

May 25, 1973

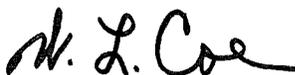
NOTICE

To Recipients of the Bell System Voice Communications Technical References:

The attached information is published by American Telephone and Telegraph Company as a guide for designers, manufacturers, and consultants of customer-provided systems which connect with Bell System communications systems or facilities. It describes alternative arrangements for providing power to Telephone Company voice connecting arrangements associated with customer-provided PBX systems. Power provision under normal commercial power conditions, and under commercial power outage conditions to insure various degrees of service continuity are discussed.

This information will be revised, if necessary, and ultimately be made available in the form of a Technical Reference or as an addendum to the applicable Technical Reference for each voice connecting arrangement affected.

Very truly yours,



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Voice Connecting Arrangements

POWER PROVISION FOR VOICE CONNECTING ARRANGEMENTS FOR CUSTOMER-PROVIDED PBXs

BACKGROUND

Direct electrical connection of customer-provided PBXs with the Bell System is made through a voice connecting arrangement furnished, installed, and maintained by the Telephone Company. Most of these connecting arrangements contain active circuitry and therefore require a source of power (nominally, -24 volt and/or -48 volt dc power) for their operation. The arrangements used to connect customer-provided PBXs are: CD6, CD7, CD8, CD9, CDH, CED, CET, C22, C25, CDQ2W, CDQ4W, CDQ2X, CDQ4X, C232W, C234W, C24, C2H, C27, and C2K.

NORMAL POWER PROVISION

Telephone Company-Provided DC Power

Connecting arrangement installations now in service generally are powered by rectifiers provided by the Telephone Company (Figure 1). Each power unit (rectifier) operates from a separately fused (15 amp), 117 ± 12 volt, 60 ± 1 Hz commercial power outlet provided by the customer. The only additional requirement is that the outlets should not be under the control of a wall switch.

Customer-Provided DC Power

A protection arrangement is now available which will permit the customer to provide the necessary dc power for voice connecting arrangements, (Figure 2). Both -24 and -48 volt versions will be available.

The major functions of this arrangement are:

- (a) To provide for powering the connecting arrangements, and
- (b) To protect Telephone Company personnel and facilities from potentially hazardous voltages which may be applied through the voice connecting arrangements to the telecommunications network.

The power protection unit, which has been designated connecting arrangement VCP24 for a -24 volt supply and VCP48 for a -48 volt supply, is mounted in a metallic box approximately $6 \times 5 \times 4\frac{1}{2}$ inches with knockout holes in the top and bottom of the box. The unit mounts on a wall or on any flat surface. The bottom hole is fitted with a $\frac{1}{2}$ inch by 2-inch long conduit nipple which extends the power leads to the customer-provided dc power source. These leads are No. 14 AWG and are approximately thirty-six inches long. The cover is equipped with a three-pole magnetic toggle switch type circuit breaker. The switch may be manually operated by the customer, without opening the unit, to supply or remove power to the connecting arrangements, as desired. A tie rod is supplied common to the breaker levers, which together act as a single lever in setting the breaker to the "ON" and "OFF" position. This arrangement will

function satisfactorily within a temperature range of 0° to 55°C and a humidity range of 5 to 95%. The power leads to the customer-provided power source are color-coded. The black lead is to be supplied by the customer with negative voltage, and the red lead shall be grounded in accordance with applicable electrical codes, such as National Electric Code. If the black lead should be grounded or if reversed voltage polarity should be supplied to the power leads, the protection unit will trip thereby removing power from the voice connecting arrangements. Whenever tripped, the unit must be manually reset. This may be done by the customer after first determining that the fault condition no longer exists in the customer-provided power source. The power leads from the customer-provided power source shall be a No. 14 AWG, or larger, copper conductor. Specific grounding requirements for each arrangement are described in the affected Technical References.

It should be noted that the current drain will not remain constant but will be dependent on the number of connecting arrangements that are simultaneously in operation. For this reason voltage regulation should be a requirement of a customer-provided power plant used with VCP. Regulation should control the voltage range from -20 volts to -26 volts with a 24 volt power plant with a current drain of 0 to 15 amperes (0 to 30 amps in the larger arrangement). When 48 volts are supplied to VCP the voltage must be maintained between 46 and 52 volts with drains of 0 - 15 amperes (0 - 30 amperes in the larger arrangement). It is contemplated that only one dc power supply of one voltage will be used at any one customer installation unless the current carrying capacity (30 amperes) of the larger arrangement is exceeded.

The voltage supplied to Voice Connecting Arrangements CD6, CD7, CD8, CD9, CDH, CED, CET, and C22 shall be -24 volts nominal (-20 to -26 volts). Similarly, the voltage supplied to Voice Connecting Arrangements C22, C25, CDQ2W, CDQ4W, CDQ2X, CDQ4X, C232W, C234W, C24, and C2H shall be -48 volts nominal (-44 to -52 volts). Voice Connecting Arrangements C27 and C2K do not require a source of dc power. In all cases, the maximum noise voltage on the dc power leads shall not exceed 23 dBm with C-Message Weighting.

The noise voltage can be measured by operating the customer-provided power supply into the power protection unit, bridged by a Hewlett-Packard Transmission and Noise Measuring Set - Model 3555B, or a Western Electric 3-Type Noise Measuring Set. To insure a proper measurement technique, the control settings on these meters should be as shown below:

| <u>Western Electric 3-Type Noise Measuring Set</u> | | <u>Hewlett-Packard Transmission and Noise Measuring Set-Model 3555B</u> | |
|--|----------------|---|----------------|
| <u>CONTROL</u> | <u>SETTING</u> | <u>CONTROL</u> | <u>SETTING</u> |
| Function (Switch) | BRDG | Input (Switch) | NOISE/BRDG |
| Norm/Damp (Switch) | NORM | Function (Pushbutton) | VF/NM-600BAL |
| WTG (PLUG-IN NETWORK) | C-message | Noise WTG (Switch) | C-message |
| | | NORM/DAMP (Switch) | NORM |

Noise measurements are of value only if taken during the busy period when the highest noise readings are most likely to occur.

The dc current drain requirements for each Voice Connecting Arrangement are given in the following chart:

| <u>Voice Connecting Arrangement</u> | <u>-24 Volt Current</u> <u>Typical*</u> | <u>Current</u> <u>Maximum*</u> | <u>-48 Volt Current</u> <u>Typical*</u> | <u>Current</u> <u>Maximum*</u> |
|-------------------------------------|--|-----------------------------------|--|-----------------------------------|
| CD6 | 25.2 ma | 30 ma | NA | NA |
| CD7 | 73 ma | 110 ma | NA | NA |
| CD8 | 73 ma | 110 ma | NA | NA |
| CD9 | 73 ma | 110 ma | NA | NA |
| CDH | 133 ma | 160 ma | NA | NA |
| CED | 133 ma | 160 ma | NA | NA |
| CET | 73 ma | 110 ma | NA | NA |
| C22 | 98 ma | 125 ma | <u>and</u> 35 ma | 100 ma |
| C25 | NA | NA | 175 ma | 300 ma |
| CDQ2W | NA | NA | 169 ma | 203 ma |
| CDQ4W | NA | NA | 169 ma | 203 ma |
| CDQ2X | NA | NA | 212 ma | 263 ma |
| CDQ4X | NA | NA | 212 ma | 263 ma |
| C232W | NA | NA | 36 ma | 40 ma |
| C234W | NA | NA | 36 ma | 40 ma |
| C24 | NA | NA | 18 ma | 20 ma |
| C2H | NA | NA | 205 ma | 215 ma |
| C27 | NA | NA | NA | NA |
| C2K | NA | NA | NA | NA |

ma = Milliamperes
NA = Not applicable

* Typical refers to what might be found in the field in an average installation. Maximum refers to worst case conditions. Investigation of factors affecting current drain in each situation will determine exact current drains to be used.

POWER OUTAGE PROVISIONS

Telephone Company-Provided Battery System - Full Service Continuity

Full service continuity to the connecting arrangements during commercial power failure conditions can be provided if an emergency source of dc power is provided by the Telephone Company (Figure 3). A special charge will be applied for this option. Of course, the customer will not have full service

continuity unless his system is also protected by a customer-provided battery reserve system. This option should be exercised in those instances in which the customer does not desire to supply dc power to the connecting arrangements.

Since there have been only a few installations equipped with this option, this power outage arrangement is being handled on a special assembly of equipment basis by most Telephone Companies.

Customer-Provided Battery System - Full Service Continuity

If instead, the customer wishes to supply dc power to the connecting arrangements from his battery reserve system to insure full service continuity during an ac power failure, the power protection arrangement previously discussed would be provided by the Telephone Company to permit this capability (Figure 4). The interface specifications previously provided are also applicable here.

With this option it is anticipated that the customer will provide dc power to the connecting arrangements from his power supply at all times.

Telephone Company-Provided Telephone Transfer - Partial Service Continuity

For some time, two different service continuity arrangements have been available which provide limited service continuity to the telecommunications network over outgoing and two-way exchange facilities during periods of commercial ac power failure. These arrangements would be applicable when an emergency source of dc power (battery reserve system) is not provided by either the Telephone Company or the customer.

These arrangements, which are available at an added charge, are used to transfer a predetermined number of PBX trunks directly to Telephone Company-provided telephone sets (Figure 5) when a commercial power failure occurs. The telephone sets are placed in strategic locations designated by the customer. During normal commercial power operation, the Bell System telephone sets are inoperative. This arrangement would be used where a customer-provided PBX is served through connecting arrangements CDH, CD7, CD8, or CD9.

A call in progress when a commercial power outage occurs will be immediately connected from the associated voice connecting arrangement to the Bell System telephone set. Calls may also be initiated from this set during commercial power outage. For trunks terminated in Voice Connecting Arrangement CDH, a separately mounted key which must be operated for ground start operation is provided to answer or originate a call.

To provide optimum service, we recommend that service continuity arrangements be provided for up to fifty percent of the applicable connecting arrangements. For ordering purposes, these arrangements have been assigned ordering (USOC) codes PFC and PFB.

With PFC, a call during a commercial power outage will remain connected to the Bell System telephone set until the call is completed even if commercial power is restored during the call. An optional indicator lamp provides a visual indication that local power has been restored during the period when the Bell System telephone set is off-hook.

With PFB, a call during a commercial power failure will be abandoned when commercial power returns even though the Bell System telephone set remains off-hook.

Summary

These notes have described various arrangements for providing power to voice connecting arrangements associated with customer-provided PBX's. Since these arrangements are provided at the option of the customer, he should specify the desired power arrangement(s) when ordering service from the Telephone Company.

NORMAL POWER PROVISION

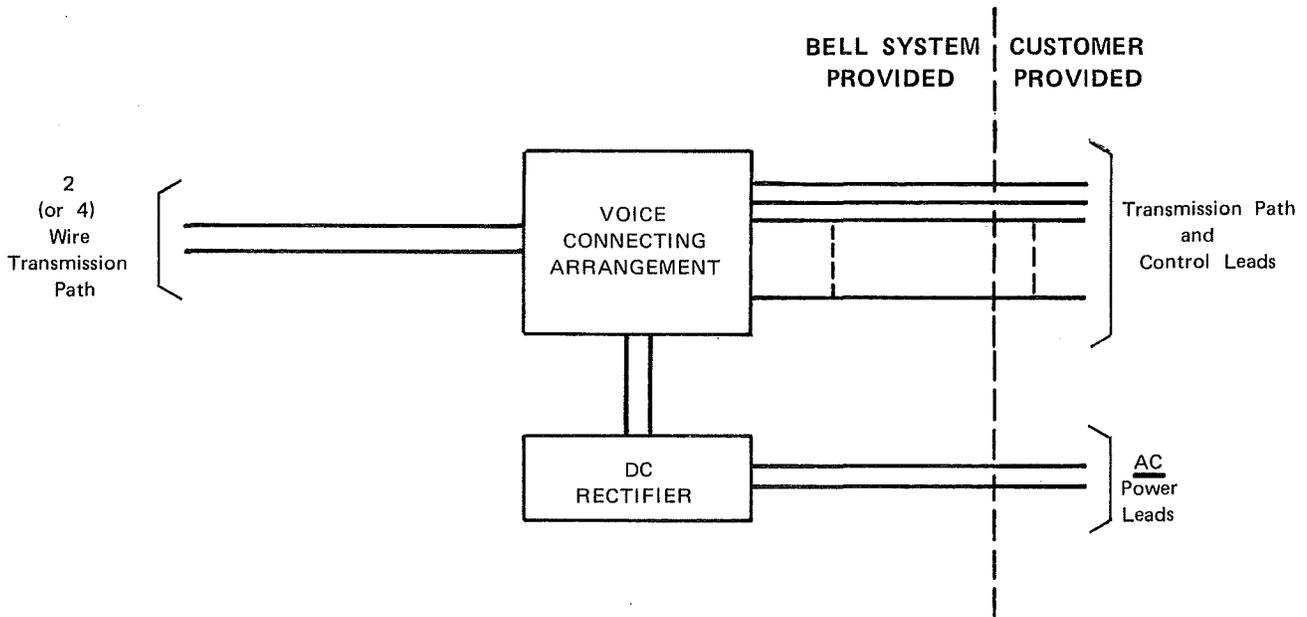


Fig. 1 – Telephone Company – Provided DC Power

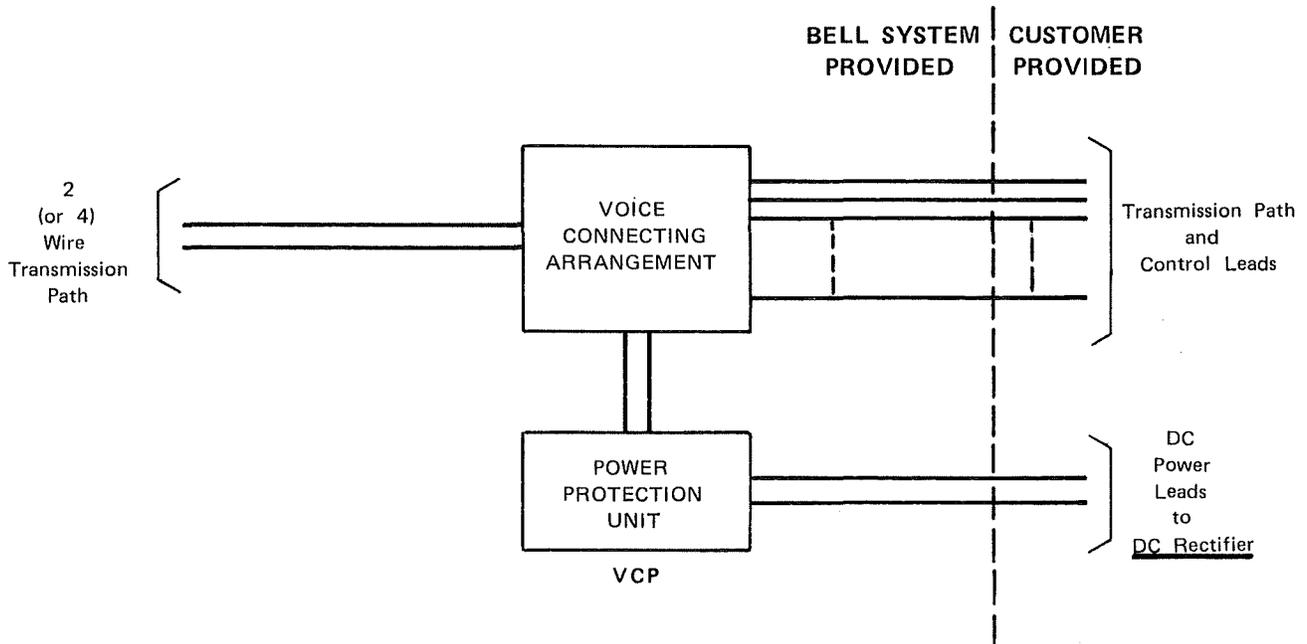


Fig. 2 – Customer-Provided DC Power

POWER OUTAGE PROVISIONS

FULL SERVICE CONTINUITY

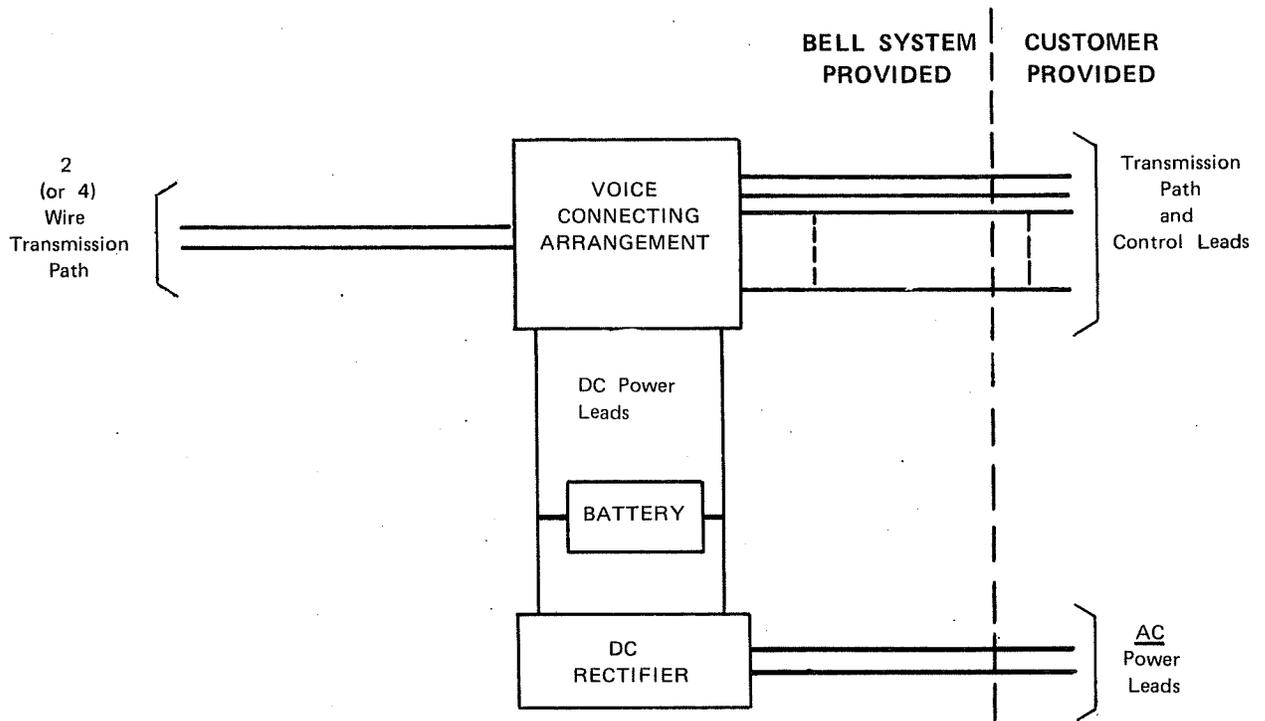


Fig. 3 - Telephone Company - Provided Battery System

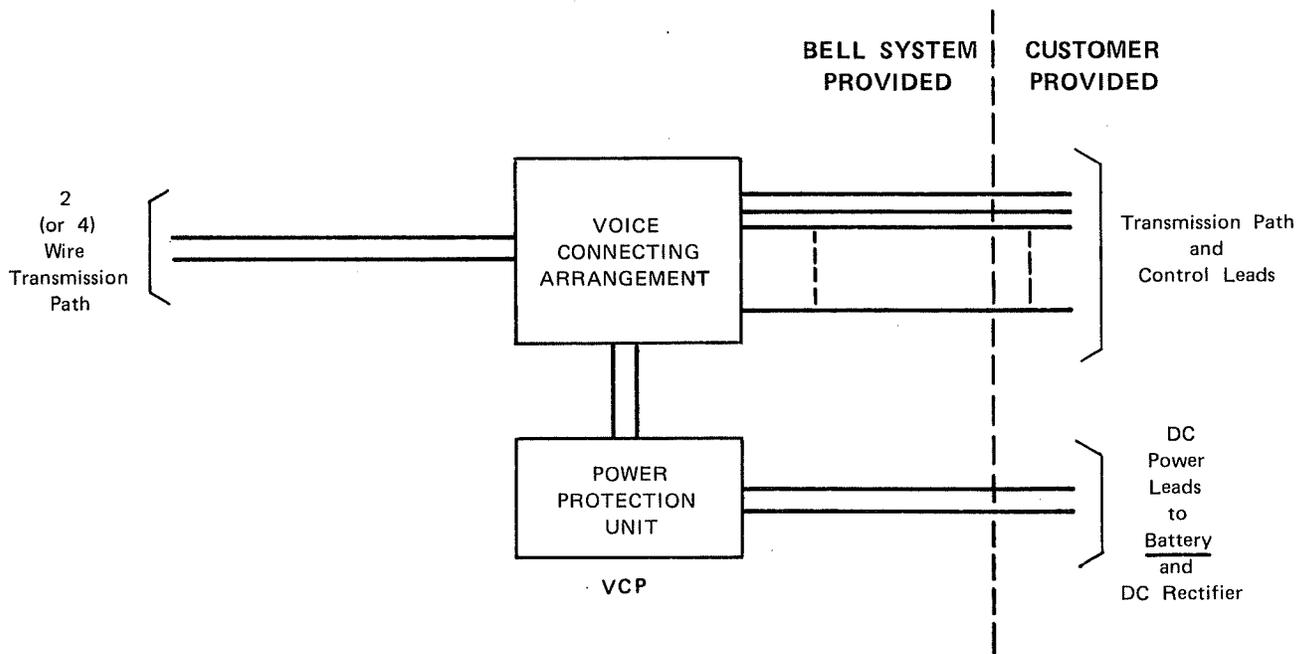
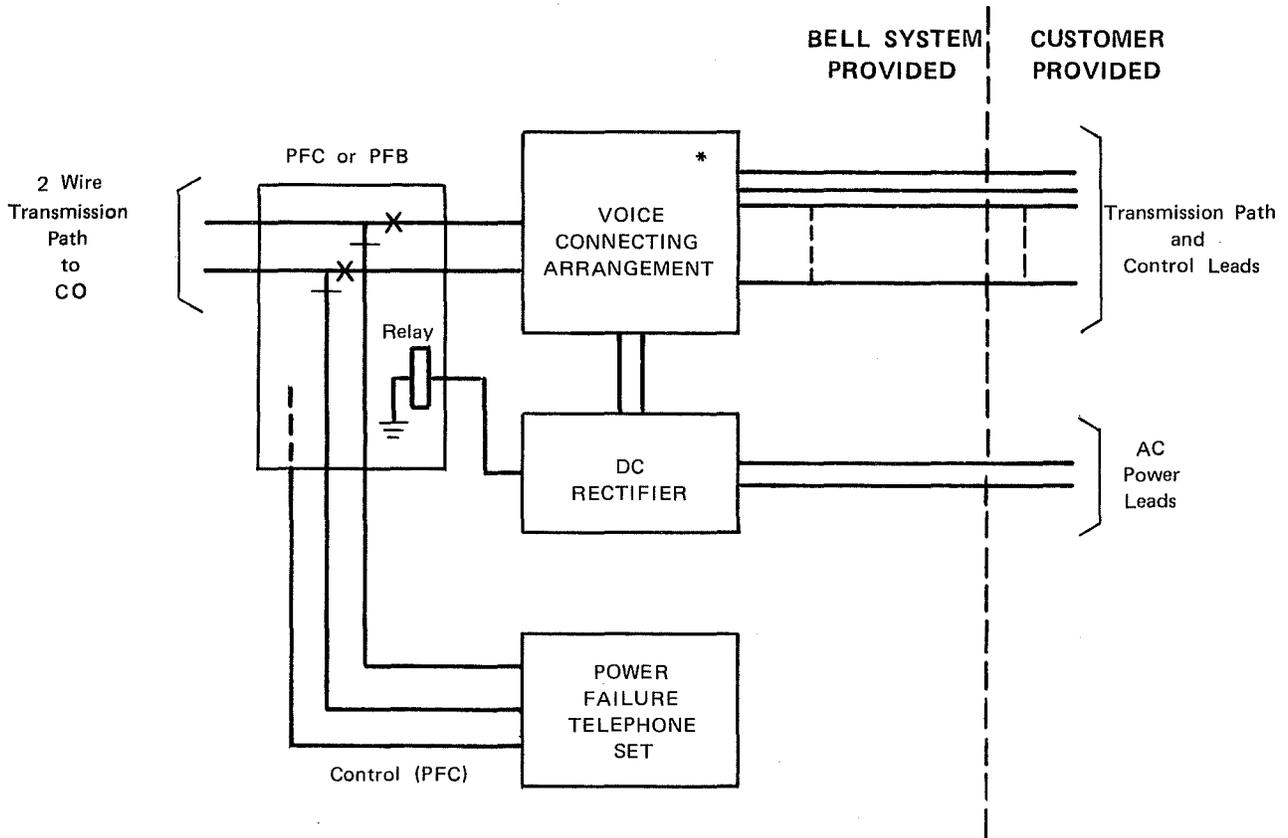


Fig. 4 - Customer-Provided Battery System

POWER OUTAGE PROVISIONS



* CDH, CD7, CD8, or CD9

Fig. 5 — Telephone Company — Provided Telephone Transfer — Partial Service Continuity



