

**NO. 1 ELECTRONIC SWITCHING SYSTEM ADF
HALF-DUPLEX—150 WORD PER MINUTE DATA STATION
USING 4-ROW TELETYPEWRITERS
DESCRIPTION AND OPERATION**

	PAGE		
		E. Alarms	12
1. GENERAL	1	F. Station Functional Description	13
A. Purpose of System	1	G. Teletypewriter Functional Description	14
B. Purpose of Station	2	H. Controller Functional Description	14
C. System Arrangement	2	I. Attendant Unit Functional Description	14
D. Station Arrangement	3	J. Data Set Functional Description	16
E. Uses of Station Components	3		
F. Station Operation	3	4. OPERATION	18
G. Station Power	3	1. GENERAL	
2. PHYSICAL DESCRIPTION	4	1.01 This section covers in general terms the physical and functional description as well as the operating procedures for the No. 1 Electronic Switching System arranged with data features (No. 1 ESS ADF) half-duplex (HDX), 150-word per minute (wpm) data station using 37-type teletypewriters (TTY).	
A. General	4	A. Purpose of System	
B. Stations	4	1.02 The No. 1 ESS ADF is a store and forward message switching system which administers a number of full-duplex (FDX) and HDX lines. FDX operation is used with 100-wpm operation only and is described in the section entitled No. 1 Electronic Switching System ADF Full-Duplex—100-Word Per Minute Data Station Using 4-Row Teletypewriters—Description and Operation (580-301-101). Each HDX line can accommodate a number of receive only (RO-) type HDX stations. More than one station on a particular line can receive data simultaneously. The system will handle interline traffic.	
C. Teletypewriter	5		
D. Controller	5		
E. Data Sets	5		
F. Attendant Unit	5		
3. FUNCTIONAL DESCRIPTION	5		
A. General	5		
B. Message Reception	5		
C. Out of Service	11		
D. Test Features	11		

B. Purpose of Station

1.03 The No. 1 ESS ADF HDX data station is used to provide low-speed (150-wpm) TTY reception from other stations, in the private network of which it is a part, under control of the No. 1 ESS ADF calling system. The No. 1

ESS ADF will be referred to hereafter as the ADF.

C. System Arrangement

1.04 Fig. 1 is a block diagram of the typical arrangement for a network consisting of an ADF and a number of 150-wpm HDX data stations.

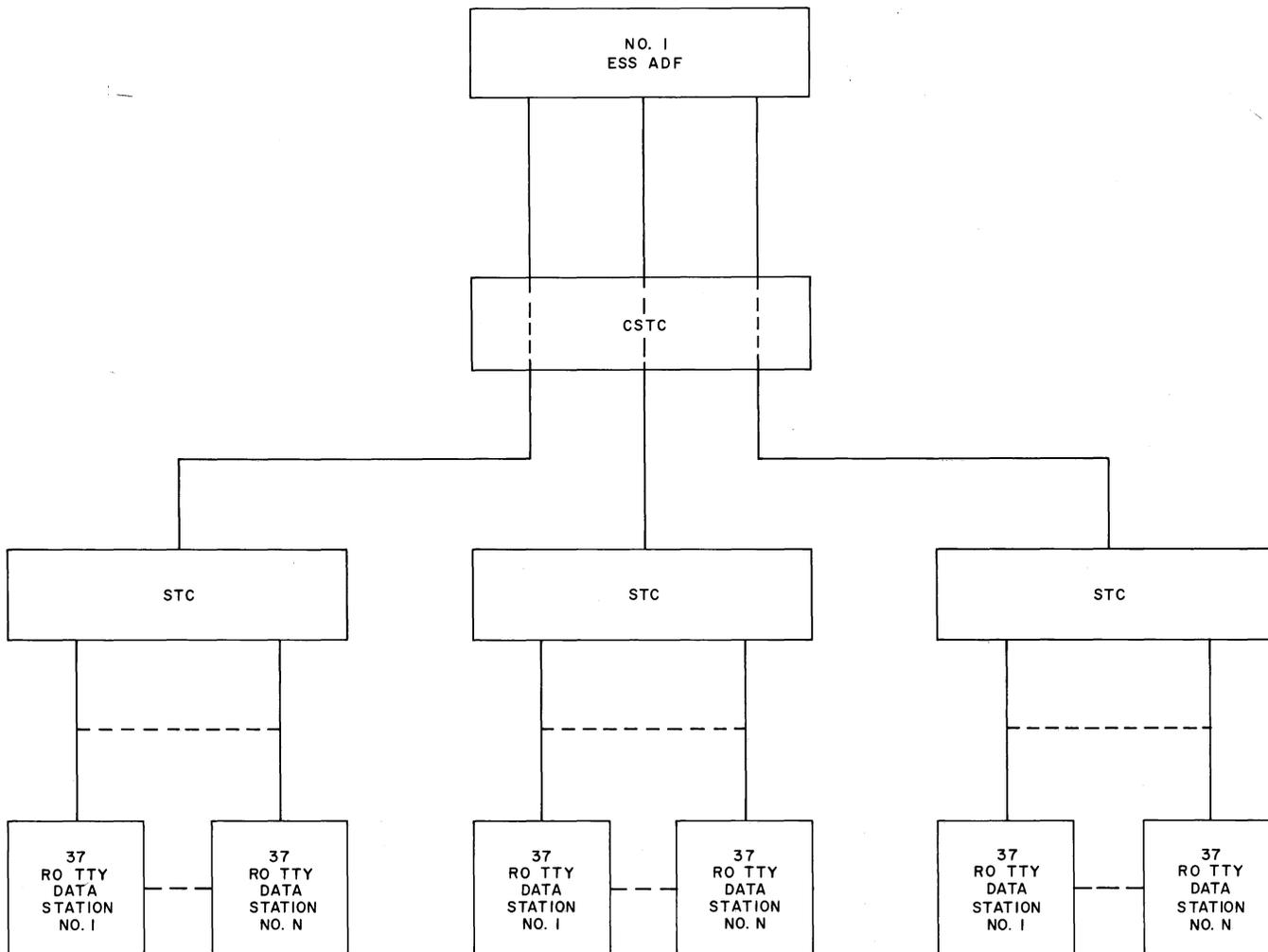


Fig. 1—Block Diagram of Typical No. 1 ESS ADF with HDX Operation

1.05 The data stations are connected to the ADF through a serving test center (STC) and the control serving test center (CSTC) via a HDX line. All stations on each line will be 150-wpm, RO-type HDX stations.

D. Station Arrangement

1.06 The 150-wpm HDX data station is a self-contained unit which is intended to be completely assembled by the distributing house prior to delivery. The data station consists of the following:

- (a) A model 37 RO TTY.
- (b) Data Auxiliary Set 820B4 (controller) with a 24A power unit.
- (c) Data Set 108A (ac transmission) or 109A (dc transmission).
- (d) Data Auxiliary Set 804R3 (attendant unit).
- (e) An M36F Cord.

A model 37 RO TTY may be optionally provided as an auxiliary receiver.

E. Uses of Station Components

1.07 The 37 RO TTY is used as a master or auxiliary machine in a 150-wpm HDX station to print copy of messages received by the station.

1.08 The controller enables the TTY to receive messages by providing circuits that recognize control characters from the ADF and generate response and service characters to the ADF.

1.09 The attendant unit contains all the keys and lamps necessary for signaling to and from the controller. The keys are used to place the station out of service, to disable the audible alarm, and to extinguish trouble indication lamps, and to silence associated audible alarms at the master machine of the station. The lamps indicate whether the station is selected as a receiver, is out of service, is in an alarm condition, or has the audible alarm disabled.

1.10 The M36F cord is used to connect the attendant unit to the TTY and the controller.

1.11 Data Sets 108A and 109A are used between the controller and the line to convert the digital data into a form suitable for transmission over telephone facilities.

F. Station Operation

1.12 The ADF interrogates the stations in a cyclic sequence to determine whether they have traffic to send and are ready to receive. This sequence is referred to as polling. Since the 150-wpm stations are all of the RO-type, they will always answer polling with either no traffic—ready-to-receive or no traffic—not ready-to-receive responses.

1.13 Message delivery is administered on a selective call-in basis. Each station designated as an addressee in the heading of a message nominated for delivery is interrogated by the ADF to determine if it is ready to receive. If the station is not ready to receive, the ADF will store the message until it discovers that the station is ready to receive during one of the cyclic polling sequences. If the station is ready to receive, it will be selected as a receiver and the message will be delivered. After the text of the message has been delivered, the ADF interrogates each receive station to determine if the message was received properly. This sequence is referred to as "roll call." If a positive reply to roll call is received from the station, the ADF goes on to roll call the other selected receive stations. If a negative reply is received, an alarm is enabled at the station being roll called and the ADF requeues the message for retransmission. After all of the selected receive stations have been roll called, they are returned to the idle state by the ADF.

G. Station Power

1.14 The 150-wpm HDX data station requires an individually fused line power source of 106 to 129 volts, 60 ± 0.5 Hz, 6 amps. The ac power for the 24A power unit is supplied from a terminal block on the TTY. The dc voltages required for the controller are supplied by the 24A power unit which is part of the controller.

2. PHYSICAL DESCRIPTION

A. General

2.01 This part describes the physical appearance of the components of a No. 1 ESS ADF, 150-wpm HDX data station.

B. Station

2.02 The 150-wpm HDX data station is shown in Fig. 2. The attendant unit is mounted on the TTY pedestal door. The controller and data set are mounted inside the TTY.

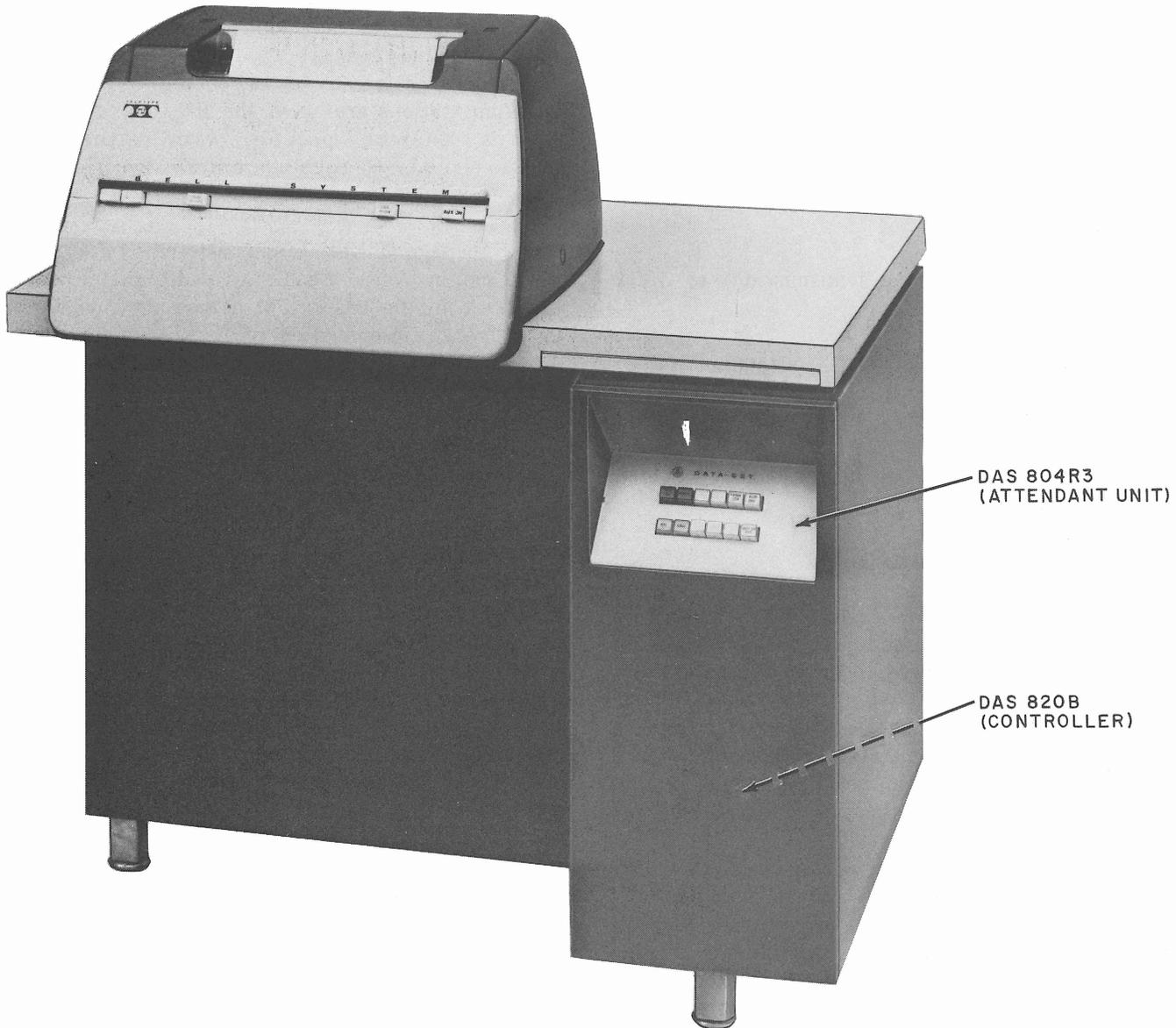


Fig. 2—37 RO HDX Station

C. Teletypewriter

2.03 The 37 RO TTY is a 4-row, 150-wpm, heavy-duty machine which contains a page printer. It may be used as the master machine at the station or as an auxiliary receiver to a master 37 RO TTY. The motor runs only when the station is receiving traffic.

D. Controller

2.04 The controller is equipped with a 24A power unit and weighs approximately 18 pounds. It has slots for 13 AR circuit packs (CP) and Data Set 108A or 109A. Only 12 of the CP slots are used. One slot remains as a spare. Seven of the CPs are used for control, state logic, and timing functions. Four CPs are used for interface functions between the controller and TTY, and one CP contains the in/out shift register.

2.05 The controller (Fig. 3) is located in the TTY. It is mounted on a 93A bracket and slides out to facilitate maintenance and CP removal.

E. Data Sets

2.06 Either one of two types of data sets are used in the HDX station. They are Data Sets 108A (ac operation) and 109A (dc operation). The data set is located on the right-hand side of the controller.

F. Attendant Unit

2.07 The 150-wpm HDX station is equipped with a DAS 804R3 attendant unit (Fig. 4) which is mounted in the right-hand door of the TTY pedestal.

2.08 The DAS 804R3 attendant unit uses two red and two white keys in its top row and two amber and one white key in its bottom row.

3. FUNCTIONAL DESCRIPTION

A. General

3.01 This part describes the functions of the various components which make up the 150-wpm HDX station.

3.02 Reference will be made to the ASCII code. Table A shows the ASCII code for bits one

through seven. An eighth bit is added to provide even bit parity. Table B 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 places the station in the idle mode.

Polling Responses

3.04 The ADF periodically polls every station on the line by sending DLE followed by the station unique station polling code (SPC). The station responses depend on the status of the receiving terminal. The ADF does not know whether a station is an RO-type or an ASR-type station; therefore, responses are as follows:

- (a) CAN—means the station has no traffic and is ready to receive.
- (b) NAK—means the station has no traffic and is not ready to receive.

Since the 150-wpm stations are all RO-type, the ready- or not ready-to-receive portion of the polling response is the only part of the response that is of real consequence.

B. Message Reception (Fig. 5)

3.05 If the ADF has a station marked ready-to-receive, it can select that station as a receiver. To call in the station, the ADF sends ENQ followed by the unique call enquiry code (CEC) of the station. The station responds with its unique station identity code (SIC) followed by either ACK if it is ready to receive, or NAK if it is not ready to receive. If the station replies NAK, the CALL lamp will be lighted. The CALL lamp is extinguished by restoring the station to ready. When the station is marked not ready-to-receive by the ADF, further call-in attempts will not be made until the station is marked ready during polling.

3.06 A station is not ready to receive if any of the following conditions exist:

- (a) The station is out of service.

Note: The station cannot be placed out of service if it is selected as a receiver.

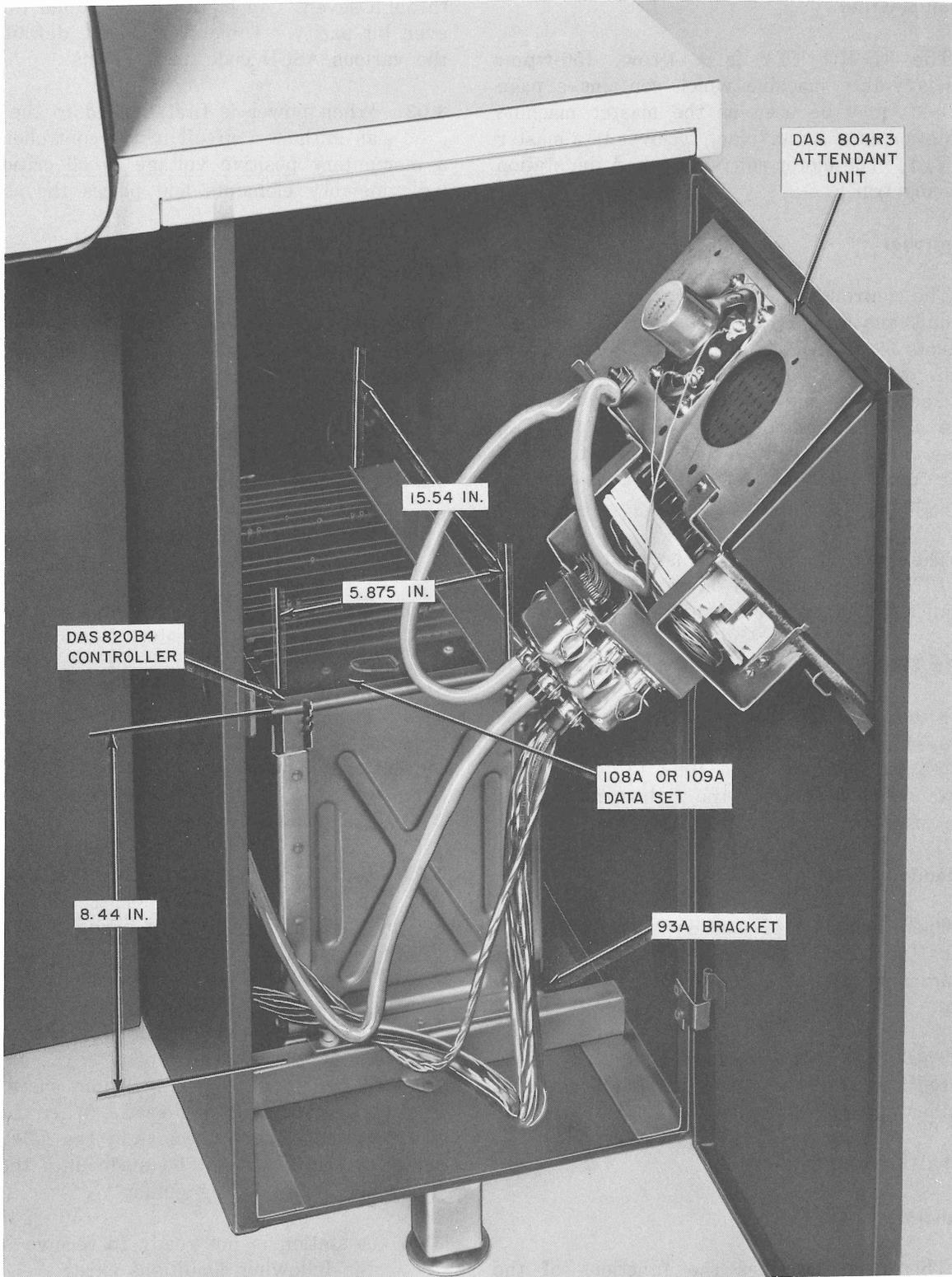


Fig. 3—DAS 820B4 Controller for 37 RO-Type HDX Station

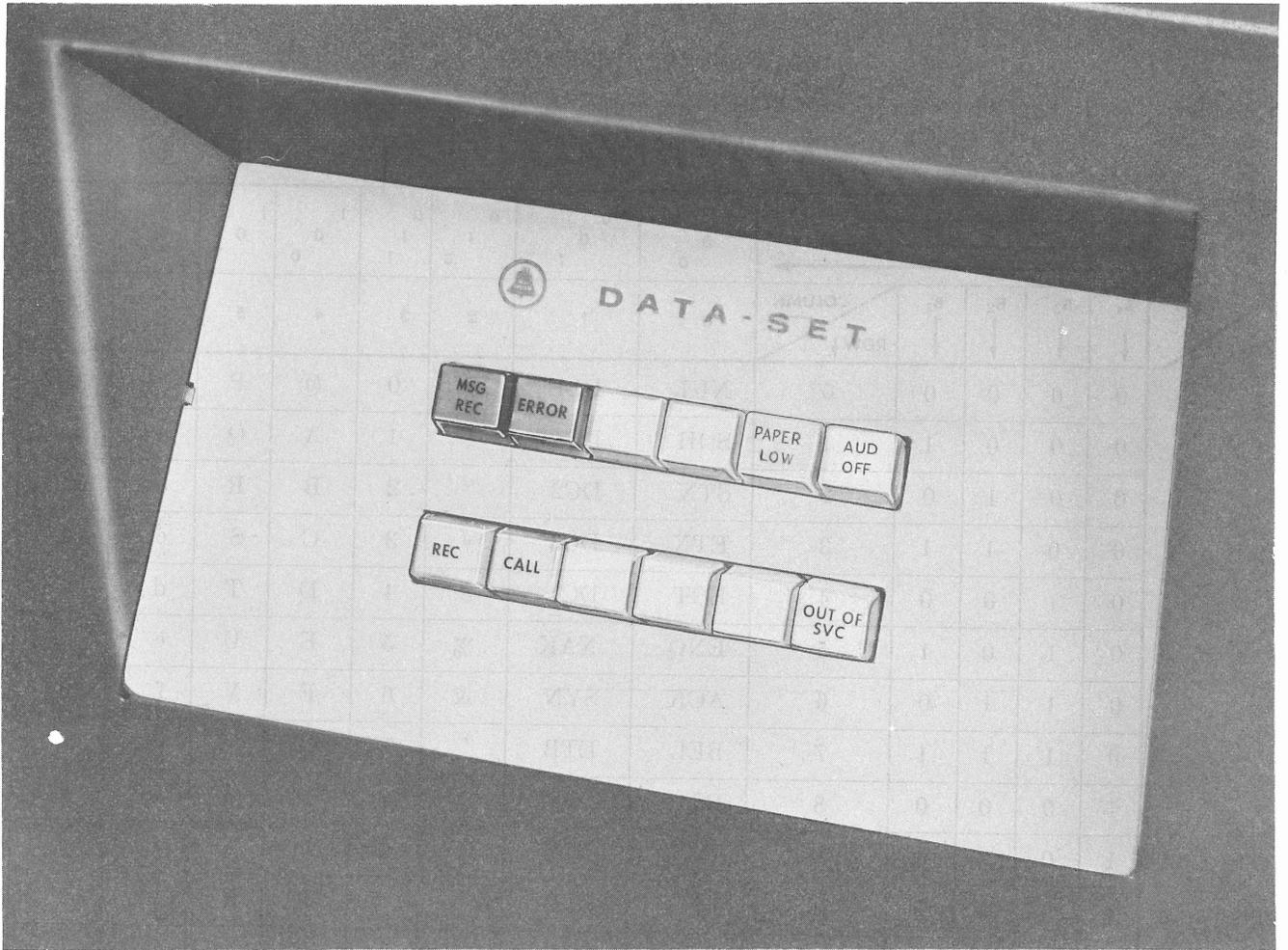


Fig. 4—DAS 804R3 Attendant Unit for Station

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

					0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
B ₄	B ₃	B ₂	B ₁	COLUMN ROW	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

TABLE B

DESIGNATION	DEFINITION	DESIGNATION	DEFINITION
NUL	All spaces	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 (Preferred for STOP)
ENQ	Enquiry	NAK	Negative Acknowledge
ACK	Acknowledge	SYN	Synchronous Idle
BEL	Bell or other signal	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 All Marks	SP	Space

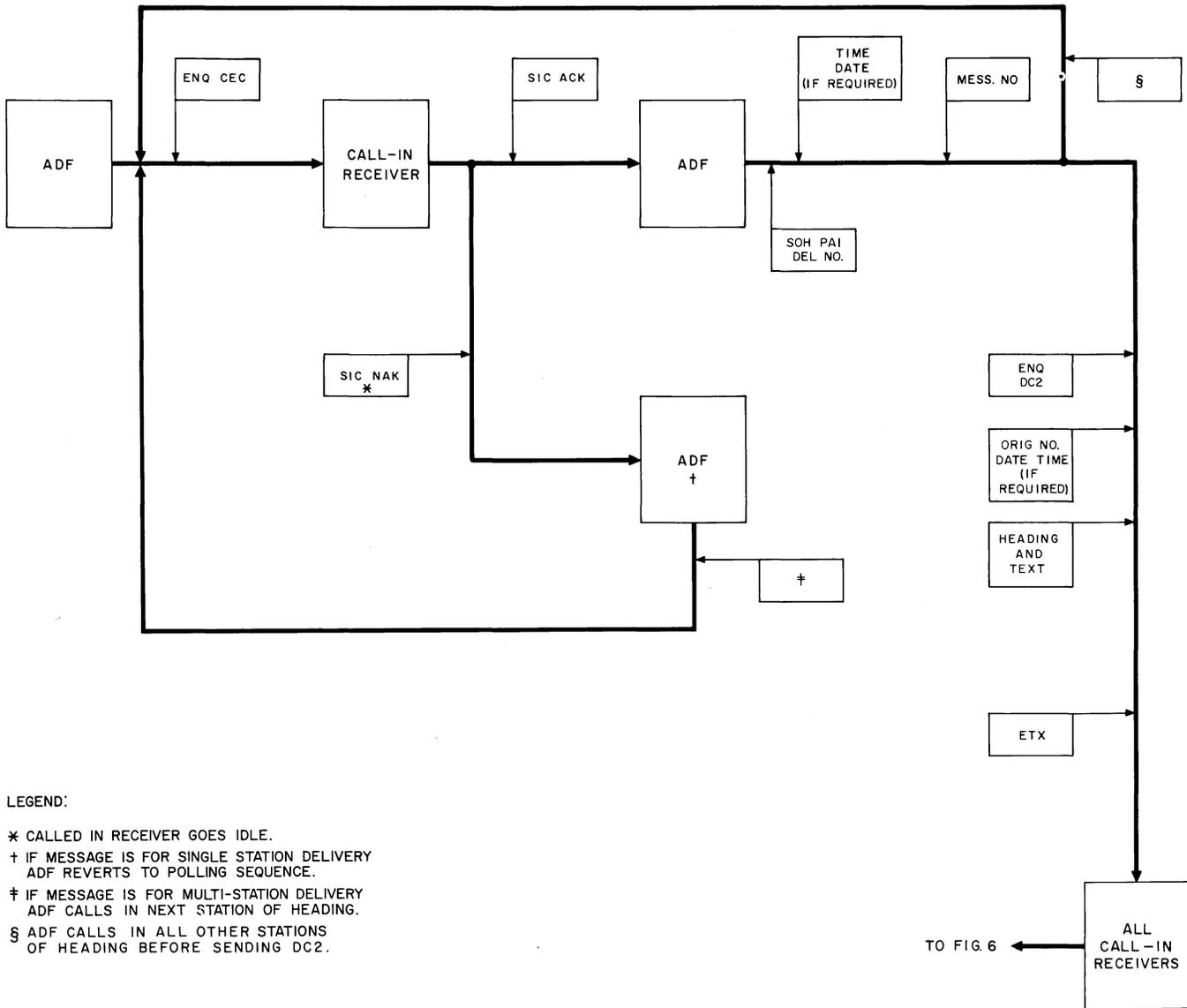


Fig. 5—Receiver Call-In Sequence Chart

- (b) Paper is low or form is out, and the station is not selected.
- (c) Form is being fed, and the station is not selected.
- (d) The controller is in the process of initialization (see 3.03) or is in the manual test mode (see 3.15).

3.07 If the station response is SIC ACK, the REC lamp is lighted (signifying that the station is selected), and the page printer is unblinded. The ADF now transmits personal address information (if required) and the message delivery number to the station. If additional stations are to be called in, the process just described is repeated. When call-in has been completed, the ADF sends ENQ DC2 unblinding the page printers of all the called-in receivers. The ADF now sends (if required) the delivery time, date, and originating number followed by the message heading, STX, text, and ETX.

3.08 After the text and ETX have been transmitted, the ADF initiates roll call by sending ENQ followed by the CEC of the station. The station responds with its SIC followed by CAN if the message was received properly, or NAK if it was not received properly. The NAK response is generated if any of the following occur during the interval between the time the station is selected to receive and roll call.

- (a) The receiver became not ready to receive.
- (b) ETX was not received and/or detected error-free by the controller.
- (c) A character was lost and did not reach the typing unit.
- (d) The station received a form feed (FF) order followed by DEL, form ran out while feeding, and the next character was not ETX (applicable to sprocket-feed page printers only).

Auxiliary Receiver TTY Connect and Disconnect

3.09 A 37 RO TTY may be used as an auxiliary receiver. It may be connected and disconnected manually and, if a wiring option is provided in the master machine, automatically.

3.10 The auxiliary receiver is manually connected by operation of AUX key located on the master machine. This places the selector magnet driver (SMD) of the auxiliary receiver in series with the SMD of the master machine, thereby allowing the auxiliary receiver to copy information being copied by the master machine. A lamp located adjacent to the AUX key on the master machine is lighted whenever the auxiliary receiver is connected. Restoration of the AUX key disconnects the auxiliary receiver.

3.11 When the wiring option allowing automatic auxiliary connect and disconnect is provided on the master machine, reception of DC2 and ETX and/or DC4 (option) will connect and disconnect, respectively, the auxiliary receiver. In addition, the auxiliary receiver cannot be disconnected unless both the manual and automatic controls are in the disconnect state.

3.12 A further option, called print suppression, may also be provided. This option causes the typing unit of the master machine to be blinded while the auxiliary receiver is connected. Disconnecting the auxiliary receiver will unblind the typing unit of the master machine.

C. Out of Service

3.13 The OUT OF SVC lamp on the attendant unit is lighted when the station is out of service. When the station is out of service, it will respond NAK (not ready to receive) to call-in. In the out of service mode, the TTY motor is normally off; however, if the OUT OF SVC key is operated while the station is selected to receive, the station will not go out of service and the motor will continue to run until the station becomes unselected.

D. Test Features

Remote Controller Loop-Back

3.14 If the station is equipped with Data Set 108A, the controller will be placed in the loop-back mode when it receives DLE + DC1. In this mode, all data that would normally be delivered to the station page printer is transmitted back to the sender. When the station receives DLE +, the OUT OF SVC lamp will be lighted and the station alarms disabled. This mode allows performance tests to be made on the controller.

Manual Loop-Back

3.15 The R switch on the controller disconnects the data set from the remainder of the station and connects the transmitted data lead to the received data lead of the data set. This isolates the station equipment allowing tests of the transmission facility and data set to be performed. In the manual loop-back mode the OUT OF SVC lamp is lighted, the controller input is clamped marking, and the carrier squelch path is bypassed around the carrier squelch switch.

E. Alarms

Roll Call and Message Reception Alarm (Fig. 6)

3.16 If the station answers NAK to roll call, the MSG REC lamp is lighted and the audible alarm is sounded. The lamp can be extinguished and the alarm silenced by operation of the MSG REC key. When roll call is completed, EOT restores all the called-in receivers to the idle state.

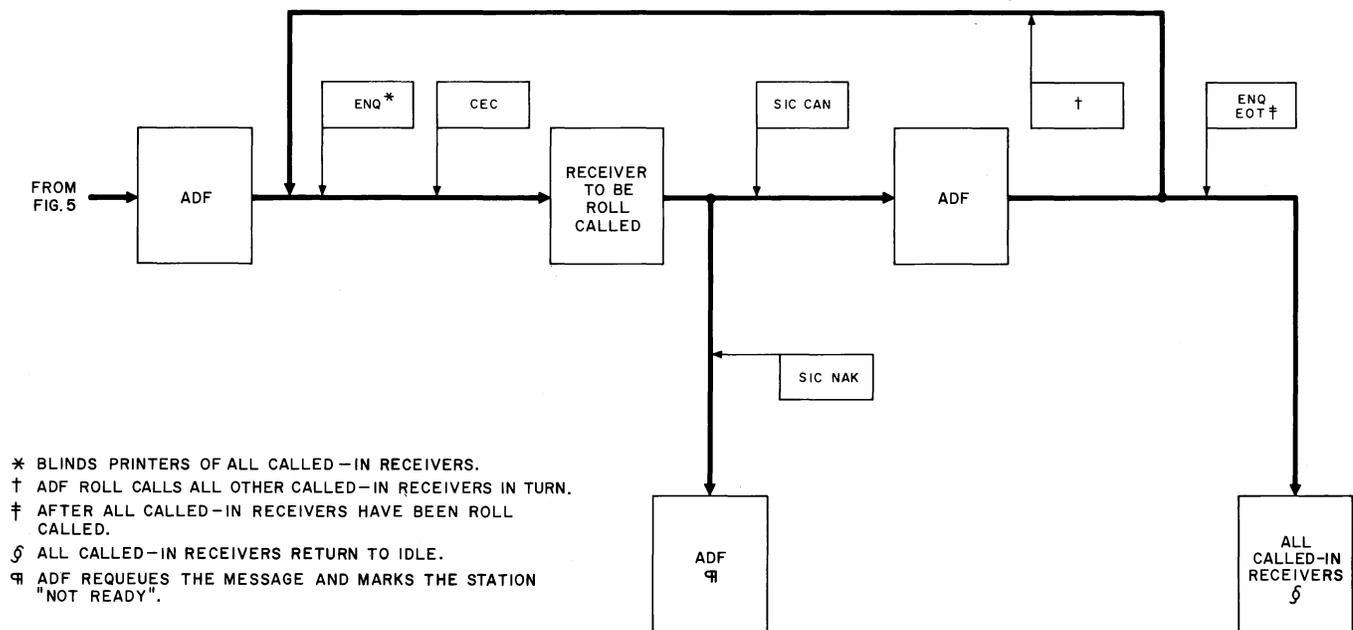


Fig. 6—Roll Call Sequence Chart

Parity Error

3.17 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 character received. If the count is odd, indicating a parity error, the ERROR lamp is lighted, the audible alarm is sounded, and the incorrect character is changed to an underline () by the controller. The ERROR lamp is extinguished and the alarm is silenced by operation of the ERROR key.

Service Message

3.18 When the ADF has a service message to send to a station that is selected to receive, it will send DLE DC1. This will light the MSG REC lamp and sound the audible alarm. After completion of the service message, operation of the MSG REC key will extinguish the lamp, silence the alarm, and restore the station to idle.

Out of Synchronism Error

3.19 In TTY systems, asynchronous character timing is employed. 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 which serves to denote when the fixed pattern is to start. In this system, the beginning of a character is identified by a mark-to-space transition. The start interval is spacing and is one-bit interval long. The stop interval is marking and is one-bit interval long for 150-wpm operation.

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

3.21 In order to reduce the number of incorrect characters which are printed when the receiver is recovering synchronization, the controller samples, at the end of the timing interval, the received character which should normally be marking. If this sample is found to be a space, the incorrect character is changed to an underline () by the controller, the ERROR lamp is lighted, and the audible alarm is activated. The alarm may be deactivated by operation of the ERROR key.

F. Station Functional Description (Fig. 7)

3.22 During the receive sequence, the data set converts the voice-frequency data tones (Data Set 108A) or dc current signals (Data Set 109A) from the line to EIA voltage signals which are presented to the controller. The EIA voltage signals are regenerated and sent to the TTY to operate the typing unit.

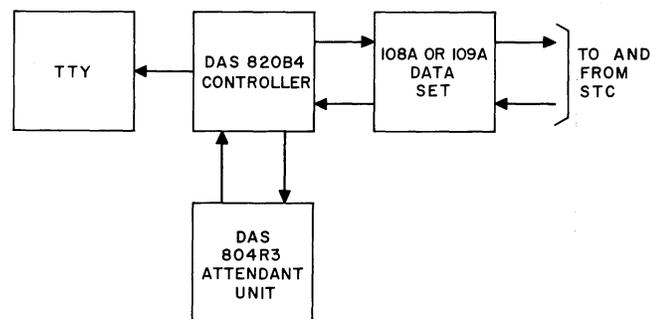


Fig. 7—Block Diagram of 150-WPM HDX Station

G. Teletypewriter Functional Description (Fig. 8)

3.23 During the receive sequence, voltage signals from the controller are applied to the SMD which operates the typing unit of the TTY.

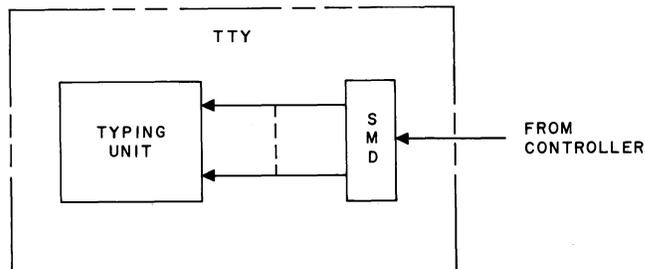


Fig. 8—Block Diagram 37 RO TTY

H. Controller Functional Description (Fig. 9)

3.24 A block diagram of the controller is shown in Fig. 9. The heavy lines represent the data transmission paths and the light lines the control signal paths.

Receive Mode

3.25 Characters are received serially from the data set under control of the gate and sample circuit. The start of each character triggers the local clock in the timing circuit and the clock runs for the duration of the character. The local clock is used to sample each bit of the received character and serially shift it into the shift register. Each character is monitored, while in the shift register, by the character detection circuit. This is done in order to detect specific receive control characters. These characters are ENQ, CEC, ETX, EOT, DC2, DC1, DLE, STX, +, and SPC.

3.26 When a receive control character is detected, the character detection circuit signals the control and state logic circuit to enable the controller to sequence through various receive functions. It also triggers the clock for timing the responses generated by the controller.

3.27 Each succeeding incoming character initiates a new timing cycle and the previous character is shifted out of the shift register.

Response Character Generation

3.28 The responses generated by the controller are ACK, NAK, CAN, and SIC. Which of these characters are generated as a response is

which monitors the state of the station equipment. The character is loaded into the shift register by the character generation circuit in a parallel fashion. The local clock in the timing circuit then serially shifts it out of the shift register. The character is now regenerated and gated to the data set.

Interface Circuits

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

- (a) Data signal exchange.
- (b) Motor on-off control.
- (c) Lost character detection.
- (d) Paper low detection.
- (e) Form-feed/form-out detection.
- (f) Ready/not ready monitoring.
- (g) Noise filtering.

I. Attendant Unit Functional Description

3.30 The DAS 804R3 Attendant Unit allows control of the station and indicates the state of the station and the controller receive circuits. Control

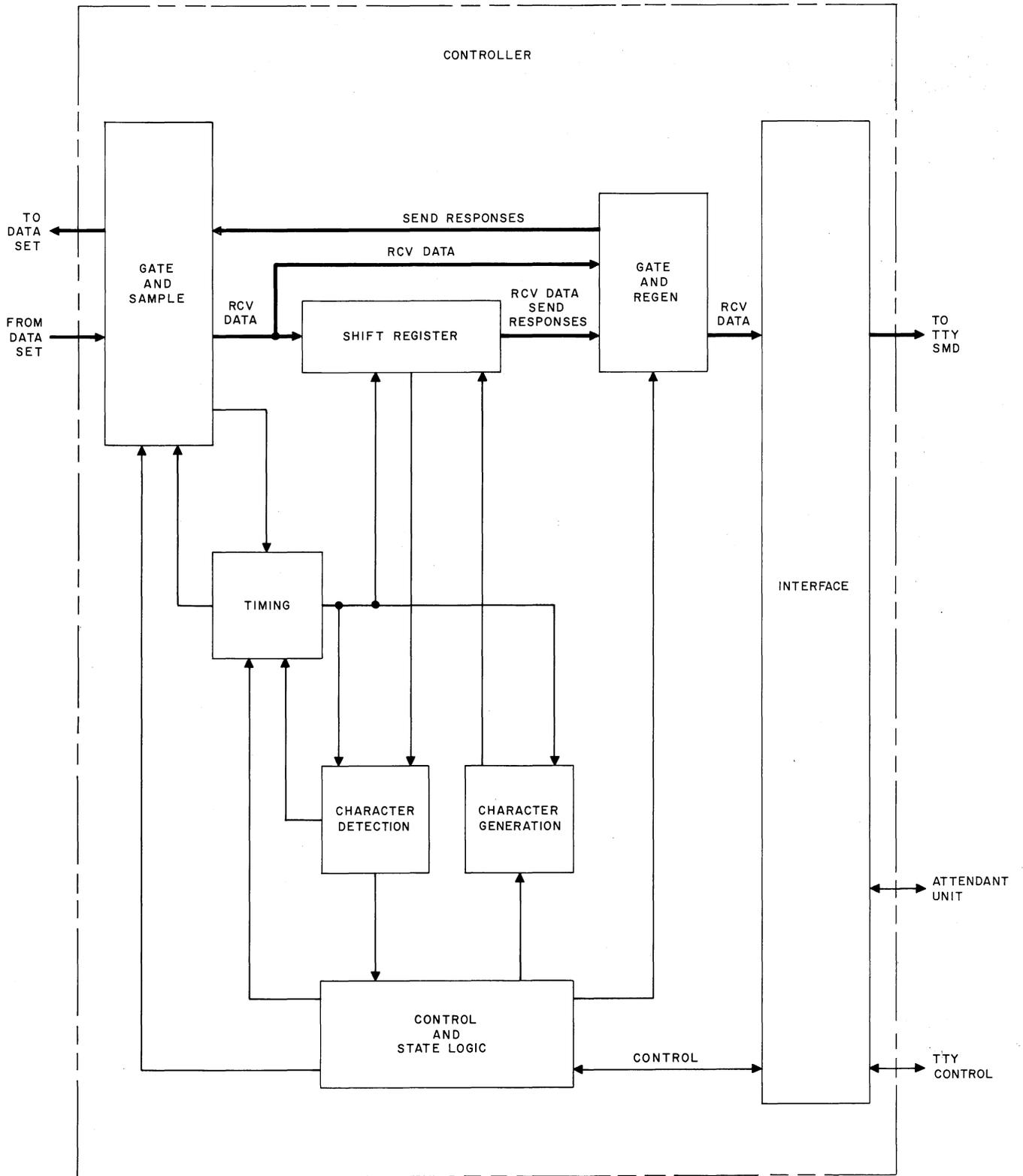


Fig. 9—Block Diagram of DAS 820B4 Controller

is facilitated by the operation of the MSG REC, ERROR, PAPER LOW, AUD OFF, and OUT OF SVC keys. The state of the station and its circuits are indicated by lamps associated with these keys plus the REC and CALL lamps. In addition, a loudspeaker is provided to give audible indications of alarm conditions.

J. Data Set Functional Description

Data Set 108A (Fig. 10)

3.31 The transmit frequencies for the Data Set 108A 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.

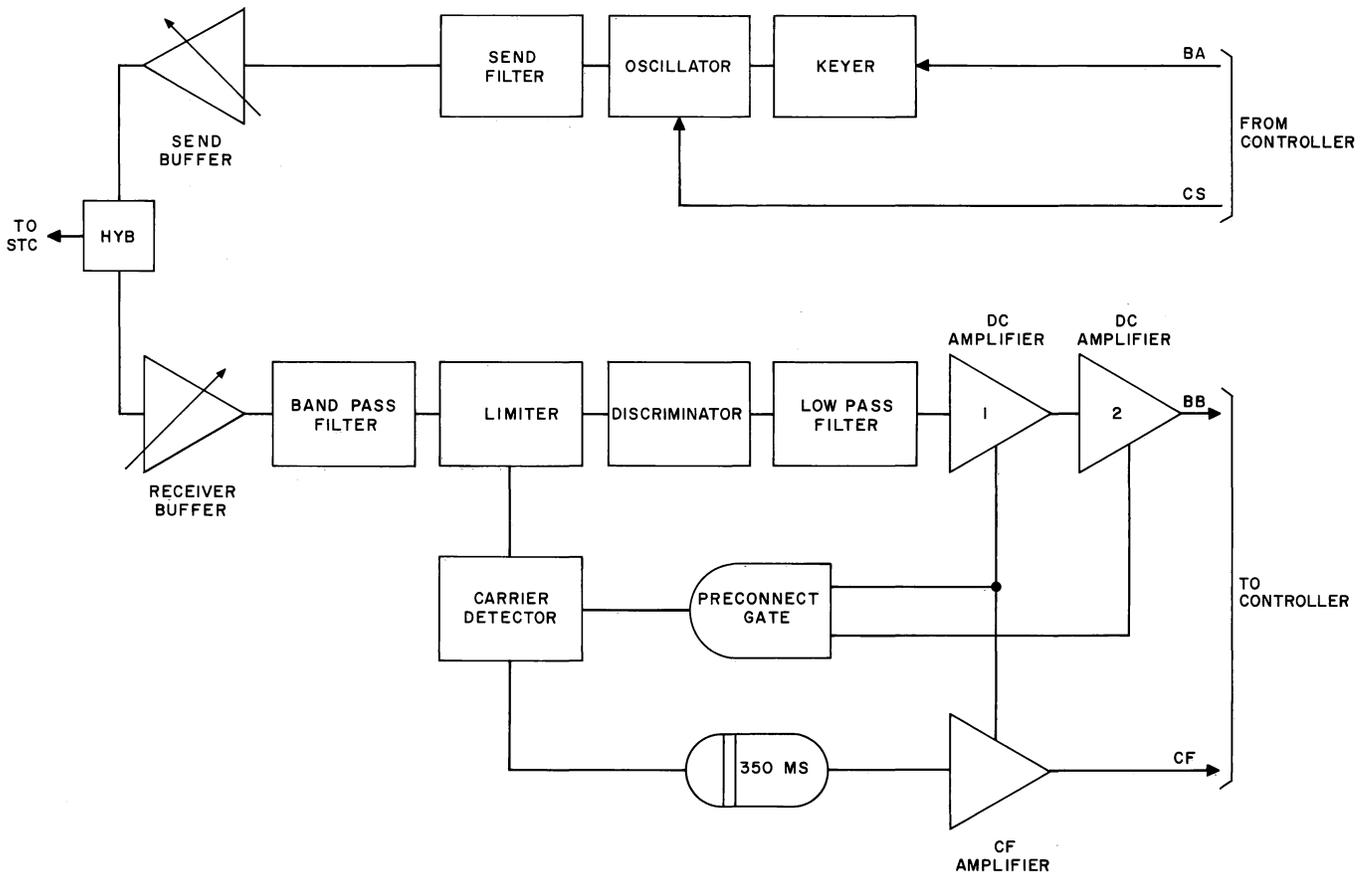


Fig. 10—Block Diagram of Data Set 108A

3.32 In the idle or marking condition, a negative voltage is applied on the transmitter data lead BA. 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 of the send buffer amplifier passes through the hybrid and then over the private line facilities to the ADF.

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

3.33 A marking signal transmitted from the ADF 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 incoming frequency and then limits 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 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 lead BB in the form of EIA voltage signals.

3.34 The second output from the limiter is to the carrier detector. The carrier detector monitors the output of the limiter 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 screw-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. The amplifier also clamps lead BB in a marking condition (ie, mark-hold condition). The data set will assume a preconnect mode in which it monitors for incoming marking carrier via the preconnect gate.

3.35 Some service applications will use carrier squelch on the data carrier failure option. When this option is provided and the CS switch is operated at the controller, the CF amplifier will cause a ground to be applied on lead CS to the oscillator. This shuts off the oscillator, thereby turning off the carrier being transmitted to the hub.

3.36 In order to restore the station to normal after 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 screw-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 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 to the oscillator.

Data Set 109A (Fig. 11)

3.37 The Data Set 109A is a current transmitting device. The output level is nominally 3 ma for both mark and space. The maximum allowable loop resistance for the 109A is 1500 ohms with one microfarad of shunt capacitance.

Note: When a Data Set 109A is used at a station, a Data Set 109B must be used at the hub.

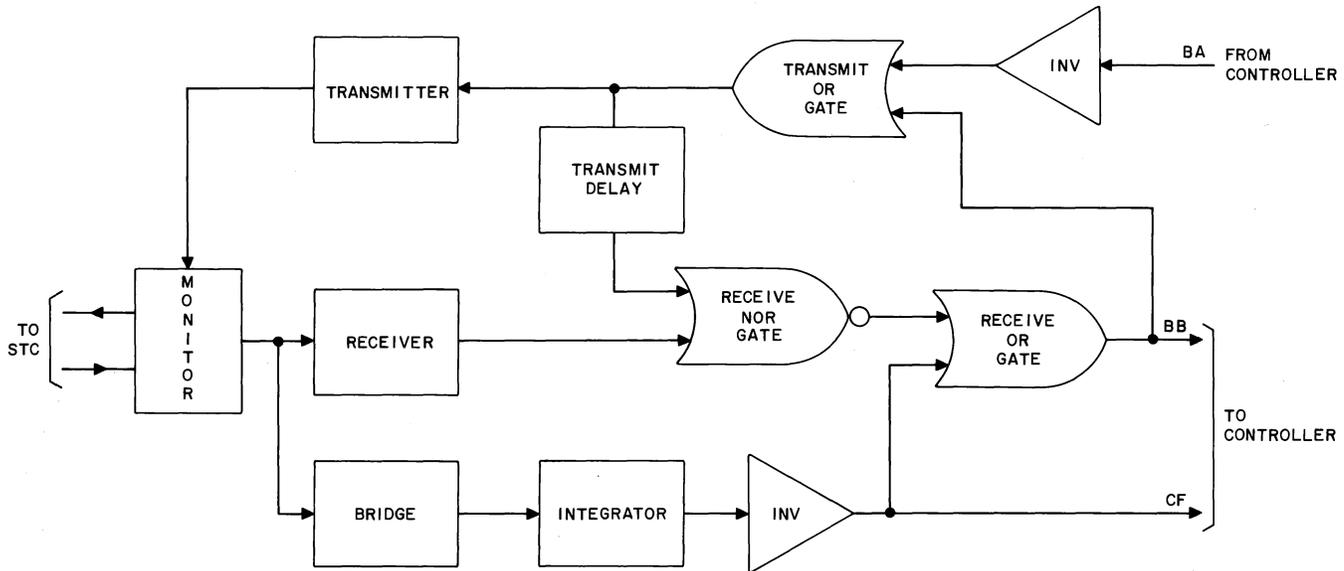


Fig. 11—Block Diagram of Data Set 109A

3.38 A space signal applied to lead BA is inverted.

This applies an off condition to the transmit OR gate which causes the transmitter to develop 12 volts. The monitor circuit couples the 12 volts to the line polarized so that 3 ma space current flows in the line. A mark signal applied to lead BA is also inverted. This applies an on condition to the transmit OR gate which causes the transmitter to develop 4 volts. The monitor circuit couples the 4 volts to the line polarized so that 3 ma mark current flows in the line.

3.39 Since the monitor in the data set recognizes

both received and transmitted signals without distinction, it is necessary to prevent transmitted signals from appearing on lead BB. This is accomplished by the transmit delay circuit, receive NOR gate, and receive OR gate. The receive NOR gate is operated by a positive voltage on either of its inputs. The output of the receiver is positive for a mark while the transmit delay circuit output is positive for a space. The operated receive NOR gate causes the BB lead to be held marking. To compensate for any delay (due to line capacity) in detecting a mark transmission, the transmit delay circuit holds the receive NOR gate for approximately 200 usec after a space-to-mark transition. To ensure that the receive NOR gate is operated before the receiver detects space transmissions, the delay circuit will operate the receive NOR gate before the receiver output goes negative following the mark-to-space transition.

3.40 When the data set is receiving, the BA lead is clamped to mark by signals from the controller. This places a negative voltage on the receive NOR gate input from the transmit delay circuit permitting the receiver to control the receive NOR gate. The monitor senses the magnitude and polarity of the line current and provides mark and space indications to the receiver. The receiver recognizes the difference in these indications and converts them into EIA voltage signals. These signals are sent through the receive NOR and OR gates and on to the controller on lead BB.

3.41 As long as the line current exceeds 1.5 ma in either a mark or space direction, the bridge conducts thus producing a negative output. The integrator circuit eliminates amplitude variations and presents a constant negative voltage to the inverter where it is inverted. A positive voltage is sent to the controller carrier fail circuit on lead CF. If the line current drops below 1.5 ma, the bridge stops conducting, the integrator discharges, a positive voltage is applied to the inverter, and the inverter sends a negative voltage to the controller carrier fail circuit. This brings in a carrier fail alarm at the station. The negative voltage from the inverter is also applied to the receive OR gate which clamps the BB lead to mark.

4. OPERATION

4.01 The station is initialized by momentarily disconnecting the TTY line cord from the

wall socket, thereby, interrupting the 117-volt ac power source. If after initialization, the OUT OF SVC and AUD OFF lamps are lighted, the OUT OF SVC and AUD OFF keys must be operated. If the PAPER LOW lamp is lighted, the paper or form supply is low or out and must be replenished. The station is now in a ready-to-receive mode and will answer SIC ACK to call in and CAN to polling.

4.02 There are seven designated keys and lamps on the station attendant units. Table C lists the lamps and when they light. Table D lists the keys and functions they perform.

4.03 To manually connect the auxiliary receiver, operate the AUX key on the master machine. This will light the AUX ON lamp.

4.04 To manually disconnect the auxiliary receiver, restore the AUX key. This will extinguish the AUX ON lamp. When the automatic auxiliary connect-disconnect wiring option is provided, manual-disconnect cannot be made if an automatic auxiliary receiver connect order has been received by the station.

TABLE C

LAMP	WHEN LAMP LIGHTS
MSG REC (Red)	Controller has answered NAK to roll call, DLE is received while station is selected, or carrier fail signal is received from the data set. (Audible alarm sounds)
ERROR (Red)	Parity or synchronization error is detected (audible alarm sounds)
PAPER LOW (White)	Typing unit paper supply is low (audible alarm sounds)
AUD OFF (White)	AUD OFF key operated
REC (Amber)	Station has been selected as a receiver
CALL (Amber)	Controller has answered SIC NAK to call-in (audible alarm sounds)
OUT OF SVC (White)	The station is in the out-of-service, remote controller loop-back, or manual loop-back mode

TABLE D

KEY	FUNCTION PERFORMED
MSG REC	Extinguishes MSG REC lamp and, if no other alarm condition exists, silences audible alarm
ERROR	Extinguishes ERROR lamp and, if no other alarm condition exists, silences audible alarm
PAPER LOW (TTY) TAPE LOW (ROTR)	After paper/tape is replenished, extinguishes PAPER LOW/TAPE LOW lamp and, if no other alarm condition exists, silences audible alarm
AUD OFF	Silences and inhibits audible alarm
OUT OF SVC	Places the station in the out-of-service mode (if station is not selected to receive)