GENERAL DESCRIPTION

CENTREX-CO

NO. 2 ELECTRONIC SWITCHING SYSTEM

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FEATURE DEFINITION AND DESCRIPTION

1. DEFINITION

1.01 ***Centrex service*** is a telecommunication switching arrangement provided for the benefit of an individual or private organization and is sometimes referred to as centrex customer group service. The service includes facilities for interconnecting telephones within a customer group and for connecting those telephones to other telephones associated with the local central office, with other central offices, and with other centrex customer groups. Attendant facilities are generally provided to assist in completing station originated or incoming calls. Centrex service can have many custom features such as add-on, call forwarding, etc. Centrex is distinguished from private branch exchange (PBX) service in that it provides for direct inward dialing (DID) and automatic identified outward dialing (AIOD) for its stations. Telephones, and generally attendant equipment such as consoles, switchboards, etc., are located on the customer's premises. The automatic switching equipment can be located on the customer's premises and when it is, the service is called Centrex-CU. The switching equipment may alternatively be located on telephone company property, and when this is done, the service is called Centrex-CO.

1.02 ***Centrex-CO***—This service originates from a No. 2 Electronic Switching System (ESS) central office which has been equipped with an extended feature (EF-1) generic program. A number of Centrex-CO customer groups as well as basic telephone subscribers may be served by this office. The individual stations within the customer groups are switched at the central office as opposed to being switched at a switching machine on the customer's premises. Each of the customer groups may be optionally equipped with 75 or more individual features. The translation structures of the No. 2 ESS and selection of station features yield the traditional Centrex I and II services which can be supplemented with any or all of the remaining features.

1.03 In some cases, a No. 2 ESS arranged for Centrex-CO operaton is located on the customer's premises. This No. 2 ESS, even though it is located on the customer's premises, is a central office. Unlike the centrex serving vehicle described in 1.04, the No. 2 ESS is not capable of homing on a class 5 central office, nor is it capable of performing automatic number identification (ANI) operation. The No. 2 ESS located on the customer premises is engineered and administered in the same way as a central office located on the telephone company premises.

1.04 ***Centrex-CU***—Centrex-CU, as related to the No. 2 ESS, implies a centrex serving vehicle (not a No. 2 ESS) located on the customer's premises which "homes" on a No. 2 ESS central office. This serving vehicle is equipped with ANI capability and is compatible with the No. 2 ESS AIOD interface arrangement. This concept is the subject of another feature document and is not covered by this document.

1.05 The remaining sections of this document describe Centrex-CO operation and include descriptions of special centrex hardware, features, restrictions, limitations, engineering, planning, and administration.

2. DESCRIPTION

2.01 The following paragraphs describe the centrex features offered to customers being served by No. 2 ESS.

A. Centrex-CO

2.02 Figure 1 is a block diagram of a system equipped for a Centrex-CO customer group with an attendant console. No. 2 ESS can serve up to 127 separate centrex customer groups. The universal attendants console has access to the No. 2 ESS via the console(s), centrex console control cabinet, attendant trunk and loop circuits and a data link. Each station (arranged for direct inward dialing) has its own directory number and may be dialed directly from any other station within or outside the centrex system. Private trunk facilities such as foreign exchange (FX), common control switching arrangement (CCSA) and tie trunks can be assigned for the exclusive use of the particular customer group (Table A). These circuits are used to connect the customer group to other switching systems. The No. 2 ESS stored memory ensures that trunks assigned to a customer group will be used only by that customer group. Residential and business telephone service is also provided by the No. 2 ESS operating independently with the centrex customer groups.

TABLE A

TRUNKING ARRANGEMENTS FOR CENTREX SYSTEMS

CIRCUITS	EQUIPMENT CODE	TRUNK USE	TRUNK ORDER CODE	REMARKS*
Attendant Circuits				
Attendant Loop Circuit with Autonomous Termination (SD-2H172-01)	J2H018 FN		75100	Connects between switching network and attendant trunk circuit.
Attendant Trunk Circuit (SD-2H173-01)	J2H018 DR		65200	Interfaces attendant console to attendant loop circuit.
Attendant Trunk Circuit 2-Wire to 4-Wire Conversion (SD-2H182-01)	J2H018 DY		67800	Used instead of SD-2H173 for those customers that require long haul tie trunks tandemed together.
Incoming Trunks				
Incoming Trunk Circuit For Local and Tandem Reverse Battery Supervision (SD-2H101-02)	J2H017 GB	TIE	15600	Incoming Loop Type Trunk Circuit.
Incoming Trunk Circuit From Distant Step-by-Step Offices Reverse Battery Supervisory (SD-2H154-01)	J2H018 GF	TIE	15703 15704	Provides transmission and supervisory functions for calls from step-by-step offices without common control features.
Outgoing Trunks				
Outgoing Trunk Circuit For Local and Tandem Reverse Battery Supervision (SD-2H103-02)	J2H017 BA	TIE	00100	Outgoing Loop Type Trunk Circuit.
Dial Pulse Repeater Circuit (SD-2H155-01)	J2H018 DS		66000	Used with recorded telephone dictation, code call, voice and dial paging.
2-Way Trunks				
2-Way Trunk Circuit E&M Lead Supervision (SD-2H112-01)	J2H018 CB	TIE	50907 50939 50937 50942 50938 50943	Handles incoming and outgoing calls using E&M supervision and MF or DP signaling.
2-Way Trunk Circuit (Short Haul) (SD-2H148-01)	J2H018 CD	TIE	55000	General 2-way No. 2 ESS trunk circuit.
2-Way Long Haul Trunk Circuit — Dial Pulsing — E&M Lead Supervision (SD-2H157-01)	J2H018 CG	CCSA, TIE	56507 56542 56539 56543	Long distance transmission quality — 4-wire with switchable pad.
2-Way Long Haul Trunk Circuit — MF Pulsing E&M Lead Supervision (SD-2H158-01)	J2H018 CF	CCSA	56642 56644	Long distance transmission quality — like SD-2H157, but without dial pulsing outgoing
Foreign Exchange Trunk Circuit Circuit — Ground Start (SD-2H174-01)	J2H018 CE	FX	55300	Provides access to a distant central office.
Foreign Exchange Trunk Circuit — Long Haul (SD-2H180-01)	J2H018 CH	FX	56440 56441	Long distance transmission quality — Long haul version of SD-2H174.
Service Circuits				
6-Port Conference Circuit (SD-2H176-01)	J2H018 DW		66200	Used to set up conference calls.
Tandem Tie Trunk Cut-Through Service Circuit (SD-2H178-01)	J2H018 DX		66345 66347 66346 66348	Returns dial tone to originating station from subsequent offices on tandem tie trunk calls.

* For technical details on these circuits, refer to J2H031A-1, No. 2 ESS trunk and service circuit engineering specification.

B. Centrex Dialing Arrangements

2.03 Each centrex customer group has its own individual group of attendants, its own listed directory number(s), and a separate and distinct dialing pattern. There are no restrictions on the mixture of intragroup dialing patterns in a No. 2 ESS. Centrex groups may have 2-, 3-, 4-, or 5-digit station dialing plans independent of other centrex intragroup plans. Each station may be arranged to receive DID calls, and is given a 7-digit number which is used for incoming calls originating outside the customer group, and is also used for station identification on automatic message accounting (AMA) entries. The last two, three, four, or five digits of the DID number correspond to the intragroup station extension number. Access codes must be used for calls to central office numbers, the attendant, private facility trunks, and special services.

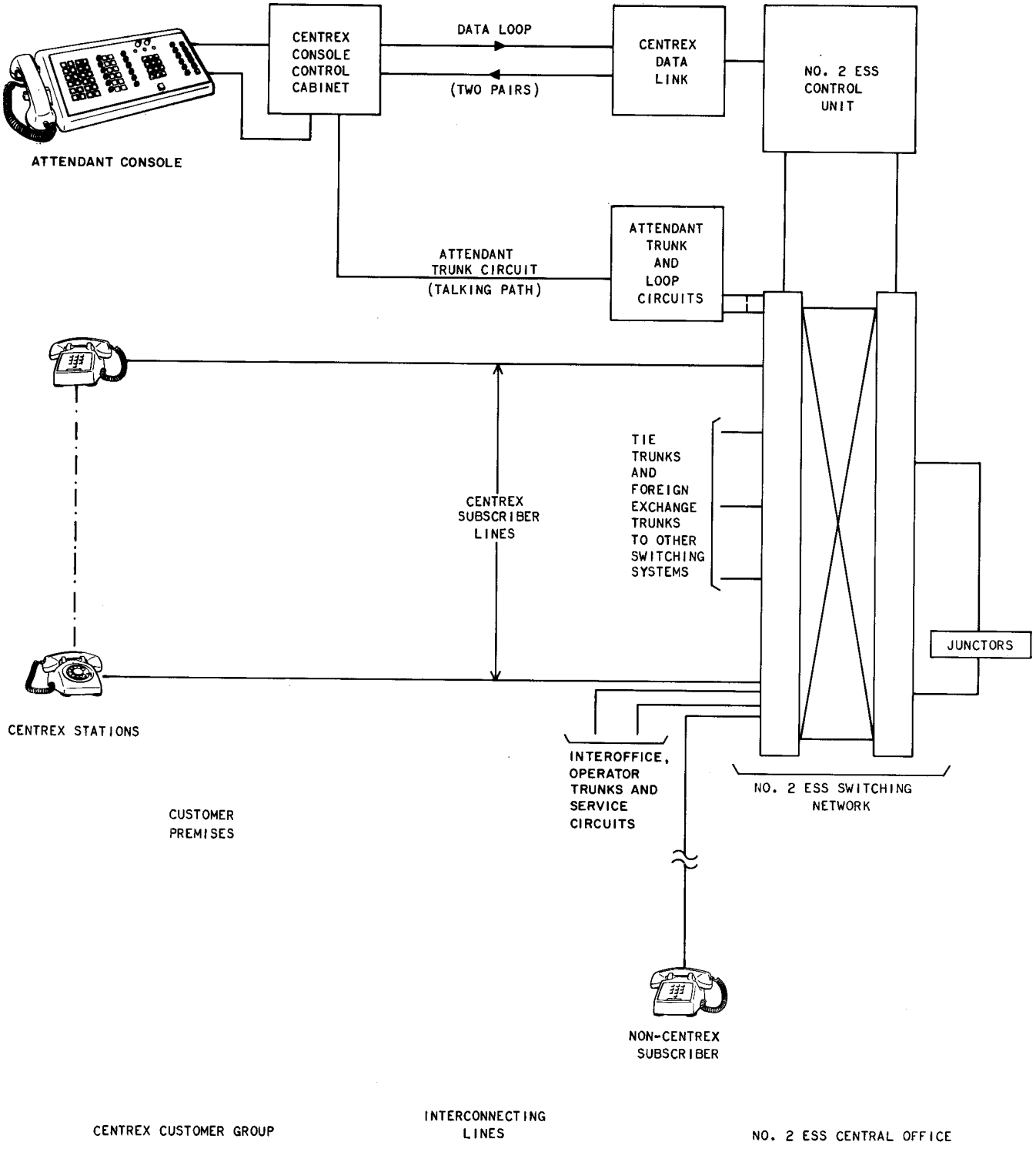


Fig. 1—No. 2 ESS Centrex System

C. Features

2.04 Centrex groups or stations within the group can be optionally equipped with features, listed in Table B, which customize the group. The features and treatment (dialing, restrictions, etc.) of stations and groups are allowed by specifying the desired options in the No. 2 ESS stored memory. Operating instructions for features are shown in Attachment A.

TABLE B

SUMMARY OF FEATURES

FEATURE	FEATURE CAPABILITY		AVAILABLE	REMARKS
	PER STATION	PER GROUP		
Add-On	√	—	YES	
AMA Recording				
CCSA	—	√	YES	
FX	—	√	YES	
Identified Outward Dialing	—	√	YES	
MER	—	√	YES	
Tie Trunk	—	√	YES	
Attendant Call Forwarding	—	√	YES	
Attendant Camp-On	—	√	YES	
Attendant Conference (6-Port)	—	√	YES	
Attendant Control of Trunk Group Access	—	√	YES	
Attendant Direct Station Selection (DSS) w/Busy Lamp Field	—	√	NP	
Attendant Position Options				
1B & 2B Console	—	√	YES	
CALL DIRECTOR	—	√	YES	See Text
50A Console	—	—	NP	
Switchboard	—	—	NP	
Attendant Restriction	—	√	YES	
Attendant Speed Calling	—	√	YES	
Automatic Wake-up Service	—	—	NP	
Busy Lamp Field	—	—	NP	
Busy Verification — Station Lines	—	√	YES	
Busy Verification — Trunks	—	—	NP	
Call Forwarding	√	—	YES	
Call Forwarding — Busy Line	√	—	YES	
Call Forwarding — Don't Answer	√	—	YES	
Call Forwarding — Don't Answer — All Calls	√	—	YES	
Call Hold	√	—	YES	
Call Pickup	√	—	YES	
Call Transfer — Attendant	√	—	YES	
Call Transfer — Individual	√	—	YES	
Call Transfer — Individual — All Calls	√	—	YES	
Call Waiting — Centrex	—	—	NP	
CCSA Access	√	√	YES	
Code Call	√	√	YES	
Code Restriction	√	—	YES	
Conference Calling	—	—	NP	
Consultation Hold	√	—	YES	
Consultation Hold — All Calls	√	—	YES	
Dial Access to Attendant	√	—	YES	
Direct Inward Dialing	√	—	YES	
Direct Outward Dialing	√	—	YES	
Directed Call Pickup	√	—	YES	

NP = Not Provided

TABLE B (Cont)

SUMMARY OF FEATURES

FEATURE	FEATURE CAPABILITY		AVAILABLE	REMARKS
	PER STATION	PER GROUP		
Flexible Numbering of Stations	—	√	YES	
Fully Restricted Terminating Station	√	—	YES	
FX CO Access	√	√	YES	
Identified Outward Dialing (IOD)	√	—	YES	
Incoming Call Identification	—	√	YES	
Indication of Camp-On	—	√	YES	
Intergroup Dialing	—	√	YES	
Inward Restriction	√	—	YES	
LDN Access	—	√	YES	
Lockout	—	—	NP	
Manual Line Service	√	—	YES	
Miscellaneous Trunk Restrictions	√	—	YES	
Most Economical Routing	√	√	YES	
Night Position	—	—	NP	
Night Service	—	√	YES	
Pad Switching on Tie Trunk	—	√	YES	
Paging — Loudspeaker	√	√	YES	
Paging — Radio	√	√	YES	
Power Failure Transfer — Station	—	—	NA	Not Applicable
Power Failure Transfer — Attendant	—	√	YES	
Recorded Telephone Dictation	√	√	YES	
Reserve Power	—	√	YES	
Restriction from Outgoing Calls	√	—	YES	
Simulated Facilities	—	√	YES	
Single Digit Dialing	—	—	NP	
Speed Calling	√	√	YES	
Station DSS	—	—	NP	
Station Hunting	√	—	YES	
Station Message Registers	—	—	NP	
Status Display	—	—	NP	
Supervisory Turret	—	—	NP	
Tandem Tie Trunk Dialing	√	√	YES	
Threeway Calling	√	—	YES	
Thru Dialing	—	√	YES	
Tie Trunks	√	√	YES	
Timed Reminders	—	√	YES	
Toll Restriction	√	—	YES	
TOUCH-TONE Calling	√	—	YES	
Trunk Answer from Any Station	—	√	YES	
Trunk Group Busy Lamps	—	√	YES	
Two-Way Splitting	—	√	YES	
WATS Access	√	√	YES	

NP = Not Provided

D. Universal Attendant Consoles

2.05 Each centrex customer may be equipped with one or more 1B- or 2B-type universal cordless telephone consoles to provide complete attendant services (Figure 2). A family of attendant consoles is being developed to replace the 1B and 2B consoles. These are coded 27A9T and 47A6T, respectively, (Figure 2A). (As an alternative, a CALL DIRECTOR or key telephone set arrangement can provide cheaper, but less versatile attendant service facilities, see 2.32.)

2.06 Call distribution by the No. 2 ESS spreads the load evenly to all attendants and prevents a new call from being switched to a console before the attendant is ready to answer it. Calls are distributed on the basis of which attendant has been idle the longest. If all attendants are busy, calls are queued (on "first-come-first-served" basis) and routed to the first attendant which becomes idle. If the queue is exceeded (greater than four calls per active console) busy tone is returned to the calling party.

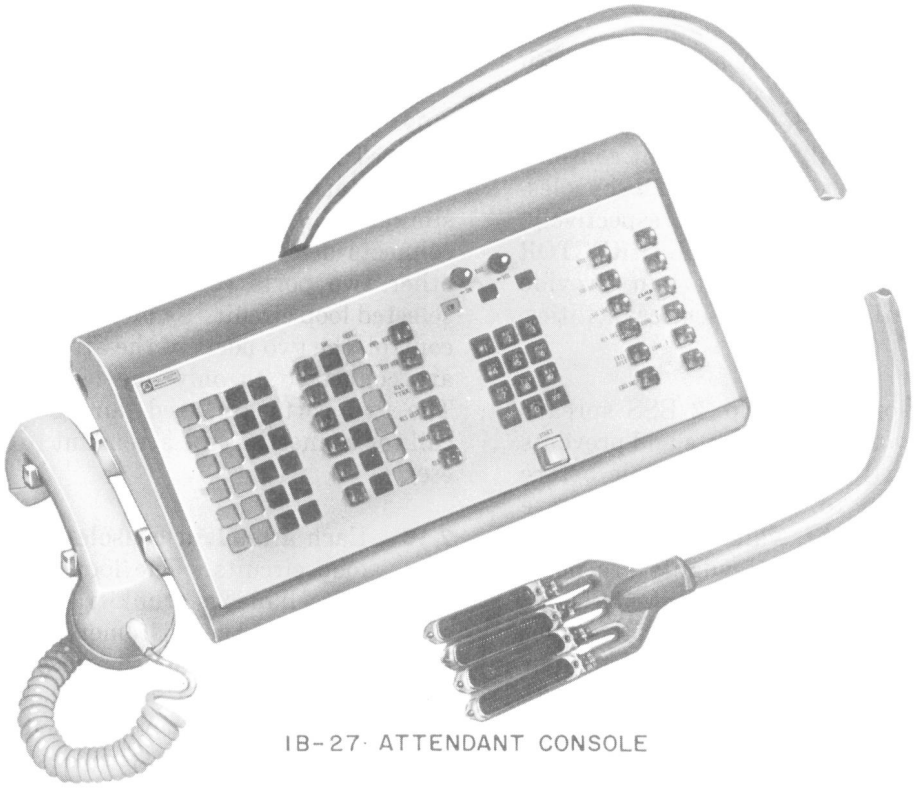
2.07 Each attendant console is equipped with a number of lamps and keys, a TOUCH-TONE® keyset, and an audible signal or buzzer. The lamps and the audible signal indicate service requests or supervisory signals needed for the attendant to serve the centrex installation. The keys depressed indicate requests by the attendant. (Refer to Section 540-576-302—Centrex Station Equipment and Attendant Equipment, 1B- and 2B-Type Telephone Consoles with Switched Loop Operation, Method of Operations, for a complete description of the consoles' operation.)

2.08 No switching occurs directly as a result of operating keys on the attendant console. Depressing these keys causes a data message to be encoded in the console control cabinet and transmitted via a data loop circuit to the No. 2 ESS office to which the centrex customer group is connected (Figure 1). At the No. 2 ESS office, this data message is interpreted and any switching actions requested are performed.

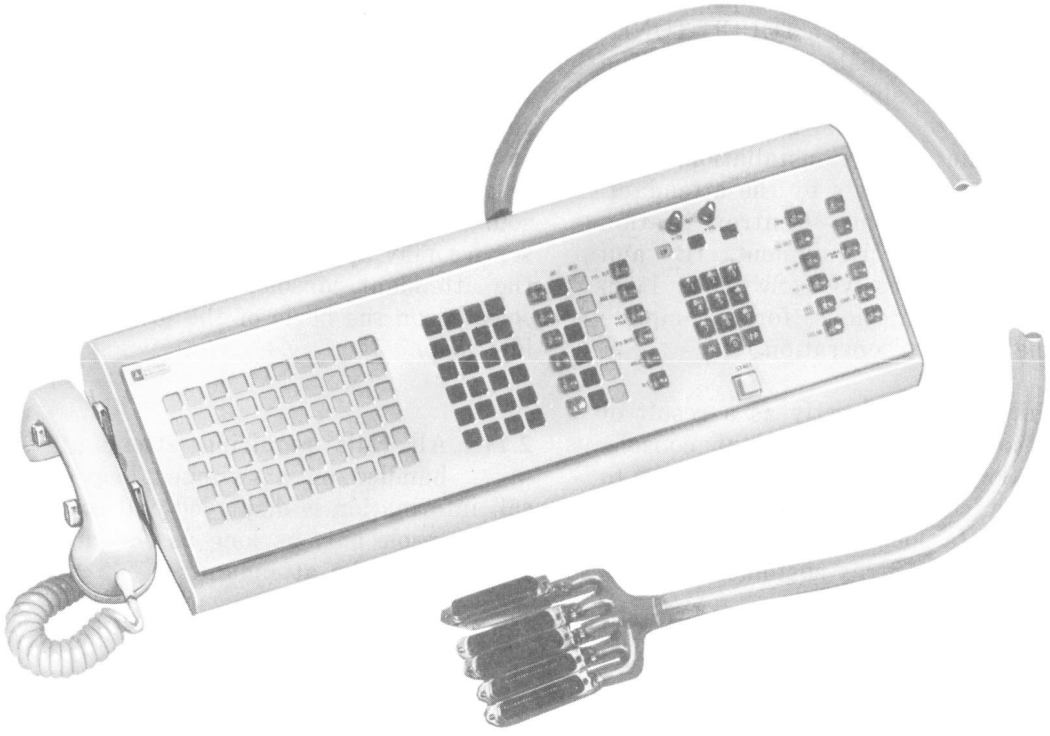
2.09 An attendant trunk circuit (Figure 3 and Table A) is provided as a speech path for each attendant telephone console. This circuit is similar to a 3-port conference circuit. One port connects directly to the console talking pair. The other two ports connect to the two ports of the selected loop circuit. By means of peripheral decoder control, the two ports of the attendant trunk circuits are connected to only one loop circuit at a time. The two ports are used during the progress of a call for connecting the attendant to stations, trunks, etc.

2.10 Each attendant console is equipped with six loop circuits. The loop circuits are located on the miscellaneous trunk frame at the No. 2 ESS office to which the customer group is connected. Each loop has two appearances as terminals on the line trunk network (LTN). When the calling and called parties are connected to their respective ports, the loop circuit provides the supervision, audible signal, and transmission to the attendant trunk. When the attendant operates appropriate keys on the console, the system program is requested to take action so that two paths may be split and the attendant may be connected to either the calling or the called party individually, excluding the other, or a 3-way connection may exist. A call from any source (station, tie trunk, etc.) requiring attendant service may appear on any of the loop circuits on the attendant console, although loops are always selected on the basis of the lowest numbered (0-5) idle loop.

2.11 All calls requiring attendant actions are handled on a switched loop basis; that is, call information is displayed and connections exist on a console only as long as the call requires the attention of the attendant.

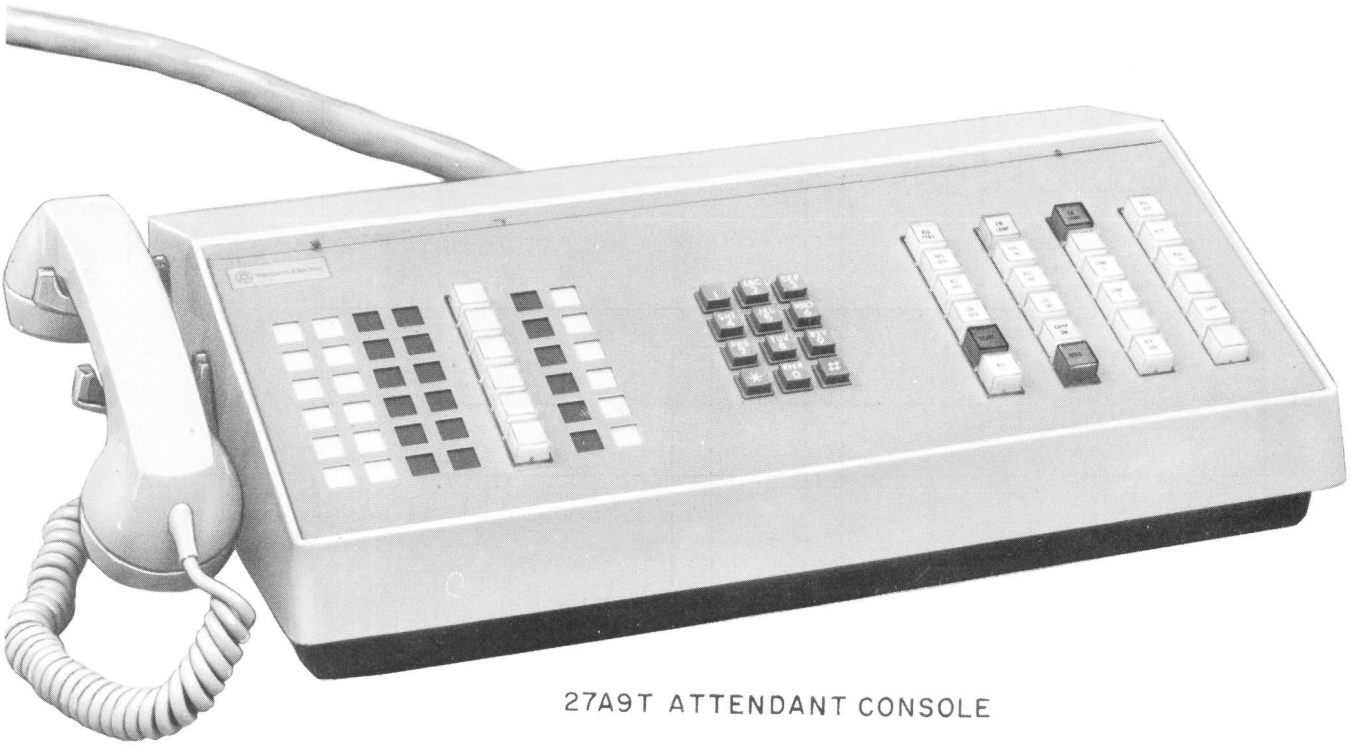


1B-27 ATTENDANT CONSOLE

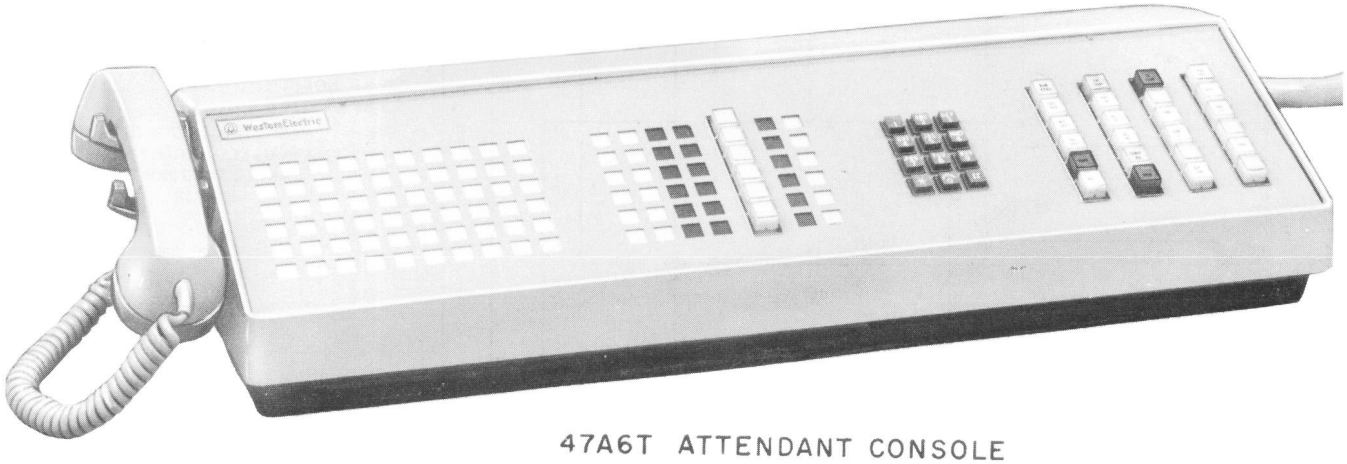


2B-38 ATTENDANT CONSOLE

Fig. 2—Attendant Consoles (1B27, 2B38)



27A9T ATTENDANT CONSOLE



47A6T ATTENDANT CONSOLE

Fig. 2A—Attendant Consoles (27A9T, 47A6T)

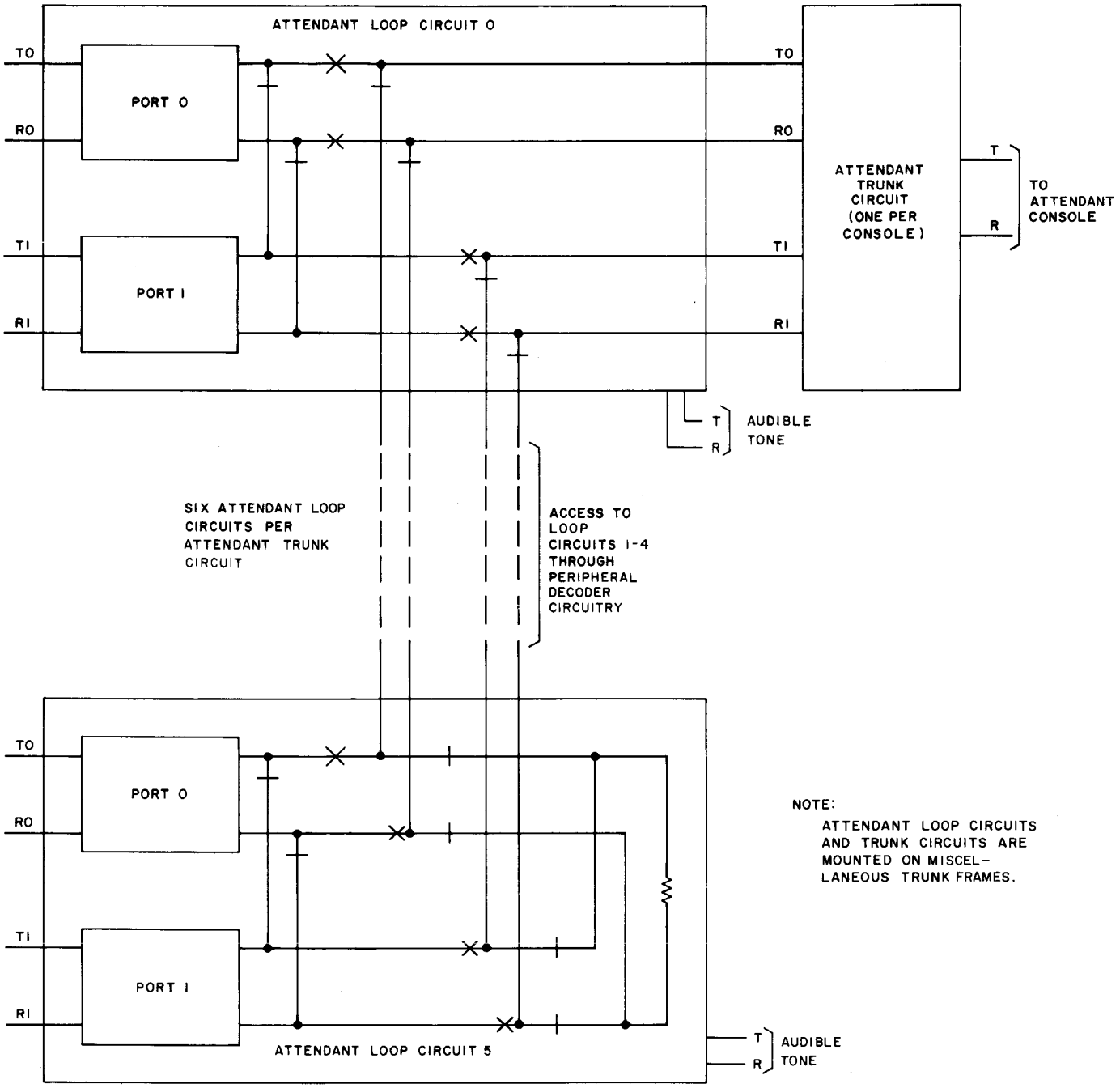


Fig. 3—Attendant Trunk and Loop Circuits

2.12 If attendant console features are not required, it is possible to provide limited centrex features with no attendant console position. In this case, all calls that would normally be directed to an attendant console are connected to a predetermined station. The person answering that station then acts as the attendant. To accomplish this, the centrex is assumed to be in a permanent night service mode by the system program. Table C is a listing of attendant type features showing which ones are available for various attendant positions, either the 1B or 2B console, CALL DIRECTOR, or key telephone set. See 2.32 for comparison of console, CALL DIRECTOR, or key telephone set features.

TABLE C

ATTENDANT POSITION OPTIONS

ATTENDANT FEATURE	ATTENDANT POSITION E/W		
	1B OR 2B CONSOLE	CALL DIRECTOR OR KEY TELEPHONE SET	REMARKS CONCERNING THE USE OF THE CALL DIRECTOR OR KEY TELEPHONE SET
Ability of Attendant to Extend Incoming Calls	Yes	Yes	Custom Calling Dial Tone
Attendant Call Forwarding of Stations	Yes	No	
Attendant Camp-On (Incoming and Intracalls)	Yes	No	
Attendant Conference (6-Party)	Yes	No	
Attendant Control of Trunk Group Access (ACOF)	Yes	Yes	Key Control Only, Lamps and Keys are provided by Local Design
Attendant DDS and Busy Lamp Field	No	No	
Attendant Hold	Yes	Yes	Keyset Hold
Attendant Joint Holding of Stations	Yes	No	
Attendant Recall	Yes	Yes	Using Call Transfer
Attendant Restriction	Yes	Yes	See Station Restriction Section 7
Busy Verification Station Lines	Yes	No	
Call Forward—Busy Line	Yes	Yes	
Call Forward—Don't Answer	Yes	Yes	
Call Transfer—Attendant	Yes	Yes	
Incoming Call Indicator	Yes	No	
Keys — RLS SRC, SIG SRC, SIG DEST, EXCL SRC, EXCL DEST	Yes	No	
Multiconsole Operation	Yes	Yes	Assumes Loops Multipled to all Positions
Night Service‡	Yes	Yes	With Call Forwarding
Position Busy Key	Yes	No	

TABLE C (Cont)

ATTENDANT FEATURE	ATTENDANT POSITION E/W		
	1B OR 2B CONSOLE	CALL DIRECTOR OR KEY TELEPHONE SET	REMARKS CONCERNING THE USE OF THE CALL DIRECTOR OR KEY TELEPHONE SET
Restricting Attendant Calls from Reaching Fully Restricted Stations	Yes	No	
Switched Loop	Yes	Yes	With add-on
Through Dialing†	Yes	No	
Timed Reminder	Yes	No	
Trunk Answer From Any Station	Yes	Yes	
Trunk Group Busy Lamps	Yes	No	
Two-Way Splitting	Yes	Yes	Consultation Hold Only
Call Queuing	Yes	No	

† Through dial allows the attendant to dial a trunk access code, receive second dial tone, and pass this second dial tone to the SOURCE station, thereby allowing this SOURCE station to complete dialing.

‡ Night Service — Fixed night service is available with the universal consoles in No. 2 ESS. Normal operation of the CALL DIRECTOR is as though the customer group were in permanent night service. This means that "night service" over and above this is not possible. It is possible, however, to call forward a CALL DIRECTOR line to another station at night.

E. Centrex Console Control Cabinet (Customer Premises)

2.13 The centrex console control cabinet (Figure 4) provides the interface between the consoles and the data loop. Connections are shown in Figure 5 to only one attendant console, but up to four 1B- or 2B-type consoles may be controlled by one console control cabinet. If 2B-type consoles are used, position number "1" of the first console control cabinet (per customer) must be occupied by the trunk group busy lamp memory and cannot be used for a console position. For specific console constraints see HARDWARE ENGINEERING. Each console control cabinet contains a data loop transmitter and receiver and a lamp control circuit, all of which are common to all consoles connected to the console control cabinet. As additional consoles are added, a console control unit is added for each console. (Refer to Section 966-202-100.)

2.14 Transmission of data on the data loop is controlled by circuitry located in the central office (see Figure 5). However, a request to transmit the contents of a register may be initiated by either the central processor at the central office or by the attendant console circuitry at the centrex premises. When either the central processor or the console requests to transmit a data word, the two data registers interchange their contents. Normally only one of these registers contains a valid word when a data transmission occurs. Since the two registers always interchange their contents a dummy word is usually transmitted in one direction. Data is transmitted serially at a rate of 1400 bits per second. Voice frequencies are used for transmission of data and no special line equalization is necessary.

F. Data Loop

2.15 The data loop provides 2-way data communications between the central office and the attendant consoles by means of two separate 2-wire unidirectional data links. These data links are interconnected at the central office end and

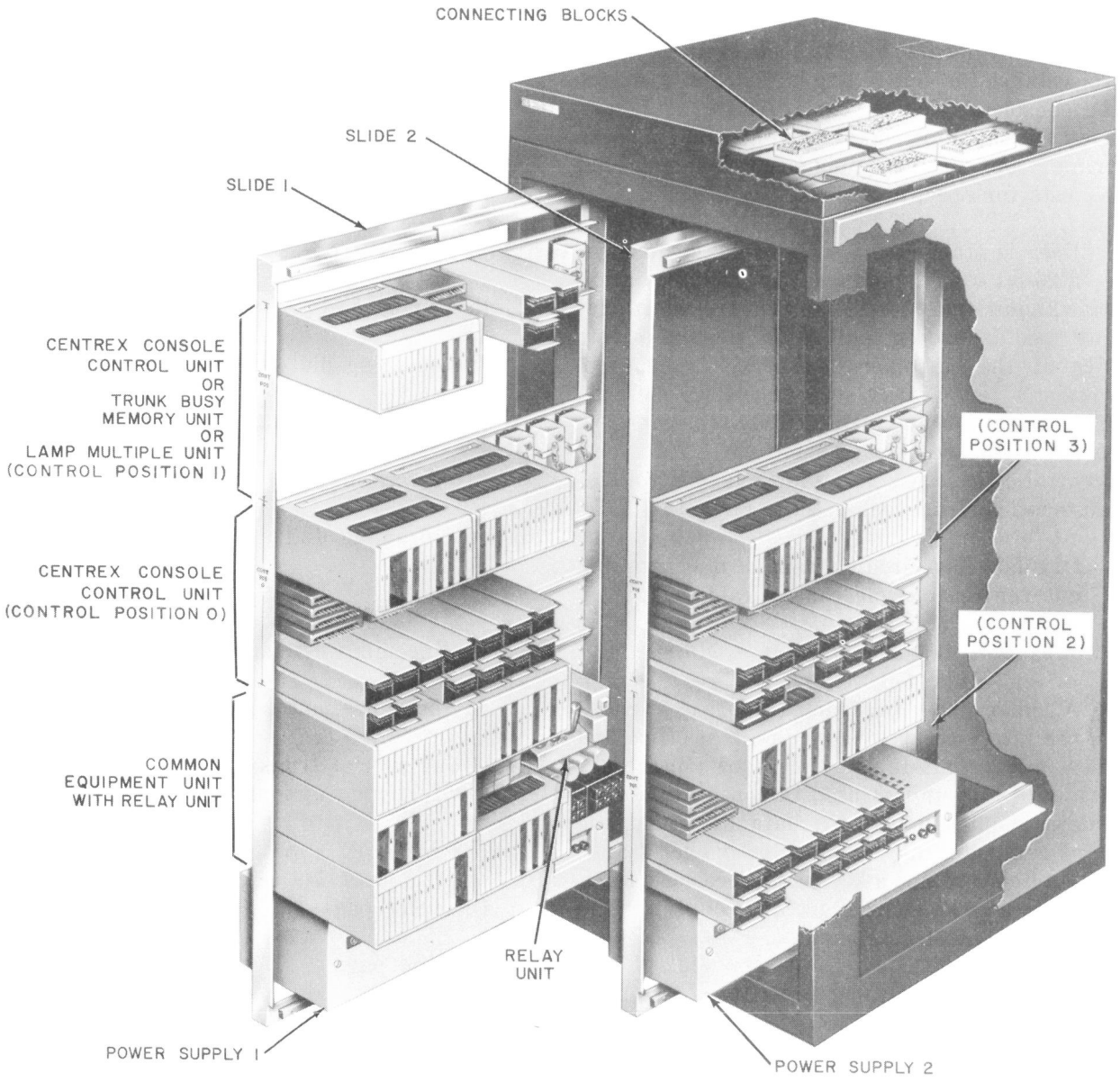


Fig. 4—No. 2 ESS Centrex Console Control Cabinet

at the remote customer end by means of transmitting and receiving circuitry in such a way that the two links form a complete loop. Lamp data is transmitted by means of this loop to the console control cabinet for controlling the states of lamps on the consoles. Key signals from the attendant consoles are transmitted to the central office over the same loop. The key signals are interpreted as requests for specific actions.

2.16 Data is transmitted serially in the form of a 26-bit word which contains 24 information bits plus 2 additional control bits. The two additional bits are used as leading control bits to start a shift register at the customer end of the data loop. This register temporarily stores the data message when lamp data is being transmitted to the consoles. When key signal data is transmitted to the No. 2 ESS central office, these two additional control bits are absorbed and are not used.

2.17 One data loop circuit is capable of controlling one centrex console control cabinet.

G. Centrex Data Link Frame (Central Office)

2.18 A centrex data link frame (Figure 6) provides the interface between the central office and the data loop. This interface is shown in Figure 5. One data link unit is used in conjunction with each data loop. Up to eight data links and one data link controller may be mounted in each frame. Each data link contains a key signal receiver circuit, a lamp data transmitter circuit, and connections to the common control equipment.

2.19 The data link controller appears as a peripheral unit on the system peripheral unit bus. The main function of the controller is to receive data messages from the central processor and to steer them to the proper data link.

H. Centrex Trunks

2.20 Trunk circuits may be assigned for the exclusive use of any centrex customer group. These trunks (shown in Table A) are used to interconnect the customer group with other switching systems.

2.21 Tie trunks are required to connect a customer group with other centrex or PBX systems. Foreign exchange trunks are required to connect the customer group with other central offices. A special trunk circuit is required for code calling, paging, and recorded telephone dictation features when these features are required (see Table A).

2.22 Translation memory is used to specify the particular treatment for each trunk group. The controlling program directs the trunk operations through the use of this memory.

2.23 The various types of trunk services available for centrex use are as follows:

(a) 2-way dial

(b) outgoing dial—incoming manual

(c) outgoing manual—incoming dial

(d) 2-way manual

(e) incoming dial

(f) outgoing dial

(g) incoming manual

(h) outgoing manual.

2.24 A special trunk circuit is required for the following optional centrex features:

(a) code call

(b) voice page

(c) dial page

(d) recorded telephone dictation.

2.25 Some additional specialized equipment is required at the customer's premises for the code call, paging, and recorded telephone dictation features.

I. Simulated Facility Groups

2.26 A wide area telephone service (WATS) customer normally receives access from the central office over a limited number of WATS lines. When the WATS customer is a centrex customer served by a central office, physical WATS lines to the centrex customer are not required. WATS access is simulated by the software to give the same grade of service and associated charges as

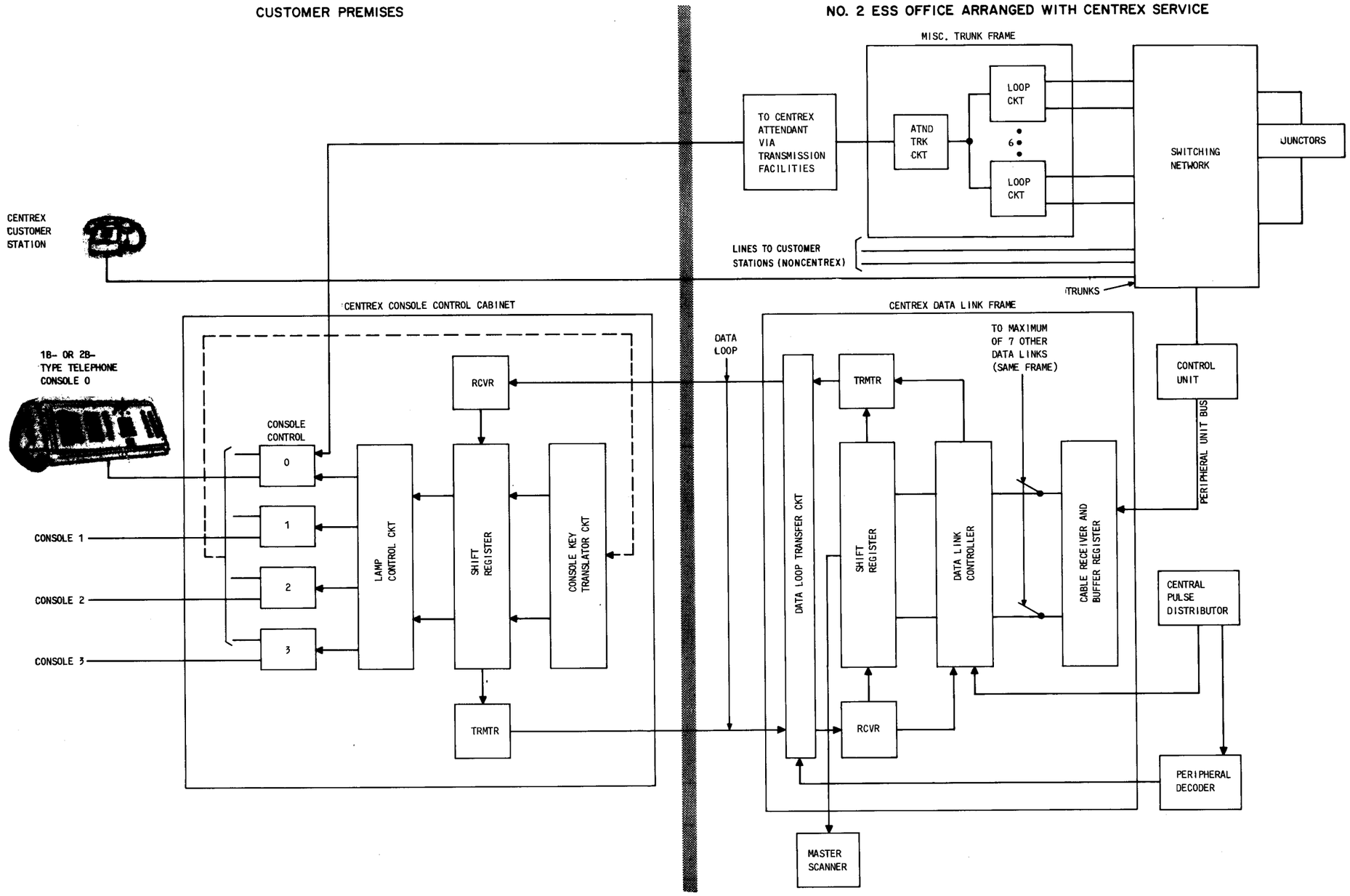


Fig. 5—Centrex System Block Diagram

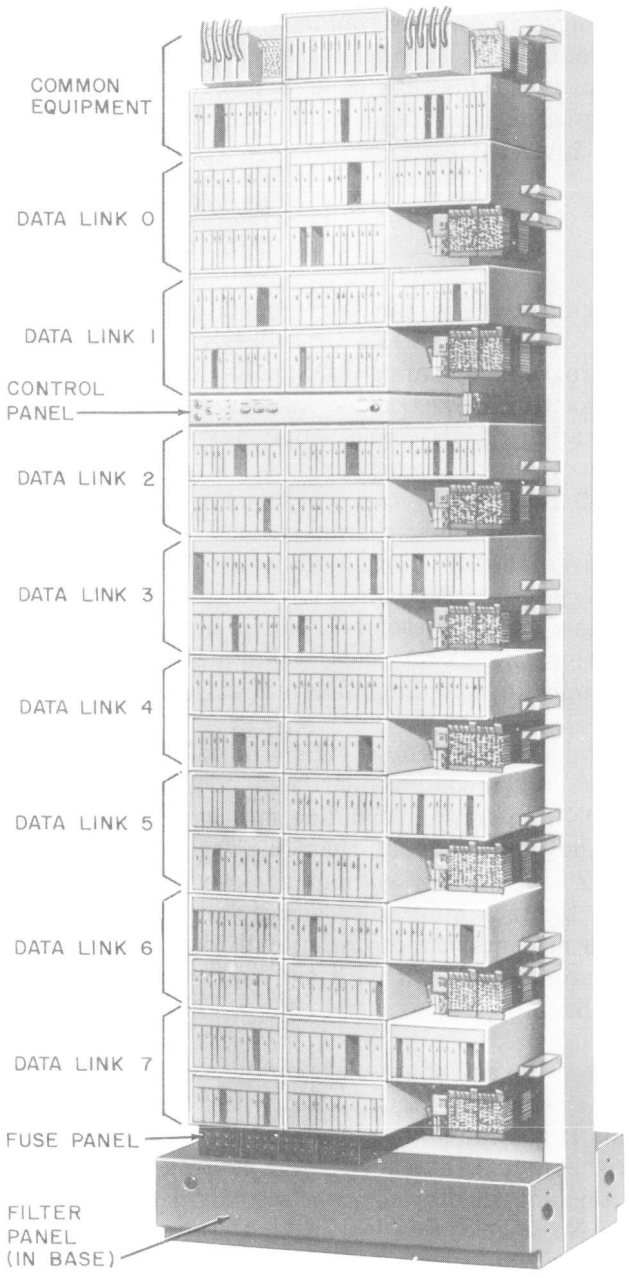


Fig. 6—No. 2 ESS Centrex Data Link Frame

the physical WATS lines. The simulation is performed by assigning the WATS service a software counter which counts the active outgoing calls and restricts the call capacity to the contracted capacity. The software system is called simulated facility groups.

2.27 Listed directory number access and dial "9" can be provided via simulated facility groups in the same manner as WATS access.

2.28 Traffic measurements for the simulated facility groups are recorded in the same way as for trunk groups. That is, peg counts, usage measurements, and overflow calls are recorded.

2.29 Traffic measurements of incoming and outgoing calls for a specific customer group may be obtained by assigning a simulated facility group to the central office access code (dial "9") for outgoing calls, or to the specific customer group LDNs for incoming calls.

J. Intercept Arrangements

2.30 Various types of intercept arrangements can be provided for Centrex-CO customers as follows:

(a) A block of a hundred numbers may be intercepted to another central office by using the route index in the number group table, or may be intercepted to a local announcement, or may be directed to another route index.

(b) A block of a hundred numbers may be fully restricted terminating or may be intercepted to another central office, to an announcement, or to another route index.

(c) All calls to a given station may be intercepted by the centrex attendant.

(d) All calls to a given station may be intercepted to an announcement or to another route index.

(e) Blank numbers for a whole hundreds group may be intercepted to the attendant, an announcement, or a dialing error route index.

2.31 As many as 96 announcement channels can be directed to any or all customer groups and/or basic telephone subscribers. Announcement channels are provided six per recorded announcement frame (maximum—16 frames per office).

K. CALL DIRECTOR Used as an Attendant Position

2.32 The Centrex-CO feature in No. 2 ESS employs a universal console of either the 1B- or 2B-type to implement the centrex attendant features. This uses a data link and console control cabinet as described earlier. An alternative, for small centrex groups, is to use the basic centrex station features of EF-1, with a CALL DIRECTOR or keyset with no data link, in place of a universal console.

2.33 An attendant using a CALL DIRECTOR or keyset does not have all of the features that the 1B- or 2B-type attendant console provides. To help understand these differences, a general description of the 1B-, 2B-type console operation follows, followed by an operational description of the CALL DIRECTOR.

2.34 ***Universal Console Operation***—The 1B- and 2B-type universal consoles employ switched loop operation. That is, incoming calls to an attendant are routed to an idle loop, then the attendant is alerted by lighting of the corresponding loop lamp and by sounding of an audible signal. Since all types of calls (dial "0", listed directory number, intercept, etc.) can come to the attendant on this loop, a separate group of incoming call identification (ICI) lamps is generally provided. One ICI lamp lights for each kind of call terminating to the attendant. When the attendant answers, the calling party may ask to be extended to a third party. At this point, the attendant extends the call and releases from the loop. (The attendant may remain associated with the loop until the third party answers, if desired.) The attendant is free to handle other calls as required. When the third party answers, the call is automatically removed from the loop and reestablished in the No. 2 ESS switching network. This loop now becomes idle, and available for new calls. This ability to hold a call until answer and then have it reconfigure automatically is referred to as "soft-hold." Before releasing (earlier in the call), the attendant can operate the HOLD key, and then release. This is a real hold and will cause the call to stay associated with the loop for the entire duration of the extended call or until the attendant reenters the call. At this time, the hold state may be released.

2.35 ***CALL DIRECTOR Console***—The CALL DIRECTOR or keyset console is a multiline keyset. Each line terminates on the No. 2 ESS network as a line, and is class-marked as an "attendant line." A few of these lines can be arranged in a series completion chain which would normally be used for incoming LDN calls. Another set of these lines can be arranged in another series completion chain and would be used for dial "0" and intercept calls.

2.36 Incoming LDN calls to the CALL DIRECTOR console can be provided in one of two ways:

(1) The LDN can correspond to the directory number of the first "LDN line." To the program, incoming LDN calls to this line look exactly like DID calls. (Trunk answer from any station (TAS) cannot apply for these calls.)

(2) The LDN can correspond to an "LDN expansion" in translations. This expansion gives the directory number of the LDN night service number which is used as the first "LDN line." This directory number must be different from the LDN. This technique allows TAS to apply to incoming LDN calls.

2.37 ***CALL DIRECTOR Console Operation***—An incoming LDN call comes to the first "LDN line" and if that line is busy, the call hunts to the next line. If that line is idle, the line is rung, and the key equipment associated with that line lights a lamp, also associated with that line. This provides the incoming call identification in a different way than with the universal console ICI lamps.

2.38 The attendant picks up the call by depressing this key/lamp button. To the No. 2 ESS, this looks like station answer. If the calling party wishes to be extended to a centrex station, the attendant flashes to get "second dial tone." To the No. 2 ESS, this looks like a station attempting to perform a call transfer, and the No. 2 ESS returns second dial tone. (This second dial tone is referred to as triple dial tone or in some literature "stutter dial tone," since it consists of three 100-ms bursts of dial tone, separated by 100-ms of silence, followed by steady dial tone.) The attendant now dials the third party. When the third party answers, this party and the attendant are split in the "consultation hold" state. To unsplit, the attendant flashes. This results in a 3-party connection. (The attendant could have flashed during the ringing of the third party, cancelling the split.) If the attendant releases now, the

remaining two parties will be reconfigured in the No. 2 ESS network as a 2-party call, and the attendant line is made idle.

2.39 There are a number of operational differences between the CALL DIRECTOR operation and normal universal attendant operation when extending calls:

(a) Triple dial tone—CALL DIRECTOR attendants performing call transfer get triple dial tone as confirmation that they have selected a 3-port conference circuit, and as a reminder that they are getting "second dial tone." With the 1B- or 2B-type console, this tone is not required since the state of the call is known by the lamps.

(b) Splitting—The CALL DIRECTOR splitting operation described in 2.39(a) is always provided. The 1B or 2B console permits calls to be processed without the attendant having to flash to connect the parties.

(c) Soft-Hold—With a universal console, when the ringing of the third party begins, the attendant usually releases to become available for other calls. The call still remains on the attendants loop during ringing, and at any time during the ringing period the attendant may reenter the call. When the called party answers and the attendant is in the released condition, the call automatically reconfigures into a 2-party call, freeing the loop. This is called soft-hold. With a CALL DIRECTOR console, when the attendant releases, the call reconfigures into a 2-party call immediately because there is no soft-hold feature. (See Section 232-190-301 for call transfer operation description.) If the attendant operates the hold key during ringing (after flashing to remove the split) the call will stay on the CALL DIRECTOR for the duration of the call. There is no soft-hold.

2.40 ***Attendant Features Available with CALL DIRECTOR Console***—Table B gives a summary of all the relevant attendant features.

L. Tie Trunk Cut-Through Service for Centrex-CO

2.41 Tie trunk cut-through service for Centrex-CO has been developed to permit a No. 2 ESS centrex to serve as a switching office in a tandem tie trunk network (TTTN) on a cut-through basis.

2.42 The distinguishing factor of the TTTN operation is the fact that the calling station has direct control over routing a call while it is being set up. The calling party can establish a path through the TTTN by dialing the proper routing codes and listening to the tones returned from the subsequent offices as the call progresses. Thus, in theory, any number of digits may be dialed by the calling party. But in practice, the No. 2 ESS limits the number of digits dialed to 24 digits.

2.43 Tandem tie trunk networks have generally been comprised of electromechanical offices utilizing dial pulse (DP) operation which:

(a) Cut-through to the next office over tie trunks determined by the first few digits (access code) received.

(b) Do not senderize, i.e., ***do not*** receive, send or reconstruct anew but just pass on the subsequent digits.

(c) Are "impervious" to subsequent digits once the cut-through is established.

(d) Permit subsequent offices to return tones back through the office switched path to the calling party.

(e) When switching through a common control system, may experience delays in attaching an incoming register receiver.

2.44 After dialing the access code, the calling party is connected to a receiver-transmitter service circuit (tandem tie trunk cut-through circuit) which is in turn connected to an outgoing tie trunk. A path is reserved from the calling party to the same outgoing tie trunk. Dial tone may be returned from this service circuit (or from the next switching office) so that further digits may be dialed. A transmission path in the receiver-transmitter circuit is closed between the outpulsing of digits so that the calling party may hear tones from the subsequent offices as the call progresses. After dialing and outpulsing are completed, the receiver-transmitter circuit is released and the calling party is connected to the outgoing tie trunk using the previously reserved network path. The end of the dialing is

defined as 10 seconds after the last digit has been dialed. During this interval, the transmission path through the receiver-transmitter circuit may be used for talking purposes.

2.45 Using tandem tie trunk operation, No. 2 ESS can:

(a) Receive digits on a TOUCH-TONE and/or DP basis and outpulse only on a DP basis.

(b) Receive a maximum of 24 digits. These digits can be AMA recorded if required.

(c) Repeat all digits after the access code. No addition, deletion, or conversion of digits is available.

(d) Permit receiving to get ahead of outpulsing at any time (after access code) by as much as 8 to 16 digits. More than 8 to 16 digits result in overflow tone being returned to the calling party.

(e) Terminate the call any time an abandon is detected during outpulsing.

(f) Allow the TOUCH-TONE "#" digit to cancel the 10-second time-out interval and signify the end of dialing.

2.46 The tie trunk cut-through service circuit for centrex will handle the following calls:

(a) Centrex station to tie trunk

(b) Incoming tie trunk to tie trunk

(c) Centrex attendant to tie trunk

A tie trunk group is defined in translation as part of a tandem tie trunk network whenever calls may be extended beyond the ***next*** switching point. If all calls over a tie trunk group terminate to a centrex station or an attendant at the next switching point, the tie trunk cut-through circuit is not required to return dial tone, and the trunk group should not be defined as a tandem tie trunk group.

2.47 The following circuits are required for tandem tie trunk cut-through service:

(a) Tie trunk cut-through service circuit for local originations—This circuit permits local centrex stations, both DP and TOUCH-TONE (as required), and the centrex attendant to gain access to a tandem tie trunk network. It is accessed automatically when the proper access codes are dialed. The service circuit consists of four circuits which are wired together and operate in combination as a single 2-port service circuit (Figure 7).

Customer Dial Pulse Receiver, SD-2H177-01 TOC 658XX

TOUCH-TONE Receiver Applique, SD-1A173-01 TOC 64000

Trunk Dial Pulse Transmitter, SD-2H122-01 TOC 61860, 61861

Tie Trunk Cut-Through Service Circuit, SD-2H178-01 See Table A

The last is a new circuit which provides cut-through between the calling party and the outgoing tie trunk for return of dial tone and other tones from subsequent switching points. This combination is treated as a 2-port service circuit and may not be used for other traffic applications. Port 0 is assigned to the customer dial pulse receiver (CDPR), SD-2H177 and port 1 is assigned to the trunk dial pulse transmitter, SD-2H122. An office may have either combination, with or without TOUCH-TONE receiver applique, but not both ways. The controlling ports of these service circuits are assigned to Trunk Group 14. The noncontrolling ports are assigned to trunk groups 64 and/or 65.

(b) Tie trunk cut-through service circuit for distant office originations—This circuit permits incoming centrex tie trunks access to outgoing tandem tie trunks. It is accessed automatically when an incoming call dials the proper access code. The service circuit consists of four circuits which are wired together and operate in combination as a single 2-port service circuit (Figure 8).

Trunk Dial Pulse Receiver, SD-2H123-01 TOC 61962, 61963

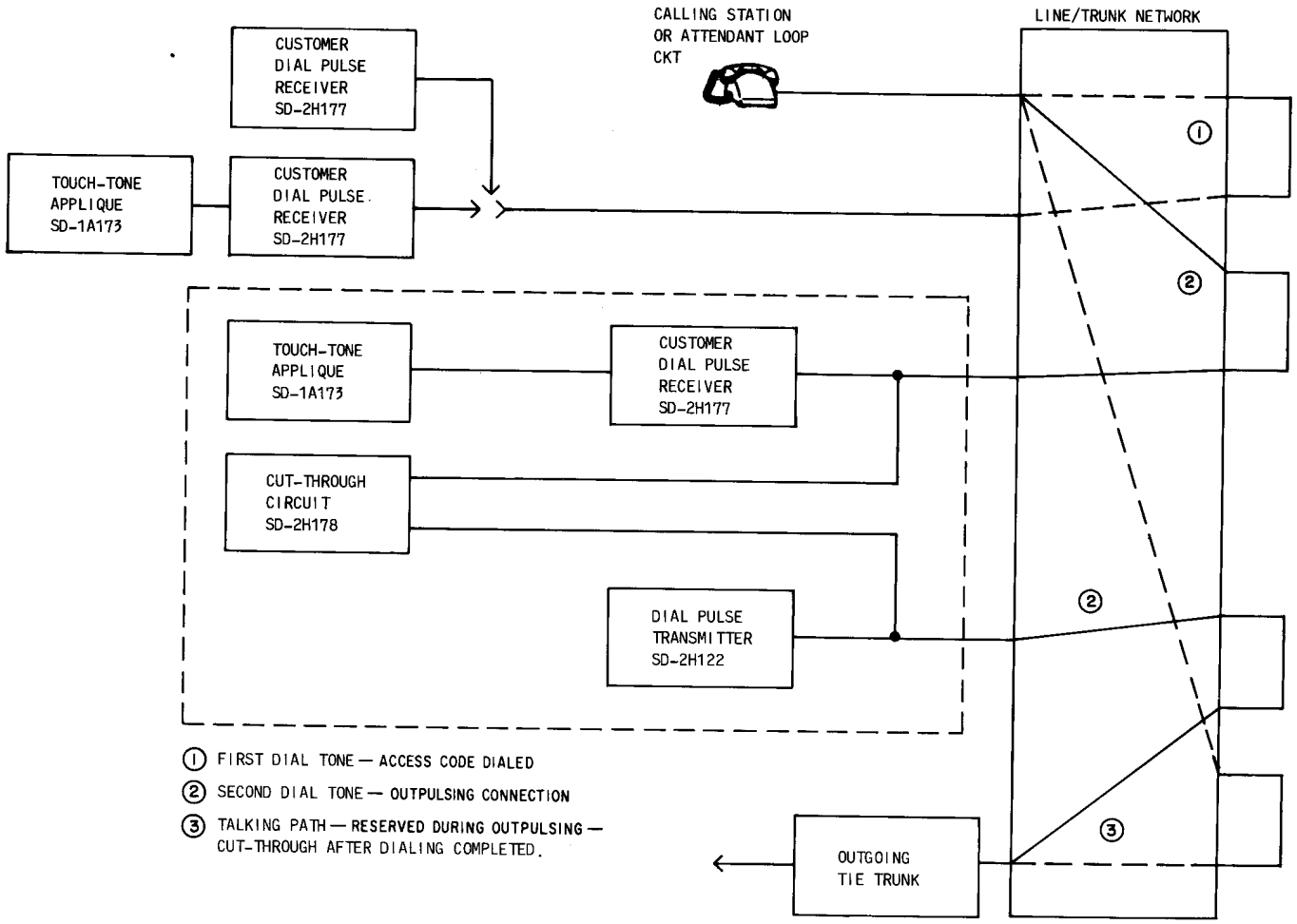


Fig. 7—Tandem Tie Trunk Cut-Through Service—Local Origination

TOUCH-TONE Receiver Applique, SD-1A173-01
TOC 64000 (as required)

Trunk Dial Pulse Transmitter, SD-2H122-01
TOC 61860, 61861

Tie Trunk Cut-Through Service Circuit, SD-2H178-01. See Table A

This circuit is the same combination as in (a) except for the substitution of a trunk dial pulse receiver (TDPR) for the CDPR. This combination is treated as a 2-port service circuit and may not be used for other traffic applications. Port 0 is assigned to the TDPR SD-2H123 and port 1 is assigned to trunk dial pulse transmitter SD-2H122. An office may have either combination, with or without TOUCH-TONE applique, but not both. The controlling ports of these service circuits are assigned to Trunk Group 15. The noncontrolling ports are assigned to trunk groups 64 and/or 65.

(c) Trunk TOUCH-TONE/Dial Pulse Receiver

This circuit permits the reception of TOUCH-TONE and/or DP on incoming tie trunks. It is required if the tie trunks come from other offices with cut-through operation and TOUCH-TONE service as an example, or any time a customer may dial TOUCH-TONE digits over a tie trunk group. The service circuit consists of a combination of the following two circuits. These service circuits are assigned to Trunk Group 13.

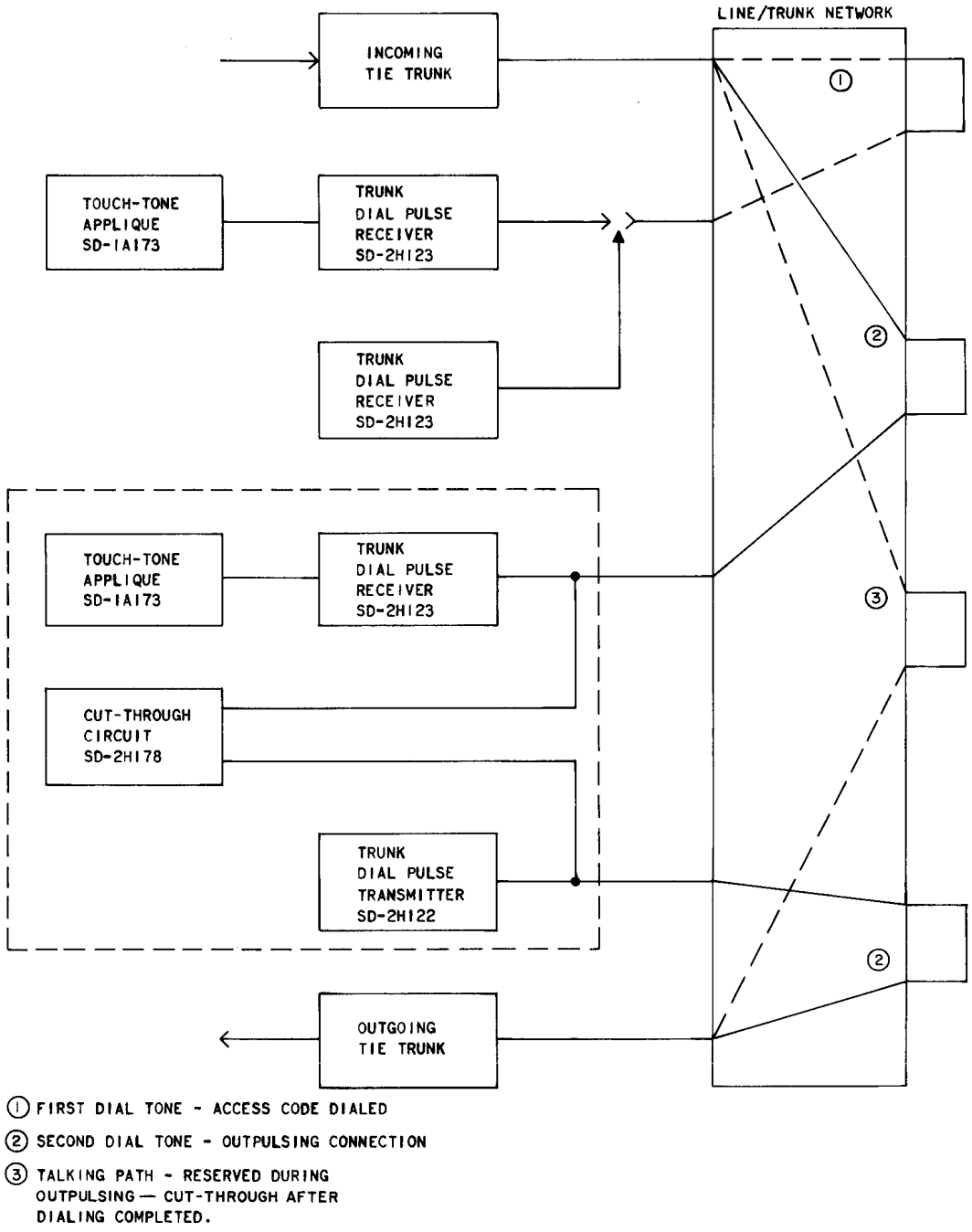


Fig. 8—Tandem Tie Trunk Cut-Through Service—Distant Origination

Trunk Dial Pulse Receiver, SD-2H123-01
TOC 61962, 61963

TOUCH-TONE Receiver Applique, SD-1A173-01
TOC 64000

M. Basic Telephone Service

2.48 Basic telephone service can be provided in a No. 2 ESS which is equipped with the EF-1 program along with Centrex-CO customers. The treatment of basic telephone customers, that

is, dialing patterns, custom calling features, screening, billing, etc., is essentially the same as that treatment provided by offices equipped with the LO-1 generic program. Descriptions of these treatments are found in Section 966-200-100.

N. Limited Main-Satellite Service

2.49 The purpose of main-satellite service is to have two or more customer locations treated as one customer group instead of treating each location as an individual group. Attendant facilities are generally only located at the "main."

2.50 The No. 2 ESS with the EF-1 generic program can be used as either the "main" or "satellite" entity in the main-satellite configuration to provide a "limited" form of main-satellite service. This service is characterized by:

- Station-to-station calling on a 4-digit (2-, 3-, 4- or 5-digit) basis whether the stations are collocated or not. (Main and satellite stations must have different thousands digits.)
- The ability to locate the attendant facilities at a single location, where all stations (both at main and satellite) have access to the attendants on a "dial 0" basis.
- Tie trunks which join the main and satellite locations for the purpose of placing the above (as well as other) types of calls.

This is a limited service because the EF-1 generic program cannot provide (or even operate with) "release link" operation, or station-call transfer capability over tie trunks.

2.51 These generic limitations impose additional restrictions on the main-satellite operation (with No. 2 ESS as either the "main" or satellite entity) as described in the following:

- All incoming DID, tie, FX, and CCSA calls destined for either the main stations or satellite stations must enter and/or be switched through the main.
- Dial "9", WATS, and other types of outgoing calls placed by stations at the satellite may leave the satellite directly, or may be switched through the main.
- All station-to-station, dial "0", etc., calls from the satellite to the main must enter the main with the received digits consistent with the dialing plan at the main; otherwise, additional trunk groups are required.
- The stations at the satellite must have attendant transfer capability as opposed to station call transfer.
- When satellite stations require access to recorded telephone dictation (RTD) equipment at the main, these stations must either be TOUCH-TONE or the RTD calls must be switched through to the main over a separate trunk group.
- Manual stations at the satellite which must terminate to the attendant at the main must be off-premises extensions that are connected to the main or must be switched through to the main over a separate trunk group.

2.52 Additionally, when using the No. 2 ESS as the main in the main-satellite configuration, the following features are not available to the main and/or satellite stations:

- Through-dial from satellite stations
- Attendant intercept of nonworking satellite stations
- Series completion from main stations to satellite stations
- Call forwarding (busy line, don't answer, or variable) from main stations to satellite stations
- Call pickup between main and satellite stations.

3. FEATURE FLOW DIAGRAM

3.01 The flow diagram of Figure 9 describes what happens when there is a request for service from a centrex station, a centrex attendant, or a centrex tie trunk. When the centrex station goes off-hook, if it is a manual station, it is connected to the attendant If the station has denied originating service, it is set high and dry. If neither, the No. 2 ESS selects a network path to

a customer dial pulse receiver, an originating register, and provides dial tone to the station.

3.02 Request for service from a centrex attendant—When the attendant originates a call, the No. 2 ESS selects a customer dial pulse receiver, an originating register, and provides dial tone to the attendant.

3.03 Request for service from a centrex tie trunk—When a centrex tie trunk goes off-hook, the No. 2 ESS selects an incoming receiver, an originating register, and a network path. The No. 2 ESS returns start dial supervision and may provide dial tone to the calling tie trunk.

3.04 From this point on, all three requests for service are handled in a similar manner. After the calling party dials one digit, an attempt is made to identify the type of call. If the digit is invalid, the calling party is given dialing error treatment. If this digit is insufficient to identify

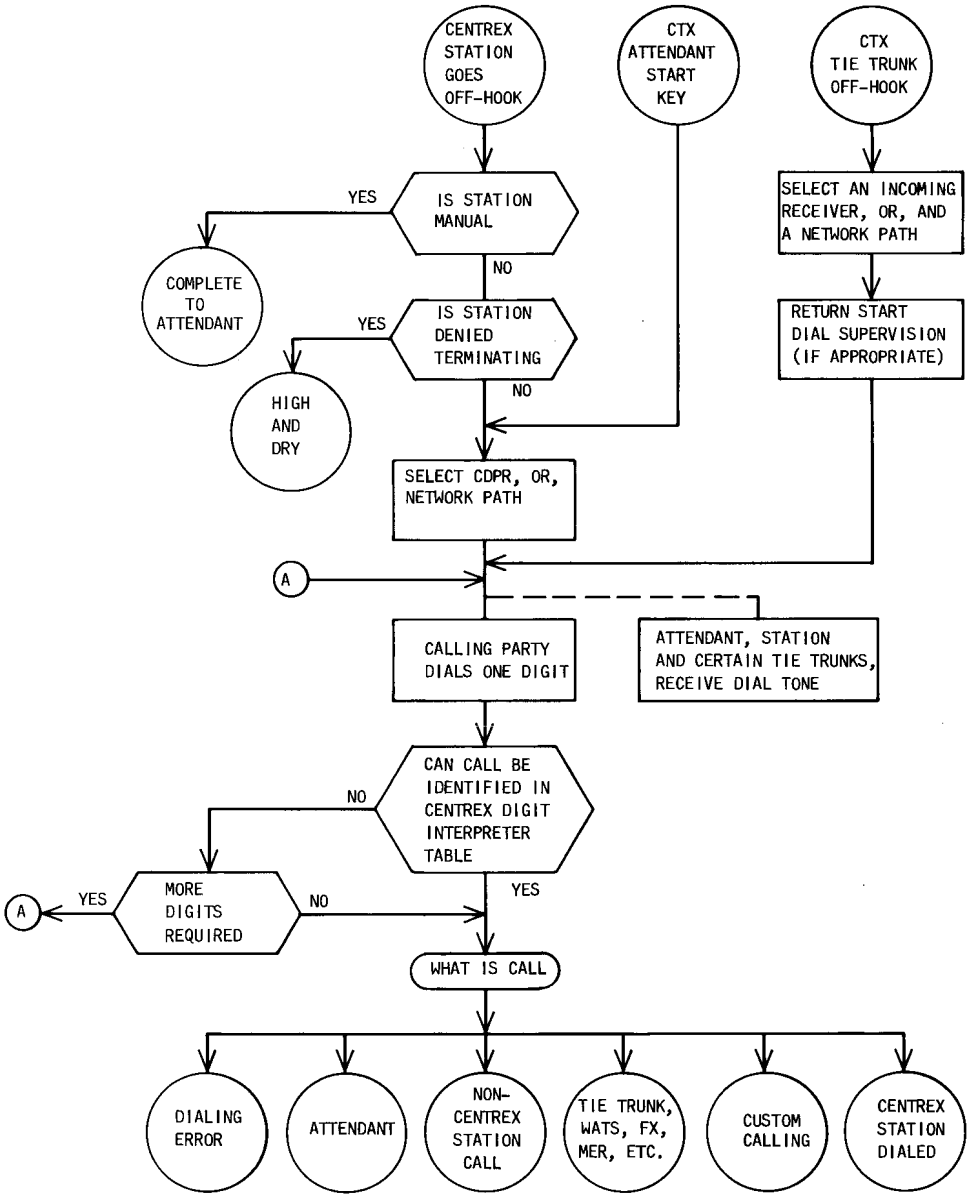


Fig. 9—Simplified Centrex Call Processing Flowchart (Sheet 1 of 2)

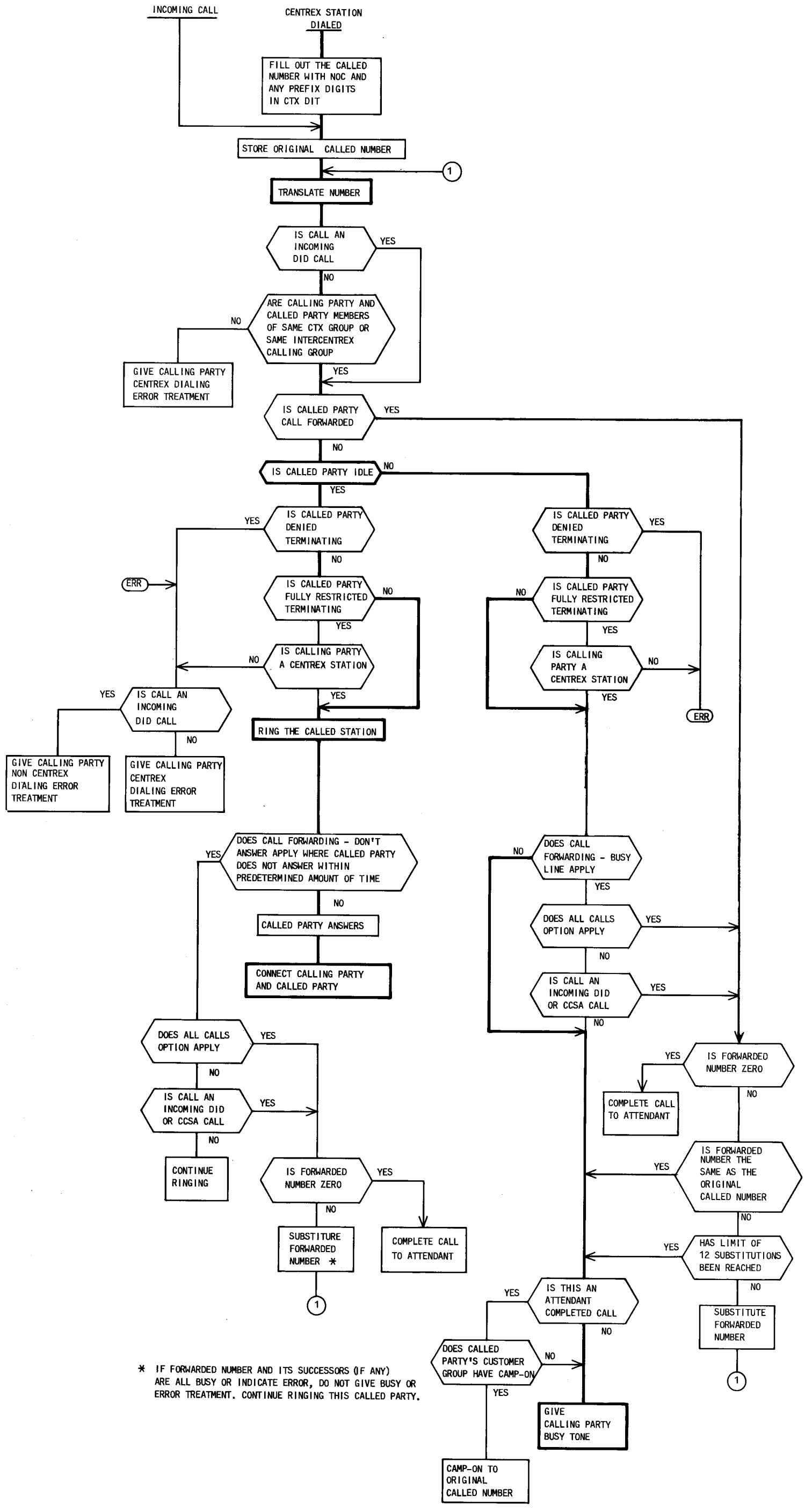


Fig. 9—Simplified Centrex Call Processing Flowchart (Sheet 2 of 2)

the type of call, the program waits for the party to dial another digit. In any case, when the dialed call can be identified by the centrex digit interpreter tables, the program initiates further action based upon what type of call has been identified.

3.05 Call to a centrex station—An example of further action is contained in the rest of Figure 7 where the call has been identified as a centrex station being dialed. If a centrex station, attendant, or trunk initiated the call, the No. 2 ESS fills out the dialed number with a normalized office code (NOC) and any prefix digits defined in the centrex dialing plan.

3.06 An incoming call for a centrex station enters the flowchart at this point. Incoming calls are noncentrex calls (line or trunk) and intercentrex calls.

3.07 After the calling party completes station dialing, the No. 2 ESS translates the called number into a terminal equipment number (TEN) and stores it in the transient call register (TCR). If the call is an incoming call, the program skips the intracentrex and intercentrex calling group checks. (See GLOSSARY.)

3.08 If the call is not an incoming call and the calling and called parties are not members of the same centrex group or the same intercentrex calling group, the dialing party receives the appropriate call failure treatment. If the call is not an incoming call and the calling and called parties are members of the same centrex group or of the same intercentrex calling group, the program continues processing the call.

3.09 If the dialed number is denied terminating, the calling party receives the appropriate call failure treatment. If the dialed number is not denied terminating, the program checks to determine if the called number is call forwarded. If the called number is call forwarded, the call forwarded number is substituted for the dialed number. When a number is reached that is not call forwarded the program checks if the called number is idle.

3.10 If the called number is idle, the call is processed the same as a station dialed noncentrex call. If the called station answers, the call is completed. If the station does not answer and the call is an incoming DID or CCSA call, the program checks if the station has the call forwarding—don't answer feature. If it does not, ringing continues. If the called station does have call forwarding—don't answer, the call is processed to the designated alternate station (or to the attendant). Similar treatment is provided on all calls for stations with the call forwarding—don't answer—all calls feature.

3.11 If the called number is busy, a check is made to see if the called number has the call forward—busy line feature. If the called number has that feature and the call is an incoming DID or CCSA call, the forwarded-to number is substituted for the called number and the call is processed to the designated alternate station (or to the attendant).

3.12 If the called number has the station hunting feature, the hunt number is substituted for the called number and the call is processed to the designated alternate station.

3.13 If the called number does not have either of the above features, and the call is an incoming call, the program checks to see if this was an incoming call completed by a universal console attendant. If the call was not completed by an attendant, the calling party is connected to busy tone. If the incoming call was completed by an attendant and the called party's customer group does not have camp-on, the attendant is connected to busy tone and the DEST lamp is flashed at 60 ipm. If the incoming call was completed by an attendant and the called party's customer group has camp-on, the attendant console DEST lamp flashes at 60 ipm. When the attendant releases, camp-on tone is given to the busy station to indicate the presence of the camp-on call. When the called station hangs up, it is rung automatically, and when the called station answers, the calling and called party are connected together and are dissociated from the attendant console. If the camped-on station has the call hold feature, it may answer the camp-on call by holding the current call. If camp-on applies after one or more substitutions of a hunt number, the original called station is the one that is camped-on.

4. INTERACTIONS

4.01 The EF-1 generic program allows provision for features listed in this document in addition to features associated with regular telephone service. These features and services interact with

each other to affect call-handling of the selected services. Detailed interactions between features and services are specified in the feature document which describes the particular feature.

4.02 When Centrex-CO is provided with the EF-1 program, fewer network terminals can be accommodated. With the EF-1 generic program equipped for centrex, the number of NCJS frames is limited to 12. With the EF-1 generic program ***not*** equipped for centrex, the number of NCJS frames is limited to 15.

ATTRIBUTES

5. STATION/SYSTEM

5.01 See LIMITATIONS, for equipment constraints.

6. LIMITATIONS

6.01 ***Customer groups:*** The No. 2 ESS may have 127 independent centrex customer groups.

6.02 ***Universal attendant console:*** The No. 2 ESS may have up to 63 universal consoles per customer group and a maximum of 128 universal consoles for the switching system.

6.03 ***Attendant trunks:*** Attendant trunks are assigned one per attendant console.

6.04 ***Attendant loop:*** Attendant loops are assigned six loops per attendant trunk.

6.05 ***Centrex console control cabinet (lamp and key control, customer location):***

(a) The No. 2 ESS may have up to 32 cabinets per No. 2 ESS system

(b) Each console control cabinet may have up to four console control units per cabinet

(c) There may be only one attendant console per console control unit.

6.06 ***Data loop:***

(a) There may be one data loop per centrex console control cabinet

(b) There may be up to eight data loops per data link frame.

6.07 ***Data link frame:*** There may be up to four data link frames per No. 2 ESS system.

6.08 ***Numbering:***

(a) Directory number codes: The No. 2 ESS may have up to six central office codes of up to 10,000 numbers each.

(b) Pseudo office codes: The No. 2 ESS may have up to six pseudo office codes of up to 10,000 numbers each (in addition to 6.08a).

6.09 ***Individual Feature Limitations, Applications, see Table B.***

6.10 ***Night Service:*** Normally, one station is assigned to night service but up to 12 can be selected by providing station hunting. If more than one LDN is supplied per customer group, each may be assigned the same or separate night stations with or without station hunting. Dial "0" calls may or may not (as desired) have a separate night service number with or without station hunting.

6.11 ***Assignable LDNs:*** The number of LDNs in the customer group is generally no larger than the number of incoming call identification lamps which are available on the attendant's console; however, any number of LDNs can be within the confines of the numbering limitations (6.08a).

6.12 ***Power Failure Transfer—Attendant:*** There is an optional power plant (105E) with a rectifier (11-A) and battery (50AH) located on the customer's premises which will provide the attendant with a variable amount of power reserve, depending on the current drain. During power failure at the customer's location, after the reserve is exhausted or if the option is not exercised, calls to the attendant are placed as though the customer group were in night service.

6.13 ***Directed Call Pickup (DPU):*** With this service, a station user can answer calls directed to a particular station line in its centrex group by dialing the unique answer code of the called station. This service may be provided in a number of different dialing plans, depending upon the customer group dialing plan, and the number of digits that the TELCo chooses to offer the

customer to dial for the pickup service. Signaling the called party is generally via a customer provided and engineered means such as a radio system or a voice paging system.

6.14 ***Call Pickup:*** Stations can be group arranged so that when a telephone rings at a vacant desk, it may be answered at another extension, within the same pickup group, by dialing a special access code. A centrex group may have a maximum of 254 pickup groups, with as many stations in a group as desired.

6.15 ***Trunks (FX, Tie, CCSA):*** There may be as many as 511 trunk groups (including interoffice trunk groups, tie, FX, CCSA trunk groups and service circuit trunk groups, but not counting simulated groups) with as many as 255 members in each group in the entire No. 2 ESS. The groups may be divided in any combination between centrex, PBX, and noncentrex customers. There can be up to two CCSA trunk groups per customer. One which accepts 7 digits and the other that accepts 7 or 10 digits. For more information on trunks, refer to Table A.

6.16 ***Incoming Call Identification (ICI):*** There are up to 12 ICI lamp indications for customers who specify 1B-type consoles and up to 24 for those who specify 2B-type consoles.

6.17 ***Speed Calling:*** Centrex speed calling is available in two plans. Each centrex customer group may have either the "dedicated digits" plan or the "time-out" plan (but not a mixture) for extension speed calling and/or attendant speed calling. With either plan, each customer group may have up to 1023 six-code speed calling lists, and up to 64 thirty-code speed calling lists. Within these limits each extension may have one 6-code list and one 30-code list. (Centrex attendants do not have 6-code lists, but may have one or two 30-code lists.)

6.18 The dedicated digits plan employs 2-digit access for 6-code speed calling (e.g., 12-17) and 4-digit access for 30-code speed calling (e.g., 1120-1149 for extension speed calling and 1120-1179 for attendant speed calling).

6.19 The time-out plan employs 1-digit access for 6-code speed calling (e.g., 2-7) and 2-digit access for 30-code speed calling (e.g., 20-49 for extension speed calling and 20-79 for attendant speed calling). The time-out plan further employs a 4-second time-out after dialing to resolve any possible conflicts between the speed calling access code and extension numbers which may begin with 2-7 or 20-79. The TOUCH-TONE "#" may be substituted for this 4-second time-out.

6.20 Some customer groups may be allowed dial changeable speed calling. If so, entries in the dialing plan must be generated which will allow for dial-change—30-code and/or for dial-change—6-code. For these customer groups so allowed, all extensions with 6-code speed calling are able to change their corresponding speed calling lists, and certain designated extensions are able to change their corresponding 30-code lists, and all attendants are able to change their 30-code list(s).

6.21 ***Simulated Facility Group (SFG):*** The maximum number of SFGs (used for WATS, dial "9", and LDN calls) in a No. 2 ESS is 127. There may be as many as 255 "members" in each group.

7. RESTRICTION CAPABILITY

7.01 ***Attendant Console***—One universal console must be designated the primary console within a customer group. This console (attendant number "1") controls the night service function. If the consoles are of the 2B type, the second console position in the first console control cabinet must be used for additional trunk group busy lamp memory control.

7.02 ***Station Restrictions***—Various restrictions may be assigned as options to stations. These restrictions are as follows:

(a) A denied origination station is not allowed to originate any calls.

(b) Manual. Calls originating at a manual station are routed to the attendant.

(c) The fully restricted terminating station may receive calls from intragroup stations only. All calls from the local switching network, CCSA network, and the attendant to these stations are routed to central office intercept or centrex dialing error treatment as appropriate.

(d) Denied terminating. A denied terminating centrex station is not allowed to receive

calls. Centrex calls to this station are routed to centrex dialing error treatment and noncentrex calls are routed to translation error announcement.

7.03 ***Miscellaneous Trunk Restriction (Attendant Restriction, Restriction from Outgoing Calls)***—Miscellaneous trunk restriction denies attendants and/or stations and/or incoming tie trunks the ability to use certain access codes to gain access to the various types of trunks or features listed in 7.04. This is accomplished by use of the centrex access treatment code.

7.04 ***Centrex Access Treatment (CAT) Code Restrictions***—CAT codes allow or deny a station, attendant, or incoming tie trunk within a centrex group access to the following services:

- Attendant (Dial 0)
- Local Exchange (Dial 9)
- Tie Trunks
- FX Trunks
- CCSA Trunks
- WATS
- Most Economical Routing
- Recorded Telephone Dictation
- Paging
- Code Call
- Code Call Pickup
- Trunk Answer from any Station
- Trunk Flash Request.

7.05 Each station, attendant, or incoming tie trunk of the centrex group is assigned a number from 00 to 15 which is its CAT code. (The attendant CAT code is preassigned as 00.) Each service for which an access code is dialed has a restriction code assigned. When an access code for service is dialed, the restriction code of that service is checked against the CAT code for the calling party, and the call is either allowed to proceed or the calling party is given centrex dialing error treatment depending upon the results of that check.

7.06 ***Features***—Features are restricted by omitting the necessary translations, by use of CAT codes or by setting or not setting appropriate bits in translation.

8. COST DATA

Description of Requirements

8.01 Price profiles on No. 2 ESS centrex services are not available at this time. However, the following equipment will be required to obtain these services. (See Traffic Facilities Practices, Division D, Section 12, for actual quantities for specific offices.)

8.02 Each customer group may require the following:

(a) Attendant Equipment (if attendant service is provided). This consists of:

(1) One or more attendant consoles

(2) One or more centrex console control cabinets

(3) One data link for each console control cabinet

(4) One or more data link frames (a frame for 1-8 data links)

(5) One associated central pulse distributor point for each data link

(6) Thirty-two associated scan points for each data link frame and 32 for each data link

(7) One associated peripheral decoder point for each data link

(8) Six attendant loop circuits for each attendant

(9) One attendant trunk circuit for each attendant

(10) Four peripheral decoder circuit packs for each attendant

(b) Trunk Equipment (see Table A)

(c) System Equipment

(1) Call Store Words—9 for each attendant, 40 for each data link, 24 for each attendant's terminal memory record (TMRs), 1040 or 2080 for the centrex scatter table depending on size of system; 2 for each tie trunk, and special service trunk circuits for TMRs. (See Traffic Facilities Practices, Division D, Section 12 for detailed calculations.)

(2) Program Store Words for translations—200 for each centrex customer. Four or six per station depending on special services. (See Traffic Facilities Practices, Division D, Section 12 for detailed calculations.)

8.03 Variation in costs with number of times the centrex service is activated—see individual features for information. Maintenance costs—to be provided at a later date.

Space Requirements

8.04 ***Central Office Equipment***—See Floor Plan Data Sheets, Section 16, for typical floor plan arrangements.

8.05 ***Customer Premises Equipment***—This includes the following:

(a) Centrex console control cabinet is 2 feet 2-1/2 inches wide, by 2 feet 4 inches deep, by 4 feet 9 inches high. A minimum of 3 feet should be provided in front of the width of the cabinet for servicing the slide-out units.

(b) The 1B- and 2B-type universal consoles are intended to be placed on a standard office desk. The 1B is 18-1/2 inches wide and 9 inches deep. The 2B is 25-1/2 inches wide and 9 inches deep. See Figure 2 for more detail.

(c) Cost to assign and unassign. An office data administration (ODA) run is required to define a centrex group or a dummy centrex group. Most data within a centrex group or dummy group may be changed by ODA or recent change. An ODA run or recent change may be employed to add or change a station.

INCORPORATION INTO SYSTEM

9. PLANNING

9.01 Generic Program Considerations—Offices with LO-1 generic programs cannot serve Centrex-CO customers. The EF-1 generic program must be used to provide centrex service. The EF-1 program can be retrofitted into a No. 2 ESS which is currently running with the LO-1 generic program.

9.02 Dialing Plan Considerations—Direct Inward Dialing numbers—A regular 7-digit central office number is assigned to each centrex station. It is essential that centrex numbers be so assigned as to use central office codes as efficiently as possible. Good planning requires a central office code be shared by several centrex or noncentrex customers.

9.03 It is suggested that the initial digit of a centrex station number not begin with:

"0"—conflicts with suggested assignment for attendant access code

"9"—conflicts with suggested assignment for direct out dial code

"8"—conflicts with suggested assignment for CCSA access code (if any)

"1"—conflicts with suggested assignment for special services access codes.

9.04 Although the customer may have no desire initially for CCSA, special services, etc., it is prudent to allow for such contingencies when developing the dialing plan.

9.05 Number series beginning with 0, 9, 8, and 1 may be assigned to noncentrex customers.

9.06 The initial dialing plan, whether two, three, four, or five digits, should be sufficient to serve the ultimate size of the customer group. Should unforeseen station growth develop, however, it may be necessary to convert a 3-digit system to a 4, or a 4-digit system to a 5. The construction of the DID numbers may prohibit this expansion if prudent number assignments were not made

initially. For example, a customer with a 3-digit system should not be assigned a code such as:

NNX-0XXX

NNX-9XXX

NNX-1XXX

NNX-8XXX (if CCSA possibility).

9.07 It can readily be seen that to convert one of the above 3-digit systems to a 4-digit system might cause conflicting dialing codes for the centrex customers which must be resolved with a dialing plan change.

9.08 Considerations for directed call pickup should be considered when developing the overall dialing plan (see Section 232-190-318).

9.09 Translations Preplanning—The number of centrex groups, and the number of stations should be anticipated for the growth period to provide for program store translation capability. An ODA run may be necessary to define the attendant, tie trunk, and special service trunk groups for a specific centrex customer, if preplanning is not handled properly.

9.10 Hardware Planning—The number of data links, centrex console control cabinets, special trunks, and attendant consoles should be anticipated for the growth period to minimize lead time. In addition, a quantity of the above equipment should be reserved for use in a "Ready to Serve" capacity.

10. HARDWARE ENGINEERING

10.01 See Table D for hardware engineering information. Also see Traffic Design Worksheets Division D, Section 12l and Traffic Business Service Facilities Engineering Practices Division B, Section 2. Three new service circuits may be required. They are:

(a) Tandem tie trunk cut-through circuit—local origination. See 2.46(a)

(b) Tandem tie trunk cut-through circuit—distant origination. See 2.46(b)

(c) Incoming Receiver with TOUCH-TONE Applique. See 2.46(c).

TABLE D

HARDWARE

EQUIPMENT	ENGINEERING	DOCUMENTATION STANDARD
1B — Type Attendant Console	E8085	BSP 540-576-302
2B — Type Attendant Console	E8085	BSP 540-576-302
Centrex Console Control Cabinet	E8085	J1A068E SD-1E059-01 SD-1E063-01
Centrex Data Link Frame	See 2.18, 2.19	J1A068A SD-1A265-01
Trunks (See Table A)	J2H031A	J2H031A EL-600
No. 2 ESS Common Hardware (See EL-600)	TFP DIV. D Sec. 12	BSP 966-200-100 BSP 966-202-100

10.02 For determination of centrex service circuit quantities, refer to Traffic Facilities Practices, Division D, Section 12n for general method for determining the number of centrex service circuits required.

10.03 ***Centrex Console Control Cabinet***—See Section 966-202-100 for hardware engineering considerations for the centrex console control cabinet.

11. SOFTWARE ENGINEERING

11.01 Memory Requirements—***Program and Call Store***—Provisions must be made for translations in the stores for customer group and per-line requirements that may be required during the growth interval. Refer to Traffic Facilities Practices, Division D, Section 12 for details in engineering the stores.

12. COMPATIBILITY

12.01 Refer to J2H031A, No. 2 ESS trunk and service circuit engineering specification.

13. OFFICE DATA

A. Translations

13.01 Typical office data translation layout of an intracentrex call is shown in Figure 10.

B. ODA Information

13.02 The following is a list of ESS input forms which may be required for an ODA run when administering centrex in EF-1 offices (refer to TG-2H for further information):

ESS 2101	Centrex Directory Number Table
ESS 2108	Attendant Console Table
ESS 2109-1	Centrex Group Table
ESS 2109-2	Centrex Group Table (Dialing Assignment)
ESS 2109-3	Private Facility Supplementary Table

ESS 2202-3	Centrex Trunk Group and Simulated Facilities Group Table
ESS 2208	Data Link Frame Table
ESS 2215	Manual Trunk Disposition and Group Billing Index Table
ESS 2307	Centrex Screening Table.

C. Translation Changes

13.03 Recent Change Capability—Orders affecting stations, (such as feature additions) trunks, service circuits, etc., may be accomplished on an ongoing basis by entering the orders via a teletypewriter (TTY) as a ***recent change.*** Some translation structures cannot be recent changed and require an ODA run. ODA runs require Western Electric Regional Center action whose input is either by forms filled out by the telephone company or by data from the No. 2 ESS over a data link. ODA changes are on a longer term rather than an ongoing basis. The following lists summarizes centrex translations which are recent changeable and those which require an ODA run. The list does not include noncentrex features. Refer to Sections 680-536-011 and 232-118-103 and IM-2H200 for recent change input procedures and TG-2H for ODA information.

Translation Changes Possible by Recent Change Messages or an ODA Run

13.04 Changes to certain station features, trunks, service circuits, etc., may be made with an appropriate RC message or by an ODA run. The following is a list of key words of RC messages and the associated functions:

Key Word	Function
A RC L/	Station Additions or Changes
A RC CTX/	Centrex Group Additions or Changes
A RC ATT/	Attendant Additions or Changes
A RC GRP/	Trunk (FX, Tie, CCSA) Group or Service Circuit Group (Tandem Tie Trunk Cut-Through, TOUCH-TONE Trunk Receiver) Changes. These recent changes require the use of octal information.
A RC SIM/	Simulated Facility Changes. These recent changes require the use of octal information.
A RC DIT/	Digit Interpreter Table Changes (Access Codes for FX, Tie, CCSA, etc.)
A RC DTB/	Digit Table—Adds or removes 16-word blocks used for new or changed numbering plan.

Translation Changes Which Require an ODA Run

13.05 The following items cannot be added by recent change, and hence, some thought should be given to providing one or more of these items as spare.

Centrex Group Expansion Tables—Provide one for each potential new customer.

Attendant Lists—Provide attendant lists of sufficient size per customer group to accommodate potential new customers.

Speed Calling Lists—Provide sufficient 6-code and 30-code speed calling lists per customer group to accommodate potential new customers.

Manual Trunk Disposition and Group Billing Index Table—One MTD/GBI table is automatically supplied with each customer group expansion table.

Attendant Blocks—One attendant block is automatically supplied with each combination of one attendant trunk circuit and six attendant loop circuits wired in the No. 2 ESS.

Centrex Data Links—Sufficient centrex data links should be supplied to accommodate potential new customers. Data link translation is inputted via ODA runs for each data link wired in the No. 2 ESS.

New Trunk Groups (Tie, CCSA, etc., Groups)—Sufficient spare trunk groups should be provided to accommodate potential new customers.

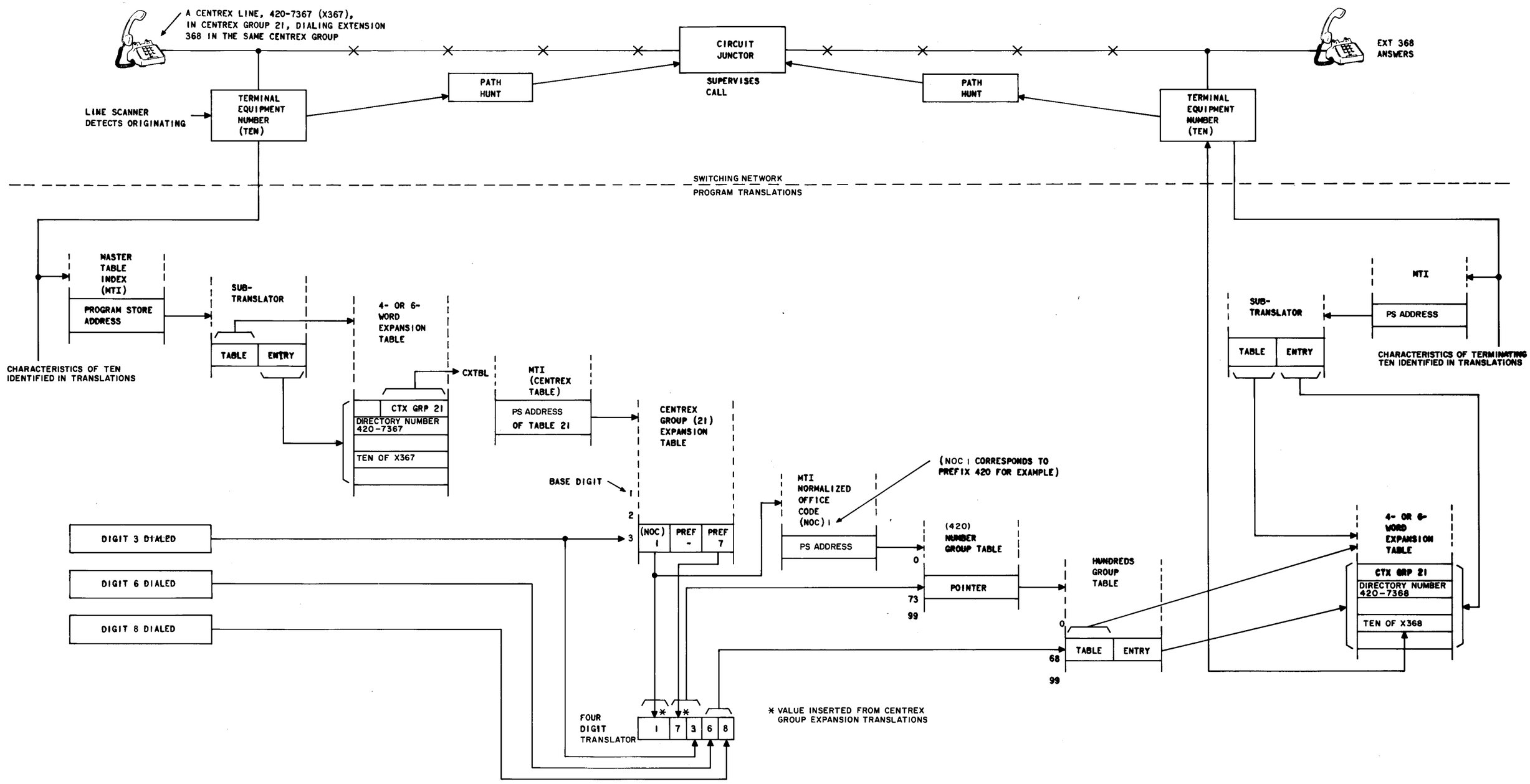


Fig. 10—Typical Office Data Program Translation Layout

Simulated Facility Groups (Required for WATS Access)—Sufficient spare simulated facility groups should be provided to accommodate potential new customers.

14. GROWTH/RETROFIT PROCEDURES

14.01 Procedures for retrofitting an LO-1 generic office to an EF-1 generic office are available. See Section 232-118-103.

14.02 Procedures for adding a centrex data link frame into a working EF-1 office are available. See Section 232-118-301.

14.03 Procedures for installing all other types of frames are available. See Section 232-019-101.

14.04 Growth procedures for adding a centrex customer to an existing EF-1 office are available. See Section 232-118-301.

15. TESTING

15.01 The attendant consoles and centrex console control cabinets should be tested in accordance with Section 540-576-302, Section 540-576-304 and Section 232-202-302, respectively, prior to providing service.

15.02 Automatic testing of the centrex data link frame, centrex data link and the ability of the centrex console control cabinet to indicate successful link operation is provided.

15.03 Centrex stations should be tested operationally for features assigned to the stations by following feature operations outlined in Attachment A.

ADMINISTRATION

16. MEASUREMENTS

16.01 In addition to the No. 2 ESS (LO-1 generic) traffic registers, registers are included for measuring centrex data and are reported in the H, C, and PLT schedules. Table E lists the registers and their use.

TABLE E

TRAFFIC REGISTERS AND APPLICATION

TRAFFIC REGISTER	PEG COUNT	USAGE	OVERFLOW	MAINTENANCE BUSY	COUNTER NUMBER
Centrex Measurements (Per Customer Group					
Centrex Customer Group Number					CTX 1
Originating Centrex Call Attempts	x				CTX 2
Centrex User To Extension Attempts	x				CTX 3
Centrex User Dialed Attendant	x				CTX 4
Centrex User Dialed CCSA	x				CTX 5
Centrex User Dialed CO Access	x				CTX 6
Call Forwarding — Don't Answer	x				CTX 7
Call Forwarding — Busy Line	x				CTX 8
Call Pickup	x				CTX 9
Call Transfer — Attendant Attempts	x				CTX 10
Call Transfer — Individual Attempts	x				CTX 11
Call Hold	x				CTX 12
Attendants Positions Occupied		x			CTX 13
Attendants Busy		x			CTX 14
Calls Waiting Queue	x				CTX 15
Calls Waiting Queue Overflow			x		CTX 16
Calls Waiting Queue Usage		x			CTX 17
Attendant Camp-on	x				CTX 18
Incoming DID Attempts to Extension	x				CTX 19
Incoming DID Attempts to LDN	x				CTX 20
Simulated Trunk Group Number					SIM 1
Group Peg Count	x				SIM 2
Group Usage Measurement		x			SIM 3
Group Overflow Count			x		SIM 4
Total Maintenance Measurements (Per Office)					
Audit Errors					
Scatter Table Entry Audit	x				CUA 20
Simulated Trunk Group Audit	x				CUA 21
Attendant Call Store Audit	x				CUA 22

16.02 Customer group, simulated trunk group, and plant measurement register description—see Section 232-120-301 for detailed descriptions of these traffic counters.

16.03 Procedures for requesting traffic measurements are as follows:

(a) Customer groups measurement reports (H and C schedules) are requested in the same way as all other registers [TTY input of desired schedule and time period(s)] for regular periodic reports. See Section 232-120-301.

(b) The service order format to initiate printing of the CTX 1 through 20 registers is:

- A TC:CTX!

(c) The service order to initiate printing of the SIM 1 through 5 registers is:

- A TC:SIM!

(d) The centrex plant measurement registers (CUA20 through 22) are part of the EF-1 generic program and as such are reported with the rest of the plant measurements. There is no specific recent change other than the normal PLT scheduling for these registers.

(e) For complete recent change format, see IM-2H200 and Sections 680-536-011 and 232-118-103.

17. RECORD KEEPING

17.01 Output records of information provided in translations are provided with each ODA run. The forms are on special computer paper which is heavy enough to withstand operating company handling until the next ODA is processed. Generally the output forms have the same number as the input forms but are suffixed with an "R".

17.02 For information regarding specific output forms refer to TG-2H.

17.03 Program for Administrative Traffic Reports On Line (PATROL) is a program which is available through AT&T for summarizing traffic data for No. 2 ESS.

18. CHARGING

18.01 Not applicable.

AVAILABILITY

19. NEW INSTALLATIONS

19.01 ***Generic Program (EF-1)***—Generic program availability for new offices is as follows:

(a) Engineering information is currently available

(b) Centrex cutover—initial installation, Naperville, Ill. 4/5/74

(c) Standard availability—2/75. Consult Western Electric Co for specific manufacturing schedules.

20. GROWTH/RETROFIT

20.01 Generic program availability for retrofit is as follows:

(a) Engineering information is currently available. See Traffic Facilities Practices, Division D, Section 12n

(b) First office 12/74

(c) Standard availability 5/75.

SUPPLEMENTARY INFORMATION

21. GLOSSARY

21.01 The following list defines features as they operate in the Centrex-CO No. 2 ESS.

Add-On—A station can add another party to an existing incoming exchange network, or CCSA call to establish a 3-party conference. This can be done without attendant assistance, by flashing the switchhook after utilizing the consultation hold feature (similar to Threeway Calling).

Attendant Call Forwarding of Stations—This feature provides the attendant with the ability to call forward any station with the call forwarding feature.

Attendant Camp-On—Any call which the attendant attempts to complete to a busy station line within the PBX or centrex system is held waiting until the called station becomes idle. The called station is then automatically rung and connected to the incoming call upon answer.

Attendant Conference (ATND CONF)—The attendant conference feature allows the attendant to establish a conference connection, via the switching equipment, of up to five conferees.

Attendant Control of Trunk Group Access—Attendant Control of Facilities (ACOF)—An attendant can restrict dial access by all station lines to FX, WATS, and/or tie trunk groups by operating a key or dialing a code. When control is activated, calls to trunk groups so restricted will be routed to the attendant for subsequent completion or to a tone or announcement. Trunk group busy (TGB) lamps on the universal

attendant consoles may be assigned to indicate activation of ACOF.

Attendant Direct Station Selection (DSS) with Busy Lamp Field—Not available.

Attendant Hold—Attendant hold allows the attendant to put any call in progress on hold by operating a momentary key for the purpose of supervising the call throughout its duration and at the same time releasing the attendant from the loop.

Attendant Joint Holding of Stations—Attendant may hold a station busy, and be connected to it even though the station might be on-hook.

Attendant Position—The equipment, usually a console, from which listed directory number and other calls requiring assistance can be answered and completed by the attendant. A 1B- or 2B-type universal console is the standard attendant position for all service packages.

Attendant Restriction—See Miscellaneous Trunk Restriction.

Automatic Wake-Up Service—Not available.

Busy Lamp Field Only—Not available.

Busy Verification, Station Lines—Busy verification of station lines allows the attendant to establish a "talking" connection to an apparently busy station line to determine if the station line is in working order. When the attendant is connected to a busy line, periodic spurts of tone are applied to alert the talking parties of the attendant's presence.

Busy Verification Trunks—Not available.

Call Forwarding—When call forwarding is activated by a station user, calls intended for the station line automatically route to any other station line selected (or to the attendant) within the same centrex group. The attendant may also activate call forwarding for a station line. (See Attendant Call Forwarding of Stations.)

Call Forwarding—Busy Line (CFBL)—Incoming DID or CCSA calls are automatically routed to the attendant or another centrex line within the same centrex group when the called station line is busy, if that station has CFBL.

Call Forwarding—Don't Answer (CFDA)—Incoming DID or CCSA calls are automatically routed to the attendant or another centrex line within the same centrex group when the called station does not answer within a prespecified amount of time if that station has CFDA. (The exact time is an option varying between 11 and 58 seconds for each centrex group.)

Call Forwarding—Don't Answer—All Calls—This feature is similar to CFDA but works with all calls. When used, CFBL, CFDA, CFDA—All calls, and station hunting must all hunt to the same centrex extension (or to the attendant). Separate hunt numbers are not available. Also, CFBL and station hunting are mutually exclusive; CFDA and CFDA—All calls are mutually exclusive.

Call Hold—Call hold allows a station user to put any call in progress on hold by flashing the switchhook and then dialing a hold code, thus freeing the same line for the purpose of originating another call, answering an attendant camp-on call, or returning to a previously held call. Only one call per station line may be held at a time. The held call cannot be added to the other call.

Call Pickup—A station user can answer any call directed to another station line within his own preset pickup group by dialing a special code. If more than one station line in the pickup group has an unanswered incoming call, the individual call to be answered is selected at random.

Call Transfer—Attendant—Call Transfer—Attendant allows the called station user, while connected to an incoming exchange network or CCSA call, to reach (recall) the attendant by flashing the switchhook so that the attendant may transfer the call to another party. (Certain stations with custom calling features may receive dial tone and will have to dial the attendant access code to reach the attendant.)

Call Transfer—Individual—A station user can transfer incoming exchange network, or CCSA calls to another party without the assistance of the attendant. This is accomplished by hanging up after utilizing the consultation hold and/or add-on features.

Call Transfer—Individual—All Calls—A station user can transfer any established call to another party without the assistance of the attendant. This is accomplished by hanging up after utilizing the consultation hold—all calls, and/or the Threeway Calling feature.

Call Waiting—Not available.

Centrex Service—Centrex Service is an automatic switching system service providing PBX capabilities and in addition direct inward dialing and identified outward dialing.

Centrex-CO—Centrex-CO is the provision of centrex service by switching equipment located on the telephone company-owned or leased premises; the station equipment and attendant facilities are located on the customer's premises.

Centrex-CU (customer)—Centrex-CU is the provision of centrex service by switching equipment, station equipment, and attendant facilities located on the customer's premises.

Code Call—The code call feature allows attendants and station users to dial an access code and a called party code to activate signaling devices (bells, gongs, horns, etc.) with a coded signal corresponding to the called code. The called party can then be connected to the calling party when the called party dials an answering code from any nonrestricted station within the centrex group.

Code Restriction—Code restriction is a feature that denies selected station lines completion of dialed outgoing exchange network calls to selected office and area codes. The restricted calls are routed to the attendant, to an announcement, or to a tone.

Conference Calling—Not available.

Common Control Switching Arrangement (CCSA)—CCSA is an assemblage of switching and other facilities used to arrange an automatic switching system to serve as a switching center for one or more switched services networks. In addition, CCSA provides access to a CCSA network for network inward calling to the centrex group, direct outward dialing to the network, and other features similar to access to the exchange network.

Consultation Hold—Using consultation hold, a station user can hold incoming exchange network or CCSA calls by flashing the switchhook and, on the same line, originate a call to another party for private consultation. After consultation or answer, the station user can, by flashing a second time: (1) return to the original call after the second party hangs up, or (2) add this party to the original call (add-on). The station user can also transfer this party to the original call by hanging up after consulting with, or adding on, the second party (call transfer—individual). Consultation hold is included with add-on and call transfer.

Consultation Hold—All Calls—A station user can hold any existing call by flashing the switchhook and, on the same line, originate a call to another party in or outside the centrex group for private consultation. After consultation or answer, the station user can, by flashing a second time: (1) return to the original call after the second party hangs up, or (2) add this party to the original call (add-on). The station user can also transfer this party to the original call by hanging up after consulting with or adding on the second party (call transfer—individual—all calls).

Dial Access to Attendant—This feature allows station users, within the switching system or via dial repeating tie trunks, to reach the centrex attendant by dialing a code, usually a single digit 0. The attendant may complete these calls to trunk facilities or station lines.

Direct Inward Dialing (DID)—This feature allows an incoming call from the exchange network to reach a specific station line without attendant assistance.

Direct Outward Dialing (DOD)—DOD allows a centrex station user to gain access to the exchange network without the assistance of the attendant by dialing an access code and receiving a second dial tone. The user may then proceed to dial the desired exchange network number. DOD access is always provided to the local central office, which must be the No. 2 ESS serving this customer group.

Direct Trunk Termination—Not available.

Directed Call Pickup—Using this feature, a station user can answer calls directed to a specific line from any other station line in the centrex

group by dialing the unique answer code of the station whose calls are to be answered.

Flexible Numbering of Stations—Flexible numbering of stations allows station numbers to be assigned to lines at the line of installation in accordance with a customer desired numbering plan.

Foreign Exchange Access—This feature provides access to a distant central office via foreign exchange trunks. Incoming calls to the centrex group which are placed to the listed foreign exchange directory number are answered by the centrex attendant. Outgoing calls are made on a dial access basis.

Foreign Exchange Trunks (FX)—A foreign exchange trunk is a trunk from a centrex customer served by the No. 2 ESS, which appears as a line in a distant central office.

Fully Restricted Station—This feature denies selected station lines the ability to place or receive any but station-to-station calls. Restricted calls are routed to an announcement or to a tone.

Fully Restricted Terminating Station—This feature denies selected station lines the ability to receive any but station-to-station calls. Restricted calls are routed to the appropriate error treatment.

Identified Outward Dialing (IOD)—Identified outward dialing provides either automatic or operator identification of the calling station line number to permit individual station billing on toll calls.

Incoming Call Identification (ICI)—This feature allows an attendant at a switched-loop console position to identify visually the type of service or trunk group associated with a call directed to that position.

Indication of Camp-On—This feature, which is always provided with attendant camp-on (except under special cases such as data stations), provides an audible burst of tone to the busy called station to indicate that the incoming call is camped on. Subsequent bursts of tone are applied each time the attendant leaves the waiting connection after reverifying the caller's desire to wait. This feature can interrupt data set transmission. Stations expecting to use data facilities can be restricted from having this feature.

Inward Restriction—See Fully Restricted Terminating Station.

Intercentrex Calling Group—This feature allows a centrex station in one centrex customer group to dial a station in another centrex customer group within the same No. 2 ESS on a 4-digit basis. There is no limitation to the number of centrex groups that can belong to one intercentrex calling group. There is a maximum of seven intercentrex calling groups within one No. 2 ESS.

Listed Directory Number (LDN)—Incoming exchange network calls to the centrex attendant are placed via the assigned local listed directory number. The attendant may complete these calls to station lines within the system or to certain trunk facilities. When direct inward dialing is not provided, all incoming exchange network calls must be made on a listed directory number basis.

Lockout—Not available.

Manual Line Service—This feature provides for station lines which are arranged to alert the attendant when the station user goes off-hook for service. Dial tone is not provided for these lines, and all originating connections are made by the attendant.

Message Waiting—Not available.

Miscellaneous Trunk Restriction—Miscellaneous trunk restriction denies attendants and/or stations and/or incoming tie trunks the ability to use certain access codes to gain access to the various types of trunks or features listed in 7.04. This is accomplished by use of the centrex access treatment code.

Most Economical Routing (MER)—This feature allows the switching machine to select the most economical route when the station user dials an MER access code. Routes may be selected from WATS, FX, CCSA, and local exchange network.

Night Position—Not available.

Night Service—Night service provides arrangements to route any calls normally directed to the attendant to a preselected station line within the centrex group when the regular attendant positions are not manned. The routing is provided on a fixed basis.

Call forwarding of the night station allows further flexibility.

Pad Switching—Pad switching allows for switching transmission pads in or out on calls involving via net loss (VNL) facilities.

Paging, Loudspeaker—Allows attendants and station users to dial customer-owned paging equipment and alert individuals by voice page.

Paging, Radio—See Directed Call Pickup and/or Paging, Loudspeaker.

Power Failure Transfer, Attendant—With this feature, calls to the attendant are routed to the night station(s) during a power failure at a customer location where reserve power to the attendant consoles is not provided or, where battery reserve is provided, when the reserve is depleted. Service to and from the station lines is maintained by the power facilities at the central office location.

Power Failure Transfer, Station—Not applicable.

Private Branch Exchange (PBX) Service—PBX service is a service which provides internal telecommunications among a group of stations and the exchange network. All outgoing toll calls are billed to the LDN and all incoming exchange network calls are completed by the attendant.

Pseudo Office Codes—Pseudo office codes are 3-digit prefixes which do not correspond to real prefixes (or office codes). Pseudo office codes are used for groups of extensions which are not to be assigned real directory numbers (such as groups of fully restricted terminating extensions or "PBX-CO" extensions). Pseudo office codes are also used for special billing numbers (like WATS billing numbers) where it is undesirable to use real office codes.

Recorded Telephone Dictation—This feature permits access to and control of customer-owned dictating equipment by station users within the centrex group.

Reserve Power—This feature provides an alternate, independent source of power to maintain attendant console service for a limited time (normally eight hours) during a power failure at the customer location.

Restriction From Outgoing Calls—Refer to Miscellaneous Trunk Restriction.

Secrecy—Not available.

Simulated Facilities—The number of simultaneous WATS calls, DOD calls, and LDN calls can be limited by software counters instead of hardware limitations.

Single-Digit Dialing—Not available.

Soft-Hold—With a standard attendant position, when the ringing of the third party begins, the attendant usually releases to become available for other calls. The call still remains on the loop during ringing and at any time during the ringing period the attendant may reenter the call. When the called party answers and the attendant is in the released condition the call automatically reconfigures to a 2-party call, freeing the loop.

Speed Calling—Speed calling allows station users to assign abbreviated codes to certain called numbers. This permits the dialing of selected numbers using fewer digits than normally required.

Station DSS—Not available.

Station Hunting—Station hunting routes a call to a preselected station line when the called station line is busy. This feature can be arranged over a group of lines to provide circular hunting or terminal hunting. In the No. 2 ESS, the number of lines busy tested is limited to 12 for any call.

Station Message Registers—Not available.

Station-to-Station Calling—The station user can directly dial other stations within the same centrex group without the assistance of the attendant by dialing two, three, four, or five digits, depending on the customer group dialing plan.

Status Display—Not available.

Supervisory Cabinet (Supervisor's Turret)—Not available.

Switched Loop—Switched loop is an attendant feature whereby a call requiring attendant assistance is automatically switched to one of six idle loops appearing as a key and lamps on an idle position. After extending a call to the desired station, the

call will automatically release from the position when it is answered by the called station, and the attendant is released.

Tandem Tie Trunk Dialing—Tandem tie trunk dialing is a method of allowing station users to dial over private tie trunk facilities which may be switched through several additional switching points, under control of the originating party.

Threeway Calling—With this feature a station user can add a third party to any established call for a 3-party conference, without the assistance of the attendant, by flashing the switchhook after utilizing the consultation hold—all calls feature (similar to add-on). A subsequent flash will disconnect the third party.

Thru Dialing—This feature allows the attendant to dial a trunk access code, receive second dial tone, and pass the second dial tone to the SOURCE party (a centrex extension) thereby allowing this SOURCE party to complete dialing.

Tie Trunks—Tie trunks provide one or more one- or two-way circuits interconnecting two PBX or centrex systems. The trunks can be either manual or dial repeating. They are dial-selected by station users, or attendants.

Timed Reminders—With this feature, the attendant is automatically alerted, after a prescribed time interval, to a camped-on or an unanswered call completed through the attendant console position, so that the calling party may be given a progress report.

Toll Restriction—See Code Restriction.

Toll Terminal—Not available.

TOUCH-TONE Calling—TOUCH-TONE calling offers greater speed and convenience in dialing through the use of pushbuttons, instead of a rotary dial, to transmit digits via audible tones to the switching equipment. Some or all of the stations may be equipped with TOUCH-TONE sets. The 1B- and 2B-type console positions are always equipped for TOUCH-TONE calling.

Trunk Answer From Any Station (TAS)—With this feature, when the attendant positions are in night service, calls normally directed to the attendant, activate a common alerting signal on the customer's premises. These calls may then be answered by any station user in the centrex group who dials a special answer code.

Trunk Group Busy Lamps (TGB)—Trunk group busy lamps provide the attendant at a switch-loop console position with a visual indication when all trunks in a given trunk group are busy. Simulated trunk groups may also be associated with TGB lamps.

Two-Way Splitting—The attendant can consult privately with either party on a call connected to the attendant's position.

WATS Access—WATS access provides the customer with the capability to access the outward WATS service for outgoing calls. In the No. 2 ESS, outward WATS service is provided for by a combination of simulated facility groups and screening and charging by translations.

Outward WATS Service—Is a direct distance dialing service whereby a customer has the ability to make calls to specified bands with a special tariff based on unlimited or limited usage.

Inward WATS Service—Not available.

22. REASONS FOR REISSUE

22.01 This is the initial issue of this section.

23. REFERENCES

23.01 The following documents provide supplementary information concerning this section.

BELL SYSTEM PRACTICES

Section 232-019-101, General Growth Description

Section 231-118-103, Recent Change Procedures (Central Office Changes) EF-1

Section 232-118-301, Procedures for Adding a Centrex-CO or PBX-CO Customer

Section 232-120-301, Traffic and Plant Measurements No. 2 Electronic Switching System

Section 232-202-101, Centrex Data Link and Console—Control Description

Section 232-202-301, Centrex Data Link and Attendant Telephone Console Maintenance Procedures Using Maintenance TTY

Section 232-202-302, Centrex Data Link and Console Demand Exercise Program Procedures

Section 232-204-501, Centrex Attendant Loop and Trunk Circuit (SD-2H172, SD-2H173 and SD-2H182)—Test

Section 232-206-501, Two-Way Long Haul Trunk Circuit (SD-02H157)—Test

Section 232-209-501, Foreign Exchange Trunk Circuit With Ground Start (SD-2H174)—Test

Section 232-211-501, Centrex-Long Haul Foreign Exchange Trunk (SD-2H180)—Test

Section 232-212-501, Six-Port Conference Circuit (SD-2H176)—Test

Section 540-576-210, 1B and 2B Consoles and Console Control Cabinet—Installation

Section 540-576-302, Centrex Station and Attendant Equipment 1B and 2B Consoles

Section 540-576-304, Centrex Data Link and Console Demand Exercise Fault Locating

Section 540-576-306, Centrex Console Control Cabinet Equipment Trouble Location

Section 680-536-011, ESS Service Order Procedures Using the Service Order TTY

Section 820-070-150, J1A068, Centrex Data Link Frame and Centrex Console Control Cabinet Equipment No. 1 Electronic Switching System Arranged with 2-Wire Features Equipment Design Requirements

Section 966-202-100, No. 2 ESS Centrex Service—General Description

AT & T Documentation

GL 73-03-043 Availability of No. 2 ESS Programs and Features

MANUALS

"How to Operate the 1- and 2-Type Consoles—No. 2 Electronic Switching System—Centrex" 999-200-128

Floor Plan Data Sheets
Section 16

Questionnaire
E-8085
E-8071
E-8100

TRAFFIC BUSINESS SERVICE FACILITIES ENGINEERING PRACTICES

Traffic Business Services Facilities Engineering Practices, Division B, Section 2.

TRANSLATION GUIDE

Translation Guide No. 2 ESS, TG-2H.

TRAFFIC ENGINEERING PRACTICES

Traffic Facilities Practices, Division D, Section 12.

TRUNK AND SERVICE CIRCUIT ENGINEERING SPECIFICATION

J2H031A-1 Electronic Switching System No. 2 (2-Wire) Trunk and Service Circuit Engineering Specification.

CENTREX SERVICE
CONDENSED STATION DIALING INSTRUCTIONS

INCOMING CALLS

Callers from outside your system may dial your 7-digit number directly.

INTRACENTREX CALLS

Dial tone — dial station number

TO CALL YOUR ATTENDANT

Dial tone — dial (1) attendant

(1) May be any access code — "0" is typical

OUTSIDE CALLS

Dial tone — dial (2) — dial tone — (dial access code and/or area code, if required) — dial number

(2) May be any single digit access code — "9" is typical

CALL TRANSFER—ATTENDANT

Depress switchhook momentarily — attendant answers — announce — hang up

CALL TRANSFER—INDIVIDUAL
CALL TRANSFER—INDIVIDUAL—ALL CALLS (3)

Depress switchhook momentarily — triple dial tone — dial station number (or attendant) — announce (or hang up during ringing) — hang up,

(3) If user does not have call transfer-individual-all calls and tries to transfer a call other than an incoming exchange network call or CCSA, flash is ignored

CONSULTATION HOLD
CONSULTATION HOLD—ALL CALLS (4)

Depress switchhook momentarily — triple dial tone — dial station number — consult — third party hangs up — depress switchhook twice to reconnect to original call.

(4) If user does not have Consultation Hold — all calls and tries to hold a call other than an incoming exchange network call or CCSA, flash is ignored.

ADD-ON
THREEWAY CALLING (5)

a. INCOMING CALL — To add third party to the call — depress switchhook momentarily — triple dial tone — dial station number — announce — depress switchhook once — call is established — If dialed number is busy, or does not answer or a dialing error is made — depress switchhook twice, slowly, (pause between depressions) to return to original call.

b. OUTGOING CALL — Originate call to station user — announce intentions — depress switchhook momentarily — triple dial tone — continue as for "OUTSIDE CALL." — If dialed number is busy, does not answer or a dialing error is made — depress switchhook twice, slowly, (pause between depressions) to return to original call.

(5) If user does not have Threeway Calling but has add-on and tries to add a call from other than an incoming exchange network call or CCSA, the flash is ignored.

INDICATION OF CAMP-ON

Short soft tone signal — complete — hang up — your telephone rings — answer waiting call.

If station has call hold feature, the following procedure may be used to answer the camp-on call. Short soft tone signal — depress switchhook momentarily — triple dial tone — dial (6) — answer waiting call — original party on hold — follow actions indicated in (a) and (b) of CALL HOLD.

(6) May be any access code up to three digits.

CALL HOLD — TO INSURE PRIVACY

Depress switchhook momentarily — triple dial tone — dial (7) — dial tone — dial number.

a. To dismiss second party — hang up — (telephone rings — answer — reconnected to first party).
b. To hold second party — depress switchhook once — triple dial tone — dial (7) — reconnected to original party.
Repeat to alternate conversation.

(7) May be any access code up to three digits.

CALL FORWARDING — ACTIVATE

Dial tone — dial (8) — dial tone — dial station number — two short spurts of tone — hang up.

(8) May be access code up to three digits.

CALL FORWARDING — CANCEL

Dial tone — dial (9) — two short spurts of tone — hang up.

(9) May be any access code up to three digits.

CALL PICKUP

Other telephone rings — dial tone — dial (10) — call connected to your telephone.

(10) May be any access code up to three digits.

SPEED CALLING

Dial tone — dial preassigned speed calling number (11).

(11) Some centrexes may have "dedicated digits" plan:
6-code speed call — 12 through 17 ("1" is typical, but may be any nonconflicting access code digit).
30-code speed call — 1120 through 1149 ("11" is typical, but may be any nonconflicting digits).

Some centrexes may have "time-out (or#)" plan:
6-code speed call — 2 through 7 (plus 4-second time-out)

or 2# through 7#

30-code speed call — 20 through 49 (plus 4-second time-out)

or 20# through 49#

CHANGE SPEED CALLING — 6-CODE

Dial tone — dial (12) — dial tone — dial preassigned speed calling number (13) — dial extension number or telephone number with appropriate access codes — two short bursts of tone — hang up. (Tandem tie trunk numbers cannot be entered into the speed calling list.)

(12) May be any access code up to three digits.

(13) See SPEED CALLING (11) for details.

CHANGE SPEED CALLING — 30-CODE

Dial tone — dial (14) — dial tone — dial preassigned speed calling number (15) — dial extension number or telephone number with appropriate access codes — two short bursts of tone — hang up. (Tandem tie trunk numbers cannot be entered into the speed calling list.)

(14) May be any access code up to three digits.

(15) See SPEED CALLING (11) for details.

TRUNK ANSWER—ANY STATION — NIGHT SERVICE

Bell, gong or lamp indication — dial tone — dial (16) — incoming call is connected to your telephone. To extend call to another station, see CALL TRANSFER — INDIVIDUAL.

(16) May be any access code up to three digits.

TRUNK ACCESS (TIE, FX, CCSA, WATS)

Dial Tone — Dial (17) — second dial tone (18) — dial number

(17) May be any access code up to three digits

(18) Second dial tone may or may not be present — customer option

MOST ECONOMICAL ROUTING ACCESS

Dial Tone — Dial (19) — second dial tone — Dial DDD number

(19) May be any access code up to three digits.

TANDEM TIE TRUNK

Dial Tone — Dial { Access Code of 1st Exchange on your call route (20) } — Dial Tone — Dial { Access code of nth exchange on your call route }

— (Last) Dial Tone — Dial Number

(20) May be any access code up to three digits

CODE CALL —TO ACTIVATE ALERTING SIGNAL

Dial Tone — Dial (21) — second dial tone (22) — dial code

(21) May be any access code up to three digits

(22) Second dial tone may or may not be present — Customer option

RECORDED TELEPHONE DICTATION

Dial Tone — Dial (23) — Follow Recording Directions

(23) May be any access code up to three digits.