PUB 42601

PRELIMINARY

Bell System Voice Communications
TECHNICAL REFERENCE

Voice Connecting Arrangement

CEK

Interface Specification

April 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.

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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 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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LIST OF FIGURES

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 Bell System as Voice Connecting Arrangement CEK 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 this voice connecting arrangement for both new and additional service.

2. SYSTEM DESIGN CONSIDERATIONS

2.1 Voice Connecting Arrangement CEK

Voice Connecting Arrangement CEK provides a means for indicating Bell System call charging information, when available, to customer-provided

message register equipment. Leads are provided to the customer through dry contacts to indicate that a message registration pulse has been received from the Central Office. Provision of this arrangement is subject to the capability of the serving Central Office to provide message register service.

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 system. 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 defects 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 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 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. 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 relay isolation.

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

	dc	ac(RMS)
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 CEK

3.1 Physical

Voice Connecting Arrangement CEK (Fig. 1) will be mounted on a 2- by 23-inch mounting plate which fits a standard relay rack. A maximum of 10 message registration circuits are provided on a single mounting plate.

The circuits work in conjunction with one-way outgoing (Voice Connecting Arrangement CD8) or two-way PBX (Voice Connecting Arrangement CDH) arrangements which provide connection to the telecommunications network. This arrangement will function satisfactorily within a temperature range of 0° to 55°C and a humidity range from 5 to 95 percent. Leads from this 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.

3.2 Functions

The major functions of this voice connecting arrangement are:

(a) To provide dc isolation to the customer-provided equipment and protect personnel from hazardous voltages.

(b) To detect message registration pulses from the Central Office.

(c) To provide a contact closure to the customer-provided equipment, for each message registration pulse.

3.3 Operation

When a station of the customer-provided PBX is connected to the telecommunications network on an outgoing call, the Central Office equipment associated with the trunk circuit provides remote message registration pulse information during the call over a control channel to operate the relay in Voice Connecting Arrangement CEK. A dry contact closure in Voice Connecting Arrangement CEK completes a circuit over the interface leads to the customer-provided equipment for each message registration

pulse transmitted from the Central Office. The pulse may indicate a single message in a flat rate area or a one unit charge in a multi-unit area. The customer can establish the relationship of the message registration pulse to actual call billing operation by contacting the local Telephone Company business office or Marketing representative.

3.4 Interface Leads

Two interface leads per circuit are provided from Voice Connecting Arrangement CEK to the Interface Connecting Block (Fig. 2) for the customer's use. Technical information pertaining to these leads is discussed in Paragraph 4.

3.5 Method of Connection

Leads from Voice Connecting Arrangement CEK will be terminated by the Telephone Company in a terminal box equipped with the Interface Connecting Block (Fig. 2). The customer or his representative will provide and install the conductors from the customer-provided equipment to the Interface Connecting Block and will make the necessary connections to associate his equipment with the arrangement at this terminal box using leads of 22 gauge wire or smaller. These leads will be designated as follows:

Lead Designation	Function
CMR1 CMR2	output pair to customer-provided equipment
2	designates second circuit
3	designates third circuit

4. ELECTRICAL CHARACTERISTICS

4.1 Signaling Path

The SUPERVISORY leads (CMR1 and CMR2) will provide a message registration pulse with minimum width of 50 milliseconds. The maximum load current on the relay contacts applied by the customer-provided equipment is limited to .25 ampere.

4.2 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 the arrangement. It is expected that the customer's equipment, if powered from commercial power, will be grounded in accordance with applicable electrical codes (NEC). Self-powered or passive customer's equipment need not be grounded.

As an example, a good ground may be obtained with a proper connection to a metallic cold water pipe, using a single No. 6 copper AWG 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 but not using the telephone ground clamp. This lead shall not be fused.

5. REFERENCES

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

(a) Breen, C., and Dahlbom, C. A., "Signaling Systems for the Control of Telephone Switching," Bell System Technical Journal, Vol. 39, No. 6 (November 1960), P. 1381.

(b) Bodle, D. W., and Gresh, P. A., "Lightning Surges in Paired Telephone Cable Facilities," BSTJ, Vol. 40, No. 2 (March 1961), p. 547.

* (c) "Principles of Electricity Applied to Telephone and Telegraph Work," by American Telephone and Telegraph Company, New York New York.

*Available through Graybar Electric Company.

6. 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.

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

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.

MESSAGE REGISTER - the customer-provided equipment used to record the number of message registration pulses received from the Central Office equipment.

MESSAGE REGISTRATION PULSE - the pulse generated by the Central Office in connection with an outgoing call to indicate call charging information and repeated by the contact closure to the customer-provided equipment.

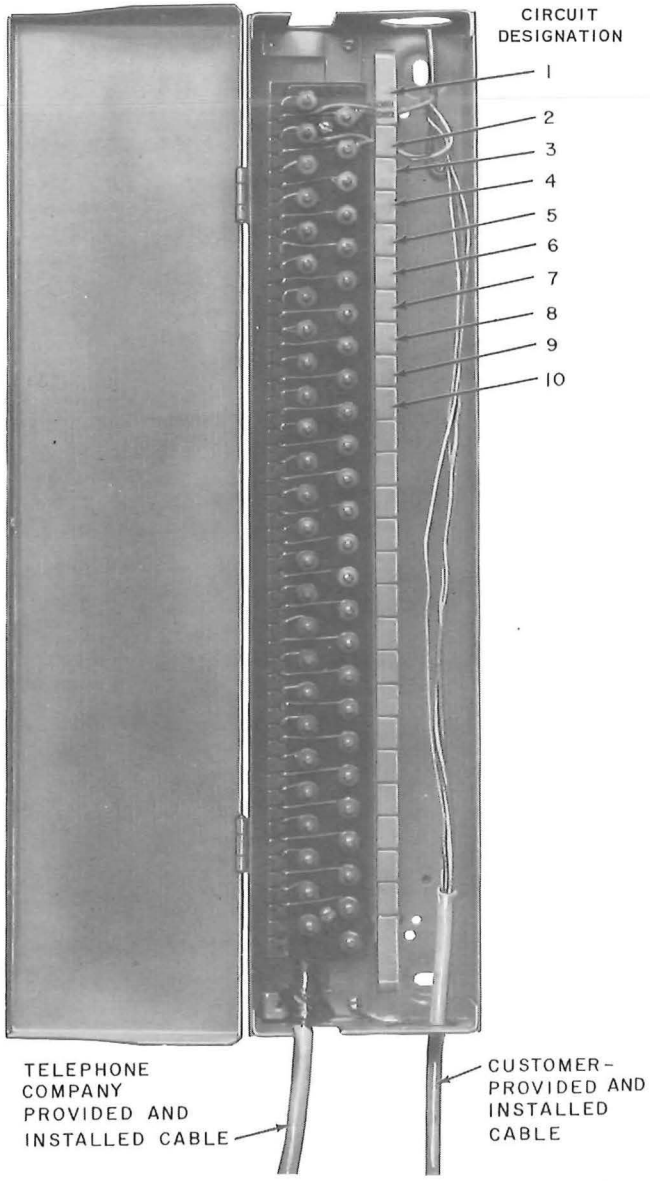
*May differ in letter from exact wording as used in the Tariffs.

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

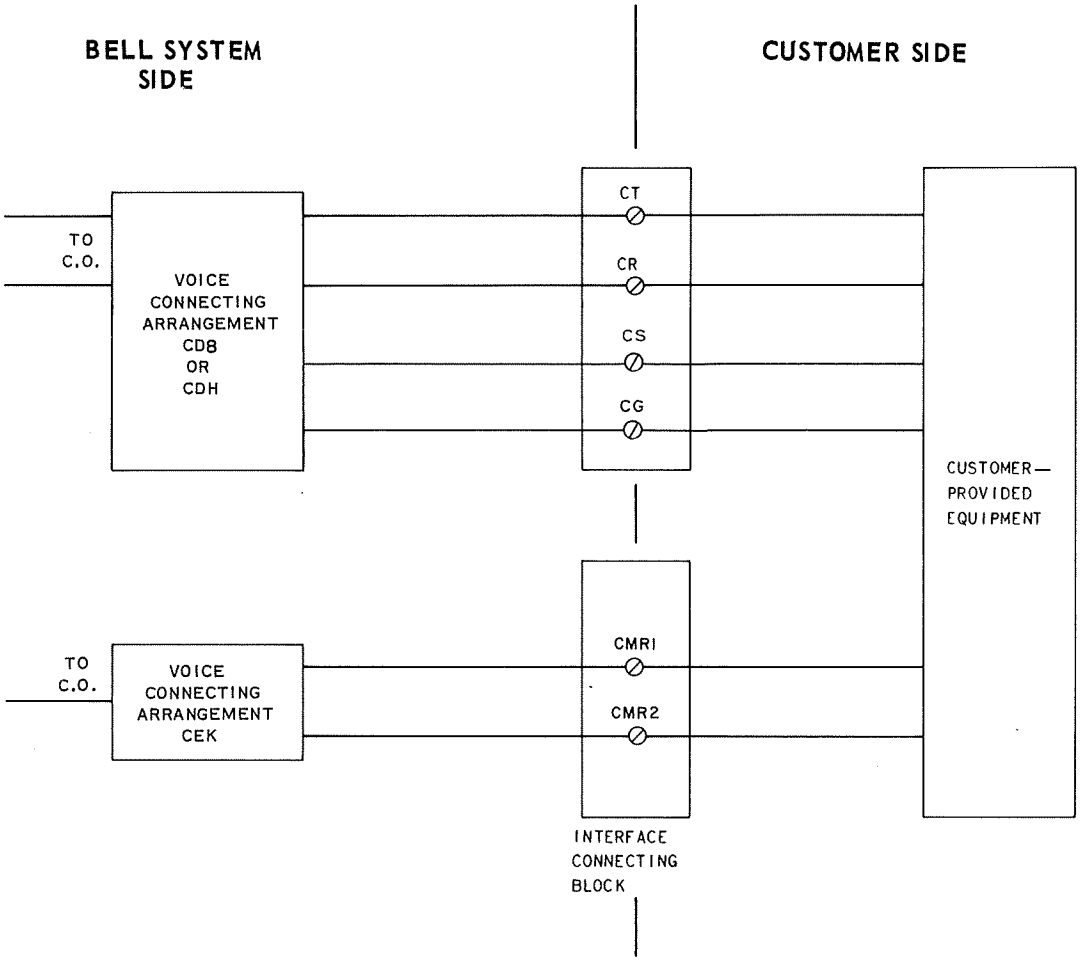
TELEPHONE COMPANY - denotes the American Telephone and Telegraph Company, the Long Lines Department, its concurring carriers and its connecting carriers, either individually or collectively.

VOICE CONNECTING ARRANGEMENT - Voice Connecting Arrangement CEK provided by the Telephone Company to accomplish the direct electrical connection of customer-provided facilities with the facilities of the Telephone Company.

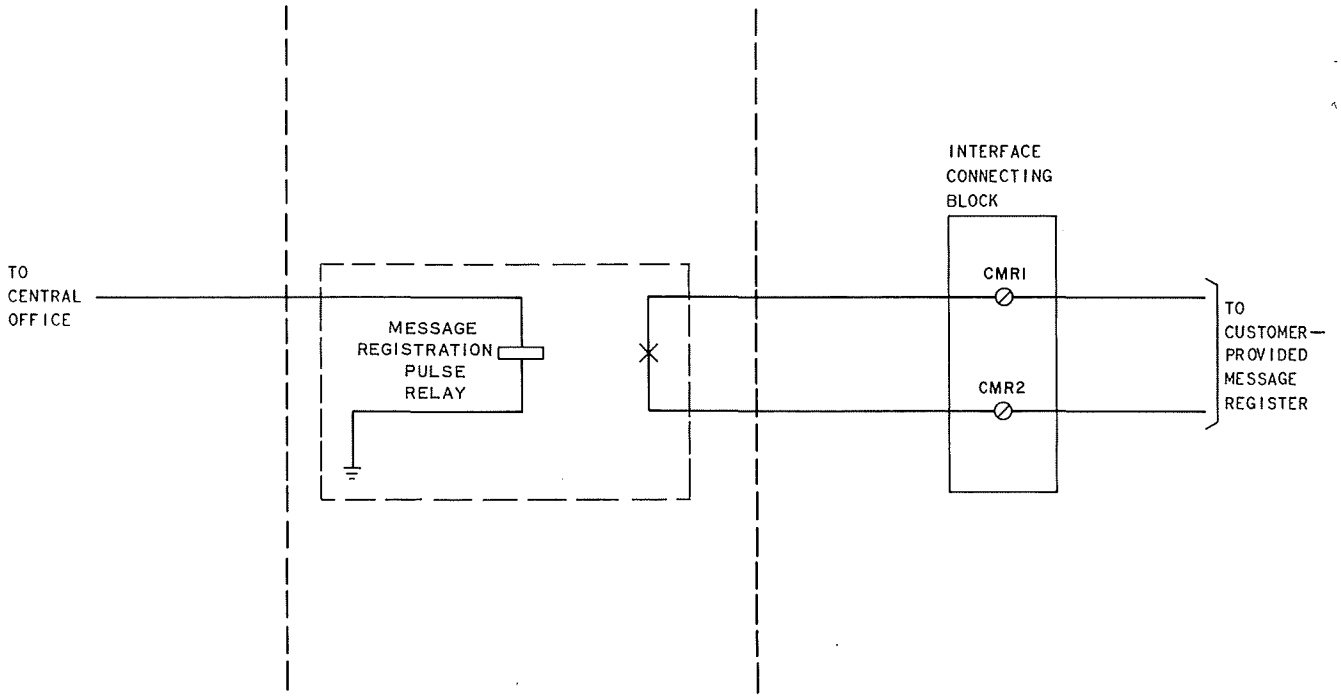
VOICE CONNECTING ARRANGEMENT CEK
FIG. 1



TYPICAL INTERFACE CONNECTING BLOCK
FIG. 2



BLOCK DIAGRAM – TYPICAL INSTALLATION OF VOICE CONNECTING ARRANGEMENT CEK
FIG. 3



SIMPLIFIED SCHEMATIC – VOICE CONNECTING ARRANGEMENT CEK
FIG. 4