

CENTREX SERVICE
TRANSMISSION ENGINEERING CONSIDERATIONS

CONTENTS	PAGE
1. GENERAL	1
2. CENTREX-CO	1
A. General	1
B. Attendant Facilities — Consoles	1
C. Attendant Facilities — Switchboards	3
D. Tie Trunks	8
E. Switched Pad Operation	9
F. Foreign Exchange Trunks	9
G. WATS Service	9
H. Conferencing	10
I. Add-On	10
J. Centrex Station Lines	10
3. CENTREX-CU	10
A. General	10
B. Effect of Direct In-Dialing	10
C. Conference Service	11
D. Attendant Facilities	11

1. GENERAL

1.01 This section discusses the transmission design considerations associated with Centrex service. Only those items which are peculiar to Centrex are covered. Reference should be made to other AB sections for the design considerations of switched private line circuits.

1.02 Centrex service is available in two basic equipment arrangements — Centrex-CO and Centrex-CU.

1.03 Centrex-CO denotes service provided with switching equipment located on Telephone Company-owned or leased premises. The switching equipment will usually be a No. 5 Crossbar machine although step-by-step equipment may be used in some cases. The No. 1 ESS will also be arranged to provide this service. Each Centrex station will be served by a direct line to the CO

location. Attendant facilities at the customer's premises may consist of consoles or a switchboard. A No. 5 Crossbar switching machine may serve only Centrex customers or may serve both Centrex and regular subscribers. The Centrex-CO normally is treated as a Class 5 office in the DDD network. The portion of the No. 5 Crossbar office which serves as a tandem PBX switching machine (i.e., switching of tie trunks at VNL), should be treated as a Class 3 office and will require both through and terminal balance. A discussion of balance considerations and requirements is covered in Section 310-350-100.

1.04 The Centrex-CU arrangement locates both the dial switching equipment and the attendant facilities on the customer's premises. The switching equipment will usually be a 701B Step-by-Step or a No. 101 ESS PBX switch unit. The transmission characteristics of a PBX and its connecting circuits used for Centrex-CU service are essentially the same as for normal PBX service. Some differences are discussed in Part 3 of this section.

2. CENTREX-CO

A. General

2.01 The discussion of Centrex-CO in this section will assume the use of a 2-wire, No. 5 Crossbar switching machine. Furthermore, most of the discussion will be based on standard equipment arrangements referred to as Phase III Centrex. As there have been several preliminary equipment arrangements, it will be necessary to verify that the features discussed in this section apply to your particular switching arrangement. Basically the transmission considerations will apply regardless of the particular arrangement (i.e., Pre-Phase I, Phase I, Phase II or Phase III).

B. Attendant Facilities — Consoles

2.02 Attendant facilities for Centrex-CO are normally provided by means of 1- or 2-type consoles or a 608-type switchboard. Console operation is preferable to the present switch-

board arrangement from a transmission standpoint as discussed later in this section. However, the type of operation desired by some customers requires switchboard facilities to permit administration by the PBX operator.

2.03 Centrex consoles are arranged for single cord operation; hence, no calls can be connected in series through the console. The console attendant completes calls requiring assistance (for example, dial "O", listed number or transfer calls) by dialing back through the Centrex machine. When the called party answers, the attendant will normally "drop off" the connection, leaving the through connection unbridged by the console circuit. However, the attendant has two other options:

1. She may monitor the call to see that it is properly completed and then release.
2. She may choose to "hold" after completing a connection. This will permit the attendant to handle other calls and still be able to monitor, at intervals, on the "held" call.

2.04 From a transmission standpoint, two phases of console operation require attention; (a) satisfactory transmit and receive volume *to* and *from* the operator and (b) the bridging effect of the console. The console arrangements have been designed to meet the following objectives:

1. The average receive volume at the console will be maintained at approximately preferred level regardless of loop loss. (See Par. 2.08.)
2. At the crossbar switches, the average transmit volume received from the console will be equivalent to that received from a 500 set at the same location as the console.
3. The effect, both on volume and return loss, of bridging the console on a through connection is negligible.

2.05 Centrex-CO console arrangements are provided on a 2-wire basis for Phase III Centrex. This is permissible since a 2-wire transistor amplifier bridge is associated with each position and position loop circuit. However, for transmission reasons, earlier versions of Centrex-CO utilize 4-wire console arrangements, consisting of a 9A or 1- or 2-type consoles.

2.06 The 9A console is now rated "A&M Only". Special arrangements are required if 1- or 2-type consoles must be used in systems designed for the 9A. A 274AC inductor must be connected in series with the talking battery supply pair at or near each console and the idle circuit terminations must be removed from the transmitters in the console.

2.07 High-impedance bridging in earlier versions of Centrex is accomplished by means of a 186C output transformer which has a 12-to-1 impedance ratio. A 900-ohm resistor is switched across the high-impedance side of each 186C transformer to provide proper termination during the interval when the call is terminated in the console. The balance network is composed of a 309-ohm resistor in series with a 14.8 mh inductor rather than the conventional compromise (900-ohm + 2 μ f) balance network. The 186C output transformer reduces the effect of impedance changes on the high-impedance side of the transformer. Under working conditions, the transhybrid losses are of the order of 35 db or higher over the voice-frequency range.

2.08 The proper transmit and receive volumes are obtained by means of V3- or 227-type amplifiers. Amplifier gain settings are given in Table I. In determining these recommended gain settings, it was necessary to consider not only the objective transmit and receive volumes, but also the sidetone at the console.

TABLE I

LOOP RESISTANCE OHMS	TRANSMITTER CIRCUIT AMPLIFIER GAIN (db)	RECEIVER CIRCUIT AMPLIFIER GAIN (db)
1- and 2-Type Consoles		
0 - 99	27	19+L*
100 - 249	28	"
250 - 499	30	"
500 and Over	31	"
9A Consoles		
0 - 99	21	15+L*
100 - 249	22	"
250 - 499	23	"
500 and Over	25	"

*L = 1000-cycle loss of loop in db.

2.09 The sidetone level at the console is dependent on, among other factors, the transhybrid loss between 4-wire legs of the hybrid, the amplifier gains, and the loop loss. With the amplifier gains given, and the expected transhybrid loss, preferred sidetone levels will be approached under working conditions. High sidetone may occur in some cases due to excessive lengths of office cabling between the hybrid and the 186C output transformer. Installation and adjustment of an external NBO capacitor may be required (approximately $0.0025 \mu\text{f}$ per 100 feet of cable). It is expected that, in the majority of cases, sidetone will be satisfactory and the NBOC will not be required. Where performance is not satisfactory, circuit difficulties such as incorrect amplifier gains, wrong equipment components, errors in cable make-up and inadequate transhybrid loss should be investigated.

2.10 During the idle condition, stability and sidetone control are maintained in the console circuit by an idle circuit termination in the position circuit. The idle circuit termination should consist of a 300-ohm resistor, a $1.5 \mu\text{f}$ capacitor shunted by a 10K-ohm resistor, and a 14.8 mh inductor. In some initial equipment arrangements, only the 300-ohm (KP) resistor was used; in others a $2 \mu\text{f}$ capacitor was used with the 300-ohm resistor. Before the gains in Table I can be used, this termination should be modified to include the inductor and correct capacitor.

C. Attendant Facilities — Switchboards

2.11 Switchboard facilities for Centrex-CO will be provided by means of the 608-type cord switchboard. As discussed in the following paragraphs, **fully satisfactory transmission cannot be expected when calls are corded through a switchboard until such time as released loop operation is available.** It may not be practical with present arrangements to provide Centrex-CO service with switchboards at all locations due to transmission and supervisory problems.

2.12 Present equipment provides for single cord (released loop) operation similar to that discussed for consoles **only** on incoming listed number calls completing to Centrex stations and on Centrex station transfer calls. Other calls, such as dial "O", and incoming listed number calls to be connected to tie trunks which involve attendant assistance, must remain looped through the switchboard. Consequently, these

calls may involve two or three loops between the switching machine and the customer's location. An attendant-assisted call from a Centrex station to the message network will involve three loops. A typical situation is shown in Fig. 1. This type of operation results in definite transmission and supervisory problems, such as:

1. **Excessive transmission loss on calls corded through the switchboard.**
2. **Degraded return loss on tie trunk or access line connections.**
3. **Limitations on the allowable conductor loop resistance of Centrex station lines.**
4. **Low transmitter current at the station.**
5. **Contrast between calls dialed directly through the crossbar machine and those corded through the switchboard.**
6. **Attendant monitoring degrades transmission and return loss.**
7. **Poor frequency response on some connections.**
8. **Loading problems when connecting loops with varying end sections and/or bridged tap.**

2.13 Various circuit and equipment configurations will result depending on the type of call. Figs. 2, 3, and 4 illustrate some of the problems mentioned above.

2.14 Fig. 2 shows a typical connection for a dial "O" call originated by a Centrex station for completion to the message network. The following are some of the transmission considerations and penalties involved:

- (a) 3 loops
- (b) 1 to 1.5 db equipment loss
- (c) talking battery supplied over the 3 loops in tandem
- (d) maximum conductor loop resistance from Centrex station to the OGT is 1300 ohms.

2.15 The layout shown in Fig. 3 will result when a dial "O" call is originated by a Centrex station for completion to a tie trunk. The transmission considerations are:

- (a) 3 loops
- (b) 1.5 to 2 db equipment loss
- (c) talking battery supplied from Aux. OGT
- (d) maximum conductor loop resistance from Centrex station to tie trunk circuit is 1300 ohms
- (e) balance considerations.

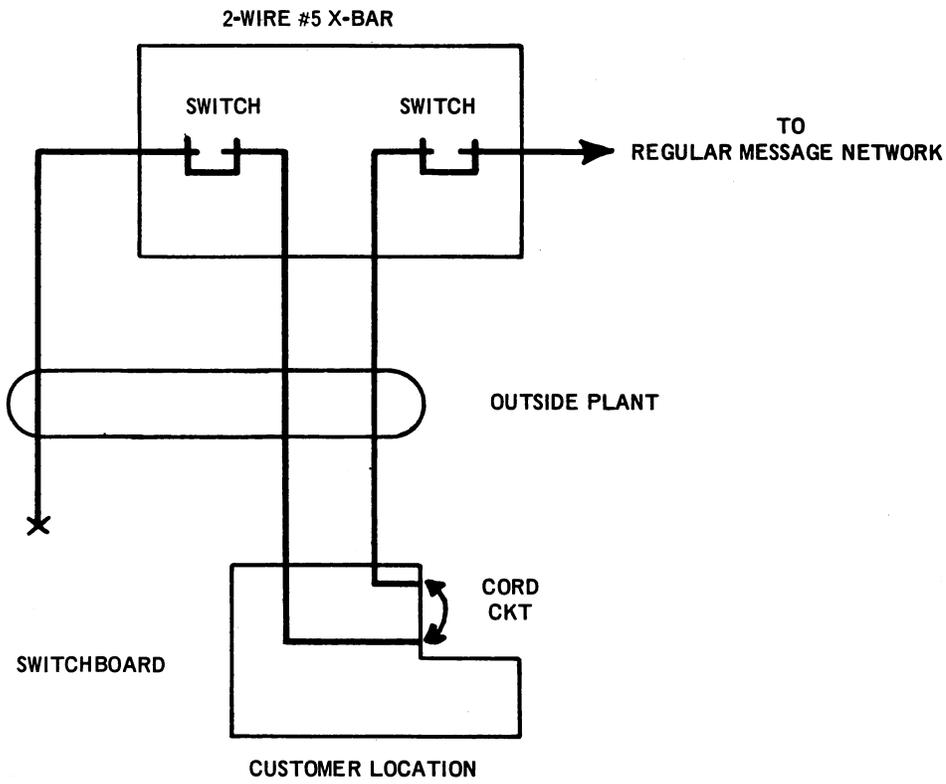


Fig. 1 – Typical Three Loop Arrangement with Centrex-CO and Switchboards

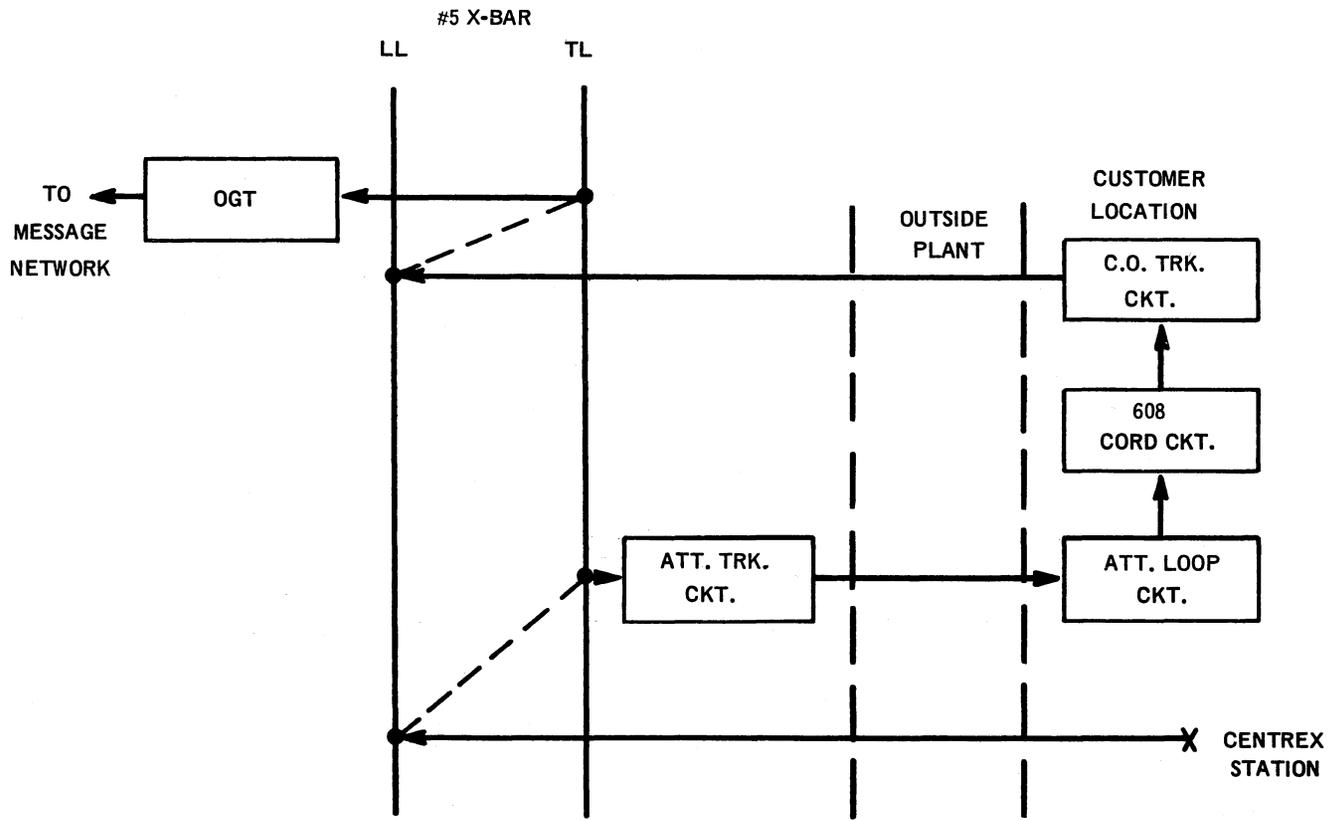


Fig. 2 - Dial "O" Call Originated by Centrex Station for Completion to the Message Network

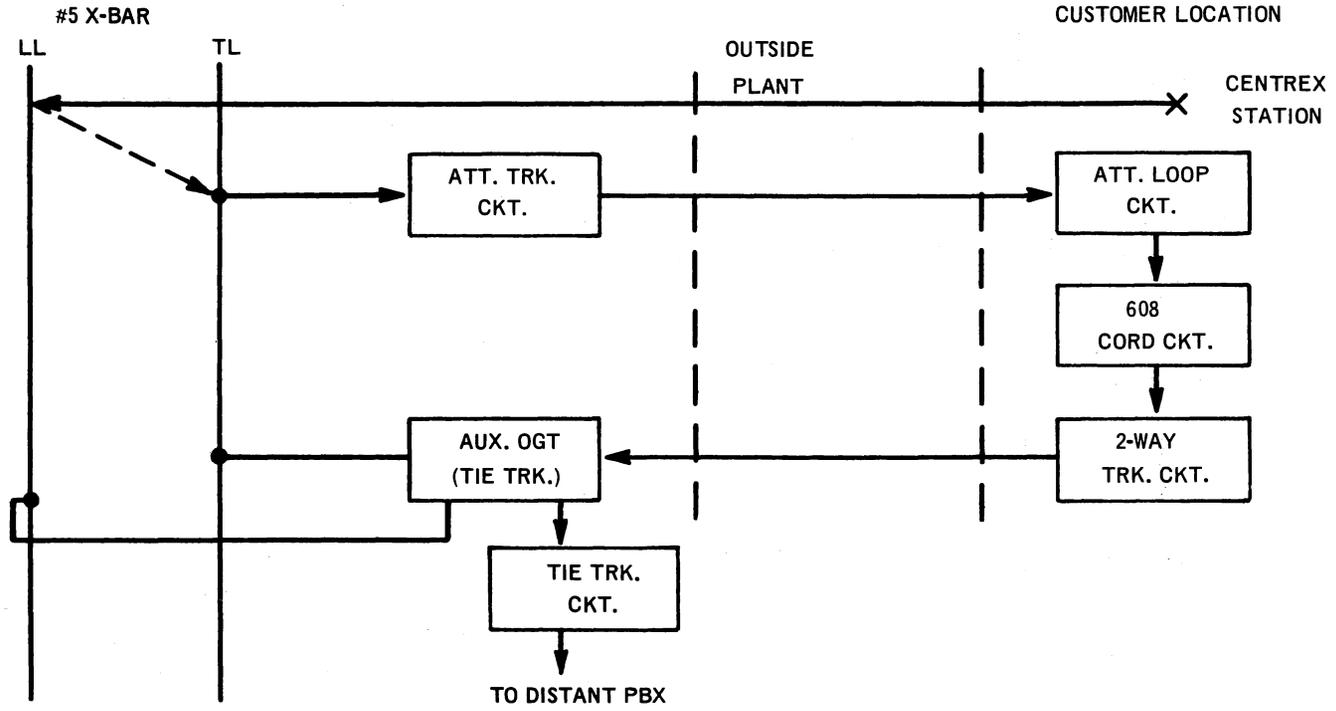


Fig. 3 - Dial "O" Call Originated by Centrex Station for Completion to Tie Trunk

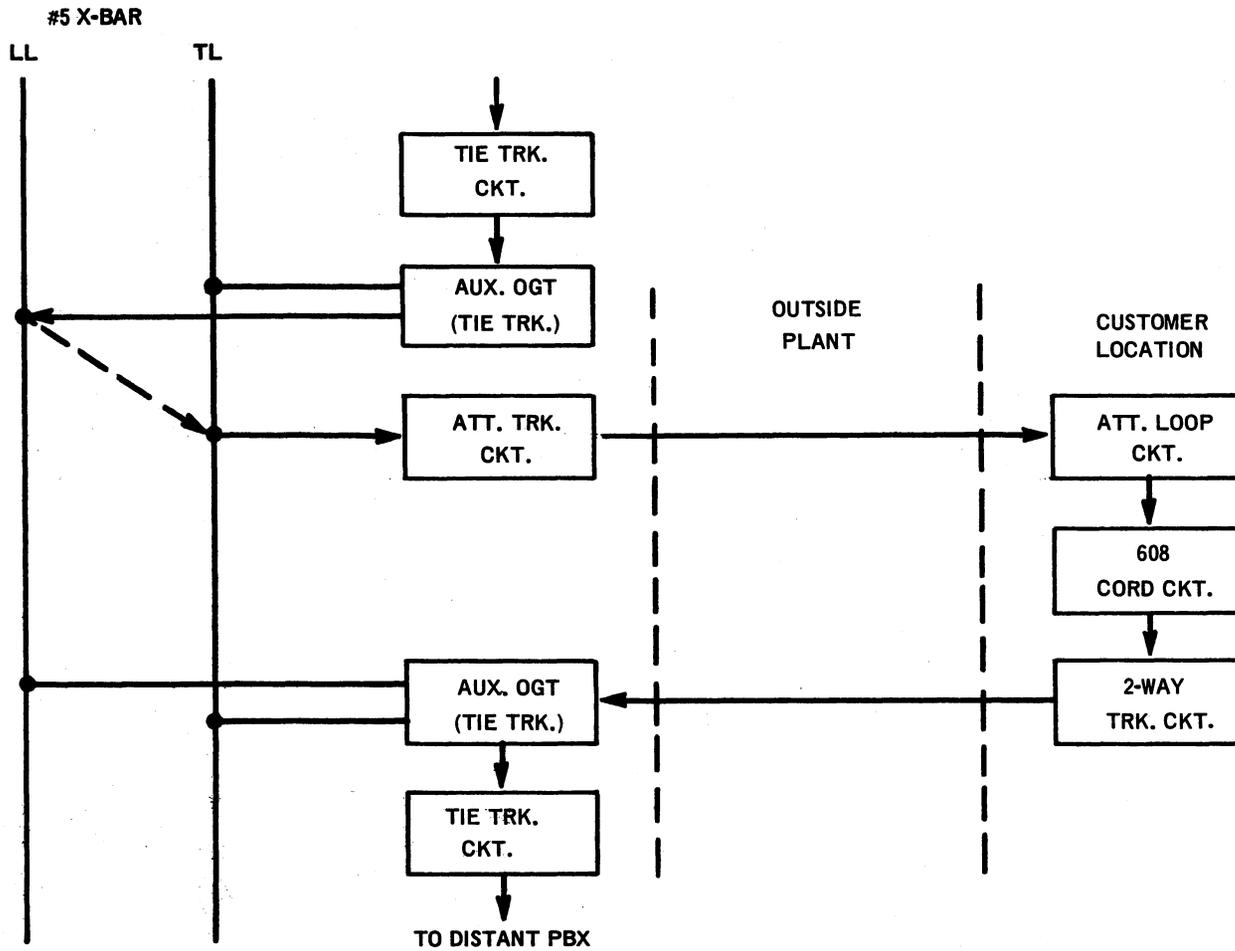


Fig. 4 - Dial "O" Call Incoming Over Tie Trunk for Completion to an Outgoing Tie Trunk

SECTION AB22.315.00

2.16 A dial "O" call incoming over an attendant trunk for completion to an outgoing tie trunk will result in the arrangement shown in Fig. 4. The transmission considerations for this connection are:

- (a) 2 loops
- (b) 1.5 to 2 db equipment loss
- (c) balance considerations.

2.17 As is evident from the above examples, definite problems arise when switchboards are used. With existing switchboard arrangements, it is necessary to hold the degrading effect of "multiple loops" to a minimum by reducing the loss of the facilities between the switchboard and the Centrex switching machine by use of 4-wire facilities, loaded facilities, and E-type repeaters. On tie trunks or access line connections, the effect of this switchboard path on return loss must be considered.

2.18 The maximum conductor loop resistance for a Centrex station line is normally 1300 ohms. However, in those cases where outgoing station calls are routed to the message network via a 608 switchboard and central office circuit such as SD-66719-01, the sum of the resistance of the three loops as outlined in Par. 2.13 must not exceed the 1300-ohm maximum. As discussed later, 1000-cycle loss objectives must also be met. Although the supervision problem is somewhat alleviated if the operator does the dialing, the limit still applies as talking battery for the station is furnished over the multiple loop. Dial long line circuits have been used at a few locations on a special basis to extend the supervision range. The use of long line equipment is *not* recommended, however, since balance may become a problem when the attendant trunks are used for other purposes such as interconnecting long haul tie trunks.

2.19 All of the calls used in the examples in Pars. 2.14, 2.15 and 2.16 may be completed on a dial basis. For example, in Fig. 2, a station call to the message network could route directly from the station to the OGT. As can be seen, the transmission contrast between this call and one placed via the switchboard operator can be very drastic unless the switchboard to switching machine losses are kept low. It is recommended that the circuits between the switchboard and the

switching machine be designed for a loss consistent with the objectives shown in Table III.

D. Tie Trunks

2.20 Tie trunks may be provided between Centrex-CO installations or from a Centrex-CO to a non-Centrex-CO PBX located on a customer's premises. Fig. 4 shows a typical tie trunk arrangement using an auxiliary OGT and a 2-way tie trunk circuit. This 2-way tie trunk can be dial-selected by a station or a console attendant on a 1XX basis after which a second dial tone will be received. Additional digits can then be dialed to reach the desired station. For incoming service, this tie trunk may either terminate on a console or appear as a PBX extension on the line link frame. For outgoing calls, access to the auxiliary OGT by the switchboard attendant is provided by means of a 2-way trunk circuit at the switchboard. Manual tie trunks must be jack-terminated on the switchboard.

2.21 The transmission objectives for Centrex tie trunks are the same as discussed in Section AB22.310 for tie trunks between customer located PBXs. The design objectives apply between the LL or TL terminations of a dial tie trunk and the distant PBX, or between the switchboard jack appearance and the distant PBX in the case of a manual tie trunk.

2.22 As discussed in Part C, tie trunks which are machine-terminated and which must also loop through a remote switchboard, present additional problems not found at a regular PBX. The extension of the tie trunk from the switching machine to the switchboard must be designed in such a manner as to introduce a minimum of additional loss. In addition, the effect on return loss must be considered. Unless released loop switchboard operation for tie trunks becomes available, it will probably not be possible to completely eliminate the degrading effect of looping through the switchboard. However, every reasonable effort must be made to hold this effect to a minimum.

2.23 Another type of tie trunk operation consists of line link pulsing circuits (LLP) and 900-ohm, 2-way MF intertoll trunk circuits. This type of operation is also used in Common Control Switching Arrangements (CCSA), more commonly referred to as Switched Services Net-

works, and is discussed in Section AB23.053.4. LLP circuits are used on dial tie trunks or access lines between a No. 5 Crossbar machine and a Step-by-Step PBX. Two-way MF intertoll trunk circuits will be used on network trunks and access lines or tie trunks between No. 5 Crossbar machines. These arrangements provide good performance on a dial basis or with console operation. However, the problems discussed above for switchboard operation still exist.

E. Switched Pad Operation

2.24 Switched pad operation can be provided at Centrex-CO installations for calls handled on a direct dial basis or by a console attendant. Where switchboard operation is used, standard switched pad arrangements are normally not available. The use of switched pads to improve return loss and permit VNL operation is discussed in Section AB23.053.4 for access lines and network trunks and Section AB22.310 for tie trunks, using SD-65718-01, or equivalent.

Tie Trunk Using SD-65718-01, or Equivalent

2.25 The 2 db switched pads used for Centrex-CO cannot be controlled in the same manner as pads are controlled in No. 5 Crossbar toll offices because of the manner in which incoming tie trunk calls are handled. For Centrex-CO, the pads are controlled by the marker by using a class of service indication to identify the originator, and a route relay to identify the termination. A combination of these two bits of information controls pads located in the tie trunk and intertoll trunk circuits in the desired fashion.

2.26 It should be noted that with this pad control arrangement the 2 db switched pads cannot be switched out of the circuit on tie trunk and access line calls which are interconnected with the regular message network on a dial basis. This will cause a transmission penalty due to the excessive loss resulting from this interconnection of the DDD and CCSA Networks at other than the serving central office of the originating station.

Attendant Trunk Circuit Arrangement for Pad Control

2.27 The Phase III Centrex attendant trunk circuit, such as SD-27689, used with an attendant console, has two line link appearances in addition to a trunk link appearance. Each of

these two line link appearances has a different class of service rating. On Dial "O" Calls into the attendant trunk circuit, the class of service of the calling party determines which of these two line link appearances will be used to extend the call.

2.28 If the transmission loss of the path up to the attendant trunk circuit is VNL +2 db, as designated by the class of service of the originating trunk, the VNL relay in the attendant trunk circuit will not be operated. Therefore, the call will be extended on the attendant trunk line link appearance that has the class of service indication, which does not normally require a 2 db pad. If the loss of the transmission path on the originating end of the attendant trunk is VNL, the VNL Relay will be operated and the call will be extended on the line link appearance which has the class of service that normally requires a 2 db pad in the circuit for an overall loss of VNL +4 db. Effectively, the above procedure transfers the class of service of the originating connection to the attendant trunk on one of the two line link appearances. This transfer of information is particularly necessary for calls that use an intraoffice trunk circuit with a switchable pad.

Line Link Pulsing Circuit Arrangements With Pad Control

2.29 With LLP and CCSA operation, the 2 db switched pads are located in the 2-way intertoll trunk and, where required, in the special pad control intraoffice trunk circuit. The pads in the intraoffice trunk are used when LLP tie trunks or access lines terminate in Centrex stations and will not be required on all installations. As discussed in Section AB22.310, tie trunks, except intertandem, with low round trip delay can be terminated at VNL +2, thereby alleviating the need for 2 db pads on the connection.

2.30 The use of LLP and 2-way intertoll trunks makes it possible to meet either terminal balance or through balance requirements and this arrangement can be used either at Class SS-3 switched services offices (See Section AB23.053.4) or for Centrex-CO operation. Dial tie trunk operation may be provided by this arrangement rather than by the use of tie trunk circuits such as SD-65718-01.

Intraoffice Trunk Circuit With Pad Control

2.31 Phase III Centrex intraoffice trunk circuits, such as SD-27685, or equivalent, can be equipped with a switchable 2 db pad. The operation of this pad is determined by the connections that are established on the originating and terminating ends of the intraoffice trunk. There are two different conditions that could occur at each end of the intraoffice trunk. The overall trunk transmission loss from the calling station or PBX to the originating end of the intraoffice trunk and from the terminating end to the called station or PBX can be either the local loop loss or VNL +2 db. This information is received from the completing marker which has determined it from the class of service indications from the originating and terminating ends and the corresponding marker cross-connections. Utilizing these two bits of information, the switchable pad is then controlled by a logic arrangement that is wired into the intraoffice trunk circuit.

2.32 For example, if a call is being made to a station located on the No. 5 Crossbar line link frame from a PBX associated with a LLP trunk that is designed at VNL +2, an intraoffice trunk circuit is necessary. In order to get an overall circuit loss of VNL +4, it is necessary to switch the 2 db pad into the circuit. This is done by the wired logic arrangement. The full logic scheme is shown in Table II.

F. Foreign Exchange Trunk

2.33 Foreign exchange trunks for Centrex-CO customers may be terminated on the crossbar machine and/or on a switchboard. On a dial

basis, a Centrex station may gain access to a foreign exchange trunk by dialing a 1XX code and then route to the distant office. Access to the FX trunk via the switchboard will involve multiple loops as previously discussed. The 1000-cycle loss objective between the Centrex office and the foreign CO is given in Section AB22.310.

G. WATS Service

2.34 WATS service for Centrex stations may be provided by any of several methods: for example, on a direct dial basis by the station using a 1XX access code, on a dial basis by a console attendant, or by means of a WATS access line terminated on a 608 switchboard. Assuming that the 2-wire No. 5 Crossbar is equipped for WATS screening, service is provided on a dial basis by interconnecting a Centrex station line via a WATS line to an outgoing toll connecting trunk between the Centrex switcher and its toll center. A separate WATS access line from the station to the switching machine is not required. WATS access via the switchboard involves multiple loops between the switchboard and the switching machine.

2.35 In those cases where the Centrex machine is not equipped for WATS screening, a trunk must be provided from the Centrex switcher to the WATS office. This arrangement is not recommended from a transmission standpoint, unless the WATS office is also a toll office, since there is additional loss in the link between the Centrex switching machine and the WATS office. Where such operation is necessary, the objectives given in Section AB22.310 should not be exceeded.

TABLE II

CONNECTED CIRCUIT DESIGN LOSS		2 DB PAD	EXAMPLE
ORIGINATING END	TERMINATING END		
Local Loop	Local Loop	Out	Station-Station*
Local Loop	VNL +2	In	Station-1XX Tie Line
VNL +2	Local Loop	In	LLP Trunk-Station
VNL +2	VNL +2	Out	1XX Tie Line-LLP Trunk

* Notice that a call from a Centrex CO Station to another station in the same Centrex CO, using an intraoffice trunk with a switchable pad, does not have an overall loss of VNL +4. The loss is that of the two local loops as would be expected.

H. Conferencing

2.36 Two types of conferencing arrangements are available for use with Centrex: One provides a dial conference whereby a station can originate a conference connection, while the other provides for conferencing under the control of a console attendant. In either case, provisions are available for conferencing from two to a maximum of six stations. The call may be originated on a dial basis by a station or a console attendant. Standard jack-terminated conference circuits are also available for use at a switchboard. Transmission considerations for conference circuits are covered in Section AB22.329.

I. Add-On

2.37 Add-on service for Centrex is provided as an extension of the station dial transfer feature. The bridging loss associated with this arrangement is partially overcome by the use of a four port transistorized bridge which is part of the transfer trunk. This bridge is the same as discussed in Section AB22.329.4.

J. Centrex Station Lines

2.38 Centrex station lines are, in many respects, similar to normal subscriber lines served out of a 2-wire No. 5 Crossbar local office. However, Centrex customers are normally large toll users, and in many cases, the Centrex is part of a CCSA. In addition, Centrex stations have requirements for special features such as conferencing and add-on.

2.39 In view of the service features involved, the maximum loss of a Centrex station line should be less than for a limiting subscriber loop. The 1000-cycle loss objective as given in Table III is from the station to the milliwatt supply in the Centrex machine. In those cases where a Centrex-CO station loops through a 608 switchboard to gain access to the message network, the overall loss from the milliwatt supply in the CO to the PBX station over the three loops in tandem should not exceed 8.5 db EML. This requirement is consistent with the objectives given in Section AB22.310.

2.40 Centrex-CO stations should all be given a Zone 5 classification and be equipped with 500-, 600-, or 700-type station apparatus.

3. CENTREX-CU

A. General

3.01 The transmission objectives outlined in other AB sections for normal PBX service will, in general, apply to Centrex-CU installations. Following are discussed the more important transmission items which are peculiar to Centrex-CU.

B. Effect of Direct In-Dialing

3.02 Centrex-CU service provides direct in-dialing from the regular toll or exchange network to a PBX station. Outgoing calls are completed in the same manner as for a non-Centrex PBX.

3.03 In conventional PBX operation, transmitter battery for PBX stations is supplied from the serving CO over the PBX-CO trunk for both incoming and outgoing calls. This means that the receiving efficiency of a 500-type station set improves as the loop resistance from the CO to the PBX station becomes larger, regardless of whether the call is incoming or outgoing.

3.04 With DID, incoming calls complete via a SxS connector at the customer's premises. Since this connector provides the transmitter battery for the station set, the equalization of the 500 set is fully effective and no receiving efficiency improvement is realized for on-premise stations. This effect not only lowers the receive volume, but also produces a different grade of transmission for incoming versus outgoing calls. To reduce this effect to a minimum, the loss of the PBX-CO trunks should at least meet the objectives outlined in Section AB22.310.

3.05 The above problem has been largely corrected in the 101 ESS by providing an 800-ohm battery supply as opposed to the 400-ohm battery supply in a SxS PBX, and by supplying battery at the PBX for both incoming and outgoing calls.

C. Conference Service

3.06 *Nongain conference bridges should not be used at Centrex-CU installations.* For transmission reasons, either the transistorized arrangement or the six port 4-wire bridge should be used.

SECTION AB22.315.00

D. Attendant Facilities

3.07 Attendant facilities for Centrex-CU will be provided by means of consoles or a 608-type switchboard.

3.08 Console arrangements use the 2-wire version of 1- and 2-type consoles. This is the same console as used for Centrex-CO service except that earlier versions of Centrex-CO used 4-wire arrangements. Also, Centrex-CU provides a 151-type amplifier to raise the transmitting level of the N-1 carbon transmitter in the operator's headset.

3.09 The transmit and receive efficiencies of the 2-wire console with amplifier vary with loop resistance from the battery supply in a manner similar to a 500 set. On short loops these efficiencies have been improved as com-

pared to the 500 set by the use of the 425D network and the 151-type amplifier.

3.10 Assuming the use of a headset with the console on a zero loop from a 400-ohm PBX battery supply, the following general comparison can be made between the console efficiency and that of a 500 set at the same location but with battery supplied from the CO:

- (a) For a zero loop, the console (with amplifier) is approximately 1 db less efficient in the transmit direction and about the same as a 500 set in the receive direction.
- (b) For a 1000-ohm conductor loop resistance, the console (with amplifier) is approximately 2.5 db more efficient in the transmit direction and about 2 db less efficient in the receive direction than a 500-type set.

TABLE III

Summary of Transmission Objectives for Centrex-CO (See Note 1)		
CIRCUIT	EML	REFERENCE
CTX Station Line	5.5 db max.	CTX station to CTX milliwatt supply
CTX Station Call	8.5 db max.	CTX station thru multiple loops to CTX milliwatt supply (See Fig. 1.)
Trunks or lines from switchboard to switching machine	0-2.5 db	Switchboard to switching machine
Console circuits	See Amplifier Gains (Table I)	
CIRCUIT	SUPERVISION LIMIT CONDUCTOR LOOP RESISTANCE	REFERENCE
CTX Station Line		
a) Dialed Call	1300 ohms	CTX station to switching machine
b) Call corded thru switchboard	1300 ohms	CTX station thru multiple loops to switching machine (See Fig. 1.)

Note 1: Centrex-CU objectives are the same as those given in Section AB22.310.