

PRELIMINARY

Bell System Voice Communications TECHNICAL REFERENCE

Voice Connecting Arrangement CD5

Interface Specification

August 1969

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

PRELIMINARY

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 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.

PRELIMINARY

TABLE OF CONTENTS

	<u>PAGE</u>
1. GENERAL	1
2. SYSTEM DESIGN CONSIDERATIONS	1
2.1 Voice Connecting Arrangement CD5	1
2.2 Service and Maintenance Considerations	2
2.21 Responsibility of the Customer	2
2.22 Responsibility of the Telephone Company	3
2.23 Trouble Reporting Procedure	4
2.3 Foreign and Surge Voltage Protection	5
2.4 Hazardous Voltage Limitations	5
3. DESCRIPTION OF VOICE CONNECTING ARRANGEMENT CD5	6
3.1 Physical	6
3.2 Functions	7
3.3 Originating and Receiving a Call	7
3.31 Outgoing Call to the Central Office	7
3.32 Incoming Call from the Central Office	8
3.4 Interface Leads	9
3.5 Method of Connection	9
4. ELECTRICAL CHARACTERISTICS	10
4.1 General	10
4.2 Transmission Path	10
4.21 Voice Signal Limiter	10
4.22 Transmission Parameters	11
4.23 Signaling Parameters	11
4.3 Grounding	12
5. POWER AND IMPEDANCE CONSIDERATIONS FOR CUSTOMER- PROVIDED EQUIPMENT	13
5.1 Average Power at the Central Office	13
5.2 Maximum Power Available	13
5.3 Signaling Considerations	14
5.4 Out-of-Band Limits	14
5.5 Internal Impedance	15
6. TESTING AND MEASURING METHODS	15
6.1 Measuring Maximum Available Power	15
7. TELECOMMUNICATIONS NETWORK CHARACTERISTICS	16
7.1 Transmission Parameters	16
7.2 End-to-End Electrical Loss	17
7.3 Bandwidth and Frequency Response	17
7.4 Nonlinearities	17
8. REFERENCES	18
9. GLOSSARY	20

PRELIMINARY

LIST OF FIGURES

- Fig. 1. Voice Connecting Arrangement CD5
- Fig. 2. Interface Connecting Block
- Fig. 3. Block Diagram - Voice Connecting Arrangement CD5
- Fig. 4. Simplified Schematic - Voice Connecting Arrangement CD5

PRELIMINARY

- 1 -

1. GENERAL

F.C.C. Tariff No. 263 and corresponding 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. They 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 the protective function of voice signal limiting and isolation of Central Office battery from the customer-provided equipment.

For new or additional service, contact your local Telephone Company business office or Marketing representative. For ready identification, the Telephone Company describes this service as Voice Connecting Arrangement CD5.

2. SYSTEM DESIGN CONSIDERATION

2.1 Voice Connecting Arrangement CD5

Voice Connecting Arrangement CD5 provides a means for connecting a customer-provided intercom or dial communication system to the Bell System telecommunications network through a Bell System Key Telephone Set (Fig. 1). It is arranged to handle voice-only calls in either direction. This arrangement is terminated at the key telephone set on

three pickup keys; a trunk key (the listed dedicated telephone number), a station key (the customer-provided switching system terminal), and a connect key (connects the listed telephone trunk to the customer-provided switching system terminal). This allows the attendant to originate calls to the telecommunications network as requested by the communications systems user and to receive calls from the telecommunications network and connect those calls to the requested station of the communications system. The TRANSMISSION leads, a pair of conductors, provides the voice coupling between the telecommunications network and the customer-provided equipment. Supervision is not provided with this arrangement.

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

Even though there is an adequate maintenance operation for this service, there will be occasions when trouble is experienced. When this occurs 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 the trouble is in the Telephone Company-provided equipment, it should be promptly reported to the Telephone Company. Trouble reports should be called to 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 surge. 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 conductors CT and CR (see Fig. 4) due to foreign potential that the customer's equipment should encounter is 30 volts.

The customer is responsible for providing protection, internal to his equipment and facilities, against surge and hazardous voltages from his equipment and facilities being applied to the voice connecting arrangement. The surge potential on the conductors CT and CR shall be limited to 30 volts.

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, and unless otherwise specified in Paragraph 4.2 of this Technical Reference, steady-state voltages applied by the customer's equipment to conductors connected to Voice Connecting Arrangement CD5 should not exceed the following:

	<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 ARRANGEMENT CD5

3.1 Physical

Voice Connecting Arrangement CD5 consists of a Bell System Key Telephone Set, two standard Bell System Key Telephone System line circuits and a coupler circuit (Fig. 1). The coupler circuit is a 4- by 5-inch, plug-in, printed wiring board. The associated apparatus mounting for the coupler will normally be installed at the same location as the Telephone Company line circuits. Leads associated with each arrangement will be 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-provided equipment. The total loop resistance across CT and CR leads at the voice connecting arrangement shall not exceed 50 ohm dc loop resistance. This circuit will function satisfactorily within a temperature range of 0° to 50°C and a humidity range of 5 to 95 percent.

3.2 Functions

The major functions of this voice connecting arrangement and its associated Bell System Key Telephone Set are:

- (a) To provide voice-only access to and from the switched telecommunications network.
- (b) To provide network control signaling to the network.
- (c) To limit abnormally high voice signal voltages.
- (d) To provide dc isolation to customer-provided equipment.
- (e) To provide for dialing into the customer-provided equipment.
- (f) To provide for accepting signal alerting from the customer-provided equipment.

3.3 Originating and Receiving a Call

3.31 Outgoing Call to the Central Office

When a customer-provided station dials the proper code for the attendant station (Bell System Key Telephone Set), ringing voltage from the customer-provided equipment, over the CT and CR leads, will activate the Telephone Company line circuit (Fig. 3). An audible signal will be heard and a flashing lamp will appear, at the pickup button assigned to the customer-provided equipment, at the attendant station.

The attendant answers the call by first depressing the pickup button and then going off-hook. This retires the audible signal and the flashing lamp changes to steady. After determining what number is desired, the attendant places the customer-provided station on hold by depressing the common HOLD button. The attendant then depresses the pickup button associated with the appropriate

Telephone Company Central Office line and dials the requested number. When the connection is completed to the desired number the attendant depresses the CONNECT button. This operates the coupler circuit which completes the voice path between the Telephone Company Central Office line and the customer-provided station. The coupler circuit is now under control of the attendant's station switchhook; therefore the attendant station cannot go on-hook until the call is completed. The attendant may leave the call at any time by operating the HOLD button, but may not go on-hook. To determine if the call has been terminated, the attendant must monitor from time to time. When the call is terminated the attendant station goes on-hook restoring the circuit to the idle condition.

3.32 Incoming Call from the Central Office

When this circuit is seized by the Central Office, ringing voltage activates the Telephone Company line circuit assigned to that line. Audible and visual signals are the same as explained in originating a call. After answering, the attendant places the call on HOLD and operates the associated pickup button assigned to the customer-provided communications system. The desired station is then dialed. When the station answers, the attendant depresses the CONNECT button. This operates the coupler circuit which completes the voice path between the Telephone Central Office line and the customer-provided station. The coupler circuit is now under control of the attendant's station switchhook; therefore the attendant station cannot go on-hook until

the call is terminated. The attendant may leave the call at anytime by operating the HOLD button, but may not go on-hook. To determine if the call is terminated, the attendant must monitor from time to time. When the call is terminated the attendant station goes on-hook restoring the circuit to the idle condition.

3.4 Interface Leads

Two interface leads per circuit are provided from Voice Connecting Arrangement CD5 to an Interface Connecting Block for the customer's use. Technical information pertaining to these leads is discussed in Paragraph 4 - ELECTRICAL CHARACTERISTICS. This pair of leads, designated CT and CR, provides the two-way voice transmission path and signaling path to and from the voice connecting arrangement.

The customer must provide and install the conductors from the customer-provided communications system to the Interface Connecting Block. This block will accept leads up to 18 gauge.

3.5 Method of Connection

The leads from Voice Connecting Arrangement CD5 will be terminated by the Telephone Company in a terminal box equipped with the Interface Connecting Block. The customer or his representative will make the necessary connections to associate his equipment with the voice connecting arrangement at this terminal box. The leads from this arrangement will be terminated by the Telephone Company on studs under washers secured by nuts on an Interface Connecting Block mounted in the box. Separate nuts and washers on the same studs will be

PRELIMINARY

- 10 -

provided for the customer's connections. These will be designated as follows:

<u>EARLIER DESIGNATION</u>	<u>CURRENT DESIGNATION</u>	<u>FUNCTION</u>
IT IR	CT CR	(voice transmission (pair
2	2	(designates second (circuit
3	3	(designates third (circuit

4. ELECTRICAL CHARACTERISTICS

4.1 General

The Bell System Key Telephone Set will generate dial pulses over the interface leads CT and CR towards the customer-provided equipment at the rate of 8 to 11 pulses per second with a percent break of 58 to 64 percent. The insertion loss of Voice Connecting Arrangement CD5 is approximately 8.5 dB over the voice frequency range of 300 to 3000 Hz. The customer's equipment must furnish its own talk and signal battery. No voice signal amplification is provided by this arrangement.

4.2 Transmission Path - Leads designated CT and CR

4.21 Voice Signal Limiter

A voice signal limiter is incorporated in the transmission path 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 Arrangement CD5 provides a one-to-one impedance transformation. The impedance is a function of the design of the connection between the Key Telephone Set and the Central Office. For design purposes, the impedance of the customer-provided equipment should 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 voice connecting arrangement, but in no case shall it exceed one milliwatt."

For Voice Connecting Arrangement CD5 the maximum permissible voice signal power at the Interface Connecting Block is -1 dBm when averaged over any 3-second interval.

4.23 Signaling Parameters

A 590 ohm ± 1 percent, 5 watt resistor, which acts as a holding

PRELIMINARY

- 12 -

bridge, is placed across the CT and CR leads when a call is cut through from the customer-provided equipment to the Central Office line. The customer-provided equipment must supply talking battery to the Bell System Key Telephone Set over the CT and CR leads. The voltage supplied when measured at the Interface Connecting Block can range from a minimum of 5 volts dc to a maximum of 20 volts dc. The current can range from .02 to .08 ampere dc, and shall be limited to a maximum of .1 ampere dc. Ringing voltage from the customer-provided equipment, over leads CT and CR, shall be between 16 to 36 Hz at a minimum of 55 volts and a maximum of 130 volts RMS measured at the Interface Connecting Block.

4.3 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 protection ground electrode when available. Self-powered or passive customer's equipment need not be grounded. One side of the customer's ringing generator supply, when provided must be grounded.

Voice Connecting Arrangement CD5 is provided with a common signal ground which is always bonded to a metallic cold water pipe or other ground approved by the NEC serving as the electric power ground and telephone protector ground (where present).

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 provide 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 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 Available Power

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

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

ohm source to -1 dBm when averaged over any 3-second interval. The customer-provided communications systems should be so designed that the average power over any 3-second interval applied to the Interface Connecting Block associated with Voice Connecting Arrangement CD5 does not exceed -1 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 as 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 not exceed 19 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, the slide switch marked DAMP/NORM in the DAMP position, and 3kHz flat weighting

*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.

PRELIMINARY

- 16 -

should be used. In almost all cases the speech power averaged over any 3-second interval will not exceed -1 dBm if the maximum meter swing does not exceed 92 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 -1 dBm if the maximum meter swing does not exceed 90 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 have discussed statistical information on talker volumes (a), end-office losses and noise (b-d), loop characteristics (e), and other characteristics (f-h). These articles are listed in Paragraph 8. In addition, five general information texts are listed.

The 1000 Hz insertion loss for this voice connecting arrangement (with a customer's communication device having a 600 ohm source impedance) and its associated loop will average about 11 dB with a standard deviation of about 2.4 dB.

7.2 End-to-End Electrical Loss

The end-to-end electrical loss of a connection is a function of the impedance 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 is about 300 to 3000 Hz. In general, an end-to-end connection may be expected to have a loss characteristic which increases with increasing frequency. Voice Connecting Arrangement CD5 does 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, 42, No. 5 (September 1963), p. 1999.
- (b) Nasell, I., "The 1962 Survey of Noise and Loss on Toll Connections," BSTJ, 43, No. 2 (March 1964), p. 697.
- (c) Nasell, I., "Some Transmission Characteristics of Bell System Toll Connections," BSTJ, 47, No. 6 (July-August), p. 1001.
- (d) Nasell, I., Ellison, C.R., and Homstrom, R., "The Transmission Performance of Bell System Intertoll Trunks," BSTJ, 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, 39, No. 3 (May 1960), p. 431.
- (g) Breen, C., and Dahlbom, C.A., "Signaling Systems for the Control of Telephone Switching," BSTJ, 39, No. 6 (November 1960), p. 1381.
- (h) Bodle, D.W. and Gresh, P.A., "Lightning Surges in Paired Telephone Cable Facilities," BSTJ, 40, No. 2 (March 1961), p. 547.

PRELIMINARY

- 19 -

- *(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.

*Available through Graybar Electric Company.

9. GLOSSARY*

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

VOICE CONNECTING ARRANGEMENT - Voice Connecting Arrangement CD5 provided by the Telephone Company to accomplish the direct electrical connection of customer-provided facilities with the facilities of the Telephone Company, and to connect the transmission path from the customer-provided equipment to the telecommunications system.

CUSTOMER-PROVIDED TERMINAL EQUIPMENT - denotes devices or apparatus and their associated wiring, provided by a customer, which do not constitute a communications systems and which, when connected to the communications path of the telecommunications system, are so connected either electrically, acoustically or inductively.

END-OFFICE - the last serving Central Office in the switching hierarchy of the telecommunications network.

INTERCOM - the general category of equipment which is used to provide internal communication between stations of a customer.

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

NETWORK CONTROL SIGNALING UNIT - that part of Voice Connecting Arrangement CD5 used with the terminal equipment furnished, installed and maintained by the Telephone Company for the provision of network control signaling.

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

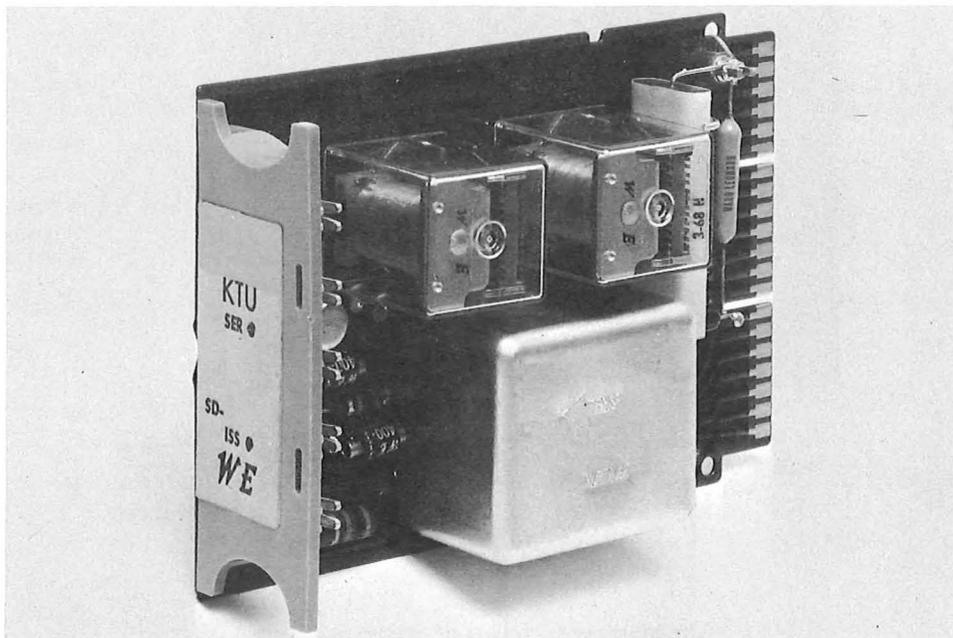
TELEPHONE COMPANY - denotes the American Telephone and Telegraph Company, the Long Lines Department, its concurring carriers and its connecting carriers, either individually or collectively.

VOICE COUPLER - that part of Voice Connecting Arrangement CD5 which connects the transmission path from the customer-provided equipment to the telecommunications network.



Typical Bell System Key Telephone Set
Network Control Signaling Unit

Fig. 1A

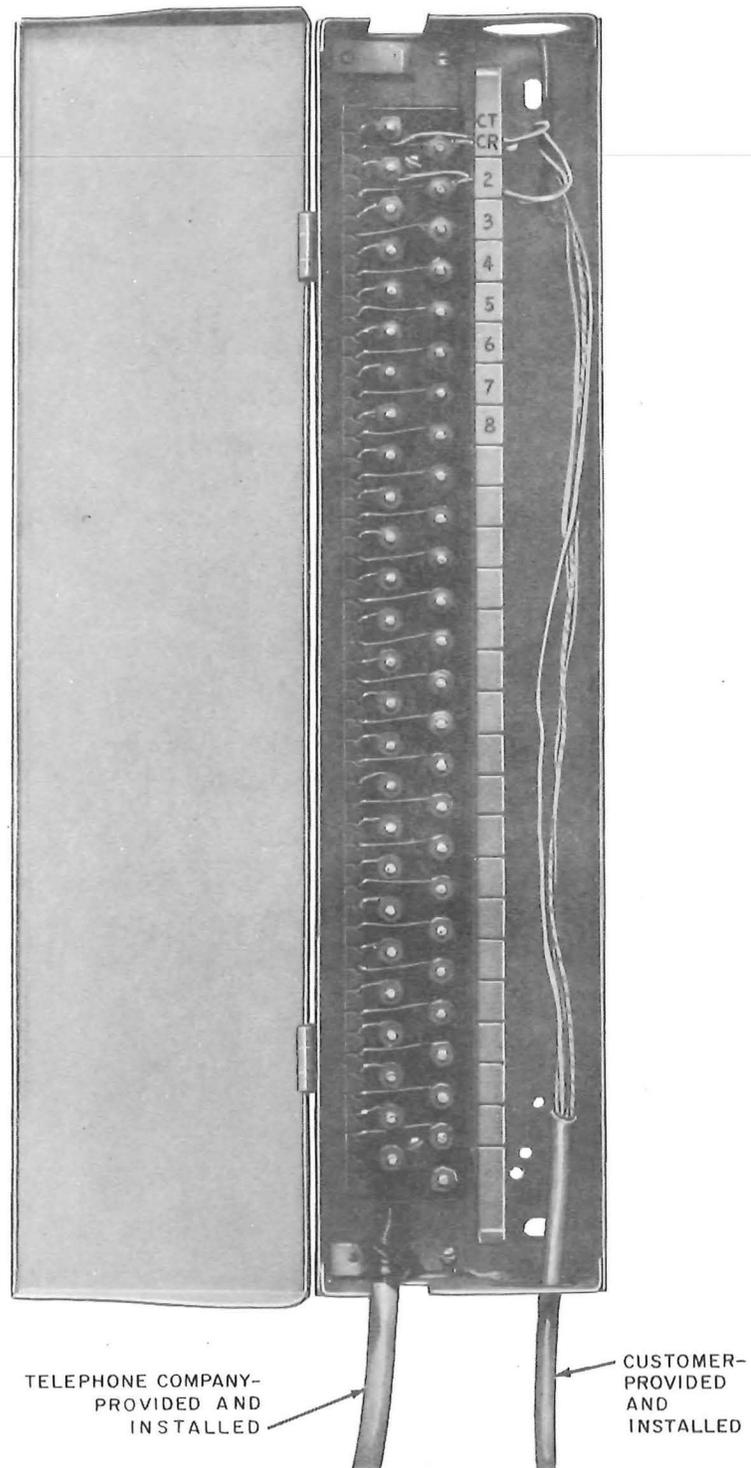


Voice Coupler Unit

Fig. 1B

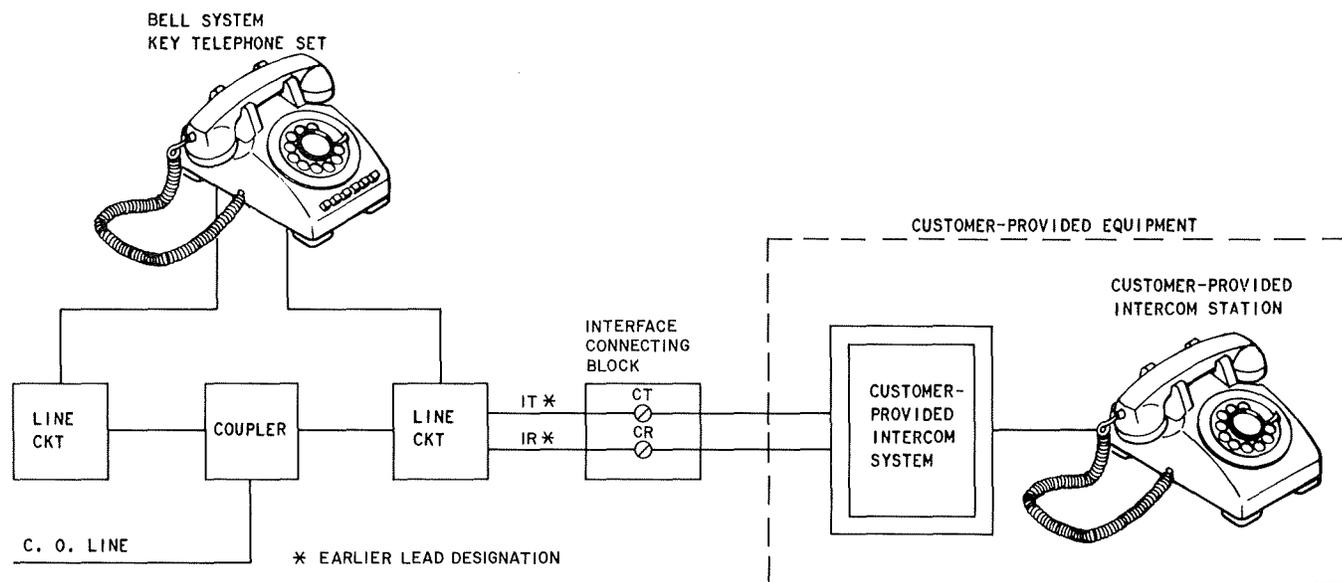
VOICE CONNECTING ARRANGEMENT CD5

Fig. 1



INTERFACE CONNECTING BLOCK

Fig. 2

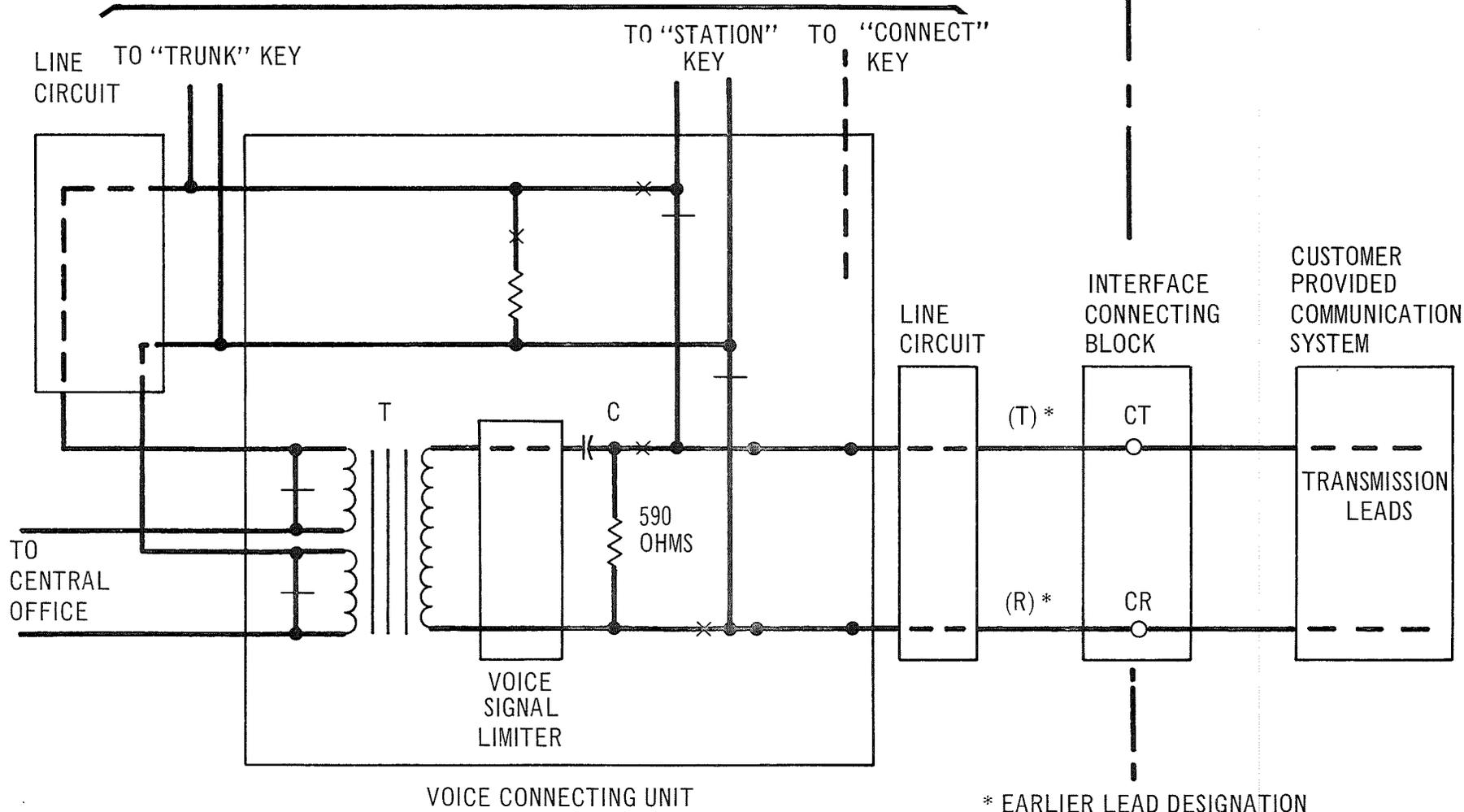


BLOCK DIAGRAM - VOICE CONNECTING ARRANGEMENT CD5
FIG. 3

Bell System Side

Customer Side

BELL SYSTEM TELEPHONE KEY SET
NETWORK SIGNALING CONTROL UNIT



SIMPLIFIED SCHEMATIC
VOICE CONNECTING ARRANGEMENT CD5

Fig. 4