

86B2 DATA SELECTIVE CALLING SERVICE
FULL-DUPLEX—150-WORD PER MINUTE DATA STATIONS
DESCRIPTION AND OPERATION

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1. GENERAL

1.01 This section covers the physical and functional description as well as the operating procedures for the full-duplex (FDX), 150-word per minute (wpm) data stations associated with the 86B2 Data Selective Calling Service.

A. Purpose of Station

1.02 The 86B2 Data Station is used to provide 150-wpm (150 baud) FDX data service between itself and other stations in the private network of which it is a part under control of a customer provided line control station (computer switcher). This configuration comprises what will hereafter be referred to as the 86B2 Data Selective Calling System.

B. Purpose of System

1.03 The 86B2 Data Selective Calling System is a store and forward message switching system which administers a number of FDX lines. Each FDX line can accommodate a number of stations which will normally be originate/terminate (ORIG/TERM) type stations. However, these stations may also be originate only (ORIG ONLY) or terminate only (TERM ONLY) type stations.

C. System Arrangement

1.04 The block diagram in Fig. 1 shows a typical arrangement of the 86B2 Data Selective Calling System. The system consists of the line control station (computer switcher) which has store and forward capabilities and a number of 86B2 stations.

1.05 The 86B2 stations are connected to the computer switcher by the FDX lines via hubbing points. The stations on each line can be either ORIG/TERM, ORIG ONLY, or TERM ONLY stations but they must all be arranged for FDX, 150-wpm operation.

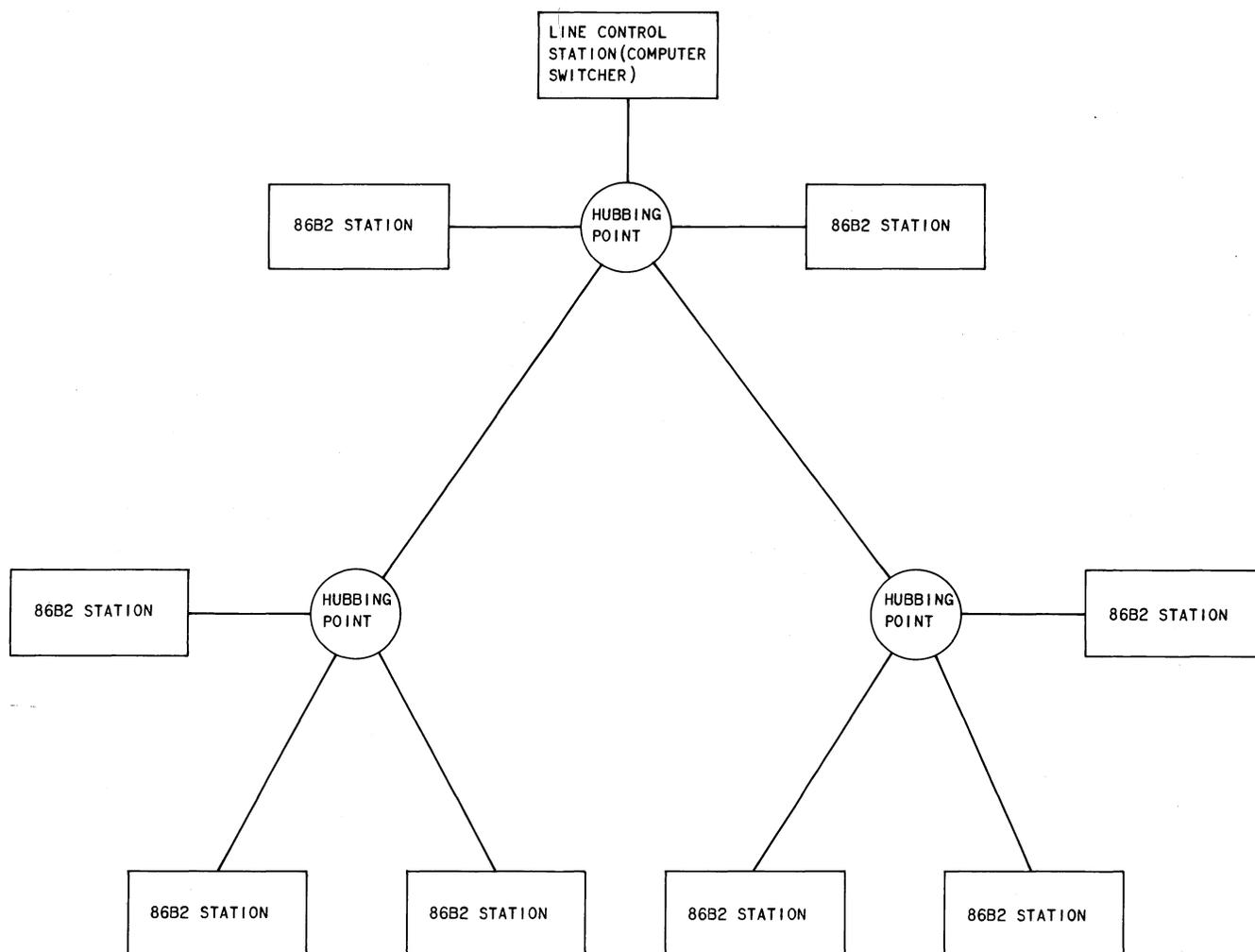


Fig. 1—Block Diagram of Typical 86B2 Data Selective Calling System Arrangement

D. Station Arrangements

1.06 The 86B2 station terminal equipment will be model 37-type teletypewriter (TTY) equipment. The 86B2 station is a self-contained unit which is intended to be completely assembled at the distributing house prior to delivery.

1.07 The 86B2 station is available in the following arrangements:

- (a) An ASR TTY and an RO TTY in combination (ORIG/TERM station—page receiving)
- (b) An ASR TTY and a receive only typing reperforator (ROTR) in combination (ORIG/TERM station—tape receiving)

(c) An ASR TTY alone (ORIG ONLY station)

(d) An RO TTY alone (TERM ONLY station—page receiving)

(e) An ROTR alone (TERM ONLY station—tape receiving).

1.08 In the case of 1.07 (a) and (d), an auxiliary RO TTY or ROTR may be optionally provided as a slave unit to the primary RO TTY. The auxiliary machine can be turned on and off manually, or automatically under on-line signal control during any message delivery.

Note: The primary RO TTY has sometimes been referred to in the past as the master RO TTY.

1.09 The block diagram in Fig. 2 shows a typical 86B2 station. The arrangements for ORIG/TERM, ORIG ONLY, and TERM ONLY stations and the components comprising each are given in Table A.

E. Uses of Station Components

1.10 The ASR TTY is used to punch tapes for message transmissions, send all station transmissions, print local copy of all station transmissions, and print local copy of all service messages received from the computer switcher concerning any message sent by the station. In addition, the ASR TTY will print local copy, if required, of the time, date, and message number (TDM) of all messages sent by the station.

1.11 The primary RO TTY is used to print the TDM of all messages received by the station, print clean copy of all messages received by the station, and print all service messages received from the computer switcher concerning messages received by the station.

1.12 The primary ROTR TTY performs the same function as a primary RO TTY except that the ROTR punches a tape of the information received instead of printing page copy.

1.13 An RO TTY or ROTR may be used as an auxiliary machine to a primary RO TTY only. The auxiliary machine, when turned on, performs as a slave to the primary RO TTY.

1.14 The Data Auxiliary Set (DAS) 820A5 (controller) enables the station to send and/or receive messages automatically by providing circuits to recognize control characters from the computer switcher and to generate response and service

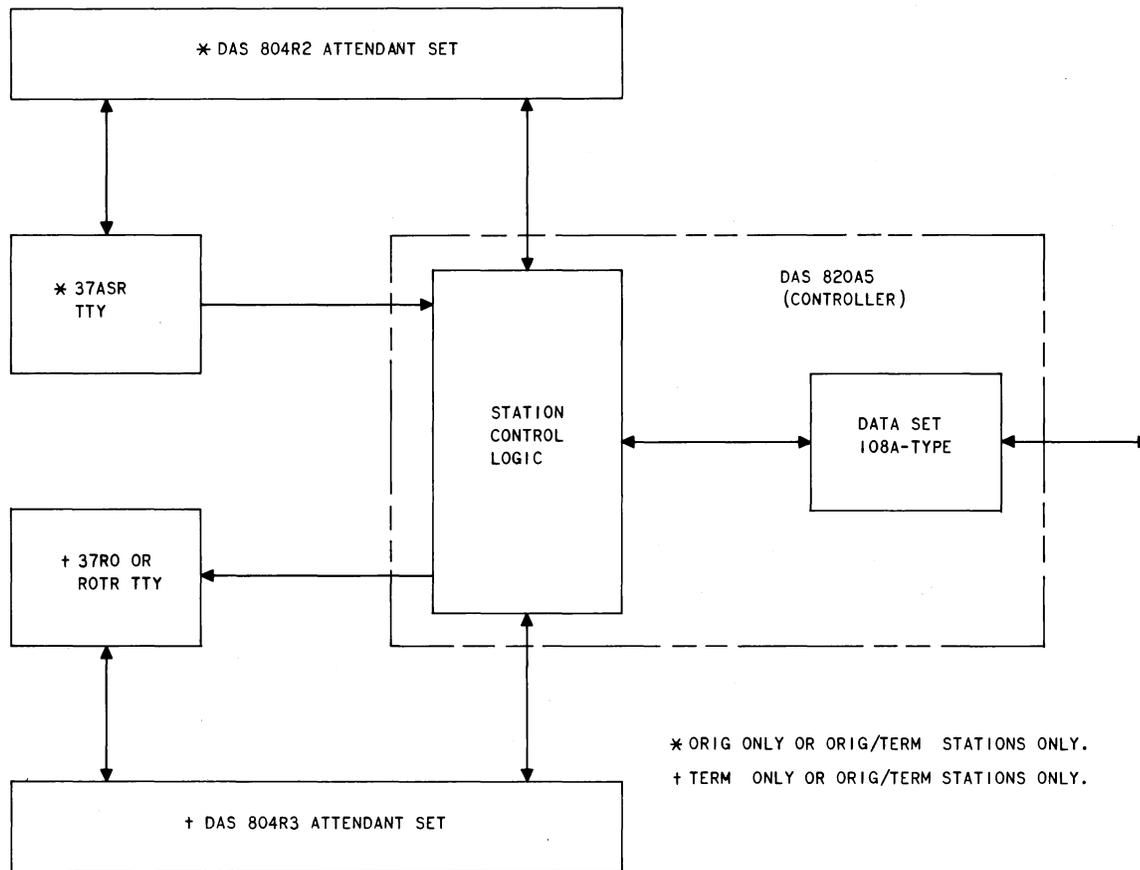


Fig. 2—Block Diagram of Typical 86B2 Data Station

TABLE A
STATION ARRANGEMENT SUMMARY

TYPE STATION	ORIGINATE TTY	PRIMARY RECEIVER TTY	ORIG TTY ATND SET	REC TTY ATND SET	CONTROLLER DAS	MTG BRKT	*M36E CORD	AUX RECEIVER TTY (OPTIONAL)
37 ORIG/TERM.	37 ASR	37 RO	804R2	804R3	820A5	93A	Yes	37 RO or 37 ROTR
	37 ASR	37 ROTR	804R2	804R3	820A5	93A	Yes	None
37 ORIG ONLY	37 ASR	None	804R2	None	820A5	93A	No	None
37 TERM. ONLY	None	37 RO	None	804R3	820A5	93A	Yes	37 RO or 37 ROTR
	None	37 ROTR†	None	804R3	820A5	95A	Yes	None

* Available in three lengths (4, 10, and 50 feet).

† A KS-20018 L1, L2, L3, or L4 cabinet is also required to mount the controller.

characters for transmission to the computer switcher. The controller also houses and supplies operating voltages for the Data Set 108A-type.

1.15 The data set performs two functions. It converts the digital data received from the data terminal via the controller into voiceband frequency tones suitable for transmission over the line. It also converts the voiceband frequency tones received from the line into digital data suitable to operate the data terminal.

1.16 The Data Auxiliary Sets 804R2 and R3 (attendant sets) are used to cause the controller to generate traffic available responses (804R2 only), place the station out-of-service (OOS), silence alarms, and extinguish alarm indication lamps. They also have lamps which indicate when the station is selected as a sender or receiver, is OOS, or is in an alarm condition.

1.17 The 93A mounting bracket is used to mount the controller in the pedestal of the 37-type TTYs. The 95A mounting bracket is used to mount the controller in the KS-20018 type cabinet at an ROTR TERM ONLY station.

1.18 The M36E cord is available in three lengths (4, 10, and 50 feet). It is used to connect the primary RO or ROTR TTY to the controller.

F. Station Operation

1.19 Normal operation of the 86B2 Data Station permits the simultaneous transmission of messages in two directions with the following momentary interruptions:

(a) Interruption of traffic pickup for selection (call-in) of receivers for message delivery, roll call, or performance of the delivery abort sequence.

(b) Interruption of message delivery for polling of the stations for traffic availability, initiation of the traffic pickup sequence, delivery of originate time, date, and message number (TDM) information, or performance of the emergency stop sequence.

1.20 To pick up traffic, the computer switcher interrupts any message delivery in progress and then interrogates each station in the system, individually, to determine which stations have traffic to send. The station reply indicates whether or not the station has traffic to send, whether or not the station is ready to receive, and, if the station has traffic to send, the status of the traffic (regular or priority). This sequence is referred to as the polling sequence. If the computer switcher receives a traffic available response from a station during the polling sequence, it can select that station as a sender.

1.21 When a station is selected to send, it will send a start-of-heading (SOH) character and

then stop. The computer switcher may then, prior to reinitiating the transmission from the selected sender or resuming any interrupted message delivery, transmit (if required) the TDM for the message pickup. This information will be printed at the station by the ASR TTY. The computer switcher will now resume the delivery of any interrupted message, and the selected sender will continue to transmit until it detects either the SOH character of another message or an end-of-transmission (EOT) character.

1.22 In the case of a multiple message transmission (selected sending station has stopped on detection of an SOH character), the computer must again interrupt any message delivery in progress. The computer switcher may then restart the transmission from the selected sender and then resume any interrupted message delivery.

1.23 In the case of a message termination (selected sender has stopped on the detection of the EOT character), the sending station will automatically become unselected (return to the idle condition). The computer may then interrupt any message delivery in progress and proceed with the polling routine by interrogating the next station in the polling sequence.

1.24 When the computer switcher has a message to deliver, it interrupts any pickup of traffic that is in progress. The computer switcher then proceeds to call in all stations addressed in the heading of the message to be delivered.

1.25 The call-in routine consists of the computer switcher interrogating each addressed station in turn for the status of the stations receive circuits. The interrogated station responds with a discrete indication as to whether or not the station is ready to receive. If the station responds that it is ready to receive, it is automatically selected as a receive station. The computer switcher will first deliver any per station information and then proceed to call in the next station addressed in the message heading. During the call-in and delivery of per station information, any previously selected to receive station is blinded so that each station receiver prints only the heading that concerns that station. Stations that respond not-ready-to-receive to repeated call-in attempts will have the CALL lamp lighted indicating an unsuccessful call-in attempt and will remain in the idle condition. In these cases, the computer switcher will enable the

message "intercept" routine being employed in the system and proceed to call in the next station.

1.26 When all of the stations that are ready to receive have been called in, the computer switcher restarts any interrupted message pickup, unblinds the selected receivers, and initiates the delivery of the message. The message intercept feature of the computer switcher will store the message for delivery to the stations that were not ready to receive at a future time.

1.27 At the completion of the message delivery, the computer switcher may again interrupt any selected send station and perform roll call to determine whether the selected receivers have received the message properly.

1.28 Delivery of the EOT character at the end of the transmission returns the selected receivers to the idle state. The computer switcher may now proceed with another message delivery by interrupting any pickup of traffic in progress, calling in the addressed stations, and proceeding as explained in 1.25, 1.26, and 1.27.

G. Station Power

1.29 The 86B2 Data Station requires an individually fused line power source of 106 to 128 volts, 60 \pm 0.45 Hz. The dc voltages required to operate the controller are supplied by the 24A power unit which is a part of the controller. The ac power for the 24A power unit is supplied from a utility strip on the TTY via the KS-14532 L16 cord which is supplied with the controller.

2. PHYSICAL DESCRIPTION

A. General

2.01 This part describes the physical appearance of the 86B2 Data Stations available. The various arrangements of each are shown in Table A.

2.02 The 37 ORIG/TERM station arrangement is shown in Fig. 3. Pictured is the 37 ASR TTY with its 804R2 attendant set, the primary 37 RO TTY with its 804R3 attendant set, and the M36E cord. The data set, controller, and the 93A bracket (not shown) are mounted inside the 37 ASR TTY table. The 37 RO or ROTR TTY, which may be used as an auxiliary receiver, is not shown.

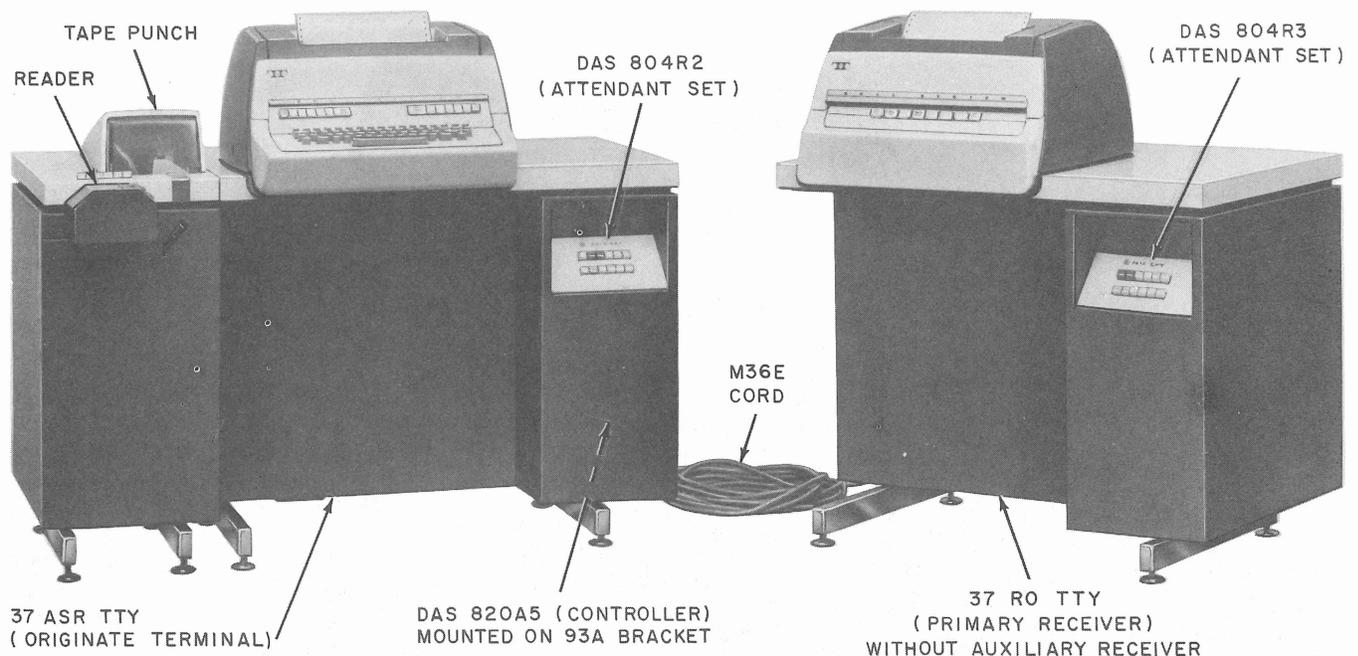


Fig. 3—Typical 37 ORIG/TERM Data Station

2.03 The 37 ORIG ONLY station arrangement is shown in Fig. 4. Pictured is the 37 ASR TTY with its 804R2 attendant set. The data set, controller, and 93A bracket (not shown) are mounted inside the 37 ASR TTY table. There is no auxiliary receiver connection possible.

2.04 The 37 TERM ONLY station arrangement is shown in Fig. 5. Pictured is the primary 37 RO TTY and its 804R3 attendant set. The data set, controller, M36E cord, and 93A bracket (not shown) are mounted inside the primary 37 RO TTY table. The 37 RO or ROTR TTY, which may be used as an auxiliary receiver, is not shown.

2.05 The 37 ROTR TERM ONLY station arrangement is shown in Fig. 6. Pictured is the 37 ROTR TTY and its 804R3 attendant set. The data set, controller, and 95A bracket are mounted in a KS-20018 type cabinet. The M36E cord connects the 37 ROTR TTY to the controller. With the 37 ROTR TERM ONLY station, it is not possible to have an auxiliary receiver.

B. Teletypewriters

2.06 The 37 ASR TTY (Fig. 7) is a 4-row, 150-wpm TTY which consists of a page printer, tape

punch, tape reader, and keyboard. All messages originated by a 37 station are transmitted from the reader. Three key selected modes of operation are possible. They are:

- (a) The off-line mode in which messages may be prepared, on tape (with page copy) for transmission. In this mode, the typing unit and tape punch operate from either the keyboard or reader. Messages cannot be transmitted and the TTY motor runs continuously unless the OUT-OF-SVC key on the attendant set is operated.
- (b) The on-line mode in which messages may be prepared on tape, without page copy, while the station is transmitting messages from the reader. In this mode, the page printer makes local copy of all messages transmitted by the station and the TTY motor runs continuously.
- (c) The unattended mode in which the page printer will copy all messages transmitted by the station. The reader is connected as in the on-line mode and the motor runs only when the station has traffic ready to send.

2.07 The overall external dimensions of the basic 37 ASR TTY are 36-1/4 inches high, 44-1/2

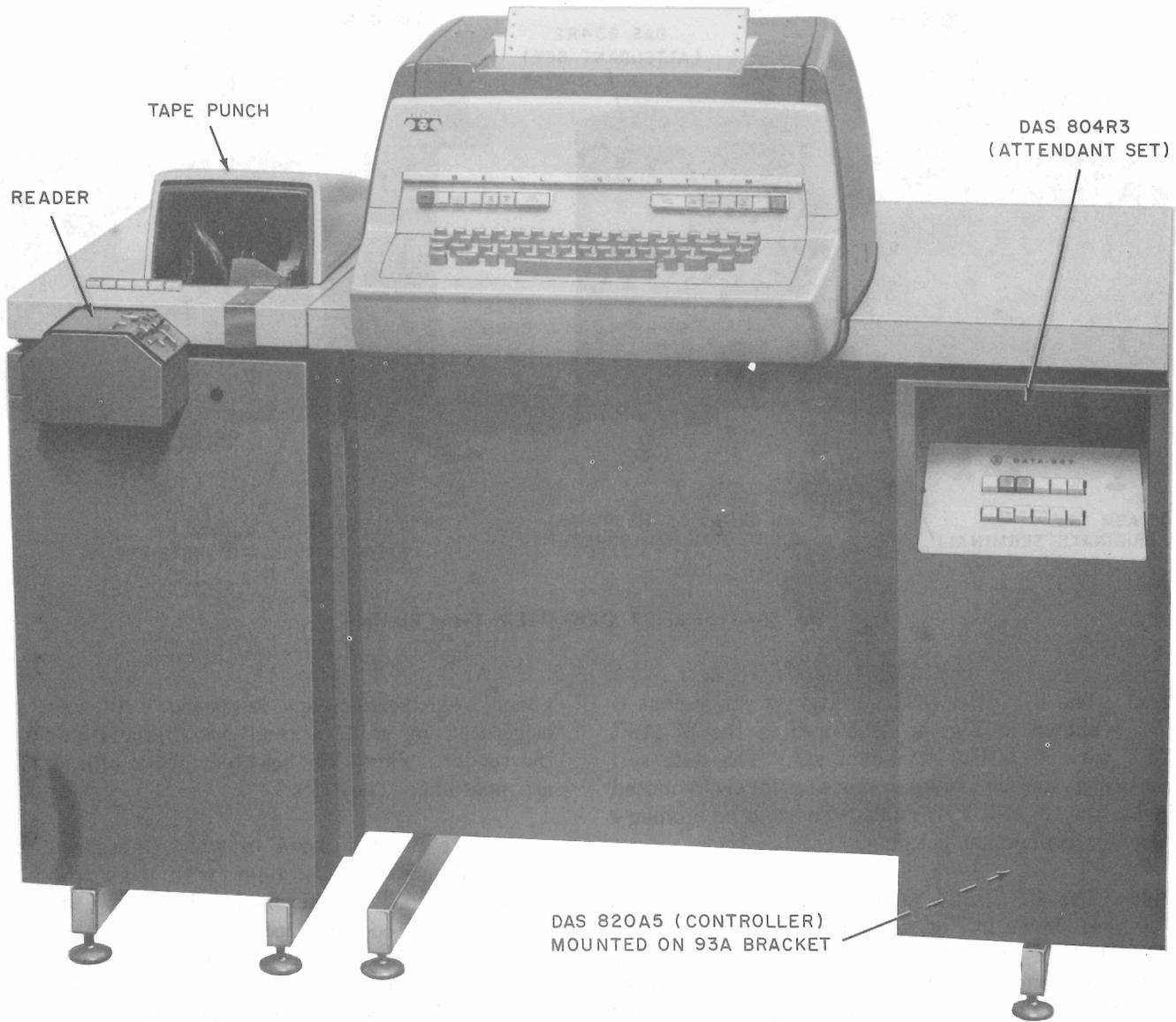


Fig. 4—Typical 37 ORIG ONLY Data Station

inches wide, and 27-1/2 inches deep. When equipped with the controller, the 37 ASR TTY weighs approximately 360 pounds.

2.08 The 37 RO TTY (Fig. 8) is a 4-row, 150-wpm TTY which consists of a page printer. The 37 RO TTY may be used as a primary receiver or as an auxiliary receiver to a primary 37 RO TTY. When used as a primary receiver, the TTY motor runs only when the station is called in to receive. When used as an auxiliary receiver (Fig. 9),

the TTY motor runs whenever the station is selected to receive.

2.09 The overall external dimensions of the basic primary 37 RO TTY are 36-1/4 inches high, 32-1/2 inches wide, and 24-1/2 inches deep. The overall external dimensions of the basic auxiliary 37 RO TTY are 36-1/4 inches high, 22-1/2 inches wide, and 24-1/2 deep. The primary RO TTY weighs, without controller, approximately 204 pounds and the auxiliary approximately 180 pounds.

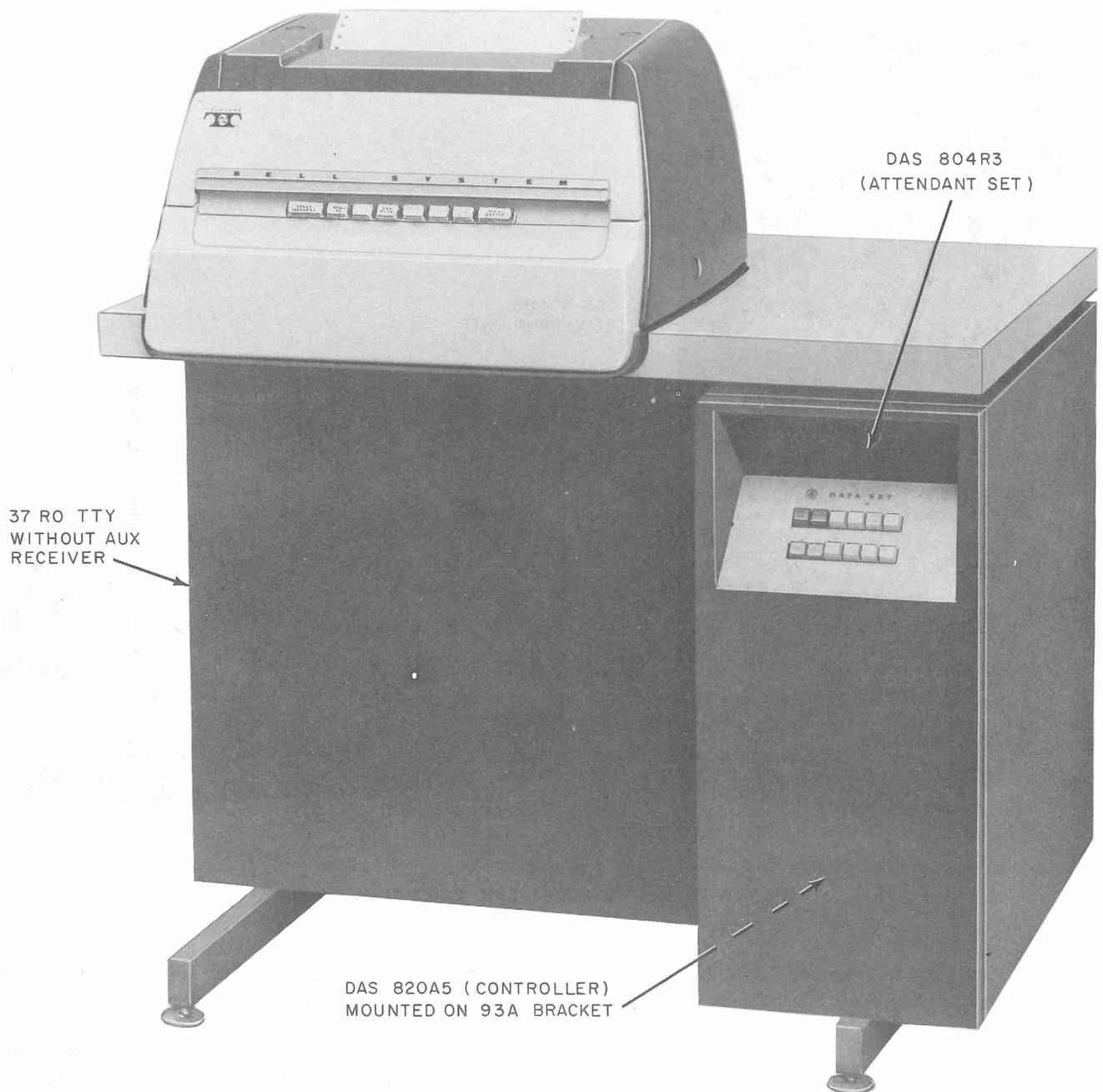


Fig. 5—Typical 37 TERM ONLY Data Station

2.10 The 37 ROTR (Fig. 10) is a 150-wpm machine which consists of a typing reperforator that punches and prints the standard 1-inch tape. It may be used for the same purposes as the 37 RO TTY except that when used as a primary receiver,

the 37 ROTR cannot be arranged to operate with an auxiliary receiver.

2.11 The overall external dimensions of the 37 ROTR are 34-1/2 inches high, 15-1/2 inches

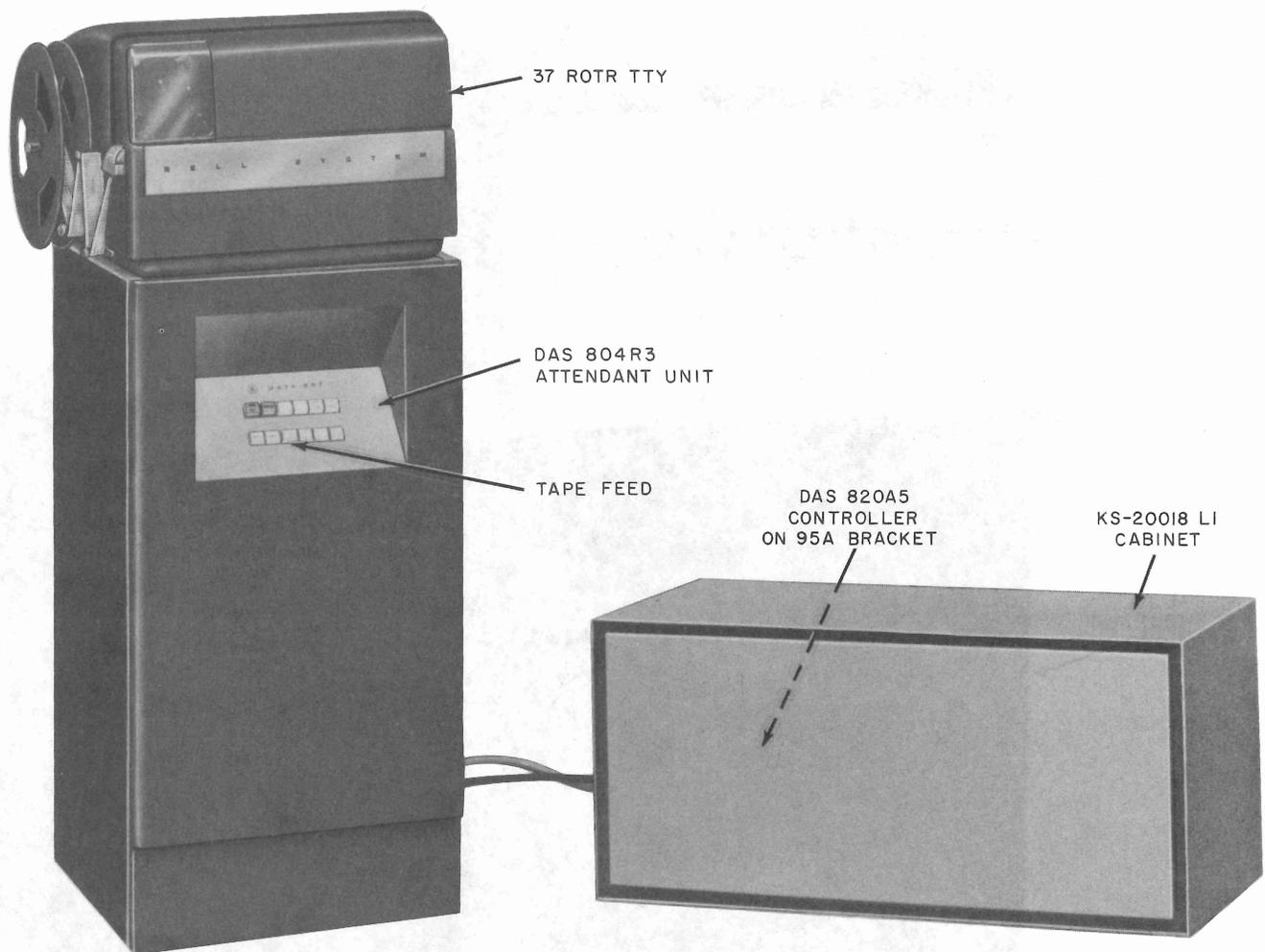


Fig. 6—Typical 37 ROTR TERM ONLY Data Station

wide (including tape winder), and 15 inches deep. It weighs approximately 75 pounds.

C. Controller

2.12 The controller is shown in Fig. 11. It comes equipped with a 24A power unit and a KS-14532 L16 power cord. The overall external dimensions of the controller are approximately 8.5 by 15.5 by 6.0 inches and it weighs approximately 19 pounds.

2.13 The controller has slots for 12 AR circuit packs (CP) and one slot for a Data Set 108A-type. Six of the CPs are for the state and control logic and timing functions, four CPs are for interface functions between the TTY and the

controller, one CP contains the *in* shift register, and one CP contains the *out* shift register.

2.14 The controller is equipped with a terminal strip for the connection of the transmission facility. Connectors are also provided for the connection of the TTY (M connector), the ASR TTY attendant set (P connector), and the primary RO or ROTR TTY attendant set (N connector). Switches are provided for control of the modulator squelch and maintenance tests (manual loop-back) circuits.

2.15 The controller for the 37-type stations (Fig. 12) is located behind the door on the right-hand side of the ASR or RO TTY table. It is mounted

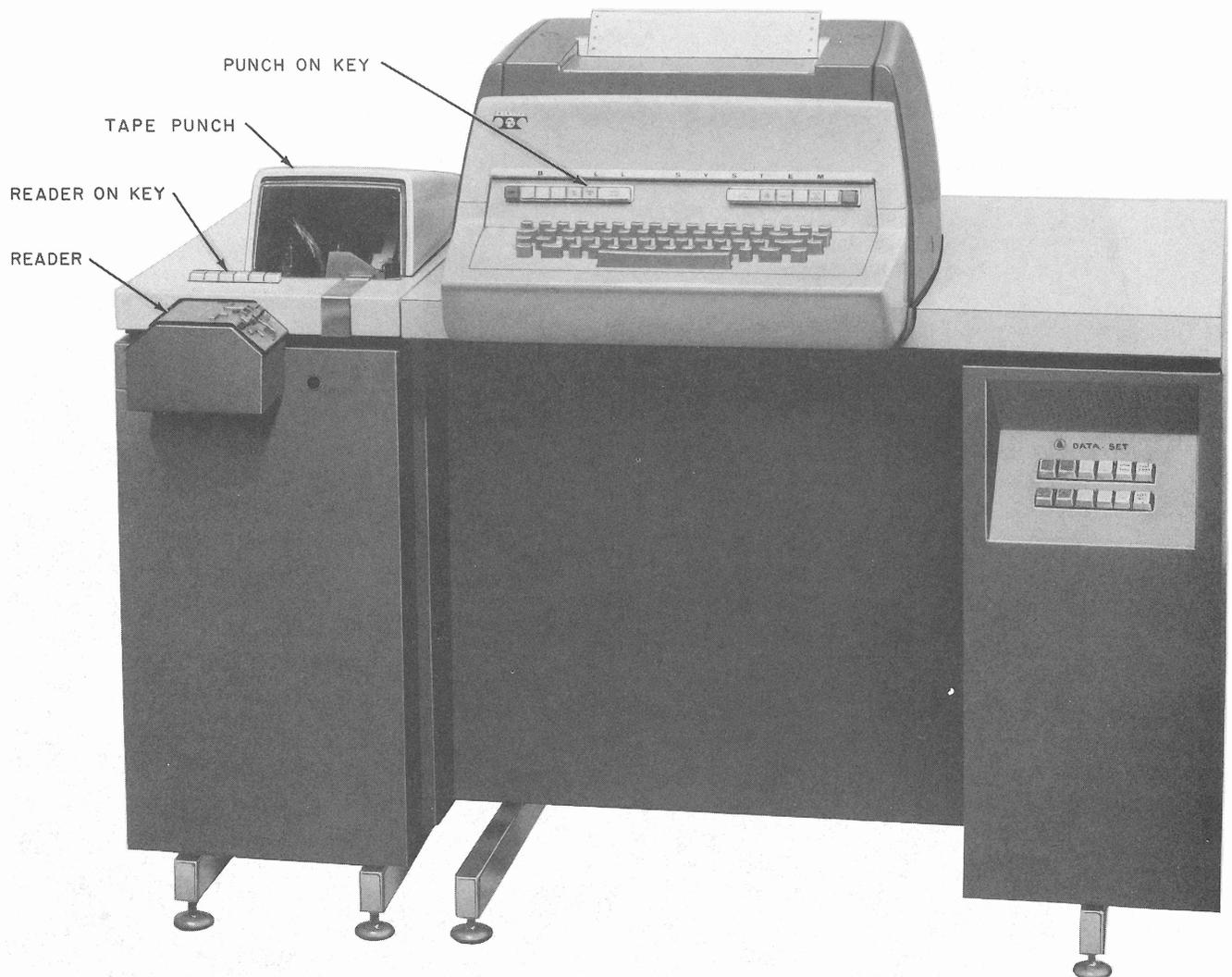


Fig. 7—37 ASR TTY

on a 93A bracket which allows it to be pulled out for maintenance and CP removal.

2.16 The controller for the 37 ROTR TERM ONLY station is located in the KS-20018 type cabinet. It is mounted on a 95A bracket in a position that facilitates maintenance and CP removal.

D. Data Set

2.17 The Data Set 108A-type is the CP located at the right-hand end of the controller (see Fig. 11). The data set is not supplied with the

controller and therefore must be ordered separately for installation with the controller.

E. Attendant Sets

2.18 Two types of attendant sets are used in the 86B2 stations. They are the DAS 804R2, and DAS 804R3. The 804R2 attendant set shown in Fig. 13 is used in the 37 ASR TTY at ORIG/TERM or ORIG ONLY stations. The 804R3 attendant set shown in Fig. 14 is used in the 37 RO TTY at ORIG/TERM or TERM ONLY stations. The DAS 804R3 attendant set shown in Fig. 15 is used in the 37 ROTR TTY at ORIG/TERM or TERM ONLY stations.



Fig. 8—Primary 37 RO TTY

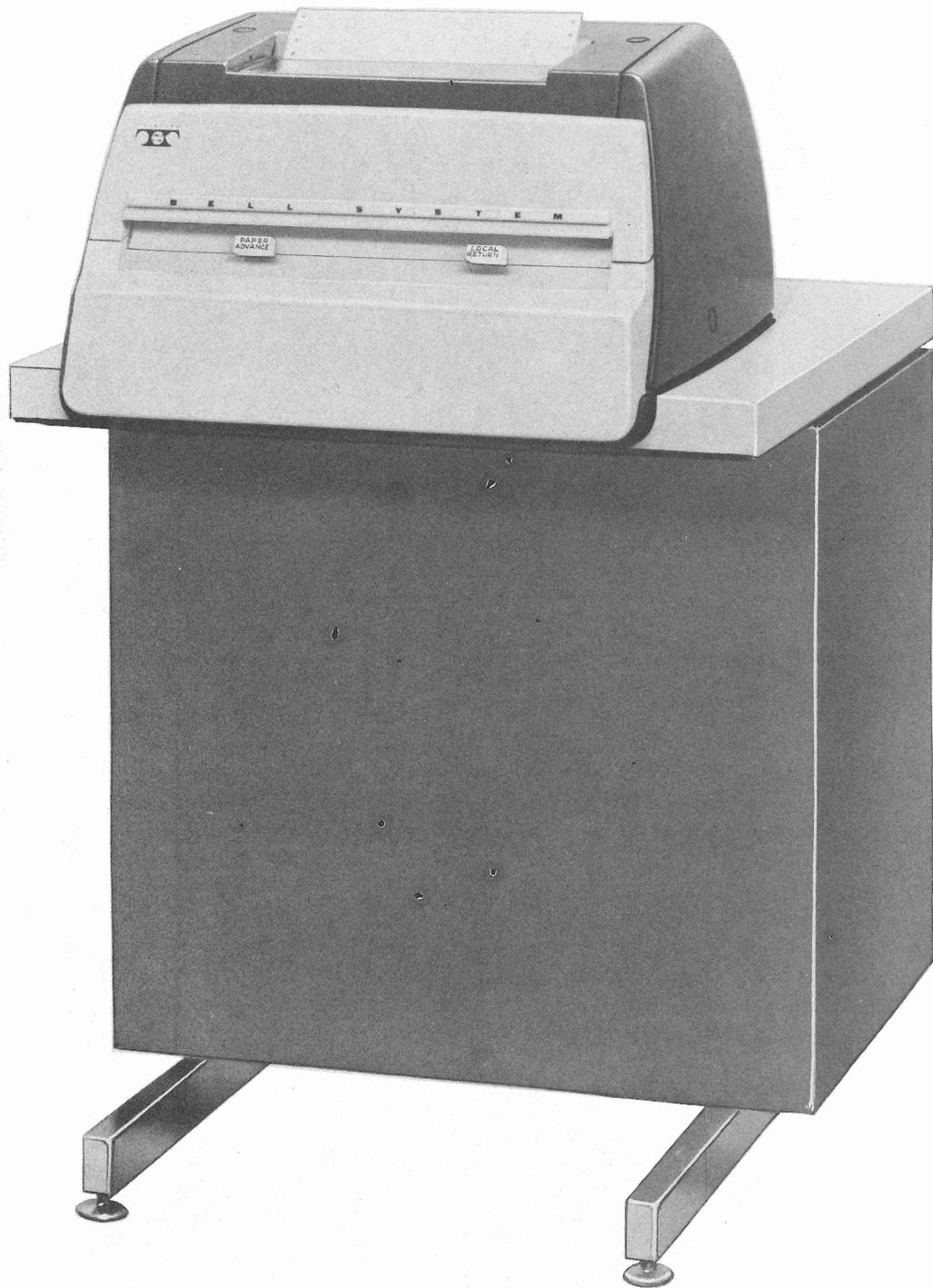


Fig. 9—Auxiliary 37 RO TTY

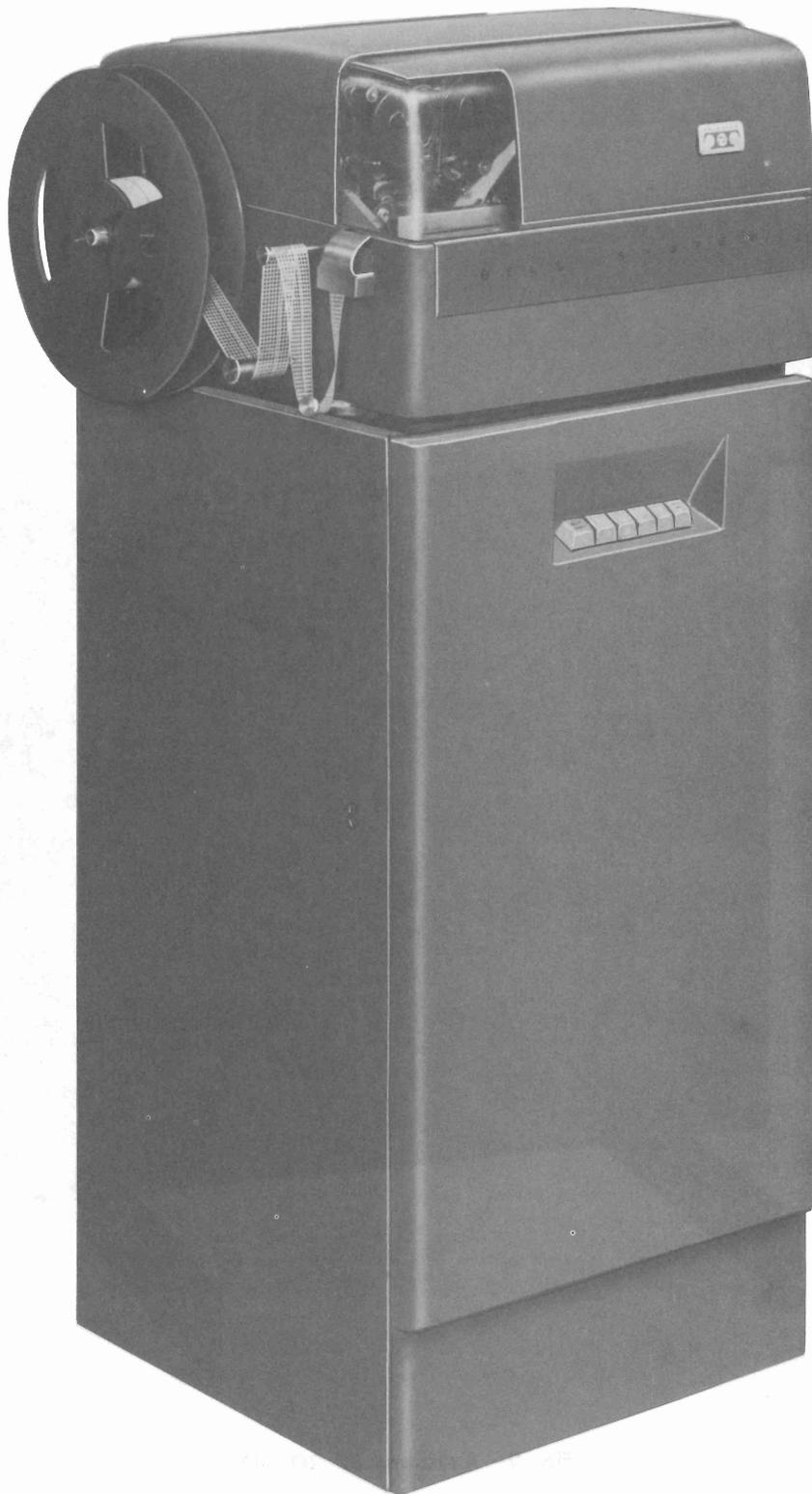


Fig. 10—37 ROTR TTY (Auxiliary)

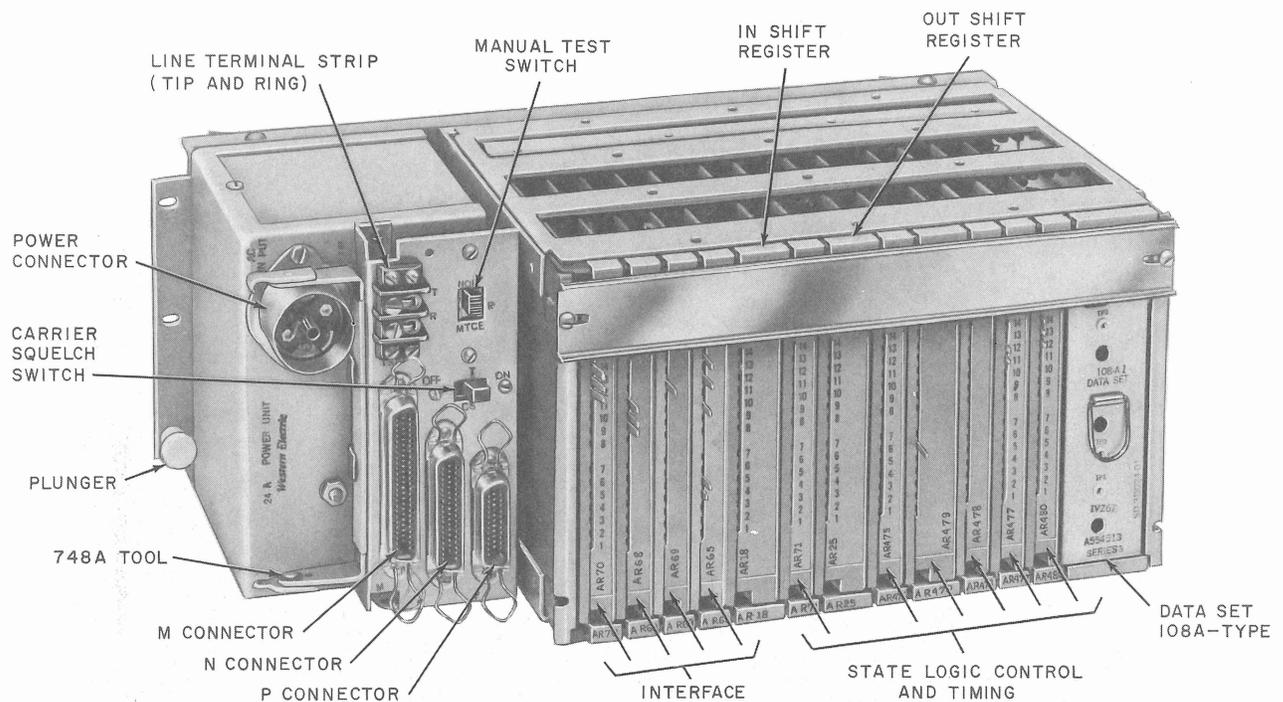


Fig. 11—Data Auxiliary Set 820A5 (Controller)

2.19 The attendant set for the ASR TTY (804R2) is mounted in the door on the right-hand side of the TTY table. It contains the keys and lamps, as shown in Table B, which are associated with the sending functions of the station.

2.20 The attendant set for the primary RO TTY (804R3) is also mounted in the door on the right-hand side of the TTY table. However, it contains the keys and lamps, as shown in Table C, which are associated with the receiving functions of the station.

2.21 The attendant set for the primary ROTR (804R3) is mounted on the front door of the ROTR pedestal. It is the same as the attendant set for the primary 37 RO TTY except for the designation of the keys and lamps, as shown in Table D. These keys and lamps are associated with the receiving functions of an ROTR station.

3. FUNCTIONAL DESCRIPTION

A. General

3.01 This part describes the functions of the various components that make up the 86B2

Data Stations and their different arrangements. In the descriptions which follow, it will be assumed that the station under consideration is an ORIG/TERM station. Message transmission will be covered separately from the message reception in order that the method of operation may be applied to ORIG ONLY and TERM ONLY station situations.

3.02 Reference will be made to the ASCII code. Table E shows the seven bit ASCII code. An eighth bit is added to provide even-bit parity. Table F gives the definitions for the various ASCII code designations.

3.03 When power is first applied to the station, an initializer circuit in the controller applies a momentary positive voltage to all critical state logic memory elements and conditions the status of the controller to the idle state. The initializing circuits in the TTY prepare the TTY as follows:

- (a) TTY in the unattended mode
- (b) Reader off
- (c) Tape punch off

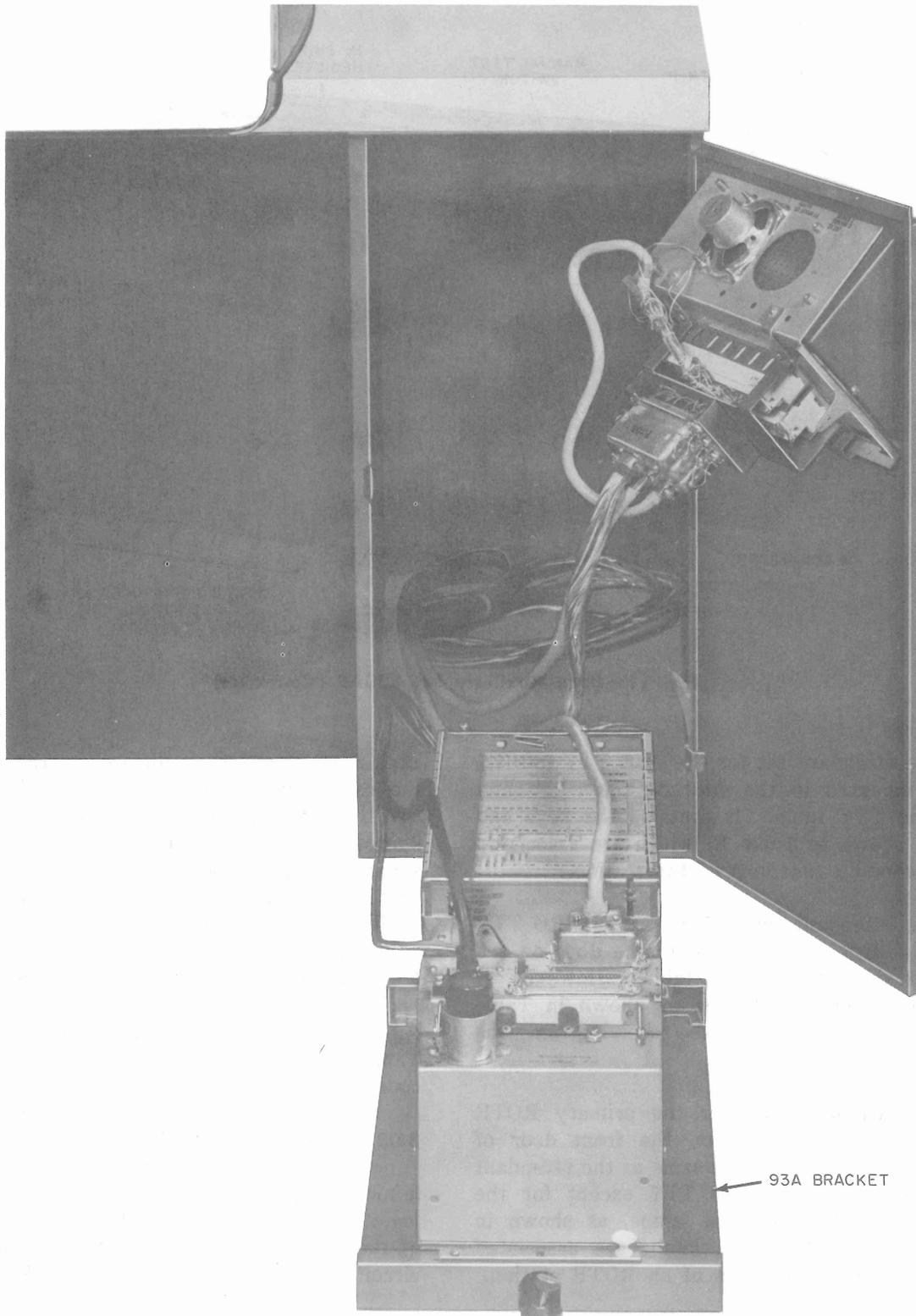


Fig. 12—37-Type Station Controller Mounting

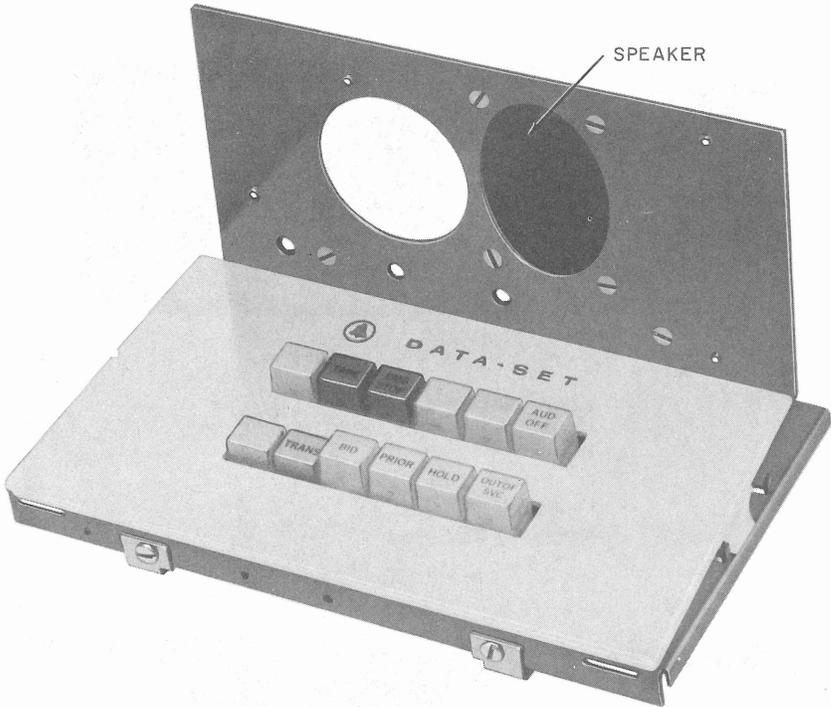


Fig. 13—DAS 804R2 Attendant Set for 37 ASR TTY at ORIG/TERM or ORIG ONLY Station

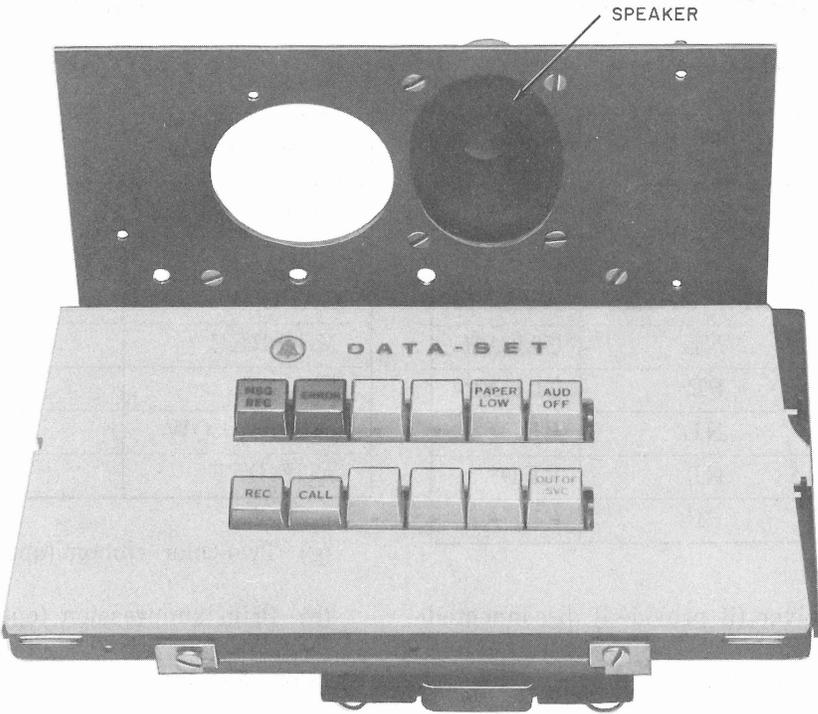


Fig. 14—DAS 804R3 Attendant Set for 37 RO TTY at ORIG/TERM or TERM ONLY Station

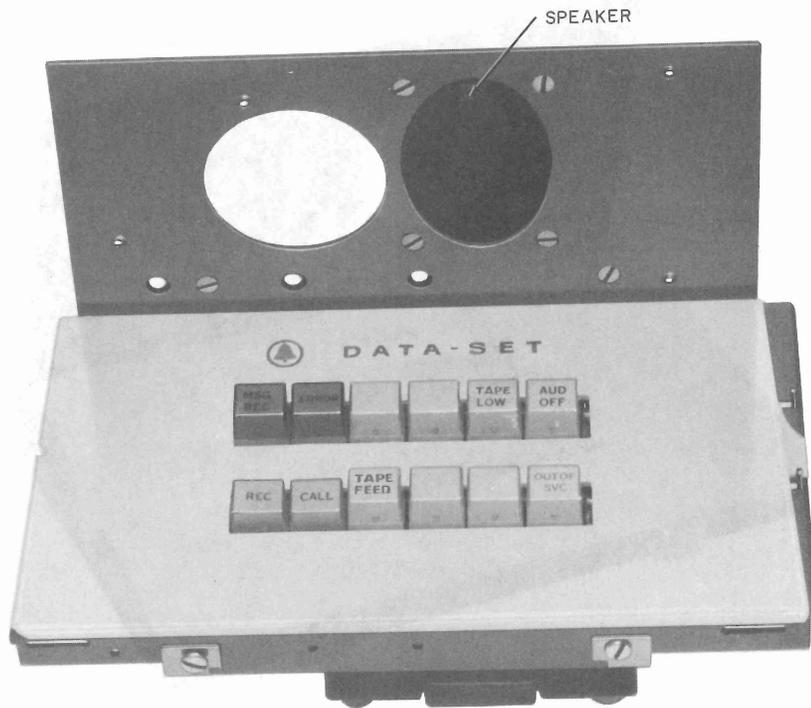


Fig. 15—DAS 804R3 Attendant Set for 37 ROTR TTY at ORIG/TERM or TERM ONLY Station

TABLE B

ASR TTY ATTENDANT SET (804R2)

KEYS AND LAMPS

DESIGNATION	KEY TYPE	LAMP COLOR
OUT OF SVC	PP	CLEAR
BID	NL	CLEAR
TRANS	LAMP ONLY	AMBER
PRIOR	NL	CLEAR
HOLD	PP	CLEAR
EMG STOP	NL	RED
TAPE	NL	RED
AUD OFF	PP	CLEAR

- (d) Auxiliary receiver (if provided) disconnected
- (e) AUX RCVR control off
- (f) End-of-line (EOL) lamp off

TABLE C

RO TTY ATTENDANT SET (804R3)

KEYS AND LAMPS

DESIGNATION	KEY TYPE	LAMP COLOR
OUT OF SVC	PP	CLEAR
REC	LAMP ONLY	AMBER
CALL	LAMP ONLY	AMBER
MSG REC	NL	RED
ERROR	NL	RED
PAPER LOW	NL	CLEAR
AUD OFF	PP	CLEAR

- (g) Two-color ribbon (option) to black
- (h) Print suppression (option) off.

Message Format

3.04 Messages are prepared from the keyboard on punched tape in the on-line or off-line

TABLE D
ROTR TTY ATTENDANT SET (804R3)
KEYS AND LAMPS

DESIGNATION	KEY TYPE	LAMP COLOR
OUT OF SVC	PP	CLEAR
REC	LAMP ONLY	AMBER
CALL	LAMP ONLY	AMBER
MSG REC	NL	RED
ERROR	NL	RED
TAPE LOW	NL	CLEAR
AUD OFF	PP	CLEAR
TAPE FEED	NL	KEY ONLY (NO LAMP)

PP denotes a push-push key.

NL denotes a non-locking key.

modes of operation. All messages follow the same format which consists of an SOH, the message heading, an STX, the text of the message, and an ETX. If a second message is prepared on one continuous length of tape, it should be put on the tape following the ETX of the first message. A third message may be put on the tape following the ETX of the second, etc. Each message must follow the same format, ie:

SOH heading STX text ETX.

In the last message, the ETX must be followed by an EOT. Delete (DEL) characters are used to allow introduction of the tape into the reader and permit the EOT character to reach the reader without causing a taut tape or tape out condition to occur. Some control characters require the use of a DEL following their use in a message. These characters are listed in Table G.

EOT Counter

3.05 The DAS 820A5 controller used in the 86B2 system is equipped with an EOT counter. This allows the utilization of continuous tape operation without the possibility of starting to send a partially prepared transmission. The messages are prepared in the on-line mode (without page copy) as described in 3.04 and fed directly from

the tape punch into the reader. When an EOT, marking the end of a transmission, is punched on the keyboard, a count is entered in the counter. The reader is then started and the BID lamp is lighted. The reader continues to run until the first SOH is detected by the controller conditioning the controller to the traffic available state. A maximum of 14 EOTs may be counted. As the computer switcher picks up the messages, the EOT count is reduced by one each time the controller detects an EOT from the tape. The station gives a traffic-available response each time it is polled until the last message is picked up and the EOT count is reduced to zero. If the EOT count exceeds 14, the controller reverts to the infinite count state which is the same state as that obtained when the BID key is operated.

BID Key Operation

3.06 When a torn tape message or a message that has been prepared in the off-line mode is to be delivered, the traffic available state can be initiated by inserting the tape in the reader, operating the READER ON key (READER ON lamp lighted), and operating the BID key on the attendant set. Operation of the BID key lights the BID lamp and starts the reader (if the transmit terminal is idle) which will run until the controller detects the first SOH character on the tape (the controller discards the DEL characters). Detection of the SOH character stops the reader, and the controller will now respond regular traffic available or, if the PRIOR key is operated, priority traffic available when polled by the computer switches.

Polling and Polling Responses (Fig. 16)

3.07 The computer switcher polls every station on the line periodically by sending DLE followed by the unique station polling code (SPC) of the station being polled. The DLE defines the start of the polling sequence and activates the appropriate logic circuits in the stations. If a message delivery was in progress, the DLE causes the control logic at the selected receiving stations to blind their receivers to signals on the line until an unblind code is detected. If the incoming line was cocked (see 3.15 (b)) when polling was initiated, the computer switcher should wait a minimum of 600 milliseconds after sending the DLE before sending the SPC. This insures that the incoming line is idle. The SPC for each station is a single character chosen from the 94 printing graphics

TABLE E
USA STANDARD CODE FOR
INFORMATION INTERCHANGE
USAS X3.4 — 1967

					0 0	0 0	0 1	0 1	1 0	1 0	1 1	1 1	
B I T S	B ₄ ↓	B ₃ ↓	B ₂ ↓	B ₁ ↓	C O L U M N →								
					R O W ↓	0	1	2	3	4	5	6	7
	0	0	0	0	0	NUL	DLE	SP	0	@	P	'	p
	0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
	0	0	1	0	2	STX	DC2	"	2	B	R	b	r
	0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
	0	1	0	0	4	EOT	DC4	\$	4	D	T	d	t
	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
	0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
	0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
	1	0	0	0	8	BS	CAN	(	8	H	X	h	x
	1	0	0	1	9	HT	EM	)	9	I	Y	i	y
	1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
	1	0	1	1	11	VT	ESC	+	;	K	[	k	{
	1	1	0	0	12	FF	FS	,	<	L	\	l	|
	1	1	0	1	13	CR	GS	-	=	M	]	m	}
	1	1	1	0	14	SO	RS	.	>	N	^	n	~
	1	1	1	1	15	SI	US	/	?	O	_	o	DEL

Denotes a 1 in the eighth bit (party bit).

TABLE F
DEFINITIONS OF VARIOUS ASCII CODES

DESIGNATION	DEFINITION	DESIGNATION	DEFINITION
NUL	Null	DLE	Data Link Escape
SOH	Start of Heading	DC1	Device Control 1
STX	Start of Text	DC2	Device Control 2
ETX	End of Text	DC3	Device Control 3
EOT	End of Transmission	DC4	Device Control 4
ENQ	Enquiry	NAK	Negative Acknowledge
ACK	Acknowledge	SYN	Synchronous Idle
BEL	Bell	ETB	End Transmission Block
BS	Backspace	CAN	Cancel
HT	Horizontal Tabulate	EM	End of Medium
LF	Line Feed	SUB	Substitute
VT	Vertical Tabulate	ESC	Escape
FF	Form Feed	FS	File Separator
CR	Carriage Return	GS	Group Separator
SO	Shift Out	RS	Record Separator
SI	Shift In	US	Unit Separator
DEL	Delete	SP	Space

(with the exception of X, W, and +) of the ASCII code.

3.08 The station polling response depends on the status of its sending and receiving terminals and are as follows:

- (a) CAN—the CAN response is sent if the station has no traffic to send and is ready to receive.
- (b) NAK—The NAK response is sent if the station has no traffic to send and is not ready to receive.
- (c) P-ACK—The P-ACK response is sent if the station has priority traffic to send and is ready to receive.

(d) R-ACK—Same as (c) except the traffic has regular status.

(e) P-NAK—The P-NAK response is sent if the station has priority traffic to send and is not ready to receive.

(f) R-NAK—Same as (e) except the traffic has regular status.

The reaction of the computer switcher should be somewhat different for each of these possible responses.

3.09 Upon reception of any polling response, the computer switcher may send the SPC of the next station to be polled. It is not necessary

TABLE G
FILL CHARACTERS

CONTROL CHARACTER	NUMBER OF DEL CHARACTERS NEEDED
CR (carriage return)	2
New Line	2
FF (form feed)	1
VT (vertical tab) clear	1
VT	1
HT (horizontal tab) clear	1
HT	1
DC2	1
DC4	1
*ETX	1

*Only when used to disconnect an auxiliary receiver.

that the DLE be sent again, however, the presence of another DLE character will not adversely affect the station operation.

3.10 Since the 86B2 station responds to polling without becoming selected as a sender, a separate function is required to assign selected-to-send status to a station. If the computer switcher does not make any distinction between regular and priority-pickup conditions, it may select the station as a sender upon receipt of either a P-ACK, P-NAK, R-ACK, or R-NAK response. If, however, the computer switcher does distinguish between the regular and priority-pickup conditions, it may immediately select that station to send upon receipt of the P-ACK or P-NAK responses only and send the SPC of the next station to be polled on receipt of the R-ACK or R-NAK responses.

3.11 If an invalid response (any response other than CAN, NAK, R-ACK, R-NAK, P-ACK, or P-NAK) is received by the computer switcher in the form of a single or two character response, the computer switcher should repoll the station in question by sending DLE to redefine the polling

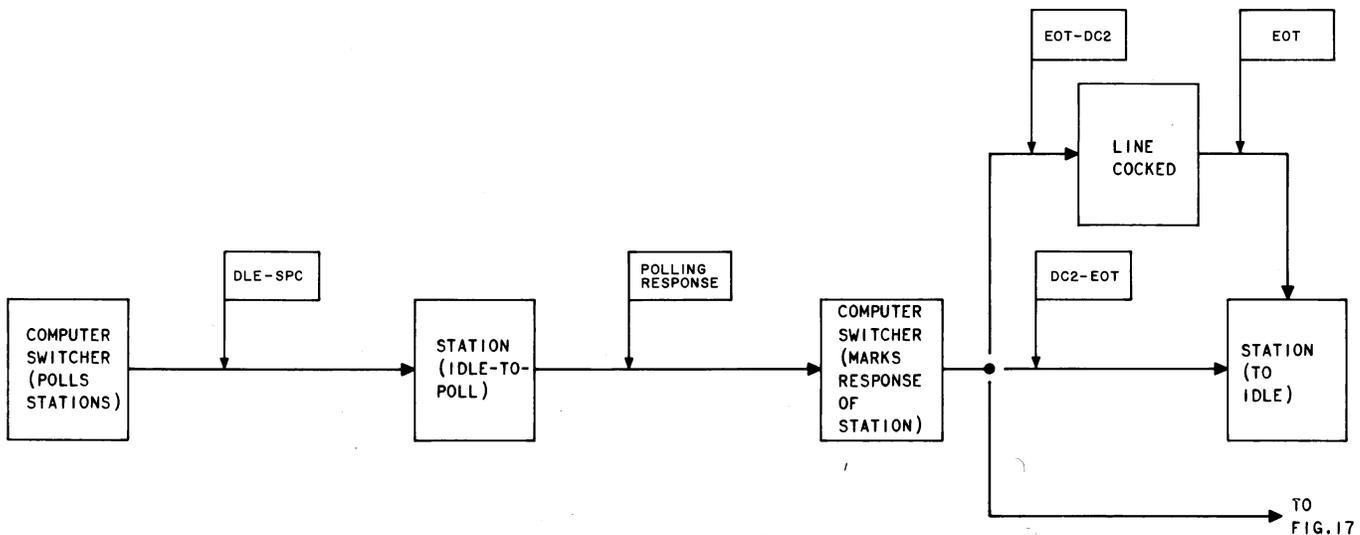


Fig. 16—Station Polling Response Sequence Chart

sequence followed by the SPC of that particular station. The assumption in this case is that the response was legitimate but had been affected by noise on the line in such a manner that the computer switcher could not recognize it as a valid response.

3.12 If the invalid response takes the form of a continuous transmission from one of the stations, the computer switcher should initiate an emergency stop action (see 3.28) with an appropriate service message and restart the polling sequence with the last station polled.

3.13 The computer switcher should employ a response time-out circuit that provides an indication when a response is not received within a specified interval (usually 600 milliseconds). If a response time-out occurs, the computer switcher should repoll the station in question by sending DLE followed by the SPC of that particular station.

3.14 The 86B2 stations are designed to include the status of the station receiving terminal as a part of every polling response. This information is provided as an aid to the computer switcher in determining whether or not it is worthwhile attempting a delivery to the station receiving element.

3.15 There are three ways to terminate the polling sequence. They are:

(a) Return all stations to idle—To return all of the stations to idle, the computer switcher sends the control character DC2 (device control 2). Upon detection of this code, all of the sending stations will assume the idle condition and any previously selected receive stations blinded by DLE will be unblinded allowing the resumption of any interrupted message delivery.

(b) Cock the sending stations—To cock the sending stations, the computer switcher sends the two character sequence EOT DC2. Upon detection of EOT while in the polling state, all sending stations will assume the cocked state and any selected receiving stations will remain selected to receive. The DLE EOT DC2 will activate the proper station logic circuitry so that the stations will automatically generate their station identity code (SIC) as a polling request signal when they have traffic to send. The computer switcher should now be prepared to accept a polling request signal when it is generated. The DC2 will also unblind any selected receive stations blinded by DLE allowing any interrupted message delivery to be resumed.

(c) Selecting a station to send—When a response to polling indicates that a station has traffic to send that should be picked up, the computer switcher terminates the polling sequence by selecting the station as a sender. To do this, the computer switcher sends the control character ENQ (enquiry) followed by the CEC (call enquiry code) of the station being selected to send as described in 3B. of this section. Detection of

ENQ will define the end of polling for all other stations on the line.

B. Sending the Message (Fig. 17)

3.16 There are three conditions under which the computer switcher may elect to select a station to send. They are:

(a) After receiving a response to polling that indicates the station has traffic to send. If the status of the traffic is priority and the computer switcher is arranged to distinguish between priority and regular traffic, the computer switcher may immediately select the station as a sender. If the computer switcher does not distinguish between priority and regular status traffic, it may select the station as a sender for any traffic available response.

(b) When the sending stations have been cocked and a polling request signal is received. The polling request signal of a station is the station identity code (SIC) of the station and indicates the exact station with traffic to send to the computer switcher.

(c) When a computer switcher arranged to distinguish between priority and regular traffic has polled all of the stations and has marked one or more of the stations as having regular traffic available.

3.17 Since, in the case of 3.16 (a), the station is in the polling mode, the computer switcher will, after receiving a traffic available response, send ENQ followed by the stations CEC to select the station as a sender. In the cases of 3.16 (b), the computer switcher will first poll the station which generated the polling request signal and, if traffic is still available, select that station to send by sending the ENQ CEC sequence. However, if the polling request signal is an invalid SIC (such as a hit on the line or simultaneous generation of the polling request signal by two or more stations), the computer switcher should initiate a full polling cycle. In the case of 3.16 (c), the computer switcher may elect to pick up traffic from any station marked as having traffic available. If the stations are still in the polling mode, the computer switcher can select a station to send by sending the ENQ CEC sequence. If for some reason the polling mode has been terminated, the computer switcher must precede the ENQ CEC with a DLE.

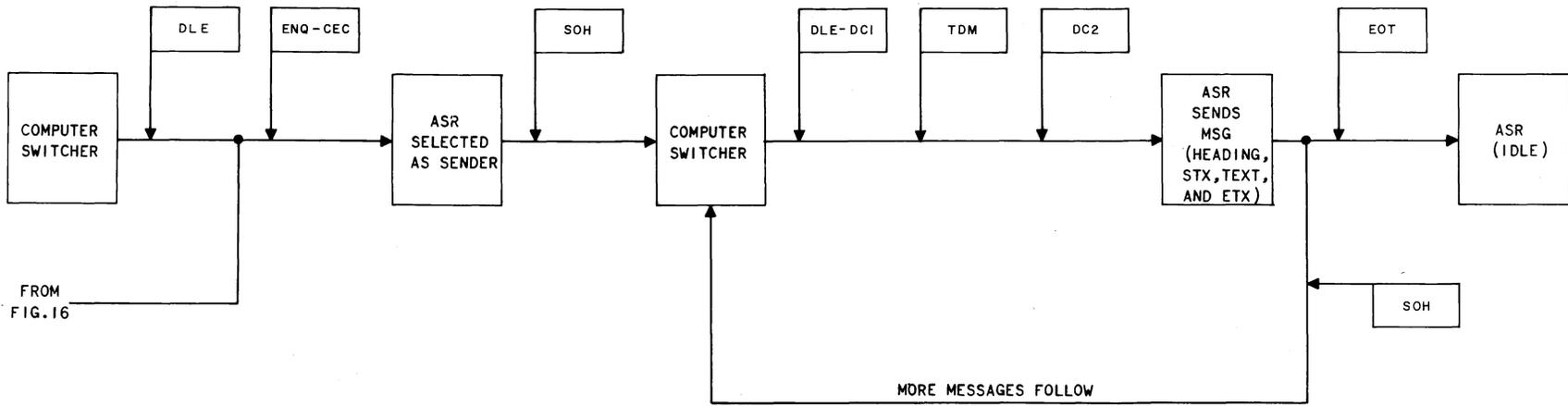


Fig. 17—Sender Selection Sequence Chart

3.18 If the station selected is still in the traffic available state, detection of the ENQ CEC will cause the station controller to send SOH. After sending SOH, the station will enter the selected to send mode (TRANS lamp lighted). After the computer switcher receives the SOH, it should transmit the sequence DLE DC1. The DLE initiates the polling sequence as previously described and the DC1 transfers the ASR TTY page printer to the receive side of the controller.

3.19 If any information (such as the TDM of the message) is required, the computer switcher will now send it to the station and it will be copied by the stations transmit terminal page printer. This information will appear ahead of the message heading and text on the station local copy. Since the incoming line to the computer switcher is idle at this time, one of the six normal polling responses may be received by the computer switcher if any station on the line has not received the DC1. In this event, the computer switcher should resend DLE DC1 plus the intended information, flagged as a possible duplicate, to insure that the selected sender receives all of the information. This should be followed by DC2. If no information is required, the computer switcher will follow the DLE DC1 immediately with a DC2 character.

3.20 In either case, detection of the DC2 character will transfer the transmit terminal page printer back to the transmit side of the controller and start the reader. The DC2 will also unblind any selected receivers that were blinded by the DLE and delivery of any interrupted message may be resumed. If, after having sent the DC2, the computer switcher gets no response from the station within the response time-out interval, the computer switcher should send the sequence DLE DC1 DC2. If repeated attempts to start the station transmitter are unsuccessful, the computer switcher should initiate an emergency stop action, send an appropriate service message, follow the system defined trouble report routine, and reactivate the polling sequence with either the next station to be polled or the next station to be selected as a sender.

3.21 If the station no longer has traffic available when the computer switcher attempts to select it as a sender, it will respond to ENQ CEC with NAK. The computer switcher will then proceed to do one of the following:

- (a) Poll the next station (DLE SPC).

- (b) Cock the sending stations.

- (c) Leave the stations in the idle state.

If the computer switcher has performed either (b) or (c) and a message delivery has been interrupted for polling, the computer switcher must send DC2 to unblind the selected receive stations and resume the message delivery.

3.22 As previously mentioned, the detection of DC2 starts the selected station reader. Under normal operation, the station will now send the message heading, STX, text of the message, ETX, any DEL fill characters, and either SOH defining the start of another message in this transmission or EOT indicating the end of the transmission. The station will stop transmitting after sending the SOH or EOT and not before except for interruptions caused by receiver call-in roll-call functions, or if the HOLD key on the transmit terminal attendant set is operated (see 3.26).

3.23 An intercharacter interval timer (usually 30 seconds) is employed by the computer switcher in case an unauthorized interruption in traffic pickup occurs. In the event an unauthorized interruption does occur, the computer switcher will transmit the sequence DLE DC1 DC2 again in an attempt to restart the selected station reader. If repeated attempts to restart the reader are unsuccessful, the computer switcher may initiate an emergency stop action, send an appropriate service message, follow the system defined trouble report routine, reactivate the polling sequence with the next station to be polled or attempt to select the next station to be selected as a sender. During the message pickup, the computer switcher should monitor the reception for repeated characters. Should this occur, the computer switcher may initiate an emergency stop action and continue as described.

3.24 If, after sending the message, the station has stopped on an SOH, it will wait for the computer switcher to send DLE DC1 and then proceed as described in 3.19 through 3.23.

3.25 After sending the EOT, the station will automatically be unselected as a transmitter and, if the traffic available state was initiated by the operation of the BID key, the reader will continue to run until either a taut tape/tape out condition occurs or another SOH is detected from

the tape. If the traffic available state was initiated by the EOT counter and the count is zero, the reader will stop when EOT is detected from the tape. Upon detection of the EOT, the computer switcher should either continue with the polling sequence by polling the next station in the polling order, attempt to select the next station to be selected as a sender, or cock the line. If the computer switcher receives an EOT from the station without an intervening ETX, the message format has been violated. Since the selected sender has assumed the idle condition, the computer switcher cannot initiate an emergency stop action to deliver a service message. In order to inform the station of the error in the message format, the computer switcher should generate a message explaining the problem for delivery to the station receive terminal. In the case of an ORIG ONLY station, some receive terminal should be assigned for this purpose.

Hold Operation (Torn Tape Message Introduction)

3.26 The HOLD key on the station transmit terminal attendant set permits the introduction of a message contained on a separate piece of tape during an in-progress transmission following the ETX of the message in progress. Operation of the HOLD key while a message is being transmitted, causes the station reader to stop after sending ETX. When the reader stops, the HOLD lamp will light and the audible alarm will sound indicating that the torn tape message may be inserted in the reader. The tape alarm is inhibited during the hold state. When the reader gate is opened, the BID lamp is extinguished, however, the station remains selected to send. The torn tape message must conform to the standard message format. Once the torn tape message tape is in place, restoration of the HOLD key and operation of the BID key will restart the reader. The AUD OFF key must be operated and then restored to silence the audible alarm. The reader will run and transmit any DEL fill characters on the tape. The computer switcher will ignore the DELs and the reader will stop when the controller detects SOH from the tape. The station will transmit the SOH. Detection of the SOH will cause the computer switcher to send DLE DC1. The computer switcher will now proceed as described in 3.19 through 3.23. Operation of the HOLD key, while the torn tape message is being delivered, will cause the reader to again stop on detection of ETX. The original tape can now be reinserted in the reader and the transmission resumed as before.

3.27 While the tape is being changed, the line is held marking and the computer switcher allows an adequate time-out interval (usually 30-seconds) to pass before initiating an emergency stop action. If the message delivery has not resumed within this interval, the computer switcher proceeds as described in 3.23. However, if the message delivery is resumed within this period, the delivery will continue in the normal manner.

Emergency Stop (Fig. 18)

3.28 There are situations, other than receiver call-in and roll call, which may make it necessary for the computer switcher to interrupt a transmitting selected sender. In this event, the computer switcher will perform an emergency stop action, transmit a service message to the sender, return the station to idle, and continue in the normal manner. The complete message format of the emergency stop procedure is:

DLE X DC1 service message DC3 DC2

3.29 The DLE blinds any selected to receive stations and stops the sending reader. The X extinguishes the BID lamp, causes the EMG STOP lamp on the transmit terminal attendant set to be lighted, and activates the audible alarm. The DC1 transfers the ASR TTY page printer to the receive side of the controller. The computer switcher may now send the service message which will be copied by the ASR TTY page printer. The DC3 following the service message unselects the send station. The station will remain in this state until the emergency stop condition is cleared by the operation of the EMG STOP key. This extinguishes the EMG STOP lamp and silences the audible alarm. The DC2 unblinds any receive stations that were blinded by the DLE, allows delivery of any interrupted message, and returns all unselected stations to idle.

C. Call-In and Roll Call

Call-In (Fig. 19)

3.30 Call-in involves calling each intended receiver, receiving a response indicating its ready-to-receive status, and enabling the stations to receive. If the outgoing side of the computer switcher has had a period of inactivity, the computer switcher should precede the call-in function with

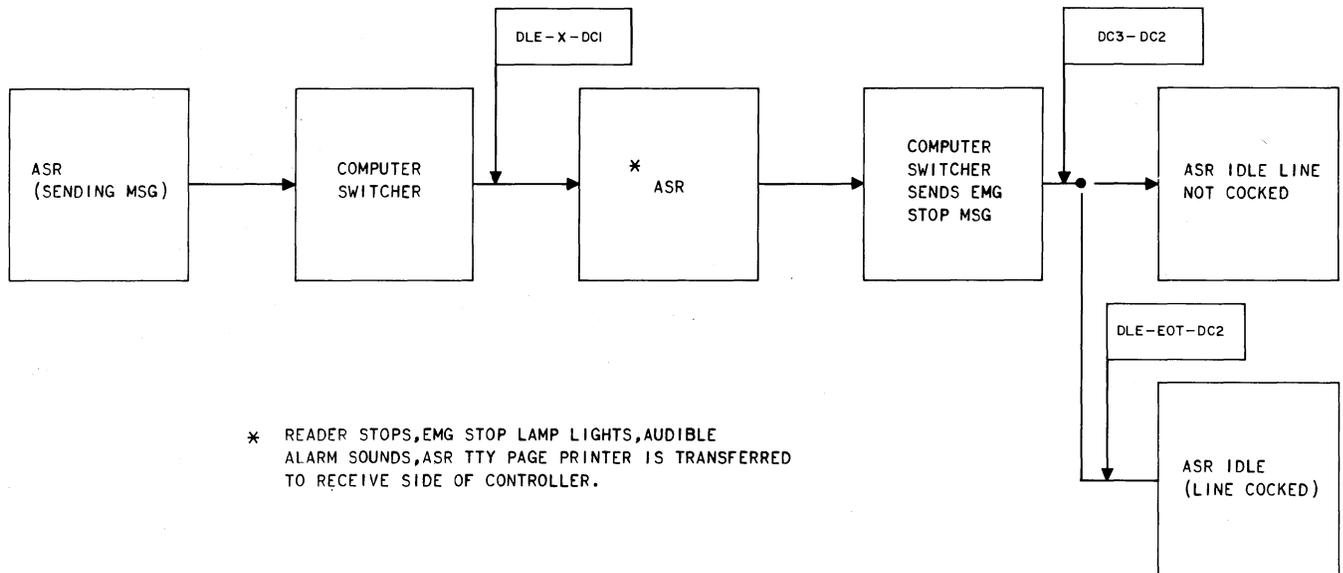


Fig. 18—Emergency Stop Sequence Chart

the sequence DC2 EOT DC2. This insures that all of the receive stations are idle.

3.31 If the computer switcher has marked a station ready to receive during polling, it can elect to call in that station as a receiver. The call-in procedure is initiated by the termination of the polling sequence and the transmission of ENQ by the computer switcher. This will stop transmission from any selected sender, inhibit the generation of a polling request by any cocked sending stations, define the beginning of the call-in procedure, and blind any previously selected receive stations.

3.32 When an interruption of traffic from a station or inhibition of polling request signals from cocked sending stations is required, the computer switcher may immediately follow the ENQ with a DEL. This is followed by a pause of sufficient duration to insure that the incoming side of the computer switcher is idle. After the required pause, the computer switcher again will send ENQ. This time the ENQ is immediately followed by the CEC of the intended receiver. The computer switcher will now wait for the station response.

3.33 When an interruption of incoming traffic is not required and the originating stations are not cocked, the computer switcher should immediately

follow the initial ENQ with the CEC of the intended receiver and wait for the station response.

3.34 The station will respond to call-in with its SIC followed by either ACK if it is still ready to receive or NAK if it has become not ready to receive. If the station replies NAK, the CALL lamp on the receive terminal attendant set will be lighted. The CALL lamp can be extinguished by returning the station to ready.

3.35 A station will be marked not ready to receive if any of the following conditions exist:

- (a) The receive terminal of the station is out of service.

Note: The station, if selected as a receiver, cannot be placed out of service until it is returned to idle.

- (b) Paper is low or form is out and the station is not selected to receive.
- (c) Form is being fed and the station is not selected to receive.
- (d) The controller is in the process of initialization.
- (e) Tape is low at primary receiver (37 ROTR).

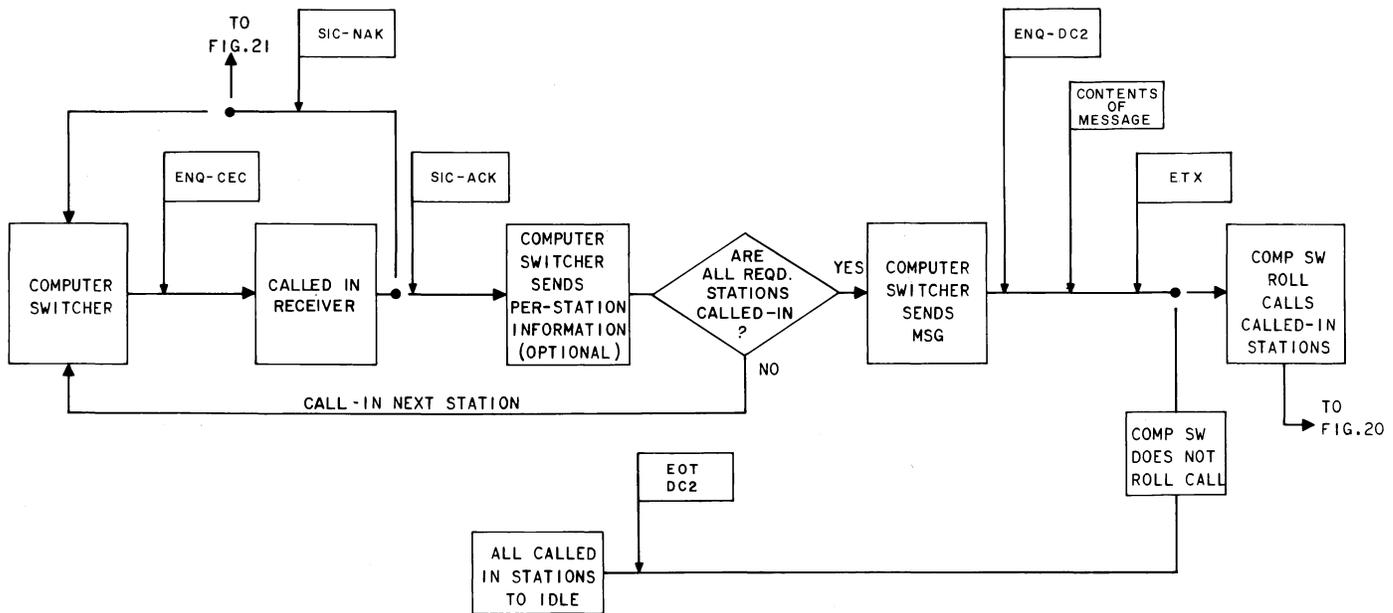


Fig. 19—Call-In Sequence Chart

(f) Tape feed out (TFO) occurs at the primary receiver and the station is not selected to receive (37 ROTR).

Note: An option may be used in the ROTR to allow selection of the station while feed-out is in progress.

3.36 If the station response is ACK, the CALL lamp will flash and the REC lamp on the primary receive terminal attendant set will be lighted. This indicates that the station is selected as a receiver. The computer switcher can now send per station information, such as personal address information (PAI) and/or message delivery number, to the called-in receiver. Since any previously called-in receiver has been blinded by the ENQ, this information will only be copied by the station being called in.

3.37 If additional stations are to be called in, the process described in 3.33 through 3.36 should be repeated for each station to be called in. After all of the intended receivers have been called in, the computer switcher will send ENQ DC2. This should unblind all of the called-in

receivers, restart any transmission that was stopped by the ENQ that initiated call-in, and allow any cocked stations to generate their polling request signals. The computer switcher may now send any information, such as date and time record, that is common to all of the called-in receivers. The computer switcher will follow this information with the entire message starting with STX all the way through ETX. This also will be copied by all of the called-in receivers.

Invalid Responses to Call-In

3.38 If the invalid response takes the form of SIC followed by something other than ACK or NAK, the computer switcher should make an attempt to call in the station a second time. If repeated attempts at call-in fail, the computer switcher may perform a delivery abort (see 3.51 and 3.52) and proceed to start the call-in process over again with the first addressee.

3.39 If the invalid response takes the form of a continuous transmission and there is no garbling of the message detected, the computer switcher may accept the incoming message as a

valid part of the traffic pickup and reinitiate call-in as described in 3.32. Any previously selected receivers should still be in the ready to receive mode and unaffected by what has taken place.

3.40 If the invalid response takes the form of a SIC ACK with the wrong SIC, one of four things can happen dependent on the programming of the computer switcher. These are:

- (a) The computer switcher can continue with call-in until all of the intended receivers have been called in and then deliver the message to the wrong station along with the proper stations.
- (b) The computer switcher can deselect this station along with any other previously selected receivers by sending EOT and reinitiating call-in with the first addressee.
- (c) The computer switcher can send ENQ DC2 followed by an explanation of why the stations are being selected and then immediately deselected. The message of explanation will be followed by EOT which will return the selected receivers to idle. In this instance, there will be no alarm sounded at the selected receivers. The computer switcher can now proceed to reinitiate call-in with the first addressee.
- (d) The computer switcher can perform the delivery abort procedure (see 3.51 and 3.52). In this instance, an alarm will be sounded at the selected stations.

If, in the case of (b) and (c), the computer switcher for some reason does not elect to reinitiate call-in, EOT will be followed by DC2. This will restart any transmission stopped by the ENQ and allow any cocked stations to generate their polling request signals.

No Response to Call-In

3.41 If the computer switcher receives no response to a call-in attempt, it should make a second attempt to call in the station. If repeated attempts to call in a station fail, the computer switcher may proceed with the call-in, deliver the message to the remaining stations, and provide for a later delivery of the message to the station that failed as prescribed for by the particular station application. Alternatively, if delivery is not to be made to any

of the stations for some period of time, the computer switcher may perform a delivery abort to inform any previously selected receivers of the reason for the immediate disconnect without a message delivery.

Roll Call (Fig. 20)

3.42 Roll call is the performance of a call-in operation of the already selected receivers at the conclusion of the message delivery to determine if the receivers received the message properly. It consists of calling each of the stations individually and getting a response from them that indicates whether or not they received the message properly. After delivery of the message up to and including ETX, the computer switcher may or may not, dependent on its programming, perform the roll call operation.

3.43 If the computer switcher is not programmed to perform roll call, the ETX should be followed by an EOT.

3.44 If the computer switcher is programmed to perform roll call, it will initiate the operation by following the ETX of the message with ENQ. As in the call-in procedure, the ENQ will stop any sending reader, inhibit the generation of any polling request signals by any cocked stations, initiate automatic TFO (option), and blind all of the selected receivers. However, since ETX preceded the ENQ this time, it will define the beginning of roll call instead of initiating call-in. After sending ENQ, the computer switcher will proceed as described in 3.32 and 3.33 for the call-in sequence.

3.45 The station will respond to roll call with its SIC followed by either CAN, if the message was received properly, or NAK if the message was not received properly. The NAK response is generated if any of the following occur during the interval between the time the station was selected to receive and roll call.

- (a) A paper-out condition was detected on a sprocket-feed machine that resulted in part of the message being lost.
- (b) The terminal device failed to respond to the received signals during message delivery (a character was lost and did not reach the typing unit).

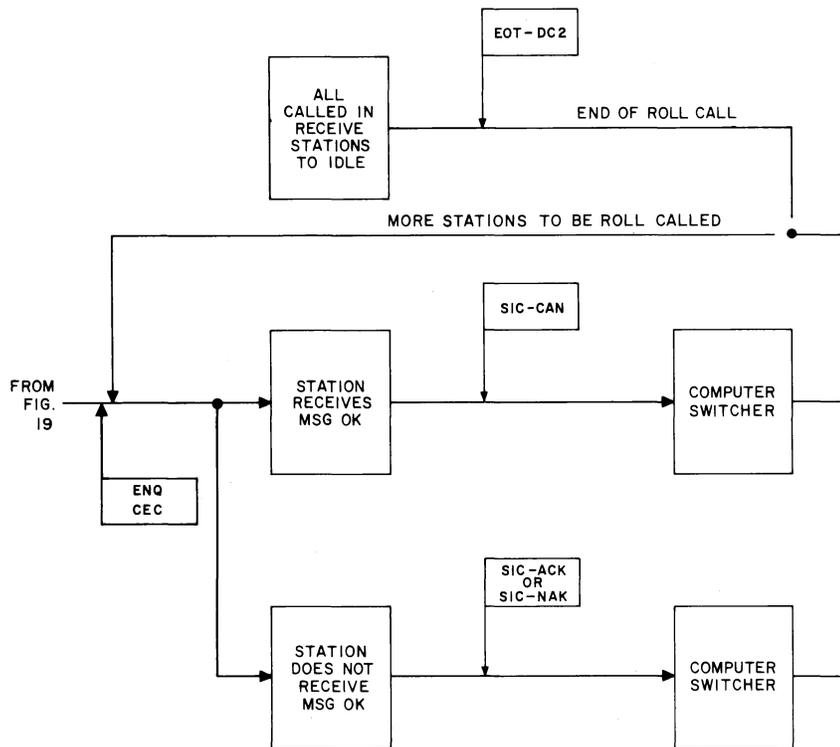


Fig. 20—Roll Call Sequence Chart

- (c) Two ETX characters were detected.
- (d) Any condition which causes a message reception alarm (MSG REC lamp lighted).

3.46 If the station responds with NAK to roll call, the MSG REC lamp on the receive terminal attendant set will be lighted and the audible alarm will sound. The computer switcher should mark the receipt of this response and deal with the redelivery of this message in the manner prescribed for by the particular system application. The computer switcher may now proceed to roll call the next station in line in the manner just described. The MSG REC lamp can be extinguished and the alarm silenced by operation of the MSG REC key on the attendant set. If the station answers CAN to roll call, the computer switcher should proceed to roll call the next station in line by sending ENQ followed by the CEC of that station.

3.47 If an invalid response, other than SIC ACK or a continuous transmission occurs, the computer switcher may make a second attempt to

roll call the station. If repeated attempts fail, the computer switcher should treat the response the same as it would a SIC NAK response.

3.48 If the response to roll call is SIC ACK, it means the ETX at the end of the message was not received and/or detected error free by the controller. The computer switcher should treat this response the same as a SIC NAK response.

3.49 If the response is in the form of a continuous transmission, the computer switcher should accept the incoming traffic as a valid part of traffic pickup, and make a second attempt to roll call the station. If repeated attempts fail, the computer may proceed as for a SIC NAK response.

3.50 After all of the receivers have been roll called, the computer switcher should do one of two things.

- (a) It can send ENQ DC2 to unblind all of the selected receivers and then deliver common information, such as date and time record, to

the receivers. This then would be followed by EOT DC2.

(b) It can send EOT DC2. The EOT will return all of the selected receivers to idle. The DC2 will restart any interrupted transmitting station and enable the cocked stations to generate their polling request signals.

Delivery Abort (Fig. 21)

3.51 The complete message format for a delivery abort is:

DLE W DC2 service message EOT DC2

The DLE blinds any selected receivers, stops the reader of any selected sender, and uncocks the send stations (if cocked). The W causes the MSG REC lamp on the receive terminal attendant set to be lighted and the audible alarm to sound. The DC2 unblinds any selected receivers that were blinded by DLE and restarts any reader that may have been interrupted. If a service message is to be included, it will follow the DC2. The MSG REC lamp may be extinguished and the alarm silenced by the operation of the MSG REC key. The EOT restores the selected receivers to idle and the DC2 will restart any interrupted reader.

3.52 If after a delivery abort service message has been delivered the send line is to be cocked, the computer switcher will follow the service message EOT DC2 with DLE EOT DC2. If no service message is delivered following the delivery abort, the DC2 following the DLE W will be

followed by EOT DC2. This will return any selected receivers to idle. If the send line is to be cocked the EOT DC2 must be followed by DLE EOT DC2.

D. Auxiliary Receiver Connect and Disconnect

3.53 A 37 RO or ROTR TTY may be used as an auxiliary receiver at a 37 ORIG/TERM or TERM ONLY station. It may be connected or disconnected manually and automatically if a wiring option is provided in the primary machine.

3.54 The auxiliary machine is connected manually by the operation of the AUX RCVR key located on the primary receiver. This unblinds the auxiliary receiver selector magnet driver (SMD) which is in parallel with the SMD of the primary receiver, thereby allowing the auxiliary receiver to print the same information that is received by the primary receiver. A lamp located in the AUX RCVR key on the primary receiver is lighted whenever the auxiliary receiver is connected manually. Restoration of the AUX RCVR key disconnects the auxiliary receiver.

3.55 When the wiring option that allows automatic auxiliary receiver connect and disconnect is provided in the primary receiver, reception of DC2 by the primary receiver stunt box will connect the auxiliary receiver, and reception of ETX and/or DC4 (option) will disconnect the auxiliary receiver. In this case, the lamp in the AUX RCVR key is not lighted. In addition, the auxiliary receiver can be disconnected only when both the manual and automatic controls are in the disconnect state.

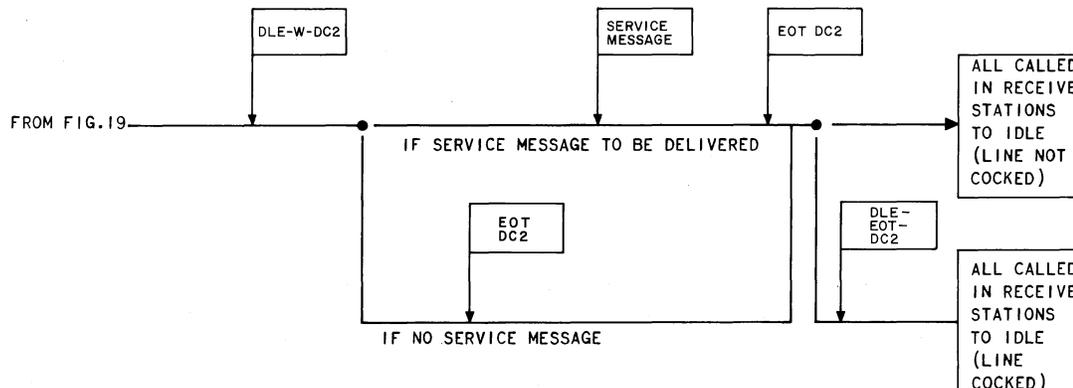


Fig. 21—Delivery Abort Sequence Chart

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When automatic connect and disconnect is used, the associated control characters (DC2, DC4, or ETX) must be followed by at least one DEL.

3.56 A further option, called print suppression, may also be provided. This option causes the typing unit of the primary receiver to be inhibited from printing while the auxiliary receiver is connected automatically by the on-line control character DC2. Disconnecting the auxiliary receiver by DC4 or ETX will restore the primary receiver typing unit to service.

3.57 When the auxiliary receiver is a 37 ROTR, a wiring option may be installed in the primary RO which allows automatic tape feed out (TFO) to occur whenever the auxiliary ROTR is disconnected manually, and/or, automatically. In either case, between 2 and 20 inches of tape (adjustable by means of a potentiometer on the electrical service unit of the TTY) will be fed out punched with DEL characters. If the auxiliary ROTR is connected manually and the automatic disconnect TFO option is provided, reception of an automatic disconnect character (optionally ETX and/or DC4) will cause TFO to occur, but the auxiliary ROTR will remain connected.

37 ROTR Primary Receiver

3.58 When a 37 ROTR is used as a primary receiver, there are no provisions for connecting an auxiliary receiver. Automatic TFO (option) will occur whenever the station is roll called, unselected as a receiver, or upon receipt of a delivery abort sequence.

E. TTY Functional Description

Sending TTY (Fig. 22)

3.59 When the TTY is in the off-line mode and the PUNCH ON key is operated, the keyboard and tape punch are used for preparing tapes. If the reader is also turned on, it may be used to reproduce or edit tapes. The page printer will type copy of what is punched on the tape. If the PUNCH ON key is restored, the tape punch is inhibited and the keyboard and page printer can be used for typing practice.

3.60 When the TTY is in the on-line mode, the reader is connected to the controller via the send data lead. The page printer will copy

the message as transmitted by the reader in addition to which it will copy originating TDM and service message information sent by the computer switcher as described in 3.18 through 3.20.

Receiving TTY (Fig. 23)

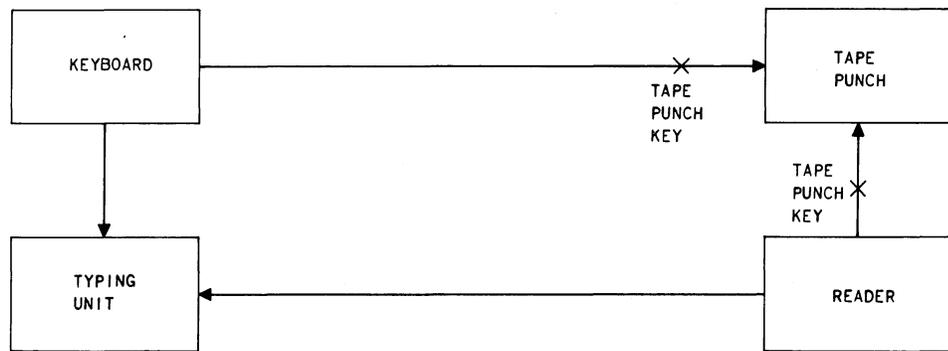
3.61 The voltage signals from the controller are applied to the SMD via the received data lead. The SMD operates the RO TTY page printer or ROTR typing reperforator. The page printer or typing reperforator is blinded by the controller to characters that are not part of the message (eg, control characters and receive message numbers for other stations). Detection of DLE blinds the receiving TTY and DC2 unblinds it.

F. Station Functional Description (Fig. 24)

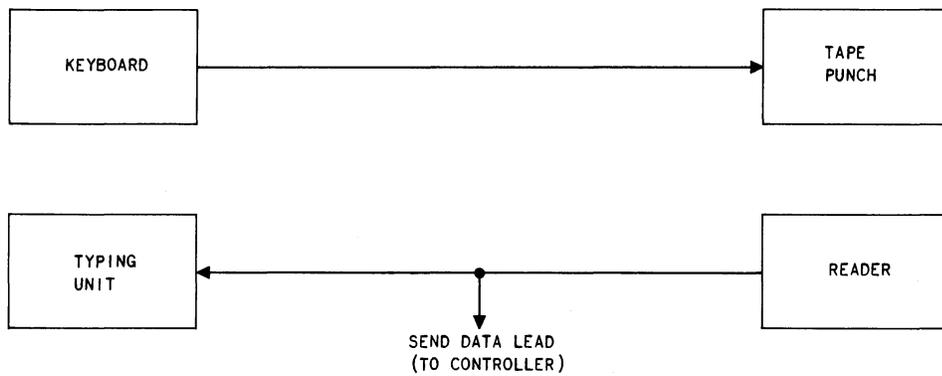
3.62 During the transmit sequence, the ASR TTY of a sending station converts the characters from the tape to voltage signals and presents them to the controller. In the controller (DAS 820A-type), the EIA voltage signals are monitored, controlled, regenerated, and sent to the data set. The Data Set 108A-type converts the signals into voice-frequency tones which are suitable for transmission over the line. The attendant set (DAS 804R2) is used with the ASR TTY unit to perform the following functions:

- (a) Provide audible and visual alarms and a means for silencing these alarms.
- (b) Condition the controller to respond to polling with either a regular or priority traffic available indication.
- (c) Provide manual TTY control functions such as the HOLD operation feature and placing the ASR TTY OOS.

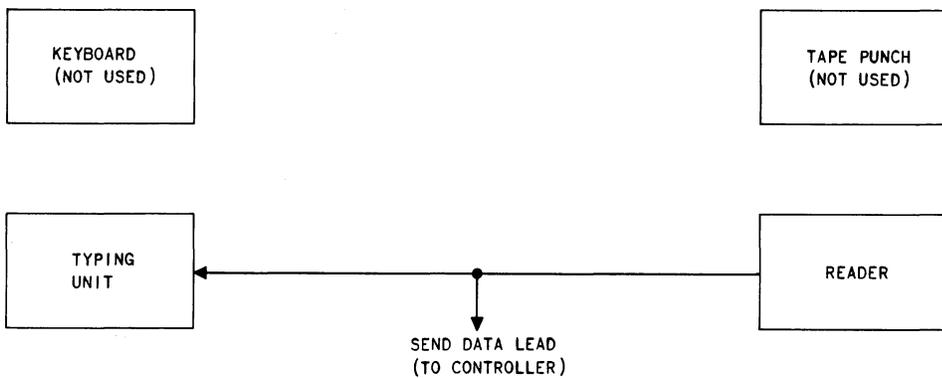
3.63 The receive sequence for a station is essentially the reverse of the transmit sequence. The Data Set 108A-type converts the voice-frequency tones received from the line into EIA voltages and presents them to the controller. The controller performs the same as it did for the transmit sequence and delivers the voltage signals to the primary TTY. The SMD operates the page printer and/or ROTR tape punch and the received characters are printed with a one character delay between reception and printing of the character.



A. OFF-LINE MODE



B. ON-LINE MODE



C. UNATTENDED MODE

Fig. 22—Block Diagram of Sending TTY (ASR)

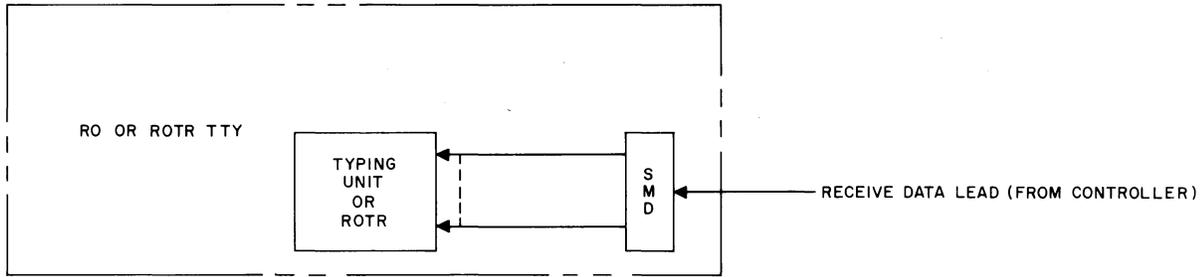


Fig. 23—Block Diagram of Receiving TTY (RO or ROTR)

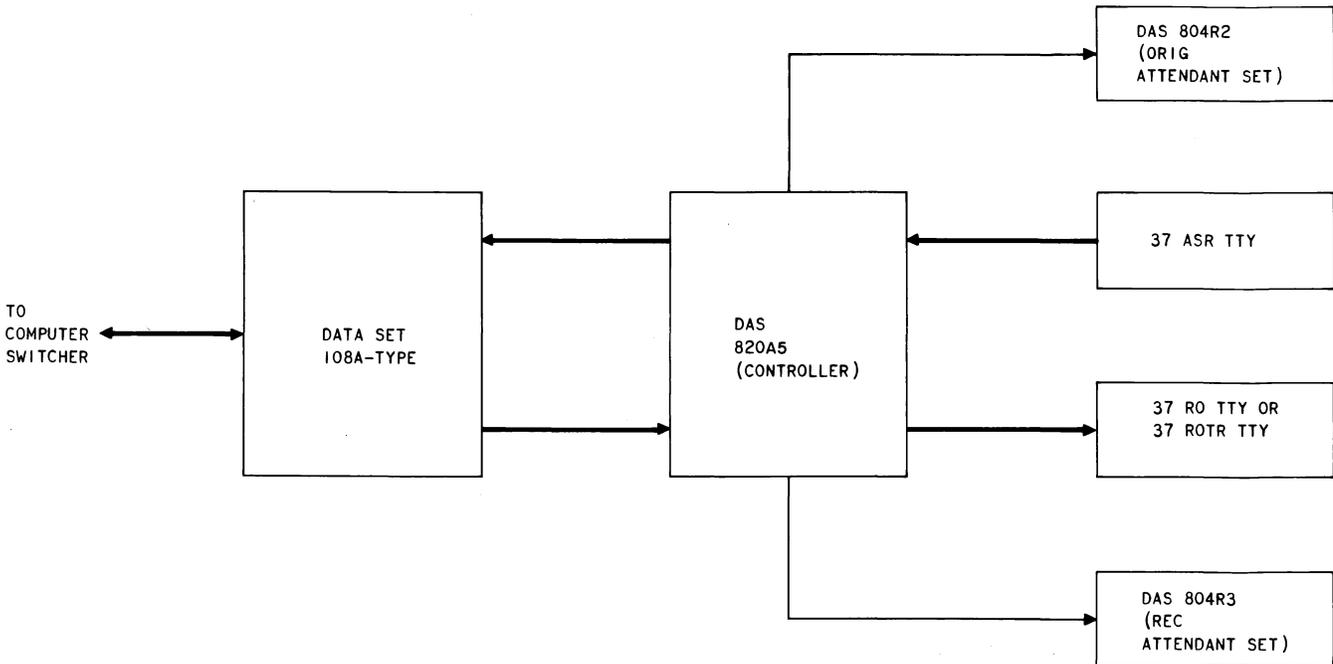


Fig. 24—Block Diagram of 86B2 ORIG/TERM, ORIG ONLY, or TERM ONLY Data Station

Out-Of-Service (OOS)

3.64 Each attendant set is provided with an OUT OF SVC lamp and key. The key is a push-to-operate, push-to-release type switch. The lamp is illuminated whenever the terminal equipment with which it is associated is OOS. When the transmit terminal equipment is OOS for any reason, the station responds to polling with a no-traffic-available indication. When the receive terminal equipment is OOS for any reason, the station responds to polling and call-in with the not-ready-to-receive indication. If the OUT OF SVC key on the send terminal attendant set is operated while the station

is selected to send, the station will not go OOS until it is unselected except as described in 4.15. Similarly, if the OUT OF SVC key on the receive terminal attendant set is operated while the station is called in to receive, the station will not go OOS until it is restored to the idle state.

Automatic Loop-Back Test Mode (Fig. 25)



Before a station is put into the automatic loop-back mode, it must be disconnected from the system at the central office and put on a test line.

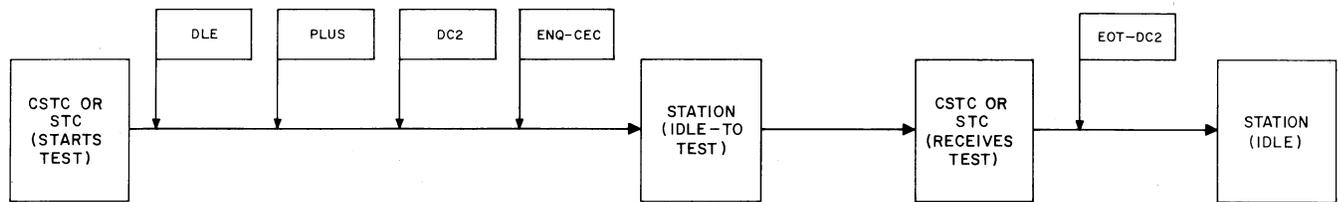


Fig. 25—Automatic Loop-Back Sequence Chart

3.65 The station controller may be automatically placed in the loop-back mode. This allows tests of most of the controller circuits and the transmission facility to be made from the test center. This mode of operation is not intended for use by the customer but by maintenance personnel only. In this mode of operation, the controller will respond to the polling, call-in, and roll call functions in the normal manner, however, all message text characters received by the station will be sent directly back onto the line with a one character delay.

3.66 The station is automatically looped back when it receives DLE, +, DC2, ENQ, CEC. The DLE blinds the station receiver. The + character lights the OUT OF SVC lamp and initiates the loop-back mode. The DC2 character performs its normal function and the ENQ CEC places the controller *in* the loop-back mode. Reception of the EOT character at the station restores it to the idle state and extinguishes the OUT OF SVC lamp.

Manual Loop-Back Test Mode



Before a station is put into the manual loop-back mode, it must be disconnected from the system at the central office and put on a test line.

3.67 Operation of the R switch to MTCE, located on the station controller, disconnects the data set from the controller and interconnects its transmit data lead and receive data lead. In this mode, the OUT OF SVC lamp is lighted and tests of the data set and transmission facility can be made from the test center. As for the automatic loop-back mode, the station must be disconnected at the central office and put on a line by itself before entering this mode.

G. Alarms

Parity Error

3.68 The eighth bit of the ASCII code is used to provide even-bit parity. That is, the eighth bit of each ASCII code character is chosen (mark or space) so that the character contains an even number of marking and spacing information bits. The controller monitors the number of spacing information bits of each received character. If the count is odd indicating a parity error, the ERROR lamp is lighted, the audible alarm is sounded, and the character with the incorrect parity is changed to an underline () by the controller. The ERROR lamp is extinguished and the alarm is silenced by the operation of the ERROR key.

Out-of-Synchronism Error

3.69 In TTY systems, asynchronous character timing is used. Specifically, a mode of operation known as start-stop is used. A fixed time pattern is used for the group of bits representing a character, but each group is preceded by a signal transition that serves to denote when the fixed pattern is to start. In this system, the beginning of a character is identified by mark-to-space transition. This is known as the start interval and is one bit interval long. The stop interval is marking and is one bit interval long.

3.70 Normally the controller receive clock, used for sampling and timing the information bits, is started on the mark-to-space transition of the start interval. The clock is arranged to run for a fixed number of cycles and stop during the stop interval of the incoming character. If the local clock is falsely started, or if the character is mutilated, there may be no marking interval on which to stop at the end of the normal sampling

cycle. In this case, the timing circuit is arranged to stop the clock at the end of a fixed timing interval and wait for the next mark-to-space transition before recycling. The receiver usually regains synchronization quickly unless some repeated combination is transmitted that causes the selector to synchronize on a mark-to-space transition other than the normal start.

3.71 In order to reduce the number of incorrect characters that are printed when the receiver is recovering synchronization, the controller samples the received character at the end of the timing interval. The controller is looking for the marking stop interval. If this sample is found to be a space, the character is incorrect and is replaced with an underline () character, the ERROR lamp is lighted, and the audible alarm is sounded. The error alarm may be silenced and the ERROR lamp extinguished by the operation of the ERROR key.

Tape Alarm

3.72 If at any time while a station is selected as a sender, a taut tape or tape out condition occurs or the reader gate is opened, the TAPE lamp will be lighted and the audible alarm will sound except when the hold function is used. The alarm will also occur when the station is not selected to send, an infinite count is in the EOT counter, and a taut tape condition occurs.

3.73 When the alarm is caused by a taut tape condition, clearing the taut tape condition and operating the TAPE key will extinguish the TAPE lamp and silence the audible alarm. In this case, the BID lamp will relight, the traffic available state will be maintained, and the station will remain selected as a sender unless an intercharacter time out occurs causing an emergency stop to be performed.

3.74 When the alarm is caused by a tape out condition or by opening the reader gate for any reason other than use of the hold function, tape must be in the reader, the gate must be closed, and the TAPE key must be operated to extinguish the TAPE lamp. The audible alarm is silenced by operation of the TAPE or AUD OFF keys. However, in this case, the BID lamp will be permanently extinguished, any count in the EOT counter will be reduced to zero thereby cancelling the traffic available state, and the station will remain selected as a sender until an emergency

stop is performed by the computer switcher or the station.

MSG REC Alarm

3.75 The message reception alarm is activated whenever a delivery abort sequence is performed or the station responds NAK to roll call. This lights the MSG REC lamp and sounds the audible alarm. Operation of the MSG REC key will extinguish the lamp. The audible alarm is silenced by operation of the MSG REC or AUD OFF keys.

H. Carrier Squelch

3.76 The T switch located on the controller provides the option of squelching the Data Set 108A-type transmitter carrier whenever the data set detects the loss of received carrier.

I. Controller Functional Description (Fig. 26)

3.77 The block diagram in Fig. 26 is of the controller. The signal paths are shown in heavy lines and the control paths are shown in thin lines.

3.78 Two shift registers are employed in the controller. The in-line shift register is in the receiving data path and the out-line shift register is in the transmitting data path. Both registers perform the functions of character detection and generation in their respective circuits. The incoming signal is delayed one character length and the outgoing signal is delayed 1/2-bit length. Both the incoming and outgoing signals are regenerated.

Receive Mode

3.79 Characters are received serially from the data set under control of the sampling gates. The start of each character triggers the receive clock in the timing circuit and the clock runs for the duration of the character. The clock is used to sample each bit of the character and serially shift it into the in-line shift register. While in the shift register, each character is monitored by the character detection circuit to detect specific control characters. These characters are ENQ, CEC, ETX, EOT, DC1, DC2, DC3, DLE, +, SPC, W, and X. The in-line shift register is wired at

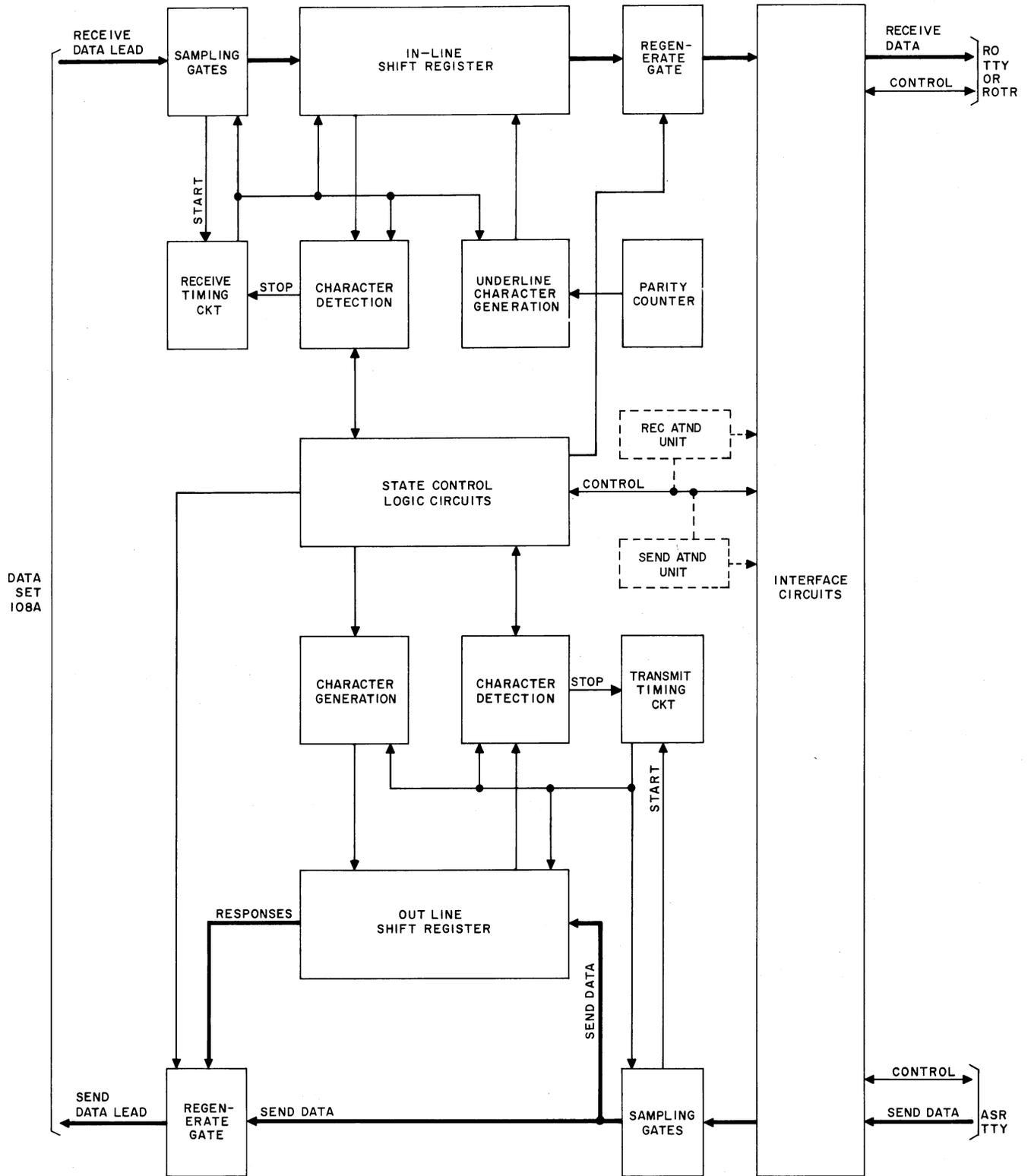


Fig. 26—Block Diagram of Station Controller

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installation to detect the unique SPC and CEC assigned to the station.

3.80 The detected characters control the receive modes (such as blinding the TTY, etc) of the station, and together with the state logic circuits, initiate appropriate responses.

3.81 Each succeeding incoming character initiates a new timing cycle and the previous character is shifted out of the shift register. If it is a control character, it will not be printed. However, if the character is a message character, it will be regenerated, gated to the SMD via the interface circuit, and printed by the page printer. At stations using a 37 ROTR as the primary receiver, all computer switcher generated controls (except DLE, ENQ, EOT, and the sequence ENQ DC2) will be punched on the tape. There is a one character delay between the reception and the printing of a character.

3.82 An underline (⎵) character generator is provided for printing an underline in place of an erroneously received message character resulting from a parity failure or out-of-synchronism errors. A generated underline character applied to the in-line shift register wipes out and replaces the erroneous character.

Generation of Responses

3.83 The responses generated by the controller are ACK, NAK, CAN, SIC, SOH, P, and R. Which of these characters are generated as a response is governed by the state control logic circuit which monitors the status of the station. The character is written into the out-line shift register in a parallel fashion. The character is then serially shifted out of the register by the transmit clock, regenerated, and then gated to the data set for transmission to the line.

Send Mode

3.84 Characters from the reader are applied serially, via the interface circuit, to the gate and sample circuit under the direction of the state logic control circuit. Timing for the send characters is developed in a manner similar to that for the receive characters. After sampling, the characters are regenerated and gated, with a 1/2 bit delay, to the data set.

3.85 At the same time, the characters are serially inserted into the out-line shift register. Each character is monitored, as it is shifted into the register, by the character detection circuit. This is done in order to detect specific transmit control characters. These characters are SOH, ETX, and EOT. When a transmit control character is detected, the character detection circuit signals the state logic control circuit to sequence the controller through various transmit modes.

Interface Circuits

3.86 The interface circuits control and monitor the station TTY or ROTR. Some of the more important functions of the interface circuits are:

- (a) Data signal exchange
- (b) Motor on-off control
- (c) Reader on control
- (d) Lost character detection
- (e) Paper/tape low detection
- (f) Form feed/form out detection
- (g) TFO control (37 ROTR primary receiver only)
- (h) Ready/not ready monitoring
- (i) Taut tape/tape out detection
- (j) Noise filtering
- (k) EOT counting (ASR TTY only)
- (l) Alarm generation
- (m) Reader ON/OFF control.

J. Attendant Set Functional Description

3.87 The attendant sets provide keys and lamps used for local control and alarm and status monitoring of the station TTY. Two types of attendant sets are used with the 86B2 stations.

3.88 The DAS 804R2 attendant set is used in the sending TTY of an ORIG/TERM or

ORIG ONLY station and provides the following keys and lamps:

- (a) Control keys—BID, PRIOR, HOLD, OUT OF SVC, and AUD OFF
- (b) Alarm reset keys—TAPE and EMG STOP
- (c) Status lamps—BID (white), PRIOR (white), HOLD (white), OUT OF SVC (white), TRANS (amber), and AUD OFF (white)
- (d) Alarm lamps—TAPE (red) and EMG STOP (red).

3.89 The DAS 804R3 attendant set is used in the primary receive 37 RO TTY of an ORIG/TERM or TERM ONLY station and provides the following keys and lamps:

- (a) Control keys—OUT OF SVC and AUD OFF
- (b) Alarm reset keys—MSG REC, ERROR, and PAPER LOW
- (c) Status lamps—OUT OF SVC (white), AUD OFF (white), REC (amber), and CALL (amber)
- (d) Alarm lamps—MSG REC (red), ERROR (red), and PAPER LOW (white).

3.90 The DAS 804R3 attendant set, used in the primary receive 37 ROTR of an ORIG/TERM or TERM ONLY station, provides the same keys and lamps as those provided on the DAS 804R3, used in the RO TTY, except that the PAPER LOW key/lamp is designated as the TAPE LOW key/lamp and an additional key designated TAPE FEED (no lamp) is provided.

3.91 In addition, each attendant set is equipped with a loudspeaker in order to provide audible alarm indications.

K. Data Set Functional Description (Fig. 27)

3.92 The transmit frequencies for the Data Set 108A-type are 2225 Hz for a mark and 2025 Hz for a space. Its receive frequencies are 1270 Hz for a mark and 1070 Hz for a space.

3.93 In the idle or marking condition, a negative voltage is applied to the transmitted data (BA) lead. This negative voltage conditions the

keyer to cause the oscillator to generate a tone representing a mark signal. This frequency will pass through the send filter to the send buffer amplifier. The send buffer amplifier, in addition to isolating the send filter impedance from the hybrid, is an adjustable gain amplifier. The output from the send buffer amplifier passes through the hybrid and then over the private line facilities to the computer switcher.

Note: When a Data Set 108A-type is installed at the data station, a Data Set 108B-type must be installed at the hub.

3.94 A marking signal transmitted from the computer switcher will pass through the hybrid at the data station to the receive buffer amplifier. The receive buffer amplifier, in addition to isolating the telephone line from the bandpass filter, is an adjustable gain amplifier. The gain of the amplifier is adjusted in two 4-dB steps by means of the D screw switch. The output of the receive buffer amplifier passes through the bandpass filter to the limiter. The limiter amplifies the output to provide a constant amplitude signal to the discriminator. The two outputs of the limiter are to the discriminator and the carrier detector. The discriminator detects, rectifies, and produces a voltage signal that is proportional to the frequency. The output of the discriminator passes through the low-pass filter. The dc voltage output from the low-pass filter passes through the dc amplifiers and out to the terminal equipment on the received data (BB) lead in the form of EIA voltage signals.

3.95 The second output from the limiter is to the carrier detector. The carrier detector monitors this output for the presence of an acceptable level of carrier. In the event that the carrier power level falls below -40, -36, or -32 dBm, dependent on the setting of the D switch, for approximately 110 to 250 milliseconds, the carrier detector operates and a signal passes to the amplifier. The amplifier conditions the data carrier detector to turn off lead CF. This notifies the terminal equipment that a failure exists. If the station is selected to receive, the MSG REC and ERROR lamps on the receive terminal attendant set will be lighted. If the station is selected to send, the EMG STOP lamp on the transmit terminal attendant set will be lighted. In either case, the audible alarm will also sound and the station returns to idle. The amplifier also clamps the BB lead in the marking condition (ie, mark-hold condition).

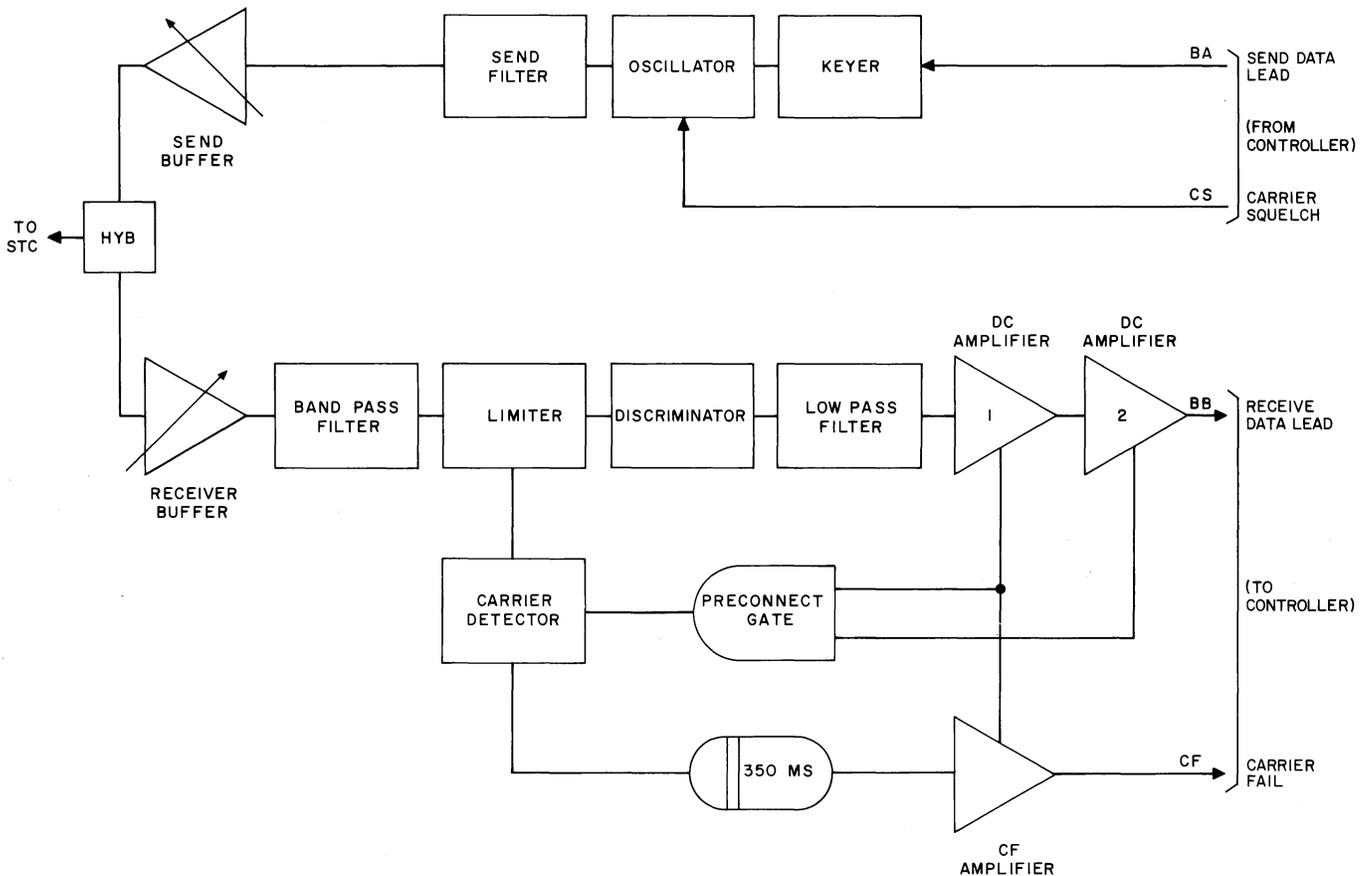


Fig. 27—Block Diagram of Data Set 108A-Type

The data set will assume a preconnect mode in which it monitors for incoming marking carrier via the preconnect gate.

3.96 Some service applications will use carrier squelch on the data carrier failure option. When this option is provided and the T switch is operated to the ON position at the controller, the CF amplifier will cause ground to be applied on lead CS to the oscillator. This shuts off the oscillator thereby inhibiting the transmission of carrier to the hub.

3.97 In order to restore the station to normal following a carrier failure, two conditions must be met:

- (a) A carrier power level greater than -40, -36, or -32 dBm, dependent on the setting of the D switch, must be received.
- (b) The received carrier must be a mark frequency.

When the two conditions have been met for 200 to 500 milliseconds, the carrier detector circuit removes the signal to the amplifier. The amplifier then removes the clamp on lead BA, turns on lead CF to notify the controller that carrier has been restored, and, if the squelch option is provided, removes the ground from the oscillator. If the station was selected to send or receive at the time of the carrier failure, the EMG STOP or MSG REC lamps, respectively, were lighted and the audible alarm was sounded. These lamps can now be extinguished by the operation of their respective keys. The audible alarm will be silenced by the operation of these keys if it has not been previously silenced by operation of the AUD OFF key.

L. Maintenance Features

3.98 The model 37 TTYs are equipped with maintenance jacks and a 3-position maintenance (MTCE) switch to facilitate testing and maintenance of the TTY. In addition, means are provided to electrically interchange the typing units of the

ASR and primary RO TTY at ORIG/TERM stations while maintenance is being performed.

3.99 The TTY maintenance jacks are designed to allow connection to a 911A Data Test Set for testing the TTY.

3.100 The MTCE switch has 3-positions (ON, OFF, and NORM). In the ON position, the TTY motor is on at all times and not under control of the controller. In the OFF position, the TTY motor is always OFF. In the NORM position, the TTY operation is normal as previously explained.

4. OPERATION

A. Sending TTY Attendant Set

4.01 The sending station attendant set (DAS 804R2) contains seven designated keys all of which contain lamps plus one additional designated lamp. Table H lists the lamps and when they are lighted. Table I lists the keys and what function they perform when they are operated.

B. Receiving TTY Attendant Sets

4.02 The receiving station attendant set (DAS 804R3) contains five (RO TTY) or six (ROTR TTY) designated keys all of which contain lamps plus two additional designated lamps. Table J lists the lamps and when they are lighted. Table K lists the keys and what function they perform when they are operated.

C. Manual Connection and Disconnection of Auxiliary Receiver

4.03 To manually connect the auxiliary receiver to a 37 primary receiver, operate the AUX RCVR key on the primary receiver. This will connect the auxiliary receiver and cause the AUX RCVR lamp to be lighted. Operation of the AUX RCVR key while the auxiliary receiver is connected will extinguish the AUX RCVR lamp and, provided an automatic auxiliary receiver connect order has not been received, disconnect the auxiliary receiver.

4.04 The 37 ROTR is not provided with a means for connecting an auxiliary receiver. To manually cause tape feed out (TFO) to occur,

TABLE H

SENDING ATTENDANT SET (804R2) LAMPS

LAMP	COLOR	WHEN LIGHTED
OUT-OF-SVC	White	Lights when ASR TTY is in the OOS mode
BID	White	Lights when the BID key is operated or the EOT count is 1 through 14 while tape is in the reader.
TRANS	Amber	Lights when station becomes selected to send
PRIOR	White	Lights when BID lamp is lighted and PRIOR key is operated
EMG STOP	Red	Lights when computer switcher interrupts sending station by performing emergency stop sequence (audible alarm sounds)
TAPE	Red	Lights when reader gate is opened or a taut-tape/tape-out condition occurs while station is selected to send (audible alarm sounds)
AUD OFF	White	Lights when AUD OFF key is operated

TABLE I

SENDING ATTENDANT SET (DAS 804R2) KEYS

KEY	TYPE	FUNCTION PERFORMED WHEN OPERATED
OUT-OF-SVC	PP	Places transmit terminal OOS when it is not selected to send or, if it is selected to send, when it becomes unselected (see 4.15)
BID	NL	Conditions the controller to respond to polling with a traffic available response
PRIOR	NL	When operated in conjunction with BID key, conditions the controller to add a priority status to the traffic available response
AUD OFF	PP	Silences and inhibits audible alarm
HOLD	PP	Causes the reader of a selected sender to stop on ETX so that another tape can be placed in the reader without having the station unselected (audible alarm sounds)
TAPE	NL	Extinguishes TAPE lamp and silences audible alarm
EMG STOP	NL	Extinguishes EMG STOP lamp and silences audible alarm

operate and release the TAPE FEED key which is located on the ROTR attendant set.

the transmission of the message will be inhibited.

D. Sending Stations

4.05 The 37 ASR TTY is equipped with three nonlocking, push-to-operate key/lamps for selecting the station mode of operation. They are the OFF-LINE, ON-LINE, and UNATT keys. Operation of any one of these keys lights the lamps, indicates to the controller the associated mode of operation, and extinguishes the lamps of any previously selected mode. Tapes can be prepared in either the off-line or on-line modes of operation. Table L is a summary of how the various station units are arranged in each mode.

4.06 To prepare tapes in the off-line mode, insure the station is **not** selected to send (TRANS lamp extinguished), operate the READER ON key (lamp extinguished), and then operate the OFF-LINE key. This lights the OFF-LINE lamp in the key and the OUT-OF-SVC lamps in the send terminal attendant set. The station will now, dependent on the status of the receive terminal, respond CAN or NAK to polling and normally to receiver call-in and roll call. Now operate the PUNCH ON key (PUNCH ON lamp lighted) if necessary and type out the message, being sure to follow the proper format (see 3.04), on the keyboard. In this mode, the message being punched on the tape will be printed by the page printer. Restoration of the PUNCH ON key will extinguish the PUNCH ON lamp and inhibit the operation of the tape punch, thereby allowing the keyboard and page printer to be used for typing practice.



Operation of the OFF-LINE key while the station is selected to send will remove the traffic available status. If the reader is running, it will continue to run in the normal manner, however,

TABLE J
RECEIVING ATTENDANT SET (804R3) LAMPS

LAMP	COLOR	WHEN LIGHTED
OUT-OF-SVC	White	Lights when primary receive TTY is in the OOS mode
REC	Amber	Lights when station becomes selected to receive
CALL	Amber	Lights when station is not ready to receive when a call-in attempt is made. (Will not extinguish until station is ready to receive)
MSG REC	Red	Lights when computer switcher interrupts message delivery to perform a delivery abort sequence or station responds with SIC NAK to roll call (audible alarm sounds)
ERROR	Red	Lights when controller detects a parity or out of synchronization error (audible alarm sounds)
PAPER LOW*	White	Lights when paper (or tape*) supply is low (audible alarm sounds)
AUD OFF	White	Lights when AUD OFF key is operated

* This lamp is designated TAPE LOW on DAS 804R3 used with ROTR TTY.

4.07 To prepare tapes in the on-line mode, operate the ON-LINE key. This lights the ON-LINE and PUNCH ON lamps. In this mode, the tape punch is always on. The message can now be typed out on the keyboard as in the off-line mode of operation, however, the page printer will not make copy of the message being punched on the tape.

4.08 To send a transmission when the EOT counter is not being used, operate the ON-LINE key, insert the prepared tape into the reader, close the reader gate, operate the READER ON key, and operate the BID key on the sending terminal attendant set. This lights the BID lamp, starts the reader which runs until the controller detects SOH from the tape, and causes the station to respond regular traffic available to polling. If the PRIOR key is operated in conjunction with the BID key, the station will respond priority traffic available to polling. The first EOT detected from the tape will remove the priority status however the traffic

available state will be maintained until the reader gate is opened.

4.09 To send a transmission when the EOT counter is to be used, operate the ON-LINE key. Load the blank tape into the punch and advance it to the reader, being sure to leave enough slack in the tape to loop it under the taut tape lever, by means of DEL characters. Close the reader gate and operate the READER ON (lamp lighted) key. Typing the message (including EOT) on the keyboard will cause the punch to perforate the tape. The EOT will raise the count in the EOT counter by one, light the BID lamp, cause the reader to run until the controller detects SOH from the tape, and cause the station to respond traffic available to polling.

4.10 To send a message or series of messages in the unattended mode, operate the UNATT key instead of the ON-LINE key and then proceed as described for a transmission without EOT count

TABLE K
RECEIVING ATTENDANT SET (804R3) KEYS

KEY	TYPE	FUNCTION PERFORMED WHEN OPERATED
OUT-OF-SVC	PP	Places receive terminal OOS when it is not selected to receive or, if it is selected to receive, when it becomes unselected
MSG REC	NL	Extinguishes MSG REC lamp and silences audible alarm
ERROR	NL	Extinguishes ERROR lamp and silences audible alarm
PAPER LOW*	NL	Extinguishes PAPER LOW (TAPE LOW*) lamp provided the paper (tape*) supply has been replenished and silences audible alarm
AUD OFF	PP	Silences and inhibits the audible alarm
TAPE FEED†	NL	Initiates tape feed out

* This key is designated TAPE LOW on DAS 804R3 used with ROTR TTY.

† This key is functional on DAS 804R3 used with ROTR TTY only.

TABLE L
STATION UNIT ARRANGEMENT SUMMARY

MODE	PRINTER	PUNCH	READER	PUNCH ON CONTROL	KEYBOARD
	CONNECTED TO				CONNECTED TO
ON-LINE	Line	Keyboard	Line	Always on (Ineffective)	Punch
OFF-LINE	Keyboard and reader	Keyboard and reader	Printer and punch	Effective	Punch and printer
UNATTENDED	Line	Disconnected	Line	Always off (Ineffective)	Blinded

(4.08). Alternatively, the station can be switched from ON-LINE to UNATT during transmission (with or without EOT counter in use).

4.11 To send a message on a tape other than one the station is already transmitting, depress the HOLD key (on the transmit terminal attendant set) before the ETX on the tape being

transmitted reaches the reader. When the controller detects ETX from the tape, it causes the HOLD lamp to light, sounds the audible alarm, and stops the reader. The new tape, which must conform to the standard format, can now be placed in the reader in place of the original tape. Opening the reader gate to remove the original tape extinguishes the BID lamp. Insert the new tape in the reader,

restore the HOLD key, and operate the BID key as for a normal transmission. Restoration of the HOLD key extinguishes the HOLD lamp and operation and release of the AUD OFF key silences the audible alarm.

4.12 To resume transmission of the original tape, the hold operation just described in 4.11 must be repeated and the original tape reinserted in the reader on the DEL characters following the original message.

4.13 If the computer switcher transmits an emergency stop procedure to the station during the transmission of a message, the following will occur:

- (1) The station reader will stop, the traffic available state is cancelled, message reception is interrupted, and the RO TTY is blinded.
- (2) The EMG STOP lamp will be lighted and the audible alarm will be sounded.
- (3) The ASR TTY page printer is connected to the receive data lead of the controller. The computer switcher may now send the proper service message which is copied by the ASR TTY page printer. Upon completion of delivery of the service message (if any), the station will be unselected as a sender, the ASR TTY page printer is restored to normal, the RO TTY is unblinded, and the normal message reception is restored. The ASR TTY is idle and it is necessary to operate the EMG STOP key in order to extinguish the EMG STOP lamp and silence the audible alarm.

4.14 When a taut tape condition occurs at the reader while the station is selected as a sender and not in hold, the TAPE lamp will be lighted and the audible alarm sounded. After the condition is cleared, operation of the TAPE key will extinguish the lamp and silence the alarm. If a potential taut or tangled tape condition is noted by the attendant, the READER ON control may

be used to temporarily stop the reader while the condition is being corrected. If, during the taut tape condition, or while the reader is stopped, an intercharacter time-out has not occurred causing the computer switcher to perform an emergency stop, transmission of the message will be resumed.

E. Emergency Stop of ASR TTY Motor

4.15 In order to stop the ASR TTY motor in an emergency, operate the OUT OF SVC key on the transmit terminal attendant set and depress the OFF-LINE mode key.

5. REFERENCES

5.01 The following circuit descriptions, schematic drawings, and Bell System Practices (BSP) are related to the 86B2 Data Selective Calling Service:

	SD- & CD-3D039-01 Data System Station—Data Auxiliary Set 820A-Type Station Controller
581-136-203	86B2 Data Selective Calling Service—Full-Duplex—150-Word Per Minute Data Station—Installation
581-136-303	86B2 Data Selective Calling Service—Full-Duplex—150-Word Per Minute Data Station—Maintenance
581-136-503	86B2 Data Selective Calling Service—Full-Duplex—150-Word Per Minute Data Station—Test Procedures
598-046-100	Data Auxiliary Set 820A-Type—Identification
598-067-100	Data Auxiliary Sets 804R2, 804R3, And 804R4—Identification
591-023-series	Data Sets 108A- and 108C-Types