TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, AND DIRECT SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS

DECODER GROUP OX-32/GT

(5805-167-0995)

HEADQUARTERS, DEPARTMENT OF THE ARMY

OCTOBER 1974

WARNING

HIGH VOLTAGE

is used in the operation of this equipment.

DEATH ON CONTACT

may result if personnel fail to observe safety precautions. Learn the areas in the equipment containing high voltages. Be careful not to contact high-voltage connections when installing or operating this equipment. Before working inside the equipment, turn power off and ground points of high potential before touching them.

WARNING
DANGEROUS CHEMICALS

are used to clean this equipment.

DEATH

or severe burns may result if personnel fail to observe safety precautions.

TECHNICAL MANUAL
HEADQUARTERS
DEPARTMENT OF THE ARMY
No. 11-5805-643-13
WASHINGTON, D.C., *25 October 1974*

OPERATOR'S, ORGANIZATIONAL, AND DIRECT SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS DECODER GROUP OX-32/GT (5805-167-0995)

Current as of 23 August 1974

LIST OF ILLUSTRATIONS

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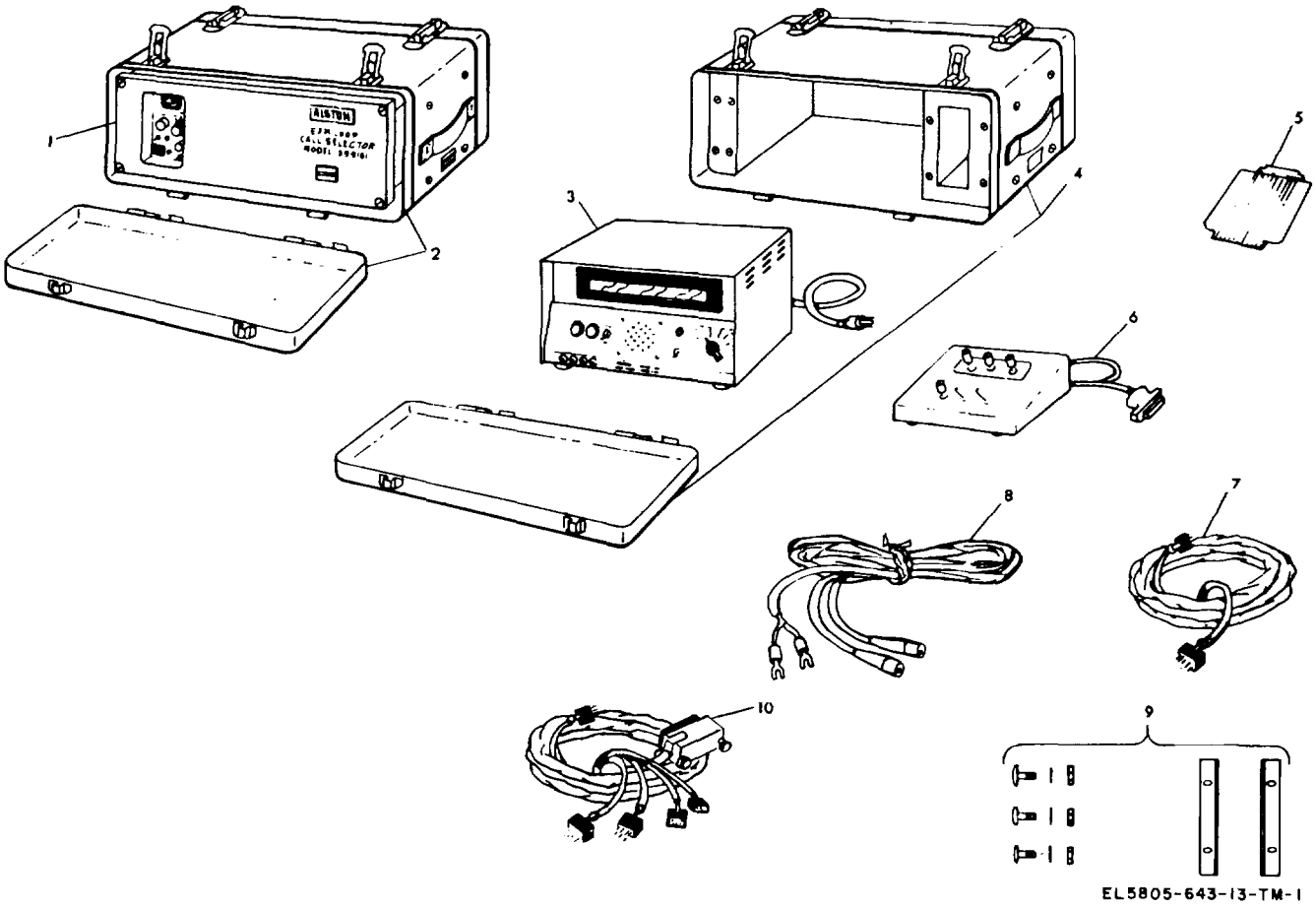
CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope
This manual contains on-site maintenance (operator/crew, organizational, and direct support) for Decoder Group OX32/GT (fig. 1-1). It provides a description, service/installation information, operation and maintenance instructions with parts list for the decoder group of components.

1-2. Indexes of Publications
a. DA Pam 310-4. Refer to the latest issue of DA Pam 3104 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

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



1. Telephone Connector Switch SA-1962/GT (call selector).
2. Electrical Equipment Case CY-7372/GT.
3. Pulse Decoder Monitor KY-791/GT.
4. Electrical Equipment Case CY-7371/GT.
5. Extender card 381001.
6. Decoder-Monitor Control C-9433/GT.
7. Interconnect cable 365202.
8. Power cable (call selector) 83016.
9. Hardware mounting kit 370019 (Rack Mount).
10. Input cable (call selector) 365097-2.

Figure 1-1. Decoder Group OX-2/GT.

1-3. Forms and Records

a. Reports of Maintenance and *Unsatisfactory* Equipment. *Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750.*

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/NAVSUP PUB 378/AFR 71-4/MCO P4030.29, and DSAR 4145.8.

c. *Discrepancy in Shipment Report (DIS-REP) (SF 361).* Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribedinAR55-38/NAVSUPINST 4610.33/AFM 75-18/MCO P4610.19A, and DSAR 4500.15.

1-4. Reporting of Errors

The reporting of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028, (Recommended Changes to Publications and Blank Forms), and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-CW, Fort Monmouth, NJ 07703.

1-5. Destruction of Materiel to Prevent Use

Demolition of equipment will be accomplished only upon order of the commander. Refer to TM 750-244-2 for demolition procedures.

1-6. Administrative Storage

Administrative storage of the equipment shall be in accordance with the requirements of TM 740-90-1.

Section II. DESCRIPTION AND DATA

1-7. Purpose and Use

Decoder Group OX32/GT (fig. 1-1) consists of two primary components, Pulse Decoder Monitor KY-791/GT (monitor) (fig. 1-2) and Telephone Connector Switch SA-1962/GT (call selector) (fig. 1-3), which are used for telephone traffic observation of the grade of service on selected subscriber lins and trunks of a 48-volt (46 to 52 volts) dial telephone central office. The decoder group has the capability of monitoring 30 to 50 circuits simultaneously, discriminating between originating and terminating calls automatically, and automatically selecting a circuit initiating a call for observation. Visual display of the circuit number elected can be provided. Up to 14 dialed digits as dialed by a subscriber, as well as the elapsed time in seconds between each circuit function can be displayed.

1-8. Description

a. Pulse Decoder Monitor.

(1) The monitor (fig. 1-2) is normally equipped to observe both dial pulse train and dual tone multifrequency signals. Data received from the call selector is displayed. When used in conjunction with the call selector (fig. 1-3), remote or local real-time monitoring of service is provided. When monitoring subscriber or PBX lines through the call selector, the trunk or line may be held for tracing by operation of a hold switch on a keypad (Decoder-Monitor Control C-9433/GT).

(2) All monitor controls are installed on the front of the chassis. These include a detection mode selector switch, power and alarm toggle switches, an internal speaker and plug-in head-set facilities with independent volume control for line observation and call completion surveys, and a 16-digit self-scan display. The rear of the unit includes connectors for interconnection to the keypad and call selector, a hard-wired power cable connection, frequency-selection toggle switch, and auxiliary input terminal posts. A rack-mounted card file contains the following printed circuit cards.

Position	*Description*	*Part .No.*	*Ref. desig.*	*Color code*
1	MF limiter	380396	A in 1A	White
2	MF channel filter	380397	A1A2	Gray
3	MF decode	380398	A1A3	Black
7	Dial pulse counter and alarm	380402	A1A7	Brown
8	Display control	380403	A1A8	Blue
9	Display clock	380404	A1A9	Pink
15	Power supply	330037	A1A15	Red

Figure 1-3. Telephone Connector Switch SA-1962/GT.

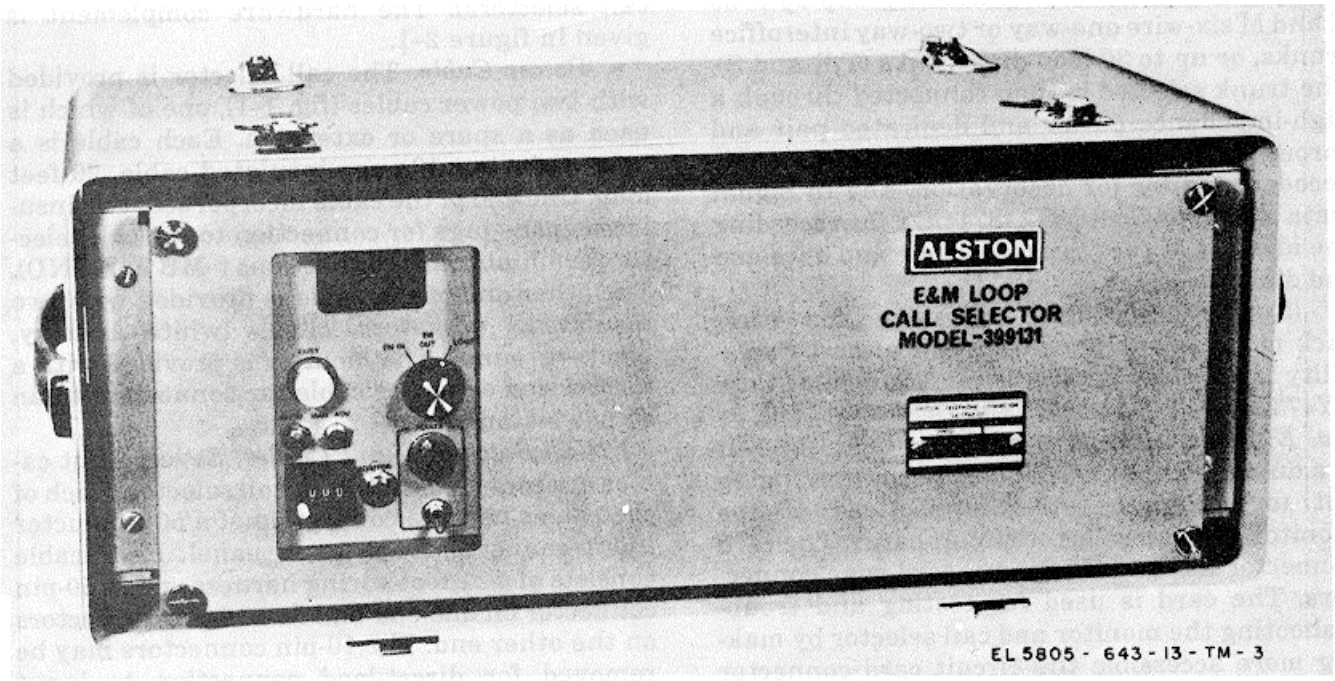


Figure 1-2. Pulse Decoder Monitor KY-791/GT.

(3) Standard dial pulse trains or dual-tone multifrequency signals are decoded and displayed on the display or readout. An electronics seconds counter is also provided on the display to aid in determining dialing period and call duration, etc. This counter, as well as clock functions, is controlled by the observer's keypad or Decoder-Monitor Control C-9433/GT. The keypad control unit contains all of the switches most frequently used by the operator during service observation.

(4) The monitor is designed primarily for desk or table use. Portability is provided by Electrical Equipment Case CY-7371/GT which has provisions for installation of both the monitor and keypad.

b. Telephone Connector Switch.

(1) The switch (fig. 13) or call selector consists of a panel containing a circuit card file, and may be mounted in a 19-inch equipment rack or electrical equipment (portable) case. All controls and indicators are located on the front panel; all connections are made to the rear of the unit. The card file contains the following printed circuit cards:

Position	*Description*	*Part No.*	*Ref. desig.*	*Color code*
1	Power supply	330036	A2A6	Red
5	Control interface assembly	220046	A2A4	
10	Identity	380418	A2A4A1	
11	Dial pulse sensor	380417	A2A3	Purple
13	Control	380419	A2A1	Blue
14	Tens address	380420	A2A7	Green
15	Units address	380421	A2A8	Lime
17-21	Input scan	380422	A2A5, A2A5A-A2A5D	Yellow
23-32	Input	380423	A2A2, A2A2A-A2A21	White

(2) The call selector functions as either a dedicated (rack-installed) or portable switch room unit designed to find, upon command, the next trunk to become busy from a group up to 50 E and M six-wire one-way or two-way interoffice trunks, or up to 30 loop dial trunks (T, R and S). The trunk selected is then connected through a high-impedance buffer and dedicated pair and through the pulse and busy wires to the pulse decoder monitor for observation, and to Signal Data Recorder Group OA-8744/GT for recording the identity of the trunk, the time and date and the dialed number.

(3) The call selector is designed for either rack mounting or portable applications. Portability is provided by Electrical Equipment Case CY-7372/GT.

c. Extender Card. The extender card (fig. 1-1) is a dummy circuit card which permits bringing out (or extending) the connections of the monitor and call selector circuit cards. The card connector fits into the circuit card edge connectors. The card is used for testing and troubleshooting the monitor and call selector by making more accessible the circuit card connector terminals.

d. Hardware Mounting Kit. The hardware mounting kit (fig. 1-1), composed of screws, washers, nuts, and brackets, for mounting the portable call selector in a rack, is contained in a heat-sealed plastic bag. The kit is required for installing the call selector in the equipment rack (or electrical equipment case, for portable call selectors). The hardware complement is given in figure 2-1.

e. Power Cable. The call selector is provided with two power cables (fig. 1-1), one of which is used as a spare or extension. Each cable is a two-conductor, 18-gage insulated cable, 20 feet long. One end of the cable incorporates two insulated spade lugs for connection to the call selector terminal board connections (-MB and GND). The other end of the cable is provided with two insulated alligator clips (white-battery, black-ground). The monitor is provided with a hard-wired ac power cable for connection to an ac power source.

f. Call Selector Input Cables. Seven input cables are provided with each call selector. Each of the cables permits connection of a 50-conductor input connector to a patch panel. Each cable consists of a 21-foot wiring harness with a 50-pin connector on one end and five 10-pin connectors on the other end. The 10-pin connectors may be removed for direct-lead connection to input sources in a dedicated installation. The cable utilizes stranded-cable lines.

g. Interconnect Cable. The interconnect cable (fig. 1-1) is used to interconnect the monitor and call selector. This 10-conductor cable is

connected between the CALL SELECTOR connector on the rear of the monitor and the OUTPUT TO 80389-2 connector on the rear of the call selector.

1-9.System Application

a. The pulse decoder monitor, call selector, and Signal Data Recorder RO-452/GT (TM 11-5805-641-13) may be installed in a single equipment rack to provide a complete service observation and recording system (fig. 1-4). A typical system block diagram is shown in figure 1-5.

b. The call selector is designed to select newly busy trunks from either E and M or loop types and transmit the voice signals, dialed number, and input I.D. for the selected call to the pulse decoder monitor. The monitor will provide visual display of the dialed number and trunk identity, and may be installed at a local or remote location. The call selector will also simultaneously drive Signal Data Recorder RO-452/GT (normally installed locally) which provides a printed readout of the dialed number, trunk identity, and time-of-day for each call monitored. Refer to chapter 2, section I, for more detailed technical considerations regarding system application.

1-10. Tabulated Data

Tabulated data pertaining to the decoder group performance and physical characteristics are contained in table 1-1.

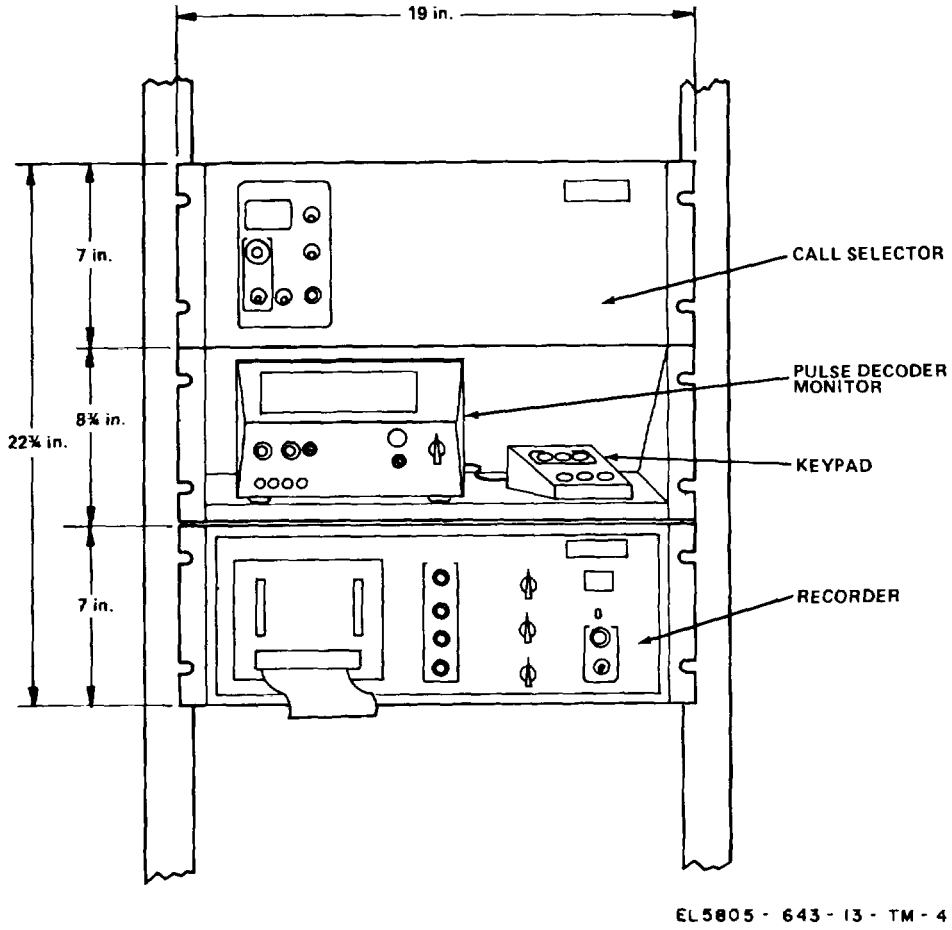


Figure 1-4. Service observation and recording system, physical configuration.

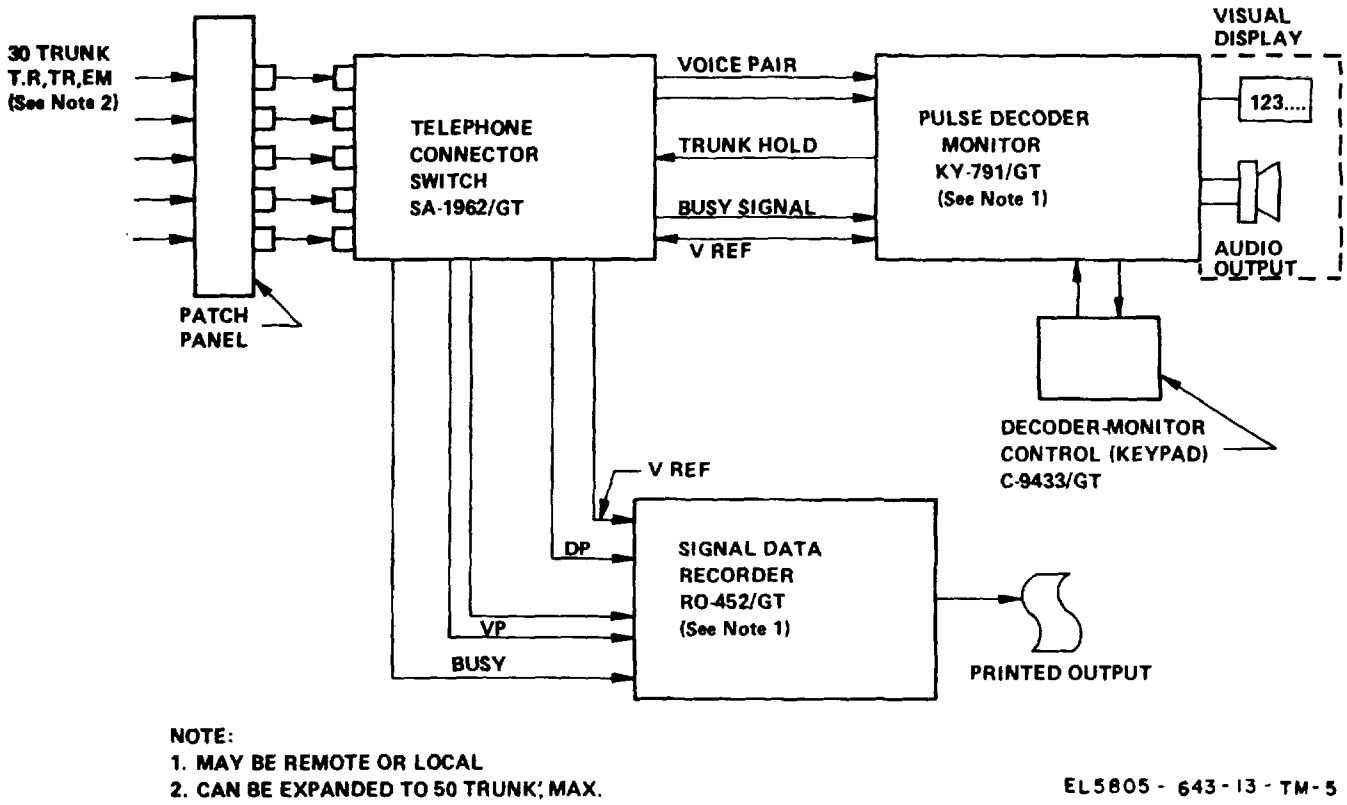


Figure 1-5. Service observation and recording system, block diagram.

Table 1-1. Tabulated Data

PULSE DECODER MONITOR

Signal input (from dedicated pair or recorder):

- Level ..... Audio-24 dbm to 0 dbm
  Multifrequency- -24 dbm to 0 dbm
- Pulse duration ..... Dial pulse interdigit Time- 250 ms minimum
  Dual tone multifrequency- 45 ms minimum, on; 45 ms minimum, off
- Impedance ..... Designed to accept 600-to 900-ohm dedicated pair from call selector
- Acceptable deviation from center frequency ..... ±2.5 percent, maximum

Audio output ..... Standard 600-ohm operator's headset jack with volume control; cabinet-mounted dynamic speaker with volume control

Power requirements ..... 120 vac, 50160 Hz (switch selectable) at 1 ampere, maximum

Signal and power connection:

- To call selector ..... 10 pin connector (Jll1)-CALL *SELECTOR*

Keypad control ..... 25 pin connector (J1)-KEYPAD

Power ..... Grounded line cable (hard-wired)

CALL SELECTOR

Trunk Inputs:

Capacity..... 30 trunks (expandable to 50): T, R, T1, RL, E, M

- Signal level ..... T, R, or T1, R1: -6 to 20 dbm
  E, M: Gnd. -49 vdc
- Impedance 47K minimum to negative battery

Trunk hold input (from pulse decoder monitor) ..... Ground on this line at monitor causes presently selected trunk to be held

Outputs:

- Pulse decoder monitor .... Dedicated voice pair- -6 dbm level (nominal)
  Busy--Gnd. busy; open (or high impedance), idle
  Dial Pulse (ID)--48 vdc

(through 4.7K ohms) with dial springs open; open with dial springs closed
Reference-Ground reference point
Signal data recorder .... Dedicated voice pair- -6 dbm level
Busy- -48 vdc (through 4.7K ohms) busy; open, idle
Dial Pulse (IDS -48 vdc (through 4.7K ohms) with dial springs open; open with dial springs closed.
Reference-Ground reference point
Power requirements ..... -48 vdc at 1 ampere, maximum

Signal and power connections:
Input 50 pin connectors (J1 through J7)
T&R0-24
T&R 25-49
TI&R1 0-24
TI&R1 25-49
E IN 0-49
M IN/E OUT 0-49
M OUT 0-49

Output:
To pulse decoder monitor ..... 10 pin connector (OUTPUT TO 80389-2)
To signal data recorder ... 10 pin connector (OUTPUT TO 399132)
Power ..... Terminal board (-MB and GND)

1-11. Items Comprising an Operable Equipment

Components comprising a complete decoder group are listed in table 1-2 and are illustrated in figure 1-1.

Table 1-2. Decoder Group

FSN	Item	Quantity	Dimensions (in.) Height	Depth	Width	Weight (lb)
5805-167-0995	Decoder Group OX42/GT consisting of:					
8505-2798463	Monitor, Pulse Decoder KY-791/GT	1	7	9 3/4	11 3/4	21
5805-2813851	Switch, Telephone Connector SA-1962/GT	1	7	10½	19	17
5805-173-7005	Control, Decoder-Monitor C-9433/GT	1	2	4½	5½	3
5805-2813858	Case, Electrical Equipment CY-7371/GT	1	8	15½	20	8
5805-2813860	Case, Electrical Equipment CY-7372/GT	1	8	15½	20	8
	Cable, input (call selector)	7	252 (lg)	----	----	5
	Cable, interconnect	1				
	Cable, power (call selector)	2	240 (lg)	----	----	2
	Card, extender	1	71/4	5/16	5 3/8	4
	Kit, hardware mounting (monitor and call selector)	2	----	----	----	1

CHAPTER 2
SERVICE UPON RECEIPT AND INSTALLATION

Section I. SYSTEMS PLANNING

2-1. Monitor/Keypad/Call Selector Configurations.

a. The pulse decoder monitor/keypad and call selector are installed in a telephone central office environment. The materiel is used, in a system application, with the following items:

Telephone Traffic
Scanner Group ---------- TM 11-5805-640-13
OA-8746(V)1/GT
(rack mounted)
OA-8746(V)2/GT
(portable)
Digital Counter Group---------- TM 11-5805-642-13
OA-8745(V)1/GT
(rack mounted)
OA-8745(V)2/GT
(portable)
Signal Data Recorder
Group ---------- TM 11-5805-641-13
OA-8744/GT

b. A typical service observation and recording system (physical configuration and block diagram) is shown in figures 1-4 and 1-5. System planning should take into account the associated equipment listed above, the installation and suitability of racks (for rack-mounted versions of the call selector), patch panels to be used as distribution points, and interconnecting cabling and/or wiring. Power requirements for the monitor/keypad/call selector are given in table 1-1.

2-2. Site and Shelter Requirements

The rack-mounted call selector and table-mounted monitor/keypad are normally housed in a permanent shelter during use; i.e., a central telephone office. Normally, 19-inch relay racks are used for installation of the call selector, while an adjacent desk is sufficient for installation of the monitor/keypad. Racks are furnished in three heights: 7 feet 6 inches, 9 feet, and 11 feet 8 inches. Refer to paragraph 2-4 for the installation of these racks at the site. Refer to paragraph 2-5 for installing the monitor/keypad, and to paragraph 2-6 for in-stalling the call selector.

Section II. SERVICE UPON RECEIPT OF MATERIEL

2-3. Unpacking

No special unpacking instructions are necessary except to observe precautions normally taken with precision electronic equipment.

2-4. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 14b).

b. Check the equipment against the component listing on the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the procedures specified in paragraph 1-3. The equipment should be placed in service even though a minor assembly or part that does not affect proper functioning is missing.

c. Check to see whether the equipment has been modified. (Equipment which has been modified will have the MWO number on the front panel, near the nomenclature plate.) Check to see whether all currently applicable MWO's have been applied. (Current MWO's applicable to the equipment are listed in DA Pam 310-7.)

Section III. INSTALLATION INSTRUCTIONS

2-5. Tools, Test Equipment, and Materials Required for Installation

a. No special tools or test equipment are required for installing the Pulse Decoder Monitor KY-791/GT and Decoder-Monitor Control C-9433/GT in the electrical equipment case, or Telephone Connector Switch SA-1962/GT in either the rack or electrical equipment case.

NOTE

The pulse decoder monitor and decoder-monitor control (keypad) ar designed for desk-top or table installation.

b. A hardware mounting kit (fig. 1-1), contained within a heat-sealed plastic bag, contains screws, washers, nuts and brackets (if required) for installation of the materiel (fig. 2-1 for installation details).

2-6. Installation of Racks On-Site

Refer to paragraph 6-1 for installing the racks on-site.

2-7. Installation of Pulse Decoder Monitor and Keypad

The pulse decoder monitor and keypad are intended for use on a desk or table in plain view of the operator. Sufficient writing space and room for a telephone should be provided. Insure that a 120 vac, 50/60 Hz line outlet is available.

2-8. Interconnections for Pulse Decoder Monitor and Keypad

a. Input Connections (fig 2-2). (1) A 10-pin connector interconnect cable (fig. 1-1) is supplied with the monitor. This cable receives the five lines from the Telephone Connector Switch SA-1962/GT (call selector). The connector on the input cable is mated with the CALL SELECTOR (J11) mating connector on the rear of the monitor.

(2) Connector pin designations are as follows:

Terminal	*Function*
1	Hold line
2,3	Dedicated audio pair
7	Busy line
10	Ground reference

(3) The red DED PAIR banana jack terminals (J13 and J14) on the rear of the monitor are in parallel with the audio input lines and may be used as an auxiliary input or for input monitoring.

b. Control Connections. The integral keypad cable must be connected to the KEYPAD (J1) mating connector on the rear of the monitor.

c. Power Connection. The integral power

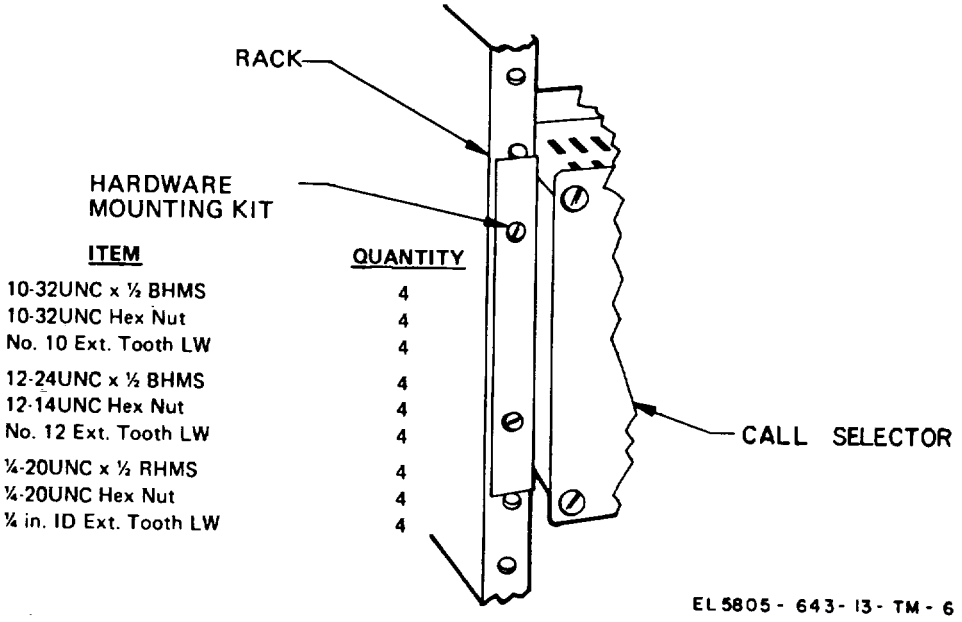


Figure 2-1. Call selector, installation details.

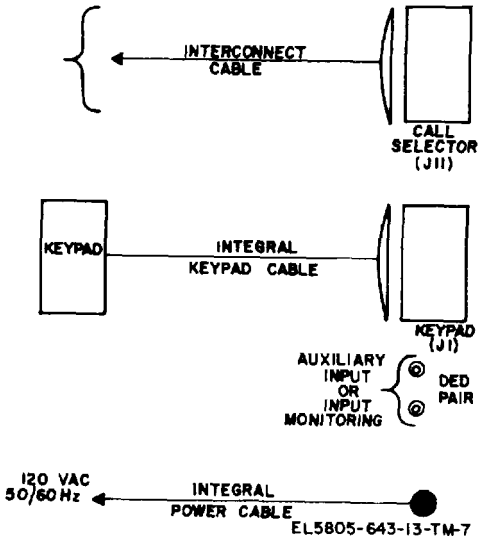


Figure 2-2. Pulse decoder monitor and keypad electrical interconnections.

cable must be connected to a grounded 120 vac, 50/60 Hz outlet. Set the 50 Hz/60 Hz toggle switch on the rear of the monitor to the correct line frequency.

2-9. Installation of Telephone Connector Switch

a. General. The telephone connector switch (call selector) is intended for either rack installation, install call selector as shown in figure 2-1. Use standard rack-mounting procedures for 19-inch relay-type racks. The call selector input connections are shown in figure 2-3.

b. Trunk Inputs.

(1) Trunk input connections are made to seven 50-pin connectors (J1 through J7) on the rear of the call selector. Where dedicated installation is required, the connections may be wire wrapped to wire-wrap mating connectors, which are then mated to the unit connectors. For portable applications, or for direct connection to a patch panel, the call selector input cables (para 1-8) may be connected direct to the connectors. The wires at the other end are then hard-wired to the patch panel.

(2) The call selector may be used on either E and M six-wire trunks, or loop three-wire trunks. Connectors J1 (T&R 0-24) and J2 (T&R 25-49) receive the tip and ring (T/R), while J3 (T1&R1, 024) and J4 (TI1&R1, 2549) receive the second tip and ring (T1/R1) used on the E and M trunks only. The terminals are arranged in vertical columns of 10 terminals each. The first pair starts at the upper left-hand corner (first column) with tip first, ring second, etc. The tip is always directly above the ring on each set.

(3) Loop trunk tip and ring are always con-

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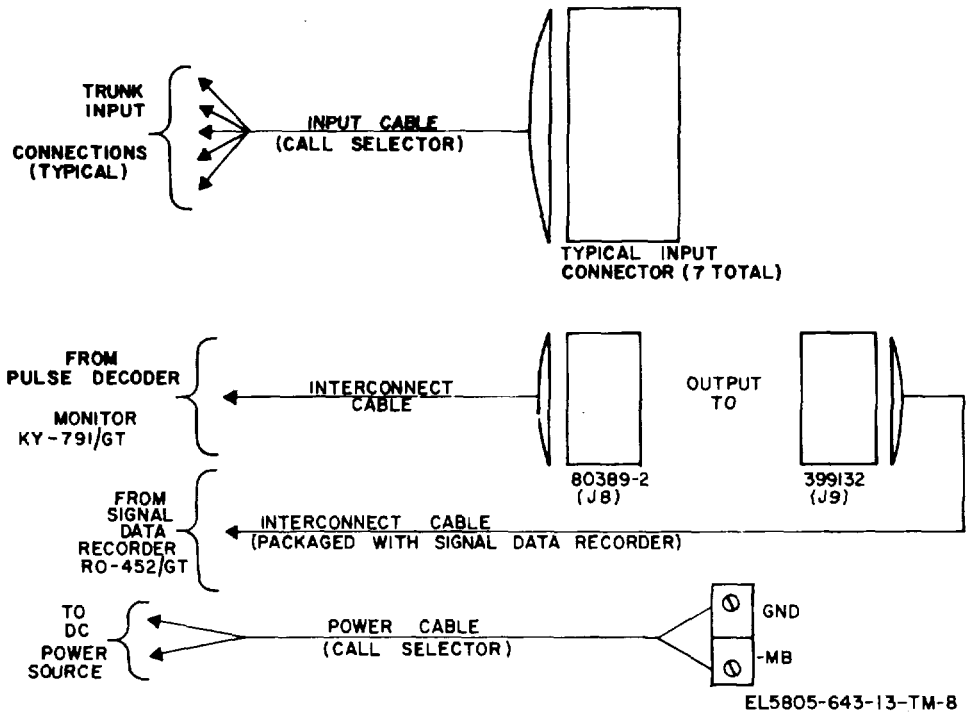


Figure 2-3. Call selector electrical interconnections.

nected to connectors J1 and J2. The sleeve from each trunk is connected to its related number terminal on connector J5 (E IN, 049).

(4) When E and M trunks are used, and response to incoming calls only is required, each E lead is connected to J5, and each M lead to J6 (M IN/E OUT, 0-49) on terminal numbers related to the T/R and T1/R1 pairs. If response to outgoing calls only is required, the E leads are connected to J6 and the M leads to J7 (M OUT, 0-49).

c. Outputs. The interconnect cable (para 2-7b(1)(a)) is connected to the J8 10-pin connector (OUTPUT TO 80389-2) on the rear of the call selector. The J9 10-pin connector (OUTPUT TO 399132) is used for connection to the Signal Data Recorder R0452/GT (TM 11-5805-641-13).

d. Power Connection. The -48-vdc, 1-ampere (minimum) central office supply is connected to the -MB terminal at the rear of the call selector.

e. Grounding. The plus (+) ground is connected to the GND terminal. An external 1% ampere alarm office fuse should be used.

NOTE

The call selector is protected against accidental reversed input power polarity by a blocking diode.

Section IV. PREUMINARY ADJUSTMENT OF EQUIPMENT

2-10. Preliminary Inspection

a. Check all connector and terminal board connections for firm seating/security.

b. Make certain that all cables and terminal board wiring are properly routed to equipment and/or patch panel.

c. Make switch settings described in paragraph 2 11.

d. Insure that the equipment is grounded (para 2 &).

2 11. Presetting of Switches and Controls

a. Pulse Decoder Monitor and Keypad. Set the pulse decoder monitor and keypad switches and controls to the following preliminary settings:

Switch/control	Set to:
POWER ON switch	Off
Rotary selector switch	As required (not in FREQ CHECK position)
ALARM switch	OFF
VOLUME potentiometers	Fully CCW
50 Hz/60 Hz switch (on rear of unit)	As required
Keypad switches	Not activated

b. Call Selector. Set the call selector switches and controls to the following preliminary settings:

Switch/control	Set to:
POWER ON	switch Off
Rotary selector switch	As required
AUTO/MAN switch	AUTO
Register	Reset (to zero)

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. CONTROLS AND INSTRUMENTS

WARNING

Insure that the equipment is grounded before operation (para 2-8c).

3-1. Damage from Improper Settings

The monitor, keypad and call selector are protected by internal circuitry from improper settings. Improper settings, however, can result in confused data and nonoperation. Refer to table 3-1 for proper settings of switches/controls on the monitor and keypad, and to table 3-2 for proper settings of switches/controls on the call selector.

3-2. Operator/Crew Controls

Operating controls and instruments for the pulse decoder monitor and keypad are tabulated in table 3-1 and illustrated in figures B-1 through B3. Controls and instruments for the call selector are tabulated in table 3-2, and illustrated in figure B-3.

Section II. OPERATION UNDER USUAL CONDITIONS

3-3. Preliminary Starting Procedure

a. Pulse Decoder Monitor and Keypad. When the pulse decoder monitor and keypad are in shutdown condition, the switches and controls should be set as prescribed in paragraph 2-ll*a*

b. Call Selector. When the call selector is in shutdown condition, the switches and controls should be set as prescribed in paragraph 2-11 *b.*

Table 3-1. Operator Controls and Instruments-Pulse Decoder Monitor and Keypad

Controls/indicators	*Function*
Pulse Decoder Monitor:	
POWER ON toggle switch	Controls ac input power.
POWER ON lamp (green)	Illuminates continuously when unit power is on.
Rotary selector switch:	
DP	Detection mode-dial pulse numbers.
DP&TD	Detection mode-dial pulse and touch dial.
TD	Detection mode-touch dial.
MF	Detection mode-multifrequency.
MF&DP	Detection mode--multifrequency and dial pulse.
FREQ CHECK	Provides frequency verification.
ALARM/OFF toggle switch	Initiates a 400-Hz alarm tone to indicate activated line.
VOLUMEIHEADSET potentiometer	Adjusts headset volume level.
VOLUME/SPEAKER potentiometer	Adjusts speaker volume level.
50 Hz/60 Hz toggle switch	Selects line frequency (50 or 60 Hz) that is available.
Keypad:	
CLOCK/START pushbutton switch	Starts 1-second timer clock on the righthand side of the display.
CLOCKISTOP pushbutton switch	Stops the timer clock.
CLOCKI/HOLD pushbutton switch	When depressed, holds the time displayed while the clock continue to count. When released, updates the display to the correct time.
RESET DISPLAY pushbutton switch	Resets display, including clock.
C.S. HOLD toggle switch	Causes call selector to lock onto trunk being observed
C.S. RELEASE toggle switch	Causes call selector to release the call being observed before normal time out.

Table 3-2. Operator Controls and Instruments-Call Selector

Controls/indicators	*Function*
POWER on toggle switch	Controls dc power input.
POWER on lamp (green)	Illuminates continuously when unit power is on.
Rotary selector switch:	
EM IN	Set for E & M trunk connection and response to incoming calls only.
EM OUT	Set for outgoing call response only.
LOOP	Set for connection of loop trunks.
TRUNK ID readout display	Indicates the number of the input.
AUTOIMAN toggle switch	Normally AUTO. Use MAN with MAN ADV.
MAN ADV pushbutton switch	Advances to trunk for identification and check.
BUSY lamp (amber)	Indicates that trunk is active.
Register (mechanical) transmitted out to	Counts the dial pulses and trunk I.D. pulses, as the pulse decoder monitor; i.e., used to verify proper pulse out.
MONITOR telephone jack	Headset connection for monitoring all audio sent out to the pulse decoder monitor and Signal Data Recorder RO-452/GT.

3-4. Operating Procedure

a. Pulse Decoder Monitor. Operation of the pulse decoder monitor is accomplished as follows:

(1) Inspect equipment to ascertain that monitor installation instructions, as prescribed in paragraphs 2-5 through 2-9, have been followed.

(2) Place POWER switch to ON and note the POWER indicator lamp illuminates, indicating the presence of ac power.

(3) If the panel selector switch is in the DP,DP&TD, or MF&DP position, the digit 1 will appear in the first column of the display.

(4) If headset monitoring is required, connect a standard 600-ohm telephone headset to one of the HEADSET jack sets (two headsets may be used, if required).

(5) Set the panel selector switch to the detection mode required. In the DP position, only dial pulse numbers will be displayed; in MF, only multifrequency. If reception of multifrequency and dial pulse is required, set the switch to MF&DP.

NOTE

The MF&DP position is not recommended unless both types will actually be encountered, since better rejection is obtained in the inhibit positions.

(6) The speaker monitoring level may be adjusted by means of the SPEAKER VOLUME control, and the headset monitoring level may be adjusted by means of the independent HEADSET VOLUME control. The dial pulse bursts and/or multifrequencies, as well as conversations, will be audible.

(7) The entire display must be cleared prior to reception of a new number readout. This is accomplished by momentarily depressing the RESET DISPLAY pushbutton on the keypad.

(8) When observation of a call is completed the operator must momentarily press C.S. RELEASE toggle switch on the keypad. This action will cause the call selector to drop that call. If a trunk must be held indefinitely (after the hang-up or time-out), the C.S. HOLD toggle switch on the keypad should be placed in the up position. The present trunk will be held until the toggle switch is again placed down. If call release is to be controlled at an interconnected Signal Data Recorder RO-452/GT, the keypad C.S. RELEASE toggle switch must remain in the up position.

(9) When the call selector is in use, an alarm feature is available. If the ALARM toggle switch on the monitor front panel is placed up, a 40-Hz alarm tone will be heard through the speaker and/or headset when a new call is selected. This tone alerts the operator and will remain audible until the ALARM switch is placed down, or when the call is dropped.

(10) The elapsed-time electronic counter is normally used to measure the duration of the dialing period, the time between the last dialed digit and completion of the call, etc. The counter is manually controlled by the top (CLOCK) row of keypad control pushbuttons. The counter is also started automatically when the call selector goes busy.

(11) The seconds-digit display begins at the right of the display screen and moves to the left (opposite from called-number display). Depression of the RESET DISPLAY pushbutton will reset and clear the counter display, as well as the dialed number. To start the counter, momentarily depress the CLOCK/START push-

button. Depression of the CLOCK/START push button will stop the counter. If restarted, the count will continue to accumulate. A third CLOCK/HOLD pushbutton, when depressed, and held, causes the displayed seconds-count to be held for observation, while the counter circuit continues to count seconds. When the CLOCK/HOLD pushbutton is released, the display will instantly update and continue to advance its count. This pushbutton must not be held for more than 15 seconds, or the updated count will no longer be accurate.

b. Keypad. The keypad contains all the switches most frequently used by the operator during service observation. The keypad is a manual finger-touch control employing four push buttons and two toggle switches. Keypad control functions are as follows:

CLOCK:

START	Starts the one-second timer clock on the right-hand side of the display (para 3-4a(10) and (11)).
STOP	Stops the timer clock.
HOLD	Holds the time displayed when the pushbutton is de-pressed while the clock continues to count. When released, the display will update to the correct time. The clock display can be held for a maximum of 15 seconds.
RESET DISPLAY	Resets the display, including the clock, which will begin counting from zero.
C.S. HOLD	When placed up, will cause the call selector to lock on to the trunk being observed at the time the switch is engaged.
C.S. RELEASE	When placed up, will cause the call selector to release the call being observed before normal time out, unless the C.S. RELEASE switch on an interconnected Signal Data Recorder RO-452/GT is in the down position.

c. Call Selector. Operation of the call selector is accomplished as follows:

(1) Inspect equipment to ascertain that call selector installation instructions, as prescribed in paragraphs 2-5 through 2-9, have been followed.

(2) Place POWER switch to ON position and note that POWER indication lamp illuminates, indicating the presence of dc power. All other system units should also be powered at this time.

(3) The three-position selector switch must be set to E&M IN if E & M trunks are connected, and response to incoming calls only is required. Set the switch to E&M OUT for outgoing call response only. If loop trunks are connected, set the selector switch to LOOP.

(4) The unit is enabled to search for the next busy trunk in its trunk group by placing a dc shunt across the voice lines (tip and ring) feeding the pulse decoder monitor. (This action is performed in the pulse decoder monitor.) A call thus selected will be held until this shunt is removed by operation of the C.S. RELEASE switch on the keypad, or until the subscriber hangs up.

(5) The input number of the first trunk To go busy will appear in the TRUNK ID window display when the call is selected. (With no call being monitored, this display is not illuminated.) A busy signal is fed out to the pulse decoder monitor as long as the selected call is held. This signal is also used to start the seconds counter (para 3-4a(10) and (11)). The busy signal may be used to start a pulsating 400-Hz audible alarm at the pulse decoder monitor if the ALARM switch is up (para 34a(9)).

(6) A headset may be connected to the MONITOR jack on the front panel of the unit for monitoring all audio sent out to the pulse decoder monitor and Signal Data Recorder RO-452/GT.

(7) A standard mechanical register may be plugged into the TEST REG. banana jacks on the front panel. This register will count the dial pulses and trunk I.D. pulses, as transmitted out to the pulse decoder monitor, and may, therefore, be used to verify proper pulse output.

(8) When a Signal Data Recorder RO-452/GT and pulse decoder monitor are both connected to the call selector (para 2-9c), a call may be remotely released from only one of the two instruments. The C.S. RELEASE switch (on the keypad and Signal Data Recorder RO-452/GT panel) on the instrument from which release control is not required must have its switch placed in the up position. Release control will then be effected from the switch on the other instrument. Both switches must be up to release a call.

3-5. Stopping Procedures for Standby Condition

To deactivate the pulse decoder monitor and call selector for standby condition, turn POWER switches to off.

3-6. Stopping Procedure for Shutdown

a. *Pulse Decoder Monitor and Keypad*. To deactivate the monitor and keypad for shutdown, proceed as follows:

(1) Turn POWER switch to off.

(2) Disconnect cable from KEYPAD connector and call selector (interconnect) cable from CALL SELECTOR connector.

(3) If applicable, disconnect connections to DED PAIR terminals.

(4) Coil cables (if disconnected from other equipment) in loose coils, then wrap with strands of string or equivalent. If desired, cover connector ends with clear plastic (or equivalent) hoods for environmental protection. Coil the hard-wired power cable and tape it to the rear of the monitor. Depending upon the environment and the time equipment will be out of service, it may be desirable to cover the CALL SELECTOR and KEYPAD connectors with some kind of protective covering.

(5) The hard-wire keypad cable should be loosely coiled and taped to the keypad.

(6) If desired, both the monitor and keypad may be installed within the equipment case and the front and rear covers of the case can be latched.

b. *Call Selector*. To deactivate the call selector for shutdown, proceed as follows:

(1) Turn POWER switch to off.

(2) Disconnect cables from OUTPUT TO 80389-2/399132 connectors.

(3) Disconnect input cables from 50-pin connectors on rear of case.

(4) Disconnect power cable connections from rear terminal board.

(5) Coil cables (if disconnected from patch panel or other equipment in loose coils, then wrap with strands of string or equivalent. If desired, cover connector ends with clear plastic (or equivalent) hoods for environmental protection. Depending upon the environment and the time equipment will be out of service, it may be desirable to cover the call selector OUTPUT TO 80389-2/399132 connectors with some kind of protective covering.

(6) For rack-mounted configurations, no further deactivation is required, and no additional shutdown or packaging should be performed unless it is desired to completely remove the call selector from its rack mounting. In this case, remove the mounting hardware (screws, washers, nuts) securing the call selector in the rack, then remove the call selector and prepare for packaging.

(7) For portable configurations, the front and rear covers of the electrical equipment case can be latched. Make certain that the power cables are stowed with the call selector within the case. It is unnecessary to remove the call selector from the equipment case mounting facilities.

3-7. Preparation for Movement

Both the monitor/keypad and call selector are provided with electrical equipment cases for portability. Weight of the materiel with case is given in table 1-2. The equipment should be deactivated, as prescribed in paragraph 3-6, then packaged, as applicable, preparatory for movement. Make certain that all equipment items, as detailed in table 1-2 and illustrated in figure 1-1, are included so as to constitute a complete decoder group.

CHAPTER 4
ON-SITE MAINTENANCE INSTRUCTIONS

Section I. TOOLS AND EQUIPMENT

4-1. General

On-site maintenance instructions cover operator/crew direct support and organizational maintenance levels to perform periodic inspections and maintenance, as necessary; restore equipment to operative condition by means of circuit card replacement, fuse/lamp/switch replacement, replacement of control panel assemblies; electrical adjustments which can be made to readily exposed devices; i.e., trim potentiometers, etc., using screwdriver and multimeter; and replacement of consumables. Generally, on-site maintenance activities will be limited to standard tool kits, and only the availability of repair parts kit. No off-site maintenance is authorized.

4-2. Repair Parts

Repair parts authorized for use by on-site maintenance activities for the decoder group are listed in appendix B of this manual.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-3. General

To insure that the decoder group is always ready for operation, the monitor/keypad and call selector must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed and described in tables 4-1 and 4-2. The interval/sequence number columns indicate the minimum inspection requirements. Defects discovered during operation of the monitor/keypad and call selector will be noted for future correction to be made as soon as operation has ceased. Stop operation immediately. if a deficiency is noted during operation which would damage the equipment. Record all deficiencies together with the corrective action taken. (Refer to TM 38-750 for the applicable form number.)

4-4. Instructions for the Performance of Preventive Maintenance Checks and Services

a. General. Preventive maintenance procedures include the procedures contained in tables 4-1 and 4-2 followed by necessary troubleshooting and/or parts replacement. The functional test (b below) should be performed following major repair/parts replacement. The functional test will verify operation of the monitor and call selector with regard to inputs from the associated equipment.

b. Functional Test. With pulse decoder monitor and call selector assembled into a system configuration (fig. 1-4 and 1-5), make necessary installation interconnections in accordance with section IV., chapter 2. Operate equipment as specified in paragraphs 3-3 and 3-4. Operational verification of the pulse decoder monitor and call selector functioning in a system application will signify proper operation of the equipment controls and indicators.

4-5. Special Instructions

The pulse decoder monitor and call selector are normally kept in continuous operation for prolonged periods of time. Therefore, operator/crew and organizational maintenance checks and services (tables 4-1 and 4-2) should arrange the inspection intervals with some flexibility. Do not necessarily shut down the equipment in order to make a particular check or service. Make only those inspections that will not disturb normal operation, especially if no malfunction or damage is suspected. Make organizational preventive maintenance checks and services when the equipment can be shut down without impairing system operation.

Section III. TROUBLESHOOTING

4-6. Organization of Troubleshooting Procedure

a. General. The first step in servicing a defective equipment is to sectionalize the fault to a major component. The second step is to localize the fault to the defective subassembly or stage. The third step is to isolate the fault by tracing it to the defective part.
b. Sectionalization Check. After the trouble has been isolated to the equipment (monitor/keypad or call selector), refer to the remaining portions of this procedure for further isolation.
c. Localization. The procedure in (1) and (2) below will aid in localizing the trouble. First localize the trouble to a plug-in circuit card or replaceable component. Then use the following methods of trouble localization.
(1) *Troubleshooting table*. Use the troubleshooting chart, as appropriate, to aid in localizing trouble to a replaceable circuit card or replaceable component.
(2) *Substitution*. Substitution of circuit cards and replaceable components will enable the repairman to localize a trouble quickly. The maintenance theory consists, primarily, or substitution techniques.
d. *Isolation.* The maintenance practices to be used with the monitor, keypad and call selector entail replacement of complete circuit cards and primary controls and indicators. Isolation techniques, wherein the trouble is localized to specific circuit card resistors, transistors, etc. are not employed. In all tests, however, the possibility of intermittent trouble should not be overlooked. If present, this type of trouble can often be made to appear by tapping or jarring the equipment under test.

Table 4-1. Operator/Crew Preventive Maintenance Checks and Services

D—Daily Time required: 0.9 W—Weekly Time Required: 2.7

Interval and Sequence No.		Item to be inspected procedure	Work Time (M/H)	Reference	
D	W			Para	Fig.
1	1	CASEICHASSIS Inspect for dents, cracks, breaks, distortion, cleanliness of ventilation holes. Check electrical equipment case latches for serviceability.	0.2	4-13	B-1, B-3
	2	ATTACHING HARDWARE Check for evidence of looseness, damaged threads, worn locking devices and/or inserts.	0.2	4-13	B-1, B-3
	3	FUSE/FUSEHOLDER Check general condition and serviceability.	0.2	B-3	
2	4	INDICATOR LAMPS Check indicator lamps for condition of bulb and lens; check general serviceability.	0.2	B-3	
3	5	PANEL SWITCHES (toggle, pushbutton, selector, etc.) Check panel switches and potentiometer controls on monitor for general condition and serviceability. Check security of installation.	0.3	4-13a	B-1, B-3
4	6	KEYPAD SWITCHES (toggle and pushbutton) Check keypad switches for general condition and serviceability; check security of installation.	0.2	4-13b, B-2	
	7	TERMINAL BOARD Check general condition and serviceability; check installation security of attached leads.	0.2	B-1	
	8	PHONE JACKS/BANANA JACKS Check general condition and serviceability.	0.2	B-3	
	9	CONNECTORS Check for evidence of damage, loose or broken terminals, installation security.	0.4	B-1, B3	
	10	MECHANICAL COUNTER (call selector) Check general condition and serviceability.	0.2	4.13c(3)	B3
	11	CLEANLINESS OF EQUIPMENT Lightly brush all accessible areas and parts with a soft non-metallic brush. Wipe front and rear panels and chassis with a clean, lint-free cloth dampened with trichlorethylene (MIL-T-27602) or similar cleaning agent. Allow parts to dry thoroughly after using cleaner.	0.4	4-10	

Q—Quarterly
Total man-hours required: 3.0

Sequence No.	Item to be inspected procedure	Work Time (M/H)	Reference	
			Para	Fig.
1	ELECTRICAL WIRING Check all electrical wiring for evidence of burning, damaged insulation, broken strands, security of connections.	0.5	4-8	B-1 through B-3
2	SOLDERED CONNECTIONS Check soldered connections for evidence of fractures, loose connections, cold solder joints.	0.7	4-8	B-1, B-3
3	ELECTRONIC COMPONENTS (chassis-installed) Check all chassis-installed electronic components for serviceability, wiring, condition of soldered connections.	0.3	4-13	B-1, B-3
4	OPERATION VERIFICATION Perform operation verification tests.	1.5	4-4	

Table 4-3. Troubleshooting-Pulse Decoder Monitor

Malfunction	Probable cause	Corrective action
		NOTE Refer to paragraph 4-13a(1) for replacement of circuit cards. Refer to 4-13a(3) for replacement of edge connectors.
1. Monitor will not operate (no power to unit).	a. Blown fuse. b. POWER switch defective. c. Defective power supply circuit card.	a. Replace fuse (para 413a(3)). b. Replace switch (para 4-13a(2)). c. Replace power supply circuit card.
2. Dialed number display normal, but no output (or low output) from speaker/headset.	a. Defective power supply circuit card. b. Defective VOLUME potentiometer. c. Defective headset.	a. Replace power supply circuit card. b. Inspect potentiometer; replace, if required (para 413a(2)). c. Inspect headset; repair/replace, as required.
3. Inproper unit and/or display operation, and no voltage at one or more of pins B, H, S and X of position 15 card (B should be + 5 VDC, H should be +250 VDC, S should be + 12 VDC, X should be -12 VDC; all to chassis ground reference).	a. Defective power supply circuit card. b. Defective edge connector. b. Defective edge connector.	a. Replace power supply circuit card. b. Inspect connector; replace, if required.
		NOTES
1. Pin identification appears on equipment. 2. Tolerance, 5 VDC +0.25 VDC; all other voltages, 10%.		
4. Touch dial/multi-freq. display and audio normal, but no display display (or consistently faulty dis- 1 of play of dial-pulse digits).	a. Defective dial pulse counter circuit card	a. Replace dial-pulse counter circuit card. b. Inspect connector; replace, if required.
5. No alarm tone when new call selected, with ALARM switch up.	a. Defective dial pulse counter circuit card. b. Defective ALARM switch. c. Defective edge connector.	a. Replace dial pulse counter circuit card. b. Inspect ALARM switch; replace, if required (para -1oa(2)). c. Inspect connector; replace, if required (para 4-13a(3)).
6. Same digits always missing from display or multi-freq. with known input number.	a. Defective MF limiter circuit card. b. Defective MF channel filter circuit card. c. Defective edge connector. d. Defective display.	a. Replace MF limiter circuit card. b. Replace MF channel filter circuit card. c. Inspect connector; replace, if required. d. Inspect display; replace, if required (para -13a(2)).
7. Dial-pulse number display and audio normal, but same digit(s) always in-	a. Defective MF decode circuit card. b. Defective edge connector.	a- Replace MF decode circuit card. b. Inspect connector; replace, if required.

Table 4-3. Troubleshooting-Pulse Decoder Monitor-Continued

Malfunction	Probable cause	Corrective action
correct in multi-freq. display with known input number.		
8. Display digits change erratically after initial appearance, with no apparent noise or cross-channel interference in audio.	a. Defective display control circuit card. b. Defective edge connector.	a. Replace display control circuit card. b. Inspect connector; replace, if required.
9. Seconds counter advances each second, but count incorrect.	a. Defective display control circuit card. b. Defective edge connector.	a. Replace display control circuit card. b. Inspect connector; replace, if required.
10. Digits overlapping or in wrong position on display screen.	a. Defective display control circuit card. b. Defective edge connector	a. Replace display control circuit card. b. Inspect connector; replace, if required.
11. Seconds counter fails to advance, or advances erratically.	a. Defective display clock circuit card b. Defective edge connector	a. Replace display clock circuit card. b. Inspect connector; replace, if required.
12. HOLD CLOCK keypad pushbutton fails to hold seconds display; count incorrect when released (if held less than 15 seconds).	a. Defective display clock circuit card b. Defective edge connector c. Defective keypad and/or HOLD CLOCK pushbutton switch.	a. Replace display clock circuit card. b. Inspect connector; replace, if required. c. Inspect keypad; replace switch or entire keypad, as required (para 4-13b).
13. Line frequency counter test function inoperative.	a. Defective display clock circuit card b. Defective edge connector c. Defective frequency selection toggle switch, or switch set to wrong position	a. Replace display clock circuit card. b. Inspect connector; replace, if required. c. Check switch setting; change setting, if required. Replace switch, if required (para 4-13a(2),(3)).

Table 4-4. Troubleshooting-Call Selector

Malfunction	Probable cause	Corrective action NOTE Refer to paragraph 4-13c(1) for circuit card replacement procedures, and to paragraph 4-13c(2) for replacement of edge connectors.
1. Call selector will not operate (no power to unit).	a. Blown fuse. b. POWER switch defective. c. Defective power supply circuit card. d. Defective control interface assembly components.	a. Replace fuse (para 4-13c(2)). b. Replace switch, (para 4-13c(2)). c. Replace power supply circuit card. d. Inspect components; replace, as required (para 4-13c(2)).
2. No busy response from a specific E and M trunk input(s).	a. Defective input circuit card (for inputs affected). b. Defective edge connector. c. Defective front panel rotary switch.	a. Replace defective input circuit card, as required. b. Inspect connector; replace, if required. c. Inspect switch; replace, if required.
3. No busy response from a specific loop (T,R, S) trunk input(s).	a. Defective input scan circuit card (for inputs affected). b. Defective edge connector.	a. Replace input scan circuit card (for inputs affected). b. Inspect connector; replace, if required.
4. Same numerical trunks input(s) in each set of ten inoperative.	a. Defective units ad address circuit card. b. Defective edge connector.	a. Replace units address circuit card, as required. b. Inspect connector; replace, if required.
5. Specific set(s) of ten consecutive trunk inputs inoperative.	a. Defective tens address circuit card. b. Defective edge connector.	a. Replace tens address circuit card, as required. b. Inspect connector; replace, if required.
6. No unit response to any busy trunks, with normal power supply voltages present	a. Defective control circuit card. b. Defective edge connector.	a. Replace control circuit card, as required. b. Inspect connector; replace, if required.
7. Audio fed out to pulse decoder monitor at incorrect level.	a. Defective control circuit card. b. Defective edge connector.	a. Replace control circuit card, as required. b. Inspect connector; replace, if required.
8. No 400-Hz alarm signal generated during monitoring of a call.	a. Defective control circuit card. required. b. Defective edge connector.	a. Replace control circuit card, as b. Inspect connector; replace, if required.
9. Trunk will not be held after hand-up when so ordered at pulse decoder monitor.	a. Defective control circuit card. required. b. Defective edge connector.	a. Replace control circuit card, as b. Inspect connector; replace, if required.
10. Outgoing as well as incoming calls accepted on loop trunks.	a. Defective dial pulse sensor circuit card. b. Defective edge connector.	a. Replace dial pulse sensor circuit card, as required. b. Inspect connector; replace, if required.

Table 4-4. Troubleshooting-Call Selector-Continued

Malfunction	Probable cause	Corrective action
11. No 2 KHz tone bursts signals sent to pulse decoder monitor to indicated called number and trunk identify.	a. Defective dial pulse sensor circuit card.	a. Replace dial pulse sensor circuit card, as required.
	b. Defective edge connector.	b. Inspect connector; replace, if required.
12. No trunk identity pulse trains received at pulse decoder monitor; dial-pulse trains normal.	a. Defective identity (I.D.) circuit card.	a. Replace identity circuit card, as required.
	b. Defective edge connector.	b. Inspect connector; replace, if required.
13. Two-digit trunk identity number incorrect at both TRUNK ID display and pulse decoder monitor display.	a. Defective identity (I.D.) circuit card.	a. Replace identity circuit card, as required.
	b. Defective edge connector.	b. Inspect connector; replace, if required.
c. TRUNK ID display and/or monitor display.	c. Inspect display(s); replace,	as required
14. Trunk identity pulse train pulses sent at incorrect rate.	a. Defective identity (I.D.) circuit card.	a. Replace identity circuit card, as required.
	b. Defective edge connector.	b. Inspect connector; replace, if required.
	c. Frequency-control potentiometer on identity circuit card requires adjustment.	c. Check and adjust, if required (20, fig. B-3).
15. No unit operation, and no voltage (or incorrect voltage) at pin B of card position 1 (should be +5 volts negative).	a. Defective power supply circuit card.	a. Replace power supply circuit card, as required.
	b. Defective edge connector.	b. Inspect connector; replace, if required.

4-7. Use of Troubleshooting Procedures

Refer to the operation verification tests specified in paragraph 4-4 Once the trouble has been isolated to a defective circuit card or replaceable component, do not attempt to make detail repairs. Replace the defective component. Do not drop or jar the circuit cards or major components; these are fragile and should be handled with extreme care.

Section IV. MAINTENANCE

4-8. General

The pulse decoder monitor and call selector are mainly nonmechanical; therefore, little maintenance is normally required. Accessibility to replaceable parts is achieved as follows:

a. Pulse Decoder Monitor. A protective rear panel, with finger pull holes, is secured to the frame with four screws. Removal of the four screws and separating the panel from the frame expose the seven circuit cards (para 1-8a(2)).

b. Call Selector. A protective front panel is secured to the frame with four screws. Removal of the four screws and separating the panel from the frame expose the 21 circuit cards (para 1-8b(1)).

WARNING

Do not remove circuit cards from their card file slots with the POWER switch in the on position. The protective panels should be installed at all times except when servicing the unit. Replace cards only as specified in the tabulation in paragraph 1-8.

4-9. Disassembly

a. The pulse decoder monitor and call selector are disassembled to the extent required for replacement of a malfunctioning component or circuit card in the general order of the index numbers listed for the respective components or circuit cards in appendix B and illustrated in the corresponding figures.

b. In general, the extent of disassembly for maintenance is based upon the availability of repair parts. Disassembly will not include desoldering or removal of electronic circuitry parts unless such removal is necessary to replace the part.

4-10. Cleaning

WARNING

Trichloroethane and isopropyl alcohol are flammable and can cause permanent damage to the lungs and general health. Allow adequate ventilation when using these types of cleaners.

a. Clean areas and parts during disassembly, as applicable, with lint-free cloth dampened with trichloroethane (MIL-T-27602) or similar cleaning agent. Allow parts to dry thoroughly after using cleaner.

b. Clean circuit cards as follows: Clean all soldered connections and electrical connectors by

lightly abrading with a rubber eraser (Nile green only). Brush off debris with a camel's-hair brush, or suitable equivalent. Clean printed circuit cards with isopropyl alcohol
(MIL-A-10428), or equivalent.

4-11. Inspection

Operator/crew inspection activity is specified in table 4-1. Inspection activity allocated to organizational maintenance is specified in table 4-2.

4-12. Repair

a. Repair is the work performed to restore the equipment to efficient operating condition after troubleshooting has identified and isolated the fault. It consists of replacement of defective parts and circuit cards, and all necessary disassembly and reassembly work.

b. After the equipment has been repaired it should be given an operational check-out (para 4-4b) to insure that the overall performance is satisfactory.

c. Repair of the monitor and call selector consists of parts/components/circuit card replacement. Replacement procedures are given in paragraph 4-13.

4-13. Replacement Parts/Components/Circuit Cards

a. Pulse Decoder Monitor (fig. B-l). Most of the parts/components of the pulse decoder monitor can be replaced by standard maintenance practices. However, note the following: However, note the following:

(1) Circuit cards. The circuit cards are accessible from the rear of the unit by removal of the rear cover (16). Each circuit card is held in place by a finger lock (ejector tab) which must be lifted up to release the card. When replacing the cards, push each card all the way into the
edge connector. Do not disturb the potentiometer settings on the MF limiter and MF channel filter circuit cards (17, 19).

(2) Front panel components. Access to the front panel components can be gained by removing the circuit cards ((1) above), followed by removal of the card file and, as required, the rear panel and components behind the rear panel. The headset phone jacks (1), volume potentiometers (2), alarm and no switches (3), speaker (8), display (9), power lamp (4), holder (5), lens (6), and rotary switch (7) are replaced using standard maintenance service procedures. Be sure to note wiring connections before disconnecting and tag for identification as required by extent of repair. Observe sequence of hardware installation.

(3) Rear panel and associated components. The rear panel (16) can be removed by removal of the attaching hardware. Removal of the panel will afford accessibility to the connectors (11, 12), (18, 20), switch (3), jacks (10), fuse/fuseholder (14, 15), and cable (13) mounted on the panel. With the panel removed, the components (26 through 36) behind the rear panel are also accessible for removal/replacement.

b. Keypad (fig. B-2) This is considered a throw-away item. Switches, if available, may be replaced by removal of rear plate to gain access.

c. Call selector (fig. B3) Most of the parts/components of the call selector can be replaced by standard maintenance practices. However, note the following:

(1) Circuit cards. The circuit cards (3, 5, 6, 7, 9, 10, 11, and 12) are accessible from the front of the unit by removal of four thumbscrews (1) which secure the front panel (2) to the chassis. Each circuit card is held in place by a finger lock (ejector tab) which must be lifted up to release the card. When replacing the cards, push each
card all the way into the edge connector, (4, 8).

(2) Front panel components. Access to the front panel components can be gained by removing the control interface assembly (5). The POWER and BUSY lamps (27) are replaced by removing the lens (28) from the front panel of the control interface assembly. Standard telephone switchboard lamps (48-C2) are used. If a lens (28, 34) is replaced, make certain to replace it with an identical color. The rotary switch (24), its knob (25), the switches (29, 30), the register (31), its banana jack (32) and telephone jack (33), and fuse/fuseholder (18, 19) are replaced using standard. Maintenance service procedures. Be sure to note wiring connections before disconnecting and tag for identification as required by extent of repair. Observe sequence of hardware installation.

4-14. Assembly

Refer to appendix B for illustrations required for assembly of the equipment. In general, the equipment is assembled in the reverse order of disassembly (para 4-9).

4-15. Installation

Installation procedures for the monitor and call selector, as applicable, are contained in paragraphs 2-5 through 2-11.

4-16. Testing after Repair

Following extensive maintenance of the equipment, the test prescribed in paragraph 4-4b should be performed.

CHAPTER 5

FUNCTIONING OF EQUIPMENT

Section I. PULSE DECODER MONITOR

5-1. General

a. Signal flow through the pulse decoder monitor is shown in figure 5-1. The two-line input to the unit is designed to accept a dedicated line pair from a local or remote call selector. The audio signals thus obtained are first fed to a line coupling transformer on the power supply circuit card. This transformer drives a prefilter circuit which passes signals in the 250 to 3000 Hz range only, thereby blocking 60-Hz line hum. The prefilter output feeds information to the multifrequency (MF) circuit cards, and also drives two audio amplifiers (OA) which supply audio power to the headset(s) and speaker. Both the dialing signals and voice signals (conversation) may thus be monitored for as long as the related call selector supplies the data. Separate panel controls for headset and speaker permit independent volume adjustment, independent of input level (fixed gain).

Table 5-1. Multifrequencies

Digit	Frequencies(Hz)
1	700+900
2	700+1100
3	900+1100
4	700+1300
5	900+1300
6	1100+1300
7	700+1500
8	900+1500
9	1100+1500
0	1300+1500

b. The dial pulses (which arrive from the call selector as -48 volt pulses) and the multifrequency signals are detected in separate circuit cards. If the signals are dial pulse only, the dial pulse counter circuit card will respond. Each pulse is sent to a binary counter where it advances the count (1 through 10) by one. When the pulse train (representing one dialed digit) is complete, the counter holds a 4-line binary code representing the digit dialed. This code is then strobed into the display control circuit card where it is stored in a random-access memory, and is used to activate the self-scan digit display. Thus each digit appears on the display as it is dialed.

c. When the incoming signals are multifrequency (MF), only the MF limiter, MF channel filter, and MF decoder circuit cards will respond to each of the six-tone signal and supply six dc logic output lines. The presence of a tone(s) causes the output line for that tone to go high. These lines are sent to the MF decoder circuit card where the two-tone digit combinations (table 5-1) are converted to the digit each represents. These digits are converted into a four-line binary code (as in the dial pulse counter circuit card) and strobed to the display control circuit card for storage and readout.

d. The unit also contains an electronic seconds timer which is operated from a keypad. This timer counts pulses supplied by the display clock circuit card. The circuit card uses the 50/60 Hz line frequency (as selected by 50 Hz/60 Hz panel toggle switch) as its reference source. This signal is divided by 50 or 60 so as to produce one pulse per second. The 1 pps pulses are sent to the display control circuit card where they are counted. This circuit card then converts the counts to BCD signals which are strobed to the display. The timer digits start at the right of the display and move to the left for a maximum of 16 digits. The keypad control permits the timer to be started or stopped, or the displayed time held on the readout for up to 15 seconds, while counting continues.

e. An ALARM toggle switch, when in the on position, will insert a pulsating 400-Hz signal on the audio outputs upon receipt of an alarm signal from the call selector.

f. The panel selector switch permits a frequency check of the 50/60 Hz line source, when required.

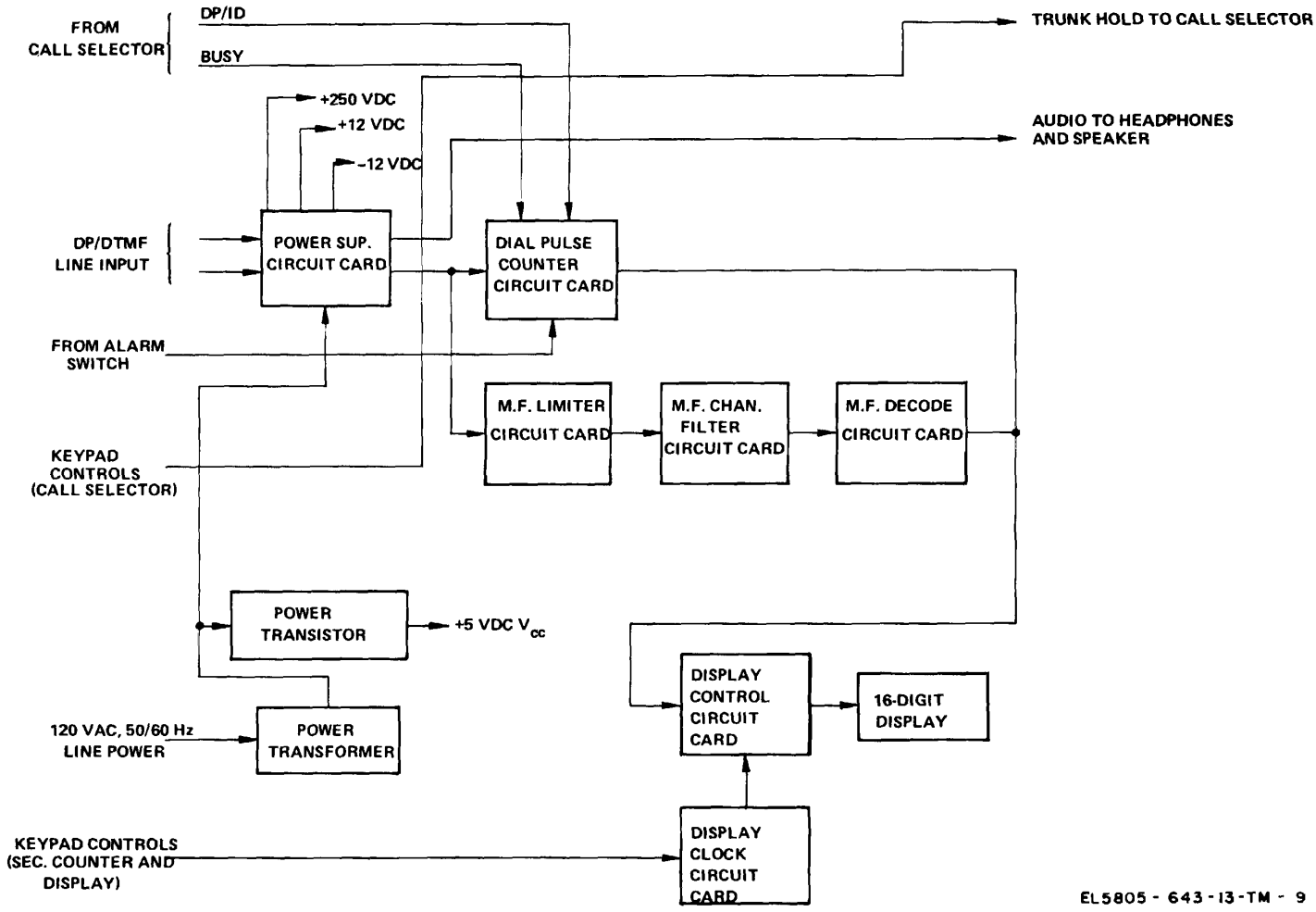


Figure 5-1. Decoder monitor, block diagram.

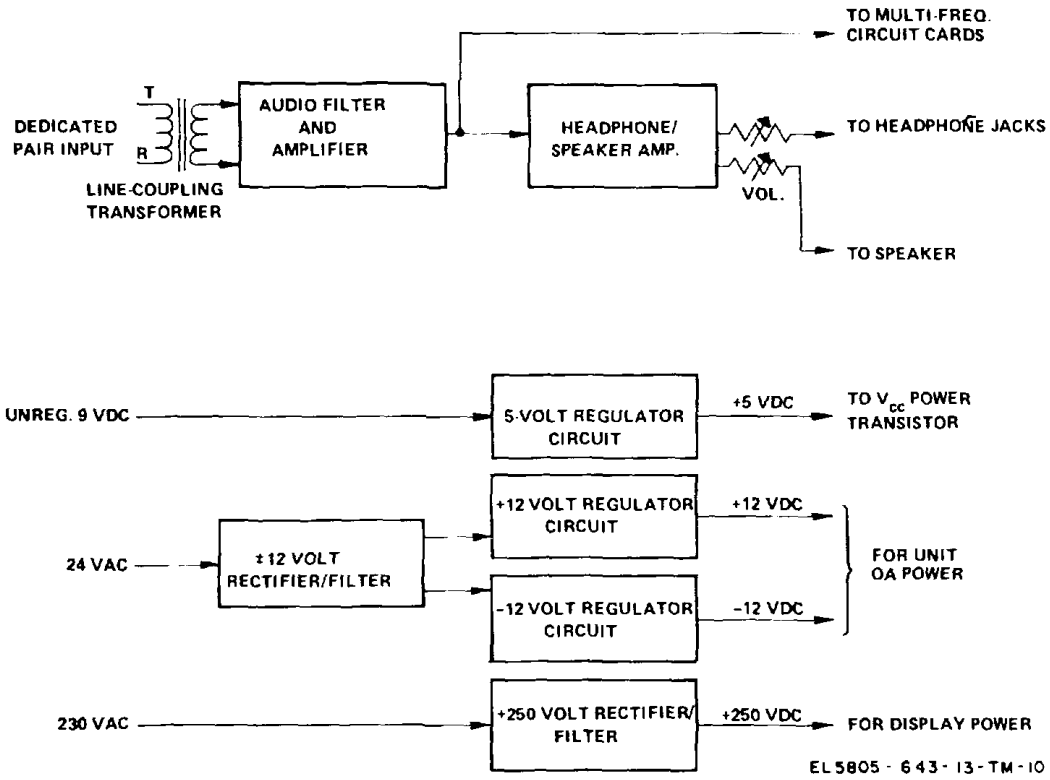


Figure 5-2. Power supply circuit card, block diagram.

5-2. Power Supply Circuit Card

a. This circuit card (fig. 5-2) contains rectifier, filter, and regulator circuits for all unit power. Additional circuitry also provides for input line coupling and filtering, headphone and speaker amplification and control.

b. Signals entering the unit (from PAIR terminals or CALL SELECTOR connector) are first sent to a line coupling transformer T1. The primary is in series with the normally closed contacts of the C.S. RELEASE switch on the keypad. When this switch is placed in the up position, the dc short is removed, and an open loop is presented to the line. This causes the call selector to release its present trunk.

c. An ac loop is maintained to the call selector with this switch in the up position. If the switch is left in the up position, release control is transferred to the signal data recorder.

d. The line coupling transformer secondary output is fed to a 6th-order high-pass, then to a 6th-order low-pass filter to eliminate frequencies outside of the 250 to 3000 Hz range. All audio signals in this range are unattenuated. The filter output is then sent to the multi-freq limiter card. This output is also fed to two operational amplifiers with independent adjustable gain (panel VOLUME controls). The outputs from the amplifiers are used to drive the headset output and a cabinet-mounted dynamic speaker.

e. The power supply section of the circuit card contains three regulator circuits. The Vcc (+5 vdc) supply obtains 9 vdc from the transformer and diodes on the unit frame. This voltage is controlled by a power transistor, also mounted on the frame, and is controlled by a Zener reference two-stage regulator circuit on the card. The +12 vdc and-12 vdc, for use in all operational amplifiers (OAs), is obtained from two Zener-referenced regulator circuits. These circuits receive 26 vdc from a diode bridge on the circuit card which is fed by the main power transformer on the unit frame. The +250 vdc, used in the readout display, is also obtained from the power transformer, and is rectified and filtered by a diode bridge and capacitors on the circuit card.

5-3. Dial Pulse Counter and Alarm Circuit Card

a. A pulse-shaping network and Schmitt trigger on this circuit card (fig. 53) convert the -48 volt dial pulses from the call selector into +5 volt logic pulses. The pulses are then passed on to an interdigit time delay one-shot circuit, and to a binary counter circuit. The counter circuit will count the dial pulses (1 through 10). The output of this circuit is a 4-line binary code

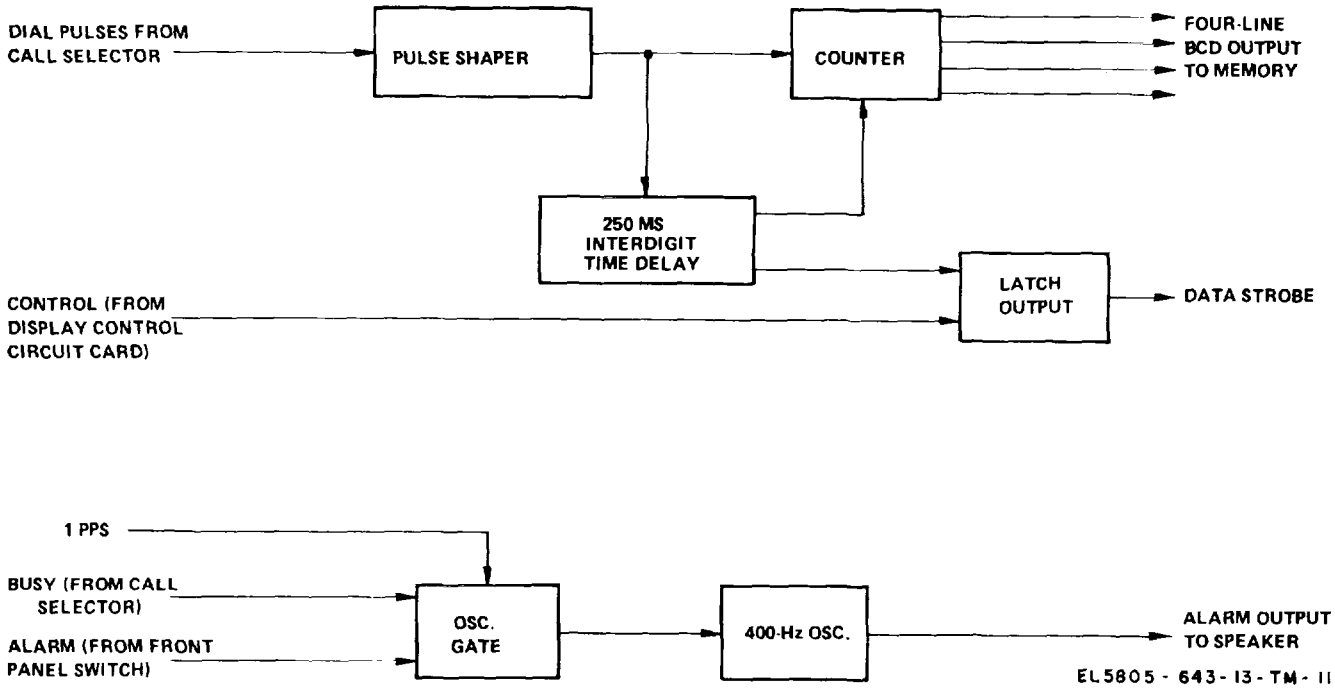


Figure 5-3. Dial pulse counter and alarm circuit card, block diagram.

which represents the final count of pulses for each digit. If a 10-pulse train is counted, the binary 10 digit is then forced to a binary 0. When the pulse train ends, a time delay circuit begins a timing function. If no new pulses appear during the next 250 ms delay, an end-of-digit is assumed, and a strobe signal is sent to the display control circuit card which causes the code for that digit to be strobed to the readout. Thus each new digit pulse train is counted and strobed out as received.

b. When the front panel selector switch is set to MF or FREQ CHECK, an inhibit signal is set to an output flip-flop circuit in the strobe line. This action blocks the strobe signal from reaching the display control card, thus preventing dial pulse readout when multifrequency only is desired.

c. A 400-Hz alarm oscillator is also located on the curcuit card. The output of this oscillator is gated by the ALARM switch on the panel, the busy (-49 volt) signal from the call selector, and a 1 pps signal generated in the unit. When a busy signal is received with the ALARM switch up, a pulsating tone (200 ms on, 80 ms off) is produced.

5-4. MF Limited Circuit Card

a. This circuit card (fig. 5-4) is the first in a series of three multi-freq signal processing cards.

b. Audio signals from the power supply circuit card are fed to six low-Q band-pass filter circuits. These circuits are each turned to one of the six MF frequencies (adjustable at R112 through R117), and provide prefiltering of the separate frequencies. Each filter output feeds a limiter which sets the output at 2 vp-p (-24 dbm
minimum output). The outputs are then sent to the MF channel filter circuit card.

5-5. MF Channel Filter Circuit Card

a. The outputs from the MF limiter circuit card are sent to six band-pass filter circuits on the MF channel filter circuit card (fig. 5-5).

b. Each filter is tuned to its respective frequency (adjustable at R109 through R115). Each of the six filter outputs is then sent to a rectifier-filter circuit which converts the tone to a dc-logic signal. As long as a tone of its assigned frequency is present, its output will provide a 5 vdc signal to the decode circuit card (fig. 5-6). Six output lines are sent to the decoder circuit card.

5-6. MF Decode Circuit Card

a. The six dc-logic output lines from the MF channel filter circuit card enter this card (fig.

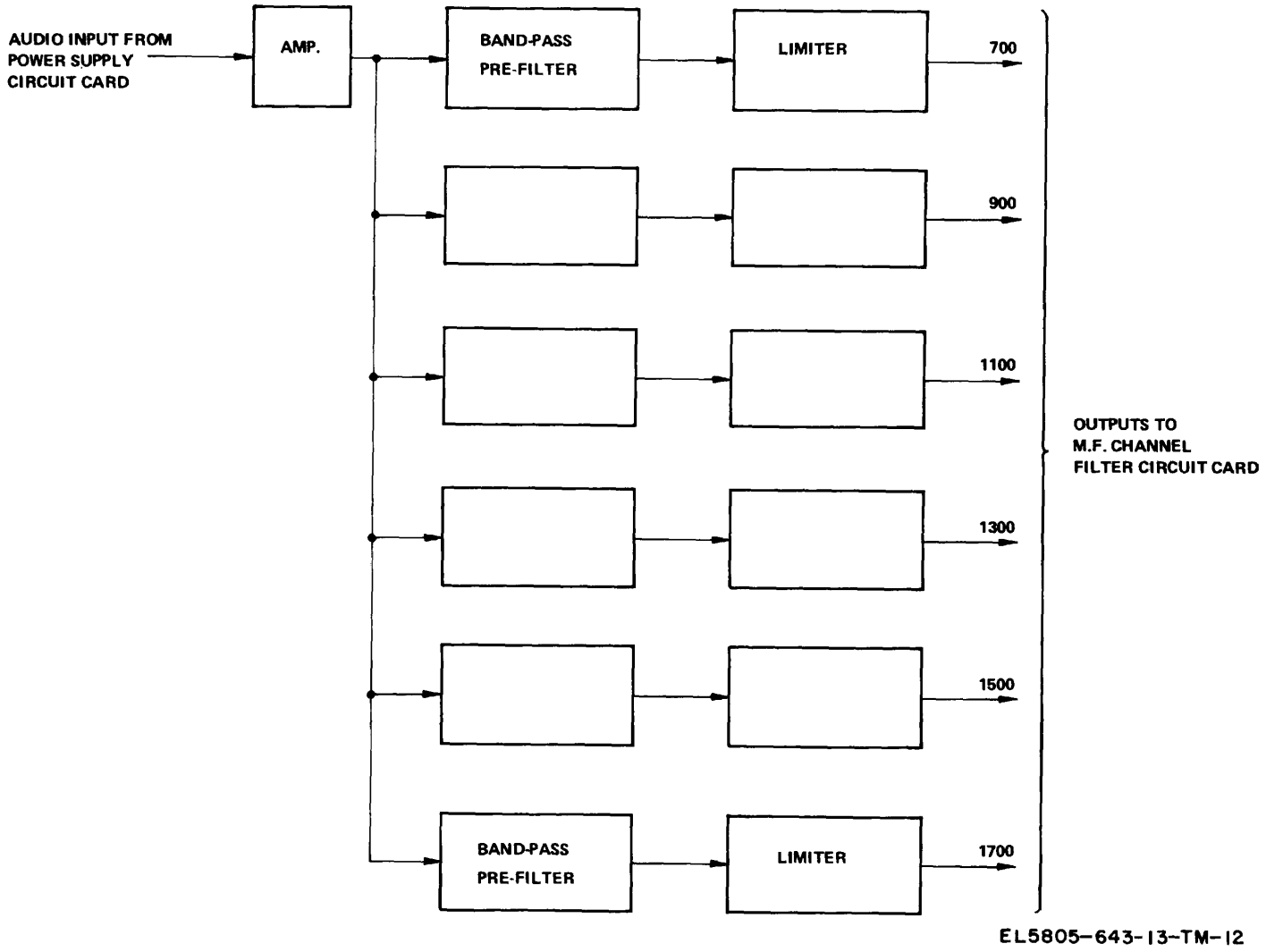


Figure 5-4. MF limiter circuit card, block diagram.

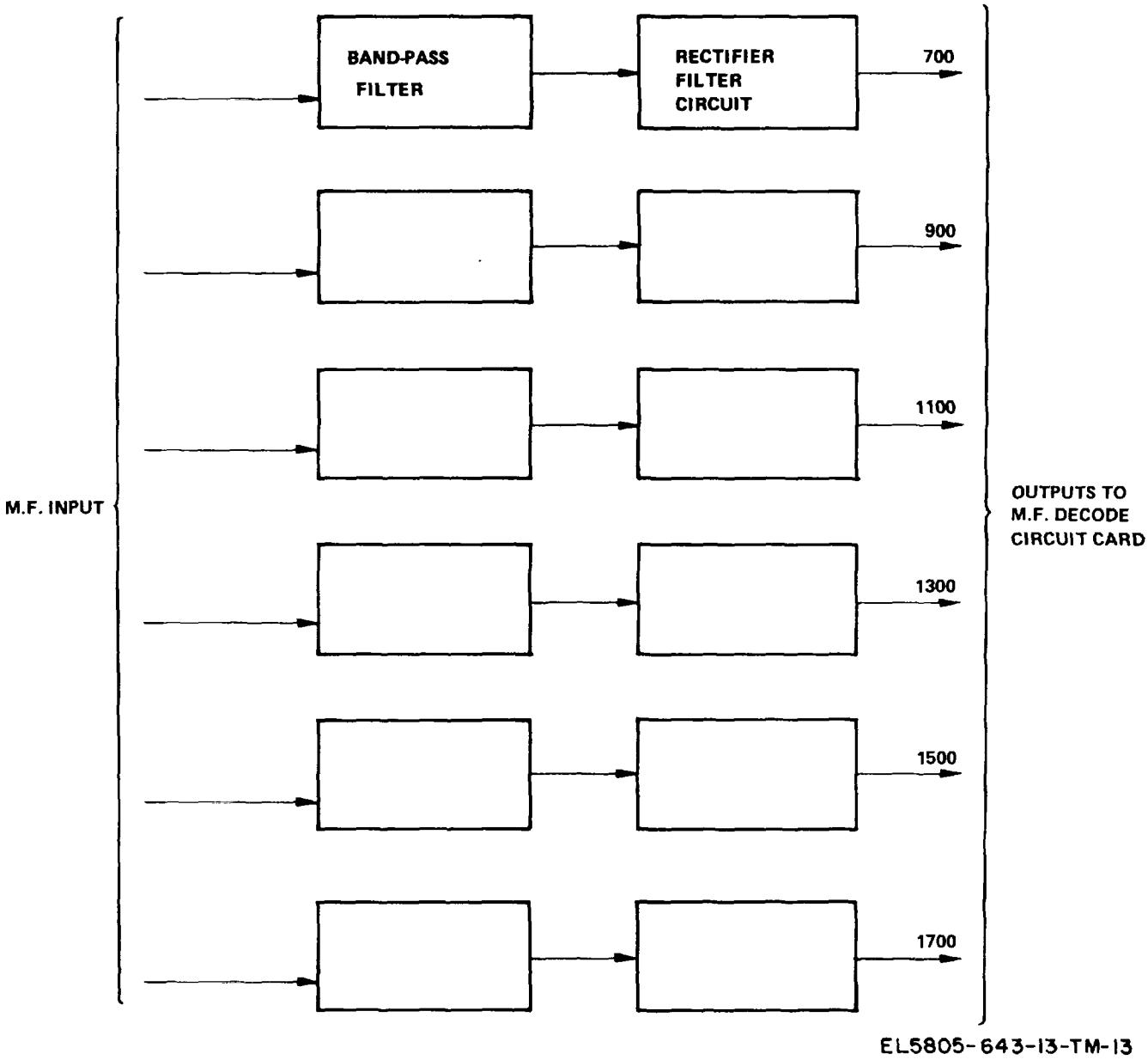


Figure 5-5. MF channel filter circuit card, block diagram.

56) where each two-tone combination is converted into the numerical digit or character which it represents. The incoming lines representing the 900, 1100 and 1300 Hz tones are fed to a binary adder A. The 1500 and 1700 Hz lines are added in a second binary adder B. The output of this adder is fed to the first adder A where its binary value is added to the 900, 1100, 1300 Hz value. The output of the A adder is a 4-line binary signal representing the number (or character) originally received, as indicated in table 5-1. Each binary digit is fed to a decade counter 4-bit storage register.

a. mine six incoming lines also feed to control circuits: an even number circuit and an at least one circuit. The even circuit will produce an output only if logic signals (representing tones) are present on two of the six lines. The at least one circuit will produce an output if one or more lines have logic signals. Both of these signals must be present to activate a strobe circuit. If a number of lines other than two is active, no strobe signal will be produced. The strobe signal causes the register to momentarily store the binary code for that digit, and operates a flip-flop which causes the stored code to be opened

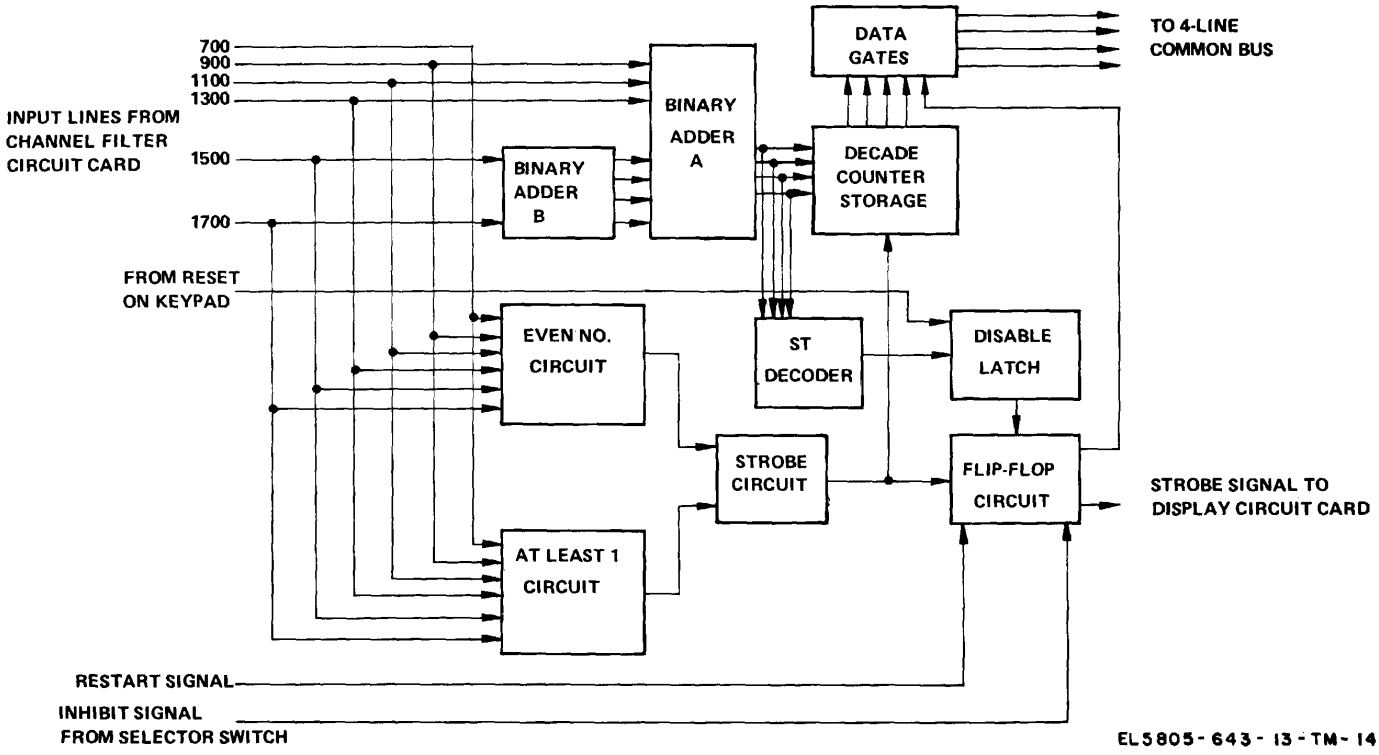


Figure 5-6. MF decode circuit card. block diagram

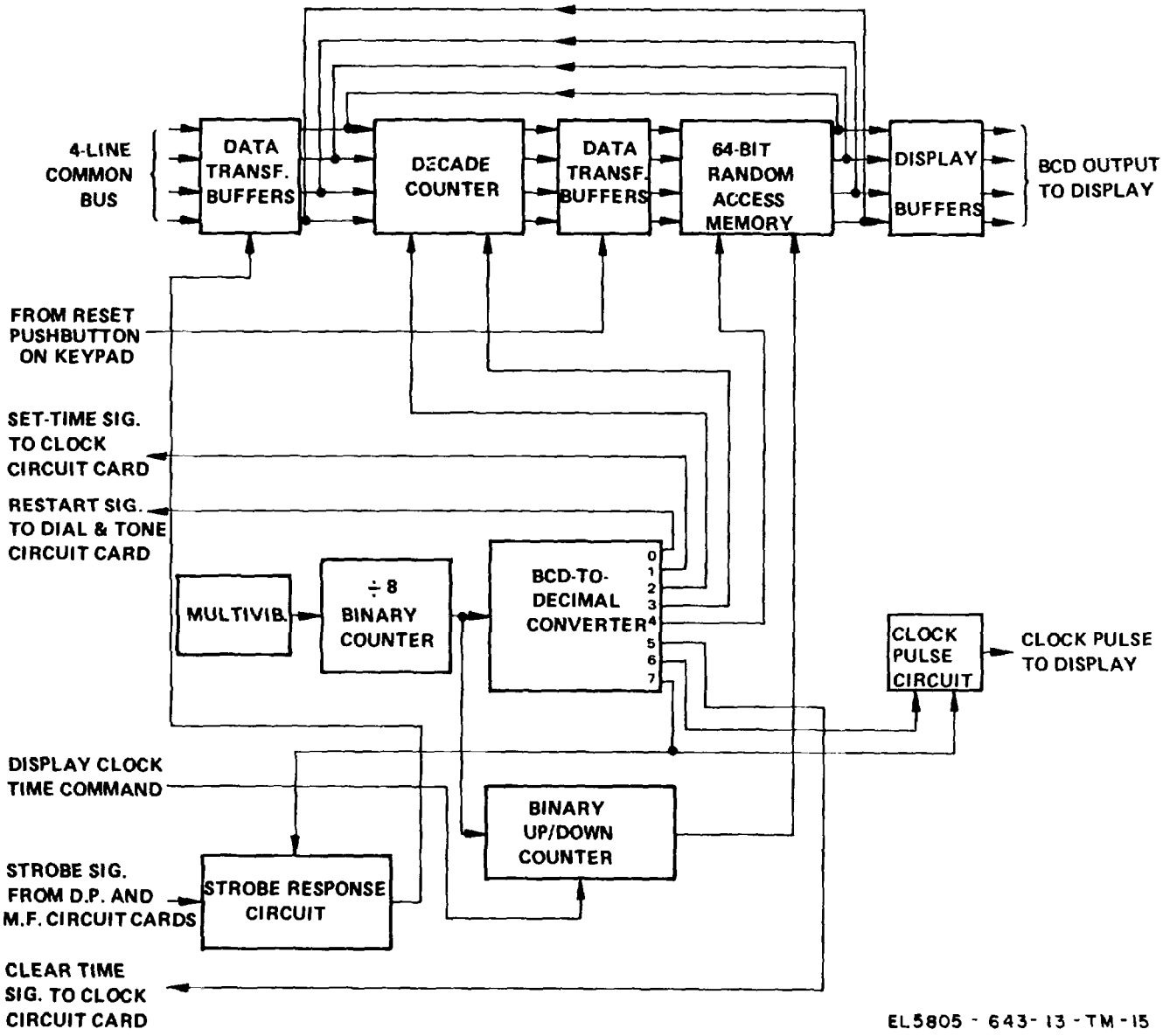


Figure 5-7. Display control circuit card, block diagram.

into the common data bus. A strobe signal is also sent to the display control circuit card. When this card has read the digit code. it sends a restart signal back to the MF decode circuit card which causes the strobe circuit flip-flop to release the stored digit. and reset the storage register in preparation for the next digit.

c. A decoder connected to the output of the second binary adder looks for a binary 13. or an MF ST (displayed as a period). The ST indicates the end of an MF number. When 17 is decoded and displayed. the card is inhibited until the display is reset. This prevents noise from generating erroneous MF digits. The dial pulses are not inhibited.

5-7. Display Control Circuit Card

a. *The display control circuit card (fig. 5-7) receives the 4-line BCD bus from the dial pulse counter and MF decoder circuit cards. The binary codes. each representing a dialed digit. are strobes (upon reception of strobe commands) into a 64-bit random access memory (RAM). The memory stores the digits. and continues to up- date the display until reset.. Initial clock excitation for all circuit card functions is obtained*

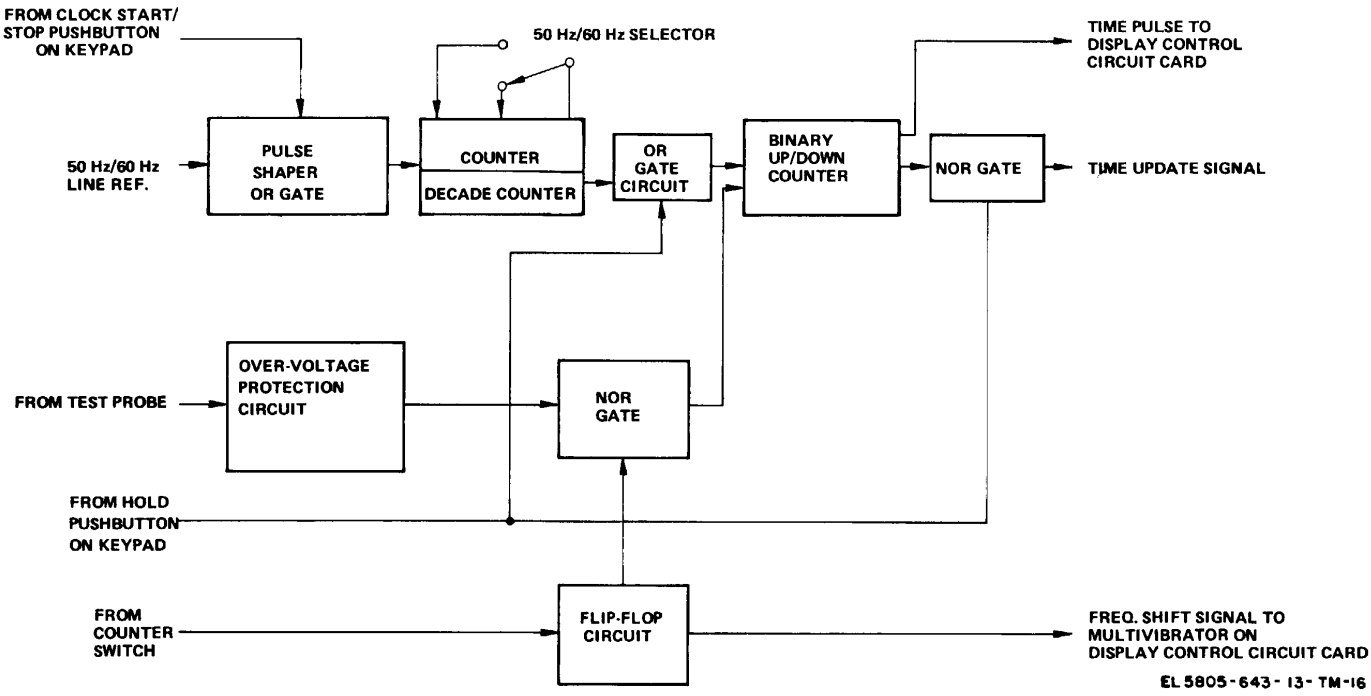


Figure 5-8. Display clock circuit card, block diagram.

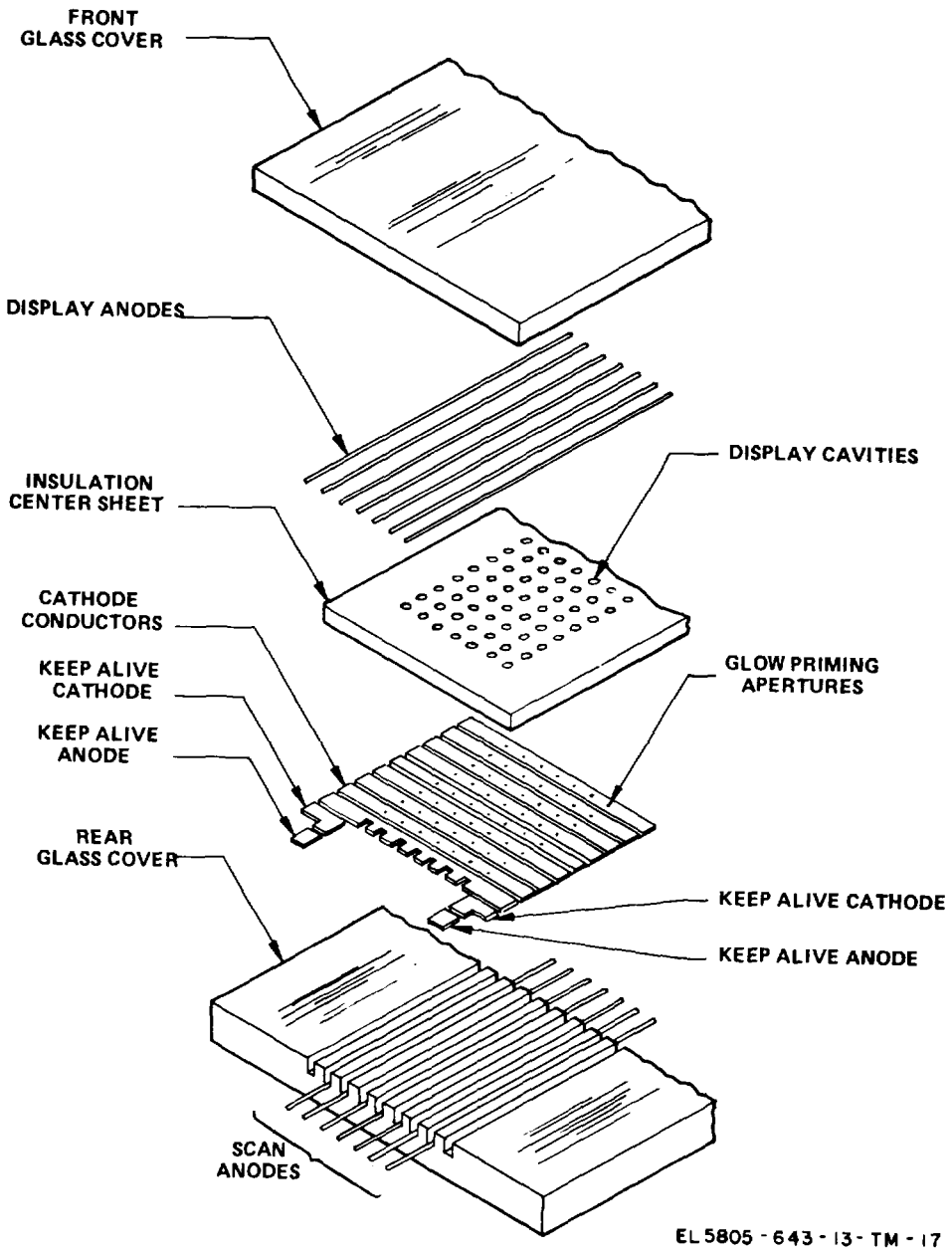


Figure 5-9. 16-digit display screen, exploded view.

from a multi-vibrator which normally supplies 6400 Hz at all times (in the COUNTER mode. this frequency is changed to 1 MHz). The 6400 Hz signal is first sent to - 8 binary counter which supplies a binary output to a BDC-to- decimal converter. The converter provides eight output lines which are sequentially made low. One complete scan (0 through 7) of these lines occurs each 1/800 second. The counter also drives a binary up/down counter with - 16 action. This counter provides a 4-line BCD code to the RAM which addresses each of the 16 words (digits) in sequence (4 bits per word). one every 1/800 second. The entire 16-word cycle thus re- quires 1/50 second. Each time a word is addressed. its 4-line code is fed out of the RAM. through the decade counter. and back into the RAM. This provides a continuous recirculating path for all stored data. b. The 4-line incoming data bus is normally blocked from the recirculating memory loops by a NAND-gate circuit. When a strobe signal is

received (from dial pulse or multi-freq), it is sent to a strobe response circuit. This circuit causes the code to be strobed into the first vacant word position of the memory. The eight lines from the BCD-to-decimal converter each actuate circuitry which provides a sequence of eight processing steps for every word position. The steps are a follows;

0. Set time (timer function)
1. Restart display
2. Reset decade counter (in memory circuit)
3. Clock decade counter
4. Write into RAM
5. Clear time board
6. Clock 7-pulse train to display
7. Gate common bus input to memory

c. Steps 0, 2, 3, and 5 are used for the seconds-counting function. Steps 1 and 7 are sequence decoded digits into the display. Step 4 is used to store digits for both counting and dialed-number display.

d. The four output lines of the recirculating RAM loops are fed out to the display, thus sending the stored digits in sequence to refresh the display each 1/50 second. Seven clock pulses are also sent to the display for each digit code presented from the memory.

e. In addition, the system functions as an elapsed-seconds counter. When activated by the keypad button, 1-second pulses from the display clock card are fed to the decade counter, where they are used to advance the least significant digit count and subsequent carryover to the next stored RAM digits. Since the seconds-counter readout starts at the right side of the display (instead of left, as for dialed digit read-out), the binary up/down counter must be reversed so as to address the RAM word positions from the right to left. The seconds-counter display takes precedence over dialed digits. The seconds-counter function is transferred to a frequency-counter function for unit adjustments (para 5-8).

5-8. Display Clock Circuit Card

a. The display clock circuit card (Fig. 5-8) supplies 1-second time signals to the display control circuit card for use in the seconds counter. A built-in frequency-counting feature is also provided on this card.

b. A 50 Hz or 60 Hz line excitation source is obtained from transformer T1 on the unit frame. This signal is filtered, shaped and fed to a ÷ 6 or ÷ 5 counter (depending upon the 50 Hz/60 Hz selector switch position), then to a decade counter. The decade counter delivers a 1-Hz square-wave output. When the START CLOCK button on the keypad is depressed, a gate passes the 60 Hz excitation signal to the counters, producing a 1-pps signal which is sent to the display card for counting. If the HOLD CLOCK keypad button is depressed and held, the pulses are not sent out, but are fed to a binary up/down counter. This causes the count on the display to be held, while the up/down counter continues to count the time pulses. The counter will count up to 15 pulses (seconds) then reset and again count up to 15. Thus, the button must be held for less than 15 seconds or the elapsed seconds displayed will no longer be accurate. If the button is released before this time, the display will instantly be updated and will continue to count. A busy (=48 volt) from the call selector will also start the clock.

c. The card also contains circuitry for conversion to a line frequency counting function. These signals received from the line and are set into the up/down counter in place of the time pulses when the selector switch on the front panel is placed to the FREQ, CHECK

position. These pulses are sent for a 1-second period to the display card where they are counted (as though they were time pulses). The frequency of the multivibrator on the display control circuit counting operation. At the end of the 1-second period, a flip-flop circuit cuts off the pulses and causes the display to hold the total count for three seconds. After this period, the pulses are again sent to the display card for one second, and this count is added to the count previously displayed. This frequency must therefore be read in the first three-second display period, or otherwise an average of several periods may be obtained (by dividing total number of periods sampled). The frequency counter will measure the exact frequency of the 50 or 60 Hz power line. This permits line frequency checks as well as verification of counting, storage and display functions in the unit.

5-9. Digit Display

a. A maximum of 16 digits may be displayed on the neon self-scan display screen (fig. 5-9). The screen consists of 111 columns by 7 rows of display cavities. Each cavity represents one glowing element of one character, and consists of a scan anode (running vertically in columns of 7 cavities each), and a display anode (running same as scan anode). The scan anodes are at the rear of the display sandwich. A scan is started by applying +250 vdc to a pair of deep-alive

anodes at the end of the display. The vertical cathode strips are actuated by a 3-phase drive signal. Each phase is connected to a cathode set representing every third cathodes. This action causes an ionized column. once initiated at the keep-alive cathode end. to be transferred. column by column. across the display from left to right. (The glow produced is not visible. since it occurs in the rear. or scan portion of the display sandwich). This scanning action is repeated continuously.

b. When a character is to be displayed at a certain position on the screen. the horizontal display electrodes required are made positive at the instant the ionization scan reaches that position. The ionization glows of the seven cavities in the rear scan area generate metastables (gas atoms raised to a high energy level which ionize other gas atoms) which pass through the priming apertures (one per cavity) in the cathode strip to the adjoining display cavities. If the display anodes in any of these cavities are positive. a visible orange glow will be produced. Thus. by actuation of the proper display anodes at the proper point in a scan. a series of characters or symbols may be written across the display screen. The scan is repeated every 1/50th second. thus the entire display of all characters appears to be continuous.

c . Each digit (or letter) displayed requires five horizontal cavities (dots) followed by two blank space cavities. The display control circuit card supplies the scan and BCD circuitry in the display with seven scan-advance pulses for each new digit displayed. The BCD code input for that digit is presented during the first five pulses. At the end of each scan. a reset pulse from the display control circuit card initiates the next successive display scan.

5-10. Line Frequency Counter

The monitor is equipped with a built-in counter for measurement of the line frequency. The panel selector switch must be set to FREQ. CHECK. When the CLOCK/START keypad pushbutton is depressed. the counter will count for one second. then display the frequency for three seconds. The display must be read during this period. or if greater accuracy is desired. the count may be allowed to accumulate for several periods. The total is then divided by the number of periods to obtain frequency. If allowed to count for 10 periods (40 seconds). the count will be 500 for 50 Hz. or 600 for 60 Hz. The 50 Hz/60 Hz rear panel toggle switch must be set to the correct position. or an erroneous count will result,

NOTE

When the frequency counter is not in use. the selector switch should be moved off the FREQ, CHECK position. or other monitor functions will not operate.

SECTION II. TELEPHONE CONNECTOR SWITCH (CALL SELECTOR)

5-11. General

(fig. 5-10)

a. The switching unit in the call selector is made up of up to 50 pairs of three-pole reed relays. each pair of which will connect one of 50 6-wire inputs: T. R. T1. R1. E and M to the control circuit card of the call selector. These 50 relay pairs are organized into five groups to ten. and addressed by tens and units. Circuit cards 16 and 17 have been assigned to inputs 0 through 9. and are enabled only when the scanner tens counter is at tens 0. Similarly. circuit cards 24 and 25 have been assigned to inputs 40 through 49. or tens 4.

b. Input relays are operated by the combination of a ground applied to one relay tens (RT) lead. and -49 volts applied to a single units (RU) lead. When the unit is scanning for a new landing call. the E IN leads are scanned at the rate of one each 100 microseconds. The maximum search time is five seconds. When connected for loop operation. the E IN inputs become the C (sleeve) lead inputs.

c. If the unit is idle and a new call appears in the group of trunks being monitored. the scanning will be stopped the next time the scan reaches the address of the input trunk on which the new call appears. The TRUNK ID display indicates the number of the input.

d. A selector switch on the front panel permits selection of EM incoming. EM outgoing. or loop outgoing calls only. If the call selector is monitoring incoming calls. and a new ground appears on an E lead. the addressed pair of re- lays will momentarily connect T. R. T1. R1. E and M of the input circuit to the control card. If both E and M are at ground potential at that instant (indicating that the call is actually an incoming call). the control card will disable the

scan. thus holding the call selector in a monitor condition until the call has been abandoned. the observer has terminated the observation of the call. or the signal data recorder has timed out (selectable from 7 to 99 seconds). The call selector is connected to the monitor through a 10-conductor cable containing a voice pair. and four additional leads: busy. PD/ID (dial pulse and identity). ground reference. and hold. A busy signal sent to the readout unit will indicate that a call is being monitored. These signals set a pulsating 400 Hz alarm. and start the seconds clock. Observation may be made by turning off the alarm at the monitor. The unit may also be connected to a signal data recorder by means of a similar 10-conductor cable. This device will automatically record the number dialed. time- of-day. day number. and call selector input ID number or call duration time in minutes (as selected).

e. Each time the E lead returns to -49 volts while signaling. a dial pulse signal will be sent to the monitor through the DP/ID lead. if the call is an incoming EM. and the dial pulses fall within acceptable limits. When the call has been terminated. the DP/ID lead will carry the identity of the input on which the call was monitored. after which the busy signal will be re- moved. When observing loop dial trunks or in- coming lines. the unit will reject incoming calls if the potential across the tip and ring of the circuit is greater than 42 volts. Dial pulses are considered valid if the tip-to-ring voltage changes from <40V to >42V.

f. If the call selector is monitoring outgoing calls. the M lead signal is inverted in one of 50 transistors mounted on one of five input scan circuit cards. located in positions 17 through 21. This M signal is then used as if it were an E signal on an incoming call. The out is inverted in the control card and used as if it were an M incoming signal. Multi-frequency signals are treated in the same manner as the audio. and are fed directly to the monitor and/or signal
data recorder for decoding.

g. When monitoring loop dial trunks or lines. a new ground on the sleeve (connected to the E IN inputs of JS5) will cause the unit to search out the new call. Voltage across the pair (between tip and ring) will indicate that the call is incoming or that the dial springs are open. h. If the observer wishes to terminate the monitoring of a call. the operation of a switch on the observer's keypad at the monitor or signal data recorder will open the voice pair loop. disabling the call selector.

i. Upon receipt of a trunk hold command from the monitor. the trunk being sampled at that time will be locked on.

5-12. Input Scan Circuit Card

a. There are five input scan circuit cards in the unit. Each input scan card. located in positions 17 through 21. is assigned to ten input
circuits in a single terns group.

b. At any time. one of the five input cards will be addressed as its tens address is being scanned. On that same card. one of the tens units leads will be addressed. completely identifying one of fifty circuits. If the call selector has been idle and a new call is addressed. a ground will appear at one of the ten E lead outputs (incoming call). or a negative signal will appear at one of the ten M lead inputs (outgoing call). In either case. a positive signal will appear at one of the signal diodes. CR11 through CR20. When the address of the new call is reached. neither the tens clamp diode (CR51 through CR50) nor the appropriate units clamp diode (CR41 through CR50) will be clamped to -49 volts. and a positive stop MV signal will appear at terminal B. After the appropriate relays have operated and the control card has determine(that the call is in the direction for which the unit is set (incoming or outgoing). the guard terminal (Y) on the input scan card will be clamped to -49 volts. pre- venting the acknowledgment of any new calls while the call selector is busy.

5-13. Control Circuit Card

a. Stop and Hold.

(1) Before the call selector will acknowledge any new call. the monitor must present a dc patch across the output voice pair. This patch will enable a flow of current originating at R2 to pass through R33 and CRZ3 to terminals 9 and 10 of U6. Terminal 14 of U6 will go negative; *transistor Q6 will not conduct.*

(2) When an input scan card has addressed a new call. the positive going stop multivibrator signal from that card will be applied to terminal X of the control card. This signal. received at pin 7 of U8. is applied through terminal 12 of U6. and stops the multivibrator. This positive going signal is also reshaped in U8 and applied to terminal 6 and 7 of U10 through capacitor C10 and resistor R35. When the appropriate input relay is operated. the E lead potential will appear at terminal 21 and the M lead potential at terminal Y. If both these signals are positive at that instant. a negative-going signal will appear *at* terminal 6 of Ull.

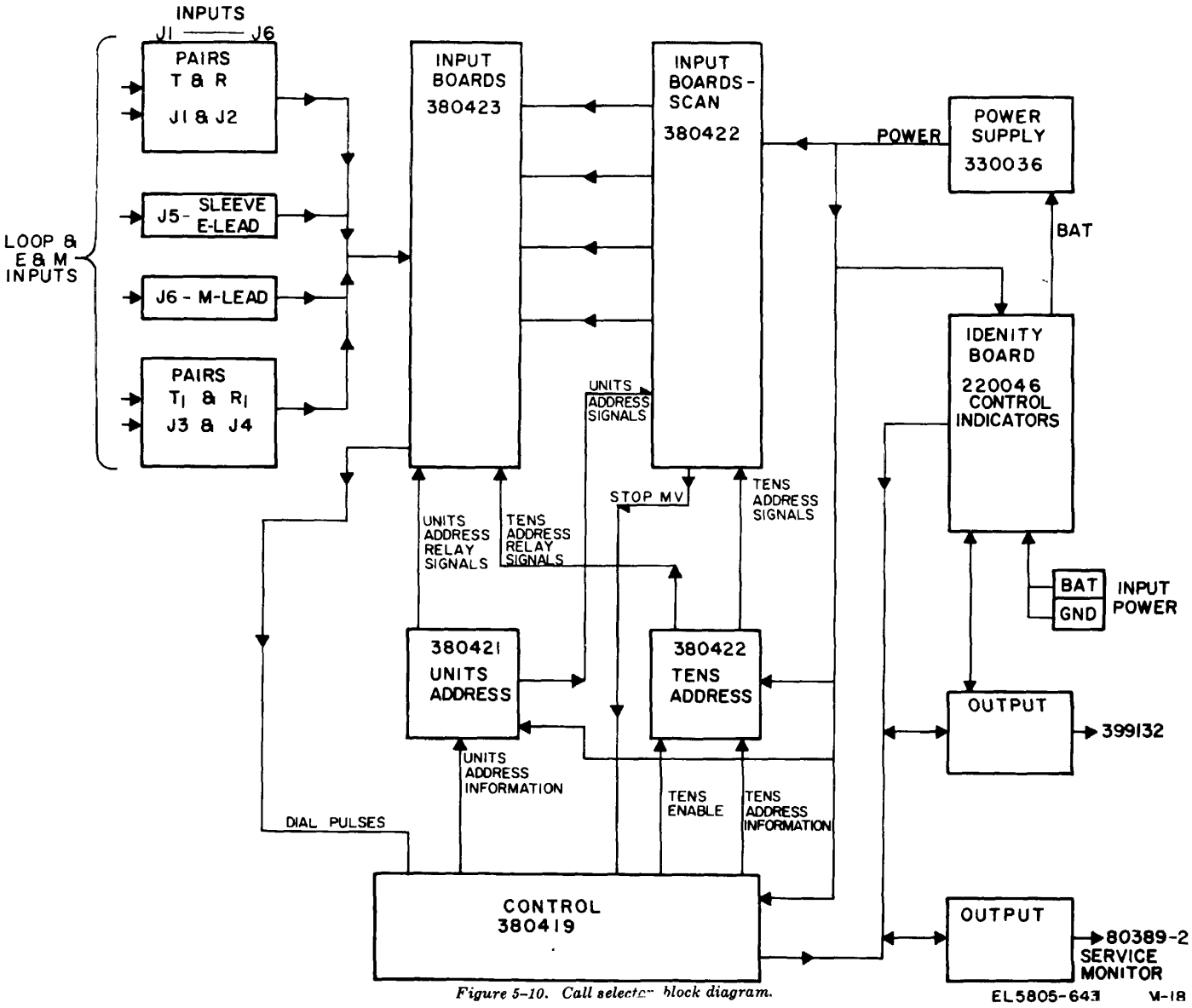


Figure 5-10. Call selector block diagram.

(3) The potential of terminal 3 at U10 will go positive. producing a positive or true potential at terminal 14 of U7. which produces a positive busy signal at pin J of the card. A portion of this signal is applied through R27 and CR3 to terminal 12 of U6 to hold the call selector after the stop multivibrator signal has disappeared. The input relays will remain in this condition until either the ground at terminal 21 (E in) disappears. or the external loop on the voice pair is opened removing the true signal from terminal 9 and 10 of U6 which. in turn. will cause Q1 to conduct. This action resets the busy signal*. causing the call to be dropped.*

b. Dial Pulse.

(1) Under monitoring conditions. terminal 21 (E in) is normally positive or true. This signal is filtered in C3 and R7. will maintain a negative signal at terminal 9 of U7. During each dial pulse. E will be returned to -49 volts for approximately 60 milliseconds. This negative-going signal. shaped in U8 and U10. is applied to the positive terminal of capacitor C16 (from pin 13 of U10). producing a charge in that capacitor.

(2) At the end of the dial pulse. the potential of both ends of C16 will return to approximately Vcc. This positive potential applied to pins 9 and 10 of U9 will drive pin 14 negative. This potential applied to pin 4 of U6 will produce a positive signal at pin 3; this signal applied to the base of Q2 through R46 will drive Q2 into conduction. producing one dial pulse at pins 15 and 18. If a subscriber should hang up before the observation of a call has been terminated. C16 will again acquire a charge. Since the E lead will not again go positive at this. time. the charge in C16 will be dissipated in R39. and will not produce an unwanted dial pulse.

(3) Before the unit is seized. pin 13 of U9 will be positive. thus preventing any spurious dial pulses from terminal 3 of U6 on seizure. Approximately 20 milliseconds after seizure, C17 will become charged and this positive potential at terminal 14 of U9 will disappear.

c. Audio Amplification. Audio signals (voice. MF tones. etc.) appearing at the T/R input. terminals A and C. are amplified in AR1 and presented to the output transformer T3. Similarly. audio signals appearing at terminals D and E (TI/RI) are applied to the output voice pair through capacitor C9.

5-14. Tens Address Circuit Card

a. A tens enable signal at pin A is obtained from the control card to control the scan cycle. During the processing of a call. this signal is positive. preventing the scanning of the ten input card address lines. Scanning of inputs is thereby halted during processing of a call.

b. Tens address information originates in U3 on the control card. This binary information is applied through terminals P. R and M of the control card to terminals E. D and C of the tens address circuit card. At any one time only one of the tens address leads ’I0 through T4 will be unclamped; the other four will be clamped to -49 volts. At the same time. the associated relay driving signal RTO/RT4 will be held at ground potential. The other four RT terminals will be in an open-circuit condition.

c. The tens address information is sent to one of the five input scan cards. The tens address relay signal is sent to two of the ten input cards.

5-15. Units Address Circuit Card

Units address information originates in U4 on the control card and appears as a binary count at terminals 16. S. U and T on that card. This information is applied to terminals 7. 6. 5 and 4 on the units line of the address leads. UO through U9 will be at ground potential. The other nine units address leads will be clamped to -49 volts by Q1. At the same time. one of the units relay driver leads. RUO through RU9. will also be clamped to -49 volts; the other nine will be open-circuited. The ten units address leads are applied to all five input scan cards. The first five units relay signals. RUO through RU4. are sent to input cards 23. 25. 27. 29 and 31. The last five units relay signals. R5 through R9. are applied to input cards 24. 26. 28. 30 and 32.

5-16. Input Circuit Card

Each input circuit card contains five pairs of three-pole reed relays. The windings on these relays are rated at 24 VDC. and two relays in any pair are connected in series for 48-volt operation. Any time a relay tens signal is applied to two input cards. this signal. entering the input card at terminal H. is common to all five pairs of relays on that card. The other terminal from each pair of relays leaves the card through terminals 7. 11. 13. S or W to be connected to the units relay lead RUO through R9. At any time. only one pair of relays will be operated. thus connecting one set of input leads to the control card.

5-17. Identity Circuit Card

a. This circuit card contains identity circuitry plus the recessed control panel. accessible from

the front of the unit. All unit controls and indicators are mounted on this panel.

b. The identity card consists primarily of a + 12 counter and two groups of comparators. When the unit is idle. the counter will be stopped at a count of eleven. A JF flip-flop. U10. which selects the output from one of the two comparators. will be in its reset condition; Q will be high. While the call selector is busy. capacitor C3 in the identity card will become charged. whenever the busy line (pin A) goes high. As the call selector is released. terminal A will return to -49 volts. Current through CR5 will shunt the stop signal originating at R19. and the oscillator signal will be allowed to pass through U2 to the clock input. C1. of the counter U6. As the first pulse advances the counter from step 11 to step 0. both sections of Ull. a dual JK flip-flop. are clocked. and the units gate of U7 is closed at pin 7 of U7. The second section of U10 opens a gate at terminal 9 of U7. The second section of U10 opens a gate at terminal 9 of U7 to allow I, D, pulses from the 10 PPS oscillator to reach the base of Q1; negative-going I,D, pulses appear at terminal P for further transmission to the monitor. These pulses are counted on the mechanical test register in the front panel.

c. The input tens address leads are tested through diodes CR6. CR7 and CR8; if no count exists (count is zero) the tens gate. pin of 4 of U7. is closed by current through CR9. On each subsequent step. the count in U6 is compared with the binary signal at terminals D and F. At coincidence. CR9. CR10. CR11 and CR12 will not conduct. and pin 3 of U7 will go positive. U10 (pin 10) is reset. closing the I. D. pulse gate at pin 9 of U7. If coincidence is not found (count is zero). U10 (pin 10) will be reset after step 9 has been completed to provide a total of ten pulses.

d. As the counter goes from pulse 11 to pulse 0,both flip-flops are clocked; the tens gate is closed at pin 5 of U7. and the units gate is opened at pin 7. The dial pulse gate is opened at pin 9 of U7. and the above process is repeated to out pulse the units I. D. When the count reaches 11 in the units part of the count. a positive signal at the anode of CR1 will close the clock pulse gate at U2 (pin 5). The guard clamp. Q2. will be released and the call selector will be ready to accept the next call.

5-18. Dial Pulse Sensor Circuit Card

When used for monitoring loop dial lines or trunks. this card measures tip-ring potential to create an M signal for rejecting outgoing calls. and to produce dial pulse information to the control card. Dial pulses are detected across the tip and ring input by means of a differential amplifier and threshold detector (U4). A digital filter on the card permits only those dial pulses to pass which are on for 17 ms or more. and off for 28 ms or more. A squelch circuit is provided which mutes the audio amplifiers during dial-pulsing intervals.

5-19. Power Supply Circuit Card

a. The power supply card is a dc-to-dc convert- which delivers 5 vdc to provide Vcc power for all logic circuitry. The converter is powered only by the -48 vdc supply source. The 5-volt output is connected with the -48 vdc source so that the Vcc is referenced to -48. and is therefore at -43 vdc.

b. The converter consists of a power oscillator employing two power switching transistors in a push-pull circuit which utilizes a base-drive feedback transformer. The oscillator supplies 33 kHz at 10 vac. which is stepped down to 5 vac and is full-wave rectified and filtered.

CHAPTER 6

MATERIEL USED IN CONJUNCTION WITH MAJOR ITEM

6-1. Electrical Equipment Racks

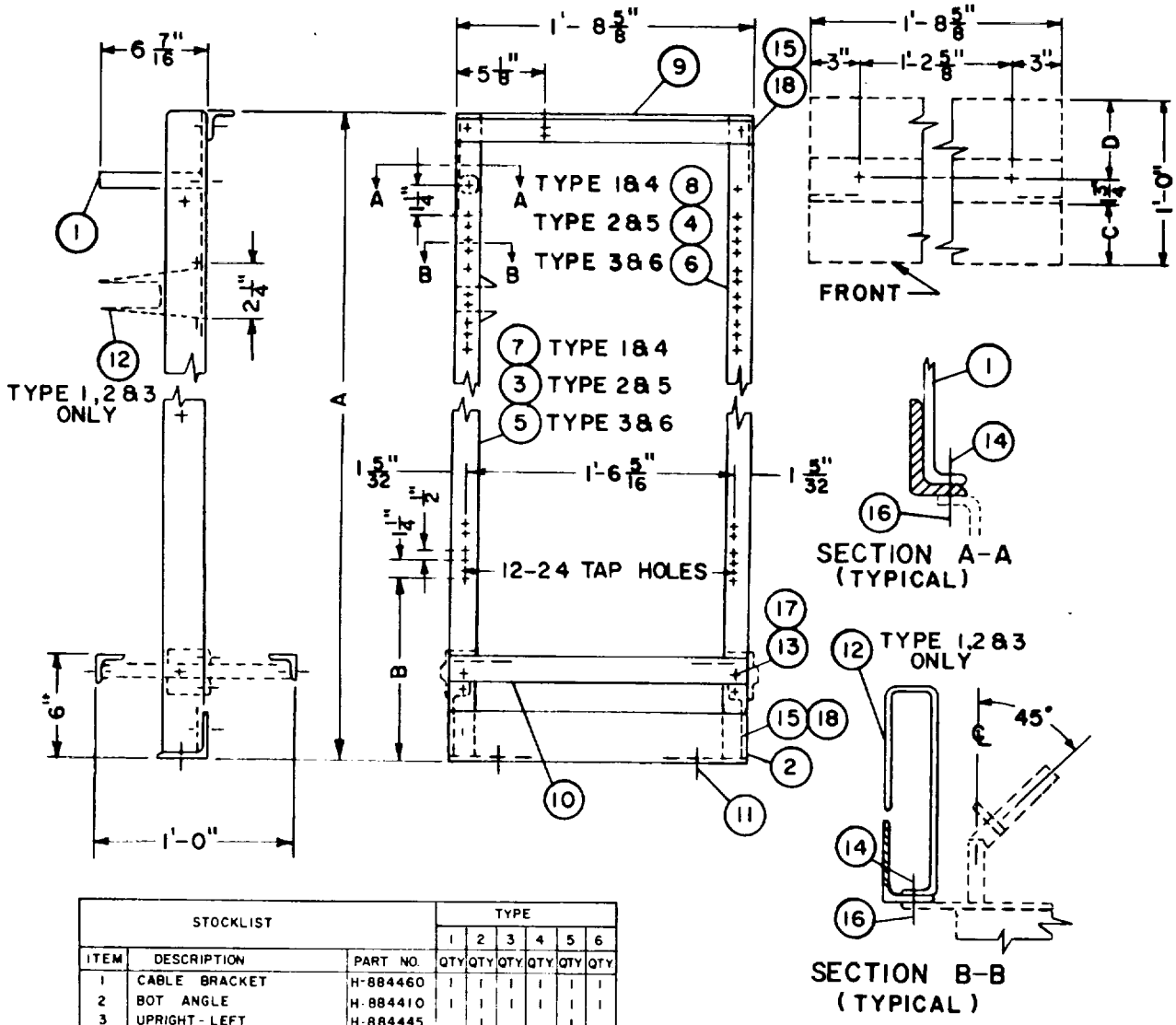
(fig. 6-1)

The electrical equipment racks are fabricated from steel and provide installation for the equipment and Electrical Connector Assembly MX-9457/GT (para 6-2),The vertical rack columns contain 12-24 tapped holes. 11/4 inch apart. The tapped holes are on 19-inch centerline-to- centerline patterns. Racks are furnished in three heights: 7½A feet. 9 feet. and 11 feet 8 inches. Hardware required for installation of the equipment and electrical connector assembly (patch panel) is listed in figure 2-1.

6-2. Electrical Connector Assembly MX-9457/GT

(fig. 6-2)

The electrical connector assembly (patch panel) is provided with 30 connectors which can receive the 10-pin connectors on the input cables (para 14*f).* The assembly includes cable-hanging U-brackets and a hardware kit for installing the U-brackets to the patch panel and the patch panel to the electrical equipment rack. The electrical connector assembly serves as a 19-inch rack-mounted electrical distribution center to be used with the equipment.



STOCKLIST			TYPE					
			1	2	3	4	5	6
ITEM	DESCRIPTION	PART NO.	QTY	QTY	QTY	QTY	QTY	QTY
1	CABLE BRACKET	H-884460	1	1	1	1	1	1
2	BOT ANGLE	H-884410	1	1	1	1	1	1
3	UPRIGHT - LEFT	H-884445		1			1	
4	UPRIGHT - RIGHT	H-884445		1			1	
5	UPRIGHT - LEFT	H-884447			1			1
6	UPRIGHT - RIGHT	H-884447		1				1
7	UPRIGHT - LEFT	H-884449	1			1		
8	UPRIGHT - RIGHT	H-884449	1			1		
9	TOP ANGLE	H-884477	1	1	1	1	1	1
10	GUARD RAIL	H-884483	2	2	2	2	2	2
11	5/16"-18 SCR & ANCHOR-FL.-FAST.	H-58058-A	2	2	2	2	2	2
12	JUMPER RING	D-65521-A	6	7	10			
13	5/16"-18 NUT-GUARD RAIL MTG	D-77033-A	4	4	4	4	4	4
14	216-24 NUT	D-77058-B	13	15	21	1	1	1
15	3/8"-16 NUT-TOP & FL. ANGLE	D-7783-A	4	4	4	4	4	4
16	.216-24 x 7/8" PHSMS-CA BRKT & JUMPER RING	D-762052-J	13	15	21	1	1	1
17	5/16-18 x 7/8" PHSMS - GUARD RAIL	D-762016-G	4	4	4	4	4	4
18	3/8"-16 x 1" HHSCS - TOP & FL ANGLE.	D-762071-E	4	4	4	4	4	4

STOCKLIST

TABLE OF DIMENSIONS		
TYPE	A	B
1 & 4	1'-6"	9"
2 & 5	9'-0"	7 3/4"
3 & 6	11'-8"	8 1/4"

FLOOR DRILLING

TABLE OF DIMENSIONS			
FIG.	C	D	FRONT GD RAIL MTG.
A	4"	6 1/4"	4 1/4"
B	5 1/4"	5"	5 1/2"

Figure 6-1. Electrical equipment racks.

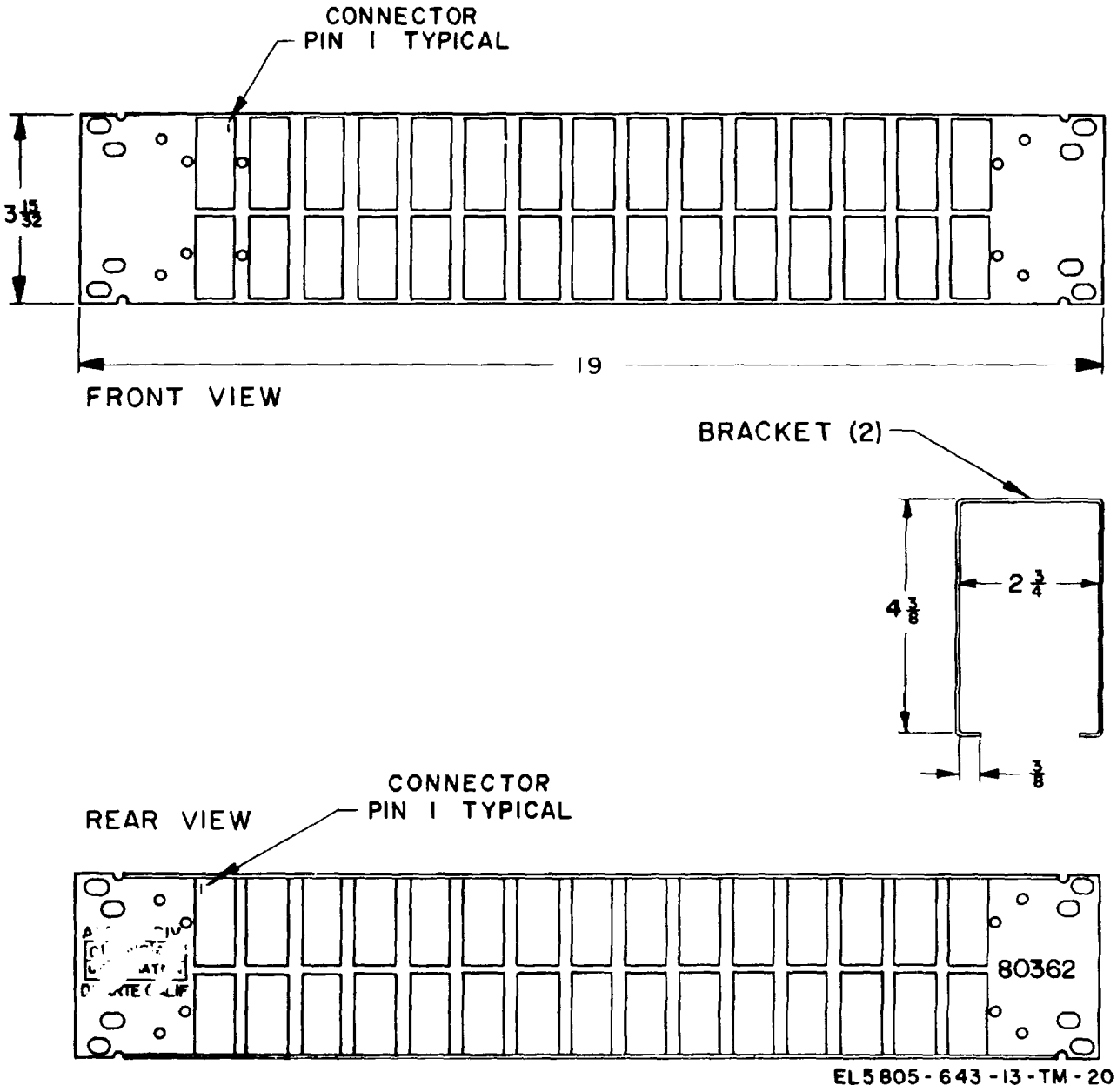


Figure 6-2. Electrical Connector Assembly MX-9457/GT

APPENDIX A

REFERENCES

The following publications contain information applicable to the operation and maintenance of the scanner.

DA Pam 310-4	Index of Technical Manuals. Technical Bulletins. Supply Manuals (types 7. 8. and 9). Supply Bulletins. and Lubrication Orders.
DA Pam 310-7	Index of Modification Work Orders.
SB 708-42	Federal Supply Code for Manufactures-United States and Canada-Code to Name (Cataloging Handbook H4-2).
TM 11-5805-640-13	Operator's. Organizational. and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) for Scanner Groups, OA-8746(V)1/GT and OA-8746V)2/GT.
TM 11-5805-641-13 I	Operator's. Organizational. and Direct Support Maintenance Manual Including Repair Parts and Special Tools Lists) for Recorder Groups, OA-8744/GT.
TM 11-5805-642-13	Operator's. Organizational. and Direct Support Maintenance Manual (Including Repair Parts and Special Tools Lists) for Counter Groups, OA-8745(V)1/GT and OA-8745(V)2/GT.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronic Command).

APPENDIX B

OPERATOR'S. ORGANIZATIONAL. AND DIRECT SUPPORT

REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists repair parts required for the performance of direct support maintenance of the OX32/GT.

NOTE

No repair parts authorized for stock-age at organizational maintenance.

B-2. General

This Basic Issue Items. Items Troop Installed or Authorized. Repair Parts and Special Tools List is divided into the following sections:

a. Basic Issue Items List-Section II. Not applicable.

b. Items Troop Installed or Authorized List-Section III. Not applicable.

c. Repair Parts List-Section IV. A list of re- pair parts authorized for use in the performance of maintenance. This list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending numerical sequence. with the parts in each group listed in figure and item number sequence.

d. Special Tools List-Section V. Not applicable.

e. *Federal Stock Number and Part Number Index-Section VI.* A list. in ascending numerical sequence. of all Federal stock numbers appearing in the listings. followed by a list. in alphanumeric sequence. of all part numbers appearing in the listings. Federal stock numbers and part numbers are cross-referenced to each illustration figure and item number appearance.

B-3. Explanation of Columns

The following provides an explanation of columns found in the tabular listings:

a. Illustration. This column is divided as follows:

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

(*2) Item number.* The number used to identify each item called out in the *illustration.*

b. Source. Maintenance, and Recoverability Codes (SMR).

(1) Source code. Source codes are assigned to support items to indicate the manner *of* acquiring support items for maintenance. repair or overhaul of end items. Source codes are entered in the first and second positions of the Uniform SMR Code format as follows:

Code	*Definition*
PA	Item procured and stocked for anticipated or known usage.
XA	Item is not procured or stocked because the requirement for the item will result in the replacement of the next higher assembly.
XB	Item is not procured or stocked, If not available through salvage. requisition.

(*2) Maintenance code.* Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the Uniform SMR Code format as follows:

*(*a) The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove. replace. and use the support item. The maintenance code entered in the third position will indicate one of the following levels of maintenance:

Code	*Application/Explanation*
F	Support item is removed, replaced. used at the direct support level.

(b) The maintenance code entered in the

fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i.e. all authorized maintenance functions). This position will contain one of the
following maintenance codes:

Code *Application/Explanation*
F --------The lowest maintenance level capable of complete repair of the support item is the direct support level.
Z --------NonrepaIrable. No repair is authorized.

(3) Recoverability code. Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the Uniform SMR Code format as follows:

Recoverability
Codes *Definition*
H --------RepaIrable item,. When uneconomically reparable. condemn and dispose of at the general support level.
Z --------Nonrepairable item. When unserviceable. condemn and dispose of at the level indicated in position 3.

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

d. *Part Number.* Indicates the primary number used by the manufacturer (individual. company. firm. corporation. or Government activity). which controls the design and characteristics of the item by means of its engineering drawings. specifications standards. and inspection requirements. to identify an item or range of items.

NOTE

When a stock-numbered item is requisitioned. the repair part received may have a different part number than the part being replaced.

e. Federal Supply Code for Manufacturer (FSCM),
The FSCM is a 5-digit numeric code listed in SB 70842. which is used to identify the manufacturer. distributor. or Government agency. etc.

f. Description. Indicates the Federal item name and. if required. a minimum description to identify the item.

g. *Unit of Measure (U/M).* Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two- character alphabetical abbreviation (e, g , ea, in, pr, etc.). When the unit of measure differs from the unit of issue. the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

h. *Quantity Incorporated in Unit.* Indicates the quantity of the item used in the breakout shown on the illustration figure. which is pre- pared for a functional group. subfunctional group. or an assembly. A "V" appearing in this column in lieu of a quantity indicates that no specific quantity is applicable (e. g. shims. spacers. etc.).

B-4. Special Information

Usable on codes are shown in the description column. Uncoded items are applicable to all con-figurations. Identification of the usable on codes used in this publication are:
Code *Used on*
CS ---------- Telephone Connector Switch SA-1962
DM---------- Pulse Decoder Monitor KY-791/GT

B-5. Abbreviations

Abbreviations *Explanation*
ADD ---------- Address
CD ---------- Card
COMP---------- Composition
DISP CLK---------- Display clock
DISP CONT ---------- Display control
DP CTR & AL ---------- Dial pulse counter and alarm
MF CH FIL---------- Multi-frequency channel filter
MF LIM ---------- Multi-frequency limiter
MIN ---------- Miniature
PB---------- Pushbutton
SPST---------- Single-pole single-throw
4P3T ---------- Four-pole triple-throw

(1) ILLUSTRATION (a) FIG NO.	(b) ITEM NO.	(2) SMR CODE	(3) FEDERAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						GROUP 01		
						MONITOR. PULSE DECODER KY-791/GT		
B-1	1	PAPZZ	5935-893-3935	*N1*12k	82389	JACK, ... DM	EA	4
B-1	2	PAFZZ	5905-964-2292	CU25321	4655	POTENTIOMETER..... DM	EA	2
B-1	3	PAFZZ	593849-5679	8050	04009	SWITCH, TOGGLE SINGLE POLE SINGE THROW..... DM	EA	3
B-1	4	PAPZZ		382	08807	LAMP. 14 V ..... DM	EA	1
B-1	5	XBFZZ		162-84*30*-09502	72619	LAMPHOLDER..... DM	EA	1
B-1	6	PAP%Z	6210-079-8943	162-0932	72619	LENS, GREEN ..... DM	EA	1
B-1	7	PAFZZ		326J	76055	SWITCH. ROTARY ..... DM	EA	1
B-1	8	PAFZZ		40246	18672	SPEAKER ..... DM	EA	1
B-1	9	PFAZZ	5805-19-3249	SSD1O00-0100	83594	DISPLAY. SELF SCAN..... DM	EA	1
B-1	10	PAFZZ		DF21RC	23541	JACK. BANANA RED ..... DM	EA	2
B-1	11	PAFZZ	5935-189-6911	531O	7178	CONNECTOR ,ELECTRICAL, 10 PIN..... DM	EA	1
B-1	12	PAFZZ		D825S	71785	CONNECTOR,ELECTRICAL, 25 PIN..... DM	EA	1
B-1	13	PAFZZ		17405B	16428	CABLE..... DM	EA	1
B-1	14	PAFZZ	520-225-9984	AGC2	71400	FUSE . 2A ..... DM	EA	1
B-1	15	PAFZZ	5920-213-1878	HTA-DD	71400	FUSEHOLDER..... DM	EA	1
B-1	16	XAFZZ		210081-1	18672	COVER, REAR', ... DM	EA	1I
B-1	17	PAFZZ	5905-164-3778	380396	18672	CIRCUIT CARD ASSEMBLY MF LIM..... DM	EA	1
B-1	18	PAFZZ	5935-917-3453	250-22 30-160	71785	CONNECTOR, ELECTRICAL. *22* PIN..... DM	EA	1
B-1	19	PAFZZ	5805-167-0999	380397	18672	CICUIT CARD ASSEMBLY. MF CH FIL ..... DM	EA	1
B-1	20	PAFZZ		251-22-3160	71785	CIRCUIT,CARD ASSEMBLY, 44 PIN ..... DM	EA	2
B-1	21	PAFZZ	5805-167-1009	380398	18672	CIRCUIT CARD ASSEMBLY,MF DECODE..... DM	EA	1
-B-1	22	PAFZZ	5805-167-1028	380402	18672	CIRCUIT CARD ASSEMBLYI. DP CRT & AL ..... DM	EA	1
B-1	23	PAFZZ	5805-167-1012	380403	18672	CIRCUIT CARD ASSEMBLY-LY, *DI*SPLAY CONT DM	EA	1
B-1	24	PAFZZ	580-167-1014	380404	18672	CIRCUIT CARD ~ASSEBMLY. DISPLAY C1 ..... DM	EA	1
B-1	25	PAFZZ	5805-159-0090	330037	18672	CIRCUIT CARD ASSEMBLY, POWER SUPPLY DM	EA	1
B-1	26	PAFZZ		36D46201 AA2A	56289	CAPACITOR..... DM	EA	2
B-1	27	PAFZZ	5910-863-093	36D602G01 0AA2A	56289	CAPACITOR..... DM	EA	1
B-1	28	PAFZZ		251-6-0-160	71785	CONNECTOR, ELECTRICAL, 1*2* PIN..... DM	EA	1
B-1	29	PAFZZ		G34FSCNJ-V	70192	CONNECTOR, ELECTRICAL. 34 PIN..... DM	EA	1
B-1	30	PAFZZ		GMM34SC NJ-VL	70192	CONNECTOR, ELECTRICAL. 34 PIN..... DM	EA	1
B-1	31	PAFZZ		SA4434	14099	DIODE,DUAL RECTIFIER..... DM	EA	1
B-1	32	PAFZZ	5940-865-1858	870	8330	BOARD, TERMINAL..... DM	EA	1
B-1	33	PAFZZ		EF662	72128	TRANSFORMER..... DM	EA	1
B-1	34	PAFZZ	5961-985-9074	2N3055	02735	TRANSISTOR ..... DM	EA	1
B-1	35	PAFZZ	5961-979-8140	2WI	71785	INSULATOR. TRANSISTOR ..... DM	EA	1
B-1	36	PAFZZ	5935-885-6598	2TS1	71785	SOCKET TRANSISTOR..... DM	EA	1
						GROUP 02		
						COUPLER, DECODER-MONITOR C-9433/G*T*		
B-2	1	PAFZZ	585-173-7005	399133	18672	CONTROL. DECODER-MONITOR C-9433/GT ... DM	EA	1

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) FEDERAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						GROUP 03 SWITCH. TELEPHONE CONNECTYOR SA-1962GT		
B-3	1	XBFZZ		216029	18672	*SCREW,* THUMB.....CS	EA	4
B-3	2	XBFZZ		308708	18672	COVER. FRONT.....CS	EA	1
B-3	3	PAFZZ	5805-164-7324	330036	18672	CIRCUIT CARD ASSEEMBLY, POWER SUPPLY.....CS	EA	1
B-3	4	PAFZZ		250-22-30-170	71785	CONNECTOR, ELCTRICAL, *22* PIN .....CS	EA	3
B-3	5	PAFFH		220046	18672	CONTROL,INTERFACE ASSEMBLY.....CS	EA	1
B-3	6	PAFZZ	5805-167-1001	380417	18672	CIRCUIT CARD ASSEMBLY,DP SENSOR .....CS	EA	1
B-3	7	PAFZZ	5805-167-1036	380419	18672	CIRCUIT CARD ASSEMBLY CONTROL.....CS	EA	1
B-3	8	PAFZZ	253-22-00-	71785 250		CONNECTOR, ELECTRIAL, 44 PIN .....CS	EA	18
B-3	9	PAFZZ	5805-167-1000	380420	18672	CIRCUIT CARD ASSEMBLY, TENS ADD .....CS	EA	1
B-3	10	PAFZZ	5805-164-3751	380421	18672	CIRCUIT CARD ASSEMBLY UNITS ADD		
B-3	11	PAFZZ	5805-198-2854	380422	18672	CIRCUIT CARD ASS EMBLY,.....CS INPUT SCAN	EA	5
B-3	12	PAPZZ	5805-164-3725	380423	18672	CIRCUIT CARD ASSEBLLY. INPUT CS	EA	10
B-3	13	PAFZZ	213-50-0-135	71785		CONECTOR,ELECTRICAL, 50 PIN .....CS	EA	7
B-3	14	PAFZZ		S3*10AB*	71785	CONETOR,ELECTRICAL.....CS	EA	2
B-3	15	PAFZZ		EB-1015	01121	RESISTOR. FIXED. COMPOSITION.....CS	EA	1
B-3	16	PAFZZ		5870	83330	TERMINAL, INSLATED .....CS	EA	4
8-3	17	PAFZZ	5940-224-5629	2-140Y	71785	BOARD. TERMINALL.....CS	EA	1
B-3	18	PAFZZ	5920-213-1878	HTA-DD	71400	FUSEOLDD.....CS	EA	1
B-3	19	PAFZZ	5920-225-9984	AC2	71400	FUSE. 2A .....CS	EA	1
B-3	20	PAFZZ	5910-435-6776	5HLS20	56289	CAPACITOR, FIXED .....CS	EA	1
B-3	21	PAFZZ		210B-1C 224M	14752	CAPACITOR. FIXED .....CS	EA	1
B-3	22	PAFZZ	5805-167-1002	380418	18672	CIRCUIT CARD ASSEBLY, IDENTITY.....CS	EA	1
8-3	23	PAFZZ		385035	18672	CIRCUIT CARD ASSBELY. LA RD .....CS	EA	1
B-3	24	PAFZZ		3234J	76055	SWITCH. ROTARY 4P3T .....CS	EA	1
B-3	25	PAFZZ		PK70B	18672	KNOB .....CS	EA	1
B-3	26	PAFZZ	6210-71-2176	95-0428 -09-301	72619	BASE. LAMP .....CS	EA	2
B-3	27	PAFZZ	6240-715-0037	48-C2	82219	LAMP. 48 V .....CS	EA	2
B-3	28	PAFZZ		135-1473	72619	LENS, LAMP, AMBER.....CS	EA	1
B-3	29	PAFZZ		23-1	81073	SWITCH, PB, MIN .....CS	EA	1
B-3	30	PAFZZ		7101	09353	SWITCH. TOGGLE, MIN, SNGLE POST SINGLE THROW.....CS	EA	2
B-3	31	PAFZZ		F4/P	18672	RESISTOR, MESH.....CS	EA	1
B-3	32	PAFZZ		20776-103	18672	JACK. BANANA. *BL*ACK.....CS	EA	2
B-3	33	PAFZZ	5935-893-3935	N112A	82389	JACK. TELEPHONE.....CS	EA	1
B-3	34	PAFZZ		135-1472	72619	LENS, LAMP, GREEN.....CS	EA	1

SECTION IV FEDERAL STOCK NUMBER AND PART NUMBER INDEX

STOCK NUMBER	FIG. NO.	ITEM NO.
5805-159-0090	B-1	25
5805-164-3725	B-3	12
5805-164-3751	B-3	10
5805-164-7324	B-3	3
5805-167-0999	B-1	19
5805-167-1000	B-3	9
5805-167-1001	B-3	6
5805-167-1002	B-3	22
5805-167-1009	B-1	21
5805-167-1012	B-1	23
5805-167-1014	B-1	24
5805-167-1028	B-1	22
5805-167-1036	B-3	7
5805-173-7005	B-2	1
5805-195-3249	B-1	9
5805-198-2854	B- 3	11
5905-164-3778	B-1	17
5905-964-2292	B-1	2
5910-435-6776	B-3	20
5910-863-4093	B-1	27
5920-213-1878	B-1	15
5920-213-1878	B-3	18
5920-225-9984	B-1	14
5920-225-9984	B-3	19
5930-849-5679	B-1	3
5935-189-6911	B-1	11
5935-885-8598	B-1	36
5935-893-3935	B-1	1
5935-893-3935	B-3	33
5935-917-3453	B-1	18
5940-224-5629	B-3	17
5940-865-1858	B-1	32
5961-979-8140	B-1	35
5961-985-9074	B-1	34
6210-079-8943	B-1	6
6210-771-2176	B-3	26
6240-715-0037	B-3	27

SECTION IV FEDERAL STOCK NUMBER AND PART NUMBER INDEX

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
AGC2	71400	B-1	14
AGC2	71400	B-3	19
CMM34-SCNJ-VL	70192	B-1	30
CMU2521	44655	B-1	2
CM34F-SCHJ-V	70192	B-1	29
DB25S	71785	B-1	12
DF21RC	23511	B-1	In
B-1015	01121	B-3	15
EF662	72128	B-1	33
FP4/P	18672	B-3	31
GMM34M-SCNS-VL	70192	B-1	30
GM34F-SCNJ-V	70192	B-1	29
HTA-DD	71400	B-1	15
ITA-IDD	71400	B-3	18
N112A	82389	B-1	1
N112A	82389	B-3	33
PK70B	18672	B-3	25
SA4434	14099	B-1	31
SSD1000-0010	83594	B-1	9
8310AB	71785	B-3	11
S31AiB	71785	B-3	14
135-1472	72619	B-3	34
135-1473	72617	B-3	28
162-0932	72619	B-1	6
162-8340-09-502	72619	B-1	5
17405B	16428	B-1	13
2-140Y	71785	B-3	17
2N3055	02735	B-1	34
2TS1	71785	B-1	36
380420	18672	B-3	9
2W1	71785	B-1	35
20776-103	12672	B-3	32
210B-1C224M	14752	B-3	21
210081-1	18672	B-1	16
213-50-00-135	71785	B-3	13
26029	18672	B-3	1
220046	18672	B-3	5
23-1	81073	B-3	29
250-22-30-170	71785	B-1	18
250-22-30-170	71785	B-3	4
251-22-30-160	71785	B-1	20
251-6-30-160	71785	B-1	28
253-22-00-250	71785	B-3	8
308708	18672	B-3	2
3234J	76055	B-3	24
3236J	76055	B-1	7
330036	18672	B-3	3
330037	18672	B-1	25
36D462G015AA2A	56289	B-1	26
36D602GO10AA2A	56289	B-1	27
380396	18672	B-1	17
380397	18672	B-1	19
380398	18672	B-1	21
380402	18672	B-1	22
380403	18672	B-1	23
380404	18672	B-1	24
380417	18672	B-3	6
380418	18672	B-3	22
380419	18672	B-3	7
380420	18672	B-3	9

SECTION VI. FEDERAL STOCK NUMBER AND PART NUMBER INDEX (CONTINUED)

PART NUMBER	FSCM	FIG. NO.	ITEM NO.	PART NUMBER	FSCM	FIG. NO.	ITEM NO.
380421	18672	B-3	10				
380422	18672	B-3	11				
380423	18672	B-3	12				
382	08807	B-1	4				
385035	18672	B-3	23				
399133	18672	B-2	1				
40-246	18672	B-1	8				
48-C2	82219	B-3	27				
5HKS20	56289	B-3	20				
5870	83330	B-3	16				
7101	09353	B-3	30				
83050	04009	B-1	3				
870	83330	B-1	32				
95-0428-09-301	72619	B-3	26				

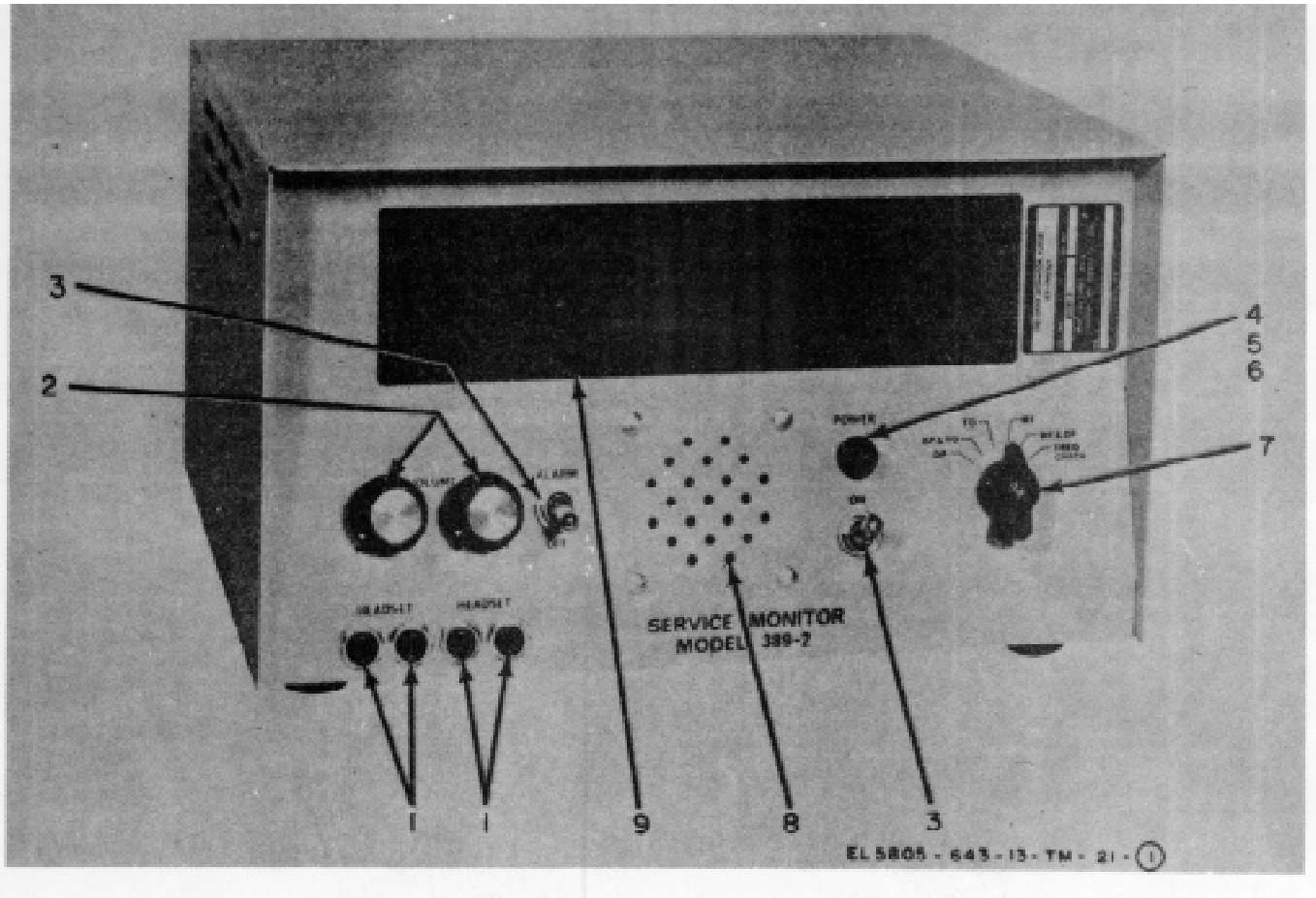


Figure B-1①. Pulse decoder monitor.

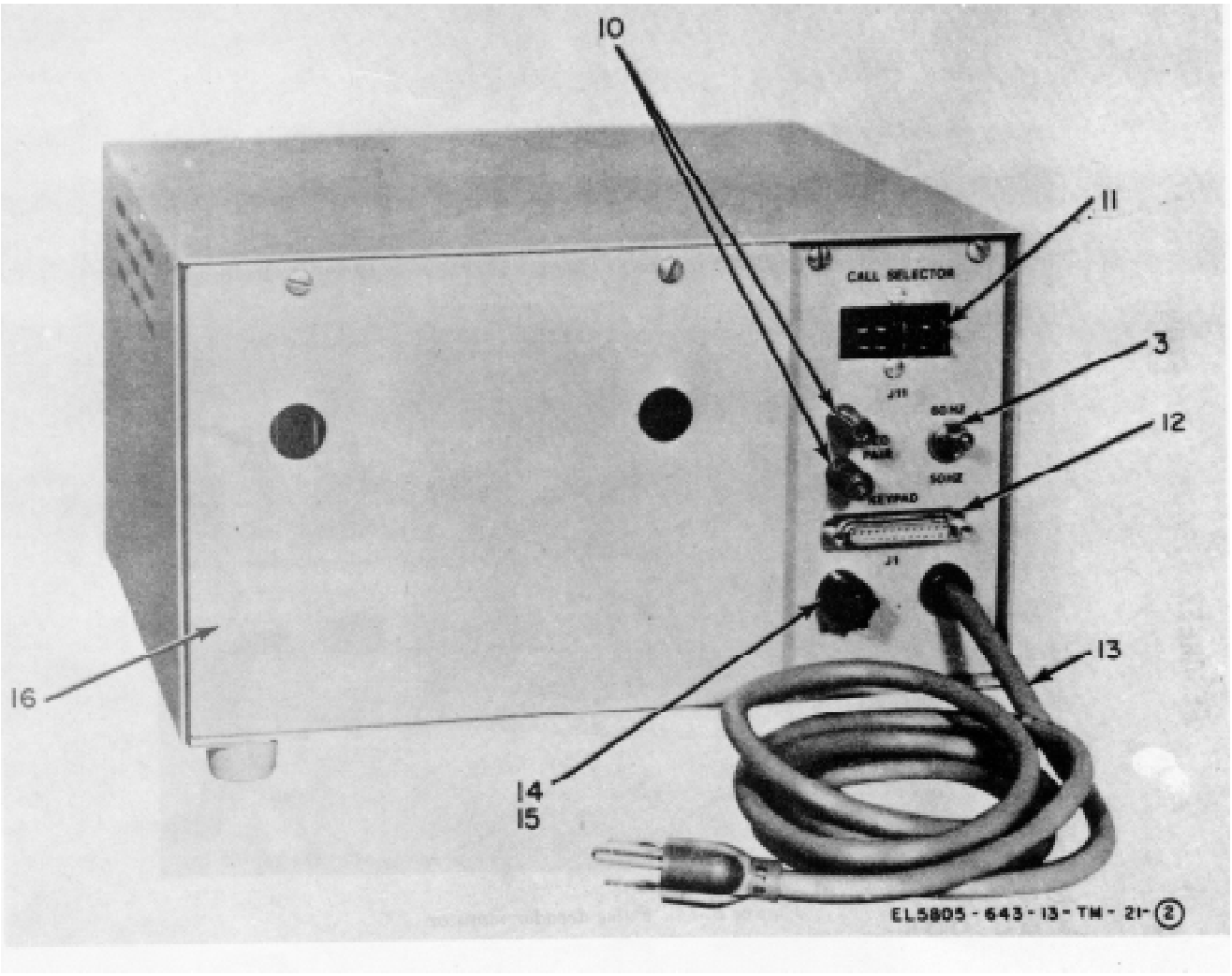


Figure B-1② Pulse decoder monitor.

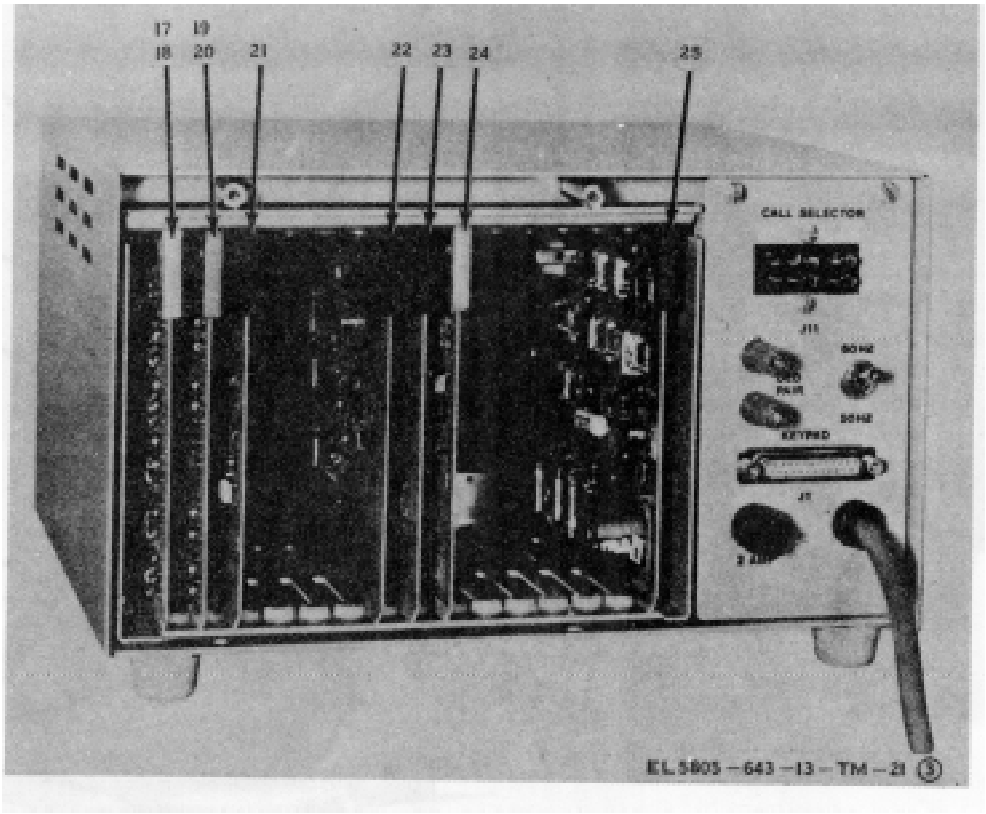


Figure B-1③. Pulse decoder monitor.

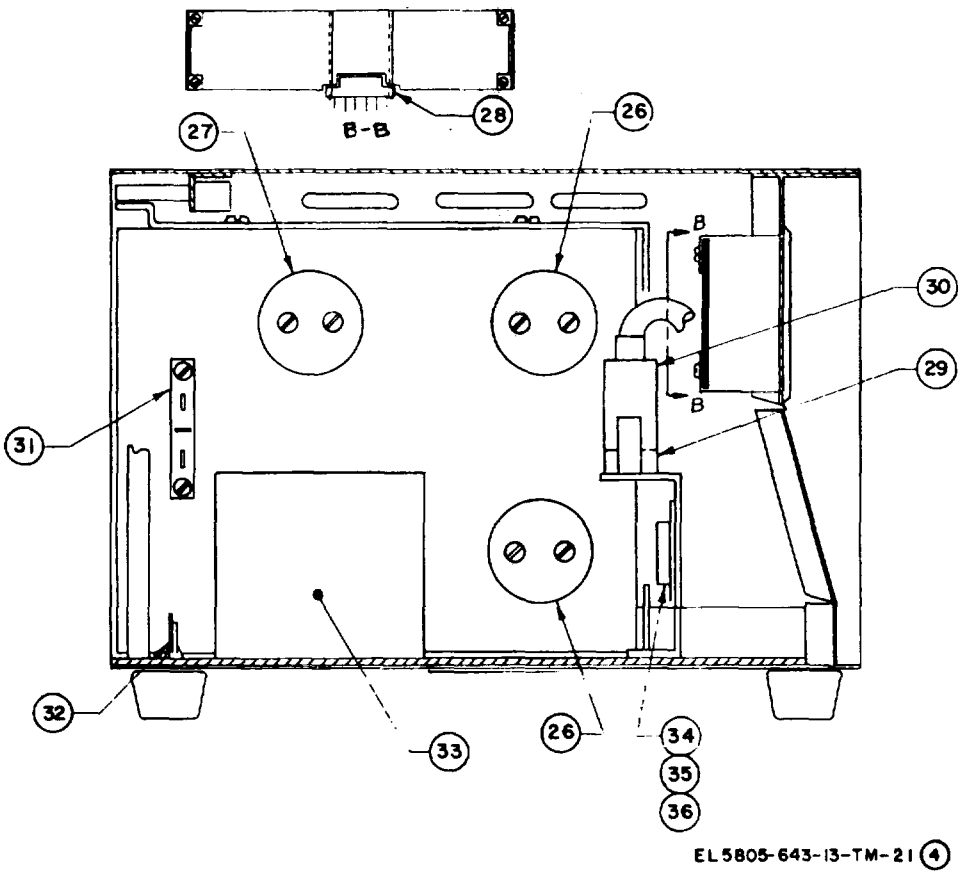


Figure B-1 ④. Pulse decoder monitor.

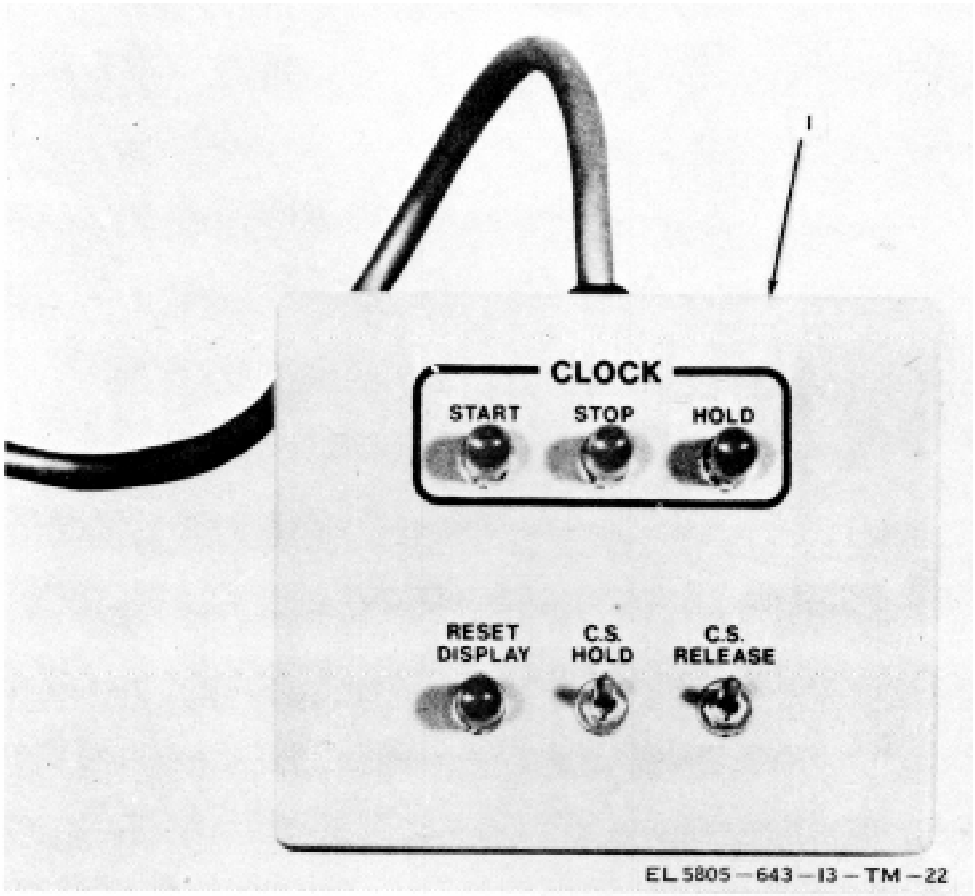


Figure B-2. Decoder-monitor control.

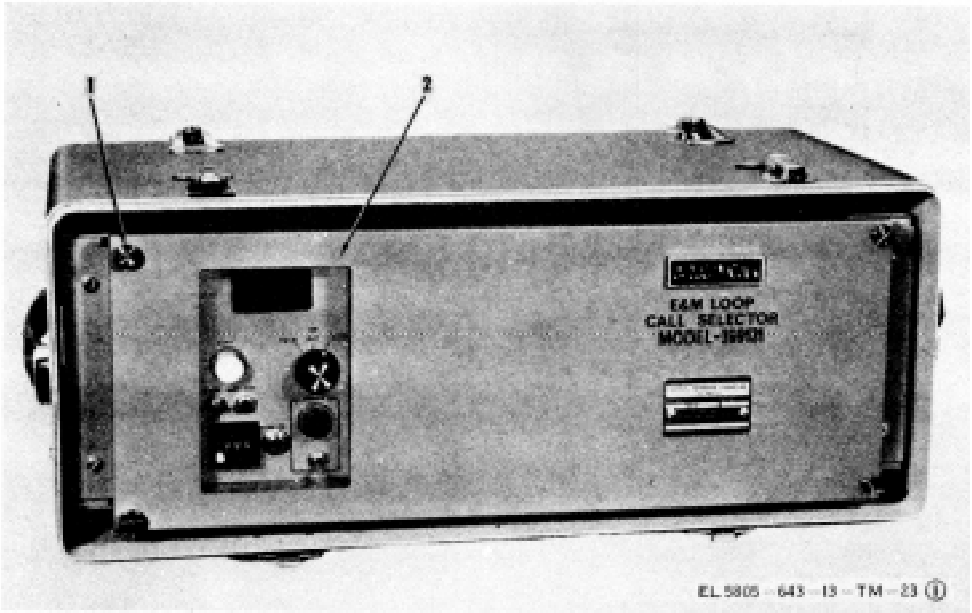


Figure B-3①. Telephone connector switch.

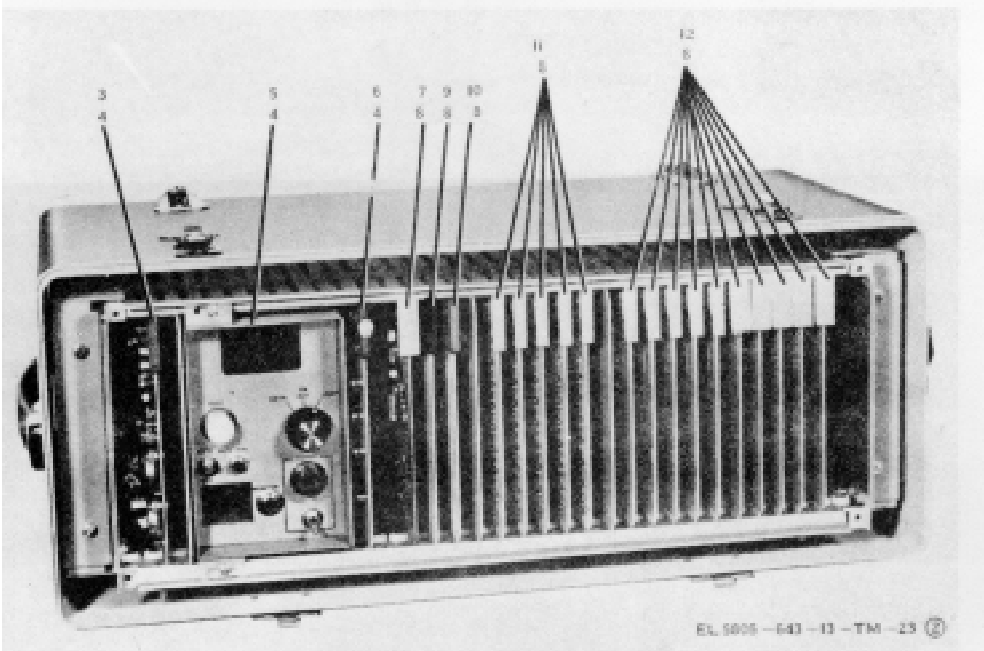


Figure B-3②. Telephone connector switch

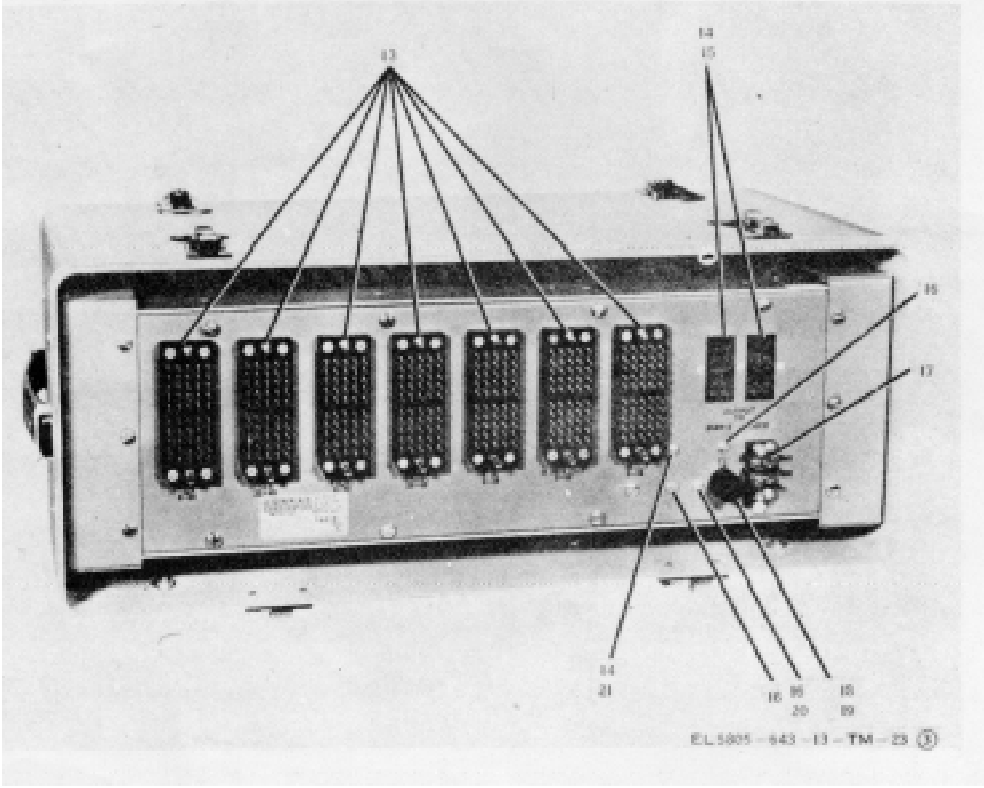


Figure B-3③. Telephone connector switch.

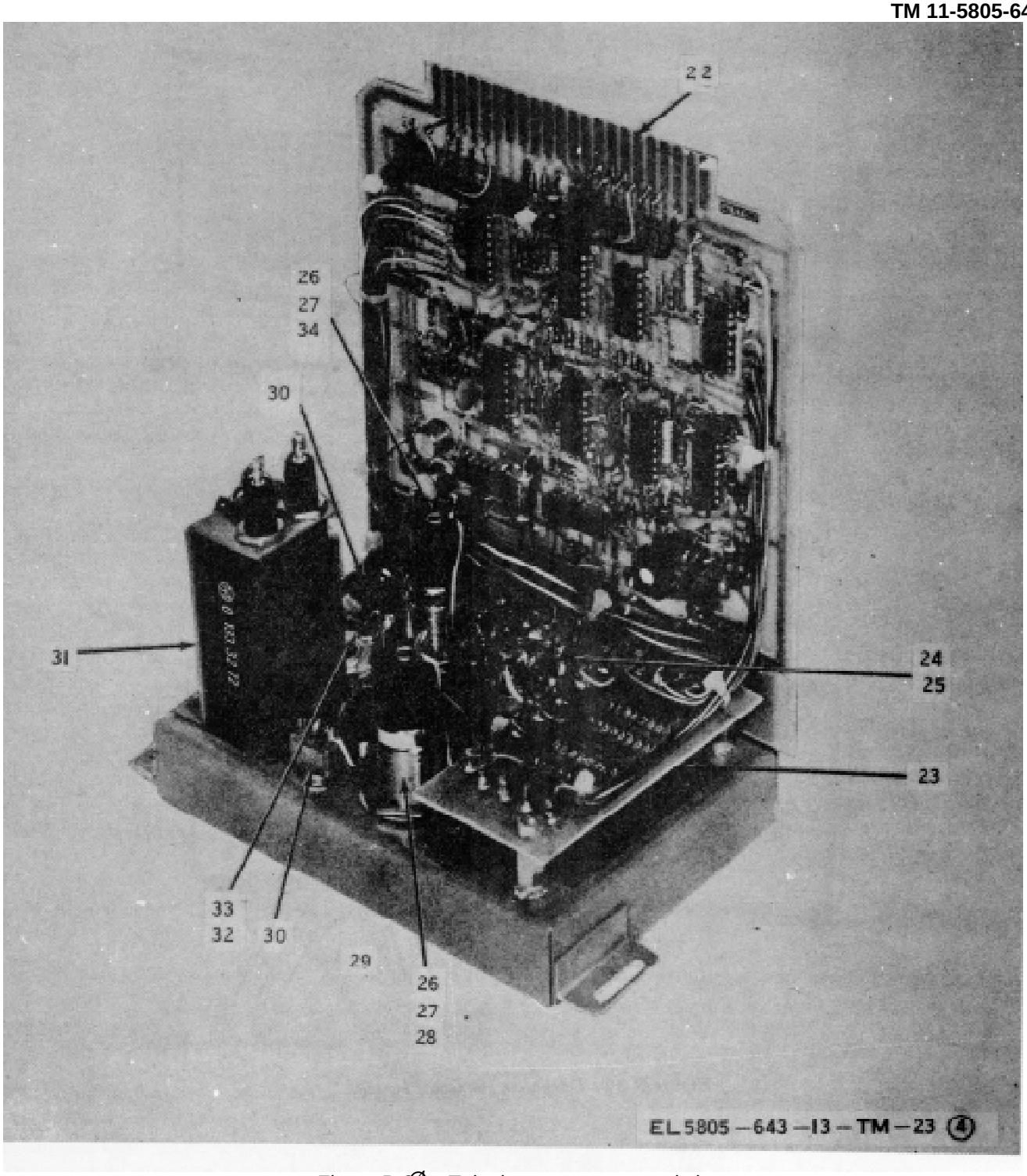


Figure B-3. Telephone connector switch.

APPENDIX C

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C-1. General

The maintenance allocation chart (MAC) gives the group number, functional group, and maintenance functions for the OX32/GT.

C2. Maintenance Functions

Maintenance functions shall be limited to and defined as follows:

a. Adjust. Maintain within prescribed limits by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

b. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

c. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

d. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

e. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in manner to allow the proper functioning of the equipment/system.

f. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (e.g., DMWR) in pertinent technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

g. Rebuild. Consists of those services/actions necessary for the restoration of serviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment/components.

h. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance activities (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module/component/assembly, end item or system.

i. Replace. The act of substituting a serviceable like-type part, subassembly, module (component or assembly) in a manner to allow the proper functioning of an equipment/system.

j. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean, preserve, drain, paint, or to replenish fuel/lubricants/hydraulic fluids or compressed air supplies.

k. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

1. Symbols. The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

C-3. Explanation of Format

a. Group Number-Column 1. Column 1 lists group numbers, the purpose of which is to match components, assemblies, subassemblies and modules with the next higher assembly.

b. Functional group-Column 2. Column 2 lists the next higher assembly group and the item names of components, assemblies, subassemblies and modules within the group for which maintenance is authorized.

c. Maintenance function-Column 3. Column 3 lists the twelve maintenance functions defined in C-2 above. Each maintenance function required for an item shall be specified by the symbol among those listed in d below which indicated the level responsible for the required maintenance. Under this symbol there shall be listed an appropriate work measurement time value determined as indicated in e below.

d. Use of symbols. The following symbols shall be used to prescribe work function responsibility:

Code *Explanation*

C .....Operator/Crew
0.....Organization
F .....Direct Support
H.....General Support
D.....Depot

e. Work Measurement Time. The active repair time required to perform the maintenance function shall be included directly below the symbol identifying the category of maintenance. The manpower figures shall be developed under conditions (real or simulated) corresponding to those that are considered normal for TOE units operating in the field. The skill levels used to obtain the measurement times shall approximate those found in typical TOE units. Active repair time is the average aggregate time required to restore an item (subassembly, assembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, fault isolation/diagnostic time, and QA/QC I time in addition to the time required to perform specific maintenance functions identified for the tasks authorized in the maintenance allocation chart. This time may be the established time standard developed through maintenance engineering analysis, or can be derived from the calculation of a statistically weighted time estimate, incorporating the optimistic (a), most likely (m), and pessimistic (b) estimate for the work to be accomplished, using the formula

$$t = \frac{a + 4m + b.}{G}$$

This time will be expressed in man-hours and carried to one decimal place (tenths of hours).

f. Tools and equipment Column 4. This column shall be used to specify, by code, those tools and test equipment required to perform the designated function.

g. Remarks-Column 5. Self-explanatory.

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) FUNCTIONAL GROUP COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
01	MONITOR, PULSE DECODER KY-791/GT	C 0.5												Refer to preventive maintenance checks and services.
			F 0.5										1, 2	
				C 0.5										Refer to preventive maintenance checks and services.
									F 0.5				1, 2	
											D 40.0			Restore to serviceable condition.
02	CONTROL. DECODER-MONITOR C-9433/GT (keypad)	C 0.5												Refer to preventive maintenance checks and services.
				F 0.5									1, 2	
					C 0.5									Refer to preventive maintenance checks and services.
									F 0.5				1, 2	
											D 40.0			Restore to service-able condition.
03	a SWITCH, TELEPHONE CONNECTOR SA-1962/GT (call selector)	C 0.5												Refer to preventive maintenance checks and services
			F 0.5										1, 2	
				C *0*.5										Refer to preventive maintenance checks and services.
					F 0.5								1, 2	
									F 0.5				1, 2	
											D 40.0			Restore to service-able condition.

TABLE I. TOOL TEST EQUIPMENT REQUIREMENTS

TOOLS AND EQUIPMENT	MAINTENANCE CATEGORY	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUMBER
1	F, D	MULTIMETER TS 352B/U	6625-242-5023	
2	F, D	TOOL KIT, ELECTRIC EQUIPMENT TK-105/G	5810-610-8177	

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CNGB (1)
ACSC-E (2)
Dir of Trans (1)
COE (1)
TSG (1)
USAARENBD (1)
AMC (1)
MICOM (2)
TECOM (2)
HISA (Ft Monmouth) (18)
USACC (4)
TRADOC (2)
ARADCOM (2)
ARADCOM Rgn (2)
OS Maj Comd (4)
LOGCOMD (3)
MDW (1)
Armies (2)
Corps (2)
Svc Colleges (1)
USASESS (5)
USAINTCS (3)
USAADS (2)
USAFAS (2)
SAARMS (2)
USAIS (2)
USAES (2)
AD (1) except
SAAD (30)
LBAD (14)
TOAD (14)
ATAD (10)
USA Dep (2)
Sig Sec USA Dep (2)
Sig Dep (2)
ATS (1)
MAAG (1)
WRAMC (1)
USARMIS (1)
USAERDAA (1)
USAERDAW (1)
Sig FLDMS (1)
Ft Richardson (ECOM Ofc) (2)
Units org under TOE 11-500 (AA-AC) (1)

ARNG & USAR: None.
For explanation of abbreviations used, see AR 310-50.

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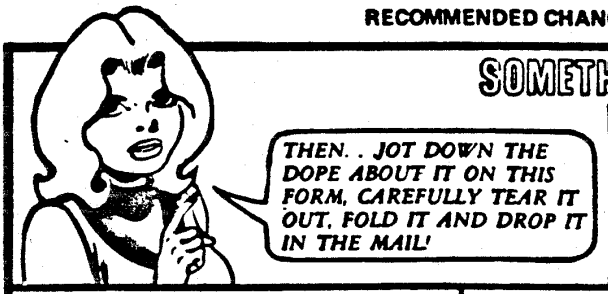

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