33 AND 35 TELETYPEWRITER STATIONS

FOR "DATA-PHONE®" SERVICE

GENERAL DESCRIPTION

1. GENERAL

1.01 This section is issued to provide a general description of 33 and 35 teletypewriter stations for DATA-PHONE service.

1.02 A station for DATA-PHONE service consists of a 33 or 35 ASR, KSR, or RO teletypewriter set equipped with the TP186627 set logic assembly, and one of the following types of data sets:

Data Set 103G-Type
Data Set 113A-Type
Data Set 403E-Type
Data Set 103A-Type

1.03 References to right, left, front, rear, etc consider the teletypewriter station as viewed by the station operator.

2. REFERENCES

2.01 The following BSP references, in addition to the various component BSPs, provide supplemental information pertinent to a 33 or 35 DATA-PHONE teletypewriter station:

BSP Reference	Title
574-010-100	33 and 35 Teletypewriter Sets for EIA and Direct Neutral Interface — Description
574-100-401	33 Automatic Send-Receive (ASR) Keyboard Send-Receive (KSR) Receive-Only (RO) — Actual and Schematic Wiring Diagrams
574-202-400	35 Automatic Send-Receive (ASR) Sets — Actual and Schematic Wiring Diagrams
574-201-400	35 Keyboard Send-Receive (KSR) Sets 35 Receive-Only (RO) Sets — Actual and Schematic Wiring Diagrams
591-815-200	33 and 35 Teletypewriter Stations for DATA-PHONE Service — Installation and Checkout
574-228-800	35 Automatic Send-Receive Cabinet — Parts
574-123-102	Call Control Unit UCC29 for EIA and Direct Neutral Interface — Principles of Operation
574-123-800	33 Call Control Unit (UCC) — Parts (Includes parts for the UCC29, TP186627 set logic assembly, TP186630 break detector and indicator modification kit, and TP336192 answer-back modification kit)
591-026-100	Data Set 103G-Type — Description and Operation
591-033-100	Data Set 113A-Type — Description and Operation
594-026-100	Data Set 403E-Type Single Receiver Station — Description and Operation
591-014-100	Data Set 103A-Type — Identification and Operation

OPTIONAL BREAK DETECTOR
AND INDICATOR

TP186627
SET LOGIC ASSEMBLY

DATA SET
103G-TYPE

(Right Front View)
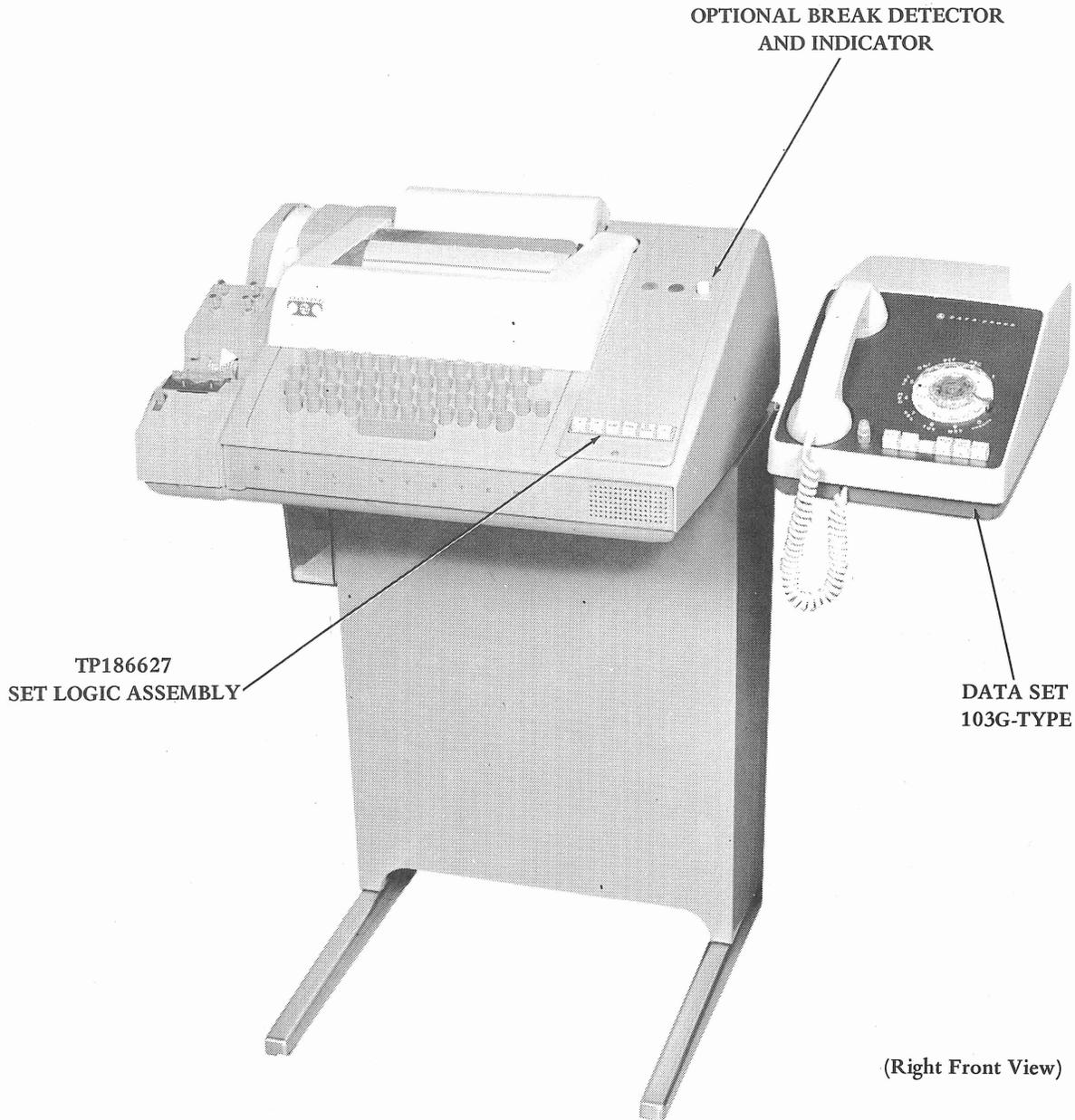
Figure 1 - 33 ASR Station With Data Set 103G-Type

3. DESCRIPTION

33 AND 35 STATIONS WITH DATA SET 103G-TYPE

3.01   33 and 35 teletypewriter stations equipped with
        data set 103G-type provide originate-answer
DATA-PHONE service with capabilities of automatic (unat-
tended) answering. Transmission is over the switched voice
message network (DDD) at 110 bauds. ASR, KSR, and RO
sets in both the friction and sprocket feed configurations are
used in this service. The 33 ASR station with data set

103G-type is shown in Figure 1. The 35 ASR station with
data set 103G-type is shown in Figure 2..

3.02   The station controls consist of two key assemblies,
        one on the data set and one provided by the
TP186627 set logic assembly. The set logic assembly serves as
the interface device between the teletypewriter and the data
set.

3.03   Data exchange between two DATA-PHONE sta-
        tions is preceded by a telephone connection which
may be established with the handset remaining on-hook

OPTIONAL BREAK DETECTOR
AND INDICATOR

DATA SET
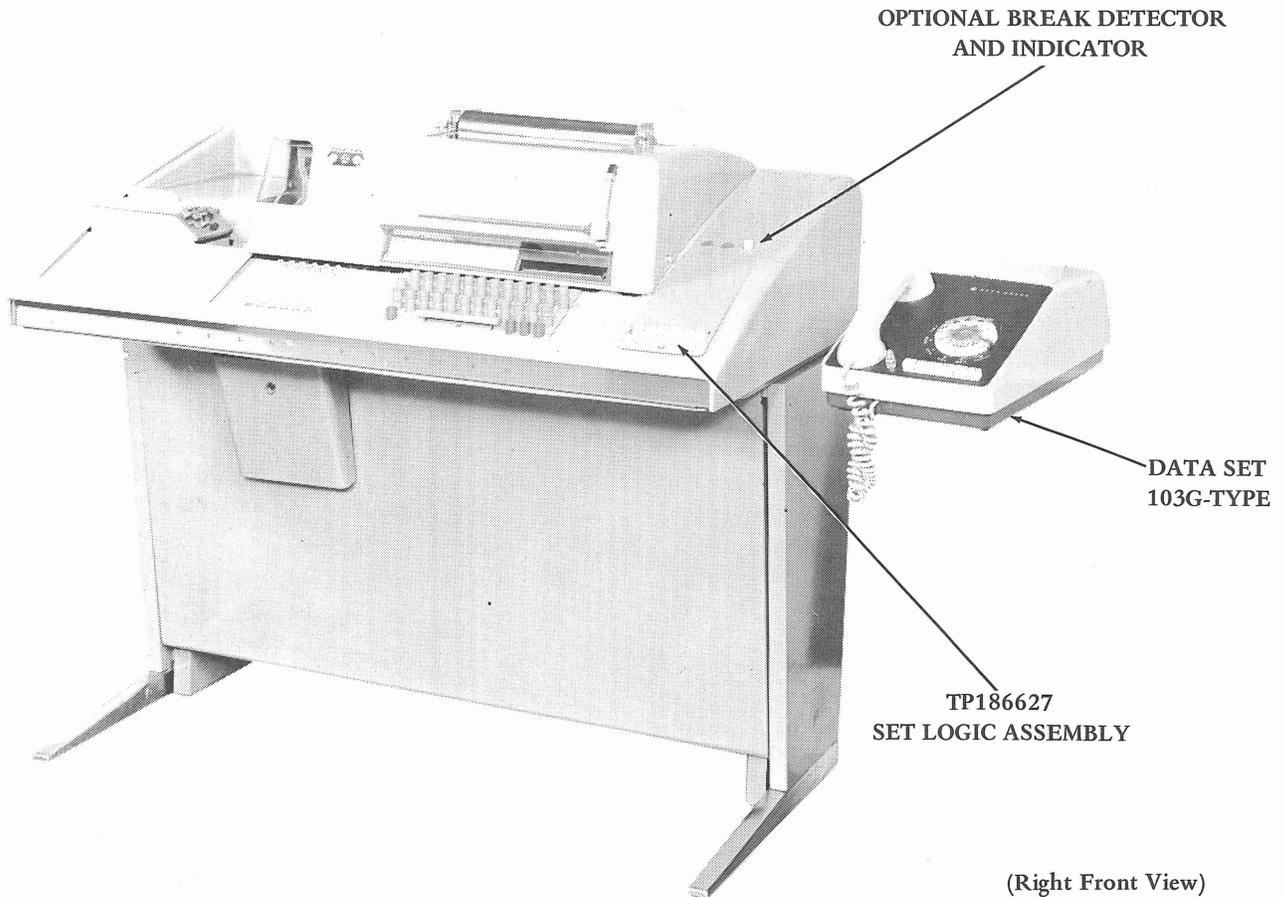103G-TYPE

TP186627
SET LOGIC ASSEMBLY

(Right Front View)

Figure 2 - 35 ASR Station With Data Set 103G-Type

during the dialing procedure ("hands free" call) or with the handset off-hook. In either case, prior to establishing a telephone connection, the teletypewriter at the calling station must be conditioned with a positive (on) voltage on the terminal ready lead (CD). This is done by depressing the nonlocking ON key of the set logic assembly, which starts the teletypewriter set motor.

3.04   In "hands-free" calls the DATA key on the calling station data set is depressed. The number of the station is then dialed and call progress can be monitored in the calling station loudspeaker. If the called station data set is in the AUTO mode, with the locking AUTO key depressed, the stations will handshake, the called station teletypewriter motor will start, and data may be exchanged.

3.05   If the called station answers a "hands-free" call in the TALK mode, the calling station will hear the operator's voice in the loudspeaker and can establish voice communication by picking up the handset and depressing the CLEAR/TALK key. After this verbal communication, both stations may go into the data mode by depressing the DATA key and replacing the handset back on-hook.

3.06   In calls originated with the handset off-hook, the CLEAR/TALK key is depressed and the number is dialed. The called station operator may pick up the handset and establish voice communication by momentarily depressing the CLEAR/TALK key and replacing the handset, or leaving the handset on-hook, depressing the DATA key until its lamp lights, indicating transfer to the data mode.

3.07   In automatic answering operation requiring station identification upon call connection the teletypewriter may be equipped with the TP336192 automatic answer-back modification kit. This option consists of a small circuit card which mounts in the call control unit area. It is activated when both the clear-to-send (CE) and ring indicator (CB) data set leads are positive 3 to 25 volts.

3.08   Stations with data set 103G-type may be optionally equipped with a TP186630 modification kit consisting of a break detector circuit card and indicating lamp with reset switch. The 33 station shown in Figure 1 is equipped with the break detector option. Receipt of a break signal will cause the automatic tape reader to stop and the break lamp to light requiring a pushbutton reset. It will also

blind the keyboard. If the break is not reset manually it will be restored on disconnect.

3.09   The keyboard arrangement for the 33 KSR and ASR stations is shown in Figure 3. The keytop designations conform to ASCII (American National Standard Code for Information Interchange) code. Following is a brief functional description of some keytop designations:

HERE IS – As in earlier keyboards, HERE IS trips the answer-back mechanism for purposes of station identification.

ESC (Escape) – This is a special control keytop intended to provide supplementary characters in general information interchange. Its specific usage is optional.

DC1 (Device Control 1) – Tape reader on.

ETB (End of Transmission Block) – A control character used to indicate the end of a block of data.

ENQ (Enquiry) – Similar to WRU. Used as a request for station identification.

DC2 (Device Control 2) – Tape punch on.

DC4 (Device Control 4) – Tape punch off.

EM (End of Medium) – This control character may be used to identify the physical end of the medium, or the end of the used, or wanted portion recorded on a medium. The position of this character does not necessarily correspond to the physical end of the medium.

NAK (Negative Acknowledge) – A negative response transmitted by the called station.

NEW LINE – This code performs CARRIAGE RETURN and LINE FEED functions at the same time.

CTRL (Control) – Depression of this keytop allows the transmission of various control functions such as ETB, ENQ, NAK, EOT, etc.

SOH (Start of Heading) – A control character used at the beginning of a sequence of characters which serve as the address portion of a message or provide routing information.

DC3 (Device Control 3) – Tape reader off.

EOT (End of Transmission) – A control character which terminates transmission.

ACK (Acknowledge) – A control character indicating that the station transmitting this character is able to receive data.

SUB (Substitute) – A character that may be substituted for a character which is determined to be invalid or wrong.

CAN (Cancel) – A control character indicating that the data with which it is sent is wrong or is to be disregarded.

ETX (End of Text) – A control character used to terminate a sequence of characters started with STX and transmitted as a whole.

SYN (Synchronous Idle) – A control character used by a synchronous transmission system in the absence of any other character to provide a signal from which synchronism may be achieved or retained.

STX (Start of Text) – A control character which precedes a sequence of characters that is to be treated as an entity and entirely transmitted through to the ultimate destination. Such a sequence is referred to as "text." STX may be used to terminate a sequence of characters started by SOH.

3.10   The keyboard arrangement for the 35 KSR and ASR stations is shown in Figure 4. This arrangement is an adaptation of existing 35 keyboards. The adaptation consists in replacing the LINE FEED keytop and its associated parts with the NEW LINE keytop and associated parts.
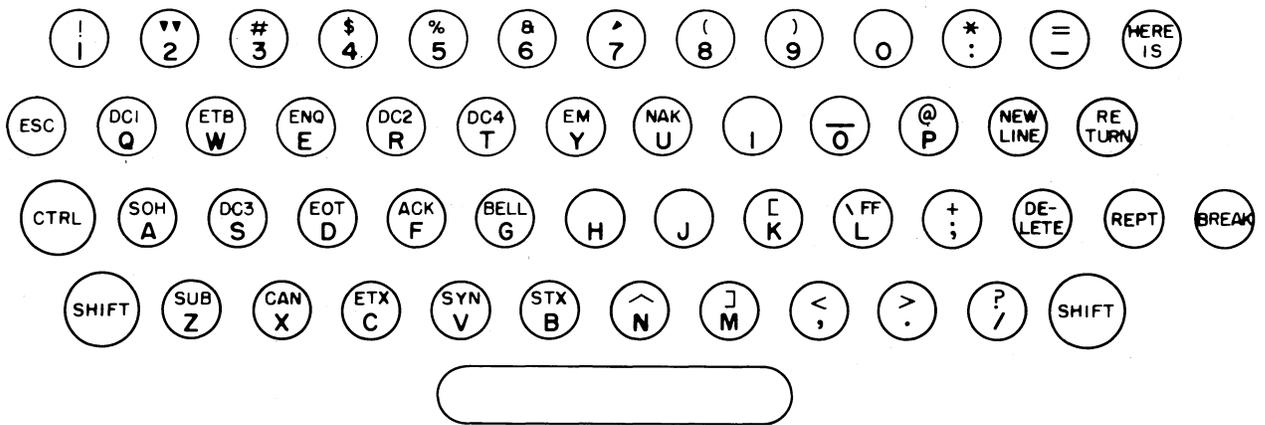
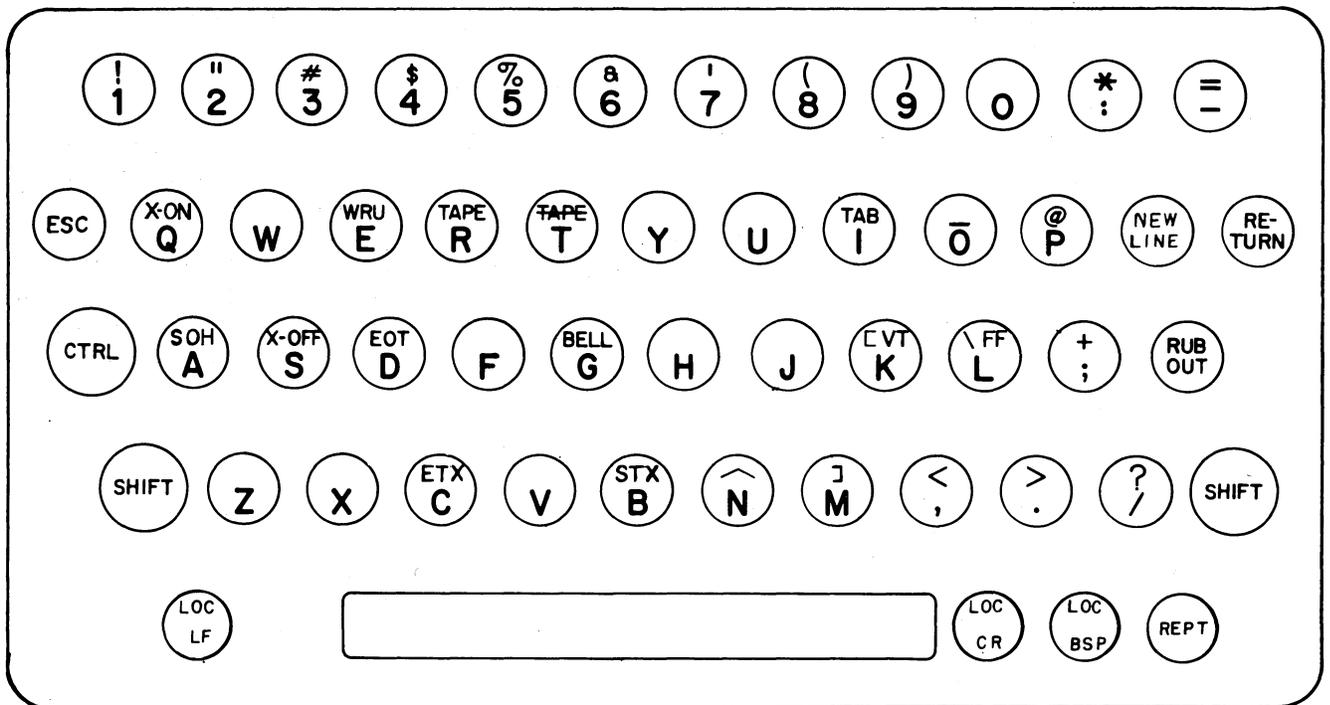Figure 3 - 33 Teletypewriter Keyboard Arrangement

Figure 4 - 35 Teletypewriter Keyboard Arrangement

3.11   Power for the data set 103G-type is supplied by the customer.

3.12   33 ASR stations are equipped with automatic tape reader and tape punch which will respond to signals generated from a remote source to turn them on or off. The 35 ASR stations have a tape reader which may be turned on and off automatically. The station is conditioned for these on and off signals by turning the TD CALL IN key on the control panel halfway to the right. A light inside the key lights. The tape punch on 35 stations cannot be turned on automatically from a remote source, but must be operated manually.

3.13   The interface between the teletypewriter and the data set is provided by the TP186627 set logic assembly which mounts in front of the call control unit underneath the set cover. The set logic assembly provides the key assembly for controlling the operational mode of the teletypewriter set. A strap option can be installed on the set logic assembly when used with data set 103G-type which will turn the terminal ready lead (CD) of the teletypewriter set on when the DATA key on the data set is depressed, starting the teletypewriter set motor. The interface leads between data set 103G-type and the teletypewriter with a brief description follows:

AA — Protective Ground: This conductor is electrically connected to the frame of the terminal apparatus. It may be further connected to external grounds as required by applicable regulations.

AB — Signal Ground: This conductor establishes the common-ground reference for all interchange circuits except AA. It may be connected to circuit AA or the frame, as required by applicable regulations.

BA — Transmitted Data: Signals on this circuit are generated by the teletypewriter for transmission to the data set.

BB — Received Data: Signals on this circuit are received by the teletypewriter from the data set.

CB — Clear to Send: Signals on this circuit are generated by the data set to indicate that the data set is ready to transmit data when in the on condition. This circuit is brought into the set logic assembly from the data set but is not used.

CC — Data Set Ready: Signals on this circuit are generated by the data set to indicate that it is ready to operate (on condition). The off condition indicates one of the following:

(a)   Any abnormal or test condition which disables or impairs normal operation.

(b)   That the communication channel is switched to an alternate means of communication.

(c)   That the data set is not connected to the communication channel.

CD — Data Terminal Ready: Signals on this circuit are generated by the teletypewriter to control switching of the data set to a communications channel. The on condition causes the data set to be connected to the communications channel. The off condition removes the data set from the communications channel to terminate a call, free the line for alternate use, or permit the use of the teletypewriter for an alternate function. A strapping option (option D) in the set logic assembly causes the data terminal relay to be held energized, thus indicating an on condition.

CE — Ring Indicator: Signals on this circuit are generated by the data set to indicate that ringing current is being received from a remote station. The on condition indicates that a ringing signal is being received with the off condition maintained at all other times.

Note: Other leads are presented by the data set to the teletypewriter but are not used.
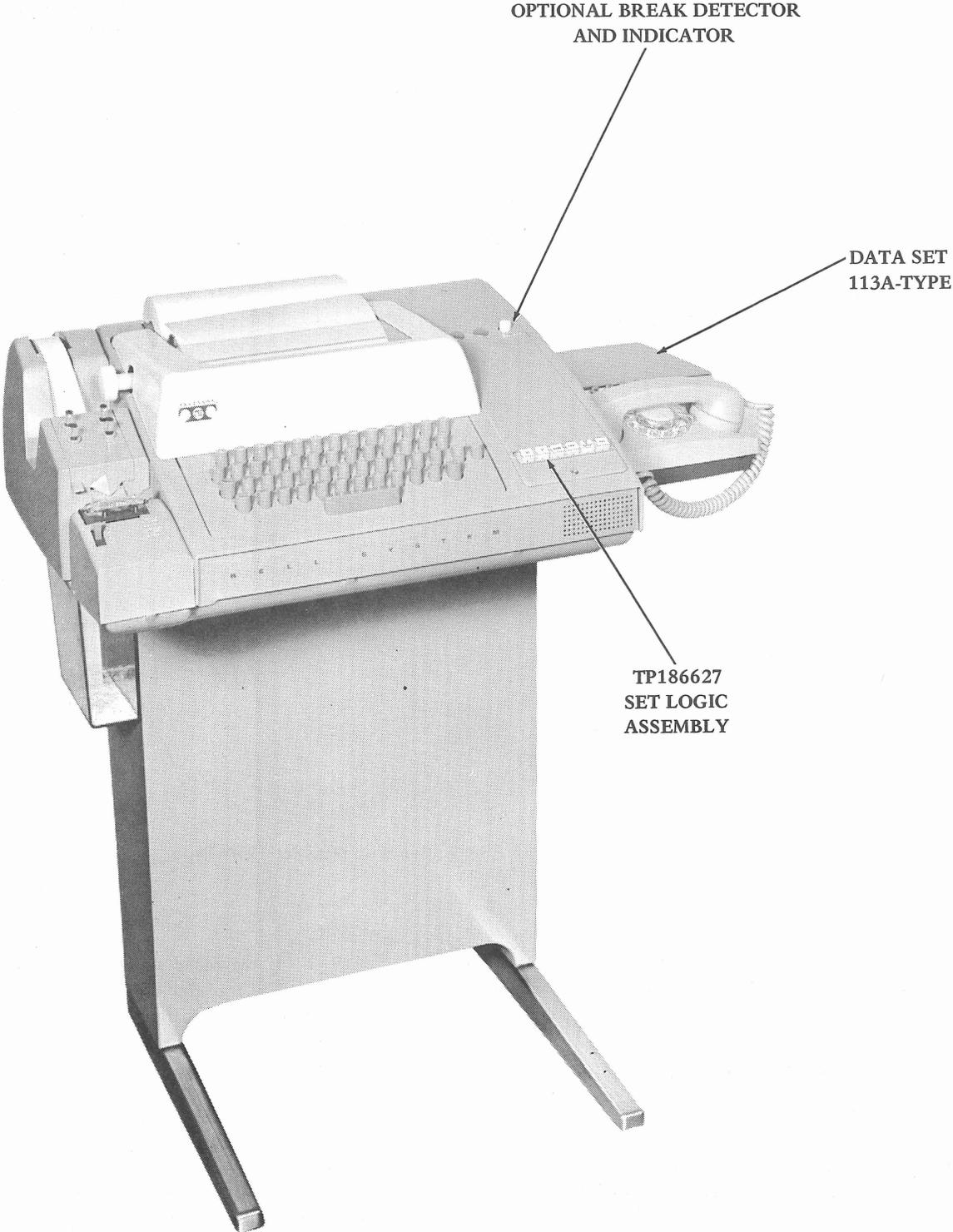
33 AND 35 STATIONS WITH DATA SET 113A-TYPE

3.14   Model 33 and 35 teletypewriter stations equipped with data set 113A-type provide 110 baud, full-duplex, originate only, serial data transmission as well as voice capabilities over the direct distance dialing (DDD) network. The 33 ASR station with data set 113A-type mounted on a TP328937 mounting shelf is shown in Figure 5. The 35 ASR station with data set 113A-type mounted on the TP328937 mounting shelf is shown in Figure 6.

3.15   Power for the data set is supplied by the telephone line.

3.16   The interface leads presented to the teletypewriter by data set 113A-type are:

AA — Protective Ground
AB — Signal Ground
BA — Transmitted Data
BB — Received Data
CA — Request to Send
CB — Clear to Send
CC — Data Set Ready (see note)

Note: This lead deviates from EIA specifications. The ON state of this signal is a positive voltage conforming

OPTIONAL BREAK DETECTOR
AND INDICATOR

DATA SET
113A-TYPE

TP186627
SET LOGIC
ASSEMBLY

(Left Front View)

Figure 5 - 33 ASR Station With Data Set 113A-Type

OPTIONAL BREAK DETECTOR
AND INDICATOR

DATA SET
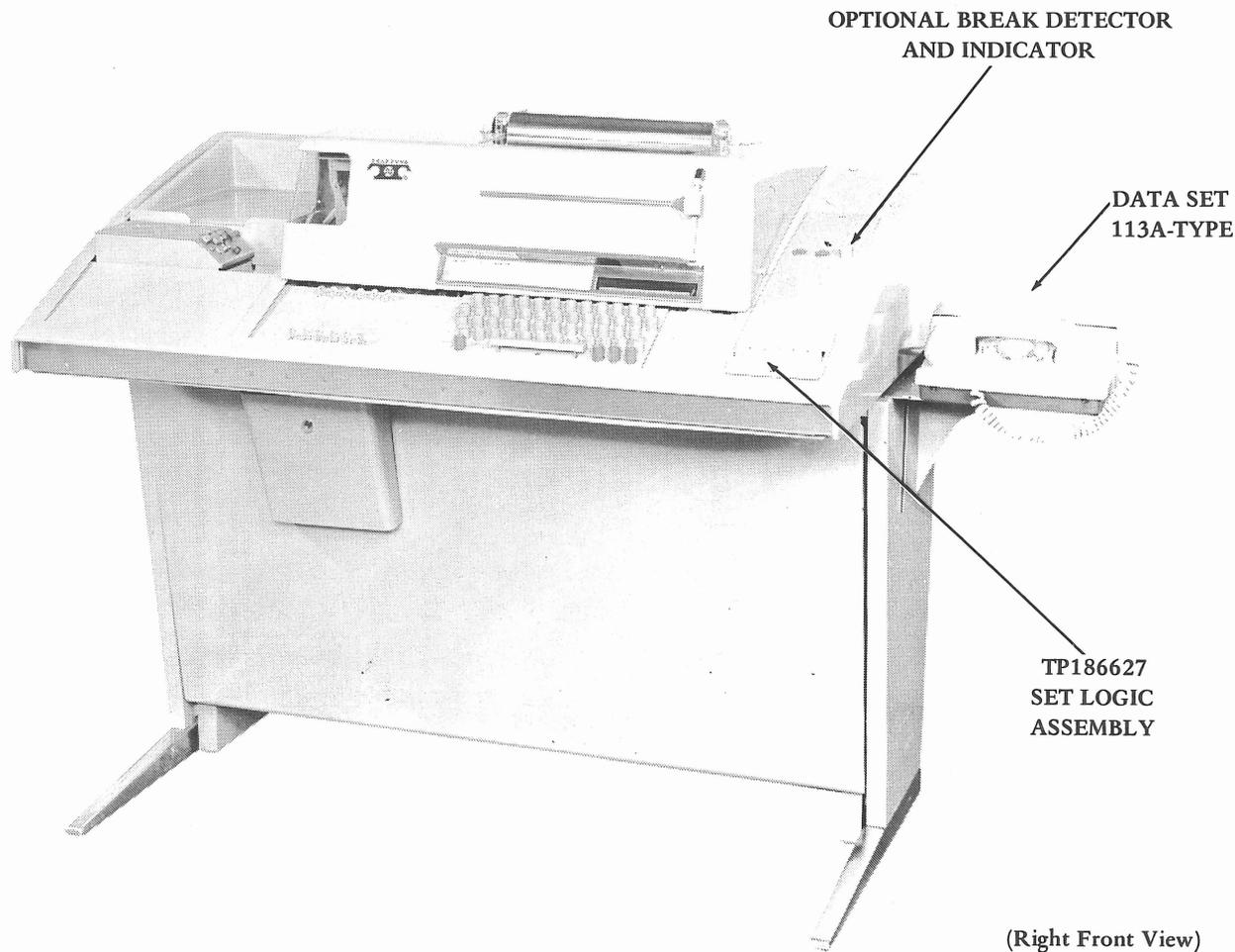113A-TYPE

TP186627
SET LOGIC
ASSEMBLY

(Right Front View)

Figure 6 - 35 ASR Station With Data Set 113A-Type

to EIA specifications. The OFF condition is zero volts. The CC circuit will be in the off condition when:

(1) The power in the data set is off or,

(2) the handset on the data set is off, or

(3) the data set is in the TEST mode.

3.17 33 and 35 teletypewriter stations equipped with data set 113A-type are compatible with teletypewriter stations equipped with 103A-type, 101C-type, or 103G-type and similar originate-answer type data sets.

Call Origination

3.18 To originate a call the attendant picks up the handset and operates the TALK key, or operates the TALK key first and then picks up the handset. The order of these operations is of no importance. After dial tone is heard the attendant dials the number.

3.19 If the called station answers in the data mode it will transmit the f2 mark signal which is heard in the handset. Upon hearing the answer tone, the attendant at the calling station depresses the DATA key within 4 seconds and replaces the handset on-hook. This starts the teletypewriter set motor and data exchange can take place. If the called station answers in the talk mode, the attendants precede data exchange with voice communication. At the end of this verbal exchange, the attendant at the called station goes into the data mode, transmitting the f2 mark signal. The attendant at the calling station hears this answer tone and goes into data mode by depressing the DATA key on the data set and replacing the handset on-hook. This starts the teletypewriter set motor and data exchange may take place.

3.20 If desired, both stations may return to the talk mode by removing the handset from the switch hook and depressing the TALK key.

3.21   Stations with data set 113A-type disconnect a call by depressing the TALK key while the handset is on–hook. If during data transmission the handset is removed from the switch hook, data transmission will stop, but the station will continue to be connected to the line.

3.22   The keyboard arrangements for the 33 and 35 stations with data set 113A-type are similar to those of stations with data set 103G-type shown in Figures 3 and 4 respectively.

3.23   The 33 ASR stations are equipped with automatic tape reader and tape punch which will respond to signals generated from a remote station to turn them on or off. As described in 3.12, the 35 ASR stations have automatic operation of the tape reader, but not of the tape punch.

3.24   33 and 35 stations with data set 113A-type may be optionally equipped with a break detector modification kit as described for stations with data set 103G-type in 3.08.

3.25   33 and 35 stations with data set 113A-type may have, optionally, either rotary or TOUCH-TONE® dialers. The respective codes are:
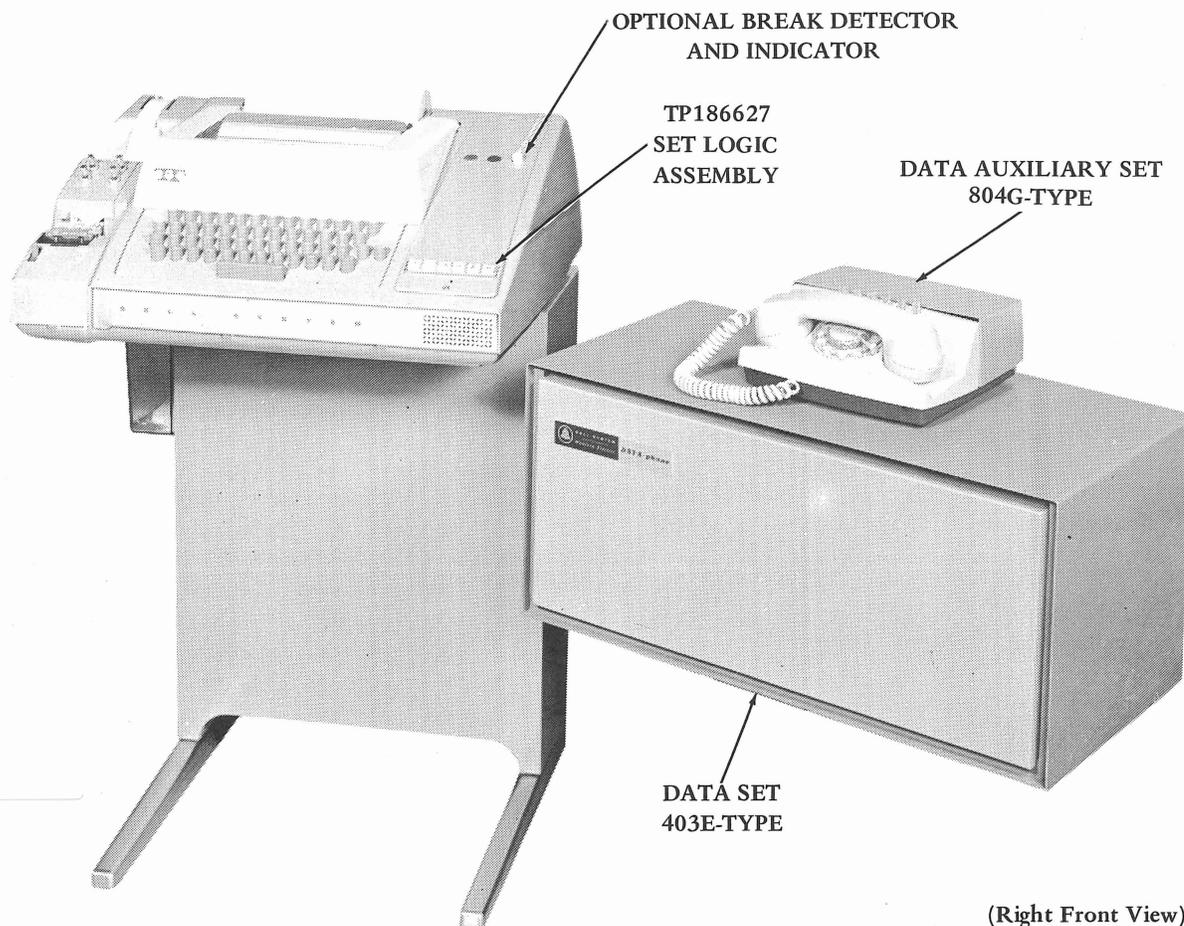
> Rotary dial – data set 113A-L1
> TOUCH-TONE dial – data set 113A-L1A

33 AND 35 STATIONS WITH DATA SET 403E-TYPE

3.26   Model 33 and 35 teletypewriter stations with data set 403E-type provide reception of numeric data generated by transmitting terminals using a 2 out of 8 code (TOUCH-TONE signals) in DATA-PHONE service at 110 bauds. The 33 ASR station with data set 403E-type and associated data auxiliary set 804G-type is shown in Figure 7. The 35 ASR station with data set 403E-type and associated data auxiliary set 804G-type is shown in Figure 8.

3.27   33 and 35 stations with data set 403E-type are capable of either attended or unattended operation. TOUCH-TONE signals received by the data set are translated into serial start-stop signals corresponding to the

OPTIONAL BREAK DETECTOR
AND INDICATOR

TP186627
SET LOGIC
ASSEMBLY

DATA AUXILIARY SET
804G-TYPE

DATA SET
403E-TYPE

(Right Front View)

Figure 7 - 33 ASR Station With Data Set 403E-Type

OPTIONAL BREAK DETECTOR
AND INDICATOR

DATA AUXILIARY
SET 804G-TYPE

DATA SET
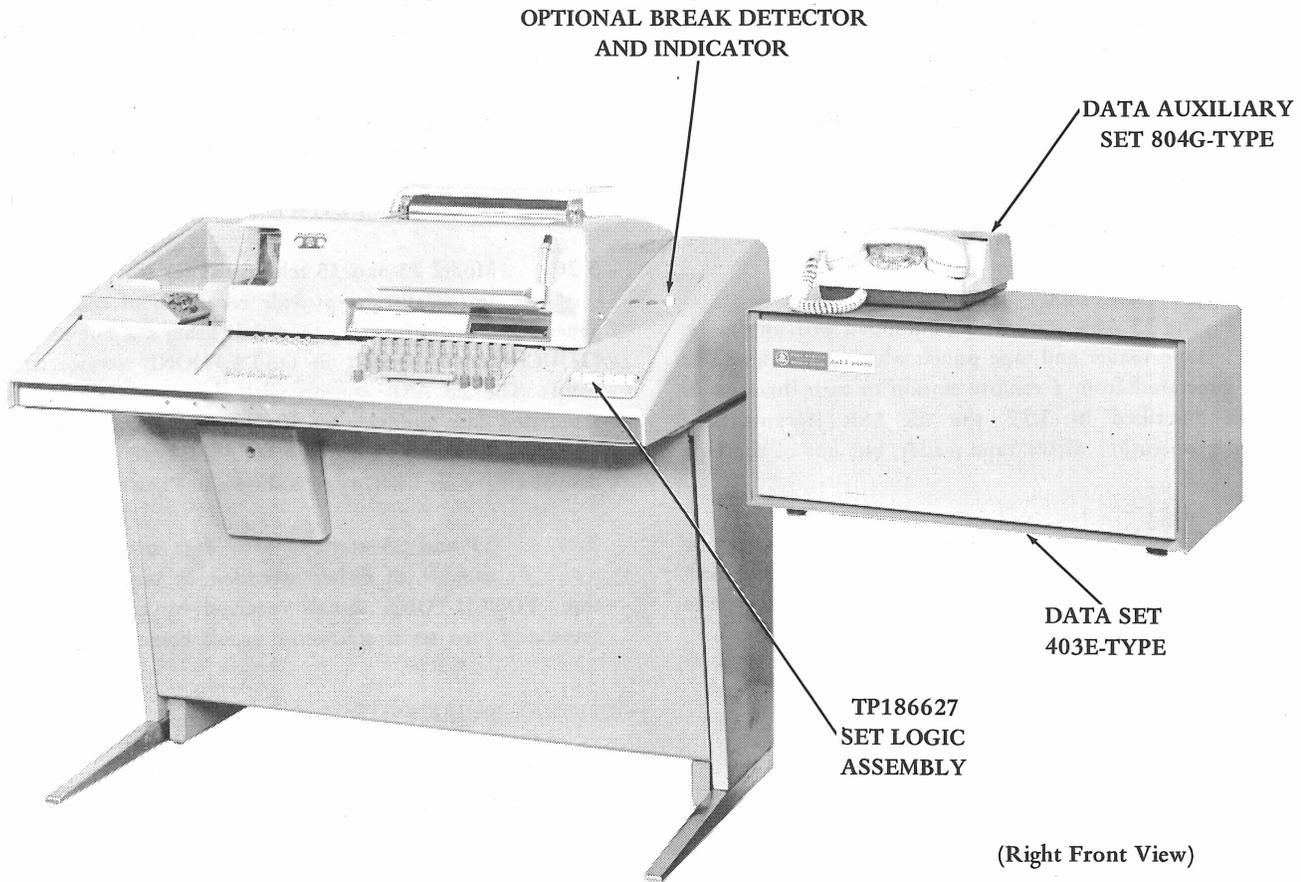403E-TYPE

TP186627
SET LOGIC
ASSEMBLY

(Right Front View)

Figure 8 - 35 ASR Station With Data Set 403E-Type

ASCII code and presented to the teletypewriter set logic assembly in bipolar form conforming to EIA-232-B. The interface leads presented to the teletypewriter by data set 403E-type and a brief discussion of their function follows:

AA – Protective Ground: This conductor is electrically connected to the frame of the terminal apparatus.

AB – Signal Ground: Common ground reference for all interchange circuits except AA.

BB – Received Data: Data on this lead is coded as an ASCII character with an even parity bit and is transmitted synchronously by bit and asynchronously by character to the teletypewriter in 11-bit serial, start-stop form.

CB – Clear to Send: This lead is held permanently in the off condition.

CC – Data Set Ready: The on indication on this circuit shows that the data set is connected to the communication line. An off condition will appear

at all other times and the teletypewriter will disregard signals appearing on any other circuits in the interface.

CD – Data Terminal Ready: Signals on this circuit are generated by the teletypewriter to control switching the data set to the line. The on condition causes the data set to be connected to the line. The off condition removes the data set from the communication channel.

(a) The data set is equipped for automatic answer of received calls, the on state of CD places the data set in the automatic mode. In this mode, connection to the line will occur only in response to ringing.

(b) An off condition of the CD lead will cause the data set to be removed from the line. The lead must be maintained in the off state for at least 50 milliseconds to insure disconnect.

(c) For communication channels arranged for receive-only service, the installer can arrange the interface coupler so that the data set will be placed in the out-of-service state (made busy to incoming calls) when the off state is placed on the data terminal ready lead.

3.28   33 and 35 stations with data set 403E-type are capable of receiving up to 13 characters, the numerals 0 thru 9 plus three optional characters. The * and # keys on the TOUCH-TONE dialer can serve to provide the three optional characters at the time of installation. The * key can serve as a request for answer-back which will be transmitted by the station to the calling party in the form of an answer-back tone in the telephone handset. The # key can be used to allow the teletypewriter to recognize two characters. A single depression of the # key on the telephone dial will be interpreted by the teletypewriter as a command to line feed (if enabled the teletypewriter will line feed and carriage return simultaneously). Two consecutive depressions of the # key will be interpreted by the teletypewriter as an EOT and the station will turn off.

3.29   Attended reception of numeric data by a 33 or 35 station with data set 403E-type is preceded by a telephone call. The talk mode is established by lifting the handset from the switch hook and depressing the locking TALK key. After voice exchange, the attendant switches the station to the data mode by depressing the nonlocking DATA key and replacing the handset on the switch hook. The teletypewriter motor turns on and an answer tone is transmitted to the originating party as an indication that the station is in the data mode. If it is necessary to return to the talk mode the attendant lifts the handset and depresses the TALK key. When the station is in the data mode the call may be terminated by removing the handset from the switch hook. If the station is in the talk mode, the call can be terminated by replacing the handset on the switch hook. Both actions will turn off the teletypewriter motor and disconnect the station from the line.

3.30   Unattended reception of data is likewise preceded by a telephone connection. On call connection the teletypewriter motor starts and the station transmits the answer tone. The station is now in the data mode and able to receive data. Reception of the # code from the calling telephone set causes the teletypewriter station to simultaneously carriage return and line feed (if the automatic carriage return/line feature in the teletypewriter has been enabled). Reception of two consecutive # code combinations turns the teletypewriter station off. If the calling party replaces the handset on the switch hook without sending two # codes, the connection will be terminated but the teletypewriter will continue to run. Provisions are available to optionally strap the station for automatic turn off after 15 or 45 seconds of inactivity.

3.31   Since the 33 and 35 stations with 403E-type data sets are receive-only stations, and because of the limited number of code combinations available, automatic operation of the tape punch is not possible. Operation of the tape punch, tape reader, and keyboard on ASR stations is limited to local operation. The 33 and 35 keyboards are as shown in Figures 3 and 4 respectively.

33 AND 35 STATIONS WITH DATA SET 103A-TYPE

3.32   Model 33 and 35 stations equipped with data set 103A-type provide full-duplex serial data communication at 110 bauds over the direct distance dialing network. These stations are capable of attended and unattended operation. The 33 ASR station with data set 103A-type and data auxiliary set 804-B1 is shown in Figure 9. The 35 ASR station with data set 103A-type and data auxiliary set 804-B1 is shown in Figure 10.

3.33   Interface leads between data set 103A-type and the teletypewriter conform to EIA standards. The interfacing is briefly as follows:

AB — Protective Ground: Common to signal ground, ac power service ground, and electrically bonded to the equipment frame.

BA — Transmitted Data: Signals generated by the teletypewriter and presented to the data set.

BB — Received Data: Signals received by the teletypewriter from the data set.

CB — Clear to Send: Signals generated by the data set and presented to the teletypewriter to indicate that the data set is ready to transmit data when in the on condition. This circuit is brought to the teletypewriter set logic assembly but is not used.

CC — Data Set Ready: Signals on this lead indicate to the teletypewriter that the data set is connected to the communication channel.

CD — Data Terminal Ready: Signals on this circuit are generated by the teletypewriter to control switching of the data set to a communication channel.

CE — Ring Indicator: Signals on this circuit are generated by the data set to indicate that ringing current is being received from a remote station. The on condition indicates that a ringing signal is being received with the off condition being received at all other times.

CF — Data Carrier Detector: An indication from the data set to the teletypewriter that carrier is being received.

OPTIONAL BREAK DETECTOR
AND INDICATOR

TP186627 SET
LOGIC ASSEMBLY

DATA SET
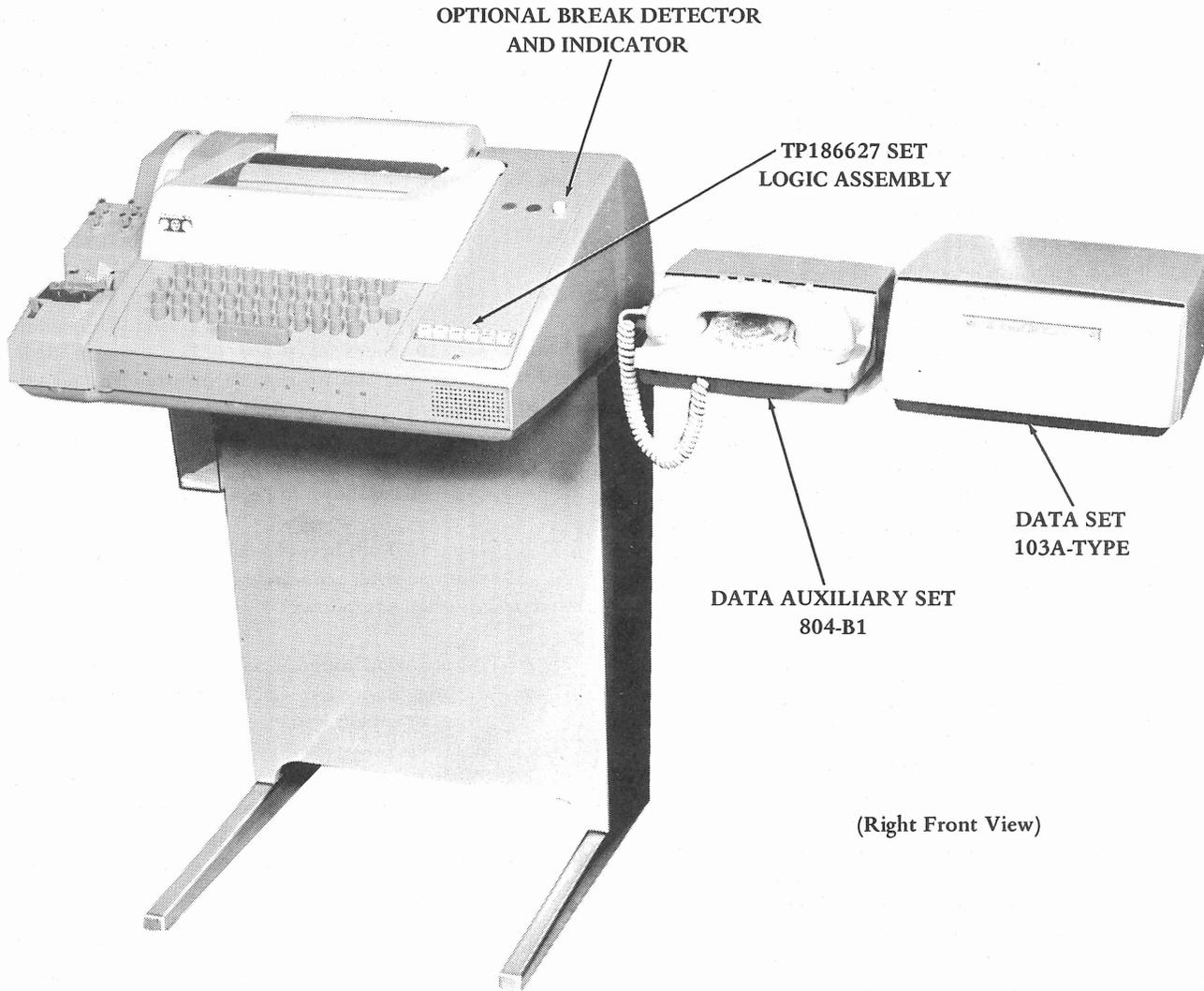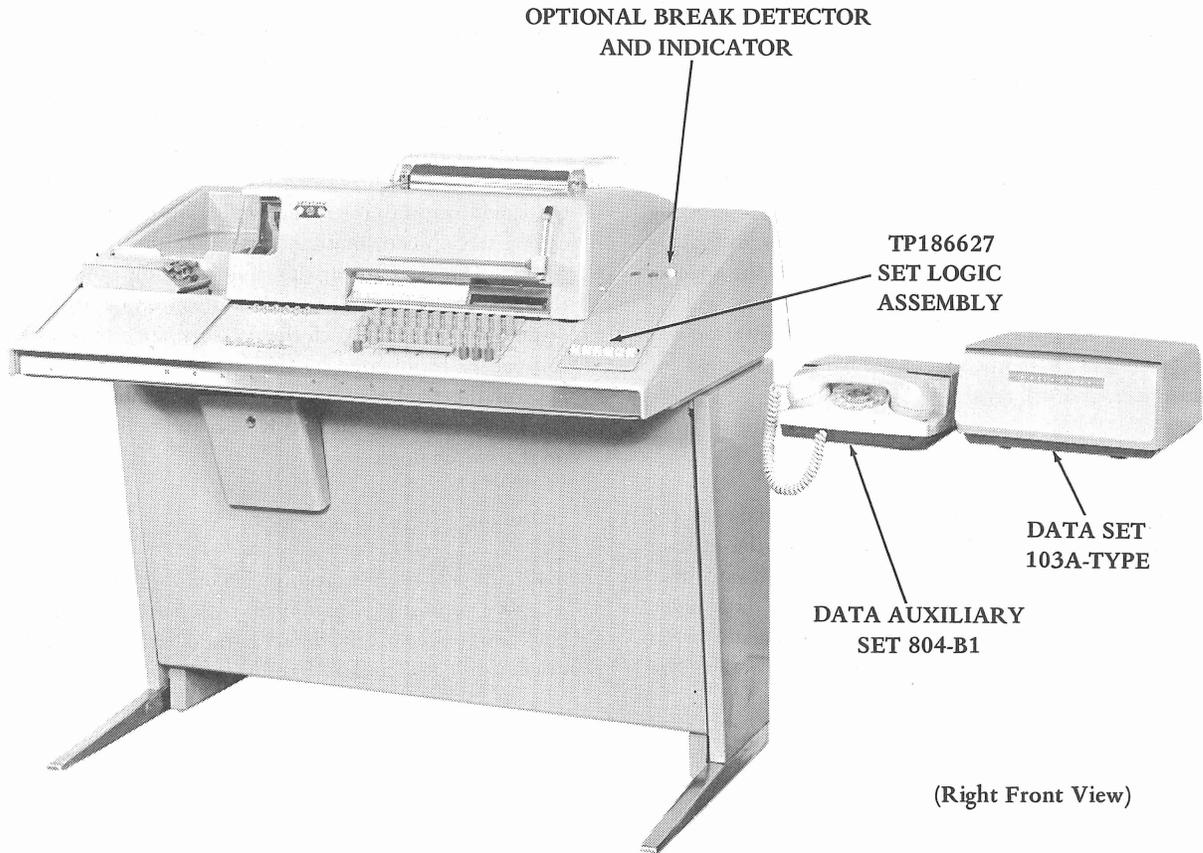103A-TYPE

DATA AUXILIARY SET
804-B1

(Right Front View)

Figure 9 - 33 ASR Station With Data Set 103A-Type

3.34   Controls for station operation consist of two key assemblies. The set logic assembly provides one key assembly for controlling the teletypewriter. The data auxiliary set 804-B1 has a key assembly for controlling the modes of operation of the data set. The two key assemblies are shown below:

TTY SET LOGIC ASSEMBLY	OFF	ON	ALARM	LOCAL	OUT OF SERVICE	TEST

DATA AUXILIARY SET 804-B1	AUTO	LOCAL	TEST 2	TEST 1	TALK	DATA

OPTIONAL BREAK DETECTOR
AND INDICATOR

TP186627
SET LOGIC
ASSEMBLY

DATA SET
103A-TYPE

DATA AUXILIARY
SET 804-B1

(Right Front View)

Figure 10 - 35 ASR Station With Data Set 103A-Type

3.35   The automatic features of the 33 tape punch and tape reader, as well as the automatic capabilities of the 35 tape reader can be utilized in operation with data set 103A-type. The keyboard arrangements for the 33 and 35 are as shown in Figures 3 and 4 respectively.

3.36   Data set 103A-type can be arranged for continuous automatic operation at the time of installation. The AUTO key therefore will not be operative and the data set will always answer in the data mode.

Attended Operation

3.37   Data exchange between two stations is preceded by a telephone call. The attendant at the calling station turns on the teletypewriter set motor by depressing the ON key on the set logic assembly, depressing the TALK key on the data auxiliary set, lifting the handset from the switch hook, and dialing the number of the other station. The attendant at the answering station responds by depressing the TALK key and lifting the handset from the switch hook. Both stations are now in the talk mode.

3.38   After voice communication has taken place and the attendant at the answering station has turned on the teletypewriter by depressing the ON key on the set logic assembly, both stations go into data mode. The attendant at the answering station depresses the DATA key and transmits the answer tone to the calling station. When the answer tone is received the attendant at the calling station operates the DATA key, thus transmitting the answer tone to the answering station. Both stations are now in the data mode. The handsets at both stations may be replaced on the switch hook and data may be exchanged.

3.39   The full-duplex capability of these stations allows them to send in one frequency and receive in another.

3.40   There are three ways to terminate a call:

(a)   If the stations have been returned to the talk mode from the data mode, disconnect may be accomplished by replacing the handset on-hook after the TALK key has been depressed.

(b) By depressing the OFF key on the teletypewriter set logic assembly. An EOT should precede this type of disconnect.

(c) By depressing the OFF key on the teletypewriter set logic assembly with the long space disconnect feature installed in the data set. The station originating the disconnect will transmit a 3-second burst of spacing carrier to the distant station. After sending the spacing signal, the station originating the disconnect will go back to the on-hook condition. The distant station will recognize the 3-second spacing signal as a request for disconnect, and will return on-hook.

Unattended Operation

3.41   As in attended operation, the attendant at the calling station dials the number of the distant station. If the AUTO key on the distant station had been operated the distant station goes directly into the data mode, starting the teletypewriter motor and transmitting an answer tone. The attendant at the calling station hears the high-pitched answer tone and goes into the data mode by depressing the DATA key and replacing the handset on the switch hook. Data exchange can now take place on a full-duplex basis. If tape had been placed in the called station tape reader with the control lever in the AUTO position and the attendant at the calling station transmits the DC1 code, the called station tape reader will transmit the message. The calling station can simultaneously transmit data to the called station. The operator at the calling station can likewise turn the tape punch of a distant 33 station on or off so that the distant station can punch the message being transmitted. The call can be terminated by the attendant depressing the OFF key on the teletypewriter set logic assembly, or lifting the handset, depressing the TALK key, and replacing the handset on the switch hook.

Options

3.42   33 and 35 stations with data set 103A-type may be optionally equipped with the automatic answer-back and the break detector and indicator features as discussed in 3.07 and 3.08 respectively.