

# PRELIMINARY

**Bell System Voice Communications  
TECHNICAL REFERENCE**

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**Voice  
Connecting  
Arrangements**

**CEBAX  
CEBBX**

**Interface  
Specification**

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**REVISED**

**JUNE, 1970**

**ENGINEERING DIRECTOR - CUSTOMER TELEPHONE SYSTEMS**



PRELIMINARY

NOTICE

This Technical Reference is specifically intended for the developers and designers of telephone voice communications systems and equipment which interface with the Bell System telecommunications network and for technical consultants to use in designing communications systems and arrangements requiring connections to the Bell System telecommunications network. The right to revise this Technical Reference for any reason, including conformity with USASI, EIA, CCITT or other standards, to utilize new advances in the state of the technical arts, or to reflect changes in the design of the equipment and/or service described herein, is expressly reserved.

If further information is required, please contact:

Engineering Director - Customer Telephone Systems  
American Telephone and Telegraph Company  
195 Broadway  
New York, New York 10007

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### PREFACE

The material in this Technical Reference is intended for use by designers and manufacturers of telephone equipment who expect to connect their communications equipment to the Bell System telecommunications network. This material covers guides which, if followed, should permit the transmission and reception of voice signals without interference to other Telephone Company services.

The responsibility of the Bell System with respect to the use of customer-provided equipment is as set forth in the appropriate Tariff regulations.

In furnishing this material, the Bell System Telephone Companies make no claims or representations and assume no responsibility, beyond that set forth in the Tariff regulations, for the suitability of the transmission path or the performance of the telecommunications system. The Bell System is in no way responsible for the design, performance, installation, operation or maintenance of the communications systems or equipment provided by others which are connected to the telecommunications network and does not endorse or approve any such system or equipment. The material in this Technical Reference is furnished in the interest of preventing interference to other Telephone Company services and users, and is not furnished with the intent to provide complete design specifications or parameters, or to assure the quality or performance of customer-provided telephone systems and equipment.

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1. GENERAL

F.C.C. Tariff No. 263 and corresponding intrastate Tariffs filed by the Bell System provide for the direct connection of customer-provided voice transmitting and receiving terminal equipment and communications systems to the Bell System telecommunications network. Direct electrical connection is made through a voice connecting arrangement furnished, installed, and maintained by the Telephone Company. The Tariffs also provide for the indirect (acoustic or inductive) connection of such equipment or systems.

In addition, the Bell System retains responsibility for network control signaling. This includes the switchhook, dialing and control functions, as well as responsibility for the protective function of voice signal limiting and isolation of Central Office battery from the customer-provided equipment.

The connection service described in this Technical Reference is identified by the Telephone Company as Voice Connecting Arrangements CEBAX and CEBBX and should be ordered as such. Contact your local Telephone Company business office or Marketing representative for information regarding rates for, and the availability of, these voice connecting arrangements for both new and additional service.

2. SYSTEM DESIGN CONSIDERATIONS

2.1 Voice Connecting Arrangements CEBAX and CEBBX

Voice Connecting Arrangements CEBAX and CEBBX provide a means of manually connecting customer-provided equipment to a line to the Bell System telecommunications network terminated on a Telephone Company-provided multiline telephone set (Control Station) associated with a Telephone Company-provided Key Telephone System. Both arrangements are arranged to handle calls

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in either direction and are intended for coupling voice signals only. A talking path is established over the transmission leads. The customer-provided equipment must provide a closure over one pair of leads to connect and maintain the connection of the customer-provided equipment to the line which is terminated on a pick-up key at the Control Station. For Voice Connecting Arrangement CEBBX, the customer-provided equipment, in addition, must provide a closure on another pair of leads to provide the identification of which Control Station established the connection.

For multistation installations, one Voice Connecting Arrangement CEBAX must be provided for each line for each Control Station; whereas, only one Voice Connecting Arrangement CEBBX need be provided for each line regardless of the number of Control Stations.

2.2 Service and Maintenance Considerations

2.21 Responsibility of the Customer

The Tariffs permitting direct electrical connection of customer-provided communications systems state that:

Where long distance message telecommunications service is available under this Tariff for use in connection with customer-provided communications systems the operating characteristics of such systems shall be such as not to interfere with any of the services offered by the Telephone Company. Such use is subject to the further provisions that the customer-provided systems do not endanger the safety of Telephone Company employees or the public; damage, require change in or alteration of, the equipment or other facilities of the Telephone Company; interfere with the proper functioning of such equipment or facilities; impair the operation of the telecommunications system or otherwise injure the public in its use

of the Telephone Company's services. Upon notice from the Telephone Company that the customer-provided system is causing or is likely to cause such hazard or interference the customer shall make such change as shall be necessary to remove or prevent such hazard or interference.

2.22 Responsibility of the Telephone Company

The Tariffs permitting direct electrical connection of customer-provided communications systems state that:

The Telephone Company shall not be responsible for the installation, operation, or maintenance of any customer-provided communications systems. Long distance message telecommunications service is not represented as adapted to the use of customer-provided systems and where such systems are connected to Telephone Company facilities the responsibility of the Telephone Company shall be limited to the furnishing of facilities suitable for long distance message telecommunications service and to the maintenance and operation of such facilities in a manner proper for such telecommunications service; subject to this responsibility the Telephone Company shall not be responsible for (i) the through transmission of signals generated by the customer-provided systems or for the quality of, or defect in, such transmission, or (ii) the reception of signals by customer-provided systems.

The Telephone Company shall not be responsible to the customer or otherwise if changes in minimum network protection criteria contained in the Tariffs and Paragraph 5 of this Technical Reference,

or in any of the facilities, operations, or procedures of the Telephone Company render any customer-provided facilities obsolete or require modification or alteration of such equipment or otherwise affect its use or performance.

### 2.23 Trouble Reporting Procedure

When trouble is experienced with this service, the customer should perform the necessary testing to sectionalize the difficulty by opening the circuit at the Interface Connecting Block and testing only toward the customer-provided equipment. If the tests indicate that the trouble is in the Telephone Company-provided equipment, it should be promptly reported to the Telephone Company. Trouble reports should be called into the listed "Repair Service" number, which can be found in the front of the telephone directory. The repair attendant should be given:

- (a) Customer's name
- (b) Customer's address
- (c) Listed telephone number
- (d) Description of the trouble
- (e) Customer's contact for additional information

### 2.3 Foreign and Surge Voltage Protection

Where telephone lines are exposed to lightning, power circuit contact, or induction, protective devices are installed at the Central Office and on the customer's premises that will provide a path to ground for foreign voltages that exceed about 600 volts peak. Since the customer's equipment is connected to the telephone line through the

voice connecting arrangement, the customer's equipment is protected from longitudinal surges by transformer isolation. The maximum surge between the transmission leads that the customer's equipment may encounter due to foreign potential is 30 volts. The surge potentials on the other conductors of the voice connecting arrangement will not exceed about 600 volts peak.

The customer is responsible for providing protection, internal to his equipment and facilities, against foreign and surge voltages from his equipment and facilities being applied to the voice connecting arrangement. The surge potential on the transmission leads shall be limited to 30 volts. The surge potential on other conductors shall be limited to 600 volts peak between conductors or from one conductor to ground.

#### 2.4 Hazardous Voltage Limitations

When it is necessary for the customer to apply an operational voltage to facilities interconnected with telephone facilities, certain voltage limitations shall be observed. These limitations are for the purpose of providing adequate protection to personnel and plant facilities. Unless otherwise specified in Paragraph 4.2 and 4.3 of this Technical Reference, steady-state voltages applied by customer-provided equipment to conductors connected to Voice Connecting Arrangements CEBAX and CEBBX should not exceed the following:

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	<u>dc</u>	<u>ac (RMS)</u>
Maximum voltage, any conductor to ground	135	50
Maximum voltage, conductor to conductor	(135 (270*)	(50 (100*)

\*Permitted only if voltage source is center-tapped to ground.

The power supplies and wiring methods used in the customer-provided equipment should meet the provisions of the National Electrical Code (NEC), Article 725, for Class 2 remote control and signal circuits.

3. DESCRIPTION OF VOICE CONNECTING ARRANGEMENTS CEBAX AND CEBBX

3.1 Physical

Voice Connecting Arrangements CEBAX and CEBBX consist of a standard line appearance on a Telephone Company-provided telephone set (Control Station) and a voice connecting unit (Fig. 1). Each voice connecting unit is contained on a 4- by 5-inch, plug-in, printed wiring board. The associated apparatus mounting for the voice connecting unit will be installed by the Telephone Company in the same location as the line circuit for the line. The unit will function satisfactorily within a temperature range of 0° to 55°C and a humidity range of 5 to 95 percent. Each unit dissipates approximately 3 watts.

Leads from each arrangement are terminated on a Telephone Company-provided Interface Connecting Block (Fig. 2) conveniently located to permit testing, maintenance, trouble isolation, and ease of connection to the customer's equipment. In some applications the block may be located adjacent to the key telephone set. The location of the block and subsequent location of the customer-provided equipment must be such that the maximum external loop resistance of the signaling pairs shall not exceed 50 ohms.

### 3.2 Functions

The major functions of each voice connecting arrangement are:

- (a) To protect Telephone Company personnel and equipment from hazardous voltages which may be applied at the interface.
- (b) To provide voice-only access to the telecommunications network.
- (c) To provide network control signaling to the network.
- (d) To limit abnormally high voice signal voltages.
- (e) To provide for accepting supervisory signals from customer-provided equipment.

### 3.3 Operation

#### 3.3.1 Connection to a Line for Voice Connecting Arrangement CEBAX

A call is received or originated on the line associated with Voice Connecting Arrangement CEBAX by the Control Station in the usual manner for a Telephone Company-provided Key Telephone System. If the attendant desires to connect this call to the customer-provided equipment, the attendant operates the customer-provided equipment to provide a locking closure on the CA and CS (CONNECT) leads (see Fig. 4). The pickup key on the Control Station must be depressed for this line.

The CONNECT closure activates the voice connecting unit which connects the customer-provided equipment to the line and holds the unit operated in series with the switchhook of the Control Station. The CG and CBL leads (STATION CONTROL) are strapped by the Telephone Company at the Interface Connecting Block on the Telephone Company side of the interface.

The attendant may then go on HOLD or go to another line to release the Control Station from the call. However, the Control Station must remain off-hook during the entire connection since the Control Station switchhook as well as the CONNECT closure controls the connection.

### 3.32 Disconnection for Voice Connecting Arrangement CEBAX

All line connections using Voice Connection Arrangements CEBAX can be terminated at the same time by the Control Station going on-hook. If an individual connection is to be released from the line, the attendant must operate the customer-provided equipment to open the contact closure on the CONNECT leads. Unless any station of the Key Telephone System is off-hook on this line, the line will also be released.

### 3.33 Connection to a Line for Voice Connecting Arrangement CEBBX

A call is received or originated on the line associated with Voice Connecting Arrangement CEBBX by the Control Station in the usual manner for a Telephone Company-provided Key Telephone System. If the attendant desires to connect this call to the customer-provided equipment, the attendant operates the customer-provided equipment to provide a locking closure on the CG and CBL (STATION CONTROL) leads and a locking closure on the CA and CS (CONNECT) leads for that line (see Fig. 4). The pickup key on the Control Station must be depressed for this line.

The CONNECT closure activates the voice connecting unit which connects the customer-provided equipment to the line and holds the unit operated, via the STATION CONTROL closure, through the switchhook of the Control Station.

The STATION CONTROL closure permits more than one Control Station to be provided per line using only one Voice Connecting Arrangement CEBBX. Since the tip and ring of the line from the arrangement will be bridged by the customer-provided equipment at each Control Station to prevent transmission degradation, it is recommended that the customer-provided equipment close the transmission leads to the voice connecting unit only when the customer-provided equipment is in use at that Control Station.

The attendant may then go on HOLD or go to another line to release the Control Station from the call. However, the Control Station must remain off-hook during the entire connection since the Control Station switchhook, as well as the customer-provided contacts, controls the connection.

### 3.34 Disconnection for Voice Connecting Arrangement CEBBX

All line connections using Voice Connecting Arrangements CEBBX can be terminated at the same time by the Control Station going on-hook. If an individual connection is to be released from the line, the attendant must operate the customer-provided equipment to open the contact closures on the CONNECT and STATION CONTROL leads for that line. Unless any station of the Key Telephone System is off-hook on that line, the line will also be released.

### 3.4 Interface Leads

Four interface leads per line are provided for Voice Connecting Arrangement CEBAX to an Interface Connecting Block for the customer's use. Two leads, designated CT and CR, provide the two-way voice transmission path from the voice connecting arrangement. The leads designated

CA and CS provide an operate path for the relay in the voice connecting unit to make and hold the connection.

Six interface leads per line are provided for Voice Connecting Arrangement CEBBX. Two leads, designated CT and CR, provide the two-way voice transmission path from the voice connecting arrangement. The leads designated CG and CBL extend the holding path for the relay in the voice connecting unit to the switchhook of the Control Station which made the original connection.

### 3.5 Method of Connection

The leads from Voice Connecting Arrangement CEBAX and CEBBX will be terminated by the Telephone Company on the Interface Connecting Block at the Telephone Company equipment location (see Fig. 2). At the customer's request the block may be located adjacent to the Control Station. The customer or his representative must provide and install the conductors and make the connections necessary to associate his equipment with the voice connecting arrangement at the Interface Connecting Block using an Amphenol No. 57-10500-7 plug, Cinch No. 222-32-50-023 plug or equivalent. The wiring scheme shown is in Table A. A clamping bracket is provided for securing the customer's connector plug to the 50-pin connector of the Interface Connecting Block. When all connections have been completed, the cover of the block should be secured.

The leads at the Interface Connecting Block are designated as follows:

<u>Voice Connecting Arrangement</u>	<u>Lead Designation</u>	<u>Function</u>
CEBAX, CEBBX	CT CR	voice transmission pair

<u>Voice Connecting Arrangement</u>	<u>Lead Designation</u>	<u>Function</u>
CEBAX, CEBBX	CA CS	connect pair pair
CEBBX	CG CBL	station control pair

#### 4. ELECTRICAL CHARACTERISTICS

##### 4.1 General

The insertion loss of Voice Connecting Arrangements CEBAX and CEBBX is approximately one (1) dB over the voice frequency range of 300 to 3000 Hz. No voice signal amplification is provided.

##### 4.2 Transmission Path

##### 4.21 Voice Signal Limiter

A voice signal limiter is incorporated in the transmission path (Fig. 4) to protect the Bell System telecommunications network from applications of abnormally high signal levels. This has no effect on normal voice signal levels.

This limiter does not remove the customer's responsibility to meet the network protection criteria as prescribed in the Tariffs and as outlined in Paragraph 5 of this Technical Reference.

##### 4.22 Transmission Parameters

Voice Connecting Arrangements CEBAX and CEBBX provide about a one-to-one impedance transformation. The input impedance is a function of the impedance of the voice connecting arrangement and the impedances of the loop to the Central Office. For design purposes, the input impedance of each voice connecting arrangement should be considered to be 600 ohms,

and, therefore, the impedance of the customer-provided equipment should also be 600 ohms. The voice signal levels must comply with the applicable Tariffs. The Tariffs permitting electrical connection of customer-provided communications systems state:

"To prevent excessive noise and crosstalk in the network, it is necessary that the power of the signal at the Central Office not exceed 12 dB below one milliwatt when averaged over any 3-second interval. To insure that this limit is not exceeded, the power of the signal which may be applied by the customer-provided equipment to the Telephone Company interface located on the customer's premises will be specified for each type of connecting arrangement, but in no case shall it exceed one milliwatt."

For Voice Connecting Arrangements CEBAX and CEBBX, the maximum permissible voice signal power at the Interface Connecting Block is -8 dBm when averaged over any 3-second interval.

#### 4.3 Signaling Path

When a connection is initiated, the customer's equipment is expected to provide a closure between the CA and CS leads to operate the relay in the voice connecting unit. The transmission path will be cut through to the customer's equipment after closure of the CA and CS leads, and will remain connected until the CS and CA leads (and the CG and CBL leads for Voice Connecting Arrangement CEBBX) are opened at the customer-provided equipment or the Control Station goes on-hook.

The CS lead has a maximum of -28 volts dc through 590 ohms. The CS and CA leads and the CG and CBL leads will load the customer's supervisory contact with .07 ampere, maximum, inductive load. The minimum open circuit insulation resistance between the CA and CS or the CG and CBL leads, and from either lead to ground, will be 15,000 ohms. The maximum external loop resistance from the CS lead to the CA lead or CG and CBL lead measured at the Interface Connecting Block toward the customer is 50 ohms.

#### 4.4 Grounding

In general, it is desirable that circuits in the customer's equipment which connect to the voice connecting arrangement have some path to ground. A direct or resistive ground on one side of the power supply would be an example of such a path. This practice avoids the possibility of the entire circuit involved being at an indeterminate potential with respect to ground. Such a potential, perhaps as a result of electrostatic induction, could result in an insulation breakdown in this arrangement. It is expected that the customer's equipment, if powered from commercial power, will be grounded in accordance with applicable electrical codes (NEC) and should be bonded to the telephone protector ground when available. Self-powered or passive customer's equipment need not be grounded.

Voice Connecting Arrangements CEBAX and CEBBX are provided with a common signal ground which is always bonded to a metallic cold water pipe or other NEC approved ground serving as the electric power ground and telephone protector ground, where present. The CG lead of the conferencing

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path is grounded from the switchhook contacts of the Control Station. It is not permitted to derive the main ground for the customer's equipment through this lead from the voice connecting arrangement.

As an example, a good ground may be obtained with a proper connection to a metallic cold water pipe, using a single No. 6 AWG copper conductor. The other end should be connected to the ground return terminal of the customer's equipment. The run should be short, straight, and if possible, a continuous piece of wire. Proper attention should be given to providing the lowest possible resistance connection at each end of the circuit. It is imperative that this ground be connected at the same location to the water piping system as the telephone protector or signal ground. This lead shall not be fused.

5. POWER AND IMPEDANCE CONSIDERATIONS FOR CUSTOMER-PROVIDED EQUIPMENT

5.1 Average Power at the Central Office

The average power in any 3-second interval delivered to a 900 ohm resistive load at the Central Office should not exceed -12 dBm. The limitations described in 5.2 below, on power at the customer's location have been set to meet an average of -12 dBm when all loops in the Bell System are considered.

5.2 Maximum Power Available

The Central Office power criterion, in 5.1 above, can be satisfied by limiting the maximum available power\* from a customer-provided 600 ohm

\*The available power of a source is the maximum power that the source can deliver to a load. Maximum power transfer occurs when the load and source impedances are matched.

source to -8 dBm when averaged over any 3-second interval. The customer-provided communications system should be so designed that the average power over any 3-second interval applied to the Interface Connecting Block associated with Voice Connecting Arrangements CEBAX and CEBBX do not exceed -8 dBm. The recommended procedure for estimating the power is given in Paragraph 6.

### 5.3 Signaling Considerations

The telecommunications network incorporates tone signaling devices that are used for network control functions. These devices, connected at all times to the telephone circuit, are designed to be sensitive to single frequency tones at 2600 Hz. They are, however, relatively insensitive to energy at this frequency if sufficient energy is present at the same time in other frequencies in the voiceband.

In order to prevent the interruption or disconnection of a call, or interference with network control signaling, it is necessary that the signal applied by the customer-provided equipment to the voice connecting arrangement at no time have energy solely in the 2450 to 2750 Hz band. If signal power is in the 2450 to 2750 Hz band, it must not exceed the power present at the same time in the 800 to 2450 Hz band.

### 5.4 Out-of-Band Limits

To protect other services it is necessary that the signal which is applied by the customer-provided equipment to the Telephone Company interface located on the customer's premises meet the following limits:

- (a) The power in the band from 3995 Hz to 4005 Hz shall be at least 26 dB below one milliwatt.

- (b) The power in the band from 4000 Hz to 10,000 Hz shall not exceed 16 dB below one milliwatt.
- (c) The power in the band from 10,000 Hz to 25,000 Hz shall not exceed 24 dB below one milliwatt.
- (d) The power in the band from 25,000 Hz to 40,000 Hz shall not exceed 36 dB below one milliwatt.
- (e) The power in the band above 40,000 Hz shall not exceed 50 dB below one milliwatt.

#### 5.5 Internal Impedance

The internal impedance of the customer's equipment should be approximately 600 ohms.

### 6. TESTING AND MEASURING METHODS

#### 6.1 Measuring Maximum Available Power

The following measuring method is satisfactory for estimating the maximum power averaged over a 3-second interval to determine that the inband criterion is being met:

Operate the customer-provided equipment into a 600 ohm load, (this assumes that the customer-provided equipment has a 600 ohm source impedance) bridged by a Hewlett-Packard Telephone Test Meter 3555B, a Western Electric 3C (3A) Noise Measuring Set, or the equivalent.\* The meter FUNCTION switch should be in the BRIDGE position (and for the Hewlett-Packard meter the 600 ohm key should be operated), the slide switch marked

\*These meters do not have a 3-second averaging time, but when used on speech they give a reliable estimate of a 3-second average.

DAMP/NORM in the DAMP position, and 3 kHz flat weighting should be used. In almost all cases the speech power, averaged over any 3-second interval, will not exceed -8 dBm if the maximum meter swing does not exceed 85 dBrn.

The accuracy of this method can be somewhat improved by increasing the size of the damping capacitance in the Western Electric 3C (3A) Noise Meter by 150 microfarads. To do this, connect the negative lead of a 150 microfarad capacitor to either terminal of the NORM/DAMP switch and connect the positive lead to ground. This allows the meter to more nearly approximate a 3-second averaging meter. (NOTE: This modification does not necessarily hold for noise meters other than the Western Electric 3C [3A].) With the additional damping, the power averaged over any 3-second interval will not exceed -8 dBm if the maximum meter swing does not exceed 83 dBrn. The use of meters with shorter time constants, such as a VU meter or a standard voltmeter, is not recommended.

## 7. TELECOMMUNICATIONS NETWORK CHARACTERISTICS

### 7.1 Transmission Parameters

Information describing the component parts and operating characteristics of the Bell System telecommunications network has been published. Various articles listed in Paragraph 8 have discussed statistical information on talker volumes (a), end-office losses and noise (b-d), loop characteristics (e), and other characteristics (f-h). In addition, five general information texts are listed.

The 1000 Hz insertion loss for these voice connecting arrangements (with a customer's communication device having a 600 ohm source impedance) and its associated loop will average about 4 dB with a standard deviation of about 1 dB.

## 7.2 End-to-End Electrical Loss

The end-to-end electrical loss of a connection is a function of the impedances of both end terminations, the losses of the loops at both ends, and the end-office loss. The information given in the REFERENCES may be used to determine statistical loss distributions for different types of calling patterns on the telephone network.

## 7.3 Bandwidth and Frequency Response

The nominal voice frequency bandwidth of the telecommunications network extends from about 300 to about 3000 Hz. In general, an end-to-end connection may be expected to have a loss characteristic which increases with increasing frequencies in the upper half of the band. These voice connecting arrangements do not limit this bandwidth.

## 7.4 Nonlinearities

Nonlinearities such as compression, clipping, and harmonic distortion can exist on the telecommunications network. Normally, these are low enough to be ignored. It is expected that total harmonic distortions no greater than about 5 percent of the fundamental will normally be encountered.

8. REFERENCES

Some references describing various transmission characteristics of the telecommunications network are listed below:

- (a) McAdoo, K. L., "Speech Volumes on Bell System Message Circuits - 1960 Survey, "Bell System Technical Journal (BSTJ), Vol. 42, No. 5 (September 1963), p. 1999.
- (b) Nasell, I., "The 1962 Survey of Noise and Loss on Toll Connections, "BSTJ, Vol. 43, No. 2 (March 1964), p. 697.
- (c) Nasell, I., "Some Transmission Characteristics of Bell System Toll Connections, "BSTJ, Vol. 47, No. 6 (July-August 1968), p. 1001.
- (d) Nasell, I.; Ellison, C. R.; and Homstrom, R., "The Transmission Performance of Bell System Intertoll Trunks, "BSTJ, Vol. 47, No. 8 (October 1968), p. 1561.
- (e) Hinderliter, R. G., "Transmission Characteristics of Bell System Subscriber Loop Plant, "IEEE Transactions, Communications and Electronics, September 1963, p. 464.
- (f) Alexander, A. A.; Gryb, R. M.; and Nast, D. N., "Capabilities of the Telephone Network for Data Transmission, "BSTJ, Vol. 39, No. 3 (May 1960), p. 431.
- (g) Breen, C., and Dahlbom, C. A., "Signaling Systems for the Control of Telephone Switching, "BSTJ, Vol. 39, No. 6 (November 1960), p. 1381.
- (h) Bodle, D. W. and Gresh, P. A., "Lightning Surges in Paired Telephone Cable Facilities, "BSTJ, Vol. 40, No. 2 (March 1961), p. 547.

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- \* (i) "Principles of Electricity Applied to Telephone and Telegraph Work," by American Telephone and Telegraph Company, New York, New York.
- \* (j) "Switching Systems," by American Telephone and Telegraph Company, New York, New York.
- (k) "Notes on Transmission Engineering," by United States Independent Telephone Association, Washington, D.C.
- \* (l) "Notes on Distance Dialing - 1968," by American Telephone and Telegraph Company, New York, New York.
- \* (m) "Transmission Systems for Communications," by Bell Telephone Laboratories.

\*May differ in letter from exact wording as used in the Tariffs.

9. GLOSSARY\*

COMMUNICATIONS SYSTEMS - denotes channels and other facilities which are capable, when not connected to Long Distance Message Telecommunications Service, of communications between customer-provided terminal equipment or Telephone Company stations.

CONTROL STATION - the Telephone Company multiline telephone set, furnished, installed, and maintained by the Telephone Company, used to originate and receive calls in the telecommunications network and to control connection and disconnection of the associated voice connecting arrangement.

INTERFACE CONNECTING BLOCK - the Telephone Company furnished connecting point to which the customer brings and connects the leads of his equipment, and to which the Telephone Company brings and connects leads from the voice connecting arrangement.

NETWORK CONTROL SIGNALING - denotes transmission of signals used in the telecommunications system which perform functions such as supervision (control, status, and charging signals), address signaling (e.g., dialing) calling and called number identification, audible tone signals (call progress signals indicating reorder or busy conditions, alerting, coin denominations, coin collect and coin return tones) to control the operation of switching machines in the telecommunications system.

\*Available through Graybar Electric Company.

NETWORK CONTROL SIGNALING UNIT - the Telephone Company multiline telephone set furnished, installed and maintained by the Telephone Company for the provision of network control signaling used with Voice Connecting Arrangements CEBAX and CEBBX.

OFF-HOOK - denotes the position of the Control Station handset (lifted from cradle) when originating or receiving a call or whenever the voice connecting arrangement is activated.

ON-HOOK - denotes the position of the Control Station handset (placed on cradle) whenever the control station and the voice connecting arrangement is idle.

TELECOMMUNICATIONS NETWORK - the Bell System voice switching equipment, associated interconnecting facilities and station equipment which connects its customers together.

TELEPHONE COMPANY - denotes the American Telephone and Telegraph Company, the Long Lines Department, its concurring carriers and its connecting carriers, either individually or collectively.

VOICE CONNECTING ARRANGEMENT - Voice Connecting Arrangements CEBAX and CEBBX provided by the Telephone Company to accomplish the direct electrical connection of customer-provided facilities with the facilities of the Telephone Company.

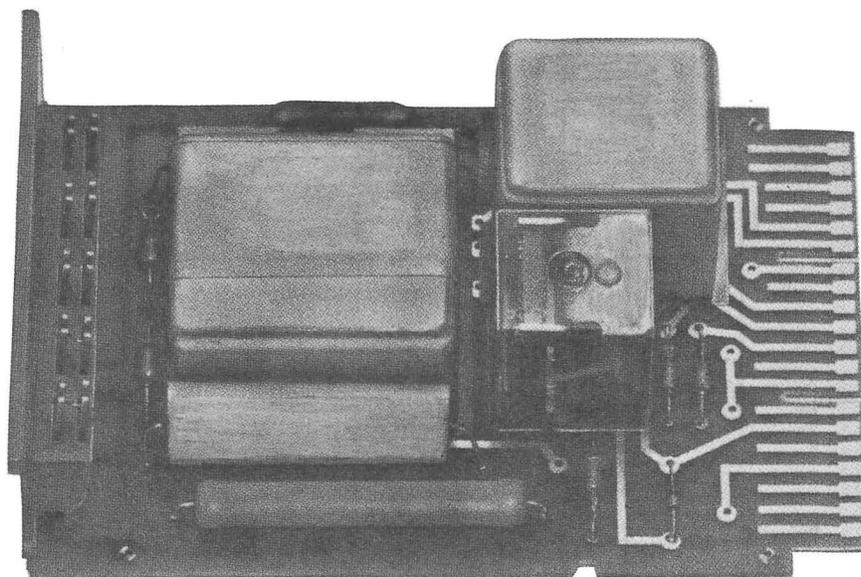
VOICE CONNECTING UNIT - that portion of Voice Connecting Arrangements CEBAX and CEBBX that provides the interconnection function between the customer-provided equipment and the telecommunications network.

**TABLE A**  
**Connections for Interface Connecting Block**

Circuit No.	Bell System Lead Desig.	Connector Pin No.	Customer Lead Desig.
1	T	26	CT
	R	1	CR
	S	27	CS
	A	2	CA
	G	28	CG
2	T	29	CT
	R	4	CR
	S	30	CS
	A	5	CA
	G	31	CG
3	T	32	CT
	R	7	CR
	S	33	CS
	A	8	CA
	G	34	CG
4	T	35	CT
	R	10	CR
	S	36	CS
	A	11	CA
	G	37	CG
5	T	38	CT
	R	13	CR
	S	39	CS
	A	14	CA
	G	40	CG
STA A	BL	3	CBL
STA B	BL	6	CBL
STA C	BL	9	CBL
STA D	BL	12	CBL
STA E	BL	15	CBL

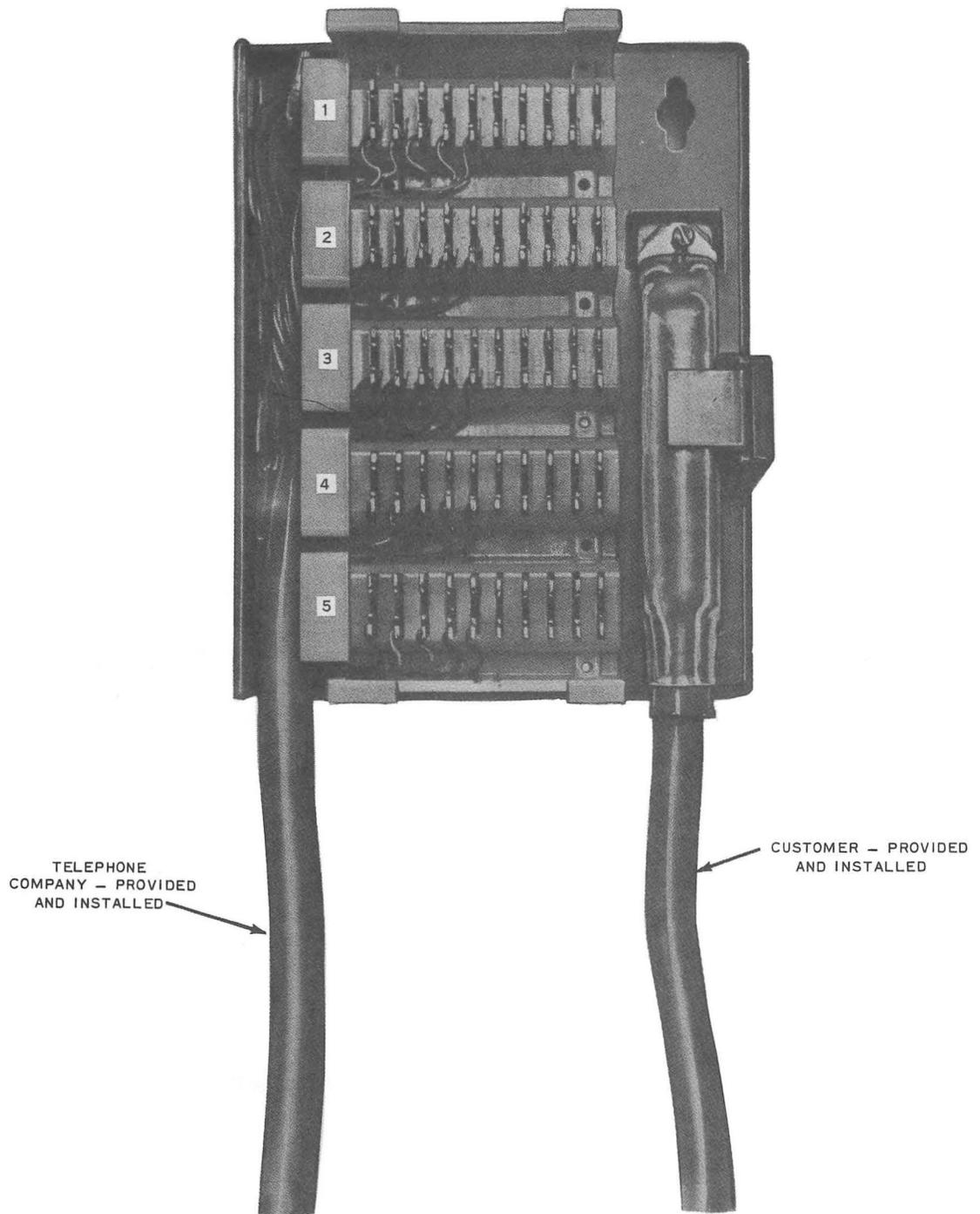


TYPICAL BELL SYSTEM KEY TELEPHONE SET  
NETWORK CONTROL SIGNALING UNIT  
FIG. 1A

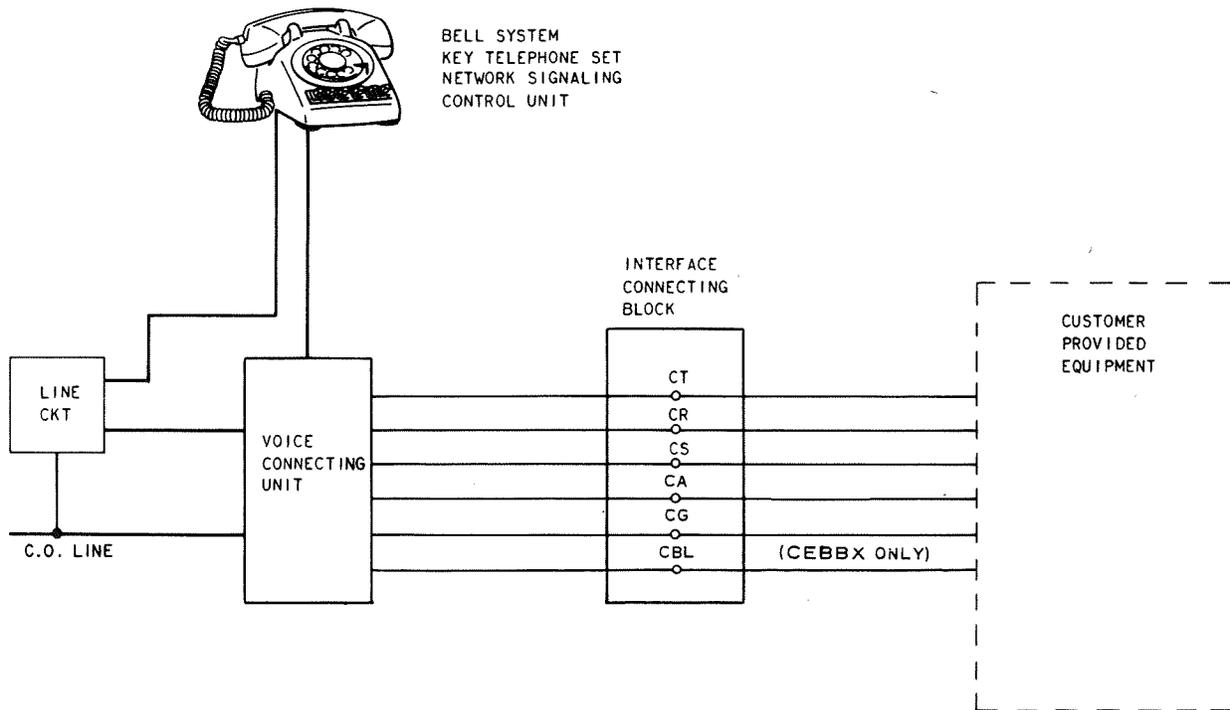


VOICE CONNECTING UNIT  
FIG. 1B

VOICE CONNECTING ARRANGEMENTS CEBAX AND CEBBX  
FIG. 1



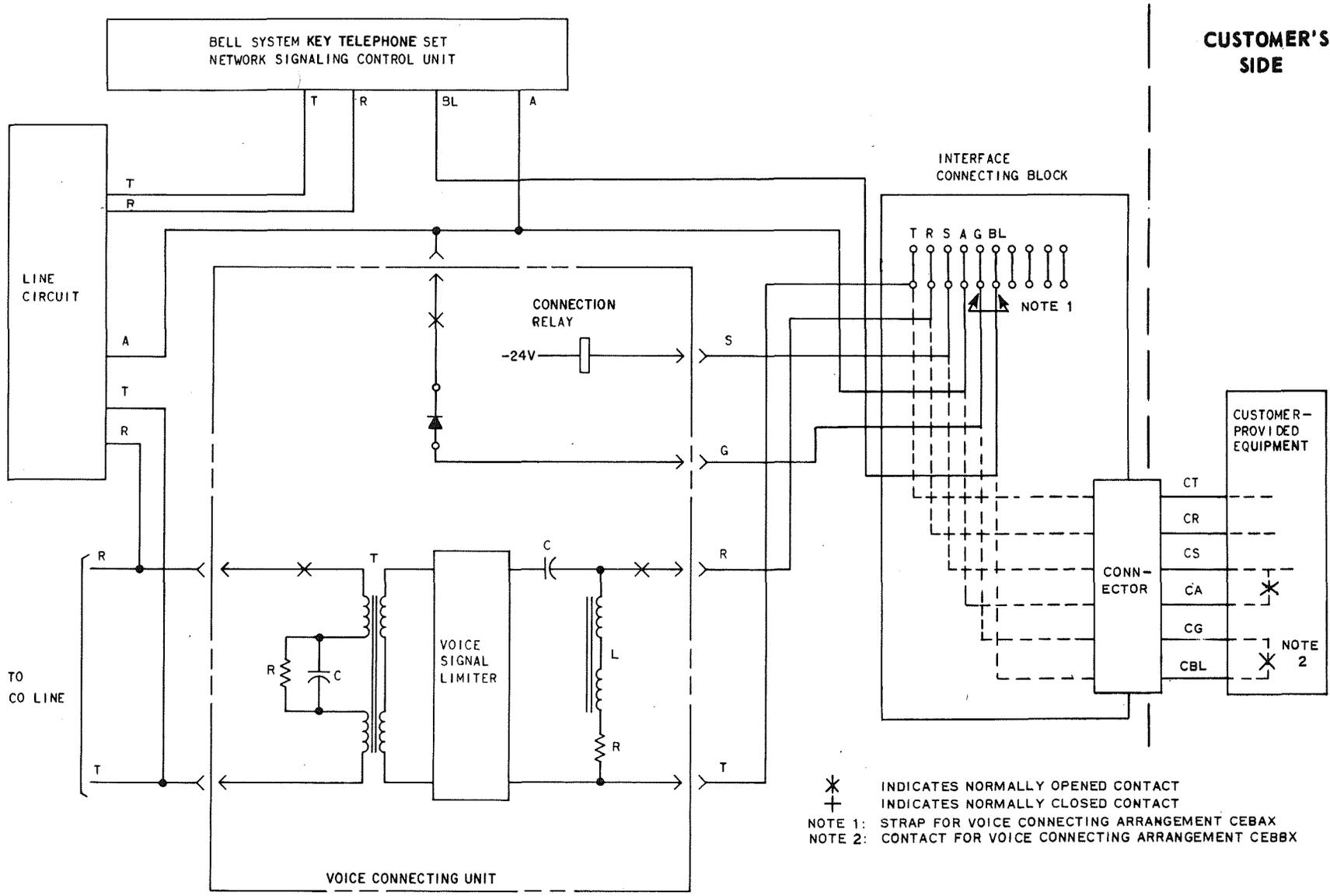
TYPICAL INTERFACE CONNECTING BLOCK  
FIG. 2



BLOCK DIAGRAM - VOICE CONNECTING ARRANGEMENTS CEBAX AND CEBBX  
FIG. 3

BELL SYSTEM SIDE

CUSTOMER'S SIDE



\* INDICATES NORMALLY OPENED CONTACT  
 + INDICATES NORMALLY CLOSED CONTACT  
 NOTE 1: STRAP FOR VOICE CONNECTING ARRANGEMENT CEBAX  
 NOTE 2: CONTACT FOR VOICE CONNECTING ARRANGEMENT CEBBX

SIMPLIFIED SCHEMATIC - VOICE CONNECTING ARRANGEMENTS CEBAX AND CEBBX

FIG. 4

Revised June 1970