35 CONTROLMATIC TELETYPEWRITER DATA STATION

ARRANGED FOR TWX

DESCRIPTION AND OPERATION

CONTENTS   PAGE

1. GENERAL

1.01 This section describes the CONTROLMATIC teletypewriter (TTY) station arranged for TWX service as shown in Fig. 1. It provides information concerning the physical description, functional description, control functions, and method of operation of the station.

Purpose of Station

1.02 The CONTROLMATIC TWX station is an automatic send and receive (ASR) TTY with a second reader and additional logic and control circuitry integrated into the set. Operation is at 100-word per minute speed utilizing 8-level ASCII codes.

1.03 The station functions in two distinct modes of operation: an on-line mode and a format mode. The on-line mode permits the station to operate as a TWX machine with the added ability to transmit and receive both data and control signals which position the type box and horizontal tabulation mechanism to specific locations. When used in the format mode, the station is switched off line and allows the operator to program the station for data and format transmission.

On-Line Operation

1.04 The station may be used in the same manner as a conventional 35 ASR TTY equipped with a 101C Data Set to originate and receive traffic via the TWX network. When used in conjunction with other TWX stations, previously formatted tape, information is transmitted and recognized causing automatic horizontal and vertical tabulation of the receiving station. This controls positioning of data on complicated business forms.

1.05 In addition, previously programmed variable and repetitive data, such as business addresses and company names, may be included in a by-product tape and transmitted as a complete message.

1.06 In many instances, the most efficient transmission will be realized by preparing a by-product tape when the station is receiving traffic in the T mode. The by-product tape contains any combination of input information plus the format instructions. The by-product tape can be inserted in the format reader and transmitted at the full 100-word per minute rate. A block diagram showing station operation in an on-line condition is shown in Fig. 2.

Format Operation

1.07 This mode allows the station to be used as a format control device. Program instructions are prepared from the keyboard by using special control codes. Logic circuits accept the program information and translate the control codes into machine functions which allow the TTY to respond to call in of optional input devices such as an edge punch card reader, stepping switch, etc.

1.08 The station may also be used in the format mode to prepare a by-product tape containing all data and format information. This tape is a combination of inputs from the format tape and the variable data sources and contains all information necessary for a complete message transmission. This tape may be transmitted at a 100-word per minute speed as explained in 1.06. A block diagram

showing station operation in format mode is shown in Fig. 3.

1.09 When absolute accuracy is required, a tape verifier circuit is available on an optional basis which makes a character-by-character comparison of two tapes which are prepared from the same source information.

2. PHYSICAL DESCRIPTION

2.01 The CONTROLMATIC TTY station is a self-contained unit which is completely assembled by the distributing house prior to delivery. A typical station and location of the subassemblies discussed in this section is shown in Fig. 1.

2.02 The complete station weighs approximately 200 pounds and all components are contained in a 35F cabinet. Maximum cabinet dimensions are as follows: height 38.5 inches, width 40.0 inches, depth 24.0 inches. Specific TTY components coded for CONTROLMATIC application are listed in Table A.

2.03 All Teletypewriter components except the format logic panel and 101C Data Set are mounted under the lower cover in a conventional manner (similar to the 35 ASR TTY). Detailed theory of operation, maintenance, and adjustment of these components are covered in Sections 574-yyy-zzz layers and will not be discussed in this text. The 101C Data Set and format logic panel are rack mounted behind the front panel. The method of access to all components is covered in Section 591-806-201.

1	Data Tape Reader	Reads data (information) tape.
2	Format Tape Reader	Reads format (program) tape containing control codes and fixed information and transmits by-product tape.
3	Local Control Panel	Provides control for on-line transmission, receiving modes, and special format operations.
4	Reperforator	Prepares a composite tape for transmission under control of tape readers, keyboard, and optional input device. Reperforates tape of received message.
5	Page Printer	Types local copy under control of tape readers and keyboard. Types copy of received message.
6	Call Control Unit	Controls connection of station to TWX switching network.
7	Dial (TOUCH-TONE)	Used to dial specific TTY stations via TWX networks.
8	Attendant Set	Controls various TTY functions through the data set.
9	Main Control Panel	Controls on-line and format modes.
10	Keyboard	Used to prepare tape for data transmission, format control, and on-line variable data transmission.
11	Data Set	Converts serial and parallel information for transmission and receiving functions.
12	Format Logic Panel	Controls format under control of keyboard and tape readers.
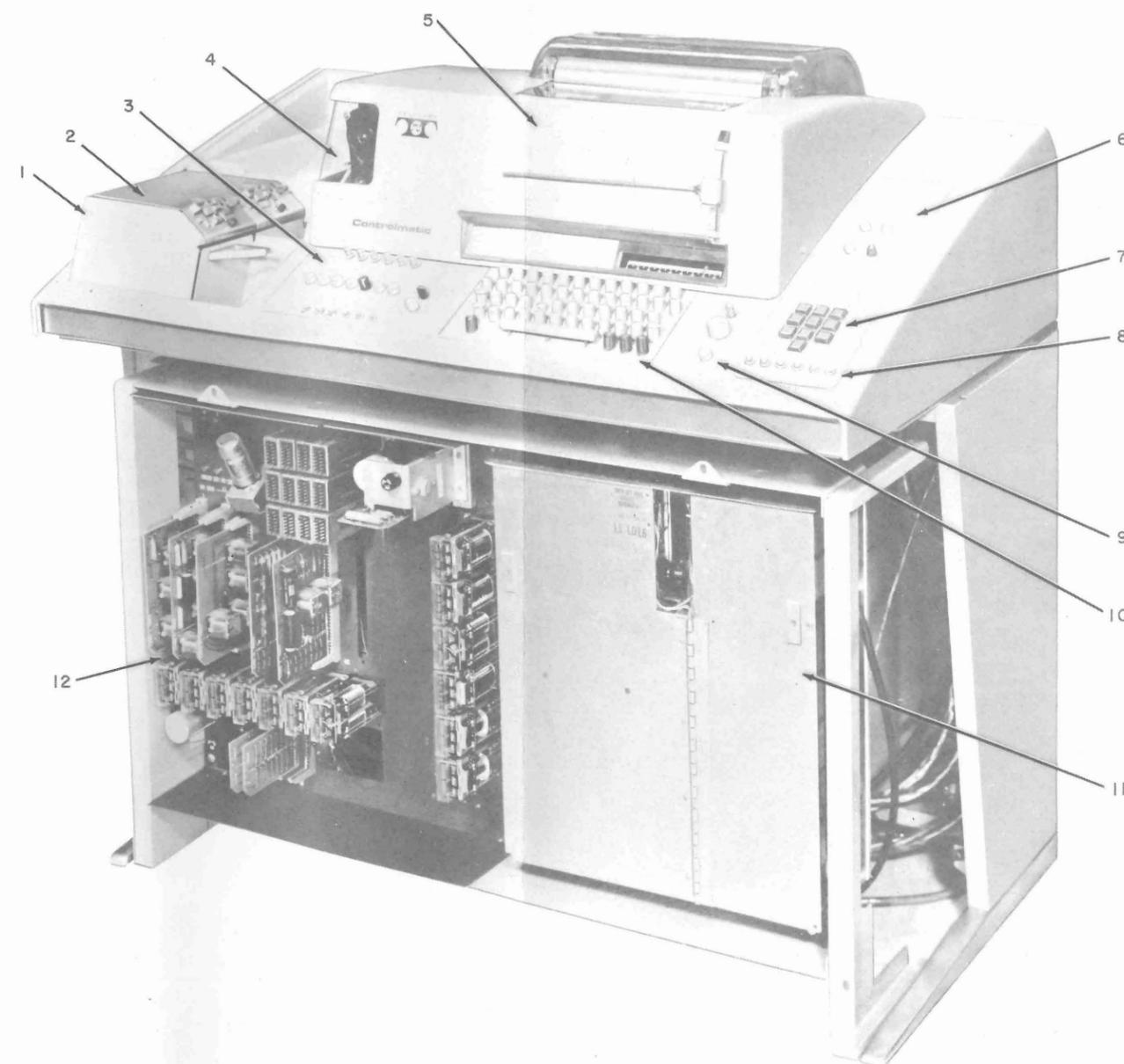
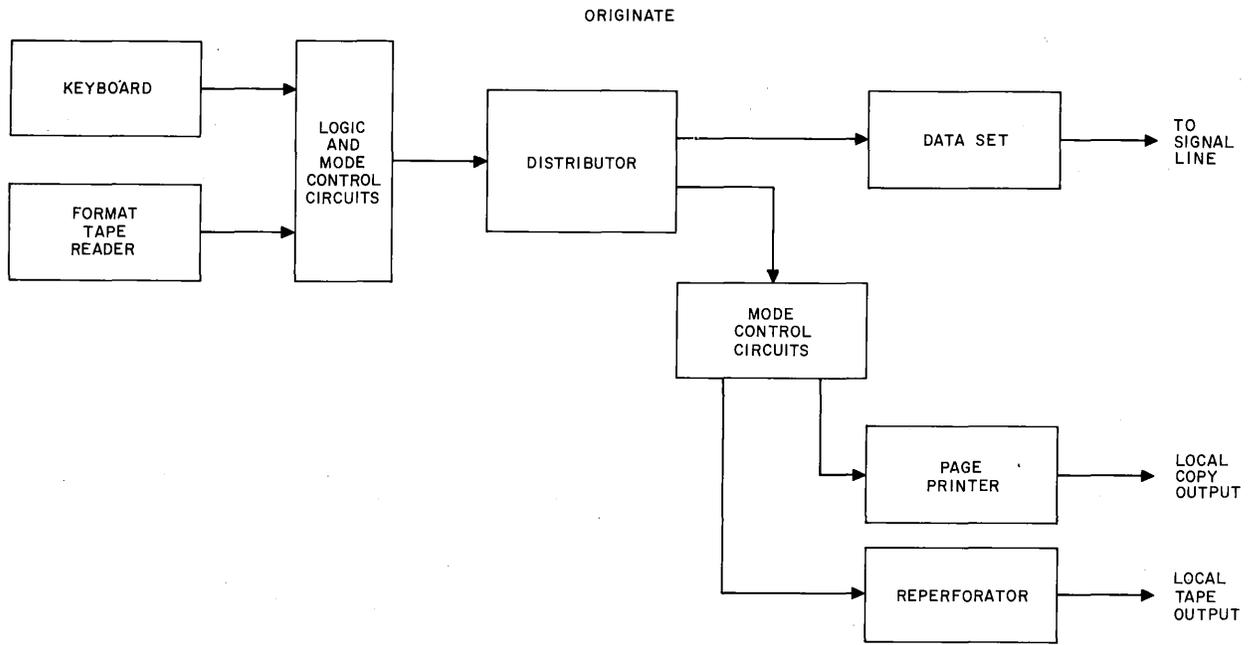
Fig. 1—CONTROLMATIC Data Station Arranged for TWX
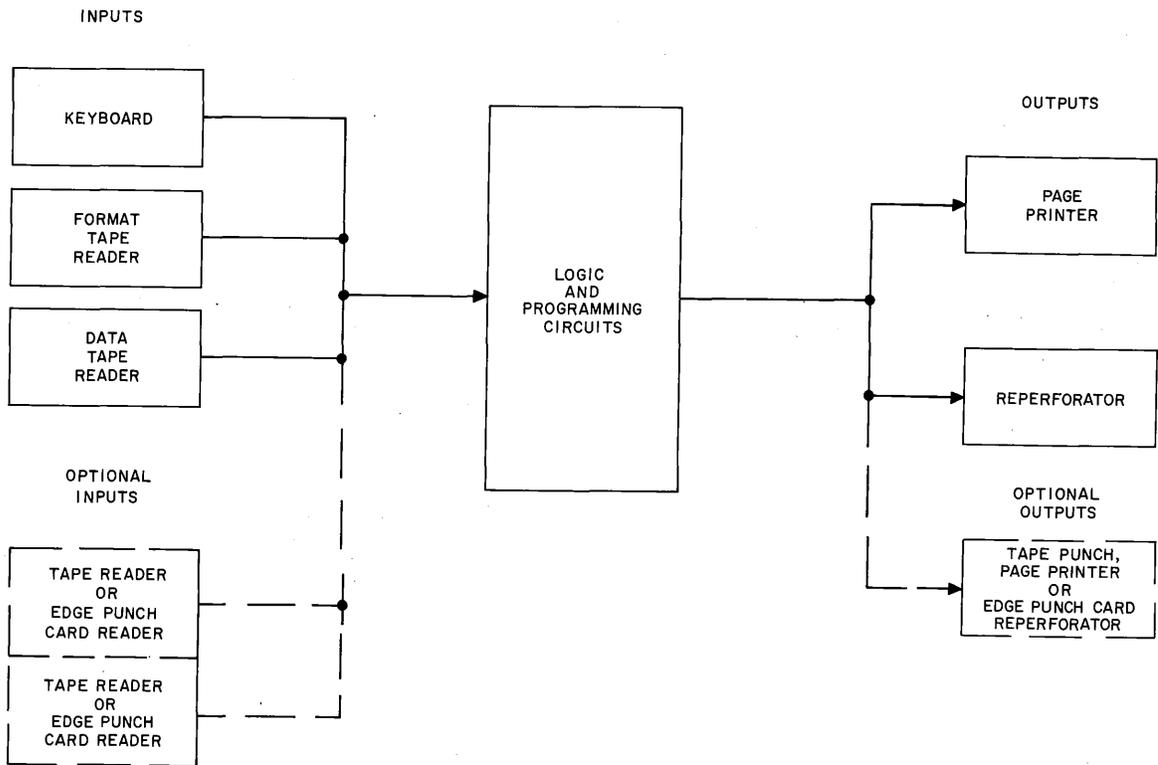
ORIGINATE

Fig. 2—On-Line (TWX) Mode

Fig. 3—Off-Line (Format) Mode

TABLE A — CODED COMPONENTS FOR CONTROLLING TTY

EQUIPMENT	FEATURES
35A Reader (2 required)	1. Parallel output, 8 level 2. One auxiliary contact, normally open 3. Two-position control lever "RUN-FREE," spring biased to "RUN" 4. 48-volt clutch magnet 5. Single-cycle clutch 6. Tight tape, tape-out contact 7. 50-pin separable connector 8. Mounts on a 35-type reader base
35AD Electrical Service Unit (ESU)	1. Two 500 millampere selector magnet drivers 2. Copylight transformer assembly 3. Two wiring fields 4. Cabling to connect to format logic panel 5. Main control relay 6. Right and left control panels are wired to this electrical service unit
35B Distributor	1. Serial output, 8 level 2. One auxiliary contact, normally open 3. 14-pin separable connector 4. Equipped with gearing 5. Mounts on a 35-type reader base
35B Format Logic Panel	1. Eight plug-in printed circuit cards for set control circuits 2. Relays — wire spring, mercury, and dry reed 3. ±48 volt power supply 4. Separable connectors and cables 5. Approximately 18 by 19 inches 6. Single chassis 7. Mode switching relay (in addition to relays provided for 35A format logic panel) 8. Mounts vertically on rack in pedestal of teletypewriter cabinet
35B Reader Base	1. Mounts two 35-type readers 2. Drive gears 3. Motor with fusing 4. Provision for mounting a 35-type distributor 5. Answer-back with gearing 6. Reader front panel 7. Sheet metal tape pan with tape guide

TABLE A (Cont)

EQUIPMENT	FEATURES
35F Teletypewriter Cabinet	1. Arranged for single page insertion 2. Furnished with a framework in the pedestal to mount the logic panel and data set
35S Teletypewriter Base	1. Even parity, 11-unit code keyboard with ASCII 1966 keytop arrangement 2. Tape container (not equipped with tape-out alarm switch) 3. Arranged for quick disconnect of reperforator from base 4. Intermediate gear assembly 5. Parallel output from code reading contacts
35T Typing Unit	1. Single page insertion for 9-1/2 by 11 inch forms 2. Sprocket feed 3. Low paper, paper out switch 4. Horizontal tabulation 5. Vertical tabulation 6. 9-1/2 by 11 inch form feed-out 7. 500 milliampere selector

3. FUNCTIONAL DESCRIPTION

3.01 Paragraphs 3.02 through 3.06 provide a brief functional description of the main TTY components in the CONTROLMATIC station. Since their use and operation is common to conventional TTY application, a detailed discussion will not be used in this text.

3.02 *Tape Readers:* The CONTROLMATIC is equipped with two paper tape readers. The rear (inboard) reader is the format program reader which supplies format control and repetitive data for the message to be transmitted. The front (outboard) reader furnishes variable data information.

Reader hold circuits provide momentary delay after a format control code is read.

3.03 *Keyboard:* The keyboard provides the operator with a means of entering data. The page printer format logic panel, reperforator or external receivers may be connected to the keyboard as required. The keyboard generates all upper case alphabet, the Arabic numerals, space, 24 punctuation marks, special symbols, and control (nonprinting) characters. An even parity is generated with every character. Refer to Fig. 4 for keytop designations.
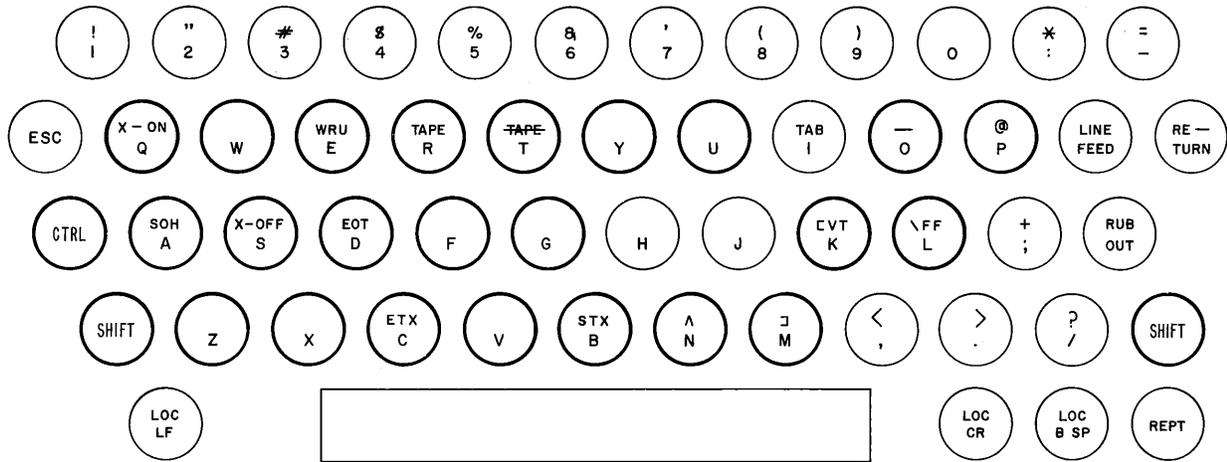
Fig. 4—Keyboard

3.04 *Page Printer:* The page printer is an electromechanical receiving device that converts serial electrical signals into mechanical motion which types data on single or multiple copies on continuous business forms. Typing signals can originate from the keyboard, tape readers, optional external input sources and the signal line. The page printer can print all lower case graphic characters in the ASCII code.

3.05 *Reperforator:* The reperforator is an electromechanical receiving device which converts serial electrical signals and combines into one paper tape all data coming from the keyboard, tape readers, and the signal line. The tape is one-inch wide and will contain an eight-level punched code and an optional corresponding printing character which is typed between the feed holes. Operation of the punch is controlled by local mode or by remote code transmission.

3.06 *Main Control Panel:* The main control panel is located at the right of the keyboard.

On it are mounted a potentiometer (SPKR VOL) for adjusting the audible level of the loudspeaker, a lamp (KEYBOARD BLINDED) for indicating keyboard condition, and a twist switch (ON LINE—FRMT CTRL) for setting either of the two main modes of station operation. The on-line mode enables the station to function as a conventional TWX TTY station and permits operator selection of the most applicable transmission mode (K, KT, T, TTs, TTR). The format mode conditions the station to operate as a program generating device and permits operator preparation of format, data, and by-product tapes.

3.07 *Mode Control Panel:* Five modes of on-line operation are provided in the CONTROLMATIC station. While these modes permit on-line traffic to be sent and received, the simultaneous preparation of by-product tape is also allowed. This flexibility allows the operator to select the mode most suitable for handling job and traffic requirements. The location of the five mode keys is shown in Fig. 5.
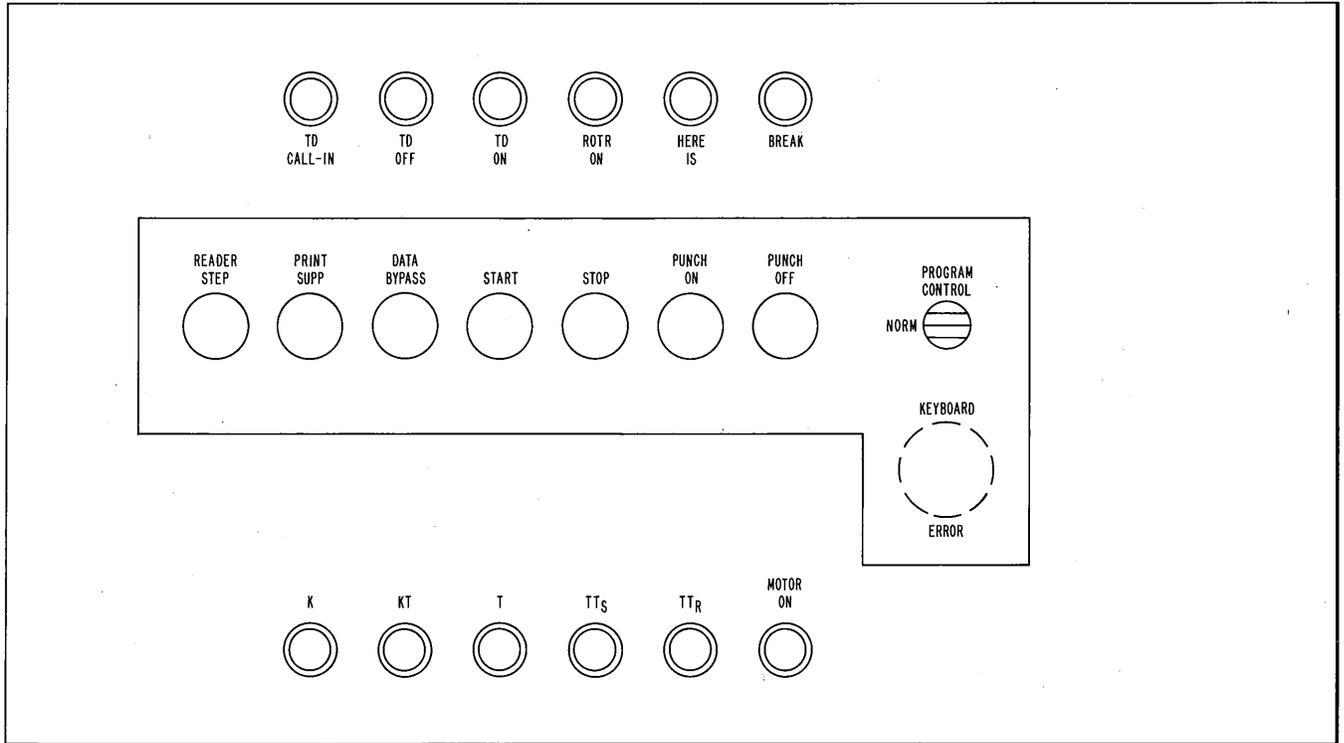
Fig. 5—Mode Control Panel

The function of each key is as follows:

(1) K—Keyboard—This mode permits transmission of traffic via the keyboard with the page

printer monitoring transmitted and received data. See Fig. 6.
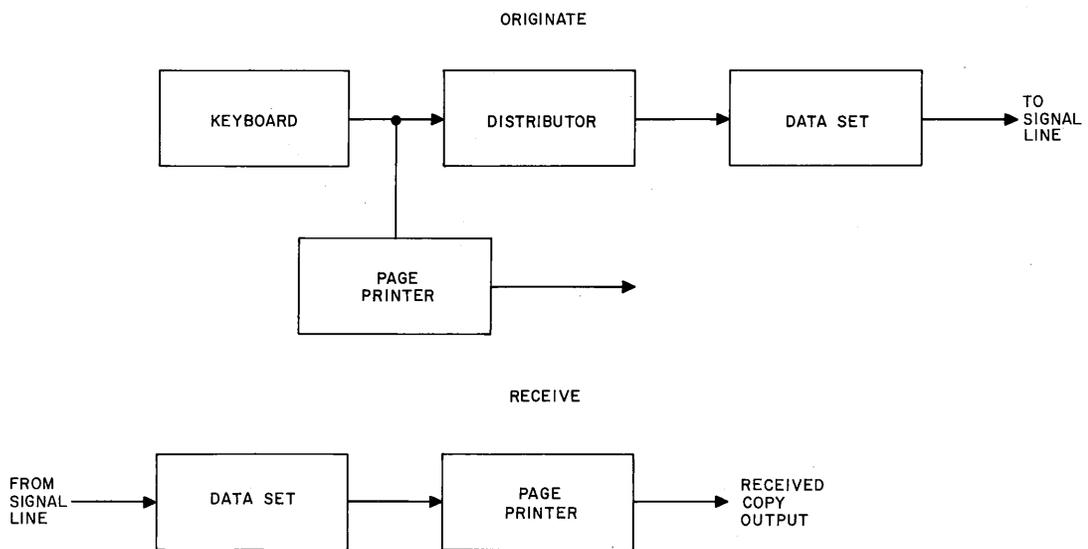
Fig. 6—K Mode

(2) KT—Keyboard Tape—This mode provides the ability to monitor both the transmitted data from the keyboard and received traffic via the reperforator and page printer. See Fig. 7.

ORIGINATE

```
┌──────────┐
│ KEYBOARD │─────────┐
└──────────┘         │
                     │      ┌─────────────┐      ┌──────────┐      TO
                     ●─────▶│ DISTRIBUTOR │─────▶│ DATA SET │────▶ SIGNAL
                     │      └─────────────┘      └──────────┘      LINE
┌──────────┐         │
│   TAPE   │─────────┘      ┌─────────────┐      LOCAL
│  READER  │         ●─────▶│    PAGE     │────▶ COPY
└──────────┘         │      │   PRINTER   │      OUTPUT
                     │      └─────────────┘
                     │
                     │      ┌──────────────┐     LOCAL
                     └─────▶│ REPERFORATOR │───▶ TAPE
                            └──────────────┘     OUTPUT
```

RECEIVE

```
                            ┌─────────────┐      RECEIVED
                     ┌─────▶│    PAGE     │────▶ COPY
                     │      │   PRINTER   │      OUTPUT
FROM      ┌──────────┐      └─────────────┘
SIGNAL ──▶│ DATA SET │──────●
LINE      └──────────┘      │
                     │      ┌──────────────┐     RECEIVED
                     └─────▶│ REPERFORATOR │───▶ TAPE
                            └──────────────┘     OUTPUT
```
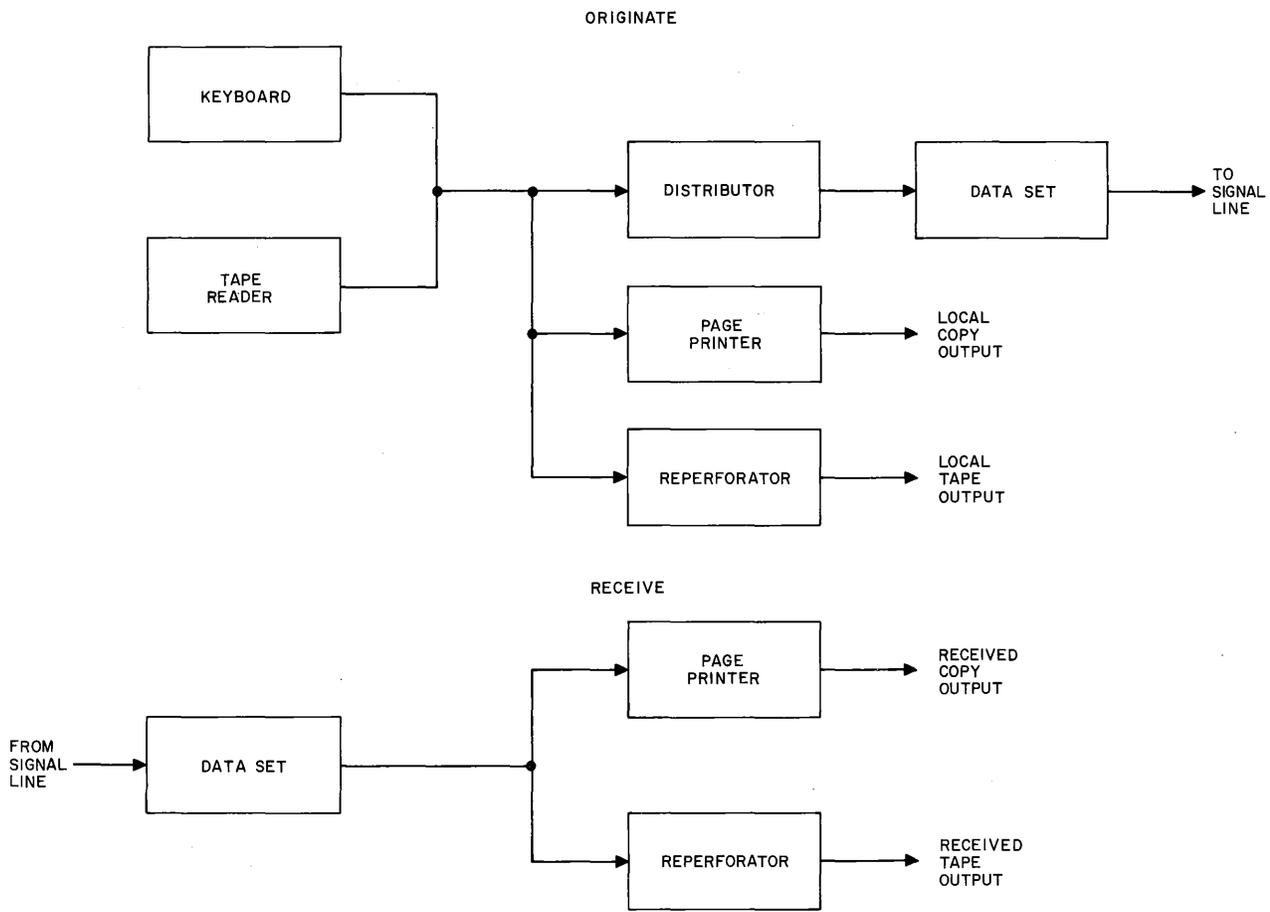
Fig. 7—KT Mode

(3) T—Tape—This mode allows traffic to be received via the page printer while allowing simultaneous preparation of tape. See Fig. 8.

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┌──────────┐      ┌───────────┐      ┌──────────────┐      LOCAL
│ KEYBOARD │─────▶│  SIGNAL   │─────▶│ REPERFORATOR │─────▶ TAPE
│          │      │ GENERATOR │      │              │      OUTPUT
└──────────┘      └───────────┘      └──────────────┘


┌──────────┐      ┌─────────────┐      ┌──────────────┐      TO
│  TAPE    │─────▶│ DISTRIBUTOR │◀───▶│   DATA SET   │◀───▶ SIGNAL
│  READER  │      │             │      │              │      LINE
└──────────┘      └─────────────┘      └──────────────┘
                         │
                         ▼
                  ┌─────────────┐      LOCAL
                  │    PAGE     │─────▶ COPY
                  │   PRINTER   │      OUTPUT
                  └─────────────┘
```
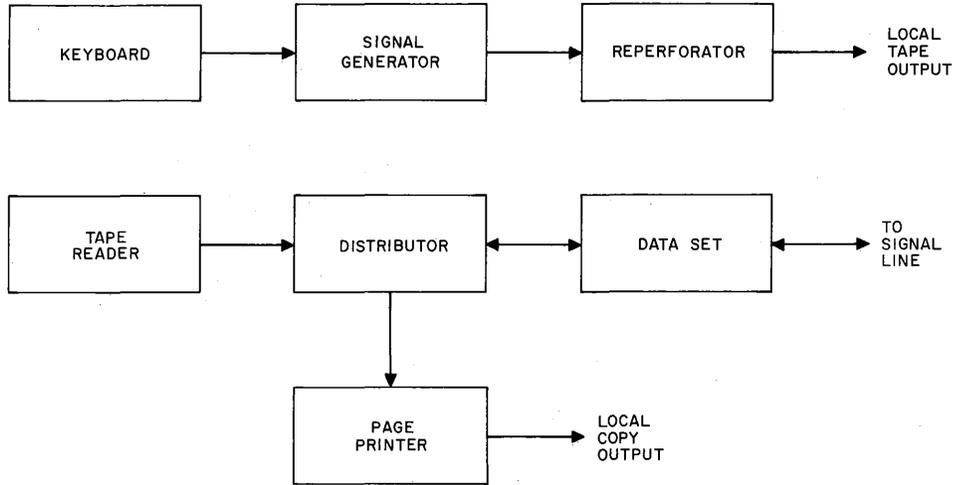
Fig. 8—T Mode
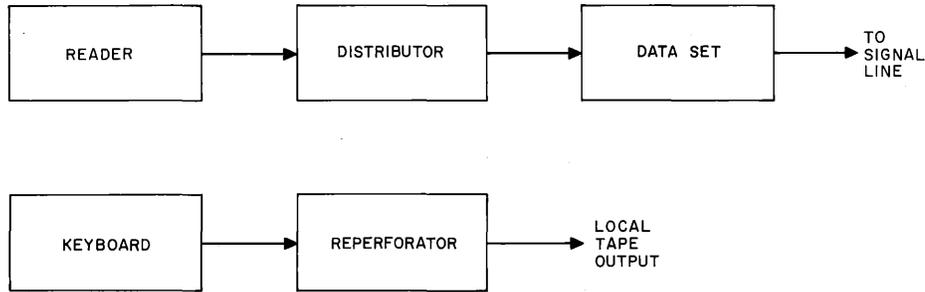
(4) TT$_S$—Tape-to-Tape Send—This mode permits traffic to be sent via the reader while allowing simultaneous preparation of tapes. See Fig. 9.
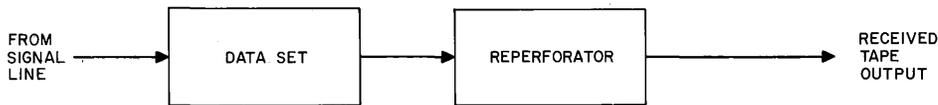
(5) TT$_R$—Tape-to-Tape Receive—This mode permits traffic to be received via the reperforator. The format mode is disabled. See Fig. 10.

3.08 Table B shows the equipment and corresponding circuit conditions for each mode key.

Fig. 9—TT$_S$ Mode

Fig. 10—TT$_R$ Mode

TABLE B — ON-LINE MODE SWITCHING CONDITIONS

MODE CONDITION	TTY UNIT CONDITION			
	PROGRAM TAPE READER	KEYBOARD	REPERFORATOR	PAGE PRINTER
TT$_S$	On	Aux Local Circuit	Aux Local Circuit	Blinded in Signal Line Circuit
TT$_R$	Disabled	Aux Local Circuit	On Signal Line Circuit	Blinded in Signal Line Circuit
KT	On	On Signal Line Circuit	On Signal Line Circuit	On Signal Line Circuit
T	On	Aux Local Circuit	Aux Local Circuit	On Signal Line Circuit
K	Disabled	On Signal Line Circuit	Aux Local Circuit	On Signal Line Circuit

Note: The program tape reader is the only reader available in the on-line mode.

3.09 The eight centrally located controls outlined in white on the format control panel are unique for CONTROLMATIC TTY operation. See Fig. 5. They are operational only when the station is in a format mode and provide functions which are not required for normal on-line TTY operation. The function of each key is as follows:

READER STEP—This control enables the preselected reader (under format control) to read and advance one character each time the pushbutton is operated.

PRINT SUPP (print suppress)—This control starts the input device which has been selected but prevents the page printer from receiving information. Other controls are not affected. This mode of operation continues until a stop code is read or the STOP pushbutton is operated. Operation of the STOP pushbutton usually results in printing of a garbled character. The mode will not stop until the last character cycle has been completed.

DATA BYPASS—This control permits skipping over blocks of data that are not always required. This mode of operation continues until a print restore character is read or the STOP pushbutton is operated. The mode will not stop until the last character cycle has been completed.

START—This control normally starts the format (inboard) reader. The data reader also will be started if it has been programmed.

STOP—This control stops both readers and terminates both data bypass and print suppress modes.

PUNCH ON—This control permits the reperforator to accept data.

PUNCH OFF—This control prevents data from reaching the reperforator.

PROGRAM CONTROL—This is a two-position twist switch which activates and deactivates

the program control features. When turned to NORM, the format control codes are prevented from entering the format logic tree.

3.10 Table C shows the conditions established for controls related to format operation and on-line transmission modes.

Note: The KEYBOARD ERROR designation is a plugged mounting reserved for use with the fixed field modification kit.

TABLE C — MODE CONTROL PANEL OPERATION

KEY	MODE	LAMP LIGHTS	LENS COLOR	METHOD OF OPERATION
Start	FRMT	X	White	Push
Stop	FRMT		Red	Push
Reader Step	FRMT		White	Push
Print Suppress	FRMT	X	White	Push
Data Bypass	FRMT	X	White	Push
Punch On	FRMT	X	White	Push
K, KT, T, TTs, TTR	ON LINE	X	White	Push
NORM/PROGRAM CONTROL	FRMT			Twist
Keyboard Control	FRMT	See Note.		

Note: Plugged closed — reserved for installation of Fixed Field Modification Kit.

3.11 Five pushbutton controls are provided on the mode control panel for control of on-line TTY operation as follows:

TD CALL-IN—This control calls in the transmitter distributor at a remote unattended station.

TD OFF—This control turns off the local TD in all modes.

TD ON—This control turns on the local TD when the TTY is in KT, T, and TTs modes.

ROTR ON—This control turns on a local ROTR when the TTY is on line.

HERE IS—This control permits sending answer-back to a distant station.

BREAK—This control is used to stop transmission over the line without losing the connection. Both sending and receiving keyboards are blinded.

MOTOR ON—This control, when energized, allows the TTY motors to remain on constantly

and permits preparation of tape in the T mode.

Call Control Unit

3.12 The call control unit is located at the extreme right of the TTY page printer. It contains circuitry for setting up station connections, transmitting to a slower speed station, and providing maintenance indications. See Fig. 11. The four external controls located at the top of the unit are as follows:

BRK-RLS—This control restores the ability to transmit after the BREAK key has been operated.

REST—This control permits communication with a slower speed station. The REST lamp lights when it is necessary to type slower.

OUT OF SERV—This lamp provides a visual indication when the TTY has been placed in a maintenance mode.

NORMAL RESTORE—This is a three position rotary switch which is used to set the TTY in a maintenance mode and to restore it to service. When the switch is turned fully counterclockwise (toward the OUT OF SERV lamp), the lamp lights and calls will no longer be automatically answered. Stations that are not in terminal hunting groups may be returned to service by rotating the switch clockwise to NORMAL position. For terminal hunting stations, the switch must be held in the spring-loaded RESTORE position until dial tone is heard.
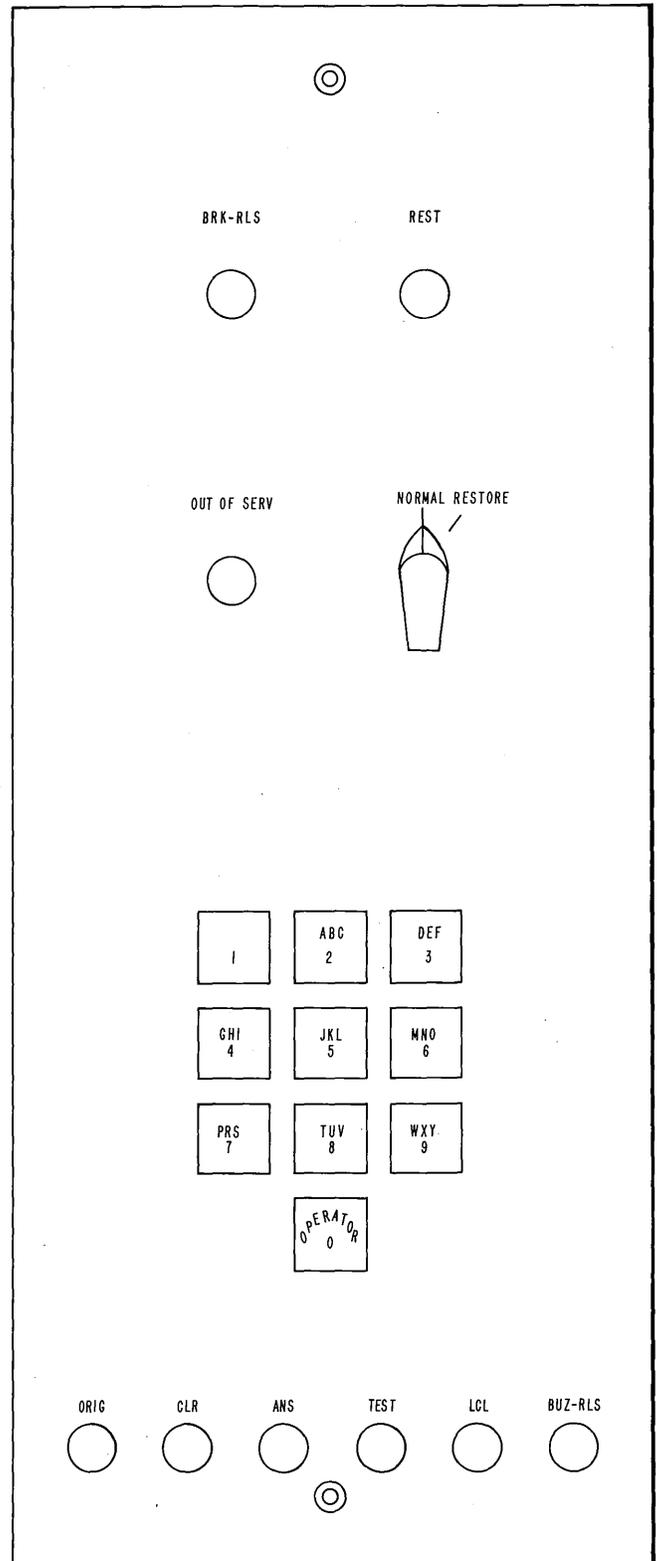

Fig. 11—Call Control Unit

3.13 The various available station dials for CONTROLMATIC are mounted at the bottom of the call control faceplate and are discussed in 3.25 through 3.27.

Format Control

3.14 Format (program control) codes, are nonprinting characters which condition the CONTROLMATIC to respond to various logic functions, ie, data input selection, tape control, punch control, maintain format, etc.

3.15 Format codes are generated by the operator at the TTY keyboard. Operation of CTRL and P keys sets the format condition and permits subsequent control codes to be treated as internal codes. Operation of CTRL D, A, E, or F keys terminates this condition.

3.16 Table D lists the keys to be operated, ASCII code generated, and logic function for each code. The illustration in Fig. 4 shows the keyboard control keys in heavy outline for CONTROLMATIC operation.

TABLE D — FORMAT CONTROL CODES

KEYBOARD DESIG- NATION	ASCII CODE GENERATED	CONTROLMATIC LOGIC FEATURE	FUNCTION
CTRL A	SOH	Data Input 1	Permits the data tape reader and keyboard to operate, stops the other input devices, and conditions the set to respond to the ASCII codes.
CTRL B	STX	Auxiliary Receiver On	Permits auxiliary receiver to operate.
CTRL C	ETX	Auxiliary Receiver Off	Stops auxiliary receiver.
CTRL D	EOT	Normal Code	Conditions the set to respond to the ASCII control codes (EOT).
CTRL E	ENQ	Data Input 2	Permits operation of a stepping switch input and the keyboard, stops the other input devices, and conditions the set to respond to the ASCII control codes.
CTRL F	ACK	Data Input 3	Permits operation of an auxiliary input device and the keyboard, stops other input devices, and conditions the set to respond to the ASCII control code.
CTRL G	BEL	Print Restore	Ends the automatic print suppress mode of operation (permits the typing unit to again operate, and stops the reader if preceded by a stop code). It also ends the maintain format mode and the data bypass mode (Bell).
CTRL P	DLE	DLE	Conditions the set to respond to internal control codes. This code is always suppressed in the program control mode.

TABLE D (Cont)

KEYBOARD DESIG- NATION	ASCII CODE GENERATED	CONTROLMATIC LOGIC FEATURE	FUNCTION
CTRL Q	DC1	Program Tape Reader On	Permits operation of the program tape reader and the keyboard, and stops the other input devices (X-On).
CTRL R	DC2	Punch On	Permits operation of the tape punch (TAPE).
CTRL S	DC3	Stop	Stops all input devices except the keyboard to permit the operator to enter information. It also ends the manual print suppress mode by permitting the typing unit to operate, and stopping the reader (X-Off).
CTRL T	DC4	Punch Off	Stops the tape punch.
CTRL U	NAK	Automatic Print Suppress	Stops the typing unit and keeps the reader running until the next print re-store code (if there is an intervening stop code) (Error).
CTRL V	SYN	Maintain Format	Modifies the print suppress mode and the data bypass mode by allowing ASCII controls . . . CR, LF, TAB, V.T., and FORM . . . to be received by the typing unit (and the tape punch in the case of data bypass). This allows the typing unit to advance across and down a form when a section is not used.
CTRL W	ETB	Card Eject	This is a lead on which an electrical pulse is provided to a card reader, to enable the card reader to eject a card.
CTRL X	CAN	—	Fixed field arrangement No. 1.
CTRL Y	EM	—	Fixed field arrangement No. 2.
CTRL Z	SUB	—	Fixed field arrangement No. 3.
SHIFT- CTRL K	ESC	—	Keyboard unblinded.
SHIFT- CTRL L	FS	—	Keyboard blinded.

TABLE D (Cont)

KEYBOARD DESIG- NATION	ASCII CODE GENERATED	CONTROLMATIC LOGIC FEATURE	FUNCTION
SHIFT- CTRL M	GS	—	Typing unit blinded.
SHIFT- CTRL N	RS	—	Typing unit unblinded.
SHIFT- CTRL O	US	—	Unassigned (SPARE).

3.17 The format logic panel is located at the left side of the station behind the front panel. The relays and plug-in circuit cards for internal control code functions are mounted on the format logic panel. It also contains a +48v power supply.

3.18 The format logic panel functions to recognize internal control codes generated at the keyboard and/or mode control panel and causes the station to take appropriate action in response to these codes. Inputs from the keyboard are in the form of parallel signals which the code recognition circuits must recognize and convert into specific relay operations. Bid relays are arranged in a logic tree which requires that certain contact closures be made to provide an enabling path for CONTROLMATIC functions. Signals from the eight controls on the mode control panel require no information conversion but directly enable circuits to respond for each control operation.

3.19 A block diagram which shows the relationship of the format logic panel to the station components is shown in Fig. 12.
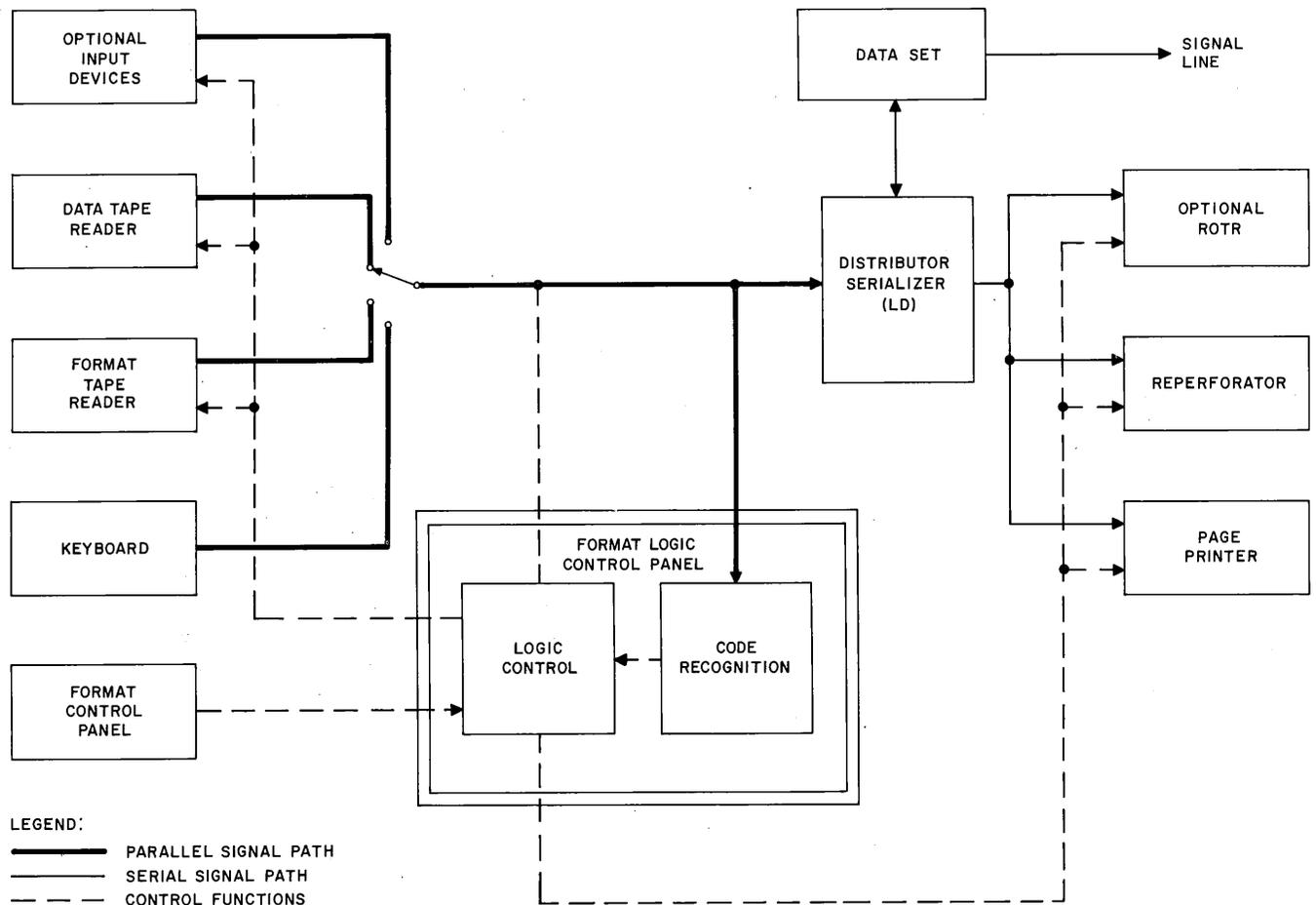
Fig. 12—Format Logic Functions

3.20 Before a control code can be applied to the logic tree, it must first be recognized as a valid code in the control group. This is accomplished by requiring that all control characters have bits 4, 6, and 7 spacing, or bits 6 and 7 spacing, and bits 4 and 5 marking. The control code recognition circuits will operate when either of these conditions is met.

3.21 When either condition is satisfied, four code relays are energized in accordance with the spacing and marking condition of bits 4, 5, 6, and

7. The contacts of these relays are arranged in a logic tree which provides a path for pulses to be applied to control circuits for specific functions.

3.22 A specific character (CTRL-P) must be generated before any control character may be generated. This conditions the logic to respond to subsequent valid control codes.

3.23 Operation of CTRL-D terminates code recognition and causes the station to respond to the standard ASCII codes. Operation of CTRL A, E, or F, which selects optional input devices, will also end control code recognition.

Optional Features

3.24 Optional apparatus and features applicable to the CONTROLMATIC station are as follows:

- *Tape Verifier*—TP327108—This unit verifies an original by-product tape by making a character-by-character comparison during preparation of a second by-product tape from the original data.

- *Two-Color Printing*—TP179724—Ribbon shift is provided under control of logic circuits and the operator.

- *Fixed Field Operation* —TP327107—Five fixed field operations are provided by this kit. A field is an information requirement where the data station or operator must supply information, such as a blank space on a business form.

(1) *Mandatory Field, Mandatory Keyboard Fill:* The operator must always enter the field with a *precise* number of keyboarded printing characters.

(2) *Mandatory Field, Mandatory Partial Keyboard Fill—With Automatic Pad-Out:* The operator must always enter the field with a *minimum* number of keyboarded printing characters. After the minimum number has been satisfied, transfer to the subsequent field is by automatic pad-out (automatic spacing) of the partially filled fields.

(3) *Mandatory Field, Mandatory Partial Keyboard Fill—Without Automatic Pad-Out:* The operator must always enter the field with some minimum number of keyboarded printing characters. Manual transfer to a subsequent field, after the minimum number of characters has been satisfied, is required.

(4) *Permissive Field, Graphics Only—With Automatic Pad-Out:* The operator is permitted to determine if a field is to be entered. If entered, only printing characters are valid. Partially filled fields are then padded out automatically.

(5) *Permissive Field, All Characters Valid—Without Pad-Out:* The operator is permitted to determine if a field is to be entered. If entered, all ASCII characters are valid. Manual transfer to a subsequent field is required.

3.25 Rotary or TOUCH-TONE® dials with optional card dialers may be used with the CONTROLMATIC station. The type of dial depends upon the serving central office arrangement. A TOUCH-TONE central office will recognize both rotary dial pulses and TOUCH-TONE signals whereas an office not equipped for TOUCH-TONE conversion will recognize only rotary dial pulses.

3.26 Dial signals generated by either rotary or TOUCH-TONE dials are applied to the signal line through the data set. When TOUCH-TONE dialing is used, each digit signal is monitored by the amplifier and loudspeaker as an indication of dialing progress. The amplifier and loudspeaker are quieted during rotary dialing to silence the dial pulses.
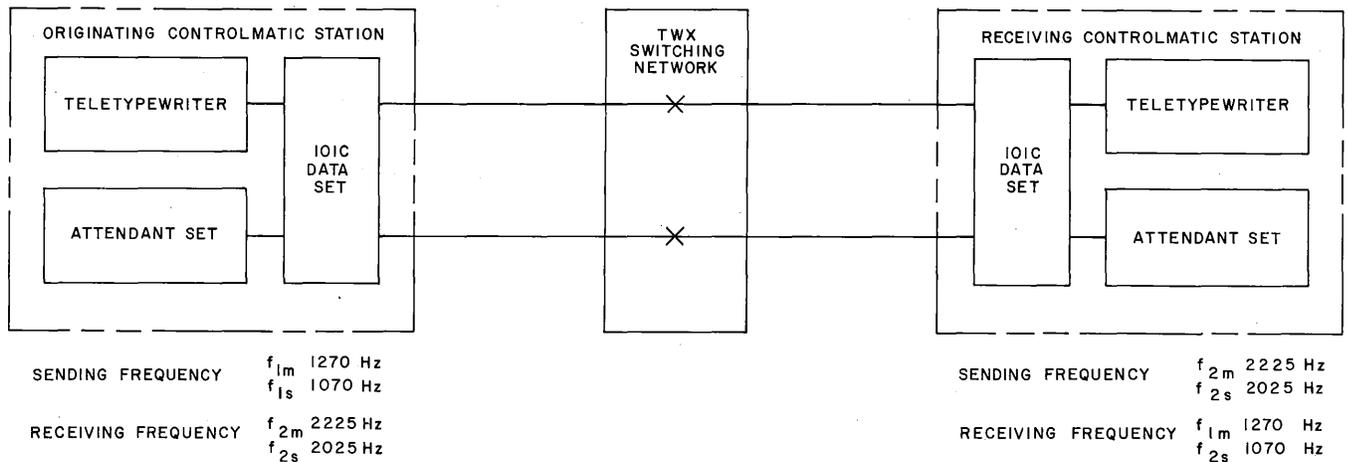
3.27 The use of optional rotary or TOUCH-TONE card dialers permits rapid dialing of frequently called numbers. Dialing is accomplished by inserting a plastic card, encoded with the desired number, into the slot on the card dialer and operating the dialer START key. A spring motor, wound by insertion of the card, pushes the card out of the dialer, past sensing contacts which read and dial the complete called number. Refer to Part 4 of this section for additional information concerning the dial equipment used in CONTROLMATIC stations.

Data Set

3.28 The 101C Data Set functions to establish connections between stations via the TWX switching network and to provide conversion between the dc TTY pulses and the ac line signals. The data set transmitter and receiver at both stations are frequency shift devices which are able to switch from either of two frequency bands. The band which is selected depends upon whether the station is the originating or the answering station.

The frequencies for both mark, space, transmit, and receive conditions are shown in Fig. 13.

3.29 The data set proper is mounted in the TTY pedestal and is connected to the TTY apparatus through separable connectors. An attendant set permits the station operator to originate and answer traffic. The attendant set consists of a six button key set mounted adjacent to the dial. The attendant set keys and functions are listed in Table E.

SENDING FREQUENCY f_{1m} 1270 Hz f_{1s} 1070 Hz

RECEIVING FREQUENCY f_{2m} 2225 Hz f_{2s} 2025 Hz

SENDING FREQUENCY f_{2m} 2225 Hz f_{2s} 2025 Hz

RECEIVING FREQUENCY f_{1m} 1270 Hz f_{2s} 1070 Hz

Fig. 13—Originating and Receiving Stations

TABLE E — ATTENDANT SET KEY FUNCTION

KEY	FUNCTION
CLR	Used to set station in "T" mode. This mode conditions the station to provide facilities for originating or receiving traffic while permitting local tape preparation. Operation also disconnects the station.
LCL	Used to provide off-line operations equivalent to those when station is in answer or originate modes. Incoming calls will *not* be automatically answered. A ringing indication will be present.
BUZ-RLS	Used to silence audible alarm resulting from low paper conditions. Lamp remains lighted as long as key is operated or paper alarm condition exists.
TST	Used for maintenance purposes. Connects the dc output of the data set to the dc data set input.
ORIG	Used to originate a call. Connects the station to the line in preparation for dialing. Lamp remains lighted until originate mode is terminated.
ANS	Used to manually answer a call. Connects station to signal line and illuminates answer lamp. Manual answer required when the automatic answer circuit is disabled by tabulating, form feed, low tape or paper, or data set in local (LCL) condition.

Originating Traffic

3.30 When the ORIG key is operated, the transmitting TTY motor is energized and an off-hook condition is sent to the serving TWX central office. Dial tone is returned over the loudspeaker as a signal to start dialing. The central office recognizes the dial pulses, or if properly equipped, TOUCH-TONE signals, and causes the called station to be connected in the same manner as an ordinary telephone call. Audible ringback, station busy, or all-trunks-busy tones are monitored by the loudspeaker to indicate the call progress. In the event of a dialed wrong number or busy condition, an on-hook condition may be established by momentarily operating the CLR key.

Answering Traffic

3.31 When the called station is rung, the called data set will automatically answer the call by turning on the receiving TTY motor and establishing an off-hook condition. This signals the central office to trip ringing and the data sets at both stations initiate a timing and signal frequency exchange to insure that the calling and called stations are properly recognized.

3.32 If the called station is in a local (LCL key operated) mode of operation, the ANS lamp will flash and the bell will ring as an indication that the station is being called and the call may either be ignored (if it is not desirable to receive traffic) or answered by operating the ANS key. If the station is in the format mode, the calling station will be disconnected by operating the ANS key. The call may be answered by switching on line and operating the ANS key. Either station attendant may interrupt transmission by operating the BREAK key for a 1/2-second interval. This timing prevents the break signal from being misread as a TTY character or a disconnect signal. Before either station can resume sending, the BRK RLS key must be operated. Disconnection is accomplished by transmission of an EOT (end-of-transmission) TTY character or by momentary operation of the CLR key. These procedures allow disconnect to be initiated from either end of the signal line.

3.33 A simplified block diagram of data set connections for two CONTROLMATIC stations is shown in Fig. 13. Refer to Part 4 for additional information pertaining to the CONTROLMATIC TTY data station.

4. REFERENCES

4.01 The following documents pertain to the CONTROLMATIC TTY data station.

- 591-013-100—Data Set 101C—Identification and Operation

- 591-013-200—Data Set 101C—Test and Installation Methods

- 591-013-300—Data Set 101C Used with 4-Row TWX—Locating Troubles and Test Procedures

- 501-162-100—Station Dials—5, 6, 7, and 8-Types—Identification and Maintenance

- 501-163-101—Station Dials—40-Type

- 501-164-105—Station Dials—25-Type— Identification and Maintenance

- 501-164-106—Station Dials—26-Type— Identification, Operation, Maintenance, and Connections

- Equipment Planning Guide—Automated Communications Set (TTY Publication)

- WHR3TC—Schematic Wiring Diagram for Model 35 CONTROLMATIC Teletypewriter

- 574-207-100—CONTROLMATIC TTY—General Description and Operation

- 574-207-200—CONTROLMATIC TTY— Installation

- 574-207-300—CONTROLMATIC TTY—Service Maintenance and Tests