TELEMETRY/ALARM BRIDGING SERVICE DESCRIPTION

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1. GENERAL

1.01 This section provides the description of Telemetry/Alarm Bridging Service. Three types of bridging arrangements are described along with end-to-end transmission requirements and channel transmission requirements.

1.02 Whenever this section is reissued, the reason(s) for reissue will be given in this paragraph.

1.03 Telemetry/Alarm Bridging Service is designed to provide intercommunications between a master and up to 128 remote premises customer provided equipment (CPE) stations at low speed (400 b/s or less) data. Telemetry and alarm bridging can be provided in any one of three bridging arrangements, that is, passive bridging; split-band, active bridging; and summation, active bridging.

2. BRIDGING ARRANGEMENTS

2.01 Telemetry/Alarm Bridging Service requires the interconnection of various legs at common bridging points. A bridging point is a central office (CO) containing one or more bridges. A hub or primary bridging point may feed any number of secondary bridging points. A secondary bridging point may not feed another secondary bridging point. See Fig. 1. In order to achieve transmission stability, all circuit appearances or ports on a bridge (except split-band, active bridging) must be properly terminated when not in use.

2.02 Two types of bridges are used in telemetry and alarm services. The first, ***passive,*** is a bridging network without amplification. The second, ***active,*** is a bridging network with amplification.

2.03 Three bridging arrangements are used in telemetry and alarm services. The end-to-end transmission requirements are given in Table A. The three bridging arrangements are described as:

- ***Passive Bridging:*** A bridging system employing 2-wire, 10-port bridges with no amplification, resulting in a channel having relatively high loss, 2-wire, multipoint circuits between the customer master station and the remote premises.

- ***Split-Band, Active Bridging:*** A bridging system which divides the voiceband into two separate portions, one portion for each direction of transmission. Split-band, active bridging employs a 4-wire trunk between the master station and the bridge and employs 2-wire facilities between the bridge and the remote premises.

- ***Summation, Active Bridging:*** A unidirectional bridging system in which separate narrowband tones are transmitted from the remote premises and summed at a 2-wire bridge for introduction onto a 2-wire trunk between the bridge and the master station.

A. Passive Bridging

2.04 A typical system using passive bridging (Fig. 2) consists of a 2-wire voice frequency

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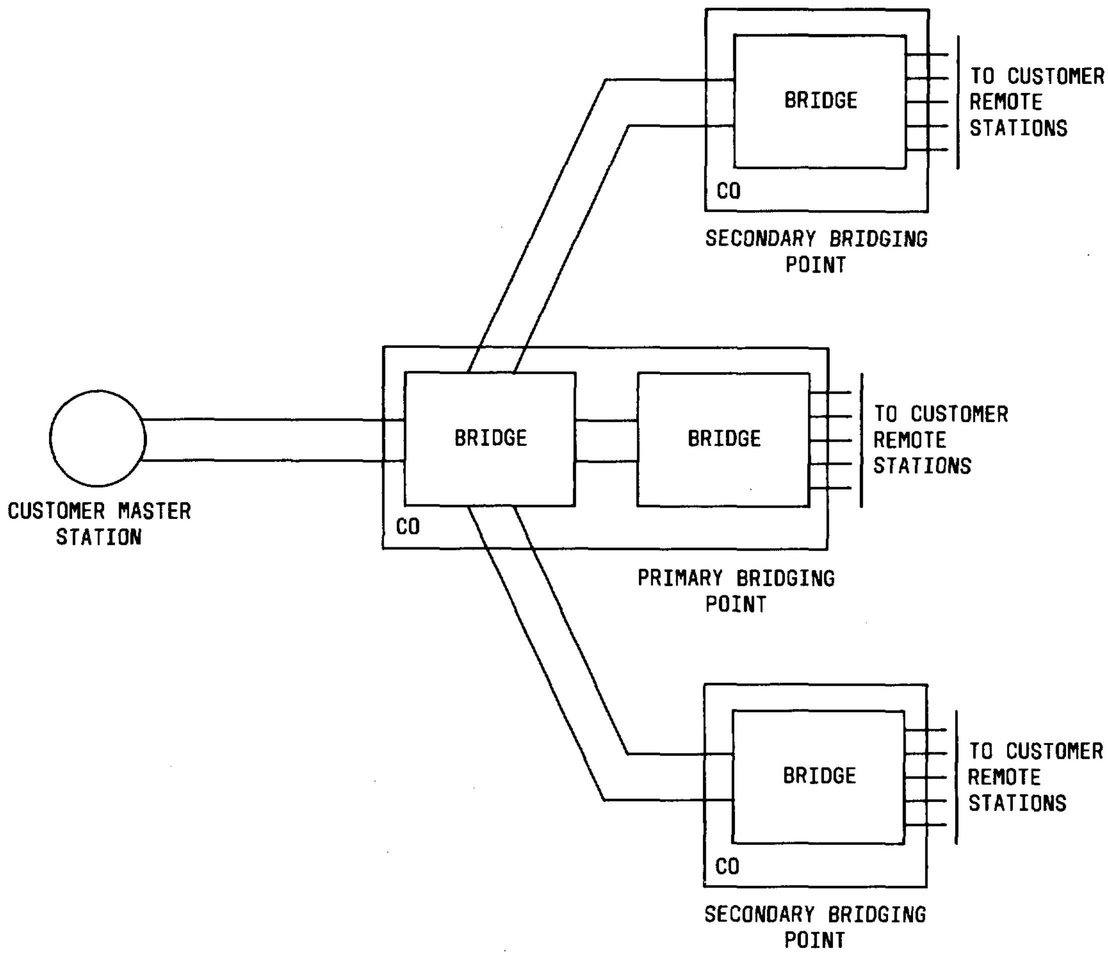


Fig. 1—Primary and Secondary Bridging Arrangement

(VF) facility from a customer master station to a 2-wire, 10-port passive bridge located in a telephone company (TELCO) CO. From the bridge, 2-wire VF facilities are distributed to nine remote customer locations. The system is referred to as passive bridging since the customer equipment is capable of receiving a signal at a very low level (less than -37 dBm) and, as a result, amplification by the TELCO is rarely required. Each of the remote customer locations will have a customer provided transponder capable of receiving and/or transmitting signals through the bridge to the master station. Each of these remote transponder locations may also house a customer provided regenerator which is capable of extending the bridging network (Fig. 3) to another 2-wire, 10-port bridge by regenerating and retransmitting the signals between the master station and the remote stations. In this way, 2-wire, 10-port bridges may be cascaded to support large customer bridged networks of 100 or more locations. (See Note.) In a passive bridging system, signals transmitted from any customer location (master station or remote premises) will be received at all other locations.

> ***Note:*** In a passive bridging network, although bridges may be cascaded, the Bell System does not assure transmission between bridges.

2.05 A typical master station transmits a remote station address code using the presence or absence of a 2740-Hz tone. Each remote transponder, upon receiving its address code responds with a code using one of four discrete frequencies. The transmit level of the signals from the master station or remote stations will be 0 dBm into 600 ohms, and the customer equipment is designed to operate with a receive level as low as -53 dBm into 600

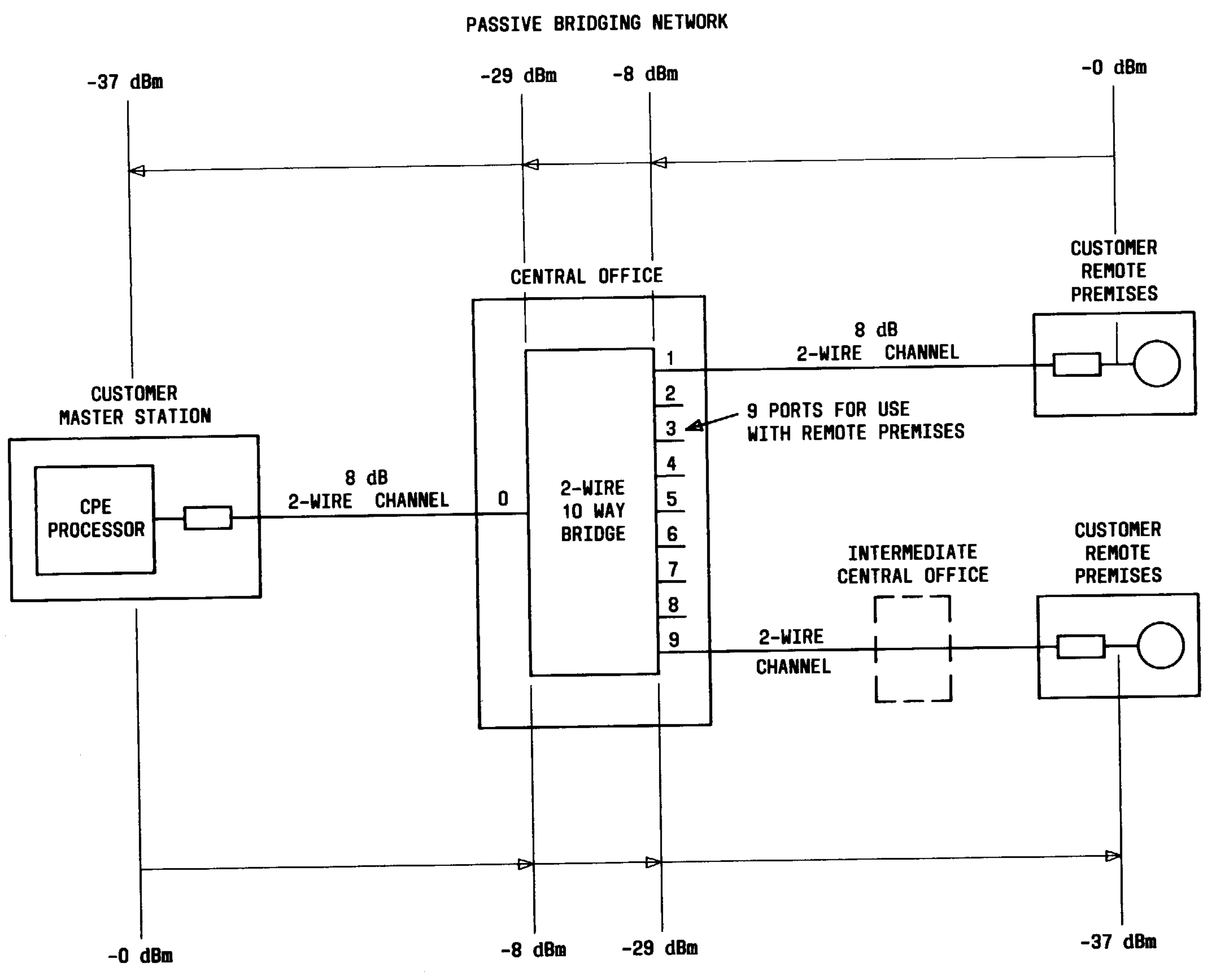
TABLE A

END-TO-END TRANSMISSION REQUIREMENTS

TYPE BRIDGING	CIRCUIT LOSS (NOTE 1)	LONG TERM VARIATION (NOTE 1)	LOSS VERSUS FREQUENCY (500 to 2800 HZ)	ENVELOPE DELAY DISTORTION	IMPULSE NOISE (NOTE 2)
Passive	37 dB ± 0.5 dB	±4 dB	—4 to +16 dB	Not Required	15 Hits
Active, Split Band	16 dB ± 0.5 dB	±5 dB	—4 to +14 dB	Not Required	15 Hits
Active, Summation	16 dB ± 0.5 dB	±5 dB	—4 to +16 dB	Not Required	15 Hits

Note 1: Total fixed 1-KHz end-to -end loss between the master station and any remote station.

Note 2: Measurement made with a threshold of 64 dBrn at each station for a 15 minute period.



– 150A CSU

– CPE TRANSPONDER

NOTE: UNUSED BRIDGE PORTS MUST BE TERMINATED WITH RESISTOR SUPPLIED WITH BRIDGE.

Fig. 2—Passive Bridging Network

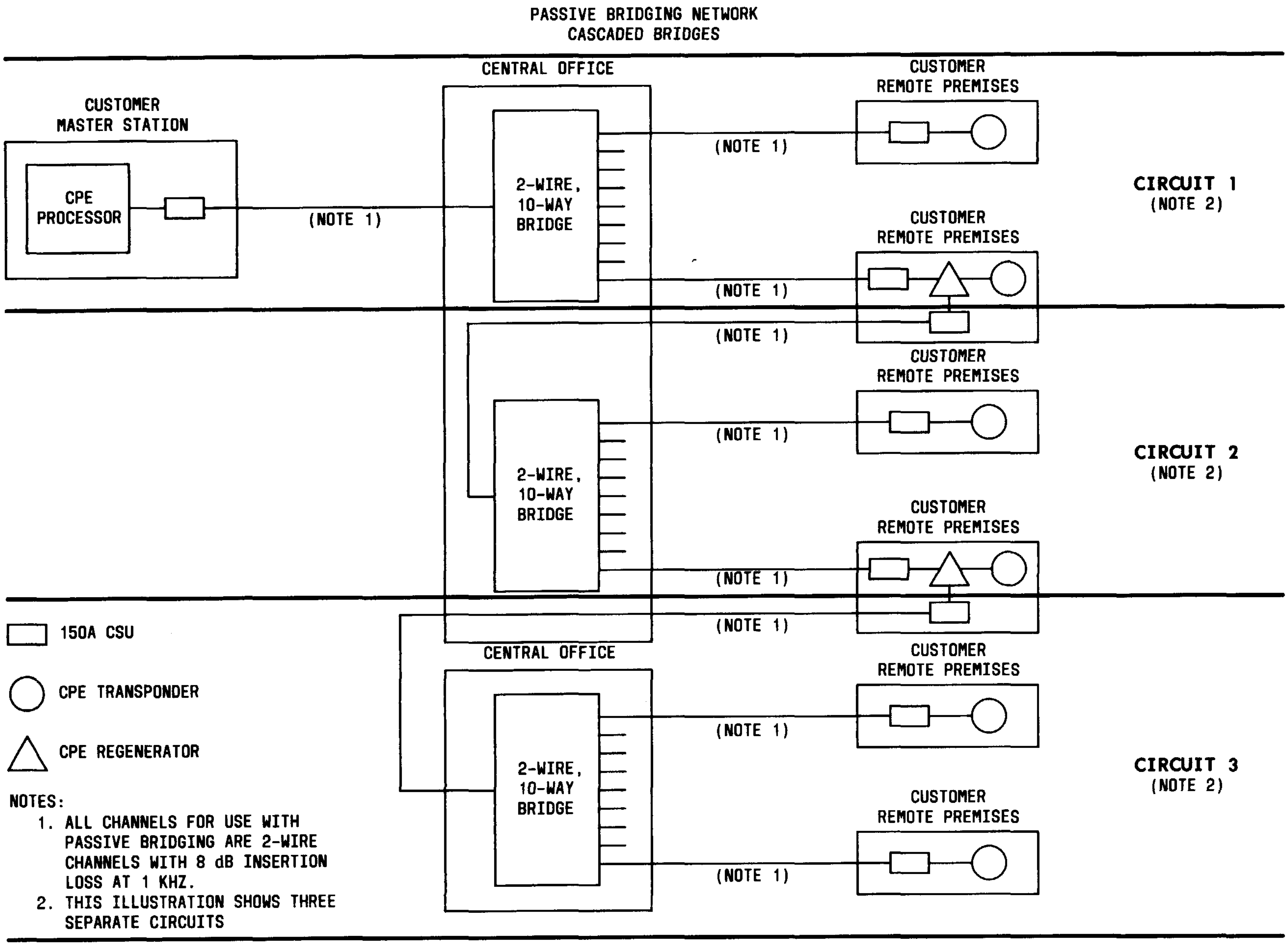


Fig. 3—Passive Bridging Network, Cascaded Bridges

ohms at 2740 Hz. In those cases where the remote signals are being regenerated, the total transmit signal power of the regenerated signals shall not exceed 0 dBm. In the case of four tones being regenerated simultaneously, each tone shall not exceed -6 dBm; the composite power of four -6 dBm tones equals 0 dBm. Where the terminal equipment is capable of transmitting a maximum of 25 different interrogation codes (with four transponder frequencies available), the system is limited to a maximum of 100 remote locations per multipoint network.

2.06 The passive bridge is a frame mounted 2-wire, 10-way resistive bridge available from various outside suppliers as defined in the Bell System's Product Evaluation Report (PER) No. 10. Copies of the PER are maintained at the headquarters of AT&T, Long Lines, and each Bell Operating Company. The passive bridge is typically a 600- or 900-ohm device consisting of ten transformer isolated ports with an insertion loss of approximately 21 dB at 1 kHz between any two ports with all ports properly terminated.

B. Split-Band, Active Bridging

2.07 A typical system using split-band, active bridging (Fig. 4) will consist of a 4-wire VF facility from the customer master station to a split-band, active bridge located in a TELCO CO. Using interchangeable filters located in the bridge, the transmission path through the bridge is divided into two portions, and these two portions are applied to the 2-wire facility from the bridge to the remote premises. Typically the band is divided around 1600 to 1800 Hz. One portion of the voiceband is used for signaling from the master station toward the remote premises transponders, and the other portion of the voiceband is used for responses from the remote premises transponders toward the master station. With the split-band, active bridge, a signal from the master station is broadcast to all remote stations; however, signals transmitted from the remote premises are received only by the master stations.

2.08 In addition to serving remote premises over 2-wire facilities, it is also possible, at the primary bridge location, to extend the 4-wire facility to other central offices where additional bridges may be added (secondary bridges).

2.09 A typical master station designed to work with the split-band, active bridging arrangement transmits a remote station address code using a frequency shifted tone of perhaps 1350 Hz. Each customer provided remote transponder, upon receiving its address code, responds with a frequency shift keying (FSK) signal in the upper half of the voiceband. The transmit level from the master station or the remote premises transponder is designed to be 0 dBm into 600 ohms, and the customer equipment is designed to operate with a receive level of -16 dBm into 600 ohms.

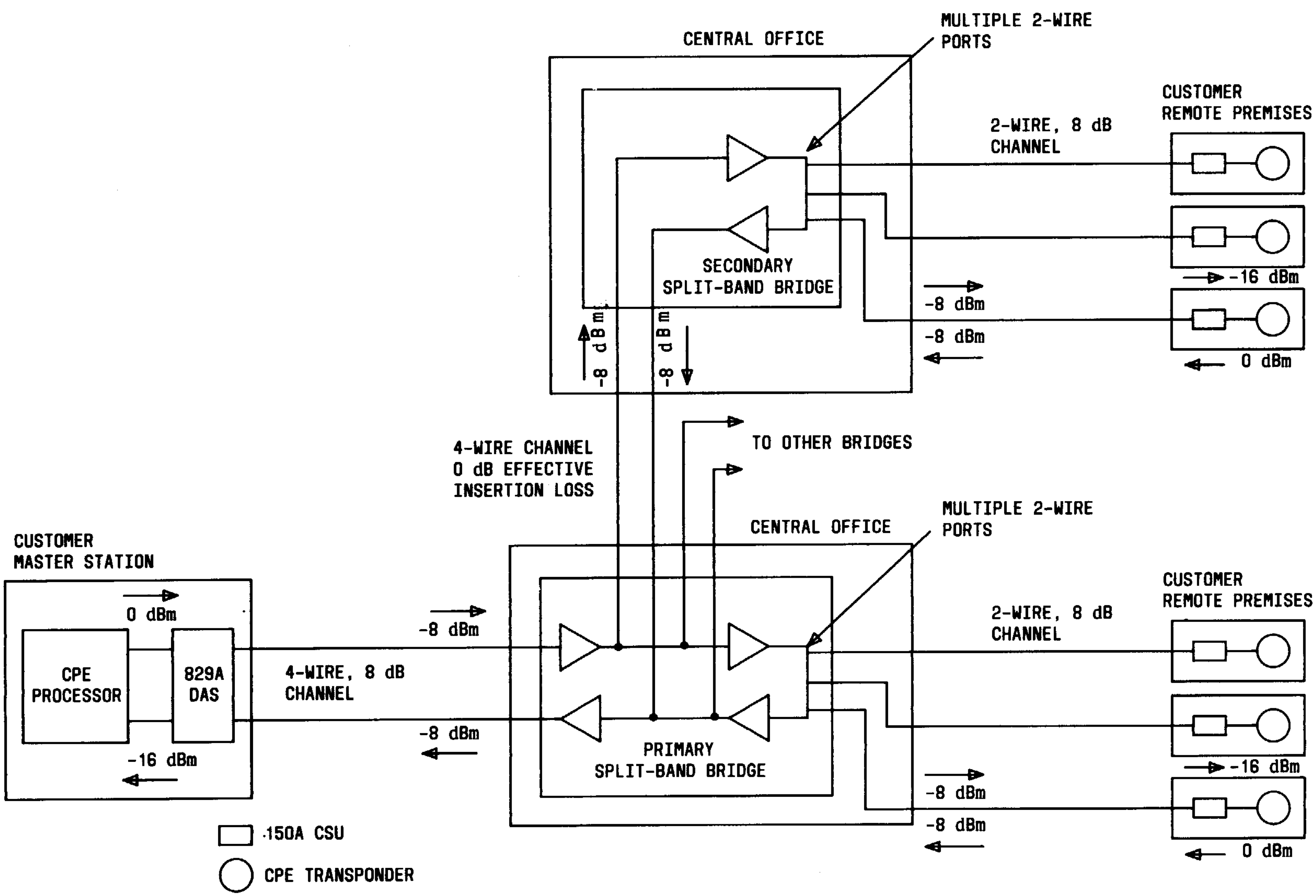
2.10 The split-band, active bridge is typified by a bay mounted, modular bridge wired with appropriate cable to the main distributing frame. These bridges are available from various outside suppliers as defined in PER No. 397. A typical split-band, active bridge mounting shelf is capable of supporting a distribution card, a summation card, and a variable number of 2-wire port termination cards. The distribution card will terminate the receive side of the 4-wire facility from the customer master station, will provide level adjustment and equalization, and will include one band-splitting filter. The summation network terminates the transmit side of the 4-wire facility to the customer master station, provides level adjustment and equalization, and includes the second band-spliting filter. The 2-wire port termination cards will provide 2-wire, transformer coupled terminations for a number of 2-wire facilities and will interface 2-wire facilities to the 4-wire trunk via a resistive network.

C. Summation, Active Bridging

2.11 Summation, active bridging (Fig. 5, 6, and 7) is a system which uses 1-way transmission from the remote customer premises through the bridge or bridges to the customer master station.

2.12 In a typical system using summation, active bridging, the customer master station and remote premises will all be connected to a CO located bridge via 2-wire VF facilities. In summation, active bridging, each remote customer premises continuously transmits a single narrowband tone through the bridge to the master station. The individual tone transmitted by each remote premises is not transmitted by any other remote premises on the bridge network. Absence of the tone at the master station would normally indicate a problem at the remote premises. With summation,

SPLIT BAND, ACTIVE BRIDGING NETWORK



NOTE: NUMBER OF 2-WIRE PORTS PER SPLIT-BAND BRIDGE SHELF IS DETERMINED BY THE MANUFACTURER.

Fig. 4—Split-Band, Active Bridging Network

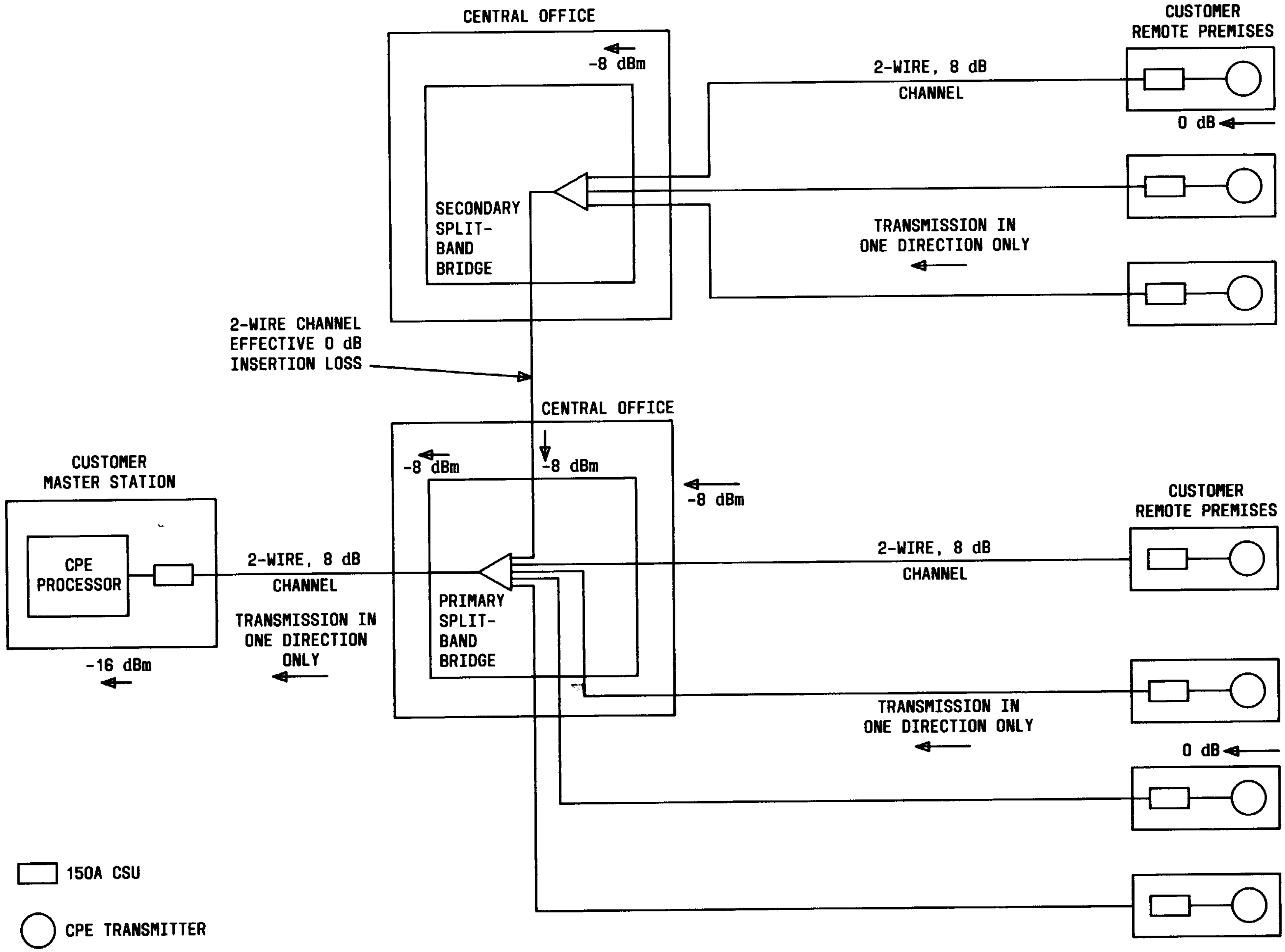


Fig. 5—Summation, Active Bridging Using Split-Band Bridging Equipment

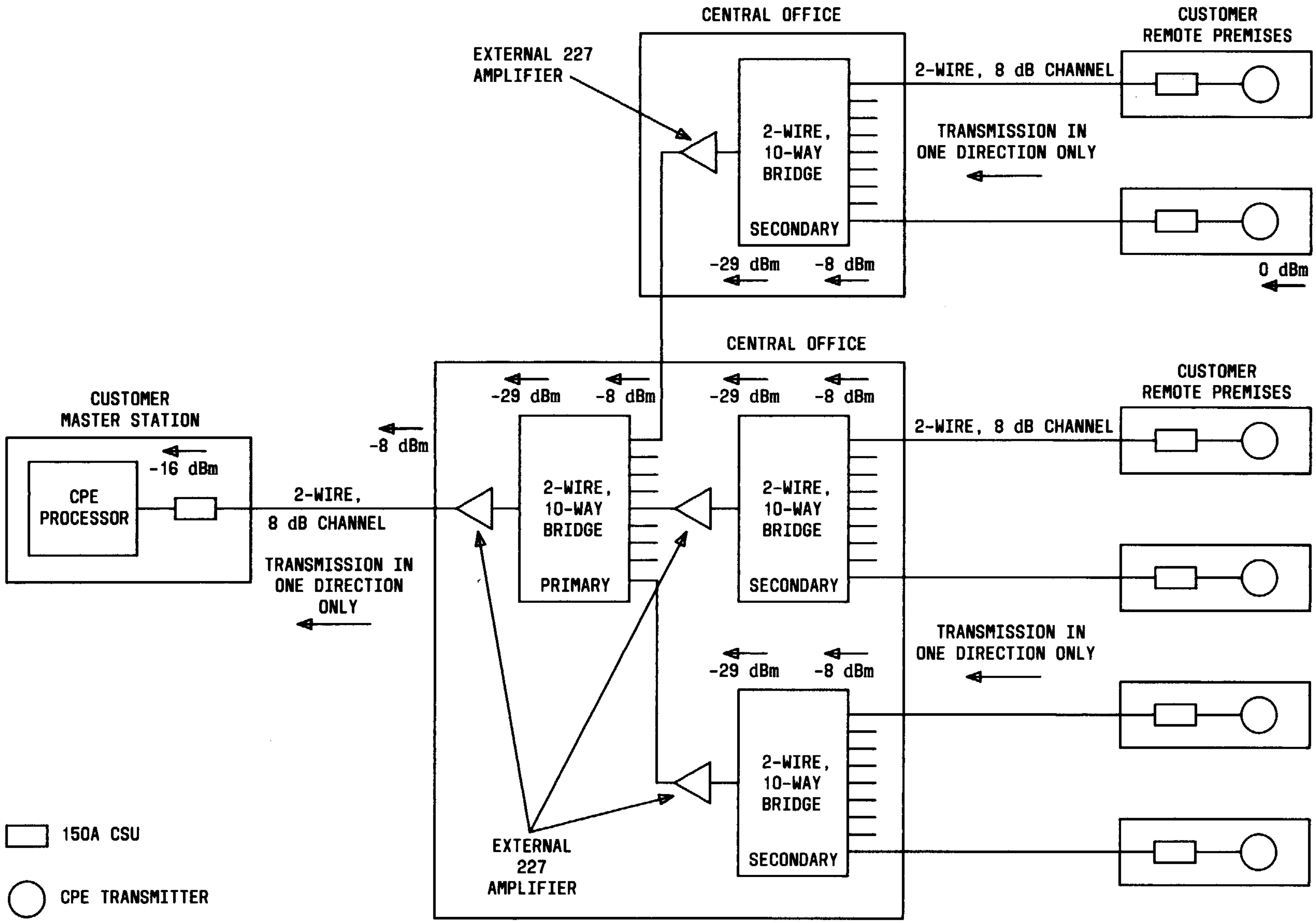


Fig. 6—Summation, Active Bridging Using Passive Bridging Equipment

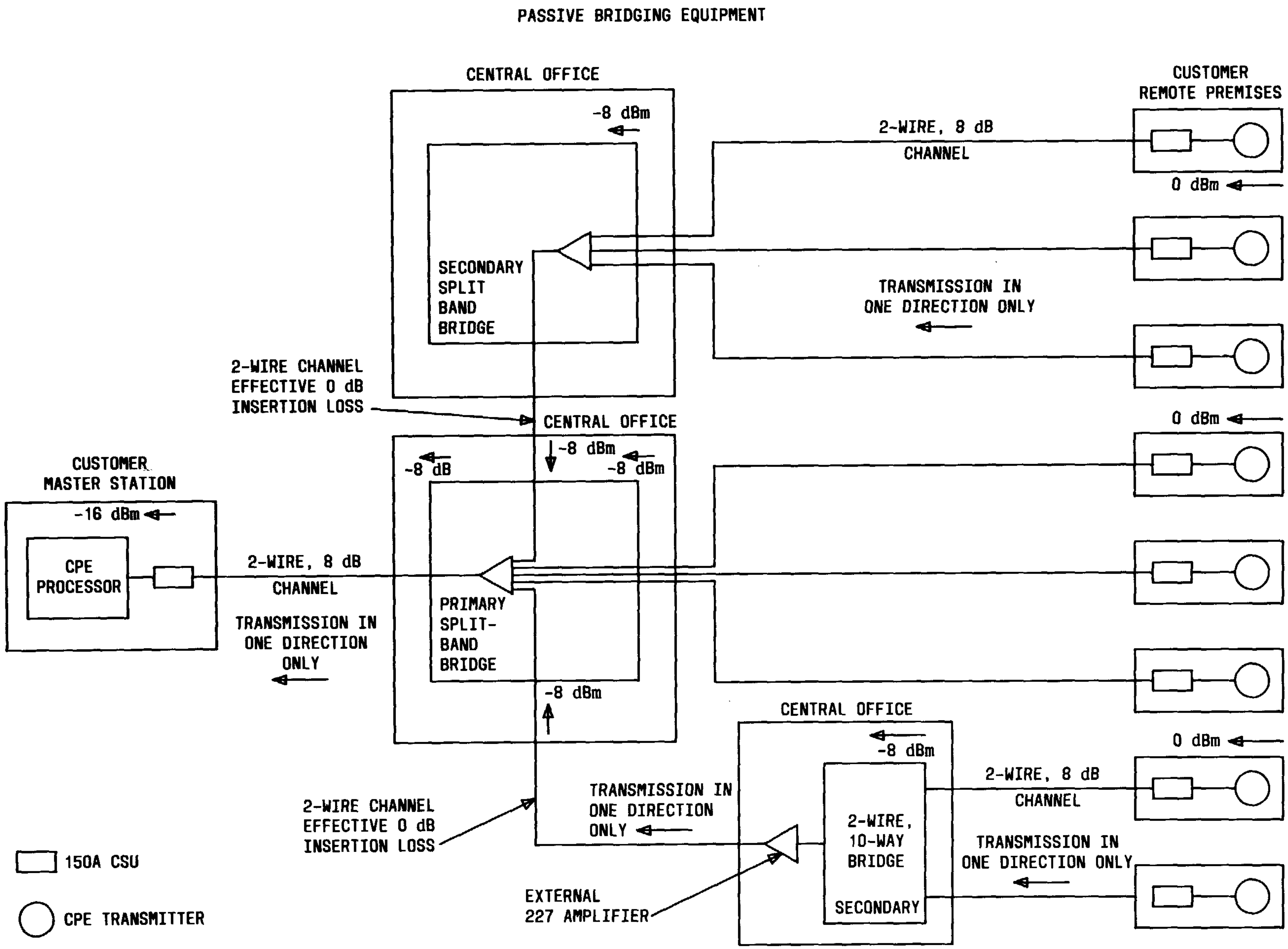


Fig. 7—Summation, Active Bridging Using A Combination of Split-Band and Passive Bridging Equipment

active bridging, the bridge may be tandemed, ie, the signal from a remote premises may be fed through the bridge on which that premises is terminated to another bridge on which the master station is terminated. In this manner a signal from a remote premises may pass through more than one bridge.

2.13 A typical master station designed for use with summation, active bridging may have 60 individual tone sources (and thus a maximum of 60 customer remote premises) connected to a single multipoint network. The transmit level of each of the 60 tones at the remote location would be -18 dBm into 600 ohms. (The CPE is designed to meet this requirement.) Therefore, when the 60 tones are composited at the bridge, the total power will not exceed 0 dBm. The overall network is designed for 16-dB loss at 1000 Hz end-to-end; therefore, each individual tone is received at the master station at approximately -34 dBm. At the master station, the customer provided receiver continuously monitors for presence of each individual tone. Absence of an assigned tone would normally indicate a problem at the remote premises.

2.14 Summation, active bridging is a special application of the equipment used to provide either passive or split-band, active bridging. When using split-band bridging equipment for summation bridging, the mounting, the summation card (without band splitting filters), and the 2-wire port cards would be required. The distribution card would not be required since transmission is in *one* direction only. Using the passive bridging equipment for summation bridging, an external 227 or metallic facility terminal (MFT) type amplifier would be required on the master station side of the 2-wire, 10-way bridge. This amplifier would be required to compensate for the loss through the bridge. The passive equipment would otherwise be the same as that used to provide passive bridging.

3. CHANNEL ARRANGEMENTS

3.01 After the initial bridge has been installed, end-to-end measurements need not be made again except in trouble conditions. When adding bridges and/or remote stations, only those additional segments need be tested. There are four channels used in telemetry and alarm services. They are:

- Two-wire, 8-dB channel — The only channel type used to provide passive bridging. In split-band, active bridging, this channel is used between the bridge and the remote premises. In summation, active bridging, this channel is used between the bridge and the master station or remote premises.
- Four-wire, 8-dB channel — Used in split-band, active bridging between the master station and the bridge.
- Two-wire, 0-dB (effective) channel — Used between bridges in summation, active bridging.
- Four-wire, 0-dB (effective) channel — Used between tandemed split-band, active bridges.

The transmission requirements of each channel are given in Table B.

3.02 The 2-wire, 8-dB channel from a design standpoint is very similar to the type 40 channel used in DATAPHONE® Select-A-Station Service (DSAS). The major difference is that the type 40 channel is a 12-dB channel instead of 8 dB; however, more than 90 percent of the loops will be less than 6.8 dB [8.0 dB minus the minimum insertion loss of a 150A channel service unit (CSU)]. Therefore, the only difference between the type 40 channel and this channel would be, in the majority of cases, the loss adjustment in the 150A CSU.

3.03 The 4-wire, 8-dB channel from a design standpoint is exactly the same as the type 41 channel used in DSAS. The channel will terminate at the customer premises in an 829A data auxiliary set (DAS), will receive a 0-dBm transmit level from the customer, and will present a -16 dBm receive level to the customer.

3.04 The 2-wire, 0-dB channel is used between summation bridges. The amplifier associated with the secondary bridge is an integral part of this channel. This amplifier is set to compensate for the loss through the secondary bridge and the channel. The level at the input of the primary bridge must be the same as the receive level at the secondary bridge. This level will be the same level as that of a remote premises channel terminating directly on the primary bridge (-8 dBm).

3.05 The 4-wire, 0-dB channel is for use between split-band bridges. Here again, the amplifiers associated with the bridge are an integral part of the channel, compensating for the insertion loss of the channel and providing compatible levels at the bridge.

TABLE B

CHANNEL TRANSMISSION REQUIREMENTS

TYPE CHANNEL	1-KHZ LOSS	1-KHZ LOSS LONG TERM VARIATION	LOSS VERSUS FREQUENCY	NOISE	
				C-NOTCHED	IMPULSE (NOTE 1)
2-Wire, 8 dB	8.0 dB ± 0.5 dB	±2.0 dB	500 to 2800 Hz −2.0 dB to +8.0 dB*	31 dBrnc	5 Counts†
4-Wire, 8 dB	8.0 dB ± 0.5 dB	±2.0 dB	500 to 2800 Hz −1.0 dB to +3.0 dB 300 to 3000 Hz −2.0 dB to +6.0 dB	31 dBrnc	5 Counts†
2-Wire, 0 dB	0 dB (effective)‡	±1.0 dB	500 to 2800 Hz −1.0 dB to +3.0 dB 300 to 3000 Hz −2.0 dB to +6.0 dB	31 dBrnc	5 Counts §
4-Wire, 0 dB	0 dB (effective)¶	±1.0 dB	500 to 2800 Hz −1.0 dB to +3.0 dB 300 to 3000 dB −2.0 dB to +6.0 dB	31 dBrnc	5 Counts §

Note 1: Measurement made for 5 minutes.

* When used for summation master station channel, 500 to 2800 Hz limits are −1.0 dB to +3.0 dB.

† Measurement made with a threshold of 64 dBrn.

‡ The gain of the amplifier associated with the secondary bridge should be adjusted to compensate for the insertion loss of the interbridge facility and any losses in the secondary bridge. Therefore, the signal level at the input to the primary bridge will be the same as the input at the secondary bridge (−8.0 dBm).

§ Measurement made with a threshold of 72 dBrn.

¶ The gain of the amplifier associated with the secondary bridge should be adjusted to compensate for the insertion loss of the interbridge facility and any losses in the secondary bridge. The transmit and receive levels between the bridges should be compatible with the interoffice facility requirements.