MEMORY CARD WRITER
DESCRIPTION
NO. 1 ELECTRONIC SWITCHING SYSTEM

CONTENTS PAGE

1. GENERAL

1.01 This section describes the memory card writer (MCW) used initially in the 2-Wire and 4-Wire No. 1 Electronic Switching System (ESS). The MCW is used for updating the program store (PS) translation information. The detailed procedure for updating the PS is covered in Section 231-004-301.

1.02 This section is reissued to eliminate references to the 1A writing head (which has been replaced by the 1B writing head) and to update illustrations and text to the latest configuration of the equipment.

1.03 The translation information is stored by magnetizing or demagnetizing small bit magnets on aluminum memory cards which are then placed in PS memory modules. Each PS contains 16 modules. Each module, in turn, contains 128 memory cards. Each memory card has 64 rows of bit magnets. Each row contains a 44-bit PS word. The memory cards in a module are handled as a unit. All 128 memory cards are inserted into or withdrawn from a module by a motor driven card loader. Two passes of the MCW are used to write all the memory cards in a module. Pass 0 writes 64 type 1A memory cards, and pass 1 writes 64 type 2A memory cards. Type 1A and 2A memory cards are positioned alternately in the card loader with magnet sides facing each other.

1.04 A portion of the translation information used in a central office must be modified as changes are made in the telephone plant, customer telephone numbers, types of customer service, etc. These changes in translation information are first entered in a recent change area of the call store (CS) via the teletypewriter (TTY) as the changes occur. Translation information in the recent change area of the CS supersedes translation information in the PS. Therefore, when the system searches for translation information, it first searches through the CS recent change area. If no change is found in the CS recent change area, it goes to the PS.

1.05 When the recent change area fills to near capacity, the TTY prints out a message notifying the attendant that the memory cards

must be updated. The MCW is used to prepare a new set of memory cards which combines the information in the recent change area and the unchanged information on the memory cards in the PS. The recent change area is then available for new translation information. The task of updating the translation information contained in the PS memory is performed at various intervals depending on local operating procedures and the size of the central office.

2. PHYSICAL DESCRIPTION

2.01 The MCW consists of a single bay frame that is 7 feet high and 26 inches wide (Fig. 1). The MCW is made up of the following:

- 1A Card Writing Unit
- Logic Unit
- Control Panel
- Power Supplies and Power Control

1A CARD WRITING UNIT

2.02 The 1A card writing unit is the electromechanical equipment that automatically handles the memory cards during the writing process.

2.03 The card writing mechanism is composed of the following.

(a) ***Loader Mounting:*** The vertically moving loader mounting raises the card loader so that the appropriate memory card is level with the writing deck of the card writing mechanism (Fig. 2 and 3).

(b) ***Card Moving Fingers:*** The fingers slide the memory card out of the card loader onto the writing deck and back into the card loader.

(c) ***1B Card Writing Head:*** The 1B card writing head (Fig. 4) is composed of 45-bit writing heads (00 to 44), 2 initialization electromagnets (0 and 1), and 2 position sensing heads (0 and 1). The initialization electromagnets are mounted directly in front of the position sensing heads and are in line over the memory cards initialization magnet rows 0 and 1, respectively. The 00 to 44 bit writing heads track over the 45-bit magnets in each word row on the memory card. As the writing head travels from left to right (as viewed from the front of the MCW), it magnetizes the memory card's initialization magnets. The writing head then generates signals in the position sensing heads which are used to sense the moment when the head is properly positioned to write each word.

(d) ***Mechanical Sequence Control Unit:*** The mechanical sequence control unit, consisting of a group of relays, controls the mechanical functions of the 1A card writing unit, polarity of writing, and the inhibit and enable signals for the logic sequence control.

LOGIC UNIT

2.04 The logic unit receives the writing information from the central processor via the peripheral unit address bus. The logic unit is made up of several circuit packs which process the writing information as follows.

(a) Register circuit packs temporarily store the words to be written.

(b) Write control circuit packs provide writing currents to the 1B writing head.

(c) Logic sequence control circuit packs generate the write gate, count, word request, word delivery checks, register reset, etc. The register and write control circuit packs are under the control of the logic sequence control circuit packs.

CONTROL PANEL

2.05 The control panel (Fig. 5) contains pushbutton keys, lamps, and some miscellaneous circuit apparatus. The pushbutton keys provide control for the mechanical operation of the 1A card writing unit as well as control of power and alarm tests. The lamps are used to indicate power status, trouble conditions, and various operating conditions of the MCW.

POWER SUPPLIES AND POWER CONTROL

2.06 The system central office battery supply, +24 volts and −48 volts, are connected to the MCW circuit, +24 volt filter and −48 volt filter. These filters keep bus current changes to less than 0.1 amp per microsecond during changing

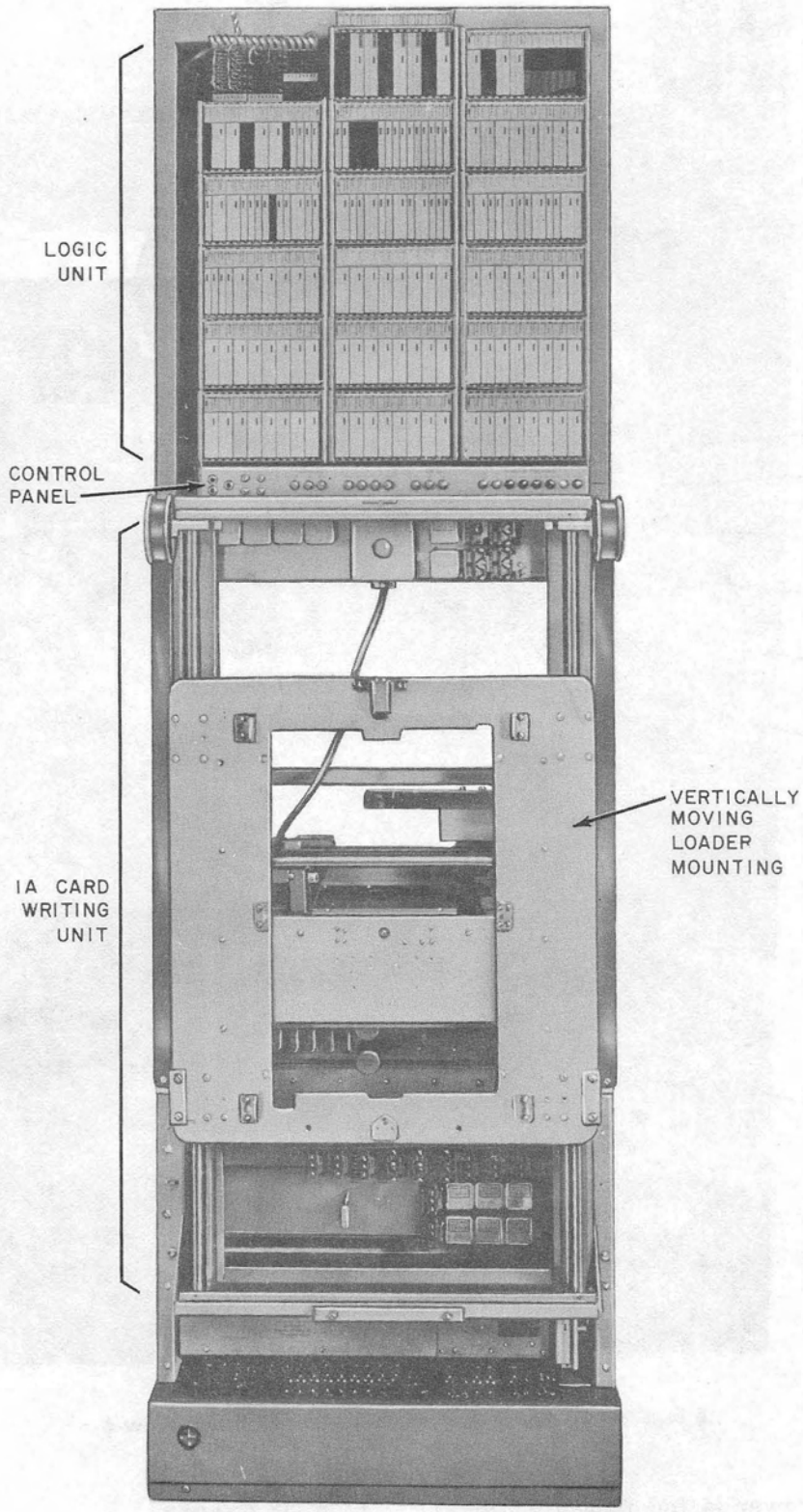


Fig. 1—Memory Card Writer Frame

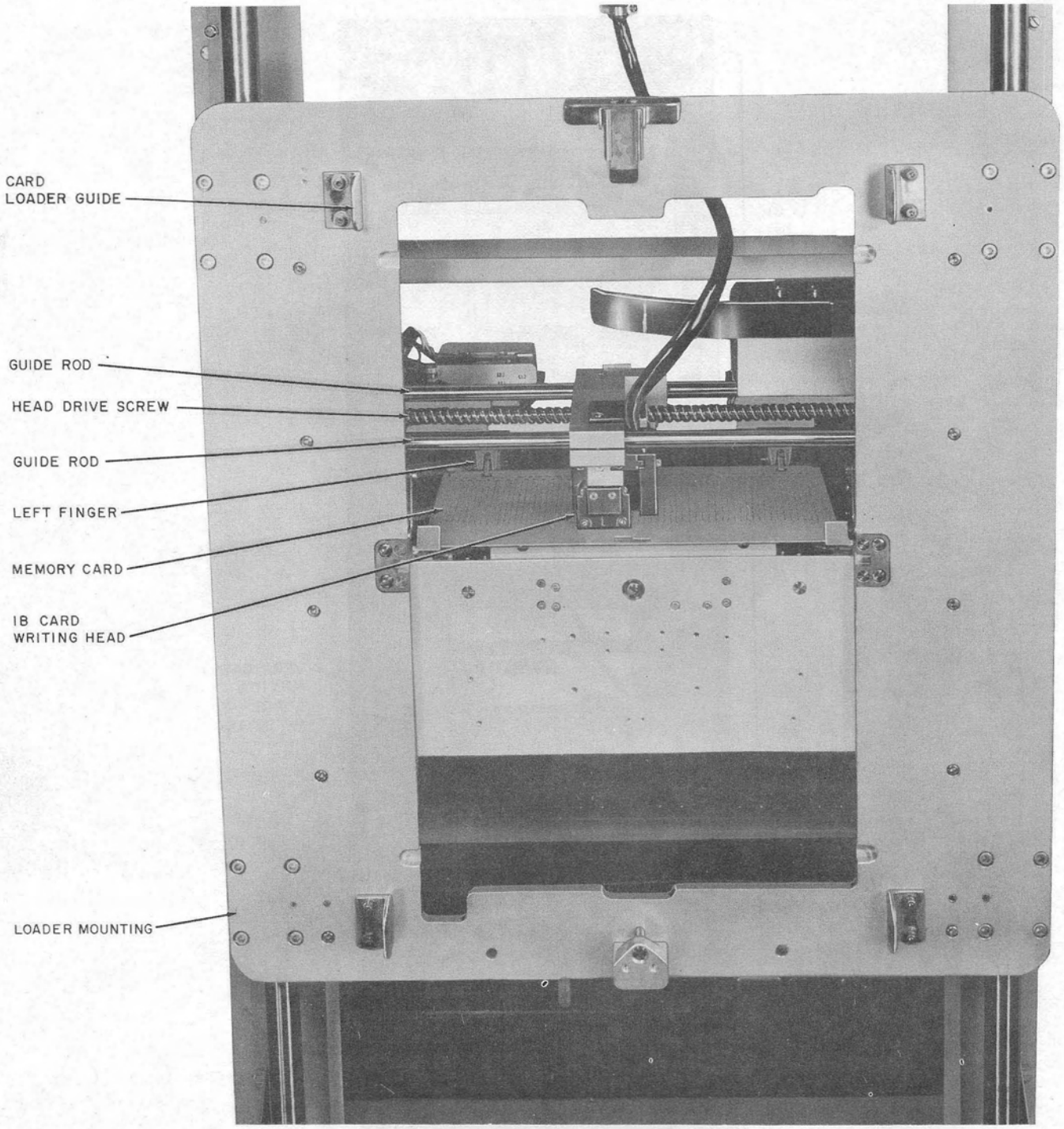


Fig. 2—1A Card Writing Unit—Partial Front View

load conditions. Power is fed from the filters where required. The power control circuits provide power switching, fusing, monitoring, and alarm functions of the MCW. The regulated power supply circuit packs are mounted on the frame with the logic unit circuit packs.

1A CARD LOADER

2.07 The 1A card loader is used at the PS and the spare card storage units to remove or insert a whole module of 128 memory cards, and it is used at the MCW to hold the module of

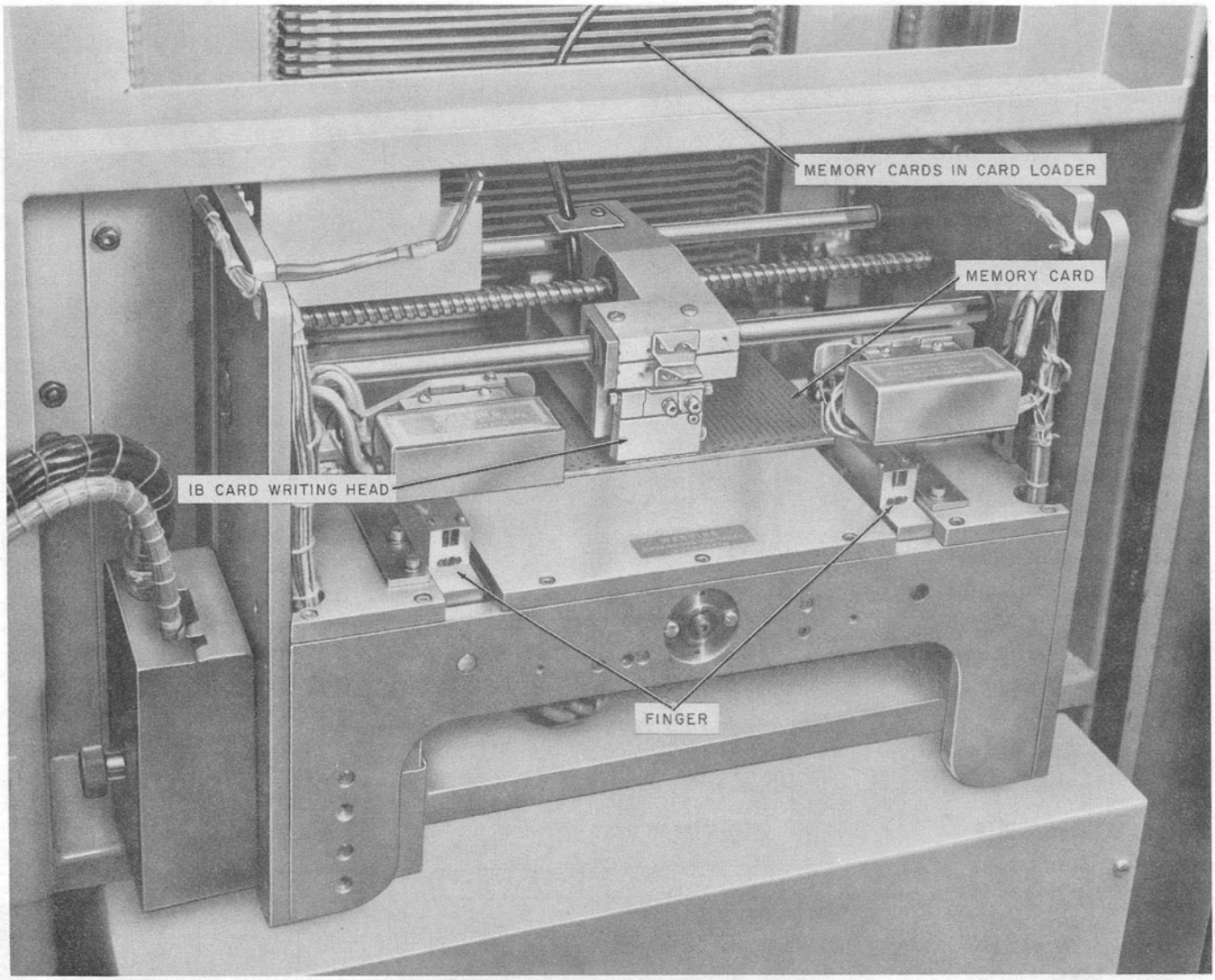


Fig. 3—1A Card Writing Unit—Partial Rear View With Loader Attached and Bar Removed

memory cards being updated. The spare card storage units may be either rack mounted or in a portable cart. All 128 memory cards are simultaneously inserted or drawn from a PS module or spare card storage unit by a motor driven arrangement in the card loader. The card loader has a variable indicator that can be set to identify the particular PS module with which the 128 memory cards are associated. The card loader weighs about 40 pounds when full and about 22-1/2 pounds when empty. The card loader can be moved from one location to another, using the cart containing the spare card storage unit.

MEMORY CARDS

2.08 The memory card (Fig. 6) is a rectangular aluminum card 11-1/4 by 6-5/8 by 0.016 inches. There are two types of memory cards used: type 1A used in pass 0 and type 2A used in pass 1. The type 1A and type 2A memory cards are physically different and can be recognized by the location of a card positioning slot which is used to position the memory cards in the PS. If the memory cards are held with the slot for the card loader at the bottom, type 1A cards are notched

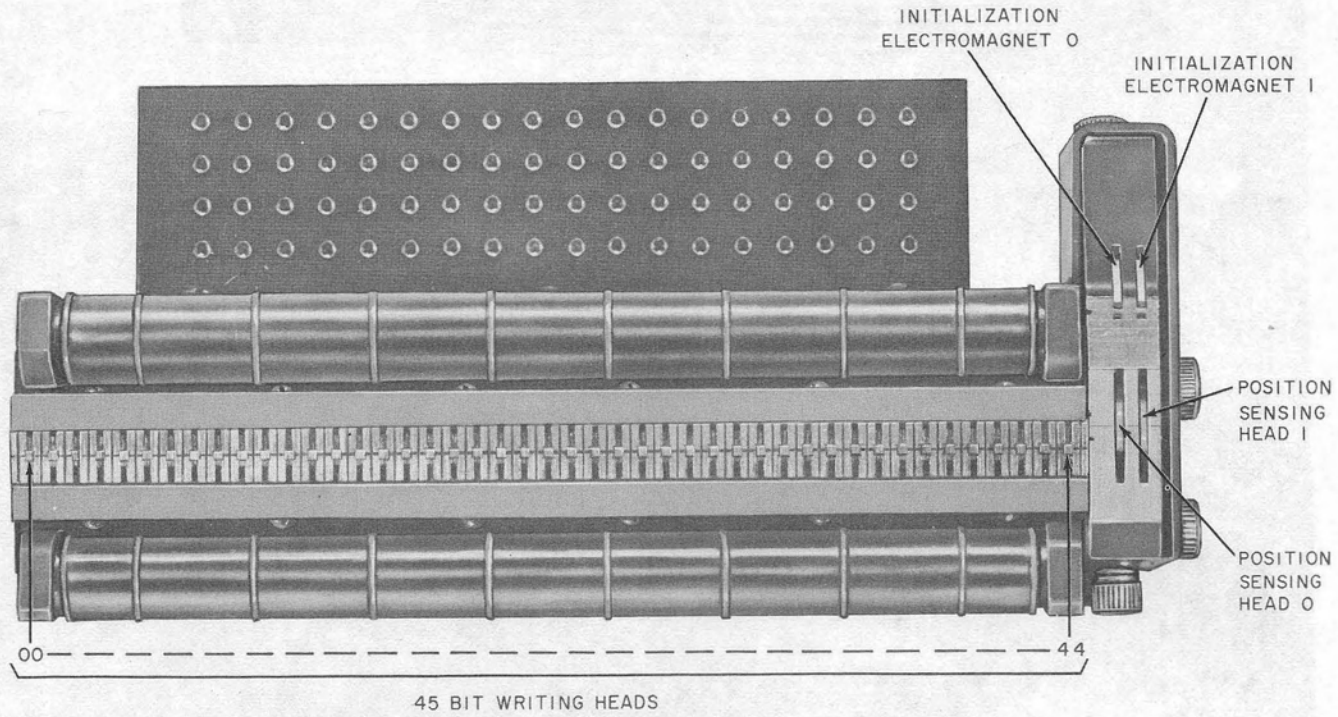


Fig. 4—1B Card Writing Head—Bottom View

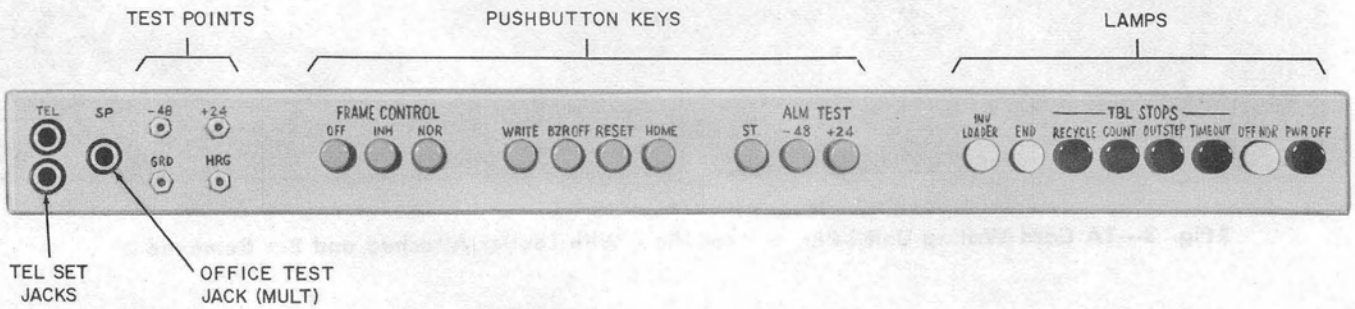


Fig. 5—MCW Control Panel

on the left top edge and type 2A cards are notched on the right top edge.

2.09 The memory cards contain 65 initialization magnets and 64 rows of word bit magnets. These 65 initialization magnets are alternately placed in two adjacent rows (0 and 1) along the length of the card. Row 0 has 33 magnets and row 1, which is nearest the finger slots, has 32 magnets. The initialization magnets provide a means for determining the position of the writing head in the MCW. In addition, when the memory card is being placed in a PS module, the initialization magnets establish buffer magnetic fields in the section of twistor wire between word rows. This reduces interference between adjacent words on the memory card. Each row of bit magnets is centered on a line that passes between the associated initialization magnets. Each row contains 45-bit magnets designated 00 to 44 (bit 44 is closest to the initialization magnets). Bits 00 to 43 are used to store a 44-bit word. Bit 44 is always magnetized

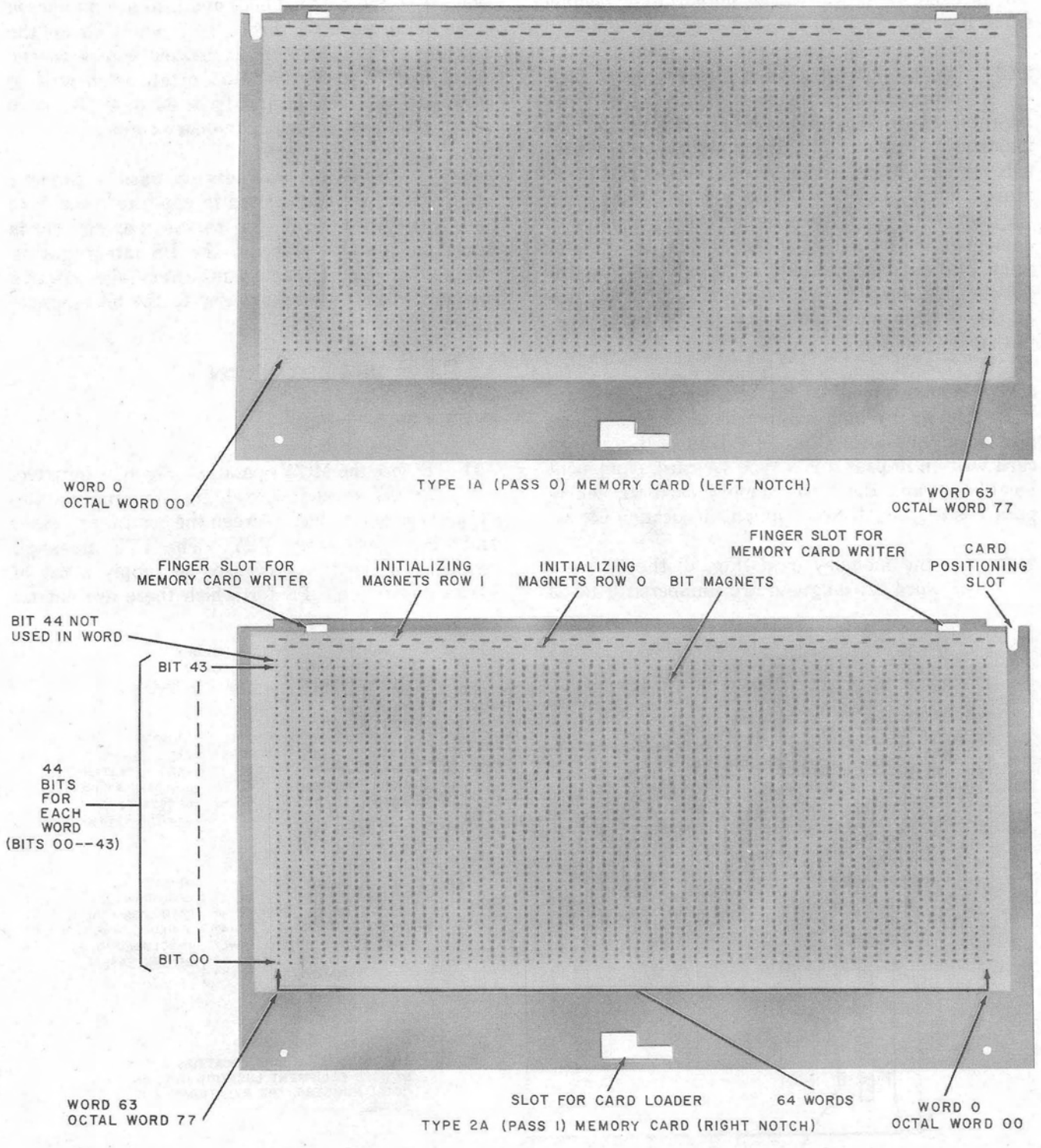


Fig. 6—Memory Cards

and is used as an aid to the initialization magnet when the memory card is inserted into the PS.

2.10 The bit magnets on a memory card store information in binary form by being either magnetized or demagnetized. A magnetized bit indicates a binary 0 and a demagnetized bit indicates a binary 1. Thus, each bit position of the 44-bit stored word is either a binary 0 or a 1. When the memory card is in place in the PS module, a demagnetized bit allows the switching of a twistor wire, indicating that a 1 is stored in that bit position. A magnetized bit inhibits the switching of the twistor wire, indicating that a 0 is stored in that bit position.

2.11 Within a module the 128 memory cards are known by both equipment location numbers and octal numbers (Fig. 7). The first memory card written in pass 0 is a type 1A card, equipment location 0; and the first memory card written in pass 1 is a type 2A card, equipment location 64.

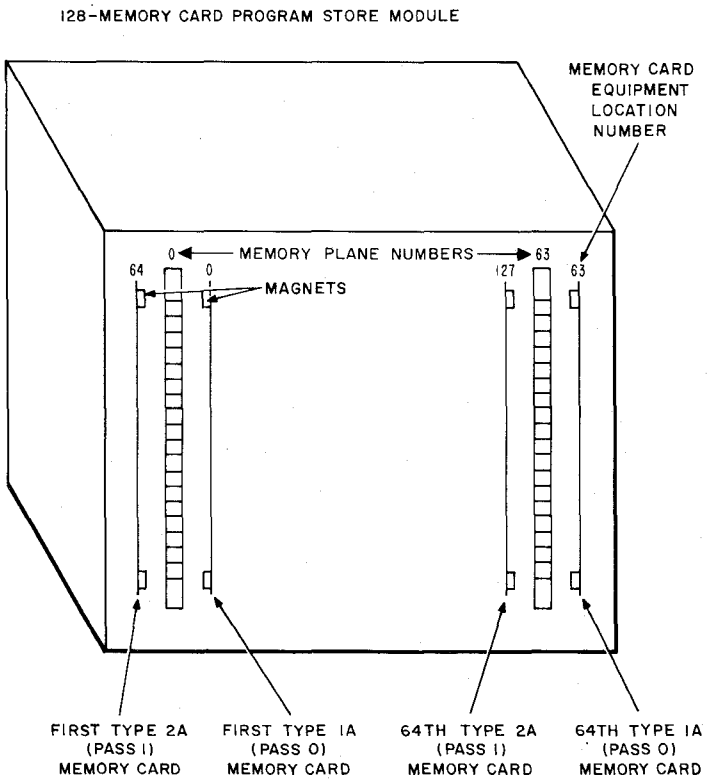
2.12 On the memory card (Fig. 6) the 64 rows of word bit magnets are numbered 0 to 63 (word 0 on the notched end) and also are numbered in an octal basis 00 through 77 (word 00 on the notched end). The system passes words to the MCW from 0 to 63 (00 to 77 octal) when writing pass 0 memory cards and from 63 to 0 (77 to 00 octal) when writing pass 1 memory cards.

2.13 The word bit magnets on pass 0 memory cards are magnetized in opposite polarity to pass 1 memory cards due to the memory cards being on opposite sides of the PS interrogating solenoids. Initialization magnets are always magnetized in opposite polarity to the bit magnets on the memory card.

3. FUNCTIONAL DESCRIPTION

SYSTEM RELATIONSHIP

3.01 Before the MCW operation (Fig. 8) is initiated, a TTY message exchange is sent via the CC-peripheral unit bus between the central processor and the maintenance TTY. The TTY message requests the central processor to supply a list of the modules in the PS for which there are entries



	MEMORY CARD EQUIPMENT LOCATION NUMBERS	MEMORY CARD OCTAL NUMBERS	
TYPE 1A (PASS 0) MEMORY CARDS	0-7	0-7	MEMORY CARD WRITER PASS 0 POSITION (CARDS 0-63 ARE PROCESSED IN WRITING PASS 0)
	8-15	10-17	
	16-23	20-27	
	24-31	30-37	
	32-39	40-47	
	40-47	50-57	
	48-55	60-67	
	56-63	70-77	
TYPE 2A (PASS 1) MEMORY CARDS	64-71	0-7	MEMORY CARD WRITER PASS 1 POSITION (CARDS 127-64 ARE PROCESSED IN WRITING PASS 1)
	72-79	10-17	
	80-87	20-27	
	88-95	30-37	
	96-103	40-47	
	104-111	50-57	
	112-119	60-67	
	120-127	70-77	

NOTE:

THE 128 MEMORY CARD LOCATIONS ARE KNOWN BY BOTH EQUIPMENT LOCATION NUMBERS AND OCTAL NUMBERS, THE RELATIONSHIP IS SHOWN ABOVE.

Fig. 7—Memory Card Locations in PS Module

in the recent change area of the CS. [This list will not be supplied by the central processor in small No. 1 ESS offices where all translations are contained in a few modules that are readily identified and all updated at the same time (refer to PD-1A083 Recent Change Update and Control Programs).] The operating personnel, upon deciding that a module should be rewritten, informs the central processor of its identity via the TTY. Another TTY message requests the central processor to initiate a program which will furnish stored information to the MCW as it requests words while writing memory cards. (TTY messages that are pertinent to the MCW operation are covered in Part 4.)

3.02 The central processor, via the peripheral unit address bus and through the signal distributor and applique circuits, sets up the MCW to write cards in pass 0. A TTY message to the attendant indicates that the system is ready to write memory cards. The system insures that the card loader is mounted in the pass 0 orientation when the WRITE key on the control panel is depressed. If the state set up in the MCW and the orientation of the card loader do not agree, the MCW will not start and the INV LOADER lamp will light.

3.03 The central processor then forms a card image, in the CS memory, of the information that is to be sent to the MCW. The card image information is obtained from the updated information in the recent change area of the CS memory and the unchanged information from the corresponding memory card in the PS.

3.04 The MCW starts writing cards when the WRITE key is depressed after the system has indicated via the TTY that this action should be taken. After the WRITE key is depressed, the MCW removes a memory card, with the bit magnets facing upward, from the card loader and positions it on the writing surface of the MCW. The MCW then sends a word request signal to the master scanner. The central processor detects the word request signal via the peripheral unit answer bus from the master scanner. The central processor then sends the information contained in the card image via the peripheral unit address bus to encode the bit magnets on the memory card in the MCW. The MCW is enabled by the central processor via the central control-central pulse distributor (CC-CPD) bus and the CPD. A verify signal from the MCW to the central processor, via the CPD and the CC-CPD bus, indicates that the MCW is enabled.

3.05 When the central processor sends the 44-bit word to the MCW, the word is stored temporarily in a register in the MCW. The contents of this register are used to control the 44-bit writing heads. The words on the memory card are written one at a time as the 44-bit writing heads pass over the 44-bit magnets on the memory card. Each word that is to be written is preceded by a word request signal sent from the MCW to the central processor. After the memory card has been completely written, the MCW returns it to the card loader, indexes the card loader up to the next memory card level, removes the next memory card, and repeats the writing process until 64 memory cards are written. Upon completion of writing the 64 memory cards associated with pass 0, the MCW sounds a buzzer, lights the INV LOADER (invert loader) lamp on the control panel to indicate the completion of pass 0, and returns the carriage to the original level. The attendant now inverts the card loader to process the 64 pass 1 memory cards.

3.06 The central processor via the peripheral unit address bus and through the signal distributor and applique circuits now sets up the MCW to write pass 1. The system insures that the card loader is mounted in the correct pass 1 orientation when the WRITE key on the control panel is depressed. If the state set up the MCW and the orientation of the card loader do not agree, the MCW will not start and the INV LOADER lamp will light. The WRITE key is depressed and the 64 memory cards associated with pass 1 are written. At the end of pass 1, the MCW sounds a buzzer, lights the END lamp, and again returns the carriage to the original level.

3.07 Between each memory card writing operation, the system assembles the information for the next memory card. There is no check on the accuracy of the information written until the memory cards are verified in the PS. Some troubles, such as failure to receive a word when requested, cause the MCW to repeat the writing of a memory card. If three tries fail to write a memory card successfully, the process is stopped and an alarm sounded. Other troubles, mechanical or electrical, cause the process to stop immediately.

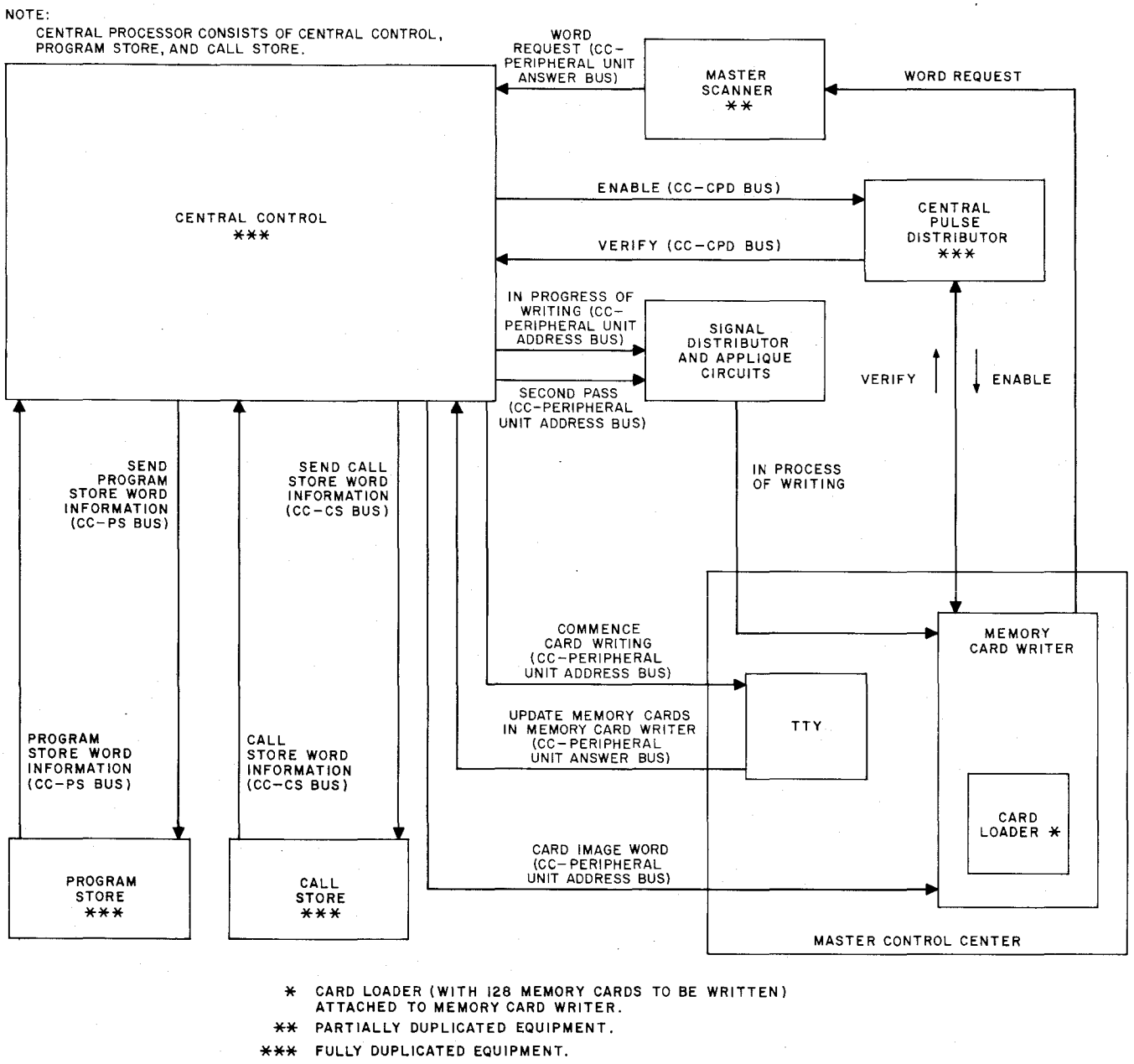


Fig. 8—Relation of MCW to System

3.08 It takes about 4.5 seconds for the MCW to index the card loader up, withdraw a memory card, write the information, and reinsert the memory card into the card loader. The time required for processing one pass of 64 memory cards is approximately 5 minutes. The time required for processing a complete module of 128 memory cards is approximately 12 minutes. These 12 minutes include attaching, inverting, and removing the card loader from the MCW.

3.09 After the MCW has completed the updating, a verification of the newly written module of memory cards is required. The PS, in which the updated module is to be placed, is taken out of service by operation of the REQ INH (request inhibit) key on the PS control panel. On signal that the PS is out of service, the memory cards are removed from this module by means of a second card loader and are immediately replaced with the updated memory cards from the MCW. Upon

receiving a request of verification via the VER (verify) key on the PS control panel, the system compares the newly written memory cards in the out-of-service PS with the duplicate module in the PS that is yet to be updated and the recent change area of the CS. The system types out TTY messages indicating that the memory cards have been successfully written or the nature of the errors or troubles encountered in the writing process. Upon a signal that the new memory cards are written correctly, the out-of-service PS is automatically returned to service.

3.10 ▶After all PS module pairs requiring updating have been written and verified, the recent change area of the CS is updated via a TTY message.◀

MODES OF OPERATION

3.11 The MCW has seven different modes of operation. These modes are controlled by keys and indicated by lamps located on the MCW control panel (Fig. 5). The modes of operation are as follows:

- Off Mode
- Normal Mode
- Inhibit Write Mode
- Start Mode
- Write Mode
- Home Mode
- Trouble Stop Mode

(a) ***Off Mode:*** Depression of the OFF key places the MCW in the off mode. The PWR OFF (power off) and OFF NOR (off normal) lamps are lighted. In this mode, power is removed from the MCW frame except for alarm relays and control panel lamps. The OFF, NOR, and INH (inhibit) keys are mechanically interlocked so that only one key can be operated at a time.

(b) ***Normal Mode:*** Depression of the NOR key places the MCW in the normal mode. The PWR OFF and OFF NOR lamps are extinguished. In this mode, the MCW circuits are set for normal communication with the system.

(c) ***Inhibit Write Mode:*** Depression of the INH key places the MCW in the inhibit write mode. The OFF NOR lamp is lighted and the PWR OFF lamp is extinguished. In this mode, the MCW circuits are inhibited from communication with the system. This prevents interference while testing or repairing the MCW. During testing or repairing, the recycle and trouble stop features are disabled permitting operation and test of the trouble checking circuits without stopping the sequence. The circuit automatically restores to the start mode at the end of a pass. Since there is no communication with the system, each of the memory card bit magnets in a word is written as a binary 0 (magnetized).

(d) ***Start Mode:*** The MCW is normally left in start mode. The start mode is a partially powered standby state which keeps the MCW ready for immediate use with a minimum of current drain. The MCW can be placed in the start mode by one of the following methods.

(1) ***ST Key:*** If the NOR or INH key has been depressed placing the MCW in the normal or inhibit mode, depress the ST key.

(2) ***RESET Key:*** If the INV LOADER or END lamp is lighted following a normal writing operation or if a control panel lamp is lighted during an alarm or trouble stop condition, depress the RESET key.

(e) ***Write Mode:*** Depression of the WRITE key places the MCW in the write mode. No lamp is lighted to indicate the start of the write mode. The write mode is the power state used for actually writing memory cards. If the MCW is in the normal or inhibit write mode and if the proper starting conditions described below are met, the MCW will start writing when the WRITE key is depressed.

(1) The 1A card writing head is in its left-most position as viewed from the front of the MCW. All switches that are operated by the 1A card writing head in that position are actuated.

(2) All switches that are operated by the fingers in the median position are actuated.

(3) Card loader is in the home position.

(f) ***Home Mode:*** Depression of the HOME key places the MCW in the home mode. No lamp is lighted to indicate the start of the home mode. The home mode sequences the card loader, fingers, and 1A card writing head back to the starting positions. The home mode is used when a trouble stop or power failure condition stops the memory card writing sequence or when the parts have been moved with the power off for test or adjustment purposes. As in the inhibit write mode, the MCW does not communicate with the system and the trouble stop feature does not operate. When the card writer has been restored to the home position, the power is removed and the circuit is left in the start mode. If the MCW is sequencing in the write mode, depression of the HOME key causes the MCW to terminate its normal processing sequence, return the card loader to its home position, and to reset to the start mode. If for some reason the card loader mounting is away from its home position and the MCW is in the start mode, depression of the HOME key will automatically put the MCW into the write mode long enough to return the card loader to its home position.

(g) ***Trouble Stop Mode:*** If a memory card sequence has begun with the NOR key depressed and the MCW detects a noncorrectable condition, the MCW goes into the trouble stop mode. All mechanical motion stops, and the cause of the stoppage is indicated by the appropriate control panel lamp. To simplify trouble diagnosis, only one trouble stop condition can occur and one lamp can be lighted at the same time. Depression of the RESET key extinguishes the lamp and restores the MCW to the start mode, thus enabling the HOME key, when depressed, to sequence the parts back to the home position. When the MCW is in the trouble stop mode, a signal is transmitted to the system and writing of the module cannot resume until the system is again prepared via the TTY.

1A CARD WRITING UNIT

3.12 The 1A card writing unit is the electromechanical equipment that automatically handles the memory cards during the writing process. The 1A card writing unit automatically performs the following.

(a) Removes a memory card from the card loader.

(b) Writes the information on the memory card.

(c) Returns the memory card to the card loader.

(d) Indexes the card loader up to the next memory card level.

(e) Removes the next memory card to be written.

(f) Repeats the process until all 64 memory cards in pass 0 are written.

(g) The attendant inverts the card loader and the process is repeated until all 64 memory cards in pass 1 are written.

LOGIC SEQUENCE CONTROL

3.13 The logic sequence control enables the writing sequence only when the ◗1B writing head◖ passes over the memory card from left to right. From signals generated in the position sensing heads of the ◗1B writing head,◖ the logic sequence control performs the following.

(a) Senses that instant when the head is properly positioned to write each word, and then orders the write control circuits to operate accordingly.

(b) Requests the system for word information and checks that each word is delivered in time to be properly written. Failing this check, it stops further word requests, tells the system of the word delivery failure, and recycles the memory card for another try.

(c) Issues requests for a new word immediately after each word has been written and resets the complete word register at the same time.

(d) Counts the number of initialization magnets that were sensed on the memory card; and if none were sensed, recycles the memory card on the assumption that the fingers had failed to pull a memory card from the card loader and that a second try will be successful.

(e) Counts recycle conditions; and if the third try (second recycle) to write a card is

unsuccessful, it lights the RECYCLE lamp and operates the trouble stop feature.

(f) Lights the COUNT lamp and operates the trouble stop feature if the counter registers other than 65 when the ▶1B writing head◀ has passed the last initialization magnet on the card.

BLOCK DIAGRAM ANALYSIS

3.14 When a new PS module needs to be written, the system is prepared for writing via the TTY. The NOR key on the control panel is then depressed extinguishing the PWR OFF and OFF NOR lamps. This removes the MCW from the off mode and places it in the normal mode. The ST key is then depressed to place the MCW in the start mode. A card loader containing a spare set of 128 memory cards is then clamped on the MCW in the pass 0 orientation.

3.15 The central processor, via the signal distributor applique circuit, applies an in process (IP) signal to the mechanical sequence control circuits (Fig. 9). This signal causes two relays (IP and SP) in the mechanical sequence control circuits to be set in the pass 0 state. The purpose of these relays is to indicate to the MCW that the system is ready and to insure that the card loader is mounted in the pass 0 orientation when the MCW is started. If the state of the relays and the orientation of the card loader do not agree, the MCW will not start when its WRITE key is depressed, and the INV LOADER lamp will light indicating that the orientation is not correct.

3.16 The WRITE key on the control panel is depressed to place the MCW in the write mode. The mechanical sequence control circuits signal the logic sequence control circuits to reset the register. The card loader brings the first memory card to a position level with the writing deck.

3.17 The mechanical sequence control circuits then operate the fingers in the card writing mechanism which remove the memory card from the card loader (Fig. 10). The fingers are spring-tensioned downward against a stop surface. The front ends are hooked and tapered so that as the fingers are driven toward the memory card, the tapered ends ride up over the edge of the memory card and the hooks drop into the finger slots in the memory card. Then the fingers are driven backward drawing the memory card onto the writing deck and against fixed back stops. The fingers are spring-tensioned in a longitudinal direction to prevent excessive strain on the card and on the fingers when the card strikes the back stops. This tension also serves to hold the card firmly against the stops. The motion of the fingers is stopped by switching the control circuit which brakes the finger motor to a stop. The card is now positioned on the writing deck in line with the ▶1B card writing head.◀ The mechanical sequence control circuits (Fig. 9) then operate the head motor. The head motor turns the head drive screw which drives the writing head over the card.

3.18 When the writing head passes over the card traveling from left to right, its initialization electromagnets 0 and 1 magnetize the alternately spaced initializing magnets in rows 0 and 1 on the card. When position sensing heads 0 and 1 pass over the initializing magnets, the position sensing heads produce and send position sensing signals to the logic sequence control circuits. The position sensing signals are used to indicate when the bit writing heads are in a position to write a word on the bit magnets of the card.

3.19 If the logic sequence control circuits do not receive a position sensing signal from the writing head, it causes the mechanical sequence control circuits to recycle the card. The card is recycled on the assumption that the fingers had failed to pull a card from the card loader and will be successful on the next try. When the writing head gets to the right side of the writing deck, a relay is operated which causes the indexing operation of the card loader at the end of cycle to be bypassed so that the same card is processed on the next cycle for the second try. If a position sensing signal is not received on the third try (second recycle), the RECYCLE lamp on the control panel is lighted and the trouble stop feature is operated.

3.20 The position sensing signals occur alternately in the position sensing heads at approximately 12.5-millisecond intervals due to the alternate placement of the initializing magnets in rows 0 and 1. The position sensing heads are positioned so that the ▶detection◀ of the position sensing signal occurs when the bit writing heads are located before the center of the bit magnets. When position sensing head 0 is located over the first initializing magnet in row 0, the bit writing heads are positioned

one word space before the first word row of bit magnets. When position sensing head 1 is located over the first initializing magnet in row 1, the bit writing heads are positioned to write the first word on the memory card.

3.21 When the logic sequence control circuits receive a position sensing signal from the writing head, it sends a word request signal to the master scanner. The central processor detects the word request signal from the master scanner and then sends a 44-bit word via the peripheral unit address bus to the receivers in the MCW in two bursts (23 bits in the first burst and 21 bits in the second burst). An enable signal timed to arrive with the first burst is sent from the central processor via the CPD to the EN0 enable and verify circuits. The EN0 enable signal gates the first burst of 23 bits through the pulse directors into the register. The EN0 enable and verify circuits send a verify signal to the central processor via the CPD to indicate that the enable signal for the first burst of 23 bits has been received. The central processor then sends a second enable signal timed to arrive with the second burst of 21 bits via the CPD to the EN1 enable and verify circuits. This enable signal gates the second burst of 21 bits through the pulse directors into the register. The EN1 enable and verify second burst circuits send a verify signal to the central processor via the CPD to indicate that the enable signal for the second burst of 21 bits which completes the word has been received. In addition, the EN1 enable and verify circuits signal the logic sequence control circuits that the word has been delivered. Then logic sequence control circuits remove the word request signal to the master scanner.

3.22 If the logic sequence control circuits do not receive a signal that the word has been delivered, a word delivery failure signal is sent to the master scanner. The delivery failure signal causes the system to retain the same card image in the CS. The logic sequence control circuits then cause the mechanical sequence control circuits to recycle the card. If the word is not delivered on the third try (second recycle), the RECYCLE lamp on the control panel is lighted and the trouble stop feature is operated.

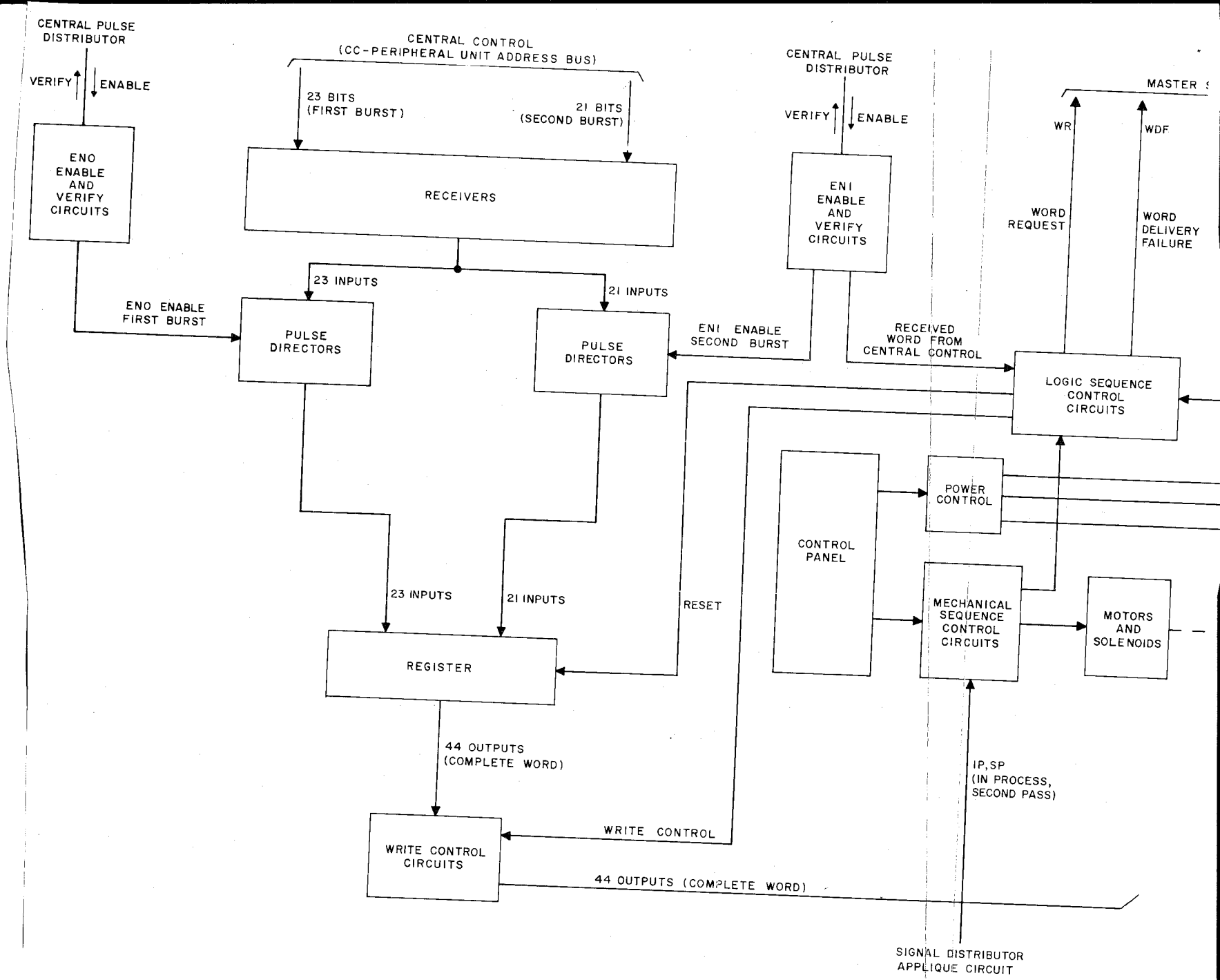
3.23 The 44 outputs from the register are sent to the write control circuits. The write control signal from the logic sequence control circuits controls the gating of the 44 outputs from the write control circuits to the 44-bit writing heads (00 through 43). Bit writing head 44 is not used in writing. When the bit writing heads 00 through 43 are positioned over bit magnets 00 through 43 in the first row, the bit magnets are magnetized or erased individually in accordance with the registered information from the central processor. The sequence is repeated until all 64 words are completely written.

3.24 After all 64 words have been written on the card, the fingers in the card writing unit return the card to the card loader. The fingers move back from the card loader to the clear position and the card loader indexes up to the next card level. The fingers move forward to remove the next card to be written, and the process is repeated until the 64 cards in pass 0 are written. After pass 0 has been written and the last card has been returned to the card loader, the system changes the state of the IP and SP relays in the logic sequence control circuits to indicate that it has delivered all the word information for pass 0. The MCW then sounds a buzzer, lights the INV LOADER lamp on the control panel, and returns the card loader to its home position. The buzzer can be turned off by depressing the BZR OFF (buzzer off) key on the control panel.

3.25 The central processor, via the signal distributor applique circuit, applies a second pass (SP) signal to the mechanical sequence control circuits. This signal changes the state of the IP and SP relays in the mechanical sequence control circuits from the pass 0 to the pass 1 state. These relays indicate to the MCW that the system is ready for pass 1. In addition, these relays detect whether the card loader is mounted in the pass 1 orientation.

3.26 If the state of the relays and the orientation of the card loader do not agree, the INV LOADER lamp will not extinguish when the RESET key is depressed and the MCW will not start when the WRITE key is depressed. The card loader is then manually inverted to the pass 1 orientation. The RESET key is then depressed to extinguish the INV LOADER lamp and turn off the buzzer if not turned off previously and to place the MCW in the start mode. The RESET key is not in the circuit until the card loader has returned to its home position.

3.27 After the card loader returns to its home position, the WRITE key is depressed and


CENTRAL PULSE DISTRIBUTOR
VERIFY
ENABLE
ENO ENABLE AND VERIFY CIRCUITS
CENTRAL CONTROL (CC-PERIPHERAL UNIT ADDRESS BUS)
23 BITS (FIRST BURST)
21 BITS (SECOND BURST)
RECEIVERS
23 INPUTS
21 INPUTS
ENO ENABLE FIRST BURST
PULSE DIRECTORS
PULSE DIRECTORS
CENTRAL PULSE DISTRIBUTOR
VERIFY
ENABLE
ENI ENABLE AND VERIFY CIRCUITS
ENI ENABLE SECOND BURST
RECEIVED WORD FROM CENTRAL CONTROL
MASTER
WR
WDF
WORD REQUEST
WORD DELIVERY FAILURE
LOGIC SEQUENCE CONTROL CIRCUITS
CONTROL PANEL
POWER CONTROL
MECHANICAL SEQUENCE CONTROL CIRCUITS
MOTORS AND SOLENOIDS
23 INPUTS
21 INPUTS
RESET
REGISTER
44 OUTPUTS (COMPLETE WORD)
IP,SP (IN PROCESS, SECOND PASS)
WRITE CONTROL
WRITE CONTROL CIRCUITS
44 OUTPUTS (COMPLETE WORD)
SIGNAL DISTRIBUTOR APPLIQUE CIRCUIT

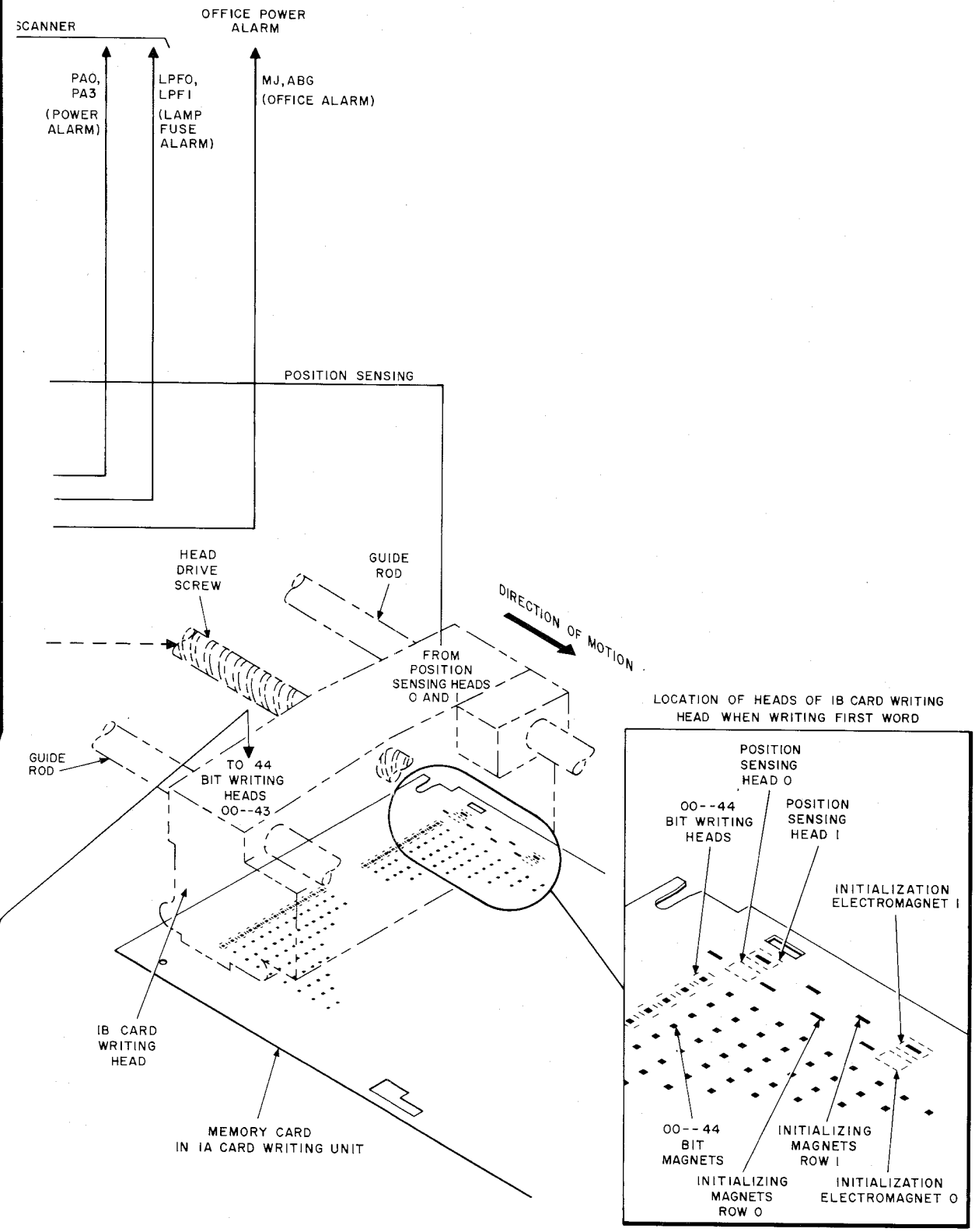


Fig. 9—MCW—Functional Diagram

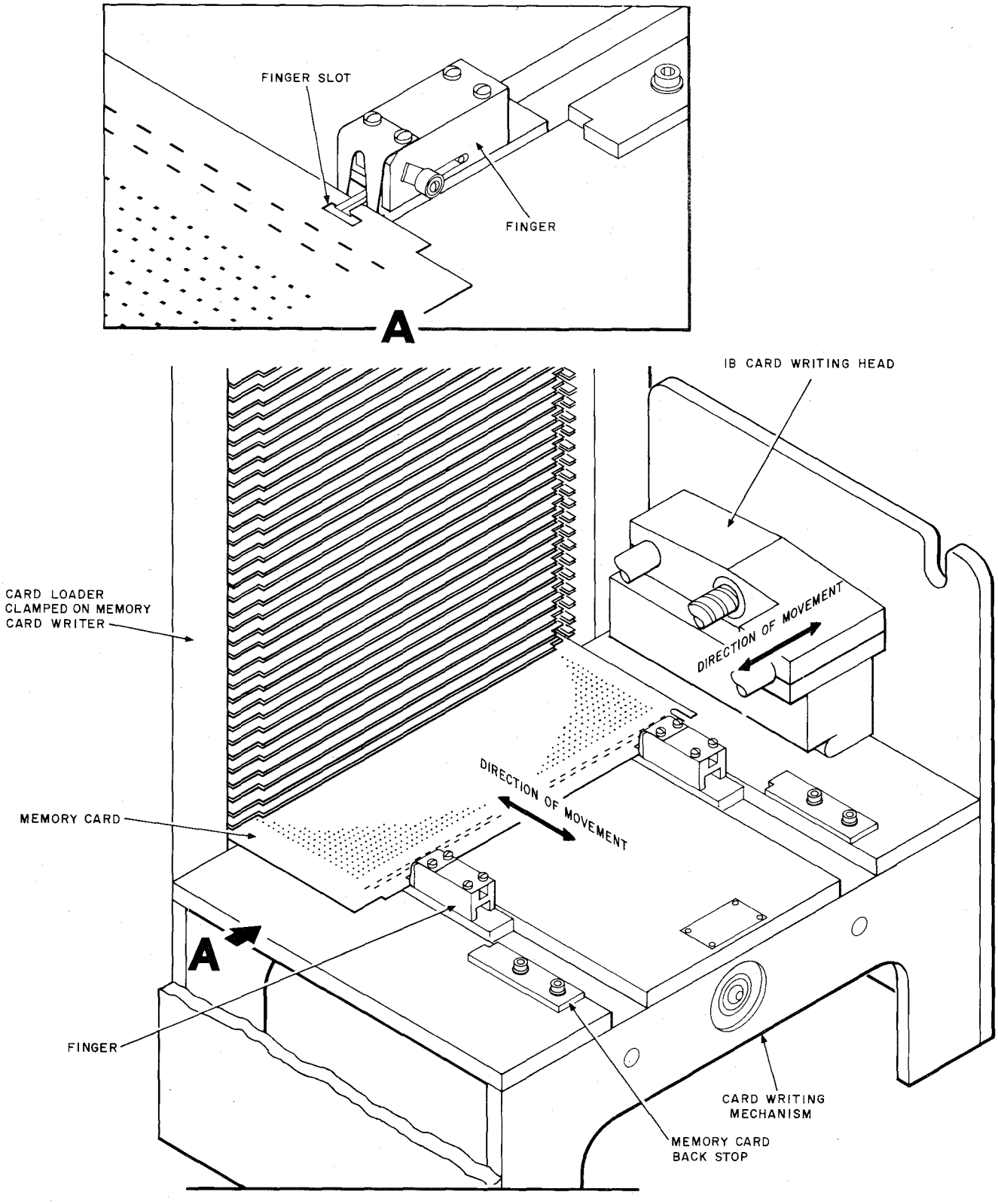


Fig. 10—Removing Memory Card From Card Loader

the 64 cards associated with pass 1 are written. At the end of pass 1, the system releases the IP and SP relays to indicate it has delivered all the words for pass 1. The MCW sounds the buzzer, lights the END lamp, and again returns the card loader to its home position. The RESET key is depressed to extinguish the END lamp, to turn off the buzzer, and to place the MCW in the start mode. After the MCW has completed the writing of all the cards and returned them to the card loader, the card loader is removed from the MCW.

3.28 The power condition of the MCW is communicated from the power control to the master scanner and office power alarm over three pairs of leads. These leads are the PA0 and PA3 (power alarm) leads, LPF0 and LPF1 (lamp fuse alarm) leads, and the MJ and ABG (office alarm) leads. Loss of battery on the PA0 lead to the master scanner indicates that power is off. Loss of battery on the LPF0 lead to the master scanner indicates that lamp fuse FT1 has failed. Closing the MJ and ABG lead loop due to the release of normally operated PA (power alarm) relay indicates a major power alarm to the office power alarm. When the power alarm relay is released, the PWR OFF lamp on the control panel lights indicating that power is down except during alarm tests.

TROUBLE STOP CONDITIONS

3.29 There are four trouble stop checking circuits which monitor the card writing process. These checking circuits are as follows:

- Out of Step
- Time-Out
- Recycle
- Count

If one of the troubles occurs, memory card writing is stopped and power is removed from the motors and solenoids. This stops all mechanical motion and leaves the sequence operated at the point where the trouble occurred. To simplify trouble diagnosis, only one of the trouble stop checking circuits can effect a trouble stop at any given time. In addition, the MCW lights a lamp on the control panel to identify the trouble. The MCW also informs the system of the trouble stop via the word request and word delivery failure leads to the master scanner. The system stops scanning for word requests, sounds an alarm, and prints a TTY message. Also the system leaves unchanged the state of the IP and SP relays in the MCW logic sequence control circuits so that a correct trouble diagnosis can be made. Depression of the RESET key will extinguish the control panel lamp, restore the MCW to the start mode, and enable the HOME key when depressed to sequence the parts back to the home position. Writing of the module cannot start until the system is again prepared via the TTY.

(a) ***Out of Step:*** The out-of-step circuits operate if the MCW and the system are out of step in locating words. If the system fails to send the last of the 4096 words at the same time that the MCW is prepared to write the 64th word on the 64th memory card of a pass, the system and the MCW are out of step. To detect the out-of-step condition, system controlled relays in the MCW logic sequence control circuits are checked before writing each memory card and at the end of each pass. If this condition occurs, the OUTSTEP lamp on the control panel is lighted.

(b) ***Time-Out:*** The time-out circuits operate if a mechanical or electrical trouble stops the sequence of writing for a minimum of 40 seconds. If this condition occurs, the TIMEOUT lamp on the control panel is lighted.

(c) ***Recycle:*** Memory cards are recycled whenever a word delivery failure occurs. The recycle circuits operate if a recycled memory card fails on the third try (second recycle). If this occurs, the RECYCLE lamp on the control panel is lighted.

(d) ***Count:*** The count circuits operate if the position sense counter registers an incorrect count after writing a memory card. If this occurs, the COUNT lamp on the control panel is lighted.

ALARMS

3.30 Depression of either the −48 or the +24 key on the control panel will simulate a fuse alarm failure. This tests the ability of the −48 or +24 test key to produce a power alarm. The test can be made with the circuit in the start mode or

the write mode without changing the mode. The successful operation of the test of either −48 or +24 key is indicated by lighting the PWR OFF lamp.

3.31 The loss of +24 or −48 volts to the circuit through the power distribution circuit or a tripped 208-volt ac circuit breaker will cause a major power alarm. The circuit automatically turns the power off and lights the PWR OFF lamp on the control panel. The audible power alarm is retired by depressing the OFF key.