

DATA SET 401H-TYPE TRANSMITTER

DESCRIPTION AND OPERATION

	CONTENTS	PAGE
1.	GENERAL	1
2.	PHYSICAL DESCRIPTION	2
3.	FUNCTIONAL DESCRIPTION	3
4.	OPERATION	7
5.	REFERENCES	7

1. GENERAL

1.01 This section provides a general description and operation of data set (DS) 401H-type transmitter. The section may be used to provide general information on DS 401H-type, and it may also be used in conjunction with other practices to assist in effectively installing and maintaining this apparatus. This section does not include information for the business machine associated with the data set.

1.02 This section is reissued to delete reference to the C4 (2350 Hz) frequency, to show operation at 3-out-of-14 instead of 3-out-of-15 frequencies, to show 100 instead of 125 possible characters, to show speed up to 20 instead of 40 characters per second, to add reference to DS 407-type, and to change number and title of the pertinent reference guide to make this practice compatible with Sections 594-022-500, 668-104-504, and 590-004-100.

1.03 DS 401H-type is designed primarily for transmission of parallel telemetry-type data in Dataphone[®] service in response to the data set telephone number having been called. These data sets are intended for use in remote unattended locations. ♦The sets employ 3-out-of-14 voiceband multifrequency parallel operation, and will transmit any of 100 possible alphanumeric characters at any speed up to 20 characters per second.♦

1.04 Data is received from the originating business machine in the form of contact (lead) closures or equivalent. These closures are converted to voice-frequency tones in the DS 401H and transmitted over the telephone line. The data set at the receiving station converts the tones back into contact closures and delivers them to the receiving business machine.

1.05 DS 401H4 replaces DS 401H3. It provides the same function as DS 401H3 except that provisions are made for selective ringing—tip or ring to ground—and the set utilizes modular circuit boards.

1.06 DS 401H5 is similar to DS 401H4. In addition, DS 401H5 incorporates a 3-tone electrical answer-back (EAB) receiver which allows reception of any one of three single frequency signals from the answer-back transmitters of DS 401-type receivers at speeds up to 30 baud and presents a contact closure to the business machine.

1.07 DS 401H6 is similar to DS 401H5 but is capable of receiving only two answer-back frequencies. Reception of answer-back A (1017 Hz) causes the data set to terminate the call. Reception of answer-back B (1785 Hz) closes a contact at the business machine interface. ♦DS 401H6 is intended for internal Bell System use only.♦

1.08 DS 401H-type is designed to operate with such receivers as DS 401J-, 403D-, and ♦407-types.♦ Descriptions of these sets are found in the sections entitled Data Set 401J-Type Receiver—Description and Operation (594-018-100), Data Set 403D-Type—Description (594-025-100), and ♦Data Set 407-Type—Description (594-800-100).♦

1.09 These data sets are intended to operate with an associated 500-type telephone set on individual lines using bridged ringing. The data set and telephone set on the same line should be for the same customer. The data set should not be connected to lines using A lead control or to a PBX line.

2. PHYSICAL DESCRIPTION

2.01 DS 401H-type is housed in a gray drawn metal housing and weighs approximately 4-1/2 lbs. Physical dimensions of data sets 401H1, H2, H3, and 401H4, H5, and H6 are given in Fig. 1 and 2, respectively. A weatherproof housing must be provided if used in exposed locations.

2.02 DS 401H-type is designed to operate properly within the ranges of the environmental conditions given below.

- DS 401H1: Ambient temperature range of +20 to +140°F

- DS 401H2, H3: Ambient temperature range of -20 to +140°F

- DS 401H4, H5, H6: Ambient temperature range of -20 to +150°F

- DS 401H-type: Relative humidity range of 20 to 95 percent.

2.03 The power required to operate DS 401H1, H2, H3, or H4 is furnished from the telephone central office over the telephone line. The EAB circuits in DS 401H5 and 401H6 use a power supply which requires a 117-volt 60-Hz ac source through a wall-mounted KS-16886-L2 or a KS-20426-L1 transformer. The transformer output is fed to

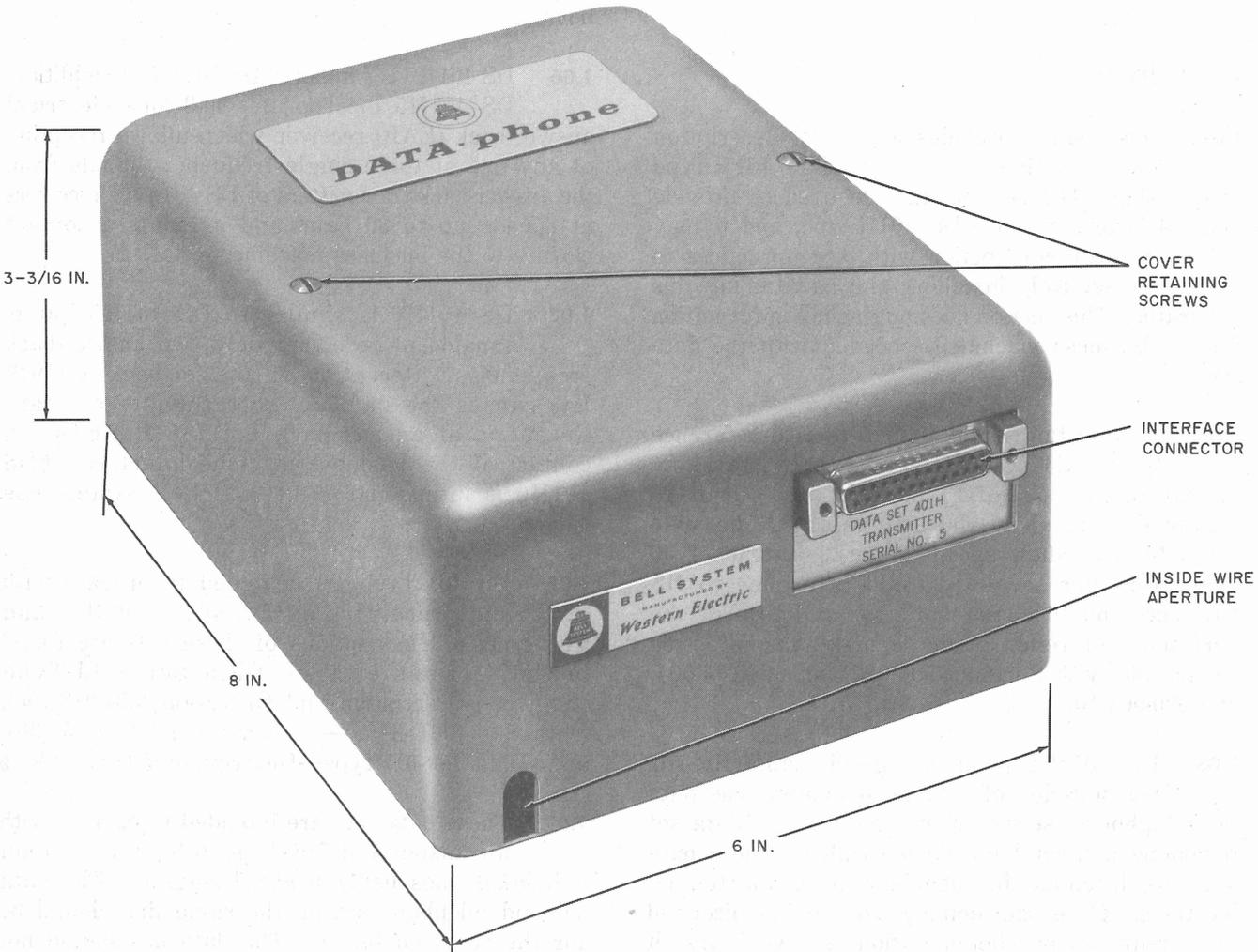


Fig. 1—Data Set 401H1, 401H2, or 401H3

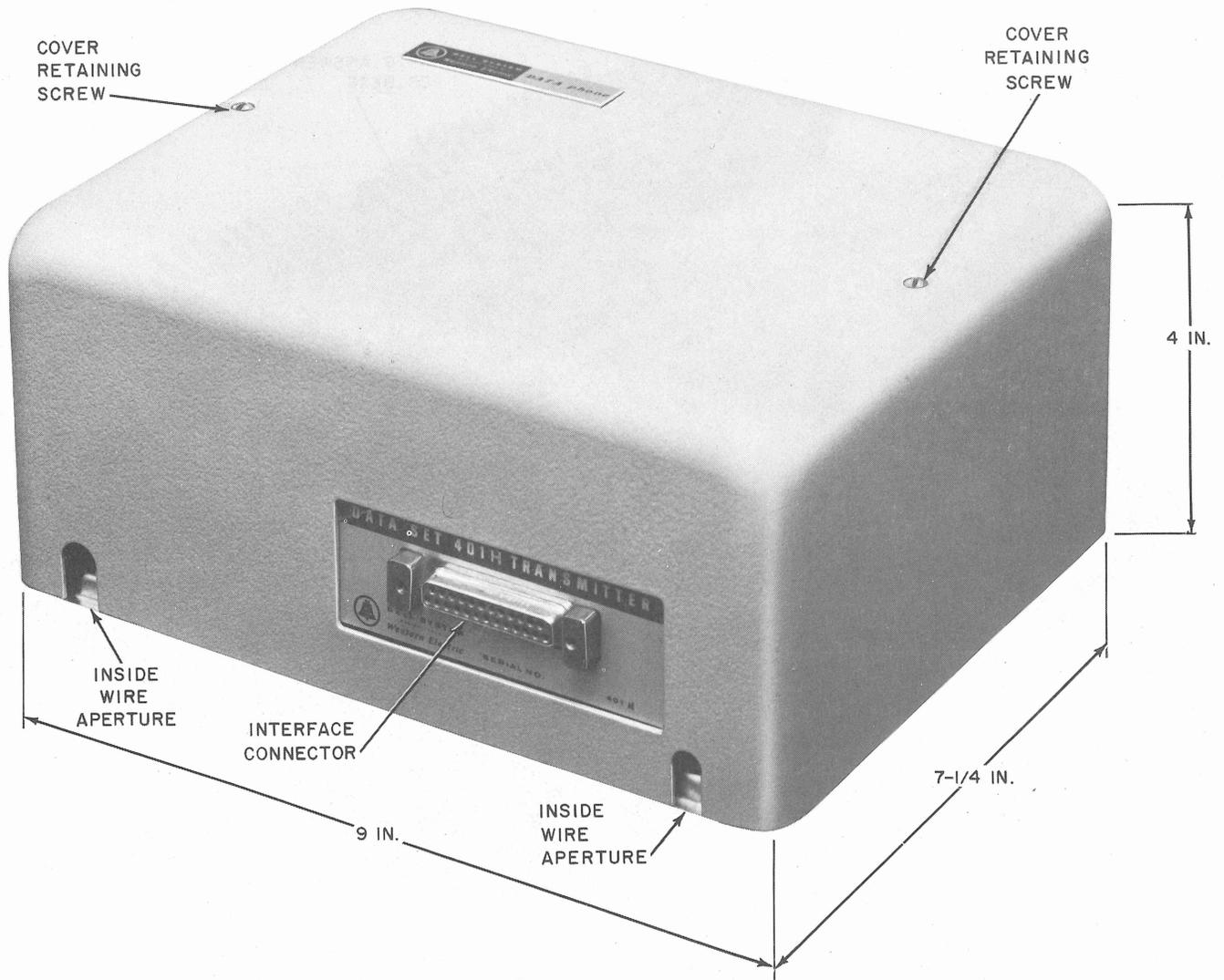


Fig. 2—Data Set 401H4, 401H5, or 401H6

the power supply circuit pack through a D4BJ-61 cord.

2.04 Refer to Fig. 3 and 4 for front and rear views, respectively, of DS 401H4, H5, or H6 with the cover removed.

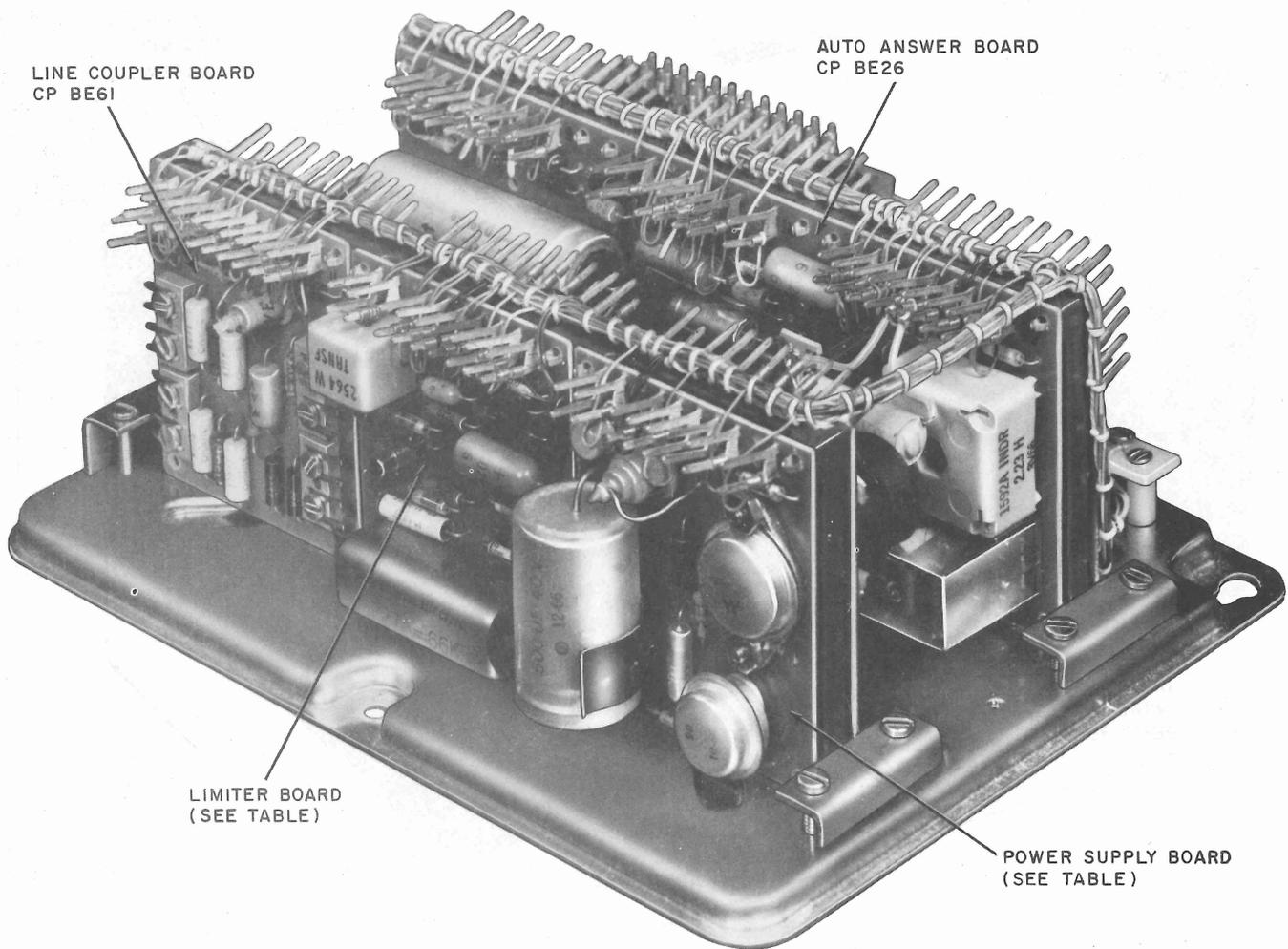
2.05 Interface connections are made by means of a KS-19087-L2 connector located at the wiring entrance end of the data set. Interface leads between the business machine and data set are supplied by a customer-provided plug (Cinch or Cannon DB 19604-432) and cord. Interface connection information, lead identification, and interface pin assignments are given in Table A.

3. FUNCTIONAL DESCRIPTION

3.01 This part describes the major functional components that make up DS 401H-type. Refer to Fig. 5 for a simplified block diagram of data set 401H1, H2, or H3 and to Fig. 6 for data set 401H4, H5, or H6.

3.02 DS 401H-type consists of automatic answering, line holding, line status indication, and oscillator circuits.

3.03 The unattended answering circuit provides a means whereby the data set is energized by dialing the station telephone number. The



DATA SET	LIMITER BOARD	POWER SUPPLY BOARD
401H4	OMITTED	OMITTED
401H5	CP BE18, SERIES 1 OR 3	CP BE1
401H6	CP BE18, SERIES 2	CP BE1
401H6, SERIES 3 AND UP	CP BE94	CP BE1

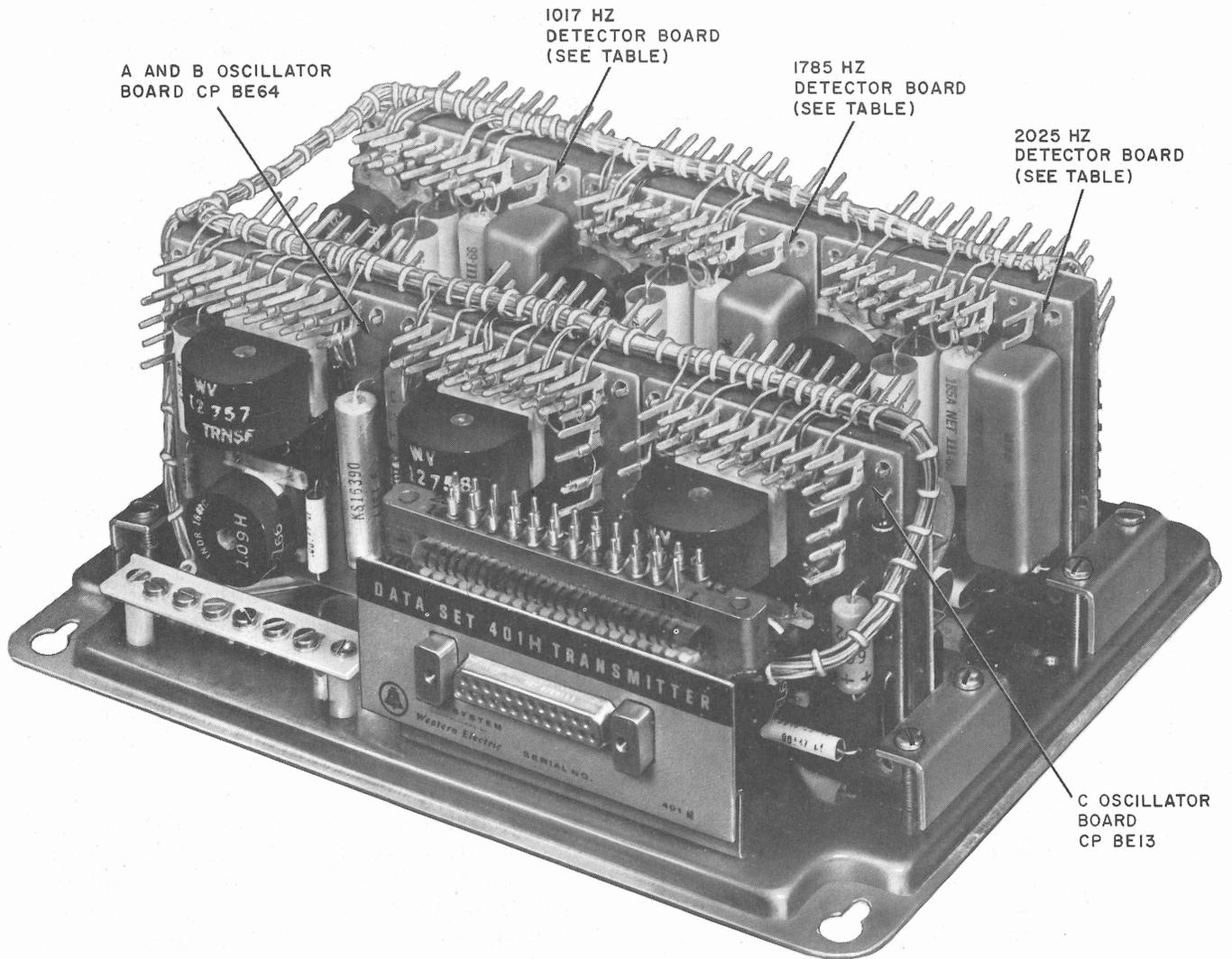
Fig. 3—Data Set 401H4, 401H5, or 401H6—Front View With Cover Removed

ringing signal is detected and applied to the answer tone and delay timer circuit to start the answer timing sequence.

3.04 The answer tone and delay timer circuit send a 2025-Hz tone to notify the associated receiver that a connection has been established. During an initial quiet period before the answer tone is transmitted, the timer circuit disables the

transmitter circuit to ensure that the data set does not generate any signals which might interfere with those of the signaling apparatus associated with the connection.

3.05 The EAB receiver in DS 401H5 consists of a high gain limiter, three single frequency detectors (1017, 1785, and 2025 Hz), and a power supply (Fig. 7). The EAB receiver in DS 401H6



DATA SET	1017 HZ DETECTOR	1785 HZ DETECTOR	2025 HZ DETECTOR
401H4	OMITTED	OMITTED	OMITTED
401H5	CP BE19, SERIES 2 OR 4	CP BE20, SERIES 2 OR 4	CP BE 21
401H6	CP BE19, SERIES 3	CP BE20, SERIES 3	OMITTED
401H6, SERIES 3 AND UP	CP BE95	CP BE96	OMITTED

Fig. 4—Data Set 401H4, 401H5, or 401H6—Rear View With Cover Removed

(Fig. 7) consists of a high gain limiter, two single frequency detectors (1017 and 1785 Hz) and a power supply. The customer selects either the data transmitter or the answer-back receiver by controlling the request-to-send interface lead. Grounding the request-to-send lead connects the data transmitter to the line and disables the answer-back limiter.

3.06 The answer-back frequencies are transmitted one at a time from the associated data receiver. The received signal is amplified by the limiter and converted to contact closures at the customer interface by the detectors.

3.07 The power supply consists of a power transformer and a power supply circuit pack

TABLE A

INTERFACE LEAD DESIGNATIONS

PIN NO.	FUNCTION
1*	Signal Ground
2	Reserved
3	A1
4	A2
5	A3
6	A4
7	Data Common
8	Reserved
9	B1
10	B2
11	B3
12	B4
13	Reserved
14	C1
15	C2
16	C3
17‡	C4
18†	Answer Back C
19	Data Terminal Ready 1
20	Data Terminal Ready 2
21	Signal Common
22*	Answer Back A
23*	Answer Back B
24	Data Set Ready (line status)
25*	Request to Send

* 401H5 and 401H6 only

† 401H5 only

‡ Present at the interface but not used in current applications

(CP BE61). The power supply circuit pack contains a full-wave rectifier and a voltage regulating circuit.

3.08 The data transmitter circuit in DS 401H-type consists of three transistor oscillators. From each oscillator circuit in the data transmitter, four data leads connect to the business machine. An additional lead from each oscillator is common with a similar lead from all other oscillators that connect to the business machine as common leads. Data from the business machine consists of contact closures between the common lead and one data lead from each oscillator. Thus, the transmitted signal for each character consists of a composite of three frequencies, one from each oscillator, sent over the telephone line simultaneously.

3.09 If none of the data leads from an oscillator is connected with the common lead, that oscillator generates a "rest" frequency. The rest frequencies are used to stabilize the sensitivity of the AGC circuit of the receiver so that transmission echoes from the previous character transmitted are not detected while data is not being transmitted. The rest frequencies may also be used as supplemental data frequencies. Table B shows the frequencies produced by the set.

3.10 The transmitter level of DS 401H1, 401H2, and 401H3 is fixed at -2 dBm. This transmit level is padded by option X, Y, or Z, and an external pad as required, so that the signal reaching the serving central office will be no greater than -12 dBm.

3.11 The transmitting levels of DS 401H4, H5, and H6 are adjusted by screw terminals on BE61 CP so that the signal reaching the serving central office will be no greater than -12 dBm.

3.12 The oscillator transformers used in the DS 401H2 are susceptible to damage due to lightning when the data common interface lead is grounded (to earth) within customer-provided interfacing equipment. AB2 circuit pack used in DS 401H2 was replaced with AB4 CP, recoding the data set to 401H3. In AB4 CP, the oscillator transformers provide insulation having a breakdown strength exceeding 700 volts, preventing lightning voltages on the line from damaging circuits at the interface. DS 401H1 is also susceptible to lightning damage. In locations where problems from lightning are known to exist, it is recommended that the telephone companies purchase the DS 401H3 and

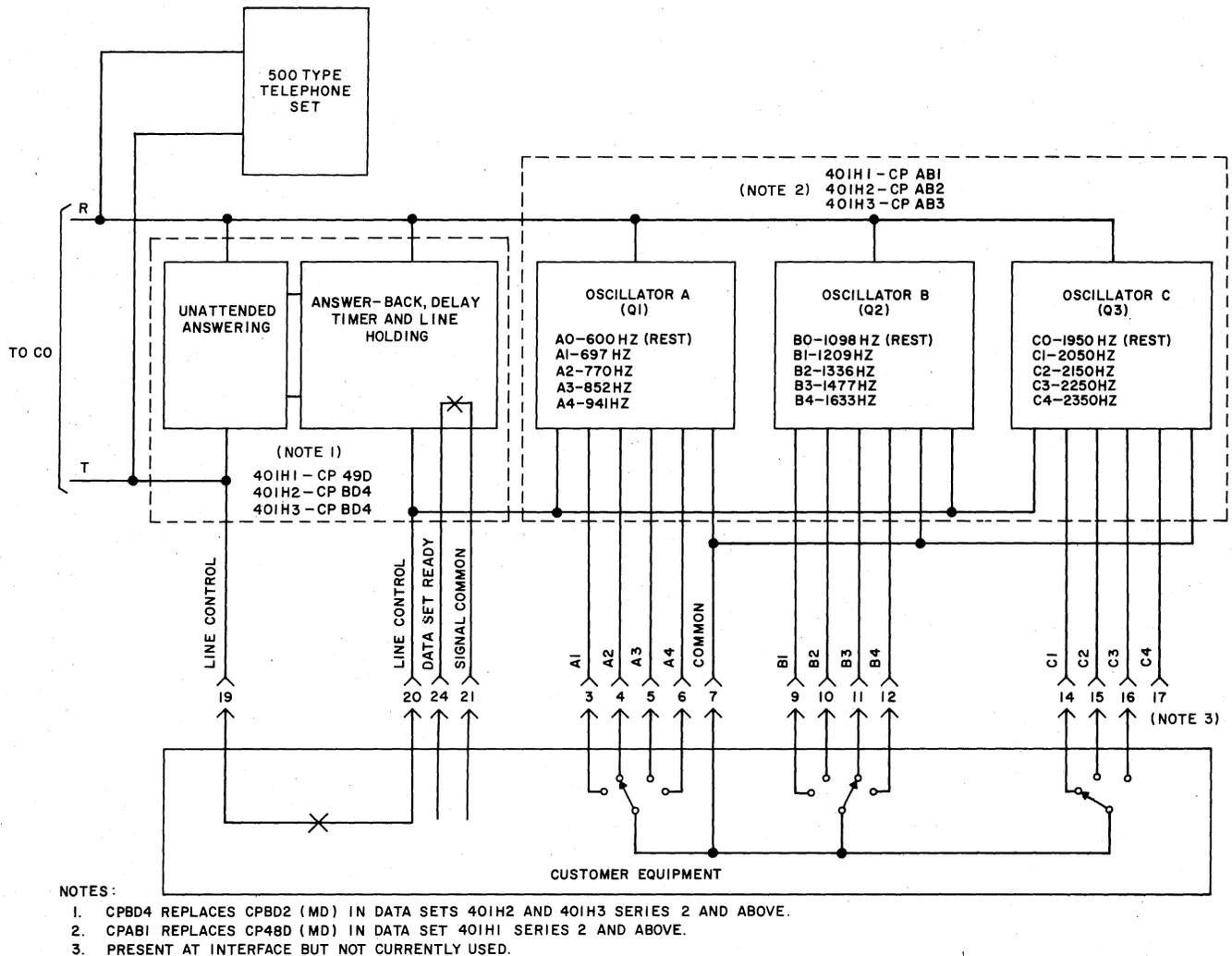


Fig. 5—Data Set 401H1, 401H2, or 401H3—Block Diagram

send DS 401H1 to the service center for full credit, using a Return Material Notice (RMN) form.

4. OPERATION

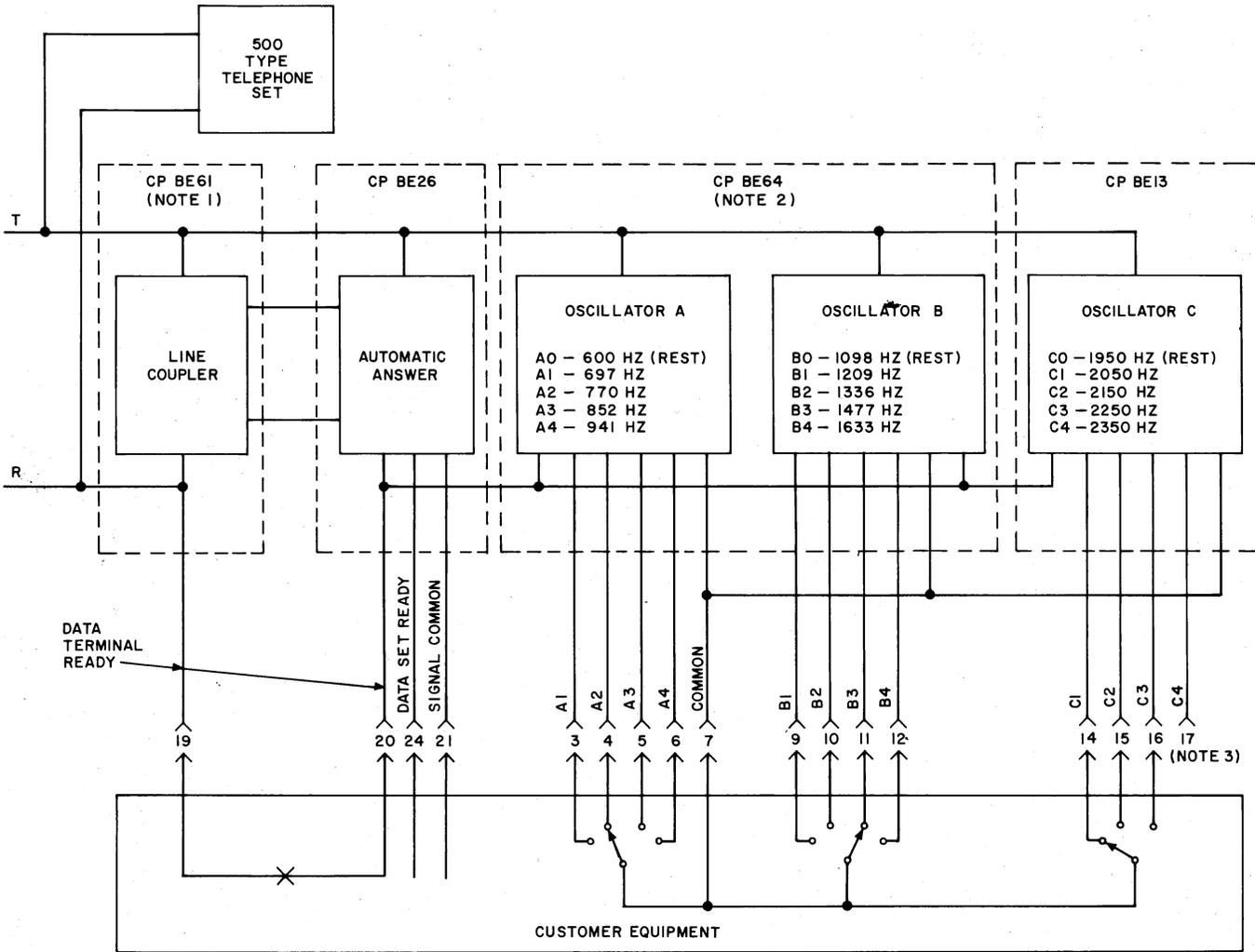
4.01 The DS 401H-type is intended for automatic operation. The ringing signal triggers a timing function sequence if the line control leads are closed and causes the data set to notify the calling party that the call has been answered. The customer indicates readiness to have the call automatically answered by shorting line control terminals. Calls are terminated by opening these terminals. To answer a call with the associated telephone set, the line control terminals must be open to prevent the data set from answering the

call. On DS 401H4, 401H5, and 401H6 the line control leads are designated data terminal ready.

5. REFERENCES

5.01 For additional information relating to DS 401H-type refer to the following documents:

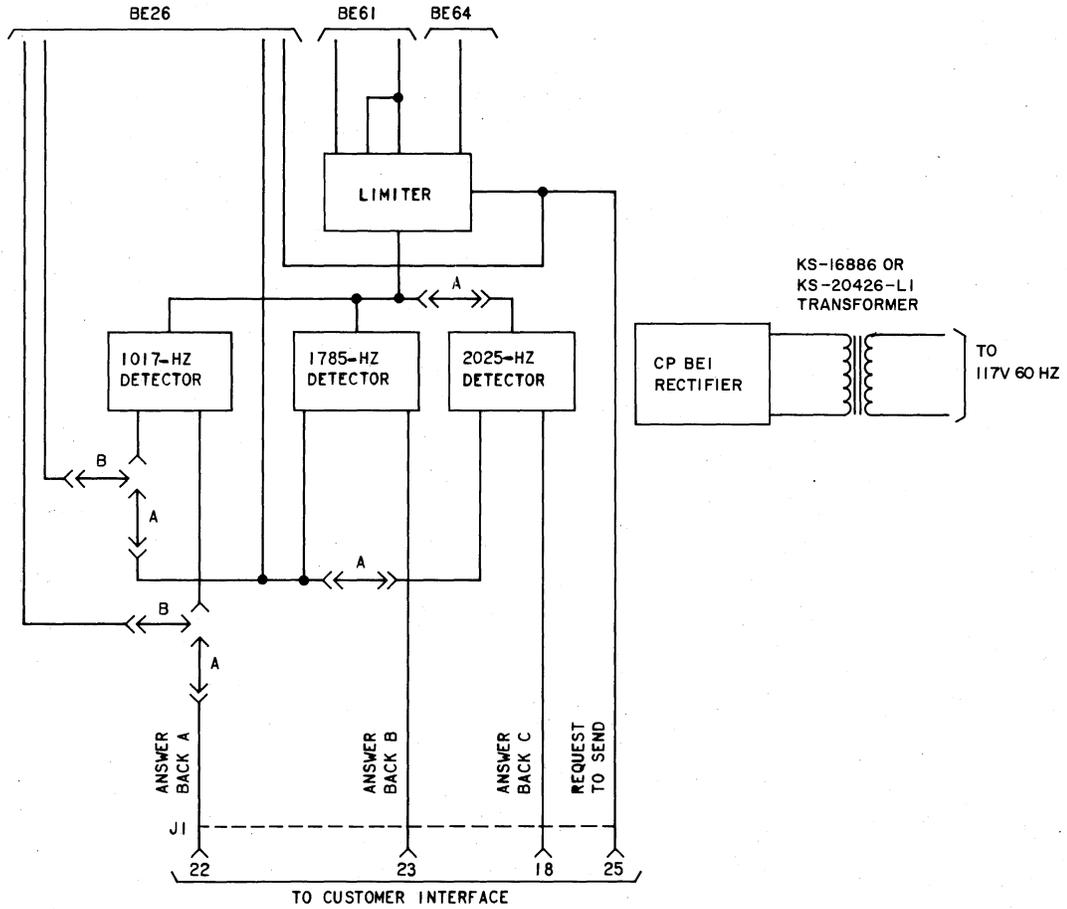
SECTION	TITLE
CD- & SD-1D028-01	Data Systems—Data Set 401H-Type Transmitter (DS 401H1, H2, and H3)



- NOTES:
1. CP BE61 REPLACES CP BE58 (MD)
 2. CP BE64 REPLACES CP BE14 (MD)
 3. PRESENT AT INTERFACE BUT NOT CURRENTLY USED

Fig. 6—Data Set 401H4 or Transmitter Portion of Data Set 401H5 or 401H6—Block Diagram

SECTION	TITLE	SECTION	TITLE
CD-& SD-1D138-01	Data Systems Station—Data Set 401H-Type Transmitter (DS 401H4, H5, and H6)	594-022-300	Data Set 401H-Type Transmitter— Maintenance
590-004-100	Data Services—Parallel Data Transmission up to 20 Characters Per Second Provided by Data Sets 401-Type—Reference Guide	594-022-500	Data Set 401H-Type Transmitter— Test Procedure
594-022-200	Data Set 401H-Type Transmitter— Installation and Connections	668-104-504	Data Test Center—904A- and 904C-Types—Test Procedure Data Set 401H
		PUB 41402	Data Set 401H Interface Specification



DATA SET	LIMITER	1017 HZ DETECTOR	1785 HZ DETECTOR	2025 HZ DETECTOR
401H5	CP BE18, SERIES 1 OR 3	CP BE19, SERIES 2 OR 4	CP BE20, SERIES 2 OR 4	CP BE21, (A WIRING)
401H6	CP BE18, SERIES 2	CP BE19, SERIES 3	CP BE20, SERIES 3	OMITTED (B WIRING)
401H6, SERIES 3 AND UP	CP BE94	CP BE95	CP BE96	OMITTED (B WIRING)

Fig. 7—Data Set 401H5 or 401H6 EAB Receiver—Block Diagram

TABLE B
DATA FREQUENCIES

DESIGNATION	FREQUENCY, Hz
A-0 (rest)	600
A-1	697
A-2	770
A-3	852
A-4	941
B-0 (rest)	1098
B-1	1209
B-2	1336
B-3	1477
B-4	1633
C-0 (rest)	1950
C-1	2050
C-2	2150
C-3	2250