DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DS, GS, AND DEPOT MAINTENANCE MANUAL

OVERSEAS AUTOVON INTERFACE COMPONENTS NOISE AND BALANCE TEST TERMINATION (AUTELCO PART NO. DH-871918-A72A)

This copy is a reprint which includes current pages from Changes I and 2.

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Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual OVERSEAS AUTOVON INTERFACE COMPONENTS: NOISE AND BALANCE TEST TERMINATION (AUTELCO PART NO. DH-871918-A72A)

LIST OF ILLUSTRATIONS

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual describes Noise and Balance Test Termination Part No. DH-871918-A72A (noise and balance test termination) (fig. 1-1). The information includes installation, functional description, preventive maintenance, troubleshooting, repair and replacement, and testing.

1-2. Indexes of Publications

a. DA Pain 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pain 310-7. Refer to DA Pam 310-7 to determine whether there are modification work oi1ders (MWO's) pertaining to the equipment.

1-3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM :)8-750).

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 (Army) NAVSUP Pub 378 (Navy) AFR 71-4 (Air Force) and MCO P4030.29 (Marine Corps).

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 (Army) NAVSUP Pub 459 (Navy) AFM 7534 (Air Force) and MCO P4610.19 (Marine Corps).

1-3.1. Reporting of Errors

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 (Recommended Changes to Publications) and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MAC Fort Monmouth, NJ 07703.

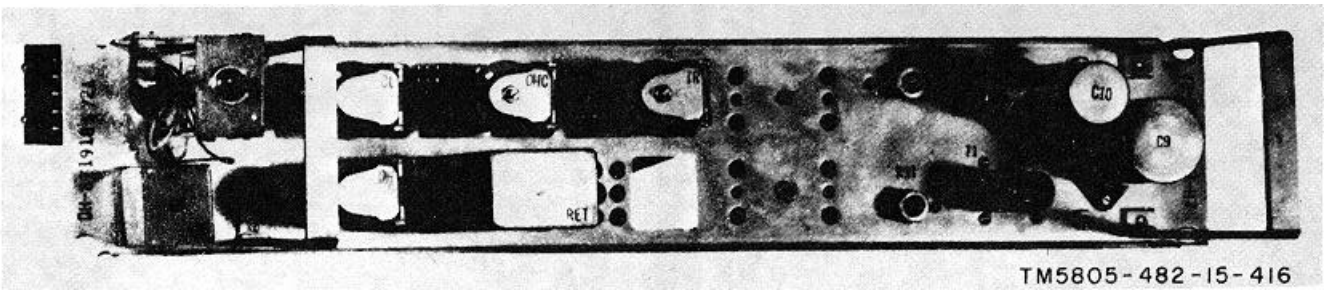

Figure 1.1. Noise and Balance Test Termination, Part No. 871918-A72A.

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

The noise and balance test termination is used at PBX installations to provide a matched voice frequency line termination. The line termination may be strapped for either 600 or 900 ohms impedance, depending upon the requirements of the PBX. This termination enables transmission and noise measurements to be made on AUTOVON access lines that terminate in two-wire PBX facilities. These measurements are usually made from the technical control board at an AUTOVON switch location. The equipment may be strapped to provide either permanent off hook or a time cycle of 10 seconds off hook followed by 1 second on hook.

1-5. Technical Characteristics

Last two digits of test number address at PABX 41

Method of access	automatic or manual (PABX OR PBX, respectively)
Method of seizure	ringing current
Line termination impedance	600 ohms or 900 ohms
Operating voltage requirement	48vdc
Method of release	option for called party or calling party release

1-6. Dimensions

The noise and balance test termination is approximately 19 inches wide, 3.47 inches high, and 9.50 inches deep; it weighs approximately 8 pounds.

1-7. Description

The noise and balance test termination consists of four 57AL twin-contact relays (class B telephone type) and associated components. The relays and associated components are individually secured on a mounting plate, designed to mount on standard 19- and 23-inch relay racks at the PBX or central office.

1-8. Items Comprising an Operable Equipment

Noise and Balance Test Termination comprises an operable equipment.

CHAPTER 2

INSTALLATION

2-1. General

Each site -is individually engineered. Job drawings and specifications are provided for each site in the drawing package which is furnished for each PBX interface installation. The installer requires all job drawings and all specifications. Included below is a list of job drawing suffixes with their definition and a list of 'items which will be found in the equipment specifications for the site.

2-2. Job Drawings

Suffix	Definition
SD	Schematic drawing of office and/or schematic of equipment layouts in office.
F Flow plan layout.	
ARR	Automatic relay rack layout.
MRR	Manual relay rack layout.
PRR	Power relay rack layout.
FR	Switchboard face equipment arrangement.
CDF	Combined distributing frame terminal
block layout.	
IF	Intermediate distributing frame layout.
IFT	Intermediate distributing frame terminal block assembly.
CRL	Cable running list.

2-3. Equipment Specifications

a. Sections for ordering equipment are referenced by the item number (equipment drawing number -and wiring diagram circuit number) and specification number (762, 726, 729 and 792).

b. Cable running list shoes cable run numbers as referenced on SD drawings. The running list information includes connections made from and to equipment, such as connections from a relay rack to a distributor frame.

c. Installer notes contain additional information or conditions not pointed out in particular associated drawings.

d. Drawing ordering specification (793) orders drawings associated with a particular site such as job drawings, wiring diagrams, specifications, appendices to specifications and equipment drawings.

e. Where job drawings are not made on a particular site, key sheet information is provided in the specification. Key sheets tabulate various information such as circuit numbers and/or figures and equipment layouts of particular relay racks.

CHAPTER 3

OPERATION

3-1. General

The interface equipments are automatically operational when ,the components have been wired into the facility. No special operating instructions are required..

CHAPTER 4

FUNCTIONING OF EQUIPMENT

4-1. Block Diagram Description

(fig. 4-1)

The noise and balance test termination circuit is used at PBX installations and is assigned to a PBX station line for making noise and balance tests. It permits transmission measurements and noise measurements to be made on AUTOVON access lines that terminate at two-wire PBX installations. These measurements are made at the AUTOVON switch location. Access to this circuit is accomplished by dialing it assigned address on any access line to the PBX. The circuit is accessed via connector bank terminal at the PBX and simulates a typical PBX station line facility with telephone in the off-hook condition (permanent off-hook operation). Optional strapping arrangements in the noise and balance test termination circuit permit a time cycle of 10 seconds off hook followed by 1 second of on hook (timed off-hook operation). This time cycle continues until the circuit is released. Release of the noise and balance test termination circuit is de pendent upon the type of the associated connector bank terminal and whether the circuit is arranged for permanent off-hook operation or timed off-hook operation.

4-2. Functional Description

a. General. The noise and balance test termination circuit consists of four multi-contact relays and associated components. When ringing current is applied the relays provide off-hook supervision and matched voice-frequency line (600 or 900 ohms) termination. The four relays, designated CL, OH, OHC and TR, operate and restore in a specific sequence when the noise and balance test termination circuit is seized, when the circuit applies the off-hook termination test to the access line, and when the circuit is released. The operation of the circuit during seizure, termination test, and release is discussed in the following paragraphs. Complete circuit details can be found on the schematic diagram, figure 6-1.

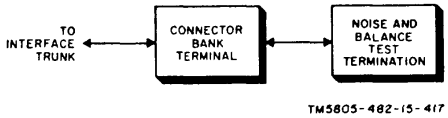

Figure 4-1. Noise and Balance Test Termination Part No. DH-871918-27A, block diagram.

NOTE

Each relay is shown on the schematic diagram in the normal condition with the circuit idle. Relays CL, OH, and OHC in the normal condition are restored and relay TR is operated.

b. Seizure (fig. 4-2). When idle the noise and balance test termination circuit places resistance battery on lead C. When seized, ringing current is applied to leads + and - causing tube T1 to conduct. This energizes the No. 1 winding of relay CL and its preliminary make contact places a ground on lead C. Ground on terminal C fully operates relay CL shorting its No. 1 winding and terminating the connector with line termination.

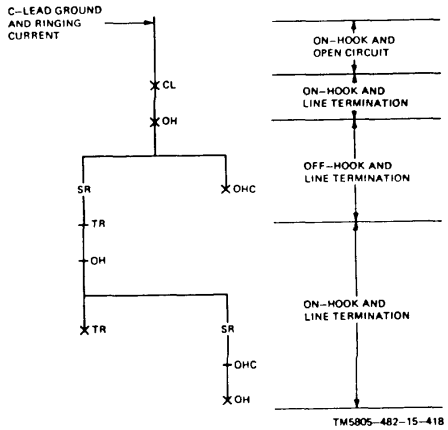

Figure 4-2. Seizure and termination test sequence diagram

c. Termination Test (fig. 4-2). Ground, via closed contact 11 of relay CL, operates relay OH, which sends an off-hook indication to the connector. If the circuit is strapped for continuous off-hook operation, the off-hook indication to the connector remains until the circuit is released. When the circuit is strapped for timed off-hook operation, ground (via closed contact 2 of relay OH) is transferred from relay TR to relay OHC. This first restores relay TR and then operates relay OHC. After 10 seconds of a continuous off-hook indication to the connector, relay TR operates and relay OH restores. On-hook indication is sent to the connector and relay OHC restores. After 1 second of on-hook indication, relay OH operates. When relay OH operates, the timed off-hook operation cycle of the circuit is repeated until the circuit is released.

d. Termination Test Release (fig. 4-3).

(1) *Calling party release offices*. Calling party release offices are PBX installations the connector bank terminal of which are designed to release when 4the calling party releases. In such offices when the calling party releases, the connector releases, ground is removed from lead C, relay CL restores, relay OH restores (if not already on the restored portion of its cycle during timed ,off-hook operation) and is prevented from operating. Relay OHC restores and relay TR operates. The circuit is .now in the idle state.

(2) *Called party release offices.* Called party release offices are PBX installations where release of the connector bank terminal is affected at the PBX. Methods of release are dependent on whether the noise and balance test termination circuit is arranged for permanent off-hook operation or timed off-hook operation.

(a) With timed off-hook operation, when the calling party releases, the connector is held if it is receiving an off-hook indication from the noise and balance test termination circuit. The connector will release when it receives the 1-second of on hook from the circuit. With the connector released, ground on C lead terminal C is removed .and the circuit then releases a described in paragraph d (1).

(b) When the noise and balance test termination circuit : is strapped for permanent off-hook operation, and the calling party releases, the connector is held by the permanent off-hook indication from the circuit. A second connector bank terminal used for release control is provided so that it may be dialed to release the noise and balance test termination circuit. The calling party accesses the connector bank terminial assigned for release control, and extends ground on its C lead to the noise and balance test termination circuit at terminal CR. This ground operates relay OHC. This restores relay OH, sending on hook to the connector on terminals + and -. The connector then releases removing ground from lead C, restoring relay CL. The calling party then releases the connector used for release control. This is accomplished even if the release connector is of the called party release type, since its connector bank terminals are open-circuited effectively being permanently on-hook. The ground extended at terminal CR is removed. This restores relay OHC and the circuit is now in the idle state.

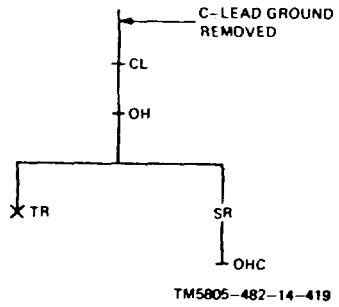

Figure 4-3. Termination test release sequence diagram.

CHAPTER 5
MAINTENANCE

Section I. GENERAL INFORMATION

5-1. Scope
This chapter describes maintenance procedures for the noise and balance test termination. Listed below are the various types of information and the paragraphs in which they can be found.

a. Preventive maintenance (para 5-3).
b. Troubleshooting (para 5-11).
c. Adjustment, repair, removal, and replacement (para 5-15).
d. Testing (para 5-21).

5-2. Maintenance Instruments
(fig. 5-1)

Instrument	Function
Test jack	Provides means to connect C-lead supervision and ringing signal for local testing of unit.
Busy key	When operated, sends continuous off-hook busy supervision to external connector bank equipment.
Variable resistor R30	Controls the 10second off-hook
Variable resistor R31	Controls the 1-second on-hook interval of the busy supervision cycle.

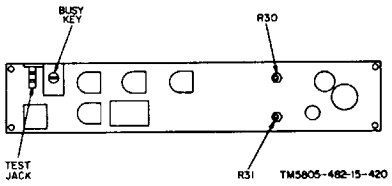

Figure 5-1. Noise and Balance Test Termination, Part No. DH-871918-A 7A, maintenance instruments.

Section II. PREVENTIVE MAINTENANCE

5-3. Scope
The preventive maintenance duties are listed below with a reference to the paragraphs covering the specific maintenance functions. These procedures do not require special tools or test equipment.

a. Monthly preventive maintenance checks and services (para 5-7).
b. Quarterly preventive maintenance checks and services (para 5-8).
c. Cleaning (para 5-9).
d. Touchup painting (para 5-10).

5-4. Materials Required
The following materials are required:

a. Cleaning compound, trichloroethane.
b. Cleaning cloth.
c. Fine sandpaper No. 000 or 0000.
d. Touchup paint.

5-5. Requirements
Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 5-6 through 5-10 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (para 5-7 and 5-8) outline functions to be performed at specific intervals. These checks and services are to maintain equipment

in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the charts indicate what to check, how to check, and what the conditions are; the Reference column lists the illustrations or paragraphs that contain additional information. If the .defect cannot be remedied by performing the corrective action indicated, higher echelon maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

5-6. Checks and Service Periods

Preventive maintenance checks and services are required on a monthly and quarterly basis. Paragraph 5-7 specifies checks and services that must be performed monthly. Paragraph 5-8 specifies checks and services that must be performed quarterly.

NOTE

If the equipment must be kept in continuous operation, perform only those checks and services that can be accomplished without disturbing operation; make the complete checks and services when the equipment may be taken out of service.

5-7. Monthly Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	Reference
1	Completeness	See that the equipment is complete.	
2	Cleanliness	Exterior of equipment must be clean and dry; free of dirt, dust, grease, and fungus.	Para 5-9
3	Cables	Inspect cables and wires for cracked or frayed insulation.	None
4	Metal surfaces	Inspect exposed metal surfaces for rust and corrosion. Touch up with paint as required.	TB 746-10 and Para 5-10
5	Terminal blocks	Inspect terminal blocks for loose connections and cracked or broken insulation.	

5-8. Quarterly Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	Reference
1	Publications	See that all publications are complete, serviceable, and current.	DA Pam 3104
2	Modifications	Check DA PAM 310-7 to determine if new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled.	TM 38-750 and DA Pam 310-7

5-9. Cleaning

Inspect the exterior surfaces of the unit. The exterior surfaces shall ,be clean, free of dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean soft cloth.

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT use near an open flame. Trichloroethane is not flammable, but exposure of the fumes to an open flame converts .the fumes to highly toxic, dangerous gases.

b. Remove grease, fungus, and ground-in dirt from the exterior of the unit. Use a damp cloth (not wet) with cleaning compound. If dirt is difficult to remove, use mild soap if necessary.

c. Remove dust or dirt from the jack and plugs with a brush.

5-10. Touchup Painting

Remove rust and corrosion from metal surfaces by lightly sanding with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TAM 9-213.

Section III. TROUBLESHOOTING

5-11. Scope

This section contains all the necessary information to troubleshoot the noise and balance test termination. The information consists of: tools and test equipment required for troubleshooting; sectionalization, localization, and isolation instructions; and maintenance aids.

5-12. Tools, Test Equipment, and Material

a. Tools.

(1) Soldering iron (25 to 50 watts).

(2) Needle nose pliers.

(3) Solder.

b. Test equipment. The only item of test required is an AN/USM-16 Multimeter.

5-13. Sectionalization, Localization, and Isolation

a. Sectionalization. The first step in servicing the noise and balance sheet termination is to sectionalize the fault to either the supervision circuit or the termination circuit. If off-hook supervision does not occur after receipt of the seizure signal, then trouble exists in the relays or other parts of the supervision circuit. If the line is not terminated after the receipt of the ringing signal, then trouble exists in the termination circuit. After the trouble has been sectionalized to one of the circuits, or both, maintenance personnel should refer to the localization information.

b. Localization. When it has been determined that a particular circuit is faulty, the trouble must be further localized to a particular functional portion of the faulty circuit such as the circuit components that control relay operation or that provide the line termination characteristics. This is best accomplished by isolation.

c. Isolation. The third step is to -isolate the trouble to the defective part responsible for the abnormal condition. Equipment -trouble will usually be isolated to dirty relay contacts or improper adjustment of the circuit timing (Section IV, para 5-17). Some faults, such as burned out resistors and arcing, can be located by means of sight, sound, or smell. The majority of faults, Whoever, must .be isolated by making voltage and resistance checks. Paragraphs (1) through (3) below contain a group of tests that should minimize the amount of work involved in isolating a trouble with-in a defective circuit.

(1) *Visual inspection*. The purpose of visual inspection is to quickly locate a fault without testing or measuring circuits. By this approach, maintenance personnel can frequently discover the trouble or determine the circuit in which the trouble exists.

(2) *Testing.* Maintenance personnel should perform the operational test located in Section V. This test will indicate the general location of -the fault and help determine the exact nature of the trouble.

(3) *Intermittent troubles*. In the preceding tests, the possibility exists that intermittent troubles can occur. If present, this type of trouble can often be located by tapping or jarring the equipment. For this type of condition, the wiring and connections to the units must be checked for .defects.

5-14. Maintenance Aids *a. Parts Location Drawings*. The parts location drawing (fig. 5-2) is provided for the noise and balance test termination to identify the individual components that will be used during troubleshooting.

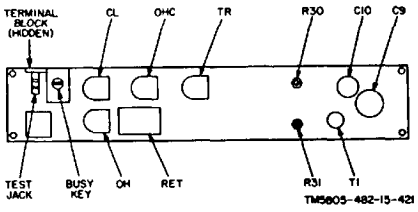

Figure 5-2. Noise and Balance Test Termination, Part No. DH-861918-A72A, parts location.

b. Schematic Diagram. Figure 6-1 is a schematic diagram of the noise and balance test termination.

c. Troubleshooting Chart. A troubleshooting chart for the noise and balance test termination is provided to aid in sectionalizing the fault to a particular circuit. In addition, the troubleshooting chart will help in localizing the trouble to a defective component. Maintenance personnel should also refer to paragraph d for resistance measurements of the repeating coil and the polarized relay windings.

Item No.	Symptom	Probable trouble	Corrective action
1	No resistance battery on C lead when unit is idle	a. Dirty contacts on relay CL busy key. b. Battery not applied to unit	a. Clean relay or busy key contacts (para 5-9). b. Check that external fuse is not open.
2	Time not terminated when ringing signal is received on leads + and	a. Defective tube T1 b. Defective relay CL c. Defective relay OH d. Open coil RET	a. Replace tube T1 b. Replace relay CL. c. Replace relay OH. d. Check resistance of coil RET: replace coil if open.
3	No off-hook supervision or permanent off-hook supervision when unit is strapped for off-hook supervision.	a. Loose connection of strap TOH b. Defective relay OH c. Defective relay OHC or TR.	a. Check that strap TOH is properly connected (fig. 6-1) b. Replace relay OH. c. Replace relay OHC or TR.
4	Off-hook supervision signal cycle is other than 10 seconds off-hook and 1 second on hook.	a. Timing resistor R30 misadjusted b. Timing resistor R31 misadjusted. c. Defective capacitor C9 or C10. d. Defective relay OHC or TR.	a. Readjust resistor R30 for correct timing. b. Readjust resistor R31 for correct timing. c. Replace capacitor C9 or C10. d. Replace relay OHC or TR.
5	Time remains terminated when lead is released.	Defective relay CL.	Replace relay CL.

d. Resistance Value of Coils. Winding resistances of coil RET are listed below. A multimeter must be used to measure between the pins indicated.

Pins 2 and 5 .....72 ohms
Pins.....43 ohms
Pins 4 and 3 .....115 ohms

Section IV. ADJUSTMENT, REPAIR, REMOVAL AND REPLACEMENT

5-15. Scope

This section contains the following pertinent maintenance procedures for the noise and balance test termination.

a. Relay adjustments (para 5-17).
b. Repair (para 5-18).
c. Removal and replacement of electrical components (para. 5-19).
d. Removal and replacement of relays (para. 5-20).

5-16. Tools, Test Equipment, and Material

a. Tools.
(1) Small soldering iron.
(2) Small screwdriver.
(3) Long nose pliers.
(4) Nonmagnetic offset thickness gage.
(5) Push-pull gage.
(6) Spring adjuster.

b. Test Equipment. The only test equipment required is current flow test set, Automatic Electric Co., Model S.
c. Materials. The only material required is solder.

5-17. Relay Adjustments

Before any adjustments are performed, the relay should be checked with the current flow test set to determine whether the relay meets the required parameters given on the associated relay adjustment sheet. The technical manual provided with the current flow test set describes the relay/test set connections, and contains operating and testing instructions for each type of relay. Unique relay adjustment sheets are provided in the facility data package to check the minimum and maximum

operating characteristics of each type of relay. When out-of-tolerance characteristics are detected during testing of the relay, maintenance personnel should perform the appropriate relay adjustments given below. After making these relay adjustments, the relay should be rechecked to ensure that it functions properly.

NOTE

Since all relays are properly adjusted by the manufacturer, avoid unnecessary adjustments that require complete readjustment of the relay, When a relay can not be adjusted, replace it in accordance with paragraph 5-20.

a. Armature Adjustment. Check and adjust air gap between armature and heelpiece by performing steps (1) through (6).

(1) Connect relay to current flow test set.

(2) Loosen yoke clamping screw until armature is free to move.

(3) Electrically operate relay.

(4) Depending upon the type of residual on the relay, select a thickness gauge from the inspection column of the following chart to measure armature to heelpiece air gap.

Type of Residual	Adjustment (inches)	Inspection (inches)
Adjustable	0.003	0.004
0	0.003	0.004
0.003-inch disc	0.003	0.004
0.006-inch disc	0.006	0.008

(5) If necessary, adjust air gap to value specified in adjustment column by sliding armature toward or away from heelpiece.

(6) Retighten yoke clamping screw and disconnect current flow test set from relay.

b. Residual Adjustment For Fixed Disc Relay. To check and adjust relays with fixed disc residual, add readjust resistance value from appropriate relay adjustment sheet into test circuit by setting current flow test set for appropriate test resistance, and proceed as follows:

(1) Check that residual disc strikes coil core so that disc does not extend over edge of coil core face for 5/16 core faces (1/16-inch tolerance permitted for 3/16-inch core faces).

(2) Check that armature does not bind on its bearings and has end play of at least 0.020 inch and not more than 0.020 inch.

(3) Use current flow test set to electrically operate relay.

(4) Select thickness gauge of approximate size (0.003 inch for class B relay; 0.003 inch for class C relay with 0.003-inch residual disc; 0.006 inch for class C relay with 0.006-inch residual disc).

(5) Insert thickness gage into air gap.

(6) If thickness gauge will not enter or enters loosely, loosen yoke clamping screw, move armature until thickness gauge fits snugly between armature and heelpiece, and tighten yoke clamping screw.

(7) Restore relay and disconnect current flow test set.

c. Contact Alignment.

(1) Place a 0.003-inch thickness gauge between both pairs of make or break contacts.

(2) Manually operate relay slowly several times.

(3) Check that contacts of both pairs make or break within 0.003 inch of each other.

(4) If necessary, place spring adjuster on one of the armature springs and twist spring until contacts open or close within 0.003 inch of each other.

5-18. Repair

There are no repair procedures for the noise and balance test termination. If attempts to adjust the relays fail to resolve a malfunction, the defective relay must be replaced. All other component of the noise and balance test termination are nonreparable items and must be replaced if found to be defective.

5-19. Removal and Replacement

All component parts of the equipment are easily reached and can be removed without disturbing other parts. Before disconnecting electrical leads, the color coding of the leads and the identification of associated terminals; should be noted or each lead tagged to identify the associated terminal. Before removing retaining hardware, the orientation of the part being removed should be noted so that the new part is installed in the same orientation. Careless replacement of parts often makes new faults inevitable. Note the following precautions:

a. Do not use a large soldering iron when soldering small resistors or capacitors, since overheating of small components can seriously damage them or change their values.

b. Do not allow drops of solder to fall into parts of the assembly, since they may cause short circuits.

c. Make well-soldered joints, since a poorly soldered joint is one of the most difficult faults to find.

5-20. Removal and Replacement of Relays

a. Unsolder and tag each lead until all leads are disconnected.

b. Remove two relay mounting screws; remove relay from mounted position.

c. Replace relay by properly positioning it on the mounting plate and securing with two screws removed din step b.

d. Resolder leads removed in step a to the proper terminals in accordance with identifying tags.

Section V. TESTING

5-21. Scope

This section provides procedures for testing the noise and balance test termination.

5-22. Test Equipment

Testing is performed by using the operator's position equipment 'to make the connections necessary for checkout.

5-23. Test Procedure

a. Insert a position call cord into an outgoing jack.

b. Dial the connector test number to access the noise and balance test termination. Approximately two ringback signals must be heard.

c. Remove position call cord to return circuit to idle.

CHAPTER 6

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

6-1. Repackaging

Repackaging of equipment for shipment or limited storage normally will be performed at a packaging facility or by a repackaging team. Should emergency packaging 'be required, select the materials from those listed in SB 38-100, Preservation, Packaging, and Packing Materials, Supplies, and Equipment Used by the Army. Package the equipment in accordance with the original packaging, in so far as possible, with the available materials.

6-2. Authority for Demolition

Demolition of the equipment will be accomplished only upon order of the commander. Use the ,destruction procedures outlined in paragraph 6-3 to prevent further use of the equipment.

6-3. Methods of Destruction

The tactical situation and time available will determine the method to be used when destruction of equipment is ordered. In most cases, it is preferable to demolish completely some portions of the equipment rather than partially destroy all equipment units.

a. Smash. Use sledges, axes, hammers, crowbars, and any other heavy tools available to smash the interior of the equipment.

b. Cut. Use axes, hand axes, machetes, and similar tools to cut cabling, cording, and wiring. Use a heavy axe or machete to cut the power cable. Cut all cords and cables in a number of places.

WARNING

Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.

c. Burn. Burn the technical manuals first. Burn as much of the equipment as is flammable; use gasoline, oil, flamethrowers, and similar materials. Pour gasoline on the cut cables and internal wiring, and ignite it. Use a flamethrower to burn spare parts or pour gasoline on the spares and ignite them. Use incendiary grenades to complete the destruction of the equipment.

d. Explode. Use explosives to complete demolition or to cause maximum damage, before burning, when time does not permit complete demolition by other means. Powder charges, fragmentation grenades, or incendiary grenades may be used. incendiary grenades usually are most effective if destruction of small parts and, wiring is desired.

e. Dispose. Bury or scatter destroyed parts or throw them into nearby waterways. This is particularly important if a number of parts have not been completely destroyed.

6-4. Reporting

The reporting of the destruction of equipment shall be made through command channels.

APPENDIX A
REFERENCES

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins. and Lubrication Orders.
DA Pam 3110-7	U.S. Army Index of Modification Work Orders.
SB 38-100	Preservation, Packaging, and Packing Materials, Supplies, and Equipment used by the Army.
TB 746-10	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 9-213	Painting Instructions for Field Use.
TM 11-5805-482-15-1	Operator, Organizational, IDS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: 690-OHM and 900-OHM two-Wire to Four-Wire Telephone Repeater Terminating Units (Wescom Part Nos. FD-6000-A00-AB, FD-6000-AC) and Four Wire to Four Wire Voice Frequency Line Amplifiers (WESCOM Part Nos. FD-to-A G, FD-6000-AH).
TM 11 5805-482-15-2	Operator, Organizational, ;DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: 26'00 Cycle Signaling Set with Self-Contained Oscillator (Wescom Part No. FD4-6-AA).
TM 11 5805-482-15-3	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: DX Signaling Equipment (AUTELCO Part No. qDHJ-5837-72A) and Repeating Coils (AUTELCO Part No. H-870)79-2).
TM 11-5805-482-15-4	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: Two-Way PABX Routine Trunk Circuit with Pad Control and Pulse Correction (AUTELCO PART NO. DH-75592-A78A); Two-Way PABX Routine Trunk Circuit with Pad Control (AUTELCO Part No. DH-7592-A?71A); Pulse Correction Circuit for Two-Way PABX Routine Trunk Circuit (AUTELCO Part No. DH-759 2-A7111A).
TM 11-5805-482-15-5	Operator, Organizational, DS, GS, and ,Depot Maintenance Manual, Overseas AUTOVON Interface Components: Two-Way PABX Preemptible Interface Trunk Circuit with Pad Control and Pulse Correction (AUTELCO Part No. DH-756550-702A); Universal Cord Appliqué for Two-Way PABX Preemptible Interface Trunk Circuits (AUTELCO Part Nos. DH-T5650-A77A and ,DH-75650-702A); H75650 Trunk circuit Adapter for AUTELCO Syst 1000/2, M819/427-A1; H75650 Trunk Circuit Adapter for AUTELCO Syst 1000/1, M819/427-A2; H756 Trunk Circuit Adapter for SIEMENS RP40 SWBD, M819/427-B; H75650 Trunk Circuit Adapter for SIEMENS PABX EMD SWBD, M819/427-H; H75650 Trunk Circuit Adapter for Telenorma SWBD, M819/427-K; H7L5650 Trunk Circuit Adapter for SIEMENS-EISENBAHN System, M819/427-N.
TM 11-5805-482-15-6	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: DTMF Keyset and Coupling Unit (AUTELCO Part No. H-88738-1).

TM 11-580-482-15-7	Operator, Organizational, DS, GS, and Depot Mainltenance Manual, Overseas AUTOVON Interface Components: Two-Way AUTOVON Trunk Circuit (Western Electric Co. Part Nos. J61561AN-1, List Nos. L-1, L-2, L-4, L-A, L-B, L-WB, L-WC, L-WE) and Multi-Level Precedence Preemption Adapter for AUTOVON Trunk Circuit (Western Electric Co. Part No. H-000-25, List No. L-1).
TM 11-580-482-15-8	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: Preempt Tone Generator (Western Electric Co. Part No. 404G).
TM 11-580-482-15-9	Operator, ,Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: 2/6 MF Tone Supply-Transfer Alarm and Distribution Circuits (AUTELCO Part No. H-887929).
TM 11-580-482-15-10	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: Combination 1-Milliwatt Stability Check and Loop-Around Termination with Release Termination (AUTELOC Part No. DH-8719,18-A70A).
TM 11-580-482-15-12	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: 100HZ, 1 Milliwatt Test-Tone Generator (Northeast Electronics Co. Part No. FD1067AK).
TM 11-580-482-15-13	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: Preemption Tone Supply, Transfer Alarm, and Distribution Circuits (AUTELCO Part No. H-886957-1).
TM 11-580-482-15-14	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: Battery Charger/Eliminator with 37 Nickel-Cadmium Cells (AUTELCO Part No. FD-6003-AA).
TM 11-580-482-15-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual. Overseas AUTOVON Interface Components: Battery Charger/Eliminator (AUTELCO Part .No. :FD-6003-AB).
TM 11-580-482-15-16	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: Reverse-Battery Test-Line Circuit with varying Supervisory Signals (AUTELCO Part No. DH-610036-71A).
TM 11-580-482-15-17	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Componenbts: DC to DC Converter, 60VDC to 48VDC (Lorain Model No. SQG-25B).
TM 11-580-482-15-18	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: DC to DC Converter, 24VDC to 5OVDC (Lorain Model No. QA7B).
TM 11-580-482-1519	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Overseas AUTOVON Interface Components: 'C" Lead Adapter for Test Termination (AUTEL00-Milan Part No. M81¶9/444A).
TM 38-750,	Army Equipment Record Procedures.

APPENDIX C
DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

C-1. Scope
This appendix lists repair parts and special tools required for the performance of general support and depot maintenance for the DII-871918-A72A. No parts authorized for stockage at direct support.

C-2. General This Repair Parts and Special Tools List is divided into the follow sections:

a. Repair Parts for Direct Support, General Support, and Depot Maintenance. A list of repair parts authorized for the performance of maintenance at the general support and depot level. No parts authorized for stockage at direct support.

b. Special Tools, Test, and Support Equipment for Direct Support, General Support, and Depot Maintenance-Section III. Not applicable.

C-3. Explanation of Columns The following provides an explanation of columns in the tabular lists:

a. Source, Maintenance, Recoverability Codes (SMR) (1) Source code indicates the selection status and source for the listed item. Source codes are

Code	Explanation
P-	Repair parts which are stocked in or supplied from the GSA/DSA or Army supply system and authorized for use at indicated maintenance categories.
P2-	Repair parts which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
P9-	Assigned to items which are NSA design controlled: unique repair parts, special tools, test, measuring and diagnostic equipment, which are stocked and supplied by the Army COMSEC logistic system, and which are not subject to the provisions of AR 380-41.
P10-	Assigned to items which are NSA design controlled: special tools, test, measuring and diagnostic equipment for COMSEC support, which are accountable under the provisions of AR 380-41, and which are stocked and supplied by the Army COMSEC logistic system.
M-	Repair parts which are not procured or stocked, but are to be manufactured in indicated maintenance levels.
A-	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X-	Parts and assemblies which are not procured or stocked and the mortality of which normally is below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.
X1-	Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.
X2-	Repair parts which are not stocked The indicated maintenance category requiring such repair parts will attempt to obtain same through cannibalization. Where such repair parts are not obtainable through cannibalization, requirements will be requisitioned, with accompanying justification, through normal supply channels.
G-	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above DS and GS level or returned to depot supply level.

(2) Maintenance code indicates the lowest category of maintenance authorized to install the listed item. The maintenance level codes are

Code	Explanation
C	Operator/crew
O	Organizational maintenance
F	Direct support maintenance
H	General support maintenance
D	Depot maintenance

(3) Recoverability code indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are-

Code	Explanation
R	Repair parts and assemblies that are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
S	Repair parts and assemblies which are economically' repairable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically repairable, they will be evacuated to a depot for evaluation and analysis before final disposition.
T	High dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.
U	Repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, or high dollar value reusable casings or castings.

b. Federal Stock Number. Indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. Indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses.

d. Unit of Measure (U/M). A two-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based; e.g., ft, ea, pr, etc.

e. Quality Incorporated in Unit. Indicates the quantity of the item used in the DH-871918-A72A.

f. 30-Day DS/GS Maintenance Allowances

NOTE
Allowances in GS Column are for GS maintenance only.

(1) The allowance columns are divided into three subcolumns. Indicated in each subcolumn is the total quantity of items authorized for the number of equipments supported. Items not authorized for use as required, but not for initial stockage, are identified with an asterisk in the allowance column.

(2) The quantitative allowances for GS level of maintenance will represent initial stockage for a 30day period for the number of equipments supported.

(3) Determination of the total quantity of parts required for maintenance of more than 100 of these equipments can be accomplished by converting the equipment quantity to a decimal factor by placing a decimal point before the next to last digit of the number to indicate hundredths, and multiplying the decimal factor by the parts quantity authorized in the 51-100 allowance column. Example, authorized allowance for 51-100 equipments is 40; for 150 equipments multiply 40 by 1.50 or 60 parts required.

g. 1-Year Allowances Per 100 Equipments/Contingency Planning Purposes. Indicates the total quantity required for distribution and contingency planning purposes. The range of items indicates total quantities of all authorized items required to provide for adequate support of 100 equipments for 1 year.

h. Depot Maintenance Allowance Per 100 Equipments. Indicates the total quantity authorized for depot maintenance of 100 equipments.

i. Illustrations

(1) Figure Number. Indicates the figure number of the illustration in which the item is shown.

(2) Item number or reference designation. Indicates the reference designation used to identify the item in the illustration.

C-4. Special Information

Repair parts mortality is computed from failure rates derived from experience factors with the individual parts in a variety of equipments. Variations in the specific application and periods of use of electronics equipment, the fragility of electronic piece parts, plus intangible material and quality factors intrinsic to the manufacture of electronic parts, do not permit mortality to be based on hours of end item use. However, long periods of continuous use under adverse conditions are likely to increase repair parts mortality.

C-5. Location of Repair Parts

This appendix does not contain any cross-reference indexes. To locate a repair part, scrutinize the repair parts list until the part is located.

C-6. Federal Supply Codes for Manufacturers

Code	Manufacturer
04773	Automatic Electric Co.

SECTION II. REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE

(1) SMR CODE / INDEX NO.	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION / USABLE ON CODE / REF. NUMBER & MFR CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30 DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30 DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATIONS (a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
		NOISE AND BALANCE TEST TERMINATION (AUTELCO PART NO. DH-871918-A72A)												
P-E	5905-185-8310	RESISTOR, FIXED , WIREWOUND: D-281137-A (04773)	EA	2				*	*	1	13	6	6-1	R25, R27
P-H	5905-196-3577	RESISTOR, FIXED , WIREWOUND: D-281222-A (04773)	EA	1				*	*	1	8	3	6-1	R21
P-H	5905-806-7142	RESISTOR, FIXED , WIREWOUND:: D-232671-A (04773)	EA	1				*	*	1	8	3	6-1	R22
P-H	5905-828-5063	RESISTOR, FIXED , WIREWOUND: D-282825-A (04773)	EA	1				*	*	1	8	3	6-1	R23
P-H	5905-185-8321	RESISTOR, FIXED , WIREWOUND: D-282910-A (04773)	EA	1				*	*	1	8	3	6-1	R33
P-H	5905	RESISTOR, FIXED , WIREWOUND:: D-283912-E (04773)	EA	2				*	*	1	13	6	6-1	R28, R29
P-H	5905-891-7966	RESISTOR, FIXED , WIREWOUND: D-284076-A6 (04773)	EA	3				*	1	1	18	9	6-1	R24, R26, R34
P-H	5905-254-9201	RESISTOR, FIXED , WIREWOUND: D-284080-B68 (04773)	EA	1				*	*	1	8	3	6-1	R35
P-H	5950-087-1990	REACTOR: D-284402-A (04773)	EA	1				*	*	1	8	3	5-2	RET
P-H	5910-127-1630	CAPACITOR, FIXED, PAPER: D-68564-A (04773)	EA	1				*	*	1	8	3	6-1	C8
P-H	5910-843-9445	CAPACITOR, FIXED, ELECTROLYTIC: D-68743-AC (04773)	EA	1				*	*	1	8	3	6-1	C10
P-H	5910	CAPACITOR, FIXED, ELECTROLYTIC: D-68743-AY (04773)	EA	1				*	*	1	8	3	6-1	C9
P-R	5960-010-6764	ELECTRON TUBE: FD-1052-CG (04773)	EA	1				1	1	2	130	100	5-2	T1
P-H	5945	RELAY, ARMATURE: CT-12016-B17 (04773)	EA	1				*	*	1	8	3	5-2	CL
P-E	5945	RELAY, ARMATURE: GT-12030-A67A (04773)	EA	1				*	*	1	8	3	5-2	TR
P-R	5945	RELAY, ARMATURE: GT-12032-C74 (04773)	EA	1				*	*	1	8	3	5-2	OH
P-H	5945	RELAY, ARMATURE: GT-12056-A61 (04773)	EA	1				*	*	1	8	3	5-2	OHC
P-H	5905-902-3294	POTENTIOMETER, 25K: D-284227-A8 (04773)	EA	2				*	*	1	13	6	6-1	R30, R31

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USAMC (5)
USCONARC (5)
ARADCOM (2)
ARADCOM Rgn (1)
OS Maj Comd (4)
LOGCOMD (2) except
1st LOGCOMD (5)
9th LOGCOMD (5)
USAMICOM (4)
USATECOM (2)
USAESC (40)
MDW (1)
Armies (2)
Corps (2)
1st Cav Div (2)
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USARMIS (1)
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USAIS (2)
USAES(2).
USAINTS (3)
USASTC (2)
WRAMC (1)
Army Pic Cen (2)
USACDCEC (10)
Fort Huachuca (10)
Fort Carson (10)
Army Dep (1) except
LBAD (14)
SAAD (30)
TOAD (14)
LEAD (7)
ATAD (10)
Gen Deps (2)
Sig Sec Gerr Deps (5)
Sig Dep (12)
Sig FLDMS (1)
USMACV (20)
Units org under fol TOE:
(2 cys each)
11-155
11-157
11-158
11-592
11-697
11-587

NG: None.
USAR: None.
For explanation of abbreviations used, see AR 320-50.

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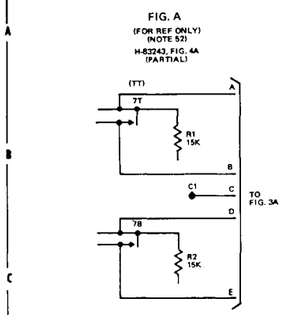
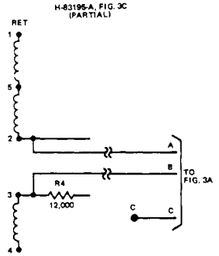
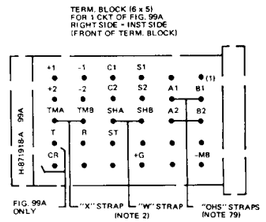
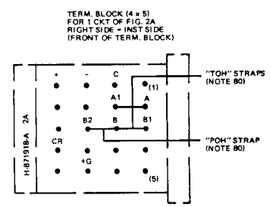








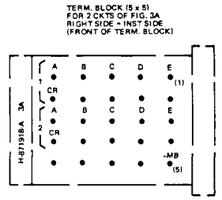


TABLE A

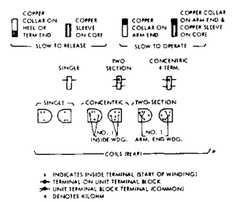
ORDERING FIGURES.	SUB-FIGURES 1A	2A	3A		FEATURES
99A	*		*		FOR END OFFICES NOT ARRANGED WITH CALLING PARTY RLS. CONNECTOR
2A		*			TERMINATION TEST
3A			*		RELEASE TERMINATION, 2 PER OFFICE

ENGINEERING NOTES:

51-IN PABX END OFFICES WHERE;
A-CALLING PARTY RELEASE CONNECTORS ARE NOT OR CANNOT BE PROVIDED.
B-AND WHERE ONE SECOND ON-HOOK SUPERVISION NORMALLY PROVIDED TO PERMIT RELEASE FROM TEST TERMINATION CANNOT BE TOLERATED DUE TO TRANSFER OF CALL TO ATTENDANT,
FIGURE 3A AND ASSOCIATED CONNECTOR TERMINAL (C LEAD ONLY) SHALL BE SPECIFIED IN CONJUNCTION WITH FIGURE 1A.
WITH FIGURE 3A EQUIPPED, PERMANENT OFF-HOOK SUPERVISION IS RETURNED ON SEIZURE OF FIGURE 1A AND IT IS NECESSARY TO DIAL CONNECTOR TERMINAL ASSIGNED TO FIGURE 3A AFTER COMPLETION OF TEST TO EFFECT RELEASE.

52-FIGURE A AND B SHOW CONNECTIONS TO H-83243 FIGURE 4A AND H-83195-A FIGURE 3C FROM FIGURE 3A TO PROVIDE STEADY OFF-HOOK SUPERVISION AND RELEASE CONTROLS IN OFFICES WHICH CANNOT PROVIDE CALLING PARTY RELEASE CONNECTORS. (SEE NOTE 51)

SYMBOLS



MANUFACTURING NOTES:

1-CONTACTS "X" OPERATE FIRST.

2-FIGURE 1A MANUFACTURED WITH "W" STRAP EQUIPPED AND CIRCUIT PROVIDES OPEN CIRCUIT TEST AND SHORT CIRCUIT TEST PRIOR TO TERMINATION TEST. INSTALLER SHALL REMOVE "W" STRAP AND ADD "X" STRAP IF TERMINATION TEST ONLY IS REQUIRED.

3-SHOP SHALL ADJUST POTENTIOMETERS R18 & R19 FIGURE 1A AND R30 & R31 FIGURE 2A TO OBTAIN RELEASE TIME OF 10 SECONDS AND 1 SECOND FOR RELAYS TR & CHC FIGURE 1A, AND TR & CHC FIGURE 2A RESPECTIVELY.

INSTALLING NOTES:

76-INSTALLER SHALL STRAP RESISTORS R3 & R5 (FIGURE 1A) OR R23 (FIGURE 2A) WHEN THESE FIGURES ARE PROVIDED IN 600 OHM OFFICES.

77-INSTALLER SHALL ADJUST VARIABLE RESISTORS R16 & R17 (FIGURE 1A), R28 & R29 (FIGURE 2A) AND R32 (FIGURE 3A) TO PROVIDE RESISTANCE BATTERY ON C LEAD (INCLUDING RESIS. MS K9 OR R8) EQUIVALENT TO RESISTANCE OF ASSOCIATED MANUFACTURER'S LINE CIRCUIT CUT-OFF RELAY. (MFG. ADJ. TO 1200 OHMS)

78-INSTALLER SHALL ADJUST VARIABLE RESISTOR R20 TO COMPENSATE FOR WIRING LOSS FROM + & - TEST LINE CIRCUIT TO THE OUTLET (CONNECTOR BANKS), I.E. MEASURE RESISTANCE FROM TERMINAL OF TEST LINE CIRCUIT TO SHORT CIRCUIT PLACED ACROSS OUTLET AT CONNECTOR BANKS.

79-INSTALLER SHALL ADD "OHS" STRAPS WHEN FIGURE 1A IS USED IN CALLING PARTY RELEASE CONNECTOR GROUPS.

80-FIGURE 2A MANUFACTURED WITH "TOH" STRAPS EQUIPPED AND CIRCUIT IS ARRANGED FOR TIMED OFF-HOOK SUPERVISION. INSTALLER SHALL REMOVE "TOH" STRAP AND ADD "POH" STRAP WHERE PERMANENT OFF-HOOK IS REQUIRED AND RELEASE IS PROVIDED FROM ANOTHER CONNECTOR TERMINAL.

CURRENT DRAIN DATA AMPS.
HOLDING CURRENT 0.24

TM5805-482-15-422 (1)

Figure 6-1 (1). Noise and Balance Test Termination, Part No. DH-871918-A72A, schematic diagram (part 1 of 2)

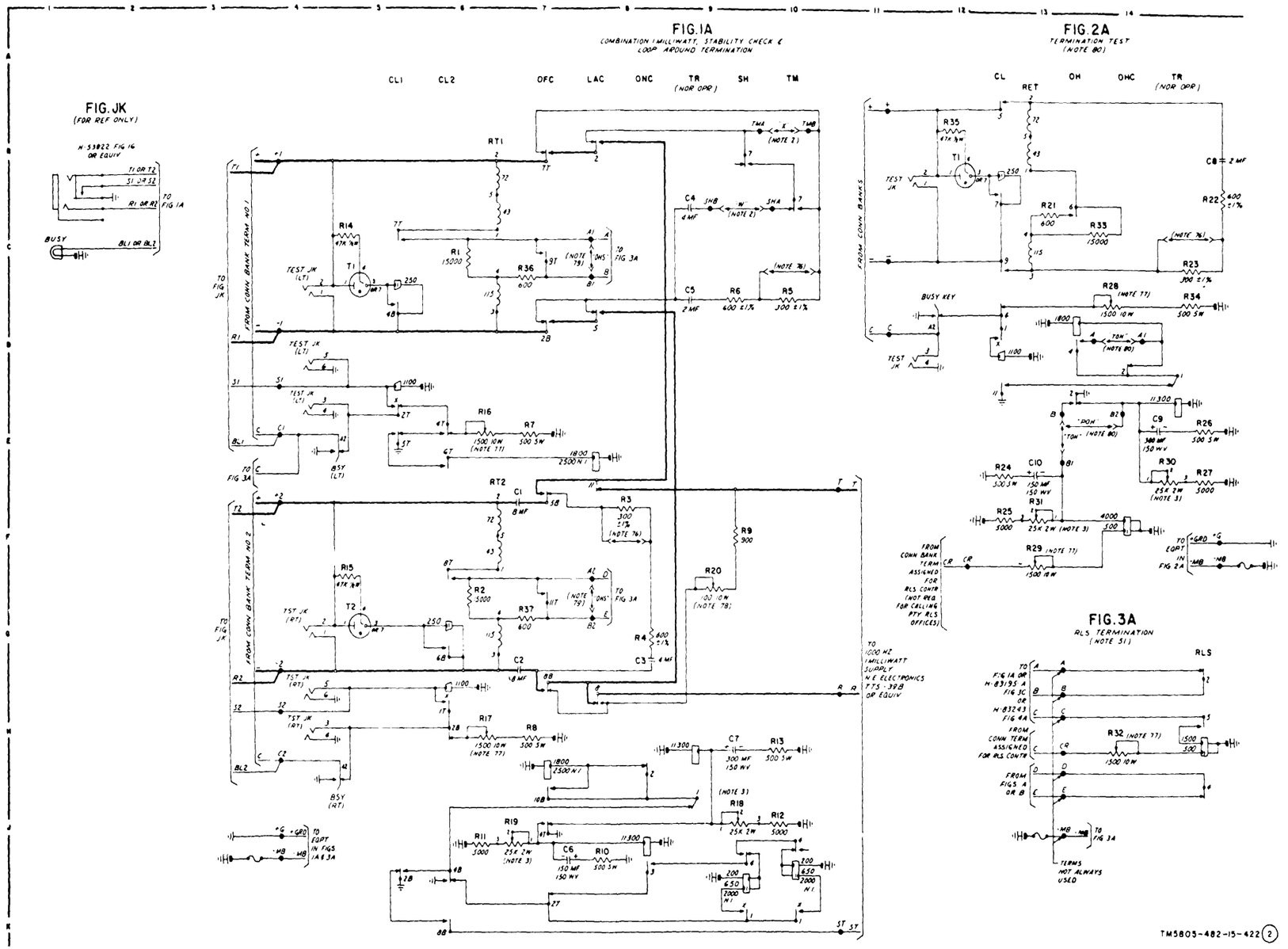


Figure 6-1 (2). Noise and Balance Test Termination, Part No. DH-871918-A72A, schematic diagram (part 2 of 2)

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq.dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 029120-000