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Honeywell

HONEYWELL INFORMATION SYSTEMS INC.

L16-92

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ENGINEERING PRODUCT SPECIFICATION PART 1 DSS175/180 SUBSYSTEMS	Rev. C

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REVISION RECORD

REVISION LETTER	DATE	PAGES AFFECTED	APPROVALS	AUTHORITY
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HONEYWELL PROPRIETARY

CE 301 (10-70)

1.0 GENERAL DESCRIPTION

This document specifies the subsystem requirements for the DSS175 Removable Media Disc Storage Subsystem. This document also specifies the subsystem requirements for the DSS180 Removable Media Disc Storage Subsystem. Therefore, subsequent references to the DSS175, DSC175 and DFE175 apply also to the DSS180, DSC180 and DFE180. (See para. 3.0, configurations.)

The basic elements of the DSS175/DSS180 are:*

- At the Subsystem level:

  Up to 2 computer controllers.
  Up to 4 Disc File Electronics (DFE).
  Up to 36 Disc Storage Units (DSU).

- At the Controller level:

  Up to 4 Computer Interface Adapters (CIA).
  Up to 2 Device Channel Adapters (DCA).
  One Medium Speed Common Peripheral Adapter (CPM).
  One Control Console Adapter (CCA).
  One Teletype Console.

*Note: See paragraph 3.0 for configurations, paragraph 3.2.4 for standard configurations.

2.0 SUBSYSTEM DESCRIPTION

The DSS175/180 Subsystems use a general purpose computer as a DSU175/180 device controller, performing data formatting, positioner control, data path switching, file protection, header search and associated functions required to reliably read and write data. Associated with the computer are the Computer Interface Adapter for interfacing the controller to the central system I/O module via the constraints of the common peripheral interface, the Device Channel Adapter, the Disc File Electronics, the DSU175/180 drives, a card reader* and console teletype* for subsystem T&D.

2.1 SYSTEM INTERFACES

Figure 2.1 is a block diagram illustrating a 600 Line Central System (635 or 655) which shares a DSS175/180 (data base) with a DATANET 355. A Single controller may have two simultaneous channels and two switched channels allowing either multiple channels of a 635/655 or a DATANET 355 to have simultaneous or alternate access to the DSS175/180 file subsystem. Access by the 600 Line is via the IOC-C or IOM Input/Output Controllers. When high data availability is required, a second IOC or IOM controller (as illustrated) may be used to provide an independent data path to the storage units. Consistent with this second control channel the two data paths to all files must be electrically independent. (However, this configuration is non-standard; see paragraph 3.0.)

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An additional 9 drives may be added to the basic controller to complete an 18-drive subsystem. Another eighteen (18) drives may also be added with or without a second controller to complete a 36-drive subsystem. Spare drives may be designated within the above configurations as required by the customer's application. Normal recommended configurations include, but are not limited to, 8 data drives plus one spare.

Initially, DATANET 355 Software needed to interface to the DSS175/180 Subsystems, will not be available.

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*Note: The card reader and teletype can be shared with other system modules.

2.2 DATA AVAILABILITY

A number of applications, especially in the service business, require that a high degree of data availability be provided. Consistent with this requirement it shall be possible to configure the subsystem in such a manner that the largest portion of the file subsystem that is unavailable due to a single component failure in a drive or switch shall be confined to a single drive and its associated switch. Further, it shall be possible to maintain a single disc drive unit while the rest of the subsystem is on line. Provision should also be made to inform the controller, via the console or sense switches, to temporarily halt data transfer in order to power down and affect necessary subsystem changes.

2.3 DATA PROTECTION

When multiple channels are provided to a common data base, care must be taken to assure that files are unavailable to alternate channels during file update operations. The controller shall provide file reservation at the device level in response to selection commands. Physical reservation of devices to controller channels shall be accomplished in the 2 x 1 data switches associated with each drive.

2.4 THRUPUT

Each External User System (EUS) channel shall be capable of accommodating a burst transfer rate of 438K characters per second. The 438KC transfer rate is the result of a worst case combination of device tolerances. Because data must be placed in controller memory and read out to the 655/IOM or the IOC-C, a peak in/out character transfer rate of 876KC can result (as seen by the 355-IOM) for a single channel subsystem. Dual channel subsystems require a peak transfer of 1752K characters per second or approximately 300K words per second as seen by the 355-IOM. This is roughly 60% of the available computer controller memory cycles assuming optimum timing. Since the CIA interface is soft failing, the buffering capability of the controller can be used to advantage. As a minimum, a record buffer per channel (384 characters) shall be provided. It is expected that additional buffering will be available in controller memory, further reducing peak throughput requirements.

So that the buffering capability of the controller can be effectively used, it is intended that an option be made available in the IOC-C that will swap the priority of up to four high speed PUB's with four low speed PUB's. That is, in order that peak transfers not overload the IOC-C, the DSS175/180 Subsystem will be connected to the high speed PUB's, but given lowest priority. This PUB priority swap capability is provided by options 4WCHP601AA1 and 4WCHP602AA1. These two options swap the priority of PUB's, 4 and 5 to 14 and 15 and PUB's 2 and 3 to 12 and 13 respectively.

3.2.4 Standard Configurations

3.2.4.1 DSS175 Subsystems

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a) The standard subsystem configuration for DSS175 subsystems is specified by figure 1 of Appendix "A"; i.e., 1 x 1 x (1 - 9 disc storage units).

b) In addition to those modules explicitly diagrammed by the appendix, the following additional modules (specified elsewhere in this EPS-1) are implicit to the standard DSS175 configuration:

- One 355 CCA Adapter for the Teletype Console.
- One Teletype Console.*
- One 355 Common Peripheral Channel Adapater for a Card Reader.
- One Card Reader, or access to a card reader (via a peripheral switch).*
- The basic controller consists of an SPA355 CPU (Processor, System Controller, Input/Output Multiplexor, 16K of memory, and wrap-around channel).
- The subsystem shall be connected to a 600 Line System through an IOC-C or IOM.

3.2.4.2 DSS180 Subsystems

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a) There are two standard configurations for DSS180 subsystems. These are specified by the following diagrams:

- Figure 1 of Appendix "A"; i.e., 1 x 1 x (1 - 9 disc storage units).
- Figure 8 of Appendix "A"; i.e., 1 x 2 x (2 -18 disc storage units).

b) In addition to those modules explicitly diagrammed by the appendix, the following additional modules (specified elsewhere in this EPS-1) are implicit to both standard DSS180 configurations:

- One 355/CCA Adapter for the Teletype Console.
- One Teletype Console.*
- One 355/Common Peripheral Channel Adapater for a Card Reader.
- One Card Reader, or access to a card reader (via a common peripheral switch).*

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*Note: The card reader and Teletype can be shared with other system modules.

3.2.4.2 DSS180 Subsystems (continued)

- The basic Controller consists of an SPA 355 CPU (Processor, System Controller, Input/Output Multiplexor, 16K of memory, and a wrap-around channel).
- The Controller shall be connected to a 600 series system through the IOC-C or 655 IOM. Dual Channel DSS180 subsystems may be connected to two Pubs, in one IOC-C (or IOM), or one Pub in each of two IOC-C's (or IOM's).* In both cases, the subsystem shall be accessed by only one 600 Line External User System.

3.2.4.3 All other (non Standard) configurations; Possible DATANET 355 Link

a) General:

C The balance of the configurations diagrammed in Appendices A, B and C are to be considered "non-standard". At a future time, some configurations will undoubtedly become "Standard", and some will always be considered "specials". The immediate purpose of the balance of the configurations diagrammed, is to record potential configurations (which the subsystem is inherently capable of) for Marketing functions, and at the same time provide both hardware and software functions with the ability to slant their efforts in the same direction. The objective, of course, is to reduce the cost of providing future "non-standard" configurations when requested by a (potential) customer. The Quality Assurance procedures required for such an eventuality will be determined at the time the configuration is ordered.

b) Mass Store Link to DATANET 355:

C Although defined as a "non-standard" configuration it is anticipated that configurations which provide a link to mass storage for a DATANET 355, will be next. These configurations are depicted in figures 1, 7, 7a, 8 and 8a. Requirements for these configurations will be specified by a later revision of this EPS-1.

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*Note: IOC's and IOM's cannot be intermixed on a common 600 Line System.

3.3.1 Computer-Controller (continued)

The DSC175/180 Controller will accept macro type commands (seek, read, write, etc.) from 600 Line systems and will issue the necessary micro type commands (load registers, set tag, etc.) to the DCA and drive units. Control software will also obtain status from the subsystem modules and return the appropriate status as specified in the DSC175/180 Controller specification. Additional functions will include: channel cross bar control, controller executed diagnostic routines, and data buffering. Future consideration may include limited file maintenance and management functions as allowed by the variable controller-processor resources and memory capacity.

3.3.2 Computer Interface Adapter

The Computer Interface Adapter (CIA) provides a direct link between the controller's input-output bus and a common peripheral channel of either the IOC-C, 655 IOM or the DATANET 355. The CIA is used to transfer data, control commands, and status. The basic operation of the CIA is to reformat the 36-bit words of the controller IOM bus to the 6-bit characters of the common peripheral interface and vice-versa. In transferring data to and from controller memory the CIA will operate as a direct channel.

The interface timing is defined in the Common Peripheral Interface Specification, 43A130524.

Physical connection is to be accomplished by means of a standard cable, defined in Drawing Number 43C136655, Revision E-1, February 15, 1965; maximum 50 feet, minimum 25 feet. The cable drivers themselves shall be capable of driving a 150 foot standard cable. Propogation delays of the standard cable affect the transfer rate capabilities of the interface. The cable connector, into which the standard cable connects, is defined by Drawing Number 43B112143P315, Revision U, February 24, 1967.

(As a reference, the female connector attached to the standard cable is defined by Drawing Number 43B112143P316, Revision U, February 24, 1967.)

5.3 DSU175 DISC STORAGE UNIT

The DSU175 is designed is accordance with the Common Design Specification M50EB00001 except as noted in section 6.0 of IDD document M50EB00075. The primary AC power requirements of paragraph 6.2.1 are included here for reference:

- Primary AC Power

  208 vac power shall be connected to each Drive Unit. Each Drive Unit shall draw current from only one phase. For a multi-unit configuration, phases feeding individual Drive Units shall be rotated within the Device Adapter among the Drive Units. Characteristics of input AC power shall be:

  a. Voltage (line to line) - 208 vac ± 10%
  b. Frequency - 60 ± ½ Hertz*
  c. Steady State Line Current - less than 3.2 amps
  d. In-rush Line Current - less than 25 amps

5.4 DSU180 DISC STORAGE UNIT

To the maximum practical extent, the DSU180 shall employ the design developed for the DSU175.

- Primary AC Power

  Three phase, 208 vac power shall be connected to each Drive Unit. Phase switching to maintain proper rotation of the 3Ø drive motor shall be accomplished in the DSU180.

  Characteristics of the input AC power shall be:

  a. Voltage (line to line) - 208 vac ± 10%
  b. Frequency - 60 ± ½ Hertz*
  c. Line Current - Run Mode
     ØA - less than 3.1 amps
     ØB - less than 3.1 amps
     ØC - less than 1.1 amps
  d. Line Current - Maximum Onrush
     ØA - less than 15.2 amps
     ØB - less than 15.2 amps
     ØC - less than 13.2 amps

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*Note: The DSU175/180 shall not be connected to the Motor-Generator set currently specified for 600 systems, due to frequency "slip" in the Motro-Generator set.

6.3 RELIABILITY AND MAINTAINABILITY DESIGN REQUIREMENTS

The following requirements are generally compatible with figures of performance given in the EPS-1 Documents for the individual units in the subsystem. That is the DSU175, DFE175/180, and the SPA 355 in the DSC175/180 mode.

6.3.1 Design MTBF and MTTR

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DEVICE	INHERENT MTBF UNIT POWER ON HOURS	CALCULATED DESIGN CONTRIBUTED MTTR HOURS
DSU175	1190	1.5*
DSU180	3200	1.5*
DFE175/180	2900	1.5*
DSC175/180	2780	1.0

*Mean T&D diagnostic time is assumed to be less than 20 minutes to isolate failure to major unit and to the optimum replaceable/adjustable subassembly.

The equipment shall be designed with components, subassemblies and optimum redundancy below device level to result in calculated MTBF's equal to or greater than the above numbers. The method of inherent MTBF calculation shall use component failure rates from the proposed (or current issued whichever applies) Group Standard Failure Rate Data Base. See report dated May 1, 1970 issued by ISG Task Group #8. For component failure rates not contained in that report, other industry standard sources may be used which shall be documented by the producer's reliability group. The above analysis shall be completed and presented at or before the formal Subsystem Step 2 Review. Also, the equipment shall be designed according to the requirements of the maintenance plan of this EPS-1 such that calculated design contributed MTTR shall be equal to or less than the numbers in the table. The method of analysis of design contributed MTTR shall be determined by analytical means based on engineering estimates for typical procedures anticipated in emergency maintenance of major subassemblies, the total time for the repair of selected failures to be statistically weighted for the probability of occurrence.

The above analysis should preferably be completed and presented at or before the formal Step 2 Review. The analysis both for MTBF and MTTR shall be formally presented at the subsystem Step 4 Review.

6.4.1 MTBF and MTTR at Step Reviews

Major Unit	Step 4 Qualification Tests		Step 5 Field Performance Evaluations	
	MTBF	MTTR	MTBF	MTTR
DSU175	409 at 50% CL	2.0* at 50% CL	725 at 90% CL	2.0* at 90% CL
DFE175/180	645 at 50% CL	2.0* at 50% CL	1300 at 90% CL	2.0* at 90% CL
DSC175/180	700 at 50% CL	2.0 at 50% CL	1700 at 90% CL	1.7 at 90% CL
DSU180	625 at 50% CL	2.0* at 50% CL	1170 at 90% CL	2.0 at 90% CL

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*Mean T&D diagnostic time is required to be less than 20 minutes to isolate failure to major unit and to the optimum replaceable/adjustable subassembly.

- All MTBF is in the major unit power-on hours.
- All MTTR is in hours.

In order to exclude infant mortality failures from the demonstrations, the initial 200 hours of System use of a DSU175 may be excluded from the MTBF results. Similarly, 100 hours of running may be excluded from the DFE175/180 and DSC175/180 results.

6.4.6.4 Basis for Reliability Predictions (Reference)

The following MTBF's, derived from both historical and statistical data available at this time(August 17, 1970) provided the basis for the mature MTBF and availability predictions included in the preceding paragraphs.

	MTBF (Power-on-Hours)
355 Processor, Wraparound channel, and IOM Control	5917
16K of Memory	6451
CIA	76923
DCA	40000
DFE	2900
C DSU175	1190
DSU180	3200
CPI Channel Adapter and the Card Reader	NA*
CCA Adapter and Teletype Console	NA*

*Note: These units are excluded from calculations because they function only as maintenance aids.

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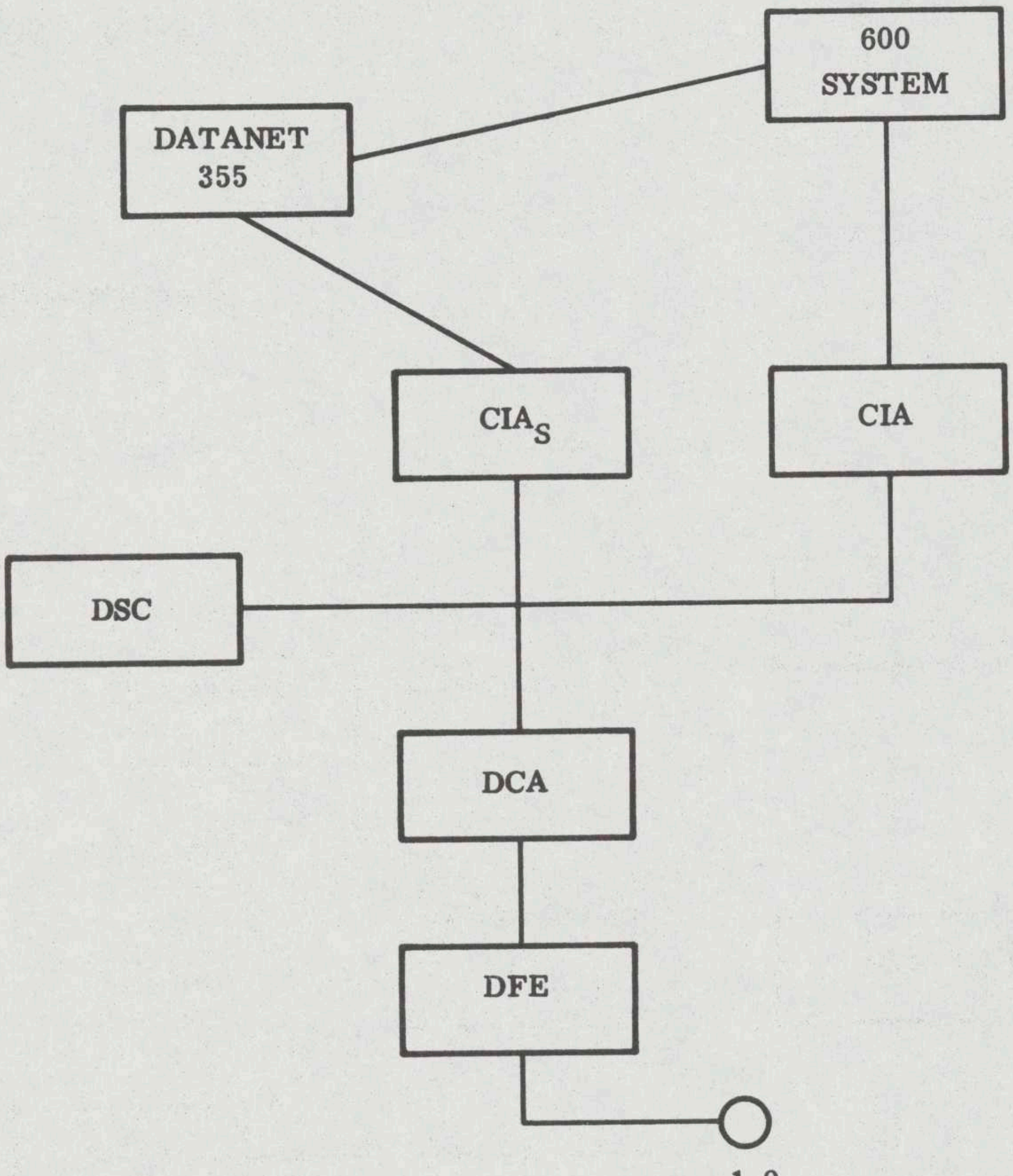
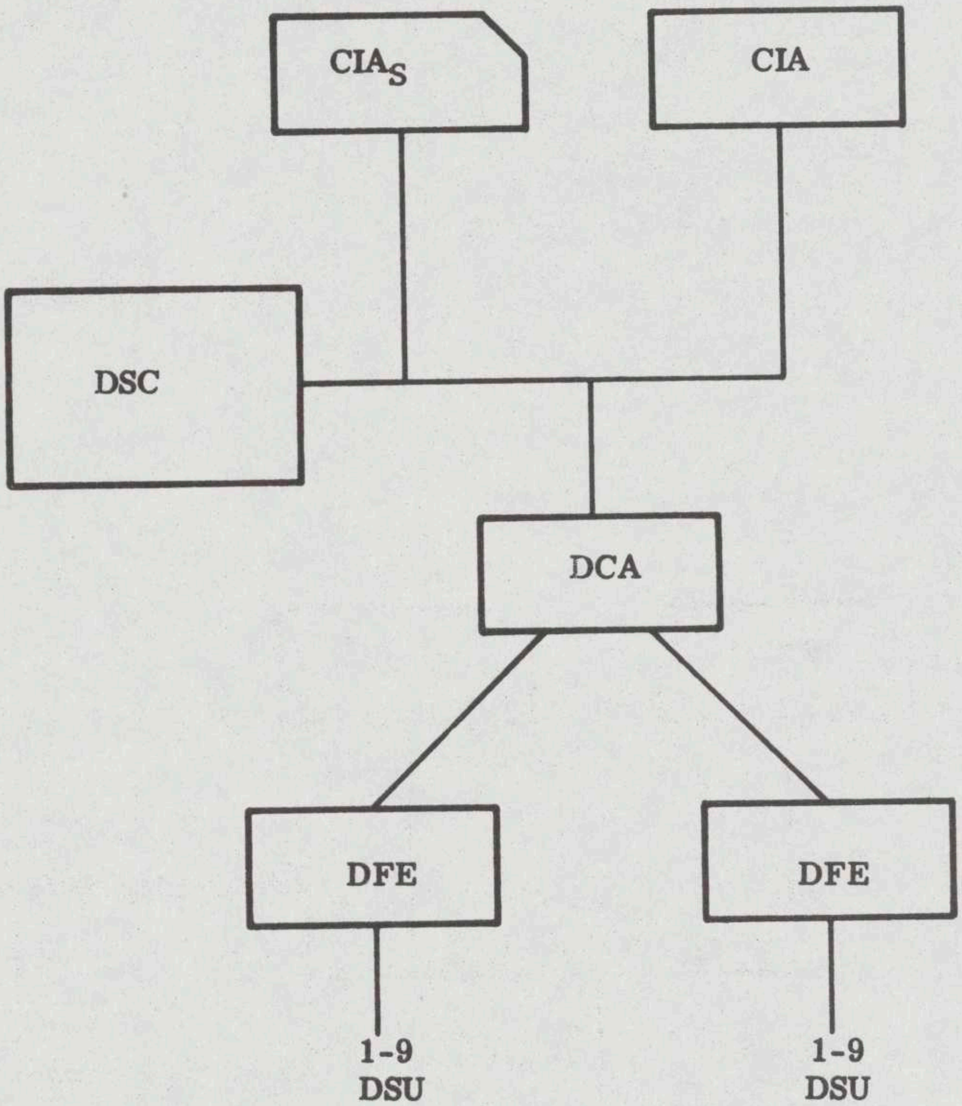


SINGLE CHANNEL 1 x 9
APP. B
FIGURE 1

 Cont. on Page 109

C

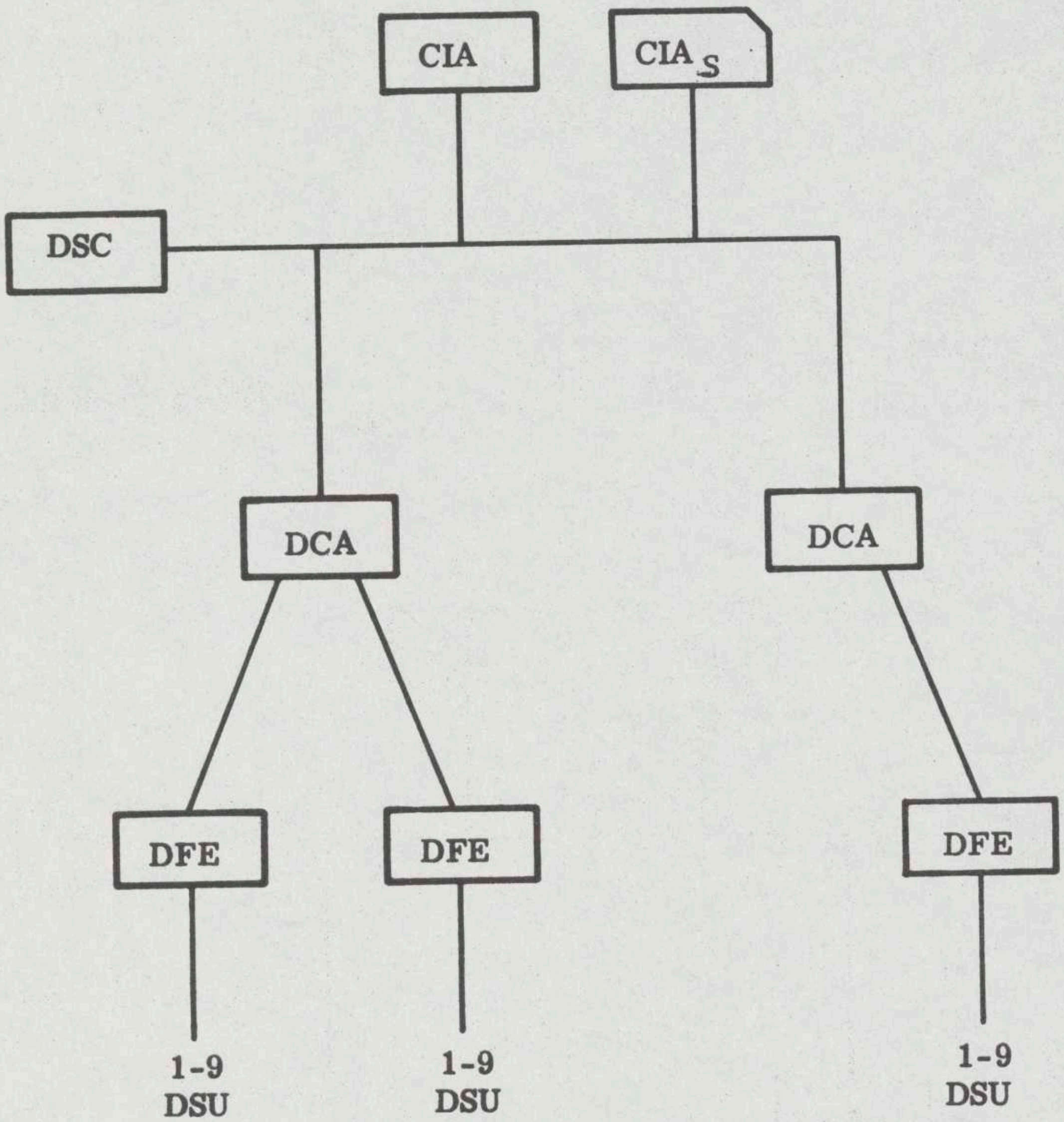


SINGLE CHANNEL 1 x 18

APP. B
FIGURE 2

 Cont. on Page 110

C



6 BIT DEVICE CODE REQUIRED

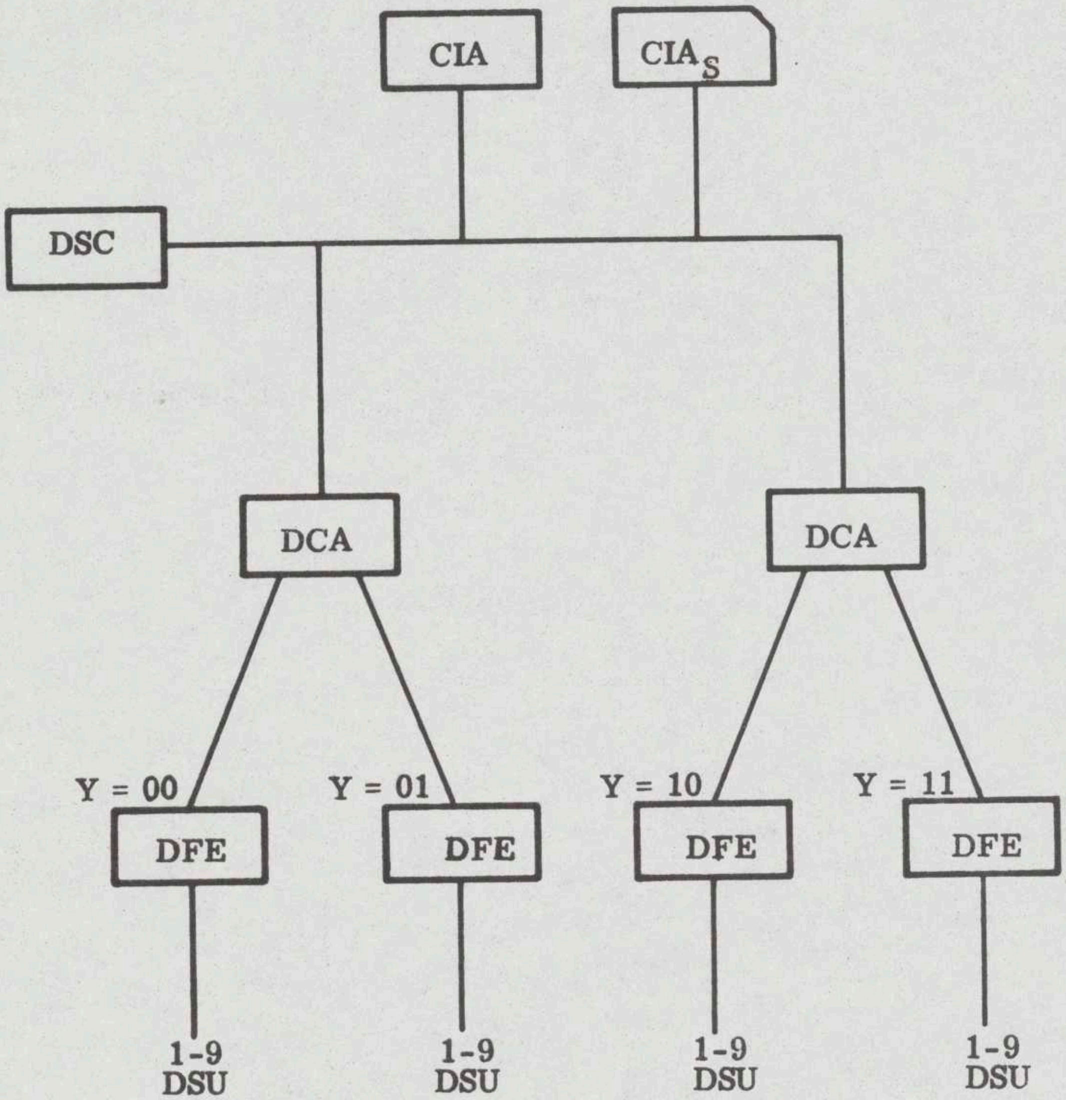
SINGLE CHANNEL 1 x 27

APP. B

FIGURE 3

 Cont. on Page 112

C

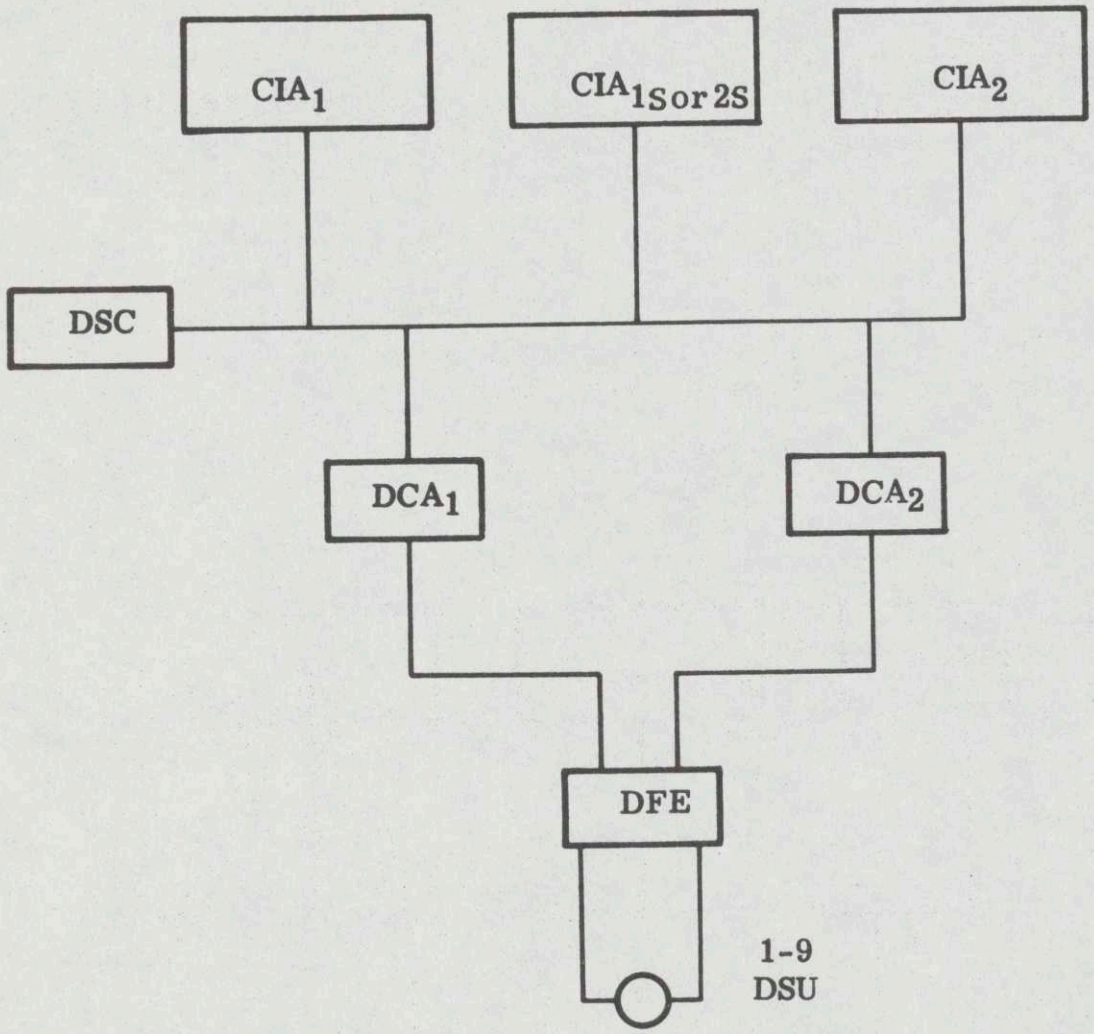


6 BIT DEVICE CODE REQUIRED

SINGLE CHANNEL 1 x 36

APP. B
FIGURE 5

C

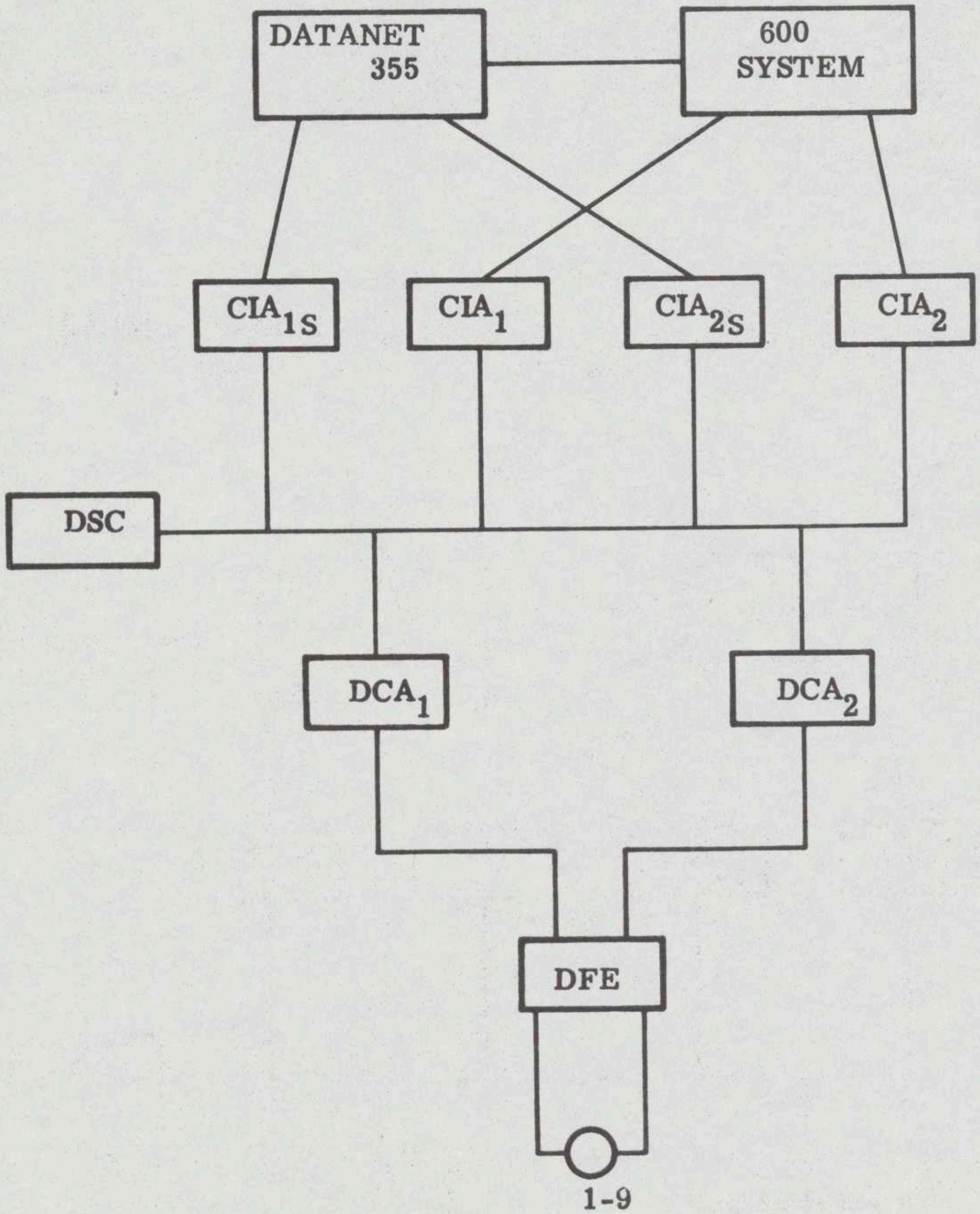


DUAL CHANNEL, SINGLE SWITCHED, 2 x 9

APP. B

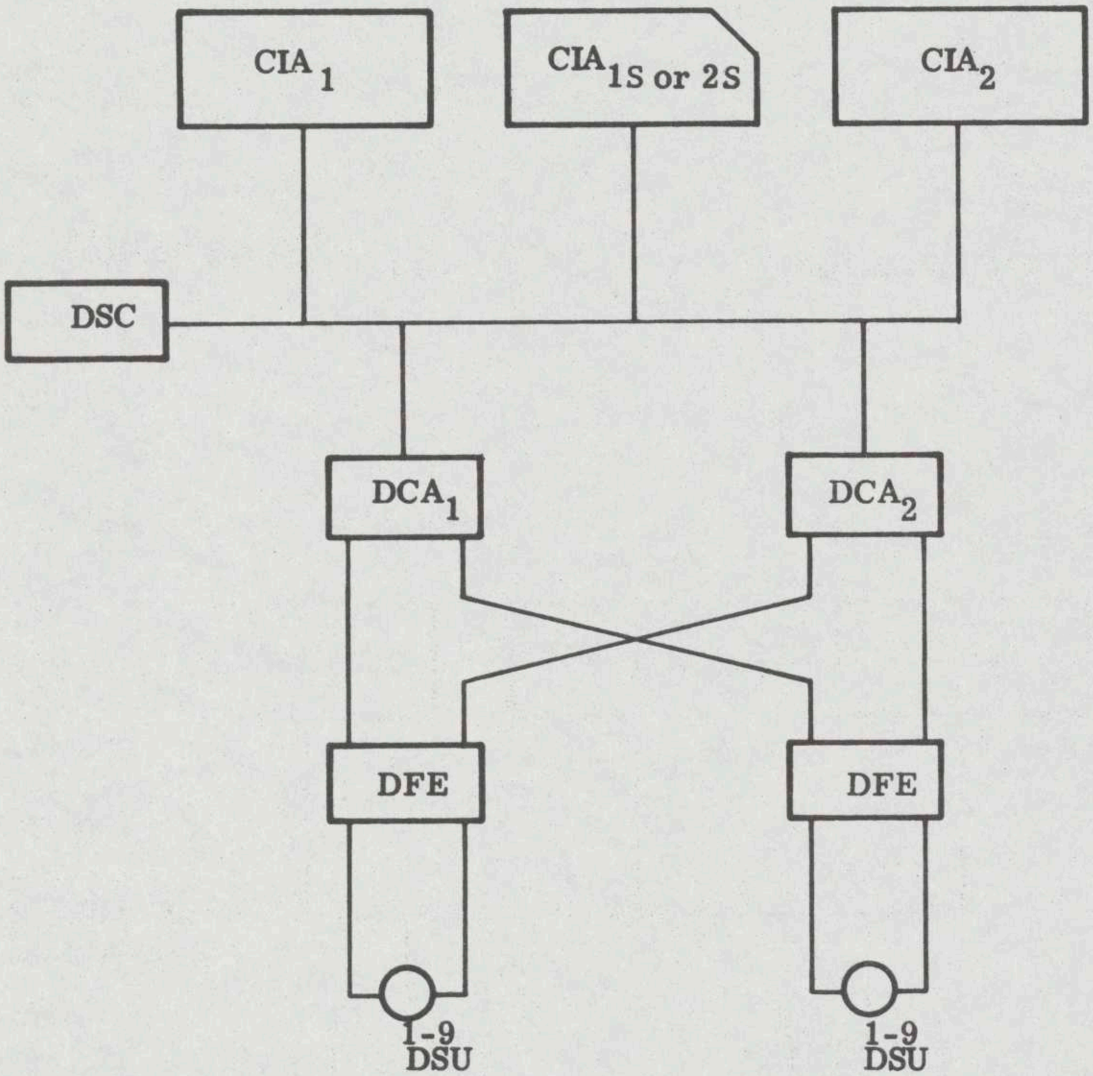
FIGURE 7

C



DUAL CHANNEL, DOUBLE SWITCHED, 2 x 9
APP. B
FIGURE 7a

C

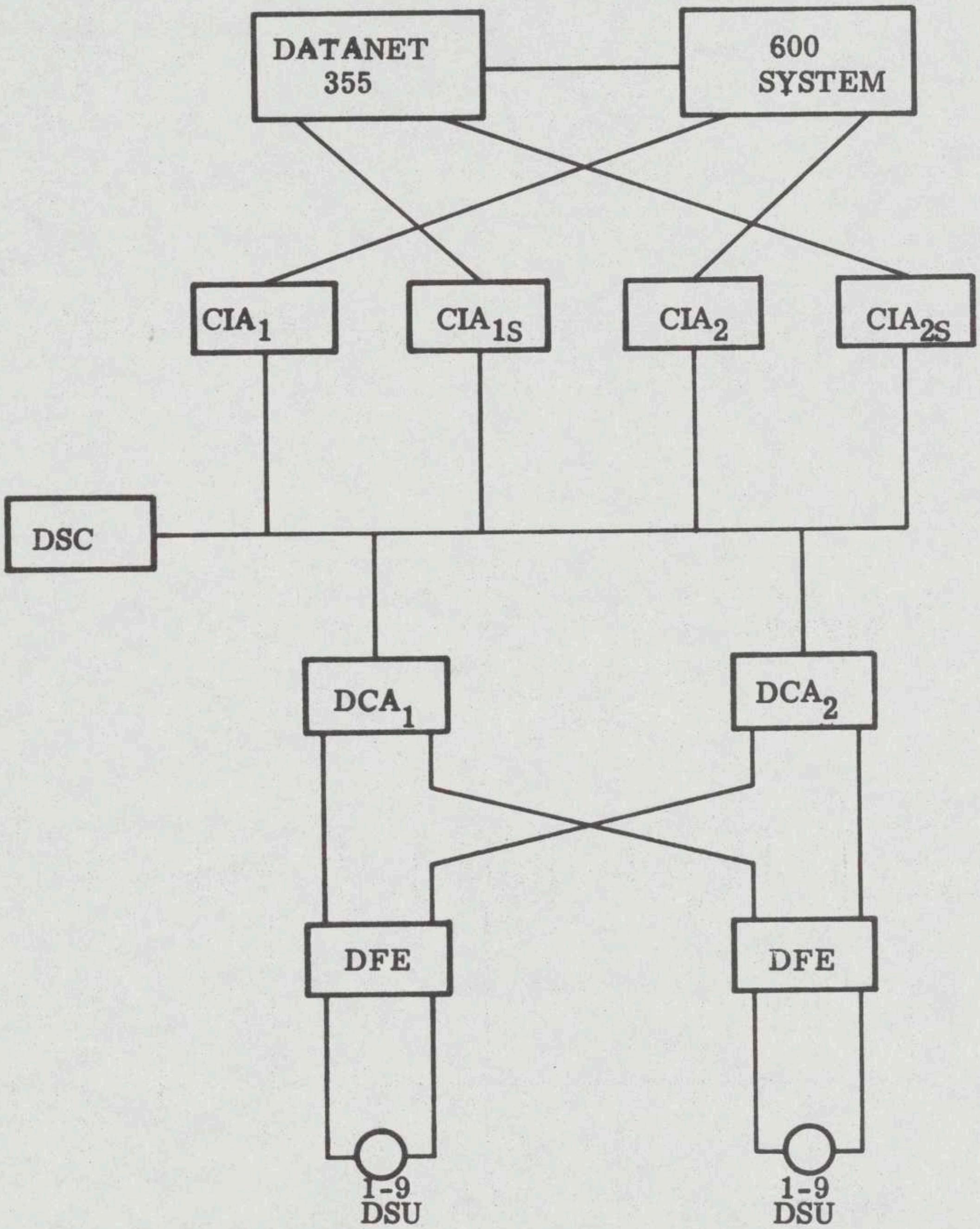


DUAL CHANNEL, SINGLE SWITCHED, 2 x 18

APP. B

FIGURE 8

C



DUAL CHANNEL, DOUBLE SWITCHED, 2 x 18

APP. B

FIGURE 8a

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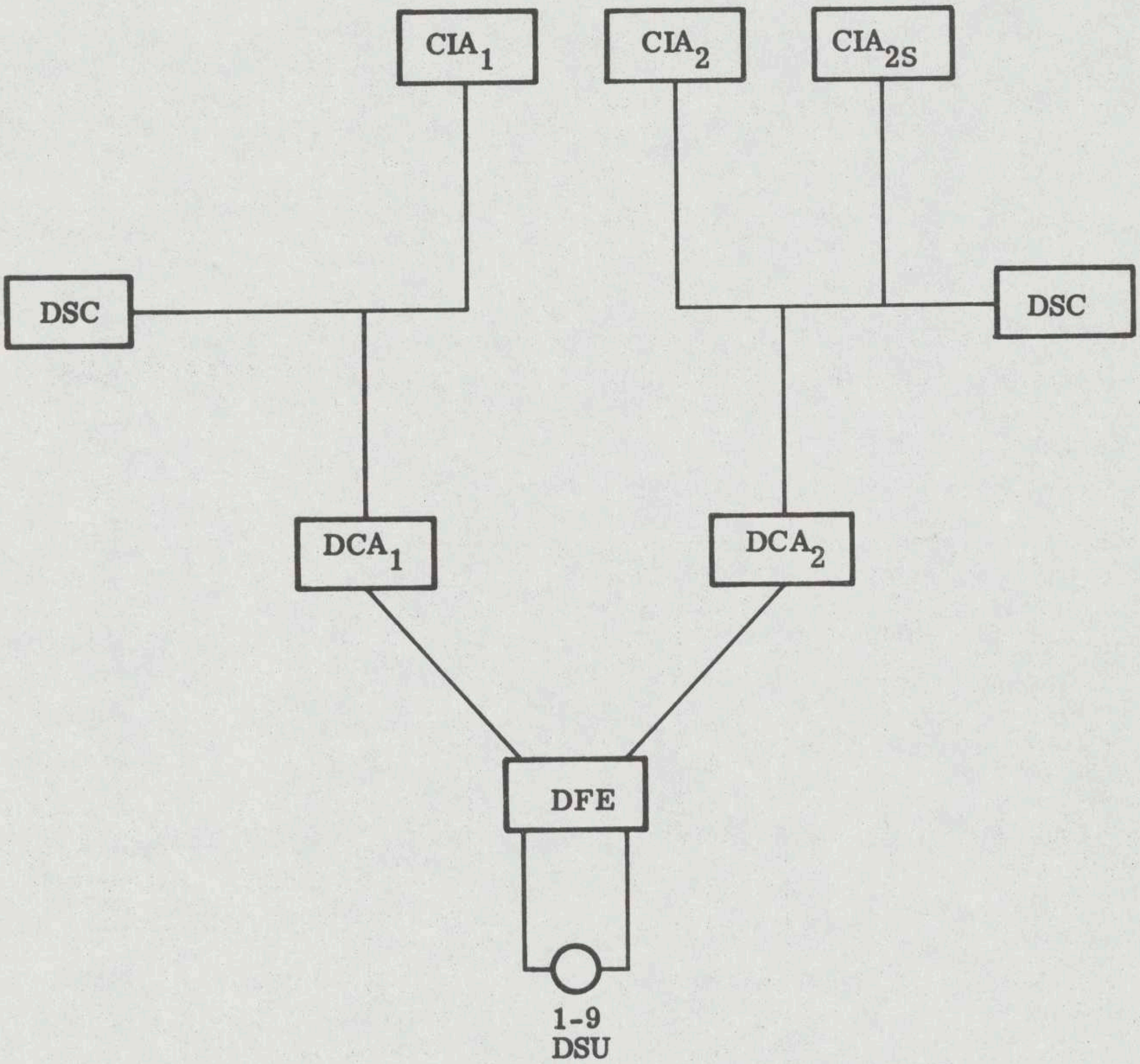
C

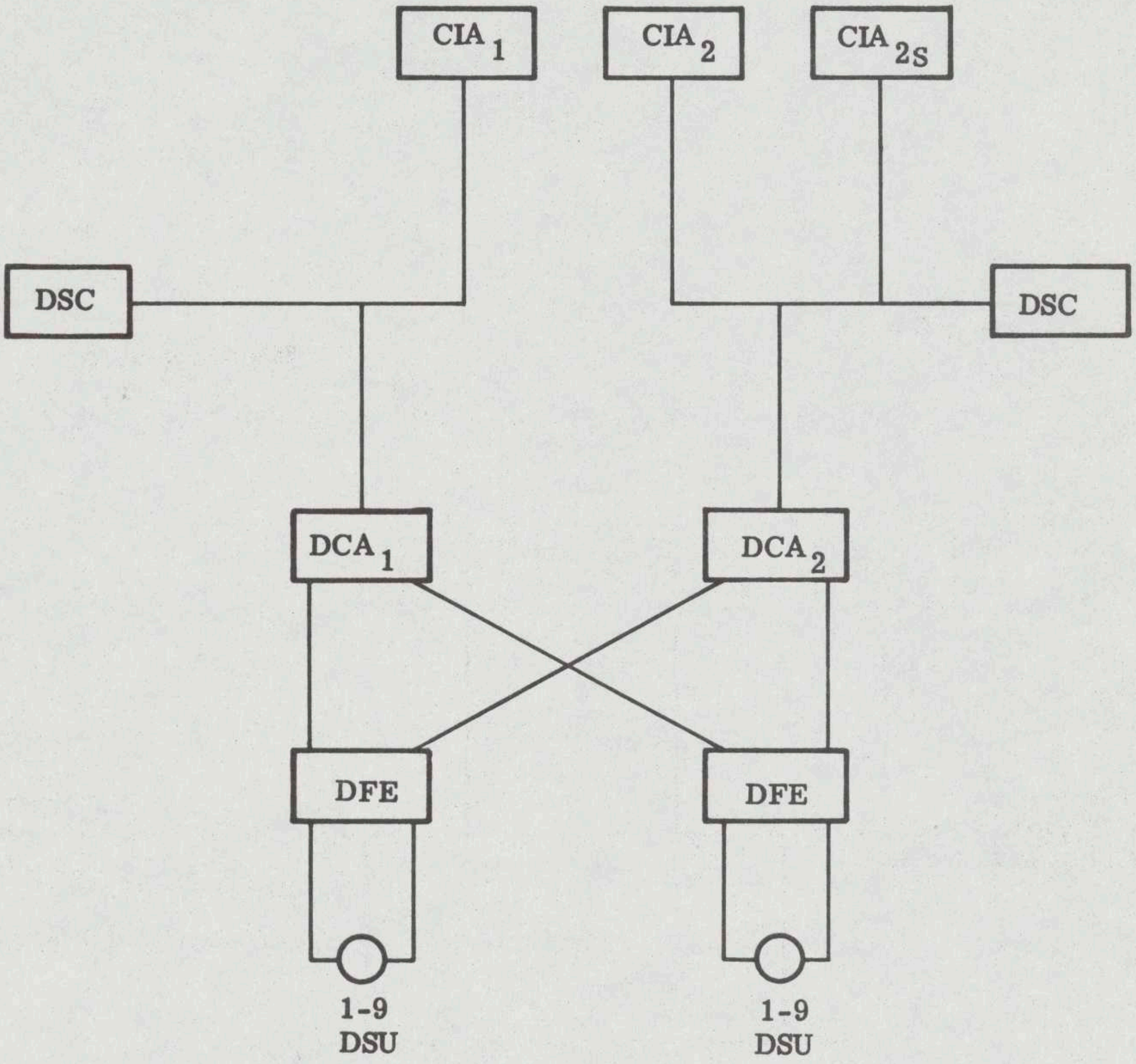


DUAL CHANNEL 2 CONTROLLER 2 x 9

APP. B

FIGURE 9

C



DUAL CHANNEL, 2 CONTROLLER 2 x 18

APP. B

FIGURE 10

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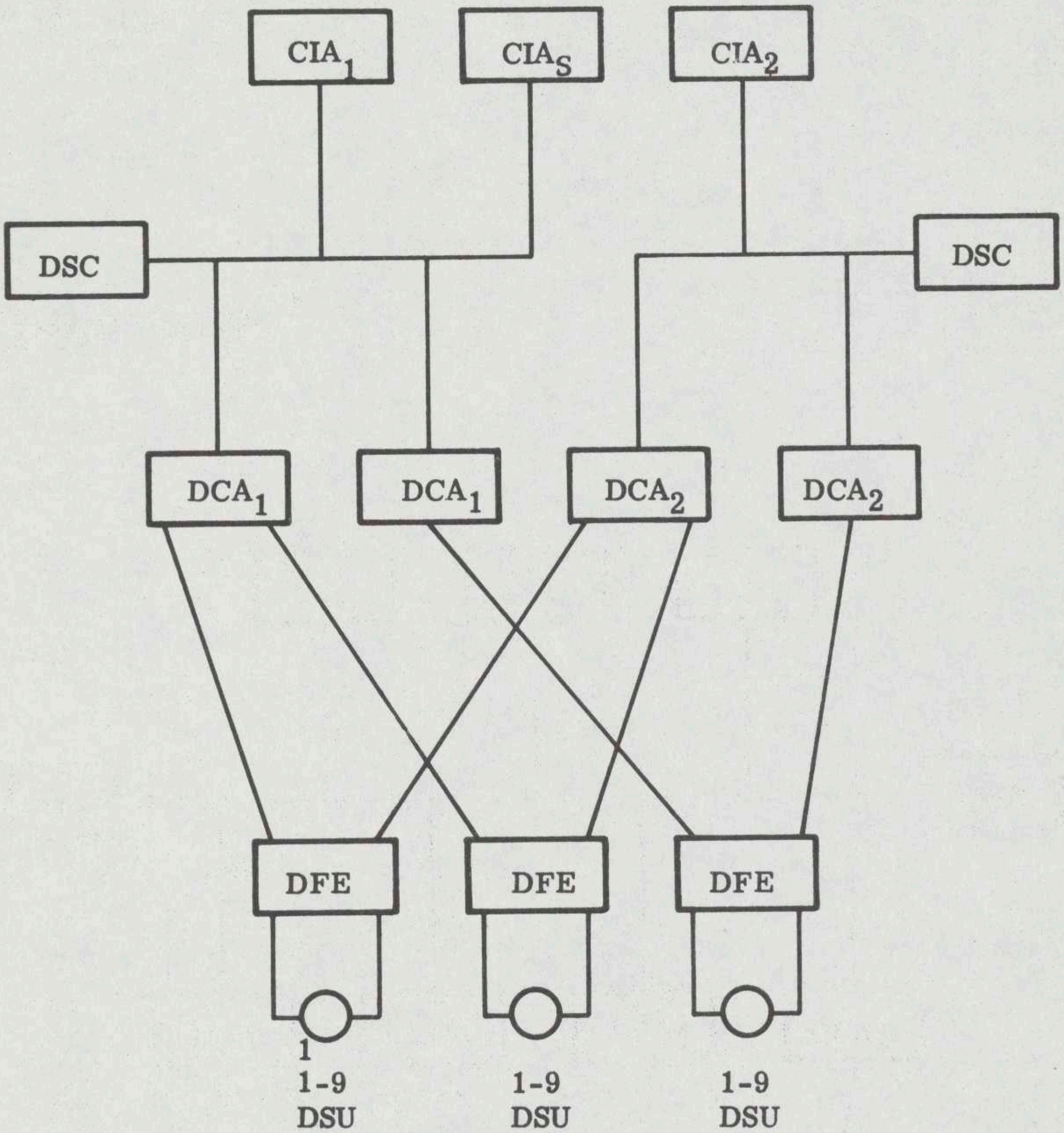
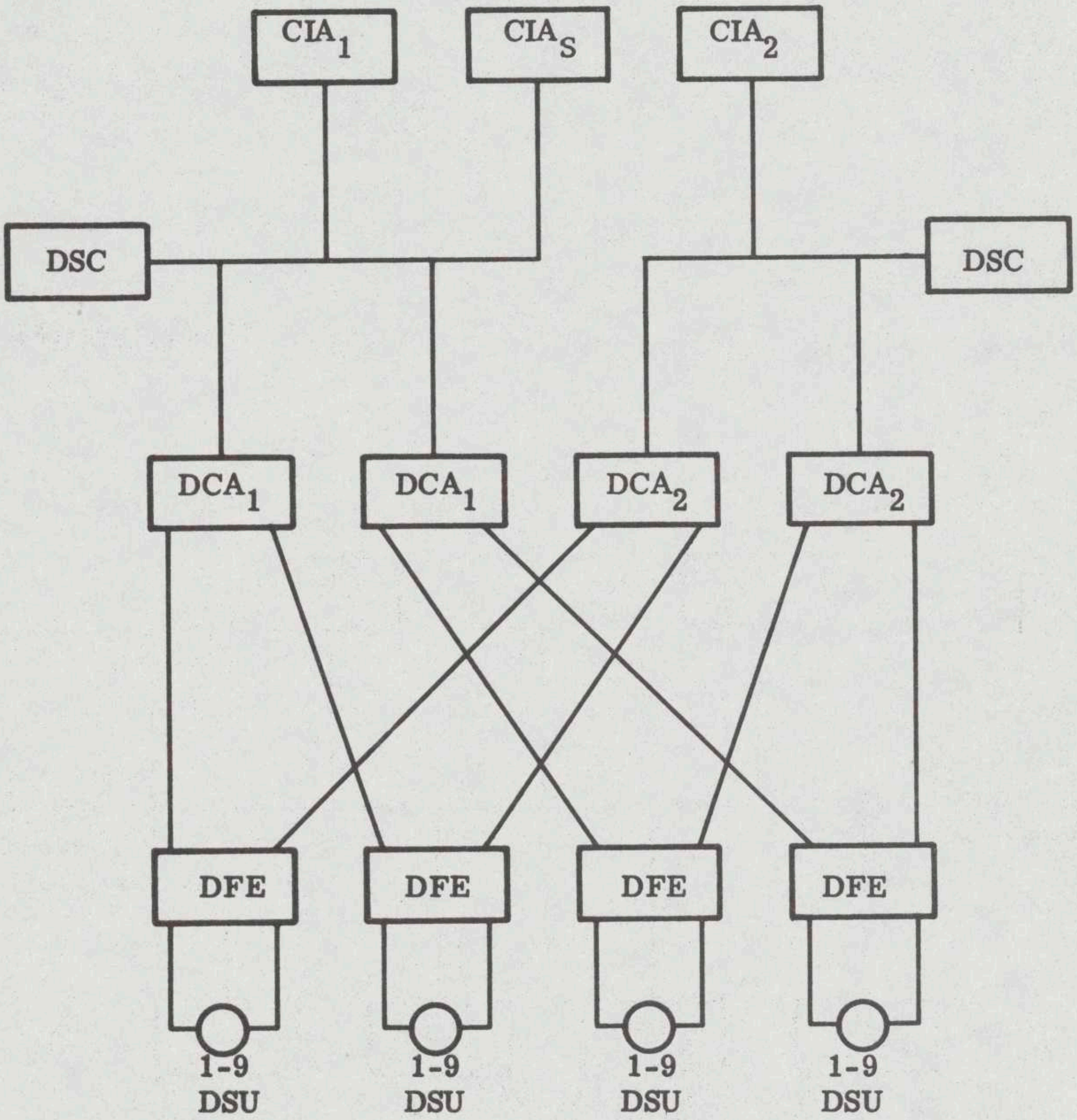
C



6 BIT DEVICE CODE
DUAL CHANNEL 2 CONTROLLER 2x27
APP. B
FIGURE 12

 Cont. on Page 123

C



6 BIT DEVICE CODE

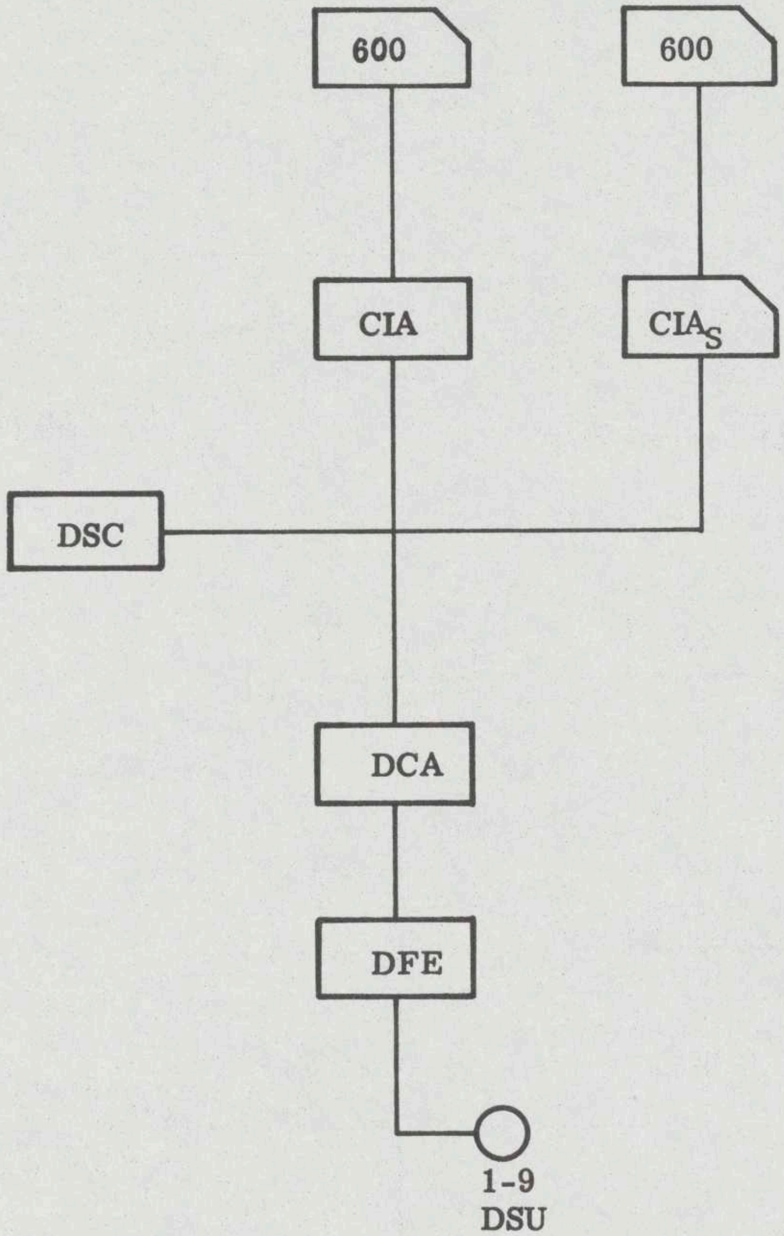
DUAL CHANNEL 2 CONTROLLER 2 x 36

APP. B

FIGURE 14

Cont. on Page 126

C



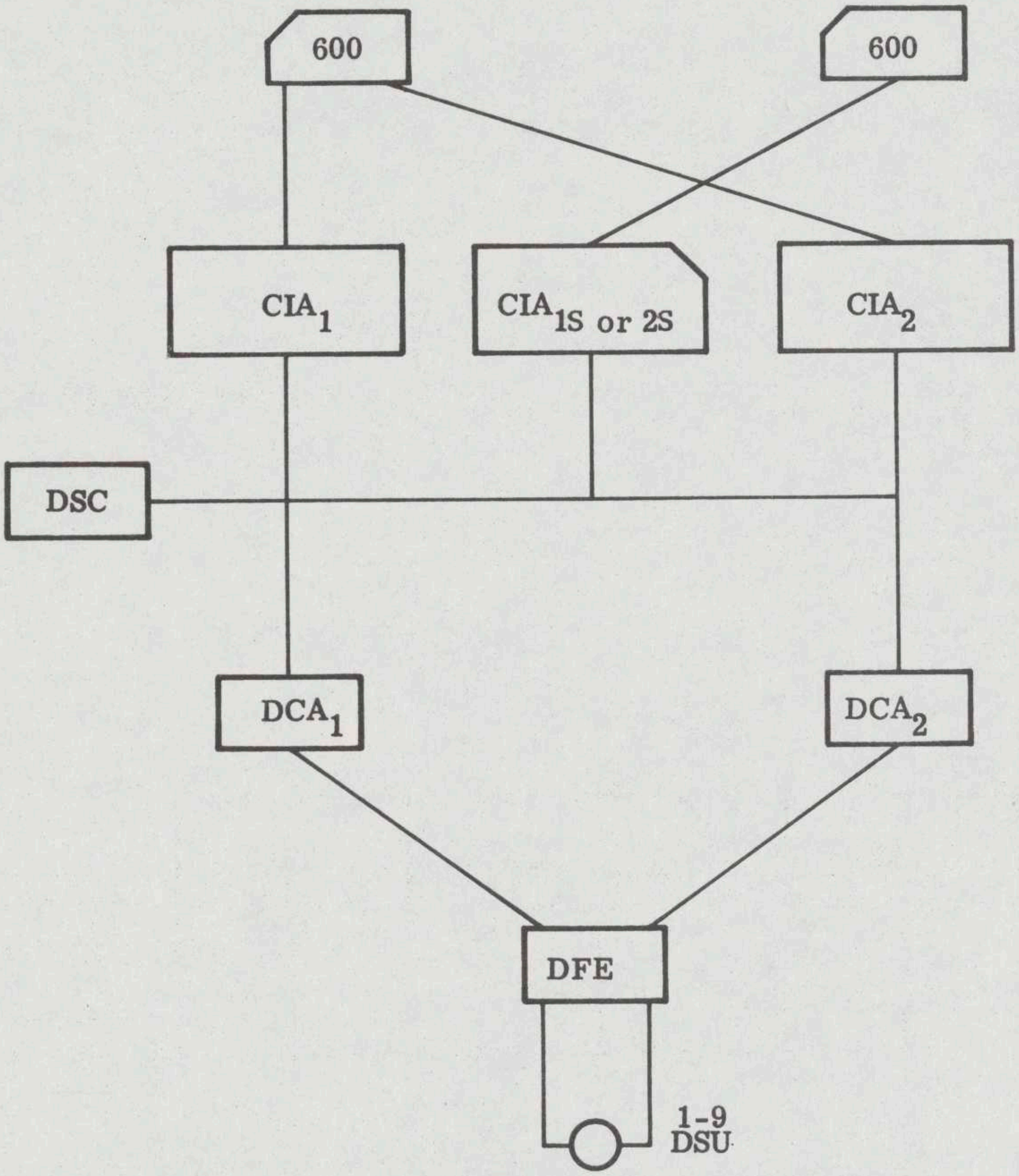
SINGLE CHANNEL, 1 x 9, SWITCHED

APP. C

FIGURE 1

 Cont. on Page 127

C



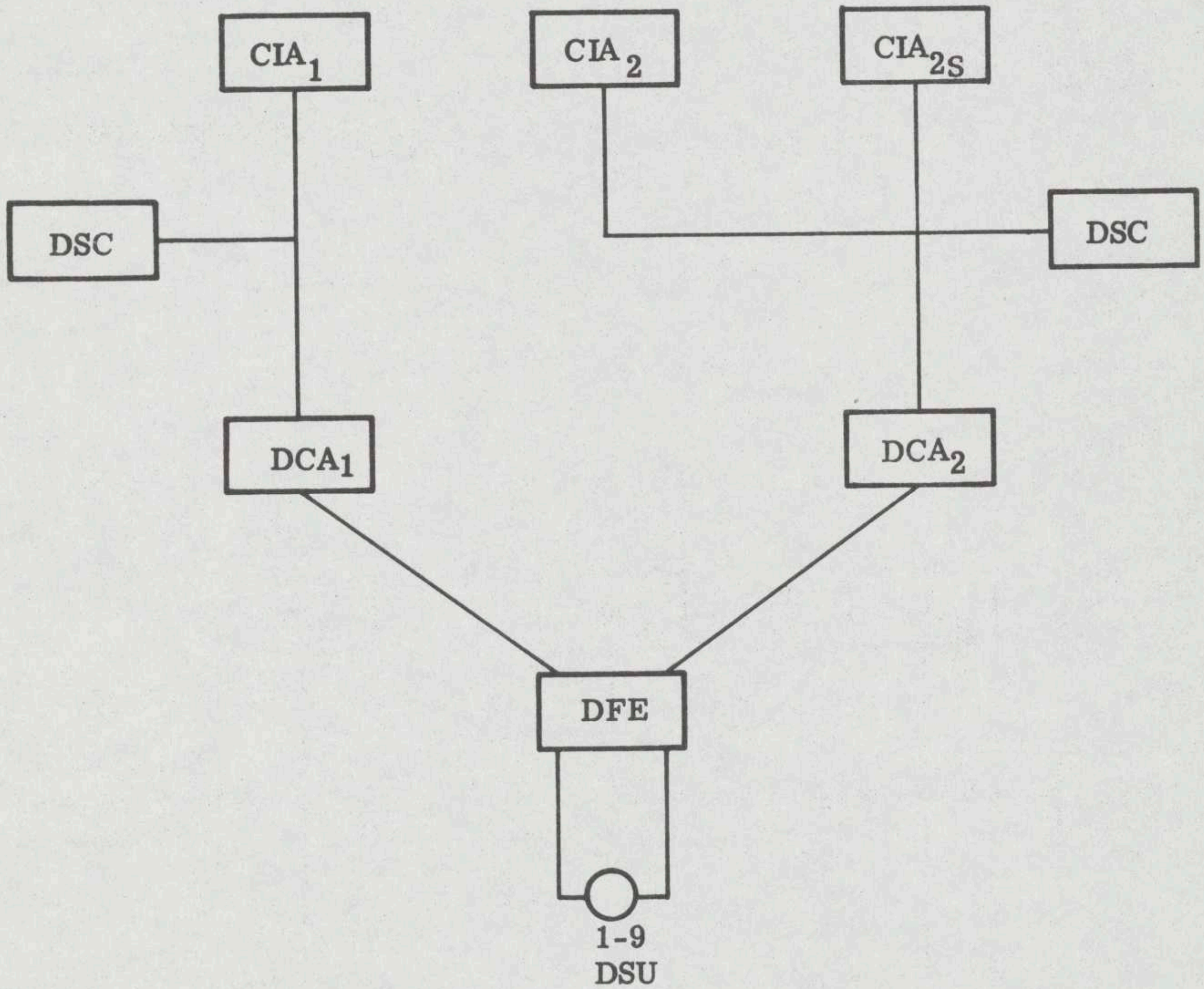
DUAL CHANNEL 2 x 9, SWITCHED SINGLE CHANNEL

APP. C

FIGURE 2

Cont. on Page 128

C

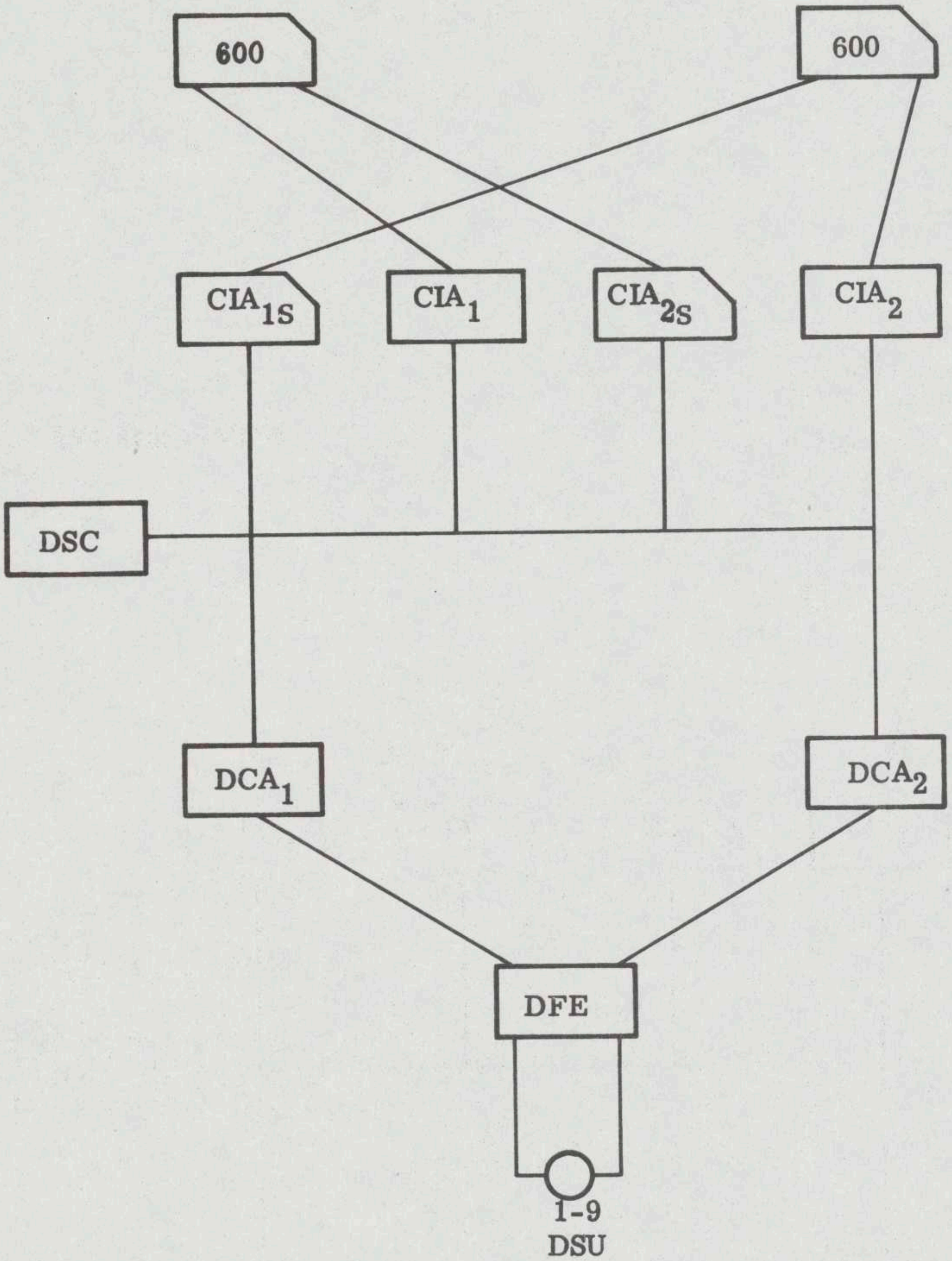


DUAL CHANNEL 2 CONTROLLER 2 x 9, SWITCHED

APP. C

FIGURE 3

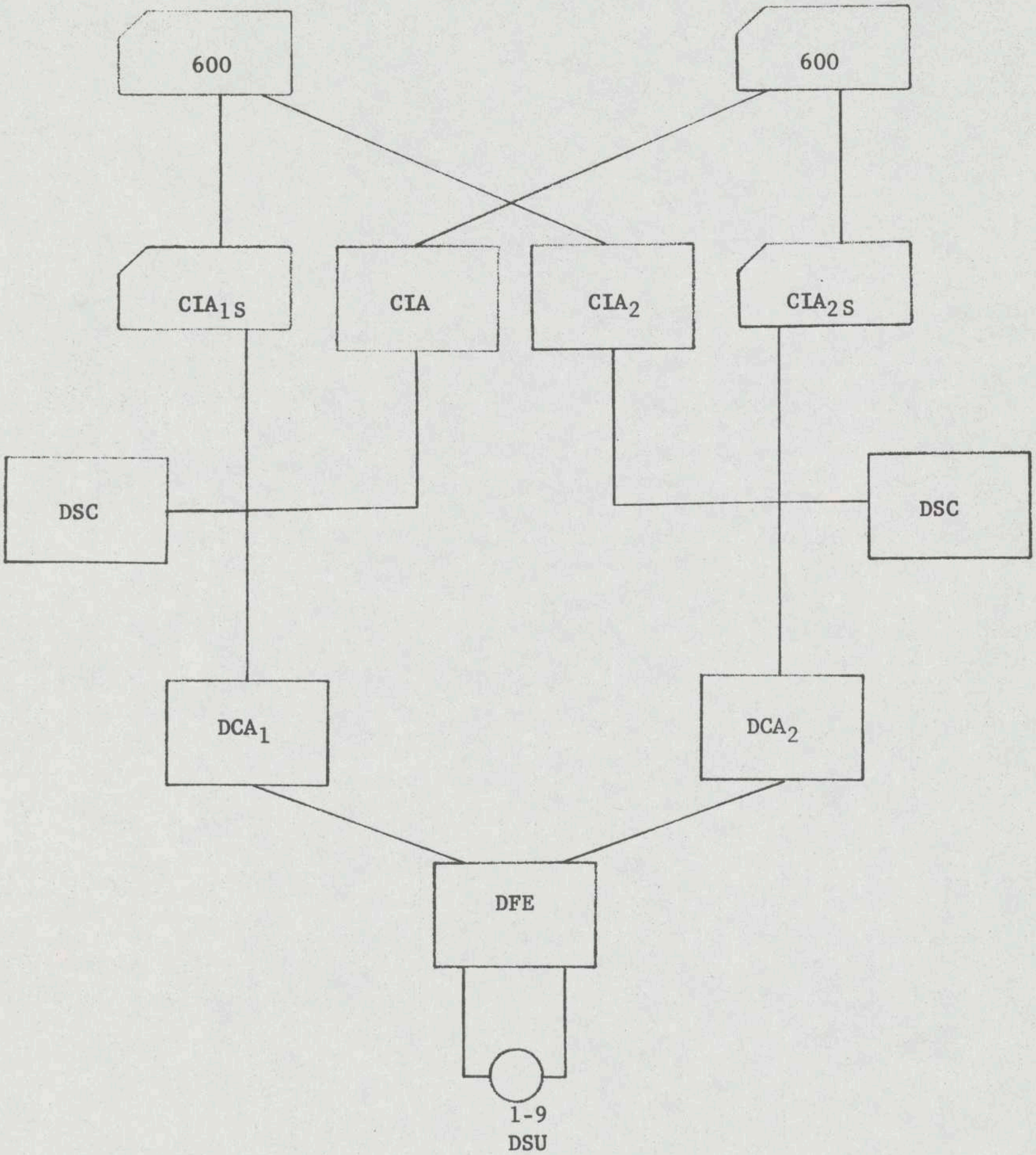
C



DUAL CHANNEL 2 x 9, SHARED

APP. C
FIGURE 4

C

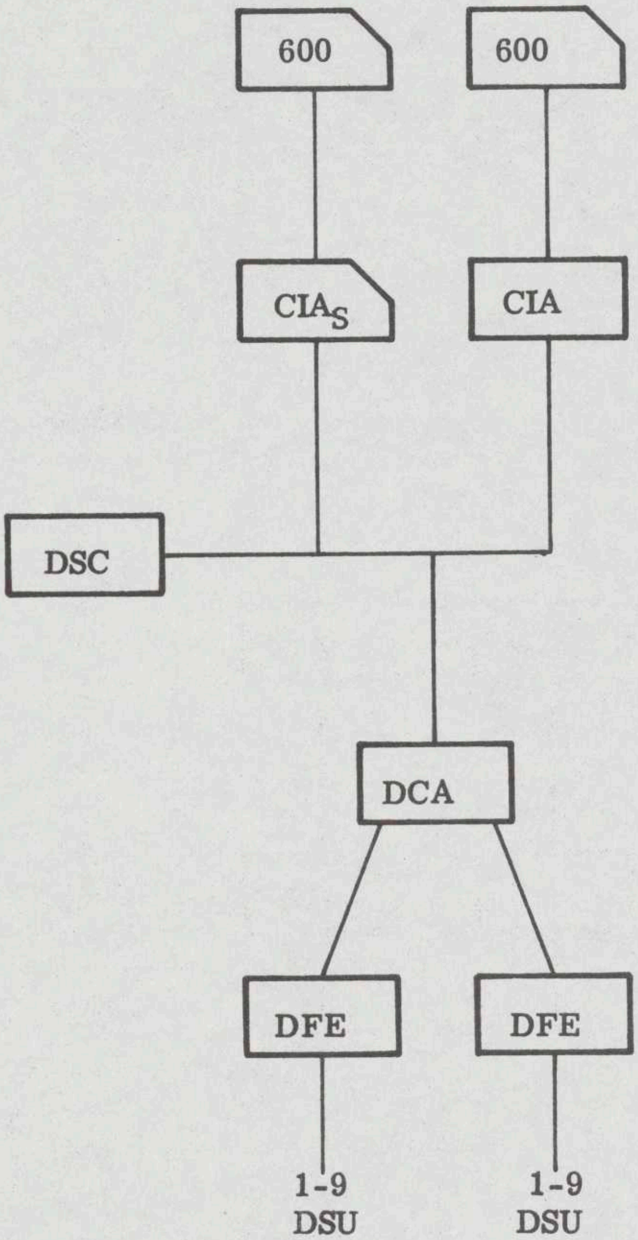


DUAL CHANNEL 2 CONTROLLER 2 X 9 SHARED

APP. C.

FIGURE 5

C

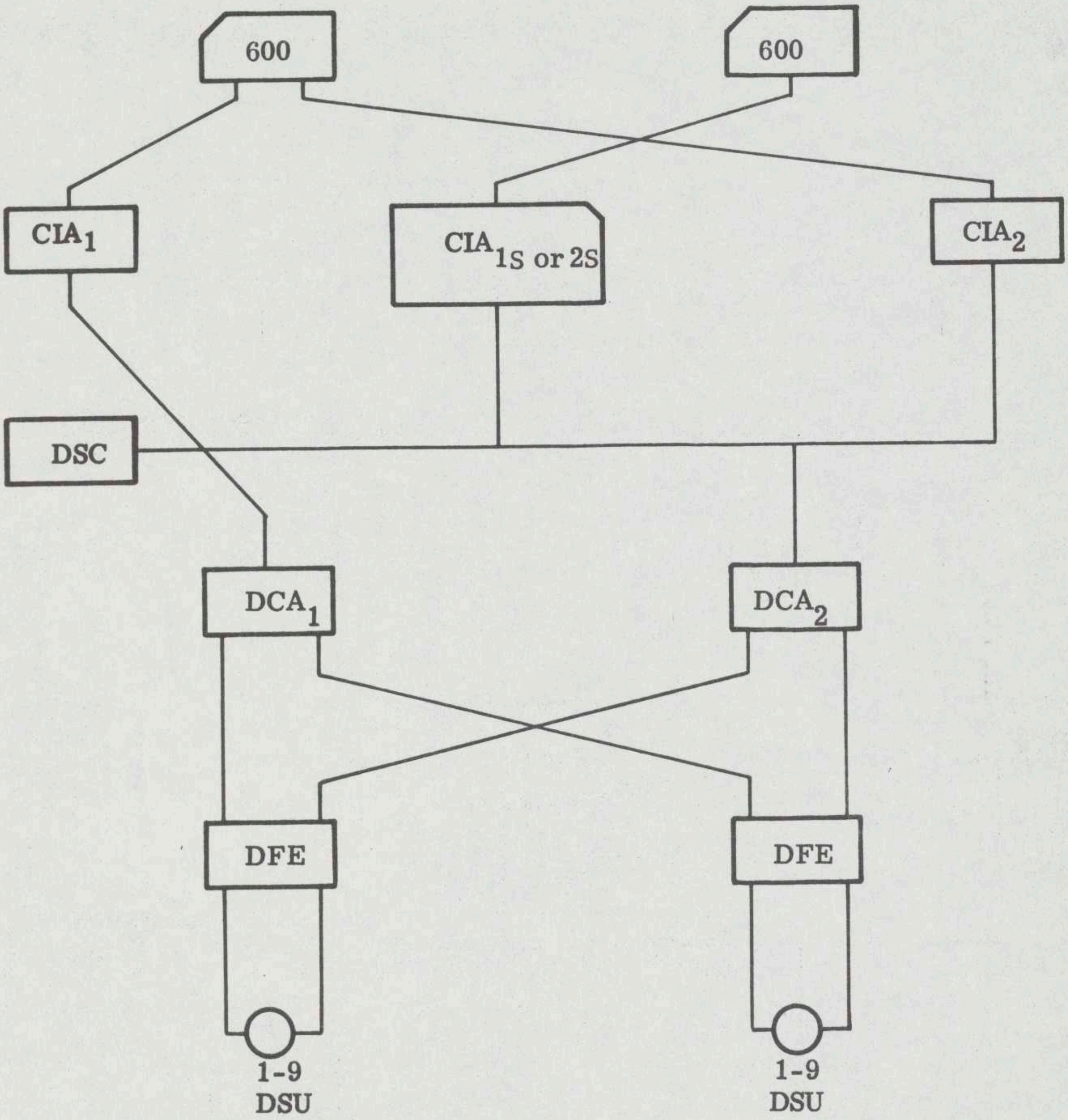


SINGLE CHANNEL 1 x 18, SWITCHED

APP. C

FIGURE 6

C



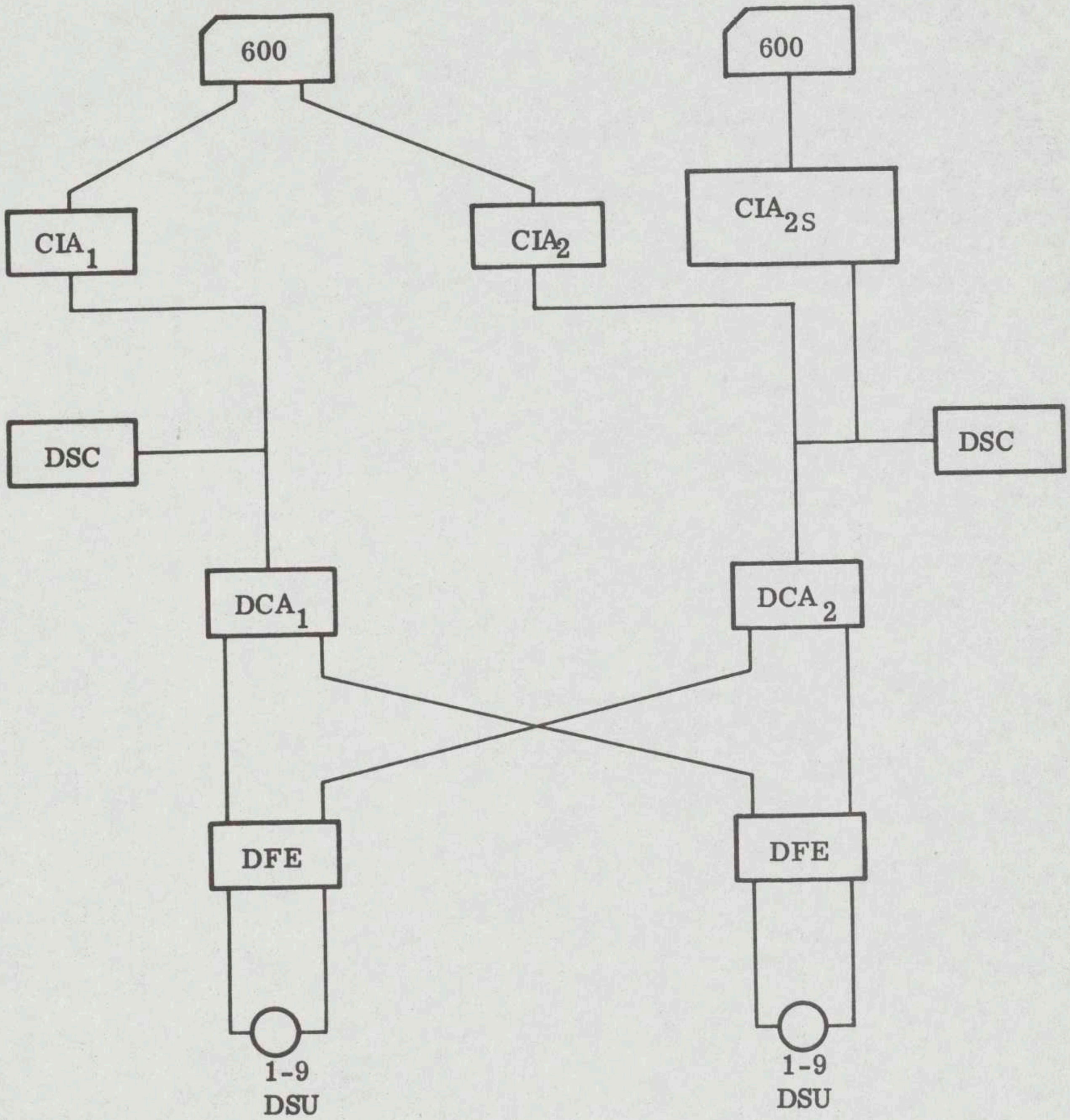
DUAL CHANNEL 2 x 18, SWITCHED

APP. C

FIGURE 7

Cont. on Page 133

C



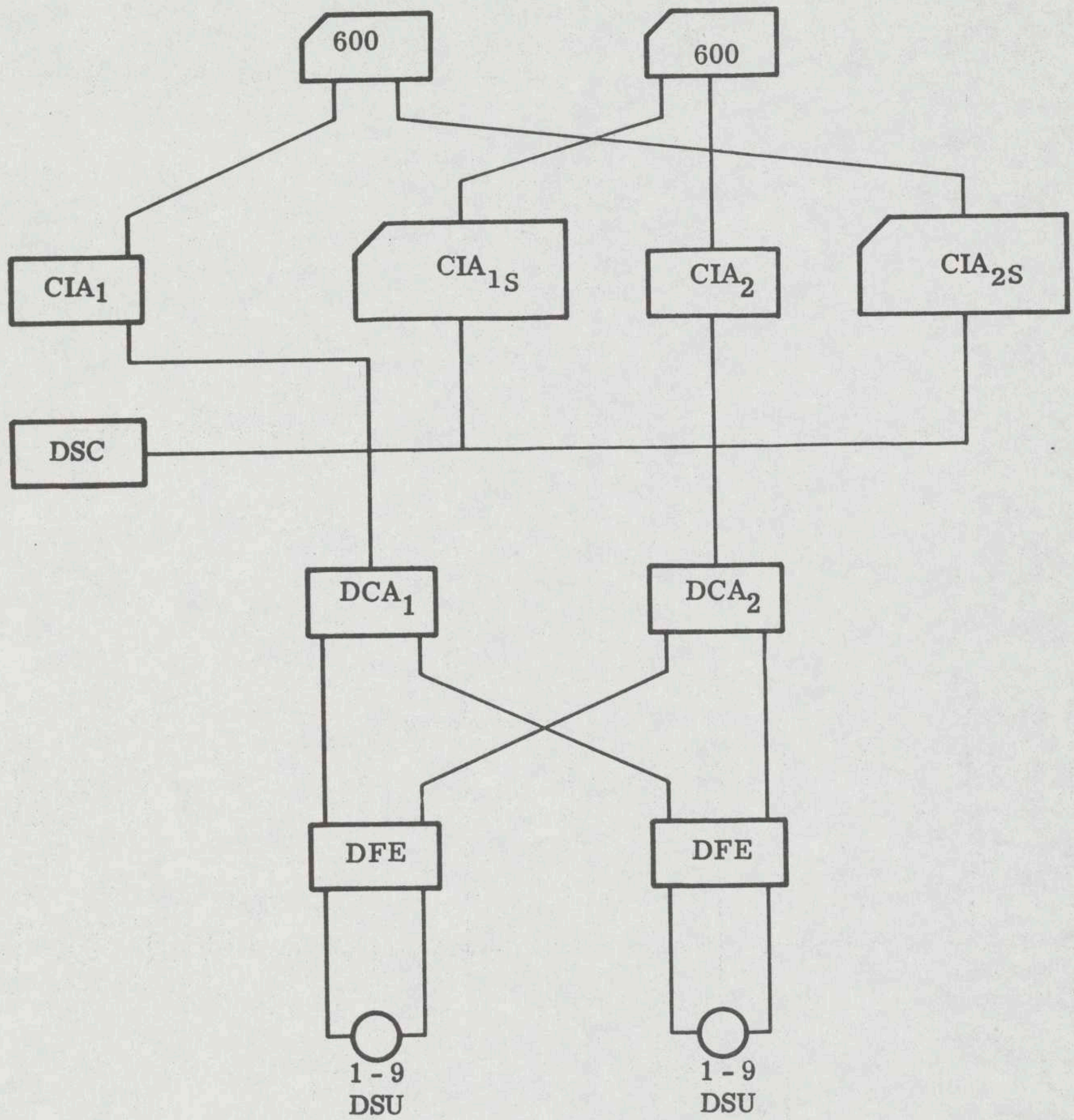
DUAL CHANNEL 2 CONTROLLER 2 x 18, SWITCHED

APP. C

FIGURE 8

Cont. on Page 136

C



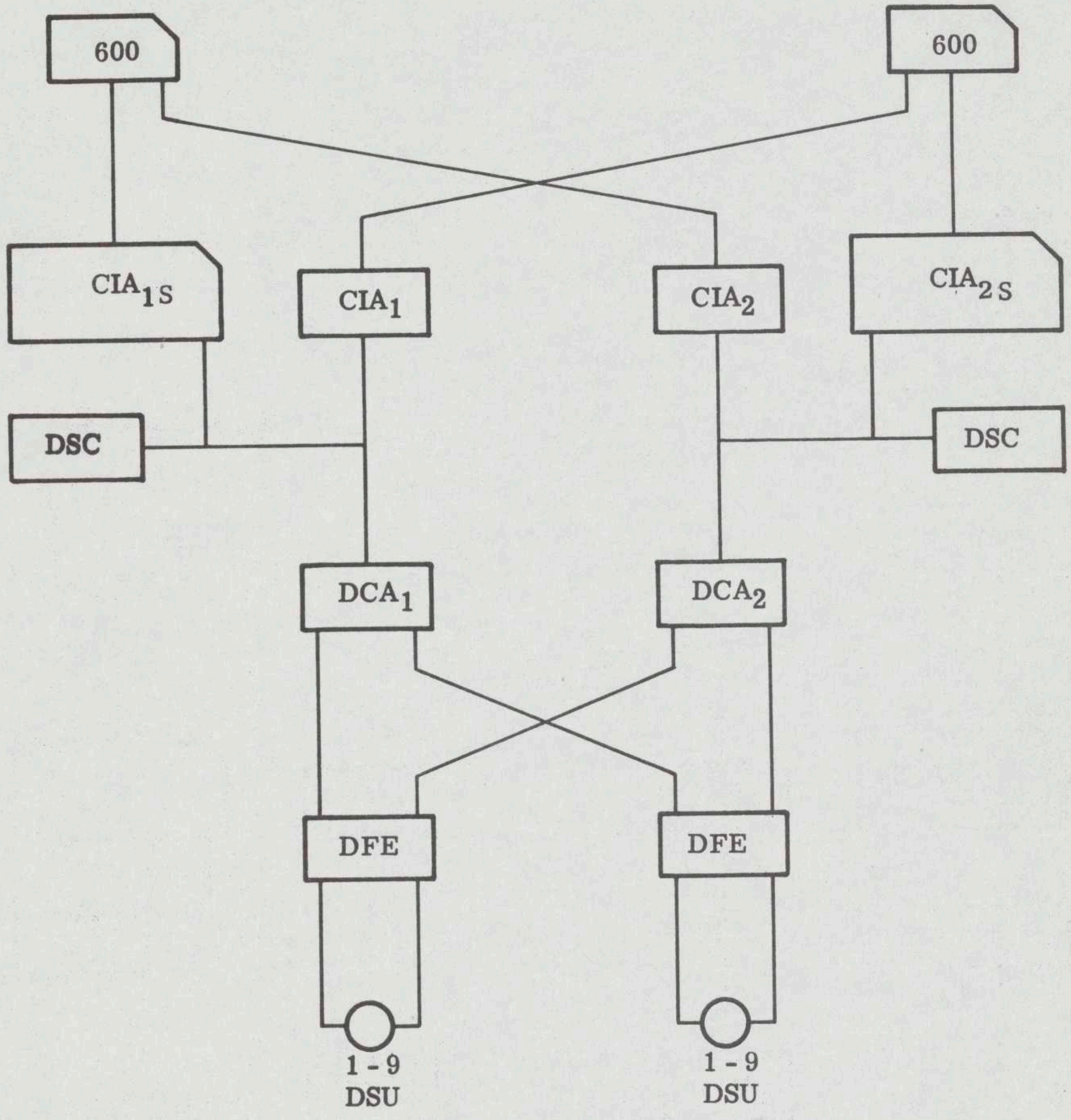
DUAL CHANNEL 2x18, SHARED

APP. C

FIGURE 11

 Cont. on Page 137

C



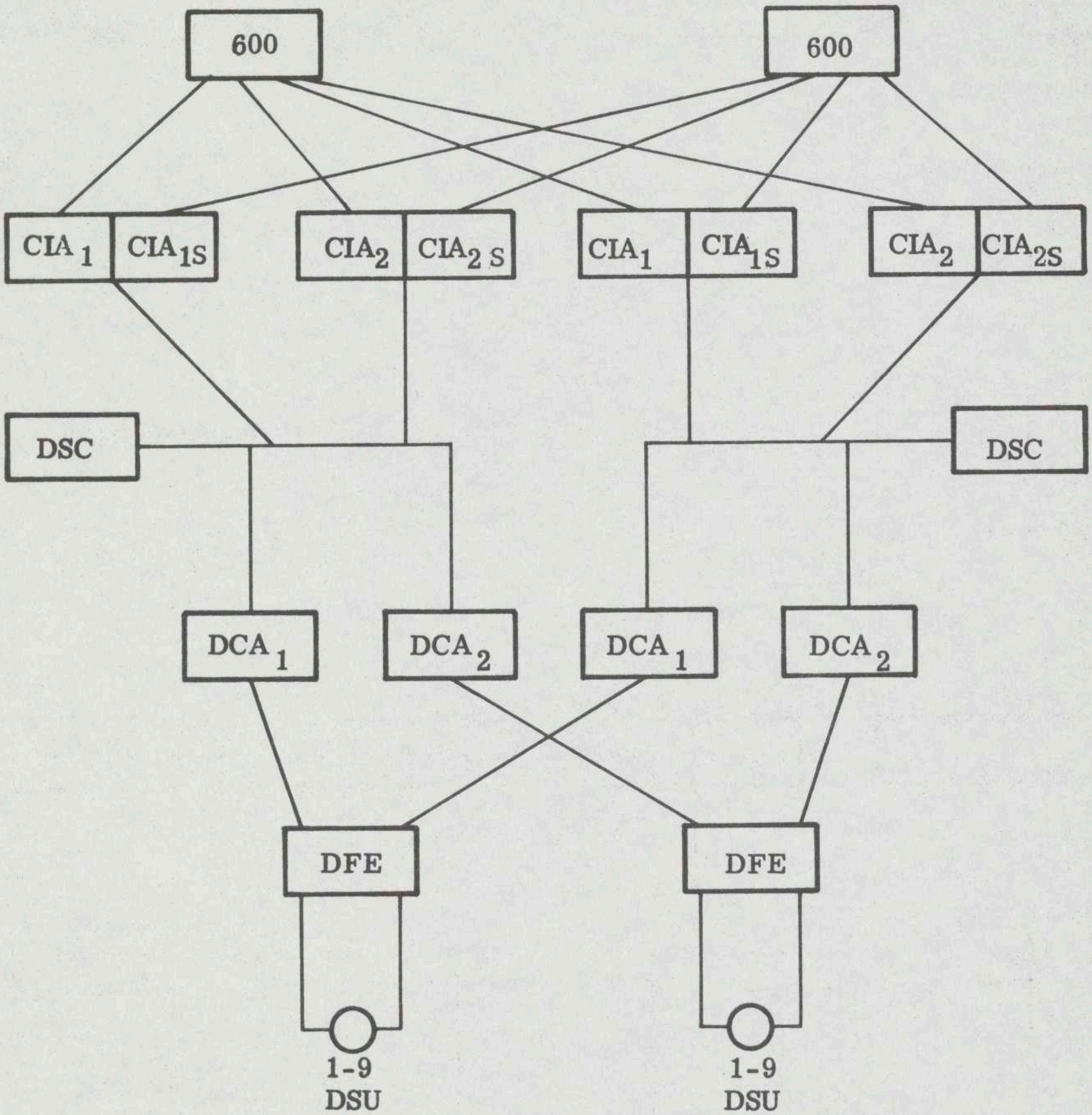
DUAL CHANNEL 2 CONTROLLER 2x18, SHARED

APP. C

FIGURE 12

 Cont. on Page 139

C



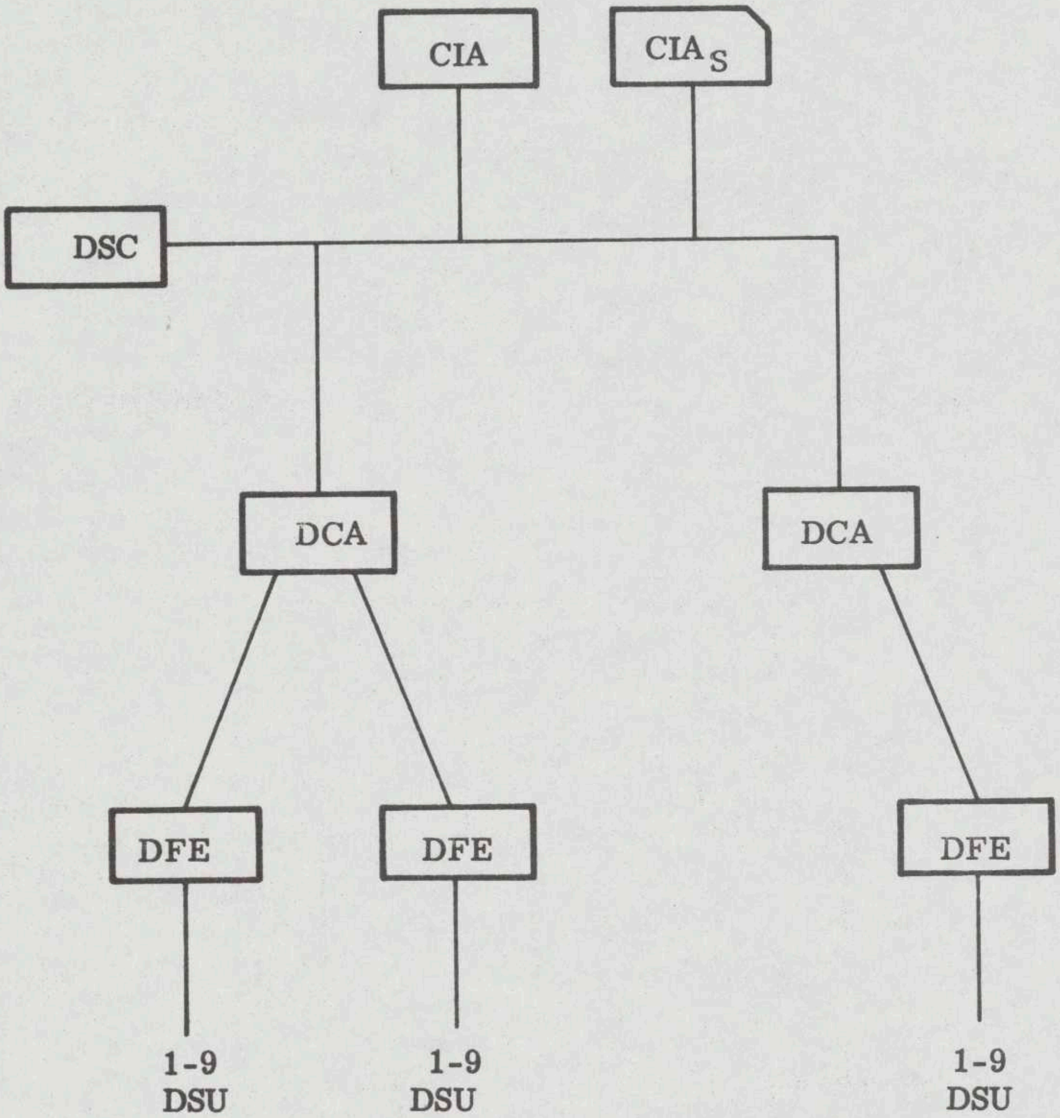
DUAL CHANNEL 2 CONTROLLER (2) 2 x 9 SHARED

APP. C

FIGURE 14

 Cont. on Page 140

C



6 BIT DEVICE CODE REQUIRED

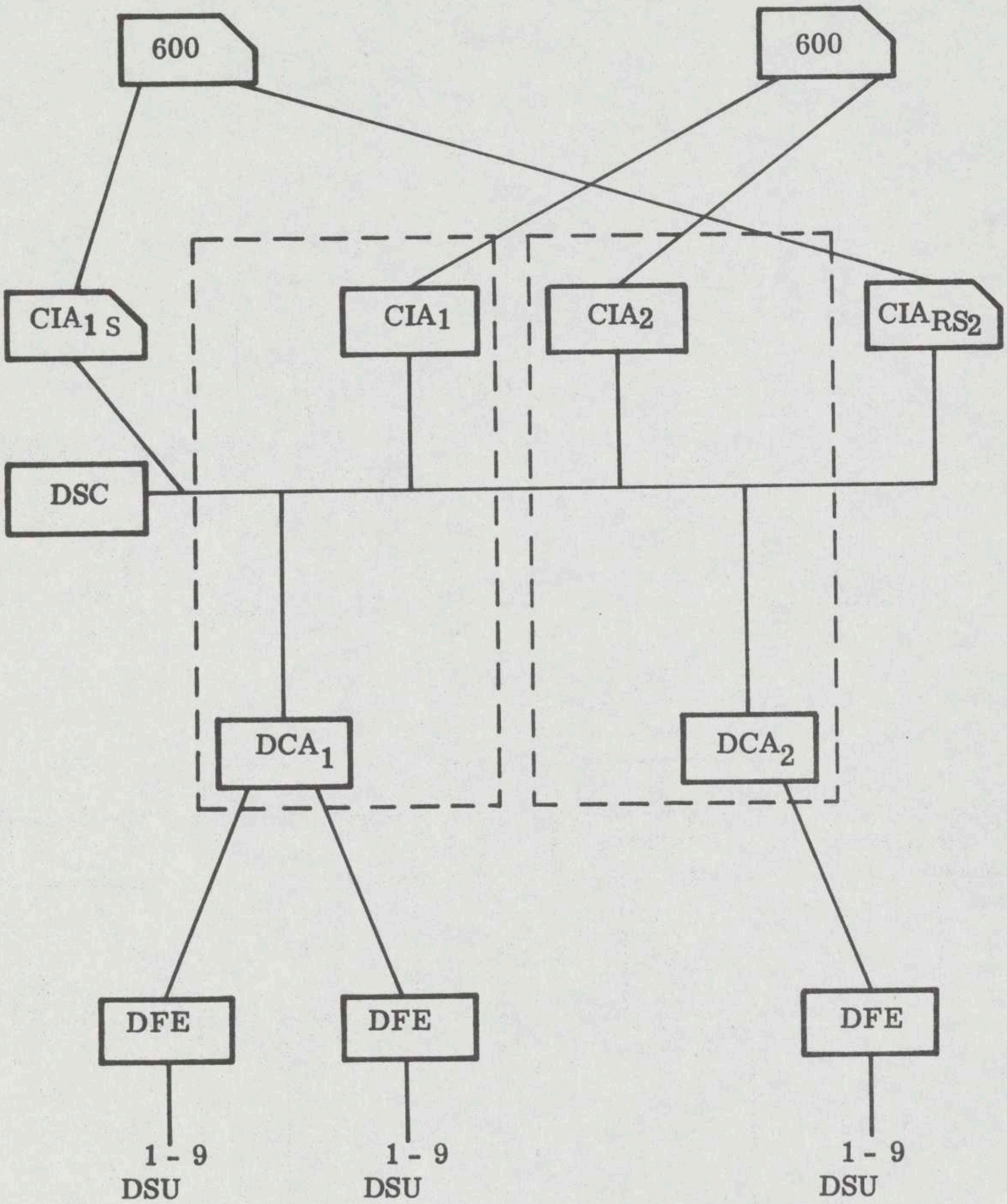
SINGLE CHANNEL 1x27, SWITCHED

APP. C

FIGURE 15

Cont. on Page 141

C



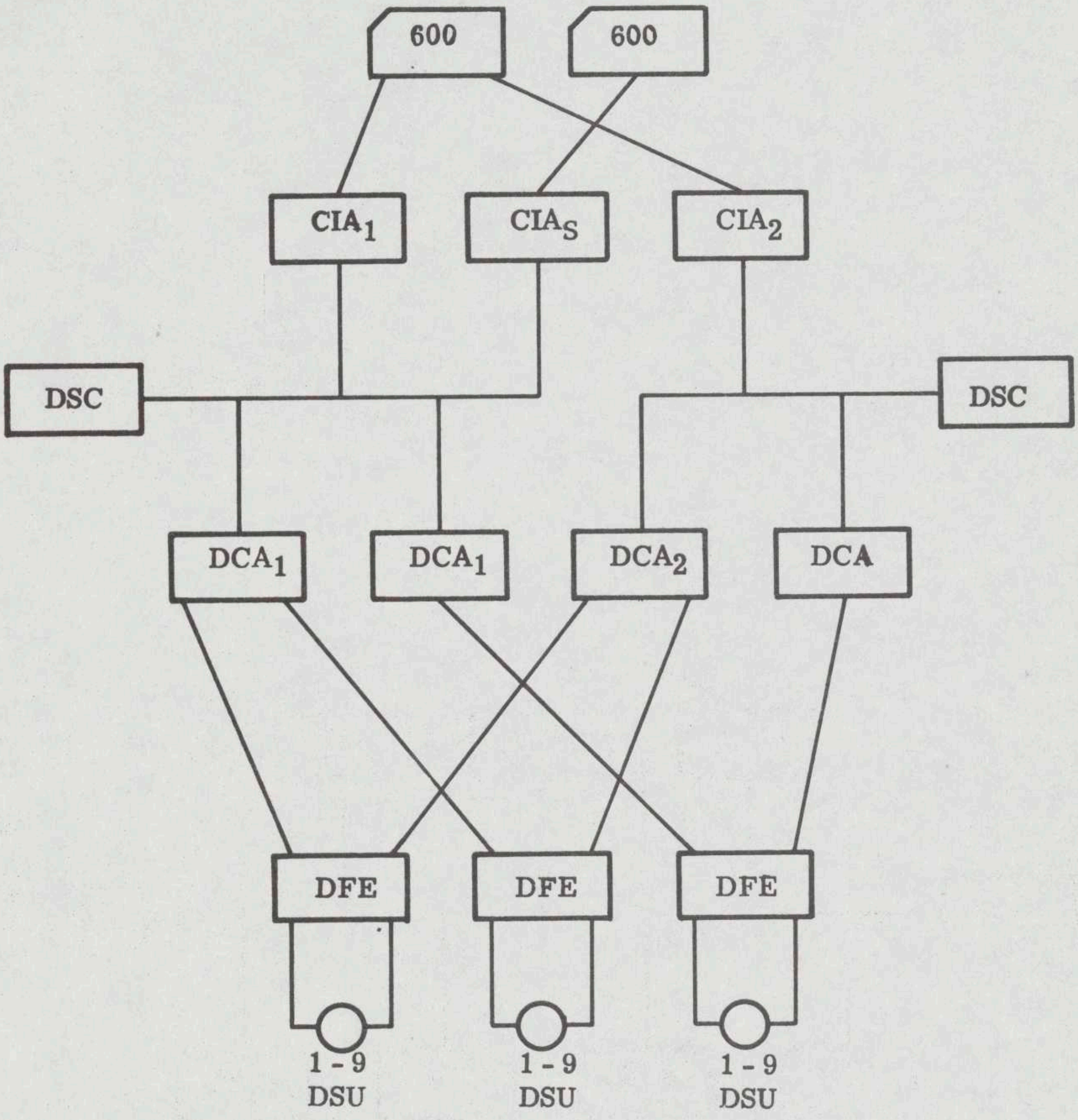
TWO SINGLE CHANNELS 1x18 + 1x9 SHARED

APP. C

FIGURE 16

 Cont. on Page 142

C



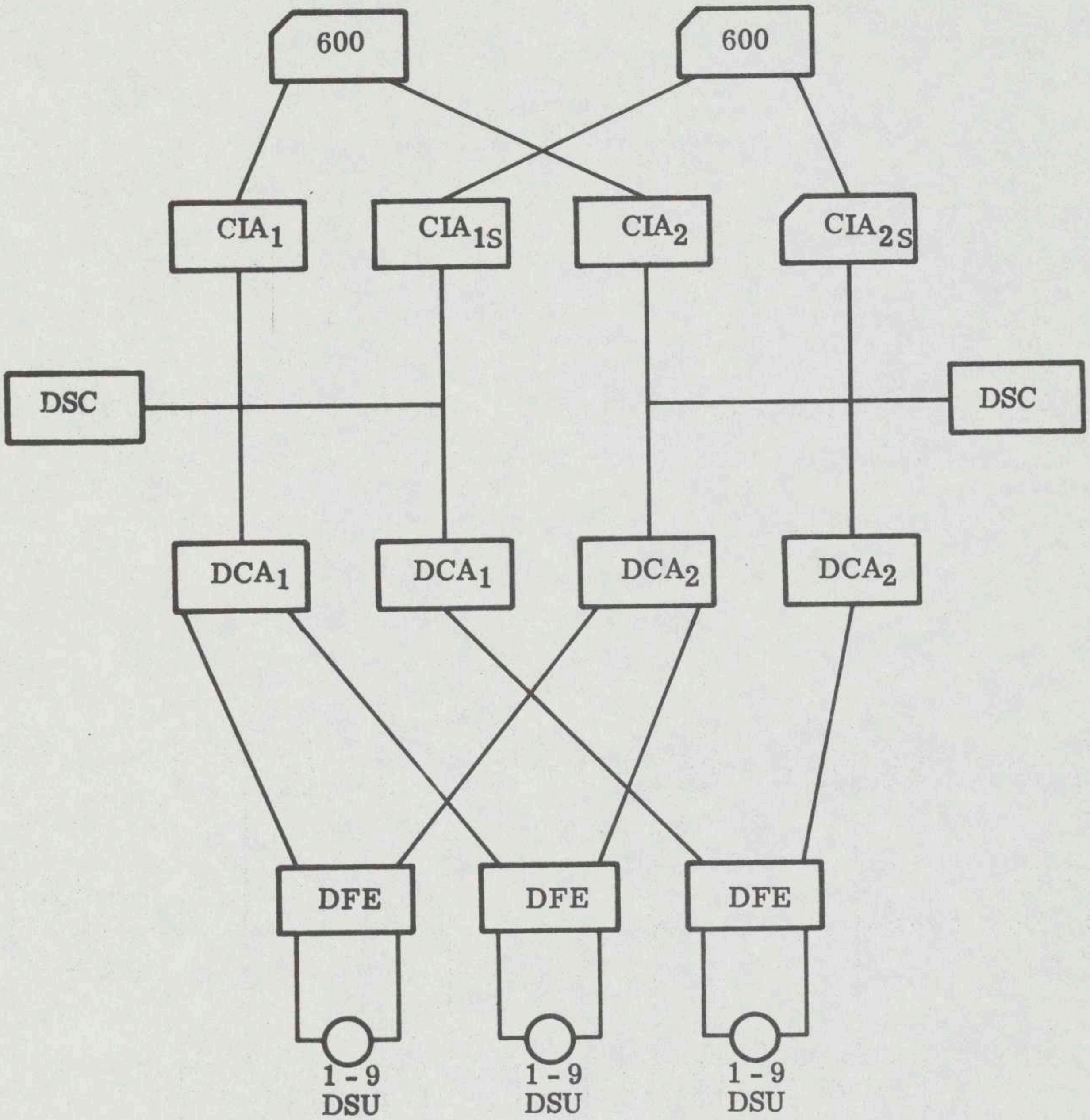
6 BIT DEVICE CODE

DUAL CHANNEL 2 CONTROLLER 2x27, SWITCHED

APP. C

 Cont. on Page 145

C



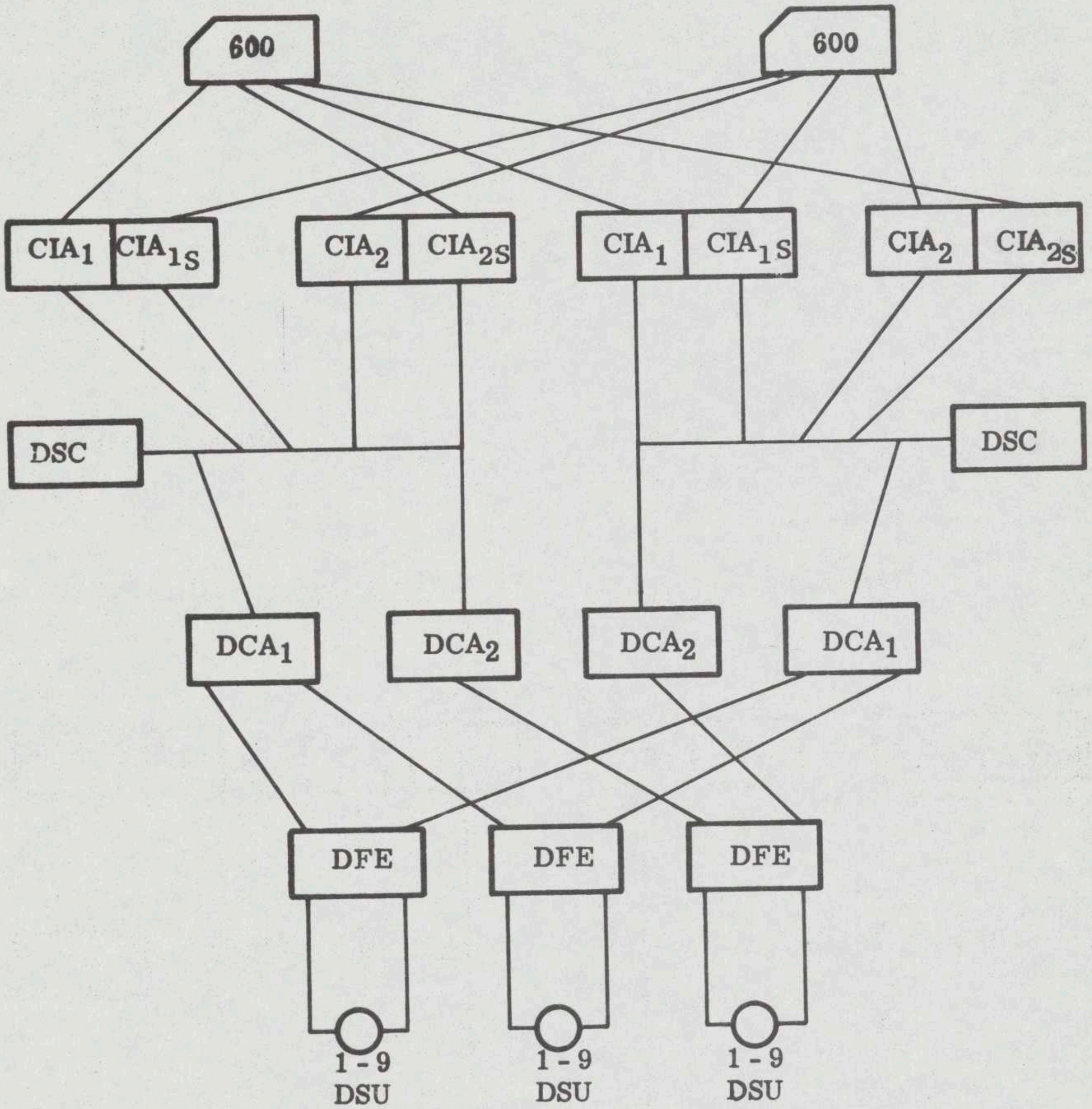
6 BIT DEVICE CODE

DUAL CHANNEL 2 CONTROLLER 2x27, SHARED

APP. C

 Cont. on Page 146

C

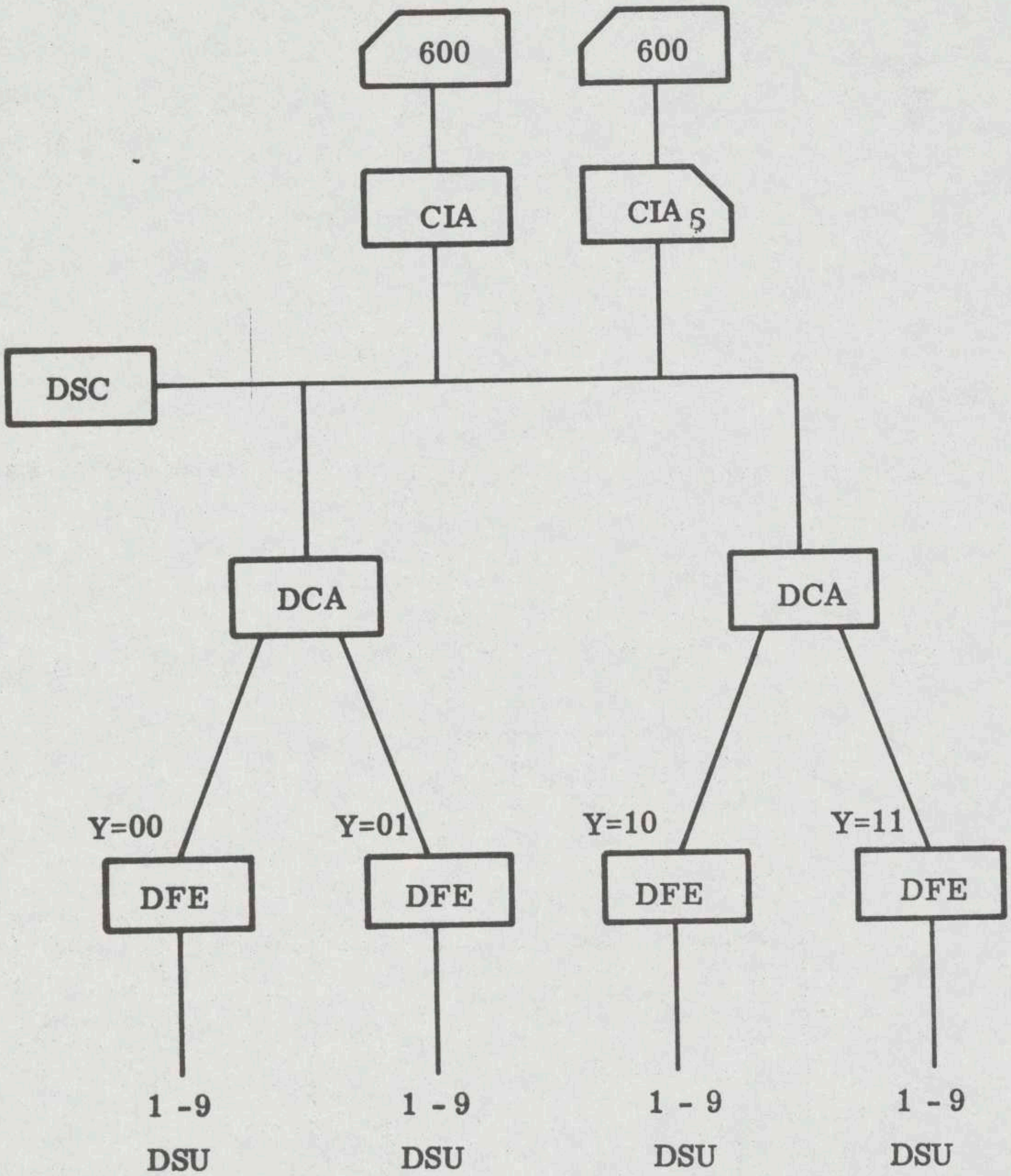


DUAL CHANNEL 2 CONTROLLER 2x18 + 2x9 SHARED

APP. C

FIGURE 21

[C]



6 BIT DEVICE CODE REQUIRED

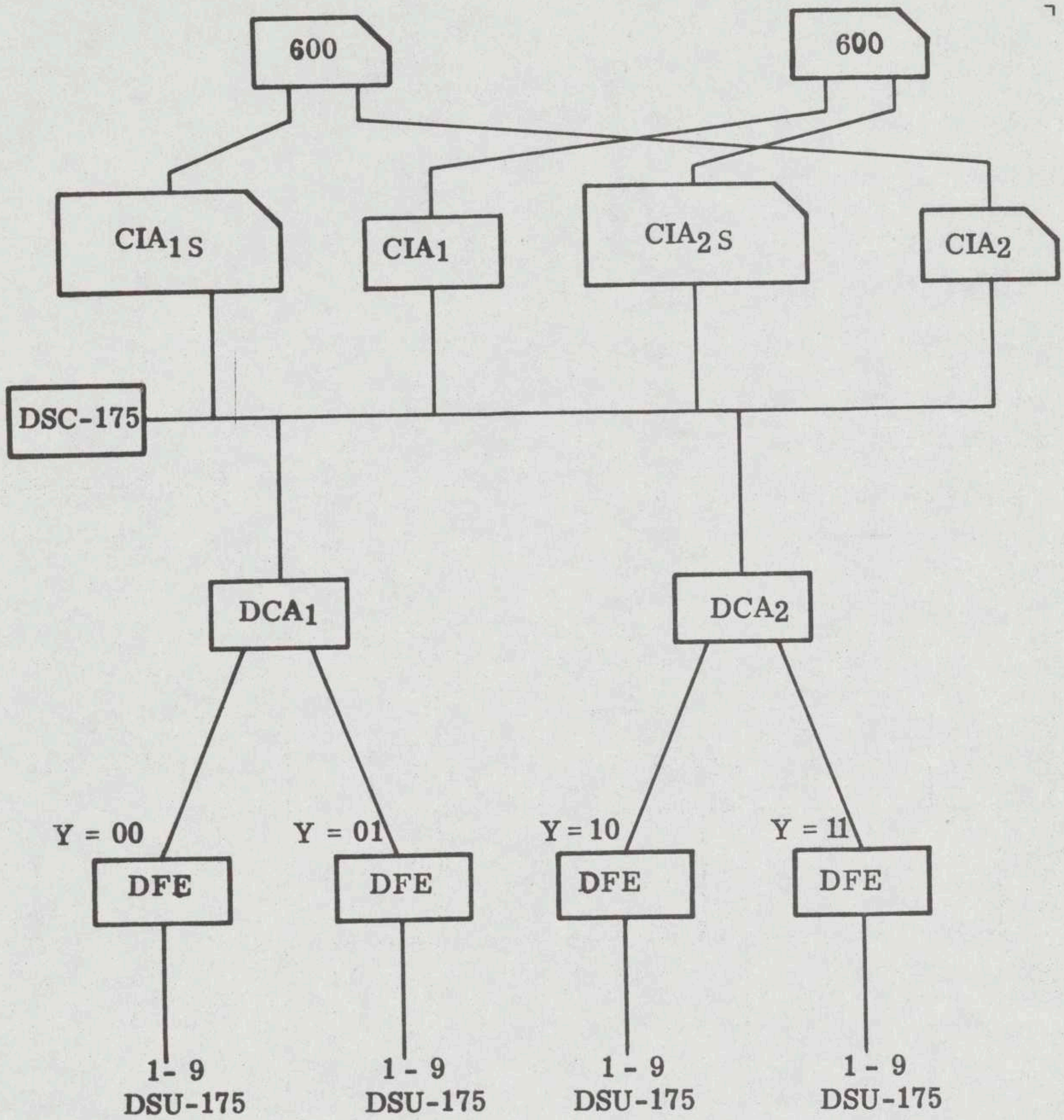
SINGLE CHANNEL 1x36 SWITCHED

APP. C

FIGURE 22

Cont. on Page 149

C



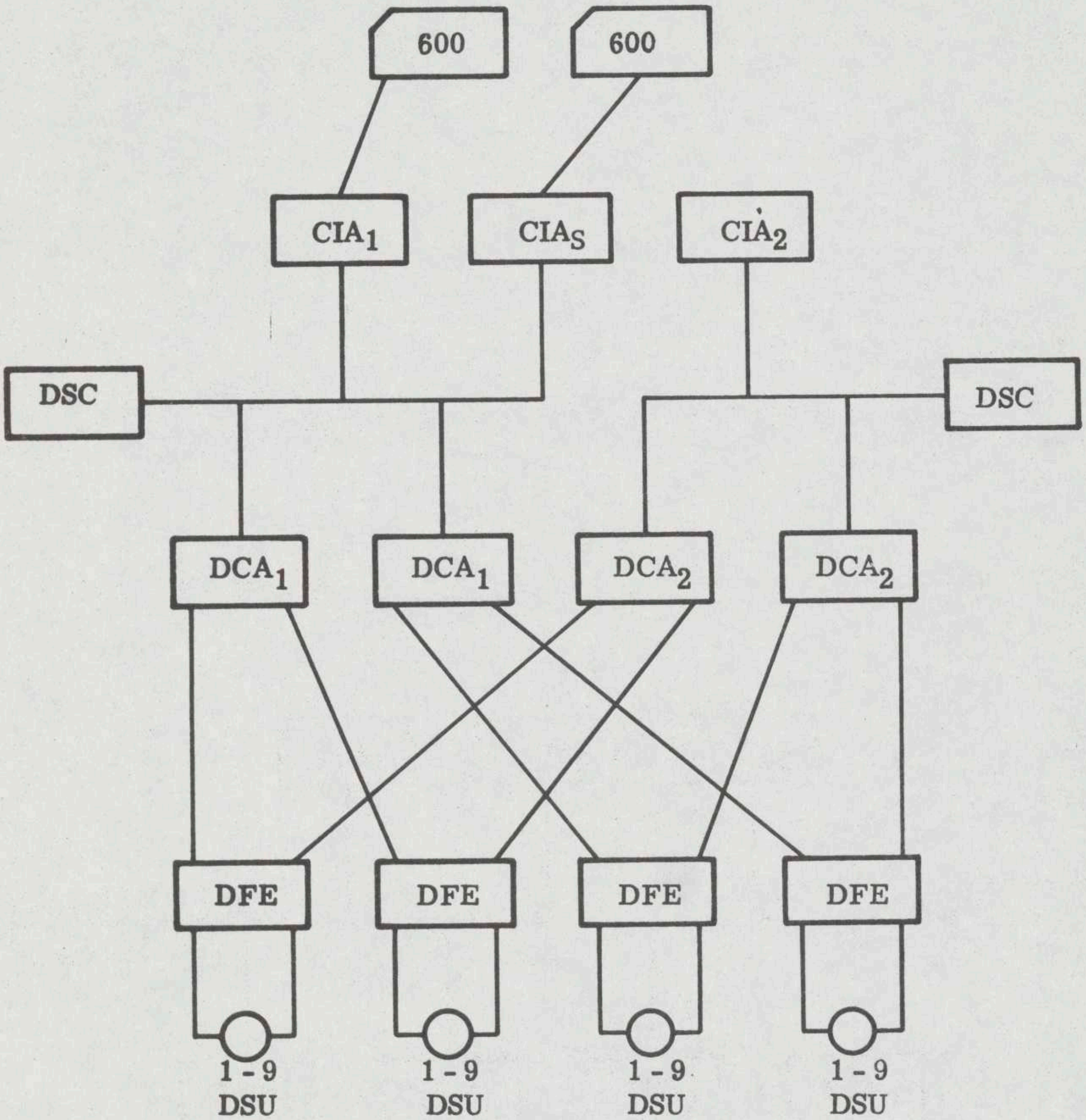
SINGLE CHANNEL (2) 1x18 SHARED

APP. C

FIGURE 24

Cont. on Page 150

[C]



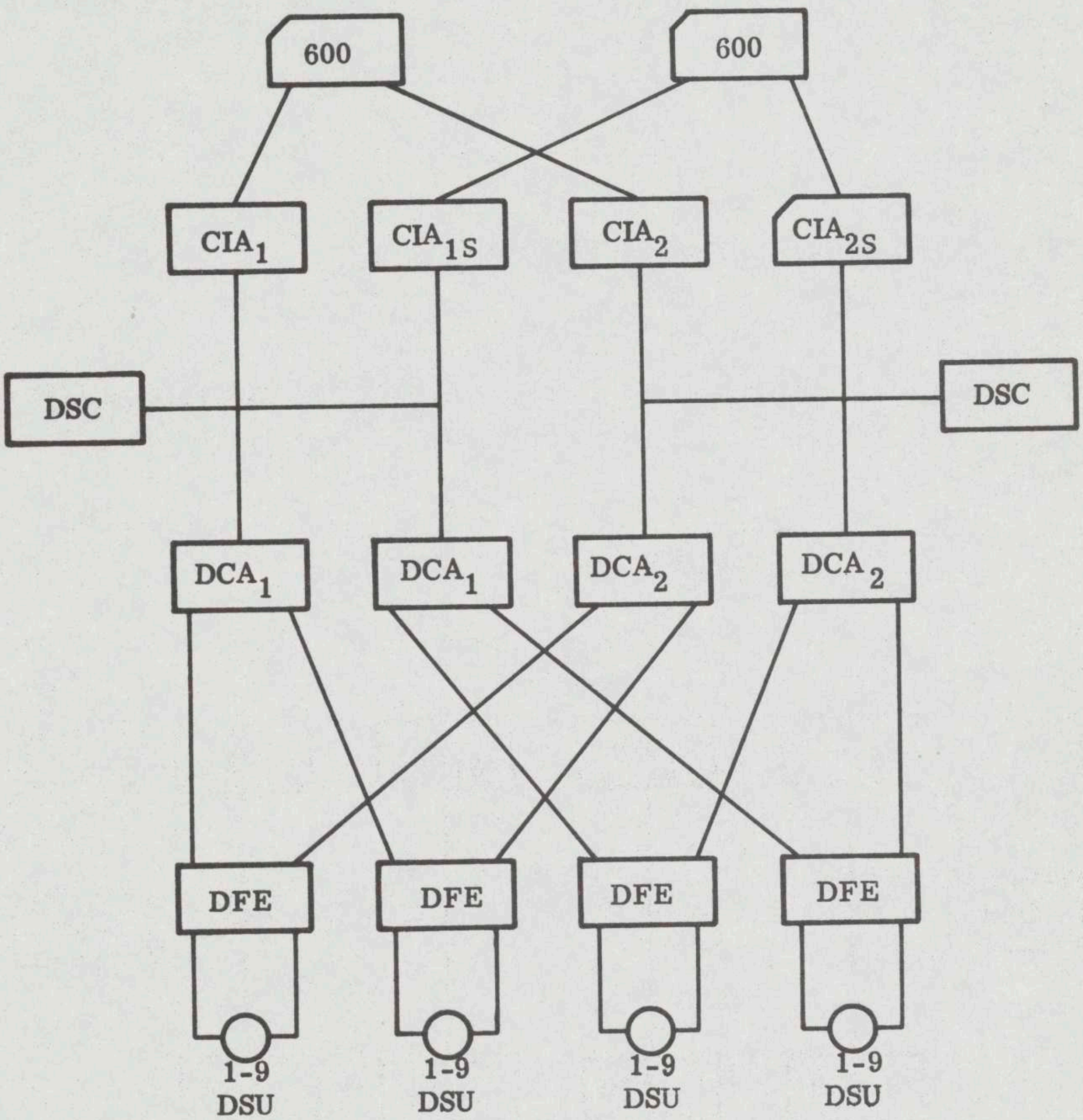
6 BIT DEVICE CODE

DUAL CHANNEL 2 CONTROLLER 2x36, SWITCHED

APP. C

FIGURE 25

C

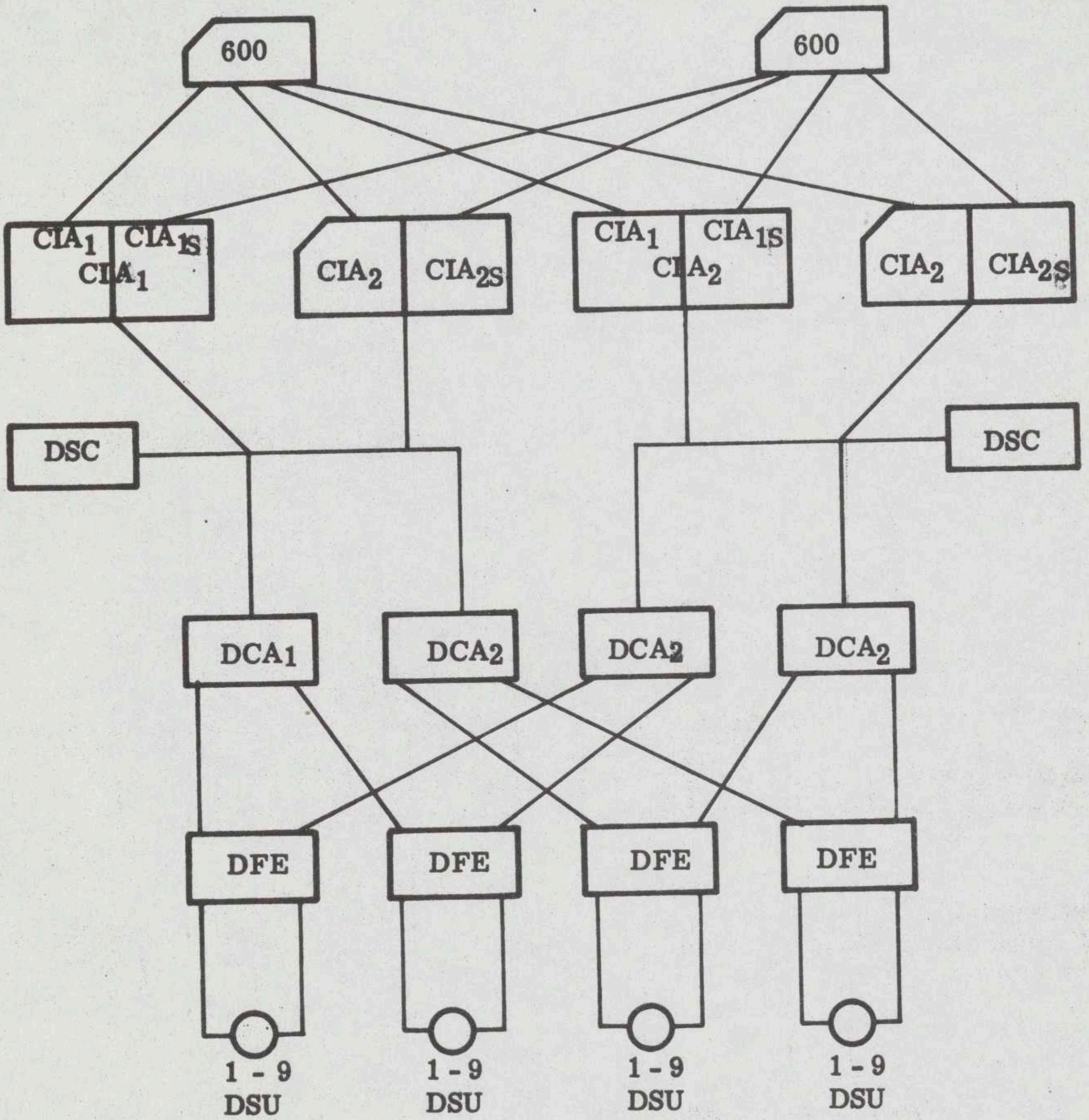


6 BIT DEVICE CODE

DUAL CHANNEL 2 CONTROLLER 2 x 36, SHARED

APP. C
FIGURE 27

C



DUAL CHANNEL 2 CONTROLLER (2) 2x18 SHARED

APP. C

FIGURE 29