DATA SET 103E-TYPE DATA STATION USING KS-20093 CABINETS DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL

1.01 This section covers the physical and functional description as well as operating procedures for Data Set 103E-type when used for a data station arrangement on customer premises and contained in a KS-20093-L1 cabinet (Fig. 1).

1.02 This section is reissued to add information on the Data Set 103E6. Information on the Data Sets 103E2 and 103E5 has been retained in this section to provide coverage for those data sets still in use. Due to extensive revision of this section change arrows have been omitted.

1.03 A Data Set 103E-type data station provides for up to 40 low-speed, full-duplex, frequency-shift-keyed, serial data circuits for DATA-PHONE® service, Teletypewriter Exchange TWX-CE service, or a combination of both services.

1.04 The 103E Data Station consists of up to 40 Data Sets 103E-type, up to 20 2A1 Data Mountings, a 1A1 Data Mounting, a 1A2 Data Mounting (if more than 20 data sets are required), and a Data Auxiliary Set 804J-type all mounted in a KS-20093-L1 cabinet.

1.05 Data Set 103E-type accepts data from the customer-provided terminal equipment in the form of voltage signals that conform to the Electronic Industries Association (EIA) Standard. These voltage signals are converted into voice-frequency tones by Data Set 103E-type for transmission over the switched telephone network (DDD). Received data, in the form of voice-frequency tones, is converted to EIA voltage signals and delivered to the customer terminal equipment.

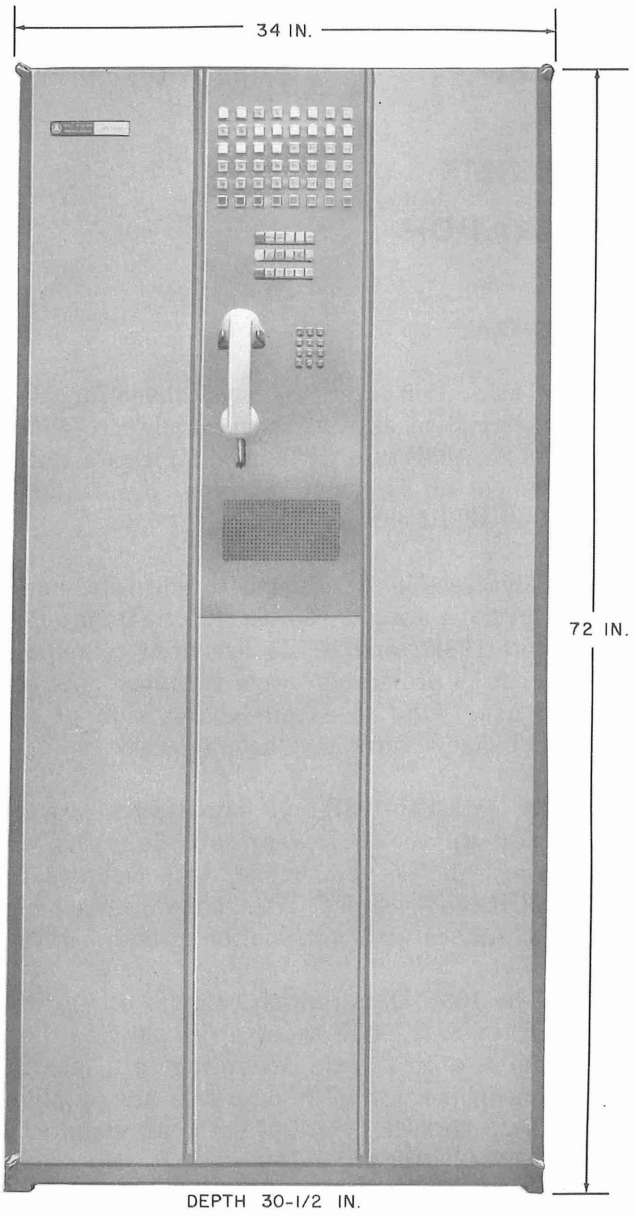


Fig. 1—Data Set 103E-Type Data Station

◗ ***Note:*** The Data Set 103E6 conforms to EIA standard RS-232-C except when the E6 is equipped with the ZD option. The Data Sets 103E2, 103E5, and 103E6 with ZD option, conform to EIA standard RS-232-B.

1.06 The following description of a typical DATA-PHONE system (Fig. 2) is provided to illustrate the capabilities of the 103E Data Station.

1.07 Station *A* is usually located at large computer locations where a great number of input/output data circuits are required, such as time-shared computers. When the customer terminal equipment is a computer, the data sets are usually arranged for automatic answering. If desired, the data sets may also be equipped with Data Auxiliary Sets 801-type for automatic origination of calls by the terminal equipment.

1.08 For example, station *D* may call station *A* and transmit data through their common central office. Suppose station *D* requests data, but station *A* requires additional data from station *B* before station *D* may be answered. The computer (customer terminal equipment) at station *A* (if equipped with Data Auxiliary Set 801-type) terminates the call from station *D* and places a call to station *B* by using the DDD network. Data is requested from station *B* and when received at station *A*, station *A* then places a local call to station *D* and transmits the required answer to station *D*.

1.09 When automatic calling capabilities are to be provided, an additional KS-20093-L1 Cabinet may be required to house the automatic calling units (ACUs). For information on installation of automatic units as part of this station, refer to the practices entitled Data Set 103-Type—Data Station Using KS-20093 Cabinets—Installation and Connections (591-025-201) and the following applicable automatic calling unit practices.

For Rotary Dial Central Offices:

Data Auxiliary Sets 801A5 and 801A6 For Automatic Calling—Identification and Operation (598-010-101)

For TOUCH-TONE® Dial Central Offices:

Data Auxiliary Set 801C3 and 801C4—Description and Operation (598-012-101)

When data sets are provided with DAS 801A5, C3, or DAS 801C4 (option-wired for ground start), the incoming data lines must be equipped for ground-start operation. In addition, it is recommended that the service line be equipped for ground-start operation to facilitate testing the DAS 801-type using the service line. The DAS 804J3 and 804J4 are equipped

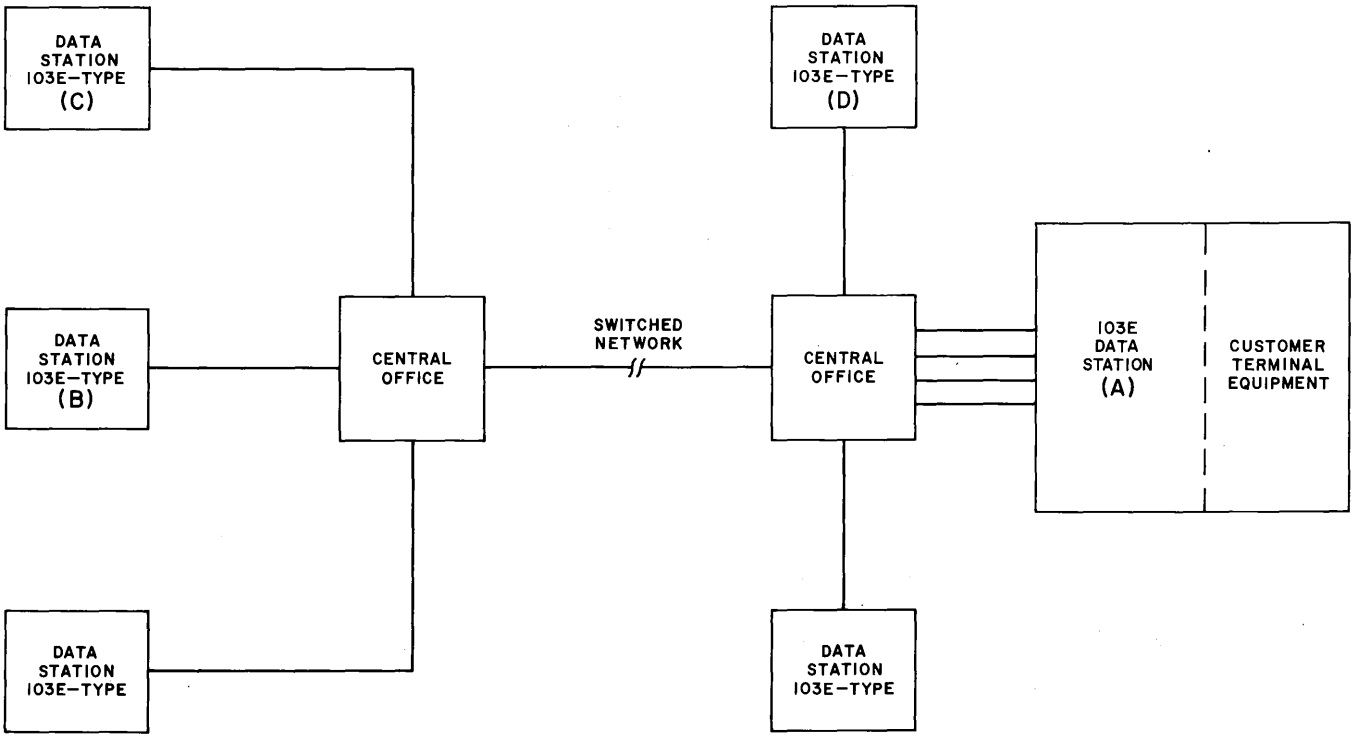


Fig. 2—Data System Using Data Set 103E-Type With a Multiple Data Station Arrangement

with a DIAL TONE key (W option) in the action field for use in obtaining dial tone on ground-start lines.

2. PHYSICAL DESCRIPTION

A. Data Set 103E-Type Data Station

2.01 The Data Set 103E-type Data Station (Fig. 3) is intended to be assembled on the customer premises in a KS-20093 cabinet.

2.02 A completely equipped 103E Data Station (not equipped with Data Auxiliary Sets 801-type) consists of the following components:

- 40—Data Sets 103E6 (or 103E5, 103E2)
- 20—2A1 Data Mountings
- 1—1A1 Data Mounting
- 1—1A2 Data Mounting
- 1—Data Auxiliary Set 804J-type
- 1—KS-20093-L1 Cabinet
- 1—KS-20093-L6 Door Panel, Half
- 1—KS-20129 Power Strip

2.03 The KS-20093 cabinet is furnished in a 2-tone (off-white and dark gray) smooth vinyl finish (the doors are off-white with the remainder of the cabinet being dark gray). Detailed information covering the installation of a KS-20093 cabinet (leveling, unpacking, etc) is contained in the section entitled Data Sets—Multiple Installation Information (590-010-201).

B. Data Sets 103E-Type

2.04 The Data Set 103E-type is a full-duplex serial data set which operates over switched facilities at speeds up to 300 baud. The Data Sets 103E-type are 8-1/4 inches wide, 4-3/4 inches high, and 6-3/8 inches deep. The Data Set 103E2 weighs approximately 7 pounds and the Data Sets 103E5 and E6 each weighs approximately 7-1/2 pounds.

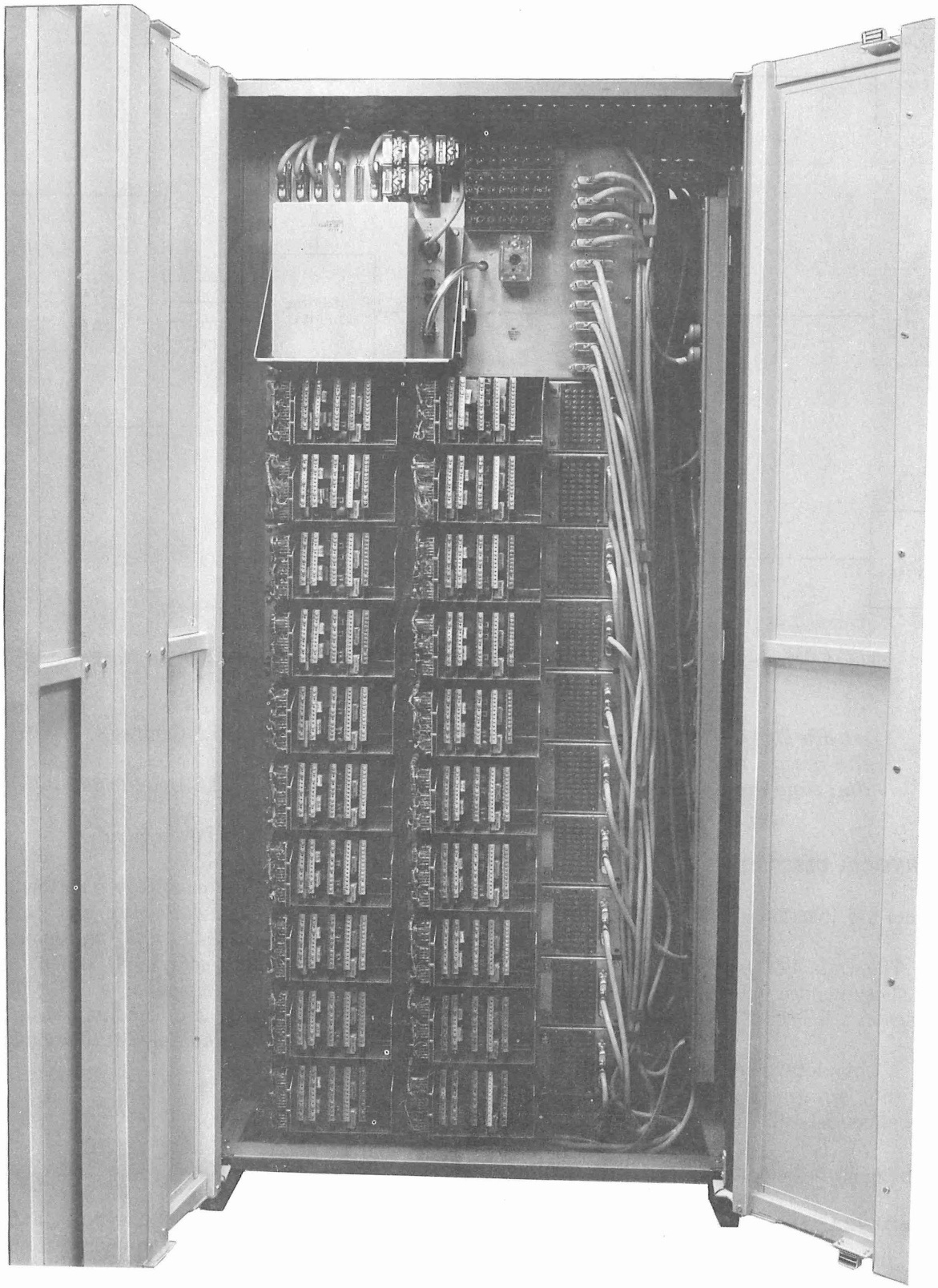


Fig. 3—Data Set 103E-Type Data Station—Cabinet Doors Open

2.05 The Data Set 103E6 (Fig. 4) contains four circuit pack units and a relay board assembly of nine miniature relays. These units are designated as follows:

- CP CJ10—Timer
- CP CJ14—Line Circuits
- 768B—Filter
- CP CJ15—Modem
- CP BN4—Relay Board Assembly (9 miniature relays)

2.06 Data Set 103E5 (Fig. 5) contains four circuit pack units and a relay board. These units are designated as follows:

- CP CJ9 or CP CJ14—Line Circuits
- CP CJ10—Timer
- 768B—Filter
- CP CJ11 or CP CJ15—Modem
- CP BN3 or BN4—Relay Board Assembly (9 miniature relays)

2.07 The Data Set 103E2 (Fig. 6) contains five circuit pack units plus a relay board. The designation of these units are designated as follows:

- CP CJ2—Timer
- CP CJ4—Transmitter
- CP CJ5—Receiver
- CP CJ8—Line Circuits
- 768A—Filter (see note below)
- CP BN2—Relay Board Assembly (12 miniature relays)

Note: Earlier models of Data Set 103E2 may be equipped with a CP CJ3 filter. Physically and functionally, it is identical to the 768A filter.

2.08 Data Sets 103E2, 103E5, and 103E6 (Fig. 4, 5, and 6) are supplied with a P47M664 Housing Assembly that provides for mounting the data sets on a 2A1 Data Mounting. The Data Set 103E4 is identical to the Data Set 103E2 except that it is not supplied with the P47M664 Housing Assembly.

2.09 The data sets are equipped with a 50-pin Cinch plug for providing the input/output connections to the 2A1 Data Mounting.

2.10 The data set is mounted on the 2A1 Data Mounting by three captive 12-24 relay rack mounting screws.

C. 2A1 Data Mounting

2.11 The 2A1 Data Mounting provides for the installation of two Data Sets 103E-type (Fig. 7) and contains the data set circuits required in a complete 103E Data Station installation. A completely equipped KS-20093-L1 cabinet would require 20 2A1 Data Mountings providing for the mounting of 40 Data Sets 103E-type (not equipped with Data Auxiliary Sets 801-type).

2.12 The data mounting is connected into the system using a M50H cord between the 50-pin connector (J5) and a 1A1 or 1A2 Data Mounting.

2.13 The customer terminal equipment connects to the 2A1 Data Mounting by using two 25-pin connectors (J1 and J2) that mount in the customer interface section of the KS-20093-L1 cabinet.

2.14 The circuit pack DG1 and relays of the 2A1 Data Mounting provide the required circuits for transferring the data set to the service line for test purposes, selecting the data set, furnishing indications of the state of the data set, and taking data sets out of service (make busy).

2.15 A terminal board (TB1) is provided to install options in each data mounting (in addition to the options installed by means of the screw switches associated with the circuit packs of the data set). When provided, Data Auxiliary Sets 801-type connect to the data set using TB1.

2.16 The 2A1 Data Mounting measures 25 inches wide, 5 inches high, 3-1/4 inches deep, and

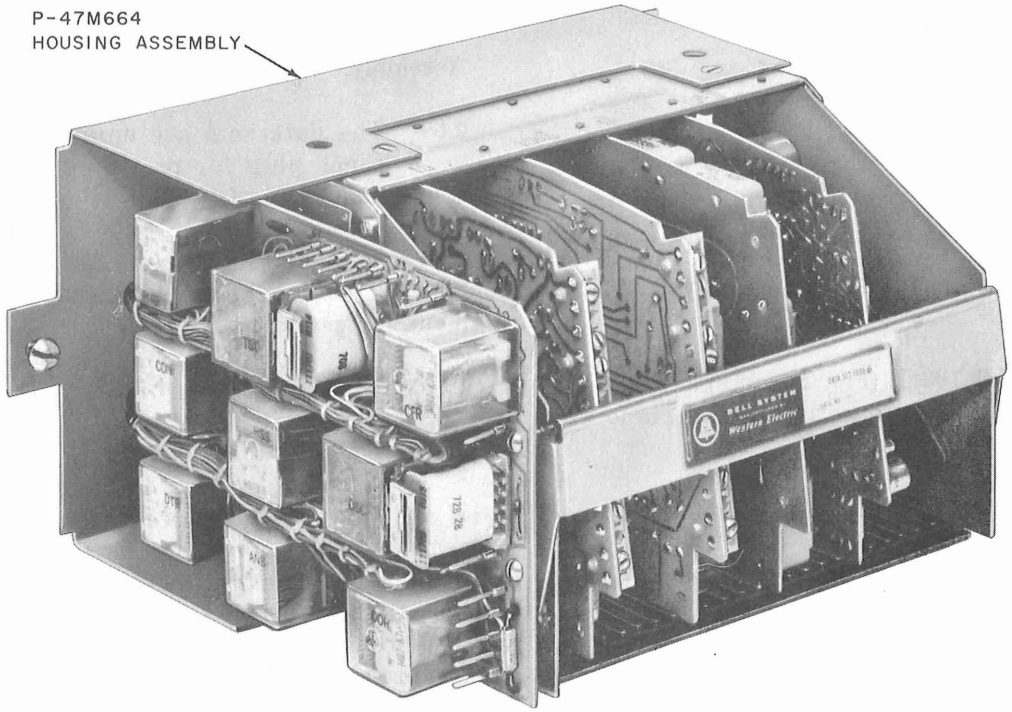


Fig. 4—Data Set 103E6

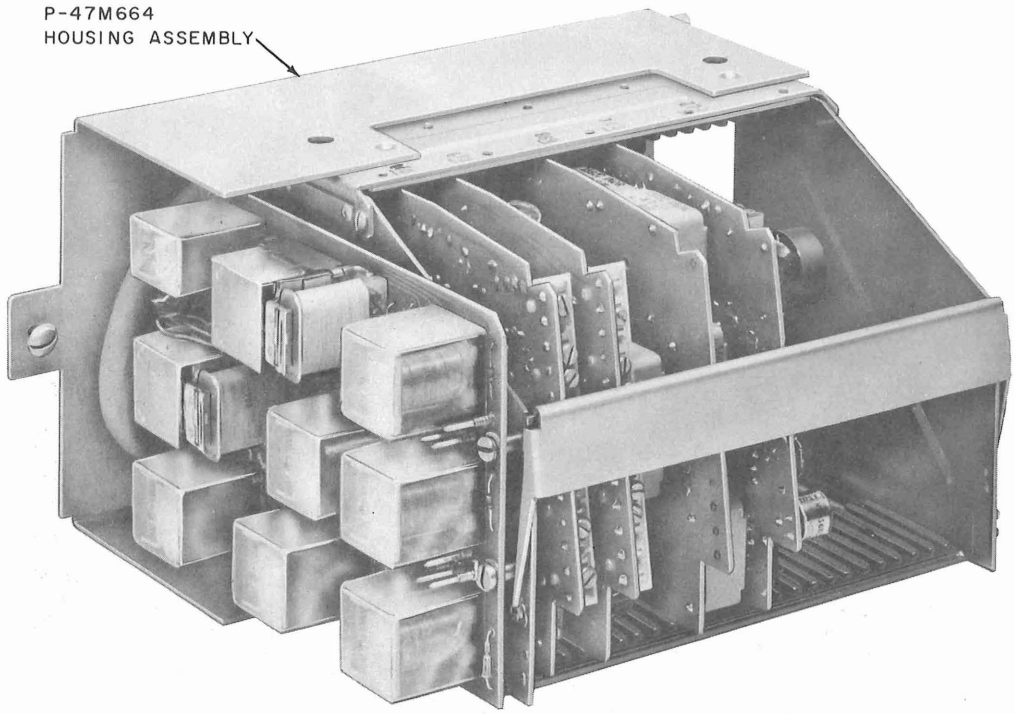


Fig. 5—Data Set 103E5

weighs approximately 12 pounds without the data sets installed.

D. 1A1 Data Mounting

2.17 The 1A1 Data Mounting (Fig. 8) contains the common control logic circuits that are used to control the status of the data sets. A common power unit (31A) provides +18V dc, 5 amps; −18V dc, 5 amps; −24V dc, 0.5 amps; and 10V ac, 1.5 amps to drive the logic circuits in the 1A1 Data Mounting, the lamps and buzzer on Data Auxiliary Set 804J-type, and up to 20 data sets with their associated 2A1 Data Mounting circuitry. Sixteen 50-pin connectors are provided to interconnect the 1A1, 2A1, 1A2 Data Mountings, Data Auxiliary Set 804J-type, the telephone lines, and key telephone equipment (if provided). An interrupter (KS-19175-L1) is also provided to generate various lamp indications.

2.18 Each data set powered from the 1A1 Data Mounting is individually fused by a 1-1/3 ampere (70A) fuse in both the positive and negative 18-volt dc leads.

2.19 The sixteen connectors (J1 through J16) interconnect the 103E Data Station as shown in Table A.

2.20 The relays on the 1A1 Data Mounting control the following:

- Data set selection
- Make busy and busy release functions
- Data set mode (talk, data, and auto answer)
- Lamps in Data Auxiliary Set 804J

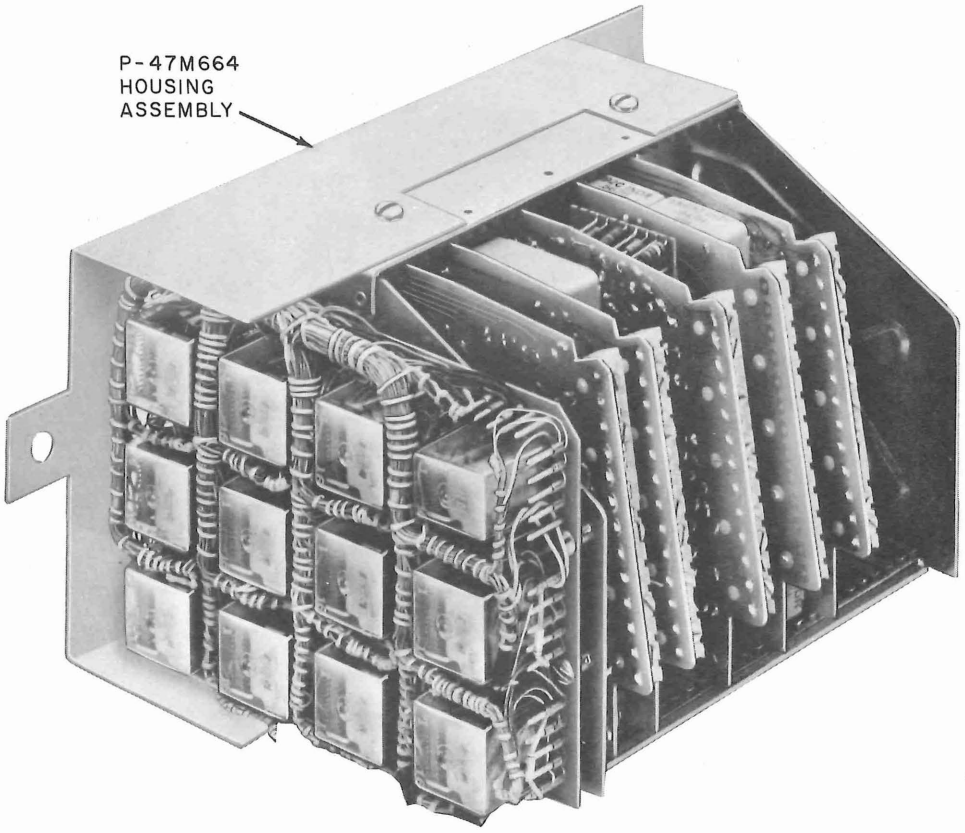


Fig. 6—Data Set 103E2

● Data set transfer to service line

2.21 Circuit pack AR256 provides the circuits to drive lamps in the Data Auxiliary Set 804J to indicate the condition of the interface leads on the ***selected*** data set. A circuit also provides for an audible signal in Data Auxiliary Set 804J when ringing is present on the line of the ***selected*** data set. A flutter generator provides the timing to drive the lamp for a ***selected*** data set.

2.22 The 1A1 Data Mounting measures 25 inches wide, 16 inches high, 9-3/4 inches deep, and weighs approximately 24 pounds without the 31A power unit installed.

E. 1A2 Data Mounting

2.23 The 1A2 Data Mounting contains a common power unit (31A) that drives lamps on Data Auxiliary Set 804J-type and up to 20 data sets with their associated 2A1 Data Mounting circuitry. Fifteen 50-pin connectors are provided to interconnect the 1A2 Data Mounting into the 103E Data Station.

2.24 The fifteen connectors (J1 through J16 excluding J3) are interconnected as shown in Table B.

2.25 The 1A2 Data Mounting is not equipped with circuit pack AR256, a KS-19175-L1 interrupter, or the control relays. The 1A1 Data Mounting is equipped with these components which are jointly used by the 1A2 Data Mounting.

2.26 The 1A2 Data Mounting measures identically to the 1A1 Data Mounting and weighs approximately 18 pounds without the 31A power unit installed.

F. Data Auxiliary Set 804J-Type

2.27 Data Auxiliary Set (DAS) 804J-type (Fig. 9) is available in four types. DAS 804J1 and

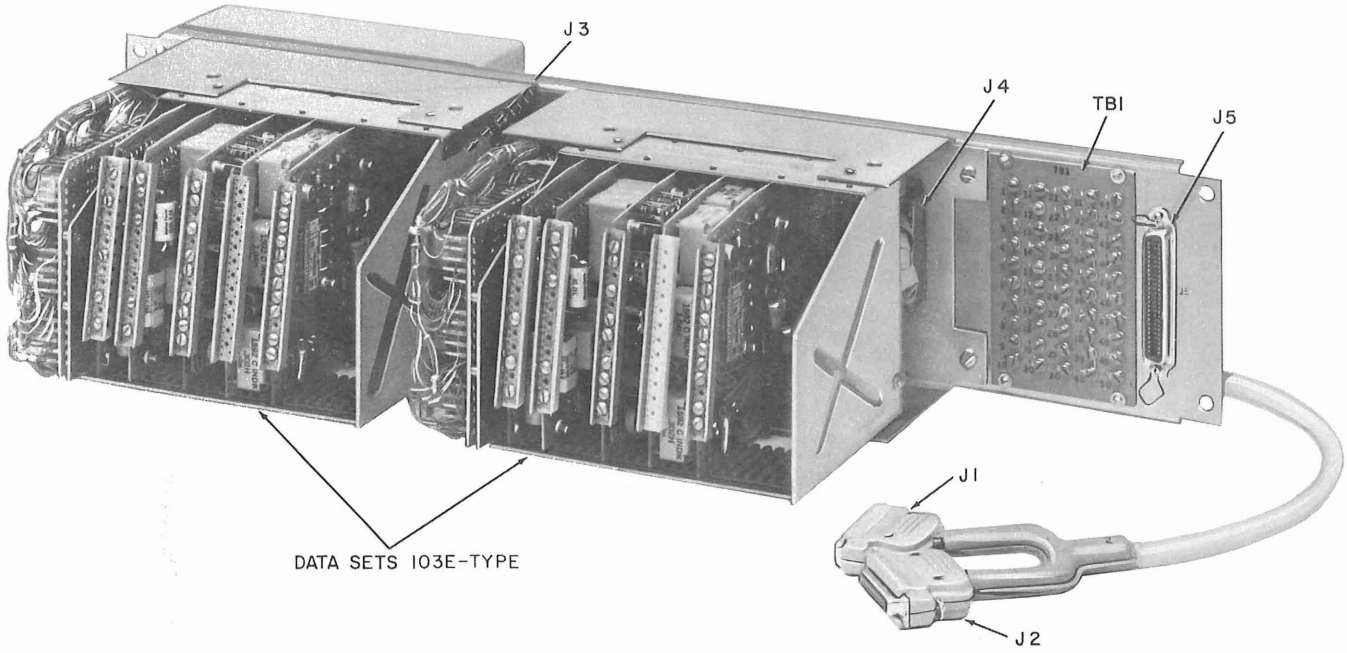


Fig. 7—2A1 Data Mounting With Data Sets 103E-Type Installed

804J3 are provided with a rotary dial (9C-58), and, DAS 804J2 and 804J4 are provided with a TOUCH-TONE pad (35A3A). In addition, DAS 804J3 and 804J4 are equipped with a DIAL TONE key in the ***action field*** for manual origination of calls on telephone lines equipped for ground-start operation. Other than the above differences, all other equipment components are the same for the four types.

2.28 Table C summarizes DAS 804J-type keys, lamps, and the function of each.

2.29 At the top of DAS 804J-type, there are 40 nonlocking keys with associated lamps designated 1 through 40. Each of the keys and lamps is associated with a particular data set. These keys are referred to as the ***select field*** and are used (in conjunction with the keys of the ***action field***) to control the individual data set in the complete system.

2.30 Just below the ***select field*** is a row of eight lamps referred to as ***monitor lamps.*** These lamps are used to monitor the condition of certain customer interface leads on the selected data set.

2.31 Below the ***monitor lamps*** is a row of six keys, of which four are used, referred to as the ***control field.*** These keys function with a selected data set in the same manner as a single data set installation.

2.32 Below the ***control field*** is a second set of six keys, referred to as the ***action field.*** These keys provide for data set selection, transfer of data set to a service line, make busy, and when required, receipt of dial tone to originate a call on ground-start lines.

2.33 Below the ***action field*** is a third set of six keys referred to as the ***attendant line field.*** These keys function to connect the DAS 804J-type telephone circuit to any of the key telephone lines or to the service line.

2.34 DAS 804J-type measures 10-1/2 inches wide, 35 inches high, 6-1/2 inches deep, and weighs approximately 27 pounds.

3. FUNCTIONAL DESCRIPTION

A. Data Set 103E-Type Data Station

3.01 A functional description of the Data Set 103E Data Station (Fig. 10) is given in the following text to provide information on the operation of the data station and its major components.

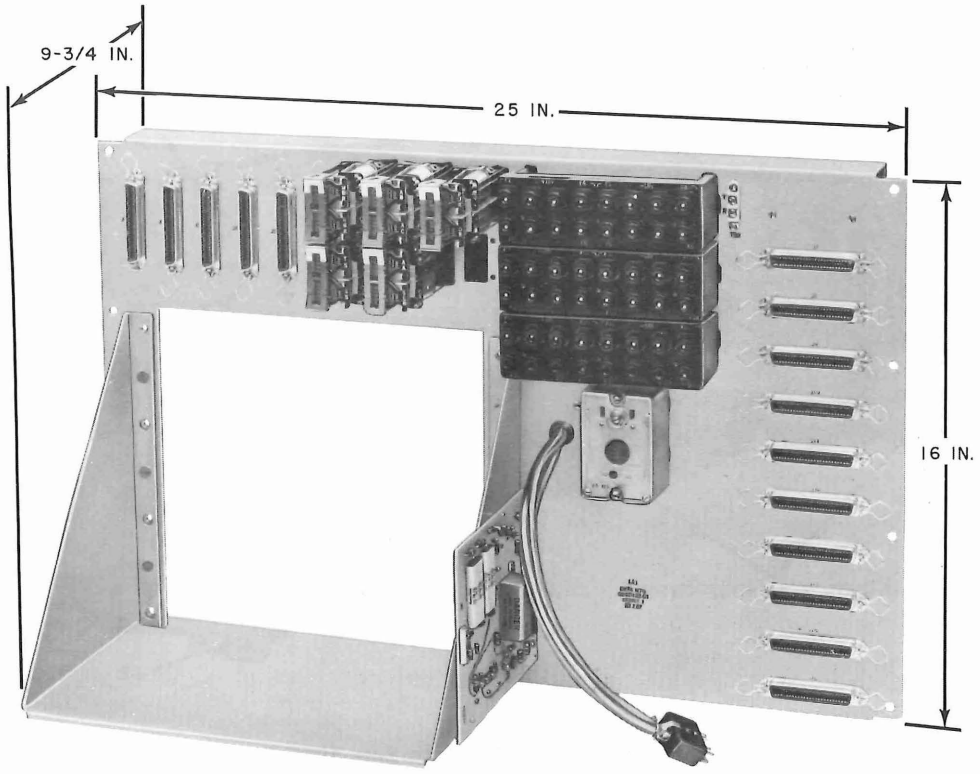


Fig. 8—1A1 Data Mounting

3.02 If the condition of the interface is correct, incoming calls from the telephone lines are automatically answered by the associated Data Set 103E-type in the same manner as a single data set station conditioned for automatic answering.

3.03 The normal operation of a 103E Data Station is equivalent to the operation of up to 40 individual data sets. In order to simplify the explanation of the data station operation, the operation of one data set is described in the following text. This description of the number 1 or first position data set operation is applicable to all other data sets in the station.

3.04 When the telephone line is seized by an incoming data call, the ringing current passes through the 1A1 Data Mounting and the control circuits of the 2A1 Data Mounting into the control circuits of the first position data set, ie, Data Set 103E-type (1). The data set automatically answers the call, handshakes, and connects in the data mode. The data set control circuits signal the terminal equipment that the incoming call has been answered and data may be exchanged.

3.05 The terminal equipment transmits EIA voltage signals to the data set through the control circuits of the 2A1 Data Mounting. The transmit circuits of the data set convert the EIA

TABLE A

1A1 DATA MTG CONNECTOR	CONNECTS TO	ON UNIT
J1	J1	Data Auxiliary Set 804J
J2	J2	
J3	J3	
J4		Incoming Telephone Lines
J5		External Key Equipment
J6	J6	1A2 Data Mounting (When required)
J7 thru J16	J5	2A1 Data Mountings

TABLE B

1A2 DATA MTG CONNECTOR	CONNECTS TO	ON UNIT
J1	J4	Data Auxiliary Set 804J
J2	J5	
J4		Incoming Telephone Lines
J5		External Key Equipment
J6	J6	1A1 Data Mounting
J7 thru J16	J5	2A1 Data Mountings

voltage signals into voice-frequency tones for transmission over the telephone line to the distant data station. These voice-frequency tones pass through the control circuits of the 2A1 Data Mounting, the 1A1 Data Mounting, and out the telephone line.

3.06 Incoming data signals in the form of voice-frequency tones pass through the 1A1 Data Mounting and the control circuits of the 2A1 Data Mounting to the receive circuits of the data set. The data set converts the voice-frequency tones into voltage signals that conform to EIA standards. The EIA voltage signals pass through the control circuits of the 2A1 Data Mounting and the customer interface to the terminal equipment.

3.07 The control circuits allow the DAS 804J and its associated keys and lamps to select a specific data set for testing, make busy, etc. These control circuits may also be used to provide for control of other apparatus at the data station.

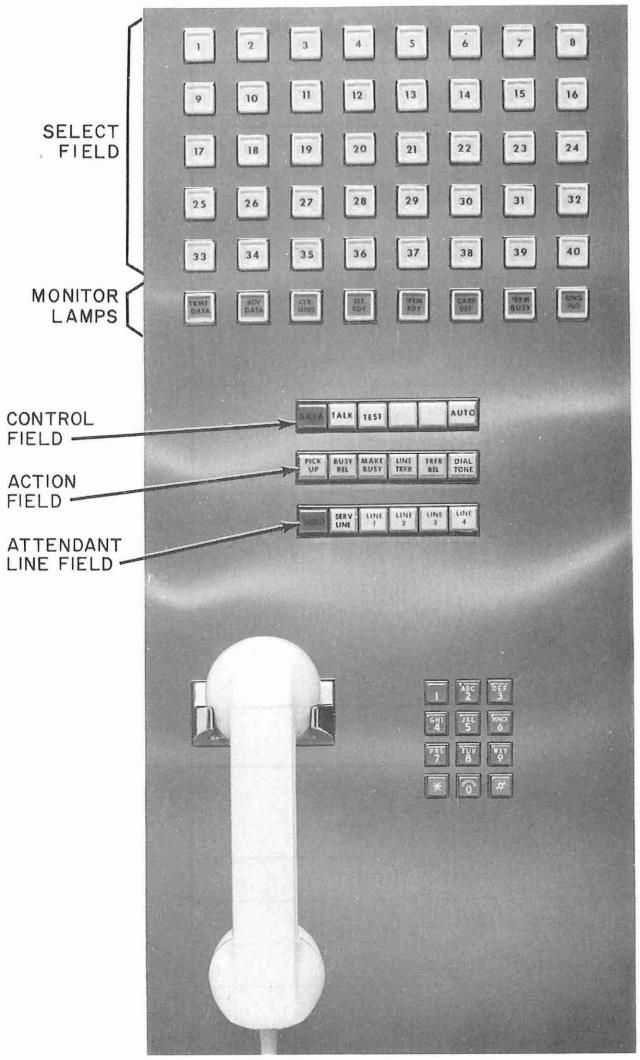


Fig. 9—Data Auxiliary Set 804J4

B. Data Sets 103E-Type

3.08 Data Set 103E-type is designed to transmit in one of two frequency bands and receive in the remaining frequency band. The proper filter *(flt)* for the transmitted frequency band and received frequency band is selected by the method of establishing the call. When the data set originates a call, the transmitting band is F1. The frequencies of this band are 1270 Hz for a mark and 1070 Hz for a space. The receiving frequencies will be 2225 Hz for a mark, 2025 Hz for a space, and are called F2. This is the ***normal*** frequency mode of operation. Data Sets 103E5 and 103E6 operate only in the ***normal*** frequency mode. Data Set 103E2, in addition to operating in the ***normal*** frequency mode, may be operated in the ***inverted*** frequency mode. Option screw switches are provided for the selection of the frequency mode of operation when Data Set 103E2 is installed.

> ***Note:*** When ***inverted*** frequency operation is used, F1 frequencies are 1070 Hz for a mark and 1270 Hz for a space. The F2 frequencies are 2025 Hz for a mark and 2225 Hz for a space.

3.09 When the data set answers a call, the transmitting band is F2 and the receiving band is F1.

3.10 The following paragraphs of data set operation refer to the block diagram of Fig. 11.

> ***Note:*** The Data Set 103E6 conforms to EIA standard RS-232-C except when the 103E6 is equipped with the ZD option. The data sets 103E2, 103E5, and 103E6 with ZD option, conform to EIA standard RS-232-B. When the Data Set 103E6 conforms to RS-232-C, the timing of the Data Set Ready (CC) indication is changed so that the CC lead is off during dialing and is turned on after carrier has been received for 100 ms (simultaneously with the CF lead). There is no change in the timing of the CC off indication during a disconnect sequence and no change in the timing of the CC indication at an answering station. When the Data Set 103E6 is equipped with ZD option, the timing of the CC indication is the same as the Data Set 103E5 as both conform to EIA standard RS-232-B.

Establishing Telephone Connection

3.11 Prior to automatically answering an incoming call, the terminal equipment is required to condition the data terminal ready (CD) and the answer control (CM), if provided, interface leads with a positive (ON) voltage. These signals indicate that the terminal equipment is available to receive and/or transmit data. The CD signal must remain on for the duration of data communications. If the terminal equipment turns lead CD off, a disconnect sequence will be originated (if data set is in the data mode), or the data set will not connect during handshaking.

> ***Note:*** Data Set 103E6 does not provide an answer control (CM) lead.

TABLE C

DATA AUXILIARY SET 804J-TYPE KEYS AND LAMPS

FIELD	DESIG	EQ/WITH		TYPE	FUNCTION
		KEY	LAMP*	KEY	
SELECT	1 - 40	YES	YES	Non-Locking Non-Releasing	Key — Performs the action preselected by operation of keys in the ACTION FIELD. Lamp — indicates the status of the data set.
MONITOR	TRMT DATA	NO	YES	—	Lamp — lights when Transmitted Data (BA) interface lead is spacing.
	RCV DATA	NO	YES	—	Lamp — lights when Received Data (BB) interface lead is spacing.
	CLR SEND	NO	YES	—	Lamp — lights when Clear to Send (CB) interface is ON.
	SET RDY	NO	YES	—	Lamp — lights when Data Set Ready (CC) interface lead is ON.
	TERM RDY	NO	YES	—	Lamp — lights when Data Terminal Ready (CD) interface lead is ON.
	RING IND	NO	YES	—	Lamp — lights when Ring Indicator (CE) interface lead is ON.
	CARR DET	NO	YES	—	Lamp — lights when Data Carrier Detector (CF) interface lead is ON.
	TERM BUSY	NO	YES	—	Lamp — lights when terminal equipment turns "CN" on to make-busy through interface lead 25 (N and/or Q Option).

TABLE C (Cont)

FIELD	DESIG	EQ/WITH		TYPE	FUNCTION
		KEY	LAMP*	KEY	
CONTROL	DATA	YES	YES	Non-Locking Releasing	Key — conditions selected data set for: 1. Data Mode 2. Manual answer of incoming call, directly in data mode Lamp — lights when data set is in data mode.
	TALK	YES	NO	Locking	Key — conditions selected data set for voice communications.
	TEST	YES	YES	Non-Locking	Key — conditions selected data set for remote tests by 904-type Data Test Center. Lamp — lights when data set is in the test mode.
	AUTO	YES	YES	Non-Locking	Key — conditions selected data set to answer incoming calls automatically. Lamp — lights when data set is conditioned for automatic answer.
ACTION	PICK UP	YES	YES	Non-Locking	Key — prepares for selection of a data set. Lamp — lights when control circuits are conditioned for selection.
	MAKE BUSY	YES	YES	Non-Locking	Key — prepares to take any or all data set(s) out of service by making data set(s) telephone line(s) appear busy. Lamp — lights when preparation is accomplished.
	BUSY RLS	YES	YES	Non-Locking	Key — prepares to restore any or all data set(s) previously taken out of service. Lamp — lights when preparation is accomplished.
	LINE TRFR	YES	YES	Non-Locking	Key — transfers selected data set to the service line. Lamp — lights when data set is transferred to service line.
	TRFR RLS	YES	NO	Non-Locking	Key — restores data set, connected to the service line, to its normal telephone line facilities.
	DIAL TONE	YES	NO	Non-Locking	Key — conditions ground-start lines to obtain dial tone for originating calls.

TABLE C (Cont)

FIELD	DESIG	EQ/WITH		TYPE	FUNCTION
		KEY	LAMP*	KEY	
ATTEN-DANT LINE	HOLD	YES	YES	Non-Locking Releasing	Key — conditions key telephone equipment (if provided) to place selected attendant line on hold. Lamp — may be used for locally engineered indicator.
	SERV LINE	YES	YES	Locking Releasing	Key — connects telephone circuit to service line for voice communications ***if data set is not connected to service line.***
	LINE 1 THRU LINE 4	YES	YES	Locking Releasing	Keys and lamps — If key telephone lines are desired by customer request, these keys and lamps are used to connect the telephone circuit into the key equipment.

* Select and Monitor lamps coded J2
Control and Attendant Line lamps coded 53A
Action lamps coded 51A

Handshaking Operation

3.12 The incoming ringing voltage will condition the ring detector ***(ring detr)*** to operate the connecting circuits ***(conn ckts).*** A timing cycle (27 seconds for Data Sets 103E5 and 103E6 or 13 seconds for Data Set 103E2) controlled by the handshake status timer ***(hss tmr)*** will start on the incoming ring. The ***hss tmr*** will disconnect the data set from the telephone line in the event that F1 is ***not*** received before the ***hss tmr*** operates. The automatic answer switch ***(auto ans sw)*** provides the terminal equipment with a means of controlling the data station for the automatic answering of incoming calls.

3.13 The ***conn ckts*** connect the line circuit ***(line ckt)*** to the telephone line and the data set ready (CC) lead is turned on. The ***line ckt*** maintains an off-hook condition. The ***conn ckts*** have selected the proper ***flt*** as covered in 3.08. The quiet interval timer ***(quiet int tmr)*** operates to disable the modulator ***(mod)*** for approximately 1.3 seconds. (This allows the off-hook signal to be propagated from the answering station to the originating central office.) At the end of 1.3 seconds, the ***mod*** generates F2 mark (2225 Hz) and passes F2 to the attenuator ***(atten)*** for power level adjustment. The output of the ***atten*** is connected to the ***high pass filter (flt).*** (The ***atten*** and ***low pass filter*** are used at the originating data station.) The output of ***flt*** connects to the telephone line via the ***line ckt.***

> ***Note:*** Data Sets 103E5 and 103E6 transmitter levels are adjusted by a potentiometer (R34), and Data Set 103E2 transmitter level is adjusted by screw-switch attenuators.

3.14 At the originating data station, the F2 mark passes through the ***line ckt, high pass filter,*** and ***conn ckts*** to the limiter ***(lim).*** The two outputs from the ***lim*** are to the differential FM detector ***(detr)*** and the carrier detector ***(carr detr).*** The ***detr*** converts F2 mark to a dc signal. The ***carr detr*** measures the power level of F2 and checks for the proper output voltage of the ***detr.*** The output of ***detr*** goes to the ***slicer*** after which the dc signal is timed for 0.5 seconds by the mark timer ***(mark tmr).*** If dc signal is valid, the ***mark tmr*** conditions the receive space timer ***(rcv spc tmr)*** to start the ***hss tmr*** and connect the data circuits to the telephone line. The ***hss tmr*** times for 0.3 seconds, then connects the transmitted data (BA) interface lead to the terminal equipment and gives an ON condition on the clear to send (CB) interface lead. At the same time, the originating ***mod*** generates F1 mark (1270 Hz) and F1 passes through ***atten, low pass filter (flt),*** and the ***line ckt*** to the telephone line.

3.15 The answering data set receives F1 mark which passes through the ***line ckt, low pass*** filter, and ***conn ckts*** to the ***lim.*** The ***lim*** output to the ***carr detr*** conditions the carrier frequency received timer ***(cfr tmr)*** to time for 0.1 second. Upon completion of this timing, handshaking is completed by use of the connect switch ***(conn sw).*** The F1 also passes through the ***detr*** to the ***slicer*** and over the received data (BB) lead to the terminal equipment.

Data Operation

3.16 At the completion of the handshaking sequence, the transmitted data (BA) lead from the terminal equipment is connected to the data set ***mod*** via the ***conn ckts.*** The terminal equipment may transmit data by applying a negative (mark) or positive (space) voltage in excess of five volts to the BA lead. This voltage (− or +) will cause the ***mod*** to generate the appropriate voice frequency for transmission to the distant data station.

3.17 The received data (BB) lead delivers data to the terminal equipment on the same voltage basis (ie, a signal more negative than −5 volts for a mark and more than +5 volts for a space).

3.18 At the end of data transmission, the terminal equipment may disconnect the data station by removing the ON (positive voltage) signal on lead CD and applying an OFF (negative voltage) signal to lead CD for at least 50 msec. This OFF signal causes the data terminal ready driver ***(dtr driver)*** to condition the ***conn ckts*** to start the send space timer ***(send spc tmr)*** and to apply a space voltage to the BA lead.

- If T option is provided, the ***send spc tmr*** allows the space frequency to be transmitted to the distant data station for three seconds. The data set will disconnect at the end of the three seconds and go on-hook.

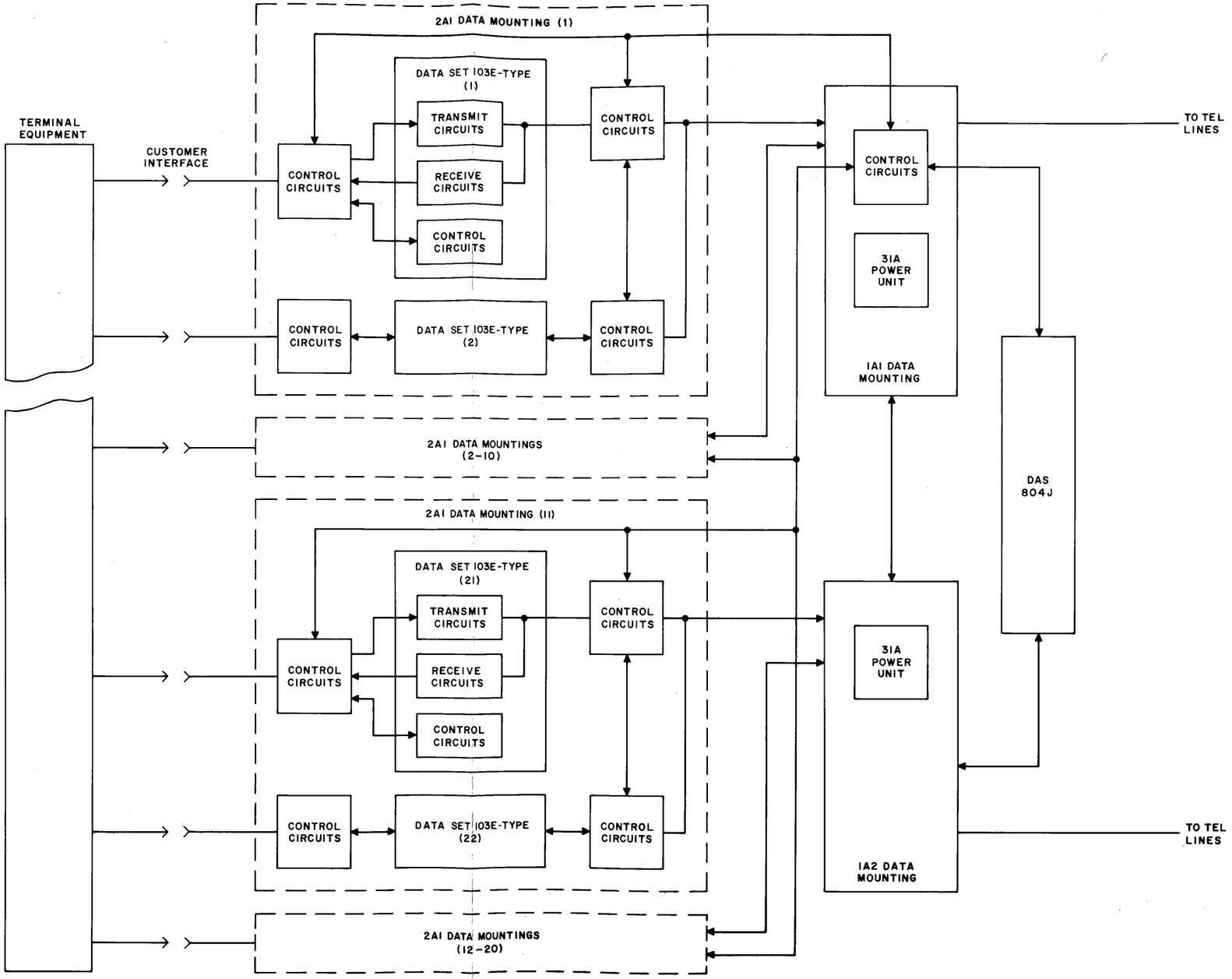
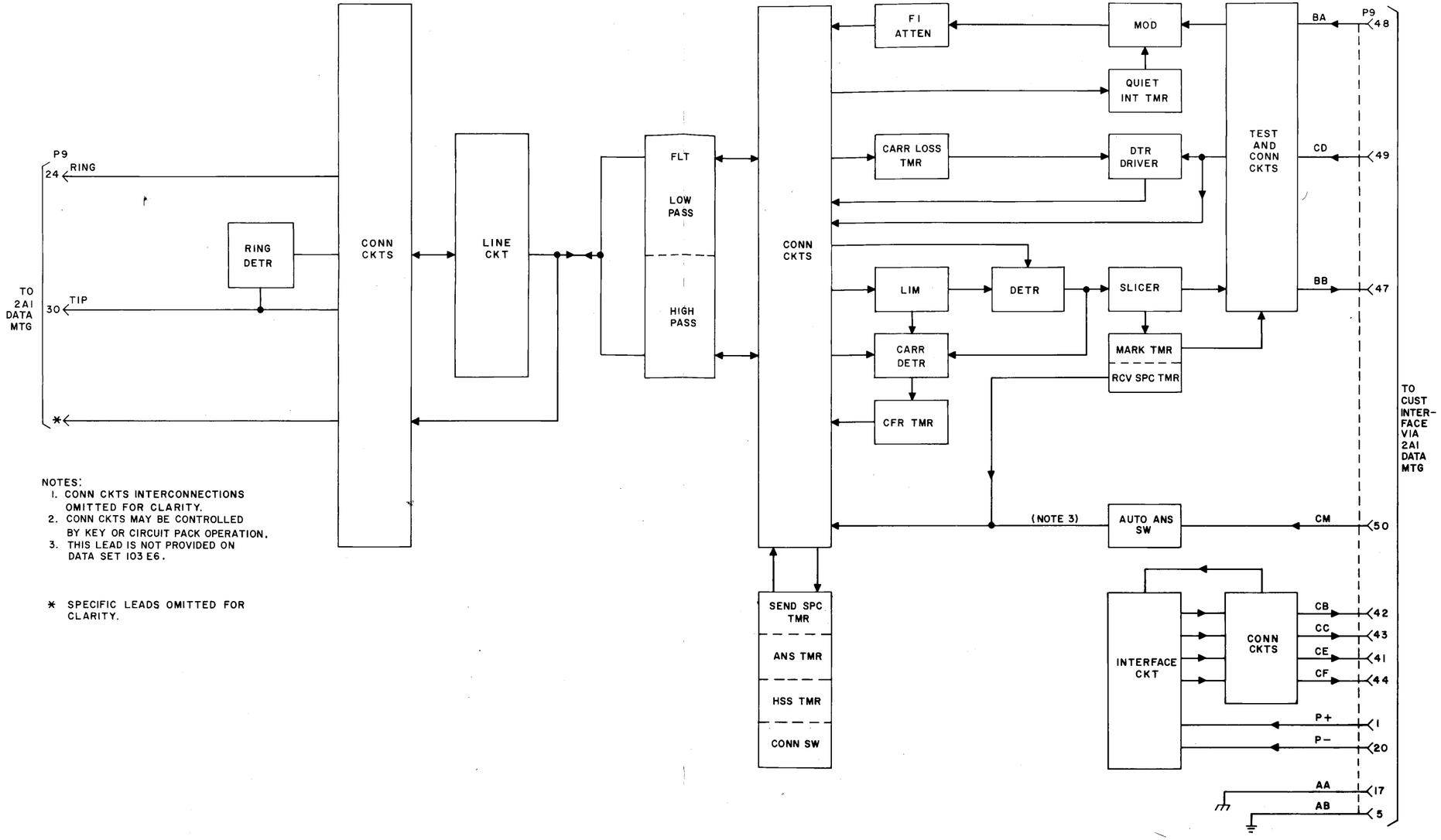


Fig. 10—Data Set 103E-Type Data Station—Functional Block Diagram



NOTES:
1. CONN CKTS INTERCONNECTIONS OMITTED FOR CLARITY.
2. CONN CKTS MAY BE CONTROLLED BY KEY OR CIRCUIT PACK OPERATION.
3. THIS LEAD IS NOT PROVIDED ON DATA SET 103 E6.

* SPECIFIC LEADS OMITTED FOR CLARITY.

Fig. 11—Data Set 103E-Type—Functional Block Diagram

- If T option is ***not*** provided, the ***send spc tmr*** is disabled and the data set will immediately disconnect and go on-hook.

3.19 If the incoming data line power level decreases below −57 dBm, the ***carr detr*** conditions the ***cfr tmr*** to start the carrier loss timer ***(carr loss tmr)*** via the ***conn ckts.*** If the loss of carrier (S) option is provided, the ***carr loss tmr,*** when operated, overrides the CD lead from the terminal equipment and initiates a 3-second space disconnect sequence independent of the T option covered in 3.18.

3.20 The answer timer ***(ans tmr)*** is used when the data set receives an incoming call. The ***ans tmr*** insures that the data set will be conditioned to ***answer*** incoming calls for up to four seconds after the ***ring detr*** returns to the off condition. Eight seconds after the ***ring detr*** returns to the off condition, the data set will be in the originate mode.

C. 2A1 Data Mounting

3.21 The 2A1 Data Mounting provides the control circuits and interface cabling required to connect two Data Sets 103E-type into the 103E Data Station. The normal function of the data mounting is to provide the data set interface cable to the customer interface for both of its associated data sets, control circuits used in the selection of a particular data set for testing, make busy, etc, and the necessary cabling to interconnect the data mounting into the station.

3.22 When a data set is to be tested by a 904-type Data Test Center (DTC), the data set is first selected. The line transfer (LINE TRFR) key is operated on DAS 804J-type that switches the selected data set to the service line. In addition, the telephone line normally associated with the transferred data set appears busy to the central office. On an option basis, the terminal equipment has the ability to make any data set appear busy via an additional interface lead (CN).

> ***Note:*** The terminal equipment make busy option (Q and N option) must ***not*** be supplied unless the terminal equipment is prepared to maintain an OFF (negative voltage) condition on the CN interface lead during normal operation. A positive voltage, or an open condition on CN will make the telephone line busy.

3.23 A selected data set will have certain interface leads extended to the DAS 804J-type ***monitor lamps.***

3.24 The monitored interface leads are:

- BA—Transmitted Data
- BB—Received Data
- CB—Clear to Send
- CC—Data Set Ready
- CD—Data Terminal Ready
- CE—Ring Indicator
- CF—Data Carrier Detector
- CN—Make Busy (if provided)

D. Data Auxiliary Set 804J-Type and 1A1 Data Mounting

3.25 The combination of DAS 804J-type and 1A1 Data Mounting provides the keys, lamps, telephone set, and control keys for an entire 103E Data Station of up to 40 data sets; however, the 31A power unit and connectors of the 1A1 Data Mounting provide for 20 data sets. To provide the power and connectors for the remaining 20 data sets that complete the 103E Data Station, a 1A2 Data Mounting will be required. The 1A2 Data Mounting is similar to the 1A1 Data Mounting in connectors and a 31A power unit, but is not equipped with control circuits. The 1A2 Data Mounting shares the control circuits of the 1A1 Data Mounting via connector J6.

3.26 The telephone lines for the 20 data sets associated with the 1A1 Data Mounting and the service line connect into the 103E Data Station via connector J4. Connector J4 of the 1A2 Data Mounting serves the same function with the exception that no service line is required. Only one service line is provided and is common to all data sets in the installation.

3.27 When key telephone equipment is provided for additional telephone line access, these

lines are connected to DAS 804J-type via connector J5 on the 1A1 or 1A2 Data Mountings. The lines are under control of the ***attendant line field.***

Note: The method of installing (mounting, connecting, etc.) the key telephone equipment should be locally engineered.

3.28 In addition to controlling additional telephone lines, if provided, the ***attendant line field*** provides for access of the attendant telephone set to the service line for voice communications.

3.29 The ***action field*** controls the action that will take place when a key in the ***select field*** is operated. An example would be the conditioning of the control circuit for data set selection by operation of the PICK UP key. Subsequent operation of a ***select field*** key would select the data set.

3.30 The ***control field*** is used with a selected data set in the same manner as a single data set installation. An example of a control function (TEST key) is the operation of the test mode relays in the data set for loop-back tests by a data test center.

3.31 When a data set is selected, control circuits of its associated 2A1 Data Mounting extend certain customer interface leads to the ***monitor lamps*** located on DAS 804J-type.

Note: The ***monitor lamps*** will light when the customer interface lead is positive and extinguish when the interface lead is negative.

4. OPERATION

4.01 Normal operation of the 103E Data Station does not require any operating procedures by an attendant. The data sets are normally arranged for automatic answering of incoming calls. If data sets are provided with DAS 801-type, automatic origination of outgoing calls by the terminal equipment is possible.

4.02 The ***select field*** (Fig. 9) lamps of DAS 804J-type may be used to check the status of each data set. Table D summarizes the data set status and the lamp indications for each status.

TABLE D

DATA SET STATUS AND LAMP INDICATIONS

LAMP INDICATION	DATA SET STATUS
FLUTTER	Data set selected and under control of the keys in the ***control field.*** This indication prevails over all other indications.
WINK	Data set line has been made busy.
STEADY ON	Data set is in use and in the data mode.
FLASH	Incoming ringing current being received but data set has not yet answered.
STEADY OFF	Data set is idle and in the automatic answer mode.

Note: ***Flutter*** is a 10 pulse per second signal with an on-off ratio of 3 to 1. ***Wink*** is a 2-1/2 pulse per second signal with an on-off ratio of 37 to 3. ***Flash*** is a one pulse per second signal with an on-off ratio of 1 to 1.

4.03 To originate a telephone call on the service line:

(1) Operate SERV LINE key (***attendant line field***).

(2) TALK key (***control field***) will release, if operated.

Note 1: The TALK key is mechanically linked to the SERV LINE key.

Note 2: If key telephone equipment is not provided in the 103E Data Station, Z option (on DAS 804J-type) should be installed. Z option connects DAS 804J-type ringer to the service line and provides lamp battery to light the SERV LINE lamp when SERV LINE key is operated.

(3) If Z option is installed, SERV LINE lamp lights.

(4) Lift DAS 804J-type handset.

(5) If the service line is equipped for ground-start operation, operate DIAL TONE key (***action field***) until dial tone is heard.

(6) When dial tone is heard in handset, call may be originated in normal telephone manner.

4.04 To answer an incoming call on the service line (when Z option is installed):

(1) When ringer sounds, operate SERV LINE key.

(2) SERV LINE lamp lights.

(3) Lift DAS 804J-type handset.

(4) Voice communications are established.

4.05 To select a specific data set:

Note: Do not lift handset.

(1) Operate PICK UP key (***action field***).

(2) PICK UP lamp lights, if extinguished.

(3) Operate the number key (***select field***) associated with the desired data set.

(4) The lamp associated with the operated number key will flutter.

(5) The PICK UP lamp extinguishes.

Note: To transfer ***selected*** data set to the service line, perform (6), (7), and (8).

(6) Operate LINE TRFR key (***action field***).

(7) LINE TRFR lamp lights.

(8) Selected data set is connected to the service line.

4.06 To originate a telephone call on the service line after a data set has been transferred to the service line:

Note: The telephone handset may be connected to the selected data set providing that the data set is not in the data mode.

(1) Lift DAS 804J-type handset.

(2) Operate TALK key (***control field***).

(3) If the service line is equipped for ground-start operation, operate DIAL TONE key (***action field***) until dial tone is heard.

(4) When dial tone is heard in handset, call may be originated in normal telephone manner.

4.07 To transfer selected data set to data mode:

Note: The terminal equipment must condition the data terminal ready (CD) interface lead with a positive (ON) voltage (TERM RDY monitor lamp ON) before data set may be transferred into data mode.

(1) On an established telephone connection (placed by DAS 804J), reach agreement to transfer to data mode.

(2) Operate DATA key (***control field***).

(3) DATA lamp lights.

(4) TALK key releases.

(5) Hang up DAS 804J-type handset.

4.08 To transfer selected data set from data mode to talk mode:

(1) Lift DAS 804J-type handset.

(2) Operate TALK key (***control field***).

(3) DATA lamp extinguishes.

(4) Voice communications are established.

4.09 To select a particular data set for loop-back tests by a 904-type Data Test Center (DTC):

(1) Select and transfer the desired data set to the service line (4.05).

(2) Originate a telephone call on the service line (4.06).

(3) When DTC answers, request loop-back test and give DTC telephone number assigned to service line.

(4) Verify that AUTO key (***control field***) is released.

Note: AUTO key is released when lamp under key is extinguished.

(5) DTC will request that when data set is called (buzzer and ringer will sound) at beginning of ***second*** ring, ***hold*** TEST key (***control field***) operated until TEST lamp lights.

(6) Hang up DAS 804J-type handset and reselect the data set.

(7) At beginning of ***second*** incoming ring of buzzer and ringer, hold TEST key (***control field***) operated until TEST lamp lights.

(8) When TEST lamp lights, release TEST key. Data set is in test mode.

Note: DTC will perform loop-back tests and will release data set from test mode. TEST lamp will extinguish at end of DTC tests.

4.10 To release a data set from the service line:

(1) Operate transfer release (TRFR RLS) key (***action field***).

(2) LINE TRFR lamp extinguishes.

4.11 To restore a selected data set to normal operation:

(1) Operate PICK UP key (***action field***).

(2) PICK UP lamp lights.

(3) The "fluttering" lamp associated with the selected data set will extinguish.

Note: The PICK UP lamp will remain lighted until another data set is selected.

4.12 To take a data set out of service by making its associated telephone line appear busy:

(1) Operate MAKE BUSY key (***action field***).

(2) MAKE BUSY lamp lights.

(3) PICK UP lamp extinguishes, if lighted.

(4) Operate the number key(s) (***select field***) associated with the desired data set(s).

Note: Any number of data sets may be made busy after operating MAKE BUSY key. It is not required to reoperate the MAKE BUSY key for each data set that is to be made busy.

(5) The lamp(s) associated with the operated number key(s) will wink.

4.13 To release data set(s) from make busy condition:

(1) Operate busy release (BUSY RLS) key (***action field***).

(2) BUSY RLS lamp lights.

(3) PICK UP or MAKE BUSY lamp extinguishes, if lighted.

(4) Operate the number key(s) (***select field***) associated with the desired data set(s).

Note: Any number of data sets may be released from the make busy condition after operating BUSY RLS key. It is not required

to reoperate the BUSY RLS key for each data set that is to be released.

(5) The "winking" lamp(s) associated with the operated number key(s) will extinguish.

5. REFERENCES

5.01 The following Bell System Practices pertain to Data Set 103E-type Data Station using KS-20093 cabinets.

103E Data Station

SECTION	TITLE
591-025-101	Description and Operation
591-025-201	Installation and Connections
591-025-301	Maintenance
591-025-501	Test Procedures

Data Set 103E-Type

591-025-100	Identification

1A-Type Data Mounting

590-102-100	Identification

2A-Type Data Mounting

590-102-102	Identification

Data Auxiliary Set 804J-Type

598-053-100	Identification

Data Sets

590-010-201	Multiple Installation Information

Data Auxiliary Sets 801A5 and 801A6 for Automatic Calling

598-010-101	Identification and Operation
598-010-201	Installation and Connections
598-010-301	Maintenance
598-010-501	Test Procedures

Data Auxiliary Sets 801C3 and 801C4

598-012-101	Description and Operation
598-012-201	Installation
598-012-301	Maintenance
598-012-501	Test Procedure

5.02 The following schematic drawings (SD) and circuit descriptions (CD) pertain to the apparatus required for a Data Set 103E-type Data Station installation.

SD- & CD-1D147-01	103E5 and 103E6
SD- & CD-1D095-01	Data Set 103E1, 2, 3, 4
SD- & CD-1D122-01	1A1 Data Mounting
SD- & CD-1D123-01	1A2 Data Mounting
SD- & CD-1D124-01	2A1 Data Mounting
SD- & CD-1D125-01	Data Auxiliary Set 804J-Type
SD- & CD-1D106-01	103E Multiple Installation, Application Schematic
SD- & CD-81878-01	31A Power Unit
SD- & CD-1D082-01	Data Auxiliary Set 801A-Type
SD- & CD-1D103-01	Data Auxiliary Set 801C-Type