DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR CATHODE RAY RELAY TESTER SIEMENS & HALSKE 9Tmse 109

Headquarters, Department of the Army, Washington DC
4 August 1980

REPORTING OF ERRORS

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Section I. IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Cathode Ray Relay Tester, Siemens Halske 9Tmse109. The cathode ray relay tester being calibrated will be referred to as the TI (test instrument) throughout the bulletin.

a. Model Variations. This procedure pertains to only one model. Some instruments have trimmer capacitors C5c and C5d and some do not, according to the balance of the circuitry of resistors R1 and R22 and capacitor assembly C5.

b. Time and Technique. The time required to perform this calibration is approximately 2 hours using the dc low frequency technique.

2. Calibration Data Card. a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TM 38-750. DA Form 2416

(Calibration Data Card) must be annotated in accordance with TM 38750 for each calibration performed.

b. Adjustments to be reported on DA Form 2416 are designated (R) at the end of the sentence in which they appear. 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
Scale	in % (percent).
Measuring range	20%
Error with bias	100% approx. 20 ms.
Distortion measurement	equal to or less than 0.25%
Error with transfer	100% ± 20 ms.
Time measurement	equal to or less than 1%
Relay excitation	25 Hz sinusoidal current (30 Hz in special version for 60 Hz power frequency).
Energizing voltage (no load)	44 V.
Relay energizing current	equal to or less than 20 mA.
Power voltage	110/125/150/220/240V ± 10%.
Power frequency	50 Hz ± 1%. (special version: 60 Hz ± 1%.
Power drain	*approx. 20 VA.*

Section II. EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment used in this calibration procedure. Alternate items may be used by the calibrating activity when this equipment listed in table 2 is not available. 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 accuracy ratio between the standard and the TI.

5. Accessories Required. The accessories listed in table 3 are to be used in this calibration procedure. When necessary, these items may be substituted by equivalent items, unless specifically prohibited.

TABLE 2. Equipment Required

Item number	Common name	Minimum use specifications	Calibration equipment Type/Model nr. and/or Mfg
A1	Audio Oscillator	Frequency: 210 to 225 Hz. Output: 20 to 30 Volts	HP 205 AG (Not available in the mobile calibration facility)
A2	Digital Oscillator	Range: 0 to 1000 Volts ac Accuracy: ±2%	HP 3490A
A3	Oscilloscope	Dual trace capability	HP 180D or Tek RM561A
A4	Variable Transformer	Range: 0 to 220 Volts*	(not available in the mobile calibration facility) Use a 220 volt monitored source

*Recommend the use of a 220 volt transformer during depot repair, overhaul or rebuild.

TABLE 3. Accessories Required

Item number	Common name	Description
B1	Clip, adapter	Banana jack to alligator clip (red)
B2	Clip, adapter	Banana jack to alligator clip (black)
B3	Lead, electrical (2 required)	Banana plug terminations (nominal length)
B4	Oscilloscope probes (2 required)	Part of oscilloscope A3

6. Preliminary Instructions. a. The instruction outlined in this section 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 and item number identification as listed in table 2 and 3. For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 3.

WARNING

HIGH VOLTAGE is used during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions

NOTE

Unless otherwise specified, verify the results of each test and, whenever the test requirement is not met, take corrective action before continuing with the procedure. Additional maintenance information is contained in the manufacturer's manual for this Test Instrument.

NOTE

Do not perform power voltages and current check unless out of tolerance conditions in the preceeding checks cannot be corrected by adjusting the specified component

7. Equipment Setup.

NOTE

Determine if the TI being calibrated is the special version that operates from a 60Hz power frequency source or the version that operates from a 50Hz power frequency source before applying power.

a. Set TI front panel switch 110V 125V 150V 220V 240V to the appropriate setting according to the available voltage source to be used.

b. Energize TI and allow sufficient time for warmup and stabilization.

Section IV. CALIBRATION

8. Deflection Voltage. *a. Performance Check.*

(1) Set TI shift control to a midrange position and the changeover switch to distortion.

(2) Connect audio oscillator (Al) to TI ground and to contact 4 (fig. 1) of the socket for relay T rls 43.

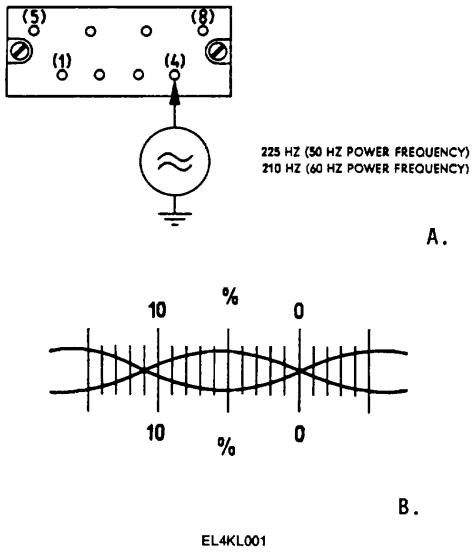

Figure 1. A. Socket for relay, pin connections.
B. Cathode ray relay tester, display.

(3) Adjust the audio oscillator until a waveform as shown in figure 1A, appears in TI cathode ray tube.

(4) The intersection of the stationary sine waves must be 11% (for 50Hz power frequency)or 12 % (for 60Hz power frequency) apart. If not, perform b, below.

b. Adjustment.

(1) Adjust R18 (behind the highvoltage warning plate on TI control panel until sinewave in figure 1B is obtained. (R)

NOTE

Variations of power frequency of up to1 % are permissible, but cause a drift of the display.

(2) Retune the audio oscillator if drift is apparent, and then repeat *a*(4), above readjusting R18 as necessary for the proper sinewave and intersection points.

9. Frequency Divider Circuit. *a. Performance Check.*

(1) Deenergize TI and remove the chassis from the protective case.

(2) Place chassis on a nonmetalic working surface, energize and allow for warmup and stabilization.

(3) Connect oscilloscope (A3) channel 1 input to TI point (A) at the junction of capacitors C3and C4, and channel 2 input to TI point (B) at the junction of capacitor C3 and resistor R1.

(4) Connect the oscilloscope ground to TI transformer terminal c1.

(5) Observe the presents of voltage of TI frequency divider circuit as shown by the upper trace in figure 2D.

(6) Observe the waveshape of the current of the frequency divider circuit as shown by the lower trace in figure 2D. If traces are not as shown in the figure, perform b, below.

b. Adjustments.

(1) Adjust R22 to obtain the waveshapes shown in figure 2D. (R)

(2) If the adjustment of R22 does not correct the waveshapes, resistor R1, and capacitors C5a,C5b, C5c, and C5d have to be unsoldered, changed or adjusted in accordance with the TI maintenance manual.

NOTE

Some instruments do not have trim-mer capacitors C5c and C5d. These two trimmer capacitors may have to be inserted in the circuit to correct the waveform.

10. Power Voltages and Current. *a. Performance Check.*

(1) Remove the TI chassis from the case by first removing the four screws on the front panel.

(2) Disconnect TI transformer 2 by unsoldering wire No 11a rt from resistor R13.

(3) Remove relay HR and tube V.

CAUTION

DANGER of implosion of cathode ray tube V. Remove the tube from the socket by inserting a flat screwdriver between the base of the tube and the socket and gently pry the tube loose around the circumference of the base. Do not force or apply pressure to the glass. Safety glasses should be worn while removing the tube and while reinserting it after the test is com-pleted.

(4) Connect TI to variable transformer (A5) and adjust for 220 Vac.

NOTE

Use 220 Volts from wall receptical if a 220 Volt transformer is not available.

(5) Measure voltages as follows using volt-meter (A2):

At terminals b3-c2 of:	
transformer Trl	660 to 700 V
At capacitor C1	840 to 880 V
At capacitor C2	645 to 685 V
At terminals bl-b4 of	
transformer Trl	6.3 to 6.9 V

(6) If the correct measurements were obtained, resolder the wire removed in (2), above. If the correct measurements were not obtained, further maintenance and troubleshooting is necessary.

b. Adjustments. No adjustments can be made.

11. Final Procedure. *a.* Deenergize and disconnect all the equipment, and reinstall the chassis in the TI case.

b. In accordance with TM 38-750, annotate and affix DA Label 80 (US Army Calibrated Instrument). When the TI receives limited or special calibration, annotate and affix DA Label 163 (US Army Limited or Special Calibration). When the TI cannot be adjusted within tolerance, annotate and affix DA Form 2417 (US Army Calibration System Rejected Instrument).

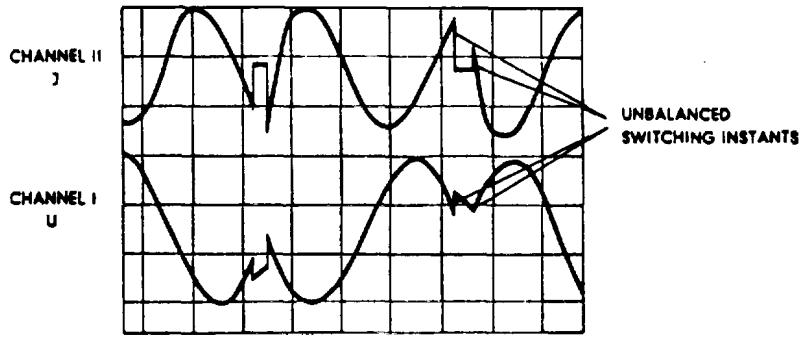

FIG. A. FREQUENCY DIVIDER UNBALANCED

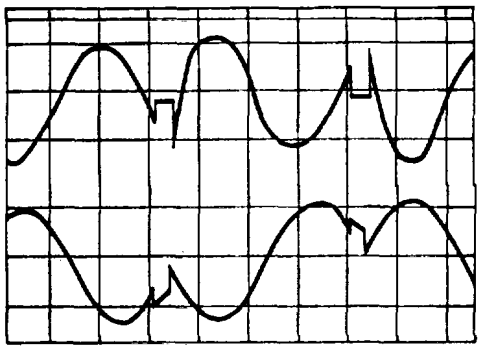

FIG. B. CAPACITANCE TOO SMALL

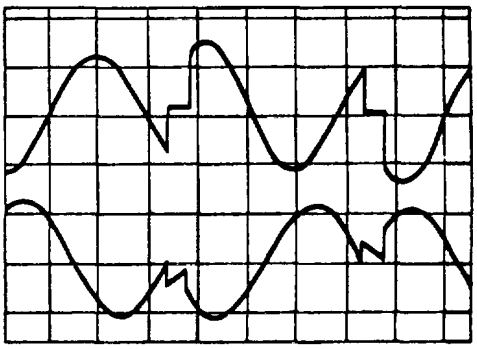

FIG. C. CAPACITANCE TOO LARGE

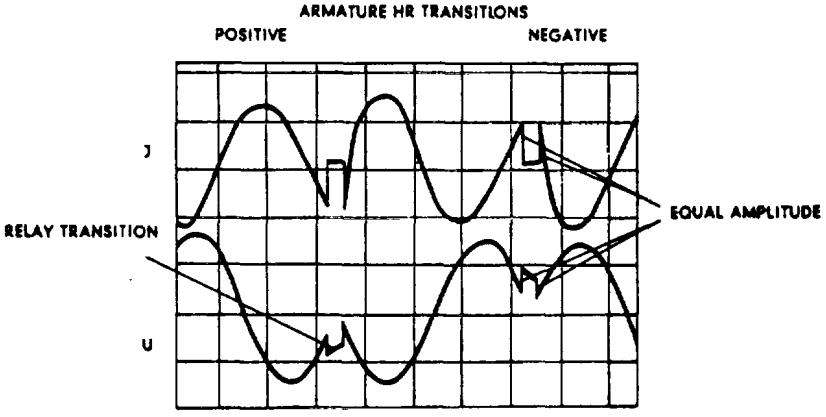

FIG. D. CORRECT SETTING

EL4KL002

Figure 2. Frequency divider circuit waveshapes

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