HOW TO OPERATE

Manual 370
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# TEMPEST model 40 DUAL ASR

TELETYPE®

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TABLE OF CONTENTS


1. INTRODUCTION ..... 1

2. TURNING ON POWER ..... 2

3. DISPLAY ..... 3

4. KEYBOARD ..... 4

Left-Hand Editing Controls ..... 6
Right-Hand Editing Controls ..... 7
Keyboard — Key Function Description ..... 9
Operational Mode Controls ..... 10
Command Mode Operation ..... 12

5. PRINTER ..... 22

Paper and Format Data ..... 25
Printer Access ..... 26
Paper Replacement ..... 27
Horizontal Form Alignment ..... 29
Form Belt Replacement ..... 30
Ribbon Replacement ..... 31

6. CASSETTE TAPE ..... 32

Tape Handling ..... 33

7. TERMINAL OPERATION ..... 35

Preliminary Procedures ..... 35
Incoming Messages ..... 36
Buffer Overrun ..... 37
Outgoing Messages ..... 41

8. TELETYPEWRITER SUPPLIES AND MAINTENANCE ..... 49

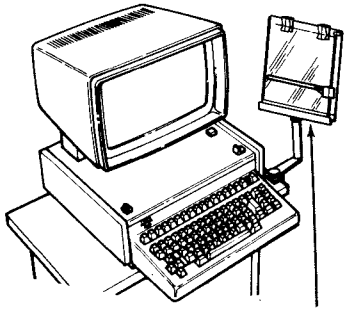
The purpose of this manual is to provide basic instructions on how to operate the Tempest Model 40 Dual ASR Terminal. This manual also provides tape, paper, ribbon and belt replacement information. The basic operating routines given in this manual may be modified or supplemented locally or by system instructions.

# 1. INTRODUCTION

The TELETYPE® Tempest Model 40 Dual ASR is a semiautomated message processing terminal. The terminal is capable of processing incoming and outgoing messages, correct and release messages to peripheral equipment, log all transactions and maintain critical recovery data.

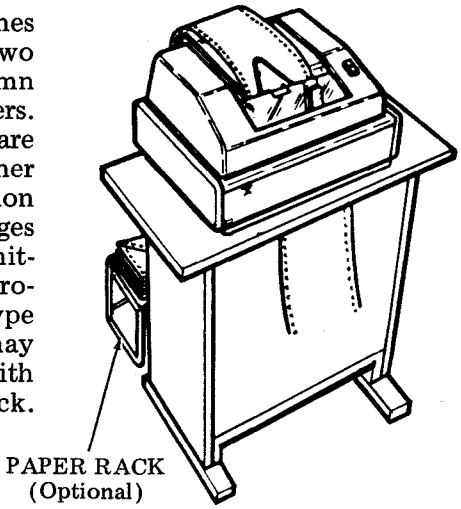
The line code to the "outside line" of the system is 5-level, Baudot at 75 baud. Off-line operation with a customer provided optical character reader is 8-level, ASCII (American National Standard Code for Information Interchange) code at 1200 baud. A 5-level interface port is provided for an off-line customer provided tape punch and reader. This feature can be optioned to operate from 50 up to 600 baud.

The two Keyboard/Display positions are equal and both can perform the same or different functions simultaneously. When a message is typed using the keyboard or received from another device it is displayed on a screen similar to that of a television set. Displayed messages can then be corrected and processed by using the keyboard's editing and mode controls prior to printing or transmission.



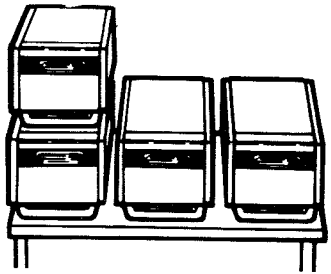

Keyboard/Display

Each terminal comes equipped with two 40-type, 80-column tractor feed printers. Both printers are accessed by either attendant position for printing messages received or transmitted. Printers are provided with 40-type pedestals and may be equipped with optional paper rack.

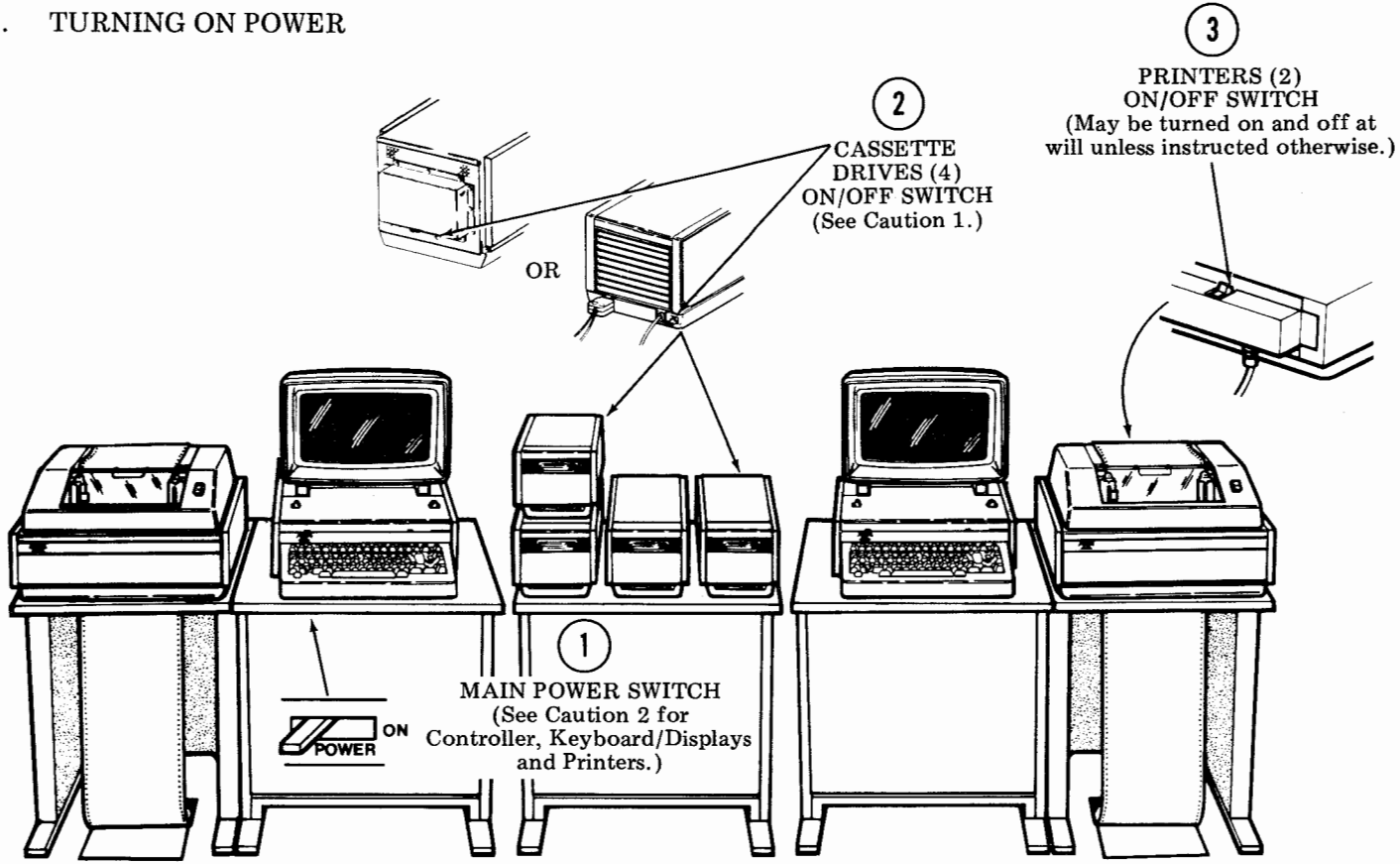



Also provided with each terminal are four cassette magnetic tape units. The four cassette units together serve as a message storage media, extended memory for the terminal electronics and storage of critical recovery data.

The interface for exchange of data between the printers, cassette units and the terminal controller is Teletype Standard Serial Interface (SSI) system.



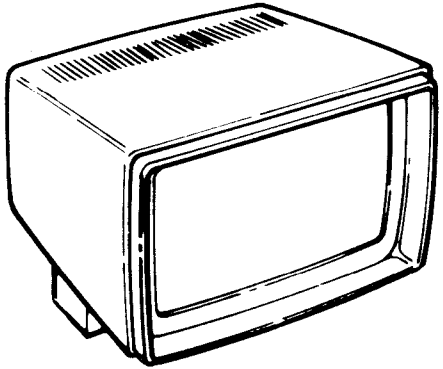
## 2. TURNING ON POWER




*Caution 1: No cassette should be in the set when power is turned ON or OFF.*

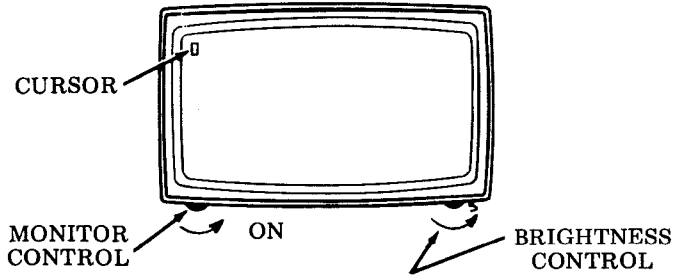
*Caution 2: Do not turn off power when terminal is operating, may cause unnecessary delay in system operation.*

## 3. DISPLAY



The display screen can accommodate a format of up to 24 lines of data (1 segment) with room on each line for up to 80 characters. The display storage contains 120 lines of 80 characters, giving a capacity of 5 segments.

There are three attendant operated controls on the display. To turn on the display, rotate the monitor control counterclockwise.

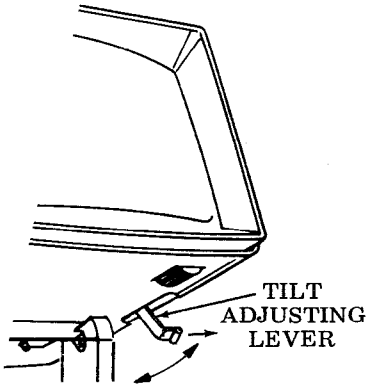



When the monitor control is turned on (provided that main power switch is on) the cursor will appear on the screen. If the cursor is not visible after a slight delay, rotate brightness control counterclockwise to brighten display.

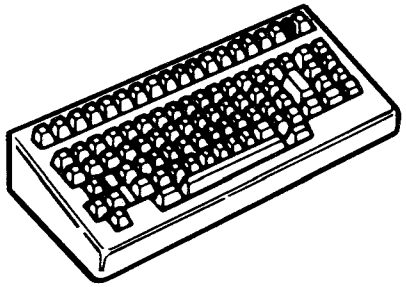
*Note:* The cursor is a light rectangular area on the screen that indicates where the next character will be displayed or next local function will take place.

If there is any lighting glare nearby, a screen tilt adjusting lever is provided. To adjust, proceed as follows:

- Move adjusting lever to the right to disengage.
- With adjusting lever held to the right, move lever forward or backward to desired position.
- Release lever to lock in place.




Brightness may be turned down or power may be turned off at the monitor control without loss of data or system delay when not in use.



Your keyboard permits you to enter data, edit displayed data, and to perform certain control functions during message processing. Data entry is accomplished by means of the keyboard operated similar to a typewriter.

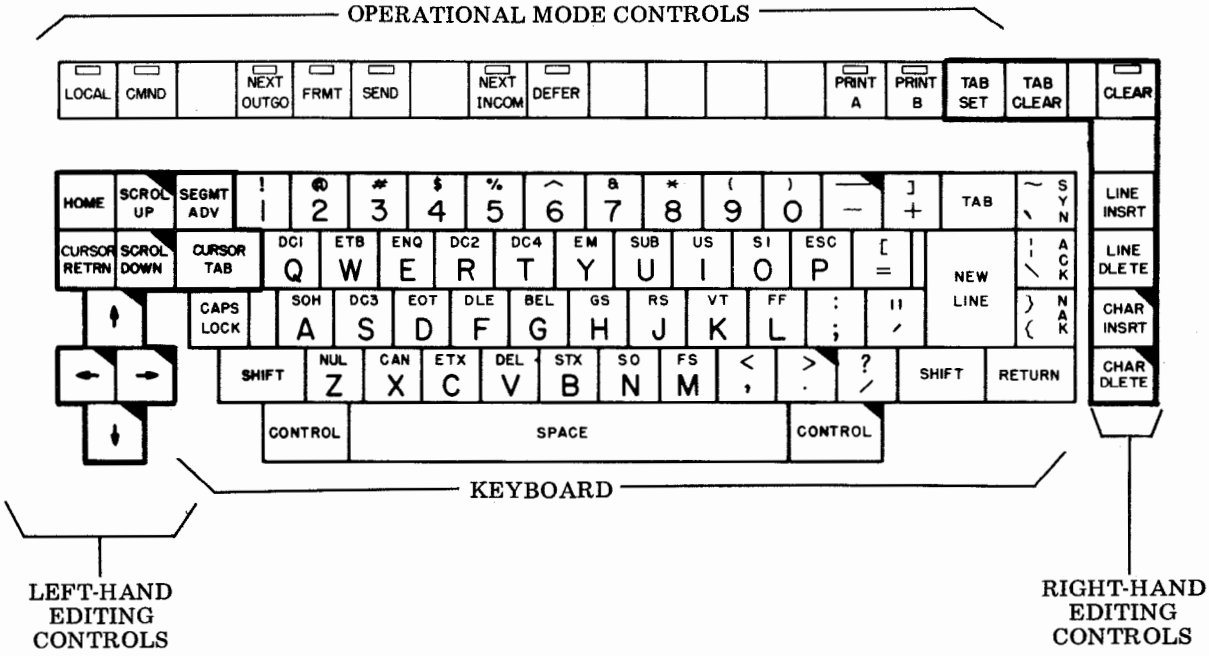
Most keys on the keyboard generate a single character when depressed. Some keys are designated as repeat keys and by depressing these keys with additional force cause the character to repeat until key is released. Only one key at a time may be depressed to enter the Repeat mode if it is a repeatable key.

An audible alarm is located in the operator console and sounds when the character $B_L$ (Bell) is received or during keyboard operation as follows:

- Entering a character at the 70th through 80th character position of a line.
- When entering characters on a line and reaching a right-hand margin.
- Entering characters after a NEW LINE symbol ($\equiv$).
- When the precedence of a message placed on the queue is either flash, critic or undetermined for unattended operation.
- In the event of a hung tape, garbled message, input queue full, tape end or buffer overrun.

The keyboard contains operational mode controls, two sets of editing clusters along with an ASCII keyboard arrangement. Message processing between the keyboard and display can only occur in the Local mode (LOCAL lamp on).

Keyboard operation can best be described in terms of what occurs when each key is depressed. The following pages are presented in this manner.




Key repeats when held fully depressed.

These keys normally light when depressed and indicate the operational mode of the terminal.

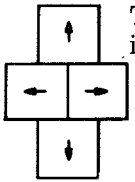
*Note:* These keys position cursor or displayed data, but do not alter information on page. They operate only in the Local mode.

HOME

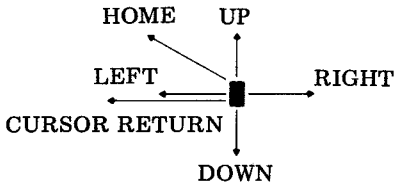
Returns cursor from any point on screen to first character position of first line of first segment.

CURSR RETRN

Returns cursor from any position on a line to first character of that line.



These keys move the cursor in the direction indicated by the arrow.




SCROL UP

Moves display up one line at a time until last line of the page appears at the bottom of display.

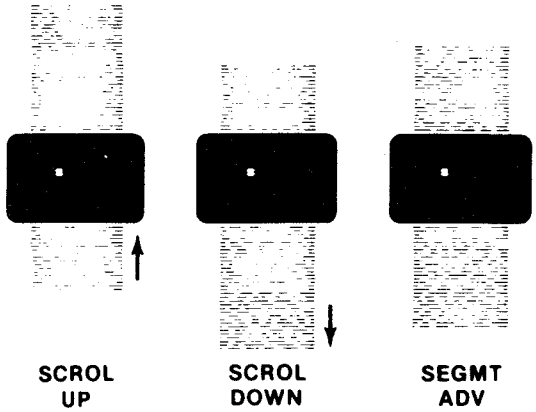
SCROL DOWN

Moves display down one line at a time until first line of the page appears at top of display.

SEGMT ADV

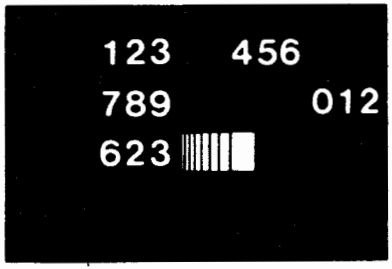
Moves display up to next 24 line segment.

*Note:* A page may consist of up to 5 segments of 24 lines each. The five segments contain a total of 120 lines; each line contains a maximum of 80 characters.



CURSR TAB

Once tab stops are set, this key permits rapid movement of cursor to next tab stop. Use at all times for all tabbing functions unless instructed otherwise.




## Right-Hand Editing Controls

*Note:* These keys alter information on the screen and operate only in the Local mode.

TAB SET

When depressed, sets tab stops on screen in column at which the cursor is located. The tab will be set for all 120 lines. Tab stops are not displayed.

TAB CLEAR

When depressed, clears all tab stops in all columns regardless of cursor location.

CLEAR

Removes all data from cursor position to the right and down to bottom of page.

Before:

After:

LINE INSRT

Line that cursor is on and following lines move down one line on the page. Cursor moves to the beginning of the inserted line.

Before:

After:

Data can now be entered in inserted line of spaces.

LINE DLETE

Line that cursor is on is removed. Cursor moves fully left. Following lines move up.

Before:

After:

CHAR INSRT

Character that cursor is over and succeeding characters to the end of the line move one position to the right.

Before:

After:

A character can now be entered in the cursor position.

CHAR DLETE

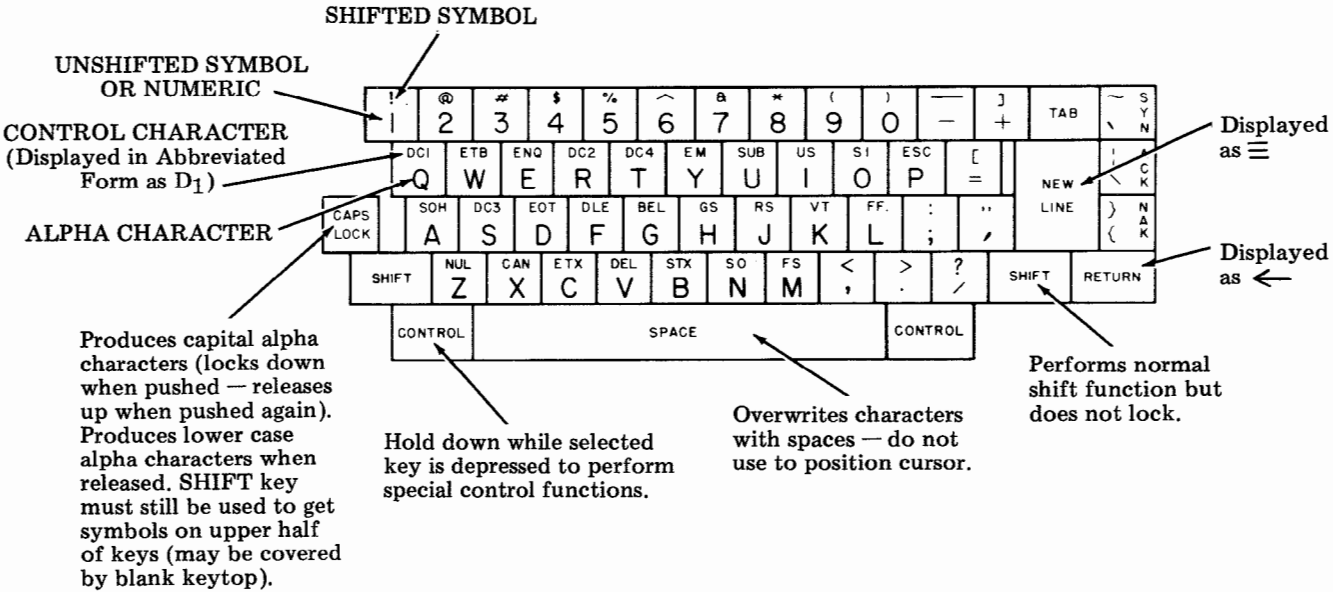
Removes character that cursor is over. Characters from the right of the cursor, to the end of the line will move one position to the left.

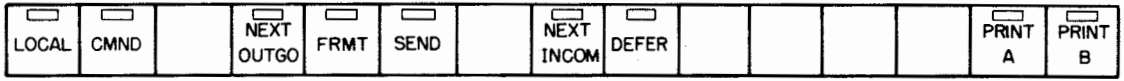
Before:

After:

TAB (Horizontal Tab) — Displays symbol ▶ and moves cursor to first tab stop on right.

NEW LINE — When depressed causes the symbol (≡) to be displayed and will position cursor at first character position of next line. If entered with the cursor on the last line of the screen, the display will "Scroll Up" and the cursor will be in the first character position of the new line which moved up on to the screen.






LOCAL Indicator automatically lights when power to terminal is turned on. In this mode, data can be entered from the keyboard and/or edit data using the cursor controls and editing features.

Terminal must first be placed in Local mode before entering other modes.

Depress the LOCAL key to terminate any other mode or routine in progress at your terminal.

The LOCAL indicator remains on during local printing.

CMND Depression of this key places terminal in the Command mode. With the CMND indicator on, depressing any of the upper case alphabetic keys and certain other characters will initiate one of the varied functions described in Command Mode Operation.

NEXT OUTGO This key enables the Optical Character Reader and calls in the next message waiting to be formatted and sent to the line. This is the primary source of outgoing messages. These messages are composed using a special format called a Pseudo Header described in Outgoing Messages of this manual.

The Optical Character Reader will be disabled and the terminal returned to the Local mode for processing of the message when an "ETX" is detected at the end of the message.

FRMT Depression of this key will transform a message on the screen that is in the pseudo header format into the ACP127 format.

At the same time the preprocessing information is being repositioned for local distribution copies and the outgoing terminal log entries and the circuit log entry are being completed for this message.

SEND Depressing this key will transfer the message on the screen in ACP127 format to the outgoing tape. This message will be placed at the next available output block and queued up for transmission on-line.

The SEND indicator will remain on until the message is transferred and the queue entry is complete and written on the tape.

Only one position may be in the Send mode at a time.

A check is also made for proper format. If an error is found in the message format, an error message will be displayed and the attendant's position will be returned to Local mode for correction.

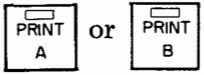
This key will automatically retrieve the highest precedence message in the incoming queue. The message is then displayed on the screen, checked for errors and certain information is selected for the incoming terminal log and the circuit log.

Also, the Message Continuity Number (MCN) and Channel Sequence Number (CSN) sequences are checked against the expected numbers.

Processing information is added to the screen and the message is prepared for printing.

The indicator will remain on as long as there is an entry in the incoming queue. If there is a high precedence message in the incoming queue (critic or flash), this indicator will flash until the high precedence message is processed. If the incoming queue is empty, the indicator will remain off and a message informing the attendant is displayed.

Returns a message called to the screen by means of the NEXT INCOM key to the bottom of the incoming queue. Since logging of an incoming message is complete after printing or punching of the received message, this key can only be used before such time. When used improperly, the attendant will be informed through an error message displayed on the screen. The DEFER indicator will light and the LOCAL indicator remains off during this function.



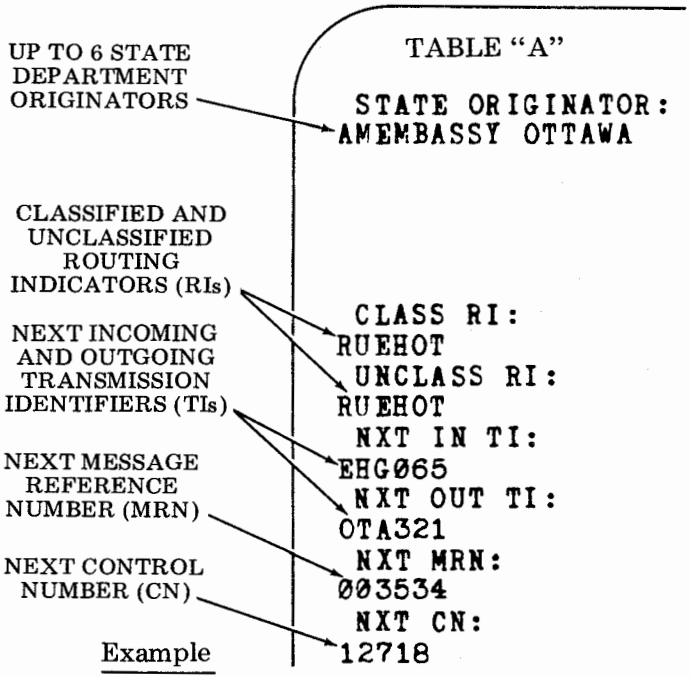

Depressing either switch will initiate local printing operation. The attendant position must be in the Local mode for printing to occur.

If the selected printer is in use by the other position, the position will remain in Local and the function can be selected again once the printer is available.

The selected key indicator lights and remains on until printing is completed or aborted.

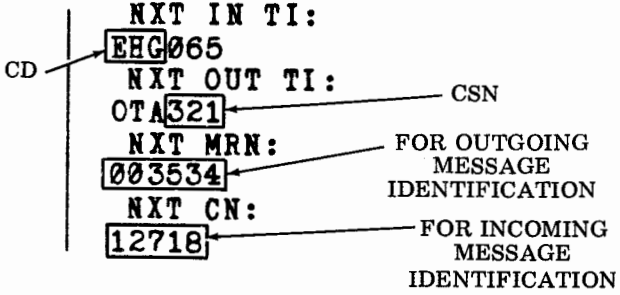
The Command mode provides additional functions that are not accommodated by the operational mode controls on the keyboard. Depressing any of the upper case alphabetic keys and certain other characters in this mode will initiate one of the varied functions described as follows:

CMND "A" — Displays Table "A" which gives the variable system information or "personality" of your particular post.




Example

A Transmission Identifier (TI) includes the Channel Designer (CD) and the Channel Sequence Number (CSN).




Example

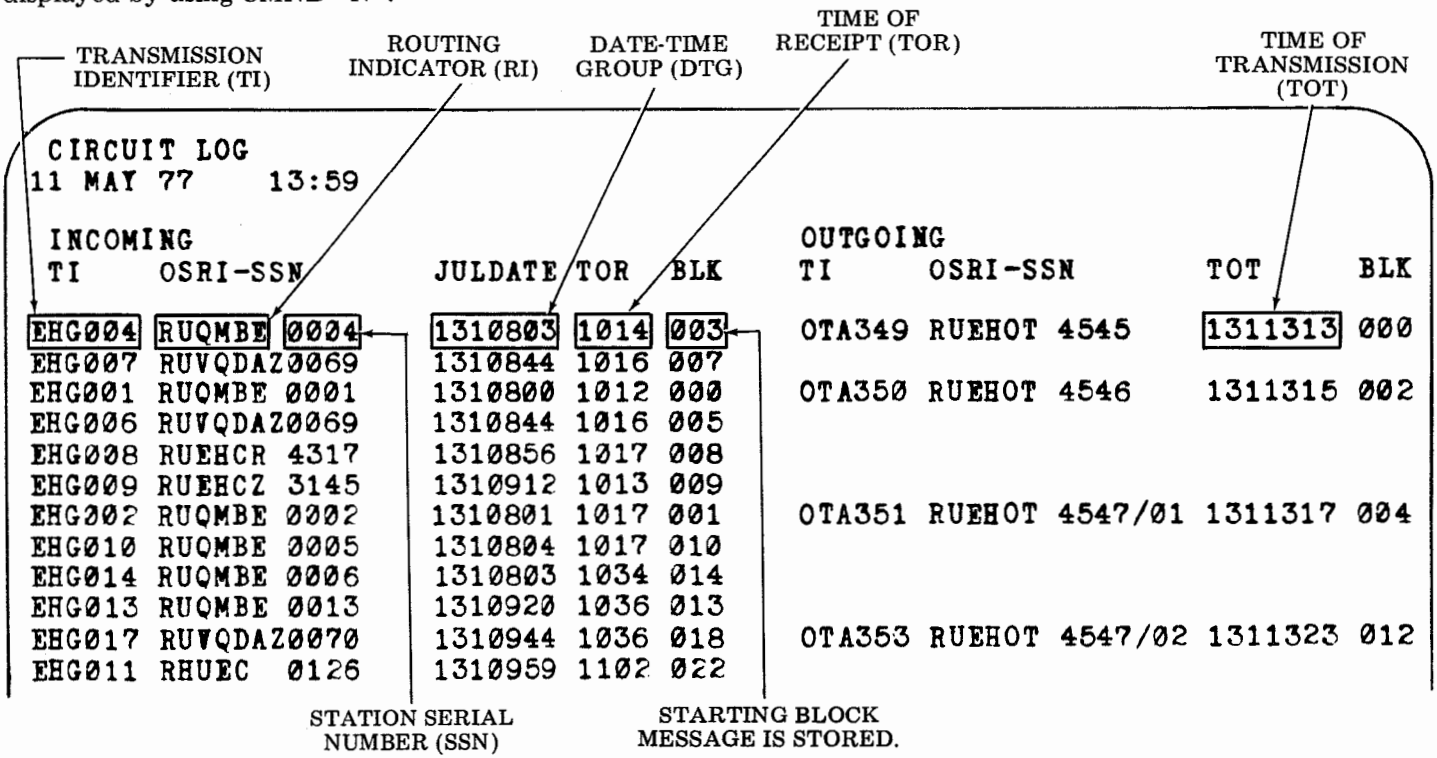
All data here is stored on the first block of Tape 3 along with other critical system recovery information. This information can be edited by the attendant by terminating editions with the CMND "E" function.

CMND "B" — Enters bootstrap loaded routines from specially prepared tapes in Cassette Drive 3. Depressing this key rewinds Tape 3 and displays special instructions for its use. Typically inserting a special tape and depressing the RETURN key will display further particular instructions for the use of that routine.

Tape 3 is rewound at the conclusion of the bootstrap loaded routine.

CMND "C" — This function displays the first 16 blocks of entries of the Circuit Log (CL). The incoming entries are to the left and the outgoing entries are to the right. There is one entry for each message received.

While there can be several Outgoing Terminal Log (OTL) entries for each message, the circuit log which is a physical extension of the OTL in storage has only one entry per message. Therefore, there can be blank lines between CL entries. The circuit log may be edited using CMND "E" and subsequent blocks of data may be displayed by using CMND "N".




Example

CMND "D" — Deletes the ASCII "SHIFT IN" and "SHIFT OUT" characters from a message. Since the code conversion routine replaces Baudot "LETTERS" and "FIGURES" with ASCII "SHIFT IN" and "SHIFT OUT", it is often desirable to eliminate them and condense the message for ease of reading. This function will do so starting at the cursor location and continues to an ASCII "ETX" character.

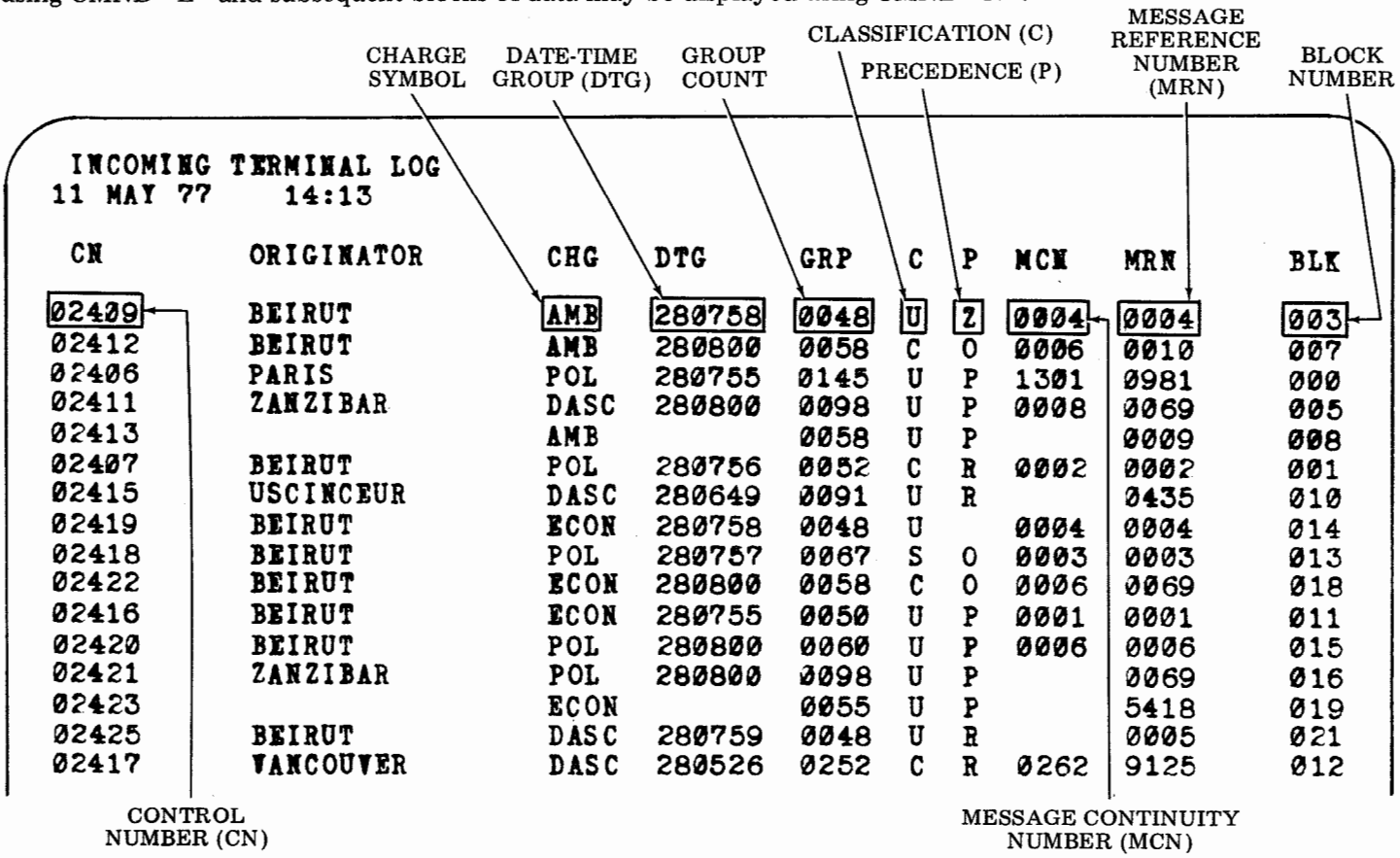
CMND "E" — Rewrites displayed data by CMND A, C, I, O, Q, T and Z that was edited to their respective buffers and/or tape. A message instructing the attendant to depress RETURN key before commencing is provided to catch attendant error.

CMND "F" — Preformats the tape in Cassette Drive 4. A message instructing the attendant to depress RETURN key is also provided here. This feature is used to clear the Incoming Terminal Log (ITL), Outgoing Terminal Log (OTL) and Circuit Log (CL) from Tape 4 to begin a new logging period. At the same time it clears block counts for incoming and outgoing messages, all counts related to the logs and all messages that may remain in the queues. This feature can also be used to preformat a tape for preparing the addressee table and for erasing and removing skew from a message tape.

CMND "G" — Processes displayed message as an incoming message. Since some messages may be received on paper tape external to the system it may be desirable to have them logged. This feature will process whatever message is on the screen as it were under the "NEXT INCOM" routine with the exception of logging Time Of Receipt (TOR), Group Count, Control Number (CN) and Block Number.

CMND "H" — Holds contents of display. All 80 characters of all 120 lines will be stored in a reserved area on Tape 3. This can be retrieved by using CMND "U".

CMND "I" — Displays the first 8 blocks of entries of the Incoming Terminal Log (ITL). The ITL may be edited using CMND "E" and subsequent blocks of data may be displayed using CMND "N".




Example

CMND "J" — Removes a "QRT" message from the outgoing queue. For unattended operation, a service message having a "Q" precedence may be placed on the outgoing queue and will be automatically released to the line in the event of a problem on the incoming line. This feature removes that message when attended operation is resumed.

CMND "K" — This feature copies all valid data blocks on Tape 1 to Tape 2. The system must be out-of-service while performing this function. If Tape 1 does not have all 500 blocks written, the system will not stop the routine until after the last block is copied. If all 500 blocks are copied, a message "COMPLETE" is displayed and both tapes are rewound. A message instructing the attendant to depress RETURN key is also provided here.

*Note:* Out-of-service is defined as both lines disabled and no processing of messages.

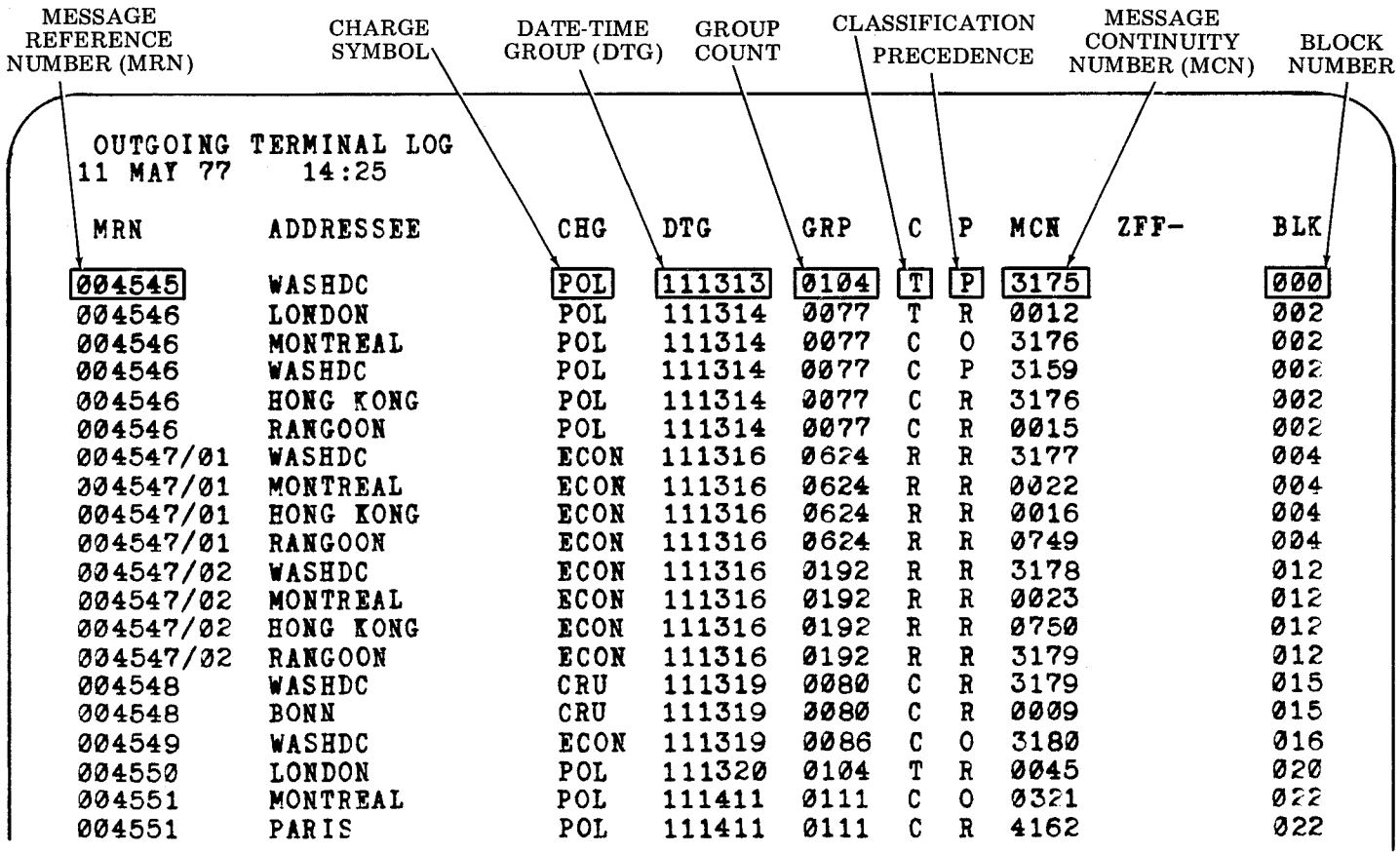
CMND "L" — Informs the attendant status of the input and output lines and whether the output buffer is empty or not. Instructions are also displayed to change line status. Entry of an "I" will enable the input status and an "O" will enable the output status.

Enabling the input line will not clear the input buffer. Power must be reset to do so. Disabling the output line will still allow any message in the process of transmission to be transmitted in its entirety. At power up, the incoming line is enabled and the outgoing line is disabled.

CMND "M" — Conversational mode. This feature enables incoming data to be sent directly to the screen at the cursor location without being buffered or logged on tape. This is used in conjunction with the CMND "S" feature to achieve a reasonable conversational mode.

CMND "N" — Displays next section of log or table or next message. This feature is used as "Scroll Up" when displaying the circuit log, incoming and outgoing terminal logs, the addressee table and for reviewing message files. Approximately one printed page is displayed at a time and this function will bring up the page.

CMND "O" — Displays the first 8 blocks of the Outgoing Terminal Log (OTL). The OTL may be edited using CMND "E" and subsequent blocks of data can be displayed using CMND "N".




OUTGOING TERMINAL LOG
11 MAY 77 14:25

| MRN | ADDRESSEE | CHG | DTG | GRP | C | P | MCN | ZFF- | BLK |
|---|---|---|---|---|---|---|---|---|---|
| 004545 | WASHDC | POL | 111313 | 0104 | T | P | 3175 | | 000 |
| 004546 | LONDON | POL | 111314 | 0077 | T | R | 0012 | | 002 |
| 004546 | MONTREAL | POL | 111314 | 0077 | C | O | 3176 | | 002 |
| 004546 | WASHDC | POL | 111314 | 0077 | C | P | 3159 | | 002 |
| 004546 | HONG KONG | POL | 111314 | 0077 | C | R | 3176 | | 002 |
| 004546 | RANGOON | POL | 111314 | 0077 | C | R | 0015 | | 002 |
| 004547/01 | WASHDC | ECON | 111316 | 0624 | R | R | 3177 | | 004 |
| 004547/01 | MONTREAL | ECON | 111316 | 0624 | R | R | 0022 | | 004 |
| 004547/01 | HONG KONG | ECON | 111316 | 0624 | R | R | 0016 | | 004 |
| 004547/01 | RANGOON | ECON | 111316 | 0624 | R | R | 0749 | | 004 |
| 004547/02 | WASHDC | ECON | 111316 | 0192 | R | R | 3178 | | 012 |
| 004547/02 | MONTREAL | ECON | 111316 | 0192 | R | R | 0023 | | 012 |
| 004547/02 | HONG KONG | ECON | 111316 | 0192 | R | R | 0750 | | 012 |
| 004547/02 | RANGOON | ECON | 111316 | 0192 | R | R | 3179 | | 012 |
| 004548 | WASHDC | CRU | 111319 | 0080 | C | R | 3179 | | 015 |
| 004548 | BONN | CRU | 111319 | 0080 | C | R | 0009 | | 015 |
| 004549 | WASHDC | ECON | 111319 | 0086 | C | O | 3180 | | 016 |
| 004550 | LONDON | POL | 111320 | 0104 | T | R | 0045 | | 020 |
| 004551 | MONTREAL | POL | 111411 | 0111 | C | O | 0321 | | 022 |
| 004551 | PARIS | POL | 111411 | 0111 | C | R | 4162 | | 022 |

Example

CMND "P" — Sends displayed message to off-line paper tape punch. This feature sends the message on the screen from the cursor position to the ASCII "ETX" character. A message warning the attendant to check the classification of the message may be displayed on the first attempt to use this command. The next attempt after the displayed warning will not be inhibited. Bringing a message to the screen from the paper tape reader, cassette tapes or the OCR that was formatted or processed as an incoming unclassified message will be sent on the first attempt.

CMND "Q" — Displays input and output queues.

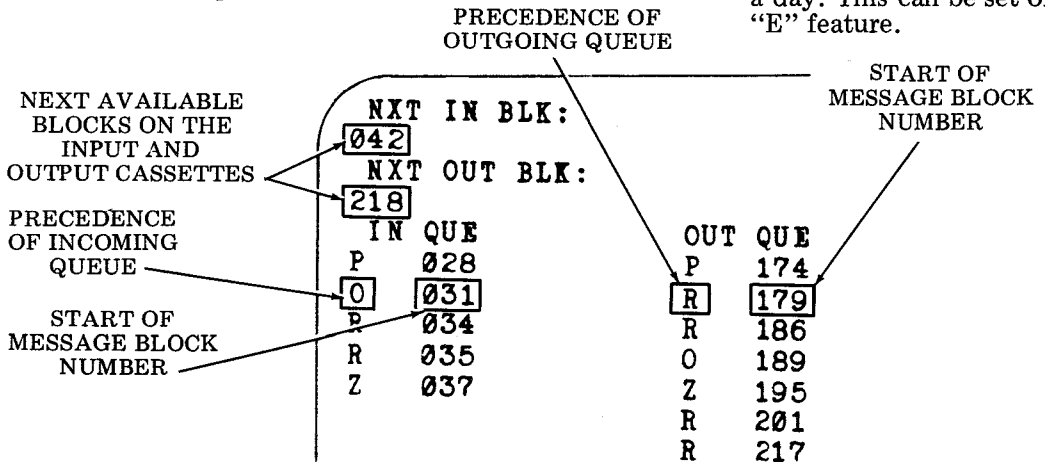
An asterisk following the precedence in the output queue denotes either as sectioned message waiting for processing of the final section or a "QRT" message for unattended operation.

The next available blocks may be changed by using the CMND "E" feature and the queue entries may be cleared by using the CMND "F" feature.

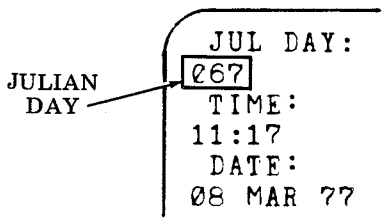
CMND "R" — Selects the off-line paper tape reader. Entering this mode displays the word "READ" at the cursor location. This mode is disabled by depressing the LOCAL key.

CMND "S" — Sends a message without ACP127 format. This feature is used in the conversational mode and for cases like sending a canned message stored on Tape 3. Data is sent from the cursor location to an ASCII "ETX".

CMND "T" — Displays the time and date. The Julian day and the date automatically change at the end of a day. This can be set or changed by using the CMND "E" feature.




Example




Example

CMND "U" — Retrieves the contents of display stored by the CMND "H" feature from a reserved area on Tape 3 and displayed on the screen exactly as stored. The same data can be called back more than once after it has been stored using the CMND "H".

CMND "V" — Retrieves messages from Tapes 1, 2 or 3. Upon entering this mode, the screen is cleared and the question "WHICH TAPE?" is displayed. The number 1, 2 or 3 may be entered. The system responds with "WHICH BLOCK?". Enter 1 to 3 digits which correspond to a given starting block of the message sought. Depressing the RETURN key initiates the retrieval.

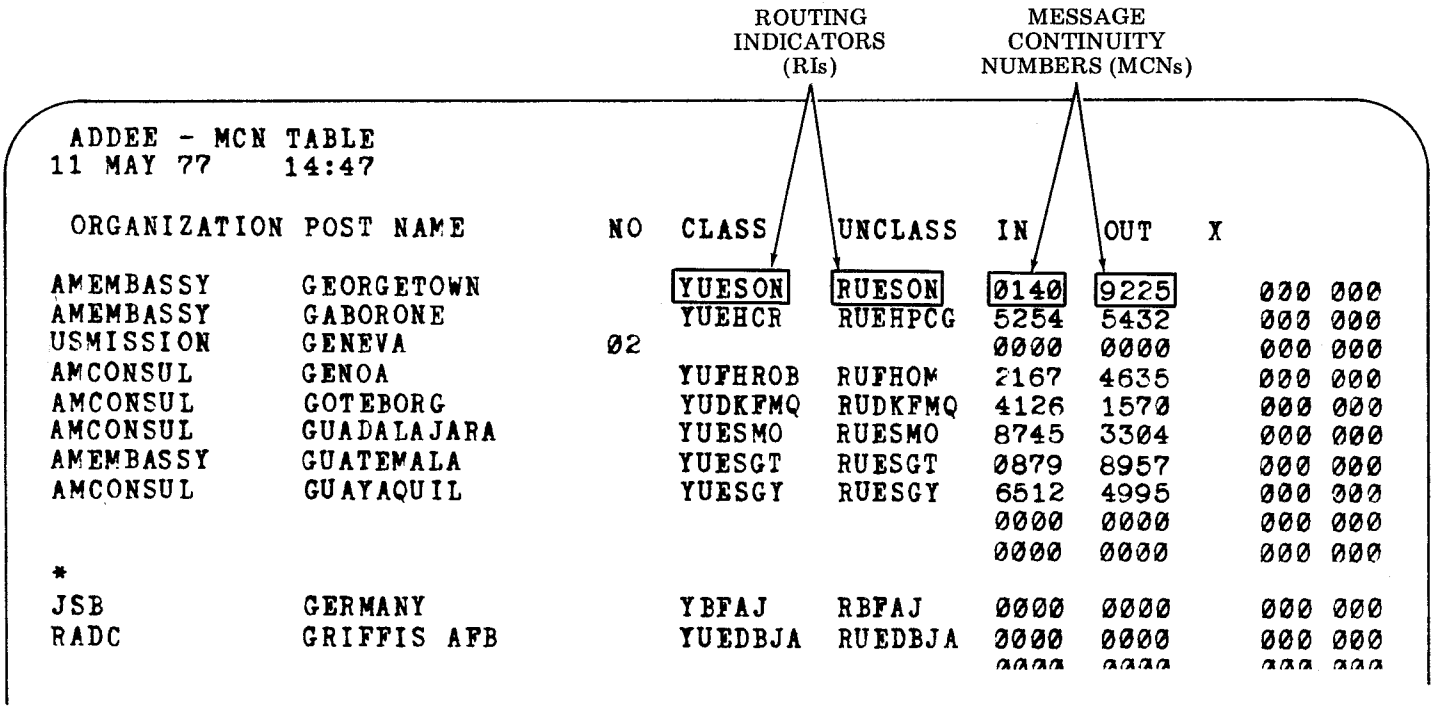
The message is displayed on the screen up to an ASCII "ETX" character, which should be the conclusion of any valid message on the tape. An improper entry will result in a displayed error message. The next message may be displayed by using CMND "N".

CMND "W" — Cancels an incoming message. Using this feature after calling up a message using the "NEXT INCOM" key will permanently remove the message from the incoming queue and prevent an incoming terminal log entry or an addressee table update. The screen is cleared and a message is displayed informing the attendant of the cancellation.

CMND "X" — Continue from processing error. When the system is forced to halt during "NEXT INCOM" or "FORMAT" routines, instructions are given to correct the problem. CMND "X" is then used to continue processing from that point.

CMND "Y" — Inserts a pseudo header format at the top of the screen. This feature inserts 9 lines at the home position and displays labels corresponding to the correct pseudo header information. Refer to Formatting.

CMND "Z" — Displays the first 5 blocks of the addressee (ADDEE-MCN) table. The addressees are grouped according to the first letter of the second word of multiword addressee and the first letter of the first word of single word addressees.




Example

The ADDEE — MCN table may be edited using the CMND "E" feature and subsequent blocks of data may be displayed using the CMND "N" feature.

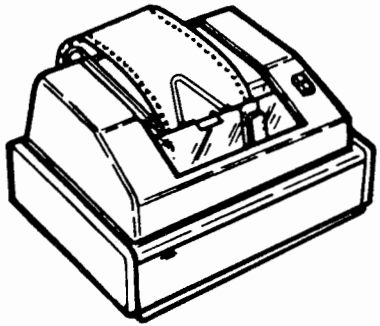
CMND "SPACE" — During conversion from Baudot to ASCII codes, data may be displayed with improperly shifted characters. With this feature enabled, depressing a repeatable key fully will transpose the data a character at a time to the opposite sense. When the cursor reaches the end of a line, this feature will automatically wrap around to the beginning of the next line.

CMND "@" (Shifted "2") — This feature displays the previous section of a log or table. It is used as a "Scroll Up" when displaying the Circuit Log, Incoming or Outgoing Terminal Logs and the Addressee Table. If the log or table is already at the first page or section, it will redisplay the first page.

CMND " ^ " (Shifted "6") — This feature automatically rewinds all tapes to the beginning of the tape. It is recommended that this command be used before removing any tape from a cassette drive that is not already at the beginning of the tape.

CMND " [ " (Shifted "=") — For future use.

CMND " ] " (Shifted "+") — For future use.



80-Column
Tractor Feed
Printer

The printer provides copy of processed incoming and outgoing messages by either depressing the PRINT A or PRINT B keys on the keyboard. Message displayed on the screen will be printed from the cursor position to an ASCII "ETX".

The printer is capable of printing from one original to original plus five copies. Form width is adjustable by varying the distance between the form feed tractors. Also, form lengths are adjustable by moving a lever to 1 of 4 settings.

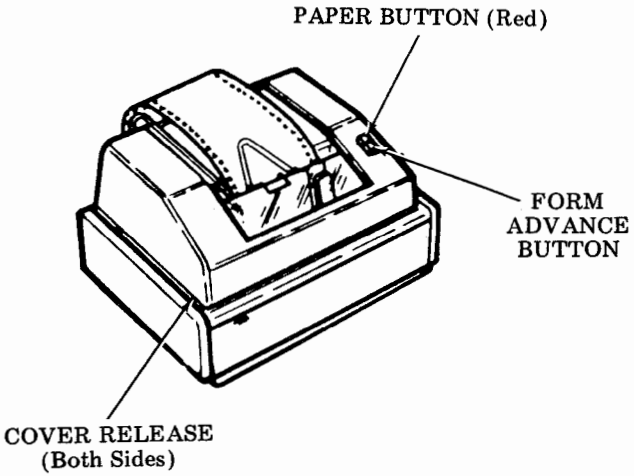
The printer prints or performs all characters generated by a corresponding operator console except as follows:

- Control characters do not print.
- Printer may be optioned to print the upper case equivalent on recept of a lower case letter.
- Symbols ` , { , } , ¦ , and ~ do not print. They may print as @, [, ], \ and ^ respectively.
- The space character is a nonprinting graphic.

In the event a NEW LINE is not received as the last character of a line, a new line function will be executed by the page printer. If the next character is a NEW LINE (character following an internally executed NEW LINE is a NEW LINE) the received NEW LINE will not be performed.

The maximum line length is 80 characters. An option will allow the right-hand margin to be moved a maximum of seven character positions to the left.

An automatic form feed sequence is generated after the first 60 lines have been printed. This will allow the attendant to page messages and to have information such as the message classification printed on the top and bottom of each page. These lines will be segregated from the body of the text by a blank line.



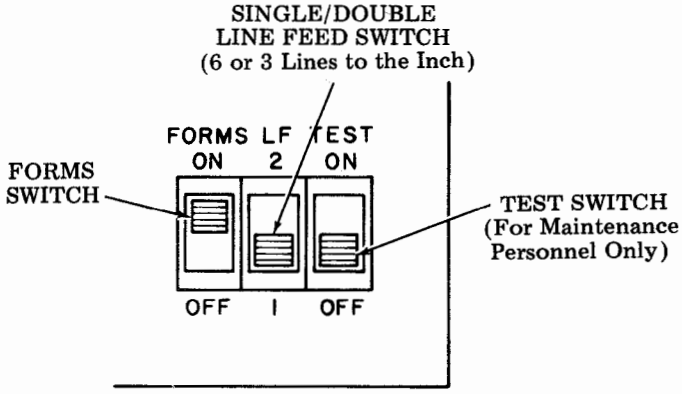

PAPER

When depressed, paper feed out will be continuous until button is released. Button lights when an out-of-paper condition exists. Replenish paper supply to extinguish lamp.

FORM ADVANCE

When depressed momentarily, forms will advance until next initialized form position is reached. (See Form Lengths on Page 24.)

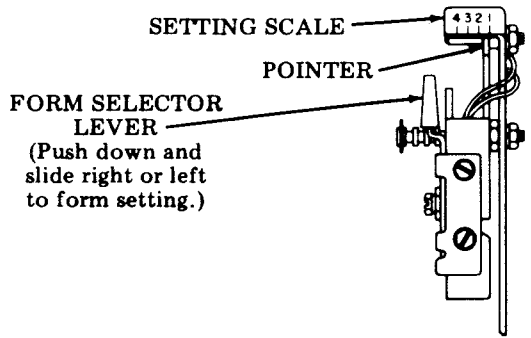
The printer normally prints six lines to the inch but can be selected to print three lines to the inch by moving the single/double line feed lever (located under the printer cover) from 1 to 2.




SWITCH PANEL — COVER OPEN
(Right Side — 80-Column)

- FORMS switch ON — Enables the printer to form feed on receipt of FF and stop at the start of the next form. Characters will not print during the on-line form feed operation.
- FORMS switch ON and FORM ADVANCE button depressed, in the On-Line mode, does not prevent printing; also, the printer feeds out paper to the start of the next form after the FORM ADVANCE button is released.
- FORMS switch OFF — Causes FF character to be converted to the new line function. When depressed, the FORM ADVANCE function causes continuous paper feed out until button is released.

Form Selector — Located under the cover on the left side of the printer. Depressing the selector lever and sliding the pointer causes different form lengths per belt color. Refer to the table on the right. The blue belt is standard.




FORM SELECTOR (Left Side)

BELT AND FORM LENGTH TABLE

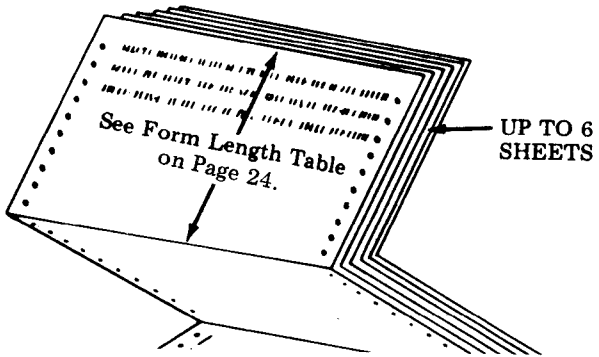
| Form Selector Setting | | | | |
|---|---|---|---|---|
| 4 | 3 | 2 | 1 | Color of Belt |
| Form Lengths (Inches) | | | | |
| 3-1/3† | 2-1/2 | 5 | 10 | Amber |
| 3-2/3† | 2-3/4* | 5-1/2 | 11 | Blue |
| 4 | 3 | 6 | 12 | Yellow |
| 4-1/3† | 3-1/4* | 6-1/2 | 13 | Brown |
| 4-2/3† | 3-1/2 | 7 | 14 | Red |
| 5 | 3-3/4* | 7-1/2 | 15 | Pink |
| 5-1/3† | 4 | 8 | 16 | Lt Green |
| 5-2/3† | 4-1/4* | 8-1/2 | 17 | Green |
| 6 | 4-1/2 | 9 | 18 | Lt Blue |
| 7-1/3† | 5-1/2 | 11 | 22 | White |

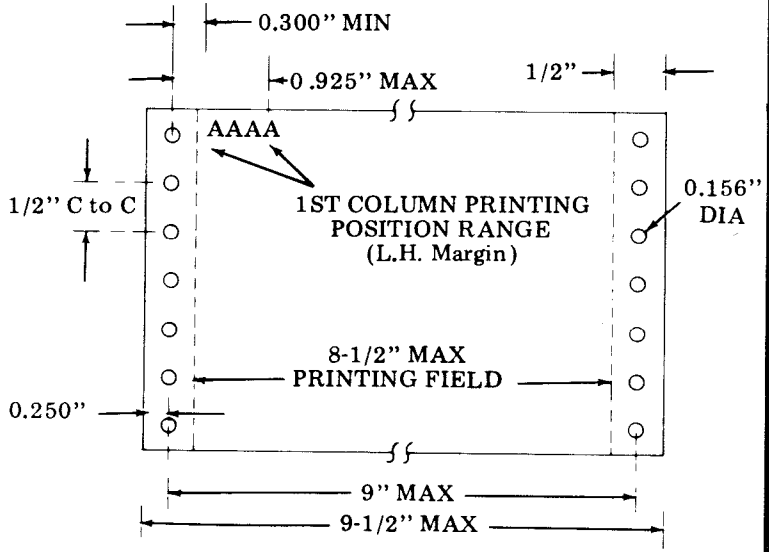
*Not operable on 6 to the inch line spacing printers.
†Not operable on 8 to the inch line spacing printers.

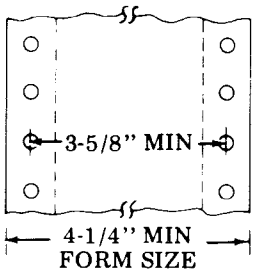
*Note 1:* See Page 30 for form belt replacement instructions. Different belts can be obtained from the Telephone Company.

*Note 2:* FORMS switch ON and FORM ADVANCE button depressed does not prevent printing.

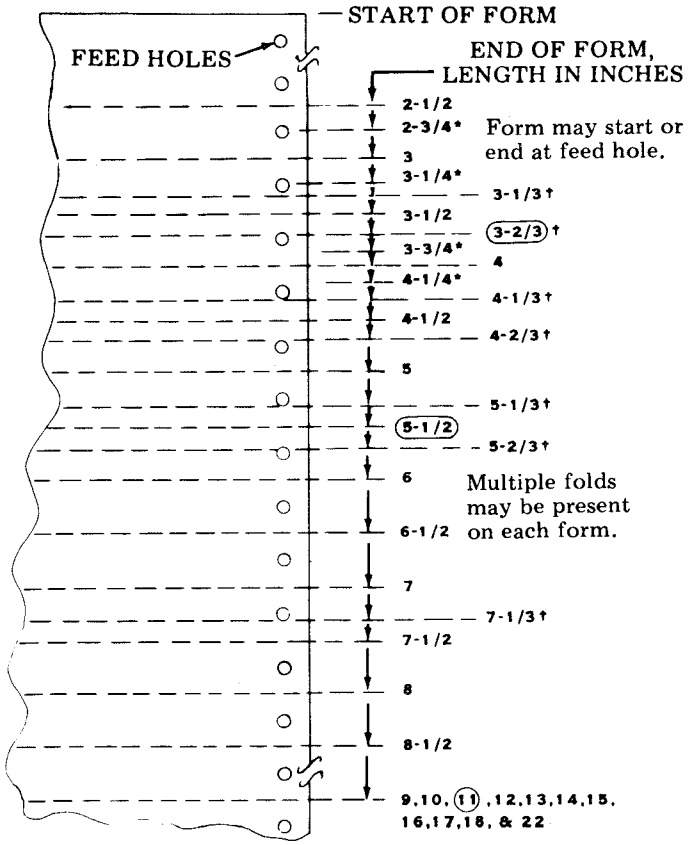
The tractor feed printer prints on standard fan-fold forms 4-1/4 to 9-1/2 inches in width and up to five copies plus the original. If various paper weight is used, the heavier paper should be to the back of the form.




**It is recommended that a maximum of 12 pound basic weight, white bond paper (continuous without splices) be used with 8-pound tab black carbon interleaved. Use of heavier paper than this, particularly** in the upper plies is not recommended. In any case **when it is desired to vary from the above, the variation should be tried for feasibility in such areas as copy legibility and paper handling.**




(  ) Enclosed form lengths are standard (blue belt) on 6 to the inch line spacing printers.

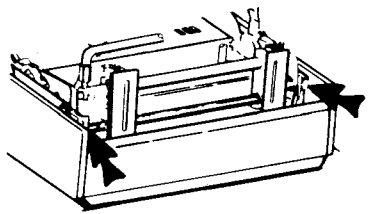
* Not operable on 6 to the inch line spacing printers.

† Not operable on 8 to the inch line spacing printers.

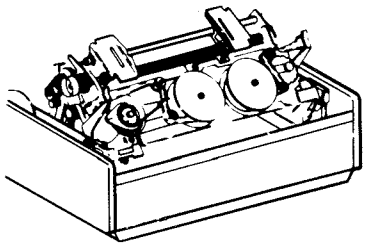
## Printer Access

To replace the paper, ribbon or form belt, you must first have access to the printer area. To gain access to the printer, proceed as follows:

- Turn off printer power switch.
- Open printer cover and raise printer as shown.
- Depress both printer release levers simultaneously. Printer will rise slightly.



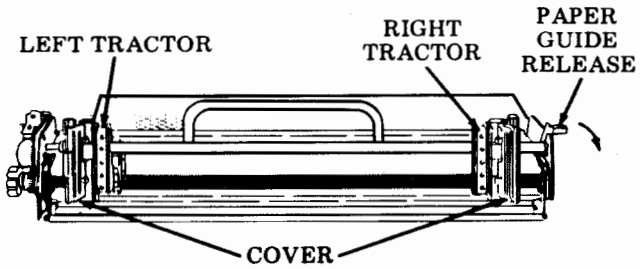
- Lift printer until release mechanism "clicks" into its locked position.



## Paper Replacement

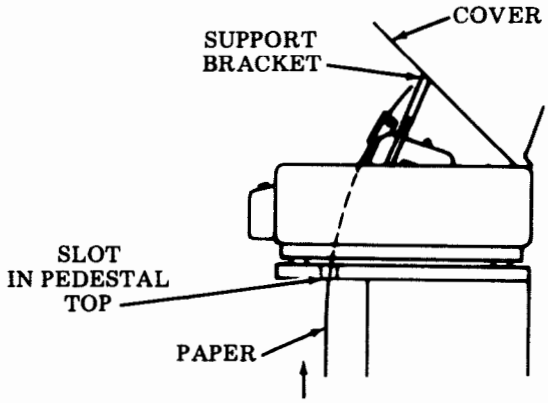
*Note:* When forms are being used and if the last message received did not end in new line RETURN or FF, the next character received will not print in the first column. As an alternative, turn printer power off when replacing paper. This will assure printing in first character position of first line.

- If forms are being used, turn on printer power and depress FORM ADVANCE button momentarily. This will assure the first line position of the form advance mechanism.
- With printer power switch turned OFF, open cover.
- Release paper guides and open tractor covers.

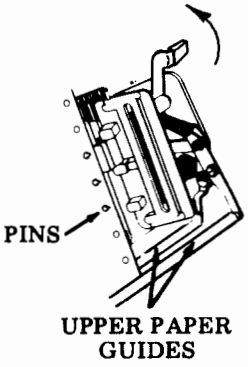



- Insert sprocket paper in slot under the table in front of set.

*Note:* If multiple forms separate, fold one form down and insert paper. See Page 29 if paper width does not match setting of tractors.

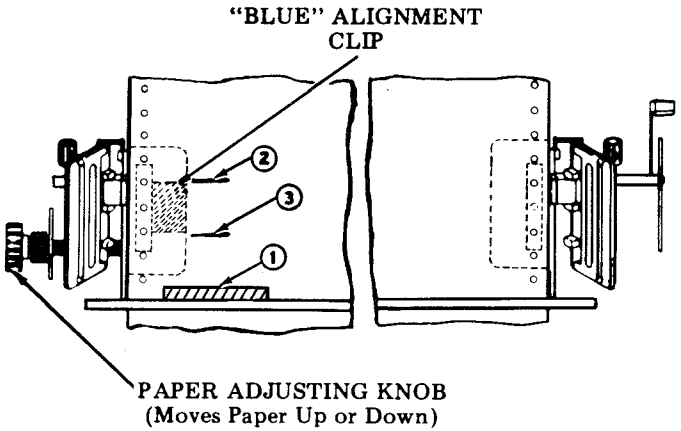



- Feed paper up through printer, guide paper in back of ribbon and between upper paper guides.
- Pull paper up and align holes on the paper with pins on the right and left tractors.
- Close tractor covers and swing paper release back.



- Pull out paper adjusting knob (blue) and turn to align form for first line of printing as follows:

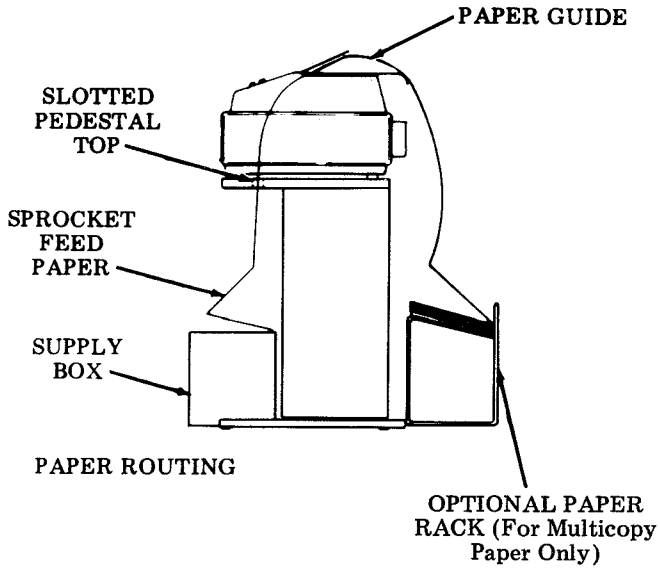
①Position paper so first line is just above paper guide.
②Position top of alignment clip to any reference mark on paper (or mark with pencil).
③Move paper down so reference mark aligns with bottom of clip.




- Route form through opening in printer cover. If form is below window, close cover and depress PAPER button momentarily. This will provide adequate paper to route through cover opening.

- Close cover, then depress FORM ADVANCE button if desired for first line printing.

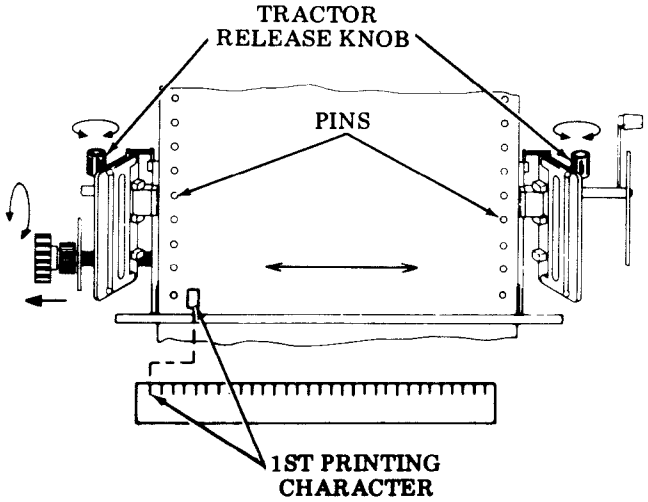
*Note:* Lift cover up slightly and push in on support bracket to close cover.



*Note:* Changing the margins or changing to a different form width will require a realignment of the left or right tractors.

To align the printer for a new form width:

- If forms are being used, operate FORM ADVANCE button momentarily before opening cover to assume first line position of mechanism.
- Loosen right tractor release knob and have tractor covers open.




- Route paper up through bottom in usual way (see Page 28).
- Place paper in left-hand tractor and close tractor cover.
- Move right-hand tractor to align pins with holes in paper. Close tractor cover.

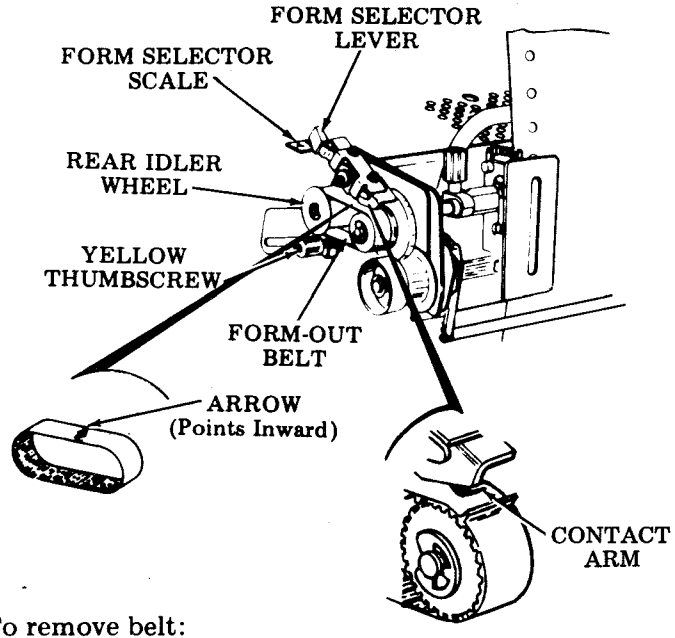
  *Note:* Be sure paper is not under stress or wrinkled when placed between tractors.
- Tighten right-hand tractor release knob.
- Pull out paper adjusting knob and adjust to first line of form.

To align left-hand margin:

- Loosen left knob and slide tractor assembly to align first position on paper with first printing character position on scale.
- Route form through opening in cover.
- Close cover.

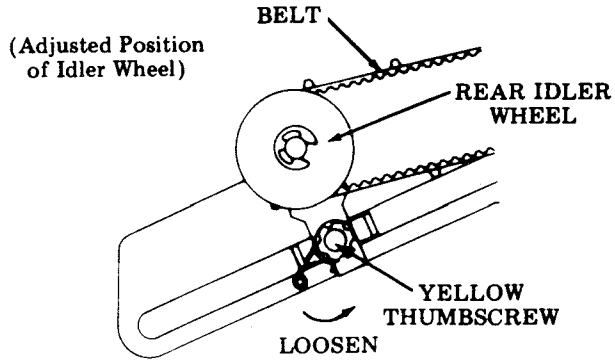
## Form Belt Replacement

Belt replacement is required when form lengths on the standard belt do not conform to the paper used.




To remove belt:

- Loosen yellow thumbscrew (counterclockwise) and slide bracket forward to remove tension.
- Depress and hold form selector lever so that contact arm clears.
- Move rear (idler) wheel forward.
- Remove belt by sliding it to the left.



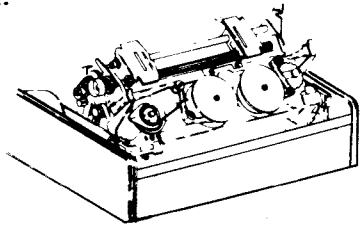

To replace belt:

- Depress and hold form selector lever while holding rear idler wheel forward.
- Position new belt on wheels so that arrow points inward.
- Position rear wheel back and remove slack in belt. Have bracket at right angles to slot as shown above.
- Tighten thumbscrew clockwise.
- Depress FORM ADVANCE and check the stop positions.

*Note:* If form stop positions do not correspond to the form lengths, the belt may be reversed or the incorrect belt used. Check Belt and Form Length Table on Page 24.

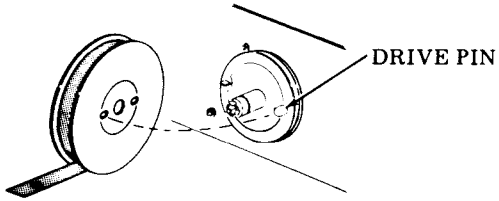
*Warning: Teletype Corporation will not be responsible for printer damage caused by the use of improper teletypewriter ribbon. Only ribbons designated for use with Tempest Model 40 printers should be used.*

- Open printer cover and raise printer to the locked position.



- Lift printer by handle to the locked position.

- The spools rest on nylon drive pins. Pull spools to remove. Discard old ribbon and both spools.

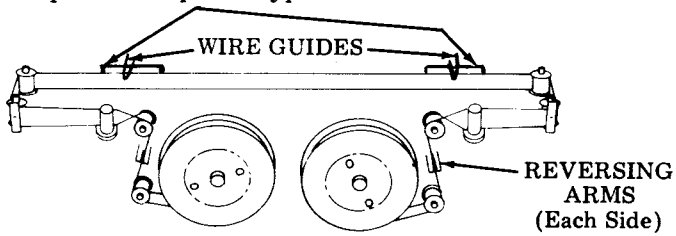



- Rotate spindles by hand to determine which one is fixed and which turns freely. Place full spool on free-turning spindle so that ribbon feeds off bottom of spool.

- Hold empty spool (ribbon attached) in one hand and thread ribbon as shown being sure that:

  - Full spool is on spindle so that retaining pin and drive pin of spindle fits into small holes of spool.
  - Ribbon feeds from bottom of spool (and into bottom of other spool).
  - Eyelet is wound on empty spool and ribbon passes through reversing arms.
  - Ribbon is centered on all rollers and not caught on type pallets or wire guides.

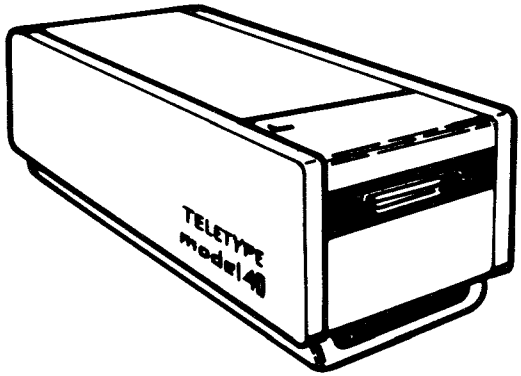
*Caution: Ribbon must pass between the clear plastic strip and type carrier.*




- Place empty spool on spindle (ribbon feeding into bottom of spool).

- Rotate full spool (free-turning spindle) by hand to take up all slack.

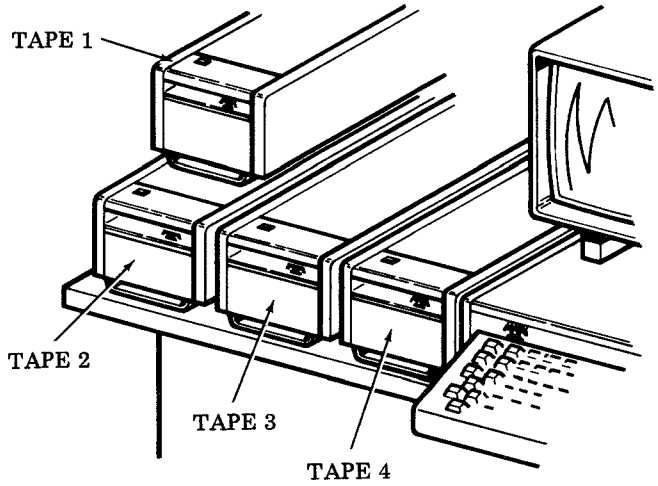
## 6. CASSETTE TAPE




Four separate cassette units are provided with the Tempest Model 40 Dual ASR Terminal. The four cassette units designated as Tapes 1, 2, 3 and 4 serve as the message storage media for the system.

Each unit is designed to operate as a data block device. A nominal 300 foot cassette tape (Teletype Part No. 403580) provides a maximum of 500 data blocks for data storage. Since each data block is 510 — 8-bit characters long, this gives a maximum possible capacity of 255,000 — 8-bit characters per tape.

Tapes 1 and 2 are used to store the systems incoming and outgoing messages, respectively. Tape 3 contains several reserved areas pertaining to several functions of the system. This tape must be preformatted and certain information must be entered on this tape before messages can be properly processed.




Tape 4 contains a log entry for each message received or sent by the system. This includes the Incoming Terminal Log (ITL), the Outgoing Terminal Log (OTL) and the Circuit Log (CL). This tape must also be formatted before the system can process messages properly.

Low Tape — A message "TAPE LOW" will be displayed at the top right of the screen when block 450 has been reached on Tape 1 or 2. This message will continue to appear on the screen until cassette is replaced.

End of Tape — A message "TAPE END" will be displayed at the top left of the screen for Tape 1 or at the top right of the screen for Tape 2 when block 500 or greater is reached.

The alarm will sound and the incoming line will be disabled to prevent buffer overrun.

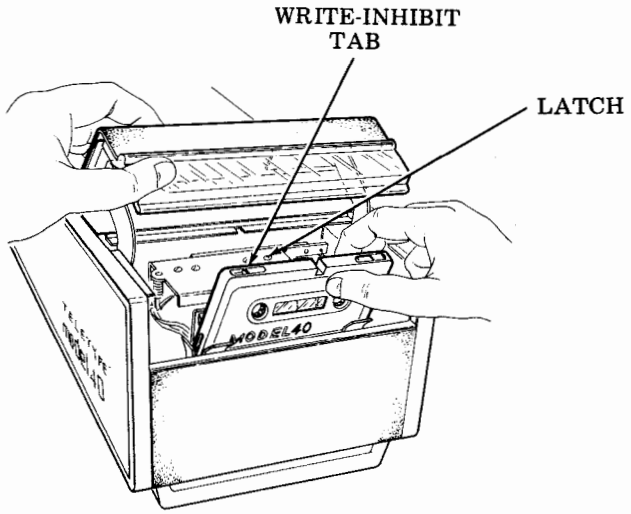
If the "TAPE END" condition occurs during the Send function, the alarm will sound and the attendant position will be returned to LOCAL.

Tape Handling

*Caution: No cassette tape should be in the set when power is turned OFF or ON.*

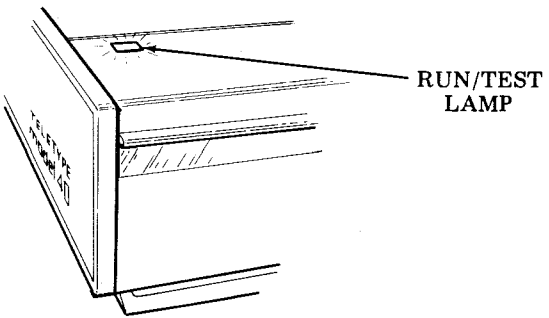
To Insert A Cassette Tape

- Make certain all power switches are ON.
- Open lid and insert cassette in the hinged holder as shown.




- Push cassette forward and toward the top with even pressure. Make sure that the tape is properly positioned.
- Close lid.

- Inserting a rewound cassette into the holder will cause the set to go through a self-check procedure unless the tape is Write-Inhibited. The Run/Test lamp at the upper left end of the cassette lid should light and remain lighted until test is completed.




*Note 1:* If the test is successful, the lamp will extinguish. Normal operation can than proceed.

*Note 2:* If the test fails, the Run/Test lamp will cycle ON and OFF. Repeat test by reinserting cassette. If the test continues to fail, try another cassette, preferably one known to be good.

*Note 3:* If tape is write-inhibited (tab up) the tape will rewind to beginning of tape but will not go through a self-check procedure.

To Remove A Cassette Tape

- Rewind tape before removing from cassette unit by using CMND " ∧ ".

  *Note:* The Run/Test lamp will remain on until the beginning of tape is reached. Maximum rewind time for a tape is approximately 85 seconds.

- Open lid and lift tape latch. The tape should pop forward and can easily be removed.

## 7. TERMINAL OPERATION

Terminal operation in the system is semiautomatic processing of incoming and outgoing messages, local function processing and system control by the two attendant positions.

Detailed description of specific procedures along with background information on ACP127 format is needed to make the system work. Such information must be provided to the attendant either locally or by means of system operational instructions. However, the following general operating routines are provided.

Preliminary Procedures

*Caution: No cassette should be in the set when power is turned OFF or ON.*

Before your terminal can be properly used, certain information must be present on certain tapes and some information must be provided to the system.

To prepare your terminal for message processing proceed as follows:

- Turn on power switches under both displays and to the four cassette drives.
- Insert Tapes 1, 2, 3 and 4 in the proper cassette drives.
- Preformat Tape 4 using CMND "F".

  *Note:* Tape 3 is already preformatted by Department of State and is not recommended that this be done at field posts.

- Check time and date displayed and correct if necessary using CMND "T" followed by CMND "E".
- Check information in Table "A" (CMND "A"), the addressee table (CMND "Z") and queues (CMND "Q") and correct if necessary. Use CMND "N" to display subsequent blocks of data in tables.

  *Note:* It is recommended that a duplicate copy of the addressee table be kept on hand at all times in case the original tape is accidentally destroyed.

- Enable whichever line is desired, input or output line using CMND "L".

  *Note:* At power on, the input line is enabled and the output line is disabled.

Incoming messages are accepted from the line and are temporarily stored in the incoming buffer. This data is then taken and converted from 5-level line code to 8-level ASCII code and is automatically transferred to Tape 1. As the data is transferred to Tape 1, errors are detected and certain information is ascertained and stored. The messages are now blocked and queued according to precedence for processing.

Now that the messages are in the system and listed on the input queue, it is the attendant's responsibility to complete the processing of these messages.

The general operating routines for processing incoming messages are as follows:

- Depress the NEXT INCOM key. If you wish to tell how many messages are waiting prior to depressing the NEXT INCOM key, use CMND "Q".

  *Note 1:* The message with the highest precedence in the incoming queue is displayed on the screen and terminated with an ASCII "ETX". If there is any error found by the system prior to depressing the NEXT INCOM key, an error message informing the attendant will be displayed at this time.

  *Note 2:* If the queue is empty when the NEXT INCOM key is used, a message "IN QUE EMPTY" is displayed informing the attendant.

Error Messages — During incoming message processing an error message and instructions may be displayed on the screen.

Usually when such a message is displayed, processing is stopped and control is returned to the attendant. The attendant can then correct the error or condition and continue the message processing by entering CMND "X".

- The system will internally process all lines of the message format. Once the message has been processed, the attendant should add the charge symbol, a routing list and reproducing information.

  *Note:* If during system processing a "ZPO" is found, the message will be encrypted and processing is limited. A message "CHECK ZPO" is displayed to inform the attendant that special message processing is needed.

- At this time the attendant has the choice of printing the message using PRINT A or PRINT B or the following.

- If the message processed is encrypted, use CMND "P" to send message to the off-line tape punch.

- The message can be deferred and the queue entry will be reinstated at the bottom of the queue. Defer is inhibited after printing of the message.

- The message can be canceled using CMND "W". No record will be kept of a canceled message except for the message itself which will be stored on Tape 1. Message canceling is inhibited after printing of the message.

Buffer Overrun

A buffer overrun can be caused from (1) Tape 1 is not seated properly, (2) buffer does not transfer to tape and (3) Tape 1 is full.

When buffer overrun does happen, the system informs the attendant by an audible alarm. When this occurs the following steps should be performed:

- Send "QRT" service message to relay station — Use CMND "Y" (Psuedo Header), type in service message, depress FRMT key then SEND key.

- Remove all tapes from cassette units.

- Power off, then power on. This will clear the buffer.

- Reinsert all tapes. This will automatically rewind all tapes.

- Reset time and date (CMND "T").

- Check and correct problem that caused buffer overrun.

- Resume normal operations by sending "QRV" service message to relay station.

- Send "ZFX" notice for any missing Channel Sequence Numbers (CSNs) that may have been lost when buffer overrun occurred.

The following is a list of notices which may appear on your screen when processing incoming messages:

| | NOTICE | EXPLANATION |
|---|---|---|
| 1. | IN QUE ERR | Error On Tape — Message cannot be retrieved. |
| 2. | IN QUE EMPTY | Refers to queue entry table. |
| 3. | IN BFR OVERRUN | Data not being transferred to tape. |
| 4. | SOM ERR<br>PUT CURSOR ON TI<br>ENTER CMND X | Attendant corrects error in Local mode, places cursor on first character of item as directed, depresses CMND key, types X. The system proceeds with incoming message process. |
| 5. | EOM-SOM ERR | Over 30 excess characters detected between valid EOM and valid SOM. |
| 6. | SOM-SOM ERR | Consecutive SOM sequence with no intervening EOM sequence. All data between the SOMs is displayed. |
| 7. | EOM-EOM ERR | Consecutive EOM sequence detected with no intervening SOM sequence. All data between the EOMs is displayed. |
| 8. | CD ERR<br>PUT CURSOR ON TI<br>ENTER CMND X | Channel designator misspelled or system cannot locate CD. |

| | NOTICE | EXPLANATION |
|---|---|---|
| 9. | EXPECTED CSN | If CSN out of sequence, expected CSN is indicated. CSN received will be in line 1 of message. |
| 10. | TOT ERR — LINE 3<br>PUT CURSOR ON TOT<br>ENTER CMND X | One cause for the notice could be figures function (ASCII) before start of TOT.<br>Explanation of Notice 5. applies. |
| 11. | DE LINE ERR<br>PUT CURSOR ON SSN<br>ENTER CMND X | System unable to locate format line 3. |
| 12. | SSN ERR<br>PLACE CURSOR ON SSN<br>ENTER CMND X | System unable to locate SSN. Explanation of Notice 5. applies. |
| 13. | SWOS ERR<br>PUT CURSOR ON CLASS<br>ENTER CMND X | System unable to locate ZNR or ZNY. |
| 14. | DTG LINE ERR<br>PUT CURSOR ON DTG<br>ENTER CMND X | System unable to locate Date-Time-Group.<br>Explanation of Notice 5. applies. |
| 15. | FM LINE ERR<br>PUT CURSOR ON FM LINE<br>ENTER CMND X | System unable to locate format line 6. |

| NOTICE | EXPLANATION |
|---|---|
| 16. SPECIAL HANDLING | A "ZZY" appearing in format line 4 will generate this notice. Attendant then handles message accordingly.<br><br>*Note:* If ZPO is detected on format line 4, cursor stops on "Z" signal and special processing is needed. |
| 17. ORIGINATOR ERR<br>PUT CURSOR ON FM<br>LINE — ENTER CMND X | System unable to locate line 6 or originator is not listed in "Z" table. Explanation of Notice 5. applies. |
| 18. MCN ERR | No MCN in table for this post. ZZH should not be on message. |
| 19. DUPE MCN | Duplicate MCN within range of 16. |
| 20. ---- EXPECTED MCN | MCN Low or High — Out of range of 16. |
| 21. MCN NOT UPDATED | System did not update MCN because of an error or post not an addressee — message is for relay to another post. If in error, attendant must update MCN manually. |
| 22. STRAGGLER ERR | First 4 numbers of SSN in line 3 and EOM validation number in line 15 do not match. |
| 23. TOR: ------<br>CN: ----<br>ACTION: ----<br>INFO: | Control and distribution designations which will appear on the screen for release with message to printer. TOR is in ZULU time. Attendant will add appropriate office symbols (maximum 4 characters) at screen. |
| 24. DEFER PROHIBITED | Message cannot be returned to the incoming queue.<br><br>*Note:* Defer is inhibited if message has already been processed. |
| 25. RETURNED TO QUE | Defer command has been completed. |

Outgoing Messages

All outgoing messages must be properly formatted. Once the attendant has a properly formatted message on the screen, the message is then written on the outgoing tape in the proper ACP127 format and queued up for transmission on-line. The system automatically takes messages from the output queue, converts them to Baudot line code, transfers the message to the line and completes the OTL log entries.

The primary source for messages to be formatted and outputted to the line is the Optical Character Reader (OCR). To facilitate the typing of outgoing messages to be read in by the OCR and to understand the data input from the OCR, a special format called a Pseudo Header is used. There are three main parts to this format:

1. Preprocessing Information — First 6 lines of the form.

2. Originator and Addressees — Up to 54 addressees for a given message.

3. Text — First line may contain a special caption separated from the text by a blank line.

DEPARTMENT OF STATE

FOREIGN SERVICE OF THE UNITED STATES

OF AMERICA

OUTGOING TELEGRAM

UNCLASSIFIED
SAS 1/19/77
AMB: GDOWE
ADMIN: GLAKEY: DU
1.DCM:HLITE, 2.POL:KJACKS, 3.GSO:HREWER
AMB DCM POL, GSO PER ADMIN, CHRON RF

AMEMBASSY OTTAWA
SECSTATE WASHDC
INFO AMEMBASSY ACCRA
AMEMBASSY MADRID
AMCOS*NSUL MONTREAL
AMCONSUL ZURICH

EO 11652: N/A
TAGS: AFSP
SUBJ: TERP TEST MESSAGE 203*1

THIS MESSAGE IS AN EXAMPLE OF A MULTI-ADDEE, UNCLASSIFIED TELEGRAM. DOWE # #

Example of a Message on the OCR Form

- Titles that appear on the OCR form are not transmitted to the system. The system relies on position of the message on the form for identification.

- The seventh line following the preprocessing information is normally blank but can be used by the attendant for operating signals "ZFF" and "ZFF-1" through "ZFF-6".

- If the message is to have Message Continuity Numbers (MCNs), the originator must correspond to one of the state originators listed in Table "A" (CMND "A"). To send a message without MCN numbers and the originator is one of those listed on Table "A", change the spelling of the originator on the screen and then correct it after formatting and before sending.

- It is the attendant's responsibility to see that the addressee list is separated from the text by a blank line in those cases where the first OCR page ends with the end of the addressee list. The OCR does not insert an extra line feed at the end of a page. The attendant must insert lines where needed.

The following are various ways of bringing a message onto the screen for formatting:

- Depressing the NEXT OUTGO key.

- Using CMND "V" to call up canned message from Tape 3.

- Using CMND "V" to call up messages from Tapes 1 and 2 for retransmission.

- Read in from the paper tape header.

- Manually entered from the keyboard.

*Note:* All messages must be made to conform to the pseudo header format before processing can begin.

The basic operating routines that will be described are:

- Processing messages using the OCR
- Processing messages using the keyboard display
- Processing outgoing ZPO messages
- Processing outgoing "FLASH" messages
- Processing outgoing "CRITIC" messages.

## Processing Messages Using the OCR

- Depress the NEXT OUTGO key. A message in pseudo header format is displayed on the screen.

- Check message for correct format and correct if necessary.

*Note:* Although preformatted messages may be sent without formatting, the format function must be used if there is to be a complete outgoing terminal log and circuit log entry made for that message. Partial logs can be entered in certain circumstances by deleting the first line of the message and replacing it with one of the following charge symbols.

"RLY (space)" — This signifies a received message that is to be relayed. The operator deletes the first line of the message and replaces it with this charge symbol.

"SVC (space)" — This denotes a service message, either canned or manually entered.

- Depress the FRMT key. The channel designator routing(s), next outgoing MCN(s) and MRN will be assigned to the message and placed into ACP127 format.

*Note:* Once the attendant has a properly formatted message on the screen and has made any necessary modifications, the message can now be transmitted.

- Depress the SEND key.

*Note:* Only one position may be in the Send mode at a time. If the other position is in the Send mode, an error message is displayed and your position is returned to the Local mode. Try again as soon as the other position has completed the send function.

- Add distribution, print and clear message from the screen.

- Depress the NEXT OUTGO key to begin the next outgoing message routine.

## Processing Messages Using the Keyboard Display

- Enter CMND "Y". Pseudo header format is displayed.

- Type in all the information as shown on the OCR form. End message with an ASCII ETX.

- Depress the FRMT key. The channel designator routing(s), next outgoing MCN(s) and MRN will be assigned to the message and placed into ACP127 format.

- Depress the SEND key.

- Add distribution, print and clear message from the screen.

## Processing Outgoing "ZPO" Messages

*Note:* "ZPO" messages require special processing. Procedures for processing "ZPO" messages should be obtained locally.

## Processing Outgoing "FLASH" Messages

*Note:* Two transmissions will be necessary to protect all addressees. All flash addressees will be sent the first time and all other precedenced addressees will be sent the second time.

For flash messages with single line of addressees, proceed as follows:

- Bring message to the screen for processing.
- Depress the FRMT key.
- Depress the SEND key for the first transmission of the flash message. Message will be logged on the circuit and outgoing terminal logs, stored on Tape 2 and sent to the line for transmission.
- Change the precedence in line 2 to the next highest precedence and delete the flash addressees.
- Depress the SEND key. Message will be logged for second transmission to nonflash addressees in the same manner as the first transmission.
- Print and clear message from the screen.

For flash messages with more than one line of addressees, proceed as follows:

- Bring message to the screen for processing.
- Depress the FRMT key.
- Hold the messages using CMND "H".
- Retrieve message using CMND "V" and delete all nonflash addresses.
- Depress the SEND key for the first transmission of the flash message. Message will be logged on the circuit and outgoing terminal logs, stored on Tape 2 and sent to the line for transmission.
- After sending message, retrieve original message from Tape 3 using CMND "V".

- Change the precedence in line 2 to the next highest precedence and delete the flash addressees.

- Depress the SEND key. Message will be logged for the second transmission to nonflash addressees in the same manner as the first transmission.

- Print and clear message from the screen.

Processing Outgoing "CRITIC" Messages

The canned critic message format is stored on Tape 3, Block 57. To retrieve, proceed as follows:

- Enter CMND "V". The notice "WHICH TAPE?" will appear on screen.

- Type in "3". The notice "WHICH BLOCK?" will appear on screen.

- Type in "57" and depress the RETURN key. This will initiate and retrieve the preformatted critic message for display on the screen.

- Type in the text of the message, the filing time and the Date Time Group.

- Depress SEND key. Message will be logged on the Circuit and Outgoing Terminal (OTL) Logs stored on Tape 2 and sent to the line.

  *Note:* Line one of the canned critic message is programmed to change the Next Outgoing Channel Number.

- Add distribution, print and clear message from the screen.

The following is a list of notices which may appear on your screen when processing outgoing messages:

| NOTICE | EXPLANATION |
|---|---|
| 1. LINE 100 | OCR has read in 100 lines of text indicating to system that this message must be formatted into sections. |
| 2. ADDEE ERR | Post not in table or misspelled. |
| 3. OUT QUE FULL | Refers to queue entry table. Attendant cannot depress SEND until at least one message is transmitted and released from the queue. Maximum number of outgoing messages that can be queued is 63 entries. |
| 4. CHECK ZPO | When attempting to send a message with a special caption for the first time, this notice will appear and processing will be inhibited. This is to alert attendant that message must go to the tape punch for off-line handling. If SEND is depressed a second time, inhibit will be ignored and message will go to line. |
| 5. PRECEDENCE ERR | System unable to determine precedence from line 2. |
| 6. CLASS ERR<br>PUT CURSOR ON CLASS<br>ENTER CMND X | Error in classification indicator line 4. |
| 7. PSEUDO HDR ERR | Caused by lengthy lines or more than six lines in the pseudo header. |
| 8. TOO MANY ADDEES<br>PUT CURSOR ON 1ST<br>ADD ENTER CMND X | Occurs when number of allowable addressees per telegram exceeds 54 and will also occur when blank line is missing between addressee field and first line of text. |

The following is a list of notices which may appear on your screen when processing outgoing and/or incoming messages:

| NOTICE | EXPLANATION |
|---|---|
| 1. TAPE LOW | Storage Tape 1 or 2 low (ie, Block 450 has been reached). Change cassette. |
| 2. TAPE END | Storage Tape 1 or 2 has run out (ie, Block 500 has been reached). Data is not being recorded. |
| 3. WAITING FOR TABLE | System is searching for appropriate block of tape on which table is stored. |
| 4. VDU CONTENTS STORED | Hold command has been completed. Contents on screen at time CMND "H" is used is being held in hold area on Tape 3.<br>*Note:* CMND "U" is used in conjunction with CMND "H" in order to retrieve message from hold area. |
| 5. BFR NOT EMPTY | Refers to command "L" (outgoing line). |
| 6. BFR EMPTY | Refers to command "L" (outgoing line). |
| 7. IMPROPER ENTRY | Attendant has not entered corrected characters from keyboard in response to system notice. |
| 8. COMPLETE | Refers to commands "F" and "K". Tape formatting and tape copying are completed respectively. |
| 9. WAIT | Table being accessed by other attendant. |

| NOTICE | EXPLANATION |
|---|---|
| 10. CHECK CLASS | When using CMND "P" to get a paper tape from remote M28, this notice will appear on screen and inhibit processing. The second time CMND "P" is entered, inhibit will be ignored and processing will continue. |
| 11. BUSY | When one attendant position is in CMND "M" mode this notice will appear if other position tries to enter CMND "M". Also, when one position is processing a section message from the OCR, the other position will get a "BUSY" notice if it tries to access the OCR at the same time. |
| 12. VDU BUFFER FULL | See Buffer Overrun. |

## Supplies

Do not be cut short, order well in advance. In addition, an adequate supply of paper and ribbon should be kept in storage. Refer to Part 5, Paper and Format Data, Page 25.

*Note:* Before ordering multicopy form paper, samples should be tried in the printer which has been properly adjusted for print density. Legibility and density of all graphics should be checked. Also, staples or other means of fastening multicopy forms should not be used until determined that they do not interfere with ribbon, print hammer, or type pallets.

The ribbon should be replaced after every 25 hours of printing operation or sooner if ribbon is worn.

*Warning: Teletype Corporation will not be responsible for printer damage caused by the use of improper teletypewriter ribbon. Only ribbons designated for use with Model 40 printers should be used. Refer to Authorized Ribbon Suppliers below.*

Ribbons received from authorized suppliers are in sealed containers with date of manufacture. Always store ribbons in a cool dry place and do not use ribbons exceeding 24 months of storage.

### AUTHORIZED RIBBON SUPPLIERS

Teletype Corporation (312-982-2000)
Specify part number: TP402444

Addressograph-Multigraph Corp. (312-527-2025)
433 N. Wabash
Chicago, Illinois 60611
OFFICE SUPPLIES DIVISION
Specify part number: 120-2230-123R

Roytype (312-266-5835)
100 W. Erie
Chicago, Illinois 60610
Specify part number: Formula 43

Aetna Products Co. Inc.
11 Commercial St.
Hicksville, New York 11851
(516-931-3120)
(212-886-0415)
Specify part number: TR135

Periodic service or maintenance can be provided by the nearest Teletype Corporation Product Service Center. Factory-trained servicemen provide nationwide service on Teletype Equipment. For service, contact one of the following:

**NORTHEASTERN REGION: CT, ME, MA, NH, UPSTATE NY, RI, VT**

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| ▲ BOSTON/HARTFORD | *7 WALKUP DR., P.O. BOX 566, WESTBORO, MA 01581* | (617) 366-8881 |
| ROCHESTER | *115 METRO PARKWAY, ROCHESTER, NY 14623* | (716) 442-8480 |
| SYRACUSE | *5858 E. MOLLOY RD., ROOM 153, SYRACUSE, NY 13211* | (315) 454-4916 |

**EASTERN REGION: DE, NJ, DOWNSTATE NY, PA**

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| LONG ISLAND | *195 PARK AVENUE, BETHPAGE, NY 11714* | (516) 822-3533 |
| ▲ NEW YORK CITY | *90 CLINTON RD., FAIRFIELD, NJ 07006* | (201) 575-8240 |
| PHILADELPHIA | *103 ROCK RD., HORSHAM, PA 19044* | (215) 674-2181 |

**SOUTHEASTERN REGION: FL, GA, MD, NC, SC, VA, WASH D.C., WV**

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| BALTIMORE | *6655 AMBERTON DR., 100 INDUSTRIAL PARK, - - UNIT A BALTIMORE, MD 21227* | (301) 796-1166 |
| CHARLOTTE | *8920 YORK RD., CHARLOTTE, NC 28210* | (704) 588-3297 |
| FT. LAUDERDALE | *6858 N.W. 20th AVE., FT. LAUDERDALE, FL 33309* | (305) 974-4660 |
| ORLANDO | *102 LIVE OAKS BLVD., CASSELBERRY, FL 32707* | (305) 834-3818 |
| ▲ WASHINGTON D.C. | *NORTHERN VA INDUSTRIAL PARK, 9022 TELEGRAPH RD., LORTON, VA 22079* | (703) 550-7507 |

**SOUTHWESTERN REGION: AR, CO, KS, LA, NM, OK, TX**

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| ▲ DALLAS | *222 N. STORY RD., SUITE 126, IRVING, TX 75061* | (214) 254-4180 |
| DENVER | *7100 BROADWAY, BUILDING 3-J, DENVER, CO 80221* | (303) 429-9555 |
| HOUSTON | *4400 S. WAYSIDE, SUITE 105, HOUSTON, TX 77087* | (713) 641-3295 |
| NEW ORLEANS | *5636 JEFFERSON HWY., NEW ORLEANS, LA 70123* | (504) 733-4823 |
| OKLAHOMA CITY | *1000 CORNELL PKWY., SUITE 700, OKLAHOMA CITY, OK 73108* | (405) 947-0969 |

## SOUTH CENTRAL REGION: AL, IL(SOUTH), IN, KY, MS, MO, OH, TN

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| ▲ CHICAGO | *9930 DERBY LANE, WESTCHESTER, IL 60153* | (312) 345-7920 |
| CLEVELAND | *5325 NAIMAN PKWY. — SUITE F, SOLON, OH 44139* | (216) 248-0288 |
| COLUMBUS | *6969 WORTHINGTON-GALENA RD., WORTHINGTON, OH 43085* | (614) 436-2065 |
| INDIANAPOLIS | *6240 LAS PAS TRAIL, INDIANAPOLIS, IN 46268* | (317) 297-4149 |
| TOLEDO | *1000 S. REYNOLDS RD., SUITE 1, TOLEDO, OH 43615* | (419) 381-9900 |

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| DES MOINES | *2318 HARDING RD., SUITE 15B, DES MOINES, IA 50314* | (515) 274-3801 |
| DETROIT | *12916 FARMINGTON RD., LIVONIA, MI 48154* | (313) 525-5356 |
| LANSING | *3202 SO. PENNSYLVANIA AVE., LANSING, MI 48910* | (517) 882-5761 |
| MADISON | *2317 SO. STOUGHTON RD., MADISON, WI 53716* | (608) 222-1662 |
| MILWAUKEE | *6725 BOTTSFORD AVE., GREENFIELD, WI 53220* | (414) 543-2200 |
| MINNEAPOLIS | *8824 SEVENTH AVE. NO., GOLDEN VALLEY, MN 55427* | (612) 546-0808 |
| KALAMAZOO | *126 E. KILGORE RD., KALAMAZOO, MI 49001* | (616) 343-0573 |

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| TUCSON/PHOENIX | *958 W. GRANT RD., TUCSON, AZ 85711* | (602) 623-6419 |
| SAN FRANCISCO | *521 MARINE VIEW, SUITE G, BELMONT, CA 94002* | (415) 591-7412 |
| SEATTLE | *635 STRANDER BLVD., KOLL COMMERCE CENTER, SEATTLE, WA 98188* | (206) 575-4515 |

## CANADA:

| | | |
|---|---|---|
| TORONTO | *31 KLONDIKE DR., WESTON, ONTARIO, CANADA M9L 1S1* | (416) 745-9474 |

▲ REGION HEADQUARTERS

Maintenance training is available from our
Technical Training Center located at 5555 Touhy Ave., Skokie, IL 60076
Phone: (312) 982-3940

*NOTES:*

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