

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, AND DIRECT SUPPORT
MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST
FOR
RECORDER GROUP, SIGNAL DATA OA-8744/GT

[FSN 5805-151-2882]

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.

**Operator's, Organizational, and Direct Support Maintenance Manual
 Including Repair Parts and Special Tools List
 For
 RECORDER GROUP, SIGNAL DATA OA-8744/GT
 [FSN 5805-151-2882]**

Current as of 24 July 1974

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CHAPTER 1 INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual contains on-site maintenance (operator, organizational, and direct support) for Recorder Group, Signal Data OA-8744/GT (fig. 1-1). It provides a description of the equipment, service, installation information, and operation and maintenance instructions

b. A repair parts and special tools list appears in appendix B, and a maintenance allocation chart appears in appendix C.

1-2. Indexes of Publications

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

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

1-3. Forms and Records

a. *Reports of Maintenance and Unsatisfactory Equipment.* Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 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 [DISREP] [SF 3611].* Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST, 4610. 33/AFM 75-18/MCO P4610. 19A, and DSAR 4500. 15.

1-4. Reporting of Equipment Publication Improvements

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be Submitted on DA Form 2028 (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 I 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

a. Signal Data Recorder Group OA-8744/GT is a dedicated unit designed for use with Telephone Connector Switch SA-1962/GT. The Recorder group provides a printed readout of the following numerical data related to each call selected:

(1) Dialed number (dial pulse or multifrequency) of up to 14 digits

(2) Time of day (AM/PM, 0-11 hours, 0-59 minutes) at which the information was recorded.

(3) Day number from 0 to 119.

(4) Trunk identity number (dialed number reduced to 12 digits).

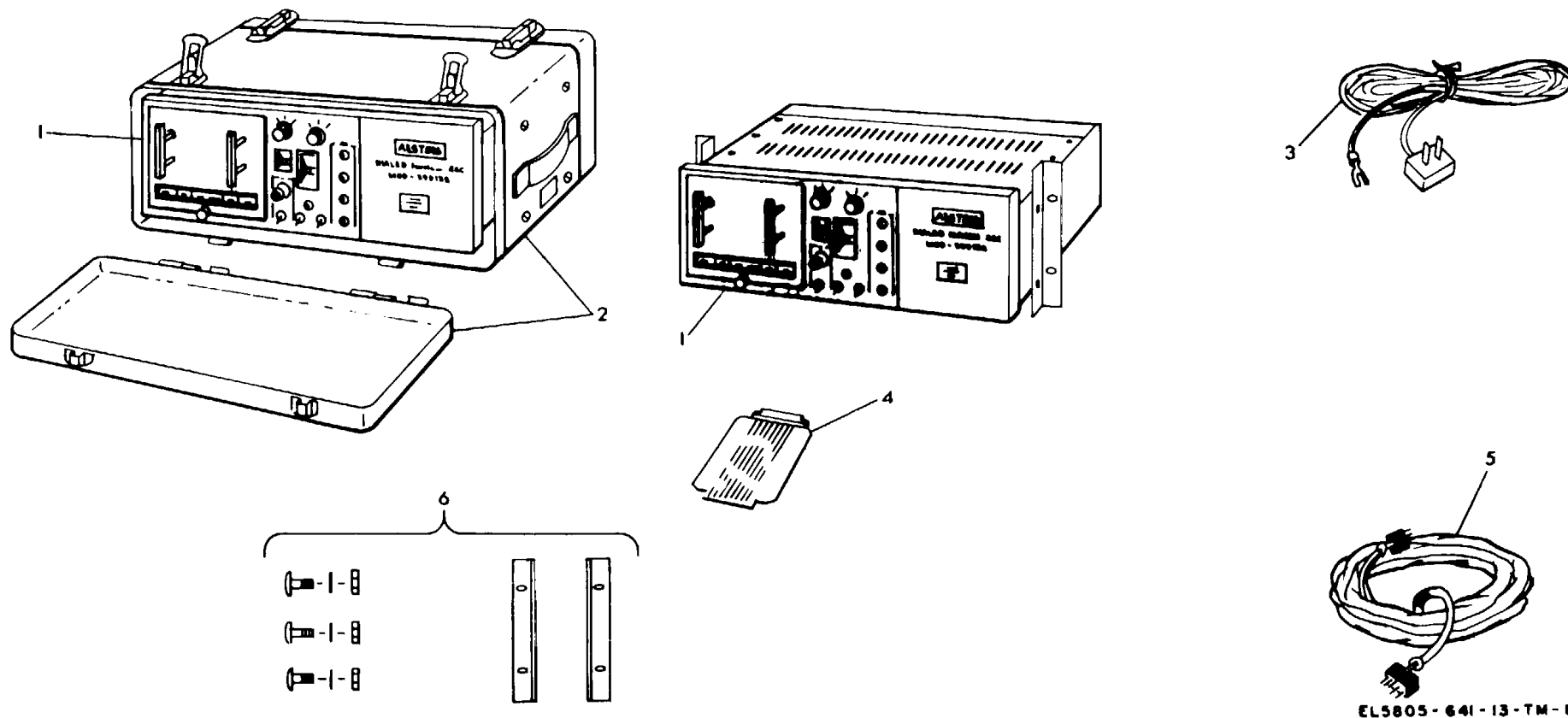
(5) Call holding time (optional) from 1 to 99

minutes (dialed number reduced to 12 digits).

b. Signal Data Recorder RO-452/GT (fig. B-1). may control the time-out operation of Telephone Connector Switch SA-1962/GT, if required.

c. The signal data recorder may be set to effect telephone connector switch time out from 7 to 99 seconds after the last digit received. At this time, the dialed digits stored in a double buffer will be printed out on a 20-position printer built into the unit.

d. If more than 14 digits are dialed, those in excess of 14 which were dialed first will be absorbed. Operation of a PRE-DIGIT ABSORB switch will enable the unit to absorb one or two additional pre-digits. The last digit dialed will



1. Signal Data Recorder RO-452/GT
2. Electrical Equipment Case CY-7372/GT
3. Power cable 365106
4. Extender card 381001
5. Interconnect cable 365202
6. Hardward mounting kit (rack mount) 370019

Figure 1-1. Signal Recorder Group)A-8744/GT

always appear in column 14. The area code will appear in columns 5, 6, and 7 to facilitate separation of local and toll calls. Toll access digits will appear in columns 1 through 4. Operation of the ID switch on the front panel will cause the unit to identify the incoming trunk or line with a two-digit number (00-49) printed in columns 1 and 2. Twelve digits dialed will appear in their normal columns.

e. The signal data recorder will not print numbers having less than a preset number of digits. This number is resettable from 1 to 14. When operated in its elapsed time + 12 digit format, the call will be recorded as the call is completed. Digits one and two will indicate holding time, since the start of the call. The time recorded will be that at printout at the completion of the call. The time may be selected in place of the input ID on the printout.

f. A built-in electronic clock, sync-locked to the 60-hertz (Hz) powerline frequency, provides 60-second pulses to the time-of-day and day-count numbers in the last six columns of the printer. The printer may be set to the correct time and date from the front panel.

g. A sample printout is as follows:

Total Access

ID/Call	Area Code	Dialed Number	Time of Day	Day Count
5 3 2 8 0 9 8 2 3 4 6 3 2 3 6			0 7 M	1 7
			P	
2 3 4 9 0 8 9 7 4 6 5 2 1 3 6			0 7 M	1 7
			A	
3 2 3 4 8 0 9 8 9 7 4 6 5 4 4			0 7 M	1 7
			A	
6 5 9 8 6 4 5 6 5 4 5 6 5 4 12 0 0			M	0 0

h. The recorder responds to DC inputs from 48 volts (46 to 52 volts) dial telephone offices such as Strowger step-by-step, Stromberg-Carlson X-Y and Federal Telephone and Radio step-by-step. Dual-tone multifrequency (DTMF) are provided for converting dual-tone multifrequencies to DC pulses into the recorder. DC power is provided by the 48-volt central office battery.

1-8. Description

a. *Signal Data Recorder.* Signal Data Recorder RO-452/GT (fig. B-1) is used as a printout unit, providing a permanent record of numbers dialed, and date and time calls were placed on subscriber lines and/or trunks under service observation. Designed for either rack mounting in fixed installations, or installed in an electrical equipment case for portable applications, the unit includes a printer, operating control panel, and a card file cover in the front, and a 10-pin male connector,

four-terminal terminal board and fuse/fuseholder on the rear. The internal card file, accessible from the front of the chassis, contains the following printed circuit cards:

Position	Description	Part No	Ref desig	Color code
2 ...	Power Supply.....	331007	A2	Red
3 ...	(Shield).....	208620.....	(none)	
4 ...	Time Pulse Generator...	381043.....	A4	Pink
5 ...	Print Control	381044.....	A5	Blue
6 ...	Register Driver	381045.....	A6	Yellow
7 ...	Input Buffer	381046.....	A7	Lime
8 ...	MF Decode	381047	A8	Black
9 ...	MF Channel Filter	381048.....	A3	Gray
10.	MF Limiter	381049.....	A10	White

b. *Interconnect Cable.* Signal Data Recorder RO-452/GT is connected to Telephone Connector Switch SA-1962/GT by means of the interconnect cable. This 10-conductor cable is connected to the TO CALL SELECTOR 10-pin male connector at the rear of the unit. The opposite end of the cable is connected to the OUTPUT TO DNR connector on the telephone connector switch.

c. *Power Cable.* The power cable, which consists of a 10-foot length of 18-gauge stranded yellow wire, a spade lug, and a sync generator module consisting of parallel-connected 47K resistors and 1-ampere fuses, is connected to the CLOCK SYNC terminal on the terminal board installed at the rear of the unit. This cable (also called the clock sync isolation cable) is then plugged into a 120-vac, 60-Hz source. The power cable is required for sync-lock accuracy of the time-of-day printout.

d. *Electrical Equipment Case.* Electrical Equipment Case CY-7372/GT is used for port- able applications with the recorder. Mounting able applications with the recorder. Mounting brackets within the case provide installation security for the recorder.

e. *Extender Card.* The extender card is a dummy circuit card which permits bringing out (or extending) the connections of the recorder circuit cards. The card connector fits into the circuit card edge connector The card is used for testing and troubleshooting the recorder by making more accessible the circuit card connector terminals.

f. *Hardware Mounting Kit.* The hardware mounting kit, composed of screws, washers, nuts, and brackets for mounting the portable recorder in a rack, is contained in a heat-sealed plastic bag. The kit is required for installing the recorder in the equipment rack (or electrical equipment case, for portable recorders). The hardware complement is given in paragraph 2-2.

1-9. System Application

a. The signal data recorder is designed to print out (after the timeout delay) the dialed number, time, and trunk identity for each call selected by an interconnected telephone connector switch (call selector). The call selector is normally installed near the recorder. Pulse Decoder Monitor KY-791/GT may also be fed by the call selector and may be installed locally or at a remote monitoring location. A typical system application is shown in figure 1-2.

b. The signal data recorder, call selector, and pulse decoder monitor may also be installed in a single

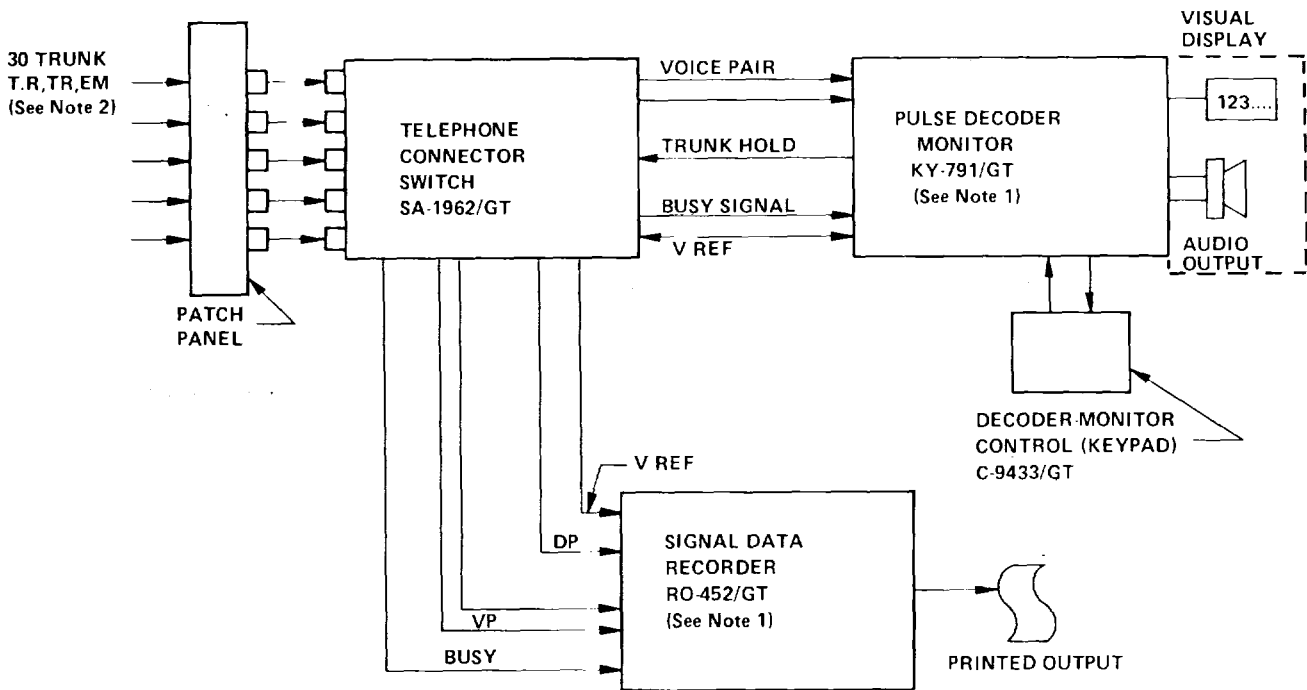
equipment rack to provide a complete service observation and recording system (fig. 1-3).

1-10. Tabulated Data

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

1-11. Items Comprising an Operable Equipment

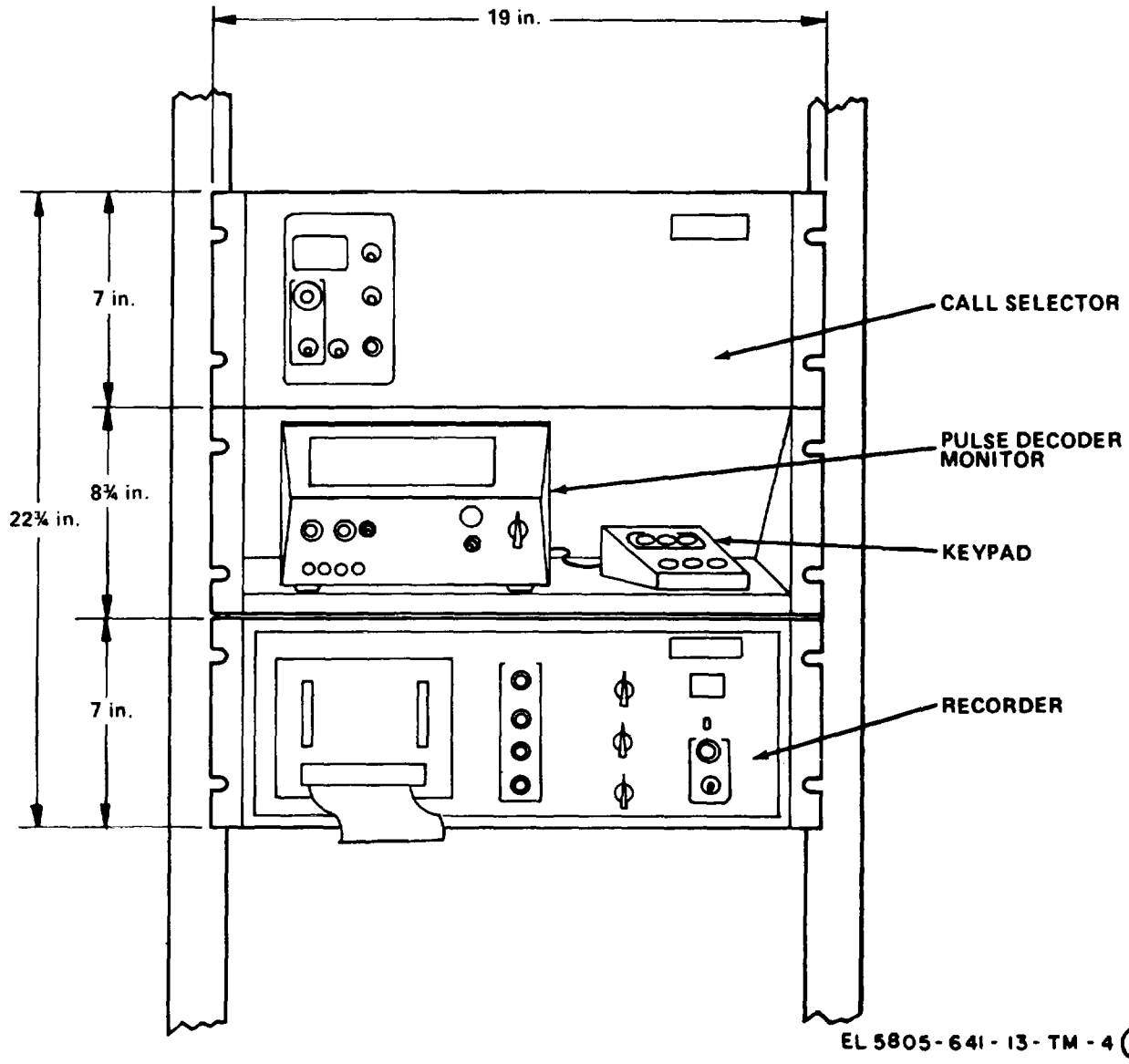
Components comprising a complete recorder group are listed in table 1-2.



- NOTE:
 1. MAY BE REMOTE OR LOCAL
 2. CAN BE EXPANDED TO 50 TRUNK; MAX.

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Figure 1-2. Service observation and recording system, block diagram.



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Figure 1-3 ①. Service observation and recording system, physical configuration (sheet 1 of 2).

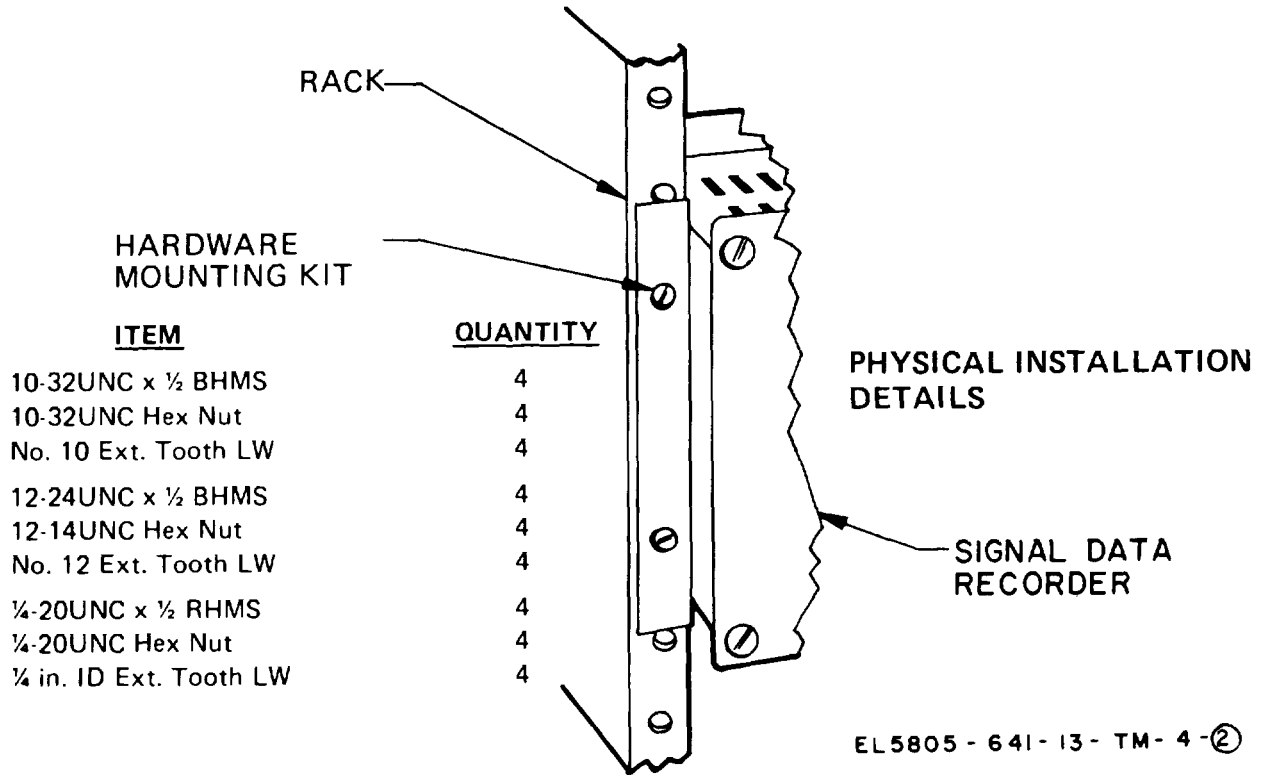


Figure 1-3 ②. Service observation and recording system, physical configuration (sheet 2 of 2).

Table 1-1. Tabulated Data

Signal Inputs (from call selector):	
Audio Pair	-6 dbm nom.
Busy Lead	-48 vdc (through 4. 7K) busy; open collector, idle.
.....	-48 vdc (through 4. 7K) with subscriber dial springs opened;
.....	open collector when dial springs closed.
Power Requirements	-48 vdc at 1 1/3 ampere max. ;
	117 vac, 60 Hz at 1 ampere max.
Physical Characteristics:	
Construction	Modular, solid-state circuitry mounted on plug-in circuit cards.
Connections:	
Signal	10 conductor cable/connector (para 1-8b).
Power	Terminal board (para 1-8c).
Dimensions:	
Rack Mounted	19 in. W, 7 in. H, 10 1/2 in. D.
Portable	20 1/2 in. W, 8 1/2 in. H, 12 in. D.
Weight:	
Rack Mounted	25 lb (approx).
Portable	35 lb (approx).

Table 1-2. Recorder Group

FSN	Item	Quantity	Dimensions (in)			Weight (lb)
			Height	Depth	Width	
5805-151-2882	Signal Data Recorder Group OA-8744/GT.					
5805-151-3915	Recorder, Signal Data RO-452/GT....	1	7	10 1/2	19	25
5995-163-8967	Cable, Interconnect.....	1	----	----	----	5
5995-163-9000	Cable, Power	1				2
5805-287-3858	Case, Electrical Equipment CY-7372/GT	1				8
	Card, Extender.....	1	7 1/4	5/16	5 3/8	1/4
	Kit, Hardware Mounting	1	----	----	--	1

**CHAPTER 2
SERVICE UPON RECEIPT AND INSTALLATION**

Section I. SYSTEMS PLANNING

2-1. Recorder Configurations

a. The recorder, which is supplied in the Electrical equipment case (para 1-8 d), is installed in a telephone central office environment. The unit is used, in a system application, with the following items:

(1) Telephone Traffic Scanner Group OA-8746(V)1/GT (rack mounted)
and/or

(2) Telephone Traffic Scanner Group OA-8746(V)2/GT (portable) (TM 11-5805-640-13).

(3) Decoder Group OX-32/GT - TM 11-5805-643-13 consisting of:

(a) Pulse Decoder Monitor KY-791/GT.

(b) Decoder-Monitor Control C-9433/GT.

(c) Telephone Connector Switch SA-1962/GT.

(4) Digital Counter Group OA-8745(V)1/GT (rack mounted)

and/or

(5) Digital Counter Group OA-8745(V)2/GT (portable) (TM 11-5805-642-13).

b. System planning should take into account the associated equipment listed above, the installation and suitability of racks (for rack-mounted versions of the recorder), the possibility that patch panels may be used as distribution points, and interconnecting cabling and/or wiring. Power requirements necessary for recorder operation are given in table 1-1. A typical recorder equipment configuration is shown in figure 1-3.

2-2. Site and Shelter Requirements

a. The recorder is normally housed in a permanent shelter during use; i. e. , a central telephone office. Power requirements necessary to scanner operation are given in table 1-1. For portable applications, the electrical equipment case affords adequate environmental protection under normal operating conditions.

b. For rack installations, a variety of 19-inch relay racks can be used. Three types of racks are furnished: 7 feet 6 inches high, 9 feet high, and 11 feet 8 inches high. Mounting hardware required for rack mounting is as follows:

<i>Hardware</i>	<i>Size</i>
Screw, Mach, Bind-hd	10-32UNC x 1/2 in. lg
Nut, Hex	10-32UNC
Washer, Lock,	
Ext. Tooth	No. 10
Screw, Mach. Bind-hd.....	No. 12 (0.216)-24UNC x 1/2 in. lg
Nut, Hex	No. 12 (0.216)-24UNC
Washer, Lock,	
Ext. Tooth.....	No. 12 (0.216)
Screw, Mach, Rd-hd.....	1/4-20UNC x 1/2 in. lg
Nut, Hex	1/4-20UNC
Washer, lock,	
Ext. Tooth.....	1/4-in ID

c. The hardware listed above is furnished in a kit. The various combinations of screws, nuts, and washers should be sufficient for any rack mounting installation.

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 1-3b)

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 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 Signal Data Recorder RO-452/GT in either the rack or Electrical Equipment Case CY-7372/GT.

b. A hardware mounting kit, contained within a heat-sealed plastic bag, contains screws, nuts, and washers necessary for installation of the recorder in either the rack or electrical equipment (portable) case. Refer to paragraph 2-2 for the contents of the hardware mounting kit.

2-6. Assembly of Equipment

Assembly of the equipment; i. e. , connection of cables, is illustrated in figure 2-1.

2-7. Installation Instructions

Physical installation of the equipment is accomplished by standard rack mounting procedures for 19-inch relay-type racks (rack-mounted configurations), or by use of the hardware mounting kit components for portable applications.

2-8. Interconnections

a. Inputs From Call Selector. The call selector (Telephone Connector Switch SA-1962/GT) is connected to the signal data recorder by means of the interconnect cable (para 1-8b). This cable is connected to the TO CALL SELECTOR 10-pin connector on the rear of the recorder. The opposite end of the cable is connected to the OUTPUT TO 399132 connector on the call selector.

b. Power Requirements. Power connections are made to the screw terminal strip at the rear of the recorder. Make power connections as follows:

(1) Connect the -48 vdc (1 1/3 ampere, Minimum) source to the -MB terminal.

(2) Connect the + ground to the GND terminal.

(3) Connect the power cable (clock sync isolation cable) lead to the SYNC terminal. Plug the other end of the power cable into a 120-vac, 60-Hz source.

NOTE

The power cable is required for sync lock accuracy of the time-of-day printout. The clock will operate without this connection, but may require occasional resetting due to oscillator drift.

2-9. Printer Checkout

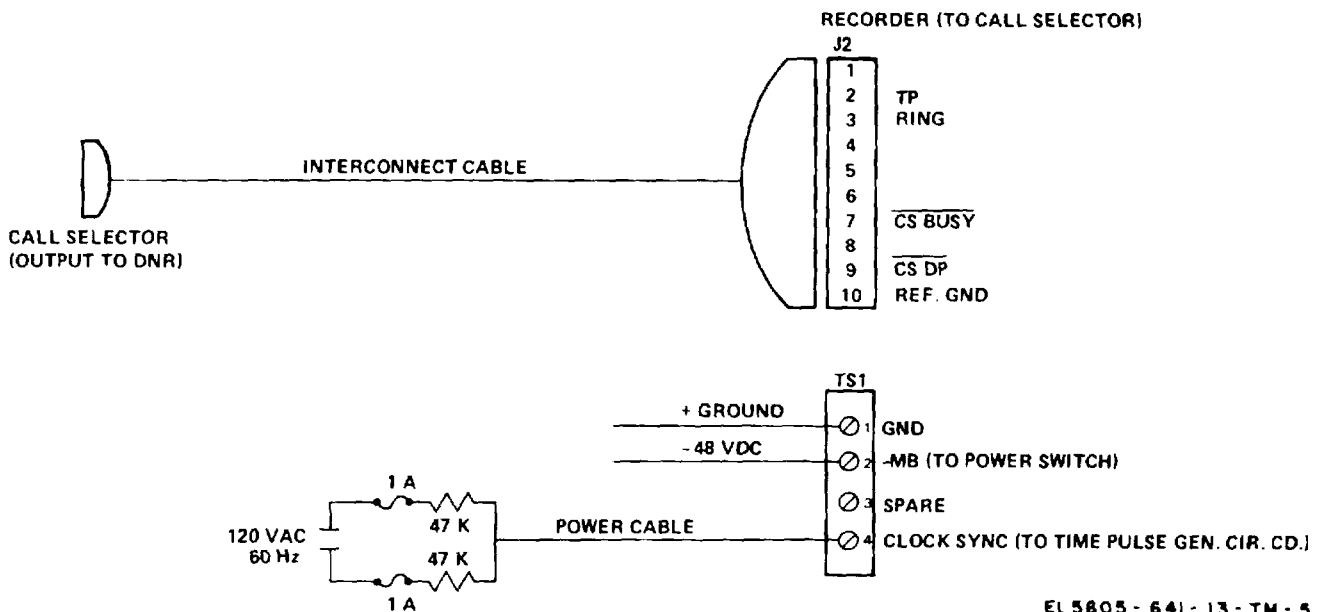
Check printer for ribbon or paper change, as required.

a. Release printing chamber (fig. 2-2) as follows:

(1) Grasp the handles and pull the printer from its inclosure until it is free. In this position the printer can be serviced.

(2) Grasping the paper bale assembly by the rear roller bar, swing up until the assembly is latched in the up position on the side plate.

(3) Swing the front plate and chamber assembly from under the lip of the locking bar, then move it



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Figure 2-1. Signal data recorder cable connections.

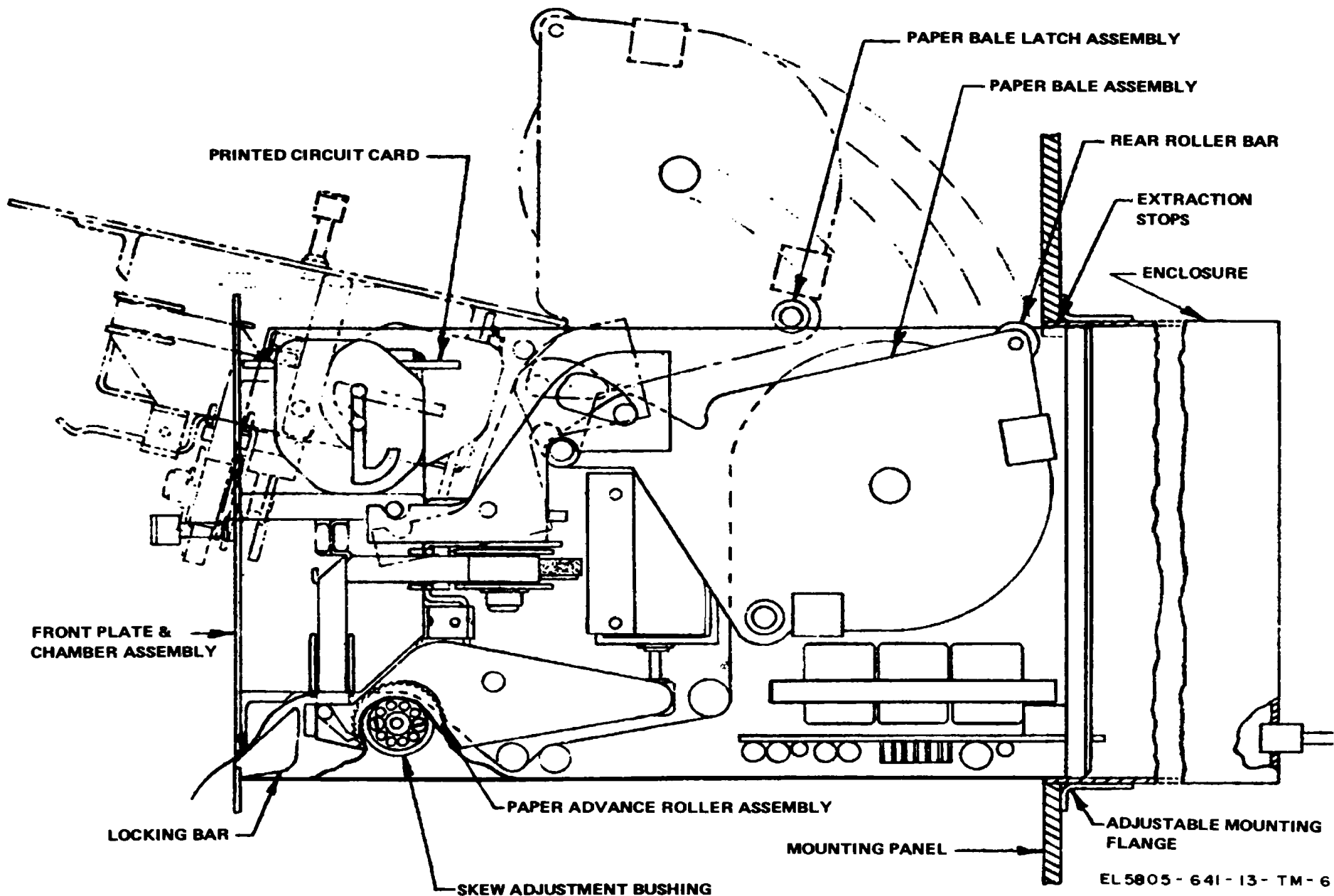


Figure 2-2. Printing chamber assembly.

straight up for about one inch. Then swing it out until the front plate is about horizontal.

(4) Unlatch the paper bale assembly by depressing the spring-loaded latch on the right side, allowing the paper bale assembly to drop back far enough to permit the front plate to fit into the two notches in the paper bale assembly. Relock the paper bale assembly by swinging it forward.

(5) The printer is now exposed for ribbon or paper change, electrical checks, and manual adjustment of the digits. In the latter case, the wheels may be moved normally in the direction of the front plate.

(6) After allowing the paper bale assembly to drop back to its rest position, and the front plate and chamber assembly to fall back down so that it is parallel to the front edges of the side plates, raise the paper bale assembly and engage the lip of the front plate cutout under the lip of the locking bar.

b. Accomplish paper loading (fig. 2-3) as follows:

(1) Refer to a above as required.

(2) With the paper bale assembly up, extract the paper shaft, removing the old core. Reload the new roll in accordance with figure 2-3.

NOTE

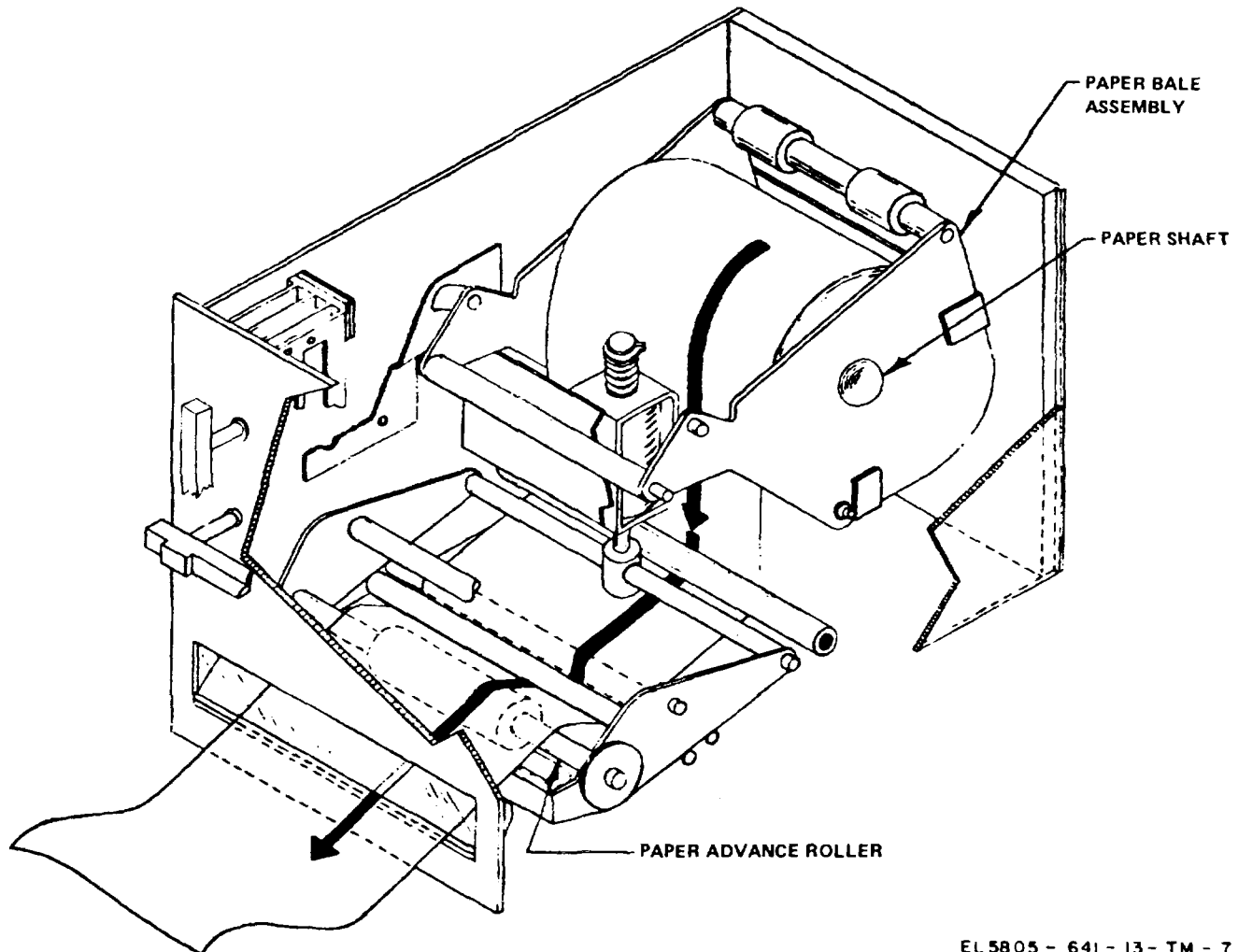
Check carefully to see that the paper roll rotates freely on shaft. This is essential for proper paper advance.

(3) Thread paper, following the path shown in figure 2-3. This will be facilitated by folding the leading edge of the paper into an arrow and then creasing up two inches behind the tip.

(4) With the paper extending through the cutout in the front plate and held taut, allow the paper bale assembly to drop into the operating positions.

(5) Make certain that the front plate properly engages the locking bar.

(6) Push the frame back into the inclosure until



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Figure 2-3. Paper loading diagram.

the rubber rollers on the paper bale assembly are inside, exerting pressure to lock up the front plate solidly. This roller bar is adjustable. Ideally, it should project over the top of the side plate 1/16th inch when free of the inclosure.

(7) In this position depress and release the solenoid manually a dozen times or so. This will cause print and advance the paper to insure that loading was correct.

c. Make print spacing adjustment as follows:

(1) If paper does not advance with adequate separation between lines, there may be inadequate pressure on the paper from the paper advance roller. Adjust the two eccentric bearings (skew adjustment bushings) that support this roller to produce the desired tension. These Bearings also control paper skew and must be adjusted relative to one another. This adjustment can only be made with pressure continuously exerted on the paper bale assembly.

(2) The ideal tension to advance paper is 9 to 10 ounces. This tension can be measured by attaching an ounce dynamometer gauge to the leading edge of the paper, then measuring the pull at right angles to the front plate.

d. Replace the ribbon (fig. 2-4) as follows:

(1) Refer to a above as required.

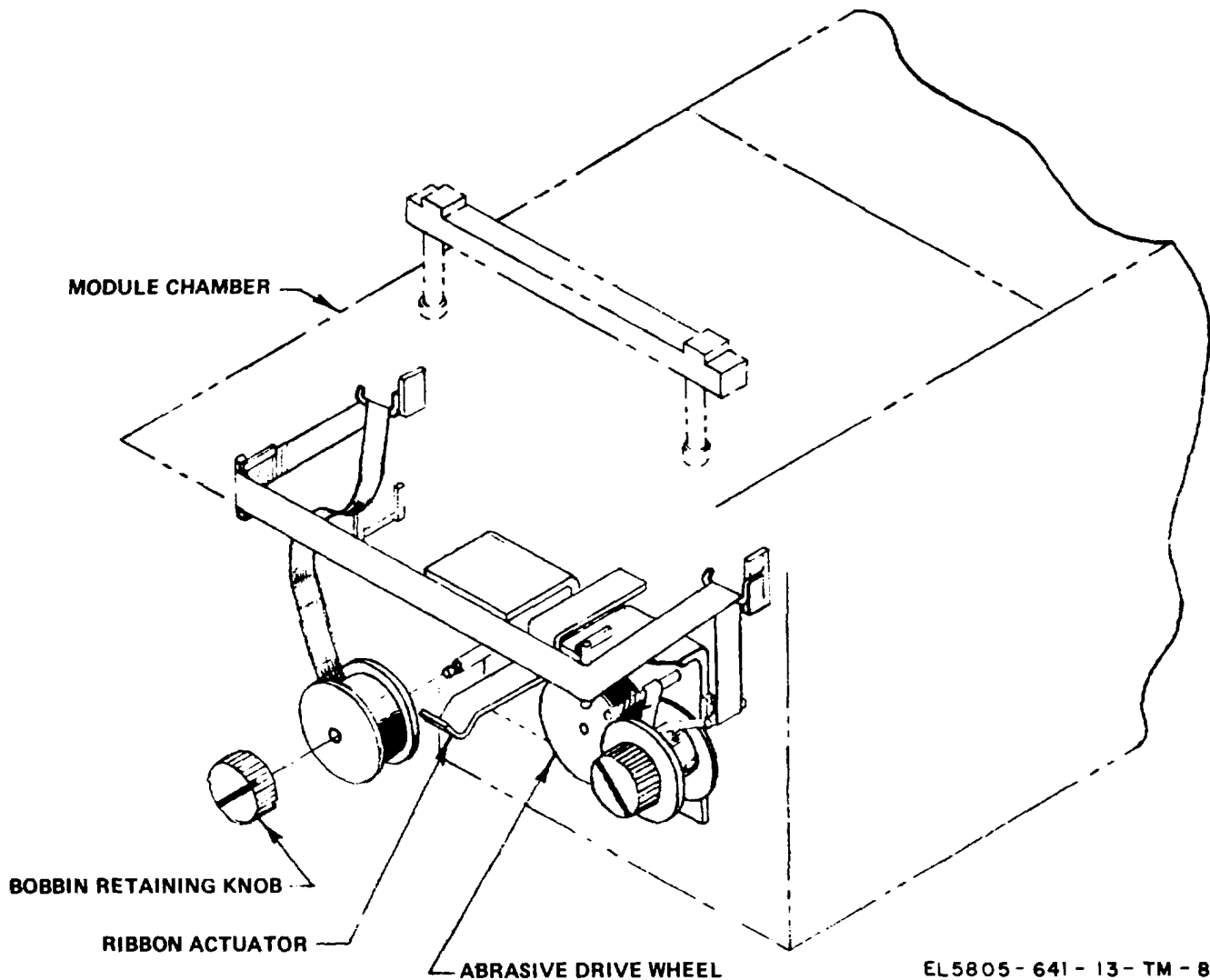
(2) With module chamber in open or Horizontal position, remove bobbin retaining knobs.

(3) Swing abrasive drive wheel against the smaller diameter bobbin. The ribbon may have to be wound manually onto the fullest bobbin to achieve sufficient clearance for the next step.

(4) With the large bobbin removed, swing abrasive drive wheel to empty side.

(5) Remove remaining bobbin in the same manner. Do not remove the tension springs on the shafts.

(6) To install new ribbon, reverse the procedure



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Figure 2-4. Ribbon replacement diagram.

described above, following the ribbon path shown in figure 2-4.

(7) Manually depress the ribbon actuator Several times to take up slack, and to insure that the new ribbon is not snagged.

(8) With the front plate back in operating position and the frame partly back in inclosure, Depress the solenoid several times, observing that ribbon bobbins are advancing.

e. If required, interchange of the counting modules is accomplished as follows:

(1) Grasp printed circuit card and pull up, rocking circuit card slightly to free it from the count module

connecting socket into which it is plugged.

(2) Remove module locking bar (fig. 2-2).

(3) Modules can now be lifted out of their slot for rotation between the lower order digits with the higher order digits for increased overall operating life or, if necessary, replacement.

(4) Replace the locking bar, depressing the bar as much as possible and printed circuit card, taking care that receptacles are squarely aligned with their appropriate connector pins before applying the firm pressure required to properly seat the card.

Section IV. PRELIMINARY ADJUSTMENT OF EQUIPMENT

2-10. Preliminary Inspection

a. Check all connector and barrier strip connections for firm seating/security.

b. Make certain that interconnect cable and barrier strip connections are properly routed to equipment used in system.

c. Make certain that circuit card cover plate is securely attached to chassis with two thumb- screws. Tighten thumbscrews. Make certain that printer lock thumbscrew is tight after printer has Been checked in accordance with procedures in paragraph 2-9.

d. Make certain that fuses are installed in rear fuseholders.

e. Make certain that the equipment is properly grounded.

f. Make switch settings described in paragraph 2-11.

2-11. Presetting of Recorder Switches and Controls

Set the recorder switches and controls (fig. B-1) to the following preliminary settings:

<i>Switch control</i>	<i>Set to</i>
POWER	OFF
M F	As desired (para 3-4).
CS RELEASE.....	UP
FORMAT	As desired (para 3-4e).
PRE-DIGIT ABSORB.....	As desired (para 3-4d)
SECONDS SELECT	As desired (para 3-4c).
DIGIT SELECT	As desired (para 3-4d).

**CHAPTER 3
OPERATING INSTRUCTIONS**

Section I. CONTROLS AND INDICATORS

3-1. Damage From Improper Settings

The recorder is 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.

3-2. Operator Controls

Operating controls and indicators for the recorder are tabulated in table 3-1, and illustrated in figure B-1.

Table 3-1. Operator Controls and Indicators

<i>Controls Indicators</i>	<i>Function</i>
POWER toggle switch (ON/OFF)	Controls dc input power
POWER lamp	Illuminates continuously when unit power is on
MF (multifrequency) toggle switch.	Selects printout: MF position: select for printout of multifrequency calls. OFF: select for printout of dial-pulse calls
CS RELEASE toggle switch	Down position: will cause call selector to release call before normal time out Up position: normal operation (para 3-4g).
PRINT pushbutton	Depressed. will cause printer to produce one line of the printout.
CLOCK/RESET pushbutton	Depressed- resets clock to 12:00 PM, day 1.
MIN/ADV pushbutton	Depressed- advances minutes by one
HOUR/ADV pushbutton	Depressed- advances hour by one.
DAY/ADV pushbutton	Depressed- advances day count by one.
FORMAT 3 - position selector switch:	Selects printout options:
14 digit.	Produces a number printout of up to 14 digits (as selected), a time-of-day, and day-count.
ID & 12 DIGIT	Produces the two-digit identity number of the bush trunk followed by the dialed number (up to 12 digits). plus time-of-day and day-count.
HOLDING TIME & 12 DIGIT	Produces a printout of the length of the call in minutes, followed by the dialed number (up to 12 digits), plus time-of-day and day-count.
PRE-DIGIT ABSORB 3-position selector switch	Permits absorption or removal of two, one, or none of the first dialed digits received (positions 0, 1, and 2).
DIGIT SELECT thumbwheel switch	Selects number of dialed digits expected in a normal completed call (1 to 14 digits).
SECONDS SELECT thumbwheel switch	Selects number of seconds required before the call selector times out, dropping the call and causing a print. Produces printout.
Printer (MODUPRINTER): TOLL ACCESS. 'AREA CODE/DIALED NUMBER/TIME/DAY	

Section II. OPERATION UNDER USUAL CONDITIONS

3-3. Preliminary Starting Procedure

When the recorder is in shutdown condition, the switches and controls should be set as prescribed in paragraph 2-4.

of the recorder is accomplished as follows:

3-4. Operating Procedure

WARNING

Insure that equipment is properly grounded before operating it. Operation

a. Inspect equipment to ascertain that recorder installation instructions, as prescribed in paragraph 2-5 through paragraph 2-9, have been followed.

b. Place power switch to ON position. Note that POWER lamp illuminates, indicating the presence of dc power.

c. Set the SECONDS SELECT thumbwheel switch for the number of seconds required before the call selector times out, dropping the call and causing a printout.

NOTE

Do not set the time-out period for less than five seconds, or incorrect unit operation will result.

d. Set the DIGIT SELECT thumbwheel switch for the number of dialed digits (1 to 14) expected in a normal, completed call. If the number of digits dialed is less than that set (as with an incompleting call), the call selector will be made to drop that call and no printout will occur. The PRE-DIGIT ABSORB switch permits two, one, or none of the first dialed digits received to be absorbed. This feature permits removal of local toll access numbers, etc. from the printout (para 1-7d).

e. Set FORMAT switch, as required, for three printout options:

(1) The 14-DIGIT position produces a number printout of up to 14 digits (as selected), a time-of-day, and day-count. This format corresponds with the markings on the plastic strip above the paper slot on the printer.

(2) The I. D. & 12-DIGIT position produces the two-digit identity number of the busy trunk followed by the dialed number (up to 12 digits), plus time-of-day and day-count.

(3) The HOLDING TIME & 12-DIGIT position causes a printout of the length of the call in minutes, followed by the dialed number (up to 12 digits), plus time-of-day and day-count. f. Set MF switch, as required. The MF switch must be up for printout of multifrequency calls. With the switch in the OFF position, dial-pulse calls only will be printed out.

g. Set CS RELEASE switch, as required. The call being processed may be dropped at any time by momentarily placing the CS RELEASE switch to the down position. The CS RELEASE switch must be up for normal call selector operation.

NOTE

The CS RELEASE switch operates in parallel with the C. S. RELEASE switch on the Decoder-Monitor Control C-9433/GT (keypad). If this switch is up, the Pulse Decoder Monitor KY-791/GT cannot effect release of a call.

3-5. Time Setting

The electronic clock which provides the time-of-day and day-count printouts is set by means of the CLOCK

buttons on the front panel. The printer will produce one line of printout, the last six columns of which indicate the 12-hour time-of-day (hour and minute), AM/PM, and the day-count. The clock may then be reset to 12:00 PM, day 1, by depressing the RESET button, or may be set beyond the time printed out by depressing the MIN ADV and HR ADV buttons. Each depression of the MIN ADV and HR ADV buttons advances the hour or minute by one. (The AM/PM printout will reverse each time 12:00 is passed.) Depress the DAY ADV button to advance the day count by one (1 through 119). Verify correct time settings by repeating the header printout cycle.

3-6. Stopping Procedure for Standby Condition

To deactivate the scanner for standby condition, place power switch to OFF. Note that the POWER lamp is extinguished.

3-7. Stopping Procedure for Shutdown

To deactivate the recorder for shutdown, proceed as follows:

a. Place power switch to OFF. Note that the POWER lamp is extinguished.

b. Disconnect the -48 vdc source to the -MB terminal, the + ground to the GND terminal, and the power cable connection to the CLOCK SYNC terminal. Disconnect the other end of the power cable from the 120 vac, 60 Hz source.

c. Disconnect the interconnect cable from the TO CALL SELECTOR connector on the rear of the recorder.

d. Coil cables (if disconnected from other equipment and/or sources) 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 the equipment will be out of service, it may be desirable to cover the recorder TO CALL SELECTOR connector with some kind of protective covering.

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

f. For portable configurations, the front and rear covers of the electrical equipment case can be latched. Make certain that the power and interconnect cables are stowed with the recorder within the case. It is unnecessary to remove the recorder from the

equipment case mounting facilities.

3-8. Preparation for Movement

The portable version of the recorder is provided with an electrical equipment case for portability. Weight of the recorder and case is approximately 35 pounds. When

the recorder is rack-mounted, the unit should be deactivated, as prescribed in paragraph 3-7a through f; then packaged, as applicable, preparatory for movement. Weight of the recorder (without case) is approximately 25 pounds.

**CHAPTER 4
ON-SITE MAINTENANCE INSTRUCTIONS**

Section I. TOOLS AND EQUIPMENT

4-1. General

On-site maintenance instructions covers operator/crew, organizational, and direct support maintenance levels to perform periodic inspection and maintenance, as necessary; restore equipment to operative condition by means of circuit card replacement, fuse/lamp/switch replacement; 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 toolkits, and only the availability of repair parts kit.

4-2. Repair parts

Repair parts authorized for use by on-site maintenance activities for the recorder are listed in appendix B.

NOTE

Maintenance of the recorder is limited to on-site maintenance only. No off-site maintenance is authorized.

Section II. PREVENTIVE MAINTENANCE CHECK AND SERVICES

4-3. General

To insure that the recorder is always ready for operation, it 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 recorder 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 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 recorder with regard to inputs from the call selector.

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

D - Daily Time required-0. 5			W - Weekly Time required: 1. 4
Interval and Sequence no.		Item to be Inspected Procedure	Work Time (M/H)
D	W		
1	1	CASE/CHASSIS Inspect for dents, cracks, breaks, distortion, cleanliness of ventilation holes. Check electrical equipment case latches for serviceability	0.1
	2	ATTACHING HARDWARE Check for evidence of looseness, damaged threads, worn locking devices and/or inserts.	0.1
2	3	PANEL SWITCHES (toggle, pushbutton, rotary, thumbwheel) Check panel switches for general condition and serviceability. Rotate thumbwheels of thumbwheel switches through their full range and check tumbler action (para 4-13c).	0.3
3	4	INDICATOR LAMP Check indicator (POWER) lamp for condition of bulb and lens; check general serviceability (para 4-13a).	0.1
	5	REAR INTERCONNECT CONNECTOR Check for evidence of damage, loose or broken terminals, installation security (para 4-13e).	0.1

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

D - Daily

W - Weekly

Time required: 0.5 Time required: 1.4

Interval and Sequence no.		Item to be Inspected Procedure	Work Time (M/H)
D	W		
	6	TERMINAL BOARD Check general condition and serviceability: check installation security of attached leads (para 4-13e).	0.1
	7	FUSE/FUSEHOLDER (2) Check general condition and serviceability (para 4-13e).	0.1
	8	PRINTER (Moduprinter) Loosen thumbscrew and pull moduprinter out of chassis, then inspect for general condition/serviceability. Check for ribbon or paper change requirement, electrical inspection, digit adjustment (para 2-9).	0.3
	9	CLEANLINESS OF EQUIPMENT (para 4-10) Lightly brush all accessible areas and parts with a soft, nonmetallic brush. Wipe front and rear panels and chassis with a clean, lint-free cloth dampened with trichloroethane (MITL-T-27602) or similar cleaning agent. Allow parts to dry thoroughly after using cleaner.	0.2

Table 4-2. Organizational Preventive Maintenance Checks and Services

Q - Quarterly

Total man-hours required: .8

Sequence No.	Item to be Inspected Procedure	Work Time (M/H)
1	ELECTRICAL WIRING Check all electrical wiring for evidence of burning, damaged insulation, broken strands, security of connections.	0.3
2	SOLDERED CONNECTIONS Check soldered connections for evidence of fractures, loose connections, cold solder joints.	0.5

b. Functional Test. The functional test prescribed herein requires a properly functioning call selector, a signal data recorder, a telephone and a hand test set (known input lines). Conduct functional test as follows:

(1) Connect 10-conductor cable (interconnect cable) from call selector to J2 (TO CALL SELECTOR) of signal data recorder.

(2) Make power connections to signal data recorder and call selector. Apply power to the two units.

(3) The signal data recorder should print. Reset the registers and print again to clear all Buffers.

(4) Manually depress the CLOCK RESET pushbutton on until the clock registers have stopped. Manually advance the clock minutes (with MIN ADV), hours (with HOUR ADV), and days (with DAYADV) to the correct time.

(5) Depress the PRINT pushbutton and verify that all registers are zero, except the clock registers which should have the correct time as set in (4) above.

(6) Set SECONDS SELECT thumbwheel switch to 07. Set DIGIT SELECT thumbwheel switch to 4. Set CS RELEASE toggle switch to CS position. Set MF toggle switch to MF position. Set FORMAT selector switch to 14 DIGIT. Set PRE-DIGIT ABSORB selector switch to 0 position.

(7) Connect the known input lines as follows:

Test Line Connections	Call Selector
S (Sleeve)	E- O
T (Tip)	T- O
R(Ring).....	R-O

Connect a telephone to the test set.

(8) Turn the call selector front panel selector Switch to LOOP. Set the AUTO/MAN toggle switch to AUTO.

(9) Using the test hand set ((7) above), remove receiver and verify that the call selector seizes. The display should read 00, and the BUSY lamp should illuminate.

(10) Using the telephone, dial a number Sequence of 0 1 2 3 4 5 6 7 8 9 0 9 8 7. After seven seconds, the call selector should drop if busy, and the signal recorder should print out the number dialed, the time, and the day set.

(11) Set FORMAT selector switch to ID & 12 DIGIT. Set the SECONDS SELECT to 18 and the DIGIT SELECT to 12. Set PRE-DIGIT ABSORB to 1.

(12) The format for a print out is as shown below:

Sample Format

Total Access												Day							
ID/Call	Time Area	Code Dialed Number					Time of Day					Count							
5	3	2	8	0	9	8	2	3	4	6	3	2	3	6	0	7	P	1	7
M																			

(13) Seize call selector and dial 9 8 7 6 5 4 3 2 1 0 1 2 3. After approximately 18 seconds the signal data recorder should print out. The format should be as follows: the first two digits should be the ID displayed on the call selector. The remaining should be the 12 digits less the first digit (9).

(14) Set the SECONDS SELECT thumb- wheel switch to 06 for the remainder of the test. Now dial a number less than what is set on the DIGIT SELECT thumbwheel switch. There should be no printout.

(15) Repeat (12) and (13) above with the PRE-DIGIT ABSORB switch set to 2. After six seconds the unit will print out the ID and the number dialed less the first two digits dialed.

(16) Set FORMAT selector switch to HOLDING TIME & 12 DIGIT. Next seize call selector and dial a 12-digit number. Wait three minutes and then place CS

RELEASE switch in RELEASE position. The unit should then print out 03 in the first two columns and the number dialed and the clock in the remainder. Set FORMAT switch back to ID & 12 DIGIT.

(17) When testing the MF use a known MF line in place of hand test set lines ((7) above, and repeat procedures (8) through (16) above).

4-5. Special Instructions

The recorder is an item of equipment that is 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 be arranged so that the inspection intervals are scheduled with considerable 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 recorder, refer to the remaining portions of this procedure for further isolation.

c. Localization. The procedures 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 table (4-3) as appropriate, to aid in localizing trouble to a replaceable circuit card, printer, or replaceable component. Table 4-3 is divided into troubles involving circuit cards and chassis-mounted electronic/electrical components, and troubles involving the printer.

(2) *Substitution.* Substitution of circuit cards and replaceable components will enable the repairman to localize a trouble quickly. The recorder maintenance philosophy consists, primarily, of substitution techniques.

d. Isolation. The maintenance practices to be used with the recorder 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 recorder under test.

4-7. Use of Troubleshooting Table

Refer to the functional test given in paragraph 4-4b. Once the trouble has been isolated to a defective circuit card, printer, or replaceable component, do not attempt to make detail repairs. Replace the defective component.

NOTE

Organizational personnel are authorized to make the repairs/adjustments noted in table 4-2.

Table 4-3. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Recorder will not operate (no power to unit).	<ul style="list-style-type: none"> a. Blown fuse b. POWER switch defective. c. Defective choke coil (LI). d. Loose or defective connection to terminal board. 	<ul style="list-style-type: none"> a. Replace 2-ampere fuse (para 4-13e). b. Replace switch (para 4-13c) c. Check/replace coil (para 4-13). d. Check/correct condition (para 4-13 e).
2. Dialed number printout consistently incorrect, with known input.	Defective buffer circuit card.	Replace input buffer circuit card, (para 4-13 b).
3. Dial-pulse printout normal, but no multi-freq. response (or incorrect printout) with known good MF limiter, MF decode, and MF channel filter circuit cards.	Defective buffer circuit card.	Replace input buffer circuit card (para 4-13b).
4. Multifreq. response normal, but no printout (or incorrect printout) of dialpulse calls.	Defective buffer circuit card.	Replace input buffer circuit card (para 4-13b).
5. Recorder fails to print out very short duration calls.	Defective buffer circuit card.	Replace input buffer circuit card (para 4-13 b).
6. Printout occurs, but call selector not released at time out.	Defective print control circuit card.	Replace print control circuit card.
7. No trunk I. D. number (or incorrect number) printed out when so set at FORMAT switch.	<ul style="list-style-type: none"> a. Defective print control circuit card. b. Defective FORMAT selector switch. 	<ul style="list-style-type: none"> a. Replace print control circuit card (para 4-13b), b. Replace FORMAT selector switch (para 4-13c).
8. Unit does not time-out, or times out after intervals other than that set on the SECONDS SELECT thumbwheel switch.	<ul style="list-style-type: none"> a. Defective print control circuit card. b. Defective SECONDS SELECT thumbwheel switch. 	<ul style="list-style-type: none"> a. Replace print control circuit card (para 4-13b). b. Replace SECONDS SELECT thumbwheel switch (para 4-13c).
9. Unit accepts calls when a number of dialed digits other than that set on DIGIT SELECT thumbwheel switch.	<ul style="list-style-type: none"> a. Defective print control circuit card. b. Defective DIGIT SELECT thumbwheel switch. 	<ul style="list-style-type: none"> a. Replace print control circuit card (para 4-13b). b. Replace DIGIT SELECT thumbwheel switch (para 4-13c).
10. Time-out (as set at SECONDS SELECT switch) never occurs.	<ul style="list-style-type: none"> a. Defective print control circuit card. b. Defective SECONDS SELECT thumbwheel switch. 	<ul style="list-style-type: none"> a. Replace print control circuit card (para 4-13b).
11. No unit printout	<ul style="list-style-type: none"> a. Defective print control circuit card. b. Printer out of paper/ribbon; defective printer. c. Blown fuse d. Check/replace fuse (para 4-13e). 	<ul style="list-style-type: none"> a. Replace print control circuit card (para 4-13c). b. Refer to table 4 for printer troubleshooting procedures.
12. Print solenoid is never actuated, but print register wheels advanced correctly .	Defective print control circuit card.	Replace print control circuit card (para 4-13 b)
13. Unit does not print out when trunk goes idle.	Defective print control circuit card.	Replace print control circuit card (para 4-13 b).
14. The same digit(s) in each printout always incorrect; no advancement of certain printer register wheels.	Defective register driver circuit card.	Replace print control circuit card (para 4-13 b).
15. Printer registers do not reset after each printout.	Defective register driver circuit card.	Replace register driver circuit card (para 4-13b).
16. Printout occurs before all registers set; last columns always incorrect.	Defective register driver circuit card.	Replace register driver circuit card (para 4-14b).
17. Dial pulse printout normal, but multifreq. numbers consistently incorrect.	Defective MF limiter circuit card.	Replace register driver circuit card (para 4-13b).
18. Same digits always missing from printout of multifreq. with known input number.	Defective MF channel filter circuit card.	Replace MF limiter circuit card (para 4-13 b).
19. Certain digits consistently incorrect in multifreq. printout only.	Defective MF decode circuit card.	Replace MF channel filter circuit card (para 4-13b).
20. No advancement of the time-of-day and day count in the printout, but	Defective time pulse circuit card.	Replace time pulse circuit card (para 4-13b)

Table 4-3. Troubleshooting

Malfunction	Probable cause	Corrective action
manual time advancement normal (assuming 120 vac, 60 Hz present at the unit). 21. Time-of-day and day count readout incorrect. 22. No unit operation, and no voltage (or incorrect voltage) at pins 4A, 10A, 17A, and 23A of power supply circuit card.	Defective time pulse circuit card. a. Defective power supply circuit card. b. Defective power transformer (T1)	Replace time pulse circuit card (para 4-13 b). a. Replace power supply circuit card (para 4-13b). b. Replace power transformer (TI) (para 4-13).

Section IV. MAINTENANCE OF RECORDER

4-8. General

The signal data recorder is a totally solid-state instrument designed for 24-hour duty; therefore, very little maintenance is normally required. The circuit card protective panel is secured to the chassis by two thumbscrews. Removal of the thumbscrews will allow access to the circuit cards. The printer is held into the chassis by a single thumbscrew which, when loosened, allows the printer to be withdrawn for paper/ribbon changing and servicing.

4-9. Disassembly

The recorder is disassembled to the extent required for replacement of a malfunctioning component/circuit card in the order of the index numbers listed for the respective components/circuit cards in appendix B and illustrated in the corresponding figures. 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 of the lungs and general health. Always 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 cleaning agent. Allow parts to dry thoroughly after using leaner. Allow parts to dry thoroughly after using cleaner.

b. Clean circuit cards as follows:

(1) Clean all soldered connections and electrical connectors by lightly abrading with a rubber eraser (Nile green only). Brush off debris with a camel's-hairbrush, or suitable equivalent.

(2) 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 a recorder to efficient operating condition after Troubleshooting has identified and isolated the fault. It consists of replacement of defective parts and circuit cards, and all disassembly and reassembly work.

b. After the equipment has been repaired, the recorder should be given a functional checkout (para 4-4 b) to insure that the overall performance is satisfactory.

c. Repair of the recorder consists of parts/components/circuit card replacement. Re- placement procedures are given in paragraph 4-13.

4-13. Replacement of Recorder Parts/ Components/Circuit Cards

Most of the parts/components of the recorder can be replaced by standard maintenance practices; however, note the following:

a. *Lamp Assembly.* The POWER lamp is easily replaced by removing the pilot jewel from the front panel. A standard telephone panel lamp (48C2) is used. Make certain to replace the lens(green) with an identical color.

b. *Circuit Cards.* The circuit cards are accessible from the front of the chassis, after removal of the protective front panel. Each is held in place by a finger lock (ejector tab; which must be lifted up to release the card. When replacing the cards, push them all the way back into the edge connector.

WARNING

Do not remove circuit cards from their card file connectors with the POWER

switch in the ON position. The protective front panel should be installed at all times, except when servicing the circuit cards. Replace cards into their connectors as prescribed in paragraph 1-8a.

CAUTION

The following circuit cards contain potentiometers which are adjusted at the time of calibration by the manufacturer.

Do not disturb their settings:

- Power supply circuit card
- Print control circuit card
- MF channel filter circuit card
- MF limiter circuit card

c. Control Panel (fig. B-1). The components installed on the control panel are accessible by removal of four screws (1) that secure the panel to the chassis allowing the panel to come forward to expose parts. The rotary switch (3) and knob (4) thumbwheel switch (6), lamp base (18), push button switch (15), and toggle switches (16, 17) can be removed by first disconnecting wire leads noting connection points and then releasing by removing securing hardware.

d. Printer. The printer can be released from the chassis by removal of a single thumbscrew. Adjustments and services of the printer can be accomplished in accordance with the procedures in paragraph 2-9.

e. Rear Interconnect Connector, Terminal Board, Fuseholder, and Fuse (fig. B-1). Turn the cap of the fuseholder (22) to expose the fuse (23) for removal. The fuseholder with fuse, the rear interconnect connector (21), and the terminal board (24) are exposed for removal by releasing the rear panel. Once exposed, disconnect the wiring, noting connections and releasing the securing hardware to remove.

4-14. Assembly

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

4-15. Installation

Installation procedures for the recorder, as applicable, are contained in paragraphs 2-5 through 2-9

4-16. Testing After Repair

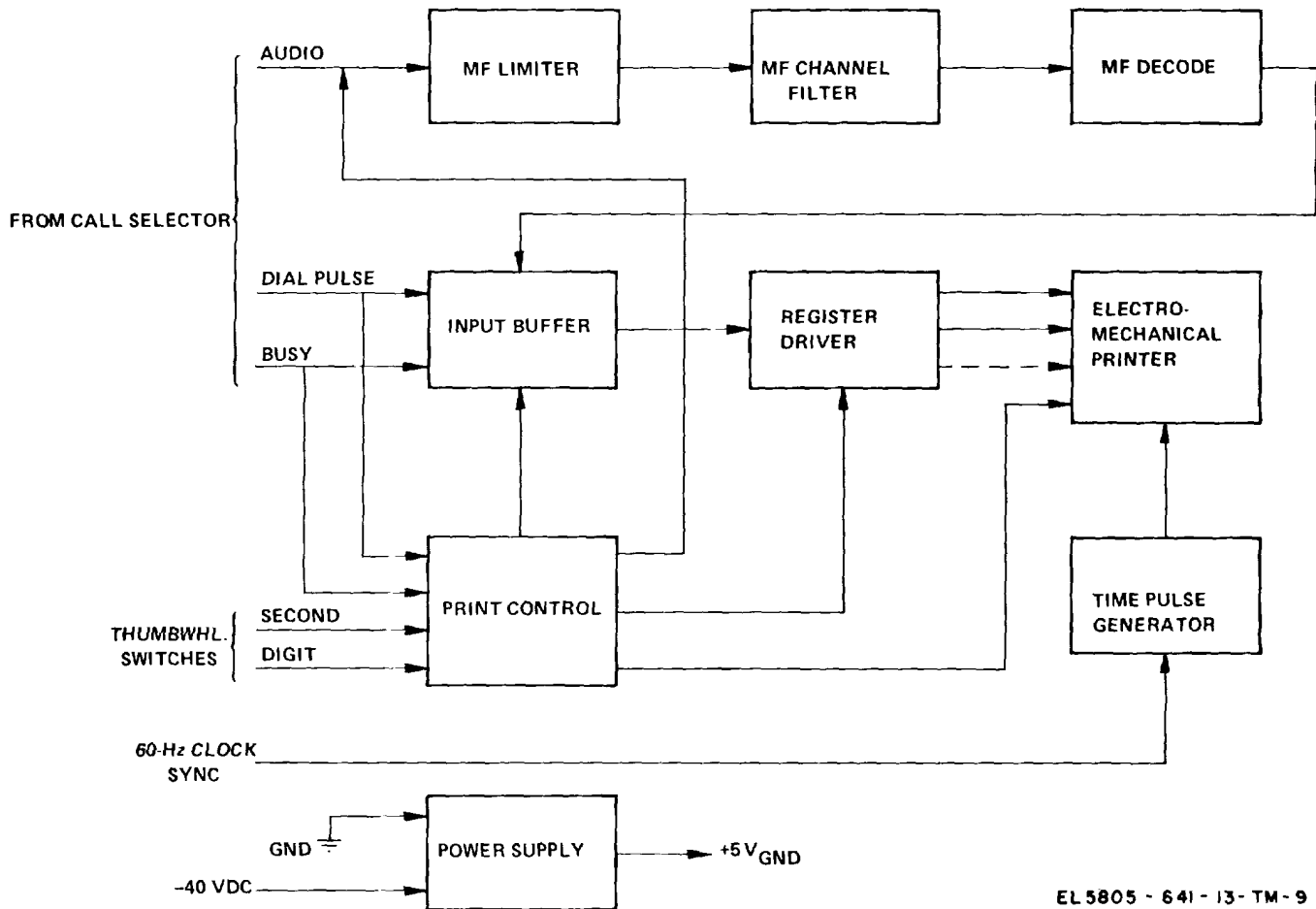
Following extensive maintenance of the recorder, the functional test specified in paragraph 4-4b should be performed.

CHAPTER 5
FUNCTIONING OF EQUIPMENT

5-1. General

a. Signal flow through the signal data recorder is shown in figure 5-1. The unit is connected to Telephone Connector Switch (call selector)

AS-1962/GT through a 10-conductor cable. This cable contains an audio pair, a busy lead, a dial pulse lead, and a ground reference.



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Figure 5-1. Signal data recorder, block diagram.

b. The call selector is controlled by a 100K ohm ground applied to the tip of the incoming pair. The TIME OUT thumbwheels on the panel are set for any time-out period from 5 to 99 seconds. The time-out starts after the last digit of the dialed number is received. At the end of the time-out period, the ground on the tip of the incoming voice circuit from the call selector will be interrupted, causing the selector to drop the trunk being monitored and to wait for the next new landing call. Release operation can also be effected prior to this time by setting the C. S. RELEASE switch to its down

position.

c. When the call selector seizes a line carrying an outgoing call, it sends a -48-vdc signal through the busy lead to the unit. This signal is fed to the input buffer circuit card where it causes one of two 160-bit shift register buffers to store the dialed number pulse trains which follow from the dial pulse input lead. If the dialing signals are multifrequency, they are received over the audio pair and fed to a series of three processing circuit cards: an MF limiter, an NIF channel filter and an MF decode. The MD decode circuit card

delivers a 4-line binary output representing the value of each digit received together with an MF strobe signal on the fifth lead to the input buffer card, where it is converted to pulses and stored in one of two 160-bit shift registers. When the MF ST signal is decoded at the end of an MNF signalling period, the MF decode card is disabled for the remainder of the call. This prevents noise and voice frequencies from producing erroneous digits on the display. The MF code card will again be enabled when the busy signal from the call selector ceases.

d. The print control circuit card determines under what conditions the stored data will be printed out. A master clock oscillator signal from the card is divided down to produce 1 pps. This signal is supplied to a system of down counters which are present to the number appearing in the seconds thumbwheel switch each time a digit is received. When the count reaches 0, if the number of digits equals or exceeds the number set on the digit select switch, a 3-second one-shot multivibrator is set, which:

(1) Sends a shift buffer signal to the input buffer circuit card.

(2) Removes the 100K ohm holding ground from the tip of the incoming audio line, causing the call selector to release.

(3) Gates incoming identity pulses appearing on the DP line through the format switch to the first register of the printer. *e.* A 130-ms one-shot multivibrator is held operated as long as the ID pulses in the first digit continue; 130 ms after the last pulse, the 130-ms one-shot multivibrator will restore itself to normal, and will provide a clock pulse to a flip-flop which in turn will close the gate to the first register in the printer, and open the gate to register. A printout cycle is also started, during which a total of 160 32-Hz output clock pulses will be sent to the input buffer circuit card, clocking out the digits stored in one of the 160-bit shift registers. The buffers may contain a total of 16 digits. The printer can accommodate only 14 digits; therefore, data stored in the first two sections would be assumed to be erroneous, and would not be printed. Data stored in the third Section would be directed to the first register of the printer. Data stored in the sixteenth (last) section of the shift register would be directed to the fourteenth register in the printer. During each print cycle, 160 output clock pulses are sent from the print control card to the input buffer. At the end of the tenth, twentieth, thirtieth, etc., pulses, a register advance signal is sent

of pulses (digit) to the next register (column) in the printer. These sequential signals are developed in the register driver circuit card which contains a 1-of-16 decoder and 14 amplifier circuits. Each pulse train, representing the number to be printed in one column, is independently switched into one of the 14 driver amplifiers.

f. These amplifiers drive the printing wheel registers in the printer. When all 14 wheels are set (before the register driver has completed 16 steps), the 3-second one shot multivibrator will have returned to its normal state, removing the start signal. At the completion of the 16th step, the +16 counter will return to a count of 0, the register advance signal will go high, the PRINT signal from the register driver card will go high, and current through the diode into the gate will stop the flow of output clock pulses into the input buffer circuit card. A 33-ms one-shot multivibrator, together with transistor circuitry, will provide a 33-ms ground time pulse to the print solenoid in the printer.

g. A panel control permits selection of any number of dialed digits from 1 to 14. If a number of digits below that set is dialed, the call will not be printed. The unit may also be set to absorb 0, 1, or 2 of the first dialed digits. These digits (such as toll access, etc.) will, therefore, not appear in the printout.

h. The time pulse generator circuit card is sync-locked to the 60-Hz line frequency. It produces one pulse per minute, which advances the 12-hour and AM/PM clock readout registers in columns 15 through 18.

5-2. Circuit Card Functions

a. MF Limiter Circuit Card (fig. 5-2). This circuit card is the first in a series of three multifrequency signal processing cards. Audio signals from the incoming pair are fed to six low-Q band-pass filter circuits. These circuits are each tuned to one of the six multifreq. 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 v p-p (-24 dbm min.). The outputs are then sent to the MIF channel filter circuit card.

b. MF Channel Filter Circuit Card (fig. 5-3). The outputs from the limiter card are sent to six band-pass filter circuits on this card. Each filter is tuned to its respective frequency. 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

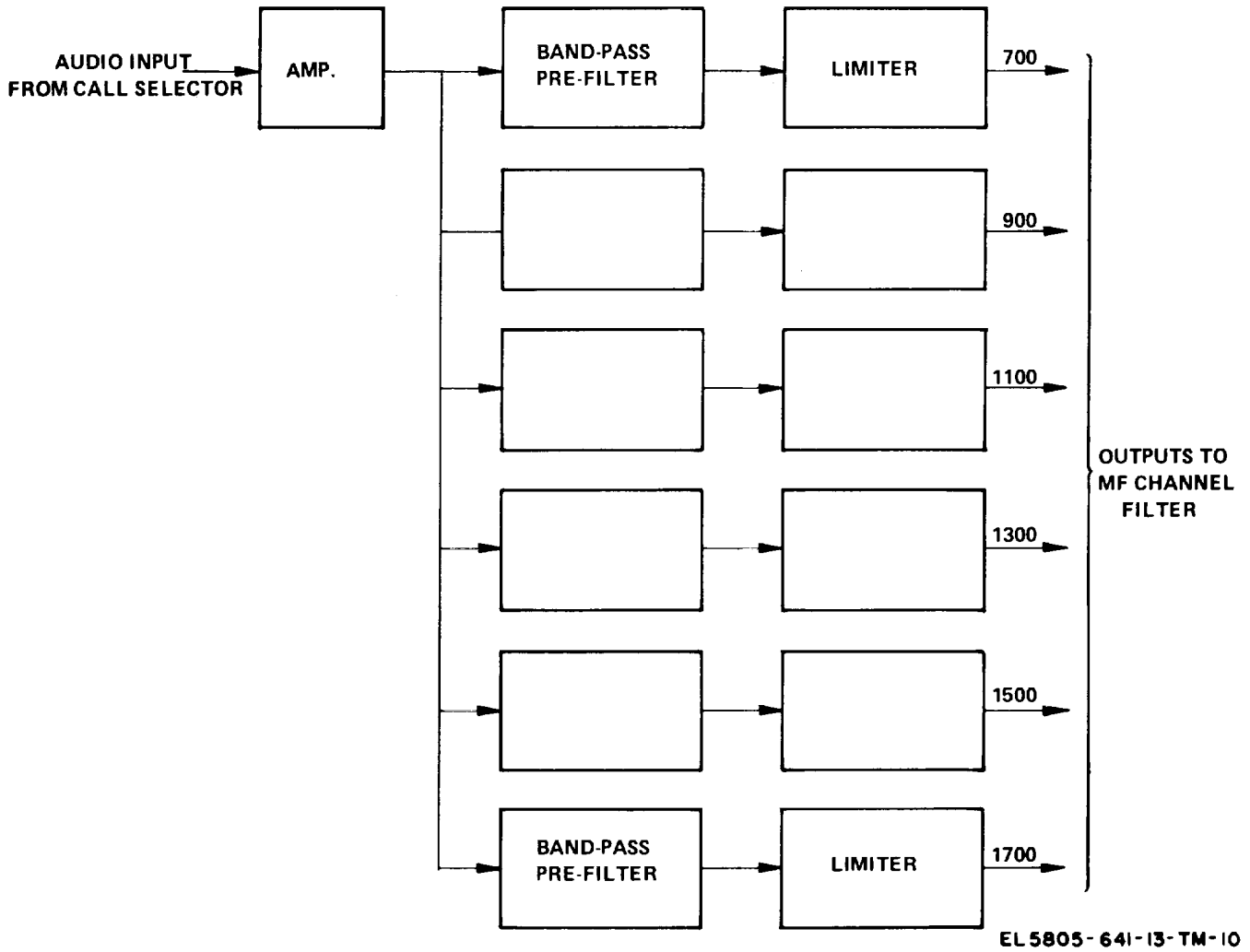


Figure 5-2. MF limiter circuit card, block diagram.

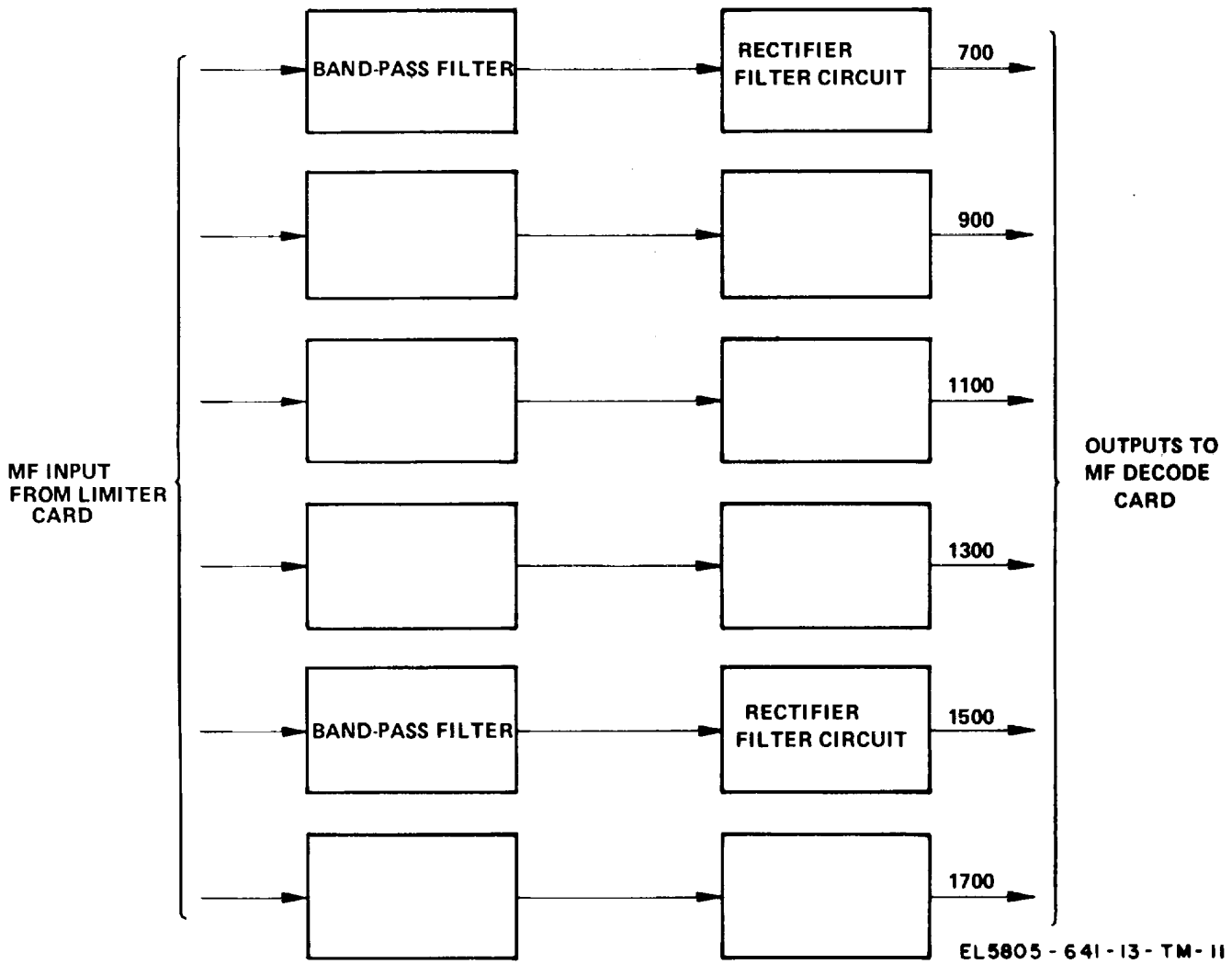


Figure 5-3. MF channel filter circuit card, block diagram.

is present its output will provide a 5 vdc signal to the decode card. Six such output signals are sent to the MF decode circuit card (fig. 5-4)

c. MF Decode Circuit Card (fig. 5-4).

(1) This card receives the six dc-signal lines from the MF channel filter card (fig. 5-3) and sends them to a system of NOR gates. These gates form a matrix which is set up to respond to each of the following two-frequency combinations:

<i>Digit</i>	<i>Frequencies(Hz)</i>
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

(2) If more or less than two-tone signals are present, the card will produce no output.

(3) A binary value circuit receives the NOR gate matrix outputs, and converts each two-tone signal received into its assigned digit. This digit is generated as a four-line binary output which is fed to the input buffer card.

(4) An additional circuit on this card decodes the binary 13 or ST tones, which indicates the end of an MF number period. This circuit disables the MF decode card until cessation of the busy signal from the call selector, eliminating erroneous display digits produced by noise or audio voice frequencies

d. Input Buffer Circuit Card (fig. 5-5.)

(1) This card receives the busy and dial pulse signals from the call selector. The four-line binary signal from the MF decode card (fig. 5-4) also enters this card. The card stores the complete at dialed number (16 digits maximum, whether received as dial pulse or multifrequency) in one of the two shift register buffers, where it is held until printed out.

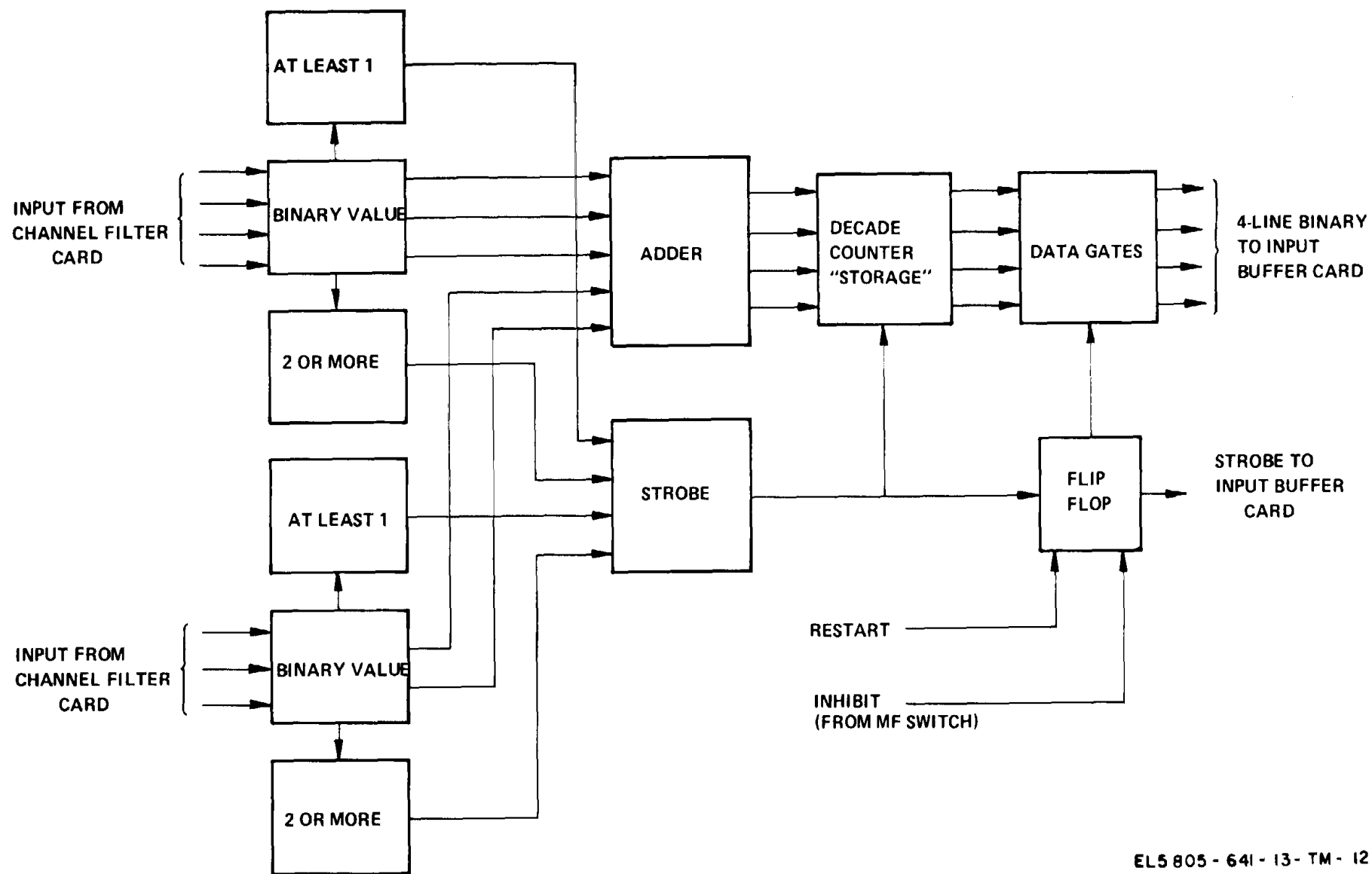
(2) A 4,096-Hz clock signal is constantly received from the master clock oscillator/divider system on the print control circuit card (fig. 5-6) and is fed through a gating circuit to the clock inputs to one of two 160-bit shift registers. Each clock pulse causes the state of each of the 60 flip-flops in the chain to move the stored data ahead one position

(3) Upon reception of a busy signal from the call selector, the clock pulse source to the shift registers is blocked, causing shift register advancement to cease. The unit now waits for pulses on the dial pulse line. If the

call is dial pulse, each received pulse will be clocked directly into the input shift register, causing one advance for each pulse received. These pulses are made low when stored in the register As the pulses are received a ÷10 counter, which was reset to zero upon reception of the busy signal, will count the dial pulses received. A 150-ms one- shot circuit also receives the dial pulse input; 150-ms after the last pulse is received, the circuit assumes an end of pulse train, and sends a signal to a gating circuit which gates 2,048-Hz clock pulses into the shift register. At this time, the input to the shift register is made high, causing all further clock pulses to register high. When the number of pulses stored in the counter then reaches 10, the circuit again blocks the clock pulses, thus stopping shift register circulation The exact . number of pulses in the train are now stored as lows in sequence in the register, followed by a equaling 10 minus dial pulse number. (If the number dialed was 0, or 10 pulses no highs will be stored.) The unit will now wait for the next dial pulse train digit

(4) If the call is multifrequency, each digit is received from the MF decode card as a four-line binary signal. This signal is sent through a latch to a comparator circuit, which also receives a four- line binary signal from the ÷ 10 counter. Upon reception of the busy signal, shift register clock pulses are blocked, as described above. When an MF time signal is then received, an MF strobe signal from the MF decode card and the MF strobe signal sets a 2-ms one-shot which releases 2,048-Hz pulses into the input shift register, and stores low pulses into the shift register. A ÷10 counter counts these pulses producing appropriate binary outputs to the comparator. When the comparator receives the same binary number from the counter as that received from the MF decode circuit card, a coincidence signal sets a latch circuit. This latch shifts the input to the shift register high, where it will remain for the balance of the ten pulses. At the conclusion of the tenth pulse, the counter again blocks further clock pulses, and awaits the next dialed digit. Each MF two-tone combination decoded in the MF decode card is thus converted into its equivalent pulse train and stored in the same manner as dial- pulse inputs

(5) The system of shift registers provides two independent buffers which may be transferred as required. The shift register receiving input pulse trains is the input buffer. Each print start signal from the control card causes the buffers be shifted, this permitting reception of a new dialed call, while printout of a previous call occurs.



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

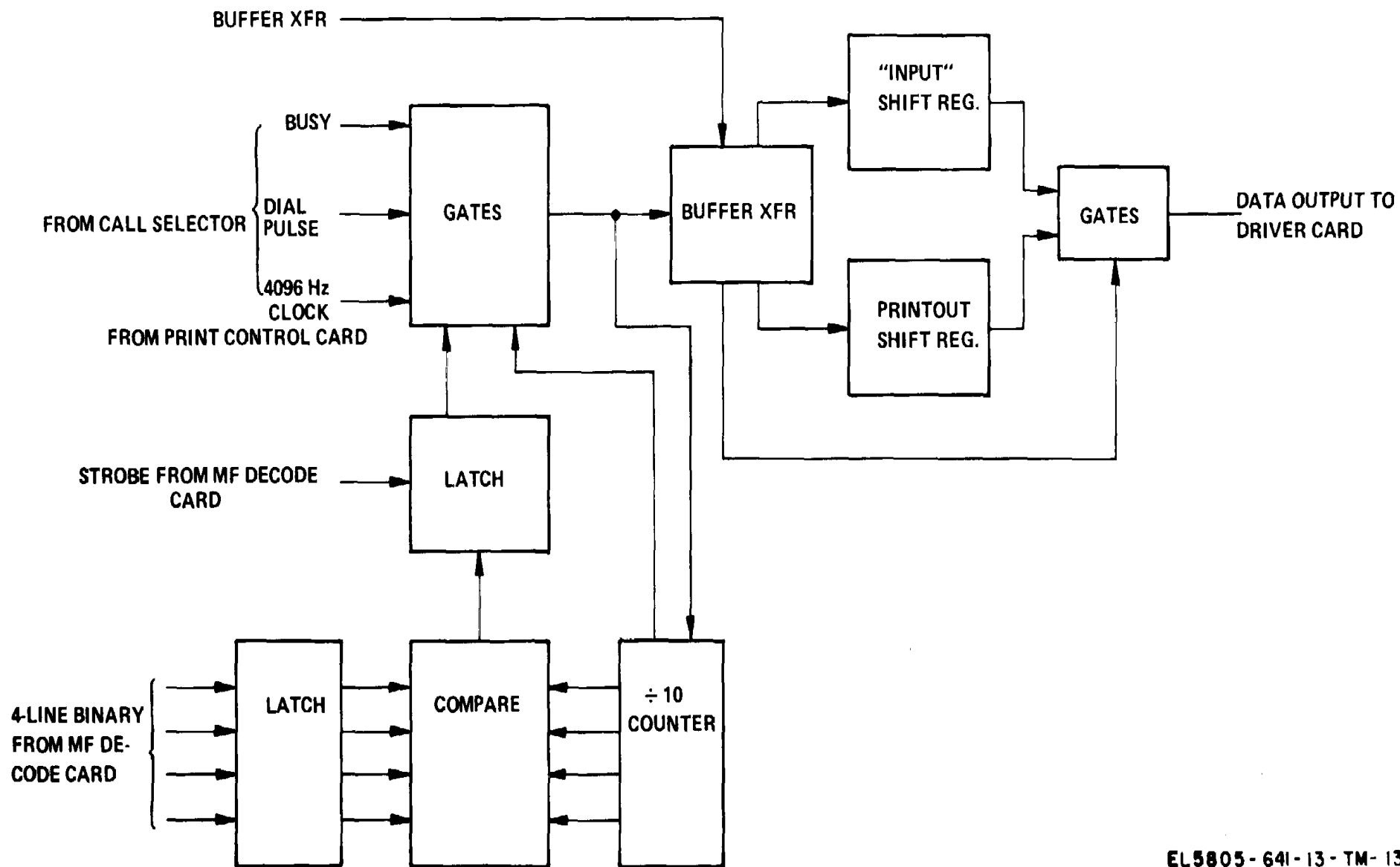


Figure 5-5. Input buffer circuit card, block diagram.

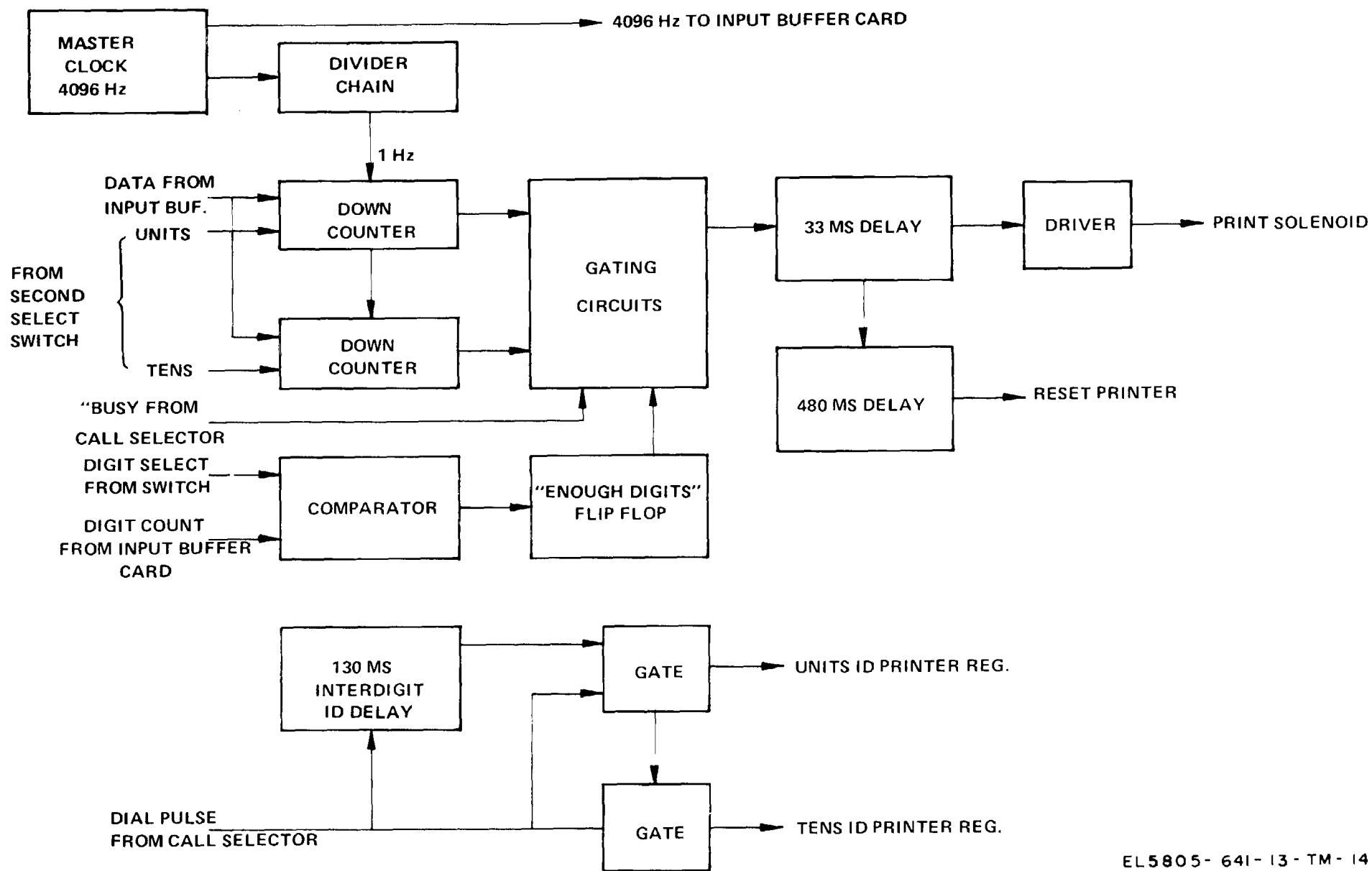


Figure 5-6. Print control circuit card, block diagram.

e. *Print Control Circuit Card* (fig. 5-6).

(1) This circuit card initiates the printout cycle, and provides time-out facilities. The unit master clock is also located on this card. Two down counters are preset on each data pulse fed into the shift register on the input buffer circuit card. When the last pulse is reached, these counters begin to count down in seconds, starting from the number set on the panel TIME OUT thumbwheel switch. When the count reaches 0, time out is complete. If enough digits have been received in this call, the print cycle will start, and the call selector will be released. The input buffer circuit card will clock out the data from the output register at the correct output rate (rate at which printer registers will respond). The data from the first 10 shift register positions is thus clocked out to the decoder on the register driver card, and is used to advance the first register wheel to the required position. Upon reception of the 10th pulse, the 10 counter sends a pulse to the counter on the register driver card, causing the decoder to advance future pulses to the second register wheel, etc. Thus, each of the 14 moduprinter registers are sequentially set. When the 14th advance signal is counted at the register driver card, a signal is sent back to a 33-ms one-shot on the print control circuit card. This one-shot provides the pulse required to operate the print solenoid in the printer. This pulse will be passed to the solenoid driver

amplifier, however, only if the number of digits dialed is equal to that set on the DIGIT SELECT switch. This is determined by a comparator which received a binary digit count from a +16 counter on the input buffer circuit card. If the number is other than that set, the pulse is blocked and no printout occurs.

(2) A 480-ms one-shot sends a pulse train to set all registers after printout has occurred. The time of the audio pair is removed from ground at the conclusion of printout, causing the call selector to drop that call. At this time, cessation of the busy signal triggers a 3-ms one-shot. During this period, a circuit on the card looks for the trunk identity dial pulse train on the dial pulse input line. Each of the two digits is fed to a separate driver for operation of the first two register wheels. A printout of the I.D. number is then initiated

f. *Register Driver Circuit Card* (fig. 5-7). This card receives the register advance signals from the print control circuit card (fig. 5-6). These signals are fed to a counter which drives two 1-of-8 decoders. Decoded signals on lines 3 through 16 are sent to 14 driver amplifiers on the card. These amplifiers drive the 14 print wheels of the printer in sequence. Each register wheel is sequentially fed the proper number of pulses to drive it to the number required in the printout during a

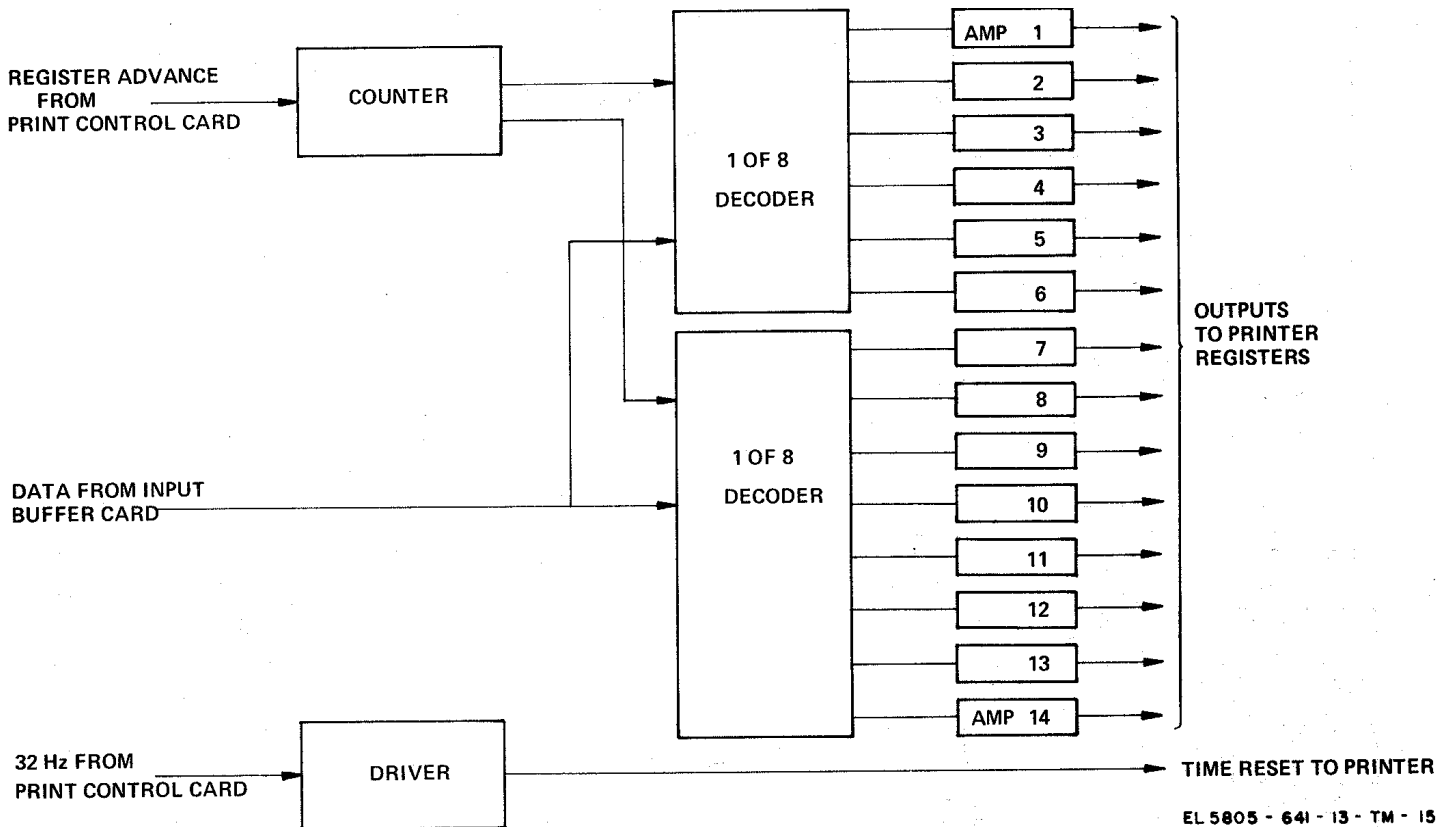


Figure 5-7. Register driver circuit card, block diagram

printout cycle All registers, except the last six, are reset after each printout. These last columns represent the time-of-day and day count, and may be reset manually by operation of a reset push-button on the front panel. This action resets the registers by means of 32-Hz pulses produced by the register driver circuit card.

g. Time Pulse Generator Circuit Card (fig. 5-8).

(1) This circuit card provides 1-pps pulses for the operation of the time-of-day and day count readouts The initial excitation for clock pulse generation is obtained from a 60-Hz multivibrator. The oscillator remains locked to the highly accurate 60-Hz powerline frequency as long as 120-vac line power is supplied to the unit (through CLOCK SYNC terminal by means of the power cable). If line reference power should fail, the oscillator will free run, thus continuing to supply uninterrupted 60-Hz square-wave pulses The frequency may be adjusted, and should be set so that the output frequency does not vary when the line reference source is removed. This feature renders the unit independent of ac line power for limited intervals The multivibrator output is first fed to a decade counter ($\div 10$), then to $\div 6$ counter

2) This counter, therefore, delivers a 1-pps output The 1-pps signal is fed to a decade counter which provides one output pulse every 10 seconds The 10-second pulse is fed to a $\div 6$ counter and another decade counter. The $\div 6$ counter provides a 60-second pulse which is

amplified and fed to the minutes input of the time-of-day register wheels on the printer. Each pulse advances the time by one minute. Automatic electrical carryover to the minutes, tens, and hours columns, as well as the AM/PM wheel and the day count registers, is provided within the printer

h. Power Supply Circuit Card (fig. 5-1).

The power supply circuit card is a dc-to-dc converter which delivers 5 vdc to provide V_{cc} power for all logic circuitry, and 12 vdc for shift register and operational amplifier requirements 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 V_{cc} is referenced to -48, and is therefore, at -43 vdc The 12-volt output is so connected that it delivers -60 vdc in relation to + ground (measurements at ground reference may vary due to -48-vdc office battery fluctuations).

(2) 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 100 vac which is stepped down to 5 vac and is full-wave rectified and filtered Voltage regulation of $\pm 2\%$ from 600 ma to 3-ampere load is achieved by means of a reference zener diode and sensing circuit which adjusts the output level of the oscillator for constant voltage output. A potentiometer on the card permits adjustments of the 5-volt output between 0 and 5.4 volts.

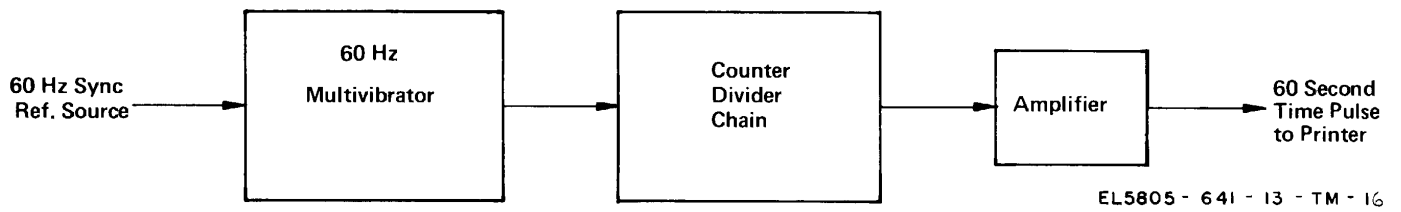


Figure 5-8. Time pulse generator circuit card, block diagram.

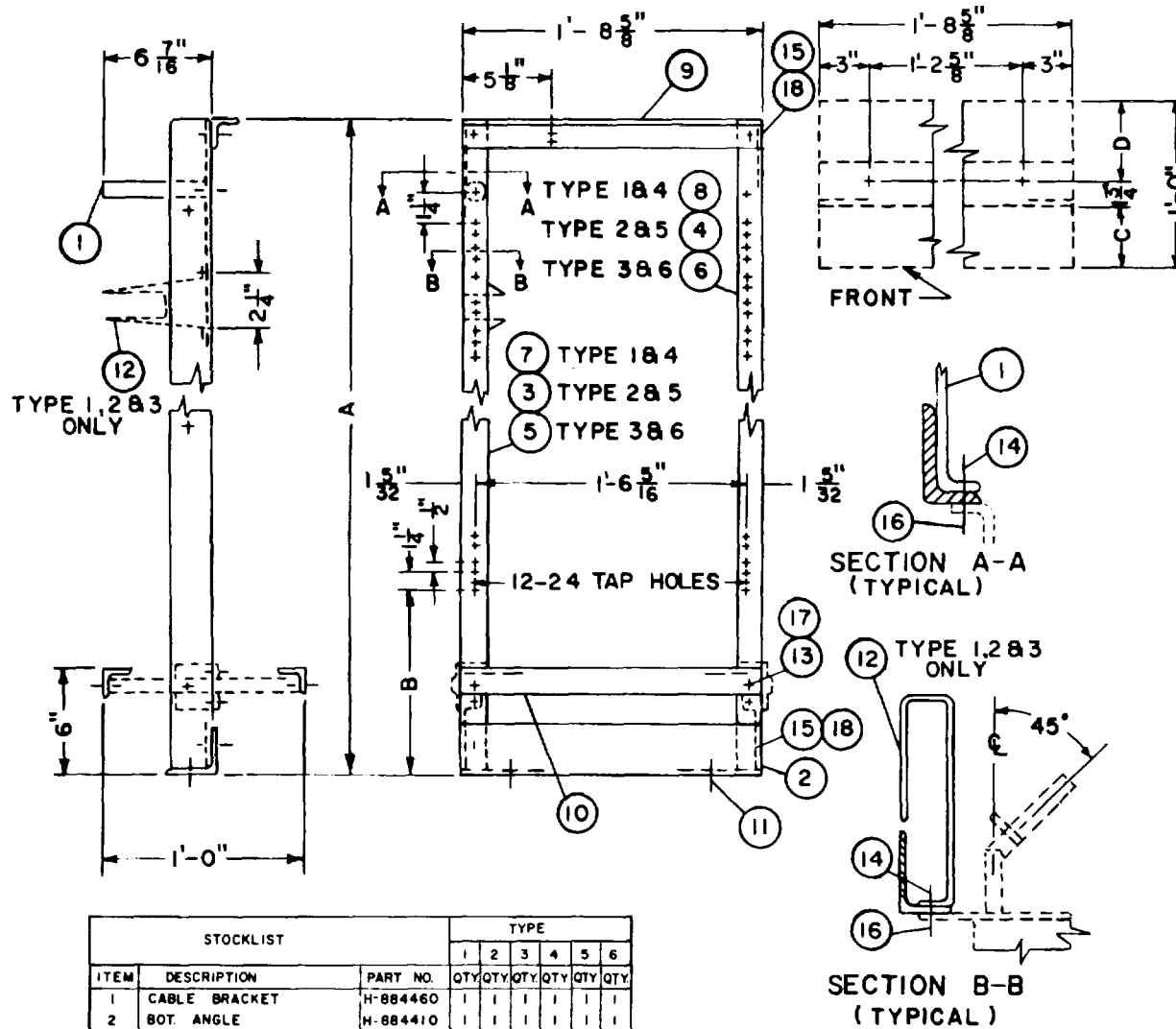
CHAPTER 6
MATERIEL USED IN CONJUNCTION WITH MAJOR ITEM

6-1. Electrical Equipment Racks

The electrical equipment racks are fabricated from steel and provide installation for the recorder and The electrical connector assembly MX-9457/GT (para 6-2) The vertical rack columns contain 12-24 tapped holes, 1 1/4 inches apart. The tapped holes are on 19-inch centerline-to-centerline patterns. Racks are furnished in three heights: 7 1/2 feet, 9 feet, and 11 feet 8 inches. Hardware required for installation of the recorder listed in paragraph 2-2 and in figure 1-3. and electrical connector assembly (patch panel) is

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

The electrical connector assembly (patch panel) is equipped with 30 connectors which can receive the 10-pin connectors on the input cables (para 1-8b). 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 recorder



ITEM	DESCRIPTION	PART NO.	TYPE					
			1	2	3	4	5	6
1	CABLE BRACKET	H-884460						
2	BOT. ANGLE	H-884410						
3	UPRIGHT - LEFT	H-884445						
4	UPRIGHT - RIGHT	H-884445						
5	UPRIGHT - LEFT	H-884447						
6	UPRIGHT - RIGHT	H-884447						
7	UPRIGHT - LEFT	H-884449						
8	UPRIGHT - RIGHT	H-884449						
9	TOP ANGLE	H-884477						
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			
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			
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"

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Figure 6-1. Electrical equipment racks

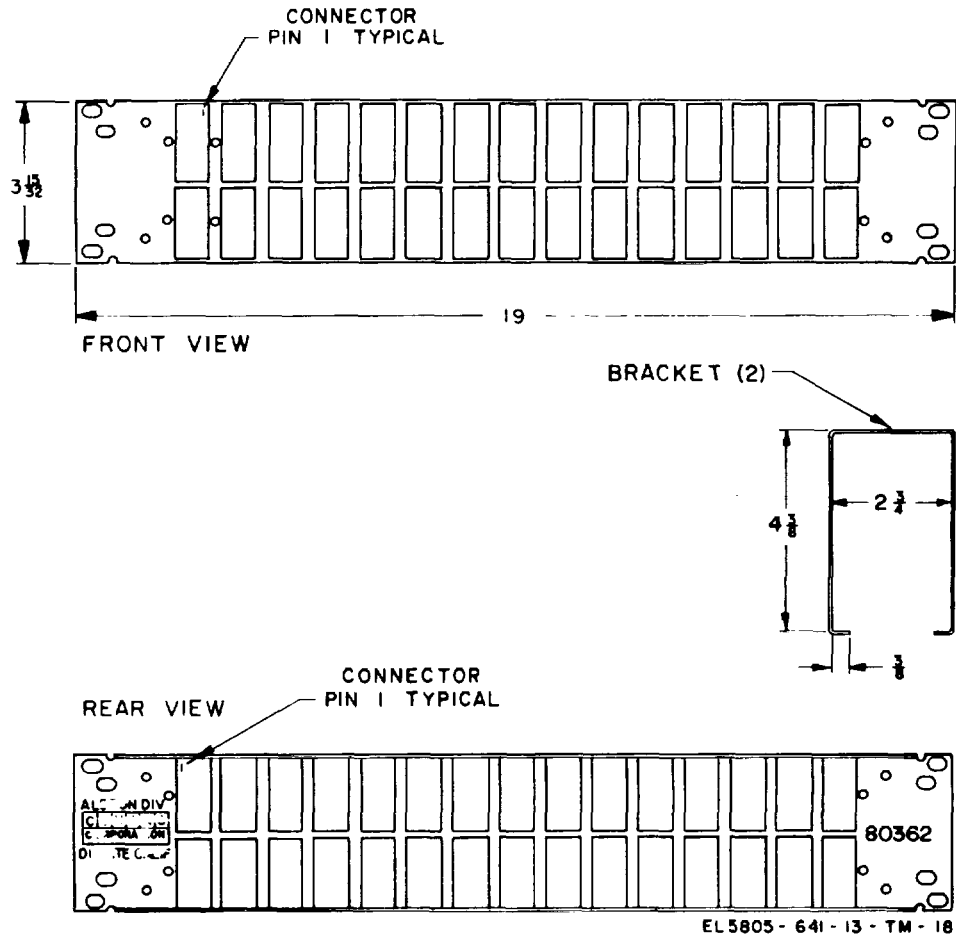


Figure 6-2. Electrical Connector Assembly MX-9457/GT.

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	U.S. Army Equipment Index of Modification Work Orders.
TM 11-5805-640-13	Operator, Organizational, and Direct Support Maintenance Manual Including Repair Parts and Special Tools List: Scanner Group OA-8746(V)1/GT and OA-8746(V)2/GT.
TM 11-5805-642-13	Operator, Organizational, and Direct Support Maintenance Manual Including Repair Parts and Special Tools List: Counter Group, Digital OA-8745(V)1/GT and OA-8745(V)2/GT.
TM 11-5805-643-13	Operator, Organizational, and Direct Support Maintenance Manual Including Repair Parts and Special Tools List: Decoder Group OX-32 /GT.
TM 38-750	The Army Maintenance Management System (TAMMS). TM 740-90-1
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

**APPENDIX B
BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST
AND ORGANIZATIONAL AND DIRECT SUPPORT MAINTENANCE
REPAIR PARTS AND SPECIAL TOOLS LIST**

Section I. INTRODUCTION

B-1. Scope

This appendix lists repair *parts* required for the performance of organizational and direct support maintenance of the RO-452/GT

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. *Section II -Basic Issue Items List.* Not applicable
- b. *Section III -Items Troop Installed or Authorized List.* Not applicable.
- c. *Section IV -Repair Parts List.* A list of as repair parts authorized for use in the performance of maintenance. The 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. *Section V --Special Tools List.* Not applicable
- e. *Section VI-Federal Stock and Reference Number Index.* A list, in ascending numerical sequence, of all Federal stock numbers appearing in the listings followed by a list, in alphanumeric sequence, of all reference numbers appearing in the listings. Federal stock number and reference numbers are cross-referenced to each illustration figure and item number appearance.

B3. 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:*

<i>Code</i>	<i>Definition</i>
PA	Item procured and stocked for anticipated or known usage.
XB	Item is not procured or stocked. If not available through salvage, requisition.

NOTE

Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded XA, XD, and aircraft support items restricted by AR 700-42.

(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 the following level of maintenance

<i>Code</i>	<i>Application/Explanation</i>
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 the following maintenance code:

<i>Code</i>	<i>Application/Explanation</i>
Z	Nonreparable. 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 Uniform SMR Code format as follows:

<i>Recoverability codes</i>	<i>Definition</i>
Z	Nonreparable item. When unserviceable, condemn

and dispose 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 708-42 which is used to identify the manufacturer, distributor, or Government agency, etc. number noted on the illustration.

f. Description. Indicates the Federal item identify the item

name and, if required, a minimum description to *g. Unit of Measure [U/M].* Indicates the standard or basic quantity by which the listed item is 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 be requisitioned.

h. Quantity Incorporated in Unit. Indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared 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

(Not applicable)

B-5. How to Locate Repair Parts

a. When Federal stock number or reference number is unknown:

(1) *First.* Using the table of contents determine the functional group within which repair part belongs This is necessary since illustrations are prepared for functional groups and listings are divided into the same groups.
 (2) *Second.* Find the illustration covering the functional group to which the repair part belongs.
 (3) *Third.* Identify the repair part on the illustration and note the illustration figure and the item number of the repair part.

(4) *Fourth.* Using the Repair Parts Listing find the functional group to which the repair part belongs and locate the illustration figure and item

b. When Federal stock number or reference

(1) *First.* Using the Index of Federal Stock Numbers and Reference Numbers, find the pertinent Federal stock number or reference number. This index is in ascending FSN sequence, followed by a list of reference numbers in ascending alphanumeric sequence cross-referenced to the illustration figure number and item number

(2) *Second.* Using the Repair Parts Listing find the functional group of the repair part and the illustration figure number and item number referenced in the Index of Federal Stock Numbers and Reference Numbers

number is known:
 . satisfy the required units of measure will

B-6. Abbreviations

(Not applicable)

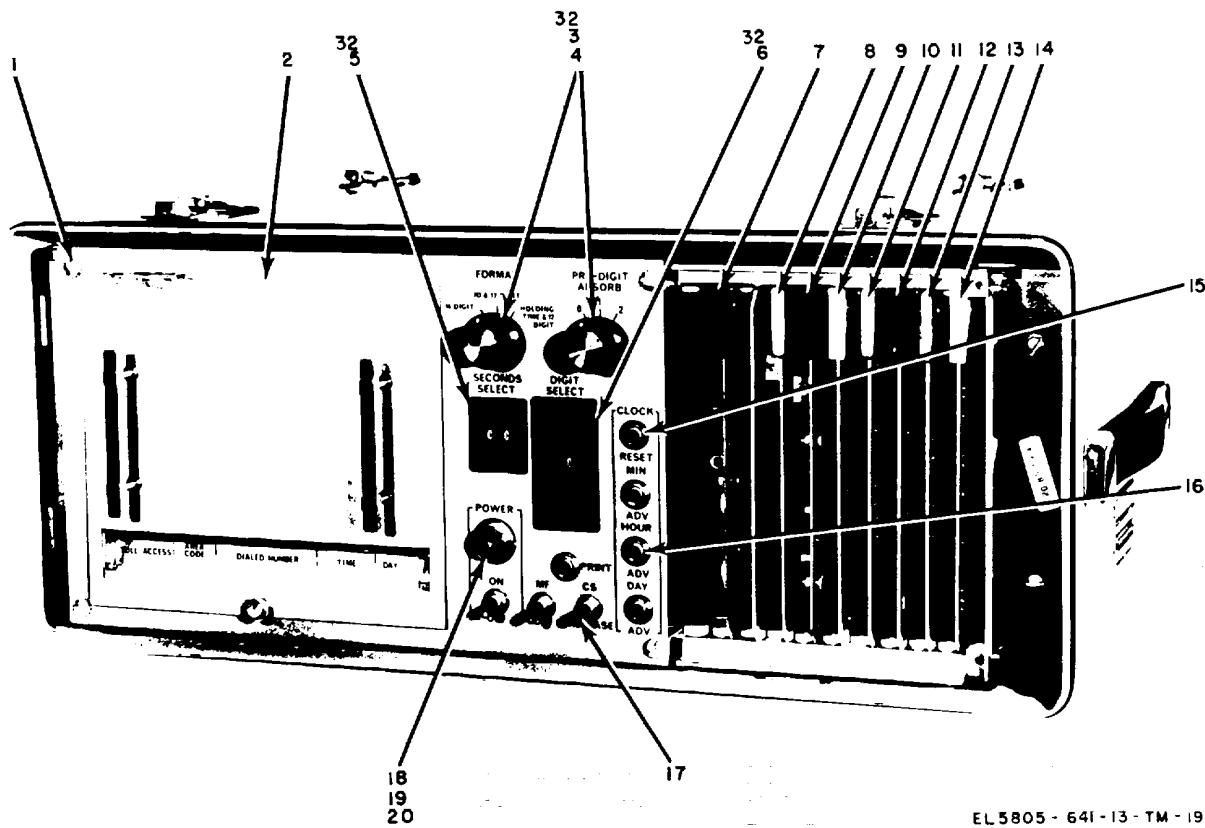
(Next printed page is B-5)

FEDERAL STOCK NUMBER AND PART NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5804-164-3723	B-1	9			
5805-164-3601	B-1	8			
5805-164-3611	B-1	14			
5805-164-3614	B-1	10			
5805-167-0998	B-1	13			
5805-167-1040	B-1	7			
5805-167-1101	B-1	11			
5805-186-0171	B-1	12			
5805-190-5705	B-2	1			
5805-190-5706	B-2	1			
5805-190-5707	B-2	1			
5805-190-5708	B-2	1			
5905-072-0531	B-1	32			
5910-188-2180	B-1	27			
5910-435-6776	B-1	29			
5920-213-1878	B-1	22			
5920-848-8882	B-1	23			
5920-050-1198	B-1	16			
5930-050-1237	B-1	15			
5930-063-6820	B-1	17			
5930-548-4887	B-1	3			
5935-867-9107	B-1	21			
5935-947-8018	B-1	31			
5961-914-6005	B-2	2			
6240-715-0037	B-1	20			
6210-984-6167	B-1	18			
6750-221-6479	B-2	3			

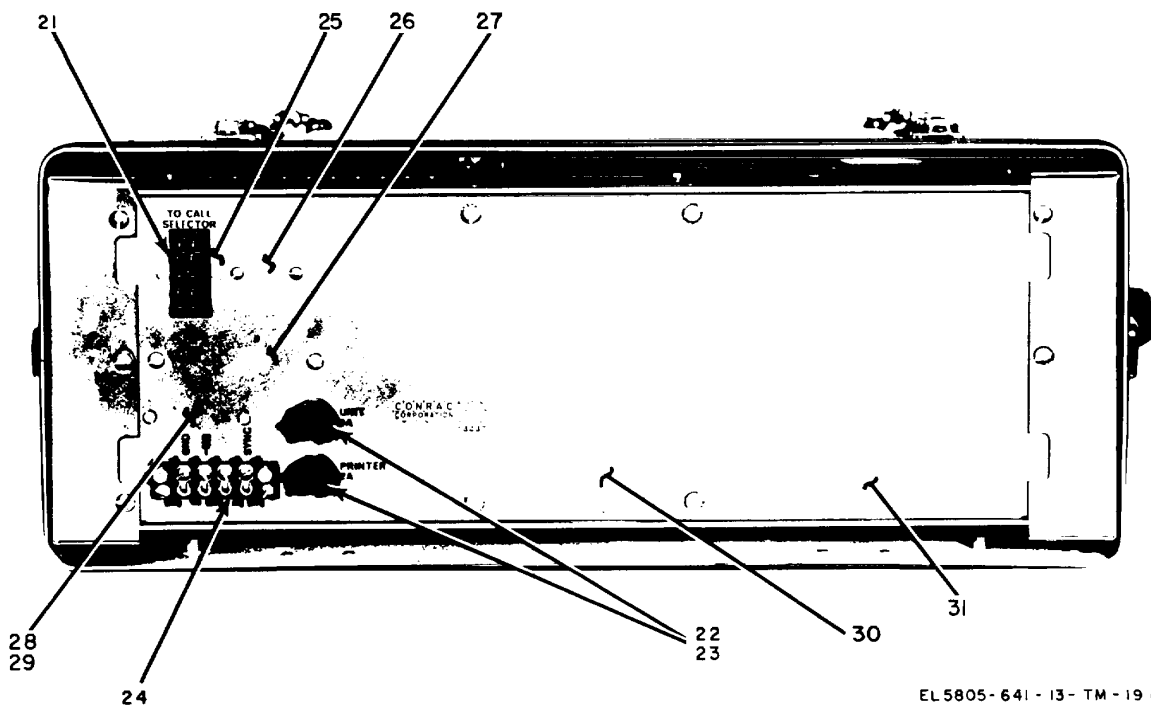
Section VI. FEDERAL STOCK NUMBER AND PART NUMBER INDEX CONTINUED

PART NUMBER	FSCM	FIG. NO.	ITEM NO.	PART NUMBER	FSCM	FIG. NO.	ITEM NO.
AGC2	71400	B-1	23	95-0428-09-301	72619	B-1	18
EB1021	01121	B-1	32				
HTA-DD	71400	B-1	22				
PKS90B	(Toya)	B-1	4				
P310AB	71785	B-1	21				
114003	18672	B-1	30				
209W73-1010-1	18672	B-1	6				
209W73-1014-2	18672	B-1	5				
210130	18672	B-1	35				
216029	18672	B-1	33				
23-1	81073	B-1	15				
251-22-30-160	71785	B-1	31				
3243J	76055	B-1	3				
329094	18672	B-1	2				
331007	18672	B-1	7				
381043	18672	B-1	8				
381044	18672	B-1	9				
381045	18672	B-1	10				
381046	18672	B-1	11				
381047	18672	B-1	12				
381048	18672	B-1	13				
381049	18672	B-1	14				
4-140Y	71785	B-1	24				
48C2	82219	B-1	20				
7101	09353	B-1	16				
7201SYZ	09353	B-1	17				
7717-94N	13103	B-1	34				
8-32X1/2	18672	B-1	1				
81-0112-300 (100)	72619	B-1	19				



EL5805 - 641 - 13 - TM - 19 ①

Figure B-1 ①. Signal Data Recorder RO-GT [sheet 1 of 3]



EL5805 - 641 - 13 - TM - 19 ②

Figure B-1 ②. Signal Data Recorder RO-453 [sheet 2 of 3].

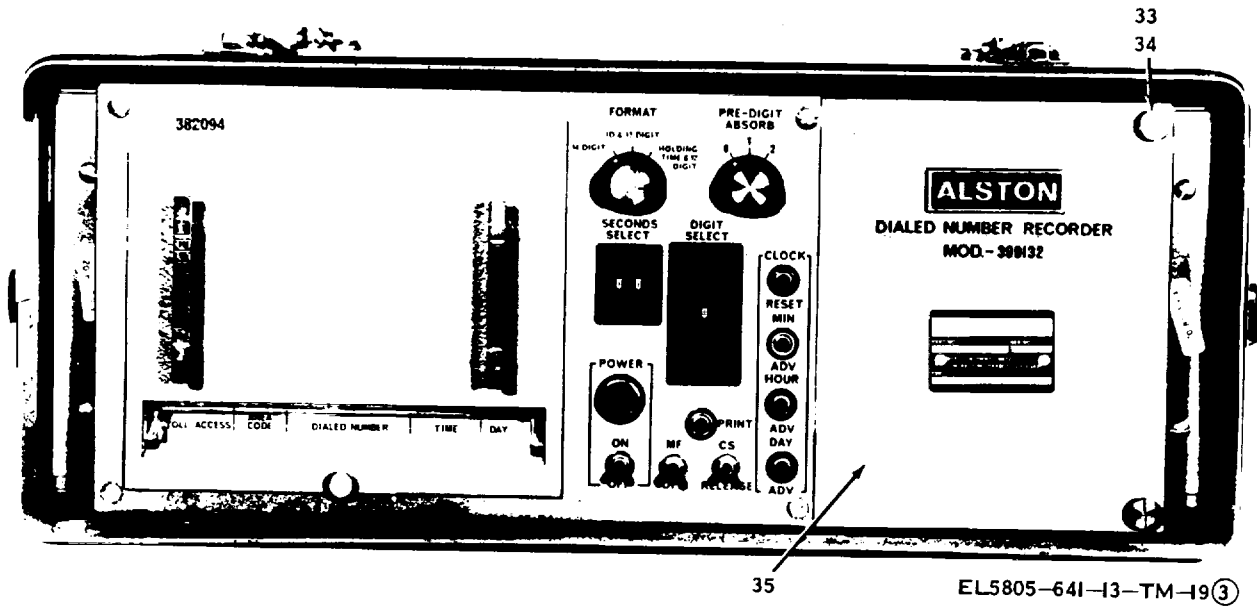


Figure B-1 ③. Signal Data Recorder RO-452/OT [sheet 3 of 3].

B-10

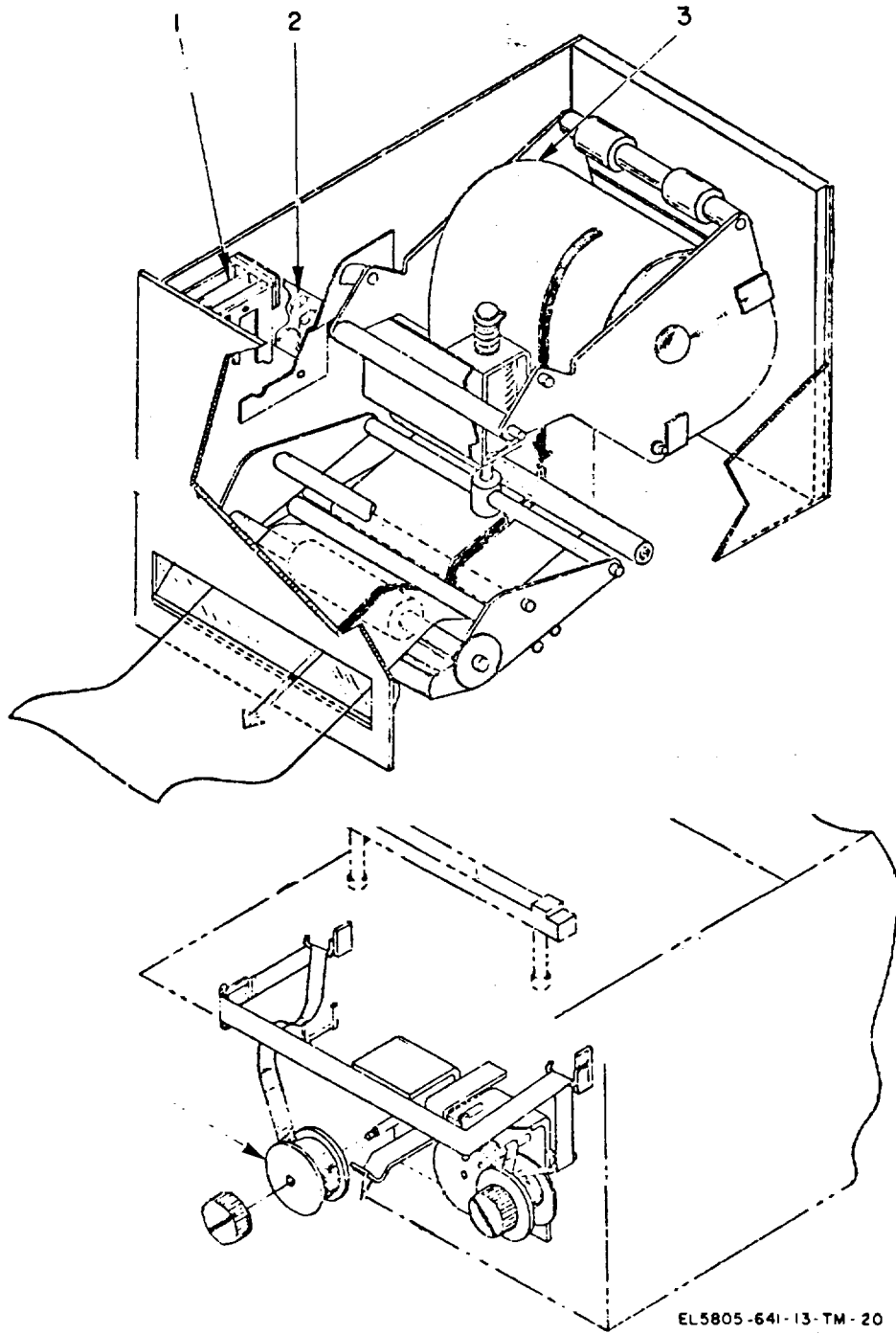


Figure B-2. Printer [moduprinter].

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 Signal Data Recorder Group

C-2. 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 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 of 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 a 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 unserviceable 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 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.

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

b. *Column 2, Functional Group.* 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. *Column 3, Maintenance Function.* Column 3 lists the twelve maintenance functions defined in paragraph C-2 above. Each maintenance function required for an item shall be specified by the symbol among those listed in d below which indicates 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:

- C - Operator/crew
- O-Organizational maintenance
- F-Direct support maintenance
- D-Depot maintenance

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 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: $t = a + 4m + b$.

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

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

g. *Column 5, Remarks.* Self-explanatory.

C4 Explanation of Format of Table I [Tool and Test Equipment Requirements]

The columns in table I are as follows:

a. *Tools and Equipment.* The numbers in this column coincide with the numbers used in the tools and equipment column of the maintenance allocation chart. The numbers indicate the applicable tool for the maintenance function.

b. *Maintenance Category.* The codes in this column indicate the maintenance category normally allocated the facility.

c. *Nomenclature.* This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

d. *Federal Stock Number.* This column lists the Federal stock number of the specific tool or test equipment.

e. *Tool Number.* Not used.

Next printed page is C-3)

Section II. MAINTENANCE ALLOCATION CHART																	
(1) GROUP NUMBER	(2) FUNCTIONAL GROUP COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTIONS											(4) TOLS AND EQUIPMENT	(5) REMARKS			
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD					
	01 GROUP, RECORDER SIGNAL DATA RO-452/GT	C 0.5	F 0.5	C 0.5								F 0.5	D	40.0	1,2	1,2	<p>Refer to preventive maintenance checks and services.</p> <p>Refer to preventive maintenance checks and services.</p> <p>Restore to serviceable condition.</p>

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1 2	F,D F,D	MULTIMETER TS-352B/U TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G NOTE: Skills up to level F are available on site.	6625-242-5023 2 5180-610-8177	

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Fort Huachuca (5)
WSMR (1)
Fort Carson(5)
USAERDAA(1)
USAERDAW (1)
Army Dep (1) except
 LBAD (10)
 SAAD (30)
 TOAD (14)
 ATAD (10)
Sig Dep (2)
Ft Richardson (ECOM Ofc) (1)
Units org under for TOE
 (1 copy each):
 29-134
 29-136

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 310-50.

Section IV. REPAIR PARTS LIST

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	FEDERAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION USABLE ON CODE	U/M	QTY INC IN UNIT
						GROUP 01. SIGNAL DATA RECORDER RO-452/GT		
B-1	1	XBFZZ		8-32 X 1/2	18672	SCREW, THUMB	EA	1
B-1	2	PAFFH		329094	18672	PRINTER (Moduprinter)	EA	1
B-i	3	PAFZZ	5930-548-4887	3243J	76055	SWITCH, ROTARY	EA	2
B-1	4	XBFZZ		PKS90B	Toya	KNOB, SWITCH	EA	2
B-1	5	PAFZZ		209W73-1014-2	18672	SWITCH, THUMBWHEEL	EA	1
B-1	6	PAFZZ		209W73-1010-1	18672	SWITCH, THUMBWHEEL	EA	1
B-1	7	PAFZZ	5805-167-1040	331007	18672	CIRC. CD ASSY, POWER SUPPLY	EA	1
B-1	8	PAFZZ	5805-164-3601	381043	18672	CIRC. CD ASSY, TIME PULSE GEN	EA	1
B-1	9	PAFZZ	5804-164-3723	381044	18672	CIPC. CD ASSY, PRINT CONTROL	EA	1
B-1	10	PAFZZ	5805-164-3614	381045	18672	CIRC. CD ASSY, REGISTER DRIVER	EA	1
B-1	11	PAFZZ	5805-167-1101	381046	18672	CIRC. CD ASSY, INPUT BUFFER	EA	1
B-1	12	PAZZ	5805-186-0171	381047	18672	CIRC. CD ASSY, MF DECODE	EA	1
B-1	13	PAFZZ	5805-167-0998	381048	18672	CIRC. CD ASSY, MF CHANNEL FILTER	EA	1
3-1	14	PAFZZ	5805-164-3611	381049	18672	CIRC. CD ASSY, MF LIMITER	EA	1
B-1	15	PAFZZ	5930-543-1237	23-1	81073	SWITCH, PB, MIN.	EA	5
B-1	16	PAFZZ	5930-050-1198	7101	09353	SWITCH, TOGGLE, MIN, SPDT	EA	2
B-i	17	PAFZZ	5930-063-6820	7201SYZ	09353	SWITCH, TOGGLE, MIN	EA	1
B-1	18	PAFZZ	6210-984-6167	95-0428-09-301	72619	BASE, LAMP	EA	1
B-1	19	PAFZZ		81-0112-300 (100)	2619	LENS, LAMP, GREEN	EA	1
B-1	20	PAFZZ	6240-715-0037	48C2	82219	LAMP	EA	1
B-1	21	PAFZZ	5935-867-9107	P310AB	71785	CONNECTOR, ELEC, MALE, 10 PIN	EA	1
B-1	22	PAFZZ	5920-213-1878	HTA-DD	71400	FUSEHOLDER	EA	2
B-1	23	PAFZZ	5920-848-8882	AGC2	71400	FUSE, 2 A	EA	2
B-1	24	XBFZZ		4-140Y	71785	STRIP, BARRIER	EA	1
B-1	25	PAFZZ		210B1C474	14752	CAPACITOR (BEHIND PANEL)	EA	1
B-1	26	PAFZZ		DU9-A	72128	-TRANSFORMER (BEHIND PANEL)	EA	1
B-1	27	PAFZZ	5910-188-2180	CS13BH1106.	56289	CAPACITOR (BEHIND PANEL)	EA	6
B-1	28	PAFZZ	5910-	210B1C224	14752	CAPACITOR (BEHIND PANEL)	EA	1
B-1	29	PAFZZ	5910-435-6776	5HK-S20	72982	CAPACITOR (BEHIND PANEL)	EA	1
B-1	30	PAFZZ		114003	18672	CONNECTOR, ELEC, 60 PIN (PC BOARDS)	EA	8
B-1	31	PAFZZ	5935-947-8018	251-22-30-160	71785	CONNECTOR, ELEC, 22 PIN (BEND PANEL)	EA	1
B-1	32	PAFZZ	5905-072-0531	EB1021	01121	RESISTOR (BEHIND PANEL)	EA	3
B-1	33	PAFZZ		216029	18672	THUMBSCREW, SLOTTED	EA	2
B-1	34	XBFZZ		7717-94N	13103	RETAINER, PLASTIC, THUMBSCREW	EA	2
B-1	35	XBFZZ		210130	18672	COVER, CARD FILE	EA	2
B-1	1	PAFZZ		CM-10P/ZT/SA	12323	WHEEL, PRINT MODULE	EA	12
B-2	1	FAFZZ	5805-190-5705	CM-12P/ZT/SPS93	12323	WHEEL, PRINT MOLULE	EA	5
B-2	1	PAFZZ	5805-190-5706	CM-12P/ZT/SM	12323	WHEEL, PRINT MOULIE	EA	1
B-2	1	PA7ZZ	5805-190-5707	CM-10P/ZT/SG	12323	WHEEL, PRINT MDUJLE	EA	1

SECTION IV. REPAIR PARTS LIST CONTINUED

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	FEDERAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION USABLE ON CODE	U/M	QTY INC IN UNIT
B-2	1	PAFZZ	5805-190-5708	CM-10P/ZT/SN	12323	WHEEL, PRINT MODULE.....	EA	1
B-2	2		5961-914-6005	1N4004	80131	DIODE	EA	75
B-2	3	PAFZZ	6750-221-6479	355001	18672	PAPER, PRINTER.....	EA	1
B-2	4	PAFZZ		SB421	18672	RIBBON, PRINTER.....	EA	1

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