

**NO. 4 ELECTRONIC SWITCHING SYSTEM
RECORDED ANNOUNCEMENT EQUIPMENT
METHOD OF OPERATION**

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SHUTDOWN	4	PURPOSE OF RECORDED ANNOUNCEMENT EQUIPMENT	
RECORDING	5	1.03 The recorded announcement equipment (Fig. 1) provides phased messages which give the calling party or the originating operator an indication of why a call was not completed and what further action should be taken. In a No. 4 Electronic Switching System (ESS) office, recorded announcements are distributed by using the unique characteristics of the TSI circuitry in the TSI frame.	
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EQUIPMENT CHARACTERISTICS

1.04 The No. 4 ESS recorded announcement equipment consists of modular units:

- Recording and playback circuits—channel and storage modules
- Control and maintenance circuits—control unit
- Power units—dc-to-dc converters, filter units, and circuit packs.

1.05 The maximum capacity of the recorded announcement equipment for No. 4 ESS application is 24 phased messages; these messages reside in a 3-bay arrangement with 9 channels in the first bay, 11 channels in the second bay, and 4 channels in the third bay. These recorded announcement messages are of a 16-second duration, with 12 seconds of audio and 4 seconds of silence. The entire 16-second interval is made up of four 4-second message segments recorded on a magnetic drum in the recorded announcement equipment. Each 4-second segment uses one track from the magnetic drum. Four magnetic heads, one per message segment track, are sequentially switched and phased together to form the total phased recorded announcement message of 16 seconds.

1.06 The modes of operation of the recorded announcement equipment are:

- Record either locally from the recorded announcement equipment or from a dedicated phone
- Reproduce.

2. FUNCTIONAL DESCRIPTION

RECORDED ANNOUNCEMENT EQUIPMENT

2.01 The recorded announcement equipment has a modular structure (Fig. 1). It is made up of a common storage module, channel modules, and associated channel module control units. The announcements are recorded on a magnetic drum which is located in the drum storage unit of the storage module.

2.02 Circuits, jacks, lamps, and switches required for equipment maintenance and a 36A

apparatus mounting with five circuit packs are also contained in the storage module. These circuit packs are used to:

- Initiate magnetic head switching
- Provide the 20-kHz high-frequency bias and erase signal
- Provide a dc output proportional to the speed of the dc servo motor
- Set motor speed reference voltage and forward gain compensation to set dc servo motor correctly
- Provide current capability and output impedance for driving the dc servo motor.

The keys, lamps, and jacks on the common control panel provide the following:

- On-off control of -48 volt power
- Off-off normal indications of -48 volt power
- On-off control of motor power
- Frame line communication
- Spare jack
- Test jacks for +5, +15, -15, -48 volts and ground
- Jacks for local recording
- Key for local test of all alarm logic circuits on frame
- Communication jacks for teletypewriter (TTY) interface to No. 4 ESS.

2.03 Each of the 4-second recorded announcement message segments is picked up from the magnetic drum by a magnetic head and sent by interconnecting units to the appropriate channel module.

2.04 A control unit is associated with each channel module. Each control unit contains jacks, lamps, and switches to provide the ability to:

- Monitor and control the state of the announcement channel
- Record voice or 1000-Hz test tone
- Request that a channel be removed from service by software
- Control power (off-on)
- Adjust the voice alarm circuits associated with the channel (alarm logic and switching alarm circuit packs)
- Measure the announcement audio output signal level.

2.05 Refer to Table A for a functional description of each key, jack, or lamp on the control unit.

2.06 Each channel module contains 17 circuit packs made up of five different types. These circuit packs are used to:

- Provide for the recording and amplification of the 4-second announcement message segments
- Provide logic required to start an announcement message and provide scan point indications when the announcement message level falls below a preset level
- Amplify the returning announcement message signal for checking of audio level at the recorded announcement frame
- Switch four magnetic heads in proper sequence for producing the 16-second announcement message interval
- Provide alarm indications due to improper or faulty switching of magnetic heads.

2.07 Scan and signal distributor (SD) points provide the control interface between the 1A processor and the recorded announcement equipment. The announcement signals are transmitted to the multifrequency (MF) signaling frame where they

are grouped and transmitted to a voiceband interface unit (VIU). A similar path from the VIU to the MF signaling frame back to the announcement frame is also provided.

EQUIPMENT MESSAGE FEATURES

2.08 The maximum capacity of the first bay of the recorded announcement equipment is nine phased recorded announcements. Each announcement requires one channel module and its associated control unit. The No. 4 ESS phased recorded announcement messages are composed of 4-second message segments used to make a 16-second recorded announcement message.

2.09 The announcement consists of up to 12 seconds of audio with a 4-second silent period at the beginning of each recorded announcement message. The 12 seconds of announcement are composed of three 4-second segments. The 16-second message is separated into 4 phases, each delayed 4 seconds with respect to the next so that at any instant in time, one phase of the message is in the silent interval. The subscriber is always connected during the 4-second silent period to ensure receiving the entire message (nonbargain-in). With the 4-second silent period, the average waiting period for the beginning of an announcement is 2 seconds, thus eliminating the need for providing audible ringing tone prior to the beginning of the announcement.

2.10 Each 4-second announcement segment is recorded on one track of the magnetic drum and picked up by the magnetic head associated with that track. By connecting the subscriber to the announcement phase in the silent period, the successive switching of the channel magnetic heads makes it possible to hear the entire message from its beginning. The recorded announcement software determines which phase of each announcement is in the silent period and maintains and updates this information for call processing program use.

2.11 In the No. 4 ESS there is a need for at least five different recorded announcements. The following are examples of three of these announcements.

- (a) "We're sorry, but all circuits are busy now. It's just a temporary condition, and we hope you will try your call again later. This is recording (identification code)."

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(b) "We're sorry, but because of a temporary equipment condition, your call did not go through. Will you please hang up and try again? This is recording (identification code)."

(c) "We're sorry, but we have a problem in completing your call as dialed. Please check the number and dial again, or ask your operator to help you. This is recording (identification code)."

2.12 Two of the announcements are special abnormal condition announcements. These may be similar to the following.

(a) (With flexibility due to situation) "We're sorry, but (storm, tornado, etc) damage to our equipment in Kansas City (or near Kansas City) has blocked your call. Emergency calls can be placed through your operator. This is recording (identification code)."

(b) "We're sorry, but because of (storm damage, tornado damage, etc), all circuits to (called place) are out of service at this time. We hope you will try your call again later. This is recording (identification code)."

At least one additional channel is provided as a spare, and provision is made to add channels as required.

3. APPARATUS

3.01 The apparatus needed to perform the method of operation procedures on the recorded announcement equipment are:

- KS-14510, L1 volt-ohm-milliammeter (VOM) equipped with KS-14510, L2 leads
- 52-type head telephone set
- 63DR-61 hand telephone set
- W1 patch cord, one P3E slate cord, 4 feet long, equipped with two 310 plugs (3P7E cord)
- W2 patch cord (ED-97753-30)

4. METHOD OF OPERATION

START-UP

4.01 To start up the recorded announcement equipment (Fig. 1) proceed as follows.

- (1) Ensure that the CONTROL OFF keys on all control units on the equipment are depressed.
- (2) Check that the MOTOR OFF key (Fig. 2) on the storage module is depressed.
- (3) The PWR OFF and OFF NOR lamps on the storage module should be lighted.
- (4) Depress the -48V NOR key on the storage module. The PWR OFF lamp on the storage module extinguishes. The PWR OFF and OFF NOR lamps on all the control units on the frame light.
- (5) Using a VOM, check the voltages at the TEST POINTS on the storage module. The voltages should be as marked.
- (6) Depress the MOTOR NOR key. The motor starts and the drum rotates.
- (7) Depress CONTROL NOR keys on all control units.
- (8) The equipment is now in operation.

SHUTDOWN

4.02 To shut down the recorded announcement equipment (Fig. 1) proceed as follows.

- (1) Notify the traffic department and receive approval for shutdown of the equipment.
- (2) Depress the CONTROL OFF key on all control units.
- (3) Depress the MOTOR OFF key (Fig. 2) on the storage module.
- (4) Depress the -48V OFF key on the storage module. The CSRAF is now out of service.

Note: Step 4 must always be performed whenever Steps 2 and 3 have been performed.

Caution: *All voltage is not removed from the equipment.*

RECORDING

A. General

4.03 Recordings can be made either locally at the equipment by central office personnel or remotely in a quiet area by operators or other qualified personnel. Observe the following restrictions before making any recorded announcement.

- (a) Recording should not be made or changed until the channel has been released by the traffic department.
- (b) Request that no operations be made at the equipment during the recording procedure at the dedicated telephone.
- (c) Request that no operations be made at the dedicated telephone during the recording procedure at the equipment.
- (d) Remove all channels from the test mode prior to recording by depressing the PHASE NOR keys on the phased message control units and the RL key on the dedicated telephone.
- (e) If the LED on the front panel of the A1017 clock circuit pack in the "A" position in the storage module (Fig. 2) is on, operations are being performed at the dedicated telephone which will affect the recording procedure. **Do not** access any channel.

B. Remote

4.04 Recordings can be made on the equipment from a remote location with a dedicated telephone (CALL DIRECTOR®) (Fig. 3).

- (a) To make a phased message recording from the dedicated telephone, proceed as follows.
 - (1) Request that no operations be made at the equipment while making the recording.

Note: If the lamp under the REC key is on, operations are being performed at the equipment which will affect the recording procedure. The interfacing circuit has the option to provide this feature.

- (2) Lift the handset of the dedicated telephone (Fig. 3).
- (3) Select the channel to be recorded by depressing the proper channel selection key (PM channel number) on the dedicated telephone.

Note: The interfacing circuit has the option to light the lamp under the REC key. If this option is provided, the recording should not be made until the lamp is on.

- (4) Monitor the existing message on the selected channel for verification of correct channel selection.
- (5) Operate and hold the REC key. The selected channel lamp will light within 4 seconds. Start recording new message immediately after channel lamp lights.

Note: After 12 seconds, the selected channel lamp will extinguish. If the message length exceeds 12 seconds, repeat the recording and adjust the message length to within the channel capacity.

- (6) After the recording interval, the selected channel lamp will extinguish. **Immediately** release the REC key, and the channel will automatically switch to the playback mode.

Note: The recording must be monitored at least **twice** (Step 7) before changing settings; otherwise, an alarm will be given to the interfacing circuit.

- (7) Monitor the recording. If the recording is invalid, repeat the recording process.
- (8) When the recorded message is acceptable, depress the RLS key and place the handset on-hook.
- (b) To record at the dedicated telephone using a prerecorded message, proceed as follows.
 - (1) Position the tape on the recording device to start at the beginning of the message.
 - (2) Perform Steps 1 through 4 in 4.05(a).

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- (3) Using an appropriate patch cord, connect the recording device to the jack on the dedicated telephone. Place the handset of the dedicated telephone on-hook.
- (4) Perform the recording procedure in 3.05(a) and start the recorded message at the beginning of the record mode.
- (5) When the recording is completed, disconnect the recording device and monitor the recording with the handset.
- (6) When the recording is acceptable, depress the RLS key and place the handset on-hook.

C. Local

4.05 Recordings can be made at the equipment location.

- (a) To make a phased message recording at the equipment, proceed as follows.

- (1) Request that no operations be made at the dedicated telephone while making the recording.
- (2) Connect the plug of the headset or handset into the HEADSET jack on the drum storage module (Fig. 2).
- (3) Insert one plug of the W1 patch cord into the SIGNAL jack on the storage module and the other plug into the TMS jack on the phased message control unit (Fig. 4).
- (4) Depress the REQ OS ROS key on the control unit.
- (5) When the OS lamp on the control unit lights, depress the PHASE RREC key.
- (6) Monitor the message on the selected channel for verification of the correct channel selection.
- (7) Depress and hold the REC key, and the REC lamp lights. Start recording *immediately* after REC lamp lights.

Note: After 12 seconds, the REC lamp will extinguish. If the message length exceeds 12 seconds, repeat the recording procedure

and adjust the message length to within the channel capacity.

- (8) After the recording interval, the REC lamp will extinguish. *Immediately* release the REC key, and the channel automatically goes into the playback mode.

Note: The recording must be monitored *twice* (Step 9); otherwise, an alarm will be given to the interfacing circuit, and the LEDs will light on the front panels of the A1020 switching alarm and A1014 alarm logic circuit packs.

- (9) Monitor the recording and if the recording is invalid, repeat Steps 7 and 8.
 - (10) Depress the PHASE NOR key.
 - (11) Depress the REQ OS NOR key.
 - (12) Remove the headset or handset and patch cord when recording is completed.
- (b) To record at the equipment using a prerecorded message, proceed as follows.
 - (1) Position the tape on the recording device to start at the beginning of the message.
 - (2) Perform Steps 1 through 6 in 4.05(a).
 - (3) Using an appropriate patch cord, connect the recording device to the HEADSET jack of the storage module.
 - (4) Perform the recording procedure in 3.05(a), and start the recorded message at the beginning of the record mode.
 - (5) When recording is completed, disconnect the recording device and monitor the recording with the headset or handset.
 - (6) When the recording is acceptable, return the channel to normal and remove the patch cord and headset or handset.

MONITORING

A. Remote

4.06 To monitor a recording from the remote location (dedicated phone), proceed as follows.

- (1) Lift the handset of the dedicated telephone (Fig. 3).
- (2) Select the channel to be monitored by depressing the proper channel selection key on the dedicated telephone.
- (3) Monitor the selected channel.
- (4) When monitoring is completed, depress the RLS key and place the handset on-hook.

B. Local

4.07 To monitor a recording at the equipment, proceed as follows.

- (1) Connect the headset or handset into HEADSET jack (Fig. 2) on the storage module.
- (2) Insert one plug of the W1 patch cord into SIGNAL jack on the storage module and the other plug into the TMS jack on the control unit of the channel to be monitored.
- (3) Depress the appropriate PHASE_ key on the control unit.
- (4) Monitor the selected channel.
- (5) Depress the PHASE NOR key.
- (6) Remove the headset or handset and W1 patch cord.

5. MAINTENANCE

INTRODUCTION

A. Maintenance Philosophy

5.01 Maintenance of the recorded announcement equipment in the No. 4 ESS deals with routine maintenance functions and changing defective circuit packs. The routine maintenance chiefly consists of cleaning and lubricating the magnetic drum and replacing defective fuses and lamps.

Circuit packs are replaced as the need arises. Figure 5 shows the location and identification of the phased message channel module circuit packs.

5.02 When two recorded announcement equipment frames exist in the No. 4 ESS office, the announcements required can be equipped in each frame to provide complete message redundancy, including the drum storage unit. Only one of the duplicated announcements can be in the active state; that is, providing the announcement to subscribers. The duplicate resides in a standby state capable of being made active should the other, for some reason, become unavailable. If a single recorded announcement equipment frame exists in the office, the recorded announcement software will function with message redundancy on the single frame or will function with a single announcement machine and no message redundancy. In all cases, the last resort is a 120-ipm reorder tone provided by the 820A ringing and tone plant when a message is no longer available. This tone automatically replaces the last announcement under control of the recorded announcement software.

B. Trouble Detection Features

5.03 The recorded announcement equipment uses two methods of monitoring the announcement signal levels (5.04) to ensure that audible announcement messages are maintained.

5.04 After being switched through the time division switching network (TDNET) via the nailed-up connection, each announcement phase is transmitted back to the recorded announcement frame where it is continuously monitored for proper audio level. The demultiplex audio amplifier circuit pack will amplify the returning message phases to provide a level compatible with the alarm monitor circuits. Each phase is then measured for the correct audio level by an alarm logic circuit. If the audio level drops below a predetermined level, a report via a scan point is made to the recorded announcement machine program (RAMP). RAMP removes the channel from service and replaces it with the duplicate or 120-ipm reorder tone if the duplicate is also unavailable. The alarm logic circuit pack has a rather long reaction time (greater than 4 seconds) and one of the magnetic heads for the channel could malfunction without being detected. Therefore, an additional monitoring method is used. The switching alarm circuit associated with each phase compares the audio level of the successive

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phase of the announcement with the previous phase, and, if any difference of a predetermined amount exists between the successive phases, a report via a scan point is made to the RAMP.

5.05 A pair of jacks is provided on the storage module to connect a TTY to the office TTY loop. TTY requests can be made to:

- Initiate a software-controlled test of the recorded announcement machine
- Change the state of a channel(s)
- Verify the state of all the channels on the recorded announcement machine
- Initialize and configure a working set of announcements.

5.06 The keys, jacks, and lamps on the storage module are used to:

- Provide connection to central office telephone and TTY loops
- Provide means of monitoring announcements by headset
- Acquire 1000-Hz tone for testing
- Measure -48 , $+5$, $+15$, or -15 volts
- Indicate and control the power
- Request a software-controlled test of all alarm logic circuits.

5.07 A lamp is on the front of each of the four alarm logic and switching alarm circuit packs of the six channel modules. A lighted lamp on the alarm logic circuit pack indicates that the audio level of that phase has dropped below a certain level. The lamp, when lighted on both the alarm logic and the switching alarm circuit packs, indicates that the successive comparison of the announcement audio levels have exceeded a certain threshold level. When any of the lamps are lighted, an indication is sent to the RAMP for processing.

5.08 The maintenance indicator lamps on the control unit are used to:

- Indicate power to associated channel module in the ON or OFF condition
- Indicate whether the associated channel module is out of service
- Indicate when recording on the associated channel module may take place
- Indicate an off-normal condition of any keys on the channel control panel.

MANUAL TEST PROCEDURES

5.09 The manual test functions that can be performed on the recorded announcement equipment consist of:

- Testing of all the alarm logic and switching alarm circuit packs
- Monitoring of new recorded announcements.

RECORDED ANNOUNCEMENT MACHINE PROGRAM

5.10 The RAMP is divided into two entities: control and test routines and audit and initialization routines.

5.11 Control routines provide the logic to implement the man-machine interface and keep the software in step with the hardware. These control routines are the:

- Request out-of-service routine used to remove or return a channel to service.
- Recording routines used to enable the recording of a new recorded announcement from either the equipment or the dedicated CALL DIRECTOR telephone.
- Manual voice alarm test routines which check all alarm logic circuit packs when requested to do so by manual operation of the VOICE ALARM test key on the storage module.
- Voice alarm routine used to process scan reports generated by alarm logic and switching alarm circuit packs.

- Transfer timing administration routine to perform 32-second timing prior to removing an active channel from service. This is done to ensure that subscribers connected to the announcement will hear at least two repetitions of the message.
 - Active phase update routine to maintain which phase of each active channel is presently in the silent period.
 - Magnetic drum speed check used to ensure that the magnetic drum is continuing to rotate.
- 5.12** Test routines check to determine if the recorded announcement equipment is functioning in the correct manner. This is done by ensuring that magnetic heads are switching in sequence and that all voice alarm detectors are capable of detecting a simulated loss of audio.
- 5.13** Recovering a working recorded announcement configuration as a result of memory mutilation or software reinitialization is the responsibility of the audit and initialization routines.

TABLE A

PHASED 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 jumper from storage module SIGNAL jack.
PHASE RREC	PHASE request record (RREC) key (enabled when OS lamp is lighted) — When depressed: <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	PHASE NOR (normal) key — Depressed when channel is operating in normal mode.
PHASE (0-3)	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.
PHASE REC	PHASE REC (record) key — When depressed, places channel in record mode when ROS and RREC keys are depressed and OS lamp is lighted.
REC	Record (REC) lamp — Lights for 12 seconds when channel is in record mode.
OS	Out-of-service (OS) lamp — Indicates that channel is out of service.
REQ OS NOR	Request out-of-service NOR (normal) key — Depressed when in normal mode.
REQ OS ROS	Request out-of-service key — When depressed, requests that channel be disconnected from subscribers.
PWR OFF	Power off lamp — Indicates channel power is off.
CONTROL NOR	CONTROL NOR key — Depressed when in normal mode.
CONTROL OFF	CONTROL OFF key — When depressed, removes power from channel.
OFF NOR	OFF NOR (normal) lamp — Indicates that at least one NOR key is not depressed.
VOICE ALARM ADJ	VOICE ALARM ADJ key — When depressed: <ul style="list-style-type: none"> • Decreases alarm audio by 6 dB. • Voice alarm level can be adjusted.
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.

INPUT/OUTPUT
CONNECTOR FOR
PHASED MESSAGE
(ONE PER
CHANNEL MODULE)

PHASED MESSAGE
(3 CHANNELS)

PHASED MESSAGE
(3 CHANNELS)

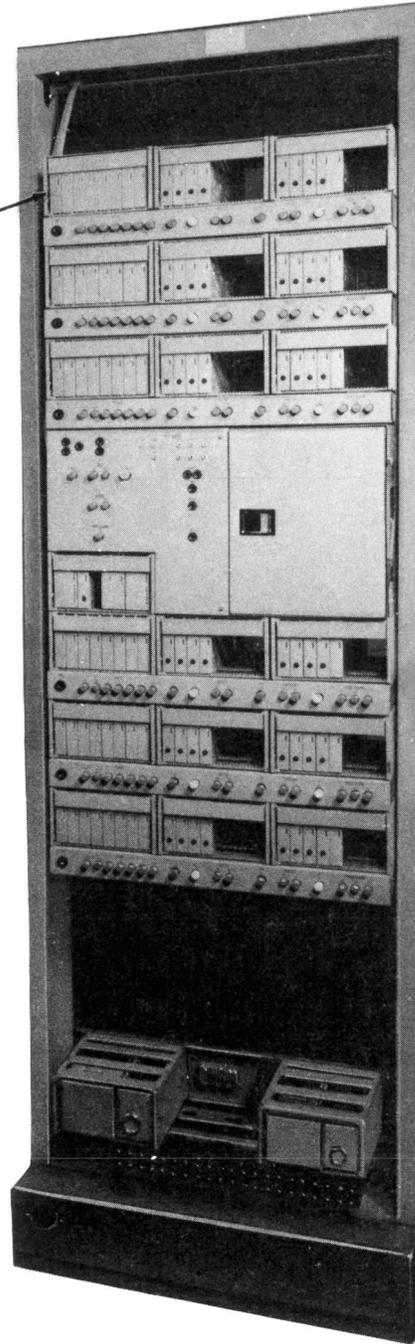


Fig. 1—Typical Frame Arrangement for Recorded Announcement

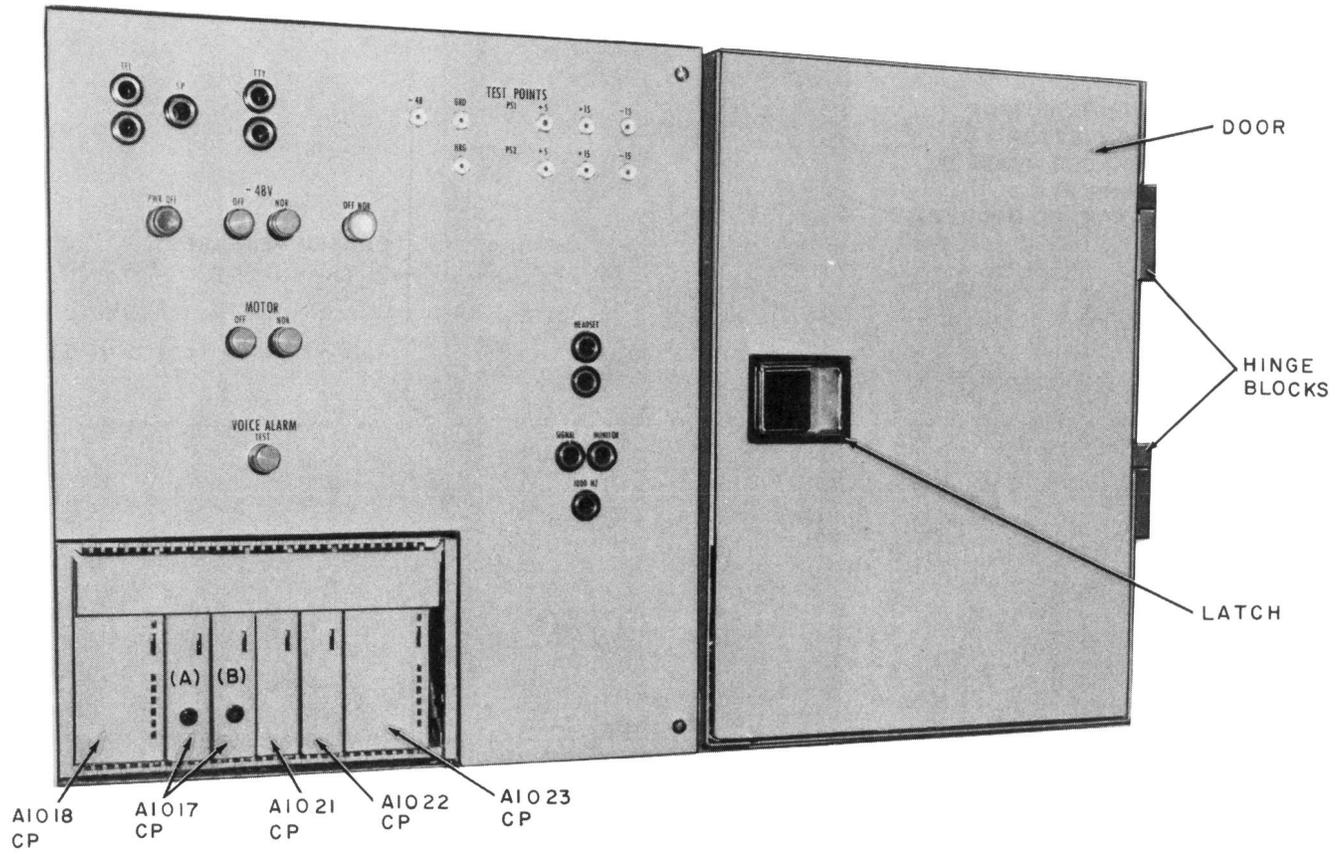
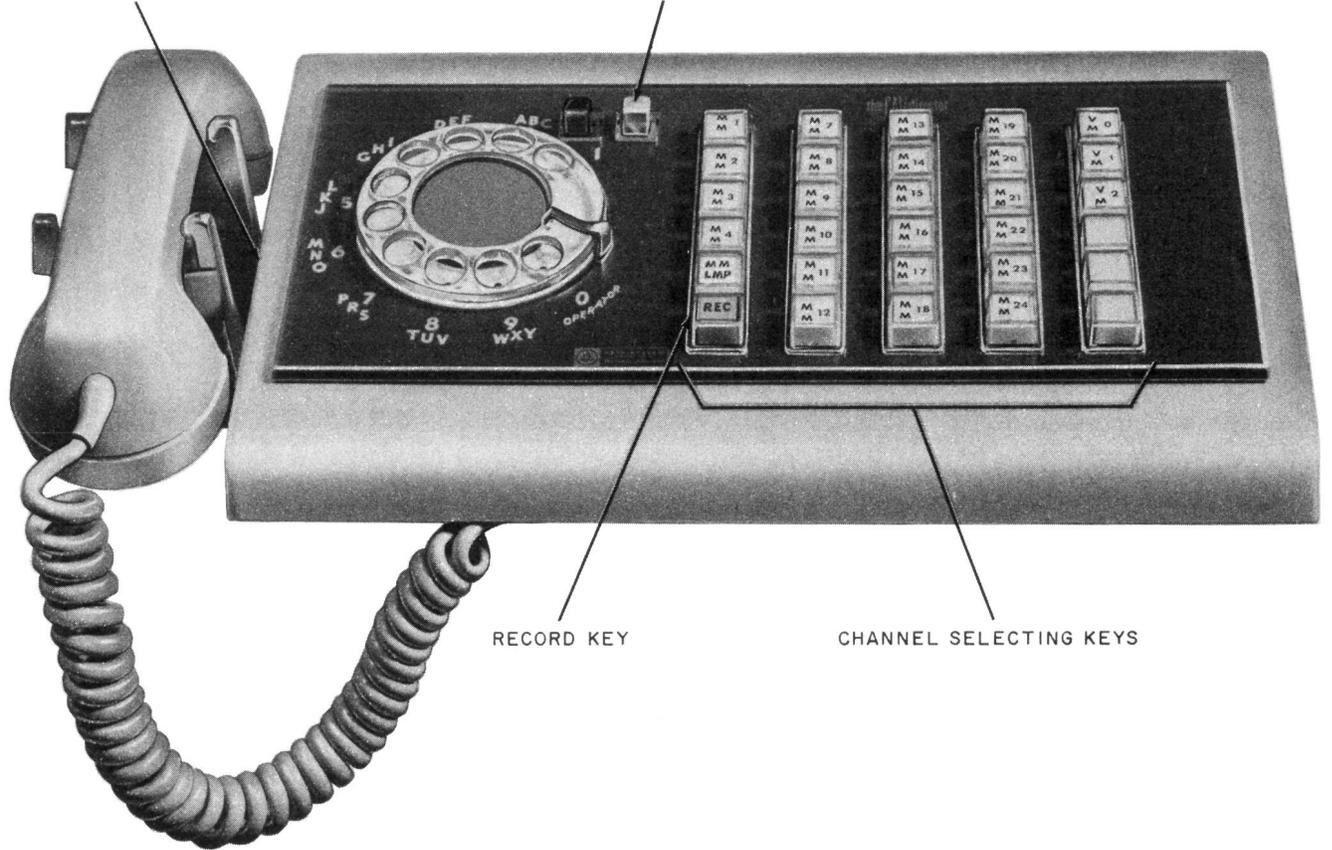


Fig. 2—Drum Storage Module

JACK ON SIDE FOR TAPE
RECORDER ATTACHMENT

RELEASE KEY



RECORD KEY

CHANNEL SELECTING KEYS

Fig. 3—637-Type Call Director

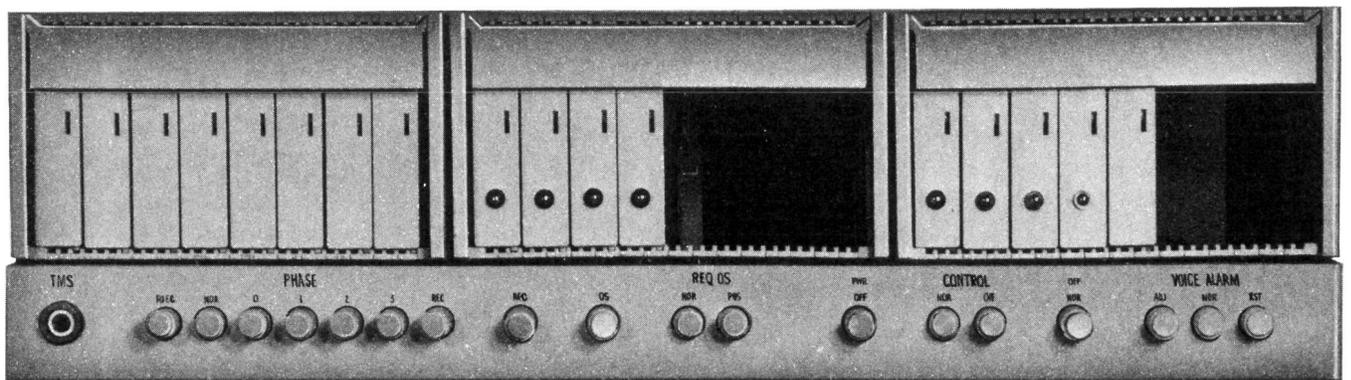
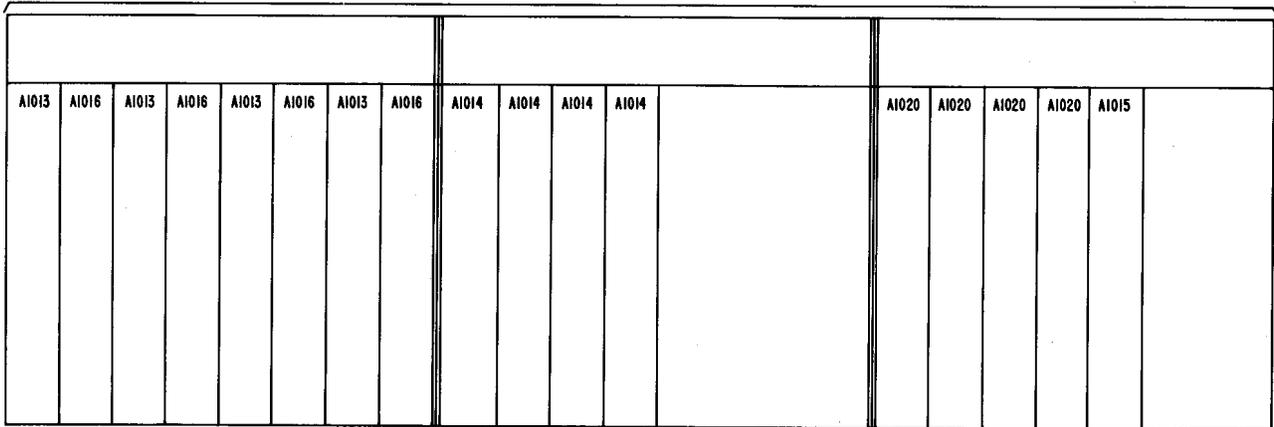


Fig. 4—Phased Message Channel Module and Control Unit

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I 12-SECOND PHASED MESSAGE ANNOUNCEMENT



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

Fig. 5—Location and Identification of Phased Message Channel Module Circuit Cards