

FEATURE DOCUMENT
BASIC DATA LINK INPUT/OUTPUT CONTROL FEATURE
2-WIRE NO. 1 AND NO. 1A ELECTRONIC SWITCHING SYSTEMS

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NOTICE

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INTRODUCTION

1. GENERAL INFORMATION

SCOPE

1.01 This document provides interface information for using the Data Link Input/Output Control (DLIO) feature with the No. 1 or No. 1A Electronic Switching System (ESS). Two services are addressed: Data Link Sequencing (DLSQ) and Automatic Call Distribution ESS Management Information System (AEMIS).

REASON FOR REISSUE

1.02 This document is reissued to make minor corrections and to update through the 1E7/1AE7 generic programs. Specifically, the impact of the Agent Log-In (AGLI) feature on the DLIO feature is addressed. Revision arrows have been used to denote significant changes.

FEATURE AVAILABILITY

1.03 The DLIO feature is available in 1E4 and later generic programs in the No. 1 ESS and 1AE4 and later generic programs in the No. 1A ESS.

1.04 The DLSQ feature is available in 1E5 and later generic programs in the No. 1 ESS and 1AE5

and later generic programs in the No. 1A ESS. Central offices with generic programs 1E4 or 1AE4 that have Automatic Call Distribution Phase 2 (ACD2) customers with AEMIS must update to the 1E5/1AE5 or later generic program to obtain the DLSQ feature.

1.05 The DLIO, DLSQ, and ACD2 feature groups discussed in this document are all optionally loadable.

2. DEFINITION/BACKGROUND

DEFINITION

2.01 The DLIO feature provides a software interface between the data link and the call processing and maintenance programs.

2.02 The DLSQ feature maintains the integrity of the AEMIS by ensuring that messages sent from the ESS to the AEMIS minicomputer over multiple data links arrive in the correct time sequence.

BACKGROUND

2.03 Prior to the DLIO feature, the centrex data link was used only for the purpose of communicating centrex console lamp and key signals of a 51A Customer Premises System (CPS) between the customer premises and the ESS. The DLIO feature allows use of the centrex data link for a wide variety of applications requiring high-speed communications between the ESS and customer premises equipment.

2.04 The DLIO feature performs data link loading procedures which allow the following functions:

- (a) Multiple word data link orders
- (b) Increased buffering and multiple data links to one destination
- (c) Data link unloading procedures which provide for multiple data link types
- (d) An interface for providing CPS functions over a data link
- (e) Maintenance diagnostic and audit changes to interface with new loading and unloading procedures
- (f) Ability to load a large block of data link orders at a regulated rate.

2.05 The DLIO feature is used in conjunction with three customer premises equipment feature offerings. These feature offerings are as follows:

- (a) The 51A CPS (optional)
- (b) Automatic Customer Message Outputting System (ACMOS)
- (c) ACD2.

2.06 As was mentioned earlier, the original application of the data link was to provide communication between ESS and customer premises located centrex consoles. The system which first used centrex data links was the 51A CPS (Fig. 1). In this application, the ESS end of the data link is controlled by a centrex data link circuit SD-1A265, and the customer premises end is controlled by a centrex console cabinet that can control up to four consoles.

2.07 The ACMOS application (Fig. 2) consists of a group of one or more centrex data links that send hotel/motel call data and room status data to a customer premises minicomputer system.

2.08 The ACD2 system (Fig. 3) consists of a set of agent consoles that are controlled by a centrex data link. In addition, ACD2 systems can be equipped with an AEMIS minicomputer that receives ACD2

call progress messages over a group of one or more centrex data links. The AEMIS minicomputer processes the call progress messages to keep complete system status and traffic data on the ACD2 system and to aid the ACD2 customer in scheduling agent work periods.

2.09 See references A(13), A(14), and A(18) in Part 18 for detailed information on the 51A CPS, ACD2, and ACMOS, respectively.

DESCRIPTION

3. USER OPERATION

CUSTOMER

3.01 Not applicable.

TELEPHONE COMPANY

3.02 The basic architecture of the centrex data link consists of the centrex data link frame in the central office (SD-1A265) and specialized equipment on the customer premises. Each data link consists of two pairs of wires, one pair for transmitting data and one pair for receiving data. The centrex data link transmission rate remains at 1400 bits per second. Shift register interchange, all seems well generation, and initiation of data exchange by the CPS remain

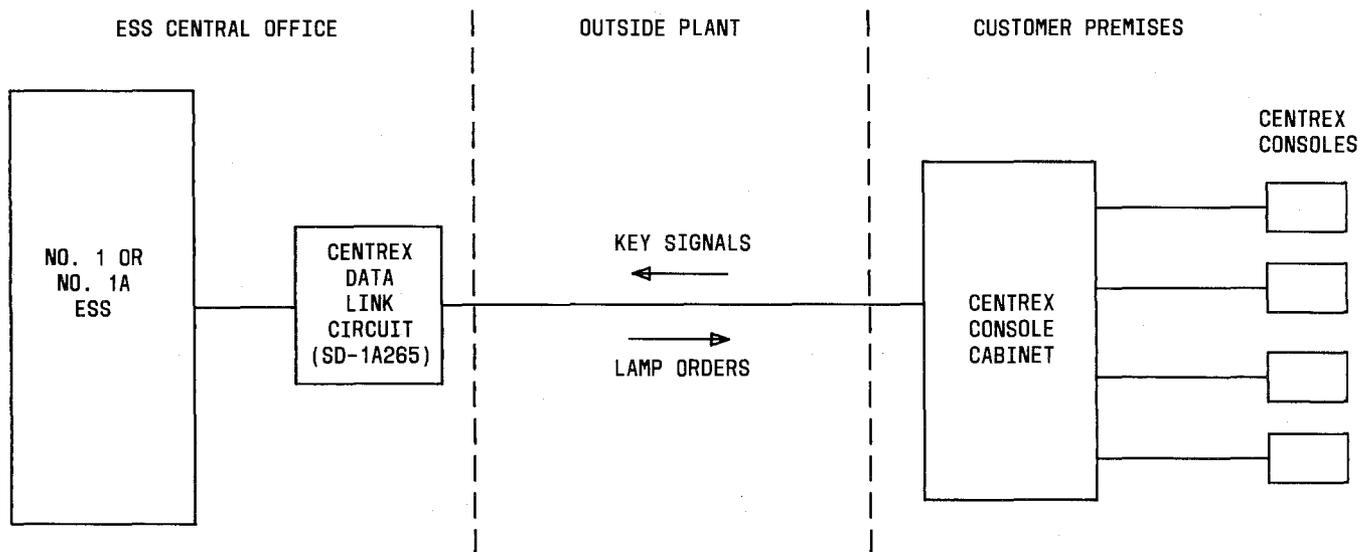


Fig. 1—Centrex Data Link With 51A CPS (Centrex Consoles)

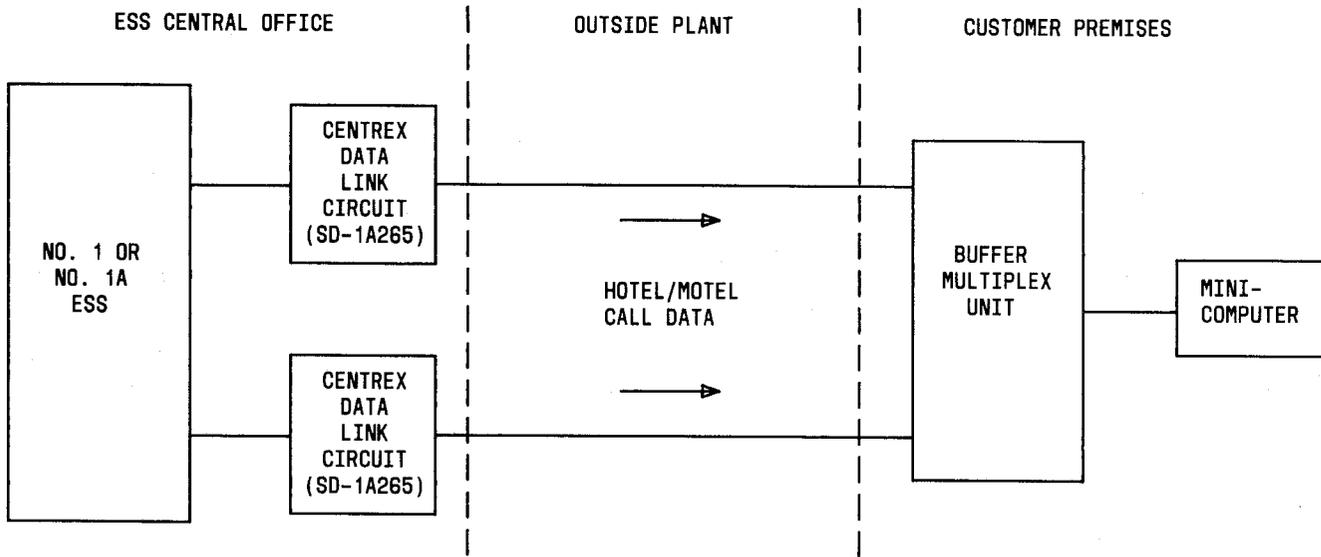


Fig. 2—Centrex Data Links With ACMOS

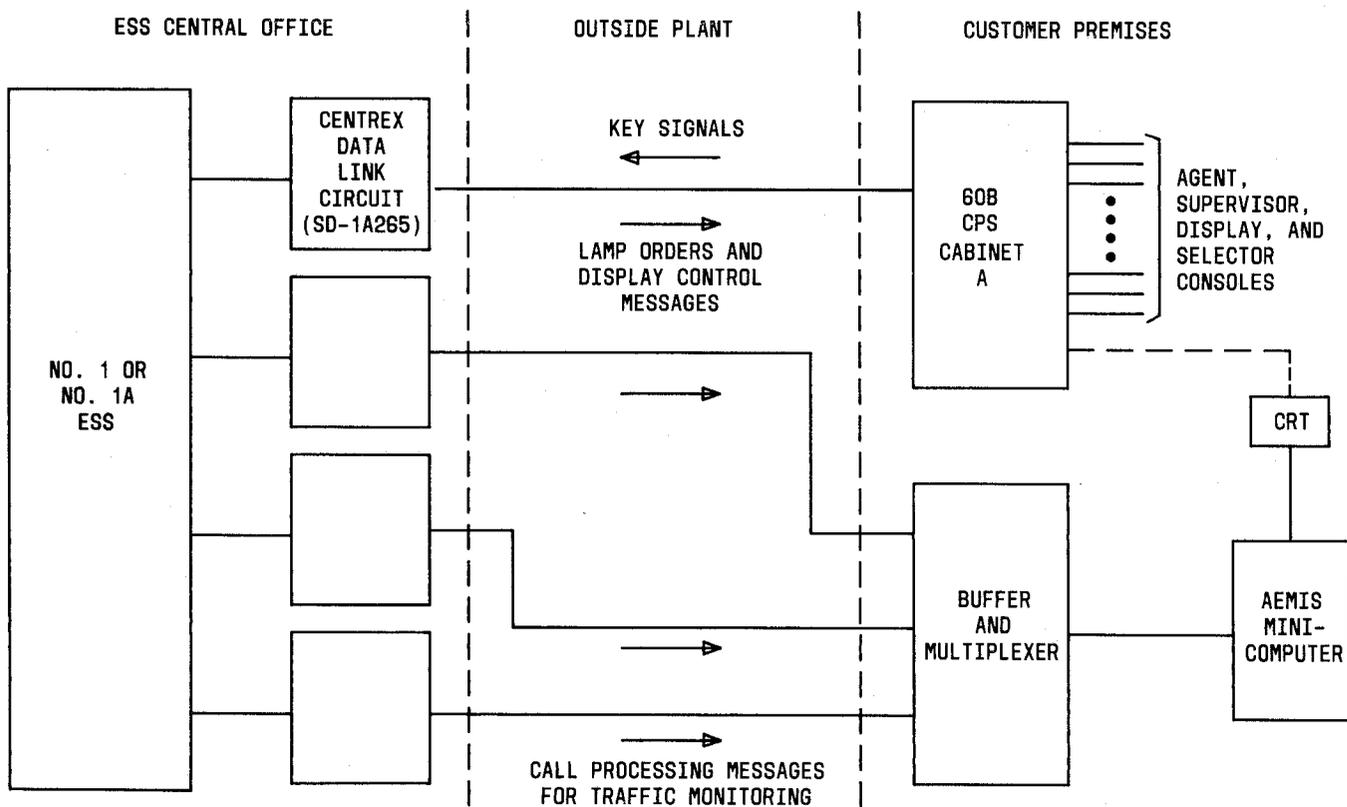


Fig. 3—Centrex Data Links With ACD2

unchanged from previous data link applications. The major changes are in the central office software structure and on some customer premises equipment.

3.03 The previous software structure for the centrex data link was closely tied to centrex attendants and their representation in ESS by means of loop and console registers. For example, the centrex unit type has three words reserved for each of four attendant consoles which might be on the link. The memory associated with sending lamp orders exists in the loop and console registers. This memory is referred to as lamp blocks. The queueing of lamp orders is accomplished by linking these lamp blocks together. This dependence on attendant consoles is inconsistent with having a general purpose data link interface (ie, basic DLIO). Thus, a new method of storing and outputting data link orders was designed.

3.04 Another important impact on ESS is in the form of how frequently data must be transmitted over centrex data links. Prior to the DLIO feature, centrex input/output was entered every 100 milliseconds. These times were tailored to the operation of a centrex attendant console and may not be satisfactory for other applications, in particular for the ACD2. Thus, the system was redesigned to handle both the large amounts of data being sent to the minicomputer and to respond quickly enough to key depressions by up to 100 agents assigned to a single remote data interface circuit. For central offices with the ACD2 feature, the average input/output entry rates are 37.5 milliseconds and 33.0 milliseconds for No. 1 ESS signal processor and central control offices, respectively. (The No. 1A ESS offices are the same as No. 1 ESS central control offices.) For offices without the ACD2 feature, the input/output entry rate remains at 100 milliseconds.

3.05 Another function that is handled by the DLIO feature is to accommodate the connection of more than one centrex data link to one piece of customer premises equipment. This function is required by the ACD2 feature, for example, if more than one data link may be needed to handle the call processing data sent to the minicomputer. This is necessary because a typical ACD2 call requires that approximately 12 data link orders be sent over the centrex data link. Thus, an ACD2 with 400 agents in which each agent handles 30 calls per hour generates 144,000 data link orders per hour. A centrex data link, however, can transmit only 96,000 data link orders per hour (assuming one order is sent every 37.5

milliseconds). Thus, more than one data link must be connected to the minicomputer. It should be noted that in this application of multiple data links, feature package DLSQ is required. The number of required data links can also be affected when the ACD2 customer has the AGLI feature capability. The impact is minimal, but should be taken into account nonetheless. See reference A(17) in Part 18 for detailed information concerning the impact of the AGLI feature on the number of required data links.

4. SYSTEM OPERATION

HARDWARE

4.01 The ESS central office hardware requirement consists of a centrex data link frame (SD-1A265). See references A(25) and A(38) in Part 18 for detailed information on the centrex data link frame.

4.02 For customer premises hardware requirements on the 51A CPS, ACD2 features, and ACMOS, see references A(13), A(14), and A(18), respectively, in Part 18.

OFFICE DATA STRUCTURES

A. Translations

Data Link Input/Output Feature

4.03 The data link group (DLG) translator (Fig. 4) is required. The significance of items unique to the DLIO feature in this translator is as follows:

- (a) **DLTYPE:** This item indicates the type of application of the DLG (see Table A).
- (b) **NDL:** This item indicates the number of data link circuits assigned to the DLG.
- (c) **NBW:** This item indicates the size of the output buffers (number of words) for each data link (see Table A).
- (d) **DLN:** This item indicates the data link circuit numbers of the data links in the DLG.
- (e) **BCW:** This item indicates beehive calls waiting information. Item BCW=1 if DLTYPE=1 or 2 and the remote data interface (RDI) is equipped to control the beehive calls waiting equipment.
- (f) **CAB1:** This item indicates common audio bus information. Item CAB1=1 if DLTYPE=1 or 2

and the RDI is equipped to connect the first group of 50 ACD2 agents to a recording device.

(g) **CAB2:** This item indicates common audio bus information. Item CAB2=1 if DLTYPE=1 or 2 and the RDI is equipped to connect the second group of 50 ACD2 agents to a recording device.

(h) **GRP2:** This item indicates group 2 information. Item GRP2=1 if DLTYPE=1 or 2 and the RDI is equipped with a second group of 50 ACD2 agents.

(i) **CRTSI:** This item indicates the cathode ray tube (CRT) storage index. It is set to a unique nonzero number for each DLG associated with customer premises equipment to which a CRT can be connected. It is required if DLTYPE=2 or 3.

(j) **DLG:** This item indicates the DLG of the RDI which can provide a backup CRT. If there is a backup CRT, this item specifies its DLG ($1 \leq \text{DLG} \leq 64$).

4.04 The unit type 29 auxiliary blocks (Fig. 5) are required. The significance of items unique to the DLIO feature in this translator is as follows:

(a) **NCC:** This item indicates a noncentrex console DLG. It is set equal to one in 8-word auxiliary blocks and zero in all 18-word auxiliary blocks.

(b) **DLTYPE:** This item indicates the type of application of the DLG. It is set equal to the same DLTYPE as specified in the DLG translator for this data link number. In 8-word auxiliary blocks DLTYPE \neq 0. In 18-word auxiliary blocks DLTYPE=0.

(c) **DLG:** This item indicates the DLG to which the data link is assigned.

(d) **DAG:** This item indicates the data group associated with the data link. It is required for DLTYPEs 1, 2, 3, and 4.

(e) **RDI:** This item indicates the selector for the RDI port translator. If DLTYPE=1 or 2, this item is the index (nonzero). If DLTYPE \neq 1 or 2, this item is zero.

Note: For generic programs 1E4/1AE4 and later, when feature package DLIO is *not* loaded,

all unit type 29 auxiliary blocks are the 17-word type and are unchanged from the pre-1E4 format. When the DLIO feature package is loaded, all existing 17-word unit type 29 auxiliary blocks in the office must be converted to 18-word blocks and all new unit type 29 auxiliary blocks added to the office must be 8- or 18-word auxiliary blocks.

Data Link Sequencing Feature

4.05 The DLG translator (Fig. 4) must have item NOHL set in addition to data for the DLIO feature. Item **NOHL** indicates the number of hunt lists in the ACD2 multiline hunt group associated with the DLG. This item is defined only for type 3 (AEMIS minicomputer) data links and is required if the size of the DLG is greater than 1.

4.06 Each trunk group, for which AEMIS minicomputer data is desired must list the trunk network numbers beginning in word 3 of the trunk group number auxiliary block. In addition, each trunk in these trunk groups must have a trunk network number-to-trunk group number auxiliary block in which the trunk's member number appears.

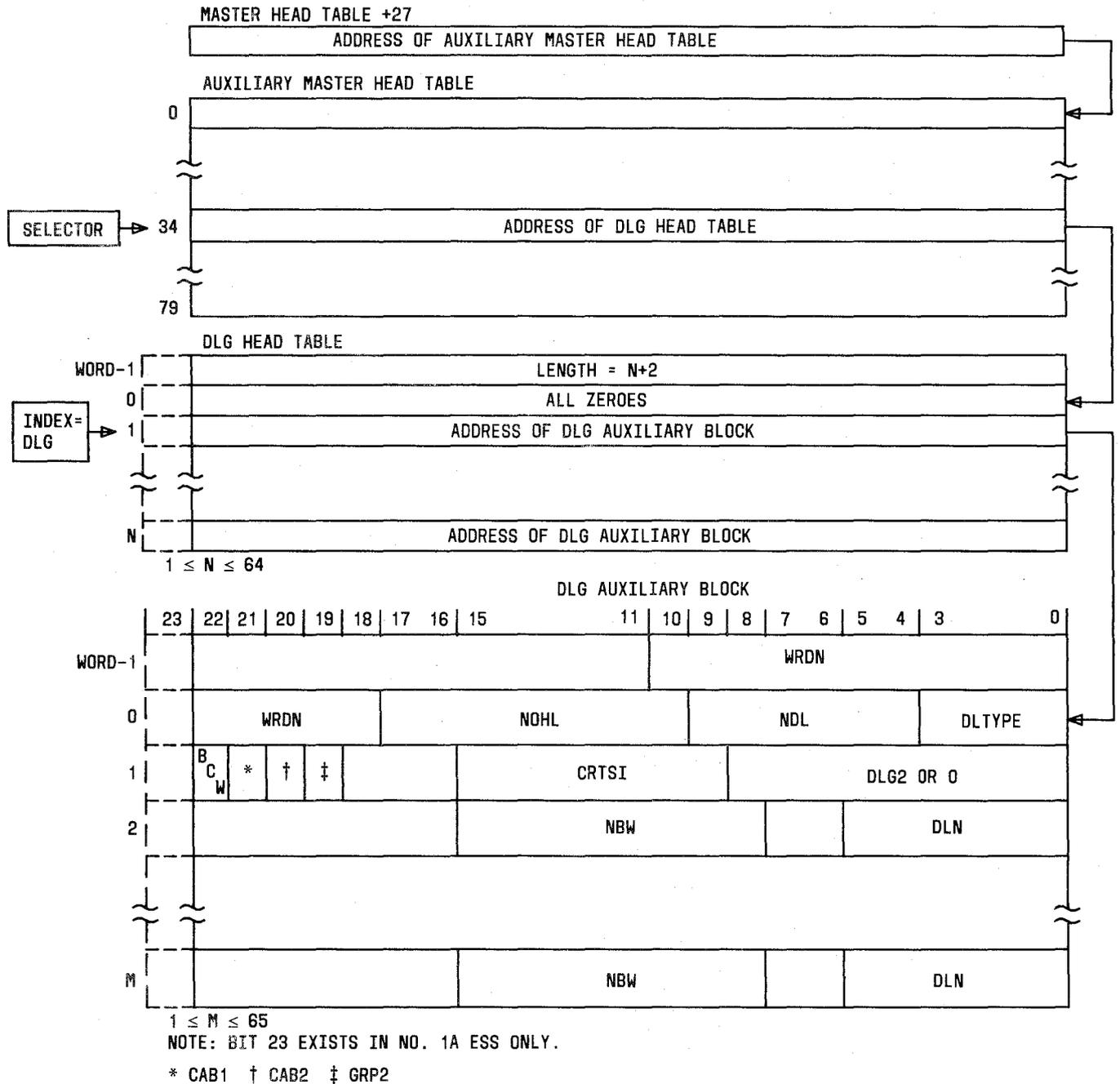
B. Parameters/Call Store

Data Link Input/Output Feature

4.07 Parameter word Z3DLGB (DLG block) contains the size of the DLG block and the call store address of this block. The following set cards are included in the calculation for determining the size of the block: DLG, DLTYP0, DLTYP1, DLTYP2, DLTYP3, and DLTYP4. This block of memory contains pointers to items in another call store block defined by parameter Z3LKPB. See Fig. 6 for details.

4.08 Parameter word Z3LKPB (data link pointer block) contains the block size and call store address of this pointer block. The following set cards are included in the calculation for determining the size of the block: CDLF, DLTYP0, DLTYP1, DLTYP2, DLTYP3, and DLTYP4. This block of call store is used to store traffic peg and overflow counts, and information for loading the data link buffer areas in the call store block defined by parameter Z3OTBF. See Fig. 6 for details.

4.09 Parameter word Z3OTBF (output buffer) contains the size (set card NOBS) of the call store



LEGEND:

BCW - BEEHIVE CALL WAITING INDICATOR
CAB1 - COMMON AUDIO BUS, 1ST GROUP OF 50 ACD AGENTS
CAB2 - COMMON AUDIO BUS, 2ND GROUP OF 50 ACD AGENTS
CRTSI - CRT STORAGE INDEX
DLG2 - DLG OF A BACKUP CRT
DLN - DATA LINK NUMBER

DLTYPE - TYPE OF CENTREX DATA LINK
GRP2 - REMOTE DATA INTERFACE IS EQUIPPED WITH 2ND GROUP OF 50 ACD AGENTS
NBW - NUMBER OF BUFFER WORDS FOR ASSOCIATED DLN
NDL - NUMBER OF DL(S) IN DLG
NOHL - NUMBER OF HUNT LISTS IN AUXILIARY BLOCK
WRDN - NUMBER OF WORDS IN AUXILIARY BLOCK

Fig. 4—DLG Translator

TABLE A

RELATIONSHIP BETWEEN DLTYPE AND BUFFER WORDS
REQUIRED

DLTYPE	BUFFER WORDS	APPLICATION
0	3	Centrex Console
1	32	ACD2 Agent Console
2	32	ACD2 Agent Consoles with CRT
3	42 (1E4) 70 (1E5)	AEMIS Minicomputer
4	42	ACMOS Minicomputer
5	—	Reserved
6—15	—	Unassigned

block used for the output buffer and the call store address of this block. This output buffer block is used for buffering data link orders from ESS to centrex data links. Items in this block are pointed to by items in the call store block defined by parameter Z3LKP. See Fig. 6 for details.

4.10 Parameter word Z3BDLL (block data link loading scratch area) contains the size of this scratch area which is fixed at five (words) and the call store address of this block. This block of call store is used as a scratch area by routines that load large blocks of data link orders into the output buffers in the call store block defined by the parameter Z3OTBF. See Fig. 6 for details.

Data Link Sequencing Feature

4.11 Parameter word Z3ATPT (assignment table pointer) contains the size of this block (set card DLG) and the call store address of the assignment table pointer. See Fig. 7 for details.

4.12 Parameter word Z3DLAT (data link assignment table) contains the size (set card DLSQAT) and call store address of this memory block. This table is used for each ACD2 multiline hunt group with an AEMIS DLG of size greater than one to store the following data:

- (a) The terminal data link index for each terminal

- (b) The queueing register, simulated facility register, and terminal data link index pointer

- (c) The number of terminals.

See Fig. 7 for layout.

4.13 Parameter word Z3SFLI (simulated facility link index table) contains the block size and call store address of the simulated facility link index table. Set card NSF is used in the calculation for determining the size of the table. This table is used to store a simulated facility data link index for each simulated facility register. See Fig. 8 for details.

FEATURE OPERATION**A. Data Link Input/Output Feature**

4.14 A fundamental aspect of the DLIO software structure is the DLG concept. Every centrex data link is a member of a DLG and each DLG has one or more data links as members. Each data link circuit is assigned an output buffer to buffer data link orders while the input/output program loads the information into the centrex data link circuit (in the central office) for transmission on the data link. Additional software coverage is provided in reference A(2) in Part 18.

4.15 The DLIO feature consists of the following software components:

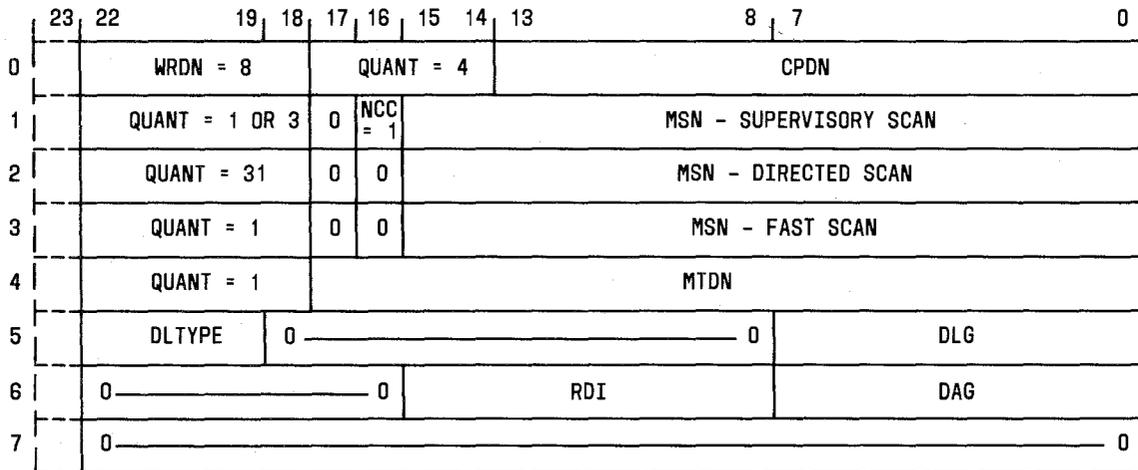
- (a) **Audits:** These programs build the call store output buffers and related pointers, and periodically verify the integrity of the buffer structure.

- (b) **Buffer Loading Subroutines:** This is a set of program instructions that will load one, two, or a multiple number of data link orders into an output buffer.

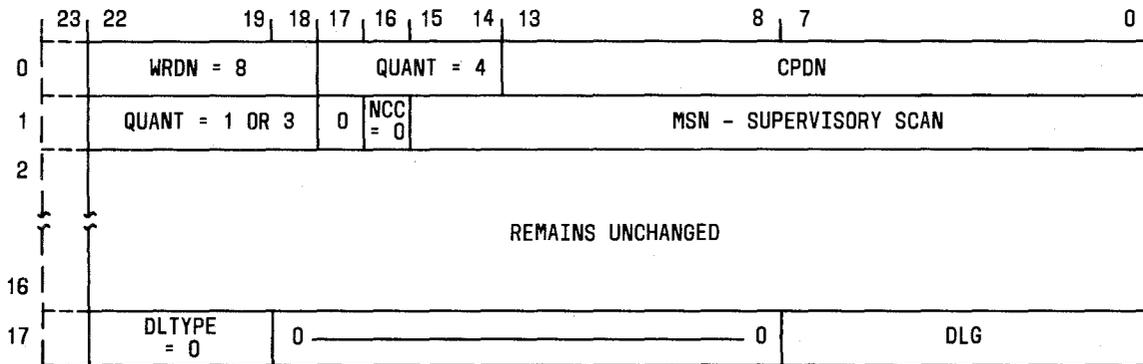
- (c) **Block Loading Routines:** This set of routines is used when a client program needs to transmit a very large block of data link orders.

- (d) **Input Analysis Routine:** This routine routes input data link orders to the proper application processing routine.

- (e) **Input/Output Routines:** These routines unload the output buffers and control the



A. UNIT TYPE 29 8-WORD AUXILIARY BLOCK FOR NON-CENTREX ATTENDANT CONSOLE DATA LINKS



B. UNIT TYPE 29 18-WORD AUXILIARY BLOCK FOR CENTREX ATTENDANT CONSOLE DATA LINKS

NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

LEGEND:

- WRDN - NUMBER OF WORDS IN THE AUXILIARY BLOCK
- QUANT - QUANTITY
- CPDN - CENTRAL PULSE DISTRIBUTOR NUMBER
- NCC - NONCENTREX CONSOLE DATA LINK
- MSN - MASTER SCANNER POINT
- MTDN - MISCELLANEOUS TRUNK SIGNAL DISTRIBUTOR NUMBER
- DLTYPE - DATA LINK TYPE
- DLG - DATA LINK GROUP
- DAG - DATA GROUP
- RDI - REMOTE DATA INTERFACE INDEX

Fig. 5—Unit Type 29 Auxiliary Block

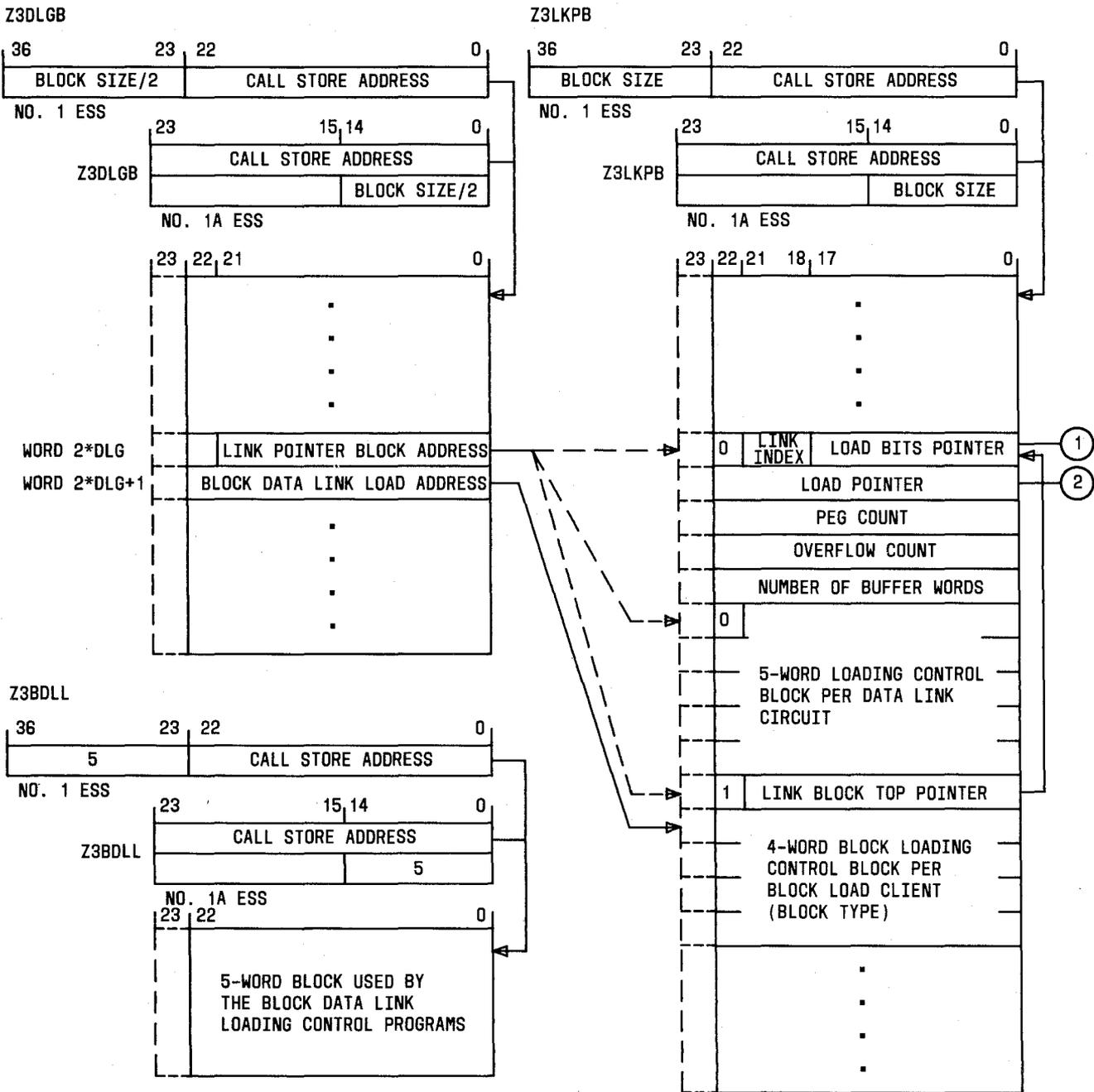
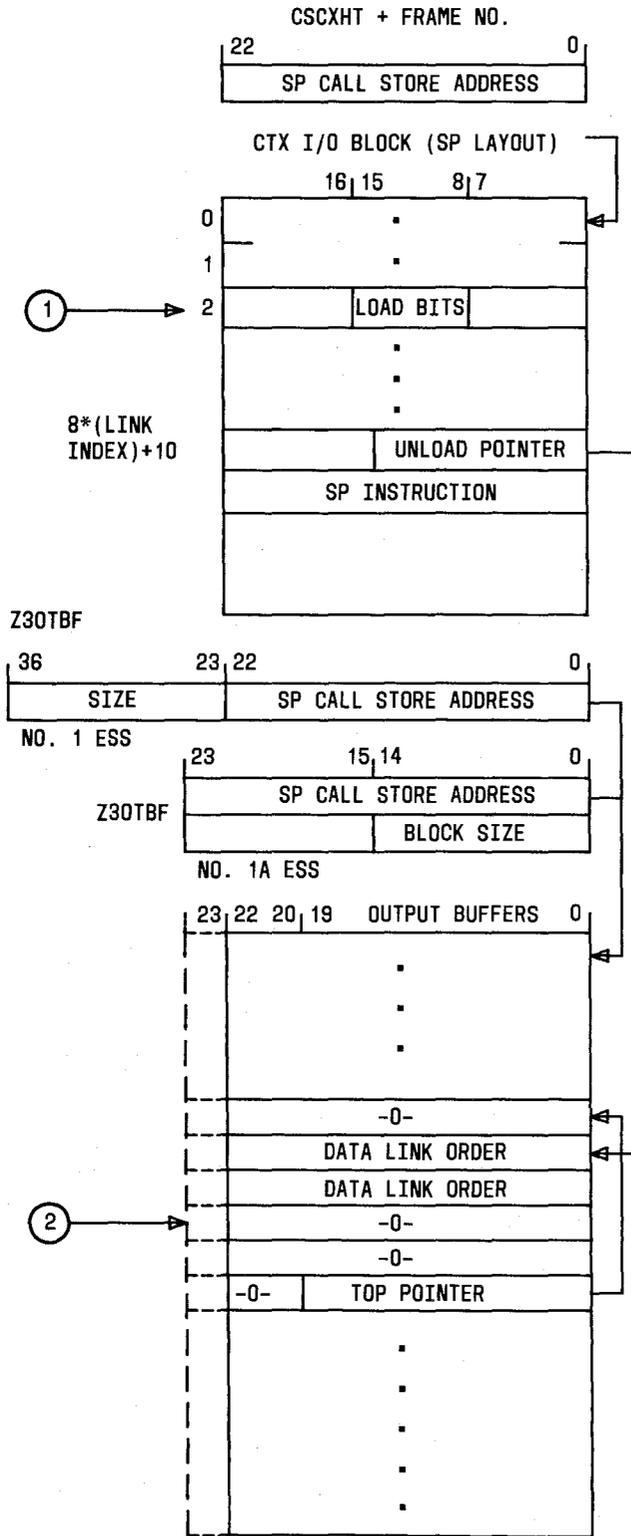


Fig. 6—Output Buffer Structure (Sheet 1 of 2)



NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

LEGEND:
 CTX - CENTREX
 I/O - INPUT/OUTPUT
 SP - SIGNAL PROCESSOR

Fig. 6—Output Buffer Structure (Sheet 2 of 2)

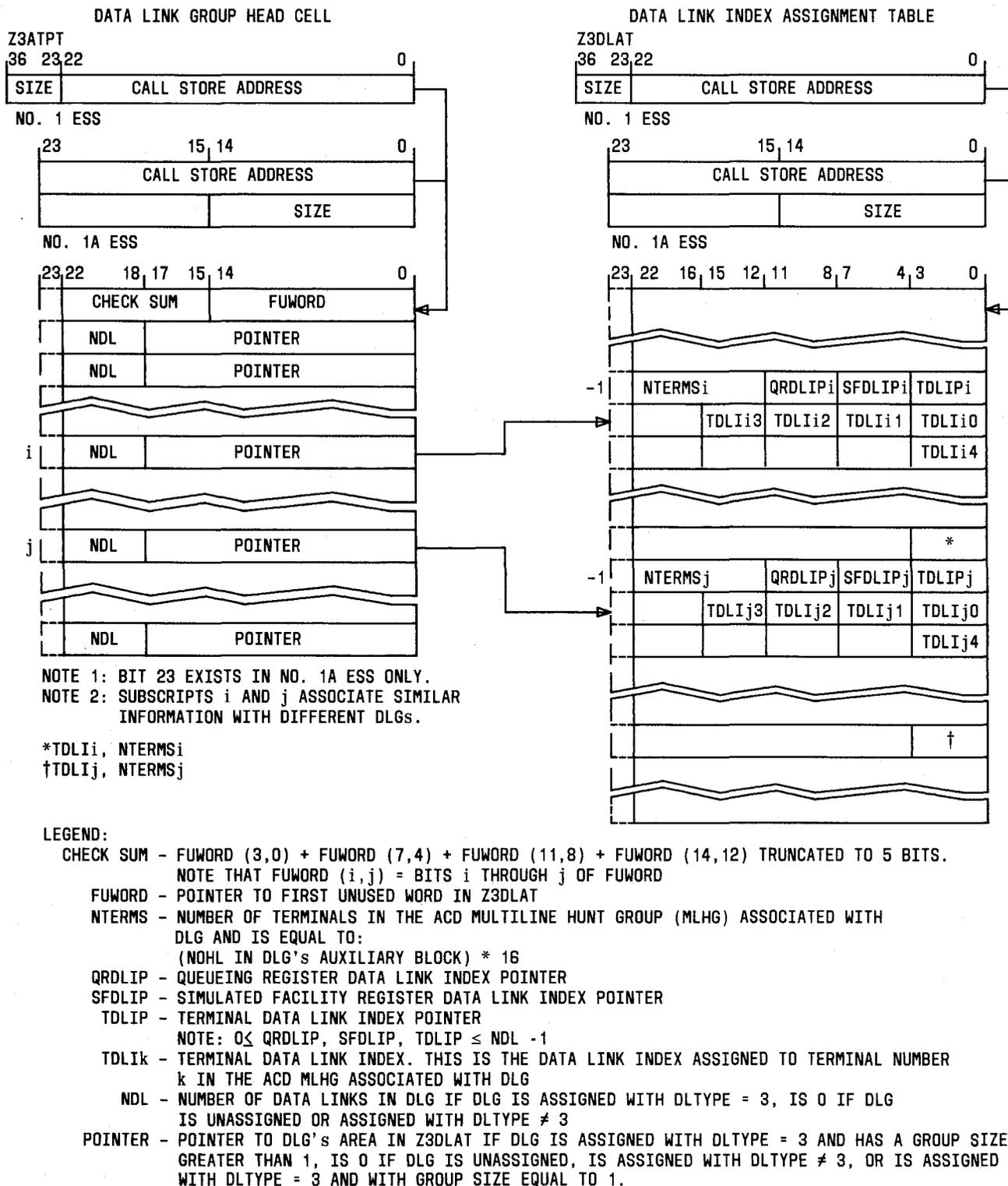
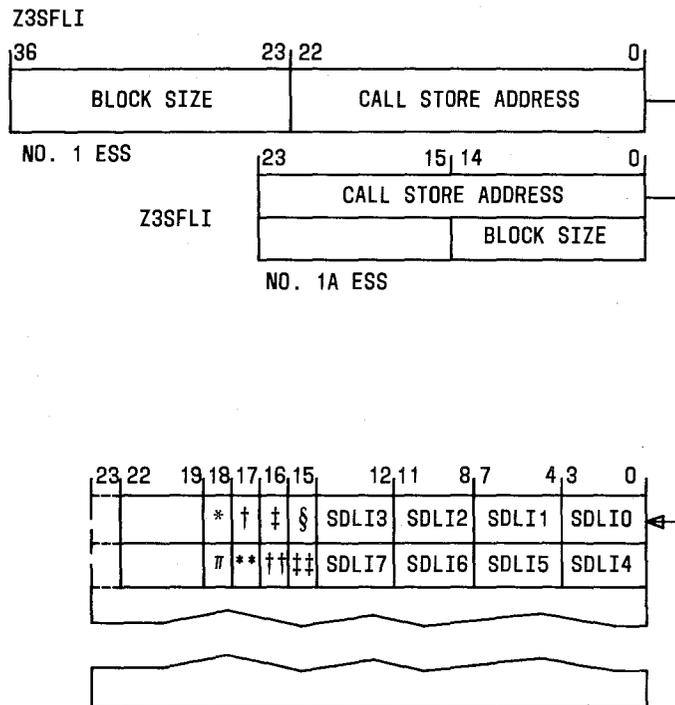


Fig. 7—Call Store Data Structure



NOTE: BIT 23 IN CALL MEMORY EXISTS IN NO. 1A ESS ONLY.

- * IDENT3
- † IDENT1
- ‡ IDENT2
- § IDENT0
- π IDENT7
- ** IDENT6
- †† IDENT5
- ‡‡ IDENT4

LEGEND:

SDLI_i - DATA LINK INDEX ASSIGNED TO SFR_i

IDENT_i - SIMULATED FACILITY REGISTER IDENTIFIER BIT ASSOCIATED WITH SFR_i

Fig. 8—Simulated Facility Data Link Index Table

transmission of data link orders on the data link hardware. These routines also monitor the data link circuit for arrival of input data link orders, and load the input data link orders into the centrex key hopper.

(f) **Maintenance Control:** The DLIO data structures and CPS hardware require changes to maintenance control for removing data links from service, restoring data links into service, and diagnosing the data links.

(g) **CRT Control:** The control of transmitting and receiving messages from the CPS CRT used in ACD2 is included in the DLIO feature. However, this control is removed from the DLIO feature and moved to the ACD2 feature beginning with the 1E6/1AE6 and later generic programs.

(h) **Centrex Console Lamp Order Interface:** The existing mechanism of transmitting centrex console lamp orders and queuing on buffer overflow has been modified to interface with the

buffer structure. The queueing mechanism has been retained.

Buffer Structure

4.16 Parameter words Z3DLGB, Z3LKPB, and Z3OTBF (previously defined) specify the call store location and the size of the output buffer structure blocks. Figure 6 shows the output buffer for one data link and the pointers for that DLG of which it is a part.

4.17 The output buffer is loaded by first using the DLG to index into the Z3DLGB block to access the link pointer block address. This points to one of the 5-word control blocks in the Z3LKPB area. This 5-word control block controls the output buffer for one of the data links in the DLG. The load pointer identifies the next available output buffer slot for loading orders, and the load bits pointer identifies the location of the load bits in the centrex input/output block. (There is a load bit for each data link circuit that is turned on to indicate to the buffer unloading routines that data link orders are present in the output buffer for that data link.) The centrex input/output block is an existing structure that contains information on eight data links. There are two words (BUF0 and BUF1) per data link that formerly provided a 2-word lamp order buffer for each centrex console data link. In a central control office with DLIO, BUF0 is now used to store the unload pointer for the unloading of the buffer while BUF1 is not used. In a signal processor office with DLIO, BUF0 contains an instruction OP-code in the high order bits and the unload pointer in the low order bits, while BUF1 contains a signal processor instruction.

4.18 Each output buffer in the Z3OTBF block is terminated with a top pointer that allows data link orders to be circularly loaded into the buffer. The top pointer can be distinguished from data link orders by examining the top three bits. A valid data link order has at least one of the top three bits equal to one. A top pointer has the three top bits equal to zero.

4.19 The Z3LKPB area for each DLG has a 5-word control block for each data link in the DLG. At the bottom of these 5-word control blocks is a pointer to the top block in this DLG. These 5-word control blocks control normal loading of data link orders. In addition, each DLG can have block data link loading activity from several client programs. Each block

data link loading client is allocated a 4-word control block in the Z3LKPB area for the DLG.

Block Data Link Loading

4.20 Block data link loading is a mechanism that allows a client program to send a very large block of data link orders. After an initial entry to start the block loading process, 1-second main program entries will be made to the client to load the buffer to a predefined level of fill. Depending on the data link type for a DLG, one or more simultaneous block loading processes may be active on the same DLG. Each independent process is identified by a separate block type parameter (Table B).

4.21 A client program initiates block data link loading with a control word that specifies:

- (a) **DLG:** This item specifies which DLG to transmit on.
- (b) **Block Type:** This item specifies the client type identifier that specifies the call store control block for this DLG to be seized.
- (c) **Function Code:** This item specifies the client identifier within the block type.
- (d) **Maximum:** This item specifies the highest level of buffer fill allowed at each 1-second entry.

4.22 The block data link loading subroutine attempts to seize a 4-word loading control block in the Z3LKPB call store area. The particular control block is found by fetching the block data link load address (Fig. 6) from word $2*DLG+1$ in the Z3DLGB area. This address is indexed by $4*(BLOCK\ TYPE-1)$ to find the address of the control block. If this control block is not already in use (the sign bit of word 0 is the used bit), then the new client control word is loaded into word 0 of the control block.

4.23 At each 1-second entry, each active control block (used=1) for each DLG is serviced by using the block type to index into a transfer table to transfer to the client program.

4.24 The client program is told how many data link orders may be loaded on this 1-second entry (this number is equal to or less than the maximum from the control word). Then the client returns to

TABLE B

BLOCK DATA LINK LOADING CLIENT CODES

DLTYPE (APPLICATION)	DEFINED BLOCK LOADING BLOCK TYPES	CLIENT FUNCTION CODES	BUFFER FILL MAXIMUM	CLIENT PROGRAM
0 (Centrex Console)	None	—	—	—
1 (ACD2 Console)	1 2	1 Not used	10 5	ACD2 Agent Data Base Update ACD2 Agent Functional Group Update
2 (ACD2 Console with CRT)	1 2 3	1 Not used Not used	10 5 5	ACD2 Agent Data Base Update ACD2 Agent Functional Group Update CRT Block Date
3 (AEMIS)	1	2	20	AEMIS Data Base Update
4 (ACMOS)	1	3	63	ACMOS Stored Message Unit Output
5 (Reserved)	—	—	—	—
6-15 (Unassigned)	—	—	—	—

block loading with an order or orders to be loaded. The client is reentered until the specified number of orders has been loaded or a stop code is returned by the client.

4.25 Block data link loading clients are serviced in the order largest-block-type-number-first. The client programs for each block type should therefore choose the control word maximum parameters so that the smaller the block type number, the larger the maximum. See Table B for the maximums for existing client programs. As an example, suppose a DLG of a DLTYP2 has a block type 1 process active with maximum=10, and a block type 2 process active with maximum=5.

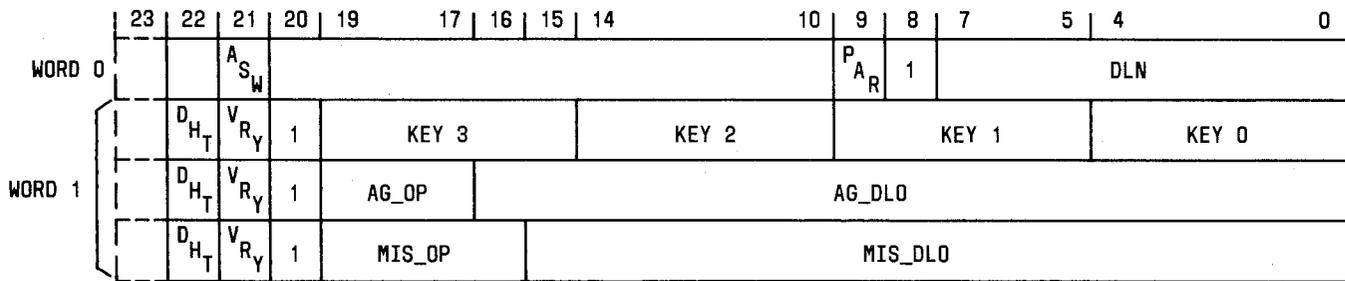
4.26 If at a 1-second entry the output buffer for a data link in this DLG has two words queued in it, the block loading control program will first go to the block type 2 client with an indication that the client can load $5-2=3$ words on this entry. Then the block type 1 client will be entered with an indication

that it can load $10-5=5$ words. In this example, if block type 1 was the only active block, the block type 1 client would be the only one entered on this 1-second entry, and the client would be told that $10-2=8$ words can be loaded.

Input of Data Link Orders to ESS

4.27 Data link orders from all centrex data links are input into the ESS through the centrex key hopper. The centrex key hoppers are unloaded and the data link orders are distributed for processing. The centrex data link circuits are scanned to determine when an input data link order has arrived. When an order is found, a 2-word entry is placed in the key hopper as shown in Fig. 9. A unit type 29 translation on the data link number occurs to determine the data link type.

4.28 Parity errors and illegal operation codes are recorded and if more than 31 occur in a 4-



NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

LEGEND:

ASW - ALL SEEMS WELL EQUAL TO 1 IF HOPPER WORD 1 CONTAINS AN OUTGOING DATA LINK ORDER THAT EXPERIENCED AN ASW FAILURE

PAR - PARITY EQUAL TO 1 IF THE PARITY OF HOPPER WORD 1 IS EXPECTED TO BE ODD

DLN - DATA LINK NUMBER

DHT - DIAGNOSTIC HOPPER TROUBLE REPORT INDICATOR

VRY - MAINTENANCE VERIFICATION REPLY INDICATOR

FOR CENTREX CONSOLE DATA LINKS:

KEY 3 - KEY REQUEST FROM CONSOLE NUMBER 3

KEY 2 - KEY REQUEST FROM CONSOLE NUMBER 2

KEY 1 - KEY REQUEST FROM CONSOLE NUMBER 1

KEY 0 - KEY REQUEST FROM CONSOLE NUMBER 0

FOR ACD AGENT DATA LINKS:

AG_OP - OPERATION CODE FIELD

AG_DLO - DATA LINK ORDER MESSAGE FIELD

FOR ACD MIS DATA LINKS:

MIS_OP - OPERATION CODE FIELD

MIS_DLO - DATA LINK ORDER MESSAGE FIELD

ITEM 20 OF WORD 1 IS EQUAL TO 1 FOR ALL VALID INPUT MESSAGES

Fig. 9—Centrex Key Hopper

minute interval, the link is taken out of service and diagnosed.

B. Data Link Sequencing Feature

General

4.29 In order to accommodate the connection of more than one data link to one piece of customer premises equipment, the DLIO feature provides a number of buffer loading subroutines which

may be used by a client program to send data link orders over a data link in a DLG. The loading subroutines use a circular selection scheme to choose a data link in a DLG over which to send the data link orders. While this circular selection scheme balances the load over all the data links in a DLG, it can, when used with multiple DLGs, cause messages to arrive at the customer premises equipment out of sequence. This becomes critical when the customer premises equipment is an AEMIS minicomputer, as the minicomputer requires that messages arrive in correct

time sequence. Thus, an additional data link selection mechanism and additional loading routines, which are provided by feature package DLSQ, are required to guarantee that messages sent from the ESS to the AEMIS minicomputer over multiple data links arrive in the correct time sequence.

4.30 The way in which messages can arrive at the minicomputer out of sequence, due to the circular selection scheme, is illustrated by the following example.

Suppose at time t_1 a call processing program calls on one of the DLIO buffer loading routines to load a data link order, DLO1, into one of the buffers associated with a given DLG. Suppose later, at time t_2 , a call processing program calls on one of the DLIO buffer loading routines to load a data link order, DLO2, into one of the buffers associated with the same DLG. If DLO1 is loaded into a buffer, say B1, which contains 40 orders, and DLO2 is loaded into a buffer, say B2, which contains no orders, then if $t_2 - t_1 < 1.5$ seconds, DLO2 will arrive at the minicomputer before DLO1 due to the signal processor buffer average unloading rate of .0375 second.

Thus, the DLIO buffer loading routines can cause messages to arrive at the minicomputer out of sequence.

Feature Requirements

4.31 An ACD2 call progress message informs the minicomputer that an event, such as a trunk seizure or a disconnect, has occurred. A message has one of two formats as shown in Fig. 10. The operation code identifies the event, while the facility number identifies the facility the event pertains to [see reference A(15) in Part 18 for details on message formats].

4.32 There are four types of facilities on which call event data is sent. They are as follows:

- (a) ACD2 agent consoles, where the facility number is the ACD2 multiline hunt group terminal number of the agent console
- (b) Trunks, where the facility number is a trunk network number
- (c) Simulated facilities, where the facility number is items 3 through 16 of a simulated facility register address

SINGLE OPERATION CODE (SOP)	VARIABLE	FACILITY NUMBER
--------------------------------	----------	--------------------

A. SINGLE WORD FORMAT

DOUBLE OPERATION CODE (DOP)	VARIABLE
--------------------------------	----------

VARIABLE	FACILITY NUMBER
----------	-----------------

B. DOUBLE WORD FORMAT

Fig. 10—AEMIS Messages

- (d) Queueing registers, where the facility number is items 3 through 16 of a queueing register address.

Event data on these four types of facilities is used by the minicomputer to keep track of system status.

4.33 In order for the AEMIS minicomputer to properly interpret messages, the following sequencing characteristics are required.

- (a) All messages identifying a terminal number must be kept in sequence.
- (b) All messages identifying a trunk network number must be kept in sequence.
- (c) All messages identifying a simulated facility register must be kept in sequence.
- (d) All messages identifying a queueing register must be kept in sequence.

4.34 These messages are termed "critically associated" messages, and are listed in Table C. It should be noted that the above requirements do not imply that all messages for a given call will be sent over the same data link; nor do they imply that all messages specifying a given facility will be sent over the same data link.

♦ TABLE C ♦

CRITICALLY ASSOCIATED MESSAGES

MESSAGE TYPE	MESSAGE (NOTE)
Terminal State Messages	SOP 0—Terminal state change SOP 1—Terminal event SOP 13—Logout message SOP 3—Login message DOP 7—Add-on call
Trunk State Messages	SOP 2—Trunk seized SOP 3—Facility dequeued SOP 4—Facility idle or seizure disclaimer SOP 5—Trunk disabled SOP 6—Trunk high and wet SOP 7—Trunk make busy key operated (TMB) or carrier group alarm SOP 11—Trunk locked out SOP 12—Trunk active (into service) DOP 0—Facility connected DOP 2—Facility queued
Simulated Facility Messages	SOP 3—Facility dequeued SOP 4—Facility idle or seizure disclaimer DOP 0—Facility connected DOP 1—Simulated facility seized DOP 2—Facility queued
Queueing Register Messages	SOP 3—Facility dequeued SOP 4—Facility idle or seizure disclaimer DOP 0—Facility connected DOP 2—Facility queued

Note: The following terms apply:
DOP - double operation code
SOP - single operation code.

CHARACTERISTICS**5. FEATURE ASSIGNMENT**

5.01 The DLIO and DLSQ features are provided on a per customer group basis.

5.02 The DLIO feature is required by all Centrex/ESSX-1 customers that subscribe to ACD2 or ACMOS.

5.03 The DLSQ feature is required whenever the ACD2 feature utilizes an AEMIS minicomputer which communicates with ESS over multiple data links.

6. LIMITATIONS**OPERATIONAL**

6.01 Not applicable.

ASSIGNMENT

6.02 Beginning with 1E4, a No. 1 ESS central control office can have a maximum of 32 centrex data links and a No. 1 ESS signal processor office can have a maximum of 64 centrex data links. For No. 1A ESS (1AE4), the maximum number of centrex data links is 64 (ie, 8 centrex data link frames with 8 centrex data links per frame). Note that these maximum quantities apply to all offices with 1E4/1AE4 or later generic programs, independent of whether or not DLIO is loaded.

6.03 An office that has the DLSQ feature loaded may have no more than 8192 simulated facility registers and a maximum of 4681 queueing registers.

7. INTERACTIONS**STATIC**

7.01 Not applicable.

DYNAMIC

7.02 Central offices that have one or more ACD2 customers with AEMIS minicomputers communicating with the ESS over multiple data links must also load the DLSQ feature.

8. RESTRICTION CAPABILITY

8.01 The telephone company has several teletypewriter input messages that are used to perform maintenance on the centrex data links that are used by the DLIO feature. Refer to paragraph 13.02 for details of these messages.

INCORPORATION INTO SYSTEM**9. INSTALLATION/ADDITION/DELETION**

9.01 Figure 11 illustrates the procedure to add the DLIO/DLSQ features. See reference A(25) in Part 18 for documentation describing growth procedures for the centrex data link frame and centrex data link unit for all generic programs.

Note: Serious service reaction may result if proper installation/addition/deletion sequences are altered.

9.02 For verification and testing of the DLIO and DLSQ features, refer to Part 13.

9.03 The following parameter set cards are required to implement the DLIO and DLSQ features. See references C(2), C(3), C(4) and C(5) in Part 18 for documentation describing parameter set cards in detail.

SET CARD	DEFINITION
CDLF	This set card specifies the quantity of centrex data link frames.
CNSij	This set card specifies the number of centrex consoles per centrex data link frame and circuit including spare positions.
CTH	This set card specifies the number of key scan hopper entries required.
DLCKT0	This set card specifies the number of centrex data link circuits that are type 0 (required by DLIO for 1E5 and later generic programs).
DLCKT1	This set card specifies the number of centrex data link circuits that are type 1 (required by DLIO for 1E5 and later generic programs).
DLCKT2	This set card specifies the number of centrex data link circuits that are type 2 (required by DLIO for 1E5 and later generic programs).
DLCKT3	This set card specifies the number of centrex data link circuits that are type 3 (required by DLIO for 1E5 and later generic programs).
DLCKT4	This set card specifies the number of centrex data link circuits that are type 4 (required by DLIO for 1E5 and later generic programs).
DLG	This set card specifies the highest numbered centrex DLG in the office (required by DLIO for 1E5 and later generic programs).
DLSQAT	This set card specifies the size of the centrex data link assignment

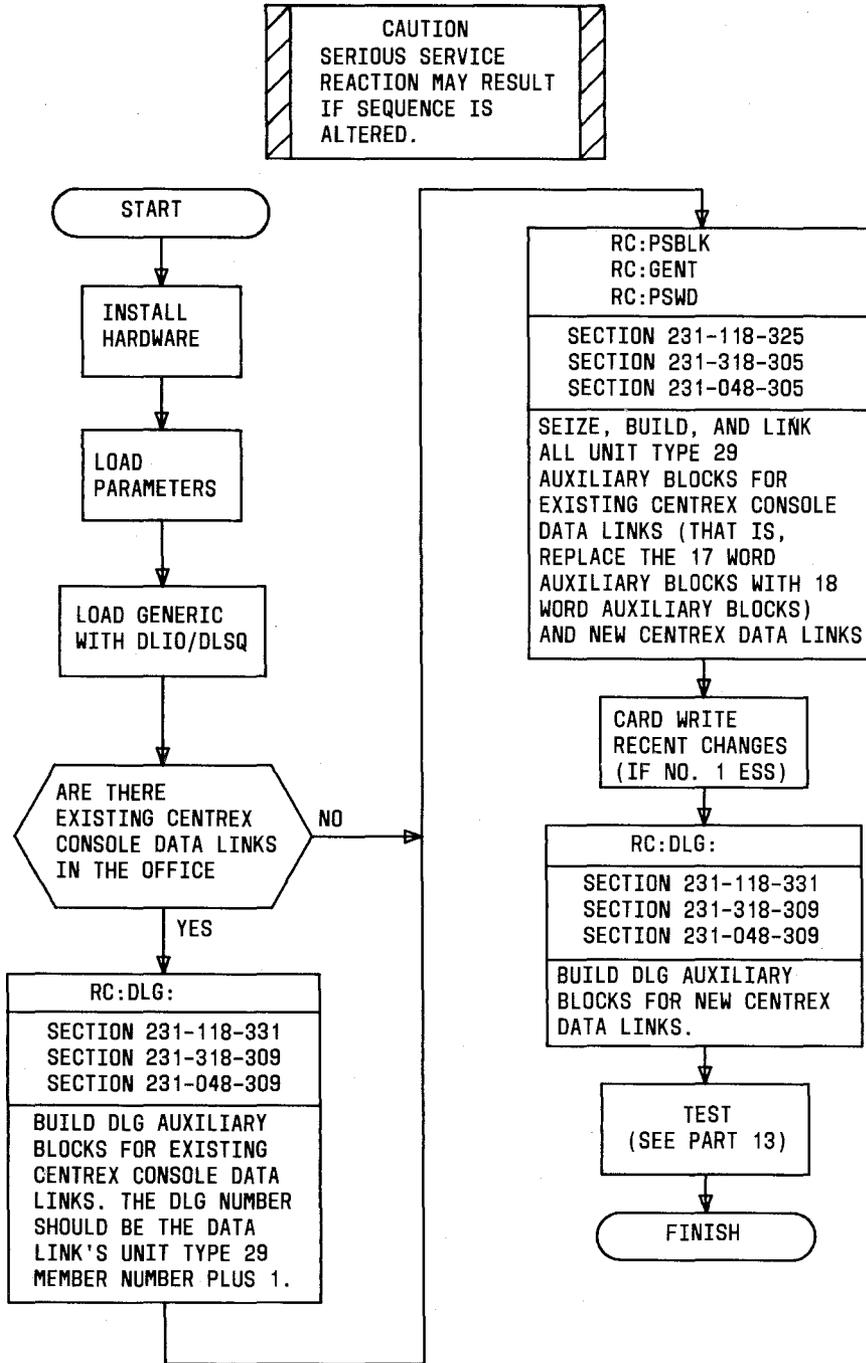


Fig. 11—Procedure for Adding the DLIO/DLSQ Features

SET CARD	DEFINITION
	table (required only for the DLSQ feature).
DLTYP0	This set card specifies the number of centrex DLGs in the DLG translator that are type 0.
DLTYP1	This set card specifies the number of centrex DLGs in the DLG translator that are type 1.
DLTYP2	This set card specifies the number of centrex DLGs in the DLG translator that are type 2.
DLTYP3	This set card specifies the number of centrex DLGs in the DLG translator that are type 3.
DLTYP4	This set card specifies the number of centrex DLGs in the DLG translator that are type 4.
NOBS	This set card specifies the number of output buffer call store words used to buffer messages from the ESS to centrex data links.
9SDLIO	This set card identifies feature group DLIO is loaded.
9FDLIO	This set card identifies feature package DLIO is loaded.
9SDLSQ	This set card identifies feature group DLSQ is loaded.
9FDLSQ	This set card identifies feature package DLSQ is loaded.

10. HARDWARE REQUIREMENTS

Note: This part contains cost factors and determination of quantities. Central Office Equipment Engineering System (COEES) Planning and Mechanized Ordering Modules are the recommended procedures for developing these requirements. However, for planning purposes or if COEES is not available, the following guidelines may be used.

Centrex Data Link Frame

10.01 The ESS central office hardware requirements for the DLIO feature consist of a centrex data link frame (SD-1A265-01). This frame along with a minimum of one data link unit requires 4 central pulse distributor (CPD) points to serve as enables, 37 master scanner (MSN) points, 1 signal distributor point for the frame, with 4 signal distributor points per assigned console (maximum 16 signal distributor points) per data link unit.

51A Customer Premises System

10.02 Hardware required for the 51A CPS includes a centrex data link frame and a centrex console control cabinet. Both the data link frame and console control cabinet may be equipped with a variable number of modular units in addition to common circuits. A centrex data link frame is always equipped with data link hardware in data link position 0. The variable number of modular units required is engineered to meet customer needs and central office requirements. See reference A(13) in Part 18 for documentation describing the quantities of hardware required for the 51A CPS.

Automatic Customer Message Outputting System

10.03 Each ACMOS customer requires one or more centrex data links. The load for each data link should be limited to 79 percent of its maximum message capacity. For central offices without the ACD2 feature, the maximum number of data link orders per data link per hour is 36,000. Therefore, a second data link is required if more than 28,440 orders per hour will be transmitted. Signal processor offices with the ACD2 feature package have a capacity of 96,000 (108,000 for central control offices) orders per data link per hour. Therefore, a second data link is required if more than 75,840 (85,320 for central control offices) orders per hour will be transmitted. Each customer also requires a 91A CPS data concentrator. See reference A(18) in Part 18 for documentation describing the quantities of hardware required for the ACMOS feature.

Automatic Call Distribution

10.04 Data link hardware required for the 60B CPS includes a centrex data link frame (located at the central office) and a 60B CPS "A" cabinet on the customer premises. A maximum of one data link (two

pairs) will be provided per 100 agent/supervisor consoles. For the data link requirements for the AEMIS, see references A(15) and A(16) in Part 18. Note that a maximum of eight data links may be provided per AEMIS minicomputer due to software constraints. For the data link requirements for AGLI see reference A(17) in Part 18.

11. SOFTWARE REQUIREMENTS

Note: This part contains cost factors and determination of quantities. The COEES Planning and Mechanized Ordering Modules are the recommended procedures for developing these requirements. However, for planning purposes or if COEES is not available, the following guidelines may be used.

MEMORY

A. No. 1 ESS

Fixed

11.01 The following memory is required whether or not the DLIO feature is used.

(a) **Base Generic Program (Program Store):** Approximately 150 words are required.

(b) **Fixed Parameters (Program Store):** Four words are required for the DLIO feature, and three words are required for the DLSQ feature.

Conditional

11.02 The following memory is required when the DLIO feature is activated:

(a) **Optionally Loadable Feature Packages (Program Store):** Table D provides this cost data.

(b) **Call Store:** These requirements are as follows:

(1) Word usage for the Z3DLGB area is two words per DLG+2.

(2) Word usage for the Z3LKPB area is as follows:

- Five words per data link plus one word per DLG

- Eight words per DLG (DLTYPE=1)
 - Twelve words per DLG (DLTYPE=2)
 - Four words per DLG (DLTYPE=3)
 - Four words per DLG (DLTYPE=4).
- (3) Word usage for the Z3OTBF area is as follows:
- Three words per data link (DLTYPE=0)
 - Thirty-two words per data link (DLTYPE=1)
 - Thirty-two words per data link (DLTYPE=2)
 - Forty-two words per data link (DLTYPE=3), or 70 words per data link (DLTYPE=3) for 1E5/1AE5 and later generic programs
 - Forty-two words per data link (DLTYPE=4).
- (4) Word usage for the centrex key hopper is as follows:
- Four words per data link (DLTYPE=0)
 - Eight words per data link (DLTYPE≠0).
- (5) Word usage for the Z3ATPT area is one word per DLG+1.
- (6) Word usage for the Z3DLAT area is 2+4 (number of hunt lists in the ACD2 multiline hunt group associated with the DLG) words per DLG with DLTYPE=3, group size greater than 1.
- (7) Word usage for Z3SFLI area is one-fourth of a word per simulated facilities register in the office.

Variable

11.03 The following **translations (program store)** memory is required when the DLIO feature is applied:

- (a) Eighteen words per data link are required for unit type 29 auxiliary blocks (centrex consoles).

TABLE D

DLIO/DLSQ PROGRAM STORE MEMORY (1E6 AND LATER)

FEATURE GROUP		FEATURE PACKAGE (NOTES)			
		NO. ACRONYM	NAME	PACKAGE WORDS	CORE WORDS
CONDIT- TIONAL	Base Generic (B6) (Core)	3 CCAD*	Customer Changeable Speed Calling	960	939
		9 CTX*	Basic Centrex	11,584	11,573
		16 HCTX*	Centrex 1B/2B Console	9,728	9,694
FIXED	DLIO	54 DLIO	Data Link Input/Output	5,248	5,037
	DLSQ†	95 DLSQ	Data Link Sequencing	1,728	1,589

Note 1: The arithmetic difference between package words and core words is patch space.

Note 2: Each feature package contains two words of overhead that define the package name and size.

* Feature packages are shared between two or more feature groups.

† The DLSQ feature group is only required when a central office has an AEMIS minicomputer customer with multiple data links.

- (b) Eight words per data link are required for unit type 29 auxiliary blocks (noncentrex consoles).
- (c) Two words per DLG are required for the DLG translator.
- (d) One word per data link is required for the DLG translator.

B. No. 1A ESS

Fixed

11.04 The following memory is required whether or not the DLIO feature is used.

- (a) **Base Generic Program (Program Store):** Approximately 200 words are required.
- (b) **Fixed Parameters (Unduplicated Call Store, File Store):** Eight words are required for the DLIO feature, and six words are required for the DLSQ feature.

Conditional

11.05 The following memory is required when the DLIO feature is activated.

(a) **Optionally Loadable Feature Packages (Program Store, File Store):** Table E provides package sizes.

(b) **Duplicated Call Store:** This cost data is the same as paragraph 11.02.

Variable

11.06 Variable cost data is identical to paragraph 11.03 above. Translations are in unduplicated call store and file store.

REAL TIME IMPACT

11.07 Table F provides a list of real time requirements for the DLIO feature. Table G provides a list of real time requirements for the DLSQ feature.

11.08 The cycle time for No. 1 ESS is 5.5 microseconds (0 percent speedup), or 5.0 microseconds (10 percent speedup). Clock speedup is available with 1E7 and base restarts of the 1E6 generic programs. Cycle time for No. 1A ESS is 0.7 microseconds.

TABLE E

DLIO/DLSQ PROGRAM STORE MEMORY (1AE6 AND LATER)

FEATURE GROUP		FEATURE PACKAGE (NOTES)			
		NO.	ACRONYM	NAME	CODE WORDS
CONDI- TIONAL	Base Generic (B6) (Core)	3	CCAD*	Customer Changeable Speed Calling	1,315
		9	CTX*	Basic Centrex	16,203
		16	HCTX*	Centrex 1B/2B Console	13,572
FIXED	DLIO	54	DLIO	Data Link Input/Output	7,052
	DLSQ†	95	DLSQ	Data Link Sequencing	2,225

Note 1: In No. 1A ESS, code words are the same as package words.

Note 2: In No. 1A ESS, feature packages share a common patch space.

* Feature packages are shared between two or more feature groups.

† The DLSQ feature group is only required when a central office has an AEMIS minicomputer customer.

12. DATA ASSIGNMENTS AND RECORDS

TRANSLATION FORMS

12.01 The following ESS translation forms, as shown in reference C(1) in Part 18, are applicable to the DLIO and DLSQ features.

(a) **ESS 1506—Miscellaneous Assignment Information Record:** For each DLG entered on the ESS 1514 form, there must be a corresponding "CONSOL" or "DATLK" entry on the ESS 1506 form containing the DLG number.

(b) **ESS 1514—Data Link Group Record:**
This form contains entries to build the DLG translator.

RECENT CHANGES

12.02 The following recent change (RC) message is used to incorporate or modify the DLIO and DLSQ translation items.

RC MESSAGE

FUNCTION

RC:DLG This message is used to add, change, or delete a DLG.

13. TESTING

13.01 To minimize problems and time-consuming changes during end-to-end testing, all translation data should be carefully checked as it is being installed. See references B(1) through B(4) in Part 18 for documentation describing the input and output messages.

13.02 Table H is a list of teletypewriter messages used in testing centrex data link operation. Figure 12 illustrates the data link state transitions associated with specific input messages. See reference A(29) in Part 18 for documentation describing maintenance procedures in detail.

14. OTHER PLANNING TOPICS

14.01 When the DLIO feature package is loaded, all existing 17-word unit type 29 auxiliary blocks in the office must be converted to 18-word blocks, and all new unit type 29 auxiliary blocks added to the office must be 8- or 18-word auxiliary blocks.

14.02 In order to ensure that centrex data links with 17-word unit type 29 auxiliary blocks function prior to the conversion to 18-word auxiliary

TABLE F
DLIO PROCESSOR TIME

OPERATION	NO. 1 ESS CYCLES	NO. 1A ESS CYCLES
Buffer Loading (With data link number specified add 40 cycles.)		
(a) Load single data link order DLG specified	60	120
(b) Load double data link order DLG specified	70	140
(c) Load multiple data link order DLG specified	60 + 10 per data link order	120 + 20 per data link order
Buffer Unloading		
(1) Signal Processor Offices Input/Output (Cycles for Signal Processor)		
(a) Per frame every input/output entry	30	—
(b) Per outgoing data link order	90	—
(c) Per incoming data link order	60	—
(2) Central Control Offices		
(a) Per frame every input/output entry	25	50
(b) Per outgoing data link order	55	110
(c) Per incoming data link order	30	60
Incoming data link order analysis		
(a) Centrex console key signals (additional)	30	60
(b) Noncentrex console (hopper to client)	60	120

blocks, the DLIO software makes the following assumptions concerning 17-word unit type 29 auxiliary blocks:

- (a) The DLG number of the DLG containing the data link is equal to the data link unit type 29 member number +1.
- (b) The data link type of the data link is 0.
- (c) The data link requires three buffer words.

14.03 The load balance over the data links in an AEMIS DLG is affected by the assignment of trunk group numbers to trunk groups on which

AEMIS data is desired. To ensure that the load balancing requirement is met, it is recommended that each ACD2 customer with multiple AEMIS data links have their trunk group numbers (for trunk groups on which AEMIS data is desired) assigned consecutively or in a number of small blocks of consecutive numbers. The closer this arrangement comes to a consecutive assignment, the better the load balance will be in the DLG.

ADMINISTRATION

15. MEASUREMENTS

15.01 The following traffic measurements, listed by type measurement code (TMC) and

TABLE G

DLSQ PROCESSOR TIME (NOTE)

OPERATION	NO. 1 ESS CYCLES	NO. 1A ESS CYCLES
Buffer Loading, Multiple Data Link DLG		
(a) Single Order		
Terminal Message	100	200
Trunk Message	150	300
Simulated Facility Message	120	240
Queueing Register Message	100	200
(b) Double Order		
Terminal Message	120	230
Trunk Message	170	340
Simulated Facility Message	140	270
Queueing Register Message	120	240
Buffer Loading, Single Data Link DLG		
(a) Single Order, all facility types	90	170
(b) Double Order, all facility types	100	200
Additional cycles to change the data link assigned to a facility		
Terminal Message	50	100
Simulated Facility Message	30	60
Queueing Register Message	30	60

Note: These cycle times apply only to ACD2 AEMIS messages listed in Table C.

printed on the "H" and "C" schedules, are associated with DLG numbers.

- TMC 100—DLG peg
- TMC 101—DLG overflow
- TMC 102—DLG usage.

15.02 The following plant measurements (PMs) are associated with the DLIO feature.

- PM01—Daily plant measurement output message
- PM02—Monthly plant measurement output message.

15.03 See reference A(26) in Part 18 for traffic measurement documentation and reference

A(27) in Part 18 for plant measurement documentation.

16. CHARGING

AUTOMATIC MESSAGE ACCOUNTING

16.01 Charging is determined according to the quantity of data links provided.

UNIFORM SERVICE ORDER CODES

16.02 Not applicable.

SUPPLEMENTARY INFORMATION

17. GLOSSARY

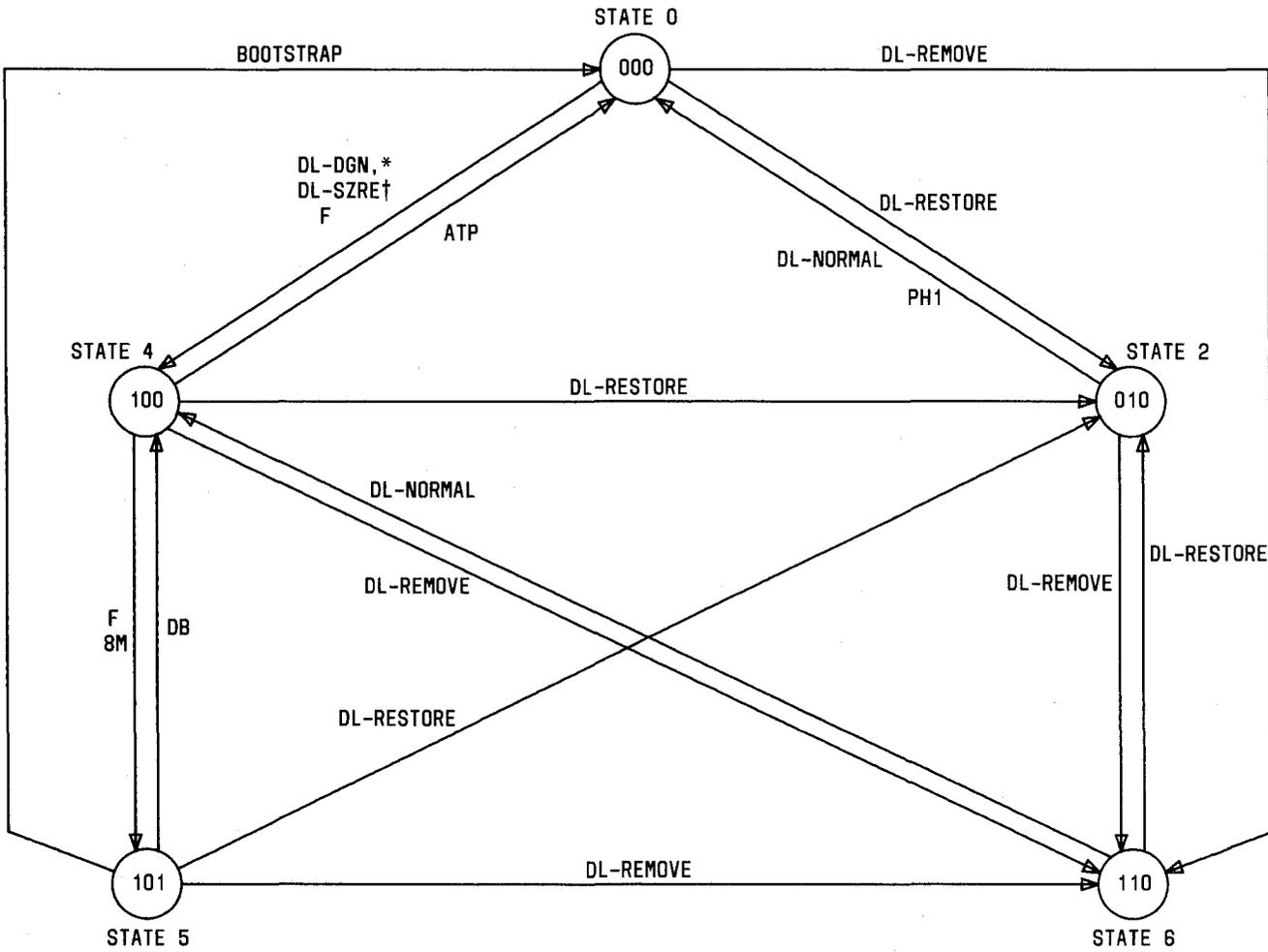
17.01 Not applicable.

TABLE H
DLIO TELETYPEWRITER MESSAGES

DESIRED OPERATION	INPUT MESSAGE FORMAT	OUTPUT MESSAGE FORMAT (NOTE)
Repetitively address a data link.	CX-CAMP*	—
Load the orders to be sent to the data link.	CX-LOAD*	—
Start the data link camp-on program.	CX-START*	—
Request a diagnosis of the specified data link.	DL-DGN	CTX10 CTX12 DR04 DR05 DR06
Request the system to diagnose data links.	DL-DGNALL	CTX10 CTX12 DR04 DR05
Request the system to place a data link in the unforced in-service or out-of-service state.	DL-NORMAL	CTX12
Request the system to close error trapping on central data links.	DL-OFFTRAP	CTX23
Request the system to initiate error trapping on the specified data link.	DL-ONTRAP	CTX15 CTX23
Request the system to unconditionally remove the data link from service and inhibit the automatic diagnosis of the link.	DL-REMOVE	CTX11 CTX12
Request the system to restore the specified data link to service without diagnosing it.	DL-RESTORE	CTX12
Request the system to print status information on the data links in the office.	DL-STATUS	CTX13
Request the system to unconditionally remove the specified data link from service and diagnose it.	DL-SZRE	CTX10 DR02 DR04 DR05
Request the system to initiate error trapping on all centrex data links.	DL-TRAPALL	CTX02
Request the system to print the error trappings status	DL-TRPSTAT	CTX22

Note: Output messages CTX14 and CTX19 are printed automatically if the system detects a situation requiring maintenance personnel attention.

* The CX-CAMP, CX-LOAD, and the CX-START input messages all work in conjunction with each other.



* IF THIS MESSAGE FAILS BECAUSE ALL CUSTOMERS ARE NOT ON NIGHT SERVICE, DL-SZRE MAY BE USED.

† ONLY VALID FROM STATE 0

- LEGEND:
- | | |
|---|--|
| PROGRAM ABBREVIATIONS: | DATA LINK STATES: |
| PH1 - EMERGENCY ACTION PHASE 1 | STATE 0 - 000 - NORMAL IN-SERVICE STATE |
| F - FAULT RECOGNITION DETECTED FAILURE (ASW, ALWAYS BUSY, ERROR COUNT) | STATE 1 - 001 - INVALID |
| 8M - 8-MINUTE CHECK CAUSES STATE CHANGE (SETS, DIAGNOSTIC FLAG) | STATE 2 - 010 - IN-SERVICE OVERRIDE STATE |
| DB - DIAGNOSIS BEGINS | STATE 3 - 011 - INVALID |
| ATP - ALL TESTS PASSED ON DIAGNOSIS | STATE 4 - 100 - NORMAL OUT-OF-SERVICE STATE |
| BOOTSTRAP - IF IN STAGE 5 FOR 8 MINUTES, LINK IS RESTORED WITHOUT DIAGNOSIS | STATE 5 - 101 - OUT-OF-SERVICE DIAGNOSIS FLAGGED STATE |
| | STATE 6 - 110 - OUT-OF-SERVICE OVERRIDE STATE |
| | STATE 7 - 111 - INVALID |

Fig. 12—Data Link State Diagram

18. REFERENCES

18.01 The following documentation contains information pertaining to or affected by the DLIO and DLSQ features.

A. Bell System Practices

- (1) Section 231-037-000—Centrex Data Loop and Console Control—Description/Theory—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (2) Section 231-045-175—Centrex Data Link Features—Software Subsystem Description (SSD)—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (3) Section 231-048-303—CCIS, CFTRK, TG, TGBVT, TGMEM, TKCONV, and TRK Trunk Translation Recent Change Formats (1E6/1AE6 and 1E7/1AE7 Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (4) Section 231-048-305—GENT, PSBLK, PSWD, and SUBTRAN Recent Change Formats (1E6/1AE6 and 1E7/1AE7 Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (5) Section 231-048-309—CTXCB, CTXDI, CTXEXR, CXDICH, DITABS, DLG, FLXDG, FLXRD, and FLXRS Centrex CO/ESSX-1 Recent Change Formats (1E6/1AE6 and 1E7/1AE7 Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (6) Section 231-048-312—ACT, CFV, LINE, MLHG, MOVE, MPTY, OBS, SCLIST, SIMFAC, TNESN, TWOPTY, and VSS Line Recent Change Formats (1E6/1AE6 and 1E7/1AE7 Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (7) Section 231-061-450—Program Store, Network Switching Engineering—2-Wire No. 1 Electronic Switching System
- (8) Section 231-061-460—Call Store, Network Switching Engineering—2-Wire No. 1 Electronic Switching System
- (9) Section 231-062-460—Processor Community Engineering, Program Stores, Network Switching Engineering—2-Wire No. 1A Electronic Switching System
- (10) Section 231-062-465—Processor Community Engineering, Call Store Memory, Duplicated Software, Network Switching Engineering—2-Wire No. 1A Electronic Switching System
- (11) Section 231-062-470—Processor Community Engineering, Call Store Memory, Unduplicated Software, Network Switching Engineering—2-Wire No. 1A Electronic Switching System
- (12) Section 231-062-475—Processor Community Engineering, File Stores, Network Switching Engineering—2-Wire No. 1A Electronic Switching System
- (13) Section 231-090-060—Feature Document—51A Customer Premises System Attendant Position Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (14) Section 231-090-399—Feature Document—Automatic Call Distribution Feature Phase 2 Description—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (15) Section 231-090-413—Feature Document—Interface With ACD-ESS Management Information System (AEMIS) Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (16) Section 231-090-421—Feature Document—Interface Coordinator CRT Terminal Automatic Call Distribution—Phase 2—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (17) Section 231-090-415—Feature Document—Automatic Call Distribution Phase 2 Agent Log-In Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (18) Section 231-090-419—Feature Document—Interface With Property Management System Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (19) Section 231-118-323—Trunk Translation Recent Change Procedures for TG, TGBVT, TRK, CFTRK, and TGMEM (Through 1E5 Generic Programs)—2-Wire No. 1 Electronic Switching System

- (20) Section 231-118-325—Recent Change Procedures for GENT, PSBLK, PSWD, and SUBTRAN (Through 1E5 Generic Programs)—2-Wire No. 1 Electronic Switching System
- (21) Section 231-118-331—Centrex/CO ESSX-1 Recent Change Procedures for CTXCB, CTXDI, CTXEXR, CXDICH, DITABS, DLG, FLXDG, FLXRD, and FLXRS (Through 1E5 Generic Programs)—2-Wire No. 1 Electronic Switching System
- (22) Section 231-118-332—Recent Change Procedures Required to Add a Centrex, ESSX-1, or Noncentrex Data Link, and Related Equipment—2-Wire No. 1 Electronic Switching System
- (23) Section 231-118-335—Line Recent Change Procedures for LINE, TWOPTY, MPTY, SCLIST, MLHG, ACT, CFV, OBS, and SIMFAC (1E4 and 1E5 Generic Programs)—2-Wire No. 1 Electronic Switching System
- (24) Section 231-119-320—Procedures for Building or Deleting Head Tables, Data Tables, Subtranslators, Auxiliary Blocks, and Unit Type Translators (CTX-6 through CTX-8 Issue 3 Generic Programs)—2-Wire No. 1 Electronic Switching System
- (25) Section 231-119-329—Centrex Data Link Frame and Centrex Data Link Unit—Growth Procedures—2-Wire No. 1 Electronic Switching System
- (26) Section 231-090-207—Traffic Measurements—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (27) Section 231-120-302—Plant Measurement Procedures—2-Wire No. 1 Electronic Switching System
- (28) Section 231-049-325—Centrex Data Link and Console—Demand Exercise Program, Procedures—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (29) Section 231-049-326—Centrex Data Link and Attendant Telephone Console—Maintenance Procedures—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (30) Section 231-318-302—Line Recent Change Procedures for LINE, TWOPTY, MPTY, SCLIST, MLHG, ACT, CFV, OBS, and SIMFAC (1AE4 and 1AE5 Generic Programs)—2-Wire No. 1A Electronic Switching System
- (31) Section 231-318-303—Trunk Translation Recent Change Procedures for TG, TGBVT, TRK, CFTRK, TGMEM, CCIS, and TKCONV (Through 1AE5 Generic Program)—2-Wire No. 1A Electronic Switching System
- (32) Section 231-318-305—Recent Change Procedures for GENT, PSBLK, PSWD, and SUBTRAN (Through 1AE5 Generic Program)—2-Wire No. 1A Electronic Switching System
- (33) Section 231-318-309—Centrex-CO/ESSX-1 Recent Change Procedures for CTXCB, CTXDI, CTXEXR, CXDICH, DITABS, DLG, FLXDG, FLXRD, and FLXRS (Through 1AE5 Generic Program)—2-Wire No. 1A Electronic Switching System
- (34) Section 231-318-320—Procedures for Adding or Deleting Head Tables, Data Tables, Subtranslators, Auxiliary Blocks, and Unit Type Translators—2-Wire No. 1A Electronic Switching System
- (35) Section 533-110-107—Centrex Data Link and Console Demand Exercise—Fault Location Procedures—2-Wire No. 1 and No. 1A Electronic Switching System
- (36) Section 231-118-339—Automatic Call Distribution ACD Phase 2—(1E4 Through 1E6 Generic Programs)—2-Wire No. 1 Electronic Switching System
- (37) Section 533-110-101—51A Customer Premises System (CPS), Attendant and Station Equipment, Method of Operation—No. 1 and No. 1A Electronic Switching Systems
- (38) Section 820-070-150—Centrex Data Link Frame and Centrex Console Control Cabinet Equipment No. 1 ESS Arranged With 2-Wire Features Equipment Design Requirements—Electronic Switching Systems (J1A068).

B. TTY Input and Output Manuals

- (1) Input Message Manual IM-1A001—No. 1 Electronic Switching System
- (2) Input Message Manual IM-6A001—No. 1A Electronic Switching System

- (3) Output Message Manual OM-1A001—No. 1 Electronic Switching System
- (4) Output Message Manual OM-6A001—No. 1A Electronic Switching System.

C. Other Documentation

- (1) Translation Guide TG-1A—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (2) Office Parameter Specification PA-591001—2-Wire No. 1 Electronic Switching System
- (3) Office Parameter Specification PA-6A001—2-Wire No. 1A Electronic Switching System
- (4) Parameter Guide PG1—2-Wire No. 1 Electronic Switching System
- (5) Parameter Guide PG1A—2-Wire No. 1A Electronic Switching System

(6) Translation Output Configuration
PA-591003—2-Wire No. 1 Electronic Switching System

(7) Translation Output Configuration
PA-6A002—2-Wire No. 1A Electronic Switching System

(8) PK-6A006—Call Store Data Layout—Electronic Switching System 1A—2-Wire

(9) BISP 759-100-000—Subject Index—Central Office Equipment Engineering (COEES)—Business Information System Programs

(10) BISP 759-100-100—General Description—Central Office Equipment Engineering (COEES)—Business Information System Programs.