IBM®

Field Engineering

Instruction - Maintenance

1971 Reservation Terminal Model 20

PREFACE

This instruction-maintenance manual introduces the Holiday Inn reservation network and describes the operation of the IBM 1971 Reservation Terminal Model 20. Maintenance information is to assist in servicing the terminal. The manual is for self-study and for future reference while you are servicing the terminal.

The terminal contains a RAP keyboard, SMS control circuitry, and a TELETYPE* ASR 32 printer, paper tape punch, and reader. Prior knowledge and experience with SMS logic and use of oscilloscopes is prerequisite for studying this manual.

The instruction information that pertains to the ASR 32 is self-supporting. Detailed maintenance information (lubrication, adjustments, removals) for the ASR 32 is contained in the TELETYPE Bulletins (manuals) that accompany each terminal. A description of the contents of each Bulletin follows:

Bulletin 273B Volume 1. Lubrication and removals. (Includes additional instruction information.)

Bulletin 273B Volume 2. Adjustments.

Bulletin 1184B: TELETYPE Parts Catalog. This bulletin contains TELETYPE part numbers. Do not use these numbers when you order parts from IBM. Use Parts Catalog: IBM 1971 Reservation Terminal Model 20, Form 124-0078.

IMPORTANT: Refer to Volumes 1 and 2 for all ASR 32 lubrication and adjustment.

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CONTENTS

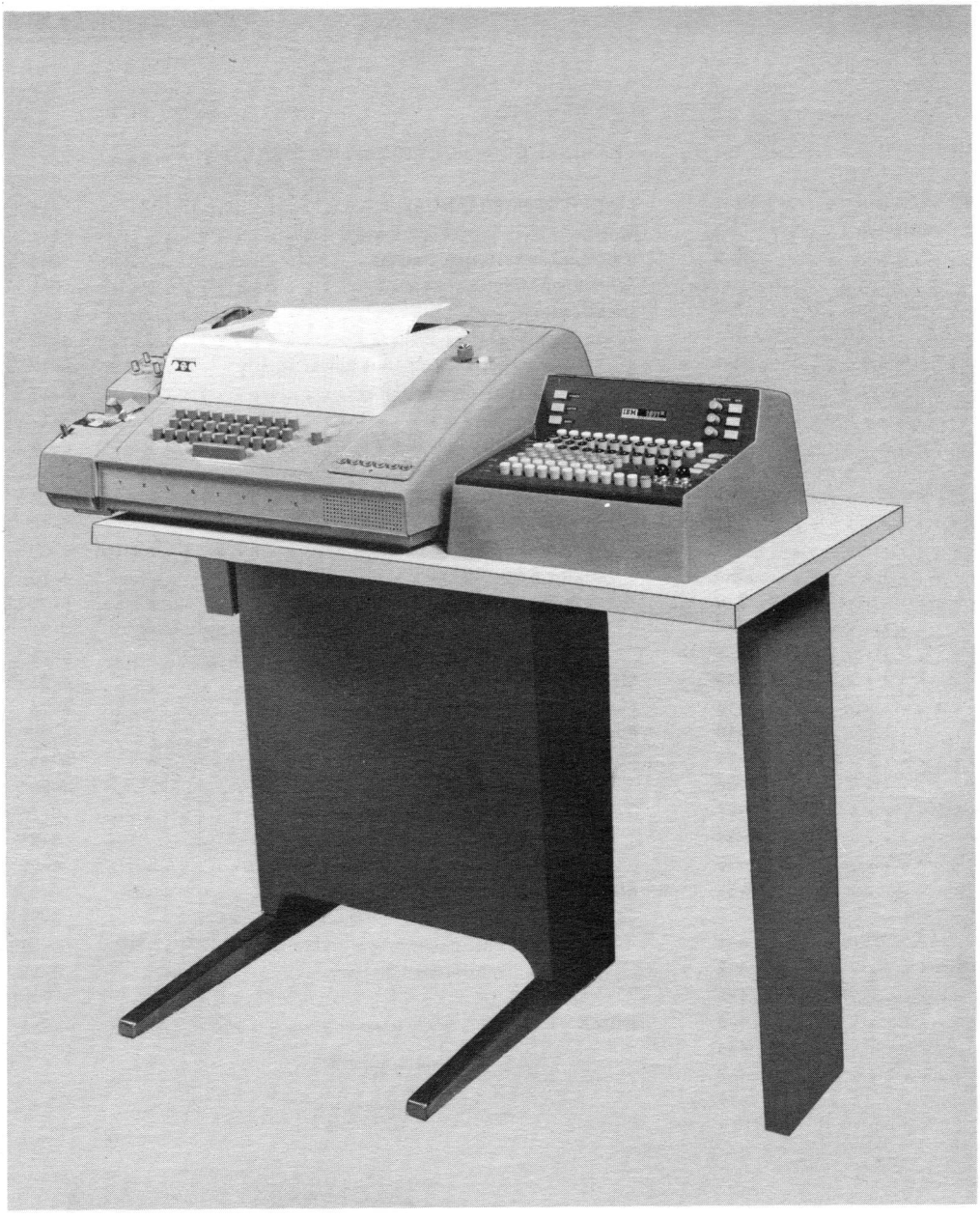

Figure 1-1. IBM 1971 Reservation Terminal Model 20

SECTION 1. SYSTEM INTRODUCTION

- This IBM Tele-processing network connects all Holiday Inns to one Central Processor.
- An IBM 1971 Reservation Terminal Model 20 is installed in each Inn.
- Communication between the processor and the inns is via 5-level telegraph code, at a rate of 60 words (5 characters per word) per minute.

An IBM Tele-processing reservation system provides the Holiday Inn of America, Inc. with a fast and up-to-the-minute reservation and communication network.

The IBM 1971 Reservation Terminal Model 20 (Figure 1-1) is installed in each Inn in the United States and Canada. The terminals are connected via commercial telegraph lines to an IBM central processor complex (two 7740's, 1311 disk files, 1050, etc.) located in Memphis, Tennessee.

All communications within the network are automatically directed to or from the central processor. The central processor therefore has the ability to send and receive messages, to answer any inquiry from a terminal, and to confirm or not confirm any reservation requests. All messages are transmitted in standard 5-level telegraph code, at a rate of 60 words per minute.

Central Processor and Terminal Description (Figure 1-2)

- The central processor controls reservations and directs messages to and from the Inns.
- The 1971 terminal sends messages to, and receives messages from the processor.
- The central processor can broadcast to all terminals at once.

The central processor controls the operation of the entire network. Stored within the central processor is reservation data about each respective Inn, including alternate Inns within the area that may be chosen by a customer. From each IBM 1971 terminal, an Innkeeper can enter into, and control transactions at the central processor.

Once the central processor has acquired the necessary data about each Inn, inquiries and reservation requests from any 1971 reservation terminal can be directed to the central processor. When a request reaches the central processor, a response is immediately returned, based on the requesting data and the decisions made by the processor itself.

In the case where a request for a reservation is made and confirmed by the central processor, a confirmation message is returned and printed at the requesting terminal.

Also, after a reservation is confirmed, it is necessary to inform the host inn (host refers to the inn chosen for the reservation) of the details pertaining to the reservation. (Name of party, type of room, number of nights, date of reservation, special instructions, etc.) The central processor automatically forwards this information to the host inn, where the details of the reservation are printed out, and punched in paper tape on the 1971 reservation terminal.

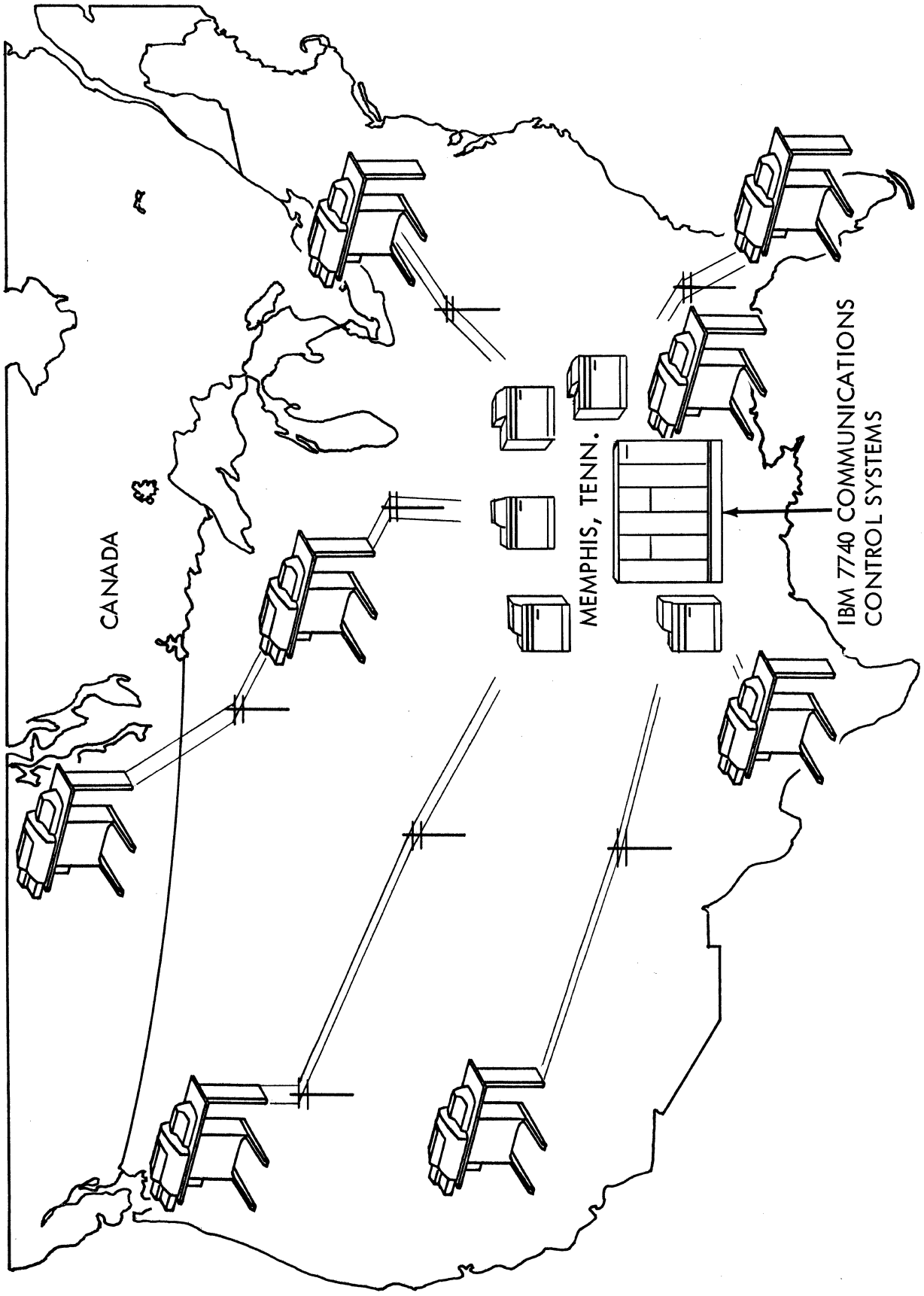

Figure 1-2. Holiday Inn Reservation Network

If a reservation request cannot be filled because of lack of the desired accommodations at the host inn, a special reply message is returned by the central processor to the requesting terminal. The reply message will cause the not-available light to come on, along with other lights at the requesting terminal. These additional lights will indicate possible substitutions to the request, such as other type rooms that are available, or even suggesting an alternate inn near the host inn that does have accommodations available. As a result of this type of not-available reply, the customer at the requesting terminal could accept the alternate suggestions. The innkeeper returns a message to the central processor to designate the substitutions. The central processor then replies with a printed confirmation message. Whenever the processor returns a confirmation message, the host inn is notified of the reservation by the central processor.

The central processor also has the ability to send messages to any or all terminals simultaneously. To do this, a broadcast address (zero, zero) is transmitted from the processor. All terminals recognize this broadcast address, and will print the message sent from the processor.

Transactions other than reservations can be performed from any Holiday Inn terminal. Inquiries can be made through the central processor as to the rates or availability of rooms at other inns. An innkeeper can close some, or all accommodations at his inn through the central processor, and specific terminal diagnostic tests can be called out from the central processor to print, punch, or light indicators at his terminal. Details of these, and all other terminal operations are explained in Section 4 and Section 5 of this manual.

Transmission Code Description

- 64 possible characters can be transmitted.
- Data transmission is by 5-level paper tape telegraph code.
- Each character consists of 7 bits.
- A mark is a time interval when current is flowing in the transmission line.
- A space is a time interval when no-current is flowing in the transmission line.

The transmission of data between the reservation terminal and the central processor is by a standard five-level character-code configuration. All characters are coded from a combination of five intelligence bits (Figure 1-3). Characters are transmitted and received serially by bit.

Only 32 characters can be selected from the combinations of five bits per character. This 32-character limitation is overcome by use of a letters-figures shift code arrangement. This method is similar to the upper and lower case of a standard typewriter, which permits each code combination to represent two characters, for a total of 64 characters.

Preceding one or more consecutive numeric characters requires a figures code combination character (1, 2, 4, 5). This figures code character mechanically locks the printer in a figure shift, thereby all subsequent character codes are treated as figures.

For letters-characters, the letters code character (1, 2, 3, 4, 5) is required to mechanically lock the printer in a letters shift. All characters following this code are treated as letters.

To ensure synchronization between the transmitting and receiving equipment, the five intelligence bits of each character are flanked by a start and stop bit. A start bit is transmitted first, then the five intelligence bits, followed by a stop bit. As a result of this, all characters consist of seven bits (Figure 1-4).

The combination of seven bits that make up each character is fed sequentially to the transmission line in the form of current or no-current time intervals. These bursts of current are rated to be a nominal 60 milliamperes, (generally referred to as a mark), whereas no current in the line is called a space.

A Mark is defined as a time interval when current is flowing in the line. A bit is also considered a mark. If the coded bit configuration of a character consists of consecutive mark bits, no break in the line current exists between the marks.

FIGURES	–	?	:	⊗ (EOB)	3	$	&	#	8	Bell (EOT)	BD	EA	.	,	9	0	1	4	RM	5	7	NT	2	/	6	PR	BLANK	LETTERS	FIGURES	SPACE	CARRIAGE RETURN	LINE FEED
LETTERS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z						
1	●	●		●	●	●				●	●						●		●		●		●	●	●	●		●	●			
2	●		●				●		●	●	●	●				●	●	●			●	●	●					●	●			●
LEVELS 3			●			●		●	●		●		●	●		●	●		●		●	●		●	●			●		●		
4		●	●	●		●	●			●	●		●	●	●			●				●		●				●	●		●	
5		●					●	●				●	●		●	●	●			●		●	●	●	●	●		●	●			

Figure 1-3. Five-Level Character Code Chart

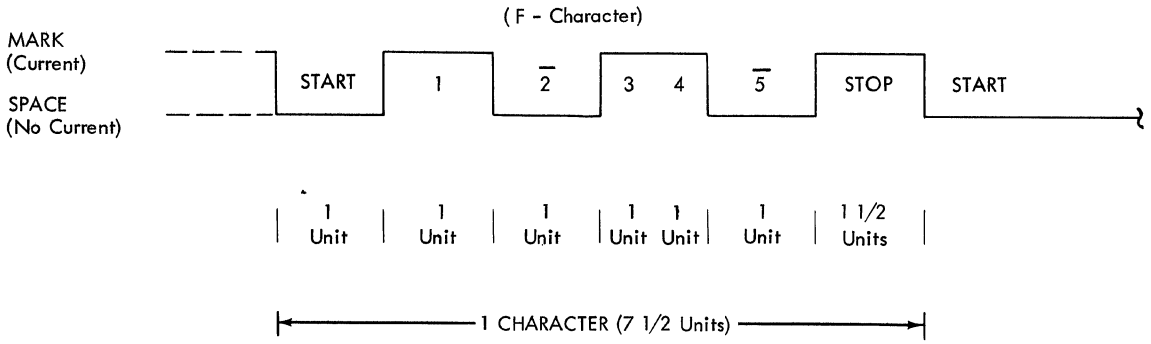

Figure 1-4. Typical Character Bit Configuration

Timing circuits in the transmitting or receiving equipment provide the bit identification, even though no change in current on the line is present.

A Space is defined as a time interval when no current is flowing in the line. A no-bit is also considered a space. The timing circuits in the transmitting or receiving equipment can recognize consecutive spaces, the same as for consecutive marks.

To further explain how actual character transmission and synchronization occur: when no characters are being transmitted on the line, the line is in a steady stop or marking condition (current flowing). All terminals attached to the line recognize or receive this continuous mark, therefore the terminal is considered in a stop condition. With this condition established, we can say all character stop bits are marks.

When a character is transmitted, a start bit is put on the line before the character intelligence bits. The start bit is a space, consequently the line goes from a current (mark) to a no-current (space) condition.

Following the start bit are the five intelligence bits (1, 2, 3, 4, 5) for the character. The line will alternate between mark and space depending on the code configuration of the character.

After the last intelligence bit (5) comes the stop bit. The stop bit, being a steady mark, is always 1.5 units of time as compared to the other bits of the character. (The start, 1, 2, 3, 4 and 5 bits are each considered 1 unit of time.) Therefore a total of 7.5 units of time are necessary for each character. The stop bit is longer to enable the terminal to recognize the end of the character so the mechanical units (printer, punch, etc.) have enough time to stop before the next character begins.

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An IBM 1971 Reservation Terminal Model 20 is installed in each Holiday Inn office. The terminal connects to a standard 110V ac, 60-cycle power outlet, and to the transmission line. No data set is required. The terminal can transmit and receive 5-level telegraph code in half-duplex only. (Half-duplex means: data can be both transmitted and received, but not simultaneously.)

While transmitting, the terminal prints and punches the transmitted data. This feature, referred to as local copy, permits the operator to visually read and check the data being transmitted.

TERMINAL FUNCTIONAL UNITS

- The 1971 terminal consists of three basic units.

Three cable connected units, mounted in one sit-down cabinet, are built into the 1971 terminal. These basic units are:

1. A Routine Action Pushbutton (RAP) keyboard.
2. The TELETYPEWRITER Automatic-Send-Receive (ASR) 32 printer, tape punch, and tape reader.
3. An SMS control unit and power supply.

Routine Action Pushbutton (RAP) Keyboard

- The RAP keyboard is used to enter standard room reservation data into the message.
- The RAP keyboard contains pushbuttons, arranged into 9 different groups.
- The enter pushbutton is pressed to scan the RAP keyboard, and punch its contents into paper tape.
- All data punched in tape is also printed by the ASR 32.

Figure 2-1 illustrates the RAP keyboard as used in the 1971 Model 20. This keyboard is recessed into the console board and cable-connected to the control unit.

The RAP keyboard contains pushbutton keys and indicators. The pushbuttons are used by the operator to select and set up standard room and reservation data, and also to address the host inn. The indicators display the status of the terminal and the transmission line, and also indicate replies to reservation requests or inquiries as sent by the central processor.

RAP Keyboard Pushbuttons

When a message to be transmitted is prepared at a terminal, the operator first has to set up the pushbutton keys on the RAP keyboard. All pushbuttons, except ENTER, remain down when pressed. The enter key is an individual momentary contact key that is spring restored when released.

For most transactions set up in the keyboard, the reset lever is used to restore any pushbuttons previously selected. The three alternate-inn pushbuttons on the upper panel are not restored by the reset lever.

Each pushbutton (except the host inn group) while being pressed, cams a permutation bar to unlatch and restore the other pushbuttons in its group. When the pushbutton is fully pressed, the permutation bar will latch onto the pushbutton to lock it down. A set of sliding contacts is operated by each pushbutton, which sets up the circuit for the selected button.

The pushbuttons are arranged in nine different groups (Figure 2-1). Each of these groups have a

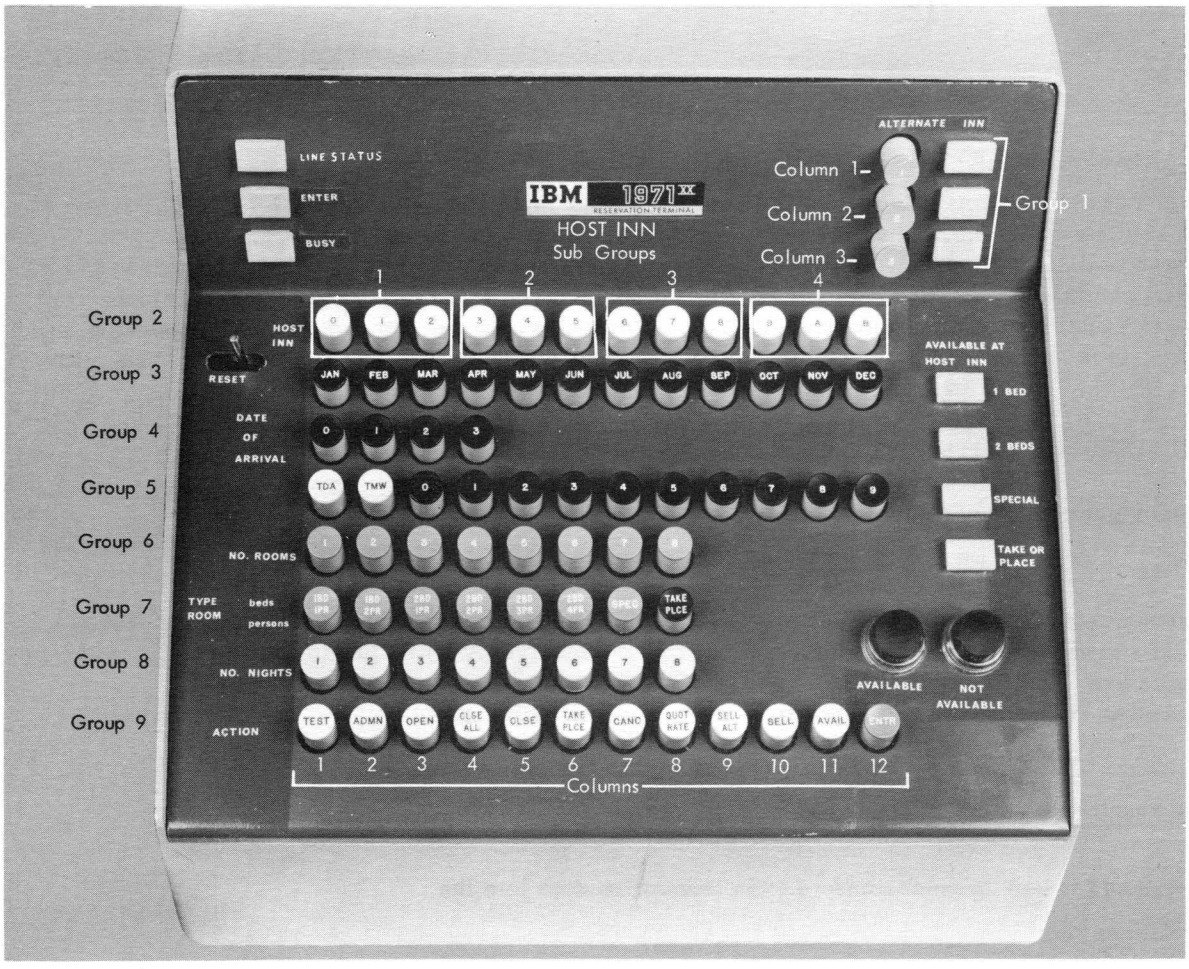

Figure 2-1. RAP Keyboard

specific function, and are set according to the type of reservation or transaction being made. A description of the groups follows.

Group 1 (Alternate Inn): This consists of three pushbuttons interlocked and restored by the other buttons in the group. These buttons line up with alternate inn names printed on the index card (Figure 2-2) when it is placed in the card holder on the keyboard. Any one of these buttons can be pressed to select an alternate inn during a sell-alternate transaction.

Group 2 (Host Inn): Twelve pushbuttons, divided into four subgroups (0, 1, 2-3, 4, 5-6, 7, 8-9, A, B). None of these pushbuttons are interlocked, or restored by other buttons in this group. This group of pushbuttons selects the address of the host inn. When the index card (Figure 2-2) for the chosen host inn is placed in the card holder, the appropriate buttons to press are shown along the bottom of the card, above the pushbuttons.

The 1 and 2 host inn pushbuttons are used for addressing, and also used in conjunction with the test button (group 9, action). If the 1-button and test button are selected, the central processor automatically sends an all-characters message to the terminal. The operator (or CE) can thereby test to ensure that the terminal prints and punches all data characters, performs functional operations, and lights all message reply lights from the central processor.

The host inn 2-button and test button initiate a message-switch test. When this test is used, all characters (including functional characters, LF, CR, etc) transmitted from a terminal are returned by the central processor to operate the same terminal. This is a very complete test, in that the terminal is tested in both transmit and receive mode, the transmission line is tested in both directions, and certain operations of the central processor are tested.

Details of these terminal tests and other tests are described in Typical Message Examples (Action Pushbuttons).

Adjacent to the host inn pushbuttons is the reset lever. When this lever is pushed to the left, all pushbuttons on the RAP keyboard (except alternate-inn) manually restore.

Group 3 (Date of Arrival): Month, twelve pushbuttons, one for each month. These buttons are

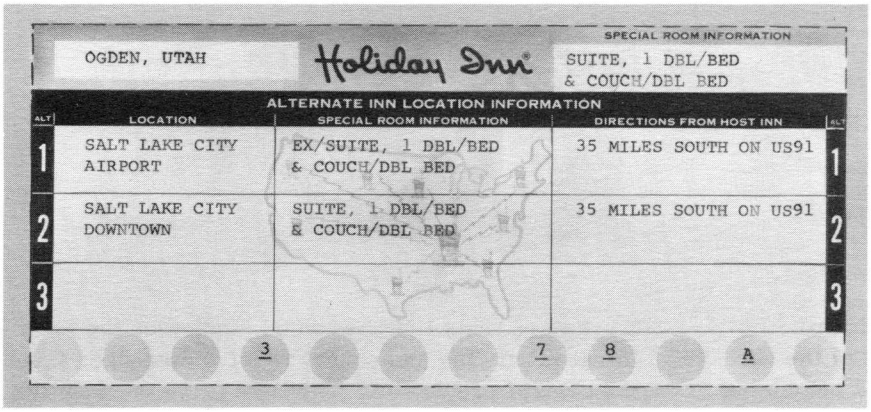

Figure 2-2. Index Card

interlocked and restored by other buttons in this group. They select the month of the reservation or transaction.

Group 4 (Date of Arrival, Days Tens): These four pushbuttons are interlocked and restored by the other buttons in the group. The buttons select the days tens of the reservation or transaction.

Group 5 (Date of Arrival, Days Units): These 12 pushbuttons are interlocked and restored by the other buttons in this group. The buttons select the days units of the reservation or transaction. To simplify the date selection, a today (TDA) and tomorrow (TMW) pushbutton is provided. If the reservation or transaction is for either of these days, select only the one applicable button. When this is the case, no other date-of-arrival pushbutton need be pressed.

Group 6 (Number of Rooms): This consists of eight pushbuttons numbered from 1 through 8. These buttons are interlocked and restored by the other buttons in this group. The buttons are used to select the number of rooms required for the reservation or transaction.

Group 7 (Type Room, Beds, Persons): This has eight pushbuttons, interlocked and restored by the other buttons in the group. The buttons select the type of room desired for the reservation or transaction. The buttons are self-explanatory except for special (SPEC) and take/place (TAKE/PLCE).

The special button is used to select the special as indicated on the index card (Figure 2-2). The index card describes the special as kitchenette, cabana, executive, etc.

The take/place pushbutton in this group has a limited, but important use. It is only used in conjunction with the CLOSE pushbutton in the action group. This type of transaction, when selected, will signal the central processor to close, or not accept any take-or-place transactions directed to the respective inn. For further details of take-or-place, see Group 9 (Action).

Group 8 (Number Nights): This group consists of eight pushbuttons numbered from 1 through 8. These buttons are interlocked and restored by the other buttons in this group. These buttons select the number of nights for the reservation or transaction.

Group 9 (Action): Eleven of these twelve pushbuttons are interlocked and restored by the other buttons (except ENTER) in the group. The twelfth (ENTER) is a spring restored momentary contact button. The enter pushbutton is pressed after the RAP keyboard is completely set up. This causes the RAP keyboard to be scanned, and the keyboard contents punched into paper tape (and printed) for later transmission.

The enter pushbutton is used with any one of the other eleven action buttons. The action buttons select the type of transaction desired from the terminal. With the exception of the available (AVAIL) button, each action button, followed by the enter button, cause the RAP keyboard to be scanned and its contents punched into paper tape for later transmission. The function called for by each action pushbutton is performed only the in the central processor, and not in the terminal.

The available (AVAIL) pushbutton, followed by the enter button, causes the RAP keyboard to be scanned. During the scan the contents of the keyboard are transmitted directly to the central processor. This same transmitted keyboard data is also punched and printed (local copy operation), but serves no useful purpose at the terminal.

Each action pushbutton is described in Terminal Operating Examples.

RAP Keyboard Lights

- The 12 RAP keyboard lights indicate the status of the terminal and also message replies from the processor.
- 3 lights indicate the status of the terminal.
- 9 lights indicate replies to certain messages.

There are twelve lights on the RAP keyboard. Three of these lights indicate the status of the terminal and the transmission line, and the remaining 9 indicate answers from the Central Processor in regard to reservation requests.

A description of the lights follows. (Refer to Figure 2-3).

Line status: This light indicates the status of the transmission line. The light is on bright when the line is in a steady mark condition (no data on the line), off when the line is in a steady space condition (open). The light should be blinking, or on dimly at all times to indicate the line is active.

Enter: This light, when on, indicates the terminal is off-line and cannot receive messages from the central processor. The light turns on from the enter pushbutton. The light turns off from the send button.

Busy: This light comes on when the terminal is ready to transmit information, or when the terminal is addressed to receive information. The light goes off when the transmit or receive operation is completed.

Note: The following 9 lights: alternate inn (3), 1-bed, 2-bed, special, take-or-place, not-available, and available come on with certain reply messages from the central processor.

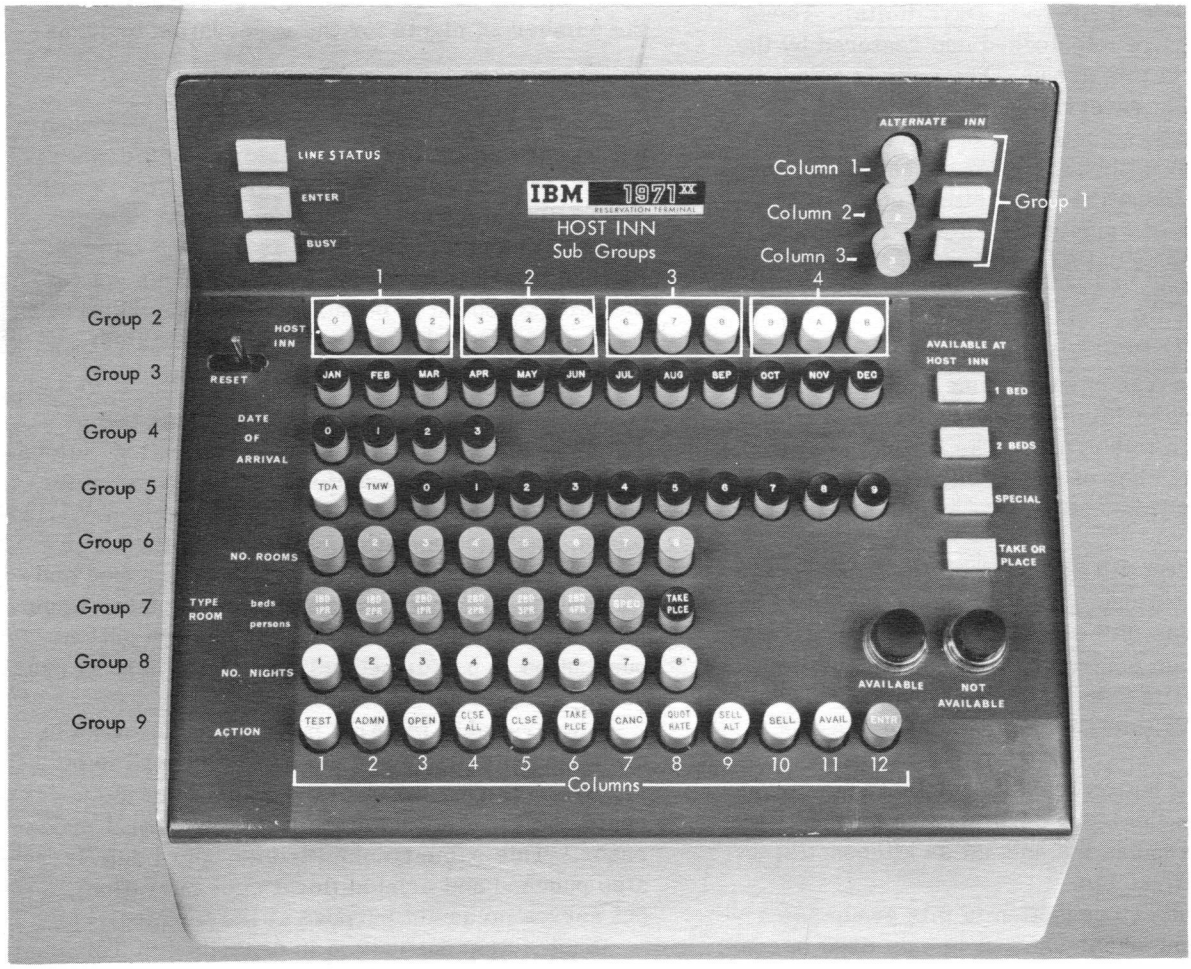

Figure 2-3. RAP Keyboard

Alternate Inn: These lights (1, 2, 3) indicate only in response to a reservation request to the central processor. The processor may send a reply suggesting an alternate inn if the requested Holiday Inn cannot accommodate the reservation (not-available light on). Every index card shows the name of the inn (if any in the area) associated with each alternate-inn light. The central processor, through programming, can answer the request with certain character(s) that cause these lights to come on. The characters that turn on the associated lights are:

Z (1, 5 marking): Alternate inn 1 on.
L (2, 5 marking): Alternate inn 2 on.
O (4, 5 marking): Alternate inn 3 on.

The lights are reset with the reset key on the ASR 32, or when the enter pushbutton is pressed on the RAP keyboard.

1-Bed: This light comes on with an S-character (1, 3 marking) received from the central processor in response to a reservation request. It indicates that a 1-bed room is available at the host inn. The enter or reset key will turn the light off.

2-Bed: This light comes on with an I-character (2, 3 marking) received from the central processor in response to a reservation request. It indicates that a 2-bed room is available at the host inn. The enter or reset key will turn the light off.

Special: This light comes on with an N-character (3, 4 marking) received from the central processor in response to a reservation request. It indicates, when on, that the special room type, as shown on the index card, is available at the selected host inn. The enter or reset key will turn the light off.

Take or Place: This light comes on with an M-character (3, 4, 5 marking) received from the central processor in response to a reservation request. It indicates, when on, that accommodations are available in the host inn area, but not necessarily at a Holiday Inn. The enter or reset key will turn the light off.

Available: This light comes on with a Y-character (1, 3, 5 marking) received from the central processor in response to a reservation request. When on, it indicates acknowledgement of the reservation request. The enter or reset key will turn off the light.

Not Available: This light comes on with a P-character (2, 3, 5 marking) received from the central processor in response to a reservation request. It indicates, when on, that the reservation cannot be fulfilled as requested. If any alternate inn lights are on with this light, it indicates that accommodations are available at the alternate inns, but the customer will have to decide if he wants his reservation filled at this inn. To do so, the innkeeper must send another message, using the appropriate alternate-inn pushbutton and the SELL ALT button. The available-at-host-inn light may also be on, and can be selected to substitute for the desired room.

To confirm the reservation, only the type accommodations as indicated by the lights can be selected with a sell transaction.

The 9 reservation status lights above can be turned on for testing purposes with the test lights switch on the ASR 32. When the switch is released, the lights go out. The 9 lights also light during an all-characters test message. (Refer to Group 2 Host Inn.)

ASR 32 (Figure 2-4)

- The ASR 32 includes a printer, tape punch, and tape reader.
- All messages received or transmitted are printed.
- All messages received or transmitted are punched into paper tape.
- The reader is used to transmit data from the terminal to the central processor.
- The terminal control panel contains keys and switches to control the terminal.

The ASR 32 (TELETYPEWRITER Automatic Send-Receive Model 32) is mounted on the console board adjacent to the RAP keyboard. The entire ASR 32 unit, which is purchased from the TELETYPE Corporation, includes a printer, 5-level paper-tape punch, and a paper-tape reader.

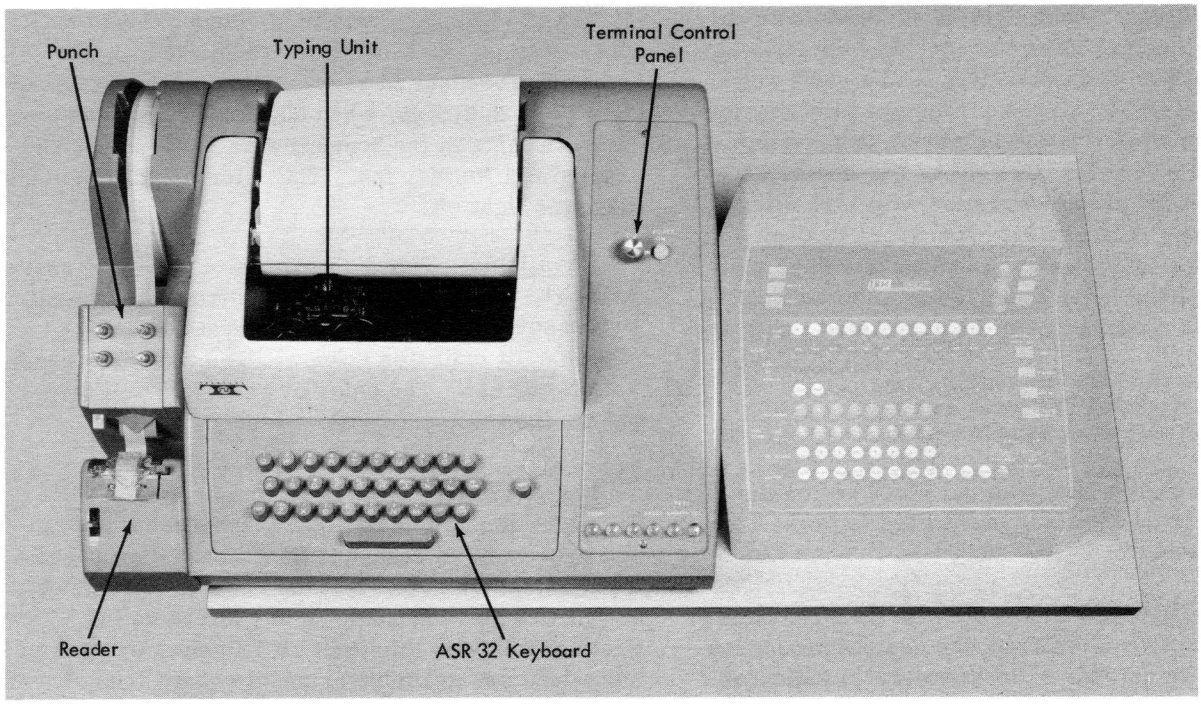

Figure 2-4. ASR 32

When the terminal is addressed to receive a message from the central processor or while messages are prepared and transmitted, the printer types the message, while the punch simultaneously punches the same data into paper tape.

Note: the punch can be turned on or off, but should always be on. The received messages punched in paper tape are not used for any purpose in the normal operation of the terminal. This received tape data is pulled through the tape reader before any message is transmitted from the terminal.

All messages (except available inquiries) transmitted from a terminal are first punched into the paper tape, and at the same time printed. This printed document permits the operator to visually check to make sure that the message is properly prepared before transmission takes place.

Nearly all messages require additional information, other than the RAP keyboard data, to be punched into the message. This data (customer, name, etc.) is punched into tape (and printed) using the ASR 32 keyboard. All keys on this keyboard cause the corresponding character to punch and print.

When the entire message is assembled into the paper tape (RAP keyboard data and ASR 32 keyboard data), the send key on the ASR 32 is pressed. This key initiates, through the terminal control unit, the transmit operation from the terminal. When the central processor is ready to receive the message, the terminal reader starts and the message is transmitted from the tape reader to the transmission line.

Receive Operation: To summarize the purpose of the ASR 32 unit during this operation:

1. The printer types the message.
2. The punch unit punches the same information into paper tape.

Transmit Operation: To summarize the purpose of the ASR 32 unit during this operation:

1. The printer types the RAP keyboard data while the punch unit punches the same data.
2. The ASR 32 keyboard is used to key in additional data to be printed and punched in paper tape.
3. The reader reads the paper tape to transmit the message after the send key is pressed.

Detailed mechanical operations of the TELETYPEWRITER ASR Model 32 is described in Section 3 of this manual, and also in the TELETYPE Bulletin 273B, Volume 1.

Terminal Control Panel (Figure 2-5).

The terminal control panel is on the ASR 32 to the right of the keyboard. An explanation of the keys and switches on this panel follows.

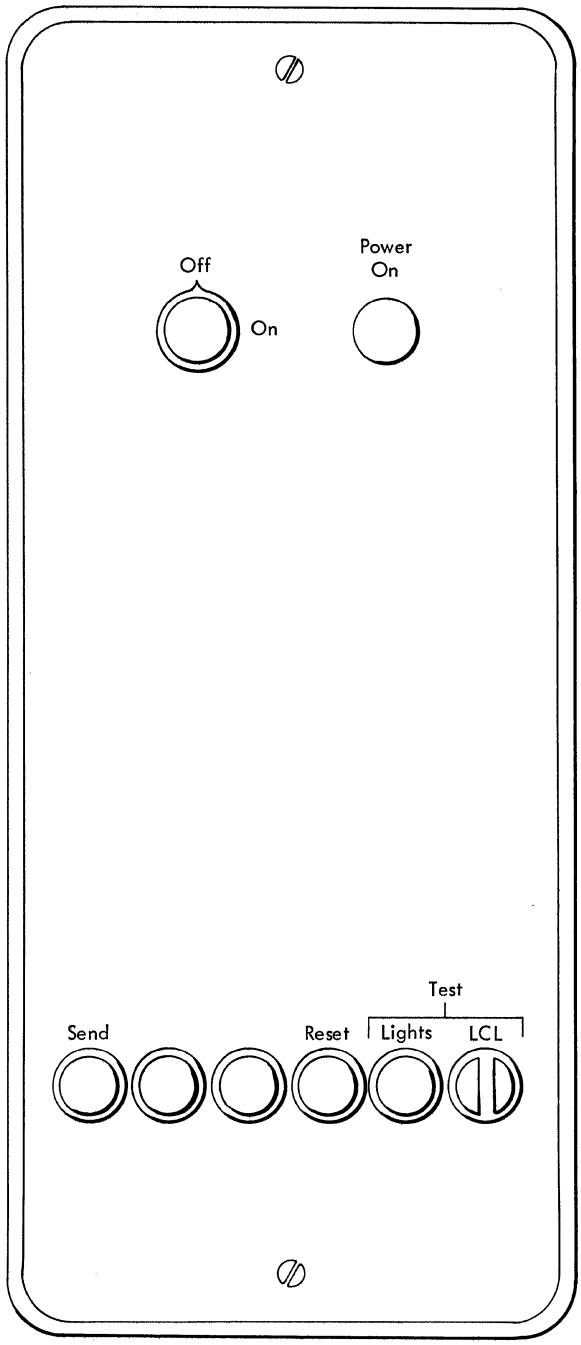

Figure 2-5. Terminal Control Panel

Power On-Off: This switch turns the power on or off to the terminal. When the switch is on, the light adjacent to the switch is also on.

Send: This key is pressed after the entire message is assembled into paper tape. It initiates the transmit (send) operation from the terminal to the central processor. It is used for all messages except an available inquiry, which is transmitted directly from the RAP keyboard (AVAIL and ENTER pushbuttons) and not from paper tape.

Note: The two unlabeled keys to the right of the send key are not used.

Reset: This key resets all control circuitry latches (except false-start and the shift register), and consequently, resets the entire terminal. If an error is noted after the enter key is pressed, use the reset key to reset the terminal before restarting the message.

Test Lights: This key, when held pressed, turns on these 9 lights on the RAP keyboard: alternate-inn (3), available-at-host-inn (4), available, and not-available. The lights go off when the button is released.

Test LCL (Local): This key is a switch. Turn it to test the terminal off-line. When in test mode, a light indicates within the key switch. This switch, when in test mode, prevents the transmit relay from operating, and also prevents the terminal from receiving messages from the central processor. This off-line test permits the terminal to be self-tested and self-addressed to print and punch all data read from the reader.

For details of this test feature, see Terminal Test Procedures.

Terminal Control Unit (Figure 2-6)

- Contains the SMS circuitry, relays, connectors, and power supply.
- The transmit and receive relays are the interface to the transmission line.
- The control circuitry detects whether the terminal is polled or addressed from the central processor.
- The terminal transmits only if it has a message ready and is polled.
- The terminal prints received messages from the processor when addressed.

The control units consists of SMS circuitry and relays that control the operation of the terminal. The SMS gate, relay gate, and terminal power supply are in the base cabinet below the ASR 32. Each gate can be opened for access to the SMS cards and the wire contact relays.

Cable connectors connect the ASR 32 and the RAP keyboard to the control unit. Each unit can be disconnected from the control unit by disconnecting the connectors.

Two mercury relays (transmit and receive) on an SMS card provide the interface from the terminal

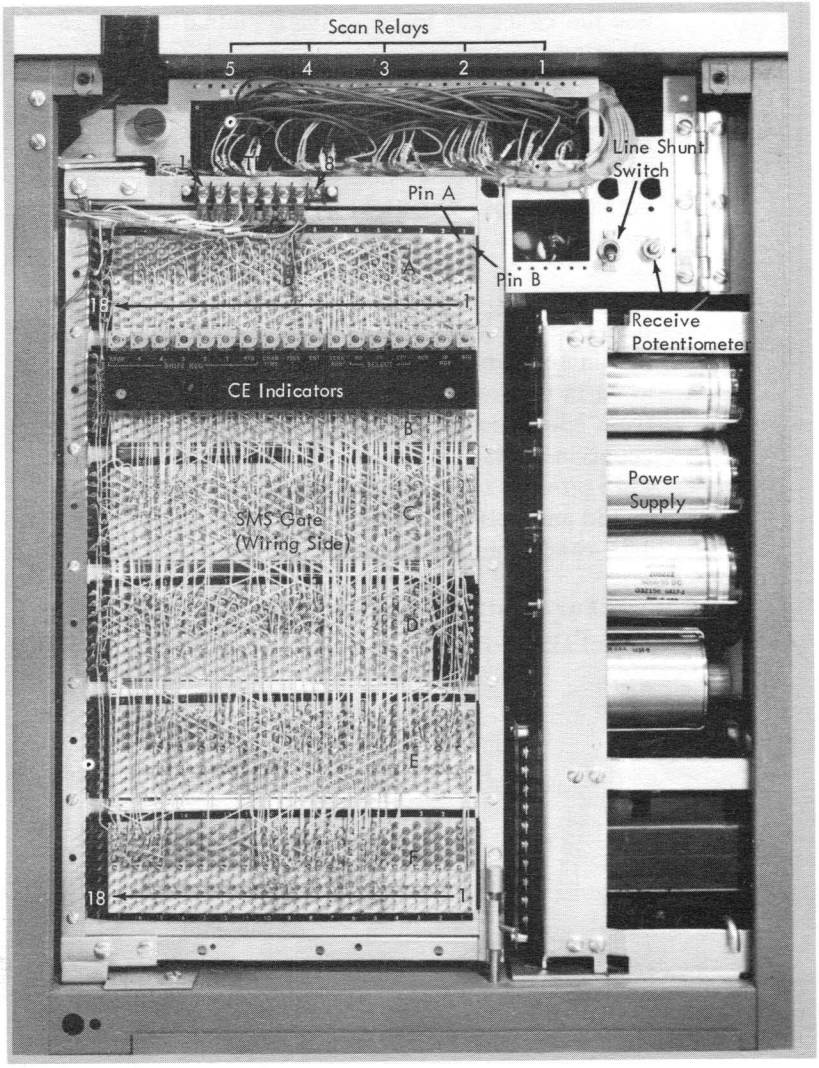

Figure 2-6. Terminal Control Unit (Rear View)

to the transmission line. In series with the line is the normally closed transmit relay point and also the pick coil to the receive relay. The transmit relay is controlled only from the terminal control unit, whereas the receive relay is controlled directly from the line. The result is that each terminal continually monitors the line with its receive relay.

The receive-relay contact point inputs the serdes (serialized, deserialized) shift register. All characters are assembled in the shift register, and the output of the shift register is sampled to control the operation of the terminal.

As a result of the character (or series of characters) sampled from the shift register, the following control unit functions are possible:

1. Terminal address recognition. Each terminal is assigned a two-character address, and the control unit in each terminal is wired to recognize only that specific address. Since the central processor controls the operation of the network, the terminal will only respond (transmit or receive) when the processor addresses or polls the respective terminal.

2. As a result of two-character address recognition, the control unit detects whether the central processor has polled or addressed the terminal.

   Polling is when the central processor, in effect, asks the terminal: "Do you have something to send to me?"

   Addressing is when the central processor, in effect, tells the terminal: "I have a message to send to you."

3. When the terminal is polled, but has no message ready to send to the central processor, the control unit conditions the terminal to transmit an acknowledgment character (V) to the central processor. If the terminal was off-line (LCL test switch on), or the power was off, no acknowledgment character is sent. The central processor, therefore, waits for a predetermined time, and then the normal polling continues at the processor.

4. When the terminal is polled and has a message ready to send, the control unit immediately starts the paper-tape reader, and the message is transmitted in place of the acknowledgment character (V). In this case, the control unit stops the transmit operation when the EOB character (end-of-block) is read from the tape.

5. The control unit turns the terminal around after a message is transmitted. This conditions the terminal to receive and print the reply message, or turn on lights on the RAP keyboard to indicate the reply message from the central processor.

6. The control unit detects, through the address-recognition circuitry, a broadcast address (zero-zero) from the central processor. All terminals with power on, and not busy, will print the broadcast message. No acknowledgment character (V) is sent to the processor in response to a broadcast.

7. The control unit controls the scan operations of the RAP keyboard to punch the keyboard data into paper tape. Four different scan cycles are available. Scan cycles 1 and 2 operate from the enter key, scan cycle 3 operates from the send key, and scan cycle 4 results from the available and enter key.

8. The relays in the control unit perform switching to make the four different scan cycles possible.

9. Indicators are wired to the triggers and latches to assist the customer engineer to diagnose control unit problems.

For a description of the terminal operation and the control unit circuitry, see Section 4, Terminal Operating Characteristics, and Section 5, Terminal Control Circuitry Operation.

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The TELETYPEWRITER ASR (Automatic Send-Receive) Model 32 is a 5-level code machine that performs the functions of printing, paper-tape punching, and paper-tape reading. Basically, the unit is mechanical, but does contain some electro-mechanical components.

Printing results from pressing character keys on the ASR 32 keyboard, or when information is received at the terminal from the transmission line. As each character is printed, that same character simultaneously punches into 5-channel paper tape. The paper tape reader is active only when the terminal is in a send or transmit status.

(Note: Refer to the TELETYPE Bulletins 273B, volume 1 for removal and assembly procedure and lubrication requirements; and volume 2 for adjustments.)

ASR 32 DESCRIPTION

- The ASR 32 contains 4 major units.

The four major mechanical units in the ASR 32 are the keyboard, typing unit, paper tape punch, and paper tape reader (Figure 3-1). All of these units are on the ASR 32 subbase. A description of these units and their individual subunits follows.

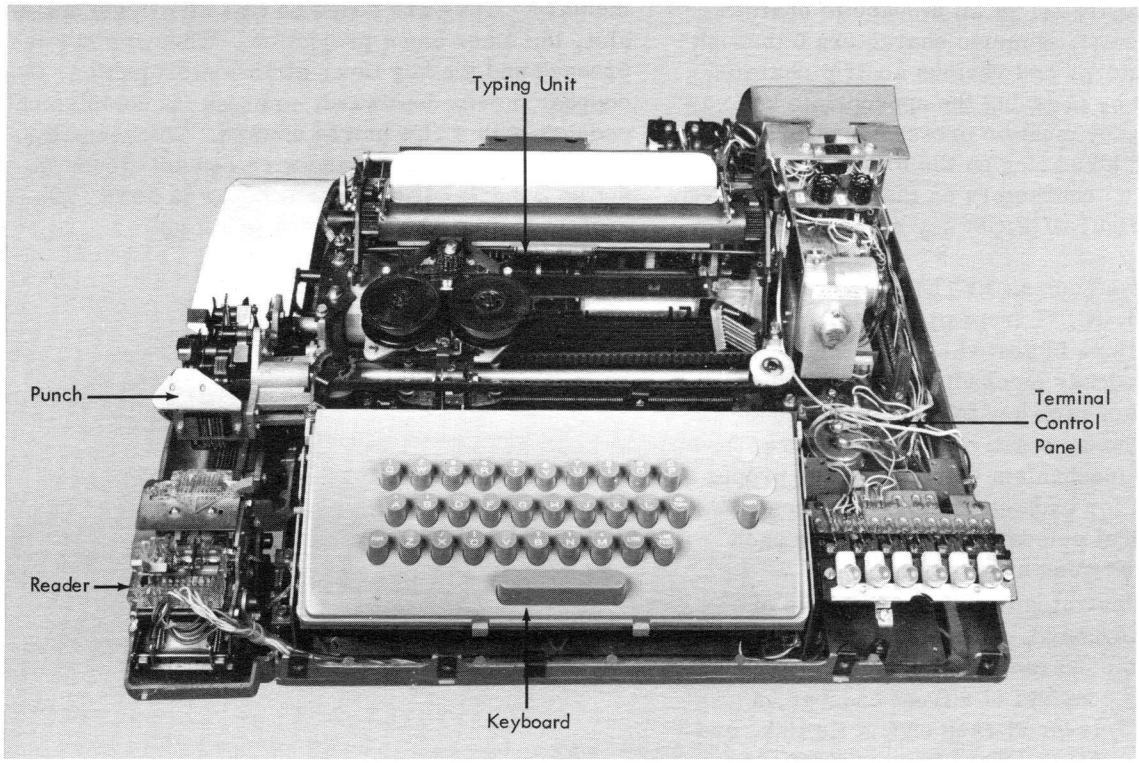

Figure 3-1. ASR 32 Units

KEYBOARD UNIT DESCRIPTION (FIGURE 3-2)

- Characters are printed and punched as each key is depressed on the keyboard.
- The keyboard codebar mechanism is set up to convert each character from a mechanical code to an electrical code.
- The universal mechanism trips the distributor clutch.

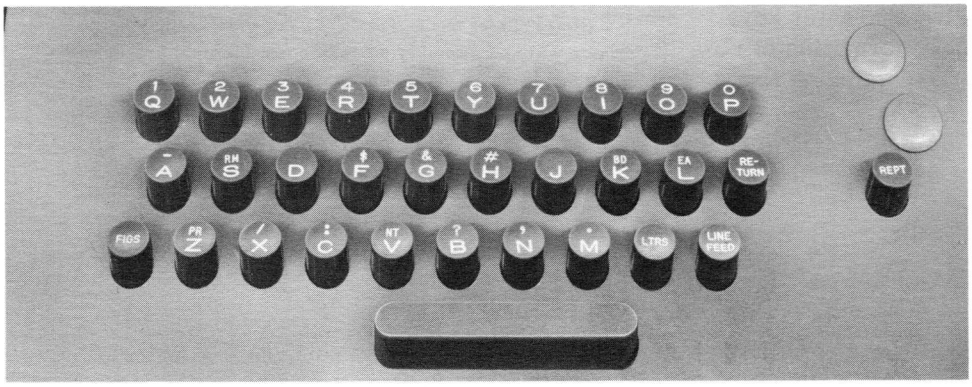

Figure 3-2. ASR 32 Keyboard

The ASR 32 keyboard has three rows of keys. Press the appropriate key to select all alphabetic characters (in capitals only), numeric characters 0 through 9, special characters, and various control characters are selected by pressing the appropriate key. A letters (LTRS) key must be pressed first to set up the characters appearing on the lower part of the keytops. To set up characters on the upper part of the keytops, the figures (FIGS) key must first be pressed.

Functional keys such as RETURN (carriage return), line feed, REPT (repeat), and spacebar perform the functions indicated.

A keyboard codebar mechanism converts the manual operation of each key to mechanical code combinations. The keyboard codebars, in turn, control a contact mechanism that sets up the proper code combination for each character. The contacts distribute electrical pulses corresponding to each character into the typing unit.

Figure 3-3 illustrates two of the five sets of codebars in the keyboard. One set is for each intelligence bit of the character. Each of the five codebar positions consists of a front codebar, a rear codebar, a T-lever at each end, a tie link, and one wire contact. All codebars have projections and slots in their top edges, which code them to be selected and positioned up or down by the keys that are pressed.

The two codebars for each position are complementary. They are coded so that where one has a slot, the other has a projection. When any key is pressed and the key lever strikes a projection, that codebar moves downward, whereas its complement codebar with a slot moves upward. Whenever the front codebar is down, the wire contact closes to set up a mark. If the rear codebar is down, the contact is opened and a space is set up.

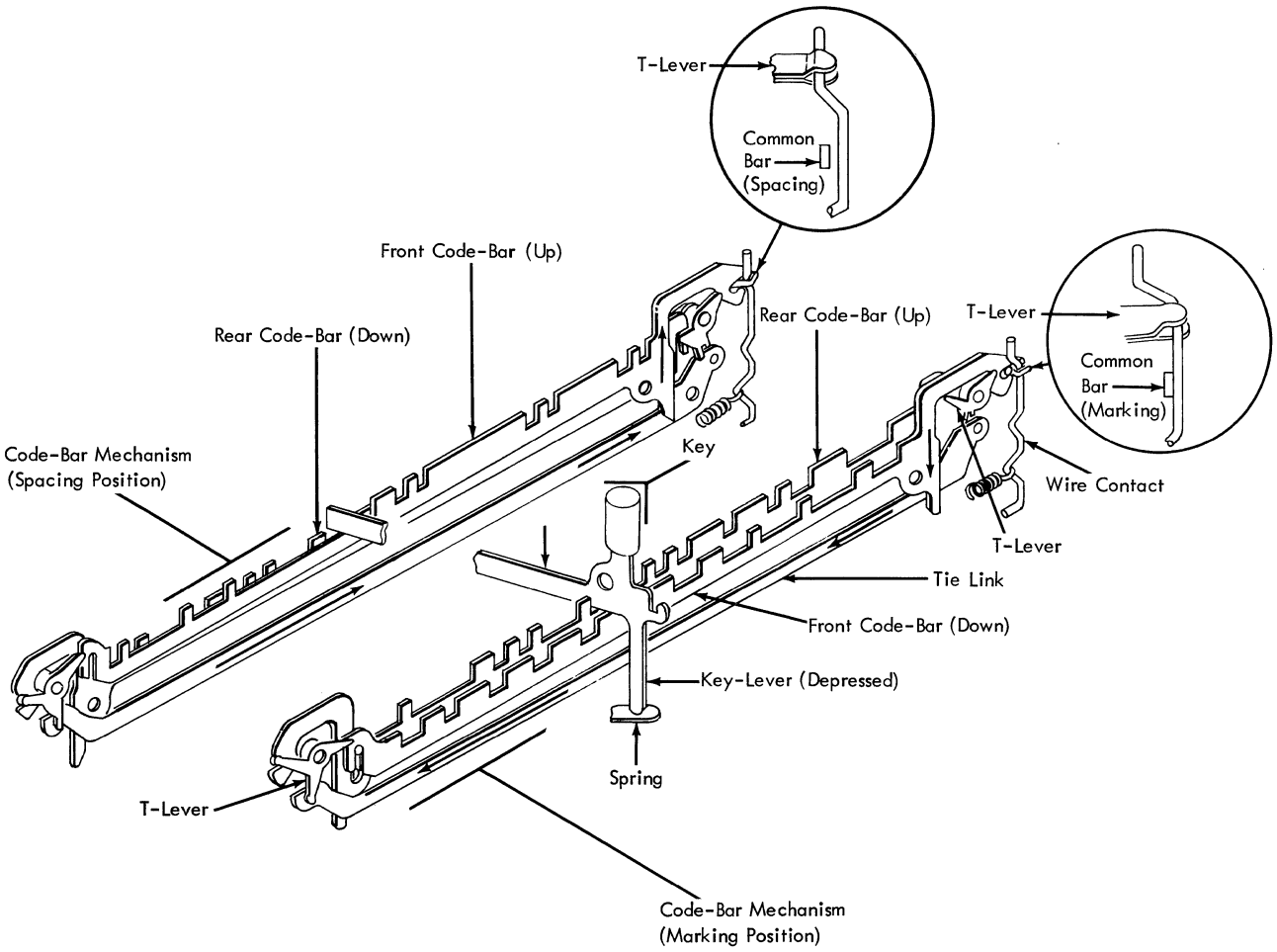

Figure 3-3. ASR 32 Keyboard Codebar Mechanism

Also, as any key is pressed, a universal mechanism (Figure 3-4) in the keyboard mechanically operates a linkage to trip the distributor clutch in the typing unit. The distributor rotates to electrically scan the keyboard contacts. The mechanical code set up in the keyboard is transferred to electrical pulses which control the typing unit. At the end of the distributor clutch cycle, the keyboard contacts are restored (opened), but the codebars remain in their respective positions until a new character is set up by pressing another key.

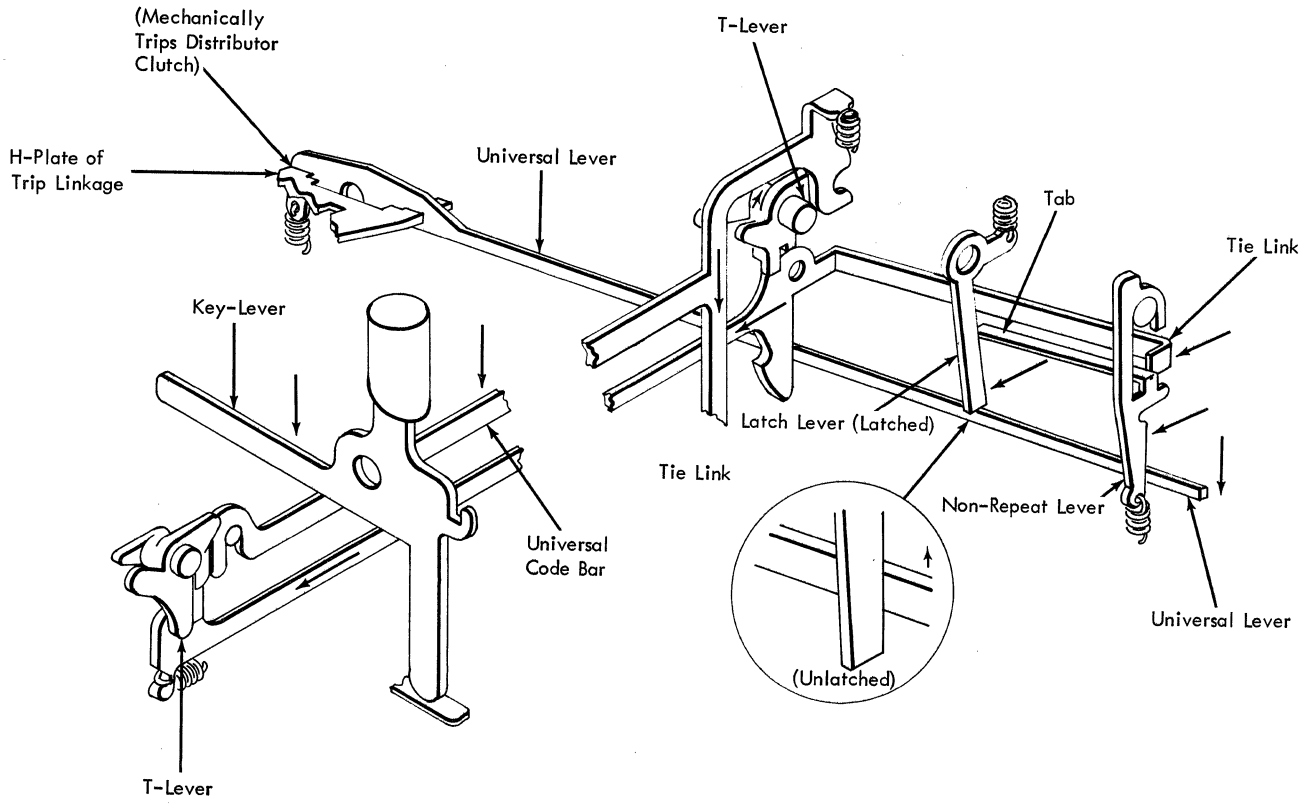

Figure 3-4. ASR 32 Keyboard Universal Mechanism

TYPING UNIT DESCRIPTION (FIGURE 3-5)

- The typing unit prints all data.
- Many submechanisms are contained in the typing unit:
  1. Main drive.
  2. Distributor.
  3. Selector.
  4. Codebar.
  5. Function.
  6. Printing.
  7. Spacing.
  8. Carriage return.
  9. Line feed.
  10. Answerback drum.

The typing unit is the largest and most involved unit in the ASR 32. All the components of the unit are on the typing unit casting, which in turn rests on the subbase casting.

CAUTION: DO NOT TILT THE ASR 32. THE TYPING UNIT FLOATS ON RUBBER MOUNTS AND WILL PULL LOOSE IF TILTED.

As the name typing unit implies, the main purpose of the unit is to set up and type the information. The typing unit is controlled to print either from the keyboard, the tape reader, the answerback drum mechanism, or from the transmission line.

Mounted within the typing unit base casting are several smaller mechanisms that are necessary to control, select, and print the proper characters.

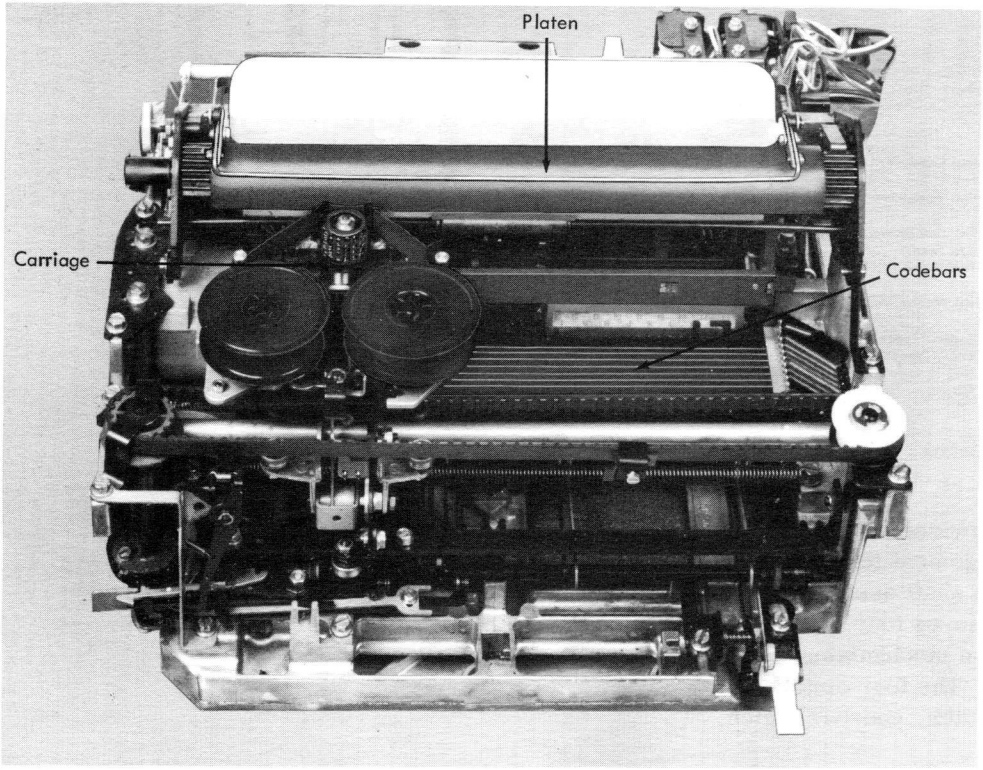

Figure 3-5. Typing Unit

Main Drive Mechanism (Figure 3-6)

- The drive motor is continuously running.
- The main shaft is gear-and-belt driven.
- Four clutches control the operation of the typing unit. They are tripped in the following sequence:
  1. Distributor clutch.
  2. Selector clutch.
  3. Codebar clutch.
  4. Function clutch.

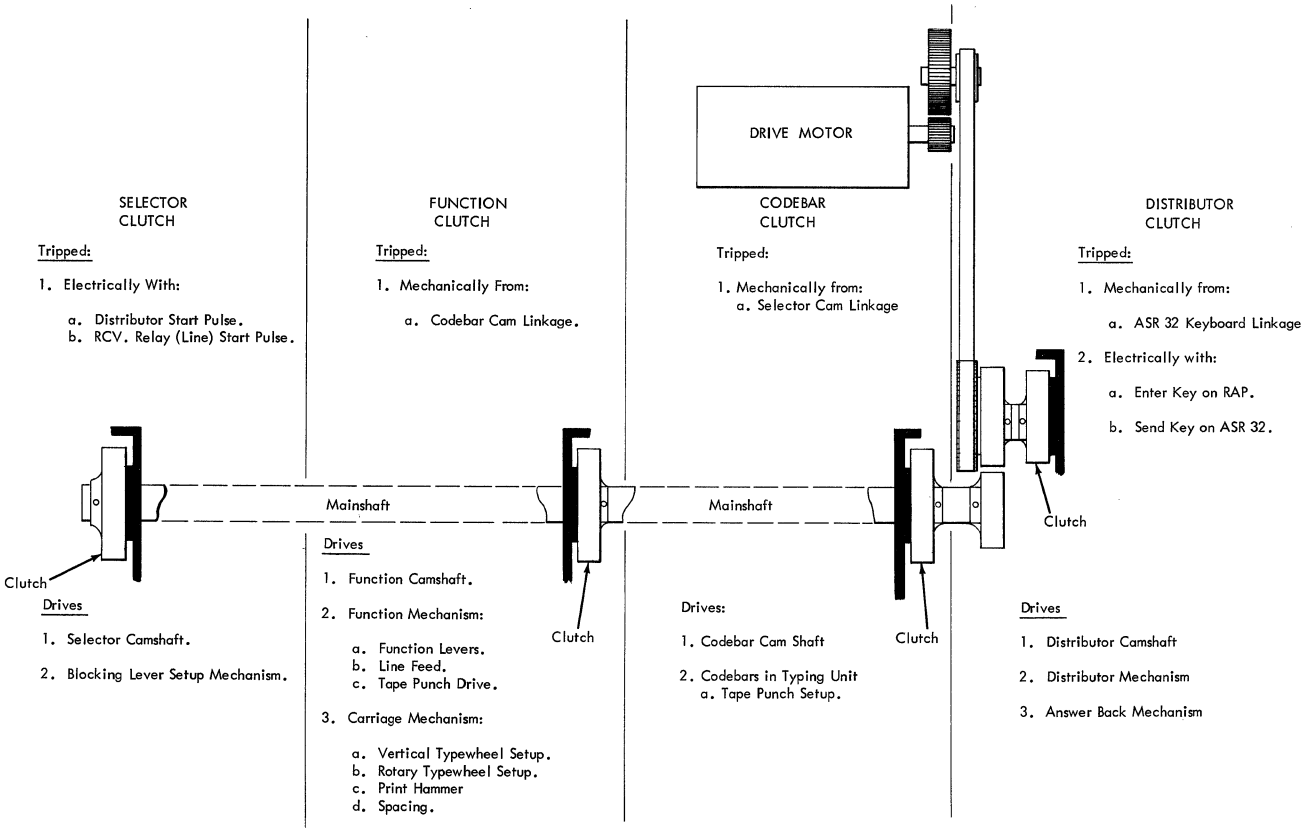

Figure 3-6. ASR 32 Main Drive and Clutches

A synchronous drive motor provides rotary motion through a belt-and-gear arrangement to the distributor mechanism and the main shaft assembly in the typing unit. The main drive moves four clutches that control the operation of the mechanisms to select and print the characters. The four clutches are: distributor clutch, selector clutch, codebar clutch, and function clutch.

Distributor Mechanism

- The distributor clutch, when tripped, drives the distributor mechanism.
- The clutch can be tripped either electrically or mechanically.
- The distributor terminates the character pulses from the ASR 32 keyboard, the tape reader, and the answerback drum.
- The output of the distributor (common wiper) controls either the selector magnet or the transmit relay.

The distributor clutch is tripped either electrically or mechanically. Only when the ASR 32 keyboard is used will the clutch be tripped mechanically. The clutch is tripped electrically with the TD (tape distributor) magnet when the terminal is transmitting data from the tape reader, or when the answerback drum magnet is energized. (Refer to Answerback Drum Mechanism.)

When the distributor clutch is tripped, it rotates the carbon brush holder on the clutch shaft. During the cycle, the brushes make contact with the start, 1, 2, 3, 4, 5, and stop printed-circuit segments on the distributor disk. The output of the distributor (common brush) controls either the selector magnet in the ASR 32, or the transmit relay.

The start and stop segments directly control the selector magnet (or transmit relay), while the character intelligence segments (1, 2, 3, 4, 5) strobe the output of the ASR 32 keyboard contacts, the tape reader contacts, and the answerback drum contacts.

The keyboard, tape reader, and answerback drum contacts are effectively all wired in parallel, and in series with the distributor. Whichever unit is used, the contacts in that respective unit are closed to coincide with the coded character to be printed or transmitted. The common of the distributor terminates the character pulses and emits them to the selector magnet (or transmit relay) in the form of mark or space bits. (A mark energizes the selector magnet. A space de-energizes the magnet, or the transmit relay.)

Figure 3-7 illustrates how the distributor controls the selector magnet or transmit relay from the ASR 32 keyboard, the tape reader, and the answerback drum.

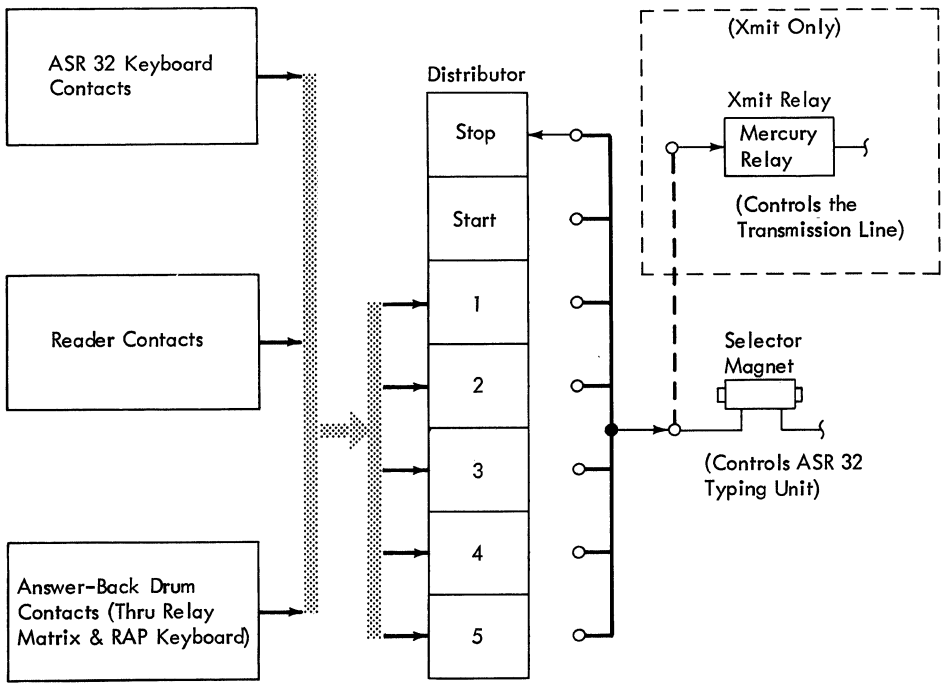

Figure 3-7. Distributor Schematic

Selector Mechanism (Figure 3-8)

- The selector mechanism is driven from the selector clutch.
- The selector clutch is tripped electrically with the start bit of each character.
- The selector mechanism sets up the blocking levers to mechanically store the bit configuration for each character.
- The blocking levers are up for a mark, down for a space.
- The range finder is set so the mechanical timings of the selector cams are in time with the electrical mark-space pulses that make up each character.
- The codebar clutch is mechanically tripped at the end of every selector clutch cycle.

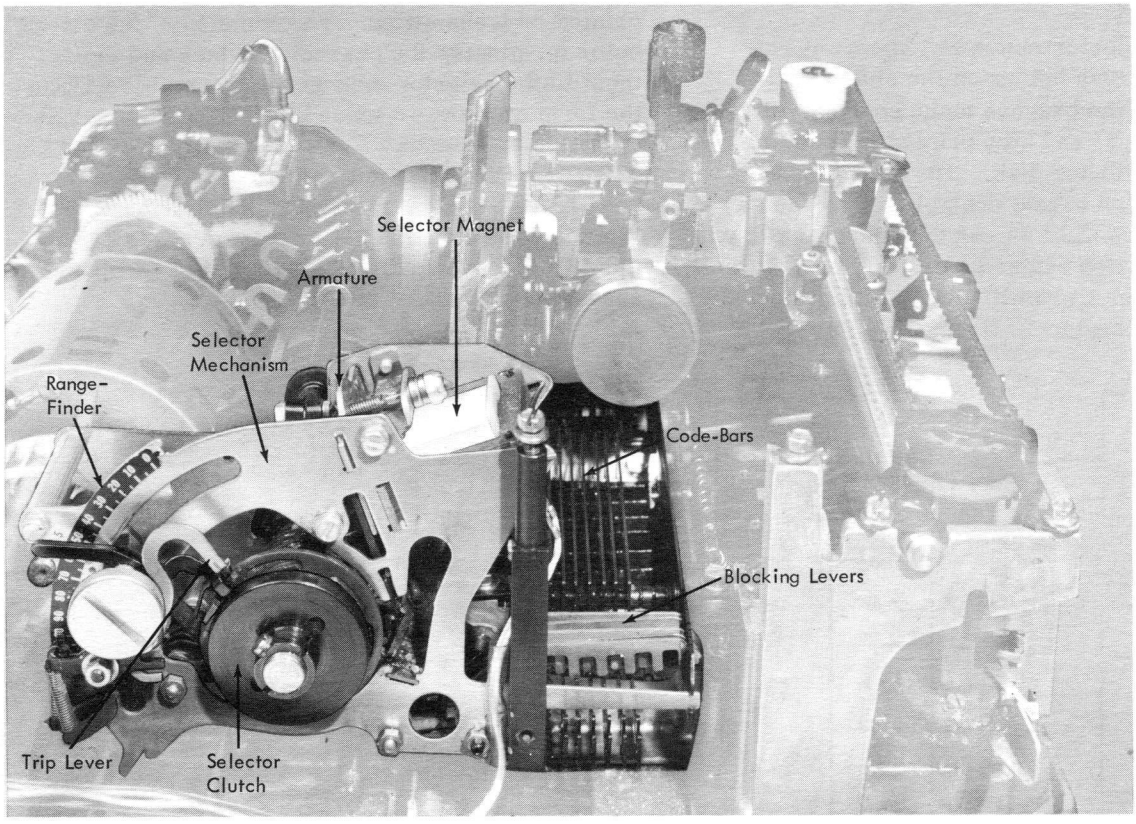

Figure 3-8. Selector Mechanism

The selector magnet is used for two purposes:

1. To control the selector clutch
2. To control blocking levers in the typing unit to set up for each character.

The magnet is energized either from the common of the distributor, or from the receive relay.

When the ASR 32 is in a stop condition (motor running, but no data being printed), internal control circuitry keeps the selector magnet energized. This keeps the selector clutch latched. A selector-magnet driver (SMD) card is in the ASR 32 to provide power to energize the selector magnet.

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The first bit of each character is a start bit (space signal). This space signal de-energizes the selector magnet, and the selector clutch is tripped. This causes the selector camshaft to complete one cycle.

During the selector clutch cycle the five intelligence bits for the character are also fed to the selector magnet. Each mark (bit) energizes the magnet, whereas each space (no bit) de-energizes the magnet. The fact that the selector camshaft is rotating while the intelligence bits are controlling the selector magnet armature allows the five blocking levers (1 for each intelligence bit) to set up according to the bit configuration of the character. Any intelligence bit that is marking causes its respective blocking lever to be positioned up, while any space bit causes its respective blocking lever to be positioned down. These blocking levers, (held in their up or down positions by the cams and selector levers) store the bit configuration for the character.

At the end of the character, the stop bit, which is a mark, holds the selector magnet energized. The selector-clutch cycle is nearly complete at this time. Consequently, with the selector magnet energized, the selector clutch will disengage, and the rotation of the selector camshaft stops. When the clutch latches, the blocking levers remain up or down to store the character code.

The range finder (Figure 3-8) changes the mechanical timings of the selector clutch (and camshaft) in relation to the mark-space pulses to the selector magnet.

By changing the range finder, the entire selector camshaft can be adjusted so the low lobes on the selector cams occur midway during the pulses to the selector magnet. This allows the selector mechanism to set up the blocking levers midway through each bit of the character, (the optimum condition desired). If the unit is properly set, maximum distortion (about 40%) can exist before printing failures begin to occur.

The timing chart (Figure 3-9) shows the cam timings of the selector camshaft. When the range finder is moved, all the timings of these cams shift either to the right or left to adjust the mechanical mechanisms of the typing unit with the electrical pulses of the character.

To set the range finder, loosen the knob and move in each direction until printing failures occur. Then set the pointer midway between the points of failure.

A summary of the operation of the selector mechanism for one character follows:

1. Start bit (space). The selector magnet de-energizes and trips the selector clutch. The selector clutch rotates the selector camshaft. All blocking levers are reset at the beginning of the selector cycle by the reset cam.

2. Intelligence bits 1 to 5 (marking or spacing) position the associated blocking levers up or down.
   a. Marking bits energize the selector magnet to position the associated blocking levers up.

   b. Spacing bits de-energize the selector magnet to position the associated blocking levers down.

3. The stop bit (mark) energizes the selector magnet, latches the selector clutch, and stops the selector camshaft. Figure 3-8 illustrates and describes the operation of the selector mechanism.

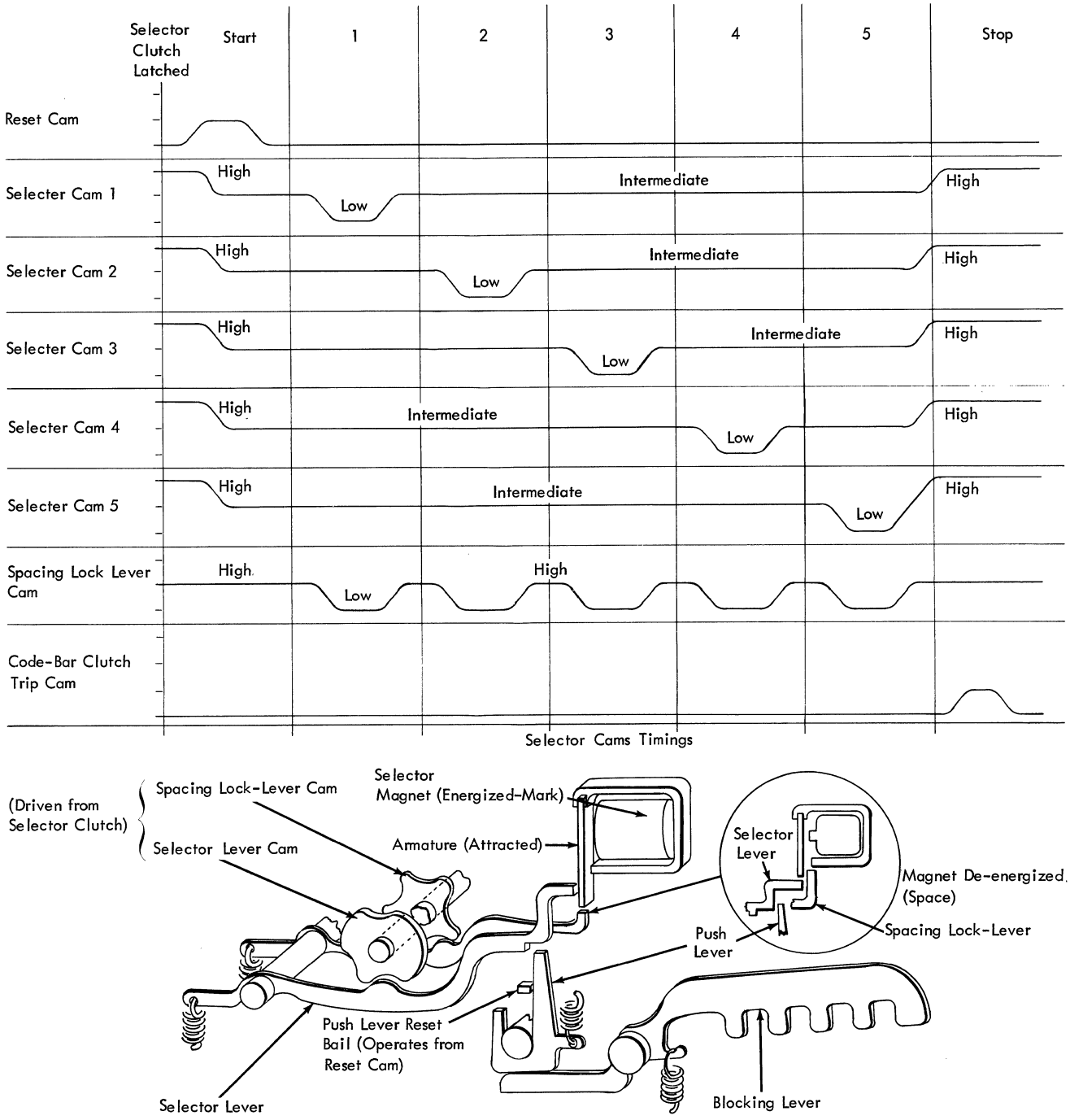


Figure 3-9. Selector Mechanism and Cam Timings

Codebar Mechanism (Figure 3-10)

- The codebar clutch is mechanically tripped at the end of the selector clutch cycle.
- 8 codebars are set up during the codebar clutch cycle.
- The setup of the codebars is controlled by the blocking levers.
- A codebar is positioned up for a mark, down for a space.
- The codebars control and position the print mechanism.
- The function clutch is mechanically tripped during each codebar clutch cycle.

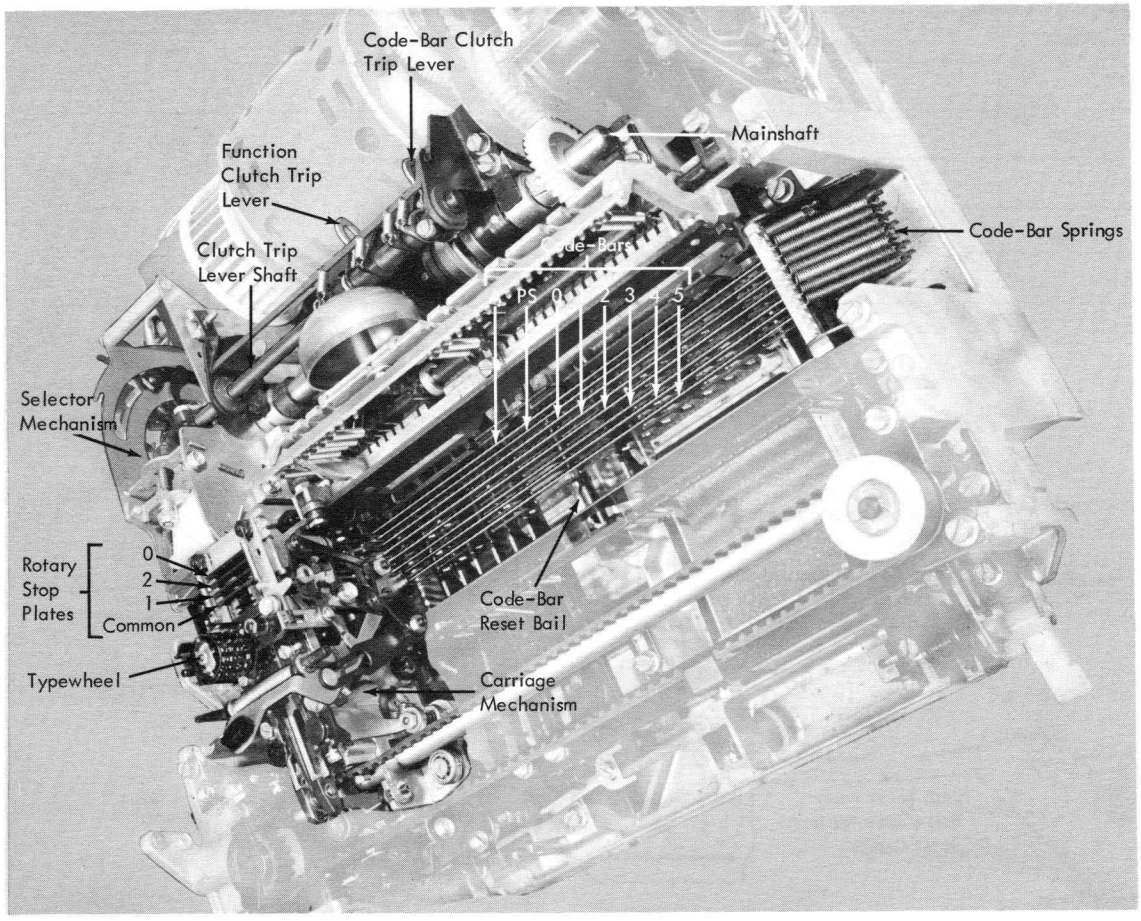


Figure 3-10. Codebar Mechanism (Typing Unit)

Just before the end of the selector clutch cycle, the codebar clutch is mechanically tripped by a cam-follower arm on the selector clutch camshaft. The codebar clutch makes one revolution to operate the typing unit codebar positioning mechanism in the typing unit. (There are two codebar mechanisms in the ASR 32, one in the keyboard and the other in the typing unit.)

The ASR 32 contains eight codebars in the typing unit. These codebars are across the base of the typing unit, so the carriage mechanism can be in contact with the codebars across the entire printing area (from left to right margin). The codebars have two purposes:

1. To position the typewheel to select the proper character for printing.
2. To control the function mechanism. (For a description of the function mechanism, see Function Mechanism).

Each of the eight codebars are labeled, and have a definite purpose. They are (from back to front):

A (automatic)	Controls the bell.
PS (print suppress)	Controls the hammer to allow printing or to suppress printing.
0 (zero)	Positions the typewheel to select letters or figures-shift characters.
1, 2, 3, 4, 5	These codebars position the typewheel to select the character for printing. The codebar numbers correspond to the respective bits that make up the character.

As the codebar clutch rotates through its cycle, the codebars are permitted, under spring pressure, to move to the left and up. The leftward movement of any codebar is blocked if its respective blocking lever is down (the blocking levers are positioned during the selector-clutch cycle). If a blocking lever is up, the codebar movement is not blocked, so it moves all the way to the left and up. Consequently, any codebar that is positioned all the way to the left will be up (marking position), whereas any codebar blocked by its blocking lever is down and not fully to the left (spacing position). You can easily observe the movement of the codebars looking into the machine below the carriage area.

Function Mechanism (Figure 3-11)

- The function clutch is mechanically tripped during the codebar clutch cycle.
- The print mechanism and typewheel are positioned during the function cycle.
- The function levers are positioned during the function clutch cycle.
- Functions supplementary to printing are performed during the function clutch cycle.

The function mechanism permits the typing unit to perform and control printing, and also supplements the printing of the characters. These functions are: spacing, carriage return, line feed, print suppressing, bell.

Early in the codebar clutch cycle, the function clutch is mechanically tripped by a cam-follower arm on the codebar clutch camshaft. The function clutch makes one cycle per character. During the cycle, the function drive bail operates up and down. Function levers are mounted under the codebars. These levers can follow the function drive bail up and down unless the upward movement is blocked by projections on the underside of the codebars.

As the function bail moves up, springs pull the function levers up. If a function lever encounters one or more projections on the underside of the codebars, it is held in its down position. If a function lever does not encounter any projections on the codebars, it follows the function bail to its most upward position. When a function lever is allowed to move to its most upward position, a function pawl latches on the end of the lever. As the lever moves downward, the pawl which is latched onto the lever also moves down. The fact that the function pawl is latched and is pulled down, allows the operation to perform for that particular lever.

Example: If the codebars are set up for a line feed code, the line feed function lever is not blocked by any codebar projections, therefore the lever is permitted to move all the way up. The line feed function pawl latches on the function lever and is pulled down as the function drive bail moves down. As the pawl moves down, the mechanical motion is applied to rotate the platen.

The timing chart, Figure 3-12, illustrates timing relationships between the selector mechanism, the codebar mechanism, and the function mechanism.

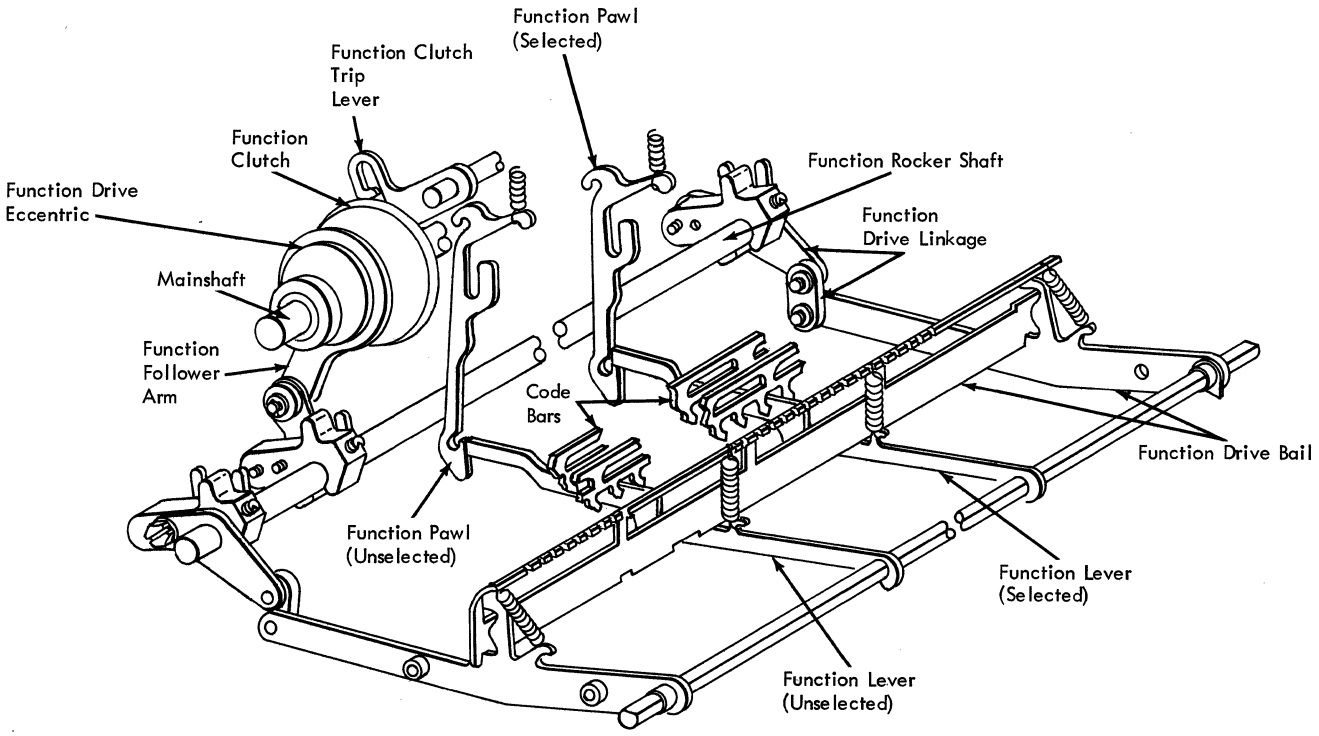


Figure 3-11. Function Mechanism

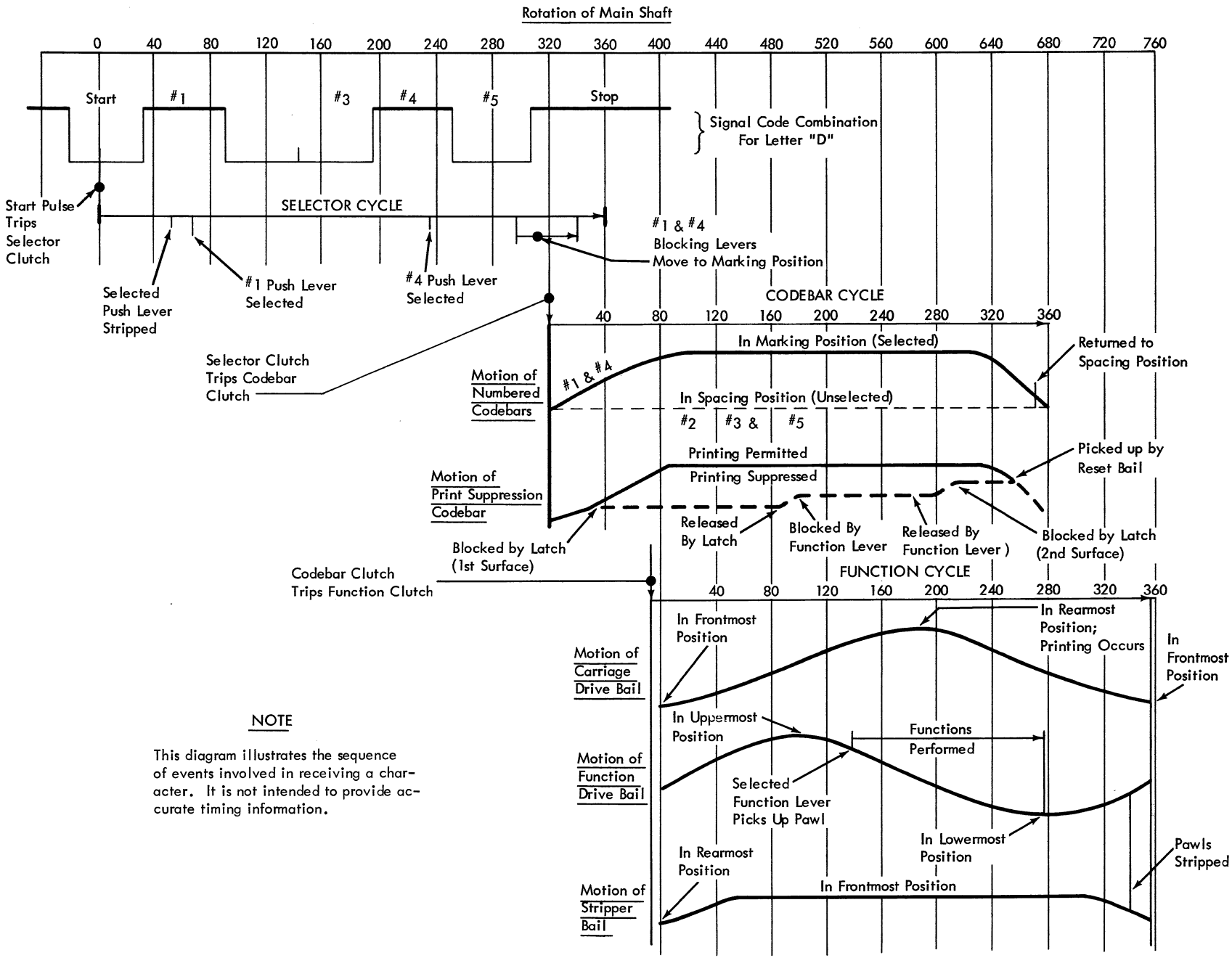


Figure 3-12. Selector, Codebar, and Function Mechanism Timings

- The typewheel is positioned during the function clutch cycle.
- The printing mechanism is contained in the carriage mechanism.
- Character selection is accomplished from two movements of the typewheel:
  1. Rotary.
  2. Vertical.
- The codebars control the amount of rotary and vertical movement of the typewheel.
- Codebars 0, 1, and 2 control the amount of typewheel rotation.
- Codebar 3 controls direction of typewheel rotation.
- Codebars 4 and 5 control vertical typewheel movement.
- The selected character is printed when the hammer is released.
- Printing is suppressed on all functional characters.

The print mechanism is driven by the function mechanism. Character printing is accomplished by positioning the typewheel for the selected character, and then the hammer strikes the typewheel to push the typewheel against the paper and platen.

The typewheel and its positioning device is on a carriage mechanism. The carriage rides on rollers, and a spacing belt moves it horizontally across the tops of the code bars. A carriage-return character releases the carriage so it can be spring-returned to the left margin, where a dash pot pneumatically stops it.

Figure 3-13 shows how a maximum of 64 characters are embossed on the typewheel, which is shaped in the form of a cylinder. There are four vertical rows, with 16 characters around each row. In order to position the typewheel to select a character, two types of movement are basically necessary:

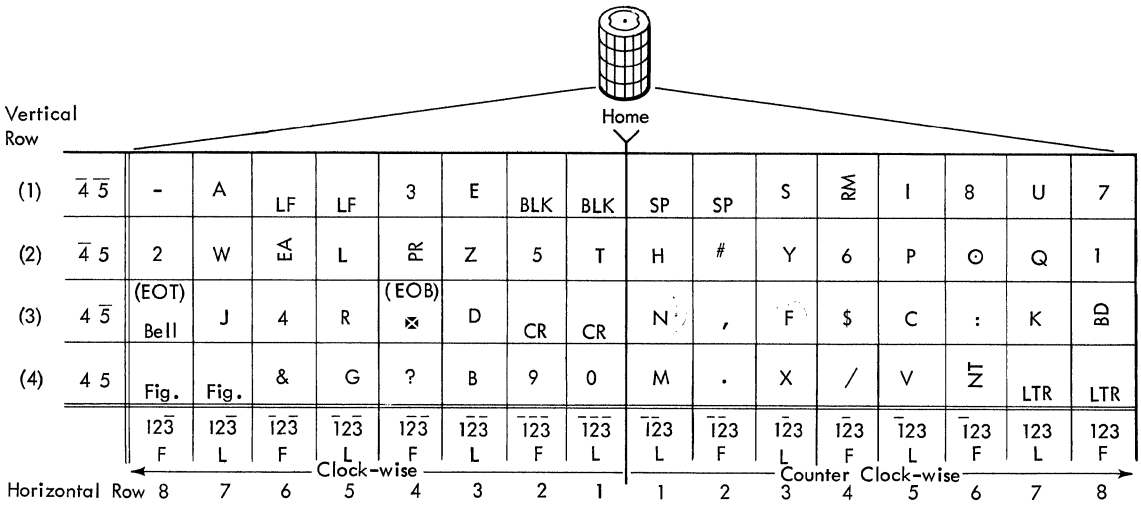
1. Vertical movement to move the typewheel up to select one of the four possible rows.
2. Rotary movement, either clockwise or counter clockwise, to select the character within the vertical row. The rows around the typewheel are numbered 1 through 8 in each direction from the stopped or home position.

The selection of the character on the typewheel is accomplished with the codebars. Gliding on top of the codebars are slides. These slides are raised and lowered as the codebars are positioned up or down. The slides are mechanically linked to the typewheel-positioning mechanism within the carriage assembly.

The character selected on the typewheel is dependent on the position of each codebar.

Note: If an individual codebar is in a mark condition, it is up. If it is in a space condition, it is down.

A few rules can be established concerning each codebar, 0 through 5. (The A and PS codebars are not considered here.)



a. 1 and 2 Code-bars Control Typewheel Rotation.

b. 3 Code-bar Controls Direction of Rotation.

c. 4 and 5 Code-bars Control Vertical Positioning.

d. The Zero Code-bar Controls Letters or Figures Shift. When Down (Spacing) the Odd Numbered (Letters) Rows are Selected; When Up (Marking) the Even Rows (Figures) are Selected.

Unique Characters on Typewheel:

NTPR BD EA RM
- RM — Room
- EA — Each
- BD — Bed
- PR — Person
- NT — Night

Figure 3-13. Typewheel

Rotary Positioning Codebars

0 Letters/figures shift codebar. When down, letters-shift characters are selected in the odd-numbered vertical rows. When up, figures-shift characters are selected in the even-numbered vertical rows.

1 Selects the amount of rotation in either direction along with codebar 2.

2 Selects the amount of rotation in either direction along with codebar 1.

3 Selects direction of rotation clockwise or counterclockwise.

Vertical Positioning Codebars

4 Selects amount of vertical movement along with codebar 5.

5 Selects amount of vertical movement along with codebar 4.

Figure 3-14 shows the status of each codebar (marking or spacing) to select the print positions on the typewheel.

Rotation CW/CCW	Row Selected	Letters/ Figures	Code-bar Positions				Rotary Rack Pulled Forward	Stop Slide Used to Stop Typewheel Rotation	Stop Slide Raised
			0	1	2	3			
CW	1	Letters	SP	SP	SP	SP	Right	Common	None
CW	2	Figures	MK	SP	SP	SP	Right	Common	0
CW	3	Letters	SP	MK	SP	SP	Right	2	Common
CW	4	Figures	MK	MK	SP	SP	Right	2	0-Com.
CW	5	Letters	SP	SP	MK	SP	Right	1	Com-2
CW	6	Figures	MK	SP	MK	SP	Right	1	0-Com-2
CW	7	Letters	SP	MK	MK	SP	Right	0	Com-2-1
CW	8	Figures	MK	MK	MK	SP	Right	0	0-Com-2-1
CCW	1	Letters	SP	SP	SP	MK	Left	Common	None
CCW	2	Figures	MK	SP	SP	MK	Left	Common	0
CCW	3	Letters	SP	MK	SP	MK	Left	2	Common
CCW	4	Figures	MK	MK	SP	MK	Left	2	0-Com.
CCW	5	Letters	SP	SP	MK	MK	Left	1	Com-2
CCW	6	Figures	MK	SP	MK	MK	Left	1	0-Com-2
CCW	7	Letters	SP	MK	MK	MK	Left	0	Com-2-1
CCW	8	Figures	MK	MK	MK	MK	Left	0	0-Com-2-1

Rotary Control of Typewheel (ASR 32)

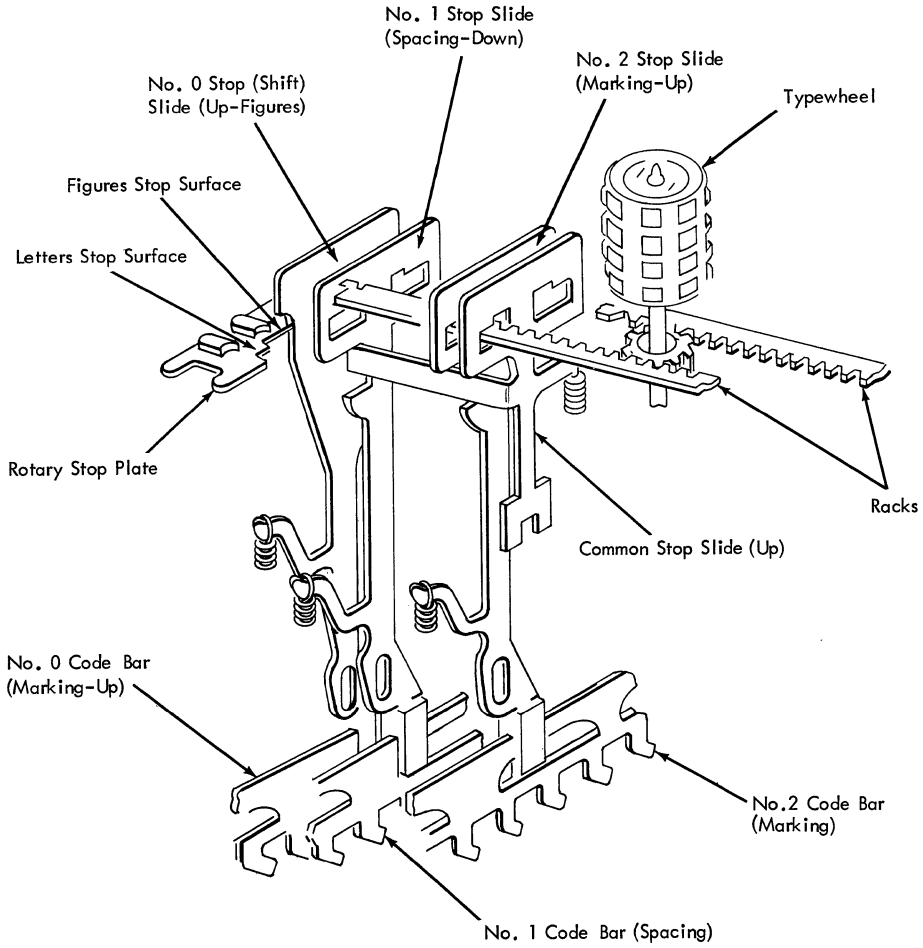
Typewheel (Top)	Row Selected	Code-bar Positions		Stop Arm Used to Stop Vertical Movement
		4	5	
1	1	SP	SP	Common
2	2	SP	MK	4
3	3	MK	SP	5
4	4	MK	MK	None

Vertical Control of Typewheel (ASR 32)

Figure 3-14. Typewheel Positioning (Rotate & Vertical)

Typewheel Rotary Positioning (Figure 3-15)

Codebars 0, 1, and 2 control the rotary positioning mechanism for the typewheel. A stop slide rests on top of each of these codebars, and follows the codebar up and down. These stop slides, numbered 0, 1, and 2, along with a fourth slide called common, stop the rotary motion of the typewheel. The common slide is mechanically linked to the 1 and 2 stop slides, rather than operated from a codebar. If either the 1 or 2 stop slide is up (codebars 1 or 2 marking) the common slide will also be up. Only if both 1 and 2 stop slides are down will the common slide be down.



NOTE:
The O Stop (Shift) Slide, when Up, permits all Stop Slides to move to the rear to select the Figures rows on the typewheel.

Figure 3-15. Typewheel Rotary Positioning Mechanism

Direction Control (Figure 3-16)

A left and right rack is meshed to each side of the typewheel pinion gear. During the function clutch cycle, rotary motion is applied to the typewheel by pulling either the left or right rack forward. If the left rack is pulled forward the typewheel rotates counterclockwise, and the right rack moves towards the rear. For clockwise rotation, the right rack is pulled forward, and the left rack moves to the rear.

The position of codebar 3 determines whether the typewheel will rotate clockwise or counterclockwise. If codebar 3 is spacing (down), the right rack is pulled forward, and the typewheel rotates clockwise. The alternate condition exists if codebar 3 is marking (up). The left rack is pulled forward, and the typewheel rotates counterclockwise.

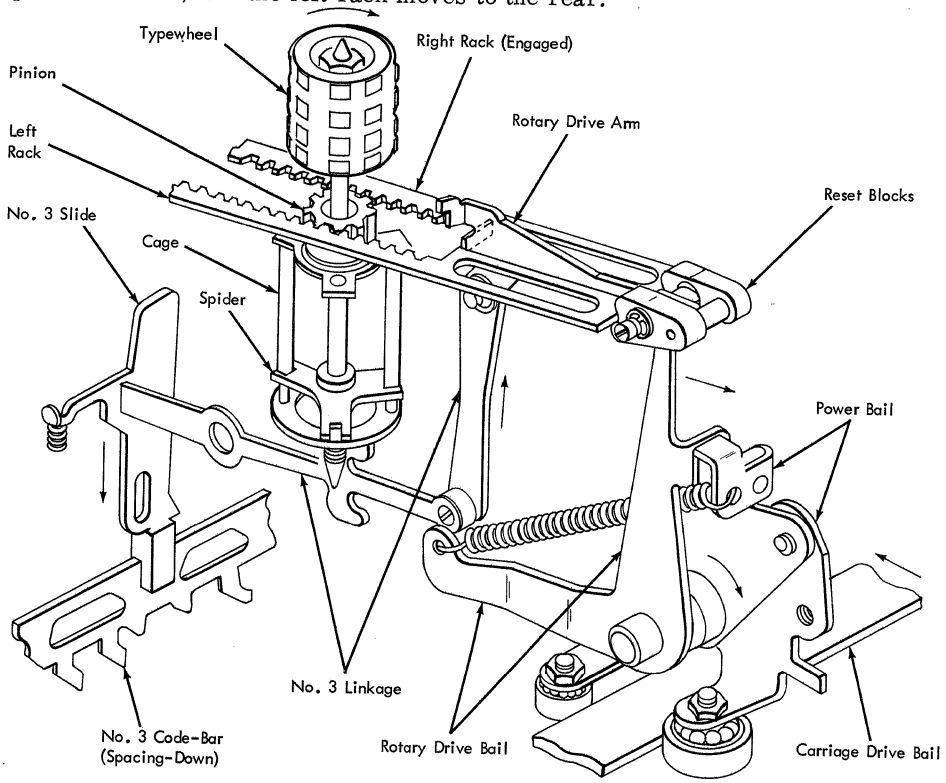
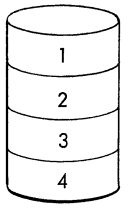


Figure 3-16. Typewheel Direction Control Mechanism

As either rack moves towards the rear it strikes the first stop slide that is down. This stops the motion of the rack, and consequently stops the rotation of the typewheel. How far the typewheel rotates is determined by the stop slides. Minimum rotation results if the common slide is down. The chart in Figure 3-17 shows the stop slides used to select the typewheel position.

Rotation CW/CCW	Row Selected	Letters/ Figures	Code-bar Positions				Rotary Rack Pulled Forward	Stop Slide Used to Stop Typewheel Rotation	Stop Slide Raised
			0	1	2	3			
CW	1	Letters	SP	SP	SP	SP	Right	Common	None
CW	2	Figures	MK	SP	SP	SP	Right	Common	0
CW	3	Letters	SP	MK	SP	SP	Right	2	Common
CW	4	Figures	MK	MK	SP	SP	Right	2	0-Com.
CW	5	Letters	SP	SP	MK	SP	Right	1	Com-2
CW	6	Figures	MK	SP	MK	SP	Right	1	0-Com-2
CW	7	Letters	SP	MK	MK	SP	Right	0	Com-2-1
CW	8	Figures	MK	MK	MK	SP	Right	0	0-Com-2-1
CCW	1	Letters	SP	SP	SP	MK	Left	Common	None
CCW	2	Figures	MK	SP	SP	MK	Left	Common	0
CCW	3	Letters	SP	MK	SP	MK	Left	2	Common
CCW	4	Figures	MK	MK	SP	MK	Left	2	0-Com.
CCW	5	Letters	SP	SP	MK	MK	Left	1	Com-2
CCW	6	Figures	MK	SP	MK	MK	Left	1	0-Com-2
CCW	7	Letters	SP	MK	MK	MK	Left	0	Com-2-1
CCW	8	Figures	MK	MK	MK	MK	Left	0	0-Com-2-1

Rotary Control of Typewheel (ASR 32)



Row Selected	Code-bar Positions		Stop Arm Used to Stop Vertical Movement
	4	5	
1	SP	SP	Common
2	SP	MK	4
3	MK	SP	5
4	MK	MK	None

Vertical Control of Typewheel (ASR 32)

Figure 3-17. Typewheel Positioning (Rotate & Vertical)

Typewheel Vertical Positioning (Figure 3-18)

Codebars 4 and 5 control the vertical movement of the typewheel during the function clutch cycle. The slides on top of the codebars position the three stop arms (numbers 4, 5, and common) which actually stop and select the vertical rows on the typewheel.

The common stop arm, which is the longest of the three, is in position to stop the vertical drive bail and select the top row if both the 4 and 5 codebars are spacing (down). If either the 4 or 5 codebars are marking (up), the common stop arm is pivoted away from the vertical drive bail.

The 5-codebar marking, and 4-spacing select row 2 with the 4-stop arm (intermediate length). The 4-marking and 5-spacing select row 3 with the 5-stop arm (shortest length). When both the 4 and 5 codebars are marking (up), all three of the stop arms pivot out of the way of the vertical drive bail, and row 4 is selected. The shoulder on the common stop arm stops the vertical movement of the typewheel.

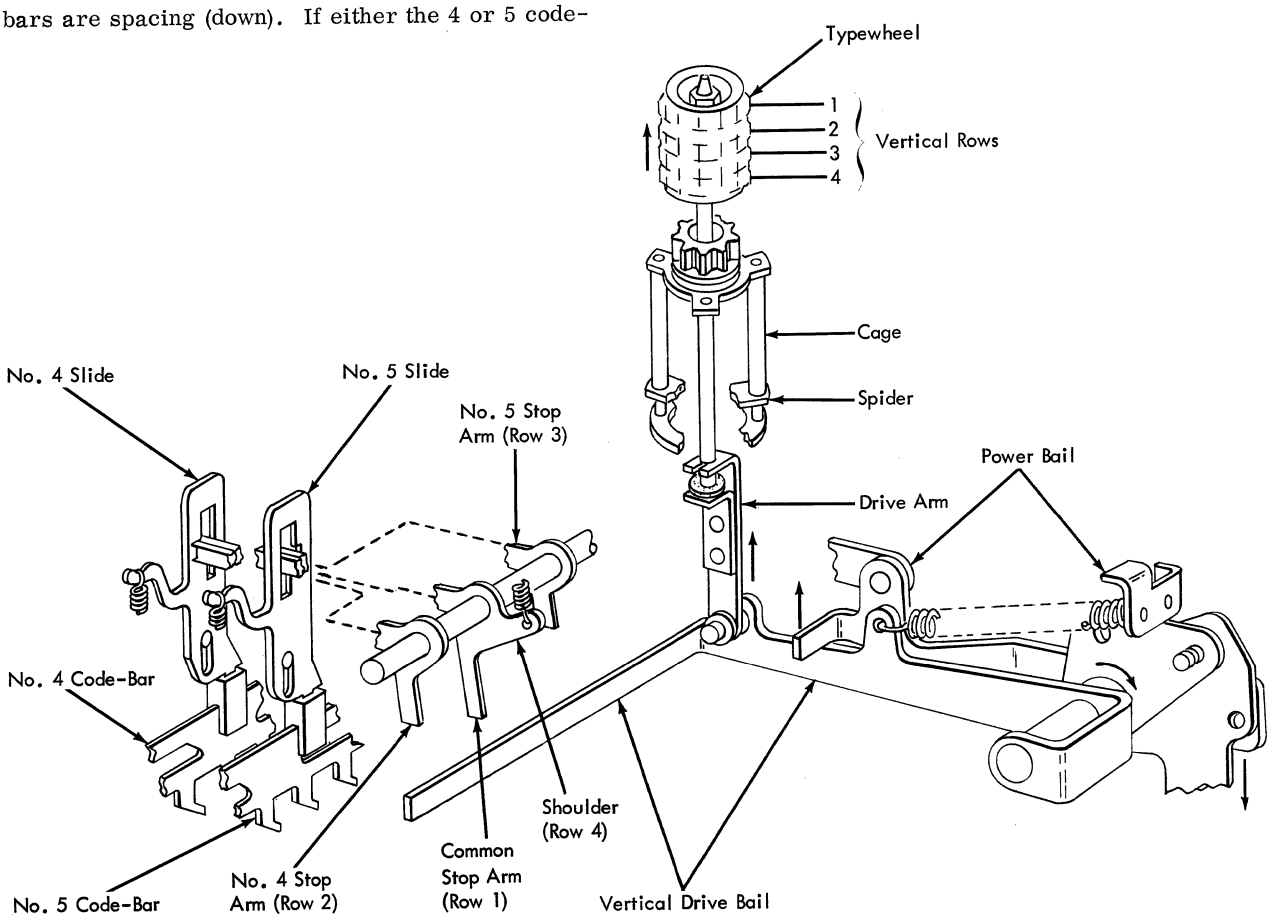


Figure 3-18. Typewheel Vertical Positioning Mechanism

Print (Figure 3-19)

To print the character, the hammer is released to strike the typewheel and push it against the paper and platen. Midway through every function clutch cycle, the print trip lever is unlatched from the print hammer bail. The hammer will release at this time unless the print-suppression latch lever keeps the hammer from striking the typewheel.

If the print-suppression codebar is down (spacing), the print-suppression latch lever is in position to stop the hammer. When the print-suppression codebar is up (marking), the print-suppression latch lever is positioned away from the print hammer, and the hammer is released.

All functional operations (line feed, carriage return, spacing, bell) suppress printing. During these operations a functional lever moves up and engages into one of a series of notches on the underside of the print suppression codebar. The selected function lever holds the print-suppression lever down and to the right, and therefore engages the print-suppression latch lever with the hammer bail, to prevent the hammer from striking the typewheel when released by the print-trip lever.

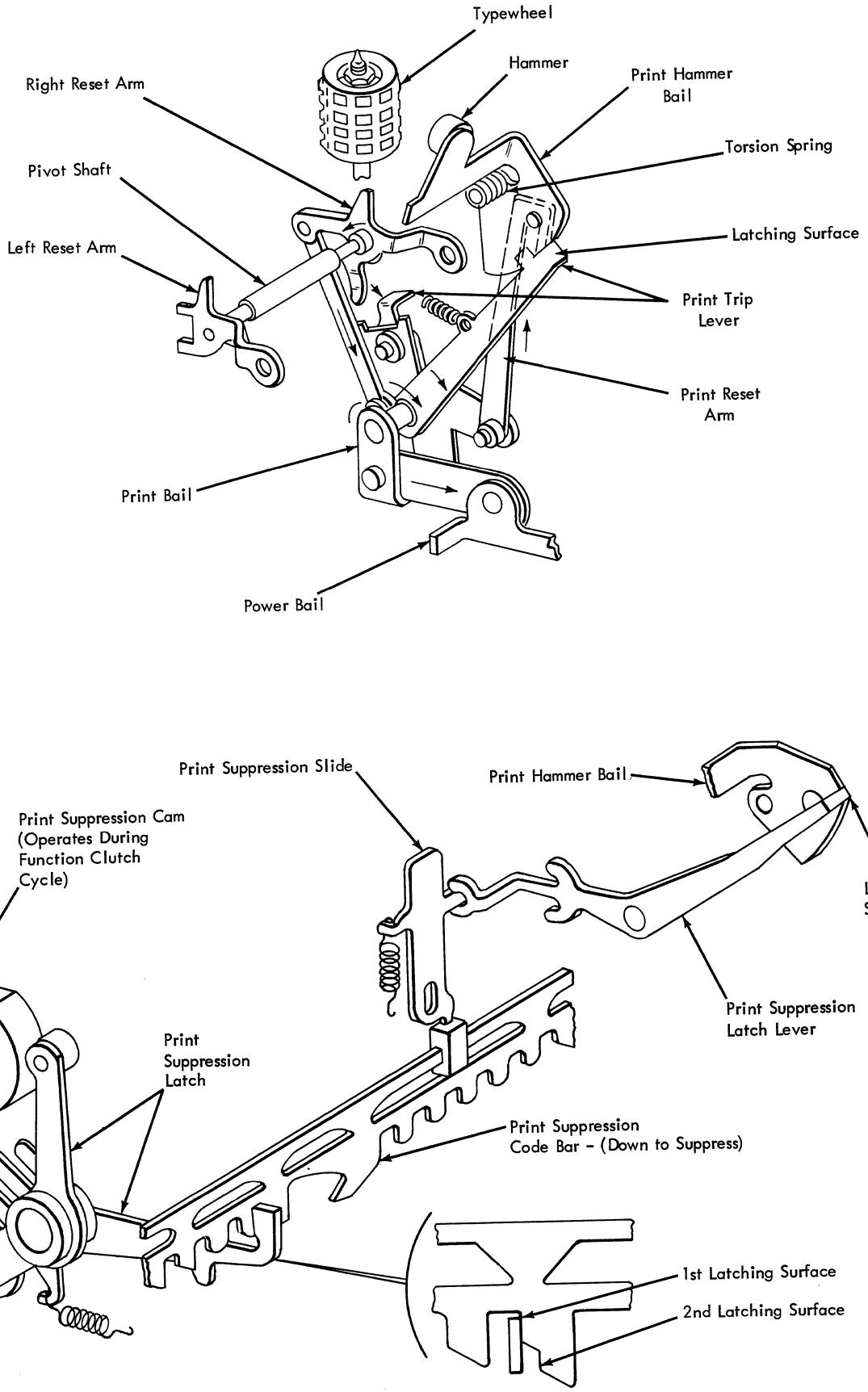


Figure 3-19. Print Hammer Release & Suppress Mechanism

Space Mechanism (Figure 3-19)

- Spacing occurs during the function clutch cycle, but after the character is printed.
- Spacing is suppressed on all functional characters except the space character.

Character spacing is performed during the function clutch cycle. After each character is printed, the entire carriage mechanism is moved one space by the spacing mechanism.

The carriage mechanism, which contains the print mechanism, is moved across the paper, left to right, with a spacing belt. The belt is driven from a drive pulley attached to a ratchet. The ratchet is advanced, a tooth at a time, with the space feed pawl. After each space, the check pawl detents in a ratchet tooth to hold the carriage in position (a of Figure 3-20).

When printing and spacing occur, the PS codebar moves up and to the left, and thereby pivots the space-suppression lever out of the way of the space feed-pawl toggle link (b of Figure 3-20). Consequently the pawl moves into the next tooth on the ratchet as the carriage-drive bail moves to the rear. As the bail moves toward the front the ratchet and space pulley rotate to move the carriage.

If a space code combination is set up in the codebars, the PS codebar is positioned down to suppress printing and spacing. In this case, the space function lever is raised to pivot the space-suppression lever out of the way of the space feed-pawl toggle link, and spacing is allowed.

On all functions except space, both spacing and printing are suppressed. The print-suppress codebar affects a space-suppression lever, and causes it to block or allow spacing. When printing is suppressed, the PS codebar is down and to the right. With the codebar down, this allows the space-suppression lever to block the movement of the space-feed pawl. If the pawl does not move into the next tooth on the ratchet, no spacing will occur.

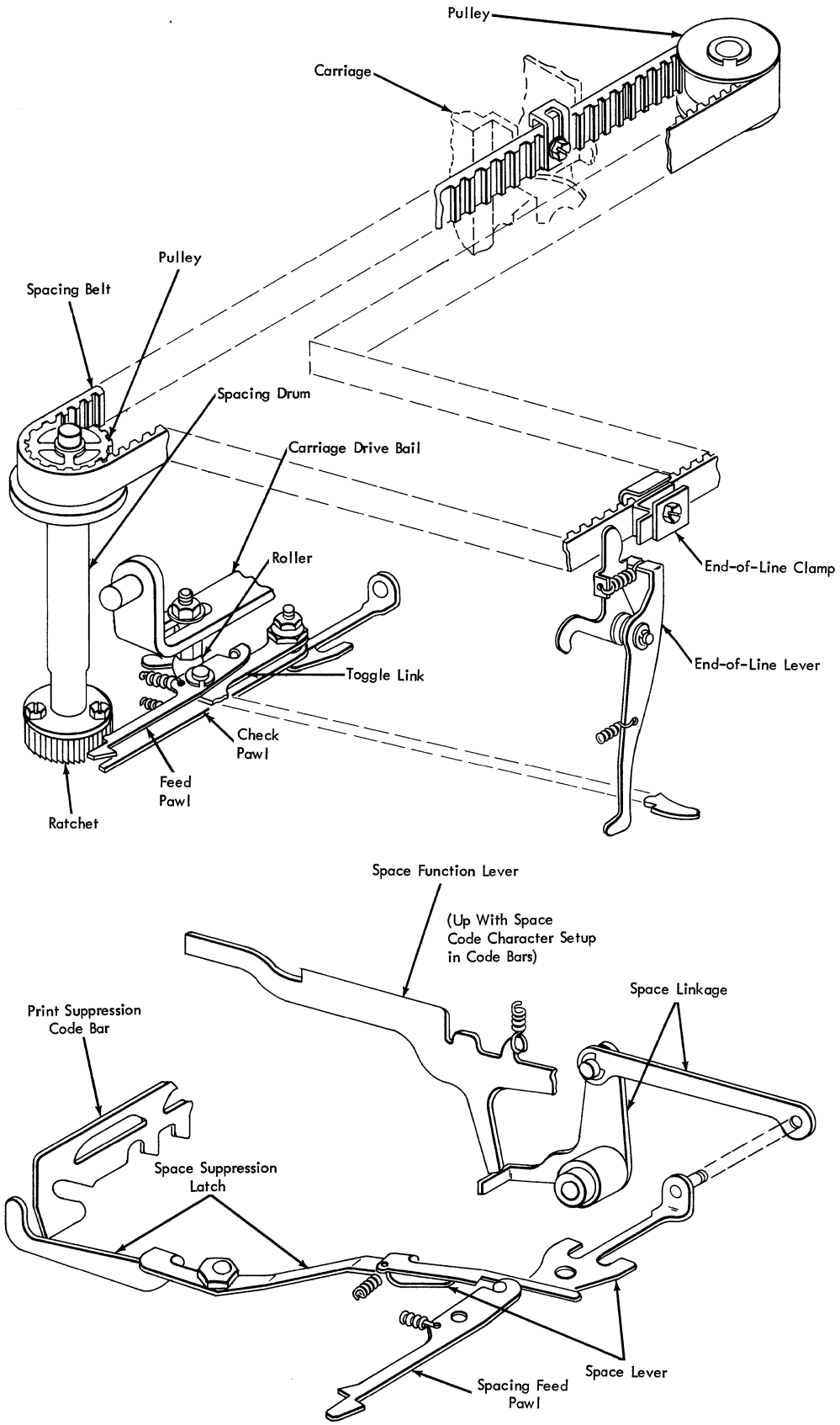


Figure 3-20. Carriage Spacing Mechanism

Carriage Return Mechanism (Figure 3-21)

- A carriage-return character set up in the codebars causes the carriage to return.
- A line feed is not automatic with a carriage return.

The carriage mechanism returns to the left margin only when a CR character (4) is set up in the codebars. The codebars permit the CR function lever to move fully upward, and, therefore, latch the CR function pawl onto the function lever. As the function lever moves downward, it carries the function pawl and carriage-return actuating lever with it. The downward motion of the actuating lever, through mechanical linkage, latches the space-feed pawl and the check pawl out of engagement with the spacing ratchet. The carriage-return spring then returns the carriage mechanism to the left margin, where a dash pot cushions the carriage to stop without excessive shock.

The carriage remains at the left margin, and no spacing can occur until a nonfunction character is set up in the codebars. Only a nonfunction character will unlatch the spacing feed and check pawls so they can engage the spacing ratchet.

Remember: a line feed function is necessary after every carriage return, or overprinting will occur. Therefore a LF character must follow a CR character. The space feed and check pawls will not unlatch with the LF character, because it is a function character.

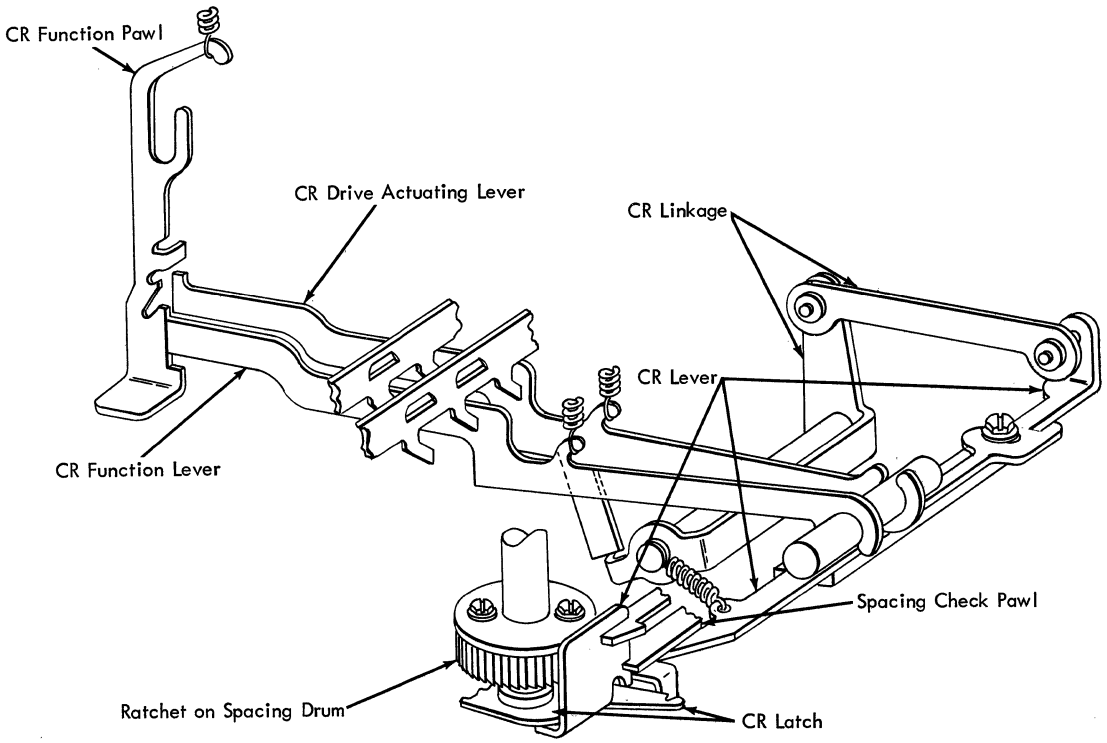


Figure 3-21. Carriage Return Mechanism

Line Feed Mechanism (Figure 3-22)

- A line feed character set up in the codebars cause a line feed function.

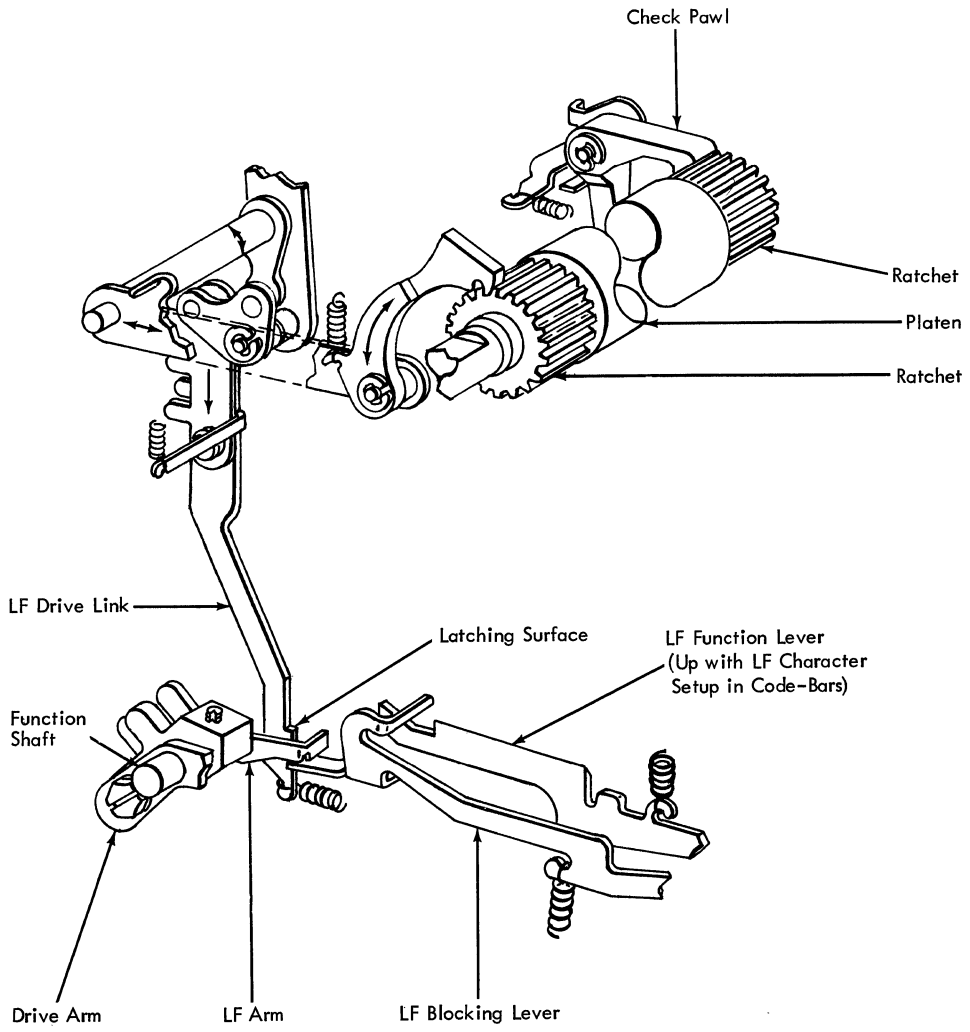


Figure 3-22. Line Feed Mechanism

The line-feed mechanism on this ASR 32 is a friction-feed device, and can be set for single or double-line feed. (The selection of single or double line feed is set by the customer engineer, and cannot be changed by the operator.) A line-feed operation is performed during the function clutch cycle when the LF code (2) is set up in the codebars. Since LF is a functional character, both printing and spacing are suppressed.

A LF code combination set up in the codebars permits the LF function lever to move fully upward during the first half of the function clutch cycle. As it moves up, it carries with it the LF blocking lever, which in its most upward position latches onto the LF drive link. As the LF blocking lever is driven downward during the last half of the function clutch cycle, the LF drive link is also pulled down to rotate the platen to the next printing line.

Answerback Drum Mechanism (Figure 3-23)

- The answerback drum is used to emit scan pulses.
- The distributor clutch is tripped whenever the answerback drum magnet is energized.
- The answerback drum emits 21 pulses during each revolution.
- The distributor clutch rotates 21 revolutions during each revolution of the answerback drum.
- The relay-switching matrix is used to generate four different scan operations.
- The enter key and send key initiate the answerback drum cycles.

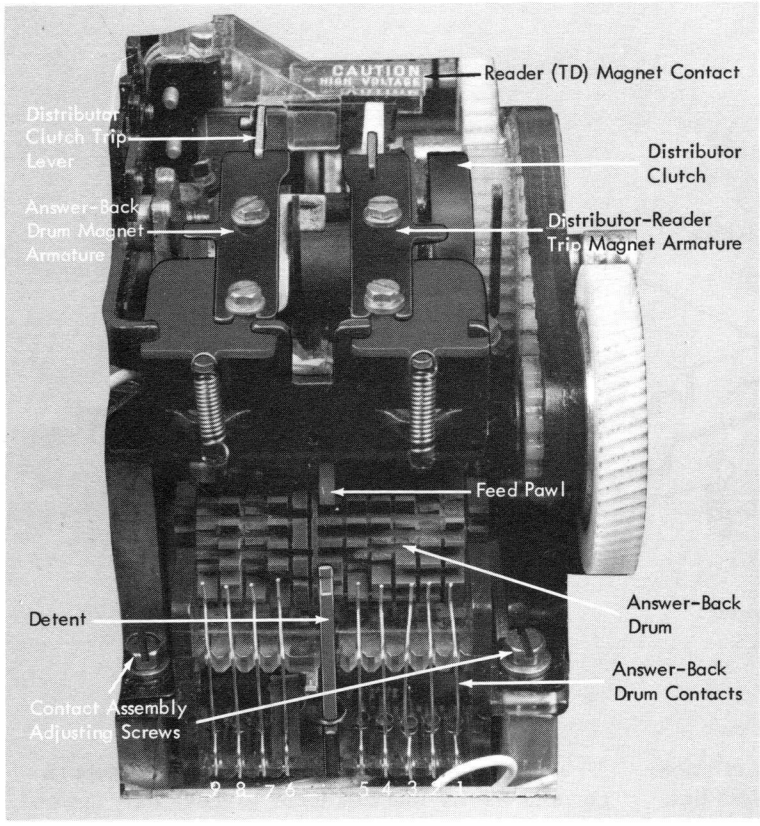


Figure 3-23. Answerback Drum Mechanism

The answerback drum mechanism was so named by TELETYPE Corporation because its purpose was to transmit a predetermined number and sequence of characters in answer to a request.

The IBM 1971 Reservation Terminal Model 20 uses the same mechanism, but for an entirely different purpose. This purpose is twofold:

1. To provide electrical pulses to scan the RAP keyboard and punch into paper tape (and print) the information set up in the keyboard.
2. To cause punching into paper tape functional characters that control and terminate the message sent from the terminal.

The answerback mechanism consists of a phenolic drum, wire contacts, a trip magnet, and mechanical linkages to advance the drum.

The drum (Figure 3-24) has 11 levels across its length. Nine are used with wire contacts to emit scan pulses. One level is for the feed ratchet to mechanically advance the drum. One level is for the

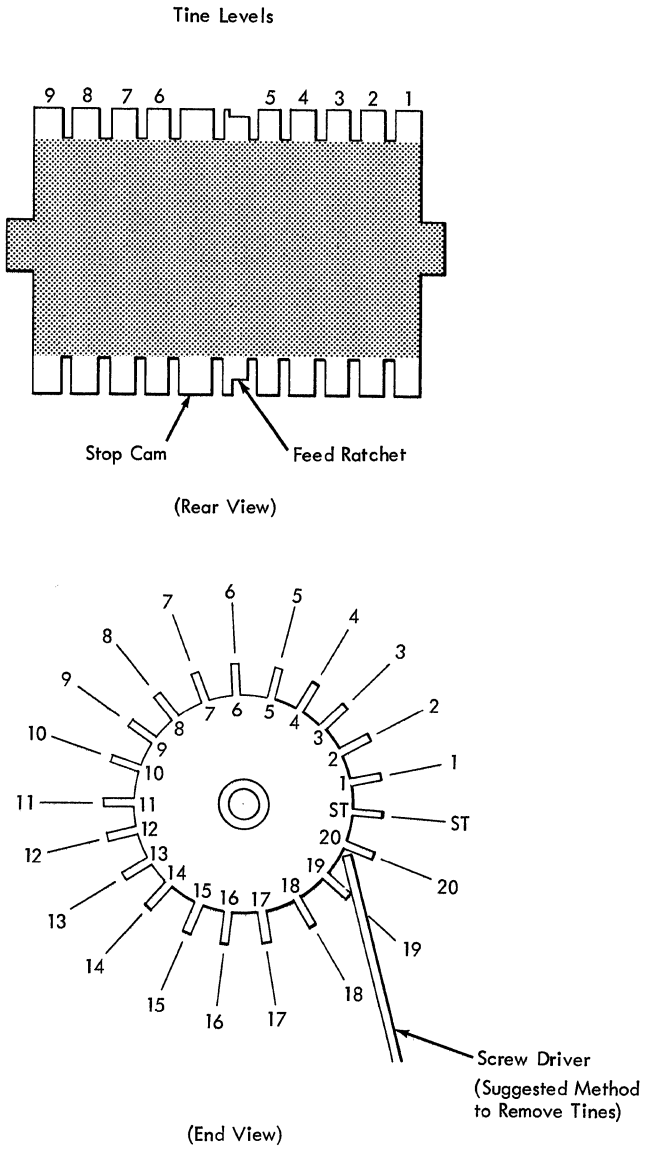


Figure 3-24. Answerback Drum

stop cam arm. Around the drum there are 21 rows of tines, 20 of which are used to emit scan pulses. (One row is reserved for start, ST, or home position.) By breaking off certain tines, these 20 pulses are emitted during each scan cycle (revolution) of the drum.

Through relay switching (control circuitry) four different scans are generated. Scans 1 and 2 are initiated with the enter key, Scan 3 with the send key. The fourth scan is a special operation, and is initiated with the available key. For detailed operations of the scan cycles, see Terminal Operation Examples.

To operate the answerback drum mechanism, the answerback drum magnet is energized. The magnet armature is mechanically linked to trip the distributor clutch. The cam roller on the distributor clutch operates the answerback drum feed pawl to advance the drum. Also the distributor clutch rotates the brush holder to distribute the electrical pulses (start, 1, 2, 3, 4, 5, stop) to the selector magnet.

Because the distributor clutch is tripped from the answerback drum magnet, the clutch trip lever is mechanically held in the tripped position. This prevents the clutch from stopping until the answerback drum has completed a scan cycle (one revolution). Consequently, the distributor clutch will make 21 cycles while the answerback drum completes 1 cycle. This 21 to 1 ratio is necessary because 21 pulses (20 usable) are emitted during 1 answerback drum cycle, and a distributor cycle is required for each pulse so the bits (start, 1, 2, 3, 4, 5, stop) for the characters can be selected.

PAPER TAPE PUNCH UNIT (FIGURE 3-25)

- The punch unit punches 5-channel paper tape.
- The punch can be turned off, but should always be left on.
- Tape punching occurs simultaneously while the characters are printed.
- The punch-unit sensing levers are set up during the codebar clutch cycle.
- The punches are actually driven during the function clutch cycle.
- Tape feeding occurs during the last part of the function clutch cycle.

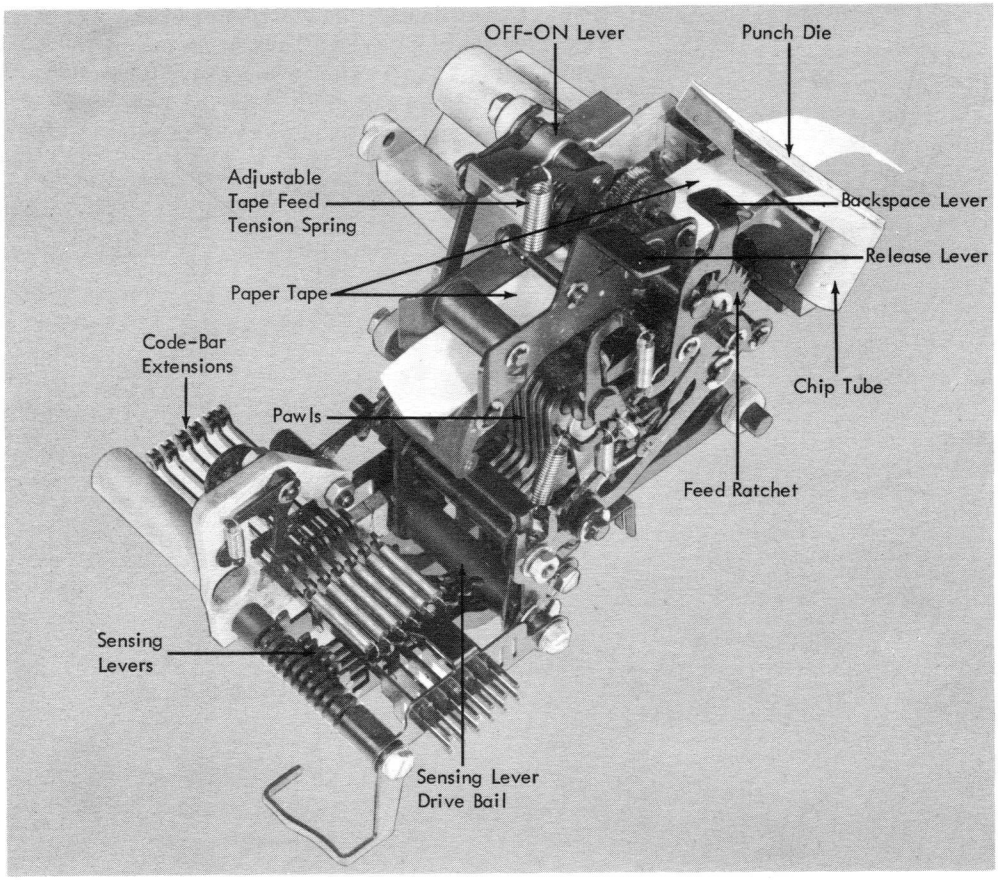


Figure 3-25. Paper-Tape Punch

The paper-tape punch, which punches a 5-channel tape, is attached to the left side of the typing unit. The unit is entirely mechanical, and utilizes no electrical controls.

Four pushbuttons are mounted on the tape punch cover. Each of these buttons control a mechanical linkage or lever within the punch unit. An explanation of the buttons follows:

ON: This button pivots a lever that attaches to the drive link. When pressed, it mechanically engages the drive link to the punch drive mechanism. All characters printed will also punch.

OFF: This button pivots the same lever as the ON button, except in the opposite direction. When pressed, the drive link disengages from the punch drive mechanism. No punching will occur.

REL (Release): When held pressed, this button opens the punch feed wheel, and releases the tape so it can be pulled either frontward or backward.

B.SP. (Backspace): For each pressing of this button, the tape will backspace one column. Pressing the button causes the backspace lever to engage with the feed-wheel ratchet, and rotate the ratchet backward one tooth.

When the tape punch is ON, tape punching occurs simultaneously while the character is printed. To punch paper tape, only two basic mechanical operations are required. These two operations are derived from the typing unit, and occur during the codebar clutch cycle and the function-clutch cycle respectively.

First, the codebar clutch cycle positions the codebars according to the code configuration of the character to be printed, see Codebar Mechanism. Any codebar set to a marking position is up and fully to the left, whereas any codebar in a space position is blocked by its blocking lever, and remains down and not to the left.

Attached to the ends of codebars 0 through 5 are codebar extensions, which extend into the punch unit. On the underside of each codebar extension is a tab that lines up over its respective sensing lever in the punch unit (Figure 3-25). Any codebar extension in a marking position moves its tab to the left and away from its sensing lever. Any codebar extension in a spacing position remains with its tab directly over its sensing lever. Consequently, only the sensing lever under a marking codebar extension is permitted to move in an upward direction during the function clutch cycle.

The second operation within the punch unit occurs during the function clutch cycle. The drive link, which is attached to the function rocker shaft in the typing unit, moves the drive mechanism. During the first half of the function clutch cycle, the drive mechanism operates the sensing-lever drive bail upward (Figure 3-26). The upward movement of the bail also allows the sensing levers to move upward under spring tension. The upward movement of a sensing lever is blocked if its associated codebar extension

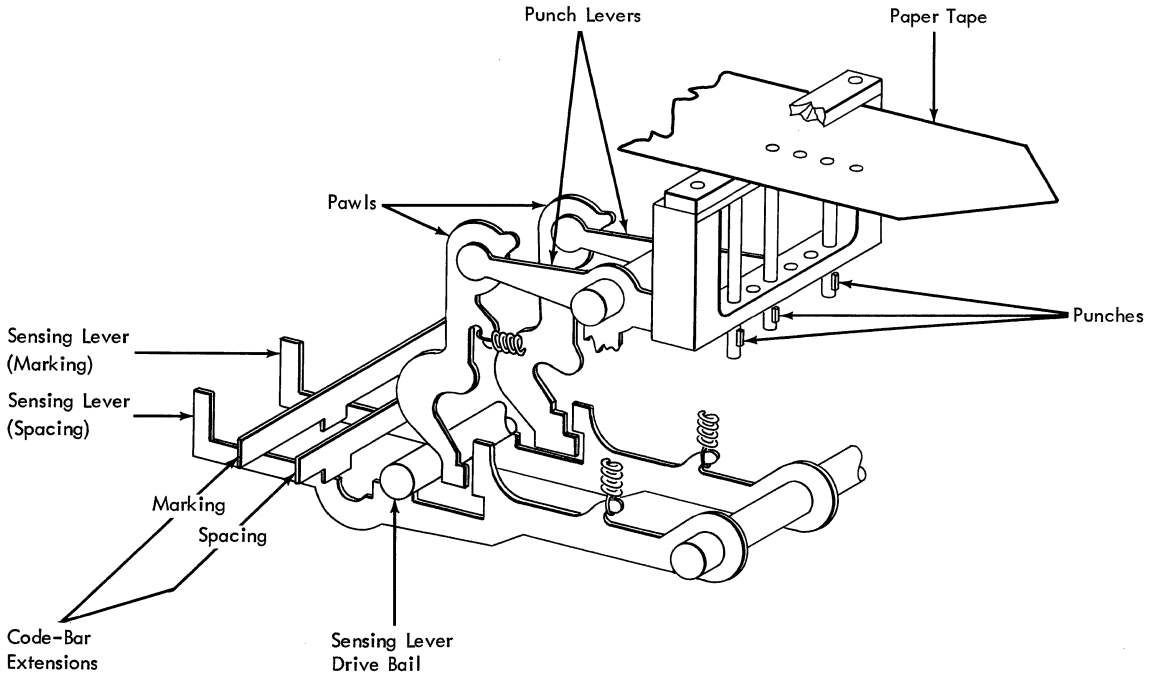


Figure 3-26. Paper-Tape Punch Mechanism

is spacing, whereas any codebar extension in a marking position allows its sensing lever to move fully upward, and latch onto its pawl.

Also during the first half of the function cycle, the tape-feed-wheel mechanism operates to advance tape one step. A feed pawl and ratchet wheel provide the movement to the feed wheel.

During the last half of the function clutch cycle, the sensing lever bail is driven downward. Any sensing lever in a mark condition (fully upward) has its pawl latched onto the lever. Consequently the pawl is pulled downward with the sensing lever. As the pawl moves down, it pivots a lever attached to a punch, and the punch is driven through the tape.

It is necessary during every punch cycle (function clutch cycle) to punch a feed hole into the tape. This feed hole is smaller than the intelligence hole, and is later used to feed tape through the tape reader.

This feed hole is mechanically punched just like the intelligence holes, with one exception. The feed hole sensing lever is not controlled by a codebar extension. Therefore, the sensing lever latches onto its pawl on every punch cycle, and the feed hole punch is driven through the tape.

PAPER TAPE READER UNIT (FIGURE 3-27)

- The reader unit reads only 5-channel paper tape.
- Sensing pins read the holes in the tape.
- The reader is used only during a transmit operation from the terminal.
- The reader (TD) magnet operates the reader mechanism.
- The reader magnet is energized from the TD feed contact (reader magnet contact) in the typing unit.
- The distributor-reader trip magnet in the typing unit is energized to operate the reader magnet contact, and also trip the distributor clutch.

The 5-channel paper tape reader is mounted on the left side of the typing unit, just in front of the punch unit. It is so located that tape feeding out of the tape punch can feed directly into the reader.

Five sensing pins with associated wire contacts sense the presence of the holes in the paper tape. These sensing pins, and the tape feed wheel ratchet, are driven from a tape reader magnet and armature extension mechanism. The magnet is impulsed each time a character is read.

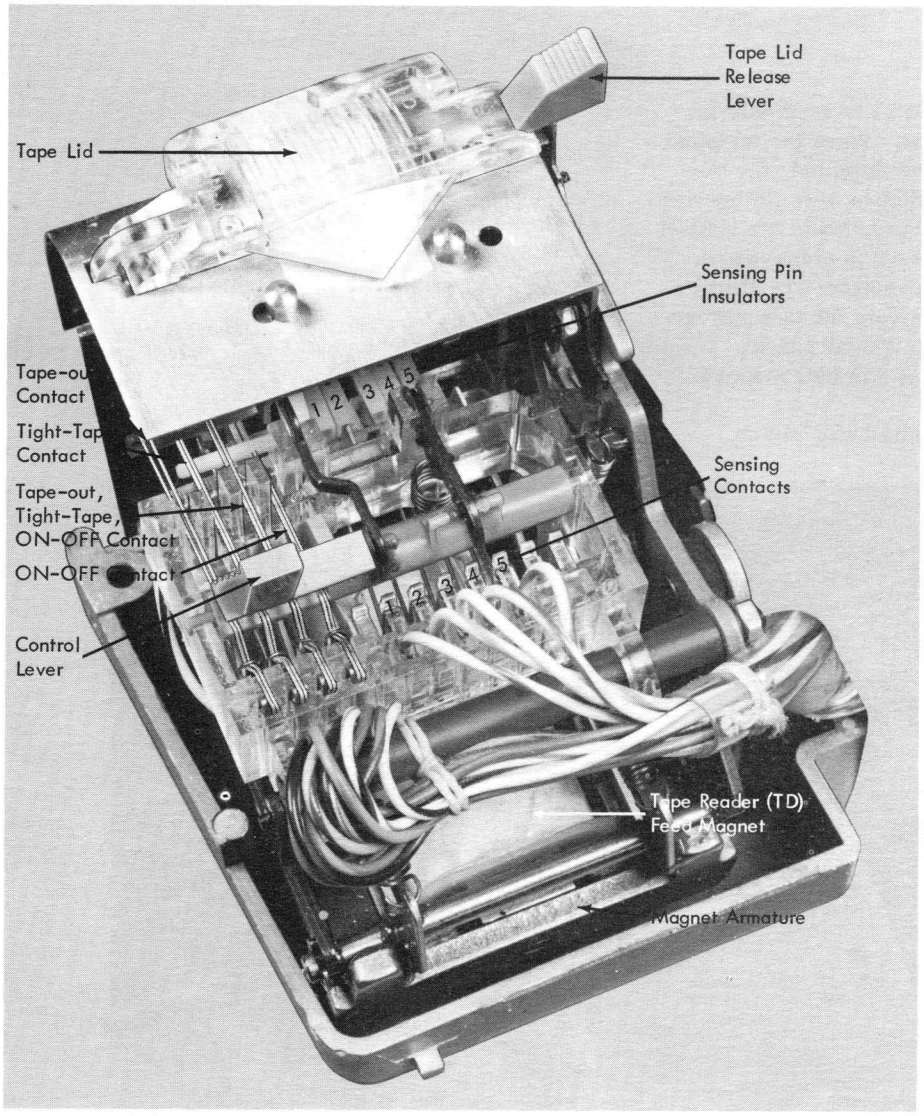


Figure 3-27. Paper-Tape Reader

The tape reader in this ASR 32 is used only to transmit data from the terminal. When the terminal is ready to send a message, and is polled, the distributor-reader trip magnet, Figure 3-28 (in the ASR 32) is energized. Control circuitry holds the magnet energized until the entire message is transmitted.

The distributor-reader trip-magnet armature, while attracted, releases and pivots the tape reader trip lever. This trip lever has two purposes:

1. It immediately closes the tape reader magnet contact.
2. It mechanically trips the distributor clutch.

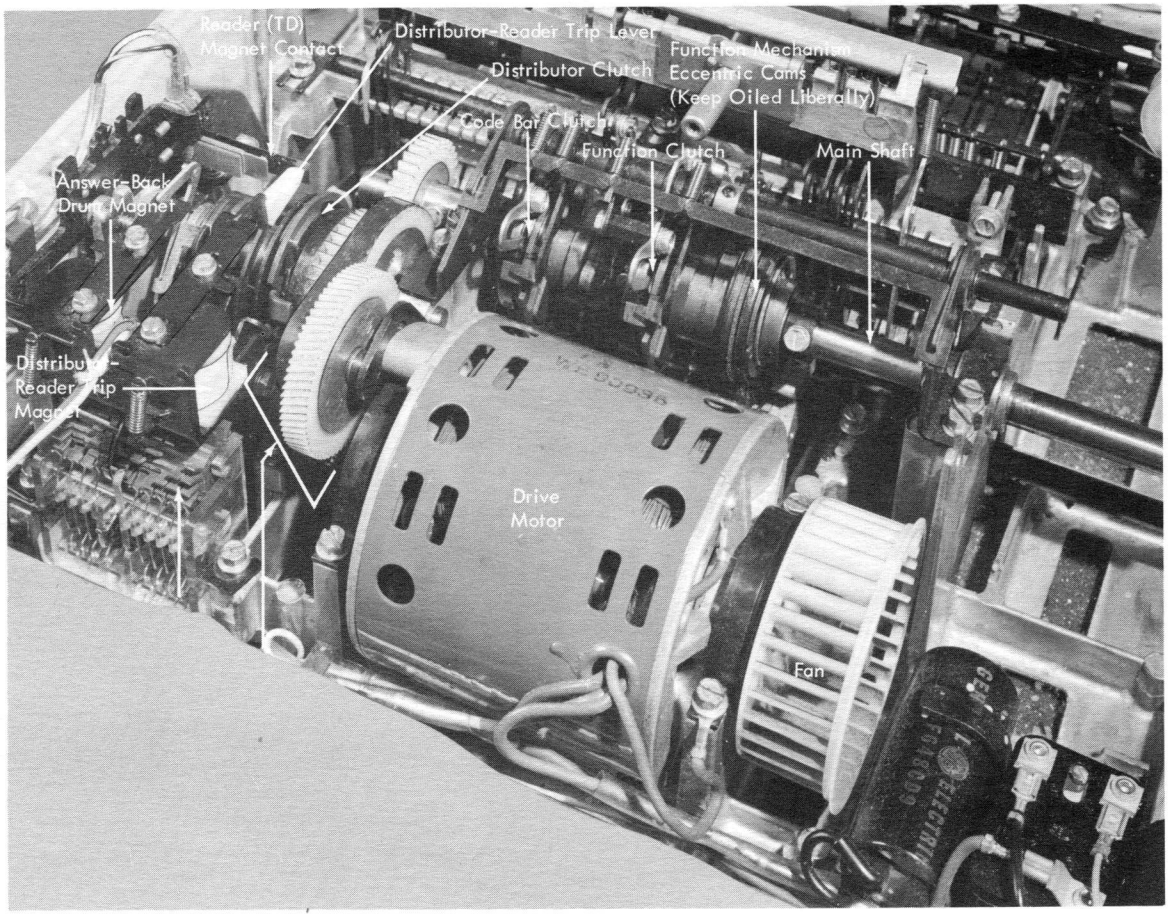


Figure 3-28. Distributor-Reader Trip Magnet Mechanism

The tape reader magnet contact, when closed, energizes the tape reader magnet, (Figure 3-29) in the reader. The reader magnet armature (while attracted) transfers motion through the armature extension to drive the sensing pins upward. A sensing pin stopped by the tape (no hole) will have its sensing contact open (spacing), whereas a sensing pin that passes through the hole in tape closes its sensing contact (marking). The armature, while attracted, also raises the feed pawl to engage a new tooth on the ratchet, but the ratchet is not stepped until the armature is de-energized.

The trip lever also mechanically trips the distributor clutch. The distributor emits the start pulse (space) directly to the transmit relay, while the character intelligence pulses (1, 2, 3, 4, 5) strobe the reader sensing contacts. Any contact closed (marking) transfers its pulse through the

respective distributor segment to the transmit relay. The stop pulse is emitted directly to the transmit relay.

Toward the end of the distributor cycle, the roller on the distributor shaft assembly cams the trip lever to its reset position. The distributor-reader trip magnet (in the ASR 32) remains energized until the end of the message. Therefore the trip lever does not relatch onto the armature.

The tape reader trip lever, while being reset, opens the reader magnet contact to de-energize the reader magnet. As the armature extension moves downward, the sensing pins are retracted, and the feed pawl advances the ratchet to step the paper tape.

As long as the distributor-reader trip magnet remains energized, the trip lever does not relatch onto the armature. Consequently the tape reader and the distributor clutch continue the read operation. Only when the EOB character (end of block) is transmitted, will the distributor-reader trip magnet de-energize to stop the operation.

Several features are incorporated into the reader that control the operation of the reader. A control lever extends out the top of the reader, and can be positioned to any of three positions. In its most forward position (stop-free) the circuit to the reader magnet is opened, and also a mechanical linkage frees the feed-wheel ratchet from the feed pawl and detent so the tape can be pulled by hand through the reader.

When the control lever is positioned in the center, the circuit to the magnet is still open, but the feed pawl and detent engage with the ratchet. Only when the control lever is moved to the start position is the circuit closed to the reader magnet so it can be energized.

A tight tape and a tape-out feature is also provided. If either of these two conditions exists, the circuit to the reader magnet is opened to prevent the reader from operating.

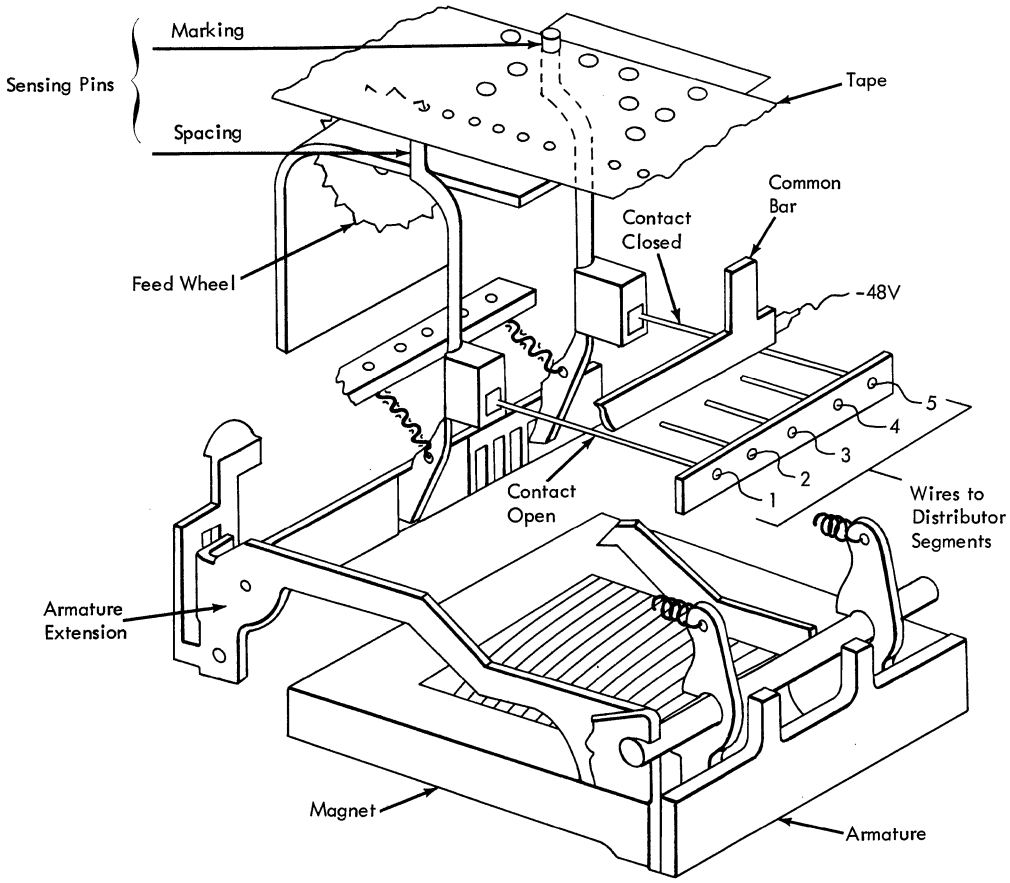


Figure 3-29. Paper-Tape Reader Mechanism

Figure 3-30 is a summary illustration and description of the operation of the ASR 32.

ASR 32 OPERATION SCHEMATIC

This is a schematic of the operation of the ASR 32. Basically, it illustrates the main drive mechanism and the sequential operation of the mechanisms driven from the main shaft.

Operation

(1) The drive motor, which provides the drive to the distributor-clutch drive gear and the mainshaft, runs continually when the power on switch is ON.

(2) Pressing any key (except REPT) on the keyboard:

a. Sets up the keyboard codebars,

b. Closes certain contacts, which set up the electrical code for the character,

c. Unlatches the universal lever, which mechanically trips the distributor clutch.

(3) The distributor clutch drives the distributor disk to scan the keyboard contacts. The common wiper controls the selector magnet as follows:

a. Start segment: De-energizes the selector magnet, which trips the selector clutch.

b. 1,2,3,4,5 segments: Scans the keyboard contacts. Any contact closed energizes the selector magnet, whereas any contact open de-energizes the magnet.

c. Stop segment: Energizes the selector magnet to latch the selector clutch.

(4) The selector magnet, when de-energized from the start segment on the distributor, trips the selector clutch. As the selector camshaft rotates, the intelligence-pulses (1,2,3,4,5) from the keyboard control the magnet and cause the blocking levers to set up. The blocking levers mechanically store the character-bit configuration.

Just before the end of the selector clutch cycle, the codebar clutch is mechanically tripped.

(5) During the codebar clutch cycle, the codebars in the typing unit are set up. The codebars control the typewheel so the desired character to print is selected.

A blocking lever positioned down (spacing) blocks the leftward movement of the corresponding codebar to position it down. Likewise, any blocking lever positioned up (marking) is out of the way of its corresponding codebar, and the codebar travels all the way toward the left and also up.

The function clutch is mechanically tripped during the codebar clutch cycle.

(6) The function clutch drives the function camshaft, the function bail eccentric, and the carriage drive bail eccentric.

NOTE: Keep the two eccentric cams lubricated liberally.

(7) The function mechanism operates up and down during the function clutch cycle. The function levers operate if a function character is set up in the codebars.

(8) The carriage drive eccentric operates the carriage drive bail to position the typewheel. Both rotary and vertical movement is applied to the typewheel. The character selected for printing is controlled by the codebars, which position the rotary stop slides and the vertical stop arms. The hammer is released during the function clutch cycle.

(9) The enter key or the send key energizes the answerback drum magnet. The answerback drum emits pulses to scan the RAP keyboard. The distributor clutch is tripped mechanically by a linkage from the answerback drum magnet armature.

In this case, the distributor terminates the pulses from the RAP keyboard and controls the selector magnet.

Steps (4) through (8) are repeated to set up the character for printing and punching.

10 Codebar extensions mechanically set up the punch unit. All characters set up in the codebars are also set up and punched in paper tape.

(11) The distributor-reader trip magnet energizes as a result of pressing the send key. When the send key is actually pressed, the answerback drum magnet is energized for scan 3. At scan point 20 the distributor-reader trip magnet is energized. When the armature is attracted it mechanically trips the distributor clutch, and also operates the paper-tape reader contact. The contact causes the tape reader to advance tape up to the first data character to be transmitted. When polled, the distributor-reader trip magnet is again energized to read tape and transmit the message. The magnet is de-energized at the end of the message (EOB character).

(12) While transmitting, the receive relay operates to local copy all transmitted data. The selector magnet is operated from the receive relay and the control circuitry to local copy (print and punch) the transmitted data.

When the terminal is addressed to receive a message from the central processor, the data is also fed from the receive relay to the selector magnet to control printing and punching.

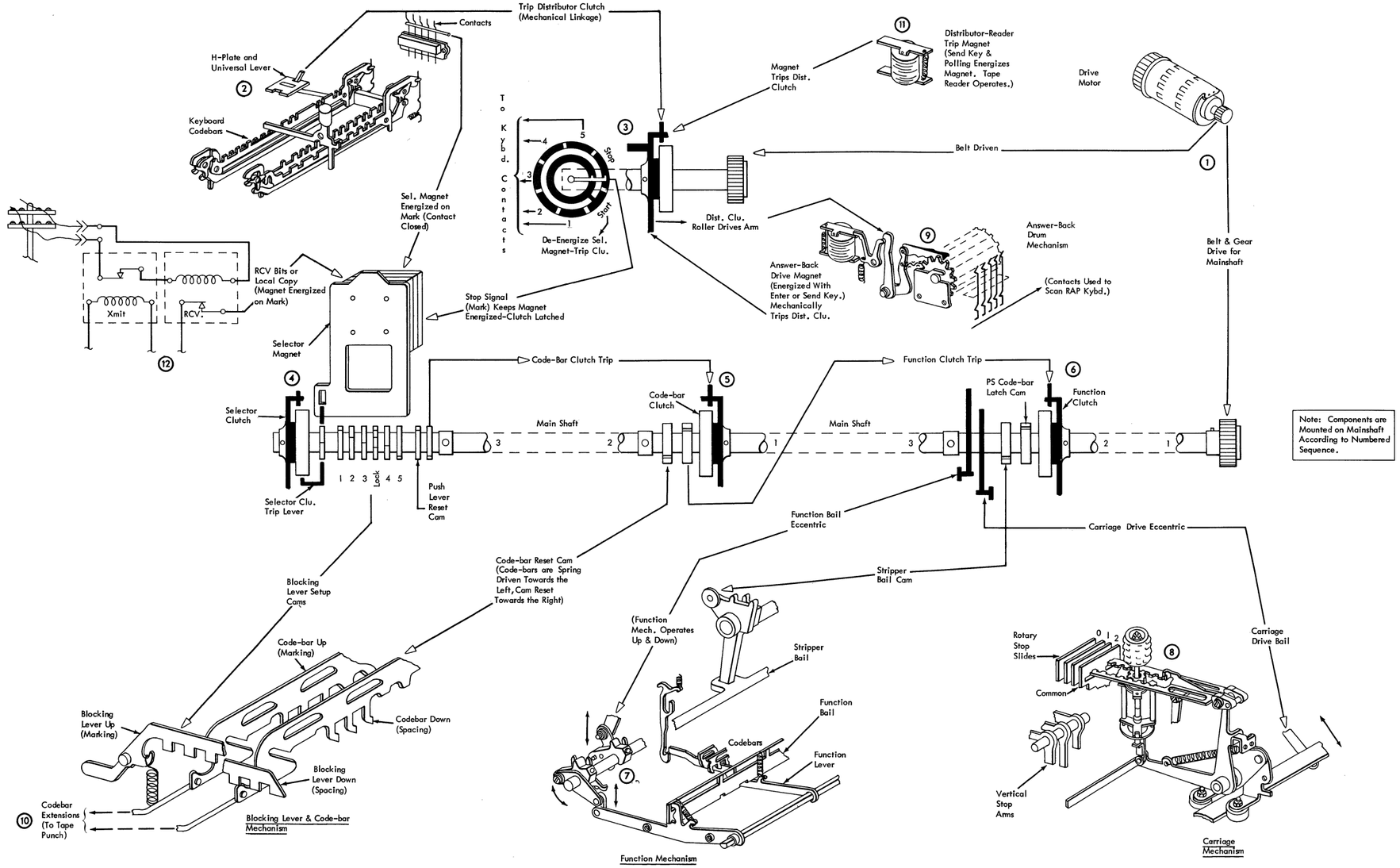


Figure 3-30. ASR 32 Operation Schematic

RECEIVE CHARACTERS

All terminals continually monitor the transmission line. This illustrates:

- How the terminal recognizes characters or noise on the line.
- How character synchronization is established at the terminal while receiving.
- The input to the shift register (SR).
- The transmit relay and how it is controlled.

Operation

(1) All terminals are connected to telegraph lines, which are current-operated. The receive relay is energized with a mark (nominal 60 ma current), de-energized with a space (no current).

NOTE: The line shunt switch should normally be OFF. Before removing the relay card, turn the switch ON. This will shunt the line and prevent an open line condition.

(2) The mark line is active when the receive relay is energized and the relay point is open. The space line is active when the receive relay is de-energized, and the relay point is closed. The transmission line is in a steady mark condition whenever there is no data on the line.

(3) When the line goes from a mark to a space condition (start bit), the 15 u s single shot times, and turns ON the character time latch. The character time latch remains ON for the entire character, to maintain character synchronization.

(4) The oscillator runs whenever the character time latch is ON. (The oscillator speed is the same as the bit speed of the transmission line.) The oscillator always starts with the oscillator-up pulse first. The oscillator-down pulse drives the shift register.

(5) Also as the character time latch comes ON, the false-start latch turns on as the 15 u s single shot times out. The output of the single shot resets the shift register. The false-start latch turns off at the beginning of the first oscillator-down pulse.

(6) The false-start latch, when ON, samples the condition of the transmission line. If the line should go to a mark condition during the time the latch is ON (first half of the start bit), the character time latch turns OFF to stop the oscillator. This permits the terminal to detect line noise, which the terminal detects as a character.

(7) The transmit relay can be energized only if the LCL (local) test switch is off.

When read is selected to transmit data from paper tape, the relay is energized with a space output from the distributor. This opens the line, and causes the line to go to a space condition. De-energizing the relay causes the line to go to a mark condition.

The transmit relay is energized for two bit-times (start and 1-bit) when a polling or addressing acknowledgment is sent. The transmit acknowledge latch (Figure 5-4) controls the transmit relay to send the acknowledge character.

All data transmitted is local-copied by the receive relay. The operations in steps 1 through 6 are performed during both transmit and receive.

(8) The timing chart shows the circuit timing conditions for normal characters and for line noise.

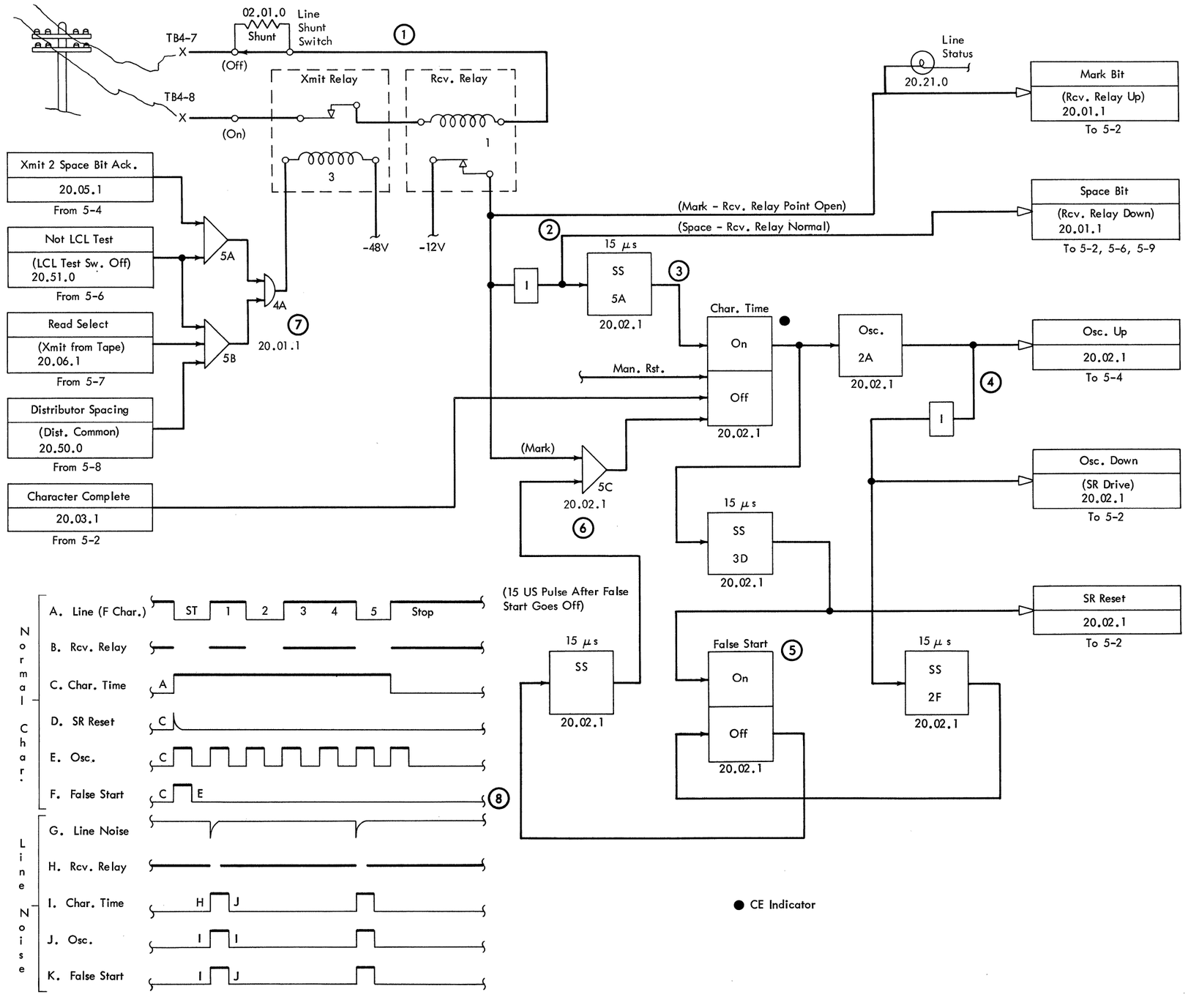


Figure 5-1. Receive Characters (Oscillator Control)

- The central processor continually polls all terminals from a programmed polling loop.
- Each terminal is polled with either 3 or 4 characters.
- Terminals are addressed when the processor has a message to send.

To operate and understand the terminal, and the way it communicates with the central processor, an explanation of the network, and the polling and addressing methods is necessary.

Figure 4-1 shows how the terminals are attached to several transmission lines that extend from the central processor. The IBM 7740 Communication Control System can accommodate up to 84 low speed (telegraph) lines, with about 20 terminals attached to each line. The number of terminals per line is limited by the telegraph line capabilities, and not by the 7740.

Polling

Polling is defined as when the central processor in effect asks each terminal, "Do you have a message to send to me?"

The central processor accomplishes this by sequentially polling all terminals in the network. A series of three or four characters is necessary to poll each terminal.

A four-character poll is necessary only once during each polling loop. All terminals are put in a figures-shift during this poll. Once this is

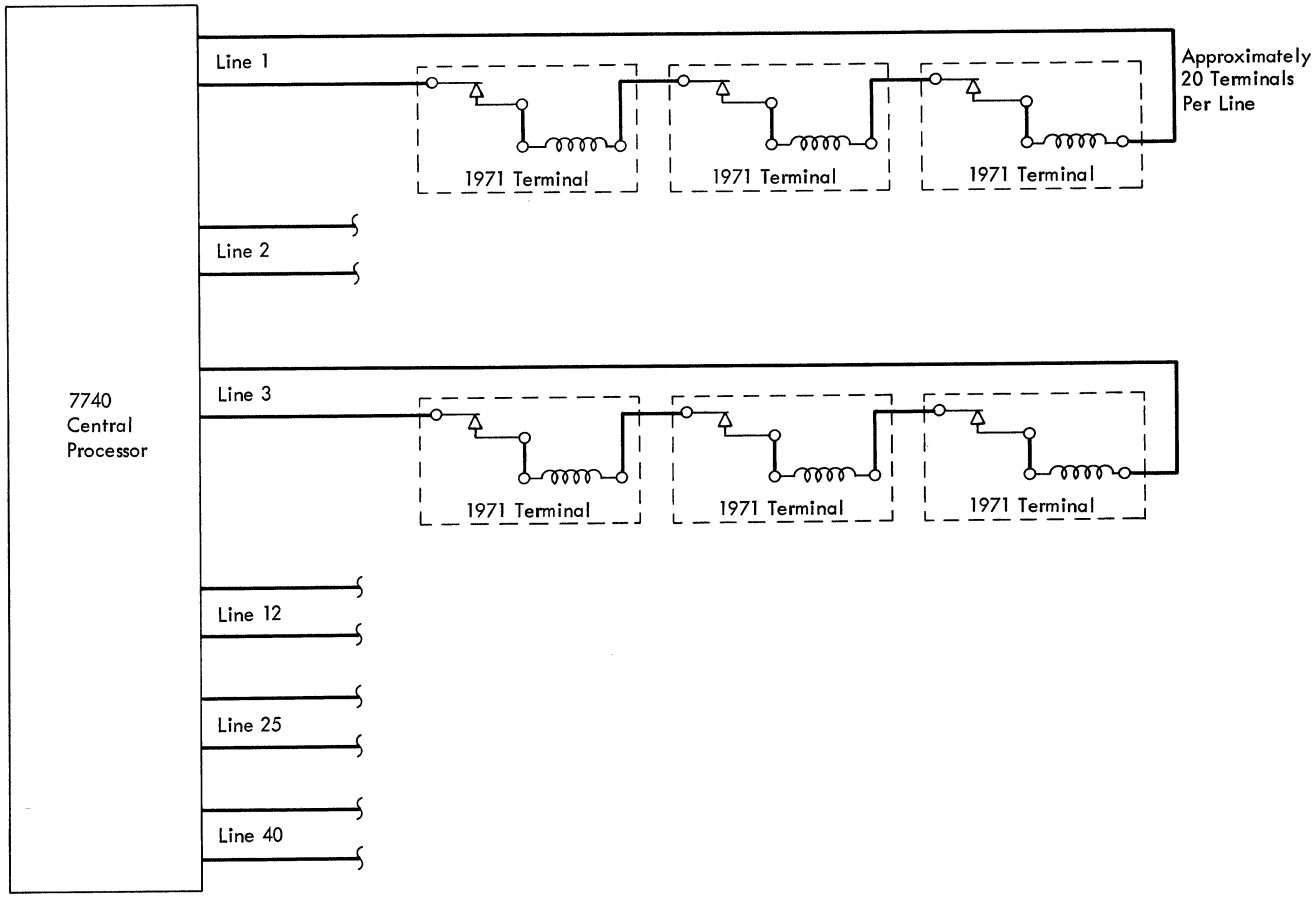


Figure 4-1. Central Process-Terminal Configuration

accomplished, only three polling characters are required (figures-character eliminated) until the beginning of the next polling loop.

A four-character poll to each terminal consists of:

1. Figures (1, 2, 4, 5). Not sent in a three-character poll.
2. Bell (figures J-1, 2, 4). This character is recognized in the terminal as EOT (end-of-transmission).
3. Tens-address character.
4. Units-address character.

Each terminal is internally wired to recognize and respond only to the two-character address assigned to the terminal (tens and units). As each individual terminal is polled, it responds by transmitting an acknowledgment character (V) or a data message.

Addressing

Addressing is defined as when the central processor, in effect, tells the terminal, "I have a message for you." The character format used for polling also applies for addressing a terminal.

Polling and Addressing Recognition

- Each terminal is internally wired to recognize only its own terminal address.
- The units and tens characters sent from the central processor determine whether the terminals are polled or addressed.

So the terminals can detect whether the central processor is polling or addressing, certain rules apply to the tens and units characters.

Polling: The tens-address character must contain a 1-bit and a not-2-bit (1 marking, 2 spacing). The 3-, 4-, and 5-bits specify the tens address of the terminal within an octal range of 1 through 7. An octal zero (not 3-, 4-, 5-bits) is used as the tens-address character for broadcasting.

The unit address character must contain a not-1 and not-2-bit (1 and 2 spacing). The 3-, 4-, and 5-bits specify the units address of the terminal within an octal range of 1 through 7. The units octal zero (not 3-, 4-, 5-bits), when combined with the tens octal zero, completes the broadcast address.

Addressing: Terminal addressing follows the same format as polling with one exception: The unit address character must contain a 2-bit (2 marking).

The polling and addressing format can be summarized as follows:

1. The 1-bit, when marking, identifies the tens address character; when spacing, the units address character. This is true for either polling or addressing from the central processor.
2. The 2-bit, when spacing in both the tens and units character, identifies polling; when marking in the units character (tens spacing), identifies addressing from the central processor.
3. The 3-, 4-, and 5-bits specify the terminal address for both the tens and units characters.

The chart (a of Figure 4-2) shows the tens and units octal polling and addressing characters. An example of the polling and addressing characters required for terminal 15 is shown in b of Figure 4-2.

Terminal Response to Polling

- When polled, a terminal responds with either an acknowledge character (V) or a data message.

Polling is continuous from the central processor to all terminals. Each time a terminal is polled, the central processor is ready to receive an acknowledgment from the terminal. To determine the type of acknowledgment, three different conditions of the terminal are considered.

			ADDRESS CHARACTERS				
			TENS		UNITS		
12	ADR BITS 3 4 5	ADR IN OCTAL	POLLING & ADDRESSING 10 XXX		POLLING 00 XXX	ADDRESSING 01 XXX	
XX	001	1	Z	PR	T 5	L	EA
XX	010	2	D	⊠	Return	R	4
XX	011	3	B	?	0 9	G	&
XX	100	4	S	RM	Space	I	8
XX	101	5	Y	6	H #	P	Ø
XX	110	6	F	$	N ,	C	:
XX	111	7	X	/	M .	V	NT
XX	000	0	E	3		Line Feed	

49 Unique Terminal Addresses

Broadcast (Internally Wired)

Example of Polling and Addressing for Terminal Number 15.

POLL CHARACTERS	ADDRESS CHARACTERS
1 2 $\bar{3}$ 4 5 - Figures (Optional)	1 2 $\bar{3}$ 4 5 - Figures (Optional)
1 2 $\bar{3}$ 4 $\bar{5}$ - EOT (Figures J)	1 2 $\bar{3}$ 4 $\bar{5}$ - EOT (Figures J)
1 $\bar{2}$ $\bar{3}$ $\bar{4}$ 5 - Z (Tens)	1 $\bar{2}$ $\bar{3}$ $\bar{4}$ 5 - Z (Tens)
$\bar{1}$ $\bar{2}$ 3 $\bar{4}$ 5 - H (Units)	$\bar{1}$ 2 3 $\bar{4}$ 5 - P (Units)

Figure 4-2. Octal Characters for Polling and Addressing

1. The terminal is ready (power on), but has no message to send. The response to polling is the acknowledge character; a V (2, 3, 4, 5, marking).
2. The terminal has a message ready to transmit to the central processor, and the send key has been pressed. In this case, when polled, the entire message is transmitted rather than the V (acknowledge) character.
3. The terminal is in test mode (off-line) or the power is off. No acknowledge character is transmitted. The central processor times out a wait period, and then continues normal polling.

Terminal Response to Addressing

- When addressed, a terminal will respond with an acknowledge character (V) if ready.
- No response is sent of the terminal is not ready to receive.
- No response is sent for a broadcast message.

Terminals are addressed from the central processor in two ways:

1. When a message is for only one terminal, the processor addresses only that respective terminal, or
2. If the message is for all the terminals, a broadcast address is sent.

When the processor addresses only the one terminal, the terminal must respond with the acknowledge character (V). This character, when received at the processor, indicates that the terminal is ready to receive the message. The central processor then transmits the message. If the terminal is not ready, no response is sent. The processor times out a wait period and continues polling.

In the case of a broadcast message, no acknowledge character is sent to the central processor because all terminals would be effectively transmitting at once. The broadcast message from the processor immediately follows the broadcast address.

Any terminal in an enter or test status (off-line) will not send an acknowledge character to the central processor to acknowledge the addressing, nor will it print a broadcast message.

TERMINAL OPERATION EXAMPLES

- The central processor sends a reply to any terminal that transmits a message.
- The reply is always terminated with the EOT character, which rings the bell at the terminal.

Reservation requests, inquiries, terminal test, and administrative transactions can be transmitted from the terminal. The central processor is programmed to reject any message that contains more than 180 characters.

In all cases, when a message is transmitted from the terminal, the central processor returns a reply.

This reply may be just two characters: figures followed by EOT (bell). The other replies possible are: a message to print, a RAP keyboard lights message, or a combination lights and printed message. Each of these message replies will be terminated with the figures-EOT characters, which cause the bell to ring at the terminal. The bell signals the operator that the transaction is complete.

Message Preparation

Messages can be prepared in two different ways:

1. Using the RAP keyboard only, or
2. using the RAP keyboard and the ASR 32.

AVAIL Inquiry Message

- AVAIL inquiry messages are transmitted directly from the RAP keyboard.
- The AVAIL and enter key together initiate direct transmission from the RAP keyboard.

For an availability inquiry, only the RAP keyboard is used. The purpose of this type of transaction is to inquire to the central processor as to the availability of whatever is set up in the RAP keyboard. This is the only type of message that is transmitted as the keyboard is being scanned.

The available inquiry is set up as follows:

1. Select the index card for the chosen host inn from the innkeeper's file. Place the card in the card holder on the RAP keyboard.
2. Press the host inn pushbuttons as designated on the card.

3. Set up the remainder of the keyboard to include the information about the reservation inquiry.
4. Press the AVAIL pushbutton in the action row.
5. Press the enter key.

The enter key bids for the line so the contents of the RAP keyboard can be transmitted. When the terminal recognizes its polling address from the central processor, the keyboard is scanned and the data is transmitted. (The data is also printed and punched from local copy as the message is transmitted. The punched tape is not used.)

A lights reply message is immediately returned by the central processor to the requesting terminal to indicate the status of the available inquiry.

- The RAP keyboard and ASR 32 are used to prepare normal reservation messages.
- All messages from a terminal are terminated with an EOB character.

All other messages prepared on the terminal require the use of the RAP keyboard and the ASR 32. Figure 4-3 shows how the paper tape would appear from the punch as the message is prepared. These messages are set up as follows:

1. Select the index card for the chosen host inn from the innkeeper's file. Place the card in the card holder on the RAP keyboard.
2. Press the host inn pushbuttons as designated on the card.
3. Set up the remainder of the keyboard to include the information about the reservation or transaction.
4. Press the appropriate pushbutton in the action group to select the type of transaction.
5. Press the enter key. Scan cycle 1 and 2 occur. Scan 1 prepares a leader in paper tape, and scan 2 scans (and prints) the RAP keyboard and punches its contents into paper tape. (a and b of Figure 4-3.)
6. At the tape reader (on the ASR 32), the lever is set to the stop-free position.
7. Pull the paper tape through the reader until it is taut between the reader and punch (c of Figure 4-3).

   Note: It is important that this step be performed only at this time.

8. Set the lever on the tape reader to the start position.
9. From the ASR 32 keyboard, type the data necessary for the transaction. The data will print and also punch into paper tape (d of Figure 4-3).

   Note: If no typed data is required, this step can be bypassed.

10. Press the send key on the ASR 32 terminal control panel (e of Figure 4-3).

The send key starts the third scan cycle. The RAP keyboard is not scanned on this cycle, but paper tape is punched with an EOB (end-of-block) sequence. At the completion of this scan cycle, a bid is made for the line, so when polled, the completed message can be transmitted to the central processor. Also at the completion of scan 3, the tape reader feeds tape up to the first character to be transmitted. When the terminal is polled, the reader again starts and the message is read and transmitted.

While the contents of the paper tape are being transmitted, the same data is printed from the local copy operation. The operator, or customer engineer can visually compare the transmitted data with the data printed as the message was being prepared.

Transmission stops when the reader and control unit detects the EOB sequence from the tape.

This EOB sequence (a figures character followed by the EOB character) also turns the terminal around so it can receive the reply sent from the central processor. This turnaround feature permits the transaction to be completed more rapidly, because the terminal does not have to wait to be addressed from the central processor.

The reply message is immediately returned to the terminal in answer to the transmitted message. This reply could be a printed message, a lights message, or a combination lights and printed message, or just an EOT character sequence (a figures character followed by the EOT character). All replies are terminated with the EOT sequence, which rings the bell to signal the terminal operator that the transaction is complete.

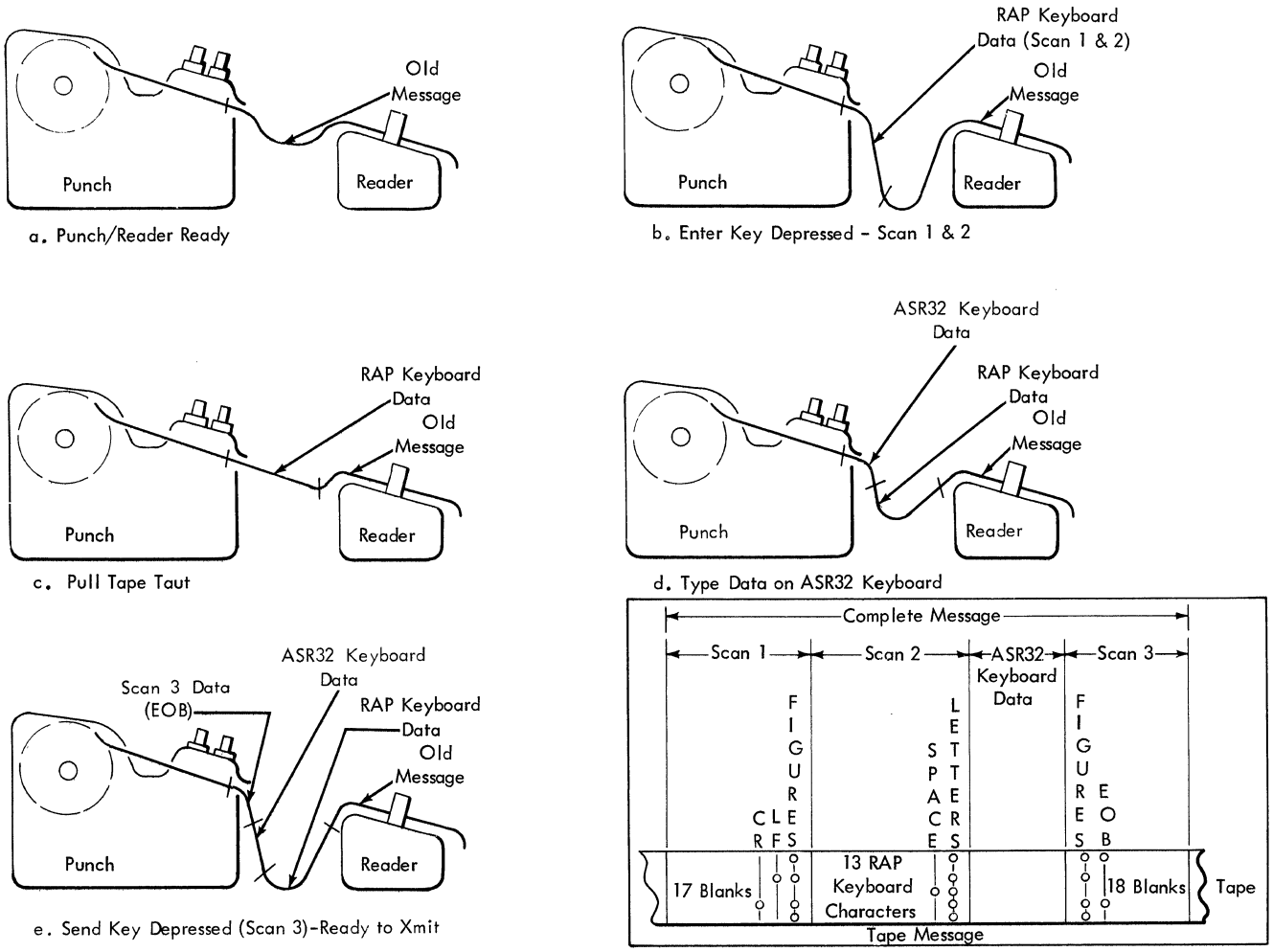


Figure 4-3. Normal Message Preparation

Scan Cycle Operations

- The answerback drum emits pulses for the scan cycle operations.
- Through the relay matrix and the coding of the answerback drum, 21 scan pulses are emitted.
- 4 different scan cycles are possible:
  Enter key: scan 1 and scan 2.
  Send key: scan 3.
  AVAIL and enter key: direct entry scan.
- Printing and tape punching result from all scan cycles.
- 13 characters are always scanned from the RAP keyboard, and printed in figures shift.
- A 5 is printed and punched from any group on the RAP keyboard that has no pushbuttons pressed.

The basic purpose of a scan operation is to punch fixed data and RAP keyboard data into the paper tape while the message is prepared at the terminal.

The answerback-drum mechanism (Figure 4-4) in the ASR 32 emits pulses so fixed data characters can be punched into tape, and also emits pulses to scan the RAP keyboard.

Whenever a scan operation is required the answerback drum rotates. Pulses emit from wire contacts that ride against the rows of tines on the drum. To emit the pulses, the tines are broken off (the drum is made of a phenolic material), which permit the wire contacts to operate against the common bar as the drum rotates. A maximum 21 pulses (scan points) can be emitted during a drum scan cycle, but only 20 of these pulses are used. The first pulse (ST-start) is suppressed on all scans.

The chart (Figure 4-5) shows which tines are removed in each of the levels on the drum. Levels 1 through 9 have contacts and are coded to emit electrical pulses.

The feed-ratchet level is used to rotate the drum and also for the detent. No tines should be removed from this level.

A stop-cam arm rides on the stop-cam level, and detents into an open slot at the end of each drum revolution. The movement of the stop cam into the open slot permits the answerback drum-magnet armature to relatch. This stops the drum and also the distributor clutch. Consequently, the drum always

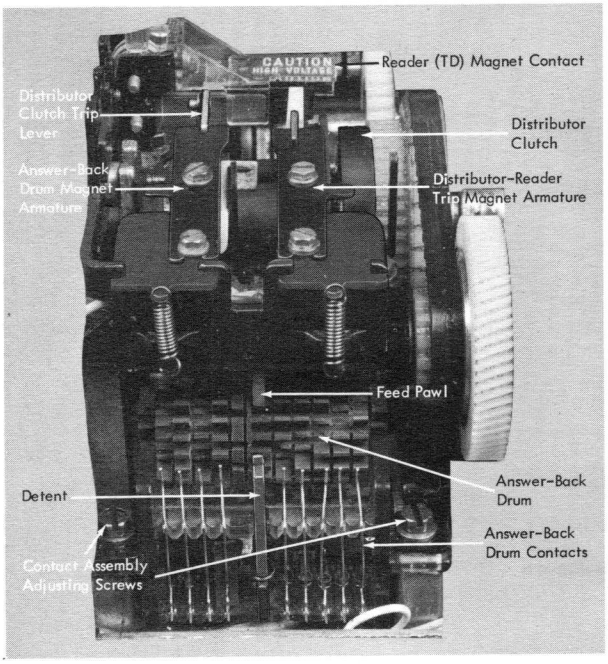


Figure 4-4. Answerback Drum Mechanism

Ⓧ - Tine Removed and Contact Closed

X - Tine Removed, But Contact Open

ROW	LEVELS										
	1	2	3	4	5			6	7	8	9
ST					X			Ⓧ	X		X
1	Ⓧ							X			
2	X	Ⓧ							Ⓧ		
3		X	Ⓧ						Ⓧ		
4			X	Ⓧ					Ⓧ		
5				X	Ⓧ				Ⓧ		
6	Ⓧ				X		X		Ⓧ	Ⓧ	
7	X	Ⓧ							Ⓧ	Ⓧ	
8		X	Ⓧ						Ⓧ	Ⓧ	
9			X	Ⓧ					Ⓧ	Ⓧ	
10				X	Ⓧ				Ⓧ	Ⓧ	
11	Ⓧ				X				Ⓧ	Ⓧ	Ⓧ
12	X	Ⓧ							Ⓧ	Ⓧ	Ⓧ
13		X	Ⓧ						Ⓧ	Ⓧ	Ⓧ
14			X	Ⓧ					Ⓧ	Ⓧ	Ⓧ
15				X	Ⓧ				Ⓧ	Ⓧ	Ⓧ
16	Ⓧ				X				Ⓧ	X	Ⓧ
17	X	Ⓧ							Ⓧ		Ⓧ
18		X	Ⓧ						Ⓧ		Ⓧ
19			X	Ⓧ					Ⓧ		Ⓧ
20				X	Ⓧ				Ⓧ		Ⓧ

Feed Ratchet Level ↑ ↑ Stop Cam Level

Figure 4-5. Answerback Drum Coding

stops at the ST (start) position.

Four different scan cycles are possible. Each of the four cycles causes tape to either space or punch characters.

Pressing the enter key on the RAP keyboard once causes scan-1 and scan-2 cycles to always occur sequentially. Printing occurs and tape is punched as follows:

1. Scan 1: 17 blanks (no punches).
   1 CR character (4 punch).
   1 LF character (2 punch).
   1 Figures character (1, 2, 4, 5 punches)
2. Scan 2: 13 characters scanned from the RAP keyboard.
   1 Space character (3 punch)
   1 LTRS character (1, 2, 3, 4, 5 punches)
3. Scan 3: Initiated from the send key. Printing occurs and tape is punched as follows:
   1 Figures character (1, 2, 4, 5 punches).
   1 EOB character (1, 4 punches).
   18 blanks (no punches).

The AVAIL pushbutton, followed by the enter key initiates the direct entry scan when the terminal is polled. Direct transmission and tape punching result as the RAP keyboard is scanned. Printing occurs and tape is punched as follows:

1. Direct Entry Scan. 13 characters scanned from RAP keyboard
   1 CR character (4 punch).
   1 LF character (2 punch).
   1 LF character (2 punch).
   1 Figs. character (1, 2, 4, 5 punches).
   1 EOB character (1, 4 punches).

Figure 4-6 shows the scan cycles, and the purpose of each scan point. As the RAP keyboard is scanned, one character punches from each group, or subgroup, dependent on the pushbutton pressed within the group.

SCAN POINT	ENTER KEY		SEND KEY	AVAIL & ENTER KEY
	1ST SCAN	2ND SCAN	3RD SCAN	DIRECT ENTRY SCAN
ST	SUPPRESS	SUPPRESS	SUPPRESS	SUPPRESS
1	BLANK	SUFFIX	FIGURES	SUFFIX
2	↑	HOST GROUP 1	EOB	HOST GROUP 1
3		HOST GROUP 2	BLANK	HOST GROUP 2
4		HOST GROUP 3	↑	HOST GROUP 3
5		HOST GROUP 4		HOST GROUP 4
6		ACTION		ACTION
7		DAY-TENS		DAY-TENS
8		DAY-UNITS		DAY-UNITS
9		MONTH		MONTH
10		ALTERNATE INN		ALTERNATE INN
11		TYPE ROOM		TYPE ROOM
12		NO. NIGHTS		NO. NIGHTS
13		NO. ROOMS		NO. ROOMS
14		SPACE		CR
15		LETTERS		LF
16	↓	SUPPRESS		LF
17	BLANK	↑		FIGURES
18	CR			EOB
19	LF	↓	↓	SUPPRESS
20	FIGURES	SUPPRESS	BLANK	SUPPRESS

Figure 4-6. Answerback Drum Scan Cycle Chart

With the exception of the host inn group, the character that punches from each column of the RAP Keyboard (see Figure 4-7), if the pushbutton is pressed as follows:

Column 1, or alternate inn 1: Z
Column 2, or alternate inn 2: L
Column 3, or alternate inn 3: W
Column 4: H
Column 5: Y
Column 6: P
Column 7: Q
Column 8: O
Column 9: B
Column 10: G
Column 11: M
Column 12: X

Four scan points (points 2, 3, 4, 5) scan the host inn group since they are divided into 4 subgroups (0, 1, 2) (3, 4, 5) (6, 7, 8) (9, A, B). The character punched from each subgroup depends on the number of pushbuttons pressed in the subgroup. (These buttons are not interlocked and restored by the other buttons.) The bit assigned to each button in subgroup 1 is as follows:

0 pushbutton: 2 bit
1 pushbutton: 3 bit
2 pushbutton: 4 bit

If all buttons are pressed, the 2-, 3-, and 4-bits will punch along with the 5-bit, which is emitted for each scan point of the RAP keyboard. The other subgroups are assigned the same bits respectively as the first subgroup, and the character is scanned in the same way.

If no pushbuttons are pressed in a group or subgroup, the 5-bit is emitted and punched in tape.

The characters printed as each column is scanned are the same as punched, only in figures shift.

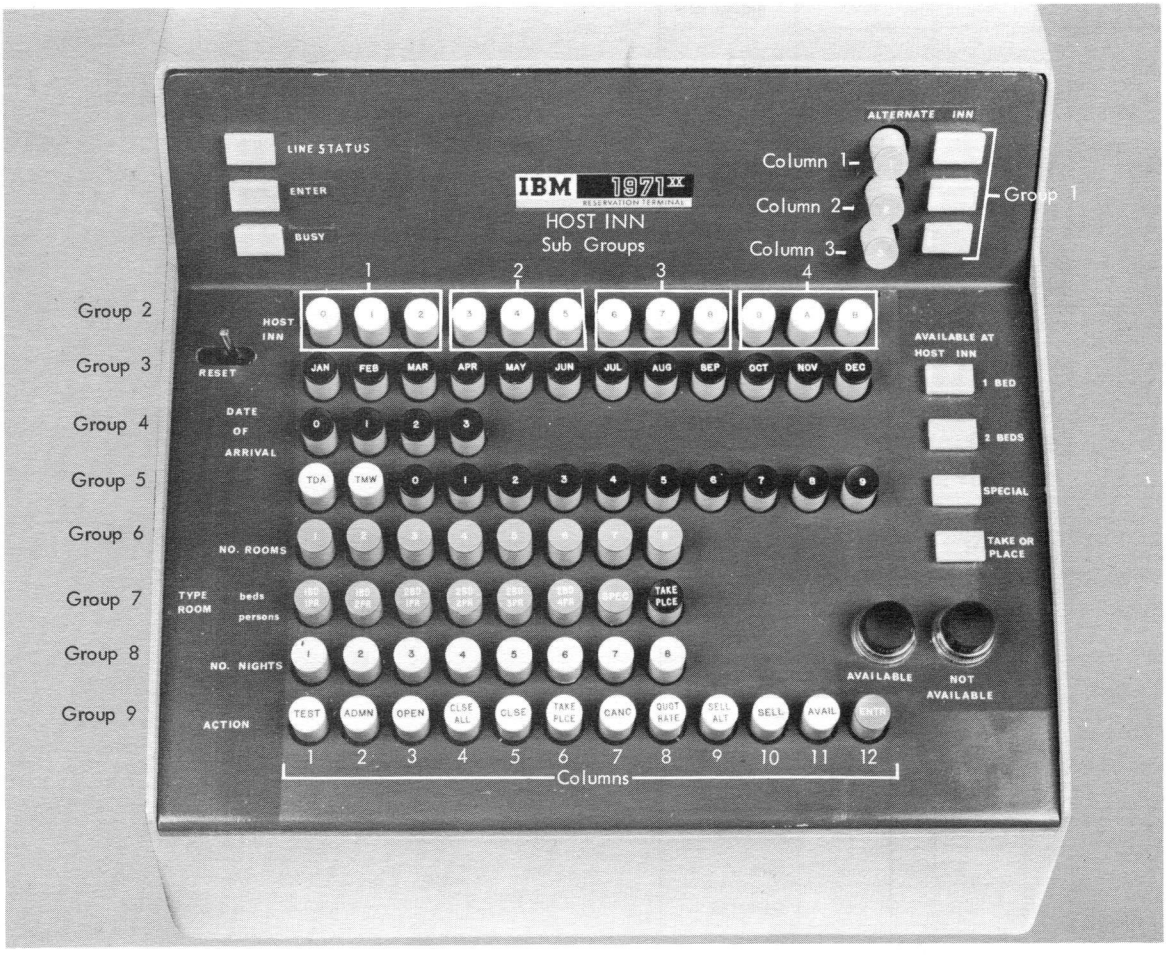


Figure 4-7. RAP Keyboard

Typical Message Examples (Action Pushbuttons)

- The action group on the RAP keyboard determines the type of message sent from the terminal.
- Eleven different types of messages are possible:

1. Test
   a. All-characters test message
   b. Message-switch test message
2. ADMIN (Administrative)
3. Open
4. Close all
5. Close
6. Take/place
7. Cancel
8. Quote rate
9. Sell alternate
10. Sell
11. Available

The RAP keyboard pushbuttons in the action row (group 9-Figure 4-7) determine the type of message to be transmitted from the terminal. The purpose of each pushbutton is described, with examples showing the message sent, and the reply returned from the central processor.

Test

This pushbutton operates in conjunction with the host inn 1 or 2 pushbuttons. Two types of terminal tests are possible using these buttons. Each test is an on-line test from the terminal, through the central processor, and back to the same terminal. The tests are useful for the operator and the customer engineer.

All-characters Test: The host-inn-1 and test pushbuttons request this all-characters test message to transmit from the central processor to the terminal. When the test message is received at the terminal, all RAP keyboard lights come on, all possible characters are printed, and all functional operations are performed on the ASR 32.

The message is set up as follows:

1. Reset the RAP keyboard.
2. Press host-in-1 pushbutton.
3. Press the test pushbutton.
4. Press the enter key.
   a. Scan 1 and 2, and print out the RAP keyboard contents.
5. Set tape-reader lever to STOP-FREE.
6. Pull the tape taut.
7. Set the tape-reader lever to START.
8. Press the send key.
   a. Scan 3.
   b. Message is transmitted when polled.
9. The central processor immediately returns the all-characters message, which prints and punches at the terminal.

Figure 4-8 shows the printout of the all-characters test message.

```
Prepare Message: (Host Inn 1 and Test Keys)
        # # 5 5 5 RC 5 5 5 5 5 5 5 ⊠

Transmit:
        # # 5 5 5 RC 5 5 5 5 5 5 5 ⊠

Reply:
    BD                (Characters to Light 9 RAP Keyboard Indicators)
    A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 - RM $ & # BD EA RR / : NT ? , .
    (Ring Bell)
```

Figure 4-8. All Characters Test Message

Message-Switch Test: The host-in-2 and test pushbutton request this message-switch test. This test permits all characters transmitted from the terminal to the central processor, to be returned by the processor to the same terminal.

The message is set up as follows:

1. Reset RAP keyboard.
2. Press host-inn 2 pushbutton.
3. Press the test pushbutton.
4. Set up the RAP keyboard as desired.
5. Press the enter key.
   a. Scan 1 and 2, and print out the RAP keyboard contents.
6. Set the tape-reader lever to STOP-FREE.
7. Pull the tape taut.
8. Set the tape-reader lever to START.
9. Type any data desired on the ASR 32 keyboard.
10. Press the send key.
    a. Scan 3.
    b. The message is transmitted when polled.
11. The central processor immediately returns the same message to the requesting terminal, where it prints and punches. This received data should compare with the printout of the transmitted data.

Figure 4-9 is an example of the printout of a typical message-switch test message.

```
Prepare Message (Only Host Inn 2 and Test Keys and Typed Data):
    # 9 5 5 5 RC 5 5 5 5 5 5 5 The Quick Brown Fox Jumped ⊠

Transmit:
    # 9 5 5 5 RC 5 5 5 5 5 5 5 The Quick Brown Fox Jumped ⊠

Reply:
    # 9 5 5 5 RC 5 5 5 5 5 5 5 The Quick Brown Fox Jumped ⊠
    Ring Bell.
```

Figure 4-9. Typical Message Switch Test Message

ADMN (Administrative)

This transaction is used when an innkeeper desires to communicate with another inn. The type of message would normally be special reservation requirements, or just an administrative message between inns. The central processor acts merely as a message forwarding center between the requesting terminal and the selected host inn. The host inn, when sending a reply message to the requesting terminal, must also use the ADMN pushbutton.

When the central processor has received the EOB sequence of an ADMN message, it immediately returns the EOT sequence (figures-EOT characters) to the requesting terminal. This is necessary to disconnect the requesting (transmitting) terminal, because of the automatic turnaround that occurs after any message is transmitted from a terminal. To complete the transaction, it is necessary that the host inn originate and send the reply message, addressed to the requesting terminal.

A typical ADMN message is set up as follows:

1. Reset the RAP keyboard.
2. Set the host inn group as designated from the chosen host inn index card.
3. Set the remainder of keyboard.
4. Press the enter kev.
   a. Scan 1 and 2, and print out the RAP keyboard contents.
5. Pull the tape taut at tape reader.
6. Type the administrative data on the ASR 32 keyboard.
7. Press the send key.
   a. Scan 3.
   b. The message is transmitted when polled.
8. The central processor will reply with the EOT sequence, which rings the bell.
9. The reply message originates from the host inn, and is forwarded to the requesting terminal when addressed from the central processor.

Figure 4-10 is an example of the printout of an ADMN message transaction.

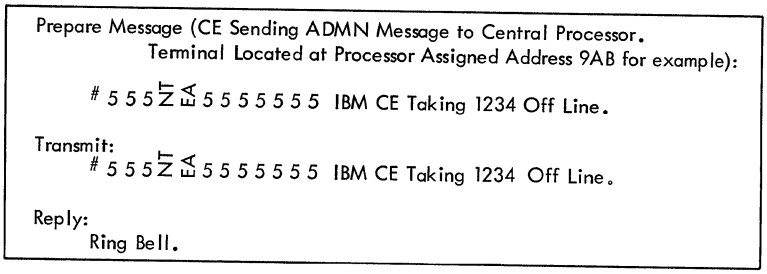


Figure 4-10. Typical ADMN Message Example

Open

This transaction informs the central processor to open a previously closed room type. The open message can only affect the room status of the requesting terminal. The specific date-to-open and room type has to be set up on the RAP keyboard to inform the processor when and what to open.

The central processor is programmed to keep all room types open unless they are closed with close or close-all transactions. Specific dates are also required for a closing. Only if it is desired to reopen a room type during or before the closed dates, is it necessary to open. The processor will automatically open a previously closed room after the date-of-close has passed.

A typical open message is set up as follows:

1. Reset the RAP keyboard.
2. Set the host inn group to correspond to your own terminal address.
3. Set the date-of-arrival groups.
4. Set the type room group.
5. Press the open pushbutton.
6. Press the enter key.
7. Pull the tape taut at tape reader.
8. Press the send key.
9. The message will transmit when polled.

Figure 4-11 shows a typical open-message transaction.

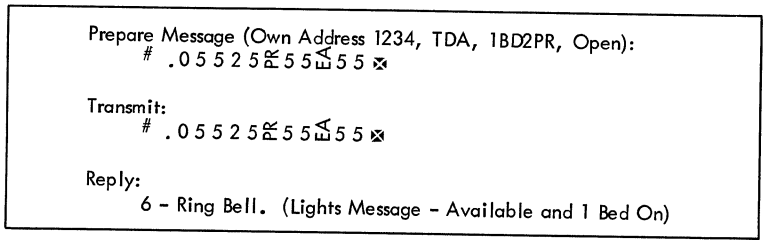


Figure 4-11. Typical Open Message Example

Close All

This transaction signals the central processor to close all room types, and to open take/place accommodations. The address of the requesting inn must be set up in the host inn groups. The date-of-closing must also be set up. If cancellations occur before or during this date, the open transaction is used to reopen. After the date-of-closing has passed, all room types are automatically reopened by the central processor.

A typical close-all message is set up as follows:

1. Reset the RAP keyboard.
2. Set the host inn group to correspond to your own terminal address.
3. Set date-of-arrival group to indicate date-of-close-all.
4. Press the CLSE ALL pushbutton.
5. Press the enter key.
6. Pull the tape taut at tape reader.
7. Press the send key.
8. The message will transmit when polled.

Figure 4-12 shows a typical close-all-message transaction.

Prepare Message (Own Address 1234, FEB, Day Tens 2, Day Units 7, Close All):
.055#2&5555 ⊠

Transmit:
.055#2&5555 ⊠

Reply:
. (Take/Place Light On) Ring Bell.

Figure 4-12. Typical Close All Message Example

Close

This transaction signals the central processor to close only the room designated by the type-room group. The address of the requesting terminal and the date-of-closing is set up. If cancellations occur before or during this date, the open transaction is used to reopen. After the date-of-closing has passed, the closed room is automatically reopened by the central processor.

A typical close message is set up as follows:

1. Reset the RAP keyboard.
2. Set up the host inn group to correspond to your own terminal address.
3. Set the date-of-arrival group to indicate date-of-close.
4. Set the type-room group to specify the type of room to close.
5. Press the CLSE pushbutton.
6. Press the enter key.

7. Pull the tape taut at the tape reader.
8. Press the send key.
9. The message will transmit when polled.

Figure 4-13 shows a typical close message transaction.

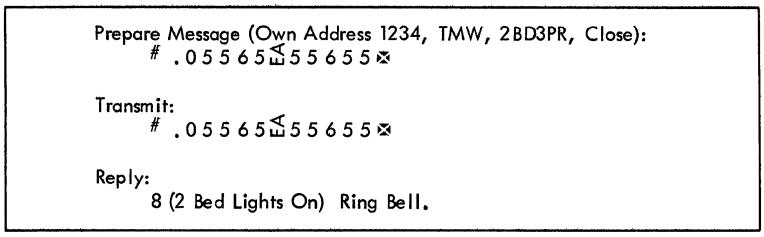


Figure 4-13. Typical Close Message Example

Take/Place

This transaction signals the central processor to sell and confirm a take-or-place accommodation. The term take or place means that accommodations are presently filled at all Holiday Inns in the area, but the host inn will still accept the reservation. It is possible that cancellations may come in, or if not, the reservation will be filled at another motel in the area.

Before the central processor confirms a take-or-place reservation for a host inn, the host innkeeper previously had to enter a close-all transaction. This automatically opens take-or-place in the area. If then, a requesting terminal transmitted a sell transaction for the Host Inn that had only take-or-place available, the processor returns a message to the requesting terminal that lights the not-available and take-or-place lights. The requesting terminal can, if the customer so desires, complete the reservation by transmitting a take-or-place transaction.

A typical take-or-place message is set up as follows: (Assume a sell request was previously transmitted and answered, with the not-available and take-or-place lights on.)

1. Do not reset the RAP keyboard as the setup is satisfactory from the sell transaction.
2. Press the TAKE/PLCE pushbutton in the action row.
3. Press the enter key.
4. Pull the tape taut at the tape reader.
5. Type the customer name, etc., on the ASR 32 keyboard.
6. Press the send key.
7. The message will transmit when polled.
8. The central processor immediately returns a printed confirmation message and lights the available light at the terminal.

Figure 4-14 shows a typical take-or-place message transaction.

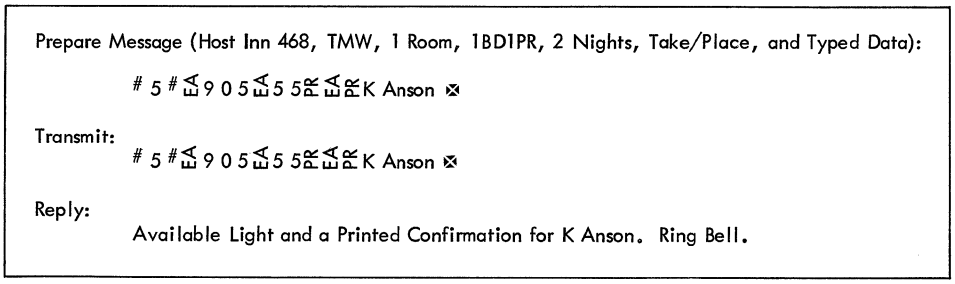


Figure 4-14. Typical Take/Place Message Example

Cancel

This transaction cancels a reservation that was previously confirmed at a host inn. The central processor forwards this type of message directly to the host inn. The processor acts as a message-switching center between the requesting (cancelling) terminal and the host inn.

A typical cancel message is set up as follows:

1. Reset the RAP keyboard.
2. Set the host inn group as designated from the host inn card affected by the cancel message.
3. Set up the remainder of keyboard to indicate the same information as the original sell transaction.
4. Press the cancel pushbutton.
5. Press the enter key.
6. Pull the tape taut at the tape reader.
7. Type the customer name, etc. on the ASR 32 keyboard.
8. Press the send key.
9. The message is transmitted when polled, and forwarded to the host inn by the central processor.

Figure 4-15 illustrates a typical cancel message transaction as printed at the requesting terminal.

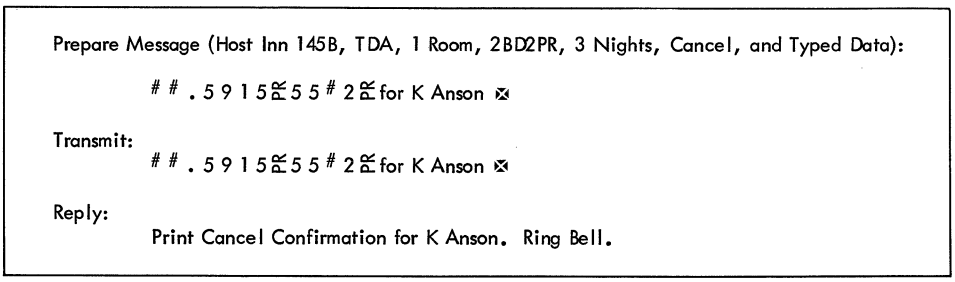


Figure 4-15. Typical Cancel Message Example

Quote Rate

This transaction is forwarded by the central processor directly to the chosen host inn. The room rates are not stored at the processor.

The message is set up on the RAP keyboard like a normal reservation, but the information typed on the ASR 32 includes a specific dollar amount that the customer desires. When this message arrives at the host inn, the innkeeper will consider this a sell order if he accepts the quoted rate.

To set up the message returned from the host inn to the requesting terminal, use the ADMN pushbutton, and the confirmation (or not confirmed) portion of the message typed on the ASR 32 keyboard.

A typical quote-rate message is set up as follows:

1. Reset the RAP keyboard.
2. Set the host inn group as designated from the chosen host inn index card.
3. Set up the remainder of the RAP keyboard to indicate the specifics of the room and date.
4. Press the quote-rate pushbutton.
5. Press the enter key.
6. Pull the tape taut at the tape reader
7. Type on the ASR 32 the customer name, rate desired, etc.
8. Press the send key.
9. The message is transmitted when polled.
10. The central processor immediately returns the EOT sequence to disconnect the requesting terminal. The bell rings at the terminal.
11. A reply message will be addressed to the requesting terminal by the host inn to confirm or not confirm the quote rate transaction.

Figure 4-16 shows a typical quote-rate message transaction as printed at the requesting terminal.

Sell ALT (Sell Alternate)

A sell-alternate transaction is used if the not-available and certain alternate-inn lights were on in reply to a sell transaction. This type of message indicates to the central processor that the customer chose to accept accommodations at an alternate inn since the selected host inn did not have the accommodations desired.

A typical sell-alternate transaction is set up as follows: (only if the alternate-inn lights and not-available light are on should the SELL ALT be used.)

1. Do not reset the keyboard (it should still be properly set up from the sell transaction).
2. Press the desired alternate-inn pushbutton beside the light that is on.

Prepare Message (Host Inn 145B, Jun, Day Tens 1, Day Units 3, 5 Rooms, 2BD2PR, 8 Nights, Quote Rate, and Typed Data):

.599ΔΔ005#96 K Anson Requests $9.50 Rate ⊠

Transmit:

.599ΔΔ005#96 K Anson Requests $9.50 Rate ⊠

Reply:

1. Ring Bell (Central Processor Sends EOT to Disconnect Terminal.)
2. Print Confirmation (or Denial) $9.50 Rate for K. Anson. Ring Bell. (This Reply originates at Host Inn. The Processor Addresses Requesting Inn to Forward Rate Reply.)

Figure 4-16. Typical Quote Rate Message Example

3. Press the SELL ALT pushbutton.
4. Press the enter key.
5. Pull the tape taut at the tape reader.
6. Type on the ASR 32 the customer name, etc.
7. Press the send key.
8. The message is transmitted when polled.
9. The central processor returns a printed confirmation message, along with the available light on.

Figure 4-17 shows a typical sell-alternate message transaction as printed at the requesting terminal.

Sell

The sell transaction is used for all reservation requests. The RAP keyboard is set up to indicate the reservation requirements, and the ASR 32 keyboard is used to type the customer name, etc. If the central processor finds the requested accommodations are available at the chosen host inn, a confirmation message is returned to the requesting terminal. A sold notice is also forwarded to inform the host inn of the reservation transaction.

If the central processor finds the requested accommodations are not available, a lights message is returned to the requesting terminal. This type of message from the processor turns on certain RAP keyboard lights to indicate substitute rooms (available at host inn) or alternate inns that may be available at the host inn area.

A typical sell transaction is set up as follows:

1. Reset the RAP keyboard.
2. Set the host inn group as designated from the chosen host inn index card.
3. Set up the remainder of the RAP keyboard to include the room and date requirements of the reservation.
4. Press the sell pushbutton.
5. Press the enter key.
6. Pull the tape taut at the tape reader.
7. Type on the ASR 32 keyboard the customer name, etc.
8. Press the send key.
9. The message is transmitted when polled.
10. The reply from the central processor is returned immediately. If confirmed, the available light is on and a printed message is typed. If not confirmed, the not-available light is on, along with certain available-at - host-inn lights and possible alternate-inn lights.

Figure 4-18 shows a typical sell message transaction as printed at the requesting terminal.

Prepare Message (Host Inn 145B,TMW, 1 Room, 1BD1PR, 1 Night, Alternate Inn 3, Sell Alt, and Typed Data):
.59?5EA52PRPRPRK. Anson ⊠

Transmit:
.59?5EA52PRPRPRK. Anson ⊠

Reply:
69RM (Light Available, Alt 3, 1 Bed)
Print Confirmation for K Anson - Ring Bell.

Figure 4-17. Typical Sell Alternate Message Example

Prepare Message (Host Inn 145B, TMW, 1 Room, 2BD2PR, 3 Nights, Sell, and Typed Data):
.59EA5EA55#2PR For K Anson ⊠

Transmit:
.59EA5EA55#2PR For K Anson ⊠

Reply:
Available Light and a Printed Confirmation for K Anson.
Ring Bell.

Figure 4-18. Typical Sell Message Example

AVAIL (Available)

This transaction inquires of the central processor as to the availability status of a particular reservation. The entire message is set up on the RAP keyboard. The processor responds immediately with a lights message, to light either the available, or not-available lights on the RAP keyboard. If the reservation as requested, is not available, alternate-inn lights, and/or available-at-host-inn lights may be on to indicate available substitutions to the original request.

The message is set up as follows:

1. Reset the RAP keyboard.
2. Set the host inn group as designated from the chosen host inn index card.
3. Set up the remainder of the RAP keyboard to include the specifics of the room and date.
4. Press the AVAIL pushbutton.
5. Press the enter key. (It is not necessary to use the ASR 32 or send key.)
6. When polled, the message is transmitted as the keyboard is scanned.
7. The central processor immediately returns a lights message to the requesting terminal.

Figure 4-19 shows a typical AVAIL message transaction as printed at the requesting terminal.

Prepare Message (Host Inn 145B, Dec, Days Ten 0, Days Units 9, 1 Room, Spec, 7 Nights, Avail):
.59.PR//511PR⊠

Transmit:
.59.PR//511PR⊠

Reply:
0RM8PR (Lights Characters - Not Available, 1 Bed, 2 Bed, Alt Inn 1)
Ring Bell

Figure 4-19. Typical Avail Message Example

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The following diagrams illustrate and describe the entire operation of the control circuitry for the terminal. The material can be used either for instruction or direct reference.

All the figures within this section are in sequential order, according to the general terminal operation. Each figure is accompanied by an operational description of the machine functions to which it pertains. Cross-references are made between the Figures and descriptions by use of circled numbers, which indicate the sequence of operation within the Figure.

High-Level Diagrams

The following high-level diagrams objectively explain the operation of the terminal and are drawn in a positive logic form. These diagrams eliminate the detail, but show the objectives of the operations without considering positive or negative levels.

The AND circuits are drawn as triangles, the OR circuits as half-moons. To condition the output of an AND circuit, all inputs have to be active. To condition the output of an OR circuit, any inputs can be active. The rectangles represent triggers or latches, which once turned on or off, remain in that condition until the opposite occurs.

The major controlling lines are shown in the boxes entering and leaving each Figure. These lines are all cross-referenced with the other Figures in this section, by using from – to Figure references.

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SERDES SHIFT REGISTER

- All data on the transmission line enters the shift register of every terminal.
- The shift register is only used for receiving, not for transmitting.
- Data enters the shift register serially by bit.
- The shift register contains 7 triggers, a position for each bit of a character.
- The shift register develops character-complete, SP1, and SP2 pulses at the end of each character.
- The shift register contents are sampled at the end of every character.

Operation

(1) SR reset pulse (beginning of the character start bit) resets all SR triggers on. The CE indicator lights come on.

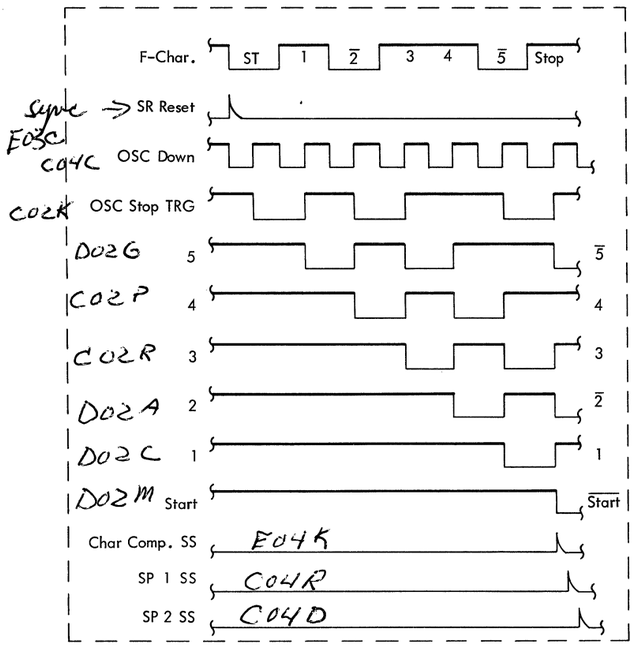
(2) The oscillator-down pulse, which occurs midway through all bit pulses, drives all SR triggers.

(3) The start bit (which is a space) gates the stop trigger off, and the oscillator-down pulse turns off the stop trigger. The preceding bits of the character also gate the stop trigger. That is, a mark bit gates the trigger on, and a space bit gates the trigger off. The triggers successively gate the following triggers as the oscillator-down pulse flips the triggers according to the gates.

As the seventh bit (stop-mark) enters the SR, the start bit is advanced into the start trigger to turn it off. This indicates the end of the character.

(4) When the start trigger goes off, it fires the single shot to generate the character-complete pulse. The time-out of the character-complete single shot starts the SP1 single-shot timing. Likewise, the time-out of the SP1 single shot starts the SP2 single-shot timing. These three pulses (character-complete, SP1, SP2) are used throughout the control circuitry to sample the contents of the SR, and control the terminal operation while receiving, and also during local copy.

(5) The timing chart illustrates the operation of the SR with an F-character as an example.



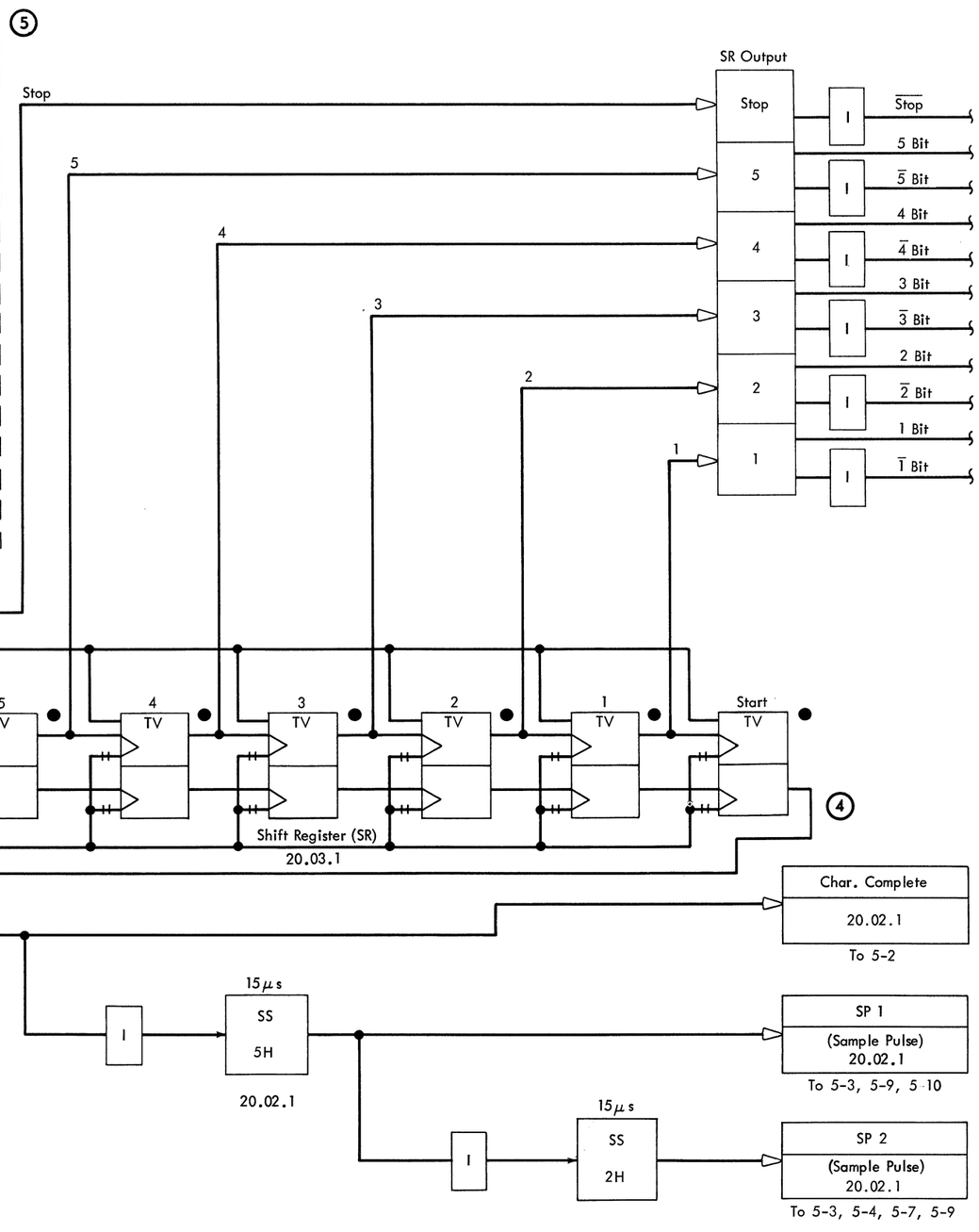


Figure 5-2. Serdes Shift Register (SR)

TERMINAL ADDRESS RECOGNITION (POLLING OR ADDRESSING)

- The TB card (C01) in each terminal has to be wired to correspond to the actual address assigned to the terminal.
- The 3, 4, and 5-bits of the units and tens polling and address characters represent the two character octal terminal address.
- All terminals on the same line recognize the figures and EOT characters of every poll or address from the central processor.
- The tens polling or addressing character is recognized by a 1-bit, not-2-bit, and the tens 3, 4, 5-bits wired out of the TB card.
- The units polling or addressing character is recognized by a not-1-bit, and the units 3, 4, 5-bits wired out of the TB card.
- All terminals are internally wired to recognize a broadcast address of tens-zero, units-zero respectively.
- The select pulse is active when a terminal recognizes its own address, either during polling or addressing.

Operation

(1) The TB card at C01 is wired to correspond to the address assigned to the terminal. The card is wired by the customer engineer at the time the terminal is installed. (See ALD 71.20.04.0 for octal coding charts.)

To assist in determining the 3, 4, and 5-bit configuration for octal characters: the 3-bit represents a binary 4, the 4-bit a binary 2, and 5-bit a binary 1. The outputs of the SR 3, 4, and 5 triggers are wired internally as inputs to the TB card.

Terminal address 15, for example, is wired as follows: the tens character 1 consists of not-3, not-4, and 5-bits-wire L to G, N to E, and P to C. The units character 5 consists of 3, not-4, and 5-bits wire K to F, N to D, and P to B.

(2) The four-character polling or address sequence is: figures, EOT, tens address, and units address. The figures-shift latch is turned on if the SR contains the figures character (1, 2, 4, 5 bits) at SP1 time. The latch is turned off with the letters character in the SR at SP1 time.

(3) When the EOT character (1, 2, 4 bits) is received after the figures character, the EOT latch comes on at SP1 time. The latch goes off with the SP2 pulse that follows the next character (if not an EOT character). All terminals on the same line recognize the figures and EOT characters.

(4) The tens-address latch comes on if the TB card is wired to recognize the tens character sent from the central processor, and the preceding character is the EOT character. The latch goes off at SP2 time of the next character.

(5) The select pulse is active at SP1 time if the TB card is wired to recognize the units character sent from the central processor.

(6) All terminals recognize the broadcast address (tens-zero, units-zero). The select pulse is active at all terminals on the same line when the central processor sends the broadcast address. (No response is sent by any terminals for a broadcast message.)

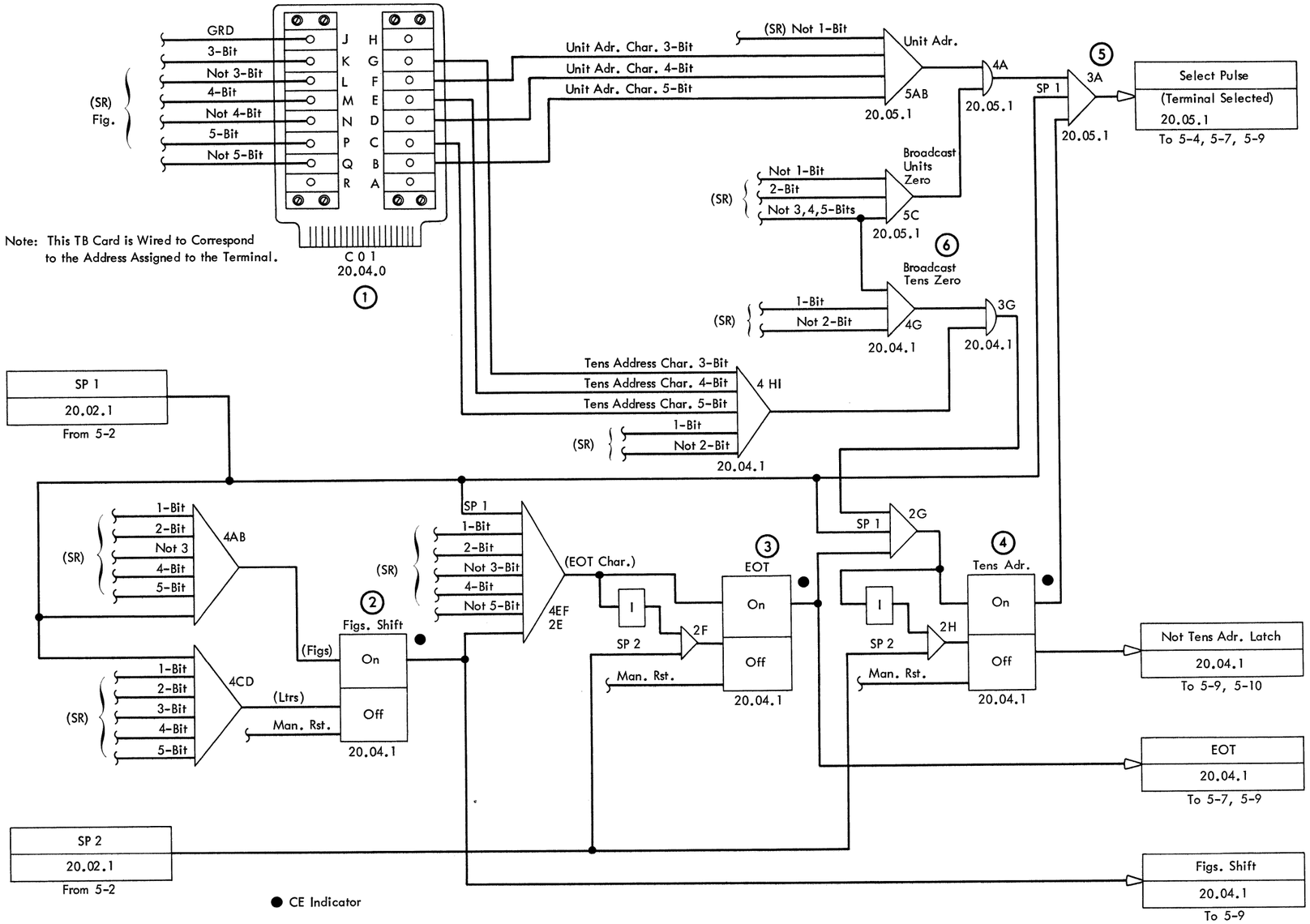


Figure 5-3. Terminal (Address Recognition Polling and Addressing)

TRANSMIT ACKNOWLEDGE TO POLLING OR ADDRESSING

- An acknowledgment character is transmitted in response to a polling or addressing from the central processor.
- The acknowledge character is a V (2, 3, 4, 5 bits).
- If a message is ready to transmit when polled, the acknowledge character is not transmitted. The message starts transmitting instead.
- No acknowledge character is transmitted in response to a broadcast address.
- After the terminal is selected by recognizing its own address, a one bit-delay (22 ms at 60 wpm) is active before transmitting the acknowledge character.

Operation

(1) The select pulse is active during SP1 when the terminal recognizes its own address during polling or addressing. The single shots delay (22 ms at 60-wpm) sampling the status of the terminal before sending the acknowledge character.

(2) Reader-not-ready is active if a message is not ready to be transmitted when the terminal is polled. The SR containing a not-2-bit at select delay time identifies polling from the central processor.

(3) Printer-ready is active if the terminal is ready to print (not busy) when the terminal is addressed. The SR containing a 2-bit at select delay time identifies addressing from the central processor.

(4) The transmit acknowledge latch comes on with either reader-not-ready or printer-ready. Whenever the latch is on, xmit-2-space-bit-ack is active to energize the transmit relay (Figure 5-1). A space signal transmits when the latch is on.

(5) Inhibit-decoding-ack is active (latch on) while the entire acknowledge character is transmitted. The latch (when ON) prevents the ASR 32 from printing the acknowledge character, and prevents turning on lights on the RAP keyboard. The latch goes OFF with SP 2 developed from the SR at the end of the acknowledge character. (The acknowledge character is local copied into the SR while transmitting.)

(6) The xmit-ack latch is turned off when the SR contains a not-5-bit, not-stop-bit, and oscillator-up pulse. These conditions are active after a space is transmitted for two-bit-times (start and not-1-bits). Remember: All data transmitted is local-copied back into the SR. The SR, therefore, has the stop trigger and the 5-trigger off after two space bits have transmitted. The xmit-ack, when OFF, de-energizes the transmit relay, and mark bits are transmitted for the 2, 3, 4, 5, and stop bits of the acknowledge character. This bit configuration (1-spacing, 2, 3, 4, 5 marking) constitutes the V character.

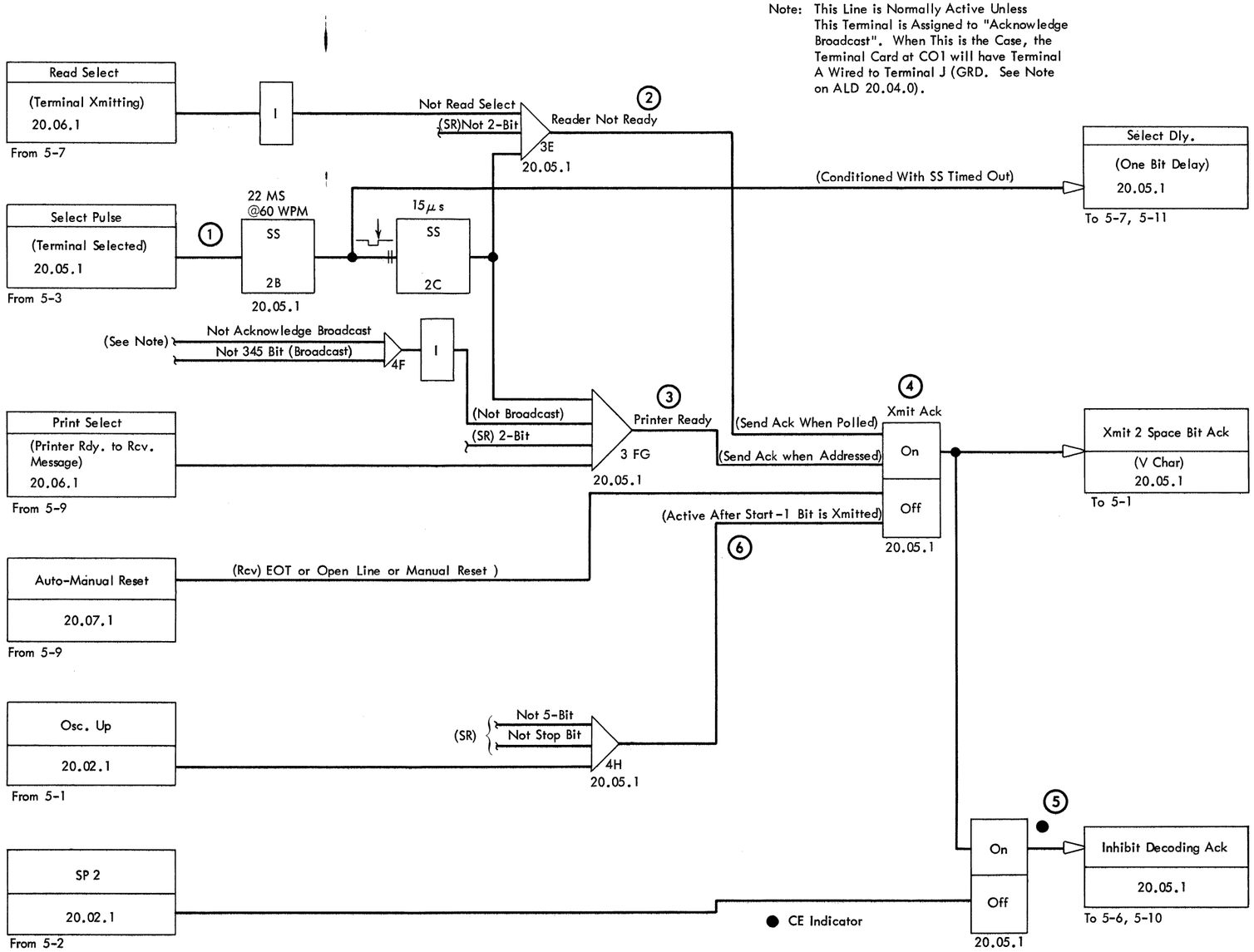


Figure 5-4. Transmit Acknowledge to Polling or Addressing

ENTER KEY-SCAN 1 AND 2

- The enter key initiates scan 1 and scan 2.
- The answerback drum magnet is energized for each scan cycle.
- Scan 1 feeds tape for 17 blanks, and punches a CR, LF, and figures characters.
- Scan 2 punches and prints 13 characters from the RAP keyboard, punches one space, and one letters character.
- Relay 3 is picked during scan 1, normal during scan 2.
- The terminal is off-line (enter light ON) after the enter key is pressed until the message begins to transmit. The terminal cannot be addressed from the central processor while off-line.

Operation

(1) The enter key is pressed after the reservation data is set up in the RAP keyboard.

(2) The scan 1 latch comes on if the terminal is not busy and the available key is not pressed on the RAP keyboard. The latch goes OFF with any scan point 3 pulse.

(3) The scan 1 and 2 latch comes ON as a result of scan 1 latch ON. This latch goes OFF with scan point 3 of scan cycle 2.

(4) Relay 3 picks after the enter key is released. R3 holds throughout the entire scan-1 cycle (one revolution of the answerback drum).

(5) Drum contact 7 is open until scan-point 2 (see timing chart Figure 5-12). The 30 ms single-shot fires only when the 7-contact breaks, which is at the end of scan point 20. Therefore, the output from the single shot is not active until scan point 20, which conditions the output of the inverter to the AND switch.

(6) The not-7-drum-contact line is active when the 7-level contact is open, which is only during scan-points ST (start) and 1.

(7) The answerback drum magnet is energized for scan-cycle 1 when the enter key is released. The magnet remains energized until the 7-drum contact closes, which is at scan-point 2, but the answerback drum continues through one revolution (20 scan points). Tape punching results from scan-cycle 1.

(8) The 30 ms single shot fires when the 7-drum contact breaks (scan-point 20 of scan 1). At the time-out of the single shot, the answerback drum magnet is again energized to initiate scan-cycle 2. The RAP keyboard data is punched and printed.

Relay 3 (step 4) drops when the 7-contact breaks (scan-point 20 of scan 1).

Scan 1 and 2 latch (step 3) goes OFF at scan-point 3 of scan 2. (See Figure 5-13 and ALD 71.20.33.0 for keyboard scan sequence.)

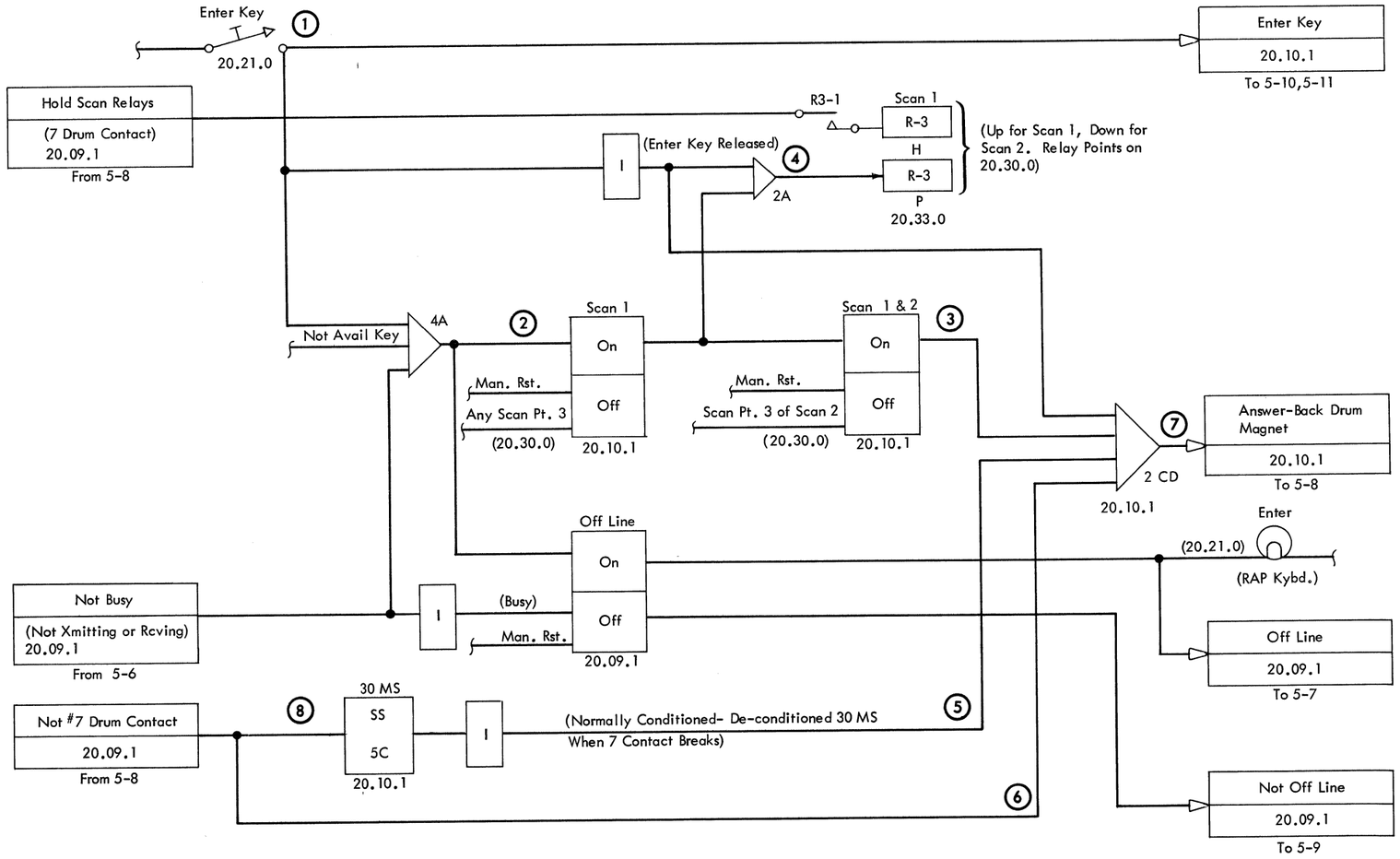


Figure 5-5. Enter Key (Scan Cycles 1 and 2)

ASR 32 PRINT OPERATION (LOCAL COPY OR RCV DATA

- Printing results on the ASR 32 while:
  a. A message is being prepared.
  b. On LCL (local) test mode of operation.
  c. Data is received from the transmission line,either local copy or received messages from the central processor.
- The selector magnet is energized in the ASR 32 to initiate a print operation.
- The selector magnet is energized for a mark, de-energized for a space.
- The distributor output controls the selector magnet for printing while a message is being prepared, and also on local test mode of operation.
- The receive relay output controls the selector magnet for printing data from the transmission line (while either transmitting or receiving messages.

Operation

Prepare Message

(1) During a scan operation, the answerback drum magnet is energized, mechanically tripping the distributor clutch. Scan pulses originate from the answerback drum contacts, and are terminated at the distributor. From the common wiper of the distributor, the distributor spacing-pulses originate according to the character-code configuration.

(2) A distributor space-pulse energizes MR 4 relay when the terminal is not selected (that is, neither read selected nor print selected).

(3) MR 4, when energized on a space signal, opens the circuit to the selector magnet to de-energize it. When MR 4 is de-energized for a mark, the normally closed MR 4 point energizes the selector magnet. Power for the selector magnet is provided through the selector magnet driver card (SMD) located in the ASR 32.

Print from Line (Received messages or local copy)

(4) When the terminal has been selected (either polled or addressed) and the acknowledge character has been transmitted (not-inhibit-decoding-ack), the space bits as received from the receive relay energize MR 4 and de-energize the selector magnet.

(5) The busy indicator is ON whenever the terminal is either read or print selected. Read-select occurs when the terminal is polled and has a message ready to transmit. Print-select results when the terminal is addressed to receive a message from the central processor. (See Figure 5-7 and 5-9). The busy indicator also comes ON if a message is properly prepared and the send key is pressed (IP ready).

(6) The LCL test switch, when ON, permits the terminal to print all information as read from the paper tape reader, without transmitting the data. The acknowledge character also prints.

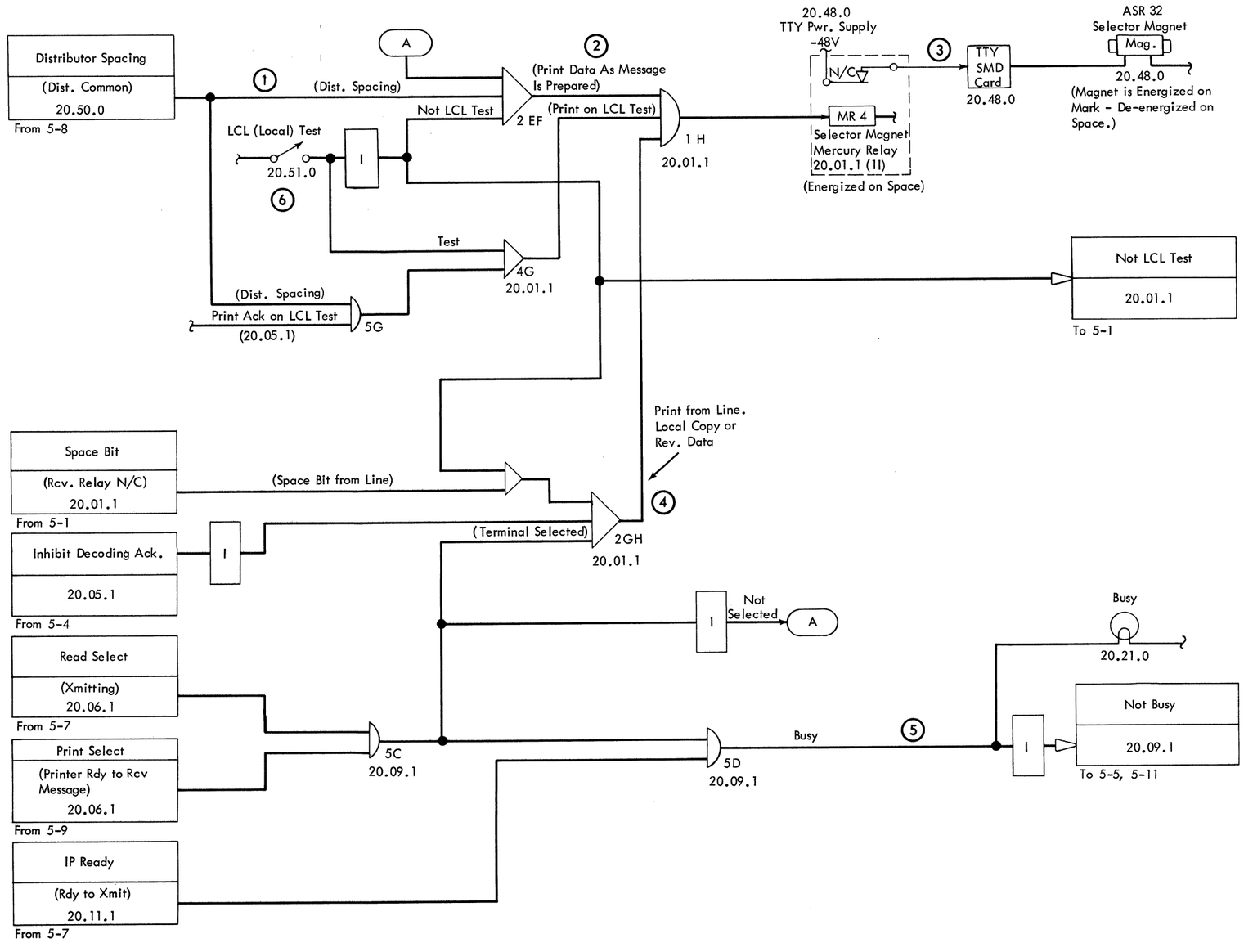


Figure 5-6. ASR 32 Print Operation (Local Copy or Rcv Data)

START TRANSMIT OPERATION (SEND KEY-SCAN 3-READ TAPE)

- Manually pull the paper tape taut after the RAP keyboard is scanned (scans 1 and 2).
- Type on the ASR 32 keyboard additional data to prepare the message. Printing and punching result.
- The send key initiates scan 3 operation to punch one figures character, one EOB character, and feed tape through eighteen blanks.
- Distributor-reader trip magnet is energized to feed tape through the reader up to the first data character. No transmission results.
- The bid latch is turned on to bid for the line, so the message will transmit when the terminal is polled.
- When polled, the terminal is read-selected, and the distributor-reader trip magnet is energized. Tape is read and the message transmitted.
- Transmission stops when the EOB character is read from paper tape.

Operation

(1) Manually pull the tape taut after scan 1 and 2 are completed. The reader tight tape contact operates to turn ON the taut tape latch. The taut tape latch turns OFF with scan-point 3 of scan 2.

(2) The send key, when pressed, turns ON the scan-3 latch if the off-line latch is on (enter key previously pressed). The scan-3 latch goes off with scan-point 3 of scan 3.

(3) Relay 4 picks when the send key is released and the scan-3 latch is on. R4 holds through scan-point 20 of scan 3.

(4) The answerback drum magnet is energized when the send key is released and scan-3 latch is ON. The answerback drum rotates through one revolution to emit scan points for scan 3. (See ALD 71.20.33.0 for keyboard scan sequence.)

(5) The feed-tape latch comes on at scan-point 20 of scan 3. The distributor-reader trip-magnet is energized to feed tape through the reader up to the first data character. Characters are not transmitted.

(6) The TTY channel-1 pulse, with the feed tape latch ON, turns ON the IP ready latch. The IP ready latch turns OFF the feed-tape latch. The TTY channel-1 pulse is active when the tape reader reads the figures character (1, 2, 4, 5 bits) that was punched in tape during scan 1. When the feed-tape latch goes OFF it de-energizes the distributor-reader trip-magnet to stop the tape reader.

(7) The bid latch turns on with the EOT character sent from the central processor (with IP-ready ON).

(8) With the bid latch ON, the read latch turns ON when the terminal is selected during a poll. The select pulse and the not-2-bit from the SR indicates that the terminal was polled rather than addressed.

(9) The distributor-reader trip-magnet is energized with select delay active (one bit delay), not available key, and the read latch ON. The tape reader starts and the message is transmitted.

The read latch ON, and the distributor output from the tape reader contacts control the transmit relay. (See Figures 5-1 and 5-8).

(10) The read latch ON turns OFF IP-ready and the bid latch with the SP2 pulse.

(11) The read latch goes OFF, and the distributor-reader trip-magnet is de-energized when the EOB character is transmitted and local copied into the SR.

If the transmitted message is too long (over 180 characters), the central processor is programmed to cut off transmission from the terminal. To accomplish this, the processor holds the line open (spacing) for about 200 ms. This continuous space activates the auto-manual-reset line, which turns off the read latch. (See Figure 5-9)

Any tape interlock condition (tight tape, tape out, etc.) turns OFF the read latch to stop the tape reader.

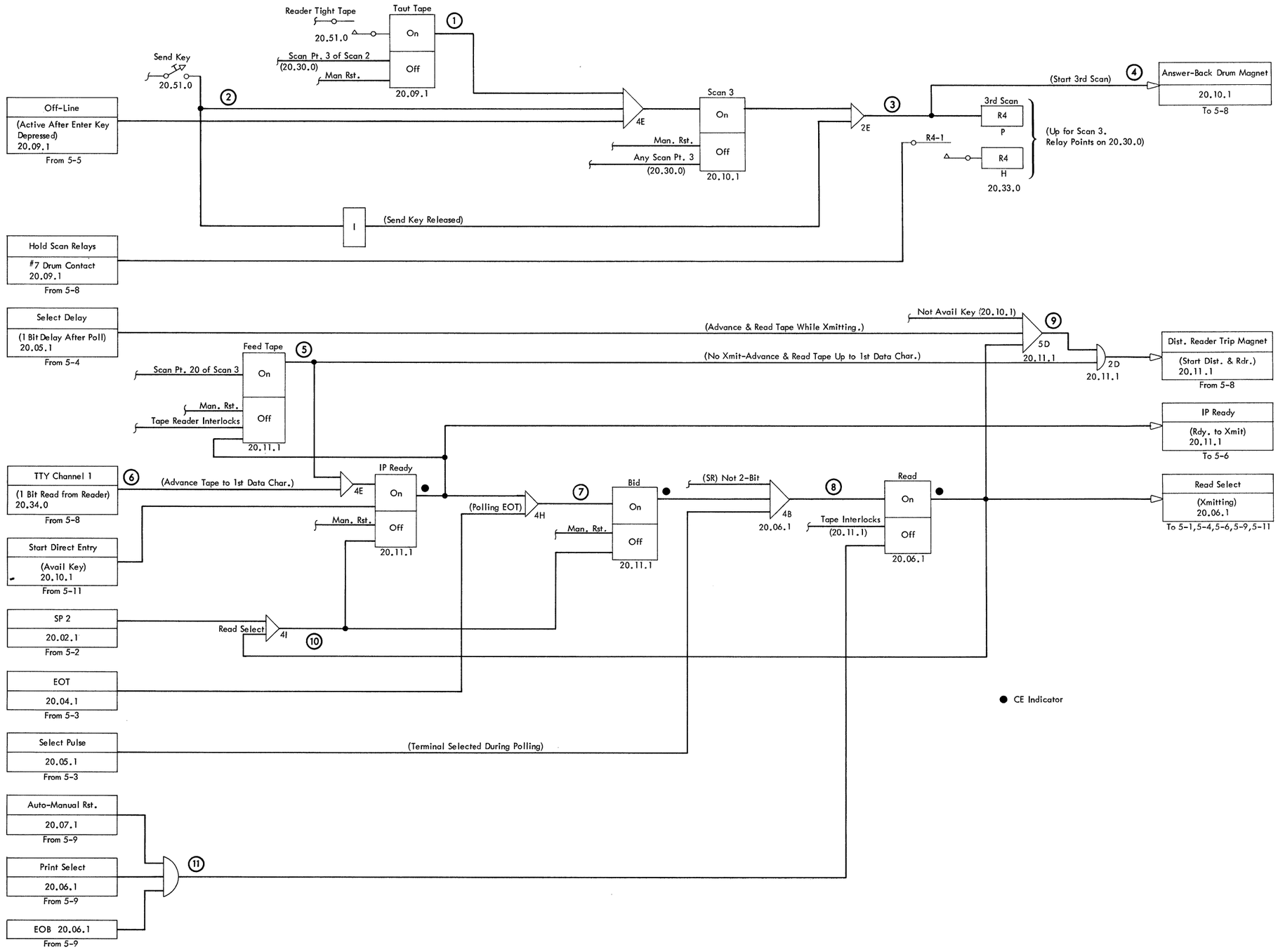


Figure 5-7. Start Transmit Operation (Send Key-Scan 3- Read Tape)

ASR 32 CONTROL SCHEMATIC

- The ASR 32 keyboard contacts set up when any key is pressed on the ASR 32 keyboard.
- The answerback drum contacts operate when the answerback drum magnet is energized to provide scan pulses during scans 1, 2, 3 and direct entry scan.
- The tape reader sensing contacts operate to read paper tape when the distributor-reader trip-magnet is energized.
- The distributor operates when:
  a. The distributor-reader trip magnet is energized.
  b. The answerback drum magnet is energized.
  c. A key is pressed on the ASR 32 keyboard.
- The distributor terminates the character code pulses from the:
  a. Tape reader contacts
  b. Answerback drum contacts
  c. ASR 32 keyboard contacts
- The output of the distributor (common wiper) controls the selector magnet or the transmit relay.

Operation

(1) Pressing any key on the ASR 32 keyboard causes the keyboard contacts to set up according to the character code configuration.

(2) The distributor clutch is mechanically tripped by the universal lever, which is unlatched from any ASR 32 key. The distributor scans the keyboard contacts and terminates the character code pulses to control the selector magnet.

(3) The answerback drum magnet is energized for scan-cycles 1, 2, 3, and direct entry.

(4) The distributor clutch is mechanically tripped by the answerback drum magnet armature. The distributor output controls the selector magnet.

(5) The answerback drum is codes so the contacts operate at certain times throughout the drum cycle (see timing chart on Figure 5-12).

Contacts 1 through 5 generate scan-points ST (start), and 1 through 20.

Contact 6 suppresses the ST scan-point from the distributor.

Contact 7 is primarily used to hold the scan-cycle relays through the entire scan cycle.

Contacts 8 and 9 pick relays A and B respectively.

(6) The distributor-reader trip-magnet is energized to start the tape reader.

(7) The distributor clutch is mechanically tripped by the distributor-reader trip-magnet armature. The output of the distributor, while tape is being read controls the transmit relay.

(8) During each cycle of the distributor clutch, the TD feed contact operates to energize the TD feed (reader) magnet.

(9) The TD feed magnet in the tape reader operates the tape reader sensing contacts, and also feeds tape through the reader. The contacts close when a hole is sensed (mark), and remain open when no hole is sensed (space).

(10) The distributor operates when a key is pressed on the keyboard, the answerback drum magnet is energized, or the tape reader operates. As the distributor disk rotates, it scans the contacts to terminate the character-code pulses to control either the selector magnet or the transmit relay. The distributor rotates through one cycle for each character.

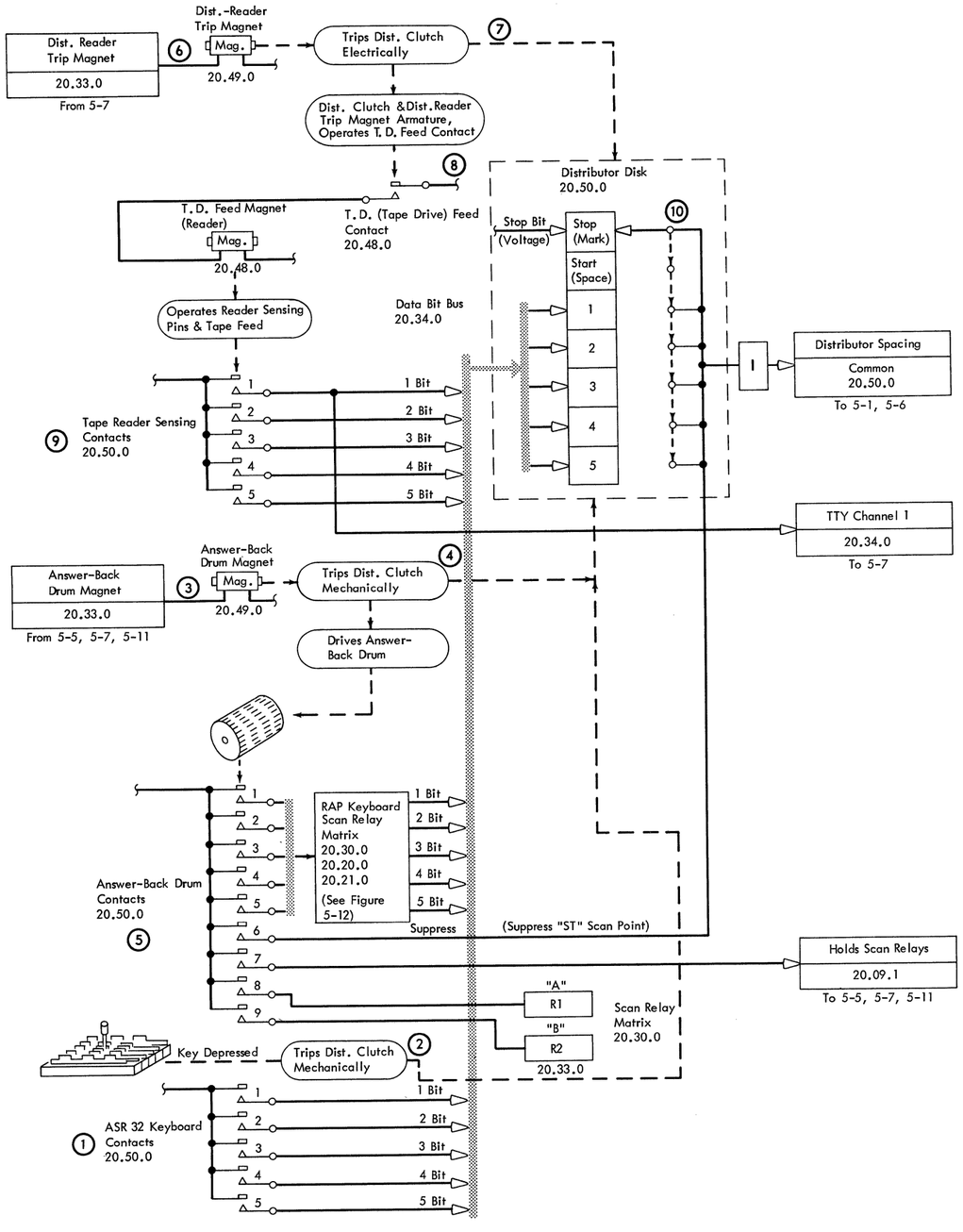


Figure 5-8. ASR 32 Control

PRINT AND LIGHTS SELECT

- After a message is transmitted, the terminal automatically turns around to receive the reply from the central processor.
- The print latch turns ON when EOB is read from tape while transmitting (automatic tumaround), or when addressed to receive a message from the central processor.
- EOB sequence is detected when a figures character (1,2,4,5 bits) is directly followed by the EOB character (1, 4 bits).
- The lights-select latch turns ON at the same time the print latch comes ON. This conditions the terminal to tum on any lights necessary for a lights reply message.
- Auto-manual reset is active when:
  a. The reset key is pressed.
  b. The power is turned ON.
  c. EOT character is received.
  d. A continuous-space condition exists on the transmission line for over 200 ms.
- Manual reset is active when:
  a. The reset key is pressed.
  b. The power is turned ON.

Operation

(1) EOB is recognized when the figures character (1,2,4,5 bits), followed by the EOB character (1, 4 bits) is read from tape.

(2) The print latch turns ON when the EOB sequence is read while the terminal is transmitting (read-selected). The print latch, when ON, conditions the terminal to print a received message.

NOTE: The inhibit-turnaround-jumper line is always active. This feature is only wired if it is not desired to automatically turn around when EOB is read (see ALD 71.20.04.0).

(3) If the terminal is not off-line (not preparing a message) when addressed to receive a message from the central processor (select-pulse and a 2-bit is the SR), the print latch is turned on.

(4) The lights-select latch is tumed ON whenever the print latch comes ON as in steps 2 and 3 . The lights-select latch, when ON, conditions the terminal to receive a lights message from the central processor.

(5) The lights-select latch is tumed OFF with any character received that contains a not-3 and not-5-bit. All characters assigned to turn on lights contain either a 3 or 5-bit. (See Figure 5-10)

(6) The central processor terminates all messages sent to a terminal with an EOT sequence (figure-EOT character). The EOT character, when received while printing a message from the processor, turns off the print latch, which deconditions the pick to the selector magnet (see Figure 5-6).

(7) If a steady space is transmitted on the line for over 200 ms, the 200 ms single shot times out. This condition, pressing the reset key, or turning power on conditions auto-manual-reset, which resets the print latch, lights-select latch, read latch, and transmit-acknowledge latch.

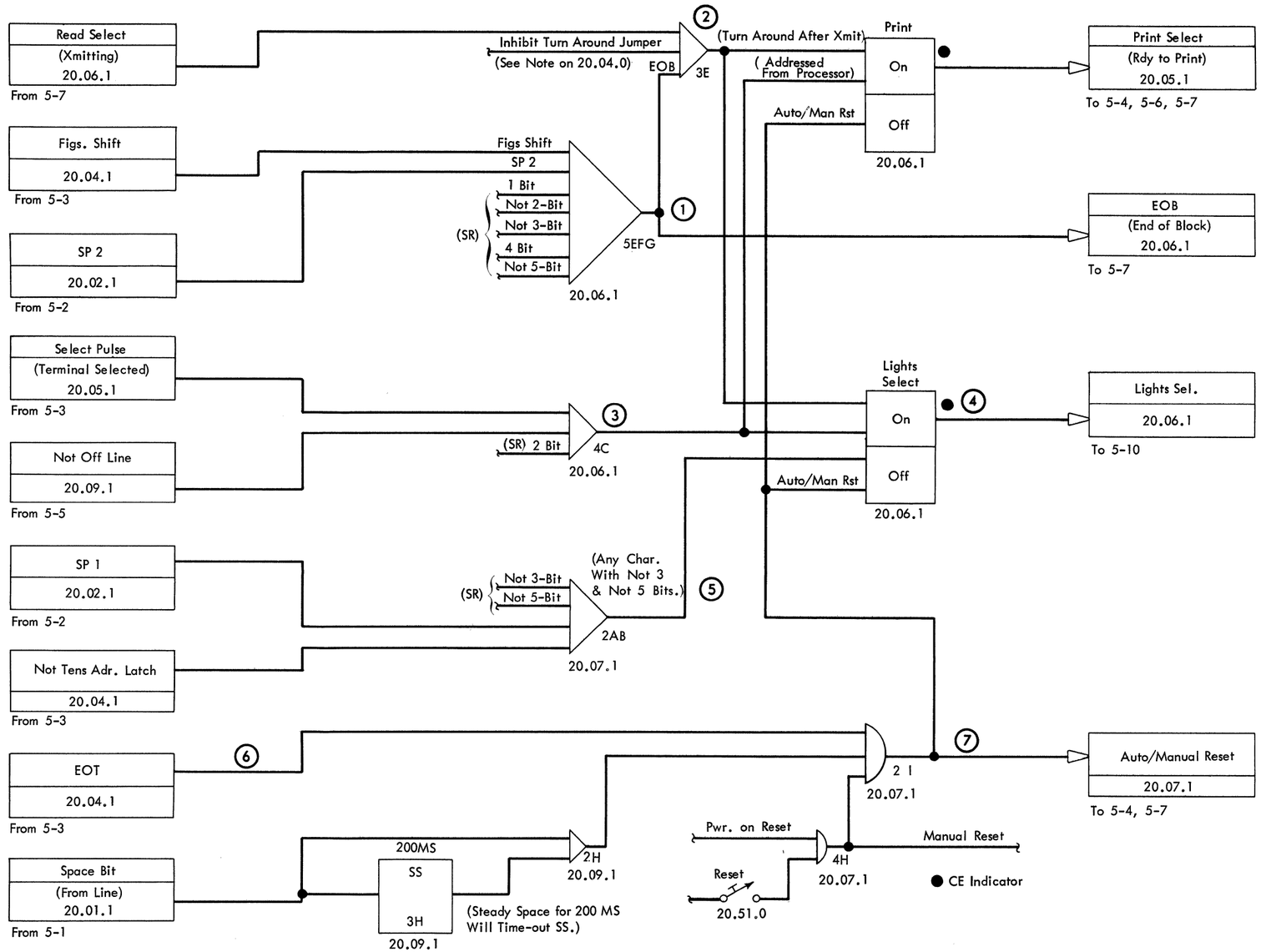


Figure 5-9. Print and Lights Select

RAP KEYBOARD LIGHTS CONTROL

- The RAP keyboard lights indicate lights messages sent from the central processor.
- The lights message characters are sent from the central processor at the beginning of the message.
- Pressing the enter key resets any lights that are on.
- The test-lights key, when pressed, turns on all lights. When released, the lights go off.

Operation

(1) The lights-select latch is turned on when the terminal automatically turns around after transmitting, or when addressed from the central processor.

(2) The alternate-inn 1, 2, 3 lights are turned on with the Z, L, O characters respectively. These 3 characters each contain a not-3-bit and a 5-bit.

(3) The 1-bed, 2-bed, and special lights are turned on with the S, I, and N characters respectively. These three characters each contain a 3-bit and a not-5-bit.

(4) The available, not-available, and take/place lights are turned on with the Y, P, and M characters respectively. These three characters each contain a 3 and 5-bit.

(5) The enter key, when pressed, resets any latches (and lights) that are on.

(6) The test-lights switch, when pressed, turns on all latches (and lights). When the switch is released, the 15 u s single shot fires to turn off all latches (and lights).

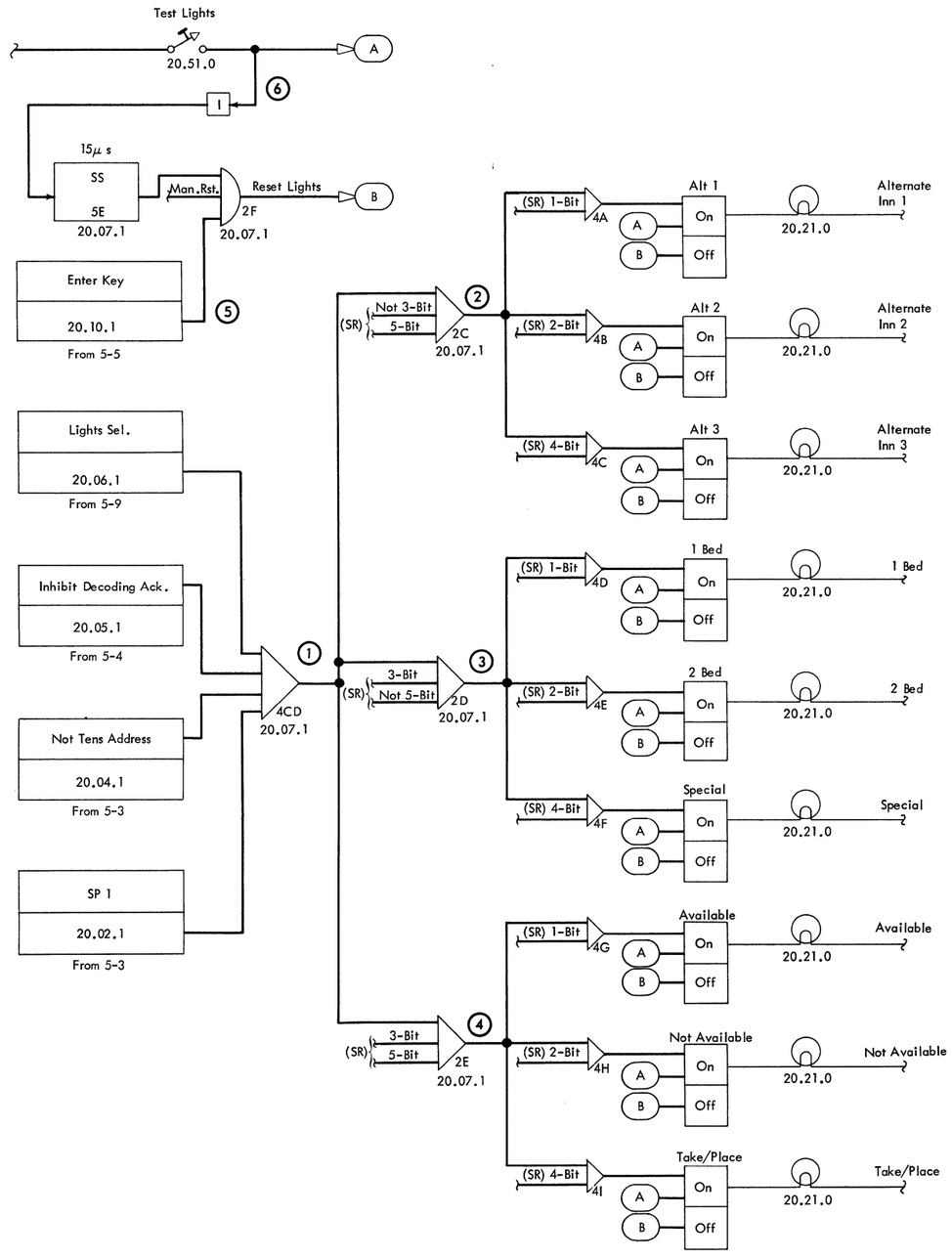


Figure 5-10. RAP Keyboard Lights Control

AVAILABLE INQUIRY MESSAGE-DIRECT ENTRY

- An available transaction message is transmitted to inquire as to the available room status at a particular host inn.
- The available pushbutton, followed by the enter key, initiates a direct entry scan operation when polled from the central processor.
- Data is transmitted as the RAP keyboard is scanned.

Operation

(1) The AVAIL pushbutton, when pressed, remains down with the contact closed.

(2) The direct IP (input) latch comes ON when the enter key is pressed and the AVAIL key contact is closed.

(3) The IP ready and bid latch are turned on to bid for the line (see Figure 5-7).

(4) When the terminal is polled, the read-select line is active.

(5) Relay 5 is picked to set up the RAP keyboard scan circuits. R5 holds throughout the direct entry scan from the answerback drum contact 7.

(6) The answerback drum magnet is energized, to trip the distributor clutch and advance the answerback drum through one revolution. The RAP keyboard data is transmitted as the keyboard is scanned. (See Figure 5-13 and ALD 71.20.33.0 for keyboard scan sequence.)

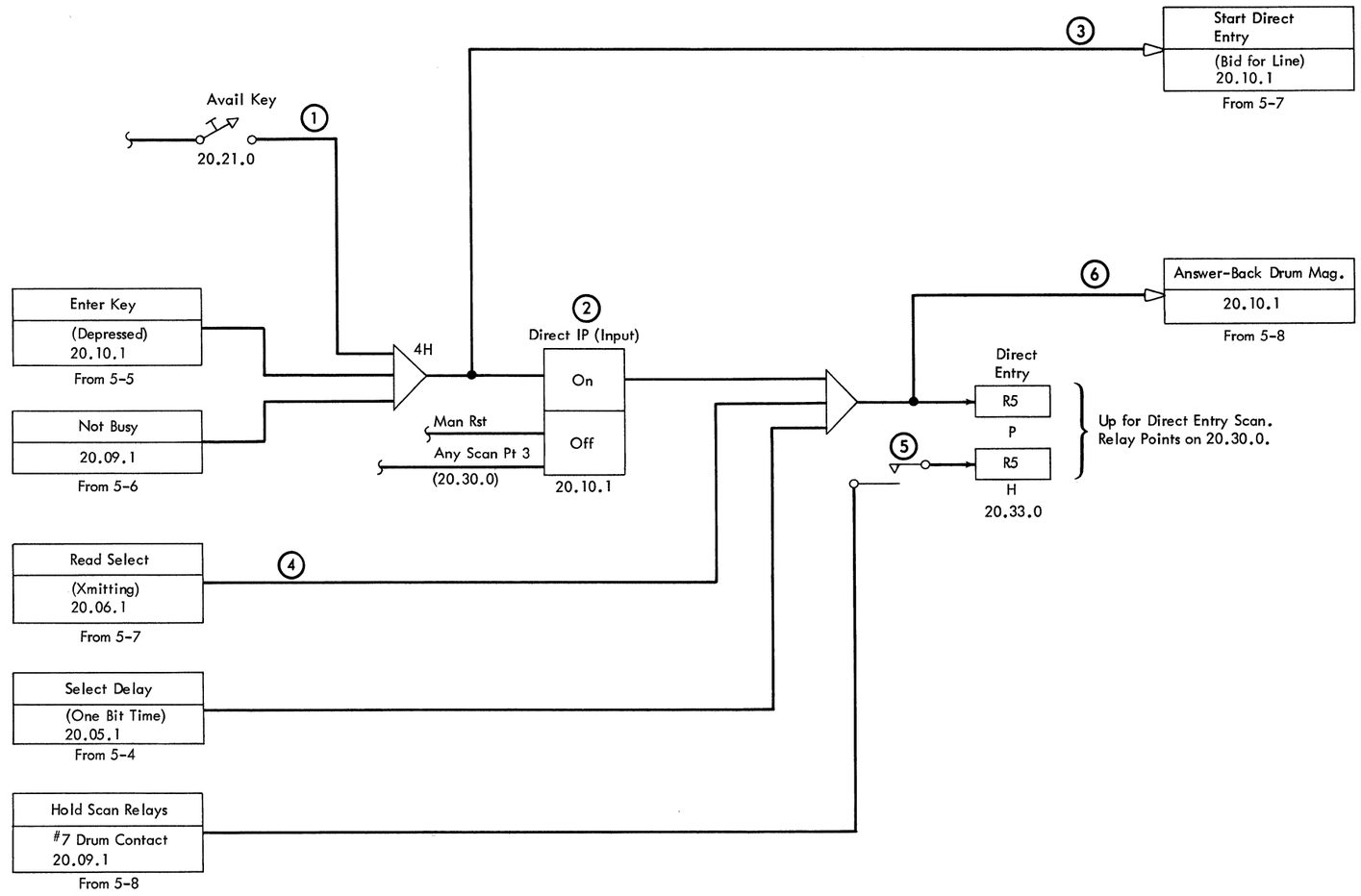


Figure 5-11. Available Inquiry Message (Direct Entry)

ANSWERBACK DRUM (SCAN POINTS AND TIMINGS)

- The answerback drum is coded to provide the pulses from the contacts.
- Contacts 1 through 5 provide the scan point pulses.
- Contact 6 suppresses the start (ST) pulse.
- Contact 7 holds the scan-cycle relays.
- Contacts 8 and 9 pick relays A and B respectively.
- The timing chart illustrates the scan point timings, and the timings for relays 1 through 5.

Operation

(1) The 6-contact closes during the start (ST) scan-point to suppress the output of the distributor. The distributor output marks throughout the start scan-point.

(2) Scan-points 1 through 5 are emitted from contacts 1-5 when both R1 (A) and R2 (B) are down.

(3) Scan-points 6 through 10 are emitted from contacts 1-5 when R1 (A) is picked and R2 (B) is down.

(4) Scan-points 11 through 15 are emitted from contacts 1-5 when both R1 (A) and R2 (B) are picked.

(5) Scan-points 16 through 20 are emitted from contacts 1-5 when R1 (A) is down and R2 (B) is picked.

(6) Contact 7 is closed from scan-points 2 through 20 to hold the scan relays 3, 4, and 5.

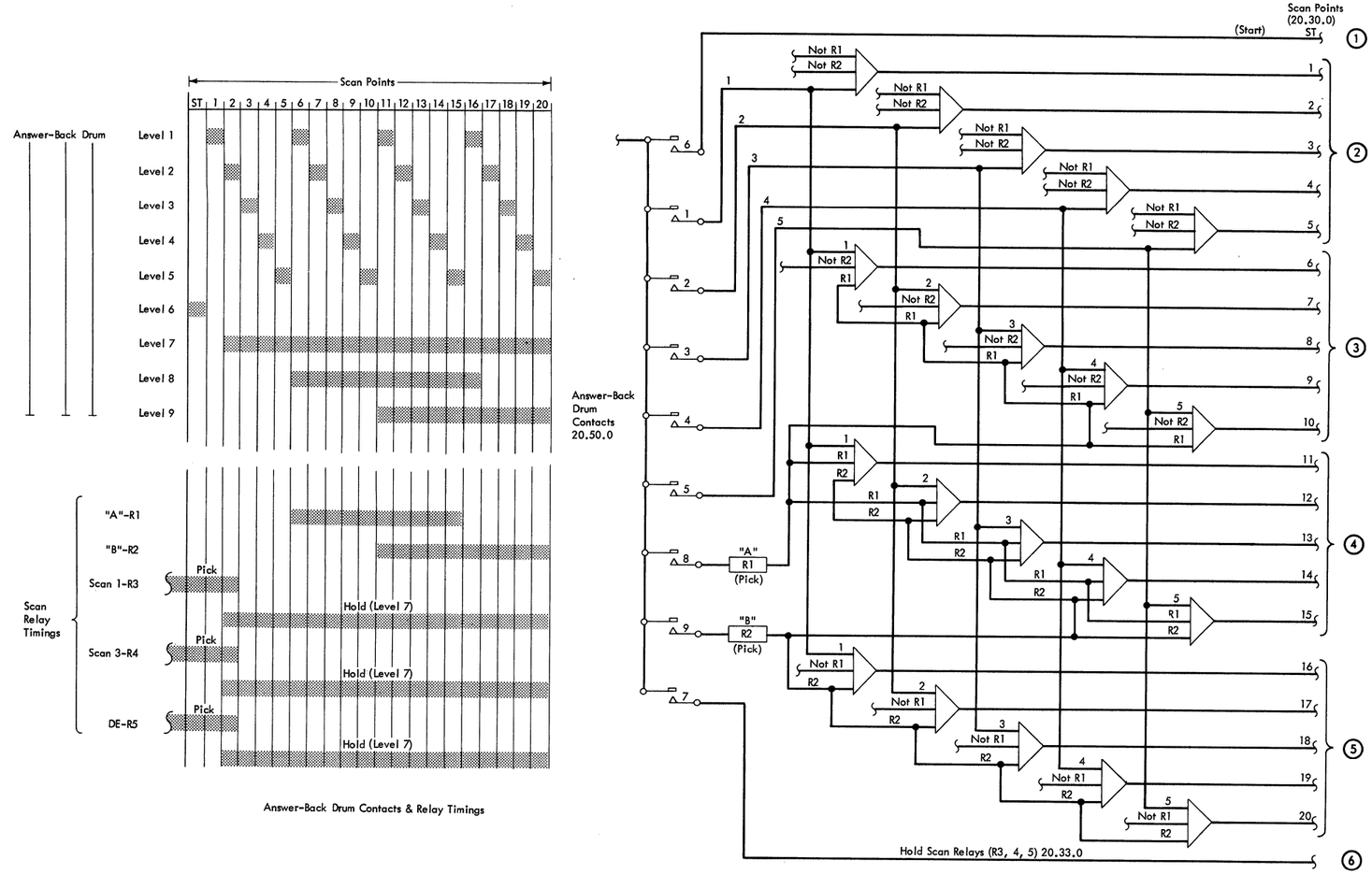


Figure 5-12. Answerback Drum (Scan Points and Timings)

RAP KEYBOARD SCAN OPERATION

- The RAP keyboard is scanned during scan-cycle 2 and direct entry scan.
- The scan point pulses are developed from the answerback drum, through the scan relay matrix to the RAP keyboard, and terminate at the data bus lines to the distributor.
- The 5-bit is internally wired to emit on all scan points through the RAP keyboard.
- The suffix character from scan-point 1 is wired by the customer engineer to provide the desired character.
- All 13 characters scanned from the RAP keyboard print in figures shift.
- The host inn pushbuttons are not interlocked with each other. Therefore, more than one button in this group can be pressed.
- For example, if the 4, 5, 7, and B pushbuttons are pressed, the following characters are printed from scan-points 2, 3, 4, 5 respectively:

  Scan-point 2: 5 character prints (5-bit)

  Scan-point 3: . character prints (3, 4, 5-bits)

  Scan-point 4: # character prints (3, 4-bits)

  Scan-point 5: 9 character prints (4, 5-bits)

- The characters that result from scan-points 14 through 20 vary depending on the scan cycle (scan 2 or direct entry).

Operation

① The suffix character can be wired to emit any character shown in the chart on ALD 71.20.32.0. The jumper wires are placed in TB A12 to A13, 14, 15, 16 accordingly to emit the desired character.

② The pushbuttons (more than one can be pressed) pressed in the host inn group determine the characters printed (and punched) during scan points 2 through 5. If no buttons are pressed in a subgroup, the 5-character (5-bit) prints.

③ Only one pushbutton can be pressed in any group. The button pressed determines the character printed and punched during the respective scan-points for the group. If any group has no buttons pressed, the 5-character (5-bit) prints.

④ The characters resulting from scan-points 14 through 20 vary as to the scan cycle. These characters are not selected through the RAP keyboard, but are controlled through the scan relay matrix.

⑤ The character-code pulses that are to print and punch are fed to the data bus lines which go to the distributor.

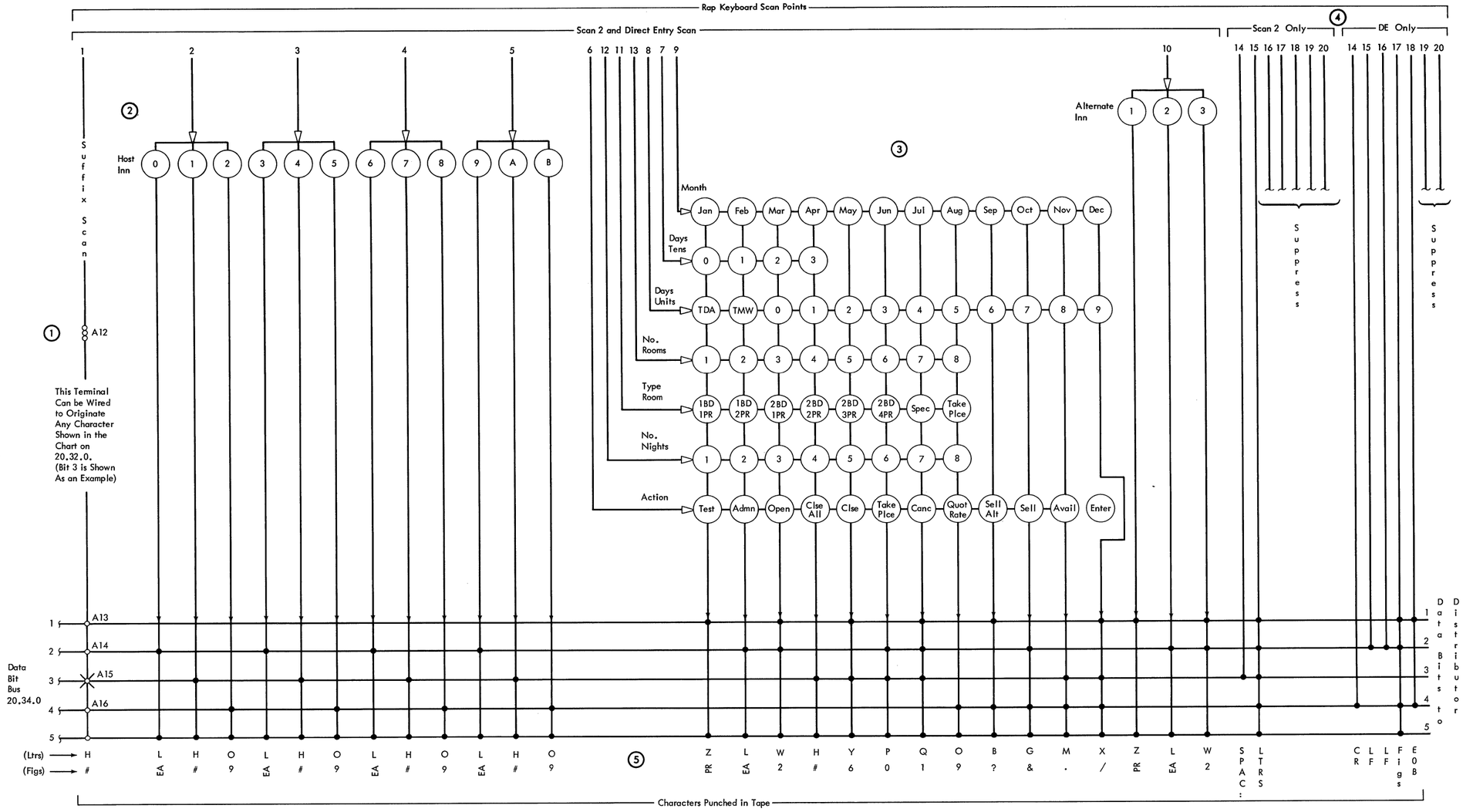


Figure 5-13. RAP Keyboard Scan Operation

SAFETY

Personal safety cannot be overemphasized. To insure your safety, make it an everyday practice to follow all safety precautions at all times. Become familiar with and use the safety practices outlined in the IBM Form 124-0082.

DANGER

- The 1971 power supply has a ferroresonant transformer with a capacitor across the high-voltage taps. this capacitor is designated as C6 on ALD 71.03.02.0. DO NOT MEASURE THIS VOLTAGE.
- The telegraph line connects to the 1971 Model 20 at TB4-7 and TB4-8 on ALD 71.02.01.0. The telegraph line carries about 62 ma current at varying voltages. Be extremely careful when you measure or work in this area. Do not disconnect either of these terminals without first removing the telegraph connector plug from the telegraph line terminal box.
- High voltage is present in the ASR 32. Some green wires in the ASR 32 are current-carrying wires, and not ground wires. Be extremely careful when you work in this area. Always turn off the main power switch and disconnect the line cord if power is not needed to service the machine.

TERMINAL INSTALLATION RECORD

The terminal installation record chart (Figure 6-1) should be completed at the time the terminal is installed. This same chart is on ALD 71.01.01.0. Both charts should be completed.

The common carrier contacts, the list of other terminals on same line, and the Memphis central processor data can be obtained from your local office, the account representative, or from the FE account representative in Memphis.

SCHEDULED MAINTENANCE

ROUTINE	FREQUENCY	OPERATION	OBSERVE
2	12	For gears and cams, use grease (part 5354902). For other moving parts and felt washers, use oil (5354901). The carriage drive eccentric requires special attention to oil the internal surface. NOTE: Do not over lubricate in the area near electrical contacts.	Inspect for binds. Check the belts for wear and proper tension.
4	12	Perform the on-line and off-line tests.	Check print alignment.
9	12	Check the power cord and telegraph connector cord for fraying and proper grounding.	
		CAUTION: Do not use alcohol, minerial spirits, or other solvents to clean the plastic parts, or the parts with protective-decorative finishes. Normally, use a soft dry cloth to remove dust, oil, grease and to clean parts or assemblies. If necessary, you may use a soft cloth dampened with mild soap or detergent. Afterward, rinse the cleaned area and buff with a soft, dry cloth.	

1971/20 Terminal Installation Record

Serial No. _____ Install Date _____
Line Number _____ Terminal Address _____
Type of Line _____
Terminal Speed _____ wpm
Suffix Character _____ (ALD 71.20.32.0)
Acknowledge Broadcast wired: Yes_____ No _____ (71.20.04.0)
Inhibit Turn-around wired: Yes _____ No _____ (71.20.04.0)

List of Terminals on Same Line

Terminal Address No.	Location (City)	B.O. Assigned

Common Carrier Contacts

Name	Phone No.	Responsible for

Central Processor Information

Terminal Address_____ Phone No._____ Name_____

(Information to complete this form is available from CE Field Management or the Account Salesman.)

Figure 6-1. 1971 Mod 20 Terminal Installation Record

LOCATIONS

Figures 6-2 through 6-18 show the locations of the various units of the terminal.

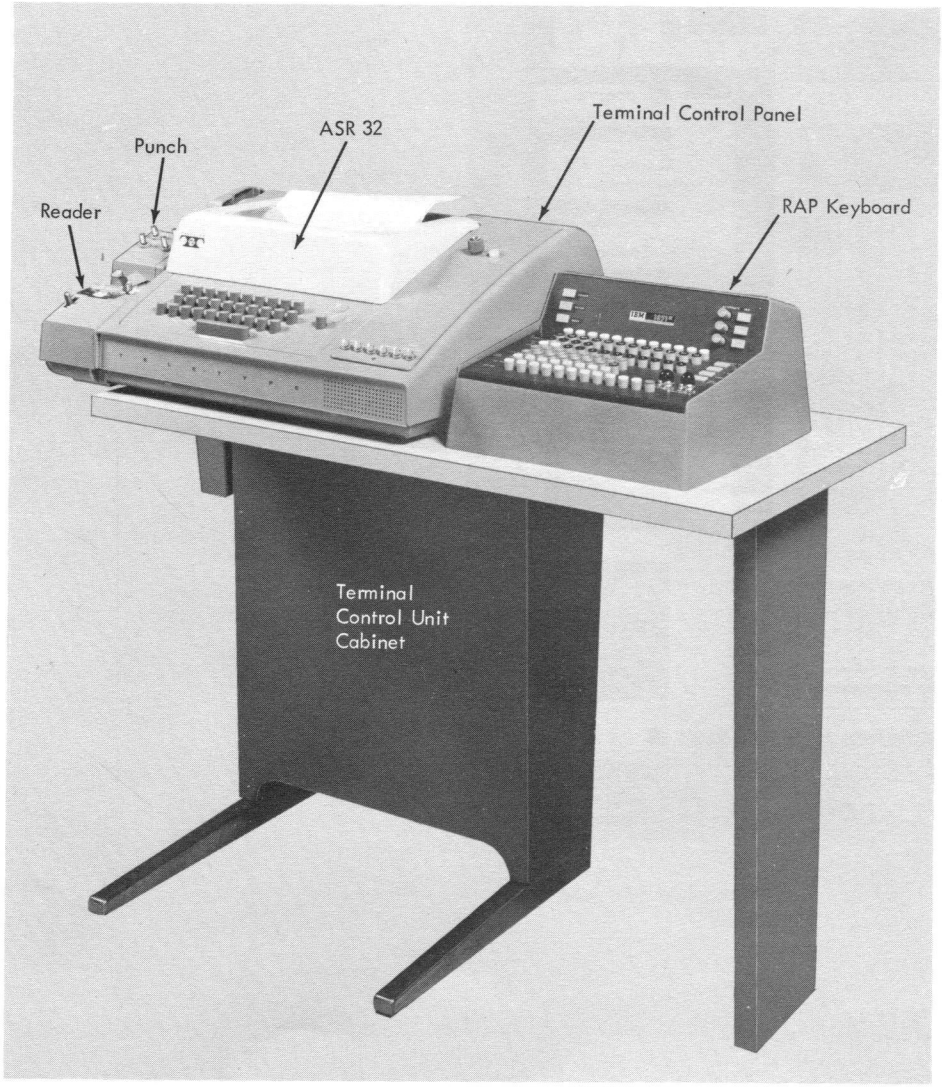


Figure 6-2. 1971 Mod 20 Reservation Terminal

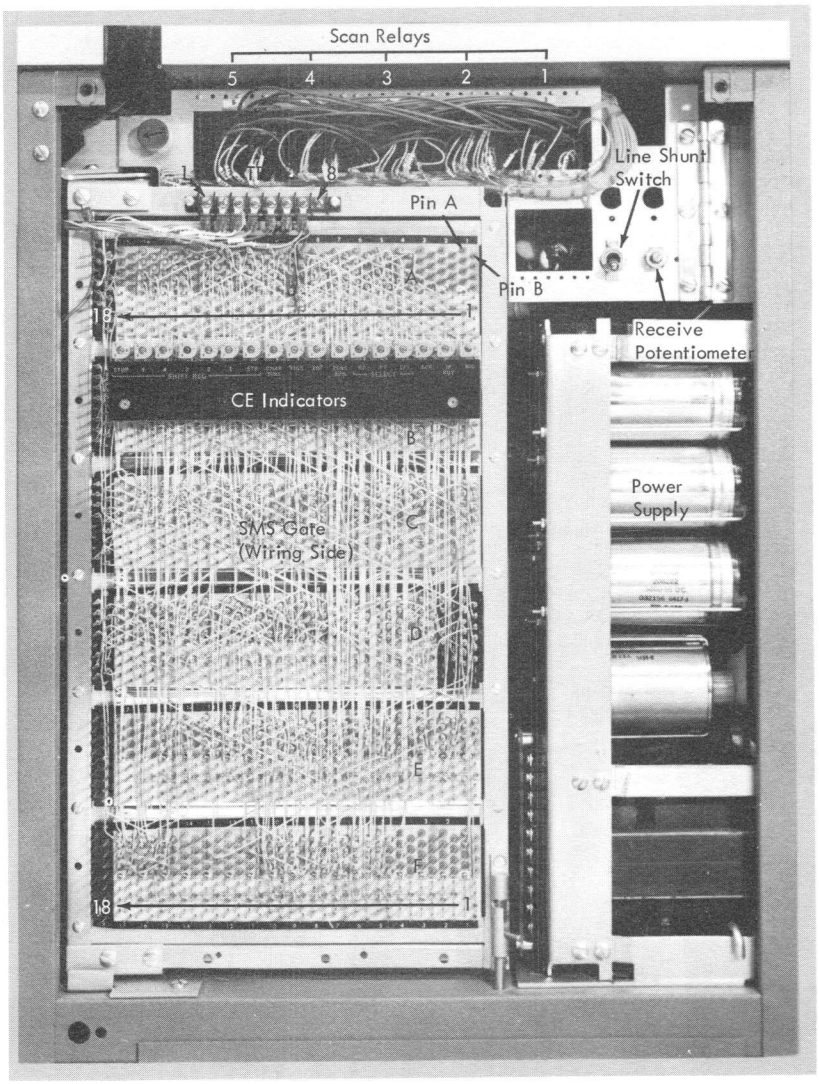


Figure 6-3. Terminal Control Unit

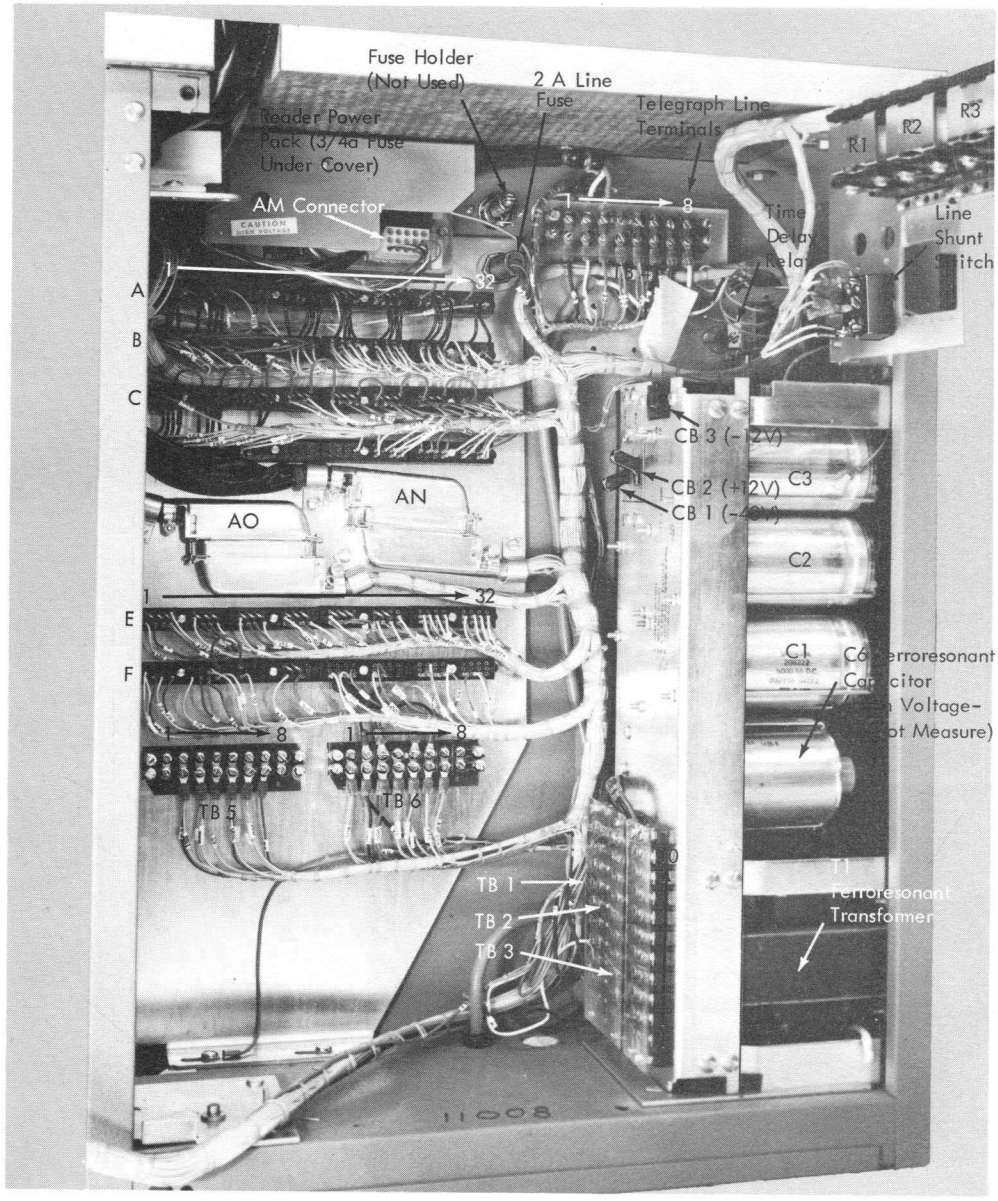


Figure 6-4. Terminal Control Unit (SMS Gate Removed)

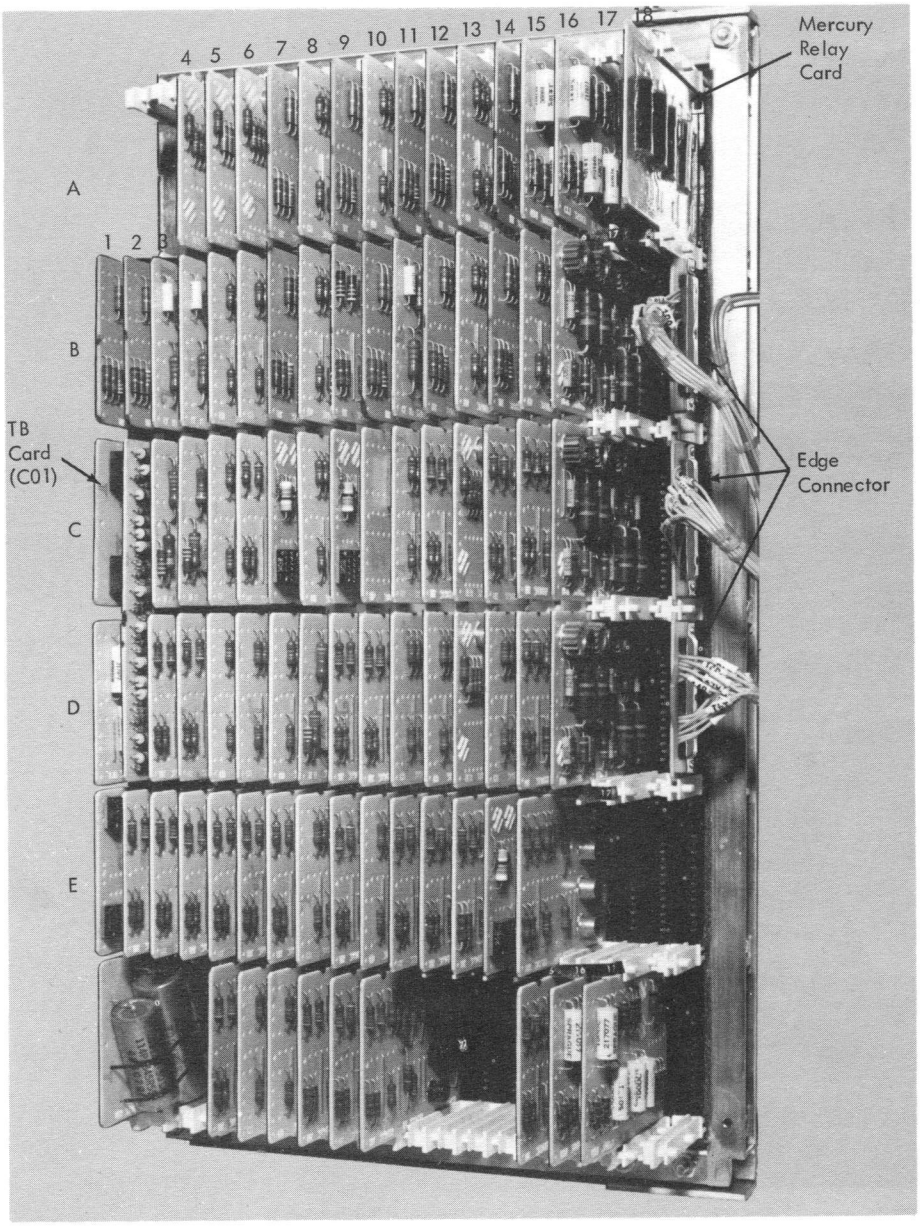


Figure 6-5. SMS Gate (Removed from Terminal)

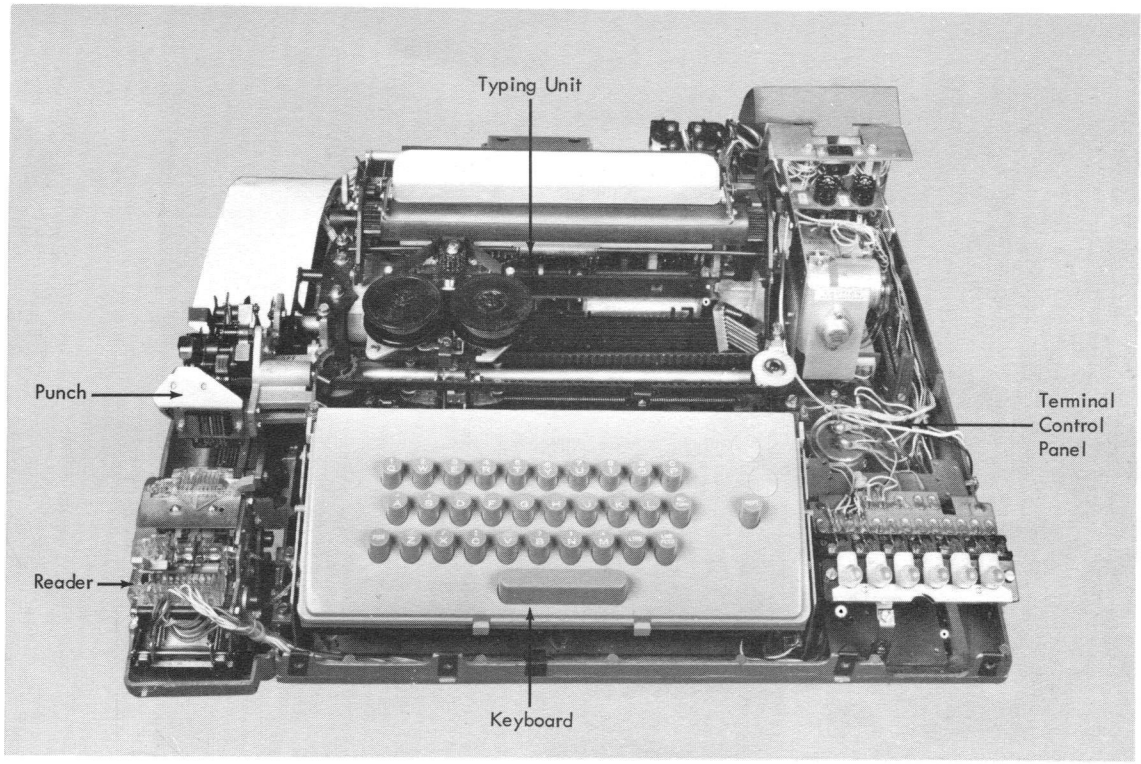


Figure 6-6. ASR 32 Units

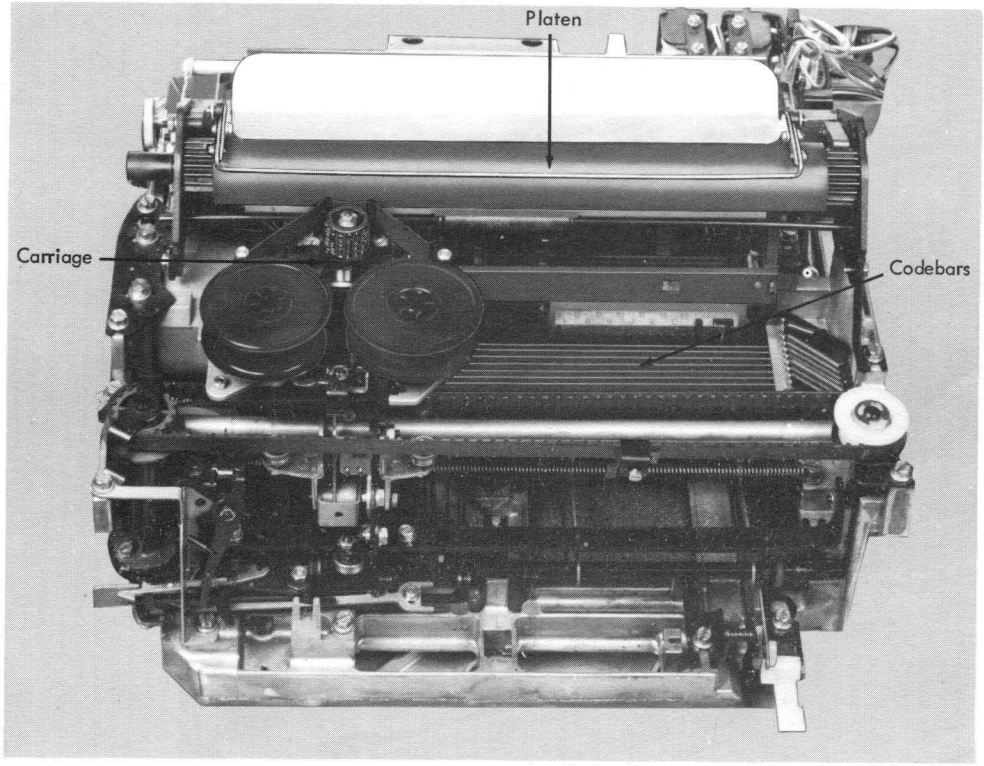


Figure 6-7. Typing Unit

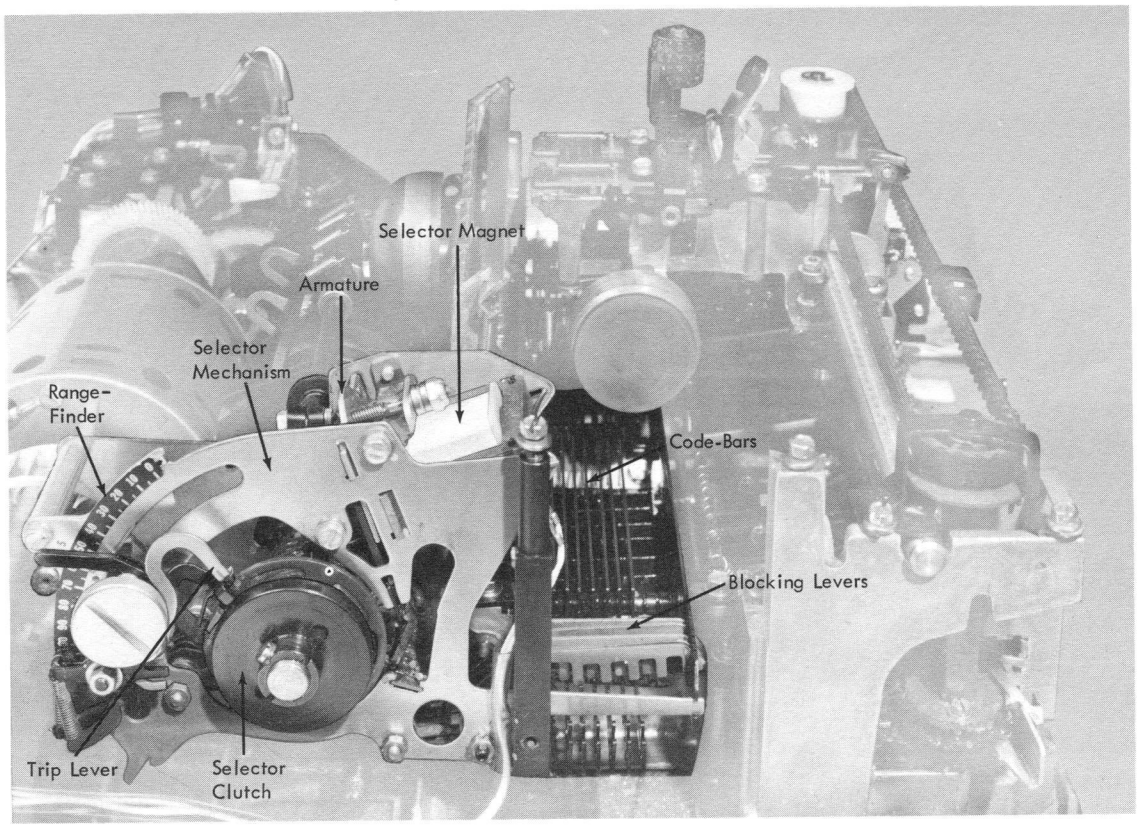


Figure 6-8. Selector Mechanism

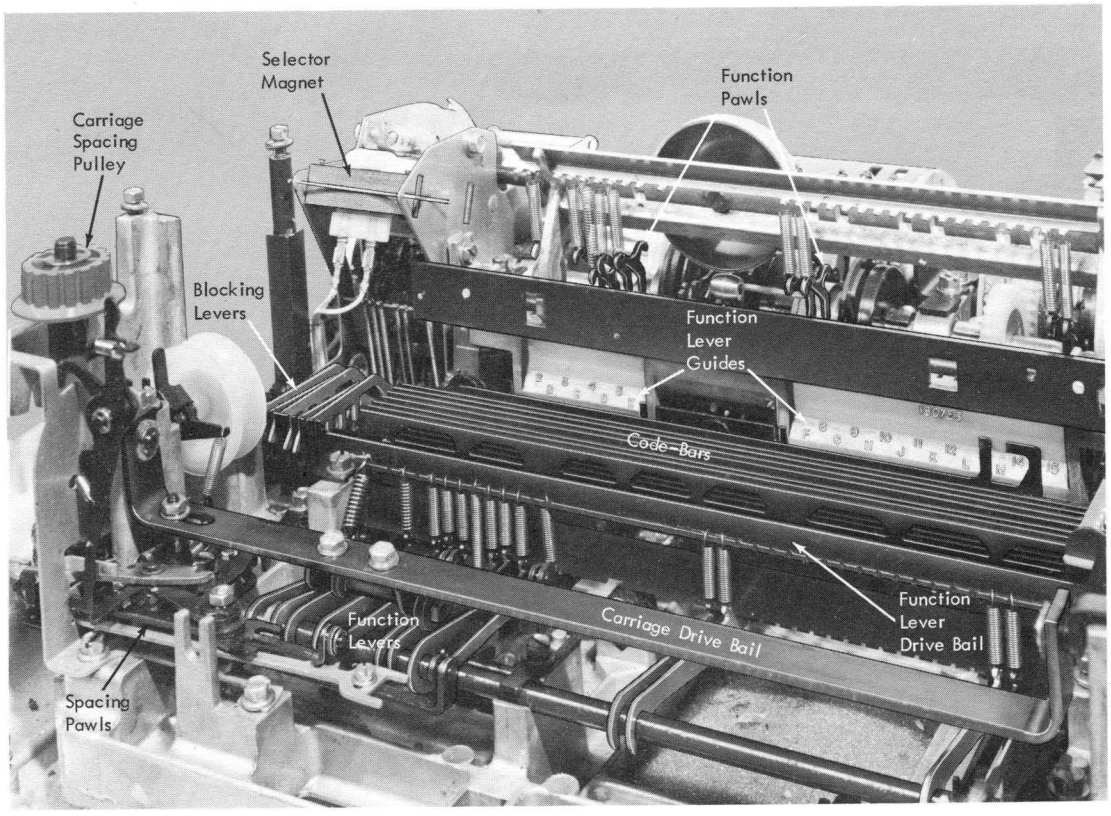


Figure 6-9. Typing Unit (Platen and Carriage Removed)

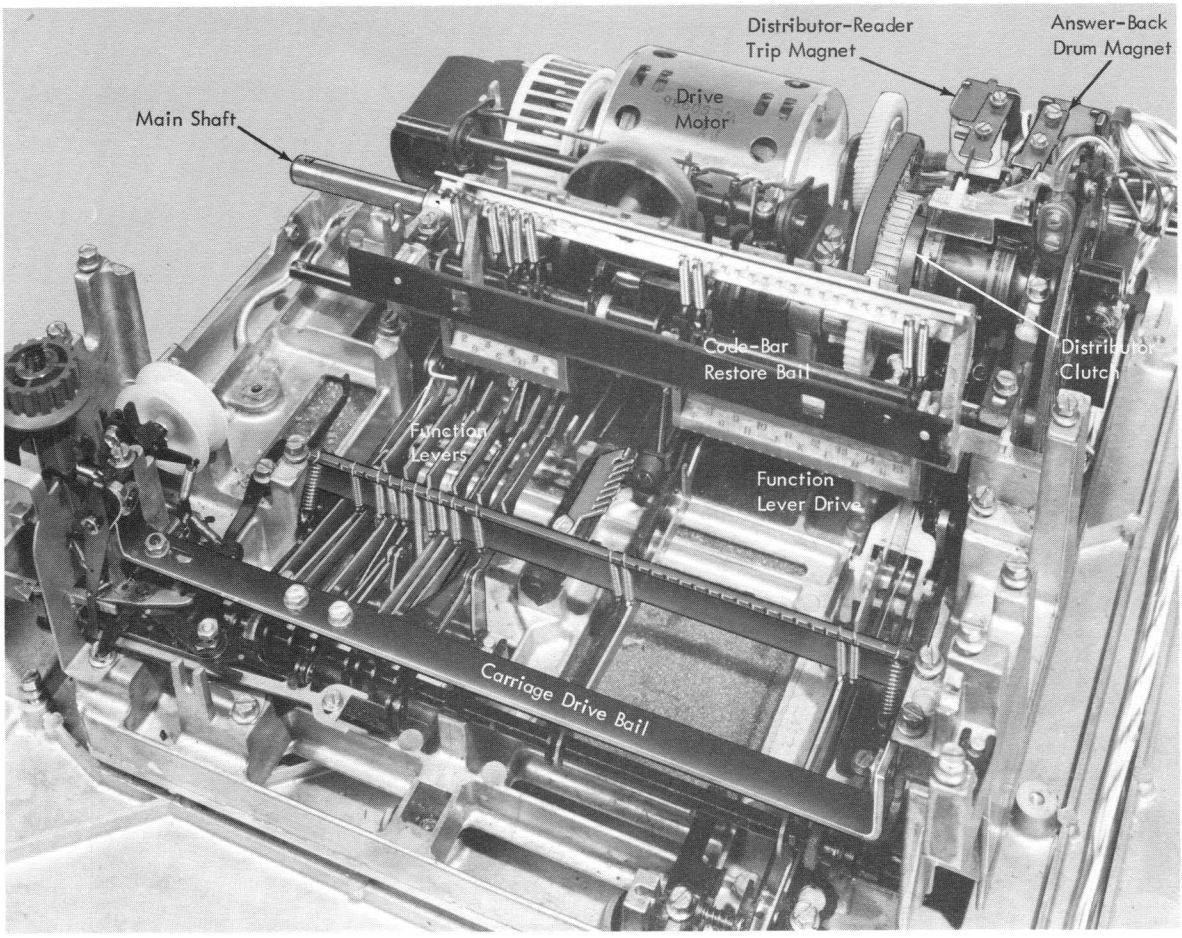


Figure 6-10. Typing Unit (Selector Mechanism and Codebars Removed)

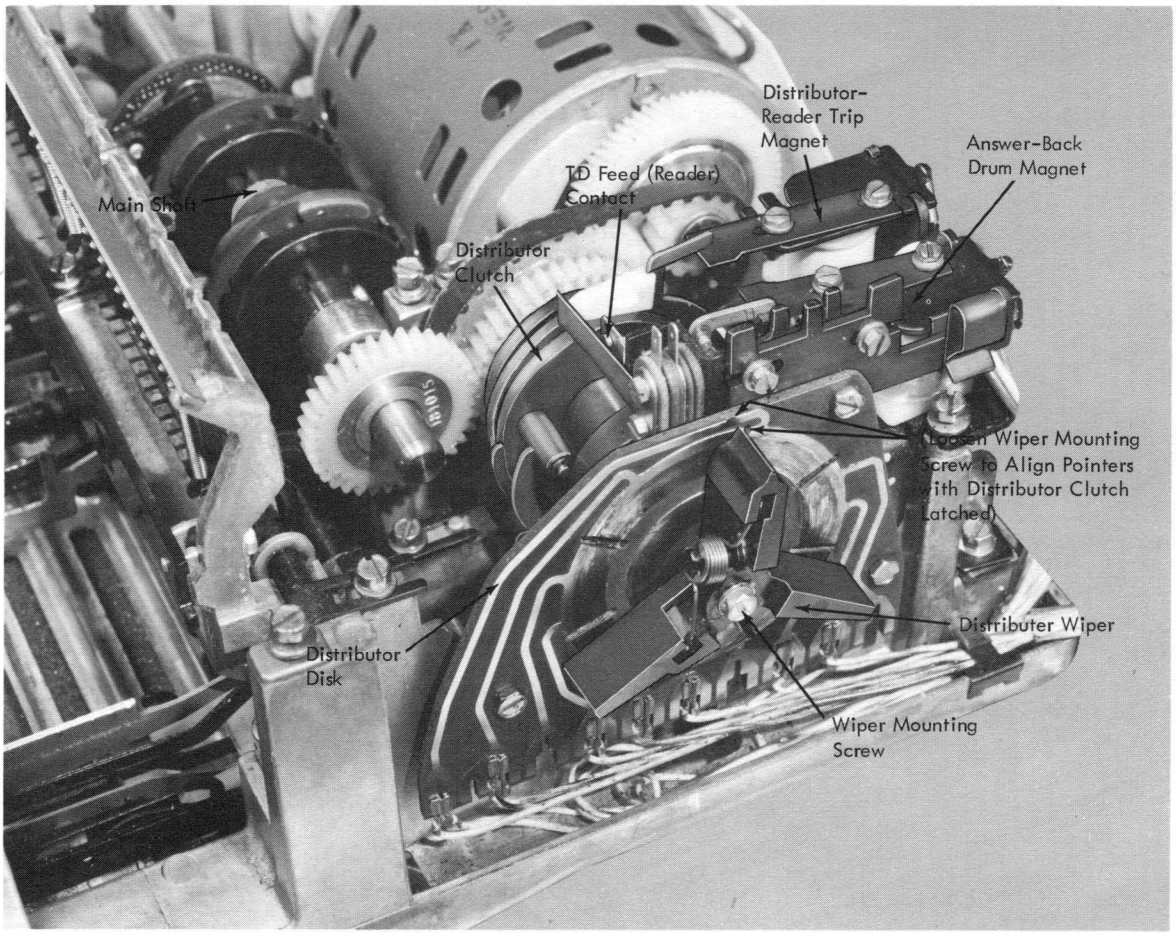


Figure 6-11. Distributor Mechanism

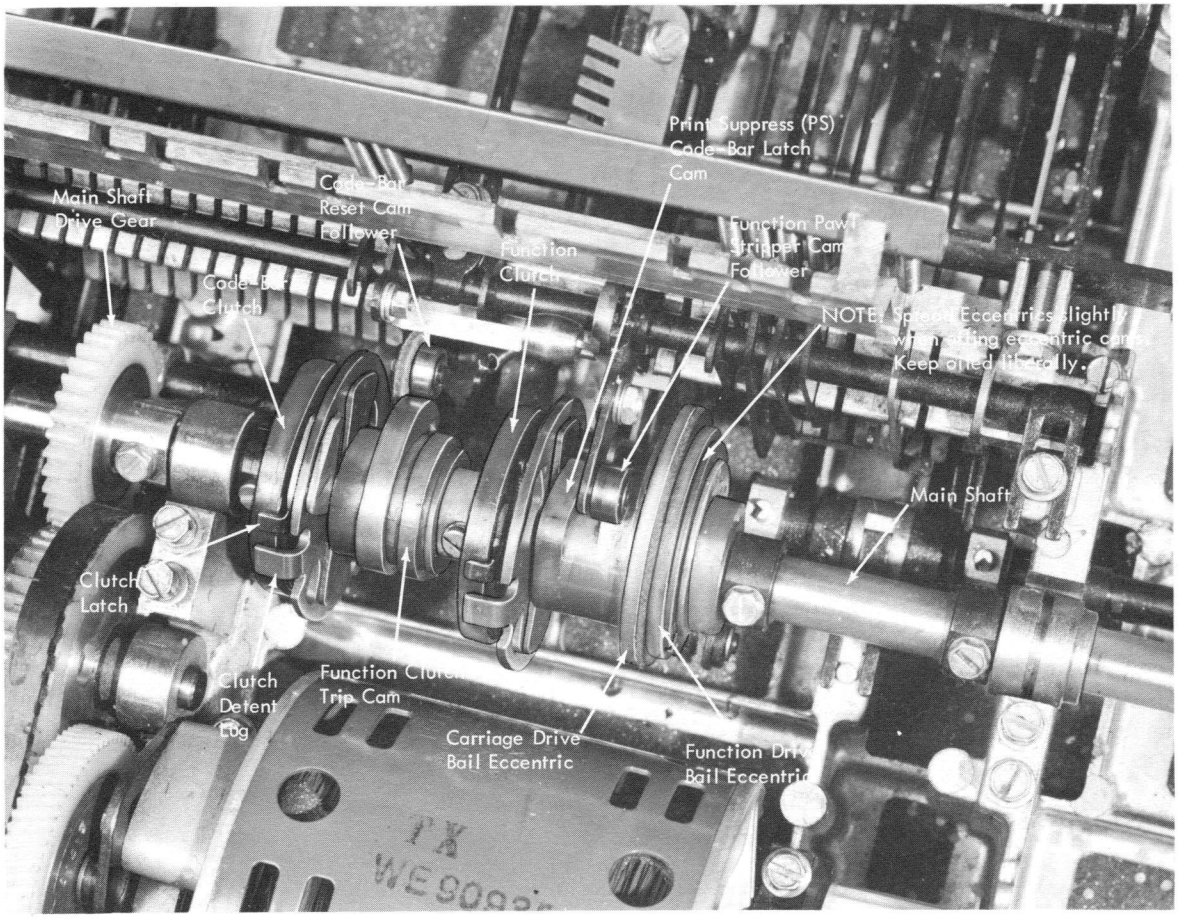


Figure 6-12. Main Shaft (Clutch Trip Shaft Removed)

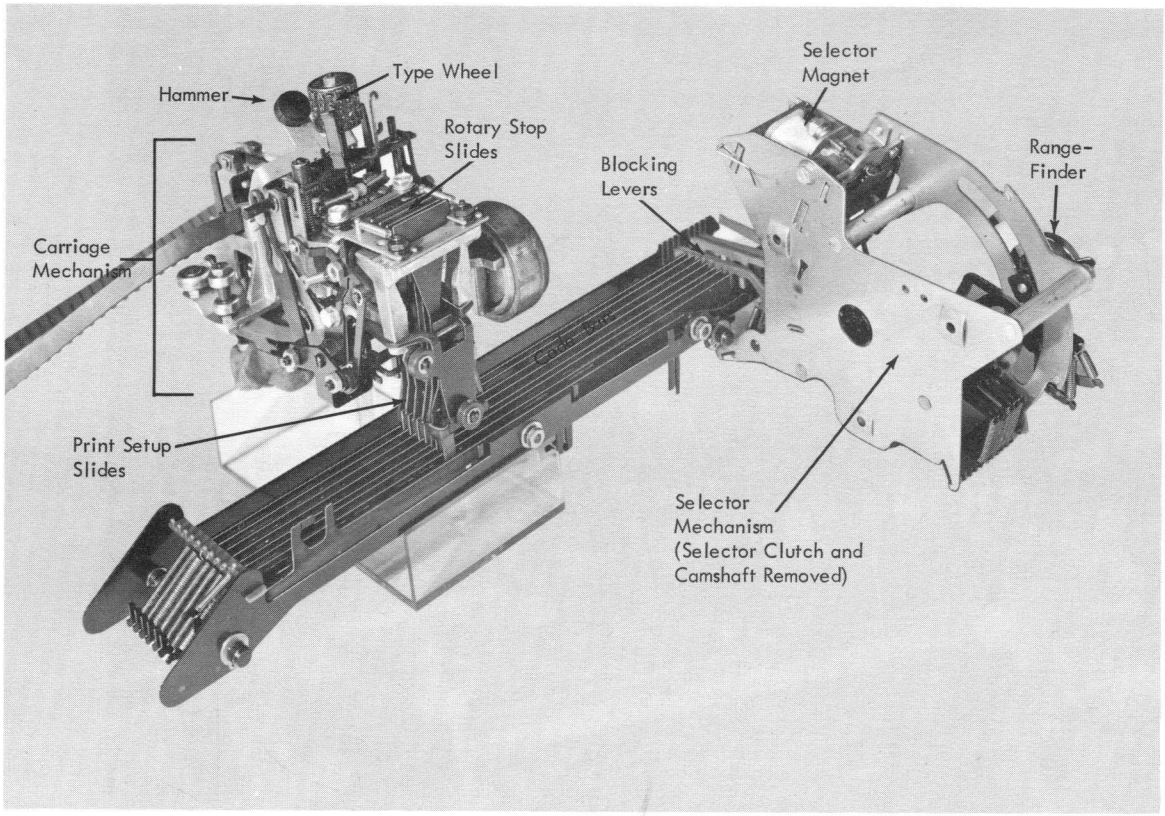


Figure 6-13. Carriage-Codebars-Selector Mechanism (Removed from ASR 32)

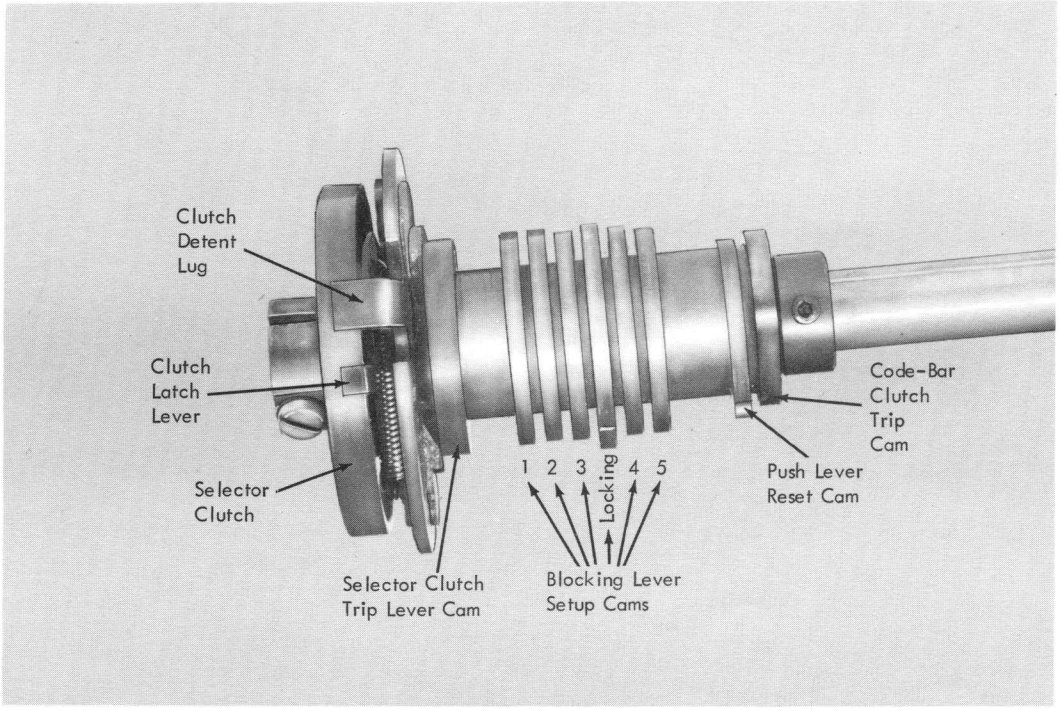


Figure 6-14. Selector Clutch and Camshaft (Removed)

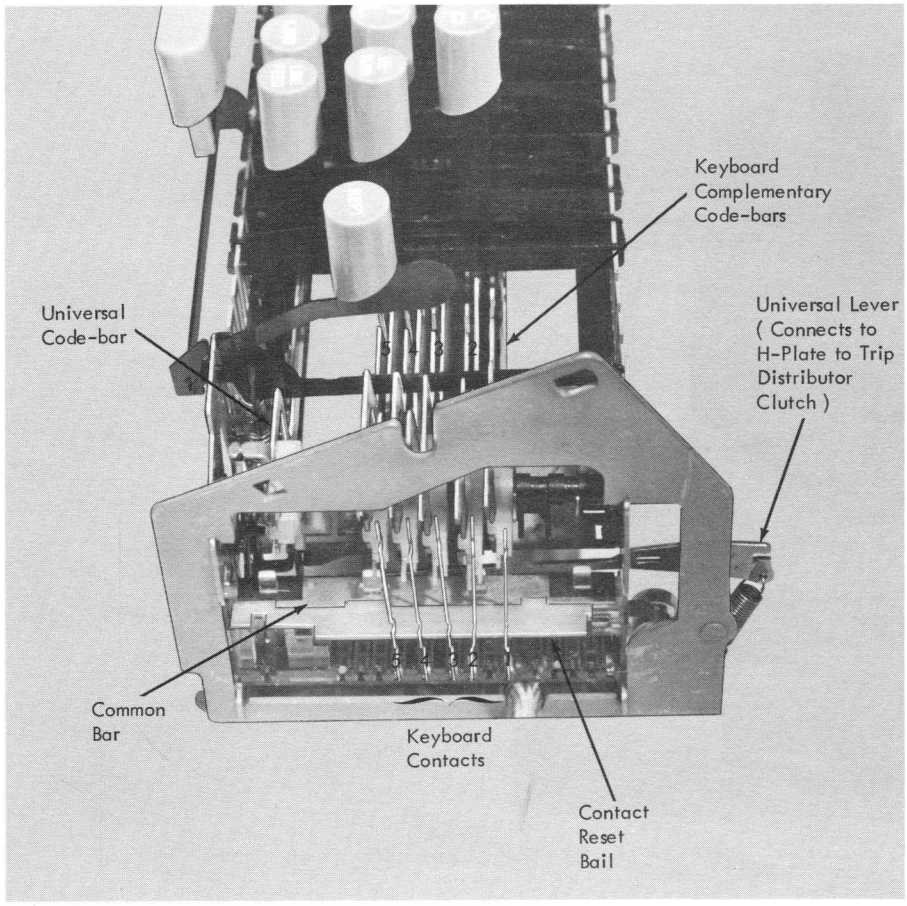


Figure 6-15. ASR 32 Keyboard Contacts

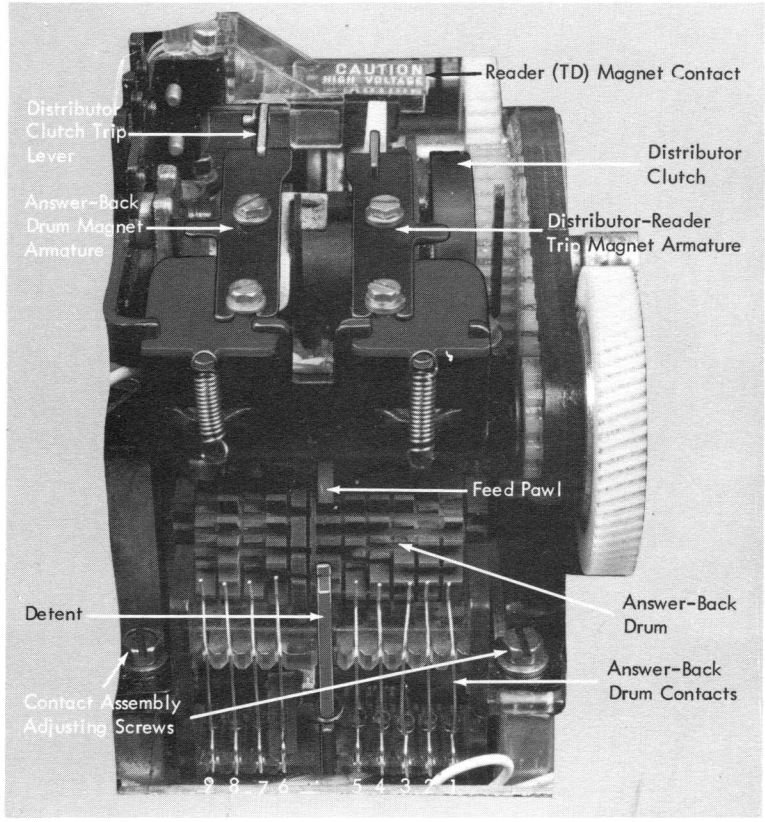


Figure 6-16. Answerback Drum Mechanism

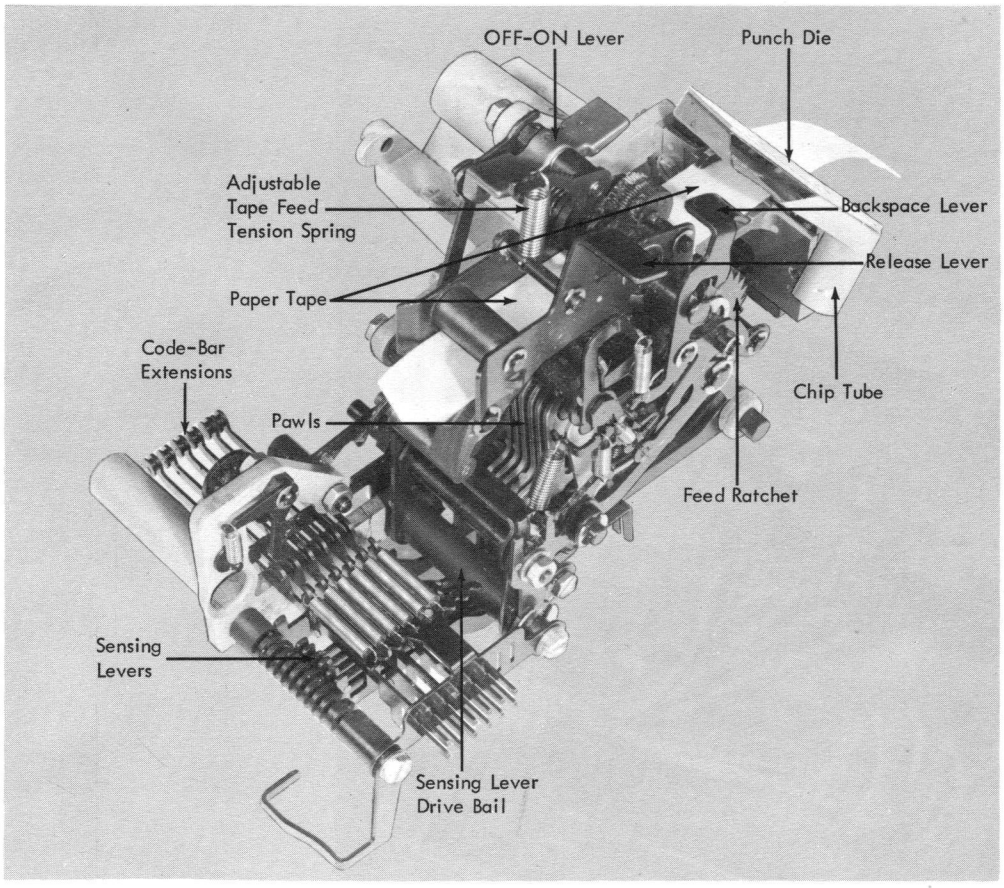


Figure 6-17. Paper Tape Punch

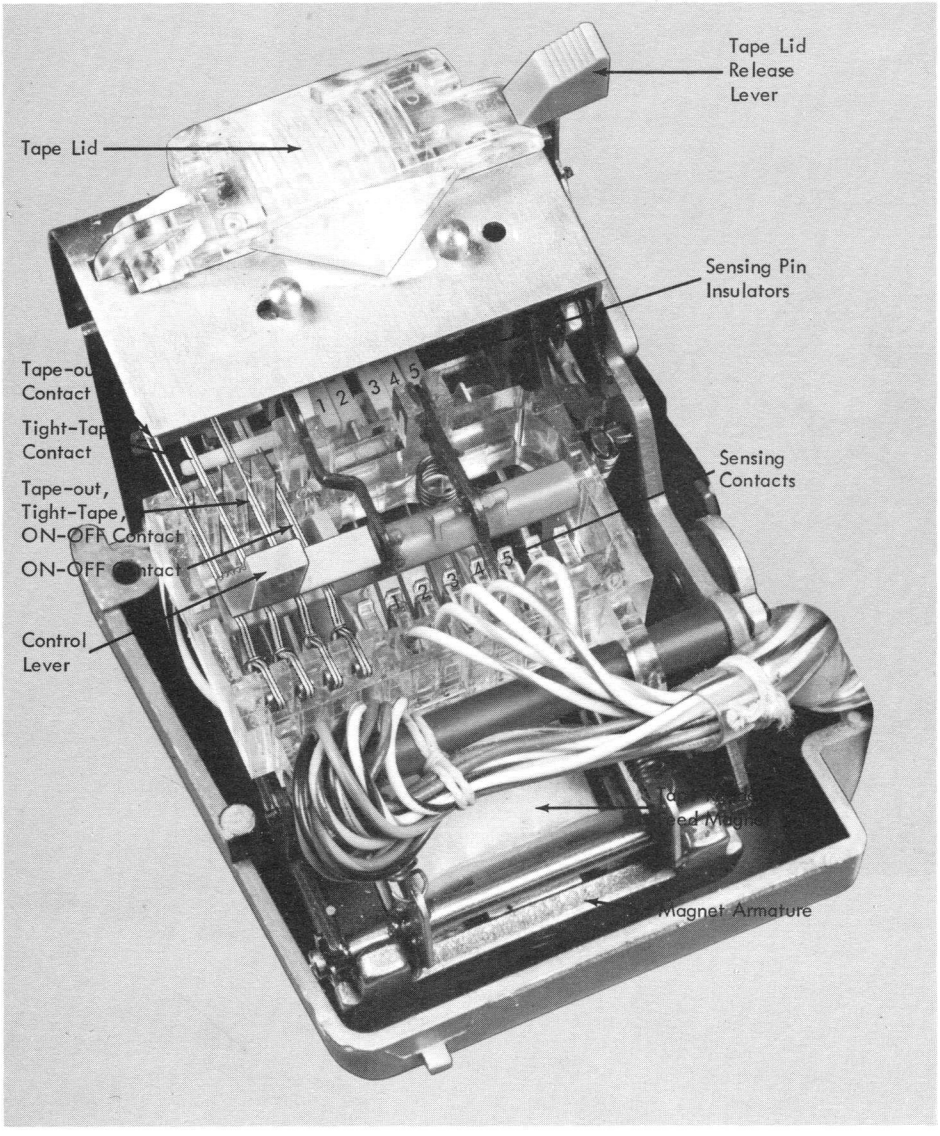


Figure 6-18. Paper Tape Reader

POWER SUPPLY

Terminal Control Unit Power Supply

DANGER: The 1971 power supply has a ferroresonant transformer with a capacitor across the high-voltage taps. This capacitor is designated as C6 on ALD 71.03.02.0. DO NOT MEASURE THIS VOLTAGE.

The power supply consists of a ferroregulator transformer with three full-wave rectifiers connected to the secondary. These rectifiers supply -48Vdc, +12Vdc, and -12Vdc to the terminal. The input to the power supply accepts 115Vac, 208Vac, or 230Vac, 1 phase, 60 cycle. The proper connections are made at the factory to accept 115Vac. ALD 71.03.02.0 shows the power supply and the proper wiring for the input voltage connections.

Mounted on the side of the power supply are three switch-type circuit breakers identified as follows:

CB1 +48Vdc to the relay circuitry
CB2 +12Vdc to the SMS circuitry
CB3 -12Vdc to the SMS circuitry

The circuit breakers will trip off if the respective circuit becomes overloaded. CB2 has an auxiliary switch position, so when tripped, it also opens the -48Vdc circuit.

ALD 71.03.01.0 shows the ac-dc voltage distribution within the 1971 terminal. Any SMS gate pin J is a power-supply ground and also frame ground. When you use the oscilloscope or meter, you can use any pin J (or frame) for a signal ground connection.

ASR 32 Power Supplies

The ASR 32 contains its own power supplies. ALD 71.20.48.0 shows the wiring schematic for these supplies.

Reader Power Pack

A separate reader power pack supplies the power to the TD feed (reader) magnet. This power pack is inside the terminal control unit cabinet (upper left corner). This is a full-wave rectifier power supply that feeds about 150 volts through the TD feed contact to the TD feed (reader) magnet. Measure the output of the reader power pack across terminals AM3 and AM6.

Note: This reader power pack is fused with a 3/4 amp glass fuse, inside the power pack. Check this fuse if the tape reader does not operate.

TTY Selector Magnet Driver (SMD)

Another supply, called the TTY power supply, provides the voltage to the TTY selector magnet driver card (SMD). This SMD card is the only card loaded in the ASR 32. The output of this supply (measured across terminals AK1 and AK2) should read about 68Vdc.

To energize the selector magnet, the -TTY selector-driver-input is conditioned through the normally closed mercury relay (MR4) point on 71.20.-01.1 (11). This conditions the transistor Q2 to conduct, and causes Q1 to cut off. To de-energize the magnet, the -TTY selector-driver-input is deconditioned (MR4 normally-closed contact point opens), to cut off Q2 and conditions Q1 to conduct. With the selector magnet energized (marking), 3.2Vdc should be measured across the magnet. Adjust the potentiometer (3-ohm) to provide this reading.

The SMD card is fused with a 3/8 amp fuse in the ASR 32. Check this fuse if the selector magnet is inoperative.

Fuses

There are 4 fuses in the 1971 Model 20 terminal:

1. SMS power supply fuse, – 2 amp fuse (71.03.01.0), in the top front of the control unit cabinet under the ASR 32. The fuse is assessible from the front of the terminal. This fuse controls the 115Vac input to the SMS power supplies.
2. ASR 32 fuse, – 3 amp glass (71.20.48.0), accessible at the right side of the ASR 32 with the cover removed. This fuse controls the 115Vac input to the entire ASR 32.
3. ASR 32 SMD card input fuse, – 3/8 amp glass (71.20.48.0), accessible at the right side of the ASR 32 (adjacent to the 3-amp fuse) with the cover removed. This fuse controls the 115Vac input to the SMD card (selector magnet).
4. ASR 32 reader power-pack fuse, – 3/4 amp glass (71.20.48.0), accessible inside the reader power pack that is mounted inside the terminal control unit cabinet. This fuse controls the 115Vac input to the reader power pack (TD feed-reader magnet).

ASR 32

DANGER: High voltage is present in the ASR 32. Some green wires in the ASR 32 are current-carrying wires, and not ground wires. Be extremely careful when you work in this area. Always turn off the main power switch and disconnect the line cord if power is not required to service the machine.

CAUTION: DO NOT TILT THE ASR 32. THE TYPING UNIT FLOATS ON RUBBER MOUNTS AND WILL PULL LOOSE IF TILTED.

Important Servicing Tips

- TELETYPE Bulletin 273B Volume 1 contains detailed lubrication and removal procedures for the ASR 32. Important: Refer to and follow these procedures when you service the ASR 32.
- Thoroughly lubricate the mechanical units in the ASR 32, but avoid overlubrication that would permit the lubricant to drip or throw onto adjacent parts.
- Saturate all felt washers and oilers with oil, and apply oil to each end of all bearings.
- Do not overlubricate the tape reader area. Keep oil and grease away from the reader contacts and reader magnet assembly.
- Keep the carriage-drive eccentric cam and the function-bail-drive eccentric cam thoroughly lubricated. These cams are on the main shaft, adjacent to the function clutch.
- Make certain all mechanical units and functions are free of binds. Binding parts are a common cause of intermittent troubles and wear.
- Make certain all function levers are properly aligned and in the correct guide positions. The levers can easily be misaligned or not in the correct guides. This is a common cause of functional operation failures (CR, LF, spacing, printing, print suppressing). Refer to Figure 6-19 for proper function-lever alignment.
- Printing failures result if any keyboard contact, reader sensing contact, or answerback drum contact is shorted. These contacts are all effectively wired in parallel with each other.
- All adjustments for the ASR 32 are contained in the TELETYPE Bulletin 273B Volume 2. Become familiar with this manual and follow the procedures closely.
- The adjustments of the answerback drum and contacts are critical. Refer to and follow the adjustments for this area in the TELETYPE Bulletin 273B Volume 2; section 574-122-700.
- Intermittent print failures can result if the answerback drum number 6 (suppress) level contact is out of adjustment. Make certain it is fully open at all times, except during the start scan point of the answerback drum cycle. This contact is referred to as the blinding contact wire. The adjustment for this contact is in section 574-122-700. Position the adjusting spring by rotating the spring on the tie link.
- Do not loosen the answerback drum-contact-bracket mounting screws (2 each) unless absolutely necessary to position the contact assembly.

Lubrication

Only the recommended lubricants can be used in the ASR 32. These lubricants are supplied under the following part numbers:

1. Oil:
   IBM part 5354901
   TELETYPE part KS7470
2. Grease:
   IBM part 5354902
   TELETYPE part KS7471

TELETYPE Bulletin 273B Volume 1 contains the lubrication specifications for the ASR 32. Use only the recommended lubricants. The table of contents of this bulletin lists the lubrication of the units in the following sections:

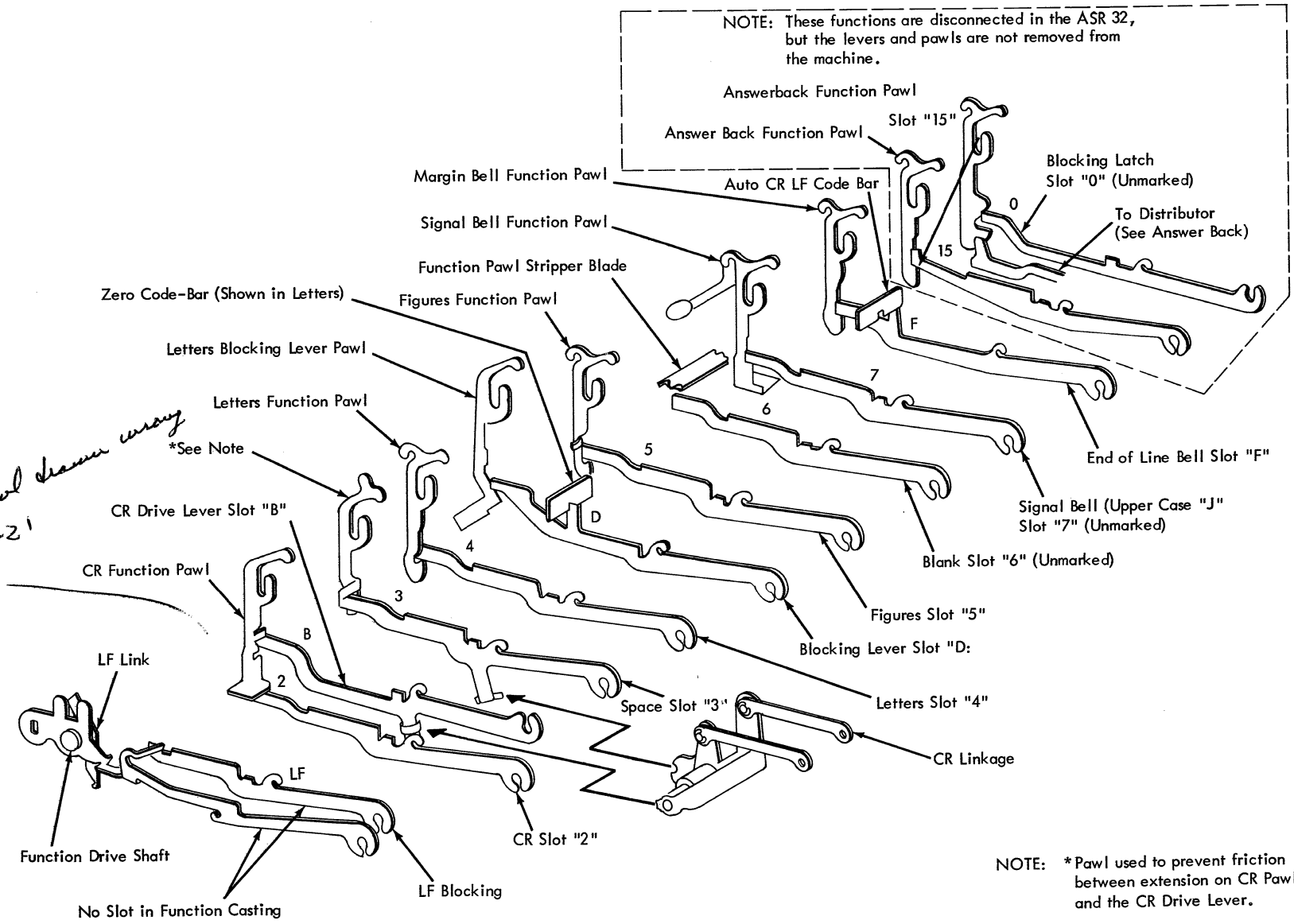
1. Keyboard, Section 574-121-701
2. Typing Unit, Section 574-122-701
3. Tape Reader, Section 574-124-701
4. Tape Punch, Section 574-125-701

Thoroughly lubricate all felt washers and oil ports, and apply oil to each end of **all the bearings.** Make certain all cams and the eccentrics are lubricated at all times. The carriage-drive eccentric cam and the function-bail eccentric cam require constant lubrication to eliminate wear. When oiling these eccentrics, slightly spread the eccentric follower and fiber bushing to make sure the oil penetrates to the eccentric cam surface.

Be careful when you lubricate in the reader area. If overlubricated, the oil has a tendency to adhere to the contacts, and reading failures result. Keep the contact wires and common bar clean.

Adjustments

All adjustments pertaining to the ASR 32 are contained in the TELETYPE Bulletin 273B Volume 2.



NOTE: *Pawl used to prevent friction between extension on CR Pawl and the CR Drive Lever.

Figure 6-19. ASR 32 Function Lever Positions

These adjustments are quite explanatory and in sequential order the way they should be done after disassembly.

IMPORTANT: REFER TO AND FOLLOW THESE PROCEDURES FOR ALL CHECKS AND ADJUSTMENTS ON THE ASR 32.

The information in the bulletin pertains to both the ASR 32 (5-channel) and the ASR 33 (8-channel), and also to various optional features. Disregard the information and adjustments that apply to the ASR 33 and also any optional features not included in the ASR 32.

The table of contents in the front of this bulletin lists the units by section as follows:

1. Keyboard, Section 574-121-700
2. Typing Unit, Section 574-122-700
3. Tape Reader, Section 574-124-700
4. Tape Punch, Section 574-125-700

Before making any adjustments, become familiar with the general information at the beginning of each section.

Do not undertake any single adjustment without first completely understanding the procedure and knowing the requirements. Therefore, read a procedure all the way through before making an adjustment.

The general format of each procedure is as follows:

1. To check
2. Requirement
3. To adjust
4. Related adjustments
   a. Affects
   b. Affected by

Always check the adjustment first, before changing the adjustment. Be aware of the related adjustments. They indicate the other areas that may be disturbed when you make any change.

At the beginning of each individual section is a detailed table of contents listing each adjustment by area and name within the section. Refer to this contents to locate the particular adjustment or area.

Range-Finder Adjustment

The range-finder provides a means to change the mechanical timings of the selector clutch (and camshaft) in relation to the mark-space pulses to the selector magnet.

Set the range-finder as follows:

1. Condition the ASR 32 to continually print RYRY characters.
2. Loosen the knob, and move the range-finder toward the lower end of the scale until printing failures occur. Note the reading on the scale.
3. Continue printing while moving the range-finder toward the upper end of the scale until printing failures again occur. Note this reading.
4. Locate the midpoint between these two readings, and tighten the range-finder at this position. (Example: lower-end failures occur at 20, upper-end failures at 100. The midpoint between these two readings is 60. 100 + 20 = 120 ÷ 2 = 60.)

Disassembly and Reassembly

The disassembly and reassembly procedures are described in the TELETYPE Bulletin 273B Volume 1. The table of contents at the beginning of this bulletin lists the 4 units by section as follows:

1. Keyboard, Section 574-121-702
2. Typing Unit, Section 574-122-702
3. Tape Reader, Section 574-124-702
4. Tape Punch, Section 574-125-702

Before you attempt any disassembly, read the general information at the beginning of each section.

The reassembly procedures are generally the reverse steps of the disassembly.

OSCILLATOR ADJUSTMENT

The oscillator card is at 1E01 (ALD 71.20.02.1). Set the timing of this oscillator to coincide with the line speed (bits or bauds per second). Two adjustments are necessary to obtain correct symmetry and frequency of the oscillator. Adjusting the symmetry affects the frequency. Therefore, the symmetry must be adjusted first and then the frequency adjustment. The output of the oscillator should be a square wave, with the positive and negative pulses equal in duration.

The initial setup necessary to set the oscillator is as follows:

1. Remove the 1971 terminal from the line by turning the line shunt switch on.

2. Set up and connect the oscilloscope as follows:
   a. Sync: internal plus or minus.
   b. Vertical input probe: connect to 1E01 pin H (71.20.02.1, 2A).

3. Jumper 1E02 pin C to 1E02 pin J (GRD) (71.20.02.1, 3A). This allows the oscillator to run free.

4. Set the time base on the oscilloscope to display two complete cycles from the oscillator.

oscillator cycle - not machine

5. Adjust the 5K (top) potentiometer on the card at 1E01 until the positive and the negative portion of the second cycle are exactly the same duration.

6. Adjust the 15K (bottom) potentiometer on the same card so that the total duration of the second cycle is 22 ms, or each pulse is 11 ms long. This adjusts the frequency of the oscillator to coincide with the line speed at 60 words per minute.

Note: If the line speed is 75 words per minute, the oscillator frequency should be adjusted to 17.6 ms per cycle.

7. When the oscillator is properly adjusted, disconnect the oscilloscope and remove the jumper wire from 1E02 pin C to 1E02 pin J.

8. Turn the line shunt switch off.

RECEIVE POTENTIOMETER ADJUSTMENT

The receive potentiometer, which affects the operation of receive relay, must be adjusted for proper mark-space symmetry. In telegraph communication terms, this adjustment is referred to as unity mark-space ratio. Figure 6-20 illustrates the receive and transmit relay circuitry, and the desired symmetry of the received mark-space signal.

A preliminary adjustment of the receive potentiometer can be made with the standard IBM ohmmeter. IBM recommends that you make the adjustment with an oscilloscope while actually receiving data from the line. If intermittent printing failures occur, check the receive potentiometer adjustment with an oscilloscope.

Preliminary Receive Potentiometer Adjustment

CAUTION: MAKE CERTAIN THE 1971 TELEGRAPH LINE CONNECTOR IS REMOVED FROM THE TELEGRAPH LINE CONNECTOR BOX BEFORE YOU MAKE THIS PRELIMINARY ADJUSTMENT.

1. Turn the 1971 power switch off.
2. Set the line shunt switch to the off position.
3. Connect the IBM ohmmeter across TB4-7 and TB4-8 (71.02.01.0).
4. Loosen the locking nut on the receive potentiometer. Adjust the potentiometer so the meter reads 110 ohms.
5. Tighten the locking nut, disconnect the meter, and connect the 1971 telegraph connector to the telegraph line connector box.

Final Receive Potentiometer Adjustment

1. Connect the 1971 terminal for on-line operation.
2. Prepare a test message (message switch test) to transmit many digit 6 characters (1, 3, 5-bits). A maximum of 180 characters can be transmitted before the central processor cuts off the message. The message switch test (host inn 2 and test pushbuttons) will return the transmitted data back to the 1971 terminal.
3. Set up and connect the oscilloscope as follows:
   a. Sync: External plus.
      Connect the sync wire to 1E02 pin C (71.20.02.1, 3A, character time).
   b. Vertical input probe.
      Connect to 1B12 pin G (71.20.01.1-1D)
      Mark pulses are negative, space pulses positive.
   c. Horizontal time base: 10 ms per division.
4. Press the send key to initiate transmitting.
5. Observe the scope during transmit and also during receive while the message is returned from the central processor. Four bits (start, 1, 2, 3) should be displayed on the scope. Due to the vertical input connection, space bits are positive, and mark bits negative.
6. Fine adjust the receive potentiometer so the mark and space signals are equal in duration. This is the final symmetry adjustment for the receive relay.

At 60 words-per-minute (wpm) speed, each pulse should be about 22 ms long. At 75 wpm speed, the pulse length should be about 17.6 ms.

Note: During transmitting, the first 13 characters are RAP keyboard data and can be disregarded. Observe only the digit 6 characters. Also, there will be a delay at the end of the transmit operation before the message is returned by the central processor.

SINGLE SHOTS

Select Delay (71.20.05.1, 2B): At 60 wpm speed, adjust for nominal 22 ms (maximum 24 ms, minimum 20 ms). At 75 wpm speed, adjust for nominal 17 ms (maximum 19 ms, minimum 16 ms).

This single shot is triggered with a minus input. The output is minus for the duration of the time-out period.

To adjust the single shot, trigger the scope on external minus connected to the input pin. Probe the output and set the potentiometer on the DHE card for the proper time duration.

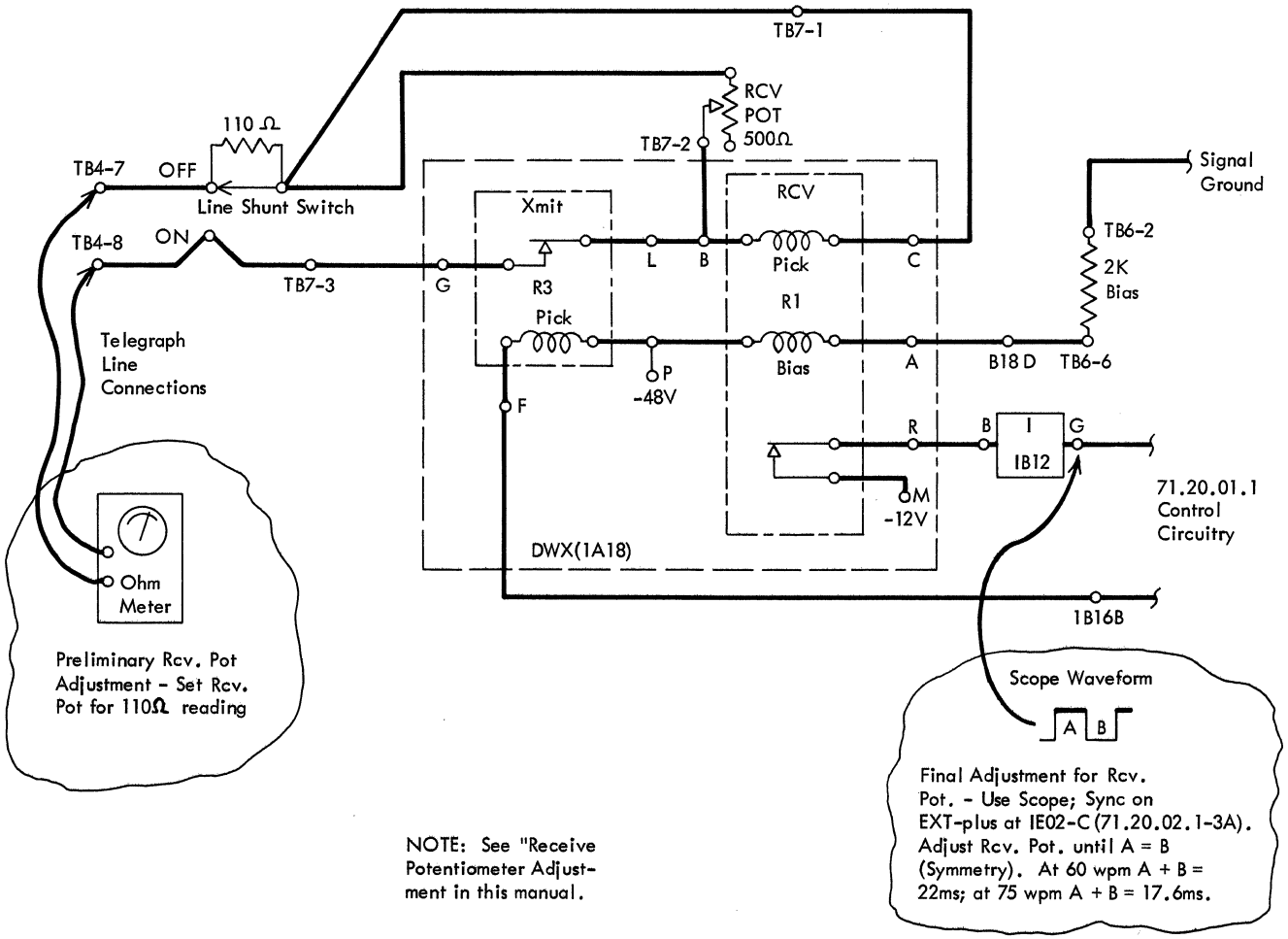


Figure 6-20. Transmit-Receive Relay Potentiometer Adjustment)

Open Line (71.20.09.1, 3H): The timing of this single shot is not critical, but should be adjusted around 200 ms (more than one character, but less than two characters).

The single shot is triggered with a negative input. The output goes negative with the input. Only if the input remains negative longer than the time duration will the single shot time out and the output go plus.

To adjust the single shot, trigger the scope on external minus, connected to the input pin. Probe the output and set the potentiometer on the DHE card for the proper time duration.

Number 7 Drum Contact (71.20.10.1, 5C): The timing of this single shot is not critical. It should be adjusted for a nominal 30 ms. The single shot functions, and is adjusted the same as the select-delay single shot.

MX or CD Card Single Shots: These single shots, or pulse generators are not adjustable. The time duration is fixed by the capacitor connection on the YJD card. The single shot is triggered with a positive input. The output goes negative for at least 15 microseconds, and may be considerably more.

The output timing can be checked with external plus sync connected to the input, and probe the output for a negative pulse.

PURPOSE OF TRIGGERS AND LATCHES

Bid (71.20.11.1, 3H)

This latch conditions the terminal to bid for the line when ready to transmit. It turns on with IP-ready on and the EOT character received from the central processor, and turns off when read selected (polled).

Character Time (71.20.02.1, 3A)

This latch, when on, starts the oscillator. It turns on when a start bit is received, and turns off with character-complete (stop bit) or a false start detection.

Direct IP (71.20.10.1, 3H)

This latch conditions the terminal to transmit an available inquiry message. It turns on with the AVAIL pushbutton and the enter key, and turns off with scan-point 3 of third scan cycle.

EOT (71.20.04.1, 1E)

This latch turns on during polling or addressing with the EOT character received from the central processor. The figures latch has to be on to condition the EOT to come on. It turns off with SP2 pulse at the end of the next character.

False Start (71.20.02.1, 1D)

This latch conditions the terminal to detect a false start pulse, which may be initiated by line noise. It turns on when the character time latch comes on and turns off with the oscillator down pulse.

Feed Tape (71.20.11.1, 3A)

When the latch is on, the distributor-reader trip magnet is energized to feed tape through the reader up to the first data character. It turns on at scan-point 20 of scan 3, and turns off with any tape interlock, or when a 1 channel hole is sensed in tape.

Figures Shift (71.20.04.1, 3B)

This latch conditions the terminal to detect polling or addressing from the central processor, and also to detect the EOB character during transmitting. This latch does not control the figures or letters shift in the ASR 32. It turns on when a figures character is received, and turns off when a letters character is received.

IP Ready (71.20.11.1, 3E)

This latch turns on when the terminal is ready to transmit and turns off when read selected during polling.

Lights (71.20.06.1, 2G)

This latch conditions the terminal to receive a lights message to turn on RAP keyboard lights. It turns on when addressed from the central processor, or after an automatic turnaround during transmitting, and turns off when a character is received that contains a not-3-and-not-5 bits.

Off Line (71.20.09.1, 2C)

This latch turns on the enter light to indicate a message is being prepared. The central processor cannot address or send a message to a terminal when this latch is on. It turns on with the enter key, and turns off with IP-ready on or terminal-selected.

Output Lights (71.20.08.1, Nine Latches)

These latches turn on RAP keyboard lights when a lights message is received from the central processor. The following characters, when received after the lights latch is on, turn on the respective latches and lights:

Z	Alternate inn 1
L	Alternate inn 2
O	Alternate inn 3
S	1-Bed
I	2-Bed
N	Special
Y	Available
P	Not Available
M	Take or Place

The latches are turned off with the enter key.

Print (71.20.06.1, 2E)

The print latch conditions the terminal to print data received from the central processor. It is turned on when addressed from the central processor, or after an automatic turnaround during transmitting, and turns off when the EOT character is received at the terminal.

Read (71.20.06.1, 2A)

The read latch conditions the terminal to begin reading tape to transmit. It is turned on when the bid latch is on and the terminal is selected during a polling, and turns off when the EOB character is read at the reader.

Scan 1 (71.20.10.1, 3A)

The scan 1 latch picks the first scan relay (R3) and energizes the answerback drum magnet to prepare tape for the scan-1 cycle. It is turned on when the enter key is pressed, and turned off at scan-point 3 of scan 1.

Scan 1-2 (71.20.10.1, 3C)

The scan 1-2 latch is on through scan 1 and scan 2. It conditions the terminal to energize the answerback drum magnet for scan 2, which scans the RAP keyboard. It is turned on when the scan 1 latch turns on, and turned off with scan-point 3 of scan 2.

Scan 3 (71.20.10.1, 3E)

The scan-3 latch picks the third scan relay (R4) and energizes the answerback drum magnet for scan 3. It is turned on when the tape has been pulled tight through the reader, the off-line latch is on, and the send key is pressed. It turns off with scan point 3 of scan 3.

Shift Register Triggers (71.20.03.1)

These 7 triggers (start, 1, 2, 3, 4, 5, and stop) serially receive all bits from the line. They are all turned on with the reset pulse at the beginning of each character. As the bits are received serially from the line, they shift through the shift register. Space bits turn the triggers off; mark bits turn them on.

Taut Tape (71.20.09.1, 2A)

The taut tape latch, when on, indicates that tape has been pulled tight into the reader. It is turned on when the reader tight tape contact closes, and turned off with scan-point 3 of scan 2.

Tens Address (71.20.04.1, 1G)

This latch is turned on when the terminal has received its own tens polling or address character as sent from the central processor. It is turned off with SP2 of the next character.

Transmit Acknowledge (71.20.05.1, 2F)

This latch, when on, energizes the transmit relay. It is turned on when a polling is received and the reader is not ready to transmit a message, or when addressed to receive a message and the terminal is ready to receive. It is turned off after two space bits are transmitted (start and 1 bits).

Transmit Acknowledge (71.20.05.1, 2H)

This latch, when on, prevents the terminal from printing the acknowledge character and also from turning on lights on the RAP keyboard. It turns on when the transmit-acknowledge latch (2F) comes on, and turns off with SP2 at the end of the transmit acknowledge character.

PURPOSE OF LIGHTS AND SWITCHES

Lights

For a description of the lights on the RAP keyboard see the Routine Action Pushbutton (RAP) Keyboard section.

The purpose of the CE indicator lights on the SMS gate is the same as the purpose of the respective triggers and latches. This description is in Purpose of Triggers and Latches.

Switches

LCL (Local)

This switch is on the ASR 32 terminal control panel. When on, it conditions the terminal to be tested off-line. A light lights within the switch when on. The transmit relay is not operational when the switch is on, nor can data enter the terminal from the receive relay.

Line Shunt Switch

The line shunt switch is on the relay gate in the terminal control unit. This switch, when on, shunts the transmission line with a 110-ohm resistor and isolates the terminal from the line.

NOTE: THIS SWITCH MUST BE TURNED ON IF THE MERCURY RELAY CARD, (TRANSMIT, RECEIVE, AND SELECTOR MAGNET RELAYS) IN THE SMS GATE AT A18, IS REMOVED. OTHERWISE, THE ENTIRE TRANSMISSION LINE BECOMES OPEN WHEN THE RELAY CARD IS REMOVED.

TERMINAL TEST PROCEDURES

Operational tests can be performed on the terminal when off-line (disconnected from the line) or on-line (controlled by the central processor).

Off-Line Terminal Tests

Test 1: RAP Keyboard Tests

These tests check to make sure scan cycles 1 and 2 operate correctly to print and punch tape from the RAP keyboard. A series of 13 tests are necessary to check the entire RAP keyboard.

Initial setup:

1. Turn the terminal power switch on.
2. Turn the LCL switch on.
3. Press the reset key on the ASR 32.
4. Reset the RAP keyboard. (Do not repeat these steps for each test.)

Each of the following tests prints and punches the characters as scanned from each group and column of the RAP keyboard.

1. Press:
   Alternate inn 1.
   All pushbuttons in column 1.
   Enter key.

   Print:
   # EA 555 PR PR PR PR PR PR PR

2. Press:
   Alternate inn 2.
   All pushbuttons in column 2.
   Enter key.

   Print:
   #0555 EA EA EA EA EA EA EA

3. Press:
   Alternate inn 3.
   All pushbuttons in column 3.
   Enter key

   Print:
   # NT 55522222222

4. Press:
   Reset all alternate inn pushbuttons.
   All pushbuttons in column 4.
   Enter key.

   Print:
   # NT EA 55####5###

5. Press:
   All pushbuttons in column 5.
   Enter key.

   Print:
   # NT 0556#665666

6. Press:
   All pushbuttons in column 6.
   Enter key.

   Print:
   # NT NT 550#005000

7. Press:
   All pushbuttons in column 7.
   Enter key.

   Print:
   # NT NT EA 51#115111

8. Press:
   All pushbuttons in column 8.
   Enter key.

   Print:
   # NT NT 059#995999

9. Press:
   All pushbuttons in column 9.
   Enter key.

   Print:
   # NT NT NT 5?#?? 5999

10. Press:
    All pushbuttons in column 10.
    Enter key.

    Print:
    # NT NT NT EA &#&&5999

11. Press:
    All pushbuttons in column 11 except AVAIL.
    Enter key.

    Print:
    # NT NT NT 0&#..5999

12. Press:
    All pushbuttons in column 12.
    Enter key.

    Print:
    # NT NT NT NT &#/ /5999

13. Press:
    RAP keyboard reset lever.
    Enter key.

    Print:
    #555555555555

Test 2: Lights Test (Off-Line or On-Line Test)

1. Press the lights test key on the ASR 32.
2. All nine room-status lights on the RAP keyboard come on.
3. Release the lights test key.
4. All nine room status lights go out.

Test 3: Off-Line Polling Test

This test checks the transmit and local-copy operation of the terminal. A polling operation is simulated by keying the terminal poll address on the ASR 32. If the terminal address card (C01) is not wired properly for the terminal tens and units-address characters, the transmit operation will not start. Make sure the address characters are properly keyed, and the address card is correctly wired.

1. Turn power on.
2. Turn the LCL test switch on.
3. Reset the RAP keyboard.
4. Press any pushbuttons desired on the RAP keyboard, or leave it completely reset.

Note: If the AVAIL pushbutton is pressed, bypass steps 6 through 10 and proceed to step 11.

5. Press the enter key. Scans 1 and 2 prepare tape and print the RAP keyboard data.
6. Set the reader lever to STOP-FREE.
7. Pull the tape taut.
8. Set the reader lever to START.
9. Type any data desired on the ASR 32 keyboard.
10. Press the send key. (The steps 11-15 simulate polling.)
11. Type the FIGS key on ASR 32 keyboard.
12. Type the J-key (EOT) on the ASR 32 keyboard.
13. Determine the proper tens-address character assigned to the terminal from the chart, (see the chart on ALD 71.20.04.0).
14. Determine the proper polling units-address character assigned to the terminal from the chart, ALD 71.20.04.0.
15. At this time the tape read should start. The tape data is read, printed, and repunched on the ASR 32. The printed data should correspond to the data printed while the message was being prepared.

On Line Terminal Tests

Tests 4 and 5 make sure the terminal is operational when on-line and controlled through the central processor.

Test 4: All Characters Test

This on-line test checks to make sure that the terminal can correctly print all characters sent from the central processor, that all room status lights can be turned on from the processor, and that functional operations can be performed.

1. The LCL test switch and the line shunt switch must be off.
2. Reset the RAP keyboard.
3. Press the Host Inn 1 pushbutton.
4. Press the Test pushbutton.
5. Press the Enter key.
6. Set tape reader lever to "stop-free".
7. Pull tape taut.
8. Set tape reader lever to "start".
9. Press the send key. The message transmits when polled.
10. The central processor immediately returns the all-characters test message. The printout of this message is as follows:

##555 PR 5555555 + BD (This line prints while transmitting.)
ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789 - RM $&# BD EA PR /: NT ?,.

Test 5: Message Switch Test

This on-line test permits all characters transmitted from the terminal to the central processor, to be returned by the processor to the same terminal. This is a very complete test, in that the terminal is tested in both transmit and receive mode, the transmission line is tested in both directions, and certain operations of the central processor are tested.

1. Reset RAP keyboard.
2. Press the host-inn-2 pushbutton.
3. Press the test pushbutton.
4. Press the enter key.
   a. Scans 1 and 2, and printout of RAP keyboard contents.
5. Set the tape-reader lever to STOP-FREE.
6. Pull the tape taut.
7. Set the tape-reader lever to START.
8. Type any data desired on the ASR 32 keyboard.
9. Press the send key.
   a. Scan 3.
   b. The message is transmitted when polled.
10. The central processor immediately returns the same message to the requesting terminal, where it prints and punches. This received data should compare with the printout of the transmitted data.

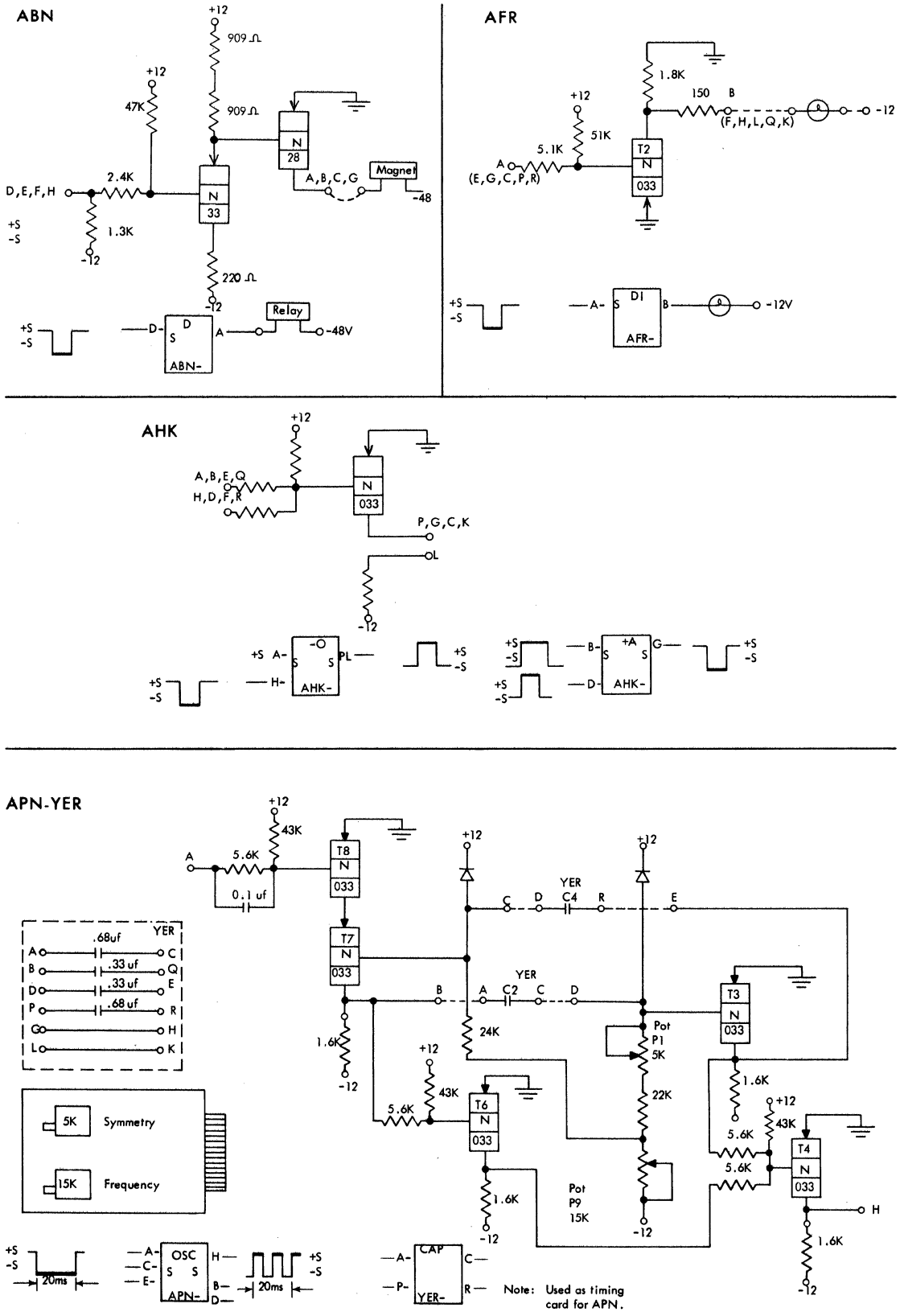


Figure 6-21. ABN-AFR-AHD-APN-YER Circuitry

SMS COMPONENT CIRCUITS

All of the information necessary to repair and maintain SMS gates, backpanel pins, wire wraps, etc. can be found in IBM Customer Engineering Instruction Reference: Standard Modular System, Form-223-6900-1.

ABN (Figure 6-21)

The ABN card (part 370126) has 4 relay magnet driver circuits. A -S level causes both transistors to conduct, and causes current to flow through the magnet coil to -48V. This picks the magnet.

AFR (Figure 6-21)

The AFR card (part 371943) is a 15 ma indicator lamp driver. A +S level holds T2 cutoff. In the off status a small amount of bias current passes from -12V through the lamp and 1.8K resistor to preheat the lamp. This prevents current surges through the transistor when the lamp is turned on. A -S level causes T2 to conduct through the lamp to -12V, and lights the lamp.

AHK (Figure 6-21)

The AHK card (part 370322) is an extender card to other AND or OR cards. Pins G, K, C, and P need an external collector load resistor if the backpanel is wired from any one of these pins to pin L. The base of the transistor is biased by the voltage developed across the input divider network. When a +S level exists on both inputs, the transistors are reverse-biased off. Current flow from the -12V supply through the 1.6K collector resistor to the external load causes an output level of about 10V, depending on the value of that load resistor. Dropping either input to a -S level causes T4 to conduct and raises the output level to 0V.

APN (Figure 6-21)

The APN card (part 370666) is a gated multivibrator. Whenever the input at pin A is at +S, the output of pin H is -S. But when pin A is gated -S, the APN card oscillates between +S and -S. This multivibrator card operates with an external capacitor card such as the YER. With the YER card, the multivibrator will operate in the ranges of 100, 75, or 32.5 cycles per second, depending on the amount of capacitance wired to the APN card.

When pin A is at ground level, the multivibrator is not gated. Transistor T8 is cut off, cutting off T7. Pin B goes to -12V through R42 and allows T6 to conduct. The output of the collector of T6 will be ground level through the 5.6K resistor to the base of T4. This cuts off T4 and causes the output of pin H to be about -12V.

When the gate at pin A is dropped to -12V, the multivibrator oscillates between T7 and T3. Pin B goes to about ground level, and cuts off T6. T6 allows T4 to conduct through the 5.6K resistor. Capacitor C2, mounted on the YER card, receives a plus shift from pin B to the base of T3. This plus shift cuts off T3 and allows T4 to conduct. Pin H is now at ground level because T4 is conducting. When the C2 capacitor times out, the resistor network on the base of T3 allows T3 to conduct again, to cause a plus shift through C4 to cut off T7. At the same time a plus level from T3 is applied to T4. When T7 is cut off, pin B goes to -12V to allow T6 to conduct. The collector of T6 goes to ground, and brings up the other leg that will cut off T4 to force it to go to -12V. The multivibrator action continues until pin A is placed at ground level, when the oscillation will cut off.

CAJ (Figure 6-22)

The CAJ card (part 370268) converts a W-level voltage (-48V) to an S-level voltage (-12V). Four individual converter circuits are on each card. Input pins are: A, B, C, D. Output pins are: F, E, G, H. The input and output are always in phase.

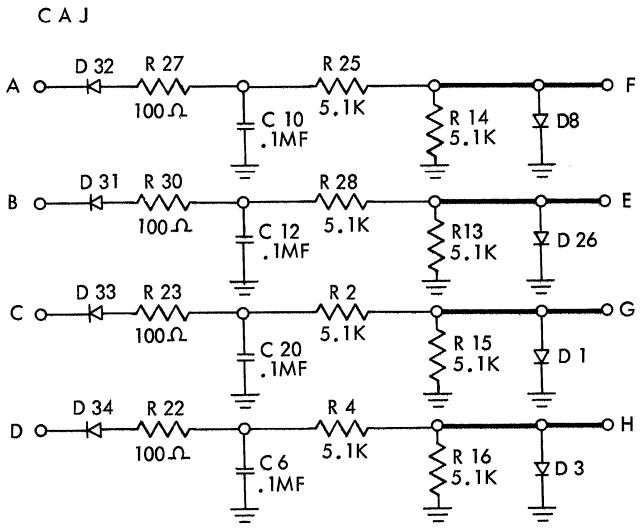


Figure 6-22. CAJ Circuitry

CD (Figure 6-23)

The CD card (part 371029) is a three-way circuit for powering and level setting of CTRL levels. Each circuit on the card performs a basic logical function (+A, -O, I) and inverts the input signal. The logical function is performed by the input resistor network and the invert function is accomplished by the common emitter transistor configuration. In the -OR logic application a +S output is obtained. whenever a -S occurs at any of the input pins. For a +AND logic application, a -S output results when all inputs are at a +S level.

CEYB (Figure 6-23)

The CEYB card (part 371032) has four emitter follower circuits. A +S input gives a +S output. Because of the low impedance of an emitter follower, the output level is not radically affected by the output load resistor. Note that only one of the four circuits has a load resistor without backpanel wiring.

DHE (Figure 6-23)

The DHE single shot provides a minus output pulse of a definite time duration. With all inputs positive, T1 is cut off and T3 is conducting. T3 is held in conduction by the voltage divider from -12V to +12V through D3.

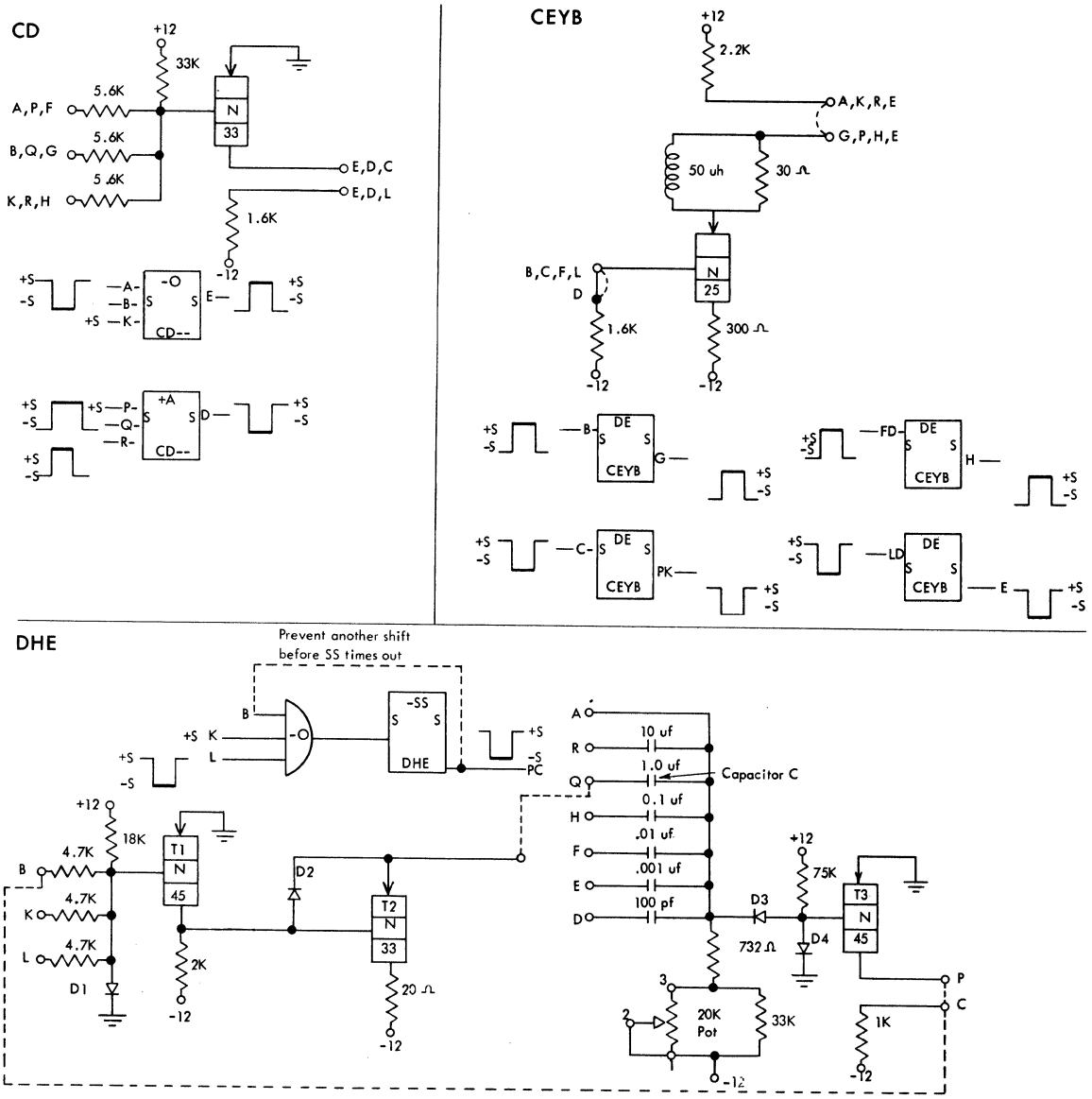


Figure 6-23. CD-CEYB-DHE Circuitry

If any input goes negative, T1 conducts. Part of the T1 current comes from -12V through the timing resistors, timing capacitor C, and D2. The resultant drop across the timing resistors reverses bias D3 so T3 is cut off by the voltage drop across D4. As capacitor C charges, the voltage across the timing resistors diminishes, and the cathode of D3 goes more and more negative. Eventually, the capacitor-charging current through the timing resistors cannot hold D3 cut off. When D3 conducts, the voltage divider in the base circuit of T3 (between -12V and +12V) is reestablished. T3 now conducts, and the output returns to the UP level.

A negative going pulse on one of the inputs causes a negative going pulse on the output. Because the charging current of the timing capacitor cannot flow without T1's conducting, T1 must be held in conduction for the timing duration of the circuit. This means either the input pulse must be of greater duration than the output pulse or the output must be tied back as one of the inputs.

When all inputs are again positive, T1 is cut off and the T1 collector and T2 base tend to go toward -12V. Current flows from -12V through T2, C, D3, and T3 base to emitter to ground. The timing capacitor is thus quickly charged to about 12V (minus on the left plate) in preparation for the next timing cycle.

DWX (Figure 6-24)

The DWX card (part 374570) contains four mercury wetted relays. Each relay has one normally closed contact point. Relays 1 and 2 each have a bias winding and a pick winding. Relays 3 and 4 have only a pick winding, and their contact points are protected with an RC network.

In the 1971 Model 20, relay 1 is the receive relay, and the bias winding is connected to -48V through a 2K resistor to ground. About 18 ma current flows in the bias circuit. Relay 3 is the transmit relay. The bias winding is not used in R2. The resistance of the pick coil of each relay (R1 and R2) is 190 ohms. The resistance of the bias coil of each relay is 665 ohms.

Relay 4 controls the input to the ASR 32 selector-magnet driver card. The pick coil is connected to -48V and controlled from the SMS control unit circuitry. The resistance of the pick coil is 2400 ohms (15% tolerance).

Relay 2 is not used.

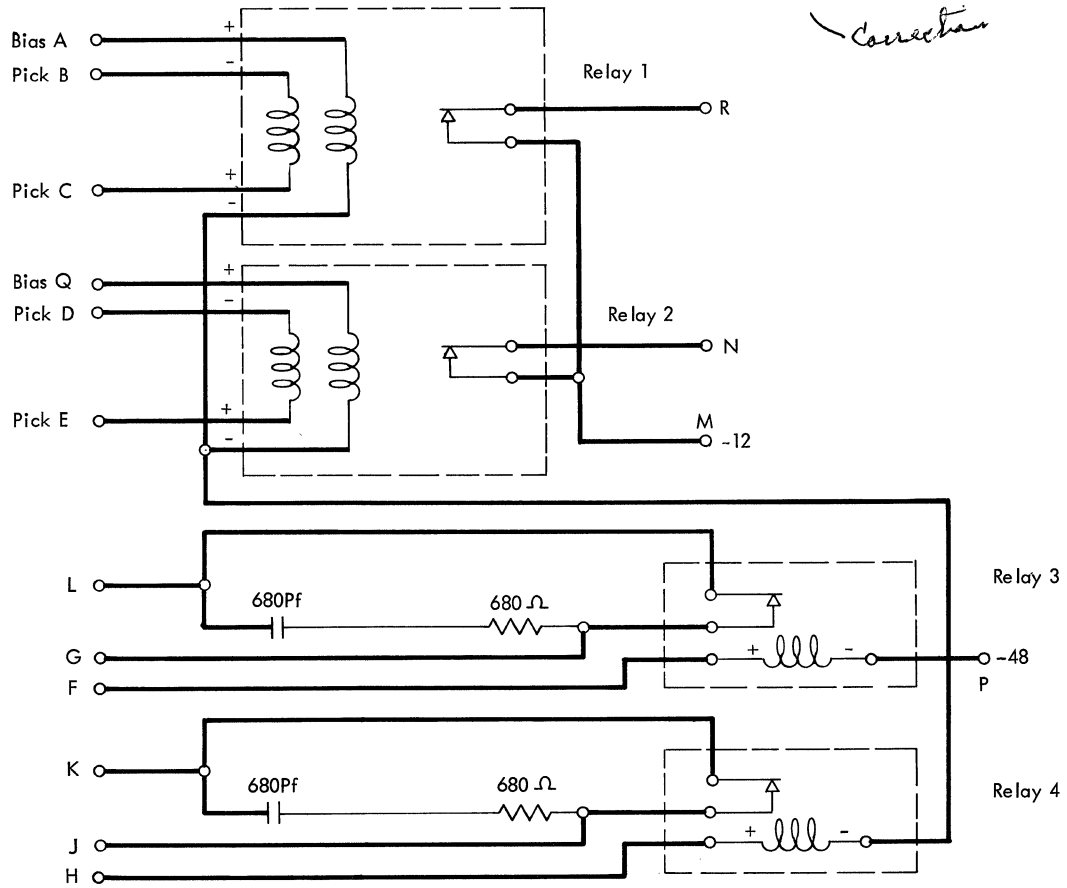


Figure 6-24. DWX-Telegraph Relay Card

MH (Figure 6-25)

The MH card (part 371487) has four power inverter circuits, each of which provides a strong output for driving additional circuits or transmission lines. A weak S input causes an amplified and inverted S output. The 3.3 ohm-33 μf network decouples the collector load resistor from the -12V supply to prevent sudden current demands from affecting other circuits.

MP (Figure 6-25)

The MP card (part 371638) is a capacitor card for single shots. Four capacitors of different values are on the card.

MX (Figure 6-25)

The MX card (part 371661) has four three-way circuits that perform basic logic functions (+A, -O, I)

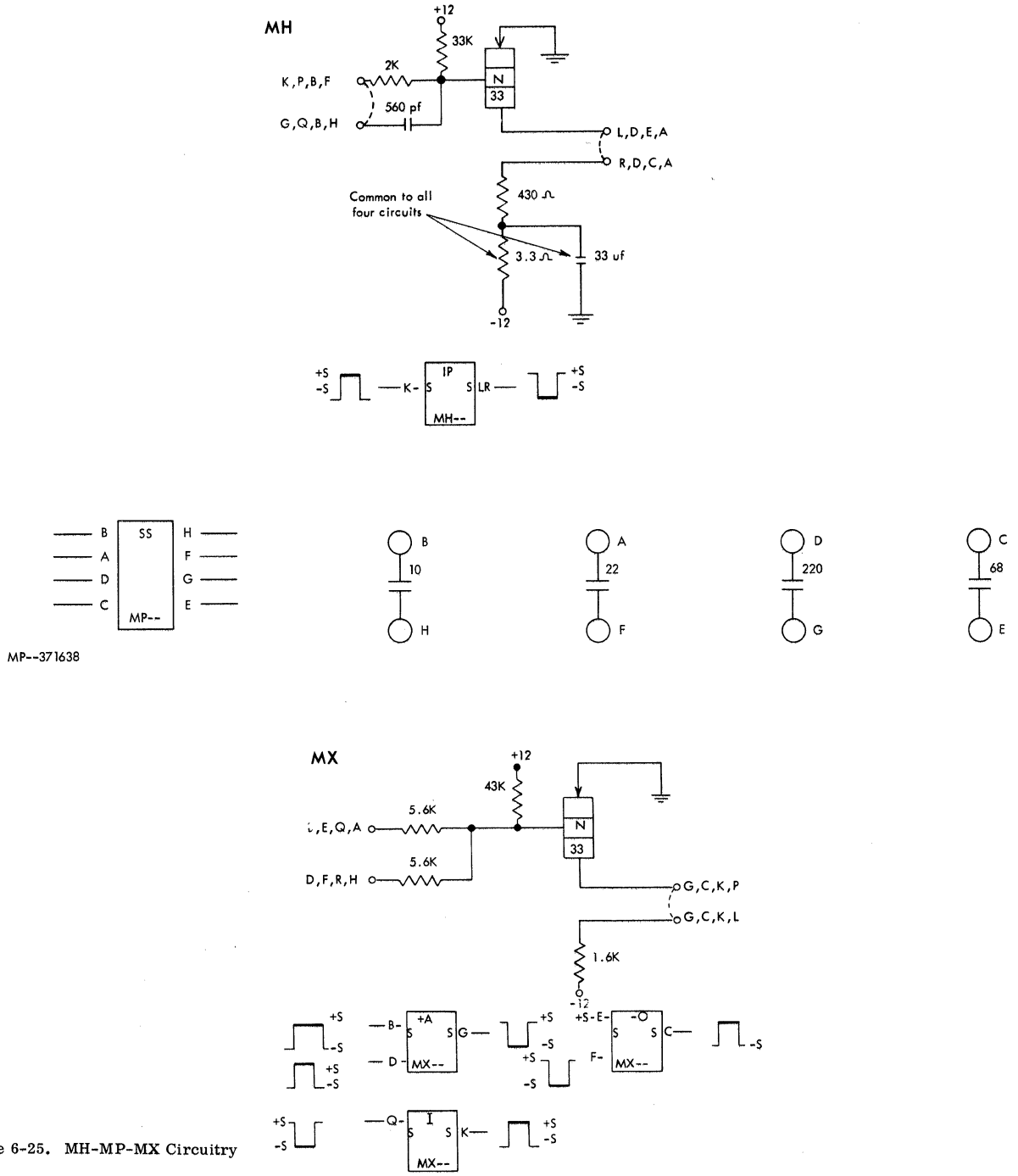


Figure 6-25. MH-MP-MX Circuitry

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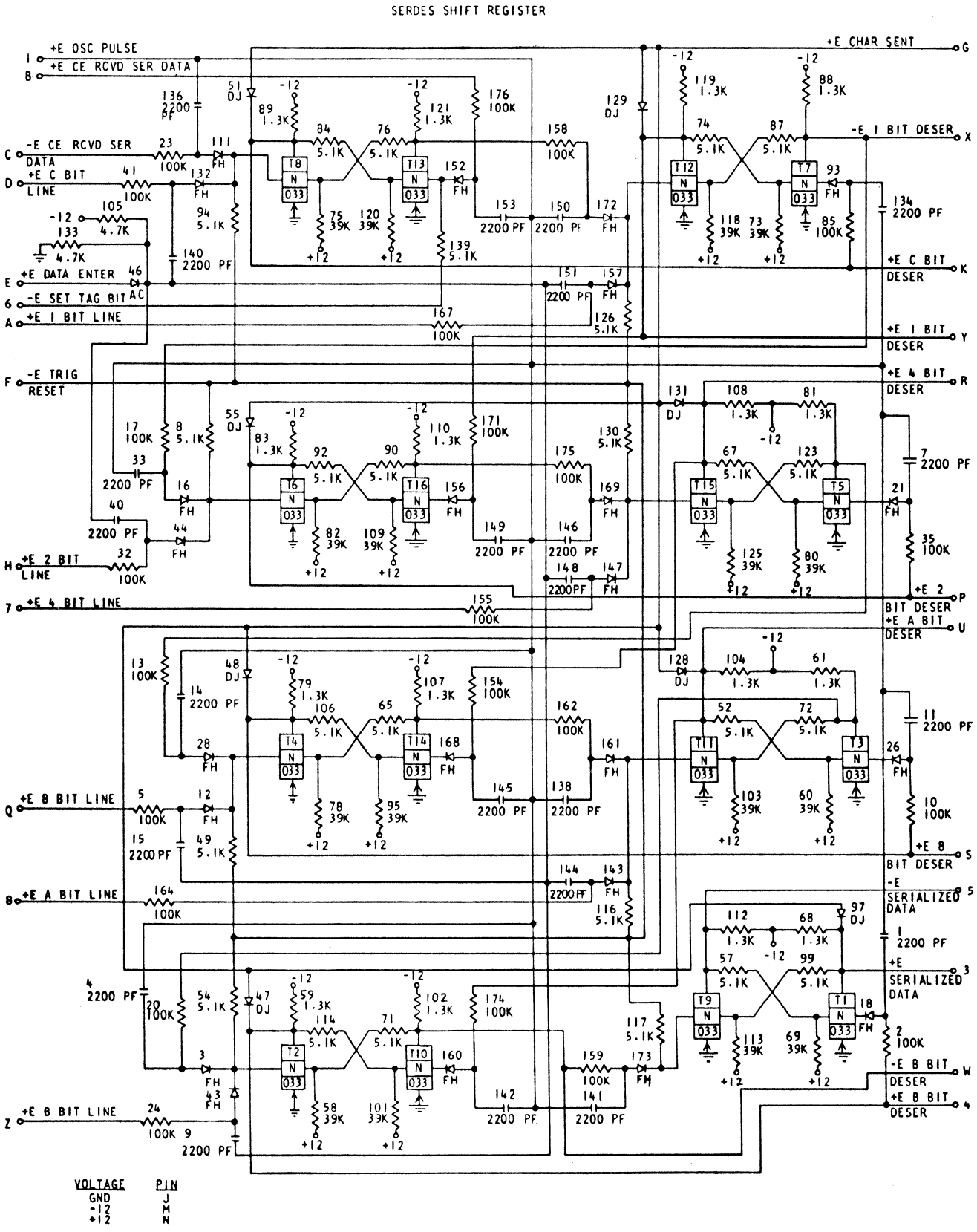

Figure 6-26. UFK Circuitry

and invert the input signal. The logic function is performed by the input resistor network and the invert function is accomplished by the common emitter configuration. One circuit is available for dot functions. Dropping either input to -S raises the output to +S.

UFK (Figure 6-26)

The UFK card (part 374143) contains all the circuitry for the serdes shift register.

Each stage of the register uses two transistors. One transistor in each stage conducts, while the other is cut off. As the stage flips, the conducting transistor cuts off while the other starts to conduct. Each stage gates the succeeding stage, and the oscillator pulse to all the stages sets the transistors that are gated. The gate pulse has to precede the set pulse by about 20 seconds.

Space bits gate T8 to conduct. Mark bits gate T13 to conduct. T8, when conducting, conditions the base of T13 positive to cut off transistor T13. The output-pin G is positive whenever T8 conducts. The other stages function the same as T8 and T13, except the gates are provided from the preceding stage.

YER (Figure 6-21)

The YER card (part 370667) is a capacitor card to control the timing of the oscillator card (APN). Four capacitors of different values are on the card.

YJD (Figure 6-27)

The YJD card, (part 370804) contains fourteen 0.1 µf capacitors. Each capacitor is a time delay for the MX-card single shots.

MX Single Shot (Figure 6-28)

This is a plus single-shot circuit created by an arrangement of SMS cards. The input at pin 1 is normally at a -S level. Pin 2 will, therefore, be plus over to the +AND output circuit. When pin 1 goes plus, the second leg to the AND circuit will be fulfilled, to allow the output of the AND circuit at pin 3 to go minus. The plus at pin 1 also goes through the inverter card and attempts to act as a minus at pin 2. However, the capacitor card will hold this line plus for a short period of time. The pulse decay at pin 2 is shown in the sequence chart.

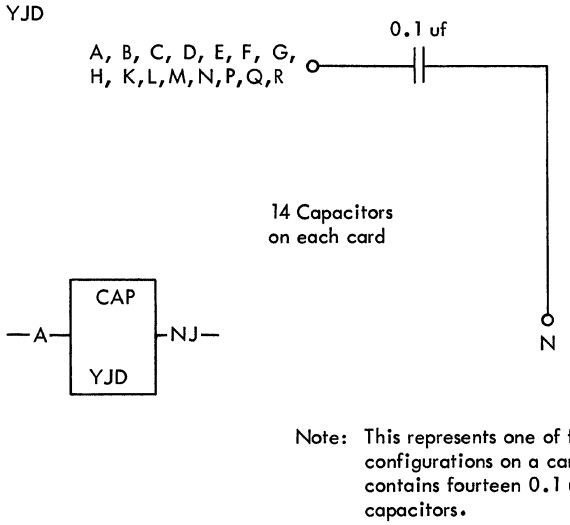

Figure 6-27. YJD Circuitry

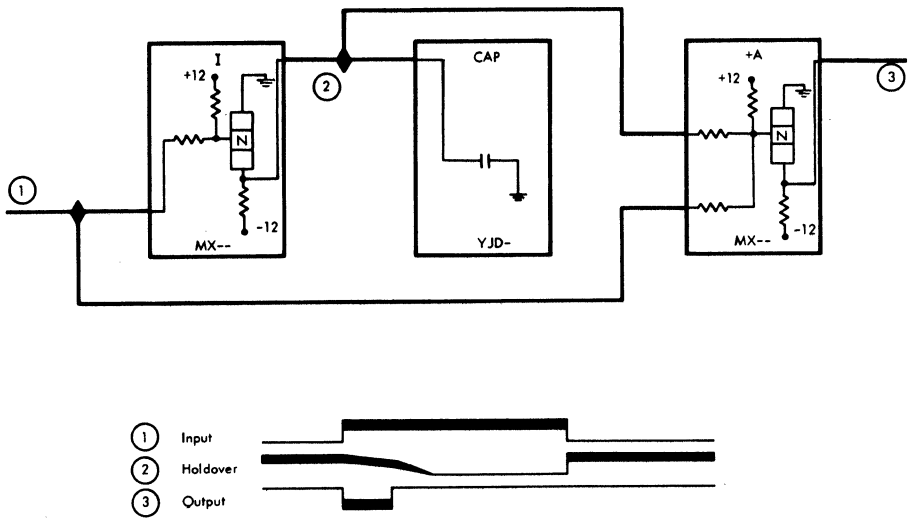

Figure 6-28. MX Single Shot

Eventually this capacitor times out, and causes the top leg of the AND circuit to go minus, and therefore the output at pin 3 goes plus. The output timing of this circuit at pin 3 should be at least 15 microseconds and may be considerably more.

This circuit is called an MX single shot because this was the first card to be widely used for this configuration. Presently AHK, CAB, and CD cards are used to make MX single shots. However, the circuit operation remains the same.

GLOSSARY:

Terms Particularly Applicable to IBM 1971

Addressing. A series of characters transmitted from the central processor to select the terminal designated to receive a message.

ASR. Automatic-send-receive.

Bid. When the terminal is ready to transmit a message it in effect, asks (bids) for the line. When polled the terminal will start to transmit by reading tape.

Bit. Same as Mark (current flowing).

Broadcast. The central processor can address all terminals at once (address zero-zero) and transmit the same message to all terminals simultaneously.

Central Processor. The message-switching center in Memphis, Tenn. All terminals connect via telegraph lines to the central processor.

CR. Carriage return.

EOB (End-of-block). This one-character code (1, 4 marking) is transmitted only from a terminal. When preceded by a figures character, it signals the central processor that the message from the terminal is complete. Also, at the terminal, the character, when preceded by figures, turns the terminal around to receive mode so it can receive the reply from the processor without being addressed.

EOB Sequence. A figures character (1,2,4,5 marking) followed by the EOB character (1,4 marking).

EOT (End-of-transmission). This one-character code (1,2,4 marking) is sent only by the central processor. It is transmitted during polling or addressing, and also as the last character of a message. The bell at the terminal will ring when the character terminates a message. The figures character precedes the EOT character.

EOT Sequence. A figures character (1,2,4,5 marking) followed by the EOT character (1,2,4 marking).

FIGS (figures character). This character puts the machine in a figures shift, and accepts all subsequent character codes as figures.

Half-Duplex. Data can be both transmitted and received, but not simultaneously.

Host Inn. The Holiday Inn chosen to receive the message or reservation.

Index Card. A card file maintained at each terminal location. Each card describes and illustrates information about each Holiday Inn, and other Inns in the immediate area.

Intelligence bits. The bits that make up each character. The 1971 is a 5-level terminal. Therefore, all characters consist of 5 intelligence bits.

IP. Input.

LCL. Local.

LF. Line feed.

Local copy. All data transmitted is simultaneously received at the transmitting terminal. The terminal copies (prints) all information sent from the terminal.

LTRS (Letter-Character). This character puts the machine in a letters shift, and accepts all subsequent character codes as letters.

Mark. A time interval when current flows in the transmission line (60 ma).

No Bit. Same as space (no current).

Polling. A series of characters transmitted from the central processor to select a terminal to transmit, if a message is ready for the central processor.

RAP. Routine-action-pushbutton keyboard.

Requesting Inn or Terminal. The Holiday Inn where the reservation or transaction originates.

Serdes (Serialized-Deserialized). This is the type of shift register used.

SMS. Standard modular system.

Space. A time interval when no-current flows in the transmission line.

SR. Shift register.

Start Bit. A space bit that always precedes every character transmitted on the line.

Stop Bit. A mark bit that always follows the character intelligence bits. The stop bit is always at least 1.5 units of time as compared to the other bits of the character.

Data Transmission Terms

Amplifier. A device which receives energy at a low level and sends it out at a high level in identical or nearly identical form.

Amplitude. The size or magnitude of a voltage or current waveform.

Attenuation. The decrease in amplitude that accompanies propagation or passage through equipment, lines or space.

Audio. Frequencies which can be heard by the human ear (usually 50 cycles to 16,000 cycles per second).

Band. Range of frequency between two defined limits.

Bandwidth. The difference, expressed in the number of cycles per second, between the two limiting frequencies of a bank.

Baud. A unit of signaling speed in data transmission. The speed in bauds is equal to the number of bits per second.

Bit. Contraction of binary digit, the smallest unit of information, which has two possible states, 1 and 0.

Bit rate. The speed at which bits are transmitted, usually expressed in bits per second (bauds).

Buffer. A storage device used to compensate for a difference in the rate of flow of information, or the time of occurence of events.

Cable. Assembly of one or more conductors within an enveloping protective sheath so constructed as to permit the use of conductors separately or in groups.

Cable, Coaxial. A cable consisting of one conductor (usually a small copper tube or wire) within and insulated from another conductor of larger diameter, usually copper tubing or copper braid.

Calling, Selective. The ability of a transmitting station to direct a call to one or more specifically designated stations.

Carrier. A high-frequency current that can be modulated by voice or signaling impulses.

Carrier, Communications Common. A company that furnishes communications services to the general public, and is regulated by appropriate state or federal agencies.

Carrier System. A means of conveying a number of channels over a single path by modulating each channel on a different carrier frequency and demodulating at the receiving point to restore the signals to their original form.

Channel. A path for electrical transmission between two or more stations or channel terminations. The channel may consist of wire or radio waves or both. A channel is sometimes referred to as a circuit.

Channel, Analog. A channel on which the information transmitted can take any value between the limits defined by the channel. Voice channels are analog channels.

Channel, Duplex. A channel that provides simultaneous transmission in both directions.

Channel, Four-Wire. A two-way circuit where the signals simultaneously follow separate and distinct paths in opposite directions in the transmission medium.

Channel, Half-Duplex. A channel capable of transmitting and receiving signals, but in only one direction at a time.

Channel, Simplex. A channel which permits transmission in one direction only.

Channel, Two-Wire. A two-way circuit for transmission in either direction, but not simultaneously.

Channel, Voice Grade. A channel that permits transmission of speech.

Channelizing. The process of dividing one circuit into several channels.

Character. The actual or coded representation of a digit, letter or special symbol.

Circuit. A physical, metallic connection between two points.

Circuit, multi-point. A circuit that interconnects several locations and makes information transmitted over the circuit available at all locations simultaneously.

Code. A system of symbols and rules for use in representing information.

Communication. The transferring of information from one point to another.

Communication, Data. The transmission of data from one point to another.

Contention. A condition on a multipoint communication channel when two or more locations try to transmit at the same time.

Converter. A device capable of converting impulses from one mode to another; such as, analog to digital or parallel to serial.

Data, Analog. A physical representation of information. The representation bears an exact relationship to the original information. The electrical signals on a telephone channel are analog representations of the original voice.

Data, Collection. The act of bringing data from one or more points to a central point.

Data, Digital. Information represented by a code that consists of a sequence of discrete elements.

Data Set. A modulation/demodulation device to provide compatibility between input/output equipment and communications facilities.

Data Transmission. The sending of data from one place to another or from one part of a system to another.

Dialing, Direct Distance. An exchange service that enables a telephone user to select subscribers outside the user's local area.

Exchange, Central Office. The place where a communications common carrier locates the equipment that interconnects incoming subscribers and circuits.

Exchange, Dial. An exchange where all subscribers originate their calls by dialing.

Exchange, Manual. An exchange where calls are completed by an operator.

Exchange, Private Automatic (PAX). A dial exchange that provides private telephone service to an organization, and does not allow calls to be transmitted to or from the public telephone network.

Exchange, Private Automatic Branch (PABX). A private automatic exchange that provides for the transmission of calls to and from the public telephone network.

Exchange, Private Branch (PBX). A manual or dial exchange that is connected to the public telephone network, located on a customer's premises and operated by his employees.

Exchange Service. A service that permits interconnection of any two customers' telephones through the use of switching equipment.

Frequency Multiplexing. A method for dividing a circuit into many channels within the bandwidth of the circuit.

Hard Copy. A machine-printed document, such as a message, order, invoice, etc.

Header. The first part of a message that contains all necessary information for directing the message to the destination(s).

In-Plant System. A data-handling system confined to one building or a number of buildings in one locality.

Interface. A common boundary. For example, physical connection between two systems or two devices.

Loop, Local. A channel that connects a subscriber to a central office exchange. Usually a metallic circuit.

Mod/Demod. Abbreviated form for modulating and demodulating units.

Modem. Contraction of modulator-demodulator.

Modulation. The process by which some characteristic of one wave is varied in accordance with another wave.

Multiplexing. The division of a transmission facility into two or more channels.

Network. A series of points interconnected by communications channels.

Network, Leased Line or Private Wire. A series of points, interconnected by telegraph, or telephone channels, and reserved for the exclusive use of one customer.

Network, Private Telegraph. A series of points interconnected by leased telegraph channels. Provides hard-copy and/or five-track punches paper tape at both sending and receiving points.

Off-Line system. A system in which human operations are required between the original recording functions and the ultimate data processing function.

This includes conversion operations as well as the necessary loading and unloading operations incident to the use of data-gathering systems.

On-Line system. A system that eliminates the need for human intervention between source recording and the ultimate processing by a computer.

Perforator, Tape. Manually operated equipment that punches holes in paper tape.

Point-to-Point Transmission. Transmission of data directly between two points without the use of any intermediate terminal or computer.

Poll. A flexible, systematic method, centrally controlled, for permitting stations on a multipoint circuit to transmit without contending for the line.

Priority Indicators. Groups of characters used in the header of a message to define the order of transmitting messages over a communication channel.

Processing, Batch. A method of processing in which a number of similar input items are accumulated and grouped.

Processing, In-Line. A method of processing in which individual input transactions are completely processed and all pertinent records are updated without previously having been grouped.

Record. A group of related facts or fields of information treated as a unit.

Relay Center. Message switching center.

Repeater. A device to amplify and/or reshape communications signals.

Reperforator, Tape. A device which automatically punches a paper tape from received signals.

Routing. Assignment of the communications path by which a message or telephone call will reach its destination.

Routing, Message. The function of selecting the route, or alternate route, if required, by which a message will proceed to its destination. Sometimes used in place of message switching.

Routing Indicator. An address or group of characters in the header of a message that defines the final circuit or terminal to which the message has to be delivered.

Service, Extended Area. An exchange service without toll charges, which extends over a geographical area (where there is a community of interest) in return for a somewhat higher exchange service rate.

Service, Private Line (Wire). A channel or circuit furnished a subscriber for his exclusive use.

Stunt Box. A device to control nonprinting function of a telegraph terminal.

Subset. A modulation/demodulation device to make business machine signals compatible with communications facilities. A subset is also known as a modem, subscribers set, or data set.

Switching, Circuit or Line. A switching technique where the connection is made between the calling party and the called party before the start of a communication (for example, telephone switching).

Switching, Message. The technique of receiving a message, storing it until the proper outgoing circuit is available, and then retransmitting it.

Switching Center. A location at which incoming data from one circuit is transferred to the proper outgoing circuit.

Switching Center, Automatic Message. A location where an incoming message is automatically directed to one or more outgoing circuits according to intelligence contained in the message.

Switching Center, Semiautomatic Message. A location where an incoming message is displayed to an operator who directs the message by pushbutton addressing to one or more outgoing circuits according to the information read from the tape.

Switching Center, Torn-Tape. A location where operators tear off the incoming printed and punched paper tape and transfer it manually to the proper outgoing circuit.

Tariff. The published rate for a particular approved commercial service of a common carrier.

Telecommunication. Any transmission or reception of signals, writing, sounds, or intelligence of any nature, by wire, radio, visual or electro-magnetic systems. Often used interchangeably with communication.

Teleprinter. Trade name used by Western Union to refer to its telegraph terminal equipment.

Teletype. Trademark of the Teletype Corporation. A system for transmitting messages over some distance. It employes keyboard or paper tape sending and printed receiving.

Teletypewriter. Trade name used by AT&T to refer to telegraph terminal equipment.

Teletypewriter Exchange Service (TWX). A switched network for interconnecting AT&T Teletypewriter subscribers.

Telex. An automatic Teletype exchange service provided domestically by Western Union.

Telpak. A tariff offered by AT&T for the leasing of wide band channels.

Toll. A charge for making a connection beyond an exchange boundry.

Transmission. The electrical transfer of a signal, message or other form of intelligence from one location to another.

Wide Area Telephone Service (WATS). A service which allows the customer to place unlimited calls within one or more zones on a direct dialing basis, for a predetermined monthly charge.

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RMC
JACK

Date: February 16, 1965
Dept/Loc): Memphis #240
Phone Ext.: 272-3031

IBM

Subject: Holiday Inns 1971-20 Terminal Installation Planning

Reference: My Letters of January 18, and February 1, 1965

LONG LINES ACCOUNT MANAGER - NASHVILLE

To: Field Engineering Branch Office Managers
Holiday Inn Service Locations

MEL DUNN
615 - 256 8904

COMMON CARRIER

A.T.&T. will provide approximately 45,000 miles of half duplex telegraph grade lines. The standard five bit positions per character Baudot code is used at a speed of 60 words per minute for the initial installations. Beginning in April, the terminals will be installed at 75 words per minute. In the future, probably September, all 60 word machines will be converted to 75. This is necessary because Teletype parts used on the 1971-20 for 75 wpm speed will not be available until April.

No data set is required for operation of the 1971-20 which is equipped with a standard phone plug for connection into a line jack provided by the common carrier. This jack is part of a D.Q.M. (Distortion Quality Monitor) box into which A.T.&T. is terminating its line in each Inn location. In addition to providing a demarcation jack, the D.Q.M. box incorporates two other functions which will assist in localizing reported troubles. These functions are displayed by two lights:

1. White Lights:

   (A) Allows full time line monitoring on in-service basis.

   (B) Flickers when signals are being received. Off in mark condition-- on in space condition.

2. Amber Light:

   (A) Shows signal deterioration in excess of a preset threshold.

   (B) Glows when distortion is in excess.

When questioned by maintenance people, the operator can determine line condition by observing status of lights. The D.Q.M. box requires a 115 volt receptacle identical to the 1971-20 outlet.

All orders for local phone line installations have been placed through A.T&T. in Memphis. No action by the local branch office should be necessary except to verify that lines have been installed prior to terminal installation date.

PHYSICAL PLANNING

The parent Holiday Inns headquarters has sent a letter to each Innkeeper describing in general the operation of the terminal, its dimensions, and power requirements. However, the local IBM office may be contacted for physical planning information by Holiday Inn personnel in your area. The enclosed specification sheet is for information in this regard. The 1971-20 will operate in parallel with the Teletype A.S.R 28 now being used by each Inn. For this reason, the electrical outlets and the D.Q.M. box should be placed in a position to permit simultaneous operation and in most instances allow the 1971-20 to be moved into the present position of the Teletype when it is discontinued. The IBM terminal is 10 inches longer than the A.S.R. 28 -- a fact of which the Innkeeper should be informed, if he is not aware of it already. This could present an awkward situation for the C.E. when installing the terminal if adequate space were not planned for before his arrival.

I suggest that at least a phone call be made to each Inn to insure that the following information has been received and understood.

1. A duplex power receptacle is required. The 1971-20 and the D.Q.M. box require a.c. power and are equipped with the same type power plug.

2. Both the IBM terminal and the presently installed Teletype will operate for at least a month in parallel prior to discontinuance of the A.S.R. 28.

3. The power receptacle and D.Q.M. box should be situated to permit both simultaneous and terminal only operation. The 1971-20 cords are long to assist in this conversion period.

4. The 1971-20 terminal is approximately 10 inches longer than the Teletype A.S.R. 28, but is 5 inches less in depth.

INSTALLATION

All installation dates shown on the February 1, listing mailed to each servicing office are for this year - 1965, and supercedes any dates that may have appeared on machine orders. This date indicates the week set aside for terminals on certain lines to check in with the host computer. Each terminal, where possible, will be scheduled on a different day to permit greatest C.E. coverage.

The machines for your office should arrive early enough to allow sufficient time for physical installation and off-line tests, which check all functions of the 1971-20. With proper off-line testing and advantages offered by the D.Q.M. box, we feel that the check-in procedure will not be very involved and that most of the required installation process can be accomplished prior to that time.

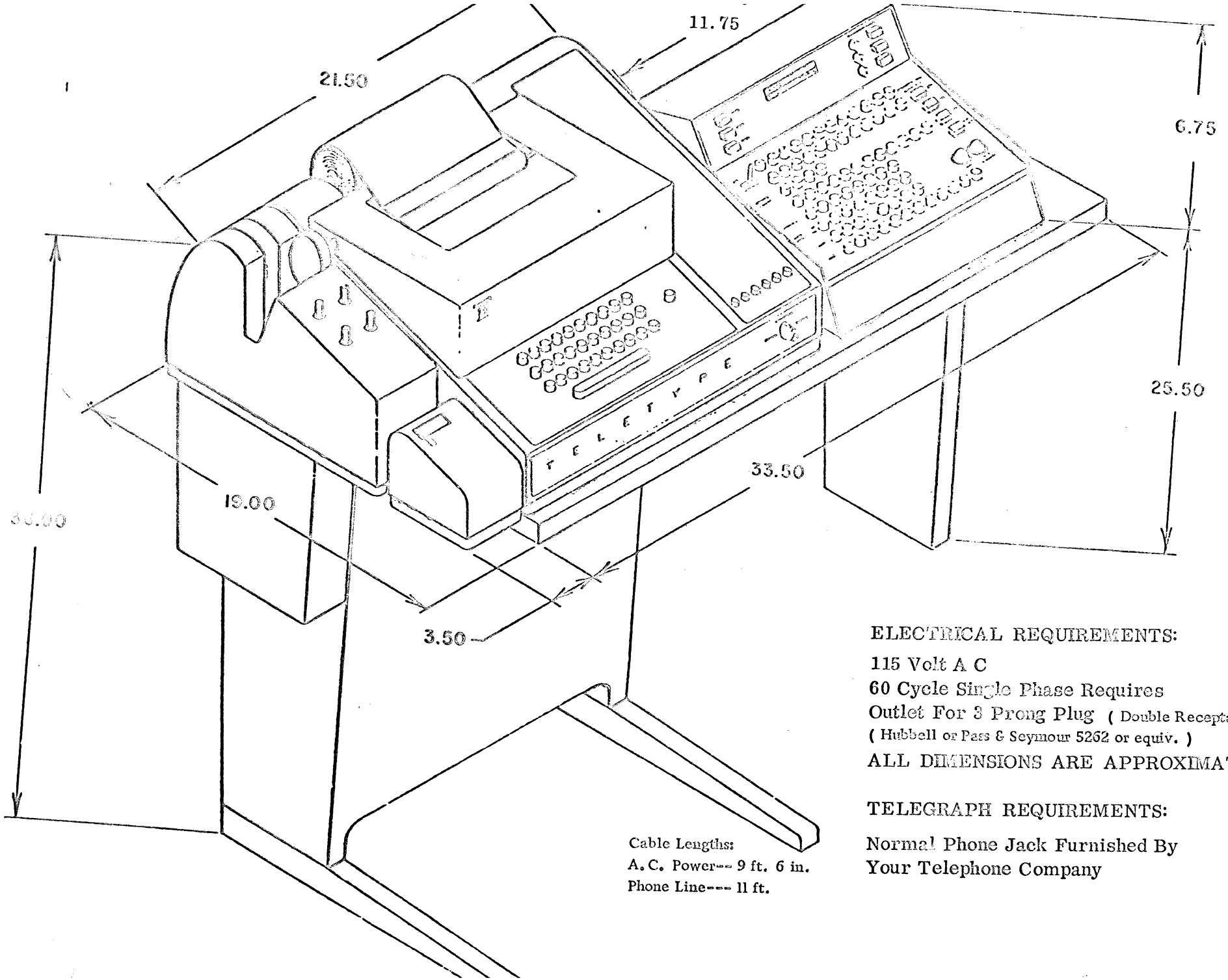
We have been given a very ambitious schedule on this system and to meet our contractual commitments, we must adhere to our proposed plans as closely as circumstances permit. I know we can count on full cooperation from everyone in the traditional IBM spirit.

If I can provide more information or assist in any way, please call on me at any time.

K. J. Byrd
Field Engineering

KJB/bm

cc: FE Area Managers



Cable Lengths:
A. C. Power--- 9 ft. 6 in.
Phone Line---- 11 ft.

ELECTRICAL REQUIREMENTS:

115 Volt A C
60 Cycle Single Phase Requires
Outlet For 3 Prong Plug (Double Receptacle)
(Hubbell or Pass & Seymour 5262 or equiv.)
ALL DIMENSIONS ARE APPROXIMATE

TELEGRAPH REQUIREMENTS:

Normal Phone Jack Furnished By
Your Telephone Company

Field Engineering Instruction-Maintenance: IBM 1971 Reservation Terminal Model 20, Form 225-3379-0

- Is the material:

	Yes	*No*
Easy to read?	☐	☐
Well organized?	☐	☐
Fully covered?	☐	☐
Clearly explained?	☐	☐
Well illustrated?	☐	☐

- How did you use this publication?

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For additional knowledge of the subject	☐
Studying machine operation	☐
During an actual service call	☐

- Which of the following terms best describes your job?

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Manager	☐	Customer Engineer	☐	Field Stock Personnel	☐
Systems Analyst	☐	Instructor	☐	Manufacturing Engineering	☐
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Your comments help us produce better publications. Please include specific page references if appropriate. You may include your name and address if you wish.

Space is available on the other side of this page for additional comments.
Thank you for your cooperation.

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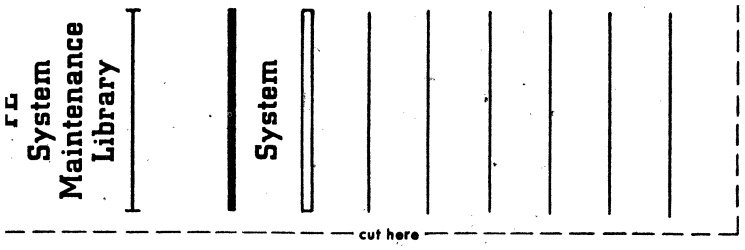

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