

COMMON SYSTEMS
RECORDED ANNOUNCEMENT FRAME (CSRAF)

SD-97725-01 AND SD-97725-02

DESCRIPTION

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1. INTRODUCTION

A. General

1.01 This section describes the Common Systems Recorded Announcement Frame (CSRAF), which can be arranged to provide ▶four◀ basic types of recorded announcements:

- Variable message length (VML) announcement
- Modular message (MM) announcement
- Phased message (PM) announcement
- ▶Message synthesis service (MSS)◀

The CSRAF is adaptable to most announcement applications, providing heavy-duty recorded announcement services from the central office.

1.02 This section is reissued to provide information for the message synthesis service (MSS) version of the CSRAF and to generally update this section.

1.03 This section also includes descriptive information for the record ▶(where applicable)◀ and playback (R/P) modes of the basic recorded announcements, new capabilities and options, interfacing information, alarm features, and equipment information. Detailed functional descriptions of the frame operations are also contained within, including functional and layout schematics.

Note 1: Figures 1, 2, 3, and 4 illustrate typical frame arrangement for the four basic types of recorded announcements. Three of the basic types of announcements (VM, MM, and PM) or any combination thereof can be contained on any one frame to meet the service objectives for recorded announcements. ▶The remaining type (MSS) cannot be combined with the other types because of timing differences, drum rotation speed, and frame layout as will be explained later in this document.

Note 2: Unless otherwise specified all information in this section pertains to all versions of the CSRAF. When any information pertains to a particular version it will be specified by using VML for variable message length, MM for modular message, PM for phased message and MSS for message synthesis service.◆

1.04 The CSRAF fulfills the need for improved heavy-duty recorded announcement facilities. The improvements that the CSRAF has made lie in the following general areas:

- Greater channel (message) capacity
- Substantially more versatility to provide for new and varying applications
- Improved reliability
- Improved quality so that the fidelity of an announcement does not deteriorate during the life of the announcement
- Modular design
- Substantially reduced maintenance.

B. Field of Use

1.05 The initial use of the CSRAF equipped with phased message service is in the No. 4 Electronic Switching System (ESS). A version equipped with modular message and variable message length services is used in the No. 5 XBAR Phase II Automatic Call Distributor (ACD). ◆A version equipped with message synthesis service is intended for use in the Automatic Intercept System (AIS).◆ The design improvements offered by the CSRAF make it adaptable for Common Systems use.

C. Capacity

1.06 The number of channels available on the CSRAF is limited by the physical mounting capacity of the frame and the storage capacity of the KS-20951 drum storage unit.

1.07 The KS-20951 drum storage unit (the magnetic storage medium for audio announcements) has a capacity for 200 separate tracks of recorded information. ◆When the frame is equipped with VML and/or MM or PM-type announcement service,

each of the tracks provides 4 seconds of recorded information, and the tracks can be electronically pieced together to provide longer announcements in 4-second increments. When the frame is equipped for MSS, each of the tracks provides 3 seconds of recorded information. This 3 second track is electronically divided into 2 alike announcements of 1.5 seconds duration, or into 6 alike announcements of .5 seconds duration.◆

1.08 The channels on the CSRAF are arranged in channel modules, one for each of the basic types of recorded announcements. ◆When provided with VML, MM, or PM service a maximum of nine of these channel modules can be mounted on the frame. When provided with MSS, due to duplication on the same frame and system requirements, the need for additional channel modules is unnecessary.◆ The VML channel module contains a maximum of 3 channels; the MM channel module contains a maximum of 24 channels; the PM channel module contains 1 channel; ◆and the MSS channel module contains a maximum of 96 channels.◆ Table A illustrates the channel capacity of a frame when it is equipped with only one type of channel. A mixture of channels however (VML, MM, and PM), will alter the channel capacity of the frame.

◆**Note:** MSS cannot be mixed on the same frame with other versions due to timing differences.◆

D. Modes of Operation

1.09 The mode of operation of the CSRAF is as follows:

Recorder/Reproducer ◆(VML, MM, PM only)◆

- Record live
- Dub from tape
- Reproduce.

◆Reproducer Only (MSS only)

- Reproduce from prerecorded drum.◆

2. DESIGN

2.01 The CSRAF design is based upon a modular building block concept which results in a unit with substantial versatility and, consequently,

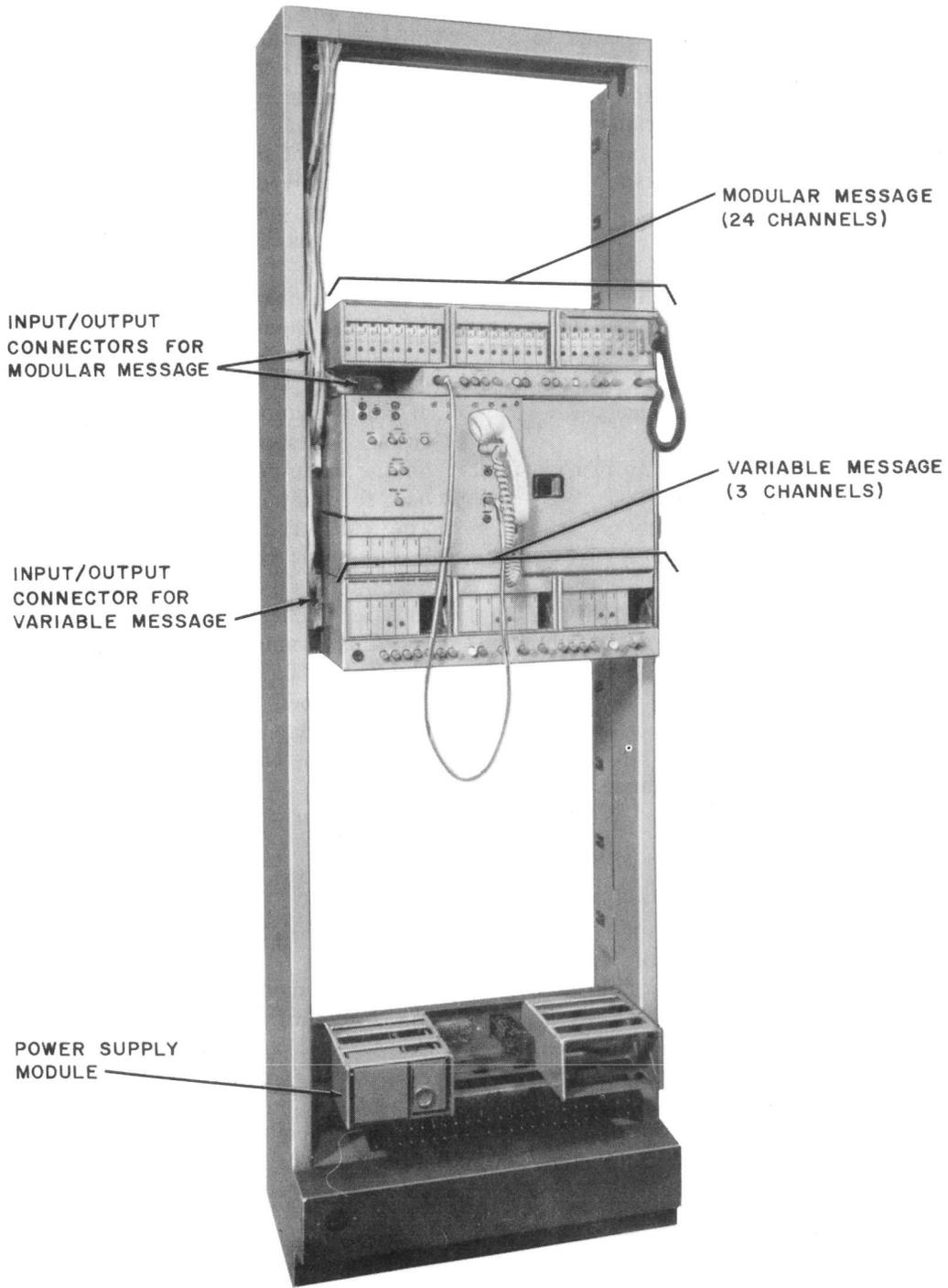


Fig. 1—Typical Frame Arrangement for the Modular Message Announcement and Variable Message Announcement

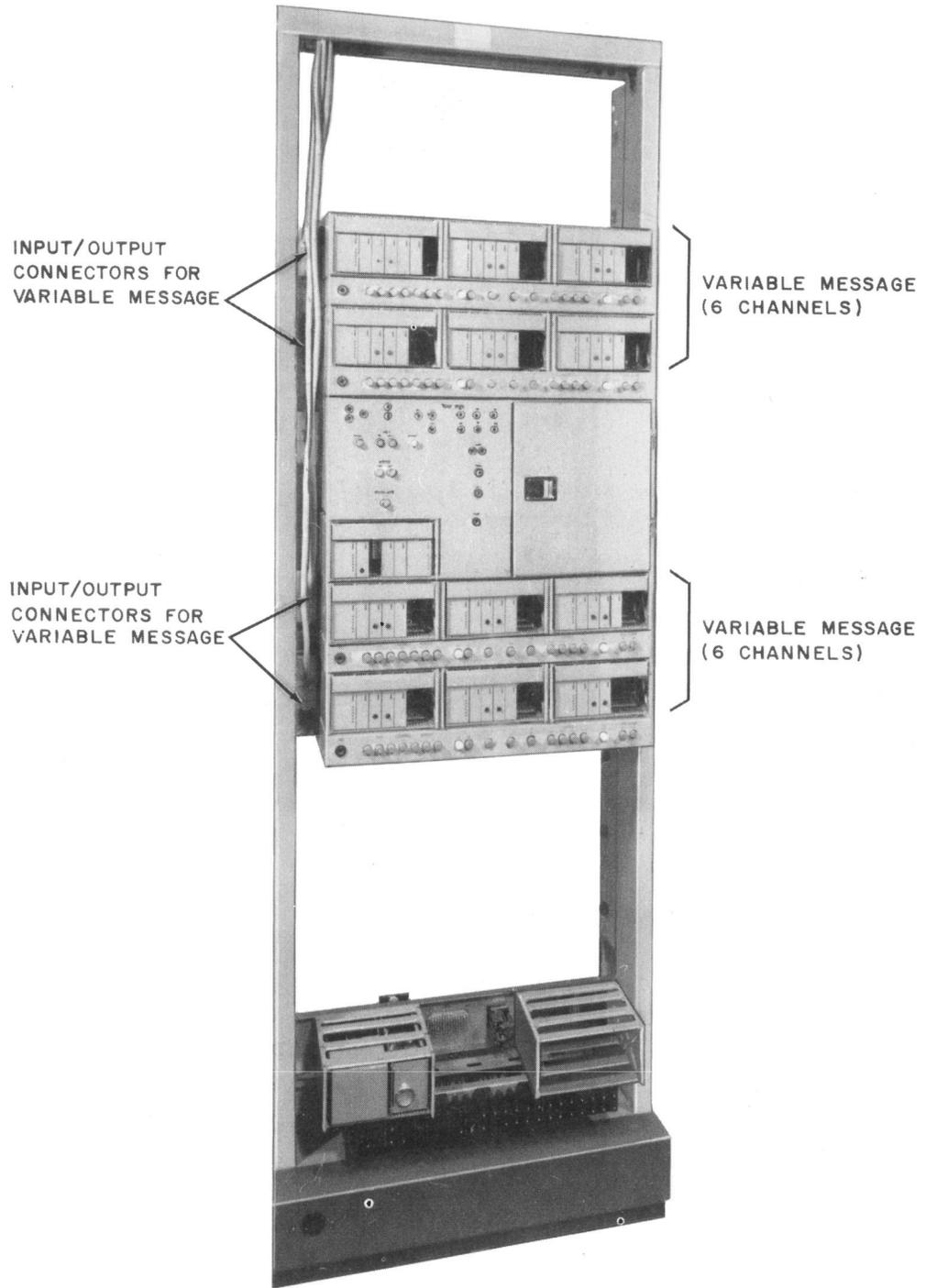


Fig. 2—Typical Frame Arrangement for the Variable Message Announcement (12 Channels Shown)

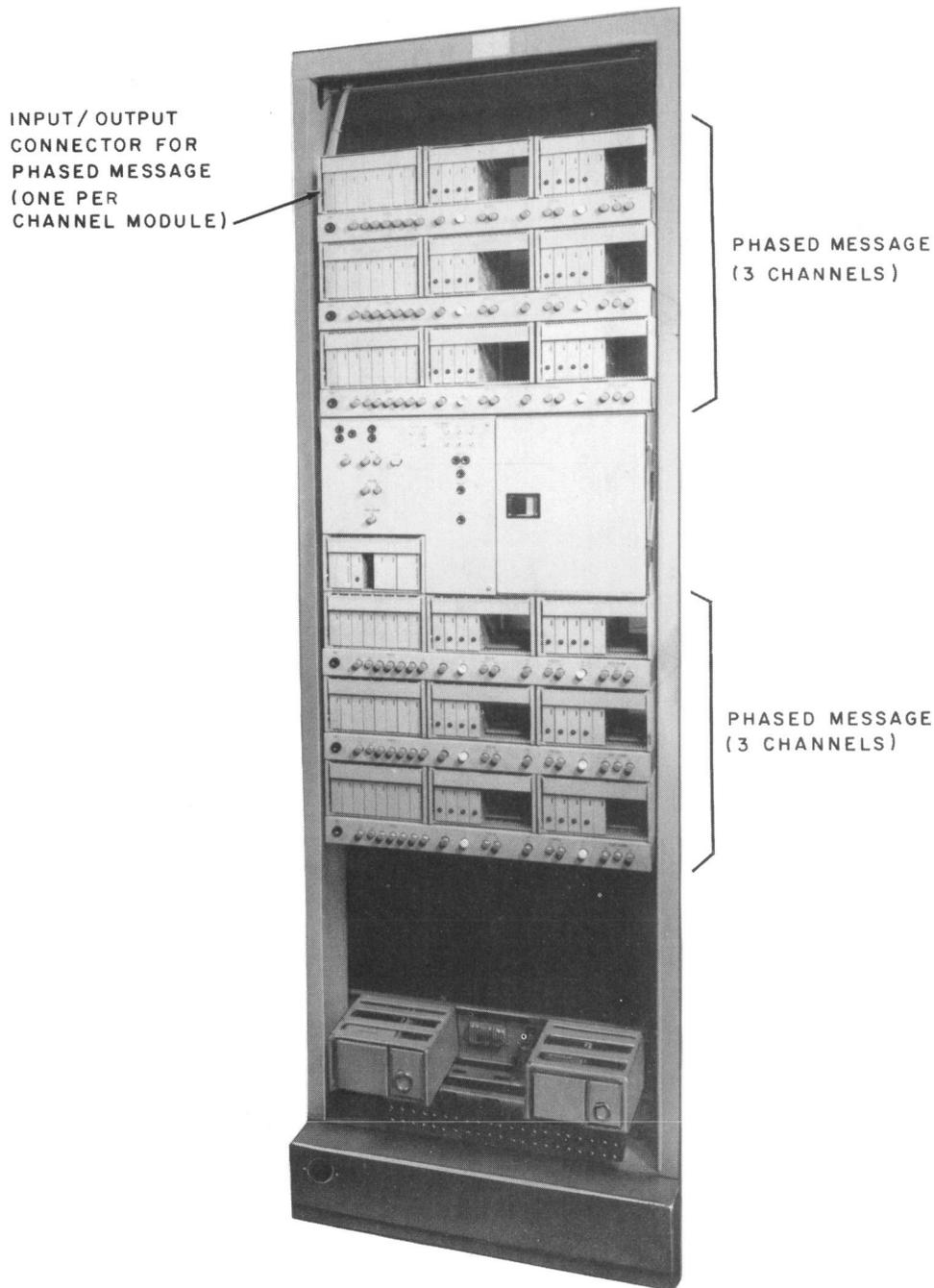


Fig. 3—Typical Frame Arrangement for the Phased Message Announcement (6 Channels Shown)

the capability to provide many types of announcement services. The CSRAF is largely electronic in nature, and all circuits are mounted on plug-in circuit packs having the envelope configuration of No. 1 ESS circuit packs. The overall design is thus based upon making maximum use of available apparatus

and design technology developed for No. 1 ESS. As a result, the entire frame resembles the appearance of No. 1 ESS equipment. Also, the units on the frame are limited to only those that are required for proper operation of the frame. These units may vary depending on the service

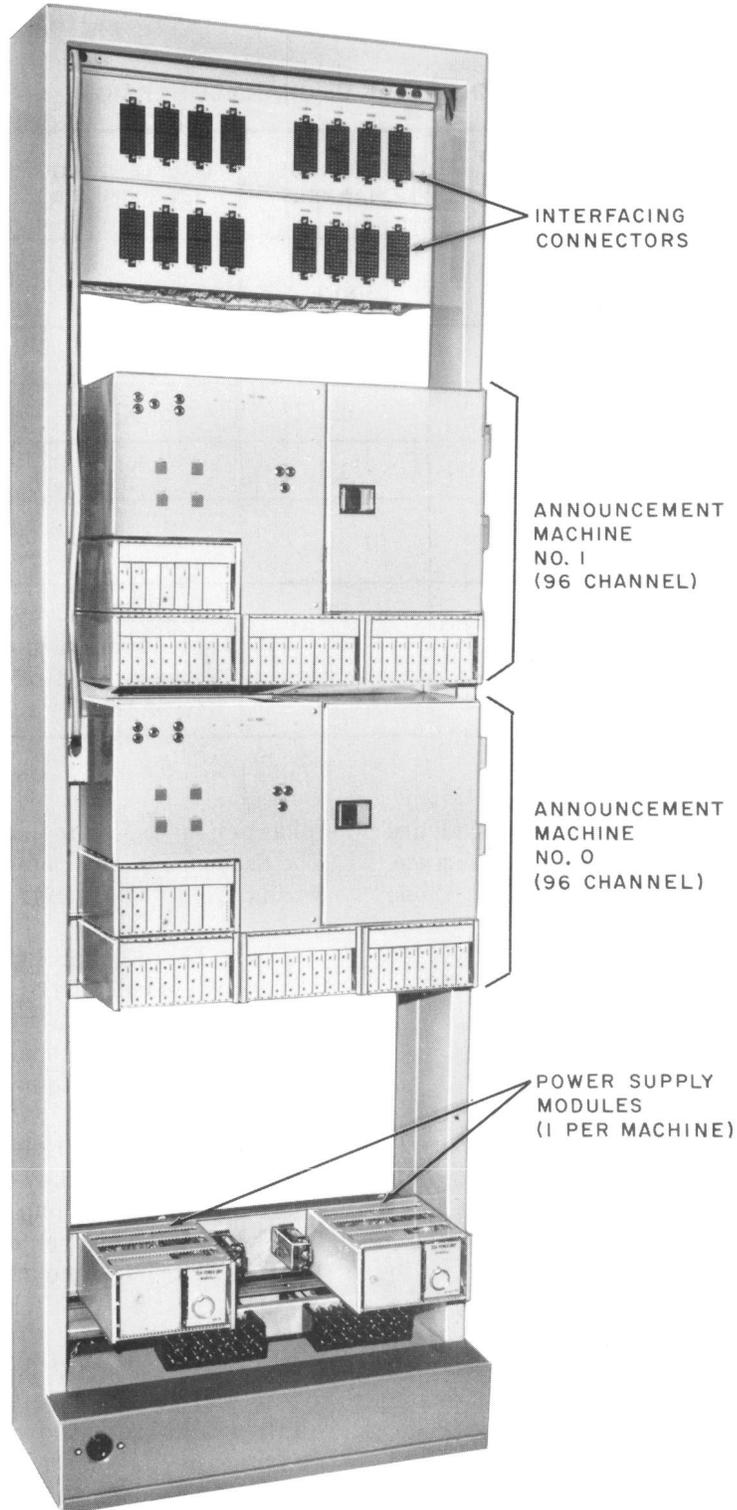


Fig. 4—Typical Frame Arrangement for the Message Synthesis Service Announcement (Duplicated Machines Per Frame)

→TABLE A←

MAXIMUM NO. CHANNELS VS CHANNEL VERSION

CHANNEL VERSION	MAXIMUM MESSAGE LENGTH FOR EACH CHANNEL	NUMBER OF CHANNELS	DRUM STORAGE UNIT LIMITED	FRAME LIMITED
Modular Message	4 seconds	200	X	
	16 seconds	27		X
	32 seconds	25	X	
	48 seconds	16	X	
Phased Message	12 seconds	9		X
Message Synthesis Service	.5 seconds or 1.5 seconds	96	Limited only by specification for present requirements of 96 channels	

provided, but in general the units required are for the recording, playback, control, maintenance, and test of the audio signal. In general, these units are:◆

- (a) Drum storage unit
- (b) R/P electronics
- (c) Control and maintenance circuits
- (d) Alarm circuits
- (e) Power and fuse circuits.

◆With the exception of MSS which provides interfacing connectors at the upper portion of the frame for both machines (Fig. 4),◆ all interfacing circuits, generally distribution and trunk circuits, are located on separate interfacing frames which are part of the switching system providing the recorded announcement service.

2.02 Flat cable is used extensively in the drum storage unit (Fig. 5) to permit a more compact design. Also ◆for VML, MM and PM type announcements◆ flexible printed wiring (FPW) (Fig. 6) is used on the back plane of the frame

(channel modules) to interconnect circuit packs. The use of FPW eliminates conventional point-to-point wiring from unit to unit.

◆**Note:** For MSS type announcements (FPW) is not used on the back plane of the frame (channel modules) to interconnect circuit packs because of the small amount of point-to-point wiring that is required. See Fig. 7.◆

2.03 The associated electronics contribute to the versatility of the CSRAF. A family of circuit packs provides a group of basic building blocks from which the proper circuits can be assembled for the particular announcement application.

2.04 The mechanical design of the drum storage unit results chiefly in improved reliability, quality, and reduced maintenance. With the exception of the rotating magnetic drum, all moving parts have been eliminated. There are no traversing heads or other mechanisms, and the drum is driven directly from a very low-speed DC servo motor, thereby eliminating the need for speed reducing gears, belts, and pulleys. The use of this motor also eliminates the need for 110 VAC power; therefore, no AC is required on the frame.

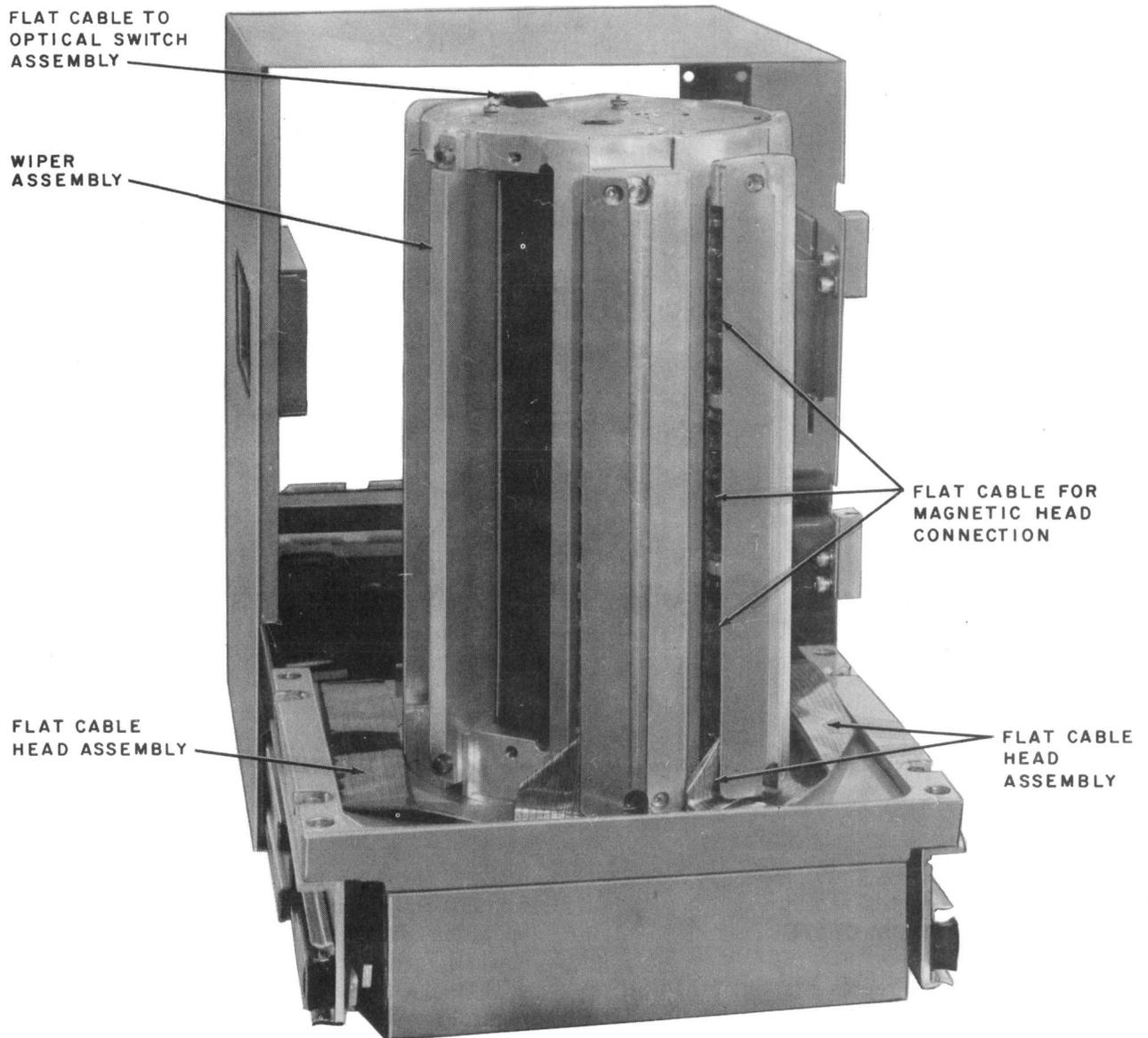


Fig. 5—Flat Cable of Drum Storage Unit

2.05 The flexible design of the magnetic heads and head bar assemblies and the channel module and control units are such that, as the need for increased or varying service arises, the capabilities and features of the frame can be increased. If increased service is needed, a head bar assembly equipped with 20 heads can be added, thus providing an additional 80 seconds of storage capacity for VML, MM, or PM service, or 60 seconds of storage capacity for MSS. Various

configurations of channel modules and control units for VML, MM, or PM service can be added to meet new requirements.

Note: Because of limitations by specification for present requirements of 96 channels for MSS, no provisions have been made for adding additional channel modules to meet new requirements.

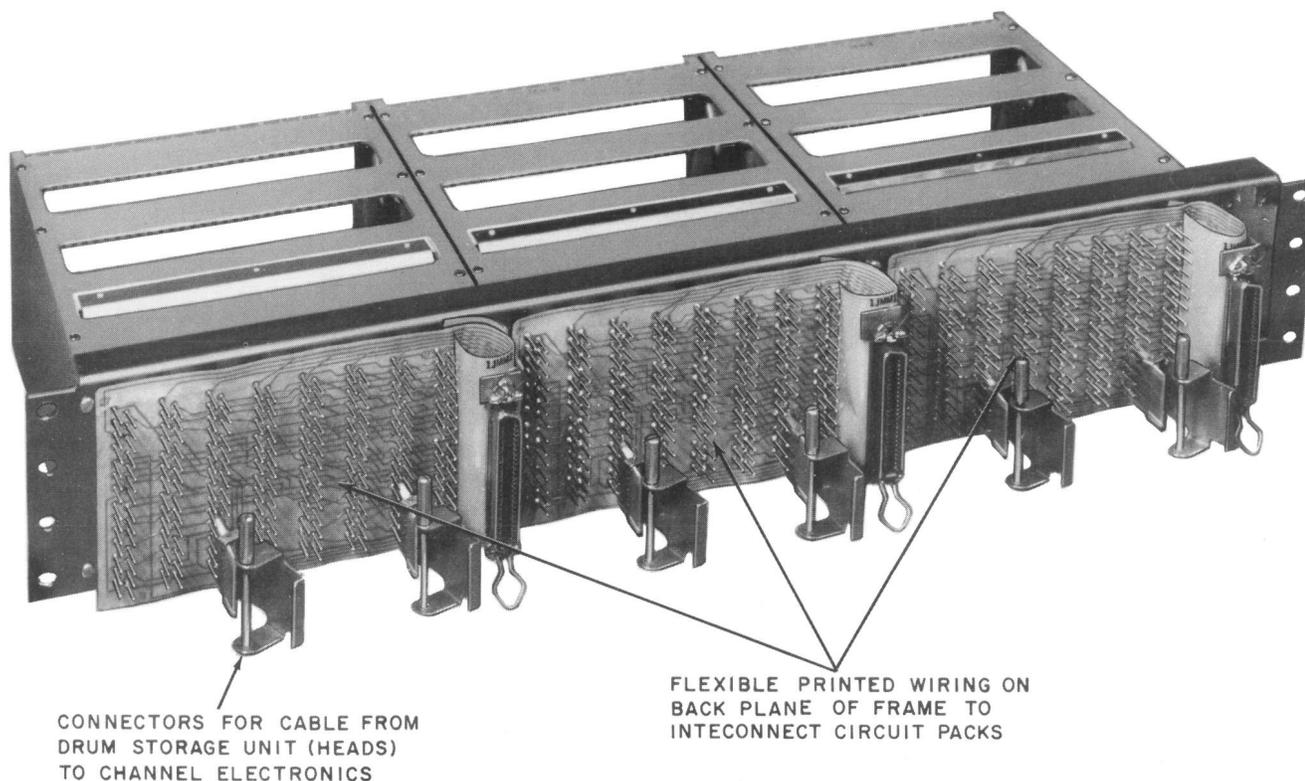


Fig. 6—Rear View of a Channel Module Showing Flexible Printed Wiring (Used With VML, MM and PM Only)

3. GENERAL

◆FOR VML, MM, AND PM ONLY◆

3.01 A diagrammatic representation of the CSRAF is shown in Fig. 8. This figure shows the physical location and arrangement of the various circuits. The 200-track drum storage unit (recorder-reproducer) is located approximately 5 feet above floor level on the right side of the frame. The section containing the drum storage unit (recorder-reproducer) is called the storage module. The left portion of the storage module contains controls and maintenance elements common to the entire frame. The audio channel electronics consist of various types of printed circuit boards, as shown in the inserts in Fig. 8.

3.02 The modular and variable message channels are arranged in horizontal rows within the channel module, 24 channels for modular or 3 channels for variable to a channel module. The phased message channel requires an entire channel

module for each announcement. Each channel contains the circuit packs required for independent operation of the channel. The channel modules are stacked vertically on the frame in numerical order with a maximum of nine modules per frame regardless of the type of announcement.

3.03 The drum storage unit tracks can be pieced together to provide multichannel VML service or used individually to provide a maximum of two hundred 4-second tracks for short message-type (4 seconds or less) service. The tracks may also be arranged to provide fixed length phased message announcement service.

3.04 The modular message announcement requires a repetitive 1.33-second announcement, achieved by dividing a 4-second recording track into three equal parts. No switching of heads is involved; therefore, the electronics for this type message channel are relatively simple. Only one circuit pack is required for this announcement. It consists of an R/P amplifier, the logic required to

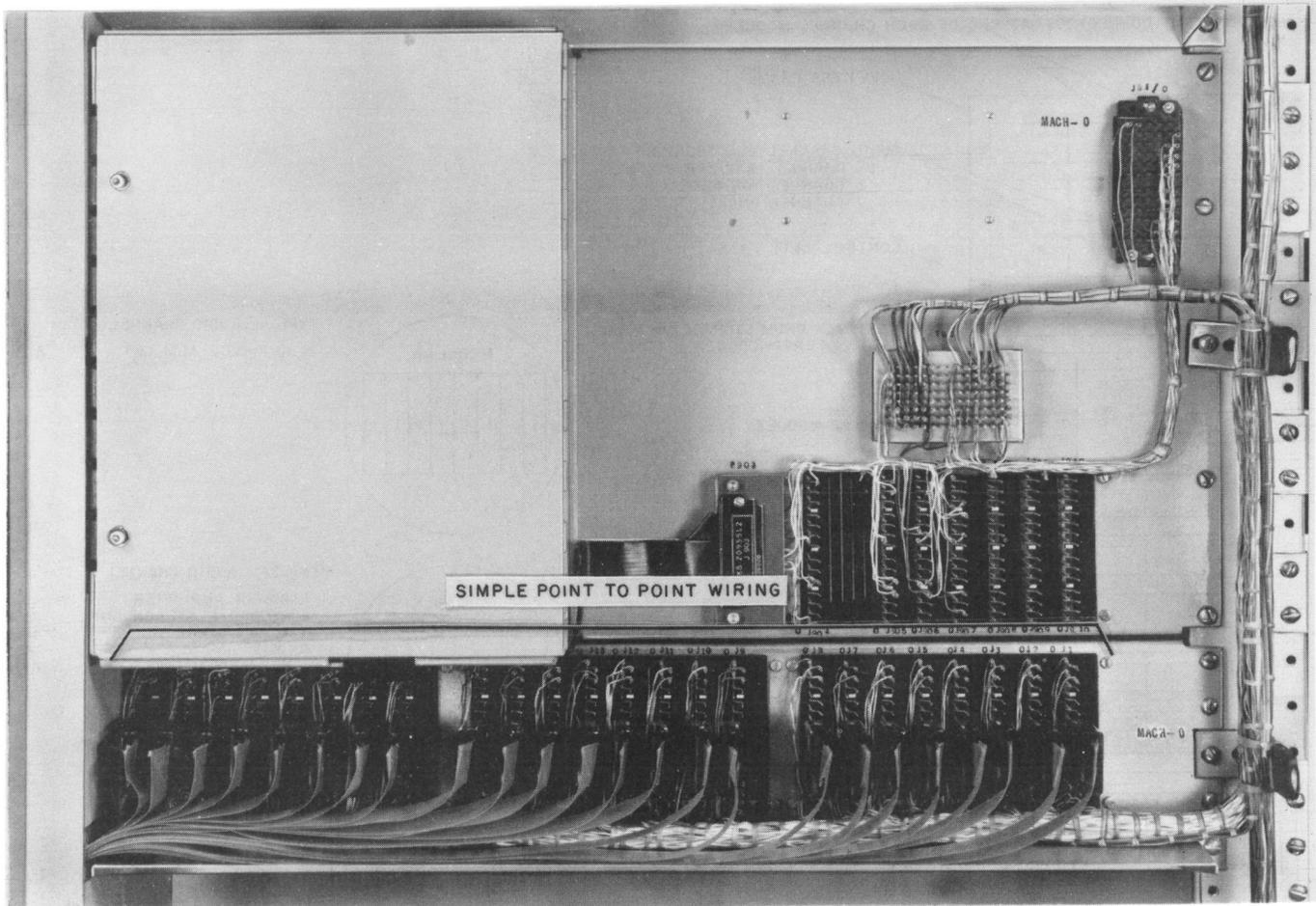


Fig. 7—Rear View of MSS Channel Module Showing Point to Point Wiring

record the name of a city or area or other short messages three times on a 4-second track, and voice alarm circuitry to indicate loss of audio signal at the output.

3.05 With variable message announcement, each channel can be provided for maximum message lengths of 16, 32, or 48 seconds by equipping the channel with either 1-, 2-, or 3-head switching circuit packs and accessing the channel to either 4, 8, or 12 tracks on the drum storage unit. The length of the message is established during recording (in 4-second increments up to the capacity of the channel) and causes the associated electronics to reset at the end of the message, thereby eliminating long silent periods.

3.06 With phased message announcement, a 12-second message is required that is "phased"

so that the beginning of the message is available every 4 seconds. During the recording process, the 12-second recorded announcement is automatically separated into three 4-second segments, with each segment being recorded by a stationary magnetic record head. During the playback mode, these three heads are switched in the proper sequence into the input of a playback amplifier. A 4-second silent period between repetitions of the announcement results in a 16-second cycle. Four sets of amplifiers are used. Therefore, by properly switching the three magnetic heads to the four amplifiers, four phases of the message are possible, and the position of the silent period indicates the amplifier which will start the announcement within 4 seconds.

3.07 Immediately below each channel module is a control unit serving the channel(s) immediately above it, an arrangement which adds

SECTION 201-520-101

INPUT / OUTPUT CONNECTORS (AT END OF EACH CHANNEL MODULE)

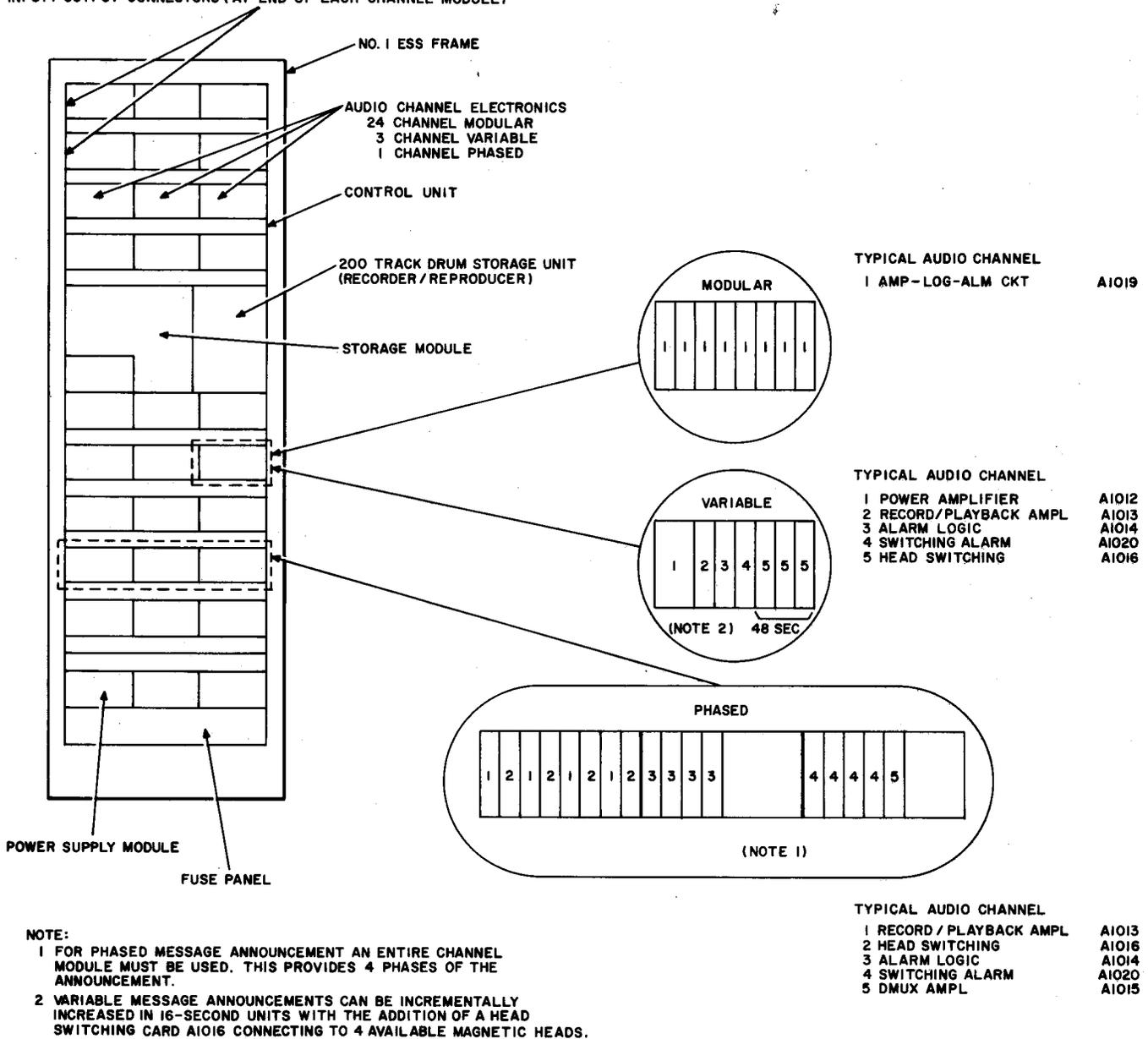


Fig. 8—Common Systems Recorded Announcement Frame—Diagrammatic Representation (VML, MM, and PM Only)

versatility to the CSRAF in that control units are added as channel modules are added. Control units are available in three configurations to provide for some differences in control that are required for the three channel modules.

3.08 The base of the frame contains a power supply module for providing the proper DC voltages and a fuse panel so that each channel can be separately fused.

Note: For modular message announcement, the entire channel module (24 channels) is fused to one common fuse.

♦FOR MSS ONLY

3.09 A diagrammatic representation of the CSRAF is shown in Fig. 9. This figure shows the physical location and arrangement of the various circuits. The basic prerecorded messages for MSS version of the CSRAF is provided by fully duplicated systems. Since the announcement equipment and the prerecorded messages they provide are both duplicated, only the description of one unit will be described for the purpose of this section except where warranted. The 200-track drum storage units are located on the right side of the frame. The section containing the drum storage unit (reproducer) is called the storage module. The left portion of the storage module contains controls and maintenance elements common to the associated machine. The audio channel electronics consists of A1102 type printed circuit boards, as shown in the insert in Fig. 9.

3.10 The MSS channels are arranged vertically on the quad amplifier circuit pack, 4 amplifiers per circuit pack, with each amplifier serving 1 announcement track. The circuit packs are arranged in a horizontal row within the channel module, 24 circuit packs per module or a total of 96 channels.

3.11 The announcement tracks after being reproduced from the drum storage unit are amplified by the associated amplifier on this frame. The announcements are then seized and pieced together electronically by the user system. No switching or connecting together of channels is performed on the MSS version of the CSRAF.

3.12 The MSS announcement provides message lengths of .5 second and 1.5 seconds. With the drum rotation at 20 rpm, the 1.5 second

announcement is recorded twice on the circumference of the same drum channel and the .5 second announcement is recorded 6 times on the circumference of the same drum channel. Each drum channel is connected to only one head, therefore no switching of heads is involved. Also the electronics for this type message channel is relatively simple. Only one circuit pack is required per 4 channels. It consists of 4 amplifiers capable of amplifying each of the 4 channels that it serves on a one-to-one basis.

3.13 The user system through stored program control is capable of connecting to a channel, extracting a 1.5 second or a .5 second phrase, piecing together in proper sequence several of these phrases to form an uninterrupted announcement.

3.14 No control units are provided for the channel modules because all controlling and accessing of the channels is performed by the user system.

3.15 The base of the frame contains two power supply modules. Each power supply module is associated with one of the duplicated systems contained on the frame. Each power supply module provides the proper DC voltages and a fuse panel provides the proper fusing for each machine.♦

4. EQUIPMENT ELEMENTS

4.01 The CSRAF equipment described in this section is designed to function in heavy-duty recorded announcement applications. This part provides a functional and physical description of each unit in the CSRAF.

A. Storage Module

♦FOR VML, MM, AND PM ONLY♦

4.02 The storage module (Fig. 10) contains the drum storage unit on the right side, a common control panel on the left side which consists of functions required for frame maintenance, and a 36A apparatus mounting frame for holding circuit packs. The packs provide the following:

- Control of the DC servo motor located in the drum storage unit
- Bias and erase signals
- Frame timing signals.

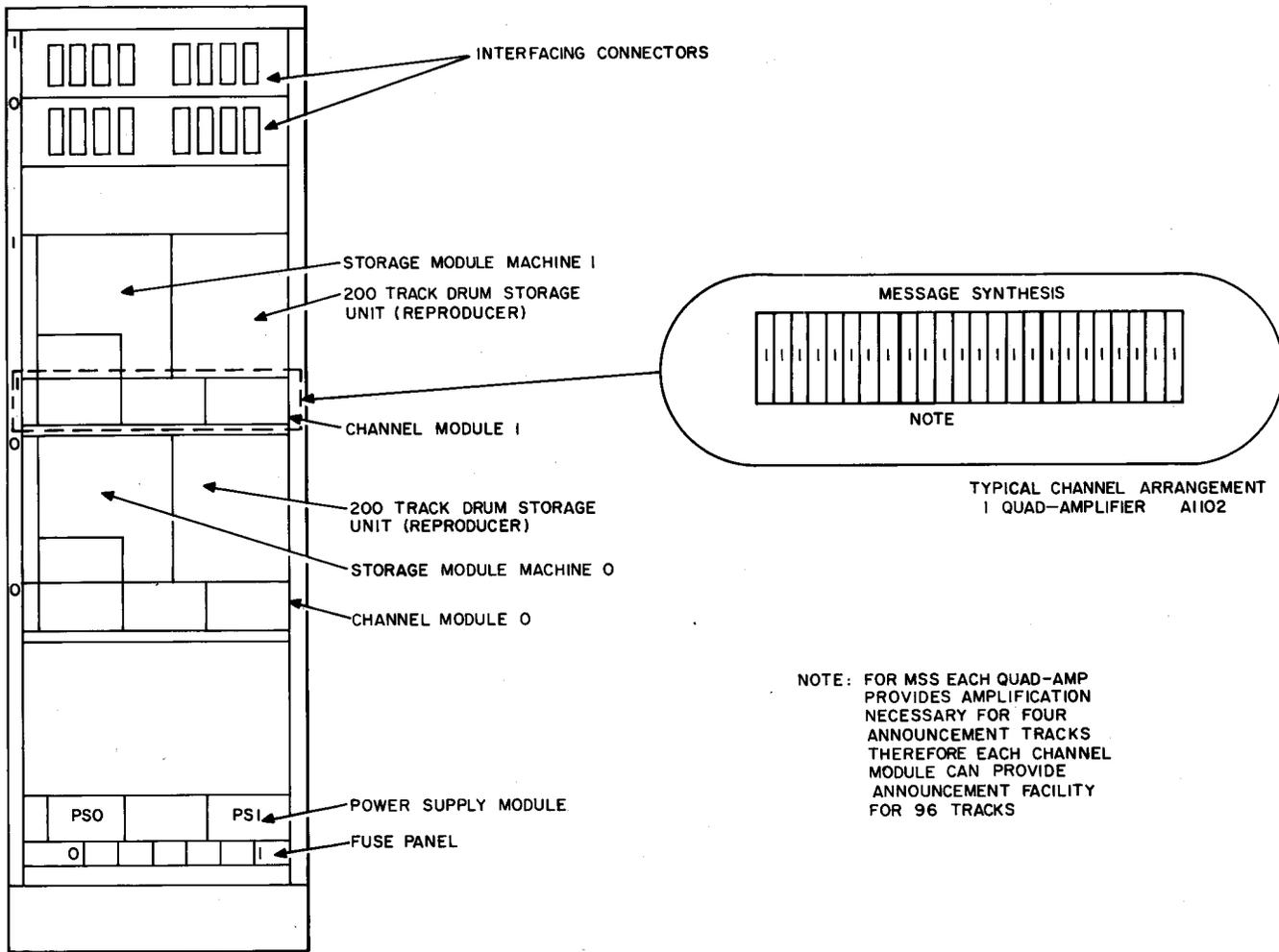


Fig. 9—Common Systems Recorded Announcement Frame—Diagrammatic Representation (MSS Only)†

4.03 The storage module is designed to be the same for all frames, independent of the announcement service provided.

Note: When modular message service is provided, an additional clock card (Fig. 11) is added to the storage module.

4.04 The keys, lamps, and jacks on the control panel (Fig. 10) provide the following features:

- (a) On-off control of -48 VDC power
- (b) On-off normal indications of -48 VDC power
- (c) On-off control of motor power
- (d) Frame line communication

- (e) Spare jack
- (f) Test jacks for +5, +15, -15, -48 VDC and ground
- (g) Local recording
- (h) Local monitoring
- (i) Local test of voice alarm.

Note: The TTY jack on the left side of the storage module is used by Electronic Switching Systems (ESS) for communication from the frame to system interfacing units for maintenance and testing purposes.

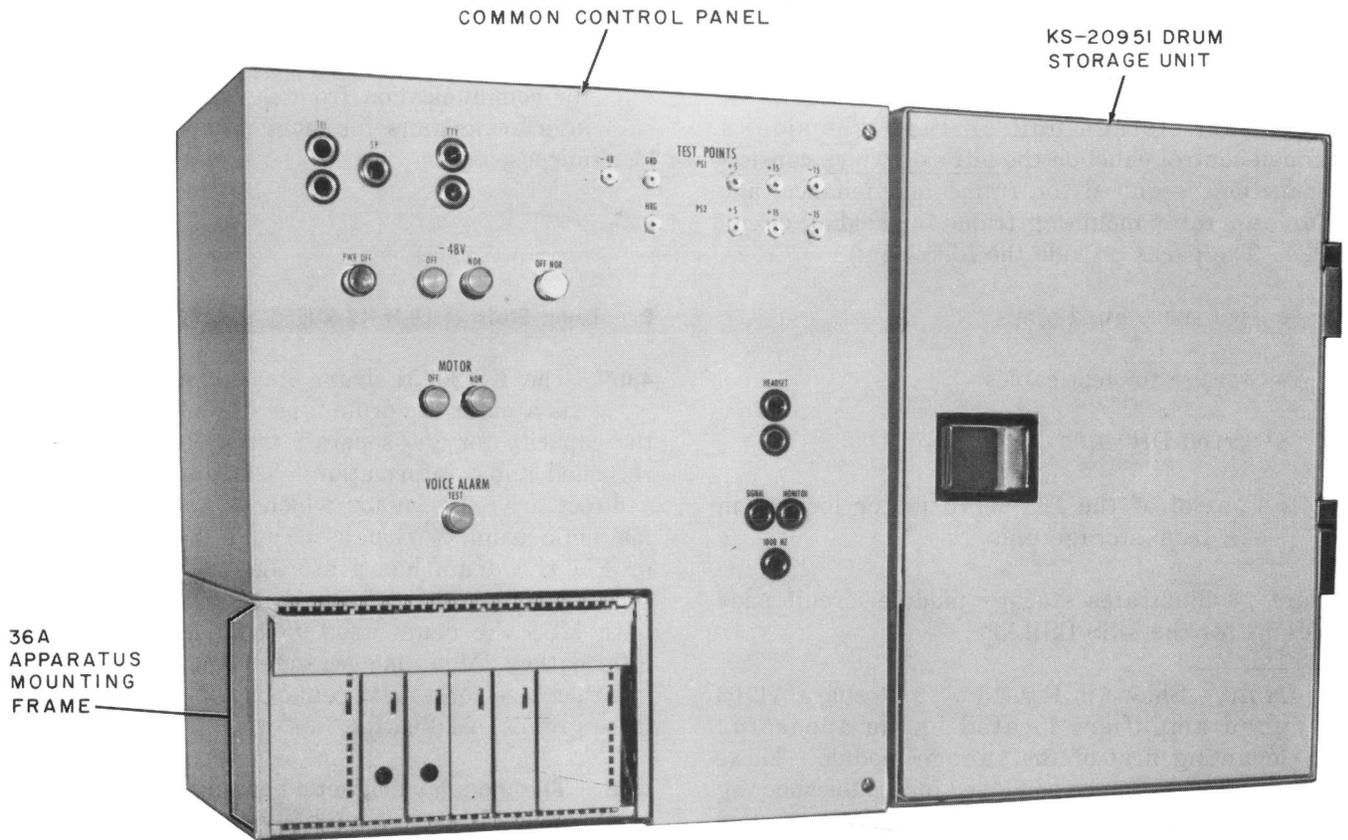
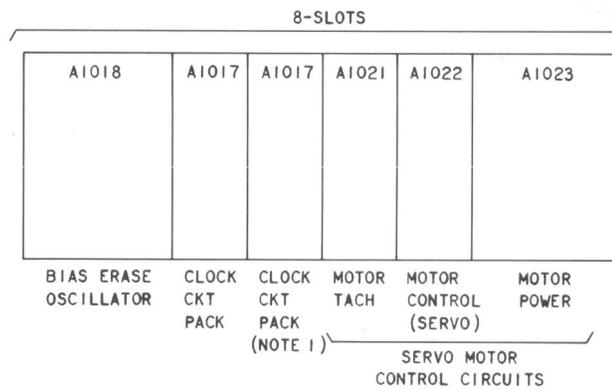


Fig. 10—Storage Module—(VML, MM, and PM Only)



- NOTES:
1. THE ADDITIONAL CLOCK CIRCUIT PACK IS ONLY USED FOR MODULAR MESSAGE ANNOUNCEMENT.
 2. SIX CARD TOTAL CAPACITY (2 DOUBLE WIDTH CARDS) FIVE USED WHEN OTHER THAN MM ANNOUNCEMENT.

Fig. 11—Storage Module Circuit Pack Location (VML, MM, and PM Only)

▶FOR MSS ONLY

4.05 The storage module (Fig. 12) contains the drum storage unit on the right side, a common control panel on the left side which consists of functions required for frame maintenance, and a 36A apparatus mounting frame for holding circuit packs. The packs provide the following:

- Two spare quad amps
- Storage for test cables
- Ferrod Driver
- Control of the DC servo motor located in the drum storage unit

Figure 13 illustrates storage module circuit pack locations for the MSS CSRAF.

Note: Shown in Fig. 13 are two spare A1103 quad amplifiers located in the apparatus mounting nest of the storage module. These spare packs can be employed for troubleshooting track amplifier problems on a direct substitution basis.

- 4.06** The keys, lamps, and jacks on the control panel (Fig. 12) provide the following features:
- (a) On-off control of -48 VDC power
 - (b) On-off normal indications of -48 VDC power
 - (c) On-off control of motor power
 - (d) On-off indications of motor power
 - (e) On-off control of amplifier power
 - (f) On-off indications of amplifier power
 - (g) On-off control and indications of audible alarm
 - (h) Frame line communication
 - (i) Spare jack
 - (j) Test jacks for +5, +15, -15, -48 VDC and ground
 - (k) Local monitoring

Note: The TTY jack on the left side of the storage module is used by the user system for communication from the frame to system interfacing units for maintenance and testing purposes.◀

B. Drum Storage Unit KS-20951

4.07 The KS-20951 drum storage unit (Fig. 14) is a magnetic drum-type storage unit having the capacity for 200 separate tracks (maximum) of recorded audio information. The unit consists of a direct drive DC motor which drives a KS-20952 magnetic drum. ▶When associated with VML, MM, or PM the drum has a storage capacity of 800 seconds of recorded information. When associated with MSS the drum uses 96 tracks of recorded information. Mounting arrangements are provided in either case for a maximum of 200 heads arranged in 10 groups of 20 each.◀

4.08 The modular magnetic head mountings make possible the assembly of a drum storage unit with capacities incremental from 80 seconds to 800 seconds, ▶or from 20 to 96 tracks of 0.5 or 1.5 seconds announcements depending on frame version,◀ as shown in Table B.

4.09 The drum storage unit contains no recording or reproducing electronics, only the basic magnetic elements necessary to record ▶(when applicable),◀ store, and reproduce an audio message, magnetic record-reproduce heads, the magnetic drum, and a means of rotating the drum continuously. The drum storage unit is the only unit of the CSRAF which contains any mechanism or moving parts.

4.10 The rotation period of the drum ▶when associated with VML, MM, or PM◀ is 4 seconds; therefore each track has the capacity for recording and reproducing 4 seconds of audio information. ▶The rotation period of the drum when associated with MSS is 3 seconds; therefore each drum track has the capacity for reproducing 3 seconds of audio information.

4.11 For VML or PM the design of the tracks of the drum storage unit are such that they can be electronically pieced together in 4-second increments to provide longer announcements. This

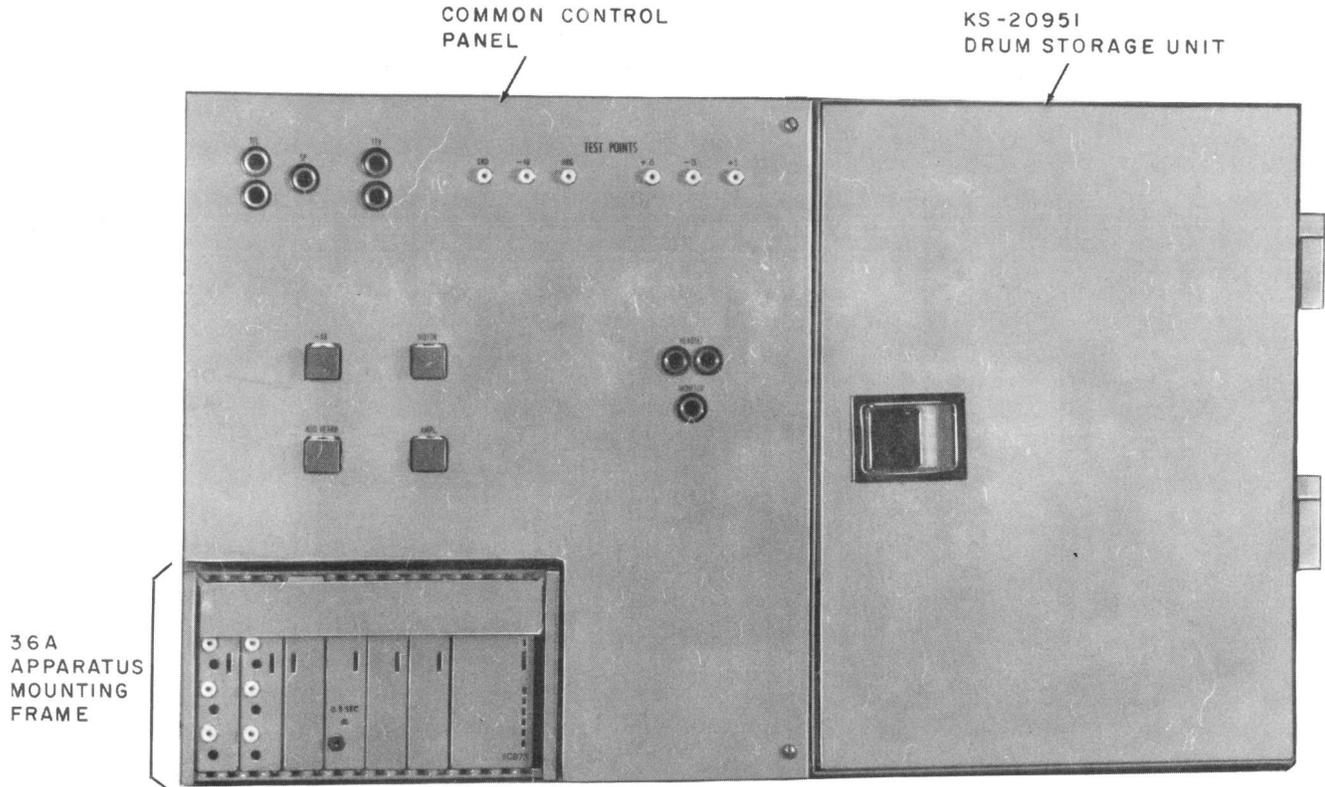


Fig. 12—Storage Module—(MSS Only)

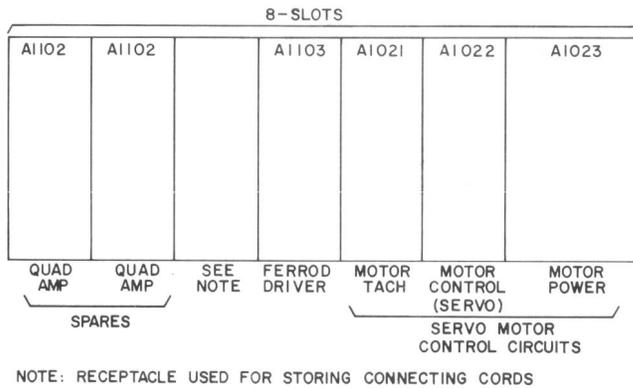


Fig. 13—Storage Module Circuit Pack Location for MSS

design efficiently provides for handling two classes of messages:

- Very short messages of fixed length
- Longer messages of variable-increment length.

4.12 For MSS the tracks of the drum storage unit are pieced together by the user system. By proper selection of phrases recorded on the drum, announcements are made by placing these phrases in the proper sequence and reproducing them.

4.13 The drum storage unit contains an optical code wheel (and its associated electronics located at bottom of drum storage unit) to provide a reference signal used in a separately mounted speed control servo circuit (not part of the drum storage unit). The reference signal is described in detail subsequently in this section.

4.14 Also contained on the top of the drum storage unit is an optical switch assembly which provides the necessary clock pulses for switching the channel electronics of the VML, MM or PM only or in the case of MSS provides timing pulses to the user system which makes use of it for proper timing of the connection to an announcement phrase.

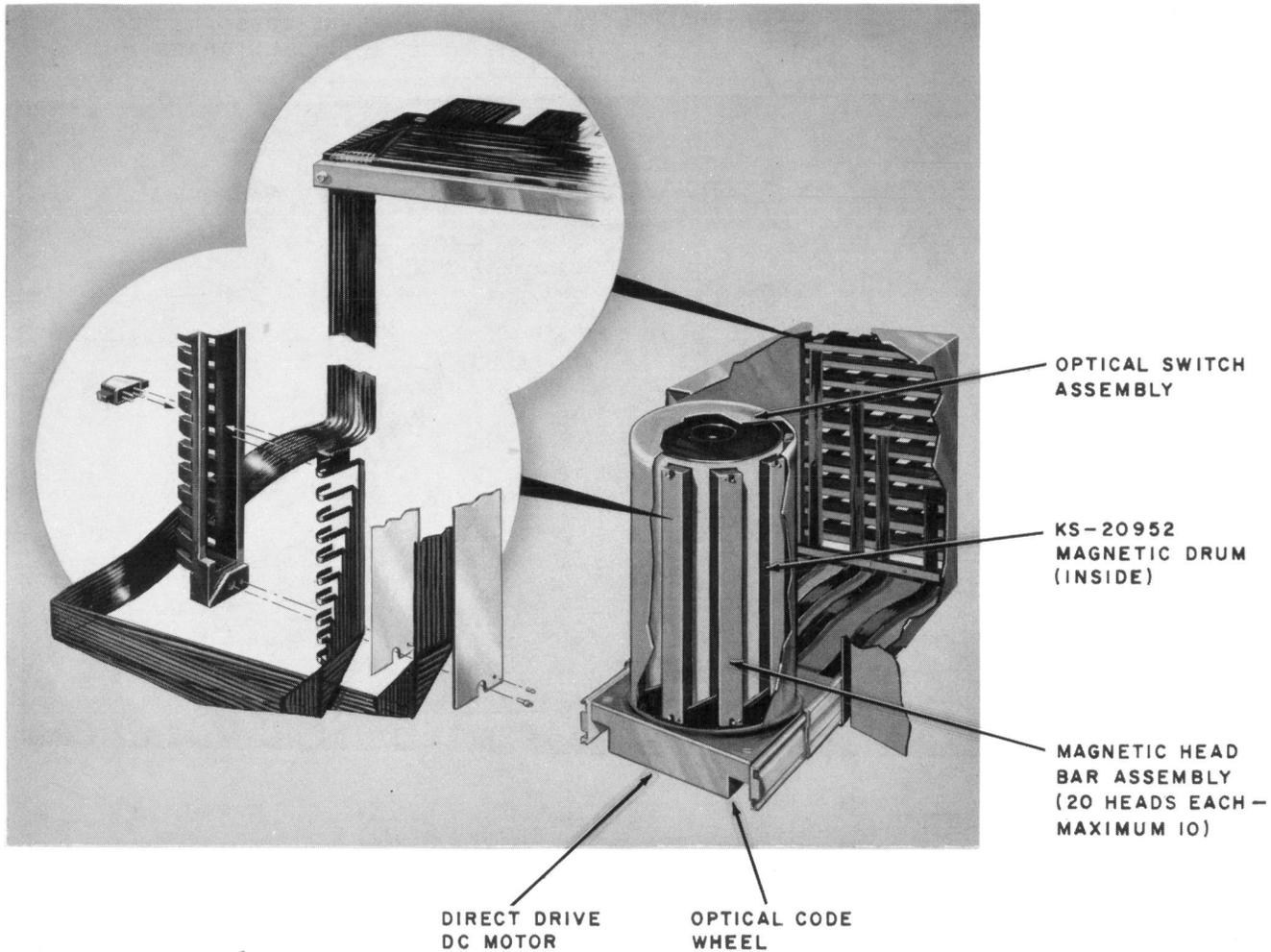


Fig. 14—KS-20951 Drum Storage Unit (Cutaway View)

Three list numbers of the KS-20951 drum storage unit are available. When a list 1 is provided, the optical switch assembly is equipped with one optical switch (for use with variable and phased message announcements). When a list 2 is provided, the optical switch assembly is equipped with either 1 (dual channel) or 3 single channel optical switches (for use with modular message announcement or on any frame having combined versions of announcements, one of which is modular message). When a list 3 is provided, the optical switch assembly is equipped with 1 (dual channel) optical switch (for use with message synthesis service announcements).

Table C illustrates the KS-20951 drum storage unit list and serial number relationship to the optical switch assemblies.◆

4.15 Elements of the servo system which are not part of the drum storage unit are located in a 36A apparatus mounting in the storage module. ◆Refer to Fig. 11 for location of servo motor control circuits (for VML, MM, and PM only) or to Fig. 13 for location of servo motor control circuits (for MSS only).◆

4.16 The drum storage unit design reduces the number of moving parts to the absolute minimum. The only moving parts are the magnetic drum (KS-20952) and DC motor armature which are directly coupled and rotate together at 15 RPM ◆(for VML, MM, and PM only) or at 20 RPM (for MSS only).◆ Thus, no speed reducing elements, such as gears, pulleys, and belts, are required.

→TABLE B←

**RELATION OF HEAD BAR ASSEMBLIES TO STORAGE CAPACITY
OF THE DRUM STORAGE UNIT**

NO. OF HEAD BAR ASSEMBLIES	NO. OF HEADS	FOR VML, MM OR PM SERVICE	FOR MSS SERVICE
		STORAGE CAPACITY (SECONDS)	ACCESS CHAN. CAP (CHANNELS)
1	20	80	20
2	40	160	40
3	60	240	60
4	80	320	80
5	100	400	100
6	120	480	
7	140	560	
8	160	640	
9	180	720	
10	200	800	

Similarly, no mechanisms are required to translate magnetic heads, since the heads are fixed.

4.17 The servo motor used to rotate the magnetic drum consists of a permanent magnet stator, a wound armature, and a brush assembly. The motor contains no bearings; therefore, motor lubrication is never necessary. Figure 14 shows the location of the direct drive DC servo motor. Figure 15 shows the drum storage unit removed from the CSRAF, revealing the servo motor mounting on the bottom of the drum storage unit.

4.18 Electrical access to the drum storage unit is provided by connectors mounted on the rear of the unit. The connectors are designed to mate with the KS-20955 and KS-20956 interconnecting units. Figure 16 shows the connectors on the rear of the drum storage unit.

4.19 The drum storage unit is mounted on slides in a steel case with a hinged front door (Fig. 17).

4.20 To provide additional dust and environmental protection, a dust cover (Fig. 17) is placed over the drum and head bar assemblies, virtually sealing the unit from outside contaminating influences. Refer to Fig. 14 for information on location of magnetic drum and head bar assemblies.

4.21 The drum storage unit case (Fig. 18) provides three features:

- Sliding mounts for the recorder unit which allow it to be pulled forward from the CSRAF for inspection or maintenance
- A mounting surface for attachment of the drum storage unit to the CSRAF
- Use of the rear of the enclosure for holding the printed circuit termination ends of the head cables (Fig. 16).

4.22 On the front of the enclosure is a door which can be opened to withdraw the recorder

→TABLE C←

DSU LIST AND SN. RELATIONSHIP TO OPTICAL SWITCH ASSEMBLY

	KS-20951, LIST 1		KS-20951, LIST 2		KS-20951, LIST 3
	SN.1→7	SN.8→UP	SN.1→8	SN.9→UP	SN.1→UP
OPTICAL SWITCH ASSEMBLY	L-504316-1	L-509855-1	L-504316-2	L-509855-2	L-509855-2
	1	3	2	4	4

NOTES:

- 1 L-504316-1 — Optical Switch Assembly with one Optical Switch. Used in List 1 Machines No. 1 through 7.
- 2 L-504316-2 — Optical Switch Assembly with three Optical Switches. Used in List 2 Machines No. 1 through 8.
- 3 L-509855-1 — Optical Switch Assembly with one Single Channel Optical Switch. Used in List 1 Machines No. 8 and up.
- 4 L-509855-2 — Optical Switch Assembly with a Dual Channel Optical Switch. Used in List 2 Machines No. 9 and up and in ALL List 3 machines.

unit. In addition, the enclosure protects the drum storage unit if it is removed from the CSRAF.

Head Bar Assemblies

4.23 To provide for flexibility, the magnetic heads are mounted on head bar assemblies (Fig. 19). Each head bar assembly contains 20 magnetic heads (in 5 groups of 4) and an interconnecting unit by which the heads are accessed. Head bar assemblies are mounted on a cylindrical housing (Fig. 20) which surrounds the magnetic drum. Head bar assemblies can be conveniently added to increase the storage capacity of the drum storage unit. The drum storage unit can be arranged with up to a maximum of ten head bar assemblies, which would provide a 200-track capability.

Note: The KS-20954 interconnecting unit is used in conjunction with the KS-20953 magnetic head and will be described subsequently in this section.

4.24 Each head bar assembly is provided with preformed flat cable to connect to the 20

magnetic heads in the bar. The cable is preconnected to the individual magnetic heads through a connector at the head end and is terminated on a printed circuit board having edge connectors at the other end. The head bars are mounted onto the cylindrical housing, and the heads run in intimate contact with the magnetic drum.

4.25 Each L504320 head bar assembly is assigned a dash number from 1 to 10.

4.26 Only one of each dash number will fit on the drum storage unit. The dash number is used to define the position of the head bar assembly on the drum storage unit. Each head bar assembly has a specific location on the drum and a specific location for its termination on the rear of the drum storage unit. Refer to Fig. 21 for termination locations. Table B shows the relationship between the number of head bar assemblies and the storage capacity of the drum unit (for VML, MM, or PM only) or accessible channel capacity (for MSS only).

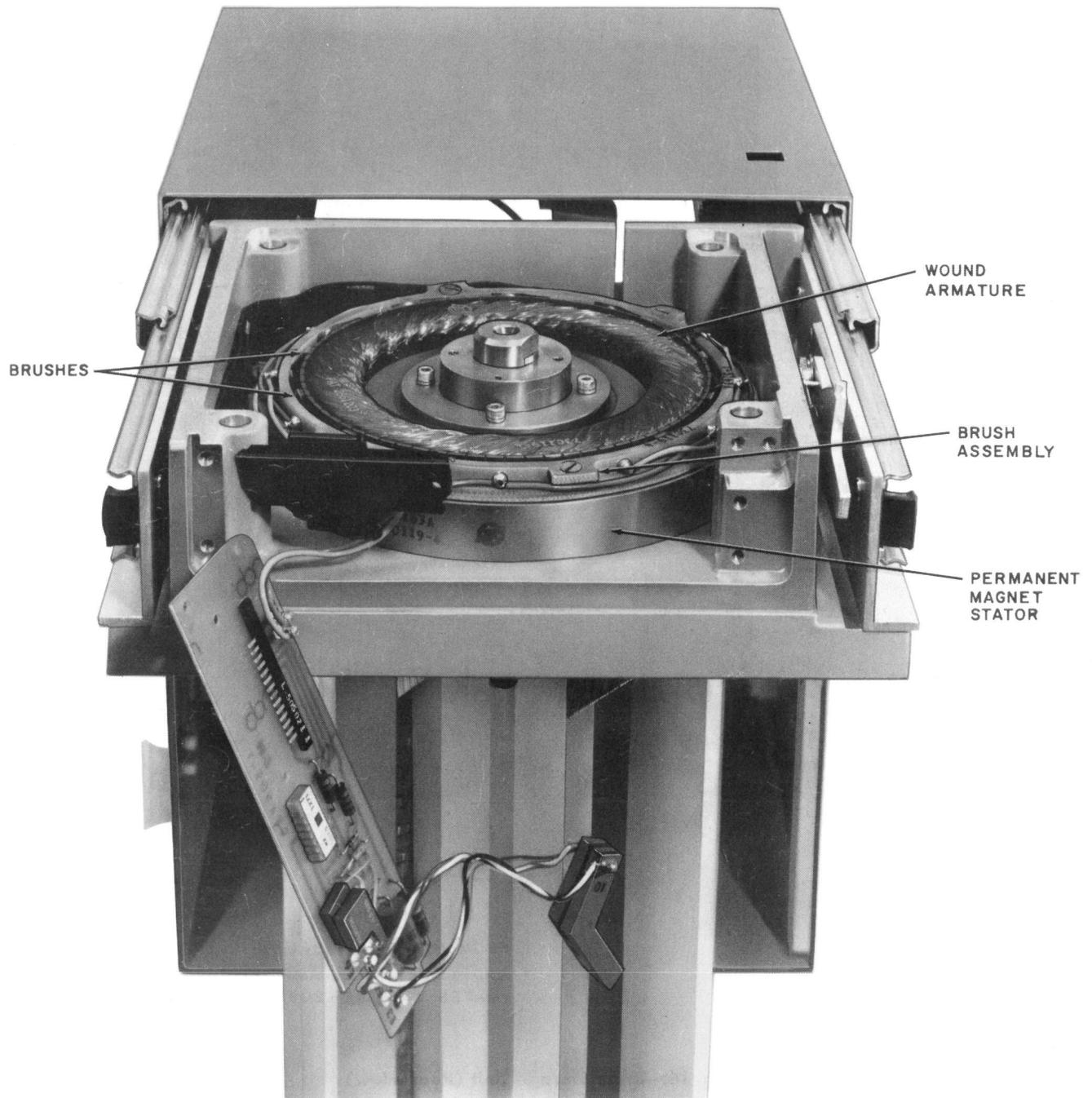


Fig. 15—Drum Storage Unit (Bottom View With Code Wheel Removed)

Interconnecting Unit KS-20954 (Cabling)

4.27 The KS-20954 interconnecting unit is used to electrically interconnect the associated heads of the head bar assembly it serves to the rear of the drum storage unit. This unit then mates at the rear of the drum storage unit with

one to five KS-20956 interconnecting units which connect to the channels served by those heads of the associated head bar assembly. This arrangement is shown in Fig. 22.

4.28 The KS-20954 interconnecting unit (Fig. 19) consists of two flat cables, each of which is

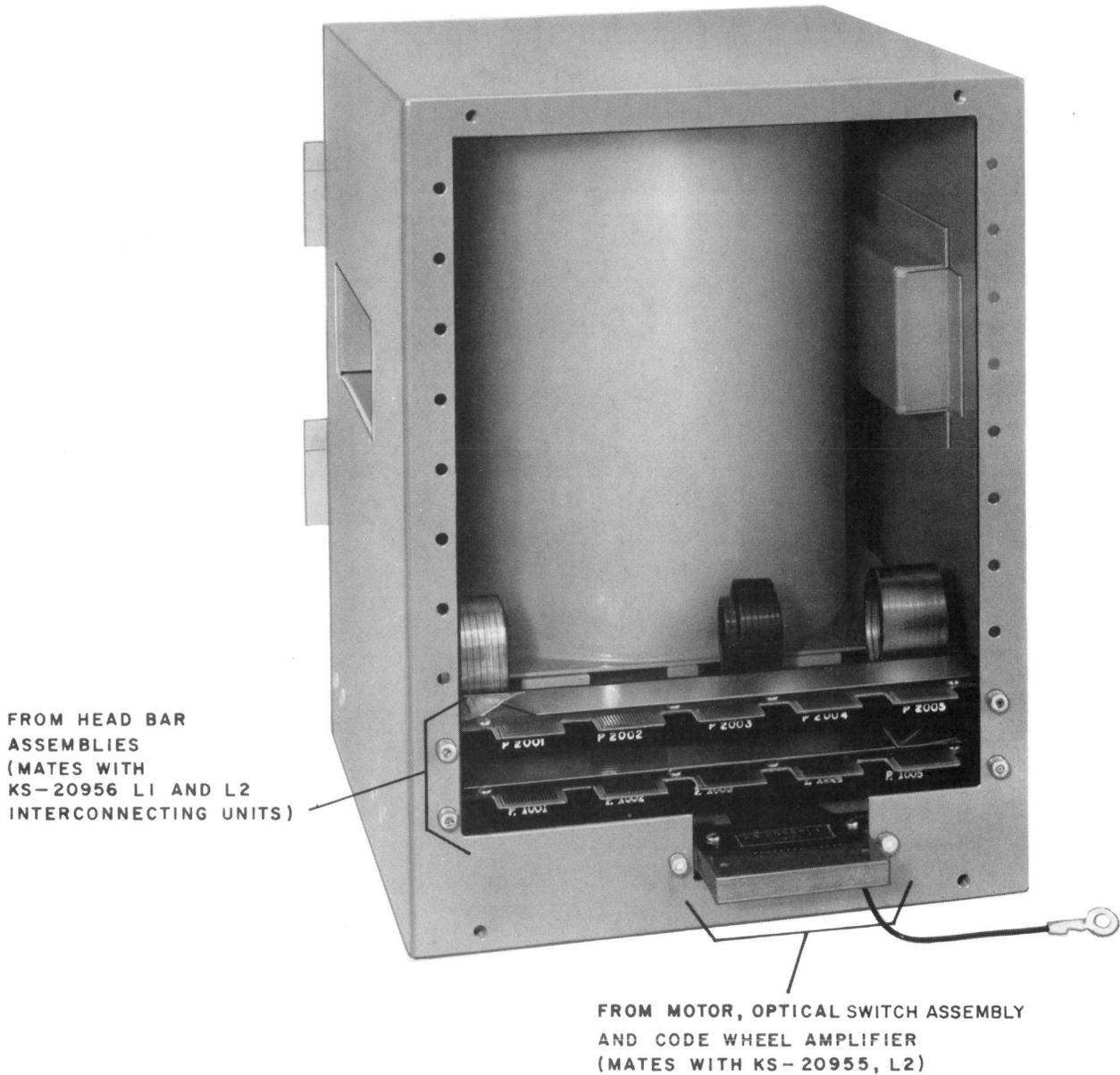


Fig. 16—Drum Storage Unit (Rear View)

1-inch wide, contains 40 conductors, terminates in 20 female 4-terminal conductors at one end (the magnetic head end), and terminates on a printed circuit board at the other end. The printed circuit board provides 5 plug ends of 16 contacts each. The plug ends have a polarizing slot to accept a key, insuring proper mating with their corresponding connectors on the KS-20956 interconnecting units.

4.29 Ten list numbers have been assigned to the KS-20954 interconnecting unit. Each number

defines a different folding pattern and length for the flat cable used in this interconnecting unit. The list numbers are coordinated with the installation position on the KS-20951 drum storage unit, as shown in Fig. 21.

Interconnecting Unit KS-20955

4.30 The KS-20955 interconnecting units exist in two distinct configurations, Lists 1 and 2. The L1 unit connects the circuitry of the optical

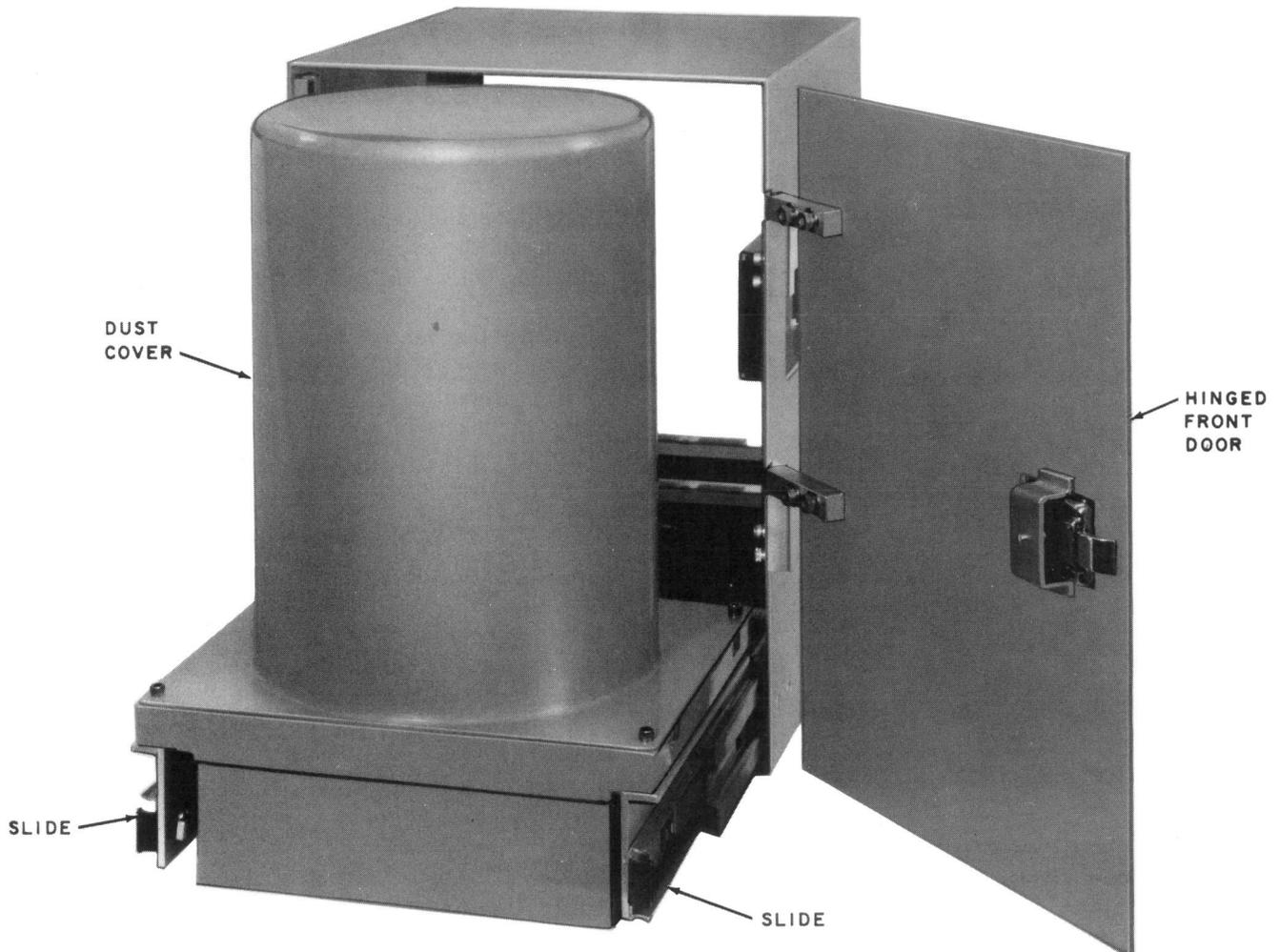


Fig. 17—Drum Storage Unit Slid Out of CSRAF on its Slides

switch assembly (located atop the drum storage unit) and the code wheel and motor (mounted on bottom of drum storage unit) to a connector on the rear of the drum storage unit. The L2 unit connects the control functions and circuit cards of the storage module to the drum storage unit. Figure 23 shows the location of interconnecting units.

4.31 The L1 unit (Fig. 24) has two flat cables both terminated in the same male connector on one end and a female connector on each of the other ends. The L2 unit (Fig. 25) has two flat cables both terminated in one female connector on each end. The unused positions in the female

connectors are filled to provide for polarization. Both units are shielded and folded to fit.

Interconnecting Unit KS-20956

4.32 The KS-20956 interconnecting unit consists of a flat cable (with 16 conductors) terminated in a female connector on each end. The connectors are keyed for polarization to mate with an edge of a printed circuit card. List numbers have been assigned to the KS-20956 interconnecting unit to identify the length.

- List 1 is 4 feet 4 inches in length.

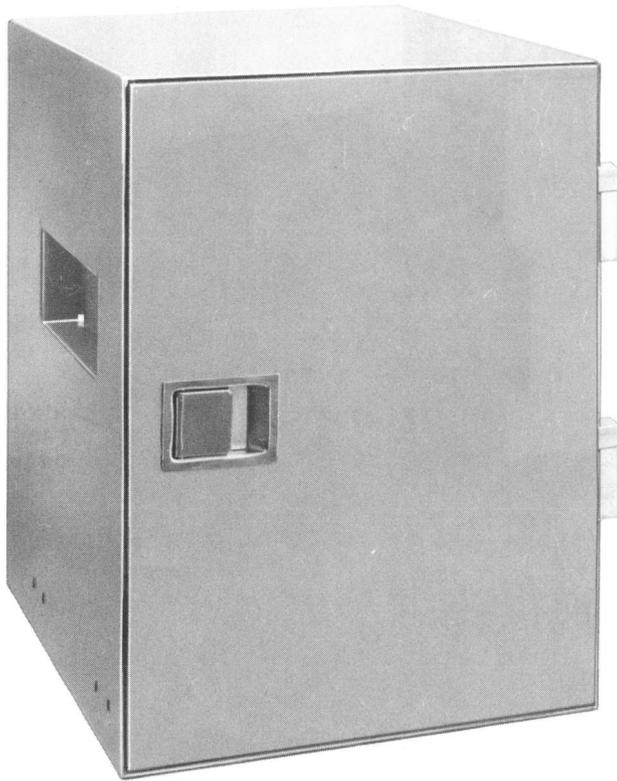


Fig. 18—Sealed Drum Assembly—Drum Storage Unit (Front View)

(VML, MM, and PM only—Used to connect to channel modules in frame positions 0 through 3.)

(MSS only—Used to connect to all amplifiers of channel module of each machine.)

- List 2 is 7 feet 0 inches in length.

(VML, MM, and PM only—Used to connect to channel modules in frame positions 4 through 8.)

(MSS only—Not used for MSS.)

4.33 The KS-20956 interconnecting unit is used to connect the magnetic heads in the drum storage unit to the associated channel electronics. Figure 26 illustrates the typical arrangement of the KS-20956-type units on the rear of the CSRAF when used with VML, MM and PM only. Figure 27 illustrates the typical arrangement of the KS-20956-type

units on the rear of the CSRAF when used with MSS only.

Magnetic Head KS-20953

4.34 The KS-20953 magnetic head (Fig. 28) is used to record when necessary and reproduce audio signals on the KS-20952 magnetic drum in the KS-20951 drum storage unit. The dual-gap magnetic head is designed to provide erase and R/P functions in the same core structure. An extended magnetic pole piece is held by a nonmagnetic supporting structure in a shielded case. Two bobbin-wound coils, erase and R/P, are fitted onto leg extensions of the core structure and wired so that the high-frequency bias for the recording section is obtained automatically by internal magnetic coupling.

Magnetic Drum KS-20952

4.35 The KS-20952 magnetic drum is 4 inches in diameter and 8-1/2 inches long and consists of a band of magnetic rubber mounted on an aluminum drum. The magnetic properties of the drum are derived from the 1/8-inch thick, specially compounded rubber which contains a uniform dispersion of magnetic iron oxide particles.

4.36 The KS-20952 magnetic drum is available in three distinct physical configurations. Figure 29 illustrates one of the two versions of the KS-20952, L1 magnetic drum available. This drum is used with the KS-20951, L1, serial number 1 through 7, and KS-20951, L2, serial number 1 through 8 only. This drum is designed only to operate with the L1 or L2 drum storage unit when equipped with an L-504316-1 or L-504316-2 optical switch assembly, respectively. This drum is not furnished with prerecorded announcements.

4.37 The second version of the KS-20952, L1 magnetic drum available is shown in Fig. 30. This drum is intended for use with the KS-20951, L1, serial number 8 and up and with KS-20951, L2, serial number 9 and up only. This drum is designed only to operate with the L1 or L2 drum storage unit when equipped with an L-509855-1 or L-509855-2 optical switch assembly, respectively. This drum is not furnished with prerecorded announcements.

4.38 The KS-20952, L3 magnetic drum shown in Fig. 31 is to be ordered with the prerecorded

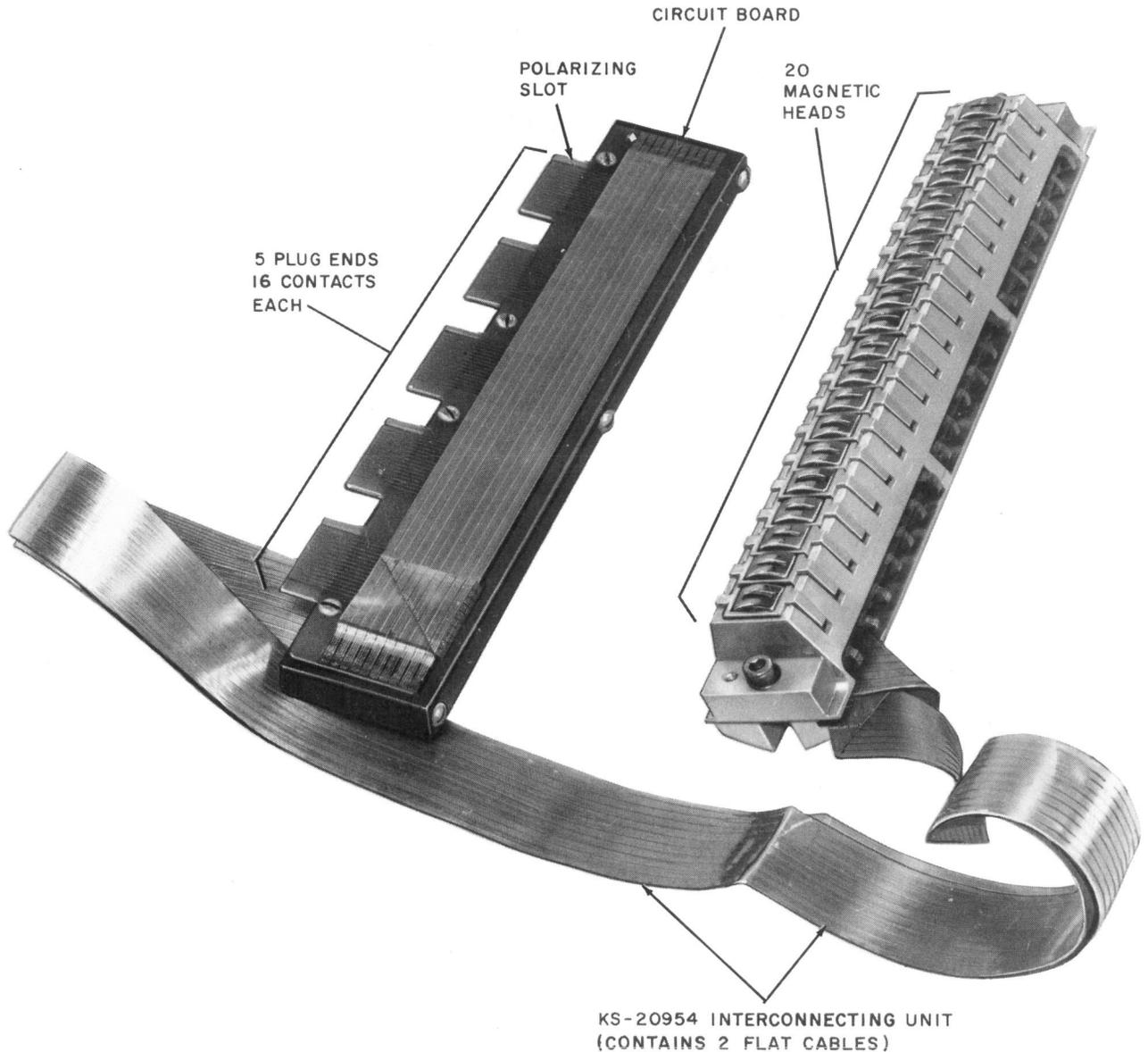


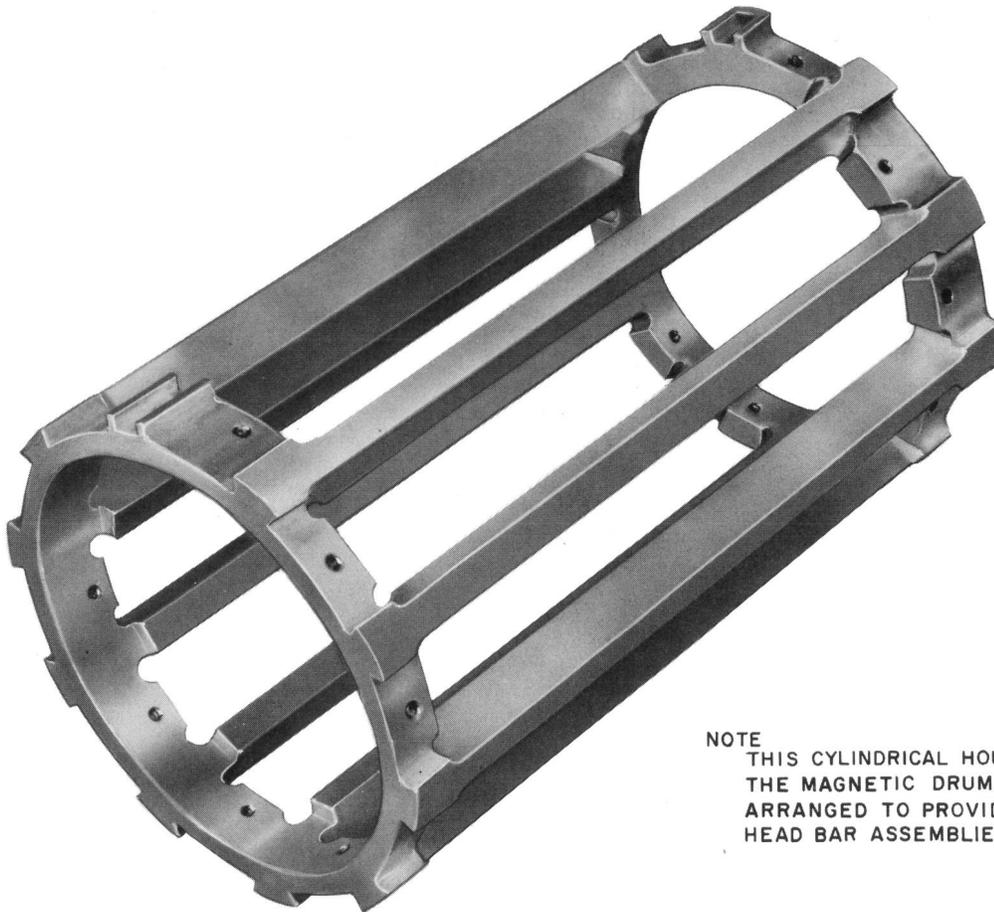
Fig. 19—Head Bar Assembly

localities specified for the area to be served. The L3 magnetic drums are intended for use with all KS-20951, L3 drum storage units only. The L3 drum is designed to operate with the L3 drum storage unit when equipped with an L-509855-2 optical switch assembly. ◀

4.39 The magnetic drum is capable of storing a maximum of 200 circumferential tracks of audio information which is recorded on and reproduced

from the magnetic drum with KS-20953 magnetic heads.

4.40 The magnetic drum rotates about a vertical axis and is directly coupled to a very simple, rugged DC servo motor located at the bottom of the drum. During operation, the magnetic drum is driven at a constant 15 or 20 RPM (depending on version of frame provided) ◀ by the DC servo motor.



NOTE
THIS CYLINDRICAL HOUSING SURROUNDS
THE MAGNETIC DRUM AND CAN BE
ARRANGED TO PROVIDE FROM 1 TO 10
HEAD BAR ASSEMBLIES.

Fig. 20—Cylindrical Housing

4.41 The bearings used to suspend the drum rotational shaft are prelubricated and sealed and require no subsequent lubrication during the life of the unit.

Code Wheel and Amplifier

4.42 The optical code wheel (Fig. 32) is rigidly attached to the drum rotational shaft and provides a frequency feedback signal through a photocell and photocell amplifier (code wheel amplifier) to the servo motor control circuits to maintain a constant rotational velocity of the magnetic drum.

4.43 The optical code wheel is a glass plate with 12,600 alternating light and dark bands located around the circumference of the plate. The width of the lines is equal to the width of the spaces located between the lines. The pattern of

the code wheel when rotating interrupts the light beam from a light-emitting diode (LED) to a photo transistor. The rate of interruption produces a feedback frequency which is proportional to the speed. Feedback signal is then locally amplified by the code wheel amplifier (Fig. 33) (located in the bottom of the drum storage unit) whose output is connected to the servo motor control circuits in the storage module to maintain a constant rotational velocity of the magnetic drum. Figure 33 illustrates the code wheel and amplifier mounted in their normal operating positions.

Optical Switch Assembly

4.44 The optical switch assembly is located atop the drum storage unit. This assembly provides the necessary switching pulses for the channel electronics, or timing pulses for seizure by the user system. The pulses are produced by

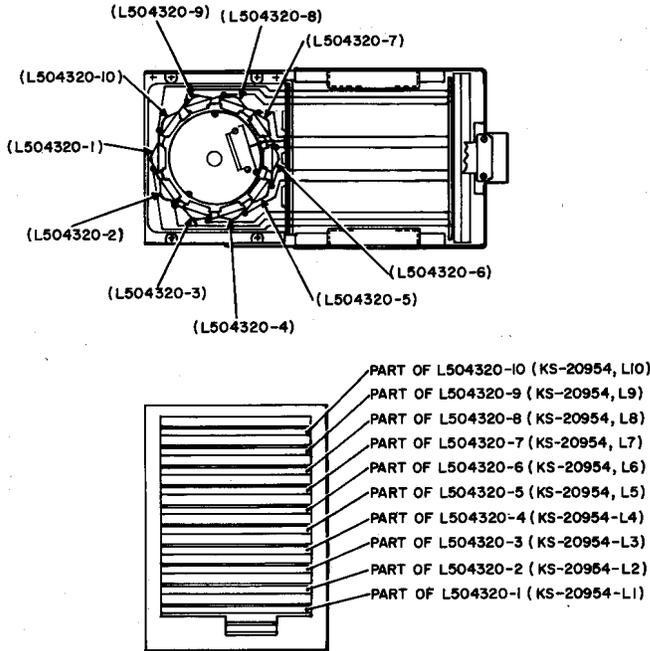


Fig. 21—Head Bar Assembly Location (From Drum Position to Rear of Storage Unit)

interrupting the light beam in the optical switch with a notched or cutaway surface on the magnetic drum.

4.45 The optical switch assembly like that of the magnetic drum is available in various physical configurations. Figure 34 illustrates a typical example of how the optical switch assembly appears when mounted in place with relation to the magnetic drum unit. Figure 35 illustrates the L-504316-1 optical switch assembly that is used in conjunction with the KS-20952, L1 magnetic drum in KS-20951, L1 drum storage units serial numbered 1 through 7. This assembly consists of only one optical switch and is used when only one timing pulse per revolution is required. (See Fig. 35).

4.46 Illustrated in Fig. 36 is the L-509855-1 optical switch assembly that is used with the KS-20952, L1 magnetic drum in KS-20951, L1 drum storage units serial numbered 8 and up. This assembly consists of only one single-channel optical switch and is used with the KS-20952, L1 magnetic drum having three cutaways one of which is larger

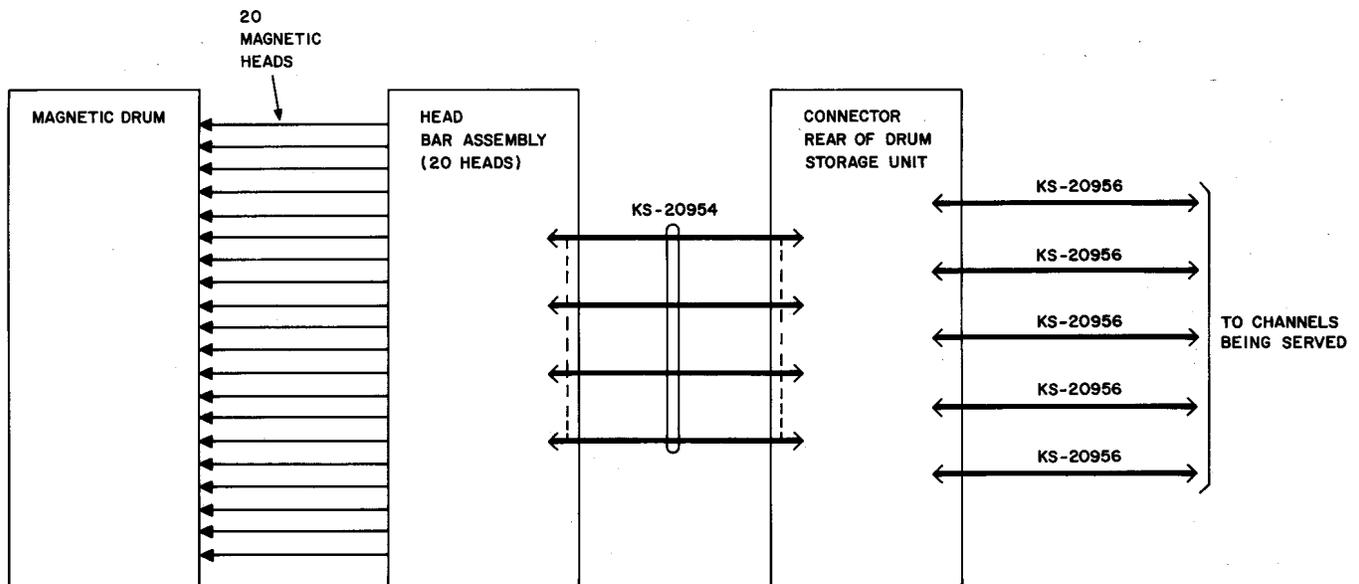


Fig. 22—Interconnecting Unit Arrangement

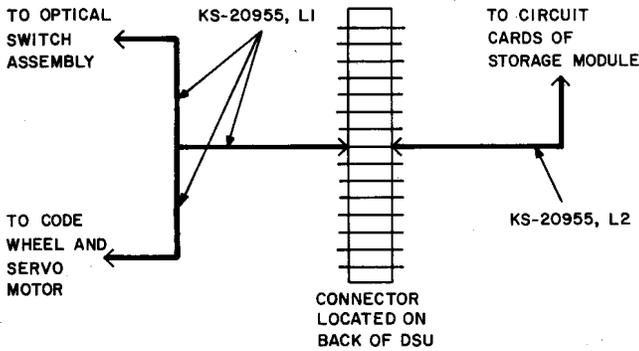


Fig. 23—Location of KS-20955, L1 and KS-20955, L2 Interconnecting Units

in depth than the other two. (See Fig. 36). With the physical mounting arrangement of the drum cutaways and the single-channel switch, this arrangement can be used like that of the L-504316-1 previously discussed when only one timing pulse per revolution is required. With this arrangement the other two alike and smaller cutaways are not used.

4.47 Illustrated in Fig. 37 is the L-504316-2 optical switch that is used in conjunction with the KS-20952, L1 magnetic drum in KS-20951, L2 drum storage units serial numbered 1 through 8. This assembly consists of three optical switches and is used with the KS-20952, L1 magnetic drum having one notched slot when three timing pulses per drum revolution are required.

4.48 Illustrated in Fig. 38 is the L-509855-2 optical switch assembly that is used with the KS-20952, L1 magnetic drum in KS-20951, L2 drum storage units serial numbered 9 and up. This assembly consists of only one dual-channel optical switch and is used with the KS-20952, L1 magnetic drum having three cutaways one of which is larger in depth than the other two (refer to Fig. 36 for mounting arrangement). With the physical mounting arrangement of the drum cutaways and the dual-channel switch, this arrangement can be used like that of the L-504316-2 previously discussed, when three timing pulses per drum revolution are required. With the design of the three slots a timing pulse from one-channel of the dual-channel switch will occur 3 times per drum revolution, while the other channel of the dual-channel switch will cause a timing pulse to occur only once per drum revolution.

4.49 Illustrated in Fig. 39 is the L-509855-2 optical switch assembly that is used with the KS-20952, L3 magnetic drum in all KS-20951, L3 drum storage units.

This assembly consists of only one dual-channel optical switch and is used with the KS-20952, L3 magnetic drum having a semi-circular cutaway for one channel of the dual-channel switch and three cutaways evenly spaced with 3 solid areas in the same circular plane. (See Fig. 39). With the physical mounting arrangement of the drum cutaways and the dual-channel switch, this arrangement is capable of producing timing signals that change state twice per revolution of the drum on one channel and 6 times per revolution of the drum on the second channel. The changes in state produce a square wave with a period of 3 seconds on one channel and a square wave with a period of 1 second on the other channel.¶

Wiper

4.50 Exceptionally long life is afforded the heads and the magnetic drum by a lubrication wiper (Fig. 40 and 5) which is mounted on the same cylindrical housing, which supports the magnetic head bar assemblies. The wiper runs in intimate contact with the drum, continually cleaning and lubricating by a wicking process as the drum rotates.

C. Channel Electronics

4.51 A family of circuit packs provides the electronics required for any channel version. In addition, a family of channel modules is provided to contain and interconnect the channel electronics. Each channel module is designed for a specific type of announcement service and a specific number of channels. Depending upon the service to be provided, the channel module can be selected and equipped with the proper types and quantities of circuit packs to provide the desired number of channels.

¶FOR VML, MM, AND PM ONLY¶

4.52 The circuit packs in each channel provide the facilities required to:

- Record and reproduce a message on a channel

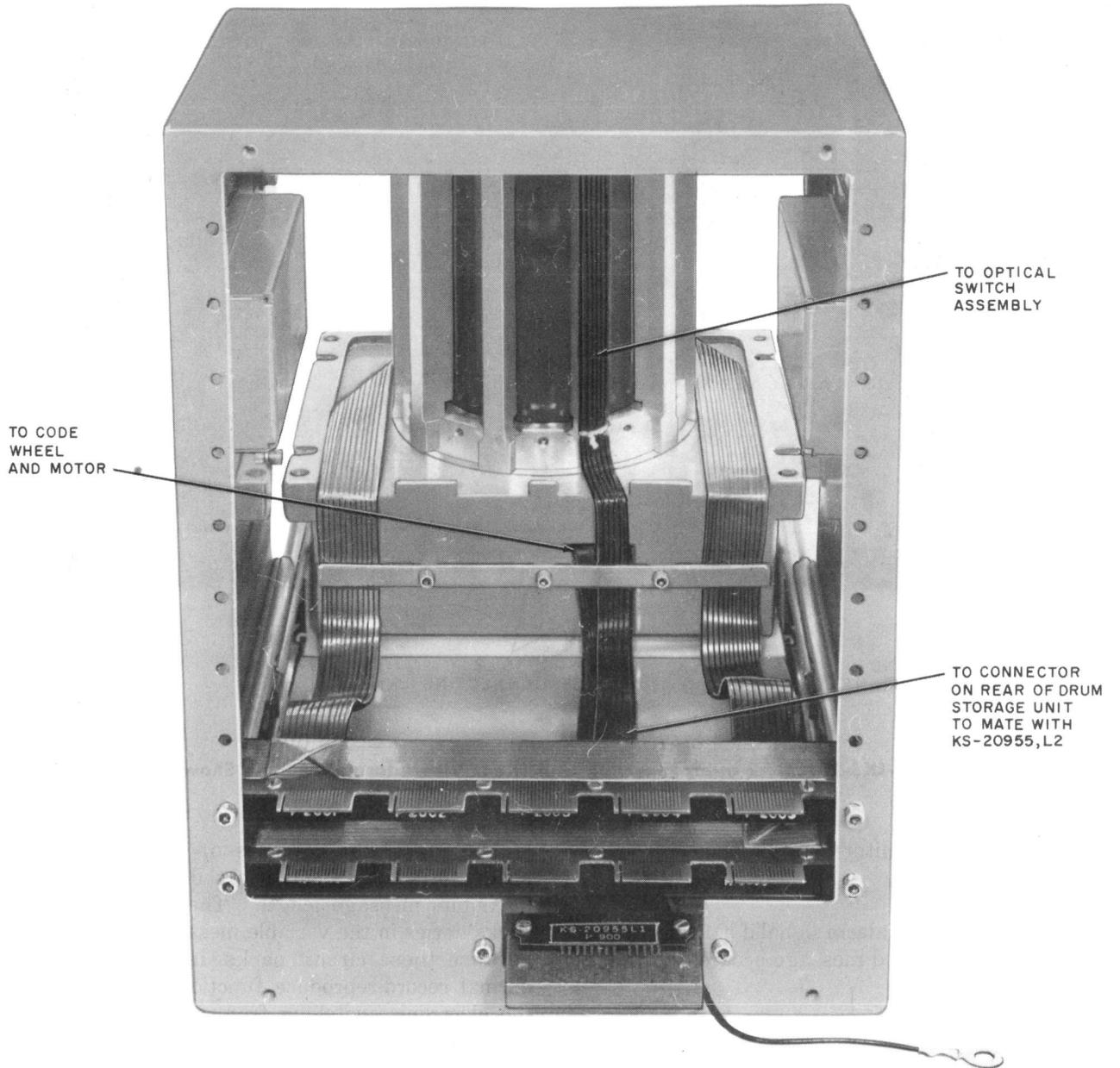


Fig. 24—KS-20955, L1 Interconnecting Unit (Rear View Drum Storage Removed From CSRAF)

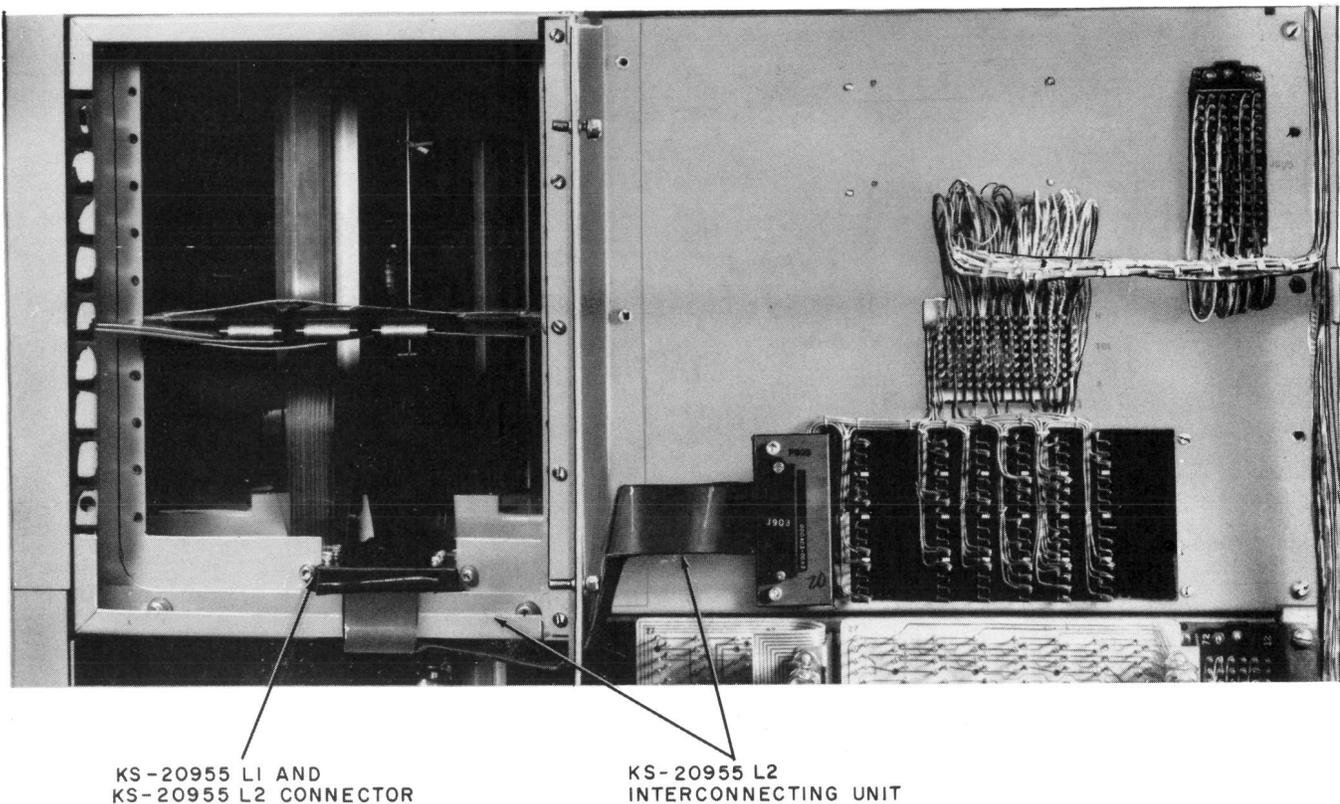


Fig. 25—KS-20955, L2 Interconnecting Unit (Rear View Storage Module Shown)

- Adjust and monitor the transmission level on a channel
- Initiate an office alarm signal if a deterioration of the reproduced message occurs.

◆ **FOR MSS ONLY**

The circuit packs in each channel provide the facilities required to:

- Reproduce a message on a channel
- Adjust and monitor the transmission level of a channel.◆

4.53 The channel electronics are designed so that each channel operates independently of any other channel.

4.54 A channel for the fixed length short messages having a 4-second single-track consists of only one circuit pack. A channel for the variable

length messages consists of minimum five to maximum seven circuit packs depending upon the maximum message length. The number of circuit packs varies in the variable message length channel because these circuit packs, in addition to their normal record-reproduce function, also provide for the electronic switching from track to track. The switching is accomplished by a switching circuit pack which is designed to handle the basic 16-second message length. Therefore, a 16-second channel would require one switching circuit pack; a 32-second channel would require two switching circuit packs; and a 48-second channel, the longest possible message, would require three switching circuit packs. A channel for the phased message announcement is comprised of 17 circuit packs, consisting of 4 amplifiers and 4 switching circuit packs to handle the 4 phases of the announcement, an alarm logic circuit pack for each phase, a switching alarm circuit pack associated with each phase, and a DMUX audio amplifier per channel. ◆ A channel (phrase) for the message synthesis service announcement consists of 1/4th of a circuit pack.

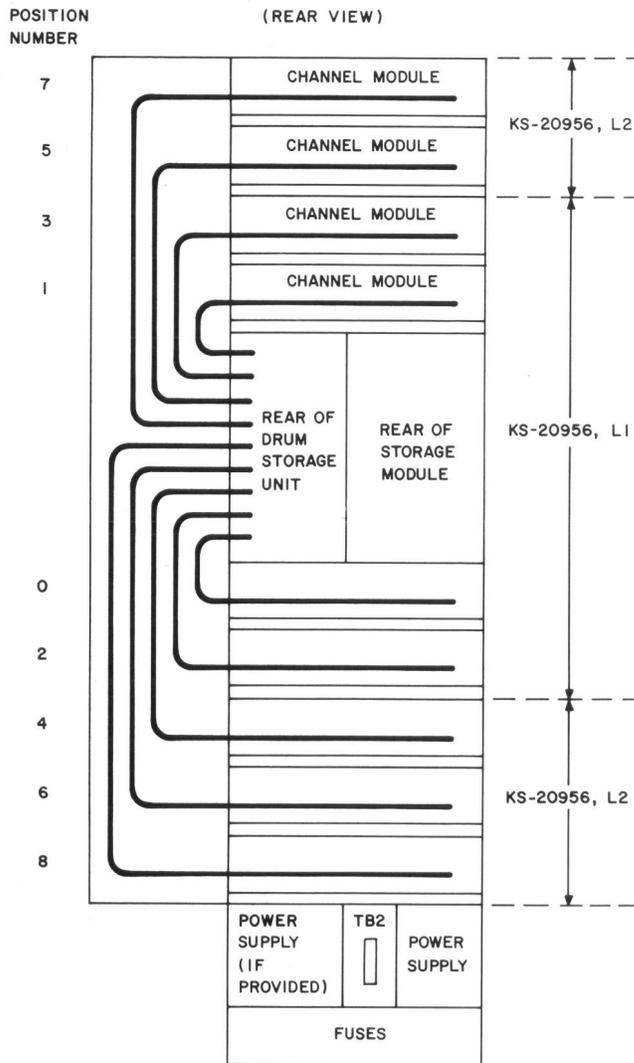


Fig. 26—Typical Arrangement of the KS-20956 Interconnecting Unit on Rear of CSRAF—(Intended for Use With VML, MM, and PM Only)

Each circuit pack of the message synthesis announcement contains four amplifiers capable of handling 4 drum channels. Therefore with the channel module containing 24 circuit packs the maximum of 96 (24×4) channels can be handled.

4.55 All electronic circuits are mounted on printed circuit boards having the envelope size and connector end configuration of the present type A-coded circuit packs used in the No. 1 ESS. A family of 14 circuit packs is provided for use with the CSRAF. Eight of the circuit pack designs are for use in various channel modules to

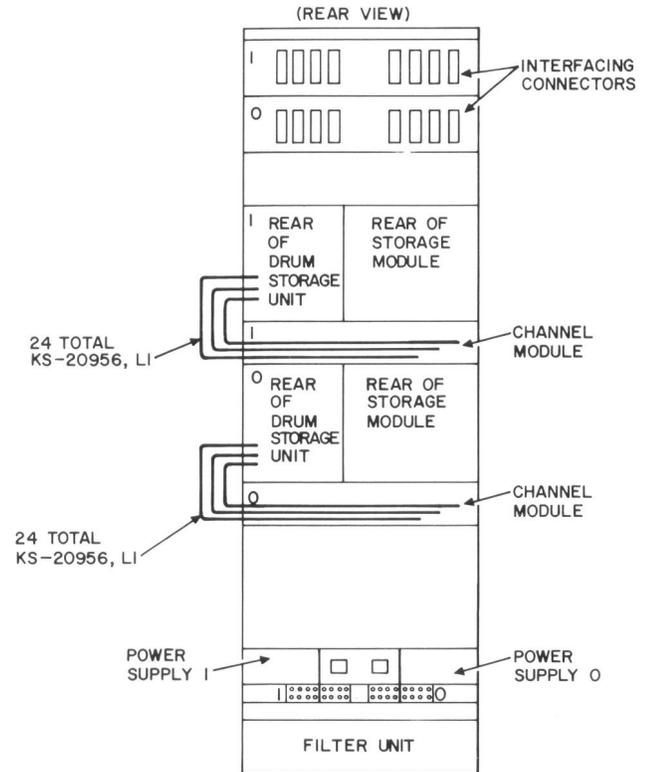


Fig. 27—Typical Arrangement of the KS-20956 Interconnecting Unit on Rear of CSRAF—Intended for Use With MSS Only

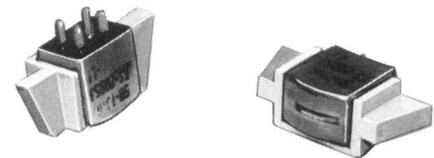


Fig. 28—KS-20953 Magnetic Head

provide the electronics needed to operate the audio channels, and the remaining six designs are for use in the storage module in partiality for providing servo motor controls, record bias and erase signals, and timing signals.

D. Channel Module

FOR VML, MM, AND PM ONLY

4.56 The channel module (Fig. 41) consists of a 291 A-type 4-inch mounting plate, three 36A apparatus mounting frames, a plurality of 905B



Fig. 29—KS-20952, L1—Magnetic Drum (Used on L1 DSU's Serial No. 1 thru 7 and on DSU's Serial No. 1 thru 8)¶



Fig. 30—KS-20952, L1 Magnetic Drum (Used on L1 DSU's Serial No. 8 and Up and L2 DSU's Serial No. 9 and Up)¶

circuit pack connectors interconnected with three FPW back planes, channel input/output connectors, and a channel module input/output connector. There are three channel module designs: one for the variable message length announcement service, one for the modular message announcement service, and one for the phased message announcement service. However, all channel modules are assembled from the same basic apparatus.

4.57 The basic differences between the channel modules lie in the type and number of circuit pack connectors they contain and the manner in which the circuit pack connectors are interconnected. Since the interconnection is accomplished by the FPW back plane, each of the different channel modules contains different FPW back planes.

4.58 All connections to the channels are made through the channel connectors located on

the FPW back plane (Fig. 42). All central office connections to the channel modules are made via the channel module input/output connectors, one of which is located at the left end of each channel module for the variable and phased message announcements (Fig. 2 and 3). For modular message announcement, two input/output connectors are provided. One is at the left end of the channel module, and one is at the left end of the control unit (Fig. 1).

4.59 A total of nine channel modules can be mounted on one frame. The total or any part of the total may consist of any combination



Fig. 31—KS-20952, L2 or L3 Magnetic Drum (Used in KS-20951, L3 DSU's)

of the three channel module designs. These modules can in no way be combined with the module used with message synthesis service.

FOR MSS ONLY

4.60 The channel module consists of a 291 A-type 4-inch mounting plate, three 36A apparatus mounting frames, a plurality of 905B circuit pack connectors interconnected by point-to-point wiring, and channel input/output connectors. All connections to the channels are made by point-to-point wiring at the rear of the module.

4.61 One channel module is used with each announcement machine. There are two announcement machines in each frame, therefore only two channel modules are needed per frame. This channel module can in no way be combined with the modules used for VML, MM, and PM versions of the CSRAF.

E. Circuit Packs

4.62 There are a total of 14 circuit pack types used in the CSRAF. Eight of the 14 types are used in the audio channels. These eight are:

- (a) Power Amplifier—A1012
- (b) Record/Playback Amplifier—A1013
- (c) Alarm Logic Circuit Pack—A1014
- (d) DMUX Audio Amplifier—A1015
- (e) Head Switching Circuit—A1016
- (f) Amp-Log-Alarm Circuit—A1019
- (g) Switching Alarm Circuit—A1020.
- (h) Quad Amplifier—A1102.

4.63 The remaining six types are common to the entire frame and are located in the storage module. Three of the remaining six types are common to all frame versions. These three are:

- (a) Motor Tach—A1021
- (b) Motor Control—A1022
- (c) Motor Power—A1023

Two of the remaining three type are common to VML, MM, and PM version frames. These two are:

- (a) Clock Circuit—A1017
- (b) Bias Erase Oscillator—A1018

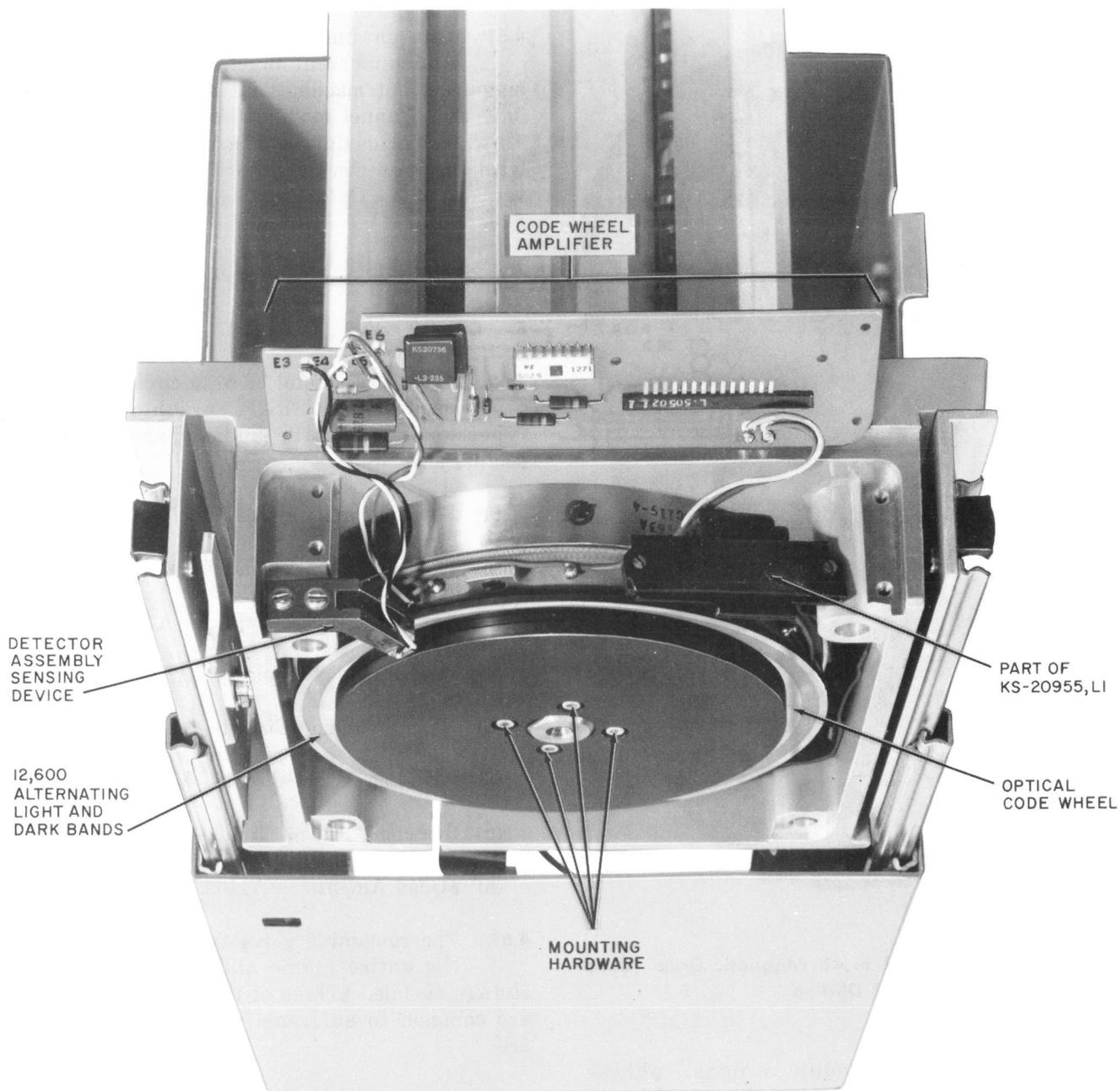


Fig. 32—Optical Code Wheel (Viewed From Underside Drum Storage Unit)

The remaining type is common to MSS version of the frame. This circuit pack is:

- (a) Ferrod Driver—A1103.4

4.64 The designation of the circuit packs and the units in which they are used are shown in Table D. The following listing gives a brief description of each circuit pack in Table D.

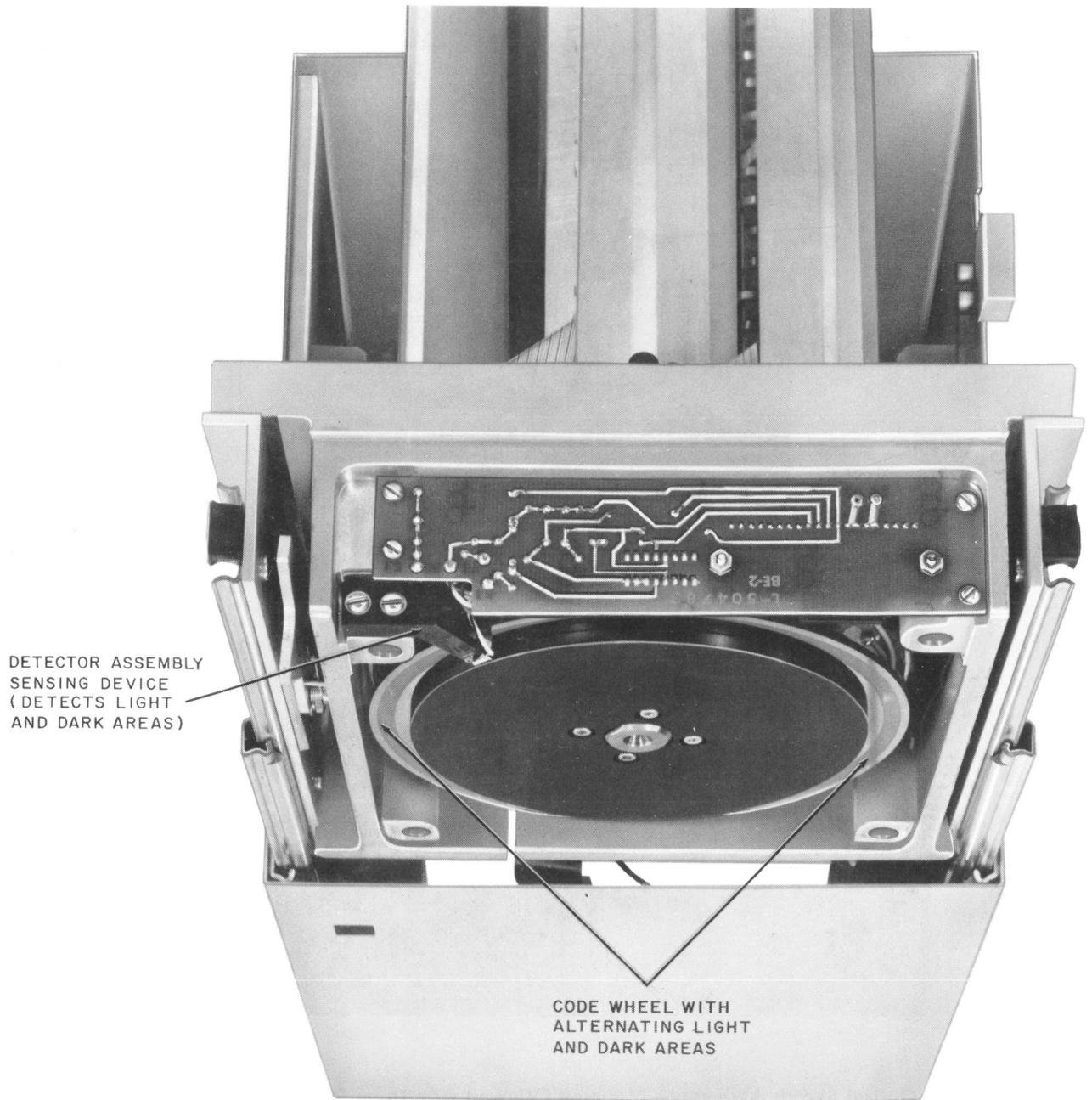


Fig. 33—Code Wheel and Code Wheel Amplifier Mounting in Relation to One Another (Viewed from Underside of Drum Storage Unit)

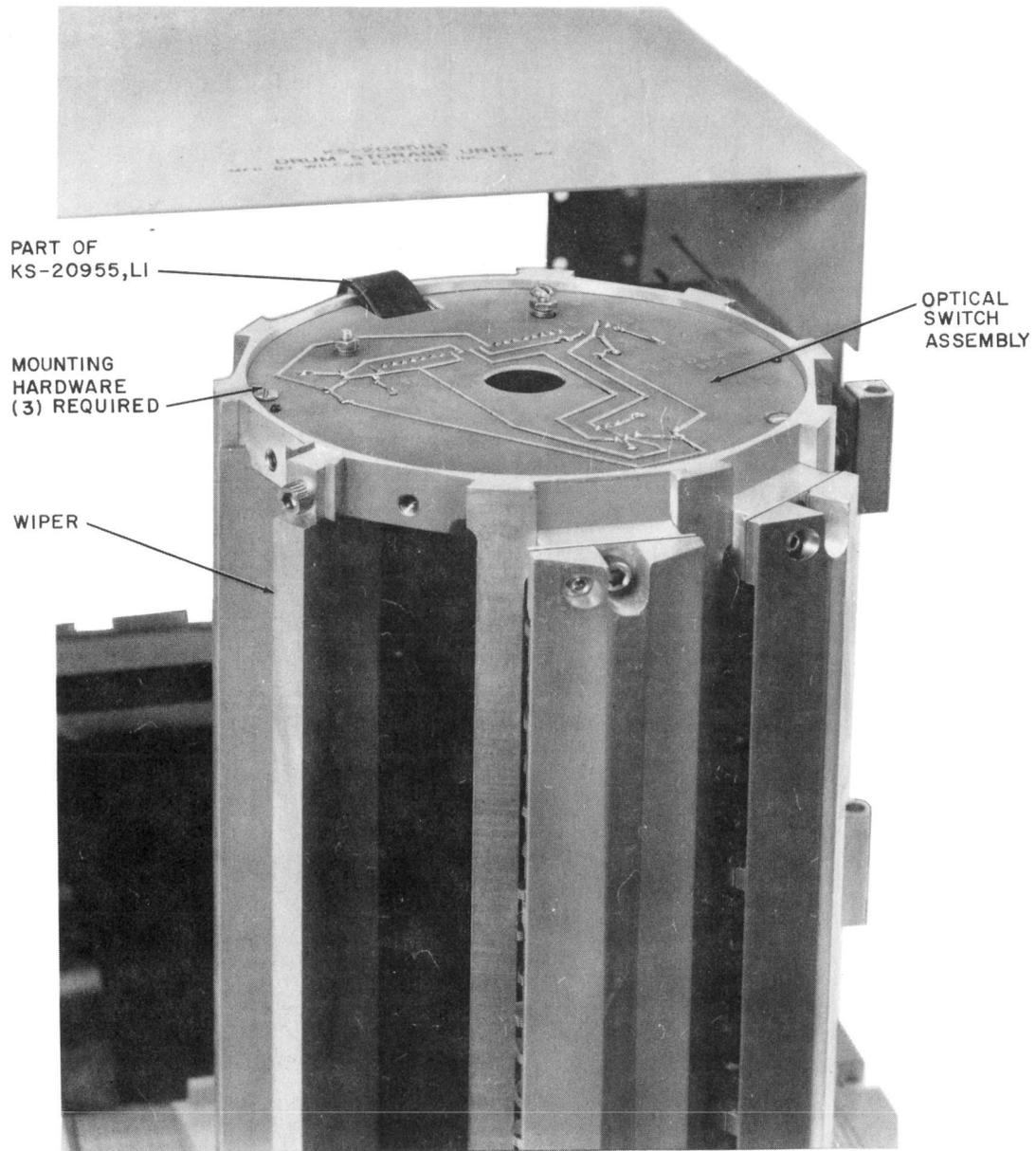


Fig. 34—Optical Switch Assembly—Mounted (Viewed with Drum Storage Unit Cover Removed)

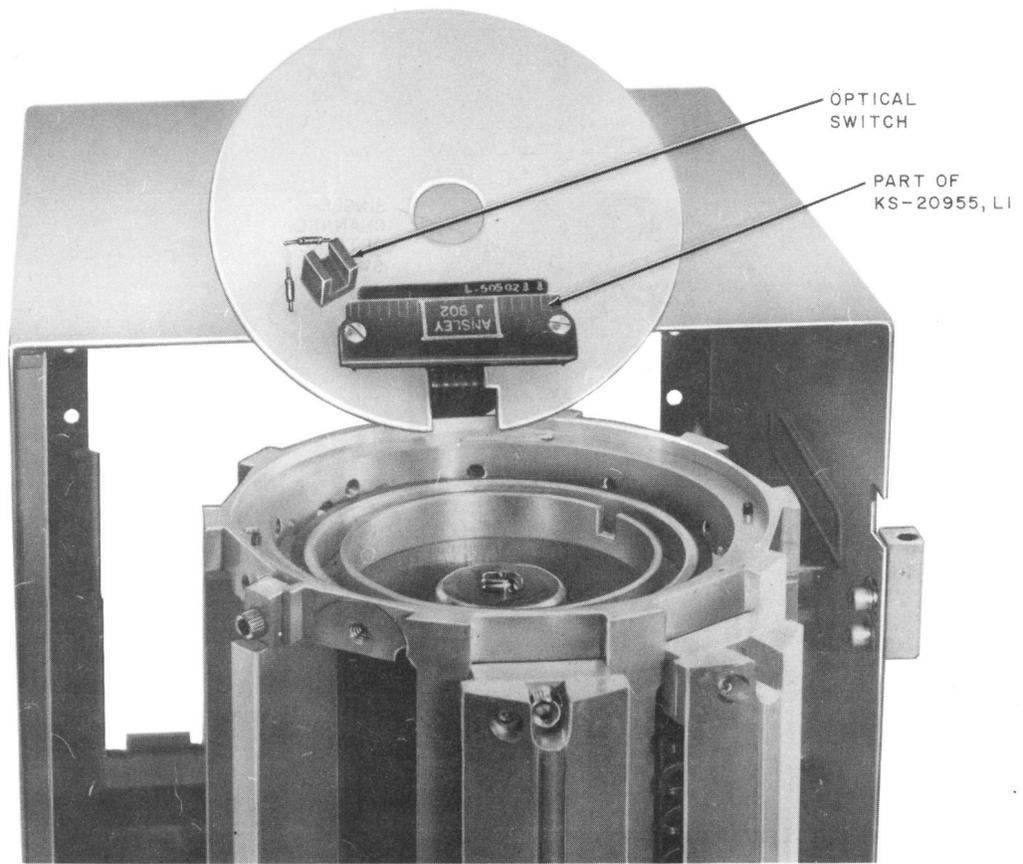


Fig. 35—L-504316-1 Optical Switch Assembly—Used With KS-20951, LI Drum Storage Units Serial No. 1 Through 7

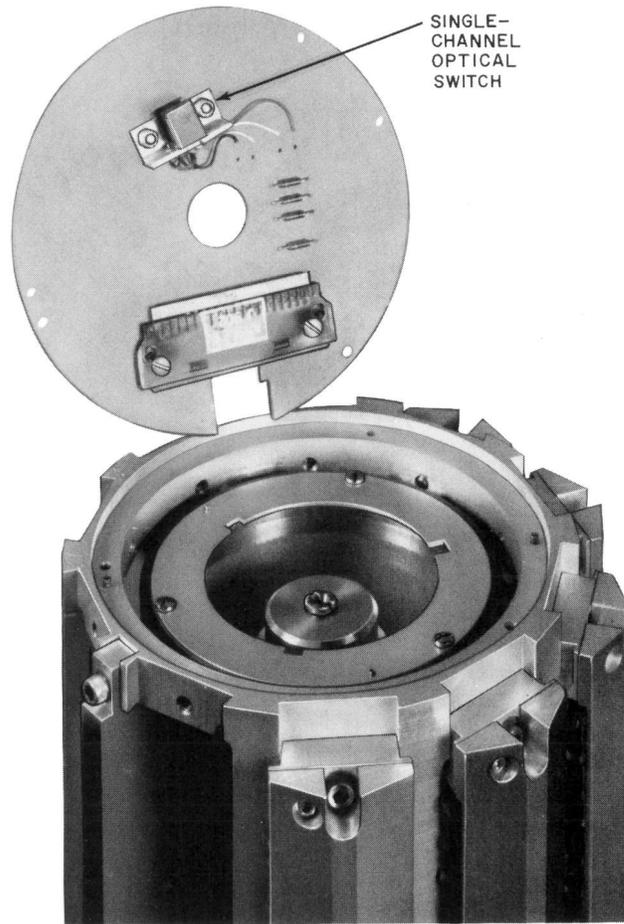


Fig. 36—L-509855-1 Optical Switch Assembly—Used With KS-20951, L1 Drum Storage Units Serial No. 8 and Up

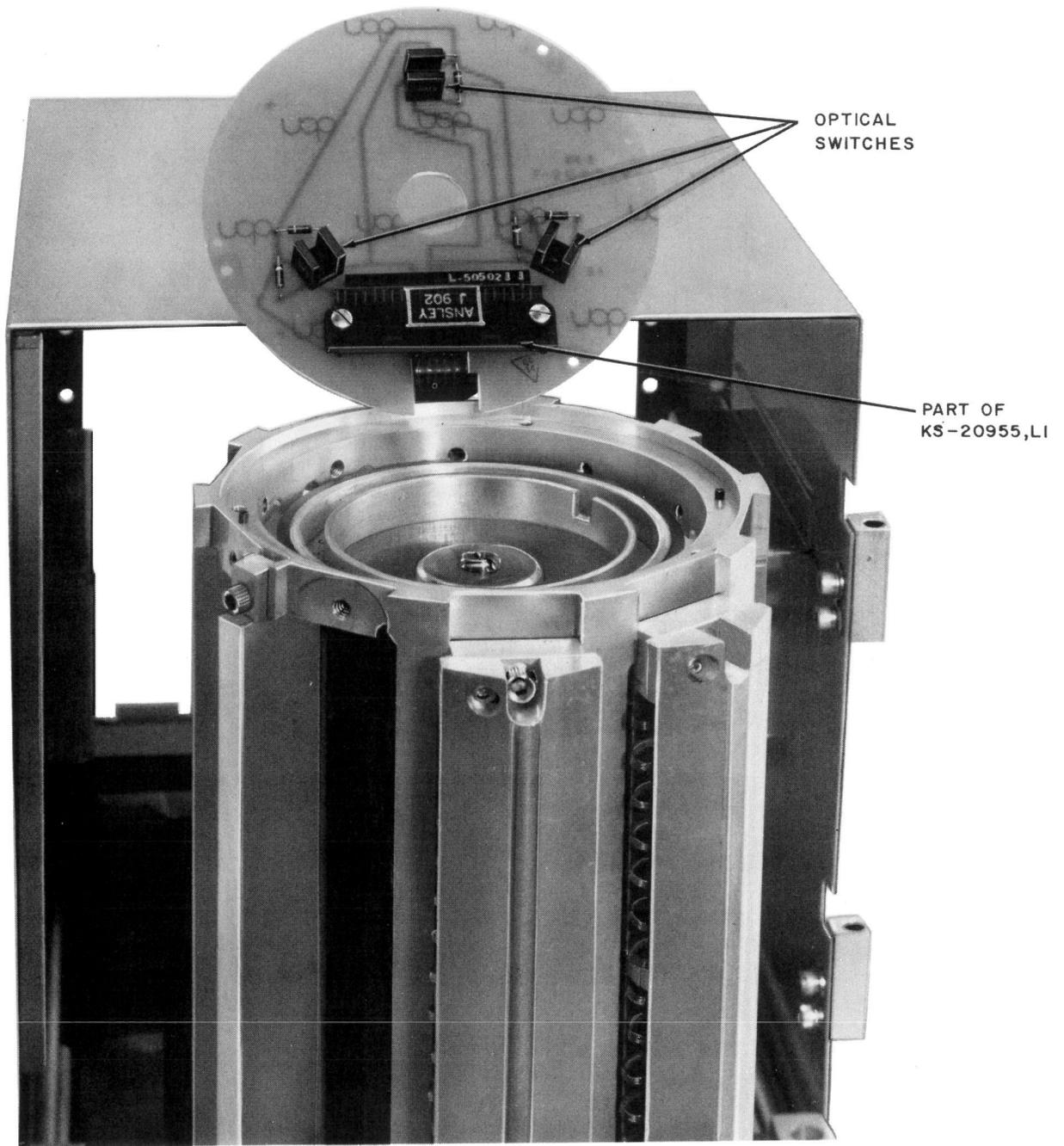


Fig. 37—L-504316-2 Optical Switch Assembly—Used With KS-20951, L2 Drum Storage Units Serial No. 1 Thru 8

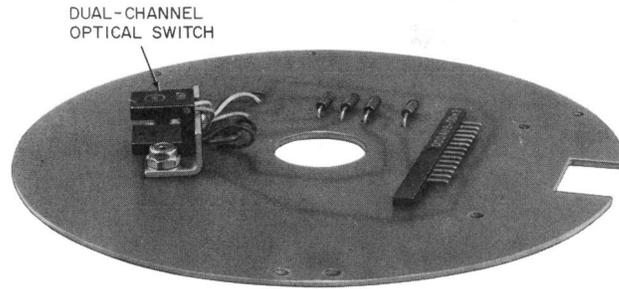


Fig. 38—L-509855-2 Optical Switch Assembly—Used With KS-20951, L2 Drum Storage Units Serial No. 9 and Up

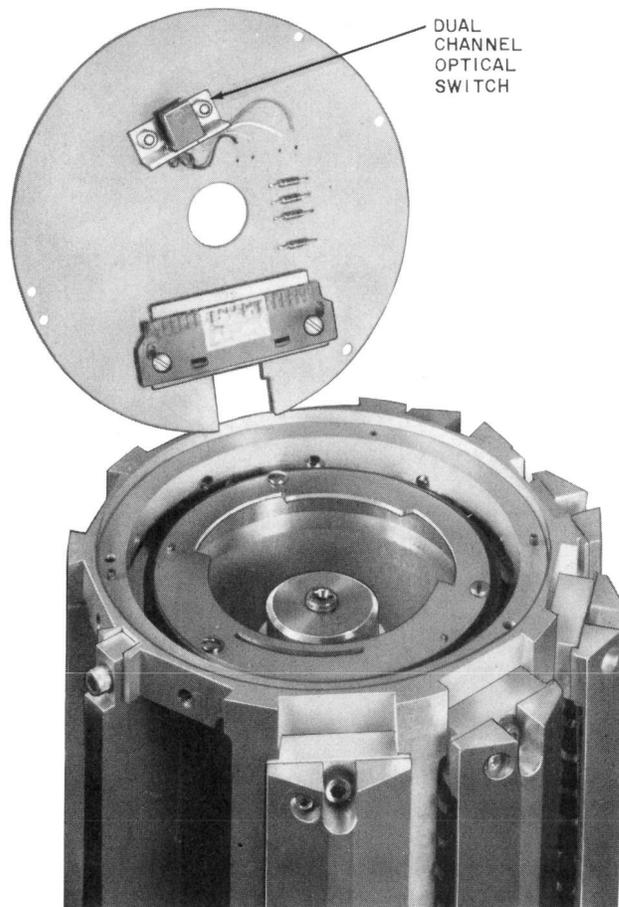
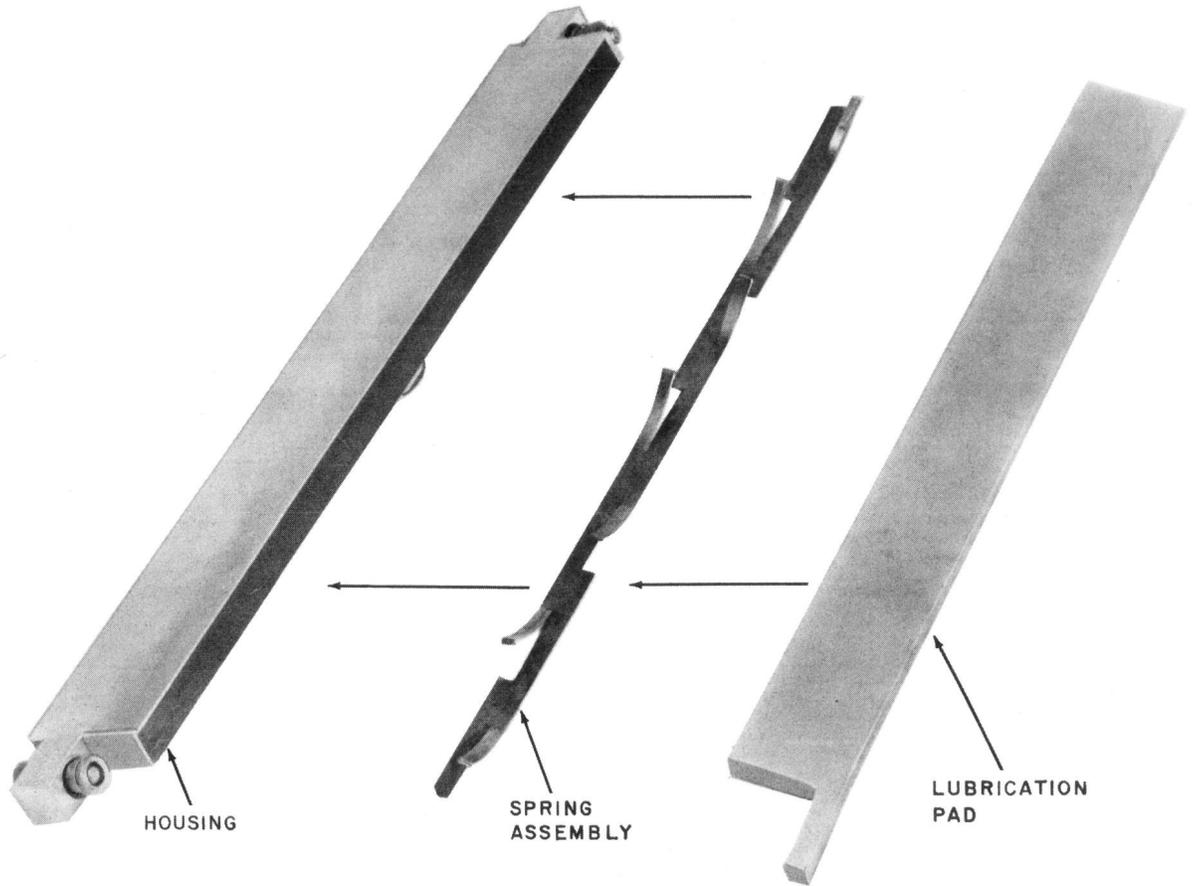


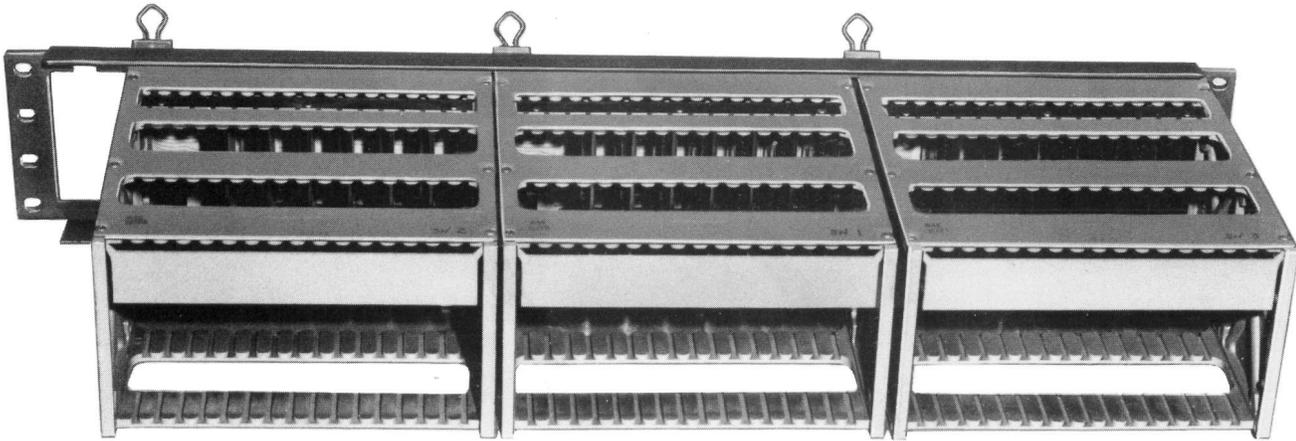
Fig. 39—L-509855-2 Optical Switch Assembly—Used With All KS-20951, L3 Drum Storage Units



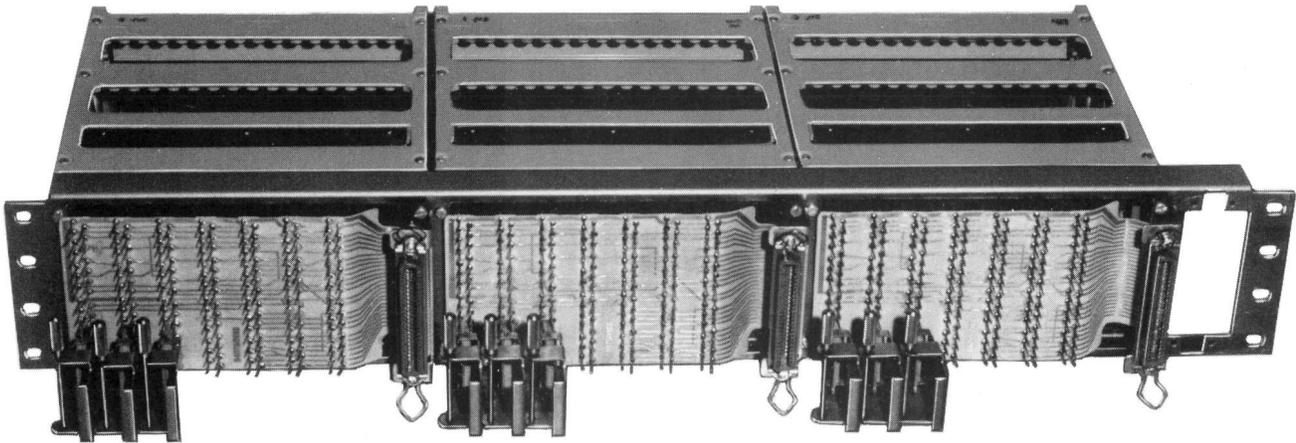
NOTE:

SPRING ASSEMBLY MOUNTS IN BACK OF HOUSING,
AND WIPER MOUNTS BEHIND SPRING ASSEMBLY,
ENTIRE UNIT MOUNTS ON DRUM STORAGE UNIT.

Fig. 40—Wiper Assembly



(FRONT VIEW)



(REAR VIEW)

Fig. 41—Channel Module—Front and Rear Views (VML, MM, or PM)

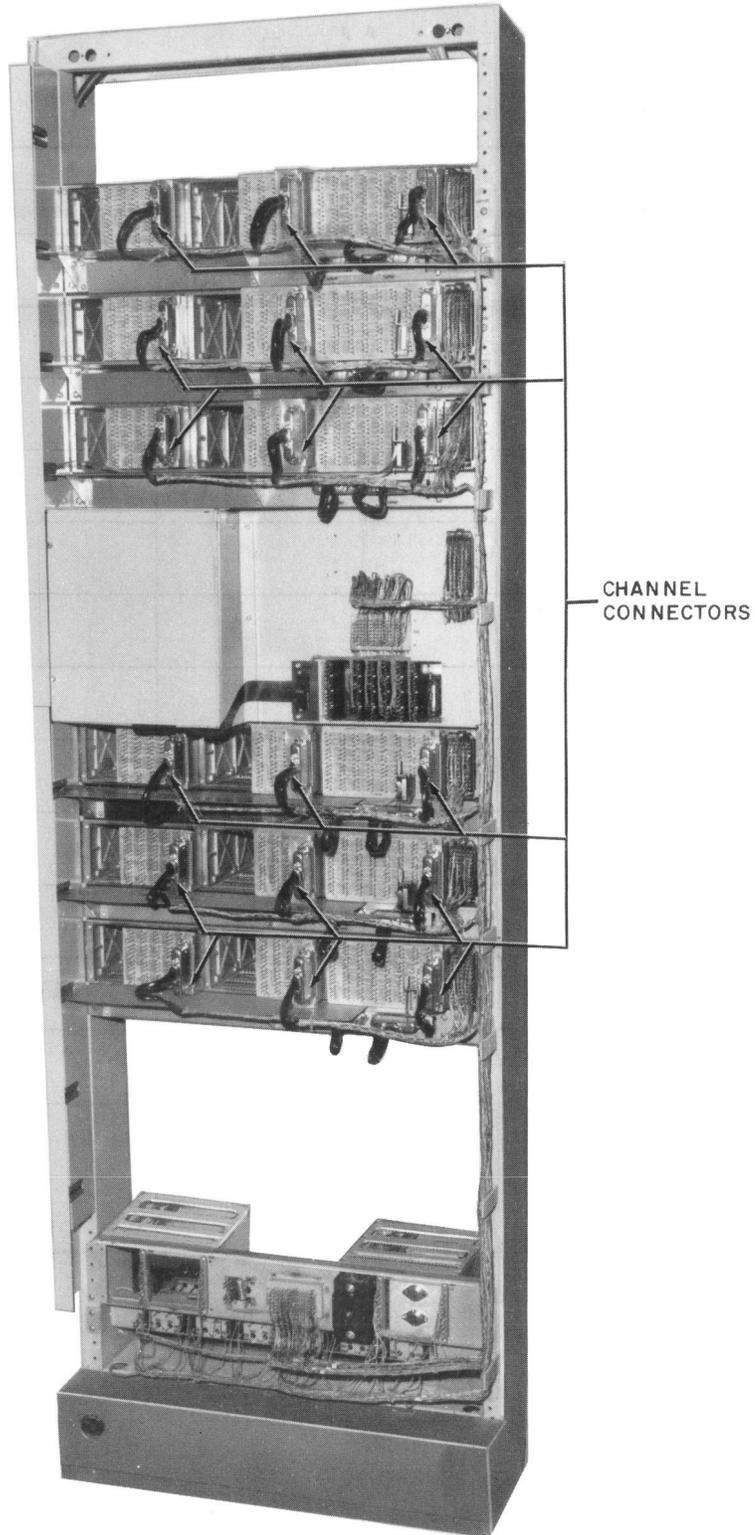


Fig. 42—Typical Rear View of CSRAF (VML, MM, or PM) Showing Channel Connectors on FPW Backplane

→TABLE D←

CIRCUIT PACK DESIGNATION AND USE

CIRCUIT PACK DESIGNATION	UNIT USED IN				
	MODULAR MESSAGE	VARIABLE MESSAGE	PHASED MESSAGE	MESSAGE SYNTHESIS	STORAGE MODULE
Power Amplifier A1012		*			
Record-Playback Amplifier A1013		*	*		
Alarm-Logic Circuit A1014		*	*		
DMUX Audio Amplifier A1015			*		
Head Switching Circuit A1016		*	*		
Clock Circuit A1017					*
Bias Erase Oscillator A1018					*
Amp-Log-Alarm A1019	*				
Switching Alarm Circuit A1020		*	*		
Motor Tach A1021					*
Motor Control A1022					*
Motor Power A1023					*
Quad Amplifier A1102				*	
Ferrod Driver A1103					*

4.65 *List of Circuit Packs Used in the CSRAF and a Description of Each*

Power Amplifier – A1012	This circuit pack is intended for use in the variable message length (VML) service as a constant gain power output stage and is capable of delivering 1 watt into 1 ohm.	Head Switching – Circuit A1016	This circuit pack is intended for use in the variable message channel and phased message channel to provide the logic, memory, and relays required to electrically couple four magnetic heads consecutively to both the R/P electronics.
Record-Playback – Amplifier A1013	This circuit pack is intended for use in the VML and phased message channels to provide amplification in the record and playback (R/P) modes of the channels. The circuitry contains switching to operate in either the record or playback mode and automatic gain control amplifiers to minimize the level differences at the input to the amplifiers. The Playback amplifier acts as a variable gain preamplifier for VML service and as a final output stage for phased message service and is capable of delivering 0.1 watts into 100 ohms.	Clock Circuit – A1017	This circuit is intended for use in the storage module to generate a fast rise-time clock pulse timing signal and a relay closure signal once-per-revolution of the magnetic drum. The clock pulse timing signal is used to initiate magnetic head switching.
Alarm-Logic – Circuit A1014	This circuit pack is intended for use in the VML and phased message channels to provide logic required to start announcements, provide timing information, and to control the channels in the R/P modes. This circuit pack also provides a cut-through relay closure and a voice alarm circuit which detects the output level of the announcement and breaks a loop to the system sensing circuitry, providing a central office alarm relay closure when the output transmission level falls below a preset level.	Bias Erase – Oscillator A1018	This circuit pack is intended for use in the storage module as a bias oscillator which provides a high-frequency (20 KHz) sine wave signal current for erasing previously recorded announcements and for AC biasing in the recording procedure.
DMUX Audio – Amplifier A1015	This circuit pack is intended for use in the phased message channel to amplify the announcement returning from a dedicated subscriber connection to a level sufficient to operate the alarm circuitry on the A1014 circuit pack.	Amp-Log-Alarm – Circuit A1019	This circuit pack is used in the modular message channel to record an announcement with the addition of external bias current and to play it back. A level detect circuit monitors the output level and provides a loop break whenever the level falls below a manually set level. The playback amplifier is capable of delivering 0.5 watts into 40 ohms.
		Switching Alarm – Circuit A1020	This circuit pack is used in the variable message and phased message channels to check for possible modes of message failures resulting from the use of head switching and to provide a central office alarm if the switching sequence is ever incorrect.

SECTION 201-520-101

Switching Alarm — Circuit A1020 (Cont)

This function is performed by comparing one message repetition to the next and detecting any sudden change in the message. Message repetitions are compared to each other by the use of two integrator and hold circuits which work on alternate message repetitions.

◆ Quad Amplifier — A1102

This circuit pack is intended for use in the MSS channel module. This circuit contains four independent amplifiers for playing back audio signals from magnetic heads. Each amplifier is capable of delivering a maximum of 80dB of gain into a 33 3300 ohm load. The output of each amplifier is made available at test points (TP1 — TP4), which are located on the faceplate of each quad amplifier circuit pack. These test points are used for monitoring purposes. Each of the four individual amplifiers of the A1102 quad amp circuit pack is also equipped with a variable gain adjustment which can be accessed through the hole in the front panel of the circuit card. This control provides the means for obtaining the required transmission levels.

Motor Tach — A1021

This circuit pack is intended for use in the storage module to operate in association with the A1022 and A1023 circuit packs, and the code wheel, code wheel electronics, and servo motor of the KS-20951 drum storage unit. This circuit receives feedback control signals from the code wheel on the magnetic drum to provide a DC output proportional to the frequency of the input signal which, in turn, is proportional to the speed of the motor (15 RPM, 4 seconds per revolution).

Ferrod Driver — A1103

This circuit pack is intended for use in the storage module when the CSRAF is equipped for MSS. This circuit provides 0.5 second and 1.5 second timing pulses which are used to drive independent but identical ferros in the master scanner of the user system. The timing pulses are initially derived from a dual channel light detecting sensor located on the optical switch assembly within the DSU. ◆

Motor Control — A1022

This circuit pack is intended for use in the storage module to operate in association with the A1021 and A1023 circuit packs, the code wheel, code wheel electronics, and servo motor of the KS-20951 drum storage unit. This circuit contains the motor speed setting reference voltage and forward gain and compensation for the servo loop controlling the servo motor in the KS-20951 drum storage unit.

Motor Power — A1023

This circuit pack is intended for use in the storage module to operate in association with the A1021 and A1022 circuit packs, the code wheel, code wheel electronics, and servo motor of the KS-20951 drum storage unit. This circuit provides the current capability and output impedance required.

4.66 The physical arrangement of the circuit packs in the various units is described in Parts 7, 8, 9, and 10 for each announcement configuration.

F. Control Unit

4.67 ◆FOR VML, MM, AND PM ONLY◆

4.67 A control unit is associated with each channel module on a one-to-one basis. There are three control unit designs, a specific control unit design provided for each of the three channel module designs.

4.68 The control unit is mounted on the frame immediately below the channel module it serves. Each of the control units contains the frame-mounted jacks, keys, and lamps required to provide for the local control, test, and maintenance of the channel module. Each time a channel module is added to a frame, an associated control unit is also added.

4.69 Each control unit is connectorized in the rear, and connection between the control unit and its associated channel module is via a connectorized harness provided for each channel module-control unit combination. The harness plugs into the channel module connectors and the control unit connectors on the back plane of the frame. Refer to Fig. 43 for harness and connector location and identification.

4.70 The front panel of the control unit, which contains the keys, jacks, and lamps, can be completely removed from the frame for replacement of components.

4.71 In general, the keys, jacks, and lamps on the front panels of the control units provide for the following functions to be performed at the front of the frame:

- Monitoring channel message with headset
- Recording message with headset or 1000-Hz tone
- Dubbing message from tape recorder
- Turning channel power on and off
- Adjusting the voice alarm

- Measuring audio output level of a channel.

◆FOR MSS ONLY

4.72 For MSS no control units are necessary since no facilities are required due to the prerecorded drum. Facilities have been provided on the storage module for turning power on and off and thus no additional control unit is necessary. Also, with the test points (TP1-TP4) provided on each quad amplifier circuit card and associated amplifier level adjustments, the monitoring, measuring, and adjusting of the output level of each channel may be made.◆

G. Power Supply

4.73 All the circuit packs in the CSRAF operate from either +15, -15, or +5 VDC. To provide for obtaining these voltages in any central office in which a CSRAF may be installed, a power supply (Fig. 1, 2, 3 and 4) is provided at the base of the frame to convert the -48 VDC, which is universally available.

4.74 The power supply is composed of two units, a 70B power unit and a 71H power unit. The combined power output capacity from all 3 voltages in one power supply is 100 watts sufficient to power the storage module and four channel modules. If five or more channel modules are used in the same frame, two power supplies are mounted beside one another at a base. Refer to Fig. 3.

◆FOR VML, MM, AND PM ONLY◆

Note 1: One power supply is used to supply channel modules and control units 0 through 3 and the storage module. The second power supply is needed when any or all of channel modules and control units 4 through 8 are used.

◆FOR MSS ONLY

Note 2: Two power supplies are required for MSS. The MSS frame is equipped with duplicated announcement systems and therefore two power supplies (one per machine and channel module) are necessary.◆

4.75 Each power supply (70B and 71H) is designed to fit into one 36B apparatus mounting frame.

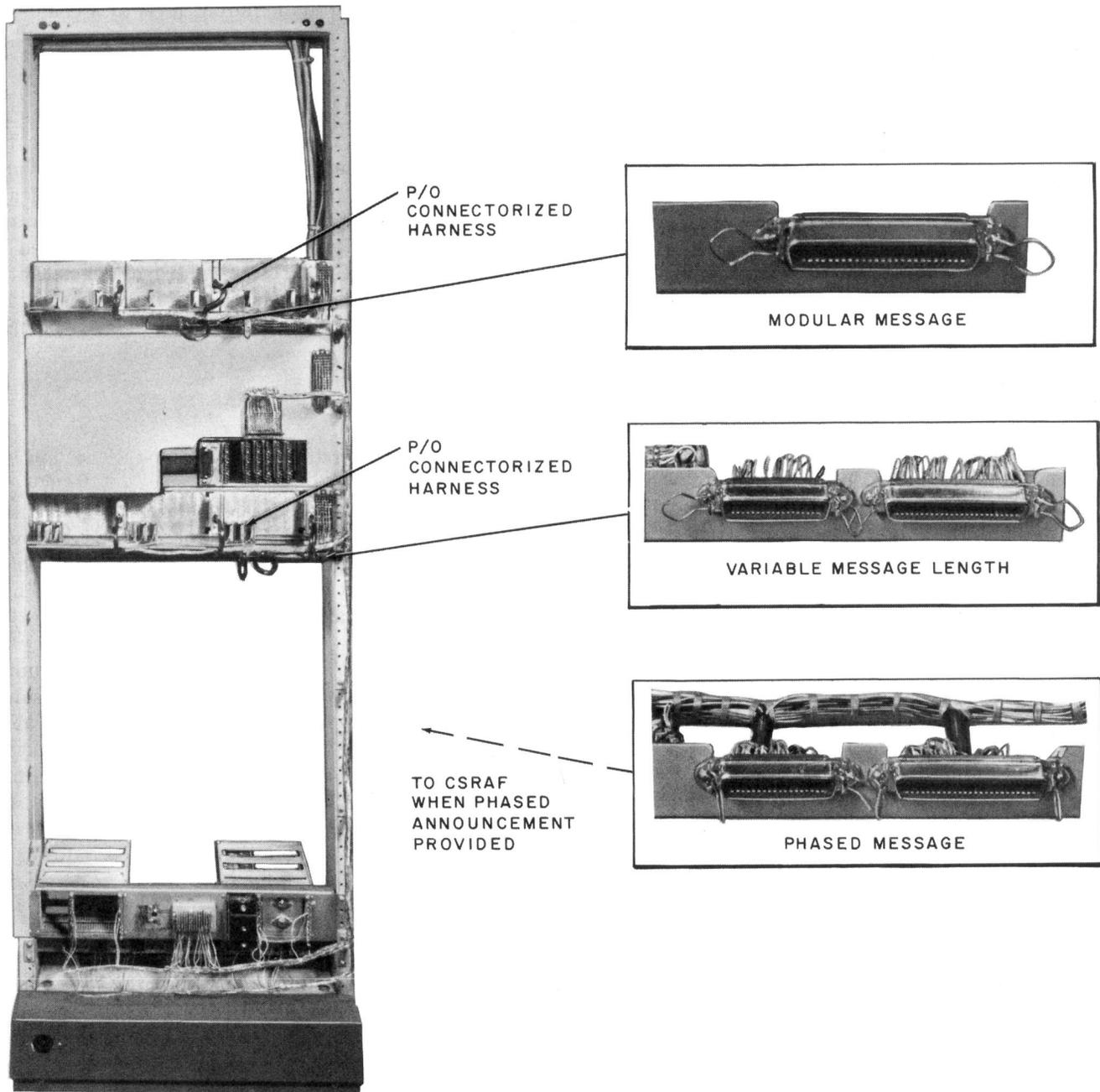


Fig. 43—Control Unit Connectors and Connectorized Harness—Typical CSRAF (VML, MM, or PM)

Two of the 36B frames are mounted on one 291 A-type 4-inch mounting plate located at the base of the main frame immediately above the fuse panel. Normally only one power supply is provided with the frame. However, if additional power is required, or if frame is arranged for MSS the mounting space is available for the second power

supply. The power supply is designed to be self-protecting under short circuit conditions.

H. Fuse Panel

4.76 A fuse panel, shown in Fig. 1, 2, 3, and 4, is mounted at the base of the frame to

protect channels on an individual or group basis. A separate fuse panel is used with each power supply.

I. Frames

4.77 With the use of the drum storage unit, channel module, channel electronics, and control units (if provided), a frame can be arranged to provide a specific announcement service or a desired combination of announcement services. The principal physical differences between arrangements of the frame would be in the type and quantity of channel modules and control units (if provided).

4.78 The CSRAF can be built up on either of two frameworks. When the equipment is mounted on a No. 1 ESS framework, the frame is coded J1C012A. When the equipment is mounted on an 11-foot 6-inch bulb angle framework, the frame is coded J1C012B. Neither of these two codes can be arranged for MSS. When the equipment is mounted on the same framework as the J1C012A and arranged for MSS the frame is coded J1C012C.

J. CALL DIRECTOR®

FOR VML, MM, AND PM ONLY

4.79 A CALL DIRECTOR (Fig. 44) is used as a dedicated phone for recording of audio information on the CSRAF from a quiet location. The CALL DIRECTOR is a 637 EA13-type standard equipped with 18 key positions; 2 positions for the record function and 16 positions for selecting channels on the CSRAF, 1 position per channel. If the CSRAF is equipped with more than 16 channels, 2 additional 635 GC keys can be added to provide for 12 additional channels or a maximum of 28 channels. Also provided on the side of the CALL DIRECTOR is a jack arrangement so that professionally prerecorded messages can be dubbed onto the recorded announcement frame.

4.80 One CALL DIRECTOR is provided per frame. Two frames located in the same frame lineup require two call directors for access.

FOR MSS ONLY

4.81 For MSS the use of a dedicated phone is not necessary. Because of the use of the prerecorded magnetic drum no recording facilities of any type are required.

5. RESTRICTIONS

FOR VML, MM, AND PM ONLY

5.01 Only three restrictions apply in use of the CSRAF. Two are associated with the input/output connecting cables and one with channel capacity.

A. Cables

5.02 The output impedance of the playback amplifiers is designed to be very low to minimize transmission loss with simultaneous trunk connections and to maximize talk through loss between trunks connected to the same amplifier. The resistance of the cable connecting the amplifier output to the distributing networks, which connect to the trunks, adds to the output impedance of the amplifier. This cable resistance should, therefore, be kept as low as possible while still allowing some degree of freedom in locating the CSRAF in a frame lineup. Generally, the service to be provided and the transmission objectives will dictate the cable resistance tolerance; but if the loop resistance of the cable can be kept to approximately 0.5 ohms, transmission performance should be excellent in all cases. Also the resistance of the cable connecting the CALL DIRECTOR to the CSRAF must be kept within bounds. In this case, however, considerably more resistance is tolerable; if the cable loop resistance does not exceed 150 ohms, very satisfactory recordings should result. The 150-ohm limitation applies to remote recording from a CALL DIRECTOR located in the same building which contains the CSRAF.

B. Channel Capacity

5.03 The channel capacity is limited to nine channel modules per frame, and the total recording time of all channels cannot exceed 800 seconds.

FOR MSS ONLY

5.04 The only restriction in the use of the CSRAF arranged for MSS is that the total number of channels cannot exceed 96. The limit is set by the number of amplifiers provided.

Note: Although not a requirement it is suggested in order to cause minimum interference to the audio signals the CSRAF should not be located adjacent to frames which produce

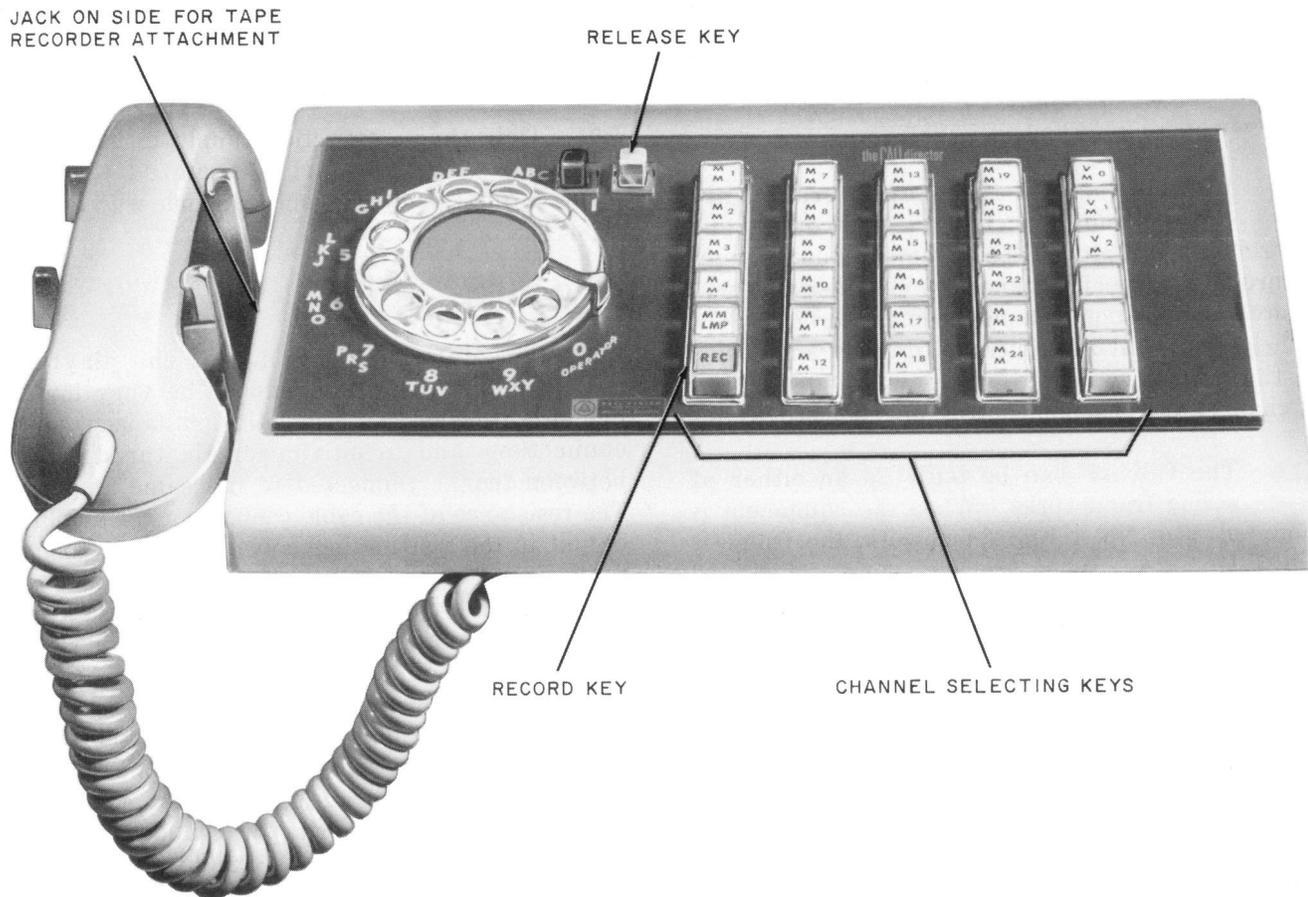


Fig. 44—637E413 Call Director

extra ordinary electrical activity. (i.e. ring and tone frame).

6. RECORDING

FOR VML, MM, AND PM ONLY

6.01 Recordings on the CSRAF can be made either locally at the frame by central office personnel or remotely in a quiet area by operators or other qualified personnel.

A. At the Frame

6.02 Recording at the frame can be accomplished in one of three ways:

- Live voice using a 52-type operator's headset or a G3DR-61 type handset.

- Using a 1000-Hz, 1-milliwatt tone
- Dubbing professionally prerecorded messages from a tape recorder.

Local recording at the frame would generally be done for test or maintenance functions. Means of accomplishing local recording are provided by keys, jacks, and lamps on the storage module and the control units. More detailed information about local recording procedures can be found in Sections 201-520-301 and 201-520-501.

B. Remote

6.03 Remote recording is accomplished from a CALL DIRECTOR located in a quiet area. Two of the keys, REC (record) and MM LMP (modular message timing lamp), are used for recording, and the remaining buttons are used for

channel selection. To make a recording, the receiver is lifted and the desired channel selection key is depressed. The present message can be immediately monitored. Interfacing equipment can be arranged to light the lamp under the REC key when the channel is available for recording. The REC key is then depressed and held. Within 4 seconds a lamp lights either under the depressed channel selection key for variable and phased messages or under the MM LMP key for modular messages, at which time the operator can start dictation. When the dictation has been completed, the REC key is released, after which the recorded message can be monitored. Remote recording is also possible using a tape recorder to dub professionally prerecorded messages onto the frame. A jack is provided on the CALL DIRECTOR for this purpose.

▶FOR MSS ONLY

6.04 Because of the use of the prerecorded magnetic drum, no recording facilities of any type either local or remote are necessary.◀

7. VML ANNOUNCEMENT

A. General

7.01 The maximum capacity of the VML announcement is 48 seconds, variable in 4-second increments at the time of recording. The channel operation is synchronous with a 4-second period which corresponds to the drum rotation period. A clock pulse is produced by an optical switch assembly mounted on top of the drum unit.

7.02 If a message exceeds 4 seconds in length, it must be recorded on two or more tracks which are electronically pieced together in the R/P process. The number of messages or channels that can be handled by the drum storage unit is dependent upon the lengths of the individual messages; the longer a message, the more tracks are required.

7.03 To handle this situation, the drum storage unit is organized to arrange the tracks in groups of four. Since each track provides 4 seconds, the 4-track group provides a basic message length of 16 seconds. The 16-second modules may then be added together to provide for the maximum length of message expected. The established standard message lengths are 16, 32, and 48 seconds. The maximum message length selected for a channel is dictated by the maximum length message

anticipated to be recorded on a channel. The actual message length can be from zero to maximum, since the message is built up in 4-second increments until maximum is reached.

7.04 In the playback mode, the message is announced on a repeating cycle which is determined by the actual message length, not the maximum length. This feature of the drum storage unit, in conjunction with the associated electronics on the frame, provides a VML announcement service. When a particular maximum message length is chosen for a given channel, an associated number of tracks (maximum message length in seconds divided by four) are dedicated to that channel and cannot be used elsewhere. Therefore, to realize the greatest number of channels, the maximum message length of each channel must be realistically chosen.

B. Channel Module

7.05 The VML channel module (Fig. 45) provides for a 3-channel operation with each channel having a maximum message length of 48 seconds. In this design each 36A apparatus mounting frame is dedicated to a single channel, and the three 36A apparatus mounting frames together provide for three separate channels. The 48-second limitation on each channel results from the physical limitation of the number of circuit packs that can be placed in one 36A mounting frame. Each VML channel requires four circuit packs for the normal record, reproduce, and alarm functions. The channel also requires switching circuit packs. If the channel is equipped for only 16-second long messages, one switching circuit pack is required in addition to the previously described normal circuit packs. If the channel is equipped for 32-second messages, two switching circuit packs are required and for 48-second messages, three switching circuit packs. The third switching circuit pack fills the 36A apparatus mounting frame. Refer to Fig. 46 for location and identification of VML channel module circuit cards.

C. Control Unit

7.06 For local maintenance a control unit (Fig. 45) is located under each channel module. This control unit is used to turn power on and off, record test signals on the tracks, monitor recorded announcements, adjust voice alarm levels, and indicate off-normal and power-off conditions.

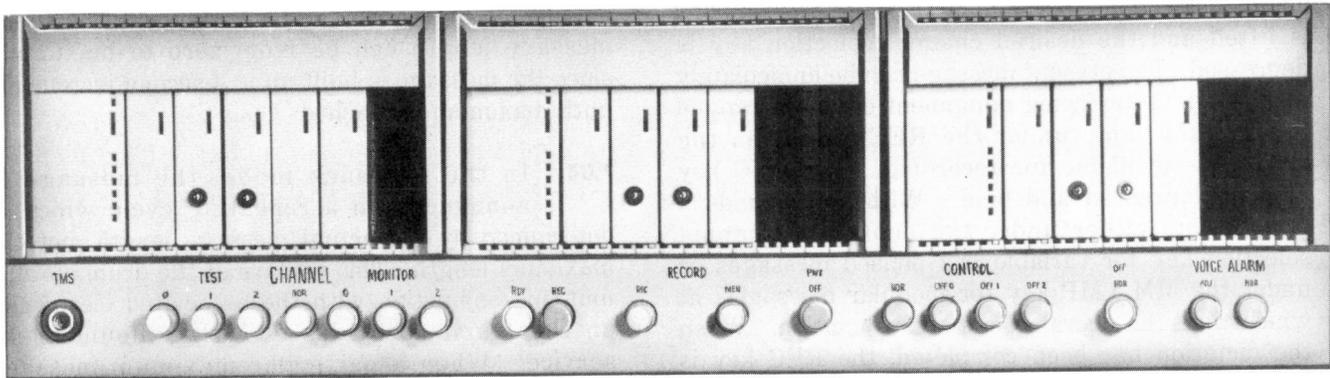


Fig. 45—Variable Message Length Channel Module and Control Unit

7.07 Table E provides a complete listing of all keys, jacks, and lamps associated with the variable message control unit and a description of each.

D. Alarms

7.08 The announcement frame is alarmed for the predominant modes of failure. To simplify the diagnosis of a machine fault, the alarm features are classified into three areas:

- Voice alarms
- Memory loss alarms
- Fuse alarms.

Alarms are given on the frame itself in the form of lights, and to the interfacing circuit in the form of relay contacts for loop closures.

Voice Alarms

7.09 To maintain a satisfactory audio level at the output of the announcement frame, a voice alarm circuit samples the audio at the output transformer through a 600-ohm coil. This ALARM AUDIO coil feeds a high input impedance circuit, which transforms the audio signal to obtain a DC level proportional to the signal strength so that at the nominal system audio output level, it is sufficient to operate an alarm relay. When the audio level drops below a preset level, the AL relay releases breaking a loop for the interfacing circuit.

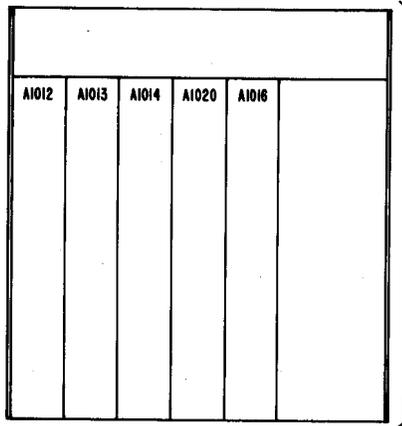
7.10 Provision for adjusting the sensitivity of the voice alarm level is available on the control unit. By depressing the VOICE ALARM ADJ key on the control unit, resistors are connected across the ALARM AUDIO coils of the three channels, decreasing the signal level by approximately 6 dB. The voice alarm circuit is adjusted in accordance with Section 201-520-701. A pair of contacts on the AL relay goes to the interfacing circuit for signaling. The three channels connected to the control unit can be adjusted simultaneously. When the VOICE ALARM NOR key is depressed, the resistors are disconnected yielding a 6 dB threshold on the voice alarm.

7.11 It is not necessary to interfere with the output audio to test the voice alarm, either locally at the machine or remotely. The voice alarm is tested locally by depressing the VOICE ALARM TEST key on the storage module or remotely by supplying a loop closure from the interfacing circuit.

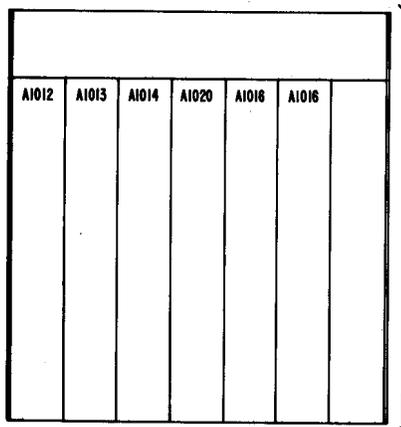
7.12 The audio level at which the voice alarm operates is adjustable to accommodate different system output requirements. The voice alarm not only detects a decrease in the audio level, but also any fault which would deteriorate or eliminate the signal, such as power loss, drum stoppage, malfunctioning magnetic head, faulty amplifier, etc.

Memory Loss Alarm

7.13 The memory feature of the VML announcement can be lost if power is removed from the associated channel module, or can be erroneously

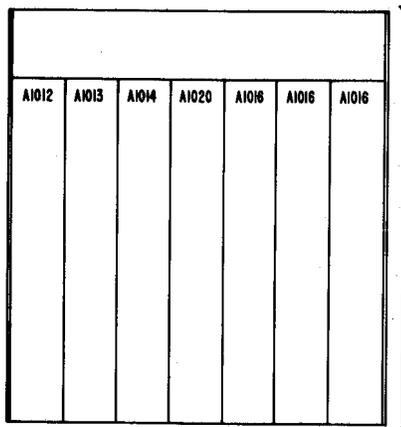


ARRANGED FOR
16-SECOND
ANNOUNCEMENT (MAX)



ARRANGED FOR
32-SECOND
ANNOUNCEMENT (MAX)

AI012- POWER AMPLIFIER
AI013- RECORD PLAYBACK AMPLIFIER
AI014- ALARM LOGIC CIRCUIT PACK
AI020- SWITCHING ALARM CIRCUIT PACK
AI016 - HEAD SWITCHING CIRCUIT PACK



ARRANGED FOR
48-SECOND
ANNOUNCEMENT (MAX)

Fig. 46—Location and Identification of Variable Message Length Channel Module Circuit Cards

TABLE E
VARIABLE MESSAGE LENGTH CONTROL UNIT

KEY, JACK, OR LAMP	DESCRIPTION
TMS	<p>Transmission measuring set jack used for:</p> <ul style="list-style-type: none"> • Measuring audio levels with transmission measuring set. • Recording from headset by inserting jumper from storage module SIGNAL jack.
CHANNEL TEST (0-2)	<p>CHANNEL TEST keys — Contacts on CHANNEL TEST keys:</p> <ul style="list-style-type: none"> • Connect corresponding channel preamplifier audio to TMS jack. • Supply power to CM relay. • Connect MEM key to corresponding channel. • Light OFF NOR lamp.
CHANNEL NOR	<p>CHANNEL NOR (normal) key — Depressed when operating in normal mode.</p>
CHANNEL MONITOR (0-2)	<p>CHANNEL MONITOR keys — Contacts on MONITOR key:</p> <ul style="list-style-type: none"> • Remove circuit ground from TMS jack. • Connect corresponding channel output to TMS jack. • Light OFF NOR lamp. <p><i>Note:</i> Indication to interfacing circuit to remove channel from service is given when a CHANNEL TEST key is depressed but not when MONITOR key is depressed.</p>
RDY	<p>RDY (ready) lamp — Gives indication from interfacing circuit that the tested channel is out of service.</p>
REC	<p>REC (record) lamp — Gives indication from alarm logic circuit that channel being tested is in the record mode.</p>
REC	<p>REC (record) key — Places channel being tested into the record mode.</p>
MEM	<p>MEM (memory reset) key — Restores memory to channel being tested in case of memory loss.</p>
PWR OFF	<p>PWR OFF (power off) lamp — Indicates:</p> <ul style="list-style-type: none"> • At least one channel has power disconnected with its CONTROL key in OFF position. • A fuse has overloaded in one of the three connected channels.
CONTROL NOR	<p>CONTROL NOR (normal) key — Depressed when in normal mode.</p>
CONTROL OFF (0-2)	<p>Channel CONTROL OFF keys — Contacts on CONTROL OFF key depressed:</p> <ul style="list-style-type: none"> • Remove power from corresponding channel. • Break loop in office alarm circuit. • Light PWR OFF lamp. • Light OFF NOR lamp. • Provide closure to interfacing circuit

TABLE E
VARIABLE MESSAGE LENGTH CONTROL UNIT (Cont)

KEY, JACK, OR LAMP	DESCRIPTION
OFF NOR	OFF NOR (off-normal) lamp — Indicates that at least one channel CONTROL key or channel TEST key is depressed.
VOICE ALARM ADJ	VOICE ALARM ADJ key — Contacts on ADJ (adjust) key: <ul style="list-style-type: none"> • Connect resistors across alarm audio coil to decrease level by 6 dB, aiding in the voice alarm adjustment. • Light OFF NOR lamp.
VOICE ALARM NOR	VOICE ALM (alarm) NOR (normal) key — Depressed when in normal mode of operation.

changed due to voltage transients and circuit malfunctions.

7.14 To make these errors observable, a switching alarm circuit is added to the channel circuitry. The switching alarm circuit will light an LED on the faceplate of the switching alarm card and will operate the voice alarm, lighting a second LED on the faceplate of the alarm-logic card and sending a voice alarm signal to the system. This malfunction is detected by observing the two lighted LEDs on the faceplates of the switching alarm card and the alarm-logic card.

7.15 If the error was due to transients, the memory can be reset without erasing the message on that channel by listening to the channel with the headset and depressing the MEM (memory) key on the control unit. The MEM key will clear the memory registers and start the message from the beginning. When the end of the message is heard, releasing the MEM key restores the memory of the channel.

Fuse Alarms

7.16 The power supply levels used in the CSRAF are +15 and -15 VDC for operating integrated circuit operational amplifiers and +5 VDC for operating digital integrated circuits. These voltages are available at the base of the CSRAF from a power supply.

7.17 The three voltages are fused individually to each channel with 70-type indicating fuses. Should a fuse overload, its contact energizes a relay

in the control unit serving that channel. Contacts on this relay light the PWR OFF lamp on the control unit and energize the fuse alarm (FA) relay located on the power supply module at the base of the announcement frame. Contacts on the FA relay complete a loop to the office major audible alarm. The -48 volt office supply is separately fused to supply the PWR OFF and the OFF NOR lamps.

E. Record Procedures

Remote Recording

7.18 Recording on the announcement frame with a dedicated phone is initiated by lifting the receiver from the line switch (LS). When the LS makes contact, the control functions on the dedicated phone are enabled, and the dedicated phone receives a filtered talking current. By depressing a channel selection L key on the dedicated phone, the playback preamplifier output of that channel is connected to the dedicated phone, and the message recorded on that channel can be heard. Contacts on the channel selection L key also energize the channel relay (CM) for that channel. The CM contacts connect the channel to the record function and give a relay closure to the interfacing circuit indicating that the channel is being tested. The interfacing circuit can provide a closure to light the lamp under the REC key to indicate that the channel has been taken out of service.

7.19 To record a new message, the REC NL key is depressed clearing the registers on the head switching circuit and reversing the state of

the relays on the R/P amplifier. These relays turn on the record amplifier and connect the bias-erase oscillator to the channel being tested.

Note: With the use of cross-field magnetic heads, erasing of the previous announcement is accomplished simultaneously with the recording of a new announcement, thus eliminating the need for a separate erase cycle.

7.20 At the next clock pulse after the REC NL key was depressed (within 4 seconds), a record lamp lights under the depressed channel selection L key on the dedicated phone, indicating that the channel is in the record mode and the new message can now be recorded by the operator. The record amplifier has automatic gain control, which sets a proper record level even though the voice level of the operator into the dedicated phone may not be at the optimum recording level.

7.21 At the completion of the message, the REC NL key is released. Within 4 seconds the channel will automatically switch into the playback mode, and the lamp under the channel selection L key will extinguish. However, if the maximum capacity of the channel is exceeded while recording, the record lamp under the channel selection L key will extinguish and the message must be rerecorded.

7.22 After a recording has been made, the operator can listen to determine whether a satisfactory announcement has been recorded. If not, the message can be rerecorded by repeating the previous procedure. The channel is released to the subscribers by selecting another channel or by pushing the release (RLS) key on the dedicated phone and replacing the receiver on the LS.

7.23 There is also provision at the CALL DIRECTOR to enable the recording of messages from a tape recorder. Remote recording using a tape recorder is accomplished by plugging the tape recording equipment into the jack provided on the side of the CALL DIRECTOR. The procedure then prescribed for remote recording from a CALL DIRECTOR is followed. The recorder can be unplugged after recording, and the message can be heard in the receiver of the CALL DIRECTOR for verification.

Local Recording

7.24 It is possible to record new messages locally at the frame, either through a headset or by dubbing a prerecorded message from a tape recorder. The local recording feature provides a valuable maintenance facility for diagnosing recording problems as well as a means for recording professional prerecorded messages. Means for accomplishing local recording are provided by keys, jacks, and lamps on the storage module and the control units.

7.25 To record on one of the channels, the corresponding channel test key (TEST) is depressed. The test contacts connect the audio signal from the preamplifier output of that channel to the TMS jack. By inserting a headset into the HEADSET jack in the storage module and connecting the SIGNAL jack in the storage module to the TMS jack in the control unit with a patch cord, the message recorded on the selected channel can be heard. The test contacts also energize the CM relay on the channel which couples the REC and MEM functions to that channel, and signals the system through a loop closure to a sensor that the channel is being tested. The interfacing circuit can provide a closure to light the record ready (RDY) lamp when no subscribers are connected to the channel (in some time interval) after the TEST key has been depressed.

7.26 To record from a tape recorder, the tape recorder output is connected into the HEADSET jack, and a transmission measuring set is inserted into the MONITOR jack. An appropriate recording level is set by adjusting the volume control of the tape recorder and observing the level on the transmission measuring set. By pushing the REC key and turning on the tape recorder when the REC lamp lights, the message from the tape recorder will be recorded on the channel. When the message ends, the REC key is released; and when the REC lamp goes off, the channel has switched into the playback mode. By inserting a headset into the HEADSET jack, the newly recorded message can be monitored. If the message on the tape recorder is longer than the capacity of the channel, only part of the message will be recorded.

Note: In preparing prerecorded tapes, the channel capacity and the reaction times in the prior procedure must be considered.

7.27 To record with a headset, it is necessary to power the microphone of the headset by inserting it into the HEADSET jack on the storage module. A patch cord is connected from the SIGNAL jack in the storage module to the TMS jack in the control unit. When the REC key is depressed within 4 seconds, the REC lamp will light and the audio dictated into the headset will be recorded on the channel as long as the REC lamp is lighted. When the dictation stops, the REC key is released; and when the REC lamp goes off, the channel has switched into the playback mode.

7.28 After a message has been recorded, the level at the output of the frame can be measured. By pushing the MONITOR key of the channel being tested, the output audio is connected to the TMS jack. Since no other function is accessed with the MONITOR button key, no indication is given to the interfacing circuit during the monitor mode. The output is measured by inserting the transmission measuring set into the TMS jack.

7.29 A 1000-Hz test tone is recorded on a channel by connecting the TMS jack to the 1000-Hz jack on the storage module using a patch cord and depressing the REC NL key. After the REC lamp extinguishes, the TMS jack can be connected to the SIGNAL jack, enabling the recorded tone to be monitored through the headset. Indication that a test tone is being recorded is given to the interfacing circuit through a closure of the 1000-Hz jack sleeve and the sleeve on the TMS jack.

F. Playback Operation

7.30 The most frequent mode of operation of the CSRAF is the playback mode, in which messages recorded on the drum are distributed to the subscribers. The message recorded on the drum is stored in 4-second tracks and is retrieved by switching heads in the same sequence in which the message was recorded. The operation of this system is synchronous, every action occurring at a clock pulse.

7.31 The timing pulse for the CSRAF is generated by the clock circuit pack (Fig. 11). Since all announcements are recorded on one drum, only one clock circuit pack per machine is necessary. The timing information to the clock circuit pack is supplied by an optical switch assembly located above the drum. A monostable multivibrator is incorporated to convert this once-per-revolution output into a

fast rise-time clock pulse. A relay (CL1), also on the clock circuit pack, provides a once-per-revolution closure for interface purposes.

7.32 The magnetic heads are consecutively switched to the preamplifier input through relay contacts. In determining which relay to switch and the number of relays necessary to handle the duration of the message, each head switching circuit pack contains four relays with all necessary logic and memory required to switch them. The logic and memory are composed of digital integrated circuit flip-flops in a shift register formation. To detect any possible failure in the switching logic and memory, a switching alarm circuit is included.

7.33 If a gate fails on the head switching card, a voice alarm indication will be given; and LEDs on the front panels of both the switching alarm and the alarm logic circuit packs will light in that channel.

7.34 Additional logic is required to start announcements to provide timing information and to control the channel in the R/P modes. This channel logic, located on the alarm-logic circuit pack, samples the switching relay current. As long as at least one relay is operating in the channel, no action is taken. When the message ends, the memory on the head switching circuit pack inhibits the next relay from operating and the relay current drops to zero. The channel logic recognizes this condition and sets the first flip-flop on the switching register at the next clock pulse. Since this 4-second period of no relay current corresponds to a silent output condition, the channel logic also provides a 4-second CT relay closure to the interfacing circuit. Zero relay current condition could also occur if one of the gates in the switching circuitry were malfunctioning. The switching alarm circuit would detect this error. During the playback mode, the magnetic heads act as sources of audio signals which are switched consecutively by the relays to the input of a preamplifier.

7.35 The audio preamplifier contains equalization to improve the audio quality and automatic gain control (AGC) to decrease differences in head output due to variations from head to head. The amplified audio signal goes to the power amplifier, to the control unit, and to the dedicated phone.

7.36 The power amplifier is capable of delivering .3 watts into .5 ohms. A separate 600-ohm

coil in the output transformer is used to monitor the level of the output audio. If the level drops 6 dB from a manually set audio output level, a voice alarm will be actuated and the LED on the front panel of the alarm logic circuit pack of the channel in question will light.

7.37 The audio signal from the preamplifier also goes to the dedicated phone and the control unit. The channel can be accessed for monitoring, and a new message can be recorded from both these locations. On the control unit, the audio signal level can be measured with a transmission measuring set to indicate that the proper audio output level is being transmitted to the interfacing circuit.

8. MODULAR MESSAGE ANNOUNCEMENT

A. General

8.01 The modular message announcement provides for modular messages, a repetitive 1.33 second announcement, with the announcement being recorded three times within the 4-second drum rotation period. The partition of the announcement is accomplished by dividing a 4-second track into three equal parts by means of the optical switch assembly. Since there is no switching of heads and the maximum load is relatively small, the circuits are very simple. For modular message application, the amp-log-alarm circuit contains an R/P amplifier, the logic required to record the audio information (normally the identification of a city or area) three times on a 4-second track, and

voice alarm circuitry to indicate loss of audio signal at the output.

B. Channel Module

8.02 The modular message channel module (Fig. 47) provides for a maximum of 24 channels of modular message announcement service. Each channel is associated with a single 4-second track, and the module is intended for service where the 4-second message would normally be divided into three repetitive 1.33-second messages, as used for area or city-of-origin announcements. All the electronics for one channel are contained on only one circuit pack. Each 36A apparatus mounting frame can house eight of these circuit cards. The three 36A apparatus mounting frames thus provide for a total channel module capacity of 24 channels.

C. Control Unit

8.03 For local maintenance a control unit (Fig. 47) is located under each channel module. This control unit is used to turn power on and off, record test signals on the tracks, adjust voice alarm levels, and indicate off-normal and power-off conditions. The method of channel selection for recording and testing is performed by using a patch cord, as shown in Fig. 48.

8.04 Table F provides a complete listing of all keys, jacks, and lamps associated with the modular message control unit and a description of each.

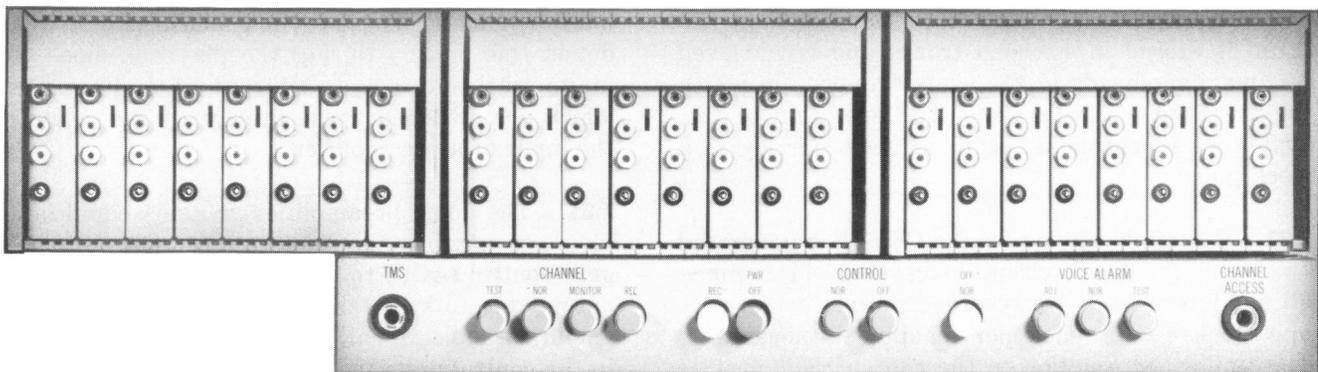


Fig. 47—Modular Message Channel Module and Control Unit

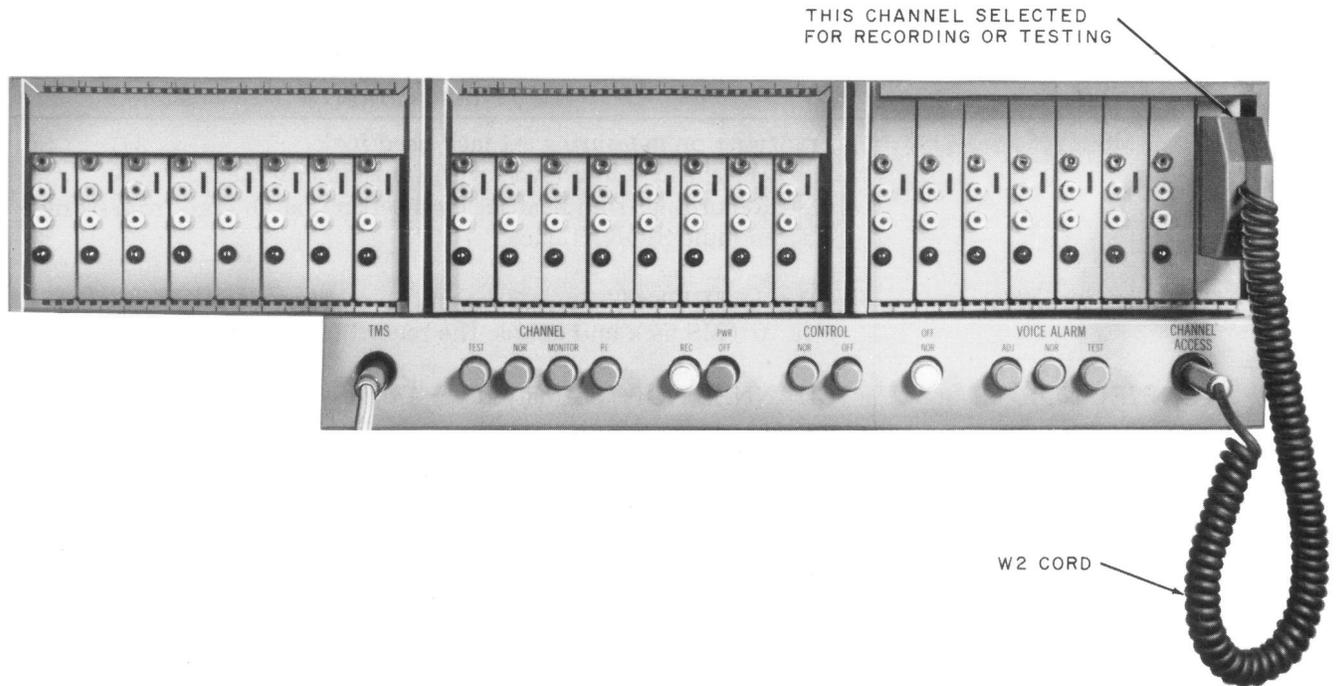


Fig. 48—Modular Message Channel Module and Control Unit and W2 Patch Cord Used for Local Recording and Testing

D. Alarms

8.05 The announcement frame is alarmed for two modes:

- Voice alarms
- Fuse alarms.

Alarms are given on the frame itself and to the interfacing circuit through relay contacts for loop closures.

Voice Alarm

8.06 To maintain a satisfactory audio level at the output of the announcement frame, a voice alarm circuit samples the audio at the output. This voice alarm circuit transforms the audio signal to obtain a DC level proportional to the signal strength so that at the nominal system audio output level, it is sufficient to operate an alarm relay. When the audio level drops below a preset level, the alarm relay releases breaking a loop to the interfacing circuit.

8.07 Provision for adjusting the sensitivity of the voice alarm level is available on the control unit. By depressing the VOICE ALARM ADJ key on the control unit, resistance is added into the alarm circuit of the channel accessed, thereby decreasing the signal level by 6 dB.

8.08 The voice alarm circuit is adjusted in accordance with Section 201-520-701.

Fuse Alarms

8.09 The power supply levels used in the CSRAF are +15 and -15 VDC for operating integrated circuit operational amplifiers, and +5 VDC for operating digital integrated circuits. These voltages are available at the base of the CSRAF from a power supply.

8.10 The 3 voltages are fused individually to each channel module with 70-type indicating fuses. Should a fuse overload, its contact energizes a relay in the control unit serving that channel module. Contacts on this relay light the PWR OFF lamp on the control unit and energize the fuse alarm

TABLE F
MODULAR MESSAGE CONTROL UNIT

KEY, JACK, OR LAMP	DESCRIPTION
TMS	Transmission measuring set jack used for: <ul style="list-style-type: none"> • Measuring audio levels with transmission measuring set. • Recording from headset by inserting patch cord from storage module SIGNAL jack.
CHANNEL TEST	CHANNEL TEST key — Contacts on test key connect ACCESS jack to TMS jack and enable the record function.
CHANNEL NOR	CHANNEL NOR (normal) key — Depressed when operating in normal mode.
CHANNEL MONITOR	CHANNEL MONITOR key — When depressed: <ul style="list-style-type: none"> • Connects output of a channel selected by a W2 cord to TMS jack.
CHANNEL REC	CHANNEL REC key — Used in conjunction with TEST key for recording purposes.
REC	REC lamp — When in record mode, flashes once every 1.33 seconds for 100 ms when recording at the frame.
PWR OFF	PWR OFF lamp — Lights when power is removed from frame or when a fuse overloads.
CONTROL NOR	CONTROL NOR (normal) key — Depressed when operating in normal mode.
CONTROL OFF	CONTROL OFF key — Powers down all 24 associated channels.
OFF NOR	OFF NOR lamp — Lights when any key is in its off-normal position.
VOICE ALARM ADJ	VOICE ALARM ADJ key — Decreases alarm level by approximately 6 dB for testing and adjusting purposes.
VOICE ALARM NOR	VOICE ALARM NOR (normal) key — Depressed when operating in normal mode.
VOICE ALARM TEST	VOICE ALARM TEST key — Causes output level of selected channel to go to 0 causing a voice alarm.
CHANNEL ACCESS	CHANNEL ACCESS jack — Used in conjunction with W2 patch cord for accessing channels for recording and monitoring purposes.

(FA) relay located on the power supply module at the base of the announcement frame. Contacts on the FA relay complete a loop to the office major audible alarm. The -48 volt office supply is separately fused to supply the PWR OFF and the OFF NOR lamps.

E. Record Procedures

Remote Recording

8.11 Recording on the announcement frame with a dedicated phone is initiated by lifting the receiver from the line switch (LS). When the LS makes contact, the control functions on the dedicated phone are enabled, and the dedicated phone receives a filtered talking current. By depressing a channel selection L (locking) key on the dedicated phone, the playback preamplifier output of that channel is connected to the dedicated phone.

The output of the selected channel can now be heard in the receiver, usually the name of a city or area or other short messages occurring every 1.33 seconds. If a new recording is to be made, an REC NL (nonlocking) key is depressed during the entire record mode. The depressed REC key turns on the bias-erase oscillator, switches the amplifier into the record mode, and enables a record lamp to light.

The optical switch assembly in the drum storage unit produces a timing pulse every 1.33 seconds which flashes the MM LMP lamp on the CALL DIRECTOR to indicate the placement of the recording.

The operator can now record a new city name three consecutive times cuing on the lamp flashes. The cross-field design magnetic head used in the announcement frame performs the erase and record functions simultaneously, eliminating the delay required to erase. After recording is completed, the REC NL key is released. The operator can now listen to determine whether a satisfactory announcement has been recorded. If the announcement is satisfactory, the RLS (release) key is depressed; and the receiver is replaced on the LS.

8.12 There is also provision at the CALL DIRECTOR to enable the recording of messages from a tape recorder. Remote recording using a tape recorder is accomplished by plugging the tape recording equipment into the jack provided on the

side of the CALL DIRECTOR. The procedure then prescribed for remote recording from a CALL DIRECTOR is followed. The recorder can be unplugged after recording, and the message can be heard in the receiver of the CALL DIRECTOR for verification.

Local Recording

8.13 It is possible to record new messages locally at the frame, either through a headset or by dubbing a prerecorded message from a tape recorder. The local recording feature provides a valuable maintenance facility for diagnosing recording problems as well as a means for recording professional prerecorded messages. Means for accomplishing local recording are provided by keys, jacks, and lamps on the storage module and control units.

8.14 To record on one of the channels, the channel is first accessed by means of a W2 cord (Fig. 49), and the W1 cord is connected from the SIGNAL jack on the storage module to the TMS jack of the associated control unit. Depressing the CHANNEL TEST key connects the audio signal from that channel's preamplifier output to the jacks. After a headset is inserted into the HEADSET jack, the message recorded on the selected channel can be heard. The test contacts also energize the REC function. When ready to record, the CHANNEL REC key is depressed and held while recording, causing the REC lamp to flash every 1.33 seconds. The announcement should be recorded between successive flashes three times, after which time the CHANNEL REC key should immediately be released.

8.15 When it is desired to record at the frame from a tape recorder, the tape recording equipment is connected into the HEADSET jack in place of the HEADSET. The same procedure is followed as with local recording, but the recorder is activated when the lamp flashes and deactivated after the fourth consecutive flash.

8.16 A 1000-Hz test tone is recorded on a channel by connecting the TMS jack to the 1000-Hz jack on the storage module using a patch cord and depressing the REC NL key. After the REC lamp extinguishes, the TMS jack can be connected to the SIGNAL jack, enabling the recorded tone to be monitored through the headset. Indication that a test tone is being recorded is given to the

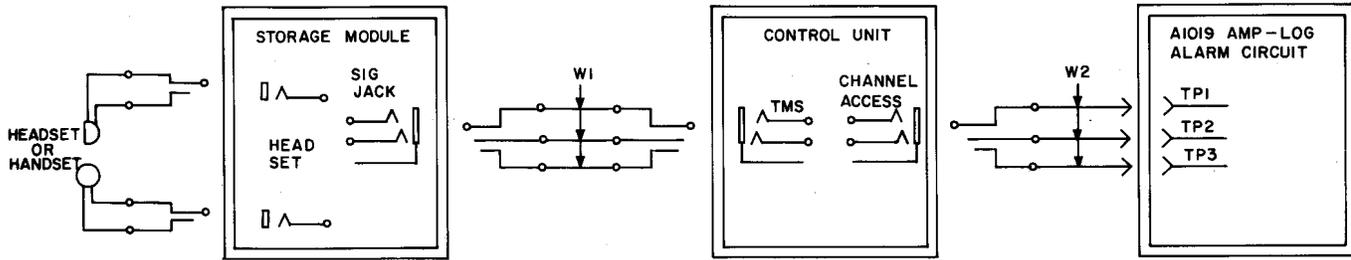


Fig. 49—Local Record Procedure for Modular Message Announcement

interfacing circuit through a closure of the 1000-Hz jack sleeve and the sleeve on the TMS jack.

F. Playback Operation

8.17 The most frequent mode of operation of the CSRAF is the playback mode in which messages recorded on the drum are distributed to the subscribers. The message recorded on the drum is stored in 1.33-second segments contained in a normal 4-second track on the drum. A timing closure is provided to the interface circuit to indicate cut-through (CLOB-CL1B), every 1.33 seconds. The playback amplifier is capable of delivering 100 milliwatts into 40 ohms.

8.18 On the control unit, the output audio signal level can be measured with a transmission measuring set to indicate that the proper level is being transmitted to the interfacing circuit.

9. PHASED MESSAGE ANNOUNCEMENT

A. General

9.01 The phased message announcement provides a 12-second message that is "phased" so that the beginning of the message is available every 4 seconds. This feature results in an average waiting time of 2 seconds to hear a complete 12-second announcement.

Note: The phased message announcement is primarily intended for those services where the rate of connection for recorded announcement is high, barge-in is not desirable, and a 12-second message is satisfactory.

9.02 The phased message announcement is 16 seconds long with 12 seconds of recorded

announcement and a 4-second silent period. During the recording procedure, the 12-second recorded message is automatically separated into three 4-second tracks, each track being recorded by a separate stationary magnetic recording head.

9.03 The ability to provide this type of service is due to the versatility of the drum storage unit. After the first track is used in the initial announcement, it is available to be used again to start the announcement from the beginning, while tracks two and three continue to complete the initial announcement. Providing the proper phased switching technique results in the prescribed phased message announcement. The channel circuit packs in this channel module are similar to those used in the VML channel module.

B. Channel Module

9.04 Each phased message channel module (Fig. 50) provides for a single channel with the channel divided into four phases. The maximum message length of each phase is 12 seconds, and the message on all four phases is the same; but each phase is displaced 4 seconds from the preceding one. Each phase requires four circuit packs: three for record, reproduce, and alarm functions and one for switching. A DMUX audio amplifier circuit pack is also associated with each phased message channel module to amplify the announcement coming back from the user system to a level sufficient to operate the alarm circuitry. All the circuit packs are arranged in three 36A apparatus mountings. Refer to Fig. 51 for location and identification of phased message channel module circuit packs.

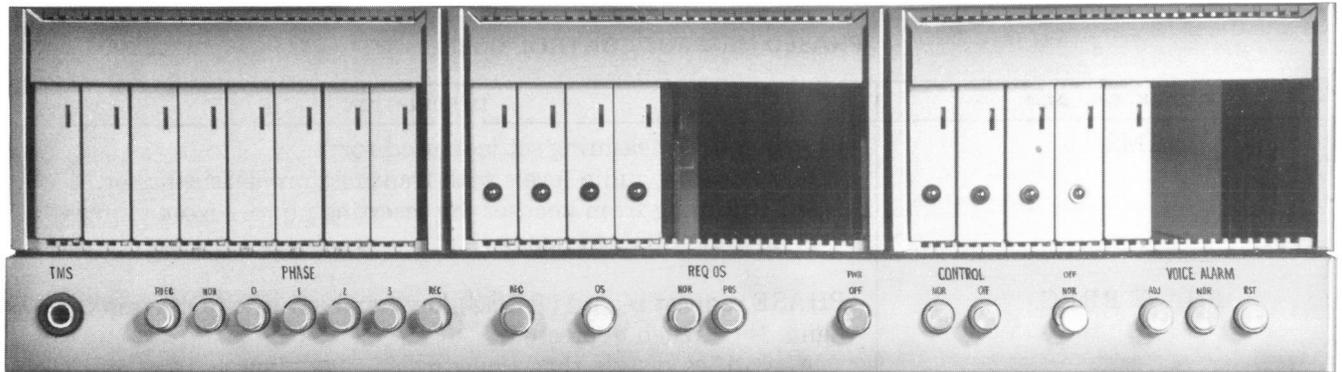


Fig. 50—Phased Message Channel Module and Control Unit

I 12-SECOND PHASED MESSAGE ANNOUNCEMENT

A1013	A1016	A1013	A1016	A1013	A1016	A1013	A1016	A1014	A1014	A1014	A1014			A1020	A1020	A1020	A1020	A1015	

A1013 - RECORD PLAYBACK AMPLIFIER
 A1016 - HEAD SWITCHING CIRCUIT PACK
 A1014 - ALARM LOGIC CIRCUIT PACK
 A1020 - SWITCHING ALARM CIRCUIT PACK
 A1015 - DEMUX AUDIO AMPLIFIER

Fig. 51—Location and Identification of Phased Message Channel Module Circuit Packs

C. Control Unit

9.05 For local maintenance and control, a control unit (Fig. 50) is located under each channel module. This control unit is used to turn power on and off, record test signals on the tracks, adjust voice alarm levels, and indicate off-normal and power-off conditions.

9.06 Table G provides a complete listing of all keys, jacks, and lamps associated with the

phased message control unit and a description of each.

D. Alarms

9.07 The announcement frame is alarmed for two modes:

- Voice alarms
- Fuse alarms.

TABLE G
PHASED MESSAGE CONTROL UNIT

KEY, JACK, OR LAMP	DESCRIPTION
TMS	<p>Transmission measuring set jack used for:</p> <ul style="list-style-type: none"> • Measuring audio levels with transmission measuring set. • Recording from headset by inserting jumper from storage module SIGNAL jack.
PHASE RREC	<p>PHASE request record (RREC) key (enabled when OS lamp is lighted) — When depressed:</p> <ul style="list-style-type: none"> • Notifies system that a new message will be recorded on the respective channel. • Places a channel in state to respond to record command. • Connects DP audio from phase 0 to TMS jack.
PHASE NOR	<p>PHASE NOR (normal) key — Depressed when channel is operating in normal mode.</p>
PHASE (0-3)	<p>PHASE (0-3) keys (interlocked with RREC and NOR) — Connects respective phase output audio signal to TMS jack where output transmission levels can be monitored.</p>
PHASE REC	<p>PHASE REC (record) key — When depressed, places channel in record mode when ROS and RREC keys are depressed and OS lamp is lighted.</p>
REC	<p>Record (REC) lamp — Lights for 12 seconds when channel is in record mode.</p>
OS	<p>Out-of-service (OS) lamp — Indicates that channel is out of service.</p>
REQ OS NOR	<p>Request out-of-service NOR (normal) key — Depressed when in normal mode.</p>
REQ OS ROS	<p>Request out-of-service key — When depressed, requests that channel be disconnected from subscribers.</p>
PWR OFF	<p>Power off lamp — Indicates channel power is off.</p>
CONTROL NOR	<p>CONTROL NOR key — Depressed when in normal mode.</p>
CONTROL OFF	<p>CONTROL OFF key — When depressed, removes power from channel.</p>
OFF NOR	<p>OFF NOR (normal) lamp — Indicates that at least one NOR key is not depressed.</p>
VOICE ALARM ADJ	<p>VOICE ALARM ADJ key — When depressed:</p> <ul style="list-style-type: none"> • Decreases alarm audio by 6 dB. • Voice alarm level can be adjusted.

TABLE G
PHASED MESSAGE CONTROL UNIT (Cont)

KEY, JACK, OR LAMP	DESCRIPTION
VOICE ALARM NOR	VOICE ALARM NOR key — Depressed when in normal mode.
VOICE ALARM RST	VOICE ALARM RST (reset) key — Depressed for greater than 32 seconds to reset switching alarm circuit.

Alarms are given on the frame in the form of lights, and to the interfacing circuit in the form of relay contacts for loop closures.

Voice Alarm

9.08 To maintain a satisfactory audio level, a voice alarm circuit samples the announcement from the point of distribution. This "feedback" audio output of each phase is amplified in the DMUX amplifier circuit and monitored for the correct level on the alarm logic circuit of the phase producing the announcement. If audio level drops below a predetermined level, an indication is given to the interfacing circuit for each phase. Since the level sense circuitry contains long-time constants, individual head dropouts are detected by the switching alarm circuit.

9.09 Provision for adjusting the sensitivity of the voice alarm is available on the control unit. By depressing the VOICE ALARM ADJ key on the control unit, resistors are added to decrease the feedback audio level of each phase by 6 dB. The voice alarm is adjusted in accordance with Section 201-520-701. A pair of contacts on the AL relay go to the interfacing circuit for signaling. The four phases can be adjusted simultaneously. When the VOICE ALARM NORMAL key is depressed, the resistors are disconnected yielding a 6 dB threshold on the voice alarm.

Fuse Alarms

9.10 The power supply levels used in the CSRAF are +15, -15, and -5 VDC for operating integrated circuit operational amplifiers, and for operating digital integrated circuits. These voltages are available at the base of the CSRAF from a power supply.

9.11 The 3 voltages are fused individually to each channel with 70-type indicating fuses. Should a fuse overload, its contact energizes a relay in the control unit serving that channel module. Contacts on this relay light the PWR OFF lamp on the control unit and energize the fuse alarm (FA) relay located on the power supply module at the base of the announcement frame. Contacts on the FA relay complete a loop closure to the office major audible alarm. The -48 volt office supply is separately fused to supply the PWR OFF and the OFF NOR lamps.

E. Record Procedures

9.12 A new announcement on a channel is recorded with the electronics of Phase 0 only, and other phases are inhibited during the record procedure.

Remote Recording

9.13 Recording on the announcement frame with a dedicated phone is initiated by lifting the receiver from the line switch (LS). When the LS makes contact, the control functions on the dedicated phone are enabled, and the dedicated phone receives a filtered talking current. By depressing a channel selection locking key on the dedicated phone, the playback preamplifier output of that channel is connected to the dedicated phone; and the message recorded on that channel can be heard. When a channel selection key is depressed at the dedicated phone, a lamp on the clock circuit face plate lights, indicating that a recording is being made from the dedicated phone. Contacts on the channel selection L key also energize the channel relay (CM) for that channel. The CM contacts connect the channel to the record function and give a relay closure to the interfacing circuit indicating that the channel is being tested. The interfacing circuit can provide a closure to light the lamp (record ready) under

the REC key to indicate that the channel has been taken out of service.

9.14 To record a new message, the REC non-locking key on the dedicated phone is depressed clearing the registers on the head switching circuit and reversing the state of the relays on the record/playback amplifier. These relays turn on the record amplifier and connect the bias-erase oscillator to the channel being tested.

Note: With the use of cross-field magnetic heads, erasing of the previous announcement is accomplished simultaneously with the recording of a new announcement, thus eliminating the need for a separate erase cycle.

9.15 At the next clock pulse after the REC non-locking key was depressed (within 4 seconds), a record lamp lights under the depressed channel selection locking key on the dedicated phone, indicating that the channel is in the record mode, and the new message can now be recorded by the operator. The record amplifier has AGC which sets a proper record level even through the voice level of the operator into the dedicated phone may not be at the optimum recording level.

9.16 At the completion of the message, the REC non-locking key is released. Within 4 seconds the channel will automatically switch into the playback mode, and the lamp under the channel selection locking key will extinguish. However, if the maximum capacity of the channel is exceeded while recording, the record lamp under the channel selection locking key will extinguish; and the message must be rerecorded.

Note: After recording, complete message must be heard at least twice to initialize the voice alarms.

9.17 After a recording has been made, the operator can listen to determine whether a satisfactory announcement has been recorded. If not, the message can be rerecorded by repeating the previous procedure. The channel is released to the system by selecting another channel or by pushing the release (RLS) key on the dedicated phone and replacing the receiver on the LS.

9.18 There is also provision at the CALL DIRECTOR to enable the recording of messages from a tape recorder. Remote recording using a tape

recorder is accomplished by plugging the tape recording equipment into the jack provided on the side of the CALL DIRECTOR. The procedure then prescribed for remote recording from a CALL DIRECTOR is followed. The recorder can be unplugged after recording, and the message can be heard in the receiver of the CALL DIRECTOR for verification.

Local Recording

9.19 It is possible to record new messages locally at the frame, either through a headset or by dubbing a prerecorded message from a tape recorder. The local recording feature provides a valuable maintenance facility for diagnosing recording problems as well as a means for recording professional prerecorded messages. Means for accomplishing local recording are provided by keys, jacks, and lamps on the storage module and the control units.

9.20 The recording procedure is initiated by depressing the request out-of-service (ROS) key. The interfacing circuit provides a closure lighting the OS lamp and enabling the record functions (R REC, REC keys).

The request record (RREC) key is depressed connecting the audio signal from the preamplifier output of that channel to the TMS jacks and giving indication to the interfacing circuit. This indication lights the lamp under the REC NL key on the CALL DIRECTOR, indicating that recording is being done at the frame.

9.21 To record from a tape recorder, the tape recorder output is connected into the HEADSET jack; and a transmission measuring set is inserted into the monitor jack. An appropriate recording level is set by adjusting the volume control of the tape recorder and observing the level on the transmission measuring set. By pushing the REC key and turning on the tape recorder when the REC lamp lights, the message from the tape recorder will be recorded on the channel. After 12 seconds the REC lamp will be extinguished and the REC key must be released within 4 seconds. By inserting a headset into the HEADSET jack, the newly recorded message can be monitored. If the message on the tape recorder is longer than the capacity of the channel, only part of the message will be recorded.

Note: In preparing prerecorded tapes, the channel capacity and the reaction times in the above procedures must be considered.

9.22 To record with a headset, it is necessary to power the microphone of the headset by inserting it into the HEADSET jack on the storage module. A patch cord is connected from the SIGNAL jack in the storage module to the TMS jack in the control unit. When the REC key is depressed (within 4 seconds), the REC lamp will light; and the audio dictated into the headset will be recorded on the channel as long as the REC lamp is lighted. After 12 seconds the REC lamp will go off, and the REC non-locking key is released within 4 seconds, automatically switching the channel into the playback mode.

Note: After recording, complete message must be heard at least twice to initialize the voice alarms.

9.23 After the message has been recorded, the level at the output of the frame can be measured. By depressing the phase keys, the output audio of each phase is connected to the TMS jack. The output is measured by inserting the transmission measuring set into the TMS jack.

9.24 A 1000-Hz test tone is recorded on a channel by connecting the TMS jack to the 1000-Hz jack of the storage module using a patch cord and depressing the REC key. After the REC lamp extinguishes, the TMS jack can be connected to the SIGNAL jack, enabling the recorded tone to be monitored through the headset. Indication that a test tone is being recorded is given to the interfacing circuit through a closure of the 1000-Hz jack sleeve and the sleeve on the TMS jacks.

F. Playback Operation

9.25 The most frequent mode of operation of the CSRAF is the playback mode in which messages recorded on the drum are distributed to the subscribers. The message recorded on the drum is stored in 4-second blocks and is retrieved by switching heads in the same sequence in which the message was recorded. The operation of this system is synchronous, every action occurring at a clock pulse.

9.26 The timing pulse for the CSRAF is generated by the clock circuit pack (Fig. 11). Since

all announcements are recorded on one drum, only one clock circuit pack per machine is necessary. The timing information to the clock circuit pack is supplied by an optical switch assembly located above the drum. A monostable multivibrator is incorporated to convert this once-per-revolution output into a fast rise-time clock pulse. A relay (CL1), also on the clock circuit pack, provides a once-per-revolution closure for interface purposes.

Note: Refer to Fig. 52 for a block diagram of a phased message announcement.

9.27 A 4-second silent period between successive repetitions of the announcement results in a 16-second cycle. Four sets of amplifiers are used. Therefore, by properly switching the three magnetic heads (fourth head is connected but not used) to the four amplifiers, phases of the message are available, and the position of the silent period indicates the amplifier that will start the announcement within 4 seconds. This characteristic of the announcement cycle is used by the interfacing circuit to switch listeners into the silent period, and the announcement will begin within 4 seconds.

9.28 A cut-through (CT) indication in the form of a loop closure is given to the interfacing circuit when the 4-second silent period occurs in each phase. In the steady state operation, there is only one phase in the silent interval.

9.29 The record/playback amplifier contains equalization to improve the audio quality and automatic gain control (AGC) to decrease differences in head output due to variations from head to head. The amplified audio signal goes to the interfacing circuit, the control unit, and the dedicated phone. The playback amplifier is capable of delivering 0.4 milliwatts into 600 ohms.

9.30 The channels can be accessed for monitoring, and a new message can be recorded from both these locations. On the control unit, the audio signal level can be measured with a transmission measuring set to indicate that the proper level is being transmitted to the interfacing circuit.

10. MESSAGE SYNTHESIS SERVICE

A. General

10.01 Each announcement machine of the CSRAF arranged for MSS has the capability of

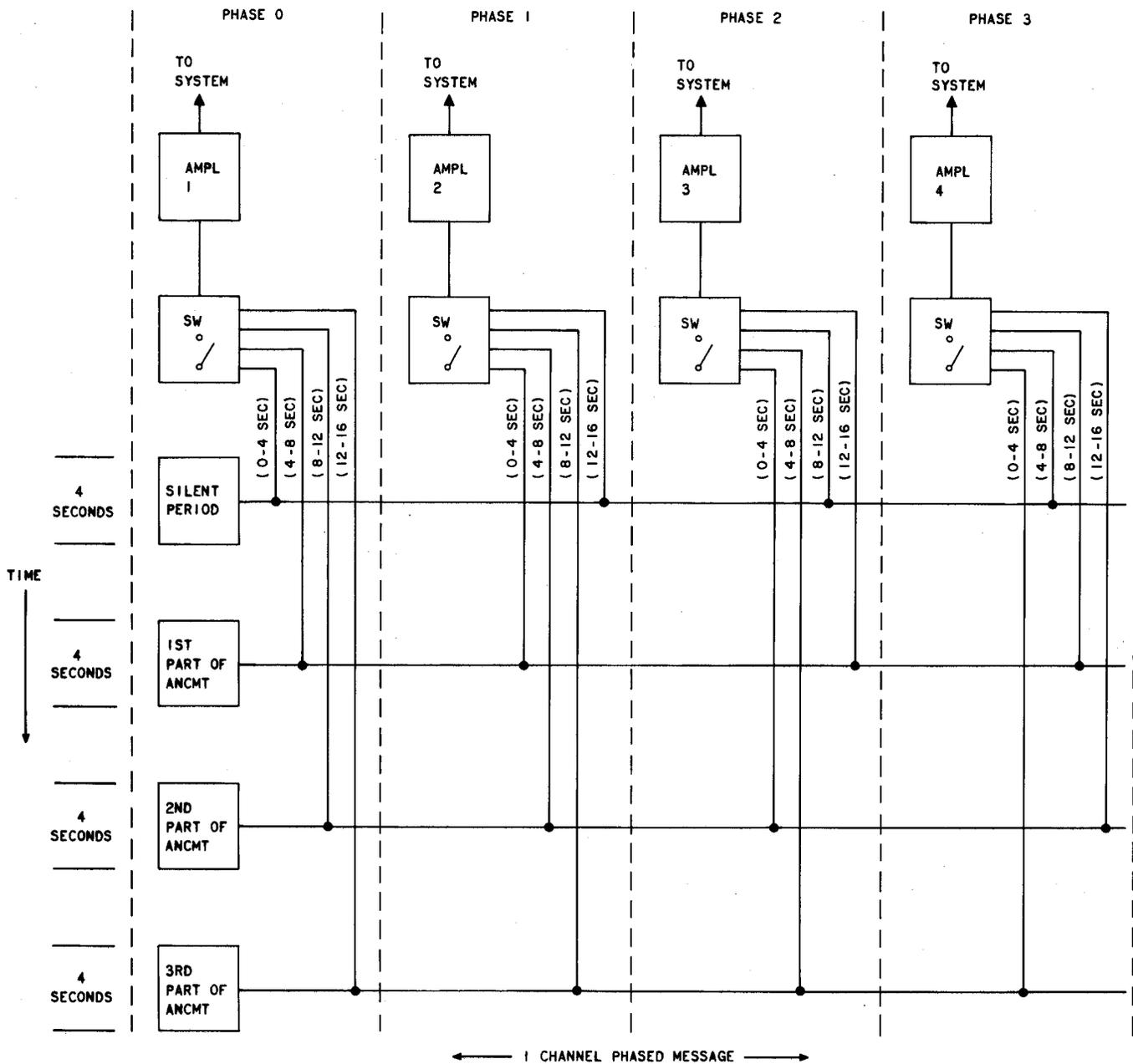


Fig. 52—Phased Message Announcement—Block Diagram

reproducing simultaneously a total of 96 tracks of prerecorded voice information. Each prerecorded track contains number, phrase, or locality messages. The maximum message interval for numbers is .5 seconds and for phrases and localities is 1.5 seconds. With the magnetic drum rotation period of 3 seconds, the 1.5 second phrase is provided two times and the .5 second phrase is provided six times within the same rotation period. The partition

of the announcement is accomplished by dividing a 3-second track into either two or six equal parts by means of the optical switch assembly. Under program control a number of prerecorded phrase, locality and number information, of either 1.5 second duration or .5 second duration or both are electronically "pieced" together (synthesized) in a logical programmed sequence by time division switching techniques.

10.02 Time division switching of phrase and number information onto and off of a common talking bus in a programmed sequential order forms complete announcements.

10.03 Each electronically synthesized announcement is arranged for responding to a specific type of calling condition entering a user system for service.

10.04 Since there is no necessity for the switching of heads and the need for recording facilities is not required the circuits for the MSS version of the CSRAF are relatively simple. The quad amplifier circuit which is used entirely to make up the MSS channel module contains four independent amplifiers for playing back audio signals from magnetic heads. Each independent amplifier of the quad amp is associated on a one-to-one basis to a magnetic head. When the user system requires a particular announcement, it will connect to the proper amplifiers in the proper sequence. With the prerecorded drum constantly rotating and the timing pulses being sent to the system, the system can connect to the beginning of a phrase of either 1.5 or .5 seconds duration and disconnect at the next timing pulse which would be the end of the phrase. With this timing arrangement no time is lost between phrases, and the user system is able to achieve a complete announcement with no noticeable gap or time lag.

Note: Timing information defining the beginning and end of prerecorded message intervals is provided by a coded disc located atop the magnetic drum.

Complete announcements are then immediately transmitted to calling subscribers who have reached nonworking numbers. The arrangement of the various announcement and the head and amplifier associated with each is shown in Table H. This table is physically located at the CSRAF on the back side of the drum storage unit door. (See Fig. 53).

B. Channel Module

10.05 The message synthesis service channel module (Fig. 54) provides for a maximum of 96 channels. The channel module is made up of 24 individual quad amplifiers with each quad amplifier providing 4 individual amplifier circuits. Thus, each channel module contains 24 (quad amps)

$\times 4$ (amps each) = for a total of 96 amplifiers per channel module. Therefore, the 96 amplifiers per channel module can serve the 96 channels on a one-to-one basis. Each amplifier is associated with a single 3-second track, and the module is intended for service where the 3-second message would normally be divided into two 1.5 second messages or six .5 second messages, for synthesizing a large inventory of intercept announcements. All the electronics for one channel is contained on one-fourth of a circuit pack. Each circuit pack therefore can handle 4 individual channels. Each 36A apparatus mounting frame can house eight of these circuit packs. The three 36A apparatus mounting frames thus provide for housing 24 circuit packs for a total channel module capacity of 96 channels. Refer to Fig. 55 for location and identification of circuit packs and channel (track) assignment for MSS.

C. Recording of Messages

10.06 For MSS no record procedures are necessary due to the use of the prerecorded drum. All announcements are recorded on a KS-20952, L3 drum for actual operation. Also, no provision is made for recording new information on blank announcement tracks or for rerecording of existing information in the field. Announcement information can be changed, added or renewed in the field only by replacement with new or refurbished drums on which the required information has been prerecorded by the manufacturer.

D. Drum Track and Message Association

10.07 Table H provides an organization breakdown and assignment for standard messages (announcement tracks 1 through 48) as they relate to magnetic head, amplifier, output, connector leads, and announcement track number.

E. Prerecorded Standard Messages

10.08 Forty-eight of the 96 available announcement tracks (tracks 1 through 48) are assigned specific standardized prerecorded messages consisting of numbers and phrases. The time duration allowed for phrases is 1.5 seconds maximum. The time duration allowed for numbers is .5 seconds. Phrases therefore are prerecorded two times around the circumference of each drum track, while numbers are prerecorded six times around the circumference of each drum track to be compatible with the 3-second period of revolution of the drum.

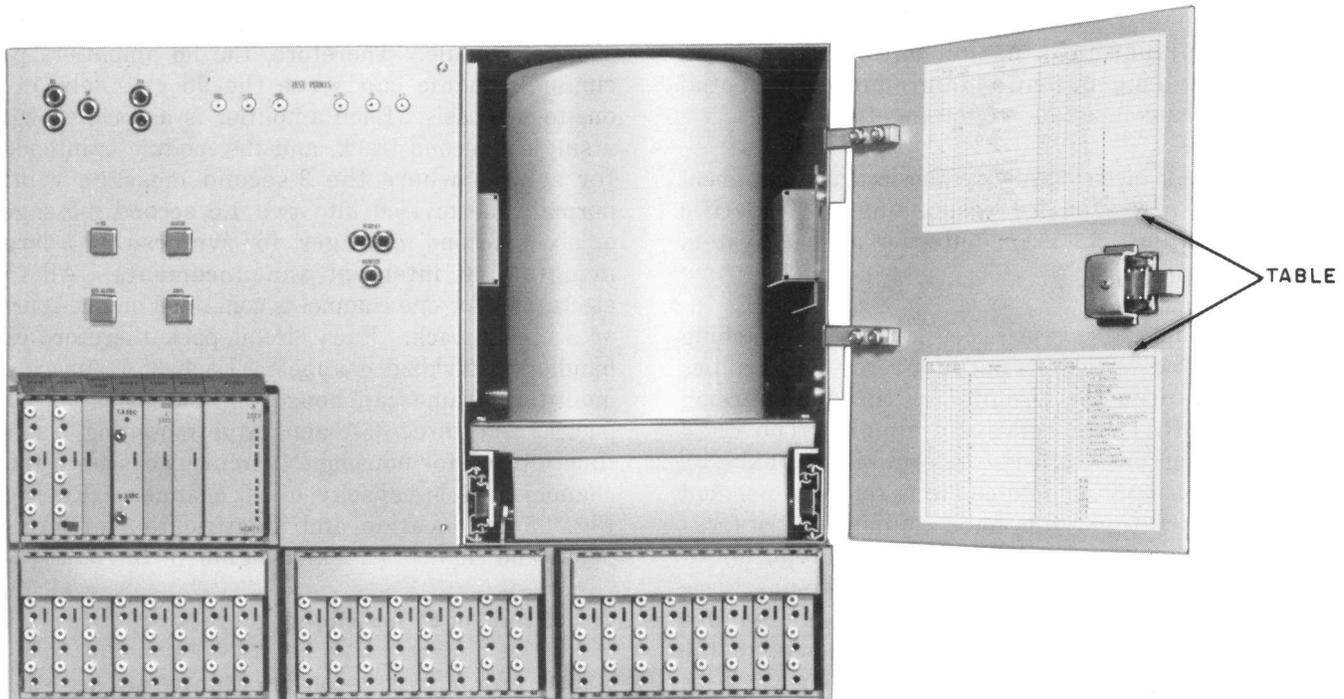


Fig. 53— Location of Table Showing Arrangement of Announcements and Drum Track and Amplifier Associated With Each

F. Prerecorded Locality Messages

10.09 Prerecorded tracks 49 through 72 are reserved for letters for 2Lt announcements or locality names with tracks 73 to 96 reserved for locality names only. The time duration allowed for letters is .5 seconds. The time duration allowed for locality names is 1.5 seconds. The locality names are specified for local area announcements to satisfy specific job requirements.

G. Playback Operation

10.10 The only mode of operation of the CSRAF arranged for MSS is the playback mode in which messages prerecorded on the drum are extracted by the user system and distributed to the subscribers. The messages recorded on the drum are stored in 1.5 second or .5 second segments contained in a normal 3-second track on the drum. The two timing signals that are provided to the interface circuit change state every 0.5 or 1.5 seconds to indicate the beginning of a letter, word, number or phrase. A large inventory of announcements are generated from the 96 prerecorded phrase, number, and locality messages. These are automatically

assembled together, in a multitude of combinations, by user system computer programs as required for the total inventory.

H. Typical Message Assembly

10.11 Figure 56 is an example of how a complete announcement is synthesized from a selected series of prerecorded messages as reproduced during the drum rotational period. The full announcement and time sequence is typical of the type of machine produced announcements provided for nonworking number calls attached to the CSRAF arranged for MSS.

11. LIST OF REFERENCES

11.01 The following listing provides information and/or test requirements for the CSRAF:

SD NO.	TITLE
SD-97723-01	Common Systems Drum Storage Unit Circuit KS-20951 For Recorded Announcement Frame

SD NO.	TITLE	SECTION	TITLE
SD-97724-01	Common Systems Circuit Pack Schematics Recorded Announcement Frame	201-520-301	Common Systems Recorded Announcement Frame (CSRAF) ▶SD-97725-01 And SD-97725-02▶ Operating Procedures
SD-97725-01	Common Systems Recorded Announcement Frame	201-520-501	Common Systems Recorded Announcement Frame (CSRAF) ▶SD-97725-01 And SD-97725-02▶ Tests and Trouble Analysis
SD-97725-02	▶Common Systems Recorded Announcement Frame Circuit For Message Synthesis Service◀	201-520-701	Common Systems Recorded Announcement Frame (CSRAF) ▶SD-97725-01 and SD-97725-02▶ Requirements and Adjusting Procedures
KS NO.	TITLE		
KS-20951	Drum Storage Unit		
KS-20952	Magnetic Drum	201-520-801	Common Systems Recorded Announcement Frame (CSRAF) ▶SD-97725-01 and SD-97725-02▶ Piece-Part Data and Replacement Procedures
KS-20953	Magnetic Head		
KS-20954	Interconnecting Unit		
KS-20955	Interconnecting Unit	801-603-162	J1C012 Recorded Announcement Frame Equipment Design Requirements for Common Systems
KS-20956	Interconnecting Unit		

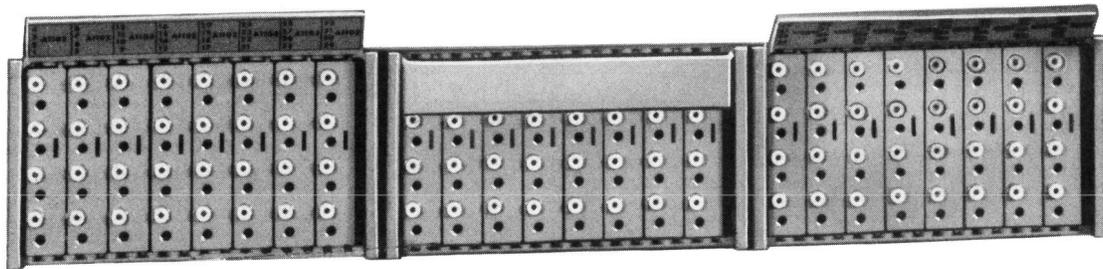


Fig. 54— ▶ Message Synthesis Service Channel Module ◀

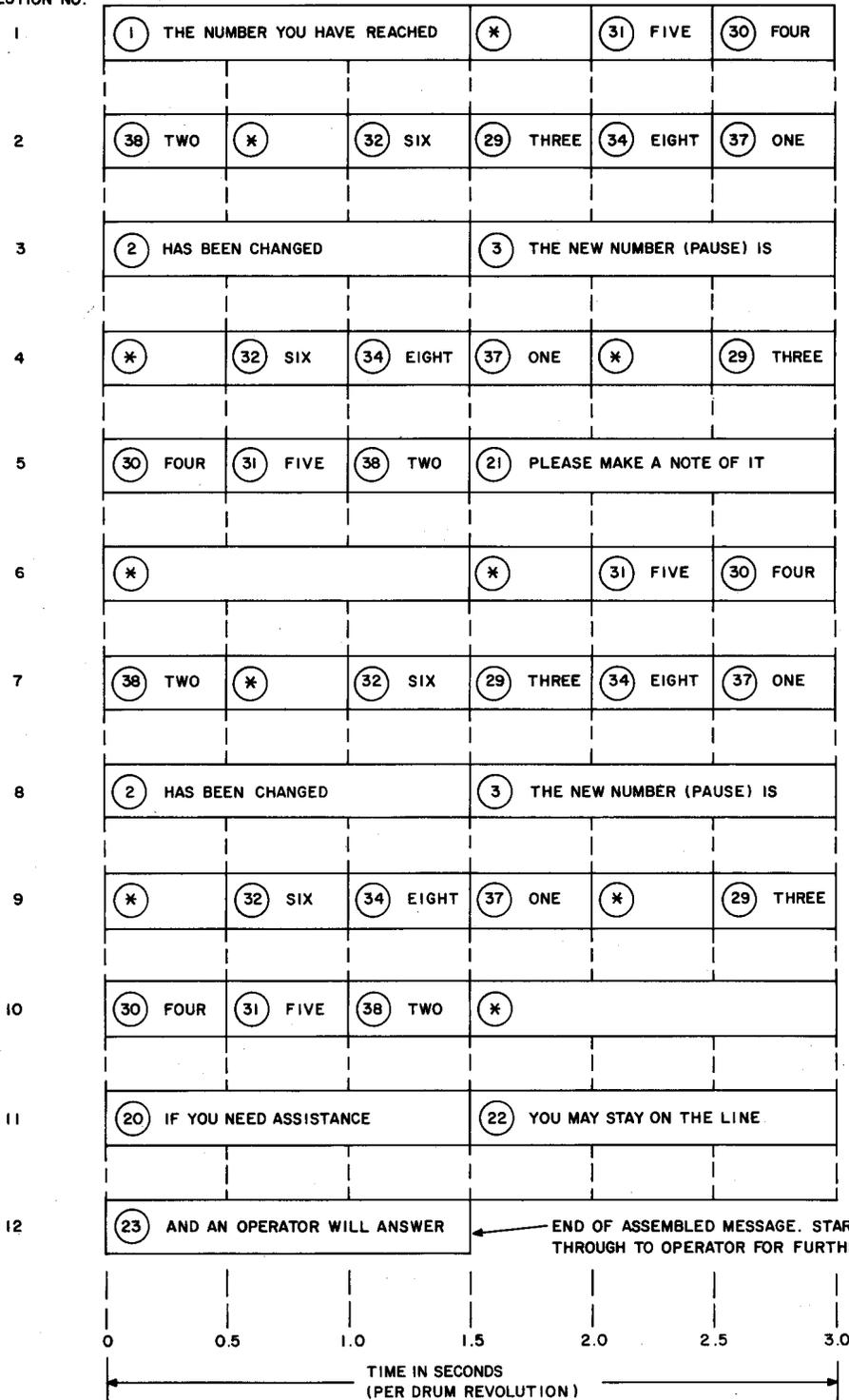
♦ TABLE H ♦
**REPRODUCER ANNOUNCEMENT TRACK, HEAD AMPLIFIER
 PLUG CONNECTIONS, TRUNK AND MESSAGE
 ASSIGNMENT**

J27 PIN NO.	AMP AND HEAD	OCTAL NUMBER	MESSAGE	J28 PIN NO.	AMP AND HEAD	OCTAL NUMBER	MESSAGE
1,13	1	640	THE NUMBER YOU HAVE REACHED	1,13	25	670	HUNDRED ↓
2,14	2	641	HAS BEEN CHANGED	2,14	26	671	OH -
3,15	3	642	THE NEW NUMBER (PAUSE) IS	3,15	27	672	ONE -
4,16	4	643	TO A NONPUBLISHED NUMBER	4,16	28	673	TWO -
5,17	5	644	FOR INCOMING CALLS	5,17	29	674	THREE -
6,18	6	645	IN AREA CODE	6,18	30	675	FOUR -
7,19	7	646	HAS BEEN DISCONNECTED	7,19	31	676	FIVE -
8,20	8	647	TO A NON-LISTED NUMBER	8,20	32	677	SIX -
9,21	9	650	TEMPORARILY	9,21	33	700	SEVEN -
10,22	10	651	AT THE CUSTOMER'S REQUEST	10,22	34	701	EIGHT -
11,23	11	652	IS BEING CHANGED	11,23	35	702	NINE -
12,24	12	653	THE NEW NUMBER	12,24	36	703	OH ↓
49,61	13	654	IS NOT YET CONNECTED	49,61	37	704	ONE ↓
50,62	14	655		50,62	38	705	TWO ↓
51,63	15	656	CALLS ARE BEING TAKEN BY	51,63	39	706	THREE ↓
52,64	16	657	IS NOT IN SERVICE	52,64	40	707	FOUR ↓
53,65	17	660	IS A WORKING NUMBER	53,65	41	710	FIVE ↓
54,66	18	661	PLEASE CHECK THE NUMBER	54,66	42	711	SIX ↓
55,67	19	662	AND DIAL AGAIN	55,67	43	712	SEVEN ↓
56,68	20	663	IF YOU NEED ASSISTANCE	56,68	44	713	EIGHT ↓
57,69	21	664	PLEASE MAKE A NOTE OF IT	57,69	45	714	NINE ↓
58,70	22	665	YOU MAY STAY ON THE LINE	58,70	46	715	(REORDER TONE)
59,71	23	666	AND AN OPERATOR WILL ANSWER	59,71	47	716	AREA CODE
60,72	24	667	THOUSAND ↓	60,72	48	717	WILL YOU DIAL IT AGAIN PLEASE

J29 PIN NO.	AMP AND HEAD	OCTAL NUMBER	MESSAGE	J30 PIN NO.	AMP AND HEAD	OCTAL NUMBER	MESSAGE
1,13	49	720	A	1,13	73	750	IN MANHATTAN
2,14	50	721	B	2,14	74	751	IN THE BRONX
3,15	51	722	C	3,15	75	752	IN BROOKLYN
4,16	52	723	D	4,16	76	753	IN QUEENS
5,17	53	724	E	5,17	77	754	IN STATEN ISLAND
6,18	54	725	F	6,18	78	755	IN NASSAU
7,19	55	726	G	7,19	79	756	IN SUFFOLK
8,20	56	727	H	8,20	80	757	IN WESTCHESTER COUNTY
9,21	57	730	I	9,21	81	760	IN ROCKLAND COUNTY
10,22	58	731	J	10,22	82	761	IN NEW JERSEY
11,23	59	732	K	11,23	83	762	IN CONNECTICUT
12,24	60	733	L	12,24	84	763	IN NEWARK
49,61	61	734	M	49,61	85	764	IN PHILADELPHIA
50,62	62	735	N	50,62	86	765	IN PENNSYLVANIA
51,63	63	736	O	51,63	87	766	IN MASSACHUSETTS
52,64	64	737	P	52,64	88	767	
53,65	65	740	R	53,65	89	770	
54,66	66	741	S	54,66	90	771	516
55,67	67	742	T	55,67	91	772	914
56,68	68	743	U	56,68	92	773	201
57,69	69	744	V	57,69	93	774	609
58,70	70	745	W	58,70	94	775	203
59,71	71	746	X	59,71	95	776	215
60,72	72	747	Y	60,72	96	777	617

SECTION 201-520-101

REPRODUCER
DRUM
REVOLUTION NO.



NOTE:
ANNOUNCEMENTS ARE PRODUCED BY PROGRAM CONTROLLED SELECTION AND ASSEMBLY OF MESSAGES REPRODUCED FROM PRERECORDED TRACKS DURING DRUM ROTATION. IN THIS EXAMPLE THE ENTIRE ANNOUNCEMENT IS MACHINE SYNTHESIZED IN 34.5 SECONDS OR DURING 11 1/2 REVOLUTIONS OF THE DRUM.

- (*) BLANK TRACK NO. 14 (REFER TO TABLE H)
- (NO.) PRERECORDED TRACK NO. AND MESSAGE REPRODUCED

Fig. 56— Typical Message Assembly for Message Synthesis Service During Reproducer Drum Rotation