NO. 2 ELECTRONIC SWITCHING SYSTEM

OPERATIONAL FEATURES

MAINTENANCE AND ADMINISTRATION CENTER

1. GENERAL

1.01 This section describes the maintenance and administration center and its application in the No. 2 Electronic Switching System (ESS) office.

1.02 It is important for the network administrator to know the functions and capabilities of the maintenance and administration center in order to perform their duties. A cooperative effort, therefore, is necessary for both the administration and maintenance personnel in order to ensure a sound performance of the No. 2 ESS office.

1.03 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.04 The title for each figure includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.

2. DESCRIPTION

2.01 The maintenance and administration center provides the interface between maintenance personnel and the No. 2 ESS. The center was designed to serve as a system maintenance tool in

an in-service office. In this capacity, the center has four functions as follows:

(a) In-service monitor of the status of the system

(b) Test and control center for routine functions

(c) Backup mechanism when the preplanned diagnostic procedures fail

(d) Emergency control in extreme situations.

2.02 The center consists of two independent frames: the maintenance center (MC) frame and the trunk test panel (TTP) frame.

3. MAINTENANCE CENTER FRAME

3.01 The maintenance center frame (Fig. 1) is physically divided into two bays (0 and 1) and functionally divisible into four major areas: maintenance center circuit, which provides manual control of the office; emergency action (EA) panel, teletypewriter (TTY) facilities and single card writer (SCW).

MAINTENANCE CENTER CIRCUIT

A. Circuitry

3.02 The maintenance center frame circuitry, or logic, is located in bay 0 and consists chiefly of registers. There are four registers which are important in determining system status and control.

(a) *Alarm Maintenance Register (AMR):* A 16-bit (binary digit) register which provides control signals for maintenance center actions.

(b) *Equipment Status Register (ESR):* A 16-bit register which records and visually displays the status of system equipment.

(c) *Error Register (ER):* This is a 16-bit register. All 16 bits of the error register serve in a memory-only capacity in that no control function is dependent upon their states. Error detection circuits, in the various equipments (ie, program store) check for proper operation; upon detecting a fault, the error bit associated with the faulty equipment is set.

(d) *Display Buffer (DB):* A 22-bit register which provides automatic visual display of

registers and store words under hardware or program control. It also provides direct access for manual load and display operation at the control and display panel as well as communication with the single card writer.

3.03 Access to these registers is gained by use of the maintenance center gating bus. Direct gating to and from these registers is accomplished by gating data to the bus with the appropriate enable signals. The maintenance center gating bus is the only means by which a maintenance center frame register can be accessed by programs.

B. Modes of Operation

3.04 The maintenance center frame has three modes of operation: normal compare, normal noncompare, and manual.

Normal Compare Mode

3.05 Without manual intervention or the detection of trouble, both control units run simultaneously, executing the same instructions in synchronism, with the outputs of the off-line control unit to the periphery and to the maintenance center inhibited. If the maintenance center frame is in the NORMAL mode and the system is functioning properly, the maintenance center frame is in the NORMAL-COMPARE state which enables the processor match circuit. In this state, the contents of the call store input (CSI) register in each control unit are being matched in the maintenance center and the display buffer is displaying the on-line program address (PA). Since the call store is frequently used to store temporary program results, any trouble that is not detected by check circuits causes the call store input registers to differ. The mismatch causes an interrupt signal to be sent to both control units, actuating a mismatch detection monitor program in an attempt to locate the trouble. When the mismatch occurs, the on-line call store address (CSA) register is gated to the display buffer, then frozen. This aids the maintenance programs in the detection and recovery process. In addition, a mismatch interrupt is sent to both control units.

Normal Noncompare Mode

3.06 In the normal noncompare mode, no interrupts are transferred to the control units. This mode of operation permits updating the memory of the standby central processor (CP) without

interrupting call processing in the active central processor.

Manual Mode

3.07 In the manual mode, the display panel is used tor access or control of the off-line central processor for test purposes as well as a limited access to the on-line central processor. This mode may be obtained either by program or by depressing the MANUAL pushbutton on the display panel. Some of the functions that may be performed in the manual mode are listed below:

- Margin testing

- Static load and display of registers

- Static read and write of call store

- Static read of program store

- Execute one instruction and advance

- Repeat execute one word

- Manual initialization.

3.08 The manual mode is required in most cases of human intervention. This mode disables certain automatic features which are performed when the center is in the NORMAL mode. Use of the MANUAL mode does not necessarily imply an abnormal or emergency situation, since several day-to-day operations which require the MANUAL mode make use of some of the same circuitry used in the NORMAL mode.

C. Routine Operations

3.09 Features that are used during routine operations are the system status displays, trouble recording, and control of the on-line/off-line status of the control units. These features are active regardless of whether the maintenance center has been placed in the MANUAL or NORMAL mode.

D. Control and Display Panel

3.10 The control and display panel provides facilities for monitoring and controlling the system (Fig. 2). It is housed in the right bay (bay 1) of the maintenance center frame.

3.11 The control panel equipment includes the following:

(a) Lamp displays which show the status of the system, including alarm conditions, maintenance center status, and certain peripheral equipment conditions.

(b) Keys and switches providing direct access to various registers for use during routine tests and a backup means of testing if programmed diagnostics fail.

(c) Lamps for displaying memory or scanner readings as aids for manual tests. The proper message, when entered on the maintenance TTY, causes certain memory words or scanner rows to be read and displayed on the panel.

(d) Keys and switches for controlling control unit and maintenance center power.

(e) Provisions for checking marginal information bits in the call store and program store via special margin testing controls and test points on the panel.

3.12 The keys on the maintenance frame may be either a locking or a nonlocking type. When a locking key is depressed, it remains depressed and is released simply by pushing it again. Once a nonlocking key has been depressed, it returns to its original position, when released.

Note: Nonlocking keys require a depression of at least one-half second to insure system recognition.

3.13 Major and minor trouble conditions in the system are indicated by lamp displays accompanied by an audible alarm. Lamps of appropriate colors are used to indicate:

(a) Which mode of operation certain units are in

(b) Trouble conditions, and

(c) Certain selections that have been made by operating various keys and switches.

3.14 *Red* lamps indicate a primary trouble. This signifies that a trouble of a major consequence

exists and that immediate attention should be given to this condition.

3.15 *Amber* lamps generally indicate a special condition or display. Amber lamp indications are also provided in the display buffer in groups of three, alternating with groups of three white lamps, to facilitate reading of displayed octal information.

3.16 *Green* lamps are used to indicate the status of the control units and to indicate whether requested tests have passed.

3.17 *White* lamps indicate an active condition or the selection of a particular key. White lamps are provided in some nonlocking as well as some locking keys. When the key is operated (or activated), the lamp is lighted.

3.18 The control and display panel is physically divided into ten sections so that functionally related controls and/or displays are grouped together. The sections are as follows.

System Status

3.19 The upper center section of the display panel provides immediate indication of the system status. The displays indicate alarm conditions and maintenance center status, denote which control unit is active and gives its status, and denote the status of certain devices. Provisions are also made for locking either control unit zero or control unit one in the active condition.

Power Control

3.20 The upper left section of the display panel provides for removing or restoring power in the control unit and maintenance center through a series of special sequences which avoid the generation of system interfering transients. There are also keys which allow manual switching of the control units, and the maintenance center control keys to allow the maintenance center access to the one-line control unit.

Store Margin Test

3.21 The upper right section of the display panel is used in program store and call store margin tests to detect weak bits in the memories. This is independent of the preset automatic margin tests

controllable by the program and allows margins to be checked manually with the threshold voltage at the sense amplifiers available at test points on the panel.

Display Buffer

3.22 The display buffer consists of a group of lighted keys which provide for dynamic program address (PA) display, dynamic program store and call store contents display, communication of data to the single card writer, and display of data under program control. This group of lighted keys also displays the contents of the 22-bit display buffer register. The lighted pushbuttons, which can be used to load the individual bits, are colored in groups of three for easy reading as octal numbers.

3.23 With the maintenance center frame in the manual mode, the display buffer can be set and reset by pushbuttons.

Comparator Input Switches

3.24 These switches provide a means for matching two inputs of up to 22 bits each. Inputs are from the MASTER CONTROL GATING BUS, the COMPARATOR INPUT SWITCHES, and CALL STORE INPUT register of each control unit. The comparator output can be used to trigger one of several functions, allowing the maintenance personnel to observe events or conditions such as a register's contents or a logic gate becoming active.

Off-Line Load and Display

3.25 These pushbuttons, when used in conjunction with the DISPLAY BUFFER keys and the COMPARATOR INPUT SWITCHES, allow maintenance personnel to display or to alter the contents of most registers in the off-line control unit. This includes information contained in the call store. The program store information can also be displayed.

Maintenance Center Functions

3.26 These keys are used to set the function for which the DISPLAY BUFFER, the COMPARATOR INPUT SWITCHES, and the OFF-LINE LOAD AND DISPLAY keys will be used (that is, which inputs are to be matched, how certain instructions are to be executed, etc).

Test Status

3.27 These lamps give a visual indication of requested test results (PASS or FAIL).

Maintenance Center Mode

3.28 These pushbuttons provide a manual method for placing the maintenance center in the manual or normal mode of operation as well as for causing the on-line control unit to be interrupted and the off-line control unit to be stopped if any of several matches occur.

Auxiliary Functions

3.29 This group of pushbuttons provides auxiliary functions for the following:

(1) Control over program execution in the off line control unit

(2) Inhibiting the automatic display of the display buffer

(3) Testing the maintenance and control center lamp circuitry.

EMERGENCY ACTION PANEL

A. General

3.30 The emergency action (*EA*) panel is located directly above the maintenance center display panel in bay 1 of the maintenance center frame (Fig. 3). The keys on this panel are used to manually initiate several emergency actions.

> *Note:* If the system is failing to process calls properly (is not able to complete test calls, etc), the system should be automatically attempting to recover itself by taking automatic emergency actions. This should be indicated to office personnel by the apparent switching of control units, teletypewriter printouts, etc. If automatic emergency actions do not restore the system to a working control unit, manual emergency actions will be required.

B. Key Functions

3.31 The eight emergency action keys (Fig. 3) are labeled (1) ENABLE, (2) READY, (3) GO, (4) STABLE, (5) REC CHNG, (6) TTY INIT,

(7) LINE TRFR, and (8) POWER. These keys are used in performing manual system initialization, teletypewriter initialization, and emergency line transfer. Detailed procedures for initiating these emergency actions are given in Bell System Practices 232-113-301.

TELETYPEWRITER FACILITIES

A. General

3.32 The maintenance center teletypewriter facilities include local maintenance teletypewriter (TTY), teletypewriter control circuits, and TTY control panel. The maintenance TTY serves as the basic communication link between the No. 2 ESS and operating personnel. The control circuits contain the equipment necessary to convert the slow speed TTY signals to the faster central processor signals and vice versa. The TTY control panel provides manual power control as well as manual disconnection of the TTYs and the associated data sets.

B. Local Maintenance (LM) Teletypewriter

3.33 The LM teletypewriter is located in bay 1 of the maintenance center frame. (A remote maintenance (RM) TTY is usually located at another location within the same building, or at a distant location where 24-hour maintenance coverage is provided.) The LM TTY is a 35-type send and receive (*KSR*) TTY with a 4-row keyboard similar to a standard office typewriter. It operates at 100 words per minute using a 7-bit code based on the American Standard Code for Information Interchange (ASCII).

3.34 The maintenance TTY provides periodic printouts of traffic and system status, and when trouble occurs, prints out the results of programmed diagnostic tests in a coded format. Maintenance TTY output messages consist of alarm indications, trouble indications, results of trouble diagnosis, traffic overload conditions, and replies to interrogations. By using the Trouble Locating Manual (TLM), the messages can be translated into probable circuit failures and repair can then begin. (The Output Message Manual, OM-2H200 may also aid in the translation of TTY messages.) The TTY, coupled with the diagnostic program and the maintenance center display panel, provides maintenance personnel with an extremely valuable troubleshooting tool.

3.35 The maintenance TTY is also used to input messages to the No. 2 ESS. The input messages can request output messages, request system changes, and provide data for system use. (Reference the Input Message Manual, IM-2H200 for specific messages.)

(a) Typical input requests for output messages include requests for traffic data, requests for line activity states, requests for diagnostic tests to be run and the results printed out, and requests for translation information associated with a particular equipment number.

(b) Typical input requests for system changes include requests for switching active and standby units and requests for taking a unit out of service.

(c) Typical input messages providing data for system use include recent change and time-of-day information. Recent change (RC) messages are a particular type of input message and can be entered via the service order channel or the maintenance channels. There are several different types of translation information which can be altered via recent change messages:

- Line translation information

- PBX translation information

- Trunk translation information

- Three-digit translation information.

C. Associated TTY Equipment

3.36 Additional equipment that may be associated with the maintenance TTY includes the idle line control unit and the stunt box.

(a) The idle line control unit allows automatic TTY motor control. The unit is required for proper local—remote operation of the maintenance TTY. This unit responds to the first character received by turning on the motor. The idle line control unit will automatically turn off the motor if no data is received within a variable period of time, up to a maximum of 20 minutes after the last output message. This adjustment is made at the idle line control unit as a user option.

(b) A stunt box decodes special TTY characters and operates a set of contacts. These contacts may be used to activate external equipment such as alarms.

Note: An optional feature that is available in the translations program is an automatic form feed after each output message.

D. Teletypewriter Control Circuits

3.37 A control circuit is interposed between the central processor and a teletypewriter channel. The control circuit converts central processor information to an acceptable format for the teletypewriter. The control circuit also converts teletypewriter status information to an acceptable format for the central processor. The control circuits are located in bay 1 of the maintenance center frame.

3.38 The control circuits are arranged in logic trays that also provide proper selection, power-off relays, and data conversion. The individual circuits grow in modules of two circuits per logic tray and can be added as needed.

3.39 The maintenance teletypewriter channel has two control circuits which act as a buffer and a conversion unit between the local and remote TTYs and the system (Fig. 4). If one of the maintenance control circuits is removed from service, the other channel remains operational. The nonmaintenance teletypewriter channels only have a single control circuit for each channel.

3.40 Any standard teletypewriter device can be attached to a channel either singularly or in combination, such as send receive TTY, receive-only (RO) TTY, paper tape punch, paper tape reader, or automatic send-receive (ASR) TTY. Equipment that is located a long distance from an office can be handled with a 108/820 data set combination over a private line.

3.41 The local maintenance TTY and the remote maintenance TTY are part of the maintenance channel and receive messages at the same time. When the No. 2 ESS office is to be left unattended for any length of time, the local maintenance TTY can be turned off via a type-in message. The remote maintenance TTY will remain connected to the maintenance channel. The local maintenance TTY is returned to service by a second type-in

message from the remote maintenance TTY. In the event of a maintenance channel equipment failure, a diagnostic program may cause a sequence of local maintenance and remote maintenance TTY disconnects and control circuit transfers to take place in an attempt to find the trouble. If either TTY fails the diagnostic, the program will disconnect it from the maintenance channel and send an out-of-service message to the remaining maintenance TTY.

3.42 A backup channel should be specified in translations whether the channel is equipped with a TTY or not. The channel assignment is flexible and may be linked (ie, channel 5 uses channel 4 for backup, channel 4 uses channel 3 for backup, etc); however, it is recommended that the channels finally back up on the maintenance channel. If a message is routed to a channel that does not exist in the office, or that is out-of-service, the backup channel is automatically used. If a backup channel is not specified, the message is lost.

E. TTY Control Panel

3.43 The TTY control panel provides manual power control for the TTY control circuits as well as manual disconnection of the TTYs and their associated data sets (Fig. 5). This control panel is located in bay 0 of the maintenance center frame, directly above the single card writer. The keys associated with the TTY control panel are divided into three functions: (a) power control, (b) data set disconnect, and (c) teletypewriter disconnect. A description of the keys and their functions are provided below.

(a) *Power Control:* Operation of the POWER OFF TTY CONTROL (TA or TB) keys removes power from the control circuits. A lamp within each key will light when the key is operated. For reliability purposes, the eight TTY control circuits, designated 0 through 7, are divided into two groups, odd and even. A power disconnect in one group results in the transfer of power to the control circuits automatically. Battery for the even-numbered group is supplied by power bus A and for the odd-numbered group by power bus B. Power may be removed by maintenance personnel from either group by operating the related POWER OFF TTY CONTROL (TA or TB) key. An electrical interlock, located in the power control

circuit, prevents power from being removed from both groups at the same time.

(b) *Data Set Disconnect:* Associated with each No. 2 ESS TTY channel is a data set disconnect key. Operation of a disconnect key for a particular channel will inhibit all data transmission via an associated data set. Except for the maintenance channel, a TTY channel out-of-service message must be typed prior to manually disconnecting any teletypewriter.

Note: The local maintenance and remote maintenance TTYs can be disconnected by central processor program control. If a programmed disconnect occurs, a lamp will light within the key associated with the disconnected channel. Central processor programmed control may also restore a maintenance TTY to service unless it has been manually disconnected. A manual TTY disconnect has priority over a programmed disconnect.

These keys are used as required and may be assigned as indicated below:

D2 = Network administration TTY

D3 = Service order TTY

D4 = Local test desk

D5 = Trunk test

D6, D7 = Spare.

(c) *Teletypewriter Disconnect:* Associated with each No. 2 ESS TTY channel is a TTY disconnect key. Operation of a disconnect key for a particular channel will inhibit all data transmission but will allow for full internal operation of the TTY involved. Except for the maintenance channel, a TTY channel out-of-service message must be typed prior to manually disconnecting any TTY.

These keys are used as required and may be assigned as indicated below:

T2 = Network administration TTY

T3 = Service order TTY

T4 = Local test desk

T5 = Trunk test

T6, T7 = Spare.

SINGLE CARD WRITER

A. General

3.44 The 3A card writing unit together with its associated circuit packages, relays, fuses, and control panel is called the single card writer (SCW). As the name implies, the single card writer writes one memory card at a time. A single memory card is manually placed on the writing deck of the single card writer by an attendant. The SCW writes by passing the 1B writing head across the card at the appropriate time as determined by the attendant and the programmed sequence of events. The writing time for a single card is normally less than two minutes.

3.45 The 3A card writing unit, along with three trays of circuit packages, a relay and fuse panel, and the control panel, is mounted in the left side (bay 0) of the double-bay maintenance center frame (Fig. 6).

B. Functional Description

3.46 The 3A card writing unit is the device by which permanent magnet twistor cards (program store or memory cards) are written in the No. 2 ESS offices. Memory cards are of two types: the 1A memory card with the card positioning notch at the left in the back edge of the card and the 2A memory card with the notch at the right in the back edge of the card (Fig. 7).

> *Note:* In the program documents, the memory cards are referred to as type A (left notch) and type B (right notch).

3.47 The memory cards are grouped in program store modules of 128 cards each. All the 1A cards face in one direction and all the 2A cards face in the opposite direction when placed in the program store. Each module contains 64 cards of each type which are arranged alternately within the module. Each memory card magnetically stores 128 words of program or translation information.

3.48 When a change is required in the program store translation information, the new information is first entered into the system in the form of a TTY input message and is stored temporarily in the recent change buffer of the call store. As far as the system is concerned, any information in the recent change buffer supersedes the information located at the corresponding address on a program store memory card. However, it eventually becomes necessary to transfer the recent changes from the call store to the more permanent memory of the program store to make room for additional recent changes to be entered into the call store. The procedure for this transfer is called *updating program store translation information* and is covered in detail in Bell System Practice 232-004-301. *CH*ange *I*n *P*rogram *S*tore (CHIPS) word procedures used for program or translation changes are given in Bell System Practice 232-004-303.

3.49 When the recent change buffer is filled to 81 percent of its capacity, the system informs the attendant via a TTY output message. (When the recent change buffer is 81 percent filled, the attendant should arrange to update the memory cards as soon as possible. At 93 percent fill no recent changes will be allowed except customer dialed changes to speed calling lists.) When ready to update the memory cards, the attendant selects an appropriate spare card and places it on the writing deck of the 3A card writing unit.

3.50 When the system receives notification from the attendant that card writing is about to begin, an image of the first card to be written is formed in the call store. To make the card image, the system uses the unchanged information from the card in the program store and the changed information from the recent change buffer in the call store. Thus, the image represents the card as it will be after it has been updated.

3.51 After the attendant has instructed the system to function with the single card writer and has placed a card on the writing deck, the attendant initiates the actual card writing by depressing the WRITE key on the single card writer control panel. The 3A card writing unit then operates under the control of the single card writer circuits and drives the 1B writing head across the card and back four times. At the end of the fourth cycle, the head stops in the home position, and, if no trouble was encountered, the END lamp lights. The attendant then removes the newly written

card and places another spare card on the writing deck. The attendant again depresses the WRITE key and thus repeats the procedure until all cards listed for the selected module have been updated. When this module is updated, the next module is updated in like manner and so on until one side of the program store is updated.

3.52 When one side of the program store is completely updated, the attendant takes the newly written cards and uses them to replace the corresponding old cards in the *off-line* program store. The attendant then requests the system via a TTY input message to verify the new cards. The system compares the new cards with the other side of the program store and with recent changes in the call store. The system requires about 128 seconds for verification of each module. When verification is complete, the system informs the attendant via the TTY. If the verification is successful, the attendant proceeds to update the other side of the program store in a manner similar to that already explained. The system action is the same except that the recent change buffer is not involved in the copy process. The single card writer copies the information from the cards previously updated. Also, when the last cards are verified, the system compares them with the cards in the previously updated modules.

4. TRUNK TEST PANEL FRAME

GENERAL

4.01 The trunk test panel (TTP) frame is a test facility provided for manual testing of service circuits, trunks, and trunk circuits in No. 2 ESS 2-wire offices (Fig. 8). All lines, trunks and service circuits are accessible by the trunk test panel frame and its circuits through the use of a panel mounted 16-button TOUCH-TONE® telephone set which is installed on the frame. The frame provides connection to the switching system enabling the system to connect to any combination of three lines, trunks or service circuits at a given time.

4.02 The trunk test panel frame can function in the following ways.

(a) Manual testing for trunks, service circuits, lines, circuit junctors, range extension circuits and attendant loop circuits.

(b) Monitoring of busy connections in the office.

(c) Talking connection over lines or trunks for intraoffice or interoffice communication.

(d) Means of removing circuits from service and restoring circuits to service.

4.03 Mounted on the upper half of the frame are the test and control panel unit, voltmeter control unit, and five optional testing units. The five optional units are the 3CR noise measuring set, 6H impulse counter, voice frequency oscillator, PAR (peak to average ratio) meter receiver, and transmission measuring set. At the extreme top of the frame are the bus input-output transformers and a miscellaneous terminal strip. A writing shelf is located on the middle of the frame. Beneath the writing shelf are the test and control relay circuitry associated with the frame control, a monitor and transmission unit, miscellaneous apparatus, an optional PAR meter generator, and the fuse panel at the lowermost mounting plate position. A filter unit is mounted in the base of the frame (Fig. 9 and 10).

4.04 Operating specific keys on the trunk test panel sends test call information to the central processor. Connection of a circuit to a trunk test panel is accomplished by dialing prescribed formats on the panel mounted TOUCH-TONE dial (Fig. 11).

4.05 Lamps on the trunk test panel indicate the type of test being performed and the success or failure of a request for system action.

4.06 Test paths to lines and to trunks are established through network paths which connect the circuit to be tested to one of three access trunks. Each access trunk is assigned a directory number and will appear on the line trunk network (LTN). The access trunks are given a unique class code which defines them as trunk test panel test lines. (Information concerning the necessary translations may be found in the Translations Guide, TG-2H.) In addition, access trunk 1 and 2 may be used to receive incoming calls and all three access trunks may be used to make outgoing calls. Once the path to a line or trunk circuit is established, proper operation of the trunk test panel switches and keys allows for connection of optional test equipment mounted in the trunk test panel to the circuit under test.

5. REFERENCES

5.01 The following documents will provide further information in related areas.

1. BSP 232-003-101—Teletypewriter Facilities Description

2. BSP 232-106-301—Maintenance Center Frame Control and Display Panel, Method of Operation

3. BSP 232-004-301—Updating Program Store Translation Information Using the Single Card Writer

4. BSP 232-004-303—Change in Program Store Word, Procedures

5. BSP 232-106-501—Maintenance Center Frame Control and Display Panel, Test Procedures

6. BSP 232-109-101—Control Complex Description

7. BSP 232-113-301—System Initialization

8. BSP 232-130-301—Trunk Test Panel, Method of Operation

9. BSP 966-200-100—General Description

10. IM-2H200, Input Message Manual

11. OM-2H200, Output Message Manual

12. TG-2H, Translation Guide—No. 2 ESS
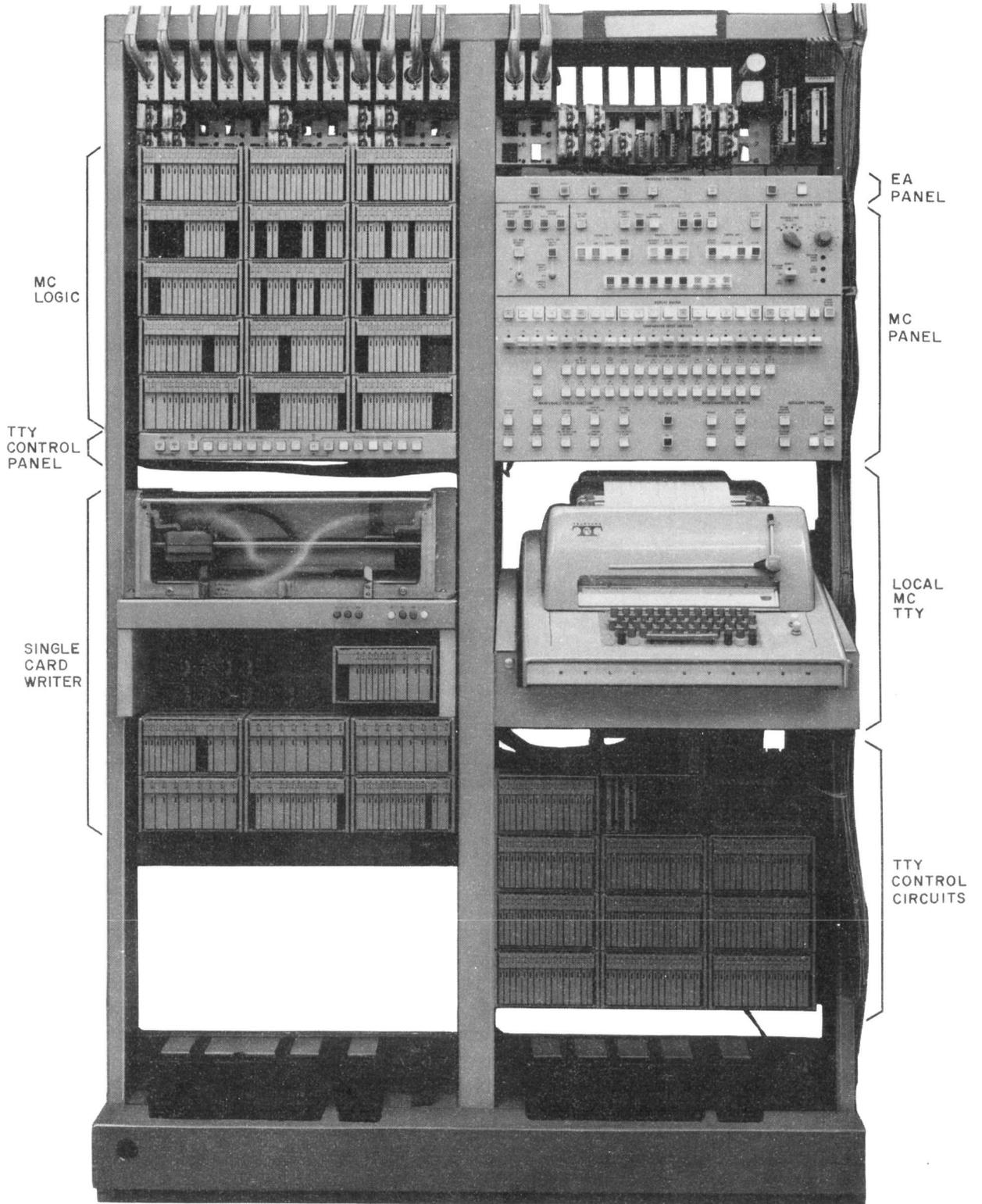
Fig. 1—Maintenace Center Frame (3.01)
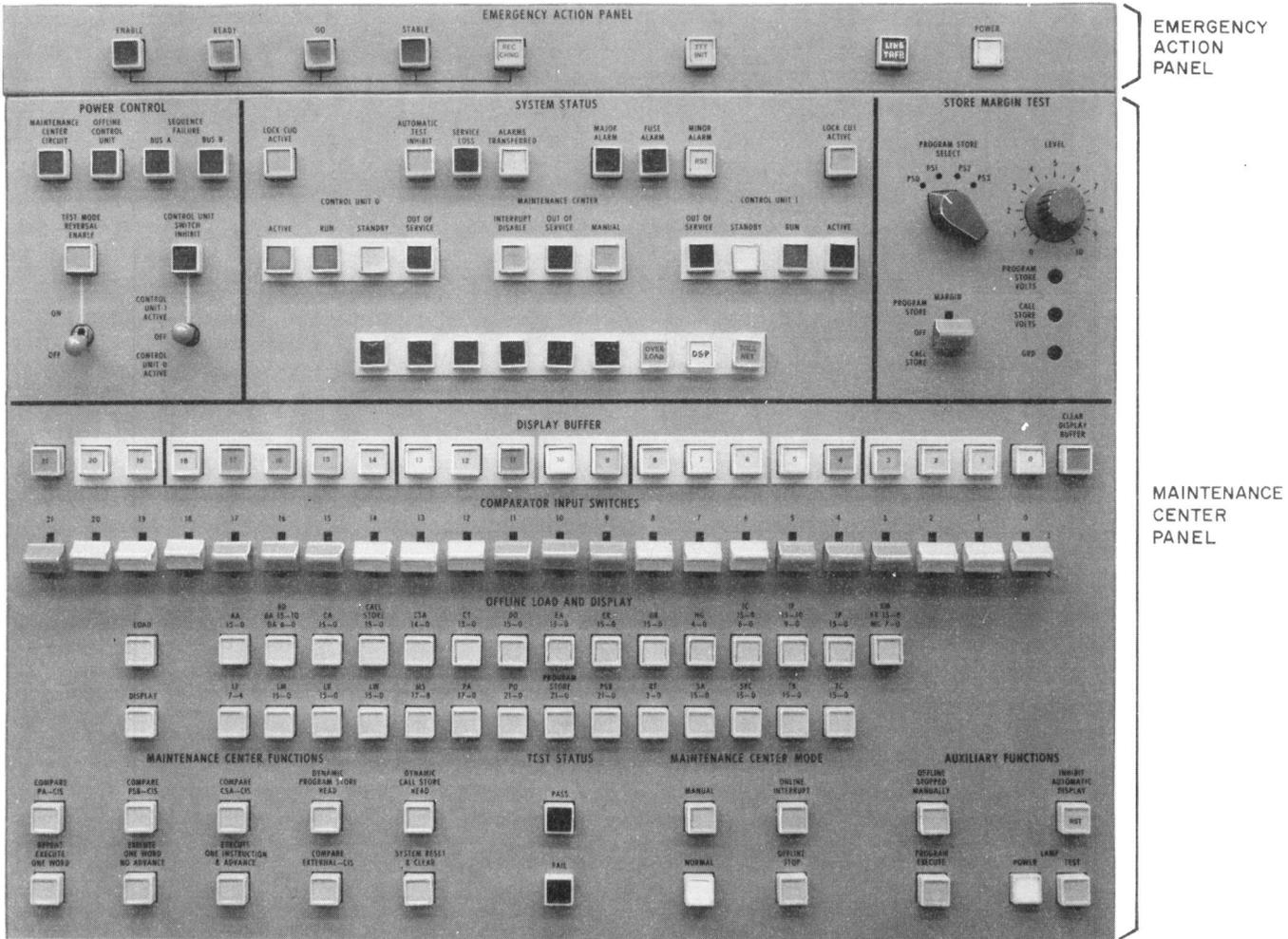
Fig. 2—Maintenance Center Control and Display Panel (3.10)
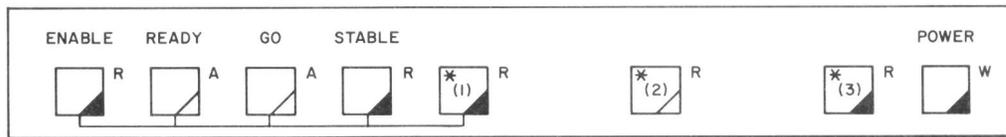
LEGEND:
  * KEY CARD INSERT MARKING
    (1) REC CHNG (RECENT CHANGE)
    (2) TTY INIT (TELETYPEWRITER INITIALIZATION)
    (3) LINE TRFR (EMERGENCY MANUAL LINE TRANSFER)

KEY SYMBOLS: KEY COLORS:
                                 A – AMBER
    NON-LOCKING   R – RED
                                 W – WHITE
    LOCKING

Fig. 3—Emergency Action Panel Keys (3.30, 3.31)
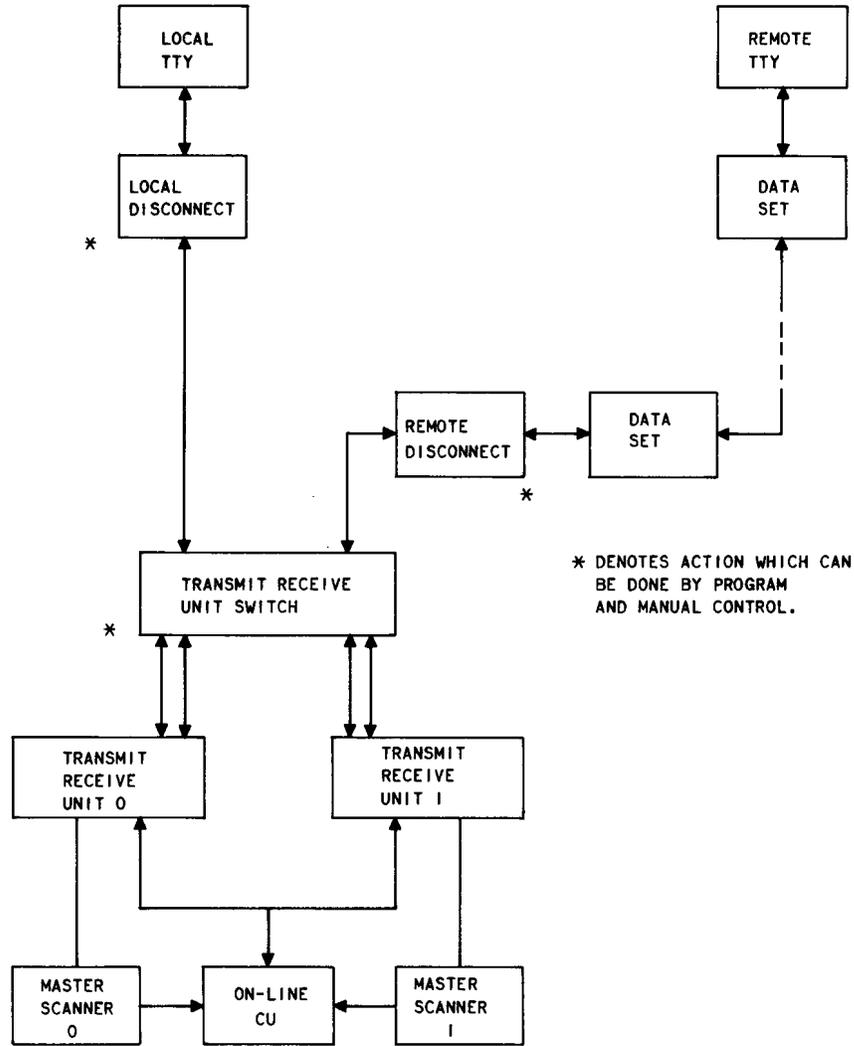
Fig. 4—Maintenance Channel Block Diagram (3.39)

Fig. 5—TTY Control Panel (3.43)

3A CARD WRITING UNIT

CONTROL PANEL

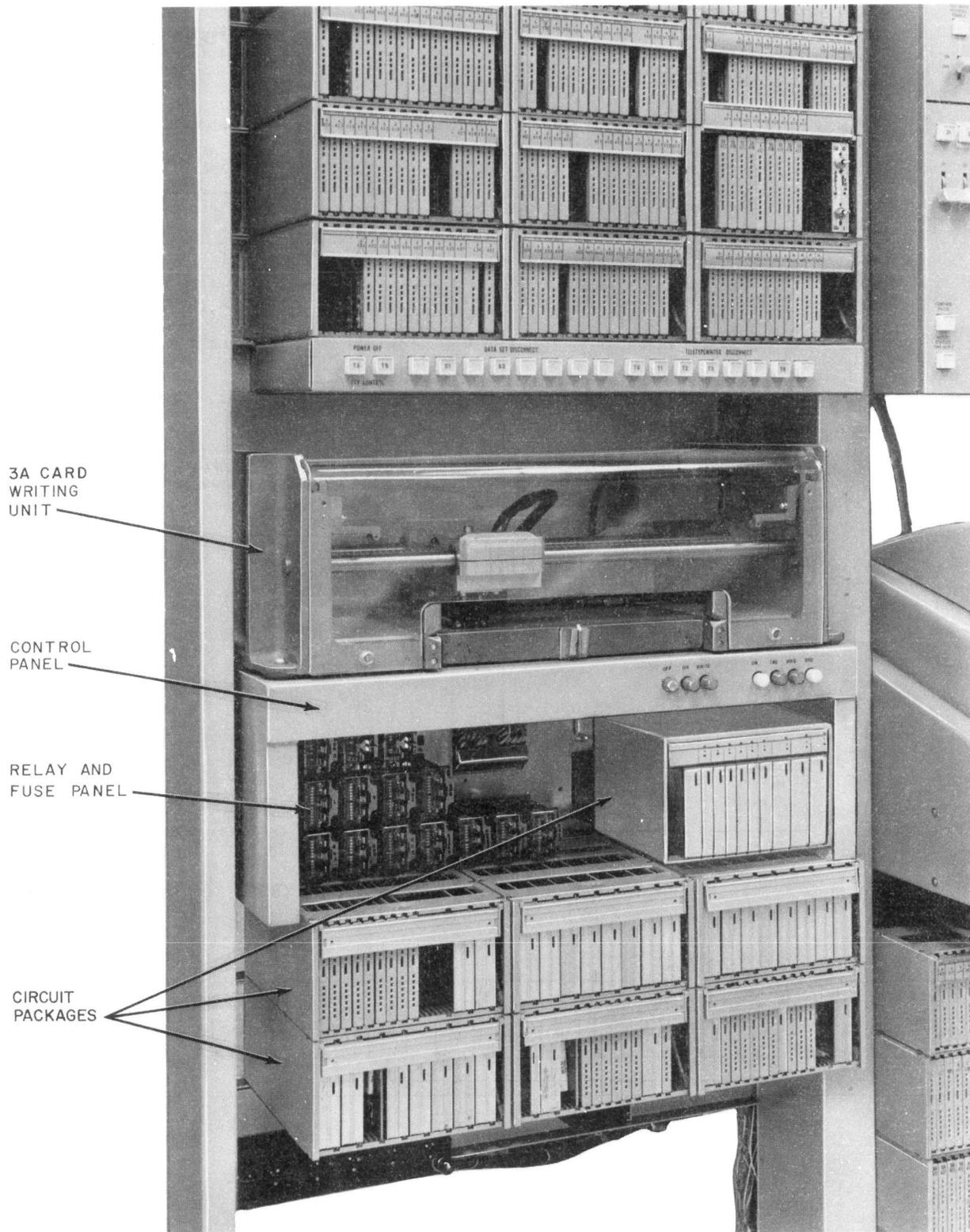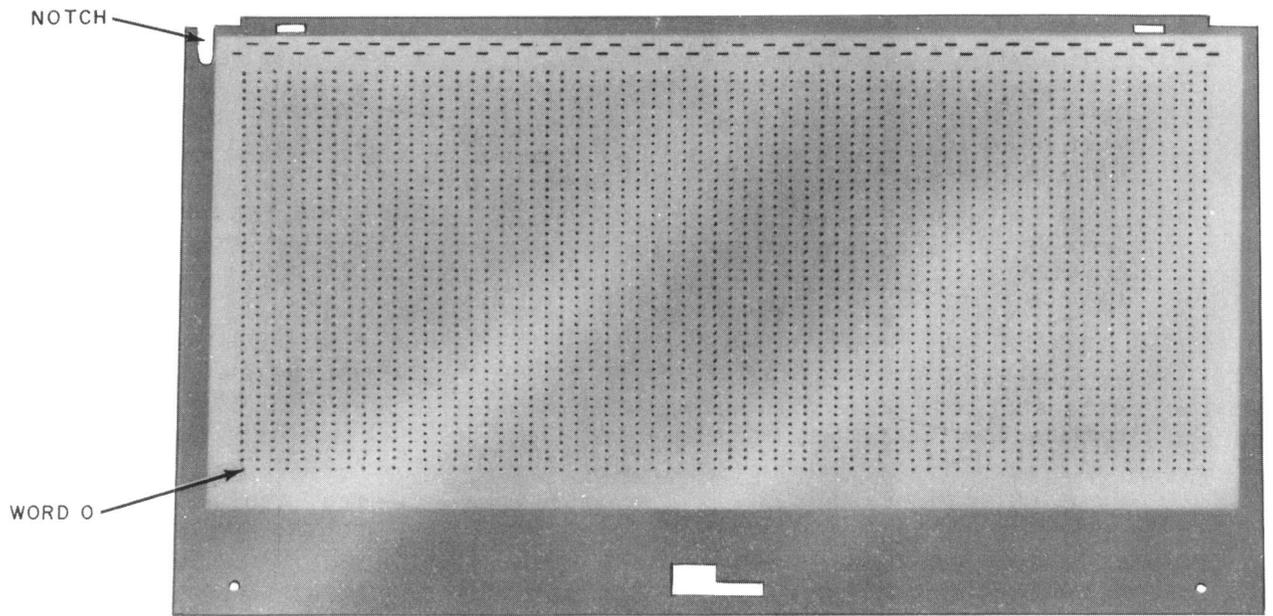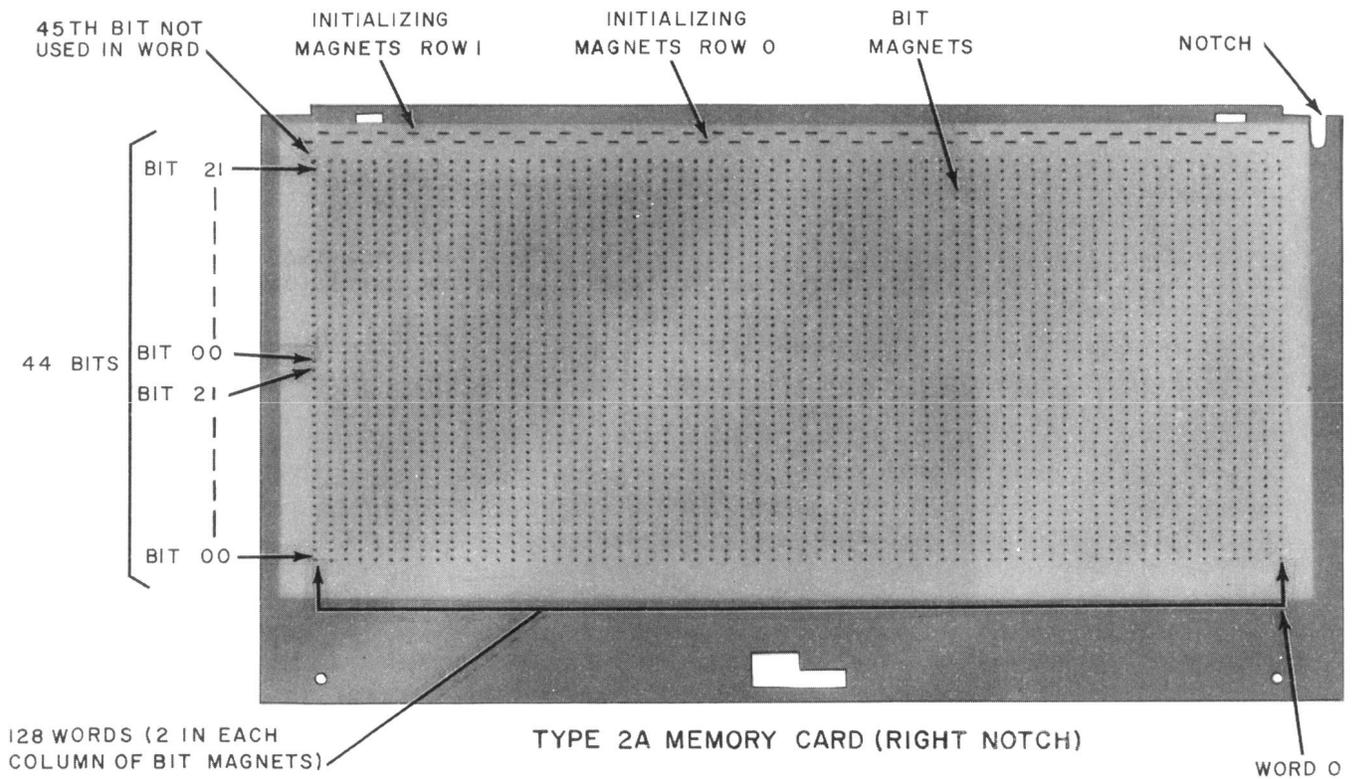**RELAY AND FUSE PANEL**

CIRCUIT PACKAGES
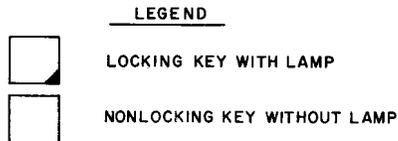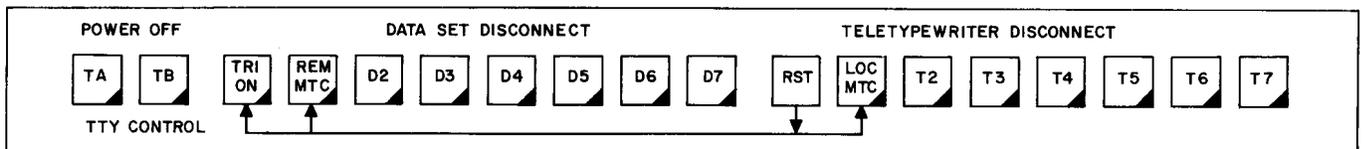
Fig. 6—Left Side of Double-Bay Maintenance Center (Frame-Partial View) (3.45)

TYPE IA MEMORY CARD (LEFT NOTCH)

TYPE 2A MEMORY CARD (RIGHT NOTCH)
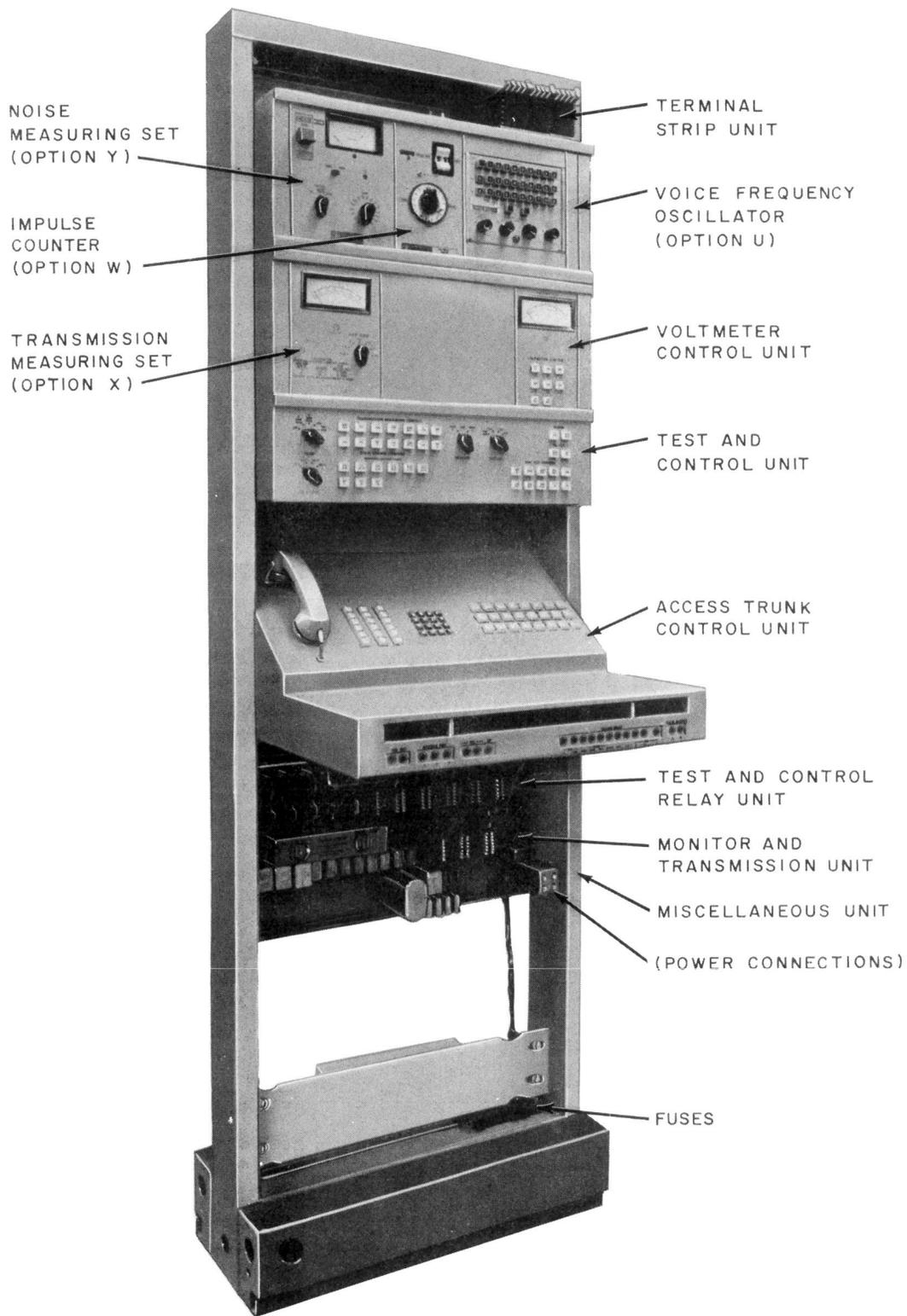
Fig. 7—Memory Cards (3.46)

NOISE
MEASURING SET
(OPTION Y)

IMPULSE
COUNTER
(OPTION W)

TRANSMISSION
MEASURING SET
(OPTION X)

TERMINAL
STRIP UNIT

VOICE FREQUENCY
OSCILLATOR
(OPTION U)

VOLTMETER
CONTROL UNIT

TEST AND
CONTROL UNIT

ACCESS TRUNK
CONTROL UNIT

TEST AND CONTROL
RELAY UNIT

MONITOR AND
TRANSMISSION UNIT

MISCELLANEOUS UNIT

(POWER CONNECTIONS)

FUSES

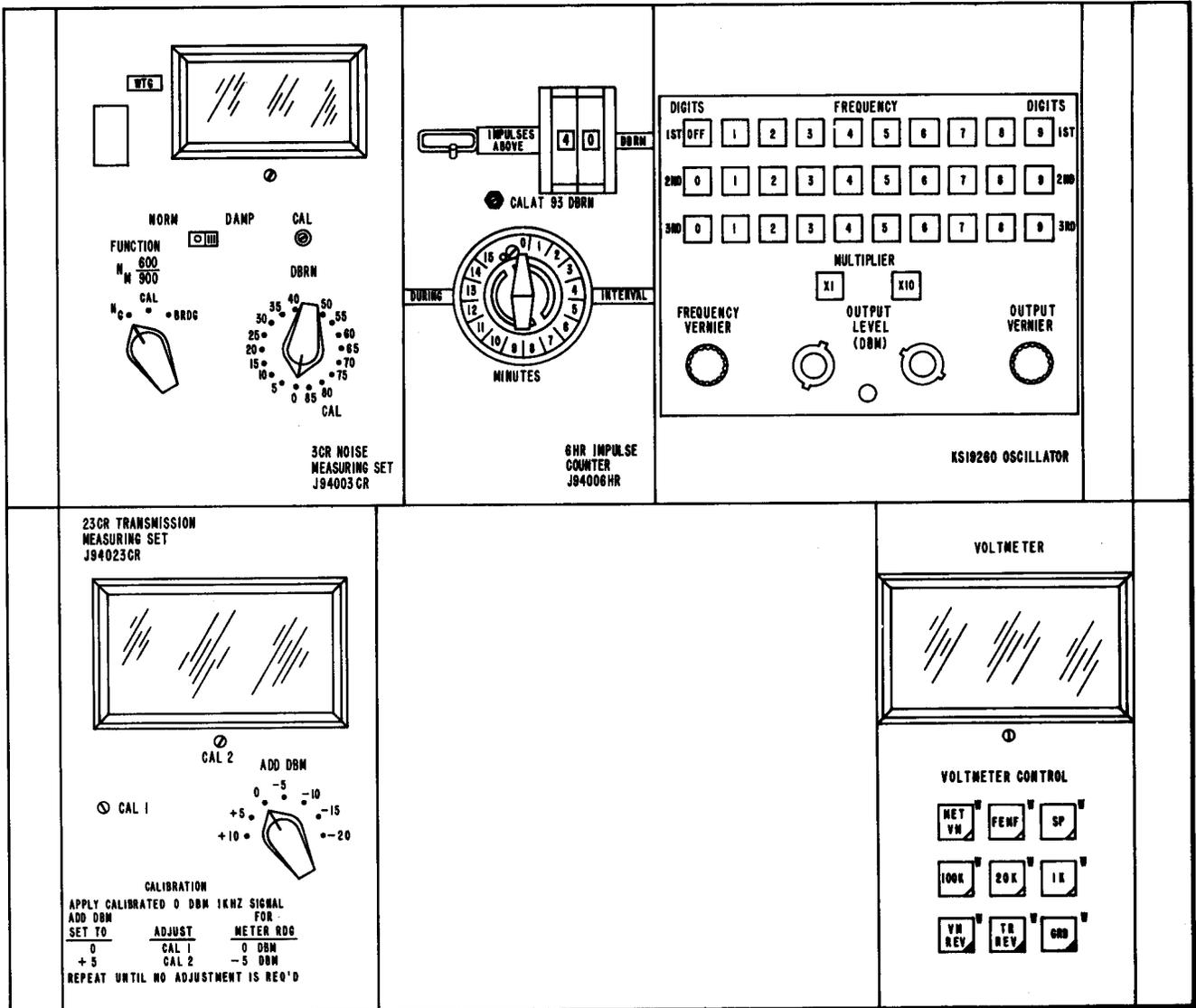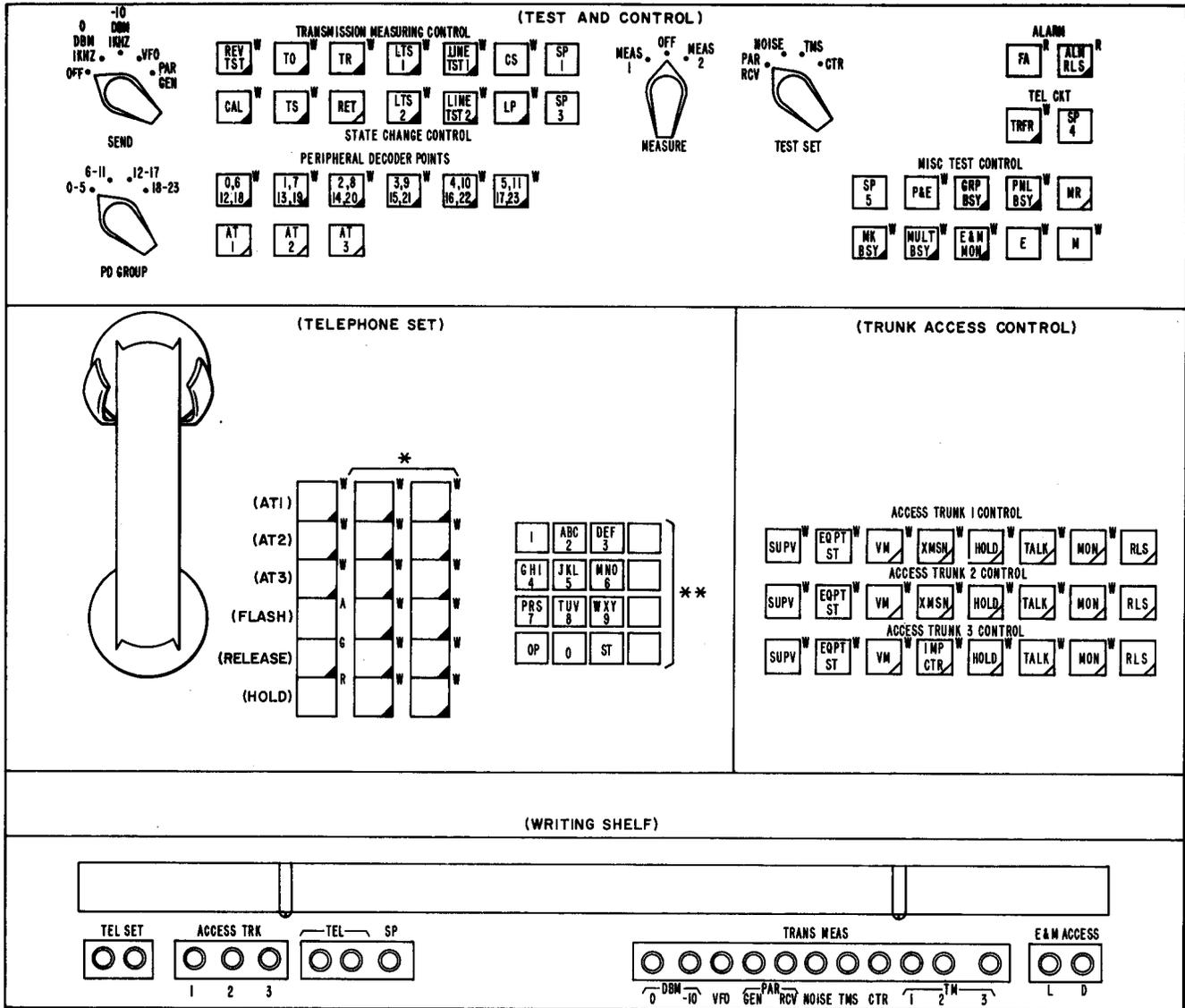**Fig. 8—Trunk Test Panel (4.01)**

Fig. 9—Trunk Test Panel—Control Designations (Test Instruments) (4.03)

LEGEND

☐ NONLOCKING KEY

☐ LOCKING KEY

SP( ) SPARE

A — AMBER
G — GREEN
R — RED
W — WHITE

* KEY USE AND DESIGNATIONS TO BE ASSIGNED PER LOCAL OPERATING COMPANY REQUIREMENTS.
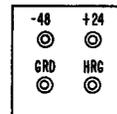
** FOURTH COLUMN NOT USED.

Fig. 10—Trunk Test Panel—Control Designations (Control Functions) (4.03)

TABLE A

ABBREVIATIONS AND ACRONYMS

ABBREVIATION	TITLE
AMR	Alarm Maintenance Register
ASR	Automatic Send and Receive
CHIPS	Change in Program Store
CP	Central Processor
CS	Call Store
CSA	Call Store Address
CSI	Call Store Input
CU	Control Unit
DB	Display Buffer
EA	Emergency Action
ER	Error Register
ESR	Equipment Status Register
ESS	Electronic Switching System
KSR	Send and Receive
LM	Local Maintenance
LTN	Line Trunk Network
MC	Maintenance Center
PA	Program Address
PS	Program Store
RC	Recent Change
RM	Remote Maintenance
RO	Receive Only
SCW	Single Card Writer
TLM	Trouble Locating Manual
TTP	Trunk Test Panel
TTY	Teletypewriter