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DX 980

General Purpose Operating System

System Operation Guide

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SECTION I

INTRODUCTION

1.1 GENERAL

DX980 is a general purpose operating system which supports the Texas Instruments Model 980 series computers in a variety of applications. Since a particular installation does not generally require all of the applications support provided by DX980, the capability to tailor the operating system to an individual installation's needs has been provided. The DX980 General Purpose Operating System (GPOS) is modified to a user's requirements through the system control console when the operating system is loaded into the computer for execution. All other system operations are provided by the operator communications modules.

1.2 INSTALLATION

The installation procedure in Section III is a set of step-by-step instructions for installing the DX980 GPOS. The procedure allows the user to install DX980 without being familiar with the details of DX980 system software.

The procedure starts with initial inspection of the DX980 GPOS software package and takes the user through preparation of the disc-resident operating system for use.

1.3 INITIAL PROGRAM LOADING

The process of loading and initiating DX980 is referred to as Initial Program Load (IPL). This is accomplished by a separate program called the IPL processor. The computer operator interacts with the IPL processor to establish key parameters within the operating system. After the interactive portion of IPL is complete, the operating system is loaded into memory and control transfers from the IPL processor to the operating system. The IPL function is then complete and subsequent communications with the operator are accomplished by the operator communications function.

1.4 OPERATOR COMMUNICATIONS

The role of operator communications in DX980 depends on the applications environment. Operator issued commands must be used to initiate subsystems; they may also be used to initiate user jobs. In environments with a high degree of batch processing, the computer operator is responsible for ensuring the availability of required resources (such as volume mounting of magnetic tapes and disc cartridges, and maintenance of unit record equipment) and is also responsible for controlling the applications programs that run on DX980. Operator communications provides the capability to accomplish those tasks interactively. Informative messages that communicate system status are printed on the control console. The console prints requests that require



operator intervention either at the console or at one of the computer peripherals. The operator may also initiate action to cancel programs that request unavailable services or execute incorrectly. He may inform the system that a peripheral has become inoperative or that a previously inoperative peripheral has become operative. In addition, several functions are available to the operator for monitoring and controlling DX980 activities.

In an environment where the computer is to run essentially unattended, such as monitoring and/or controlling instrumentation in a production environment or time sharing where the users have access only to canned programs, the system control console can be switched from "system mode" to "user mode", where it becomes another peripheral to an applications program.

1.5 SOFTWARE ERRORS, EQUIPMENT FAILURES, AND SERVICE

A number of errors and hardware failures may be corrected by the operator. Assistance is also available from Texas Instruments field service offices.

1.5.1 ERROR AND FAILURE MESSAGES

The DX980 General Purpose Operating System is designed to notify the operator about errors or equipment failures by displaying messages or codes on the system control console or the computer front panel. The meanings of error and failure codes and corrective procedures are given in Appendixes A and B of this manual.

1.5.2 SERVICE FROM TEXAS INSTRUMENTS

If service from Texas Instruments is needed to correct problems not described in the 980 series computer documentation, contact a field service representative at the nearest TI sales and service office.

1.6 RELATED PUBLICATIONS

The following publications provide additional information about the DX980 General Purpose Operating System and the 980 series computers.

<u>Description</u>	<u>Manual No.</u>
DX980 General Purpose Operating System Programmer's Guide	943005-9701
DX980 General Purpose Operating System System Documentation	943015-9701
Model 980 Series Computer Programming Card	943000-9701
Model 980A Computer Maintenance Manual System Description	960699-9701
Model 980B Computer Maintenance Manual System Description	943012-9701
Model 980 Computer Basic System Use and Operation	961961-9710



SECTION II

SYSTEM FEATURES

2.1 GENERAL

The major features of the DX980 operating system are interrupt-driven device handlers, multiprogramming with biased addressing and protected memory bounds, and subsystems to support batch and interactive terminal processing. The system's management features include flexible job management with complete resource allocation, comprehensive data management, dynamic memory management, and priority scheduling of jobs and of tasks within jobs.

2.2 HARDWARE NEEDED FOR SYSTEM OPERATION

The operating system nucleus occupies approximately 24,000 words of main memory. Additional system hardware to support the nucleus includes the following:

- Additional memory for support of subsystems, language processors, and application programs.
- Either a moving head disc or a DS330 disc system.
- A magnetic tape drive to initially load the disc and provide a means to dump the disc contents for reloading.
- A system control console for system interaction with the user.
- An interval timer.

2.3 HARDWARE EXPANSION

In addition to the hardware for operation of the system, DX980 supports a full 64K word memory computer system. The modular construction of the system allows easy addition of new peripheral devices and their related service routines. Standard device service routines include support for one or more of each of the following peripherals:

- Single or multiple configuration of cartridge disc drives
- Large capacity disc drive (IBM 3330 equivalent)
- Single or multiple configurations of magnetic tape drives
- Model 733 ASR or Model 733 KSR terminal
- Model 33 ASR teletypewriter
- Card reader
- Line printer



- Video display terminal
- Paper tape reader and punch
- Analog-to-digital and digital-to-analog converters

2.4 SYSTEM STRUCTURE

The operating system is divided into a nucleus for executive functions common to most operations, and several subsystems that perform specific functions. In addition to the nucleus, two subsystem modules are supplied with the standard operating system: the Interactive Terminal Subsystem (ITS) and the Batch Processing Subsystem (BPS). Figure 2-1 illustrates the relationship of these subsystems to the nucleus. Other subsystems may also be added to perform functions suited to special applications. The following paragraphs describe the characteristics of the standard system components.

2.4.1 NUCLEUS

The nucleus is the portion of the operating system that defines the system parameters, handles input and output servicing, and provides real time reaction to the subsystems. The nucleus is divided into four main parts: the system table, the memory resident code, the procedure pool or system overlay area, and a Dynamic System Control Area (DSCA). The real time features of the operating system are integrated into these areas and do not form a separate subsystem as do the Interactive Terminal Subsystem and the Batch Processing Subsystem. Real time features include rollin and rollout, task synchronization supervisor calls, dynamic device allocation, the ability to start other jobs via a supervisor call, and a method for controlling file updating with multiple online users. Most of the code for these features occupies main memory only when in direct use and runs in the procedure pool.

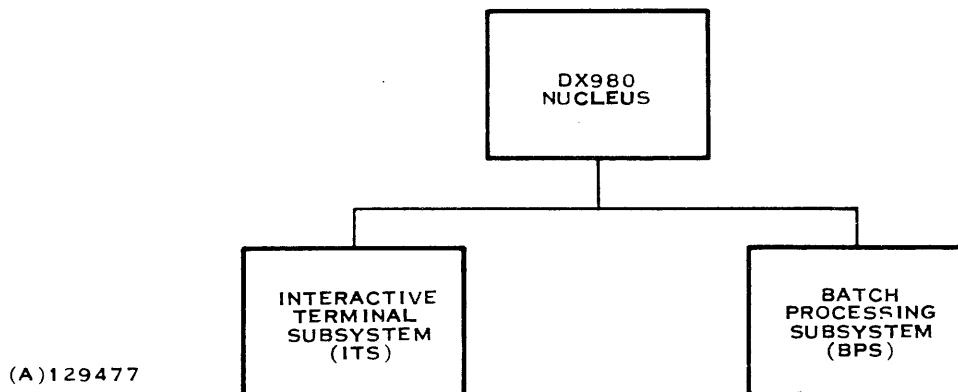


Figure 2-1. DX980 General Structure



2.4.1.1 SYSTEM TABLE. The System Table describes the operating parameters of the system including: system job parameters, system-wide control blocks, and pointers to system queues, the DSCA, procedure pool and free area. The table is created during system generation.

2.4.1.2 MEMORY RESIDENT CODE. Memory resident code is that portion of the operating system that is always in main memory. This code performs the following functions in the DX980 system: interrupt processing, system disc device handling, task management, preliminary supervisor call processing, memory management, overlay management, and commonly used lower level system subroutines.

2.4.1.3 PROCEDURE POOL. The procedure pool is a dynamically allocated memory area used for system overlays. Approximately 80% of the system routines run in this area. These routines include: device service routines not handled by the memory resident code, job management, file management, operator communications, and modules of rollin and rollout. The user can select the size of the procedure pool to adapt the amount of memory available to the operating speed required.

2.4.1.4 DYNAMIC SYSTEM CONTROL AREA (DSCA). The DSCA is a volatile memory pool that is used by the procedure pool routines. Most of these routines are written in reentrant code. The DSCA provides a designated work area for each task executing a procedure pool routine. The user can select the size of the DSCA.

2.4.2 INTERACTIVE TERMINAL SUBSYSTEM (ITS)

The Interactive Terminal Subsystem (ITS) provides simplified concurrent communications with several terminals. Included in ITS is the ITS Supervisor (ITSUPV). ITSUPV oversees the execution of specific applications, including the Remote Job Entry (RJE) feature, status determination (STATUS) and the Interactive File Editor (IFE). ITSUPV manages the terminals, and provides LOG ON and LOG OFF functions plus the required housekeeping functions for multi-terminal usage. ITSUPV interfaces easily with user written application programs. IFE provides interactive generation and editing of disc files containing source text.

2.4.3 BATCH PROCESSING SUBSYSTEM (BPS)

The Batch Processing Subsystem (BPS) consists of three data handling subsystems that allow convenient batch input and output for the operating system. The three data handling subsystems are Batch Input Reader (BIR), Batch Input Spooler (BIS) and Batch Output Spooler (BOS).

2.5 INPUT/OUTPUT MANAGEMENT

User programs running under DX980 select I/O devices with a logical unit number (LUN) rather than a physical device number. A statement within



the JCL input for the job equates the LUN to a physical device name, while a physical device table for the operating system specifies an actual I/O device to respond to the physical device name. This arrangement allows the logical unit numbers within the user program to remain constant.

2.6 MEMORY MANAGEMENT

All of memory that is not occupied by the system job (comprised of the resident operating system, system tables, and the procedure pool) is designated as a free area. The operating system dynamically allocates this area to subsystems and to user jobs.



SECTION III INSTALLATION

3.1 INTRODUCTION

This section contains a step-by-step procedure for installing the DX980 General Purpose Operating System (GPOS). The procedure allows the system operator to install the operating system prior to understanding the details of the system's operation.

At two places in the procedure, in subsections on the building of Physical Device Tables and the editing of the Job Control Language (JCL) source templates, references are made to supplementary material. This material includes Section IV of this manual (Initial Program Load) and the description of the use of Interactive File Editor (IFE) commands in the DX980 General Purpose Operating System Programmer's Guide. The operator should be familiar with these subjects before starting the installation procedure.

3.2 NOTATIONAL CONVENTIONS

Major procedural sequences are described in separate paragraphs. Within each sequence, steps are identified by Arabic numbers and substeps by lower case letters. Some steps in the procedure are optional or are performed if specific conditions exist; these options or conditions are identified in the procedure.

Lower-case letters and words enclosed in angle brackets (< >) represent parameters or options that must be substituted for the term shown. These parameters or options are supplied by the operator or by the software program.

A required blank in text typed on an input terminal is indicated by a slashed lower case letter b (*b*). This symbol is not used to indicate optional blanks.

3.3 OPERATING SYSTEM INSTALLATION PROCEDURE

The installation procedure includes procedural sequences for inspection of the DX980 GPOS package after shipment from Texas Instruments, preparation of a disc for loading, placement of the operating system on the disc, and preparation of the disc-resident operating system for use.

3.3.1 INITIAL INSPECTION

Before proceeding with installation, inspect the contents of the DX980 GPOS installation package. It should include the following items:

- A set of DX980 software manuals, which includes this manual and the DX980 General Purpose Operating System Programmer's Guide, Manual No. 943005-9701.



- A reel of magnetic tape (part no. 944140-1303 or 944140-1304) containing a copy of DX980 and its associated data sets and utilities.
- A blank 1200-foot reel of magnetic tape (part no. 973718-0004).
- Copies of the Diablo Disc Initializer Utility on punched cards (part no. 944140-1201) and paper tape (part no. 944140-1101).
- Copies of the DS330 Disc Initializer Utility on punched cards (part no. 944140-1202) and paper tape (part no. 944140-1102).
- A copy of both disc initialization utilities on a cassette (part no. 944140-0020).
- Punched card copies of the Disc Save/Restore Monitor (part no. 944140-1203), Disc Restore (part no. 944140-1204), and Disc Save (part no. 944140-1205).
- Paper tape copies of the Disc Save/Restore Monitor (part no. 944140-1103), Disc Restore (part no. 944140-1104), and Disc Save (part no. 944140-1105).
- Cassette copy of the Disc Save/Restore Monitor, Disc Save, and Disc Restore (part no. 944140-0021).
- A card loader (part no. 967120-0001), paper tape loader (part no. 967121-0001), and an EIA loader (part no. 969768-5101).

These items are supplied in several media to support additions to the initial hardware configuration.

Contact a field service representative if any parts are damaged or missing. Damaged or omitted parts will be replaced.

3.3.2 HARDWARE PERFORMANCE DEMONSTRATION TESTS

After the DX980 GPOS has been inspected and found to be complete, the hardware system must be tested to make sure that it is operating correctly. To verify that all system hardware is functioning properly, execute a Performance Demonstration Test for each hardware equipment item. Instructions for running these tests are included in the hardware manuals shipped with the equipment. The minimum hardware configuration required to support the DX980 GPOS is as follows:

- Model 980A or 980B Computer. The memory size must be 48K words or larger. In addition, an interval timer, input/output (I/O) bus and DMAC device controllers, and I/O bus and DMAC expansion electronics are required to support the hardware system peripheral devices.
- Disc, either Texas Instruments Model DS330 or Diablo. Each disc may have up to three add-on disc drives.



- Magnetic Tape Transport. The Texas Instruments Model 979 Magnetic Tape Drive is required to support the DX980 software system.
- Control Console. A Model 733 ASR Data Terminal dedicated for system operator use is required for DX980 system software.

3.3.3 DISC INITIALIZATION

The first part of the DX980 GPOS installation procedure, after preliminary inspection and testing, is disc initialization. Run the Disc Initializer utility to format the disc on which the DX980 GPOS will be stored. Also initialize any other disc packs in the system. Disc initialization must also be performed after executing the disc Performance Demonstration Test (PDT), head alignment, or any other operation which may affect the initialization format. The procedure is as follows:

1. Mount a copy of the programs in the appropriate medium on the input load device. The items to be loaded for different input devices and disc types are shown below. These items must be loaded in the listed order.

<u>Input Device</u>	<u>Diablo Disc</u>	<u>DS330 Disc</u>
Card Reader	Card loader (part no. 967120-0001) Diablo Initializer (part no. 944140-1201)	Card loader (part no. 967120-0001) DS330 Initializer (part no. 944140-1202)
High-Speed Paper Tape Reader	PT loader (part no. 967121-0001) Diablo Initializer (part no. 944140-1101)	PT loader (part no. 967121-0001) DS330 Initializer (part no. 944140-1102)
33 ASR with Communications Module Interface	EIA loader (part no. 969768-5101) Diablo Initializer (part no. 944140-1101)	EIA loader (part no. 969768-5101) DS330 Initializer (part no. 944140-1102)
Cassettes	Disc Initializer cassette (part no. 944140-0020), side A	Disc Initializer cassette (part no. 944140-0020) side B

2. Mount the disc that is to become the system-resident disc on its drive. Place this disc drive in the non-write-protected mode.
3. Turn on and enable the input load device.
4. Set the MODE switch on the computer front panel to the HALT position.
5. Momentarily press the RESET switch downward.



6. Set the data switches (top row) to the number code for the input load device, as follows:

Card Reader	0003 ₁₆
High-Speed Paper Tape Reader	0004 ₁₆
33 ASR with Communications Module interface	0006 ₁₆
733 ASR (cassettes)	0006 ₁₆
7. Momentarily set the PC switch to the ENTER (up) position to enter the device number into the program counter.
8. Set the MODE switch to the RUN position.
9. Momentarily set the LOAD switch to the up position. This action causes the relocating loader to be loaded into main memory.
10. When this portion of the loading is complete, the IDLE indicator lamp lights. After this occurs, set the data switches to the hexadecimal value of the main memory size and enter this number into the E register by momentarily setting the E switch to the ENTER (up) position.
11. Momentarily set the START switch to the START (down) position. Wait for the Disc Initializer to be loaded and the IDLE indicator to light.
12. Momentarily set the M switch to the DISPLAY (down) position to display the contents of the M register. The M register value is displayed by the data indicator lamps. If the value is 0000₁₆, the load was completed normally; otherwise, load the routine again. If the second load is unsuccessful, contact a field service representative.

3.3.3.1 DIABLO DISC INITIALIZATION. The next part of the disc initialization sequence depends on whether the disc is a Diablo or a DS330. If the system-resident disc (unit 0) is a Diablo, perform the steps in paragraph 3.3.3.1 and skip paragraph 3.3.3.2. If the system-resident disc is a DS330, skip the remainder of this paragraph and perform the steps in paragraph 3.3.3.2.

Initialize the Diablo disc as follows:

1. Set the SENSE switches to the device number of the unit containing the disc to be initialized, as follows:

<u>Unit No.</u>	<u>Switch Settings</u>
0	All four switches down.
1	Switch 1 up, others down.
2	Switch 2 up, others down.
3	Switch 3 up, others down.



- Note that DMA channel number 1 is assumed for the Diablo.
2. Momentarily set the START switch to the START (down) position. The IDLE and RUN indicator lamps infrequently light and extinguish to indicate that the program is running. The program terminates after approximately one minute. At program termination, the RUN indicator remains lit.
 3. Set the MODE switch to the HALT position. A diagnosis of the disc initialization may now be made by examining the contents of the Program Counter and the A register.
 4. To examine the contents of the Program Counter, momentarily set the PC switch to the DISPLAY (down) position. The data indicator lamps at the top of the front panel display the Program Counter contents. The interpretation of the contents is shown in table 3-1. If PC indicates that the program terminated abnormally (0003_{16}), examine the A register to determine the cause. To examine the contents of the A register, momentarily set the A switch to the DISPLAY (down) position. The data indicator lamps display the A register contents. The interpretation of the contents is shown in table 3-1.

Table 3-1. Computer Display Diagnostic Interpretations
Diablo Disc Initialization

Indication	Meaning
PC = 0002_{16}	Program terminated normally.
PC = 0003_{16}	Program terminated abnormally.
A = 0000_{16}	Program terminated normally, but some disc tracks are bad. To identify which tracks are bad, get the address of the bad track list from the E register (refer to <u>Model 980A Computer Maintenance Manual: System Description</u> , Manual No. 960699-9701, or <u>Model 980B Computer Maintenance Manual: System Description</u> , Manual No. 943012-9701). The first word of the list contains the number of bad tracks.
A = 0001_{16}	Disc is write-protected.
A = 0002_{16}	Disc is offline.
A = 0015_{16}	A device or program failure occurred. This will not normally happen.
A = 0016_{16}	Track 0 is bad.
A = 0017_{16}	There are more than 30 bad tracks.
A = 0018_{16}	SENSE switch setting was invalid.
A = 0019_{16}	An interrupt occurred by a device other than the disc being initialized. This will not normally happen.



3.3.3.2 DS330 DISC INITIALIZATION. The procedural steps in this paragraph apply to the DS330 disc only. Initialize the DS330 disc as follows:

1. Enable the system control console (a 733 ASR Data Terminal).
2. On the computer front panel, momentarily set the START switch to the START (down) position. Query messages are printed out by the control console. Reply as instructed in the message by entering the DMAC port number and the unit number. The standard for both of these parameters is zero. Each entry must be followed by a carriage return.
3. The program prints out a set of Track Extent information, and asks whether the operator wants to proceed with initialization rather than cancel the program. Reply by entering YES, then typing a carriage return (by pressing the RETURN key).
4. The program analyzes defects in disc operation and formats the disc pack for approximately 30 minutes. The program reports defects by printing appropriate information out on the control console as the defects are found. Note that it is not uncommon for several minor defects to be reported. At program termination, END OF JOB is printed out on the control console.

3.3.4 LOADING DX980 TO THE SYSTEM DISC

If the system is already installed on a Diablo disc pack, proceed to section 3.3.4.2, otherwise, proceed to section 3.3.4.1 and skip 3.3.4.2.

3.3.4.1 LOADING FROM MAGNETIC TAPE TO DISC. Run the Disc Restore routine to load the DX980 GPOS from magnetic tape to the disc on which it is to be stored. Proceed as follows:

1. Enable the system control console (a 733 ASR Data Terminal).
2. Place the copy of the programs in the system input device. The programs must be in a medium appropriate to the input device. If the medium is cassette, either cassette drive on the Model 733 ASR may be used. The items to be loaded for different input devices are listed below. These items must be loaded in the order listed.

<u>Input Device</u>	<u>Items to Be Loaded</u>
Card Reader	Card loader (part no. 967120-0001) Disc Save/Restore Monitor (part no. 944140-1203) Disc Restore (part no. 944140-1204)
High-Speed Paper Tape Reader	PT loader (part no. 967121-0001) Disc Save/Restore Monitor (part no. 944140-1103) Disc Restore (part no. 944140-1104)



<u>Input Device</u>	<u>Items to Be Loaded</u>
33 ASR with Com- munications Mod- ule Interface	EIA loader (part no. 969768-5101) Disc Save/Restore Monitor (part no. 944140-1103) Disc Restore (part no. 944140-1104)
Cassettes	Disc Save/Restore cassette (part no. 944140-0021), side A

3. Enable the input load device.
4. Mount the magnetic tape containing the DX980 GPOS (part no. 944140-1303 for the Diablo disc and 944140-1304 for the DS330 disc) on the tape drive. Ensure that the write ring has been removed. Refer to the Model 979 Tape Transport Operators Manual, Part Number 216376-9701.
5. Ready the tape transport (press RESET, then press LOAD).
6. On the computer front panel, set the MODE switch to the HALT position.
7. Momentarily set the RESET switch to the RESET (down) position.
8. Set the data switches to the number code for the input load device, as follows:

Card Reader	0003 ₁₆
High-Speed Paper Tape Reader	0004 ₁₆
33 ASR with Communications Module interface	0006 ₁₆
733 ASR (cassette)	0006 ₁₆
9. Momentarily set the PC switch to the ENTER (up) position.
10. Set the MODE switch to the RUN position.
11. Momentarily set the LOAD switch to the up position. The input load device loads the routine, but stops before reading all of the input data. At this point, the relocating loader has been loaded.
12. When this portion of the loading is complete, the IDLE indicator lamp lights. After this occurs, set the data switches to the hexadecimal value of the main memory size and enter this number into the E register by momentarily setting the E switch to the ENTER (up) position.
13. Momentarily set the START switch to the START (down) position. The Disc Save/Restore Monitor will then be loaded. Wait for the IDLE indicator to light.



14. Momentarily set the M switch to the DISPLAY position to display the contents of the M register. The M register value is displayed by the data indicator lamps. If the value is 0000_{16} , the load was completed normally; otherwise, load the routine again. If the input medium is punched data cards, make sure that they are in the correct order when reloaded. If the second load is unsuccessful, contact a field service representative.
15. Momentarily set the START switch to the START (down) position. Wait until the word READY is typed out by the control console.
16. On the control console, type
//ASSIGN, 5, MT1.
followed by a carriage return.
17. Type
//RUN, <mnemonic>.
where <mnemonic> is one of the following mnemonics for input load devices:

PTR for the high-speed paper tape reader
TTR for the 33 ASR paper tape reader
CR for card reader
CS1 for data terminal with tape cassette (left-hand cassette drive)
CS2 for right-hand cassette drive

Type a carriage return. The input load device finishes reading the input data; i. e., the Disc Restore program.
18. The program identifies itself by printing
RESTORE DISC FROM MAGNETIC TAPE
19. The control console now types out a series of messages requiring operator response. The first message is
DO YOU WANT TO SAVE THE BAD TRACK MAP FROM DISC
INITIALIZATION? (Y/N)

Enter Y followed by a carriage return. The console now types
VERIFY TAPE AND DISC AFTER WRITE? (Y/N)

Enter Y followed by a carriage return. The console now types
DISC UNIT #(0, 3) =

Enter 0 (zero) followed by a carriage return.



20. This message is now typed:

DATA SAVED ON <mm>/<dd>/<yy> WILL BE RESTORED TO< xxxxxx >
DISC UNIT # 0

where <mm>/<dd>/<yy> is a calendar date (month, day, and last two
digits of the year) in numeric format and < xxxxxx > is the type of
disc, either DIABLO or DS330.

21. The control console now prints

OK TO CONTINUE?

Respond by entering a carriage return. The disc image from the
magnetic tape will then be written to the disc and verified.

22. When the program has terminated, the control console prints

RESTORE COMPLETE

READY

Remove the DX980 GPOS magnetic tape from the tape transport.

3.3.4.2 LOADING FROM DISC TO DISC. Run the Disc Copy/Verify routine
to copy the DX980 GPOS from the master disc to the disc on which it is to be
loaded. Proceed as follows:

1. Enable the system control console (a 733 ASR Data Terminal).
2. Place the copy of the programs in the system input device. The pro-
grams must be in a medium appropriate to the input device. If the
medium is cassette, either cassette drive on the Model 733 ASR
may be used. The items to be loaded for different input devices are
listed below. These items must be loaded in the order listed.

<u>Input Device</u>	<u>Items to Be Loaded</u>
Card Reader	Card Loader (part no. 967120-0001) Disc Save/Restore Monitor (part no. 944140-1203) Disc Copy/Verify (part no. 944145-1201)
High-Speed Paper	PT loader (part no. 967121-0001)
Tape Reader	Disc Save/Restore Monitor (part no. 944140-1103) Disc Copy/Verify (part no. 944145-1101)



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munications Mod-
ule interface

EIA Loader (part no. 969758-5101)
Disc Save/Restore Monitor (part no.
944140-1103)

Disc Copy/Verify (part no. 944145-
1101)

Cassettes

Disc Copy/Verify cassette (part no.
944145-0020), side A

3. Enable the input load device.
4. Mount the master disc containing the DX980 GPOS in the disc drive.
Ensure that the unit is in the write protect mode.
5. Ready the disc drive (press RUN).
6. On the computer front panel, set the MODE switch to the HALT position.
7. Momentarily set the RESET switch to the RESET (down) position.
8. Set the data switches to the number code for the input load device, as follows:

Card Reader	0003 ₁₆
High-Speed Paper Tape Reader	0004 ₁₆
33 ASR with Communications Module Interface	0006 ₁₆
733 ASR (cassette)	0006 ₁₆
9. Momentarily set the PC switch to the ENTER (up) position.
10. Set the MODE switch to the RUN position.
11. Momentarily set the LOAD switch to the up position. The input load device loads the routine, but stops before reading all of the input data. At this point, the relocating loader has been loaded.
12. When this portion of the loading is complete, the IDLE indicator lamp lights. After this occurs, set the data switches to the hexadecimal value of the main memory size and enter this number into the E register by momentarily setting the E switch to the ENTER (up) position.
13. Momentarily set the START switch to the START (down) position. The Disc Save/Restore Monitor will then be loaded. Wait for the IDLE indicator to light.



14. Momentarily set the M switch to the DISPLAY position to display the contents of the M register. The M register value is displayed by the data indicator lamps. If the value is 0000₁₆ the load was completed normally; otherwise, load the routine again. If the input medium is punched data cards, make sure that they are in the correct order when reloaded. If the second load is unsuccessful, contact a field service representative.
15. Momentarily set the START switch to the START (down) position. Wait until the word READY is typed out by the control console.
16. On the control console, type
//RUN, <mnemonic>.
where <mnemonic> is one of the following mnemonics for input load devices:
PTR for the high-speed paper tape reader
TTR for the 33 ASR paper tape reader
CR for card reader
CS1 for data terminal with tape cassette (left-hand cassette drive)
CS2 for right-hand cassette drive
Type a carriage return. The input load device finishes reading the input data; i. e., the Disc Copy/Verify DDCOPY program.
17. The program identifies itself by printing:
DIABLO TO DIABLO COPY/VERIFY
18. A series of messages are printed requiring operator response. The first message is:
COPY OR VERIFY (0, 1):
Enter a 0 (zero). Follow by a carriage return.
19. The program now prints
MOD. 31 or MOD. 44 (0, 1):
If the disc is a model 31, enter a 0 (zero); enter a 1 (one) if a model 44. Complete the entry with a carriage return.
20. The program now prints
INPUT CHAN#
Usually a 1 (one) will be entered, followed by a carriage return. Refer to Block Transfer Controller Maintenance Manual, P/N 240802-9701, to determine if other than a one should be entered.



21. The program now prints
INPUT UNIT #
Enter a 0, 1, 2 or 3 followed by a carriage return.
22. If the model 44 was specified, the program will print:
REMOVABLE OR FIXED PLATTER (0, 1):
Enter a 0 (zero) to specify the removable platter or a 1 (one) for the fixed platter, followed by a carriage return.
23. The program now prints
OUTPUT CHAN#
Usually a 1 (one) will be entered followed by a carriage return.
Refer to Block Transfer Controller Maintenance Manual, Part Number 240802-9701, to determine if other than a one should be entered.
24. The program now prints
OUTPUT UNIT #
Enter a 0, 1, 2 or 3 followed by a carriage return.
25. If the Model 44 was specified, the program will print
REMOVABLE OR FIXED PLATTER (0, 1):
Enter a 0 (zero) to specify the removable platter or a 1 (one) for the fixed platter, followed by a carriage return.
26. At the end of the copy phase, the message
COPY COMPLETE
will be printed. At the end of the verify phase the message
VERIFY COMPLETE
will be printed. Any error messages that occur are self explanatory. All error data is displayed in hexadecimal format.
27. Upon completion the message
READY
will be printed. Remove the DX980 GPOS master from the drive.



3.3.5 INITIAL PROGRAM LOAD SEQUENCE

Although the DX980 GPOS is on disc, Physical Device Tables (PDT's) must be added to support the hardware configuration, and the desired Job Control Language (JCL) templates must be converted into the object format used by DX980 job management. To add the PDT's and convert the JCL templates, perform an Initial Program Load (IPL), proceeding as follows:

1. Set the MODE switch on the computer front panel to the HALT position.
2. Momentarily set the RESET switch to the RESET (down) position.
3. Set the data switches (top row of switches) to $000F_{16}$.
4. Momentarily set the PC switch to the ENTER (up) position.
5. Set the MODE switch to the RUN position.
6. Momentarily set the LOAD switch to the up position. This procedure initializes all of main memory with IDLE instructions.
7. Set the MODE switch to the HALT position.
8. Momentarily set the RESET switch to the RESET (down) position.
9. If the system-resident disc is a DS330, enter 0007_{16} into the Program Counter by setting the data switches to this value and momentarily setting the PC switch to the ENTER (up) position. If the system-resident disc is a Diablo, skip this step.
10. Set the MODE switch to the RUN position.
11. Momentarily set the LOAD switch to the up position. The control console prints out
LM=
12. Type a carriage return on the control console by pressing the Carriage Return (RETURN) key. The console now prints
BASE=
13. Type an S followed by a carriage return to bring in the base that has been saved at system generation time by TI. The console then prints a question mark
?
14. In order to determine what minimal device configuration is in the saved set, type L \emptyset D followed by a carriage return to obtain a listing of the saved devices. (The \emptyset symbol denotes a required blank.)



NOTE

To this point the Initial Program Load (IPL) sequence has prepared the system for addition of new Physical Device Tables (PDTs). The IPL ALTER command performs this addition. Therefore, refer to Section IV of this manual to familiarize yourself with this command before continuing with the procedure.

15. Examine the listing produced in step 14. If the devices listed are sufficient for the system being installed, skip to step 21.
16. On the control console keyboard, type
A
followed by a carriage return. The console prints out a number of messages to which the operator replies as outlined in Section IV of this manual.
17. The sequence and content of the messages printed by the control console depends on the hardware devices and their properties. Make sure that hardware parameters are entered accurately when replying to console messages and queries. The parameters include the Direct Memory Access Channel (DMAC) number, the external expander number, hardware priority slot, and external register numbers.
18. To terminate PDT additions, reply to this console query:
KEYNAME=
by typing a carriage return.
19. To list all PDT's and verify your entries, enter
LØD
on the control console, followed by a carriage return.
20. If an error is found in the listing, type
A
on the console and correct the error as the PDT modification procedure is repeated. List the PDT's again to verify the entries.
21. When the previous steps are completed and the entries are accurate, type
S
on the control console, followed by a carriage return, to preserve the PDT's.
22. Type
G
followed by a carriage return.



23. When the query

DATE & TIME =

is printed by the console, respond by typing in the date and time in the format:

MM/DD/YY, HH:MM:SS

followed by a carriage return.

24. The console responds by printing:

RUNNING MM/DD/YY, HH:MM:SS

followed by two carriage returns. After a short delay, it prints the following (other messages may precede this message):

*READY

When the sequence is complete, the DX980 GPOS is loaded.

3.3.6 LISTING OF THE HELP FILE

The DX980 system is provided with a HELP file that should be listed at this time. This file is used to communicate information on the status of the current system and minor items that were omitted from other forms of documentation. List this file by performing the following steps:

1. On the control console keyboard, press the Escape key (ESC). The console prints a double slash:

```
//
```
2. Type

```
JOBØHELPØSYSTEM
```

followed by a carriage return.
3. Press the ESC key, and after the console prints a double slash, type

```
RUNØHELP
```

followed by a carriage return.
4. After the JOB is submitted, the HELP file is listed on the system console.
5. After the JOB terminates, read the listing and perform any operations at this time that may be indicated.

3.3.7 SELECTION AND EDITING OF JOB CONTROL LANGUAGE SEQUENCES

If devices have been added to the minimum configuration, some or all of the JCL sequences supplied may require modification. The procedures in this and the following paragraphs will normally be completed before the system



is used. These procedures are used to select and edit the individual user's JCL sequences, modify the system so that the BIS and BOS batch processing systems can be used if desired, and create a backup copy of DX980 GPOS. Refer to the DX980 General Purpose Operating System Programmer's Guide (Part Number 943005-9701) for sample listings of JCL source sequences.

The following procedure is used to select and edit the individual user's JCL sequences and convert the sources to object format Job Control Blocks (JCB's). The first part of the procedure is the loading of the Interactive Terminal System (ITS).

1. On the control console keyboard, press the Escape (ESC) key. The console prints a double slash:

```
//
```

2. Type

```
JOBITSSYSTEM
```

followed by a carriage return. This assigns a name and identifier to the job.

3. Press the ESC key, and after the console prints a double slash, type

```
RUNITST1=SC
```

followed by a carriage return. This loads and initializes ITS, with the system control console as the interactive terminal.

4. The console prints

```
NO. = <n> UID=SYSTEM NAME=ITS SUBMITTED  
USER MODE NO. = <n> UID=SYSTEM NAME=ITS
```

where <n> is a number. Type

```
LOGONSYSTEM1
```

in order to provide a user identifier and an accounting number for the software system. ITS is ready for use and the console prints:

```
READY
```

5. The next part of the procedure is used to select the JCL source templates to be used at the individual user's site. On the control console, type

```
JOBEXTRACSYSTEM
```

followed by a carriage return.

6. Type

```
RUNYANKDCON=TERMIO
```

followed by a carriage return.



7. The control console prints out a number of messages and the console bell sounds. If an index of the names of the JCL source templates on file is desired, type

```
.#INDEX
```

followed by a carriage return. After the list is printed, type

```
.#LIST\b<xxxxxxx>
```

where <xxxxxxx> is the name of a JCL template with which the user wishes to work. Type a carriage return. The control console prints a listing of the template. A listing of all JCL templates can be obtained by typing

```
.#LSTALL.
```

followed by a carriage return.

8. Examine the listing produced in step 7.

NOTE

If the JCL template requires modification, skip step 9.

9. Repeat step 7 to list any other file for examination. If none of the JCL procedures require modification, type

```
.#ENDALL
```

followed by a carriage return. Skip to step 17.

10. If the JCL template requires modification, type

```
.#COMPILE\b<xxxxxxx>
```

followed by a carriage return to copy the JCL source to the work file for editing.

NOTE

Only one JCL source may be copied to the work file at any one time.

11. When the console bell sounds, type

```
.#ENDALL
```

followed by a carriage return. Then wait for the terminal to print READY (other messages may also appear before READY).



12. On the control console, type
EDIT~~Y~~FILE=(1, SYSTEM, JCWORK)

followed by a carriage return. The editing procedure makes use of IFE commands. For detailed information about these commands, refer to the DX980 General Purpose Operating System Programmer's Guide, Manual No. 943005-9701.

NOTE

This procedure cannot be used to add a new template. Refer to manual 943005-9701 for the required procedure.

13. Make the desired changes to the template.

14. Type
STOP

followed by a carriage return.

15. The next part of the procedure builds the JCB from the edited template and updates the JCL source file with the edited template. On the console, type

RUN~~Y~~JCLUP~~Y~~DLST=TERMIO~~Y~~DERR=TERMIO

followed by a carriage return. When the console prints the STRING termination message, the new JCB has been built. Any modifications to the JCL template are reflected in both the system binary and source JCL files.

16. To repeat the procedure of template selection, template editing, and JCB construction for other TI-supplied templates, perform the instructions in steps 5 through 15 again.

17. When all editing of all JCL procedures is complete, type

LOGOFF

followed by a carriage return.

18. Cancel ITS by pressing CTRL O and then the ESC key and typing

CANCEL <n>

and a carriage return, where <n> is the job number of the ITS job as displayed in the submitted message in step 4. The console prints termination messages.



3.3.8 PREPARATION OF BATCH INPUT AND OUTPUT SPOOLER FOR USE

If the Batch Input Spooler (BIS) and Batch Output Spooler (BOS) routines are to be used, perform the procedure in this paragraph. The Initial Program Load sequence in paragraph 3.3.5 should already have been performed.

Proceed as follows:

1. On the control console keyboard, press the ESC key. The console prints
//
Type in
JOB~~Ø~~INITSP~~Ø~~SYSTEM
followed by a carriage return.
2. Press ESC and then type
RUN~~Ø~~INITSP
followed by a carriage return.
3. The console prints a submission message followed by a termination message. Repeat steps 1 through 13 of the Initial program Load sequence in paragraph 3.3.5, followed by steps 4 through 6 below.
4. On the control console keyboard, type
L~~Ø~~P
followed by a carriage return. The console prints out a list of IPL parameters.
5. Look at the reference numbers (<nn₁> and <nn₂>) of the spool file VOL parameters (left column of listing). These numbers represent the spool-in and spool-out volumes, respectively. Change the contents of these parameters to one by typing
C~~Ø~~<nn₁>=1
C~~Ø~~<nn₂>=1
and follow each entry by a carriage return.
6. The next time the console prints a question mark:
?
Reply by typing
S
followed by a carriage return to save the new setting.



3.3.9 SYSTEM BACKUP

The completed copy of DX980 should be backed up immediately; in other words, a tape or disc copy of the information should be made in order that one intact copy is available if the other is accidentally changed.

For the dual disc configuration proceed to section 3.3.9.2, otherwise proceed to section 3.3.9.1 and skip section 3.3.9.2.

3.3.9.1 SYSTEM BACKUP TO TAPE. The backup procedure is as follows:

1. Load the input device with a copy of the programs on the appropriate medium. The items to be loaded for different input devices are shown below. These items must be loaded in the order listed.

<u>Input Device</u>	<u>Items to Be Loaded</u>
Card Reader	Card loader (part no. 967120-0001) Disc Save/Restore Monitor (part no. 944140-1203) Disc Save (part no. 944140-1205)
High-Speed Paper Tape Reader	PT loader (part no. 967121-0001) Disc Save/Restore Monitor (part no. 944140-1103) Disc Save (part no. 944140-1105)
33 ASR with Com- munications Mod- ule Interface	EIA loader (part no. 969768-5101) Disc Save/Restore (part no. 944140-1103) Disc Save (part no. 944140-1105)
Cassettes	Disc Save/Restore cassette (part no. 944140-0021), side B

2. Enable the input load device.
3. Mount a blank tape (part no. 973718-0004) with write ring inserted on the magnetic tape transport.
4. Ready the tape transport (press RESET, then press LOAD).
5. On the computer front panel, set the MODE switch to the HALT position.
6. Momentarily set the RESET switch to the RESET (down) position.
7. Set the data switches to the number code for the input load device, as follows:

Card Reader	0003 ₁₆
High-Speed Paper Tape Reader	0004 ₁₆



- 33 ASR with Communications Module interface 0006₁₆
733 ASR (cassette) 0006₁₆
8. Momentarily set the PC switch to the ENTER (up) position.
 9. Set the MODE switch to the RUN position.
 10. Momentarily set the LOAD switch to the up position. The input load device loads the routine, but stops before reading all of the input data. At this point, the relocating loader has been loaded.
 11. Complete the loading of input data and assignment of peripheral devices by performing steps 12 through 17 of paragraph 3.3.4.
 12. After the load device finishes reading the input data, the control console prints out a series of messages, some requiring operator response. The first message is printed to identify the program and appears as
SAVE DISC IMAGE ON MAGNETIC TAPE
 13. The console now prints
DISC TYPE - DS330/DIABLO - ENTER (0, 1)
Reply by entering 0 for a DS330 disc or 1 for a Diablo disc. Type a carriage return.
 14. The console now prints
DISC UNIT # (0, 3) =
Enter 0 (zero) followed by a carriage return.
 15. The console now prints
TOTAL # OF TRACKS TO SAVE =

If the disc is a Diablo, type a carriage return (this will default to 406 tracks). If it is a DS330, type
900
followed by a carriage return. A carriage return default for the DS330 will result in saving all 7809 tracks. The selection of 900 tracks should be adequate until more files are added.
 16. This message is now typed:
VERIFY TAPE AND DISC AFTER WRITE? (Y/N)
Enter Y followed by a carriage return.



17. The console now prints

TODAY'S DATE --MM/DD/YY =

Reply by typing in the date in numeric form, for example 01/31/75 for January 31, 1975. The next 48 characters may be used for comments that will be presented on future restores from this tape. Type a carriage return. The save program copies the contents of the disc (i. e., the operating system) on tape and verifies disc and tape data. Error messages may be printed by the console; error messages and their meanings are described in the Model 980 Computer Basic System Use and Operation, Manual No. 961961-9710.

18. If the program terminates normally, the console prints

SAVE COMPLETE

followed by

READY

19. Remove the magnetic tape from the tape transport.
 20. Remove the write ring from the tape reel.
 21. Label this backup tape and store it in a safe place.
 22. To return control to the DX980 Operating System, perform the IPL procedure described in paragraph 3.3.5.

3.3.9.2 SYSTEM BACKUP TO DISC. Run the Disc Copy/Verify routine to backup the DX980 GPOS disc to the disc on which it is to be stored. Proceed as follows:

1. Enable the system control console (a 733 ASR Data Terminal).
2. Place the copy of the programs in the system input device. The programs must be in a medium appropriate to the input device. If the medium is cassette, either cassette drive on the Model 733 ASR may be used. The items to be loaded for different input devices are listed below. These items must be loaded in the order listed.

<u>Input Device</u>	<u>Items to Be Loaded</u>
Card Reader	Card Loader (part no. 967120-0001) Disc Save/Restore Monitor (part no. 944140-1203) Disc Copy/Verify (part no. 944145-1201)
High-Speed Paper	PT loader (part no. 967121-0001)
Tape Reader	Disc Save/Restore Monitor (part no. 944140-1103) Disc Copy/Verify (part no. 944145-1101)



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munications Mod-
ule interface

EIA Loader (part no. 969758-5101)
Disc Save/Restore Monitor (part no.
944140-1103)
Disc Copy/Verify DDCOPY (part no.
944145-1101)

Cassettes

Disc Copy/Verify cassette (part no.
944145-0020), side A

3. Enable the input load device.
4. Mount the blank disc in the disc drive. Ensure that the unit is not in the write protect mode and that the blank disc has been initialized as described in paragraph 3.3.3.
5. Ready the disc drive (press RUN).
6. On the computer front panel, set the MODE switch to the HALT position.
7. Momentarily set the RESET switch to the RESET (down) position.
8. Set the data switches to the number code for the input load device, as follows:

Card Reader	0003 ₁₆
High-Speed Paper Tape Reader	0004 ₁₆
33 ASR with Communications Module Interface	0006 ₁₆
733 ASR (cassette)	0006 ₁₆
9. Momentarily set the PC switch to the ENTER (up) position.
10. Set the MODE switch to the RUN position.
11. Momentarily set the LOAD switch to the up position. The input load device loads the routine, but stops before reading all of the input data. At this point, the relocating loader has been loaded.
12. When this portion of the loading is complete, the IDLE indicator lamp lights. After this occurs, set the data switches to the hexadecimal value of the main memory size and enter this number into the E register by momentarily setting the E switch to the ENTER (up) position.
13. Momentarily set the START switch to the START (down) position. The Disc Save/Restore Monitor will then be loaded. Wait for the IDLE indicator to light.



14. Momentarily set the M switch to the DISPLAY position to display the contents of the M register. The M register value is displayed by the data indicator lamps. If the value is 0000₁₆, the load was completed normally; otherwise, load the routine again. If the input medium is punched data cards, make sure that they are in the correct order when reloaded. If the second load is unsuccessful, contact a field service representative.
15. Momentarily set the START switch to the START (down) position. Wait until the word READY is typed out by the control console.
16. On the control console, type
//RUN, <mnemonic>.
where <mnemonic> is one of the following mnemonics for input load devices:
PTR for the high-speed paper tape reader
TTR for the 33 ASR paper tape reader
CR for card reader
CS1 for data terminal with tape cassette (left-hand cassette drive)
CS2 for right-hand cassette drive
Type a carriage return. The input load device finishes reading the input data; i. e., the Disc Copy/Verify DDCOPY program.
17. The program identifies itself by printing:
DIABLO TO DIABLO COPY/VERIFY
18. A series of messages are printed requiring operator response. The first message is
COPY OR VERIFY (0, 1):
Enter a 0 (zero) to copy, followed by a carriage return.
19. The program now prints
MOD 31 or MOD. 44 (0, 1):
If the disc is a model 31, enter a 0 (zero); enter a 1 (one) if a model 44. Complete the entry with a carriage return.
20. The program now prints
INPUT CHAN#
Usually a 1 (one) will be entered, followed by a carriage return. Refer to Block Transfer Controller Maintenance Manual, Part Number 240802-9701 to determine if other than a one should be entered.



21. The program now prints
INPUT UNIT #
Enter a 0, 1, 2 or 3 followed by a carriage return.
22. If the model 44 was specified, the program will print:
REMOVABLE OR FIXED PLATTER (0, 1):
Enter a 0 (zero) to specify the removable platter or a 1 (one) for the fixed platter, followed by a carriage return.
23. The program now prints
OUTPUT CHAN#
Usually a 1 (one) will be entered followed by a carriage return. Refer to the Block Transfer Controller Maintenance Manual, Part Number 240802-9701, to determine if other than a one should be entered.
24. The program now prints
OUTPUT UNIT #
Enter a 0, 1, 2 or 3 followed by a carriage return.
25. If the model 44 was specified, the program will print
REMOVABLE OR FIXED PLATTER (0, 1):
Enter a 0 (zero) for removable or a 1 (one) the fixed platter, followed by a carriage return.
26. At the end of the copy phase the message
COPY COMPLETE
will be printed. At the end of the verify phase the message
VERIFY COMPLETE
will be printed. Any error messages that occur are self explanatory. All error data is displayed in hexadecimal format.
27. Upon completion the message
READY
will be printed. Remove the backup, label appropriately and store in a safe place.

3.3.10 SYSTEM POWER DOWN PROCEDURE

When the DX980 Operating System is running, use the following procedure to remove power from the system:

1. Use the STATUS operator communications function described in Section VI of this manual to display system status.



2. Cancel all jobs in the system except DX980 by using the CANCEL command.
3. Use the OFFLINE command to place any non-system discs in off-line mode.
4. Remove power from all peripheral devices.
5. Remove power from the Model 980 Computer.

3.3.11 BUILDING A NON-SYSTEM DISC

Perform the following procedure when adding a secondary disc to the DX980 Operating System:

1. Perform the Disc Initialization procedure described in paragraph 3.3.3 to initialize the new disc. The secondary disc address must be used in place of the system disc address.
2. Perform the Initial Program Loading (IPL) procedure to load the DX980 Operating System from the system disc. Use the ALTER command described in Section IV of this manual to add the secondary disc.
3. Use the List Devices (L/D) IPL Command to display the devices added.
4. When the IPL procedure is complete, place the new disc online by using the ONLINE operator communications command. When using this command, use the same device name that was specified in the ALTER command procedure.

NOTE

Before defining files on the new disc, create a User File Directory (UFD) for the disc by using the subsystem, CATLOG. This subsystem is described in Section VIII of the DX980 General Purpose Operating System Programmer's Guide, Part Number 943005-9701.

5. Use the CATLOG subsystem to define a UFD for the new disc. When the subsystem requests the Disc Volume ID, enter the number from the ID column for the appropriate disc found in the listing produced in step 3.
6. When the UFD has been created on the new disc, files may be defined in the same manner as on the system disc.



SECTION IV

INITIAL PROGRAM LOAD (IPL)

4.1 GENERAL

This section of the manual contains the Initial Program Load (IPL) operating procedure that the operator uses to initialize the DX980 operating system. The following paragraphs contain information about the Read-Only Memory (ROM) bootstrap loader, the DX980 disc-resident system loader and its command structure, IPL default parameter selection, IPL substitute parameter selection, modification of Physical Device Tables (PDT's), and date/time initialization.

4.2 ROM BOOTSTRAP

The IPL program is loaded into 980 computer memory by one of the ROM bootstrap loaders, all of which reside permanently in the 980 front panel ROM.

4.2.1 BOOTSTRAP LOADER SELECTION

If the system-resident disc is a Diablo, the Program Counter address setting to evoke the proper bootstrap is 0000_{16} ; if it is a DS330, the address will be 0007_{16} .

4.2.2 BOOTSTRAP LOADER INITIATION

The loader is activated by using the computer front panel switches, as follows:

1. Set the MODE switch to the HALT position.
2. Momentarily set the RESET switch to the RESET (down) position.
3. Set the data switches to the address of the selected ROM bootstrap loader.
4. Momentarily set the PC switch to the ENTER (up) position to enter the address into the Program Counter.
5. Set the MODE switch to the RUN position.
6. Momentarily set the LOAD switch to the up position.

The IPL processor is loaded and program control is transferred to the starting address of the IPL processor.

4.3 DISC-RESIDENT SYSTEM LOADER

After the transfer of control, IPL displays the following message on the system control console:

LM=



This is a request to the computer operator to supply the name of a disc file where a DX980 Load Module (LM) is stored. Normally there is only one version, called the primary system, of DX980 available at an installation. If other versions are created either by Texas Instruments or the customer, secondary systems may be selected for loading at this time. The primary system is the default, and can be loaded by pressing the carriage return (RETURN) key on the console. A secondary system can be selected by supplying the appropriate user identification (ID) and file name as follows:

(USERID, FILENAME)

After user ID and file name are supplied, press the RETURN key to load the appropriate secondary system.

4.4 SELECTION OF BASE SET OF DEFAULT PARAMETERS

After DX980 is loaded, the IPL processor displays the following message on the console:

BASE=

This is a request to select the set of default IPL parameters that will be used as the base set for this IPL.

4.4.1 TI DEFAULT PARAMETERS

Each system load module is generated with a base set of default parameters, which may be changed during an IPL sequence. If this set is to be used (or later modified) in the present loading of DX980, type a carriage return on the console keyboard.

4.4.2 USER DEFAULT PARAMETERS

If a user has already adapted DX980 to his needs by modifying the preset values, and "saved" the new parameter set by the process described in the discussion of the SAVE command in paragraph 4.5.7, he should enter

S

on the console, followed by a carriage return to select the saved base.

4.5 COMMANDS

After either reply to the "BASE=" query, the IPL program retrieves the appropriate set of default values; it then displays a question mark

?

which is the standard IPL prompt message. A prompt message is one that notifies the operator that a response is required before the program will continue.



The question mark is a request to supply parameters as temporary substitutes for one or more of the defaults in the base set. If the base set is acceptable, without modification, the IPL processor can be notified by keying in

G

followed by a carriage return.

If the base set requires change, or the operator desires to examine the base set, the operator may use the IPL command set to accomplish any examination and/or change. Operator functions are provided for listing and querying, and for modification of the parameters.

A typing error may be corrected in the following way. If a carriage return has not been entered, press the CTRL and H keys simultaneously, then correct the entry (the carriage will skip a line after the correction). If an error was entered and the carriage return key was pressed, the message

ILLEGAL PARAMETER

is printed, and another prompting question mark is printed. Continue in this manner until all errors are corrected.

The IPL commands are entered on the system control console keyboard. This subsection describes each command and provides instructions for using it. The command set includes the following:

- LIST
- QUERY
- CHANGE
- ALTER
- IN
- OUT
- SAVE
- GO

The following paragraphs describe each of the IPL commands and its use. The description of the ALTER command includes a discussion of associated subcommands.

The \emptyset symbol indicates a required blank.

4.5.1 LIST

The three parameters P, S and D indicate numeric parameters, SVC pro-



cedures, and devices, respectively. The LIST command causes all of the specified items to be displayed.

The LIST command has the following formats:

LØP

LØS

LØD

The three parameters in the command formats are used in the following ways:

- P - Refers to changeable numeric parameters in the operating system. The LIST and QUERY commands together with the change command can be used to establish the values of all numeric parameters that are changeable during IPL.
- S - Refers to SVC procedures in the procedure pool which can be either permanently resident or made resident only when requested. The LIST and QUERY commands, in conjunction with the IN and OUT commands, can be used to control which modules are made permanently resident.

CAUTION

SVC # 0, 4, 67, 73, 74, 95, and 132 are resident in the root segment and should not be referenced by the OUT command. This action would attempt to free these elements from the system root segment, and would cause a system failure.

- D - Refers to the hardware devices that were incorporated into DX980 during the SYSGEN procedure. The LIST and QUERY commands, in conjunction with ALTER, can be used to control which devices will be considered for user program allocation. Note that devices may be placed on line and off line during system execution by use of the Operator Communication commands.

Figures 4-1 through 4-3 are sample printouts obtained by entering each of these commands on the control console keyboard. The listings are examples only and are not necessarily related to the minimum configuration hardware.

4.5.2 QUERY

The QUERY command causes only the specified item to be displayed.

Examples of the format of this command follow:

QØP=3

QØS=98

QØD=DEVNAM



```

?L P
 1 PP SIZE      =8500
 2 DSCA SIZE   =5000
 3 MAX JOBSTRG =5
 4 MAX JOB STEPS=15
 5 MAX JOB LUNDS=31
 6 MAX JOB DSCA =500
 7 LD ROLLEE LIM=31
 8 HI ROLLER LIM=0
 9 CLOCK INTRVAL=100
10 SPOOL IN VOL=1
11 SPOOL IN PHY=64
12 SPOOL OUT VOL=1
13 SPOOL OUT PHY=64
14 DMAC EXPANDER=1
15 # OF IBUS EXP=0
16 INT EXPANDER=1

```

Figure 4-1. Sample Listing, Numeric Parameters

```

?L S
 0=I  1=0  2=0  3=0  4=I  5=0  6=0  7=0  8=0  9=0
10=0 11=0 12=0 13=0 14=0 15=0 16=0 17=0 18=0 19=0
20=0 21=0 22=0 23=0 24=0 25=0 26=0 27=0 28=0 29=0
30=0 31=0 32=0 33=0 34=0 35=0 36=0 37=0 38=0 39=0
40=0 41=0 42=0 43=0 44=0 45=0 46=0 47=0 48=0 49=0
50=0 51=0 52=0 53=0 54=0 55=0 56=0 57=0 58=0 59=0
60=0 61=0 62=0 63=0 64=0 65=0 66=0 67=0 68=0 69=0
70=0 71=0 72=0 73=I 74=I 75=0 76=0 77=0 78=0 79=0
80=0 81=0 82=0 83=0 84=0 85=0 86=0 87=0 88=0 89=0
90=0 91=0 92=0 93=0 94=0 95=I 96=0 97=0 98=0 99=0
100=0 101=0 102=0 103=0 104=0 105=0 106=0 107=0 108=0 109=0
110=0 111=0 112=0 113=0 114=0 115=0 116=0 117=0 118=0 119=0
120=0 121=0 122=0 123=0 124=0 125=0 126=0 127=0 128=0 129=0
130=0 131=0 132=I 133=0 134=0 135=0 136=0 137=0 138=0 139=0
140=0 141=0 142=0 143=0 144=0 145=0 146=0 147=0 148=0 149=0
150=0 151=0 152=0 153=0 154=0 155=0 156=0 157=0 158=0 159=0
160=0 161=0 162=0 163=0 164=0 165=0 166=0 167=I 168=0 169=0
170=0 171=0 172=0 173=0 174=0 175=0 176=0 177=0 178=0 179=0
180=0 181=0 182=0 183=0 184=0 185=0 186=0 187=0 188=0 189=0
190=0 191=0 192=0 193=0
?

```

Figure 4-2. Sample Listings, SVC Procedures

```

?L D
KEY  DEVNAM  ID  ENABLED  EXTREG  EXP #-SLOT  DEVICE TYPE
IT  DUMMY  00FF  Y  0404  DEUS 0000 0002
DT  SC  0015  Y  0606  DEUS 0000 0008  CRT - CM
DT  KEY1  0016  Y  0505  DEUS 0000 000A  733 - CM
DD  DISC1  0001  Y  DMAC  0001  DIABLD
DD  DISC2  0002  N  DMAC  0001  DIABLD
CR  CR1  0033  Y  1F1F  DEUS 0000 0004
LP  LP1  0029  Y  DMAC  0005
MT  MT1  001F  Y  DMAC  0002
MT  MT2  0020  N  DMAC  0002
SYSTEM DISC = DISC1
LOGGING DEVICE = KEY1
SYSTEM CONSOLE = SC
?

```

Figure 4-3. Sample Listing, Peripheral Devices



4.5.3 CHANGE

The CHANGE command changes the value of a parameter. The first number identifies the reference number of the parameter defined in the LIST command; the second number is the new value.

An example of the format of this command is:

C18 = 5

Note that the CHANGE command may be applied only to parameters (P), and not to SVC's (S) or devices (D). The P, S and D parameters are explained in the discussion of the LIST command, paragraph 4.5.1.

4.5.4 ALTER

The ALTER command allows the user to add, modify, or delete physical device information for the table from which IPL will build the DX980 PDT queue. This command makes it possible for the operator to tailor DX980 to the specific hardware configuration. Figure 4-4 provides examples of the use of the ALTER command.

The format of this command is

A

4.5.4.1 TABLE BUILDING ROUTINE. The table building routine is invoked when the operator enters an A on the control console keyboard, followed by a carriage return. The prompt messages (messages that notify the operator that a reply is required) are not question marks, but textual information that depends on the requested input. Therefore, several sequences of subcommands (described in paragraph 4.5.4.4) are possible.

4.5.4.2 IPL PDT BUILDER PARAMETERS. In the IPL parameter list, there are three parameters used by the IPL PDT builder routine. These parameters must be set with the CHANGE command before the ALTER (A) command is used. These parameters are:

DMAC EXPANDER =	A flag indicating whether or not DMAC expansion is in the system. If the flag is 0, no; if it is 1, yes.
# of DBUS EXP =	The number of external expanders connected into the system. A value of 0 indicates no external expanders.
INTERNAL EXP =	A flag indicating whether or not internal I/O bus expansion is available on the system. If the flag is 0, no; if it is 1, yes.

The LIST command may be used to display these parameters.



```
KEYNAME =DT
DISPOSITION DEVICE NAME=N SC
ENABLE DEVICE-(Y/N)Y
TIME OUT IN SECONDS(1-255)=
DMAC DEVICE-(Y/N)N
COMMAND REGISTER # =6
DATA REGISTER # =6
EXTERNAL EXPANDER # (0-4)=0
EXPANDER SLOT # =9
730-733-912CRT-ASR33 ENTER(0,1,2,3) 2
TTY/CM ENTER (0,1)1
CRT PAGE SIZE IN LINES (1-24) 1
SYSTEM CONSOLE-(Y/N)Y
LOGGING DEVICE (Y/N)N
```

```
KEYNAME =IT
DISPOSITION DEVICE NAME=N KEY1
ENABLE DEVICE-(Y/N)Y
TIME OUT IN SECONDS(1-255)=
DMAC DEVICE-(Y/N)N
COMMAND REGISTER # =5
DATA REGISTER # =5
EXTERNAL EXPANDER # (0-4)=0
EXPANDER SLOT # =10
730-733-912CPT-ASR33 ENTER(0,1,2,3) 1
TTY/CM ENTER (0,1)1
SYSTEM CONSOLE-(Y/N)N
LOGGING DEVICE (Y/N)Y
```

```
KEYNAME =LP
DISPOSITION DEVICE NAME=D LP2
KEYNAME =
```

```
KEYNAME =CR
DISPOSITION DEVICE NAME=R CR1
ENABLE DEVICE-(Y/N)Y
TIME OUT IN SECONDS(1-255)= 15
DMAC DEVICE-(Y/N)N
COMMAND REGISTER # =>1F
DATA REGISTER # =>1F
EXTERNAL EXPANDER # (0-4)=0
EXPANDER SLOT # =4
```

Figure 4-4. Examples of Use, ALTER Commands and Subcommands (Sheet 1 of 2)



```
KEYNAME =CP
DISPOSITION DEVICE NAME=N CR1
ENABLE DEVICE-(Y/N)Y
TIME OUT IN SECONDS(1-255)= 15
DMAC DEVICE-(Y/N)N
COMMAND REGISTER # =>1F
DATA MULTIPLE # =>1F
EXTERNAL EXPANDER # (0-4)=0
EXPANDER SLOT # =4
```

```
KEYNAME =LP
DISPOSITION DEVICE NAME=N LP1
ENABLE DEVICE-(Y/N)Y
TIME OUT IN SECONDS(1-255)= 15
DMAC DEVICE-(Y/N)Y
DMAC CHANNEL #=5
```

```
KEYNAME =MT
DISPOSITION DEVICE NAME=N MT1
ENABLE DEVICE-(Y/N)Y
TIME OUT IN SECONDS(1-255)=
DMAC DEVICE-(Y/N)Y
DMAC CHANNEL #=2
TAPE DRIVE #(0-2) =0
```

```
KEYNAME =MT
DISPOSITION DEVICE NAME=N MT1
ENABLE DEVICE-(Y/N)Y
TIME OUT IN SECONDS(1-255)= 255
DMAC DEVICE-(Y/N)Y
DMAC CHANNEL #=2
TAPE DRIVE #(0-2) =0
```

```
KEYNAME =MT
DISPOSITION DEVICE NAME=N MT2
ENABLE DEVICE-(Y/N)N
TIME OUT IN SECONDS(1-255)= 255
DMAC DEVICE-(Y/N)Y
DMAC CHANNEL #=2
TAPE DRIVE #(0-2) =1
```

```
KEYNAME =
```

Figure 4-4. Examples of Use, ALTER Commands and Subcommands (Sheet 2 of 2)



Table 4-1. ALTER Subcommands (Continued)

Subcommand Query	Description
ENABLE DEVICE (Y/N)	<p>This reply instructs the PDT build routine to put the device on/off line initially.</p>
	<p style="text-align: center;">NOTE</p>
	<p style="text-align: center;">The system disc, system console, and logging device are put online unconditionally by the IPL processor.</p>
TIME OUT IN SECONDS (1-255)	<p>The amount of time that elapses before the device times out. If no time-out is desired, enter 255 on the console keyboard, followed by a carriage return, or enter a carriage return only. Typical values for standard devices are given in table 4-2.</p>
DMAC DEVICE (Y/N)	<p>Y specifies a DMAC device, N a data bus device.</p>
<u>DMAC Device Subcommand</u>	
DMAC CHANNEL #	<p>Number of the slot occupied by the DMAC interface card. The message</p>
	<p style="text-align: center;">WARNING SLOT IS ALREADY ASSIGNED</p>
	<p>will be printed by the console if the operator attempts to assign the same</p>
	<p>DMAC CHANNEL # to two different DMAC controllers. Only the last</p>
	<p>channel assignment specified will be valid.</p>
<u>Disc Subcommands</u>	
DS330 OR DIABLO ENTER (0, 1)	<p>For discs, the disc type (DS330 or Diablo) is requested; so are the disc</p>
DISC UNIT # (0-3)	<p>unit number and whether or not the disc is the system-resident disc.</p>
SYSTEM DISC (Y/N)	
<u>Tape Drive Subcommand</u>	
TAPE DRIVE # (0-2)	<p>For magnetic tapes, the tape unit number is requested.</p>



Table 4-1. ALTER Subcommands (Continued)

Subcommand Query	Description
<u>Data Bus Device Subcommands</u>	
COMMAND REGISTER #	External register number for command/status information about I/O data bus devices.
DATA REGISTER #	External register number for data transfer to or from I/O data bus devices.
EXTERNAL EXPANDER # (0-4)	Number of the external I/O data bus expander occupied by the I/O interface card.
EXPANDER SLOT #	Slot number occupied by the card in the appropriate expander. The message **WARNING SLOT IS ALREADY ASSIGNED will be printed on the console if the operator attempts to build two devices with the same expander and slot number. The PDT's for both devices will be built, but only the last one is valid.
<u>Data Terminal Subcommands</u>	
730-733-912CART-ASR33 ENTER (0, 1, 2, 3)	For data terminals, the device type (730, 733 ASR/KSR, 912, or 33 ASR) is requested.
TTY/CM ENTER (0, 1)	The device interface card (teletypewriter or communications module) is requested.
CRT PAGE SIZE IN LINES (1-24)	Number of lines per screen used by ITS. Requested for CRT devices only.
SYSTEM CONSOLE - (Y/N)	Is this data terminal the system console?
LOGGING DEVICE - (Y/N)	Is this terminal the system logging device? (I.e., will submission and termination messages be printed here?)



Table 4-1. ALTER Subcommands (Continued)

Subcommand Query	Description
<u>Paper Tape Subcommand</u> DEVICE TYPE TTY/CM/HS (0, 1, 2)	For the paper tape reader and paper tape punch, three interface types may be specified: teletypewriter, communications module, or high speed.

Table 4-2 lists standard assignments of command and data registers and the expander slot numbers.

4.5.4.5 **HARDWARE PRIORITY AND EXTERNAL REGISTER NUMBER CHANGES.** The interval timer PDT is always resident in the system table area. The hardware priority and external register numbers may be changed during the table builder process by entering the keyname

IT

and

R/DUMMY

4.5.4.6 **TERMINATION OF ALTER COMMAND PROCESSING.** To terminate the processing of the ALTER commands, wait for the next KEYNAME = prompt from the control console, and enter only a carriage return. A question mark query denotes return to main-line IPL processing.

Before proceeding further, validate the input by entering L/D followed by a carriage return, to obtain a listing of the updated device information. Errors are easily made at this point in the procedure; therefore, the listing should be checked carefully.

4.5.5 **IN**

The IN command causes an SVC procedure to be made permanently resident.

An example of the format of this command follows:

I/D10

The IPL processor will bring all those SVC's marked resident into the Procedure Pool before passing control to the system. Since the DX980 Procedure Pool manager provides optimum use of the Procedure Pool region, it is suggested that this command be used with discretion.

Note that the IN and OUT commands apply only to SVC's (S parameter).



Device Type	Device and Interface	KEYNAME	Suggested DEVICE NAME(s)	ENABLE DEVICE-(Y/N)	TIMEOUT (Note 1)	DMAC DEVICE-(Y/N)	DMAC CHANNEL #	DS330 OR DIABLO ENTER (0, 1)	DISC UNIT NUMBER (Note 2)	SYSTEM DISC-(Y/N)	TAPE DRIVE # (0-2)	COMMAND REGISTER (Note 3)	DATA REGISTER (Note 3)	EXTERNAL EXPANDER # (Note 4)	EXPANDER SLOT # (Note 5)	730-733-912 CRT 33 ASR ENTER (0, 1, 2, 3)	TTY or CM (0, 1)	CRT Page Size in Lines (1-24)	SYSTEM CONSOLE	LOGGING DEVICE	DEVICE TYPE-- TTY/CM/HS --ENTER (0, 1, 2)
Data Terminals	733 ASR (Communications Module)	DT	KEYn or SC (if system console)	Note 6	255	N						5	5	0	Note 3	1	1		Note 9	Note 10	
	33 ASR (Communications Module)	DT	KEYn or SC (if system console)	Note 6	255	N						5	5	0	Note 3	3	1		Note 9	Note 10	
	33 ASR (TTY)	DT	KEYn or SC (if system console)	Note 6	255	N						>A	2	0	Note 3	3	0		Note 9	Note 10	
	733 KSR (Communications Module)	DT	KEYn or SC (if system console)	Note 6	255	N						5	5	0	Note 3	1	1		Note 9	Note 10	
	912 CRT (Communications Module)	DT	CRTn SC (if system console)	Note 6	255	N						5	5	0	Note 3	2	1	Note 11	Note 9	Note 10	
	730 (Communications Module)	DT	KEYn or SC (if system console)	Note 6	255	N						5	5	0	Note 3	0	1		Note 9	Note 10	
Cassette	Cassettes on 733 ASR (Communications Module)	CS	CSn1 Note 13. * CSn2	Note 6	60	N						5	5	0	Note 3						
Card Reader	Data Products (CDR)	CR	CRn	Note 6	15	N						>1F	>1F	0	Note 5						2
Paper Tape Reader	Remex, High Speed (PTR)	PR	PTRn	Note 6	30	N						>10	>18	0	Note 5						1
	33 ASR, Low Speed (Communications Module)	PR	PTRn	Note 6	60	N						5	5	0	Note 5						0
	33 ASR, Low Speed (TTY)	PR	PTRn	Note 6	60	N						>A	2	0	Note 5						2
Paper Tape Punch	Remex, High Speed (PTP)	PP	PTPn	Note 6	30	N						>11	>18	0	Note 5						1
	33 ASR, Low Speed (Communications Module)	PP	PTPn	Note 6	60	N						5	5	0	Note 5						0
	33 ASR, Low Speed (TTY)	PP	PTPn	Note 6	60	N						>A	2	0	Note 5						0
Data Module	User specified (DM)	DM	DMn	Note 6	255	N						>44	>44	0	Note 5						
AD/DA	Digital I/O and Analog Output (7430) High Level Analog Input (7460) Low Level Analog Input (7470) Wide Range Analog Input (7480)	AD	ADDAn	Note 6	60	N						>44	>44	0	Note 5						
Interval Timer	Interval Timer	IT	DUMMY	Y	60	N						4	4	0	Note 5						
Line Printers	Centronics (DM)	LP	LPn	Note 6	15	N						50	50	0	Note 5, 12						
	Data Products (LP)	LP	LPn	Note 6	15	Y	5														
Discs	Diablo (MHD)	DD	DISCn	Note 6	255	Y	1	1	0	Note 7											
	DS330 (DMAC)	DD	DISCn	Note 6	255	Y	0	0	0	Note 7											
Magnetic Tape	979 Magnetic Tape (TC)	MT	MTn	Note 6	255	Y	2				Note 8										

Note 1: An entry of 255 specifies no timeout. A simple carriage return provides the same result.
 Note 2: Unit numbers are set by the mod-select plug for the DS330 and by internal jumpers for the Diablo disc drive.
 Note 3: No two device interfaces may use the same register number. The ones shown here are standard for the first device of each type. See the Model 980 Computer Assembly Language Input/Output Manual (Manual No. 961961-9734), for standard register

assignments of secondary devices. The standard minimum configuration has the system console in chassis location I03.
 Note 4: Refers to the Data Bus Expansion Chassis number that contains the interface card for this device. A response of 0 indicates that the interface resides in the 980 Computer internal expansion or that no expansion is available.
 Note 5: Indicates the data bus I/O slot number that contains the interface card

for this device. Slot numbers (XX) are indicated on the expansion chassis and the 980 main frame as '10XX'.
 Note 6: Device should be enabled only if it is physically available.
 Note 7: Only one system disc may be specified.
 Note 8: Tape unit numbers are determined by the order in which they are daisy-chained together. Unit 0 is the first unit in the chain, etc.
 Note 9: Only one device may be specified as a system console.

Note 10: Only one device may be specified as a logging device.
 Note 11: Refers to CRT's only. This variable is used by the Interactive Terminal System (ITS) and determines the number of display lines available. A carriage return will result in a default of 1 line, or else the number of lines desired must be entered. The maximum value is 24 lines (a full screen).
 Note 12: Assign the Centronics line printer to the lowest priority I/O slot.
 Note 13: The first cassette entered is assumed to be the one on the left side.

Table 4-2. Responses for IPL ALTER Command



4.5.6 OUT

The OUT command causes the SVC procedure to be made non-resident.

An example of the format for this command is:

0/15

Note that the IN and OUT commands apply only to SVC's (S parameter). If the operator attempts to use the OUT command to make an SVC non-resident which is in the system root, the command will be ignored.

4.5.7 SAVE

The SAVE command causes the configuration to be saved on disc.

NOTE

The configuration includes parameters, the SVC resident/non-resident table, and the device table.

The format of this command is:

S

S may be entered on the control console keyboard at any time during the commanding process (i. e., in reply to a question mark). The configuration which the operator last saves is the one that will be retrieved when the BASE = query is answered with an S and a carriage return. Therefore, a SAVE should be the last command entered before the GO command.

4.5.8 GO

The GO command indicates that all the variables have been set.

The format of this command is:

G

Entering G followed by a carriage return causes the IPL processor to incorporate the base set into the system, and closes the commanding process; therefore, the operator must have carried out all modifications, and saved them, before this command is entered.

4.6 DATE AND TIME INITIALIZATION

After the operator enters the G command, the following request is displayed on the console:

DATE & TIME=



The values are set by a single entry, with the following format:

MM/DD/YY, HH:MM:SS

Where hours (HH), minutes (MM) and seconds (SS) represent the elapsed time since midnight. The IPL processor echoes the date and time and then transfers control to the operating system. From that point on, all system communications with the console are carried out by the operator communications functions.

4.7 CONSEQUENCES OF CHANGES

For some options modifiable by IPL, tradeoffs and interactions exist which are not obvious to the operator, but which can have a significant impact on system performance. The following discussions explain the important points for changes to parameters, supervisor calls (SVC's), and peripheral devices.

4.7.1 DEFINITIONS OF TERMS

The operator should understand several terms related to program loading and execution; these terms are briefly explained here.

Rollin and rollout are processes for transferring an entire job partition from disc to memory and from memory to disc, respectively, when a program must relinquish memory to a higher priority program. The memory being used by the lower priority job is copied to disc, after which the higher priority job is loaded and serviced by the Central Processor. The lower priority job is returned to memory from disc when all jobs of priority sufficient to cause rolling have been serviced, and the Central Processor then resumes servicing of the lower priority job.

Spooling is the process of copying information to or from disc. The Procedure Pool is a file of frequently used procedural routines.

4.7.2 PARAMETERS

The TI-supplied parameter default values are calculated to provide optimum system performance in a typical user installation. Individual installations may have special requirements which justify modifying the preset values for their own needs. Users at these installations may wish to utilize optional features, such as ROLLIN/ROLLOUT or spooling, which must be enabled during IPL execution.

A list of parameters modifiable by IPL is given in table 4-3. Their ordering may change in different releases; therefore, they should be listed (by entering LØP and a carriage return on the control console keyboard) before making any modifications.



Table 4-3. Parameters Modifiable by IPL

Parameter	Description
PP SIZE	Procedure Pool size in words.
DSCA SIZE	Dynamic System Control Area size in words.
MAX JOB STRING	The maximum number of jobs that will be allowed in the system. Used for small memory systems.
MAX JOB STEPS	Maximum number of independent job steps allowed in the system.
MAX JOB LUNOS	The maximum number of logical unit numbers that will be allowed within a single job.
MAX JSB DSCA	The maximum amount of memory in words that will be used for storage of the job queue. All job step JSB's beyond this amount will be stored on disc.
LO ROLLEE LIM	The priority level below which a job may be rolled out.
HI ROLLER LIM	The priority level above which a job may cause rolling.
CLOCK INTRVAL	The interval (in milliseconds) between timer interrupts.
SPOOL IN VOL	The number of the disc volume containing the input spool file.
SPOOL IN PHY	Physical record size of input spool file (in words).
SPOOL OUT VOL	The number of the disc volume containing the output spool file.
SPOOL OUT PHY	Physical record size of output spool file (in words).
SPOOL LP WIDTH	The size of the line printer carriage. 0 implies 80 columns, 1 implies 132 columns.
DMAC EXPANDER	Denotes the presence (1) or absence (0) of a DMAC expander.
# OF DBUS EXP	Number (0 to 4) of external data bus expanders.
INT EXPANDER	Denotes presence or absence of an internal data bus expander.

ROLL FILE SIZE-

SIZE OF ROLL FILE, IN TRACKS, TO BE ALLOCATED



4.7.2.1 DECREASING PROCEDURE POOL SIZE. One desired modification, especially in installations with limited main memory size, is to increase the memory size available to user programs by decreasing space for the Procedure Pool. In some cases this is feasible; for example, running with one job doing limited I/O, and with infrequent step termination, makes relatively light demands on the Procedure Pool. However, in most cases, any trimming of the Pool will result in substantially slower system performance. A large reduction in the Pool size may cause a system failure. Changes to the size must be on a cut-and-try basis; in general, a size cut is not recommended.

4.7.2.2 DECREASING DYNAMIC SYSTEM CONTROL AREA SIZE. Similar considerations apply to changes in the Dynamic System Control Area (DSCA) size. The parameter interacts with the MAX JOBSTRING and MAX JOB DSCA parameters; any reductions in DSCA size should be accompanied by reductions in the others. DSCA reductions are less likely than are Procedure Pool reductions to slow the system performance but are more likely to cause a system failure.

The addition of devices (Physical Device Tables) should be accompanied by increases to DSCA size.

4.7.2.3 USE OF ROLLIN/ROLLOUT FACILITY. The preset values of the ROLLER and ROLLEE parameters will not enable the ROLLIN/ROLLOUT facility, so that the user who desires the facility must manually specify the desired priority levels.

The purpose of the two parameters is to allow three categories of program:

- Those which cause rolling.
- Those which can be rolled.
- Those which can neither roll nor be rolled.

Specifying a ROLLEE limit of higher priority (or lower priority) number than the ROLLER limit may result in a run-time error condition. If this facility is to be used, the operations manager of the installation should exercise a set of standards governing program priority specification.

4.7.2.4 SPECIFICATION OF DISC VOLUMES. If the SPOOL IN VOL and SPOOL OUT VOL parameters specify different volumes, the SPINT utility program which creates the files must be executed once for each volume. If the same volume is specified, the SPOOL OUT PHY and SPOOL IN PHY parameters must be identical and must be multiples of 32.

NOTE

The roll file will be allocated only if the roll limits are set such that rolling is possible.



4.7.3 SUPERVISOR CALLS

The only operator option available to control DX980's treatment of service calls (SVC's) is the IN/OUT function, by which an SVC may be locked into the procedure pool regardless of the activity against the SVC.

Since the Procedure Pool Manager in DX980 has logic to detect the frequency of use of a given module, and retain a module in memory on that basis, almost all SVC's are preset to nonresident status. In almost all cases, an installation does not gain in system efficiency by causing any of these modules to be resident. Therefore, the operator is advised to refrain from using the option except in unusual circumstances.

4.7.4 PERIPHERAL DEVICES

The discussion of physical devices includes system performance considerations affecting Physical Device Tables and JCL templates.

4.7.4.1 PHYSICAL DEVICE TABLES. Since only a rudimentary set of PDT's are included in the shipped version of DX980, the user must use the ALTER command to create new PDT's as part of the installation procedure. Because the PDT's are built in the DSCA, the parameter for DSCA space should be increased by 25 words for each new PDT to allow the available working space to remain constant.

4.7.4.2 JCL TEMPLATES. All JCL templates referring to freshly ALTERed devices must be reprocessed by the JCL translator.



SECTION V

OPERATION AND STRUCTURE OF OPERATOR COMMUNICATIONS PACKAGE

5.1 GENERAL

The operator communications package for DX980 exists as a task which runs under the system job. The procedures driven by this task consist of a group of modules, only one of which is part of the resident system. The remaining modules are invoked by supervisor calls and occupy memory in the procedure pool as necessary.

The operator communications task is only active when explicitly requested by receipt of an Escape (ESC) character from the system console when in the system mode. This task remains active for the time needed to request and process a command. It then reenters an inactive state, awaiting an event which will activate it again. Once the operator communications task is active, the ESC character is utilized to cancel an input or output record currently in progress at the device. This action provides early termination of requested displays; e.g., the display of status on all tasks.

5.2 SYSTEM CONSOLE CHARACTERISTICS

The following are characteristics of the system console which affect the functioning of the operator communications task:

- LUN 0 of the system job is permanently assigned to the system console.
- LUN 0 is always open and has a maximum record length of 80 characters.
- The console has two modes: system and user. The system mode is activated by pressing the CTRL and letter O keys simultaneously (Control O). The user mode is activated by pressing the CTRL and U keys simultaneously (Control U). In the system mode, any output to the console from a user job is queued until return to user mode. In user mode, however, output from a system job is printed on the console immediately, breaking into the user's activity.
- All input/output via the system console is performed via LUN 0 or LUN 1 of the system job.

5.3 OPERATOR COMMUNICATIONS TASK STRUCTURE

The structure of the package can be divided into four functional components. They are the initiator, driver, processor, and diagnostic components, which are described in the following paragraphs.



5.3.1 INITIATOR

The initiator is the only resident portion of the package and consists of a single module, which occupies a minimum amount of memory. It provides an entry point for execution when the operator communications task is activated, initiates execution of the non-resident portion of the package, provides the exit point from the non-resident portions, and suspends the operator communications task pending re-activation.

5.3.2 DRIVER

The driver is the module invoked by the initiator. It requests input from the console and transfers control to the appropriate module to process the command received. It also will invoke a diagnostic function if the command received was syntactically incorrect, or if return from the processing module indicated the need to call the diagnostic function.

5.3.3 PROCESSORS

At least one processor module exists for each command that is defined. The processor module accomplishes the necessary action for the requested command.

5.3.4 DIAGNOSTIC

A single module provides a common vehicle by which diagnostic messages for operator communication are displayed. This module is called from the driver module if one of the processor modules called from the driver returns a completion code. The following conventions apply to the completion code:

- Code = 0: Normal termination of processor module.
- Code \neq 0: Signifies request for a diagnostic message.

The driver module itself uses the diagnostic module if it encounters an error in the initial processing of the command. Nonzero codes are printed on the console listing.

5.4 COMMAND LANGUAGE

The command language utilized by the operator communication package consists of a command name followed by zero or more operands, whose meaning is dependent on the particular command being requested. The command name is a label containing 1 to 8 characters, but DX980 responds correctly if only the first two letters of the label are entered.

Delimiters between operands are either a comma, or one or more blanks; the commands are terminated with either a period and a carriage return (RETURN) or a RETURN alone. If a command with operands is longer than a line, the line is terminated with a semicolon and a carriage return.



5.4.1 PROMPT CHARACTERS

The Operating System uses prompt characters to request user input on the system console. The two prompt characters are double slash (//) and double period (..). When the operator presses the ESC key, the system displays a double slash if it recognizes that the new line is also a new command (a new command is recognized when the previous line is terminated with a carriage return, or with a period and a carriage return). If the new line is a continuation of the previous command, the system displays a double period for a prompt character (a continued command is recognized when the previous line is terminated with a semicolon and a carriage return). The operator may not enter a command until the prompt character is printed.

5.4.2 CORRECTIONS TO ENTRIES

When an error has been typed in the string of characters for a command, there are two ways to delete the error. The operator may backspace one character at a time by entering CTRL H on the console keyboard until he has backspaced past the error and then resume normal entry; the carriage skips one line so that the correction may be easily read. If the entire input string is in error, the command may be omitted by entering a RUBOUT character and starting the command again.

If several corrections are made in one command and the printing appears in several horizontal lines, the operator may view an entire line by entering CTRL N on the keyboard. At this point, the entire line is printed and further action may occur as required.

5.5 COMMANDS

Available commands for the operator communications functions allow the operator to display memory, display job or system information, and start or cancel programs. Descriptions of the commands and examples of their use are included in Section VI.

5.6 BATCH SUBSYSTEMS

Any batch subsystem (BIR, BIS, or BOS) may be started at any time from the operator's console. This is accomplished by the operator commands

```
//JOB ...  
and  
//RUN ...
```

Refer to the DX980 General Purpose Operating System Programmer's Guide for more detailed descriptions of the Job Control sequences required.

Typically, once a batch subsystem is started, it remains in memory for a relatively long time. The subsystems are terminated by the //CANCEL



command. The operator should start the batch subsystems when no other jobs are running, in order to use memory most efficiently.

BIS and BIR are completely autonomous; there are no operator commands for these subsystems. BOS does have an operator command, which is discussed in Section VI.

BIR requires the assignment of LUN 10 to a card reader. BIS requires the assignment of LUN 5 to a card reader. When these are executed using the RUN command, the assigned input peripheral device becomes the Batch Input Device.

BOS requires the assignment of LUN 5 to an output peripheral device, typically a line printer, and LUN 6 to an input file. LUN 6 is a "newsflash" input LUN - the assigned file is to contain pertinent data of interest to all users at a particular installation and is printed on the output peripheral device ahead of user data. The "newsflash" file must be a linked-sequential file, with a logical record length of 80 characters.



SECTION VI

OPERATOR COMMUNICATIONS COMMANDS AND PRINTED OUTPUTS

6.1 INTRODUCTION

This section presents programming information for certain input/output operations using the operator communications package. Included are descriptions of operator commands, messages printed by the control console that are not a result of operator input, and examples of listings generated by the commands.

6.2 AVAILABLE COMMANDS

The available commands permit the operator to perform the following:

- Display main and disc memory.
- Display job or system statistics.
- Display or modify system time and date.
- Start or cancel programs using the job management facilities.

6.2.1 COMMAND MNEMONICS, FUNCTIONS AND FORMATS

The command mnemonics, functions and input formats are shown in table 6-1. Note that the input operands indicated in the formats must be entered exactly as shown; this precludes error messages and incorrect DX980 actions.

The JOB and RUN commands use the same processor modules as does the batch input system, and require the same input operands. The CANCEL command is invoked by job number. If the job name is known, but not the job number, the STATUS command may be used to obtain a cross-reference.

6.2.2 EXAMPLES OF USE

The following examples show the use of the various operator communications commands. In these examples, (ESC) indicates an Escape control character typed on the control console keyboard and (CR) indicates a carriage return.

- Example 1. Change systems time to 11:59:15 and enter appropriate comment.
 - a. (ESC)
//TIME 11, 59, 15. CHANGE TIME (CR)



Table 6-1. Operator Communication Commands

Mnemonic	Function	Format
DMEM	Display main memory	DMEM start addr end addr
DDISC	Display disc memory	DDISC disc drive no. start sector addr end sector addr
ONLINE	Bring device online	ONLINE device mne- monic
OFFLINE	Take device offline	OFFLINE device mne- monic
STATUS	Display statistics for steps in a specified job	STATUS job no.
STATUS	Display statistics for all jobs in system	STATUS (none)
DATE	Modify system date	DATE month day year
DATE	Display system date	DATE
TIME	Modify system time (24 hr)	TIME hours minutes seconds
TIME	Display system time	TIME (none)
REPLY	Reply to a system query for a task	REPLY message ID {YES} { NO }
JOB	Enter setup information to run a job from the console	JOB (Same as batch input)*
JOB	Display job setup informa- tion already entered	JOB (none)
RUN	Enter a job into the system from the console	RUN (Same as batch input)*
CANCEL	Cancel a job in the system by job number	CANCEL job number
SYSTAT	Display Procedure Pool in- formation	SYSTAT (none)

*Refer to description of Job Control Language in DX980 General Purpose Operating System Programmer's Guide, Manual No. 943005-9701.



- b. (ESC)
//TIME 11; (CR) ..59; (CR) ..15; CHANGE TIME (CR)
- c. (ESC)
//TIME 11 59 15 (CR)
- Example 2. Request STATUS of all programs in the system.
(ESC)
//STATUS (CR)
- Example 3. Display memory from location 1000 for 512 words.
 - a. (ESC)
//DMEM 1000 1512 (CR)
 - b. (ESC)
//DMEM >3E8 >5E8 (CR)
 - c. (ESC)
//DMEM >3E8;(CR)>5E8. COMMENT (CR)
- Example 4. Start JCL translator from the console.
(ESC)
//JOB JCLTRN USER01
(ESC)
//RUN JCL DSRC=SC DLST=DUMMY; (CR)..DERR=SC
DOBJ=DISC1; (CR) .. FOBJ=(SYSTEM.....) (CR)
- Example 5. Cancel job by number (for this example job number = 2).
(ESC)
//STATUS. FIND NUMBER (CR)
(ESC)
//CANCEL 2. (CR)



- Example 6. Operator reply to a message from DX980, informing him that a needed line printer is offline.

```
DEVICE LP1 JOB-NO 5 JOB-NAME XXX NOT READY  
REPLY YES OR NO WITH MESSAGE ID = 377
```

```
(ESC)
```

```
//REPLY 377 YES
```

6.2.3 BATCH OUTPUT SPOOLER (BOS) COMMAND

If the Batch Output Spooler has been activated, the operator has another command in his set, BOS, which he may use to control the listing of the spooled output. The three options of this command are as follows:

- a. (ESC)

```
//BOS $\backslash$ CANCEL (CR)
```

This causes printing of the currently active data set to terminate, and printing of the next data set in the spool file to commence.

- b. (ESC)

```
//BOS $\backslash$ RESTART (CR)
```

As the name RESTART implies, this option of the command causes repositioning to the beginning of the current data set.

- c. (ESC)

```
//BOS $\backslash$ SKIP $\backslash$ <nn> (CR)
```

The integer <nn> represents the number of lines by which the file is to be repositioned. The integer may be positive (reposition ahead) or negative (reposition backwards). For instance, <nn> = 10 means skip the next ten lines of print; <nn> = -10 means reprint the last ten lines. The positioning is relative to the line being printed when the Batch Output Spooler acts on the received BOS command.

Backspacing a number of lines greater than the number already printed from the data set using the SKIP option is equivalent to the RESTART option; similarly, requesting a skip ahead for more lines than the number remaining to be printed is equivalent to the CANCEL option.

6.3 UNSOLICITED MESSAGES

The operator may see five categories of unsolicited messages appearing on the control console printout. These message categories are described in the following paragraphs.



6.3.1 SUBMISSION

Upon receipt of a newly submitted job by the Job Management modules, an acknowledgement message is sent to the console. An example of this type of message is:

```
NO.=4  UID= SYSTEM NAME=S    SUBMITTED
```

where NO. is the job number, UID is the user ID, and NAME is the job name. The message is informational, and no action is required.

6.3.2 TERMINATION

Messages referring to the termination of both jobs and steps may be printed by the control console. The step termination messages carry more information, including a code indicating the cause of the termination. An example of a step termination message is:

```
NO.=3  UID= SYSTEM NAME=LNKCLG STEP=1  TERMINATED AT 02D3  
TERM CODE=0  TASK TIME= 0  0  21  101  MJAR=7914  MJEA=i059  EX=7048
```

The parameters in this message have the following meanings:

NO.	Job number
UID	User ID
NAME	Job name
STEP	Step number
TERMINATED AT	Exit relative address - of interest if termination was not normal
TERM CODE	Code that is equal to 0 if termination was normal, and is not equal to 0 otherwise; see the appendixes of the <u>DX980 General Purpose Operating System Programmer's Guide</u> for the meaning of termination codes. Error codes greater than 10,000 are generated by user programs via SVC 4.
TASK TIME	Time in hours, minutes, seconds, and milliseconds
MJAR	User program size - actual, instead of requested
MJEA	Actual job extension area (JEA) memory space used
EX	Excess memory space requested - user area plus JEA



The step termination message is informational and does not require operator action. If the termination code is nonzero, however, the programmer responsible for the job should be informed.

Certain other error messages may be given with the step termination message. There are three formats for these messages as follows:

ERROR ID=	This message gives the device name or file name to which the TERM CODE applies (if applicable.)
ERROR CODE=59 ERROR ID=	This message gives the device name or file name for each logical unit number for which the user program failed to do a Close I/O call. (Maximum of 6 names given.) (Not given if the operator cancels the job.)
ERROR # /ERROR ID=	This message gives the error number and corresponding device name or file name if any errors are detected by Job Management after the job step terminates. (Maximum of 3 names given.) An example of such an error is specifying Delete on a file without giving the proper password. Meanings of the error numbers are given in Appendix A of the <u>DX980 General Purpose Operating System Programmer's Guide</u> , Part Number 943005-9701.

If *MJAR appears in the message instead of MJAR, the program uses memory space beyond the physical end of the load module.

An abbreviated termination message is printed if a ready job which was in the JCBFIL is cancelled.

The format of the message is as follows:

```
NO.=3  TERM CODE = nnnn
```

where nnnn is the termination error number.

The job termination message informs the operator that all steps within the job have finished. An example is:

```
STRING NO.=5  TERMINATED
```

where STRING NO. is the job number.



6.3.3 INTERVENTION REQUEST

The intervention request message informs the operator that a device required by the active job is offline, has timed out, run out of paper, or is otherwise in need of an operator action. When the operator receives an intervention request he must:

1. Correct the specified problem or determine that it is not correctable.
2. Enter a REPLY command that has the first operand equal to the message ID and the second operand equal to either YES or NO.

For example, the following message from a card reader indicates a data error:

```

DEVICE CR1      JOB-NO 31      JOB-NAME E      DATA ERROR
REPLY  YES OR NO WITH MESSAGE ID = 24574

```

To respond to this message, the operator must:

1. Put the last card read back in the card reader to be read as the next card.
2. Ready the card reader.
3. Press CTRL and O simultaneously.
4. Press the ESC key; the system responds with //
5. Enter the following:
REPLY 24574 YES
followed by a carriage return.

Similarly, the following message from a line printer:

```

DEVICE LP1      JOB-NO 29      JOB-NAME JCLBIR OFFLINE
REPLY YES OR NO WITH MESSAGE ID = 24550

```

requires the following actions from the operator:

1. Ready the printer
 2. Press CTRL and O simultaneously
 3. PRESS ESCAPE Key
 4. ENTER
- RE 24550 YES



3. Press the ESC key; the system responds with //
4. Enter the following:
ONLINE LP1
The console responds with:
ONLINE COMPLETE
5. Press the ESC key; the system responds with //
6. Enter the following:
REPLY 24550 YES
followed by a carriage return.

Finally, the following message from a card reader:

```
DEVICE CR1    JOB-NO 7    JOB-NAME  JCLBIS    NOT READY
REPLY YES OR NO WITH MESSAGE ID = 24574
```

requires the following actions from the operator:

1. Ready the card reader
2. Press CTRL and O simultaneously
3. Press the ESC key; the system responds with //
4. Enter the following:
REPLY 24574 YES
followed by a carriage return.

6.3.4 OPERATOR COMMUNICATIONS ERROR MESSAGES

If an entry made by the operator is incorrectly formatted or otherwise invalid, a message with the following format will appear:

```
OCM - <nnn>
```

where <nnn> is an error code.

The meaning of a specific code, and the action to correct it, is found in Appendix A.

6.3.5 MESSAGES FROM UTILITIES

Several systems programs, such as the link editor, send messages to the console. The text of these should be self-explanatory, for example:

```
READY INPUT, HIT C/R
```

If there is any doubt about the required action to be taken, refer to the discussion of the particular utility in the DX980 General Purpose Operating System Programmer's Guide.



6.4 EXAMPLE LISTINGS

The following paragraphs present examples of listings generated by commands and the messages printed in response to the commands. Explanations of the listings are included.

6.4.1 OUTPUT OF STATUS COMMAND

The output of the STATUS command is obtained by entering the following on the control console keyboard:

(ESC)

//STATUS

followed by a carriage return. A display is printed out in the format shown in figure 6-1.

The parameters shown in the listing in figure 6-1 have the following meanings:

JOBNAM	Job name
JOBNUM	Job number
STATE	Running, ready or rolling status of program
PRI	Priority number
PRV	Privileged job (Y), or non-privileged (user) job (N)
LL	Starting address of program area
EX	Ending address of program area, or the starting address of the Job Extension Area minus 1. For DX980, the field refers to the present boundaries of the DSCA.
UL	Ending address of Job Extension Area. For DX980, the field refers to the present boundaries of the DSCA.
TIME USED	Length of time the program has been running, in seconds and milliseconds of CPU time
STEP	Step number of program within job

```

JOBNAM..JOBNUM..STATE.....PRI..PRV...LL....EX....UL...TIME USED...STEP.
DX980   0       RUNNING   0    Y   0000  4F44  6524  8    3    1
S       3       RUNNING   1    N   652C  C529  CF29  6    55   1
FTN     5       READY
FTN     5       READY
FTN     5       READY
FTN     5       READY
FTN     5       READY
S       2       ROLLED    29   N   6529  C529  CF29  0    350  1
END OF DISPLAY

```

Figure 6-1. STATUS Command Output Listing



In the example in figure 6-1, job S started running, but was rolled out by job B after using about a third of a second of CPU time. B is a one-step job. When B terminates, S will roll back in or job FTN (a FORTRAN compile, link and go) will begin running, or both at the same time, depending on the priority of FTN and its memory size requirement.

Since FTN has not started running (the STATE is READY), it has not yet been assigned a memory area, and has not used CPU time.

6.4.2 OUTPUT OF JOB COMMAND

Entering the JOB command on the control console keyboard without an operand causes a listing of current JOB information to be printed, in the format of the following example:

```
//JOB
  SAMPLE  USER01  FILE=SJCBFL  DEV=1  DIR=SYSTEM
  PSW=NONE
```

In this example, the parameters have the following meanings:

SAMPLE	A specific job name
USER01	A specific user ID
FILE	Residence of the JCL
DEV	Disc containing the file
DIR	Directory
PSW	Password: NONE if there is no password, **** if one is present.

6.4.3 ONLINE, OFFLINE AND CANCEL MESSAGES

When an ONLINE, OFFLINE or CANCEL command is issued, the request is acknowledged when it is serviced. Examples of the commands and messages follow:

```
//ONLINE LP1
  ONLINE COMPLETE

//OFFLINE LP1
OFFLINE COMPLETE

//CA 4
JOB NUMBER 4  CANCELLED
```



If a device is in use at the time of an OFFLINE request, the action is delayed until completion, and the following is printed by the console:

```
//OFFLINE CR1
OFFLINE IN PROGRESS
```

6.4.4 DMEM DISPLAY

The DMEM display has the format shown in the example in figure 6-2.

The right-hand portion of figure 6-2 is a character dump. Unprintable characters are represented by dots in this dump.

If only the first operand is input, the default display length is specified. The default length is eight words (a one-line display).

```
//DMEM >1000 >1040
1000 = 0F03 C0E1 8915 0F05 C0E1 8916 0825 8917  ..@.....@....%..
1008 = 0822 8918 0822 8919 0821 891A 090B 891F  ."..."!.....!
1010 = 0F09 C0E1 891C 0F07 C0E1 891D 0F08 C0E1  ..@.....@.....@.
1018 = 891E 0F0E 8910 1F10 C0E2 7411 0700 6905  .....@.....
1020 = CDA0 780E 0509 DB45 8509 0702 8105 798D  M....[E.....
1028 = 1036 1608 1037 1038 1039 103A 103B 1F18  .6...7.8.9.:.:.
1030 = 18FA 7403 B10C C516 C507 1E85 0198 0001  ....1.E.E.....
1038 = 0000 010C 0064 7000 001F 6329 62EF C7B6  ...L.....)..G6
1040 = B101 80FC C550 C531 A414 1C14 C536 010F  1...EPE1$...E6..
```

Figure 6-2. DMEM Display Format Example

6.4.5 DATE AND TIME

The DATE and TIME displays appear as in the following examples:

```
//DATE
DATE = 1 / 1 / 74

//TIME
TIME = 0 : 16 : 52
```

The time in the TIME display is given on a 24-hour basis, so that the example printout shows about 17 minutes after midnight.

6.4.6 OUTPUT OF SYSTAT COMMAND

The SYSTAT display has the format shown in the following example:

```
//SYSTAT
NL= 130  R=2  MAXDSCA=1946
```

where NL is the number of SVC loads actually performed by the Procedure Pool Manager, R is the ratio of the number of SVC requests to the number of SVC's actually loaded (truncated to the nearest integer), and MAXDSCA is the maximum DSCA memory space used to this point in the program.



After the display is sent, the NL counter is reset to zero, so that each SYSTAT request shows what has happened since the prior request. The MAXDSCA counter is not reset, and reflects the maximum memory space used since the last IPL.



APPENDIX A
OPERATOR COMMUNICATIONS ERROR CODES



APPENDIX A
OPERATOR COMMUNICATIONS ERROR CODES

A.1 GENERAL

This appendix includes a list of error codes for the errors most frequently encountered by operators. Error codes 95 through 99 are errors in JOB and RUN commands, and error codes 101 through 112 are error indications that come directly from the operator communications modules.

Error codes between 400 and 536 may appear occasionally; they indicate problems in the JCL scanning processes and may reflect bad JCL templates; if a retry does not correct the error, refer the problem to the programmer in charge.

Error Codes greater than 10,000 are generated by user programs through SVC 4. The meanings of error codes that can appear may be found in the DX980 General Purpose Operating System Programmer's Guide.

A.2 MEANINGS OF ERROR CODES

The meanings of the error codes most often encountered by operators and the corrective actions to be taken are listed in table A-1.

Table A-1. Operator Communications Error Codes

Code	Meaning	Action
95	User ID specified for procedure library is misspelled or does not exist.	Correct and retry.
96	User ID is valid but does not have a procedure library of the specified name.	Correct and retry.
97	Integrity code violation on library access.	Correct and retry, or return message to responsible programmer.
98	User ID and procedure library exist, but requested procedure does not.	Correct and retry, or inform responsible programmer.
99	Hardware failure while attempting read of library.	If retry fails, call field service representative.
101	Hardware I/O error.	If retry fails, call field service representative.



Table A-1. Operator Communications Error Codes (Continued)

Code	Meaning	Action
102	A REPLY command was sent where none was expected, or REPLY contained wrong message ID.	Correct and retry.
103	Invalid operand in command. May indicate wrong number of operands, or misspelled operand, or characters instead of integers.	Correct and retry.
104	Invalid argument list. May indicate any of the problems given for code 103, or no operands where operands were required.	Correct and retry.
105	Invalid job number where operand expected a job number; or an attempt to cancel DX980.	Correct and retry.
106	Attempt was made to OFFLINE the system disc or the system console.	Do not retry.
107	No space in the DSCA	If other jobs are in system, wait for a job to terminate; otherwise, re-IPL and increase DSCA size.
108	Command invalid or misspelled.	Retry, with full command or first two letters of command.
109	Job number not found.	Correct and retry; enter STATUS without operands to check data.
110	In a Job step, JSB size is too large (>800 words).	Refer to programmer in charge.
111	The integer <nn> in BOS b SKIP b <nn> is missing or mistyped, or otherwise invalid.	Correct and retry.
112	Operand <xxx> in BOS b <xxx> is invalid.	Only RESTART, CANCEL and SKIP b <nn> are valid here. Retry.



APPENDIX B
SYSTEM FAILURE (SCRASH) CODES



APPENDIX B
SYSTEM FAILURE (SCRASH) CODES

B.1 GENERAL

If the CPU goes into a hard idle (front panel IDLE indicator remains lit), display the contents of the Instruction Register (IR). If the value is $CE01_{16}$ or $CE0F_{16}$, a system failure has occurred. Display the contents of the A register on the computer front panel, and use this value to determine the cause of the failure from table B-1. The code in the second column of the table indicates the action to be taken by the operator.

B.2 OPERATOR ACTION CODES

The meanings of the codes in the second column of table B-1 are as follows:

- B There is a bug in the software. Send a Software Trouble Report (STR).
- C The problem can be corrected by the user. For example, a Procedure Pool failure ($A = 0001_{16}$) should indicate a re-execution of IPL with an increase in the Procedure Pool size.
- I Restart the system. The problem should not recur, but if it does, send a Software Trouble Report (STR).
- N The problem is not correctable. Generally, it is a hardware problem; call a field service representative.
- R Rebuild system.

Operator action codes not marked in the second column are those that had never been observed when this manual was published.

Table B-1. System Failure Codes

A Register (Hexadecimal)	Operator Action	Meaning
0001	C	Unable to find room in Procedure Pool.
0002		Error code returned from SLOADR. Second argument:
	C	0002_{16} DSCA too small.
	N	$00EC_{16}$ Hardware disc error on system disc.
0003		Second argument:
	C	0001_{16} DSCA too small.
	C	0002_{16} TCB too small for newly created task



Table B-1. System Failure Codes (Continued)

A Register (Hexadecimal)	Operator Action	Meaning
0004	B	Unable to find LDT for LUN 255
0005	N	Supervisor memory parity error: (E Register) = Address of error. (X Register) = Status.
0006	B	Attempted to cancel DX980 system job.
0007	-	I/O error when writing Master File Directory (MFD).
0008		Second argument:
	C	0000 ₁₆ No PDT designated as system console.
	C	0001 ₁₆ Error on create task; DSCA too small.
	B	0002 ₁₆ Error on create task; TCB too small
0009	-	Invalid status from controller.
000A	-	Disc busy.
000B	-	Invalid head number.
000C	B	No space in DSCA.
000D	B	No system Job Management task for job number.
000E	B	TFNHIB = 0 at entry.
000F	B	TFNHIB ≠ 1 at entry.
0010	B	Error from task suspend.
0011	B	Unable to find or open UFD during file de-assignment. Unable to find PDT for device during deassignment.
0012	B	Attempt to delink MFD FCB.
0013	-	Reserved
0014	-	Reserved
0015	-	Delete file error.
0016	-	TFNHIB ≠ 1 on entry.
0017	-	Error on definition of JSB file..



Table B-1. System Failure Codes (Continued)

A Register (Hexadecimal)	Operator Action	Meaning
0018	-	Tried to write JSB to JSB file and failed.
0019	-	Error on definition of JSB file.
001A	-	Resource in PCB not in PDT-FCB links.
001B	-	Reserved
001C	-	Either invalid file type or track zero bad. <div data-bbox="950 703 1356 997" style="text-align: center;"> </div>
001D	-	Error while attempting to ASSIGN to the SOQ file. Look at argument. (It is the error returned from attempting the dynamic ASSIGN.)
001E	B	Could not find (SFIND) the "CCB" for a ready JOB upon cancellation.
001F	-	Delete entry on SOQ file upon program error.
0020	R	Track zero bad status.
0021	I	Could not open current User File Directory. <div data-bbox="982 1501 1356 1732" style="text-align: center;"> </div>



Table B-1. System Failure Codes (Continued)

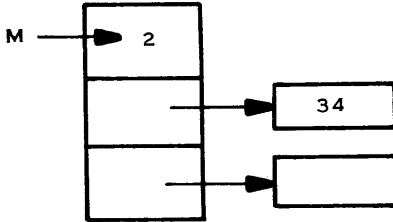
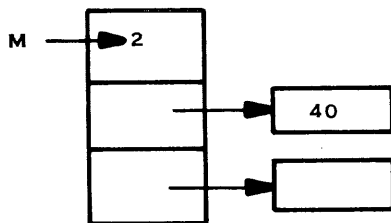
A Register (Hexadecimal)	Operator Action	Meaning
0022	-	Received error. Check second parameter. 
0023	-	Received integrity code violation when attempting to delete a file under a user.
0024	-	Reserved
0025	-	Reserved
0026	-	Reserved
0027	-	Could not open the UFD, check the second parameter.
0028	-	Unable to open the UFD. 
0029	-	Disc error while releasing temporary files. Second parameter contains error number.
0101	I	Power failure. (X Register) = Status.



Table B-1. System Failure Codes (Continued)

A Register (Hexadecimal)	Operator Action	Meaning
		NOTE For the failure codes that follow, the Instruction Register contents is $CE01_{16}$.*
FFC0	N	Unserviceable data bus interrupt. (E Register) = Internal data bus interrupt expander.
FFC1	N	Unserviceable DMAC interrupt. (E Register) = DMAC status word.
FFC2	B	Unserviceable vectored interrupt. (X Register) = interrupt level

*If the START switch is momentarily set to the START (down) position, normal processing should continue.

B.3 SECOND ARGUMENTS

Some of the error codes require that the operator determine the value of a second argument in addition to the error code. To find the second argument, proceed as follows:

1. Display the contents of the M register by momentarily setting the M switch on the computer front panel to the DISPLAY (down) position.
2. The next three steps will display the memory word at the address given by the location two words higher than the address in the M register. Set the data switches to the value of the address containing the memory word to be displayed.
3. Momentarily set the MA switch to the ENTER (up) position.
4. Momentarily set the MD switch to the DISPLAY (down) position.

If it is necessary to send an STR to report a software problem, include all available information. The memory addresses and words in the procedure above should be part of this information.



APPENDIX C
REQUIRED SETTINGS FOR HARDWARE



APPENDIX C

REQUIRED SETTINGS FOR HARDWARE

C.1 INTERVAL TIMER SWITCH SETTINGS

A seven-element switch on the Interval Timer circuit board is used to select the timer resolution intervals (the period between decrement pulses to the counter) and the external register address. All seven pencil switch positions should be off except position no. 4, the 1-millisecond resolution interval. The resolution intervals are marked adjacent to the pencil switch positions. Setting the two switch positions for the external register address to Off selects the standard address.

C.2 COMMUNICATIONS MODULE SWITCH SETTINGS

To get output from IPL using a minimum hardware configuration (system console is a 733 ASR assigned to Register 5), the Communications Module switches must be set as follows:

Switch 1: Poles 1, 2, 3, 4 and 6 set to the ON position;
Poles 5 and 7 set to the Off position.

Switch 2: Poles 1, 2, 4, 5 and 7 set to the ON position;
Poles 3 and 6 set to the Off position.

Refer to the Model 980 Series Computer Programming Card, Publication No. 943000-9701, for Communications Module switch settings to drive other devices.

C.3 I/O CARD SLOT LOCATIONS

The DX980 software operating system requires I/O cards to occupy specific I/O slot positions. When 980 systems that run DX980 are installed or serviced, the I/O card position must be maintained.

All 980 I/O card addresses are a function of wiring (or switches) on the interface card itself. Software that is not interrupt-driven (such as the Basic Operating System and most data bus device Performance Demonstration Tests) may address a specific external register, and the I/O card that is configured for this address responds regardless of its slot position in the chassis. Interrupt-driven software (such as DX980) addresses I/O cards by the same procedure, but uses the data bus interrupt capability of the interface. Data bus interrupts depend on I/O slot position. The software determines which device needs service by reading the data bus interrupt expander word (external register 13₁₆). Nonzero bits of this 16-bit word (bits 0-15) indicate interrupts from the card in the slot corresponding to the bit number.



If a DX980 system successfully completes all Performance Demonstration Tests but fails to print

*READY

when a DX980 system is loaded, the improper I/O card configuration is identified by the following procedure. When an unrecognizable data bus interrupt is received by DX980 software, the CPU idles. The instruction register contains CE01₁₆, the A register contains FFC0₁₆, and the E register contains the data bus interrupt expander word. Check which bit positions are 1's in this word to see which I/O slot positions are interrupting. To determine the proper I/O card configuration for a DX980 system, one of two procedures must be followed. One procedure makes use of a system table; the other makes use of an IPL program display.

C.3.1 SYSTEM TABLE

A System Table (an assembly language listing) was delivered with the earlier DX980 systems. If this table is available for the specific system, find the data bus PDT address table at label ITDBTO. The 13 Data statements in this table correspond to the 13 I/O ports available in the CPU chassis. A zero entry in a given position indicates that the corresponding I/O card slot should be unoccupied. If the Data statement contains a nonzero value, the device that should occupy the corresponding slot can be determined from the operand field of the Data statement. This field contains a name (such as ITPDT) which is the pointer to the Physical Device Table for the device. Find this label in the listing.

The comments directly above the label indicate the type of I/O card required (Interval Timer Module, for example).

C.3.2 IPL PROGRAM DISPLAY

The IPL (Initial Program Load) program that is shipped with more recent systems displays the I/O slot configuration by use of the List Devices command as shown below.

```

?L D
KEY  DEVNAM  ID  ENABLED  EXTREG          EXP #-SLOT  DEVICE TYPE
IT   DUMMY   00FF  Y        0404          DBUS  0000  0002
DT   SC      0015  Y        0505          DBUS  0000  0003  733 - CM
DD   DISC1   0001  Y        0505          DMAC  0001  0001  DIABLO
CS   CS11    0065  Y        0505          DBUS  0000  0003
CS   CS12    0066  Y        0505          DBUS  0000  0003
MT   MTI     001F  Y        0505          DMAC  0002  0002
SYSTEM DISC = DISC1
LOGGING DEVICE = SC
SYSTEM CONSOLE = SC

```



The Keyname, Device Name, and Expansion Number-Slot priority columns above indicate an interval timer card should be in slot IO2, a communications module for the data terminal system console in slot IO3. Note that the port number for DMAC devices is also indicated in this table.



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ALPHABETICAL INDEX

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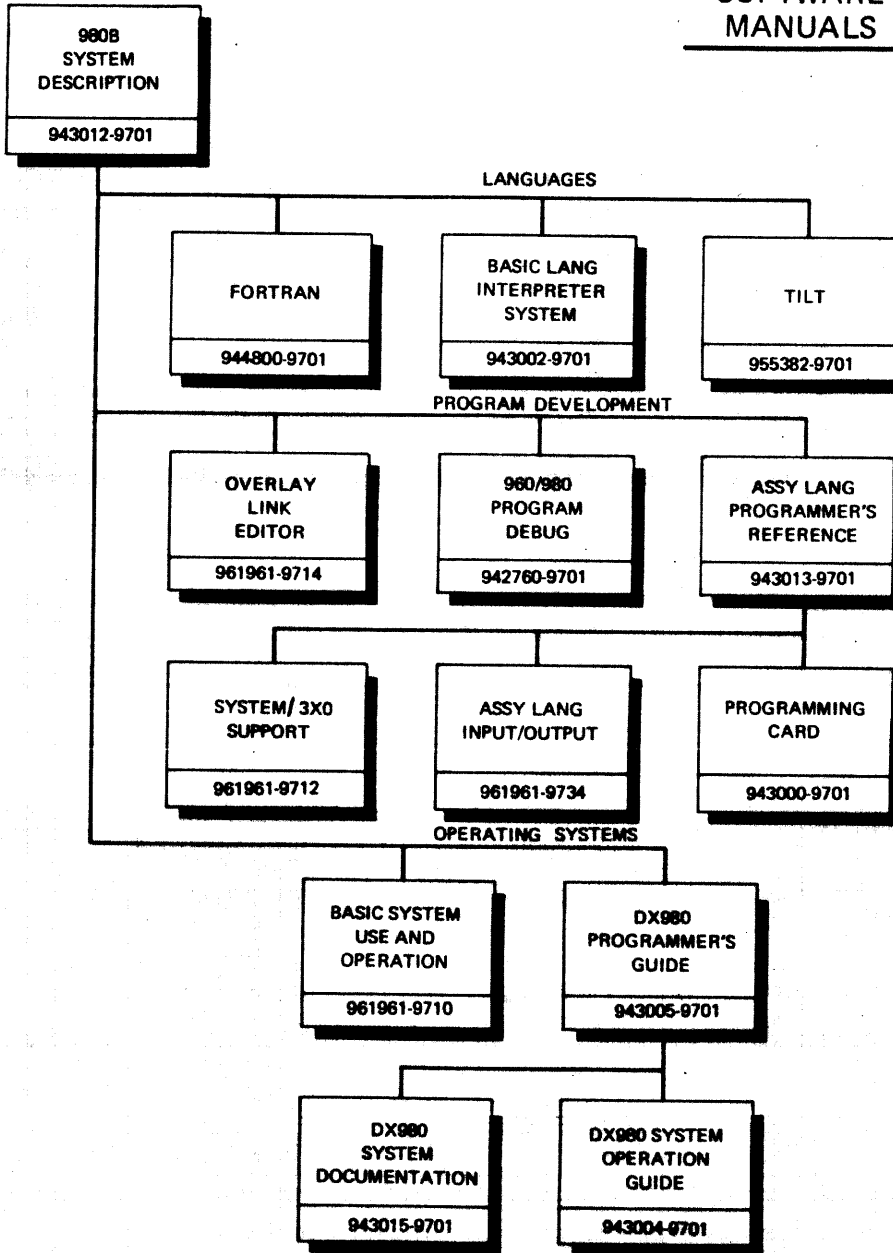
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