# TECHNICAL BULLETIN

# CALIBRATION PROCEDURE
# FOR
# TEST SET, ELECTRONIC SYSTEMS AN,'UKM-5

**(NSN 6625-01-073-9858)**

**HEADQUARTERS, DEPARTMENT OF THE ARMY**
**4 SEPTEMBER 1980**

**WARNING**

All operations must conform to TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment (8 August 1979).

**WARNING**

Dangerous voltage exist in this equipment. Serious injury or DEATH may result from contact with terminals carrying dangerous voltages. Make sure all power is off when disassembling the equipment. DO NOT service or adjust the equipment alone. Always have another person available to give first aid in case of an accident.

**WARNING**

Avoid shock; ground the test set. Before connecting to a power source, the protective ground terminals must be connected to the equipment grounding (safety) conductor (green) of the power cable. Ensure that the AC lines power plug is connected to a circuit that has a protective earth (safety) ground. Improperly grounded equipment can result in hazardous voltage between equipments. Ensure that all devices connected to the test set are connected to earth ground.

TECHNICAL BULLETIN

No. 11-6625-2937-35

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC *4 September 1980*

# CALIBRATION PROCEDURE FOR TEST SET, ELECTRONIC SYSTEMS AN/UKM-5 (NSN 6625-01-073-9858)

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSELME-MQ, Fort Monmouth, New Jersey 07703. In either case, a reply will be furnished direct to you.

## Section I.

## IDENTIFICATION AND DESCRIPTION

### 1. Test Instrument Identification

a. This technical bulletin provides calibrator procedures for Test Set, Electronic Systems AN/UKM-5. The AN/UKM-5 is used for bench testing, aligning, calibrating, and troubleshooting the following equipment:

(1) Transmitting Set, Radar Data AN/AKT- 18B (Encoder, Video KY-865/AKT-18B).

(2) Receiving Set, Radar Data AN/TKQ-2B (Decoder, Video KY-871/TKQ-2B).

(3) Test Set, Electronic Systems AN/UKM-5 (Test Set, Electronic Systems TS-3796,'UKM-4).

b. The AN/UKM-5 contains two major components which require calibration: Test Set, Electronic Systems AN/UYM-7 (digital tester) and Test Set, Electronic Systems TS-3796,'UKM-4 (control-interface unit). When interconnected they function as a single operating unit. The digital tester (fig. 1) supplies the test number being run, test stimuli and module test power to the control-interface unit (fig. 2). The test number input is a verification check for proper switch settings on the control-interface unit. The control interface unit, through switching devices, supplies the test power and stimuli from the digital tester to the microprocessor or standard logic card being tested. Digital outputs from the card being tested are supplied to the control interface unit, which feeds this data back to the digital tester for comparison. Procedures for calibrating and testing the digital tester are provided in TM 11-6625-2951-13. Additional data on the control-interface unit is listed below.

*Nomenclature*. ---------- Test Set, Electronic Systems TS-3796/'UKM-4 (control-interface unit)
*Size* ----------13.76 x 17.25 x 17.30 inches
*Weight* ----------37 pounds
*Reference* ------TM 11-6625-2937-13
TM 11-6625-2937-23P

*Specifications:*

| | |
|---|---|
| *Input power requirements* ------ | AC: 115+5 V ac line-to-neutral, 3 phase, 4 wire, 400 Hz at 50 watts<br>DC: +5V, 5; amperes; +15 V, 100 milliamperes; +15 V, 1 ampere and -15 V, 1 ampere |
| *DC voltage output* | _+_ 50.1 V<br>+15+0.1 V<br>+28t0.2 V |
| *AC voltage output* | 115+5 V ac line-to-neutral, 3 phase, 4 wire, 400 Hz |

### 2. Calibration Description

Table 1 lists the parameters to be calibrated and the performance specifications for the control-interface unit.

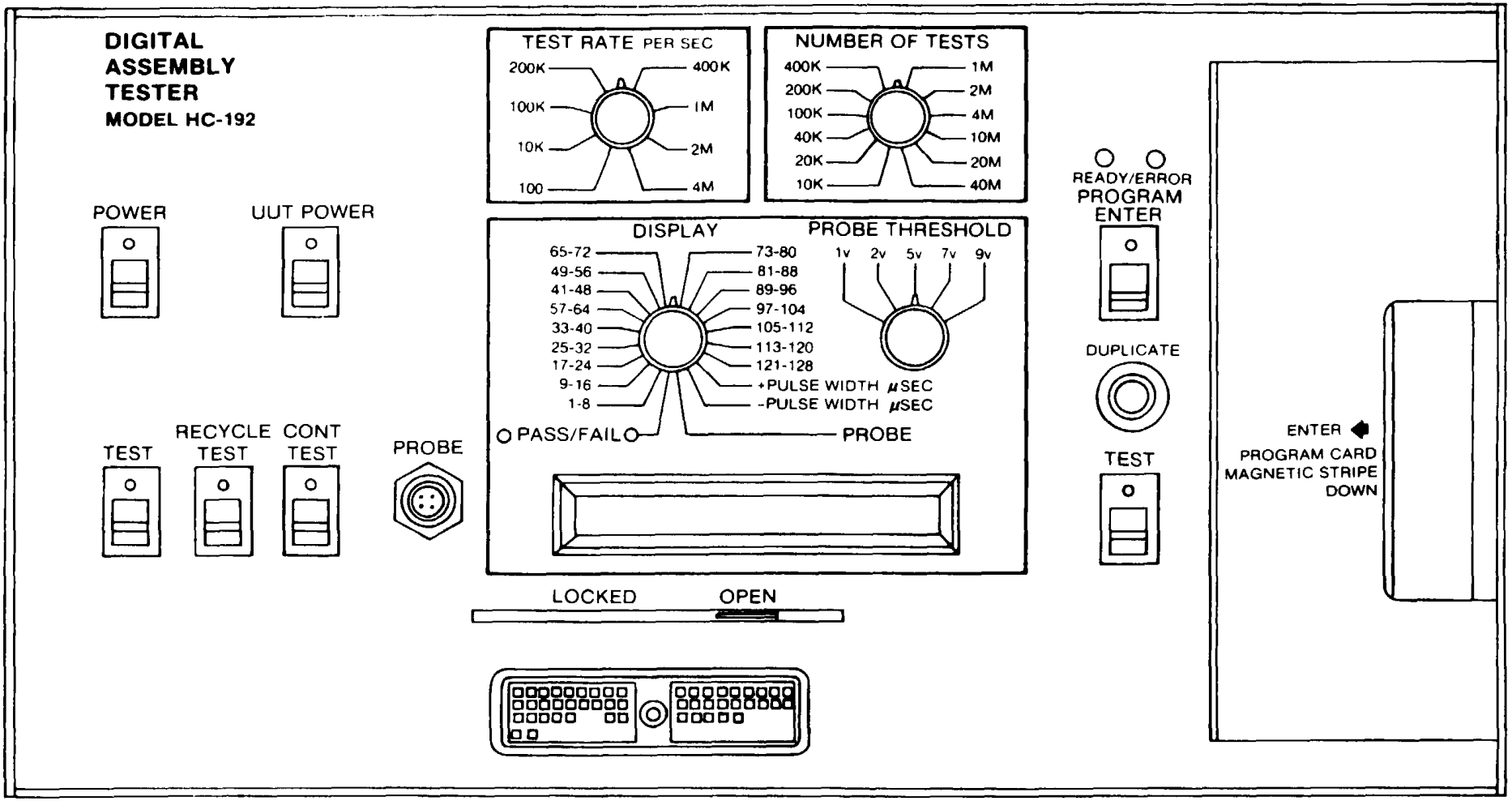
*Table 1. Calibration Description*

| Parameters | Performance specifications |
|---|---|
| Dc voltage output levels | +5+0.1 V<br>+15+0.1 V<br>+28+0.2 V |
| Processor test clock output | 4 MHz±1000 Hz. |
| Phase lock waveforms | Waveforms as shown in figure 6 with zero displacement + 100 msec. |
| System test clock output | 4 MHz_1000 Hz. |

### 3. Calibration Reporting

a. Forms, records, and reports required for calibration personnel at all levels are prescribed in TM 38-750. DA Form 2416 (Calibration Data Card) must be annotated in accordance with TM 38-750 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).




FRONT VIEW

*Figure 1 . Test Set Electronic Systems AN/UYM-7 (sheet 1 of 2) .*

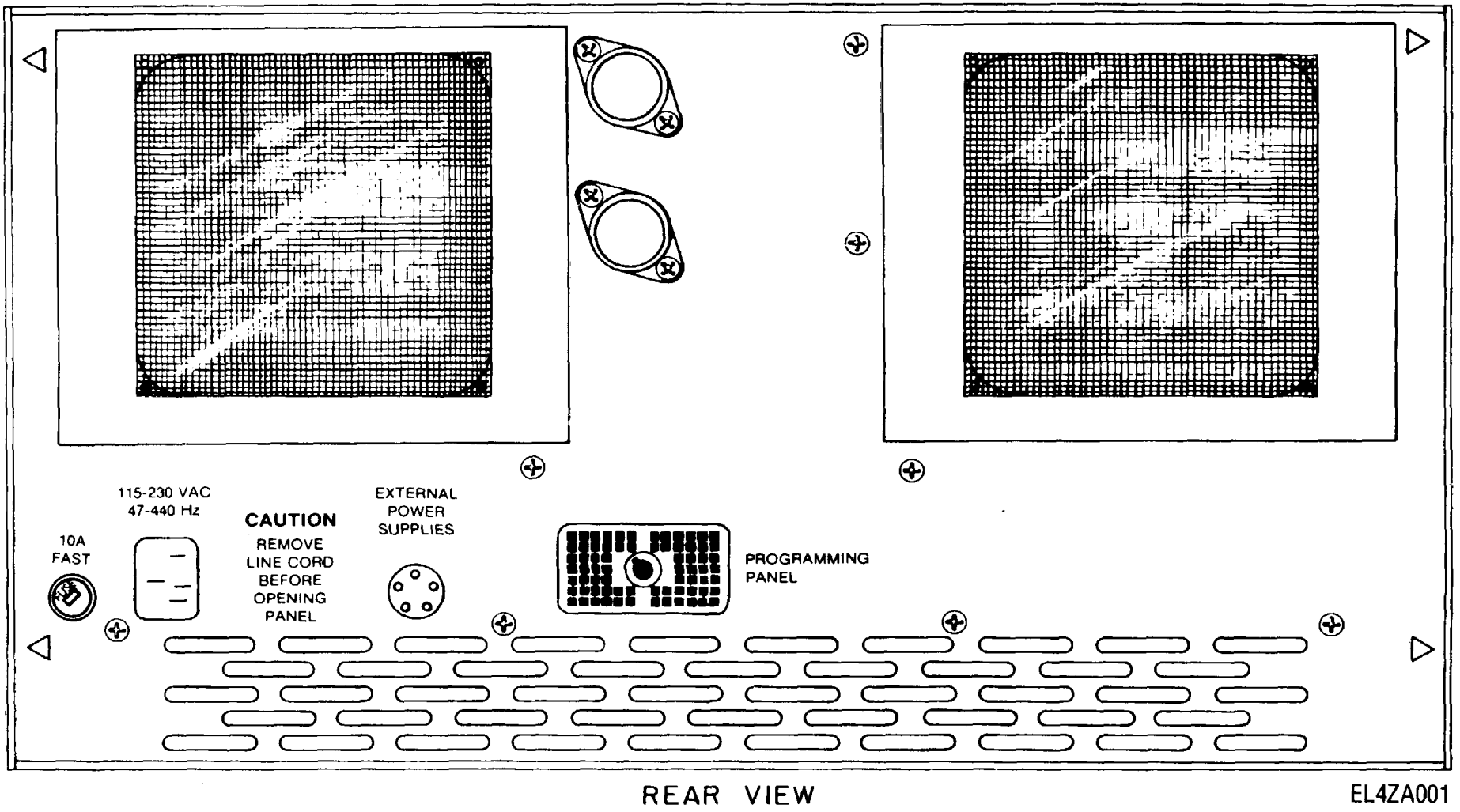
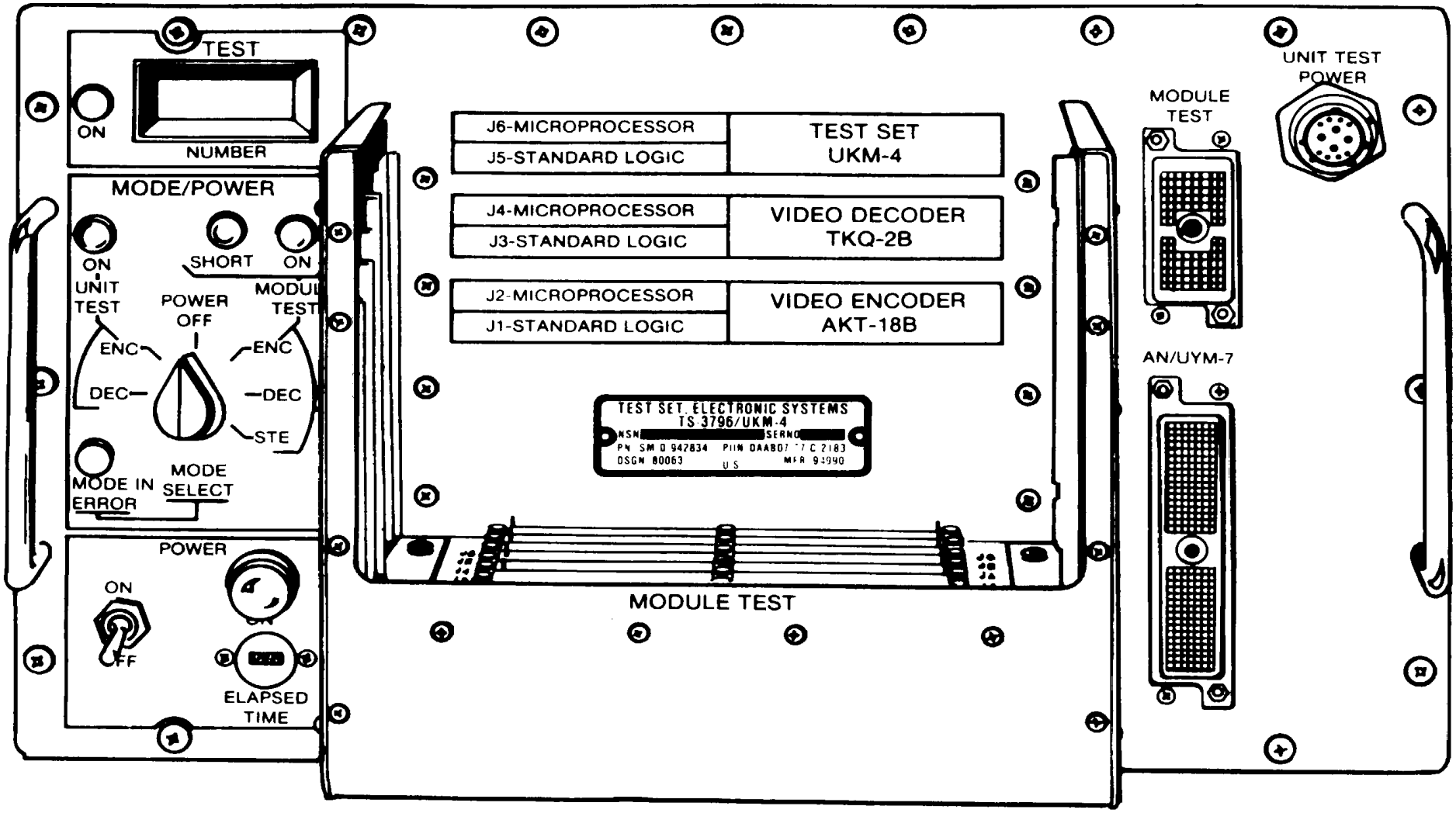



*Figure 1. Test Set, Electronic Systems AN/UYM-7 (sheet 2 of 2). EL4ZA001*




FRONT VIEW

*Figure 2. Test Set, Electronic Systems TS-3796/ukm-4(Sheet 1 of 2)  EL4ZA026*

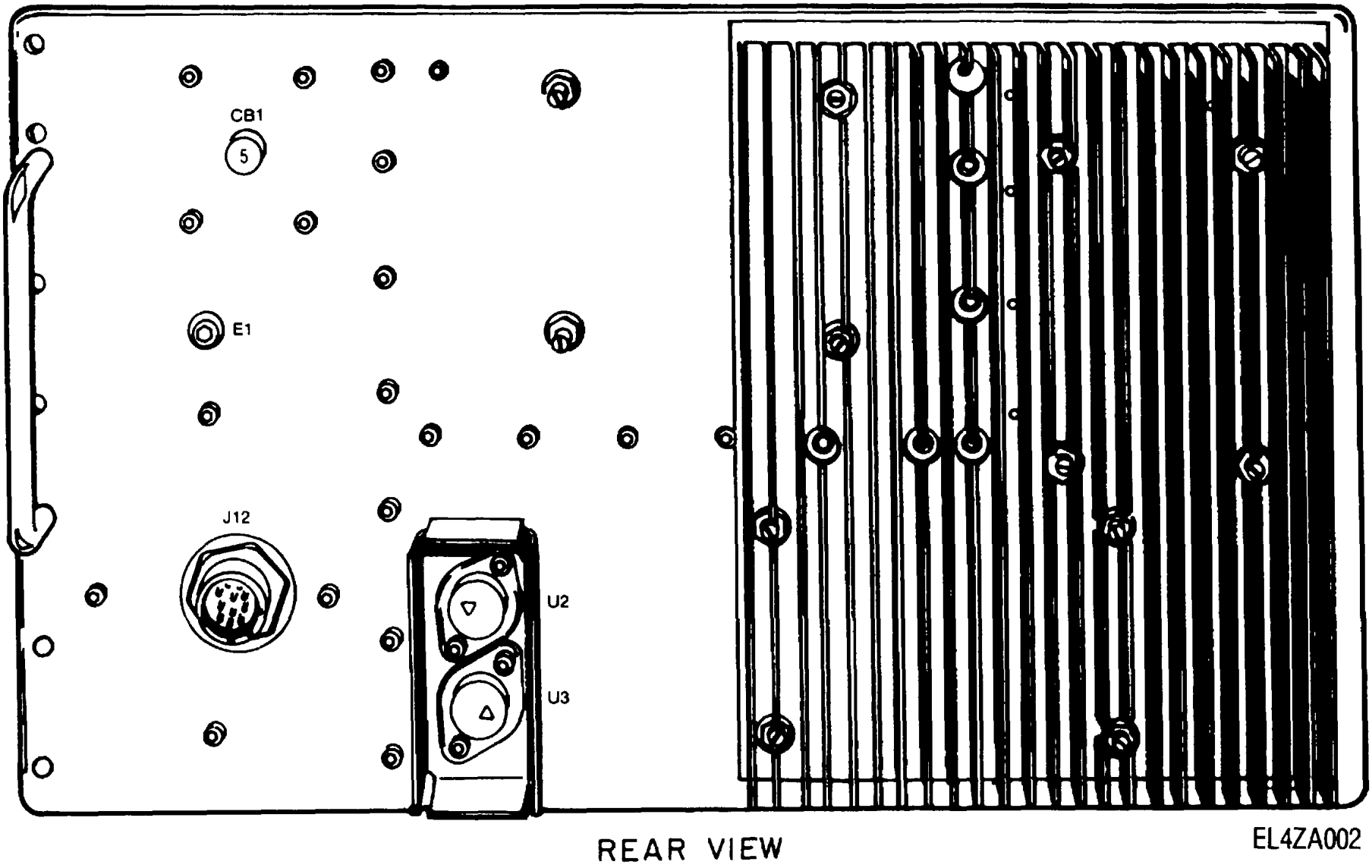



*Figure 2. Test Set, Electronics Systems TS-3796/ukm-4 (sheet 2 of 2)  EL4ZA002*

## Section II.

## EQUIPMENT REQUIREMENTS

### 4. General

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.

### 5. Minimum Specifications of Equipment Required

| Item | Minimum use specifications | Calibration equipment' |
|---|---|---|
| 1. Multimeter | +5.0+0.1 V<br>+15.0+0.1 V<br>+28.0±0.2 V<br>115+5 V ac, 400 Hz | AN/USM-223 |
| 2. Oscilloscope | Square wave waveform with zero displacement + 100 msec. | AN/USM-281C |
| 3. BITE program card | None | Program Card SM-A-942909-2 |
| 4. STE extender card | None | Extender Card SM-D-942431-2 |
| 5. 4-Conductor cable (Wl) | None | Cable Assembly, Power Electrical SM-D-942901 (6 ft) |
| 6. 156-Conductor cable (W2) 942902 (3 ft) | None | Cable Assembly, Special Purpose, Electrical SM-D- |

The calibration equipment used in this procedure was selected from that 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.

## Section III.

## PRELIMINARY OPERATIONS

### 6. Familiarization

Be familiar with the entire procedure before performing calibration of the control-interface unit.

### 7. Preliminary Procedures

*a. Removal.*

(1) Remove top and bottom access covers of the control-interface unit (fig. 3).

(2) Remove inner cover to gain access to the circuit cards of the control-interface unit.

(3) Position the control-interface unit in a clean work area, for convenient access to both front and rear of unit.

*b. Test Connections.*

(1) Set the control-interface unit controls as follows prior to performing calibration.

| *Control* | *Setting* |
|---|---|
| POWER ON,'OFF | OFF |
| MODE SELECT | POWER OFF |

(2) Set the digital tester controls as follows prior to performing calibration.

| *Control* | *Setting* |
|---|---|
| POWER | Down (off) |
| UUT POWER | Down (off) |
| Display | PASS/FAIL |
| TEST RATE PER SEC | 2M |
| NUMBER OF TESTS | 20M |
| PROBE THRESHOLD | 2V |

(3) Connect equipment as shown in figure 4.

**NOTE**

Do not connect test equipment until instructed to do so.

(4) Energize all test equipment.

(5) Using multimeter, verify input voltage of 196 10 V ac phase-to-phase.

Legend for figure 3.

1. Quarter-turn fastener (36 places)
2. Top access cover
3. Bottom access cover
4. Inner cover
5. Filter assembly AIFL1
6. Screw, 6-32 x 0.500; No. 6 washer (42 places)
7. Power supply AlPSI
8. Screw lock assembly (4 places)
9. Receptacle connector P110. Receptacle connector P2
11. Circuit card assembly rack 1A2
12. Nut, 10-32; No. 10 lockwasher; No. 10 flat washer (12 places)
13. Power supply AlPS2
14. Power supply ALPS3
15. Electrical equipment housing lAl
16. Screw, 8-32 x 5,''8; No. 8 washer (20 places)

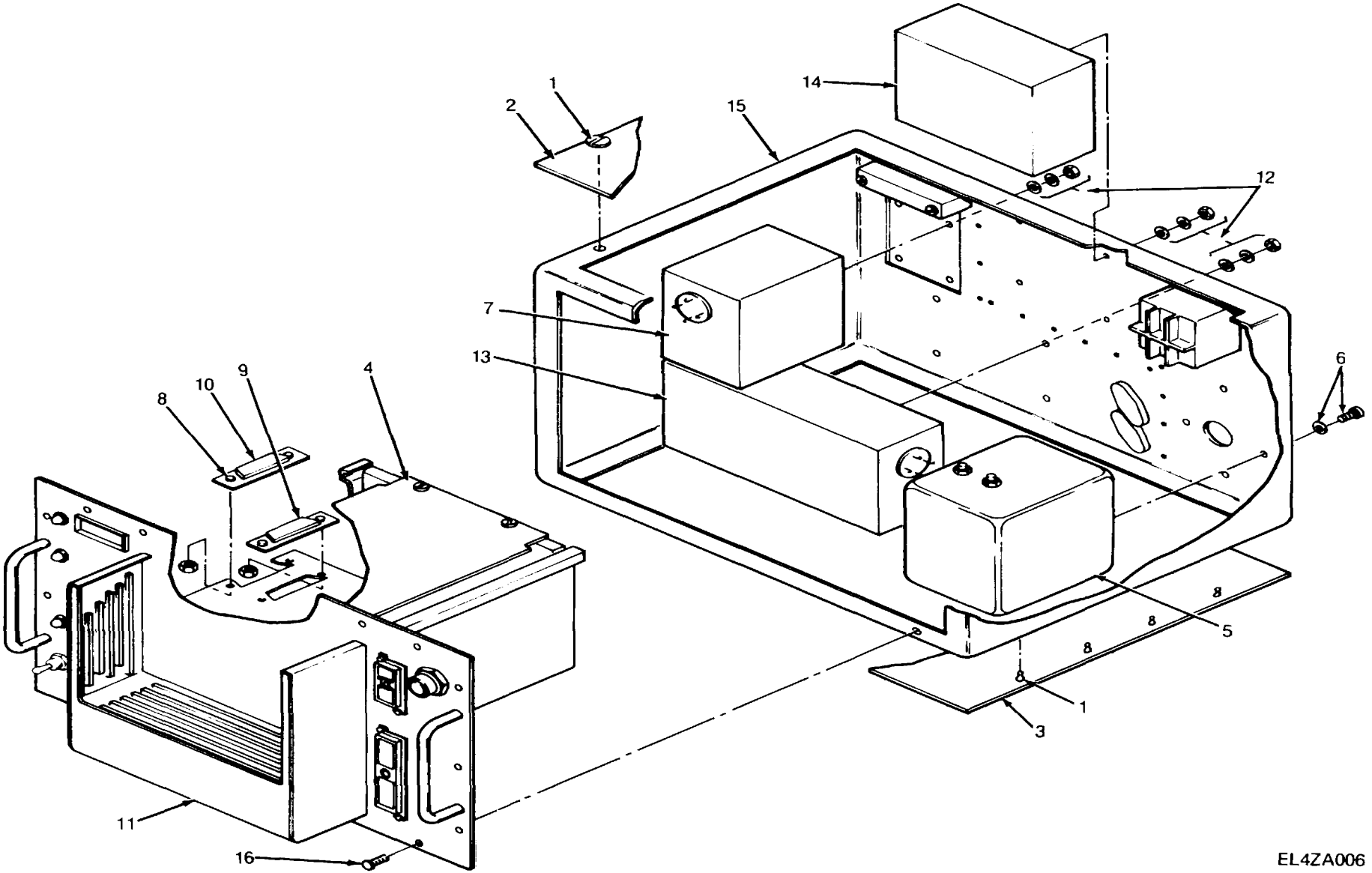



*Figure 3. Control-interface unit, explored view EL4ZA006*

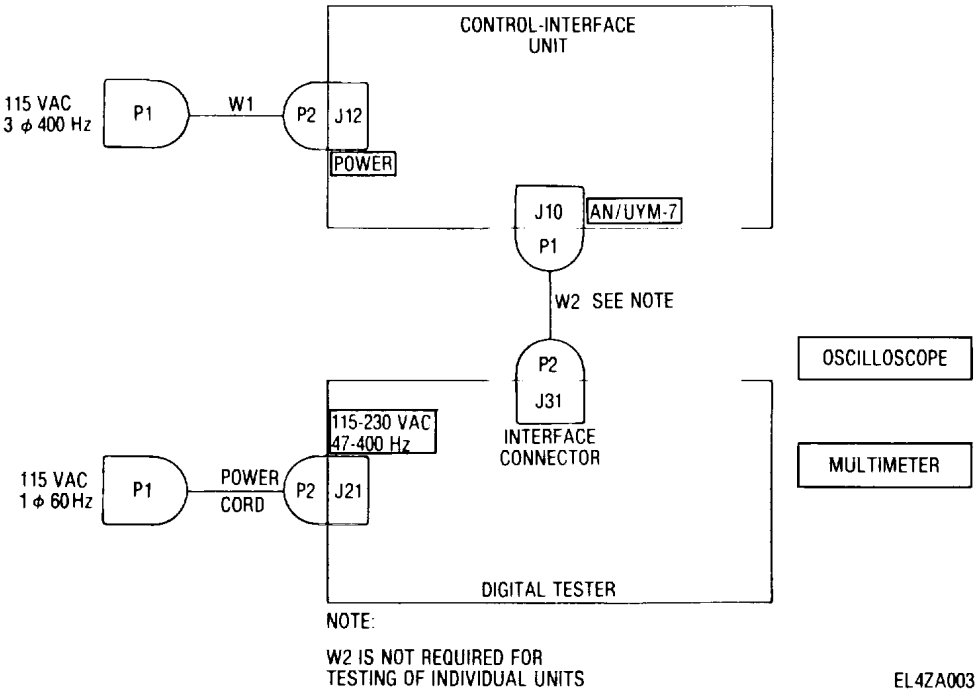



*Figure 4. Basic calibration setup. EL4Z003*

## Section IV.

## CALIBRATION PROCESS

**NOTE**

The calibration procedures are divided into performance checks and adjustments. When a performance check is not within tolerance and no adjustment is specified, the deficiency must be corrected before continuing with the procedure.

### 8. System Loop Lock

*a. Performance Check.*

(1) Perform all instructions in paragraph 7.

(2) Install circuit card assembly 2A4 (fig. 5) on extender card and plug extender card into control-interface unit.

(3) Connect channel A of oscilloscope between pin 41 and GND of extender card connector.

(4) Connect channel B of oscilloscope between pin 86 and GND of extender card connector.

(5) Set the digital tester controls as follows:

| *Control* | *Setting* |
|---|---|
| POWER | Up (on) |
| UUT POWER | Up (on) |

(6) Insert BITE program card in digital tester card reader slot.

(7) Press PROGRAM ENTER switch, on digital tester, down and release. Observe that red PROGRAM ENTER indicator, on digital tester, goes out and white READY indicator lights.

(8) Set the control-interface unit controls as follows:

| *Control* | *Setting* |
|---|---|
| MODE SELECT | MODULE TEST STE |
| POWER ON, OFF ON | |

(9) Press RECYCLE TEST switch, on digital tester, down and release. Observe that red RECYCLE TEST indicator lights during test.

(10) Adjust oscilloscope controls so that waveforms displayed are similar to A, figure 6.

*b. Adjustment*

(1) Press RECYCLE TEST switch, on digital tester, down and release. Observe that red RECYCLE TEST indicator lights during test.

(2) Adjust capacitor C2 (fig. 5) for square wave with zero displacement +100 msec similar to waveform A, figure 6.

(3) Remove circuit card assembly A4 from extender card, remove extender card and plug A4 into control-interface unit.

### 9. Processor Loop Lock

*a. Performance Check.*

(1) Perform all instructions in paragraph 7.

(2) Install circuit card assembly 2A4 (fig. 5) on extender card and plug extender card into control-interface unit.

(3) Connect channel A of oscilloscope between pin 41 and GND of extender card connector.

(4) Connect channel B of oscilloscope between pin 14 and GND of extender card connector.

(5) Set the digital tester controls as follows:

| *Control* | *Setting* |
|---|---|
| POWER | Up (on) |
| UUT POWER | Up (on) |

(6) Insert BITE program card in digital tester card reader slot.

(7) Press PROGRAM ENTER switch, on digital tester, down and release. Observe that red PROGRAM ENTER indicator, on digital tester, goes out and white READY indicator lights.

(8) Set the control-interface unit controls as follows:

| *Control* | *Setting* |
|---|---|
| MODE SELECT | MODULE TEST STE |
| POWER ON, OFF ON | |

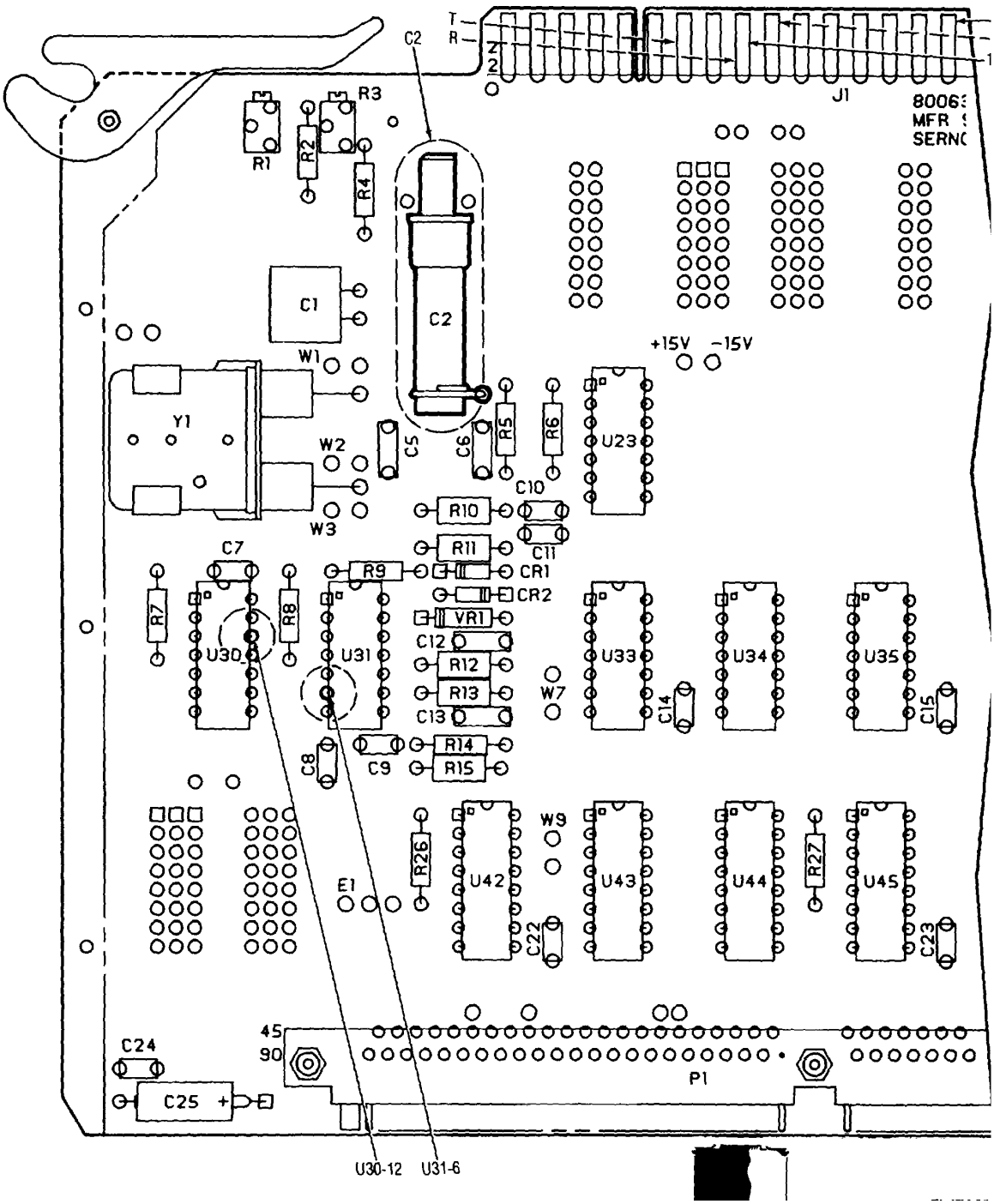
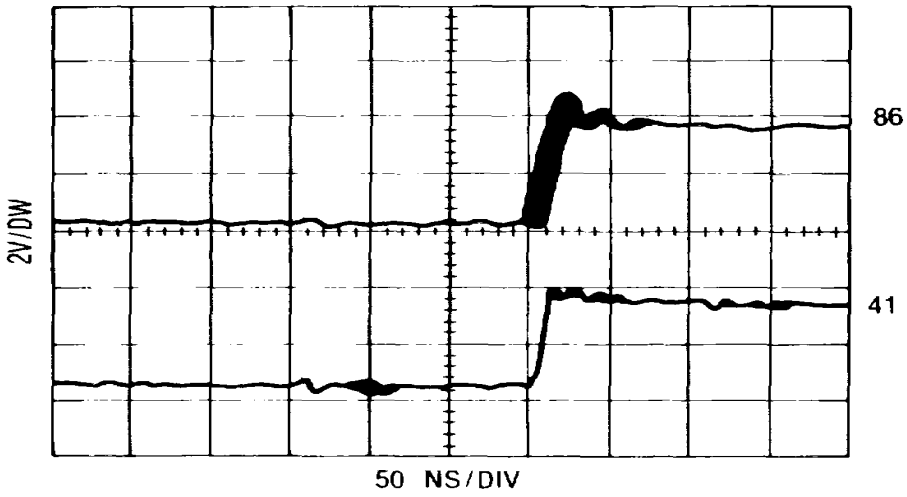
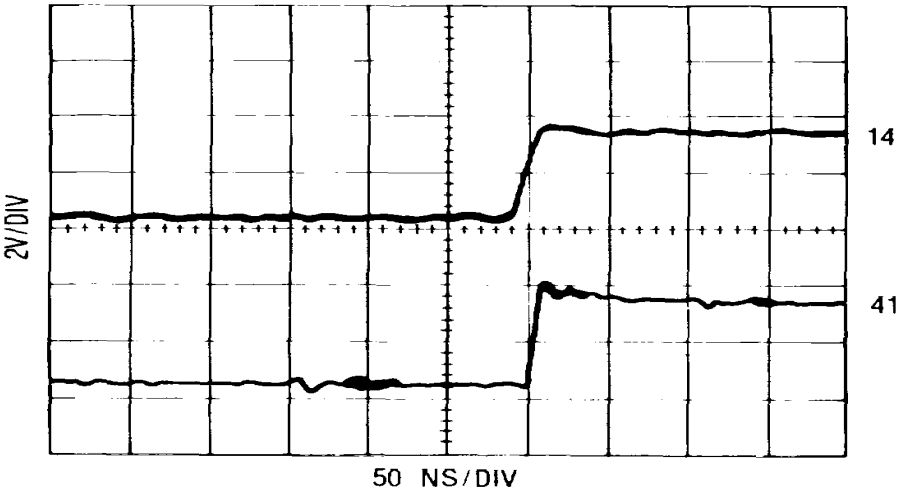



*Figure 5. Derived timing No. 1 2A4 (Sheet 1 of 2)EL4ZA005*




VOLTS/DIV: 2V
TIME/DIV: 50 NS
SYNC: INT
SWEEP: DELAYED
A. WAVEFORMS MONITORED AT EXTENDER CARD CONNECTOR PINS 41 AND 86.




VOLTS/DIV: 2V
TIME/DIV: 50 NS
SYNC: INT
SWEEP: DELAYED
B. WAVEFORMS MONITORED AT EXTENDER CARD CONNECTOR PINS 41 AND 14.

EL4ZA004

*Figure 6. Typical loop lock waveforms. EL4ZA004*

(9) Press RECYCLE TEST switch, on digital testing down and release. Observe that red RECYCLE TEST indicator lights during test.

(10) Adjust oscilloscope controls so that waveforms displayed are similar to B, figure 6.

b. Adjustment.

(1) Press RECYCLE TEST switch, on digital tester, dow nand release. Observe that red RECYCLE TEST indicator lights during test.

(2) Adjust capacitor C3 (fig. 5) for square wave with zero displacement +100 msec similar to waveform B, figure 6.

(3) Remove circuit card assembly A4 from extender card, remove extender card, and plug A4 into control-interface unit.

10. Power Supply Al PS1

a. Performance Check.

**NOTE**

Digital tester is not used when performing calibration process on control-interface unit power supply AlPS1.

(1) Remove top and bottom access covers of the control-interface unit (fig. 3).

(2) Position the control-interface unit in a clean work area, for convenient access to both top and bottom of unit.

(3) Set the control-interface unit controls as follows:

| *Control* | *Setting* |
|---|---|
| POWER ON/OFF | OFF |
| MODE SELECT | POWER OFF |

**NOTE**

Do not connect test equipment until instructed to do so.

(4) Connect three-phase power (115 Vac, 400 Hz) to control-interface unit via power cable assembly W1 (fig. 4).

(5) Using multimeter, verify input voltage of 196 10 V ac phase-to-phase.

(6) Set multimeter to 50 V dc range and connect meter to terminals 3 (+) and 4 (-) of power supply AIPS1 (7, fig. 3).

(7) Set POWER ON/,'OFF switch to ON.

(8) Observe the voltage indicated on the multimeter. The multimeter should indicate -. +5.0+0.1 V.

b. *Adjustment.*

(1) Adjust power supply output voltage adjustment (ADJ POT) for a voltage indication of +5.0_+0.1 V on the multimeter.

(2) Set POWER ON/OFF switch to OFF.

(3) Remove multimeter from terminals 3 (+) and 4 (--) of power supply AlPS1.

11. Power Supply Al PS2

a. Performance Check.

**NOTE**

Digital tester is not used when performing calibration process on control-interface unit power supply AlPS2.

(1) Perform all instructions in paragraph 10a(l) through 10a(5).

(2) Set multimeter to 50 V dc range and connect meter to terminals 7 (+) and 6 (-) of power supply ALPS2 (13, fig. 3).

(3) Set POWER ON/OFF switch to ON.

(4) Observe the voltage indicated on the multimeter. The multimeter should indicate +15 +0.1 V.

*b. Adjustment.*

(1) Adjust power supply voltage adjustment (ADJ POT) for a voltage indication of +15.0_+0.1 V on the multimeter.

(2) Set POWER ON/OFF switch to OFF.

(3) Remove multimeter from terminals 7 (+) and 6 (-) of power supply AlPS2.

**12. Power Supply Al PS3**

*a. Performance Check.*

**NOTE**

Digital tester is not used when performing calibration process on control-interface unit power supply AlPS2.

(1) Perform all instructions in paragraph 10a (1) through 10a (5).

(2) Set multimeter to 50 V dc range and connect meter to terminals 3 (+) and 4 (-) of power supply AlPS3 (14, fig. 3).

(3) Set POWER ON/OFF switch to ON.

(4) Observe the voltage indicated on the multimeter. The multimeter should indicate +28.0+0.2 V

*b. Adjustment.*

(1) Adjust power supply output voltage adjustment (ADJ POT) for a voltage indication of +28.0+0.2 V on the multimeter.

(2) Set POWER ON/OFF switch to OFF.

(3) Remove multimeter from terminals 3 (+) and 4 (-) of power supply AlPS3.

**13. Final Procedure**

*a.* Deenergize and disconnect all equipment and reinstall covers on control-interface unit.

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

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