TB 11-6625-2478-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR TEST SET, CONTROL MONITOR-RECORDING HEAD AN/AYM-9

Headquarters, Department of the Army, Washington, D.C.
31 January 1973

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SECTION I
GENERAL

1. Purpose and Scope. **a. This bulletin provides information for the periodic calibration of Test Set, Control Monitor-Recording Head AN/AYM-9 which is used by maintenance calibration personnel. Since calibration personnel are trained and qualified in the use of calibration test and measuring equipment, detailed instructions concerning the operation and use of these equipments are not contained in this bulletin.**

b. This bulletin contains illustrations that locate all controls and components used in this calibration procedure. Equipment ground connections are not necessarily shown in the diagrams.

2. Reporting of Technical Bulletin Improvements. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (&commended Changes to Publications) and forwarded direct to Commander, U S Army Electronics Command, ATTN: AMSEL-MA-CRA, Fort Monmouth, NJ 07703.

3. Description. a. Test Set, Control Monitor-Recording Head AN/AYM-9 (hereinafter referred to as the CM-RH test set), is used to test and record operational serviceability of Control-Monitor C-8338/AYA-10 (hereinafter referred as the control-monitor) of an AN/AYA-10 Airborne Data Annotation System. Bench testing includes an operational check of the CRT monitor assembly, testing switch circuitry, and testing recording head assemblies used in airborne sensor and camera systems. Ensure that calibration procedures are performed in the environmental conditions shown in table 1.

Table 1. Calibration Environmental Conditions

Environment	Condition
Temperature	55 to 91°F or 13 to 33°C
Atmospheric Pressure	26.5 to 33.0 inches of Mercury
Relative Humidity	20 to 80 percent

b. The test set consists of two hand carried combination cases. Case 1, Monitor Input Simulator SM-627/AYM-9 (hereinafter referred to as monitor input simulator) contains all electronic circuits mounted on a removable chassis. The major portion of the signal generating circuits are contained on seven printed circuit cards. The remaining circuitry consists of the panel controls, indicators, and power transformer. Case 2, Test Set Case CY-7ll7/AYM-9 contains a camera, recording head assembly holding fixture, cable assemblies, and accessories.

4. General Instructions. a. Calibration Reporting. During the performance of the calibration procedures included in this bulletin, annote DA Form 2416 (Calibration Data Card) in accordance with TM 38-750.

b. Removal. Do not remove any of the subassemblies to be calibrated from its protective case unless necessitated by equipment connections and/or components to be adjusted which cannot be reached from the external parts of the CM-RH test set.

c. Test Instrument. The CM-RH test set will be referred to as "test instrument" throughout this procedure.

d. Program Data.

Calibration interval	In accordance with TB 750-236
Time required for calibration	2.5 hours (approx.)
Calibration level -	Maintenance

SECTION II
CALIBRATION

5. Equipment Required. a. Table Explanation. Table 2 contains calibration equipment accessories required to properly calibrate the CM-RH test set. **The item column gives a reference item number and the generic name; the minimum use specifications column gives the parameters, range, and accuracy required by the calibration procedures· the calibration equipment column contains examples of** equipment that meets or exceeds the criteria shown in the minimum use specifications column.

NOTE

Minimum use specifications are the principal parameters required for performance of the 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.

b. *Selected Equipment.* The calibration equipment utilized in this procedure was 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 Required

Item	Minimum use specification	Calibration equipment[1]
1. DIFFERENTIAL VOLTMETER	Range; 0 to 500 volts dc Accuracy: ±0.05% Range: 8 to 40 volts ac Accuracy: ±0.2%	ME-202B/U or H-P 741B
2. ELECTRONIC COUNTER	Range: 99 Hz to 6.56 kHz	AN/USM-207A or H-P 5245L
3. OSCILLOSCOPE	Dual Channel Band width: dc to 50 MHz, dc coupled, 2 Hz to 50 MHz, ac coupled Risetime. Less than 7 microseconds Deflection range. 5mV/div to 20V/div Triggering: A, B or A + B on displayed signal Sweep range: 0.1 microsec/div to 5 sec/div,W/vernier Sweep modes. Normal, Automatic and Single	AN/USM-281A or H-P 180F
4. POWER SUPPLY	Variable 4.6 to 5.0 volts dc	PP-3940/G
5. FACILITIES POWER	103 to 127 volts ac, 380 to 420 Hz, single phase	N/A

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6. Preliminary Procedures. a. Depress core of relief valve on monitor input simulator Case 1.

b. Unlatch and remove case 1 cover.

c. Remove the monitor input simulator front panel from base of combination case 1 and set controls to the following positions:

(1) Set FOCAL LENGTH-NORMAL to NORMAL.

(2) Set RESISTOR TEST A to OFF.

(3) Set RESISTOR TEST B to OFF.

(4) Set SWITCH TEST-RESISTOR TEST +5VDC POWER to SWITCH TEST.

(5) Set RHA TEST SELECT to KA60 IR/SLAR CDM.

(6) Set RHA MODE to CONTINUOUS.

(7) Set BCD THUMBWHEEL AND PANEL SWITCH TEST to OFF'.

(8) Set DECIMAL THUMBWHEEL SWITCH TEST to OFF.

(s) Set DECIMAL THUMBWHEEL AND PANEL SWITCH TEST to OFF'.

(10) Set ON-OFF SWITCH to OFF.

d. Remove cable assembly W-3 from combination case 2, and connect to POWER receptacle J4 on monitor input simulator panel and to 115 volt ac, 400 Hz facilities power supply.

c. Activate 115 volt ac, 400 Hz power supply.

f. Place ON-OFF switch to ON and observe the following lamps for illumination: RHA HIGH VOLTAGE; —522VDC, +500VDC, —80VDC, and

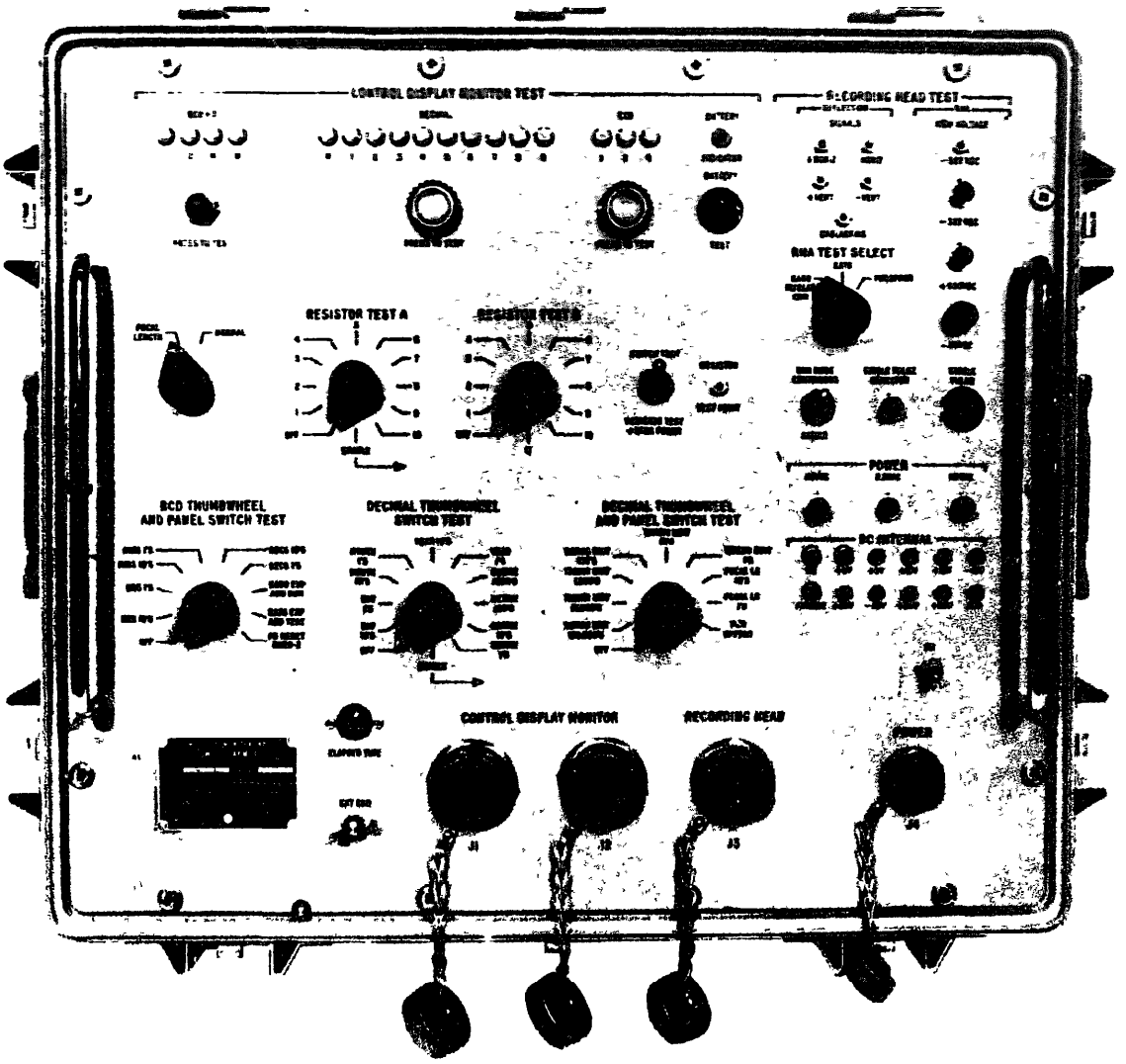

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Figure 1. Simulator Monitor Input SM-627/AYM-9 control panel.

POWER; 115VDC, 63VAC, 115VAC, and DC INTERNAL; GO, and +5V.

NOTE

If any lamp in step f fails to light or if FAILURE lamp lights at any time during calibration, terminate calibration **procedures** and return **the test set to** the **using** organization for **repair disposition**.

7. Low Regulator, Board A4.

NOTE

Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirement is not met, before proceeding. When measuring ac and dc voltages of the test set, use the differential voltmeter. The differential voltmeter is specified for voltage measurements instead of the multimeter to ensure accuracy when performing calibration procedures. All readings are to be taken with respect to ground, except where otherwise specified. Set all test equipment controls to settings required for measuring voltage prior to connecting test equipment to test points. When performing high voltage measurements, deactivate the test set,

make all necessary scale settings, connect the test equipment leads to the circuit, and activate the test set. The multimeter cannot provide the degree of accuracy needed for taking voltage measurements, the multimeter is used only for resistance measurements.

a. Performance Check.

(1) Connect voltmeter positive (red) lead to test point A4TP1-1 and negative (black) lead to test point A4TP1-5 (fig. 2).

(2) Observe that voltmeter indicates between +84.75 and +85.30 volts dc.

(3) Set ON-OFF switch to OFF. Lamps RHA HIGH VOLTAGE; -522VDC, +500VDC, —80VDC, and POWER; 115VDC, 6.3VAC, 115VAC, and DC INTERNAL: GO, and +5 shall extinguish.

(I) Connect voltmeter positive (red) lead to test point A4TP1-8 (fig. 2) and set ON-OFF switch to ON; observe that voltmeter indicates between +4.8 and +5.2 volts dc, and all lamps of step (3) illuminate.

(5) Set ON-OFF switch to OFF; all lamps of step (3) extinguish.

(6) Remove voltmeter leads.

b. Adjustments.

(1) If voltmeter does not indicate requirements of a (2), adjust screw adjustment potentiometer A4R4 (fig. 2) until voltmeter indicates between +84.70 to +85.30 volts dc.

8. Low Voltage Regulator, Board A1. a. Performance check.

(1) Connect voltmeter positive (red) lead to test point A1TP1-6 and negative (black) lead to test point A1TP1-7 (fig. 2).

(2) Set ON-OFF switch to ON. Lamps RHA HIGH VOLTAGE; -522 VDC, +500VDC, -80VDC, and POWER; 115VDC, 6.3VAC, 115VAC, and DC INTERNAL; GO and +5 shall illuminate.

(3) Observe that voltmeter indicates between -24.99 and -25.01 volts dc.

(4) Move positive (red) lead of voltmeter to test point A1TP1-4.

(5) Observe that voltmeter indicates between +14.995 and +15.005 volts dc.

(6) Move positive (red) lead of voltmeter to DC INTERNAL +115V J13 test point on the front panel; observe that voltmeter indicates between +103 and +127 volts dc.

(7) Set ON-OFF switch to OFF; all lamps of step (2) shall extinguish.

(8) Remove voltmeter leads.

b. Adjustments.

(1) If voltmeter does not indicate between —24.99 and —25.01 volts dc during step a (3), adjust screw adjustment potentiometer A1R10 (fig. 2).

(2) If voltmeter does not indicate between +14.995 and +15.005 volt dc during step a (5), adjust screw adjustment potentiometer A1R8 (fig. 2).

9. Low Voltage Regulator, Board A3. *a. Performance Check.*

(1) Connect voltmeter positive (red) lead to test point A3TP1-6 and negative (black) lead to test point A3TP1-7 (fig 2).

(2) Set ON-OFF switch to ON. Lamps RHA HIGH VOLTAGE; -522VDC, +500VDC, -(80VDC, and POWER; 115VDC, 6.3VAC, 115VAC, and DC INTERN& GO, and +5 shah illuminate.

(3) Observe that voltmeter indicates between -14.995 and -15.005 volts dc.

(4) Set ON-OFF switch to OFF; all lamps of step (2) shall extinguish.

(5) Move voltmeter positive (red) lead to test point A3TP1-4 (fig 2).

(6) Set ON-OFF switch to ON; all lamps of step (2) shall illuminate.

(7) Observe that voltmeter indicates between +24.99 and +25.01 volts dc.

(8) Set ON-OFF switch to OFF; all lamps of step (2) shall extinguish.

(9) Move voltmeter positive (red) lead to DC INTERNAL +10V J16 test point on the front panel, and set ON-OFF switch to ON; observe that voltmeter indicates between +8.5 and +11.5 volts dc, and all lamps of step (2) illuminate.

(10) Set ON-OFF switch to OFF; all lamps of step (2) shall extinguish.

(11) Remove voltmeter leads.

b. Adjustments.

(1) If voltmeter does not indicate between -14.995 and -15.005 volts dc during step a (3), adjust screw adjustment potentiometer A3R10 (fig. 2).

(2) If voltmeter does not indicate between +24.99 and +25.01 volts dc during a (7), adjust screw adjustment potentiometer A3R8 (fig. 2).

10. High Voltage Power Supply 3A9. a. Performance Check.

(1) Connect voltmeter positive (red) lead to -442VDC test point J2 on power supply 3A9 (fig. 4) and connect negative (black) lead to GND test point J6 on front panel.

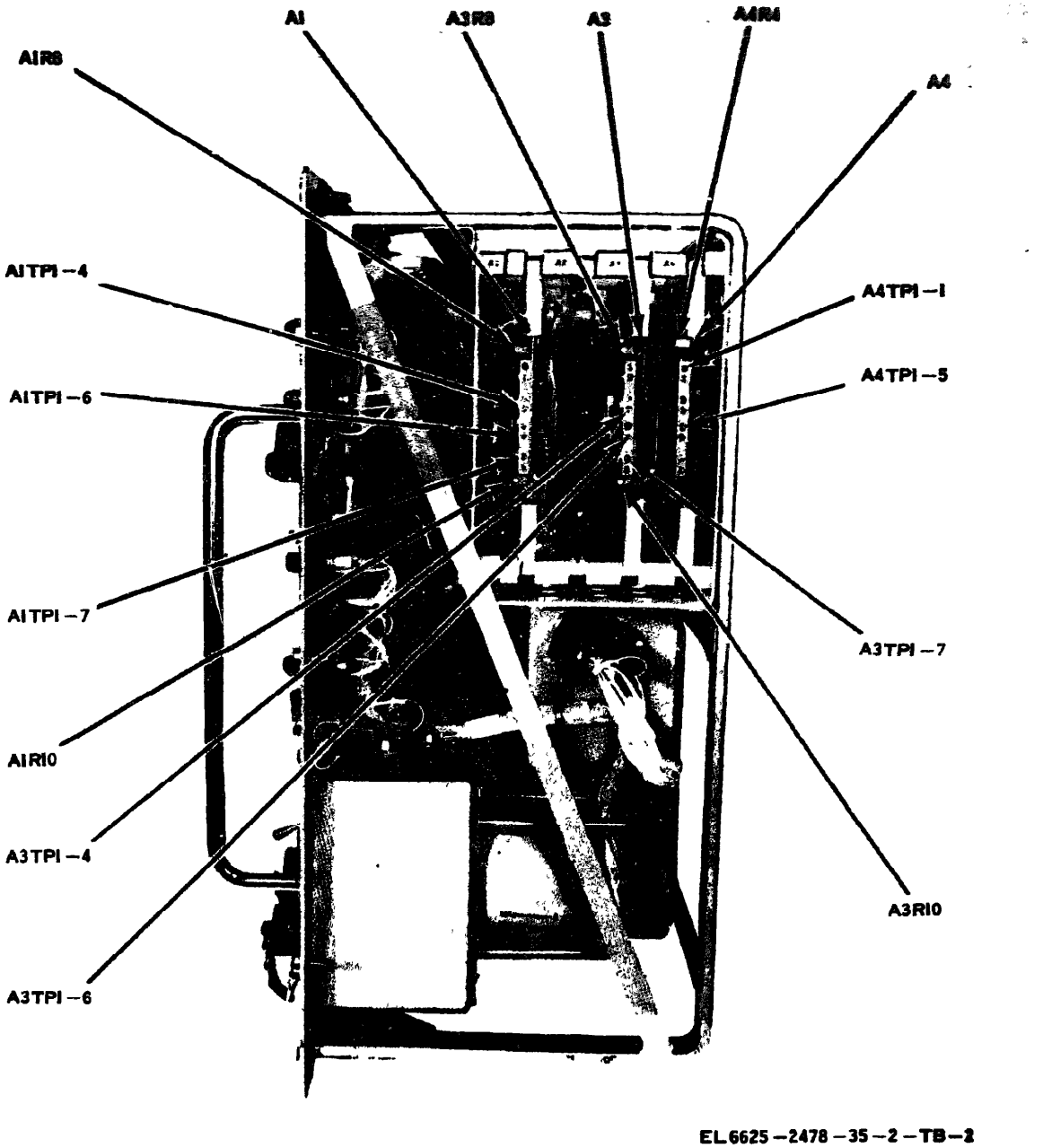

Figure 2. Low voltage boards A1, A3 and A4 adjustment and test points, left side.

(2) Set ON-OFF switch to ON. Lamps RHA HIGH VOLTAGE; -522VDC, +500VDC, -80VDC, and POWER; 115VDC, **6.3VAC, 115VAC,** and DC **INTERNAL;** GO, and -1-**5 shall illuminate.**

(3) **Observe that** voltmeter **indicates between** -437.58 and -446.42 volts dc.

(4) **Set ON-OFF swi**tch to **OFF; all lamps** of **step** (2) **shall extinguish.**

CAUTION

Prior to performing steps (5) through (9), remove the negative terminal grounding link on the voltmeter.

(5) Connect voltmeter positive (red) lead (floating input) to —442VDC test point J2 on power supply 3A9 (fig. 4) and connect negative

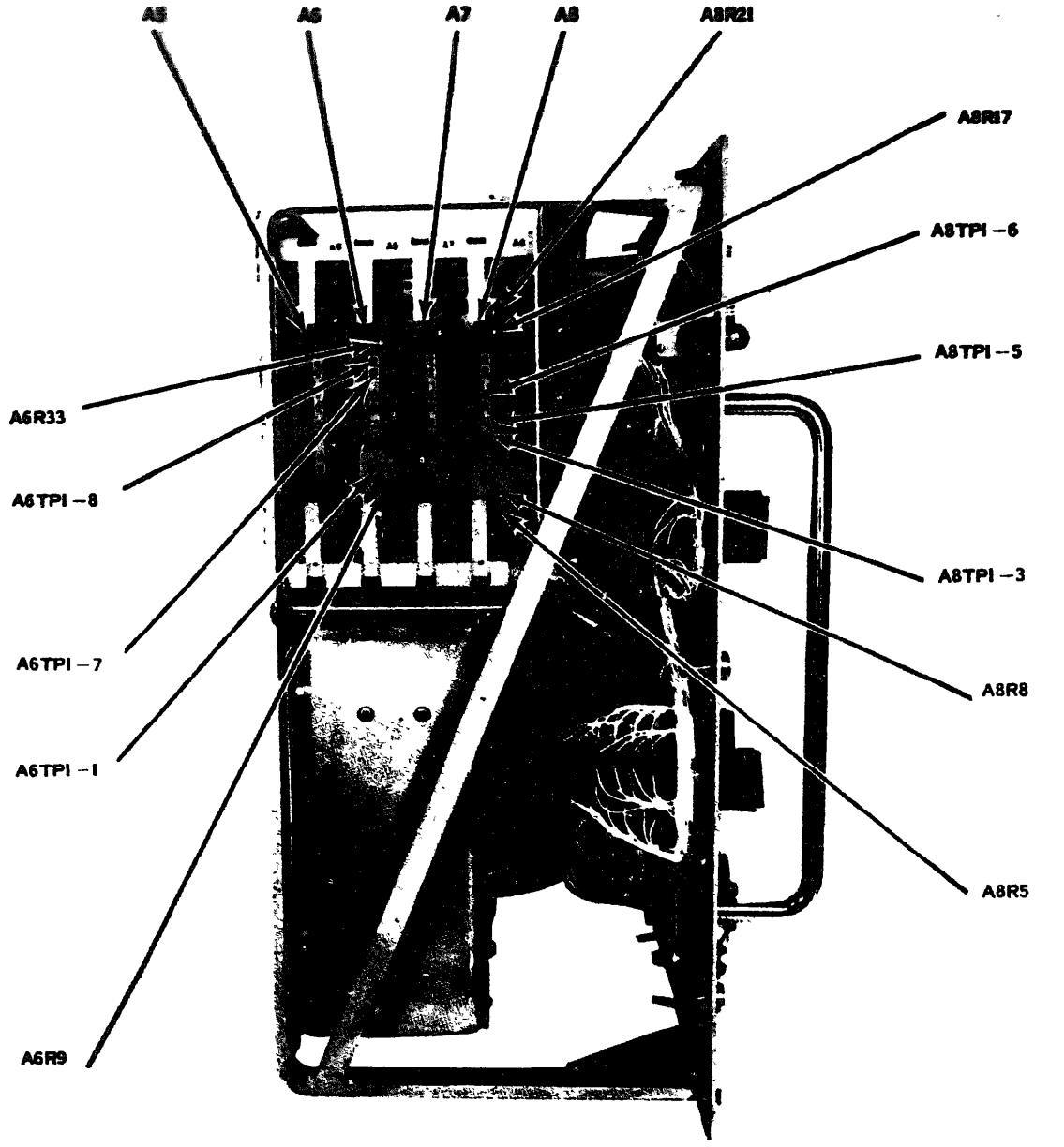

Figure 3. Pulse generator board A6 and deflection amplifier board AS adjustment and test points, right side.

(black) lead to RHA-HIGH VOLTAGE —522VDC test point J11 on front panel.

(6) Set ON-OFF switch to ON; all lamps of step (2) shall illuminate.

(7) Observe that voltmeter indicates between —79.60 and —80.40 volts dc.

(8) Set ON-OFF switch to OFF; all lamps of step (2) shall extinguish.

(9) Remove voltmeter leads.

b. *Adjustments.*

(1) If voltmeter does not indicate between —437.58 and —446.42 volts dc, during a (3), adjust

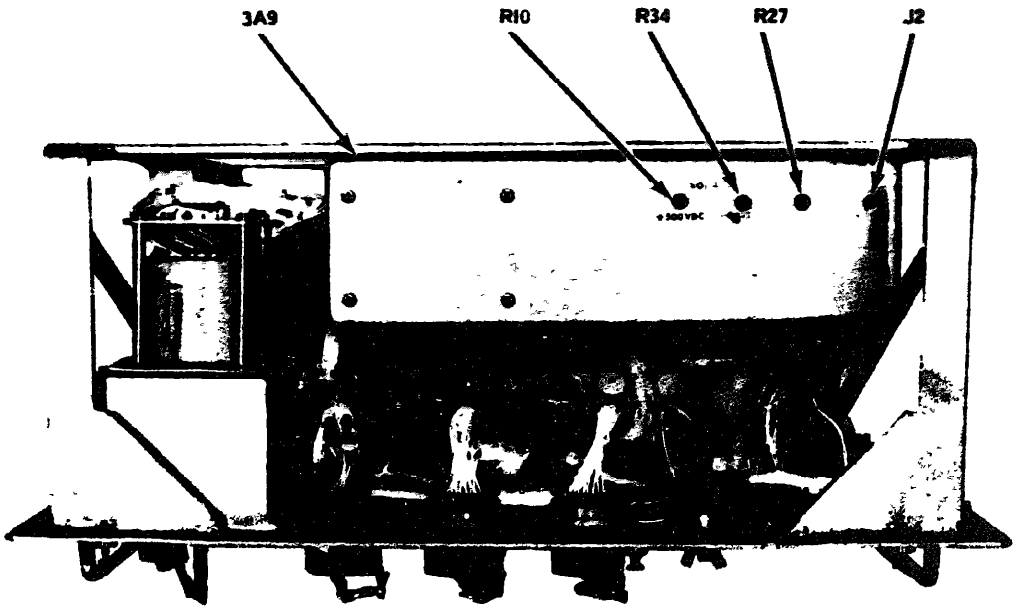

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Figure 4. High voltage supply 3A9 adjustment and test points, bottom side.

-422VDC potentiometer adjustment screw R27 (fig. 4).

(2) If voltmeter does not indicate between -79.60 and -80.40 volts dc during a (I), adjust -80VDC potentiometer adjustment screw R34 (fig. 4).

11. +500 Volt DC Section Output. a. Performance Check

(1) Connect voltmeter positive (red) lead to DEFLECTION SIGNALS +HORIZ test point J7 and negative (black) lead to GND test point J6 on front panel.

(2) Set ON-OFF switch to ON. Lamps RHA HIGH VOLTAGE; -522VDC, +500VDC, +80VDC, and POWER 115VDC, 6.3VAC, 115VAC, and DC INTERNAL; GO, and +5 shall illuminate.

(3) Observe that voltmeter indicates between **+494.99 and +499.99 volts dc.**

(4) Set ON-OFF switch to OFF; all lamps of step (2) shall extinguish.

(5) Remove voltmeter leads from test points.

b. ***Adjustments.*** **If voltmeter does not indicate between +494.99 and +499.99 volts dc during a (3), adjust +500VDC potentiometer adjustment screw R10 (fig. 4).**

12. Pulse Generator, Board A6. a. Performance check.

(1) To check the battery test circuit, adjust test power supply for +4.445 to +4.455 volt dc output.

(2) Connect positive lead of test power supply to test point A6TP1-1 and negative lead to test point A6TP1-8 (fig. 3).

(3) Connect voltmeter positive (red) lead to pin 8 on printed circuit board **extender** card 2A4 (fig. 5).

(4) Connect negative (black) lead to test point A6TP1-8 (fig. 3).

(5) Set ON-OFF switch to ON. Lamps RHA HIGH VOLTAGE; —522VDC, +500VDC, —80VDC, and POWER; 115VDC, 6.3VAC, 115VAC, and DC INTERNAL; GO, and +5 shall illuminate.

(6) Observe that voltmeter reads greater than +4.0 volts dc.

(7) Readjust test power supply for +4.9 to +5.0 volt dc output.

(8) Press and hold BATTERY TEST switch; BATTERY INDICATOR lamp shall illuminate.

(9) Slowly decrease test power supply voltage output while observing BATTERY INDICATOR

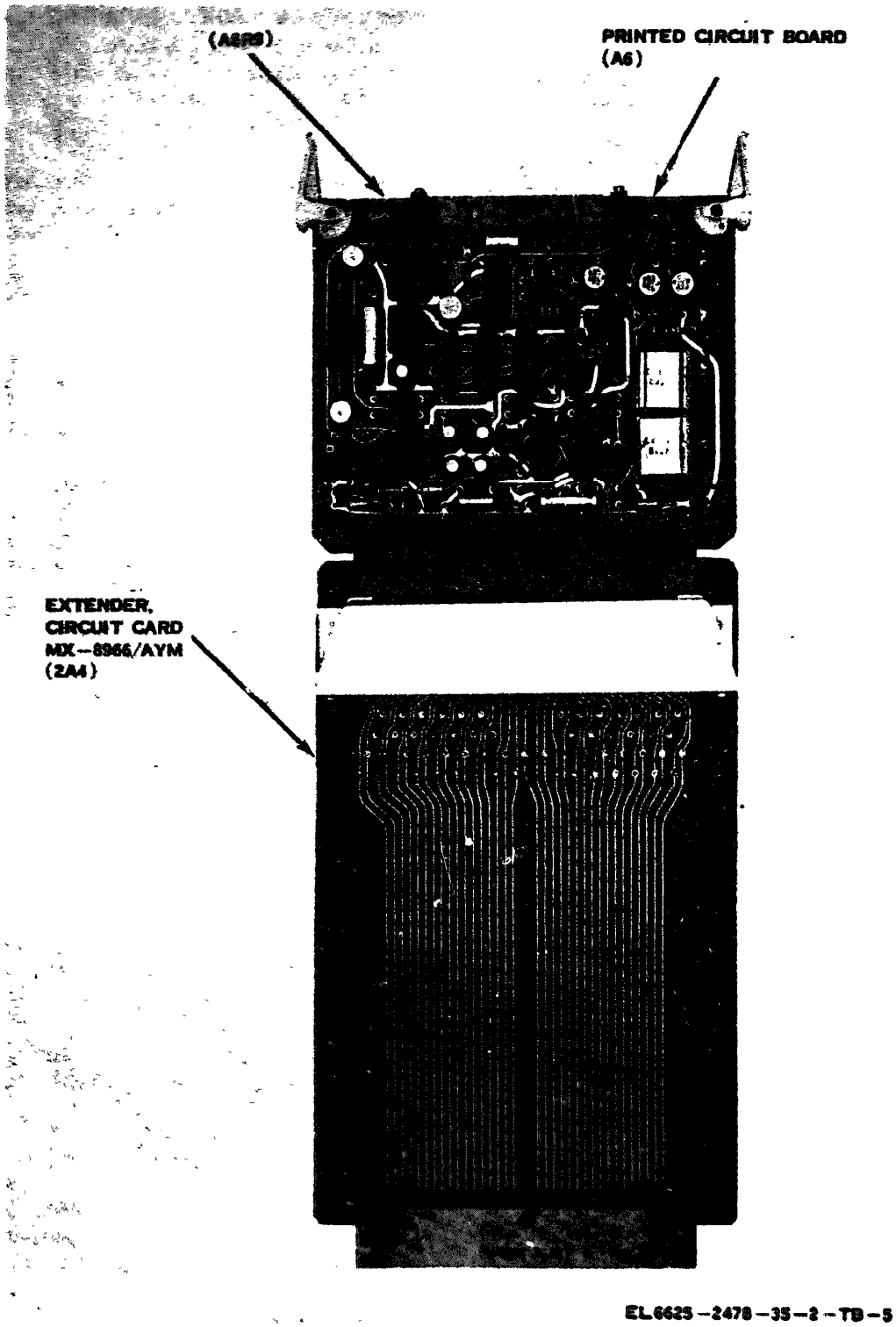

Figure 5. Printed circuit board A6 and extender circuit card 2A4.

lamp; the lamp shall extinguish at a voltage reading from +4.4 to +4.5 volts dc.

(10) Release BATTERY TEST switch.

(11) Set ON-OFF switch to OFF; all lamps of step (5) shall extinguish.

(12) Remove voltmeter leads.

(13) To check the unblanking pulse, connect oscilloscope vertical input probe to test point A6TP1-7 and ground lead to test point A6TP1-8 (fig. 3).

(14) Set ON-OFF switch to ON; all lamps of step (5) shall illuminate.

(15) Observe that the oscilloscope displays a waveform period of 98 to 102 microseconds.

(16) Set ON-OFF switch to OFF; all lamps of step (5) shall extinguish.

(17) Remove oscilloscope vertical probe and ground lead.

(18) Connect oscilloscope vertical input probe to pin 32 on printed circuit board extender card 2A4 and connect ground lead to A6TP1-8 (fig. 3).

(19) Set ON-OFF switch to ON; all lamps of step (5) shall illuminate. The rise and fall time from the 10-percent to the 90-percent amplitude levels as observed on the oscilloscope shall not exceed 1.5 microseconds.

(20) Set ON-OFF switch to OFF, all lamps of step (5) shall extinguish.

(21) Set RHA TEST SELECT switch to KA76.

(22) Connect electronic counter positive lead to test point A6TP1-7 and the negative lend to test point A6TP1-8 (fig. 3).

(23) Set ON-OFF switch to ON; all lamps of step (5) shall illuminate.

(24) Measure signal frequency; the frequency shall measure 5.56 to 6.14 KHz.

(25) Measure the rise and fall times from the 10-percent to the 90-percent amplitude levels on the oscilloscope; the rise and fall times shall not exceed 1.5 microseconds.

(26) Set RHA TEST SELECT switch to PHOSPHOR.

(27) Measure the signal frequency on the electronic counter; the frequency shall measure 5.94 to 6.56 KHz.

(28) Measure the rise and fall times from the 10-percent to the 90-percent amplitude levels on the oscilloscope; the rise and fall times shall not exceed 1.5 microseconds.

(29) Set RHA MODE switch to SINGLE, RHA TEST SELECT switch to KA76, and the electronic counter to MANUAL START.

(30) Depress and release SINGLE PULSE switch; observe that SINGLE PULSE INDICATOR (red) indicator, lights momentarily.

(31) Set electronic counter in MANUAL STOP; the count shall be 54 to 62.

(32) Set ON-OFF switch to OFF; all lamps of step (5) shall extinguish.

(33) Remove printed circuit board extender card 2A4 and reinstall pulse generator board A6 in the test set.

(34) Disconnect electronic counter and oscilloscope from test set.

b. Adjustments

(1) If voltmeter does not indicate a voltage reading greater than +4.0 volts dc during a (6), slowly adjust screw adjustment potentiometer A6R9 (fig. 3) clockwise.

NOTE

An abrupt change of approximately +0.5 volts dc from the initial voltage reading will occur on the voltmeter. The setting of A6R9 (fig. 3) should be located just past the point of change to over +4.0 volts dc.

(2) IF BATTERY INDICATOR lamp does not extinguish at a reading on the voltmeter of +4.4 to +4.5 volts dc, repeat b (1).

(3) If the oscilloscope does not display a waveform period of 98 to 102 microseconds during a (15), adjust potentiometer adjustment screw A6R33 (fig. 3).

13. Deflection Amplifier. Alignment of deflection amplifier boards A7 and A8 consists of adjustment of the horizontal and vertical signal outputs. Because the assemblies are identical, the procedures are only given for deflection amplifier board A8. The locations of adjustment potentiometers and test points are shown in figure 3 for deflection board assembly A8.

a. Performance Check.

(1) Connect voltmeter positive (red) lead to test point A8TP1-3 and negative (black) lead to test point A8TP1-6 (fig. 3).

(2) Set ON-OFF switch to ON. Lamps RHA HIGH VOLTAGE, —522VDC, +500VDC, —80VDC, and POWER: 115VAC, 6.3VAC, 115VAC, and DC INTERNAL; GO, and +5 shall illuminate.

(3) Set RHA TEST SELECT switch to KA76.

(4) Observe that voltmeter indicates between 8.27 and 8.43 volts dc.

(5) Set ON-OFF switch to OFF; all lamps of step (2) shall extinguish.

(6) Disconnect voltmeter leads from test points.

(7) Connect electronic counter positive lead to test point A8TP1-3 and the negative lead to test point A8TP1-6 (fig. 3).

(8) Set ON-OFF switch to ON; all lamps of step (2) shall illuminate.

(9) Measure signal frequency; the frequency counter shall measure from 98 to 102 Hz.

(10) Set ON-OFF switch to OFF; all lamps of step (2) shall extinguish.

(11) Reposition electronic counter positive lead with AC coupling to test point ASTP1-5 and negative lead to test point A8TP1-6 (fig.3).

(12) Set ON-OFF switch to ON; all lamps of step (2) shall illuminate.

(13) Measure signal frequency; the frequency counter shall measure 98 to 102 Hz.

(14) Set ON-OFF switch to OFF, all lamps of step (2) shall extinguish.

(15) Remove the electronic counter.

(16) Connect voltmeter positive (red) lead to test point A8TP1-5 and negative (black) lead to test point A8TP1-6 (fig. 3).

(17) Set ON-OFF switch to ON; all lamps of step (2) shall illuminate.

(18) Observe that voltmeter indicates between 8.27 and 8.43 volts ac.

(19) Set RHA TEST SELECT switch to KA60 IR SLAR CDM.

(20) Observe that voltmeter indicates between 14.18 and 14.46 volts ac.

(21) Set ON-OFF switch to OFF; all lamps of step (2) shall extinguish.

(22) Relocate voltmeter positive (red) lead to test point A8TP1-3 (fig. 3).

(23) Set ON-OFF switch to ON; all lamps of step (2) shall illuminate.

(24) Observe that voltmeter indicates between 14.18 and 14.46 volts ac.

(25) Set ON-OFF switch to OFF; all lamps of step (2) shall extinguish.

(26) Deactivate 115 volt ac, 400 Hz power.

(27) Remove voltmeter from test set.

b. Adjustments.

(1) If voltmeter does not indicate between 8.27 and 8.43 volts as during a (4), adjust potentiometer adjustment screw A8R5 (fig. 3).

(2) If voltmeter does not indicate between 8.27 and 8.43 volts ac during a (18), adjust potentiometer adjustment screw A8R17 (fig. 3).

(3) If voltmeter does not indicate between 14.18 and 14.46 volts ac during a (20), adjust potentiometer adjustment screw A8R21 (fig. 3).

(4) If voltmeter does not indicate between 14.18 and 14.46 volts ac during a (24), adjust potentiometer adjustment screw A8R8 (fig. 3).

14. Final Procedure. a. Disconnect all test equipment from CM-RH test set.

b. Roll and stow connecting cables in case number 2.

c. Install CM-RH test set front panel 1A3 in case number 1, and close and secure cases 1 and 2.

d. In accordance with TM 38-750, annotate and affix calibration DA Label 80 (U. S. Army Calibration System). When the test instrument cannot be adjusted to within tolerance, annotate and affix DA Form 2417 (Unserviceable or Limited Use) red tag.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-36A (qty rqr block No. 1210) calibration procedures for all geographical areas.

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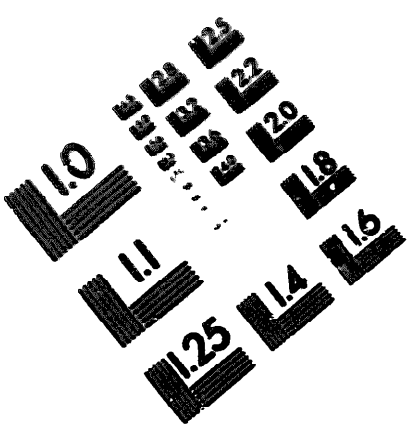
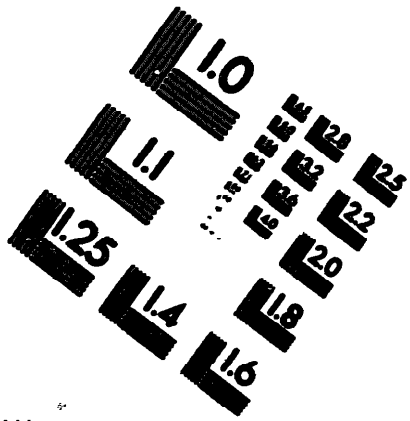
DATE

DEPARTMENT OF THE ARMY

MICROFORM
TEST TARGET





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1.5 mm (e= 1.09 mm)

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2.0 mm (e= 1.37 mm)

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2.5 mm (e= 1.77 mm)

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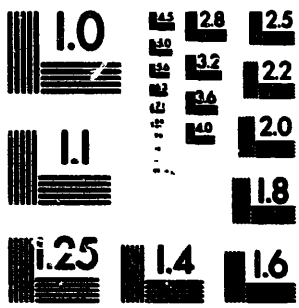

1.5 mm (e= 1.09 mm)

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2.0 mm (e= 1.37 mm)

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2.5 mm (e= 1.77 mm)

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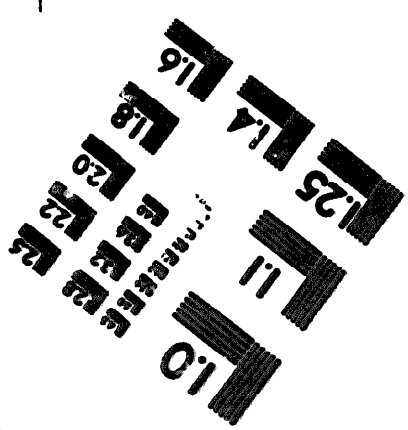
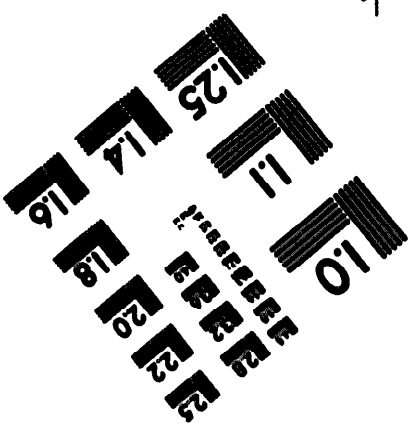
200 MM





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