PUB 42603

PRELIMINARY

Bell System Voice Communications
TECHNICAL REFERENCE

Connecting Arrangements

CIV
RCX
GC2

Interface Specification

REVISED

June 1972

ENGINEERING DIRECTOR - CUSTOMER TELEPHONE SYSTEMS

NOTICE

This Technical Reference is published by American Telephone and Telegraph Company as a guide for the designers, manufacturers, and consultants of customer-provided systems and equipment which connect with Bell System communications systems or equipment. American Telephone and Telegraph Company reserves the right to revise this Technical Reference for any reason, including, but not limited to, conformity with standards promulgated by ANSI, EIA, CCITT, or similar agencies; utilization of new advances in the state of the technical arts; or to reflect changes in the design of equipment or services described therein. The limits of responsibility and liability of the Bell System with respect to the use of customer-provided equipment and systems are set forth in the appropriate tariff regulations.

This Technical Reference supersedes and replaces Bell System Voice Communication Technical Reference for Connecting Arrangements ClV and RCX dated December 1970.

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PRELIMINARY

VOICE CONNECTING ARRANGEMENTS C1V, RCX, GC2

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1. GENERAL

1.1 Introduction

F.C.C. Tariffs and corresponding intrastate tariffs filed by the Bell System provide for the direct electrical connection of customer-provided voice transmitting and receiving terminal equipment and communications systems to Bell System telecommunications network. The tariffs also provide for the indirect (acoustic or inductive) connection of such equipment or systems. Both methods require compliance with network protection criteria given in the tariffs.

Direct electrical connection is made through a connecting arrangement furnished, installed, and maintained by the Telephone Company.

1.2 Application

Various combinations of Connecting Arrangements C1V, RCX and GC2 provide an indication of the dc supervisory and ringing conditions on Central Office or PBX lines to customer-provided traffic recording equipment, typically used for peg count and dialed number recording. The arrangements are intended for use in conjunction with Telephone Company-provided PBX Central Office trunks, PBX Station lines, Key Telephone System lines, WATS Access Lines or Central Office station lines. In addition, Connecting Arrangement RCX may also be used with PBX dial tie lines.

Application of these services to Centrex trunks and tie lines is limited to Centrex-CU locations, that is, where the Centrex switching

equipment is all on the customer's premises. The local Telephone Company should be consulted concerning the availability of these service at locations served by Centrex service.

1.3 Ordering and Identification

The connection services described in this Technical Reference are identified by the Bell System as Connecting Arrangement ClV, RCX and GC2. One connecting arrangement should be ordered for each station line or PBX trunk which is to be monitored by the customer-provided equipment. All three connecting arrangements may be applied to the same line if desired. The local Telephone Company business office or Marketing representative will provide information regarding availability and rates for these services.

2. DESCRIPTION

2.1 Functions

The major functions of these connecting arrangements are:

(a) To protect Telephone Company personnel and facilities from hazardous voltages which may be applied to the voice connecting arrangements.

(b) To provide isolation from longitudinal imbalance.

(c) To indicate to the customer-provided equipment by contact closure the dc supervisory and ringing conditions on the line.

2.2 Physical

Connecting Arrangements C1V, RCX, and GC2 will be mounted in a covered apparatus box that will accommodate the required number of units.

An apparatus box equipped with two C1Vs or two GC2s measures 6-7/8" by 7-3/8" by 3-3/8". Connecting Arrangement RCX consists of four complete circuits mounted on a 3-15/32" by 6-15/16" panel. An apparatus mounting that will accommodate up to 24 RCXs (six panels) measures 16-1/2" by 13" by 9".

An external power supply is required for Connecting Arrangement C1V. Normally the key system power supply associated with the lines being monitored will be used. The Telephone Company will provide a separate power supply if it is required.

Connecting Arrangement GC2 does not require a separate source of power. Connecting Arrangement RCX requires an external source of power when applied to ground start PBX trunks and 800-type PBX station lines.

2.3 Interface Leads

Two interface leads per circuit are provided from Connecting Arrangements C1V, RCX and GC2 to the interface connecting block (Fig. 4) for the customer's use. The connecting arrangements provide a contact closure between these two leads to indicate the line conditions.

The maximum load current applied by the customer-provided equipment on the relay contacts shall be limited to 0.5 ampere. The maximum voltage permissible across the interface leads with the contacts opened is 135 volts dc or 50 volts ac RMS.

Each contact and associated Telephone Company wiring will have a nominal 1 ohm dc resistance when the contact is closed. This figure is based on 25 feet of 24-gauge conductor loop between the connecting arrangement and the interface connecting block.

Leads from this arrangement will be terminated on a Telephone Company provided interface connecting block conveniently located within 25 feet of the Telephone Company equipment to permit testing, maintenance, trouble isolation, and ease of connection to the customer-provided equipment. The customer must provide and install the conductors and make the necessary connections of his equipment to the voice connecting arrangement at this block.

A typical interface connecting block is shown in Fig. 4. This "quick connect" type connecting block utilizes tin-plated spring clip terminal strips which accommodate unstripped polyethylene or polyvinyl chloride insulated (8 mils maximum thickness) conductors of No. 20 to 24 AWG. A Reliable Electric R714B Tool or equivalent is used to press the insulated wire down into the slot. The spring pressure of the clip cuts away the insulation and makes the electrical connection. The Telephone

Company will provide strapping clips between the second and third terminals of the block to interconnect the leads. The clips should be removed by the customer's representative when it is necessary to test toward the customer-provided equipment and then replaced to restore the circuit to service.

3. OPERATION

3.1 Connecting Arrangement C1V

When the line is seized by the Telephone Company-provided station or PBX, the relay of Connecting Arrangement C1V operates from the line current, and provides a contact closure to the customer-provided equipment on leads CBS1 and CBS2.

The contact closure will not follow dc dial pulses but will remain closed until the line becomes idle.

A simplified schematic of this connecting arrangement in shown in Fig. 5.

3.2 Connecting Arrangement RCX

Connecting Arrangement RCX contains a high impedance mercury relay that is bridged across the Central Office or PBX line (see Fig. 7). The relay is held operated in the idle condition by the line battery. When the station goes off hook the relay is shunted by the dc resistance of the set, releasing the relay, and providing a contact closure to the customer-provided equipment. The relay will follow dial pulses on outgoing calls.

On loop start lines, incoming ringing will cause the relay to operate and release on each half cycle of the ringing voltage. This application is shown in Fig. 8A and 8B.

The connecting arrangement does not contain any filtering; momentary interruptions in line battery when the station is on-hook will be sensed by the relay and be passed on to the customer-provided equipment. The relay is released when the station is off-hook so Central Office momentary opens or polarity reversals occurring on the line will not be registered.

When Connecting Arrangement RCX is applied to two-way PBX Central Office trunks (Ground Start), an additional control relay is required. The high impedance relay is not bridged across the line until the control relay senses that the line has been seized. A contact within the control relay holds the open condition on leads CDP1 and CDP2 during the idle line condition. When the line is seized, the control relay connects the high impedance relay across the line. The relay will then follow dial pulses and supervision conditions as outlined above. On incoming calls, the relay will not follow ringing since it is not connected across the line until the station (or PBX attendant) answers. Application of Connecting Arrangement RCX to ground start PBX trunks is shown in Fig. 8C and 8D. The arrangement shown in figure 8F is required when Connecting Arrangement RCX is used on a station line from an 800-type PBX.

In tie trunk applications, Connecting Arrangement RCX is arranged to monitor outgoing dial pulse and supervisory signals (see Fig. 8E). On incoming calls, Connecting Arrangement RCX will close the contact to the interface when the local PBX returns answer supervision to the distant (calling) PBX.

3.3 Connecting Arrangement GC2

Connecting Arrangement GC2 consists of an ac ring-up relay bridged across the line (see Fig. 6). The relay responds only to incoming ringing signals and not to dc signals on the line. When ringing voltage is present, the relay operates providing a contact closure between the C1 and C2 leads. The relay will release when ringing ceases.

4. FOREIGN AND SURGE VOLTAGE PROTECTION

The customer's equipment is protected from metallic and longitudinal surges on the telephone line by the relay isolation provided by the connecting arrangement.

The customer is responsible for providing protection, internal to his equipment and facilities, against foreign and hazardous voltages from his equipment and facilities being applied to the connecting arrangement.

5. SERVICE AND MAINTENANCE CONSIDERATIONS

5.1 Responsibility of the Customer

The tariffs permitting connection of customer-provided terminal equipment or communications systems state that where telecommunications

service is available under these tariffs for use in connection with terminal equipment or communications systems, provided by a customer, the operating characteristics of such equipment or 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 equipment or systems provided by a customer does not endanger the safety of Telephone Company employees or the public; damage, require change in or alteration of, the equipment or systems or other facilities of the Telephone Company, interfere with the proper functioning of such equipment or systems or facilities, impair the operation of the telecommunications system or facilities or otherwise injure the public in its use of the Telephone Company's services. Upon notice from the Telephone Company that the equipment or system provided by a customer is causing or is likely to cause such hazard or interference, the customer shall take such steps or make such change as shall be necessary to remove or prevent such hazard or interference.

5.2 Responsibility of the Telephone Company

The tariffs permitting connection of terminal equipment and communications systems, provided by a customer, state that the Telephone Company shall not be responsible for the installation, operation or maintenance of said terminal equipment or communications systems. Telecommunications service is not represented as adapted to the use of customer-provided equipment or systems and where such equipment or systems are connected to

Telephone Company facilities, the responsibility of the Telephone Company shall be limited to the furnishing of facilities, including the protective connecting arrangements and network control signaling units, suitable for telecommunications service and to the maintenance and operation of such facilities in a manner proper for such services. Subject to this responsibility the Telephone Company shall not be responsible for (i) the through transmission of signals generated by the customer-provided equipment or systems or for the quality of, or defects in, such transmission, or (ii) the reception of signals by customer-provided equipment or systems, or (iii) address signaling where such signaling is performed by customer-provided tone-type signaling equipment. The Telephone Company shall not be responsible to the customer if changes in minimum network protection criteria contained in the tariffs (and in 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 systems or otherwise affect its use or performance.

5.3 Trouble Reporting Procedure

When trouble is experienced with this service, the customer should perform the necessary testing at the interface to sectionalize the difficulty, i.e., determine whether the service impairment is located in the customer-provided equipment or in the equipment provided by the Telephone Company. 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

If a Telephone Company service call results in the location of the trouble in the customer-provided equipment, the customer is liable to be charged for the service call. The Telephone Company does not maintain or repair the customer-provided equipment.

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GLOSSARY

CENTREX SERVICE - an automatic switching system service providing PBX service and in addition Direct Inward Dialing (DID) and Identified Outward Dialing (IOD).

CENTREX - CO (COMPANY) - the provision of Centrex service by switching equipment located on Telephone Company owned or leased premises; the station equipment and attendant facilities are located on the premises of the customer.

CENTREX - CU (CUSTOMER) - the provision of Centrex service by switching, station equipment, and attendant facilities located on the premises of the customer.

CONNECTING ARRANGEMENT - equipment provided by the Telephone Company to accomplish the electrical connection of customer-provided equipment and the Telecommunications Network.

CUSTOMER - the person, firm or corporation which orders service and is responsible for the payment of charges and compliance with Telephone Company regulations.

CUSTOMER-PROVIDED EQUIPMENT - devices or apparatus and their associated wiring, provided by a customer, authorized user or joint user which when connected to Telephone Company equipment are so connected either electrically, acoustically, or inductively.

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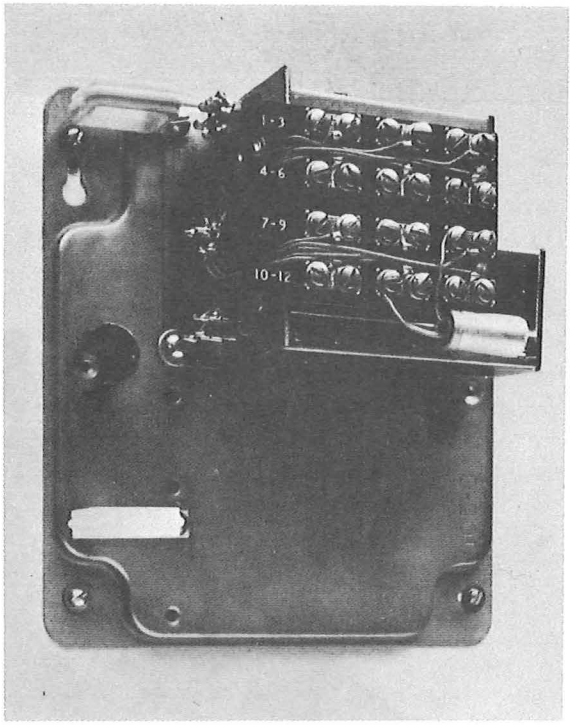
GLOSSARY

SUPERVISORY SIGNALS - signals used to initiate a request for service by the calling party (off-hook); to notify the called party that he is being called (ringing); to indicate an answered call (off-hook); to indicate a disconnect (on-hook); and to recall an operator or distant party to a connection (switchhook flash).

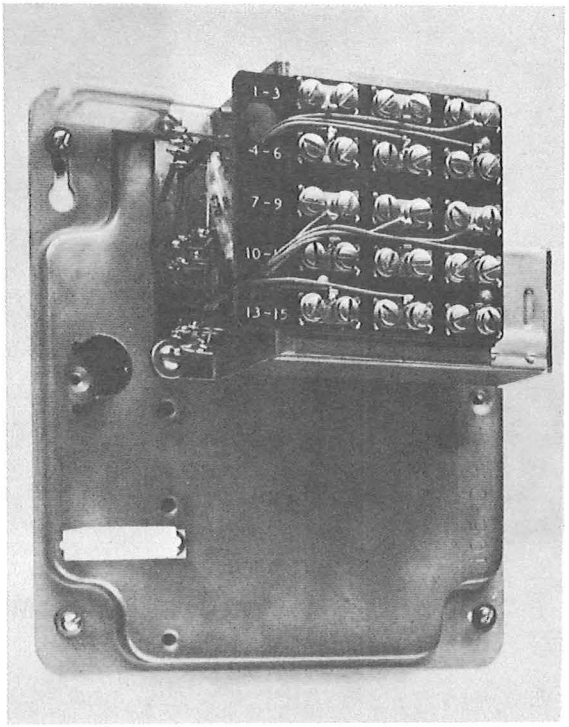
TELECOMMUNICATIONS NETWORK - the Bell System voice switching equipment, associated interconnecting facilities, and station equipment which provide Long Distance Message Telecommunications service or private line service.

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

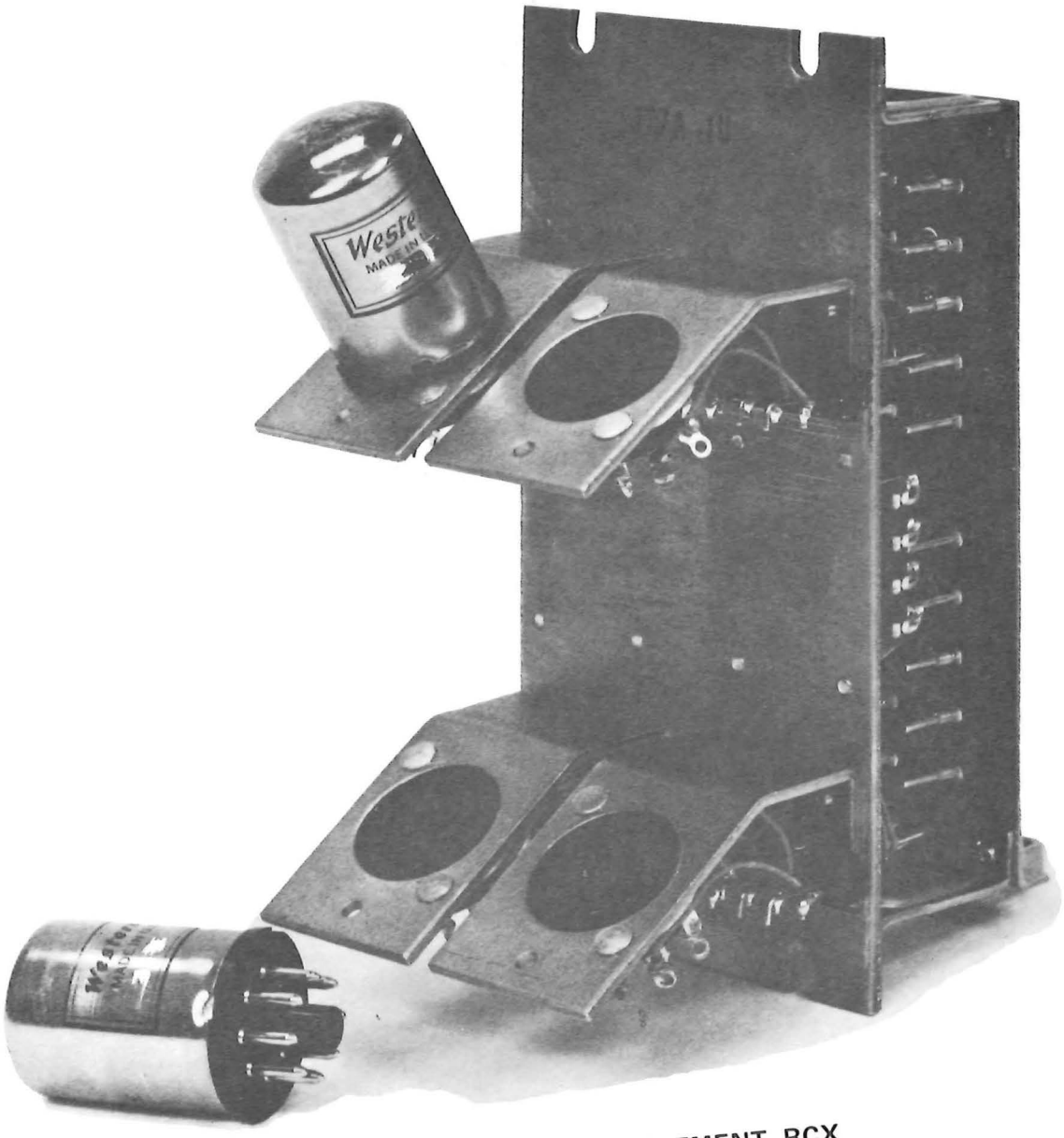
PBX TIE TRUNK - a direct circuit between two PBX's with no switching at any intermediate point.



CONNECTING ARRANGEMENT C1V
FIG. 1



CONNECTING ARRANGEMENT GC2
FIG. 2



CONNECTING ARRANGEMENT RCX
FIG. 3

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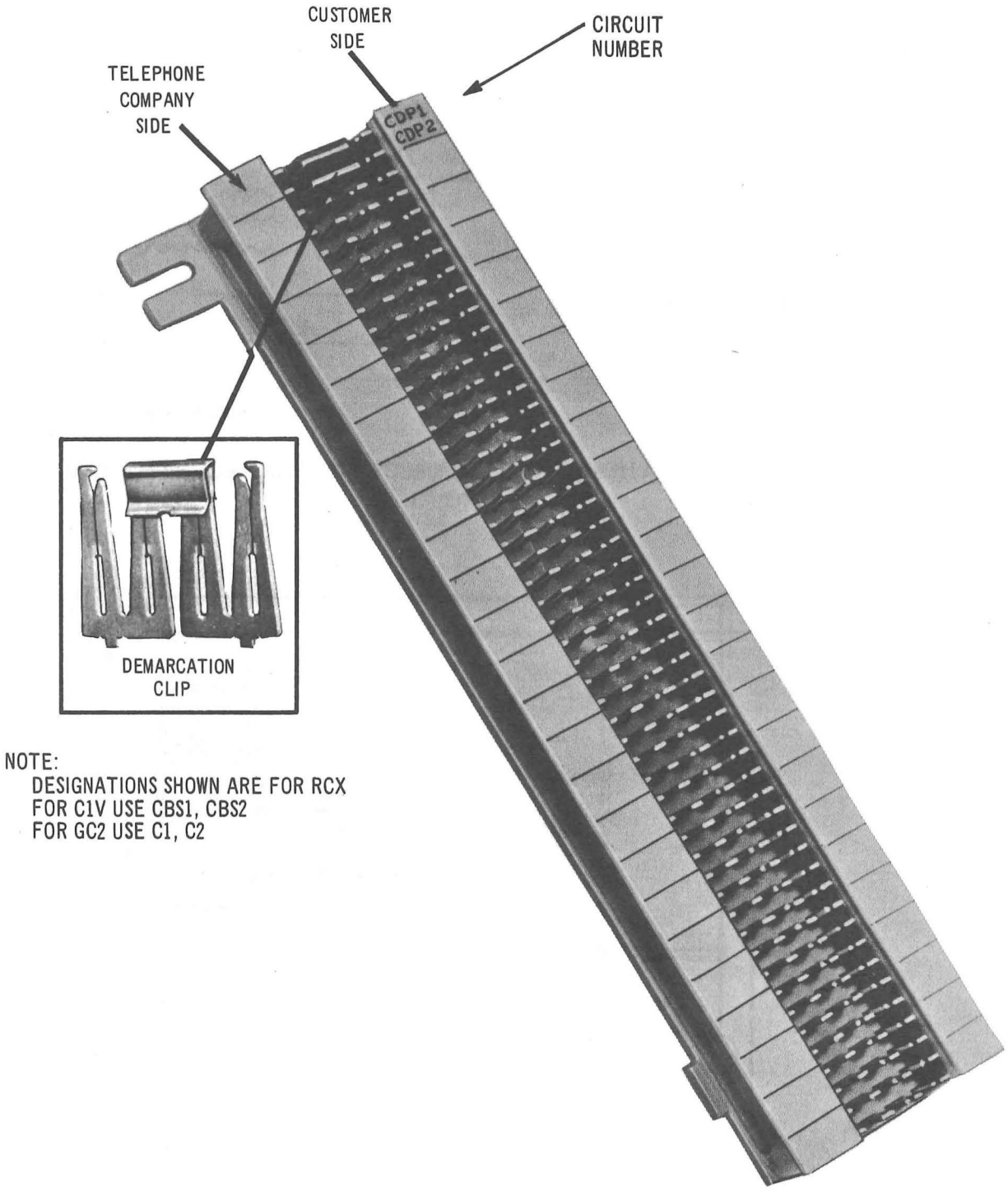
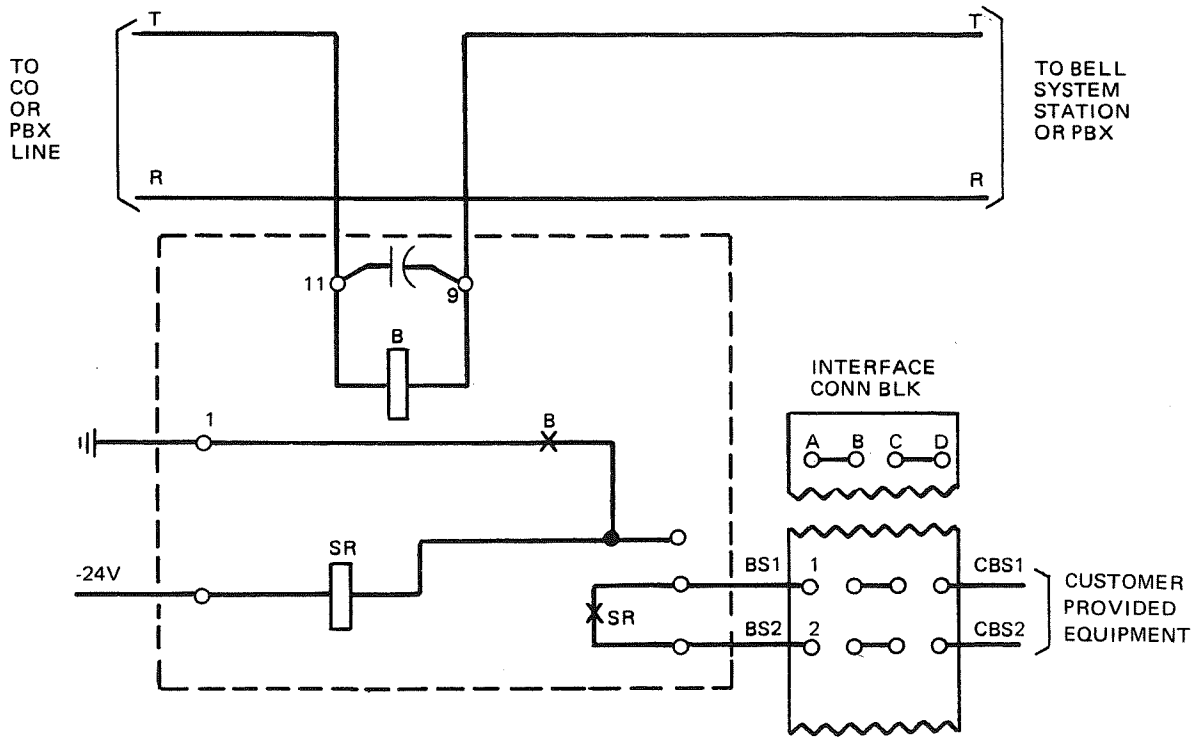


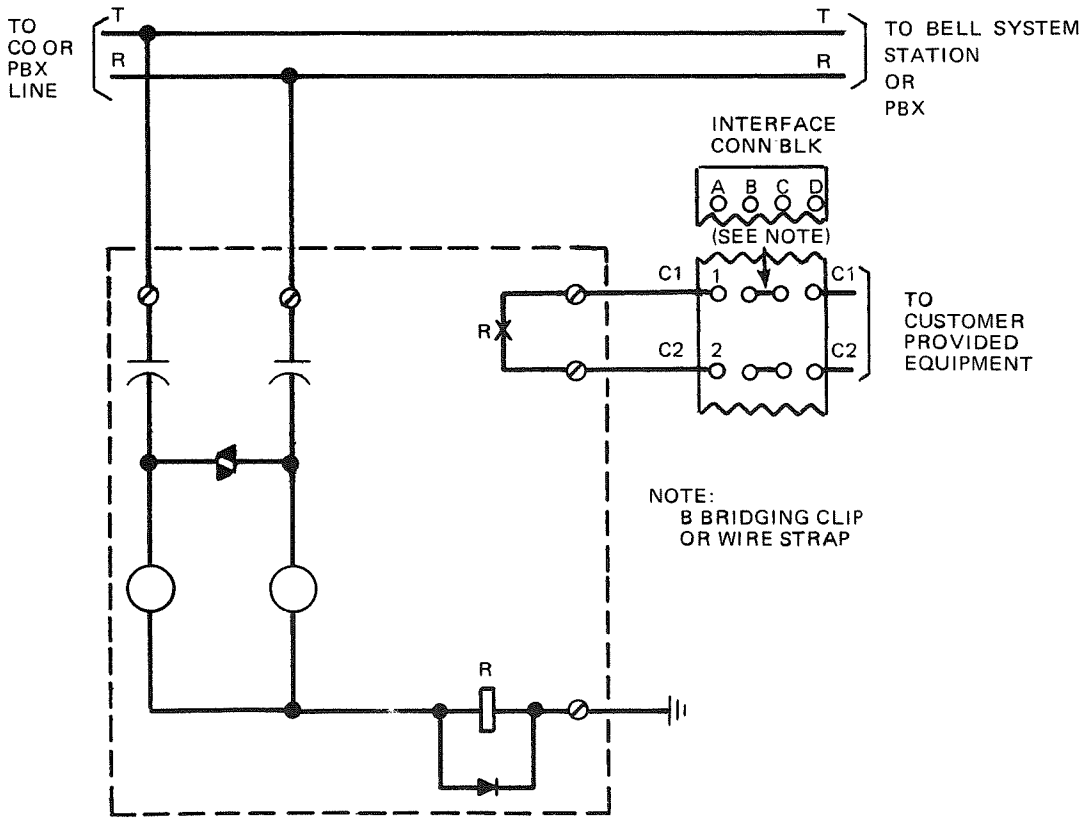
NOTE:
DESIGNATIONS SHOWN ARE FOR RCX
FOR C1V USE CBS1, CBS2
FOR GC2 USE C1, C2

TYPICAL INTERFACE CONNECTING BLOCK

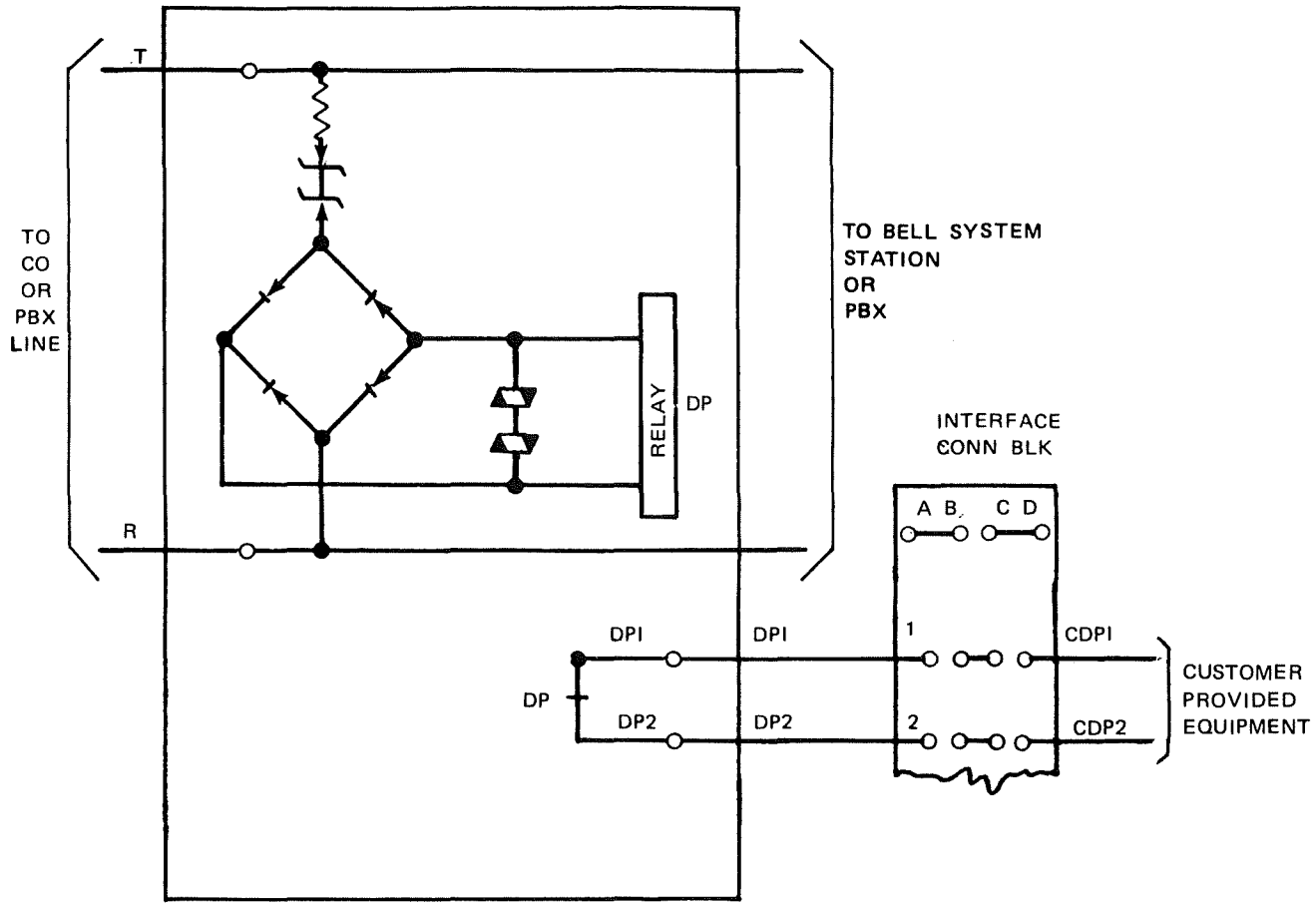
FIG.4



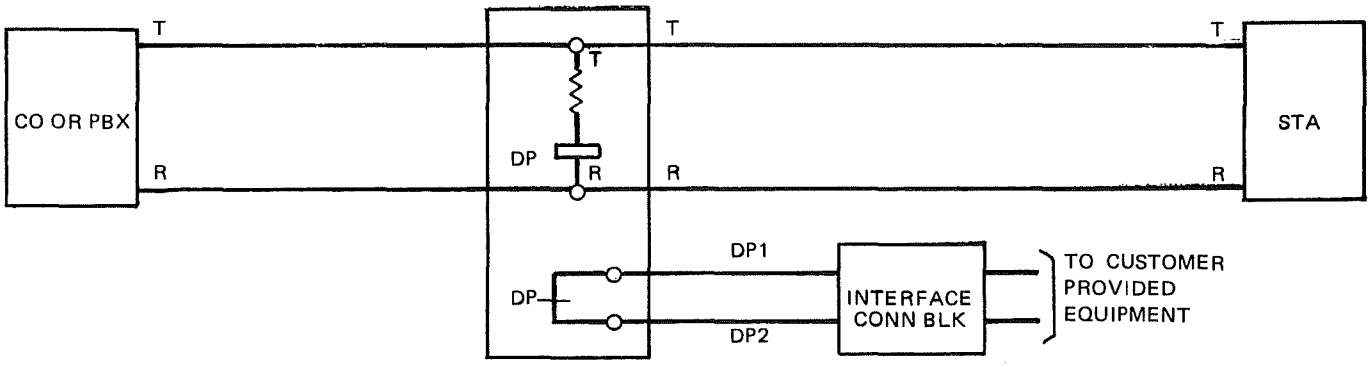
SIMPLIFIED SCHEMATIC – CONNECTING ARRANGEMENT C1V
FIG. 5



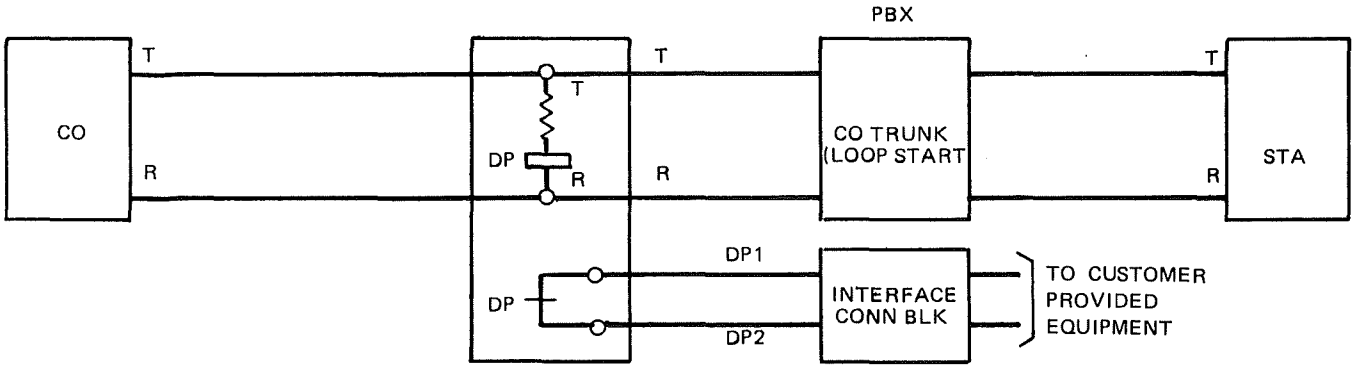
SIMPLIFIED SCHEMATIC – CONNECTING ARRANGEMENT GC2
FIG. 6



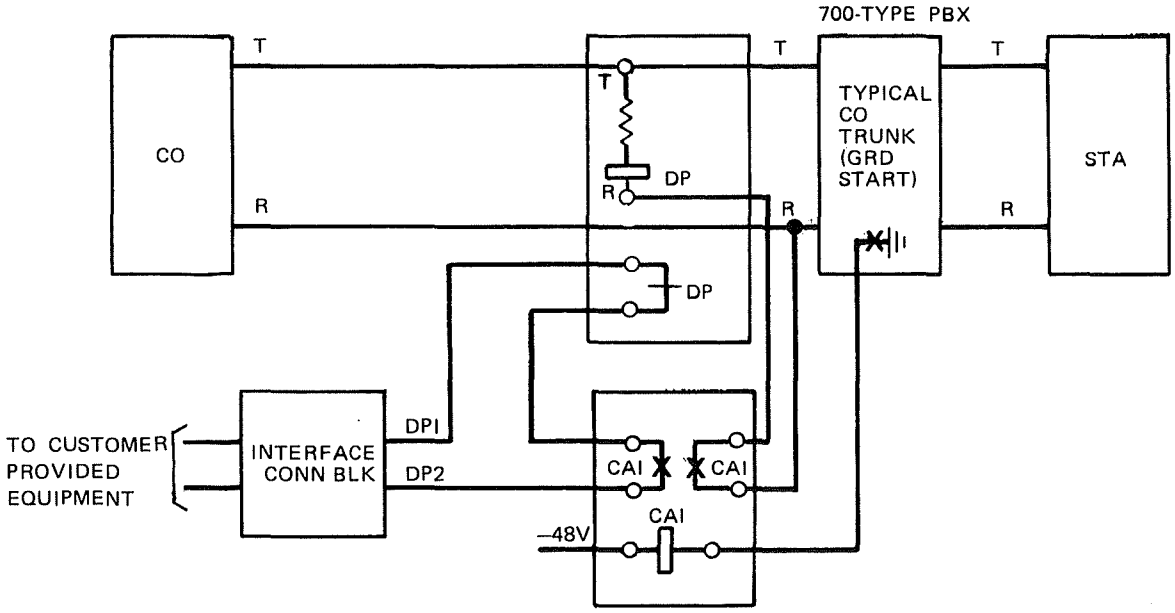
SIMPLIFIED SCHEMATIC – CONNECTING ARRANGEMENT RCX
FIG. 7



RCX WITH CO OR PBX LINE
FIG. 8A

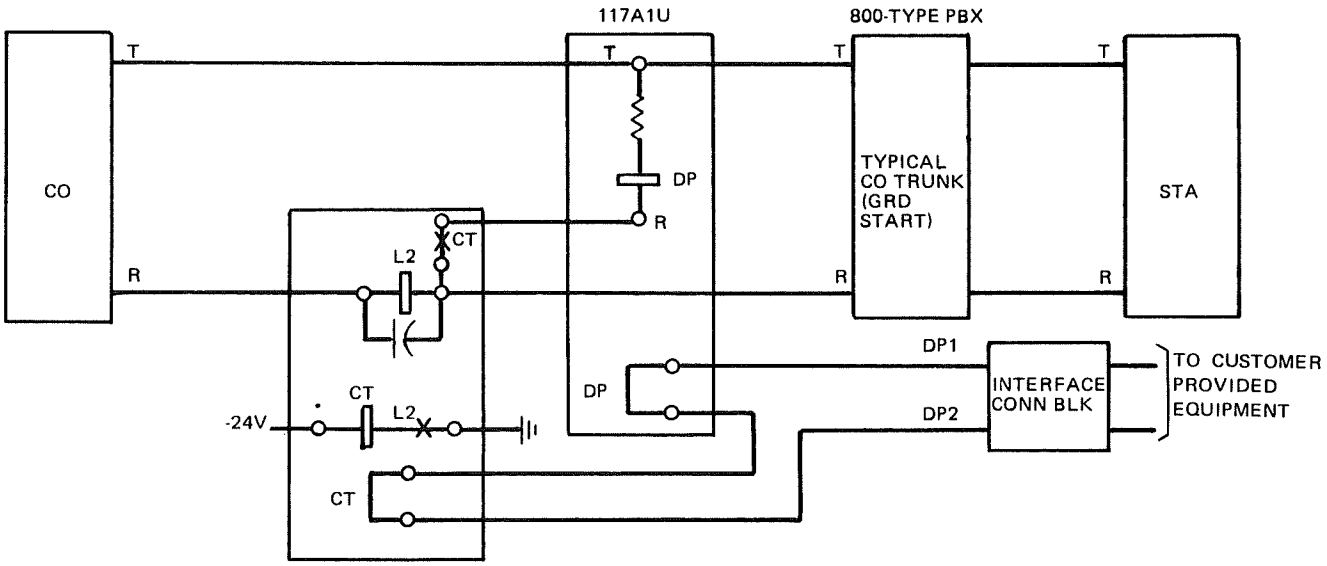


RCX WITH LOOP START CO TRUNK
FIG. 8B

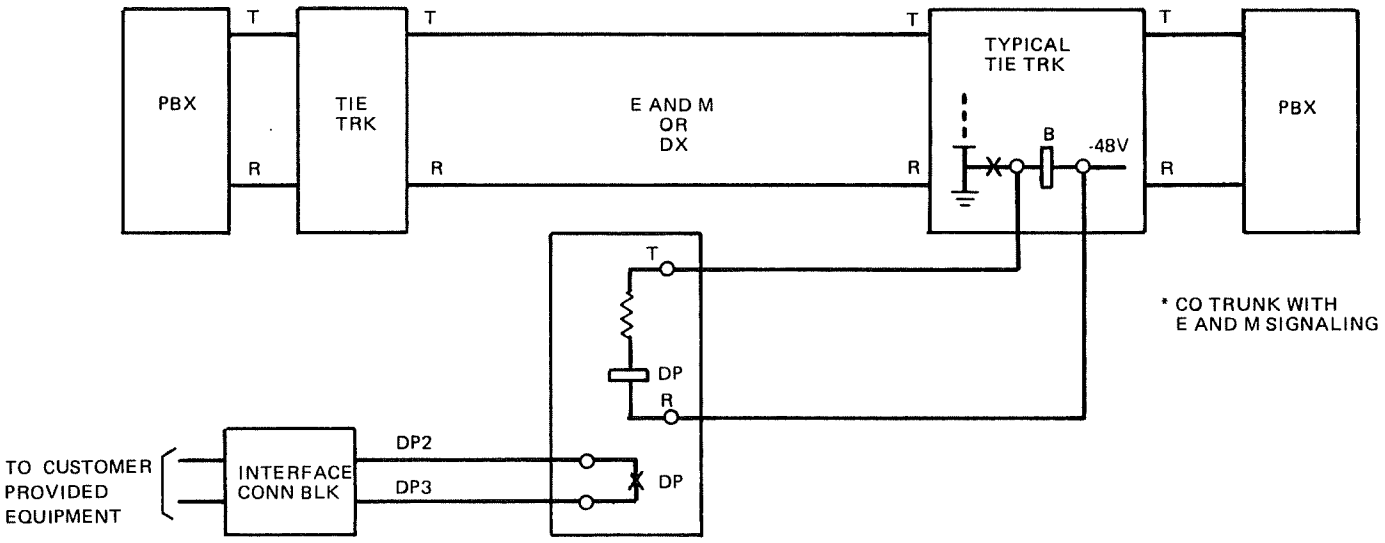


RCX WITH GROUND START CO TRUNK (700–TYPE PBX)
FIG. 8C

TYPICAL CIRCUIT APPLICATIONS – CONNECTING ARRANGEMENT RCX
FIG. 8

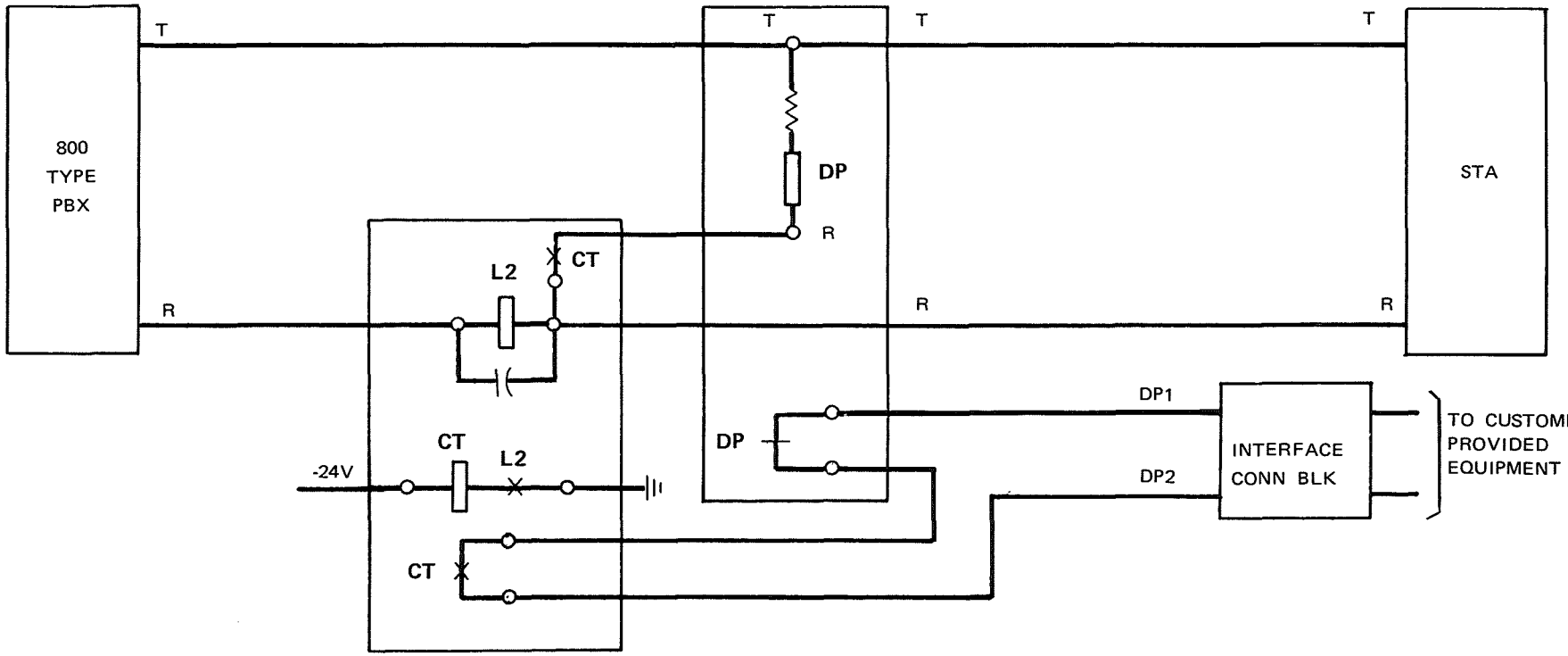


RCX WITH GROUND START CO TRUNK (800-TYPE PBX)
FIG. 8D



RCX WITH TIE TRUNK
FIG. 8E

TYPICAL CIRCUIT APPLICATIONS – CONNECTING ARRANGEMENT RCX
FIG. 8 (CONTINUED)



RCX WITH STATION LINE FROM 800-TYPE PBX

FIG. 8F

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