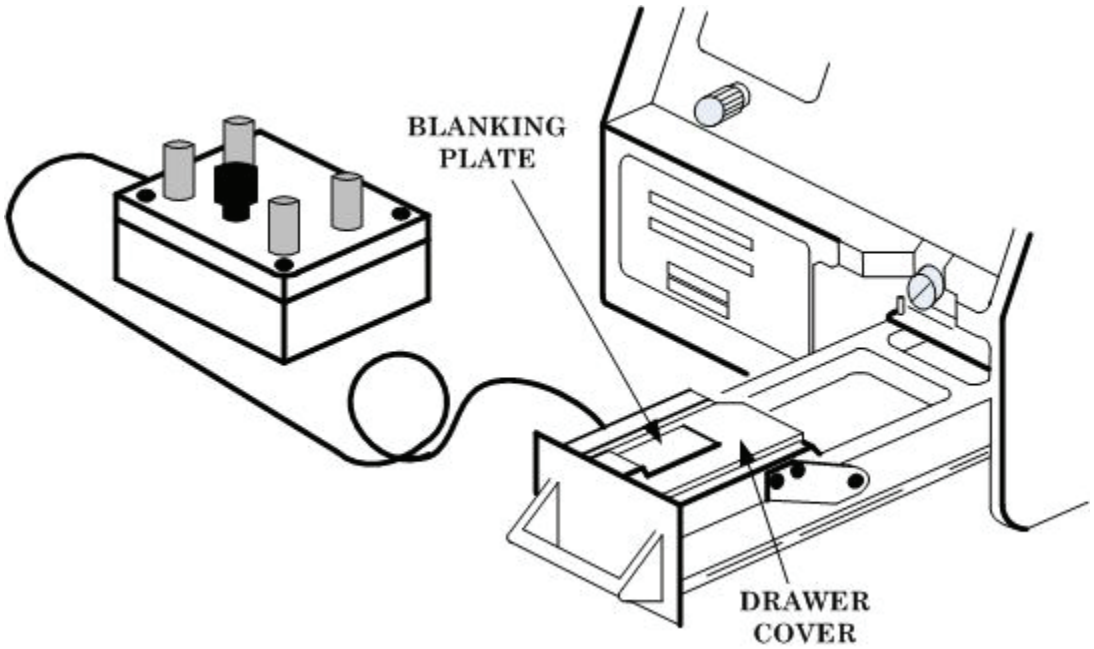

Figure 3. Blanking plate installation.

(13) Position voltage control unit next to TI.

(14) Install TEST DOSIMETER (fig. 2) (part of voltage control unit) on dosimeter locating plate.

NOTE

Position test dosimeter cable so that it will fit into opening in the side of drawer cover when drawer cover is closed.

(15) Close drawer cover.

(16) Install BLANKING PLATE (fig. 3) (part of maintenance kit), so that rectangular window in cover plate is sealed.

NOTE

Blanking plate will hold drawer assembly open just enough so that test dosimeter cable is not pinched when drawer assembly is closed.

(17) Close drawer assembly as far as possible.

(18) Adjust **SET VOLTS** knob (on voltage control unit), until multimeter indicates 5.814 ±0.001 V dc.

(19) Press and release **DEPRESS FOR READING** switch. If digital panel meter does not indicate 800 ±1 cGy, readjust **NEUTRON CAL 800**.

(20) Recheck **NEUTRON CAL 0** as in (1) and (2) above.

(21) Repeat (7) and (18) through (20) above until no further adjustments are needed.

CAUTION

Ensure that reference dosimeters are clean and dry before fitting them on drawer locating plate. Turn cover ccw to remove. Always set cover in a clean place. Do not touch dosimeter inner surfaces. Ensure that dosimeter box stays closed whenever possible, and that the humidity indicator on top of box is colored blue. Moisture, fingerprints, or contamination may cause faulty reference dosimeter readings.

NOTE

Remember to readjust reader every 30 minutes or if ambient temperature changes more that 5 °F (2.8 °C).

(22) Note neutron, gamma, and total dose of M1. Refer to chart attached to lid of maintenance kit.

(23) Open drawer assembly.

(24) Remove blanking plate and test dosimeter.

(25) Fit base of M1 onto dosimeter locating plate.

(26) Close drawer cover.

NOTE

When using blanking plate, drawer cover will not seat against reader even when drawer assembly is pushed closed as far as possible. The drawer assembly may be considered fully closed in this position, provided blanking plate has been properly installed.

(27) Reinstall blanking plate so that rectangular window in drawer cover is sealed.

(28) Close drawer assembly as far as possible.

NOTE

Blanking plate will hold drawer assembly open slightly.

(29) Set selector switch to **GAMMA CAL 800**.

(30) Press and release **DEPRESS FOR READING** switch five times, recording each reading. Average the readings and record average value.

(31) Set selector switch to **READ**.

(32) Press and release **DEPRESS FOR READING** switch.

(33) Take five consecutive readings. Average the readings and record the average value.

(34) Calculate difference between (30) and (33) above. If the difference is not within ±10 cGy or ±10%, which ever is greater of assigned "NEUTRON" dose listed in chart on maintenance kit lid, perform **b** (1) through (24) below.

(35) Open drawer assembly and remove blanking plate.

(36) Close drawer assembly.

(37) Set selector switch to **GAMMA CAL 800**.

(38) Press and release **DEPRESS FOR READING** switch.

(39) Take five consecutive readings. Average the readings and record the average value.

(40) The average value will be within ±10 cGy or ±10%, whichever is greater, of the "GAMMA" dose listed in chart on maintenance kit lid.

(41) Set selector switch to **READ**.

(42) Press and release **DEPRESS FOR READING** switch.

(43) Take five consecutive readings. Average the readings and record the average value.

(44) If average value is not within ±10 cGy or ±10%, whichever is greater, of the "TOTAL" dose listed in chart on maintenance kit lid, perform **b**(25) through (32) below.

(45) Open drawer assembly and lift drawer cover.

(46) Turn M1 cover onto base.

(47) Remove dosimeter from drawer assembly.

NOTE

Ensure that base and cover of reference dosimeter are clean, dry, and undamaged before reassembling.

NOTE

Remember to keep dosimeter box closed whenever possible.

(48) Repeat technique of (23) through (47) above for remaining reference dosimeters M2 through M6.

(49) When all reference dosimeters have been read and readings are within limits, return dosimeter box to maintenance kit.

b. Adjustments

NOTE

Perform **10 a** (1) through (4) below.

(1) Open drawer and remove blanking plate and reference dosimeter.

(2) Install TEST DOSIMETER (fig. 2) and BLANKING PLATE (fig. 3) into drawer assembly. Close drawer.

(3) Turn **GAMMA CAL 800** adjust fully ccw.

(4) Adjust **SET VOLTS** control (voltage control unit) until multimeter indicates 1.577 ±0.001 V dc.

(5) Press and release **DEPRESS FOR READING** switch.

(6) Adjust **NEUTRON CAL 0** until digital panel meter indicates 5 ±1 cGy.

(7) Using thermometer (part of maintenance kit), measure temperature of TI front panel between **DEPRESS FOR READING** switch and selector switch**.**

(8) Record front panel temperature (temperature must be between 59 and 86 °F (15 and 30 °C).

(9) Note voltage that corresponds to front panel temperature in (8) above, using table 3 below.

(10) Adjust **SET VOLTS** knob on voltage control unit until multimeter indicates within ±0.001 V of voltage noted in (9) above.

Table 3. Neutron Calibration 800 Standard Output Voltage as a Function of Temperature

Temperature (°F)	Neutron calibration 800 standard output (V dc)	Temperature (°C)	Neutron calibration 800 standard output (V dc)
59	5.578	15.0	5.578
60	5.591	15.5	5.590
61	5.604	16.0	5.602
62	5.617	16.5	5.613
63	5.630	17.0	5.625
64	5.644	17.5	5.637

Table 3. Neutron Calibration 800 Standard Output Voltage as a Function of Temperature - Continued

Temperature (°F)	Neutron calibration 800 standard output (V dc)	Temperature (°C)	Neutron calibration 800 standard output (V dc)
65	5.657	18.0	5.649
66	5.670	18.5	5.661
67	5.683	19.0	5.672
68	5.696	19.5	5.684
69	5.709	20.0	5.696
70	5.723	20.5	5.708
71	5.736	21.0	5.720
72	5.749	21.5	5.732
73	5.762	22.0	5.743
74	5.775	22.5	5.755
75	5.788	23.0	5.767
76	5.801	23.5	5.779
77	5.814	24.0	5.791
78	5.827	24.5	5.802
79	5.841	25.0	5.814
80	5.854	25.5	5.826
81	5.867	26.0	5.838
82	5.880	26.5	5.850
83	5.893	27.0	5.861
84	5.906	27.5	5.873
85	5.919	28.0	5.885
86	5.932	28.5	5.897
- - -	- - -	29.0	5.908
- - -	- - -	29.5	5.920
- - -	- - -	30.0	5.932

(11) Press and release **DEPRESS FOR READING** switch.

(12) Adjust **NEUTRON CAL 800** until digital panel meter indicates 800 ±1 cGy.

(13) Set selector switch to **NEUTRON CAL 800**.

(14) Press and release **DEPRESS FOR READING** switch five times, recording digital panel reading each time.

(15) Average the reading recorded in (14) above.

(16) Average reading will be between 778 and 822 cGy.

(17) Set selector switch to **READ**.

(18) Adjust **SET VOLTS** knob (on voltage control unit) until multimeter indicates 1.577 ±0.001 V dc.

(19) Press and release **DEPRESS FOR READING** switch five times, recording digital panel reading each time.

(20) Average the readings and recorded the average value.

(21) If average value is not between 4 and 6 cGy readjust **NEUTRON CAL 0** until average digital panel meter indication is between 4 and 6 cGy. Repeat (18) through (20) above.

(22) Set selector switch to **NEUTRON CAL 0** and while pressing and releasing the **DEPRESS FOR READING** switch, adjust RV201 (fig. 4) until digital panel meter indicates between 4 and 6 cGy (R).

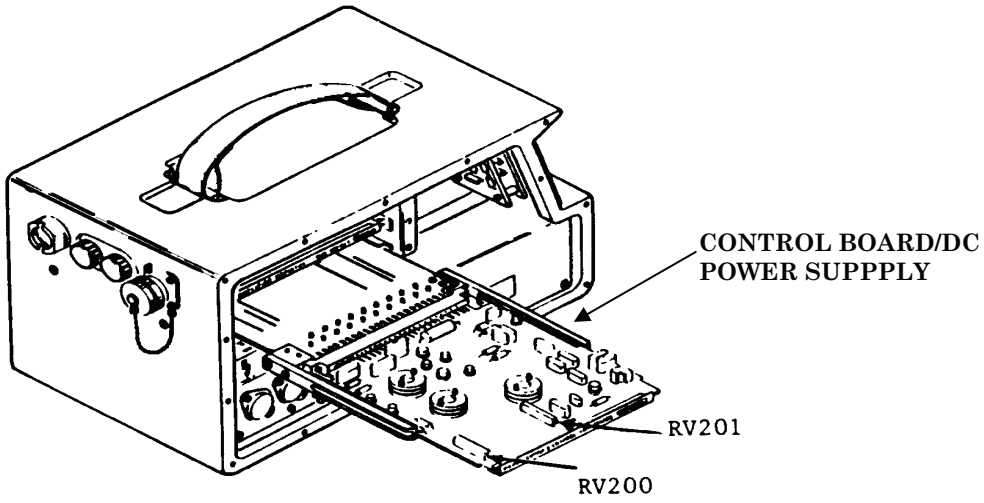

Figure 4. Reader adjustment power supply and control board location.

(23) Remove test dosimeter and blanking plate. Close drawer fully.

(24) Repeat **9 a** (2) through (38) above.

(25) Set selector switch to **GAMMA CAL 800**.

NOTE

Perform the following procedure with amplifier board installed directly in reader. Do not use extender board.

(26) Connect oscilloscope to R120 (fig. 5) (end closest to edge of amplifier board) and ground to SKD bracket on amplifier board (fig. 5), using probe supplied with oscilloscope.

(27) Install reference dosimeter M2 in TI.

NOTE

During the following step, allow at least 4 seconds between each operation of **DEPRESS FOR READING** switch to permit reader to recycle.

(28) Press and release **DEPRESS FOR READING** switch repeatedly.

NOTE

Make certain trigger level is as close to baseline as possible. To keep trace/pulse as steady as possible, use oscilloscope EXT TRIG input. Connect EXT TRIG input to R120 (fig. 5) along with oscilloscope input.

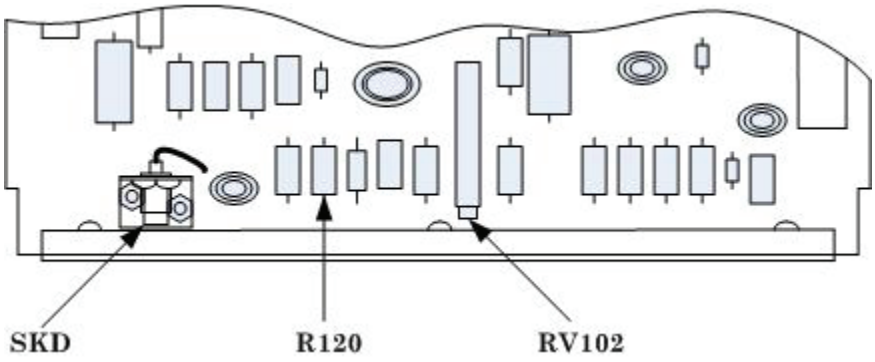

Figure 5. Gamma channel adjustments - amplifier board.

(29) Adjust oscilloscope to obtain a pulse trace with a known zero volt baseline (pulse height approximately 5 V, width less than 1 mS).

(30) If positive pulse amplitude, with reference to zero volt, is not 0.006 times assigned gamma dose for M2 (example: 4.8 V for an M2 with a nominally assigned value of 800 cGy) when **DEPRESS FOR READING** switch is pressed, adjust RV102 (fig. 5) until positive pulse amplitude is 0.006 times assigned gamma dose for reference dosimeter M2 (R).

(31) Disconnect oscilloscope.

(32) With reference dosimeter used in **9 a** (48) above installed, repeat **9 a** (40) through (48) above.

10. Power Supply

WARNING
HIGH VOLTAGE

Potentials of up to 1200 V dc may be present within the EHT power supply and flash unit and at terminal 606 on the EHT power supply. This high voltage may be present even when reader is not operating or is disconnected from its power source. General support maintenance personnel must not remove side panel of reader or flash unit cover unless specifically instructed to do so. Death or serious injury may result from failure to comply with this warning.

NOTE

Do not perform power supply check if all other parameters are within tolerance.

a. Performance Check

(1) Deenergize TI and dc power supply No. 1.

(2) Remove side panel from TI. Do not remove ground wire.

(3) Remove dc power supply and control board (fig. 4).

(4) Reinstall DC POWER SUPPLY and CONTROL BOARD (fig. 4), using extender board supplied with maintenance kit.

(5) Connect multimeter to dc power supply No. 1.

(6) Energize dc power supply No. 1 and adjust for 24 V dc indication on multimeter.

(7) Disconnect multimeter from dc power supply No. 1.

(8) Set selector switch to **NEUTRON CAL 800**.

(9) Connect multimeter to TP6 (-) and TP18 (+) on extender board. If multimeter does not indicate between -11.992 and -12.008 V dc, perform **b** below.

(10) Deenergize TI and dc power supply.

(11) Remove DC POWER SUPPLY and CONTROL BOARD (fig. 4) from extender board and reinstall into TI.

b. Adjustments. Adjust RV200 (fig. 4) until multimeter indicates between -11.992 and -12.008 V dc (R).

11. Final Procedure

a. Deenergize and disconnect all equipment and reinstall protective cover on TI.

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

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0717804

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342300, requirements for calibration procedure TB 9-6665-286-24.

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.