Application System/400

SY44-3902-00

Service Functions

Version 3

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First Edition (May 1994)

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(RSFTD201)

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DANGER

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Chapter 1. System Tools

System Service Tools and Dedicated Service Tools Overview

The system service tools (SST) run one or more Vertical Licensed Internal Code (VLIC) or hardware service functions under the control of the Operating System/400* (OS/400*) licensed program. SST allows you to perform service functions concurrently with the customer's application programs.

The dedicated service tools (DST) are used to service Vertical Licensed Internal Code and to work with disk unit configuration.

The following diagrams highlight some service options from system service tools (SST) and dedicated service tools (DST).

System Service Tools Overview

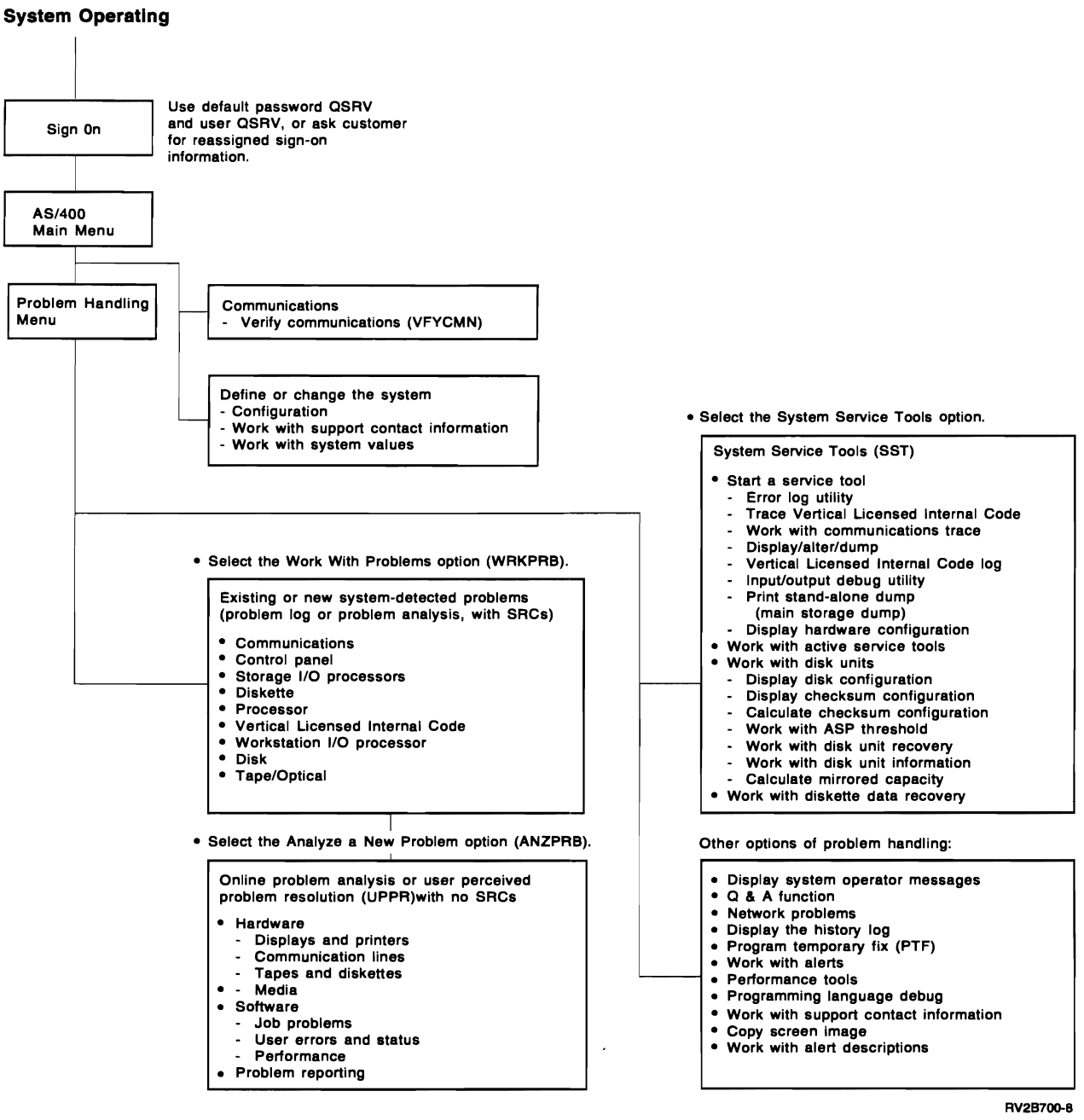


Figure 1-1. System Service Tools overview

Dedicated Service Tools Overview

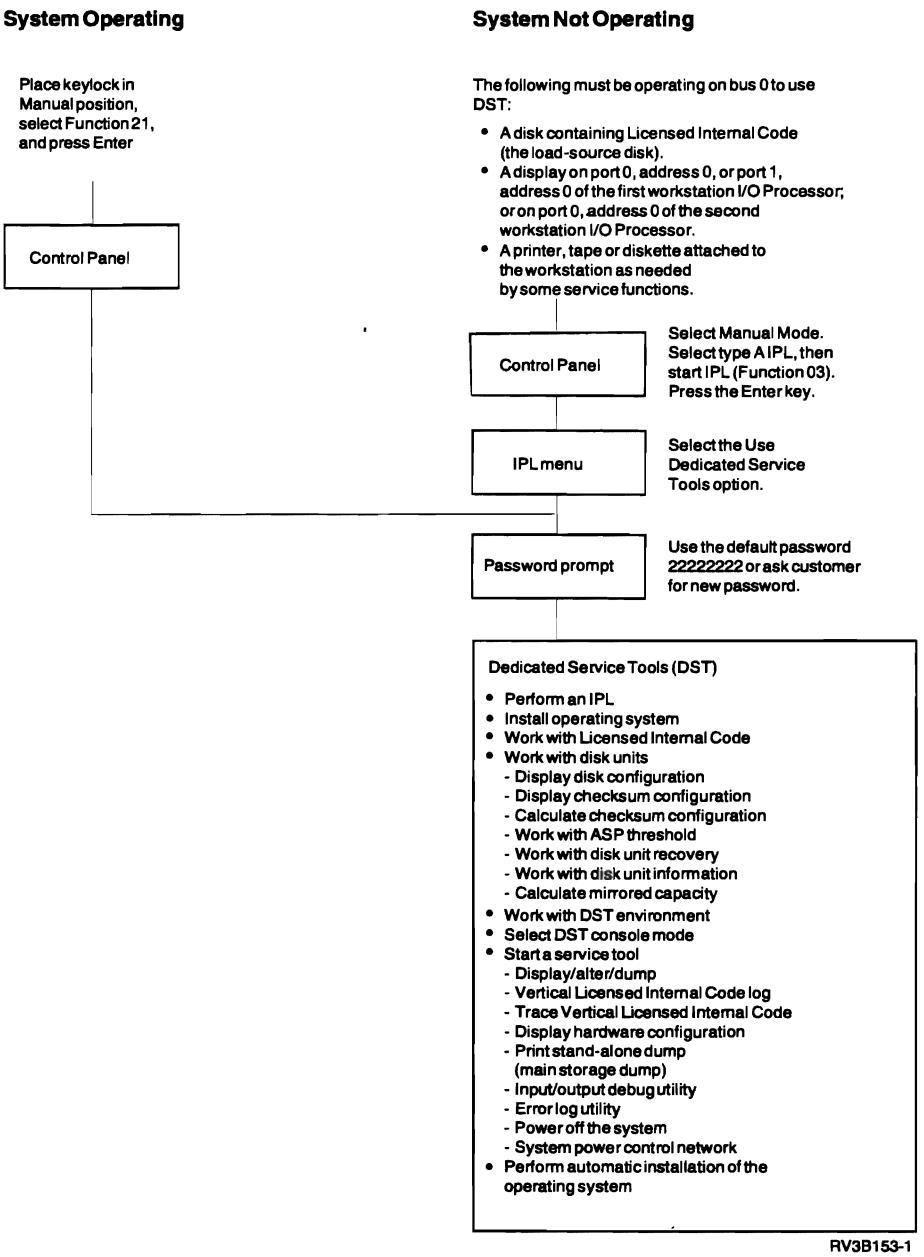


Figure 1-2. Dedicated Service Tools overview

System Service Tools (SST)

How to Access SST

System service tools (SST) can be accessed in either of the following ways:

- Select the *Problem handling* option on the AS/400 Main Menu. Then, select the *System service tools* option on the Problem Handling display.
- Type the

  STRSST

  (Start System Service Tools) command on the command entry line on the AS/400 Main Menu and press the Enter key.

Function Keys (SST)

Keys F3, F5, F10, F12, and F16 usually have the following functions:

- F3 key ends the SST function.
- F5 key causes input to the display to be ignored. This results in the same display being shown with the input erased or for a waiting display to be shown.
- F10 key causes the command entry display to be shown. CL commands can then be entered.
- F12 key causes a return to the previous display. You can use this key to return through the prompts to the first service tool display that has an option that can cancel the service tool.
- F16 key always returns control to the System Service Tools (SST) display. The active service tool is not canceled.

Menu Flow (SST)

This option is selected on the AS/400 Main Menu.

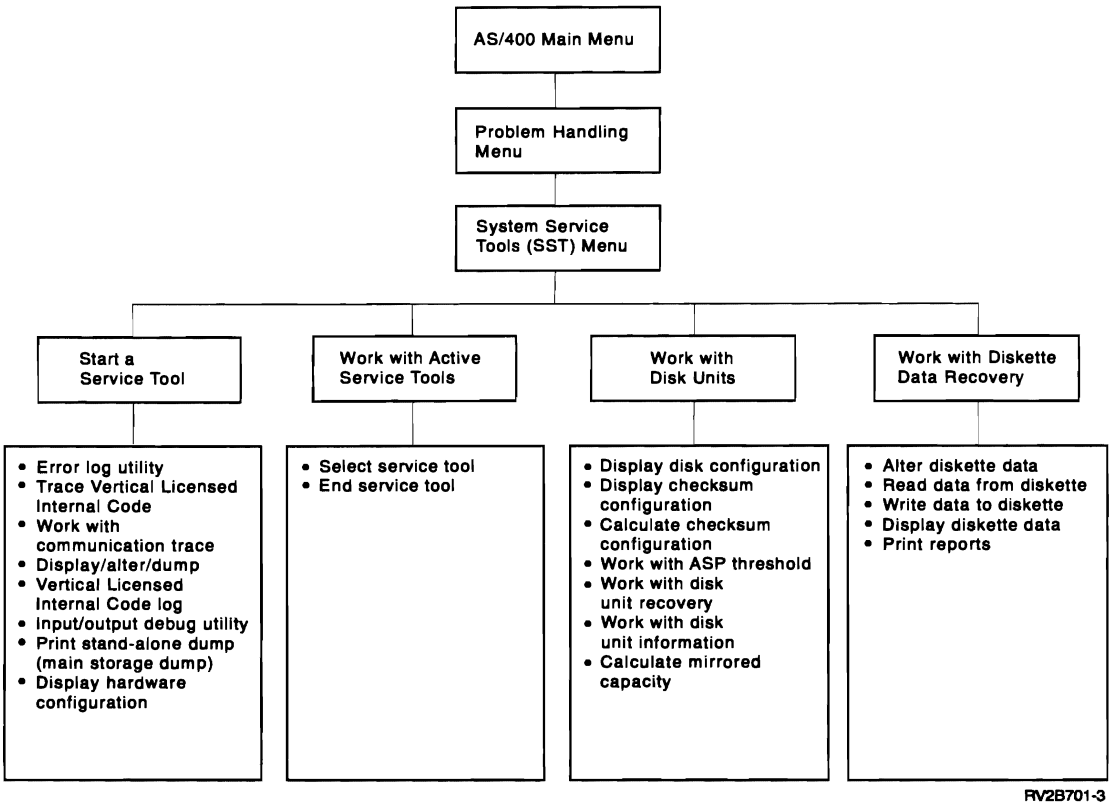


Figure 1-3. Start a Service Tool overview

Options:

- Start a service tool

  This option displays service tools that you can start from the System Service Tools (SST) display. For details, see "Start a Service Tool" on page 1-8.

- Work with active service tools

  This option lists active service tools and their status. Service tools can be started and left active while you start another service tool. Use this function to work with a service tool you left active or to end an active service tool. The status of a service tool shows if the service tool is active or ending. For more information, see "Work with Active Service Tools (SST)" on page 1-41.

- Work with disk units

  This option displays tools that can be run for disk units. You can display disk configuration, display checksum configuration, calculate checksum configuration, work with auxiliary storage pools (ASP) threshold, work with disk unit recovery, work with disk unit information, or calculate mirroring capacity.

  This option is a subset of the functions available from dedicated service tools (DST) under dedicated (limited paging) environment. Complete function is not available from SST or from DST under non-dedicated (full paging) environment. For more information, see "Work with Disk Units (SST)" on page 1-41.

- Work with diskette data recovery

  This option allows you to work with data on a diskette that contains cyclical redundancy check (CRC) errors. For more information, see "Work with Diskette Data Recovery (SST)" on page 1-43.

Start a Service Tool

To access this menu, select the *Start a service tool* option on the System Service Tools (SST) display.

Options:

- Error log utility

  This option allows you to display or print errors that have occurred and have been logged. You can also work with tape and diskette statistics. For more information, see "Error Log Utility."

- Trace Vertical Licensed Internal Code

  This option allows you to start or stop a trace of Vertical Licensed Internal Code. You can also display, dump, allocate, or clear the trace tables where the Vertical Licensed Internal Code trace is recorded. For more information, see "Trace Vertical Licensed Internal Code" on page 1-20.

- Work with communications trace

  This option allows you to start or stop a trace of data on a communications line or network. Once you have run a trace of data, the data can be formatted for printing or browsing. You can then print any traced data. For more information, see "Work with Communications Trace" on page 1-21.

- Display/alter/dump

  This option allows you to display or change virtual storage data. You can place a dump of the data to tape, diskette, or printer. You can also print data (dump) that was already placed on a tape or diskette. For more information, see "Display/Alter/Dump" on page 1-28.

- Vertical Licensed Internal Code log

  This option allows you to display Vertical Licensed Internal Code log information. You can send a dump of the Vertical Licensed Internal Code log information to tape, diskette, or printer. For more information, see "Work with Vertical Licensed Internal Code Log" on page 1-29.

- Input/output debug utility

  This option allows you to display, trace, or set a breakpoint in the I/O processor Licensed Internal Code. I/O processors control the storage devices, workstations, and communications data links on the system. For more information, see "Input/Output Debug Utility" on page 1-30.

- Print stand-alone dump

  This option allows you to display a main storage dump or copy the dump to tape, diskette, or printer. For more information, see "Print Stand-Alone Dump" on page 1-32.

- Display hardware configuration

  This option allows you to display the configuration and the status of the hardware on the system. For more information, see "Display Hardware Configuration" on page 1-34.

Error Log Utility: The *Error log utility* option displays or prints errors that the system has detected. It provides a summary of system error log information and allows you to work with tape and diskette statistics.

If the system is operational, select the *Error log utility* option under SST (which is selected on the System Service Tools display). If the system is not operational, select the *Error log utility* option under dedicated service tools (DST). For more information on the *Error log utility* option under DST, see "Start a Service Tool (from DST)" on page 1-59.

Figure 1-4. Error Log Utility

Machine State	Use	Specific Option	Why Used
OS/400 licensed program is operational	SST	Error log utility	To look at or print the contents of the error log.
OS/400 licensed program is not operational	DST	Error log utility	To look at or print the contents of the shadow log at virtual address or SID 0000 8300 0000. Only the latest errors (including those logged during an IPL) are available until a full IPL has been completed.

Using Error Log and Problem Log Reports:
The preferred method of correcting errors is to use the information from both the *Error log utility* option and the WRKPRB (Work with Problem) command when you correct system, subsystem, and device errors.

The error log can be interpreted as an activity log that contains information about events that occurred in the system or subsystem, or on an attached device.

The Problem Log (WRKPRB command) is used to verify that a problem exists, to display the problem status and details, or to run problem analysis:

- Enter the WRKPRB (Work with Problem) command.
- Press the F4 key to enter the time and date of the possible occurrence.
- If a problem is listed, use the *Display the details* option or the *Run problem analysis* option. Continue analyzing the error.

  If no problem is listed, no action is necessary, unless directed by your next level of support.

Notes:

1. The entries in the error log may have been previously reported and resolved (for example, machine check entries).
2. The Print Error Log (PRTERRLOG) command may be used to print error log reports. You can also put it into a control language (CL) program to generate daily and weekly reports.
3. For more information on the Problem Log, see "Problem Log" on page 1-61.
4. For more information on interpreting 93xx DASD error log entries, see the error information sections under "Recovery Procedures" in the *Repair and Parts* information.

Error Log Utility Menu Flow

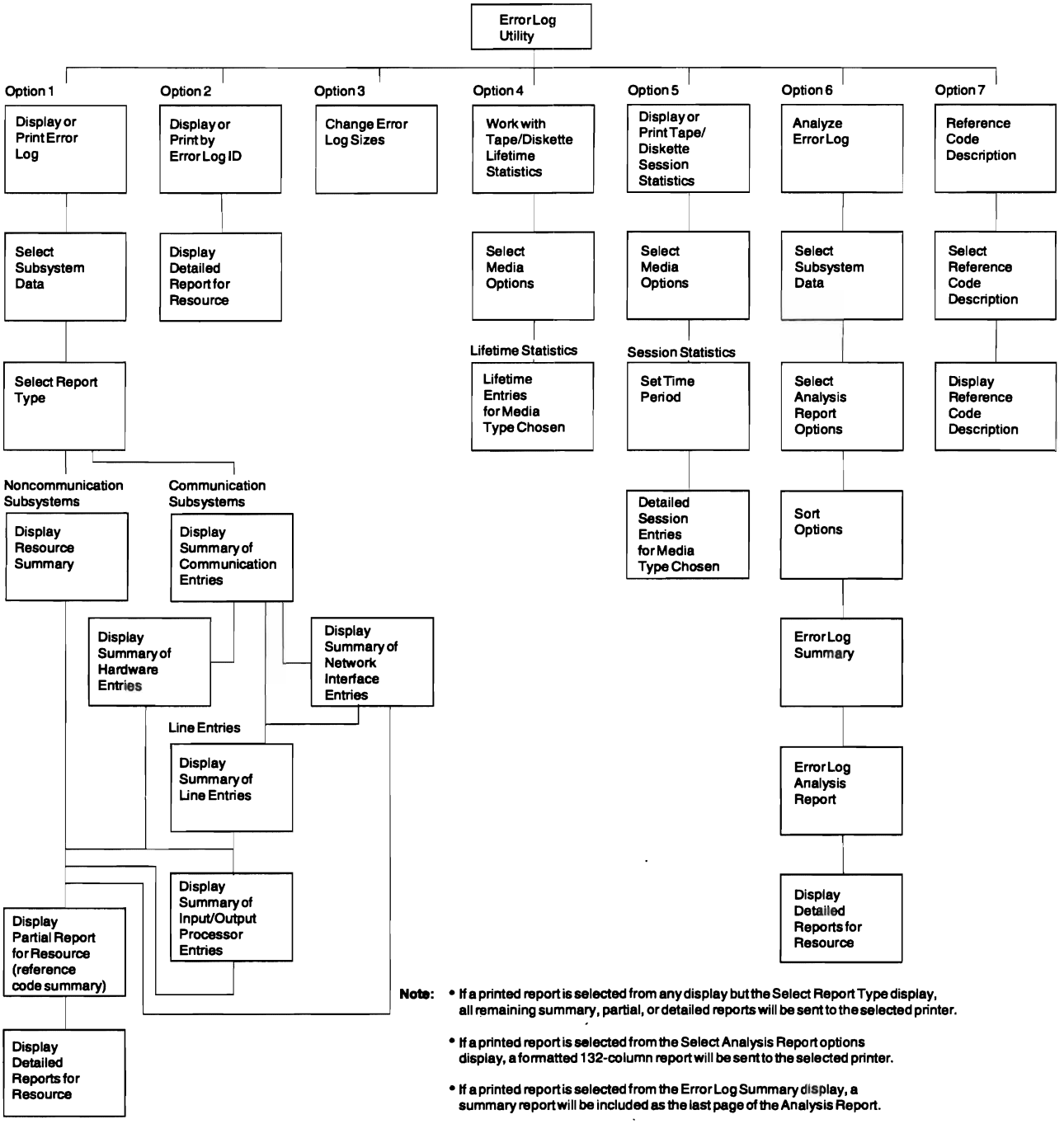


Figure 1-5. Error Log Utility overview

Options: The *Error log utility* option allows you to select a display with options to print or display information concerning a selected system error, or a combination of errors, on the system. Online help is available for each option on the Error Log Utility display. Also, input validity checking is performed for the correct error messages.

The *Error log utility* options are:

- Display or print error log
- Display or print data by error log ID
- Change error log sizes
- Work with tape/diskette lifetime statistics
- Display or print tape/diskette session statistics
- Analyze error log
- Reference code description

Use the *Error log utility* option to:

- Analyze the error log data of a specific subsystem. Some subsystem selections are:
  - All error logs
  - Processor
  - Magnetic sources
  - Local workstation

    Note: ASCII and asynchronous workstation errors are logged based on the input/output processor (IOP) to which they are connected.
  - Communications (SDLC, BSC, X.25, token ring, DDI, remote workstation, Ethernet Version 2/IEEE 802.3, ISDN, IDLC, frame relay)
  - Power (System Power Control Network errors)
  - licensed program
  - Licensed Internal Code
- Analyze all error log data associated with the same error log ID. The user must have an error log ID to use this function.
- Display error summary information.
- Display information concerning a grouping of errors.
- Display information concerning specific errors.
- Change error log area sizes.
- Display information concerning volume statistics for removable magnetic media.
- Review session or lifetime counters for a specific volume or removable media type.
- Delete or print volume statistics lifetime counters.
- Display description text for specified reference codes.

Selection can be made on:

- Time and date
- Error log ID
- Device type
- Logical address
- Configuration object
- Subsystem

Output can be sent to:

- A printer (if printer is available)
- A workstation

If problems occur while you are using the *Error log utility* option, data that is not formatted is available using the *Display/alter/dump* option. A Licensed Internal Code machine index can be dumped, address 0000 2B00 0000, with the option to format index entries.

How to Interpret Error Log Utility Reports:

Figure 1-6 shows an example of a summary of error log entries for the magnetic media log.

```
                    Display Summary of Magnetic Media Entries

From . . :   08/26/90  10:00:00      To . :   08/27/90  10:00:00

Type option, press Enter.
  5=Display report  6=Print report

        A                                   Serial      B           C
Opt    Resource        Type      Model      Number      Address     Count
 _     DEVICE          0000      000        10-17794    0010-0000FFFF   4
 _     DEVICE          9332      400        10-22661    0010-0400FFFF   1
 _     DEVICE          9347      001        00-00000    0010-0700FFFF   8
 _     CNTL            9347      001        00-00000    0010-07FFFFFF   5
 _     DKT01           9331      001        53-00000    0010-0300FFFF   2
 _     TAPE            9347      001        00-00000    0010-0700FFFF   4
 _     TAP01           9347      001        00-00000    0010-0700FFFF   1



F3=Exit               F5=Refresh               F12=Cancel
```

Figure 1-6. Example of Summary of Magnetic Media Entries Display

- The *Resource* field **A** contains a description of where the error occurred.

  If the error log records do not contain resource names, the error log utility function generates an address and resource name

based on the I/O processor direct select address and the device unit address.

- The *Address* field **B** contains the BBCb address and the unit address (see Figure 1-7 on page 1-13). The BBCb address describes the hardware bus, card, and board address. The system configuration list should be used to determine which position number the BBCb address describes.

  Note: A BBCb address is equal to a direct select address.

  The address that is generated looks similar to this:

  ```
  BBCb-xxyyZZAA
  ```

  where:

  BBCb = I/O processor direct select address (DSA)

  The error log utility function uses the DSA to identify an I/O processor, where:

  BB = Bus number
  C = Card number
  b = Board number

  xxyyZZAA = Unit address (UA)

  There is a unit address (UA) for each resource attached to an I/O processor. The UA is the local address used by an I/O processor to get access to a specific physical resource, where:

  xx = Device controller or I/O adapter
  yy = Station, port, or device
  ZZ = Channel
  AA = Reserved

  The resource names that are generated are:

Subsystem	Possible Names Used
Processor	IOP or SYSTEM
Magnetic media (tape or diskette)	IOP, CNTL, or DEVICE
Local workstation	IOP, PORT, or DEVICE
Communications	IOP, IOA, PORT, or CHANNEL

  For example, if an error is logged with a unit address of 01FF FFFF in the magnetic media subsystem and no object name was specified in the log entry, the error log utility function puts the common name *CNTL* in the *Resource* field.

  Note: If a character in any of the following fields cannot be displayed, an asterisk (*) is displayed instead of that character:

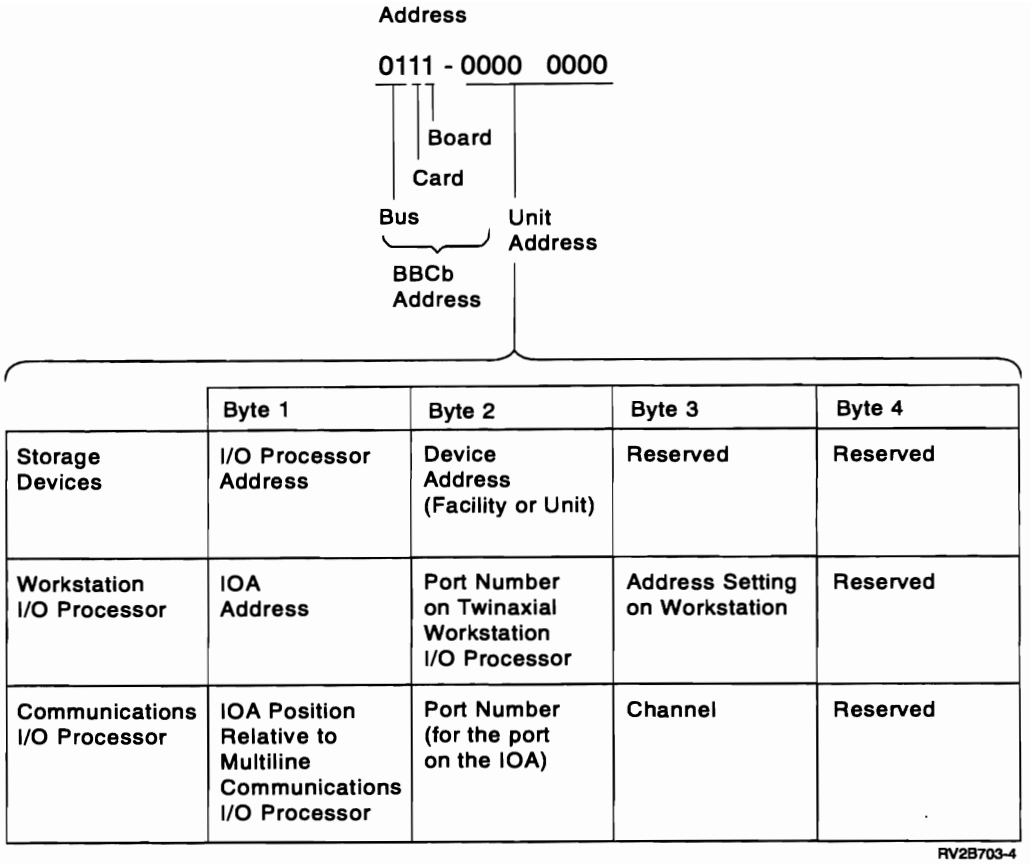
  - *Resource* field
  - *Type* field
  - *Model* field
  - *Serial Number* field

- The *Count* field **C** contains the number of times the error occurred.

The summary report display has two options:

- Display report
- Print report

To select the *Display report* option, type 5 in the *Opt* (option) field for a specific resource and press the Enter key. This displays a partial report for that resource (see Figure 1-8 on page 1-13).



	Byte 1	Byte 2	Byte 3	Byte 4
Storage Devices	I/O Processor Address	Device Address (Facility or Unit)	Reserved	Reserved
Workstation I/O Processor	IOA Address	Port Number on Twinaxial Workstation I/O Processor	Address Setting on Workstation	Reserved
Communications I/O Processor	IOA Position Relative to Multiline Communications I/O Processor	Port Number (for the port on the IOA)	Channel	Reserved

RV2B703-4

Figure 1-7. Address description

```
                    Display Partial Report for Resource

From . . :   08/26/90  10:00:00      To . :   08/27/90  10:00:00
                                      Serial
Resource       Type     Model        Number      Address        Total Count
DEVICE         9332       400        10-22661    0010-0400FFFF        1

Type option, press Enter.
  5=Display report  6=Print report

                                                 E
Option         Reference Code          Error Type            Count
  _               101E                 Temporary                1

                                                                 Bottom
F3=Exit        F5=Refresh          F12=Cancel
```

Figure 1-8. Example of Partial Report for a 9332 device

For details on reference codes (such as FRUs that describe the failure), see the *Problem Analysis* information for the machine type and model shown in the *Type* and *Model* fields **D**.

Note: EE1D is displayed for I/O bus errors when the I/O processor is not identified by the system. Use the *Address* field and configuration information to determine the card position of the I/O processor.

In the *Error Type* field **E**, the event that has occurred is described. Some of the events are errors; some of the events are not actual errors. The meaning of the error varies depending on the system, subsystem, or device that the error was logged against. Perform a service action only if directed by a system operator message, problem log entry, or your next level of support.

The events that might be shown in the *Error Type* field are:

Permanent An error for which no successful additional attempt occurred.

Temporary An error for which a successful additional attempt occurred.

Threshold Indicates that a service action point was reached. The occurrence of temporary errors was

more than the limit specified for that type of error condition.

Qualified An error occurred which is described (qualified) more in the *Description* field on the Display Detail Report for Resource display under the Error log utility function. See the system *Problem Analysis* information or the device service information for a complete listing of reference codes.

Statistic Indicates that this error type contains statistical information (number of bytes read or written, for example).

Recoverable An error occurred for which intervention was needed for recovery (printer out of forms, for example).

Informational Indicates that an event of importance occurred that was not an error.

Machine Check An error occurred that caused the system not to operate. These errors are logged during the next IPL if the system was not powered-off. They are logged with the data that was displayed in control panel Functions 11 through 19.

Remote Indicates buffered errors from remote devices or input/output processors.

Software An error occurred due to a software problem.

Vary On Indicates that a vary on operation occurred.

Hardware Redundancy Lost An error occurred in redundant (back-up or duplicate) hardware. This function continues to operate, but service is required. A second failure in this hardware results in a loss of the function.

Data Protection Lost An error occurred in hardware that has data protection (mirroring). This function continues to operate, but service is required. A second failure in this area may result in the loss of the function and the data.

To select the *Display report* option, type 5 in the *Opt* (option) field for a specific reference code and press the Enter key. This displays a detail report for that reference code.

Figure 1-9 shows an example of a detail report for reference code 111E. Important information concerning a specific reference code is shown.

```
                    Display Detail Report for Resource
From . . :   08/26/90  10:00:00      To . :   08/27/90  10:00:00

Resource          Type        Model     Serial Number           Address
DEVICE            9332          400     10-30193                0070-0601FFFF

Error log ID . . . . . . :   00070160     Sequence . . . . . . :        6308 F
Date . . . . . . . . . . :   08/26/90     Time . . . . . . . . :   13:30:00
Reference code . . . . . :   111E         Error Code . . . . . :   00000000 G
Table ID . . . . . . . . :   93320400 H    IPL Source . . . . . :   B
Error type . . . . . . . :   Temporary
Description . . . . . . :
Read error, data should be in another disk area

Machine exception data
  Format . . . . . . . . :     4          Block . . . . . . . . :     000527E7
  Cylinder . . . . . . . :   0000         Head . . . . . . . . :           00
  Sector . . . . . . . . :     08         Message ID . . . . . :           48
  Bytes 0-15 . . . . . . :    0000000000000048  0000000000000000
  Bytes 16-29 . . . . . :    0000000527E70000  000000000000

Press Enter to continue.                I
F3=Exit                                 F6=Display hexadecimal report
F10=Display previous detail report      F12=Cancel
```

Figure 1-9. Example of Detail Report

F The sequence number is increased by 2 each time an entry is put into the error log.

G The error code is a 4-byte hexadecimal value returned from the I/O adapter hardware. The code is used mainly for protocol or Licensed Internal Code problems.

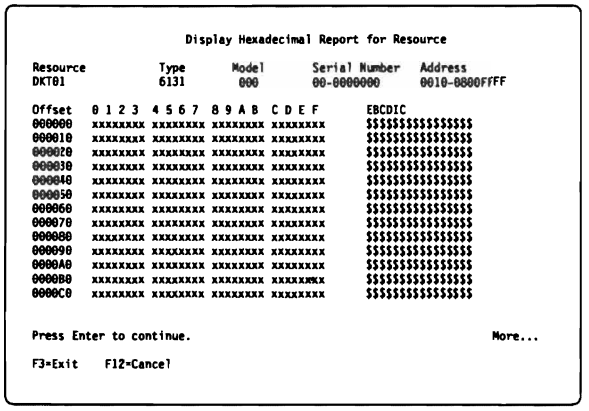
H The table ID identifies a group of reference codes for the system or device. See the system *Problem Analysis* information or the device service information for a complete listing of reference codes.

I *Display hexadecimal report* is an optional field for this report. Additional information may be available in the hexadecimal part of the dump. Press F6 (Display hexadecimal report) to access hexadecimal dump information (see Figure 1-9). Figure 1-10 on page 1-15 shows how to analyze the information logged in the hexadecimal dump.

Note: If a character in the *EBCDIC* field cannot be displayed, a period (.) is displayed instead of that character.

To find information in the hexadecimal dump, read down the *Description* column in Figure 1-11 or Figure 1-12 on page 1-15 until you find the item you want (for example, reference code). Read across to the leftmost column to find the hexadecimal offset. For a reference code, this is hexadecimal offset 0058. Notice that the reference code is 2 bytes long.

Go to Figure 1-10 and read down the leftmost column until you find the entry 000050. Read across to the right to the data under 8. Hexadecimal offset 0058 starts here. Since the reference code is 2 bytes long, hexadecimal offsets 0058 and 0059 contain the reference code.



```
                    Display Hexadecimal Report for Resource

Resource          Type       Model      Serial Number   Address
DKT01             6131       000        00-0000000      0010-0800FFFF

Offset   0 1 2 3  4 5 6 7  8 9 A B  C D E F      EBCDIC
000000   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
000010   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
000020   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
000030   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
000040   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
000050   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
000060   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
000070   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
000080   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
000090   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
0000A0   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
0000B0   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$
0000C0   xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx     $$$$$$$$$$$$$$$$

Press Enter to continue.                                        More...

F3=Exit    F12=Cancel
```

Figure 1-10. Example of a Hexadecimal Report for Resource

Figure 1-11. Hexadecimal Dump Byte Assignments for Keyed Data

Hexadecimal Offset	Length in Bytes	Description
0000	4	Release level
0004	4	Length of component specific data
0008	2	Non-keyed data
000A	2	Component specific
000C	8	Time stamp
0014	4	Sequence number
0018	1	Subsystem type
0019	4	I/O processor type
001D	2	I/O processor direct select address
001F	4	I/O adapter type
0023	2	I/O adapter direct select address
0025	10	Port group name
002F	10	Line name

Figure 1-11. Hexadecimal Dump Byte Assignments for Keyed Data

Hexadecimal Offset	Length in Bytes	Description
0039	10	Controller description
0043	10	Logical unit description
004D	4	Device type
0051	3	Model number
0054	4	Serial number
0058	2	Reference code
005A	4	Error log identification
005E	8	Volume identification
0066	4	Unit address
006A	1	Error type
006B	5	Reserved

Figure 1-12. Hexadecimal Dump Byte Assignments for Non-keyed Data

Hexadecimal Offset	Length in Bytes	Description
0070	8	Reference code translate table (RCTT) name
0078	4	Product ID
007C	4	Component ID
0080	4	Manufacturing ID
0084	12	Part number
0090	1	Format of data
0091	1	Delayed reporting
0092	1	Signal event
0093	4	IOP return error code
0097	1	Communications protocol
0098	4	Length of component specific
009C	2	Flags
009E	10	System resource path name 1
00A8	10	System resource path name 2
00B2	10	System resource path name 3
00BC	10	System resource path name 4
00C6	1	SPCN rack
00C7	1	SPCN unit address
00C8	1	SPCN regulator
00C9	23	Reserved

Figure 1-13. Hexadecimal Dump Byte Assignments for Variable Component Specific Data

Hexadecimal Offset	Length in Bytes	Description
00E0-FFFFFFF		This field is different for each error log and is intended for engineering use only.

Display or print data by error log ID: This option allows you to:

- Analyze all error log data associated with the same error log ID.
- Select by error log ID.

Output can be sent to a workstation or to a printer, if a printer is available.

Note: You must have an error log ID to use this function.

Change error log sizes: This option allows you to change error log area sizes.

Note: Increase the error log sizes when Error Log Utility prompts you.

Work with Tape/Diskette Lifetime Statistics: This option allows you to:

- Work with the tape unit and the diskette unit lifetime statistics.
- Get information concerning volume statistics for tapes or diskettes.
- Review lifetime counters for a specific volume, tape, or diskette.
- Delete volume statistics lifetime counters.
- Sort lifetime statistics by error dates or volume IDs.

The output of this option can be sent to a printer, if a printer is available, or to a workstation.

Select the *Work with tape/diskette lifetime statistics* option to display a lifetime entry report.

Figure 1-14 shows an example of a lifetime entry report. This report contains information concerning various volume IDs for tape. The customer might want to exchange diskettes or tapes that have a high number of read or write errors.

```
                        Work with Lifetime Statistics

Removable media . . . . . :   1/4 inch cartridge tape

Type options, press Enter.
  4=Delete entry   6=Print entry

          Volume      --------Errors--------     --------K Bytes-------
Option    ID              Read       Write          Read      Written
        >>PHB021      23452450       23450      23457123     97689690
          THB021              2           0         14307            0
          AIPLT               0           3        214494       137546
          AD0000              0           0             3            0
          AIPL                0           0             2        27620
          IVIHE               0           0             1            0
          MM                  0           0           361            0
          PHB031              0           0             2            0
          PTFFIX              0           0             3          432


F3=Exit              F5=Refresh           F10=Delete all
F11=Print all        F12=Cancel

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```

Figure 1-14. Example of a Lifetime Report

If the following symbols precede the volume ID on the Work with Lifetime Statistics display, perform the suggested action:

Symbol	Explanation	Action to take
>>	Media replacement recommended	Copy the contents of the media to a new tape and discard the old tape.
>	Media approaching replacement criteria	• Replace the tape if the tape format is: – QIC-120 – 7208 2.3GB – 6250 bpi density

If the tape format does not fulfill the above conditions, continue to monitor this tape to ensure that media replacement is not necessary.

Note: To ensure accurate statistics, each tape cartridge or reel must have a unique volume ID.

If a character in the *Volume ID* field cannot be displayed, an asterisk (*) is displayed instead of that character.

Display or Print Tape/Diskette Session Statistics: This option allows you to:

- Display or print session statistics for a tape unit or a diskette unit.
- Select a media type to display or print the statistics.

- Select a time range to display or print the statistics.
- Select a volume ID to display or print the statistics.
- Review session counters for a specific volume, tape, or diskette.

The output of this option can be sent to a printer, if a printer is available, or to a workstation.

Analyze Error Log: This option allows you to:

- Display or print a complete list of entries for one or all subsystems in a shortened, one-line-per-entry format.
- Summarize and sort multiple errors by date, time of day, logical address, or type of error.
- Analyze errors that have specific reference codes, or to omit unwanted reference codes.
- Analyze errors for specific devices, for groups of devices at the same logical address, or for groups of devices of the same type.
- Display or print the detailed reports, including the hexadecimal data, for individual entries in the output list.

The "Error Log Utility Menu Flow" on page 1-10 shows the displays for this option.

Error log entries can be selected by specifying resource type or address for a specific period of time. Error log entries can also be included or excluded from the output report by specifying reference codes to include or omit.

```
                    Select Analysis Report Options

Type choices, press Enter.

  Report type . . . . . .  1   1=Display Analysis, 2=Display Sum
                               3=Print Analysis
  Optional entries to include:
    Informational . . . . .  N   Y=Yes, N=No
    Statistic . . . . . .    N   Y=Yes, N=No

  Reference code selection:
    Option . . . . . .       1   1=Include, 2=Omit
    Reference codes
    *ALL                                      *ALL...

  Device selection:
    Option . . . . . .       1   1=Types, 2=Addresses
    Device types or addresses
    *ALL                                      *ALL...



F3=Exit      F5=Refresh      F9=Sort by ...      F12=Cancel
```

Figure 1-15. Example of the Select Analysis Report Options Display

The *Analyze error log* option on the Error Log Utility menu allows you to display or print hardware error log entries in a summarized form. Two reports are available:

- The Analysis Report contains a one-line entry for each error log specified in the command.

Figure 1-16 shows an example of an Error Log Analysis option 5 or 6 to display or print all entries that have the same error log ID as the selected entry.

```
                        Error Log Analysis Report

From . . :   92-01-17  13:41:06      To . . :   93-02-18  13:41:06

Type options, press Enter.
  5=Display report   6=Print report

           Ref
Opt  Type  Code  Address         Date      Time      Error Type
     9336  D010  0110-0001FFFF   92-05-01  21:04:46  Threshold
     9336  D010  0110-0001FFFF   92-05-01  21:06:14  Threshold
     9336  D010  0110-0001FFFF   92-05-18  08:35:14  Threshold
     9331  1010  0020-0600FFFF   92-05-21  13:30:58  Permanent
     9336  D010  0110-0001FFFF   92-05-25  13:41:25  Threshold
     6040  D023  0241-FFFFFFFF   92-06-03  00:15:37  Threshold
     6040  D001  0241-000700FF   92-06-11  09:54:07  Threshold
     9331  1030  0020-0500FFFF   92-06-23  08:15:55  Permanent
     9331  1030  0020-0500FFFF   92-06-23  08:17:01  Permanent
     6110  3110  0020-0101FFFF   92-06-30  14:47:17  Permanent


F3=Exit                          F5=Refresh
F9=Display Descriptions          F12=Cancel
```

Figure 1-16. Example of the Error Log Analysis Data Display

When you select F9 (Display Descriptions), the SRC is formatted as follows:

```
                        Error Log Analysis Report

From . . :   92-01-17  13:41:06      To . . :   93-02-18  13:41:06

Type options, press Enter.
  5=Display report   6=Print report

      System
Opt   Ref Code     Address    Date      Time      Description
      93360010     0110-0001  92-05-01  21:04:46  Device error, positi
      93360010     0110-0001  92-05-01  21:06:14  Device error, positi
      93360010     0110-0001  92-05-18  08:35:14  Device error, positi
      93311010     0020-0600  92-05-21  13:30:58  Diskette read error
      93360010     0110-0001  92-05-25  13:41:25  Device error, positi
      6040D023     0241-FFFF  92-06-03  00:15:37  WS IOP detected erro
      6040D001     0241-0007  92-06-11  09:54:07  WS IOP detected erro
      93311030     0020-0500  92-06-23  08:15:55  Diskette write error
      93311030     0020-0500  92-06-23  08:17:01  Diskette write error
      61103110     0020-0101  92-06-30  14:47:17  Attached storage dev
      61103110     0020-0100  92-06-30  14:47:17  Attached storage dev

F3=Exit                          F5=Refresh
F9=Display Error Types           F12=Cancel
```

Figure 1-17. Example of the Error Log Analysis Display Descriptions

- The Summary report contains a one-line entry for each group or subgroup of error log entries requested. This report also displays a count of the error log entries it contains.

Each report can be sorted by date, time, address, or error type. The selected *Sort* option determines how the error log entries are grouped in the Summary report.

The *Sort* option is used primarily for problem isolation tasks and for checking the error log when performing preventive maintenance.

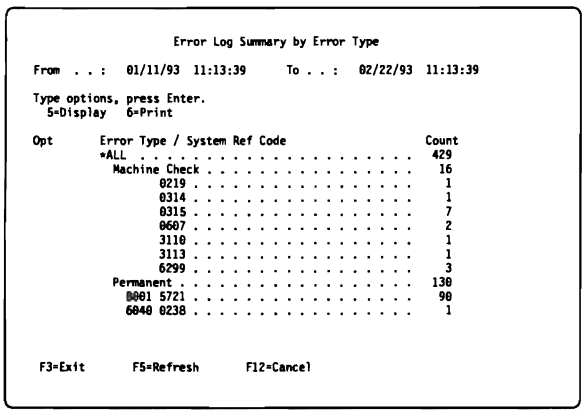


Figure 1-18. Error Log Summary by Error Type and Reference Code

The use of an asterisk (*) to request error log entries is limited. The asterisk symbol must be the rightmost character of the specified string. The string, including the asterisk symbol, cannot exceed the total number of characters allowed in that string. For example, a request of A00* would display all the error log entries that begin with A00.

Displaying and Printing the Results: The formatted report can be displayed or sent to the output queue assigned to your display session.

For large reports, the print option is recommended.

To display the printer file and the name of the output queue, enter the following command:

```
WRKSPLF
```

At the Work with All Spooled Files display:

- Enter option 5 next to the printer file to display the results.
- If necessary, enter option 6 next to the printer file to release the spooled printer file to print the results.

To generate the report using batch mode, enter the following command:

```
PRTERRLOG *ANZLOG
```

Interpreting the Results: The Error Log Analysis report can be used to analyze problems occurring over a period of time. Look for error patterns such as multiple I/O processor errors that occur at the same time, or environmental effected errors that occur at the same time of the day or week.

Figure 1-19 on page 1-19 shows how a lightning strike on a workstation I/O processor cable resulted in storage subsystem errors; 16 errors were logged at approximately the same time.

Reference Code Description: This option allows you to view or print a short description for any reference code that is contained in the online reference code table ID.

```
                    Error Log Utility                    Page . . . :       2
                                                        CUSTSYS1  05/05/91  08:00:00
--------------Resource Information---------------                    ----------------------Error Information-----------------------
                      Serial                                                                                  Ref
Name       Type  Model  Number      Address        Date     Time      Log ID    Type  Table ID  Code  Description
---------  ----  -----  ----------  -------------  -------- --------  --------- ----  --------  ----  ----------------------------
IOP        6110  A00    10-9065148  0020-0003FFFF  05/05/91 08:47:25  400000AB  Qual  61100A00  3200  Error Occurred in Device Star
IOP        6110  A00    10-9065148  0020-00FFFFFF  05/05/91 08:47:25  400000A8  Qual  61100A00  3000  Storage Device Controller Com
IOP        6110  A00    10-9065148  0020-00FFFFFF  05/05/91 08:47:25  400000AA  Qual  61100A00  300D  Storage Device Controller Com
IOP        6110  A00    10-9065148  0020-00FFFFFF  05/05/91 08:47:25  400000A9  Qual  61100A00  3110  Attached Storage Device Stopp
IOP        6110  A00    10-9065197  0030-0000FFFF  05/05/91 08:47:25  000300E0  Qual  61100A00  3200  Error Occurred in Device Star
IOP        6110  A00    10-9065197  0030-0000FFFF  05/05/91 08:47:25  000300E1  Qual  61100A00  3200  Error Occurred in Device Star
IOP        6040  001    10-9057019  00B1-FFFFFFFF  05/05/91 08:47:25  000901EC  Perm  60400001  D023  WSC Detected Errors on Some,
DEVICE     6040         00-00000    0261-000301FF  05/05/91 08:47:25  00460249  Perm  60400001  0001  WSC Detected Error when Trans
DEVICE     6040         00-00000    0261-000302FF  05/05/91 08:47:25  0046024A  Perm  60400001  0001  WSC Detected Error when Trans
DEVICE     6040         00-00000    0261-000304FF  05/05/91 08:47:25  0046024B  Perm  60400001  0001  WSC Detected Error when Trans
DEVICE     6040         00-00000    0261-000306FF  05/05/91 08:47:25  0046024C  Perm  60400001  0001  WSC Detected Error when Trans
IOP        6040  001    10-9057097  0261-FFFFFFFF  05/05/91 08:47:25  00460248  Perm  60400001  D023  WSC Detected Errors on Some,
DEVICE     6040         00-00000    0081-000301FF  05/05/91 08:47:26  000901ED  Perm  60400001  0091  WSC Detected Busy Time-out fr
DEVICE     6040         00-00000    00B1-000701FF  05/05/91 08:47:26  000901EE  Perm  60400001  0001  WSC Detected Error when Trans
DEVICE     6040         00-00000    00B1-000702FF  05/05/91 08:47:26  000901EF  Perm  60400001  0001  WSC Detected Error when Trans
DEVICE     6040         00-00000    00B1-000705FF  05/05/91 08:47:26  000901E0  Perm  60400001  0001  WSC Detected Error when Trans
DEVICE     6040         00-00000    00B1-0301FFFF  05/05/91 09:32:19  000901F8  Perm  60400001  0091  WSC Detected Busy Time-out fr
DEVICE     6040         00-00000    00B1-000701FF  05/05/91 09:32:19  000901FC  Perm  60400001  0001  WSC Detected Error when Trans
DEVICE     6040         00-00000    00B1-000702FF  05/05/91 09:32:19  000901FD  Perm  60400001  0001  WSC Detected Error when Trans
DEVICE     6040         00-00000    00B1-000705FF  05/05/91 09:32:19  000901FE  Perm  60400001  0001  WSC Detected Error when trans
IOP        6040  001    10-9057019  00B1-FFFFFFFF  05/05/91 09:32:19  000901FA  Perm  60400001  D023  WSC Detected Errors on Some,
```

Figure 1-19. Example of Error Log Analysis Printed Report

Trace Vertical Licensed Internal Code:

Menu Flow:

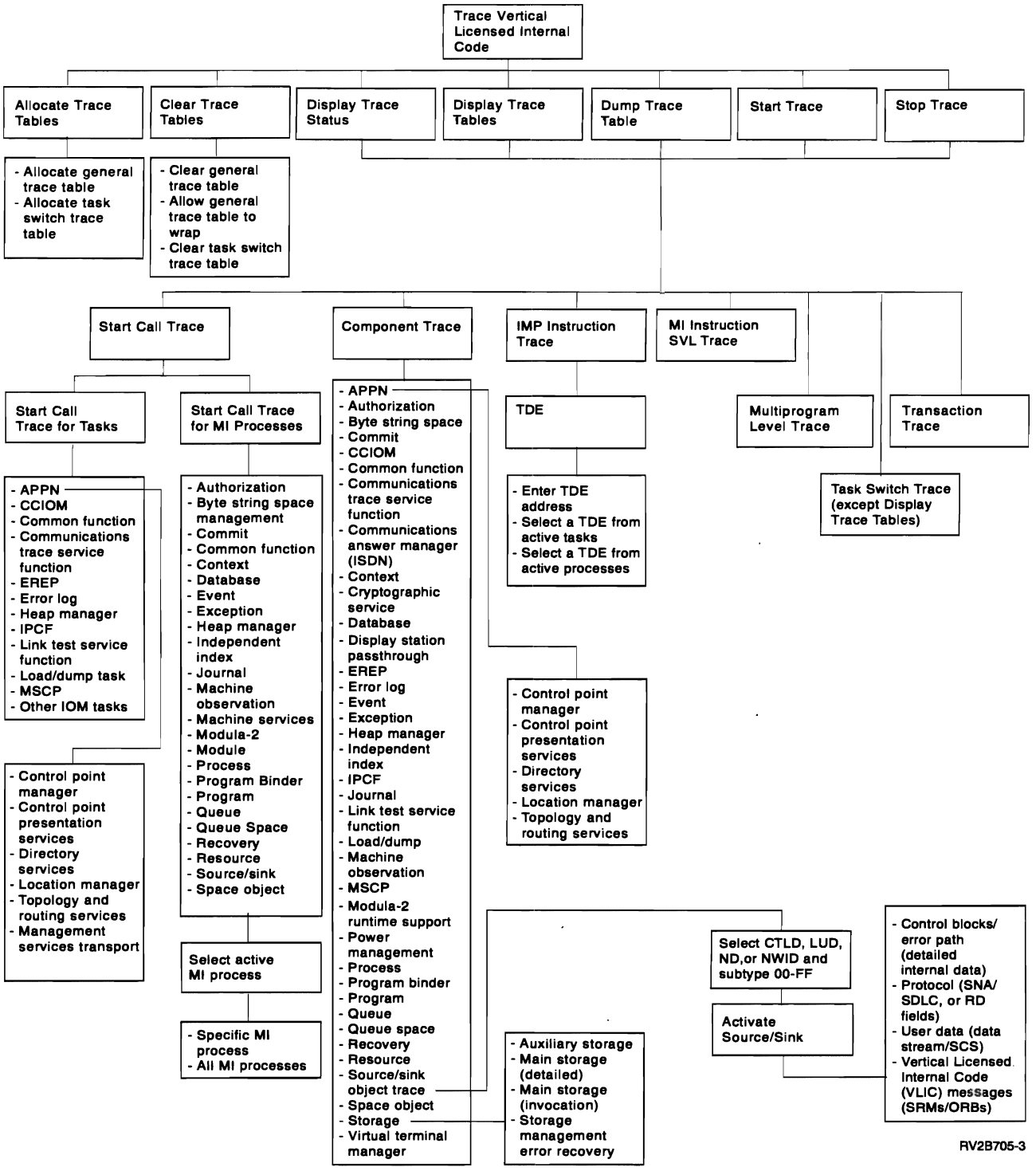


Figure 1-20. Trace Vertical Licensed Internal Code overview

Work with Communications Trace:

This option allows you to start or stop a trace on a communications configuration object. Once you run the trace, the data can be formatted for printing or viewing. You can view the print file only in the output queue.

Communications trace can be used to isolate errors that cannot be isolated using the system communications verification routines. Communications trace options run under SST. SST allows you to use the configuration objects while communications trace is active.

Data may be traced and formatted for lines with the following communications types:

- Asynchronous
- BSC
- Synchronous data link control (SDLC)
- X.25
- Token-ring network
- Ethernet Version 2 or IEEE 802.3
- Integrated services digital network (ISDN)
- Integrated services digital network data link control (IDLC)
- Distributed data interface (DDI)
- Frame relay

Note: Traces on a twinaxial data link control (TDLC) line are not supported. Twinaxial lines can be traced using the Twinaxial Line Monitor, available at most IBM branch offices. The AS/400 communications trace can run from any display connected to the system. Anyone with special authority (SPCAUT) of *SERVICE can run the trace on an AS/400 system. Communications trace supports all line speeds.

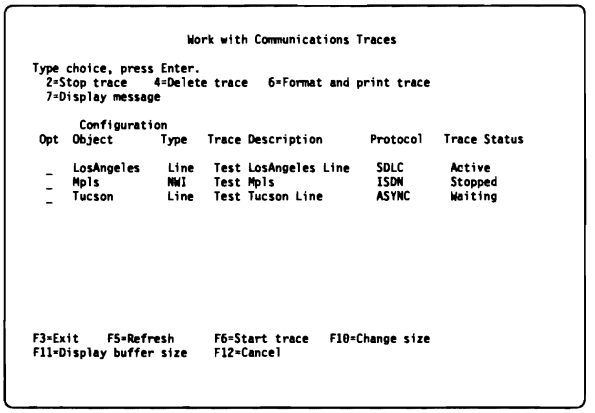
Communications trace should be used when:

- The problem analysis procedures do not yield sufficient information about the problem.
- You suspect a protocol violation is the problem.
- You suspect line noise is the problem.
- The error messages indicate there is an SNA BIND problem.

Running communications trace requires detailed knowledge of the line protocols being used to correctly interpret the data generated. Whenever possible, start the communications trace before varying on the lines. This gives you the most accurate sample of your line status.

How to Use: To use the *Communications trace* option:

1. Start SST by selecting the *System Service Tools* option from the Problem Handling display or by entering the STRSST command.
2. Select the *Start a service tool* option from the System Service Tools menu.
3. Select the *Work with communications trace* option from the Start a Service Tool menu. The following Work with Communications Traces display appears.



Details of the trace, including status, are displayed. The trace status can be one of the following:

Condition	Description
Waiting	The trace is waiting for the configuration object to be varied on (not collecting data).
Active	The trace data is being collected.
Stopping	The trace is stopping.
Stopped	The trace has stopped (not collecting data).
Error	An error occurred on the configuration object while the trace was collecting data. The data might or might not be collected. The trace stopped.
Starting	Trace is being started by another user. You may not stop or delete this trace.

Press F11 on the Work with Communications Traces display to view the buffer size:

```
                    Work with Communications Traces

Type choice, press Enter.
  2=Stop trace    4=Delete trace    6=Format and print trace
  7=Display message

      Configuration
 Opt  Object      Type    Buffer Size (K)   Trace Direction   Stop/Wrap

  _   LosAngeles  Line          128          Sent              Stop
  _   Mpls        NWI           256          Both              Stop
  _   Tucson      Line         4096          Received          Wrap




F3=Exit    F5=Refresh     F6=Start trace   F10=Change size
F11=Display trace status  F12=Cancel
```

Menu Flow: Figure 1-21 shows the Work with Communications Trace menu flow.

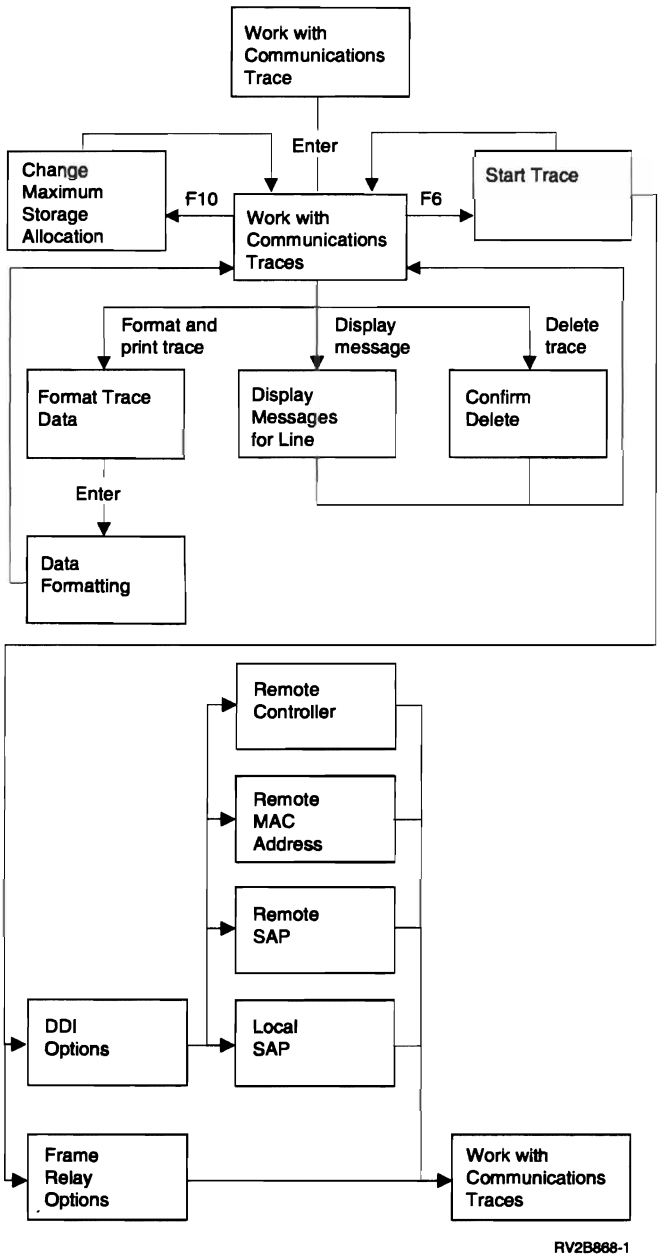


Figure 1-21. Work with Communications Trace Menu Flow

Options and Function Keys: The Work with Communications Trace menu has the following options and function keys:

- Start trace (F6)

  This function key allows you to start tracing the data on a communications configuration object. The Start Trace display appears after you press this function key. For more information, see "Starting a Trace" on page 1-23.

- Stop trace (option 2)

  This option appears only on the Work with Communications Traces display. It allows you to end the trace and stop collecting data. A trace must be stopped before the data can be formatted, printed, or deleted. To ensure the trace is stopped, press the Refresh function key and check the trace status field.

- Delete trace (option 4)

  The trace must be stopped (option 2) before you can use this option. Select this option to delete the trace information when you no longer need the data. Traces are not automatically deleted when you leave a communications trace function. *Delete trace* releases system space so that you can start other traces without having to increase the maximum amount of storage provided for the communications trace. Traces that are not deleted are listed on the Work with Communications Traces display.

- Format and print trace (option 6)

  Use this option to format and prepare the trace for printing. For more information on the *Format and print trace* option, see "Format and Print Trace" on page 1-24.

- Display message (option 7)

  Use this option to view a message indicating the status of the trace that stopped because of an error.

- Change size (F10)

  Use this function key to change the amount of storage used by all traces. You may want to increase the amount of storage if your system has many active traces or if the traces will be active for a long time.

- Display buffer size or display trace status (F11)

  This function key allows you to select and alternate between buffer size and trace status.

- Refresh (F5)

  This function key updates the data on the display.

Starting a Trace: The Work with Communications Traces display has a Start trace function key that allows you to select options for tracing data.

The following is an example of a Start Trace display:

```
                          Start Trace

Type choices, press Enter.

  Configuration object . . . . . .  _______

  Type . . . . . .  _ 1=Line, 2=Network Interface

  Trace description  . . . . . .  ________________

  Buffer size  . . . . . .  _ 1=128K, 2=256K, 3=2048K
                              4=4096K, 5=6144K, 6=8192K

  Stop on buffer full  . . . . . .  _ Y=Yes, N=No

  Data direction  . . . . . .  _ 1=Sent, 2=Received, 3=Both

  Number of bytes to trace
    Beginning bytes . . . . . .  _ VALUE, *CALC
    Ending bytes  . . . . . .  _ VALUE, *CALC

F3=Exit   F5=Refresh   F12=Cancel
```

Enter the name of a communications configuration object in the *Configuration object* prompt. If you do not know the name of the configuration object:

1. Press F16 to return to the System Service Tools (SST) display.
2. Select the Command entry function key (F10) from the System Service Tools (SST) display.
3. Type `WRKCFGSTS *lin` to display a list of all available lines on the system, or type `WRKCFGSTS *NWI` to display a list of all available network interfaces.
4. Select the *Work with active service tools* option from the System Service Tools (SST) display to return to communications trace.

Describe the trace in the *Trace description* field. This field can help you identify the trace.

You can select a buffer size to hold the communications data that the trace collects. The default buffer size is 1=128K bytes. Base the size of the buffer on the speed of the communications line and on the amount of time needed to trace the data. For high speed lines or long periods of tracing, a larger buffer size is recommended.

If `Yes` is specified in the *Stop on buffer full* field, the trace stop is when the buffer is full. This option is useful for viewing the initial data coming across a line. If `No` is specified, the trace continues until you stop it. In this case, the data in the buffer will be written over each time the buffer is full.

You can select the direction of data to be traced by specifying one of the three selections in the *Data direction* field:

- Only data being sent from the system (option 1).
- Only data being received by the system (option 2).
- Both data sent from the system and data received by the system (option 3).

Note: If you specify option 1 (Sent) for lines that are SDLC short hold mode, the trace does not include any controller names.

You can select how much data is traced in a frame of data. The value that is entered is the amount that is saved as part of the trace. Thirty six bytes is the minimum value allowed for both the beginning and the end value. The protocol header is included in the 36-byte minimum values. The maximum value allowed is determined by the configuration object you are tracing.

Notes:

1. The beginning and ending byte values are ignored by the BSC protocol.
2. The ending byte value is ignored by the SDLC, HDLC, X.25, frame relay, DDI, token ring, and Ethernet protocols.
3. 72 bytes is the minimum value allowed for the beginning byte value for token ring, Ethernet, frame relay, and DDI protocols.

If a DDI type line is entered as the configuration object to trace on the Start Trace display, the Select Trace Options for DDI display is shown. Specify trace options by choosing one of the following:

- All data. Traces all the data specified on the Start Trace display.
- Remote controller data. Traces only that data matching the Start Trace display options and a specified remote controller.
- Remote MAC address data. Traces only that data matching the Start Trace display options and a specified remote MAC address.
- Remote SAP data. Traces only that data matching the Start Trace display options and a specified remote SAP.
- Local SAP data. Traces only that data matching the Start Trace display options and a specified local SAP.
- IP identifier group data – traces only that data matching the Start Trace display options and a specified IP identifier group.
- IP address data – traces only that data matching the Start Trace display options and a specified IP address.

If a frame relay type was entered as the configuration object to trace on the Start Trace display, the Select Trace Options for Frame Relay display is shown. Specify trace options by choosing one of the following:

- All data. Traces all the data specified on the Start Trace display.
- Exclude local management interface (LMI) data. Traces all data that is specified from the Start Trace display, except the LMI data.
- Only local management interface (LMI) data. Traces only LMI data.

When all required options are complete, press the Enter key. The Work with Communications Trace display appears.

The trace remains active until:

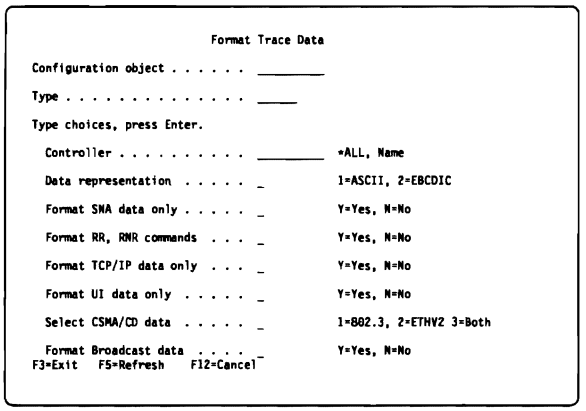
- The option to stop the trace is selected on the Work with Communications Traces display.
- The configuration object being traced is varied off.
- The configuration object being traced has an error.
- The trace buffer is full and the option to stop on buffer full was selected.

Note: You may exit the communications trace function to do other work while the trace is active. Traces are not automatically deleted when you exit a communications trace function. To return to the communications trace:

1. Select the *Start a service tool* option from the SST Main Menu.
2. Select the *Work with communications traces* option from the Start a Service Tool menu.

Format and Print Trace: The trace must be stopped (option 2) before you can use this option. This option allows you to select various formatting

options and prepare the trace data for printing. The options vary for each protocol. The trace must be stopped before you can format or print the information. The following is an example of a Format Trace Data display for an Ethernet Version 2/IEEE 802.3.



Notes:

1. Press the Enter key without changing to the defaults on the Format a Trace Data display to view all the data associated with the trace; the information is not in any special format.
2. Select an option to format and print only the data that you want to see.
3. All options available for formatting depend on the protocol of the line being traced. Only valid choices appear for each protocol.
4. Not all combinations of options are valid for all protocols. If you select an invalid option, error messages appear. If an error message appears, you must change your selections. You can restore all options to their default values using the F5 (Refresh).
5. See the online help for more information about these options and how to locate, print, save, and send the spooled trace data.

Select whether or not to:

- Format only the records for a specific controller by typing *ALL or the name of the controller in the *Controller* field.

Notes:

1. When you type a controller name in this field, the printout contains only the records that match that controller name.
2. Records that have a blank controller name are the result of transmission modes that cannot be connected. These records appear in the printout only when *ALL is selected.

- Format the data for printing in ASCII by typing a 1, or for printing in EBCDIC by typing a 2.

  This option determines how the hexadecimal data is converted to characters. Most data transmitted by the system contains an indication of whether it is considered ASCII or EBCDIC characters. Use this option only when the data does not contain such an indication. Data that clearly specifies how it is to be interpreted does not change.

  If you select ASCII for this option, the hexadecimal data is converted to displayable characters following ASCII conversion rules. If you select EBCDIC for this option, the hexadecimal data is converted following EBCDIC conversion rules. For example, hexadecimal C1 is A in EBCDIC but hexadecimal 41 is A in ASCII characters.

- Format only records with SNA data by typing Y (Yes) in the *Format SNA data only* field.

  This option is only valid for local area networks, IDLC, SDLC, and X.25. If you select Yes, only SNA (Systems Network Architecture) data is formatted and spooled. If you select No, the line protocol (SDLC, X.25, CSMA/CD, IDLC, or TRLAN) data is formatted and spooled, but the SNA data is spooled in unformatted (hexadecimal) form.

- Format records with RR or RNR commands by typing a Y (Yes) or in the *Format RR, RNR commands* field.

  This option is only valid for local area networks, IDLC, SDLC, and X.25. If you select Yes, the RR (Receiver Ready) and RNR (Receive Not Ready) commands are formatted along with other data. If you select No, the RR and RNR commands are not formatted with other data.

- Format only the records with TCP/IP data by typing a Y (Yes) in the *Format TCP/IP data only* field.

  This option is only valid for local area networks and X.25. If you select Yes, only the frames that contain Terminal Control Protocol/Internet Protocol (TCP/IP) data is formatted and spooled. If you select No, the line protocol (TRLAN, CSMA/CD, or X.25) data is formatted and spooled. You cannot select the TCP/IP option and specify a specific controller name. Communications trace has no way to map the controller name to the data that is provided to communications trace.

- Format only records with UI data by typing a Y (Yes) in the *Format UI data only* field.

  This field is valid only for local area networks. To select this option, you must have a N (NO) in the *Format SNA data only* field. If you select Yes in the *Format UI data only* field, only unnumbered information (UI) data is formatted and spooled. If you select No, the line protocol (TRLAN or CSMA/CD) data is formatted and spooled.

  You cannot select the TCP/IP option and specify a specific controller name. Communications trace has no way to map the controller name to the data that is provided to communications trace.

- Select CSMA/CD data for IEEE 802.3 only, Ethernet Version 2, or both.

  This option is only valid for CSMA/CD local area networks. If you select 1, only the IEEE 802.3 data is formatted and spooled. If you select 2, the Ethernet V2 data is formatted and then spooled. If you select 3, both types of data are formatted and spooled.

- Format broadcast data by typing a Y (Yes) in the *Format Broadcast data* field.

  Broadcast data frames contain FFFFFFFFFFFF for the machine address.

- If formatting a trace of a frame relay NWI, the Format Trace Data display shows the following options:

  - Line. Select

    *ALL

    to format frames from all lines attached to the NWI, or specify a line name to format only those frames from the specified line.

  - Exclude LMI data. LMI frames are not formatted.

  - Format LMI data only. Only LMI frames are formatted.

When the format of the trace data is complete, the output is placed in a spool file named QPCSMPRT in the default output queue. The spooled trace data cannot be displayed or printed from communications trace or SST. To browse, print, save, or transmit the spooled trace data, you must leave SST and use system functions. For directions on how to look at (browse), print, save, or transmit the spooled data, press the Help key.

The format of the trace data is:

- An introduction page containing, for example, configuration object, type, protocol, start and stop dates and times, trace options, and formatting options.
- A help page, to aid you in understanding the output. Help text for a specific protocol is given because the trace data differs for each communications protocol.
- The formatted trace data output. See Figure 1-22 on page 1-27.

```
Record      Data    Record    Record  Data    Controller            Number  Number    Poll/
Number S/R  Length  Status    Timer   Type    Name / Number Command Sent    Received  Final
------ ---  ------  --------  ------  ------  ------------- ------- ------  --------  -----
000001   S      10  00000000  1000.3  EBCDIC  CTLNAME001/C0 XID                       On

                    Data . . . . :    0102030405060708090A

000002   R      10  00000000  1022.7  EBCDIC  CTLNAME001/C0 XID                       On

                    Data . . . . :    0102030405060708090A

000003   S       0  00000000  1069.8  EBCDIC  CTLNAME001/C0 SNRM                      On

000004   R       0  00000000  1122.3  EBCDIC  CTLNAME001/C0 UA                        On

000005   S      15  00000000  1313.5  EBCDIC  CTLNAME001/C0 I       0       0       Off

                    Data . . . . :    0102030405060708090A0B0C0D0E0F

 *** End of Computer Output ***
```

Figure 1-22. An Example of a Formatted Trace Data Output for SDLC

The width of the spooled file is 132 characters. The data is in hexadecimal representation and either ASCII or EBCDIC character representation. The different columns of the trace output common to all protocols are:

Record number
: The number of the trace record.

S/R
: Shows if the record type is sent (S) or received (R).

  Notes:

  1. The letter C in this column indicates an X.21 short hold mode connection was cleared.
  2. If an M appears, a modem change has occurred.

Data length
: The amount of data, in decimal, contained in the record.

Record status
: The protocol-dependent return code for the trace record. 00000000 is an unqualified success. Other return codes are listed in the functional specification for the protocol that is running or the port manager. For a list of return codes, see "Protocol Dependent Return Codes" on page 1-28.

Record timer
: The time each event occurs.

Data type
: Shows whether the data traced is printed in ASCII or EBCDIC character representation. If the character representation of the data is mostly periods, you may want to format the data again using the other option for data representation.

Controller name / number
: Indicates which controller originated the frame or record. In some conditions, this data is not available and the column remains blank.

Notes:

1. All traces end with *** End of Computer Output *** to mark the end of the spooled data.
2. The formatted trace output is not security protected. Customer passwords are shown going across the line.

Communications Trace Limitations: Only two communications traces can run concurrently on one communications controller. Only one trace can exist for the same configuration object at the same time. You need another session of SST to trace more lines.

Although a communications trace can start before or after the configuration object is varied on, a

communications trace must be started *before* the configuration object is varied on if it is important to see the starting information coming across the configuration object.

Two or more users can select the same trace to format and print. When multiple users attempt to use the same resources (trace data), one user must wait for the other user to finish before beginning to process the data.

When the AS/400 is configured as an SDLC secondary station on a multipoint configuration object, the communications controller traces all records or frames. The records or frames sent to the system include those records and frames intended for other stations. When you use the communications trace service tool to format the data for this configuration, the resulting report may show received records that were intended for other stations.

On a single point-to-point line, where only one secondary station is configured, SDLC traces all frames received before it gets the frames intended for other station addresses. It is not until the secondary SDLC receives the other station addresses that it knows which single-station address the communications equipment uses.

Protocol Dependent Return Codes: The record status column in a formatted communications trace dump should show a successful return code of:

```
00 00 00 00
```

For more information about return codes, see *Diagnostic Aids – Volume 1*.

Display/Alter/Dump: Select the *Display/alter/dump* option on the System Service Tools (SST) display. Use the display/alter/dump function to get selected data from storage and to write storage data to an output device. An output device can be used to:

- View the data from storage on the display.
  - Select the *Display/alter storage* option to display **unformatted** data and to change the contents of storage. Use the keyboard to scroll forward or backward to view the storage information.
  - Select the *Display formatted dump* option to generate a **formatted** dump of the contents in storage. The display is inhibited while the format function is running. When the process is complete, use the keyboard to search, scroll (forward or backward), or shift (left or right) the output.
- Generate a formatted dump of the data in storage to an output device.
  - Select one of the following:
    - *Dump to printer*
    - *Dump to diskette*
    - *Dump to tape*

    When the output device is a printer, diskette, or tape, the actual dump task runs asynchronously with the display/alter/dump control functions. That is, while a dump is completing on a printer, diskette, or tape, you can operate the display/alter function (output device is the display), or you can make other dump requests for a printer, diskette, or tape. The dump requests are saved in a first-in-first-out queue and are processed one at a time. The status of the display/alter/dump asynchronous dump task can be displayed by selecting the *Display dump status* option on the Display/Alter/Dump Output Device display.
- Generate a printout from a diskette or tape that contains data from the display/alter/dump function or from other Vertical Licensed Internal Code service functions.
  - Select the *Print diskette dump file* or the *Print tape dump* file option on the Display/Alter/Dump Output Device display.

The display/alter/dump function is controlled by selecting display options and by responding to prompts.

When the display/alter/dump function is ended, the dump request that is running is also ended (even if it has not completed). Dump requests that have not been processed are lost.

Menu Flow

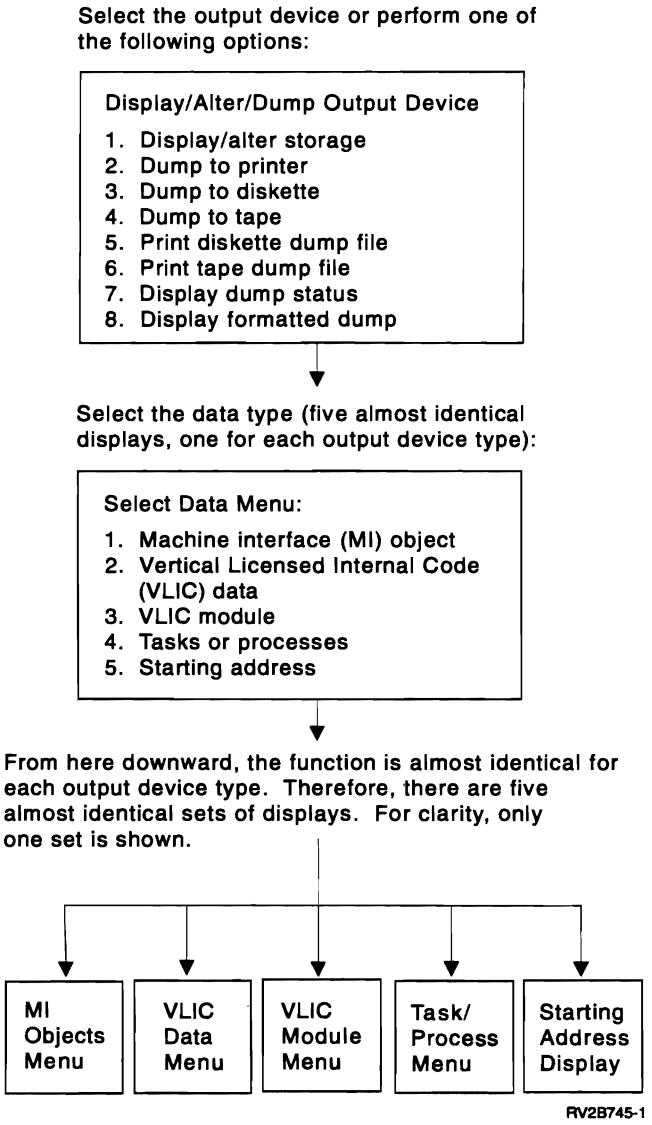


Figure 1-23. Display/Alter/Dump Menu Flow

Work with Vertical Licensed Internal Code Log: The *Work with Vertical Licensed Internal Code Log* option can be selected through SST or DST. Use this option to perform the following:

- Dump selected Vertical Licensed Internal Code (VLIC) log entries to a diskette, tape, or printer.
- Change the following VLIC log attributes:
  - The size of the note log area and the size of the dump log area
  - The size limit for dump entries
- Clear the VLIC log.

In SST and DST, there are three dump tasks (one for printer, one for diskette, and one for tape) that run asynchronously from the control functions for this tool. The requests are saved in a first-in-first-out queue, and there is no practical limit to the number of requests you can have waiting to be processed.

Menu Flow

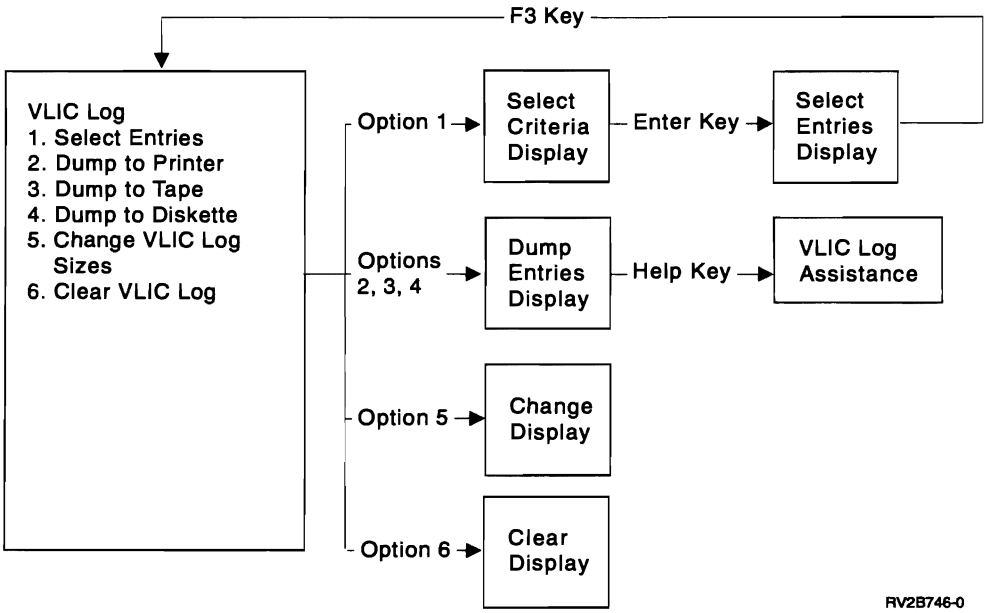


Figure 1-24. VLIC Log Menu Flow

Input/Output Debug Utility: The *Work with input/output debug utility* option aids in correcting code problems in the Licensed Internal Code of an I/O processor.

Note: You should use this option only with the aid of your next level of support or from the product developer.

Functions: The following functions are made available under DST and SST:

- Static Trace
- Dynamic Trace
- Breakpoint
- Read I/O Processor Data
- Dump I/O Processor Data
- IPL I/O Processor
- Set to Normal Dump
- Set to Exception Dump
- Clear Exception Dump Storage

Static Trace

This function collects, displays, prints, and saves data from static trace points. Trace points are in the Licensed Internal Code of an I/O processor. The trace points consist of a compare address and one or more data addresses. When the instruction at the compare address is processed, the contents of memory at the corresponding data addresses are collected. Static trace points are defined by IBM and cannot be changed.

Dynamic Trace

This function defines trace points in the Licensed Internal Code of an I/O processor. The data from these trace points can be collected, displayed, printed, and saved. Dynamic trace points are temporary user-defined trace points that are removed at the end of a trace session.

Breakpoint

This function sets a breakpoint in the Licensed Internal Code of an I/O processor. The interpreting of instructions for a process stops at the breakpoint address. Other functions under this utility can be performed while the process is stopped.

Read I/O Processor Data

This function collects, displays, prints, and saves data from the memory and registers of an I/O processor. This operation takes place through a software interface that is only for operational processors.

Dump I/O Processor Data

This function collects, displays, prints, and saves data from the memory, hardware registers, and error log of an I/O processor. This operation occurs at the hardware bus level and may be used to collect data from processors that are not operational.

Note: If the message "No Internal Storage is Available" is displayed, most likely you were doing a manual IPL and you were using dedicated service tools (DST) when the message was displayed. If so, perform the following:

1. Continue the Manual IPL, in step mode, by following the DST displays until the storage management recovery step completes.
2. Enter Function 21 on the control panel. This allows you to re-enter DST.
3. Start the input/output debug utility again. Now you should be able to dump the I/O processor data.

IPL I/O Processor

For some I/O processors a function is supplied that allows an IPL. This causes the I/O processor to be loaded again. When this occurs, all attached devices must be varied off and then varied on to be operational.

Set to Normal Dump

This function enables some communication and cryptographic I/O processors to display a dump of selective portions of storage. This option is displayed only when the following conditions exist:

- The I/O processor has a very large storage capacity.
- The system IPL is past the storage management recovery step.

Set to Exception Dump

This function enables an I/O processor to dump the entire contents of storage. This option is displayed only when the following conditions exist:

- The I/O processor has a very large storage capacity.
- The system IPL is past the storage management recovery step.

After the IOP is set to exception dump, it dumps the full contents of storage to a specific area of main storage when it encounters a serious error. The storage area can be viewed by using the procedure, "Copying the Type 2617,2618,2619, or 2666 Communications IOP and 2620 or 2628 Cryptographic IOP Storage Exception Dump" on page 8-11.

Clear Exception Dump Storage

This function clears internal storage that has been used to store an exception dump. Clear exception dump storage will not appear on the option menus until the system IPL is past storage management recovery.

Warning: When a unit reset is sent out to an operational processor, it cannot operate. This may result in a system failure that needs the operating system to be loaded with possible loss of data.

All attached devices fail when the workstation I/O processor is dumped; therefore, if there is only one workstation I/O processor on the system, it cannot be dumped.

Menu Flow: Select the *I/O debug utility* option on the Start a Service Tool display. The *Start a service tool* option is selected on either the System Service Tools (SST) display or the Use Dedicated Service Tools (DST) display.

Options: The I/O Debug Utility display allows you to select the type of I/O device to work with. The options are:

- Select communications I/O processor

  This option displays the communications processors and their active (varied-on) configuration objects. One processor can be selected either by a processor or one of its configuration objects. Selecting a configuration object selects the controlling processor.

- Select workstation I/O processor

  This option displays the workstation processors. One processor can be selected.

- Select storage I/O device

This option displays the storage I/O processors and their controlled devices. The disk units and those devices that have a system object name (for example, DKT01 and TAP01) are shown. One processor can be selected by either a processor or one of its devices. Selecting a device (except for the 9335, which selects itself) selects the controlling processor.

- Select failing I/O processor

  This option displays I/O processors that are not operational. One processor can be selected. For failing I/O processors, the only function available is the dump function.

The communications, workstation, or storage devices attached to the system are shown on a selection display. One device can be selected. Other displays show data associated with this device. Only one device can be selected at a time, but breakpoints and trace sessions can be active in other devices. The data associated with these functions is shown when the corresponding device is selected.

The selected device determines which debug functions are available. Although there are different ways of starting the various I/O devices, several of the functions are common. The general operation of these functions is described under "Functions" on page 1-30.

A failing I/O processor may appear o one or more than one selection display. For example, a failing communications I/O processor may appear under the *failing I/O processor* option or the "hp1.communications I/O processor option, or both.

Print Stand-Alone Dump:

Data to Print or Display: The items that can be printed or displayed using the Print Stand-alone Dump display are:

- Machine communications area (MCA)
- Machine check log buffer (MCLB)
- Task summary
- Task dispatching elements (TDE) chained to the TDE anchor pointer (MCA4RTDE) in the MCA
- Call/return elements (CRE) chained to each TDE
- All main storage pages in main storage at the time of the dump including:
  - Primary directory (PD) entry status for each page.
  - PIN count for each page. A page with a PIN count is held in main storage and therefore is not to be page faulted out of main storage.

    Note: A **PIN count** is the number of times a page is marked in use. A page in use is held in main storage. If a page PIN count is not zero, the page must remain in or is not to be removed from main storage and the V=R page frames are not to be changed.
  - Subpool numbers for each page.
  - Storage management status bits that mark the page in use.
  - Page segment ID (SID) extender.

    Note: A **segment identifier (SID)** indicates the 3 or 4 high-order bytes of a 6-byte virtual storage address. The SID extender is used internally to extend the size that can be specified.
  - Storage management flags.

Content Errors: For the print stand-alone dump to supply correct information, the machine communications area (MCA), primary directory, and storage management vector table (SMVT) structures dumped by the main storage dump must contain valid data. If print stand-alone dump determines that the above structures contain data that is not valid, the following occurs:

- TDE and CRE chains are not printed.
- Main storage pages are printed in real address order.
- Page header fields contain zeros.

Requirements for Using Tape or Diskette: If the main storage dump is copied to tape, the following considerations apply:

- The tape must be initialized using the Initialize Tape (INZTAP) command.
- The file name is DMS.

If the main storage dump is copied to diskette, the following considerations apply:

- The diskette must be initialized using the Initialize Diskette (INZDKT) command.
- The volume name and file name of each diskette must be DMS.
- If there are multiple diskettes, each diskette must be read back in the same order as when the dump was taken.

Menu Flow: Select the *Print stand-alone dump* option on the Start a Service Tool display. The *Start a service tool* option is selected on either the System Service Tools (SST) display or the Use Dedicated Service Tools (DST) display.

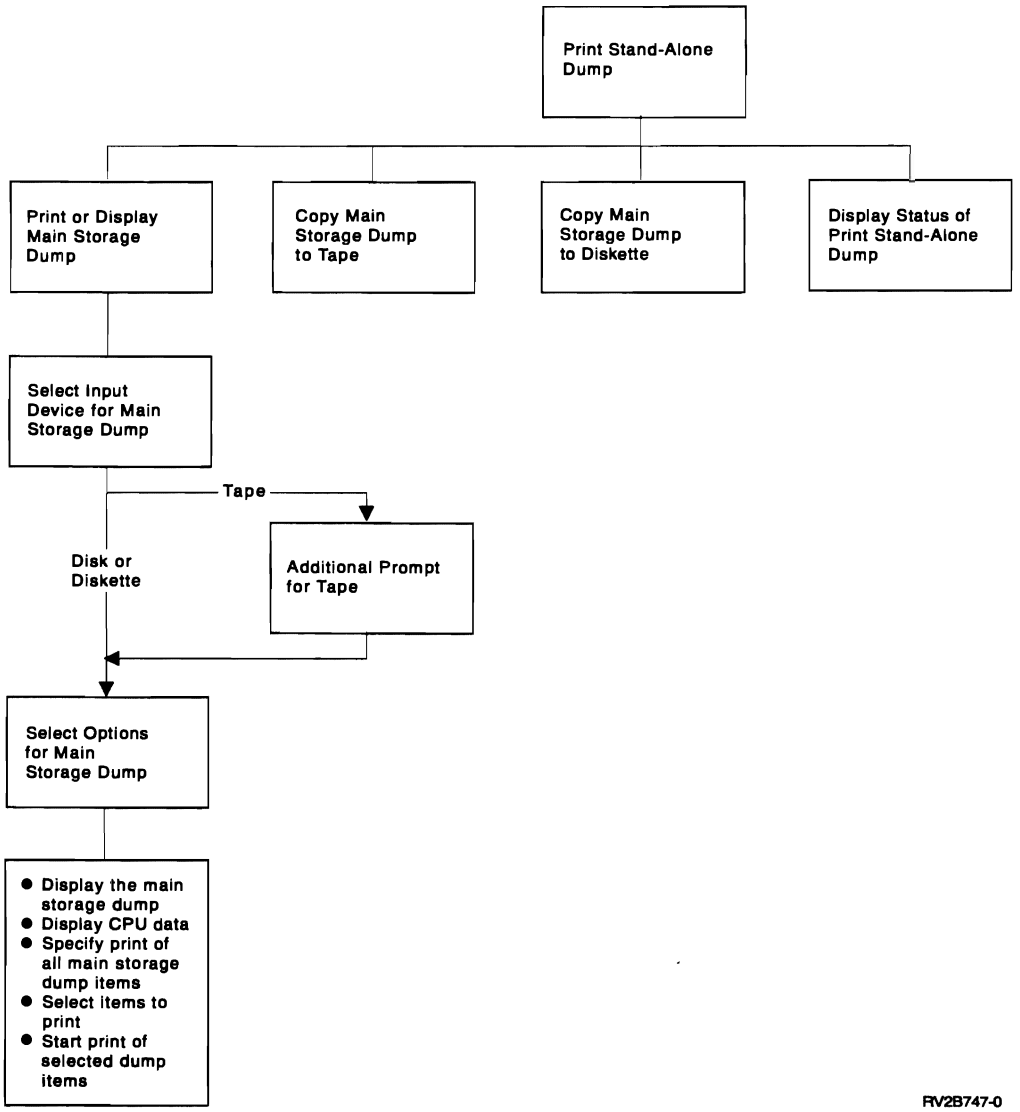


Figure 1-25. Print stand-alone dump overview

Options: Options on the Print Stand-Alone Dump display are:

- Print or display main storage dump

  Selecting this option causes the Select Input Device for Main Storage Dump display to appear. When you select the input device and press the Enter key, the Select Options for Main Storage Dump display appears. When you select a specific item on this display to be printed and press the Enter key, the display is shown again with a message stating that the selection was added to the list of items to dump.

- Copy main storage dump from disk to tape
- Copy main storage dump from disk to diskette
- Display print stand-alone dump status

  This option displays a status to indicate the number of dump requests that are not complete.

Display Hardware Configuration: The *Display hardware configuration* option allows you to display the configuration and status of the hardware on the system. The hardware for which you can display the configuration and status consists of:

- I/O buses
- Cards on the I/O buses:
  - I/O processors (IOP)
  - I/O adapters (IOA)
  - Bus extension drivers (BED)
  - Bus extension receivers (BER)
- Hardware associated with the IOPs:
  - Input/Output Processors
  - Devices
  - Communications ports
  - Communications channels
- Main storage cards
- Processor cards
- Battery power units

Menu Flow: Select the *Display hardware configuration* option on the Start a Service Tool display. The *Start a service tool* option is selected on either the System Service Tools (SST) display or the Use Dedicated Service Tools (DST) display.

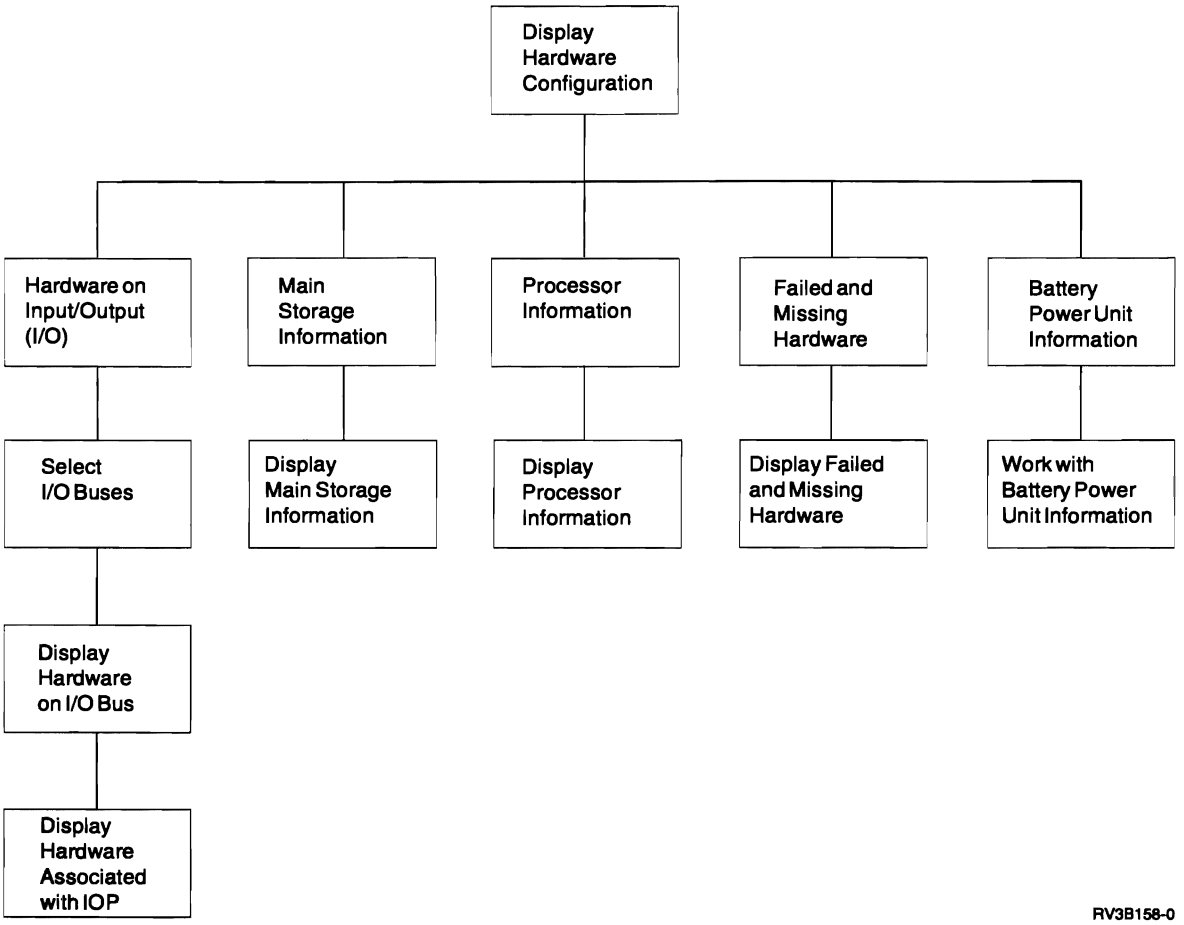


Figure 1-26. Display Hardware Configuration overview

Displays: The Display Hardware Configuration display appears when you select the *Display hardware configuration* option on the Start a Service Tool display.

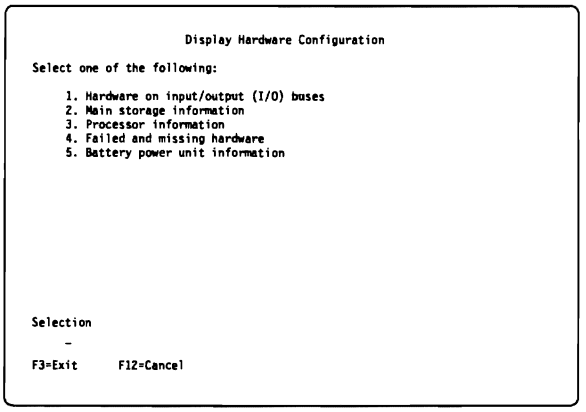


Figure 1-27. Display Hardware Configuration Display

Options: Options on the Display Hardware Configuration display are:

- Hardware on input/output (I/O) buses

  Selecting this option displays the I/O buses on the system.

- Main storage information

  Selecting this option displays the main storage cards on the system.

- Processor information

  Selecting this option displays the processor cards on the system.

- Failed and missing hardware

  Selecting this option displays the hardware that has failed or seems to be missing from the system.

- Battery power unit information

  Selecting this option displays the battery power units on the system. It allows you to update the manufacture dates of the battery power units. This option does not appear on systems with the system power control network (SPCN).

Select I/O Buses: The Select I/O Buses display appears when you select the *Hardware on input/output (I/O) buses* option on the Display Hardware Configuration display (Figure 1-27).

In the example display shown in Figure 1-28, the system has three I/O buses. Type 1 in the *Option* field **A** to display the hardware on the buses shown in the *Bus* field **B**.

You can select more than one bus and display the hardware on each bus without returning to this display.

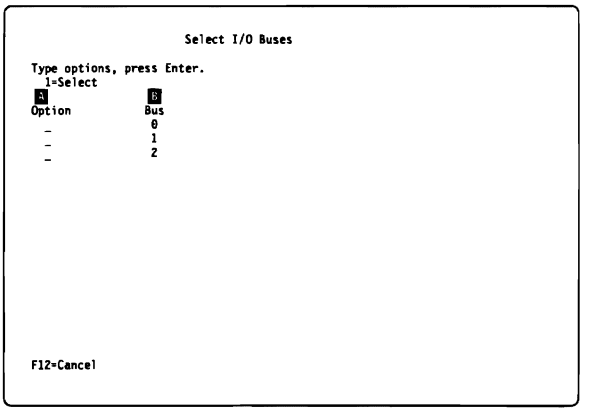


Figure 1-28. Example of Select I/O Buses Display

The Display Hardware on I/O Bus display appears when you select an I/O bus on the Select I/O Buses display (Figure 1-28).

The display in Figure 1-29 on page 1-37 shows examples of cards that you might find on I/O bus 0. The PF keys defined at the bottom of the display let you display additional information concerning the hardware.

If you selected more than one bus on the Select I/O Buses display, you can display the hardware on these buses without returning to the Select I/O Buses display.

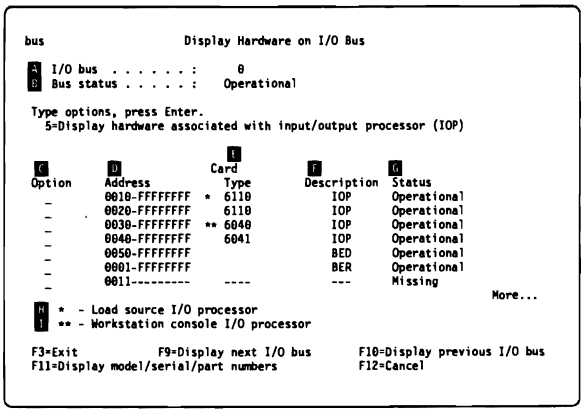


Figure 1-29. Example of Display Hardware on I/O Bus Display

I/O bus **A** :

This field contains the number of the I/O bus you selected to be displayed.

Bus status **B** :

This field describes the status of the I/O bus and can contain the following statuses:

- Operational
- Degraded (optical only)
- Failed
- No power
- Not connected

Option **C** :

This field allows you to display the hardware associated with an I/O processor. Enter a 5 in the *Option* field on any line that contains IOP in the *Description* field **F** .

Address **D** :

This field contains the BBCb address and the unit address (see the Locations section of the *Problem Analysis* information). The BBCb address relates to the hardware bus, card, and board address. Use the system configuration list to determine which position the BBCb address points to.

If the last eight positions of the *Address* field contain dashes (----), the card position identified by the first four positions of the *Address* field seems to be empty. If the card position does contain a card, either the card is not seated correctly, or the card or bus hardware is failing.

The dashes are present in other fields if a card position seems to be empty.

Card Type **E** :

This field contains a number that identifies the card in the card position.

If the load-source I/O processor has mirrored protection, two magnetic storage I/O processor types are shown with an asterisk.

If this field is blank, the hardware is either a failing I/O processor and the system cannot determine its type, or it is a bus extension driver card or bus extension receiver card.

Description **F** :

This field is an abbreviation of the card name and can contain one of the following:

- IOP (I/O processor)
- IOA (I/O adapter)
- BED (Bus extension driver)
- BER (Bus extension receiver)

Status **G** :

This field describes the status of the card and can contain one of the following:

- Operational
- Failed
- No power

  There is no power from the bus extension driver card to the bus extension receiver card.

- Missing

  The card position seems to be empty.

Asterisks (and **)* **H** *and* **I** :

These asterisks explain the meaning of asterisks on the display.

Display Hardware Associated with IOP: The Display Hardware Associated with IOP display appears when you type a 5 in the *Option* field of the display Hardware on I/O Bus display (Figure 1-29).

The display in Figure 1-30 on page 1-38 shows examples of the hardware associated with an IOP. The PF keys defined at the bottom of the display

let you display additional information concerning the hardware.

If you selected more than one IOP on the Display Hardware on I/O Bus display, you can display the hardware on these IOPs without returning to the Display Hardware on I/O Bus display. Press the Enter key to display the hardware on these IOPs.

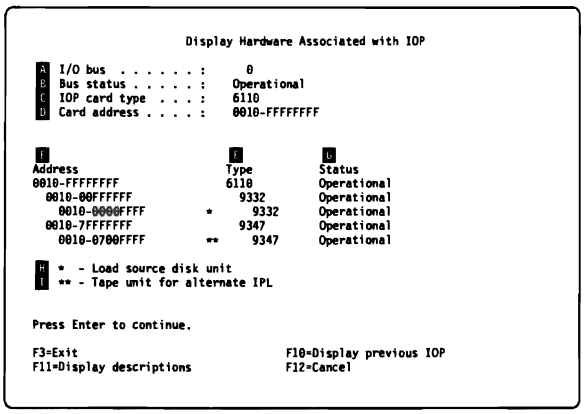


Figure 1-30. Example of Display Hardware Associated with IOP Display

I/O bus **A** :

This field is repeated from the Display Hardware on I/O Bus display.

Bus status **B** :

This field is repeated from the Display Hardware on I/O Bus display.

IOP card type **C** :

This field is the card type of the IOP you selected on the Display Hardware on I/O Bus display.

Card address **D** :

This field is the *Address* field of the IOP you selected on the Display Hardware on I/O Bus display.

Address **E** :

This field contains the BBCb address and the unit address. See "Locations and Addresses" in the "Service Referenced Procedures and Information" section of the *Problem Analysis* information. The BBCb address relates to the hardware bus, card, and board address. Use the system configuration list to determine which position number the BBCb address points to.

The first line under *Address* is the address of the IOP you selected on the Display Hardware on I/O Bus display. The system operates with the IOP as the first level of hardware. The other lines under *Address* are the addresses of the hardware associated with the IOP. The system operates with this hardware as the second, third, or fourth level of hardware.

The IOP address is aligned to the left, while each level of hardware associated with the IOP is indented two positions to the right.

In the display shown in Figure 1-30, the 6110 (Magnetic Storage I/O Processor) is level 1, the 9332 and 9347 (Device Controllers) are level 2, and the 9332 (Disk Unit) and 9347 (Tape Unit) are level 3.

Type **F** :

This field contains a number that identifies the hardware.

The indenting in this field means the same as the indenting in the *Address* field.

If the load-source disk unit has mirrored protection, two disk units are shown with an asterisk.

If this field is blank, the failing hardware is an I/O processor, but the system cannot determine its type.

If this field contains four asterisks (****) and the *Status* field **G** contains *Operational*, the hardware specified by the *Address* field **E** may have failed.

Status **G** :

This field describes the status of the hardware and can contain one of the following:

- Operational
- Failed

Asterisks (and **)* **H** *and* **I** :

These asterisks explain the meaning of asterisks on the display.

Display Main Storage Information: The Display Main Storage Information display appears when you select the *Main storage information* option on the Display Hardware Configuration display (Figure 1-27 on page 1-36).

The display in Figure 1-31 shows examples of the location, card type, and storage size of the main storage cards on the system, and the status of the cards. It also shows if a main storage card position seems to be empty.

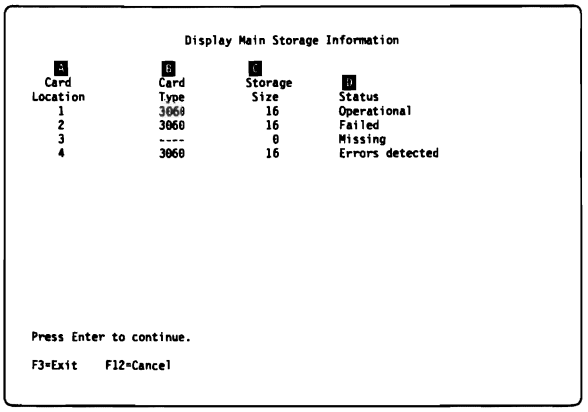


Figure 1-31. Example of Display Main Storage Information Display

Card location **A** :

This field is the main storage card position. To determine the card position, see "Locations and Addresses" in the "Service Referenced Procedures and Information" section of the *Problem Analysis* information.

This field may have a suffix of A or B.

Card type **B** :

This field contains a number that identifies the main storage card.

Storage size **C** :

This field specifies the size, in megabytes, of the main storage card.

Status **D** :

This field describes the status of the main storage card during IPL. If the card was operational during IPL but failed after IPL, this field will contain *Operational*. This field can contain one of the following:

- Operational

  The main storage card is operational; no errors have been detected.

- Errors detected

  Errors have been detected on the main storage card; the card is still usable.

- Failed

  The main storage card has failed; the card is not usable.

- Missing

  The main storage card position seems to be empty.

Display Processor Information: The Display Processor Information display appears when you select the *Processor information* option on the Display Hardware Configuration display (Figure 1-27 on page 1-36).

The display in Figure 1-32 shows examples of the type, model, and serial number of the system, and the type, description, model, serial number, and part number of the processor cards in the system.

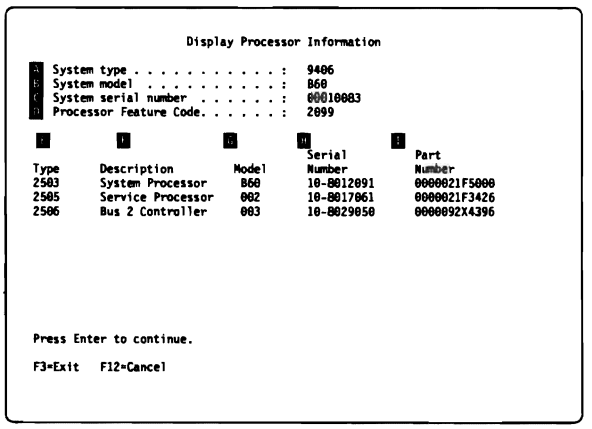


Figure 1-32. Example of Display Processor Information Display

System type **A** :

This field contains the number used to identify the system.

System model **B** :

This field contains the numbers or letters used to identify the model of the system.

System serial number C :

This field contains the number assigned to the system at the time it is manufactured.

Processor feature code D

This field contains the processor feature code of the system (shown only if the feature code exists).

Type E :

This field contains a number that identifies the processor card.

Description F :

This field describes the processor card.

Model G :

This field contains the numbers and letters used to identify the feature level of the processor card.

Serial Number H :

This field contains a number assigned to the processor card when it was made.

Part Number I :

This field contains a number assigned to the processor card when it was made.

Display Failed and Missing Hardware: The Display Failed and Missing Hardware display appears when you select the *Failed and missing hardware* option on the Display Hardware Configuration display (Figure 1-27 on page 1-36).

The display in Figure 1-33 shows examples of:

- Hardware that has failed
- card positions on the I/O buses that seem to be empty
- Main storage Card positions that seem to be empty

The PF keys defined at the bottom of the display let you display additional information concerning the hardware.

```
                    Display Failed and Missing Hardware

 A
Address
or Card          B                    C
Position           Type               Description
0001-FFFFFFFF                         Bus Extension Receiver
0011--------     ----                 Missing
0031-FFFFFFFF                         Bus Extension Driver
0220-0000FFFF    6034                 Port
0230-FFFFFFFF                         Input/Output Processor
  2              3060                 Main Storage
  3--------     ----                 Missing




Press Enter to continue.

F3=Exit    F11=Display model/serial/part numbers    F12=Cancel
```

Figure 1-33. Example of Display Failed and Missing Hardware Display

Address or Card Position A :

This field is defined as follows:

- If the field indicates other than a main storage card position (none of the first three positions in the field are blank), the field contains the BBCb address and the unit address (see "Locations and Addresses" in the "Service Referenced Procedures and Information" section of *Problem Analysis* information). The BBCb address points to the hardware bus, card, and board address. The system configuration list should be used to determine which position number the BBCb address points to.
- If the field indicates a main storage card (one or more of the first three positions in the field are blank), the field contains the main storage card position number. To determine the card position for, see "Locations and Addresses" in the "Service Referenced Procedures and Information" section of the *Problem Analysis* information.
- This field may contain a suffix of A or B.

If the last eight positions of the *Address or Card Position* field contain dashes (--------), the card position identified by the first four positions of the *Address* field seems to be empty. If the card position does contain a card, either the card is not seated correctly, or the card or some other hardware is failing.

The dashes are present also in other fields if a card position seems to be empty.

Type B :

This field contains a number that identifies the hardware.

If this field is blank and the failing hardware is an IOP, the system cannot determine its type.

This field may also be blank when there is no power from the bus extension driver card to a bus extension receiver card.

Description C :

This field contains a description of the hardware. If a card position seems to be empty, the word *Missing* is in this field.

Battery Power Unit Information: The Battery Power Unit Information display allows you to view the manufacture dates and replacement dates for the battery power units on your system. It also allows you to update the manufacture dates when battery power units are installed or replaced. Help is available by pressing the Help key.

Work with Active Service Tools (SST)

You can get to this display by selecting the *Work with active service tools* option on the System Service Tools (SST) display. This option lists active service tools and their status. You can start service tools from the System Service Tools (SST) display and keep them active while you start another service function. From the list of active service tools, you can work with a service tool you kept active, or you can end an active service tool.

Work with Disk Units (SST)

You can get to this display by selecting the *Work with disk units* option on the System Service Tools (SST) display.

Options

- Display disk configuration

  This option displays the system disk configuration and any disk units that are installed but not configured.

- Display checksum configuration

  This option displays the checksum configuration for an auxiliary storage unit with checksum protection.

- Calculate checksum configuration

  This option allows the system to calculate the checksum configuration for the specified storage protection.

- Work with ASP threshold

  This option allows you to display or change the amount of storage being used. The system storage pool is ASP 1. Storage pools ASP 2 through ASP 16 are auxiliary storage pools that the customer configures.

- Work with disk unit recovery

  This option allows you to perform service procedures on disk units. For more information, see "Work with Disk Unit Recovery."

- Work with disk unit information

  This option allows you to work with the vital product data (VPD) or the field-replaceable unit (FRU) data. For more information, see "Work with Disk Unit Information" on page 1-43 and "Work with Disk Unit Information" on page 1-55.

- Calculate mirrored capacity

  This option allows you to calculate the mirrored capacity for an ASP. You can calculate using your present configuration or a different one.

Work with Disk Unit Recovery: The Work with Disk Unit Recovery display is selected from the *Work with disk units* option on the System Service Tools (SST) display. Some of the service procedures available when you select this option are:

- Replace a configured disk unit with a non-configured disk unit. For more information, see "Replace Configured Unit" on page 1-42.
- Run disk unit problem recovery procedures. For more information, see "Disk Unit Problem Recovery Procedures" on page 1-42.
- Suspend or resume mirrored protection on a disk unit.
- Delete data from a non-configured disk unit.
- Rebuild disk unit data. This procedure is not available for all types of disk units.

Replace Configured Unit: This option allows you to exchange a configured disk unit for which mirrored protection has been suspended with a non-configured unit. Selecting this option clears all the units and destroys all data in the ASP in which the disk unit is being exchanged unless that ASP has checksum protection or the disk unit being exchanged is a suspended unit of a mirrored pair.

Rebuild Disk Unit Data: This option is available only for disk units that are protected by device parity. When a disk unit that caused the exposure of a device parity set is repaired, use this option to rebuild the data. Using this option allows the device parity protection redundancy feature to rebuild the disk unit data.

Disk Unit Problem Recovery Procedures: This option allows you to select functions that help in problem isolation and repair actions. Only those functions that are correct for a specific disk unit will be available. You may perform these procedures only on disk units that are non-configured or that have had mirrored protection suspended.

- Initialize and format

  This option runs when the disk unit reference code indicates that reallocations have failed because no alternative space is available. All of the ID fields on the disk unit are written again. The disk unit is formatted to 520 bytes in each sector. Running this option erases all of the data from the disk unit.

- Analyze disk unit surface

  This option performs a read verify operation on the selected range of sectors. The block size of the disk unit is set to 520 bytes per sector during this operation. Sectors that report disk unit reference codes indicating data check errors should be assigned to new locations on the disk using the *Display/change unit sector data* option.

  The analyze results can be:

  - Printed (all disk unit errors detected can be printed).
  - Displayed on the console (up to 999 detected errors can be displayed).

- Display/change unit sector data

  This option sets the block size of the disk unit to 520 bytes per sector.

  This option is used as follows:

  - The results of the *Analyze disk unit surface* option show which sectors have data check conditions. You can use the *Display/change unit sector data* option to assign those sectors to new locations on the disk.
  - You can inspect and change the 8 bytes of sector header, if necessary.
  - You can inspect and change the 512 bytes of sector data, if necessary.

  The *Display/change unit sector data* option has the following functions:

  - Reads the data from a selected sector.
  - Displays the data in hexadecimal and EBCDIC formats.
  - Lets the hexadecimal data be changed and written again to the sector.
  - Displays the 8-byte sector header in formatted form.
  - Lets the 8-byte sector header be changed and written again to the sector.
  - Lets the sector be assigned to a new location on the disk.
  - Displays the disk unit reference code after each operation.

- Download Licensed Internal Code

  This option moves the Licensed Internal Code that controls the operation of the disk unit from system storage to the disk unit. The disk unit I/O processor is reset to activate the Licensed Internal Code.

- Recover reassigned sectors

  This option runs when a 9335 disk unit reference code indicates that reallocations have failed because no alternative space is available. The recover function will attempt to recover the sectors that have been assigned to new locations on the disk and alternative sectors that have not been used. When all usable sectors have been recovered, an ending display appears.

- Reformat diagnostic cylinder

  This option runs when a 9335 disk unit reference code indicates that the ID fields of the

sectors on the diagnostic cylinder should be written again. The block size of the diagnostic cylinder is set to 520 bytes per sector during this operation. When all the ID fields of the sectors on the diagnostic cylinder are written again, an ending display is presented.

Work with Disk Unit Information: The Work with Disk Unit Information display is activated from the *Work with disk units* option on the System Service Tools (SST) display.

Options

- Work with vital product data (VPD)
- Work with field replaceable unit (FRU) data

Work with Diskette Data Recovery (SST)

You can get to this display by selecting the *Work with diskette data recovery* option on the System Service Tools (SST) display.

This option allows you to read data from a diskette containing cyclical redundancy check (CRC) errors. CRC errors occur when data is found on a diskette that is not readable during a read operation. Normally, when an CRC error is found you can not read the diskette past the point of the failing sector. Using this option, diskettes containing sectors with CRC errors can be read.

The AS/400 system can use diskettes for saving and putting back system objects. One or more objects can be stored on a diskette. Whenever the AS/400 system finds a diskette containing a bad sector during a read operation, the operation ends. A bad diskette sector, which causes a CRC error, can result from failure in the diskette or from wrong handling. The *Work with diskette data recovery* option allows you to read data from a diskette, change any failing sectors present on the diskette to correct the failing sectors, then write the new data to a new diskette.

Options

- Alter diskette data

  This option allows you to change the data in any sector on a diskette. For more information, see "Alter Diskette Data" on page 1-44.

- Read data from diskette

  This option reads the contents of a diskette while ignoring diskette sectors with read data CRC errors. For more information, see "Read Data from Diskette" on page 1-44.

- Write data to diskette

  This option writes the volume table of contents (VTOC) and data sectors to a new diskette. For more information, see "Write Data to Diskette" on page 1-44.

- Display diskette data

  This option allows you to display the data in any sector on a diskette. For more information, see "Display Diskette Data" on page 1-44.

- Print reports

  This option allows you to print the following reports from the diskette:

  - Volume label
  - Data set label
  - Load or dump object descriptor
  - Failing sector
  - Sector range

  For more information, see "Print Reports" on page 1-44.

Processing Restrictions: The *Work with diskette data recovery* option:

- Cannot duplicate diskettes containing data sets which have data set directories in the data area.

  Deleted sectors are accepted by the read option and are identified by the print operation. The write operation compresses the data set in which the deleted sectors are found. Compression must occur before the write operation occurs; there is no MI interface to write a deleted sector. The automatic compression saves all data sets starting with extent sector addresses. When suitable, the option adjusts end-of-extent and end-of-data addresses. Diskettes containing data sets that have data set directories in the data area cannot be duplicated because the automatic compression could destroy the sector addressability of the data set directory. Any change made to the VTOC area should not change the sector size as determined by the read operation; compression logic assumes the same sector size.

- May not read VTOC or data set identification sectors into a space object.

  This option accepts I/O media errors associated with the sectors read during a read VTOC command. Because the IOP does not always return sectors read in error, the VTOC or data set identification sectors may not be read into the system space object. You can assemble valid sectors in place of those sectors that are not read back into the space object because of sector errors. The write operation checks the volume and first data set identification sectors to verify if they are present or absent.

Alter Diskette Data: The display in Figure 1-34 appears when you select the *Alter diskette data* option on the Work with Diskette Data Recovery display.

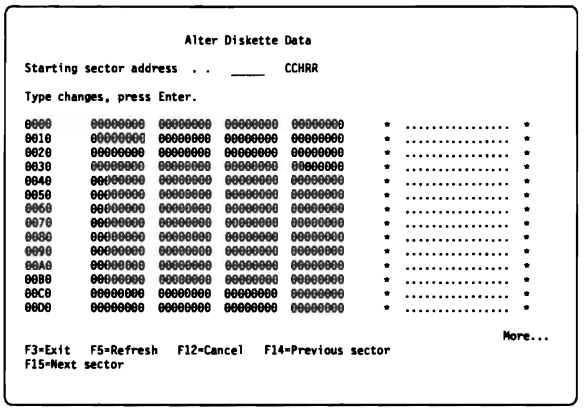


Figure 1-34. Example of Alter Diskette Data Display

You can advance one sector at a time by pressing F15, or you can return to the previous sector by pressing F14. Also, you can type over the *Starting sector address* field. This field gives you direct access to any sector on the diskette.

Read Data from Diskette: Select this option first. This option reads cylinder 0, sector by sector, and cylinders 1 through 74 with one read request. When the read operation finds a CRC or a deleted or sequentially relocated sector, it builds an error summary record and continues reading until it reaches an end-of-volume.

Write Data to Diskette: This option writes the VTOC and the data sectors from the image contained in the system space object. The diskette is written in either ASCII or EBCDIC, as determined by the read option. If the operation receives a bad feedback response code from the REQIO instruction, the write data to diskette operation ends, and an error message is supplied. If the write operation is successful, the output diskette is given the same volume serial number and content as the original diskette.

Display Diskette Data: The display in Figure 1-35 appears when you select the *Display diskette data* option on the Work with Diskette Data Recovery display.

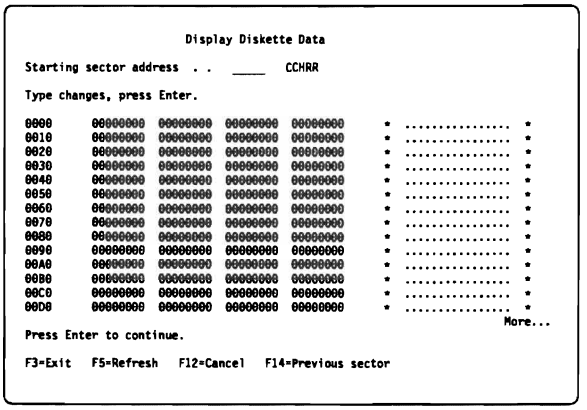


Figure 1-35. Example of Display Diskette Data Display

The contents of sector 1 on cylinder 0, track 0 are displayed first. You can advance one sector at a time by pressing the Enter key, or you can return to the previous sector by pressing F14. Also, you can type over the *Starting sector address* field. This field gives you direct access to any sector on the diskette.

Print Reports: The Print Reports display appears when you select the *Print reports* option on the Work with Diskette Data Recovery display. You can print the following reports or select options from the Print Reports display:

- Volume label report

  This report is supplied from the system space object by virtual address in a standard hexadecimal and character format. This option formats the volume label fields. The volume label field contains a field description,

the hexadecimal field offset into the sector, and the field contents.

- Data set label report

  For each data set on the diskette, a data set label report is supplied from the system space object by virtual address in a standard hexadecimal and character format. This option formats the data set label fields. The data set label field contains a field description, the hexadecimal field offset into the sector, and the field contents.

- Load/dump object descriptor report

  The AS/400 system save and restore options specify a list of system objects that contains the database in the request descriptor (RD) part of the source/sink request (SSR) data used by the REQIO instruction. For each object that the REQIO instruction specifies, the load/dump IOM writes on the diskette a load/dump object dump descriptor containing a summary of the system environment that the object was dumped from. For each load/dump object dump descriptor contained on the diskette, the descriptor sector is dumped from the system space object by virtual address in a standard hexadecimal and EBCDIC format. This option formats the load/dump object dump descriptor fields. The descriptor field contains a field description, the hexadecimal field offset into the sector, and the field contents.

- Failing sector report

  This report is supplied from the sectors that found read (or CRC feedback response code) errors after the *Read data from diskette* option is selected. The sectors are formatted to provide the sector address (CCHRR–cylinder, head, record), data set identifier, the hexadecimal data offset into the sector, and the sector contents. Because the data CRC can be anywhere in the failing sector, the failing sector report shows where to place the failing sector in its correct context.

- Sector range report

  This report is supplied from the sectors in the specified sector range. Each sector is formatted to contain the sector address (CCHDRR), the data set identification, load/dump object type, subtype, and object name (if suitable). The sector is dumped from the space object by virtual address in a standard hexadecimal and EBCDIC format. You must enter a starting and ending sector address to print a sector range report.

How to Use the Work with Diskette Data Recovery Option:

1 Select the *Work with diskette data recovery* option on the System Service Tools (SST) display. The Work with Diskette Data Recovery display appears. This display shows the diskette units with which you can work.

```
                        Work with Diskette Data Recovery

Warning:  Work with Diskette Data Recovery should only be used when
directed to by your service representative.

Type option, press Enter.
  2=Alter diskette data      3=Read data from diskette
  4=Write data to diskette   5=Display diskette data    6=Print reports

Opt     Device
 -      DKT01
 -      DKT02
 -      DKT03
 -      DKT04
 -      DKT05
 -      DKT06
 -      DKT07
 -      DKT08
 -      QDKT



F3=Exit   F12=Cancel
```

2 Insert a diskette with read errors into the diskette unit with which you want to work.

3 Type a 3 in the *Opt* field next to the diskette unit in which you inserted the diskette and press the Enter key. Selecting the read option moves the contents of the diskette to a system space object where you can display or change them.

4 After the diskette is read into the system space object, select the *Print reports* option on the Work with Diskette Data Recovery display to print the contents of the diskette. This helps you find the failing sectors and the address of the system space object where you can change the contents of the diskette.

5 Select a diskette summary report. Print the summary reports in any combination by

typing a 6 in front of the summary report you want and press the Enter key.

Note: The type of summary report you want to print is determined by the type of diskette with which you are working. All diskettes have volume headers and data set headers. Therefore, you may want summary reports for these areas. The number of read errors determine whether you should look at the failing sector summary. If read errors have been found, you should look at the failing sector summary. For diskettes used in save and restore operations, you should use the load/dump object descriptor summary.

6 If you want to print the sector range report, specify the start and end sector address for the sector range. If you do not specify a sector address, no sectors will be printed in the print range sector area of the report.

7 To display the contents of the diskette, select the *Display diskette data* option on the Work with Diskette Data Recovery display.

To change the failing sectors, select the *Alter diskette data* option on the Work with Diskette Data Recovery display.

8 Exchange the diskette that contains CRC errors with one of the same type and format.

9 Select the *Write data to diskette* option on the Work with Diskette Data Recovery display to write the changed data to the new diskette.

This ends the procedure.

Dedicated Service Tools (DST)

Dedicated service tools (DST) is used to service Vertical Licensed Internal Code (VLIC) and to work with disk unit configuration.

How to Access Dedicated Service Tools

Dedicated service tools (DST) can be accessed in several ways:

- **IPL to DST**

  Perform the following steps:

  1. Select Manual mode
     - If the system unit control panel has a rotary, mechanical keylock:
       a. Insert the metal key
       b. Turn keylock to the Manual position
     - If the system unit control panel has an electronic keylock:
       a. Insert the keystick.
       b. Select Manual mode by pressing the Mode switch.
     - If the system unit control panel does not have a keylock:
       a. Select Function 02 (using the Increment (↑), or Decrement (↓) switches)
       b. Press Enter on the control panel.
       c. Select Manual (M) mode, IPL type B (using the Increment (↑), or Decrement (↓) switches)
       d. Press Enter on the control panel.
  2. Perform an IPL on the system:
     - If the system is currently powered on, select Function 03 (using the Select, Increment (↑), or Decrement (↓) switches). Press Enter on the control panel.
     - If the system is not powered on, press the Power switch on the control panel.
  3. Identify the primary console.

For more information on how to identify the primary console, see "Determining a Primary or Alternative Console" on page 2-3.

4. The IPL or Install the System display appears on the primary console.

   Select the *Use dedicated service tools (DST)* option.

5. Sign-on to DST.

   Type 22222222 as the valid password. If the customer has changed the DST full authority password, ask the customer for the correct password.

   The Use Dedicated Service Tools (DST) display appears.

   This ends the procedure.

Note: If the system is configured for attended operation, the IPL or Install the System display appears when you perform an IPL in Normal mode.

- **Select Function 21 while the system is operational**

  In Manual mode, enter Function 21 on the control panel to see the DST Sign On display on the primary console. Also, the job that is running at that workstation is canceled if you did not perform an IPL of the system in debug mode.

  Note: Function 21 should be used to access DST only if SST is not available (for example, if the IPL will not complete, or if the operating system is not working). Function 21 has no effect on other jobs unless the system is in the restricted state. If you lose the console job while in restricted state, machine processing ends.

  The primary console may be a twinaxial, ASCII, or LocalTalk** workstation. For more information on determining the primary and alternative consoles, see "Determining a Primary or Alternative Console" on page 2-3.

  If the primary console is twinaxial, it is the workstation with address 0 on port 0 of the first workstation I/O processor on bus 0. If you enter Function 21 and the primary console is powered off or not usable, reference code 5004 appears on the control panel. Entering Function 21 forces the DST Sign On display to appear on one of the alternative consoles.

  If the primary console is ASCII, it is the workstation on port 0 of the first workstation I/O processor on bus 0. If you enter Function 21 and the primary console is powered off or not usable, reference code 5003 appears on the control panel. Entering Function 21 forces the DST Sign On display to appear on the alternative console.

  If the primary console is LocalTalk protocol, it is the workstation that is assigned address 0 and port 0 by icon selection, and is attached to the first workstation I/O adapter contained in the first I/O processor on bus 0. If you enter Function 21 and the primary console is powered off or not usable, reference code 5004 appears on the control panel. Entering Function 21 forces the DST Sign On display to appear on one of the alternative consoles.

- **From DST debug mode**

  If DST debug mode was previously selected when you performed an IPL of the system (see "Select DST Console Mode" on page 1-58), press the System Request key. Then, type

  ```
  DST
  ```

  (in upper case) on the system request line and press the Enter key. The Use Dedicated Service Tools (DST) display is displayed on the primary console. The job that is running at that workstation is stopped.

Dedicated Service Tools Requirements

The following items are required to use DST:

- The disk containing the Licensed Internal Code (the load-source disk).
- An operational workstation on bus 0 for the primary console or one of the alternative consoles.
- A printer attached to the same workstation I/O processor, a tape device, or diskette device may be needed by some service functions.
- The printer used with DST to print service tool output must be an SCS data stream printer.

Note: ASCII printers are not available with DST.

- A valid DST password is needed to sign on to DST. There are three levels of DST authorization, each with a separate level of access to service functions and DST options. See "Change DST Passwords" on page 1-58 for more information.

Function Keys (DST)

The F3, F12, F16, and System Request function keys perform the following:

- The F3 function key returns you to the primary menu of the service tool you are using.
- The F12 function key returns you to the previous DST display.
- The F16 function key returns you to the Use Dedicated Service Tools (DST) display from the service function you are in. The active service function is not canceled.
- The System Request function key returns you to the Use Dedicated Service Tools (DST) display from the workstation in debug mode when you have typed

  ```
  DST
  ```

  on the system request line. The active user job is not canceled. This key is active only if an IPL of the system was performed in DST console debug mode.

Menu Flow (DST)

DST is selected from the IPL or Install the System display.

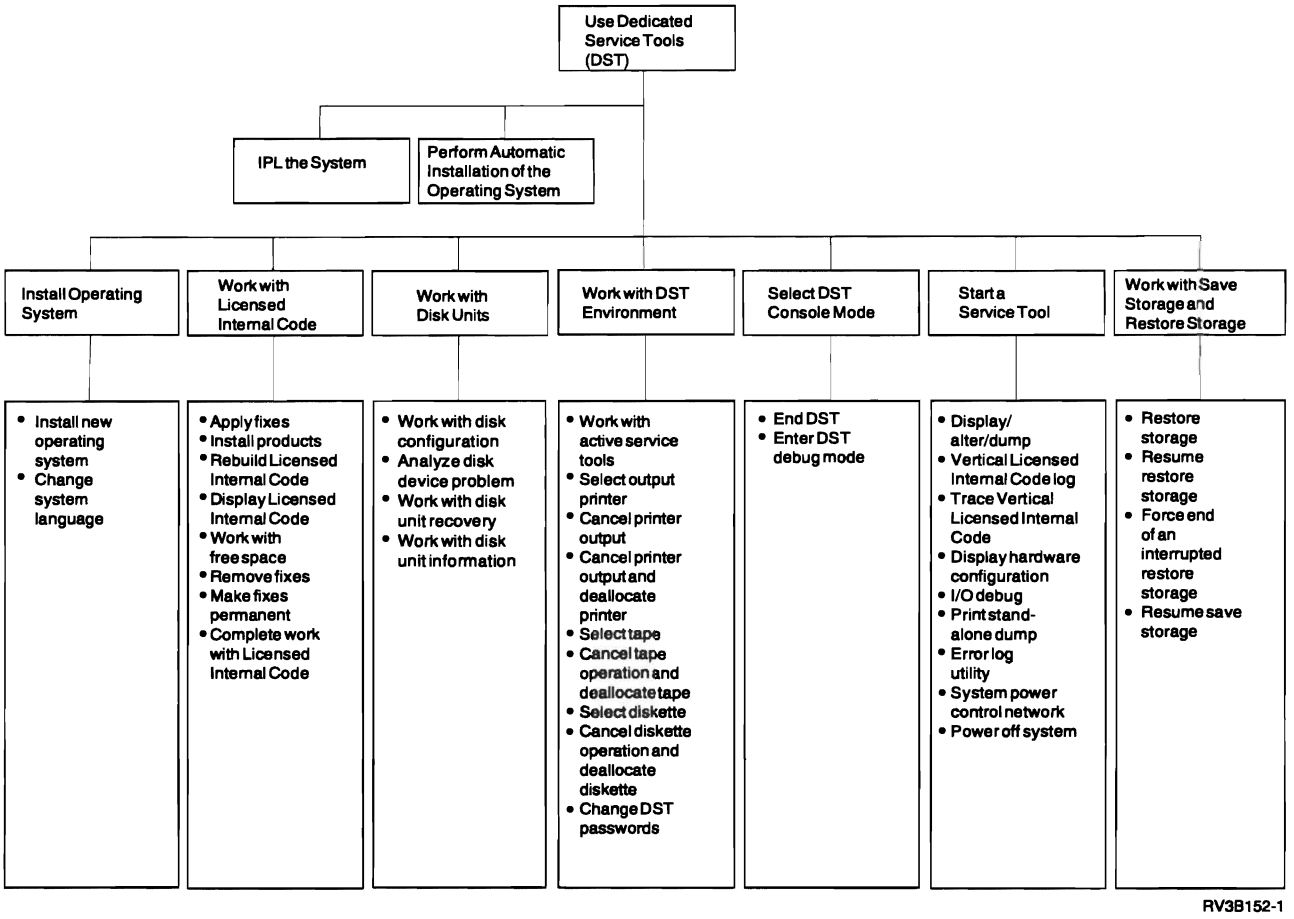


Figure 1-36. DST overview

Options (DST)

- IPL the system

  This option does the Vertical Licensed Internal Code recovery phases and passes control to the operating system. The operating system is loaded. For more information about this option, see "IPL the System (option under DST)" on page 1-50.

- Perform an automatic installation of the operating system

  This option allows you to install the operating system. For more information about this option, see the *Software Installation*, SC41-3120.

- Install operating system

  This option installs the operating system from tape. The present operating system (if any) is exchanged. This option is used for installing a new release of the presently installed operating system or for installing the operating system after a failure. This must be run from the primary console.

  This option is not available under basic authority. For more information about this option, see "Install Operating System (DST)" on page 1-50.

- Work with Licensed Internal Code

  This option applies program temporary fixes (PTFs), removes PTFs, or makes permanent PTFs to the system Licensed Internal Code from tape or diskette when the operating system is not available. This option also allows you to build the Vertical Licensed Internal Code nucleus again or display product release and modification level information.

For information about this option, see the "Work with Licensed Internal Code (DST)" on page 1-50.

- Work with disk units

  This option displays functions that can be run for disk units. You can work with disk configuration (including display disk configuration, work with storage threshold, work with ASP configuration, work with checksum protection and plan mirrored protection configuration), analyze disk unit problems, work with disk unit recovery, and work with disk unit information.

  Limited function is available after the IPL of the system is started. For information about this option, see "Work with Disk Units (DST)" on page 1-51.

- Work with DST environment

  This option allows you to select printers, tape units, and diskette units to be used by DST, control active service functions, and control DST security. All DST tools that require a printer, tape unit, or diskette unit are referred to this option. If you have DST security authority, you can change DST passwords and override the operating system passwords. For information about this option, see "Work with Dedicated Service Tools Environment (DST)" on page 1-56.

- Select DST console mode

  This option allows the operating system to share the system console workstation with DST. This option specifies the status of the workstation being used by DST when an IPL of the system is performed.

  This option is not possible with basic authority. For information about this option, see "Select DST Console Mode" on page 1-58.

- Start a service tool

  This option displays service functions available under DST. You can select and start a service function from this display. For information about this option, see "Start a Service Tool (from DST)" on page 1-59.

- Work with save storage and restore storage

  This option allows you to restore all system auxiliary storage (except Licensed Internal Code) from tape, resume a restore storage that was interrupted, force the end of an interrupted restore storage, or resume a save storage that was interrupted. This option is not available with basic authority or when the IPL of the operating system has started. For more information, see the *Backup and Recovery – Basic* information.

IPL the System (option under DST)

This option is selected from the Use Dedicated Service Tools (DST) display. The *IPL the system* option is the same as calling out the Select DST Debug display. For more information, see "Select DST Console Mode" on page 1-58 and "Licensed Internal Code Install and Restore Overview" on page 6-8.

Install Operating System (DST)

This option is the same as the *IPL the system* option except that the operating system is loaded from the load-source tape device. For more information see the *Software Installation*, SC41-3120.

Work with Licensed Internal Code (DST)

This option applies PTFs, removes PTFs, or makes permanent PTFs to the system Licensed Internal Code from tape or diskette when the operating system is not available. It also allows you to install the Licensed Internal Code, rebuild the Licensed Internal Code, display the Licensed Internal Code information and display free space. This option is selected from the Use Dedicated Service Tools (DST) display.

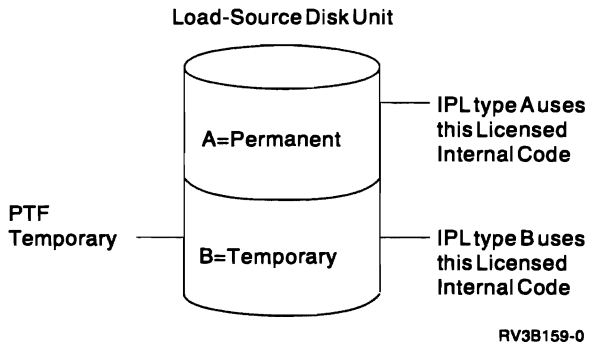
General Information: There may be two versions of some Licensed Internal Code modules on the load-source disk device. The IPL type (A or B) determines which version of the modules your system uses. The original version is used when the system is running on a type A IPL. When a Licensed Internal Code Program Temporary Fixes (PTF) is temporarily applied on the system, a second version of the module is created. The second version is used when the system is running on a type B IPL.

When PTF is permanently applied, the original version of the module is replaced with the PTF

version. The system will then use the PTF version when running on a type A IPL.

To apply PTFs, you must perform an IPL type A, then load and apply the PTFs.

When PTFs are applied to the Licensed Internal Code, they are applied as an inactive copy of the Licensed Internal Code. The IPL type is switched automatically by the system. The *Work with Licensed Internal Code* option sets the IPL type to B automatically when Licensed Internal Code PTFs are applied temporarily. When this happens, the next IPL is type B. After PTFs are applied permanently, this option sets the IPL to type A. When this happens the next IPL is a type A.



To run with the PTFs, you must perform an IPL type B. These PTFs can now be made permanent. When the PTFs are made permanent, you return to performing an IPL type A for normal operations.

Options

- Apply Licensed Internal Code PTFs

  This option places PTFs in the system Licensed Internal Code from either a tape unit or a diskette unit. These PTFs are placed in the inactive (change) copy of the Vertical Licensed Internal Code.

  Note: There are two types of some Licensed Internal Code on the load-source disk unit. It is the IPL type (A or B) that selects the Licensed Internal Code level your system will run with. When PTFs are placed in the Licensed Internal Code, the IPL type is automatically changed so that the next IPL will be from the copy with the changes.

- Install Licensed Internal Code product

  This option installs a new Licensed Internal Code product into the system.

- Rebuild Licensed Internal Code
- Display Licensed Internal Code information
- Display free space

  This option displays space available for storing new modules on the system.

- Remove Licensed Internal Code PTFs

  To remove PTFs, the system has to be running on the copy without the changes (primary copy). When these changes are removed, the replaceable units (RUs) from the primary copy are loaded over the changes that were placed in the change copy of Vertical Licensed Internal Code.

- Make Licensed Internal Code PTFs permanent

  To make Licensed Internal Code PTFs permanent, the system has to be running on the copy with the changes. When these changes are made permanent, they are loaded into the primary copy of the Vertical Licensed Internal Code.

For more information on PTFs see the *System Operation* or the *System Startup and Problem Handling* information.

Work with Disk Units (DST)

This option allows you to:

- Work with disk configuration
- Analyze disk device problem
- Work with disk unit information

  This option allows you to observe and update vital product data when exchanging a disk unit, and display or change a failing field replaceable unit (FRU).

- Work with disk unit recovery

Work with Disk Units Menu Flow: This option is selected from the Use Dedicated Service Tools (DST) display or the System Service Tools (SST) display, but the function available is limited after the IPL of the operating system is started.

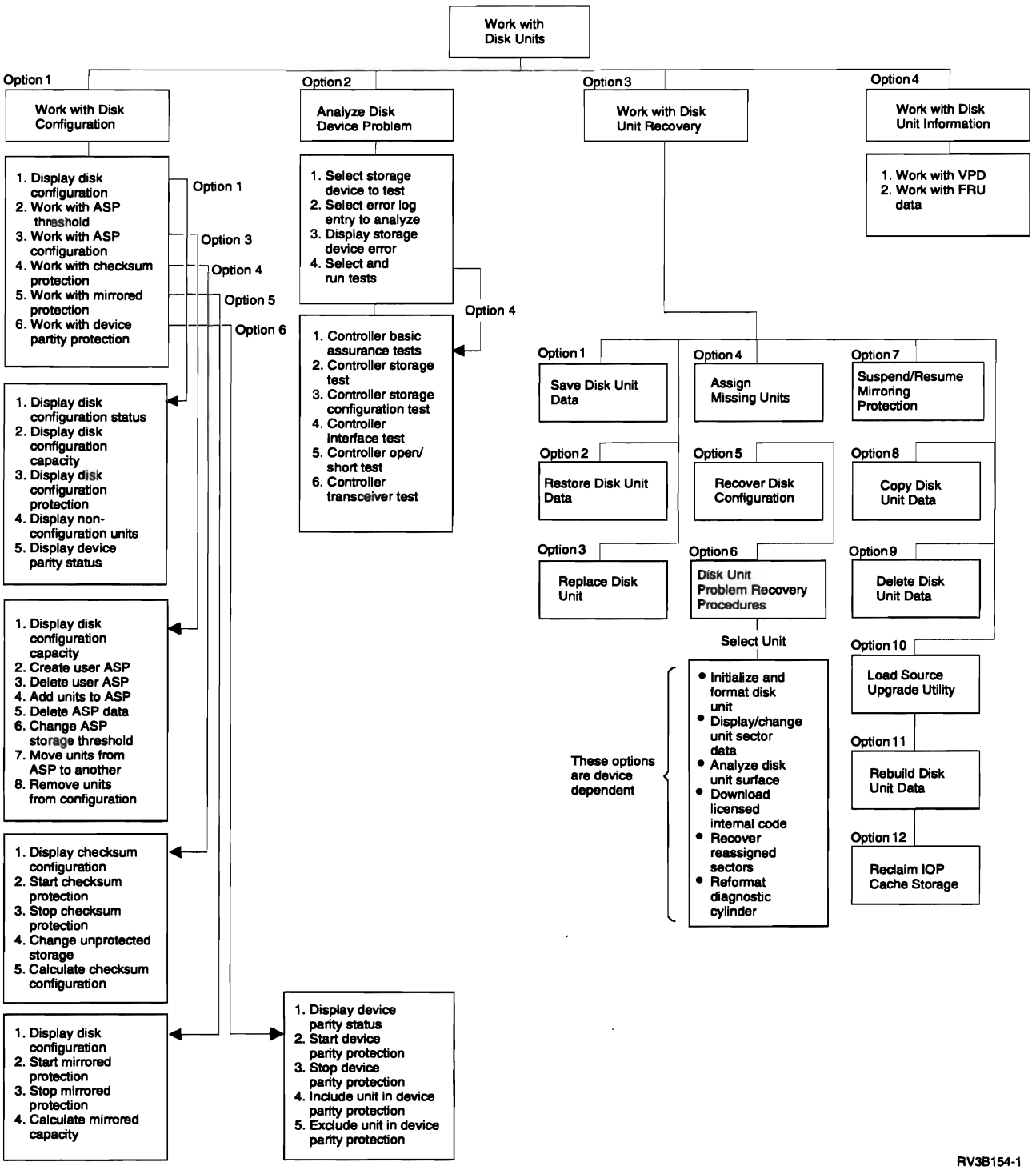


Figure 1-37. Work with Disk Units overview

Work with Disk Configuration:

Options

- Display disk configuration

  Select this option to display the system's disk configuration and any non-configured disk units. The configuration displays show which disk units are assigned to the auxiliary storage pools. Information about storage use and optional protection methods can also be displayed.

- Work with ASP threshold

  Select this option to display or change the threshold for auxiliary storage pools.

- Work with ASP configuration

  Select this option to display, change, or define configuration for ASPs.

- Work with checksum protection

  Select this option to display or change the checksum protection for the auxiliary storage pools.

- Work with mirrored protection

  Select this option to display or change the mirrored protection, to calculate the DASD size provided by mirrored protection, and to display the disk configuration.

- Work with device parity protection

  Select this option to perform the system functions used for handling device parity protection on the system. Device parity protection is a data redundancy feature available on some storage units. It can improve system availability.

Analyze Disk Device Problem: The *Analyze disk device problem* option is selected to analyze errors on any disk device. Devices and reference codes are displayed for the errors being analyzed or for the device that was selected to be tested. This option also runs disk or storage controller tests.

The Analyze Disk Device Problem display has the following options:

- Select storage device to test
- Select error log entry to analyze
- Display storage device error
- Select and run tests

Options

- Select storage device to test

  This option displays all the devices that make up the disk storage subsystem for the AS/400 system. You can select a storage device to test from the display, but only if that device gives support to tests. Most devices that can be attached to the AS/400 system have very defined initial error reporting and do not require tests. After selecting the device, you must select the *Select and run tests* option to analyze the device.

- Select error log entry to analyze

  This option displays part of the limited paging environment error log. The limited paging environment error log is a list of the most recent system errors.

  When you select this option, only the storage device errors will appear. You can then select the storage device error to analyze. After you select the error to analyze, you must select the *Display storage device error* option or the *Select and run tests* option.

  Note: You cannot view the system error log display when using the *Analyzing disk devices* option.

- Display storage device error

  This option displays the storage device and the error codes for the device error now being analyzed. The reference code and additional error data are displayed if needed.

- Select and run tests

  This option allows you to select a test to be run, if needed, for a particular disk unit. The test will be run using the device selected via option 1 or 2. The results will be displayed when the test is completed.

Work with Disk Unit Recovery: The Work with Disk Unit Recovery display is selected from the *Work with disk units* option on the Use Dedicated Service Tools (DST) display.

Save Disk Unit Data: This option is run when the disk unit reference code (URC) indicates the disk enclosure should be exchanged.

Before the disk enclosure is removed and a new disk enclosure is installed, the data from the disk units in the disk enclosure should be saved to tape.

When all of the disk unit data has been saved to the tape, an ending display is shown.

Note: The Licensed Internal Code on the load-source disk unit is not saved by using this procedure. Use the SAVSYS or SAVSTG tapes to restore the Licensed Internal Code to the load-source disk unit if the load-source disk unit is being restored.

Restore Disk Unit Data: This option reads the data from the tapes made during the Save Disk Unit operation and writes the data on the disk unit. The data can be restored to a disk unit that is the same type, or to a different type of disk unit that has the same or a larger storage capacity. The block size of the disk unit is set to 520 bytes per sector during this operation. When all data has been restored to the disk unit, an ending display is shown. The system performs an IPL to DST when the load source restore is complete.

Replace Disk Unit: This option is part of the disk recovery procedures that let you exchange a configured disk unit with a non-configured unit. This option will result in clearing all the units in the ASP in which the disk unit is being exchanged, unless that ASP has checksum protection or the disk unit being exchanged is a suspended unit of a mirrored pair.

Assign Missing Units: This option reports any missing units (the units that were part of the system during the last IPL, but have been disconnected accidentally or are configured differently). When a unit is selected to be assigned, the system will attempt to find one or more valid non-configured disk units. If none can be found, you will have to use the Replace function.

Recover Disk Configuration: This option aids in the recovery of a system by recovering the correct system configuration in cases where the load source was damaged, and the device configuration table was lost.

Disk Unit Problem Recovery Procedures: This option allows you to select functions that help in problem isolation and repair actions. Only those functions that are correct for a specific disk unit will be available.

- Initialize and format

  This option runs when the disk unit reference code indicates that reallocations have failed because no other space is available. All of the ID fields on the disk unit are written again. The disk unit is formatted to 520 bytes in each sector. Running this option erases all of the data from the disk unit. Ensure the disk unit data by saving it to tape before you run this option.

- Display/change unit sector data

  This option sets the block size of the disk unit to 520 bytes per sector.

  This option is used as follows:

  - The results of the *Analyze disk unit surface* option show which sectors have data check conditions. You can use the *Display/change unit sector data* option to assign those sectors to new locations on the disk.
  - You can inspect and change the 8 bytes of sector header, if necessary.
  - You can inspect and change the 512 bytes of sector data, if necessary.

  The *Display/change unit sector data* option has the following functions:

  - Reads the data from a selected sector.
  - Displays the data in hexadecimal and EBCDIC formats.
  - Allows the hexadecimal data to be changed and written to the sector again.
  - Displays the 8-byte sector header in formatted form.
  - Allows the 8-byte sector header to be changed and written to the sector again.
  - Allows the sector to be assigned to a new location on the disk.
  - Displays the disk unit reference code after each operation.

- Analyze disk unit surface

  This option performs a read verify operation on the selected range of sectors. The block size of the disk unit is set to 520 bytes per

sector during this operation. Sectors that report disk unit reference codes indicating data check errors should be assigned to new locations on the disk using the *Display/change unit sector data* option.

The analyze results can be:

- Printed (all disk unit errors detected can be printed).
- Displayed on the console (up to 999 detected errors can be displayed).

- Download Licensed Internal Code

  This option moves the Licensed Internal Code that controls the operation of the disk unit from system storage to the disk unit. The disk unit controller is reset to activate the Licensed Internal Code.

- Recover reassigned sectors

  This option runs when the 9335 disk unit reference code indicates that reallocations have failed because no other space is available. The recover function will attempt to recover the sectors that have been assigned to new locations on the disk and other sectors that have not been used. When all usable sectors have been recovered, an ending display appears.

- Reformat diagnostic cylinder

  This option runs when the 9335 disk unit reference code indicates the ID fields of the sectors on the diagnostic cylinder should be written again. The block size of the diagnostic cylinder is set to 520 bytes per sector during this operation. When all the ID fields of the sectors on the diagnostic cylinder are written again, an ending display is shown.

Suspend/Resume Mirrored Protection: This option allows you to suspend (stop) or resume (start) mirrored protection on a specific disk unit.

Delete Disk Unit Data: This option allows you to delete all the data from a non-configured disk unit.

Copy Disk Unit Data: This option allows you to copy all the data from a configured disk to a non-configured disk unit. This action can take the place of save disk unit data to tape and a restore disk unit data. After the operation is complete, the target disk unit (the one copied to) takes the place of the original disk unit in the system's configuration.

Upgrade Load Source Facility: When installing Stage 2 hardware, this option is used to upgrade the 280x Disk Unit as the load source without having to restore the entire system. All the disk units from the previous configuration must still be attached (cabled) to the system and powered on. This option removes the old configuration and the Vertical Licensed Internal Code from the previous load source to make the 280x Disk Unit the new load source.

Rebuild Disk Unit Data: This option is available only for disk units that are protected by device parity. When a disk unit that caused the exposure of a device parity set is repaired, use this option to rebuild the data. Using this option allows the device parity protection redundancy feature to rebuild the disk unit data.

Reclaim IOP Cache: Use this option to discard all the data in the IOP cache storage. Be aware that this option could cause damaged objects because the discarded data is lost.

Work with Disk Unit Information:

The Work with Disk Unit Information display is selected from the *Work with disk units* option on the Use Dedicated Service Tools (DST) display.

Options

- Work with vital product data (VPD)
- Work with field replaceable unit (FRU) data
- Work with 9331 vital product data (VPD)(9406 System Unit only)

Updating the Serial Number for a 9331 Diskette Unit

1. A configured diskette device did not report a valid serial number. This is usually a device that was just added to the system or was just repaired.
2. Select Manual mode.
3. Perform an IPL and start DST (see "Dedicated Service Tools (DST)" on page 1-46).
4. Select the *Work with disk units* option.

5 Select the *Work with disk unit information* option.

6 Select option 9 (not visible) to work with 9331 vital product data (VPD).

Is more than one 9331 diskette unit connected?

No	Yes
↓	Select the device with the serial number that is not valid by typing 2 next to the device needing change and pressing the Enter key. Continue with step 7.

7 Correct the serial number field by typing in the new value. Then, press the Enter key.

8 Return to the Work with Disk Units display.

9 Return to the Use Dedicated Service Tools (DST) display.

This ends the procedure.

Work with Dedicated Service Tools Environment (DST)

This option can be used to select printers, tape units, and diskette units used by dedicated service tools (DST). If you are logged on with DST security authority, you can also change DST passwords and override the operating system passwords.

The Work with DST Environment menu is selected from the Use Dedicated Service Tools (DST) display.

Options

- Work with active service tools

  This option lists active service functions and their status. Service functions can be started and left active while you start another service function. Use this option to work with a service function you left active or to end an active service function. The status of a service function can show as active or ending.

  For more information, see "Work with Active Service Tools" on page 1-57.

- Select output printer

  This option displays a list of printers connected to the system. You need to select from this list the printer to be used by a service tool. All printers attached to the same workstation I/O processor as the DST display are shown.

  Note: Selecting a printer that is allocated to the operating system displays a warning display. If the printer is then selected, the job using that printer is ended.

  For more information, see "Select Output Printer, Tape, or Diskette" on page 1-57.

- Cancel printer output

  This option cancels the existing print job for a service tool. The printer remains allocated to DST and in use by the service tool.

- Cancel printer output and deallocate printer.

  This option cancels the existing print job for a service tool and deallocates the printer from DST and the service tool.

- Select tape

  This option displays a list of tape units connected to the system. You need to select from this list the tape unit to be used by a service tool.

  Note: Selecting a tape unit that is allocated to the operating system displays a warning display. If the tape unit is then selected, the job using that tape unit is ended.

  For more information, see "Select Output Printer, Tape, or Diskette" on page 1-57.

- Cancel tape operation and deallocate tape

  This option cancels the existing tape job for a service tool and deallocates the tape unit from DST and the service function.

- Select diskette

  This option displays a list of diskette units connected to the system. You need to select from this list the diskette unit to be used by a service tool.

  Note: Selecting a diskette unit that is allocated to the operating system displays a warning display. If the diskette unit is then

selected, the job using that diskette unit is ended.

For more information, see "Select Output Printer, Tape, or Diskette."

- Cancel diskette operation and deallocate diskette

  This option cancels the existing diskette job for a service tool and deallocates the diskette unit from DST and the service tool.

- Change DST passwords

  This option allows you to change DST passwords.

  Note: This option is available with DST security level authorization only.

Work with Active Service Tools: This option is selected from the Work with DST Environment display, which is selected from the Use Dedicated Service Tools (DST) display.

A list of active service tools and their status is shown on this display. The status of a service tool can be active or ending. A service function in the process of ending cannot be selected until the ending process is complete.

- Display

  This option allows you to work with an active service tool. You can select only one active service tool.

- End service tool

  This option ends an active service function.

- Option

  Type the desired option number in this field next to the active service tool name you are displaying or ending.

Select Output Printer, Tape, or Diskette: If you have a printer device available, ensure that it is connected and configured to the workstation I/O processor you are using with this workstation. If you have a tape or diskette unit available, ensure that it is installed, connected to the system, and configured correctly. Then, select the *Select output printer* option on the Work with Service Tools Environment display. On the Select Output Printer display, the Tape display, or the Diskette display, fill in the following fields if the system has not already done so:

Type — A number assigned by the manufacturer to identify a specific type of printer, tape, or diskette unit.

Model — The model number of the printer, tape, or diskette unit.

Serial — A number assigned by the manufacturer to identify a specific printer, tape, or diskette unit.

Address — (1234-5678ABCD)

1-4 These characters identify the location of the workstation I/O processor card. See the configuration list located in the binder with the *System Operation* or the *System Startup and Problem Handling* information, for card locations.

5-6 With a tape or a diskette unit, 5-6 identifies the tape or diskette unit controller.

For a 9406 tape or diskette unit, 5-6 match the switch setting. For a tape, 7-8 are the switch addresses of the tape unit if there is more than one tape unit attached to the tape unit controller.

For a 9402 or 9404 tape or diskette unit, there are no switches to set. The address is determined by how it is attached to the system.

See the configuration list (WRKHDWPRD printout) located in the binder with the *System Operation* or the *System Startup and Problem Handling* information for a list of card locations.

7-8 For a printer, characters 7-8 identify the port number of the twinaxial workstation attachment.

A-B For printers, characters A-B identify the device by the address-switch-setting on the device.

C-D Characters C-D are always FF.

If you do not have a printer available for this workstation I/O processor, you must select a different

output device for the service tool to use (such as a tape or diskette unit).

If the device you selected is already being used by a job, you can:

- Press the Enter key to cancel the job and use the device for the service tool, or
- Press F12 (Cancel) to cancel this device selection. Then, select a different device.

Change DST Passwords: DST passwords control access to DST functions and Vertical Licensed Internal Code service functions. When a password is changed, the old password is exchanged with the new one.

There is only one password for each level of authorization. When you type the existing and new passwords, they are not displayed on the display.

Options

- Change the password that gives basic use of DST

  Basic allows you to:

  - Use trace Vertical Licensed Internal Code.
  - Use print stand-alone dump.
  - Run error log utility.
  - Use work with Licensed Internal Code.
  - Perform an IPL of the system.

- Change the password that gives full use of DST

  Full allows you to use all of the service functions, except you cannot change DST passwords.

- Change the password that gives security use of DST

  Security allows you to use all of the service functions, including changing DST passwords.

- Reset operating system password (see the *Security – Reference* manual.)

  Note: Password reset is in effect for one IPL. If the password is not set again, the password stored on the system is used.

- Change security for the *Install operating system* option of DST.

  The customer uses this option to allow only users with DST full authority or DST security authority to install the OS/400 operating system (see the *Security – Reference* manual).

Select DST Console Mode

This option is selected from the Use Dedicated Service Tools (DST) display.

This option causes the operating system to share the console workstation with DST when an IPL of the operating system is performed. Operating system displays are displayed until either:

- Function 21 (Bring up DST) is entered from the control panel.
- A system request is made by pressing the System Request key while holding the Shift key and then typing

  DST

  and pressing the Enter key.
- A breakpoint is hit by the Program Debug service function.

When you press the System Request key while holding the Shift key and type

DST

and then press the Enter key, the operating system being displayed is saved and the Use Dedicated Service Tools (DST) display appears. DST operations may then be performed.

Selecting the *Select DST console mode* option causes the operating system display to be restored. Any active service functions remain active, and any device allocated to the service tool is still allocated. When a breakpoint is hit by the Program Debug service function, the breakpoint hit display appears. The workstation is then in DST mode.

Options

- End DST

  Service functions will not interrupt the system console display if debug mode has not been set before. Sign-on is necessary to access DST. All active service functions are ended.

- Enter DST debug mode

  Service functions can interrupt the normal operating system process to display debug

information. When an operating display is being displayed, and you want to enter DST, press the System Request key, type

```
DST
```

and press the Enter key. This displays the Use Dedicated Service Tools (DST) display without having to log on to DST.

Start a Service Tool (from DST)

This option is selected from the Use Dedicated Service Tools (DST) display.

Options

- Display/alter/dump

  This option allows you to display or change virtual storage data. The data can be copied to tape, diskette, or printer. The data can then be printed.

  For more information about this option under SST, see "Display/Alter/Dump" on page 1-28.

- Vertical Licensed Internal Code log

  This option allows you to display Vertical Licensed Internal Code log information. You can dump all or part of the Vertical Licensed Internal Code log entries to tape, diskette, or printer. You can also clear the Vertical Licensed Internal Code log.

  For more information, see "Work with Vertical Licensed Internal Code Log" on page 1-29 under SST.

- Trace Vertical Licensed Internal Code

  This option shows a display that allows you to resume (start) or suspend (stop) a trace of Vertical Licensed Internal Code. You can also display, dump, allocate, or clear the trace tables where the Vertical Licensed Internal Code trace is recorded. Also, select this option to collect data about the internal operation of Vertical Licensed Internal Code.

  For more information, see "Menu Flow" on page 1-20 under SST.

- Display hardware configuration

  This option allows you to display the hardware configuration and the status of the hardware. The following information is displayed:

  - The I/O buses
  - The cards on the buses, which consist of:
    - I/O processors (IOP)
    - I/O adapters (IOA)
    - Bus extender driver (BED) (9406 System Unit only)
    - Bus extender receiver (BER) (9406 System Unit only)
  - The hardware attached to the I/O processors and I/O adapters, which consists of:
    - Input/Output Processor
    - Devices
    - Communication ports
  - Information about the main storage cards
  - Information about the processor cards

- Input/output debug utility

  This option shows a display that allows you to display, trace, or set a breakpoint in the I/O processor Licensed Internal Code. I/O processors control the storage devices, workstations, and communications data links on your system.

  For more information, see "Input/Output Debug Utility" on page 1-30 under SST.

- Print stand-alone dump

  This option (also known as print main store dump) allows you to display a main storage dump, or copy the dump to tape, diskette, or printer.

  For more information, see "Print Stand-Alone Dump" on page 1-32 under SST.

- Error log utility

  This option displays or prints errors that have occurred (such as in disk and tape units, communications, processors, and workstations).

  A 64K-byte shadow log is maintained by Vertical Licensed Internal Code on the load-source disk. The log contains a duplicate copy of the latest errors. When the system is operating in limited paging environment, the *Error log utility* option uses this shadow log. When running in the limited paging environment, this option has less function than the *Error log utility* option under SST. SST allows you to work with tape and diskette statistics, but the limited paging environment of DST

does not. Under the limited paging environment of DST, you cannot:

- Change error log sizes
- Work with tape and diskette lifetime statistics
- Display or print tape and diskette session statistics

If error log initialization (ELI) is not complete, only the shadow log is accessible to this option. The Error log utility display offers only a subset of all the Error log utility options. The AS/400 Main Menu informs the user that ELI is not complete, that all error log records are not accessible, and to load the OS/400 licensed program to complete ELI. If ELI completes after the *Error log utility* option has been selected, the *Error log utility* option must be selected again to make all *Error log utility* options available for use, and to generate reports that show all the error log entries.

For more information, see "Error Log Utility" on page 1-8 under SST.

- Power off the system

  This option forces the system to become powered-off.

- System Power Control Network (SPCN)

  This option allows you to view the configuration of the power components in the system and to assess the status of these components. In addition, SPCN enables the service representative to:

  - Write vital product data to the rack and unit power components in the system.
  - Test new batteries that have been installed.
  - Enable or disable the system-initiated battery capacity test.

  For more information, see " System Power Control Network (SPCN)" on page 7-4.

Online Problem Analysis and Resolution

Introduction

Online Problem Analysis and Resolution (PAR) consists of:

- Displays and prompts to instruct the customer and service representative through problem determination procedures.
- Problem determination procedures for the hardware and software parts of the devices to perform problem analysis.
- The Problem Log, which contains system problem descriptions and the status of each problem.
- The Service Support Facility, which controls reporting the problems to the service support system.

Online PAR manages system errors and gives the customer maximum system availability, effective problem analysis, and a set of software tools for analyzing, repairing, and reporting problems. It runs concurrently with other customer programs; therefore, part of the system may be reserved (not usable by the customer) for a problem analysis task. The customer should be aware of this when deciding to run Online PAR.

Another part of PAR is the AS/400 system problem management functions. This provides automated problem analysis, automated problem logging and tracking, automated problem reporting, and problem correction. It quickly and accurately manages problems occurring on the system. For more information on the automated problem management functions, see "DSPSRVA or CHGSRVA Command" on page 1-81.

Online help is available by pressing the Help key. Some displays may have more than one Help screen. Additional Help screens are indicated by a + or **More...** in the lower right hand corner. These screens may be displayed by pressing the Roll or Page keys.

System failures fall into two groups:

- Those the system detects
- Those the customer detects

System-Detected Problems

System-detected problem management starts with a software or hardware error that is detected by a device attached to the system or by software. When a problem is detected by software, the data is collected and the error is noted. When a problem is detected by a device, an error message (note) is reported to the system using the common I/O interface. The system uses these error notes to create a Problem Log entry and sends a message to the QSYSOPR message queue. The Problem Log entry has a description of the failing device. This allows a problem determination procedure to be called without initial customer input.

Problem Log: The Problem Log is used by the system operator and other authorized persons to manage the problem records made by Online PAR. The problem log contains descriptions for all messages with problem analysis routines. Functions provided by this facility include the following:

- Display or print problem records
- Define a new problem
- Analyze an existing problem
- Report a problem
- Add notes to a problem record
- Recover from a problem
- Verify that a problem has been corrected
- Mark a problem as corrected
- Delete one or more problem records
- Query problem analysis status from a remote site

The customer has access to problem log functions in one of the following ways:

- Type the

  `WRKPRB`

  (Work with Problem) command and press the Enter key.
- On the AS/400 Main Menu, select the *Problem handling* option. Then, on the Problem Handling display, select the *Work with problems* option.

The WRKPRB command has search parameters available to control the range of problems that is displayed. Pressing F4 displays the search parameters. One of these parameters is SRVID, which is the problem management report (PMR) number returned from the IBM Support System when the problem was reported. Some other examples of search parameters are time range, type of failing hardware, and resource name of failing hardware.

Each entry in the problem list that WRKPRB displays contains a unique, ten-digit problem identification (ID). This ID appears on all displays for a specific problem and in the PMR for the problem in the IBM Support System. The problem list has a field that you can use to specify the problem ID that you want to go to directly.

Messages Relating to Hardware Failures:

While the system makes an entry in the problem log for each system-detected problem, it also sends a message to the QSYSOPR message queue. Messages that are associated with system-detected problems are marked with an asterisk (*) or are highlighted. Problem analysis is started by placing the cursor anywhere on the message line containing the asterisk and pressing F14. For more options, press the Help key to view the Additional Message Information display, then press F15 (Work with Problem) to view the Work with Problems display. For details, see the *Problem Analysis* information for your system. Online help is available by pressing the Help key.

Note: It is possible to have multiple system messages that are related to the same failure marked with an asterisk or highlighted. For example, a 9335 A01 control unit failure would generate its own message and two more system messages (one per actuator) for each B01 unit on the A01 device function processor.

If you have additional messages marked with an asterisk from the original failure, you can remove them by doing the following:

1. Close the problem under "Work with problem" (WRKPRB).
2. Display system messages [(DSPMSG QSYSOPR ASTLVL(*INTERMED))]. Run problem analysis by moving the cursor to the message that is marked with an asterisk (*) or highlighted and press F14 to remove the * or highlighting. Then press F11 or select option 4 to remove the message.

Once you have started problem analysis for a message, the F14 key for that message is disabled. Online help is available by pressing the Help key. If you want to start problem analysis for that message again, enter the WRKPRB (Work with Problem) command and select the problem you want to analyze.

You can display the QSYSOPR message queue by entering

```
DSPMSG QSYSOPR
```

To display the message queue every time a message is logged, put the queue in *BREAK mode.

To put the queue in Break mode, enter

```
CHGMSGQ QSYSOPR *BREAK
```

Putting the QSYSOPR message queue in Break mode lets the customer know immediately when the system detects a problem. The customer may then select to analyze the problem or to delay analysis until a later time. System-detected problems may be analyzed later by displaying QSYSOPR or using the WRKPRB command.

Other messages that describe system problems may be logged in QSYSOPR although they are not associated with a specific system-detected problem.

The first three letters in the message are the message identifier and indicate the message category. The following list shows some typical message identifiers relating to hardware:

CPA	Messages that need system operator action
CPD	Diagnostic messages
CPI	Informational messages
MCH	Machine interface

The remaining four digits indicate the sequence number of the message. If an error condition occurs, you receive an error message that identifies the error.

1. Place the cursor anywhere on the same line as the error message.
2. Press the Help key; you get a separate Additional Message Information display that contains the message identifier, the name of the program sending the message, and additional message information.
3. Read the additional message information about the error or the description of which corrective action to take; take the corrective action.

Customer-Detected Problems

Customer-detected problem management is activated when the customer detects a problem that has not been detected by the system. Online PAR guides the customer through a series of panels to solve customer problems, analyze problems to a failing part, or generate a symptom string for reporting to IBM. During the definition of a customer-detected problem, guidance is given to ensure that the customer did not make an error in the procedure. A problem determination procedure (PDP) is supplied by system units as the entry points from Online PAR. Once the problem is analyzed to a part, Online PAR determines which general entry PDP is requested, if any. Online PAR generates a symptom string for a software error, which the IBM service support system uses later to determine if a software problem already has a fix available.

Customer-detected problem analysis may be started in one of the following ways:

- Enter the

  ```
  ANZPRB
  ```

  (Analyze Problem) command. Use the ANZPRB command to analyze a user-detected problem when no problem analysis message was generated, or when a problem is intermittent.

- Enter the

  ```
  WRKPRB
  ```

  (Work with Problem) command. Select the *Work with problem* option for any problem listed that has *Opened* in the Status field. Select the *Analyze problem* option.

Service Support Facility

The service support facility can be used for system-detected problems and user-detected problems.

When problem analysis has been completed, the customer is given the option of reporting the

problem. For many problems, analysis results are shown as a Field Replaceable Unit (FRU). Other analysis procedures make a symptom string to be reported with the problem.

Disk Unit Concurrent Maintenance

Introduction

Storage protection minimizes the chance of data loss and reduces recovery time during disk unit damage or failures. When the system is configured with mirrored or device parity protection, disk unit maintenance may be performed while the system is operating. Concurrent maintenance is the process of removing or replacing disk unit hardware while the system is in use.

Note: Concurrent maintenance is not available on all system types.

For more information on storage protection, see the *Backup and Recovery – Advanced* information.

To determine the storage protection status for your system see "Start Disk Service Here" under "Disk Service Support" in the *Repair and Parts* information.

Concurrent Maintenance Command (CALL QCNCMNT)

The Call Concurrent Maintenance command (CALL QCNCMNT) is used during concurrent maintenance procedures.

Note: CALL QCNCMNT cannot be performed under system service tools (SST).

Use the following to assist in concurrent maintenance procedures:

1 Enter the concurrent maintenance command

```
CALL QCNCMNT
```

Enter information for the following fields:

- Address - the address of the failing disk unit.
- Action - to remove or install the disk unit.
- Time delay - the time requested to wait for the concurrent maintenance operation to begin.

  Note: Time delay, generally, should not exceed 20 minutes. Use this feature if the disk unit is not near the console.

2 The indicator lights on and near the disk unit assist in performing the disk unit action (see "Disk Unit (Concurrent)" in the *Repair and Parts* information).

3 A series of informational SPCN SRCs appear on the control panel. These SRCs indicate when it is safe to perform an action or show the status of the action. Each SRC series repeats three times. For example, when performing an install action, the series 1xxx 01xx and 1xxx 05xx appears three times. After the third time, a display appears asking if you need to reinitialize the operation.

Figure 1-38 shows the informational SPCN SRCs. For more information on specific SRCs, go to "(1xxx) System Power Control Network (SPCN) Reference Codes" in the *Problem Analysis* information.

SRC	Action/Status
1xxx 01xx	Install disk unit
1xxx 02xx	Remove disk unit.
1xxx 03xx	Disk unit is installed.
1xxx 04xx	Disk unit is removed.
1xxx 05xx	No action was detected.

Figure 1-38. Informational concurrent maintenance SRCs

4 Perform the required action and continue with the concurrent maintenance procedure you are following in the *Repair and Parts* information.

This ends the procedure.

Verification Procedures

Introduction

Communications, and various hardware units and devices, can be checked for correct operation by performing verification procedures. Use Figure 1-39 to assist in determining which verification procedure to use.

Notes:

1. The AS/400 Device Exerciser is a program that allows you to verify the correct operation of I/O devices. For information about the AS/400 Device Exerciser, see "AS/400 Device Exerciser" on page 1-73.
2. Hardware units may perform automatic self-tests when they are powered on.

Figure 1-39 (Page 1 of 2). Verification Procedures

Item	Verification Procedure
SYSTEM UNIT HARDWARE	
Verifying that a specific problem has been corrected	• Enter `CHGMSGQ QSYSOPR *BREAK` to put the message queue in *BREAK mode and receive error messages. Enter the `WRKPRB` (Work with Problem) command and select the specific problem from the Problem Log. Select the *Verify problem corrected* option.
Verifying hardware without a problem logged	• Enter the `ANZPRB` (Analyze Problem) command. – Select Hardware or Communication Problem. – Select Hardware to be Analyzed. Use the hardware or device. Enter the `DSPMSG QSYSOPR` command to see if any errors have been logged.
SPECIFIC HARDWARE	
Printers	• Enter the `VFYPRT` (Verify Printer) command to print a pattern on the printer (use the Prompt key (F4) for parameters).
Workstations	• Some workstations can be tested using the Test Request function key from the Sign On display. To verify the operation of locally attached 525x twinaxial workstations, see "Verify 525x Workstations" on page 1-72.
Communications	• Enter the `VFYCMN` (Verify Communications) command to test communications: – Select from the specific tools available under the `VFYCMN` (Verify Communications) command (see "Verify Communications" on page 1-65). • The wireless LAN adapter card indicators assist in determining the card status and the transmit/receive activity (see "Wireless LAN Adapter Card Indicators" on page 1-70).

Figure 1-39 (Page 2 of 2). Verification Procedures

Item	Verification Procedure
Tape or Optical Units	• Enter the VFYTAP (Verify Tape) command to run selected tests on the tape or optical unit. Use the Prompt key (F4) for parameters (see "Verify Tape" on page 1-72).
Disk Units	• Verify that mirrored protection has resumed (see "Work with Disk Units (SST)" on page 1-41). Use the *Work with disk unit recovery* option to suspend and resume mirrored protection. • Verify the use of checksum or device parity protection (see "Work with Disk Configuration" on page 1-53).
Other	• See the specific device information for possible off-line tests that you can run.

Note: If you exchanged a device or a part that contained a serial number, print the System Configuration List (use the WRKHDWPRD command to print the configuration list), and place the new printout in the *System Operation* or the *System Startup and Problem Handling* binder.

Verify Communications

Introduction: Use the VFYCMN (Verify Communications) command to:

- Verify communications:
  - Remote communications - SDLC, ISDN, frame relay, and so on
  - Local area networks - Ethernet, token-ring, wireless, LocalTalk, and so on
  - Cryptographic resources
  - Facsimile features
- Diagnose and verify communications hardware and cable problems when you cannot run problem analysis procedures.
- Send test data to the remote equipment to verify correct connection.
- Analyze problems

  Note: Use the VFYCMN command as an aid when you are attempting to correct hardware problems that the ANZPRB (Analyze Problem) command does not diagnose.
- Run a trace on a communications interface.
- Run concurrent LPDA-2 tests.
- Run wireless network management utility to collect network statistics and topology information (concurrently).
- Monitor telephone lines and modems concurrently.
- Monitor modems interface signals.
- Run the echo back procedure (ISDN only).

Use one of the following methods to verify communications:

- Type the

  `VFYCMN`

  (Verify Communications) command and press the Enter key.
- On the AS/400 Main Menu, select the *Problem handling* option. On the Problem Handling display, select the *Network problem handling* option. Then, select the *Verify communications* option.

Select the type of connection you want to test. Follow the system menus, using online information supplied in the help text; for example, select the number of times you want the test to run. The system responds with either the `Verification Successful` message or the `Errors Occurred` message.

For details on verifying communications see the *Diagnostic Aids – Volume 1* information.

Test Descriptions: Diagnostic tests are supplied for the following:

- Remote modem
- Local modem
- Communications cable
- Communications I/O adapter card
- Communications I/O processor card
- External ring
- Communications/Local area network link
- Cryptographic I/O processor card
- Cryptographic external hardware
- LocalTalk interfaces

When you run these tests, the system displays only that the test completed successfully or failed. You can get additional problem isolation information by running more than one test. For example, if the communications cable test is failing, before you can isolate positively the cable as the cause of the problem, you must also run the communications I/O adapter card test. If the communications I/O adapter card test completes successfully, the communications cable is failing. If the communications I/O adapter card test fails, the communications I/O adapter card is failing.

Remote Modem Test: The remote modem test verifies that the remote modem is operating correctly. To run this test, the remote modem must be compatible with LPDA-1 or LPDA-2 diagnostic tests and must be attached via a nonswitched telephone line. The MODEM parameter in the line description determines the diagnostic test to run. Before running this test, the line must be varied off because the test loads a diagnostic program into the communications I/O adapter card. The diagnostic program takes the place of the programs used for normal operation.

If this test completes successfully, the remote modem and the telephone line are operating correctly.

If this test fails, the remote modem or the telephone line is the cause of the problem.

Local Modem Test: The local modem test verifies that the local modem is operating correctly. To run this test, the local modem must be compatible with LPDA-1, LPDA-2, or V.54 loop 3 diagnostic tests, or support the IBM ability to wrap. The MODEM parameter in the line description determines the diagnostic test to run. Before running this test, the line must be varied off because the test loads a diagnostic program into the communications I/O adapter card. The diagnostic program takes the place of the programs used for normal operation.

If this test completes successfully, the local modem, the communications cable, and the communications I/O adapter card are operating correctly. However, modems that are not compatible with LPDA-1 or LPDA-2 diagnostic tests are not completely tested. It is possible that they are failing, although the local modem test completes successfully.

If this test fails, the cause of the problem is the local modem, the communications I/O adapter card, or the communications cable.

To further isolate the cause of the problem, run the communications cable test and the communications I/O adapter card test.

Communications Cable Test: The communications cable test verifies that the communications cable is operating correctly. Before running this test, the line must be varied off because the test loads a diagnostic program into the communications I/O adapter card. To run this test, the cable must be an IBM cable with an attached wrap connector (note that IBM token-ring cables are self-wrapping; no external wrap connector is needed).

If this test completes successfully, the communications cable and the communications I/O adapter card are operating correctly.

If this test fails, the cause of the problem is the communications cable or the communications I/O adapter card.

To further isolate the cause of the problem, run the communications I/O adapter card test.

Communications I/O Adapter Card Test: The communications I/O adapter card test verifies that the communications I/O card is operating correctly. Before running this test, the line must be varied off because the test loads a diagnostic program into the communications I/O adapter card.

If this test completes successfully, the communications I/O adapter card is operating correctly.

If this test fails, verify that the wrap connector is the correct part number (as indicated by the display prompt) and that it is installed correctly, then exchange the communications I/O adapter card. In some conditions, the associated I/O processor card is the failing card. Exchange the I/O processor card if a new adapter card does not correct the problem. Some I/O adapter cards have an internal I/O processor and do not have an associated I/O processor card. Use the WRKHDWPRD (Work with Hardware Products) command to determine if the I/O adapter card has an associated I/O processor card.

For a communications adapter with the two port I/O adapter card, this is a two step test, testing only the selected port.

- Test the two port adapter cable.
- Test the I/O adapter card.

Communications I/O Processor Memory Test: The communications I/O processor memory test verifies that the storage of the I/O processor card is operational. Before running this test, the line must be varied off because the test loads a diagnostic program into the communications I/O processor card.

If the test completes successfully, memory modules on the I/O processor card are operational.

If the test fails, the memory modules on the I/O processor card are failing. If the memory modules on the card are replaceable, exchange the memory modules. Otherwise, exchange the communications I/O processor card.

Communications I/O Adapter Wrap Test: The communications I/O adapter wrap test verifies that the I/O adapter card is operating correctly. Use this test to to verify the operation of the facsimile I/O processor. Before running this test, the line must be varied off because the test loads a diagnostic program into the communications I/O adapter card. To run this test, the wrap connector cable must be attached from port A to port B on the I/O adapter card. This test sends a facsimile signal from port A to port B and back again.

If the test completes successfully, the ports on the adapter card are operational.

If the test fails, the I/O adapter card is failing. Exchange the I/O adapter card.

Communications Port A Modem and Coupler Test: The communications port A modem and coupler test verifies that the modem (which is built into the I/O adapter card) and the externally attached coupler are operating correctly. The coupler is attached to the port of the I/O adapter card. Before running this test, the line must be varied off because the test loads a diagnostic program into the communications I/O adapter card.

If these tests complete successfully, the modem and the coupler are operational.

If a modem error appears on the Results display, exchange the I/O adapter.

Note: A test is provided for both ports (A and B) on the I/O adapter card. If one port is operational, the I/O adapter card is still operational.

If a coupler error appears on the Results display, exchange the coupler.

External Ring Test: The External Ring test verifies that all hardware to the network is operational. It is available for token-ring networks and distributed data interfaces. To run this test, all hardware must be connected as it would be in normal operation. This test allows a signal to be sent through the network and wrapped (no wrap connectors are required).

If the test completes successfully, the adapter, cable, and access unit are operating correctly.

If the test fails, run the cable, and I/O adapter tests in the order they are listed on the display for further problem analysis.

Communications/Local Area Network (LAN) Link Test: The communications/local area network link test allows you to send data to remote equipment using the Ethernet, token-ring, DDI, wireless, SDLC, X.25, or BSC protocols. This test is useful on multipoint lines to verify that a specific terminal is operating correctly without interrupting normal operation of the other terminals.

To run this test, the line must be varied on, and you must make a connection with the remote equipment. This is necessary because the functional communications program performs this test. If you are using the BSC protocol and if the remote equipment is not an AS/400 system, a service representative is needed at the remote location to start diagnostic programs. When you run a link test against the Local Area Network, you may enter *NONE in the controller description field to test a specific remote adapter address.

If this test completes successfully, all equipment within the communications link are operating correctly.

If this test fails and all other devices on the line are operating correctly, one of the following could be the problem:

- The remote device being tested
- The remote modem
- The cabling at the remote site

If this test fails and all devices on the line are not operating correctly, run the cable, modem, and I/O adapter tests in the order they are listed on the display for further problem analysis.

Wireless Network Management Utility: The wireless network management utility allows you to monitor the operation of a wireless network. Information collected by this utility can assist in analyzing network problems. For more details, see the *Local Area Network Support* information.

Before running this utility, the line and the attached descriptions must be varied on and a job must be active.

The following functions are available:

- Display active network topology
- Collect wireless network statistics
- Display statistics for any node on the wireless network
- Run tests between any wireless network nodes

Notes:

1. Running the wireless network management utility may affect the performance of the network or decrease system performance.
2. For more information on the wireless LAN adapter indicators, see "Wireless LAN Adapter Card Indicators" on page 1-70.

Cryptographic Processor Card Test: The cryptographic processor test verifies the correct operation of the cryptographic I/O processor. To run this test, you must also reference the *IBM Common Cryptographic Architecture Services/400 Installation and Operating Guide*, SC41-0102.

Before running this test, end the resource by entering the ENDCS (End Cryptographic Services) command. The test loads a diagnostic program into the cryptographic I/O processor.

Warning: Disconnecting or removing the type 2620 or type 2628 cryptographic I/O processor *for any reason* causes the loss of the master encryption key. Before disconnecting or removing the cryptographic I/O processor, ensure that the customer has access to a record of the master encryption key. The customer must reinstall the master encryption key after completing any service action that involves disconnecting or removing the cryptographic I/O processor, and before the data encryption function can be used again. Refer the customer to *IBM Common Cryptographic Architecture Services/400 Installation and Operating Guide*, SC41-0102, for more information.

If this test completes successfully, the cryptographic I/O processor is operating correctly.

If this test fails, exchange the cryptographic I/O processor card.

Cryptographic Processor Card Wrap Test: The cryptographic processor card wrap test verifies the correct operation of the cryptographic I/O processor card. To run this test, you must also reference the *IBM Common Cryptographic Architecture Services/400 Installation and Operating Guide*, SC41-0102.

Before running this test, end the resource by entering the ENDCS (End Cryptographic Services)

command. The test loads a diagnostic program into the cryptographic I/O processor card.

If this test completes successfully, the cryptographic I/O processor card is operating correctly.

If this test fails, verify that the wrap connector is the correct part number (as indicated by the display prompt) and that it is installed correctly. Then, exchange the cryptographic I/O processor card.

Warning: Disconnecting or removing the type 2620 or type 2628 cryptographic I/O processor *for any reason* causes the loss of the master encryption key.

Read the warning on page 1-68 before disconnecting or removing the cryptographic I/O processor.

External Cryptographic Hardware Tests: The external cryptographic hardware tests verify the correct operation of the hardware that is attached to the cryptographic I/O processor.

Warning: Disconnecting or removing the type 2620 or type 2628 cryptographic I/O processor *for any reason* causes the loss of the master encryption key. Read the warning on page 1-68 before disconnecting or removing the cryptographic I/O processor.

Note: When you have completed testing the external cryptographic hardware, you must perform the Reset Processor and Exit function to restart the encryption subsystem.

- Security Interface Unit Cable Wrap Test:

  This test verifies the correct operation of the security interface unit cable.

  If this test completes successfully, the security interface unit cable that is attached to the cryptographic I/O processor card and the cryptographic I/O processor is operating correctly.

  If this test fails, verify that the wrap connector is the correct part number (as indicated by the display prompt) and that it is installed correctly.

  To further isolate the cause of the problem, run the cryptographic processor card wrap test. If the security interface unit cable wrap test fails and the cryptographic processor card wrap test passes, replace the security interface unit cable.

- Personal Security Card Test:

  This test verifies the correct operation of the card reader and the personal security card with which you test the reader.

  If this test completes successfully, the card reader and the personal security card are operating correctly.

  If this test fails, repeat the test using a different personal security card. If the repeat of this test completes successfully, the original card used must be replaced. There are two types of personal security cards available. Verify the correct part number by using online help for this test option. If this test fails again, replace the security interface unit.

- Security Interface Unit Keypad Test:

  This test verifies the correct operation of the unit keypad.

  The test prompts the user to press specific keys. It displays the keys that were requested and the keys that were pressed for comparison. If the keys that were pressed match the keys that were requested, the keypad is operational.

  If the keys that were pressed do not match the keys that were requested, replace the security interface unit.

- Security Interface Unit LED 1, LED 2 and Beep Test:

  This test verifies the correct operation of LED 1, LED 2 and the beeper.

  If this test completes successfully, LED 1 and LED 2 light and the beeper sounds.

  If this test fails, replace the security interface unit.

- Reset Processor and Exit:

  This function allows the encryption subsystem to be reset.

  If this function completes successfully, you must ask the customer contact with the proper authority to start the subsystem again. This resets the encryption subsystem.

If this function fails, replace the cryptographic IOP.

Warning: Disconnecting or removing the type 2620 or type 2628 cryptographic I/O processor *for any reason* causes the loss of the master encryption key. Read the warning on page 1-68 before disconnecting or removing the cryptographic I/O processor.

LocalTalk Interface Test: The LocalTalk interface test verifies that the workstation I/O adapter card and the cable (connector box cable) that attaches to the workstation I/O adapter card are operating correctly. The workstations that support LocalTalk protocol and the connecting cables are **not** tested. Since the test loads a diagnostic program into the communications I/O adapter card, you must run the test from a workstation that is not attached to the I/O adapter you are testing. To run this test, you must have more than one workstation I/O adapter on the system.

If this test completes successfully, the workstation I/O adapter card and the cable that attaches to the workstation I/O adapter card are operating correctly.

If this test fails, a display appears indicating the probable failure rates of the workstation I/O adapter card and the cable that attaches to the workstation I/O adapter card.

Wireless LAN Adapter Card Indicators:

The wireless LAN adapter has two indicators located above the 8-pin RS-485 connector.

The top-most indicator shows the adapter card status. The indicator closest to the RS-485 connector shows data transmit or receive activity.

Use Figure 1-40 to assist in problem analysis.

Status	Data	Action
Blinking Green	Off	No action required
Solid Green	Green (momentarily)	No action required
Solid Red	Solid Amber	Run VFYCMN procedure
Solid Red	Solid Red	Run VFYCMN procedure
Solid Red	Solid Green	Run VFYCMN procedure
Off	Off	Run VFYCMN procedure
Solid Amber	Solid Amber	Verify configuration
Solid Red	Off	Verify configuration
Solid Amber	Off	Verify configuration

Figure 1-40. Wireless LAN adapter card indicators

Communications Interface Trace:

The purpose of this test is to monitor the modem interface signals and to detect use of the modem interface that is wrong or not compatible.

Starting the trace before varying on the communications lines will provide the most accurate sample of the lines coming up.

Test Description: This test monitors the following five modem interface signals:

- Data Terminal Ready (DTR)
- Data Set Ready (DSR)
- Request To Send (RTS)
- Ready For Sending (CTS)
- Carrier Detect (CD)

This test displays five of the modem interface signals in a graphic format, showing the time relationship of the signals to each other.

Data Terminal Ready (DTR): Data terminal equipment (DTE) uses this signal to show the modem that the DTE is ready to transmit and receive data.

Data Set Ready (DSR): For nonswitched telephone lines, the active DSR signal shows that the modem is powered-on and ready to transmit and receive data. For switched telephone lines, the active DSR signal shows that the modem is connected to the telephone line and is ready to transmit data.

Request To Send (RTS): DTE uses this signal to activate or deactivate the modem's modulator lines. If the DSR signal is active, the RTS signal causes the modem to activate the carrier signal.

Ready For Sending (CTS): The modem activates this signal in response to the Request To Send signal when the modem is ready to transmit data. When the CTS signal is active, the DTE can send data on the transmitted data line.

CTS delay is the time between the RTS signal active condition and the CTS signal active condition. On most nonswitched telephone line modems, there are three CTS delay options, ranging from 0 to 250 milliseconds (ms). Switched telephone line modems, operating in half-duplex mode, are normally set for 150 to 250 ms of CTS delay.

Carrier Detect (CD): The modem uses this signal to show the DTE that the modem is receiving an acceptable carrier signal.

Because of hardware limits on taking short frame samples, the carrier detect signal may not be accurate. In this condition, an asterisk (*) takes the place of the sample data. The status is still correct.

Concurrent LPDA-2 Tests: The purpose of these tests is to test the local and remote modems and get modem status information.

Test Description: Use this option to run the Verify Link; it supports the LPDA-2 (VFYLNKLPDA) command. The concurrent LPDA-2 tests let you retrieve information from the data circuit-terminating equipment (DCEs). DCEs may be analog (modems) or digital (combined data service units and channel service units (DSU/CSUs)). Information can be obtained from four tests:

- DCEs and line status
- DCEs and line test
- Analyze line
- Send and receive test

You can run the LPDA-2 tests on a line while applications are using the line. The tests do not interrupt communications but temporarily slow the data transfer.

The following restrictions apply to these tests:

- The DCEs must be compatible with LPDA-2.
- You may run the tests only on non-switched synchronous data link control (SDLC) lines.
- For multiport DCEs, the DCEs and Line Status test does not interrupt normal communications. The other LPDA-2 tests may interrupt normal communications.
- You cannot run the tests on an active secondary line. A line is secondary if its data link role is either secondary or is negotiable and has negotiated to a secondary role. A line is active if a controller description under the line is varied on.

The *DCEs and line status* and *DCEs and line test* options are two modes of the same LPDA-2 request.

The DCEs and Line Status test reports parameters that the local and remote DCEs monitor during normal communications.

The DCEs and Line Test reports these parameters, runs internal tests, and reports the results. If poor line conditions are causing problems at normal speed, this test is sent over the communications line to the remote DCE at a slower transmit speed.

These two tests return the following information:

- Configuration summary

  This includes DCE type and model, address, operating mode, transmit speed, network function, LPDA-2 code level, switched network

backup (SNBU) status, data terminal equipment (DTE) interface connection, and installed features.

- DCEs and line parameters

  This includes receive level, number of received line signal detector (RLSD) losses, line quality, number of line errors, ages of remote DCE power-off and failure, ages of local DCE reinitialization and error conditions, DCE idle condition, base DCE in error, and features in error.

- Remote DCE interface status

  This reports the current status and previous activity of the signals on the DTE interface lines attached to the remote DCE. The DCE monitors the following signals:

  - Request to send
  - Ready for sending
  - Transmit data
  - Receive data
  - Received line signal detector or carrier detect
  - Data signalling rate selector
  - Data terminal ready
  - DTE power loss detected
  - Test control

You can run the *Analyze line test* only on analog DCEs (modems). The test causes the modems to exchange test patterns on the line. The modems measure parameters of the analog signals. The modems report:

- Frequency shift
- Second and third harmonic distortion ratios
- Signal to noise ratio
- Phase jitter
- Receive level
- Transmit level
- Round trip delay time
- Modem type, model, address, and transmit speed
- Number of line errors and RLSD losses

The modem returns acceptable limits for some of the parameters.

The *Send and receive test* causes the DCEs to exchange several blocks of test patterns and track the errors that occur during transmission. The test reports the following:

- DCE type, model, address, and transmit speed
- Signal lost condition
- Worst line quality
- Number of line errors
- The number of blocks sent, received, and in error

Test Description for Echo Back Procedure: This is not a test procedure. If the user has a network-terminating program that can run the Loop 4 test, this procedure prepares the AS/400 system to run the Loop 4 test.

Verify Tape

The OS/400 licensed program can verify that the tape and optical unit hardware and the tape and optical interface are operating correctly.

You can use the VFYTAP (Verify Tape) command to:

- Verify tape unit or optical unit operation
- Diagnose problems

You can also use this command as an aid when you are attempting to correct hardware problems that the ANZPRB (Analyze Problem) command does not diagnose. The purpose of these tests is to:

- Verify the correct operation of the tape or optical unit hardware and cables after installation.
- Diagnose tape unit or optical unit hardware and cable problems when you cannot run problem analysis procedures.

Verify 525x Workstations

To verify the operation of locally attached 525x twinaxial workstations, use the Test Request function.

To perform this function:

- Go to the 525x workstation that you want to test.
- Be sure the OS/400 Sign-on display appears on the 525x workstation.
- Press and hold the CMD BSK or ALT key, while you press the TEST (PAUSE) key.

- The Prime Option Menu appears.
- Select the *Test* option.
- When the test is complete, go to the Prime Option Menu and select the *End* option.

AS/400 Device Exerciser

Description: The AS/400 Device Exerciser is a program that allows you to run I/O devices in a mode similar to running customer applications. The Device Exerciser operates concurrently with customer applications.

The Device Exerciser allows you to check system hardware changes easily and quickly. It is menu driven and can be run from any workstation on the system. All displays that permit input contain default values (where suitable) and online help information.

The AS/400 Device Exerciser writes its own data and files to run the devices. It does not use any customer data. The following devices can be run: disk units (including user ASPs), workstations, diskette units, printers, tape units, media libraries, communications, and optical units.

Note: Some versions of the AS/400 Device Exerciser can run data encryption and file server I/O processors, and facsimile devices. For more information, call your next level of support.

Workstations attached locally (twinaxial or ASCII type I/O processors) or remotely (through the IBM 5294 or the IBM 5394 Control Units) can be run by the Device Exerciser. The Device Exerciser does not run other types of workstation attachments.

For disk and optical units, customers can access the devices but they cannot use the data areas being used by the Device Exerciser. For example, the customer can access any volume that is loaded on the optical unit while the exerciser is in progress on that unit.

Running the Device Exerciser on communications, media libraries, data encryption, and facsimile devices requires the use of the advanced exercising features (Device Exerciser Plus). For more information about exercising communications, select any *Communications exerciser* option on the Work with Device Exercisers display.

The Device Exerciser displays or prints a summary report containing operation statistics and the total number of permanent errors found. Errors cannot be diagnosed using the Device Exerciser. For detailed error information, use the Error Log Utility service function.

Loading the Exerciser

1. Check to see if the Device Exerciser is already loaded and stored on the system.
   - If your system is before Version 2 Release 2, enter:

     ```
     WRKLIB QDEX
     ```

   - If your system is at Version 2 Release 2 or later, enter:

     ```
     DSPSFWRSC
     ```

     and look for the resource ID 1DEVEXR.
2. If the Device Exerciser is already loaded on the system, go to "Running the Exerciser."

   If the Device Exerciser is not loaded on the system, continue to step 3 of this procedure.
3. Load the tape that contains the Device Exerciser (Alternate IPL Test tape or Device Exerciser tape) on a system tape unit and ensure that the tape unit is ready. It takes approximately 5 to 10 minutes to load the Device Exerciser on the system.

   If you are starting with a locked Device Exerciser session, see "Locking and Unlocking the Device Exerciser."
4. Go to the Log On display and enter the following:

   ```
   User          QSRV
   Password      (password, if needed)
   ```

   Notes:

   a. If your system is at Version 2 Release 2 or later, you must sign on with QSECOFR authority in order to **load** and **remove** the Device Exerciser. If the customer chooses not to give your sign-on the proper authority, you may need their assistance (have them sign on as QSECOFR) in loading and deleting this program. The service sign-on can be

used with its normal authority to **run** the exerciser.

b. If your system is before Version 2 Release 2, you must perform steps 5 and 6 (step 7 does not apply).

   If your system is at Version 2 Release 2 or later, you may perform step 7 in place of steps 5 and 6.

   If you are unsure of the level of your system, perform steps 5 and 6.

5. Enter the following command:

   ```
   RSTOBJ OBJ(LODDEVEXR) SAVLIB(QTEMP)
   DEV(tape unit name)
   ```

6. After receiving the message at the bottom of the display telling you that the restore operation is complete, enter the following command:

   ```
   QTEMP/LODDEVEXR DEV(tape unit name)
   ```

   Note: If your system is at Version 2 Release 2 or later, you receive a message that the Device Exerciser uses RSTLICPGM to restore this product. You must be signed on with QSECOFR authority for this function to run. If the customer chooses not to give your sign-on the proper authority, you may need their assistance (have them sign on as QSECOFR) in loading and deleting this program.

7. If your system is at Version 2 Release 2 or later, enter the following command to restore the licensed program:

   ```
   RSTLICPGM LICPGM(1DEVEXR) DEV(tape unit name)
   ```

   Press F4 to prompt the parameters. You must specify the value for the LNG parameter. If the primary language on your system is 2950, 2938, 2986, 2987, or 2989, use 2950 (English, uppercase only) as the LNG value. If the primary language on your system is any **other** language type use 2924 (English, uppercase and lowercase) as the LNG value. (To display the system national language, use the GO LICPGM command.)

The tape automatically rewinds when loading is complete. Remove the tape from the tape unit and continue with "Running the Exerciser."

Running the Exerciser: The following steps describe how to get to the first AS/400 Device Exerciser display (*Specify Device Exerciser Output Queue*). Online help information is available by pressing the Help key.

1. Be sure you are logged on the system as

   ```
   QSRV
   ```

2. Enter the following command:

   ```
   CHGMSGQ QSYSOPR *BREAK SEV(00)
   ```

   This allows messages to appear automatically. Answer them as required.

   If this message appears at the bottom of the display:

   ```
   MESSAGE QUEUE QSYSOPR NOT ALLOCATED TO JOB
   ```

   you are not able to see messages automatically as they appear. You should periodically check the system operator message queue by doing the following:

   a. Press the Sysreq key.
   b. Press the Enter key.
   c. Enter the option to Display the system operator messages.

   To return to the Device Exerciser, press the Enter key.

3. Ensure that the devices you want to run are powered on, ready, and varied on.

   Also:

   - Workstations must be in *sign-on* status. The status can be checked by entering the following command:

     ```
     WRKCFGSTS *DEV
     ```

   - Diskette and tape units must have a scratch diskette or tape installed. The Device Exerciser automatically initializes and checks for active files before it starts running

   - Printer writers must be in *end* status for printers to run. Printer writer status can be displayed or changed by entering the following command:

     ```
     WRKWTR
     ```

   - Optical units must have a scratch cartridge added to the system. You must initialize the volumes before you use them. Note the volume IDs of the scratch cartridges and exercise **only** those volumes.

4. Start the Device Exerciser.

   - If your system is before Version 2 Release 2, enter:

     ```
     QDEX/STRDEVEXR
     ```

   - If your system is at Version 2 Release 2 or later, enter:

     ```
     STRDEVEXR
     ```

   Note: If you receive a message that the Device Exerciser is locked, go to "Locking and Unlocking the Device Exerciser" on page 1-76.

   If you receive a message that the Device Exerciser is down-level, go to step 3 of "Loading the Exerciser" on page 1-73.

   The Specify Device Exerciser Output Queue display appears.

5. **Make a note of the output queue listed on this display. You will need this information to obtain any printed results.**

   Complete the fields in this display and the displays that follow, using the help text if you have any questions. You may use the default values shown or change the values for the exercisers (see "Changing the Exerciser Default Values"). The number of displays you see changes as you select different types of devices to run.

   On the Specify Devices displays, you may use F4 (Prompt) to display and select the devices configured on the system. You should press F5 (Refresh) to refresh the current device status.

6. Type in the values you want on the Run Device Exerciser display.

   Press Enter to start the Device Exerciser.

   Notes:

   a. As the number of devices exercised increases, the performance of the system decreases.

   b. If you attempt to start the Device Exerciser and you get a message that you are not authorized to do so, you do not have operational authority for the workstation. You must be given *CHANGE authority by the security officer to run the device.

After starting the Device Exerciser, the Display Device Exerciser Results display appears.

Note: If your system is at Version 2 Release 2 or later, you must press F11 to display the results. There are two views for this display. Press F11 to alternate between the two views.

To see the operation statistics and the total number of errors found, press F5 (Refresh). Each time you press F5, the display is refreshed. The Display Device Exerciser Results display will include information about each device that was exercised.

The system workload can cause some exerciser runs to end later than the specified run time, or cause a different number of operations to be run in a given time.

When you have completed running the Device Exerciser, continue with "Interpreting the Results."

Stopping the Exerciser: To stop (end) the Device Exerciser before the specified run time is over, press F3 (Exit) on the Display Device Exerciser Results display. After the Work with Device Exercisers display appears, enter option 4 (*End*). It may take several minutes to stop the Device Exerciser.

Changing the Exerciser Default Values:

You can change the values for the Device Exerciser from the Work with Device Exercisers display. If you choose to change the values, you must change the values **before** running the exerciser. Exercisers that are already active will not be affected. Enter option 2 (*Change*) and complete the displays that follow. Online help information is available by pressing the Help key.

Interpreting the Results: Errors cannot be diagnosed using the Device Exerciser. Use the *Error log utility* option in System Service Tools (SST) for:

- Permanent errors shown in the errors detected column
- Temporary recoverable errors (not shown in the errors detected column)

Analyze the errors on the Display Device Exerciser Results display.

If no errors appear on the Display Device Exerciser Results display, the devices you requested ran successfully.

If errors are indicated on the Display Device Exerciser Results display, analyze the Error Log entries for the time period that the Device Exerciser was running, and follow the necessary problem analysis procedure.

If your system is at Version 2 Release 2 or later, you may select option 5, *Display error data*. If the message ID is DEXA020 or DEXA121, the error that was logged is a data integrity type error. Otherwise, the error that was logged is a permanent I/O type error.

If the number of errors detected by the Device Exerciser is more than the number of permanent errors in the error log, then the data read did not compare with the data written for that device. This is a system error. Ask your next level of support for assistance.

After analyzing the results, continue with either "Locking and Unlocking the Device Exerciser" or "Exiting the Device Exerciser."

Printing the Results: To print the report, press F6 (Print) from the Display Device Exerciser Results display. The report is sent to the output queue selected on the Specify Device Exerciser Output Queue display. Check the printer for the printed report. If the report is not printed, you will need to start the printer writer.

To start the printer writer, exit the Device Exerciser (see "Exiting the Device Exerciser") and enter the following command:

```
STRPRTWTR DEV(printer name) OUTQ(output queue name)
```

Note: If you do not know the output queue name, enter the following command:

```
WRKSPLF
```

The Work with All Spooled Files display shows the output queue name you need. It is shown with a file name of QPDVRSLT and a user name of QSRV. The output queue name is shown in the Device or Queue column.

Your report should be printed after entering the output queue name in the command.

Locking and Unlocking the Device Exerciser:

Note: Lock mode is only available on systems earlier than Version 2 Release 2.

Locking: To put the Device Exerciser in the lock mode, do the following:

1. From the Work with Device Exercisers display, press F3 (Exit).
2. From the Exit AS/400 Device Exerciser display, enter the option to *Exit and Lock AS/400 Device Exerciser on the System*.

The Device Exerciser is now in the lock mode. The Device Exerciser data still remains on the system (taking approximately 12 megabytes of disk space), and the exerciser cannot be started, stopped, or changed. Active exercisers will continue to run.

To display results in the lock mode (but not start any exercisers), enter the following command:

```
QDEX/STRDEVEXR
```

Note: The tape is not needed to do this.

Unlocking: To unlock the Device Exerciser, do the following:

1. Complete steps 3 through 5 in "Loading the Exerciser."
2. Enter the following command:

```
QTEMP/LODDEVEXR DEV(tape unit name) UNLOCK(*YES)
```

This will take much less time than the normal loading steps.

Exiting the Device Exerciser: To exit the Device Exerciser, press F3 (Exit) from either the Specify Device Exerciser Output Queue display or the Work with Device Exercisers display. When the Exit Device Exerciser display appears, do one of the following:

- To exit the Device Exerciser, end all active exerciser runs, and leave the program loaded on the system, enter option 1. The Device Exerciser program takes approximately 12 megabytes of customer disk space.

- To exit the Device Exerciser, keep the active exercisers running, and leave the program loaded on the system, enter option 2. The Device Exerciser program takes approximately 12 megabytes of customer disk space.

  If the system is earlier than Version 2 Release 2, this option also locks the Device Exerciser program.

- To exit and remove the Device Exerciser program from the system, enter option 3. You will receive a message at the bottom of the display when this operation completes successfully.

  Note: At Version 2 Release 2 or later, QSECOFR authority must be given to your sign-on for this function to complete successfully. If the customer chooses not to give your sign-on the proper authority, you may need their assistance (have them sign on as QSECOFR). When you are signed on with the proper authority, enter the following command to remove (delete) the licensed program:

  ```
  DLTLICPGM LICPGM(1DEVEXR)
  ```

It takes approximately 3 to 5 minutes to remove the Device Exerciser from the system.

How to Reset an I/O Processor Card While the System Is Up and Running

Resetting an I/O processor restarts and reloads that I/O processor. This procedure is used to recover from an intermittent error condition.

1 **Note:** You cannot reset the workstation I/O processor for the workstation at which you are working or if it is the only one on the system.

Do you want to reset the local workstation I/O processor?

No **Yes**

↓ Vary off the local workstation I/O processor (see "Varying Configuration Descriptions On and Off" on page 7-43).

Then, go to step 6 of this procedure.

2 Do you want to reset the communications I/O processor?

No **Yes**

↓ Vary off all the lines on a communications I/O processor (see "Varying Configuration Descriptions On and Off" on page 7-43).

Then, go to step 6 of this procedure.

3 Do you want to reset the cryptographic I/O processor?

No **Yes**

↓ You must end cryptographic services. Enter

```
ENDCS
```

(End Cryptographic Services) command.

To reset the cryptographic IOP, enter

```
STRCS
```

Press F4 to prompt parameters. Then, enter

RESET *YES

This ends the procedure.

4 Do you want to reset a tape, optical, or disk I/O processor without an attached disk unit?

Yes **No**

↓ **This ends the procedure.**

5 Vary off all the I/O processors and device descriptions on the I/O processor (see "Varying Configuration Descriptions On and Off" on page 7-43).

6 Enter the

VRYCFG

(Vary Configuration) command. Then, press F4 for prompting.

7 Enter

STATUS *ON

RESET *YES

Then, press the Enter key.

This ends the procedure.

History Log

Perform one of the following to display the history log:

- Select the *Problem handling* option on the AS/400 Main Menu. Then, select the *Display the history log* option on the Problem Handling display.
- Enter the

  DSPLOG QHST

  (Display History Log) command.

The history log provides a high-level audit trail of the actions performed by the system. The history log can be used by the system operator, the data processing manager, and the service representative.

A message is sent to the history log when:

- PTFs are loaded to the system.
- PTFs are applied temporarily.
- PTFs are applied permanently.
- PTFs are removed temporarily.
- PTFs are removed permanently.

Note: A copy of the history log and a listing from the DSPPTF (Display Program Temporary Fix) command should be submitted with every APAR or LICTR.

For detailed information on the contents of the history log, see *Diagnostic Aids – Volume 1*.

Commonly Used Service Commands

The following list is supplied as a quick reference to some of the commonly used commands used in servicing the AS/400 system. For more information on some of these service commands, see the *CL Reference* information.

Command	Use the Command to:
APYPTF	Apply a Program Temporary Fix (PTF)
ANZPRB	Analyze a new problem
CHGMSGQ QSYSOPR *BREAK	Change message to break
CHGSRVA	Change service attributes
CHGNETA	Activate alert log
CHGSYSVAL	Change system values
CHGXMTLVL	Change transmit level of the facsimile I/O processor
CRTCTLBSC	Create a controller description for a BSC controller
CRTCTLLWS	Create local workstation I/O processors
CRTDEVDSP	Create a local display device
CRTDEVPRT	Create a local printer device
CRTDEVSPR	Create a device description for a remote display
CRTDEVTAP	Create a local tape device
CRTLINASC	Create a line descriptor for an asynchronous line
DLTPRB	Delete all entries in problem log over 30 days old
DSPJOB	Display a job
DSPJOBLOG	Display the job log
DSPLCLHDW	Display local hardware
DSPLOG QHST	Display the history log
DSPMSG QSYSOPR	Display messages in the system operator's message queue
DSPPFM	Display physical file member
DSPPTF	Display Program Temporary Fixes (PTFs)
DSPSFWRSC	Display software resources
DSPSYSVAL	Display system values (for example, QTIME)
ENDRMTSPT	End remote support
ENDSBS	End subsystem
GO *ALL	Lists all menus for system commands
GO CMDDSK	Go to the disk commands menu
GO CMDHDW	Go to the hardware commands menu
GO CMDHDWRSC	Go to the hardware resource commands menu
GO CMDINF	Go to the information commands menu
GO CMDPTF	Go to the PTF commands menu
GO CMDPWR	Go to the power commands menu
GO CMDSPT	Go to the support commands menu
GO CMDSRV	Go to the service commands menu
GO CMDSYS	Go to the system commands menu
GO CMDSYSVAL	Go to the system value commands menu
GO CMDVFY	Go to the verify commands menu
GO INFO	Go to the information assistant options menu
GO LICPGM	Display Release/ Version/Modification level of the OS/400 program;Display national language
GO MAIN	Go to the main menu
GO ORDER	Display the IBM market support commands
GO SUPPORT	Go to the support and education menu
INSPTF	Install PTF
INZDKT	Initialize diskette
INZTAP	Initialize tape
PRTDEVADR	Print device address
PRTERRLOG	Print information from the error log
PRTINTDTA	Print the Vertical Licensed Internal Code exception information
PWRDWNSYS *IMMED	Power down the system
QDEX	Device exerciser
RQSORDAST	Request (marketing) order assistance
SAVAPARDTA	Save APAR data
SAVSYS	Save system
SIGNOFF	Sign you off the system
SNDPTFORD	Send PTF order
SNDSRVRQS *TEST	Test the IBM support link
STRPRTWTR	Start printer writer
STRRMTSPT	Start remote support to give service access to the system from a remote location
STRSST	Start the system service tools
SNDSRVRQS	Test the support link
VFYCMN	Show the Communications Verification display

Command	Use the Command to:
VFYPRT	Verify printer prints a pattern on the printer
VFYTAP	Verify tape or optical unit
VRYCFG	Vary configuration (vary device, I/O processor, or communications line on or off)
WRKALR	Show the alert log
WRKCFGSTS	Display the status of all I/O processors
WRKDEVD	Work with device display
WRKORDINF	Work with order information to build topology files for upgrades
WRKOUTQ	Work with output queue
WRKPRB	Show the Problem Log display
WRKHDWPRD	Show the *Work with hardware products* options to display or print the system configuration list.
WRKHDWRSC	Displays the resource names
WRKSYSSTS	Work with system status

To sign off the workstation, return to the main menu by selecting the *end* option, or by pressing the System Request key. Then, enter `90` to sign off.

WRKSYSVAL Command

The system is shipped with system values that control different aspects of its operation. The Work with System Value (WRKSYSVAL) command displays a list of all system values. For more information, see the *CL Reference* information.

If you know the name of the system value you want to display or change, you may use the Display System Value (DSPSYSVAL) or Change System Value (CHGSYSVAL) command.

To work with system values:

1. Enter

   `WRKSYSVAL`

2. From the Work with System Values display, you can either request a list of all of the system values or a subset of that list.
   - To list all system values, type `*ALL` in the *Subset by type* field.
   - To list a subset of system values, enter a type in the *Subset by type* field. (Press F4 for a list of types).
3. To change the system value, select the *Change* option.

Commonly Used System Values

QDATE: QDATE is the system date. It is composed of the following system values: QYEAR, QMONTH, and QDAY. The date formats that can be specified are YMD, MDY, DMY (Y = year, M = month, D = day), or JUL (Julian format). Its value is set from the IPL Options display, and is updated when the system value QTIME reaches midnight (000000). A change made to this value may also change QYEAR, QMONTH, and QDAY.

QTIME: QTIME is the system value for the time of day. It is composed of the following system values: QHOUR, QMINUTE, and QSECOND. Its value can be set from the IPL Options display. QTIME format is hhmmss.

```
hh=24 hour time clock
mm=minutes
ss=seconds
```

A change made to this value takes effect immediately, and may affect the system values QHOUR, QMINUTE, and QSECOND.

QAUTOCFG: The automatic configuration indicator (QAUTOCFG) controls whether the system creates device descriptions automatically for locally attached devices. The system default, 1, is to perform automatic configuration. If you do not want the system to create device descriptions, change the system value to zero (0). You can use the WRKSYSVAL command, or enter the following command:

```
CHGSYSVAL SYSVAL(QAUTOCFG) VALUE('0')
```

DSPSRVA or CHGSRVA Command

The system is shipped with service attributes that assist in system operation. You can display the service attributes by entering the DSPSRVA command, or change the service attributes by entering the CHGSRVA command.

Commonly Used Service Attributes

ANZPRBAUTO: The automated problem analysis function enables problem analysis routines to run automatically. Problem analysis routines are programs that attempt to isolate a problem. They are run at the time of the failure in a background batch job. This function also monitors for selected critical conditions and sends a *BREAK message to users (who are specified by the service attribute, CRITMSGUSR) to ensure that the condition is recognized.

To change the value of the automated analysis function, type:

```
CHGSRVA ANZPRBAUTO(*YES)
```

The system default (*Yes) is to run the automated analysis function.

If you do not want the system to perform the automated analysis function, change the value to *NO.

CRITMSGUSR: When problem analysis routines are run automatically at the time of a failure (see "ANZPRBAUTO"), this function specifies the user (or class of users) who is sent a *BREAK message. Use the critical message user function to create an ordered list of user identifiers and user classes. When a critical condition is detected, the first entry in the list is notified by a *BREAK message. If the user or the user class is not signed on, the system sequentially notifies the entries in the list until a user is notified.

To work with the critical message user function, type:

```
CHGSRVA CRITMSGUSR(*QSYSOPR)
```

The system default (*QSYSOPR) sends a *BREAK message to the system operator.

You can change the value and create an ordered list of user identifiers and user classes.

RPTPRBAUTO: When problem analysis routines are run automatically at the time of a failure (see "ANZPRBAUTO"), the RPTPRBAUTO function specifies whether the service provider is notified. For more information on the service provider function, see "RPTSRVPVD" on page 1-82. To change the value of automated reporting function, type:

```
CHGSRVA RPTPRBAUTO(*YES)
```

The system default is to run the automated problem notification (*YES). It is run at the time of the failure in a background batch job.

When problem notification is not done automatically (*NO), problems can be reported to the service provider from the QSYSOPR message queue, or by using the Work with Problems (WRKPRB) command.

RPTSRVPVD: When problems are automatically reported (see "RPTPRBAUTO" on page 1-81), this function specifies the name of the service provider for your system.

To work with the service providers function, type:

```
WRKSRVPVD
```

The system default (*IBMSRV) is to automatically report problems to IBM.

You can change the service provider. Use the Help key for more information on the specific options.

SNDDTAPKT: When problems are automatically reported (see "RPTPRBAUTO" on page 1-81), this function sends data that was collected at the time of the failure to the specified service provider.

To change the value of the send data packet function, type:

```
CHGSRVA SNDDTAPKT(*YES)
```

The system default (*YES) is to send up to 2000 bytes of data to the service provider.

If you do not want the system to send data, change the system value to *NO.

PTFINSTYP: This function specifies when to apply PTFs. A PTF can be applied using the install PTF command (INSPTF), or the GO PTF command (select the *Install a program temporary fix* option from the the Program Temporary Fix (PTF) display). These commands use the PTFINSTYP service attribute automatically when the *Type* field is not specified.

To change the value of the PTF install function, type:

```
CHGSRVA PTFINSTYP (*DLYIPL)
```

The system default (*DLYIPL) is to designate all of the PTFs for a delayed type of application, and then perform an IPL on the system.

Use the Help key for more information on the specific options.

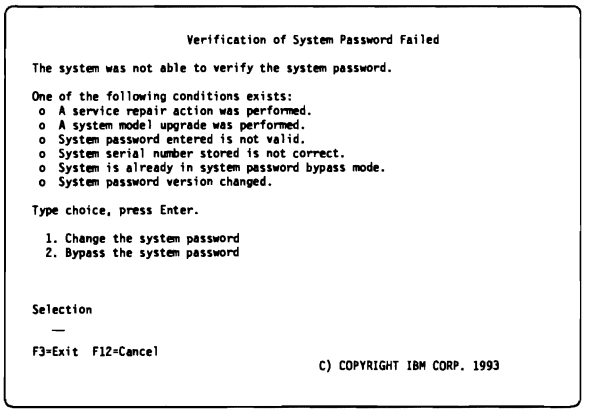
Chapter 2. Service Referenced Procedures

System Password

New systems are shipped from the factory with the correct system password already installed. A new system password is required for each model change or for conditions that indicate probable change of ownership. The new system password, required at the time of the first IPL, is provided by IBM. A customer who does not have the system password when it is needed must contact their marketing representative to place an AS/400 system password RPQ (Request for Price Quotation) order. The RPQ order is received by IBM manufacturing, which sends the system password to the customer for installation. If the correct system password is not entered, you can select a system password bypass period to allow you to obtain the correct system password from the marketing representative. If the correct system password is not available and the bypass period expires, the system will not complete the next IPL unless the correct system password is installed.

While in bypass mode, the system indicates the time remaining until the bypass period expires through control console messages.

If a system password is required, the following display appears just prior to the IPL or Install the System display.



Determining a Primary or Alternative Console

A console is a workstation that allows you to view and to control system operations. The workstation that is on bus 0, port 0, and at address 0 is the **primary** console. The **alternative** console is the workstation that functions as the console if the primary console is not operational.

A twinaxial or ASCII I/O processor is called a workstation I/O processor. The I/O processor that contains the workstation I/O adapter is not the workstation I/O processor. For example, a Multiple Function I/O Processor can contain a workstation I/O adapter.

Workstation addresses are used by the system for identification. Twinaxial device addresses are set at the workstation. The device address is always set to zero if the primary, first alternative, or the second alternative console workstation is a twinaxial device. It is not necessary to set the device address for ASCII devices because the address (0) is determined by the port. For more details on ASCII workstations, see the device information. Assignment of an Apple** workstation as the console is done by icon selection using the workstation mouse. Information on how to set up an Apple device and how to use the mouse can be found in the device information. When the Apple device is selected as the primary or alternative console, the LocalTalk protocol assigns the address (0) and the port (0). For more details on Apple workstations, see the device information.

The following information helps you identify the **primary** or **alternative** console.

If the First Workstation I/O Processor Is Twinaxial

The **primary** console is the workstation that is:

- On the first workstation I/O processor on bus 0
- On port 0
- At address 0

The **first alternative** console is the workstation that is:

- On the first workstation I/O processor on bus 0
- On port 1
- At address 0

The **second alternative** console is the workstation that is:

- On the second I/O processor on bus 0

  Note: The second I/O processor may be a twinaxial or an ASCII workstation I/O processor, or may be an I/O processor that contains a workstation I/O adapter that supports the LocalTalk protocol.
- On port 0
- At address 0

If the First Workstation I/O Processor Is ASCII

The **primary** console is the workstation that is:

- On the first workstation I/O processor on bus 0
- On port 0
- At address 0

There is no **first alternative** console when the primary console is an ASCII workstation.

The **second alternative** console is the workstation that is:

- On the second I/O processor on bus 0

  Note: The second I/O processor may be a twinaxial or an ASCII workstation I/O processor, or may be an I/O processor that contains a workstation I/O adapter that supports the Localtalk protocol.
- On port 0
- At address 0

If the First I/O Processor Contains a Workstation I/O Adapter

The **primary** console is a workstation that supports the LocalTalk protocol that is:

- On the first workstation I/O adapter in the first I/O processor on bus 0
- On port 0
- At address 0

There is no **first alternative** console when the primary console is a workstation that supports the LocalTalk protocol.

The **second alternative** console is a workstation that is:

- On the first workstation I/O processor on bus 0 **OR** On the second I/O processor on bus 0

  Note: The second I/O processor may be a twinaxial or an ASCII workstation I/O processor, or may be an I/O processor that contains a workstation I/O adapter that supports the Localtalk protocol.
- On port 0
- At address 0

Determining a Primary or Secondary Rack (9406 System Unit)

Introduction

This procedure determines which are the **primary** and **secondary** racks on the system.

Primary Rack

The **primary** rack is the rack that contains the rack control panel with the words *Continuous Processor Power* (Stage 1) or *Continuous Power* (Stage 2) at the top. The primary rack always contains the system unit, which includes the system control panel. This may be the only rack on the system. For Stage 1 models, the primary rack is labeled A. For Stage 2 models, the primary rack is labeled 01.

Secondary Racks

Secondary racks are any racks that are not primary racks.

The system can have multiple secondary racks, but only one primary rack. For Stage 1 models the secondary racks are labeled B through Z. For Stage 2 models, the secondary racks are labeled 02 through 99.

On Stage 1 racks, emergency power-off cables connect the primary and secondary racks together and enable sequential power-on and power-off operations. The emergency power off cables also enable all emergency power off-connected racks to switch off power immediately if the Unit Emergency Power Off switch is set to the Off position. The emergency power off cables are also known as rack power sequence cables.

On Stage 2 racks, SPCN rack-to-rack cables connect the primary and secondary racks together and enable all racks in the system to power on and power off at the same time. The SPCN rack-to-rack cables are also known as rack power sequence cables.

Low Level Debug and Data Collecting Procedures

Introduction

These procedures are used for collecting data for problems with Licensed Internal Code or hardware that you have not been able to solve with other methods.

The low level debug functions (Function 54 - 64) use subfunctions. This means that these functions have a function range inside them (00-FF) where you can display or enter information.

Getting Started

Before you start, ensure that Manual mode is selected.

You must follow the first four steps of this procedure exactly and after you complete steps 1 - 4, do not do them again until after you perform another IPL.

1. At the control panel, press the Select, Increment (↑), or Decrement (↓) switch until 25 appears in the Function display.
2. Press Enter on the control panel. Either 0000 0000, or blanks and zeros (for example; 2 5 _ _ _ _ 0 0) appear in the Data display.
3. Press the Select, Increment (↑), or Decrement (↓) switch again. The number 26 appears in the function display.
4. Press Enter on the control panel. The function display changes from 26 to 01.

Recording Status SRCs

Use this procedure for recording status SRCs for Stage 1 hardware. For Stage 2 hardware, use "Displaying Data for Functions 54 through 58, 63 and 64" on page 2-8 to record data from Functions 63 and 64.

1. Complete steps 1 through 4 in the "Getting Started" section.
2. Press the Select, Increment (↑), or Decrement (↓) switch until 56 appears in the Function display.
3. Press Enter on the control panel; ** appears next to the function number (this indicates subfunction mode).
4. To record all of the system status SRCs that have been saved in the trace, do the following:
   a. Press the Select, Increment (↑), or Decrement (↓) switch until the subfunction number is 20.
   b. Press Enter on the control panel. The first system status SRC appears in the Data display.
   c. Record the system status SRC.
   d. Press the Select, Increment (↑), or Decrement (↓) switch to continue from subfunction 20 to subfunction 21.
   e. Press Enter on the control panel. Record the data shown in the Data display.
   f. Continue this procedure, increasing the subfunction number one at a time and recording the data until you reach subfunction 2A.
5. Press the Select, Increment (↑), or Decrement (↓) switch to move from the last subfunction back to the **.
6. Press Enter on the control panel. Blanks appear next to the function number in the place of the ** (this indicates you are leaving the subfunction mode).

Putting the SRCs in Order

To put the SRCs in sequential order, do the following :

1. Use the first 2 digits (ss) of the function display 5620 to find the first SRC.

   Add those two digits to the base subfunction number (20) and record the result (20 + ss = ____), where ss is a hexadecimal number between '01'x and '0A'x.
2. The number recorded in step 1 is the subfunction number of the beginning of the SRC trace.

   Fill in the number 1 next to this subfunction display on the form (Status SRC number ____).

3. Number the SRCs recorded at step 4 in order from 1 to 10.

   Start with the subfunction numbered 1 and continue numbering each subfunction sequentially.

   Note: After subfunction 2A, the next subfunction is 21.

4. The LAST system status SRC is numbered 10.

5. The form now indicates the last 10 system status SRCs displayed before the current error condition, numbered in order from 1 to 10.

Stage 1 System Status SRC Form

Function	Data	Description
5620	S S x x 0 0 0 0	SS = Offset to first SRC in trace 20 + SS = ____ (subfunction number for first SRC in trace)
5621		Status SRC number ____
5622		Status SRC number ____
5623		Status SRC number ____
5624		Status SRC number ____
5625		Status SRC number ____
5626		Status SRC number ____
5627		Status SRC number ____
5628		Status SRC number ____
5629		Status SRC number ____
562A		Status SRC number ____

Figure 2-1. System status SRC trace form, part 1 of 1 (Stage 1)

Collecting Specific Data

Use the following table to help you get the information you were sent here to collect. If you were not instructed to get specific information, collect all the data from the following table.

Figure 2-2 (Page 1 of 2). Data Collection Information

If You Entered For:	Then Go To:
IPL Configuration Table (function 54)	"Displaying Data for Functions 54 through 58, 63 and 64" on page 2-8. Available for Stage 1 and Stage 2.
SP Card Log Buffer (function 55)	"Displaying Data for Functions 54 through 58, 63 and 64" on page 2-8. Available for Stage 2 only.
SP Code Area (function 56)	"Displaying Data for Functions 54 through 58, 63 and 64" on page 2-8. Available for Stage 1 and Stage 2.
IPL Message Save Area (function 57)	"Displaying Data for Functions 54 through 58, 63 and 64" on page 2-8. Available for Stage 1 and Stage 2.
IPL Parameters Area (function 58)	"Displaying Data for Functions 54 through 58, 63 and 64" on page 2-8. Available for Stage 1 and Stage 2.
SRC Trace (Status: function 63)	"Displaying Data for Functions 54 through 58, 63 and 64" on page 2-8. Available for Stage 2 only.

Figure 2-2 (Page 2 of 2). Data Collection Information

If You Entered For:	Then Go To:
SRC Trace (Diagnostic: function 64)	"Displaying Data for Functions 54 through 58, 63 and 64" on page 2-8. Available for Stage 2 only.
SP Card Error Log	"Changing the Address in Functions 59 through 61" on page 2-11, with address 002C80. Since this is the default address, proceed directly to "Displaying Data from Function 62" on page 2-12. If another address has been entered into 59, 60 and 61 since the last IPL, proceed to "Changing the Address in Functions 59 through 61" on page 2-11, with the address. Available for Stage 2 only.
VPD Data	"Changing the Address in Functions 59 through 61" on page 2-11, with address 000A24. Use function 59, 60 and 61 to insert the address and use function 62 to display the information. Available for Stage 2 only.
SP Card Resource Status Table	"Changing the Address in Functions 59 through 61" on page 2-11, with address 004180. Use function 59, 60 and 61 to insert the address and use function 62 to display the information. Available for Stage 2 only.
SP Card ROS Status Area	"Changing the Address in Functions 59 through 61" on page 2-11, with address 002480. Use function 59, 60 and 61 to insert the address and use function 62 to display the information. Available for Stage 2 only.

Displaying Data for Functions 54 through 58, 63 and 64

This procedure is used to collect data. Each function has a different amount of data to collect. Collect the data for the range listed for each function in the following table.

Figure 2-3. Data Collection Ranges

Function	Description	Stage 2 Range	Stage 1 Range
54	I/O configuration table	5400, 5401, 5402...continue until you get 0000 0000 two times.	5400, 5401, 5402...continue until you get 0000 0000 two times.
55	SP card log buffer	550A to 5518 and 554C to 5563	5509 to 5521 and 5530 to 553F
56	SP code area	5600 to 560E, 5616 to 562A, 5635 to 563F, 5686, 56F6, and 56F7.	5600 to 5608 and 5620 to 563F
57	IPL message save area	5700 continue until you get 0000 0000 four times	5700 continue until you get 0000 0000 four times
58	IPL parameters area	5800 to 5808	5800 to 5808
63	status SRCs trace	6300 to 6318	not available
63	final status SRC only	6318	not available
64	diagnostic status SRC trace	6400 to 6420	not available
64	final diagnostic SRC only	6418	not available
64 diagnostic status SRC trace	all words of final diagnostic SRC	6418 to 6420	not available

Use the following procedure and record the data as shown.

1 Press the Select, Increment (↑), or Decrement (↓) switch until the function you want appears in the Function display (example: 54).

2 Press Enter on the control panel; ** appears next to the function number to indicate that you are in the subfunction mode. This is the *entry* point and *exit* point for subfunction mode).

If the data is **FFFF** _ _ _ _ this function is not available. You must use "Function Not Available" to determine the address associated with each function and continue with "Changing the Address in Functions 59 through 61" on page 2-11 to display the subfunction data.

3 Press the Select, Increment (↑), or Decrement (↓) switch until 00 is next to the function number.

4 Press Enter on the control panel. Data appears in the display. Record the data.

5 Press the Select, Increment (↑), or Decrement (↓) switch to continue to the next subfunction (example: 5401).

6 Press Enter on the control panel. Record the data.

7 Repeat steps 5 and 6, increasing the subfunction number one at a time and recording the data until all the suitable data is collected.

8 Press the Select, Increment (↑), or Decrement (↓) switch to move from the last subfunction back to ** (example: 543F to 54**).

9 Press Enter on the control panel. This takes you out of subfunction mode and ** no longer appears.

Repeat steps 1 through 9 for other data you were instructed to collect.

Call your next level of support and give them the information you collected to write an MTR.

Function Not Available: If the function was not available (the display was FFFF _ _ _ _) this table gives you an address to use while performing "Changing the Address in Functions 59 through 61" on page 2-11.

Figure 2-4 (Page 1 of 2). Data Collection Information

If Functions 54 - 58 Are Not Available And You Entered For:	**Then Go To:**
IPL Configuration Table (function 54)	"Changing the Address in Functions 59 through 61" on page 2-11, with address 000900. Use function 59, 60 and 61 to insert the address and use function 62 to display the information.
SP Card Log Buffer (function 55)	"Changing the Address in Functions 59 through 61" on page 2-11, with address 000B00. Use function 59, 60 and 61 to insert the address and use function 62 to display the information.
SP Code Area (function 56)	"Changing the Address in Functions 59 through 61" on page 2-11, with address 001300. Use function 59, 60 and 61 to insert the address and use function 62 to display the information.
IPL Message Save Area (function 57)	"Changing the Address in Functions 59 through 61" on page 2-11, with address 000700. Use function 59, 60 and 61 to insert the address and use function 62 to display the information.

Figure 2-4 (Page 2 of 2). Data Collection Information

If Functions 54 - 58 Are Not Available And You Entered For:	**Then Go To:**
IPL Parameters Area (function 58)	"Changing the Address in Functions 59 through 61" on page 2-11, with address 000A80. Use function 59, 60 and 61 to insert the address and use function 62 to display the information.
SRC Trace (Status: function 63)	If this function is not available, the data is not available.
SRC Trace (Diagnostic: function 64)	If this function is not available, the data is not available.

Changing the Address in Functions 59 through 61

Introduction: Use the address from Figure 2-2 on page 2-7 or Figure 2-4 on page 2-9 for this procedure, or the address you were given when you were sent to this procedure.

The address consists of 4 bytes. You cannot control the first byte; 00 is displayed.

ADDR	00xx yyzz

The xx, yy, and zz are used to represent parts of the address you found in Figure 2-2 on page 2-7 or Figure 2-4 on page 2-9.

For example, the address of 002C80 has:

- 00 in the xx position
- 2C in the yy position
- 80 in the zz position

Changing the address: Setting the xx Position:

1. Press the Select, Increment (↑), or Decrement (↓) switch until 59 appears in the Function display.
2. Press Enter on the control panel; ** appears next to the function number.
3. Press the Select, Increment (↑), or Decrement (↓) switch until the value of xx appears next to the function number.
4. Press Enter on the control panel.

00xx 2C80

5. Press the Select, Increment (↑), or Decrement (↓) switch until ** appears next to the function number (59**).
6. Press Enter on the control panel.

Setting the yy Position:

7. Press the Select, Increment (↑), or Decrement (↓) switch until 60 appears in the Function display.
8. Press Enter on the control panel; ** appears next to the function number.
9. Press the Select, Increment (↑), or Decrement (↓) switch until the value of yy appears next to the function number.
10. Press Enter on the control panel.

00xx yy80

11. Press the Select, Increment (↑), or Decrement (↓) switch until ** appears next to the function number (60**).
12. Press Enter on the control panel.

Setting the zz Position:

13. Press the Select, Increment (↑), or Decrement (↓) switch until 61 appears in the Function display.
14. Press Enter on the control panel; ** appears next to the function number.
15. Press the Select, Increment (↑), or Decrement (↓) switch until the value of zz appears next to the function number.
16. Press Enter on the control panel. Record the data from the display as the base address.

00xx yyzz

17. Press the Select, Increment (↑), or Decrement (↓) switch until ** appears next to the function number (61**).
18. Press Enter on the control panel.

You have just entered your address into the system. Now use the following procedure to obtain the information from function 62.

The following table shows the range to collect data for each function that was not available (from Figure 2-4 on page 2-9) and the range to collect data for additional information.

Figure 2-5. Additional Data Collection Ranges

Name	Description	Range
54 not available	IPL configuration table	6200, 6201, 6202...continue until you get 0000 0000 two times.
55 not available	SP card log buffer	620A to 6218 and 624C to 6263
56 not available	SP communications	6200 to 620E, 6216 to 622A, 6235 to 623F, 6286, 62F6, and 62F7
57 not available	IPL message save	6200 continue until you get 0000 0000 four times
58 not available	IPL parameters area	6200 to 6208
SP card error log		6200 to 6205
VPD data		6200 to 6202
SP card resource status table		6200 continue until you get 0000 0000 four times
SP card ROS static area		6200 to 6247

Displaying Data from Function 62:

Press the Select, Increment (↑), or Decrement (↓) switch until 62 appears in the Function display. Press Enter on the control panel. Press the Select, Increment (↑), or Decrement (↓) switch until 6200 appears. Press Enter on the control panel. Record the data.

Press the Select, Increment (↑), or Decrement (↓) switch until 01 appears after the function number (6201). Press Enter on the control panel and record the data. Continue until you have the data defined in Figure 2-5 on page 2-11.

When you are done, press the Select, Increment (↑), or Decrement (↓) switch until 62** appears. Press Enter on the control panel.

Repeat this procedure starting with "Changing the address" on page 2-11 until you have recorded all the data you need as defined by the procedure that sent you here.

Call your next level of support and give them the information you collected to write an MTR.

Chapter 3. Control Panel Functions

Lamp Test

Use this procedure to verify that the lights on the system control panel are working correctly. Performing the lamp test on the 9406 System Unit will also start a lamp test on the Stage 2 rack control panels and on the 5032 or 504x units attached to the system being tested.

If you cannot complete these steps, go to the "Starting Point for All Problems" in the *Problem Analysis* information to start problem analysis.

1 Power on the system.

2 Press the Select, Increment (↑), or Decrement (↓) switch on the control panel to display Function 04.

Press Enter on the control panel.

3 Do you have a 9406 Stage 2 system?

Yes	No
↓	Go to step 6 of this procedure.

4 Press Enter on the control panel.

Do all of the following lights on the rack control panels and on the units noted in the first paragraph of this procedure go on?

- Rack Power Ready light

  Note: The following lights remain on for 25 seconds after you press Enter.
- Rack Attention light
- SPCN control panel lights:
  - Attention light
  - Power On light
  - A 5 x 7 dot pattern for each character in the Data display

No	Yes
↓	Go to step 6 of this procedure.

5 Go to "SPCN PIP4" in the *Problem Analysis* information if the failure is on a secondary rack or frame.

This ends the procedure.

6 Press Enter on the control panel.

Do all of the following lights on the system control panel go on?

- Processor Active/Activity light
- System Attention light
- Power On light
- A 5 x 7 dot pattern for each character in the Function display
- A 5 x 7 dot pattern for each character in the Data display
- Mode LEDs (if available)

  Note: Some system types have a single Function/Data display.

Yes	No
↓	Exchange the control panel or the ac module (See "Removal and Installation Procedures" in the *Repair and Parts* information). **Note:** On some models, the control panel circuit board is the FRU.

7 The lights on the system control panel are working correctly.

This ends the procedure.

Function Code Table

Locate the function, code, and the function description in the following table:

Notes:

1. The x can be any number 0 through 9, any letter A through F, or a blank.
2. If the function was being performed by the customer, verify why the function was selected and if it is complete.
3. If you cannot change the function display or complete the selected function, go to "Starting Point for All Problems" in the *Problem Analysis* information for your system.

Function Code	Function Selected
01 xxxx xxxx	Display the currently selected IPL type value (and IPL mode, if available).
02 xxxx xxxx	Select the IPL type value (and IPL mode, if available).
03 xxxx xxxx	Start an IPL and load the system. The IPL uses the selected IPL options.
04 xxxx xxxx	Lamp test; all displays and indicators will be switched on.
05 xxxx xxxx	Not available on all system types - informational power-fault system reference code (SRC); displays an SRC on the control panel.
06 xxxx xxxx	Reserved.
07 xxxx xxxx	Not available on all system types - restore system power; sends a command to the power system to attempt to power on any devices or frames that fail to power on.
08 xxxx xxxx	Emergency Power Off
09 xxxx xxxx through 10 xxxx xxxx	Reserved.
11xx xxxx xxxx through 19xx xxxx xxxx	System reference code (SRC); displays an SRC on the control panel.
20 xxxx xxxx	Display the machine type and model number.
21 xxxx xxxx	Calls up Dedicated Service Tools; causes the Dedicated Service Tool (DST) Log-on display to appear on the system console (workstation attached to bus 0).
22 xxxx xxxx	Displays an attention SRC, 11-x A1xx 3022, which indicates that the Function 22 has been selected. Reselect the function to dump main storage and system processor data.
23 xxxx xxxx	Stand-alone utility (restore); instructs the stand-alone Licensed Internal Code to run this utility.
24 xxxx xxxx	Stand-alone utility (install); instructs the stand-alone base to run this utility.
25 xxxx xxxx	The service representative switch 1 is set; this function is the first step necessary to set the service function range from 50 to 70.
26 xxxx xxxx	The service representative switch 2 is set; this function is the second step necessary to set the service function range from 50 to 70.
27 xxxx xxxx	Reserved for stand-alone utility.
28 xxxx xxxx	Reserved for stand-alone utility.
29 xxxx xxxx	Load the Model-Unique Licensed Internal Code. Loads the Model-Unique Licensed Internal Code from tape to disk. Used only after a mode D IPL.
30 xxxx xxxx	Reserved for stand-alone utility.
31 xxxx xxxx	Reserved for stand-alone utility.
32 xxxx xxxx	Load Licensed Internal Code; loads Licensed Internal Code from tape to disk. Used only after a mode D IPL.
33 xxxx xxxx	Reorder SPCN rack addressing.
34 xxxx xxxx through 49 xxxx xxxx	Reserved (not used).
50 xxxx xxxx	System processing unit stop.

Function Code	Function Selected
51xx xxxx xxxx	System processing unit status; displays the following values: B0 register contents System instruction address register (IAR) address Current task dispatching element (TDE) contents
52 xxxx xxxx	System processing unit start.
53 xxxx xxxx	Resets the control panel interface.
54xx xxxx xxxx	Display low-level diagnostic I/O configuration table.
55xx xxxx xxxx	Display low-level diagnostic service processor log buffer.
56xx xxxx xxxx	Display low-level diagnostic service processor code area.
57xx xxxx xxxx	Display low-level diagnostic IPL message save area.
58xx xxxx xxxx	Display low-level diagnostic IPL parameters area.
59xx xxxx xxxx	Set first character of base address for function 62 display.
60xx xxxx xxxx	Set second character of base address for function 62 display.
61xx xxxx xxxx	Set third character of base address for function 62 display.
62xx xxxx xxxx	Display multiple function I/O processor storage.
63xx xxxx xxxx	System status SRC trace.
64xx xxxx xxxx	Service processor diagnostic status SRC trace.
65xx xxxx xxxx	Reserved.
66xx xxxx xxxx	Reserved.
67 xxxx xxxx	Disk Unit IOP Reset/Reload - enabled only by a disk unit SRC.
68 xxxx xxxx	Reserved.
69 xxxx xxxx	Reserved.
70 xxxx xxxx	Dump multiple function I/O processor control storage.

Function Code	Function Selected
You cannot find the code in this chart.	If you cannot find the function code in this chart, the customer support for added features or devices may not have been available when this information was produced. Look for any supplement unit function code information for the function code you have displayed on the control panel. If you do not find any additional function code information, go to "Lamp Test" on page 3-2 and verify that the lamps are working correctly.

Control Panel Functions Descriptions

To select a function number, press the Select, Increment (↑), or Decrement (↓) switch on the control panel. To activate the function, press Enter on the control panel while the desired function number is displayed.

Note: When you select a function and then press Enter on the control panel, the function is activated. The function is not activated until you press Enter on the control panel.

For more information about Functions 01 through 19, see the *System Operation* or *System Startup and Problem Handling* information.

Function 01–Display Selected IPL Type/Mode: On all system types, this function displays the IPL type (A, B, C, or D) in the third character position of the Data display.

A IPL from disk
B IPL from disk
C Reserved
D IPL from tape

Note: See "General Information" on page 1-50 and "IPL Mode Options" on page 5-2 for more information on IPL options.

On some system types (for example, 9404 Model 200), this function also displays the IPL mode (M or N only) in the fourth character position of the Data display.

M Manual mode
N Normal mode

Function 02–Select IPL Type/Mode: On all system types, this function selects the IPL type (A, B, C, or D).

Note: This function is available only when Manual mode is selected.

On some system types, this function also selects the IPL mode: M (Manual) or N (Normal).

For more information on IPL options, see "Function 01–Display Selected IPL Type/Mode" and "IPL Types" on page 5-2.

When Enter is pressed with 02 in the Function display, the selected IPL type value is displayed in the third character position of the Data display. Some system types have Manual and Normal IPL mode selection available when control panel Function 02 is displayed. For these systems, mode value is displayed in the fourth character position of the Data display.

To change the IPL values:

- Select Manual mode.
- Press the Select, Increment (↑), or Decrement (↓) switch until the desired value is displayed.
- Press Enter on the control panel to save this value.

Function 03–Start IPL: This function starts an IPL using the selected IPL mode.

Notes:

- No system shut down is performed before the IPL (see "Initial Program Load (IPL) Summary" on page 5-2).
- This function is only available when Manual mode is selected.
- This function is not available when the system is powered off.

Function 04–Lamp Test: This function ensures that no indicators are burned out and that characters displayed at the control panel are valid. When this test is activated the following lights go on:

- A 5 x 7 dot pattern for each character in the Function display
- A 5 x 7 dot pattern for each character in the Data display
- The Processor Active/Activity light

  Note: For 9406 Stage 2, these lights are on only after you power on the system
- The System Attention light
- The Power On light
- The Keylock Mode lights (if available)

The lamp test continues until the Select, Increment, or Decrement switch is pressed.

Function 05–Power Fault System Reference Code (SRC): Function 05 displays information about power faults and provides informational reference codes during disk unit concurrent maintenance procedures. Function 05 is only available on systems with SPCN.

For more information on interpreting SRCs, go to the Introduction section in Chapter 4, "System Reference Code (SRC) Record" on page 4-1.

To use the SRC for problem analysis, go to the "Starting Point for All Problems" in the *Problem Analysis* information.

Function 06–Reserved: This function is reserved for future control panel operations.

Function 07–Restore System Power:
Function 07 is displayed when the system power control network (SPCN) detects that the processor is powered on, but all the system system components are not. Function 07 allows you to restore power to devices or frames that have had a power failure or have been powered off. It is used to retry an incomplete system power on or to restore power after a concurrent maintenance repair. Function 07 is enabled only when Manual mode is selected. Function 07 is not available on all system types.

Function 08–Emergency Power Off:
This function is available on systems that do not have an emergency power off switch. To force the system to power off, perform the following procedure:

1. Select Manual mode on the control panel.
2. Select Function 8 and press Enter on the control panel.
3. An attention SRC, A100 8008, is displayed on the control panel. This indicates that Function 8 has been selected.
4. To power off the system, reselect Function 8 and press Enter on the control panel.

Note: Selecting other functions may reset the sequence.

Functions 09 to 10–Reserved: These functions are reserved for future control panel operations.

Functions 11 to 19–System Reference Code: Functions 11 though 19, if enabled, represent the words of the SRC.

SRC information should be recorded for error reporting (use the Problem Summary Form in the *System Operation* or *System Startup and Problem Handling* information).

For more information on interpreting SRCs, go to the Introduction section in Chapter 4, "System Reference Code (SRC) Record" on page 4-1.

To use the SRC for problem analysis, go to the "Starting Point for All Problems" in the *Problem Analysis* information.

Function 20–System Type and Model:
This function displays the machine type and model number in the following format:

MMMM 0mmm

MMMM Machine type (9406, 9404, ...)

mmm Model number (B10, C20, ...)

This information should be recorded with the SRC.

Notes:

- When the Machine Type and Model Number are not available FFFF or FF is shown.
- This function is available only when Manual mode is selected.

Extended Control Panel Functions

The extended control panel functions consist of two major groups:

- Functions 21 through 26, which are available when Manual mode is selected.
- Support service representative Functions 50 through 70, which are available when Manual mode is selected and the customer service switch 1 (Function 25) has been selected and entered, followed by the entry of service switch 2 (Function 26).

Note: When a function is not available FFFF or FF is shown.

Function 21–Make DST Available:

Note: If SST is available, use it instead of DST. Function 21 should be used when the operating system is not available.

This function makes DST available on the machine default console display. The DST display appears on the primary console or the alternative console. For more information on the primary and alternative consoles, see "Determining a Primary or Alternative Console" on page 2-3.

For more information on DST, see "Dedicated Service Tools (DST)" on page 1-46.

Function 22–Main Storage Dump: This function dumps main storage and processor data to the disk. Initially, an attention SRC, 11-x A1xx 3022, is displayed. This indicates that Function 22 has been selected. To dump main storage and system processor data to the disk, you must re-select the function. When the function is available, a 0000 0000 data response followed by informational SRCs and ended with an attention level SRC displays. The System Attention light indicates whether an SRC needs attention or is for information.

This function is operated only when a main storage dump is necessary. For example, a system hang condition or after an operating system failure.

See "Perform a Main Storage Dump to Disk" on page 8-2 and "Error Recovery for Dumps" on page 8-9 for more information.

Function 23–Restore Licensed Internal Code: This function restores Licensed Internal Code from tape to disk. This function is used only following an alternate IPL (mode D IPL).

For a description of how to run the Restore Licensed Internal Code utility, see "Restore Licensed Internal Code Utility" on page 6-14.

Function 24–Install Licensed Internal Code: This function initializes and assembles the load-source disk unit (formats, if necessary) and loads the Licensed Internal Code from tape again. This function is used only following an alternate IPL (mode D IPL).

For a description of how to run the Install Licensed Internal Code utility, see "Install Licensed Internal Code Utility" on page 6-11.

Functions 25 and 26–Service Switches 1 and 2: Service switches 1 and 2 can be used to enable or disable the Functions 50 through 70. If Functions 50 through 70 are enabled, entry of either switch disables them. If the Functions 50 through 70 are disabled, of service switch 1 followed by service switch 2 enables them.

A data response of 0000 0000 is always returned and is followed by the display of the present IPL mode (Function 01), if the extended function range has been changed.

Functions 27, 28, 30, and 31–Reserved for Stand-Alone Utilities: These functions are reserved for *stand-alone* utilities.

Function 29–Load Model-Unique Licensed Internal Code: This function copies only the processor Model-Unique Licensed Internal Code from tape and replaces any existing Model-Unique Licensed Internal Code in the load-source disk unit. This function is used only following an Alternate IPL (type D).

For a description of how to run this function, see "Licensed Internal Code Install and Restore Utilities" on page 6-11.

Function 32–Download Disk Licensed Internal Code: This function downloads the Licensed Internal Code to disk and is used only following an alternative IPL (type D).

Function 33–Reorder SPCN Rack Addressing:

This function puts the rack addresses in the correct order to show their position in the System Power Control Network (SPCN). It is used when racks have been added to or removed from the system.

Service Panel Functions

These functions are enabled when Manual mode is selected and Functions 25 and 26 are entered. The following is a list of all the service panel functions and a description of each.

Service functions 50 through 70 are available when Manual mode is selected and when service switch 1 (Function 25) has been entered, followed by the entry of service switch 2 (Function 26). The service functions may be disabled again by selecting and entering either service switch 1 (Function 25) or service switch 2 (Function 26).

Notes:

1. For 9406 Stage 1, functions 59 through 70 are not available.
2. Low-level debug 54 through 58 functions are available only after a terminating error.

Using Subfunctions:

Subfunctions are used with Functions 51 and 54 through 64. After selecting and entering the function, the subfunction field appears with two asterisks. You may now select and enter a subfunction value. When selected and entered, actual data, FFFF, or YY FF (where YY is the function number), is displayed. The 'FFFF' or 'YY FF' response indicates that no data is present for this subfunction value. The data is displayed as 8 hexadecimal digits, which is 4 bytes of data.

These steps may be repeated for different subfunction values. To exit subfunctions, select and enter the two asterisks for the subfunction value. Figure 3-1 shows an example of a subfunction data display.

Figure 3-1. Subfunction Data Display Example

Function	Subfunction	Data Display
51	**	Subfunction mode entered
51	00	IAR (2 bytes) and base register 0 (2 bytes)
51	01	Base register 0 (4 bytes)
51	02	Current TDE (4 bytes)
51	03	Current TDE (2 bytes) and reserved (2 bytes)

Function 50–System Processor Stop:

This function stops the system processor.

Function 51–System Processor Status:

This function displays the following values:

- System IAR address
- Base zero (B0) register contents
- Current TDE contents

The data may be displayed 8 digits at a time. Select and enter a subfunction number to display each word of data from 00 to 0F.

Function 52–System Processor Start:

This function starts the system processor (after it has stopped).

Function 53–Path Switch:

This function resets communication between the service processor and the control panel.

Low-Level Debug (LLD) Panel Functions

These functions are enabled when Manual mode is selected, the system is stopped, and Functions 25 and 26 are selected. These functions are used for analyzing IPL errors. The following is a list of all the low level debug (LLD) panel functions and a description of each.

Function 54–Display Configuration Table:

The I/O configuration table (ICT) contains the state of every I/O bus unit (IOBU) and bus extended unit (BEU) found on the system's bus 0. Using this function helps determine the status of the load-source IOP at the time of failure. The data may be displayed 8 digits at a time. Select and enter a subfunction number to display each word of data from 00 to 3F.

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 55–Display Service Processor Log Buffer (SPLB):

The SPLB contains data related to the system terminating. The data may be displayed 8 digits at a time. Select and enter a subfunction number to display each word of data from 00 to FF.

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 56–Display Service Processor Code Area:

The service processor code area (SPCA) contains the state of the system processor and service processor at the time of failure. This area contains data such as the failing LID (Load ID) which indicates what LID the service processor wanted from the load-source IOP. The data may be displayed 8 digits at a time. Select and enter a subfunction number to display each word of data from 00 to FF.

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 57–Display IPL Message Area:

The IPL message save area (IMSA) is a first-in-first-out queue of messages sent to the service processor before the time of failure. This area is useful in determining the sequence of events on the system I/O bus before the failure. The data may be displayed 8 digits at a time. Select and enter a subfunction number to display each word of data from 00 to 3F.

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 58–Display IPL Parameter Area:

The IPL parameters area contains the status of the type of IPL being performed. The data may be displayed 8 digits at a time. Select and enter a subfunction number to display each word of data from 00 to 08.

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 59–Setting First Character of Address for MFIOP Control Storage Display:

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 60–Setting Second Character of Address for MFIOP Control Storage Display:

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 61–Setting Third Character of Address for MFIOP Control Storage Display:

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 62–MFIOP Control Storage Display:

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 63–System Status SRC Trace:

The system status SRC trace is a copy of the last 25 status SRCs (usually associated with the IPL sequence or the power-off sequence).

Enter a subfunction between hexadecimal 00 and 18 to look at the status SRCs in sequential order. The most recent SRC (the last status SRC) is viewed at subfunction hexadecimal 18.

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 64–Diagnostic Status SRC

Trace: The diagnostic status SRC trace is a copy of the last 25 status SRCs (usually associated with the service processor function of problem determination and main store dump).

Enter a subfunction between hexadecimal 00 and 18 to look at the status SRCs in sequence. The most recent SRC (the last status SRC) is seen at subfunction hexadecimal 18, and the extended SRC words for this SRC are seen at subfunction 19 through 20.

See "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information.

Function 67–Disk Unit IOP Reset/Reload

Note: Function 67 is available only if your system is at Version 3 Release 1 or later.

This function is used to initiate an I/O processor dump and a disk unit I/O processor reset/reload. The function is enabled only when an attention SRC, A6xx 0255, is displayed on the control panel and the associated I/O processor supports a reset/reload function.

Function 70–MFIOP Control Storage

Dump: This function dumps the contents of the control storage from the MFIOP to SID 00008700 0000 on the load-source disk.

Chapter 4. System Reference Code (SRC) Record

Introduction

The SRC record is the mechanism that supplies first failure-data-found information, and is used by the customer or service representative during problem analysis, repair actions, and verification. The SRC record supplies the linkage to the problem analysis procedures (in the service information and online), which supply the detailed steps used to analyze the problem. There are two general methods in which SRC record information is displayed on the control panel. These are described in "Stage 1 System Reference Code (SRC) Definition" on page 4-3 and "Stage 2 System Reference Code (SRC) Definition" on page 4-7.

The SRC record is a sequence of words (codes) that are displayed on the control panel. It is coded information that identifies a status; a detected hardware, Licensed Internal Code, or software failure; and the unit reporting the failure with its location. The Function 11 word is displayed automatically when the SRC record is shown. Additional functions (Functions 12 through 20) must be selected by using the Select, Increment (↑), Decrement (↓), or Enter switches on the control panel. Some portions of the SRC record may not contain data. SRC records vary in length (up to 40 bytes) and are displayed as described in the following paragraphs.

SRC records are shown with a -2 next to the function number in the Function display on Stage 2 systems (example 11-2 xxxx xxxx). The SRC records are shown with two blanks next to the function number in the Function display on Stage 1 systems (example 11 xxxx xxxx).

The type of SRC record can be identified by the first digit in the Function 11 Data display as follows:

Function display	Description
11xx Axxx xxxx	Attention or action required. The system is waiting for a user action. Example: This type of SRC record is displayed on a tape IPL if the tape unit is not ready.
11xx Bxxx xxxx	Machine check detected by Licensed Internal Code. A Licensed Internal Code component detected a system error. The problem could be failing hardware or software; follow the unit reference code tables.
11xx Cxxx xxxx	IPL status. Status SRC records are displayed to indicate the progression of the IPL. These values can be: • C1xx xxxx service processor • C3xx xxxx system processor • C6xx xxxx Vertical Licensed Internal Code • C9xx xxxx OS/400
11xx Dxxx xxxx	General system status. Status SRC records are displayed to indicate the status of system functions when the console is not available. Some of these functions are main storage dump or delayed power off.
11xx 0xxx xxxx to 11xx 9xxx xxxx or 11xx Fxxx xxxx	Hardware reported error. A system failure resulted from a hardware error.

Stage 1 System Reference Code (SRC) Definition

The system reference code record is made up of words 11 through 20. A unit reference code is located within the SRC record. The unit reference code is located either in the right half of Function 11 or the right half of Function 12. When the unit reference code (from word 11 or 12) is added to the leftmost 4 characters of word 11, it becomes the 8-digit SRC (example: xxxx xxxx). This SRC is used throughout the maintenance package during problem analysis. The basic Stage 1 SRC formats are provided in this section.

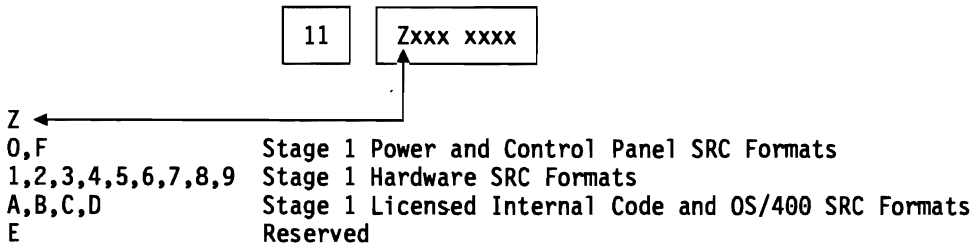
Figure 4-1. Licensed Internal Code or power and control panel SRC structure

Function	Description
11	The 4 leftmost characters displayed describe the Licensed Internal Code or power or control panel unit reporting the error. The 4 rightmost characters are the unit reference code.
12 through 19	Displays additional information about the failure, such as location of the unit, sense data, and serial number.
20	Displays machine type and model number.

Figure 4-2. Hardware SRC structure

Function	Description
11	The 8 characters displayed describe the hardware unit reporting the error.
12	The 4 rightmost characters are the unit reference code.
13 through 19	Displays additional information about the failure, such as location of the unit, sense data, and serial number.
20	Displays machine type and model number.

The general SRC format can be determined by the first digit in Function 11 data display as follows:



Stage 1 Hardware SRC Formats

Notes:

1. This figure represents three SRC record formats; other formats exist.
2. For Functions 14 through 19, data may not be displayed for some SRC records.
3. For Function 20, when data is not available the display will show 'FFFF '.

IOP SRC Format		Device SRC Format		System Processor SRC Format	
Function	Data	Function	Data	Function	Data
11	TTTT LMMM	11	tttt lmmm	11	25xx lmmm
12	ZZZZ RRRR	12	ZZZZ rrrr	12	000F RRRR
13	BBCb @@@@	13	ssss ssss	13	SSSS VVDD
14	tttt lmmm	14	uuuu uuuu	14	uuuu uuuu
15	ZZZZ rrrr	15	TTTT LMMM	15	uuuu uuuu
16	ssss ssss	16	ZZZZ RRRR	16	uuuu uuuu
17	uuuu uuuu	17	BBCb @@@@	17	uuuu uuuu
18	ZZZZ ZZZZ	18	ZZZZ ZZZZ	18	uuuu uuuu
19	ZZZZ ZZZZ	19	ZZZZ ZZZZ	19	ZZZZ ZZZZ
20	94xx 0mmm	20	94xx 0mmm	20	94xx 0mmm

@@@@ = Unit address
BBCb = Bus, bus, card, and board address (direct select address)
lmmm = Level indicator plus 3-digit model number of failing device
LMMM = Level indicator plus 3-digit model number (for example 6100 or 6150)
rrrr = Outboard failing unit reference code
RRRR = Unit reference code
ssss = Serial number of failing unit
tttt = Outboard failing unit type number (for example, 6100)
TTTT = Type number or card identification number (hexadecimal 2xxx through 9FFF)
uuuu = Unit specific data
ZZZZ = Reserved
94xx = AS/400 machine type (for example, 9404)
mmm = AS/400 model number

Figure 4-3. Example of Stage 1 Hardware SRC records. This figure represents three SRC record formats; other formats exist.

Stage 1 Power and Control Panel SRC Formats

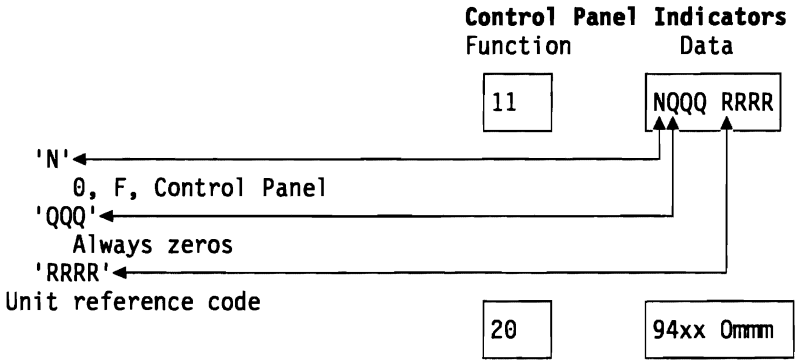


Figure 4-4. Example of Stage 1 Power and Control Panel SRC records

Stage 1 Licensed Internal Code and OS/400 SRC Formats

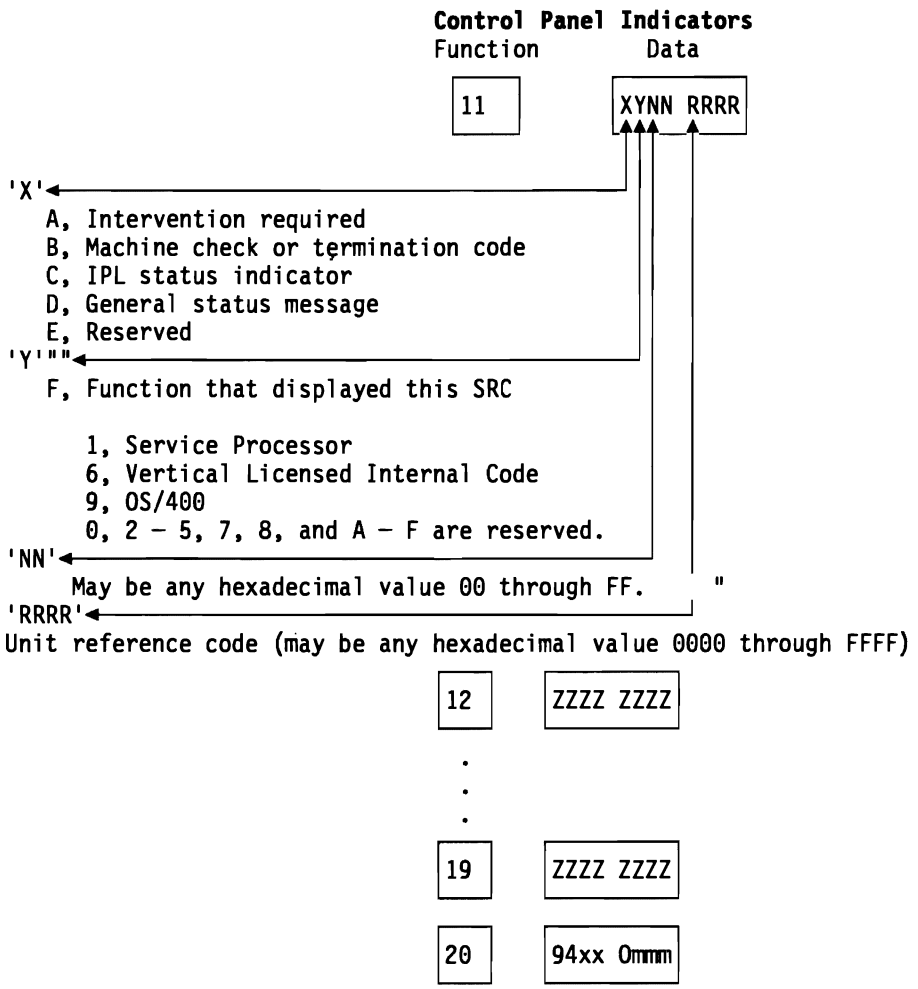


Figure 4-5. Example of Stage 1 Licensed Internal Code and OS/400 SRC records

Stage 2 System Reference Code (SRC) Definition

On Stage 2 systems, word 11 is the 8-digit SRC (example: xxxx xxxx), and is used throughout the maintenance package during problem analysis.

The SRC structure for Stage 2 systems provides more information about the machine at the time of the failure. The following are included with Stage 2 systems:

- The system reference code record is made up of words 11 through 20.
- The unit reference code is always located in the right half of Function 11-2.
- General system condition information is shown in Function 12-2.
- The unit address is shown in 8 digits instead of 4.
- The SRC function number contains a *-2* to show the Stage 2 structure.

Figure 4-6. Stage 2 SRC Structure

Function	Description
5	Displays a power reference code. Only available on systems with SPCN. Use Figure 4-9 on page 4-9 to interpret the power reference code.
11-2	The 4 leftmost characters displayed describe the unit reporting the error. The 4 rightmost characters are the unit reference code.
12-2	Displays general system state information.
13-2 through 19-2	Displays additional information about the failure, such as location of the unit, sense data, and serial number.
20	Displays machine type and model number.

Stage 2 Hardware SRC Formats

Notes:

1. This figure represents three SRC formats; other formats exist.
2. For Functions 14-2 through 19-2, data may not be displayed for some SRCs.
3. For Function 20, data is always available. Select Manual mode.

IOP SRC Format 17		Device SRC Format 27		IOP SRC Format 13	
Function	Data	Function	Data	Function	Data
11-2	TTTT RRRR	11-2	tttt rrrr	11-2	TTTT RRRR
12-2	MIGV EP17	12-2	MIGV EP27	12-2	MIGV EP13
13-2	ZZZZ BBCb	13-2	ZZZZ BBCb	13-2	ZZZZ BBCb
14-2	@@@@ @@@@	14-2	@@@@ @@@@	14-2	@@@@ @@@@
15-2	TTTT LMMM	15-2	tttt lmmm	15-2	TTTT LMMM
16-2	tttt lmmm	16-2	TTTT LMMM	16-2	uuuu uuuu
17-2	ZZZZ rrrr	17-2	ZZZZ RRRR	17-2	uuuu uuuu
18-2	ssss ssss	18-2	ssss ssss	18-2	uuuu uuuu
19-2	uuuu uuuu	19-2	uuuu uuuu	19-2	uuuu uuuu
20	94xx mmmm	20	94xx Qmmm	20	94xx 0mmm

@@@@ = Unit address
BBCb = Bus, bus, card, and board address (direct select address)
lmmm = Level indicator plus 3-digit model number of failing device
LMMM = Level indicator plus 3-digit model number (for example, 6100 or 6150)
M = Main storage dump indicator
rrrr = Outboard failing unit reference code
RRRR = Unit reference code
ssss = Serial number of failing unit
tttt = Outboard failing unit type number (for example, 9335)
TTTT = Type number or card identification number (hexadecimal 2xxx through 9FFF)
uuuu = Unit specific data
V = Additional SRC information exists
ZZZZ = Reserved
94xx = AS/400 machine type (for example, 9406)
mmmm = AS/400 model number
MIGV EP = general system status (see Function 12-2 System Status Information)

Figure 4-7. Example of Stage 2 Hardware SRC records. This figure represents three SRC record formats; other formats exist.

Stage 2 Control Panel Format

Control Panel Format

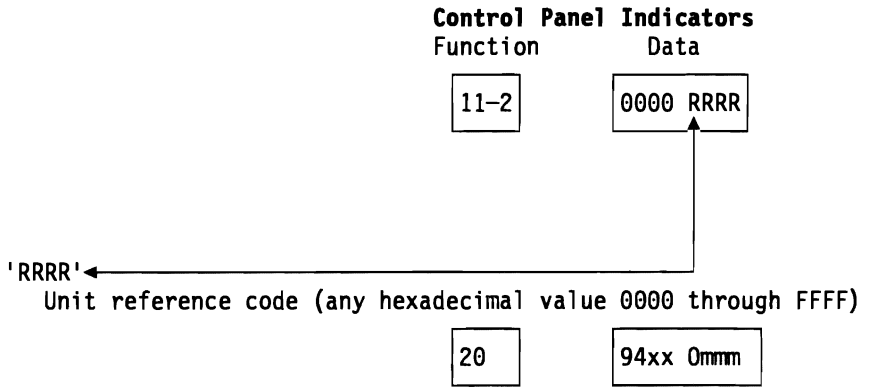


Figure 4-8. Example of Stage 2 Control Panel SRC records

Stage 2 Power Format

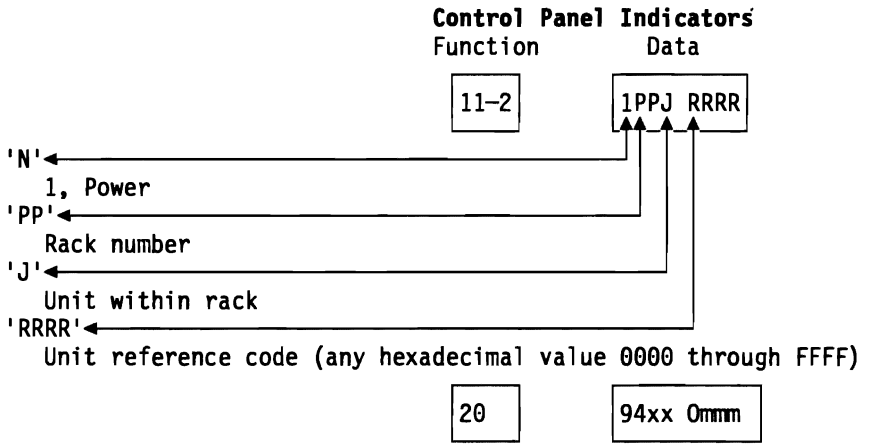


Figure 4-9. Example of Stage 2 Power SRC records

Stage 2 Licensed Internal Code and OS/400 SRC Formats

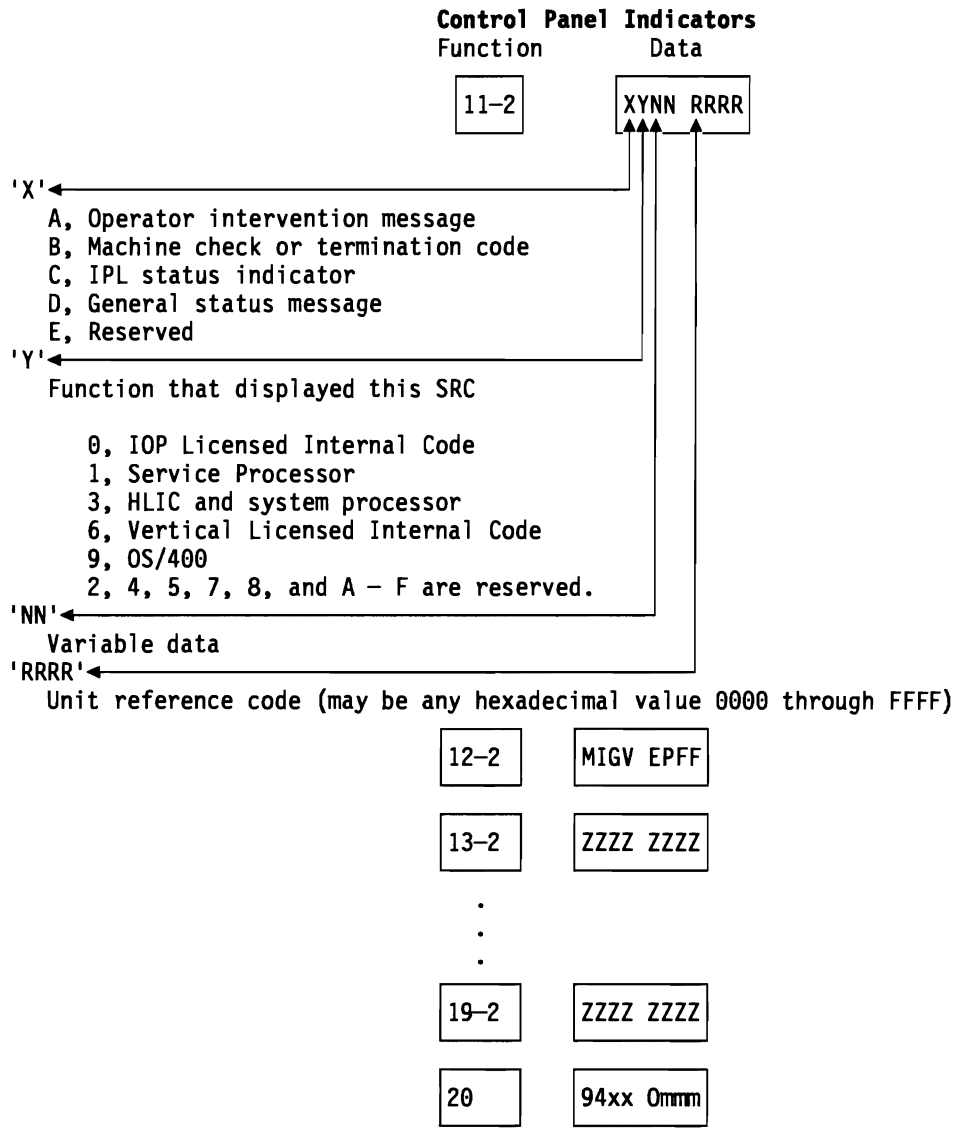


Figure 4-10. Example of Stage 2 Licensed Internal Code and OS/400 SRC records

Function 12-2 System Status Information

Function 12-2 provides a fixed location for information common to all SRCs shown on the control panel. It is available for all Stage 2 SRC formats except power and control panel. This information is provided by the service processor at the time the SRC is displayed to the panel. Figure 4-11 shows the contents of Function 12-2.

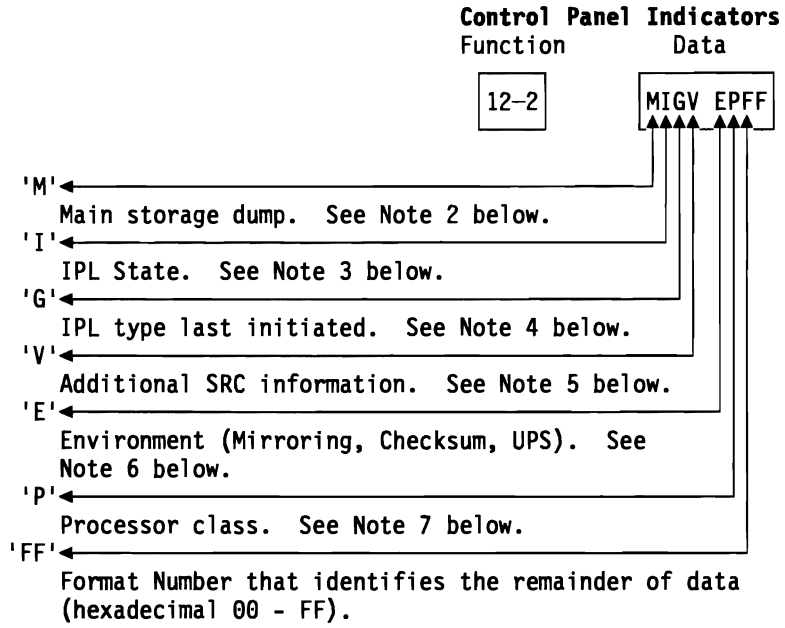


Figure 4-11. Structure of Fixed Data in Function 12-2

Notes:

1. This data is not provided on Stage 1 hardware.
2. For coding of M, **Main storage dump** indicator, see "Main Storage Dump Indicator (M)" on page 4-12.
3. For coding of I, **IPL state** indicator, see "IPL State Indicator (I)" on page 4-12.
4. For coding of G, **IPL type last initiated** indicator, see "IPL Type Last Initiated Indicator (G)" on page 4-12.
5. For coding of V, **Additional SRC information** indicator, see "Additional SRC Information Indicator (V)" on page 4-13.
6. For coding of E, **Environment** indicator, see "Environment Indicator (E)" on page 4-14.
7. For coding of P, **Processor class** indicator, see "Processor Class Indicator (P)" on page 4-14.

Main Storage Dump Indicator (M): The first hexadecimal digit displayed in Function 12-2 indicates whether a main storage dump was started and if it was successful. The indicator has the following meanings.

Hex Digit	Description
0	**No Main Storage Dump Requested**
1 - 7	**Requested Dump Was Successful**

Hex Digit	Description
1	Hardware dump successful
2	MCLB dump only successful
3	Hardware and MCLB dump successful
4	Main storage dump only (VLIC) successful
5	Reserved
6	MCLB and main storage dump successful
7	Full dump successful
8	Wrote to DASD, then failed; some data written for debug

Hex Digit	Description
9 - F	**Requested Dump Failed; No Data Written**

Hex Digit	Description
9	Hardware dump failed; no debug data exists
A	MCLB dump only failed; no debug data exists
B	Hardware and MCLB dump failed; no debug data exists
C	Main storage dump only (VLIC) failed; no debug data exists
D	Reserved
E	MCLB and main storage dump failed; no debug data exists
F	Full dump failed; no debug data exists

IPL State Indicator (I): The second hexadecimal digit displayed in Function 12-2 indicates how far the IPL went on before the SRC was displayed. The indicator has the following meanings.

Hex Digit	IPL State Description
0	IPL from ROS in progress
1	IPL from RAM is running
2	Service processor task initialized
3	HLIC initialization completed
4	Operational load of VLIC complete
5	Bus manager initialized
6	Main storage initialization complete
7	Load-source DASD connection established
8	DST or limited paging available
9	Storage management directories verified
A	Authority structures verified
B	Indexes verified
C	Data base verified
D	VLIC handoff to OS/400
E	IPL complete to sign on screen
F	Power off attempted

IPL Type Last Initiated Indicator (G):

The third hexadecimal digit displayed in Function 12-2 indicates the IPL type (IPL mode and environment) of the last IPL performed, or the IPL running at the time of the failure. The IPL type is coded as shown in the following matrix.

A *Power-on IPL* (first row in the table) includes the IPL that occurs automatically when the main power switch is turned on or when power is started after a power failure. It also includes an IPL started by the timer and a remote IPL started by a communication line. A *Programmed IPL* is an IPL resulting from the PWRDWNSYS command with Restart=Yes specified. A *Function 3 IPL* is started by selecting Function 03 on the control panel and pressing the Enter key.

Selecting IPL types A or B (type C is reserved) with Function 02 causes an IPL from different areas on the load-source DASD. IPL type D is from the alternative load-source device, normally a tape.

Figure 4-12. IPL Type Indicator

IPL Environment	IPL Type A	IPL Type B	IPL Type C	IPL Type D
Power-on IPL	A	B	C	D
Programmed IPL	1	2	3	4
Function 3 IPL	5	6	7	8
Unknown IPL type	0	0	0	0

Additional SRC Information Indicator (V): The fourth hexadecimal digit displayed in Function 12-2 indicates that additional information is available that might be important in determining the cause of the failure. Four types of additional data are identified:

1—Service Processor Communications Area (SPCA).

The SPCA may contain additional SRCs from the system processor which were not displayed on the control panel because they were not terminating errors. The whole SPCA may be displayed by using Function 56. Go to "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information on how to use Function 56.

2—Service Processor Log Buffer (SPLB).

The SPLB may contain additional SRCs pertaining to mirrored DASD which were not displayed on the control panel because they were not terminating errors. These SRCs may be related to the terminating SRC, which is displayed. The whole SPLB may be displayed by using Function 55. Go to "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information on how to use Function 55.

4—IPL Message Area

The IPL message area may contain AER (Asynchronous Error Report) records, sent from an IOP during the IPL but not displayed on the control panel as SRCs because they were not terminating errors. These AERs may be related to the terminating SRC, which is displayed. The whole IPL message area may be displayed by using Function 57. Go to "Low Level Debug and Data Collecting Procedures" on page 2-5 for more information on how to use Function 57.

8—IOP Dump Taken

An IOP dump may be started by the multiple function IOP (self dump) or requested by VLIC. In either case, if the code in this digit indicates that an IOP dump has been written to a disk, the dump can be found in SID 87. Go to "Copying the IOP Storage Dump to Tape or Diskette" on page 8-11 if this code indicates that the IOP dump has been written.

Any combination of these data areas may contain useful information. Therefore the *V* digit of Function 12-2 is coded as follows:

Figure 4-13. Additional SRC Information Indicator

Hex Digit	IOP Dump	IPL Msg Function 57	SPLB Function 55	SPCA Function 56
0				
1				X
2			X	
3			X	X
4		X		
5		X		X
6		X	X	
7		X	X	X
8	X			
9	X			X
A	X		X	
B	X		X	X
C	X	X		
D	X	X		X
E	X	X	X	
F	X	X	X	X

Environment Indicator (E): The fifth hexadecimal digit displayed in Function 12-2 indicates the system environment, that is, whether DASD mirroring or checksums are being used and whether a back-up power source is being used.

Figure 4-14. Environment Indicator

Hex Digit	Environment
0, 8	Environment is unknown. DASD protection is unknown.
1, 9	No mirroring or checksums. No DASD protection. No checksummed or mirrored ASPs.
2, A	System ASP is mirrored. Partial DASD protection. At least 1 user ASP that is not mirrored. No checksummed user ASPs.
3, B	All DASD is mirrored. Complete DASD protection. System ASP and any user ASPs are mirrored.
4, C	Some DASD is mirrored, some is checksummed. At least partial DASD protection. System ASP is not mirrored. At least 1 user ASP is mirrored. At least 1 ASP is checksummed.
5, D	Some DASD is checksummed, none is mirrored. At least partial DASD protection. At least 1 ASP is checksummed. No mirrored ASPs.
6, E	System ASP is mirrored, some DASD is check-summed. At least partial DASD protection. At least 1 ASP is checksummed.
7, F	Some mirrored user ASPs. Partial DASD protection. System ASP is not mirrored. At least 1 user ASP is mirrored. No checksummed ASPs.

Note: Hexadecimal codes 0 through 7 indicate normal power. Hexadecimal codes 8 through F indicate UPS or battery backup is in use.

Processor Class Indicator (P): The sixth hexadecimal digit displayed in Function 12-2 indicates the type of processor. The indicator has the following meanings.

Figure 4-15. Processor Class Indicator

Hex Digit	Processor Class
0	Unknown
1	9402 System Unit
2	9404 System Unit
3	9406 System Unit, Model D35/D45, E35/E45, and F35/F45
4 - 8	9406 System Unit, Models D50, E50, F50, and above
9 - F	Reserved

How SRC Information Is Displayed in the Operating System/400

For specific hardware errors, Vertical Licensed Internal Code informs the Operating System/400 program of the failure. The Operating System/400 program records this information in the problem log and sends a message to the system operator's message queue. The operator sees the following:

Message
Short description of the failure

Additional message information (help)
Recovery actions to be performed by customer

The message is displayed using the DSPMSG QSYSOPR command. When the message or the help information has problem analysis procedures, press F15 (Work with problem). The SRC associated with the message is displayed.

Chapter 5. Initial Program Load Information

Initial Program Load (IPL) Summary

The IPL consists of five steps:

1. Service processor performing power-on tests and loading control storage and main storage
2. Horizontal Licensed Internal Code initialization
3. Vertical Licensed Internal Code initialization
4. Performing the machine-to-program transition
5. Installing or starting the OS/400 program

System Values

System values are control information that affect the operation of some parts of the system. You can display or change system values either after an IPL or during an IPL. For more information on displaying or changing system values *after* an IPL, see "WRKSYSVAL Command" on page 1-80.

To change system values *during an IPL*, set the *Define or change system at IPL* option to Y (yes) on the IPL Options display. Then, select the *System values commands* option from the Define or Change the System at IPL display.

System Value **Description**

QIPLTYPE — Indicates the type of IPL. This value is valid only when Normal mode is selected.

The following values may be specified.

Value	Meaning
0	No Use Dedicated Service Tools (DST) menu is displayed. Perform an IPL in unattended mode. This is the shipped default value.
1	The DST menu is displayed. Perform an IPL in attended mode.
2	The DST menu is displayed. Perform an IPL in attended mode. QCONSOLE is not varied off and the system remains in restricted condition.

IPL Mode Options: The IPL mode is selected in several ways depending upon the system and model type:

- If the control panel has a keylock, the keylock controls the IPL modes. A keylock gives the operator security control over the functions which may be activated or deactivated from the control panel and control over data which may be accessed from the control panel. There are two types of keylocks available.
  - rotary mechanical - uses a metal key to activate lock
  - electronic - uses an electronic circuit card (keystick) to activate the Select, Increment (↑), or Decrement (↓) switches

  The keylock allows you to choose one of the following IPL mode values:

Manual	DST menu is displayed. Perform an IPL in attended mode. Enables the Delayed Power Off switch.
Normal	Perform an IPL according to the value of QIPLTYPE.
Secure	Locks the control panel on the system unit.
Auto	Most control panel functions are locked. Automatic IPLs are allowed.

- If the control panel does not have a keylock, use the Increment (↑), or Decrement (↓) switch to select control panel Function 02. Function 02 allows you to select an IPL mode of Manual (M) or Normal (N). Manual and Normal are the only modes available.

IPL Types: The type of IPL is displayed using control panel Function 01 and can be set using control panel Function 02.

A	Normal disk IPL using copy A of the system Licensed Internal Code.
B	Normal disk IPL using copy B of the system Licensed Internal Code.
C	Reserved
D	Alternate IPL from tape. Used for code install and restore.

Notes:

1. If the system does not have a keylock on the control panel, Function 02 allows you to select eight possible combinations of IPL modes and types. Types A, B, C, and D can be selected in Manual (M) mode in Normal (N) mode.
2. For more information on IPL options, see "General Information" on page 1-50, the *System Operation* information, the *System Startup and Problem Handling* information, or the *Diagnostic Aids – Volume 1* information.

IPL Environments	Description
POR	Power on reset IPL. The system was powered off and powered on. During the power on, all hardware runs diagnostic tests.
F03	Control panel Function 03 starts a Load IPL. This differs from a POR IPL because no power off and power on sequence is done. This means a system shut down is not performed and not all hardware diagnostics are performed during the IPL. IOPs are reset using a software POR equivalent (UR-D/IR-D).
Programmed IPL without parameters	This IPL is started by the operating system. An example of this is the command PWRDWNSYS IMMED RESTART(*YES). This is similar to a Function 03 IPL except that a system shut down is performed.
Programmed IPL with parameters	This IPL is started by the Licensed Internal Code. It is directed to a specific load-source disk unit. This is used during installs and for IPL failures that can be directed to a mirrored load-source disk unit.
Remote power on	This IPL is started from a remote location (using a modem) if the system value QRMTIPL is set to 1. Normal or Auto mode must be selected and the system power must be turned off.
Automatic restart	This IPL is started automatically after a power failure if the system value QPWRRSTIPL is set to "1." Normal or Auto mode must be selected.
Power on by date/time	This IPL is started by an internal clock. Normal or Auto mode must be selected.

Problems During an IPL

Figure 5-2 on page 5-5 shows the sequence of events that occur during an IPL. For more information on attended and unattended IPLs, see the *System Operation* or *System Startup and Problem Handling* information.

Attended IPL: Errors detected before 1 are displayed on the control panel lights. To analyze these errors, go to the "Starting Point for All Problems" in the system *Problem Analysis* information to start problem analysis.

If a VLIC intervention screen appears before 1, go to "VLIC-PIP Display Examples" in the system *Problem Analysis* information.

For system errors that occur while using the Use Dedicated Service Tools (DST) display or while installing the operating system, go to the "Starting Point for All Problems" in the system *Problem Analysis* information to start problem analysis.

Device errors detected while using the Use Dedicated Service Tools (DST) display and while installing the operating system are shown on a separate error message display. Follow the instructions on the display.

Unattended IPL: Serious path errors detected before 2 are displayed on the control panel lights.

Path errors that are not serious are recorded in the problem log, the error log, and the message handler. Look at the message handler after the sign-on is completed.

The status of IPL at 3 is displayed on the control panel lights. Figure 5-1 shows that most problems that occur during an IPL are machine checks. Machine checks are shown on the control panel as SRCs.

For analyzing IPL problems, it is important that the correct information be collected. Normally, the hardware service representative collects information concerning error conditions that could not be corrected by completing a procedure or by exchanging a part. A copy of the system SRC trace is useful for an IPL failure. See "Recording Status SRCs" on page 2-5 for more information.

Figure 5-1. System Reference Codes on the Control Panel

Machine problems	0xxx xxxx through 9xxx xxxx	Machine error
	1xxx xxxx	Power problem (Stage 2 systems)
	B0xx xxxx	IOP common code
	B1xx xxxx	Service processor machine checks
	B3xx xxxx	System processor and HLIC machine checks
	B6xx xxxx	Vertical Licensed Internal Code machine check
	B9xx xxxx	OS/400 machine check
Normal operations	A1xx xxxx	Operation interruption by service processor
	A6xx xxxx	Operation interruption by VLIC
	A9xx xxxx	Operation interruption by OS/400
	C1xx xxxx	IPL status for the service processor
	C3xx xxxx	IPL status for the system processor
	C6xx xxxx	IPL status for Vertical Licensed Internal Code
	C600 4260	IPL status after abnormal power-off
	C900 xxxx	IPL status for OS/400 program
Other	D1xx xxxx	General status for the service processor
	D6xx xxxx	Stand-Alone Utility and run-time status for Vertical Licensed Internal Code

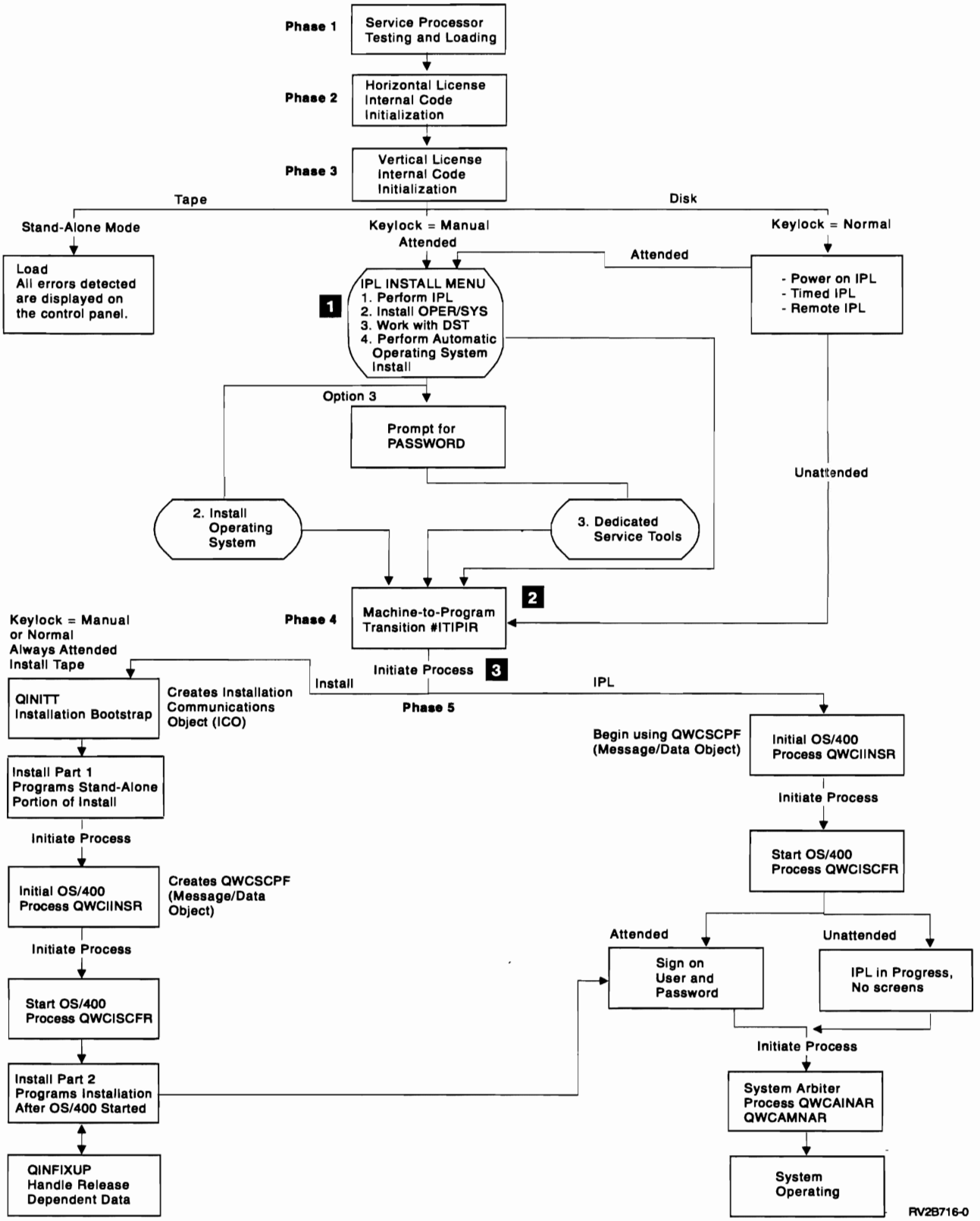


Figure 5-2. Initial Program Load (IPL) Sequence

IPL Sequence

Service Processor Initialization:

Functions Performed:

The following list is a high-level description of the functions performed by the service processor during an IPL:

1. The service processor starts by running the hardware diagnostic routines to verify the service processor's own hardware.
2. The service processor obtains the necessary code (software) from the load source (disk or tape) to load itself and control the remainder of the IPL.
3. The service processor runs hardware diagnostic routines on the system processor and loads a series of Horizontal Licensed Internal Code diagnostic routines into the processor unit control storage.
4. Horizontal Licensed Internal Code diagnostic routines run their diagnostic tests, then request that the service processor load the run-time Horizontal Licensed Internal Code into the processor unit control storage and Vertical Licensed Internal Code information into main storage.
5. The service processor loads the run-time Horizontal Licensed Internal Code and Vertical Licensed Internal Code. When Horizontal Licensed Internal Code initialization is complete, the service processor starts the processing unit, which causes Vertical Licensed Internal Code initialization (performed by tasks that are on the task dispatching queue) to start.

What Is Initialized: The following data areas are initialized by the service processor during an IPL:

- Bus 0 I/O configuration table
- Bus 0 IOP message save area
- IPL parameters
  - IPL mode
  - Switch setting
  - Power control status
  - Power-on cause
- System vital product data (VPD)
- Time of day

Abnormal Ending: The service processor ends an IPL when a condition is detected that prevents the base machine from doing work. If an IPL is ended, an SRC is shown on the control panel and the System Attention light goes on. The SRC indicates the failing condition.

Horizontal Licensed Internal Code (HLIC) Initialization

Control Functions: Horizontal Licensed Internal Code is in control storage starting at address hexadecimal 0001.

Input Descriptions: Input descriptions are contained in a control address table that is located at virtual or real address hexadecimal 8000 0000 0000.

Functions Performed: The following list is a high-level description of the functions performed by Horizontal Licensed Internal Code during an IPL:

1. Horizontal Licensed Internal Code sets the internal processing unit registers and arrays necessary to run Licensed Internal Code using data that is in the main storage reference data in data function of the control address table.
2. When initialization is complete, Horizontal Licensed Internal Code signals the service processor of the event.
3. Horizontal Licensed Internal Code enters the disabled state (task dispatcher is disabled). Once the service processor starts the processing unit, the earlier constructed queue is made ready. The Horizontal Licensed Internal Code then does its normal work-time functions.

Abnormal Ending: Horizontal Licensed Internal Code ends an IPL when a condition is detected that prevents the machine from doing work. In this case, the machine check status is detected by the service processor, and the service processor sends the correct SRC to the control panel.

The SRC displayed on the control panel consists of 12 bytes. The 4 leftmost bytes of the SRC indicate the type of Licensed Internal Code. For example:

Licensed Internal Code Type	SRC
Horizontal Licensed Internal Code	B3xx
Vertical Licensed Internal Code	A6xx, B6xx, C6xx, D6xx

Note: xx is a 2-digit modifier which supplies more information on the failing unit.

Conditions that cause Horizontal Licensed Internal Code initialization to fail are:

- Horizontal Licensed Internal Code hangs (loops or waits), causing a Horizontal Licensed Internal Code initialization time-out. The processor gives control to the service processor which, in turn, ends the IPL.
- Bad data in the control address table.

  The control address table is located at virtual or real address hexadecimal 8000 0000 0000.
- Horizontal Licensed Internal Code that is not compatible with the control storage.

  Some of the Horizontal Licensed Internal Code is in main storage in an area known as the Horizontal Licensed Internal Code overlay area. If this code is not compatible with resident code in control storage, the IPL may end during the Horizontal Licensed Internal Code initialization phase.
- Bad data on file.

  If bad data is not detected when read from the file but is detected by the Horizontal Licensed Internal Code initialization routine, the IPL ends with an SRC. If bad data is on the file, the main storage before IPL should be written to tape or diskette using main storage dump (Function 22) on the control panel. The Licensed Internal Code must be installed again to correct this problem. If the system does not complete an IPL after initializing the Licensed Internal Code again, the QFILEMCD file on the Licensed Internal Code tape is bad. The Licensed Internal Code tape is made by the Save System (SAVSYS) command.
- Hardware errors.

  If hardware errors occur during the Horizontal Licensed Internal Code initialization step, the IPL ends with a hexadecimal 1016 machine check or hexadecimal 8039 unit reference code (URC). If the hardware error is associated with the file, the Licensed Internal Code may need to be installed again. Use the stand-alone utility program to install the Licensed Internal Code again.

Vertical Licensed Internal Code (VLIC) Initialization

Error Logging: On the AS/400 system unit, error logging is a function of Vertical Licensed Internal Code and starts during Vertical Licensed Internal Code initialization. Vertical Licensed Internal Code parts can send error records to the error log. Vertical Licensed Internal Code input/output managers do much of the error machine check controlling.

The I/O processors also have the ability to send data into the error log. Error records from the I/O processors are processed by the Reliability and Serviceability (RAS) Focal Point Common Class I/O Manager Task in Vertical Licensed Internal Code. The following are the types of error records that come from the I/O processor:

Asynchronous Error Report: This is a "bus level" record and is used when the I/O processor has detected a critical failure. The asynchronous error report is used when the I/O processor cannot communicate with Vertical Licensed Internal Code or the service processor.

Error Notification Record: This is an error record that is reported to the system from the I/O processor after the RAS connections have been done.

Log Information Record: This is an information-only record reported to the system after the RAS connections have been done. The information records (statistics) are logged as error log information.

The following list describes the attributes of the AS/400 system unit error log:

- Permanent errors that do not stop the system
- Machine check data when available on the next IPL (if power was not switched off before doing the next IPL)
- Any temporary errors necessary for problem analysis

- Data in multiple formats
- RAS error information and bus level asynchronous error report
- Some dumps and trace data
- Volume information (statistics) data records

A formatted printout of the error log records is available by using the Print Error Log (PRTERRLOG) system command or by using the *Error log utility* option under Dedicated Service Tools or System Service Tools.

Initialization Output: The output generated from the Vertical Licensed Internal Code initialization function consists of:

- Machine status information saved in the machine initialization status record (MISR).
- Status codes for an initial program load displayed on the control panel for long-running IPL functions. See *Diagnostic Aids – Volume 1* for these displayed functions.
- Error log and Vertical Licensed Internal Code log information needed by service personnel to service the machine.

Input Descriptions:

- Preceding stopped data
- Bad page table

Functions Performed: See "IPL Status SRC Sequence" on page 5-9 for information that is displayed on the control panel during an IPL.

Abnormal Ending: At any point in the Vertical Licensed Internal Code initialization phase, errors that end machine processing during an IPL can occur. If this occurs, error indicators are set to the data function. The machine check error log buffer (MCLB), Vertical Licensed Internal Code log or the error log contain information about the condition that caused the ending.

If the system enters a wait or loop, the diagnostic mode is used to determine the cause of the wait or loop.

If a power failure occurs and the Power Warning feature is installed, verify that the system is on utility power (must be verified with the customer because the source is beyond the AS/400 connection to power).

Information concerning the Power Down System (PWRDWNSYS) system command can be found in the *System Operation* or *System Startup and Problem Handling* information. The information concerning system values that control IPL may also be an aid in diagnosing IPL failures.

The critical Vertical Licensed Internal Code initialization functions operate under a task. The address to the task's dispatching element can be located as follows:

- Stand-Alone Dump: The Vertical Licensed Internal Code initialization task may be located by searching the task dispatching element chain. If the task cannot be located, the Vertical Licensed Internal Code function has completed, and the task has been destroyed.

The first AS/400 process job is started during an IPL by the IPL service function. This process performs the remaining Vertical Licensed Internal Code initialization and recovery functions and also the machine-to-programming transition. The task associated with this process has the following attributes:

- Does not contain OS/400-defined job functions
- Does not appear at the AS/400 interface
- Occurs only during an IPL
- Starts the first AS/400 user process (job) using an IPL or alternate initial program load
- Has no task name

IPL Status SRC Sequence

While the system is doing an initial program load (IPL), system reference codes (SRCs) appear on the control panel. The SRCs indicate the current status sequence of SRCs.

Note: The system unit power supply, control panel, and primary rack power supply are operational before the first status SRC is displayed. Also, each IOP runs ROS BATs (Basic Assurance Tests). The service processor also runs ROS BATs, and status is displayed on the control panel.

All hardware does a Power-On Self Test (POST) at initial power on.

IPL Status	Function Performed
C1xx Bxxx	Basic assurance tests on service processor hardware
C1xx 1008	Service processor ROS searching for RAM load.
Service processor has completed BATs. Now it needs to partially IPL bus 0 and get the load-source IOP initialized. The IOPs will run their BATs again as part of bus 0 initialization (BATs are run a second time so that I/O device BATs are also completed).	
C1xx 1xxx	Loading service processor LIC
Both the service processor and the load-source device are operational. Now the service processor can start loading the system processor.	
C1xx 5010	Service processor testing system processor hardware, Stage 1
C3xx 3xxx	Service processor testing system processor hardware, Stage 2
C1xx 2xxx	Service processor loading system processor LIC
C1xx 202E	HLIC BATs performing system main storage tests
C100 D009	HLIC initialized, VLIC running initialization
C100 2034	VLIC initialized, control passed to VLIC
Both the system processor and the system main storage are operational. Now the VLIC can start initializing the system.	
C6xx 1800	VLIC SPCN setup
C6xx 400x	VLIC storage management and bus manager initialization
C6xx 41xx	VLIC bus manager performs an IPL on all IOPs on all buses.
C6xx 401x	VLIC Resource, exception and event management initialization
C6xx 430x	CCIOM task initialization
At this point an attended IPL will display the IPL or Install the System display. From the display, the hardware service representative can select the *Use dedicated service tools (DST)* option. The remaining SRCs are displayed when the IPL to OS/400 is started.	
C600 4021	VLIC Storage Management Recovery
C600 4210	VLIC subset checksum validation
C600 4220	VLIC completion of checksum configuration
C600 4230	VLIC checksum device recovery
C600 4240	VLIC reclaim main storage
C600 4250	VLIC subset directory recovery
C600 4260	VLIC storage management reading disk devices, directory recovery
C600 4270	VLIC validation of checksum data
C600 4272	VLIC user ASP overflow recovery
C600 4275	VLIC move extents off of load source
C600 4280	VLIC allocate main storage dump space
C600 4282	VLIC verify directories
C600 4022	VLIC start VLIC log
C600 4023	VLIC context rebuild
C600 4024	VLIC start error log and APPN
C600 4025	VLIC authority recovery
C600 4026	VLIC journal recovery
C600 4027	VLIC database recovery

IPL Status	Function Performed
C600 4028	VLIC journal synchronization
C600 4029	VLIC commit recovery
C600 4030	VLIC database initialization
C600 4031	VLIC journal IPL cleanup
C600 4032	VLIC commit initialization
C600 4036	VLIC start the operating system
VLIC initialization is complete and OS/400 is started. **All hardware is verified.**	
C900 2810	OS/400 reclaim machine context
C900 2820	OS/400 resolve system objects
C900 2830	OS/400 system value object
C900 28C0	OS/400 prepare SCOF job
C900 2910	OS/400 library and OIR cleanup
C900 2920	OS/400 start system logging
C900 2930	OS/400 database cross reference
C900 2940	OS/400 console configuration
C900 2950	OS/400 install complex objects
C900 2960	OS/400 log on processing
C900 2970	OS/400 database, journal commit
C900 2980	OS/400 storage requirements
C900 2990	OS/400 performance adjustments
C900 29A0	OS/400 system control block
C900 29B0	OS/400 spool initialization
C900 29C0	OS/400 write control block table
C900 2A80	OS/400 start system arbiter
C900 2B10	OS/400 start even monitors
C900 2B20	OS/400 resource manager
C900 2B30	OS/400 QLUS job
C900 2B40	OS/400 device configuration
C900 2C10	OS/400 after system arbiter
C900 2C20	OS/400 office recovery
C900 2C30	OS/400 SNADS recovery
OS/400 initialization is complete and the sign on screen is displayed on the system console.	

Alternate IPL Test

Description

This test is for service representatives who are using the Alternate IPL Test to help analyze problems or save customer data when the system cannot perform an initial program load (IPL) to dedicated service tools (DST) because of a load-source disk unit problem.

The Alternate IPL Test tape has the following part numbers:

- 1/4-inch cartridge uses part number 17G4094.
- 1/2-inch reel uses part number 17G4092.
- 1/2-inch cartridge uses part number 17G4093.
- 8-mm cartridge uses part number 17G4095.

Alternate IPL Test is a utility program, loaded from tape, that provides the following functions for bus 0.

- Display Bus 0 Configuration

  Displays all I/O processors and devices attached to bus 0 (see "Display Bus 0 Device Configuration" on page 5-15 for the procedure to use this function).

- Alternate IPL Test Copy Options

  Note: If you were instructed to use the Alternate IPL Test from the system *Problem Analysis* information or are trying to correct a system problem, see "Starting Point for System Problems" in this section. This procedure will send you to the correct copy option to use.

- Disk Device to Disk Device: Copies data from one disk device to another disk device (see "Disk Device to Disk Device" on page 5-15 for the procedure to use this function).
- Disk Device to Tape: Copies data from a disk device to a tape unit (see "Disk Device to Tape" on page 5-15 for the procedure to use this function).
- Tape to Disk Device: Copies data from a tape unit to a disk device (see "Tape to Disk Device" on page 5-15 for the procedure to use this function).

- Disk Device Utility
  - Initialize: Initializes a disk device (see "Initialize" on page 5-16 for the procedure to use this function).
  - Scan Disk Device: Scans a disk device for errors (see "Scan Disk Device" on page 5-16 for the procedure to use this function).
- Display System SRC

  Displays SRCs that occurred since the start of an IPL from the Alternate IPL tape (see "Display System SRC" on page 5-16 for the procedure to use this function).
- Reset IOP on bus 0

  Sends a reset command to an IOP on Bus 0 (see "Reset IOP on Bus 0" on page 5-16 for the procedure to use this function).

Starting Point for System Problems

Note: Help displays are available for most Alternate IPL Test displays.

1 Is auxiliary storage pool (ASP) 1 of your system using mirrored protection or checksum protection?

No	Yes
↓	Go to "Starting Point for All Problems" in the *Problem Analysis* information.
	This ends the procedure.

2 Can you perform an IPL to DST?

No	Yes
↓	Go to "Starting Point for All Problems" in the *Problem Analysis* information.
	This ends the procedure.

3 Perform an IPL using the Alternate IPL Test tape by doing the following:

Note: Normal IPL status SRCs appear on the control panel during the IPL (see "Alternate IPL Test Status SRCs" on page 5-19 for a description of these SRCs).

a. Power on the system, the alternate IPL tape unit, and the disk units.

b. Load the Alternate IPL Test tape into the IPL tape unit (see "Tape Unit for an Alternate IPL" in the *Problem Analysis* information for details)

c. Perform a type D (tape) IPL.

Does the Alternate IPL Test display appear on the console?

No	Yes
↓	Go to step 7 of this procedure.

4 An SRC appears on the system control panel.

- C900 000x, C90x 0y05, C91x 0y05, C9A0 xxxx, and CBxx xxxx are normal Alternate IPL Test status SRCs, where x= any character and y= any character except 0 (see "Alternate IPL Test Status SRCs" on page 5-19 for a description of each SRC). A problem is indicated if the 6 rightmost characters do not change in 5 minutes. Correct the problem, then continue with step 5 on page 5-12 of this procedure.
- C9E2 xxxx, CAxx xxxx, and CExx xxxx are not normal status SRCs. Go to "Alternate IPL Test Unit Reference Codes" on page 5-18 for a description of the problem. Correct the problem, then continue with step 5 of this procedure.
- If you get any other SRC, go to the *Problem Analysis* information to determine the cause of the SRC. Correct

the problem, then continue with step 5 of this procedure.

5 After correcting the problem that caused the SRC, select Manual mode on the control panel and perform an IPL to DST.

Can you perform an IPL to DST?

No **Yes**

↓ Go to "Starting Point for All Problems" in the *Problem Analysis* information.

This ends the procedure.

6 Go to step 3 of this procedure to attempt another IPL from the Alternate IPL Test tape.

7 Press Enter to get the Alternate IPL Test Main Menu display.

8 Do you want to copy the load-source data from the failing disk unit (see the *Problem Analysis* information for how to find the load-source disk unit (unit 1))?

Yes **No**

↓ Although you do not want to copy the load-source data, you may want to use some of the other options on the Alternate IPL Test Main Menu display (see "Alternate IPL Test Functions" on page 5-15 for procedures to use these functions).

This ends the procedure.

9 Determine the number of unreadable sectors on the load-source disk using the scan function under the *Disk device utility* option (see "Scan Disk Device" on page 5-16 for the procedure to scan a disk).

Are a large number of sectors unreadable?

No **Yes**

↓ You may want to install the system instead of trying to save data (see "Licensed Internal Code Install and Restore Overview" on page 6-8).

This ends the procedure.

10 Do you want to copy the load-source data to another disk?

Yes **No**

↓ Perform the following to copy the load-source information to tape:

Note: Perform the following steps completely. Do not perform any other actions until all steps are completed.

a. Select *Copy options* from the Alternate IPL Test Main Menu display and follow the prompts to copy the load-source data to tape. If your disk enclosure has two units (actuators), the copy function must be done on each unit, one at a time (see "Disk Device to Tape" on page 5-15 for the procedure to copy from disk to tape).

b. Exchange the failing load-source disk unit (see the system *Repair and Parts* information or device service information for details on removing and installing a disk unit).

Note: If the new disk device does not become ready, there may be a Licensed Internal Code mismatch. No action is required. This will be corrected in later steps.

c. Select the *Disk device utility* option from the Alternate IPL Test Main Menu Display and follow the prompts to initialize the new load-source disk unit. If your disk enclosure has two units (actuators), the initialize function must be done on each unit, one at a time (see "Initialize" on page 5-16 for the

procedure to initialize a disk unit).

d. Select *Copy options* from the Alternate IPL Test Main Menu display and follow the prompts to copy the load-source data from the tape to the new load-source disk unit. If your disk enclosure has two units (actuators), the copy function must be done on each unit, one at a time (see "Tape to Disk Device" on page 5-15 for the procedure to copy from tape to disk).

e. Go to step 13 of this procedure.

11 Perform the following to copy the load-source data to another disk.

Note: Perform the following steps completely. Do not perform any other actions until all steps are completed.

a. Find a disk unit on bus 0 that is the same type and model as the load-source disk unit.

b. **Warning:** Be very careful when removing the disk enclosure. The disk enclosure you remove in this step is **not** the failing disk enclosure. You must remove it so you can install a new disk enclosure. Then you can copy the data from the failing load-source disk enclosure to the new disk enclosure. Later, you will reinstall the disk enclosure you remove in this step.

Remove a disk enclosure from the disk unit you found in step 11a.

c. Install a new disk enclosure in the empty position in the disk unit you found in step 11a (see the system *Repair and Parts* information or device service information for details on removing and installing a disk enclosure).

d. Select the *Disk device utility* option from the Alternate IPL Test Main Menu display and follow the prompts to initialize the new disk unit. If your disk enclosure has two units (actuators), the initialize function must be done on each unit, one at a time (see "Initialize" on page 5-16 for the procedure to initialize a disk unit).

e. Select *Copy options* from the Alternate IPL Test Main Menu display and follow the prompts to copy the data from the failing load-source disk unit (unit 1) to the new disk enclosure (see "Disk Device to Disk Device" on page 5-15 for the procedure to copy from disk to disk).

f. If the failing disk enclosure has two units (actuators), select *Copy options* from the Alternate IPL Test Main Menu display and follow the prompts to copy the data from the other unit (actuator) to the new disk enclosure. The other unit you are copying data from is **not** unit 1 (see "Disk Device to Disk Device" on page 5-15 for the procedure to copy from disk to disk).

g. Remove the failing load-source disk enclosure from the system (see the system *Repair and Parts* information or device service information for how to remove and install a disk enclosure).

h. Remove the new disk enclosure that you just copied the data to in steps 11e and 11f.

i. Install the new disk enclosure in the place from which you removed the failing load-source disk unit. This new disk enclosure contains the load-source disk unit.

Note: If the new disk unit does not become ready, there may be a Licensed Internal Code mismatch. No action is required. This will be corrected in later steps.

j. Reinstall the disk enclosure you removed in step 11b back into its original position.

12 **Restore** the Model-Unique License Internal Code to the new disk unit (see "Licensed Internal Code Install and Restore Overview" on page 6-8).

13 **Warning:** Perform a **restore operation of the Licensed Internal Code** in this step. If you perform an installation of the Licensed Internal Code, customer data will be destroyed.

Restore the Licensed Internal Code to the new disk unit (see "Licensed Internal Code Install and Restore Overview" on page 6-8).

14 Ensure that the serial number in the vital product data (VPD) matches the serial number on the disk unit by doing the following:

a. On the Use Dedicated Service Tools (DST) display, select the *Work with disk units* option.

b. Select the *Work with disk unit information* option.

c. Select the *Work with vital product data (VPD)* option.

d. Select unit 1.

e. Find the serial number on the disk unit. Verify that the displayed serial number matches the serial number on the disk unit. If the serial numbers do not match, type the correct serial number in the field supplied. Then press the Enter key.

15 Inform the customer that the OS/400 program must be restored (refer the customer to the section on restoring the OS/400 program and licensed programs in the *Backup and Recovery – Advanced*).

16 Inform the customer that there may be damaged objects.

Note: A damaged object may be identified by message CPI81xx. Use the Display Log (DSPLOG) command to display any messages in the history log (QHST).

17 If you copied the data from the failing load-source disk unit to a tape in step 10 of this procedure, do not use this tape again to restore data to the load-source disk unit. If you restore data to the load-source disk unit using this tape, all customer data will be destroyed.

This ends the procedure.

Alternate IPL Test Functions

Display Bus 0 Device Configuration:

Displays all I/O processors and devices attached to bus 0.

Select the *Display bus 0 device configuration* option from the Alternate IPL Test Main Menu display.

Alternate IPL Test Copy Options:

Disk Device to Disk Device: Copies data from one disk device to another disk device.

1. Select *Copy options* from the Alternate IPL Test Main Menu display.
2. Select the *Disk device to disk device* option from the Alternate IPL Test Copy Options display.
3. Select the disk unit you want the data copied from on the Alternate IPL Test Select DASD to Copy From display.
4. Select the disk unit you want the data copied to on the Alternate IPL Test Select DASD to Copy To display.
5. When the copy operation begins, the Alternate IPL Test Copy Utility Status display appears, showing the elapsed time and percent complete of the copy operation.
6. When the copy operation is complete, the Alternate IPL Test Copy Utility Results display appears, showing the sector status of the copied information and the total time of the copy operation.

   This ends the procedure.

Disk Device to Tape: Copies data from a disk device to a tape device.

1. Select *Copy options* from the Alternate IPL Test Main Menu display.
2. Select the *Disk device to tape* option from the Alternate IPL Test Copy Options display.
3. Select the disk unit you want the data copied from on the Alternate IPL Test Select DASD to Copy From display.
4. Select the tape unit you want the data copied to on the Alternate IPL Test Select Tape to Copy To display.
5. When the tape unit is ready, select the *Start* option from the Alternate IPL Test Tape Handling display.
6. When the copy operation begins, the Alternate IPL Test Copy Utility Status display appears, showing the elapsed time and percent complete of the copy operation.
7. When the copy operation is complete, the Alternate IPL Test Copy Utility Results display appears, showing the sector status of the copied information and the total time of the copy operation.

   This ends the procedure.

Tape to Disk Device: Copies data from a tape device to a disk device.

1. Select *Copy options* from the Alternate IPL Test Main Menu display.
2. Select the *Tape to disk device* option from the Alternate IPL Test Copy Options display.
3. Select the tape unit you want the data copied from on the Alternate IPL Test Select Tape to Copy From display.
4. Select the disk unit you want the data copied to on the Alternate IPL Test Select DASD to Copy To display.

5 When the tape unit is ready, select the *Start* option from the Alternate IPL Test Tape Handling display.

6 When the copy operation begins, the Alternate IPL Test Copy Utility Status display appears, showing the elapsed time and percent complete of the copy operation.

7 When the copy operation is complete, the Alternate IPL Test Copy Utility Results display appears, showing the sector status of the copied information and the total time of the copy operation.

This ends the procedure.

Disk Device Utility

Initialize: Initializes a disk device.

1 Select the *Disk device utility* option from the Alternate IPL Test Main Menu display.

2 Select the *Initialize* option from the Alternate IPL Test Disk Device Utility display.

3 Select the disk device you want to initialize on the Alternate IPL Test Select Bus 0 Disk Device to Initialize display.

4 Enter Y (Yes) on the Alternate IPL Test Confirm Initialize Utility display.

5 When the initialize operation begins, the Alternate IPL Test Initialize Utility Status Display appears, showing the elapsed time and percent complete of the initialize operation.

6 When the initialize operation is complete, the Alternate IPL Test Initialize Utility Results display appears, showing the active device during the initialize operation and any reference codes received during the initialize operation.

This ends the procedure.

Scan Disk Device: Scans a disk device for errors.

1 Select the *Disk device utility* option from the Alternate IPL Test Main Menu display.

2 Select the *Scan disk device* option from the Alternate IPL Test Disk Device Utility display.

3 Select the disk device you want to scan on the Alternate IPL Test Select Bus 0 Disk Device to Scan display.

4 Enter Y (Yes) on the Alternate IPL Test Confirm Scan Utility display.

5 When the scan operation begins, the Alternate IPL Test Scan Utility Status display appears, showing the elapsed time and percent complete of the scan operation.

6 When the scan operation is complete, the Alternate IPL Test Scan Utility Results display appears, showing the active device during the scan operation, any reference codes received during the scan operation, and the sector status of any sectors that had problems during the scan operation.

This ends the procedure.

Display System SRC: Displays SRCs that occurred since the start of an IPL from the Alternate IPL Test tape.

Select the *Display system SRC* option from the Alternate IPL Test Main Menu display.

Reset IOP on Bus 0: Resets an IOP on bus 0.

1 Select the *Reset IOP* option from the Alternate IPL Test Main Menu display.

2 Select the IOP you want to reset on the Alternate IPL Test Select IOP for Reset display.

3 Select the reset mode on the Alternate IPL Test Reset IOP Mode Selection display.

4 Enter Y (Yes) on the Alternate IPL Test Confirm IOP Reset display.

5 When the reset operation begins, the Alternate IPL Test IOP Reset Status display appears, showing the elapsed time of the reset operation.

This ends the procedure.

Alternate IPL Test Unit Reference Codes

Unit Reference Code	Description	Action
0002	IPL of load source failed	Ask your next level of support for assistance
0003	Initializing IPCF with load source failed	Ask your next level of support for assistance
0004	Initializing LID Manager failed	Ask your next level of support for assistance
0014	Load source not found	Check power to the load source, cables to the load source, and the address switches of the load source
0024	IPCF Open with load-source device failed	Ask your next level of support for assistance
0034	Load-source device not a valid load source	Check cables to the load source and the address switches of the load source
0044	General IORM failure with load source	Ask your next level of support for assistance
000A	Initializing Clock Manager failed	Ask your next level of support for assistance
000B	Initializing Console Manager failed	Ask your next level of support for assistance
001B	No workstation IOP found	Check the workstation IOP
002B	No display found	Ensure the workstation is powered on
003B	Second initialization message received	Ask your next level of support for assistance
004B	Read ASCII console display VPD failed	Ask your next level of support for assistance
005B	ASCII console display VPD has an unsupported device type	Ensure you are using the correct type of console.
006B	Load of translate tables for ASCII console display failed	Ask your next level of support for assistance
007B	Console display workstation IOP activate failed	Ask your next level of support for assistance
008B	Console display workstation IOP open connection failed	Ask your next level of support for assistance
009B	ASCII console display device activation failed	Ask your next level of support for assistance

C9E2 xxxx: These SRCs indicate that the alternate IPL failed, or there is a configuration problem.

The 4 rightmost characters (C9E2 **xxxx**) are the unit reference code. Read the description of the unit reference code in the following table. Then perform the action listed for that unit reference code. After the problem is corrected, go to step 7 on page 5-12 and follow the procedure. If you get this reference code again, ask your next level of support for assistance.

CAxx xxxx: These SRCs indicate an error in one of the IOPs.

The 4 rightmost characters (CAxx **xxxx**) are the unit reference code. The third and fourth characters from the left (CA**xx** xxxx) indicate the address of the IOP in bit format BBBA AAAA, where BBB is the bus number and A AAAA is the IOP logical address.

Exchange the failing item (see the *Repair and Parts* information for details on removing and installing a card). Then go to step 7 on page 5-12 and follow the procedure. If you get this reference code again, ask your next level of support for assistance

CExx xxxx: These SRCs indicate the alternate IPL failed. Go to step 7 on page 5-12 and follow the procedure. If you get this reference code again, ask your next level of support for assistance.

Alternate IPL Test Status SRCs

The following are IPL status SRCs shown on the control panel while an initial program load (IPL) is being done from the Alternate IPL Test tape.

IPL Status SRC	Description
C1xx Bxxx	Basic assurance tests (BATs) on service processor (SP) hardware
C1xx 1xxx	Loading service processor Licensed Internal Code
C1xx 5010	Service processor testing Stage 1 system processor hardware
C3xx 3xxx	Service processor testing Stage 2 system processor hardware
C1xx 2xxx	Service processor loading system processor Licensed Internal Code
C1xx 202E	HLIC BATs performing system main storage tests
C100 D009	HLIC initialized, Alternate IPL Test base started
C100 2034	System processor has control of IPL
C900 000A	Initializing Clock Manager
C900 0002	Invoking IPL of load source
C900 0003	Initializing IPCF with load source
C900 0004	Initializing LID manager
C900 000D	Loading the AXLT for ASCII workstation IOPs
C900 0005	Invoking IPL of bus 0
C90x 0105 C91x 0105	Bus walk in progress The third and fourth characters from the left are the IOP address. 0x indicates IOP addresses 00 to 0F, and 1x indicates IOP addresses 10 to 1F.
C90x 0B05 C91x 0B05	Waiting for Acknowledge to be set
C90x 0205 C91x 0205	Message Wrap IPL message being sent
C90x 0A05 C91x 0A05	Initiate Bus Tests sent
C90x 0305 C91x 0305	Get LID IPL message being sent
C90x 0405 C91x 0405	Initial self load IPL message being sent
C90x 0505 C91x 0505	Load from storage IPL message being sent
C90x 0E05 C91x 0E05	Waiting for operation load complete to be sent by the IOP
C90x 0905 C91x 0905	Request Load received
C90x 0C05 C91x 0C05	Reset Timeout received
C90x 0605 C91x 0605	Continue IPL message being sent
C90x 0D05 C91x 0D05	Waiting for Suspend to be reset

IPL Status SRC	Description
C90x 0705 C91x 0705	Bus unit init parms bus transport message (BTM) message being sent
C90x 0805 C91x 0805	Bus Configuration message set
C90x 0F05 C91x 0F05	Performing an IPL of an IOP again
CBxx xxxx	Indicates which IOP has not had an IPL
C900 000B	Initializing Console Manager
C9A0 xxxx	Loading base extensions
C900 0000	Alternate IPL Test base initialization complete

Chapter 6. Licensed Internal Code Information

Software Licensed Internal Code Summary

The AS/400 system units operate under the control of hardware and software parts. These parts are made up of the following:

- Service processor
- Vertical Licensed Internal Code
- Horizontal Licensed Internal Code
- Input/output processor
- Operating System/400 (OS/400) program
- Hardware

Licensed Internal Code Information

Overview

There are two types of Licensed Internal Code, horizontal and vertical. Horizontal Licensed Internal Code controls the hardware and the Vertical Licensed Internal Code controls the software.

The Licensed Internal Code and the software licensed programs are packaged together and delivered on the same tape media. The operating system for the AS/400 system provides one interface to the customer for handling all the code on the system.

Between code releases, problems found with the code are fixed with PTFs. Since PTFs repair problems that may appear to be hardware failures, your actions with PTFs are important for both the customer and for IBM. Many service calls you take will be for a problem that needs a PTF repair. It is often hard to determine between a real hardware failure and a code timing problem that is fixed by a PTF. Always ensure that the recommended PTFs are applied first before exchanging hardware.

Code Naming Conventions

Licensed Internal Code: The following table lists the names of the code groups that can be loaded and descriptions of each code group:

Figure 6-1 (Page 1 of 3). Licensed Internal Code–Code Group Names

Group Name	Hardware Stage	OS/400 Software Level	Description
AJDDC01	S2	V2	9406 system processor Horizontal Licensed Internal Code
AJDDH01	S2	V2	Common system processor Horizontal Licensed Internal Code
AJDDP01	S1, S2	V2	Common system processor Horizontal Licensed Internal Code
AJDG001	S1, S2	V1, V2	Common system processor Horizontal Licensed Internal Code
AJDG301	S1, S2	V1, V2	Common Vertical Licensed Internal Code
AJEAA01	S1, S2	V1, V2	9336 magnetic storage device Licensed Internal Code
AJEA001	S1	V1	9332 magnetic storage device Licensed Internal Code

Figure 6-1 (Page 2 of 3). Licensed Internal Code–Code Group Names

Group Name	Hard-ware Stage	OS/400 Software Level	Description
AJEDA00	S1, S2	V2	Common multiple function I/O processor Licensed Internal Code
AJED001	S1	V1, V2	9332, 9335, 9331, 9347 magnetic storage device I/O processor Licensed Internal Code
AJEHL00	S1, S2	V2	Common multiple function I/O processor Licensed Internal Code
AJEHB01	S1, S2	V2	3422, 3430, 3480, 3490 Tape Unit I/O processor Licensed Internal Code
AJEHM01	S1	V1, V2	2440, 9346, 9348 Tape Unit I/O processor Licensed Internal Code
AJEHN01	S1, S2	V2	9402, 9404 expansion and communications I/O processors
AJEH901	S1	V1	2440, 9346, 9348 Tape Unit I/O processor Licensed Internal Code.
AJEK001	S1, S2	V2	2800, 6101, 6102 magnetic storage device Licensed Internal Code
AJENV00	S1	V1	9335 magnetic storage device Licensed Internal Code.
AJEPB01	S2	V2	9337 DASD array subsystem system power control network (SPCN) Licensed Internal Code
AJER101	S2	V2	9336, 9332, 9335, 9331, 9347 magnetic storage device I/O processor Licensed Internal Code
AJEW101	S1	V1, V2	9336 magnetic storage device I/O processor Licensed Internal Code
AJFD001	S1, S2	V2	9335, 9332 magnetic storage device Licensed Internal Code
AJGDF01	S1, S2	V1, V2	Common communications I/O adapter Licensed Internal Code
AJGJF01	S1, S2	V1, V2	Common communications I/O adapter Licensed Internal Code
AJGJQ01	S1, S2	V2	Common communications I/O adapter Licensed Internal Code
AJGJR01	S1, S2	V2	Common token-ring network adapter Licensed Internal Code
AJGJS01	S1, S2	V2	Common ISDN basic adapter Licensed Internal Code
AJGJT01	S1, S2	V2	Common communications PAR Licensed Internal Code
AJGJZ01	S1, S2	V1, V2	5294, 5394 remote workstation I/O processor Licensed Internal Code
AJGJ001	S1, S2	V1, V2	9406 communications I/O adapter Licensed Internal Code
AJGJ601	S2	V2	2664 Integrated fax Licensed Internal Code

Figure 6-1 (Page 3 of 3). Licensed Internal Code–Code Group Names

Group Name	Hard-ware Stage	OS/400 Software Level	Description
AJGLD01	S2	V2	Common communications I/O processor protocol Licensed Internal Code
AJGN301	S1, S2	V2	9402, 9404 communications I/O adapter Licensed Internal Code
AJGW701	S2	V2	Common communications I/O processor base Licensed Internal Code
AJLAF01	S2	V2	LocalTalk attachment (local) Licensed Internal Code
AJLAG01	S2	V2	LocalTalk workstation (LAN) Licensed Internal Code
AJLLN01	S1	V1	Common ASCII workstation I/O processor Licensed Internal Code
AJLYA01	S2	V2	Common twinaxial workstation I/O processor Licensed Internal Code
AJLYC01	S1, S2	V2	Common ASCII workstation I/O processor Licensed Internal Code
AJLYD01	S1, S2	V2	Common twinaxial workstation I/O processor Licensed Internal Code
AJLYE01	S1, S2	V2	Common twinaxial translation tables
AJLYF01	S1, S2	V2	Common ASCII translation tables
AJLYG01	S1, S2	V2	Common ASCII and twinaxial translation tables
AJLY001	S1	V1	Common twinaxial workstation I/O processor Licensed Internal Code
AJSDB00	S2	V2	9406 service processor Licensed Internal Code
AJSDC00	S2	V2	9406 system processor PAR Licensed Internal Code
AJSDG00	S2	V2	Common service processor Licensed Internal Code
AJSDH00	S2	V2	Common system processor PAR Licensed Internal Code
AJSDJ01	S2	V2	9406 system power control network Licensed Internal Code
AJSG501	S1	V1, V2	9406 service processor Licensed Internal Code
AJSLC01	S1, S2	V1, V2	9404 multiple function I/O processor Licensed Internal Code
AJSLX01	S1, S2	V1, V2	9402 multiple function I/O processor Licensed Internal Code

Licensed Internal Code Install and Restore: Ensure that the latest level of Licensed Internal Code is being used before assuming a Licensed Internal Code problem. To do this, you will need to ensure that the customer has applied the latest cumulative PTF package. Enter DSPPTF 5763SS1 to view a list of the PTF packages installed. The first entry displayed is the latest PTF package. For more information about installing and restoring Licensed Internal Code, see "Licensed Internal Code Install and Restore Utilities" on page 6-11.

HIPER PTFs: HIPER means High Impact PERvasive. Customers may also refer to HIPER PTFs as critical PTFs. It is necessary for all systems to have HIPER PTFs installed soon after they are released so that customers reduce their risk to the problem being fixed. You will need to take an active part in ensuring your customers put the HIPER PTFs on all AS/400 systems.

Licensed Programs: Licensed program are represented by names in the form 5763xxx, where xxx is a unique, 3-character alphanumeric identifier. For example, 5763SS1 is the OS/400 base operating system software; 5763999 is the Licensed Internal Code. Each code module, referred to as a FRU in this code group, starts with a Q (for example, QDCCRLSD).

Code Levels - How to Determine What Is Loaded

When OS/400 is operating:

- To display installed licensed programs and installed secondary languages, type the

  GO LICPGM

  (Go Licensed Program) command and press the Enter key.

- To display the Licensed Internal Code and licensed programs, type

  DSPSFWRSC

  (Display Software Resources) command and press the Enter key.

- To print the Licensed Internal Code and licensed programs, type

  DSPSFWRSC

  (Display Software Resources) command and press the Enter key.

  Press F4 (Command Prompt), type

  *PRINT

  as the output parameter and press the Enter key.

  See the sample Display Software Resources display below.

  To display the Licensed Internal Code while in Dedicated Service Tools (DST), select the *Work with Licensed Internal Code* option from the Use Dedicated Service Tools (DST) display (see "Work with Licensed Internal Code (DST)" on page 1-50).

```
                          Display Software Resources

Resource
  ID      Option  Feature  Description
5763SS1   7       *CODE    OS/400 - Example Tools Library
5763SS1   7       2924     OS/400 - Example Tools Library
5763SS1   8       *CODE    OS/400 - *PRV CL Compiler Support
5763SS1   8       2924     OS/400 - *PRV CL Compiler Support
5763SS1   9       *CODE    OS/400 - AFP Compatibility Fonts
5763SS1   9       2924     OS/400 - AFP Compatibility Fonts
5763BA1   *BASE   *CODE    AS/400 BASIC
5763BA1   *BASE   2924     AS/400 BASIC
5763CB1   *BASE   *CODE    COBOL/400 - Base Support
5763CB1   *BASE   2924     COBOL/400 - Base Support
5763CB1   1       *CODE    COBOL/400 - System/36-compatible COBOL
5763CB1   1       2924     COBOL/400 - System/36-compatible COBOL
5763CB1   2       *CODE    COBOL/400 - System/38-compatible COBOL
5763CB1   2       2924     COBOL/400 - System/38-compatible COBOL
5763CB1   3       *CODE    COBOL/400 - *PRV Base Support
                                                                  More...
Press Enter to continue.

F3=Exit   F11=Display libraries/releases   F12=Cancel
                                           (C) COPYRIGHT IBM CORP. 1988, 1993
```

Figure 6-2. Display Software Resources Example

If the system has not had a cumulative PTF tape loaded in the last 3 months, instruct the customer to load the most recent cumulative PTF tape. Because PTFs repair problems that may appear to be hardware failures, your actions with PTFs are important for both the customer and for IBM.

APAR or LICTR

Task To Be Performed	What To Do	Location of Instructions
Determine if customer-reported symptom is a problem fixed by a PTF.	Use support data: Support publications, TIPS, Exception lists, CAG or Support Center recommendations	
Review the PTF level to see if a cumulative PTF package needs to be installed.	DSPPTF 5763SS1 and DSPPTF 5763999. Look for PTF marker. See PTF levels on back.	*System Operation, System Startup and Problem Handling, Problem Analysis* information - CE PM Checklist
Order a cumulative PTF package.	SNDPTFORD SF99VRM	*System Operation, System Startup and Problem Handling* information
Obtain a list of generally available AS/400 PTFs.	SNDPTFORD SF97VRM (VRM = version, release, modification example 120).	*System Operation, System Startup and Problem Handling* information
Determine if a PTF has been superseded	SNDPTFORD SF97VRM Find the PTF number in the PTF summary listing. The latest PTF is listed in the "replaced by" column.	*System Operation, System Startup and Problem Handling* information
Determine if the system has all the LIC HIPER fixes.	Check for HIPER marker TLYYDDD using DSPPTF 5763999 and compare with the latest PSP.	This section of this book.
Obtain a list of HIPER PTFs not in the latest cumulative PTF package.	SNDPTFORD SF98VRM	*System Operation, System Startup and Problem Handling* information
Obtain a list of all HLIC HIPER repairs (hardware PSP listing)	SNDPTFORD MF98VRM	*System Operation, System Startup and Problem Handling* information
Install all HIPER PTFs from the cumulative PTF package.	Get latest cumulative PTF package and use GO PTF.	Follow the instructions in the cumulative PTF package.
Install just the HIPER LIC fixes from the cumulative PTF package.	Get the latest cumulative PTF package and use GO PTF.	Follow the instructions in the cumulative PTF package.
Order a PTF	SNDPTFORD PTF # (You supply the PTF #).	*System Operation, System Startup and Problem Handling* information
Load a PTF	LODPTF	*System Operation, System Startup and Problem Handling* information
Apply a PTF	APYPTF	*System Operation, System Startup and Problem Handling* information
Remove a PTF	RMVPTF	*System Operation, System Startup and Problem Handling* information
Display a PTF	DSPPTF	*System Operation, System Startup and Problem Handling* information
Display the release level	Enter "GO LICPGM" and select menu option 10.	*System Operation, System Startup and Problem Handling* information
Install all Licensed Internal Code after a load source disk fails.	Use customers latest SAVE tapes.	94xx service library
Restore all Licensed Internal Code if the IPL code is damaged.	Use customers latest SAVE tapes.	94xx service library

PTF Levels

The following markers are automatically logged to indicate PTF level.

- Enter DSPPTF 5763SS1 and look for the following:
  - TCYYDDD - The entire cumulative PTF package was applied.
  - TAYYDDD - All HIPER PTFs were applied.
- Enter DSPPTF 5763999 and look for the following:
  - TLYYDDD - All LIC HIPER Fixes were applied.

YYDDD = Year, Julian date (If the entire cumulative PTF package is applied, then all 3 markers will be present).

CYDDDVRM is the format of the cumulative PTF package.

Cumulative PTF Packages

PTFs are stacked on the cumulative PTF tapes in the following order.

- HIPER LIC Fixes
- HIPER OS/400 PTFs
- HIPER LPP PTFs
- Non-HIPER LIC Fixes
- Non-HIPER OS/400 PTFs
- Non-HIPER LPP PTFs

The cumulative PTF package contains the majority of the PTFs that were available approximately 1 month before the package date. Additional PTFs which either have special instructions, or have not been requested often, are available through the IBM software support center.

PSP Listings

The preventive service planning (PSP) information can be obtained by entering SNDPTFORD SF98VRM. It contains the following information:

- Availability date of the next scheduled cumulative PTF package
- List of any defective PTFs in the cumulative PTF package
- List of additional HIPER PTFs not in the latest cumulative PTF package
- PSP table for previous cumulative PTF packages and other PTF information.

Before you generate an authorized program analysis report (APAR) or Licensed Internal Code trouble report (LICTR), ask your next level of support to screen the APAR or LICTR and to have the symptoms of the problem entered into the service support system.

Use the SAVAPARDTA (Save APAR Data) command to collect and save the data that describes the problem.

To prepare an APAR data volume, you must perform the following:

- Analyze the SAVAPARDTA command parameters to determine the load or dump volume ID, the report labeling information, and the optional data that you want to include. The APAR load or dump volume must be in the *SAVRST format.
- Enter the SAVAPARDTA command with its required parameters to create and write a file to a tape, to a diskette, or to save-files. The report file can include items such as:
  - Dumps taken previously and written to a saved spooling printer file. These can be dumps taken manually by the CL, or they can be dumps taken automatically and saved as a part of the automatic problem determination procedures.
  - Other information, for example, trace data, job logs, parts of the system log, and other status information, is saved in spooling files.
  - Information available in data base files, for example, the problem log, the change log, and the history log.
  - Error log information using the error log identifier.
  - System or user programs and files suspected of being defective, or files needed to make the failure again.
  - Vital product data (VPD) for licensed programs, licensed internal code modules, a network, an I/O processor, or logical unit descriptions.

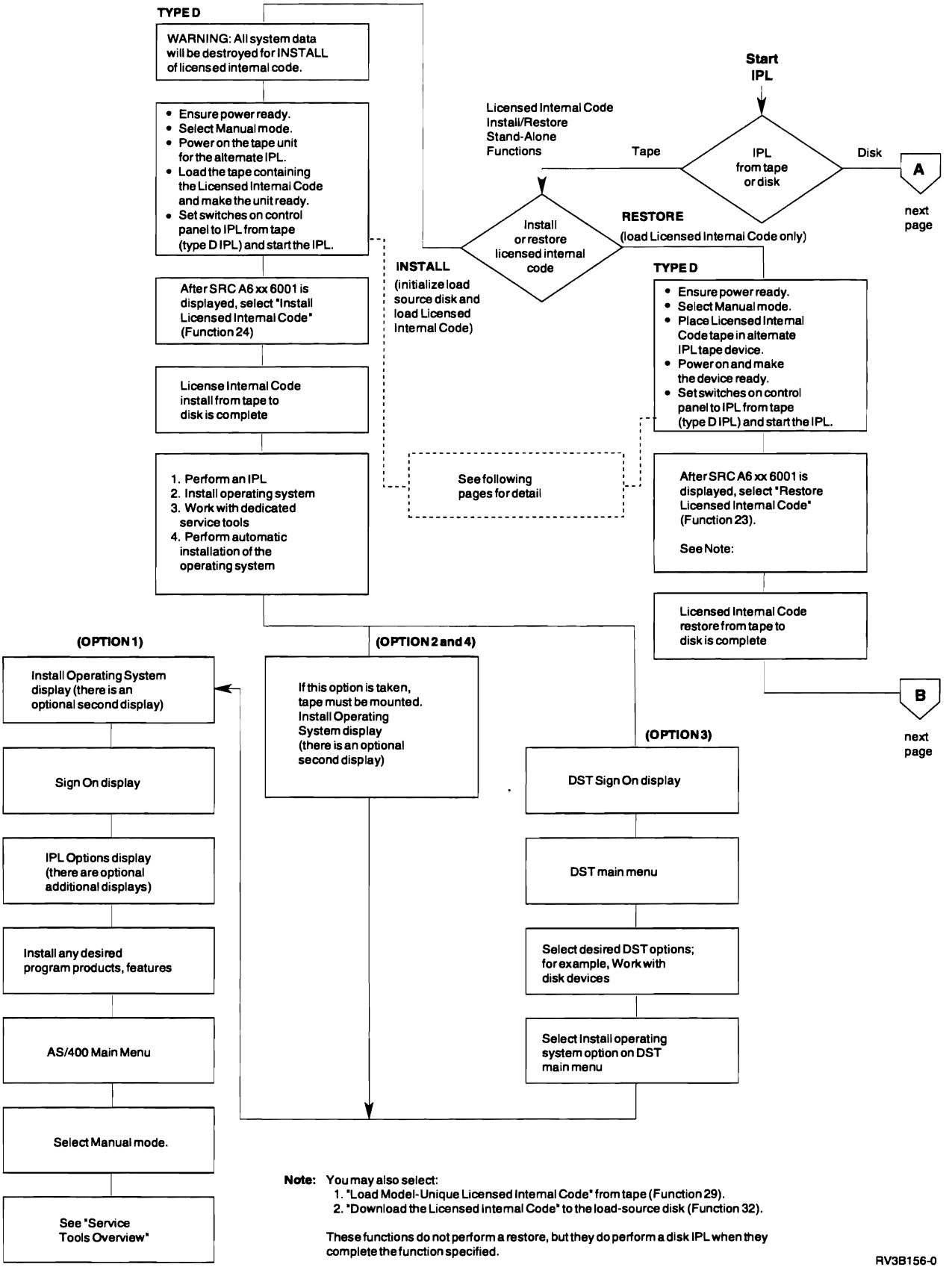
Licensed Internal Code Install and Restore Overview

This overview shows:

- How to install the system Licensed Internal Code from tape when the load-source disk is exchanged.
- How to restore the Licensed Internal Code or Model-Unique Licensed Internal Code from tape for a Licensed Internal Code upgrade or when the DST is not functional and the system Licensed Internal Code must be loaded again.
- How to perform an IPL from disk. See "General Information" on page 1-50 for a description of IPL types A and B.

For detailed information, see "Licensed Internal Code Install and Restore Utilities" on page 6-11.

Licensed Internal Code Install and Restore Overview

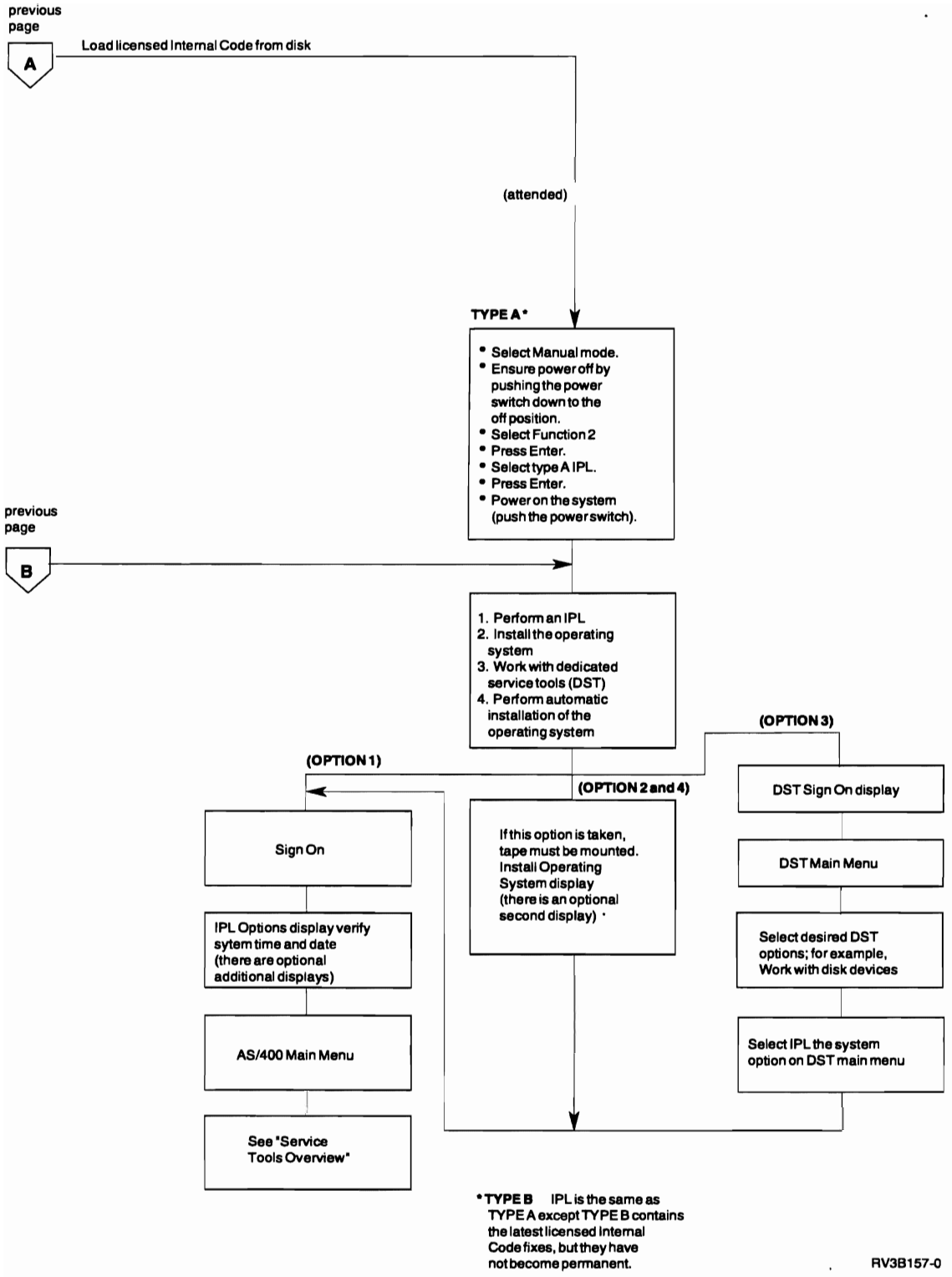


Note: You may also select:

1. "Load Model-Unique Licensed Internal Code" from tape (Function 29).
2. "Download the Licensed Internal Code" to the load-source disk (Function 32).

These functions do not perform a restore, but they do perform a disk IPL when they complete the function specified.

RV3B156-0


previous page
A
Load licensed Internal Code from disk
(attended)
TYPE A*
• Select Manual mode.
• Ensure power off by pushing the power switch down to the off position.
• Select Function 2
• Press Enter.
• Select type A IPL.
• Press Enter.
• Power on the system (push the power switch).
previous page
B
1. Perform an IPL
2. Install the operating system
3. Work with dedicated service tools (DST)
4. Perform automatic installation of the operating system
(OPTION 1)
(OPTION 2 and 4)
(OPTION 3)
Sign On
IPL Options display verify sytem time and date (there are optional additional displays)
AS/400 Main Menu
See "Service Tools Overview"
If this option is taken, tape must be mounted. Install Operating System display (there is an optional second display)
DST Sign On display
DST Main Menu
Select desired DST options; for example, Work with disk devices
Select IPL the system option on DST main menu
*TYPE B IPL is the same as TYPE A except TYPE B contains the latest licensed Internal Code fixes, but they have not become permanent.
RV3B157-0

Licensed Internal Code Install and Restore Utilities

Install Licensed Internal Code Utility

Warning: The Install Licensed Internal Code utility erases all information on the load-source disk unit. The data on the remainder of the disk units is not erased, but may not be accessible (because of the way data is arranged over multiple drives on the system).

After the information is erased on the load-source disk unit, the utility copies all system Licensed Internal Code from tape to disk.

If you want to restore only the Licensed Internal Code (without erasing customer data), see "Restore Licensed Internal Code Utility" on page 6-14.

Use this utility for the initial installation of the Licensed Internal Code when one of the following occur:

- The load-source disk has been replaced.
- The system does not contain customer data and Licensed Internal Code.
- The instructions for a new Licensed Internal Code release specify that you cannot use the Restore Licensed Internal Code utility.

Either installing or restoring Licensed Internal Code completely exchanges all Licensed Internal Code with a new level of code.

Because the Install Licensed Internal Code utility is run completely from the control panel, it is also referred to as a *stand-alone* utility.

The system Licensed Internal Code may be on a customer's SAVSYS tape, a SAVSTG tape, or on the IBM distribution (ISMD) tapes. Start the installation with the first tape from one of these sets of tapes.

The model-unique Licensed Internal Code is not contained on the SAVSYS, SAVSTG, or the IBM distribution (ISMD) tapes. A tape containing **only** this code is shipped with the system. It may be kept in a storage bag located in the rear of the system unit. Note that some 9402 models do not require this tape.

If you use the customer's SAVSYS or SAVSTG tape, the Licensed Internal Code level (PTFs applied) is returned to the level supported at the time when the tape was saved.

For example, if you are using the customer's saved tapes to install or restore Licensed Internal Code, the PTFs that were applied (permanent or temporary) after the tape was saved would no longer be applied. PTFs that were applied at the time the tape was saved and later removed would be applied again after using this utility.

If volume 1 of the IBM distribution tape is used, no PTFs are applied. The operating system reflects that no Licensed Internal Code PTFs have been applied. DST can be used to determine the correct level of any Licensed Internal Code PTFs.

While running this utility, the system continuously displays SRCs on the control panel. The System Attention light is on when intervention is needed.

SRCs that start with A6 indicate the system is waiting for you to do something (for example, answer a question or make a tape unit ready).

The A6 SRCs are documented in Appendix A, "Licensed Internal Code Install and Restore SRCs That Require User Action (A6xx xxxx)" on page A-1. All other SRCs are documented in the *Problem Analysis* information or in the device information.

When xx is shown in the SRC (for example, A6xx 6001), it means a variety of characters can be shown where the xx appears.

Installing Licensed Internal Code

Notes:

1. If the system is running, end all jobs.
2. Ensure that the system is powered off.

1 Select Manual mode.

2 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until

you see Function 02 (Select IPL), then press Enter on the control panel.

3 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see IPL type D (Tape IPL), then press Enter on the control panel.

4 Do the disk devices on this system have separate power-on and power-off switches?

No	Yes
↓	Power on the disk devices you want to use. Continue with step 5 of this procedure.

5 Power on the system and the console.

6 Determine the tape unit for an alternate IPL (see "Determining Load-Source Disk or Tape Unit for an Alternate IPL" in the system *Problem Analysis* information).

Does the tape unit for an alternate IPL have separate power-on and power-off switches?

No	Yes
↓	Power on the tape unit for an alternate IPL. For 34xx tape units ensure they are enabled and online. Continue with step 7 of this procedure.

7 Place the tape containing the Licensed Internal Code (first tape of the SAVSYS, SAVSTG, or ISMD tapes) in the tape unit for an alternate IPL. Make the tape unit ready. See the device information on loading the tape.

8 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see Function 03 (Start IPL), then press the Enter key.

Note: Some types of tape units automatically reset. In this condition, SRC A100 1933 (tape device not ready) is displayed until the tape device automatically makes itself ready.

The tape starts to move. Then, there is a delay while the system loads information from the tape. SRCs showing status are updated continuously on the control panel while processing occurs.

9 Wait for the System Attention light on the control panel to go on. This normally takes at least 15 to 20 minutes. The time is based on the speed of the tape unit and the processor speed for the specific system model.

SRC A6xx 6001 should be displayed.

Note: This SRC indicates that the system is prepared to start installing the Licensed Internal Code on the load-source disk unit.

Does SRC A6xx 6001 occur?

No	Yes
↓	Go to step 11 of this procedure.

10 Is the System Attention light on and is a different SRC shown?

No	Yes
↓	Look up the displayed SRC: • In Appendix A, "Licensed Internal Code Install and Restore SRCs That Require User Action (A6xx xxxx)" on page A-1 for SRCs starting with A6. • In the *Problem Analysis* information for all other SRCs. Ask your next level of support for assistance. **This ends the procedure.**

11 **Warning:** Selecting Function 24 (Install Licensed Internal Code) destroys all data on the system, including customer data.

- Select Function 24 (Install Licensed Internal Code) by pushing the Select, Increment (↑), or Decrement (↓) switch on the control panel. Then, press Enter on the control panel.

Note: The system again starts displaying status SRCs, which are updated contin-

uously to show the status of the Licensed Internal Code install. An example of a status SRC is C6xx 6201, which means that the stand-alone utility is running. An example of an attention SRC is A6xx 6002.

Is the System Attention light on again and is a different SRC shown?

No **Yes**

↓ Look up the displayed SRC:

- In Appendix A, "Licensed Internal Code Install and Restore SRCs That Require User Action (A6xx xxxx)" on page A-1 for SRCs starting with A6.
- In the *Problem Analysis* information for all other SRCs.

Ask your next level of support for assistance.

This ends the procedure.

12 When all of the Licensed Internal Code is installed, the system automatically performs a disk IPL.

The next display that appears asks you to select your primary language. See the following chart.

Feature Code	National Language
2911	Slovene
2912	Croatian
2922	Portuguese
2923	Dutch Netherlands
2924	English Uppercase and Lowercase
2925	Finnish
2926	Danish
2928	French
2929	German
2931	Spanish
2932	Italian
2933	Norwegian
2937	Swedish
2938	English Uppercase Support for Double-Byte Character Set (DBCS)
2939	German Multinational Character Set
2940	French Multinational Character Set
2942	Italian Multinational Character Set
2950	English Uppercase
2954	Arabic
2956	Turkish
2957	Greek
2958	Icelandic
2961	Hebrew
2962	Japanese Double-Byte Character Set (DBCS)
2963	Belgian Dutch
2966	Belgian French
2972	Thai
2975	Czech
2976	Hungarian
2978	Polish
2979	Russian
2980	Brazilian Portuguese
2981	Canadian French
2984	English Uppercase and Lowercase Support for Double-Byte Character Set (DBCS) (SEAR version)
2986	Korean Double-Byte Character Set (DBCS)
2987	Traditional Chinese Double-Byte Character Set (DBCS)
2989	Chinese Simplified Double-Byte Character Set (DBCS)
2994	Slovakian
2996	Portuguese Multinational Character Set

13 Remove the tape from the tape unit for an alternate IPL.

This ends the procedure.

Restore Licensed Internal Code Utility

Introduction: The stand-alone Restore Licensed Internal Code utility copies all system Licensed Internal Code from tape and puts it on a disk.

Select this utility to:

- Install the new Licensed Internal Code in place of the system's existing Licensed Internal Code without losing customer data already on the system.
- Update a system's Licensed Internal Code to a new release.
- Load or restore the Model-Unique Licensed Internal Code.
- Reinstall Licensed Internal Code when DST is not operational.

Because the Restore Licensed Internal Code utility is run completely from the control panel, it is referred to as a *stand-alone* utility.

The system Licensed Internal Code may be on a customer's SAVSYS tape or a SAVSTG tape or on the IBM distribution (ISMD) tapes. Start the restore with the first tape from one of these sets of tapes.

The information for this utility also indicates a Model-Unique Licensed Internal Code tape. This tape, if required, is shipped with the system.

If you use the customer's SAVSYS or SAVSTG tape, the Licensed Internal Code level (PTFs applied) is returned to the level supported at the time when the tape was saved.

For example, if you are using the customer's saved tapes to install or restore Licensed Internal Code, the PTFs that were applied (permanent or temporary) after the tape was saved would no longer be applied. PTFs that were applied at the time the tape was saved and removed after the save would be applied again after using this utility.

If tape 1 of the IBM distribution tape is used, no PTFs are applied. The operating system reflects that no Licensed Internal Code PTFs have been applied. DST can be used to determine the correct level of any Licensed Internal Code PTFs.

While running this utility, the system continuously displays SRCs on the control panel. The System Attention light is on when intervention is needed.

SRCs that start with A6 indicate the system is waiting for you to do something (for example, answer a question or make a tape device ready).

The A6 SRCs are documented in Appendix A, "Licensed Internal Code Install and Restore SRCs That Require User Action (A6xx xxxx)" on page A-1. All other SRCs are documented in your *Problem Analysis* information or in a device manual.

When xx is shown in the SRC (for example, A6xx 6001), it means a variety of characters can be shown where the xx appears.

Restoring Licensed Internal Code

Notes:

1. If the system is running, end all jobs.
2. Ensure that the system is powered off.

1 Select Manual mode.

2 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see Function 02 (Select IPL), then press Enter on the control panel.

3 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see IPL type D (Tape IPL), then press Enter on the control panel.

4 Do the disk devices on this system have separate power-on and power-off switches?

No	Yes
↓	Power on the disk devices you want to use. Continue with step 5 of this procedure.

5 Power on the system and the console.

6 Determine the tape unit for an alternate IPL (see "Determining Load-Source Disk or

Tape Unit for an Alternate IPL" in the system *Problem Analysis* information).

Does the tape unit for an alternate IPL have separate power-on and power-off switches?

No **Yes**

↓ Power on the tape unit for an alternate IPL.

For 34xx tape units ensure they are enabled and online.

Continue with step 7 of this procedure.

7 Place the tape containing the Licensed Internal Code (first tape of the SAVSYS, SAVSTG, or ISMD tapes) in the tape unit for an alternate IPL. Make the tape unit ready. See the device information on loading the tape.

8 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see Function 03 (Start IPL), then press the Enter key.

Note: Some types of tape devices automatically reset. In this condition, SRC A100 1933 (tape device not ready) is displayed until the tape device automatically makes itself ready.

The tape starts to move. Then, there is a delay while the system loads information from the tape. SRCs showing status are updated continuously on the control panel while processing occurs.

9 Wait for the System Attention light on the control panel to go on. This normally takes at least 15 to 20 minutes, but the time is based on the speed of the tape unit and the processor speed for the specific system model.

SRC A6xx 6001 should be displayed.

Note: This SRC indicates that the system is prepared to start restoring the Licensed Internal Code on the load-source disk unit.

If A6xx 6001 appears, continue with step 10 of this procedure.

If an SRC other than A6xx 6001 appears, look up the displayed SRC in the *Problem Analysis* information and perform the action for that SRC.

10 **NOTE:** Do not remove the Licensed Internal Code tape at this time.

Do you want to load or exchange the model-unique Licensed Internal Code?

Yes **No**

↓ Go to step 13 of this procedure.

11 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see Function 29, then press Enter on the control panel.

Note: Function 29 selects **only** the Model-Unique Licensed Internal Code to be exchanged.

12 Wait for SRC A6xx 6011 to be displayed. SRC A6xx 6011 verifies the selection to exchange the Licensed Internal Code.

Note: Do not remove the Licensed Internal Code tape at this time.

After step 13 of this procedure, you will be prompted to insert the Model-Unique Licensed Internal Code tape when SRC A6xx 6051 appears.

Continue with step 13 of this procedure.

13 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see Function 23 (Restore Licensed Internal Code), then press Enter on the control panel.

Note: The system again starts displaying status SRCs, which are updated continuously to show the status of the Licensed Internal Restore. An example of a status SRC is C6xx6201, which means that the stand-alone utility is running.

14 Is the System Attention light on and is an SRC shown?

No **Yes**

↓

- SRC A6xx 6051 is displayed to prompt you to load the Model-Unique Licensed Internal Code tape.
- If an SRC other than A6xx xxxx is displayed, look up the displayed SRC in the *Problem Analysis* information and perform the action for that SRC.
- If SRC A6xx xxxx is displayed, look up that SRC in Appendix A, follow the instructions, and repeat this step.

15 When all the Licensed Internal Code or Model-Unique Licensed Internal Code is restored, the system automatically performs a normal IPL of the system from the disk unit.

A display appears asking you if you want to start dedicated service tools (DST) or continue the IPL.

16 Remove the tape from the tape unit for an alternate IPL.

This ends the procedure.

Other Install Licensed Internal Code Functions

Note: If the system requires a system password in order to perform an IPL, see "System Password" on page 2-2 for details.

Load Model-Unique Licensed Internal Code:

This function copies the Model-Unique Licensed Internal Code from the tape and writes over any existing Model-Unique Licensed Internal Code on the disk.

The model-unique Licensed Internal Code is not contained on the SAVSYS, SAVSTG, or the IBM distribution (ISMD) tapes. A tape containing **only** this code is shipped with the system. It may be kept in a storage bag located in the rear of the system unit.

Note: 9402 models A02, D02, E02, F02, C04, and D04 do not require this tape.

You should use this function when performing a model change to the system. Start the installation with the first tape of the SAVSYS, SAVSTG, or the ISMD tapes. The system prompts you when to load the Model-Unique Licensed Internal Code tape.

This function will be used by the system, if necessary, on a restore or install of Licensed Internal Code.

1 Select Manual mode.

2 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see Function 02 (Select IPL), then press Enter on the control panel.

3 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see IPL type D (Tape IPL), then press Enter on the control panel.

4 Do the disk devices on this system have separate power-on and power-off switches?

No **Yes**

↓ Power on the disk devices you want to use. Continue with step 5 of this procedure.

5 Power on the system and the console.

6 Determine the tape unit for an alternate IPL (see "Determining Load-Source Disk or Tape Unit for an Alternate IPL" in the system *Problem Analysis* information).

Does the tape unit for an alternate IPL have separate power-on and power-off switches?

No **Yes**

↓ Power on the tape unit for an alternate IPL.

For 34xx tape units ensure they are enabled and online.

Continue with step 7 of this procedure.

7 Place the tape containing the Licensed Internal Code (first tape of the SAVSYS, SAVSTG, or ISMD tapes) in the tape unit for an alternate IPL. Make the tape unit ready. See the device information for details on loading the tape.

8 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see Function 03 (Start IPL), then press the Enter key.

Note: Some types of tape devices automatically reset. In this condition, SRC A100 1933 (tape device not ready) is displayed until the tape device automatically makes itself ready.

The tape starts to move. Then, there is a delay while the system loads information from the tape. SRCs showing status are updated continuously on the control panel while processing occurs.

9 Wait for the System Attention light on the control panel to go on. This normally takes at least 15 to 20 minutes, but the time is based on the speed of the tape unit and the processor speed for the specific system model.

SRC A6xx 6001 should be displayed.

Note: This SRC indicates that the system is prepared to start to restoring the Model-Unique Licensed Internal Code on the load-source disk unit.

If SRC A6xx 6001 appears, continue with step 10 of this procedure.

If an SRC other than A6xx 6001 appears, look up the displayed SRC in the *Problem Analysis* information and perform the action for that SRC.

10 When SRC A6xx 6001 occurs, select Function 29 by pushing the Select, Increment (↑), or Decrement (↓) switch on the control panel. Then, press Enter on the control panel.

11 Wait for SRC A6xx 6011 to be displayed. SRC A6xx 6011 verifies the selection to exchange the Licensed Internal Code.

Note: Do not remove the Licensed Internal Code tape at this time.

After step 12 of this procedure, you will be prompted to insert the Model-Unique Licensed Internal Code tape when SRC A6xx 6051 appears.

Continue with step 12 of this procedure.

12 Select Function 23 if you want to load Model-Unique Licensed Internal Code. If you want to cancel this request, select Function 29. In this condition, SRC A6xx 6001 occurs again. You may select another function or cancel this request by powering off the system at the control panel.

13 Press Enter on the control panel.

When SRC A6xx 6051 occurs, load the Model-Unique Licensed Internal Code tape. Processing continues when the tape is ready.

Note: The system again starts displaying status SRCs, which are updated continuously to show the status of the Model-Unique Licensed Internal Code load. An example of a status SRC is C6xx 6201, which means the stand-alone utility is running.

14 Is the System Attention light on and a different SRC shown?

No **Yes**

↓ Look up the displayed SRC:

- In Appendix A, "Licensed Internal Code Install and Restore SRCs That Require User Action (A6xx xxxx)" on page A-1 for SRCs starting with A6.
- In the *Problem Analysis* information or in a device manual for all other SRCs.

15 After all of the Model-Unique Licensed Internal Code is loaded, look at the system console.

Is the Verification of System Password Failed screen displayed?

No **Yes**

↓ Select the option to *Change the system password*. Type the system password and press the Enter key.

The system automatically performs a disk IPL.

16 Remove the tape from the tape unit for an alternate IPL.

This ends the procedure.

Download Disk Licensed Internal Code:

This function downloads the Licensed Internal Code to the load-source disk unit. Use this function if you need to exchange the load-source disk enclosure or if the load-source disk unit has the wrong level of Licensed Internal Code. Your next level of support will instruct you when to use this function.

1 Select Manual mode.

2 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see Function 02 (Select IPL), then press Enter on the control panel.

3 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see IPL type D (Tape IPL), then press Enter on the control panel.

4 Do the disk devices on this system have separate power-on and power-off switches?

No **Yes**

↓ Power on the disk devices you want to use. Continue with step 5 of this procedure.

5 Power on the system and the console.

6 Determine the tape unit for an alternate IPL (see "Determining Load-Source Disk or Tape Unit for an Alternate IPL" in the system *Problem Analysis* information).

Does the tape unit for an alternate IPL have separate power-on and power-off switches?

No **Yes**

↓ Power on the tape unit for an alternate IPL.

For 34xx tape units ensure they are enabled and online.

Continue with step 7 of this procedure.

7 Place the tape containing the Licensed Internal Code (first tape of the SAVSYS, SAVSTG, or ISMD tapes) in the tape unit for an alternate IPL. Make the tape unit ready. See the device information on loading the tape.

8 Push the Select, Increment (↑), or Decrement (↓) switch on the control panel until you see Function 03 (Start IPL), then press the Enter key.

Note: Some types of tape devices automatically reset. In this condition, SRC A100 1933 (tape device not ready) is displayed until the tape device automatically makes itself ready.

The tape starts to move. Then, there is a delay while the system loads information from the tape. SRCs showing status are updated continuously on the control panel while processing occurs.

9 Wait for the System Attention light on the control panel to come on. This normally takes at least 15 to 20 minutes, but the time is based on the speed of the tape unit and the processor speed for the specific system model.

Does SRC A6xx 6001 occur?

Note: This SRC indicates that the system is prepared to start installing the Licensed Internal Code on the load-source disk unit.

Yes **No**

↓ Look up the displayed SRC in the *Problem Analysis* information and perform the action for that SRC.

10 When SRC A6xx 6001 occurs as described in the "Install Licensed Internal Code Utility" procedures, select Function 32 (Download Licensed Internal Code to Load-Source Disk) by pushing the Select, Increment (↑), or Decrement (↓) switch on the control panel.

11 Press Enter on the control panel.

Note: The system again starts displaying status SRCs, which are updated continuously to show the status of the download of the disk Licensed Internal Code. An example of a status SRC is C6xx 6201, which means that the stand-alone utility is running.

Is the System Attention light on and a different SRC shown?

No **Yes**

↓ Look up the displayed SRC:

- In Appendix A, "Licensed Internal Code Install and Restore SRCs That Require User Action (A6xx xxxx)" on page A-1 for SRCs starting with A6.
- In the *Problem Analysis* information for all other SRCs.

12 After the download of the Licensed Internal Code is complete, the system automatically performs a disk IPL.

13 Remove the tape from the tape unit for an alternate IPL.

This ends the procedure.

Chapter 7. System Architecture and Configuration

Architecture of the AS/400 System

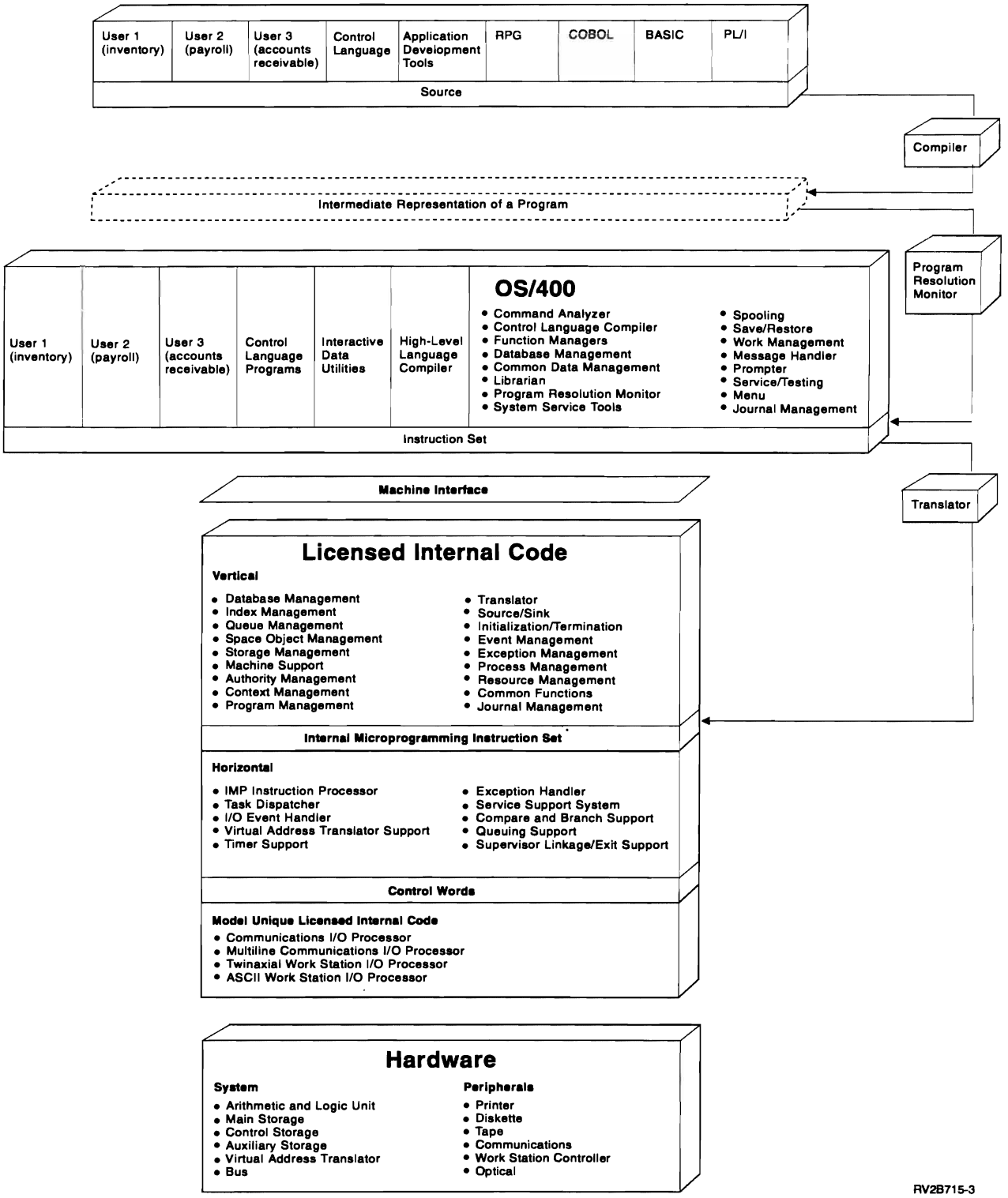


Figure 7-1. AS/400 Architecture

System Power Overview

Introduction

Power for the AS/400 systems consists of all or some of the following components:

- A mainline ac power cable for each frame that connects to the customer's ac power receptacle.
- A power supply that converts ac voltage to dc voltage. For more information on the power supply, see "Power Supply."
- A power control compartment (PCC) that distributes ac power to each rack-mounted unit. For more information on the PCC, see "Power Control Compartment (PCC)."
- The system power control network (SPCN) that controls and monitors the distribution of ac and dc power to the units in the frame. For more information on the SPCN, see " System Power Control Network (SPCN)" on page 7-4.
- Rack power sequence cables, emergency power off cables, or SPCN cables that connect the frame units.
- Signal cables that connect the rack-mounted units.
- A rack control panel on each frame. For more information on the rack control panel, see "Rack Control Panel."
- A battery backup unit that automatically supplies power to the system when utility power is interrupted. For more information, see "Battery Backup Unit" on page 7-4.

For power overview diagrams on specific AS/400 system types, see "System Power Distribution Diagrams" on page 7-14 and the "Locations and Connector Information" section in the *Problem Analysis* information.

Power Supply

Power for the AS/400 systems is supplied in one of two ways: from a common power supply, or by the distributed power concept.

- The common, or centralized, power supply generates the dc voltages needed for the system unit and the devices that are in the frame.
- The power supply in a distributed power system generates a single voltage to the regulator of each device. The device regulator develops the voltages that are used by that unit.

Power Control Compartment (PCC)

9406 Stage 1 and Stage 2 systems use a power control compartment (PCC) to distribute ac power to the rack-mounted units. The PCC is located on the lower left-hand side in the rear of the frame. In systems with SPCN, PCC power is controlled by the SPCN nodes.

Rack Control Panel

The rack control panel is found on all frames that contain a PCC. It is located in the upper right-hand portion on the front of the frame. The rack control panel consists of a unit emergency power-off switch, a Rack Power Ready indicator, and a Rack Attention indicator (on 9406 Stage 2 units only). A signal cable connects the rack control panel to the PCC.

Two types of rack control panels are used on the 9406 Stage 1 and Stage 2 systems. The Continuous Processor Power rack control panel is found only on the primary rack. It is similar to the secondary rack control panel, except that it has a Continuous Processor Power label at the top of the panel. This rack control panel also has circuits that cause the PCC to continuously send ac power to connectors J1 and J2 on Stage 1, and J1 through J5 (as long as the PCC is receiving power and the emergency power off circuit is completed). For more information on primary and secondary racks, see "Determining a Primary or Secondary Rack (9406 System Unit)" on page 2-4. The secondary rack control panel is found only on secondary racks and has an emergency power off switch, a Rack Power Ready indicator, a Rack Attention indicator (on 9406 Stage 2 Units only), and connectors on the rear where the signal cables from the PCC connects.

Battery Backup Unit

Some AS/400 systems are equipped with a battery backup unit. To verify that the system has a battery backup unit, see " System Power Control Network (SPCN)" on page 7-4.

The battery backup unit:

- Automatically supplies power to some or all of the system when utility power is interrupted, allowing the shut-down process to complete

  Note: The amount of time the battery supplies power is determined by a system default parameter. This parameter can be changed by the user during system configuration.
- Warns the SPCN when the battery charge falls below an acceptable level
- Keeps fully charged during normal system operation

  Note: The charging unit has no way of sending a signal to the operating system to indicate the charge state or the load test status of the battery.

System Power Control Network (SPCN)

The SPCN is a power distribution and control concept that allows system power status and power problems to be reported to the operating system for analysis. This concept of power distribution and control for the AS/400 system makes it easier for new system hardware units to be added. Problems reported to the operating system by the SPCN are logged and displayed by the problem management function for user action.

All Stage 2 frames are shipped with the SPCN installed. SPCN frames can be combined with Stage 1 racks. For a diagram of SPCN power control, see "SPCN Power Control Diagram" on page 7-6.

SPCN Power Components

The power component in each frame and some rack-mounted units contains a SPCN node. The SPCN node is a microprocessor. It is placed in the SPCN network and connects the points necessary for controlling power, sending commands, and reporting status. A SPCN node also connects to the unit power supply and display panel.

The three type of nodes are primary node, rack node, and secondary node. There is one primary node in a system, one rack node for each frame, and one secondary node for each rack-mounted unit. The primary node and rack nodes remain powered on as long as there is ac power to the frame.

Note: In 940x Models 3xx, the rack node is combined with the primary and secondary nodes.

Primary Node: The primary node is the microprocessor located in the power system ac module. It is programmed to issue network commands and poll for status from other SPCN nodes in the network.

The primary node communicates with the operating system through the control panel, exchanging commands and network status. It also monitors power and status of the power supply, and during power interruption, starts backup power. The primary node is powered on as long as there is ac power to the frame.

Command responses and error status from the SPCN network are collected by the primary node and formatted for return to the operating system.

Rack Node: The rack node is a microprocessor located inside the PCC or, if the frame does not contain a PCC, in the ac module in the support box. It receives power-on and power-off commands from the primary node for switching ac power to the rack-mounted units on or off. In the primary rack, the rack node provides continuous ac power to connectors J1 through J5 as long as the PCC is receiving power and the emergency power off circuit is completed. In a secondary rack, all ac outlets (J1 through J10) are controlled by the rack node.

Secondary Node: The secondary node is a microprocessor located inside a rack-mounted unit (with SPCN circuits). Each secondary node is programmed to report unit status and respond to commands from the primary node. It also displays the following type of information on the rack-mounted unit display.

- SPCN address
- Power reference codes

Note: In 940x Models 3xx, the rack node is combined with the primary and secondary nodes. They are located in the power system ac module.

SPCN Power Control Diagram

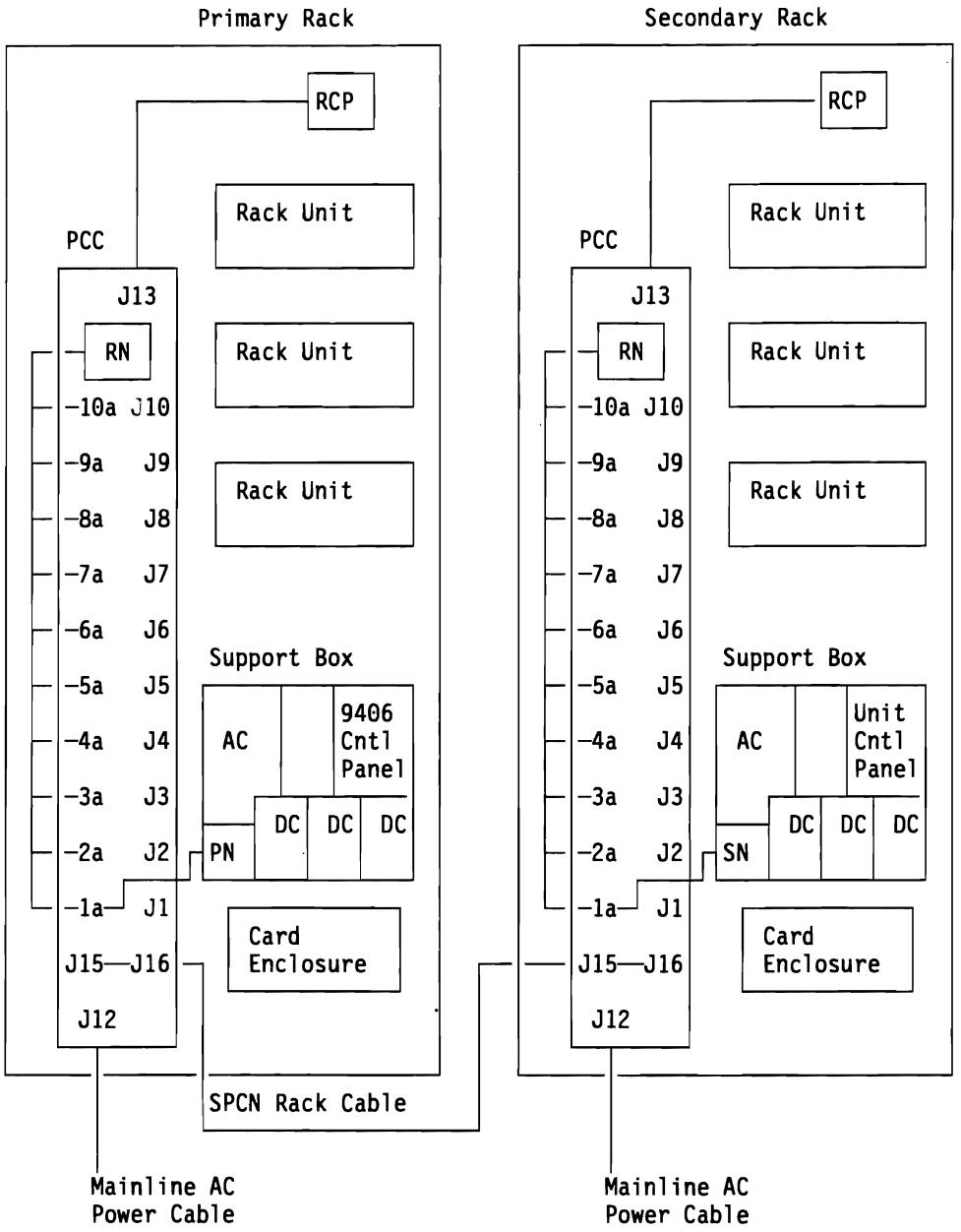


Figure 7-2. SPCN Power Control for 9406 Models Dxx through Fxx

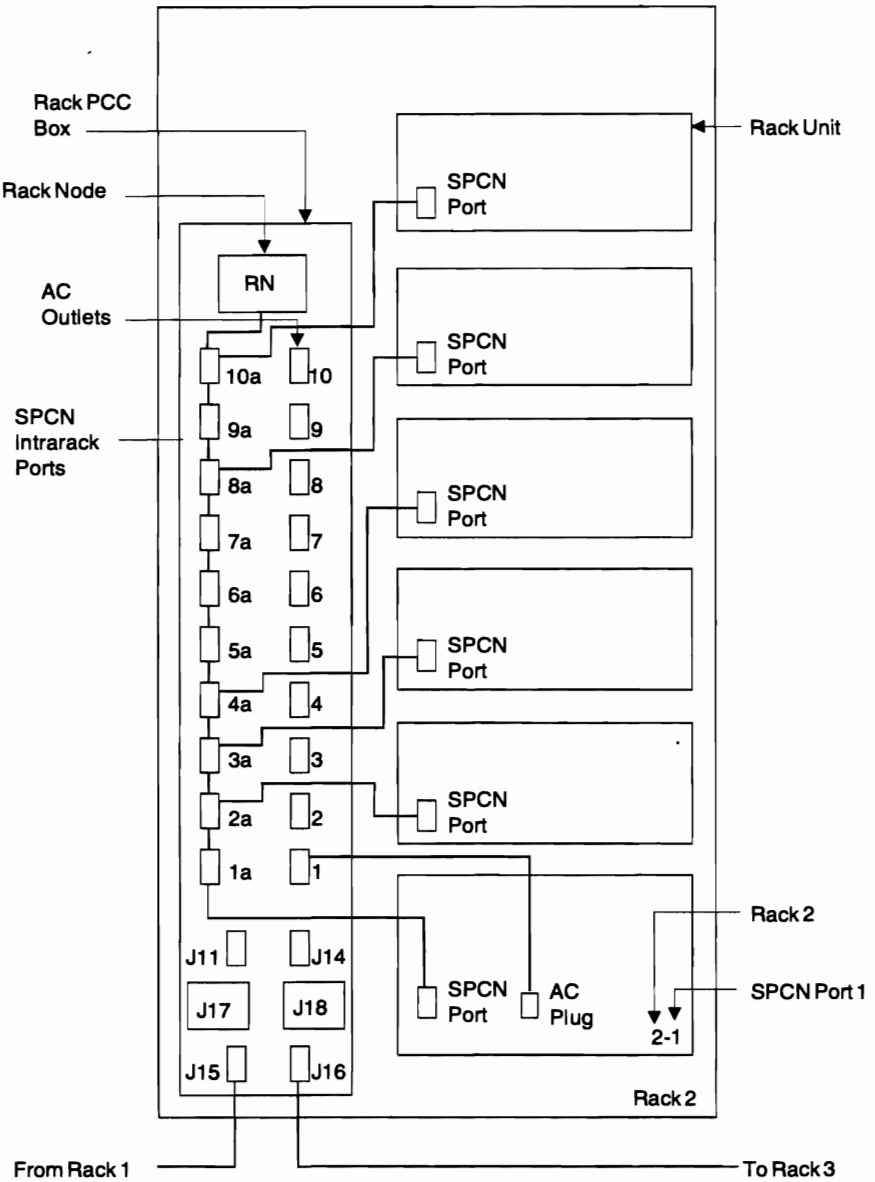
SPCN Addressing

A rack-mounted unit is identified and located by a rack address and a unit address. A rack address is fixed and is assigned by the primary node or by the operating system. A unit address is fixed and determined by the SPCN port that the rack unit is connected to, as shown in Figure 7-3.

The rack and unit addresses are normally displayed on the secondary node (for example,the FC 5042 unit) control panel. They appear in the following format:

```
*RRU      RR = The rack address (01 - 24)
           U = The unit address (1 - A)
```

Note: Although all rack-mounted units are connected to the PCC box, only one is shown connected in Figure 7-3.



J15 Inter-rack Port 0 Outbound on Primary; Inbound on Secondary
J16 Inter-rack Port 1 Outbound on Primary; Outbound on Secondary
J17 PCC J9 In
J18 PCC J10 Out
J11 Remote Power On
J14 UPS

RV3B155-0

Figure 7-3. SPCN Secondary Rack Showing SPCN Addressing.

SPCN Menu Flow

Figure 7-4 shows the menu flow for SPCN. The first display is selected from the DST Start a Service Tool menu.

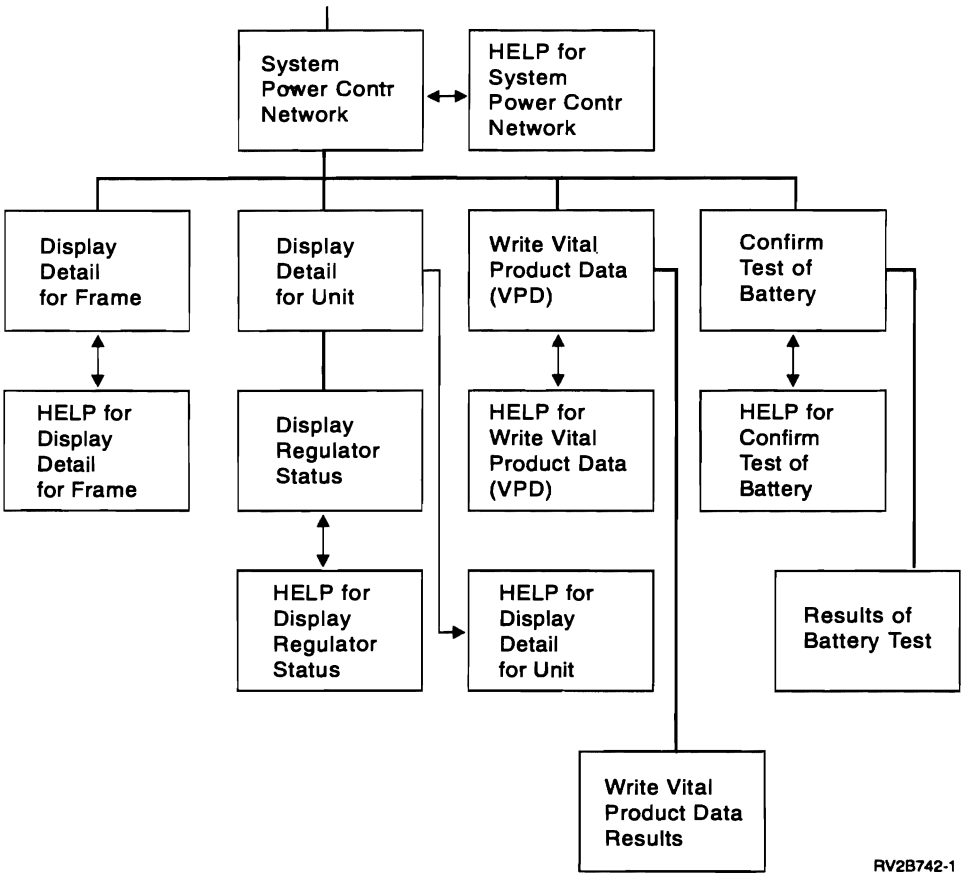
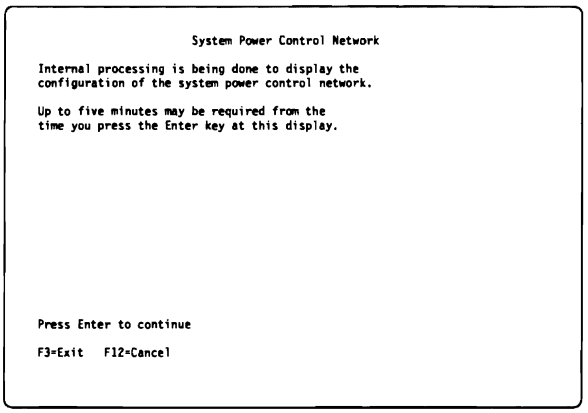


Figure 7-4. SPCN Menu Flow

SPCN Advisory Display: This display advises the operator that a delay of up to 5 minutes may occur before the main menu is displayed. This is the first display of the SPCN menu flow.

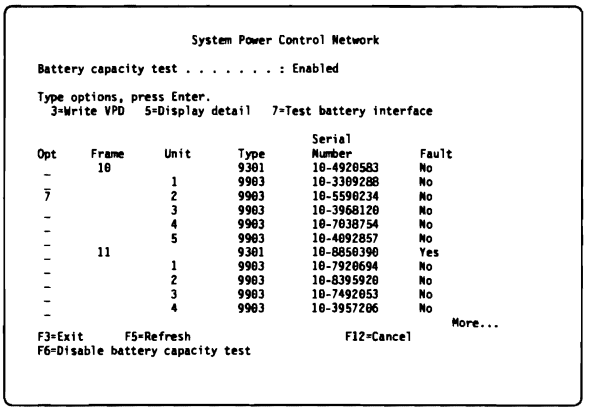


SPCN Main Menu: This display allows the service representative to choose the frame or rack-mounted unit to work with.

Note: SPCN on the 9337 disk unit does not support this function.

The SPCN display may be scrolled for a maximum number of 100 entries.

Pressing F5 causes updated information for the SPCN to be displayed. For example, if the operator had written new VPD information, pressing F5 would display the newly written VPD information.



The fields in this display have the following meanings:

Battery capacity test: This field shows the status of the system-initiated periodic battery capacity test, either enabled or disabled. When used with the F6 key, it allows the service representative to enable or disable the system-initiated periodic battery capacity test. If the field is already enabled, F6 disables the battery capacity test. If the field is already disabled, F6 enables the battery capacity test. When the field is enabled, the test will run on all battery backup units in the system, every 3 months.

Opt: This field allows the service representative to choose the rack or unit components to work with. The service representative may enter options for more than one rack or unit at a time, allowing the options to be stacked and handled in order.

The following options are available for the *Opt* field:

3 (Write VPD)

This option should be used whenever the CE replaces an ac module or a PCC (see "Write Vital Product Data (VPD)" on page 7-10). This option allows the service representative to write the VPD to a rack or unit on the power system.

5 (Display detail)

This option displays detailed information for the selected rack or unit (see "Display Detail for Frame" on page 7-11 and "Display Detail for Unit" on page 7-12).

7 (Test battery interface)

This option causes a battery interface test to be performed and schedules a battery capacity test in 24 hours. Because the system automatically will test the batteries every 3 months (if enabled), this option should be used only after replacing a battery power unit. This option is valid for only those units that contain a battery power unit and is not valid for a rack. Also, this test does not affect the automatic quarterly test.

Note: Excessive testing of the battery will shorten its useful life.

Frame: This field refers to one of the system racks. The value is the SPCN address. If the field has a value in it, then the *Unit* field contains a blank.

Unit: This field refers to one of the rack-mounted units connected to the SPCN. The value is the SPCN port to which the unit is connected.

Type: This field shows the product type of the rack or unit.

Serial number: This field refers to the serial number of the rack or unit.

Fault: This field indicates whether a power fault currently exists on that rack or unit. Information on the fault can be found either from a message to the system operator or a power reference code on the unit.

Write Vital Product Data (VPD): This display allows the service representative to select the values for writing the VPD to an SPCN rack or unit.

```
                    Write Vital Product Data (VPD)

Frame. . . . . :  10
Unit. . . . . :

Change information and press Enter.

   Type . . . . . .  9301

   Model. . . . . .  001

   Serial Number. . .  10 - 3892064




F3=Exit   F12=Cancel
```

The fields in this display have the following meanings:

Type: This field shows the product type of the unit or rack.

Model: This field shows the model number the rack or unit.

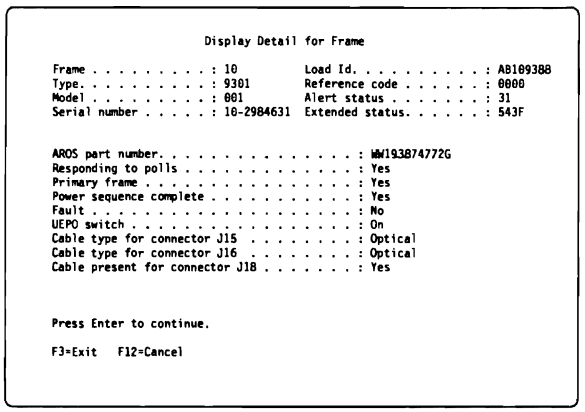
Serial Number: This field shows the serial number of the rack or unit. It consists of two fields, the manufacturing ID and the unit serial number, separated by a hyphen (-).

Write Vital Product Data (VPD) Results: This display indicates the results of the write VPD. A message is displayed on line 24 that describes the results.

Note: VPD for a rack-mounted unit will not be written until the next IPL.

```
                    Write Vital Product Data (VPD) Results

Frame. . . . . :  10
Unit. . . . . :

Change information and press Enter.

   Type . . . . . .  9301

   Model. . . . . .  001

   Serial Number. . .  10 - 3892064




F3=Exit   F12=Cancel
Vital product data has been successfully written.
```

Display Detail for Frame: This display shows details for the selected rack.



The fields in this display have the following meanings:

Frame: This field shows the rack address.

Type: This field shows the product type of the rack.

Model: This field shows the model number of the rack.

Serial number: This field shows the serial number of the rack.

Load ID: This field shows the load identifier of the rack Licensed Internal Code.

Reference code: This field shows the error code for the rack.

Alert status: This field shows the status of the rack SPCN node.

Extended status: This field provides additional status information for the rack.

AROS part number: This field shows the alterable read-only storage (AROS) part number.

Responding to polls: This field indicates whether the rack is responding to polling requests from the Primary SPCN node. Field values are Yes or No.

Primary frame: This field indicates whether this is the primary rack. Field values are Yes or No.

Power sequence complete: This field indicates whether the rack power sequencing completed. Field values are Yes or No.

Fault: This field indicates whether a power or functional fault currently exists. Field values are Yes or No.

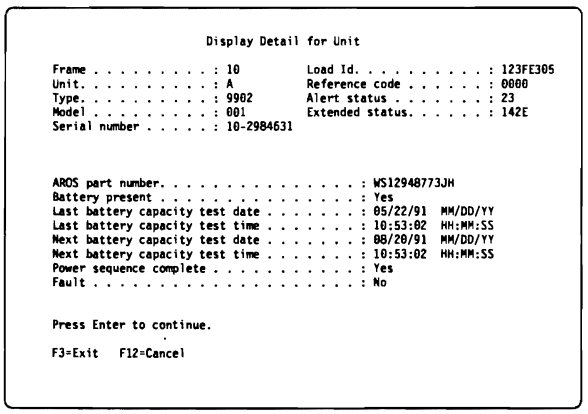
UEPO switch: This field indicates whether the unit emergency power-off (UEPO) switch is on or off.

Cable type for connector J15: This field indicates the presence or type of cable. Field values are None, Copper, or Optical.

Cable type for connector J16: This field indicates the presence or type of cable. Field values are None, Copper, or Optical.

Cable type for connector J18: This field indicates whether a cable for connector J18 is present. Field values are Yes or No.

Display Detail for Unit: This display shows details for the selected unit.



The fields in this display have the following meanings:

Frame: This field shows the rack address.

Unit: This field shows the SPCN port number the rack-mounted unit is connected to.

Type: This field shows the product type of the unit.

Model: This field shows the model number of the unit.

Serial number: This field shows the serial number of the unit.

Load ID: This field shows the load identifier of the unit Licensed Internal Code.

Reference code: This field shows the error code for the unit.

Alert status: This field shows the status of the unit SPCN node.

Extended status: This field provides additional status information for the unit.

AROS part number: This field shows the alterable ROS part number.

Battery present: This field indicates whether a battery is present. Field values are Yes or No. The following four fields on battery information contain data if the field value is Yes:

Last battery capacity test date: This field gives the date of the last battery test in the format MM/DD/YY.

Last battery capacity test time: This field gives the time of the last battery test in the format HH:MM:SS.

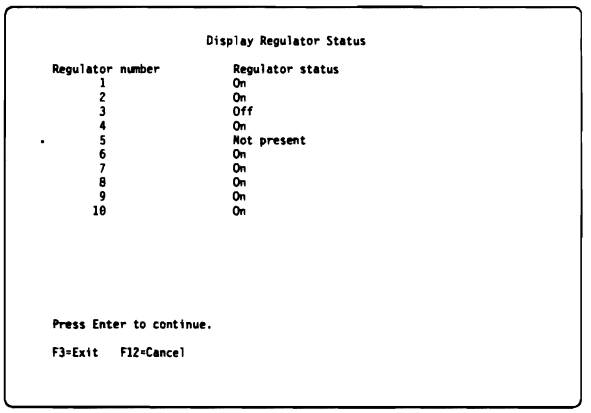
Next battery capacity test date: This field gives the date of the next battery test in the format MM/DD/YY.

Next battery capacity test time: This field gives the time of the next battery test in the format HH:MM:SS.

Power sequence complete: This field indicates whether or not the power sequence is complete. Field values are Yes or No.

Fault: This field indicates whether or not a power or functional fault currently exists. Field values are Yes or No.

Display Regulator Status: This display shows the status of the regulators in the selected rack mounted units.



The fields in this display have the following meanings:

Regulator number: This field indicates the sequential number of the position of a regulator. Field values are 1 through 32. For information on the location of these regulators in the 9406, and 504x, see "Locations and Addresses" in the "Service Referenced Procedures and Information" section in the *Problem Analysis* information.

For the 5032 Removable Storage Unit, the regulators are installed in the tray assemblies and are numbered in the order shown on the control panel.

Regulator status: This field indicates the status of a regulator. Field values are *Not present*, *On*, or *Off*.

Confirm Test of Battery: This display confirms that the battery interface test has been requested and may take up to one minute to complete. The service representative has the chance to cancel the test by pressing the F12 key.

```
                    Confirm Test of Battery

You have requested to run a battery interface test for the
unit shown below.

NOTE: This test may take up to one minute to complete.


                                          Serial
Opt     Frame     Unit     Type           Number        Fault

 7                 1       9903           10-4920857    No


F12=Cancel
```

Results of Battery Test: This display indicates the results of the battery interface test. The bottom portion of the display shows the results of the battery test.

```
                    Results of Battery Test

The results of the battery interface test are displayed
below.  If the test was successful, a battery capacity
test will be performed on this unit in 24 hours.


                                          Serial
Opt     Frame     Unit     Type           Number        Fault

 7                 1       9903           10-4920857    No


F12=Cancel
Test has completed.  No problems were found.
```

If the interface test is successful, a capacity test will automatically be performed 24 hours later. The capacity test is delayed to allow the battery to become fully charged. Results of the capacity test are logged in the error log.

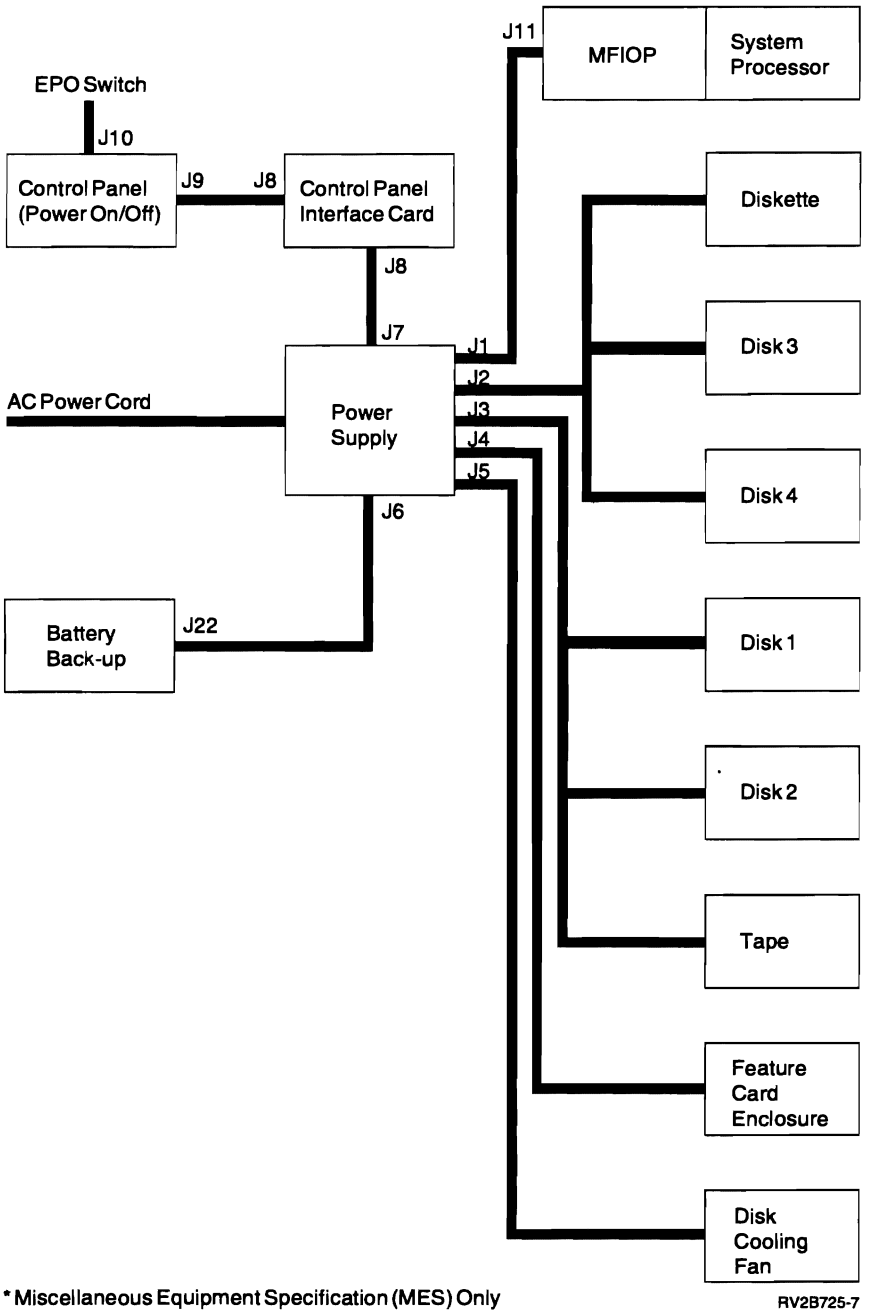
Note: Excessive testing of the battery will shorten its useful life.

System Power Distribution Diagrams

Following are diagrams of several system types and models.

9402 Power Distribution Diagram (1 of 3)

Models C0x, D04, D06, E04*, E06, F04*, F06



* Miscellaneous Equipment Specification (MES) Only

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Figure 7-5. 9402 System Power Distribution (1 of 3). The 9402 Power Distribution Diagram shows the FRUs that receive dc voltages from the central power supply.

9402 Power Distribution Diagram (2 of 3)

Models D02, E02, E04, F02, F04

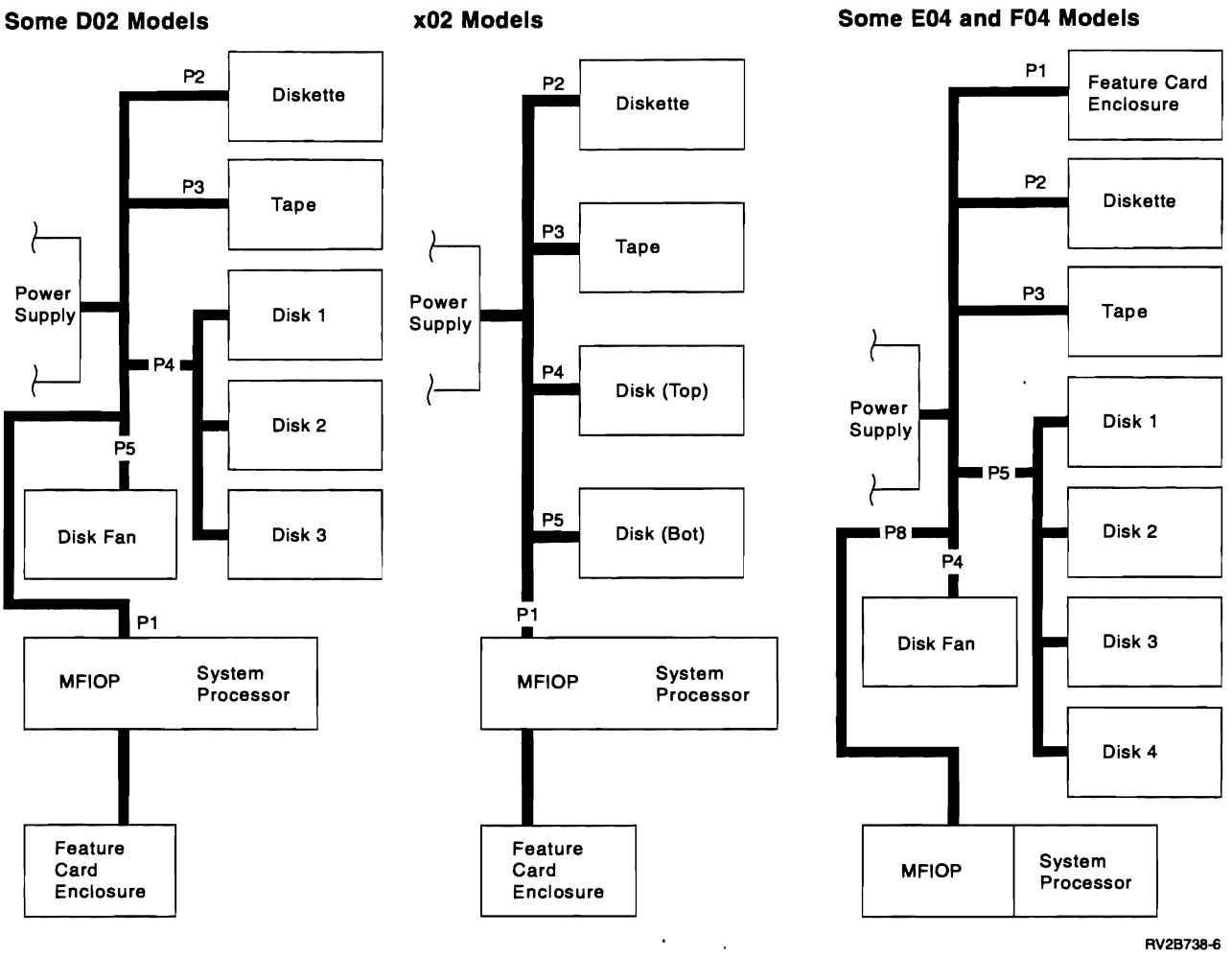


Figure 7-6. 9402 System Power Distribution (2 of 3). The 9402 Power Distribution Diagram shows the FRUs that receive dc voltages from the central power supply.

9402 Power Distribution Diagram (3 of 3)

Expansion Unit

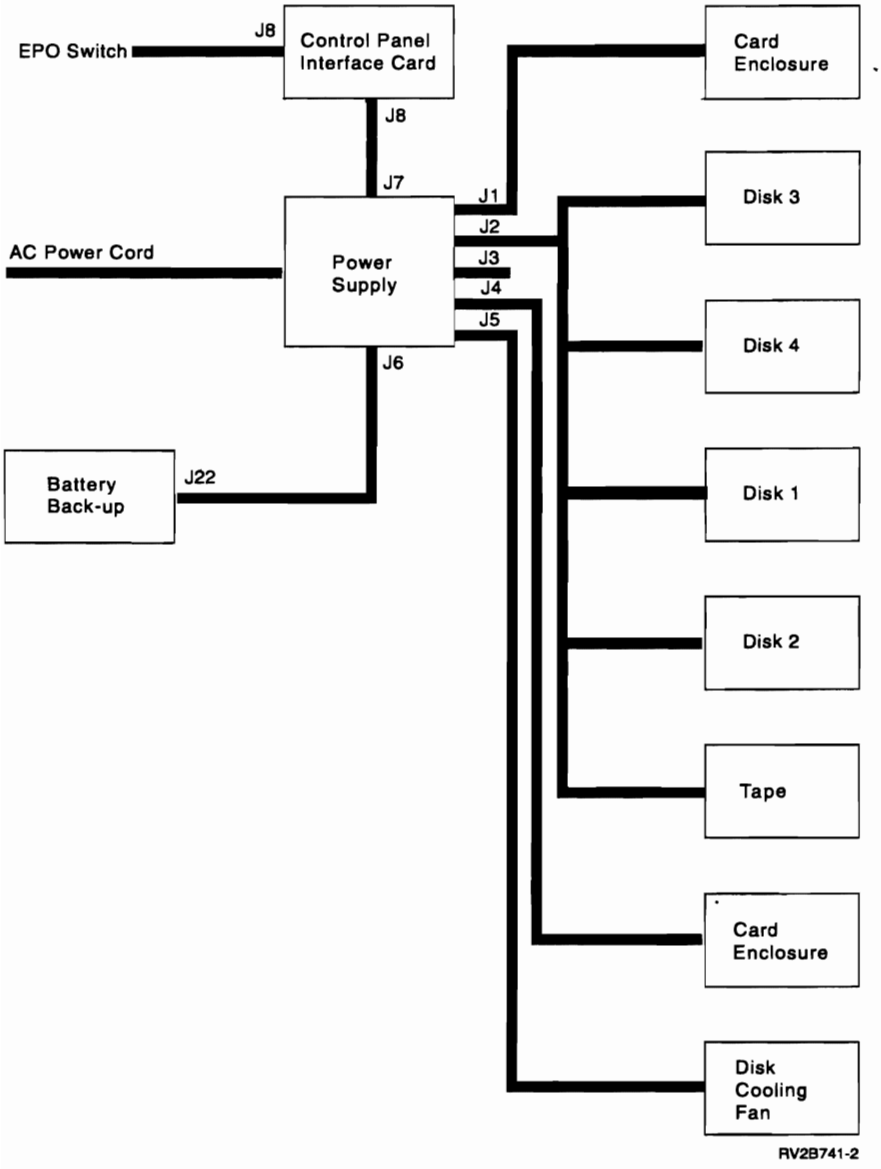


Figure 7-7. 9402 System Power Distribution (3 of 3). The 9402 Power Distribution Diagram shows the FRUs that receive dc voltages from the central power supply.

9404 Power Distribution Diagram

Note: The 9404 system uses a distributed power system. The Expansion Unit power and distribution is identical to that used in the 9404 System Unit. Power and signal cables connect to the central cable assembly allowing new units to be added. The base power supply sends control supply voltages to the control panel when the power plug is connected to utility power. A 4-bit power supply diagnostic error code is sensed by the control panel to display power system reference codes.

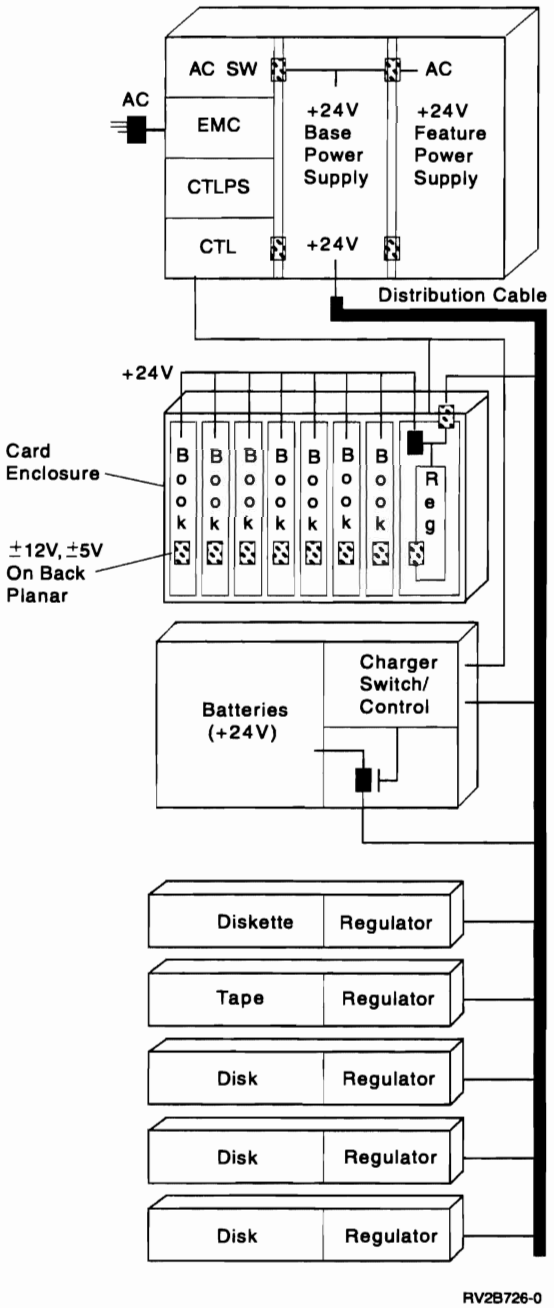


Figure 7-8. 9404 System Power Distribution

9406 Stage 1 Power Distribution Diagram

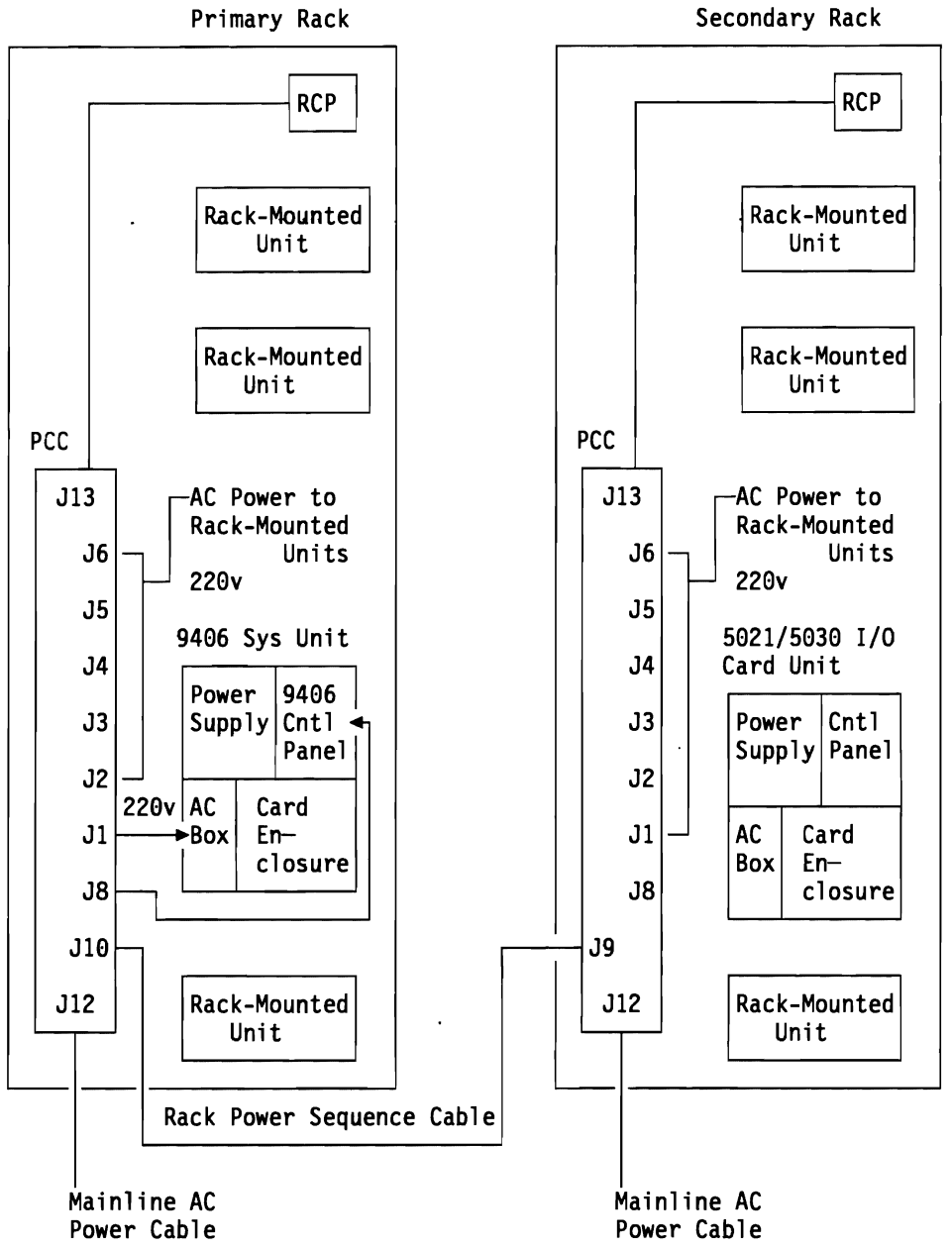


Figure 7-9. Stage 1 Power Distribution. The 9406 Stage 1 system uses the distributed power concept.

that has a Continuous Power label on .

9406 Stage 2 Power Distribution Diagram

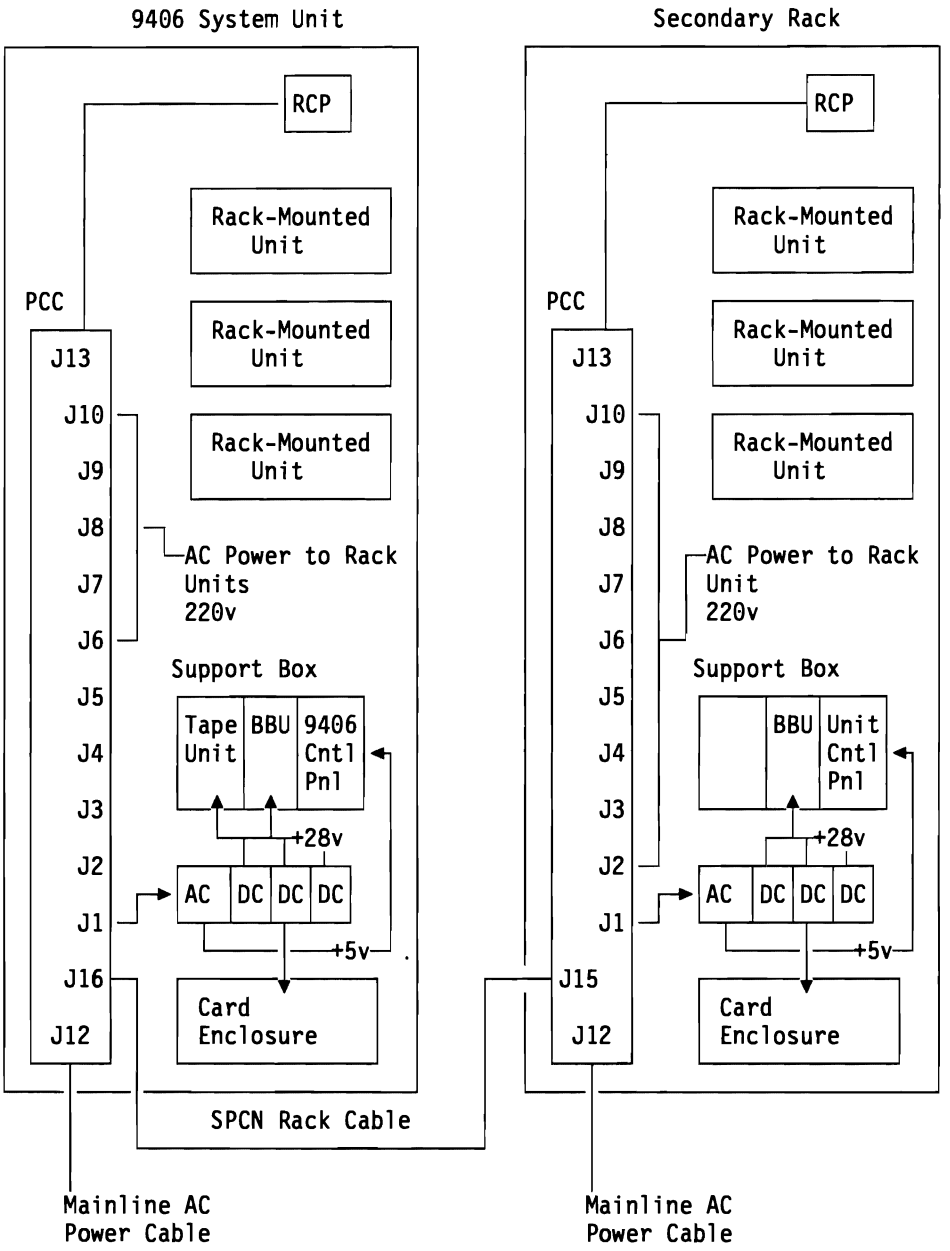


Figure 7-10. Stage 2 Power Distribution. The 9406 Stage 2 system uses the distributed power concept.

System Hardware Information

Introduction

The AS/400 system consists of logic cards and various hardware. The "Software Licensed Internal Code Summary" on page 6-2 lists the hardware and software that controls the AS/400 system. The logic diagram, Figure 7-11 on page 7-21, is an example to help you understand how system hardware is linked together. The diagram represents a logical overview, **not** the system configuration.

Note: The hardware shown in Figure 7-11 on page 7-21 may not be available on all system types and models. The diagram is shown as an example only.

To display or print a list of the hardware that is on the system you are working with, see "System Configuration List" on page 7-23 of the Work with Hardware Products (WRKHDWPRD) Command section. For more information on system configuration, see "Configuration Rules" in the *Install and Upgrade* information.

Note: The "Configuration Rules" section is not available for all system types.

For information on card types, descriptions, and part numbers, see "Type, Model, Part Number List" in the *Problem Analysis* information for the system.

For more information on card locations and addressing, see the locations and addressing sections of the *Problem Analysis* information.

For information on power distribution, see " System Power Overview" on page 7-3.

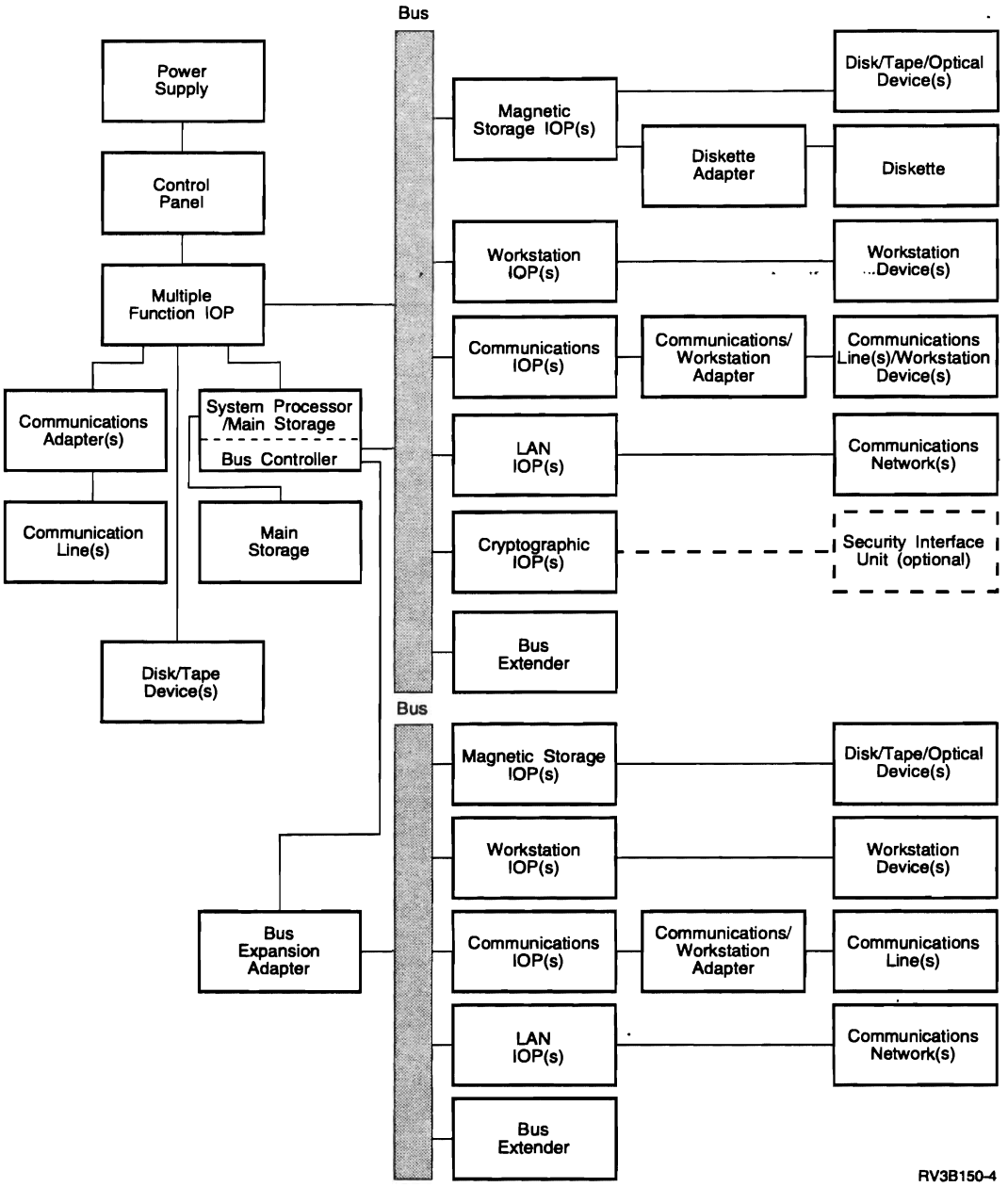


Figure 7-11. Example - 9406 Model F95 logic diagram

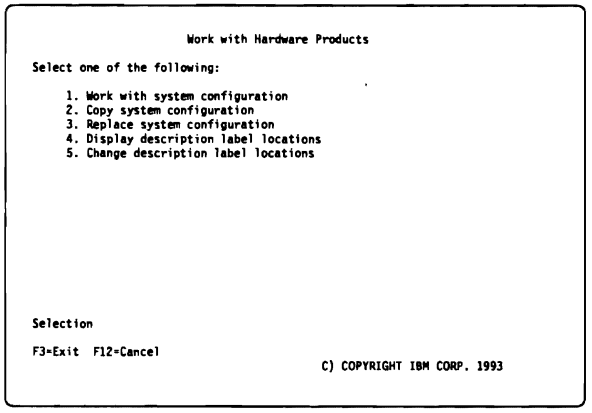
Work with Hardware Products (WRKHDWPRD) Command

Introduction

The Work with Hardware Products (WRKHDWPRD) command helps you to maintain an inventory of the hardware attached to your system locally, not including displays and printers. This command is used for service and for hardware upgrades. Use the WRKHDWPRD command to:

- Display, print, and verify hardware equipment for upgrades or service.
- Maintain an inventory of system hardware. The system configuration list shows hardware (type, model, serial number, resource name, part number) information specifying physical locations, and bus addresses.
- Add, change, and remove hardware items.

When you run the WRKHDWPRD command, the Work with Hardware Products display appears with the following options:



1. Work with system configuration

   This option allows you to display, change, and remove information about locally attached hardware (not including displays and printers). If some hardware does not have physical location information, you are automatically prompted for this information when this option is selected. See "System Configuration List" on page 7-23 for more information.

2. Copy system configuration

   This option performs a backup of the physical location information that was entered using the *Work with system configuration* option. It allows you to copy the system configuration data from the system resources manager (SRM) database to user-accessible files. User accessible topology files can be transferred from one location to another using data communications or other media types, such as tape or diskette.

3. Replace system configuration

   This option can be used if the system configuration data was lost for some reason. It allows you to restore the physical location information that you entered using the *Work with system configuration* option.

4. Display description label locations

   This option allows you to display or print the current configuration label location information. It is used along with some system upgrade procedures. For more information on how to use this option, see "Configuration Description Labels" on page 7-29.

5. Change description label locations

   This option allows you to display and change, or print a worksheet of the current configuration label location information. This option is used along with some system upgrade procedures. For more details on how to use this option, see "Change the Label Descriptions" on page 7-31.

System Configuration List

Introduction: The system configuration list shows the system hardware. It includes FRU locations, addresses, serial numbers, and part numbers.

Display or Print the System Configuration List:

The most recent system configuration printout is stored in the back of the *System Operation* or *System Startup and Problem Handling* binder. If it is not there, or if it is not current, use this procedure to generate a printout.

To display the system configuration list, perform steps 1 through 5 of this procedure.

Note: For a description of what each field means, see "Location Information" on page 7-24.

1 Sign on to the system (if not already signed on).

2 Enter the Work with Hardware Products

```
WRKHDWPRD
```

command to access the Work with Hardware Products display.

Note: The display shown is an example only.

```
                    Work with Hardware Products

Select one of the following:

     1. Work with system configuration
     2. Copy system configuration
     3. Replace system configuration
     4. Display description label locations
     5. Change description label locations




Selection

F3=Exit  F12=Cancel
                                   C) COPYRIGHT IBM CORP. 1993
```

3 Select the *Work with system configuration* option and press the Enter key.

4 Does the Work with System Configuration display appear?

Yes **No**

↓ Enter the requested hardware information. See "Adding Information for New Hardware" on page 7-25 for details. Card positions are automatically filled in, as are the resource name, description, type, and most serial number and part number fields.

When you have typed all the requested information and the Work with System Configuration display appears, continue with step 5 of this procedure.

Note: The display shown is an example only.

```
                        Work with System Configuration

System ID . . . .9406-1234567-19880108-104526

Type options, press Enter.
  2=Change   4=Remove
                                                 ----------Location----------
                                                 Frame    EIA    Device   Card
Opt  Description            Type-Model           ID     Location Position Posi
     1.6M Rack                9309-002            A
       8-inch Diskette Unit   9331-001            A       30
       5.25 Diskette Unit     9331-002            A       27
       Reel Tape Unit         9347-001            A       21
       Main Card Enclosure    9406-B50            A       13
         12MB Main Storage    3030                A       13              1
         12MB Main Storage    3030                A       13              2
         12MB Main Storage    3030                A       13              3
         Processor Card       2502                A       13              4
         Service Processor    2505                A       13              5
         Mag Stge Device Ctl  6110                A       13              6
                                                                          More...
F3=Exit      F11=Display serial numbers and resource names   F12=Cancel
F17=Print    F18=Work with cables   F24=More Keys
                                        C) COPYRIGHT IBM CORP. 1993
```

5 To view the configuration list, use the Page Up and the Page Down keys.

6 Is the system operator available to print the system configuration list?

No **Yes**

↓ Ask the system operator to print the output. Then, go to step 13 of this procedure.

7 Press F17 (Print) on the Work with System Configuration display to spool the information to an output queue.

8 Press F3 (Exit) to leave the Work with System Configuration display and go to a command entry display.

9 Do you need help to print the system configuration list?

No	Yes
↓	Go to the *System Operation* information for how to print a spool file. Then, continue with step 10 of this procedure.

10 If the system asks for alignment verification, you can do either of the following:

- Set the printer alignment
- Enter `I` to select the Ignore option.

11 The printer prints the system configuration list.

12 When printing is complete, enter

```
ENDWTR name *IMMED
```

where `name` is the name of the printer used in the STRPRTWTR command.

13 Verify that the system configuration list is correct (see "Verify That the System Configuration List Is Correct").

Keep a copy of the latest system configuration list in the *System Operation* or *System Startup and Problem Handling* binder.

When you have verified that the system configuration data is correct, copy the system configuration (see "Copying and Replacing System Configuration Data" on page 7-28).

This ends the procedure.

Verify That the System Configuration List Is Correct: Use the printed system configuration list (see "Display or Print the System Configuration List" on page 7-23). to compare the system hardware to the hardware listed.

- Are the correct number of frames displayed?
- Are the correct hardware items displayed?
- Do the serial numbers of the hardware items match?
- Are the cables on the hardware items connected as shown on the system configuration list cable charts?

Note: Devices must be powered on to be recognized by the system and shown in the system configuration list. Devices that are not powered on are not shown on the system configuration list, unless they were previously entered in the list during an earlier IPL.

Correct any differences between the system hardware and the hardware listed on the configuration list (see "Change Information in the Configuration List" on page 7-28 and "Adding Information for New Hardware" on page 7-25 for details).

Location Information: This section describes the hardware location information. The fields explained in this section are not required for all systems.

- EIA location:

  Inside the back of some frames, along the sides, are black and white numbers that start with the number 1 on the bottom. Each number is an EIA location. A device is in the EIA location where the bottom of the device aligns with a number. If the frame has no numbers, start at the bottom and count every three holes as making up one EIA location. The first three holes make up EIA location number 1.

- Frame ID for Stage 1 racks:

  The frame ID label is placed inside the rear door in the upper right-hand corner of each frame. Each frame should have an ID. The primary frame is labeled A. Frame IDs are requested by the system when new hardware items are added. If the hardware item is in a frame that has not been previously defined, the Work with Hardware Products command prompts you for the frame information.

- Frame ID for Stage 2 racks:

  Stage 2 racks have two-digit IDs that are assigned through the system power control network (SPCN). The frame ID is displayed on a panel on the front.

- Frame ID for expansion units:

  Expansion units have 2-digit IDs that are assigned through the system power control network (SPCN). The frame ID is displayed

on a panel on the front. If the SPCN is not available, the user may enter a one- or two-digit alphanumeric ID after selecting the *Work with system configuration* option from the Work with Hardware Products main menu.

- Card position:

  Position numbers are found by looking in the back of the card enclosure and, starting on the left, counting the positions until you reach the correct position.

  Note: Stage 2 card enclosures also have card positions in the front. The position numbers continue around from the back, starting with position 14 in the front left. Card positions for the various cards in the system are automatically determined by the system.

  Some cards have second-level cards attached to them. These second-level cards can be communications I/O adapters, workstation I/O processors, or cards containing more system storage. Second-level card position A is at the bottom of the main card, and position B is above A. For example, position 5A is the bottom second-level card position in card position 5. Position 5B is the second-level card position above A in card position 5. Position C is above B.

- Port:

  Ports are cable-connecting locations. Ports for cards are marked with the numbers 1, 2, 3, and so on from the top of the card to the bottom of the card.

  Ports for three-connector power cords (also known as mainline power cables) are numbered J1, J2, and so on.

  Ports for power control cables (reddish-brown connectors) are numbered J1A, J2A, and so on.

- Part numbers:

  Part numbers usually appear on the part.

  You can also find part numbers in the *Repair and Parts* information and in the unit reference code tables in the *Problem Analysis* information for your system.

- Machine types:

  Machine type identifiers are located on the front of the hardware unit. These four-digit codes are used to identify specific devices. For example, 9347 is a 1/2-inch reel tape unit, and 9332 is a disk unit.

- Models:

  Model numbers are usually found next to the machine type numbers. The model number is used to differentiate between different models of the same machine type.

- Card type codes:

  Card type codes are four-digit codes used to differentiate between the various cards in the system. For example, 6040 is a twinaxial workstation I/O processor. These four-digit codes are on the card handles and can be seen from the rear of the machine. The card type codes (except communications cards) are often the same as the feature code that the Marketing Representative uses when ordering a feature for the system.

- Serial numbers:
  - If any tape or diskette unit reports a serial number of all zeros, use the *Change* option on the Work with System Configuration display to enter the correct serial number. The serial number is found on the front of the device.
  - The serial number for main storage cards is initially all zeros.
  - You cannot change the serial number for any item that reports a serial number that is not all zeros.

Add Information to the Configuration List

Adding Information for New Hardware: When new hardware is added to the system, you may have to enter the hardware information because the system cannot determine this information automatically. You are prompted for the necessary information. The full system configuration list is not displayed until all data is entered.

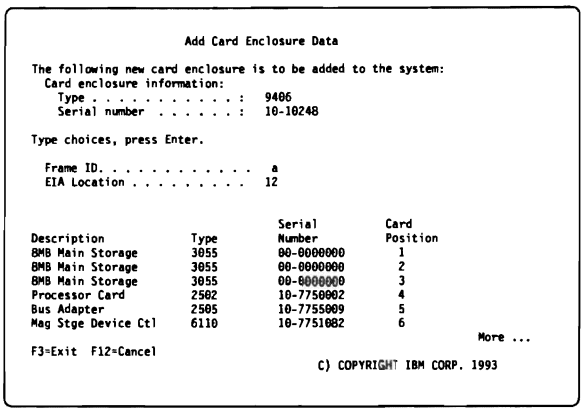


Figure 7-12. Add Card Enclosure Data Example

When prompted, enter the requested hardware information. See "Location Information" on page 7-24 for details. Card positions are automatically filled in, as are the resource name, description, type, and most serial number and part number fields.

Note: When adding to or changing the system configuration list, it is possible to show that card enclosures, devices, and so on, are in the same physical location. Collision detection (determining if two units of hardware are in the same location) is not performed. Ensure when entering location information that the system configuration list shows correct information. If an entry is not correct, change or remove it. Print the system configuration list (see "Display or Print the System Configuration List" on page 7-23) and verify that the hardware information you entered is correct (see "Verify That the System Configuration List Is Correct" on page 7-24). If any entries are not correct, make the necessary changes (see "Change Information in the Configuration List" on page 7-28).

After all the data is correct, use the *Copy system configuration* option of the WRKHDWPRD command to make a backup copy of the data you entered. Print the system configuration list (see "Display or Print the System Configuration List" on page 7-23) and place the printout in the back of the *System Operation* or *System Startup and Problem Handling* binder.

To enter new system configuration data, enter

```
WRKHDWPRD
```

(the Work with Hardware Products command). The Work with Hardware Products display appears with these options:

- Work with system configuration
- Copy system configuration
- Replace system configuration
- Display description label locations
- Change description label locations

Adding Cables to the Hardware Information:
You can add cables to the hardware information by doing the following:

1 Start from the Work with System Configuration display. Press F18. The Select Cable Type display appears.

2 Select the type of cable to be added.

A display appears that lists all cables of this type now in the system configuration.

3 Press F6 to add cables to the system. The Add Cable display appears. This displays the various cable part numbers and descriptions for the type of cable you selected.

4 Select the quantities for the cable part numbers you want to add. Then, press the Enter key.

Do you want to add workstation cables?

Yes	**No**
↓	Go to step 9 of this procedure.

5 Enter the type number for the workstation I/O processor card (for example, 6040/6140).

6 Enter the frame ID of the card enclosure holding the workstation I/O processor card.

7 If the frame contains EIA location information, enter the EIA location of the card enclosure.

8 Enter the card position where the workstation I/O processor card is found.

9 Do you want to add bus extension, IPI-3, SCSI, or signal cables?

Yes **No**

↓ Go to step 13 of this procedure.

10 If needed, enter the type number for the card or device from which the cable is coming.

11 Enter the ID of the frame this card or device is in, its EIA location (if available), card position, and the port number for this cable.

12 Enter the same information for the card or device at the other end of the cable.

Note: Signal cables for the 9335 Models A01 to B01 are also entered this way.

13 Do you want to add power cables?

Yes **No**

↓ Go to step 16 of this procedure.

14 Enter the ID of the frame the power cable is coming from and the port (socket) it is attached to.

15 Enter the device type number and EIA location (if available) where this power cable is connected.

16 Do you want to add power sequence cables?

Yes **No**

↓ **This ends the procedure.**

17 Enter the ID of the frame that the cable is coming from and going to, and the ports for each end.

This ends the procedure.

Adding Filler Panels to the Hardware Information: You can add filler panels to the hardware information on 1.6M racks by doing the following:

1 Display the Work with System Configuration display. Then, press F6.

2 You have a choice of three sizes of filler panels. Determine the size of filler panel you need by counting the number of EIA units the panel fills in the frame.

3 Enter the amount of each type you need.

4 Enter the frame ID and EIA location (if available) for each filler panel you selected. Press the Enter key when you have keyed in the information for each filler panel.

5 Press F3 (Exit) to return to the Work with System Configuration display.

This ends the procedure.

Adding Reserve Frame Space to the Hardware Information: You can reserve space in 1.6M racks by doing the following:

1 Press F16 to enter the reserve frame space. The ID of the frame that contains the non-IBM hardware, the EIA location, and the height in EIA units are required parameters.

This ends the procedure.

Remove Information from the System Configuration List:

Removing a Card or Device from the System Configuration List: You can remove a card or device from the system configuration by doing the following:

1 Start from the Work with System Configuration display.

2 Type a 4 next to the entry you want to remove. Press the Enter key.

This ends the procedure.

Note: Any card or device the system detects during the latest IPL cannot be removed until the

system is powered off, the device is powered off or removed, and you perform an IPL of the system with the device removed.

Removing a Cable from the System Configuration List: You can remove cables by doing the following:

1. Display the system configuration list. Then, press F18 (Work with cables).
2. Select the type of cable you want to change and press the Enter key. A display appears that shows all cables of this type now in the system configuration list.
3. Move the cursor to the cable you want to remove and select the *Remove* option to remove the cable.

   This ends the procedure.

Change Information in the Configuration List

Changing Card and Device Information: When cards and devices have been moved to a new address or exchanged, hardware information is automatically updated. The system cannot automatically determine when a card or device has been moved to a new frame location. If a device is moved to a new frame location, you must use the *Change* option on the Work with System Configuration display to update the location. Existing system configuration data is changed by moving the cursor on the Work with System Configuration display to the line of the entry to be changed and selecting the desired option.

Note: Use the *Remove* option on the Work with System Configuration display to delete entries for hardware that has been removed from the system.

Changing Cable Information: You can change cable parameters by doing the following:

1. Display the system configuration list. Then, press F18 (Work with cables).
2. Select the type of cable you want to change and press the Enter key. A display appears that shows all cables of this type now in the system configuration list.
3. Move the cursor to the cable information to be changed and select the *Change* option.
4. You can now make the changes.

   This ends the procedure.

Copying and Replacing System Configuration Data: The Work with Hardware Products display has options to copy and replace system configuration data. These options are provided to protect against the loss of system configuration information if the database becomes damaged. To ensure that an accurate, up-to-date copy is saved when you make changes to the system configuration, always:

1. Change the system configuration data using the *Work with system configuration* option on the Work with Hardware Products display.
2. Print the system configuration list and check for accuracy.
3. Copy the system configuration data using the *Copy system configuration* option on the Work with Hardware Products display.

Copying System Configuration Data

1. From the Work with Hardware Products display, select the *Copy system configuration* option.
2. The file names and library names on the next display are QASURACK and QUSRSYS. You can change these names, but do not use library QSYS. Use the default name for consistency.

   Note: If a file already exists, you may have to type Y to confirm that you want to create a new file.
3. A message shows that the system configuration has been copied.

   Note: You can use the SAVLIB (Save Library) or SAVOBJ (Save Object) command to save the data to another type of media (for example, tape).

This ends the procedure.

Replacing System Configuration Data

1 From the Work with Hardware Products display, select the *Replace system configuration* option.

2 The file names and library names on the next display are QASURACK and QUSRSYS. You can change these names to show the name that was used when the file was copied.

Press the Enter key.

3 A message shows that the system configuration has been replaced.

Notes:

a. If hardware has been added to the system since the file was last saved, you may see a panel showing a list of hardware. Press the Enter key to enter the location information, or press F3 to exit the function.

b. You can use the Restore Object (RSTOBJ) command to restore the previously saved file from another type of media. This is needed only if the file is no longer on the disk.

This ends the procedure.

Restoring System Configuration Data:

If the system configuration data is missing (for example, because the system resource management database is damaged), the program that maintains the hardware-reported information restores part of the data contained in the database. However, it cannot restore the data you entered manually.

You can use the *Replace system configuration* option to restore all system configuration information you entered manually. Because the hardware may have been changed since the system configuration was copied, the saved system configuration may not match the present hardware. The *Replace system configuration* option lists most cards or devices added since the last copy was performed. You then have the option of cancelling the replace operation or continuing. If you cancel the replace operation, the information you entered manually into the copy file is not loaded. If you continue the replace operation, the data from the copy file is loaded. You have to enter data for new cards or devices added to the system since the last copy was done.

For example, assume that you have copied the system configuration data to a file named SAVECFG. You have also added a 9331 Diskette Unit to the system, and it is powered on. If you restore SAVECFG, the data for all items except the 9331 is restored. You can then select the *Work with system configuration* option on the Work with Hardware Products display to enter the system configuration data for the 9331 Diskette Unit.

Configuration Description Labels

Introduction: When a system upgrade procedure requires that you label cables and devices, follow the steps in the "Preparation for System Installation or Upgrade" section.

The *Display description label locations* option on the Work with Hardware Products display allows you to display or print the current configuration label location information.

The *Change description label locations* option on the Work with Hardware Products display allows you to display, change or print a worksheet of the current configuration label location information. Use this option when the label currently attached to the cable or device does not match the label information in the system. For more information, see "Change the Label Descriptions" on page 7-31.

If a previously labeled cable or device is replaced during a system upgrade, be sure to transfer the label information to the new hardware.

Preparation for System Installation or Upgrade:

Before you ask the customer to power down the system for an upgrade, you must record specific system value information, verify the system configuration, and create labels for the system cables and devices. Perform the following steps before you begin the upgrade:

Record the System Values

1 Follow these steps to display SYSVAL QIPLTYPE:

a. On the command line of the AS/400 Main Menu, type

```
wrksysval qipltype
```

and press the Enter key.

b. Type a 5 in the *qipltype* field to display its value. Press the Enter key.

Record the information for later use.

Follow these steps to display SYSVAL QAUTOCFG:

a. On the command line of the AS/400 Main Menu, type

```
wrksysval qautocfg
```

and press the Enter key.

b. Type a 5 in the *qautocfg* field to display its value.

Record the information for later use.

2 Verify that the system configuration is correct:

- On the command line of the AS/400 Main Menu, type

```
wrkhdwprd
```

and press the Enter key.
- On the Work with Hardware Products display, select the *Work with system configuration* option and press the Enter key.
- Verify that the system configuration is correct and update it, if necessary.
- Press the F17 key to print a copy.

Note: Pressing the F17 key provides a copy of the system configuration in a system print spool if a printer is not available.

3 Return to the Work with Hardware Products display.

4 Select the *Display description label locations* option and press the Enter key.

5 When the Display Description Label Locations display appears, press the F17 key to print a copy. You must press the F17 key even if a printer is not available.

Note: Pressing the F17 key provides a copy of the label locations in a system print spool if a printer is not available. This allows the label locations to print at another time or at another printer location. You can continue by copying the information from the displays onto a piece of paper.

6 Find the blank labels that came with the upgrade shipment.

7 To label all of the cables, do the following:

a. On the Display Description Label Locations printout, find the card position that has information in the Label column.

- If asterisks (*) appear in the *Location* field and the *Serial number* field, the label is no longer associated with hardware in the system; therefore, you do not create a label.
- If *NONE appears in the Label column, there is no cable for that card position or the customer has not assigned label information to that cable; therefore, you do not create a label.

b. Create a label for each cable that has information in the Card Position column and the Label column. On the blank labels provided, write all of the information exactly as shown in the Label column.

c. Go to the back of the unit, and open (or remove) the back cover.

d. Use the Card Position information on the printout to locate the cables, then attach the labels.

e. Close (or reinstall) the back cover.

8 To label all of the devices, do the following:

a. On the Display Description Label Locations printout, find the device posi-

tion that has information in the Label column.

- If asterisks (*) appear in the *Location* field and the *Serial number* field, the label is no longer associated with hardware in the system, therefore, you do not create a label.
- If *NONE appears in the Label column, the customer has not assigned label information to that device; therefore, you do not create a label.
- For a stand-alone device, a label appears with information in the Type-Model and Serial Number columns. The Location shows a Frame ID of SA and all other Location information contains the period (.) characters. This is a valid label.

b. Create a label for each device that has information in the Device Position column and the Label column. On the blank labels provided, write all of the information exactly as shown in the Label column. Place the label on the device.

Note: Use the Device Position information and the Type-Model and Serial Number information on the printout to locate the devices.

9 Keep the Display Description Label Locations printout to use during the Test Procedure portion of the upgrade.

10 Press F3 (Exit) until you reach the AS/400 Main Menu.

Warning: If the cable or device that you labeled is replaced during the hardware install of the upgrade, ensure that you transfer the label from that cable or device to the replacement cable or device. If you cannot remove the label without damaging it, copy the information onto a new label and attach it to the replacement cable or device.

11 Save the system configuration to a file. Perform the following:

- Create a file to store the system configuration data.

```
CRTSAVF QGPL/CFGSAVE
```

- Save the system configuration data to the file you created.

```
SAVCFG DEV(*SAVF) SAVF(QGPL/CFGSAVE)
```

12 Go to the instructions to perform the upgrade.

After you have completed the upgrade, go to "Change the Label Descriptions" to verify that the labels attached to the cables or devices match the label information in the system.

Change the Label Descriptions: The *Change the label descriptions* option should be used by the CE *only* if the label attached to the cable or device does **not** match the Label information in the system.

Before changing the label descriptions, note the following:

- If the label attached to the cable or device matches the label information in the system, no action is required.
- If the cable or device is new, it does not have a label attached. No action is required by the CE at this time. It is the customer's responsibility to configure and assign labels in the system for all new cables and devices.
- If the previously labeled cable or device, is replaced during a system upgrade, be sure to transfer the existing label information to the replacement cable or device. It is not necessary to change the label description information in the system.

  If you cannot remove the label without damaging it, copy the information onto a new label and attach it to the replacement cable or device.
- It is normal for the resource names to change during the upgrade process. Use the *Change label descriptions* option to match the label to the physical device (do not use the resource name).

To change the label description information in the system:

1. Perform an attended IPL:
   a. Ensure that Manual mode is selected.
   b. Press the system unit Power On switch.
   c. When the IPL or Install display appears, select the *Perform an IPL* option.
   d. At the Sign On display, ask the customer to sign on as QSECOFR.

      Note: It is important that the following step is performed so that the device resource names are updated correctly.

   e. At the IPL Options display:
      - Set the *Start this Device Only* Option to **Y** (Yes).
      - Set the *Define or Change System at IPL* Option to **Y** (Yes).
      - Select System Value Commands
      - Select Change System Values
      - Ensure that the system value QAUTOCFG is 0
      - Ensure that the system value QIPLTYPE is 2

   f. Press F3 twice to continue the IPL.

      Note: As the IPL continues, SRC A900 2000 appears. No action is necessary at this time.

   g. Have the customer sign off after the IPL is complete.
2. Sign on to the system at the console:
   - On the *User* line of the Sign On display, type

     `QSRV`

   - On the *Password* line, type the default password

     `QSRV`

     or ask the customer for the password and press the Enter key.
3. Use the following commands to verify that all devices are varied off.

```
WRKCFGSTS CFGTYPE(*CTL) CFGD(*LWS)
WRKCFGSTS CFGTYPE(*CTL) CFGD(*TAP)
WRKCFGSTS CFGTYPE(*DEV) CFGD(*TAP)
WRKCFGSTS CFGTYPE(*DEV) CFGD(*DKT)
WRKCFGSTS CFGTYPE(*LIN)
WRKCFGSTS CFGTYPE(*NWI)
WRKCFGSTS CFGTYPE(*NWS)
```

   Note: The WRKCFGSTS CFGTYPE(*NWS) command is only available if your system is at V3R1 or later.
4. Verify that the system configuration is correct:
   - On the command line of the AS/400 Main Menu, type

     `wrkhdwprd`

     and press the Enter key.
   - On the Work with Hardware Products display, select the *Work with system configuration* option and press the Enter key.
   - Verify that the system configuration is correct, or update it, if necessary.
5. Return to the Work with Hardware Products display. Select the *Change description label locations* option and press the Enter key.
6. The Using Change Label Locations display appears.
7. Press the Enter key to continue.
8. The Change Description Label Locations display appears. Use the information to verify that the labels you attached to the cables and devices are correct.
   - If asterisks (*) appear in the *Location* field and the *Serial number* field, the label is no longer associated with hardware in the system, and you do not need to create a label.
   - If *NONE appears in the Label column, no label exists for the hardware at that location.
   - If a label appears with the Type-Model and Serial Number information filled in, but the location information is blank, it is a stand-alone device. This is a valid label.

     For a stand-alone device, a label appears with information in the Type-Model and Serial Number columns. The location shows a Frame ID of SA and all other location information contains a period (.) character.

- If you want to display the information in the Type-Model or Serial Number columns, press F11. To see the locations information again, press F11.
- If `More...` appears on the bottom of the screen, scroll forward to view more information.
- To print a worksheet of the Change Description Label Locations information, press the F17. You must press F17 even if a printer is not available. Pressing F17 provides a copy of the label locations in a system print spool if a printer is not available. This allows the label locations to print at another time or at another location. You can continue by copying the information from the displays onto a piece of paper.

9. Use the printout to verify that the labels attached to the cables and devices match the labels on the printout.

   Mark the Work Sheet printout as follows:

   - If the label attached to the cable or device matches the Label information on the printout, no action is required.
   - If the cable or device is new, it does not have a label attached. No action is required by you. It is the customer's responsibility to configure and assign labels in the system for all new cables and devices.
   - If the label attached to the cable or device does **not** match the Label information on the worksheet, you need to change the label in the system. Use the Enter labels from machine here column on the worksheet to list the information from the label that is attached to the cable or device.

   The following is an example of partial printout:

```
Label Locations
             ENDAS001 06/27/94 08:06:58

         ----------- Work Sheet -------
             Serial          Enter labels from
Type-Model   Number            machine here
6140         10-8020111 -------> o.k.
6140         10-8020333 -------> o.k.
6050         10-8050111 -------> BLD6, CTL02
6050         10-8050222 -------> No label
6348-001     00-9110000 -------> TAP01
```

10. Do you have labels to change?

    Yes **No**

    ↓ Return to the upgrade instructions.

11. On the Change Description Label Locations display, type a 2 in the *Opt* column for each location that requires a label change.

    If `More...` appears on the bottom of the screen, do not press the Enter key. Scroll forward to view more information.

12. Type a 2 in the *Opt* column for any other labels you need to change.
13. When you have selected all the locations that require a label change, press the Enter key.
14. The Change Description Label display appears for the first item you selected, showing all of the labels that could be used for that cable or device.
15. Find the label on the display that matches the label attached to that cable or device.

    If you cannot find the label on the display that matches the label attached to that cable or device, verify that you have the correct information. If the information is correct, mark this label on the printout and contact your next level of support when you have completed these instructions. Leave the *Opt* column blank and press the Enter key. Go back to step 15.

16. If you find the label on the display, type a 1 in the *Opt* column next to that label and press the Enter key.
17. If you chose to change more than one item, the Change Description Label display appears for the next label.

    A message at the bottom of the display indicates whether the previous change was successful.

18. For all of the labels that require a change, repeat steps 15 through 17.
19. After you change the last label, the Change Description Label Locations display appears with the updated information.

    A message at the bottom of the display indicates whether the last change was successful.

    If `More...` appears on the bottom of the screen, scroll forward to view more information.

20. Press the F17 key on the Change Description Label display to request a printout of the new information.

    You must press the F17 key, even if a printer is not available.

    Note: Pressing the F17 key provides a copy of the label locations in a system print spool if a printer is not available. This allows the printing of the label locations at another time or allows the printing of label locations at another location that has an available printer.

21. Verify that the labels on the printout match the labels attached to the cables or devices.

22. If you find any errors, go to step 11 on page 7-33 and repeat the instructions through step 21.

    Continue with the next step if all description label information is correct.

23. Sign off from the system (you are signed on as QSRV).

24. Ask the customer to sign on as QSECOFR and change the QAUTOCFG and QIPLTYPE system values to the values you recorded before the upgrade. See step 1 of "Preparation for System Installation or Upgrade" on page 7-29 for more information.

25. Select Normal mode.

    Perform an immediate IPL by typing the following on the AS/400 Main Menu:

    ```
    pwrdwnsys *immed restart (*Yes)
    ```

26. After the IPL is complete, sign on as User QSRV

27. Request a new system configuration printout:
    - On the command line of the AS/400 Main Menu, type

      ```
      wrkhdwprd
      ```

      and press the Enter key.
    - On the Work with Hardware Products display, select the *Work with system configuration* option and press the Enter key.
    - Press F17 to print the system configuration information.

28. Sign off from the system.

29. Insert a printout of the new Description Label information (step 20) and the new System Configuration information (step 27) in the *System Operation* or *System Startup and Problem Handling* binder.

If you were directed to this section by a system installation or upgrade instruction, you may return to that instruction at this time to complete all of the installation or upgrade tasks.

Work with Hardware Products (WRKHDWPRD) Error Messages

Move the cursor down to the error message and press the Help key. Follow the instructions provided in the recovery section of the error message.

Warning: Do not swap cards for problem analysis purposes. Card and device serial numbers are tied to the customer's configuration records.

Configuring and Varying Devices

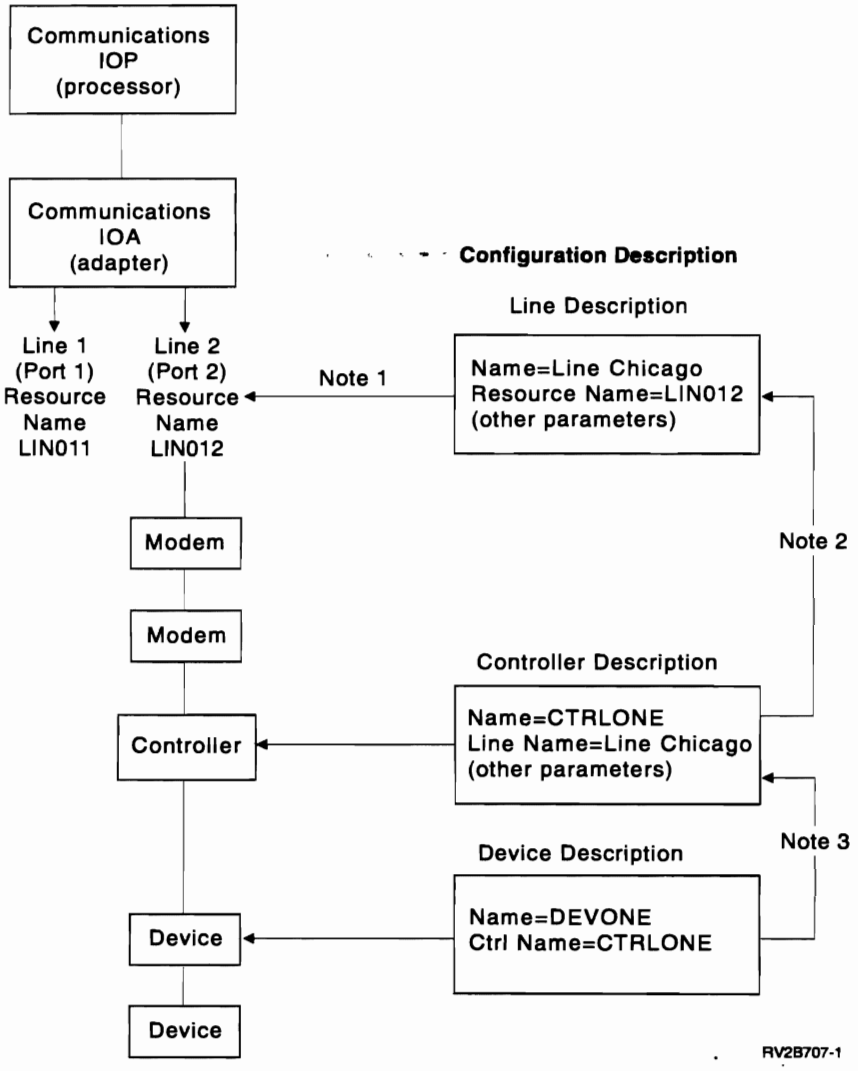
With the OS/400 licensed program, you can make, delete, and vary devices without having to end subsystems and I/O processors. This section describes that process.

Configuration Descriptions

The OS/400 licensed program and other applications use configuration descriptions to communicate with lines, I/O processors, and devices. The following diagrams show the different relationships of configuration descriptions to communications, local workstations, and storage subsystems.

Note: Cryptographic resources can be displayed, but, because they do not use configuration resources, they cannot be changed.

Communications Subsystem Hardware



Notes:

1. Line descriptions are associated with ports on I/O adapter cards by resource name. To determine the resource name of lines (ports or cable plug locations on I/O adapter cards):
   - Enter

     ```
     WRKHDWRSC *CMN
     ```

     (the Work with Hardware Resources command)

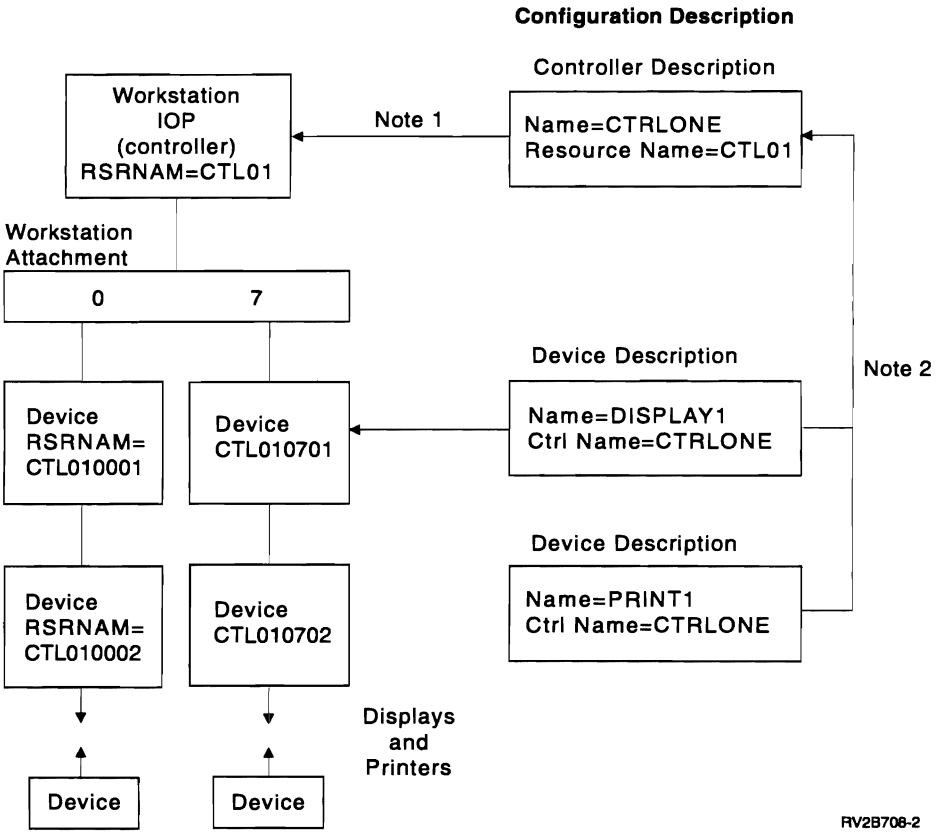
     OR
   - Enter

     ```
     GO HARDWARE
     ```

     (the Go Hardware command) and then select the *Work with communications resources* option.

     You can also use the WRKHDWPRD (Work with Hardware Products) command to display or print resource names.
2. Communications controller descriptions are associated with line descriptions by line description name.
3. Communications device descriptions are associated with controller descriptions by controller description name.

Workstation Subsystem Input/Output Processor



Notes:

1. Controller descriptions are associated with a local workstation I/O processor by resource name. To determine the resource name of workstation I/O processors:

   - Enter

     ```
     WRKHDWRSC *LWS
     ```

     (the Work with Hardware Resources command),

     OR

   - Enter

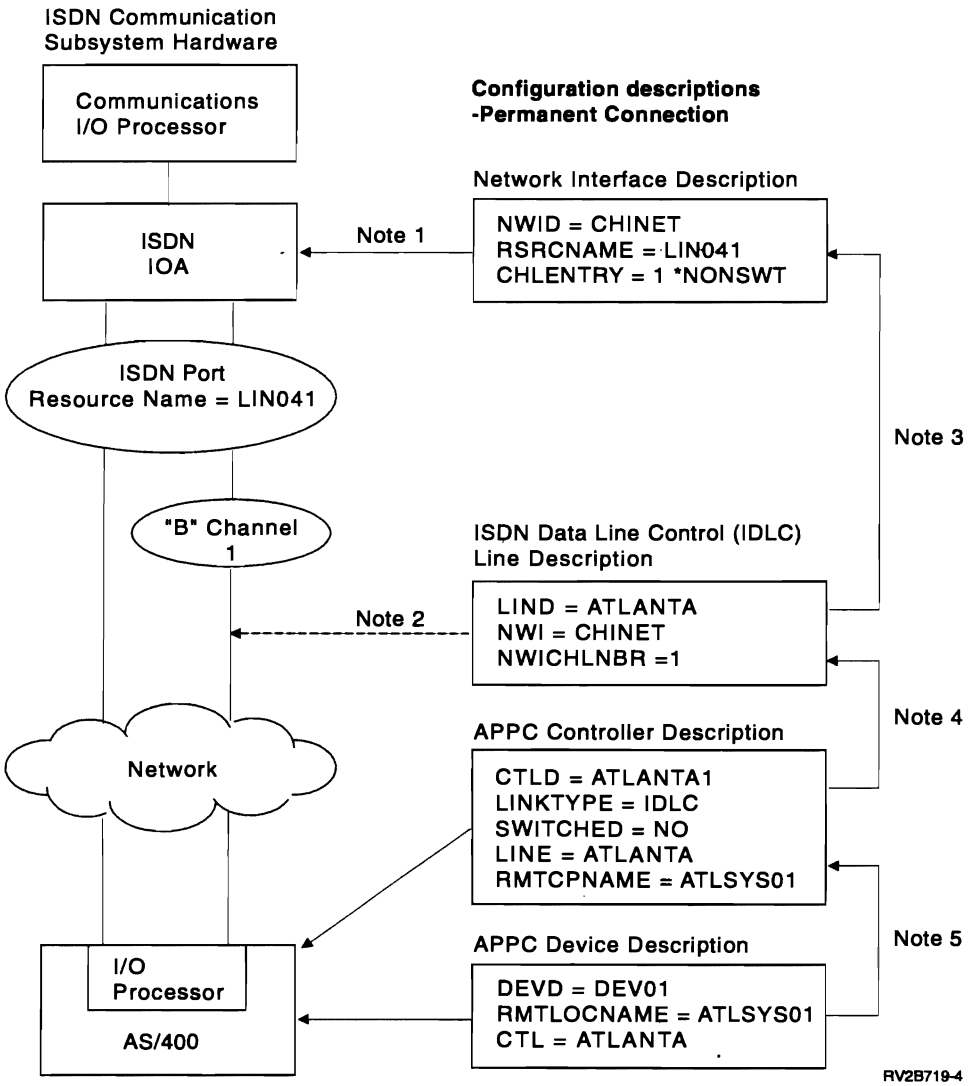
     ```
     GO HARDWARE
     ```

     (the Go Hardware command) then select the *Work with local workstations* option.

   You can also use the WRKHDWPRD (Work with Hardware Products) command to display or print resource names.

2. Device descriptions are associated with controller descriptions by controller description name. The devices have resource names, but the resource names are not needed in the device descriptions. The device resource names have the format CTLnnccss, where CTLnn is the resource name of the controller, cc is the cable port, and ss is the device switch address.

ISDN Communications Subsystem Hardware



Notes:

1. NWI description is associated with an ISDN basic rate interface (port) on the I/O adapter by the resource name.

   To determine the resource name of lines (ports or cable plug locations on the I/O adapter cards):

   - Enter

     `WRKHDWRSC *CMN`

     (Work with Hardware Resources command)

     OR

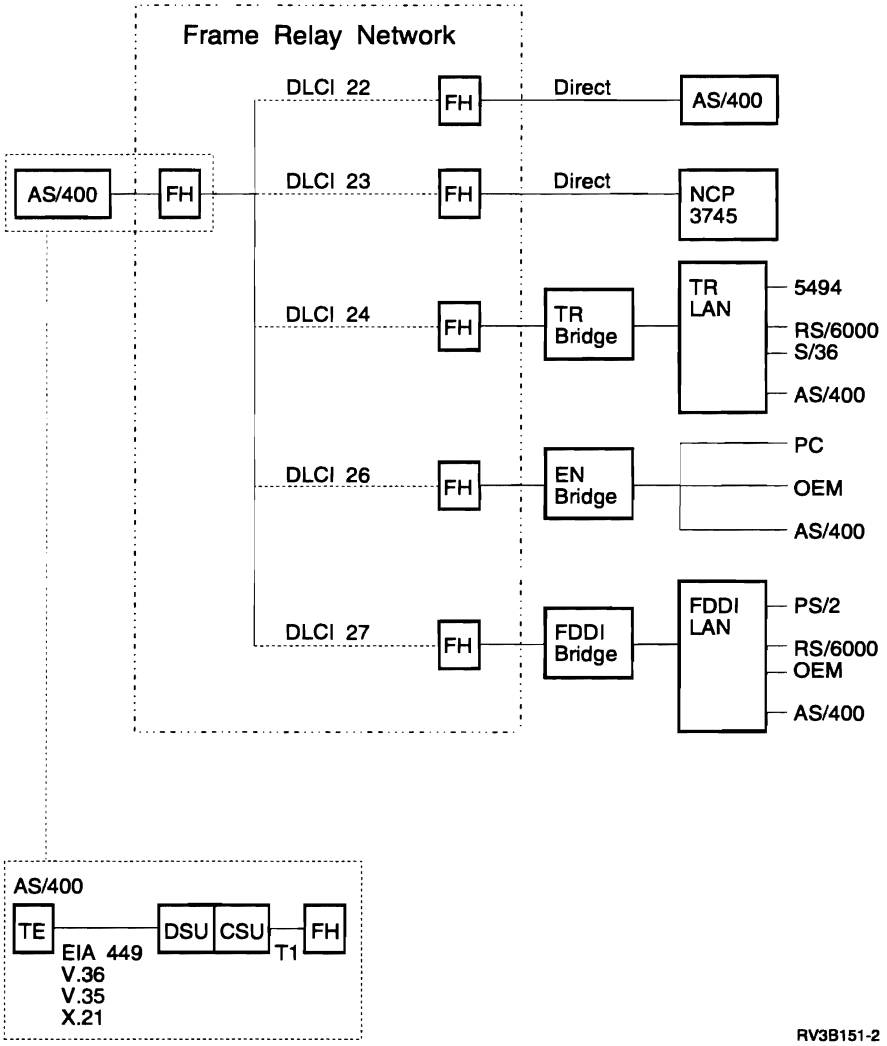
   - Enter

     `GO HARDWARE`

     (the Go Hardware command) and then select the *Work with communications resources* option.

     You can also use the WRKHDWPRD (Work with Hardware Products) command to display or print resource names.
2. In this example, one of the B channels on the basic rate interface is used for a permanent connection from Chicago to Atlanta.
3. Line descriptions are associated with network interface descriptions by network interface description name.
4. Controller descriptions are associated with line descriptions by line description name.
5. Device descriptions are associated with controller descriptions by controller description name.

Frame Relay Communications Subsystem Hardware



RV3B151-2

Notes:

1. NWI description is associated with the physical interface (V.36/EIA 449, V.35, X.21) to the frame relay network.

   You can determine the resource name of lines (ports or cable plug locations on the I/O adapter cards) in the following two ways:

   - Enter

     `WRKHDWRSC *CMN`

     (Work with Hardware Resources command)

     OR

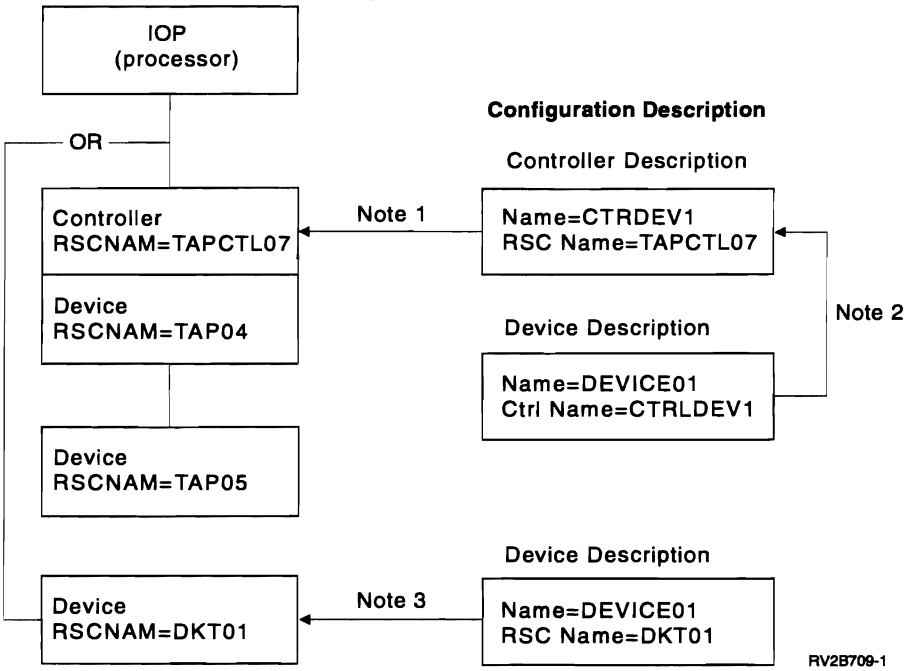
   - Enter

     `GO HARDWARE`

   (the Go Hardware command) and select the *Work with communications resources* option.

   You can also use the WRKHDWPRD (Work with Hardware Products) command to display or print resource names.
2. Logical connections.
   a. In this example, one of the logical connections is to a 6611 that bridges to a token ring attached to a System 36 Unit in Los Angeles.
   b. In this example, one of the logical connections is to an AS/400 system in Dallas.
3. Line descriptions are associated with the logical connections and define the protocol and the format that are used by the network interface description name.
4. Controller descriptions are associated with line descriptions by line description name.
5. Device descriptions are associated with controller descriptions by controller description name.

Removable Media Subsystem



Notes:

1. Controller descriptions are associated with controllers integrated into devices by resource name. See note 3 to determine resource names.
2. Device descriptions for devices attached to controllers are associated with controller descriptions by controller description name.
3. Device descriptions for devices without integrated controllers are associated with the device by resource name.

   To determine the resource name of storage I/O processors:

   - Enter

     `WRKHDWRSC *STG`

     (the Work with Hardware Resources command),

     OR

   - Enter

     `GO HARDWARE`

     (the Go Hardware command) then select the *Work with storage resources* option

   You can also use the WRKHDWPRD (Work with Hardware Products) command to display or print resource names.

Creating Configuration Descriptions: You must create and vary on the correct set of configuration descriptions to use a device. Use the following table to assist in creating configuration descriptions.

File Server I/O Processor Communications	ISDN Communications	Communications Devices	Local Workstation Controller Attached Devices[1]	Removable Media Devices[1]
• Network server description • Line description • Controller description • Device description	• Network interface description • Line description • Controller description • Device description	• Line description • Controller description • Device description	• Controller description • Device description	• Controller description • Device description or • Device

1 The system creates configuration descriptions for these controllers and devices if auto configuration has been set to On. Auto configuration is controlled by the QAUTOCFG system value. If a new controller or device resource is added to the system and auto configuration has been set to On, configuration descriptions are created for the resources that are powered on at the next IPL.

Use the DSPSYSVAL command to display the QAUTOCFG value. Use the CHGSYSVAL command to change the value. For more information on system values, see "WRKSYSVAL Command" on page 1-80.

To see more information on auto configuration, use the index search function as follows:

1. Enter

   `GO SUPPORT`

2. Select the *Search system help index* option.
3. Enter

   `CONFIGURATION`

   or

   `CFG`

4. Select the "Automatic configuration" topic.

Note: Information on how to configure lines, controllers, and devices is also accessible with this procedure.

To create configuration descriptions, enter the

`GO HARDWARE`

command.

The Hardware Resources display appears:

```
                          Hardware Resources
                                                              SYSTEM: ABCDEF
Select one of the following:

     1. Work with communications resources
     2. Work with local workstation resources
     3. Work with storage resources
     4. Work with processor resources
     5. Work with Token-ring LAN adapter information


    70. Related commands




Selection or command
===>
F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel   F16=System Main Menu
                                        (C) COPYRIGHT IBM CORP. 1988, 1993
```

Figure 7-13. Hardware Resources Display

- Select the *Work with communications resources* option to see and configure communications resources (see Figure 7-14 on page 7-42).
- Select the *Work with local workstation resources* option to see and configure local workstation resources.
- Select the *Work with storage resources* option to see and configure storage resources.
- Select the *Work with processor resources* option to see card enclosure resources.

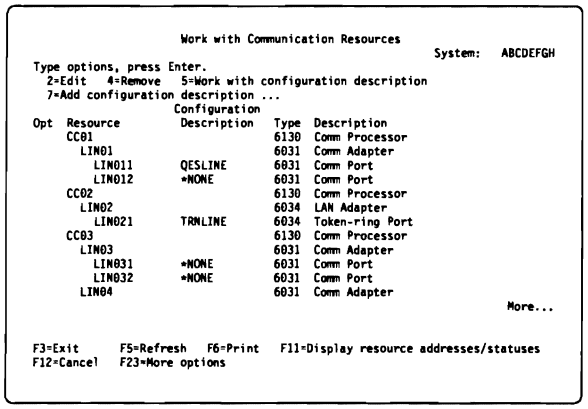


Figure 7-14. Example of Work with Communications Resources Display

In Figure 7-14

- 6130 represents a communications processor
- 6031 represents a two-line adapter

Other or additional devices (types) may also be used depending on the AS/400 model involved.

Online help information for this display explains each option and function key.

Lines with a blank configuration description cannot be configured. Lines with a configuration description name, or *NONE in the configuration description column, can be configured by selecting the *Add configuration description* option. Additional configuration descriptions can be defined for a specific resource by selecting the *Add configuration description* option. You can create more than one configuration description per resource.

Press F11 (Resource Status) to see resource status, location, and serial number.

Resource Names for Tape and Diskette Devices: All system resources are identified by a resource name. Devices, I/O processors, and line descriptions are associated with devices, I/O processors, and lines by using this name. These names are listed on the System Configuration List generated from the AS/400 system (see "System Configuration List" on page 7-23 for more information). They can also be displayed by using the WRKHDWRSC command or the GO HARDWARE command. Tape or optical units are named TAPxx or DEPTAPxx, where xx is a number. Diskette drives are named DKTxx. The value xx is assigned during system IPL or when the unit is powered-on, whichever comes *last*. Units are numbered consecutively starting with 01 (see the following table for more information). Once a resource name is associated with a specific device, it does not change. The system uses the serial numbers of the units to keep track of devices.

During IPL, all powered-on units without resource names are assigned a resource name in the order in which they *report into* the system. That is, the order is completely random. When the IPL of the system is complete, and a unit without a resource name is powered-on, a resource name is assigned to it.

Some units do not report their serial number. Moving one of these units to another I/O processor or changing its address on the same I/O processor causes the system to assign a new resource name to the device. This can cause devices to seem to be missing from the system. These devices appear with a *Not detected* status when you press F11 (Resource Status) on the Work with XXXXXXXX Resources displays (where X = the resource name). See Figure 7-14 for a sample display. You can use the *Work with configuration description* option to change the Resource Name field of the device description to match the new resource name assigned to the device that was moved. You can also use the Work with Hardware Products command to get a new Configuration List, to view the resource names, then to change the resource name in the line, controller, or device description to the new name.

Figure 7-15. Resource Naming Format Conventions

Prefix PPP	Descriptive Name	# Value NNN *	Format	Line L	Example
BC	Bus controller	01-99	PPNN		BC01
CC	Communications IOP	01-99	PPNN		CC01
CTL	Workstation I/O processor	01-99	PPPNN		CTL01
DC	Storage controller (disk)	01-99	PPNN		DC01
DD	Disk	001-999	PPPNN		DD001
DKT	Diskette	01-99	PPNNN		DKT01
LIN	Communications IOA	01-99	PPPNNL	1-9	LIN011
MP	Main processor	01-04	PPNN		MP01
MS	Main storage card	01-99	PPNN		MS01
SI	Storage IOP	01-99	PPNN		SI01
SP	Service processor	01	PPNN		SP01
TAP	Tape**/Optical	01-99	PPPNN		TAP01
DEPTAP	Tape**	01-99	PPPNN		DEPTAP01
TAPCTL	Tape**	01-99	PPPPPPNN		TAPCTL01
CH	ISDN Channel	0001-9999	PPNNNN		CH0001
UNK	Unknown resource***				

* Numbering scheme does not imply configurations to which it gives support.

** Tape units may vary because of the model of AS/400 (3422 and 3430 are examples of tape units used with the 9406 System Unit).

*** UNK = unknown resource. This is typically assigned to an I/O processor that is not operating or to a device the operating system code does not recognize.

The resource names of workstation devices, printers, and some tape devices do not need to be known when creating device descriptions because the device descriptions are associated with a I/O processor name, not a resource name. The system-assigned device name for workstations is DSPnnnn and for printers is PRTnnnn.

The resource name of the workstation I/O processor or tape I/O processor that the device is attached to must be known when creating controller descriptions.

Communications line (port) resource names come from the communication I/O adapter resource name. For example, for the I/O adapter with resource name LIN05, the first port (unit address 00xx) has resource name LIN051.

Varying Configuration Descriptions On and Off:

The Go Hardware display allows you to access all lines, devices, and I/O processors and to see and change (vary on or off) the configuration status for these resources. The status of all configuration descriptions can also be displayed or changed (varied on or off) using the WRKCFGSTS (*NWI | *CTL | *LIN | *NWS) command. This command is also used for varying off a line and all the I/O processors and devices under it.

Notes:

1. All active jobs must be ended before you can vary off. You can enter the WRKACTJOB (Work with Active Jobs) command on the command line on the WRKCFGSTS display or use the Work with Job option to end active jobs.

   Note: To end active jobs running on the facsimile I/O processor, use the ENDFAXSPT command.

2. If a line, I/O processor, or device is hung up, varying its configuration description off, then

on (in that sequence) provides recovery for some intermittent problems.

3. Cryptographic resources cannot be displayed or changed using the WRKCFGSTS command. To view these resources, use the WRKHDWRSC command.

Configuration Hardware Restrictions

- If a workstation I/O processor (IOP) is moved, the attachment cable connected to the IOP must be moved to the card position along with the IOP.

  Note: The cable must be moved because the configuration for the IOP is tied to the resource name of the IOP, which follows the serial number of the card.

- The first workstation I/O processor on bus 0 should remain the first workstation I/O processor on bus 0.

  Note: If another workstation I/O processor becomes the first workstation I/O processor on bus 0, the device that is used as the console changes. The DST and install code always use the display on port 0 (with address of 0) of the first workstation I/O processor on bus 0 as the console.

- If a communications I/O adapter (IOA) is moved, the cables connected to the IOA must be moved along with the IOA.

  Note: The cable must be moved because the configuration for the lines is tied to the resource name of the IOA that is based on the serial number of the IOA card.

Change Transmit Level (CHGXMTLVL)

The CHGXMTLVL command is used to change the transmit level of the facsimile I/O processor. The command exists in library QFAX and is only accessible to users with *SERVICE authority. CHGXMTLVL should be used only by trained service personnel. The command is supported in the Facsimile Support/400 Licensed Program.

The following parameters are used with the CHGXMTLVL command:

- CARD: Specifies the facsimile description name that you want to work with. For more information on facsimile description names, see *Application System/400 Facsimile Support/400 Users Guide and Reference*, SC41-8245. The name must be a member of file QAFFCFG in library QUSRSYS.
- TELPORT: Specifies the port you want to work with. The only choices are FAX1 or FAX2.
- XMTLVL: Specifies the new transmit level of the port. *DFT is the default value.

  The default value, 99, is contained in the internal tables of the facsimile I/O processor. At each ADDFAXCRD request, the *XMTLVL* field is initialized to 99. Valid *XMTLVL* values range from 0 through 30 (in whole number increments). The values represent the negative db level of the port. For example, a value of 9, changes the transmit level to -9 db.

Note: There is no help text available for the CHGXMTLVL command.

Examples—Configuration of Communications Lines

For more details on the configuration of communications lines see the *Communications Configuration* information.

Configuration of an SDLC Communications Line

Create Line Description (CRTLINSDLC)

1. From the AS/400 Main Menu, press the F4 function key.
2. Select the *Verb commands* option from the Major Command Groups display.
3. Select the *Create commands* option from the Verb Commands display.
4. Select the *Create line descriptions (SDLC)* option from the Create Commands display.
5. Type the following information on the Create Line Description (SDLC) display for the following fields. All other fields should be left with the default value that appears.

   Note: This is an example for an SDLC communications line. Some values may have to be changed to match your specific configuration.

   ```
   Line description . . . . . RM1
   Resource name  . . . . . __
   ```

   Note: Get the resource name from the Work with System Configuration Listing printout (WRKHDWPRD). Place a *1* at the end of the resource name.

   ```
   Data link role . . . . . *PRI
   Physical interface . . . . . *RS232V24
   Connection type  . . . . . *NONSWTPP
   ```

   Press the Enter key twice and type the following information:

   ```
   NRZI data encoding . . . . . *YES
   Line speed . . . . . 9600
   Modem type supported . . . . . *NORMAL
   ```

   Press the Enter key and type the following information:

   ```
   Duplex . . . . . *HALF
   ```

6. Press the Enter key to create the communications line description and cause the AS/400 Main Menu to appear.

Create Controller Description (CRTCTLRWS)

1. From the AS/400 Main Menu, press the F4 function key.
2. Enter option 2 (Verb commands) from the Major Command Groups display.
3. Enter option 18 (Create commands) from the Verb Commands display.
4. Enter option 27 (Create controller description (Remote WS)) from the Create Commands display.
5. Type the following information on the Create Controller Description display for the following fields. All other fields should be left with the default value that appears.

   Note: This is an example for an SDLC communications line. Some values may have to be changed to match your specific configuration.

   ```
   Controller description . . . . . RM1
   Controller type  . . . . . 5251
   Controller model . . . . . 12
   Link type  . . . . . *SDLC
   ```

   Press the Enter key twice and type the following information:

   ```
   Attached nonswitched line  . . . . . RM1
   ```

   Press the Enter key and type the following information:

   ```
   Station address  . . . . . 01
   ```

6. Press the Enter key to create the communications controller description and cause the AS/400 Main Menu to appear.

Create Device Description (CRTDEVDSP)

1. From the AS/400 Main Menu, press the F4 function key.
2. Enter option 2 (Verb commands) from the Major Command Groups display.
3. Enter option 17 (Create commands) from the Verb Commands display.

4. Enter option 35 (Create device description(Display)) from the Create Commands display.

5. Type the following information on the Create Device Description display for the following fields. All other fields should be left with the default value that appears.

   Note: This is an example for an SDLC communications line. Some values may have to be changed to match your specific configuration.

```
Device description . . . . . RM1
Device class . . . . . *RMT
Device type  . . . . . 5251
Device model . . . . . 11
```

   Press the Enter key and type the following information:

```
Local location address . . . . . 00
Attached controller  . . . . . RM1
```

6. Press the Enter key to create the communications device description and cause the AS/400 Main Menu to appear.

Chapter 8. Working with Storage Dumps

Introduction

A manual system dump is started (by selecting Function 22 on the control panel) for:

- System waits or loops
- OS/400 failures

When the system waits or loops, or OS/400 appears to have failed, proceed as follows:

- See "Perform a Main Storage Dump to Disk" to force a dump of main storage.
- See "Main Storage Dump Status (SRCs on the Control Panel)" on page 8-6 to follow the progression of the dump.
- See "Copying Main Storage Dump to Tape or Diskette" on page 8-3 to save the dump.
- See "Error Recovery for Dumps" on page 8-9 to take the correct action to recover from an abnormal end of the dump.

The following procedures are used to perform a main storage dump (MSD) to disk and to copy an MSD from disk to a removable media. The "Main Storage Dump Status (SRCs on the Control Panel)" on page 8-6 shows the progression of a MSD to disk. The "Error Recovery for Dumps" on page 8-9 is used when an abnormal end occurs while performing a main storage dump to disk.

The system automatically takes MSDs to:

- Trap possible error information
- Decrease storage management recovery time on the next IPL

When a MSD may have been taken automatically, see "Error Recovery for Dumps" on page 8-9 to determine if the main storage dump data was written to disk. Follow the actions as instructed.

This function can be done from SST or DST.

Perform a Main Storage Dump to Disk

1 **Warning:** Ask the customer to verify that there are no interactive jobs running.

a. Select Manual mode.

b. Use the Select, Increment (↑), or Decrement (↓) switch to display Function 22 (main storage dump).

c. Press Enter on the control panel.

2 Is 22 0000 0000 displayed on the control panel for more than 30 seconds?

No **Yes**

↓ The multiple function IOP or service processor is not responding to a request from the control panel.

Ask your next level of support for assistance and write a Licensed Internal Code Trouble Report (LICTR) if suitable.

This ends the procedure.

3 An attention SRC is displayed, 11x A1xx 3022, indicating that Function 22 has been selected. Reselect Function 22, press Enter on the control panel, and wait for the dump to complete.

4 Follow the status of the main storage dump:

- If the system displays status SRCs as Function 11-2 during the dump, see "Stage 2 Main Storage Dump Status" on page 8-7.
- If the system displays status SRCs as Function 11 during the dump, see "Stage 1 Main Storage Dump Status" on page 8-6.

5 Did the main storage dump complete successfully (11xx A1xx 300x displayed)?

No **Yes**

↓ Return to the problem isolation procedure that sent you here, or go to "Copying Main Storage Dump to Tape or Diskette" on page 8-3 for the correct procedure to save a main storage dump.

This ends the procedure.

6 Go to "Error Recovery for Dumps" on page 8-9.

This ends the procedure.

Copying Main Storage Dump to Tape or Diskette

Ask your next level of support to determine if the dump needs to be copied or if a program temporary fix (PTF) is available. If the dump needs to be copied, continue with this procedure.

Ask the customer to verify that there are no interactive jobs running.

1 Is the system powered on?

Yes **No**

↓ Start an IPL of the system by doing the following:

a. Select Manual mode.
b. Power on the system.

Go to step 5 of this procedure.

2 Does a system reference code (SRC) appear on the control panel?

No **Yes**

↓ Start an IPL of the system by doing the following:

a. Select Manual mode.
b. Select Function 3 on the control panel.
c. Press Enter on the control panel.

Go to step 5 of this procedure.

3 Is the system available for customer operations?

No **Yes**

↓ Ask the customer to verify that there are no interactive jobs running.

Go to the System Service Tools (SST) display by doing the following:

a. Select the *Problem handling* option on the AS/400 Main Menu.
b. Select the *System service tools* option on the Problem Handling display.

Go to step 8 of this procedure.

4 The system is powered on, but system operations have stopped (system is hung).

Make DST available by doing the following:

a. Select Manual mode.
b. Select Function 21 on the control panel.
c. Press Enter on the control panel.

5 Did the IPL complete successfully to the IPL or Install the System display?

Yes **No**

↓ Perform the following:

a. Use the system reference code or system symptoms to repair the system. Go to the "Starting Point for All Problems" section in the *Problem Analysis* information to start problem analysis.
b. When the system is operational, start an IPL of the system. When the IPL or Install the System display appears, continue with the next step of this procedure.

6 Select the *Use dedicated service tools (DST)* option.

7 Enter the password.

22222222

Note: If this password is not valid, ask the customer for the correct one.

8 Load the tape or diskette.

9 Select the *Start a service tool* option (from the Use Dedicated Service Tools (DST) or System Service Tools (SST) display).

10 Select the *Print stand-alone dump* option from the Start a Service Tool display.

11 Select either the *Copy main storage dump to tape* option or the *Copy main storage dump to diskette* option from the Print Stand-Alone Dump main menu.

12 When the Copy Main Storage Dump to Tape or Diskette display appears, do the following:

a. For volume ID, enter

```
DMS
```

b. For sequence number, enter

```
0001
```

Note: Wait for the tape to become ready before continuing with the next step of this procedure.

13 From the Select Tape or Diskette Unit display, select the option for the device to which you are copying the data.

14 Is a `Dump request submitted` message indicated on the bottom of the Copy Main Storage Dump from Disk to Tape or Diskette display?

No **Yes**

↓ The dump image is being copied from disk to the tape or diskette.

Go to step 23 of this procedure.

15 Does the Device Intervention Required display appear?

No **Yes**

↓ Go to step 21 of this procedure.

16 Does the Handle Tape or Diskette Intervention display appear?

Yes **No**

↓ Go to step 25 of this procedure.

17 On the Handle Tape or Diskette Intervention display, enter the option format the tape or diskette.

18 Is a `Dump request submitted` message indicated on the bottom of the Copy Main Storage Dump from Disk to Tape or Diskette display?

No **Yes**

↓ Go to step 25 of this procedure.

19 Does the Device Intervention Required display indicate a `Wrong volume loaded` message?

Yes **No**

↓ If the Handle Tape or Diskette Intervention display is shown, go to step 23 of this procedure.

20 To give the tape or diskette a new name, do the following:

a. For the new Volume or File name (at the bottom of the display), type

```
DMS
```

b. Press the Enter key.

c. Wait for the Handle Tape or Diskette Intervention display to be shown.

21 From the Handle Tape or Diskette Intervention display, enter the option to format the tape or diskette.

22 Does the Copy Main Storage Dump from Disk to Tape or Diskette display indicate a `Dump request submitted` message?

Yes **No**

↓ A problem has occurred that was not expected. Ask your next level of support for assistance.

This ends the procedure.

23 The dump image is being copied from the disk to the tape or diskette. Wait for the operation to complete. The copy of the main storage dump may take several minutes to complete. To determine if the dump is complete:

a. Select the *Start a service tool* option (from the Use Dedicated Service Tools (DST) or System Service Tools (SST) display).

b. Select the *Print stand-alone dump* option.

c. Select option 4 to display status.

d. Check the *Requests not complete* field for a value of 0. This indicates the dump copy is complete.

e. If the value of the *Requests not complete* field is not 0, press the Enter key to refresh the status. Continue checking status (by pressing the Enter key) until the value of the field is 0.

Note: If the main storage dump cannot be stored on one tape or diskette, you are prompted to load another tape or diskette.

Warning: Do not remove the last tape or diskette until you have selected the option to end the Print Stand-Alone Dump display at the end of this procedure.

24 To end the Print Stand-Alone Dump display, do the following:

a. Press F3 (Exit) on the Print Stand-Alone Dump display.

b. Remove the tape or diskette.

c. Press F3 (Exit) from the AS/400 Main Menu.

25 Ask your next level of support for instructions on how to send the main storage dump image (now on tape or diskette) to IBM by using an Authorized Program Analysis Report (APAR).

This ends the procedure.

Main Storage Dump Status (SRCs on the Control Panel)

Stage 1 Main Storage Dump Status

The following main storage dump (MSD) status is shown on the control panel while the Stage 1 system is doing a main storage dump.

MSD Status	Function Performed	Approximate Time
11 D1xx 3100	Scanning registers of CPU processor	1-2 seconds
11 D1xx 3101	Scanning hardware arrays of processor	25-40 seconds
11 D1xx 3102	Scanning array of processor	50-85 seconds
11 D1xx 3103	Scanning page 1 of main storage	20-30 seconds
11 D100 3110	Scanning page 1 of main storage	20-30 seconds
11 D100 3111	Scanning page 2 of main storage	20 seconds
11 D100 3112	Scanning page 3 of main storage	20-30 seconds
11 D100 3113	Scanning page 3 of main storage	20-30 seconds
11 D100 3114	Scanning page 3 of main storage	20-30 seconds
11 D100 3115	Scanning page 4 of main storage	20-30 seconds
11 D100 3116	Scanning page 4 of main storage	20-30 seconds
11 D100 3117	Scanning page 5 of main storage	20-30 seconds
11 D100 3118	Scanning page 5 of main storage	20-30 seconds
11 D100 3119	Scanning page 6 of main storage	20-30 seconds
11 D100 311A	Scanning page 6 of main storage	20-30 seconds
11 D100 311B	Scanning page 15 of main storage	20-30 seconds
11 D100 311C	Scanning page 15 of main storage	20-30 seconds
11 D100 311D	Complete scanning of main storage	< 1 second

The following SRCs are specific to the 9406 System Unit:

MSD Status	Function Performed	Approximate Time
11 C100 2008	Destructive reset to load source	< 1 second
11 C100 2012	Unit reset D to processor	< 1 second
11 C100 2004	Unit reset to load source IOP	2 seconds
11 C100 200A	Initiate self-load to load source	10 seconds
11 C100 200B	Complete load source self-load (checking for dump space on load source)	30-75 seconds

The following SRCs are specific to the 9404 System Unit and 9402 System Unit:

MSD Status	Function Performed	Approximate Time
11 C100 201x	Resetting system processor	3 seconds
11 C100 207x	Checking for dump space on disk	2 seconds

The following SRCs are common to the 9406 System Unit, 9404 System Unit, and 9402 System Unit:

MSD Status	Function Performed	Approximate Time
11 D100 3121	Complete checking dump space	0 seconds
11 D100 3122	Scanning array of processor	0 seconds
11 D100 31FF	Complete writing SID 82 to disk. Collecting 1MB of main storage.	12-15 seconds
11 D100 3200	Collecting next 1MB of main storage.	12-15 seconds
11 D100 3201	Collecting next 1MB of main storage.	12-15 seconds
11 D100 3202	Collecting next 1MB of main storage.	12-15 seconds
11 D100 3203	Collecting next 1MB of main storage.	12-15 seconds
11 D100 32xx	Collecting next 1MB of main storage.	12-15 seconds/MB

Note: The last MSD status SRC is *11 D100 32xx* where (xx + 2) is the hexadecimal number of 1 megabyte (MB) blocks dumped from main storage. For example, an AS/400 with 20MB of main storage, the last status SRC is *11 D1xx 3212*. For an AS/400 with 96MB of main storage, the last status SRC is *11 D1xx 325E*.

Note: x can be any hexadecimal character (1-9, A-F).

Stage 1 Terminating System Reference Codes

Dump completion is indicated by the System Attention light going on. The terminating SRC is displayed when the main storage dump has completed.

- In the case of an automatic dump (system terminating, including a main storage dump), the normal terminating SRC is the one associated with the system error that started the dump.
- In the case of a manual dump (Function 22), the normal terminating SRC is a service processor completion code (*11 A1xx 300x* or *11 B1xx xxxx*).

11 xxxx xxxx	System end SRC. See "Error Recovery for Dumps" on page 8-9.
11 A100 300x	Main storage dump completed successfully. See "Copying Main Storage Dump to Tape or Diskette" on page 8-3.

Note: x can be any hexadecimal character (1-9, A-F).

Stage 2 Main Storage Dump Status

The following main storage dump (MSD) status is shown on the control panel while the Stage 2 system is doing a main storage dump.

Note: Some of these status SRCs may not be shown on the smaller system models.

MSD Status	Function Performed	Approximate Time
11-2 D1hm 3080	Preparing for write to disk	1 second
11-2 D1hm 31F0	Preparing SID 82 data area	<1 second
11-2 D1hm 3080	Preparing for write to disk	1 second
11-2 D1hm 3100	Scanning processor 0 CPU registers	<1 second
11-2 D1hm 3101	Scanning processor 0 CPU rings	<1 second
11-2 D1hm 3102	Scanning processor 0 FPU registers	<1 second
11-2 D1hm 3110	Scanning processor 1 CPU registers	<1 second
11-2 D1hm 3111	Scanning processor 1 CPU rings	<1 second
11-2 D1hm 3112	Scanning processor 1 FPU registers	<1 second
11-2 D1hm 31FB	Scanning out Bus control rings	<1 second

The following SRCs are specific to the 9406 System Unit high end models:

MSD Status	Function Performed	Approximate Time
11-2 D1hm 3103	Scanning processor arrays	5 seconds
11-2 D1hm 3104	Scanning processor arrays	1 second
11-2 D1hm 3105	Scanning processor arrays	2 seconds
11-2 D1hm 3106	Scanning processor arrays	2 seconds
11-2 D1hm 3107	Scanning processor arrays	2 seconds
11-2 D1hm 3108	Scanning processor arrays	2 seconds
11-2 D1hm 3109	Scanning processor arrays	2 seconds
11-2 D1hm 310A	Scanning processor arrays	2 seconds
11-2 D1hm 310E	Scanning processor arrays	3 seconds
11-2 D1hm 310F	Scanning processor arrays	2 seconds
11-2 D1hm 3113	Scanning processor arrays	5 seconds
11-2 D1hm 3114	Scanning processor arrays	1 second
11-2 D1hm 3115	Scanning processor arrays	2 seconds
11-2 D1hm 3116	Scanning processor arrays	2 seconds
11-2 D1hm 3117	Scanning processor arrays	2 seconds
11-2 D1hm 3118	Scanning processor arrays	2 seconds
11-2 D1hm 3119	Scanning processor arrays	2 seconds
11-2 D1hm 311A	Scanning processor arrays	2 seconds
11-2 D1hm 311E	Scanning processor arrays	3 seconds
11-2 D1hm 311F	Scanning processor arrays	2 seconds

The following SRCs are specific to the 9406 System Unit lower end models and to the 9404 System Unit:

MSD Status	Function Performed	Approximate Time
11-2 D1hm 3103	Scanning processor arrays	5 seconds
11-2 D1hm 310D	Scanning processor arrays	1 second
11-2 D1hm 311D	Scanning processor arrays	1 second

The following SRCs are common to the 9406 System Unit, 9404 System Unit, and 9402 System Unit:

MSD Status	Function Performed	Approximate Time
11-2 D1hm 31F1	Reading control address table	<1 second
11-2 D1hm 31F2	Reading VLIC machine check log buffers	<1 second
11-2 D1hm 31F3	Reading HLIC machine check log buffers	<1 second
11-2 D1hm 31F4	Scanning control address table	5 seconds
11-2 D1hm 31F5	Scanning VLIC machine check log buffers	5 seconds
11-2 D1hm 31F6	Scanning HLIC machine check log buffers	5 seconds
11-2 D1hm 31F7	Scanning main storage data	5 seconds
11-2 D1hm 31F8	Scanning main storage data	5 seconds
11-2 D1hm 31F9	Scanning main storage data	5 seconds
11-2 D1hm 31FA	Scanning main storage data	5 seconds
11-2 D1hm 31FF	Completed writing SID 82 to disk	<1 second
11-2 D1hm 3200	Writing first 16M block of main storage	50 seconds
11-2 D1hm 3201	Writing second 16M block of main storage	50 seconds
11-2 D1hm 3202	Writing third 16M block of main storage	50 seconds
11-2 D1hm 32xx	Writing next 16M block of main storage	50 seconds

Note: The last 32xx MSD status SRC is *11-2 D1hm 32xx* where xx+1 is the number (in hexadecimal) of 16MB blocks dumped from main storage. For example, an AS/400 with 64 MB of main storage, the last status SRC is *11-2 D1hm 3203*. For an AS/400 with 384 MB of main storage, the last status SRC is *11-2 D1hm 3217*.

The following SRCs are specific to some system terminating conditions:

MSD Status	Function Performed	Approximate Time
11-2 D1hm 3B0x	Scanning main storage rings	2-12 seconds
11-2 D13m 3B10	Scanning main storage rings	1 second

The following SRC is common to the 9406 System Unit, 9404 System Unit, and 9402 System Unit:

MSD Status	Function Performed	Approximate Time
11-2 D1hm 308F	Preparing for completion of dump	<1 second

Note:

h is the processor class used to identify the correct unit reference code table.

m is the module id of the current operating main storage dump code.

x can be any hexadecimal character (1-9, A-F).

Stage 2 Terminating System Reference Code (SRC)

Dump completion is indicated by the System Attention light going on. The terminating SRC is displayed after the main storage dump has completed.

- In the case of an automatic dump (system terminating, including a main storage dump), the normal terminating SRC is the one associated with the system error that started the dump.
- In the case of a manual dump (Function 22), the normal terminating SRC is a service processor completion code (*11-2 A1xx 300x* or *11-2 B1xx xxxx*).

MSD Status	Function Performed
11-2 xxxx xxxx	System terminating SRC. See "Error Recovery for Dumps."
11-2 A1xx 300x	Main store dump successful completion. See "Copying Main Storage Dump to Tape or Diskette" on page 8-3.

Note: x can be any hexadecimal character (1-9, A-F).

Error Recovery for Dumps

Determining If Main Storage Dump Data Was Written to Disk for Stage 1 Hardware

For Stage 1 hardware (displays SRCs as *11 xxxx xxxx*) do the following:

1. Select Function 25 and press the Enter key.
2. Select Function 26 and press the Enter key.
3. Select Function 56 and press the Enter key.
4. Select Function 5600 and press the Enter key.
5. Look at the sixth character (M) of function 5600 data display (*5600 xxxx xMxx*)
6. Use this character as follows:

M Value (Hex)	Description
4, 8, or C	No main storage dump was attempted. Go to "Perform a Main Storage Dump to Disk" on page 8-2 to start a main storage dump.
1, 3, 5, 7, 9, B, D, or F	A main storage dump was written to disk for debug. Go to "Copying Main Storage Dump to Tape or Diskette" on page 8-3 to save the main storage dump.
2, 6, A, or E	A main storage dump was attempted but failed. No data was written to the disk. Go to "Reporting the Error" on page 8-10 to record the system data to solve this problem. Go to "Analyzing Problems with an SRC" in the *Problem Analysis* information to determine the cause of the failure.

Note: Dumps must be copied to tape or diskette as soon as possible. If another machine check occurs after the system has performed an IPL past the Use Dedicated Service Tools (DST) display, another dump may be automatically taken and the first dump will **not be saved**; it will be written over.

Determining If Main Storage Dump Data Was Written to Disk for Stage 2 Hardware

For Stage 2 hardware (displays SRCs as *11-2 xxxx xxxx*) do the following:

1. Look at the first character (*M*) of the Function 12 data display on the control panel (*12-2 Mxxx xxxx*).
2. Use this character as follows:

M Value (Hex)	Description
0	No main storage dump was attempted. Go to "Perform a Main Storage Dump to Disk" on page 8-2 to start a main storage dump.
1-8	A main storage dump was written to disk for debug. Go to "Copying Main Storage Dump to Tape or Diskette" on page 8-3 to save the main storage dump.
9-F	A main storage dump was attempted but failed. No data was written to the disk. Go to "Reporting the Error" on page 8-10 to record the system data to correct this problem. Go to "Analyzing Problems with an SRC" in the *Problem Analysis* information to determine the cause of the failure.

Note: Dumps must be copied to tape or diskette as soon as possible. If another machine check occurs after the system has performed an IPL past the *Dedicated Service Tools (DST)* display, another dump may be automatically taken and the first dump will **not be saved**; it will be written over.

Reporting the Error

1. Select Manual mode.
2. Record the complete SRC (control panel function display 11xx through 20xx). Example:
   11xx _ _ _ _ _ _ _ _
   12xx _ _ _ _ _ _ _ _

   See the "Problem Summary Form" in Appendix A of the *Problem Analysis* information
3. For a system with Stage 1 hardware, record data from control panel Functions 54, 55, 56, 57, and 58 (see "Low Level Debug and Data Collecting Procedures" on page 2-5).
4. For a system with Stage 2 hardware, do the following:
   a. Record 2 display words of service processor control storage using Function 62 at address 00136C (see "Low Level Debug and Data Collecting Procedures" on page 2-5).
   b. Record the system status SRCs using:
      - Function 63
      - Function 64

      See "Low Level Debug and Data Collecting Procedures" on page 2-5.
   c. Save the service processor control storage by forcing a self-dump of the multiple function I/O processor:
      1) Select control panel Function 70.
      2) Press Enter.
      3) Wait for a B1xx 8ABF or A1xx 8ABF SRC to indicate the dump is complete.
      4) Save the data (see "Copying the IOP Storage Dump to Tape or Diskette" on page 8-11).
5. Ask your next level of support for the procedure to send the information that you have recorded using a Licensed Internal Code Trouble Report (LICTR).
6. For more isolation of the original system error, use the terminating SRC from step 2 and go to "Unit Reference Codes" in the *Problem Analysis* information.

Additional Help

For details on the use of main storage dumps, see "Main Storage Dump" in *Diagnostic Aids – Volume 1* information or "Print Stand-Alone Dump" on page 1-32.

If you are going to save the dump data on a tape or diskette, go to "Copying Main Storage Dump to Tape or Diskette" on page 8-3.

Performing an IOP Storage Dump to Disk

Perform the following to obtain a storage dump of the MFIOP (service processor) card:

1. Select Manual mode.
2. Select control panel Function 25 (CE switch 1 function).
3. Press Enter on the control panel.
4. Select control panel Function 26 (CE switch 2 function).
5. Press Enter on the control panel.
6. Select control panel Function 70 (MFIOP storage dump).
7. Press Enter on the control panel.
8. Wait for the completion SRC (11xx B100 8ABF or 11xx A100 8ABF).
9. Use the Select, Increment (↑), or Decrement (↓) switch to advance to Function 12-2. Press Enter on the control panel to display the data. The fourth character from the left should be an 8. This indicates a successful IOP dump.
10. The data is now written to the disk.
11. Save the MFIOP (service processor) data for the storage dump to tape or diskette (see "Copying the IOP Storage Dump to Tape or Diskette" on page 8-11).

    This ends the procedure.

Copying the IOP Storage Dump to Tape or Diskette

1. Access SST or DST on the operator console (see "System Service Tools (SST)" on page 1-6 or "Dedicated Service Tools (DST)" on page 1-46).
2. Is the service tool operational?

   No **Yes**

   ↓ Go to "Starting Point for All Problems" in the *Problem Analysis* information Use the system reference code or system symptoms to repair the system.

   When the system is operational, start an IPL of the system. When the service tool you want is operational, continue with the next step of this procedure.
3. Load the tape or diskette initialized with Vol Id = SID87.

   Note: Use file = DUMP and Vol Id = SID87.
4. Select the *Start a service tool* option from the Use Dedicated Service Tools (DST) display.
5. Select the *Display/Alter/Dump* option from the Start a Service Tool display.
6. Select either the *Dump to Tape* or the *Dump to diskette* option from the Display/Alter/Dump Output Device display.
7. Select the *Starting address* option.
8. Enter a starting address of 00008700 0000 and length of 400000.
9. Type `DUMP` in the field named *File*. Type `SID87` in the field named *Volume ID*. If you are using a volume with a different volume name, use that name in place of SID87. Press Enter.
10. The dump image is being copied from the disk to the tape or diskette. Wait for the operation to complete.
11. Press F3 (exit) from the Specify Dump Title display.

    Repeat steps 6 - 11 using a starting address of 00018700 0000 and a length of 400000. Use a file name = DUMP2.
12. Press F3 (exit) from the Use Dedicated Service Tools (DST) display.
13. Remove the tape or diskette.
14. Ask your next level of support for procedures to send the IOP storage dump image (now on tape or diskette) by using a Licensed Internal Code Trouble Report (LICTR).

    This ends the procedure.

Copying the Type 2617,2618,2619, or 2666 Communications IOP and 2620 or 2628 Cryptographic IOP Storage Exception Dump

1. Access SST or DST on the operator console (see "System Service Tools (SST)" on page 1-6 or "Dedicated Service Tools (DST)" on page 1-46).
2. Is the service tool operational?

   No **Yes**

   ↓ Go to "Starting Point for All Problems" in the *Problem Analysis* information. Use the system reference code or system symptoms to repair the system.

   When the system is operational, start an IPL of the system. When the service tool you want is operational, continue with the next step of this procedure.
3. Load the tape or diskette initialized with Vol Id = SID61.

   Note: Use file = DUMP and Vol Id = SID61.
4. Select the *Start a service tool* option from the Use Dedicated Service Tools (DST) display.
5. Select the *Display/Alter/Dump* option from the Start a Service Tool display.
6. Select either the *Dump to tape* option or the *Dump to Diskette* option from the Display/Alter/Dump Output Device display.
7. Select the Starting Address option.
8. Enter a starting address of 00006100 0000 and length of 500000.

9. Type DUMP in the field named *File*. Type SID61 in the field named *Volume ID*. If you are using a volume with a different volume name, use that name in place of SID61. Press Enter.
10. The dump image is being copied from the disk to the tape or diskette. Wait for the operation to complete.
11. Press F3 (Exit) from the Specify Dump Title display.
12. Press F3 (Exit) from the Dedicated Service Tools display.
13. Remove the tape or diskette.
14. Ask your next level of support for procedures to send the IOP storage dump image (now on tape or diskette) by using a Licensed Internal Code Trouble Report (LICTR).

    This ends the procedure.

Chapter 9. Communications Cable and Wrap Connector Reference

Single-Port Communications Adapter Card and TPAC Wrap Connector

Note: TPAC = Two-Port Adapter Cable.

Figure 9-1. Single-Port Communications Adapter Card Wrap Connector. This adapter wrap connector is also used for the 25-pin D shells on the two port adapter cable.

Communications Adapter Card Wrap Connector	Connector Pin	V.24-RS232 Adapter Card	X.21 Adapter Card	V.35 Adapter Card
1 cable ID 3	1	CID 3	CID 3	CID 3
2 to 3	2	XD	XD-A	XD-A
3 to 2	3	RD	RD-A	RD-A
4 to 5	4	RTS	XD-B	XD-B
5 to 4	5	CTS	RD-B	RD-B
6 to 20	6	DSR	IND-A	Not Used
7	7	SGND	SGND	SGND
8 to 16,18	8	CD	SET-B	RX-A
9 to 11,17	9	DCERS	Not Used	CD
10 cable ID 2	10	CID 2	CID 2	CID 2
11 to 9,17	11	STBY	DCLK-A	CTS
12 cable ID 1	12	CID 1	CID 1	CID 1
13 cable ID 0	13	CID 0	CID 0	CID 0
14 to 21,22	14	Not Used	Not Used	DX-B
15 to 23	15	TCLK	IND-B	DSR
16 to 8,18	16	Not Used	Not Used	TX-A
17 to 9,11	17	RCLK	SET-A	RTS
18 to 8,16	18	WRAP	DCLK-B	DX-A
19 to 24,25	19	Not Used	Not Used	Not Used
20 to 6	20	DTR	CTL-A	Not Used
21 to 14,22	21	RLB	Not Used	RX-B
22 to 14,21	22	RI	Not Used	TX-B
23 to 15	23	RATE	CTL-B	DTR
24 to 19,25	24	DTE	Not Used	Not Used
25 to 19,24	25	TI	Not Used	Not Used

Stage 1 Single-Port Communications Adapter Card and Wrap Connector Wiring

Figure 9-2. Single-Port Communications Adapter Card Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
Transmit data to receive data V.24	2 to 3
RTS to CTS V.24	4 to 5
DTR to DSR V.24	24 to 6
Data signal rate selector to carrier detector	43 to 8
DTE clock to RSET DCE V.24	11 to 21
Select standby to TSET V.24	29 to 19
Remote loop back to calling indicator	25 to 27
Local loop back to test indicator	22 to 12
TD A to RD A EIA-422-A	18 to 37
TD B to RD B EIA-422-A	34 to 20
Control A to indicator A EIA-422-A	36 to 38
Control B to indicator B EIA-422-A	35 to 39
DTE clock A to ST EIA-422-A	10 to 40
DTE clock B to ST B EIA-422-A	9 to 41
TDA to RDA, RSET A, TSET A V.35	42 to (44, 13, 48)
TDB to RDB, RSET B, TSET B V.35	26 to (31, 46, 30)
Wrap connector cable ID	7 to (16, 17, 33, 50)

High Speed Communications Card and Wrap Connector Wiring

Figure 9-3. High Speed Communications Card and Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
RTS A to CTS A, CD A	4 to 5,8
RTS B to CTS B, CD B	21 to 22,25
DTR A to DSR A	36 to 38
DTR B to DSR B	35 to 39
TD A to RD A	18 to 37
TD B to RD B	34 to 20
DTE clock A to RCLK A, TCLK A	10 to 12,40
DTE clock B to RCLK B, TCLK B	27 to 29,41
Remote loop back to RI	14 to 11
Local loop back to test indicator	15 to 45
RSGND to TSGND	28 to 47
SGND to CID 0, CID 1, CID2, CID 3	7 to 9, 43, 49, 50

Cryptographic Processor Card and Wrap Connector Wiring

Figure 9-4. Cryptographic Processor Card and Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
CD to RTS,CTS	1 to 7,8
RD to TD	2 to 3
DTR to DSR	4 to 6

Stage 2 Two-Port Communications Adapter Card and Wrap Connector Wiring

Figure 9-5 (Page 1 of 2). Two-Port 232/ac dc

Wrap Connector Pin to Pin	Connector Pin	EIA 232 or V.24	EIA 366 or V.25	X.21
1 Cable ID (CID) 3	1	CID 3 P1	CID 3 P1	CID 3 P1
2 to 3	2	XD P1	Not Used	XD-A P1
3 to 2	3	RD P1	PWI P1	RD-A P1
4 to 38	4	DSR P1	Not Used	IND-A P1
5 to 6, 18	5	DCERS P1	DG RV P1	Not Used
6 to 5, 18	6	STBY P1	NB2 P1	DCLK-A P1
7 to 8, 36	7	RLB P1	NB4 P1	Not Used
8 to 7, 36	8	Not Used	Not Used	Not Used
9 to 10	9	XD P2	Not Used	XD-A P2
10 to 9	10	RD P2	PWI P2	RD-A P2
11 to 15	11	DSR P2	Not Used	IND-A P2
12 to 13, 33	12	DCERS P2	DG RV P2	Not Used
13 to 12, 33	13	STBY P2	NB2 P2	DCLK-A P2
14 to 44, 46	14	Not Used	Not Used	Not Used
15 to 11	15	DTR P2	Not Used	CTL-A P2
16 to 29, 30	16	CD P2	DSC P2	SET-B P2
17	17	SGND P2	SGND P2	SGND P2
18 to 5, 6	18	RCLK P1	RCV1 P1	SET-A P1
19 to 20	19	RTS P1	DPR P1	XD-B P1
20 to 19	20	CTS P1	PND P1	RD-B P1
21 to 39	21	TCLK P1	RCV2 P1	IND-B P1
22 to 23, 35	22	Not Used	Not Used	Not Used
23 to 22, 35	23	WRAP P1	NB8 P1	DCLK-B P1
24 to 25, 37	24	TI P1	DLO P1	Not Used
25 to 24, 37	25	DTE P1	CRQ P1	Not Used
26 to 27	26	RTS P2	DPR P2	XD-B P2

Figure 9-5 (Page 2 of 2). Two-Port 232/ac dc

Wrap Connector Pin to Pin	Connector Pin	EIA 232 or V.24	EIA 366 or V.25	X.21
27 to 26	27	CTS P2	PND P2	RD-B P2
28 to 32	28	TCLK P2	RCV2 P2	IND-B P2
29 to 16, 30	29	Not Used	Not Used	Not Used
30 to 16, 29	30	WRAP P2	NB8 P2	DCLK-B P2
31 to 43, 45	31	RI P2	ACR P2	Not Used
32 to 28	32	RATE P2	NB1 P2	CTL-B P2
33 to 12, 13	33	RCLK P2	RCV1 P2	SET-A P2
34	34	SGND P1	SGND P1	SGND P1
35, 22, 23	35	CD P1	DSC P1	SET-B P1
36 to 7, 8	36	RI P1	ACR P1	Not Used
37 to 24, 25	37	Not Used	Not Used	Not Used
38 to 4	38	DTR P1	Not Used	CTL-A P1
39 to 21	39	RATE P1	NB1 P1	CTL-B P1
40	40	CID 2 P1	CID 2 P1	CID 2 P1
41	41	CID 1 P1	CID 1 P1	CID 1 P1
42	42	CID 0 P1	CID 0 P1	CID 0 P1
43 to 31, 45	43	Not Used	Not Used	Not Used
44 to 14, 46	44	DTE P2	CRQ P2	Not Used
45 to 31, 43	45	RLB P2	NB4 P2	Not Used
46 to 14, 44	46	TI P2	DLO P2	Not Used
47	47	CID 3 P2	CID 3 P2	CID 3 P2
48	48	CID 2 P2	CID 2 P2	CID 2 P2
49	49	CID 1 P2	CID 1 P2	CID 1 P2
50	50	CID 0 P2	CID 0 P2	CID 0 P2

ISDN Wrap Connector and Connector Pin

Figure 9-6 (Page 1 of 2). ISDN

Wrap Connector Pin to Pin	Connector Pin	ISDN
1 Cable ID (CID) 3	1	CID 3
2 to 3	2	FLASHER TRIG
3 to 2	3	Jumper to FLASHER DISCH
4 to 38	4	OPTO OUT/DEGLITCH IN
5 to 6, 18	5	FLASHER OUT
6 to 5, 18	6	OPTO OUT/DEGLITCH IN
7 to 8, 36	7	VCC OPTO
8 to 7, 36	8	Not Used
9 to 10	9	+XMIT TE DRIVER (+DATA IN)
10 to 9	10	+RCV TE DSHL (+DATA OUT)
11 to 15	11	RES
12 to 13, 33	12	Not Used
13 to 12, 33	13	Not Used
14 to 44, 46	14	Not Used
15 to 11	15	Not Used
16 to 29, 30	16	Not Used
17	17	SGND
18 to 5, 6	18	DEGLITCH DISCH
19 to 20	19	Not Used
20 to 19	20	Not Used
21 to 39	21	DEGLITCH BASE
22 to 23, 35	22	Not Used
23 to 22, 35	23	Not Used
24 to 25, 37	24	Not Used
25 to 24, 37	25	Not Used
26 to 27	26	-XMIT TE DSHL (-DATA IN)
27 to 26	27	-RCV TE DRIVER (-DATA OUT)
28 to 32	28	Not Used
29 to 16, 30	29	RES
30 to 16, 29	30	Not Used
31 to 43, 45	31	RES

Figure 9-6 (Page 2 of 2). ISDN

Wrap Connector Pin to Pin	Connector Pin	ISDN
32 to 28	32	Not Used
33 to 12, 13	33	Not Used
34	34	SGND
35 to 22, 23	35	Not Used
36 to 7, 8	36	Not Used
37 to 24, 25	37	Not Used
38 to 4	38	JUMPER TO DEGLITCH IN
39 to 21	39	DEGLITCH RST
40	40	CID 2
41	41	CID 1
42	42	CID 0
43 to 31, 45	43	Not Used
44 to 14, 46	44	Not Used
45 to 31, 43	45	Not Used
46 to 14, 44	46	Not Used
47	47	CID 3
48	48	CID 2
49	49	CID 1
50	50	CID 0

Stage 2 Two-Port Communications Adapter Cable

Figure 9-7 (Page 1 of 2). Stage 2 Two-Port Communications Adapter Cable Wiring

50-Pin Connector	Port 1 DTE Connector Number	Port 2 DTE Connector Number
1	1	Not Used
2	2	Not Used
3	3	Not Used
4	6	Not Used
5	Not Used	Not Used
6	11	Not Used
7	21	Not Used
8	Not Used	Not Used
9	Not Used	2
10	Not Used	3
11	Not Used	6
12	Not Used	Not Used
13	Not Used	11
14	Not Used	19
15	Not Used	20
16	Not Used	8
17	Not Used	7
18	17	Not Used
19	4	Not Used
20	5	Not Used
21	15	Not Used
22	Not Used	Not Used
23	18	Not Used
24	25	Not Used
25	24	Not Used
26	Not Used	4
27	Not Used	5
28	Not Used	15
29	Not Used	Not Used
30	Not Used	18
31	Not Used	22
32	Not Used	23
33	Not Used	17
34	7	Not Used
35	8	Not Used
36	22	Not Used

Figure 9-7 (Page 2 of 2). Stage 2 Two-Port Communications Adapter Cable Wiring		
50-Pin Connector	**Port 1 DTE Connector Number**	**Port 2 DTE Connector Number**
37	19	Not Used
38	20	Not Used
39	23	Not Used
40	10	Not Used
41	12	Not Used
42	13	Not Used
43	Not Used	Not Used
44	Not Used	24
45	Not Used	21
46	Not Used	25
47	Not Used	1
48	Not Used	10
49	Not Used	12
50	Not Used	13

RJ-45 Cable Wrap Connector

Figure 9-8. RJ-45 Cable Wrap Connector	
Description	**Wrap Connector Pin to Pin**
+RCV_TE DRIVER (+DATA_OUT TO +XMIT_TE DSHL (+DATA_IN)	3 to 4
-XMIT_TE DSHL(-DATA_IN) TO -RCV_TE DRIVER (-DATA_OUT)	5 to 6
(Positions 1,2,7,8 not used)	

Stage 1 V.24 Communications Adapter Remote Power-On Cable

Figure 9-9. V.24 Communications Adapter Remote Power-On Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data	103	2	2
Received data	104	3	3
Request to send (RTS)	105	4	4
Ready for sending (CTS)	106	5	5
Data set ready (DSR)	107	6	6
Data terminal ready/connect data set to line	108/2 108/1	24	20
Received line signal (carrier) detector	109	8	8
Data signal rate selector (DTE source)	111	43	23
Transmitter signal element timing (DTE)	113	11	24
Transmitter signal element timing (DCE)	114	19	15
Receiver signal element timing (DCE)	115	21	17
Select standby[3]	116	29	11
Calling indicator[4]	125	27, E1	22
Remote loopback	140	25	21
Local loopback	141	22	18
Test indicator	142	12	25
Cable ID 1, common return	102	7,16,17,33	7

Notes:

1 Cable ID 1, 2, 4 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

2 The V.24 cable wrap connector is used with this cable. See V.24 cable information for wiring diagram.

3 The Select Standby signal (circuit 116) is not used on all V.24 Communication Adapter Remote Power-On cables.

4 Adapter Connector Number E1 is needed only with Stage 1 hardware.

Stage 1 V.24/X.21bis Communications Adapter Cable

Figure 9-10. V.24/X.21bis Communications Adapter Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data	103	2	2
Received data	104	3	3
Request to send (RTS)	105	4	4
Ready for sending (CTS)	106	5	5
Data set ready (DSR)	107	6	6
Data terminal ready/connect data set to line	108/2 108/1	24	20
Received line signal (carrier) detector	109	8	8
Data signal rate selector	111	43	23
Transmitter signal element timing (DTE)	113	11	24
Transmitter signal element timing (DCE)	114	19	15
Receiver signal element timing (DCE)	115	21	17
Select standby[2]	116	29	11
Calling indicator	125	27	22
Remote loopback	140	25	21
Local loopback	141	22	18
Test indicator	142	12	25
Cable ID 1, common return	102	(17, 7)	7

Notes:

1 Cable ID 1 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

2 The Select Standby signal (circuit 116) is not used on all V.24/X.21bis Communication Adapter cables.

Stage 2 V.24/X.21bis Communications Adapter Cable

Figure 9-11. V.24/X.21bis Communications Adapter Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data	103	2	2
Received data	104	3	3
Request to send (RTS)	105	4	4
Ready for sending (CTS)	106	5	5
Data set ready (DSR)	107	6	6
Data terminal ready/connect data set to line	108/2	20	20
Received line signal (carrier) detector	109	8	8
Data signal rate selector	111	23	23
Transmitter signal element timing (DTE)	113	24	24
Transmitter signal element timing (DCE)	114	15	15
Receiver signal element timing (DCE)	115	17	17
Select standby[2]	116	11	11
Calling indicator	125	22	22
Remote loopback	140	21	21
Local loopback	141	18	18
Test indicator	142	25	25
Cable ID 0, common return	102	(7, 13)	7

Notes:

1 Cable ID 0 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

2 The Select Standby signal (circuit 116) is not used on all V.24 Communication Adapter cable assemblies.

Stage 1 V.24/X.21bis Cable Wrap Connector Wiring

Figure 9-12. V.24/X.21bis Cable Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
Transmit data to receive data A	2 to 3
RTS to CTS	4 to 5
DTR to DSR	20 to 6
Data signal rate selector to carrier detector	23 to 8
DTE clock to RSET DCE, (TSET)[1]	24 to 17 (15)
Select standby to TSET[1]	11 to 15
Remote loopback to calling indicator	21 to 22
Local loopback to test indicator	18 to 25

Note:

1 Some cables do not contain the Select Standby to TSET wrap. In these cables, DTE Clock wraps to RSET DCE and TSET.

Stage 2 V.24/X.21bis Cable Wrap Connector Wiring

Figure 9-13. V.24/X.21bis Cable Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
Transmit data to receive data A	2 to 3
RTS to CTS	4 to 5
DTR to DSR	20 to 6
Data signal rate selector to carrier detector	23 to 15 (17)
DTE clock to RSET DCE, (TSET)	24 to 25
Select standby to TSET[1]	11 to 17
Remote loopback to calling indicator	21 to 22
Local loopback to test indicator	18 to 8

Note:

1 Some cables do not contain the Select Standby to TSET wrap. In these cables, DTE Clock wraps to RSET DCE and TSET.

Stage 1 EIA-232/X.21bis Communications Adapter Cable

Figure 9-14. EIA-232/X.21bis Communications Adapter Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data	103	2	2
Received data	104	3	3
Request to send (RTS)	105	4	4
Ready for sending (CTS)	106	5	5
Data set ready (DSR)	107	6	6
Data terminal ready/connect data set to line	108/2 108/1	24	20
Received line signal (carrier) detector	109	8	8
Data signal rate selector	111	43	23
Transmitter signal element timing (DTE)	113	11	24
Transmitter signal element timing (DCE)	114	19	15
Receiver signal element timing (DCE)	115	21	17
Select standby[2]	116	29	11
Calling indicator	125	27	22
Cable ID 1, 4 common return	102	(17, 33, 7)	7

Notes:

1 Cable ID 1, 4 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

2 The Select Standby signal (circuit 116) is not used on all EIA-232/X.21bis Communication Adapter cables.

Stage 2 EIA-232/X.21bis Communications Adapter Cable

Figure 9-15 (Page 1 of 2). EIA-232/X.21bis Communications Adapter Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data	103	2	2
Received data	104	3	3
Request to send (RTS)	105	4	4
Ready for sending (CTS)	106	5	5
Data set ready (DSR)	107	6	6
Data terminal ready/connect data set to line	108/2	20	20
Received line signal (carrier) detector	109	8	8
Data signal rate selector	111	23	23
Transmitter signal element timing (DTE)	113	24	24

Figure 9-15 (Page 2 of 2). EIA-232/X.21bis Communications Adapter Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitter signal element timing (DCE)	114	15	15
Receiver signal element timing (DCE)	115	17	17
Select standby[2]	116	11	11
Calling indicator	125	22	22
Cable ID 0, 3 common return	102	(1, 7, 13)	7

Notes:

1 Cable ID 0, 3 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

2 The Select Standby signal (circuit 116) is not used on all V-24 Communication Adapter cable assemblies.

EIA-232/X.21bis Cable Wrap Connector Wiring

Figure 9-16. EIA-232/X.21bis Cable Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
Transmit data to receive data	2 to 3
RTS to CTS	4 to 5
DTR to DSR, calling indicator	20 to 6, 22
Data signal rate selector to carrier detector	23 to 8
DTE clock to RSET DCE, (TSET)[1]	24 to 17, (15)
Select standby to TSET[1]	11 to 15

Note:

1 Some cables do not contain the Select Standby to TSET wrap. In these cables, DTE Clock wraps to RSET DCE and TSET.

V.36/EIA 449 High Speed Communications Adapter Cable

Figure 9-17 (Page 1 of 2). V.36/EIA 449 High Speed Communications Adapter Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data A, B	103	18,34	4,22
Received data A, B	104	37,20	6,24
Request to send (RTS) A, B	105	4,21	7,25
Ready for sending (CTS) A, B	106	5,22	9,27
Data set ready (DSR) A, B	107	38,39	11,29
Data terminal ready (DTR) A, B	108	36,35	12,30

Figure 9-17 (Page 2 of 2). V.36/EIA 449 High Speed Communications Adapter Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Received line signal (carrier) detector (RLSD) A, B	109	8,25	13,31
Transmitter signal element timing (DTE) A, B	113	10,27	17,35
Transmitter signal element timing (DCE) A, B	114	40,41	5,23
Receiver signal element timing A, B	115	12,29	8,26
Calling indicator (CI)	125	11	15
Local loop back (LLB)	141	15	10
Remote loop back (RLB)	140	14	14
Test indicate (TI)	142	45	18
Receive circuit ground		28	20
Send circuit ground		47	37

Note: Cable ID 0, 2, 3 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

V.36/EIA 449 High Speed Communications Adapter Cable Wrap Connector Wiring

Figure 9-18. V.36/EIA 449 High Speed Communications Adapter Cable Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
Transmit data A to receive data A	4 to 6
Transmit data B to receive data B	22 to 24
DTR A to DSR A	12 to 11
DTR B to DSR B	30 to 29
RTS A to CTS A and RLSD A	7 to 9,13
RTS B to CTS B and RLSD B	25 to 27,31
TSET A (DTE) to TSET A (DCE) RSET A	17 to 5,8
TSET B (DTE) to TSET B (DCE) RSET B	35 to 23,26
Remote loopback to ring indicate	14 to 15
Local loopback to test indicate	10 to 18
Send circuit ground to receive circuit ground	37 to 20

Stage 1 V.35 Communications Adapter Cable

Figure 9-19. V.35 Communications Adapter Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data A, B	103	42, 26	P, S
Received data A, B	104	44, 31	R, T
Request to send (RTS)	105	4	C
Ready for sending (CTS)	106	5	D
Data set ready (DSR)	107	6	E
Received line signal (carrier) detector	109	8	F
Transmitter signal element timing (DCE) A, B	114	48, 30	Y, a
Receiver signal element timing (DCE) A, B	115	13, 46	V, X
Cable ID 2, 1, common return	102	(17, 16, 7)	B
Data terminal ready	108	24	H

Note: Cable ID 2, 1 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

Stage 1 V.35 Cable Wrap Connector Wiring

Figure 9-20. V.35 Cable Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
Transmit data A to receive data A, TSET A, RSET A	P to (R, Y, V)
Transmit data B to receive data B, TSET B, RSET B	S to (T, a, X)
RTS to CTS, DSR, carrier detector	C to (D, E, F)

Stage 2 V.35 High Speed Communications Adapter Cable

Figure 9-21. High Speed V.35 Communications Adapter Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data A, B	103	2, 4	P, S
Received data A, B	104	3, 5	R, T
Request to send (RTS)	105	17	C
Ready for sending (CTS)	106	11	D
Data set ready (DSR)	107	15	E
Received line signal (carrier) detector	109	9	F
Transmitter signal element timing (DCE) A, B	114	16, 22	Y, a
Receiver signal element timing (DCE) A, B	115	8, 21	V, X
Cable ID 1, 0, common return	102	7, 12, 13	B
Data terminal ready	108	23	H

Note: Cable ID 1, 0 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

Stage 2 V.35 Cable Wrap Connector Wiring

Figure 9-22. V.35 Cable Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
Transmit data A to receive data A, RSET A, TSET B	P to R, V, a
Transmit data B to receive data B, RSET B, TSET A	S to T, X, Y
RTS to CTS, carrier detector	C to D, F
DSR to data terminal ready	E to H

V.35/High Speed Communications Adapter Cable

Figure 9-23. High Speed Communications Adapter Cable

Signal Designation	Interchange Circuit Number	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data A, B	103	18, 34	P, S
Received data A, B	104	37, 20	R, T
Request to send (RTS)	105	4, 21	C
Ready for sending (CTS)	106	05, 22	D
Data set ready (DSR)	107	38, 39	E
Received line signal (carrier) detector	109	8, 25	F
Transmitter signal element timing (DCE) A, B	114	40, 41	Y, a
Receiver signal element timing (DCE) A, B	115	12, 29	V, X
Cable ID 1, 0, common return	102	43, 09, 7	B
Data terminal ready	108	36, 35	H
Transmitter signal element timing (DTE) A, B	113	10, 27	U, W
Ring Indicate (RI) A, B	125	11, 28	J

Note: Cable ID 1, 0 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

V.35 High Speed Communications Adapter Cable Wrap Connector Wiring

Figure 9-24. High Speed V.35 Cable Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
Transmit data A to receive data A	P to R
Transmit data B to receive data B	S to T
RTS to CTS, RI	C to (D,J)
DTR to DSR, RLSD	H to (E,F)
TSET A(DTR) to TSET A(DCE), RSET A	U to (V,Y)
TSET B(DTE) to TSET B(DCE), RSET B	W to (X,a)

Stage 1 X.21 Communications Adapter Cable

Figure 9-25. X.21 Communications Adapter Cable

Signal Designation	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data A, B	18, 34	2, 9
Received data A, B	37, 20	4, 11
Control A, B	36, 35	3, 10
Indication A, B	38, 39	5, 12
Signal element timing A, B	40, 41	6, 13
Cable ID bit 2, common return	(50, 7)	8

Note: Cable ID 3 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

Stage 2 X.21 Communications Adapter Cable

Figure 9-26. X.21 Communications Adapter Cable

Signal Designation	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data A, B	2, 4	2, 9
Received data A, B	3, 5	4, 11
Control A, B	20, 23	3, 10
Indication A, B	6, 15	5, 12
Signal element timing A, B	17, 8	6, 13
Cable ID bit 2, common return	7, 10	8

Note: Cable ID 2 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

Stage 2 X.21/High Speed Communications Adapter Cable

Figure 9-27. X.21/High Speed Communications Adapter Cable

Signal Designation	Adapter Connector Pin Number	DCE Connector Pin Number
Transmitted data A, B	18, 34	2, 9
Received data A, B	37, 20	4, 11
Control A, B	36, 35	3, 10
Indication A, B	38, 39	5, 12
Signal element timing A, B	12, 29	6, 13
Cable ID bit 2, common return	49, 7	8

Note: Cable ID 2 is connected to common return pin 7 only at the DTE connector end and is not connected at the DCE end.

X.21 Cable Wrap Connector Wiring

Figure 9-28. X.21 Cable Wrap Connector Wiring

Signal Designation	Wrap Connector Pin to Pin
Transmit data A to receive data A, signal timing A	2 to 4, 6
Transmit data B to receive data B, signal timing B	9 to 11, 13
Control A to indicate A	3 to 5
Control B to indicate B	10 to 12

Token-ring Communications Adapter Cable and Card Wrap

Figure 9-29. Token-ring Communications Adapter Cable

Interface Line Name	Adapter Connector Pin Number	ICS Data Connector	Wrap Connector Pin to Pin
Transmit positive (TX+)	9	Orange dot	9 to 1
Transmit negative (TX-)	5	Black dot	5 to 6
Receive positive (RX+)	1	Red dot	1 to 9
Receive negative (RX-)	6	Green dot	6 to 5

Ethernet/IEEE 802.3 Transceiver Adapter Cable and Card Wrap

Figure 9-30. Ethernet/IEEE 802.3 Transceiver Adapter Cable and Card Wrap

Interface Line Name	Adapter Connector Pin Number	Wrap Connector Pin to Pin (Normal Wrap)	Wrap Connector Pin to Pin (Collision Wrap)
Data out - circuit A (DO-A)	3	3 to 5	3 to 2
Data out - circuit B (DO-B)	10	10 to 12	10 to 9
Data out - circuit shield (DO-S)	11		
Data in - circuit A (DI-A)	5	5 to 3	
Data in - circuit B (DI-B)	12	12 to 10	
Data in - circuit shield (DI-S)	4		
Control in - circuit A (CI-A)	2		2 to 3
Control in - circuit B (CI-B)	9		9 to 10
Control in - circuit shield (CI-S)	1		
Voltage common (VC)	6		6 to 13
Voltage plus (VP)	13		13 to 6
Voltage shield (VS)	14		
Protective ground (PG) (Conductive shell)	Shell		

Facsimile Adapter Cable Wrap Connector Wiring

Figure 9-31. Facsimile Adapter Cable Wrap Connector Wiring

Signal Designation	Wrap Connector Port A Pin to Port B Pin
OH/DP to RI	11 to 13
AN1 to AN2	9 to 9
AN2 to AN2	10 to 10
RI to OH/DP	13 to 11
+5V to wrap cable logic	19
DL to country code	23 to 14
CLK to CLK Wrap	16 to 18
Country code to DL	14 to 23
CLK wrap to CLK	18 to 16
Logic ground to wrap cable logic	7

DDI Transceiver Adapter Cable and Card Wrap

Figure 9-32. DDI Transceiver Adapter Cable and Card Wrap

Interface Line Name	Adapter Connector Pin Number	ICS Data Connector	Wrap Connector Pin to Pin
Transmit positive (TX+)	5	Red dot	5 to 1
Transmit negative (TX-)	9	Green dot	9 to 6
Receive positive (RX+)	1	Black dot	1 to 5
Receive negative (RX-)	6	Orange dot	6 to 9

Communications Signal Voltage Levels

Figure 9-33. Communications Signal Voltage Levels

Interface Type	OFF Voltage Level	ON Voltage Level
V.24 EIA-232 X.21bis	Less than -3 volts	More than +3 volts
V.35	When terminated by a 100-ohm resistive load, the differential voltage (A-B) is 0.55 volts +/- 20%.	When terminated by a 100-ohm resistive load, the differential voltage (B-A) is 0.55 volts +/- 20%.
Note: See the V.35 cable to find out which pin numbers are A and B.		
X.21	The differential voltage (A-B) is less than -0.3 volts. When terminated by a 100 ohm resistive load, the differential voltage (B-A) is the larger of 2.0 volts or 50% of the open circuit voltage. The open circuit voltage is between 2.0 and 6.0 volts.	The differential voltage (A-B) is more than + 0.3 volts. When terminated by a 100 ohm resistive load, the differential voltage (A-B) is the larger of 2.0 volts or 50% of the open circuit voltage. The open circuit voltage is between 2.0 and 6.0 volts.
Note: See X.21 cable diagram to find out which pin numbers are A and B.		
ISDN	Logic 0 The differential voltage (A-B) is less than +.75 volts and more than -.75 volts (nominal).	Logic 1 The differential voltage (A-B) is 0.0 volts (nominal).

Appendix A. Licensed Internal Code Install and Restore SRCs That Require User Action (A6xx xxxx)

A6xx 6001—Select the Utility You Want to Run

Function	Data
11xx	A6xx 6001

Description

Select the utility (Licensed Internal Code Restore or Licensed Internal Code Install) you want to run.

Reply

Using the Select, Increment (↑), or Decrement (↓) switch on the control panel, select the function code for the utility you want to run and press Enter on the control panel.

Function Code		Utility Selected
Stage 1	**Stage 2**	
23	23	Stand-Alone Restore Licensed Internal Code The stand-alone Restore Licensed Internal Code utility copies all system Licensed Internal Code from tape and writes over the Licensed Internal Code on disk. Select this utility to exchange or update a system's existing Licensed Internal Code without losing customer data already on the system.
24	24	Stand-Alone Install Licensed Internal Code The stand-alone Install Licensed Internal Code utility erases all information on the load-source disk device (including customer data), then copies all system Licensed Internal Code from tape to disk. The data on the remainder of the disk devices is not erased but may become not accessible (because of the way data is written on multiple disk devices). Select this utility when starting up a new system (which contains no customer data and no Licensed Internal Code) or in conditions where the primary disk was exchanged.
29	29	Load Model-Unique Licensed Internal Code The Load Model-Unique Licensed Internal Code utility copies only the Model-Unique Licensed Internal Code from tape and writes over any existing Model-Unique Licensed Internal Code on disk. Select this utility when a hardware model change is performed.
32	32	Download Disk Licensed Internal Code The Download Disk Licensed Internal Code utility down-loads the disk Licensed Internal Code to disk. Select this function when the disk Licensed Internal Code should be changed.
(None)	(None)	Cancel this request If you do not want to select any of the options, switch off power to the system (see "System Power Off" in the *Problem Analysis* information).

A6xx 6002—Load Source Disk Already Contains Data

Function	Data
11xx	A6xx 6002

Description

Warning: The stand-alone Install Licensed Internal Code utility could destroy all data on all disk devices.

The stand-alone Install Licensed Internal Code utility was requested; however, the load-source disk device already contains data. Continuing with the Install Licensed Internal Code utility erases all data on the load-source disk device. The data on the remainder of the disk devices is not erased but may become not accessible (because of the way data is written on multiple disk devices).

The following function codes may be used to display which disk the system is attempting to install.

Function Code		Function Description
Stage 1	**Stage 2**	
14	15-2	Display the type and model of the load-source disk device. The 4 leftmost characters displayed show the type. The next 4 characters show the model.

The following is an example of what is displayed when you select Function 14 and the disk device is a 9332 Model 400.

Function	Data
14xx	9332 0400

Function Code		Function Description
Stage 1	**Stage 2**	
15	16-2	Display the address of the load-source disk device. 8 characters are displayed. These characters are described below.

Character Position	Function Description
1-2	Bus number (should be 0)
3	I/O processor card number
4	I/O processor board number
5-6	Controller address
7-8	Device address

The following is an example of what is displayed when you select Function 15 to display the disk unit address.

Function	Data
15xx	0010 0000

Function Code		Function Description
Stage 1	**Stage 2**	
16	17-2	Display the serial number of the load-source disk device.

The following is an example of what is displayed when you select Function 16 to display the disk unit serial number.

Function	Data
16xx	0012 3456

Reply

Using the Select, Increment (↑), or Decrement (↓) switch on the control panel, select one of the following codes and press Enter on the control panel.

Function Code		Function Description
Stage 1	Stage 2	
23	23	Restore the Licensed Internal Code without destroying customer data. Select function code 23 if you want to restore the Licensed Internal Code to the load-source disk device without erasing any other data from the system. Selecting this function copies all system Licensed Internal Code from tape and exchanges the Licensed Internal Code on the load-source disk. Select this function if you want to exchange or update an existing system's Licensed Internal Code without losing customer data.
24	24	Destroy all system data and restore the Licensed Internal Code. Select function code 24 if you want to destroy all data on the system and restore the Licensed Internal Code to the selected disk device. Selecting this function first erases all information on the load-source disk device (including customer data), then copies all system Licensed Internal Code from tape to disk. The data on the remainder of the disk devices is not erased but may become not accessible (because of the way data is written on multiple disk devices). Select this function if you are installing a new system (which contains no customer data and no Licensed Internal Code), or if you have exchanged the load-source disk device. Information (other than Vertical Licensed Internal Code) is not destroyed when using checksum. For details on checksum recovery performed by the service representative, see the *Backup and Recovery – Advanced* information.
(None)	(None)	Cancel this request If you do not want to continue with the Licensed Internal Code install, switch off power to the system (see "System Power Off" in the *Problem Analysis* information).

A6xx 6003—Disk Not a Load Source Disk

Function	Data
11xx	A6xx 6003

Description

Warning: The stand-alone Install Licensed Internal Code utility could destroy all data on all disk devices.

The stand-alone Install Licensed Internal Code was requested. The system found a disk device attached at the correct location for being a load-source disk device. However, the disk device found already contains data, and the data is not in the correct format to be a load-source disk device. The wrong disk device may be attached at the location where a load-source disk device should be, or the correct load-source disk device may not be powered-on (in this condition, the system detected the wrong disk device as the load-source disk device).

Continuing with the Install Licensed Internal Code utility erases all data on the load-source disk device. The data on the remainder of the disk

devices is not erased but may become not accessible (because of the way data is written on multiple disk devices).

Function codes 14, 15, and 16 may be used to display which disk the system is attempting to install. This information can be used with the system configuration list printouts to ensure that the system will install or restore to the correct disk.

Function Code		Function Description
Stage 1	**Stage 2**	
14	15-2	Display the type and model of the load-source disk device. The 4 leftmost characters displayed show the type. The next 4 characters show the model.

The following is an example of what is displayed when you select Function 14 and the disk device is a 9332 Model 400.

Function	Data
14xx	9332 0400

Function Code		Function Description
Stage 1	**Stage 2**	
15	16-2	Display address of the load-source disk device. 8 characters are displayed. These characters are described below.

Character Position	Function Description
1-2	Bus number (should be 0)
3	I/O processor card number
4	I/O processor board number
5-6	Controller address
7-8	Device address

The following is an example of what is displayed when you select Function 15 to display the disk unit address.

Function	Data
15xx	0010 0000

Function Code		Function Description
Stage 1	**Stage 2**	
16	17-2	Display the serial number of the load-source disk device.

The following is an example of what is displayed when you select Function 16 to display the disk unit serial number.

Function	Data
16xx	0012 3456

Reply

Using the Select, Increment (↑), or Decrement (↓) switch on the control panel, select one of the following codes and press Enter on the control panel.

Function Code		Function Description
Stage 1	**Stage 2**	
24	24	Destroy all system data and restore the Licensed Internal Code. Select function code 24 if you want to destroy all data on the system and restore the Licensed Internal Code to the selected disk device. Selecting this function first erases all information on the load-source disk device (including customer data), and then copies all system Licensed Internal Code from tape to disk. The data on the remainder of the disk devices is not erased but may become not accessible (because of the way data is written on multiple disk devices).
		Select this function if you are installing a new system (which contains no customer data and no Licensed Internal Code), or if you have exchanged the load-source disk device.
(None)	(None)	Cancel this request If you do not want to continue with the Licensed Internal Code install, switch off power to the system (see "System Power Off" in the *Problem Analysis* information).

A6xx 6004—Disk Not a Load Source Disk

Function	Data
11xx	A6xx 6004

Description

Warning: Load-source disk device does not contain Licensed Internal Code.

Stand-Alone Licensed Internal Code Restore was requested. The system found a disk device attached at the correct location for being a load-source disk device. However, the disk device found already contains data and the data is not in the correct format to be a load-source disk device. The wrong disk device may be attached at the location where a load-source disk device should be, or the correct load-source disk device may not be powered-on (in this condition, the system detected the wrong disk device as the load-source disk device).

To restore Licensed Internal Code to this disk device, the system must first destroy all data on the load-source disk device (to correctly format this disk device to be a load-source disk device). The data on the remainder of the disk devices is not erased, but may become not accessible (because of the way data is written on multiple disk devices).

Function codes 14, 15, and 16 may be used to display the disk that the system is attempting to restore. This information can be used with the system configuration list printouts to ensure that the system will restore to the correct disk.

Function Code		Function Description
Stage 1	**Stage 2**	
14	15-2	Display the type and model of the load-source disk device. The first 4 characters displayed show the type. The next 4 characters show the model.

The following is an example of what is displayed when you select Function 14 and the disk device is a 9332 Model 400.

Function	Data
14xx	9332 0400

Function Code		Function Description
Stage 1	**Stage 2**	
15	16-2	Display the address of the load-source disk device. 8 characters are displayed. These characters are described below. **Character Position** — **Function Description** 1-2 — Bus number (should be 0) 3 — I/O processor card number 4 — I/O processor board number 5-6 — Controller address 7-8 — Device address

The following is an example of what is displayed when you select Function 15 to display the disk unit address.

Function	Data
15xx	0010 0000

Function Code		Function Description
Stage 1	**Stage 2**	
16	17-2	Display the serial number of the load-source disk device.

The following is an example of what is displayed when you select Function 16 to display the disk unit serial number.

Function	Data
16xx	0012 3456

Reply

Function Code		Function Description
Stage 1	**Stage 2**	
24	24	Destroy all system data and restore the Licensed Internal Code. Select function code 24 if you want to destroy all data on the system and restore the Licensed Internal Code to the selected disk device. Selecting this function first erases all information on the load-source disk device (including customer data), then copies all system Licensed Internal Code from tape to disk. The data on the remainder of the disk devices is not erased but may become not accessible (because of the way data is written on multiple disk devices).
		Select this function if you are installing a new system (which contains no customer data and no Licensed Internal Code), or if you have exchanged the load-source disk device.
(None)	(None)	Cancel this request If you do not want to continue with the download of disk Licensed Internal Code, switch off power to the system (see "System Power Off" in the *Problem Analysis* information).

A6xx 6005—Load Source Disk Cannot Be Found

Function	Data
11xx	A6xx 6005

Description

Load-source disk device not found.

The load-source disk device cannot be found. Ensure that the device cables are installed correctly and the devices are powered-on.

For the 9406, see "Determining Load-Source Disk or Tape Unit for an Alternate IPL" in the *9406 Models Bxx-Fxx Problem Analysis* information for a description of how to find the primary disk device.

For 9402 and 9404 review the installation procedures and be sure that the load-source disk unit is installed correctly in device location 1 in the system unit. If you cannot determine the cause of this SRC, perform an IPL from disk to determine if there are any hardware errors.

A6xx 6006—Tape Licensed Internal Code File Not Compatible for Restoring

Function	Data
11xx	A6xx 6006

Description

Tape Licensed Internal Code file is not compatible for restoring.

The Licensed Internal Code level found on tape is not compatible with the Licensed Internal Code found on disk. Continuing to restore this code will result in system failure.

Reply

Function Code		Function Description
Stage 1	**Stage 2**	
24	24	Destroy all system data and install the Licensed Internal Code. Select function code 24 if you want to destroy all data on the system and restore the Licensed Internal Code to the selected disk device. Selecting this function first erases all information on the load-source disk device (including customer data), and then copies all system Licensed Internal Code from tape to disk. The data on the remainder of the disk devices is not erased but may become not accessible (because of the way data is written on multiple disk devices).
(None)	(None)	Cancel this request If you do not want to continue with the Licensed Internal Code restore, switch off power to the system (see "System Power Off" in the *Problem Analysis* information.)

A6xx 6007—Load-source Disk Does Not Contain Licensed Internal Code

Function	Data
11xx	A6xx 6007

Description

Warning: Load-source disk device does not contain Licensed Internal Code.

The stand-alone Download Disk Licensed Internal Code utility, Function 32, was requested. The system found a disk device attached at the correct location for being a load-source disk device. However, the disk device found is not in the correct format to be a load-source disk. The wrong disk device may be attached at the location

where a load-source disk device should be, or the correct load-source disk device may not be powered-on (in this condition, the system detected the wrong disk device as the load-source disk device).

Function codes 14, 15, and 16 may be used to display the disk that the system is attempting to restore. This information can be used with the system configuration list printouts to ensure that the system will restore to the correct disk.

Function Code		Function Description
Stage 1	**Stage 2**	
14	15-2	Display the type and model of the load-source disk device. The 4 leftmost characters displayed show the type. The next 4 characters show the model.

The following is an example of what is displayed when you select Function 14 and the disk device is a 9332 Model 400.

Function	Data
14xx	9332 0400

Function Code		Function Description
Stage 1	**Stage 2**	
15	16-2	Display the address of the load-source disk device. 8 characters are displayed. These characters are described below.

Character Position	Function Description
1-2	Bus number (should be 0)
3	I/O processor card number
4	I/O processor board number
5-6	Controller address
7-8	Device address

The following is an example of what is displayed when you select Function 15 to display the disk unit address.

Function	Data
15xx	0010 0000

Function Code		Function Description
Stage 1	**Stage 2**	
16	17-2	Display the serial number of the load-source disk device.

The following is an example of what is displayed when you select Function 16 to display the disk unit serial number.

Function	Data
16xx	0012 3456

Reply

Function Code		Function Description
Stage 1	**Stage 2**	
24	24	Destroy all system data and restore the Licensed Internal Code. Select function code 24 if you want to destroy all data on the system and restore the Licensed Internal Code to the selected disk device. Selecting this function first erases all information on the load-source disk device (including customer data), then copies all system Licensed Internal Code from tape to disk. The data on the remainder of the disk devices is not erased but may become not accessible (because of the way data is written on multiple disk devices).

Function Code		Function Description
Stage 1	Stage 2	
		Select this function if you are installing a new system (which contains no customer data and no Licensed Internal Code), or if you have exchanged the load-source disk device.
32	32	Force download of disk Licensed Internal Code. Select function code 32 to force a download of disk Licensed Internal Code to the disk device selected.
(None)	(None)	Cancel this request If you do not want to continue with the procedure, switch off power to the system (see "System Power Off" in the *Problem Analysis* information).

A6xx 6008—Load-Source Disk Is Not Found

Function	Data
11xx	A6xx 6008

Description

The vital product data (VPD) in the system indicates that the load-source disk unit can be found at the address specified by Functions 14 and 15. Either the device at this address did not report (come online), or the device at this address is not a DASD.

This condition can occur for one of the following reasons:

- The DASD at the address specified by Functions 14 and 15 is not powered-on, failed to report, or is missing. Verify the following and correct if necessary. The install operation will continue automatically when the device becomes ready and reports.
  - Ensure that the Enable/Disable switches on all 9335 and 9336 disk units (if installed) are set to the Enable position.
  - Ensure that the disk unit at the address specified by Functions 14 and 15 is powered-on, and the Ready light is on. If the disk unit is already powered-on, and its indicators show a ready status, attempt to power-off the device, wait a few minutes, and then power on the device. The install operation will continue automatically when the device becomes ready and reports.
  - Ensure that any separate DASD controller attached to the requested disk unit is powered-on and ready. Do not switch off power to the controller.
- The AS/400 service processor has been exchanged.

  The service processor contains some of the VPD information being used. If the service processor has been exchanged, the VPD information will not be correct.

  Warning: Do not select Function 27 before reading the instructions below. Function 27 can be used to override the VPD information and find the default load-source disk unit.
- The DASD on the system have been moved or connected in a different way, or the DASD address switches have been changed.

  Ensure that the DASD are connected correctly and that the DASD address switches are set correctly. Note that some disk units also contain VPD information concerning the system. If the disk units are not in the same positions, this VPD information will not be correct.

  To correct this condition, switch off power to the system. Then, move and connect the disk unit cables so that the load-source disk unit and its mirrored disk unit (if the system is configured for mirrored protection) have their correct addresses. Run the stand-alone utility again.

  Warning: Do not select Function 27 before reading the instructions below. Function 27 can be used to override the VPD information and find the default load-source disk unit.

Function codes 14 and 15 may be used to display the disk unit the system is attempting to use. This information can be used with the system config-

uration list to ensure that the system will install or restore to the correct disk unit.

Function Code		Function Description
Stage 1	**Stage 2**	
14	15-2	Display the address of the load-source disk unit. The location of the load-source disk unit is displayed. **Character Position** — **Function Description** 1-2 — Bus number (should be 0) 3 — I/O processor card number 4 — I/O processor board number 5-6 — Controller address 7-8 — Device address

The following is an example of what is displayed when you select Function 14 to display the load-source disk unit address.

Function	Data
14xx	0010 0000

Function Code		Function Description
Stage 1	**Stage 2**	
15	16-2	Display the serial number of the load-source disk unit. If the serial number of the disk unit is available, it is displayed. If the serial number is not available, zeros are displayed.

The following is an example of what is displayed when you select Function 15 to display the load-source disk unit serial number.

Function	Data
15xx	0012 3456

Reply

Using the Select, Increment (↑), or Decrement (↓) switch on the control panel, select the function code for the utility you want to run and press Enter on the control panel.

Function Code		Function Description
Stage 1	**Stage 2**	
27	27	Ignore VPD information. Select default DASD. **Warning:** Using this option may cause the Licensed Internal Code to be loaded to the wrong disk unit. **Note:** The VPD and the DASD configuration do not match. Performing an IPL to the OS/400 sign-on display will correct the VPD information or show displays that indicate the problem and recommended actions or both.
		Select Function 27 to ignore the VPD information or if you cannot cause the requested DASD to come online. This causes the default DASD to become the load-source disk unit. See "Determining Load-Source Disk or Tape Unit for an Alternate IPL" in the *Problem Analysis* information for a description of how to find the primary disk device.
(None)	(None)	Cancel this request If you do not want to continue with this install or restore, remove the tape and switch off power to the system (see "Powering Off the System" in the *Problem Analysis* information).

A6xx 6009—Mirrored Pair Load-Source Disk Not Found

Function	Data
11xx	A6xx 6009

Description

The vital product data (VPD) in the system indicates that the mirrored pair load-source disk unit can be found at the address specified by Functions 14 and 15. Either the device at this address did not report (come online), or the device at this address is not a DASD.

This condition can occur for one of the following reasons:

- The DASD at the address specified by Functions 14 and 15 is not powered-on, failed to report, or is missing. Verify the following and correct if necessary. The install operation will continue automatically when the device becomes ready and reports.
  - Ensure that the Enable/Disable switches on all 9335 and 9336 disk units (if installed) are set to the Enable position.
  - Ensure that the disk unit at the address specified by Functions 14 and 15 is powered-on, and the Ready light is on. If the disk unit is already powered-on, and its indicators show a ready status, attempt to power-off the device, wait a few minutes, and then power on the device. The install operation will continue automatically when the device becomes ready and reports.
  - Ensure that any separate DASD controller attached to the requested disk unit is powered-on and ready. Do not switch off power to the controller.
- The AS/400 service processor has been exchanged.

  The service processor contains some of the VPD information being used. If the service processor has been exchanged, the VPD information will not be correct.

  Warning: Do not select Function 27 before reading the instructions below. Function 27 can be used to override the VPD information and find the default load-source disk unit.
- The DASD on the system have been moved or connected in different way, or the DASD address switches have been changed.

  Ensure that the DASD are connected correctly and that the DASD address switches are set correctly. Note that some disk units also contain VPD information concerning the system. If the disk units are not in the same positions, this VPD information will not be correct.

  Warning: Do not select Function 27 before reading the instructions below. Function 27 can be used to override the VPD information and find the default load-source disk unit.

  To correct this condition, switch off power to the system. Then, move and connect the disk unit cables so that the load-source disk unit and its mirrored disk unit (if the system is configured for mirrored protection) have their correct addresses. Run the stand-alone utility again.

  Warning: Do not select Function 27 before reading the instructions below. Function 27 can be used to override the VPD information and find the default load-source disk unit.

Function codes 14 and 15 may be used to display the disk unit the system is attempting to use. This information can be used with the system configuration list to ensure that the system will install or restore to the correct disk unit.

Function Code		Function Description
Stage 1	**Stage 2**	
14	15-2	Display the address of the mirrored pair load-source disk units. The location of the mirrored pair load-source disk units will be displayed.

Character Position	Function Description
1-2	Bus number (should be 0)
3	I/O processor card number
4	I/O processor board number
5-6	Controller address
7-8	Device address

The following is an example of what is displayed when you select Function 14 to display the load-source disk unit address.

Function	Data
14xx	0010 0000

Function Code		Function Description
Stage 1	**Stage 2**	
15	16-2	Display the serial number of the load-source disk unit. If the serial number of the disk unit is available, it is displayed. If the serial number is not available, zeros are displayed.

The following is an example of what is displayed when you select Function 15 to display the load-source disk unit serial number.

Function	Data
15xx	0012 3456

Reply

Using the Select, Increment (↑), or Decrement (↓) switch on the control panel, select the function code for the utility you want to run and press Enter on the control panel.

Function Code		Function Description
Stage 1	**Stage 2**	
27	27	Ignore the missing mirrored pair load-source disk units. **Warning:** Using this option may cause the Licensed Internal Code to be loaded to the wrong disk unit. **Note:** The VPD and the DASD configuration do not match. Performing an IPL to the OS/400 sign-on display will correct the VPD information or show displays that indicate the problem and recommended actions or both. Select Function 27 if you cannot cause the requested DASD to come online. This causes the install to continue without the mirrored pair load-source disk units.
(None)	(None)	Cancel this request If you do not want to continue with this install, remove the tape and switch off power to the system (see "Powering Off the System" in the *Problem Analysis* information).

A6xx 6010—Load-Source Disk Specified Is Part of a Mirrored Pair

Function	Data
11xx	A6xx 6010

Description

The load-source disk unit specified by Functions 14 and 15 indicates that it is part of a mirrored DASD pair. Because of the information available, the stand-alone utility cannot verify that this disk unit selected is at the correct mirrored condition.

Warning: Continuing may cause the Licensed Internal Code to be loaded to a suspended or resuming DASD mirrored pair.

Either the vital product data (VPD) in the system indicates that the disk unit specified by Functions 14 and 15 is the load source and the disk is not compatible with the VPD, or the request to override the VPD was done by entering Function 27 before the request in response to SRC A6xx 6008 or SRC A6xx 6009.

This condition can occur for one of the following reasons:

- The AS/400 service processor has been exchanged.

  The service processor contains some of the VPD information being used. If the service processor has been exchanged, the VPD information will not be correct.

  Warning: Do not select Function 27 before reading the instructions below. Function 27 can be used to override the VPD information and find the default load-source disk unit.

- The DASD on the system have been moved or connected in a different way, or the DASD address switches have been changed.
  - Ensure that the DASD are connected correctly and that the DASD address switches are set correctly. Note that some disk units also contain VPD information concerning the system. If the disk units are not in the same positions, this VPD information will not be correct.
  - A request to override the VPD information was done earlier, and the default DASD location was selected.

    Warning: Do not select Function 27 before reading the instructions below. Function 27 can be used to override the VPD information and find the default load-source disk unit.

Function codes 14 and 15 may be used to display the disk unit the system is attempting to use. This information can be used with the system configuration list to ensure that the system will install or restore to the correct disk unit.

Function Code		Function Description
Stage 1	**Stage 2**	
14	15-2	Display the address of the load-source disk unit. The location of the load-source disk unit is displayed.

Character Position	Function Description
1-2	Bus number (should be 0)
3	I/O processor card number
4	I/O processor board number
5-6	Controller address
7-8	Device address

The following is an example of what is displayed when you select Function 14 to display the load-source disk unit address.

Function	Data
14xx	0010 0000

Function Code		Function Description
Stage 1	**Stage 2**	
15	16-2	Display the serial number of the load-source disk unit.

The following is an example of what is displayed when you select Function 15 to display the load-source disk unit serial number.

Function	Data
15xx	0012 3456

Reply

Function Code		Function Description
Stage 1	**Stage 2**	
27	27	Ignore this warning and continue with the install. **Note:** The VPD and the DASD configuration do not match. Performing an IPL to the OS/400 sign-on display will correct the VPD information or show displays that indicate the problem and recommended actions or both.
(None)	(None)	Cancel this request If you do not want to continue with this install, switch off power to the system (see "Powering Off the System" in the *Problem Analysis* information).

A6xx 6011—Load Model-Unique Licensed Internal Code Utility Was Selected

Function	Data
11xx	A6xx 6011

Description

Verify selection to load Model-Unique Licensed Internal Code.

The Load Model-Unique Licensed Internal Code Utility was selected. Continuing with this procedure will copy Model-Unique Licensed Internal Code from tape to disk. Any existing Model-Unique Licensed Internal Code on disk will be exchanged.

Using the Select, Increment (↑), or Decrement (↓) switch on the control panel, select one of the following codes and press Enter on the control panel.

Function Code		Function.Description
Stage 1	**Stage 2**	
23	23	Load the Model-Unique Licensed Internal Code. Select function code 23 if you want to exchange the existing Model-Unique Licensed Internal Code with the Model-Unique Licensed Internal Code on tape.
29	29	Cancel this request. Select function code 29 if you do not want to load Model-Unique Licensed Internal Code. After selecting this function, SRC A6xx 6001 occurs again.

A6xx 6030—Load-Source Disk Is Not Ready or Not Operational

Function	Data
11xx	A6xx 6030

Description

Load-source disk device is not ready or not operational.

Reply

Make the disk device ready. See the the specific disk device information for a description of how to make the disk device ready.

A6xx 6041—Tape Device Is Not Operational

Function	Data
11xx	A6xx 6041

Description

Tape device is not operational.

Reply

See the specific tape unit information for a description of how to make the tape device operational.

A6xx 6042—Tape Device Is Not Ready

Function	Data
11xx	A6xx 6042

Description

Tape device is not ready.

The third and fourth characters in the SRC (xx) give more information on why the tape drive is not ready.

Code	Definition
33	Load assistance
37	Cartridge length check
3B	Volume removed early
43	Tape not installed
FE	Tape drive powered-off
FF	Tape drive powered-off

Reply

Make the tape unit ready.

See the tape device information for a description of how to make the tape unit ready.

A6xx 6043—Tape Device Load Failure Occurred

Function	Data
11xx	A6xx 6043

Description

Tape device load failure occurred.

The third and fourth characters in the SRC (xx) give more information on why a load failure occurred.

Code	Definition
11	Door open
12	Reel missing
13	Reel inverted
14	No beginning-of-tape (BOT) marker
16	Load failure
1B	Address switch changed
1C	Address switch failure

Reply

Make the tape unit ready.

See the tape unit information for a description of how to make the tape unit ready.

A6xx 6048—Install New Tape Volume

Function	Data
11xx	A6xx 6048

Description

New tape volume needs to be installed.

Reply

Install the tape volume, then make the tape unit ready. When the tape is loaded and ready, the system starts reading this tape and continues with the install (or restore) process.

The third and fourth characters in the SRC (xx) indicate the volume that should be loaded.

Code	Definition
01	Volume 1
02	Volume 2
03	Volume 3
.	
.	
nn	Volume nn

See the tape device information for a description of how to install a tape.

A6xx 6049—Install Correct Tape Volume

Function	Data
11xx	A6xx 6049

Description

Install correct tape volume.

Reply

You already installed a new tape volume, but it was not the correct volume.

The third and fourth characters in the SRC (xx) give information on which volume should be loaded.

Code	Definition
01	Volume 1
02	Volume 2
03	Volume 3
nn	Volume nn

See the tape device information for a description of how to install a tape.

A6xx 6050—Duplicate Tape Volume Label

Function	Data
11xx	A6xx 6050

Description

Duplicate tape volume label.

Reply

The tape volume installed has the same volume label as a one just removed. If the inserted volume is the correct volume, make the tape unit ready. If the wrong volume has been inserted, load the correct volume and make the tape unit ready.

A6xx 6051—Load Tape Volume Containing Model-Unique Licensed Internal Code

Function	Data
11xx	A6xx 6051

Description

Load the model-unique Licensed Internal Code tape for your system.

Reply

This tape was shipped with the system. Insert the model-unique Licensed Internal Code tape into the tape unit for an alternate IPL and make the tape unit ready. When the tape is loaded and the tape unit is ready, the system begins reading this tape and loads the model-unique Licensed Internal Code.

A6xx 6052—Tape Does Not Contain Model-Unique Licensed Internal Code

Function	Data
11xx	A6xx 6052

Description

The inserted tape did not contain the model-unique Licensed Internal Code.

Reply

Place the model-unique Licensed Internal Code tape into the tape unit for an alternate IPL and make the tape unit ready.

Appendix B. Restore the OS/400 System and Other Licensed Programs

Inform the customer that you plan to load the Operating System/400* (OS/400) and other licensed programs again. Review the reasons for loading them again with the customer or the System Engineer. They should be familiar with the restore process and the disk configuration of the system. When selecting the correct recovery procedure, plan for the disk configuration (ASPs and checksums, for example) and the system recovery procedures. One of the following manuals should be used as a reference:

- *Backup and Recovery – Advanced*, SC41-3305

  This manual should be used when recovering from a system failure or when an install of Licensed Internal Code (Function 24) is required.

- *Software Installation*, SC41-3120

  This manual should be used when you are restoring Licensed Internal Code (Function 23), installing OS/400, or installing other licensed programs.

Glossary

This glossary includes terms and definitions from:

- The *American National Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. Definitions are identified by the symbol (A) after the definition.
- The *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Committee (ISO/IEC JTC1/SC1). Definitions of published parts of this vocabulary are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among participating National Bodies of SC1.

alternate IPL. The process of loading code into main storage and preparing for system operation from a input/output hardware unit other than the system's primary load source unit.

ac. Alternating current.

American National Standard Code for Information Interchange. The code developed by the American National Standards Institute for information exchange among data processing systems, data communications systems, and associated equipment. The ASCII character set consists of 7-bit control characters and symbolic characters, plus one parity-check bit.

American National Standards Institute (ANSI). An organization sponsored by the Computer and Business Equipment Manufacturers Association for establishing voluntary industry standards.

ANSI. See *American National Standards Institute*.

APAR. See *authorized program analysis report*.

AROS. Alterable read-only storage.

ASCII. See *American National Standard Code for Information Interchange*.

ASP. See *auxiliary storage pool*.

Attended IPL. An initial program load that allows you to manually control how the system does an IPL and how the system runs, by changing configuration options from the display.

authorized program analysis report (APAR). A request for correction of a defect in a release of an IBM-supplied program.

auxiliary storage pool (ASP). A group of disk units defined from the auxiliary storage devices. See also *system ASP* and *user ASP*.

AXLT. Alternate translate table.

basic assurance test. An automatic test(s) to test the I/O processor.

BAT. See *basic assurance test*.

BBCb. Addressing scheme for the bus (BB), card (C), and board (b).

BBU. Battery backup unit.

browse. To look at records in a file. To rapidly scan information on the screen of a visual display unit by vertical scrolling.

BSC. Binary synchronous communications. A form of telecommunication line control that uses a standard set of transmission control characters and control character sequences, for binary synchronous transmission of binary coded data between stations.

BTM. Bus transport message.

bundle. A group of things fastened together for convenient handling.

card enclosure. The area that contains the logic cards.

CCITT. The International Telegraph and Telephone Consultative Committee.

CD. Controller description.

CE area. The name of a reserved area on disk used for analyzing hardware.

characters per inch (cpi). The number of characters printed horizontally within an inch across a page.

checksum. A utility that writes data in a sector for error detection purposes.

collision wrap. A method of testing the power, ground, and signal lines on the interface of an Ethernet

adapter. This test requires the use of specialized wrap connectors.

concurrent maintenance. The process of removing or replacing disk unit hardware while the system is in use.

configure. To describe to a system the devices, optional features, and programs installed on the system.

confirm. To remove doubt about any authoritative act or indisputable fact.

cryptography. A method of transforming customer data to conceal its meaning. Cryptographic services include data encryption and message authentication.

cpi. See *characters per inch*.

DASD. Direct access storage device.

dc. Direct current.

DDI. distributed data interface. The term *DDI* is used to represent all LAN types based on the fiber distributed data interface (FDDI) specifications, regardless of the media used (optical fiber, copper, or shielded twisted pair).

DE. See *disk enclosure*.

debug. To check diagnose and eliminate errors in programs.

dedicated service tools (DST). The part of the service functions used to service the system when the operating system is not working.

defect. An imperfection that impairs worth or utility.

detent. A device used to restrict motion.

DFCI. Disk file control interface.

disk enclosure. The part of a disk unit that contains the read and write heads, the magnetic disks, and the actuators.

download. To transfer data from a processing unit to an attached device, such as a microcomputer, for processing.

DST. See *dedicated service tools*.

duct. A pipe, tube, or channel that conveys a substance.

EBCDIC. See *extended binary-coded decimal interchange code*.

EPO. Emergency power-off.

ESD. Electrostatic discharge.

ERAP. See *error recording analysis procedure*.

error recording analysis procedure (ERAP). An IBM-supplied program that processes and records errors related to the devices (disk, for example) of the system.

extended binary-coded decimal interchange code. A coded character set of 256 eight-bit characters.

fault. An accidental condition that causes a functional unit to fail to perform its required function.

fax. To transmit an image using a telephone system and facsimile machines.

facsimile machine. A functional unit that converts images to signals (from a telephone system) or that converts received signals back to images.

fiber optics. The technology of guiding optical power (light) through thin, transparent strands (fibers) that are made of glass, fused silica, or plastic.

frame. A general term which refers to a rack or expansion unit.

frame relay. A protocol for routing frames through the communications network.

FRU. Field-replaceable unit.

GND. Ground (electrical).

HLIC. Horizontal Licensed Internal Code.

HDLC. High-level data link control.

ID. Identification.

IDLC. Integrated Services Digital Network Data Link Control

I/O. See *input/output*.

initial program load (IPL). The process that loads the system programs from the system auxiliary storage, checks the system hardware, and prepares the system for user operations.

intermittent. Occurring or appearing in interrupted sequence.

input/output. Data provided to the computer or data resulting from computer processing.

input/output processor. One or more circuits that process programmed instructions, and controls one or more input/output devices or adapters.

IOA. Input/output adapter.

IOP. See *input/output processor.*

IORM. Input/Output Request Message

IPCF. Interprocess Communications Facility

IPI-3. The IBM implementation of the proposed ANSI/X3T9.3 standard defining the electrical, data link protocol, and functional interface.

IPL. See *initial program load.*

ISMD tapes. IBM distribution tapes.

ISL. Initial self load.

ISND. Integrate Services Digital Network

isolation. See *problem isolation procedure.*

kVA. Kilovolt amperes; a measure of electrical power.

LAN. See *local area network.*

LED. Light-emitting diode.

local area network. The physical connection that allows transfer of information among devices that are on the same premises.

license. A permission granted by competent authority to engage in a business or occupation or in an action otherwise unlawful.

LID. Line Isolation Device

load source. The disk unit that contains the Licensed Internal Code for the system.

logo. An identifying statement.

LP. licensed program.

machine interface (MI). The instruction set that tells the computer how to operate.

MED. Machine exception data.

med data. See *MED.*

media. Any storage type device.

mirrored protection. A function that protects data by duplicating all disk unit data on one storage unit in an auxiliary storage pool to another storage unit within the same auxiliary storage pool.

MRJE. See *multi-leaving remote job entry.*

MSIOP. Magnetic storage device input/output processor.

MTR. Machine trouble report.

multi-leaving remote job entry (MRJE). The fully synchronized, two-directional transmission of a variable number of data streams between two computers using binary synchronous communications.

OEM. Original equipment manufacturer.

OLC. Operation load complete.

overview. A general survey or summary.

PAR. Online problem analysis and resolution.

PCC. Power control compartment.

pin count. A count of the number of times a page is marked in use. A page in use is held in main storage.

PIP. See *problem isolation procedure.*

planar. A circuit board that other cards plug into.

PM. Preventive maintenance.

PMR. Problem management report.

pool. (1) A readily available supply. (2) A designated place to store data.

port. System hardware where the input/output devices are attached.

problem analysis. The process of finding the cause of a problem.

problem isolation procedure. Written information used by service representatives to repair IBM equipment. A PIP contains questions and procedures that direct the user to the failing part of the equipment.

protocol. A set of rules controlling the communication and transfer of data between two or more devices (or systems) in a communications network.

PSP. Preventive service planning.

PTF. Program temporary fix. A temporary solution to, or bypass of, a defect in a licensed program.

RAS. Reliability, availability, serviceability.

RCP. Rack control power.

RCTT. Reference code translation table.

reallocate. To allocate again.

replace. To exchange; for example, to exchange one part with another.

request/response unit (RU). A combined term to identify a request unit or a response unit.

restore. To return to an original value or image; for example, to restore data to main storage from auxiliary storage.

RLSD. Received line signal detector.

RPQ. Request for price quotation

SAVSYS tape. Recorded and saved system data tape generated by the SAVSYS command.

SCS. See *SNA character string*.

SCSI. small computer system interface.

SDLC. Synchronous Data Link Control data to be sent on the logical unit-to-logical unit (LU-to-LU) session.

shadow log. A duplicate of the error log that is maintained by Vertical Licensed Internal Code.

sign on. The procedure by which the user starts a terminal session.

SNA. See *Systems Network Architecture*.

SNA character string (SCS). A data stream composed of EBCDIC controls, optionally intermixed with end-user data, which is carried within a request/response unit.

SPCN. See *system power control network*.

SRC. See *system reference code*.

SRM. System Resource Manager

SST. See *system service tool*.

storage management recovery. A function that prepares the system to access data from all disk units configured to the system.

subfunction. A set of functions that are contained in a specific function. about a record.

subrecord control byte (SRCB). A control character used to provide additional information about a record.

subset. A set of elements that are part of a specified set.

system ASP. The auxiliary storage pool where system programs and data reside. It is the storage pool used if a storage pool is not defined by the user. See also *auxiliary storage pool* and *user ASP*.

system power control network. An asynchronous serial communications network that connects the power system in participating components to the operating system.

system reference code. A group of characters that identifies the machine status or a specific error condition. The system reference code can be displayed on the control panel or from the console (problem log).

system service tool. The part of the service functions used to service the system while it is running.

Systems Network Architecture. The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through and controlling the configuration and operation of networks.

task. One or more sequences of instructions treated by a control program as an element of work to be accomplished. The basic unit of work from the standpoint of a control program.

Unattended IPL. An initial program load that is done automatically by the system after the system power is on.

UEPO. Unit emergency power off.

upgrade. To change or add to the system; to add devices, features, or programs.

uninterruptible power supply. A source of power from a battery installed between commercial power and the system that keeps the system running, if a commercial power failure occurs, until it can complete an orderly end to system processing.

URC. Unit reference code.

user ASP. One or more auxiliary storage pools used to isolate journals, journal receivers, and save files from the other system objects stored in the system ASP. See also *auxiliary storage pool* and *system ASP*.

Vertical Licensed Internal Code. Programming that defines logical operations on data.

vital product data. A structured description of a device or program. For devices, it is recorded in the device at manufacture and includes at least the type, model, serial number, and installed features. It may include the manufacturer's ID and other fields. For programs, it is compiled as a data area accompanying the program and includes the name of the licensed program or Licensed Internal Code group; the release and modification; the program module names, the national language or languages selected, and possibly other fields. Vital product data is transferred from the device to the system and retained for display. Vital product data is also visible on the device name plate or a similar tag.

VLIC. See *Vertical Licensed Internal Code*.

volume table of contents (VTOC). An area on a disk or diskette that describes the location, size, and other characteristics of each file, library, and folder on the disk or diskette.

VPD. See *vital product data*.

VTOC. See *volume table of contents*.

workstation input/output processor. An I/O processor card in the card enclosure that provides the direct connection of local workstations to the system.

WSIOP. See *workstation input/output processor*.

X.25. In data communications, a specification of the CCITT that defines the interface to an X.25 (packet-switching) network.

Bibliography

See the following for more information:

- *Backup and Recovery – Advanced*, SC41-3305.
- *Backup and Recovery – Basic*, SC41-3304.
- *CL Reference*, SC41-3722.
- *Communications Configuration*, SC41-3401.
- *Programming: Command Reference Summary*, SC21-8076.
- *Local Area Network Support*, SC41-3404.
- *Physical Planning Reference*, SA41-3109.
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- *Diagnostic Aids – Volume 1*, LY44-3900.
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- *9406 Models Bxx-Fxx Problem Analysis*, SY44-3931.
- *9406 Models Bxx-Fxx Repair and Parts*, SY44-3932.
- *9406 Models Bxx-Fxx Installation and Upgrade*, SY44-3930.
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- *9404 Models Bxx-Fxx Repair and Parts*, SY44-3922.
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- *9402 Models 1xx and Axx-Fxx Installation and Upgrade*, SY44-3910.
- *System Operation*, SC41-3203.
- *System Startup and Problem Handling*, SC41-3206.
- *Twinaxial Cabling Troubleshooting Guide*, SY31-0703.
- *Port Tester Use*, SA41-3136.

For information regarding other units attached to the system, see the service information for the specific unit.

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