NO. 1 TRUNK CONCENTRATOR

TRANSMISSION ENGINEERING CONSIDERATIONS

1. GENERAL

1.01 This section covers the application of the No. 1 Trunk Concentrator to existing arrangements in metropolitan systems and presents the transmission considerations for the associated trunks. These considerations are also applicable to transmission plans, extending the ranges of No. 5 Automatic Call Distributor (No. 5 ACD) and Automatic Intercept System (AIS) for Directory Assistance (DA) and Intercept Service (INCPT) applications. Figure 1 shows a basic system arrangement.

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

1.03 Operator number service is a class of customer assistance that handles local, toll DA and INCPT service. Traditionally, number service was provided manually by operators at a switchboard or desks in a nearby office. Recent trends, however, have been to automate these services and centralize the remaining operators at positions more remote from the customers.

1.04 The 4-wire No. 1 Trunk Concentrator was developed to provide an economical and efficient means of routing number service traffic by consolidating the small trunk groups from individual end offices into a single trunk group to the DA or INCPT switching system.

1.05 The primary purpose of the No. 1 Trunk Concentrator is to centralize number service traffic to operators normally originating from Class 5 (CL5) central offices (COs) terminating in the following applications:

(1) Intercept—Automatic Intercept System (AIS)

(2) Intercept—No. 5 Automatic Call Distributor (ACD) Phases I and II

(3) Intercept—23 Desk

(4) Directory Assistance—No. 5 ACD—Phases I and II

(5) Directory Assistance—23 Desk.

1.06 The 4-wire No. 1 Trunk Concentrator is recommended for all new starts as compared to the 2-wire No. 23 Trunk Concentrator, except where No. 23 Trunk Concentrators are already available; however, if the No. 23 Trunk Concentrator is considered, refer to Section 852-408-100 for transmission consideration.

1.07 One of the major objectives of number service applications is to provide acceptable voice grade-of-service to both the customer and the operator, much like that provided by calls through the Message Telecommunication System (MTS) network. This is only possible if high quality message grade trunks are used between the originating office and terminating number service operators.

2. DESCRIPTION

2.01 The concentrator consists of three basic units: the 4-wire switch, the incoming trunk preference and control circuit, and the outgoing trunk preference and control circuit as shown in Fig. 2. These units are discussed in the following paragraphs. In addition, maintenance features, physical arrangement, and applications of the No. 1 Trunk Concentrator are described.

A. Switch

2.02 The 4-wire switch is a 600-ohm, 6-wire, 240-point, small crossbar switch (CF type) with banjo wiring split between the tenth and eleventh verticals. The split banjo wiring results in two 10 by 12 half-switches. The incoming trunks are associated with the verticals of the switch, and the outgoing trunks are associated with the horizontals of the switch. Controls for the vertical and horizontal selection are on a per switch (modular) basis rather than on a common control basis. That is, each concentrator acts independently from all others in the system. For reliability, the minimum system size is two switches with their associated control circuits. Maximum system size is 10 switches. Ten switches provide 200 incoming trunks with access to a maximum of 60 outgoing trunks. The concentrator always switches four transmission leads (T, R, T1 and R1) and two signaling leads. Two-wire to four-wire conversion, when required, is a function of the No. 1 Trunk Concentrator incoming trunk circuit. The outgoing trunk circuit is always a 4-wire trunk circuit except when collocated with the AIS or ACD.

B. Incoming Trunk Preference and Control Circuit

2.03 The incoming trunk preference and control circuit interfaces the incoming trunk to the switch and determines the order in which incoming trunk demanding service is served.

C. Outgoing Trunk Preference and Control Circuit

2.04 The outgoing trunk preference and control circuit interfaces the switch to the outgoing trunks and determines which idle outgoing trunks are to be connected to a particular incoming trunk. The outgoing trunk preference and control circuit also determines when all outgoing trunks to the half-switch being served are busy.

D. Transmission Maintenance Features

2.05 For transmission maintenance and test, a jack-ended J94747A (see Section 801-206-153) trunk test set, with necessary TOUCH-TONE® signals, is available. Jacks for test access are provided on both sides of the incoming trunk but only next to the half-switch on the outgoing trunk circuits. These jacks are located on the equipment frames and not centrally located. Also, the No. 1 Trunk Concentrator is provided with means to enable operating personnel to force a connection from a particular incoming trunk to a particular outgoing trunk to allow testing with the J-test set of every path through the switch to the terminating number service system.

E. Physical Arrangement

2.06 Originally the No. 1 Trunk Concentrator was designed for an 11-foot by 6-inch frame. However, a newly developed 7-foot high No. 1 Trunk Concentrator system is also available and mainly differs in physical arrangement.

F. Application

2.07 The No. 1 Trunk Concentrator is used to concentrate intercept traffic originating at many CL5 offices. The switching machine at the central office (CO) may be any one of the following: Step by Step, No. 1 Crossbar, No. 5 Crossbar, No. 1 ESS, or No. 2 ESS.

2.08 The No. 1 Trunk Concentrator should be located in a CL4 office which is nearest to the COs being served by the No. 1 Trunk Concentrator. The incoming trunks are similar to 2-wire or 4-wire toll connect type and the outgoing trunks are similar to 4-wire intertoll type. In extended systems the outgoing trunks may require the addition of the N3 compandor applique circuit (see Section 332-421-100) to reduce circuit noise if the transmission facilities are over analog "L" carrier. When compandors are used, return answer supervision is necessary to remove single frequency signaling tone which otherwise defeats the noise advantage provided by the compandor.

2.09 Refer to Section 201-850-101 for a detailed description of the No. 1 Trunk Concentrator.

3. TRANSMISSION CONSIDERATION

3.01 The overall trunking plan for the No. 1 Trunk Concentrator in conjunction with the AIS, No. 5 ACD, and No. 23 ACD system is shown by the block diagrams. Figure 3 is for DA with charging, and Fig. 4 is for DA without charging and for intercept. As the No. 1 Trunk Concentrator cannot handle a mix of DA and INCPT, separate Trunk Concentrators are required for DA traffic and for INCPT traffic. Figures 5 and 6 show the transmission plan being used for the No. 1 Trunk Concentrator in conjunction with a general AIS

application. As indicated in Fig. 3 and 4, the No. 1 Trunk Concentrator is used between a preceding switching office having a transmission level of 0 dB TLP or -2 dB TLP (which means TP0 or TP2 testing, respectively) and a following office having -2 dB TLP. Using the No. 1 Trunk Concentrator between 0-dB TLP office is not recommended now, because the ICLs and EMLs may not be the same for the different direction of transmission in the same trunk and because the allowable 2-wire loss of the incoming trunk will be reduced. This means that the 23 ACD, No. 5 ACD, or AIS switching offices which follow the No. 1 Trunk Concentrator must have the standard -2 dB TLP and TP2 assignments.

3.02 The No. 1 Trunk Concentrator has been designed for +5 dB TLP and -10 dB TLP at the switch and to work between a CL5 office (TP0) and the higher class ACD or AIS switching office (TP2), providing 3-dB insertion loss (ICL) between these offices as shown in Fig. 3 and 4. But with the introduction of different trunking arrangements for different applications, some minor deviations from the original requirements have developed.

3.03 The jack-ended J94747A trunk test set to be used in alignment of the No. 1 Trunk Concentrator trunks contains the necessary amplifiers and pads for application of the office 0-dBm test signal to provide the proper expected measured loss (EML). This is shown in Fig. 7 and 8 for 2-wire (2W) or 4-wire (4W) trunking between TP0 and TP2 end offices. This arrangement allows a maximum loss of about 5.5 dB for 2W facilities of the trunk from the CL5 to the hybrid of the incoming trunk circuit of the No. 1 Trunk Concentrator. Figure 9 shows a No. 1 Trunk Concentrator collocated with AIS or ACD switch.

3.04 When used between a toll switchboard (3CL) and the ACD office as shown in Fig. 3 and 4, the No. 1 Trunk Concentrator operates between TP2 offices and the trunking is designed to provide an ICL of 0 dB between offices. For this case, the trunks are aligned for EML as shown in Fig. 10 and 11 for 2W or 4W trunking. In this case the No. 1 Trunk Concentrator is +5 dB and -9 dB TLP. Testing is originated from the switch jacks instead of the trunk test set.

A. Trunking Arrangement

3.05 The trunking arrangements for the No. 1 Trunk Concentrator are shown in Fig. 3 and 4. The customer request for directory assistance is made by dialing 411, 1 + 411, 555-1212, 1 + 555-1212, or 1 + NPA + 555-1212. If the CL5 office is not equipped with Local Automatic Message Accounting (LAMA), charging can be accomplished at a toll office with connections to Centralized Automatic Message Accounting (CAMA) or Traffic Service Position System (TSPS) equipped with Generic Program No. 5 or higher, or at a No. 1 Electronic Switching System (ESS) using Generic 8 or higher and having a data connection to the AMA system. (See Fig.12 and 13.) If the originating CL5 offices do not have Automatic Number Identification (ANI), the customer must be connected to Operator Number Identification (ONI) operators who obtain the calling number for the AMA system.

B. Transmission Path

3.06 The incoming trunks to the 600 ohm No. 1 Trunk Concentrator may be either 2- or 4-wire facilities:

(1) 2-wire

For 2-wire incoming facilities from Class 5 Office, a 1M terminating set (900 ohm) is used for interfacing between the 2-wire lines and the 4-wire concentrator (Fig. 5). The pads on the terminating set are adjusted to give the required trunk loss and hence for intrabuilding connection. The usual 2-dB external pads are not required. For some trunks on 2-wire facilities, the impedance compensator (837 type) may be used and the internal compromise network of the 1M terminating set will then be used. For other trunks on 2-wire facilities, the impedance compensator (837 type) is not used, but a precision network (4066 type) may be needed at the 1M terminating set (see Section 852-307-10Z for V4 telephone repeater engineering).

(2) 4-wire

Figure 6 shows a 2-wire No. 1 Trunk Concentrator transmission plan. The 4182-type network used in the 4-wire incoming trunk is employed to extend 4-wire voice frequency

or carrier facilities to the 4-wire concentrators. The transmission requirement is to adjust incoming and outgoing levels through the No. 1 Trunk Concentrator for proper transmission performance. By applying appropriate 89-type resistors in the 4182-type network, transmission level can be controlled and readily adjusted for optimum performance.

(3) Toll Switchboard (No. 1 or No. 3 type SD-56525-01)

The connections to a toll switchboard (600 ohms) are shown in Fig. 3 and 4. When the switchboard is collocated with the No. 1 Trunk Concentrator, a 2-wire connection not exceeding 250 feet of 26 gauge cable can be allowed and 1N terminating set (2W/4W 600/600) is used in the No. 1 Trunk Concentrator incoming trunk circuit. Otherwise, 4-wire facilities must be used in order to meet return loss requirements. The switchboard modifications are required as follows:

(a) Midpoint "A" capacitor should be changed to 2 μF (code 439)A

(b) Midpoint "B" capacitor should be changed to 4 μF (code 437A)

(c) Repeat coil "A" should be a 120C for 600 ohm/600 ohm ratio.

C. Trunk Loss Requirement

3.07 The loss requirements for ICL and EML applicable to 2W or 4W trunks are shown in Table A. These requirements are in accord with the existing usage of the No. 1 Trunk Concentrator [(eg, CL5, Operator Room Desks (ORD), No. 5 ACD Phases I and II, AIS, TSPS, No. 1 ESS, CAMA, and switchboard (SWBD)] for charging and noncharging applications. The No. 1 Trunk Concentrator switch loss between the incoming and outgoing jacks should not exceed 0.5 dB and is included in the assigned trunking losses.

D. Switch Noise Requirements

3.08 There are no gain devices in the No. 1 Trunk Concentrator and the noise level should be relatively low. The noise measured on the switching circuit between the incoming and outgoing jacks should not exceed 21 dBrnC for the +5 dB level and 6 dBrnC for the -10 dB level. The noise of the incoming and outgoing trunk circuits would be included in the associated trunk noise measurement. Trunk noise measured with the J94747A trunk test set should conform to message circuit noise requirements in Section 660-403-500 or as specified by the AIS or ACD, Section 852-40Y-100.

E. Return Loss Requirement

3.09 The terminal balance requirements for echo return loss (ERL) and singing return loss (SRL) are shown in Table B for the incoming trunks. There are no balance requirements on the outgoing trunks as the No. 1 Trunk Concentrator and the trunk facilities are 4-wire. These requirements are necessary to achieve a satisfactory echo grade-of-service. The balance requirements and verification tests are given in Section 660-461-301.

F. Transmission Levels at the Switch

3.10 The No. 1 Trunk Concentrator switch has been assigned +5 dB TLP and -10 dB TLP transmission levels. This was done so that in cases where a cable trunk is connected to a carrier trunk (or vice versa) via the switch, some carrier gain can be used to offset the cable loss. This available gain will compensate for the 2-wire end office trunk to a maximum of 5.5-dB loss as shown in Fig. 5. If the loss exceeds 5.5 dB, repeaters must be provided in the end office. Whenever possible, the gain in the terminal of carrier facilities should be utilized to minimize the need for repeaters in 2-wire end office trunks.

3.11 The transmission levels at the switch are measured with the portable trunk test set J94747A as shown in Fig. 7, 8, and 9.

Note: When the proper keys are operated, the test set provides a 10-dB pad or 5-dB amplifier in the transmit and receive pairs to obtain the proper transmission levels (see Fig. 14 and 15).

3.12 Refer to the following sections for transmission consideration of the desired application.

Section	Application
852-405-100	AIS

852-406-100	Phase I No. 5 ACD
852-406-101	Phase II No. 5 ACD
852-406-102	No. 23 ACD

4. OFFICE CABLING CONSIDERATIONS

4.01 Voice frequency office cabling is used between the trunk facilities, intermediate distributing frames, and the trunk circuits of the No. 1 Trunk Concentrator. The pairs making up the 2- or 4-wire transmission circuits should have a good longitudinal balance to avoid longitudinal noise problems. In addition, electrical coupling between pairs in a common cable or cabling will cause crosstalk. The crosstalk effects are dependent upon the difference in transmission levels and the length of the common cable. Small differences in levels require restrictions on the length of the common cabling. Large differences in levels require separate cables in which pairs having the same level are grouped together. Sensitive (low level) transmission circuits should be assigned to exclusive cables.

Note: Excessive length of the transmission pairs will cause the following:

(a) Impedance mismatch due to the added resistance and capacity effects

(b) Increase in the frequency slope at 2800 Hz relative to 1004 Hz

(c) Increase in the insertion loss at 1004 Hz.

Wiring length is also restricted by the DC signaling range.

5. OFFICE WIRING RESTRICTIONS

5.01 In general, office wiring restrictions for transmission reasons are based on current MTS practices and the use of 24-gauge switchboard cable. Other wiring gauges can be used provided the resistance limits do not exceed the 24-gauge wiring restrictions. Wiring restrictions are primarily necessary in order that terminal or through-balance return loss requirements can be met and also to avoid excessive insertion loss or loss slope (loss at 1004 Hz relative to 2800 Hz) or exposure to crosstalk 60 Hz ac or to noise on connections through the office. As usual, low level transmission wiring should be separated from wiring used for control, signaling, interrupter circuits, and power wiring to reduce chances of noise from these sources.

5.02 The office wiring restrictions for the No. 1 Trunk Concentrator are shown in Fig. 16. As noted on the figure, separate cable sheaths (separated by at least 3 inches) are required from carrier bays to the trunk circuits to separate the -16 dB TLP and the +7 dB TLP wiring.

6. CERTIFICATION OF OFFICE BALANCE

6.01 The certification of an office as balanced is the responsibility of the transmission engineer. The requirements for certification are given in Section 852-400-010. The following is a summary of these requirements.

(a) Trunks that do not meet the loss design objectives are classified as not meeting minimum balance requirements.

(b) Trunks for which recorded measurements are not available are classified as below minimum requirements for ERL and SP/SRL.

(c) At least 50 percent of all measurements for each class of trunk must be equal to or greater than the median requirement. Similarly, not more than two percent of the measurements for each class of trunk may be below minimum requirements.

(d) All trunks with measurements below turndown limit have been removed from service.

(e) Balance records must be complete as specified in Section 660-461-101.

7. REFERENCES

7.01 The following references provide supplementary information for this section.

SECTION	TITLE
201-850-101	No. 1 Trunk Concentrator—Description
332-421-100	N3 Compandor Applique Circuit-General Description

SECTION	TITLE
332-421-500	N3 Compandor Applique Circuit-Tests and Adjustments
660-403-500	Message Circuit Noise Measurements on Message Trunks—Requirements
801-206-153	No. 1 Trunk Concentrator Portable Test Set (J94747A-SD-97576-01)
852-307-10Z	V4 Repeater Engineering
852-405-100	Automatic Intercept System—Transmission Considerations
EL 3327	No. 1 Trunk Concentrator—General Description
EL 3700	No. 1 Trunk Concentrator—For Directory Assistance
EL 4302	No. 1 Trunk Concentrator With 7-Foot Frames—Introduction

TABLE A

TRUNK TRANSMISSION REQUIREMENTS
(NOTES 1, 2, 3 & 4)

CONNECTION	NO. 1 TRUNK CONCENTRATOR TRUNKS	TRUNK FACILITY	TRUNK LOSS dB		
			ICL	EML	
Class 5 to No. 1 Trunk Concentrator to AIS or ACD	Class 5 to No. 1 Trunk Concentrator	2- or 4-Wire	10.0	5.0	See Fig. 7, 8
	No. 1 Trunk Concentrator to AIS, No. 5 ACD, (Phase I & II), 23 ACD, No. 1 ESS, & TSPS	4-Wire	7.0 (Gain)	5.0	See Fig. 7, 8
Switchboard to No. 1 Trunk Concentrator to AIS or ACD	SWBD to No. 1 Trunk Concentrator	4- or 2-Wire In Bldg (Note 4)	7.0	9.0	See Fig. 10, 11
	No. 1 Trunk Concentrator to AIS, No. 5 ACD, (Phase I & II) & 23 ACD	4-Wire	7.0 (Gain)	5.0 (Gain)	See Fig. 10, 11
No. 1 Trunk Concentrator Collocated With AIS or ACD	Class 5 to No. 1 Trunk Concentrator	2-Wire	5.0 (Gain)	5.0	See Fig. 9
	No. 1 Trunk Concentrator to AIS, No. 5 ACD (Phase I & II) & 23 ACD	4-Wire	8.0	5.0	See Fig. 9

Note 1: See Section 660-450-301 for Circuit Order Test, 660-402-300 for Maintenance Test and E.L. 4318 for noise reduction with compandors added to LMX facilities for extended range application.

Note 2: TP0 testing at Class 5 Office
TP2 testing at AIS, ACDs, SWBD, TSPS and Toll.

Note 3: EML at the switch jacks.

Note 4: A 2-wire path not exceeding 250 feet of 26 gauge cabling can be used from SWBD to the No. 1 Trunk Concentrator (see par 3.06 for SWBD modifications).

TABLE B

RETURN LOSS REQUIREMENTS
NO. 1 TRUNK CONCENTRATOR TO CLASS 5 OFFICE OR SWBD
(NOTES 1, 2, 3 & 4)

TYPE OF FACILITY		APPROX 2-WIRE LOSS (dB)	INC TRK HYB. TRMT OR RCV PAD LOSS (dB)	ERL (dB)			SRL (dB)		
				MED	MIN	TURN DOWN LIMIT	MED	MIN	TURN DOWN LIMIT
To Class 5 Office	2- or 4-Wire With 2-Wire Extensions (Interbuilding)	0 to 2	6 to 4	22	18	10.5	14	10	4
		2.5	3.5	18	13	10.5	10	6	4
		3	3	18	13	10.5	10	6	4
		4	2	20	15	12.5	12	8	6
		5	1	22	17	14.5	14	10	8
		5.5	0.5	23	18	15.5	15	11	9
	2-Wire Intra-Building	0 to 2	6 to 4	22	18	10.5	14	10	4
	4-Wire	—	—	22	16	10.5	15	11	4
To SWBD	2-Wire Intra-Building (Max. 250′ 26 ga) Cable	0 to 0.5	6 to 5.5	27	21	18	20	14	11
	4-Wire (at SWBD, Max. Length 2-Wire is 250′ 26 ga Cable From 4 WTS to SWBD)	—	—	27	21	18	20	14	11

Note 1: Class 5 Office termination is 900 Ohm plus 2.16 μf.

Note 2: Switchboard termination is 600 Ohm plus 2.16 μf.

Note 3: The Wiltron Model 9041 or 9031 return loss measuring set (RLMS) is connected to the No. 1 Trunk Concentrator incoming jacks. The KS-20501 RLMS requires using the J94747A trunk test set which has 5 dB gain in the transmit and in the receive directions. The values in the table are based on establishing a zero reference reading by shorting at the 2-wire hybrid point.

Note 4: For 2-wire loss over 3 dB, meeting return loss requirements will require cable having high structural return loss.

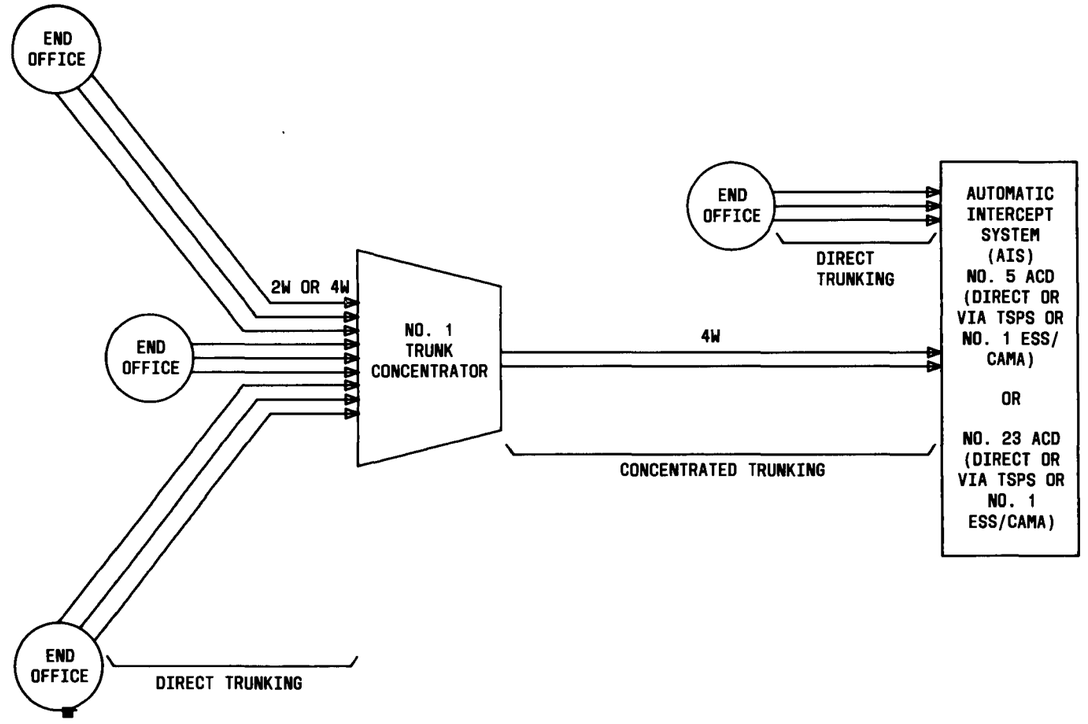


Fig. 1—No. 1 Trunk Concentrator—Basic System Arrangement

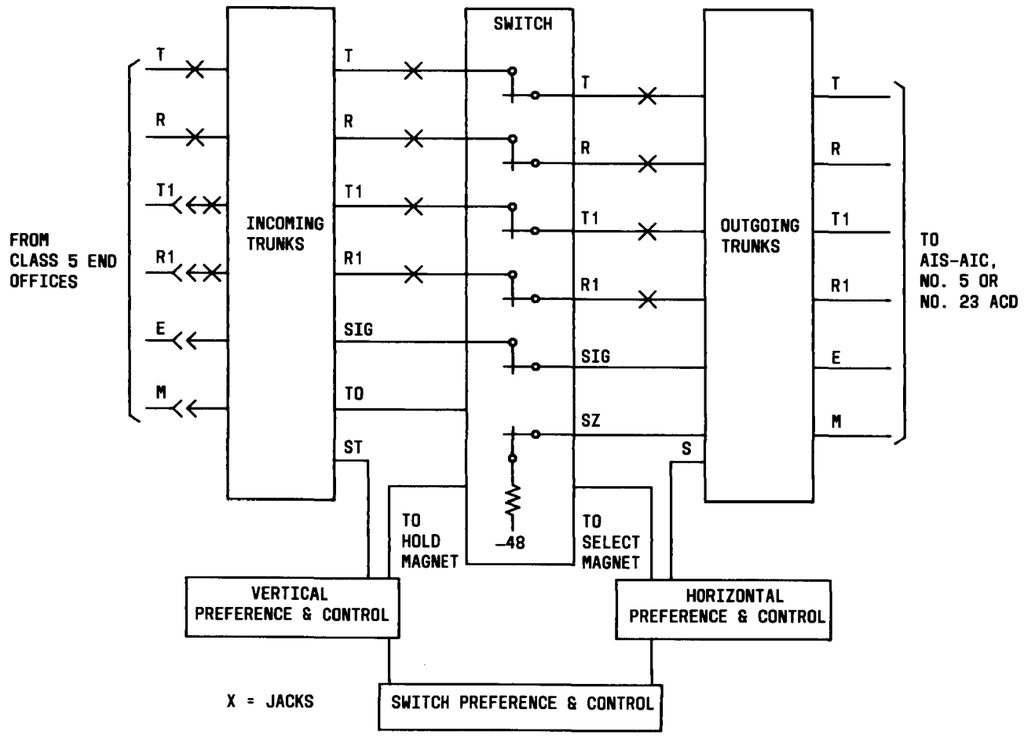


Fig. 2—No. 1 Trunk Concentrator—Block Diagram

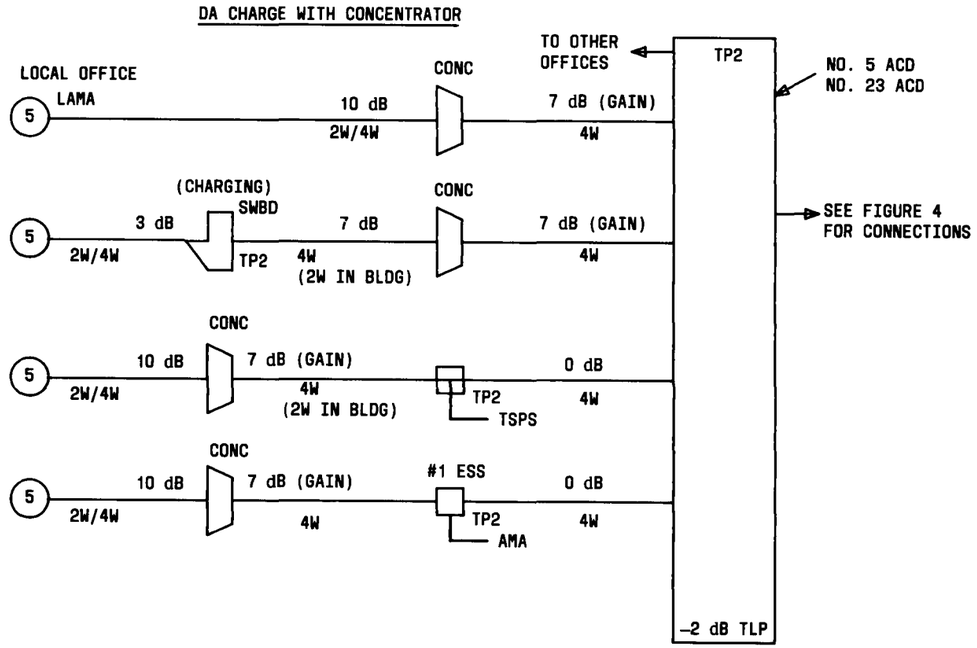


Fig. 3—No. 1 Trunk Concentrator—Trunking Plan—With DA Charging

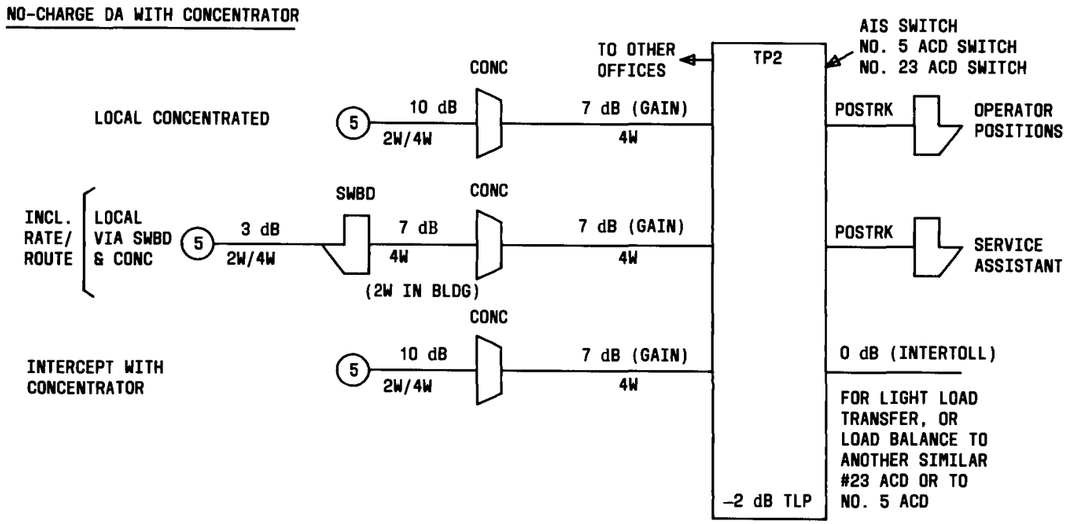
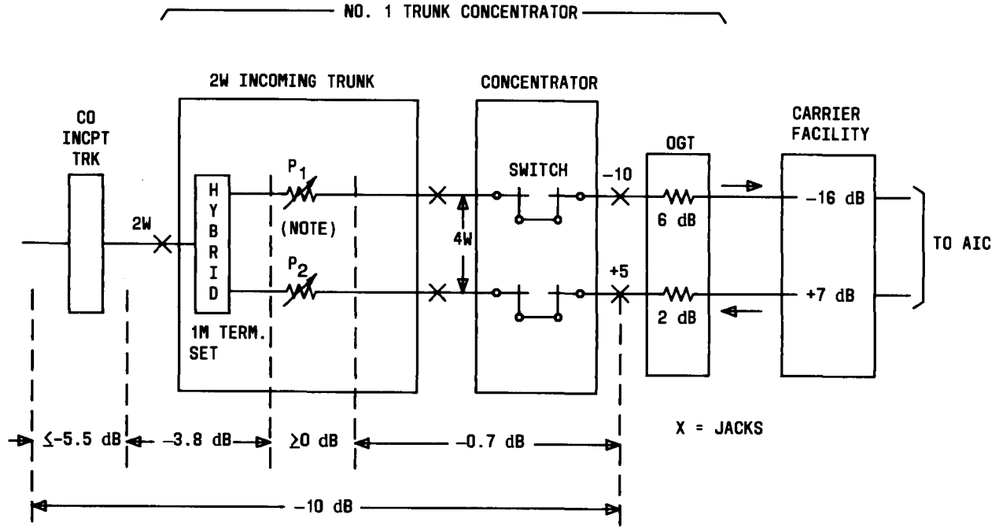
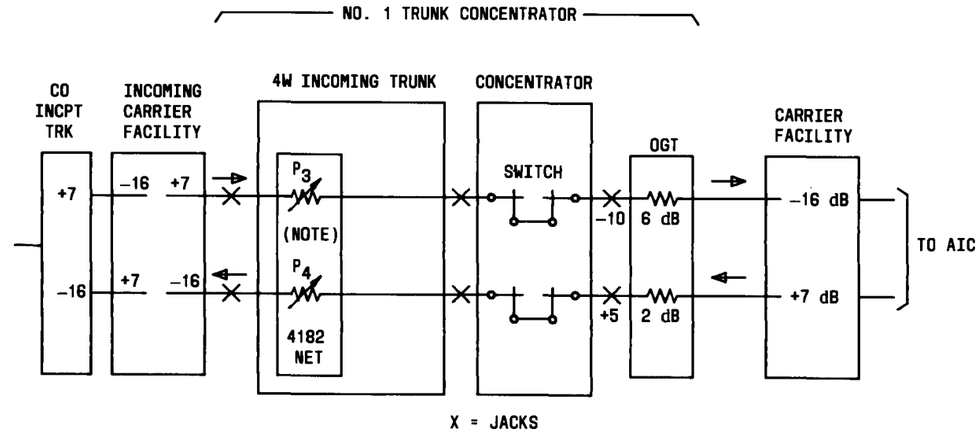


Fig. 4—No. 1 Trunk Concentrator—Trunking Plan—Without DA Charging and for Intercept



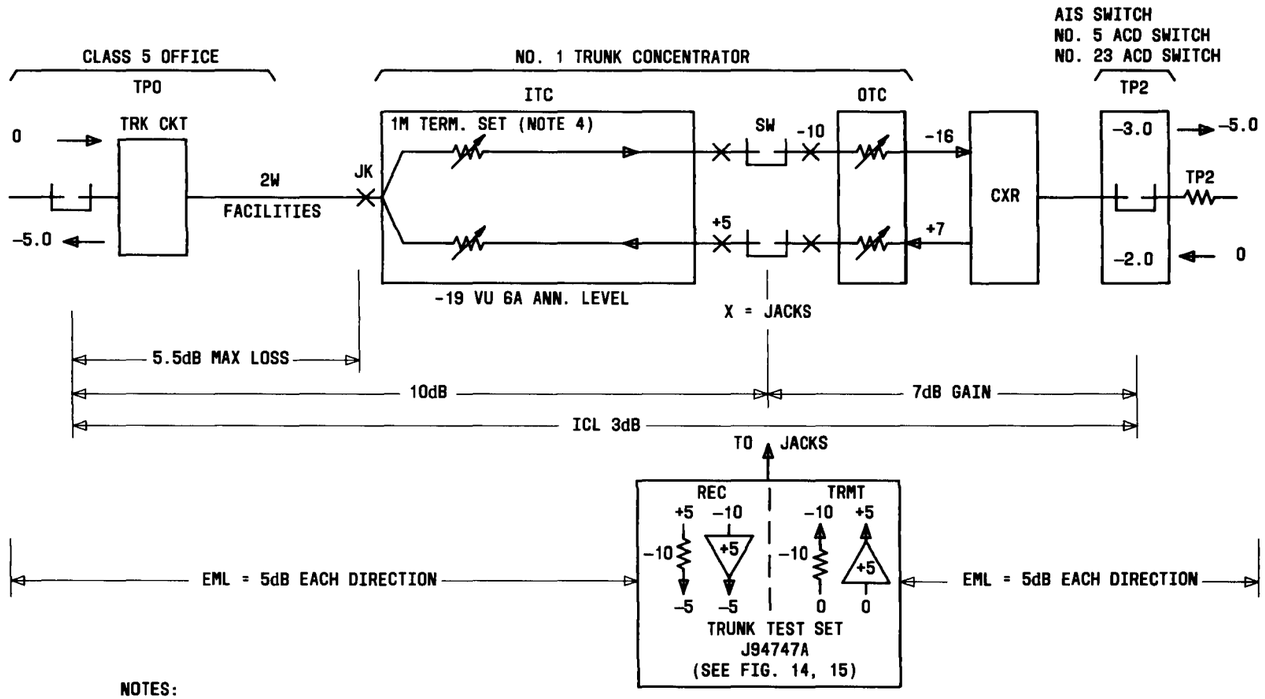
NOTE:
PADS P_1 AND P_2 PROVIDE 0 TO 15 dB LOSS IN .25 dB INCREMENTS TO ADJUST 10 dB TRANSMISSION LOSS FROM CO TO TRUNK CONCENTRATOR OUTGOING TRUNK

Fig. 5—Transmission Plan—2-Wire Incoming Trunks



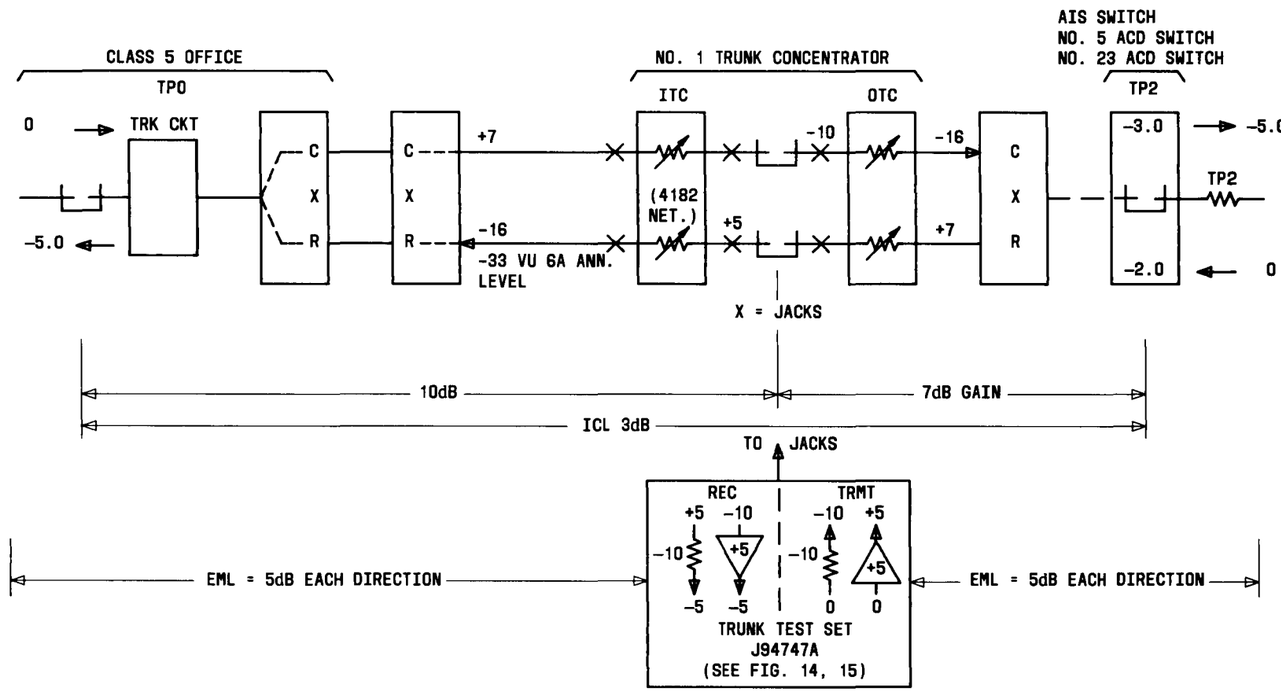
NOTE:
PADS P_3 AND P_4 PROVIDE 0 TO 23 dB LOSS IN .25 dB INCREMENTS TO MATCH INCOMING AND OUTGOING CARRIER LEVELS

Fig. 6—Transmission Plan—4-Wire Incoming Trunks



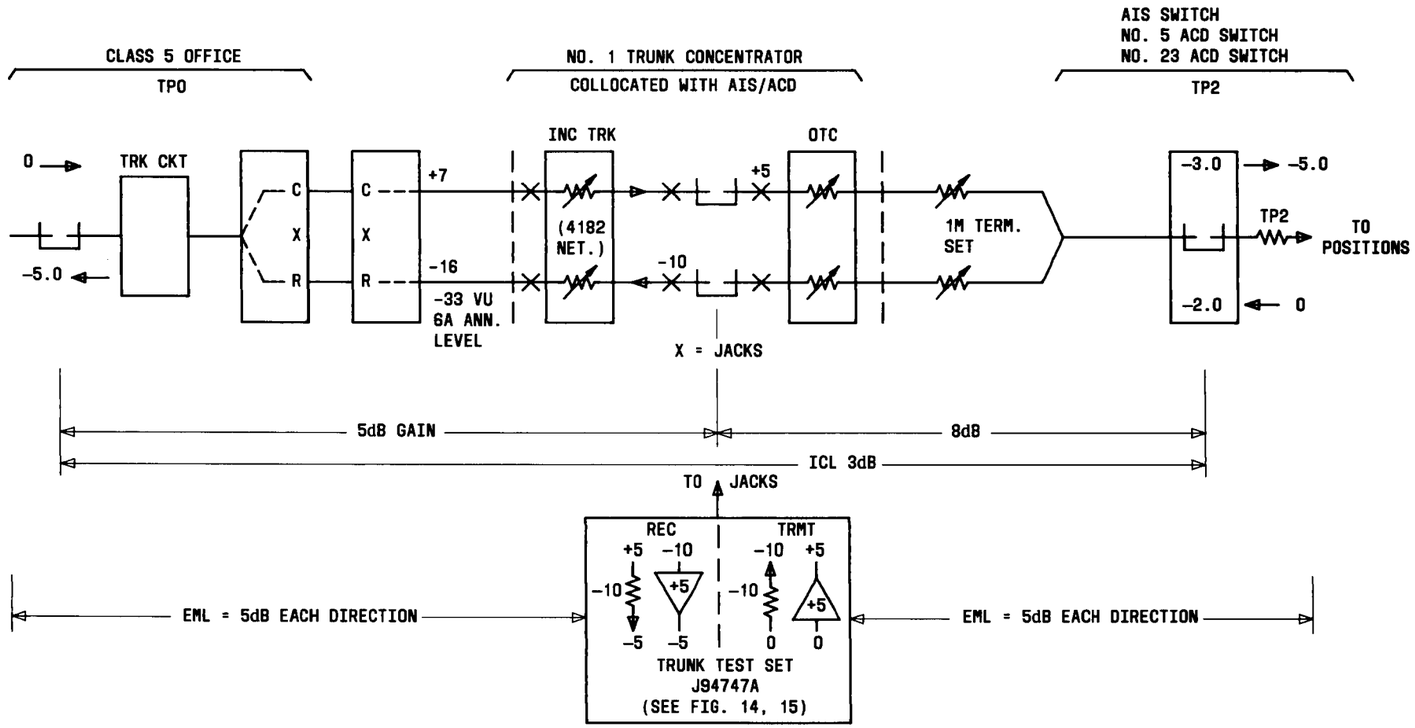
NOTES:
1. CONCENTRATOR OPERATES AT -10 AND +5 LEVELS
2. IF THE 2W AND 4W TRUNKS ARE REVERSED, THE LEVELS AT THE SW ARE REVERSED
3. PADS ARE ADJUSTABLE TO ACCOUNT FOR OFFICE LOSSES AND CABLE FACILITIES
4. PRECISION BALANCE NETWORK 4066 TYPE MAY BE REQUIRED FOR LOADED CABLE OR FOR LONG NON-LOADED CABLE

Fig. 7—2-Wire Incoming and 4-Wire Outgoing Trunks—Used Between TPO (Class 5) and TP2 Offices



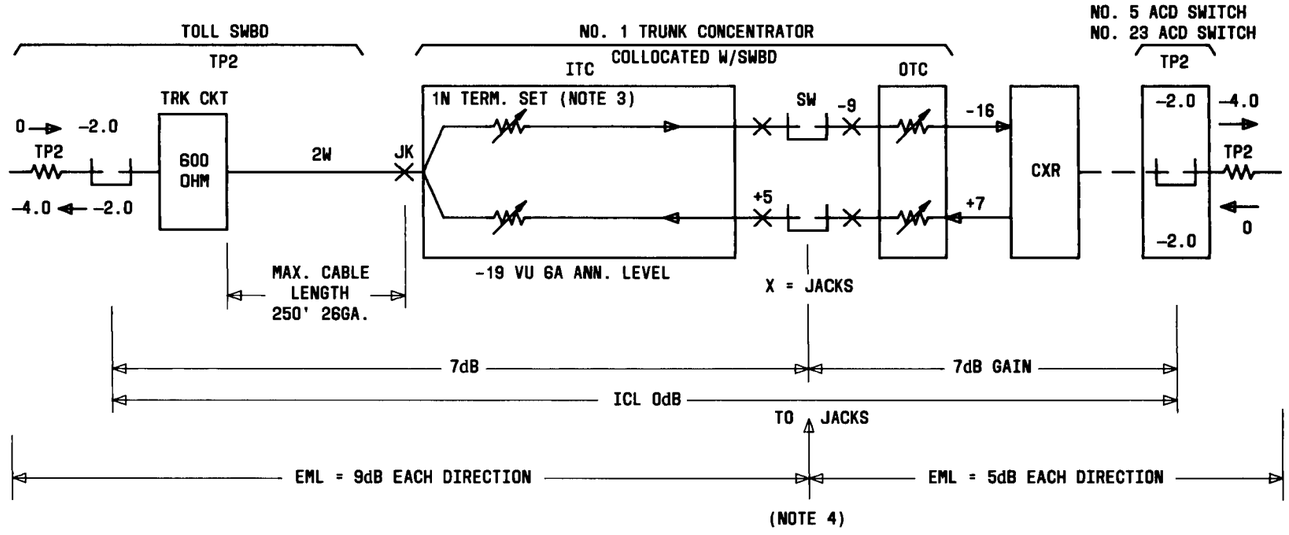
NOTES:
1. CONCENTRATOR OPERATES AT -10 AND +5 LEVELS
2. PADS ARE ADJUSTABLE TO ACCOUNT FOR OFFICE LOSSES AND CABLE FACILITIES

Fig. 8—4-Wire Incoming and 4-Wire Outgoing Trunks—Used Between TPO (Class 5) and TP2 Offices



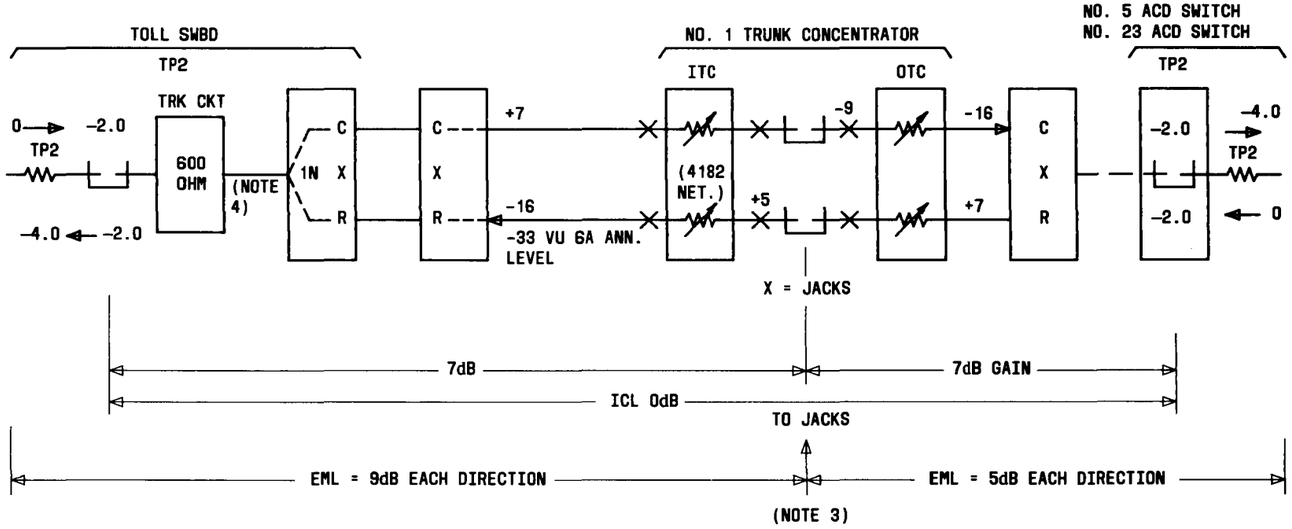
NOTES:
1. CONCENTRATOR OPERATES AT +5 AND -10 LEVELS, REVERSED FROM OTHER FIGURES
2. PADS ARE ADJUSTABLE TO ACCOUNT FOR OFFICE LOSSES AND CABLE FACILITIES

Fig. 9—No. 1 Trunk Concentrator—Collocated With AIS or ACD Switch—Used Between TP0 (Class 5) and TP2 Offices



NOTES:
1. CONCENTRATOR OPERATES AT -9 AND +5 LEVELS.
2. PADS ARE ADJUSTABLE TO ACCOUNT FOR OFFICE LOSSES AND CABLE FACILITIES
3. PRECISION BALANCE NETWORK 4066 TYPE MAY BE REQUIRED FOR LOADED CABLE OR FOR LONG NON-LOADED CABLE
4. MAKE TEST FOR EML AS SHOWN FROM SWITCH JACKS IN EACH DIRECTION WITH OUT TEST SET

Fig. 10—No. 1 Trunk Concentrator—Collocated With Toll SWBD—2-Wire Incoming and 4-Wire Outgoing Trunks



NOTES:
1. CONCENTRATOR OPERATES AT -9 AND +5 LEVELS
2. PADS ARE ADJUSTABLE TO ACCOUNT FOR OFFICE LOSSES AND CABLE FACILITIES
3. MAKE TEST FOR EML AS SHOWN FROM SWITCH JACKS IN EACH DIRECTION WITH OUT TEST SET
4. MAX. CABLE LENGTH 250 FEET - 26 GAUGE

Fig. 11—No. 1 Trunk Concentrator—Remotely From Toll SWBD—4-Wire Incoming and 4-Wire Outgoing Trunks

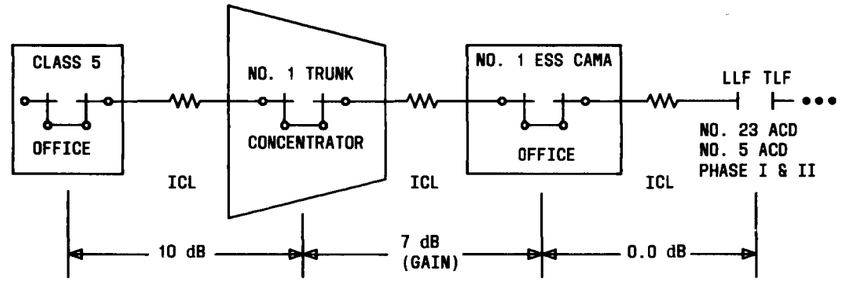


Fig. 12—No. 1 ESS/CAMA Office—Arranged for Charge Recording

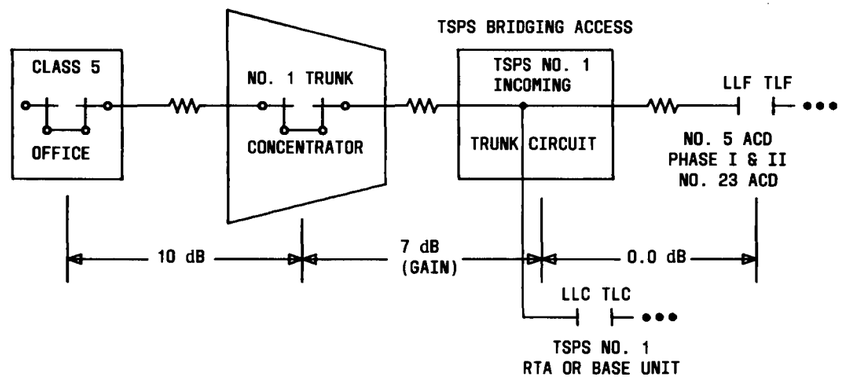
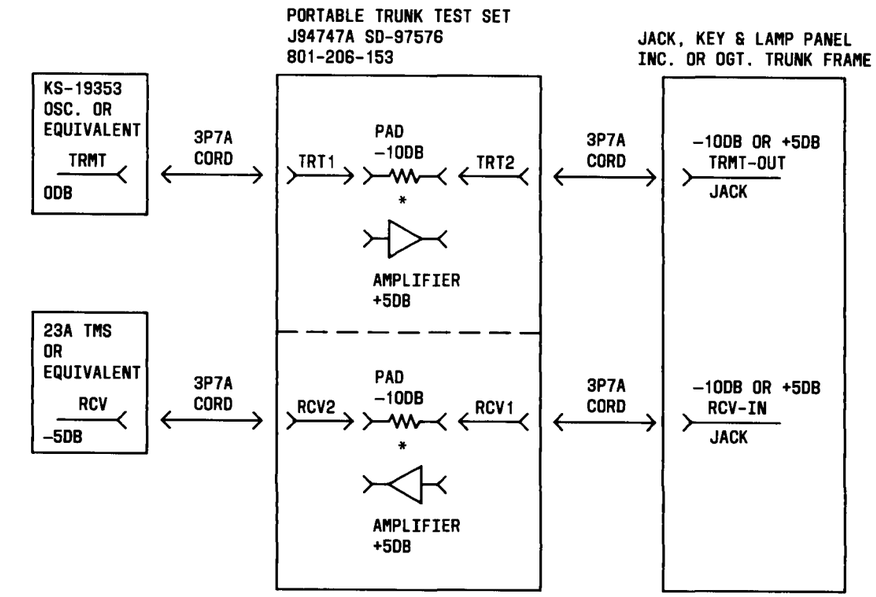


Fig. 13—No. 1 TSPS—Arranged for Charge Recording



*WHEN THE PROPER KEYS ARE OPERATED THE TEST SET PROVIDES A 10dB PAD OR 5dB AMPLIFIER IN THE TRANSMIT AND RECEIVE PAIRS TO OBTAIN THE PROPER TRANSMISSION LEVELS.

Fig. 14—No. 1 Trunk Concentrator Portable Trunk Test Set—Top View

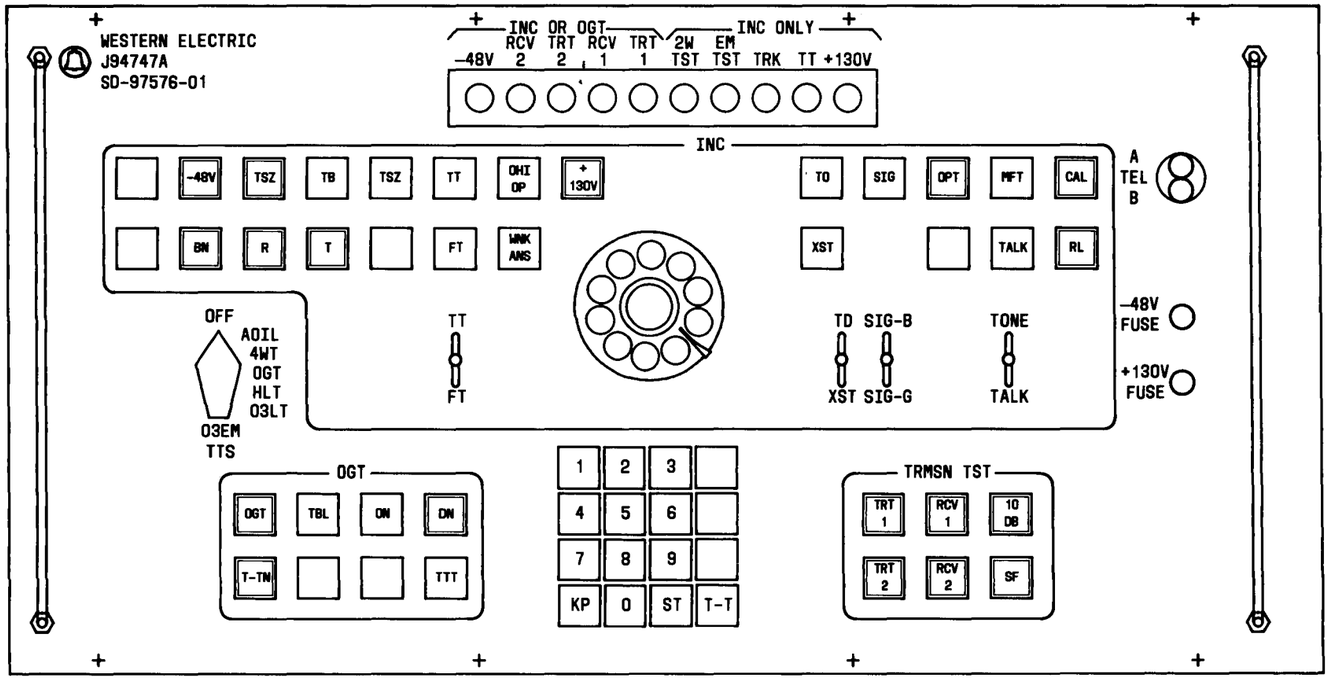
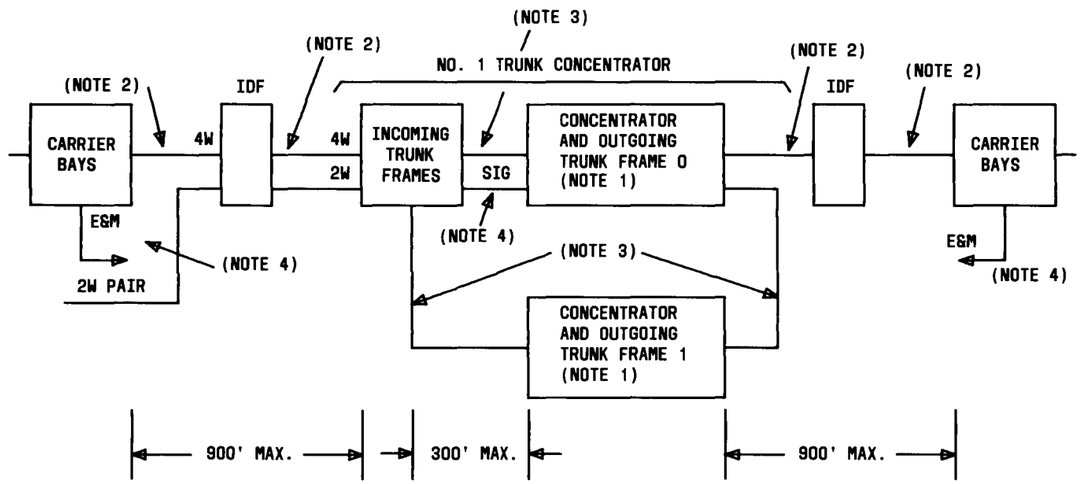


Fig. 15—Basic No. 1 Trunk Concentrator Portable Trunk Test Set J94747A SD-97576



NOTES:
1. CONCENTRATOR AND OUTGOING TRUNK FRAMES 0 AND 1 WILL MOUNT ADJACENT TO EACH OTHER.
2. SEPARATE SHEATHS.
3. COMMON SHEATH
4. SEE SIGNALING EQUIPMENT FOR LIMITS.

Fig. 16—Office Wiring Restrictions—For 24 Gauge Cable