ADVANCE PRINTING



# TRAFFIC SERVICE POSITION SYSTEM NO. 1
# GENERIC 1T8 FEATURES
# TRANSMISSION ENGINEERING CONSIDERATIONS

CONTENTS PAGE





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## 1. GENERAL

**1.01** The Traffic Service Position System (TSPS) No. 1 is a stored-program controlled electronic switching system. It is designed to extend the direct customer-dialed long distance service by providing certain customer-dialing features which previously required operator dialing. This section describes the transmission plan and engineering considerations associated with generic program 1T8. The features provided by this generic include the following:

(a) Automatic Coin Toll Service (ACTS)

(b) Detection of signaling irregularities (SIGIRR)

(c) Trunk rehome

(d) Improved program tape unit diagnostics

(e) Hotel billing-information system interface

(f) Improve measurement of call duration

(g) Dynamic queuing strategy and improved queuing for transfer CAMA traffic

(h) Expanded dialing to Mexico.

Of these, only the ACTS and SIGIRR features have an impact on the TSPS transmission plan. This section describes only the changes to the existing TSPS transmission plan that are required by the addition of the ACTS and SIGIRR features of Generic 1T8. Transmission considerations associated with previous generics are presented in Sections 852-400-100 and 852-404-101.

**1.02** When this section is reissued, the reason for reissue will be given in this paragraph.

**1.03** The ACTS feature further mechanizes the handling of coin toll calls at the TSPS. This mchanization is accomplished through the addition of a Station Signaling and Announcement Subsystem (SSAS) at the TSPS to provide announcements to customers and to count coin deposits. With ACTS, the functions of quoting the charges on initial contact and charge-due phases of a call, verifying the amount deposited, collecting the coins, and notifying the customer at the end of the initial period are handled without operator intervention on most coin-paid calls. When operator assistance is needed, the SSAS detects and counts coin deposits, displays this information to the operator, and provides protection against coin deposit fraud. In addition, the announcement capabilities of the SSAS are used to automate non-coin notifications and time-and-charge quotations.

**1.04** The SIGIRR feature detects irregular changes in trunk supervision from toll offices. Irregular signals of this type may be caused by network problems (eg, equipment malfunctions, transmission impairments) or by a customer attempting to bypass the billing process for the purpose of making a free toll call (ie, "blue box" fraud). When irregular signals are detected, the TSPS records pertinent call information including any unauthorized multifrequency (MF) digits. This information is recorded on the automatic message accounting (AMA) billing tape and (optionally) a new channel 6 teletypewriter for subsequent analysis.

## 2. SYSTEM DESCRIPTION

**2.01** Implementation of the ACTS and SIGIRR requires the addition of new TSPS service circuits with connections to the TSPS position link (PL) and trunk link (TL) as shown in Fig. 1.

### Coin Detection and Announcement (CDA) Circuits

**2.02** The Type I and Type II CDA circuits form a part of the SSAS. These circuits are similar in concept to, but different in function from existing TSPS service circuits such as the dial pulse receiver (DPR), multifrequency receiver (MFR), multifrequency outpulser (MFO), and coin control and ringback circuit (CCR). Unlike existing service circuits, which are used to communicate with other switching offices, the CDAs communicate directly with the customer. In conjunction with the SSAS controller and announcement store (ANN STORE), the CDAs provide announcements to the customer and count coin deposits made by the customer. Access to the customer is obtained via a standard TSPS/RTA connection involving a toll connecting (TC) trunk from the local office, a 2-wire (2W) or 4-wire (4W) incoming trunk, and a concentrator and base-remote (BR) trunk for RTA-handled calls. The CDA's interface with the customer either in place of, or in conjuncton with, a TSPS operator. The call is ultimately completed through the toll office to an intertoll (IT) trunk.

**High Impedance Multifrequency Receiver (HMFR)**

**2.03** The detection of unauthorized MF digits by the SIGIRR feature is accomplished by attaching a HMFR to the call. The HMFR is a TSPS service circuit, with a single connection to the position link network.

## 3. TRANSMISSION OBJECTIVES

**3.01** The transmission objectives for TSPS No. 1 and TSPS No. 1 with RTA with Generic 1T8 are the same as stated in Sections 852-404-100 and 852-404-101. Any circuits inserted in tandem in a normally occurring circuit should not introduce an unacceptable increase in transmission loss, circuit noise, signal propagation delay, or signal power reflections.

## 4. TRANSMISSION PLAN

### A. GENERAL

**4.01** This part describes the transmission and signaling configurations which are unique to the ACTS and SIGIRR features of Generic 1T8. It shows how the CDAs and the HFMR interface with existing TSPS equipment, what transmission and signaling paths are established, and the transmission level points (TLPs) throughout the system.

### B. ACTS

**Initial and End-of-Call Seizures**

**4.02** The CDA arrangement shown in Fig. 2 is used on those phases of an ACTS call which doesn't require coin deposit detection while the called customer is present. These include initial and end-of-call seizures (during which the called party is disconnected) and notification at the end of the initial period. This arrangement is also utilized to provide non-coin notifications and time-and-charge quotations.

**4.03** For these situations, the position-link (PL) appearance of the Type I CDA (ie, the P1 port) is connected to the T1 port of the incoming trunk circuit, either directly (for a base TSPS call) or via a zero-loss B-R trunk and concentrator connection (for an RTA call). On those seizures requiring coin deposit detection, the trunk circuit is placed in the "split" state with the called customer disconnected. Customer announcements are generated by the CDA announcement circuit (ANN) and are inserted into the connection at the T1 port of the CDA; there is nominally 0 dB of loss between the announcement circuit and the T1 port of the trunk circuit.

**4.04** When required, detection of coin deposit signals is performed by the CDA coin tone receiver (CTR) which is located at a -3 TLP.

**4.05** Protection against announcement interference with coin deposit detection is achieved by isolating the CTR through the use of 4-wire transmission within the CDA.

**Interim Charge-due Seizure (2-wire Trunk)**

**4.06** For phases of ACTS calls which require the detection of coin deposit signals with the called customer present, the Type II CDA is used. These situations include interim charge-due seizures (typically occurring every ten overtime intervals), initial seizures from postpay coin stations, and initial seizures where the required charges could exceed the hopper capacity of the coin station ("large-charge calls"). Figure 3 shows the arrangement utilized for call situations of this type occurring on 2-wire trunks. This arrangement provides protection against both unintentional speech interference with coin deposit detection, and attempted coin deposit fraud by the called customer. This is accomplished by routing the calling-called customer connection through the CDA via the T1 and T2 ports of the incoming trunk circuit.

**4.07** The Type II CDA is placed in its "2-wire mode" under program control. In this configuration, three simultaneous 0 dB connections are established through the CDA: P1-T1, P2-T1, and P1-P2. The connections are established between the P1 port, T1 port, CTR 1, and ANN of the Type II CDA and the T1 port of the trunk circuit, are analogous to the Type I CDA, except that the 2-wire/4-wire hybrid facing ANN in the Type 1 CDA is incorporated into the 3-way bridge of the Type II CDA. The calling-called customer path is maintained via the P1-P2 connection within the CDA.

**4.08** ACTS announcements are directed to both the calling and called customers via the CDA P1 and P2 ports, respectively. The clipper/filter (CF) contains a signal power limiter and band-filter

to effectively block any fraudulant coin deposit signals generated by the called customer which could ultimately be reflected into CTR 1 due to poor return loss at the P1 port of the CDA. CTR 2 is connected at a -3 TLP, and arranged to detect any coin deposit fraud attempts by the called customer.

**Interim Charge-due Seizure (4-wire Trunk)**

**4.09** The CDA arrangement shown in Fig. 4 is utilized to handle the same call situations identified in the previous section, except on 4-wire trunks. This arrangement is compatible with the JW237 RTA 4-wire incoming trunk circuit and all base TSPS 4-wire incoming trunk circuits. It provides protection against both unintentional speech interference with coin deposit detection, and attempted coin deposit fraud, by the called customer. In this arrangement, the calling-called customer connection is maintained directly through the trunk circuit.

**4.10** The Type II CDA is placed in its "4-wire mode" under program control. In this configuration, the connections between the P1 port, T1 port, CTR1 and ANN of the Type II CDA and the T1 port of the trunk circuit are analogous to the Type I CDA. ACTS announcements are directed to both the calling and called customers via the T1 port of the trunk circuit and its associated bridging repeater. Protection against speech interference and attempted fraud by the called customer is achieved by monitoring the T2 port of the trunk circuit for coin deposit signals with CTR 2 (via the P2 port of the CDA). The levels of coin deposit signals received by CTR 1 and CTR 2 are compared, and a determination made as to whether the received coin deposit signal is legitimate or fraudulent. Because of this signal comparison, strict adherence is required to the recommended alignment for incoming trunks.

**4.11** The JW217 and JW218 RTA 4-wire incoming trunk circuits do not provide the T2 port access required to achieve maximum protection against unintentional speech interference with coin deposit detection, and attempted coin deposit fraud, by the called customer. Their use is, therefore, not encouraged. However, the CDA arrangement shown in Fig. 5 will permit these trunk circuits to be used with generally satisfactory performance in situations when the called customer is present during coin deposit detection. With this arrangement, the Type II CDA is placed in its "Type I mode" under program control, allowing it to assume the operating configuration of a Type I CDA. Its use is analogous to that just described for other 4-wire trunk circuits, except that no connection is established between CTR2 and the T2 port of the JW217/JW218 trunk circuit.

**Initial Seizure on Large-Charge Calls**

**4.12** The CDA configuration shown in Fig. 6 is used for those ACTS call phases normally requiring a Type-II CDA because of the presence of the called customer, but in which the called customer is disconnected for a portion of the phase. These situations include large-charge initial seizures prior to called customer answer, and interim charge-due seizures during which the called customer hangs up. In this arrangement, the Type II CDA is placed in its "Type I mode" and used in a manner analogous to the Type I CDA.

**Service-Observed and Operator-Assisted ACTS Call**

**4.13** Due to the circumstances of a particular call, operator assistance may be required for the ACTS call situations discussed in paragraphs 4.02 to 4.12. In addition, each of these calls may be service-observed. The resulting configuration is shown in Fig. 7 for the Type I CDA and a base TSPS incoming trunk; configurations for the other call situations are analogous. As indicated in the figure, the 0 dB service-observing circuit (SVC OBS) is inserted between the T1 port of the trunk circuit and the P1 port of the CDA. The operator is connected to the T1 port of the CDA, and is therefore indirectly connected to the T1 port of the trunk circuit via the CDA and service-observing circuit (a nominal 0 dB path).

**Coin Station Test Call**

**4.14** The Type I CDA may be used to facilitate testing of the signaling capability of coin stations equipped with dual-frequency signal generators as shown in Fig. 8. The CDA configuration is analogous to that described in paragraph 4.02 except that 3 dB of additional loss is inserted ahead of the CRT, thereby reducing the transmission level at that point to -6TLP. This arrangement provides a stringent test environment in which the craftsperson located at the coin station can verify the ability of the TSPS to detect coin deposit signals from the station under test.

### C. SIGIRR

**4.15** When irregular toll office supervision is detected on a base TSPS or RTA incoming trunk, or a base TSPS delayed call trunk, an HMFR is connected to the call in order to monitor any unauthorized MF digits. The HMFR connection for base TSPS and RTA incoming trunks is shown in Fig. 9; the arrangement for delayed call trunks is analogous. In either case, the HMFR is simply connected to the T1 port of the trunk circuit, either directly (for a base TSPS call), or via a 0 dB B-R trunk and concentrator (for an RTA call).

### D. TRANSMISSION REQUIREMENTS

**4.16** ***Transmission Loss and Noise:*** The loss and noise objectives for the CDA and HMFR are given in Table A. The transmission loss/gain of both Type I and Type II CDA circuits will be adjusted to 0 dB in all possible voice transmission paths through these circuits. Also, the circuit noise and signal propagation delay introduced by either the Type I or Type II CDA circuits will be sufficiently small to be negligible in the ACTS application.

**4.17** ***Balance:*** Referring to Fig. 1 through 4, it can be seen that there are two 4-wire terminating sets (4WTSs) in the Type I CDA circuit and two 4WTSs and a 900-ohm hybrid associated with the 3-way, 4-wire bridging repeater in the Type II CDA circuit. These 4WTSs and the 900-ohm hybrid employ a transformer-type balanced hybrid junction between 4-wire transmission and 2-wire transmission. Because of the use of a transformer-type balanced hybrid, signal power reflections will occur whenever differences exist between the impedance of the circuit connected to its 2-wire line port and that of the circuit connected to its balance network port. Therefore, it is necessary to control the impedance of the circuits connected to these two ports to minimize any signal power reflections which would degrade the loss-noise-echo transmission performance provided on a given connection when added in tandem to that connection. In all except one of the ACTS-related connections, only a Type I or Type II CDA circuit will be added at the TSPS base unit in tandem with the connection between the TSPS operator and the TSPS bridging access points on the toll connecting (TC) trunk carrying the coin toll call. However, two base-remote (BR) trunks in addition to a Type II CDA circuit will be inserted in tandem in the connection between the calling and called customers during coin deposit announcement and registration during talking state intervals when TSPS access to the TC trunks carrying the coin toll call is provided via an RTA 2-wire incoming trunk circuit as indicated in Fig. 2.

**4.18** In general, balancing of the ACTS-related connections involving the Type I and Type II CDA circuits will not impact the balance already achieved on other connections through the TSPS base unit switching network and the RTA concentrator. If the TSPS base unit has not yet been balanced because there is no RTA associated with it, or any PSS 2 operator unit over 200 miles away, ***the Base Unit will be balanced and certified as balanced when ACTS features are applied.***

**4.19** To balance the non-ACTS part of the TSPS, refer to Section 852-404-101.

**4.20** The echo return loss (ERL) and singing return loss (SRL) balance requirements presented in Section 660-463-301 are reference values. If balance measurement results meet or exceed the requirements in Section 660-463-301, no further action is necessary. If measurement results are below the requirements in Section 660-463-301, the results will be reported to the transmission engineer. The transmission engineer will determine whether the results meet ERL and SRL requirements based on the median and minimum criteria in Tables B and C.

**4.21** The following are the steps in balancing the CDA circuits. Detail procedures are available in Section 660-463-500:

(a) The NBOC of the hybrid balancing network of HYB1 (1P 4WTS) of the Type I and Type II CDA circuits is set equal to the value used in the 1P 4WTS associated with PSS No. 2 and retrofitted PSS No. 1 operator position trunks of that base unit.

(b) Verify that NBOCs in the 1P 4WTS have been properly strapped by testing from each 1P 4WTS to a termination provided by the CDT trunk link network (TLN) port.

(3) The DBOC associated with port T1 of the Type I and Type II CDA circuits is set to maximize the balance provided at the 1P 4WTS

in the balance test circuit of the control, display and test (CDT) circuit when connected through the TSPS base unit switching network to port T1 of the Type I or Type II CDA circuit.

(d) The NBOC of the hybrid balancing network of HYB2 (1M 4WTS) of the Type I CDA is set to maximize the balance of HYB2 with the balance test circuit of the CDT circuit connected through the TSPS base unit switching network to the T1 port of the Type I CDA circuit.

(e) The NBOC of the hybrid balancing network of the 900-ohm hybrid in the 3-way, 4-wire bridging repeater is set to maximize the balance of this 900-ohm hybrid with the balance test circuit of the CDT circuit connected through the TSPS base unit switching network to port T1 or the type II CDA circuit.

(f) The NBOC of the hybrid balancing network of HYB2 (1M 4WTS) of the Type II CDA circuits is set equal to the value used in the 1P 4WTSs associated with PSS No. 2 and retrofitted PSS No. 1 operator position trunks of the TSPS base unit.

(g) The integrity of HYB2 of the Type II CDA is checked and the setting of its NBOC is verified.

(h) The DBOC associated with the idle circuit termination (ICT) for the 2-wire line port of HYB2 is set to maximize the balance of HYB2 when the ICT is connected to the 2-wire line port of HYB2.

(i) The switchable DBOC associated with the 2-wire line port of HYB2 of the Type II CDA circuit is set equal to the average of the largest and the smallest values for the DBOCs associated with the base trunk, base-remote trunk circuits of all of the BR trunks in the TSPS base unit have been balanced.

(j) The integrity of the switchable DBOC is checked and its setting is verified.

**4.21** ***Balance Certification:*** If measurement results meet or exceed the requirements for a given test connection presented in Section 660-463-301, the entity will generally be certified if other requirements in Section 852-400-010 are met. The initial certification and recertification requirements are presented in Section 852-400-010.

## 5. TRANSMISSION ENGINEERING CONSIDERATIONS

**5.01** This part presents the considerations for standard TSPS connections involving ACTS and SIGIRR.

### A. Type I CDA

**5.02** The Type I CDA is shown in Fig. 10. Switchable pads are provided in the Type I CDA and are activated under program control. The pad provides 3 dB of additional loss to the received coin deposit signals and is only activated for coin station test calls. It provides a reduction in CTR sensitivity for testing coin station dual-frequency signal generators. CTR and ANN are both high impedance circuits. CTR is designed to bridge onto a terminated 600-ohm line; ANN is designed to be bridged onto a terminated 900-ohm line. Network build-out capacitors (NBOCs) and a drop build-out capacitor (DBOC) compensate for variation in office wiring and permit CDA balance requirements to be met.

### B. Type II CDA

**5.03** The Type II CDA is shown in Fig. 11. When the CDA P2 port is connected to the T2 port of an RTA 2-wire trunk via a BR trunk, the active termination at the base end of the BR trunk is removed in order to properly terminate the CDA 1M terminating set. Removal of this termination also removes the associated DBOC of the BR trunk. In order to meet balance requirements imposed on the 1M terminating set, a DBOC is switched onto the CDA P2 port under program control. In the 4-wire mode a matching pad and DBOC must be inserted into the P2 port of the CDA in order to properly terminate the 1M terminating set within the BR trunk and provides the proper voltage levels to CTR2. This is accomplished under program control by inserting a terminated, 900-ohm 1.8 dB pad and DBOC for connections to an RTA trunk (see Fig. 12). A second DBOC is required to properly terminate the 1M terminating set of the CDA for connections to both RTA and base TSPS trunks. The type II CDA used in the Type I mode is analogous to the 4-wire mode of the Type II CDA, except that no connection is established to the CDA P2 port (see Fig. 13).

### C. High-Impedance Multifrequency Receiver (HMFR)

**5.04** The HMFR consists of a conventional MF receiver, preceded by a 1P terminating set and amplifier which provide the required high impedance interface with the position link network (see Fig. 14).

### D. Four-Wire Bridging

**5.05** The ACTS and SIGIRR features are compatible with 4-wire base unit incoming trunks equipped with the following repeaters:

(a) Four-wire bridging repeater (SD-7C022-01)

(b) Three-way 4-wire bridging repeater (SD-99782-01).

The ACTS and SIGIRR features are compatible with 4-wire RTA incoming trunks equipped with the following repeaters:

(a) Four-wire bridging repeater (SD-7C022-01)

(b) Three-way 4-wire bridging repeater (SD-99782-01).

In order to achieve protection against called party fraud with the ACTS feature, 4-wire incoming trunks must be aligned according to the TSPS transmission level standards specified in paragraph 5.09. In some cases, compliance with these level standards will require the installation of additional amplifiers. Failure to comply with these standards will require the ACTS fraud feature to be disabled via office data.

**5.06** The TSPS 4-wire bridging repeater is standard but, the use of 424V4-type repeater may be found in existing TSPS base units. It should be noted that a DBOC is provided on the 2-wire port of the TSPS 4-wire bridging repeater but is not provided on the 2-wire port of the 424V4-type repeater. Exclusion of the DBOC will preclude balance adjustments to be made to meet balance requirements at 1P terminating sets in operator position trunks and CDAs. A DBOC cannot be added to the 2-wire port of the 424V4-type repeater because the hybrid balancing network of the 1J 4WTS used does not include a NBOC needed to balance the effect of the addition of a DBOC. Due to this shortcoming, all of the 424V4-type repeaters in a TSPS base unit should be retrofitted with the TSPS 4-wire bridging repeater. Additional information is given in paragraphs 6.07 through 6.11 of Section 852-404-101.

### E. RTA 4-Wire Incoming Trunk Circuit (JW237)

**5.07** In order to realize the full capabilities of the ACTS feature, all RTA 4-wire incoming trunks handling coin traffic must be equipped with the JW237 trunk circuit (SD-1B117-01, SD-1B118-01). Use of the older JW217 (SD-1B117-01) and JW218 (SD-1B118-01) trunk circuits will cause a reduction in the reliability of coin deposit detection and the loss of protection against coin deposit fraud by the called party. The JW237 trunk circuit provides the required T2 port access and proper impedance matching for all connections to the T2 port. The transmission level alignment for RTA 4-wire trunks equipped with the JW237 trunk circuit differs from the alignment for trunks equipped with the JW217 or JW218 trunk circuit, as specified in paragraphs 5.09 and 5.10. Effective with Generic 1T8, the type of trunk circuit equipped must be indicated in office data.

### F. Base TSPS and RTA Incoming Trunk Alignment

**5.08** The transmission alignment required for base TSPS and RTA incoming trunks with Generic 1T8 is specified in Fig. 15 to 21. The information in these figures is, for the most part, simply a restatement or clarification of the alignment levels specified in Sections 852-404-100 and 852-404-101. (Figures 20 and 21 specify the required alignment of RTA 4-wire incoming trunks equipped with JW237 trunk circuits). Adherence to these standard alignments will provide control of the transmission levels at the T1 and T2 ports of the incoming trunk circuits as required by the ACTS feature.

**5.09** The alignment of inward and delayed call trunks is not affected by either the ACTS or SIGIRR feature of Generic 1T8. However, due to the recent introduction of the JW237 trunk circuit, the required alignment of RTA inward trunks equipped with the JW237 trunk circuit is also specified here (see Fig. 22 and 23).

### G. Announcement Level

**5.10** The average power of ACTS announcement is comparable to the average operator speech power of -24 dBm (-21 dBm0).

### H. CTR Sensitivity

**5.11** The CTRs of the Type I and Type II CDAs have a required operating range of -6 dBm to -28 dBm per frequency (-3 dBm0 to -25 dBm0). The median level of coin deposit signals at the class 5 office is -11 dBm0 per frequency for current C-type coin stations.

### I. Wiring Restrictions

**5.12** In order to meet the balance requirements on the CDA and HMFR circuits, the following cable length restrictions must be met.

(a) 100 feet of 26SB cable maximum between the CDA circuit transmission frame (SD-7C038-01) and the SSAS service circuit frame (SD-18302-01)

(b) 100 feet of 26SB cable maximum between the CDA circuit transmission frame (SD-7C038-01) and the Position Link Circuit.

(c) 250 feet of 26SB cable maximum between the CDA circuit transmission frame (SD-7C038-01) and the Trunk Link Circuit.

(d) 100 feet of 26SB cable maximum between the 2-wire port of the 1P 4WTS in the HMFR and the TSPS position link circuit of the TSPS base unit switching network.

### J. Operator Position Trunk

#### Position Subsystem (PSS) No. 2

**5.13** The PSS No. 2 includes a 1P 4-wire terminating set with a 2-wire appearance on the positon link circuit, intertoll grade carrier facilities and/or metallic facilities, and a 4251-type network used as the operator telephone network. The PSS No.2 is the current standard operator position trunk and is compatible with ACTS. Additional information can be found in Sections 852-404-100 and 852-404-101.

#### Position Subsystem (PSS) No. 1

**5.14** The voice transmission portion of the original PSS No. 1 operator position includes a 1H 4WTS, a T1 carrier system or metallic facility and an operator telephone circuit. The PSS No. 2 has replaced the PSS No. 1 as system standard.

**5.15** In order to eliminate transmission deficiencies associated with the original PSS No. 1 voice circuitry, each operator position trunk associated with the PSS No. 1 of existing TSPS base units must be retrofitted as follows:

(a) The operator telephone circuit currently used must be replaced by the 4251-type network

(b) If T1 carrier facilities are used, the existing bridging end DIC channel units which employ 1H 4WTS must be replaced by a DIC channel unit which employ 1P terminating sets, or equivalent

(c) If metallic facilities are used, the existing 4WTSs mounted in 24V4-type repeaters must be replaced by 1P 4WTSs.

### K. Service Observing Trunks

**5.16** The ACTS feature requires that Service Observing Trunks be equipped with the Service Observing Trunk Access Circuit (SD-1B275-01).

## 6. REFERENCES

**6.01** The following references are to the TSPS/RTA ACTS and SIGIRR feature

### A. TSPS No. 1 and RTA Circuits

| DRAWING | TITLE |
|---|---|
| SD-7C038-01 | Coin Detection and Announcement |
| SD-1B302-01 | Station Signaling and Announcement Subsystem |
| SD-1C598-01 | Coin Tone Receiver |
| SD-1B117-01 | RTA Incoming or Inward Trunk |
| SD-1B118-01 | RTA Incoming or Inward Trunk |

### B. TSPS No. 1 Bell System Practices

| SECTION | TITLE |
|---|---|
| 250-131-501 | Station Signaling and Announcement Subsystem, Service Circuits and |

| | | | |
|---|---|---|---|
| | Transmission Equipment, Transmission Tests and Adjustments | 852-401-1-1 | TSPS No. 1, Transmission Engineering Considerations |
| 852-401-101 | TSPS No. 1, RTA, Transmission Engineering Considerations | 660-463-XXX | TSPS and RTA Balance Sections |

TABLE A

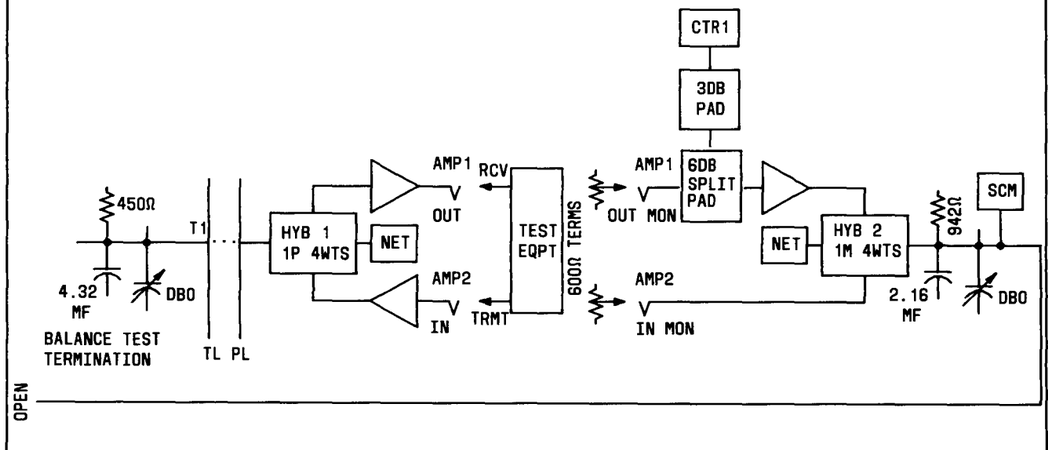
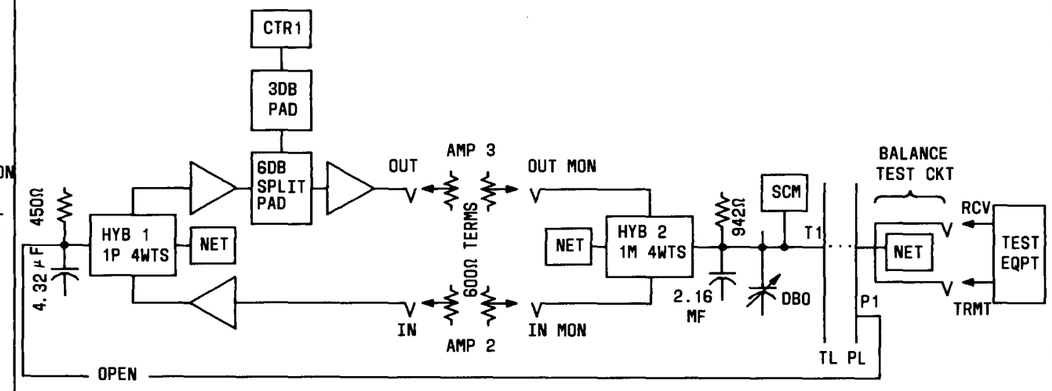
DCA AND HMFR LOSS AND NOISE OBJECTIVES

| CIRCUIT/CONNECTION | LOSS (dB) | NOISE (dBrnC) | REMARKS |
|---|---|---|---|
| Type 1 CDA | | | |
| a) P1 to T1 | 0.0 | < 10 | |
| b) T1 to P1 | 0.0 | < 10 | |
| c) P1 to CTR | 0.0 | — | Only Pad 1 Operated |
| Type 2 CDA | | | |
| a) P1 to T1 | 0.0 | < 10 | |
| b) T1 to P1 | 0.0 | < 10 | Path Includes C/F |
| c) P1 to CTR1 | 0.0 | — | Pad 1 Operated |
| d) P2 to T1 | 0.0 | < 10 | 2-Wire Mode Only |
| c) T1 to P2 | 0.0 | < 10 | 2-Wire Mode Only |
| f) P1 to P2 | 0.0 | < 10 | 2-Wire Mode Only |
| g) P2 to P1 | 0.0 | < 10 | 2-Wire Mode Only. Path Includes C/F: |
| h) P2 to CTR2 | 0.0 | — | 2-Wire and 4-Wire Modes |
| HMFR | | | |
| a) P1 to MF Receiver | 0.0 | — | |

## TABLE B

### TYPE I COIN DETECTION AND ANNOUNCEMENT CIRCUIT

### BALANCING TEST CONDITONS AND REQUIREMENTS

| TEST NO. | TYPE OF TEST | ERL AND SP/SRL TEST CONDITIONS | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ERL IN DB | | | SP/SRL IN DB | | |
| | | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| 1.0 | 1P 4WTS NBOC VERIFI-CATION |   | - | 27 | 27 | - | 27 | 27 |
| 2.0 | HYB 2 PORT DBOC SELECTION AND VERIFI-CATION |   | - | 24 | 21 | - | 19 | 16 |

## TABLE B (CONT)

### TYPE I COIN DETECTION AND ANNOUNCEMENT CIRCUIT

### BALANCING TEST CONDITONS AND REQUIREMENTS

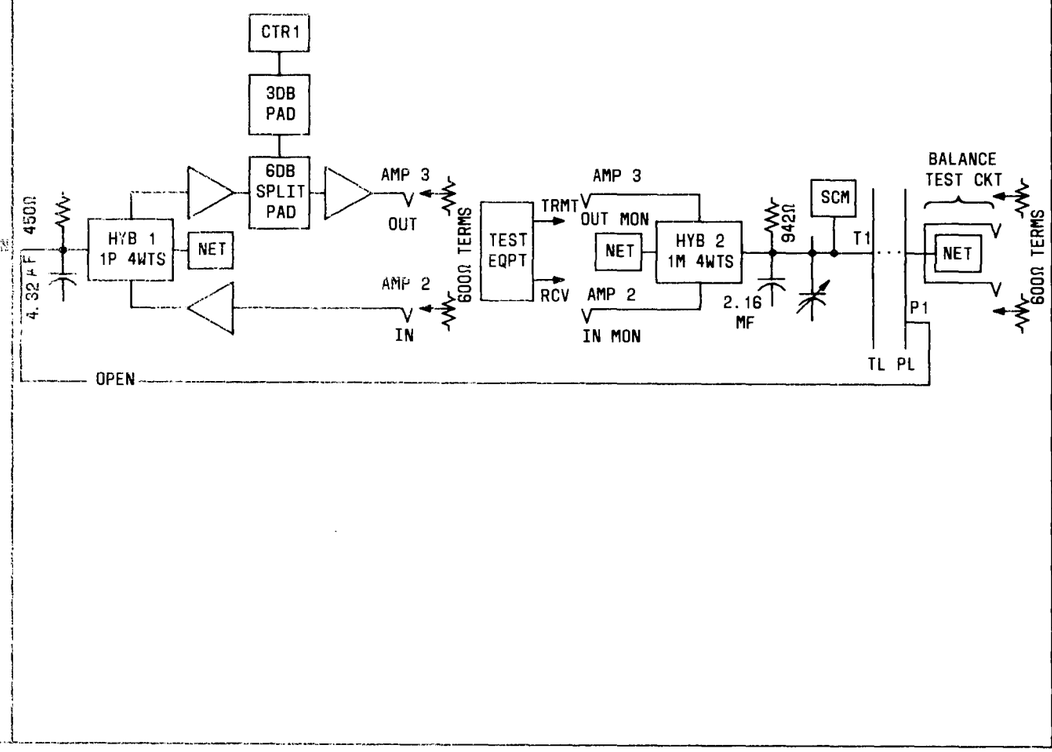
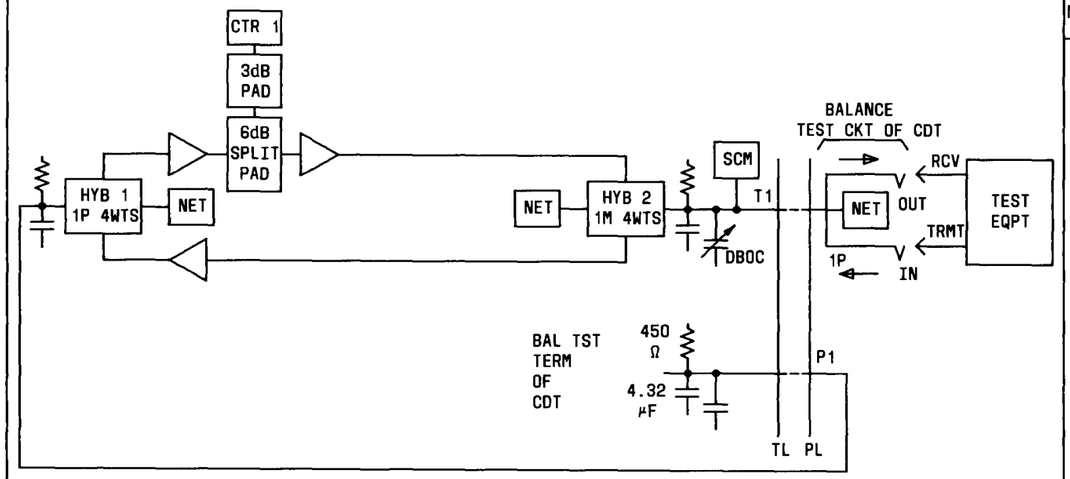
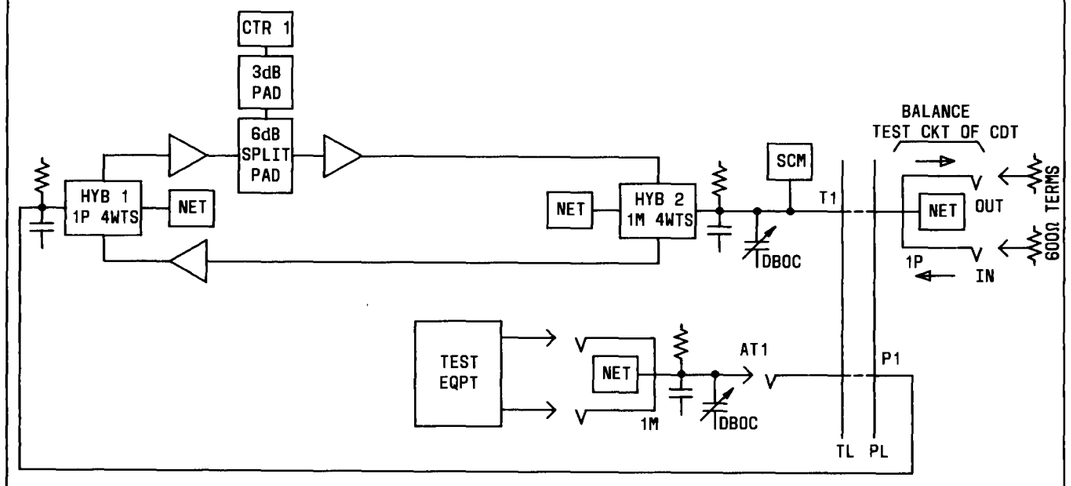
| TEST NO. | TYPE OF TEST | ERL AND SP/SRL TEST CONDITIONS | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ERL IN DB | | | SP/SRL IN DB | | |
| | | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| 3.6 | HYB 2 PORT 4WTS WBOC SELECTION AND VERIFI-CATION |  | - | 25 | 22 | - | 20 | 17 |

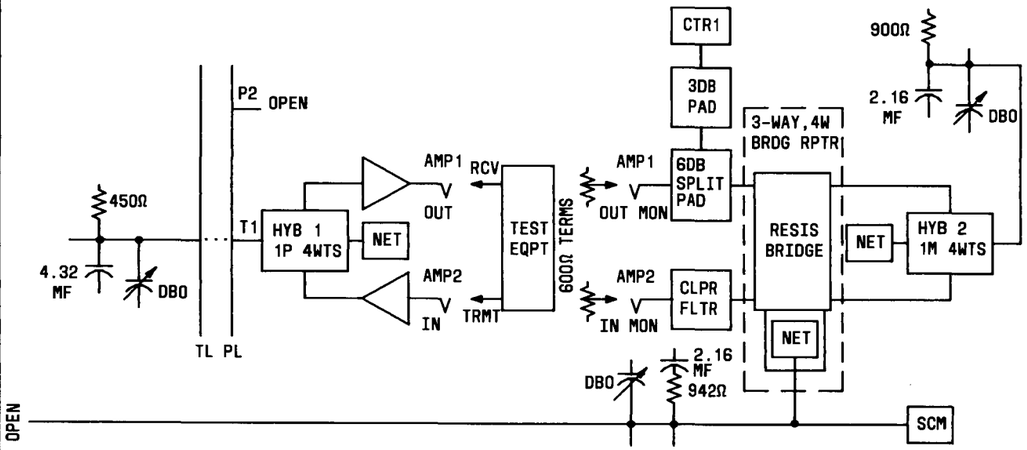
TABLE B CONTINUED

| TEST | TEST CONNECTION | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|
| | | ERL IN DB | | | SP/SRL IN DB | | |
| | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| OVERALL VERIFICATION |  | - | 24 | 21 | - | 19 | 16 |
| OVERALL VERIFICATION |  | - | 25 | 22 | - | 20 | 17 |

## TABLE C

### TYPE II COIN DETECTION AND ANNOUNCEMENT CIRCUIT

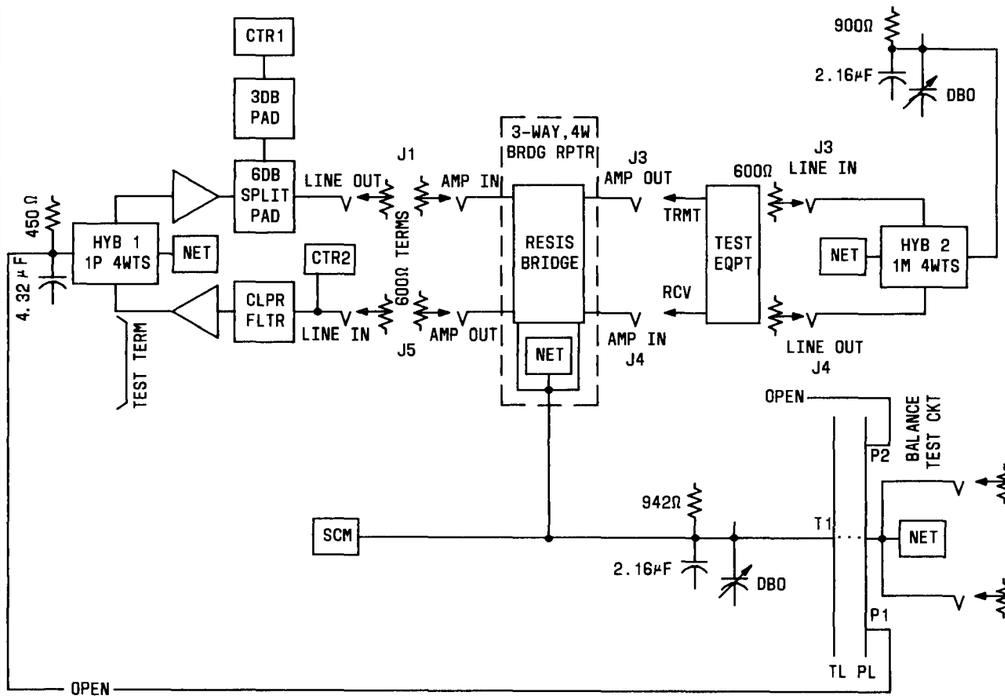
### BALANCING TEST CONDITONS AND REQUIREMENTS

| TEST NO. | TYPE OF TEST | ERL AND SP/SRL TEST CONDITIONS | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ERL IN DB | | | SP/SRL IN DB | | |
| | | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| 1.0 | 1P 4WTS NBOC VERIFI-CATION |  | - | 27 | 27 | - | 27 | 27 |
| 2.0 | T1 PORT DBOC SELECTION AND VERIFI-CATION |  | - | 24 | 21 | - | 19 | 16 |

## TABLE C (CONT)

### TYPE II COIN DETECTION AND ANNOUNCEMENT CIRCUIT

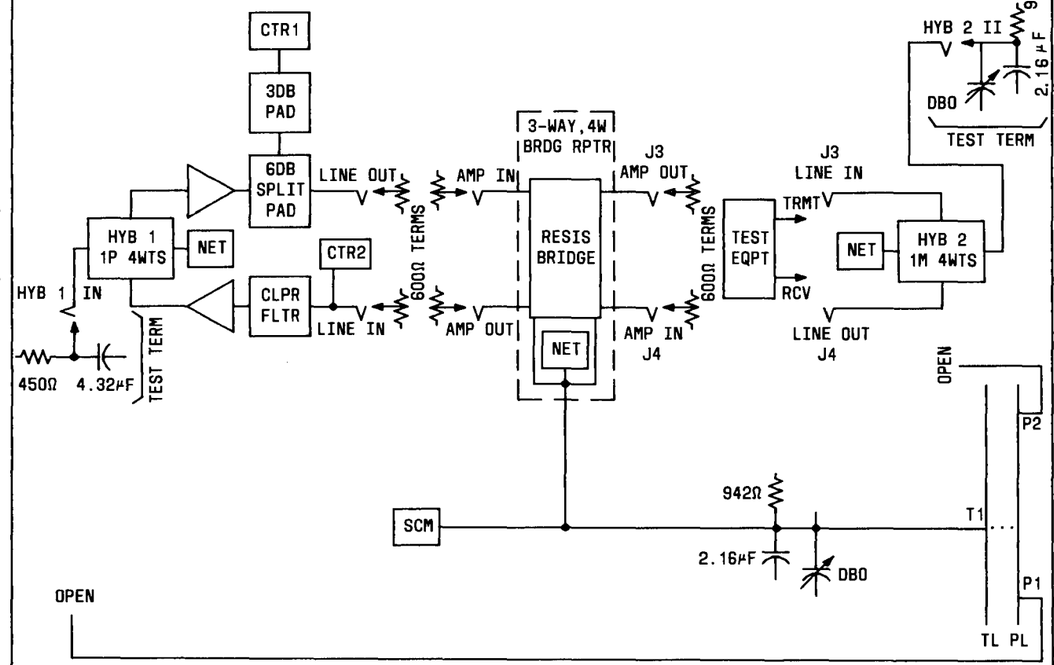
### BALANCING TEST CONDITONS AND REQUIREMENTS

| TEST NO. | TYPE OF TEST | ERL AND SP/SRL TEST CONDITIONS | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ERL IN DB | | | SP/SRL IN DB | | |
| | | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| 3.0 | T1 PORT 4WTS NBOC SELECTION AND VERIFI-CATION |  | - | 25 | 22 | - | 20 | 17 |

## TABLE C (CONT)

### TYPE II COIN DETECTION AND ANNOUNCEMENT CIRCUIT

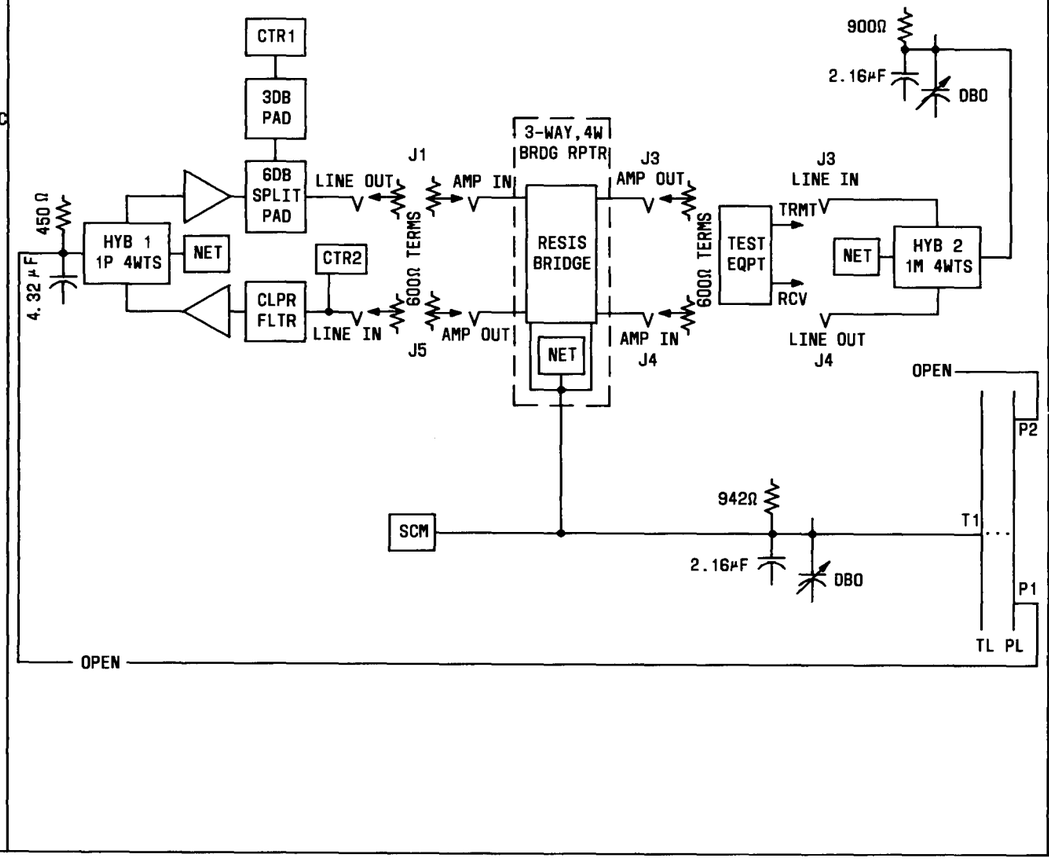
### BALANCING TEST CONDITONS AND REQUIREMENTS

| TEST NO. | TYPE OF TEST | ERL AND SP/SRL TEST CONDITIONS | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ERL IN DB | | | SP/SRL IN DB | | |
| | | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| 4.0 | P2 PORT HYB 2 NBOC VERIFI-CATION |  | - | 33 | 33 | - | 33 | 33 |

## TABLE C (CONT)

### TYPE II COIN DETECTION AND ANNOUNCEMENT CIRCUIT

### BALANCING TEST CONDITONS AND REQUIREMENTS

| TEST NO. | TYPE OF TEST | ERL AND SP/SRL TEST CONDITIONS | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ERL IN DB | | | SP/SRL IN DB | | |
| | | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| 5.0 | P2 PORT ICT DBOC SELECTION AND VERIFI-CATION<br><br>ADJUST-ABLE DBOC |  | - | 33 | 33 | - | 33 | 33 |

## TABLE C (CONT)

### TYPE II COIN DETECTION AND ANNOUNCEMENT CIRCUIT

### BALANCING TEST CONDITONS AND REQUIREMENTS

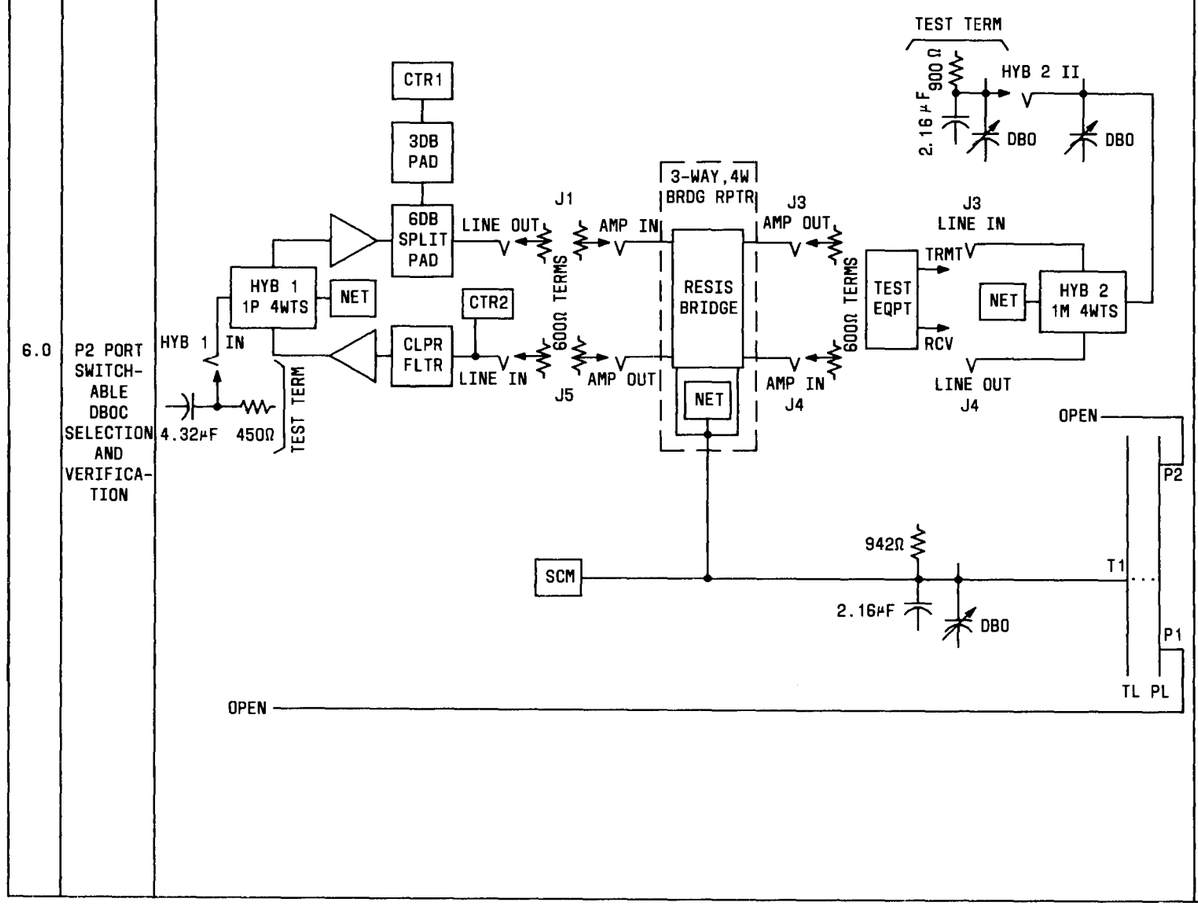
| TEST NO. | TYPE OF TEST | ERL AND SP/SRL TEST CONDITIONS | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ERL IN DB | | | SP/SRL IN DB | | |
| | | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| 6.0 | P2 PORT SWITCH-ABLE DBOC SELECTION AND VERIFICA-TION |  | - | 33 | 33 | - | 33 | 33 |

TABLE C - CONTINUED

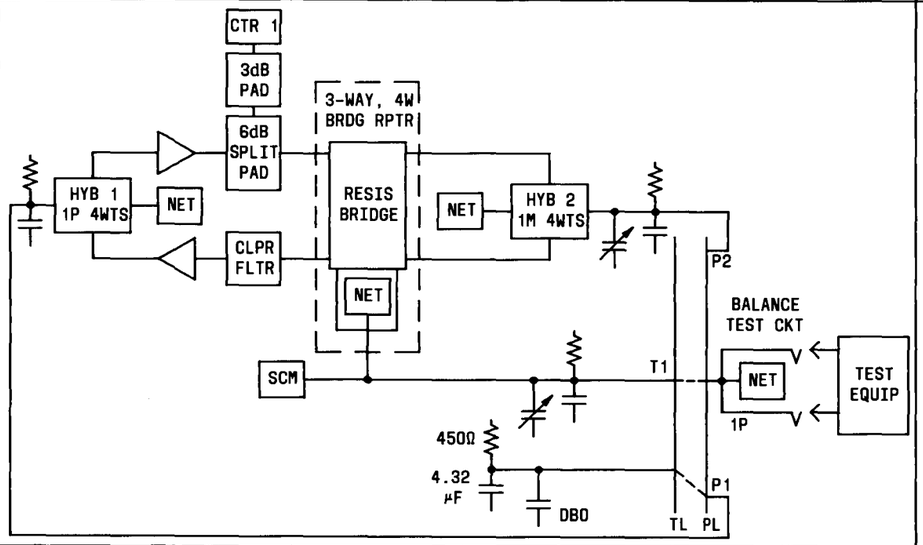
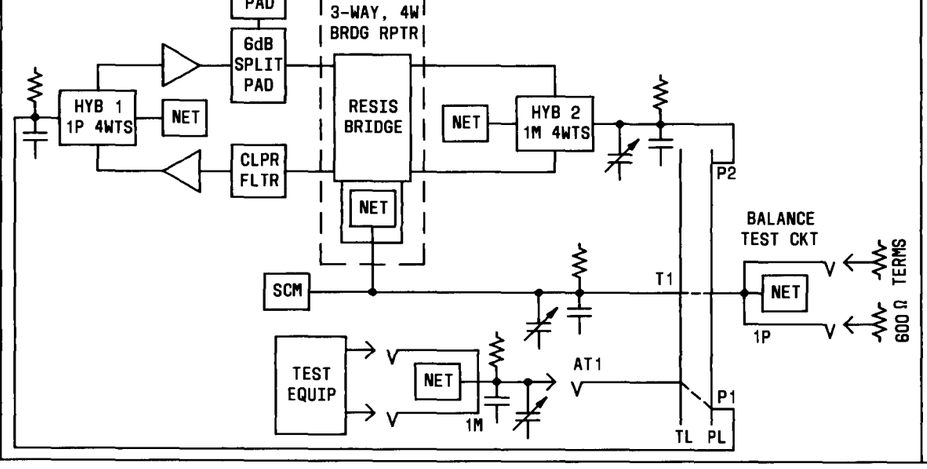
| TEST | CONNECTION | CIRCUIT | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ERL IN DB | | | SP/SRL IN DB | | |
| | | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| |  | T1-P1 | – | 24 | 21 | – | 19 | 16 |
| |  | P1-T1 | – | 25 | 22 | – | 20 | 17 |

TABLE C - CONTINUED

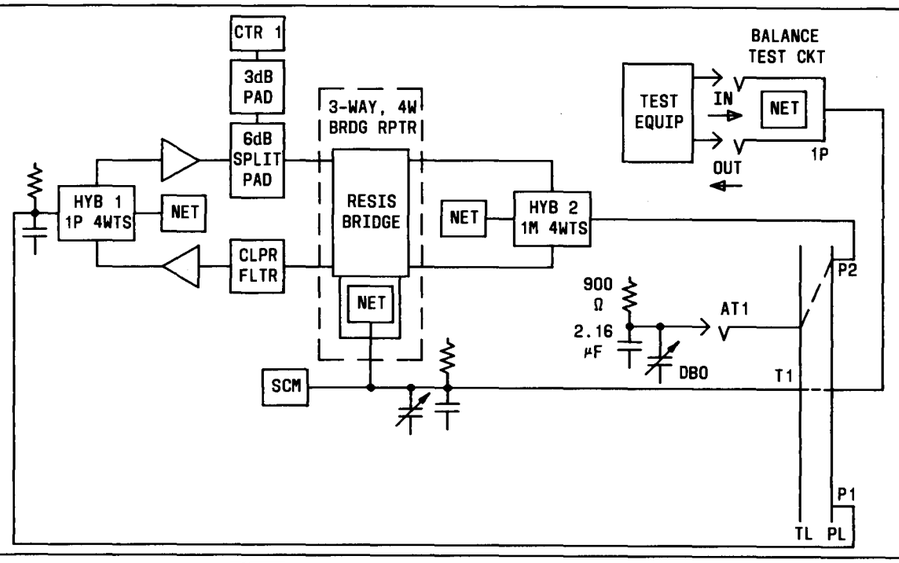
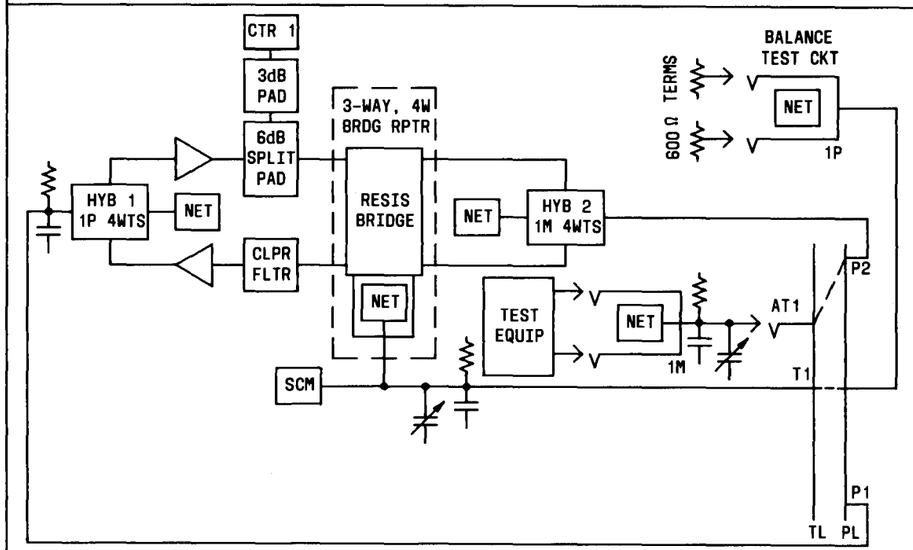
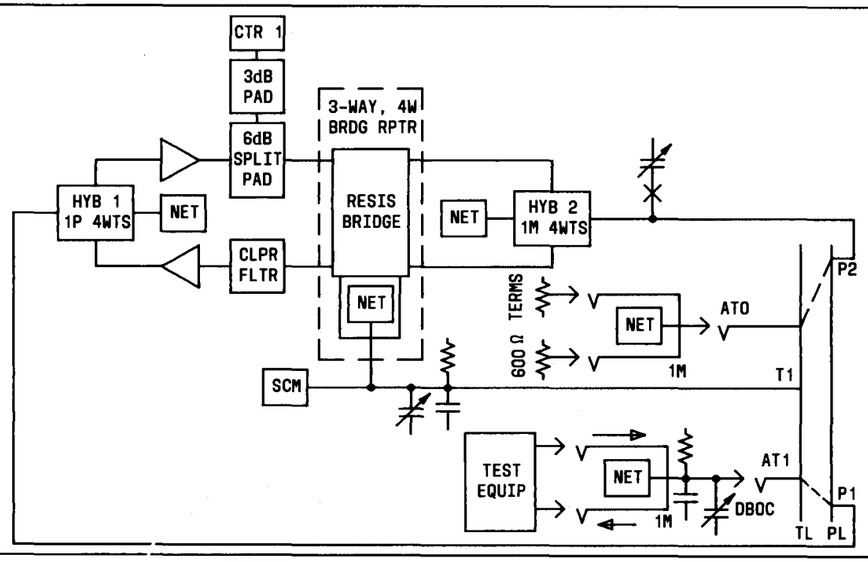
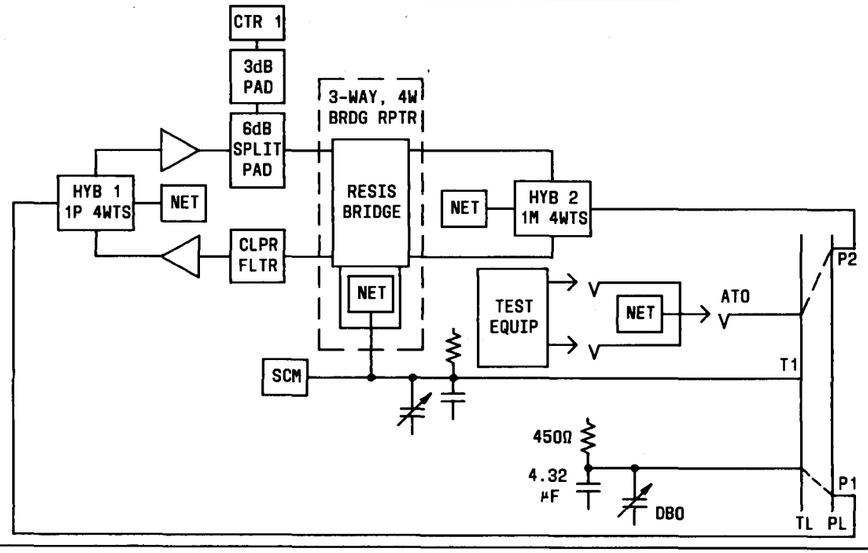
| TEST | CONNECTION | CIRCUIT | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ERL IN DB | | | SP/SRL IN DB | | |
| | | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| OVERALL VERIFICATION CONTINUED |  | T1-P2 | – | 24 | 21 | – | 19 | 16 |
| |  | P2-T1 | – | 25 | 22 | – | 20 | 17 |

TABLE C - CONTINUED

| TEST | CONNECTION | CIRCUIT | REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ERL IN DB | | | SP/SRL IN DB | | |
| | | | MED | MIN | TURNDN LIMIT | MED | MIN | TURNDN LIMIT |
| OVERALL VERIFICATION CONTINUED |  | P1-P2 | – | 26 | 18 | – | 19 | 11 |
| |  | P2-P1 | – | 26 | 18 | – | 19 | 11 |

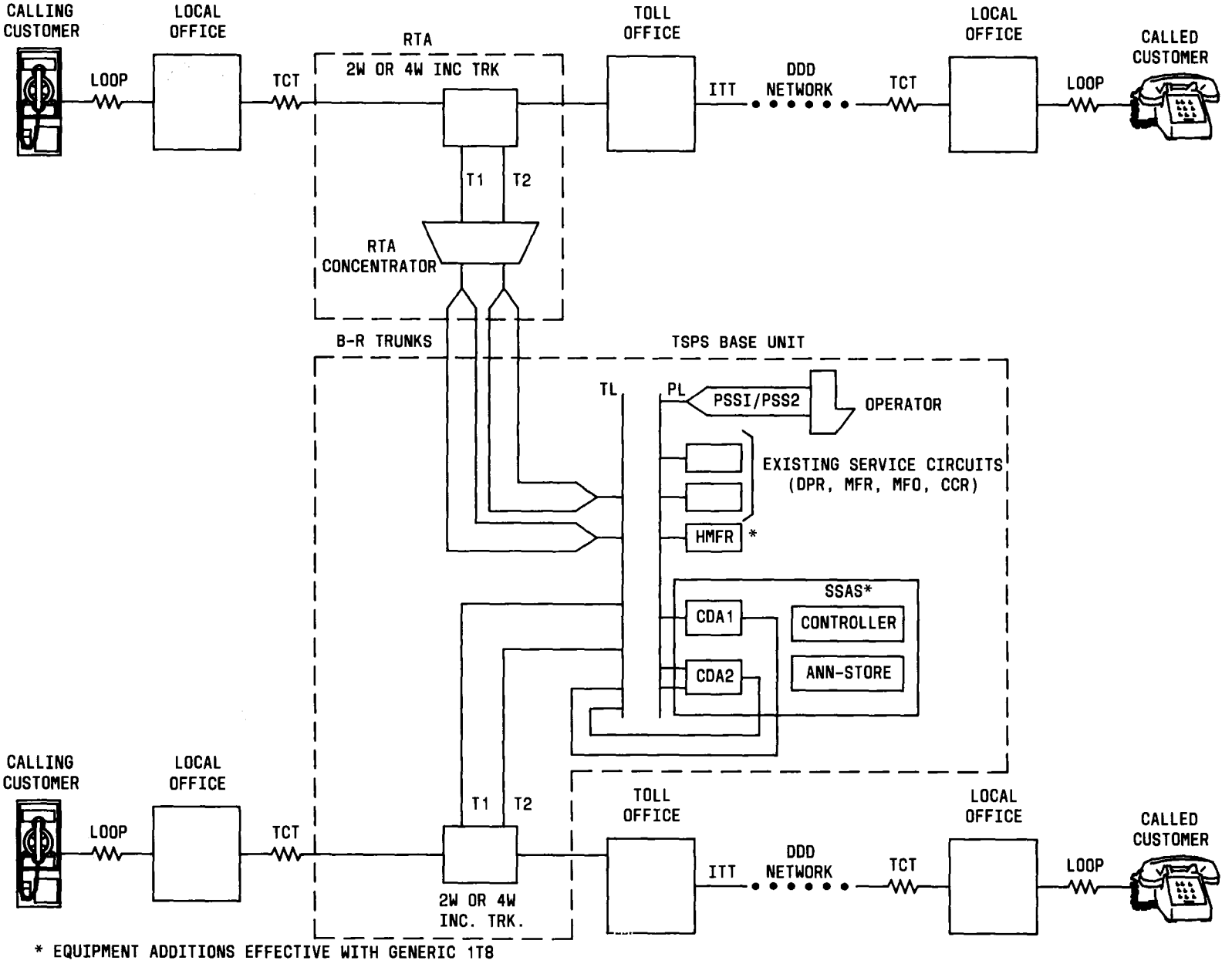



**Fig. 1—TSPS and RTA with ACTS Features Block Diagram**

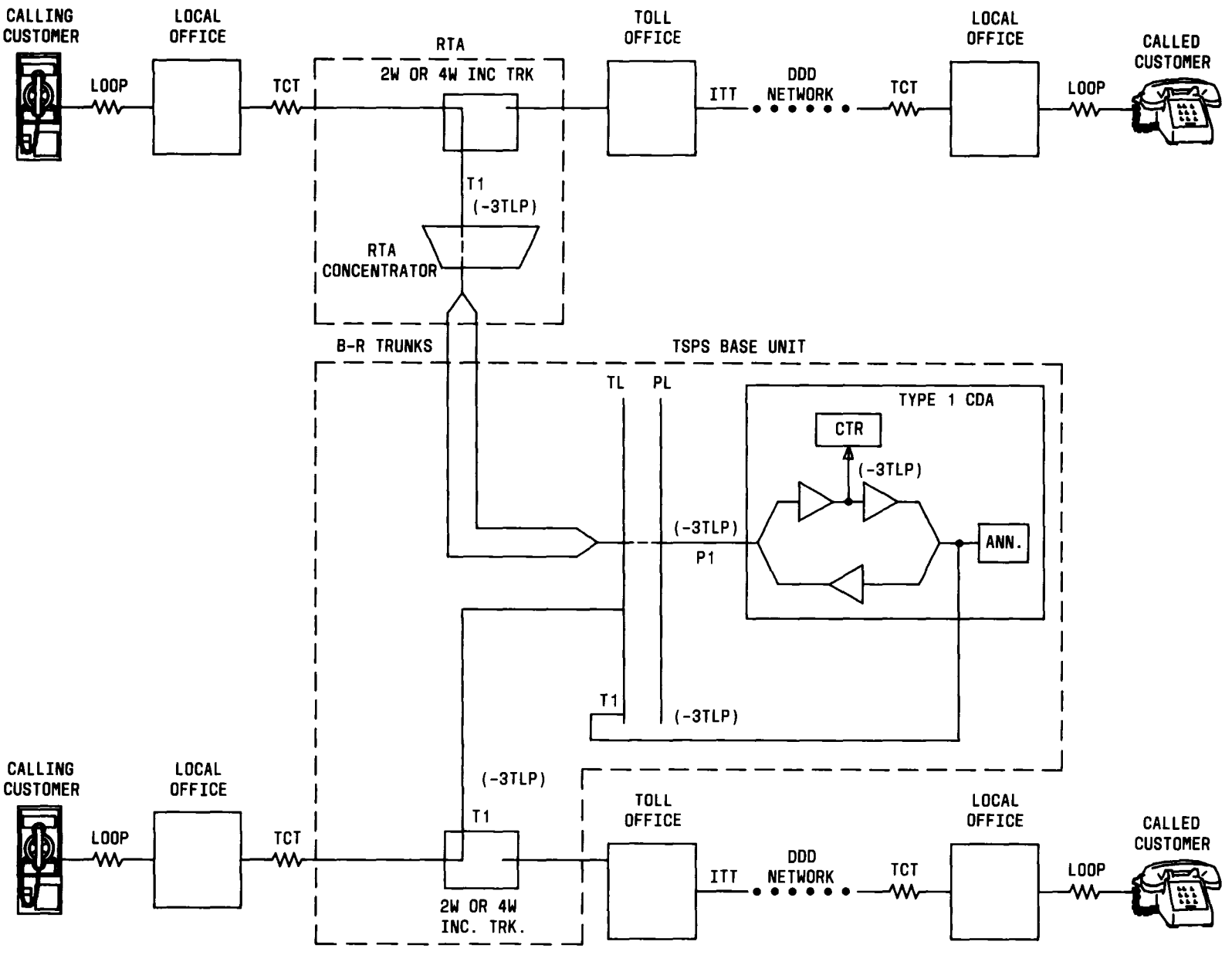



**Fig. 2—ACTS Connection Model-Initial and End-of-Call Seizures**

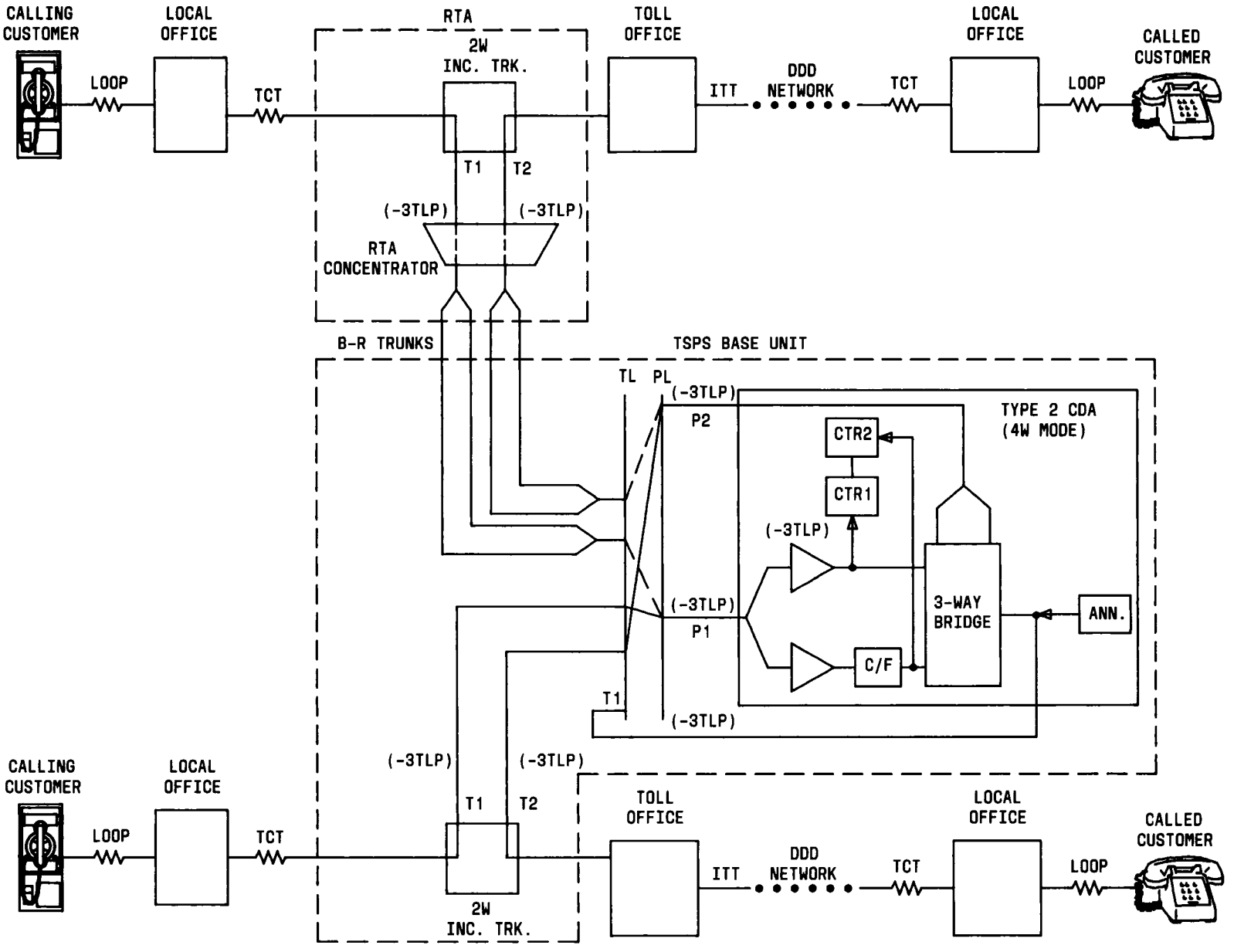



**Fig. 3—ACTS Connection Model-Interim Charge-Due Seizure—2-Wire Trunk**

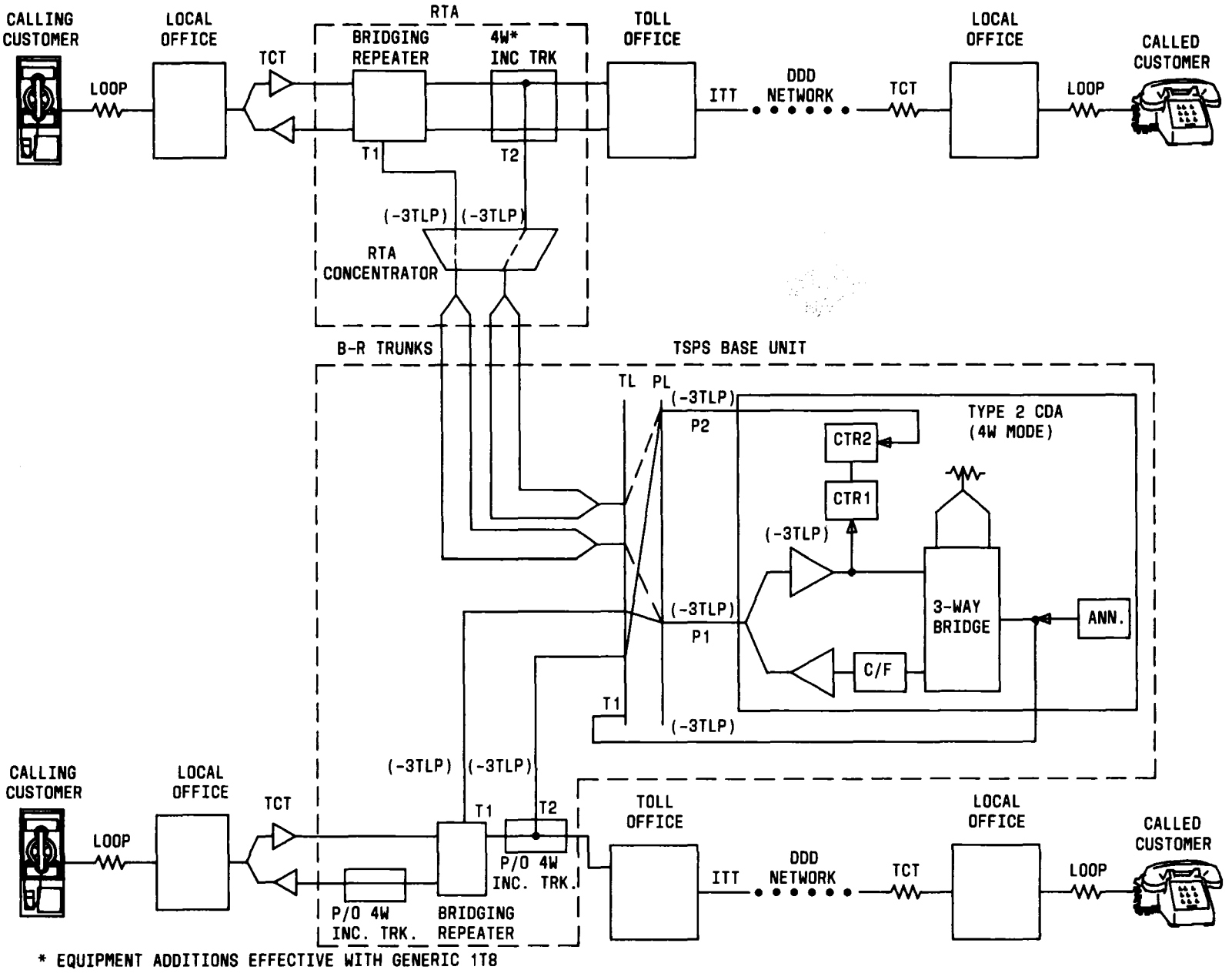



**Fig. 4—ACTS Connection Model-Interim Charge-Due Seizure—4-Wire Trunks**

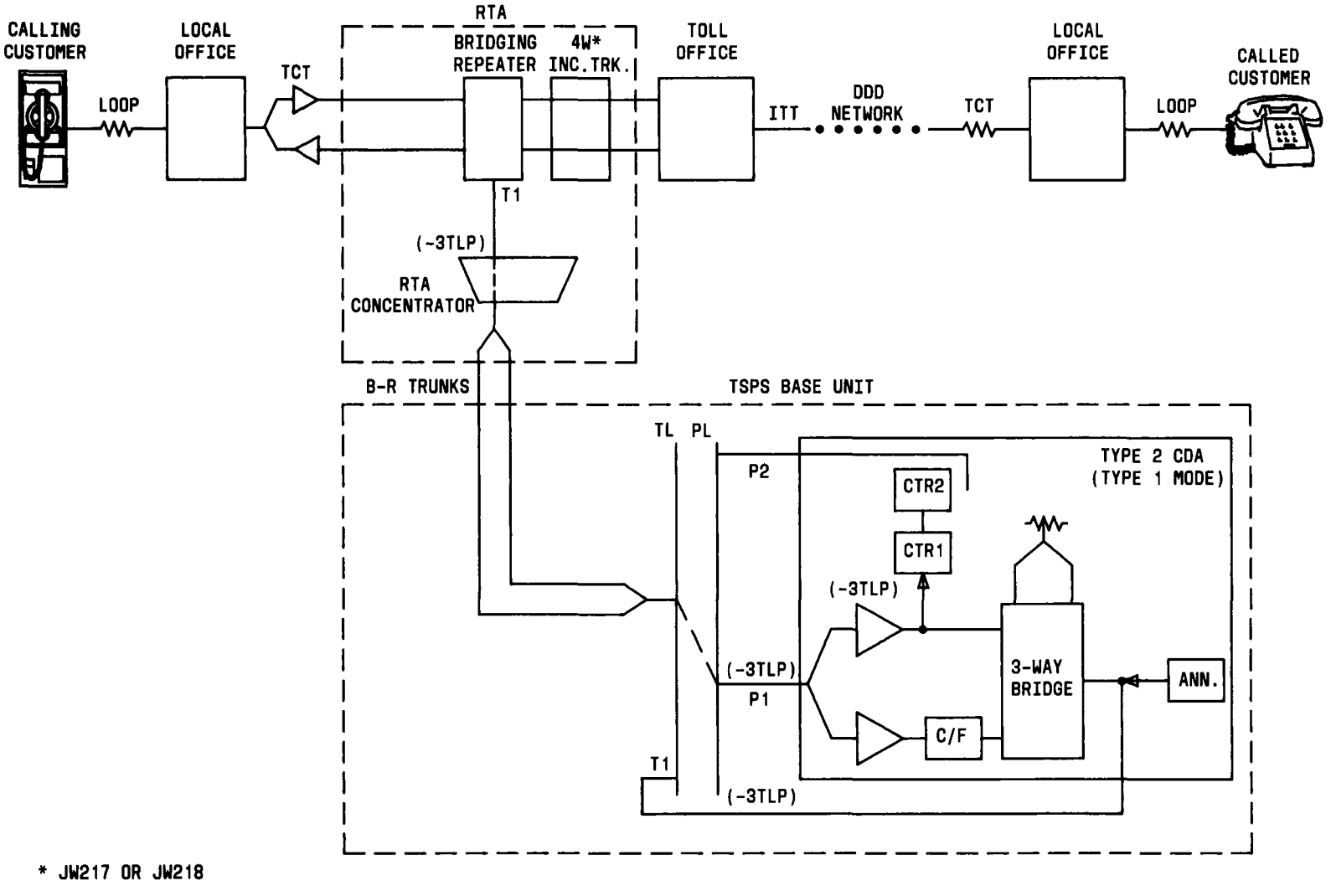



**Fig. 5—ACTS Connection Model-Interim Charge-Due Seizure—4-Wire RTA Trunk (JW217, JW218)**

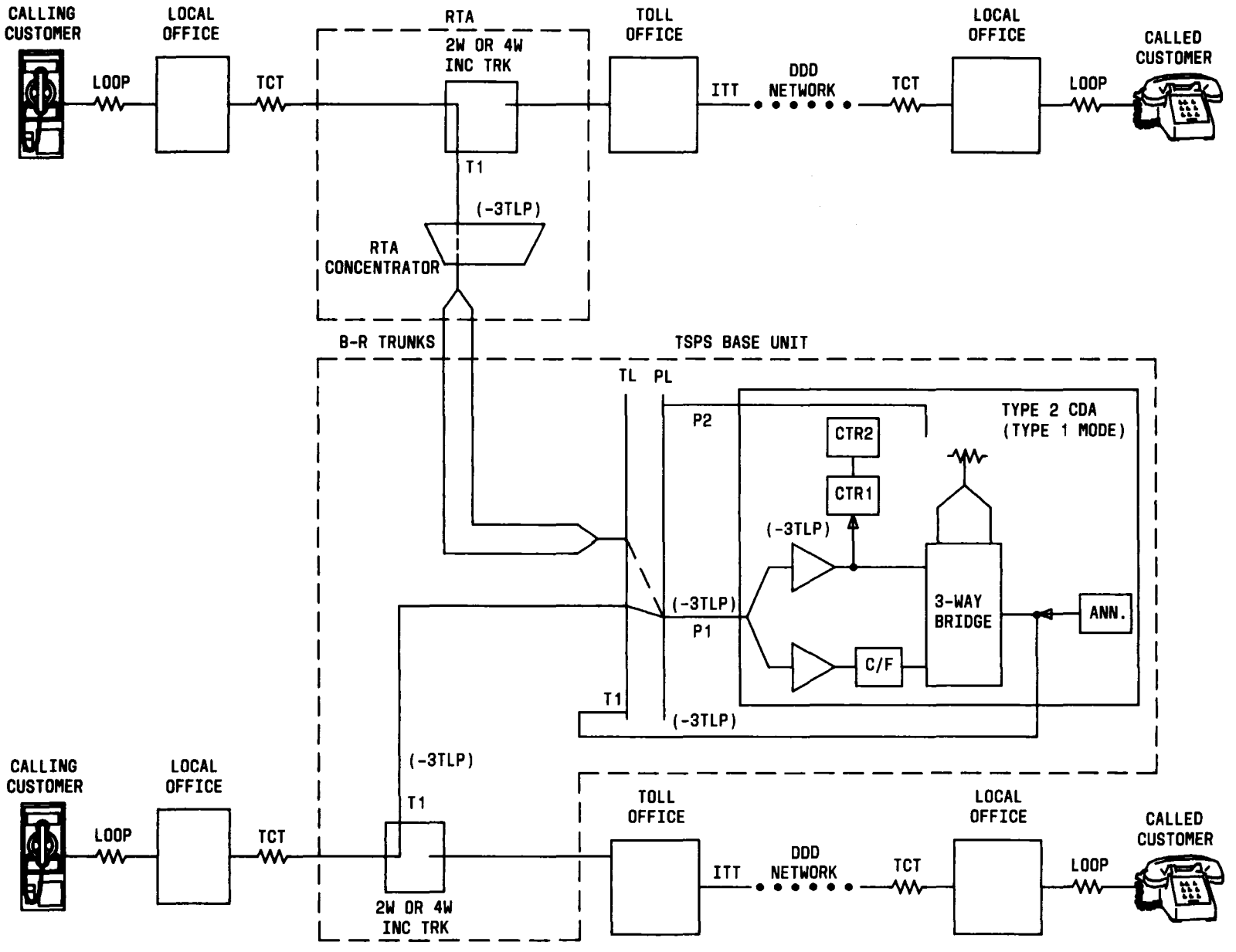



**Fig. 6—ACTS Connection Model-Initial Seizure on Large Charge Calls**

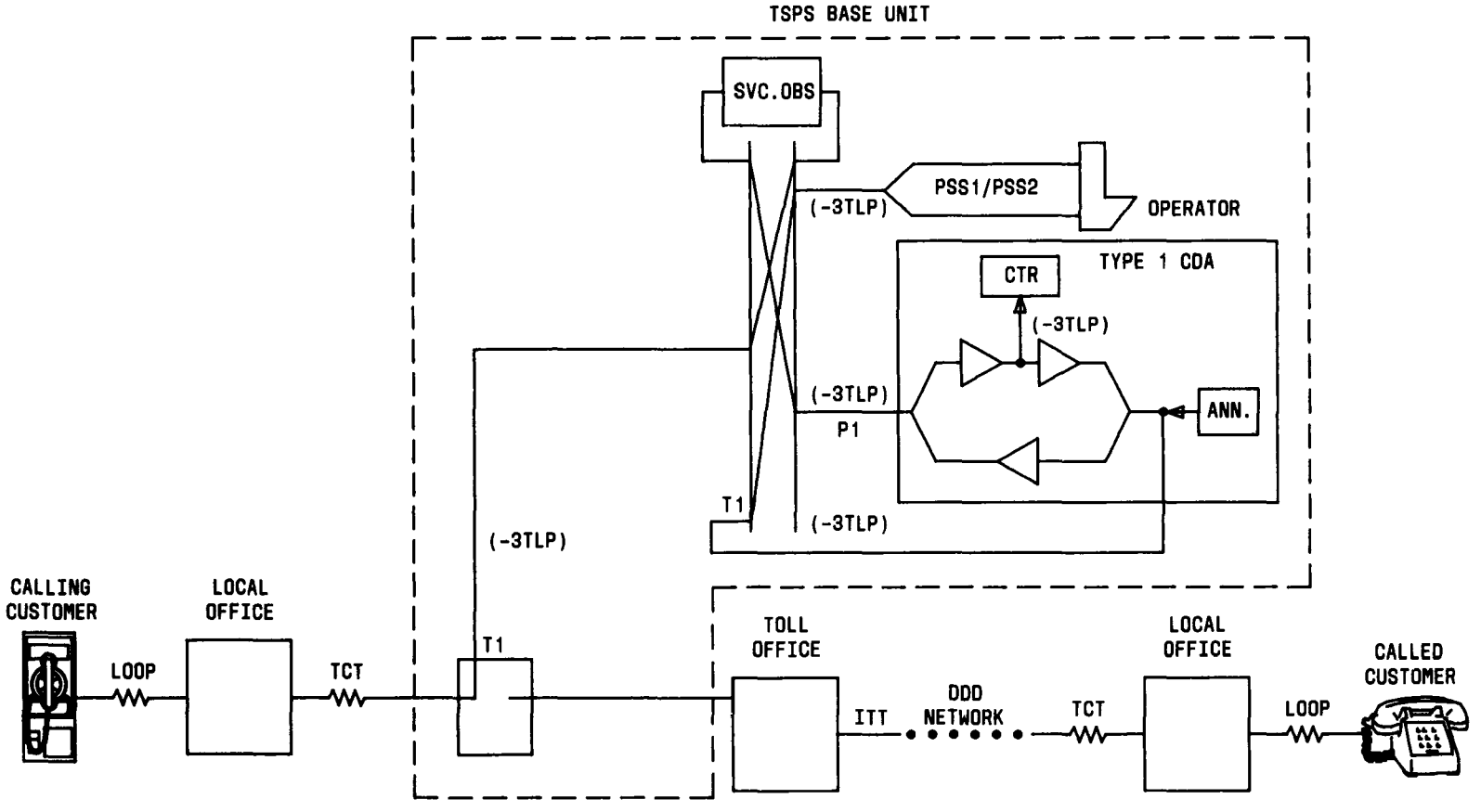



**Fig. 7—ACTS Connection Model-Service Observed and Operator-Assisted ACTS Call**

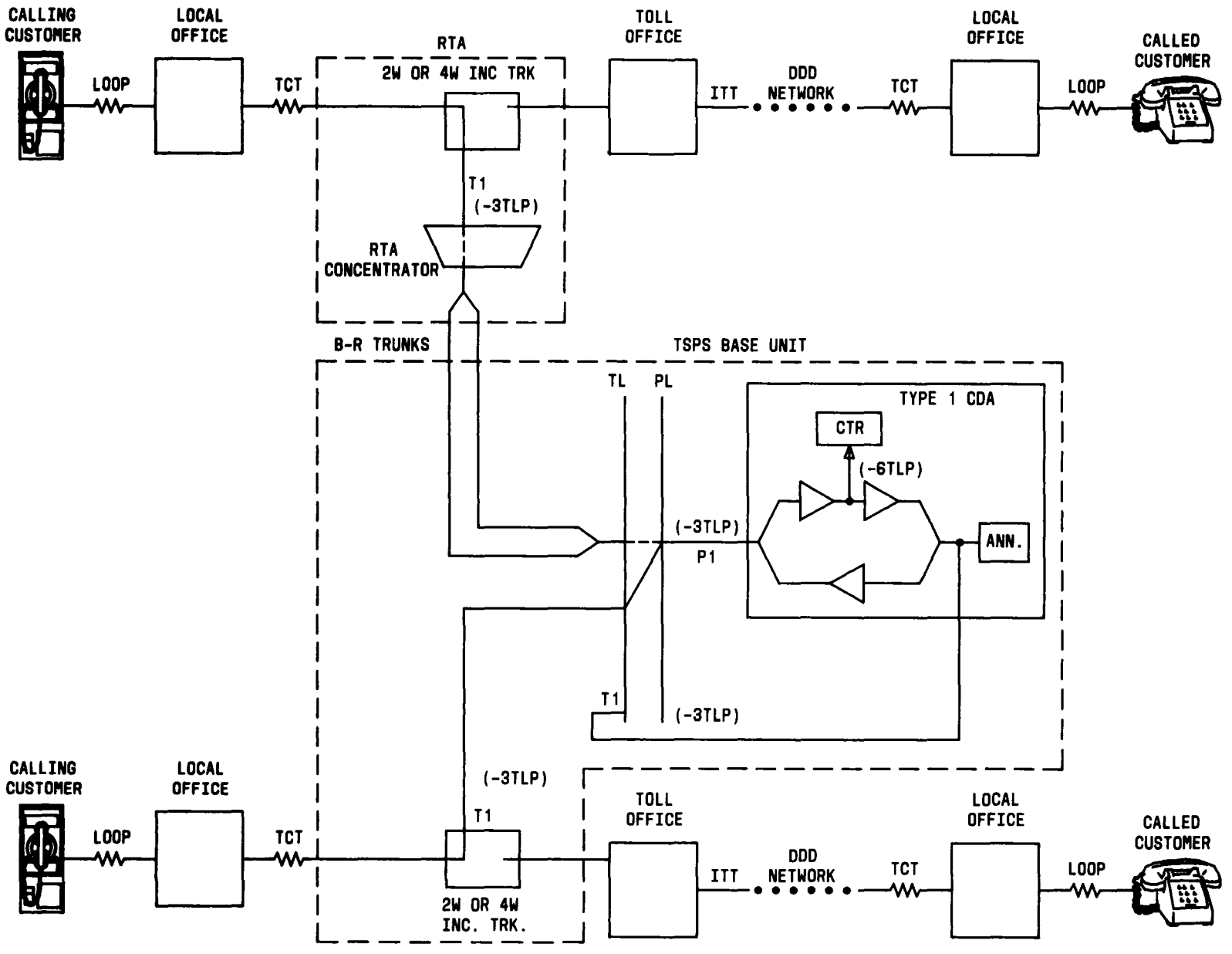



**Fig. 8—ACTS Connection Model-Coin Station Test Call**

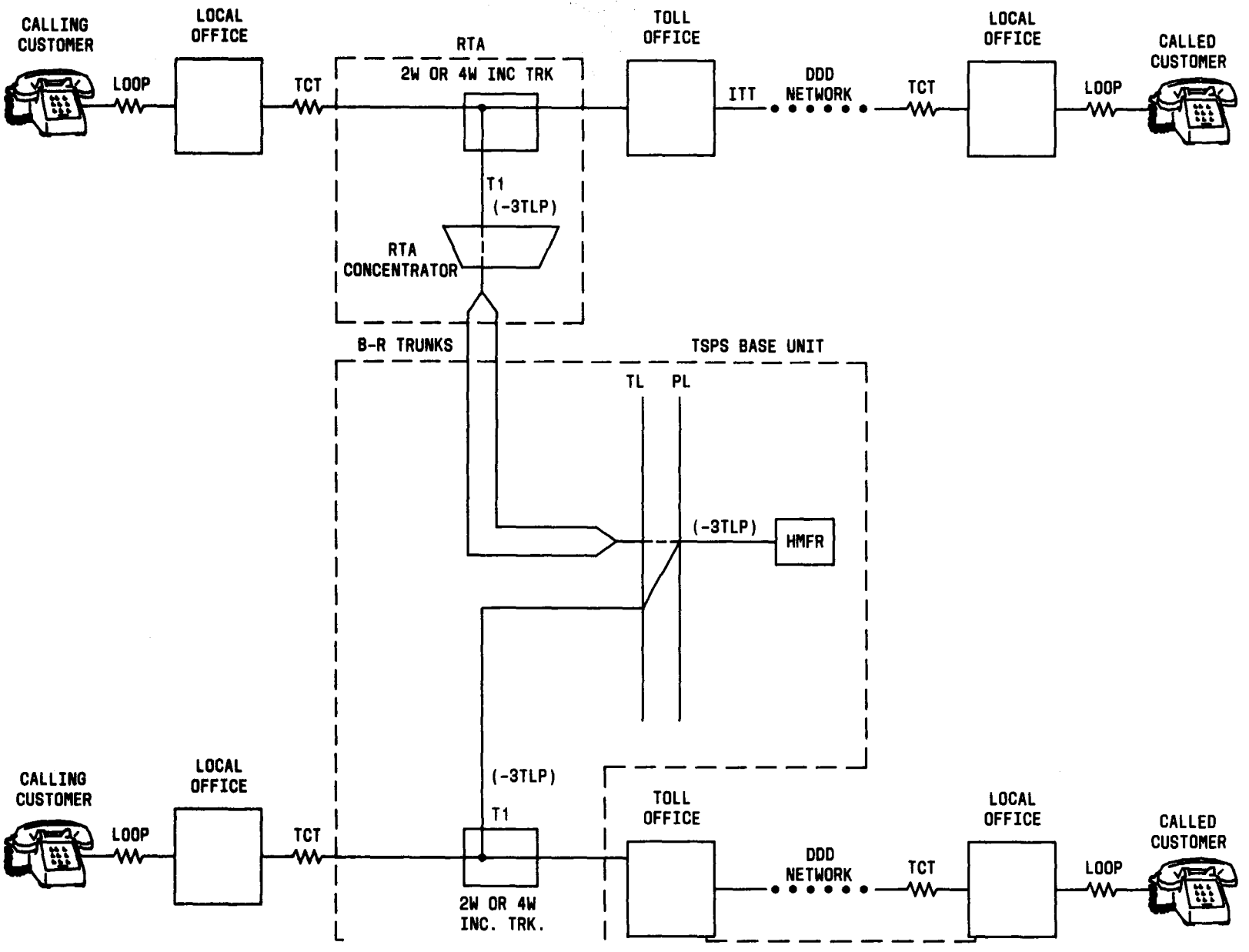
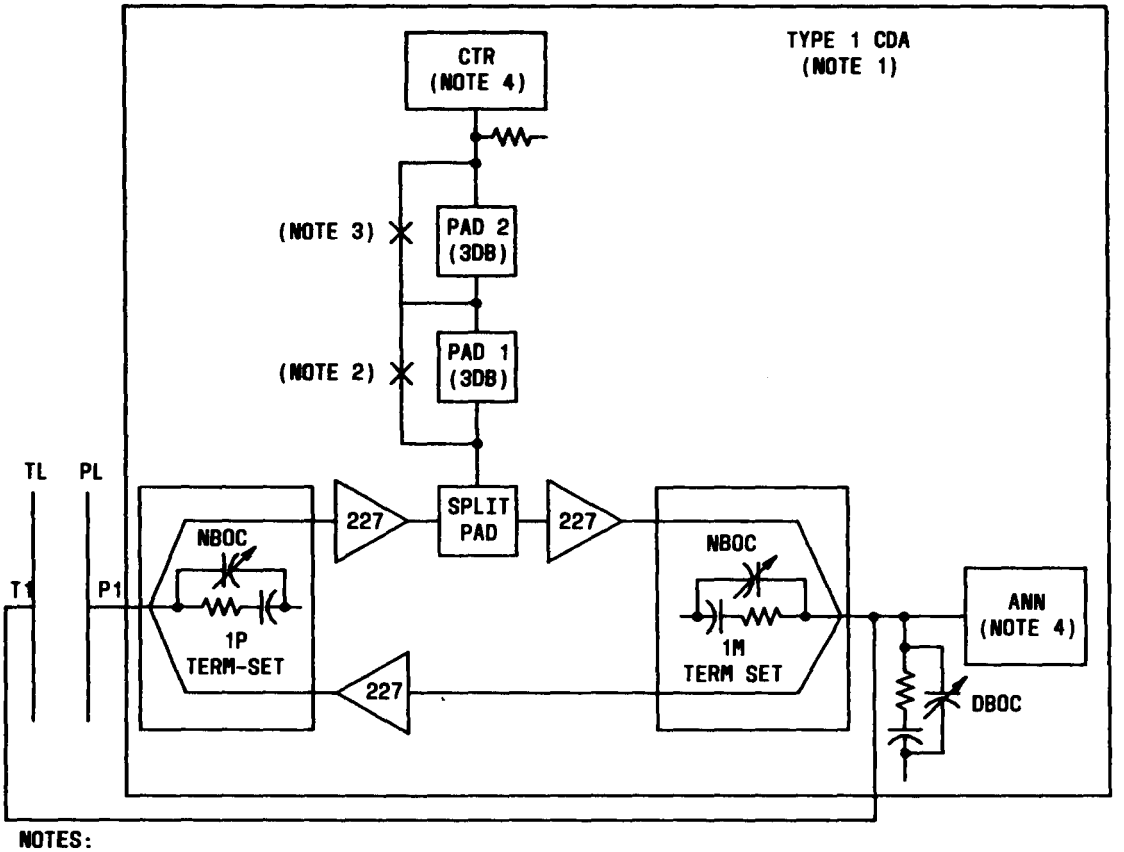


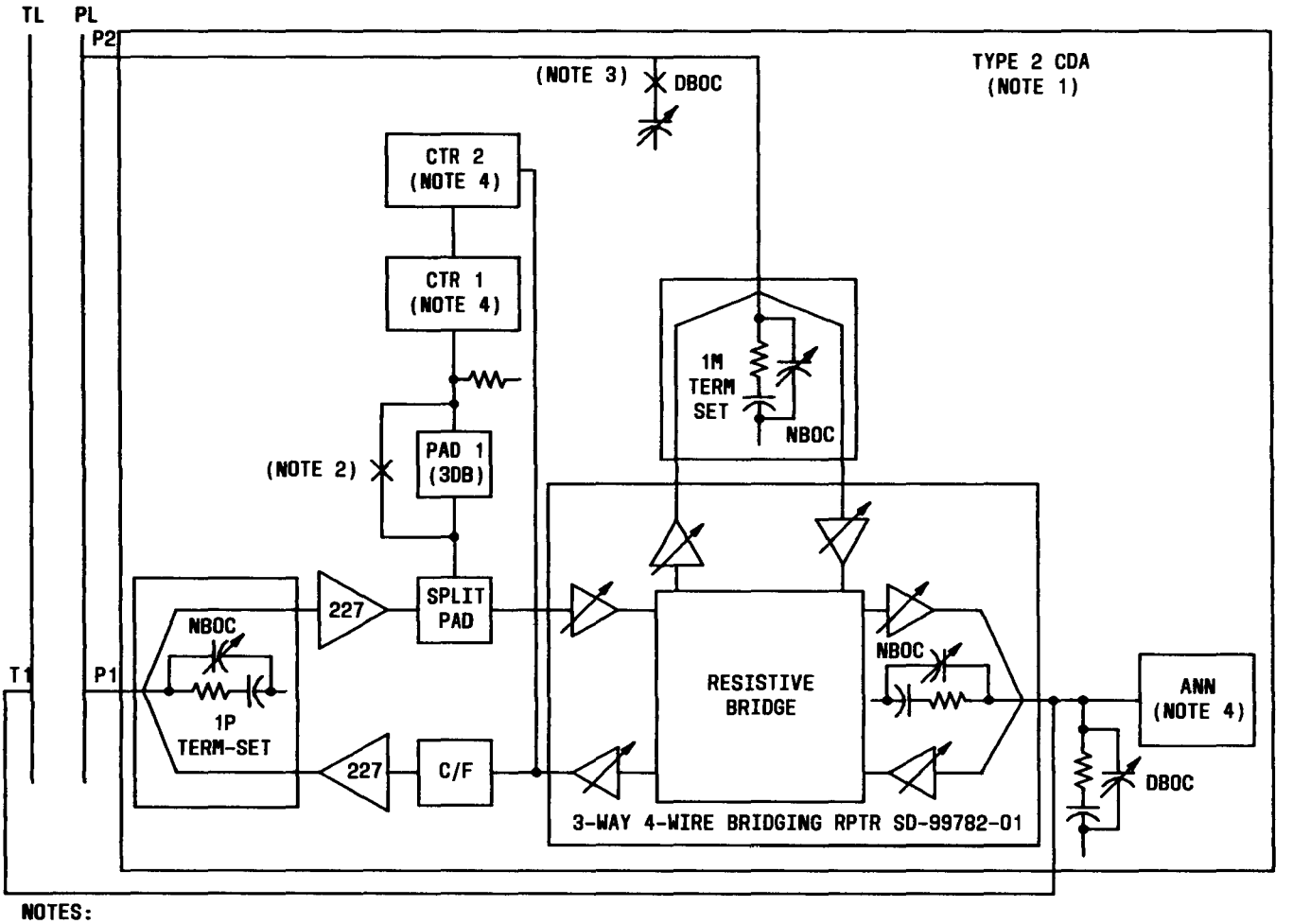

Fig. 9—SIGRR Connection Model




NOTES:

1. ALL CDA COMPONETS ARE PART OF THE CDA TRANSMISSION FRAME (SD-7C038-01) EXCEPT ANN. AND CTR WHICH ARE PART OF THE SSAS SERVICE CIRCUIT FRAME (SD-1B302-01)
2. PAD IS BYPASSED ONLY WHEN CDA IS CONNECTED TO A BASE 4-WIRE TRUNK EQUIPPED WITH A A 424V4A/B REPEATER
3. PAD IS BYPASSED EXCEPT WHEN CDA IS USED FOR A COIN STATION TEST CALL
4. ANN, CRT 1, AND CTR 2 ARE HIGH IMPEDANCE CIRCUITS.

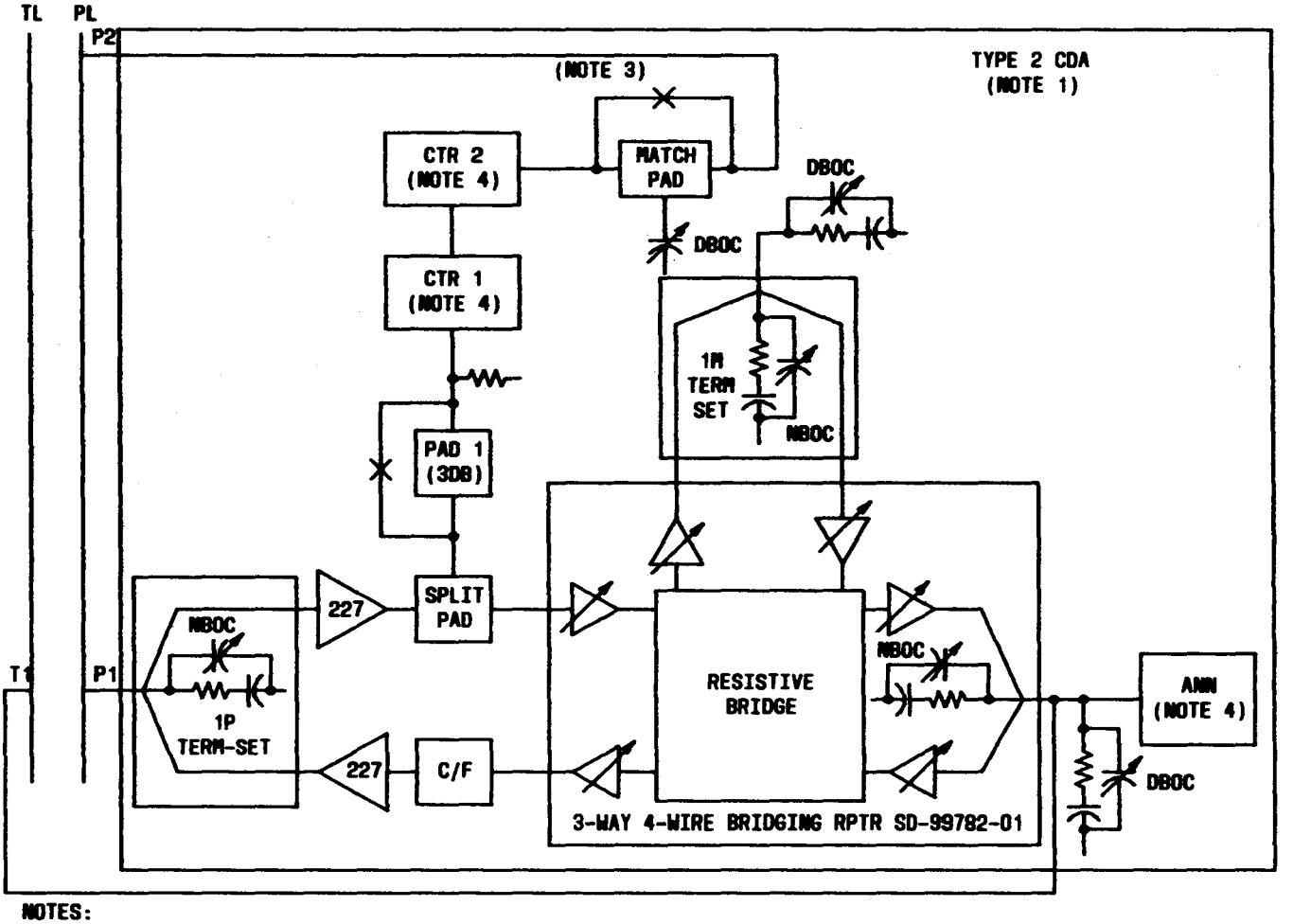
**Fig. 10—Type 1 CDA Block Diagram**




NOTES:

1. ALL CDA COMPONENTS ARE PART OF THE CDA TRANSMISSION FRAME (SD-7C038-01) EXCEPT ANN, CTR 1, AND CTR 2 WHICH ARE PART OF THE SSAS SERVICE CIRCUIT FRAME (SD-1B302-01).
2. PAD IS BYPASSED ONLY WHEN CDA IS CONNECTED TO A BASE 4-WIRE TRUNK EQUIPPED WITH A 424V4A/B REPEATER.
3. DBOC IS CONNECTED ONLY WHEN CDA IS CONNECTED TO AN RTA TRUNK.
4. ANN, CRT 1, AND CTR 2 ARE HIGH IMPEDANCE CIRCUITS.

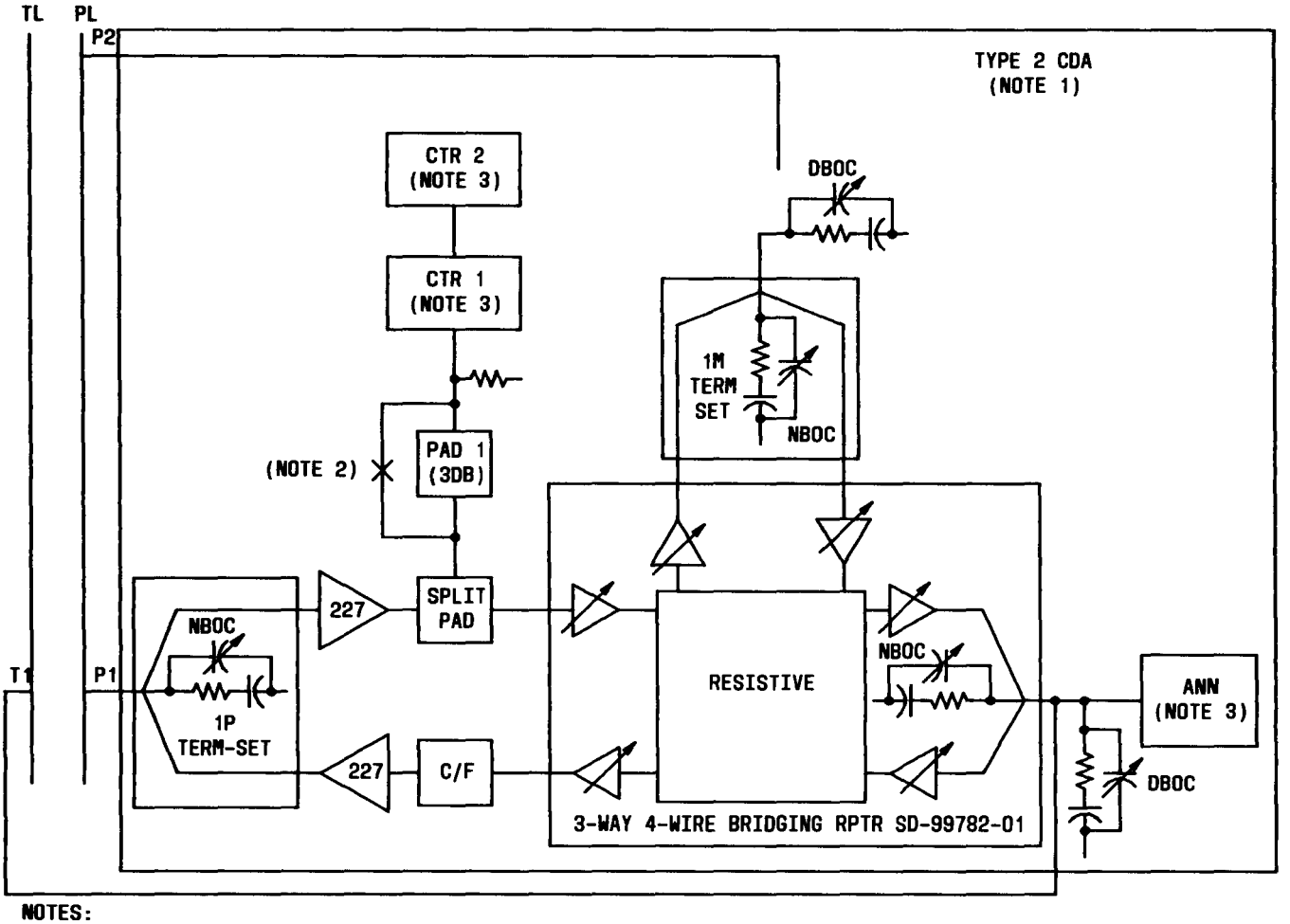
**Fig. 11—Type 2 CDA Block Diagram (2-Wire Mode)**




NOTES:

1. ALL CDA COMPONENTS ARE PART OF THE CDA TRANSMISSION FRAME (SD-7C038-01) EXCEPT ANN, CTR 1, AND CTR 2 WHICH ARE PART OF THE SSAS SERVICE CIRCUIT FRAME (SD-1B302-01).
2. PAD IS BYPASSED ONLY WHEN CDA IS CONNECTED TO A BASE 4-WIRE TRUNK EQUIPPED WITH A 424V4A/B REPEATER.
3. PAD AND DBOC ARE CONNECTED ONLY WHEN CDA IS CONNECTED TO AN RTA TRUNK.
4. ANN, CRT 1, AND CTR 2 ARE HIGH IMPEDANCE CIRCUITS.

**Fig. 12—Type 2 CDA Block Diagram (4-Wire Mode)**




NOTES:

1. ALL CDA COMPONENTS ARE PART OF THE CDA TRANSMISSION FRAME (SD-7C038-01) EXCEPT ANN, CTR 1, AND CTR 2 WHICH ARE PART OF THE SSAS SERVICE CIRCUIT FRAME (SD-1B302-01).
2. PAD IS BYPASSED ONLY WHEN CDA IS CONNECTED TO A BASE 4-WIRE TRUNK EQUIPPED WITH A 424V4A/B REPEATER.
3. ANN, CRT 1, AND CTR 2 ARE HIGH IMPEDANCE CIRCUITS.

**Fig. 13—Type 2 CDA Block Diagram (Type 1 Mode)**

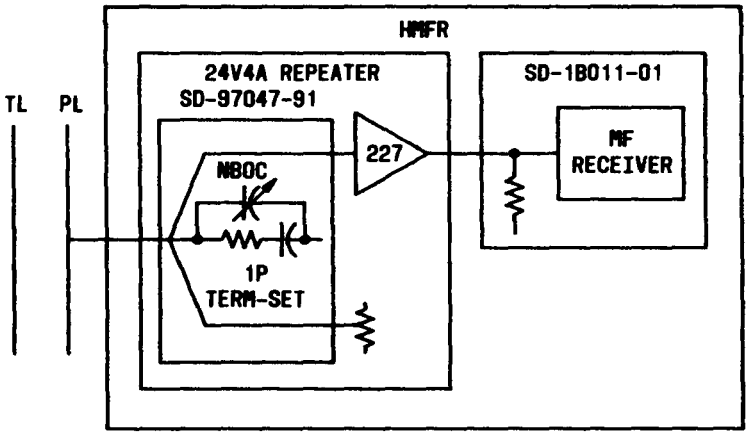
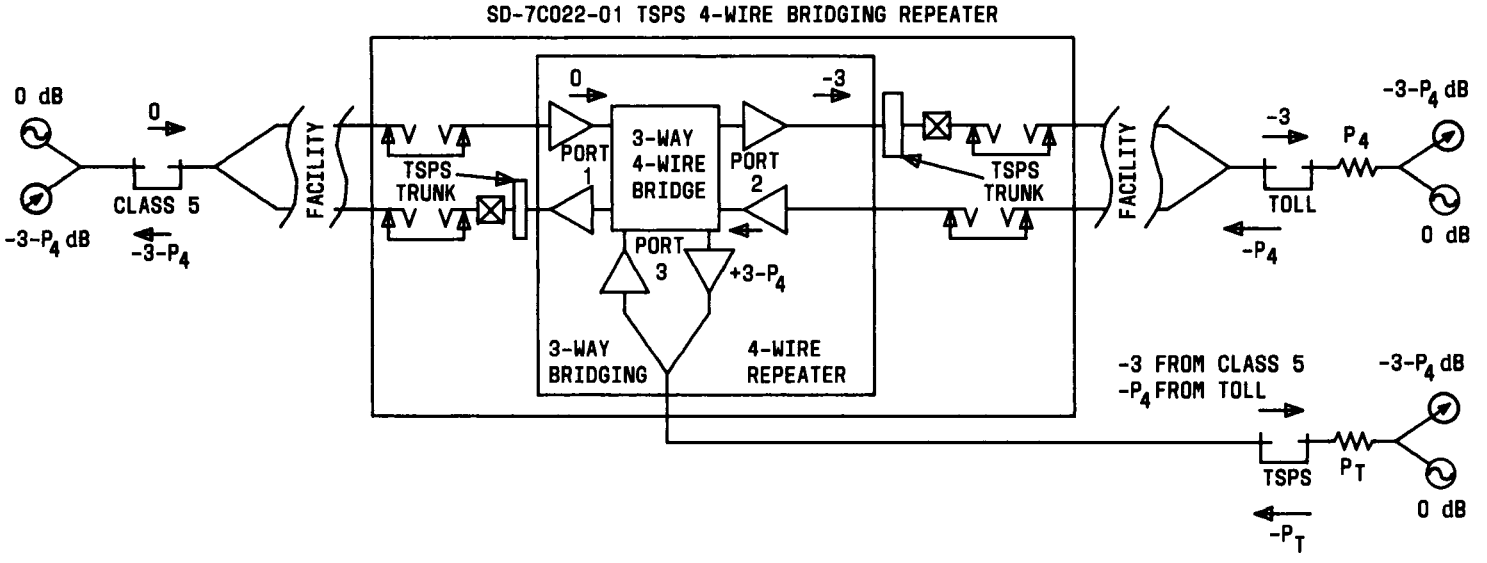


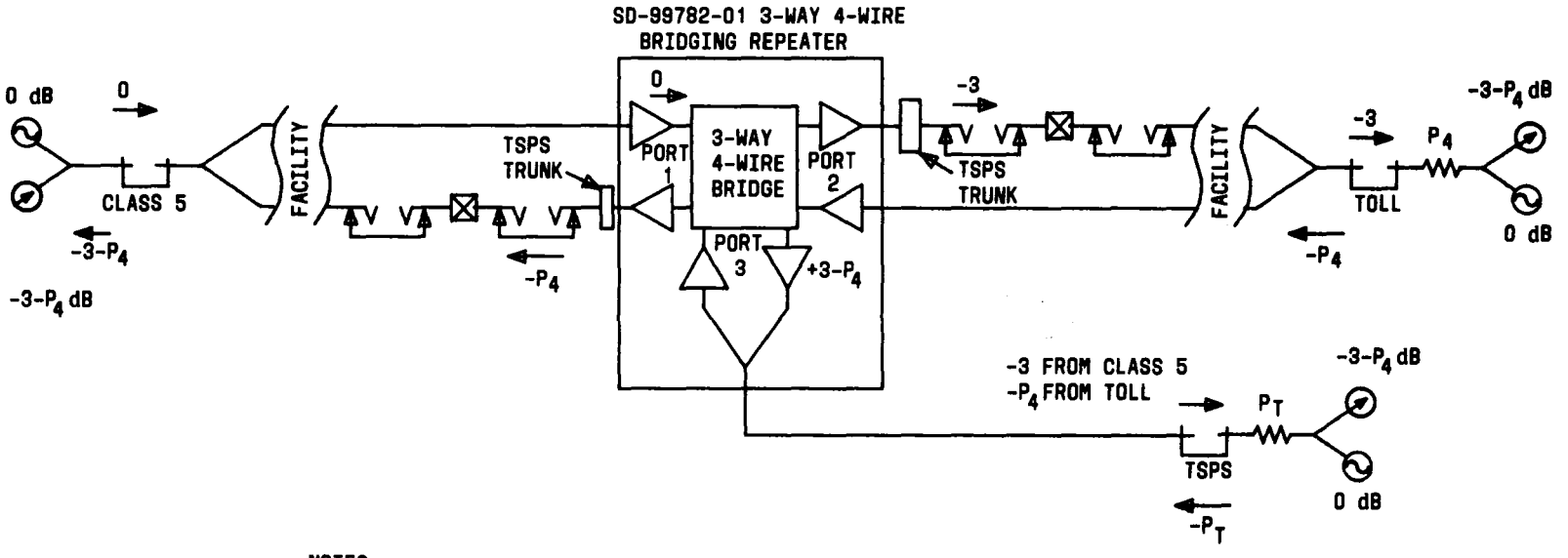

**Fig. 14—HMFR Block Diagram**




NOTES:

1. $P_4$ IS THE TOLL OFFICE TEST PAD VALUE OF 0, 2, OR 3DB
2. $P_T$ IS THE TSPS TEST PAD. IT IS $P_4$ WHEN TESTING WITH THE CLASS 5 OFFICE AND 3DB WHEN TESTING WITH THE TOLL OFFICE.
3. ☒ IS EITHER A 1C PAD, AND 849C NETWORK EQUIPPED WITH A 89 TYPE RESISTOR, OR 227 AMPLIFIER.
4. Ⓜ IS A TRANSMISSION MEASURING SET (TMS). Ⓞ IS A REFERENCE OSCILLATOR.

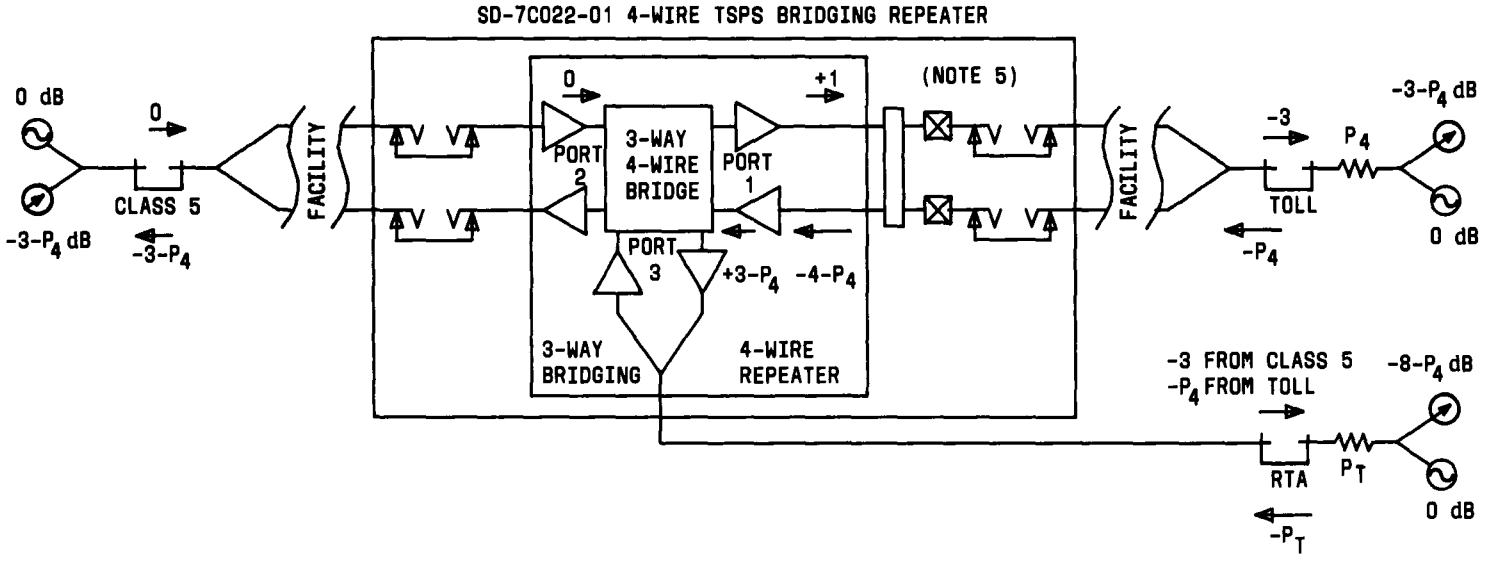
**Fig. 15—Base TSPS Lineup of 4-Wire TC Trunks Using 4-Wire Bridging Repeater (SD7C022-01)**




NOTES:

1. $P_4$ IS THE TOLL OFFICE TEST PAD VALUE OF 0, 2, OR 3dB
2. $P_T$ IS THE TSPS TEST PAD. IT IS $P_4$ WHEN TESTING WITH THE CLASS 5 OFFICE AND 3dB WHEN TESTING WITH THE TOLL OFFICE.
3. ⊠ IS EITHER A 1C PAD, AND 849C NETWORK EQUIPPED WITH A 89 TYPE RESISTOR, OR 227 AMPLIFIER.
4. ◎ IS A TRANSMISSION MEASURING SET (TMS). ∿ IS A REFERENCE OSCILLATOR.

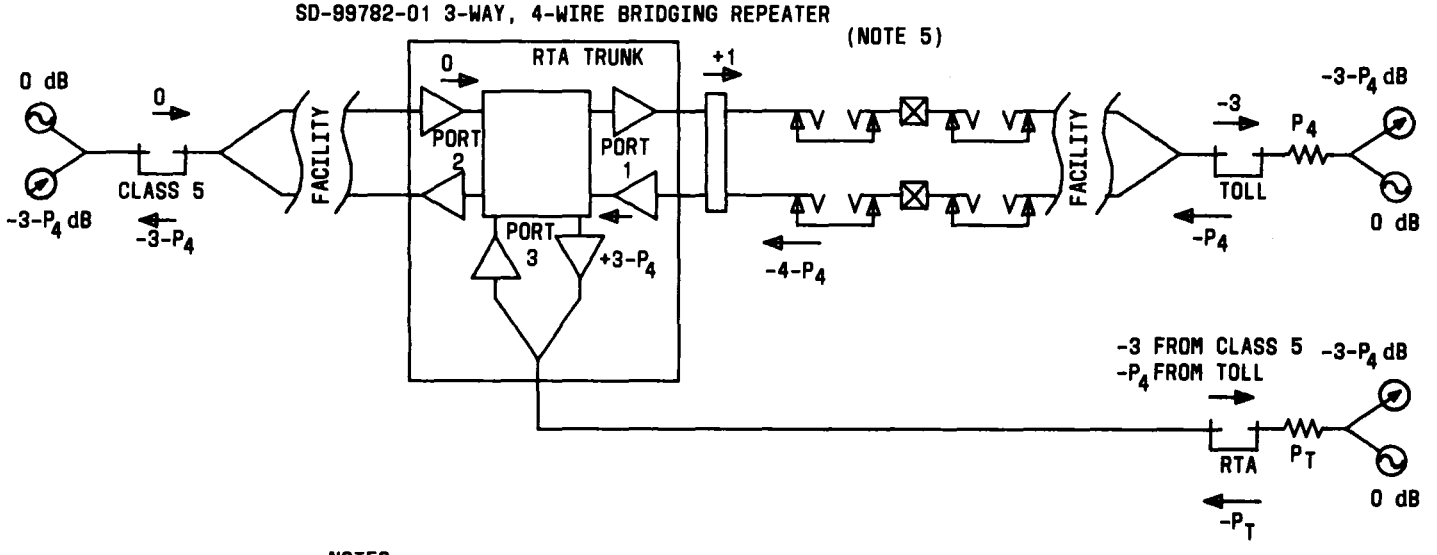
**Fig. 16—Base TSPS Lineup of 4-Wire TC Trunks Using 3-Way 4-Wire Bridging Repeater (SD99782-01)**




NOTES:

1. $P_4$ IS THE TOLL OFFICE TEST PAD VALUE OF 0, 2, OR 3dB
2. $P_T$ IS THE TSPS TEST PAD. IT IS $P_4$ WHEN TESTING WITH THE CLASS 5 OFFICE AND 3DB WHEN TESTING WITH THE TOLL OFFICE.
3. ☒ IS EITHER A 1C PAD, AND 849C NETWORK EQUIPPED WITH A 89 TYPE RESISTOR, OR 227 AMPLIFIER.
4. Ⓜ IS A TRANSMISSION MEASURING SET (TMS). Ⓞ IS A REFERENCE OSCILLATOR.
5. THIS APPLIES ONLY WHEN THE RTA TRUNK CIRCIUT PLUG-IN IS A JW217 OR JW218

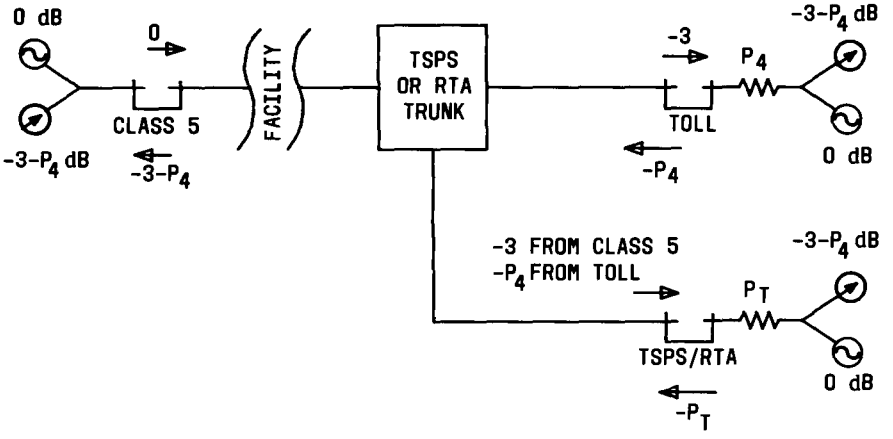
**Fig. 17—RTA Lineup of 4-Wire TC Trunks Using 4-Wire Bridging Repeater (SD7C022-01) and JW217 or JW218**




NOTES:

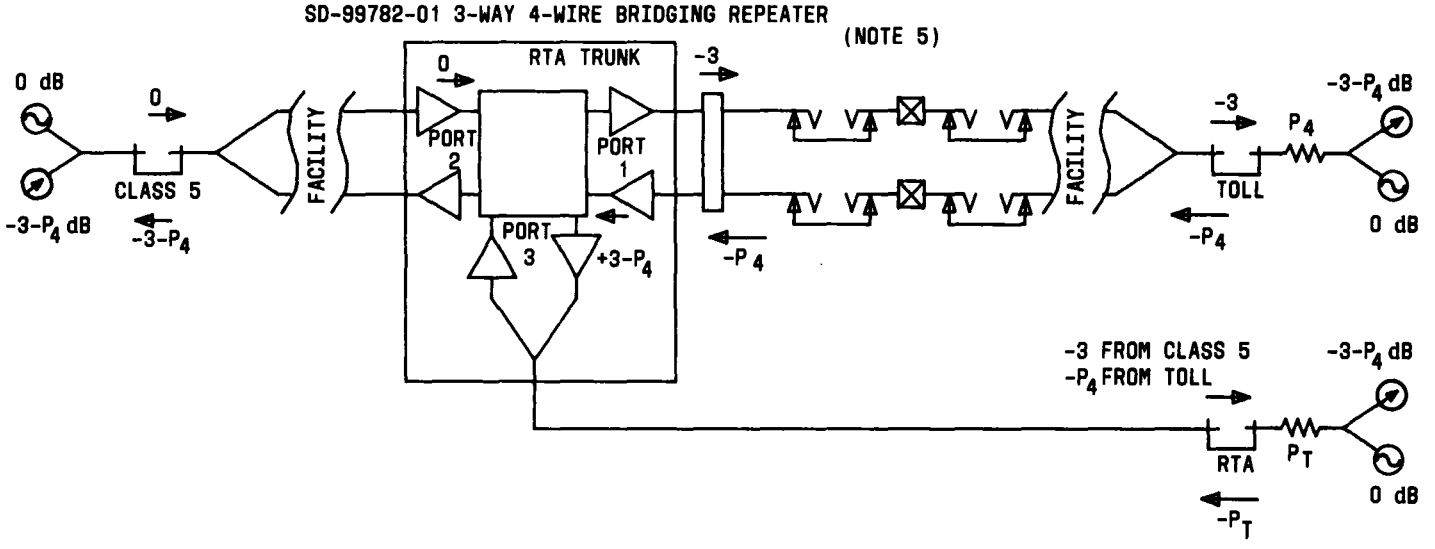
1. $P_4$ IS THE TOLL OFFICE TEST PAD VALUE OF 0, 2, OR 3dB
2. $P_T$ IS THE TSPS TEST PAD. IT IS $P_4$ WHEN TESTING WITH THE CLASS 5 OFFICE AND 3DB WHEN TESTING WITH THE TOLL OFFICE.
3. ⊠ IS EITHER A 1C PAD, AND 849C NETWORK EQUIPPED WITH A 89 TYPE RESISTOR, OR 227 AMPLIFIER.
4. Ⓜ IS A TRANSMISSION MEASURING SET (TMS). Ⓞ IS A REFERENCE OSCILLATOR.
5. THIS APPLIES ONLY WHEN THE RTA TRUNK CIRCIUT PLUG-IN IS A JW217 OR JW218

**Fig. 18—RTA Lineup of 4-Wire TC Trunk Using 3-Way 4-Wire Bridging Repeater (SD99782-01) and JW217 or JW218**




NOTES:
1. $P_4$ AND $P_T$ AS DEFINED IN FIGURE A1
2. NORMAL CIRCUIT AND MAINTENANCE LIMITS BETWEEN CLASS 5 AND TOLL OFFICES
3. AN ADDITIONAL ±0.5DB DEVIATIN IS ALLOWED BETWEEN TSPS AND THE CLASS 5 OR TOLL OFFICE BECAUSE OF CABLING LOSSES
4. THE EXAMPLE ASSUMES ICL = 3.0dB. THE ICL MAY VARY FROM 2.0
5. Ⓜ IS A TRANSMISSION MEASURING SET (TMS). ∿ IS A REFERENCE OSCILLATOR

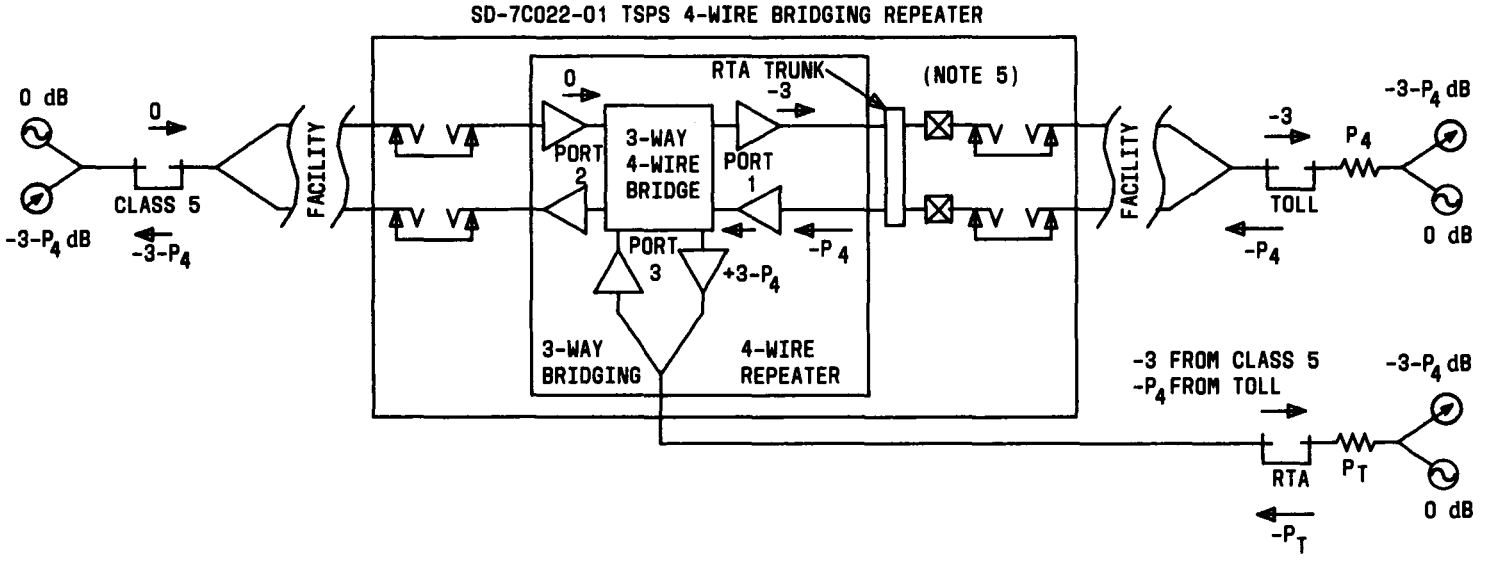
**Fig. 19—Base TSPS or RTA Lineup of 2-Wire TC Trunks**




NOTES:

1. $P_4$ IS THE TOLL OFFICE TEST PAD VALUE OF 0, 2, OR 3dB
2. $P_T$ IS THE RTA TEST PAD. IT IS $P_4$ WHEN TESTING WITH THE CLASS 5 OFFICE AND 3DB WHEN TESTING WITH THE TOLL OFFICE.
3. ⊠ IS EITHER A 1C PAD, AND 849C NETWORK EQUIPPED WITH A 89 TYPE RESISTOR, OR 227 AMPLIFIER
4. Ⓜ IS A TRANSMISSION MEASURING SET (TMS). Ⓞ IS A REFERENCE OSCILLATOR
5. THIS APPLIES ONLY WHEN THE RTA TRUNK CIRCIUT PLUG-IN IS A JW237

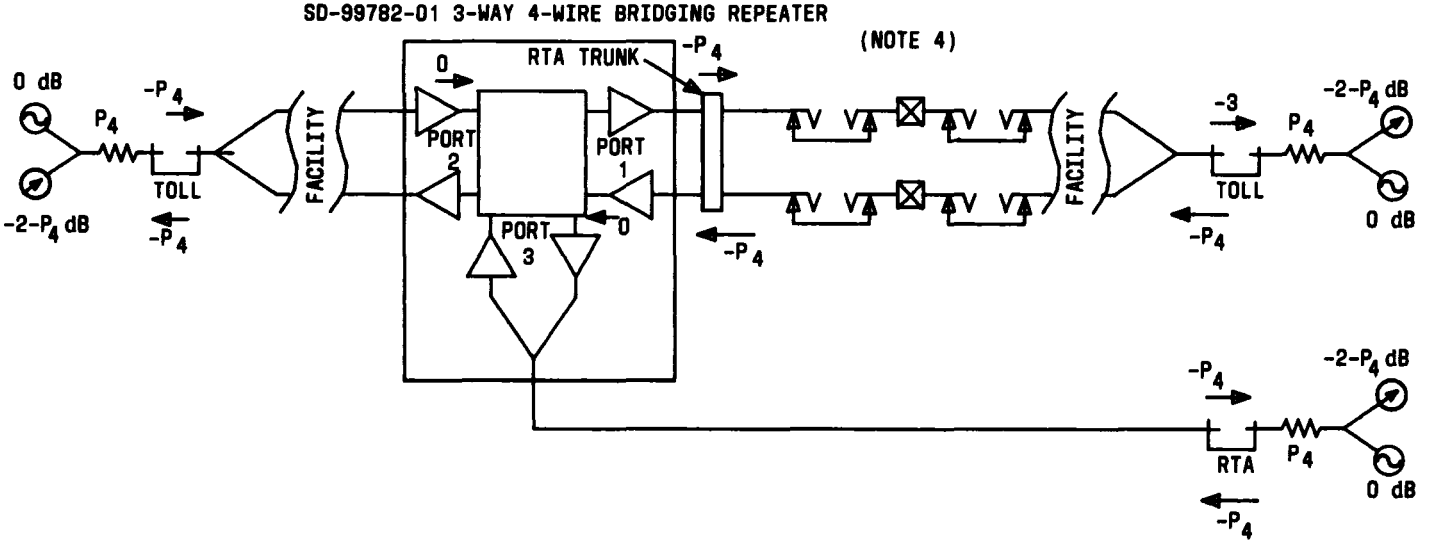
**Fig. 20—RTA Lineup of 4-Wire TC Trunks Using 3-Way 4-Wire Bridging Repeater (SD99782-01)**




NOTES:

1. $P_4$ IS THE TOLL OFFICE TEST PAD VALUE OF 0, 2, OR 3dB
2. $P_T$ IS THE TSPS TEST PAD. IT IS $P_4$ WHEN TESTING WITH THE CLASS 5 OFFICE AND 3dB WHEN TESTING WITH THE TOLL OFFICE
3. ⊠ IS EITHER A 1C PAD, AND 849C NETWORK EQUIPPED WITH A 89 TYPE RESISTOR, OR 227 AMPLIFIER
4. Ⓜ IS A TRANSMISSION MEASURING SET (TMS). Ⓞ IS A REFERENCE OSCILLATOR
5. THIS APPLIES ONLY WHEN THE RTA TRUNK CIRCIUT PLUG-IN IS A JW237

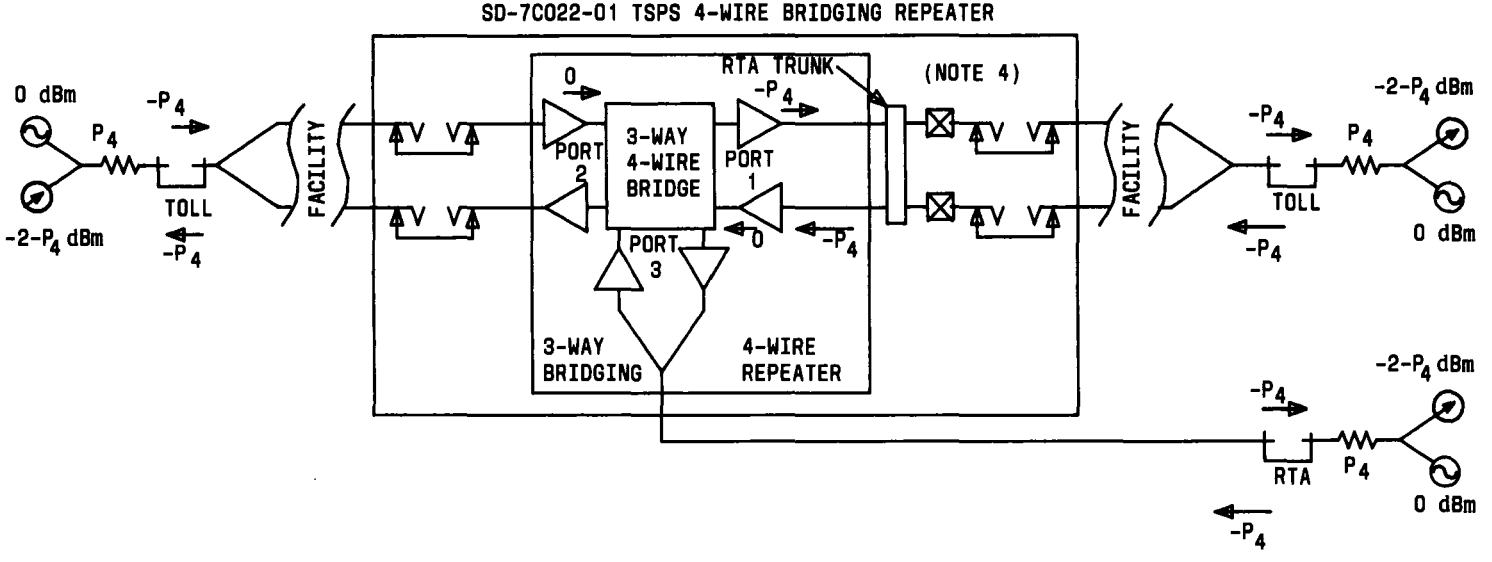
**Fig. 21—RTA Lineup of 4-Wire TC Trunks Using 4-Wire Bridging Repeater (SD7C022) and JW237**




NOTES:

1. $P_4$ IS THE TOLL OFFICE TEST PAD VALUE OF 0, 2, OR 3dB
2. ⊠ IS EITHER A 1C PAD, AND 849C NETWORK EQUIPPED WITH A 89 TYPE RESISTOR, OR 227 AMPLIFIER
3. Ⓜ IS A TRANSMISSION MEASURING SET (TMS). Ⓞ IS A REFERENCE OSCILLATOR.
4. THIS APPLIES ONLY WHEN THE RTA TRUNK CIRCIUT PLUG-IN IS A JW217 OR JW218

**Fig. 22—RTA Lineup of Inward Trunks Using 3-Way 4-Wire Bridging Repeater (SD99782-01) and JW237**




NOTES:

1. $P_4$ IS THE TOLL OFFICE TEST PAD VALUE OF 0, 2, OR 3dB
2. ⊠ IS EITHER A 1C PAD, A 849C NETWORK EQUIPPED WITH A 89 THPE RESISTOR, OR A 227 AMPLIFIER
3. Ⓜ IS A TRANSMISSION MEASURING SET (TMS). Ⓞ IS A REFERENCE OSCILLATOR.
4. THIS APPLIES ONLY WHEN THE RTA TRUNK CIRCIUT PLUG-IN IS A JW237

**Fig. 23—RTA Lineup of Inward Trunks Using 4-Wire Bridging Repeater (SD7C022-01) and JW237**